

MICROMODULE SWITCH DOUBLE

QUICK INSTALLATION GUIDE v1.7

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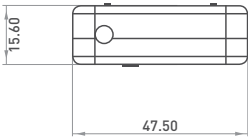
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ELECTROMAGNETIC COMPATIBILITY

When operated according to manufacturer instructions, the product complies with all applicable CE harmonised standards from EMC Directive 2004/108/EC and Part 15 of the FCC Rules. The connections conducting HF signals must not be damaged or altered in any way by the user.

1.



PACKAGE CONTENT

| | |
|-----|---------------------------|
| 1PC | Micromodule Switch Double |
| 1PC | Quick Installation Guide |

FEATURES

- Slim, compact remote Z-Wave module switches and controls all parameters of power that your electrical appliances consume.
- Voltage, Current, Power factor, Instant power wattage and Accumulated power report
- Resistive load 1500W x 2
- Zero-crossing switch
- Higher output power enhances communication range(+2.5dBm output power compared to -2.5dBm 300 series)
- New Z-Wave 500 series chip supports multichannel operation and higher data rates (9.6/40/100kbps)
- Overload protection
- Auto reports wattage when variation exceeds 5%
- Very low power power consumption
- Over-the-air firmware update
- Easy installation

SPECIFICATION

| | |
|--------------------------------|--------------------------------------|
| TECHNICAL SPECIFICATION | |
| Protocol | Z-Wave Plus |
| Operating voltage | 100-240VAC |
| Maximum load | 6.5A(230VAC/120VAC) [Resistive load] |
| Operating temperature | 0°C - 40°C |

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LED INDICATION

| State Type | LED Indication |
|------------|---|
| Normal | Whatever we switch On/Off on the Micromodule by S1 S2 or On/Off button or RF command, the LED will light up for 1 second. |
| No node ID | Under normal operation, when the Micromodule has not been allocated a node ID, the LED flashes on and off alternately at 2-second intervals. By pressing S1 S2 or On/Off button, it will stop flashing temporarily. |
| Learning | When Micromodule is in learning mode, LED flashes on and off alternately and repeatedly at 0.5 second intervals. |
| Overload | When overload state occurs, the Micromodule is disabled of which LED flashes on and off alternately at 0.2 second intervals. Overload state can be cleared by disconnect and reconnect the Micromodule to the main power. |

ADDING TO Z-WAVE NETWORK

In the front casing, there is an on/off button with LED indicator below which is used to toggle Micromodule on and off or carry out inclusion, exclusion, reset or association. When first power is applied, LED repeatedly flashes in 0.5-second intervals. It implies that it has not been assigned a node ID and starts auto inclusion.

AUTO INCLUSION

The function of auto inclusion will be executed as long as the main power is applied and it is connected to the main power.

Note: Auto inclusion timeout is 2 minutes during which the node information of explorer frame will be emitted once every several seconds. Unlike "inclusion" function as shown in the table below, auto inclusion doesn't require pressing on/off buttons on the Micromodule.

The table below lists an operation summary of basic Z-Wave functions. Please refer to the instructions for your Z-Wave Primary Controller to access the Setup function, and to include/exclude/associate devices.

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TAKE CARE OF YOUR SAFETY

Display extreme caution when using ladders or steps, please follow manufacturer's instructions. Be careful when using hand and power tools and follow the manufacturer's guidelines when using them. Take care that the correct tools are used. Wear goggles or protective clothing where required.

DANGER RISK OF ELECTROCUTION

All work on the device should only be carried out by trained and skilled electricians. Observe the country-specific regulations.

DANGER RISK OF FATAL INJURY FROM ELECTRIC CURRENT.

The device has no basic insulation and must therefore be installed in a way that protects against accidental contact.

DANGER RISK OF FATAL INJURY FROM ELECTRIC CURRENT.

When installing a wall plate, the distance between the cover's fixing brackets or screws and the connections of the flush-mounted MicroModule Switch Double must be at least 4 mm once installed. If the distance is less than 4 mm, a deeper installation box must be used. The fixing brackets or screws of the cover do not press against the housing. Only insulated tools may be used for operation on the device, e.g. an insulated phase tester.

CAUTION

The connected devices and the flush-mounted receiver can become damaged if devices are operated that do not correspond to the technical specifications (see technical data).

INTRODUCTION

This product can be operated in any Z-Wave network with other Z-Wave certified devices from other manufacturers. All non-battery operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network. Micromodule Switch Double is a transceiver which is a Z-Wave Plus enabled device and is fully compatible with any Z-Wave enabled network. Mini size design allow the module to be easily hidden into the wall box which is good for the house decoration.

There are many kinds of application for using the module to switch AC power ON and OFF, one of which is the light control. The new smart

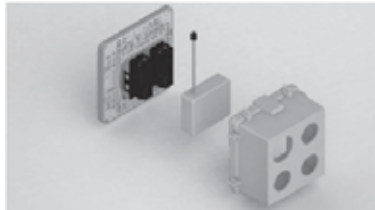
2.

| | |
|--------------------|---|
| Range | Minimum 30m indoor / 70m outdoor |
| Weight | 39g |
| Dimensions | 46mm x 15mm x 39mm |
| Package weight | 68g |
| Package dimensions | 67mm x 22mm x 162mm |
| Regulations | EMC 2004/108/EC, R&TTE 1995/5/EC, LVD 2006/95/EC, FCC PART 15 |
| Warranty | 1 year |

MODELS AND FREQUENCIES

| | |
|----------------|--------------------------------------|
| Australia | ph-pan04.au / 919.80 MHz, 921.40MHz |
| European Union | ph-pan04.eu / 868.40 MHz, 869.85 MHz |
| India | ph-pan04.in / 865.20MHz |
| Israel | ph-pan04.is / 916.00 MHz |
| Russia | ph-pan04.ru / 869.00 MHz |
| United States | ph-pan04.us / 908.40 MHz, 916.00 MHz |

INSTALLATION AND OPERATION



- Put the in wall Micromodule into a wall box and connect the AC power wire L,N to Micromodule's connector L, N.
- Connect the Micromodule to the switch as shown in picture
- To manually turn ON the Micromodule, press and release the On/Off button. The LED will light ON for 1 second, and the load plugged into the Micromodule will also turn ON.
- To manually turn OFF the Micromodule, simply press and release the On/Off button. The LED will light ON for 1 second and the load plugged into the Micromodule will turn OFF

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| Function | Description | LED Indication |
|------------|--|---|
| No node ID | The Z-Wave Controller does not allocate a node ID to the Micromodule. | 2-second on, 2-second off |
| Inclusion | Have Z-Wave Controller entered inclusion mode by following the instructions provided by the controller manufacturer. | One press one flash |
| | Pressing INCLUDE_BUTTON threetimes within 2 seconds will enter inclusion mode. | |
| Exclusion | Have Z-Wave Controller entered exclusion mode by following the instructions provided by the controller manufacturer. | One press one flash |
| | Pressing INCLUDE_BUTTON three times within 2 seconds will enter exclusion mode. | |
| Reset | Node ID has been excluded. | 0.5-second on, 0.5-second off |
| | Pressing INCLUDE_BUTTON three times within 2 seconds will enter inclusion mode. | One press one flash (Use this procedure only in the event that the primary controller is lost or otherwise inoperable.) |
| | Within 1 second, press On/Off button again for 5 seconds until LED is off. | |
| | IDs are excluded. | 0.5-second on, 0.5-second off |
| | Including a node ID allocated by Z-Wave Controller means inclusion. Excluding a node ID allocated by Z-Wave Controller means exclusion. Failed or success in including/excluding the node ID can be viewed from the Z-Wave Controller. | |

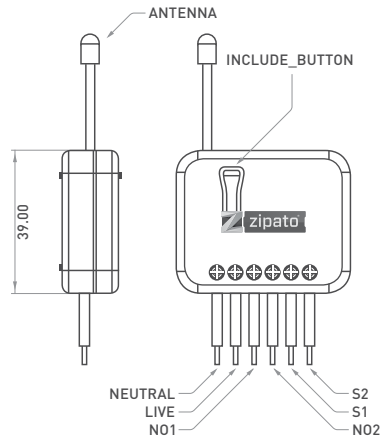
Sometimes, people find it hard to execute exclusion or inclusion especially when Micromodule is already installed in a wall box. To solve this issue, Micromodule supports a special feature that can use S1 or S2 to execute "exclusion, inclusion, Reset or Association" during first 3 minutes when connected to the main power for first time.

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relay calibration technology can reduce the inrush current caused by the load and let the module work perfectly with many kinds of light like incandescent, fluorescent and LED light. This Micromodule is able to detect Instant power wattage and overload wattage (current 7.5A) of connected light or appliances. When detecting overload state, the switch will be disabled and its ON/OFF button will be locked during which LED will flash repeatedly. Unplugging and reconnecting the Module will reset its overload condition to normal status.

OVERVIEW

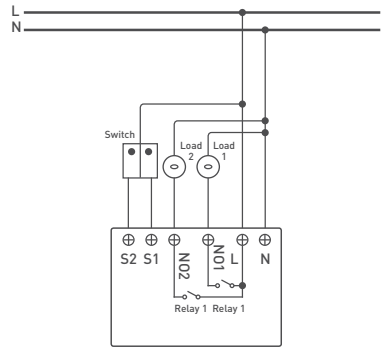
FIGURE 1
Dimensions (unit: mm)



3.

APPLICATION

- In Wall Switch 2 relay; 1A Type



CHOOSING A SUITABLE LOCATION

- Do not locate the Micromodule facing direct sunlight, humid or dusty place.
- The suitable ambient temperature is 0°C-40°C.
- Do not locate the Micromodule where exists combustible substances or any source of heat, e.g. fires, radiators, boiler etc.
- After putting it into use, Micromodule's casing can become little hot on touch which is normal operation.

PROGRAMMING

1 | BASIC COMMAND CLASS / BINARY SWITCH COMMAND CLASS

Micromodule will respond to BASIC and BINARY commands that are part of the Z-Wave system.

1.1 | BASIC_GET / BINARY_SWITCH_GET

Since the switch have two relay, the Micromodule will report its ON/OFF state to the Controller by setting Configuration parameter 3.

| | |
|---------------------------------------|--|
| Configuration parameter 3=1 | Report ON when relay 1 ON Report OFF when relay 1 OFF |
| Configuration parameter 3=2 | Report ON when relay 2 ON Report OFF when relay 2 OFF |
| Configuration parameter 3=3 (default) | Report ON when either relay 1 ON or relay 2 ON Report OFF when both relay 1 and relay 2 OFF |

Basic Get Command: [Command Class Basic, Basic Get]

Basic Report Command:
Report OFF: [Command Class Basic, Basic Report, Value = 0(0x00)]
Report ON: [Command Class Basic, Basic Report, Value = [255](0xFF)]

Binary Switch Get Command: [Command Class Switch Binary, Switch Binary Get]

Binary Switch Report Command:
Report OFF: [Command Class Switch Binary, Switch Binary Report, Value = 0(0x00)]
Report ON: [Command Class Switch Binary, Switch Binary Report, Value = [255](0xFF)]

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1.2 | BASIC_SET / SWITCH_BINARY_SET

Since the switch have two relays, the load attached to the Micromodule will turn on or off upon receipt of the following commands from a Z-Wave Controller by setting Configuration parameter 3.

| | |
|---------------------------------------|--|
| Configuration parameter 3=1 | Switch ON and OFF of relay 1 |
| Configuration parameter 3=2 | Switch ON and OFF of relay 2 |
| Configuration parameter 3=3 (default) | Switch ON and OFF both relay 1 and relay 2 |

[Command Class Basic, Basic Set, Value = 1-99, 255[0xFF)]: the load attached to the Micromodule turns on.

[Command Class Basic, Basic Set, Value = 0[0x00)]: the load attached to the Switch turns off.

[Command Class Switch Binary, Switch Binary Set, Value = 1-99, 255[0xFF)]: the load attached to the Switch turns on.

[Command Class Switch Binary, Switch Binary Set, Value = 0[0x00)]: the load attached to the Micromodule turns off.

2 | Z-WAVE'S GROUPS (ASSOCIATION COMMAND CLASS VERSION 2)

Micromodule can be set to send reports in order to control associated Z-Wave devices. It supports 3 association groups which every group has one node support. Group1-Group3 support SWITCH_BINARY_REPORT, METER_REPORT_COMMAND_V3 For group 1, Micromodule will report (1) ON/OFF status of Relay1 and Relay2 (2) Instant Power Consumption [Watt] of Relay1 and Relay2 (3) Accumulated Power Consumption [KWh] of Relay1 and Relay2 to Z-Wave Controller.

For group 2, Micromodule will report (1) ON/OFF status of Relay1 (2) Instant Power Consumption [Watt] of Relay1 (3) Accumulated Power Consumption [KWh] of Relay1 to Z-Wave Controller.

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2.2.3 | CLEARING ACCUMULATED POWER CONSUMPTION

If you want to reset accumulated power consumption, you can use Meter Reset Command to clear it.

Meter Reset Command: [Command Class Meter, Meter Reset]

2.2.4 | AC LOAD VOLTAGE (V)

When receiving Meter Get Command, it will report Meter Report Command to the requested node. Meter Get Command: [Command Class Meter, Meter Get, Scale =0x04[V].

Meter Report Command: [Command Class Meter, Meter Report, Rate Type =0x01, Meter Type =0x01, Precision = 1, Scale =0x04, Size = 2. Meter Value[V].

Example:

Scale = 0x04 [V]
Precision = 1
Size = 2 (2 Bytes of V)
Meter Value 1 = 0x09[V]
Meter Value 2 = 0x10[V]
AC Load Voltage = [Meter Value 1*256] +[Meter Value 2]= 230.5 [V]

2.2.5 | AC LOAD CURRENT (I)

When receiving Meter Get Command, it will report Meter Report Command to the requested node.

Meter Get Command: [Command Class Meter, Meter Get, Scale =0x05[I].

Meter Report Command: [Command Class Meter, Meter Report, Rate Type =0x01, Meter Type =0x01, Precision = 2, Scale =0x05, Size = 2, Meter Value[I].

Example:

Precision = 2
Size = 2 (2 Bytes of I)
Meter Value 1 = 0x01[I]
Meter Value 2 = 0x21[I]
AC Load current = [Meter Value 1*256] +[Meter Value 2]= 2.89 [A]

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- Command =0x01
- [Switch_Binary_Set =0x01]
- Parameter 1 =0x00
- [ON=0xFF, OFF=0x00]

2.3.3 | METER_SUPPORTED_GET

This command is to ask the endpoint of Switch which kind of meter data can be reported.

Below example shows how to get the meter report type:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x1
- this is the endpoint of command owner here we assume endpoint is 1, if the owner doesn't support multi Channel this value will be 0
- [Bit Address+Destination End Point = 0x03]
- [Bit Address=0; Destination End Point range1-3]
- Command Class =0x32
- [Command_Class_Meter_V3 =0x32]
- Command =0x03
- [Meter_Supported_Get =0x03]

Below is the example show Switch report to last command:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x03
- [Bit Address+Destination End Point = 0x01]
- Command Class =0x32
- [Command_Class_Meter_V3 =0x32]
- Command =0x04
- [Meter_Supported_Report =0x04]
- Parameter 1 =0x81
- [Meter_Reset=1, Meter Type=0x01]
- Parameter 2 =0x75
- [Scale Supported = KWh+W+V+A+Power Factor =0x75]

2.3.4 | METER_RESET

This command is to reset the Accumulated Power Consumption [KWh] to 0.

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For group 3, Micromodule will report (1) ON/OFF status of Relay2 (2) Instant Power Consumption [Watt] of Relay2 (3) Accumulated Power Consumption [KWh] of Relay2 to Z-Wave Controller.

2.1 | AUTO REPORT TO GROUPING 1 ~3 (MAXIMUM NODE 1)

2.1.1 | ON/OFF EVENT REPORT

When "on" or "off" state has been changed by pressing S1, S2 or on/off button, it will send Binary Switch Report to the nodes of Group1-3.

Binary Switch Report:

ON:[Command Class Switch Binary, Switch Binary Report, Value=255[0xFF)
OFF:[Command Class Switch Binary, Switch Binary Report, Value=0[0x00]

2.1.2 | INSTANT POWER CONSUMPTION VARY OVER 5% REPORT

When the power consumption of load vary over 5%, it will send Meter report to the nodes of Group.

[Command Class Meter, Meter Report, Rate Type =0x01, Meter Type =0x01, Precision = 1, Scale =0x02, Size =4, Meter Value[W]]

2.1.3 | OVERLOAD ALARM REPORT COMMAND

When Micromodule detects the overload , it will send Alarm Report to the corresponding Group.

The content of Alarm Report:

Alarm report command: [Command_Class_Alarm, Alarm_Report, Alarm Type =0x08, Alarm Level =0xFF]

2.2 | RESPONSE TO METER GET COMMAND

Micromodule will report its (1) instant Power Consumption [Watt] or (2) accumulated power consumption(KWh) or (3) AC load Voltage [V] or (4) AC load current [I] (5) load power factor (PF) to Z-Wave Controller after receive the Meter Get Command from Z-Wave Controller.

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2.2.6 | LOAD POWER FACTOR (PF)

When receiving Meter Get Command, it will report Meter Report Command to the requested node.

Meter Get Command: [Command Class Meter, Meter Get, Scale =0x06[PF]]

Meter Report Command: [Command Class Meter, Meter Report, Rate Type =0x01, Meter Type =0x01, Precision = 2, Scale =0x06, Size = 1 Bytes, Meter Value[PF]]

Example:

Scale = 0x06 (PF)
Precision = 2
Size = 1 (1 Byte of PF)
Meter Value 1 = 0x63[PF] [It means that the load power factor is 0.99]

2.3 | MULTI CHANNEL COMMAND CLASS VERSION 3

Micromodule also supports multi channel command class(version 3), which includes BINARY_SWITCH_GET, BINARY_SWITCH_SET, METER_SUPPORTED_GET, METER_RESET, METER_GET

You may control or get report from 3 endpoints of Micromodule.

2.3.1 | BINARY_SWITCH_GET

You may get the ON/OFF state from every endpoint, when endpoint set to 1, Micromodule will reply state of Relay1. If endpoint set to 2, Micromodule will reply state of Relay2. If endpoint set to 3, Micromodule will reply ON [0xFF] when either Relay 1 or Relay2 is ON, report OFF [0x00] when both Relay 1 and Relay2 are OFF.

Below example shows a source endpoint 5 send a Get command to Micromodule endpoint 3:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x05
- this is the endpoint of command owner here we assume endpoint is 5, if the owner doesn't support multi Channel this value will be 0

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The example show how to reset the KWh:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x03
- this is the endpoint of command owner, here we assume endpoint is 3, if the owner doesn't support multi Channel this value will be 0
- [Bit Address+Destination End Point = 0x01]
- [Bit Address=0; Destination End Point range1-3]
- Command Class =0x32
- [Command_Class_Meter_V3 =0x32]
- Command =0x05
- [Meter_Reset =0x05]

2.3.5 | METER_GET

Using meter get command to get the KWH,W,V,I,PF from endpoint of Switch.

Example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x05
- this is the endpoint of command owner, here we assume endpoint is 5, if the owner doesn't support multi Channel this value will be 0
- [Bit Address+Destination End Point = 0x03]
- [Bit Address=0; Destination End Point range1-3]
- Command Class =0x32
- [Command_Class_Meter_V3 =0x32]
- Command =0x01
- [Meter_Get =0x01]
- Parameter 1 =0x00
- [Scale = KWh =0x00]

Accumulated power consumption [KWh] Report example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x03
- [Meter report =Endpoint3]
- [Bit Address+Destination End Point = 0x05]
- [Bit Address=0; Destination End Point = command owner Endpoint value]

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2.2.1 | INSTANT POWER CONSUMPTION (WATT) OF MICROMODULE

When receiving Meter Get Command, it will report Meter Report Command to the node asked.

Meter Get Command: [Command Class Meter, Meter Get, Scale =0x02[W]]

[Command Class Meter, Meter Report, Rate Type =0x01, Meter Type =0x01, Precision = 1, Scale =0x02, Size = 4, Meter Value[W]]

Example:

Meter Value 1 = 0x00 [W]
Meter Value 2 = 0x00 [W]
Meter Value 3 = 0x03 [W]
Meter Value 4 = 0xEA [W]
Meter[W] = Meter Value 3 *256 + Meter Value 4 = 100.2W

2.2.2 | ACCUMULATED POWER CONSUMPTION (KW/H)

When receiving Meter Get Command, it will report Meter Report Command to the node asked.

Meter Get Command: [Command Class Meter, Meter Get, Scale =0x00 KW/h]]

[Command Class Meter, Meter Report, Rate Type =0x01, Meter Type =0x01, Precision = 2, Scale =0x00, Size = 4, Meter Value [KWh]]

Example:

Scale = 0x00 [KWh]
Precision = 2
Size = 4 Bytes [KW/h]
Meter Value 1 = 0x00[KWh]
Meter Value 2 = 0x01[KWh]
Meter Value 3 = 0x38[KWh]
Meter Value 4 = 0xA3[KWh]

Accumulated power consumption [KW/h] = [Meter Value 2*65536] + [Meter Value 3*256] + [Meter Value 4] = 800.35 [KW/h].

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- [Bit Address+Destination End Point = 0x03]
- [Bit Address=0, Destination End Point range from 1-3]
- Command Class =0x25
- [Command_Class_Switch_Binary =0x25]
- Command =0x02
- [Switch_Binary_Get =0x02]

Below is the example show Micromodule report to last command:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x03
- Since the endpoint is 3 so Micromodule will reply ON[0xFF] either Relay 1 or Relay2 is ON, report OFF [0x00] when both Relay 1 and Relay2 OFF
- [Bit Address+Destination End Point = 0x05]
- [Bit Address=0; Destination End Point]
- Command Class =0x25
- [Command_Class_Switch_Binary =0x25]
- Command =0x03
- [Switch_Binary_Reportet =0x3]
- Parameter 1 =0xFF
- [ON=0xFF, OFF=0x00]

2.3.2 | BINARY_SWITCH_SET

By using BINARY_SWITCH_SET Command of Multi Channel Command Class Encapsulation Command, you can switch both Relay1 and Relay2 ON/OFF by setting endpoint to 1 or switch Relay1 ON/OFF by setting endpoint to 2 or switch Relay2 ON/OFF by setting endpoint to 3.

Below command example shows switching off relay1 of the Micromodule:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x01
- this is the endpoint of command owner, here we assume endpoint is 1, if the owner doesn't support multi Channel this value will be 0
- [Bit Address+Destination End Point = 0x01]
- [Bit Address=0; Destination End Point range1-3]
- Command Class =0x25
- [Command_Class_Switch_Binary =0x25]

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- Command Class =0x32
- [Command_Class_Meter_V3 =0x32]
- Command =0x02
- [Meter_Report =0x02]
- Parameter 1 =0x21
- [Scale Bit= 0, Rate Type =0x01, Meter Type=0x01]
- Parameter 2 =0x44
- [Precision = 2, Scale Bit1Bit0 = 0, Size = 4]
- Parameter 3; 4 =0x00
- Accumulated Power Consumption =0x00005FD = 15.33 KWh
- Parameter 5 =0x05
- Parameter 6 =0xFD

Get Instant Power Consumption [Watt] from endpoint.

METER_GET example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x05
- this is the endpoint of command owner, here we assume endpoint is 5, if the owner doesn't support multi Channel this value will be 0
- [Bit Address+Destination End Point = 0x03]
- [Bit Address=0; Destination End Point range 1-3]
- Command Class =0x32
- [Command_Class_Meter_V3 =0x32]
- Command =0x01
- [Meter_Get =0x01]
- Parameter 1 =0x10
- [Scale = W =0x02]

Micromodule Power Consumption [W] Report example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point =0x03
- [Meter report =Endpoint3]
- [Bit Address+Destination End Point = 0x05]
- [Bit Address=0; Destination End Point = command owner Endpoint value]
- Command Class =0x32
- [Command_Class_Meter_V3 =0x32]
- Command =0x02

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- [Meter_Report = 0x02]
- Parameter 1 = 0x21
- [Scale Bit2 = 0, Rate Type = 0x01, Meter Type=0x01]
- Parameter 2 = 0x34
- [Precision = 1, Scale Bit1Bit0 = 0x02, Size = 4]
- Parameter 3; 4 = 0x00
- Instant Power Consumption = 0x000003EA = 100.2W
- Parameter 5 = 0x03
- Parameter 6 = 0xEA

Get load voltage V from endpoint

METER_GET example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point = 0x05
- this is the endpoint of command owner, here we assume endpoint is 5, if the owner doesn't support multi Channel this value will be 0
- [Bit Address+Destination End Point = 0x03]
- [Bit Address=0, Destination End Point range 1-3]
- Command Class = 0x32
- [Command_Class_Meter_V3 = 0x32]
- Command =0x01
- [Meter_Get = 0x01]
- Parameter 1 = 0x20
- [Scale = V = 0x04]

Micromodule AC load Voltage example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point = 0x03
- [Meter report = Endpoint3]
- [Bit Address+Destination End Point = 0x05]
- [Bit Address=0, Destination End Point = command owner endpoint value]
- Command Class = 0x32
- [Command_Class_Meter_V3 = 0x32]
- Command =0x02
- [Meter_Report=0x02]
- Parameter 1 = 0xA1
- [Scale Bit2 = 1, Rate Type = 0x01, Meter Type=0x01]
- Parameter 2 = 0x22

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- [Precision = 1, Scale Bit1Bit0 = 0x00, Size = 2]
- Parameter 3 = 0x09
- Voltage = 0x0910 = 232.0V
- Parameter 4 = 0x10

Get load current I from endpoint

Meter_GET example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point = 0x05
- this is the endpoint of command owner, here we assume endpoint is 5, if the owner doesn't support multi Channel this value will be 0
- [Bit Address+Destination End Point = 0x03]
- [Bit Address=0; Destination End Point range 1-3]
- Command Class = 0x32
- [Command_Class_Meter_V3 = 0x32]
- Command =0x01
- [Meter_Get = 0x01]
- Parameter 1 = 0x28
- [Scale = A = 0x05]

Micromodule AC load current (I) example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point = 0x03
- [Meter report = Endpoint3]
- [Bit Address+Destination End Point = 0x05]
- [Bit Address=0, Destination End Point = command owner endpoint value]
- Command Class = 0x32
- [Command_Class_Meter_V3 = 0x32]
- Command =0x02
- [Meter_Report = 0x02]
- Parameter 1 = 0xA1
- [Scale Bit2 = 1, Rate Type = 0x01, Meter Type=0x01]
- Parameter 2 = 0x4A
- [Precision = 2, Scale Bit1Bit0 = 0x01, Size = 2]
- Parameter 3 = 0x00
- Current = 0x002B = 0.43A
- Parameter 4 = 0x2B

20.

Get power factor PF from endpoint

Meter_GET example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point = 0x05
- this is the endpoint of command owner, here we assume endpoint is 5, if the owner doesn't support multi Channel this value will be 0
- [Bit Address+Destination End Point = 0x03]
- [Bit Address=0, Destination End Point range 1-3]
- Command Class = 0x32
- [Command_Class_Meter_V3 = 0x32]
- Command =0x01
- [Meter_Get = 0x01]
- Parameter 1 = 0x30
- [Scale = PF = 0x06]

Micromodule power factor report example:

- COMMAND_CLASS_MULTI_CHANNEL
- MULTI_CHANNEL_CMD_ENCAP
- Source End Point = 0x03
- [Meter report = Endpoint3]
- [Bit Address+Destination End Point = 0x05]
- [Bit Address=0, Destination End Point = command owner endpoint value]
- Command Class = 0x32
- [Command_Class_Meter_V3 = 0x32]
- Command =0x02
- [Meter_Report = 0x02]
- Parameter 1 = 0xA1
- [Scale Bit2 = 1, Rate Type = 0x01, Meter Type=0x01]
- Parameter 2 = 0x51
- [Precision = 2, Scale Bit1Bit0 = 0x10, Size = 1]
- Parameter 3 = 0x63
- Power Factor = 0x63 = 0.99

21.

Z-WAVE CONFIGURATION

| Configuration Parameter 1 | | |
|---------------------------|-------------|---------------------|
| Function | Size (byte) | Value |
| Watt Meter Report Period | 2 | 0x01-0x7FFF |
| Unit | Default | Description |
| 5s | 720 | 5*720s=3600s=1 hour |

| Configuration Parameter 2 | | |
|---------------------------|-------------|-----------------|
| Function | Size (byte) | Value |
| KWH Meter Report Period | 2 | 0x01-0x7FFF |
| Unit | Default | Description |
| 10min | 6 | 6*10min= 1 hour |

| Configuration Parameter 3 | | |
|---------------------------|-------------|--|
| Function | Size (byte) | Value |
| Selected End Point | 1 | 1-3 |
| Unit | Default | Description |
| 1 | | 1: Relay1 2: Relay1 3: Relay1 & Relay2 |

| Configuration Parameter 4 | | |
|--|-------------|--|
| Function | Size (byte) | Value |
| Edge or Pulse mode or Edge-Toggle mode | 1 | 1-3 |
| Unit | Default | Description |
| 1 | | 1: Edge mode 2: Pulse mode 3: Edge-Toggle mode |

| Configuration Parameter 5 | | |
|------------------------------------|-------------|-------------|
| Function | Size (byte) | Value |
| Threshold of Watt for Load Caution | 2 | 10-750 |
| Unit | Default | Description |
| 0.01A | 750 | |

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| Configuration Parameter 6 | | |
|-----------------------------------|-------------|-------------|
| Function | Size (byte) | Value |
| Threshold of KWH for Load Caution | 2 | 1-10000 |
| Unit | Default | Description |
| 1KWh | 10000 | |

| Configuration Parameter 7 | | |
|---------------------------|-------------|---|
| Function | Size (byte) | Value |
| Restore switch state mode | 1 | 0-2 |
| Unit | Default | Description |
| 1 | | 0: Switch off 1: Last switch state 3: Switch on |

| Configuration Parameter 8 | | |
|---------------------------|-------------|---|
| Function | Size (byte) | Value |
| Auto off timer | 2 | 0-0x7FFF |
| Unit | Default | Description |
| 1s | 0 | 0: Disable auto off function 1-0x7FFF: 1s - 32767s |

| Configuration Parameter 9 | | |
|---------------------------|-------------|--|
| Function | Size (byte) | Value |
| RF off command mode | 1 | 0-3 |
| Unit | Default | Description |
| | 0 | 0: Switch off 1: ignore 2: Switch toggle 3: Switch on |

| Configuration Parameter 10 | | |
|----------------------------|-------------|--------------------------------------|
| Function | Size (byte) | Value |
| Existence of Endpoint3 | 1 | 1-2 |
| Unit | Default | Description |
| 1 | | 1: Endpoint exist 2: No Endpoint3 |

23.

| Set command | Relay state |
|------------------------------------|-------------------------|
| Basic Set or Binary_Switch_Set ON | Relay1 ON & Relay2 ON |
| Basic Set or Binary_Switch_Set OFF | Relay1 OFF & Relay2 OFF |

| Get command | Relay state | Report to command sender |
|--------------------------------|-------------------------|--------------------------|
| Basic_Get or Binary_Switch_Get | Relay1 ON & Relay2 ON | ON |
| Basic_Get or Binary_Switch_Get | Relay1 OFF & Relay2 OFF | OFF |

| Get command | Parameter | Report sender to command |
|-------------|-----------------|--|
| Meter_Get | KWh | Relay1 KWh1+Relay2 KWh2 |
| Meter_Get | Watt | Relay1 W1+Relay2 W2 |
| Meter_Get | Voltage | Relay1 and Relay2 are the same voltage |
| Meter_Get | Current | Relay1 I1+Relay2 I2 |
| Meter_Get | Power factor PF | Relay1 |

3.4 | EDGE AND PULSE MODE

Manual switch S1 and S2 can set to Edge mode or Pulse mode or Edge-Toggle mode, default value is Edge mode.

3.4.1 | EDGE MODE

This mode is suitable for the bi stable wall switch that has indicator point on the Micromodule, and the same position correspond to same state of relay1 and relay2, if the Switch's relay changes the state because of receiving Z-Wave RF command, it may need two switchings (switch on to off or switch off to on) to let relay back to the corresponding state.

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3.4.2 | PULSE MODE

This mode is suitable for the toggle type wall switch to swap the state of Relay1 or Relay2.

3.4.3 | EDGE-TOGGLE MODE

This mode is suitable for the normal bi-stable switch, every state change of the wall switch will also swap the state of Relay1 or Relay2.

3.5 | THRESHOLD OF WATT FOR LOAD CAUTION

This is a warning when the wattage of load over the preset threshold value, if the setting value is 750, when the load wattage of Relay1 or Relay2 over this value, Micromodule will send Watt Meter Report command to the node of correspond Group, the Range of the setting value is from 10 to 750, and the default value is 750.

3.6 | THRESHOLD OF KWH FOR LOAD CAUTION

This is a warning when the KWh of load exceeds preset threshold value, if the setting value is 1000, when the Accumulated Power Consumption of Relay1 or Relay2 exceeds this value, Micromodule will send KWh Meter Report command to the node of corresponding Group, the Range of the setting value is from 10 to 1000, and the default value is 750.

3.7 | RESTORE SWITCH STATE MODE

Whenever the AC power return from lost, Micromodule will restore the switch state which could be SWITCH OFF, LAST SWITCH STATE, SWITCH ON. The default setting is LAST SWITCH STATE.

3.8 | AUTO OFF TIMER

Whenever Micromodule switches to on, the auto off timer begin to count down. After the timer decrease to zero, it will switch off automatically. However if Auto off timer is set as 0, the auto off function will be disabled. The default setting is 0.

3.9 | RF OFF COMMAND MODE

Whenever a switch off command, BASIC_SET, BINARY_SWITCH_SET, SWITCH_ALL_OFF, is received, it could be interpreted as 4 kinds of commands.

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| Configuration Parameter 14 | | |
|----------------------------|-------------|---|
| Function | Size (byte) | Value |
| Watt Differential | | 0-1 |
| Unit | Default | Description |
| N/A | 0 | Meter Report whenever power consumption vary over 5% 0: Disable 1: Enable |

3.1 | WATT METER REPORT PERIOD

If the setting is configured for 1hour (set value =720), Micromodule will report its instant power consumption every 1 hour to the node of correspond Group. The maximum interval to report its instant power consumption is 45 hours (5s*32767/3600=45hr).

3.2 | KWH METER REPORT PERIOD

If the setting is configured for 1hour (set value =6), Micromodule will report its Accumulated Power Consumption (KWh/h) every 1 hour to the node of correspond Group. The maximum interval to report its Accumulated Power Consumption (KW/h) is 227.55 days (10min*32767/1440=227.55 days).

3.3 | SELECTED RELAY

If Micromodule is not using Multi_Channel command class to access the relay of Switch, you may configure the select value to react the Basic Command Class, Binary Switch Command Class or Meter Command Class V3.

3.3.1 | SELECTED RELAY1:

Only relay1 can be controlled and report.

3.3.2 | SELECTED RELAY2:

Only relay2 can be controlled and report.

3.3.3 | SELECTED RELAY1 AND RELAY2: DEFAULT SELECT IS 3

Both relay1 and relay2 can be controlled and report.

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3.9.1 | SWITCH OFF

It switches to OFF state. The default setting is Switch Off.

3.9.2 | IGNORE

The switch off command will be ignored.

3.9.3 | SWITCH TOGGLE

It switches to the inverse of current state.

3.9.4 | SWITCH ON

It switches to ON state.

3.10 | EXISTENCE OF ENDPOINT3

Multi-Channel Command is a good way to control relay1 and relay2 of Switch individually. The endpoint3 of Micromodule is related to both relay1 and relay2. In some condition it becomes redundant in Multi-Channel Command Class. When the Existence of Endpoint3 is set as 2, the endpoint3 will be disabled. The default value is 1. Endpoint1 and Endpoint2 are fixed, only Endpoint3 is dynamic.

4 | PROTECTION COMMAND CLASSES

Micromodule supports Protection Command Class version 2, it can protect the switch against unintentional control by e.g. a child. And it can also protect the switch from being turned off by setting it in "No RF Control" state. After being set to "Protection by sequence" state, any intentional pressing of On/Off button or S2/S2 should be held for longer than 1 second, or the switch state will not change. However, the operation of learn function will not change, because learning will not be protected.

Z-WAVE COMMAND CLASSES

- * COMMAND_CLASS_ZWAVEPLUS_INFO
- * COMMAND_CLASS_VERSION_V2
- * COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2
- * COMMAND_CLASS_DEVICE_RESET_LOCALLY
- * COMMAND_CLASS_ASSOCIATION_V2
- * COMMAND_CLASS_ASSOCIATION_GRP_INFO
- * COMMAND_CLASS_POWERLEVEL
- * COMMAND_CLASS_SWITCH_BINARY
- * COMMAND_CLASS_BASIC

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- * COMMAND_CLASS_SWITCH_ALL
- * COMMAND_CLASS_ALARM
- * COMMAND_CLASS_SCENE_ACTIVATION
- * COMMAND_CLASS_SCENE_ACTUATOR_CONF
- * COMMAND_CLASS_PROTECTION
- * COMMAND_CLASS_FIRMWARE_UPDATE_MD_V2
- * COMMAND_CLASS_MULTI_CHANNEL_V3
- * COMMAND_CLASS_METER_V3
- * COMMAND_CLASS_CONFIGURATION

OVER THE AIR FIRMWARE UPDATE

Micromodule is based on 500 series SoC and supports Firmware Update Command Class, so it can receive the updated firmware image sent by controller via the Z-wave RF media. It is a helpful and convenient way to improve some function if needed.

TROUBLESHOOTING

■ Micromodule is not working and LED off

- Cause of Failure:
 - The Switch is not connect to the Main power
 - Recommendation:
 - Check power connections
 - Don't open up the Micromodule and send it for repair.
- Micromodule's LED illuminating, but cannot control the ON/OFF switch of the load attached
 - Cause of Failure:
 - Check if the load connect into the Micromodule has its own ON/ OFF switch
 - Recommendation:
 - Set the ON/OFF switch of the load attached to ON
 - Micromodule's LED is illuminating, but the Detector cannot control the Switch
 - Cause of Failure:
 - Not carry out association
 - Same frequency interference
 - Recommendation:
 - Carry out association
 - Wait for a while to re-try
 - LED keep flashing, but cannot control
 - Cause of Failure:
 - Overload occurs

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- Recommendation:
 - Remove the load attached or check max. load cannot exceed 7.5A

Having trouble installing your new product?

Zipato's website contains the latest user documentation and software updates for Zipato products and services: www.zipato.com

You can also find answers in the Zipato Community at: community.zipato.com

Zipato Support: support@zipato.com

LIMITED PRODUCT WARRANTY

⊕ GENERAL TERMS

Nothing in this Limited Product Warranty affects your statutory rights as a consumer.

The Limited Product Warranty set forth below is given by Tri plus grupa d.o.o. (Europe) (herein referred to as "ZIPATO"). This Limited Product Warranty is only effective upon presentation of the proof of purchase. Upon further request by ZIPATO, this warranty card has to be presented, too.

EXCEPT AS EXPRESSLY SET FORTH IN THIS LIMITED WARRANTY, ZIPATO MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. ZIPATO EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED IN THIS LIMITED WARRANTY. ANY IMPLIED WARRANTIES THAT MAY BE IMPOSED BY LAW ARE LIMITED IN DURATION TO THE LIMITED WARRANTY PERIOD. TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES AGAINST ZIPATO. THEY DO NOT, HOWEVER, AFFECT OR RESTRICT THE RIGHTS YOU HAVE AGAINST THE BUSINESS YOU BOUGHT A ZIPATO PRODUCT FROM. IN NO EVENT WILL ZIPATO BE LIABLE FOR LOSS OF DATA OR FOR INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR

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OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE. HOWEVER, NOTHING IN THIS AGREEMENT LIMITS ZIPATO'S LIABILITY TO YOU (I) IN THE EVENT OF DEATH OR PERSONAL INJURY TO THE EXTENT RESULTING FROM ZIPATO'S NEGLIGENCE, OR (II) TO THE EXTENT RESULTING FROM ANY FRAUDULENT MISREPRESENTATION ON THE PART OF ZIPATO, OR (III) TO THE EXTENT ARISING UNDER PART 1 OF THE CONSUMER PROTECTION ACT 1987 OF THE UNITED KINGDOM. SOME STATES OR COUNTRIES DO NOT ALLOW: (1) A DISCLAIMER OF IMPLIED WARRANTIES; (2) A LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS OR THE EXCLUSION; OR (3) LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS. IN SUCH STATES OR COUNTRIES, SOME EXCLUSIONS OR LIMITATIONS OF THIS LIMITED WARRANTY MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS THAT MAY VARY FROM STATE TO STATE OR FROM COUNTRY TO COUNTRY. YOU ARE ADVISED TO CONSULT APPLICABLE STATE OR COUNTRY LAWS FOR A FULL DETERMINATION OF YOUR RIGHTS.

This Limited Product Warranty applies to ZIPATO branded hardware products (collectively referred to as "ZIPATO Hardware Products") sold by ZIPATO (Europe), its European subsidiaries, affiliates, authorized resellers, or country distributors (collectively referred to as "ZIPATO Resellers") with this Limited Product Warranty.

The term "ZIPATO Hardware Product" is limited to the hardware components and all its internal components including firmware. The term "ZIPATO Hardware Product" DOES NOT include any software applications or programs.

⊕ GEOGRAPHICAL SCOPE OF THE LIMITED PRODUCT WARRANTY

This Limited Product Warranty is applicable to Hardware Products sold by Zipato Resellers in all countries listed at the beginning of this document under the heading "Countries in which this ZIPATO Limited Product Warranty applies". The Limited Product Warranty will be honored in any country where ZIPATO or its authorized service providers offer warranty service subject to the terms and conditions set forth in this Limited

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Product Warranty. However, warranty service availability and response times may vary from country to country and may also be subject to registration requirements.

⊕ LIMITATION OF PRODUCT WARRANTY

ZIPATO warrants that the products described below under normal use are free from material defects in materials and workmanship during the Limited Product Warranty Period set forth below ("Limited Product Warranty Period"), if the product is used and serviced in accordance with the user manual and other documentation provided to the purchaser at the time of purchase (or as amended from time to time).

ZIPATO does not warrant that the products will operate uninterrupted or error-free or that all deficiencies, errors, defects or non-conformities will be corrected.

This warranty shall not apply to problems resulting from: (a) unauthorized alterations or attachments; (b) negligence, abuse or misuse, including failure to operate the product in accordance with specifications or interface requirements; (c) improper handling; (d) failure of goods or services not obtained from ZIPATO or not subject to a then-effective ZIPATO warranty or maintenance agreement; (e) improper use or storage; or (f) fire, water, acts of God or other catastrophic events. This warranty shall also not apply to any particular product if any ZIPATO serial number has been removed or defaced in any way.

ZIPATO IS NOT RESPONSIBLE FOR DAMAGE THAT OCCURS AS A RESULT OF YOUR FAILURE TO FOLLOW THE INSTRUCTIONS FOR THE ZIPATO HARDWARE PRODUCT.

⊕ LIMITED PRODUCT WARRANTY PERIOD

The Limited Product Warranty Period starts on the date of purchase from ZIPATO. Your dated sales or delivery receipt, showing the date of purchase of the product, is your proof of the purchase date. You may be required to provide proof of purchase as a condition of receiving warranty service. You are entitled to warranty service according to the terms and conditions of this document if a repair to your ZIPATO branded hardware is required within the Limited Product Warranty Period.

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[Other than in respect of products for domestic use (in particular those listed in the first and last boxes in the table below), this Limited Product Warranty extends only to the original end user purchaser of this ZIPATO Hardware Product and is not transferable to anyone who obtains ownership of the ZIPATO Hardware Product from the original end-user purchaser.

⊕ PRODUCT WARRANTY PERIOD TABLE

| | |
|-------------------------|---------------------------|
| PRODUCT TYPE | Micromodule Switch Double |
| PRODUCT WARRANTY PERIOD | One (1) year |

IMPORTANT

The content of "Product Type" listed above is subject to change; please refer to the www.zipato.com for latest update.

⊕ PERFORMANCE OF THE LIMITED PRODUCT WARRANTY

If a product defect occurs, ZIPATO's sole obligation shall be to repair or replace any defective Zipato Hardware Product free of charge provided it is returned to an Authorized ZIPATO Service Centre during the Limited Warranty Period. Such repair or replacement will be rendered by ZIPATO at an Authorized ZIPATO Service Centre. All component parts or hardware products that are replaced under this Limited Product Warranty become the property of ZIPATO. The replacement part or product takes on the remaining Limited Warranty Period of the replaced part or product. The replacement product need not be new or of an identical make, model or part; ZIPATO may in its discretion replace the defective product (or any part thereof) with any reconditioned equivalent (or superior) product in all material respects to the defective product.

WARRANTOR

Tri plus grupa d.o.o.
Banjaveciceva 11
10 000 Zagreb
CROATIA
TEL +385 (0)1 4004 404
FAX +385 (0)1 4004 405

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DECLARATION OF CONFORMITY



The manufacturer Tri plus grupa d.o.o declares under our sole responsibility that the product:

Marketing model: Micromodule Switch Double
Regulatory model: ph-pan04
Trade/Brand name: Zipato

is in conformity with the Low Voltage Directive 2006/95/EC, EMC Directive 2004/108/EC and R&TTE Directive 1995/5/EC and carries the CE marking accordingly.

The following harmonized standards were applied:

R&TTE (1995/5/EC)

EN 300 220-1: V2.4.1
EN 300 220-2: V2.4.1

EMC (2004/108/EC)

EN 301 489-1: V1.9.2
EN 301 489-3: V1.6.1

LVD (2006/95/EC)

EN 60669-2-1:2004 + A1:2009 + A12:2010 used in conjunction with EN 60669-1:1999 + A1:2002 + A2:2008

Changes or modifications not expressly approved by Tri plus grupa d.o.o. for compliance could void the user's authority to operate the equipment.



THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES.

Operation is subject to the following two conditions:
1 | this device may not cause harmful interference, and
2 | this device must accept any interference received, including interference that may cause undesired operation.

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NOTE: Changes or modifications not expressly approved by Zipato for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

⊕ DISPOSING AND RECYCLING YOUR PRODUCT

When it reaches end of life, dispose of the product according to your local environmental laws, guidelines and regulations.



This symbol on the product or packaging means that according to local laws and regulations needs to be disposed of separately from household waste. Once this product has reached the end of its life, please take it to a collection point (recycle facilities) designated by your local authorities, some will accept your product for free or simply drop it off at your Zipato re-seller store. By recycling the product and its packaging in this manner you help to conserve the environment and protect human health. At Zipato, we understand and are committed to reducing any impact our operations and products may have on the environment.

34.

To minimize this impact Zipato designs and builds its products to be as environmentally friendly as possible, by using recyclable, low toxic materials in both products and packaging.

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