# **IPSO Smart Objects**

Smart Objects Starter Pack 1.0

Internet Protocol for Smart Objects (IPSO) Alliance

Technical Guideline

IPSO Smart Object Committee

July 21, 2014

Copyright 2014

IPSO Alliance

The IPSO Smart Object Framework is based on the object model specified in OMA LightWeight M2M [1] Chapter 6, Identifiers and Resources.

An IPSO Smart Object is a specified collection of reusable resources (See Table 2, Reusable Resources) that has a well-known object ID (See Table 1, Smart Objects) and which represents a particular type of sensor, actuator, or other connected data source. The reusable resources that make up the object represent static and dynamic properties of the connected object.

This document defines a set of IPSO Smart Objects, which conform to the OMA LWM2M Object Model, and which can be used as data objects, or web objects, to represent common sensors, actuators, and data sources.

Although OMA LWM2M is based on the IETF CoAP [2] protocol, these objects may be used with other transport protocols (e.g. HTTP [3] with REST [4]) by adhering to the Content-Types defined in [1].

Table 1 Summarizes the Objects defined by this specification.

Table 1 Smart Objects defined by this specification (\* Temporary values, to be assigned by OMNA)

| **Object** | **Object ID \*** | **Multiple Instances?** |
| --- | --- | --- |
| **IPSO Digital Input** | 3200 | Yes |
| **IPSO Digital Output** | 3201 | Yes |
| **IPSO Analogue Input** | 3202 | Yes |
| **IPSO Analogue Output** | 3203 | Yes |
| **IPSO Generic Sensor** | 3300 | Yes |
| **IPSO Luminosity Sensor** | 3301 | Yes |
| **IPSO Presence Sensor** | 3302 | Yes |
| **IPSO Temperature Sensor** | 3303 | Yes |
| **IPSO Humidity Sensor** | 3304 | Yes |
| **IPSO Power Measurement** | 3305 | Yes |
| **IPSO Actuation** | 3306 | Yes |
| **IPSO Set Point** | 3308 | Yes |
| **IPSO Load Control** | 3310 | Yes |
| **IPSO Light Control** | 3311 | Yes |
| **IPSO Power Control** | 3312 | Yes |
| **IPSO Accelerometer** | 3313 | Yes |
| **IPSO Magnetometer** | 3314 | Yes |
| **IPSO Barometer** | 3315 | Yes |

`

# IPSO Object: Digital Input

Description: This IPSO object is a generic object that can be used with any kind of digital input interface. Specific objects for a given range of sensors are described later in the document, enabling to identify the type of sensors directly from its Object ID. This object may be used as a generic object if a dedicated one does not exist.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Digital Input** | 3200 | urn:oma:lwm2m:ext:3200 | Yes | Generic digital input for non-specific sensors |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Digital**  **Input**  **State** | 5500 | R | No | Mandatory | Boolean |  |  | The current state of a digital input. |
| **Digital Input**  **Counter** | 5501 | R | No | Optional | Integer |  |  | The cumulative value of active state detected. |
| **Digital**  **Input**  **Polarity** | 5502 | R,W | No | Optional | Boolean |  |  | The polarity of the digital input as a Boolean (0 = Normal, 1= Reversed) |
| **Digital Input**  **Debounce Period** | 5503 | R,W | No | Optional | Integer |  | ms | The debounce period in ms. |
| **Digital**  **Input**  **Edge Selection** | 5504 | R,W | No | Optional | Integer | 1-3 |  | The edge selection as an integer (1 = Falling edge, 2 = Rising edge, 3 = Both Rising and Falling edge) |
| **Digital**  **Input**  **Counter**  **Reset** | 5505 | E | No | Optional | Opaque |  |  | Reset the Counter value |
| **Application Type** | 5750 | R,W | No | Optional | String |  |  | The Application type of the input, for example “Motion Closure”. |
| **Sensor Type** | 5751 | R | No | Optional | String |  |  | The type of the sensor (for instance PIR type) |

# IPSO Object: Digital Output

Description: This IPSO object is a generic object that can be used with any kind of digital output interface. Specific object for a given range of sensors is described later in the document, enabling to identify the type of sensors directly from its Object ID. This object may be used as a generic object if a dedicated one does not exist.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Digital Output** | 3201 | urn:oma:lwm2m:ext:3201 | Yes | Generic digital output for non-specific actuators |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Digital Output State** | 5550 | R,W | No | Mandatory | Boolean |  |  | The current state of a digital output. |
| **Digital Output Polarity** | 5551 | R,W | No | Optional | Boolean |  |  | The polarity of a digital ouput as a Boolean (0 = Normal, 1= Reversed) |
| **Application Type** | 5750 | R,W | No | Optional | String |  |  | The application type of the output as a string, for instance, “LED” |

# IPSO Object: Analog Input

Description: This IPSO object is a generic object that can be used with any kind of analog input interface. Specific object for a given range of sensors is described later in the document, enabling to identify the type of sensors directly from its Object ID. This object may be used as a generic object if a dedicated one does not exist.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Analog Input** | 3202 | urn:oma:lwm2m:ext:3202 | Yes | Generic analog input for non-specific sensors |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Analog Input**  **Current Value** | 5600 | R | No | Mandatory | Float | 0-5 | V | The current state of the analog input. |
| **Min Measured**  **Value** | 5601 | R | No | Optional | Float | 0-5 | V | The minimum value measured by the sensor since power ON or reset |
| **Max Measured**  **Value** | 5602 | R | No | Optional | Float | 0-5 | V | The maximum value measured by the sensor since power ON or reset |
| **Min**  **Range**  **Value** | 5603 | R | No | Optional | Float | 0-5 | V | The minimum value that can be measured by the sensor |
| **Max Range**  **Value** | 5604 | R | No | Optional | Float | 0-5 | V | The maximum value that can be measured by the sensor |
| **Reset Min and Max Measured Values** | 5605 | E | No | Optional | Opaque |  |  | Reset the Min and Max Measured Values to Current Value |
| **Application Type** | 5750 | R,W | No | Optional | String |  |  | If present, the application type of the sensor as a string, for instance, “CO2” |
| **Sensor Type** | 5751 | R | No | Optional | String |  |  | The type of the sensor (for instance PIR type) |

# IPSO Object: Analog Output

Description: This IPSO object is a generic object that can be used with any kind of analog output interface. Specific object for a given range of sensors is described later in the document, enabling to identify the type of sensors directly from its Object ID. This object may be used as a generic object if a dedicated one does not exist.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Analog Output** | 3203 | urn:oma:lwm2m:ext:3203 | Yes | Generic analog output for non-specific actuators |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Analog Output**  **Current Value** | 5650 | R,W | No | Mandatory | Float | 0-5 | V | The current state of the analog output. |
| **Application Type** | 5750 | R,W | No | Optional | String |  |  | If present, the application type of the actuator as a string, for instance, “Thermostat” |

# IPSO Object: Generic Sensor

Description: This IPSO object allow the description of a generic sensor. It is based on the description of a value and a unit according to the UCUM specification. Thus, any type of value defined within this specification can be reporting using this object.

Specific object for a given range of sensors is described later in the document, enabling to identify the type of sensors directly from its Object ID. This object may be used as a generic object if a dedicated one does not exist.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Generic Sensor** | 3300 | urn:oma:lwm2m:ext:3300 | Yes | Generic sensor for applications not covered by a specific object type |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Sensor Value** | 5700 | R | No | Mandatory | Float |  | Defined by “Units” resource. | The current value of the sensor. |
| **Units** | 5701 | R | No | Optional | String |  |  | If present, the type of sensor defined as the UCUM Unit Definition e.g. “Cel” for Temperature in Celsius. |
| **Min Measured**  **Value** | 5601 | R | No | Optional | Float |  | Defined by “Units” resource. | The minimum value measured by the sensor since power ON or reset |
| **Max Measured**  **Value** | 5602 | R | No | Optional | Float |  | Defined by “Units” resource. | The maximum value measured by the sensor since power ON or reset |
| **Min**  **Range**  **Value** | 5603 | R | No | Optional | Float |  | Defined by “Units” resource. | The minimum value that can be measured by the sensor |
| **Max Range**  **Value** | 5604 | R | No | Optional | Float |  | Defined by “Units” resource. | The maximum value that can be measured by the sensor |
| **Reset Min and Max Measured Values** | 5605 | E | No | Optional | Opaque |  |  | Reset the Min and Max Measured Values to Current Value |
| **Application Type** | 5750 | R,W | No | Optional | String |  |  | If present, the application type of the sensor as a string, for instance, “CO2” |
| **Sensor Type** | 5751 | R | No | Optional | String |  |  | The type of the sensor (for instance PIR type) |

# IPSO Object: Luminosity

Description: This IPSO object should be used over a luminosity sensor to report a remote luminosity measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the luminosity sensor. The unit used here is Lux (ucum:lx).

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Luminosity** | 3301 | urn:oma:lwm2m:ext:3301 | Yes | Luminosity sensor, units = ucum:lx |

Object info:

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Sensor Value** | 5700 | R | No | Mandatory | Float |  | lx | The current value of the luminosity sensor. |
| **Min Measured**  **Value** | 5601 | R | No | Optional | Float |  | lx | The minimum value measured by the sensor since power ON or reset |
| **Max Measured**  **Value** | 5602 | R | No | Optional | Float |  | lx | The maximum value measured by the sensor since power ON or reset |
| **Min**  **Range**  **Value** | 5603 | R | No | Optional | Float |  | lx | The minimum value that can be measured by the sensor |
| **Max Range**  **Value** | 5604 | R | No | Optional | Float |  | lx | The maximum value that can be measured by the sensor |
| **Reset Min and Max Measured Values** | 5605 | E | No | Optional | Opaque |  |  | Reset the Min and Max Measured Values to Current Value |

# IPSO Object: Presence

Description: This IPSO object should be used over a presence sensor to report a remote presence detection. It also provides resources to manage a counter, the type of sensor used (e.g the technology of the probe), and configuration for the delay between busy and clear detection state.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Presence** | 3302 | urn:oma:lwm2m:ext:3302 | Yes | Presence sensor with digital sensing, optional delay parameters |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Digital Input State** | 5500 | R | No | Mandatory | Boolean |  |  | The current state of the presence sensor |
| **Digital Input**  **Counter** | 5501 | R | No | Optional | Integer |  |  | The cumulative value of active state detected. |
| **Digital**  **Input**  **Counter Reset** | 5505 | E | No | Optional |  |  |  | Reset the Counter value |
| **Sensor Type** | 5751 | R | No | Optional | String |  |  | The type of the sensor (for instance PIR type) |
| **Busy to Clear delay** | 5903 | R,W | No | Optional | Integer |  | ms | Delay from the detection state to the clear state in ms |
| **Clear to Busy delay** | 5904 | R,W | No | Optional | Integer |  | ms | Delay from the clear state to the busy state in ms |

# IPSO Object: Temperature

Description: This IPSO object should be used over a temperature sensor to report a remote temperature measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the temperature sensor. The unit used here is degrees Celsius (ucum:Cel).

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Temperature** | 3303 | urn:oma:lwm2m:ext:3303 | Yes | Temperature sensor, units = ucum:Cel |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Sensor Value** | 5700 | R | No | Mandatory | Float |  | Cel | This resource returns the current Temperature Value in °C |
| **Min Measured**  **Value** | 5601 | R | No | Optional | Float |  | Cel | The minimum value measured by the sensor since power ON or reset |
| **Max Measured**  **Value** | 5602 | R | No | Optional | Float |  | Cel | The maximum value measured by the sensor since power ON or reset |
| **Min**  **Range**  **Value** | 5603 | R | No | Optional | Float |  | Cel | The minimum value that can be measured by the sensor |
| **Max Range**  **Value** | 5604 | R | No | Optional | Float |  | Cel | The maximum value that can be measured by the sensor |
| **Reset Min and Max Measured Values** | 5605 | E | No | Optional | Opaque |  |  | Reset the Min and Max Measured Values to Current Value |

# IPSO Object: Humidity

Description: This IPSO object should be used over a humidity sensor to report a remote humidity measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the humidity sensor. The unit used here is relative humidity as a percentage (ucum:%).

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Humidity** | 3304 | urn:oma:lwm2m:ext:3304 | Yes | Relative humidity sensor, units = ucum:% |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Sensor Value** | 5700 | R | No | Mandatory | Float |  | % | This resource returns the humidity Value in % |
| **Min Measured**  **Value** | 5601 | R | No | Optional | Float |  | % | The minimum value measured by the sensor since power ON or reset |
| **Max Measured**  **Value** | 5602 | R | No | Optional | Float |  | % | The maximum value measured by the sensor since power ON or reset |
| **Min**  **Range**  **Value** | 5603 | R | No | Optional | Float |  | % | The minimum value that can be measured by the sensor |
| **Max Range**  **Value** | 5604 | R | No | Optional | Float |  | % | The maximum value that can be measured by the sensor |
| **Reset Min and Max Measured Values** | 5605 | E | No | Optional | Opaque |  |  | Reset the Min and Max Measured Values to Current Value |

# IPSO Object: Power Measurement

Description: This IPSO object should be used over a power measurement sensor to report a remote power measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range for both active and reactive power. Il also provides resources for cumulative energy, calibration, and the power factor.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Descriptiomn** |
| --- | --- | --- | --- | --- |
| **IPSO Power Measurement** | 3305 | urn:oma:lwm2m:ext:3305 | Yes | Power measurement object with reactive power and min/max tracking |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Instantaneous active power** | 5800 | R | No | Mandatory | Float |  | W | The current active power |
| **Min Measured**  **active power** | 5801 | R | No | Optional | Float |  | W | The minimum active power measured by the sensor since power ON or reset |
| **Max Measured**  **active power** | 5802 | R | No | Optional | Float |  | W | The maximum active power measured by the sensor since power ON or reset |
| **Min**  **Range**  **active power** | 5803 | R | No | Optional | Float |  | W | The minimum active power that can be measured by the sensor |
| **Max Range**  **active power** | 5804 | R | No | Optional | Float |  | W | The maximum active power that can be measured by the sensor |
| **Cumulative active power** | 5805 | R | No | Optional | Float |  | Wh | The cumulative active power since the last cumulative energy reset or device start |
| **Active Power Calibration** | 5806 | W | No | Optional | Float |  | W | Request an active power calibration by writing the value of a calibrated load. |
| **Instantaneous reactive power** | 5810 | R | No | Optional | Float |  | var | The current reactive power |
| **Min Measured**  **reactive power** | 5811 | R | No | Optional | Float |  | var | The minimum reactivepower measured by the sensor since power ON or reset |
| **Max Measured**  **reactive power** | 5812 | R | No | Optional | Float |  | var | The maximum reactivepower measured by the sensor since power ON or reset |
| **Min**  **Range**  **reactive power** | 5813 | R | No | Optional | Float |  | var | The minimum active power that can be measured by the sensor |
| **Max Range**  **reactive power** | 5814 | R | No | Optional | Float |  | var | The maximum reactivepower that can be measured by the sensor |
| **Reset Min and Max Measured Values** | 5605 | E | No | Optional | Opaque |  |  | Reset the Min and Max Measured Values to Current Value |
| **Cumulative reactive power** | 5815 | R | No | Optional | Float |  | varh | The cumulative reactive power since the last cumulative energy reset or device start |
| **Reactive Power Calibration** | 5816 | W | No | Optional | Float |  | var | Request a reactive power calibration by writing the value of a calibrated load. |
| **Power factor** | 5820 | R | No | Optional | Float |  |  | If applicable, the power factor of the current consumption. |
| **Current Calibration** | 5821 | R,W | No | Optional | Float |  |  | Read or Write the current calibration coefficient |
| **Reset Cumulative energy** | 5822 | E | No | Optional | Opaque |  |  | Reset both cumulative active/reactive power |

# IPSO Object: Actuation

Description: This IPSO object is dedicated to remote actuation such as ON/OFF action or dimming. A multi-state output can also be described as a string. This is useful to send pilot wire orders for instance. It also provides a resource to reflect the time that the device has been switched on.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Actuation** | 3306 | urn:oma:lwm2m:ext:3306 | Yes | Actuator object with on/off control and proportional control |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **On/Off** | 5850 | R, W | No | Mandatory | Boolean |  |  | On/off control of the actuator, 0=OFF, 1=ON |
| **Dimmer** | 5851 | R, W | No | Optional | Integer | 0-100 | % | Proportional control of the actuator, integer value between 0 and 100 as a percentage. |
| **On Time** | 5852 | R, W | No | Optional | Integer |  | s | The time in seconds that the device has been on. Writing a value of 0 resets the counter. |
| **Muti-state Output** | 5853 | R,W | No | Optional | String |  |  | A string describing a state for multiple level output such as Pilot Wire |

# IPSO Object: Set Point

Description: This IPSO object should be used to set a desired value to a controller, such as a thermostat. This object enables a setpoint to be expressed units defined in the UCUM specification, to match an associated sensor or measurement value. A special resource is added to set the colour of an object.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Setpoint** | 3308 | urn:oma:lwm2m:ext:3308 | Yes | Setpoint object with configurable units float and optional color setting resource |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Set Point Value** | 5900 | R,W | No | Mandatory | Float |  | Defined by “Units” resource. | The setpoint value. |
| **Units** | 5701 | R | No | Optional | String |  |  | If present, the type of sensor defined as the UCUM Unit Definition e.g. “Cel” for Temperature in Celcius. |
| **Colour** | 0 | R, W, E | No | Optional | String |  |  | Colour of the object. A light for instance. |

# IPSO Object: Load Control

Description: This Object is used for demand-response load control and other load control in automation applications (not limited to power).

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Load Control** | 3310 | urn:oma:lwm2m:ext:3310 | Yes | Load control object with critical event parameters |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Event Identifier** | 0 | R, W | No | Mandatory | String |  |  | The event identifier as a string. |
| **Start Time** | 1 | R, W | No | Mandatory | Time |  |  | Time when the load control event will start started. |
| **Duration In Min** | 2 | R, W | No | Mandatory | Integer |  | min | The duration of the load control event. |
| **Criticality Level** | 3 | R, W | No | Optional | Integer | 0-3 |  | The criticality of the event. The device receiving the event will react in an appropriate fashion for the device. |
| **Avg Load Adj Pct** | 4 | R, W | No | Optional | Integer | 0-100 | % | Defines the maximum energy usage of the receiving device, as a percentage of the device's normal maximum energy usage. |
| **Duty Cycle** | 5 | R, W | No | Optional | Integer | 0-100 | % | Defines the duty cycle for the load control event, i.e, what percentage of time the receiving device is allowed to be on. |

# IPSO Object: Light Control

Description: This Object is used to control a light source, such as a LED or other light. It allows a light to be turned on or off and its dimmer setting to be control as a % between 0 and 100.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Light Control** | 3311 | urn:oma:lwm2m:ext:3311 | Yes | Light control object with on/off and optional dimming and energy monitor |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **On/Off** | 5850 | R, W | No | Mandatory | Boolean |  |  | This resource represents a light, which can be controlled, the setting of which is a Boolean value (1,0) where 1 is on and 0 is off. |
| **Dimmer** | 5851 | R, W | No | Optional | Integer | 0-100 | % | This resource represents a light dimmer setting, which has an Integer value between 0 and 100 as a percentage. |
| **On Time** | 5852 | R, W | No | Optional | Integer |  | s | The time in seconds that the light has been on. Writing a value of 0 resets the counter. |
| **Cumulative active power** | 5805 | R | No | Optional | Float |  | Wh | The total power in Wh that the light has used. |
| **Power factor** | 5820 | R | No | Optional | Float |  |  | The power factor of the light. |

# IPSO Object: Power Control

Description: This Object is used to control a power source, such as a Smart Plug. It allows a power relay to be turned on or off and its dimmer setting to be control as a % between 0 and 100.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Power Control** | 3312 | urn:oma:lwm2m:ext:3312 | Yes | Power control object with on/off and optional dimming and energy monitor |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **On/Off** | 5850 | R, W | No | Mandatory | Boolean |  |  | This resource represents a power relay, which can be controlled, the setting of which is a Boolean value (1,0) where 1 is on and 0 is off. |
| **Dimmer** | 5851 | R, W | No | Optional | Integer | 0-100 | % | This resource represents a power dimmer setting, which has an Integer value between 0 and 100 as a percentage. |
| **On Time** | 5852 | R, W | No | Optional | Integer |  | s | The time in seconds that the power relay has been on. Writing a value of 0 resets the counter. |
| **Cumulative active power** | 5805 | R | No | Optional | Float |  | Wh | The total power in Wh that has been used by the load. |
| **Power factor** | 5820 | R | No | Optional | Float |  |  | The power factor of the load. |

# IPSO Object: Accelerometer

Description: This IPSO object can be used to represent a 1-3 axis accelerometer.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Accelerometer** | 3313 | urn:oma:lwm2m:ext:3313 | Yes | Accelerometer sensor for 1 to 3 axis, units = ucum:g |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **X Value** | 0 | R | No | Mandatory | Float |  | g | The acceleration value of the X axis. |
| **Y Value** | 1 | R | No | Optional | Float |  | g | The acceleration value of the Y axis. |
| **Z Value** | 2 | R | No | Optional | Float |  | g | The acceleration value of the Z axis. |
| **Measurement Range** | 3 | R, W | No | Optional | Float |  | g | The +- range configured for the accelerometer |

# IPSO Object: Magnetometer

Description: This IPSO object can be used to represent a 1-3 axis magnetometer with optional compass direction.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Magnetometer** | 3314 | urn:oma:lwm2m:ext:3314 | Yes | Magnentometer object with 3 axis, units = ucum.G, optional compass |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **X Value** | 0 | R | No | Mandatory | Float |  | G | The magnetic value of the X axis |
| **Y Value** | 1 | R | No | Optional | Float |  | G | The magnetic value of the Y axis |
| **Z Value** | 2 | R | No | Optional | Float |  | G | The magnetic value of the Z axis |
| **Compass Direction** | 3 | R | No | Optional | Float | 0-360 | deg | The compass direction |

# IPSO Object: Barometer

Description: This IPSO object should be used with an air pressure sensor to report a remote barometer measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the barometer sensor.

Object info:

| **Object** | **Object ID** | **Object URN** | **Multiple Instances?** | **Description** |
| --- | --- | --- | --- | --- |
| **IPSO Barometer** | 3315 | urn:oma:lwm2m:ext:3315 | Yes | Barometer object, units = kPa |

Resource Info:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID** | **Access Type** | **Multiple**  **Instances?** | **Mandatory** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Sensor Value** | 5700 | R | No | Mandatory | Float |  | kPa | This resource type returns the air pressure Value in kPa |
| **Min Measured**  **Value** | 5601 | R | No | Optional | Float |  | kPa | The minimum value measured by the sensor since power ON or reset |
| **Max Measured**  **Value** | 5602 | R | No | Optional | Float |  | kPa | The maximum value measured by the sensor since power ON or reset |
| **Min**  **Range**  **Value** | 5603 | R | No | Optional | Float |  | kPa | The minimum value that can be measured by the sensor |
| **Max Range**  **Value** | 5604 | R | No | Optional | Float |  | kPa | The maximum value that can be measured by the sensor |
| **Reset Min and Max Measured Values** | 5605 | E | No | Optional | Opaque |  |  | Reset the Min and Max Measured Values to Current Value |

# Reusable Resource ID Definitions

This section defines new resources defined for the Reusable Resource Registry maintained by OMNA. These resources are used to compose the objects.

Table 2 Reusable Resource definitions (\* Temporary values, to be assigned by OMNA)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Resource Name** | **Resource ID \*** | **Access Type** | **Type** | **Range or Enumeration** | **Units** | **Descriptions** |
| **Digital Input State** | 5500 | R | Boolean |  |  | The current state of a digital input. |
| **Digital Input**  **Counter** | 5501 | R | Integer |  |  | The cumulative value of active state detected. |
| **Digital Input Polarity** | 5502 | R,W | Boolean |  |  | The polarity of a digital input as a Boolean (0 = Normal, 1= Reversed) |
| **Digital Input Debounce Period** | 5503 | R,W | Integer |  | ms | The debounce period in ms. |
| **Digital Input**  **Edge Selection** | 5504 | R,W | Integer |  |  | The edge selection as an integer (1 = Falling edge, 2 = Rising edge, 3 = Both Rising and Falling edge) |
| **Digital**  **Input**  **Counter Reset** | 5505 | E | Opaque |  |  | Reset the Counter value |
| **Digital Output State** | 5550 | R,W | Boolean |  |  | The current state of a digital output. |
| **Digital Output Polarity** | 5551 | R,W | Boolean |  |  | The polarity of a digital input as a Boolean (0 = Normal, 1= Reversed) |
| **Analog**  **Input**  **Current Value** | 5600 | R | Float | 0-5 | V | The current state of the analog input. |
| **Min Measured**  **Value** | 5601 | R | Float |  | Defined by “Units” resource. | The minimum value measured by the sensor since power ON or reset |
| **Max Measured**  **Value** | 5602 | R | Float |  | Defined by “Units” resource. | The maximum value measured by the sensor since power ON or reset |
| **Min**  **Range**  **Value** | 5603 | R | Float |  | Defined by “Units” resource. | The minimum value that can be measured by the sensor |
| **Max Range**  **Value** | 5604 | R | Float |  | Defined by “Units” resource. | The maximum value that can be measured by the sensor |
| **Reset Min and Max Measured Values** | 5605 | E | Opaque |  |  | Reset the Min and Max Measured Values to Current Value |
| **Analog Output**  **Current Value** | 5650 | R,W | Float | 0-5 | V | The current state of the analog output. |
| **Sensor Value** | 5700 | R | Float |  | Defined by “Units” resource. | If present, the value of the sensor. |
| **Sensor Units** | 5701 | R | String |  |  | If present, the type of sensor defined as the UCUM Unit Definition e.g. “Cel” for Temperature in Celsius. |
| **Application Type** | 5750 | R,W | String |  |  | The Application type of the device, for example “Motion Closure”. |
| **Sensor Type** | 5751 | R | String |  |  | The type of the sensor (for instance PIR type) |
| **Instantaneous active power** | 5800 | R | Float |  | W | The current active power |
| **Min Measured**  **active power** | 5801 | R | Float |  | W | The minimum active power measured by the sensor since it is ON |
| **Max Measured**  **active power** | 5802 | R | Float |  | W | The maximum active power measured by the sensor since it is ON |
| **Min**  **Range**  **active power** | 5803 | R | Float |  | W | The minimum active power that can be measured by the sensor |
| **Max Range**  **active power** | 5804 | R | Float |  | W | The maximum active power that can be measured by the sensor |
| **Cumulative active power** | 5805 | R | Float |  | Wh | The cumulative active power since the last cumulative energy reset or device start |
| **Active Power Calibration** | 5806 | W | Float |  | W | Request an active power calibration by writing the value of a calibrated load. |
| **Instantaneous reactive power** | 5810 | R | Float |  | var | The current reactive power |
| **Min Measured**  **reactive power** | 5811 | R | Float |  | var | The minimum reactivepower measured by the sensor since it is ON |
| **Max Measured**  **reactive power** | 5812 | R | Float |  | var | The maximum reactivepower measured by the sensor since it is ON |
| **Min**  **Range**  **reactive power** | 5813 | R | Float |  | var | The minimum active power that can be measured by the sensor |
| **Max Range**  **reactive power** | 5814 | R | Float |  | var | The maximum reactivepower that can be measured by the sensor |
| **Cumulative reactive power** | 5815 | R | Float |  | varh | The cumulative reactive power since the last cumulative energy reset or device start |
| **Reactive Power Calibration** | 5816 | W | Float |  | var | Request a reactive power calibration by writing the value of a calibrated load. |
| **Power factor** | 5820 | R | Float |  |  | If applicable, the power factor of the current consumption. |
| **Current Calibration** | 5821 | R,W | Float |  |  | Read or Write the current calibration coefficient |
| **Reset Cumulative energy** | 5822 | E | Opaque |  |  | Reset both cumulative active/reactive power |
| **On/Off** | 5850 | R, W | Boolean |  |  | This resource represents an on/off actuator, which can be controlled, the setting of which is a Boolean value (1,0) where 1 is on and 0 is off. |
| **Dimmer** | 5851 | R, W | Integer | 0-100 | % | This resource represents a dimmer setting, which has an Integer value between 0 and 100 as a percentage. |
| **On time** | 5852 | R, W | Integer |  | s | The time in seconds that the device has been turned on. Writing a value of 0 resets the counter. |
| **Muti-state Output** | 5853 | R,W | String |  |  | A string describing a state for multiple level output such as Pilot Wire |
| **Set Point Value** | 5900 | R,W | Float |  | Defined by “Units” resource. | The setpoint value. |
| **Busy to Clear delay** | 5903 | R,W | Integer |  | ms | Delay from the detection state to the clear state in ms |
| **Clear to Busy delay** | 5904 | R,W | Integer |  | ms | Delay from the clear state to the busy state in ms |

References:

[1] OMA Lightweight M2M

<http://openmobilealliance.hs-sites.com/lightweight-m2m-specification-from-oma>

[2] The Constrained Application Protocol

<http://tools.ietf.org/html/rfc7252>

<http://coap.technology/>

[3] HTTP

<http://tools.ietf.org/html/rfc2616>

[4] REST

<https://www.ics.uci.edu/~fielding/pubs/dissertation/fielding_dissertation.pdf>