

# **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?
<b>IPSO Digital Input</b>	3200	Yes
<b>IPSO Digital Output</b>	3201	Yes
<b>IPSO Analogue Input</b>	3202	Yes
<b>IPSO Analogue Output</b>	3203	Yes
<b>IPSO Generic Sensor</b>	3300	Yes
<b>IPSO Luminosity Sensor</b>	3301	Yes
<b>IPSO Presence Sensor</b>	3302	Yes
<b>IPSO Temperature Sensor</b>	3303	Yes
<b>IPSO Humidity Sensor</b>	3304	Yes
<b>IPSO Power Measurement</b>	3305	Yes
<b>IPSO Actuation</b>	3306	Yes
<b>IPSO Set Point</b>	3308	Yes
<b>IPSO Load Control</b>	3310	Yes
<b>IPSO Light Control</b>	3311	Yes
<b>IPSO Power Control</b>	3312	Yes
<b>IPSO Accelerometer</b>	3313	Yes
<b>IPSO Magnetometer</b>	3314	Yes
<b>IPSO Barometer</b>	3315	Yes

## 1. 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
<b>IPSO Digital Input</b>	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
<b>Digital Input State</b>	5500	R	No	Mandatory	Boolean			The current state of a digital input.
<b>Digital Input Counter</b>	5501	R	No	Optional	Integer			The cumulative value of active state detected.
<b>Digital Input Polarity</b>	5502	R,W	No	Optional	Boolean			The polarity of the digital input as a Boolean (0 = Normal, 1= Reversed)
<b>Digital Input Debounce Period</b>	5503	R,W	No	Optional	Integer		ms	The debounce period in ms.
<b>Digital Input Edge Selection</b>	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)
<b>Digital Input Counter Reset</b>	5505	E	No	Optional	Opaque			Reset the Counter value
<b>Application Type</b>	5750	R,W	No	Optional	String			The Application type of the input, for example “Motion Closure”.
<b>Sensor Type</b>	5751	R	No	Optional	String			The type of the sensor (for instance PIR type)

## 2. 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
<b>IPSO Digital Output</b>	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
<b>Digital Output State</b>	5550	R,W	No	Mandatory	Boolean			The current state of a digital output.
<b>Digital Output Polarity</b>	5551	R,W	No	Optional	Boolean			The polarity of a digital output as a Boolean (0 = Normal, 1= Reversed)
<b>Application Type</b>	5750	R,W	No	Optional	String			The application type of the output as a string, for instance, "LED"

## 3. 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
--------	-----------	------------	---------------------	-------------

<b>IPSO Analog Input</b>	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
<b>Analog Input Current Value</b>	5600	R	No	Mandatory	Float	0-5	V	The current state of the analog input.
<b>Min Measured Value</b>	5601	R	No	Optional	Float	0-5	V	The minimum value measured by the sensor since power ON or reset
<b>Max Measured Value</b>	5602	R	No	Optional	Float	0-5	V	The maximum value measured by the sensor since power ON or reset
<b>Min Range Value</b>	5603	R	No	Optional	Float	0-5	V	The minimum value that can be measured by the sensor
<b>Max Range Value</b>	5604	R	No	Optional	Float	0-5	V	The maximum value that can be measured by the sensor
<b>Reset Min and Max Measured Values</b>	5605	E	No	Optional	Opaque			Reset the Min and Max Measured Values to Current Value
<b>Application Type</b>	5750	R,W	No	Optional	String			If present, the application type of the sensor as a string, for instance, "CO2"
<b>Sensor Type</b>	5751	R	No	Optional	String			The type of the sensor (for instance PIR type)

## 4. 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
<b>IPSO Analog Output</b>	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
<b>Analog Output Current Value</b>	5650	R,W	No	Mandatory	Float	0-5	V	The current state of the analog output.
<b>Application Type</b>	5750	R,W	No	Optional	String			If present, the application type of the actuator as a string, for instance, “Thermostat”

## 5. 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
<b>IPSO Generic Sensor</b>	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
<b>Sensor Value</b>	5700	R	No	Mandatory	Float		Defined by “Units” resource.	The current value of the sensor.
<b>Units</b>	5701	R	No	Optional	String			If present, the type of sensor defined as the UCUM Unit Definition e.g. “Cel” for Temperature in Celsius.
<b>Min Measured Value</b>	5601	R	No	Optional	Float		Defined by “Units” resource.	The minimum value measured by the sensor since power ON or reset
<b>Max Measured Value</b>	5602	R	No	Optional	Float		Defined by “Units” resource.	The maximum value measured by the sensor since power ON or reset
<b>Min Range Value</b>	5603	R	No	Optional	Float		Defined by “Units” resource.	The minimum value that can be measured by the sensor
<b>Max Range Value</b>	5604	R	No	Optional	Float		Defined by “Units” resource.	The maximum value that can be measured by the sensor
<b>Reset Min and Max Measured Values</b>	5605	E	No	Optional	Opaque			Reset the Min and Max Measured Values to Current Value
<b>Application Type</b>	5750	R,W	No	Optional	String			If present, the application type of the sensor as a string, for instance, “CO2”
<b>Sensor Type</b>	5751	R	No	Optional	String			The type of the sensor (for instance PIR type)

## 6. 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 info:

Object	Object ID	Object URN	Multiple Instances?	Description
<b>IPSO Luminosity</b>	3301	urn:oma:lwm2m:ext:3301	Yes	Luminosity sensor, units = ucum:lx

Resource Info:

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



## 7. 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
<b>IPSO Presence</b>	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
<b>Digital Input State</b>	5500	R	No	Mandatory	Boolean			The current state of the presence sensor
<b>Digital Input Counter</b>	5501	R	No	Optional	Integer			The cumulative value of active state detected.
<b>Digital Input Counter Reset</b>	5505	E	No	Optional				Reset the Counter value
<b>Sensor Type</b>	5751	R	No	Optional	String			The type of the sensor (for instance PIR type)
<b>Busy to Clear delay</b>	5903	R,W	No	Optional	Integer		ms	Delay from the detection state to the clear state in ms
<b>Clear to Busy delay</b>	5904	R,W	No	Optional	Integer		ms	Delay from the clear state to the busy state in ms

## 8. 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
<b>IPSO Temperature</b>	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
<b>Sensor Value</b>	5700	R	No	Mandatory	Float		Cel	This resource returns the current Temperature Value in °C
<b>Min Measured Value</b>	5601	R	No	Optional	Float		Cel	The minimum value measured by the sensor since power ON or reset
<b>Max Measured Value</b>	5602	R	No	Optional	Float		Cel	The maximum value measured by the sensor since power ON or reset
<b>Min Range Value</b>	5603	R	No	Optional	Float		Cel	The minimum value that can be measured by the sensor
<b>Max Range Value</b>	5604	R	No	Optional	Float		Cel	The maximum value that can be measured by the sensor
<b>Reset Min and Max Measured Values</b>	5605	E	No	Optional	Opaque			Reset the Min and Max Measured Values to Current Value

## 9. 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
<b>IPSO Humidity</b>	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
<b>Sensor Value</b>	5700	R	No	Mandatory	Float		%	This resource returns the humidity Value in %
<b>Min Measured Value</b>	5601	R	No	Optional	Float		%	The minimum value measured by the sensor since power ON or reset
<b>Max Measured Value</b>	5602	R	No	Optional	Float		%	The maximum value measured by the sensor since power ON or reset
<b>Min Range Value</b>	5603	R	No	Optional	Float		%	The minimum value that can be measured by the sensor
<b>Max Range Value</b>	5604	R	No	Optional	Float		%	The maximum value that can be measured by the sensor
<b>Reset Min and Max Measured Values</b>	5605	E	No	Optional	Opaque			Reset the Min and Max Measured Values to Current Value

## 10. 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. It also provides resources for cumulative energy, calibration, and the power factor.

Object info:

Object	Object ID	Object URN	Multiple Instances?	Description
<b>IPSO Power Measurement</b>	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
<b>Instantaneous active power</b>	5800	R	No	Mandatory	Float		W	The current active power
<b>Min Measured active power</b>	5801	R	No	Optional	Float		W	The minimum active power measured by the sensor since power ON or reset
<b>Max Measured active power</b>	5802	R	No	Optional	Float		W	The maximum active power measured by the sensor since power ON or reset
<b>Min Range active power</b>	5803	R	No	Optional	Float		W	The minimum active power that can be measured by the sensor
<b>Max Range active power</b>	5804	R	No	Optional	Float		W	The maximum active power that can be measured by the sensor
<b>Cumulative active power</b>	5805	R	No	Optional	Float		Wh	The cumulative active power since the last cumulative energy reset or device start
<b>Active Power Calibration</b>	5806	W	No	Optional	Float		W	Request an active power calibration by writing the value of a calibrated load.
<b>Instantaneous reactive power</b>	5810	R	No	Optional	Float		var	The current reactive power
<b>Min Measured reactive power</b>	5811	R	No	Optional	Float		var	The minimum reactive power measured by the sensor since power

								ON or reset
<b>Max Measured reactive power</b>	5812	R	No	Optional	Float		var	The maximum reactive power measured by the sensor since power ON or reset
<b>Min Range reactive power</b>	5813	R	No	Optional	Float		var	The minimum active power that can be measured by the sensor
<b>Max Range reactive power</b>	5814	R	No	Optional	Float		var	The maximum reactive power that can be measured by the sensor
<b>Reset Min and Max Measured Values</b>	5605	E	No	Optional	Opaque			Reset the Min and Max Measured Values to Current Value
<b>Cumulative reactive power</b>	5815	R	No	Optional	Float		varh	The cumulative reactive power since the last cumulative energy reset or device start
<b>Reactive Power Calibration</b>	5816	W	No	Optional	Float		var	Request a reactive power calibration by writing the value of a calibrated load.
<b>Power factor</b>	5820	R	No	Optional	Float			If applicable, the power factor of the current consumption.
<b>Current Calibration</b>	5821	R,W	No	Optional	Float			Read or Write the current calibration coefficient
<b>Reset Cumulative energy</b>	5822	E	No	Optional	Opaque			Reset both cumulative active/reactive power

## 11. 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
<b>IPSO Actuation</b>	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
<b>On/Off</b>	5850	R, W	No	Mandatory	Boolean			On/off control of the actuator, 0=OFF, 1=ON
<b>Dimmer</b>	5851	R, W	No	Optional	Integer	0-100	%	Proportional control of the actuator, integer value between 0 and 100 as a percentage.
<b>On Time</b>	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.
<b>Muti-state Output</b>	5853	R,W	No	Optional	String			A string describing a state for multiple level output such as Pilot Wire

## 12. 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
<b>IPSO Setpoint</b>	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
<b>Set Point Value</b>	5900	R,W	No	Mandatory	Float		Defined by “Units” resource.	The setpoint value.
<b>Units</b>	5701	R	No	Optional	String			If present, the type of sensor defined as the UCUM Unit Definition e.g. “Cel” for Temperature in Celcius.
<b>Colour</b>	0	R, W, E	No	Optional	String			Colour of the object. A light for instance.

## 13. 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
<b>IPSO Load Control</b>	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
<b>Event Identifier</b>	0	R, W	No	Mandatory	String			The event identifier as a string.
<b>Start Time</b>	1	R, W	No	Mandatory	Time			Time when the load control event will start started.
<b>Duration In Min</b>	2	R, W	No	Mandatory	Integer		min	The duration of the load control event.
<b>Criticality Level</b>	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.

<b>Avg Load Adj Pct</b>	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.
<b>Duty Cycle</b>	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.

## 14. 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
<b>IPSO Light Control</b>	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
<b>On/Off</b>	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.
<b>Dimmer</b>	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.
<b>On Time</b>	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.
<b>Cumulative active power</b>	5805	R	No	Optional	Float		Wh	The total power in Wh that the light has used.
<b>Power factor</b>	5820	R	No	Optional	Float			The power factor of the light.

## 15. 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
<b>IPSO Power Control</b>	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
<b>On/Off</b>	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.
<b>Dimmer</b>	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.
<b>On Time</b>	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.
<b>Cumulative active power</b>	5805	R	No	Optional	Float		Wh	The total power in Wh that has been used by the load.
<b>Power factor</b>	5820	R	No	Optional	Float			The power factor of the load.

## 16. 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
<b>IPSO Accelerometer</b>	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
<b>X Value</b>	0	R	No	Mandatory	Float		g	The acceleration value of the X axis.
<b>Y Value</b>	1	R	No	Optional	Float		g	The acceleration value of the Y axis.
<b>Z Value</b>	2	R	No	Optional	Float		g	The acceleration value of the Z axis.
<b>Measurement Range</b>	3	R, W	No	Optional	Float		g	The +- range configured for the accelerometer

## 17. 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
<b>IPSO Magnetometer</b>	3314	urn:oma:lwm2m:ext:3314	Yes	Magnetometer 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
<b>X Value</b>	0	R	No	Mandatory	Float		G	The magnetic value of the X axis
<b>Y Value</b>	1	R	No	Optional	Float		G	The magnetic value of the Y axis
<b>Z Value</b>	2	R	No	Optional	Float		G	The magnetic value of the Z axis
<b>Compass Direction</b>	3	R	No	Optional	Float	0-360	deg	The compass direction

## 18. 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
<b>IPSO Barometer</b>	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
<b>Sensor Value</b>	5700	R	No	Mandatory	Float		kPa	This resource type returns the air pressure Value in kPa
<b>Min Measured Value</b>	5601	R	No	Optional	Float		kPa	The minimum value measured by the sensor since power ON or reset
<b>Max Measured Value</b>	5602	R	No	Optional	Float		kPa	The maximum value measured by the sensor since power ON or reset
<b>Min</b>	5603	R	No	Optional	Float		kPa	The minimum

<b>Range Value</b>								value that can be measured by the sensor
<b>Max Range Value</b>	5604	R	No	Optional	Float		kPa	The maximum value that can be measured by the sensor
<b>Reset Min and Max Measured Values</b>	5605	E	No	Optional	Opaque			Reset the Min and Max Measured Values to Current Value

## 19. 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
<b>Digital Input State</b>	5500	R	Boolean			The current state of a digital input.
<b>Digital Input Counter</b>	5501	R	Integer			The cumulative value of active state detected.
<b>Digital Input Polarity</b>	5502	R,W	Boolean			The polarity of a digital input as a Boolean (0 = Normal, 1= Reversed)
<b>Digital Input Debounce Period</b>	5503	R,W	Integer		ms	The debounce period in ms.
<b>Digital Input Edge Selection</b>	5504	R,W	Integer			The edge selection as an integer (1 = Falling edge, 2 = Rising edge, 3 = Both Rising and Falling edge)
<b>Digital Input Counter Reset</b>	5505	E	Opaque			Reset the Counter value
<b>Digital Output State</b>	5550	R,W	Boolean			The current state of a digital output.
<b>Digital Output Polarity</b>	5551	R,W	Boolean			The polarity of a digital input as a Boolean (0 = Normal, 1= Reversed)
<b>Analog Input Current Value</b>	5600	R	Float	0-5	V	The current state of the analog input.
<b>Min Measured Value</b>	5601	R	Float		Defined by “Units” resource.	The minimum value measured by the sensor since power ON or reset

<b>Max Measured Value</b>	5602	R	Float		Defined by “Units” resource.	The maximum value measured by the sensor since power ON or reset
<b>Min Range Value</b>	5603	R	Float		Defined by “Units” resource.	The minimum value that can be measured by the sensor
<b>Max Range Value</b>	5604	R	Float		Defined by “Units” resource.	The maximum value that can be measured by the sensor
<b>Reset Min and Max Measured Values</b>	5605	E	Opaque			Reset the Min and Max Measured Values to Current Value
<b>Analog Output Current Value</b>	5650	R,W	Float	0-5	V	The current state of the analog output.
<b>Sensor Value</b>	5700	R	Float		Defined by “Units” resource.	If present, the value of the sensor.
<b>Sensor Units</b>	5701	R	String			If present, the type of sensor defined as the UCUM Unit Definition e.g. “Cel” for Temperature in Celsius.
<b>Application Type</b>	5750	R,W	String			The Application type of the device, for example “Motion Closure”.
<b>Sensor Type</b>	5751	R	String			The type of the sensor (for instance PIR type)
<b>Instantaneous active power</b>	5800	R	Float		W	The current active power
<b>Min Measured active power</b>	5801	R	Float		W	The minimum active power measured by the sensor since it is ON
<b>Max Measured active power</b>	5802	R	Float		W	The maximum active power measured by the sensor since it is ON
<b>Min Range active power</b>	5803	R	Float		W	The minimum active power that can be measured by the sensor
<b>Max Range active power</b>	5804	R	Float		W	The maximum active power that can be measured by the sensor
<b>Cumulative active power</b>	5805	R	Float		Wh	The cumulative active power since the last cumulative energy reset or device start
<b>Active Power Calibration</b>	5806	W	Float		W	Request an active power calibration by writing the value of a calibrated load.
<b>Instantaneous reactive power</b>	5810	R	Float		var	The current reactive power
<b>Min Measured reactive power</b>	5811	R	Float		var	The minimum reactive power measured by the sensor since it is ON
<b>Max Measured reactive power</b>	5812	R	Float		var	The maximum reactive power measured by the sensor since it is ON
<b>Min Range reactive power</b>	5813	R	Float		var	The minimum active power that can be measured by the sensor
<b>Max Range reactive power</b>	5814	R	Float		var	The maximum reactive power that can be measured by the sensor
<b>Cumulative reactive power</b>	5815	R	Float		varh	The cumulative reactive power since the last cumulative energy reset or device start

<b>Reactive Power Calibration</b>	5816	W	Float		var	Request a reactive power calibration by writing the value of a calibrated load.
<b>Power factor</b>	5820	R	Float			If applicable, the power factor of the current consumption.
<b>Current Calibration</b>	5821	R,W	Float			Read or Write the current calibration coefficient
<b>Reset Cumulative energy</b>	5822	E	Opaque			Reset both cumulative active/reactive power
<b>On/Off</b>	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.
<b>Dimmer</b>	5851	R, W	Integer	0-100	%	This resource represents a dimmer setting, which has an Integer value between 0 and 100 as a percentage.
<b>On time</b>	5852	R, W	Integer		s	The time in seconds that the device has been turned on. Writing a value of 0 resets the counter.
<b>Muti-state Output</b>	5853	R,W	String			A string describing a state for multiple level output such as Pilot Wire
<b>Set Point Value</b>	5900	R,W	Float		Defined by "Units" resource.	The setpoint value.
<b>Busy to Clear delay</b>	5903	R,W	Integer		ms	Delay from the detection state to the clear state in ms
<b>Clear to Busy delay</b>	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](https://www.ics.uci.edu/~fielding/pubs/dissertation/fielding_dissertation.pdf)