MANITOU API

Connected Solutions - Using the service

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Description : this document provides information on how to obtain the best results of the MANITOU API service for Connected Solutions range of API products. This documentation is for customer IT teams to understand the service's design and know how to use its features, upon agreement signature and terms & conditions acceptance.

NOTE : changes from the previously published version of this document are marked with the "new" symbol in the margin.

Preamble

MANITOU API is a data service in the form of APIs (Application Programming Interface) that provides the Customer access to protected resources, in coherence with the Customer's service level of subscription.

These APIs provide a wide range of features that help improve efficiency and productivity. All the features rely on the principles of RESTful APIs, which consider every accessible item as a resource with its unique id that can be used and reused, using a set of methods.

Each API serves a specific set of information, but shares common features of results paging, attribute filtering, records sorting. All these features are described with examples in this document, which is focused on one range of API products named "Connected Solutions".

Using this documentation comes as a second step after creating an account on the MANITOU API Developer Portal.
The user should already have received approval for a subscription to one of the "Connected Solutions" products, obtained keys and a secret user token, and understood the technicalities of the MANITOU API service, as described in the "MANITOU API - How to get onboard" companion document.

Understanding the Connected Solution service's design

Overview

The following schema describes the global design of MANITOU API's Connected Solutions service :
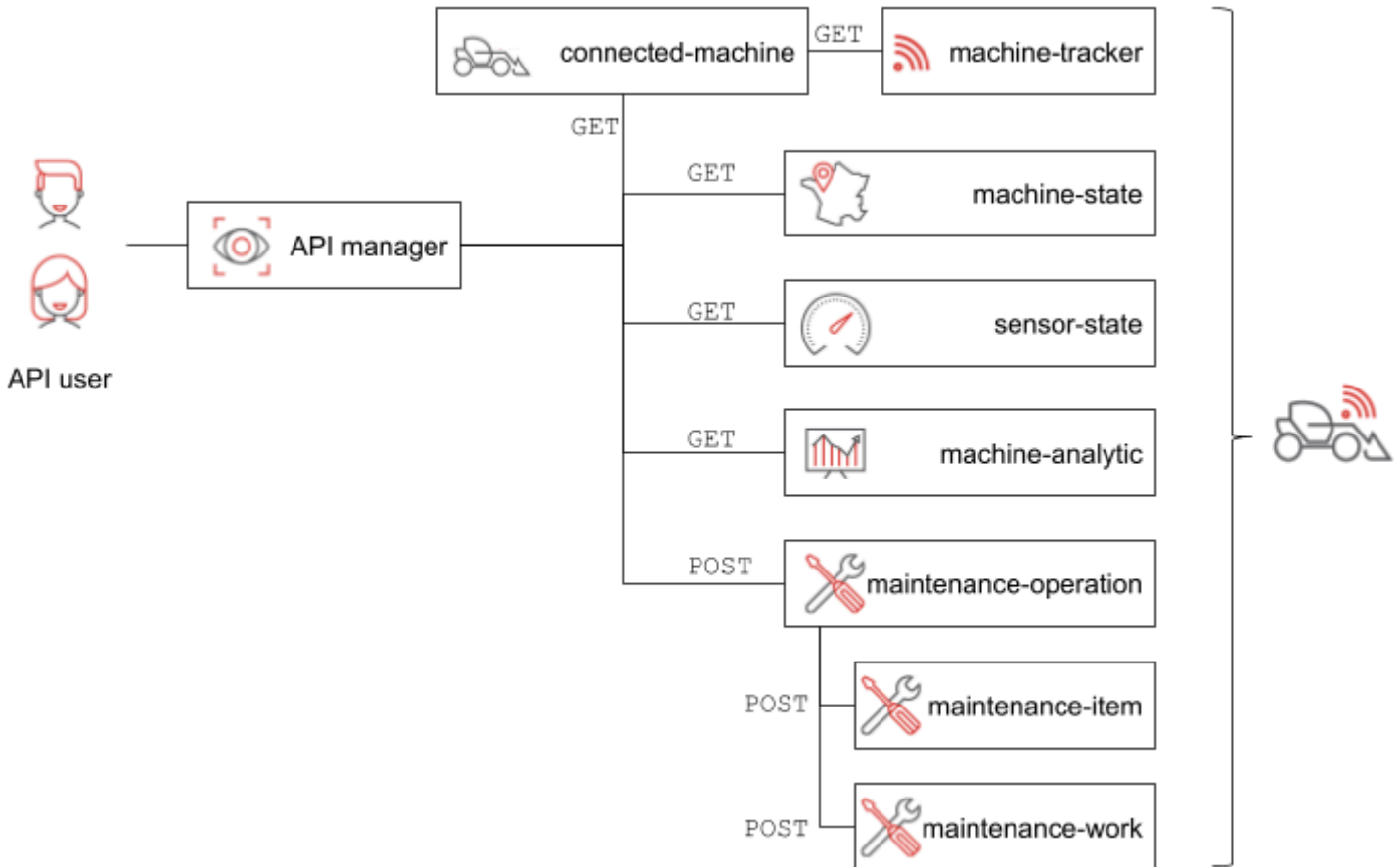
Security through API manager

It is necessary for the API user to **be authenticated** when performing a call to data APIs.
Please refer to the "MANITOU API - How to get onboard" documentation for more information on this process and a detailed technical explanation.

Static information with connected-machine API

This API holds **the list of all the machines that are part of the customer fleet.**

Among many static information (serial number, brand, model, etc), this API provides the customer with machine id's, each of which is unique to one machine and permanently affected to it.

The machine id information is the key that lets the customer retrieve dynamic information about the machines through the other data APIs.

This API also provides the user with the reference needed to retrieve information on the tracker the machine is equipped with, when necessary for the customer.

This API only needs to be called once in a while by the customer, each time a machine moves in or out of the fleet, to keep the machine id's catalog up to date.

Using the tracker reference provided by connected-machine, this API lets the user **retrieve information about the telematics device** used to retrieve machine data.

This API only needs to be called once in a while by the customer, each time a machine moves in or out of the fleet, to keep the customer's tracker references catalog up to date.

Dynamic machine state information with machine-state API

Using the machine id provided by connected-machine, this API lets the user **know where the machine is, how much time is on the hourmeter, etc**.

This API is designed to be called several times a day, for the user to keep track of the machine's movement and overall state.

Dynamic sensor information with sensor-state API

Using the machine id provided by connected-machine, this API lets the user **know the latest information of each exposed sensor of a given machine** (CAN-based information).

This API is designed to be called several times a day, for the user to keep track of the sensors' evolution.

Analytic information with machine-analytic API

Using the machine id provided by connected-machine, this API lets the user **access several analytic indicators**.

These indicators are calculated daily, on the basis of the machine sensors evolution, among other composite indicators that provide analytic insight on the machine's usage and performance.

This API is designed to be called once a day, for the user to keep track of the indicators progress over time.

Upload maintenance data with machine-operation API

Using the machine id provided by connected-machine, this API lets the user **upload details about the maintenance operations performed on the machine to MANITOU**.

This is helpful for MANITOU to keep track of the machine's life, installed replacement parts, respect of manufacturer recommendations, etc.

This API is designed to be called every time maintenance operations are performed on the machine.

Best practices reminder

When pairing your IT system with the Connected Solutions products, remember to keep an eye on these 5 best practices, detailed in "MANITOU API - How to get onboard" :
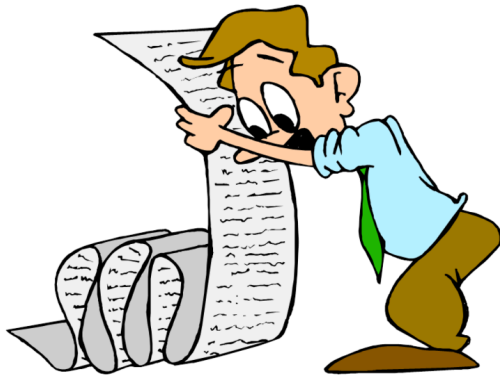
Keep the page size low

Pinpoint what you want

Avoid hammering
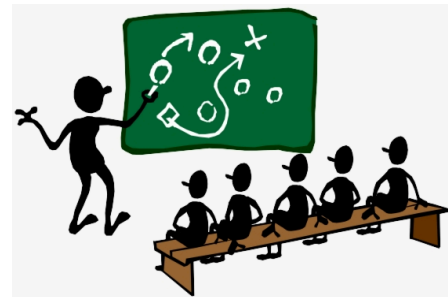
Design a realistic data request strategy

Pick only what matters

In details : the connected-machine API

NEW

Endpoint URLs

The API can be reached at :

```
https://api.manitou-group.com/connected-machine/connected-machine
https://api.manitou-group.com/connected-machine/machine-tracker
```

Data set examples

The following chart lists the fields exposed by the API for connected-machine resources :

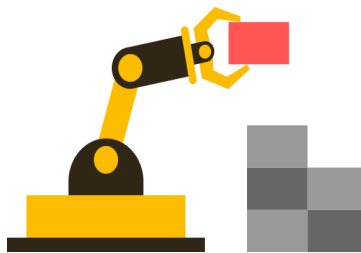| JSON data	Comments

<pre>{
   "data" : [
      {
         "attributes" : {
            "brand" : "Manitou",
            "model" : "MRT 123",
            "model-reference": "52000884",
            "model-variant": "0145",
            "description" : "MRT 123 Forklift",
            "serial-number" : "MAN00000Z000000123",
            "height" : "312",
            "width" : "288",
            "length" : "513",
            "weight" : "2140",
            "build-year" : "2019",
            "build-date": "2019-06-14T00:00:00",
            "start-up-date": "2019-07-12T00:00:00",
 	
            "contractual-warranty-end-date":
 	
"2020-07-12T00:00:00",
            "extended-warranty-end-date":
 	
2022-07-12T00:00:00
            "extended-warranty-program":
                          +1Y-2000H/TOT/0 EUR
DIFF,
            "invoice-date": "2019-10-01T00:00:00"
 	
         },
         "relationships" : {
            "machine-tracker" : {
               "links" : {
"self"   :
"/connected-machine/abcd1234-ab12-34cd-ab12-abcdef123456/
relationships/machine-tracker",
                               "related" :
"/connected-machine/abcd1234-ab12-34cd-ab12-abcdef123456/
machine-tracker"
               }
            }
         },
         "type" : "connected-machine",
         "id" : "abcd1234-ab12-34cd-ab12-abcdef123456"
      },</pre>
	Record list start indicator
	Record start indicator
	
	Machine brand
	Machine model name
	Machine model reference
	Machine model variant
	Machine description
	Machine serial number
	Machine overall height in cm
	Machine overall width in cm
	Machine overall length in cm
	Machine gross weight in kg
	Machine build year
	Machine build date
	Machine start up date
	
	Contractual warranty end date
	
	Extended warranty end date (if exists, null otherwise)
	Extended warranty program description
	Machine invoice date
	
	Machine-dependent objects list
	Machine-dependent tracker info start
	
	Resource type
	Resource id (connected-machine id)

The following chart lists the fields exposed by the API for machine-tracker resources :

JSON data	Comments

<pre>{
    "meta": {
        "total-records": 1
    },
    "links": {
                                    "self":
"/machine-tracker?filter[id]=3266136d-5ce1-4756-a9be-8975
395c133f"
    },
    "data": [
        {
            "type": "machine-tracker",
            "id": "3266136d-5ce1-4756-a9be-8975395c133f",
            "attributes": {
                "tracker-serial-number": "751321",
                "tracker-phone-number": null,
                "tracker-imei": null
            },
            "relationships": {
                "tracker-model": {
                    "links": {
                                        "self":
"/machine-tracker/3266136d-5ce1-4756-a9be-8975395c133f/re
lationships/tracker-model",
                                        "related":
"/machine-tracker/3266136d-5ce1-4756-a9be-8975395c133f/tr
acker-model"
                    }
                }
            },
            "links": {
                                    "self":
"/machine-tracker/3266136d-5ce1-4756-a9be-8975395c133f"
            }
        }
    ]
}</pre>
	Record count indicator
	
	Self link
	
	Data set beginning
	
	Record type
	Record id
	Record attributes
	Tracker serial number
	Tracker phone number
	Tracker GSM equipment IMEI
	
	Resource relationships beginning

API parameters

This API allows the use of the following parameters :

Parameter name	Type	Manda-tory	Usage
Applicable for all resources			
Ocp-Apim-Subscription-Key	Header	yes	Customer subscription key (primary or secondary)
X-token	Header	yes	Customer secret user token. Provide the API with the secret user token that lets the customer retrieve its resources.

`api-version`	Header	yes	Version number of the API (v1, v2, etc.)
`page[size]` `page[number]`	Query	no	The API may return many resources records when called. The page[size] allows the user to define the number of records wanted per page, and the page[number] allows the user to jump to the desired result page. Examples : • `page[size]=30` ⇒ the API will return a maximum of 30 records per response • `page[number]=3` ⇒ the API will return page number 3 of all available results page.
`sort`	Query	no	The API will order the result records list according to ascending or descending value of the given attribute name. Using a dash ("-") before the attribute name indicates the API to perform the sort in a descending way. Elseway the sort is ascending. Examples : • `sort=height` ⇒ the API will return every recorded machine for the user, ordered from lowest height attribute value to highest • `sort=-weight` ⇒ the API will return every recorded machine for the user, ordered from highest weight attribute value to lowest
`include`	Query	no	The API will include in the result records the data related to the specified relationship Example : • `include=machine-tracker` ⇒ the API will return data about the machine-tracker relationship, including the machine-tracker's id Result :

```
[...]
"relationships": {
  "machine-tracker": {
    "links": {
      "self":
"/connected-machine/abcd1234-ab12-34cd-ab12-ab
cdef123456/relationships/machine-tracker",
      "related":
"/connected-machine/abcd1234-ab12-34cd-ab12-ab
cdef123456/machine-tracker"
        },
    "data": {
      "type": "machine-tracker",
      "id":
"defg5678-cd34-56ef-cd34-ghijkl789012"
        }
      }
    },
```

			[...]
fields	Query	no	The API will only return the resource attributes listed in this parameter, which helps deliver the data faster and focus only on data useful for the customer Example : ● `fields=serial-number,build-year` ⇒ for a connected-machine resource, the API will return only the serial number and build year attributes.
Applicable for connected-machine resources			

`filter[brand]`
`filter[model]`
`filter[description]`
`filter[serial-number]`
	Query	no	The API will filter the result so that only machines matching the given attribute's value are retrieved
			Examples :
			● `filter[brand]=GEHL` ⇒ get only GEHL machines
			● `filter[model]=MT 625 H COMFORT 75K ST5 S1` ⇒ get all machines matching this model
			● `filter[serial-number]=MAN00000A0000000` ⇒ get only the machine matching this serial number

`filter[height]`
`filter[width]`
`filter[length]`
`filter[weight]`
`filter[build-year]`
	Query	no	The API will filter the result so that only machines matching the given attribute's value or provided value comparison are retrieved
			Examples :
			● `filter[height]=lt:2.5` ⇒ get machines under 2.5 meters in height
			● `filter[weight]=ge:3000` ⇒ get machines over or equal 3000 kg in weight
			● `filter[build-year]=ge:2015,le:2018` ⇒ get machines built from 2015 to 2018 (including boundaries)
			● `filter[build-year]=in:2017,2019` ⇒ get machines built in 2015 and 2019
			● `filter[brand]=nin:GEHL,MANITOU` ⇒ get machines not branded as GEHL and MANITOU

Applicable for machine-tracker resources			

`filter[tracker-serial-number]`
`filter[tracker-phone-number]`
`filter[tracker-imei]`
	Query	no	The API will filter the result so that only machine trackers matching the given attribute's value are retrieved
			Example :
			● `filter[tracker-serial-number]=123456` ⇒ get all trackers matching this serial number

Please note that the filter parameters can be combined one with another, so one can retrieve all the machines of a given brand and for a given build year range, for example.

NOTE : as attribute values can differ from numerals to character strings, the attribute name provided to perform the sort or filter must be chosen wisely.
When performing comparisons on a character string attribute, the user must understand that even if the attribute value is expressed as a number ("1234"), it is not considered a number data type, so sorting and comparing is made through lexicographic comparison.

In details : the machine-state API

Endpoint URL

The API can be reached at :

`https://api.manitou-group.com/machine-state/machine-state`

Data set example

The following chart lists the fields exposed by the API :

JSON data	Comments

<pre>{
   "data" : [
      {
         "attributes" : {
            "latitude" : 56.88721000,
            "longitude" : -111.36433500,
            "altitude" : 0,
            "street-address" : "Unnamed Road",
            "city" : "Division No. 16",
            "zip-code" : "T0P",
            "country" : "CA",
            "engine-status" : 0,
            "key-status" : 1,
            "odometer" : 124.20,
            "cumulative-operation-hours" : 156,
            "cumulative-idle-hours" : 148,
            "input3" : "0",
            "input4" : "0",
            "input5" : "0",
            "input6" : "0",
            "input7" : "0",
            "input8" : "0",
            "input9" : "0",
            "input10" : "0",
            "gps-fix-time" : "2019-12-08T17:40:50",
            "message-time" : "2019-12-08T17:40:50",
            "battery-voltage" : 14.00
            "cumulativeOperationSeconds" : 561600
         },
         "relationships" : {
            "connected-machine" : {
               "links" : {
                                    "self" :
"/machine-state/9e6c5a77-588c-4192-a01b-00cc07baa72a/rela
tionships/connected-machine",
                                 "related" :
"/machine-state/9e6c5a77-588c-4192-a01b-00cc07baa72a/conn
ected-machine"
               },
               "data" : {
                  "type" : "connected-machine",
                                          "id"   :
"abcd1234-ab12-34cd-ab12-abcdef123456"
               }
            }
         },
         "type" : "machine-state",
         "id" : "9e6c5a77-588c-4192-a01b-00cc07baa72a"
      },</pre>
	<pre>Record list start indicator
	Record start indicator
	
	latitude
	longitude
	Altitude in m
	Approximate street address
	Approximate city
	Approximate zip code
	Approximate country code (2 letters)
	Engine status (0 = off, 1 = on)
	Ignition key status (0 = off, 1 = on)
	Odometer in km
	Tracking device's engine on hours
	Tracking device's ignition on hours
	Digital input 3 value (0 = off, 1 =
	on)
	Digital input 4 value (0 = off, 1 =
	on)
	Digital input 5 value (0 = off, 1 =
	on)
	Digital input 6 value (0 = off, 1 =
	on)
	Digital input 7 value (0 = off, 1 =
	on)
	Digital input 8 value (0 = off, 1 =
	on)
	Digital input 9 value (0 = off, 1 =
	on)
	Digital input 10 value (0 = off, 1
	=on)
	Gps positioning timestamp
	Machine state timestamp
	Machine battery voltage in V
	Number of seconds of machine engine
	operation (similar to
	cumulativeOperationHours, but with a
	better precision)
	
	Machine-dependent objects list
	Machine-dependent connected-machine
	info start</pre>

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```
Connected resource type
Connected resource id
(See parameter "include" below)



Resource type
Resource id (machine-state id)
```

API parameters

This API allows the use of the following parameters :

Parameter name	Type	Manda-tory	Usage
Ocp-Apim-Subscription-Key	Header	yes	Customer subscription key (primary or secondary)
X-token	Header	yes	Customer secret user token. Provide the API with the secret user token that lets the customer retrieve its resources.
api-version	Header	yes	Version number of the API (v1, v2, etc.)
include=connected-machine	Query	no	The API will return the id of the corresponding connected-machine in the "relationships/connected-machine/data" sub-schema.
page[size] page[number]	Query	no	The API may return many resources records when called. The page[size] allows the user to define the number of records wanted per page, and the page[number] allows the user to jump to the desired result page. Examples : ● page[size]=30 ⇒ the API will return a maximum of 30 records per response ● page[number]=3 ⇒ the API will return page number 3 of all available results page.
filter[attribute name]	Query	no	Similarly to the filtering feature of connected-machine API, this API will filter the result

			so that only machine state records matching the given attribute's value are retrieved Examples : • `filter[message-time]=ge:2019-12-01T10:00:00,le:2019-12-01T11:00:00` ⇒ the API will return every recorded machine state for the user, comprised between 10am and 11am for Dec 1st 2019 • `filter[connected-machine.id]=abcd1234-ab12-34cd-ab12-abcdef123456` ⇒ the API will return every available machine-state record for the given machine id (as retrieved from connected-machine API) • `filter[battery-voltage]=lt:10.5` ⇒ the API will return every available machine-state record indicating a machine battery voltage under 10.5 volts • `filter[country]=in:FR,IT` ⇒ get machines located in France and Italy • `filter[country]=nin:BE,NL` ⇒ get machines not located in Belgium or the Netherlands
`sort`	Query	no	The API will order the result records list according to ascending or descending value of the given attribute name. Using a dash ("-") before the attribute name indicates the API to perform the sort in a descending way. Elseway the sort is ascending. Examples : • `sort=battery-voltage` ⇒ the API will return every recorded machine state for the user, ordered from lowest battery voltage attribute value to highest • `sort=-odometer` ⇒ the API will return every recorded machine state for the user, ordered from highest odometer attribute value to lowest
fields	Query	no	The API will only return the resource attributes listed in this parameter, which helps deliver the data faster and focus only on data useful for the customer Example : • `fields=message-time,battery-voltage` ⇒ for a machine-state resource, the API will return only the message time and battery voltage attributes.

The filter parameters can be combined one with another, so you can retrieve all the machine-state records obtained today that show a cumulative-operation-hours over 3000 and a battery voltage under 10 volts, for example.

NOTE : as attribute values can differ from numerals to character strings, the attribute name provided to perform the sort or filter must be chosen wisely.
When performing comparisons on a character string attribute, the user must understand that even if the attribute value is expressed as a number ("1234"), it is not considered a number data type, so sorting and comparing is made through lexicographic comparison.
It must be noted that time-related information is expressed in Coordinated Universal Time (UTC), unless otherwise mentioned.

In details : the sensor-state API

Endpoint URL

The API can be reached at :

```
https://api.manitou-group.com/sensor-state/sensor-state
```

Data set example

The following chart lists the fields exposed by the API :

JSON data	Comments

`{`
`   "data" : [`
`      {`
`         "attributes" : {`
`            "sensor-value" : "6.86",`
`            "tracker-Sensor-Id" : 10007,`
`               "sensor-name" : "Engine Percent Load At Current Speed",`
`            "sensor-unit" : "%",`
`            "timestamp" : "2019-12-08T23:15:02"`
`         },`
`         "relationships" : {`
`            "equipment" : {`
`               "links" : {`
`                                       "self"  : "/sensor-state/ca058771-0d50-4392-a14f-7d19303896fe/relationships/equipment",`
`                                   "related"  : "/sensor-state/ca058771-0d50-4392-a14f-7d19303896fe/equipment"`
`               },`
`               **"data" : {**`
`                  **"type" : "connected-machine",**`
`                                     **"id"  : "abcd1234-ab12-34cd-ab12-abcdef123456"**`
`               **}**`
`            }`
`         },`
`         "type" : "sensor-state",`
`         "id" : "ca058771-0d50-4392-a14f-7d19303896fe"`
`      },`
`[...]`
`   "links" : {`
`                           "next"      : "/sensor-state?page[size]=10&page[number]=2&filter[id]=abcd1234-ab12-34cd-ab12-abcdef123456",`
`                           "last"      : "/sensor-state?page[size]=10&page[number]=652&filter[id]=abcd1234-ab12-34cd-ab12-abcdef123456"`
`   },`
`   "meta" : {`
`      "total-records" : 6513`
`   }`
`}`
	Record list start indicator
	Record start indicator
	
	Sensor value (expressed in sensor unit)
	Sensor id
	Sensor name
	Sensor unit
	Sensor record timestamp
	
	Sensor-state dependent objects list
	Sensor-state dependent equipment info start
	
	Dependant resource type
	Dependent resource id
	(See parameter "include" below)
	
	Resource type
	Resouce id (machine-state id)
	
	...other records of sensor-state…
	Result pages link records start
	Next result page link
	
	Last result page link
	
	Total number of available records matching the request

API parameters

This API allows the use of the following parameters :

Parameter name	Type	Manda-tory	Usage
`Ocp-Apim-Subscription-Key`	Header	yes	Customer subscription key (primary or secondary)
`X-token`	Header	yes	Customer secret user token. Provide the API with the secret user token that lets the customer retrieve its resources.
`api-version`	Header	yes	Version number of the API (v1, v2, etc.)
`include=equipment`	Query	no	The API will return the id of the corresponding equipment (connected-machine) in the "relationships/equipment/data" sub-schema.
`page[size]` `page[number]`	Query	no	The API may return many resources records when called. The page[size] allows the user to define the number of records wanted per page, and the page[number] allows the user to jump to the desired result page. Examples : • `page[size]=30` ⇒ the API will return a maximum of 30 records per response • `page[number]=3` ⇒ the API will return page number 3 of all available results page.
`filter[attribute name]`	Query	no	Similarly to the filtering feature of connected-machine API, this API will filter the result so that only sensor state records matching the given attribute's value are retrieved Examples : • `filter[tracker-Sensor-id]=10001` ⇒ the API will return every recorded sensor state for the user, for sensor id 10001 (see list in the appendix) • `filter[timestamp]=ge:2019-12-01T10:00:00,le:2019-12-01T11:00:00` ⇒ the API will return every recorded sensor state for the user, comprised between 10am and 11am for Dec 1st 2019 • `filter[equipment.id]=abcd1234-ab12-34cd-ab12-abcdef123456` ⇒ the API will return every available sensor-state record for the

			given equipment id (as retrieved from connected-machine API, provided the equipment related to the sensor is of the connected-machine type) ● `filter[sensor-value]=lt:10` ⇒ the API will return every available machine-state record indicating a sensor-value under 10 ● `filter[tracker-Sensor-id]=in:10001,10012` ⇒ get data for sensors 10001 and 10012 ● `filter[brand]=nin:10001,10005` ⇒ get data for sensors other than 10001 or 10012
`sort`	Query	no	The API will order the result records list according to ascending or descending value of the given attribute name. Using a dash ("-") before the attribute name indicates the API to perform the sort in a descending way. Elseway the sort is ascending. Examples : ● `sort=sensor-value` ⇒ the API will return every recorded sensor state for the user, ordered from lowest sensor-value attribute value to highest ● `sort=-sensor-value` ⇒ the API will return every recorded sensor state for the user, ordered from highest sensor-value attribute value to lowest
`fields`	Query	no	The API will only return the resource attributes listed in this parameter, which helps deliver the data faster and focus only on data useful for the customer Example : ● `fields=tracker-Sensor-Id,sensor-value` ⇒ for a sensor-state resource, the API will return only the sensor's id and value.

NOTE : as attribute values can differ from numerals to character strings, the attribute name provided to perform the sort or filter must be chosen wisely.
When performing comparisons on a character string attribute, the user must understand that even if the attribute value is expressed as a number ("1234"), it is not considered a number data type, so sorting and comparing is made through lexicographic comparison.
It must be noted that time-related information is expressed in Coordinated Universal Time (UTC), unless otherwise mentioned.

In details : the machine-analytic API

Endpoint URL

The API can be reached at :

`https://api.manitou-group.com/machine-analytic/machine-analytic`

Data set example

The following chart lists the fields exposed by the API :

JSON data	Comments

`{`
`   "data" : [`
`      {`
`        "attributes" : {`
`           "reference-number" : "MAN00000Z000000123",`
`           "message-date" : "2019-11-12T00:00:00",`
`           "message-date-first":`
`"2021-08-18T06:13:53.217",`
`           "message-date-last":`
`"2021-08-18T06:58:53.726",`
`           "variable-id" : 10003,`
`                "var-name" : "Engine Total Hours of`
`Operation",`
`           "uom" : "hr",`
`           "value-min" : 29.75,`
`           "value-max" : 36.049999237060547,`
`           "value-avg" : 33.072158813476562,`
`           "value-sum" : 5820.7001953125,`
`           "value-count" : 176.0`
`        },`
`        "relationships" : {`
`         "equipment" : {`
`            "links" : {`
`                                  "self"  :`
`"/equipment-analytic/6ccae061-e613-4fc7-9da4-0139dc68777d`
`/relationships/equipment",`
`                                 "related"  :`
`"/equipment-analytic/6ccae061-e613-4fc7-9da4-0139dc68777d`
`/equipment"`
`                }`
`            }`
`        },`
`        "type" : "equipment-analytic",`
`        "id" : "6ccae061-e613-4fc7-9da4-0139dc68777d"`
`     },`
`[...]`
`   "links" : {`
`                                 "last"       :`
`"/equipment-analytic?page[size]=10&page[number]=1&filter[`
`reference-number]=MAN00000Z000000123&filter[message-date]`
`=ge:2019-11-12&filter[message-date]=le:2019-11-12"`
`   },`
`   "meta" : {`
`      "total-records" : 2`
`   }`
`}`
	Record list start indicator
	Record start indicator
	
	Machine reference number (S/N)
	Calculation date
	Date of the first message used to compute the analytic value
	Date of the last message used to compute the analytic value
	Sensor id
	Sensor name
	Sensor unit of measure
	Min sensor value of the day
	Max sensor value of the day
	Average sensor value of the day
	Sum of available values of the day
	Nb of available values of the day
	
	Machine-analytic dependent objects list
	Machine-analytic dependent equipment info start
	
	Resource type
	Resouce id (equipment-analytic id)
	
	...other records of machine-analytic...
	Result pages link records start
	Last result page link
	
	Total number of available records matching the request

API parameters

This API allows the use of the following parameters :

Parameter name	Type	Manda-tory	Usage
`Ocp-Apim-Subscription-Key`	Header	yes	Customer subscription key (primary or secondary)
`X-token`	Header	yes	Customer secret user token. Provide the API with the secret user token that lets the customer retrieve its resources.
`api-version`	Header	yes	Version number of the API (v1, v2, etc.)
`page[size]` `page[number]`	Query	no	The API may return many resources records when called. The page[size] allows the user to define the number of records wanted per page, and the page[number] allows the user to jump to the desired result page. Examples : • `page[size]=30` ⇒ the API will return a maximum of 30 records per response • `page[number]=3` ⇒ the API will return page number 3 of all available results page.
`filter[`*`attribute name`*`]`	Query	no	Similarly to the filtering feature of connected-machine API, this API will filter the result so that only sensor state records matching the given attribute's value are retrieved Examples : • `filter[variable-id]=10001` ⇒ the API will return every recorded machine-analytic for the user, for sensor id 10001 (see list in the appendix) • `filter[message-date]=ge:2019-12-01T10:00:00,le:2019-12-01T11:00:00` ⇒ the API will return every recorded machine-analytic for

			the user, comprised between 10am and 11am for Dec 1st 2019 • `filter[reference-number]=MAN00000Z000000123` ⇒ the API will return every available machine-analytic record for the given machine serial number
`sort`	Query	no	The API will order the result records list according to ascending or descending value of the given attribute name. Using a dash ("-") before the attribute name indicates the API to perform the sort in a descending way. Elseway the sort is ascending. Examples : • `sort=value-max` ⇒ the API will return every recorded machine-analytic for the user, ordered from lowest value-max attribute value to highest • `sort=-value-count` ⇒ the API will return every recorded machine-analytic for the user, ordered from highest value-count attribute value to lowest
fields	Query	no	The API will only return the resource attributes listed in this parameter, which helps deliver the data faster and focus only on data useful for the customer Example : • `fields=variable-id,value-avg` ⇒ for a machine-analytics resource, the API will return only the variable id and average value attributes.

NOTE : as attribute values can differ from numerals to character strings, the attribute name provided to perform the sort or filter must be chosen wisely.
When performing comparisons on a character string attribute, the user must understand that even if the attribute value is expressed as a number ("1234"), it is not considered a number data type, so sorting and comparing is made through lexicographic comparison.
It must be noted that time-related information is expressed in Coordinated Universal Time (UTC), unless otherwise mentioned.

In details : the maintenance-operation API

Endpoint URLs

The API can be reached at :

```
https://api.manitou-group.com/maintenance-operation/maintenance-operation
https://api.manitou-group.com/maintenance-operation/maintenance-item
https://api.manitou-group.com/maintenance-operation/maintenance-work
```

Data set example

The following chart lists the fields to transmit to the API for the creation of a maintenance-operation resource :

JSON data	Comments

<pre>{
  "data": {
    "type": "maintenance-operation",
    "attributes": {
      "dealer-code": "1",
      "dealer-name": "FakeDealer001",
      "sender-software-name": "DealerERP",
      "sender-software-version": "v2.021",
      "operation-timestamp": "2021-02-10T10:10:10",
      "operation-number": "264",
      "equipment-hourmeter": 510,
      "operation-range": "Planned maintenance",
      "operation-label": "500h complete checkup",
       "operation-description": "Manufacturer recommended
500h planned maintenance + hydraulic leakage repair"
    },
    "relationships": {
      "connected-machine": {
        "data": {
          "type": "connected-machine",
          "id": "abcd1234-ab12-34cd-ab12-abcdef123456"
        }
      }
    }
  }
}</pre>
	
	Resource type
	
	Machine dealer's MANITOU customer #
	Machine dealer's name
	Machine dealer's software name
	Machine dealer's software version
	Maintenance operation timestamp
	Maintenance operation reference
	Machine hourmeter during maintenance
	Operation range
	Operation label
	Operation description
	
	Relationship declaration
	Concerned connected-machine resource
	
	Linked resource type
	Linked resource id

The following chart lists the fields to transmit to the API for the creation of a maintenance-item resource :

JSON data	Comments

<pre>{
  "data": {
    "type": "maintenance-item",
    "attributes": {
       "item-code": "4321",</pre>
	
	Resource type
	
	Item code

MANITOU GROUP

```
      "item-name": "elbow grease",                    Item name
      "item-quantity": 2.3                             Item quantity
   },
   "relationships": {                                  Relationship declaration
     "maintenance-operation": {                        Concerned maintenance-operation
       "data": {                                       resource
         "type": "maintenance-operation",              Linked resource type
         "id": "operat1234-op12-34er-op12-operat123456"  Linked resource id
       }
     }
    }
  }
}
```

The following chart lists the fields to transmit to the API for the creation of a maintenance-work resource :

JSON data	Comments
```{ "data": { "type": "maintenance-work", "attributes": { "work-label": "Test général", "work-type": "Test", "work-quantity": 0.25 }, "relationships": { "maintenance-operation": { "data": { "type": "maintenance-operation", "id": "operat1234-op12-34er-op12-operat123456" } } } } }```	Resource type Work operation label Work operation type Work operation quantity Relationship declaration Concerned maintenance-operation resource Linked resource type Linked resource id

API parameters

This API allows the use of the following parameters :

Parameter name	Type	Manda-tory	Usage
Applicable for all resources			
Ocp-Apim-Subscription-Key	Header	yes	Customer subscription key (primary or secondary)
X-token	Header	yes	Customer secret user token. Provide the API with the secret user token that lets the customer retrieve its resources.

<table>
<table>
<tr><td><code>api-version</code></td><td>Header</td><td>yes</td><td>Version number of the API (v1, v2, etc.)</td></tr>
<tr><td><code>Message body</code></td><td>Body</td><td>yes</td><td>See data set examples.</td></tr>
</table>

Return values

Here are the possible return values when sending a POST request to create a maintenance-operation resource :

Content	Comments
Successful creation	

```
HTTP 201 Created

Location:
/maintenance-operation/operat1234-op12-34er-op12-operat12
3456

Body:
{
    "links": {
        "self": "/maintenance-operation"
    },
    "data": {
        "type": "maintenance-operation",
        "id": "operat1234-op12-34er-op12-operat123456",
        "attributes": {
            "dealer-code": "1",
            "dealer-name": "FakeDealer001",
            "sender-software-name": "DealerERP",
            "sender-software-version": "v2.021",
            "operation-timestamp": "2021-02-10T10:10:10",
            "operation-number": "264",
            "equipment-hourmeter": 510.00,
            "operation-range": "Planned maintenance",
            "operation-label": "500h complete checkup",
                    "operation-description": "Manufacturer
recommended 500h planned maintenance + hydraulic leakage
repair"
        },
        "relationships": {
            "connected-machine": {
                "links": {
                                        "self":
"/maintenance-operation/operat1234-op12-34er-op12-operat1
23456/relationships/connected-machine",
                                        "related":
"/maintenance-operation/operat1234-op12-34er-op12-operat1
23456/connected-machine"
                }
            }
        },
        "links": {
                                "self":
"/maintenance-operation/operat1234-op12-34er-op12-operat1
23456"
        }
    }
}
```

Comments column:
- Successfully created
- New resource location (contains the resource id)
- New resource id / Resource attributes
- Relationships of the resource
- Link to the connected-machine
- Link to self

Bad request	
HTTP 400 Bad request Body : Error explanation when possible	Request couldn't be handle because of an error in the request
Server error	
HTTP 500 Internal server error	Request couldn't be handled because of an error on the server's side

Here are the possible return values when sending a POST request to create a maintenance-item resource :

Content	Comments
Successful creation	

HTTP 201 Created
 	
Location:
/maintenance-item/item1234-it12-34em-it12-item1234
 	
Body:
{
    "links": {
        "self": "/maintenance-item"
    },
    "data": {
        "type": "maintenance-item",
        "id": "item1234-it12-34em-it12-item1234",
        "attributes": {
            "item-code": "4321",
            "item-name": "elbow grease",
            "item-quantity": 2.30
        },
        "relationships": {
        "maintenance-operation": {
            "links": {
                                    "self":
"/maintenance-item/item1234-it12-34em-it12-item1234/relat
ionships/maintenance-operation",
                                    "related":
"/maintenance-item/item1234-it12-34em-it12-item1234/maint
enance-operation"
                }
            }
        },
        "links": {
                                    "self":
"/maintenance-item/item1234-it12-34em-it12-item1234"
        }
    }
}
	Successfully created
	
	New resource location (contains the resource id)
	
	New resource id
	Resource attributes
	
	Relationships of the resource
	
	Link to the maintenance-operation
	
	Link to self

Bad request	
HTTP 400 Bad request Body :	Request couldn't be handle because of an error in the request

Error explanation when possible	
Server error	
HTTP 500 Internal server error	Request couldn't be handled because of an error on the server's side

Here are the possible return values when sending a POST request to create a maintenance-work resource :

Content	Comments
Successful creation	
```HTTP 201 Created```	Successfully created
Location: /maintenance-work/work5678-wo56-78rk-wo56-work5678	New resource location (contains the resource id)
Body: { "links": { "self": "/maintenance-work" }, "data": { "type": "maintenance-work", "id": "work5678-wo56-78rk-wo56-work5678", "attributes": { "work-label": "Test général", "work-type": "Test", "work-quantity": 0.25 }, "relationships": { "maintenance-operation": { "links": { "self": "/maintenance-work/work5678-wo56-78rk-wo56-work5678/relationships/maintenance-operation", "related": "/maintenance-work/work5678-wo56-78rk-wo56-work5678/maintenance-operation" } } }, "links": { "self": "/maintenance-work/b2345968-82f1-41db-b415-08d908c2de28" } } }	New resource id Resource attributes Relationships of the resource Link to the maintenance-operation Link to self
Bad request	
HTTP 400 Bad request Body : Error explanation when possible	Request couldn't be handle because of an error in the request
Server error	

HTTP 500 Internal server error	Request couldn't be handled because of an error on the server's side

Appendix : list of sensor id's and description

This list details all availables sensor id's. Please note that not all sensors listed below do exist on every machine : depending on the machine range, model and options, some may not be available.

Please note also that this list may be updated as new machines and options are made available.

Sensor id	Description	In sensor-state API	In machine-analytic API
~~101~~	~~Temperature1~~		
~~102~~	~~Temperature2~~		
498	Engine Starter Mode	X	X
512	Ambient Air Temperature	X	X
884	Transmission Oil Temperature 1	X	X
1296	attachment recognition	X	X
1300	Boom movement cut off	X	X
1301	Current engine status	X	X
1302	Current ignition status	X	X
1303	Attachment Confirmed	X	X
1304	Fuel less than 10%	X	X
1305	Command position	X	X
1306	Machine Type (PLUS 2150 = 1;Plus 2550 = 2; etc)	X	X
1307	Engine type (Mercedes-Benz = 1; Perkins = 2; etc)	X	X
1308	transmission type (Sauer = 1; Rexroth = 2;etc)	X	X
1310	Diesel Particulate Filter Status	X	X
1311	SPN Error code from CPC4 (Mercedes-Benza Master ECU)	X	X
1312	FMI Error code from CPC4 (Mercedes-Benza Master ECU)	X	X

1313	Distributor errors	X	X
1314	Transmission errors	X	X
1315	Manitou Error codes	X	X
1316	Manitou Warning message	X	X
1317	Actual load	X	X
1319	Radius	X	X
1320	Height	X	X
1321	turret position	X	X
1322	Angle	X	X
1323	Lmi percentage	X	X
1324	SPN Error code from MCM	X	X
1325	FMI Error code from MCM	X	X
1326	SPN Error code from ACM	X	X
1327	FMI Error code from ACM	X	X
1471	Transmission Oil Pressure	X	X
1475	Total Vehicle Distance	X	X
1476	Engine Intake Air Temperature	X	X
1770	Auxiliary I/O #03	X	X
1771	Auxiliary I/O #02	X	X
1783	Ambient Air Temperature	X	X
1792	Engine Coolant Level 1	X	X
1793	Engine Air Filter 1 Differential Pressure	X	X
1794	Aftertreatment Diesel Particulate Filter Active Regeneration Status	X	X
2030	Telescop In status	X	X
2031	Cab/ Platform /RC mode status	X	X
2032	Fork / Bucket / Suspended load mode status	X	X

		X	X
2033	DEF tank level below 10%	X	X
2034	Direction engaged	X	X
2035	Strain gauge (Max/min)	X	X
2036	Strain gauge (Average)	X	X
2077	Engine Oil Temperature 1	X	X
2084	Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch	X	X
2085	Aftertreatment SCR Operator Inducement Severity	X	X
2086	Aftertreatment 1 Diesel Particulate Filter Soot Load Percent	X	X
2087	Aftertreatment 1 Diesel Particulate Filter Ash Load Percent	X	X
2106	STOP Lamp	X	X
2107	WARNING Lamp	X	X
2108	Servicing Lamp	X	X
2109	Active Error Code	X	X
2950	Active Diagnostic Trouble Codes	X	X
3660	Door opened while driving	X	X
3661	Travelling with boom angle high	X	X
4873	Driving without seatbelt	X	X
10001	Engine Coolant Temperature	X	X
10002	Engine Speed	X	X
10003	Engine Total Hours of Operation	X	X
10004	Maximum load	X	X
10005	Engine Total Fuel Used	X	X
10006	Engine Oil Pressure	X	X
10007	Engine Percent Load At Current Speed	X	X
10008	Aftertreatment 1 Diesel Exhaust Fluid Concentration	X	X

10009	Aftertreatment Diesel Particulate Filter Status	X	X
10010	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	X	X
10011	Air Filter Clogging lamp	X	X
10012	Alternator Not Charging lamp	X	X
10013	Wheel-Based Vehicle Speed	X	X
10014	Coolant Temperature lamp	X	X
10015	Dpf lamp	X	X
10016	Engine Fuel Rate	X	X
10017	Engine Oil Pressure lamp	X	X
10018	Exhaust System High Temperature Lamp Command	X	X
10019	Fault Braking lamp	X	X
10020	Fuel Level	X	X
10021	Hydraulic Filter Clogging lamp	X	X
10022	Low Brake Fluid Level lamp	X	X
10023	Low Coolant Fluid Level lamp	X	X
10024	Outriggers on ground	X	X
10025	Override	X	X
10026	Scr lamp	X	X
10027	Seat	X	X
10028	Steering Default lamp	X	X
10029	Transmission Oil Pressure lamp	X	X
10030	Transmission Oil Temperature lamp	X	X
10031	Water In Fuel Indicator 1	X	X
10032	Power battery charge level	X	X
10033	Power battery voltage	X	X

10034	Power battery capacity	X	XOu
20002	Hourly breakdown : engine use duration during a 1h period (in seconds)		X
20003	Fuel consumption during a 1h period (in liters)		X
20004	CO2 mass emission during a 1h period (in kg)		X
30000	ISO 15143 - Peak daily speed in the last 24h (in km/h)		X
30001	ISO 15143 - Peak daily speed in the last 24h (in mph)		X
30002	ISO 15143 - Fuel consumption in the last 24h (in liters)		X
30003	ISO 15143 - Fuel consumption in the last 24h (in US gallons)		X
30005	ISO 15143 - Average engine load factor in the last 24h (in %)		X
40000	ISO 15143 - Peak daily speed in the last 24h of engine runtime (in km/h)		X
40001	ISO 15143 - Peak daily speed in the last 24h of engine runtime (in mph)		X
40002	ISO 15143 - Fuel consumption in the last 24h of engine runtime (in liters)		X
40003	ISO 15143 - Fuel consumption in the last 24h of engine runtime (in US gallons)		X
40005	ISO 15143 - Average engine load factor in the last 24h of engine runtime (in %)		X