ferroamp

Cloud API

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Revision B

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Table of contents

1 Revision History

Revision	History
B	Fixed direction of arrow in figure 1
A	Initial Release

2 Global

2.1 Measurements

To understand all the measurement points we need to understand that there are three main parts in a system. There is the grid connection, load and the energy hub system. For all three parts there can be either production, when the power flow is positive, or consumption, when the power flow is negative. Figure 1 illustrates this, were load can be positive whenever there is another production source than Ferroamp's energyhub system.

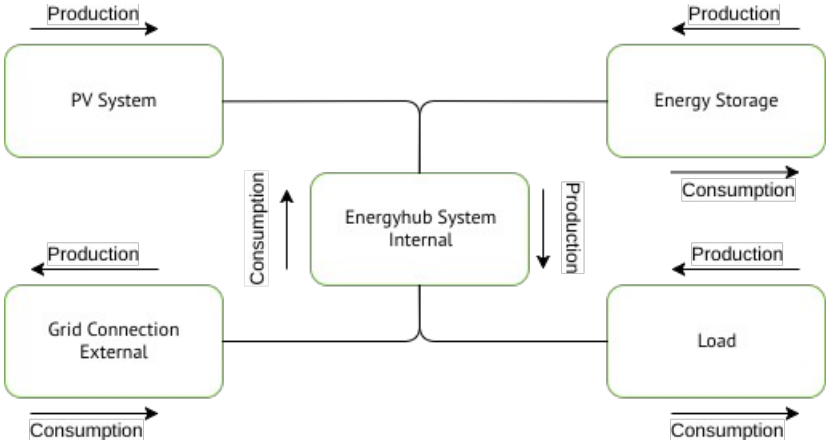

Figure 1: Power and energy flow in a Energyhub System

2.2 Available APIs

Type of api	Explanation	Example
3.1 Energy	An array of energy per given resolution in the given time intervall.	/api?type=energy&resolution=hour&startdate=2017-08-03T00&enddate=2017-08-30T00&api_key=<API_KEY>&fid=<FID>
3.2 totalEnergy	Latest given PV energy	/api?type=totalenergy&api_key=<API_KEY>&fid=<FID>
3.3 Pvdisplay	PV Data to be display directly at a monitor	/api?type=pvdisplay&api_key=<insert api_key>&fid=<insert facility_id>
3.4 Mixed Data	Data to display in a monitor	/api?type=mixeddisplay&api_key=<API_KEY>&fid=<FID>

2.3 Query parameters

Definition of the available query parameters.

Param	Explaination	Type	Unique	Example	Required
api_key	Unique generated key at portal	40 char string	Yes		Yes
fid	Facility Identification	Int	Yes	1	Yes
type	Type of API requested	String	No	energy	Yes
resolution	If needed resolution of API	String	-	hour	No
startdate	If needed start of timeintervall	ISO8601 Date YYYY-MM-DDTHH	-	2017-03-05T23	No
enddate	If needed end of timeintervall	ISO8601 Date YYYY-MM-DDTHH	-	2017-03-05T23	No

2.4 HTTP Response Codes

StatusCode	StatusText	Explanation
200	OK	Request is valid.
400	Bad Request	Most probably the fault is the query params has wrong format and the api will tell you about the fault. **Example**: ?startdate=201-12-3T0 will generate a fault: *Date format for startdate is not YYYY-MM-DD*
401	Not Authenticated	The API Key do not match the FacilityId or that the IP address are not valid.
404	Not Found	If no api authentication can be found.
429	Too many requests	If the daily quota of max 300 requests is exceeded it will response with to many requests
500	Internal Server Error	This is a problem on the Ferroamp site, if this occur, please contact support@ferroamp.se

3 API

3.1 Energy

Example url	/api?type=energy&resolution=hour&startdate=2017-08-03T00&enddate=2017-08-30T00&api_key=&fid=
Method	GET
Query Params	• type=energy • facility_id=<INT> • api_key=<STRING> • resolution=hour • startdate=YYYY-MM-DDTHH • enddate=YYYY-MM-DDTHH
Format	JSON
Limitations	Max 32 days

3.1.1 Response

For a full JSON example see 4.1 Energy response example

Name	Type	Description
facility_id	Int	Unique System Identifier
max_requests	Int	Allowed max requests per 24 hours
requests	Int	Request made within allowed max requests, if requests >=max_requests returns 401
unit	String	wH
type	String	energy
resolution	String	hour
startdate	String	YYYY-MM-DDTHH:mm:ss.000Z ,ex: 2017-08-03T00:59:00.000Z
enddate	String	YYYY-MM-DDTHH:mm:ss.000Z ,ex: 2017-08-03T00:59:00.000Z
data	Object[]	Energy measured per hour within time interval. See 4.7 Energy data Definition , where type is Number and Ts is defined

3.2 TotalEnergy

Example url	/api?type=totalenergy&api_key=<API_KEY>&fid=<FID>
Method	GET
Query Params	• type=totalenergy • facility_id=<INT> • api_key=<STRING>
Format	JSON

3.2.1 Response

Name	Type	Description
facility_id	Int	Unique System Identifier
max_requests	Int	Allowed max requests per 24 hours
requests	Int	Request made within allowed max requests, if requests >=max_requests returns 401
unit	String	wH
type	String	totalenergy
data	Object	`{"pve": Float ,"ts": String}`

3.3 Pvdisplay

Example url	/api?type=pvdisplay&api_key=<insert api_key>&fid=<insert facility_id>
Method	GET
Query Params	• type=pvdisplay • facility_id=<INT> • api_key=<STRING>
Format	JSON

3.3.1 Response

Name	Type	Description
facility_id	Int	Unique System Identifier
max_requests	Int	Allowed max requests per 24 hours
requests	Int	Request made within allowed max requests, if requests >=max_requests returns 401
unit	String	wH
type	String	totalenergy
data	Object	`{ "pve": { "val": <Float>,, "unit": "Wh" }, "pvp": { "val": <Float>, "unit": "W" }, "pvetoday": { "val":<Float>, "unit": "Wh" } }`

3.4 Mixed Data

Example url	*/api?type=mixeddisplay&api_key=<>&fid=<>*
Method	GET
Query Params	• type=mixeddisplay • facility_id=<INT> • api_key=<STRING>
Format	JSON

3.4.1 Response

For a full JSON example see 4.4 Mixed data response example

Name	Type	Description
facility_id	Int	Unique System Identifier
max_requests	Int	Allowed max requests per 24 hours
unit	String	
type	String	Mixeddisplay
data	Object	JSON

Mixed data , data Object

Name	Type	Description

totalenergy	Object	Total mesaured energy, see 4.7 Energy data definition
uidata	Object	Currents, Voltages, Power. See 4.5 Uidata definition
batterydata	Object	Aggregated state of energystorage, See 4.6 Battery data definition
dailyenergy	Object	Energy measured *today*, see 4.7 Energy data definition

4 Appendix

4.1 Energy response example


```
{
   "facility_id":1,
   "requests": 0,
   "max_requests": 300,
   "enddate": "2017-08-03T00:59:00.000Z",
   "startdate": "2017-08-03T00:59:00.000Z",
   "resolution": "hour",
   "unit": "wH",
   "type": "energy",
   "data": [{
     "ep1": 0,
     "ep2": 0,
     "ep3": 0,
     "ec1": 114.77539000008255,
     "ec2": 628.553087499924,
     "ec3": 489.7865705555305,
     "ip1": 0,
     "ip2": 0.005437777377665043,
     "ip3": 0.00727444514632225,
     "ic1": 114.50452416666667,
     "ic2": 113.06467194444122,
     "ic3": 116.28260388888884,
     "lp1": 7.289098611101508,
     "lp2": 0,
     "lp3": 0,
     "lc1": 7.55994555586949,
     "lc2": 515.4933683332056,
     "lc3": 373.5107474999968,
     "ts": "2017-08-03T00:59:00.000Z",
     "pve": 0
   },
   ...
  ]
 }
```

4.2 Total pve energy example response


```
{
  "facility_id": 1,
  "requests": 4,
  "max_requests": 300,
  "unit": "wH",
  "type": "totalenergy",
  "data": {
    "pve": 16522.264024166667,
    "ts": 0
  }
}
```


4.3 Pvedisplay example response


```
{
  "facility_id": 1,
  "requests": 24,
  "max_requests": 300,
  "unit": "Wh / W",
  "type": "pvdisplay",
  "data": {
    "pve": {
      "val": 1415886.3279830555,
      "unit": "Wh"
    },
    "pvp": {
      "val": 1546.4100341796875,
      "unit": "W"
    },
    "pvetoday": {
      "val": 3058.5674780556,
      "unit": "Wh"
    }
  }
}
```


4.4 Mixed data response example


```
{
 "facility_id": 1,
 "max_requests": 300,
 "unit": "Wh / W",
 "type": "mixeddisplay",
 "data": {
   "totalenergy": {
     "wExtProdQ1": { "ts": "2018-11-20T15:27:31.000Z", "val": 351458.25 },
     "wExtProdQ2": { "ts": "2018-11-20T15:27:31.000Z", "val": 392120.12 },
     "wExtProdQ3": { "ts": "2018-11-20T15:27:31.000Z", "val": 386096.16 },
     "wExtConsQ1": { "ts": "2018-11-20T15:27:31.000Z", "val": 4962268 },
     "wExtConsQ2": { "ts": "2018-11-20T15:27:31.000Z", "val": 4862835 },
     "wExtConsQ3": { "ts": "2018-11-20T15:27:31.000Z", "val": 5035439 },
     "wInvProdQ1": { "ts": "2018-11-20T15:27:31.000Z", "val": 2860673.8 },
     "wInvProdQ2": { "ts": "2018-11-20T15:27:31.000Z", "val": 2620683.5 },
     "wInvProdQ3": { "ts": "2018-11-20T15:27:31.000Z", "val": 3041408 },
```

```
    "wInvConsQ1": { "ts": "2018-11-20T15:27:31.000Z", "val": 211008.38 },
    "wInvConsQ2": { "ts": "2018-11-20T15:27:31.000Z", "val": 556170.4 },
    "wInvConsQ3": { "ts": "2018-11-20T15:27:31.000Z", "val": 339899.53 },
    "wLoadProdQ1": { "ts": "2018-11-20T15:27:31.000Z", "val": 1910.825 },
    "wLoadProdQ2": { "ts": "2018-11-20T15:27:31.000Z", "val": 1981.5365 },
    "wLoadProdQ3": { "ts": "2018-11-20T15:27:31.000Z", "val": 1947.0344 },
    "wLoadConsQ1": { "ts": "2018-11-20T15:27:31.000Z", "val": 8234872 },
    "wLoadConsQ2": { "ts": "2018-11-20T15:27:31.000Z", "val": 7583877.5 },
    "wLoadConsQ3": { "ts": "2018-11-20T15:27:31.000Z", "val": 8780480 },
    "wPv": { "ts": "2018-11-20T15:27:31.000Z", "val": 1.4 },
    "wBatProd": { "ts": "2018-11-20T15:27:31.000Z", "val": 711830.06 },
    "wBatCons": { "ts": "2018-11-20T15:27:31.000Z", "val": 866012.1 },
    "unit": "Wh",
  },
  "uidata": {
    "u1": { "val": 233.99, "ts": "2018-11-20T15:27:31.000Z" },
    "u2": { "val": 233.36, "ts": "2018-11-20T15:27:31.000Z" },
    "u3": { "val": 235.72, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvRms1": { "val": 0.68, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvRms2": { "val": 0.87, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvRms3": { "val": 0.85, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvQ1": { "val": 0.22, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvQ2": { "val": 0.78, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvQ3": { "val": -0.73, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvD1": { "val": 0.89, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvD2": { "val": 0.89, "ts": "2018-11-20T15:27:31.000Z" },
    "iInvD3": { "val": 0.92, "ts": "2018-11-20T15:27:31.000Z" },
    "iExtRms1": { "val": 7.42, "ts": "2018-11-20T15:27:31.000Z" },
    "iExtRms2": { "val": 7.92, "ts": "2018-11-20T15:27:31.00Z" },
    "iExtRms3": { "val": 8.4, "ts": "2018-11-20T15:27:31.000Z" },
    "iExtQ1": { "val": 9.03, "ts": "2018-11-20T15:27:31.000Z" },
    "iExtQ2": { "val": 8.89, "ts": "2018-11-20T15:27:31.000Z" },
    "iExtQ3": { "val": 9.1, "ts": "2018-11-20T15:27:31.000Z" },
    "iExtD1": { "val": 5.1, "ts": "2018-11-20T15:27:31.000Z" },
    "iExtD2": { "val": 6.21, "ts": "2018-11-20T15:27:31.000Z" },
    "iExtD3": { "val": 7.06, "ts": "2018-11-20T15:27:31.000Z" },
    "uPos": { "val": 380.3, "ts": "2018-11-20T15:27:31.000Z" },
    "uNeg": { "val": -379.72, "ts": "2018-11-20T15:27:31.000Z" },
    "pvPower": { "val": 0, "ts": "2018-11-20T15:27:31.000Z" },
    "batPower": { "val": 0, "ts": "2018-11-20T15:27:31.000Z" },
    "pLoadD3": { "val": 1023.41, "ts": "2018-11-20T15:27:31.000Z" },
    "pLoadD2": { "val": 877.86, "ts": "2018-11-20T15:27:31.000Z" },
    "pLoadD1": { "val": 696.57, "ts": "2018-11-20T15:27:31.000Z" },
    "pLoadQ3": { "val": 1638.46, "ts": "2018-11-20T15:27:31.000Z" },
    "pLoadQ2": { "val": 1338.23, "ts": "2018-11-20T15:27:31.000Z" },
    "pLoadQ1": { "val": 1457.67, "ts": "2018-11-20T15:27:31.000Z" },
    "pInvD3": { "val": 153.34, "ts": "2018-11-20T15:27:31.000Z" },
    "pInvD2": { "val": 146.86, "ts": "2018-11-20T15:27:31.000Z" },
    "pInvD1": { "val": 147.26, "ts": "2018-11-20T15:27:31.000Z" },
    "pInvQ3": { "val": -121.68, "ts": "2018-11-20T15:27:31.000Z" },
    "pInvQ2": { "val": 128.71, "ts": "2018-11-20T15:27:31.000Z" },
    "pInvQ1": { "val": 36.4, "ts": "2018-11-20T15:27:31.000Z" },
    "pExtD3": { "val": 1176.76, "ts": "2018-11-20T15:27:31.000Z" },
    "pExtD2": { "val": 1024.71, "ts": "2018-11-20T15:27:31.000Z" },
    "pExtD1": { "val": 843.83, "ts": "2018-11-20T15:27:31.000Z" },
    "pExtQ3": { "val": 1516.78, "ts": "2018-11-20T15:27:31.000Z" },
    "pExtQ2": { "val": 1466.94, "ts": "2018-11-20T15:27:31.000Z" },
    "pExtQ1": { "val": 1494.07, "ts": "2018-11-20T15:27:31.000Z" },
    "sExt": { "val": 5564.47, "ts": "2018-11-20T15:27:31.000Z" },
  },
  "batterydata": { "soc": 65.75, "soh": 100, "ratedCapacity": 7200 },
  "dailyenergy": {
```

```
      "wExtProdQ1": { "val": null },
      "wExtProdQ2": { "val": 0.39832917 },
      "wExtProdQ3": { "val": 0.5367064 },
      "wExtConsQ1": { "val": 20635.637 },
      "wExtConsQ2": { "val": 20652.492 },
      "wExtConsQ3": { "val": 20724.87 },
      "wInvProdQ1": { "val": 2077.6982 },
      "wInvProdQ2": { "val": 2944.6572 },
      "wInvProdQ3": { "val": 2718.064 },
      "wInvConsQ1": { "val": 734.82935 },
      "wInvConsQ2": { "val": 867.6332 },
      "wInvConsQ3": { "val": 1256.9956 },
      "wLoadProdQ1": { "val": null },
      "wLoadProdQ2": { "val": null },
      "wLoadProdQ3": { "val": 0.025895834 },
      "wLoadConsQ1": { "val": 22105.266 },
      "wLoadConsQ2": { "val": 22862.463 },
      "wLoadConsQ3": { "val": 22314.783 },
      "wPv": { "val": 3692.677 },
      "wBatCons": { "val": 1333.6722 },
      "wBatProd": { "val": 3316.6624 },
      "unit": "Wh",
    },
  },
}
```


4.5 Uidata definition

valTs = Object<{val : <Float>, ts : Date}>

Param	Type	Description
u1	valTs	Line Voltage Phase 1 [Vrms], Line to neutral
u2	valTs	Line Voltage Phase 2 [Vrms], Line to neutral
u3	valTs	Line Voltage Phase 3 [Vrms], Line to neutral
iInvRms1	valTs	Line Inverter (EnergyHub) Current RMS 1 [Arms]
iInvRms2	valTs	Line Inverter (EnergyHub) Current RMS 2 [Arms]
iInvRms3	valTs	Line Inverter (EnergyHub) Current RMS 3 [Arms]
iInvQ1	valTs	Line Inverter (EnergyHub) Active Current Component, Phase 1 [Apeak]
iInvQ2	valTs	Line Inverter (EnergyHub) Active Current Component, Phase 2 [Apeak]
iInvQ3	valTs	Line Inverter (EnergyHub) Active Current Component, Phase 3 [Apeak]
iInvD1	valTs	Line Inverter (EnergyHub) Reactive Current Component, Phase 1 [Apeak]
iInvD2	valTs	Line Inverter (EnergyHub) Reactive Current Component, Phase 2 [Apeak]
iInvD3	valTs	Line Inverter (EnergyHub) Reactive Current Component, Phase 3 [Apeak]
iExtRms1	valTs	Grid (Measured by Current Transformers) Current, RMS, Phase 1 [Arms]
iExtRms2	valTs	Grid (Measured by Current Transformers) Current, RMS,, Phase 2 [Arms]
iExtRms3	valTs	Grid (Measured by Current Transformers) Current, RMS,, Phase 3 [Arms]
iExtQ1	valTs	Grid (Measured by Current Transformers) Active Current Component, Phase 1 [Apeak]
iExtQ2	valTs	Grid (Measured by Current Transformers) Active Current Component, Phase 2 [Apeak]
iExtQ3	valTs	Grid (Measured by Current Transformers) Active Current Component, Phase 3 [Apeak]
iExtD1	valTs	Grid (Measured by Current Transformers) Reactive Current Component, Phase 1 [Apeak]

iExtD2	valTs	Grid (Measured by Current Transformers) Reactive Current Component, Phase 2 [Apeak]
iExtD3	valTs	Grid (Measured by Current Transformers) Reactive Current Component, Phase 3 [Apeak]
uPos	valTs	DC Nanogrid positive voltage [V]
uNeg	valTs	DC Nanogrid Negative voltage [V]
pvPower	valTs	PvPower [W]
batPower	valTs	EnergyStorage Power [W]
pLoadD1	valTs	Load Power Reactive Component, Phase 1, [VAr]
pLoadD2	valTs	Load Power Reactive Component, Phase 2, [VAr]
pLoadD3	valTs	Load Power Reactive Component, Phase 3, [VAr]
pLoadQ1	valTs	Load Power Active Component, Phase 1, [W]
pLoadQ2	valTs	Load Power Active Component, Phase 2, [W]
pLoadQ3	valTs	Load Power Active Component, Phase 3, [W]
pInvD1	valTs	Inverter Power (EnergyHub) Reactive Component, Phase 1, [VAr]
pInvD2	valTs	Inverter Power (EnergyHub) Reactive Component, Phase 2, [VAr]
pInvD3	valTs	Inverter Power (EnergyHub) Reactive Component, Phase 3, [VAr]
pInvQ1	valTs	Inverter Power (EnergyHub) Active Component, Phase 1, [W]
pInvQ2	valTs	Inverter Power (EnergyHub) Active Component, Phase 2, [W]
pInvQ3	valTs	Inverter Power (EnergyHub) Active Component, Phase 3, [W]
pExtD1	valTs	Grid Power (Measured by Current Transformers) Reactive Component, Phase 1, [VAr]
pExtD2	valTs	Grid Power (Measured by Current Transformers) Reactive Component, Phase 2, [VAr]
pExtD3	valTs	Grid Power (Measured by Current Transformers) Reactive Component, Phase 3, [VAr]
pExtQ1	valTs	Grid Power (Measured by Current Transformers) Active Component, Phase 1, [W]
pExtQ2	valTs	Grid Power (Measured by Current Transformers) Active Component, Phase 2, [W]
pExtQ3	valTs	Grid Power (Measured by Current Transformers) Active Component, Phase 3, [W]
sExt	valTs	Apparent Grid Power, 3-Phase, [VA]

4.6 Battery data definition

Name	Type	Description
soc	Number	State of Charge in %
soh	Number	State of health in %
ratedCapacity	Number	Rated Capacity in Wh

4.7 Energy data definition

valTs = Object<{val : <Float>, ts : Date}>

Param	Type	Description
wExtProdQ1	ValTs | Number	External Production (Grid) Active Energy, Phase 1, [kWh]
wExtProdQ2	ValTs | Number	External Production (Grid) Active Energy, Phase 2, [kWh]
wExtProdQ3	ValTs | Number	External Production (Grid) Active Energy, Phase 3, [kWh]
wExtConsQ1	ValTs | Number	External Consumption (Grid) Active Energy, Phase 1, [kWh]

wExtConsQ2	ValTs | Number	External Consumption (Grid) Active Energy, Phase 2, [kWh]
wExtConsQ3	ValTs | Number	External Consumption (Grid) Active Energy, Phase 3, [kWh]
wInvProdQ1	ValTs | Number	Inverter (Energyhub) Production Active Energy, Phase 1, [kWh]
wInvProdQ2	ValTs | Number	Inverter (Energyhub) Production Active Energy, Phase 2, [kWh]
wInvProdQ3	ValTs | Number	Inverter (Energyhub) Production Active Energy, Phase 3, [kWh]
wInvConsQ1	ValTs | Number	Inverter (Energyhub) Consumption Active Energy, Phase 1, [kWh]
wInvConsQ2	ValTs | Number	Inverter (Energyhub) Consumption Active Energy, Phase 2, [kWh]
wInvConsQ3	ValTs | Number	Inverter (Energyhub) Consumption Active Energy, Phase 3, [kWh]
wLoadProdQ1	ValTs | Number	Load Production Active Energy, Phase 1, [kWh]
wLoadProdQ2	ValTs | Number	Load Production Active Energy, Phase 2, [kWh]
wLoadProdQ3	ValTs | Number	Load Production Active Energy, Phase 3, [kWh]
wLoadConsQ1	ValTs | Number	Load Consumption Active Energy, Phase 1, [kWh]
wLoadConsQ2	ValTs | Number	Load Consumption Active Energy, Phase 2, [kWh]
wLoadConsQ3	ValTs | Number	Load Consumption Active Energy, Phase 3, [kWh]
wPv	ValTs | Number	PV Production Energy, [kWh]
wBatProd	ValTs | Number	Energy Storage, Produced Energy, [kWh]
wBatCons	ValTs | Number	Energy Storage, Consumed Energy, [kWh]
ts	String	Optional Param if response is an array with time-serie. **Format**: YYYY-MM-DDTHH:hh:dd.000Z