



-power in control



User's manual



Ship Energy Monitoring System, SEMS

- Application
- Setup guide
- Data logging



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1. General information

1.1 Warnings, legal information and safety

1.1.1 Warnings and notes

Throughout this document, a number of warnings and notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

Warnings



Warnings indicate a potentially dangerous situation, which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

Notes



Notes provide general information, which will be helpful for the reader to bear in mind.

1.1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the unit. If there is any doubt about how to install or operate the unit, the company responsible for the installation or the operation must be contacted.



The unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

1.1.3 Safety issues

Installation of the unit should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

1.1.4 Electrostatic discharge awareness

Sufficient care must be taken to protect the terminal against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

1.2 About the user manual

1.2.1 General purpose

This document includes a user manual for DEIF's SEMS. It mainly includes general product information, mounting instructions and a guide how to setup.

The general purpose of the user manual is to help the user with the first steps of installing and using the AGI 400 series touch screen.



Please make sure to also read the Installation Instructions before starting to work with the AGI 400. Failure to do this could result in human injury or damage to the equipment.

1.2.2 Contents and overall structure

This document is divided into chapters, and in order to make the structure simple and easy to use, each chapter will begin from the top of a new page.

2. SEMS variants

2.1 Protocols

SEMS is compatible with three different DEIF products. The three products are ML-2, ML 300 and MIC-2 MKII. The ML series is made for the three gensets and the MIC-2 MKII is available both as genset and consumer.

SEMS can handle two kinds of protocols, which is RTU and TCP. It is only possible to use one protocol at a time.

i If the three gensets have ML-2 controllers with Option H2 (RTU), then all the MIC-2 MKIIs on the consumers have to use the RTU as well.

i If the three gensets have ML 300 controllers (TCP), then all the MIC-2 MKIIs on the consumers have to use the TCP as well.

If SEMS is running the RTU protocol and an external system is running TCP, it is possible to connect these systems through a server in the AGI and visa versa. A Modbus table and more about this is described in chapter: "External communication".

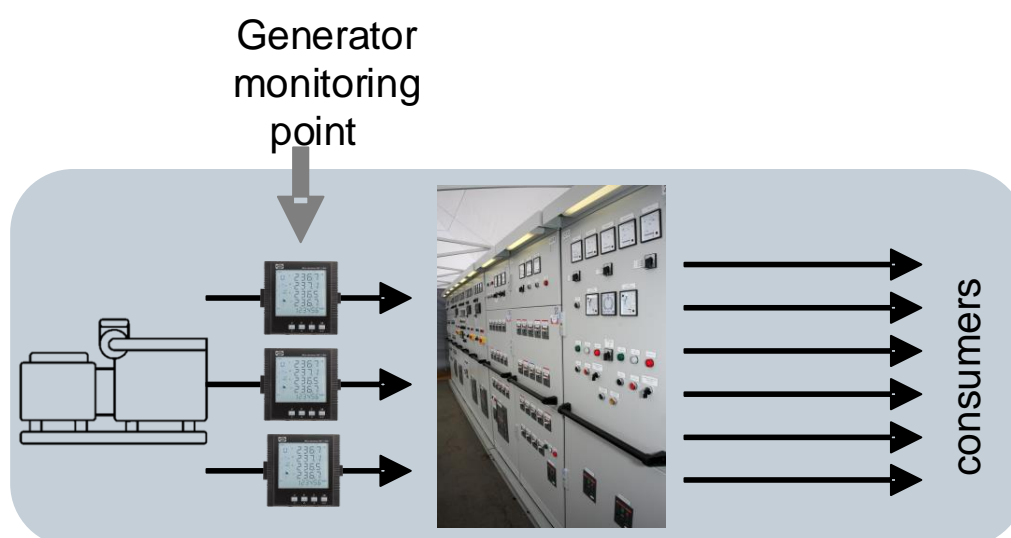
2.1.1 MIC-2 MKII

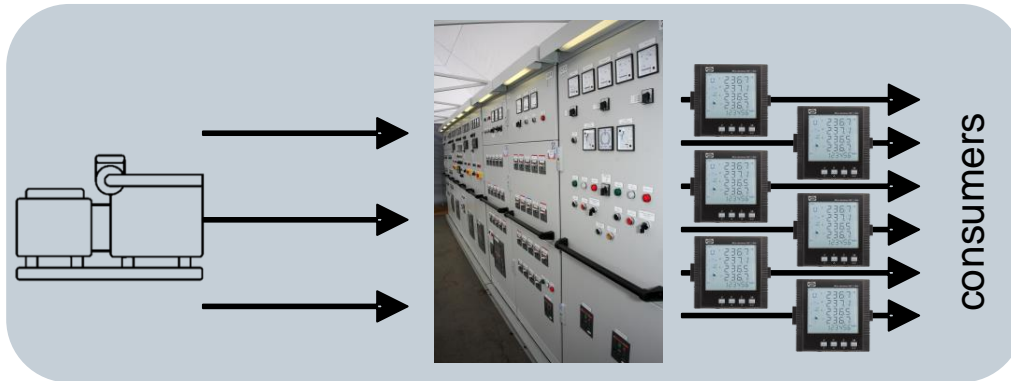
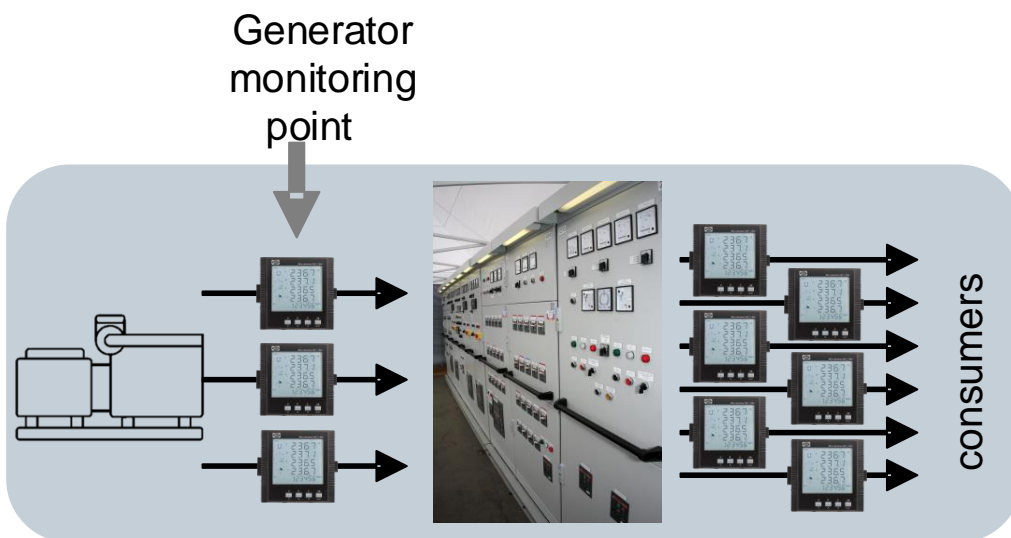
The MIC-2 MKII is compatible with both protocols. A standard MIC-2 MKII uses the RTU Modbus protocol. If a TCP protocol is needed, an AXM-NET Ethernet - TCP/IP Modbus module can be added to the MIC-2 MKII.

i RTU and TCP Modbus tables are similar.

The MIC-2 MKII is available as consumer measurement device as well as genset measurement device. Below are some system examples:

Only genset application:



Only consumers' application:**Combined genset and consumer application:****2.1.2 Multi-line 2**

The ML-2 series is compatible with RTU as well as TCP protocol.

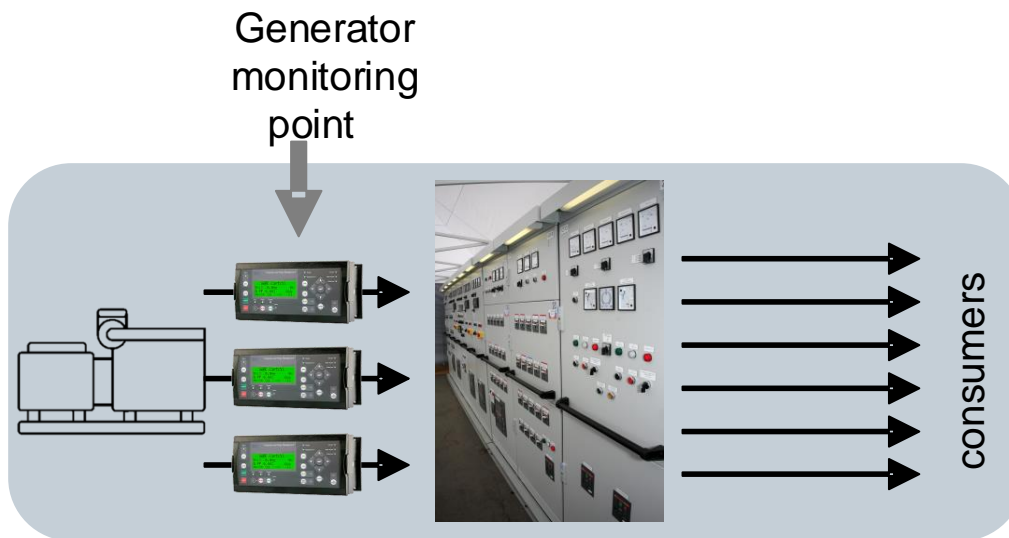
If RTU is needed, the controller needs the Option H2. The TCP comes available through the Option N.



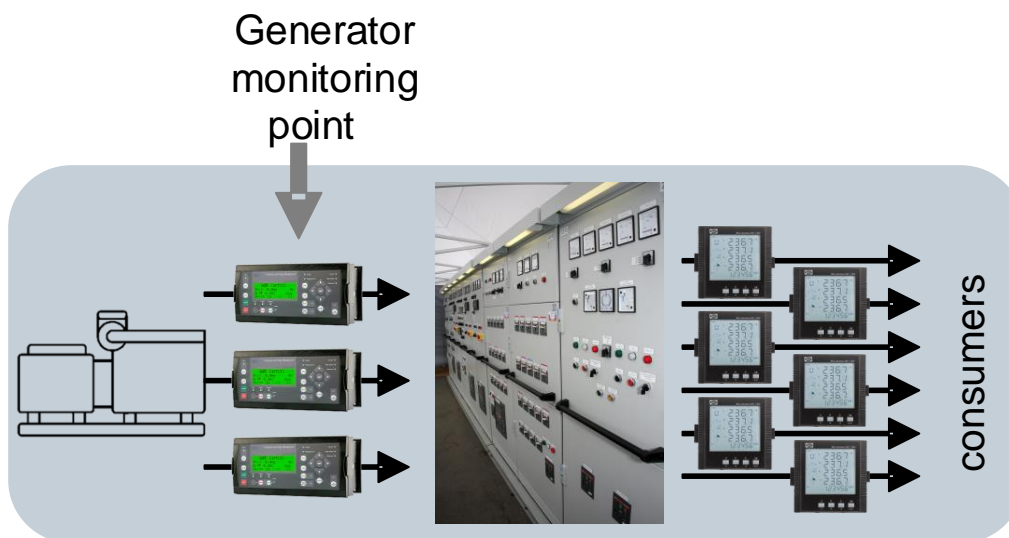
RTU and TCP Modbus tables are similar.

The ML-2 can be used to monitor up to three gensets in an application. Below are the two system options:

Only genset application:



Combined genset and consumer application:



2.1.3 Multi-line 300

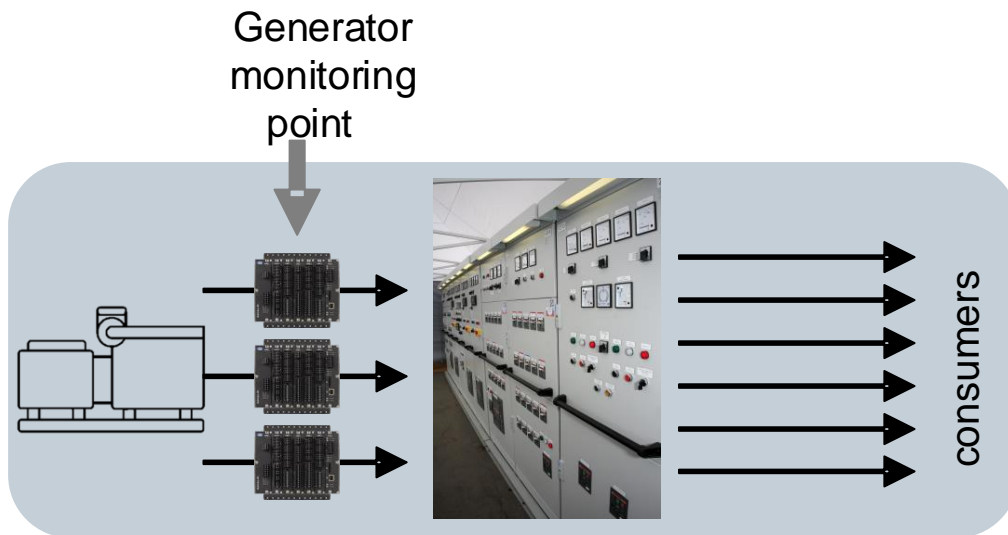
In the ML 300 series, the only available protocol is TCP. This protocol is available in a standard ML 300 product.



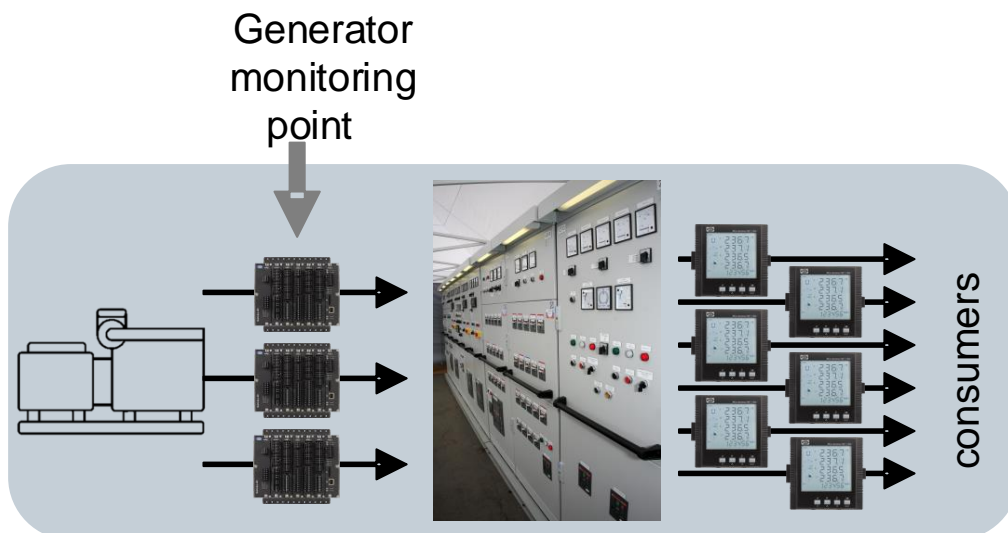
For Modbus table, see "Modbus table".

The ML 300 can be used to monitor up to three gensets in an application. The ML 300 application is the same principle as the ML-2 TCP application. An example of the application can be seen below:

Only genset application:



Combined genset and consumer application:



3. Installation

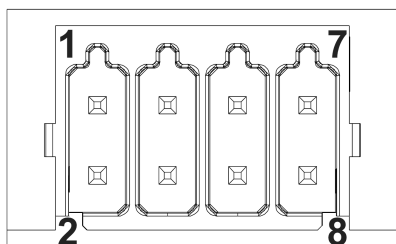
3.1 Wiring

3.1.1 AGI RTU

The mounting of the serial port on the rear of the AGI has to be done according to the table below:

Pin no.	Description
1	RX/CHB-
2	TX/CHA-
3	CTS/CHB+
4	RTS/CHA+
5	+5 V output
6	GND
7	
8	SHIELD

The pin numbering:



Short circuit pin 1 and 2.



Short circuit pin 3 and 4.

3.1.2 MIC-2 MKII RTU

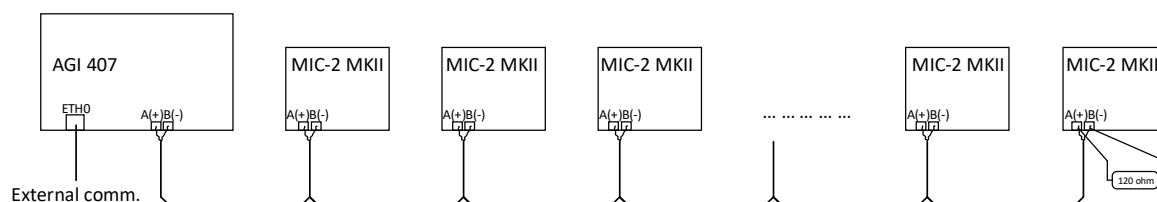
The MIC-2 MKII uses RS-485 serial communication. Up to 16 devices can be connected on an RS-485 bus. Use good quality shielded twisted pair cable, AWG22 (0.5 mm²) or higher. The overall length of the RS-485 cable connecting all devices should not exceed 1200 m (4000 ft).

Keep communication cables away from sources of electrical noise. When several devices are connected to the same long communication, an anti-signal reflecting resistor (typical value 120 Ω-300 Ω/0.25 W) must be added to the end of the circuit beside the last MIC-2 MKII unit.

Term.	Function	Description
14	DATA A(+)	Modbus RTU, RS-485
15	DATA B(-)	
16	DATA GND	

Setting	Value
Baud rate	19200
Device address	1

The setup of a system with MIC-2 MKII RTU protocol can be seen below:



It is essential for the functionality that there are no star points on the RS-485 line.



It is important to remember the end resistor on the last MIC MKII.

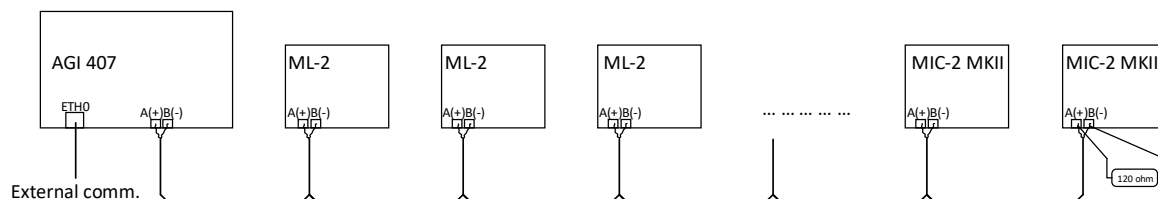
3.1.3 ML-2 RTU

The ML-2 has the RTU protocol available through the Option H2. Option H2 is a hardware option, and therefore a separate PCB is installed in slot #2 in addition to the standard-installed hardware.

Term.	Function	Description
29	DATA A(+)	Modbus RTU, RS-485
30	DATA GND	
31	DATA B(-)	

Setting	Value
Baud rate	19200 or 9600
Data bits	8
Parity	None
Stop bit	1
Flow control	No

The setup of a system with ML-2 RTU protocol can be seen below:



It is very essential for the functionality that there are no star points on the RS-485 line.



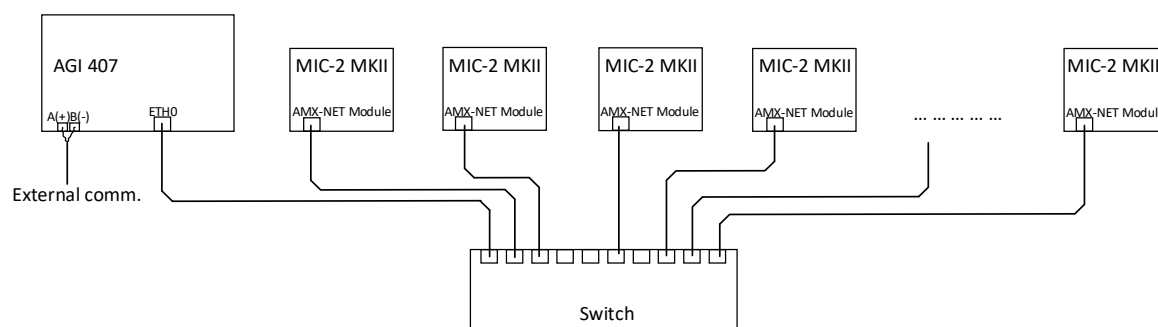
It is important to remember the end resistor on the last MIC MKII.

3.1.4 MIC-2 MKII TCP

The TCP applications need an external switch to connect all the devices. Of course, the size of the switch depends on how many gensets and/or consumers the system contains.

The AXM-NET Ethernet module is an extended communication module of the MIC-2 MKII unit. With the Ethernet module, the MIC-2 MKII can be linked to the Ethernet easily.

The setup of a system with MIC-2 MKII TCP protocol can be seen below:



Use the ETH0 port on the AGI for Ethernet connection. ETH0 is the port next to the power supply.

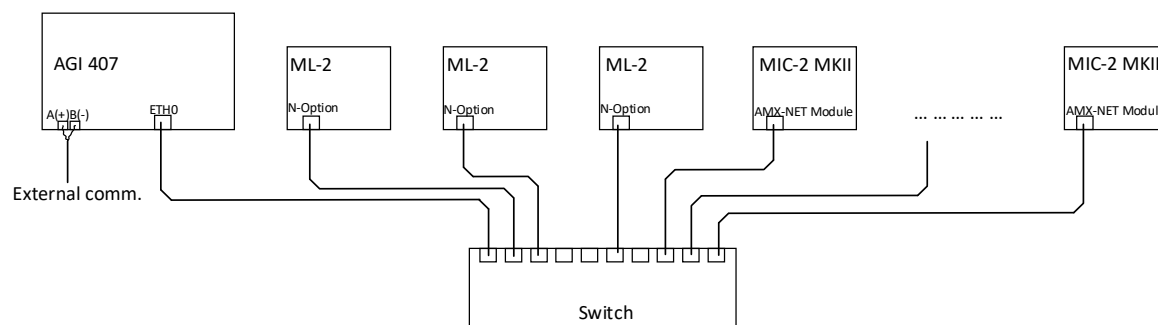


The Ethernet port comes available through the AXM-NET Ethernet module.

3.1.5 ML-2 TCP

The ML-2 with the Option N hardware has the TCP protocol. Furthermore, the MIC-2 MKII needs the AXM-NET Ethernet module to fit to the TCP protocol of the ML-2.

The setup of a system with ML-2 TCP protocol can be seen below:



Use the ETH0 port on the AGI for Ethernet connection. ETH0 is the port next to the power supply.

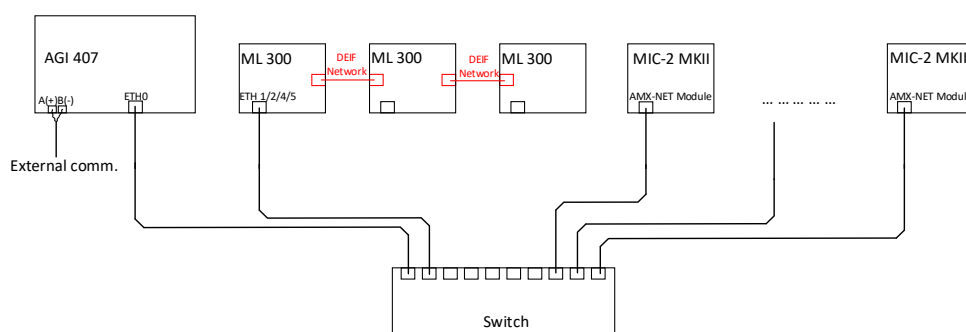


The Ethernet port comes available through the AXM-NET Ethernet module.

3.1.6 ML 300 TCP

The ML 300 has the TCP protocol available in all standard products. This means that the MIC-2 MKII has to have the AXM-NET Ethernet module to be able to fit a system with the ML 300.

The setup of a system with ML-2 TCP protocol can be seen below:



Use the ETH0 port on the AGI for Ethernet connection. ETH0 is the port next to the power supply.



The Ethernet port comes available through the AXM-NET Ethernet module.



It is important that SEMS does not interfere with the DEIF network. This means that **ONLY ONE** of the ML 300s is connected to the switch.

3.2 Setup guide

3.2.1 Quick setup guide

Setup of the application has to be carried out on the first power up of the AGI and that one time only. To do this in the easiest way, please follow the guide from A to Z.

1. Go to page "About".
2. Press the ip address xxx.xxx.xxx.xxx.
3. Enter an ip to fit your system.
4. Go to page "Settings".
5. Set up screen brightness 20 -> 100 %
6. Set up back light timeout off -> 10 min.
7. Set up time and date.
8. Go to page "Setup 5/5".
9. Press Initial application button.
10. Choose the application types according to the wiring.
11. After reboot, go to page "Setup 5/5"
12. Activate or deactivate the three sliders to fit your system.
13. Go to page "Setup 1/5".
14. Enable or disable the units.
15. Enter the name of the units.
16. **TCP applications:** Enter IP address.
17. **RTU applications:** Ensure ID no. is correct.
18. Go to page "Setup 2/5".
19. Repeat step 14 to 17.
20. Go to page "Setup 3/5".
21. Repeat step 14 to 17.
22. Go to page "Setup 4/5".
23. Repeat step 14 to 17.
24. Go to page "Set point configuration"
25. Enter nominal power in all used units from 1 to 16.
26. **Genset applications:** Enter low set point.
27. **Genset applications:** Enter high set point.
28. **Genset applications:** Enter overload set point.
29. Go to page "Save log to storage device".
30. Ensure that the save button is visible
31. Go to page "Overview".
32. Ensure that the units have the right names
33. Ensure that there is live data on the enabled units.

The application is now fully functional and is logging data to the chosen storage device.

4. Application

4.1 Page description

4.1.1 Menu bar

The menu is located in the bottom of the application and is the same on all pages. The menu bar is used for navigating around the different pages.

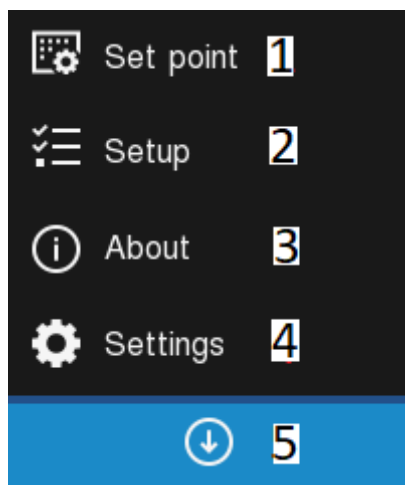


1. Overview page
2. Generator page
3. Data logger page
4. Miscellaneous menu



The generator page symbol will only be available when the generator is activated under "Setup 5/5".

The miscellaneous menu gives access to all the different setup pages, set point configuration page, settings page and the about page.



1. Set point configuration page
2. Setup pages
3. About page
4. Settings page
5. Close menu box

4.1.2 Overview page

The overview page is the home page of the application, meaning that when the AGI is powered up, this page will be shown.



The overview page gives all information from the different units.

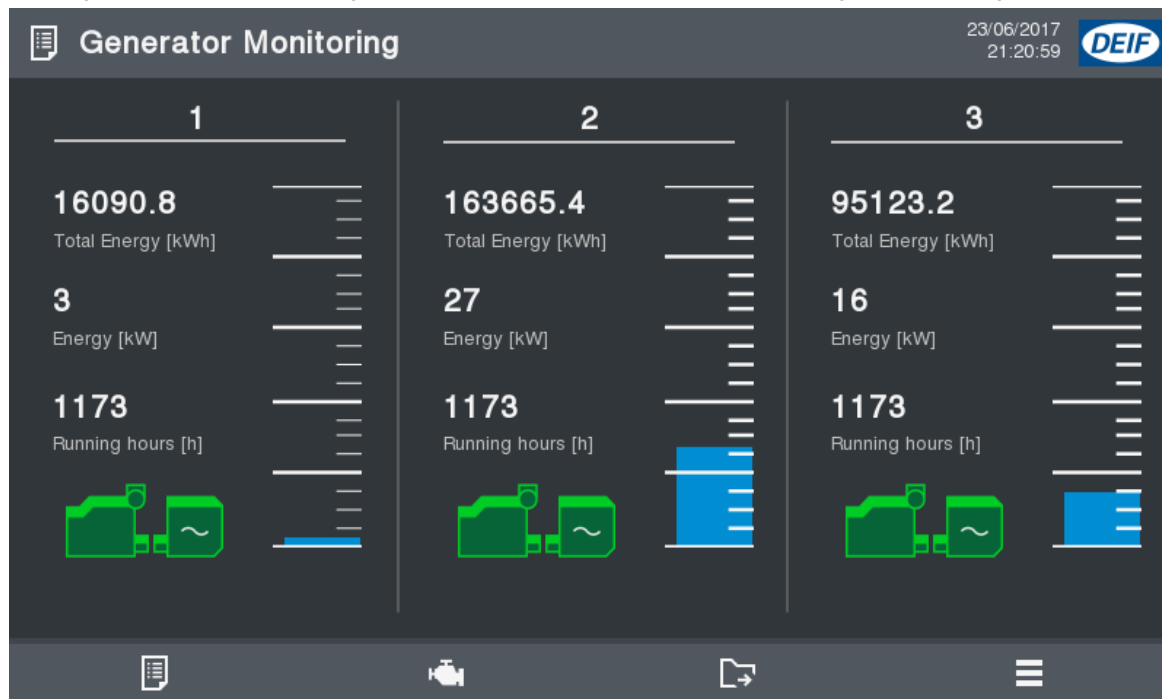
1. Name of the unit.
2. Actual energy/power on the unit.
3. Actual energy/power in percentage of the nominal power of the unit.
4. Warning symbols for genset - Low/High/Overload.
5. Total energy measured by the device.
6. Running hours of the genset.



Running hours and warnings will only be available when the generator is activated under "Set-up 5/5".

4.1.3 Generator monitoring page

The content on the generator monitoring page is only for the gensets. The same information is available on this page as on the overview page, but additional is an indication of the running status of the gensets.



The running indication of the genset is shown by the genset symbol. When the genset is standby, the symbol will appear in black and grey colours. When the symbol appears in green colours, the genset is running. The warning alarms will be visible below the genset symbol if they are active.



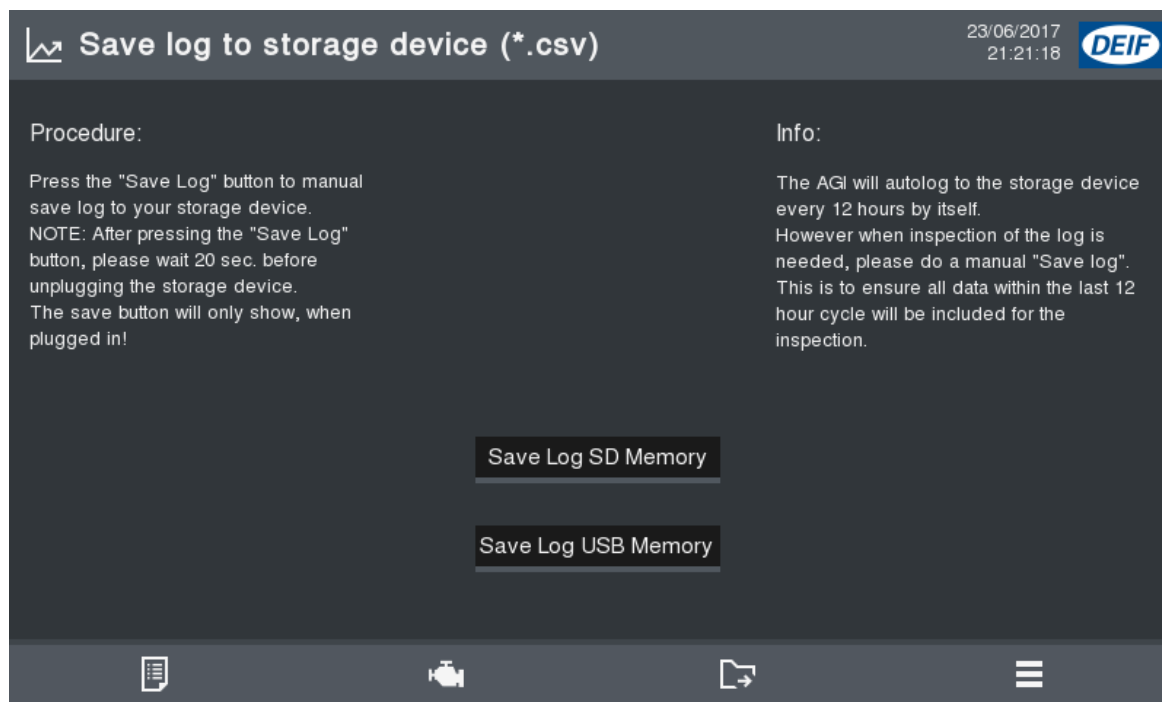
The generator page will only be available, when the generator is activated under "Setup 5/5".



The running status is activated when the frequency of the generator is above 40 Hz.

4.1.4 Data logger page

The purpose of the functions on the data logger page is only to ensure, that the latest data is saved before removing the storage device. The data logging procedure is described in the page below:

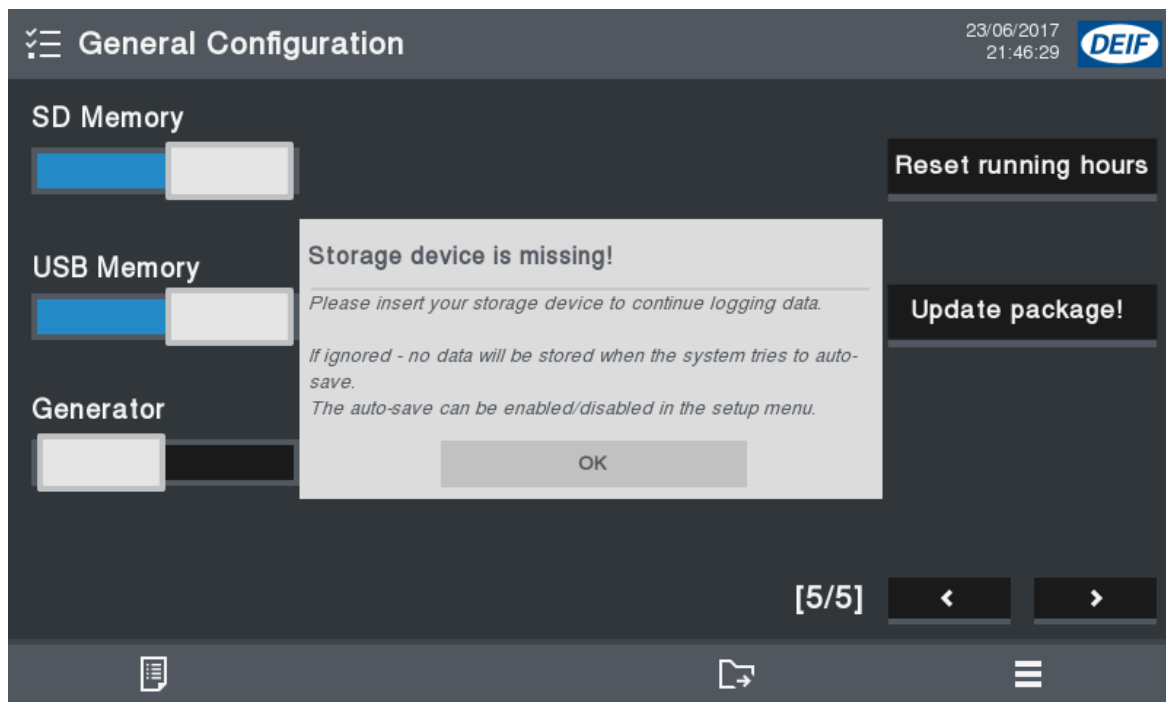




The save buttons will only be visible if the device is inserted in the AGI.



How to dump and process these data is described in section 5.

The prompt box looks like the following:



-  Storage devices are activated under "Setup 5/5. If the storage device is not activated or there is no storage device inserted in the AGI, no data will be logged.
-  If storage device is activated and no actual device is inserted, an error prompt will occur every minute.

4.1.5 Setup pages

Setup page 1/5 to 4/5 is similar and is used to enable/disable units, setup names of units and ip addresses. Setup page 5/5 is different from the others.

Enable/Disable 23/06/2017 21:23:45

UNIT #	Name	ID no.:	Enable	Disable
UNIT #1	1	1	Enable	Disable
UNIT #2	2	2	Enable	Disable
UNIT #3	3	3	Enable	Disable
UNIT #4	4	4 1	Enable	Disable

[1/5] < 4 >

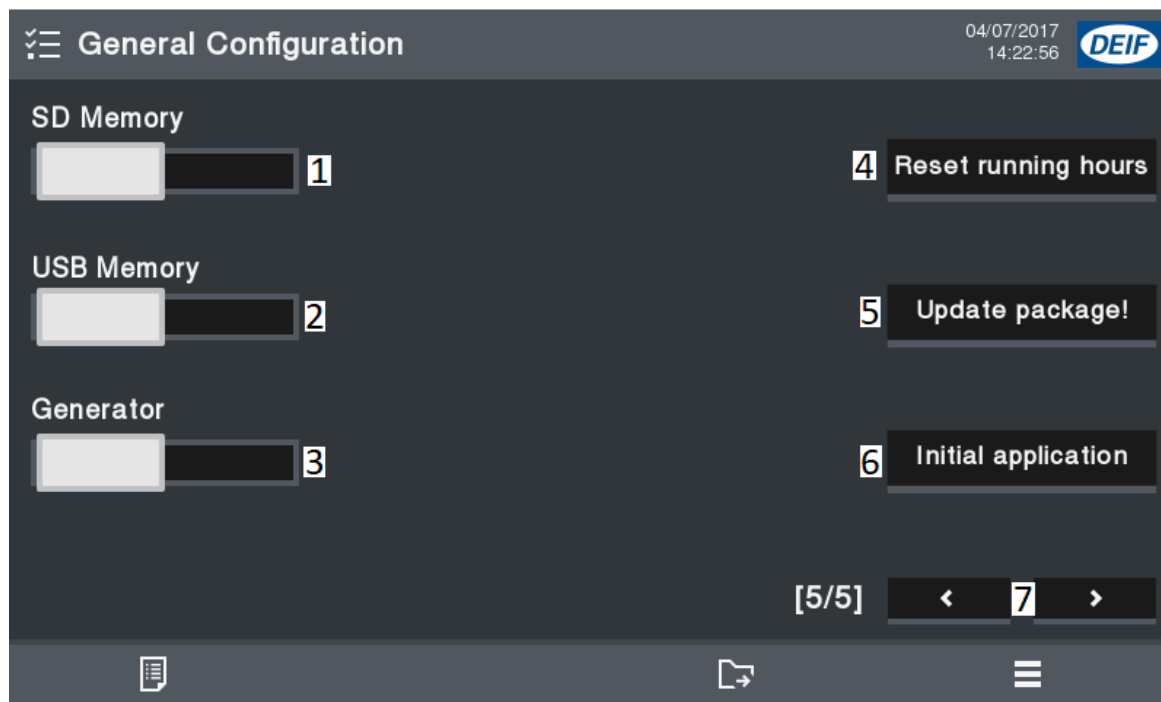
1. Name of unit
2. ID no. on RTU/IP addresses on TCP
3. Enable or disable unit
4. Next and previous setup page



Unit names will be shown in overview and generator page.




ID no.: will be shown on RTU applications/IP address will be shown on TCP applications.



1. Turn "SD Memory" ON or OFF.
2. Turn "USB Memory" ON or OFF.
3. Turn "Generator" ON or OFF.
4. Press and hold to reset running hours.
5. For support-related updates, insert USB handed out from DEIF and then press and hold to update AGI software.
6. Press and then choose your application when prompted.
7. Next and previous setup page.

4.1.6 Set point configuration page

The set point configuration page is used to set up nominal values on consumers and warning limits on gensets.

Overview Setpoint Config				
23/06/2017 21:23:28 				
1	Nominal Power [kW] 2	Setpoint LOW Warning [kW] 3	Setpoint HIGH Warning [kW] 4	Setpoint OVERLOAD Warning [kW] 5
1	100	1	100	100
2	100	1	100	100
3	100	1	100	100
4	100			
5	100			
6	100			
7	100			
8	100			
9	100			
10	100			
11	100			
12	100			
13	100			
14	100			
15	100			
16	100			

1. Name of the unit
2. Nominal power of the unit
3. Low warning limit on genset
4. High warning limit on genset
5. Overload limit on genset



Set point on warnings for gensets will only be available when the generator is activated under "Setup 5/5".



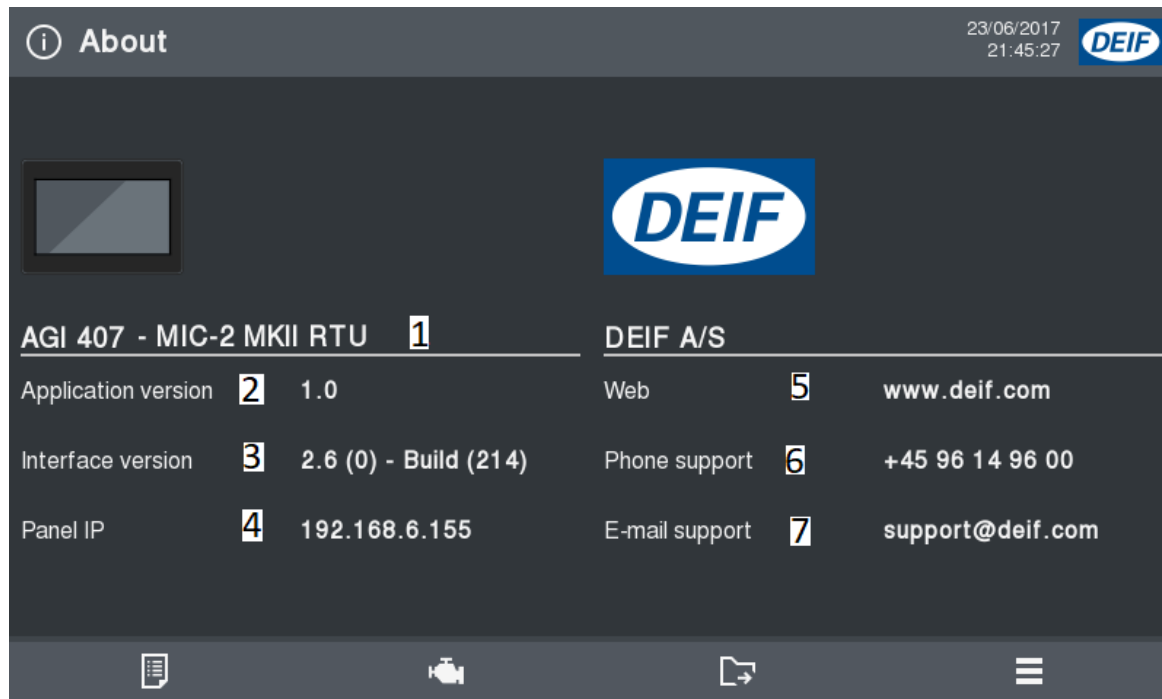
Overload set point has to be set higher than high warning limit.



The above is only an example.

4.1.7 About page

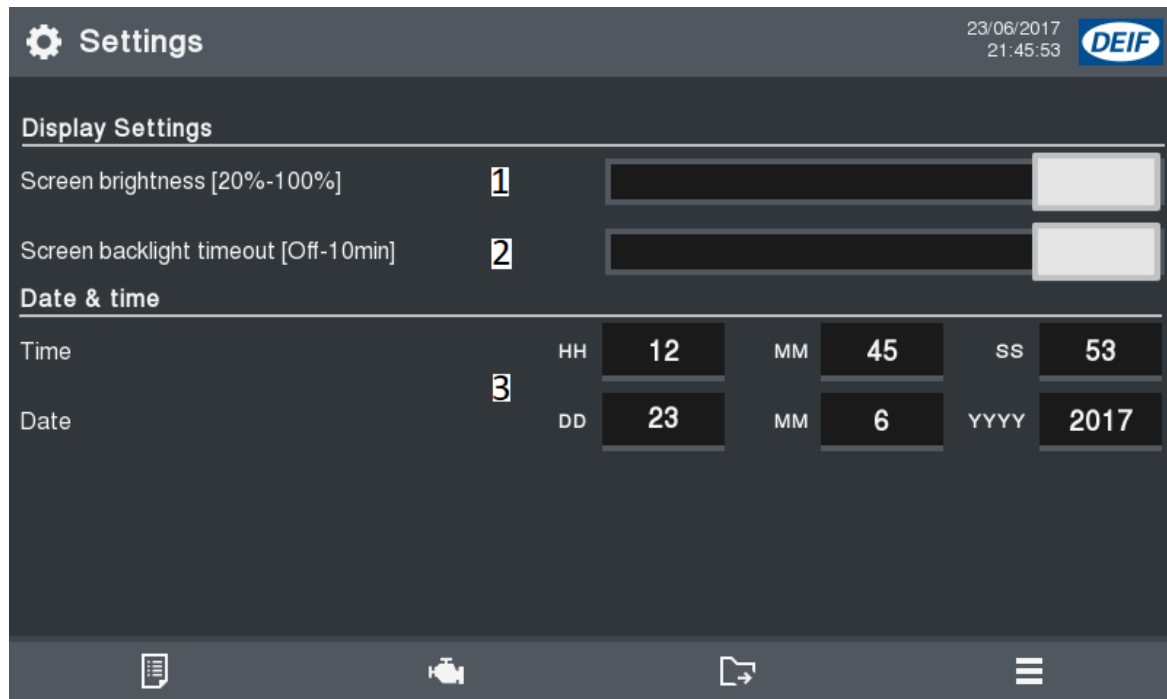
The about page contains practical information and the IP address of the AGI.



1. Application variant.
2. SEMS software/application version.
3. Interface version of the runtime in AGI.
4. Default IP of the AGI/Change IP of the AGI.
5. DEIF official web page.
6. Contact DEIF for support by phone.
7. Contact DEIF for support by email.

4.1.8 Settings page

The page for accessing settings for power saving of the AGI and to change the date and time inside the AGI.



1. Screen brightness from 20 to 100 %
2. Back light timeout timer for power saving and extending lifetime of AGI.
3. Setting date and time.

5. Data logging

5.1 Storage devices

5.1.1 USB memory

SEMS data logging can be saved to a USB stick. There are two USB ports on the rear of the AGI, but it is recommended that only one USB stick is used at a time.

The memory size of the USB stick is depending on the time interval between taking out the logged data. One month of data is the size of approx. 11 MB.

5.1.2 SD card

SEMS data logging can be saved to an SD card. There is one SD card port on the rear side of the AGI. The memory size of the SD card is depending on the time interval, between taking out the logged data. One month of data is the size of approx. 11 MB.

5.2 Exported data

Data that has been logged to the storage device is used for further analysis, to discover opportunities for energy savings.

Another storage device should be inserted in the AGI right after taking out the current storage device, so no data is lost. When taking out the storage device, an error prompt can occur. If this is the case, just put the new device in the AGI and press OK.

The data should be copied to a PC to ensure, that no data is lost. To analyse and process the data, different programmes can be used, for example a free programme software called "LibreOffice" or Excel. Due to the fact that LibreOffice is free and can process comma-separated .csv-files makes it suitable for this operation.

5.2.1 Spreadsheet guide


The data is saved in two different documents, which is an "Accumulated" and a "Realtime" sheet.

The "Accumulated" sheet contains actual power values, genset alarm states and genset running status.

The "Realtime" sheet contains total energy values and running hours of the gensets.


First a short guide on how to merge several *.csv files into one.

1. Open Windows' command prompt.
2. Navigate to the folder where the files are located by changing directory (cd):

 Command Prompt

```
C:\Users\jhh\Desktop\Test>cd C:\Users\jhh\Desktop\Test 123
C:\Users\jhh\Desktop\Test 123>_
```


3. Use the command "Type copy *.csv Total.csv":

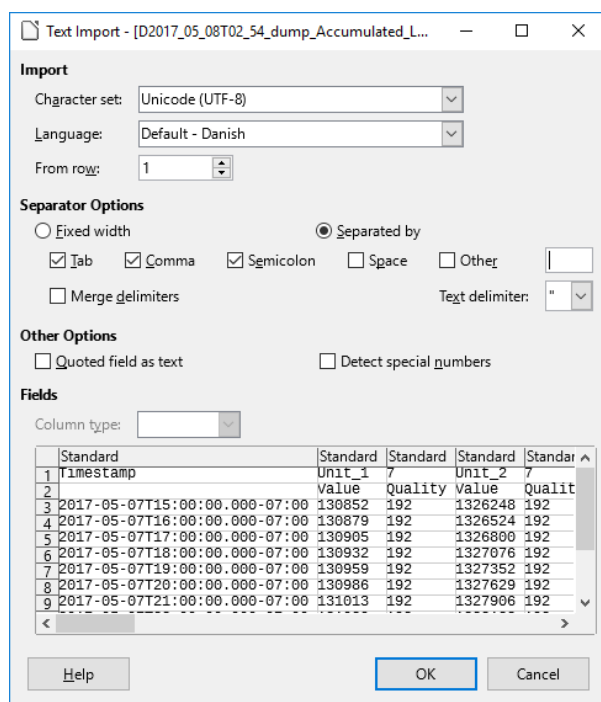
 Command Prompt

```
C:\Users\jhh\Desktop\Test 123>copy *.csv Total.csv
D2017_05_06T02_54_dump_Accumulated_Log.csv
D2017_05_06T02_54_dump_Realtime_Log.csv
D2017_05_06T14_54_dump_Accumulated_Log.csv
D2017_05_06T14_54_dump_Realtime_Log.csv
D2017_05_07T02_54_dump_Accumulated_Log.csv
D2017_05_07T02_54_dump_Realtime_Log.csv
D2017_05_07T14_54_dump_Accumulated_Log.csv
D2017_05_07T14_54_dump_Realtime_Log.csv
D2017_05_08T02_54_dump_Accumulated_Log.csv
D2017_05_08T02_54_dump_Realtime_Log.csv
D2017_05_08T14_54_dump_Accumulated_Log.csv
D2017_05_08T14_54_dump_Realtime_Log.csv
D2017_05_09T02_54_dump_Accumulated_Log.csv
D2017_05_09T02_54_dump_Realtime_Log.csv
D2017_05_09T14_54_dump_Accumulated_Log.csv
D2017_05_09T14_54_dump_Realtime_Log.csv
D2017_05_10T02_54_dump_Accumulated_Log.csv
D2017_05_10T02_54_dump_Realtime_Log.csv
D2017_05_10T14_54_dump_Accumulated_Log.csv
D2017_05_10T14_54_dump_Realtime_Log.csv
D2017_05_11T02_54_dump_Accumulated_Log.csv
D2017_05_11T02_54_dump_Realtime_Log.csv
D2017_05_11T14_54_dump_Accumulated_Log.csv
D2017_05_11T14_54_dump_Realtime_Log.csv
D2017_05_12T02_54_dump_Accumulated_Log.csv
D2017_05_12T02_54_dump_Realtime_Log.csv
D2017_05_12T14_54_dump_Accumulated_Log.csv
D2017_05_12T14_54_dump_Realtime_Log.csv
D2017_05_13T02_54_dump_Accumulated_Log.csv
```

4. Now, a "Total.csv" file is created, which is located in the same folder.

Here is a short guide how to handle the .csv files in any spreadsheet programme, for example MS Excel or LibreOffice Calc.

1. Open the document with LibreOffice.
2. Choose these separator options:



3. A screen shot of data table:

	1	2	3
	A	B	C
1	Timestamp	Unit_1	7
2		Value	Quality
3	2017-05-06T03:00:00.000-07:00	129887	192
4	2017-05-06T04:00:00.000-07:00	129913	192
5	2017-05-06T05:00:00.000-07:00	129940	192
6	2017-05-06T06:00:00.000-07:00	129967	192
7	2017-05-06T07:00:00.000-07:00	129994	192
8	2017-05-06T08:00:00.000-07:00	130021	192
9	2017-05-06T09:00:00.000-07:00	130047	192
10	2017-05-06T10:00:00.000-07:00	130074	192
11	2017-05-06T11:00:00.000-07:00	130101	192
12	2017-05-06T12:00:00.000-07:00	130128	192
13	2017-05-06T13:00:00.000-07:00	130155	192
14	2017-05-06T14:00:00.000-07:00	130182	192

3.1 The time stamp is set up like this: yyyy-mm-dd hh:mm:ss.sss-time zone.

3.2 Value is the actual value from the measurement device.

3.3 Quality codes can be seen in the table below:

Quality Code	Quality	Description
0	BAD	The value is bad but no specific reason is given
4	BAD	Specific server problem with the configuration. For example, the tag has been deleted from the configuration file (tags.xml).
8	BAD	No value may be available at this time, for example the value has not been provided by the data source.
12	BAD	Device failure detected
16	BAD	Timeout before device response.
24	BAD	Communication failure
28	BAD	No data found for upper or lower bound value Trend interface specific flag.
32	BAD	No data collected (for example, archiving not active. Trend interface specific flag. This value is also used to indicate a temporary offline status (for any condition where sampling was stopped).
64	UNCERTAIN	No specific reason.
65	UNCERTAIN	No specific reason. The value has 'pegged' at some lower limit.
66	UNCERTAIN	No specific reason. The value has 'pegged' at some higher limit.
67	UNCERTAIN	No specific reason. The value is a constant and cannot move.
84	UNCERTAIN	Returned value outside its defined limits defined. In this case the Limits field indicates which limit has been exceeded but the value can move farther out of this range.
85	UNCERTAIN	Returned value outside its defined limits defined. In this case the Limits field indicates which limit has been exceeded but the value can move farther out of this range. The value has 'pegged' at some lower limit.
86	UNCERTAIN	Returned value outside its defined limits defined. In this case the Limits field indicates which limit has been exceeded but the value can move farther out of this range. The value has 'pegged' at some higher limit
87	UNCERTAIN	Returned value outside its defined limits defined. In this case the Limits field indicates which limit has been exceeded but the value can move farther out of this range. The value is a constant and cannot move.
192	GOOD	-

6. External communication

6.1 TCP/RTU server

6.1.1 Modbus table

It is possible to read out values from the Modbus server in SEMS. Connect directly to the AGI by either of the two below options - depending on your chosen SEMS application.

- If you are using Modbus RTU for your data point inputs to the AGI, then the AGI will have a Modbus TCP server with read-only data available.
- If you are using Modbus TCP for your data point inputs to the AGI, then the AGI will have a Modbus RTU server with read-only data available.

The Modbus tables are NOT the same for all applications however they are the same for Modbus RTU as well as TCP.



TCP server: Plug-in the Ethernet cable in the ETH0 port on the rear of the AGI.



RTU server: Use the serial port on the rear of the AGI. Please make sure that the cable is fixed, because the serial port has no strain relief.

Modbus RTU/TCP server table: MIC-2 MKII application

Name	Function code	Modbus address	Data type
Unit 1 - Total energy	03	400000	unsignedInt
Unit 2 - Total energy	03	400002	unsignedInt
Unit 3 - Total energy	03	400004	unsignedInt
Unit 4 - Total energy	03	400006	unsignedInt
Unit 5 - Total energy	03	400008	unsignedInt
Unit 6 - Total energy	03	400010	unsignedInt
Unit 7 - Total energy	03	400012	unsignedInt
Unit 8 - Total energy	03	400014	unsignedInt
Unit 9 - Total energy	03	400016	unsignedInt
Unit 10 - Total energy	03	400018	unsignedInt
Unit 11 - Total energy	03	400020	unsignedInt
Unit 12 - Total energy	03	400022	unsignedInt
Unit 13 - Total energy	03	400024	unsignedInt
Unit 14 - Total energy	03	400026	unsignedInt
Unit 15 - Total energy	03	400028	unsignedInt
Unit 16 - Total energy	03	400030	unsignedInt

Name	Function code	Modbus address	Data type
Unit 1 - Actual power	03	400032	Float
Unit 2 - Actual power	03	400034	Float
Unit 3 - Actual power	03	400036	Float
Unit 4 - Actual power	03	400038	Float
Unit 5 - Actual power	03	400040	Float
Unit 6 - Actual power	03	400042	Float
Unit 7 - Actual power	03	400044	Float
Unit 8 - Actual power	03	400046	Float
Unit 9 - Actual power	03	400048	Float
Unit 10 - Actual power	03	400050	Float
Unit 11 - Actual power	03	400052	Float
Unit 12 - Actual power	03	400054	Float
Unit 13 - Actual power	03	400056	Float
Unit 14 - Actual power	03	400058	Float
Unit 15 - Actual power	03	400060	Float
Unit 16 - Actual power	03	400062	Float
Unit 1 - Low warning	03	400064.0	Boolean
Unit 2 - Low warning	03	400064.1	Boolean
Unit 3 - Low warning	03	400064.2	Boolean
Unit 1 - High warning	03	400064.3	Boolean
Unit 2 - High warning	03	400064.4	Boolean
Unit 3 - High warning	03	400064.5	Boolean
Unit 1 - Overload	03	400064.6	Boolean
Unit 2 - Overload	03	400064.7	Boolean
Unit 3 - Overload	03	400064.8	Boolean
Unit 1 - Running status	03	400064.9	Boolean
Unit 2 - Running status	03	400064.10	Boolean
Unit 3 - Running status	03	400064.11	Boolean

- "unsignedInt" is a 32-bit Long/double word (without sign) [AB CD] data type in the unit [kWh]
- "Float" is a 32-bit Float/Real [AB CD] data type in the unit [W]
- "Boolean" is a 1-bit Boolean [Binary] data type



Power and kWh data are updated each 5 sec.



Warning, Overload and Running bits are updated each 5 sec.



Accumulating data is updated each 60 sec.

Modbus RTU/TCP server table: ML-2 and ML 300 application

Name	Function code	Modbus address	Data type
Unit 1 - Total energy	03	400000	unsignedInt
Unit 2 - Total energy	03	400002	unsignedInt
Unit 3 - Total energy	03	400004	unsignedInt
Unit 4 - Total energy	03	400006	unsignedInt
Unit 5 - Total energy	03	400008	unsignedInt
Unit 6 - Total energy	03	400010	unsignedInt
Unit 7 - Total energy	03	400012	unsignedInt
Unit 8 - Total energy	03	400014	unsignedInt
Unit 9 - Total energy	03	400016	unsignedInt
Unit 10 - Total energy	03	400018	unsignedInt
Unit 11 - Total energy	03	400020	unsignedInt
Unit 12 - Total energy	03	400022	unsignedInt
Unit 13 - Total energy	03	400024	unsignedInt
Unit 14 - Total energy	03	400026	unsignedInt
Unit 15 - Total energy	03	400028	unsignedInt
Unit 16 - Total energy	03	400030	unsignedInt

Name	Function code	Modbus address	Data type
Unit 1 - Actual power	03	400032	Short
Unit 2 - Actual power	03	400034	Short
Unit 3 - Actual power	03	400036	Short
Unit 4 - Actual power	03	400038	Float
Unit 5 - Actual power	03	400040	Float
Unit 6 - Actual power	03	400042	Float
Unit 7 - Actual power	03	400044	Float
Unit 8 - Actual power	03	400046	Float
Unit 9 - Actual power	03	400048	Float
Unit 10 - Actual power	03	400050	Float
Unit 11 - Actual power	03	400052	Float
Unit 12 - Actual power	03	400054	Float
Unit 13 - Actual power	03	400056	Float
Unit 14 - Actual power	03	400058	Float
Unit 15 - Actual power	03	400060	Float
Unit 16 - Actual power	03	400062	Float
Unit 1 - Low warning	03	400064.0	Boolean
Unit 2 - Low warning	03	400064.1	Boolean
Unit 3 - Low warning	03	400064.2	Boolean
Unit 1 - High warning	03	400064.3	Boolean
Unit 2 - High warning	03	400064.4	Boolean
Unit 3 - High warning	03	400064.5	Boolean
Unit 1 - Overload	03	400064.6	Boolean
Unit 2 - Overload	03	400064.7	Boolean
Unit 3 - Overload	03	400064.8	Boolean
Unit 1 - Running status	03	400064.9	Boolean
Unit 2 - Running status	03	400064.10	Boolean
Unit 3 - Running status	03	400064.11	Boolean

- "unsignedInt" is a 32-bit Long/double word (without sign) [AB CD] data type in the unit [kWh]
- "Float" is a 32-bit Float/Real [AB CD] data type in the unit [W]
- "Short" is a 16-bit Word (with sign) [A B] data type in the unit [kW]
- "Boolean" is a 1-bit Boolean [Binary] data type



Power and kWh data are updated each 5 sec.



Warning, Overload and Running bits are updated each 5 sec.



Accumulating data is updated each 60 sec.