



-power in control



## DATA SHEET



### Ship Energy Monitoring System, SEMS

- Simple preprogrammed graphical HMI solution
- Designed for monitoring power efficiency
- Real time monitoring
- Export historical logs



DEIF A/S · Frisenborgvej 33 · DK-7800 Skive  
Tel.: +45 9614 9614 · Fax: +45 9614 9615  
info@deif.com · www.deif.com

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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.**

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 Application and advantages

### 1.2.1 Application

A comprehensive HMI solution, DEIF's AGI 400 series connects to all DEIF Multi-line controllers and third party controllers via standard communication protocols, featuring functionalities which eliminate the need for other instruments, thus saving you both space and wiring.

The AGI 400 series is intended for visualisation and active control in multiple applications managed on board maritime vessels or platforms, where it provides full graphical overviews and user-friendly touch screen control with a quality display that is easily readable even at sharp angles. Monitor or control multiple setups simultaneously, or share data via Ethernet connections, effectively enabling the DEIF HMI to be used as a small SCADA system.

#### SEMS

The marine industry is today increasing their focus on operating all electrical and mechanical systems in the highest, most efficient way. IMO has set up different regulations to ensure that ships today are designed and managed most efficiently. Ships are getting an energy mark today to utilise a way of comparing the price of operating a given vessel. Still, the fact that focus on energy use can save money, the price and installation cost is a key factor for the customers. DEIF's Ship Energy Monitoring System, SEMS, monitors real time and stores historical performance and power data for analysis of energy generation and consumption.

- Up to 16 power monitoring points to be monitored simultaneously
- Select between total overview or generator monitoring only view
- DEIF controller and/or DEIF instruments serves as data providers
- Data logging to external memory for reporting of historical data

#### Advantages

Abnormal operation of different energy systems and energy waste can be detected and stopped. Maintenance and optimisation planning can be calculated based on valid energy data. Implements an energy awareness across the crew, saving energy by changing pattern of behavior. Presents and documents a green company profile.



**All systems mentioned above must comply with the guidelines of the classification societies.**

## 2. Technical information

### 2.1 Specifications

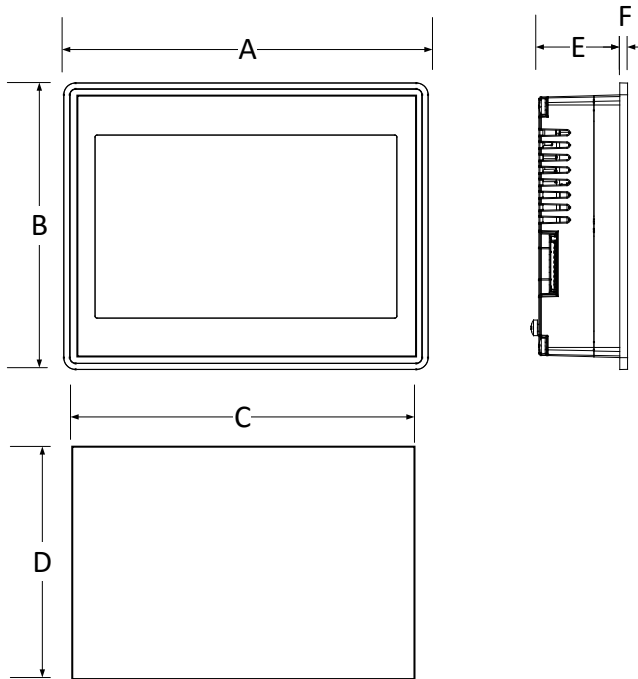
#### 2.1.1 Product data and dimensions, AGI 407

<b>Display</b>	
Type	TFT
Resolution	800x480 pixel
Active display area	7" diagonal
Aspect ratio H/V	16:9
Colours	24 bit (16 million)
Viewing angle (H/V)	170/170
Backlight	LED
Brightness	500 Cd/m <sup>2</sup> typ.
Backlight dimming 0-100 %	Yes
Backlight time out	Yes, customisable
Backlight service time	50.000 h or more*
<b>System resources</b>	
Operating system	Linux RT
CPU	ARM Cortex-A9 iMX.6 Dual Core 1 GHz
RAM	1 GB DDR
User memory	4 GB Flash/64 KB FRAM
<b>Operator interface</b>	
Touch screen	Projected capacitive, multi-touch
<b>Interface</b>	
Ethernet	2 pcs. 10/100 Mbit, 1 pcs. 10/100/1000 Mbit
USB	2 x USB 2.0 (hosts) - max. 500 mA
Serial	RS-232, RS-485, RS-422, software-configurable
Expansion slot	2 optional plug-ins
Memory card	SD card slot
<b>Ratings</b>	
Power supply voltage	24 V DC (10 to 32 V DC)
Current consumption	0.7 A at 24 V DC (max.)
Fuse	Automatic, self-resettable

Weight	Approximately 1.3 kg (un-boxed)
Battery	Rechargeable Lithium battery, not user-replaceable
<b>Environmental conditions</b>	
Operating temperature	-20° C to +60 °C (vertical installation)
Storage temperature	-30° C to +70 °C
Operating and storage humidity	95 % RH Condensation IEC 60068-2-30 Db (Cyclic)
Vibration	IEC 60068-2-6 and IACS UR E10. 2-13.2 Hz ±1 mm 13.2-100 Hz 0.7 g
Shock	IEC 60068-2-27, test Ea 50 g 11 ms
Protection class	IP66 (front) IP20 (rear) According IEC/EN 60529
<b>Dimensions</b>	
Faceplate A x B	187x147 mm (7.36x5.79")
Cutout C x D	176x136 mm (6.93x5.35")
Depth E + F	47+8 mm (1.85+0.31")
<b>Approvals</b>	
CE	EN 61000-6-4 Emission, installation in industrial environments EN 61000-6-2 Immunity, installation in industrial environments EN 60945-2002 Maritime navigation and radio communication equipment and systems
DNV GL	IEC 60092-504 Electrical Installations in Ships - Part 504: Special features - Control and Instrumentation (IACS UR E10 Bridge and deck zone) IEC 60533 Electrical and electronic installations in ships – electromagnetic compatibility (IACS UR E10 Bridge and deck zone)  DNV GL Type Approval Certificate
UL	UL508 Listed (Pending) Haz. Loc. Class I, Division 2, Groups A, B, C and D (Pending)

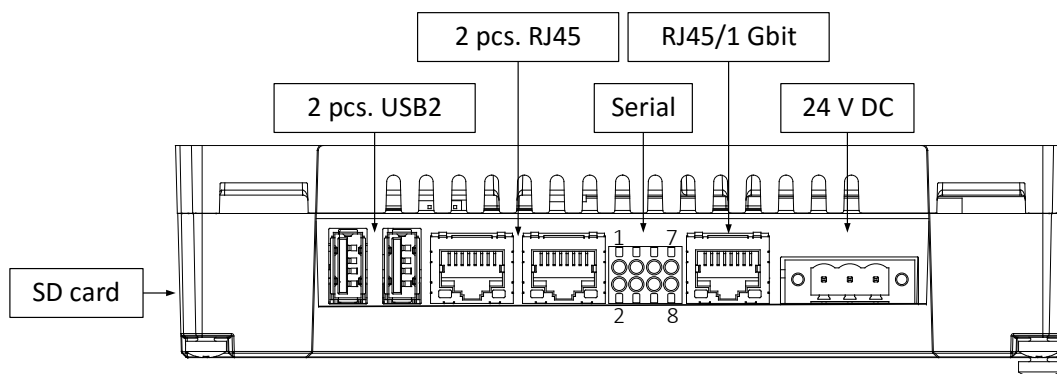
\* Time of continuous operation until the brightness of the backlight reaches 50 % of the rated value when the surrounding air temperature is 25 °C. Extended use in environments where the surrounding air temperature is 40 °C or higher may degrade backlight quality/reliability/durability.

### Dimensions



### 2.1.2 Connections

Below you will find the connection location:



## 3. SEMS Solution

### 3.1 Functionality

#### 3.1.1 Real time data visualisation

**List screen** is an overview of all 16 data points.

- Up to 16 power monitoring data points in total. All power data points monitor actual and accumulated power.
- Data points 1-3 are dedicated to generator power production as these will include accumulated running hours.
- Data points 1-3 include visual warning for **low, high and overload** operation of generators.
- Data points 4-16 are dedicated to power consumption.

**Generator screen** is a percentage overview of the three generators with vertical comparison.

- This screen is dedicated to monitoring up to three generators alone. Data is the same as presented on List screen (data points 1-3), but the graphics are **enlarged and enhanced**, to full readability at longer distances.

#### 3.1.2 Historical data export

All data points will log their values if a storage device is plugged into the AGI and that device is enabled within the settings menu. Data collected over time can be exported as a \*.csv file to a removable storage device, either SD card or USB memory. These \*.csv files can be **read, edited and reported** within a spreadsheet application, as well as some online reporting tools.

There are two types of logs:

1. **Automatic log** is based on two parallel schedules that save logs automatically.
  - Each transition, from the last day of the month to 1st day in a new month, a monthly log file is saved @ 00.00 exactly (according to screen date/time settings).
  - Every 12th hour, a log file is saved to progressively store logs in case of a blackout occurring during the month of logging. In worst case scenario, the user is always able to restore a full month\* of data by merging the 12-hour logs manually with a 3rd-party programme.  
(\* This is except from the amount of time a blackout is present and if the screen is powered off while trying to save the 12-hour log.
2. **Manual log** is a FIFO log that contains data from when the screen is powered on and up to 31 days – given that no blackout occurs.
  - Manual “Save Log” buttons are available in the save menu, where the user chooses his storage device to save the log onto. If no storage device is inserted into the AGI and manual “Save Log” is triggered, then an onscreen warning prompt will appear stating to insert a storage device.

For both above-mentioned log types, the following rule applies:

- When logs are saved successfully, the buffer is flushed within the AGI. New logs will then contain data from that moment exactly and forward until flushed again by the next save.

Regardless of the used log type, SEMS will save the following data:

- "Total energy" data is buffered every 60 minutes for each data point
- Active "Energy" data is buffered every 15 min for each data point
- "Running hours" data is buffered every 60 min for data point 1-3
- True/false bit status for "low warning active" is buffered every 15 min for data point 1-3
- True/false bit status for "high warning active" is buffered every 15 min for data point 1-3



- True/false bit status for "overload active" is buffered every 15 min for data point 1-3
- True/false bit status for "genset running" is buffered every 15 min for data point 1-3

### 3.1.3 Compatibility

SEMS is compatible with the following: **ML-2 series:** GPU-3, PPU-3, PPM-3, and the **ML 300 series:** GPU 300, PPU 300, PPM 300, and at last the MIC-2 MKII.

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



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



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

If your SEMS application is using the RTU protocol and an external system is using TCP, it is possible to connect the external system to read from a Modbus server in the AGI. A Modbus table and more about this is described in a separate chapter.

### 3.1.4 User settings

The SEMS unit is delivered pre-programmed. For the end user, the below settings will be available in the settings menu.

- Nominal power set point for data point 1-16
- Low warning set point for data point 1-3
- High warning set point for data point 1-3
- Overload warning set point for data point 1-3
- Each data point can be enabled/disabled
- Each data point can be renamed by user
- Adjustable LED backlight off timer, for prolonging the LED lifetime
- Screen brightness adjustment from 20-100 %
- Auto export USB enable/disable
- Auto export SD enable/disable
- Time and date setting

### 3.1.5 Modbus output

SEMS offers read only data output from the AGI screen. These Modbus data are available to external web gateways, to transfer data electronically from the SEMS system. The following sample rates apply:

- Power and kWh data is updated each 5 sec.
- Warning, Overload and Running bits are updated each 5 sec.
- Accumulating data is updated each 60 sec.

### 3.1.6 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**

<b>Name</b>	<b>Function code</b>	<b>Modbus address</b>	<b>Data type</b>
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.**