
# COMMISSIONING GUIDELINES

# ASC-4

## Automatic Sustainable Controller



4189341077D

# 1. General information

## 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**

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

**Notes**

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

## 1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator controlled by the Multi-line 2 unit, the company responsible for the installation or the operation of the set must be contacted.

**NOTE** The Multi-line 2 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.

## 1.3 Safety issues

Installing and operating the Multi-line 2 unit may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

**DANGER!**
Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

## 1.4 Electrostatic discharge awareness

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

## 1.5 Factory settings

The Multi-line 2 unit is delivered from the factory with default settings. These are not necessarily correct for the engine/generator set. Check all the settings before running the engine/generator set.

## 1.6 General purpose

The commissioning guidelines provide information for a thorough, safe and effective commissioning of controller(s), within the system.

**DANGER!**
Commissioning is the most risky period of operation. Commissioning errors can lead to personal injury or death, or equipment damage. These guidelines cannot anticipate or include every possible commissioning problem. Commissioning must therefore be done thoughtfully, systematically and carefully by qualified and experienced personnel.

**INFO**
DEIF does not accept any responsibility for wiring errors.

**INFO**
The controllers interface to third party equipment. DEIF does not accept any responsibility for the operation of third party equipment.

**INFO**
The commissioning guidelines provide information about checking third-party equipment, for example, the switchboard wiring. This information is provided to help ensure a successful commissioning of the entire system. However, DEIF does not accept any responsibility for the operation of third party equipment.

# 2. Overview

The commissioning guide is for the PV controller in the ASC series.

There are a few steps to follow when the ASC is configured. During the planning of the commissioning job, it can be useful to check whether the ASC is installed in the DEIF cabinet or in a customer-designed cabinet.

This document can be used in both cases.

The document contains the AGC terminal numbers even if installed in a switchboard. Please refer to the switchboard diagrams to see the actual terminal block and terminal number. If in doubt, ask the switchboard designer.

| | |
|---|---|
| ASC-4 | SW version 4.14 or later |

## 2.1 Commissioning overview

Before commissioning starts, a work breakdown structure must be created. The work breakdown structure includes the necessary planning from the start to the end of the commissioning and comprises of mechanical work, electrical DC work, electrical AC work and so on.

This guide only focusses on the work breakdown structure concerning the ASC configuration.

| Chapter | DEIF control system commissioning |
|---|---|
| 2.2.1 | Create IP list of all devices in the plant with IP addresses and adjust |
| | Create list of power meters and inverters connected to the ASC with their ID numbers and baud rate and adjust |
| 2.2.2 | Create a complete list of the power source data |
| 3 | Configure all DPM from front face with CT ratio, PT ratio and relevant others |
| 4 | Establish communication with the ASC with PC Utility SW |
| 4 | Configure the application configuration |
| 5 | Wiring overview and parameters associated with the terminals |
| 6 | Configure AC configuration and scaling of the ASC |
| 7 | Configure power supply alarms |
| 8.1 | Configure settings for the breaker control and feedbacks PV breaker |
| 8.2 | Configure settings for the breaker control and feedbacks ESS breaker |
| 8.3 | Configure settings for the breaker feedbacks mains breaker |
| 8.4 | Configure input settings for breaker feedbacks |
| 18.1 | Configure multi-inputs 102,105,108 |
| 9 | Configure generator values (nominal, power readings (P/Q) from input and scaling) |
| 10 | Configure mains values (power input (P/Q) and scaling) |
| 11 | Configure nominal values [U,I,f,P,S,Q,CT ratio, PT ratio] of the PV |
| 12 | Configure nominal values [U,I,f,P,S,Q,CT ratio, PT ratio] of the ESS |
| 13.1 | Configure DPM for mains incomer (number, ID and baud rate) |
| 13.1 | Configure DPM for generator (number, ID and baud rate |
| 13.2 | Configure DPM for PV (number, ID and baud rate) |
| 13.3 | Configure DPM for ESS (number, ID and baud rate) |
| 13.1 | Configure M-Logic with breaker feedbacks from MIC 4000 series |

| Chapter | DEIF control system commissioning |
|---|---|
| 13.2, 13.3 | Configure inverter type, IDs and baud rate |
| 14 | Emergency stop |
| 15 | Configure plant modes and set points |
| 15.2 | Configure minimum DG load |
| 16 | Configure spinning reserve alarms |
| 17 | Configure M-Logic with AUTO start/stop |
| 18 | Transducer setup |

## 2.2 Before commissioning starts

Before commissioning the ASC-system the commissioning engineer must have an overview of the IP and ID plan, and an overview of the power source data.

### 2.2.1 IP and ID plan

It is necessary to know all IDs and IP addresses of the plant. Below is an example. Please create a suitable IP plan in Excel so this is ready before commissioning.

These parameters are needed for the commissioning:

- Device
- IP address
- Modbus ID, monitoring
- Modbus ID, control
- Baud rate

**Table 2.1** Example of selected communication data for commissioning

| Device | IP address | Modbus ID, monitoring | Modbus ID, control | Baud rate |
|---|---|---|---|---|
| ASC | - | 10 | - | 19200 |
| ADFWEB HD67510 | 172.170.10.2 | | 0 | 19200 |
| | - | | | |
| Inverter #1 | 172.170.10.10 | 10 | 126 | |
| Inverter #2 | 172.170.10.11 | 11 | 126 | |
| Inverter #3 | 172.170.10.12 | 12 | 126 | |
| Inverter #4 | 172.170.10.13 | 13 | 126 | |
| Inverter #5 | 172.170.10.14 | 14 | 126 | |
| Inverter #6 | 172.170.10.15 | 15 | 126 | |
| Inverter #7 | 172.170.10.16 | 16 | 126 | |
| Inverter #8 | 172.170.10.17 | 17 | 126 | |
| Inverter #9 | 172.170.10.18 | 18 | 126 | |
| DPM - MIC 4002 (mains) | - | 1 | | 19200 |
| DPM - MIC 4002 (generator#1) | - | 2 | | 19200 |

| Device | IP address | Modbus ID, monitoring | Modbus ID, control | Baud rate |
|---|---|---|---|---|
| DPM - MIC 4002 (generator#2) | - | 3 | | 19200 |
| DPM - MIC 4002 (generator#3) | - | 4 | | 19200 |

**Table 2.2** Menus for Ethernet connection

| Connection | Function | Associated menus |
|---|---|---|
| Ethernet | ASC device IP number | 9000<br>(9002 = IP/Subnet mask)<br>(9003 = Gateway) |

### 2.2.2 Power source data

The power source data must be available before the commissioning starts.

For the example the plant consists of one mains incomer, three generators and nine inverters.

**Table 2.3** Example of power source data for plant

| Power source | Frequency [Hz] | Voltage [V] | Current [A] | S [VA] | PF | P [kW] | CT ratio | PT ratio | Amount |
|---|---|---|---|---|---|---|---|---|---|
| generator 1 | 50 | 400 | | 625 | 0.8 | 500 | 1000/5 | 1:1 | |
| generator 2 | 50 | 400 | | 625 | 0.8 | 500 | 1000/5 | 1:1 | |
| generator 3 | 50 | 400 | | 480 | 0.8 | 384 | 1000/5 | 1:1 | |
| mains | 50 | 400 | | 600 | | 480 | 1000/5 | 1:1 | |
| solar panel | | | | | | 0.265 | | | 2100 |
| solar park | | | | | | 557 | | | |
| inverter size | | | | 60 | | | | | 9 |
| inverter total | 50 | 400 | 779 | 540 | | | 1000/5 | 1:1 | |

# 3. Configuration of digital power meter

With the collected information, it is possible to configure the digital power meters. If transducers are used instead of digital power meters, they must be configured instead.

Depending on the type of power meter, the configuration menu is accessed from the front, and configuration is done from the front. The programming of transducers and power meters are not done from the DEIF PC Utility SW.

On DEIF power meters, for instance MIB 7000C, the configuration menu is typically accessed by pressing “H”+ “VA” simultaneously.

Please refer to the programming manual of your specific meter.

# 4. Single line diagram

The DEIF controller contains the single line diagram. In DEIF terms, this is represented with the “Application configuration”.

There are two types of application configurations:

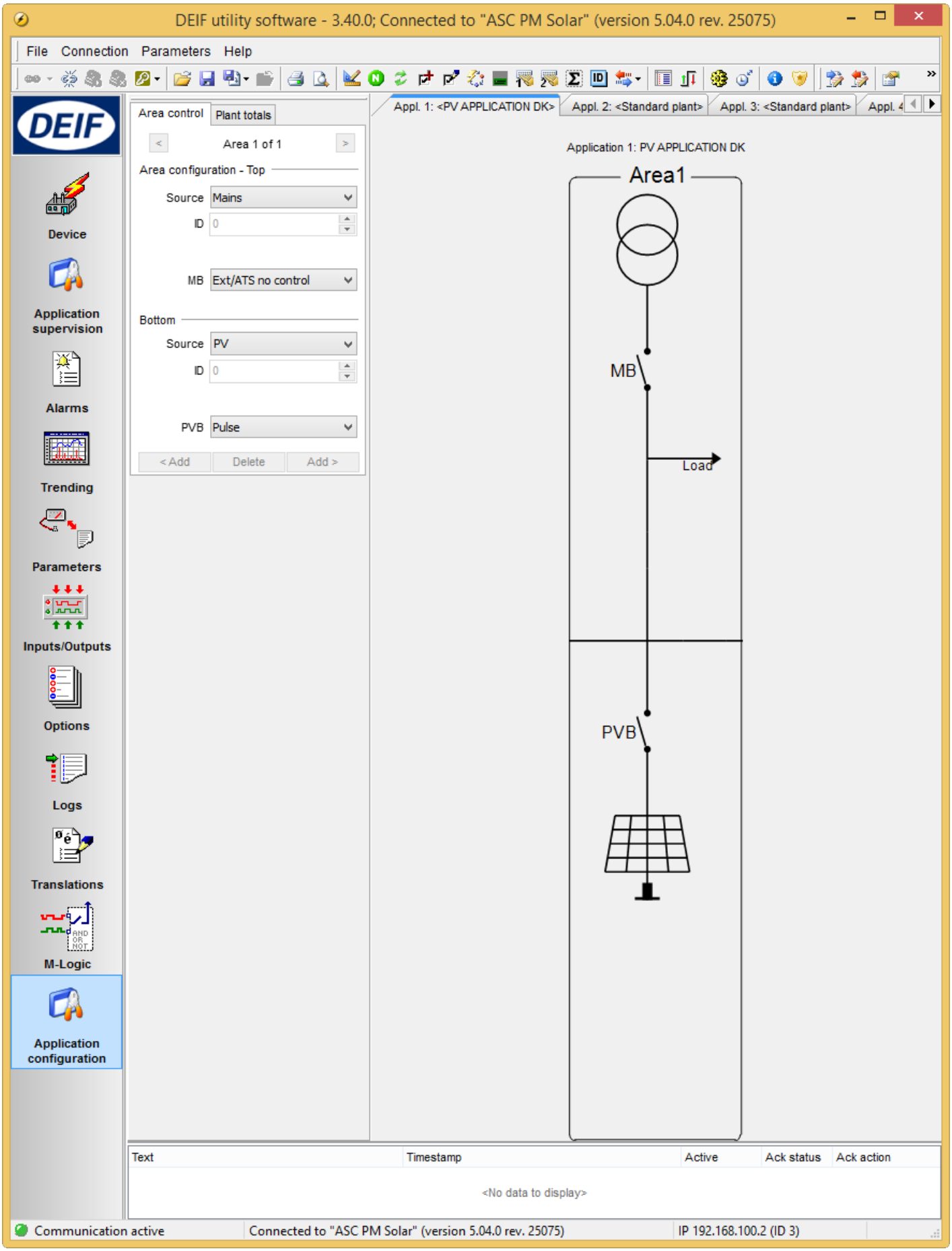
- Stand-alone configuration
- Power management configuration

A stand-alone configuration contains only one DEIF ASC controller in the plant configuration.

A power management configuration contains multiple ML-2 controllers (for example, ASC-4 Solar and AGC-4 Genset) in various combinations.

## 4.1 Stand-alone application configuration

The application can be adjusted by using the PC utility SW. In the tab on the left hand side, the “application configuration” can be selected. Then the configuration is done by selecting the plant specifics.

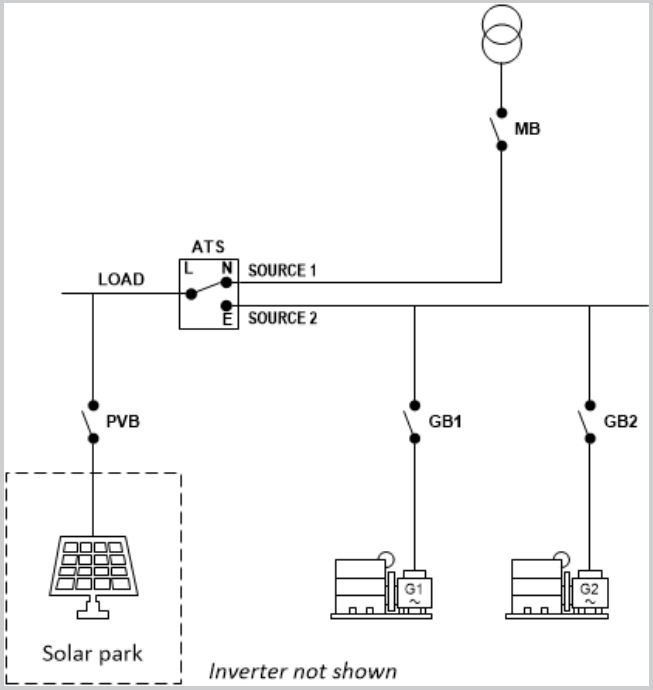


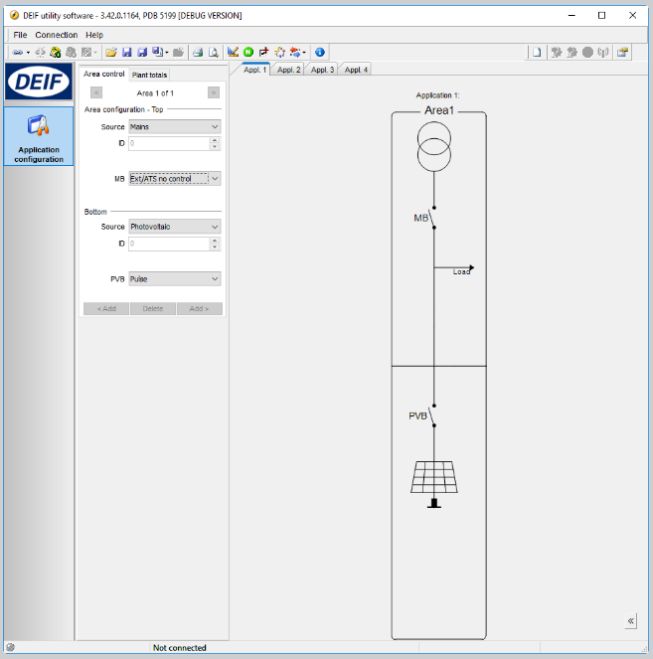

This example shows the plant with one ASC in a configuration with grid. The number of generators in the application cannot be configured on this screen unless it is a power management application.

The generators are configured in the “Input settings” or in “M-Logic”, they are not included in the application configuration. A maximum of 16 generators can be configured.

**Example of stand-alone configuration**

This is an example of a stand-alone application where a solar park supplies the load in combination with a mains connection. Two generators are included on an emergency busbar.




The generators are not visible in the “application configuration”, but they are present in the plant.

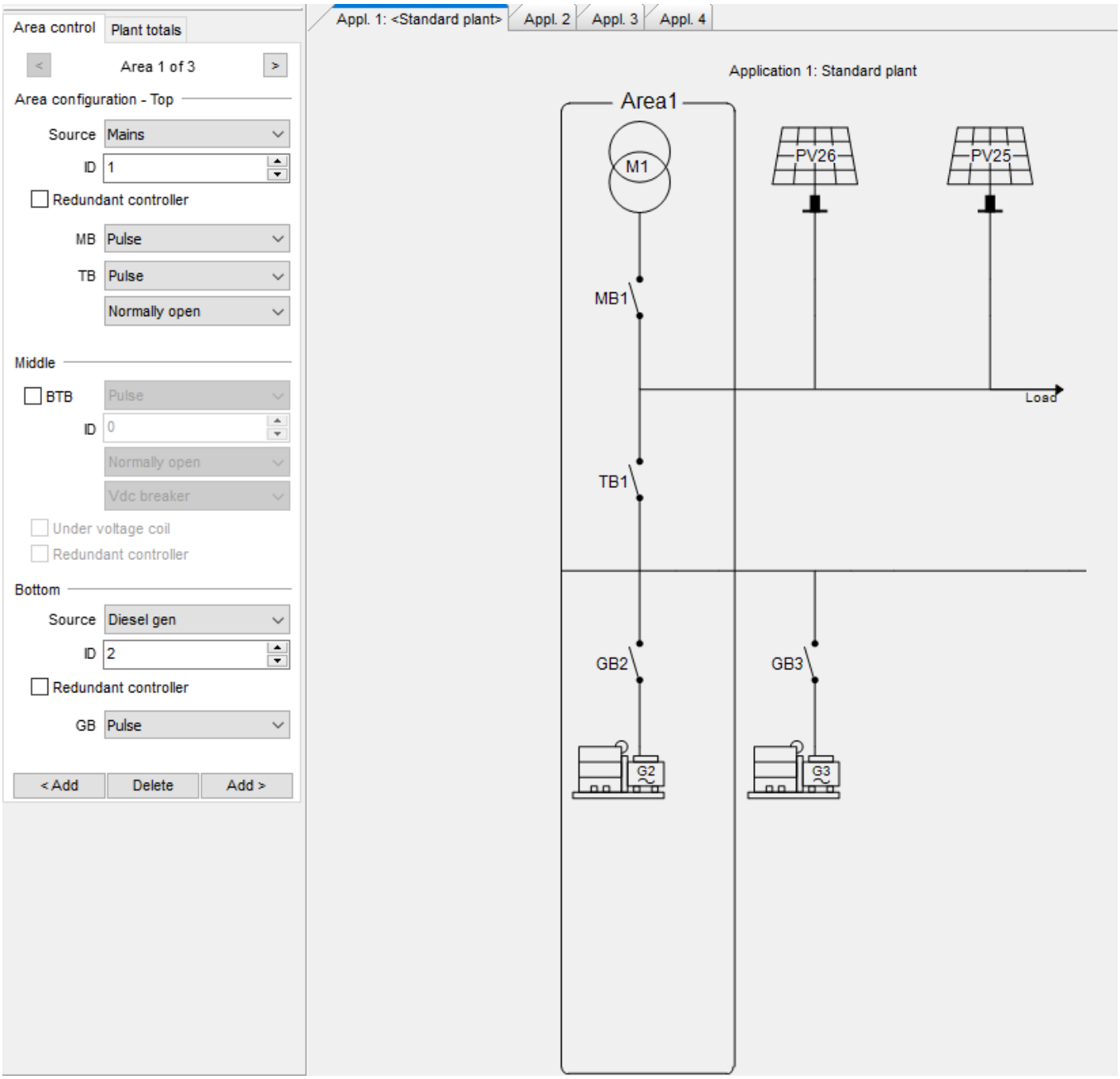
**More information**
See **Generator configuration** in this document for more information about configuring generators.

**More information**
See **PV configuration** in this document for more information about configuring PV breakers.

## 4.2 Power management application configuration

The power management provides a lot of combinations. The below screenshot shows only an example.

Special for the power management application is that there is one controller per power source. In the example below, there are five DEIF Multi-line 2 controllers (AGCs and ASCs).




To connect the photovoltaic and battery sources to the Mains load point:

1. The photovoltaic or battery source must be in **Area configuration – Top**.
2. Select the Area with the photovoltaic or battery source.
3. Select **Mains load point** under **Area configuration – Top > Connection**.
4. Write your changes to the controller.

The power management configuration is described in **Option G4 G5 and G8 Power management AGC-4**.

**More information**
See **Breaker connections** for more information about the wiring and configuration for PV and ESS breakers.

### 4.2.1 Power management CAN bus

These menus are used if the ASC is part of an integrated system (power management system). The menus are not used if the ASC is the only controller in a stand-alone system.

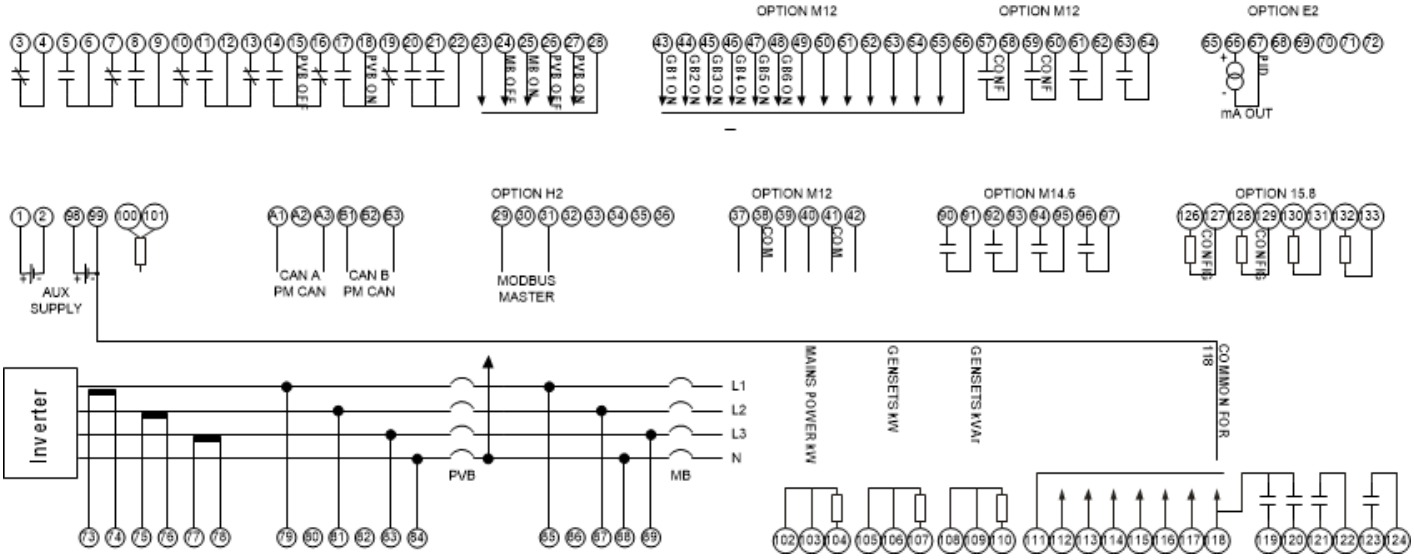
| Terminal | Function | | Associated menus |
|---|---|---|---|
| **A1** | Power management communication | CAN H | 7841, CANport select<br>7870, actions at CAN failure |
| **A3** | Power management communication | CAN L | |

Notice that the CAN bus line has to be terminated in each end with a 120 Ω resistor. The recommended CAN bus cable is a Belden 3105A or Lapp CAN bus cable or an equivalent cable.

# 5. Terminal overview

Some basic wiring is needed before engaging the ASC in the system. These terminals must be wired in most cases.

This terminal overview of the ASC is used in the case:




This terminal overview of the ASC contains the hardware options M12-E2-H2-M14.6-M15.8. Other combinations of the option configuration will of course have different terminal overviews. In the installation manual, the precise I/O list of the separate options is shown.

# 6. AC configuration: Scaling

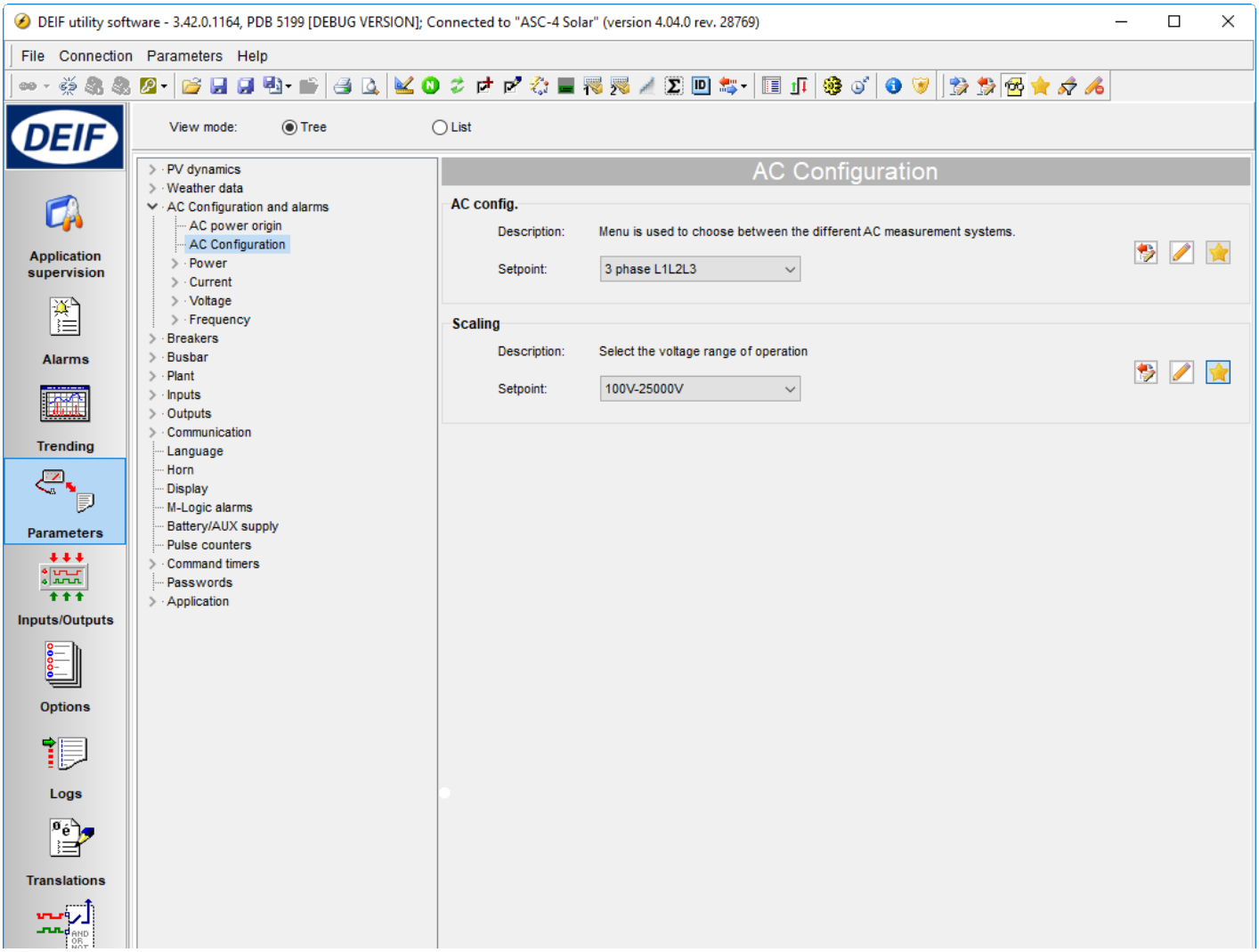
Select the scaling to the proper setting.

Note that you must do this before the rest of the nominal values are set up.

If this selection is made from the display unit, you must press the key JUMP (keyJUMP, then keyUP or keyDOWN until you reach menu 9030). The master password is still needed.

| Parameter | Range | Default | Comment |
|---|---|---|---|
| 9030 | 10 V - 2500 V<br>100 V - 25000 V<br>10 kV - 160 kV<br>1 kV - 75 kV | 100 - 25000 V | This parameter affects how the AC measurement values are displayed on the controller.<br><br>It is recommended to use a scale range that matches your installation. |

The difference between the scale ranges is the way the power is displayed on the controller. For example, 6 kW is displayed as 6.0 kW in the 10 - 2500 V scale and 6 kW in the 100 - 25000 V scale. For low power installations, it is recommended to use 10 -2500 V AC.



# 7. Power supply alarms

These alarms will activate if the power supply fails. The menus 4980/4990 are only present if the option G5/M4 is installed.

| Terminal | Function | Associated menus |
|---|---|---|
| 1 | 24 V DC power supply | 4960 aux supply low voltage<br>4970 aux supply high voltage |
| 2 | Negative for terminal 1 | |
| 98 | 24 V DC power supply | 4980 aux supply low voltage<br>4990 aux supply high voltage |
| 99 | Negative for terminal 98 | |

# 8. Breaker connections

## 8.1 PV breaker is present

If the application configuration includes a PV breaker, the following terminals must be wired:

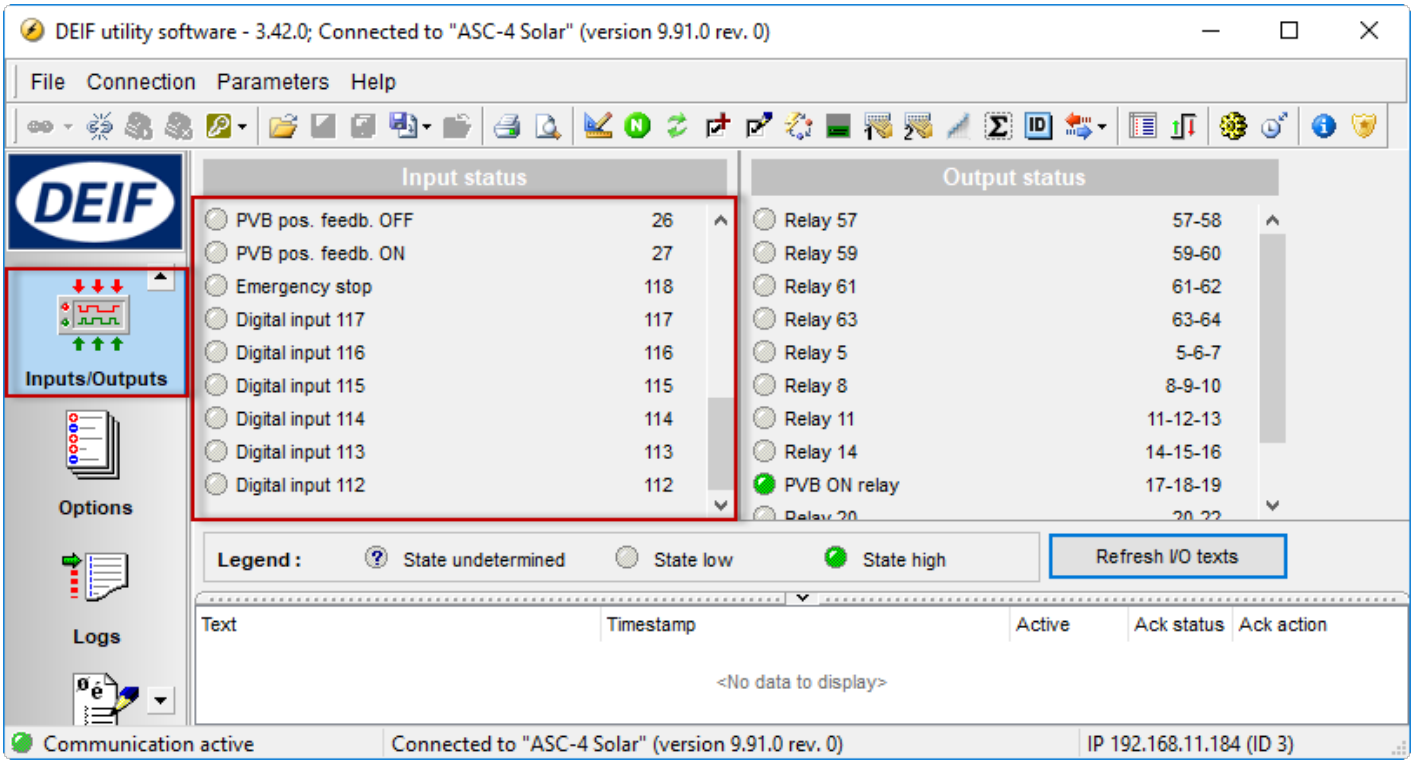
| Terminal | Function | | Comments |
|---|---|---|---|
| 14 | Open PV Breaker | NO | Open relay is used depending on breaker type: pulse |
| 15 | Common for 14/16 | Comm | |
| 16 | | NC | |
| 17 | Close PV Breaker | NO | Closed relay is used depending on breaker type: pulse and continuous (contactor) |
| 18 | Common for 17/19 | Comm | |
| 19 | | NC | |

It is noted that the breaker configuration is set up in the “Application configuration”. There are no parameter menus for this. Compact breaker (MCCB) is not supported by the ASC.

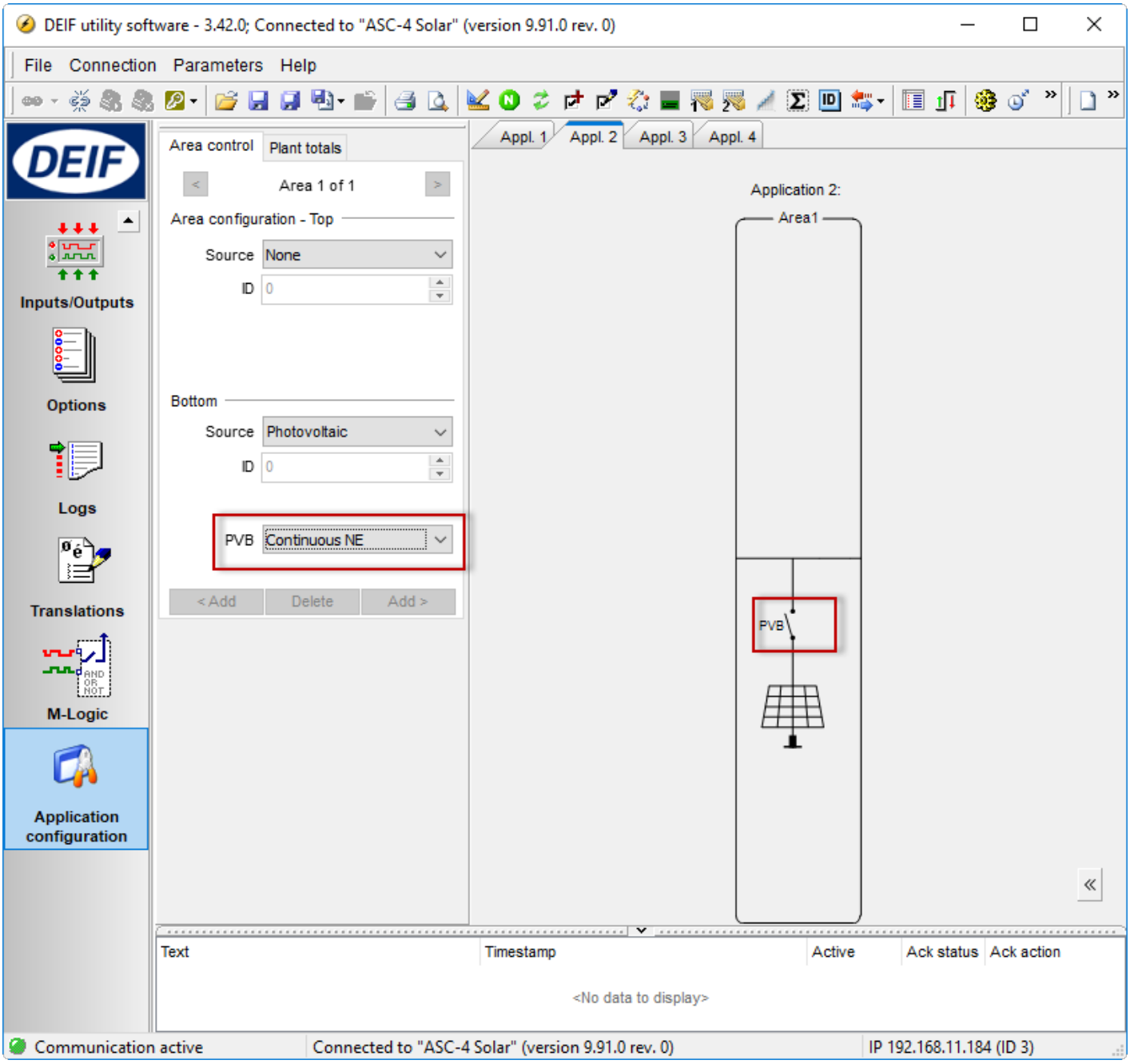
These menus and inputs associate with each other.

| Terminal | Function | | Comments |
|---|---|---|---|
| 26 | Feedback for the PVB open position | | 2160 PVB open failure<br>2180 PVB pos failure |
| 27 | Feedback for the PVB closed position | | 2170 PVB close failure<br>2180 PVB pos failure |
| 28 | Common for 26 and 27 | | |

Breaker feedback can be checked in the utility software on the inputs/outputs page. Note that the input terminal numbers are mentioned on the right hand side of the terminal description.



When there is a PV Breaker in the application and the ASC controls it, the application always contains one:




## 8.2 ESS breaker is present

If the application configuration includes a ESS breaker, the following terminals must be wired:

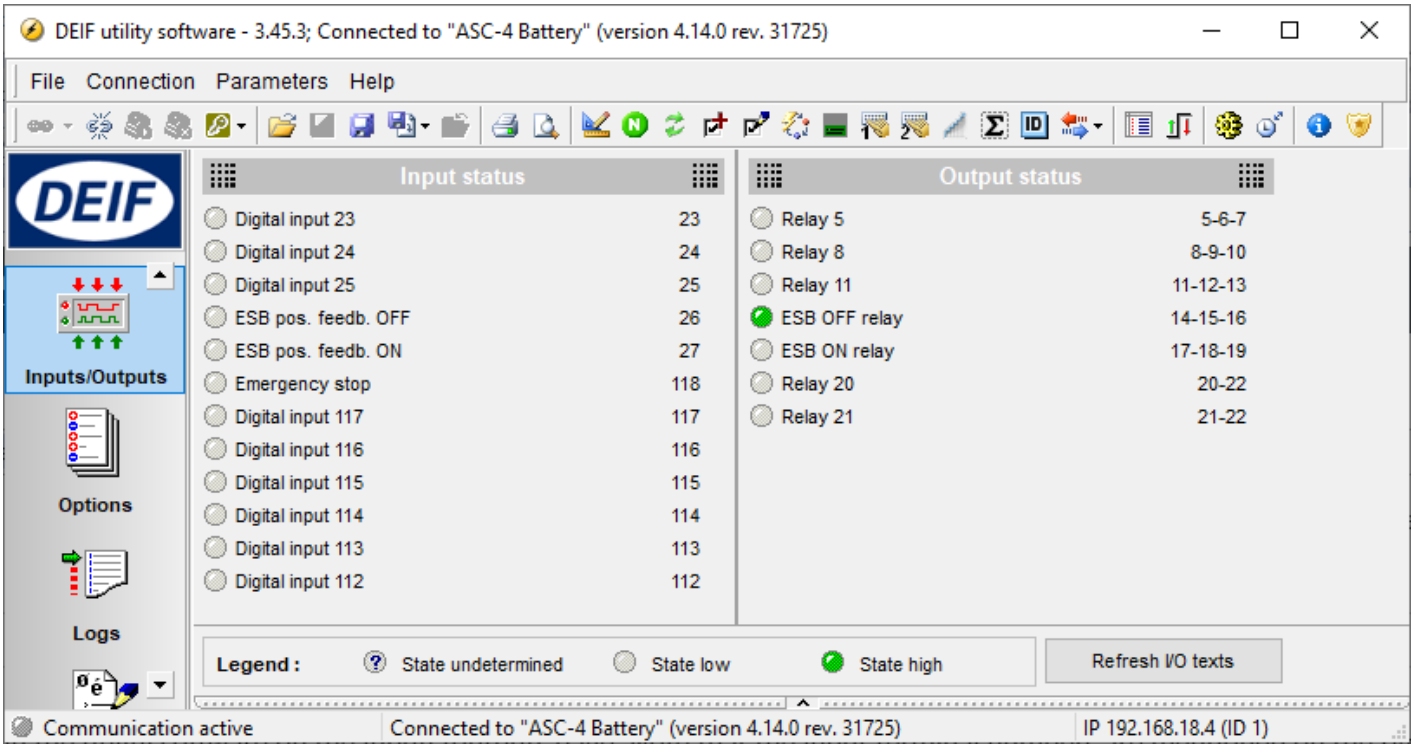
| Terminal | Function | | Comments |
|---|---|---|---|
| 14 | Open ESS Breaker | NO | Open relay is used depending on breaker type: pulse |
| 15 | Common for 14/16 | Comm | |
| 16 | | NC | |
| 17 | Close ESS Breaker | NO | Closed relay is used depending on breaker type: pulse and continuous (contactor) |
| 18 | Common for 17/19 | Comm | |
| 19 | | NC | |

It is noted that the breaker configuration is set up in the “Application configuration”. There are no parameter menus for this. Compact breaker (MCCB) is not supported by the ASC.

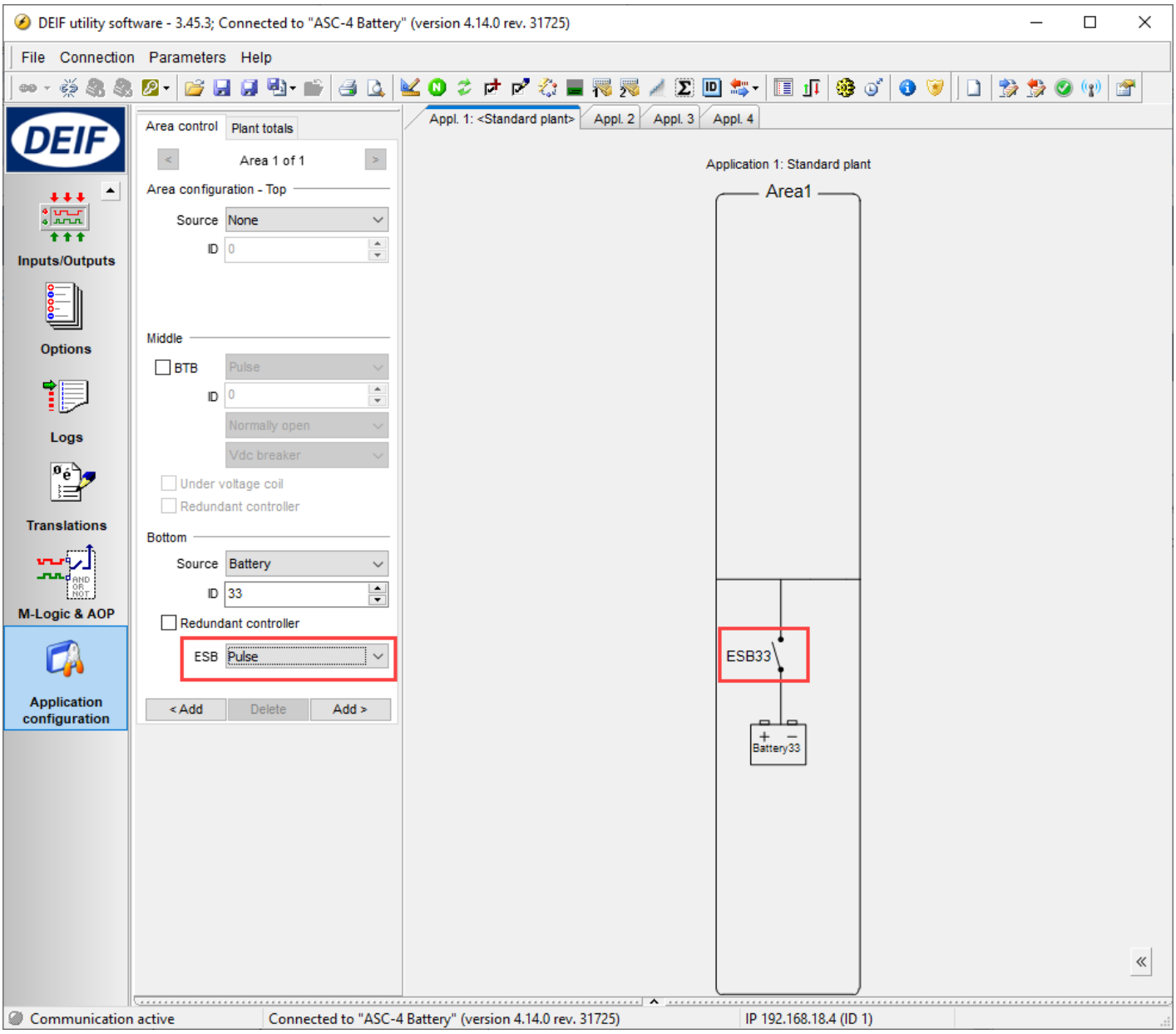
These menus and inputs associate with each other.

| Terminal | Function | | Comments |
|---|---|---|---|
| 26 | Feedback for the ESB open position | | 2160 ESB open failure<br>2180 ESB pos failure |
| 27 | Feedback for the ESB closed position | | 2170 ESB close failure<br>2180 ESB pos failure |
| 28 | Common for 26 and 27 | | |

Breaker feedback can be checked in the utility software on the inputs/outputs page. Note that the input terminal numbers are mentioned on the right hand side of the terminal description.




When there is an ESS Breaker in the application and the ASC controls it, the application always contains one:

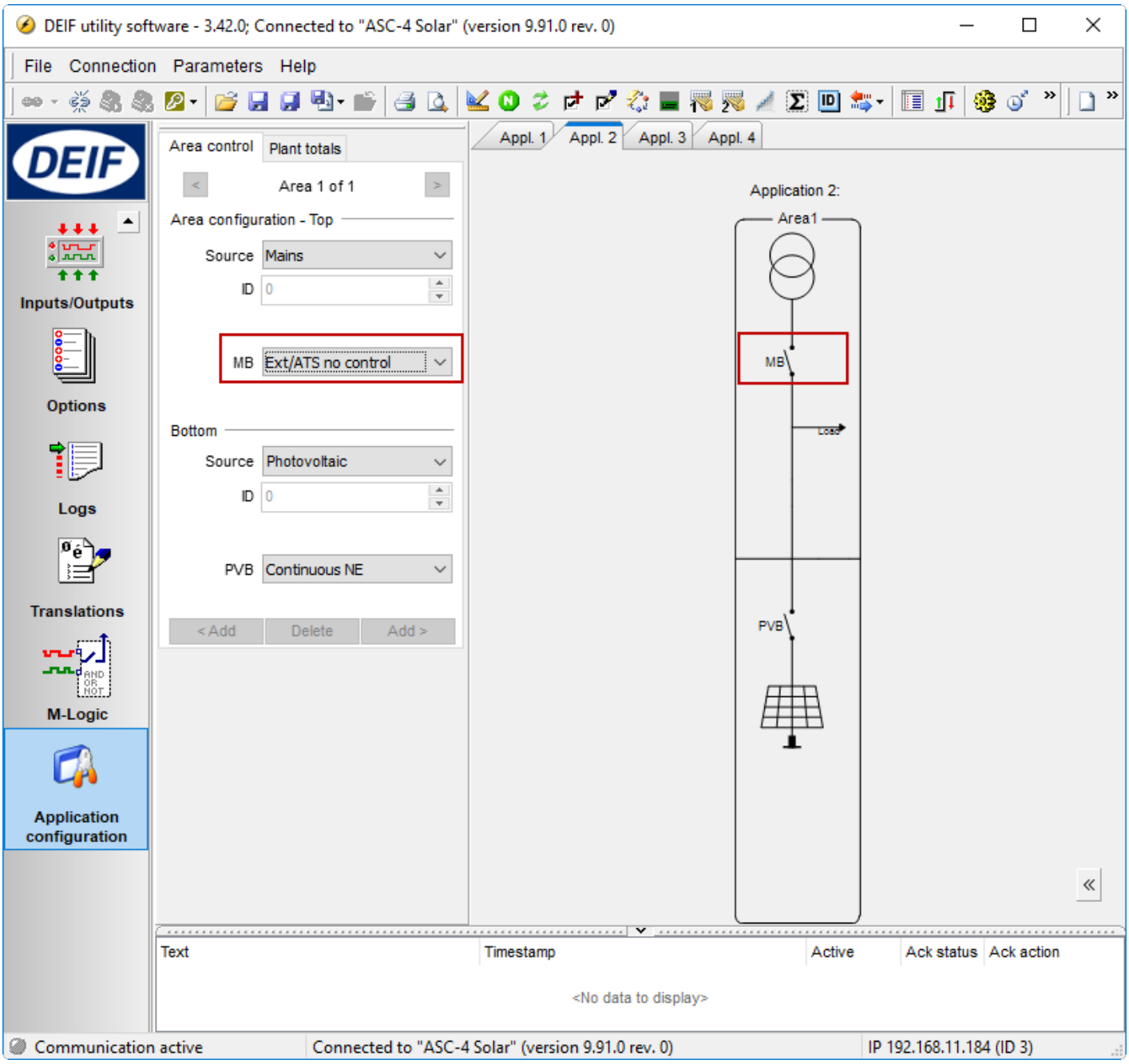



## 8.3 Mains breaker is present

The ASC cannot control the mains breaker, but it is necessary to wire in position feedbacks so that the ASC knows the status of the mains breaker. This is the case for non-power management systems (ASC is the only DEIF controller in the system).

| Terminal | Function | Associated menus |
|---|---|---|
| 24 | Feedback for the MB open position | 2210 MB pos failure |
| 25 | Feedback for the MB closed position | 2210 MB pos failure |
| 28 | Common for 24 and 25 | |

The check of the input functionality is done in the inputs/outputs page similar to the PVB. The application will contain a breaker which is not controlled by the ASC.



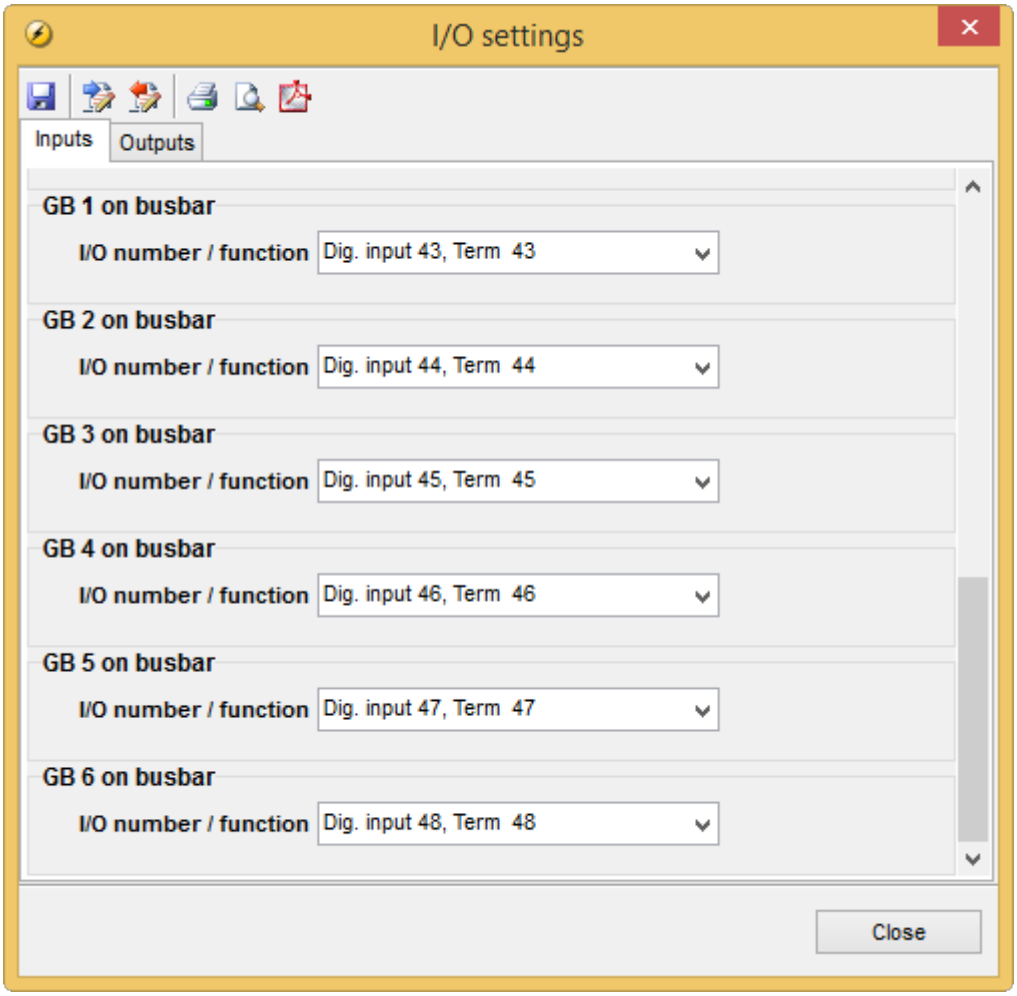

## 8.4 Generator breaker feedback inputs

The mentioned parameters, wiring and settings must be configured when it is not a power management system. Notice that the DPM DEIF MIC 4000 series also gives the possibility to configure this in the “M-Logic” programming tool.

Note the available number of inputs is option-dependent. The below shown 43-48 (56:common) belong to option M12.

| Terminal | Function | | Associated menus |
|---|---|---|---|
| 43 | Genset #1 breaker is closed | | 7481 DG1 nominal power |
| 44 | Genset #2 breaker is closed | | 7482 DG2 nominal power |
| 45 | Genset #3 breaker is closed | | 7483 DG3 nominal power |
| 46 | Genset #4 breaker is closed | | 7484 DG4 nominal power |
| 47 | Genset #5 breaker is closed | | 7485 DG5 nominal power |
| 48 | Genset #6 breaker is closed | | 7486 DG6 nominal power |

| Terminal | Function | | Associated menus |
|---|---|---|---|
| | | | **Maximum 16 gensets can be configured** |
| 56 | Common for 43-55 | Com. | |




Select the desired inputs in the I/O settings, which are accessed from the horizontal toolbar.

# 9. Generator configuration

## 9.1 Generator parameter settings

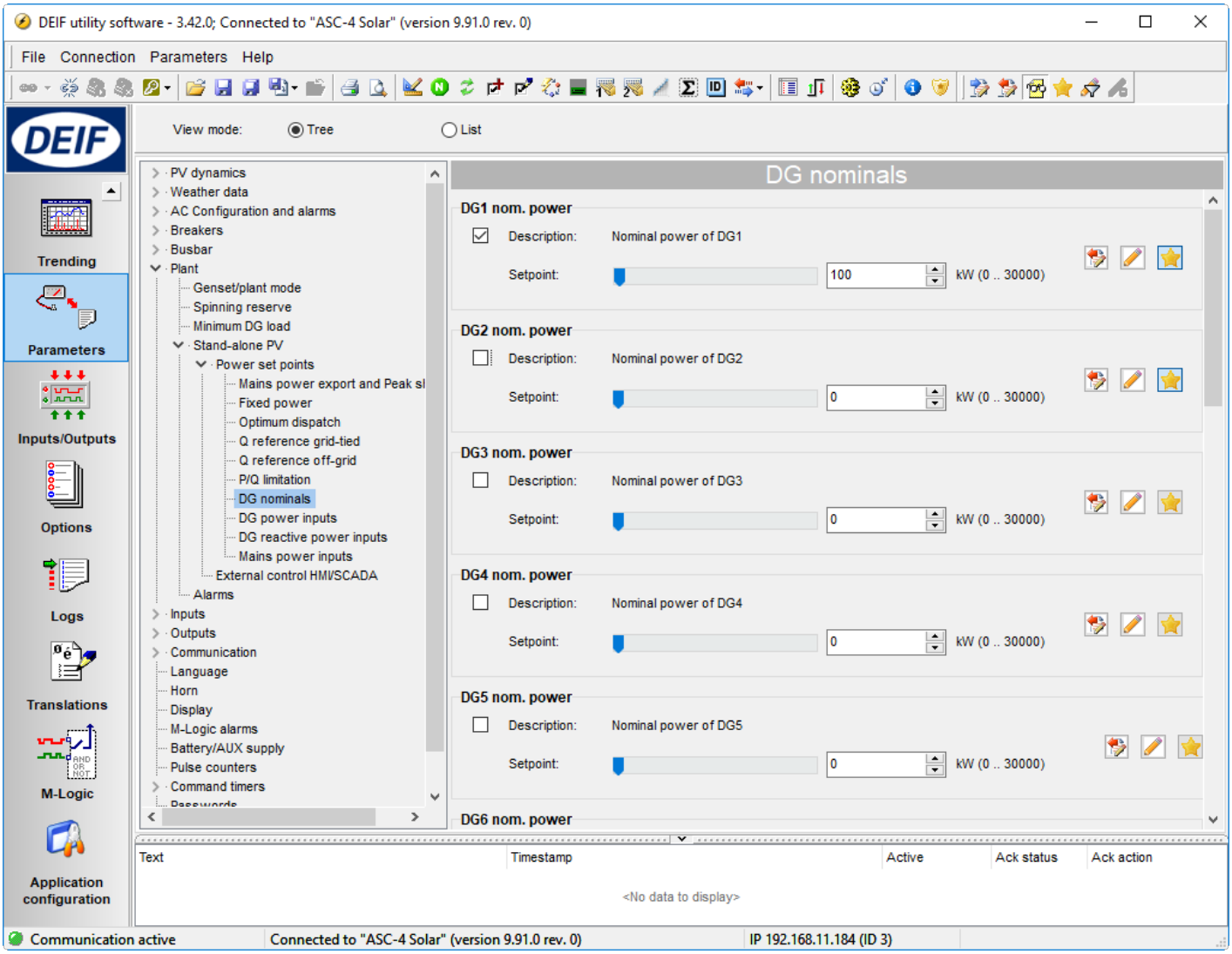
Before starting on this setup, please adjust the multi-inputs 102, 105, 108 to the needed input type, for instance 4-20 mA inputs. This applies only for units with option G5/M4 and if the transducer inputs are being used.

The chapter describes the configuration and setup of the generator and mains values. It is easily done in the utility software.

You need to go through these steps when the system is a stand-alone system. If the system is an integrated power management system, the ASC retrieves the data from the power management communication lines.

### Nominal power

Note that the generator power is adjusted in kW rather than kVA. The kW value can be found by multiplying the kVA value of the generator with the generator power factor.

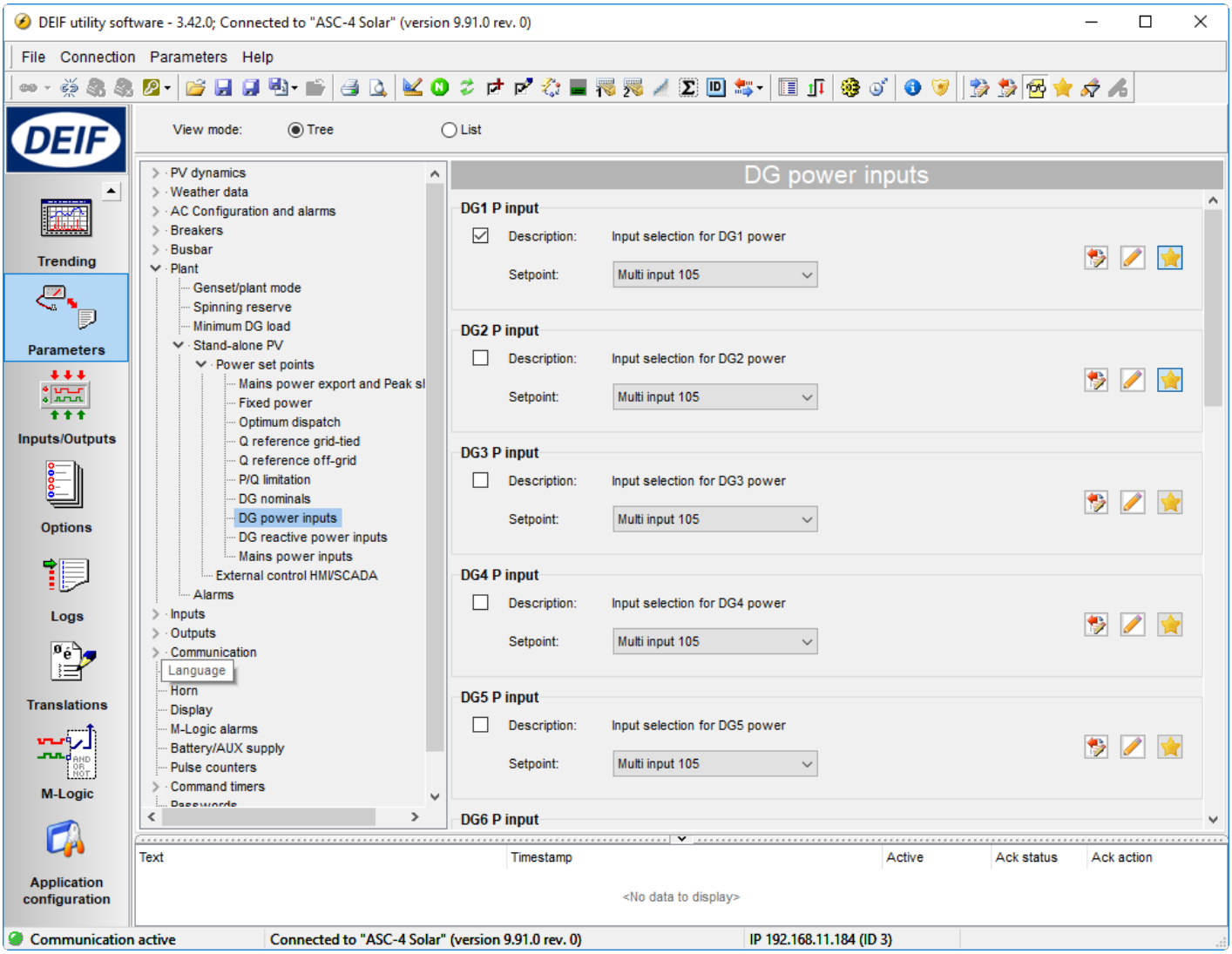



In this example, there is one generator, called DG1 and its size is 100 kW.

## 9.2 Power inputs

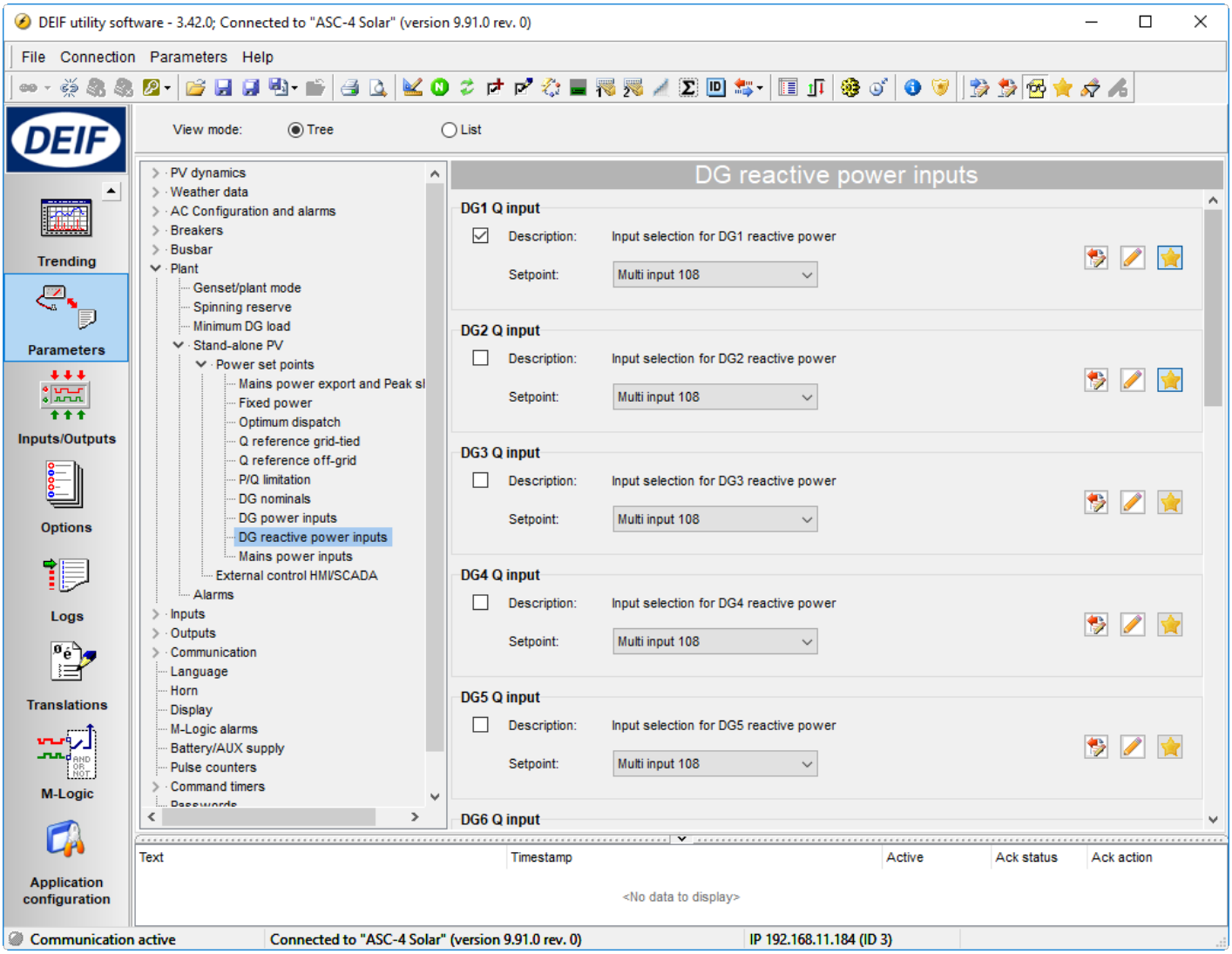
The “power inputs” define where the ASC receives the data from for the generator power.

## Active power inputs




Above, it is indicated that the ASC uses the multi-input 105 for the input that represents the active power of the generator.

## Reactive power inputs

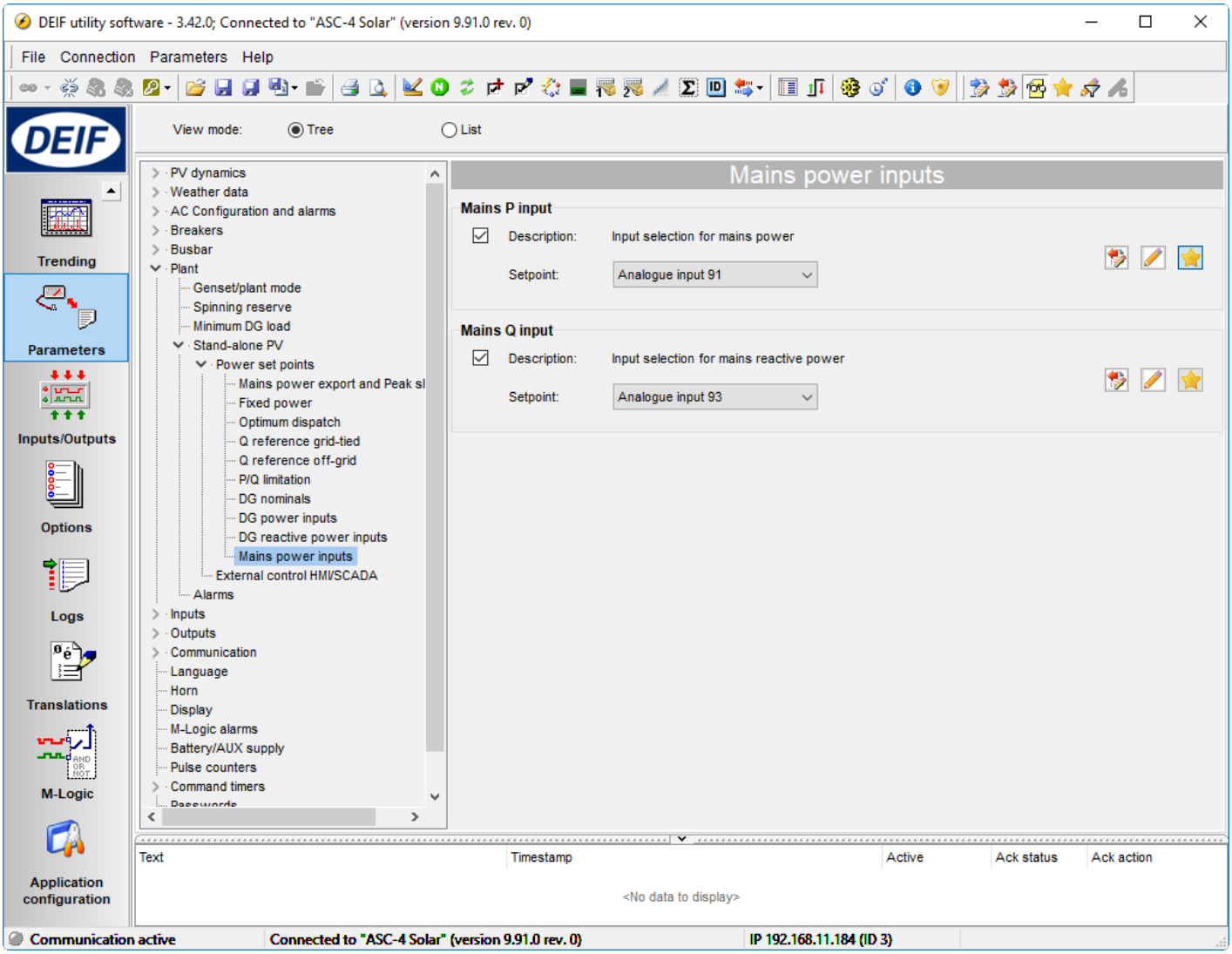



Above, it is indicated that the ASC uses the multi-input 108 for the input that represents the reactive power of the generator.

# 10. Mains configuration

## 10.1 Mains parameter settings

The mains configuration is used in stand-alone applications which contain a mains feeder.




The above shows that the active power of the mains import/export is measured on the analogue input 91 and the reactive power on analogue input 93 (in this example).

It is voluntary to use the “Mains Q input” if the ASC is only doing kW control of the inverters or are running the inverters at a fixed PF.

# 11. PV configuratiion

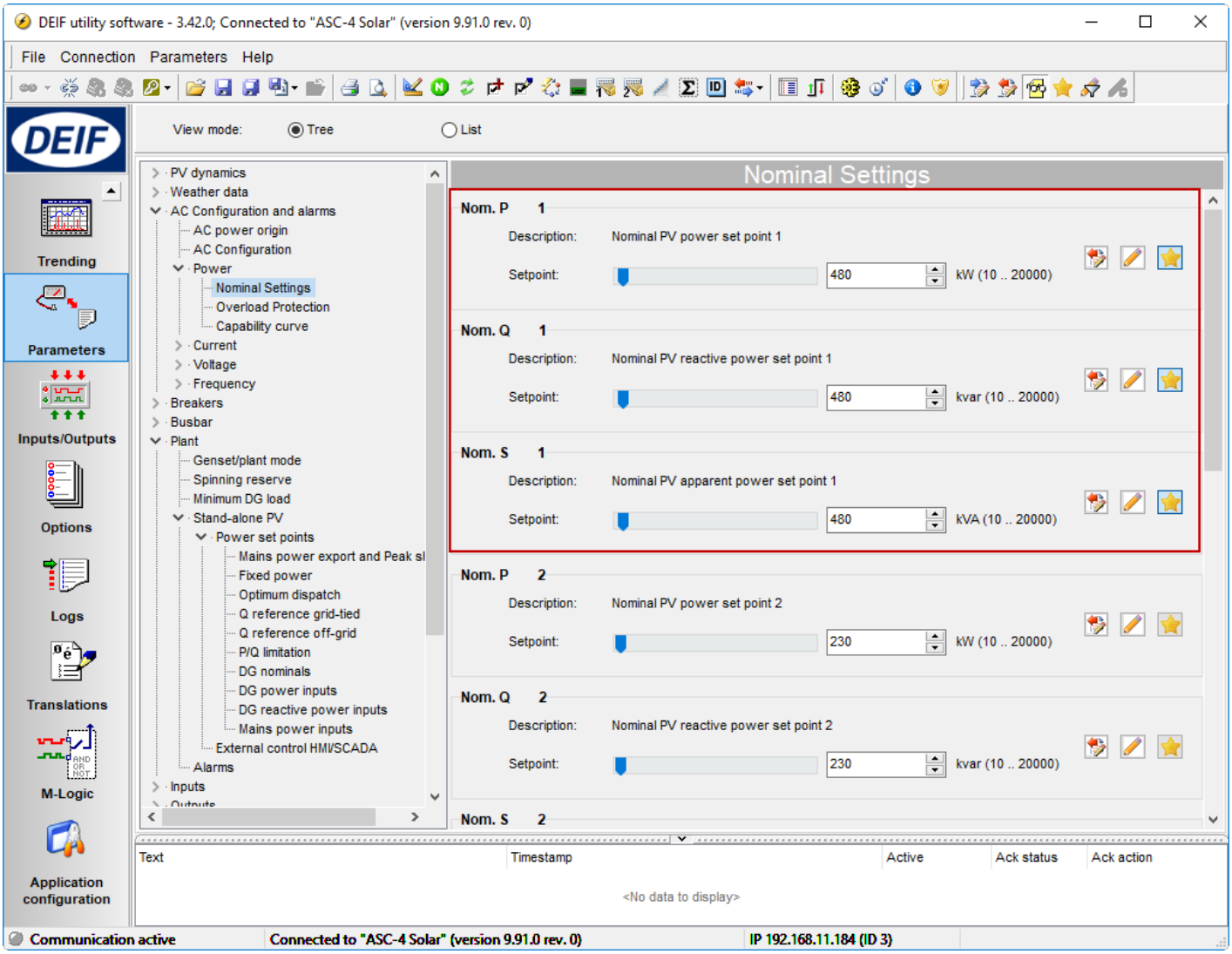
## 11.1 PV nominal values

In the section “Power source data”, all AC values were collected. Now they can be entered into the ASC.

### 11.1.1 Nominal ratings

Use the values collected in the **Power source data** chapter to adjust the nominal rating parameter values.

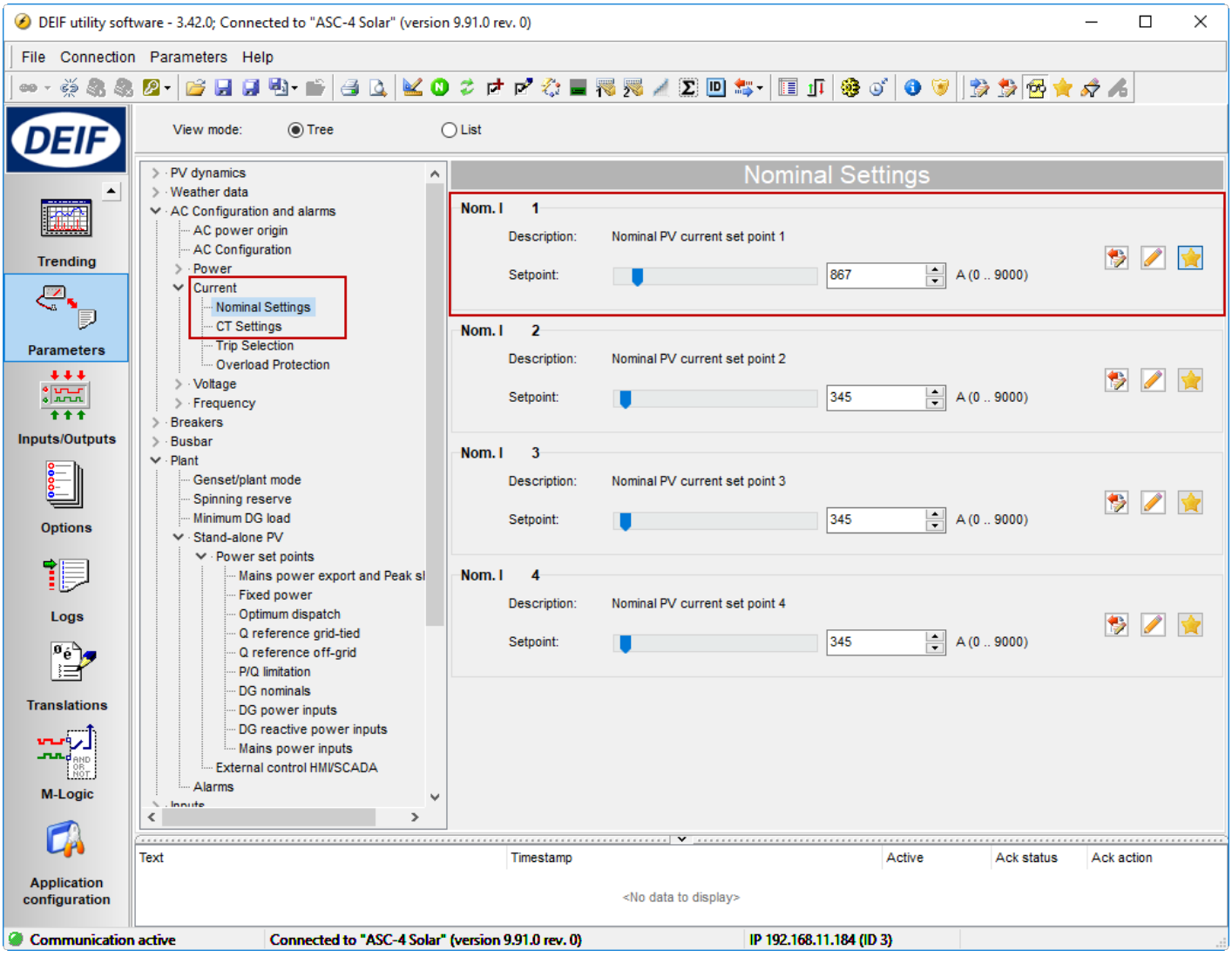
| Menu | Function | Comments |
|---|---|---|
| 6002 | Adjust the rating of the installed PV panels. | For example, 200 modules with a 250 Wp rating are installed. Set the value in this menu to 200 × 250 × 0.001 = 50 kW. |
| 6005 | Adjust the Q rating of the inverter | If given. Otherwise, set to the same value as 6006. |
| 6006 | Adjust the S rating of the inverters. | For example, three 20 kVA inverters are installed. Set this menu to 3 × 20 = 60 kVA. |




### 11.1.2 Nominal current

The voltage and current measurements need to be connected and set up in the menus.

| Terminal | Function | | Associated menus |
|---|---|---|---|
| 73 | PV IL1 | S1 | 6003, I nominal<br>6043, CT primary<br>6044, CT, secondary |
| 74 | PV IL1 | S2 | |
| 75 | PV IL2 | S1 | |
| 76 | PV IL2 | S2 | |
| 77 | PV IL3 | S1 | |
| 78 | PV IL3 | S2 | |




Also adjust the CT settings of the CTs connected to the CT input terminals of the ASC.

### 11.1.3 Nominal voltage

The voltage measurements need to be connected and set up in the menus.

| Terminal | Function | | Associated menus |
|---|---|---|---|
| 79 | UL1 | PV | 6004, Nominal U 1<br>6041, BA primary U |

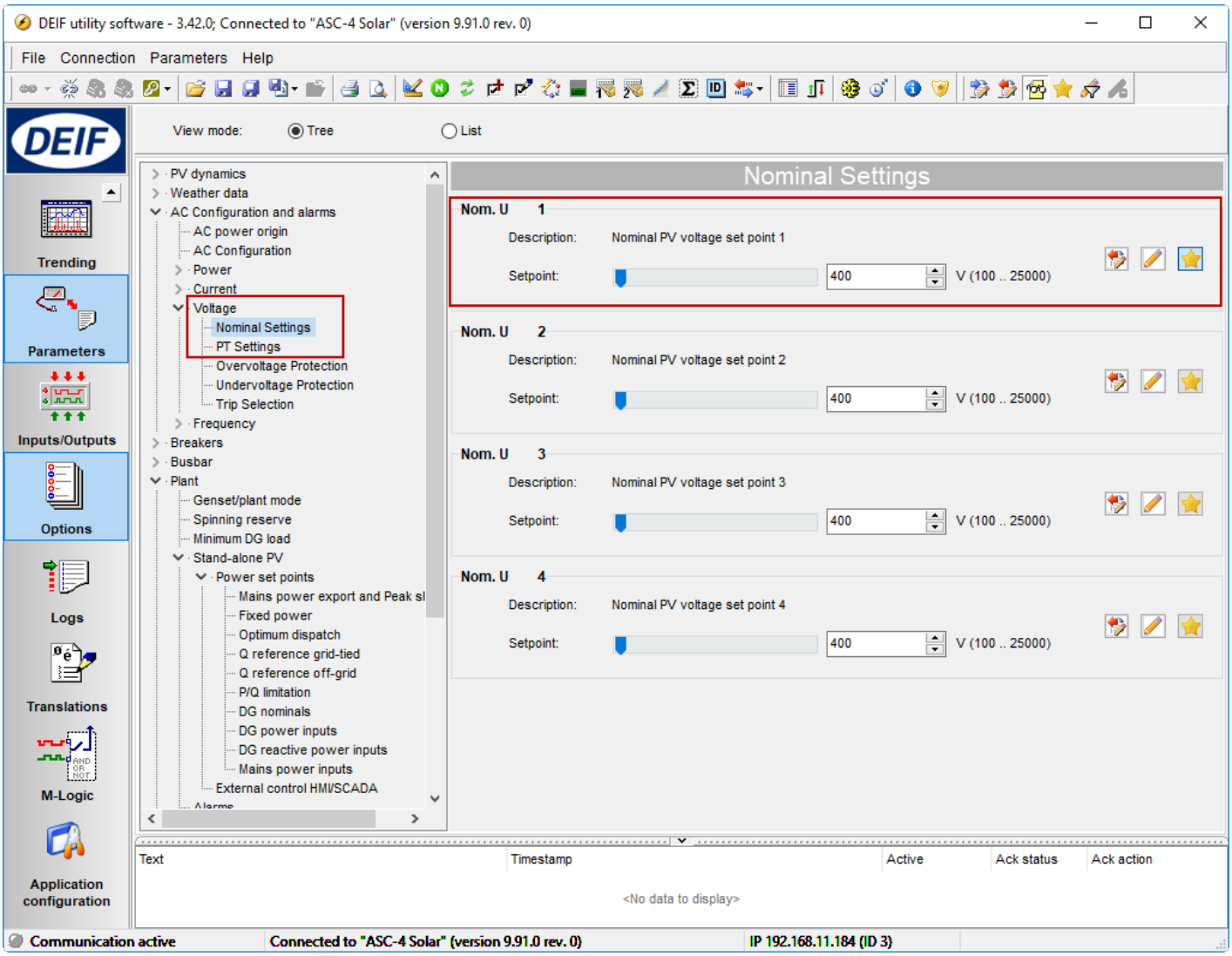
| Terminal | Function | | Associated menus |
|---|---|---|---|
| | | | 6042, BA secondary U |
| 80 | | | |
| 81 | UL2 | PV | |
| 82 | | | |
| 83 | UL3 | PV | |
| 84 | N | PV | |

If no voltage transformer is installed and the voltage is wired directly into the ASC, the ratio is set to 1:1.

For example 415:415 on a 415 volt system.

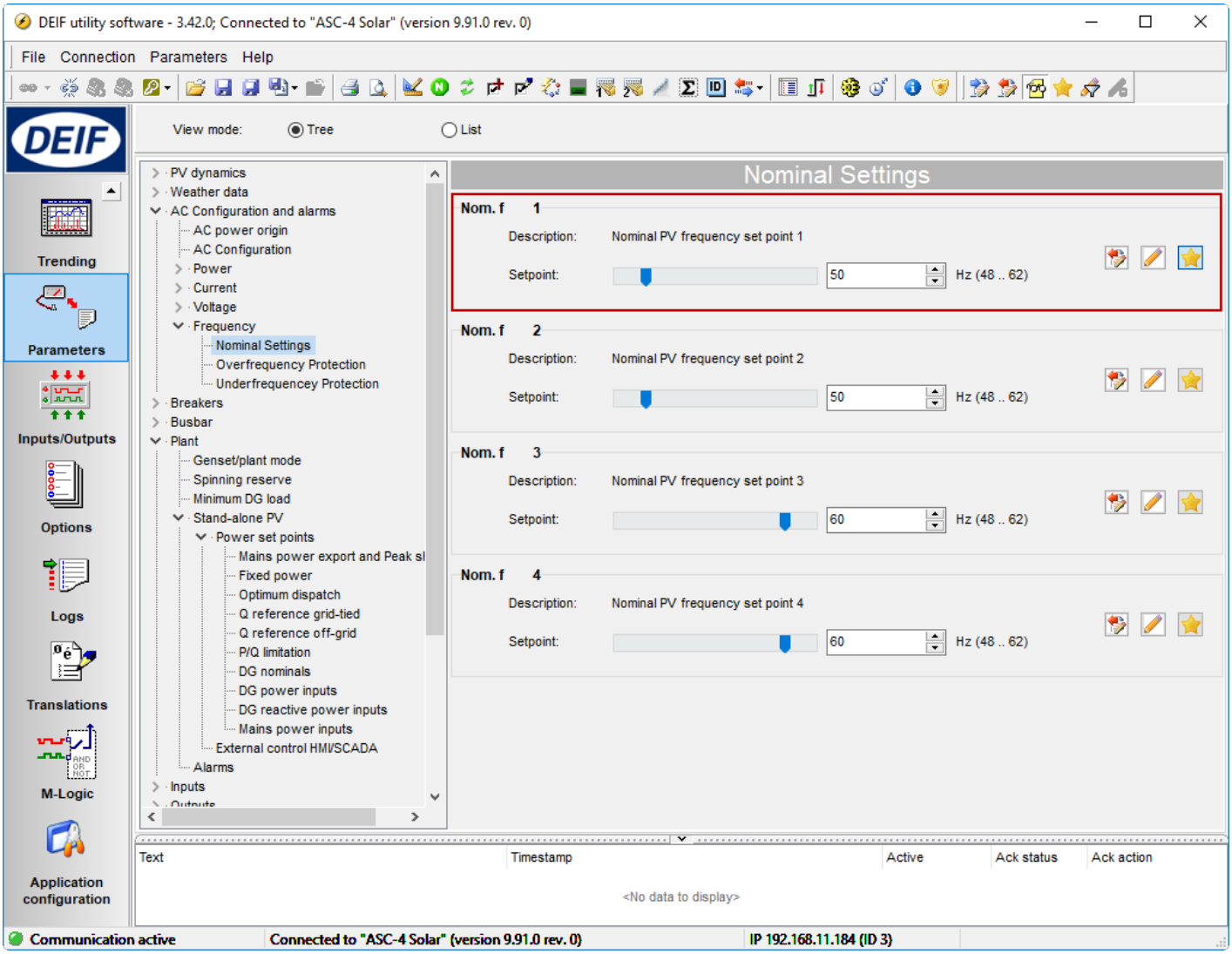
| Terminal | Function | | Associated menus |
|---|---|---|---|
| 85 | UL1 | BUS | 6051, BB primary U 1<br>6052, BB second. U 1<br>6053, BB Nominal U 1 |
| 86 | | | |
| 87 | UL2 | BUS | |
| 88 | N | BUS | |
| 89 | UL3 | BUS | |

Notice that the terminal for the neutral is placed between L2 and L3.




Also adjust the voltage transformer ratio if voltage transformers are used. They must always be checked if the scaling has been configured to 10-2500 V AC.

## 11.1.4 Nominal frequency



# 12. ESS configuratiion

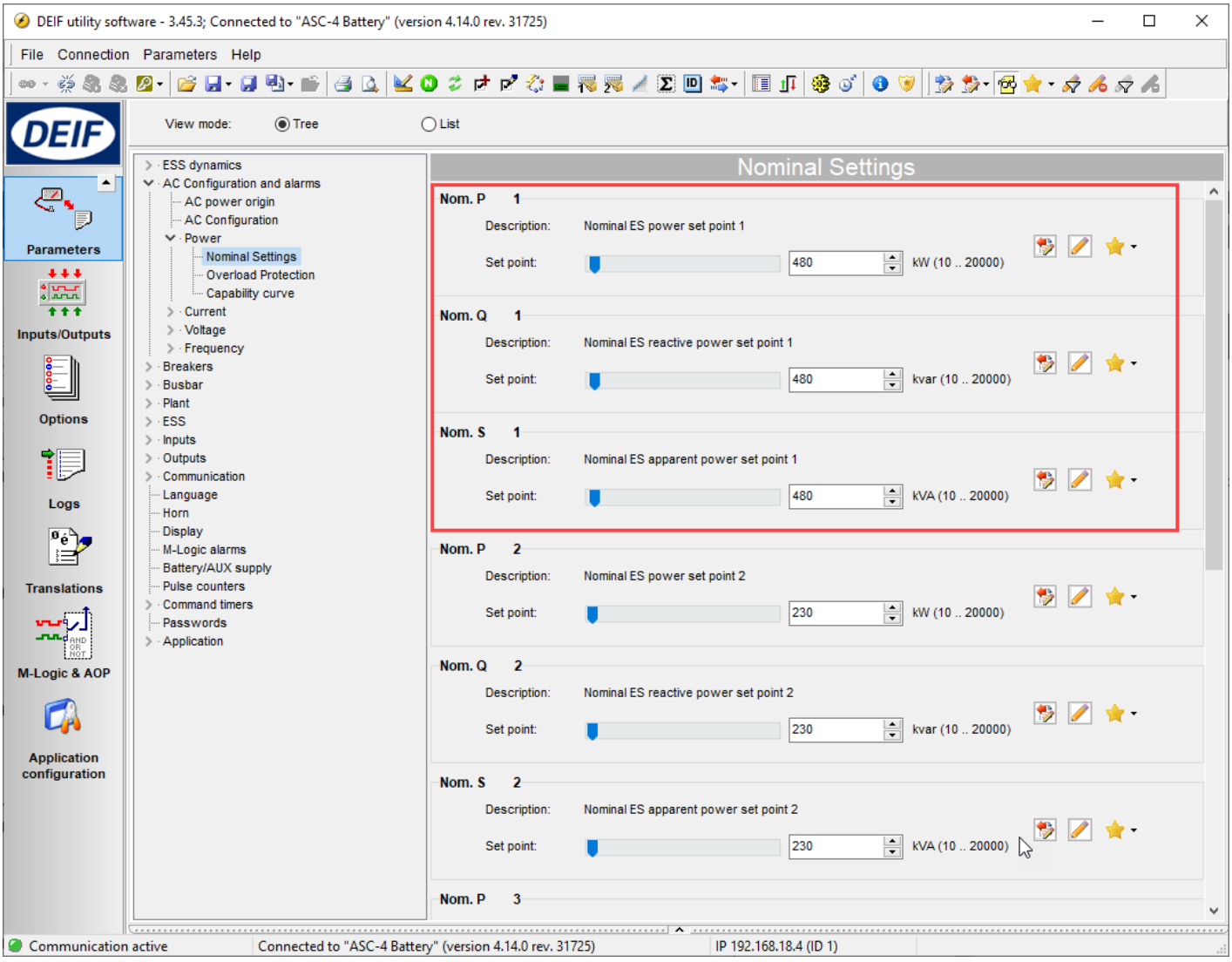
## 12.1 ESS nominal values

In the section “Power source data”, all AC values were collected. Now they can be entered into the ASC.

### 12.1.1 Nominal ratings

Use the values collected in the **Power source data** chapter to adjust the nominal rating parameter values.

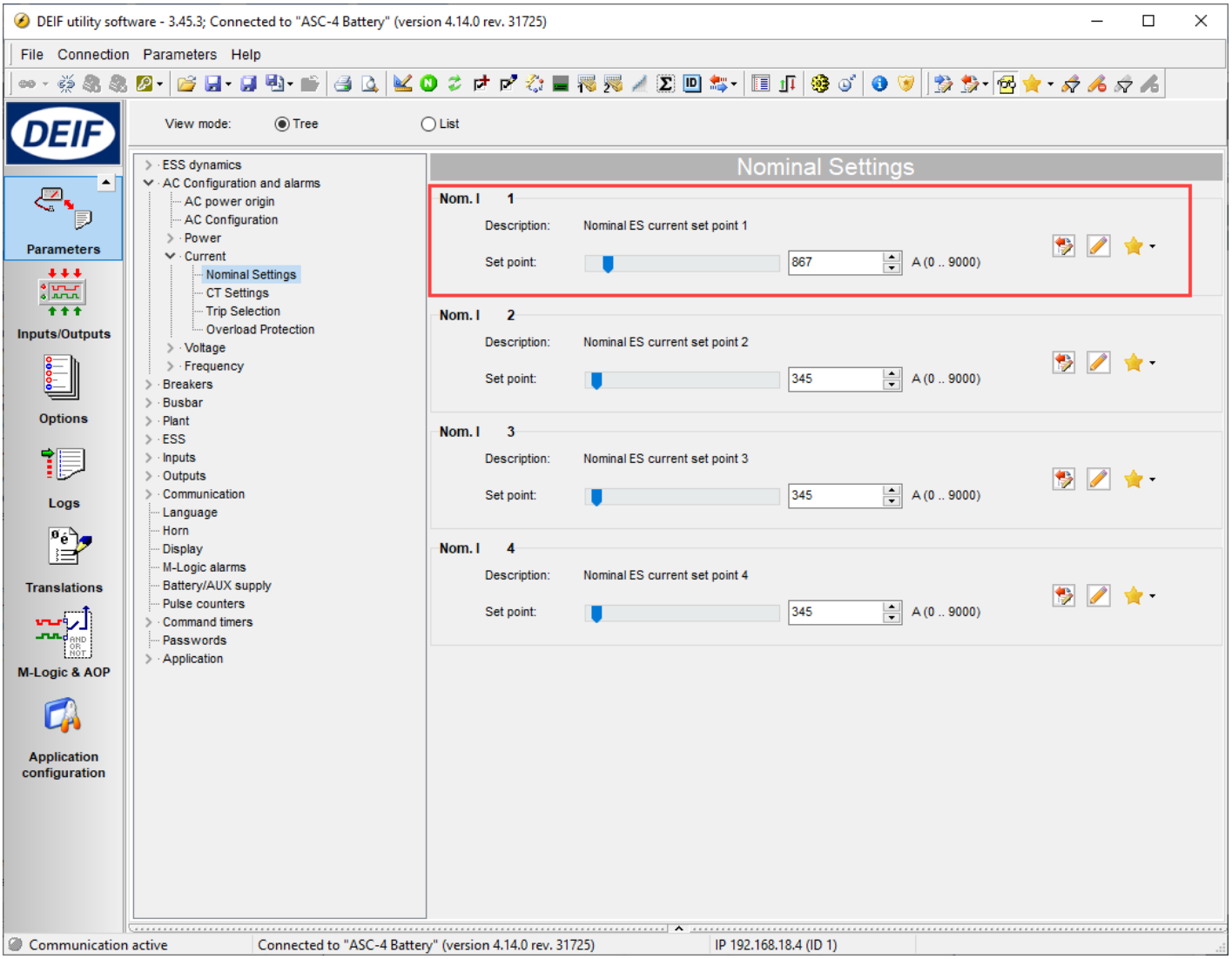
| Menu | Function | Comments |
|---|---|---|
| 6002 | Set the total power rating of the energy storage system. | |
| 6005 | Set the Q rating of the inverter. | If given, otherwise, set to the same value as 6006. |
| 6006 | Set the S rating of the inverter. | |




### 12.1.2 Nominal current

The voltage and current measurements need to be connected and set up in the menus.

| Terminal | Function | | Associated menus |
|---|---|---|---|
| 73 | ESS IL1 | S1 | 6003, I nominal<br>6043, CT primary<br>6044, CT, secondary |
| 74 | ESS IL1 | S2 | |
| 75 | ESS IL2 | S1 | |
| 76 | ESS IL2 | S2 | |
| 77 | ESS IL3 | S1 | |
| 78 | ESS IL3 | S2 | |




Also adjust the CT settings of the CTs connected to the CT input terminals of the ASC.

### 12.1.3 Nominal voltage

The voltage measurements need to be connected and set up in the menus.

| Terminal | Function | | Associated menus |
|---|---|---|---|
| 79 | UL1 | ESS | 6004, Nominal U 1<br>6041, BA primary U |

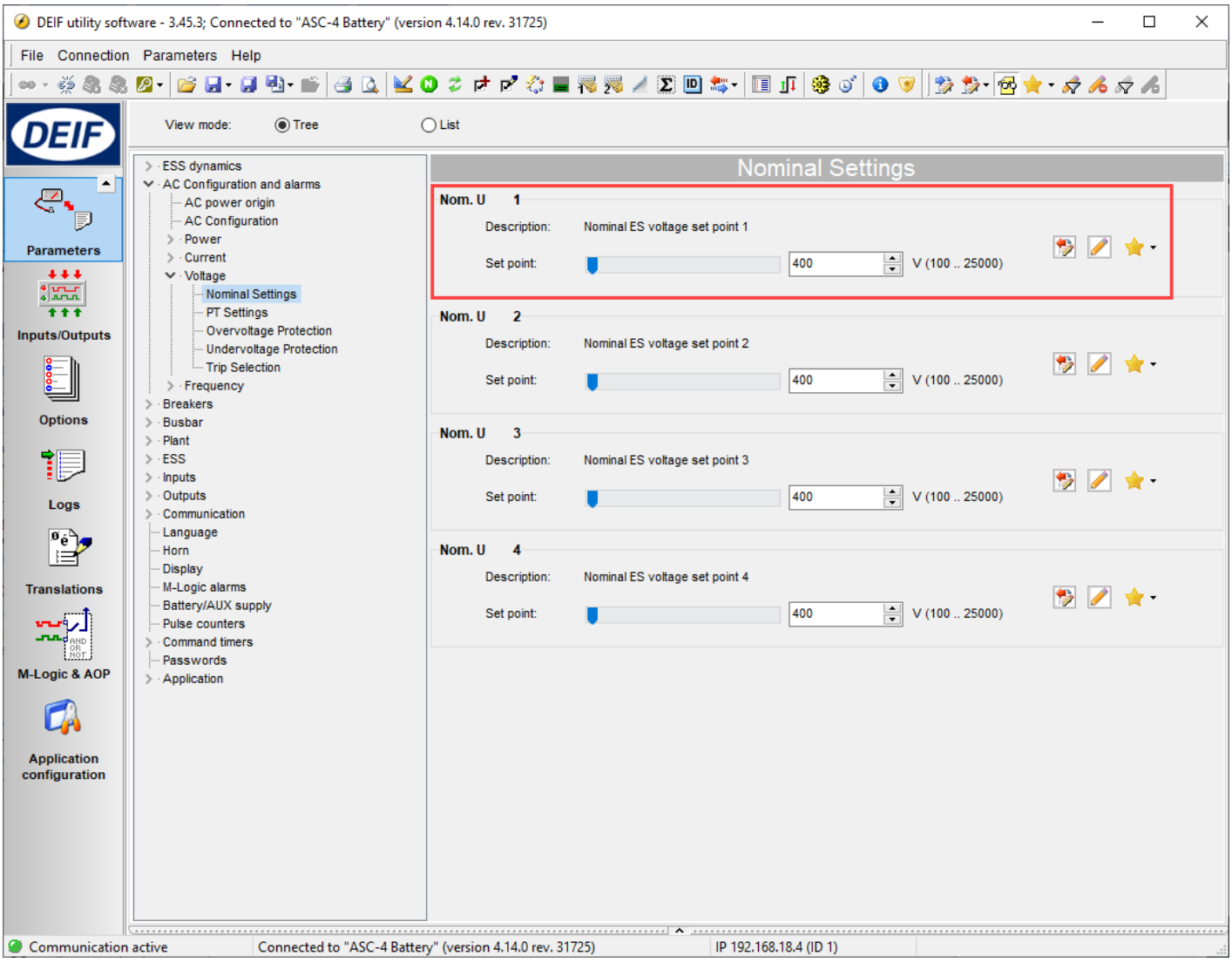
| Terminal | Function | | Associated menus |
|---|---|---|---|
| | | | 6042, BA secondary U |
| 80 | | | |
| 81 | UL2 | ESS | |
| 82 | | | |
| 83 | UL3 | ESS | |
| 84 | N | ESS | |

If no voltage transformer is installed and the voltage is wired directly into the ASC, the ratio is set to 1:1.

For example 415:415 on a 415 volt system.

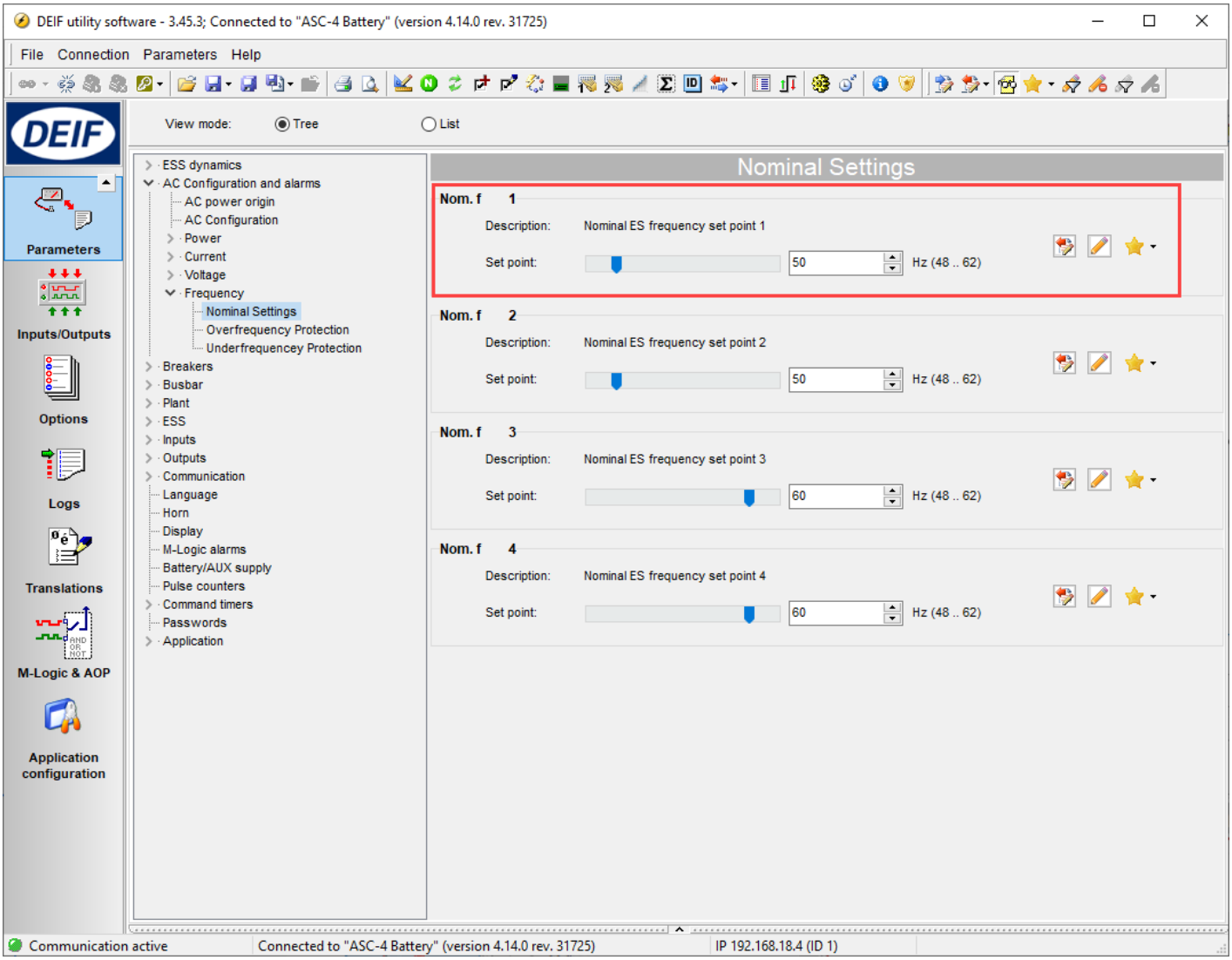
| Terminal | Function | | Associated menus |
|---|---|---|---|
| 85 | UL1 | BUS | 6051, BB primary U 1<br>6052, BB second. U 1<br>6053, BB Nominal U 1 |
| 86 | | | |
| 87 | UL2 | BUS | |
| 88 | N | BUS | |
| 89 | UL3 | BUS | |

Notice that the terminal for the neutral is placed between L2 and L3.




Also adjust the voltage transformer ratio if voltage transformers are used. They must always be checked if the scaling has been configured to 10-2500 V AC.

## 12.1.4 Nominal frequency



# 13. Communication setup

## 13.1 General Modbus communication

### 13.1.1 Modbus master, Serial 2

The ASC can read the power (active and reactive) from various digital power meters or Modbus devices. The Modbus serial communication connections are located in slot #8 in the ASC as shown:

| Terminal | Function | | Associated menus |
|---|---|---|---|
| 131 | Modbus communication | B | 7720, DPM protocol type (for example DEIF MIB 7000C) and number of nodes<br>7730-7750, action at DPM Communication error (Modbus master)<br>7700 Comm ID and baud rate<br>7710, action at communication error |
| 133 | Modbus communication | A | |

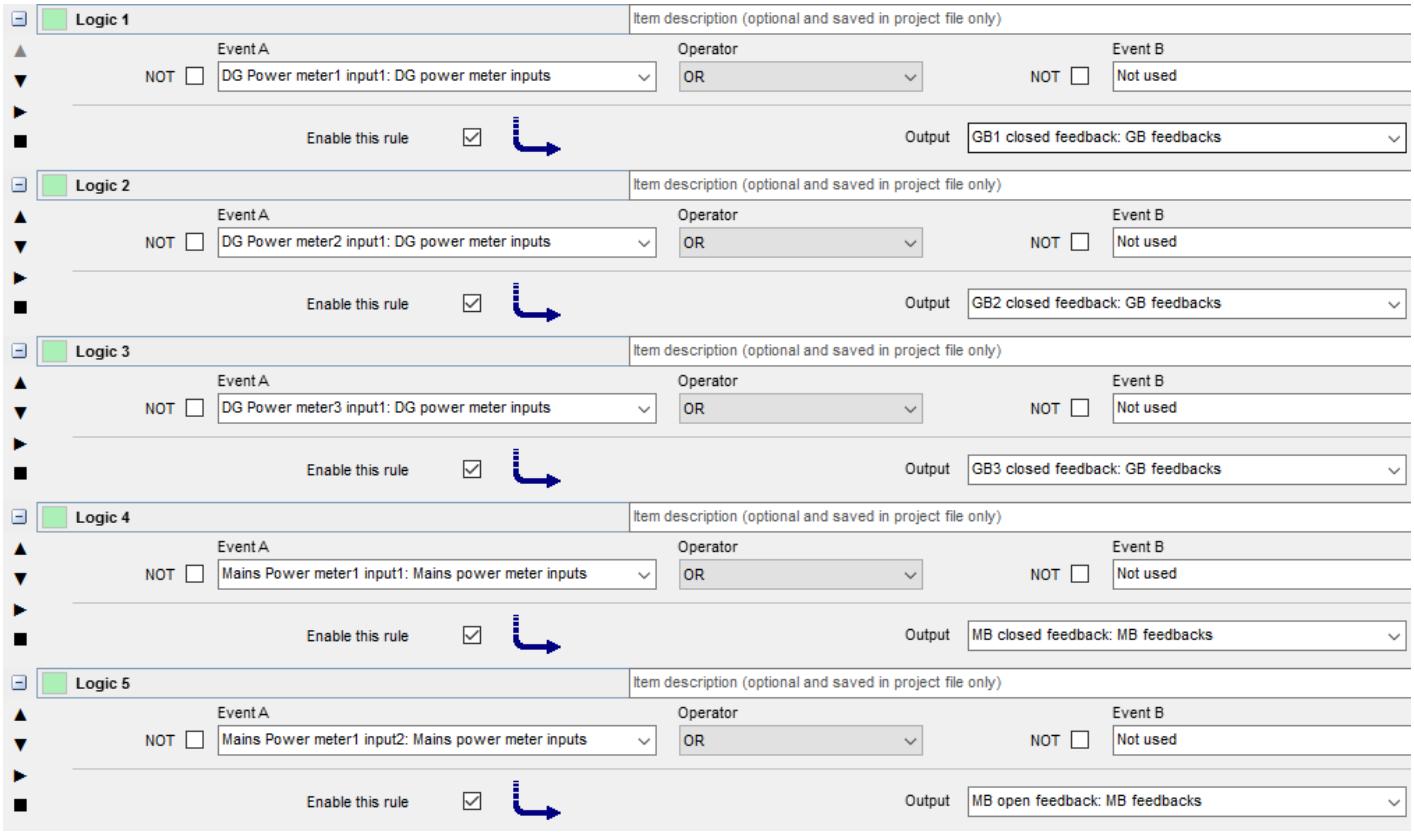
Note that the meters have their own Modbus parameters (ID and baud rate). Adjust these on the meters directly, typically on the front display of the DPM.

Note that when using the Modbus master, serial 2 for measuring the mains, generator and/or PV power, it is not necessary to use the transducers for measuring the power sources.

#### Breaker feedback on DPM

MIC 4002 and MIC 4224 include inputs that can be used as various breaker feedbacks. This is practical if the DPM is installed near the generator so additional feedback wiring over a large distance is avoided.

In DEIF M-Logic, the feedbacks are configured. This example includes 3 generators and 1 mains incomer.



Notice that in the M-Logic, the power meter number should be read as “the first”, “the second”, “the third” and so on.

Example:

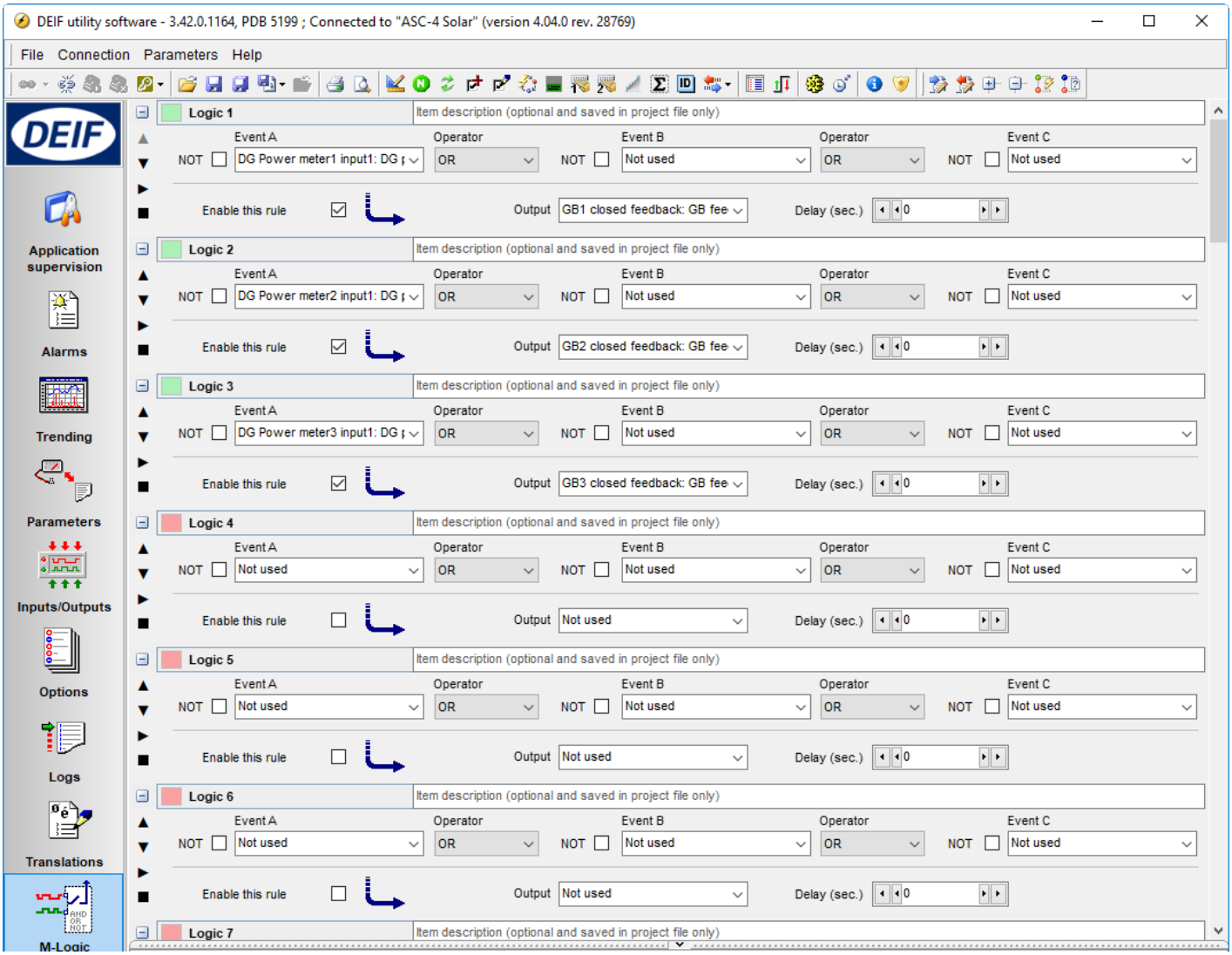
| Device | Modbus ID, monitoring | Logic line (in example) | Associated DPM |
|---|---|---|---|
| DPM - MIC 4002 (mains) | 1 | 4/5 | Mains power meter 1 |
| DPM - MIC 4002 (generator#1) | 2 | 1 | DG power meter 1 |
| DPM - MIC 4002 (generator#2) | 3 | 2 | DG power meter 2 |
| DPM - MIC 4002 (generator#3) | 4 | 3 | DG power meter 3 |

Note that the Modbus ID must strictly be configured as different. And its assignment can be given depending on where it is connected, for instance generator breaker closed feedback.

**Table 13.1** Example of Modbus ID allocation

| Common point of connection or building | Power source | Modbus DPM | Modbus ID (M-Logic order) |
|---|---|---|---|
| Building 1 | PV#1 | MIC 4002 | 1 |
| Building 2 | PV#2 | MIC 4002 | 2 |
| Building 3 | PV#3 | MIC 4002 | 3 |
| Building 4 | PV#4 | MIC 4002 | 4 |
| Building 5 | PV#5 | MIC 4002 | 5 |
| Building 6 | PV#6 | MIC 4002 | 6 |
| Building 7 | PV#7 | MIC 4002 | 7 |
| Building 8 | PV#8 | MIC 4002 | 8 |
| Building 9 | PV#9 | MIC 4002 | 9 |
| Building 10 | PV#10 | MIC 4002 | 10 |
| Basement MSB | DG1 | MIC 4002 | 11 (first) |
| Basement MSB | DG2 | MIC 4002 | 12 (second) |
| Basement MSB | DG3 | MIC 4002 | 13 (third) |
| Mains Tx | Transformer #1 | MIC-2 | 14 |
| Mains Tx | Transformer #2 | MIC-2 | 15 |

M-Logic orders are used when configuring the breaker feedbacks on the MICs.




# 13.2 PV communication

## 13.2.1 Modbus master, Serial 1

Using the communication interface requires the use of Modbus master for the Sunspec-supported inverters or inverters with proprietary protocols.

| Terminal | Function | | Associated menus |
|---|---|---|---|
| 29 | Modbus communication | A | 7561, PV Comm type (for example Sunspec)<br>7570, action at PV Communication error (Modbus master)<br>7510 Ext comm ID and Baud rate<br>7520, action at communication error (Modbus slave) |
| 31 | Modbus communication | B | |

Note that the Modbus line should be properly terminated. Long lines typically with 120 Ohm in each. For short lines, it is often seen that the termination can be removed, but it also depends on the inverter type.

Note that the Modbus ID in the inverter can be set to the same as in the ASC. The baud rate has to be the same in the ASC and the inverter.

## 13.2.2 Modbus protocol and write type

The Modbus transmit specifics is set in menu 7560:

- 7561, select the inverter type.
- 7562, select broadcast or unicast.
  - Broadcast at multiple string inverters.
  - Unicast at single string inverters or central inverters.
- 7563, transmit rate, set it to 1-2 seconds. Don't set it below 1 second unless advised to.
- 7564, transmit telegram, use 0x06h prior to 0x10h. Switch to 0x10h if 0x06h is not responding.

Schneider, ABB uses 0x10h, Fronius, SMA uses 0x06h, inverters following Sunspec uses 0x06h.

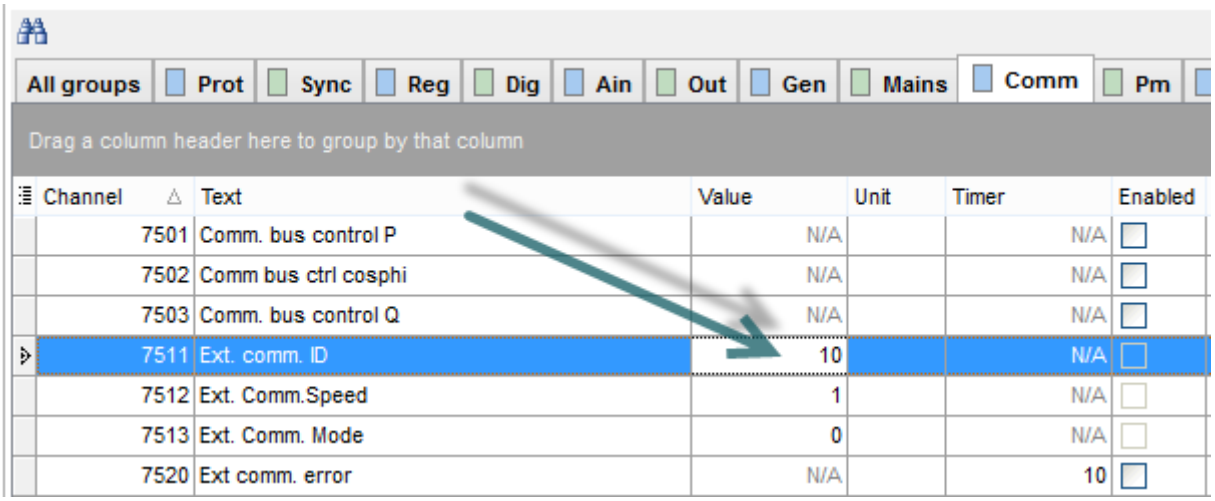
### 13.2.3 Verification of the communication

Notice that it is often convenient to start with the communication adjusted to "UNICAST" even though broadcast is eventually going to be used.

| Inverter number | Inverter Modbus ID | Baud rate selected | DEIF ASC comm. ID |
|---|---|---|---|
| 1 | 10 | 19200 | Menu 7511 |
| 2 | 11 | 19200 | Menu 7511 |
| 3 | 12 | 19200 | Menu 7511 |

Now switch to unicast and adjust the DEIF ASC to a proper ID:

| Inverter number | Inverter Modbus ID | Baud rate selected | DEIF ASC comm. ID |
|---|---|---|---|
| 1 | 10 | 19200 | 10 |
| 2 | 11 | 19200 | - |
| 3 | 12 | 19200 | - |




This means that the inverter number 1 will be tested and should respond to the ASC set points. By switching the menu 7511 to ID11 and ID12 (in this example), the other two inverters can be tested.

This means that the communication can be verified and eventually switched to "broadcast" (where all three inverters will respond).

Not all inverters support this method of using unicast.

### 13.2.4 Alarms for unicast communication

Three alarms can be used when using the unicast approach (due to the continuous handshake with the inverter communications). In a communication topology where the broadcast method is used, the alarms can be switched off due to one-sided communication (ASC > inverter).

| | | | | | |
|---|---|---|---|---|---|
| 7570 | PV COMM error | N/A | | 3 | ☑ |
| 7580 | PV Warning | N/A | | 3 | ☑ |
| 7590 | PV Shutdown | N/A | | 0 | ☑ |

- 7570, PV comm error
- 7580, PV warning
- 7590, PV shutdown

Enable the alarms and configure the appropriate actions.

### 13.2.5 Alarms for broadcast communication

When broadcast is used and the inverters receive set points using broadcast frames, the PV Monitoring alarm can be used. This is only the case if “PV monitoring” is switched on and receiving data back from the inverters.

If the broadcast frames are sent to a common inverter manager, for instance Fronius Data Manager Box 2.0, the ASC does not retrieve data from the inverters. Then the alarm “PV Monitoring error” cannot be used.

- 7570, PV comm error
- 7580, PV monitoring error

Enable the alarms and configure the appropriate actions.

## 13.3 ESS communication

### 13.3.1 Modbus master, Serial 1

Using the communication interface requires the use of Modbus master for the inverters with proprietary protocols.

| Terminal | Function | | Associated menus |
|---|---|---|---|
| 29 | Modbus communication | A | 7561, ESS protocol<br>7570, ESS communication error action (Modbus master)<br>7510 External communication ID and Baud rate<br>7520, external communication error action (Modbus slave) |
| 31 | Modbus communication | B | |

Note that the Modbus line should be properly terminated. Long lines typically with 120 Ohm in each. For short lines, it is often seen that the termination can be removed, but it also depends on the inverter type.

Note that the Modbus ID in the inverter can be set to the same as in the ASC. The baud rate has to be the same in the ASC and the inverter.

### 13.3.2 Modbus protocol and write type

Modbus transmit specifications are set in menu 7560:

- 7561, select the communication type.

- 7562, select broadcast or unicast.
  - Broadcast at multiple string inverters.
  - Unicast at single string inverters or central inverters.
- 7563, transmit rate, set it to 1-2 seconds. Don't set it below 1 second unless advised to.
- 7564, transmit telegram, use 0x06h prior to 0x10h. Switch to 0x10h if 0x06h is not responding.

### 13.3.3 Verification of the communication

Notice that it is often convenient to start with the communication adjusted to "unicast" even though broadcast is eventually going to be used.

| Inverter number | Inverter Modbus ID | Baud rate selected | DEIF ASC comm. ID |
|---|---|---|---|
| 1 | 10 | 19200 | Menu 7511 |
| 2 | 11 | 19200 | Menu 7511 |
| 3 | 12 | 19200 | Menu 7511 |

Now switch to unicast and adjust the DEIF ASC to a proper ID:

| Inverter number | Inverter Modbus ID | Baud rate selected | DEIF ASC comm. ID |
|---|---|---|---|
| 1 | 10 | 19200 | 10 |
| 2 | 11 | 19200 | - |
| 3 | 12 | 19200 | - |

| Char △ | Text | Address | Value | Unit | Timer | OutputA | OutputB | Enab |
|---|---|---|---|---|---|---|---|---|
| 7501 | Comm. bus control P | 557 | N/A | | N/A | N/A | N/A | ☐ |
| 7502 | Comm bus ctrl cosphi | 560 | N/A | | N/A | N/A | N/A | ☐ |
| 7503 | Comm. bus control Q | 561 | N/A | | N/A | N/A | N/A | ☐ |
| 7511 | Ctrl. comm. ID | 562 | 10 | | N/A | N/A | N/A | ☐ |
| 7512 | Mon. comm. ID | 574 | 3 | | N/A | N/A | N/A | ☐ |
| 7514 | Ext. Comm 1 Spd | 563 | 1 | | N/A | N/A | N/A | ☐ |
| 7515 | Ext. Comm 1 Mod | 564 | 0 | | N/A | N/A | N/A | ☐ |
| 7520 | Ext comm 1 err. | 565 | N/A | | 10 | Not us... | Not used | ☐ |

This means that the inverter number 1 will be tested and should respond to the ASC set points. By switching the menu 7511 to ID11 and ID12 (in this example), the other two inverters can be tested.

This means that the communication can be verified and eventually switched to "broadcast" (where all three inverters will respond).

Not all inverters support this method of using unicast.

### 13.3.4 Alarms for unicast communication

Three alarms can be used when using the unicast approach (due to the continuous handshake with the inverter communications). In a communication topology where the broadcast method is used, the alarms can be switched off due to one-sided communication (ASC > inverter).

- 7570, ESS comm error
- 7580, ESS warning
- 7590, ESS shutdown

Enable the alarms and configure the appropriate actions.

### 13.3.5 Alarms for broadcast communication

When broadcast is used and the inverters receive set points using broadcast frames, the ESS Monitoring alarm can be used. This is only the case if “ESS monitoring” is switched on and receiving data back from the inverters.

If the broadcast frames are sent to a common inverter manager, for instance Fronius Data Manager Box 2.0, the ASC does not retrieve data from the inverters. Then the alarm “ESS Monitoring error” cannot be used.

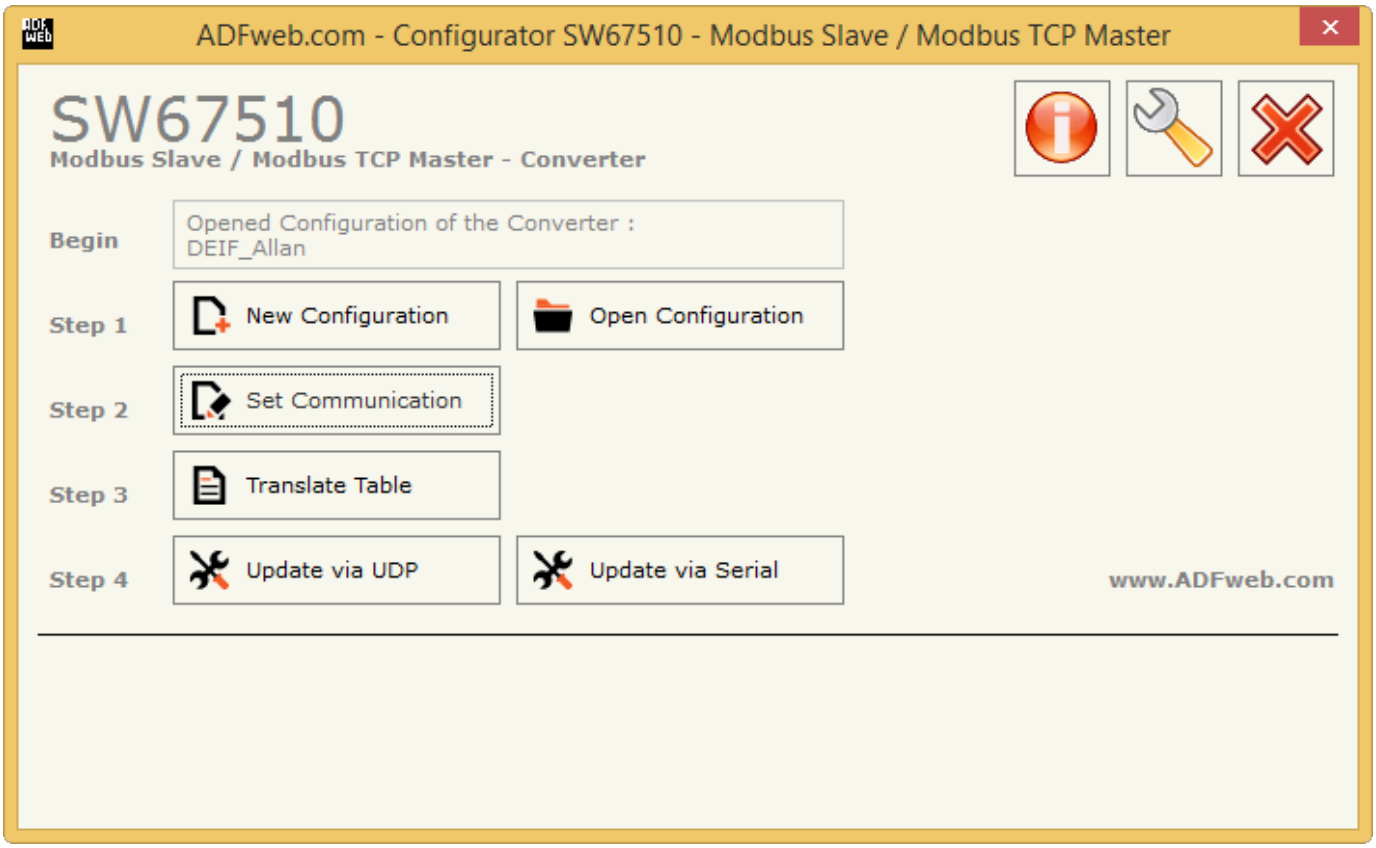
- 7570, ESS communication error
- 7600, ESS monitoring error

Enable the alarms and configure the appropriate actions.

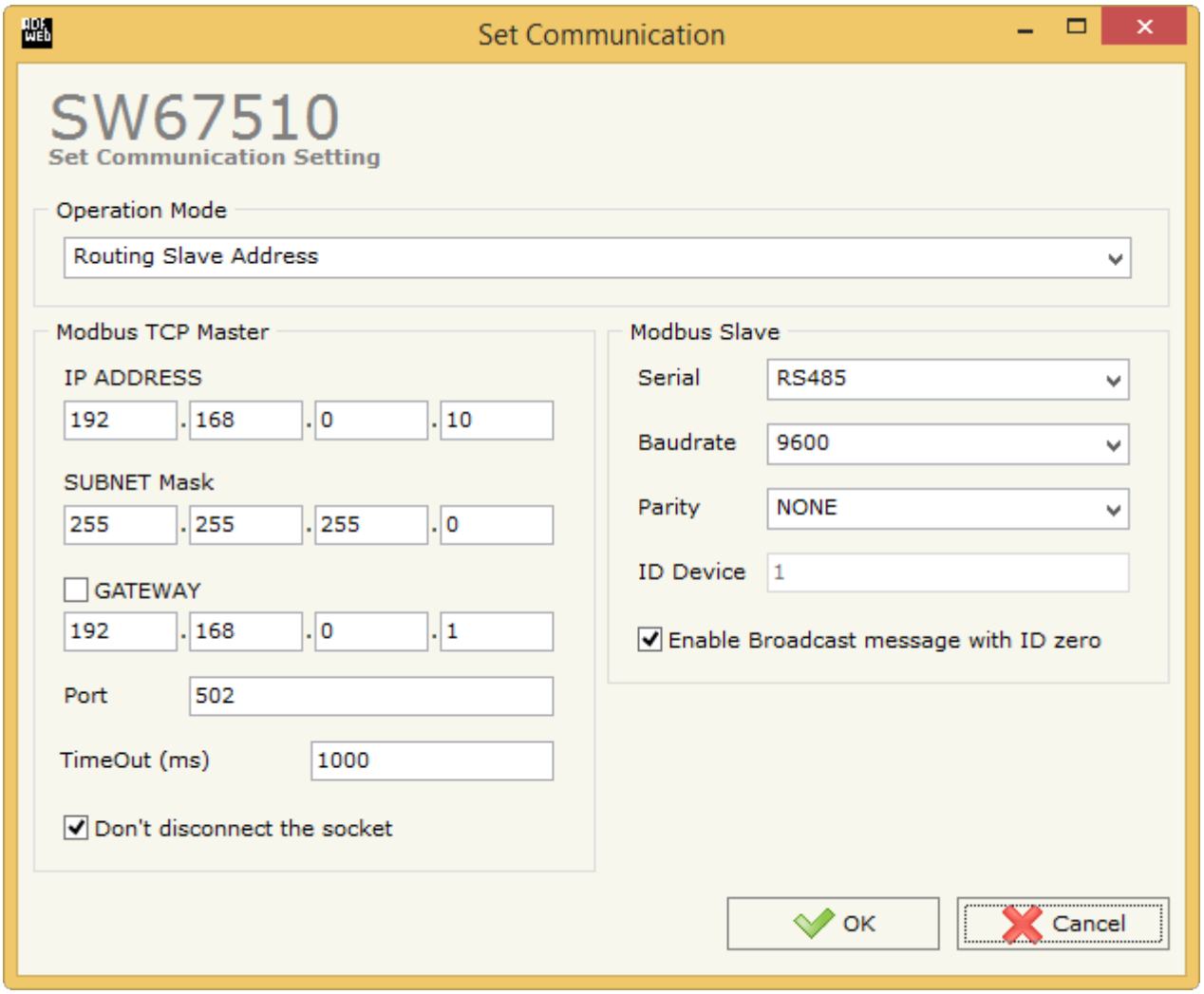
## 13.4 ADFweb setup

In order to install the ADFweb HD67510 device in the application where it is required, for example using SMA STP25000 TL, follow these steps:

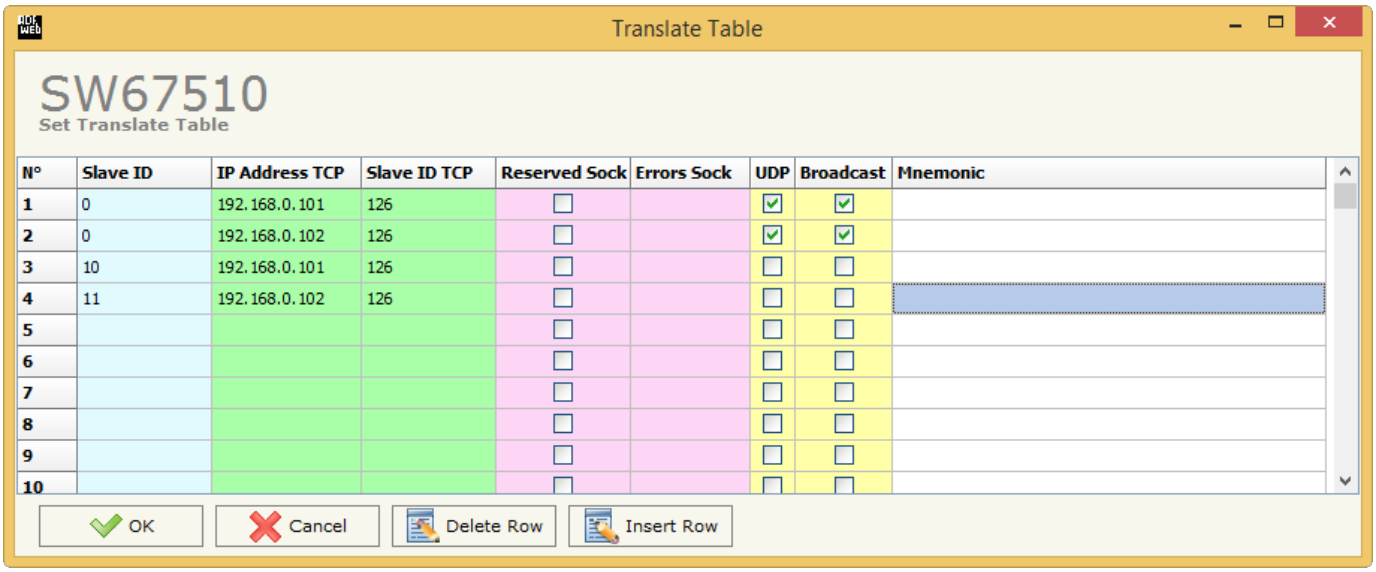
1. Install the PC utility from www.adfweb.com and find the utility on the free download page.
2. Make a configuration with the relevant settings.



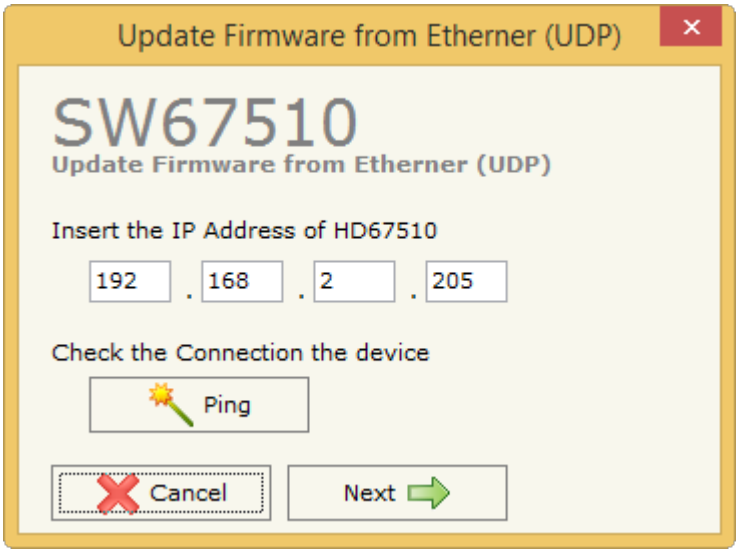

3. When setting up the communication:
   a. Use the routing table
   b. Set up the IP address you intend the HD67510 to have
   c. Set up the Modbus slave details (communication to DEIF ASC)
   d. Don’t disconnect the socket
   e. Enable broadcast with ID 0




4. Set up the translate table:
   a. Set up slave ID 0 for broadcast using UDP Broadcast and route it to the IP of the inverter.
      - Note that the desired slave ID address of the inverter has to be checked in the user manual of the inverter – 126 is for example for SMA STP25000 TL.
   b. Repeat steps for the number of IP addresses you have in your system (the example below shows a system with two (2) inverters).
   c. For remote monitoring (ASC reads from inverters), set up the translate table with your connected inverters, for example in this case, there are two inverters where the ASC reads from ID10 and ID11.
   d. All connected inverters must be included in the table for remote monitoring.




5. Update the settings to the ADFweb (check ADFweb manual for factory IP address).




**INFO**
Notice the dip switch position of the ADFweb. Both dip 1 and dip 2 have to be checked according to the manual from ADFweb. If one them is wrong, you cannot programme the device.

# 14. Emergency stop

The emergency stop will send a 0 kW reference to the PV plant and open the PV breaker if it is present.

The fail class can be selected to warning if the alarm input has to be used for other purpose.

| Menu | Function | | Comments |
|---|---|---|---|
| 3490 | Emergency stop details | | Emergency stop alarm consists of sub menus. |
| 3491 | Timer | | If used as e-stop then select 0 sec. |
| 3492 | Relay output for PLC | OA | |
| 3493 | Relay output for PLC | OB | |
| 3494 | Enable this alarms | | |
| 3495 | Select fail class | | If used as e-stop, then select S/D. |

# 15. Operating modes

All modes are described in the designer's reference handbook of the ASC and the AGC in more details.

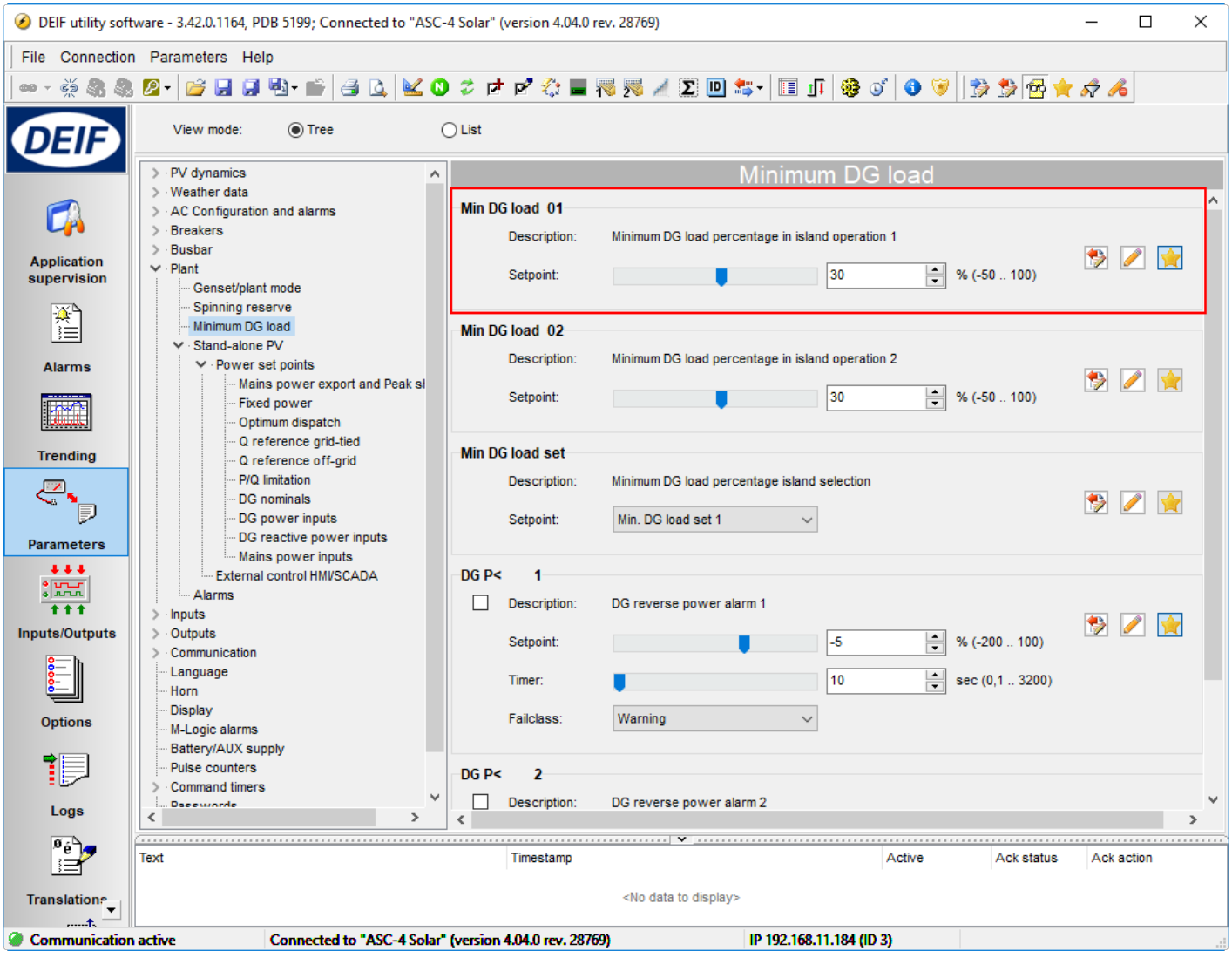
## 15.1 Stand-alone system

In a stand-alone system, the requested mode is adjusted in the menu 6071.

| Parameter | Range | Menu group | Notes |
|---|---|---|---|
| 6071 | Island mode<br>Fixed power<br>Mains power export<br>Power management | 6070 | A stand-alone system can only run in Island mode, Fixed power, or mains power export. |

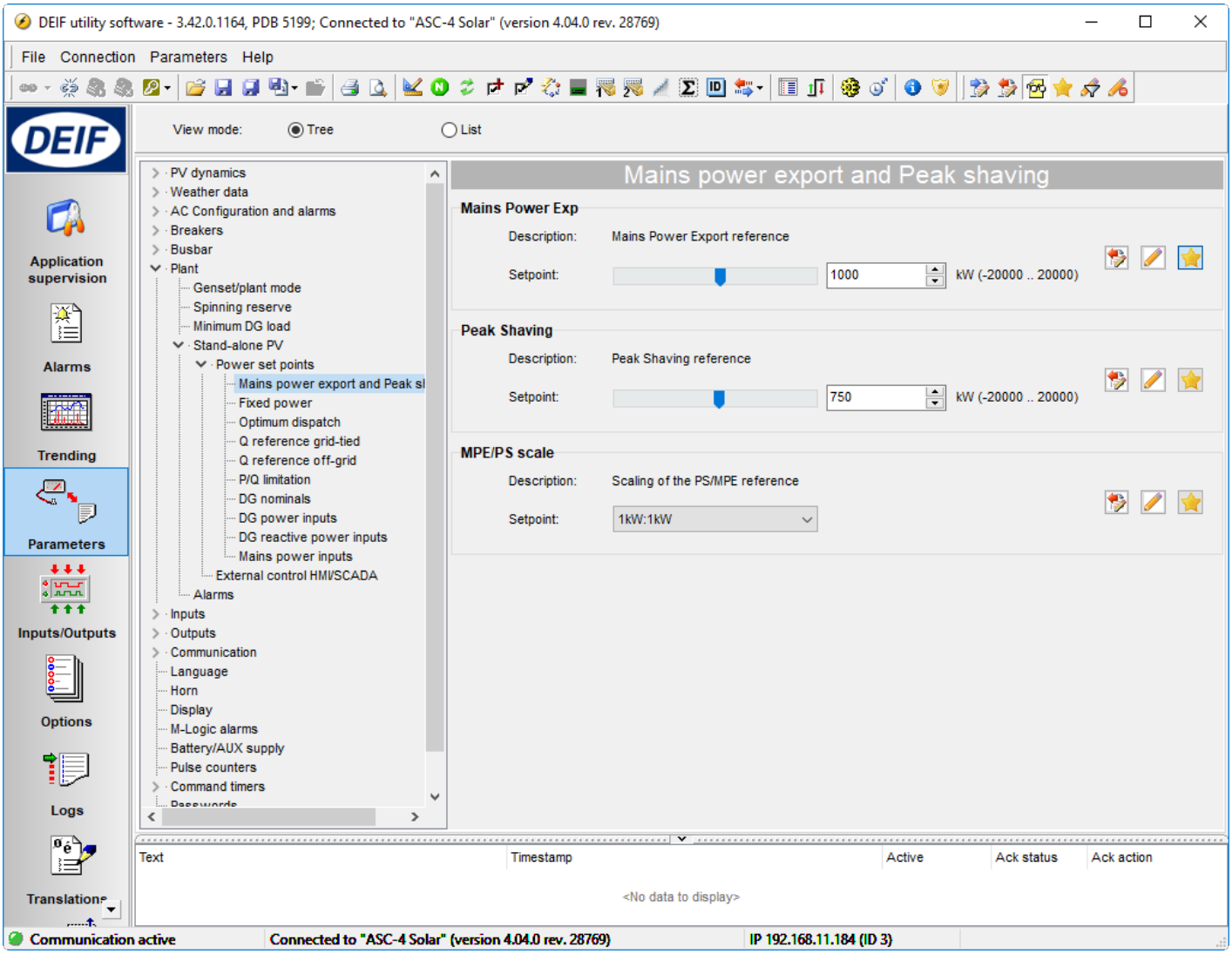
### Set points off-grid

In off-grid mode, the set point will be as high as possible but will be curtailing the PV in order to keep the genset minimum load. There are two different min. load settings in case you have different engine types.



### Set points grid-tied

The set points during grid-tied operation are adjusted in the ASC. In the tree structure, the peak shaving, power export and fixed power values can be selected and adjusted.




## 15.2 Power management system

In an integrated system, the power management selection is needed. The actual mode is transmitted on the power management communication.

**Table 15.1** Plant mode parameter

| Parameter | Range | Menu group | Notes |
|---|---|---|---|
| 6071 | Island mode<br>Fixed power<br>Mains power export<br>Power management | 6070 | For a power management system, this parameter must be set to Power management. |

### Set points

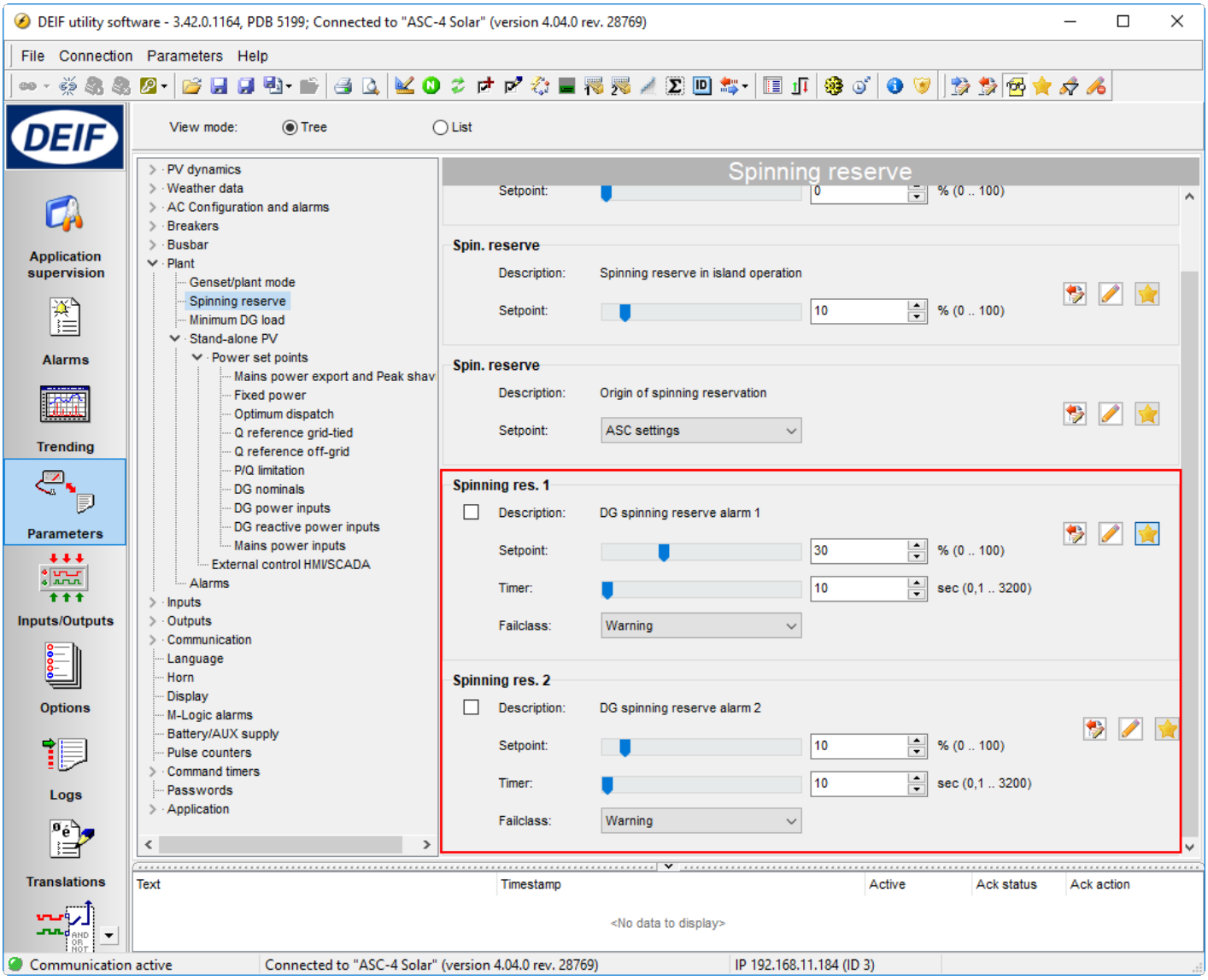
The set points are communicated with the power management system. For the DG minimum load setting, refer to the same settings as mentioned in the stand-alone system above.

# 16. Spinning reserve

Spinning reserve alarms can be used to start additional generators when the alarm is activated, or the ASC can notify the genset controllers to start or stop generators in a power management solution to manage the available spinning reserve.

## 16.1 Spinning reserve alarms

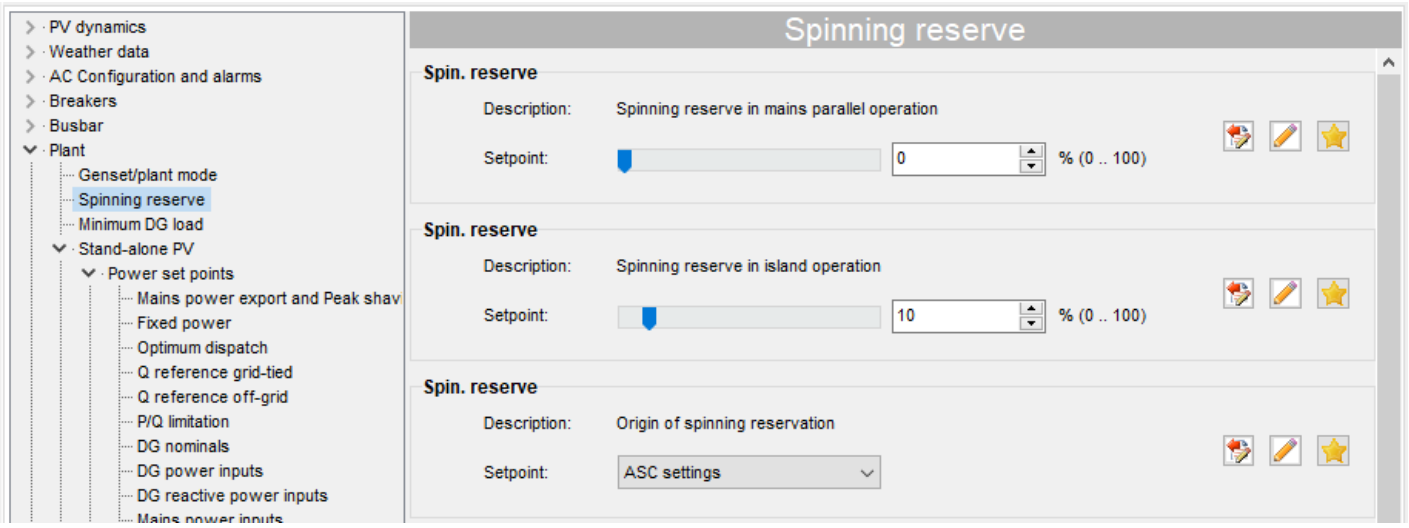
Two alarms can be enabled. They can drive alarm relays and display alarms. These signals can be used as a driver to start additional generators or trip load groups. Since the DEIF controller only raises the alarm, the associated actions must be configured in the peripheral system (for instance third party genset controllers and load groups PLCs).




## 16.2 Dynamic spinning reserve

The DEIF ASC supports the feature “dynamic spinning reserve” in power management systems.

There are two settings, spinning reserve off-grid and grid-tied, and it depends on being grid-tied or not, which one is active.




If adjusted to 10 %, the setting will reserve that on the generators. In this way, the generator plant can always instantly supply the set amount. The setting refers to the actual PV production, hence it is a dynamic spinning reserve because the pv production may vary.

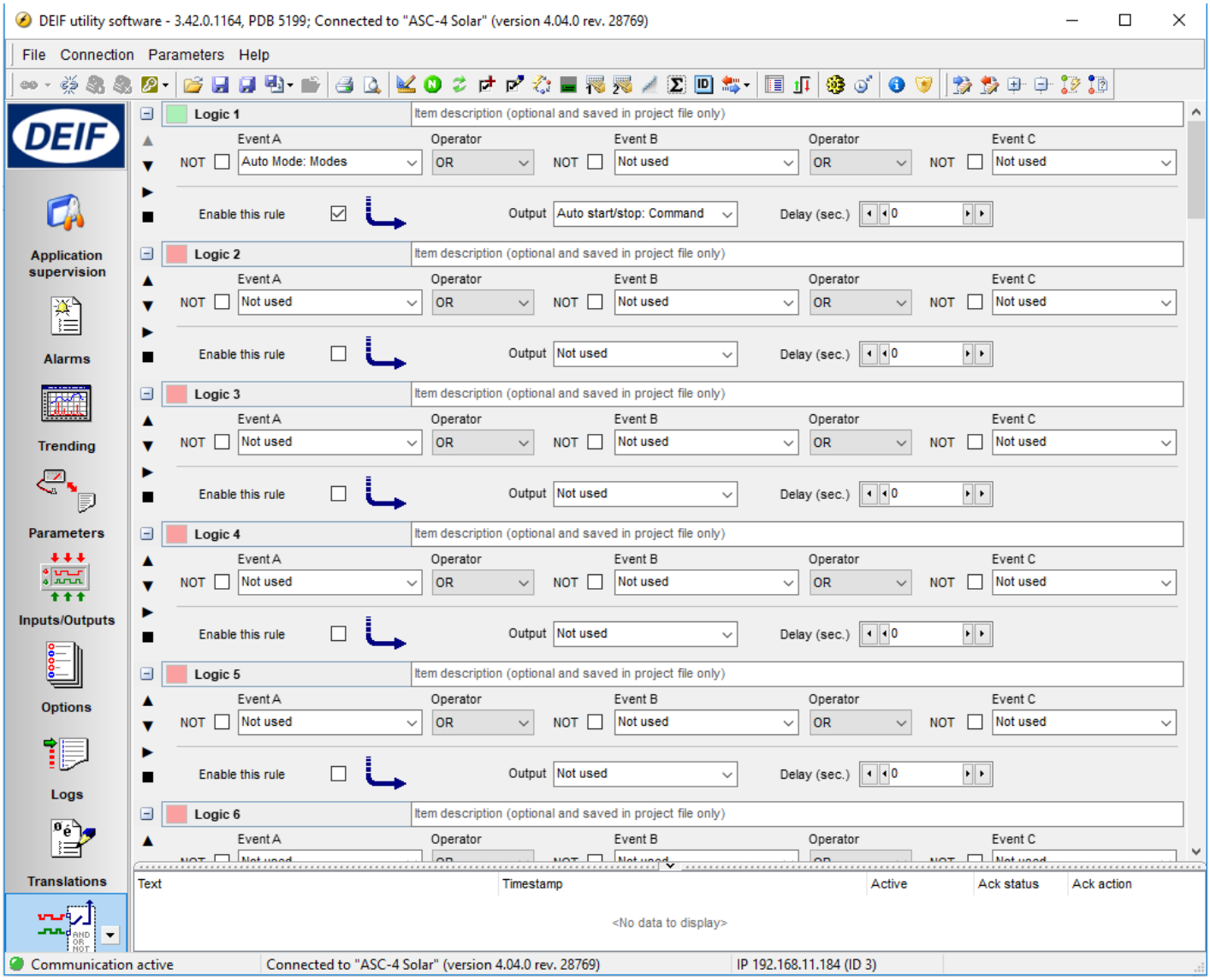
### Origin of spinning reserve

Note that the spinning reserve setting can be taken from the ASC, or a PLC can write the data into the ASC. This is adjusted in the last setting, and the default is “ASC settings”.

# 17. Auto start/stop

In order to automatically start and stop the production from the inverters, it is recommended to configure a condition in M-Logic that ensures that the start signal is there while the controller is in full automatic:

If switches, operators, PLC, SCADA or other methods are used, of course this setup is not needed or may vary depending on the requested.



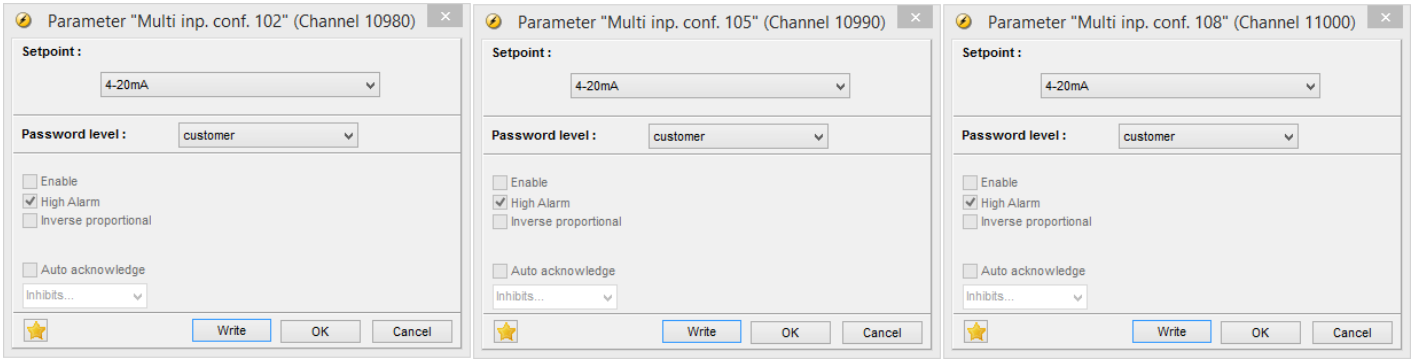
# 18. Transducer setup

## 18.1 Multi-input setup

This applies only to units purchased with the option M4 or G5.

Multi-input 102, 105, 108 are configured to 4-20 mA signals in menus 10980/10990/11000 in the utility SW.

Notice that the 4-20 mA inputs of the option M4 are multi-inputs, and they must be configured correctly in the DEIF Utility SW.




This has to be done as one of the first steps before configuring the transducer inputs.

Normally, these are always kept as 4-20 mA signal inputs.

## 18.2 Transducer signals

Generator and mains power (active and/or reactive) can be read by the ASC using transducer signals or by using Modbus RS-485. In this chapter, using the transducer method is described.

Eleven transducer inputs may be available namely four inputs on each of M15:6 (91, 93, 95, 97) and M15:8 (127, 129, 131, 133) plus the three signals described below concerning to option M4/G5. (102, 105, 108).

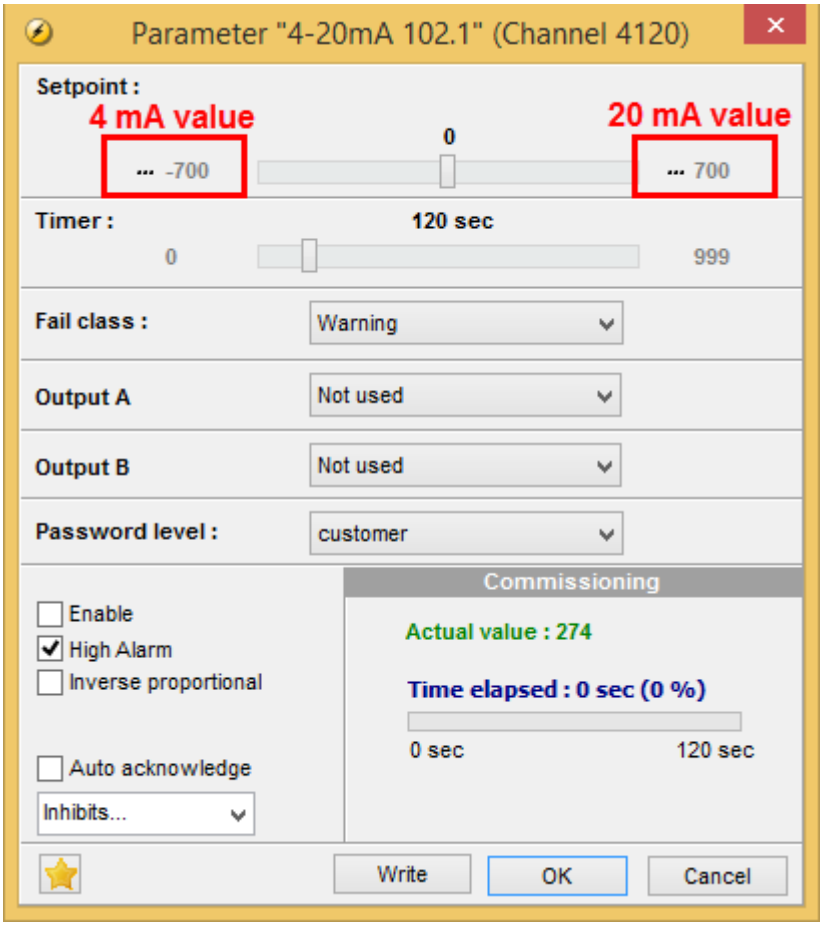
Note that the three inputs should be set to 4-20 mA (assuming your transducers are 4-20 mA) before starting configuring this as described in the section Multi-input setup.

| Terminal | Function | | Example of associated menus |
|---|---|---|---|
| 103 | 4-20 mA input for mains power | + | 4120, mains power 20 mA value<br>4120, mains power 4 mA value |
| 104 | | - | |
| 106 | 4-20 mA input for genset total active power | + | 4250, DG power 20 mA value<br>4250, DG power 4 mA value |
| 107 | | - | |
| 109 | 4-20 mA input for genset total reactive power | + | 4380, DG reactive power 20 mA value<br>4380, DG reactive power 4 mA value |
| 110 | | - | |

### 18.2.1 4 - 20 mA values

It is strictly necessary to adjust the 4-20 mA values of the connected transducer. This is done like the following example for a 4-20 mA mains transducer with the configuration of:

| | Power [kW] | Current out [mA] |
|---|---|---|
| Power import from grid | 700 kW | 20 mA |
| Power export to grid | -700 kW | 4 mA |




Press the dotted line in front of the value to modify it.

### 18.2.2 Translation

In the translations page, the multi-inputs can be translated.

**Figure 18.1** Display unit translation

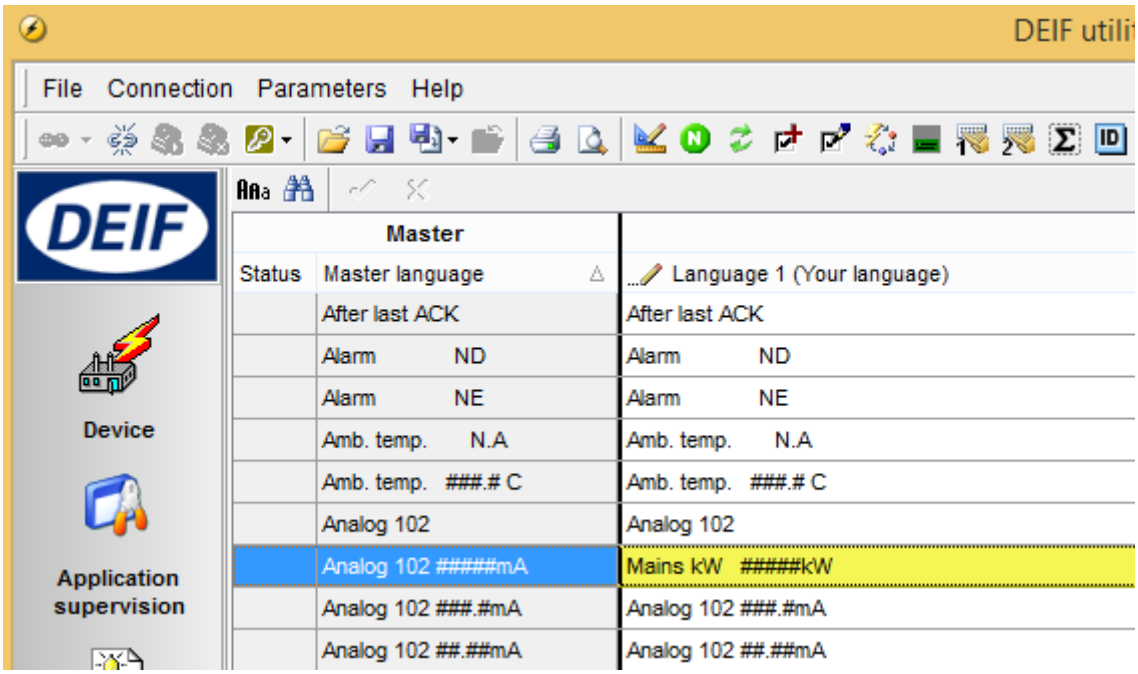
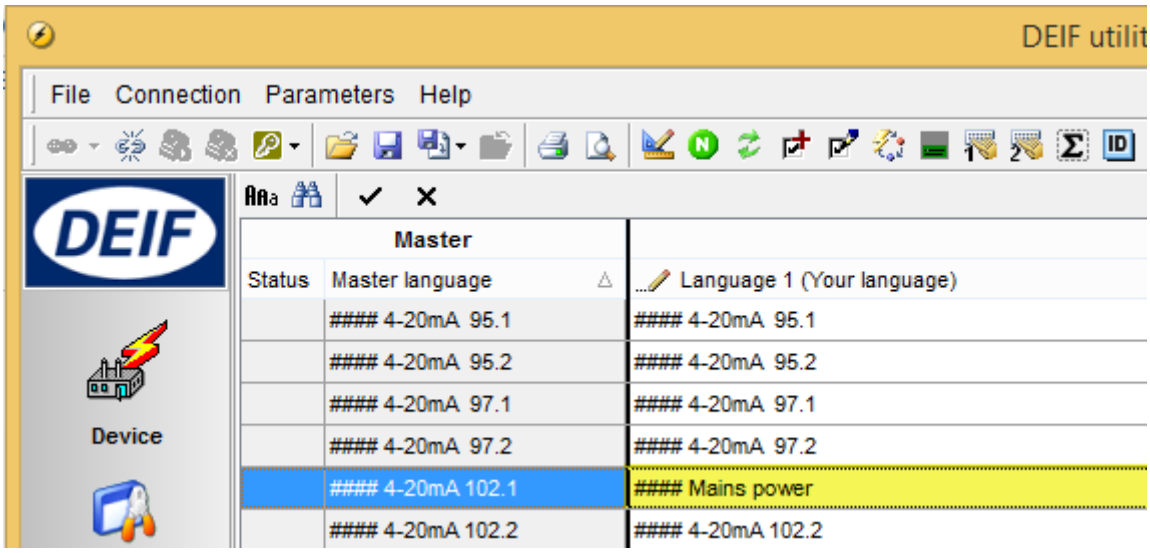



**Figure 18.2** Parameter list translation




**NOTE** #### signifies the live value

## 18.3 Test procedure for transducer signals

It is essential to test the transducer signals into the DEIF controller. Please follow these steps to verify the good functionality. All 4-20 mA inputs may be used. In the example, the mains power transducer is used (multi-configurable input 102).

| Terminal | Designation |
|---|---|
| 102 | Not used |
| 103 | + (4 to 20 mA) |
| 104 | 0 (common) |

### 18.3.1 Mains transducer

Open the MB (Mains Breaker). Now zero amps will flow to or from the mains.

| | Power | Current out |
|---|---|---|
| MB open position | 0 kW | 12 mA |

| Display view (translated example) | Display view (master language) |
|---|---|
| PV380.0 380.0 380.0V<br>Mains kW 0kW<br>PROTECTION SETUP<br>PROT CTRL I/O SYST | PV380.0 380.0 380.0V<br>Analog 102 0mA<br>PROTECTION SETUP<br>PROT CTRL I/O SYST |

Close the MB without any generation in the plant. Current will flow into the plant (depending on load demand).

| | Power | Current out |
|---|---|---|
| MB open position | 352 kW | 16 mA |

| Display view (translated example) | Display view (master language) |
|---|---|
| PV380.0 380.0 380.0V<br>Mains kW 352kW<br>PROTECTION SETUP<br>PROT CTRL I/O SYST | PV380.0 380.0 380.0V<br>Analog 102 352mA<br>PROTECTION SETUP<br>PROT CTRL I/O SYST |

Synchronise and close the MB when there is generation in the plant. Current will flow out of the plant (depending on load demand).

| | Power | Current out |
|---|---|---|
| MB open position | -349 kW | 8 mA |

| Display view (translated example) | Display view (master language) |
|---|---|
| PV380.0 380.0 380.0V<br>Mains kW -349kW<br>PROTECTION SETUP<br>PROT CTRL I/O SYST | PV380.0 380.0 380.0V<br>Analog 102 -349mA<br>PROTECTION SETUP<br>PROT CTRL I/O SYST |

### 18.3.2 Transducer testing tables

Fill in the readings of the display/utility SW as the example above shows. This will give a good indication whether the configuration is correct.

| Signal [mA] | Display reading | | |
|---|---|---|---|
| | Multi-conf. input 102 [kW] | Multi-conf. input 105 [kW] | Multi-conf. input 108 [kW] |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |

| Signal [mA] | Display reading | | |
|---|---|---|---|
| | Multi-conf. input 102 [kW] | Multi-conf. input 105 [kW] | Multi-conf. input 108 [kW] |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | | | |
| 17 | | | |
| 18 | | | |
| 19 | | | |
| 20 | | | |

# 19. Appendix A: Modified parameter list

An example of the modified parameter list for the ASC. The parameter list may seem overwhelming when opened but some main groups may be worked on.

As it may be noted, about 35 parameters need to be changed in order to get a functioning system.

**Figure 19.1** Example of a stand-alone system modified parameter list for a Solar controller

Drag a column header here to group by that column

| Channel | Text | Value | Unit | Timer | Enabled | Level | Mismatch | FailClass |
|---|---|---|---|---|---|---|---|---|
| 2611 | P ramp up | 5 | %/s | N/A | ☐ | customer | | N/A |
| 2621 | P ramp down | 5 | %/s | N/A | ☐ | customer | | N/A |
| 3490 | Emergency STOP | N/A | | 0 | ☐ | customer | | Shutdown |
| 4250 | 4-20mA 105.1 | 10 | | 5 | ☐ | customer | | Warning |
| 4380 | 4-20mA 108.1 | 10 | | 120 | ☐ | customer | | Warning |
| 6002 | Nom. P 1 | 80 | kW | N/A | ☐ | customer | | N/A |
| 6003 | Nom. I 1 | 116 | A | N/A | ☐ | customer | | N/A |
| 6004 | Nom. U 1 | 400 | V | N/A | ☐ | customer | | N/A |
| 6005 | Nom. Q 1 | 80 | kvar | N/A | ☐ | customer | | N/A |
| 6006 | Nom. S 1 | 80 | kVA | N/A | ☐ | customer | | N/A |
| 6041 | BA primary U | 400 | V | N/A | ☐ | customer | | N/A |
| 6043 | BA Primary I | 150 | A | N/A | ☐ | customer | | N/A |
| 6044 | BA Secondary I | 5 | A | N/A | ☐ | customer | | N/A |
| 6051 | BB primary U 1 | 400 | V | N/A | ☐ | customer | | N/A |
| 6053 | BB Nominal U 1 | 400 | V | N/A | ☐ | customer | | N/A |
| 6061 | BB primary U 2 | 400 | V | N/A | ☐ | customer | | N/A |
| 6063 | BB Nominal U 2 | 400 | V | N/A | ☐ | customer | | N/A |
| 6071 | Operation mode | 0 | | N/A | ☐ | customer | | N/A |
| 7331 | DG1 nom. power | 60 | kW | N/A | ☑ | customer | | N/A |
| 7333 | DG1 P input | 5 | | N/A | ☑ | customer | | N/A |
| 7335 | DG2 Q input | 6 | | N/A | ☑ | customer | | N/A |
| 7512 | Ext. Comm.Speed | 1 | | N/A | ☐ | customer | | N/A |
| 7520 | Ext comm. error | N/A | | 10 | ☐ | customer | | Warning |
| 7561 | PV protocol | 10 | | N/A | ☐ | customer | | N/A |
| 7562 | Tx write type | 1 | | N/A | ☐ | customer | | N/A |
| 7570 | PV COMM error | N/A | | 3 | ☑ | customer | | Warning |
| 7580 | PV Warning | N/A | | 0 | ☑ | customer | | Warning |
| 7590 | PV Shutdown | N/A | | 0 | ☑ | customer | | Shutdown |
| 9030 | Scaling | 0 | | N/A | ☐ | master | | N/A |
| 10980 | Multi inp. conf. 102 | 0 | | N/A | ☐ | customer | | N/A |
| 10990 | Multi inp. conf. 105 | 0 | | N/A | ☐ | customer | | N/A |
| 11000 | Multi inp. conf. 108 | 0 | | N/A | ☐ | customer | | N/A |