

# Hybrid compatibility

Energy storage systems, photovoltaic, weather, and power measurements

## Application notes



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# 1. Introduction

## 1.1 DEIF's hybrid controllers

The DEIF hybrid controllers allow you to combine renewable energy with other power sources in a wide range of applications.

| Controller            | Integrate                  | Documentation                                                                                              |
|-----------------------|----------------------------|------------------------------------------------------------------------------------------------------------|
| iE 150 Battery        | Battery energy and storage | <a href="http://www.deif.com/documentation/ie-150">www.deif.com/documentation/ie-150</a>                   |
| iE 150 Solar          | Photovoltaic power         | <a href="http://www.deif.com/documentation/ie-150">www.deif.com/documentation/ie-150</a>                   |
| iE 150 Hybrid genset  | Photovoltaic power         | <a href="http://www.deif.com/documentation/ie-150">www.deif.com/documentation/ie-150</a>                   |
| iE 150 Marine Battery | Battery energy and storage | <a href="http://www.deif.com/documentation/ie-150-marine">www.deif.com/documentation/ie-150-marine</a>     |
| iE 150 Marine Solar   | Photovoltaic power         | <a href="http://www.deif.com/documentation/ie-150-marine">www.deif.com/documentation/ie-150-marine</a>     |
| ASC 150 Storage       | Battery energy and storage | <a href="http://www.deif.com/documentation/asc-150-storage">www.deif.com/documentation/asc-150-storage</a> |
| ASC 150 Solar         | Photovoltaic power         | <a href="http://www.deif.com/documentation/asc-150-solar">www.deif.com/documentation/asc-150-solar</a>     |
| AGC 150 Hybrid genset | Photovoltaic power         | <a href="http://www.deif.com/documentation/agc-150-hybrid">www.deif.com/documentation/agc-150-hybrid</a>   |
| ASC-4 Battery         | Battery energy and storage | <a href="http://www.deif.com/documentation/asc-4-battery">www.deif.com/documentation/asc-4-battery</a>     |
| ASC-4 Solar           | Photovoltaic power         | <a href="http://www.deif.com/documentation/asc-4-solar">www.deif.com/documentation/asc-4-solar</a>         |

**NOTE** For Modbus RTU, for iE 150, iE 150 Marine, ASC 150, and AGC 150, use RS-485 port 1 if galvanic isolation is required.

## 1.2 Compatibility and compliance

DEIF hybrid controllers are compatible with photovoltaic and battery systems from a wide range of manufacturers.

### SunSpec compliance

All DEIF hybrid controllers are compliant with the SunSpec standards (see [sunspec.org](http://sunspec.org)). DEIF controllers are therefore compatible with new inverters that use the generic SunSpec protocol.

### Testing

Many PV inverter makers and battery system makers use the same protocol for a wide range of their products. New PV inverters and battery systems often comply with the older protocol. If a specific inverter or battery management system is not listed here, but the maker is listed, there is a good chance that the DEIF controller is compatible.

If your PV inverter or Battery system is not listed, DEIF can help to confirm compliance using the Modbus protocol documentation.

### Implementing new protocols

Since new battery and photovoltaic systems are launched every year, DEIF developers continuously implement new protocols. If your system is not listed, please contact DEIF. We can work with you to quickly implement the required protocol.

In addition, local DEIF subsidiaries have tools to set up communication with new battery and PV systems. For power measurements from new power meters and genset controllers, you can use the configurable power meter protocol to set up communication.

## 1.3 Software versions

This document is valid for the following software versions.

| Controller            | SW version |
|-----------------------|------------|
| iE 150 Battery        | 1.35       |
| iE 150 Solar          | 1.35       |
| iE 150 Hybrid genset  | 1.35       |
| iE 150 Marine Battery | 1.35       |
| iE 150 Marine Solar   | 1.35       |
| ASC 150 Storage       | 1.35       |
| ASC 150 Solar         | 1.35       |
| AGC 150 Hybrid genset | 1.35       |
| ASC-4 Battery         | 4.29*      |
| ASC-4 Solar           | 4.29*      |

**NOTE** \* Some protocols are not available for these controllers. If you need a protocol that is not supported, contact DEIF.

## 2. Battery

### 2.1 Overview

#### 2.1.1 Compatible battery energy storage systems

##### Controllers

**iE 150 Battery**, **iE 150 Marine Battery**, and **ASC 150 Storage** support the protocols in this chapter.

**ASC-4 Battery** supports some of the protocols in this chapter. If you need a protocol that is not supported, contact DEIF.

If your battery system is not on the list, contact your local DEIF subsidiary. The local DEIF subsidiaries have tools to set up communication with new battery systems.

##### Interfaces

| Controller            | Modbus RTU (RS-485) | Modbus TCP | ESS protocol parameter | BMS protocol parameter | PDS protocol parameter |
|-----------------------|---------------------|------------|------------------------|------------------------|------------------------|
| iE 150 Battery        | ●                   | ●          | 7561                   | 7682                   | 7912                   |
| iE 150 Marine Battery | ●                   | ●          | 7561                   | 7682                   | 7912                   |
| ASC 150 Storage       | ●                   | ●          | 7561                   | 7682                   | 7912                   |
| ASC-4 Battery         | ●                   | ●*         | 7561                   | 7681                   | 7882                   |

**NOTE** \* An external converter is required. This can be supplied by DEIF.

##### System types

| System                          | ESS protocol | BMS protocol | PDS protocol |
|---------------------------------|--------------|--------------|--------------|
| Battery control unit (BCU)      | ●            |              |              |
| Power conversion system (PCS)   | ●            |              |              |
| Energy storage system (ESS)     | ●            |              |              |
| Battery management system (BMS) |              | ●            |              |
| Power DC-DC system (PDS)        |              |              | ●            |

#### 2.1.2 Power and droop/VSG modes

The ESS protocols can support one or more of these power modes.

##### Power-reactive power (P/Q)

The inverter is grid-following. The inverter matches the busbar voltage and frequency, and generates power based on a P and Q reference. Before the inverter can start, a grid-forming energy source, like a genset or a mains connection, must be connected to the busbar.

If the grid-forming genset or mains trips, the inverter cannot keep the voltage and frequency stable. The inverter therefore also trips, which causes a blackout.

##### Voltage-frequency (V/f)

The inverter is grid-forming. The inverter tries to keep the output voltage and frequency constant (usually at the nominal voltage and frequency of the grid). This allows the PCS/BCU to generate power and charge without any gensets or mains connected to the busbar.

However, since the inverter keeps the voltage and frequency constant, the inverter generally cannot be connected work in parallel with a genset or mains connection. The constant voltage and frequency would conflict with other voltage and

frequency sources. Therefore, if a genset or mains is connected to busbar, the inverter must generally switch back to P/Q mode. Depending on the inverter, a blackout might be required.

Some PCS/BCU support running in V/f mode while parallel with other identical PCS/BCU (which are also in V/f mode).

## Droop/VSG

Droop mode is also called VSG-mode (Virtual Synchronous Generator mode). The inverter acts like a generator, which allows the inverter to always be grid-forming. In addition, in droop mode, the output voltage and frequency are controlled using predefined droop slopes. This allows the inverter to be connected in parallel with gensets and sometimes also a mains connection.

If the gensets or mains connection trip, the inverter can then immediately keep the voltage and frequency stable based on the droop slope, to prevent a blackout. The gensets and mains are also able to synchronise back to the inverter.

### 2.1.3 List for BCU control

| Maker         | Type                                                                             | Modbus RTU | Modbus TCP | COC |
|---------------|----------------------------------------------------------------------------------|------------|------------|-----|
| Any maker     | DEIF Generic Modbus protocol for implementation<br>The ASC is the Modbus client. | ●          | ●          |     |
| Any maker     | DEIF Open Modbus protocol for implementation<br>The ASC is the Modbus server.    | ●          | ●          |     |
| Aggreko       | Y.Cube                                                                           |            | ●          |     |
| Alfen         | TheBattery Connect                                                               | ●          | ●          |     |
| ATESS-Growatt | PCS series                                                                       | ●          |            | ●   |
| CubEnergy     | Powercombo-20C2H1600K                                                            | ●          | ●          |     |
| Faro          | AIO EMS                                                                          |            | ●          |     |
| GPSS          | GPSS-240-020K-3P-Cxx                                                             |            | ●          | ●   |
| H2            | Enerflow                                                                         |            | ●          | ●   |
| Huawei        | SACU – LUNA                                                                      |            | ●          |     |
| JinkoSolar    | SunGiga SCU                                                                      |            | ●          |     |
| LS PowerBRiC  | E-series                                                                         |            | ●          |     |
| Moura         | Moura BESS LFP (100kW/110kWh)                                                    |            | ●          |     |
| Nomad         | 12R-1000P-NT                                                                     |            | ●          |     |
| Northvolt     | VMS                                                                              |            | ●          |     |
| Rolls Royce   | Qinous RDD                                                                       |            | ●          | ●   |
| Sungrow       | SunGrow LC100 Utility LFP                                                        |            | ●          |     |
| Sungrow       | SunGrow LC100 Utility LFP v1.12                                                  |            | ●          |     |
| Sungrow       | SunGrow local controller                                                         | ●          | ●          |     |
| Sungrow       | SC XXX (Upper Computer Communication Protocol for PCS (V1.2.1.1))                | ●          |            |     |
| Sungrow       | LC200                                                                            | ●          | ●          |     |
| Sungrow       | LC200 DPS                                                                        |            | ●          |     |
| Sungrow       | LC200 Multi PCS                                                                  |            | ●          |     |
| Sungrow       | LC200 Single PCS                                                                 |            | ●          |     |
| Sungrow       | LC300                                                                            |            |            |     |

| Maker   | Type            | Modbus RTU | Modbus TCP | COC |
|---------|-----------------|------------|------------|-----|
| Sungrow | PowerStack      |            | ●          |     |
| Tesla   | Tesla Powerpack |            | ●          |     |

COC = Certificate of compliance

## 2.1.4 List for BCU and PCS control

| Maker         | Type                                                                             | Modbus RTU | Modbus TCP | COC |
|---------------|----------------------------------------------------------------------------------|------------|------------|-----|
| Any maker     | DEIF Generic Modbus protocol for implementation<br>The ASC is the Modbus client. | ●          | ●          |     |
| Any maker     | DEIF Open Modbus protocol for implementation<br>The ASC is the Modbus server.    | ●          | ●          |     |
| ABB           | PCS                                                                              |            | ●          |     |
| Ausar         | Ausar MAE                                                                        | ●          |            |     |
| CanadianSolar | BCS100K-B-HM X2                                                                  | ●          | ●          |     |
| CanadianSolar | BCS1725K-B-HUD                                                                   | ●          | ●          |     |
| CanadianSolar | BCS75-175K-B-HM-US X2                                                            | ●          | ●          |     |
| Danfoss Vacon | Danfoss NXP                                                                      | ●          | ●          |     |
| Delta         | EPCS 1200/1500/1725                                                              |            | ●          |     |
| Delta         | PCS100HV                                                                         |            | ●          |     |
| Delta         | PCS1000                                                                          | ●          |            |     |
| Dynapower     | CPS 1500                                                                         |            | ●          |     |
| Dynapower     | MPS-125 EVH PCS                                                                  |            | ●          |     |
| Enjoypowers   | Energy storage PCS                                                               | ●          |            |     |
| EPC power     | CAB1000                                                                          | ●          | ●          |     |
| Fimer         | PVS980-58BC                                                                      | ●          |            |     |
| Jinko         | JKP 1xxxHN-CA PCS                                                                |            | ●          |     |
| Jinko         | PCS 500K                                                                         | ●          | ●          |     |
| Kehua         | BCS series                                                                       | ●          | ●          |     |
| Kehua         | Kehua Tech KC541A (PCS)                                                          |            | ●          |     |
| KStar         | GSE series                                                                       | ●          | ●          |     |
| Matter Energy | Matter Energy PCS                                                                | ●          | ●          |     |
| Megarevo      | MPS series                                                                       | ●          | ●          |     |
| Nari          | pcs-9567AN                                                                       |            | ●          |     |
| Oztek         | OZPCS-RS40                                                                       | ●          | ●          |     |
| Pixii         | PowerShaker                                                                      | ●          | ●          |     |
| Sicon         | EPCS series                                                                      | ●          |            |     |
| Sinexcel      | PWS1-50K to 250K series                                                          | ●          |            |     |
| Sinexcel      | PWS1-500KTL-EX                                                                   | ●          |            |     |
| Sinexcel      | PWS1-1750KTL                                                                     |            | ●          |     |

| Maker                     | Type                              | Modbus RTU | Modbus TCP | COC |
|---------------------------|-----------------------------------|------------|------------|-----|
| <a href="#">Sinexcel</a>  | PWS2-30P                          | ●          |            |     |
| <a href="#">Sinexcel</a>  | PWS2 Series                       | ●          |            |     |
| <a href="#">Sino Soar</a> | SP100H                            | ●          |            |     |
| <a href="#">SMA</a>       | Sunny Island                      |            | ●          |     |
| <a href="#">TRUMPF</a>    | TruConvert AC3025                 |            | ●*         |     |
| <a href="#">TRUMPF</a>    | TruConvert DC1008                 |            | ●*         |     |
| <a href="#">Vertiv</a>    | V1EA series                       | ●          | ●          |     |
| <a href="#">WEG</a>       | BIW610                            | ●          | ●          |     |
| <a href="#">Yingbo</a>    | Yingbo INPPCS-xxx-0.4/w 50/100 kW | ●          | ●          |     |
| <a href="#">YUNT PCS</a>  | Mars-125KT                        | ●          | ●          |     |

**NOTE** \* Modbus UDP/TCP  
COC = Certificate of compliance

## 2.1.5 List for BMS control

| Maker                            | Type                                                                             | Modbus RTU | Modbus TCP | COC |
|----------------------------------|----------------------------------------------------------------------------------|------------|------------|-----|
| <a href="#">Any maker</a>        | DEIF Generic Modbus protocol for implementation<br>The ASC is the Modbus client. | ●          | ●          |     |
| <a href="#">Allsparkpower</a>    | Allsparkpower                                                                    | ●          | ●          |     |
| <a href="#">BMSer</a>            | Battery Cluster Unit                                                             | ●          | ●          |     |
| <a href="#">BMSer</a>            | BMSer Technology V.1                                                             | ●          | ●          |     |
| <a href="#">BMSer</a>            | BMSer Technology V2.3.10                                                         | ●          | ●          |     |
| <a href="#">BYD</a>              | Cube Pro                                                                         |            | ●          |     |
| <a href="#">CATL</a>             | CATL BMS systems                                                                 |            | ●          |     |
| <a href="#">Enervenue</a>        | Energy Rack                                                                      |            | ●          |     |
| <a href="#">EOS Energy Block</a> | Energy Block                                                                     |            | ●          |     |
| <a href="#">EVE</a>              | MBMU                                                                             |            | ●          |     |
| <a href="#">Gold</a>             | ESMU                                                                             |            | ●          |     |
| <a href="#">Gotion</a>           | Gotion BMS                                                                       | ●          |            |     |
| <a href="#">Greatpower</a>       | Greatpower BMS                                                                   |            | ●          |     |
| <a href="#">GTZKNE</a>           | FX34                                                                             | ●          | ●          |     |
| <a href="#">GTZKNE</a>           | WK-BMS-C                                                                         | ●          | ●          |     |
| <a href="#">Hangzhou Huasu</a>   | CELLCHECK H3G-TA                                                                 | ●          |            |     |
| <a href="#">Hangzhou Huasu</a>   | Huasus S02/03 LFP 3-Layer BMS                                                    |            | ●          |     |
| <a href="#">Hangzhou Huasu</a>   | Huasus S04 LFP 3-Layer BMS                                                       |            | ●          |     |
| <a href="#">Hangzhou Huasu</a>   | Huasus S06 LFP 3-Layer BMS                                                       |            | ●          |     |
| <a href="#">Hangzhou Huasu</a>   | Huasus Single Cluster                                                            |            | ●          |     |
| <a href="#">HoyCore</a>          | HoyCore outdoor liquid-cooling battery system                                    | ●          | ●          |     |
| <a href="#">Jinko</a>            | Suntera G2 or Utility BMS                                                        |            | ●          |     |

| Maker                              | Type                                | Modbus RTU | Modbus TCP | COC |
|------------------------------------|-------------------------------------|------------|------------|-----|
| Kgooer                             | BCMU                                | ●          |            |     |
| LANLI Technology                   | CBMS/GBMS                           | ●          |            |     |
| LFP                                | LiFe Po                             | ●          |            |     |
| Lithium Valley                     | SCU                                 | ●          | ●          |     |
| Narada                             | NESP and NPFC series                | ●          |            |     |
| Ningbo                             | SYL Golden Sigma - model SU340U170K |            | ●          |     |
| Ningbo                             | Ningbo Golden Sigma                 | ●          | ●          |     |
| Ningbo                             |                                     |            |            |     |
| Ocean Batteries                    | BAMU                                | ●          |            |     |
| Polarium                           | SLB48                               | ●          |            |     |
| PylonTech                          | PowerCube H1/H2                     | ●          |            |     |
| Qualtech                           | Qualtech SBAU                       |            | ●          |     |
| Samsung                            | E1                                  | ●          |            |     |
| Shenzhen Coslight Power Technology | ESMU                                |            | ●          |     |
| Sunwoda                            | BCMU                                |            | ●          |     |
| Sunwoda                            | Main BCMU                           |            | ●          | .   |
| WEG                                | WEG BMS                             |            | ●          |     |

COC = Certificate of compliance

## 2.1.6 List for PDS control

| Maker    | Type               | Modbus RTU | Modbus TCP | COC |
|----------|--------------------|------------|------------|-----|
| SinExcel | SinExcel DC/DC PDS | ●          | ●          |     |
| SinExcel | SinExcel PDS1-750K | ●          | ●          |     |

PDS = Power DC-DC System

COC = Certificate of compliance

## 2.2 Protocols

### 2.2.1 Any maker (generic protocols)

#### DEIF Generic (PCS or BCU)

|                         |                                    |
|-------------------------|------------------------------------|
| Maker                   | Any                                |
| Type                    | Modbus protocol for implementation |
| Interface               | Modbus RTU (RS-485) or Modbus TCP  |
| ASC ESS (7561) protocol | DEIF Generic                       |
| System                  | PCS or BCU                         |

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power mode(s) | P/Q, V/f, Droop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Notes         | <p>For <b>DEIF Generic</b>, the controller acts as a Modbus client, while an external PLC acts as a Modbus server.</p> <p>For more information, see the <b>iE 150 Battery ASC 150 Storage ASC-4 Battery Modbus client tables</b>, and the <b>iE 150 ASC 150 Modbus client User manual</b> or <b>ASC-4 Modbus client User manual</b>.</p> <p><b>ESS protocol M-Logic custom input 1:</b><br/>The state of ESS custom input 1 is reflected in bit 3 of the config bits written to the PCS/BCU.</p> |

### DEIF Generic (BMS)

|                              |                                                                                                                                                                                                                                                                                                                                          |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maker                        | Any                                                                                                                                                                                                                                                                                                                                      |
| Type                         | Modbus protocol for implementation                                                                                                                                                                                                                                                                                                       |
| Interface                    | Modbus RTU (RS-485) or Modbus TCP                                                                                                                                                                                                                                                                                                        |
| ASC BMS (7681/7682) protocol | DEIF Generic                                                                                                                                                                                                                                                                                                                             |
| System                       | BMS                                                                                                                                                                                                                                                                                                                                      |
| Notes                        | <p>For <b>DEIF Generic</b>, the controller acts as a Modbus client, while an external PLC acts as a Modbus server.</p> <p>For more information, see the <b>iE 150 Battery ASC 150 Storage ASC-4 Battery Modbus client tables</b>, and the <b>iE 150 ASC 150 Modbus client User manual</b> or <b>ASC-4 Modbus client User manual</b>.</p> |

### DEIF Open

|                         |                                                                                                                                                                                                                                                                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maker                   | Any                                                                                                                                                                                                                                                                                                                                   |
| Type                    | BESS using the DEIF open protocol                                                                                                                                                                                                                                                                                                     |
| Interface               | Modbus RTU (RS-485) or Modbus TCP                                                                                                                                                                                                                                                                                                     |
| ASC ESS (7561) protocol | DEIF Open                                                                                                                                                                                                                                                                                                                             |
| System                  | PCS or BCU                                                                                                                                                                                                                                                                                                                            |
| Power modes             | -                                                                                                                                                                                                                                                                                                                                     |
| Notes                   | <p>For <b>DEIF Open</b>, the controller acts as a Modbus server, while an external PLC acts as a Modbus client.</p> <p>For more information, see the <b>iE 150 Battery ASC 150 Storage ASC-4 Battery Modbus client tables</b>, and the <b>iE 150 ASC 150 Modbus client User manual</b> or <b>ASC-4 Modbus client User manual</b>.</p> |

## 2.2.2 ABB

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | ABB                               |
| Type                    | PCS100                            |
| Interface               | Modbus TCP                        |
| ASC ESS (7561) protocol | ABB PCS100                        |
| System                  | PCS                               |
| Power mode(s)           | PQ, V/F isoc, V/F droop, PQ droop |

### 2.2.3 Aggreko

|                         |                                               |
|-------------------------|-----------------------------------------------|
| Maker                   | Aggreko                                       |
| Type                    | Y.Cube                                        |
| Interface               | Modbus TCP                                    |
| ASC ESS (7561) protocol | Aggreko Y-Cube*                               |
| System                  | BCU                                           |
| Power mode(s)           | P/Q                                           |
| Notes                   | * Requires a special Aggreko option in ASC-4. |

### 2.2.4 Alfen

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | Alfen                             |
| Type                    | TheBattery                        |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | Alfen BCU                         |
| System                  | BCU                               |
| Power mode(s)           | P/Q, Droop                        |

### 2.2.5 Allsparkpower

|                              |                                   |
|------------------------------|-----------------------------------|
| Maker                        | Allsparkpower                     |
| Type                         | Allsparkpower                     |
| Interface                    | Modbus RTU (RS-485) or Modbus TCP |
| ASC BMS (7681/7682) protocol | Allsparkpower BMS                 |
| System                       | BMS                               |

### 2.2.6 ATESS-Growatt (深圳时代能创)

|                         |                                 |
|-------------------------|---------------------------------|
| Maker                   | ATESS-Growatt                   |
| Type                    | PCS                             |
| Interface               | Modbus RTU (RS-485)             |
| ASC ESS (7561) protocol | ATESS Growatt                   |
| System                  | BCU                             |
| Power mode(s)           | P/Q, and V/f with Bypass panel. |
| Notes                   | Certificate of compliance       |

### 2.2.7 Ausar

|                         |                     |
|-------------------------|---------------------|
| Maker                   | Ausar               |
| Type                    | Ausar MAE           |
| Interface               | Modbus RTU (RS-485) |
| ASC ESS (7561) protocol | Ausar MAE v4*       |
| System                  | PCS, ESS            |

|               |                                                                                                                                      |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Power mode(s) | P/Q, V/f                                                                                                                             |
| Notes         | <b>ESS protocol M-Logic custom input 1:</b><br>Enables the "MAE low battery recharge current ripple" mode for maintenance charging." |

**NOTE** \* Previously *Ausar MAE v2*.

## 2.2.8 BMSer (协能)

### BMSer Single Cluster

|                              |                                   |
|------------------------------|-----------------------------------|
| Maker                        | BMSer                             |
| Type                         | Battery Cluster Unit              |
| Interface                    | Modbus RTU (RS-485) or Modbus TCP |
| ASC BMS (7681/7682) protocol | BMSer Single Cluster              |
| System                       | BMS                               |

### BMSer Technology V1

|                              |                                   |
|------------------------------|-----------------------------------|
| Maker                        | BMSer                             |
| Type                         | BMSer Technology V.1              |
| Interface                    | Modbus RTU (RS-485) or Modbus TCP |
| ASC BMS (7681/7682) protocol | BMSer Technology V1               |
| System                       | BMS                               |
| Notes                        | Ethernet port number 503          |

### BMSer v2.3.10

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | BMSer                             |
| Type                    | BMSer Technology v.2.3.10         |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC BMS (7682) protocol | BMSer v2.3.10                     |
| System                  | BMS                               |
| Notes                   | Ethernet port number 503          |

## 2.2.9 BYD (比亚迪-弗迪)

|                              |              |
|------------------------------|--------------|
| Maker                        | BYD          |
| Type                         | Cube Pro     |
| Interface                    | Modbus TCP   |
| ASC BMS (7681/7682) protocol | BYD Cube Pro |
| System                       | BMS          |

## 2.2.10 CanadianSolar

|       |                                   |
|-------|-----------------------------------|
| Maker | CanadianSolar                     |
| Type  | BCS100K-B-HM X2<br>BCS1725K-B-HUD |

|                         |                                   |
|-------------------------|-----------------------------------|
|                         | BCS75-175K-B-HM-US X2             |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | Kubank LEMS BCU                   |
| System                  | BCU                               |
| Power mode(s)           | P/Q, V/f, Droop                   |

## 2.2.11 CATL (宁德时代)

### CATL air cooled BMS

|                              |                      |
|------------------------------|----------------------|
| Maker                        | CATL                 |
| Type                         | CATL BMS systems     |
| Interface                    | Modbus TCP           |
| ASC BMS (7681/7682) protocol | CATL air cooled BMS* |
| System                       | BMS                  |

**NOTE** \* Previously CATL BMS.

### CATL EnerOne BMS

|                              |                   |
|------------------------------|-------------------|
| Maker                        | CATL              |
| Type                         | CATL BMS systems  |
| Interface                    | Modbus TCP        |
| ASC BMS (7681/7682) protocol | CATL EnerOne BMS* |
| System                       | BMS               |

**NOTE** \* Previously CATL liquid cooled BMS.

### CATL EnerOne Plus BMS

|                              |                       |
|------------------------------|-----------------------|
| Maker                        | CATL                  |
| Type                         | CATL BMS systems      |
| Interface                    | Modbus TCP            |
| ASC BMS (7681/7682) protocol | CATL EnerOne Plus BMS |
| System                       | BMS                   |

## 2.2.12 CubEnergy (库博能源)

|                         |                       |
|-------------------------|-----------------------|
| Maker                   | CubEnergy             |
| Type                    | Powercombo-20C2H1600K |
| Interface               | Modbus RTU and TCP    |
| ASC ESS (7561) protocol | CubEnergy BCU         |
| System                  | BCU                   |
| Power mode(s)           | PQ, VSG               |

## 2.2.13 Danfoss Vacon

|                         |                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maker                   | Danfoss Vacon                                                                                                                                        |
| Type                    | Danfoss NXP                                                                                                                                          |
| Interface               | Modbus RTU (RS-485) or Modbus TCP                                                                                                                    |
| ASC ESS (7561) protocol | Danfoss Vacon NXP                                                                                                                                    |
| System                  | PCS                                                                                                                                                  |
| Power mode(s)           | P/Q, V/f, Droop                                                                                                                                      |
| Notes                   | <b>ESS protocol M-Logic custom input 1:</b><br>Allows the Danfoss Vacon to be in "Keep zero Q" mode when only a genset/s is connected to the busbar. |

## 2.2.14 Delta (台达)

### Delta EPCS 1200/1500/1725

|                         |                           |
|-------------------------|---------------------------|
| Maker                   | Delta                     |
| Type                    | PCS/EPCS                  |
| Interface               | Modbus TCP                |
| ASC ESS (7561) protocol | Delta EPCS 1200/1500/1725 |
| System                  | PCS                       |
| Power mode(s)           | P/Q, V/f                  |

### Delta PCS 100HV

|                         |                 |
|-------------------------|-----------------|
| Maker                   | Delta           |
| Type                    | PCS             |
| Interface               | Modbus TCP      |
| ASC ESS (7561) protocol | Delta PCS 100HV |
| System                  | PCS             |
| Power mode(s)           | P/Q, V/f        |

### Delta PCS1000

|                         |                                                                |
|-------------------------|----------------------------------------------------------------|
| Maker                   | Delta                                                          |
| Type                    | PCS1000                                                        |
| Interface               | Modbus RTU (RS-485)                                            |
| ASC ESS (7561) protocol | *                                                              |
| System                  | PCS                                                            |
| Power mode(s)           | P/Q, V/f                                                       |
| Notes                   | * Customer-specific version. Not included in standard release. |

## 2.2.15 Dynapower

### Dynapower CPS-1500

|       |           |
|-------|-----------|
| Maker | Dynapower |
| Type  | CPS 1500  |

|                         |                    |
|-------------------------|--------------------|
| Interface               | Modbus TCP         |
| ASC ESS (7561) protocol | Dynapower CPS-1500 |
| System                  | PCS                |
| Power mode(s)           | P/Q, V/f, Droop    |

### Dynapower MPS-125

|                         |                   |
|-------------------------|-------------------|
| Maker                   | Dynapower         |
| Type                    | MPS-125 EVH PCS   |
| Interface               | Modbus TCP        |
| ASC ESS (7561) protocol | Dynapower MPS-125 |
| System                  | PCS               |
| Power mode(s)           | P/Q, V/f, Droop   |

## 2.2.16 Enervenue

|                              |               |
|------------------------------|---------------|
| Maker                        | Enervenue     |
| Type                         | Energy Rack   |
| Interface                    | Modbus TCP    |
| ASC BMS (7681/7682) protocol | Enervenue BMS |
| System                       | BMS           |

## 2.2.17 Enjoypowers (恩玖)

|                         |                     |
|-------------------------|---------------------|
| Maker                   | Enjoypowers         |
| Type                    | Energy Storage PCS  |
| Interface               | Modbus RTU (RS-485) |
| ASC ESS (7561) protocol | Enjoy PCS           |
| System                  | PCS                 |

## 2.2.18 EOS Energy Block

|                              |                  |
|------------------------------|------------------|
| Maker                        | EOS              |
| Type                         | Energy Block     |
| Interface                    | Modbus TCP       |
| ASC BMS (7681/7682) protocol | EOS Energy Block |
| System                       | BMS              |

## 2.2.19 EPC power

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | EPC power                         |
| Type                    | CAB1000                           |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | EPC power                         |

|               |          |
|---------------|----------|
| System        | PCS      |
| Power mode(s) | P/Q, V/f |

### 2.2.20 EVE (亿纬)

|                              |              |
|------------------------------|--------------|
| Maker                        | EVE          |
| Type                         | MBMU         |
| Interface                    | Modbus TCP   |
| ASC BMS (7681/7682) protocol | EVE MBMU BMS |
| System                       | BMS          |

### 2.2.21 Faro (法罗)

|                         |                              |
|-------------------------|------------------------------|
| Maker                   | Faro                         |
| Type                    |                              |
| Interface               | Modbus TCP                   |
| ASC ESS (7561) protocol | Faro BCU                     |
| System                  | BCU                          |
| Power mode(s)           | PQ (On-grid), VSG (off-grid) |

### 2.2.22 FIMER

|                         |                     |
|-------------------------|---------------------|
| Maker                   | FIMER               |
| Type                    | PVS980-58BC         |
| Interface               | Modbus RTU (RS-485) |
| ASC ESS (7561) protocol | FIMER PVS980-58BC   |
| System                  | PCS                 |
| Power mode(s)           | P/Q, Droop          |

### 2.2.23 Gold (高特)

|                              |            |
|------------------------------|------------|
| Maker                        | Gold       |
| Type                         | ESMU       |
| Interface                    | Modbus TCP |
| ASC BMS (7681/7682) protocol | Gold BMS   |
| System                       | BMS        |

### 2.2.24 Gotion (国轩)

|                              |            |
|------------------------------|------------|
| Maker                        | Gotion     |
| Type                         | Gotion BMS |
| Interface                    | Modbus RTU |
| ASC BMS (7681/7682) protocol | Gotion BMS |
| System                       | BMS        |

## 2.2.25 GPSS

|                         |                           |
|-------------------------|---------------------------|
| Maker                   | GPSS                      |
| Type                    | GPSS-240-020K-3P-Cxx      |
| Interface               | Modbus TCP                |
| ASC ESS (7561) protocol | GPSS                      |
| System                  | BCU                       |
| Power mode(s)           | P/Q                       |
| Notes                   | Certificate of compliance |

## 2.2.26 Greatpower (鹏辉能源)

|                         |                |
|-------------------------|----------------|
| Maker                   | Greatpower     |
| Type                    |                |
| Interface               | Modbus TCP     |
| ASC BMS (7682) protocol | Greatpower BMS |
| System                  | BMS            |

## 2.2.27 GTZKNE (国投高科)

### GTZKNE FX34 BMS

|                              |                                   |
|------------------------------|-----------------------------------|
| Maker                        | GTZKNE                            |
| Type                         | FX34                              |
| Interface*                   | Modbus RTU (RS-485) or Modbus TCP |
| ASC BMS (7681/7682) protocol | GTZKNE FX34 BMS                   |
| System                       | BMS                               |

**NOTE** \* A CAN to Modbus converter is required.

### GTZKNE WK-BMS-C

|                              |                                   |
|------------------------------|-----------------------------------|
| Maker                        | GTZKNE                            |
| Type                         | WK-BMS-C                          |
| Interface*                   | Modbus RTU (RS-485) or Modbus TCP |
| ASC BMS (7681/7682) protocol | GTZKNE WK-BMS-C                   |
| System                       | BMS                               |

**NOTE** \* A CAN to Modbus converter is required.

## 2.2.28 H2

|                         |            |
|-------------------------|------------|
| Maker                   | H2         |
| Type                    | Enerflow   |
| Interface               | Modbus TCP |
| ASC ESS (7561) protocol | Enerflow   |
| System                  | BCU        |

|               |                           |
|---------------|---------------------------|
| Power mode(s) | P/Q                       |
| Notes         | Certificate of compliance |

## 2.2.29 Hangzhou Huasu (杭州华塑)

### CellCheck CM BMS

|                              |                                                                                                                                                          |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maker                        | Hangzhou Huasu                                                                                                                                           |
| Type                         | CELLCHECK H3G-TA                                                                                                                                         |
| Interface                    | Modbus RTU (RS-485)                                                                                                                                      |
| ASC BMS (7681/7682) protocol | CellCheck CM BMS                                                                                                                                         |
| System                       | BMS                                                                                                                                                      |
| Notes                        | Only for PbAc batteries. The charging and discharging capacity are not available in this protocol. The DEIF controller therefore uses the nominal power. |

### Huasu S02/03 BMS

|                              |                              |
|------------------------------|------------------------------|
| Maker                        | Hangzhou Huasu               |
| Type                         | HuaSu S02/03 LFP 3-Layer BMS |
| Interface                    | Modbus TCP                   |
| ASC BMS (7681/7682) protocol | Huasu S02/03 BMS             |
| System                       | BMS                          |

### Huasu S04 BMS

|                              |                                                                                               |
|------------------------------|-----------------------------------------------------------------------------------------------|
| Maker                        | Hangzhou Huasu                                                                                |
| Type                         | HuaSu S04 LFP 3-Layer BMS                                                                     |
| Interface                    | Modbus TCP                                                                                    |
| ASC BMS (7681/7682) protocol | Huasu S04 BMS*                                                                                |
| System                       | BMS                                                                                           |
| Notes                        | Ethernet port number is 4002. It is possible to change the port number on a BMS, ESS and PDS. |

**NOTE** \* Previously *Huasu BMS*.

### Huasu S06 BMS

|                              |                           |
|------------------------------|---------------------------|
| Maker                        | Hangzhou Huasu            |
| Type                         | HuaSu S06 LFP 3-Layer BMS |
| Interface                    | Modbus TCP                |
| ASC BMS (7681/7682) protocol | Huasu S06 BMS             |
| System                       | BMS                       |

### Huasu Single Cluster

|           |                      |
|-----------|----------------------|
| Maker     | Hangzhou Huasu       |
| Type      | Huasu Single Cluster |
| Interface | Modbus TCP           |

|                              |                      |
|------------------------------|----------------------|
| ASC BMS (7681/7682) protocol | Huasu Single Cluster |
| System                       | BMS                  |

### 2.2.30 HoyCore (青禾)

|                              |                                               |
|------------------------------|-----------------------------------------------|
| Maker                        | HoyCore                                       |
| Type                         | HoyCore outdoor liquid-cooling battery system |
| Interface                    | Modbus RTU (RS-485) or Modbus TCP             |
| ASC BMS (7681/7682) protocol | HoyCore HC01CUBE                              |
| System                       | BMS                                           |

### 2.2.31 Huawei (华为)

|                         |                             |
|-------------------------|-----------------------------|
| Maker                   | Huawei                      |
| Type                    | SACU – LUNA                 |
| Interface               | Modbus TCP                  |
| ASC ESS (7561) protocol | Huawei SACU ESS smartlogger |
| System                  | BCU                         |
| Power mode(s)           | P/Q, Droop (VSG)            |

### 2.2.32 Jinko (晶科)

#### Jinko JKP 1xxxHN-CA PCS

|                         |                                         |
|-------------------------|-----------------------------------------|
| Maker                   | Jinko                                   |
| Type                    | JKP 1xxxHN-CA PCS                       |
| Interface               | Modbus TCP                              |
| ASC ESS (7561) protocol | Jinko JKP 1xxxHN-CA PCS                 |
| System                  | PCS                                     |
| Power mode(s)           | PQ, V/F, Droop (On-grid, off-grid, VSG) |

#### Jinko PCS

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | Jinko                             |
| Type                    | PCS 500K                          |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | Jinko PCS                         |
| System                  | PCS                               |
| Power mode(s)           | P/Q, V/f                          |

#### Jinko Utility BMS

|           |                           |
|-----------|---------------------------|
| Maker     | Jinko                     |
| Type      | Suntera G2 or Utility BMS |
| Interface | Modbus TCP                |

|                         |                   |
|-------------------------|-------------------|
| ASC BMS (7682) protocol | Jinko Utility BMS |
| System                  | BMS               |

### 2.2.33 JinkoSolar (晶科能源)

|                         |             |
|-------------------------|-------------|
| Maker                   | JinkoSolar  |
| Type                    | SCU         |
| Interface               | Modbus TCP  |
| ASC ESS (7561) protocol | SunGiga SCU |
| System                  | BCU         |
| Power mode(s)           | PQ, V/f     |

### 2.2.34 Kehua (科华)

#### Kehua BCS-B-HUD Series

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | Kehua                             |
| Type                    | BCS series                        |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | Kehua BCS-B-HUD Series            |
| System                  | PCS                               |
| Power mode(s)           | P/Q, V/f, Droop                   |

#### Kehua Tech local controller, KC541A

|                         |                                           |
|-------------------------|-------------------------------------------|
| Maker                   | Kehua                                     |
| Type                    | Kehua Tech local controller, KC541A       |
| Interface               | Modbus RTU (RS-485) or Ethernet           |
| ASC ESS (7561) protocol | Kehua Tech KC541A                         |
| System                  | PCS                                       |
| Notes                   | Supports PCS protocol via RS485/Ethernet. |

### 2.2.35 Kgooer (科工)

|                              |                                |
|------------------------------|--------------------------------|
| Maker                        | Kgooer                         |
| Type                         | BCMU                           |
| Interface                    | Modbus RTU                     |
| ASC BMS (7681/7682) protocol | KGooer BMS                     |
| System                       | BMS                            |
| Notes                        | KGooer BCMU, single cluster BM |

### 2.2.36 KStar (科士达)

|           |                                   |
|-----------|-----------------------------------|
| Maker     | KStar                             |
| Type      | GSE series                        |
| Interface | Modbus RTU (RS-485) or Modbus TCP |

|                         |                      |
|-------------------------|----------------------|
| ASC ESS (7561) protocol | KStar GSE 50-630 PCS |
| System                  | PCS                  |
| Power mode(s)           | P/Q, V/f             |

### 2.2.37 LANLI Technology (蓝锂科技)

|                              |                  |
|------------------------------|------------------|
| Maker                        | LANLI Technology |
| Type                         | CBMS/GBMS        |
| Interface                    | Modbus TCP       |
| ASC BMS (7681/7682) protocol | LANLI Tech BMS   |
| System                       | BMS              |

### 2.2.38 LFP

|                              |                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Maker                        | LFP                                                                                                                             |
| Type                         | LiFe Po                                                                                                                         |
| Interface                    | Modbus RTU (RS-485)                                                                                                             |
| ASC BMS (7681/7682) protocol | LFP                                                                                                                             |
| System                       | BMS                                                                                                                             |
| Power mode(s)                | Not relevant                                                                                                                    |
| Notes                        | The charging and discharging capacity are not available in this protocol. The DEIF controller therefore uses the nominal power. |

### 2.2.39 Lithium Valley

|                              |                                   |
|------------------------------|-----------------------------------|
| Maker                        | Lithium Valley                    |
| Type                         | SCU                               |
| Interface                    | Modbus RTU (RS-485) or Modbus TCP |
| ASC BMS (7681/7682) protocol | Lithium Valley BMS                |
| System                       | BMS                               |

### 2.2.40 LS PowerBRiC

|                         |              |
|-------------------------|--------------|
| Maker                   | LS PowerBRiC |
| Type                    | E-series     |
| Interface               | Modbus TCP   |
| ASC ESS (7561) protocol | LS PowerBRiC |
| System                  | BCU          |
| Power mode(s)           | P/Q, V/f     |

### 2.2.41 Matter Energy

|       |               |
|-------|---------------|
| Maker | Matter Energy |
| Type  | BCU           |

|                         |                                   |
|-------------------------|-----------------------------------|
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | MatterEnergy PCS                  |
| System                  | PCS                               |
| Power mode(s)           | P/Q, V/f                          |

## 2.2.42 Megarevo (迈格瑞能)

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | Megarevo                          |
| Type                    | MPS series                        |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | MEGAREVO MPS                      |
| System                  | PCS                               |
| Power mode(s)           | P/Q, V/f                          |

## 2.2.43 Moura

|                         |                               |
|-------------------------|-------------------------------|
| Maker                   | Moura                         |
| Type                    | Moura BESS LFP (100kW/110kWh) |
| Interface               | Modbus TCP                    |
| ASC ESS (7561) protocol | Moura BCU                     |
| System                  | BCU                           |

## 2.2.44 Narada (南都)

### Narada BMS V1

|                              |                      |
|------------------------------|----------------------|
| Maker                        | Narada               |
| Type                         | NESP and NPFC series |
| Interface                    | Modbus RTU (RS-485)  |
| ASC BMS (7681/7682) protocol | Narada BMS V1        |
| System                       | BMS                  |

### Narada BMS V1 w Ctrl

|                              |                      |
|------------------------------|----------------------|
| Maker                        | Narada               |
| Type                         | NESP and NPFC series |
| Interface                    | Modbus RTU (RS-485)  |
| ASC BMS (7681/7682) protocol | Narada BMS V1 w Ctrl |
| System                       | BMS                  |

## 2.2.45 Nari (南瑞)

|                         |                 |
|-------------------------|-----------------|
| Maker                   | Nari            |
| Type                    | pcs-9567AN      |
| Interface               | Modbus TCP      |
| ASC ESS (7561) protocol | Nari PCS-9567AN |

|               |     |
|---------------|-----|
| System        | BCU |
| Power Mode(s) | PQ  |

## 2.2.46 Ningbo SYL (双一力)

### Ningbo SYL Golden Sigma

|                              |                                      |
|------------------------------|--------------------------------------|
| Maker                        | Ningbo                               |
| Type                         | SYL Golden Sigma - model SU340U170K. |
| Interface                    | Modbus TCP                           |
| ASC BMS (7681/7682) protocol | SYL G. S. Air*                       |
| System                       | BMS                                  |

**NOTE** \* Previously *Ningbo BMS*.

### Ningbo Golden Sigma

|                              |                                   |
|------------------------------|-----------------------------------|
| Maker                        | Ningbo                            |
| Type                         | Ningbo Golden Sigma               |
| Interface                    | Modbus RTU (RS-485) or Modbus TCP |
| ASC BMS (7681/7682) protocol | SYL G. S. Air*                    |
| System                       | BMS                               |

**NOTE** \* Previously *Ningbo BMS*.

### SYL G. S. Liq cooled

|                         |                     |
|-------------------------|---------------------|
| Maker                   | Ningbo              |
| Type                    |                     |
| Interface               |                     |
| ASC BMS (7682) protocol | SYL G.S. Liq cooled |
| System                  | BMS                 |

## 2.2.47 Nomad

|                         |                 |
|-------------------------|-----------------|
| Maker                   | Nomad           |
| Type                    | 12R-1000P-NT    |
| Interface               | Modbus TCP      |
| ASC ESS (7561) protocol | Nomad BCU       |
| System                  | BCU             |
| Power mode(s)           | P/Q, V/f, Droop |

## 2.2.48 Northvolt

|           |            |
|-----------|------------|
| Maker     | Northvolt  |
| Type      | VMS        |
| Interface | Modbus TCP |

|                         |                                                                                                                                                                                                |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASC ESS (7561) protocol | Northvolt VMS                                                                                                                                                                                  |
| System                  | ESS                                                                                                                                                                                            |
| Notes                   | <b>ESS protocol M-Logic custom input 1:</b><br>Keeps the BCU in Grid Boost mode no matter what is connected to the busbar.<br>Can still be overridden by the set grid mode outputs in M-Logic. |

## 2.2.49 Ocean Batteries

|                              |                                                    |
|------------------------------|----------------------------------------------------|
| Maker                        | Ocean Batteries                                    |
| Type                         | BAMU                                               |
| Interface                    | Modbus RTU (RS-485)                                |
| ASC BMS (7681/7682) protocol | HagalOcean PD-003V2 BMS                            |
| System                       | BMS                                                |
| Notes                        | Ocean Batteries was formerly known as Hagal Ocean. |

## 2.2.50 Oztek

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | Oztek                             |
| Type                    | OZPCS-RS40                        |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | Oztek OZpcs-RS40                  |
| System                  | PCS                               |
| Power mode(s)           | P/Q, V/f, Droop                   |

## 2.2.51 Pixii

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | Pixii                             |
| Type                    | PowerShaper                       |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | Pixii PowerShaper                 |
| System                  | PCS and BCU                       |
| Power modes             | P/Q                               |

## 2.2.52 Polarium

|                              |                     |
|------------------------------|---------------------|
| Maker                        | Polarium            |
| Type                         | SLB48               |
| Interface                    | Modbus RTU (RS-485) |
| ASC BMS (7681/7682) protocol | Polarium BMS        |
| System                       | BMS                 |

## 2.2.53 PylonTech (派能)

|       |                 |
|-------|-----------------|
| Maker | PylonTech       |
| Type  | PowerCube H1/H2 |

|                              |                     |
|------------------------------|---------------------|
| Interface                    | Modbus RTU (RS-485) |
| ASC BMS (7681/7682) protocol | PowerCube H1/H2     |
| System                       | BMS                 |

### 2.2.54 Qualtech (高泰昊能)

|                              |               |
|------------------------------|---------------|
| Maker                        | Qualtech      |
| Type                         | Qualtech SBAU |
| Interface                    | Modbus TCP    |
| ASC BMS (7681/7682) protocol | Qualtech BMS  |
| System                       | BMS           |

### 2.2.55 Rolls Royce

|                         |                                                                   |
|-------------------------|-------------------------------------------------------------------|
| Maker                   | Rolls Royce                                                       |
| Type                    | Qinous ESS                                                        |
| Interface               | Modbus TCP                                                        |
| ASC ESS (7561) protocol | Qinous                                                            |
| System                  | BCU                                                               |
| Power mode(s)           | V/f, Droop                                                        |
| Notes                   | Certificate of compliance.<br>Maker was formerly known as Qinous. |

### 2.2.56 Samsung

|                              |                     |
|------------------------------|---------------------|
| Maker                        | Samsung             |
| Type                         | E1                  |
| Interface                    | Modbus RTU (RS-485) |
| ASC BMS (7681/7682) protocol | Samsung BMS         |
| System                       | BMS                 |

### 2.2.57 Shenzhen Coslight Power Technology (深圳光宇)

|                              |                                    |
|------------------------------|------------------------------------|
| Maker                        | Shenzhen Coslight Power Technology |
| Type                         | ESMU                               |
| Interface                    | Modbus TCP                         |
| ASC BMS (7681/7682) protocol | Coslight ESMU BMS                  |
| System                       | BMS                                |

### 2.2.58 Sicon (先控)

#### Sicon PCS

|       |             |
|-------|-------------|
| Maker | Sicon       |
| Type  | EPCS series |

|                         |                     |
|-------------------------|---------------------|
| Interface               | Modbus RTU (RS-485) |
| ASC ESS (7561) protocol | Sicon PCS           |
| System                  | PCS                 |
| Power mode(s)           | P/Q, V/f            |

### Sicon VSG

|                         |                     |
|-------------------------|---------------------|
| Maker                   | Sicon               |
| Type                    | EPCS series         |
| Interface               | Modbus RTU (RS-485) |
| ASC ESS (7561) protocol | Sicon VSG           |
| System                  | PCS                 |
| Power mode(s)           | P/Q, V/f, VSG       |

## 2.2.59 Sinexcel (盛弘)

### Sinexcel 30P

|                         |                                              |
|-------------------------|----------------------------------------------|
| Maker                   | Sinexcel                                     |
| Type                    | 30P                                          |
| Type                    | PWS2-30P<br>PWS1-1250/1375/1500/1575/1725KTL |
| Interface               | Modbus TCP                                   |
| ASC ESS (7561) protocol | SinExcel 30P                                 |
| System                  | PCS                                          |
| Power mode(s)           | P/Q, V/f, Droop                              |

### Sinexcel PWS1

|                         |                                                    |
|-------------------------|----------------------------------------------------|
| Maker                   | Sinexcel                                           |
| Type                    | PWS1-50K to 250K Series<br>PWS1-500KTL-EX SINEXCEL |
| Interface               | Modbus RTU (RS-485)                                |
| ASC ESS (7561) protocol | SinExcel PWS1*                                     |
| System                  | PCS                                                |
| Power mode(s)           | P/Q, V/f, Droop                                    |

**NOTE** \* Previously *SinExcel*.

### Sinexcel PWS2

|                         |                     |
|-------------------------|---------------------|
| Maker                   | Sinexcel            |
| Type                    | PWS2 Series         |
| Interface               | Modbus RTU (RS-485) |
| ASC ESS (7561) protocol | SinExcel PWS2 30K   |
| System                  | PCS                 |
| Power mode(s)           | P/Q, V/f, Droop*    |

**NOTE** \* For droop to work for the PWS2, the droop mode must be selected in the ASC using M-Logic (Output > Command Battery > Set mode to Droop).

### SinExcel DC/DC PDS

|                              |                                   |
|------------------------------|-----------------------------------|
| Maker                        | Sinexcel                          |
| Type                         | PDS1-xxxK                         |
| Interface                    | Modbus RTU (RS-485) or Modbus TCP |
| ASC PDS (7882/7912) protocol | SinExcel DC/DC PDS*               |
| System                       | PDS                               |

**NOTE** \* Reads the power of up to 8 DC strings.

### SinExcel PDS1-750K

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | Sinexcel                          |
| Type                    | PDS1-xxxK                         |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC PDS (7912) protocol | SinExcel PDS1-750K                |
| System                  | PDS                               |

## 2.2.60 Sino Soar (中腾)

|                         |                     |
|-------------------------|---------------------|
| Maker                   | Sino Soar           |
| Type                    | SP100H              |
| Interface               | Modbus RTU (RS-485) |
| ASC ESS (7561) protocol | Sinosoar SP100H     |
| System                  | PCS                 |
| Power mode(s)           | P/Q, V/f            |

## 2.2.61 SMA

|                         |                  |
|-------------------------|------------------|
| Maker                   | SMA              |
| Type                    | Sunny Island     |
| Interface               | Modbus TCP       |
| ASC ESS (7561) protocol | SMA Sunny Island |
| System                  | PCS              |
| Power mode(s)           | P/Q              |

## 2.2.62 Sungrow (阳光)

### Sungrow LC100 Utility LFP

|                         |                           |
|-------------------------|---------------------------|
| Maker                   | SunGrow                   |
| Type                    | LC100 Utility LFP         |
| Interface               | Modbus TCP                |
| ASC ESS (7561) protocol | Sungrow LC100 Utility LFP |

|               |                    |
|---------------|--------------------|
| System        | BCU                |
| Power mode(s) | P/Q, V/f and Droop |

### Sungrow LC100 Utility LFP v1.12

|                         |                                  |
|-------------------------|----------------------------------|
| Maker                   | SunGrow                          |
| Type                    | LC100 Utility LFP V112           |
| Interface               | Modbus TCP                       |
| ASC ESS (7561) protocol | Sungrow LC100 Utility LFP v.1.12 |
| System                  | BCU                              |
| Power mode(s)           | P/Q, V/f and Droop               |

### Sungrow LC200

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | SunGrow                           |
| Type                    | LC200                             |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | Sungrow LC200                     |
| System                  | BCU                               |
| Power mode(s)           | P/Q, V/f and Droop                |

### Sungrow LC200 DPS

|                         |                    |
|-------------------------|--------------------|
| Maker                   | SunGrow            |
| Type                    | LC200 DPS          |
| Interface               | Modbus TCP         |
| ASC ESS (7561) protocol | Sungrow LC200 DPS  |
| System                  | BCU                |
| Power mode(s)           | P/Q, V/f and Droop |

### Sungrow LC200 Multi

|                         |                         |
|-------------------------|-------------------------|
| Maker                   | SunGrow                 |
| Type                    | LC200 Multi PCS         |
| Interface               | Modbus TCP              |
| ASC ESS (7561) protocol | Sungrow LC200 Multi PCS |
| System                  | BCU                     |
| Power mode(s)           | P/Q, V/f and Droop      |

### Sungrow LC300

|                         |                     |
|-------------------------|---------------------|
| Maker                   | SunGrow             |
| Type                    | LC300               |
| Interface               | Modbus TCP          |
| ASC ESS (7561) protocol | Sungrow LC300       |
| System                  | BCU                 |
| Power mode(s)           | P/Q, V/f, and Droop |

### Sungrow LC200 Single PCS

|                         |                          |
|-------------------------|--------------------------|
| Maker                   | SunGrow                  |
| Type                    | LC200 Single PCS         |
| Interface               | Modbus TCP               |
| ASC ESS (7561) protocol | Sungrow LC200 Single PCS |
| System                  | BCU                      |
| Power mode(s)           | P/Q, V/f and Droop       |

### Sungrow local controller

|                         |                                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------|
| Maker                   | SunGrow                                                                                                              |
| Type                    | SunGrow local controller                                                                                             |
| Interface               | Modbus RTU (RS-485) or Modbus TCP                                                                                    |
| ASC ESS (7561) protocol | Sungrow STXXXCP-50HV                                                                                                 |
| System                  | BCU                                                                                                                  |
| Power mode(s)           | P/Q, V/f                                                                                                             |
| Notes                   | <b>ESS protocol M-Logic custom input 1:</b><br>Disables the need for a heartbeat to be sent from the ASC to the BCU. |

### Sungrow power stack

|                         |                                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------|
| Maker                   | Sungrow                                                                                                              |
| Type                    | PowerStack                                                                                                           |
| Interface               | Modbus TCP                                                                                                           |
| ASC ESS (7561) protocol | Sungrow Powerstack ST                                                                                                |
| System                  | BCU                                                                                                                  |
| Power mode(s)           | P/Q, V/f and Droop                                                                                                   |
| Notes                   | <b>ESS protocol M-Logic custom input 1:</b><br>Disables the need for a heartbeat to be sent from the ASC to the BCU. |

### Sungrow SC XXX

|                         |                                                                   |
|-------------------------|-------------------------------------------------------------------|
| Maker                   | Sungrow                                                           |
| Type                    | SC XXX (Upper Computer Communication Protocol for PCS (V1.2.1.1)) |
| Interface               | Modbus RTU (RS-485)                                               |
| ASC ESS (7561) protocol | Sungrow PCS                                                       |
| System                  | BCU                                                               |
| Power mode(s)           | P/Q                                                               |

## 2.2.63 Sunwoda (欣旺达)

### Sunwoda BCMU

|           |            |
|-----------|------------|
| Maker     | Sunwoda    |
| Type      | BCMU       |
| Interface | Modbus TCP |

|                              |              |
|------------------------------|--------------|
| ASC BMS (7681/7682) protocol | Sunwoda BCMU |
| System                       | BMS          |

### Sunwoda Main BCMU

|                              |                   |
|------------------------------|-------------------|
| Maker                        | Sunwoda           |
| Type                         | Main BCMU         |
| Interface                    | Modbus TCP        |
| ASC BMS (7681/7682) protocol | Sunwoda Main BCMU |
| System                       | BMS               |

## 2.2.64 Tesla

|                         |                                                                                                                                     |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Maker                   | Tesla                                                                                                                               |
| Type                    | Tesla Powerpack                                                                                                                     |
| Interface               | Modbus TCP                                                                                                                          |
| ASC ESS (7561) protocol | Tesla PowerPack                                                                                                                     |
| System                  | BCU                                                                                                                                 |
| Power mode(s)           | P/Q, Droop                                                                                                                          |
| Notes                   | An SEL700B relay, acting as a mains breaker, is needed to switch between grid-tied mode and island (droop mode) without a blackout. |

## 2.2.65 TRUMPF

### TruConvert AC3025

|                         |                        |
|-------------------------|------------------------|
| Maker                   | TRUMPF                 |
| Type                    | TruConvert AC3025      |
| Interface               | Modbus UDP/TCP         |
| ASC ESS (7561) protocol | TRUMPF TruConvert ACDC |
| System                  | PCS                    |
| Power mode(s)           | P/Q, V/f               |

### TruConvert DC1008

|                         |                                       |
|-------------------------|---------------------------------------|
| Maker                   | TRUMPF                                |
| Type                    | TruConvert DC1008                     |
| Interface               | Modbus UDP/TCP                        |
| ASC ESS (7561) protocol | TRUMPF TruConvert DCDC                |
| System                  | PCS                                   |
| Power mode(s)           | Not relevant: Only controls DC power. |

## 2.2.66 Vertiv

|           |                                   |
|-----------|-----------------------------------|
| Maker     | Vertiv                            |
| Type      | V1EA series                       |
| Interface | Modbus RTU (RS-485) or Modbus TCP |

|                         |                                                          |
|-------------------------|----------------------------------------------------------|
| ASC ESS (7561) protocol | Vertiv Custom*                                           |
| System                  | PCS                                                      |
| Power mode(s)           | P/Q, V/f                                                 |
| Notes                   | * This is a customer-specific version of the Vertiv PCS. |

## 2.2.67 WEG

### WEG BMS

|                              |            |
|------------------------------|------------|
| Maker                        | WEG        |
| Type                         | WEG BMS    |
| Interface                    | Modbus TCP |
| ASC BMS (7681/7682) protocol | WEG BMS    |
| System                       | BMS        |

### WEG PCS

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | WEG                               |
| Type                    | BIW610                            |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | WEG BIW610 PCS                    |
| System                  | PCS                               |
| Power mode(s)           | P/Q, V/f                          |

## 2.2.68 Yingbo (英博)

|                         |                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maker                   | Yingbo                                                                                                                                               |
| Type                    | Yingbo INPPCS-xxx-0.4/W<br>50/100kW                                                                                                                  |
| Interface               | Modbus RTU (RS-485) or Modbus TCP                                                                                                                    |
| ASC ESS (7561) protocol | InPower PCS*                                                                                                                                         |
| System                  | PCS                                                                                                                                                  |
| Power mode(s)           | P/Q, V/f                                                                                                                                             |
| Note                    | Multi-PCS control is supported for Yingbo. One PCS acts as the master (the others follow the master). The ASC only communicates with the master PCS. |

**NOTE** \* Previously *Yingbo*.

## 2.2.69 YUNT PCS (云天)

|                         |                                   |
|-------------------------|-----------------------------------|
| Maker                   | YUNT PCS                          |
| Type                    | Mars-125KT                        |
| Interface               | Modbus RTU (RS-485) or Modbus TCP |
| ASC ESS (7561) protocol | YUNT PCS                          |
| System                  | PCS                               |
| Power mode(s)           | P/Q, V/f, Droop                   |

## 3. Photovoltaic

### 3.1 Compatible PV systems

#### Controllers

**iE 150 Solar**, **iE 150 Marine Solar**, **iE 150 Hybrid genset**, **AGC 150 Solar**, and **ASC 150 Hybrid genset** support the protocols in this chapter.

**ASC-4 Solar** supports some of the protocols in this chapter. If you need a protocol that is not supported, contact DEIF.

If your PV system is not on the list, contact your local DEIF subsidiary. The local DEIF subsidiaries have tools to set up communication with new PV systems.

| Controller            | Modbus RTU (RS-485) | Modbus TCP | PV protocol parameter |
|-----------------------|---------------------|------------|-----------------------|
| iE 150 Solar          | ●                   | ●          | 7561                  |
| iE 150 Marine Solar   | ●                   | ●          | 7561                  |
| iE 150 Hybrid genset  | ●                   | ●          | 17321                 |
| ASC 150 Solar         | ●                   | ●          | 7561                  |
| AGC 150 Hybrid genset | ●                   | ●          | 17321                 |
| ASC-4 Solar           | ●                   | ●*         | 7561                  |

**NOTE** \* An external converter is required. This can be supplied by DEIF.

COC = Certificate of compliance

**NOTE** If different PV inverter types from the same branch use the same SunSpec models, these can often be installed on the same communication bus and support broadcast.

#### 3.1.1 ABB/Fimer

| ABB/Fimer                    | Interface           | PV protocol     | COC |
|------------------------------|---------------------|-----------------|-----|
| Pro33                        | Modbus RTU (RS-485) | ABB PRO         |     |
| PVS 50/60                    | Modbus RTU (RS-485) | SunSpec Generic |     |
| PVS 100/200                  | Modbus RTU (RS-485) | SunSpec Generic |     |
| PVS 175                      | Modbus RTU (RS-485) | SunSpec Generic |     |
| PVS 800                      | Modbus RTU (RS-485) | ABB PVS800      |     |
| Trio 5.8-8.0 (ID restricted) | Modbus RTU (RS-485) | ABB TRIO        |     |
| Trio 20.0                    | Modbus RTU (RS-485) | ABB TRIO        | ●   |
| Trio 27.6                    | Modbus RTU (RS-485) | ABB TRIO        | ●   |
| Trio 50.0                    | Modbus RTU (RS-485) | ABB Trio 50     |     |

#### 3.1.2 CanadianSolar

| CanadianSolar     | Interface           | PV protocol                | COC |
|-------------------|---------------------|----------------------------|-----|
| CSI-110K-T4001A-E | Modbus RTU (RS-485) | Canadian CSI-110K-T4001A-E |     |

### 3.1.3 Chint (正泰)

| Chint                                                                                                                                            | Interface           | PV protocol                          | COC |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------------|-----|
| SCA14-36 KTL                                                                                                                                     | Modbus RTU (RS-485) | CPS (Chint Power) 14/36kW            |     |
| SCA50-60 KTL                                                                                                                                     | Modbus RTU (RS-485) | CPS (Chint Power) 50/60kW            |     |
| CPS SCHxxxKTL:<br><ul style="list-style-type: none"> <li>100kW_9Boost_1100V</li> <li>136kW_12Boost_1100V</li> <li>250kW_12Boost_1500V</li> </ul> | Modbus RTU (RS-485) | CPS (Chint Power) Boost<br>100-250kW |     |

### 3.1.4 CHISAGE (浙江中哲)

| CHISAGE     | Interface           | PV protocol    | COC |
|-------------|---------------------|----------------|-----|
| CE-3P40KEG  | Modbus RTU (RS-485) | Eachenergy PV* |     |
| CE-3P50KEG  | Modbus RTU (RS-485) | Eachenergy PV* |     |
| CE-3P60KEG  | Modbus RTU (RS-485) | Eachenergy PV* |     |
| CE-3P75KEG  | Modbus RTU (RS-485) | Eachenergy PV* |     |
| CE-3P80KEG  | Modbus RTU (RS-485) | Eachenergy PV* |     |
| CE-3P100KEG | Modbus RTU (RS-485) | Eachenergy PV* |     |
| CE-3P110KEG | Modbus RTU (RS-485) | Eachenergy PV* |     |

**NOTE** \* Pending new protocol name.

### 3.1.5 DEIF open

| DEIF open                              | Interface                         | PV protocol | COC |
|----------------------------------------|-----------------------------------|-------------|-----|
| Inverters using the DEIF open protocol | Modbus RTU (RS-485) or Modbus TCP | DEIF Open   |     |

For this protocol, the ASC is the Modbus server.



#### More information

For more information, see the **ASC-4 Modbus server tables** or **ASC 150 Modbus server tables**, and the **ASC-4 Modbus server User manual** or **ASC 150 Modbus server User manual**.

### 3.1.6 Delta (台达)

| Delta                   | Interface           | PV protocol    | COC |
|-------------------------|---------------------|----------------|-----|
| RPI M6A                 | Modbus RTU (RS-485) | Delta RPI      |     |
| RPI M10A                | Modbus RTU (RS-485) | Delta RPI      |     |
| RPI M15A (unicast only) | Modbus RTU (RS-485) | Delta RPI      |     |
| RPI M20A (unicast only) | Modbus RTU (RS-485) | Delta RPI      |     |
| RPI M30A                | Modbus RTU (RS-485) | Delta RPI      |     |
| RPI M50A                | Modbus RTU (RS-485) | Delta RPI      |     |
| RPI M88H                | Modbus RTU (RS-485) | Delta RPI M88H |     |

### 3.1.7 Deye (德业)

| Deye               | Interface           | PV protocol         | COC |
|--------------------|---------------------|---------------------|-----|
| SUN 1.3K-G         | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 3-6K-G         | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 4-12K-G05      | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 4-12K-G05-P    | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 7-10.5K-G      | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 15-17K-G03     | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 18-25K-G04     | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 30-36K-G04     | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 30-60K-G03     | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 60-80K-G       | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 70-110K-G03    | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |
| SUN 120-136K-G01P3 | Modbus RTU (RS-485) | Deye SUN 30-50k-G03 |     |

**NOTE** For new software version 0603 or later, the Deye PV protocol supports broadcast and modbus ID can be changed.

### 3.1.8 Each Energy (壹启)

| Each Energy | Interface           | PV protocol   | COC |
|-------------|---------------------|---------------|-----|
| EET40K-M1   | Modbus RTU (RS-485) | Eachenergy PV |     |
| EET50K-M1   | Modbus RTU (RS-485) | Eachenergy PV |     |
| EET60K-M1   | Modbus RTU (RS-485) | Eachenergy PV |     |
| EET75K-M1   | Modbus RTU (RS-485) | Eachenergy PV |     |
| EET80K-M1   | Modbus RTU (RS-485) | Eachenergy PV |     |
| EET100K-M1  | Modbus RTU (RS-485) | Eachenergy PV |     |
| EET110K-M1  | Modbus RTU (RS-485) | Eachenergy PV |     |

### 3.1.9 EVVO

| EVVO                        | Interface           | PV protocol | COC |
|-----------------------------|---------------------|-------------|-----|
| 50-70kW                     | Modbus RTU (RS-485) | EVVO        |     |
| 1110TL/1600TL/2200TL/3000TL | Modbus RTU (RS-485) | EVVO        |     |

**NOTE** The EVVO PV protocol does not support broadcast. The protocol only supports Modbus function code 0x06 (single register write) for write telegrams. However, the DEIF controller can use unicast to communicate with multiple inverters.

### 3.1.10 Fimer

| Fimer  | Interface           | PV protocol  | COC |
|--------|---------------------|--------------|-----|
| PVS980 | Modbus RTU (RS-485) | FIMER PVS980 |     |

### 3.1.11 Fronius

| Fronius      | Interface                         | PV protocol*    | COC |
|--------------|-----------------------------------|-----------------|-----|
| Data manager | Modbus RTU (RS-485) or Modbus TCP | SunSpec Generic |     |
| Eco          | Modbus RTU (RS-485) or Modbus TCP | SunSpec Generic |     |
| Tauro        | Modbus RTU (RS-485) or Modbus TCP | SunSpec Generic |     |
| Symo         | Modbus RTU (RS-485) or Modbus TCP | SunSpec Generic |     |

**NOTE** \* Fronius inverters with firmware 3.7.1-4 and earlier must use the **Fronius before 3.7.1-5** protocol.

### 3.1.12 Gamesa

| Gamesa   | Interface  | PV protocol     | COC |
|----------|------------|-----------------|-----|
| E-series | Modbus TCP | Gamesa E-series |     |

### 3.1.13 Goodwe (固德威)

| Goodwe                  | Interface           | PV protocol      | COC |
|-------------------------|---------------------|------------------|-----|
| XS Series: 0.7-3 kW     | Modbus RTU (RS-485) | Goodwe DT series | ●   |
| DNS Series: 3-6 kW      | Modbus RTU (RS-485) | Goodwe DT series | ●   |
| MS Series: 5-10 kW      | Modbus RTU (RS-485) | Goodwe DT series | ●   |
| A-MS Series: 5-9.6 kW   | Modbus RTU (RS-485) | Goodwe DT series | ●   |
| SDT G2 Series: 4-15 kW  | Modbus RTU (RS-485) | Goodwe DT series | ●   |
| SDT G2 Series: 17-25 kW | Modbus RTU (RS-485) | Goodwe DT series | ●   |
| LVSMT Series: 12-20 kW  | Modbus RTU (RS-485) | Goodwe MT series | ●   |
| SMT Series: 25-36 kW    | Modbus RTU (RS-485) | Goodwe MT series | ●   |
| MT Series: 50-80 kW     | Modbus RTU (RS-485) | Goodwe MT series | ●   |
| HT Series: 73-136 kW    | Modbus RTU (RS-485) | Goodwe HT series | ●   |
| HT Series: 225/250 kW   | Modbus RTU (RS-485) | Goodwe HT series | ●   |

### 3.1.14 Growatt (古瑞瓦特)

| Growatt                                                                                                                                                                              | Interface           | PV protocol                      | COC |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------------------|-----|
| CP100, CP250                                                                                                                                                                         | Modbus RTU (RS-485) | Growatt CP100-CP250              |     |
| CP500, CP630, CP850, CP1000, CP1700, CP2000, CP2520                                                                                                                                  | Modbus RTU (RS-485) | Growatt CP500-CP2520             |     |
| MIN 2500TL-X to 6000TL-X<br>MIN 2500TL-XE to 6000TL-XE<br>MID 15KTL3-x to 40KTL3-X<br>MAC 15KTL3-XL to 36KTL3-XL<br>MAC 30KTL3-X LV to 60KTL3-X LV<br>MAC 50KTL3-X MV to 70KTL3-X MV | Modbus RTU (RS-485) | Growatt MAC, MAX and MID series* |     |

| Growatt                                                                                                | Interface           | PV protocol         | COC |
|--------------------------------------------------------------------------------------------------------|---------------------|---------------------|-----|
| MAX 50KTL3-X LV to 125KTL3-X LV<br>MAX 60KTL3-X MV to 100KTL3-X MV<br>MAX 185KTL3-X HV to 253KTL3-X HV |                     |                     |     |
| 10000UE/12000UE/18000UE/<br>20000UE                                                                    | Modbus RTU (RS-485) | Growatt UE-series** |     |

**NOTE** \* *Tx min interval* (parameter 7760) must be at least 0.85 s. Growatt recommends 1 s.

**NOTE** \*\* Previously Growatt.

### 3.1.15 Havells

| Havells  | Interface           | PV protocol        | COC |
|----------|---------------------|--------------------|-----|
| 1-40kW   | Modbus RTU (RS-485) | Havells 1-40kW*    |     |
| 50-70kW  | Modbus RTU (RS-485) | Havells 50-70kW*   |     |
| 80-136kW | Modbus RTU (RS-485) | Havells 80-136kW** |     |

**NOTE** \* For 1-40kW and 50-70kW, the *Tx write fnc* (parameter = ASC-4 Solar: 7564, ASC 150 Solar: 7564, AGC 150 Hybrid: 17324) must be **Single register 0x06**. To use broadcast, the inverter firmware must be at least 2.40. The *RTU broadcast ID* (parameter = ASC-4 Solar: 7515, ASC 150 Solar: 7553, AGC 150 Hybrid: 17313) must be **Enabled** and set to **136**.

**NOTE** \*\* For 80-136kW, the *Tx write fnc* (parameter = ASC-4 Solar: 7564, ASC 150 Solar: 7564, AGC 150 Hybrid: 17324) must be **Multiple register 0x10**. To use broadcast, the inverter firmware must be at least 2.40. The *RTU broadcast ID* (parameter = ASC-4 Solar: 7515, ASC 150 Solar: 7553, AGC 150 Hybrid: 17313) must be **Enabled** and set to **0**.

### 3.1.16 HiQ

| HiQ        | Interface           | PV protocol          | COC |
|------------|---------------------|----------------------|-----|
| Truestring | Modbus RTU (RS-485) | HiQ solar truestring |     |

### 3.1.17 Hypontech (海鹏)

| Hypontech   | Interface           | PV protocol  | COC |
|-------------|---------------------|--------------|-----|
| HPS Series* | Modbus RTU (RS-485) | Hypontech PV |     |
| HPT Series* | Modbus RTU (RS-485) | Hypontech PV |     |

**NOTE** \* Broadcast not supported.

### 3.1.18 Huawei (华为)

| Huawei*                           | Interface           | PV protocol        | COC |
|-----------------------------------|---------------------|--------------------|-----|
| Smartlogger                       | Modbus TCP          | Huawei smartlogger |     |
| SUN2000-2KTL-L0/-L1               | Modbus RTU (RS-485) | Huawei V.3         |     |
| SUN2000-3KTL-CNL0/-L0/-L1/-M0/-M1 | Modbus RTU (RS-485) | Huawei V.3         |     |
| SUN2000-3.68KTL-L10               | Modbus RTU (RS-485) | Huawei V.3         |     |

| Huawei*                                    | Interface           | PV protocol | COC |
|--------------------------------------------|---------------------|-------------|-----|
| SUN2000-3.8KTL-USL0                        | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-4KTL-CNL0/-L0/-L1/-M0/-M1          | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-4.6KTL-L1                          | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-4.95KTL-JPL0/-JPL1                 | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-5KTL-CNL0/-L0/-L1/-M0/-M1/-USL0    | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-6KTL-CNL0/-L1/-M0/-M1              | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-7.6KTL-USL0                        | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-8KTL/-M0/-M1/-M2                   | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-9KTL-USL0                          | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-10KTL/-M0/-M1/-M2/-USL0            | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-11.4KTL-USL0                       | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-12KTL/-M0/-M1/-M2                  | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-15KTL/-M0/-M2/-M3                  | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-17KTL/-M0/-M2/-M3                  | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-20KTL/-M0/-M2/-M3                  | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-22KTL-US                           | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-23KTL/-M3                          | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-24.5KTL/-M3                        | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-24.7KTL-JP                         | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-25KTL-NAM3/-US                     | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-28KTL/-M3                          | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-29.9KTL/-M3                        | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-30KTL-A/-M3/-NAM3/-US              | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-33KTL/-A/-E001/-JP/-NAM3/-NHM3/-US | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-33KTL/-A/-E001/-JP/-NAM3/-NHM3/-US | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-36KTL/-M3/-NAM3/-US                | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-40KTL/-JP/-M3/-NAM3/-NHM3/-US      | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-42KTL/-M3                          | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-43KTL-IN-C1/-INM3                  | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-44KTL-M3                           | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-45KTL/-US-HV-D0                    | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-50KTL/-C1/-JPM0/-JPM1/-M0/-M3      | Modbus RTU (RS-485) | Huawei V.3  |     |
| SUN2000-55KTL-HV-D1/-HV-D1-001/-IN-HV-D1   | Modbus RTU (RS-485) | Huawei V.3  |     |

| Huawei*                                       | Interface           | PV protocol                  | COC |
|-----------------------------------------------|---------------------|------------------------------|-----|
| SUN2000-60KTL-HV-D1/-HV-D1-001/-M0            | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-63KTL-JPH0/-JPM0                      | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-65KTL-M0                              | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-70KTL-C1/-INM0                        | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-75KTL-C1                              | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-90KTL-H0/-H1/-H2                      | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-95KTL-INH0/-INH1                      | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-100KTL-H0/-H1/-H2/-INM0/-M0/-M1/-USH0 | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-105KTL-H1                             | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-110KTL-M0                             | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-125KTL-JPH0/-M0                       | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-168KTL-H1                             | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-175KTL-H0                             | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-185KTL-H1/-INH0                       | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-193KTL-H0                             | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-196KTL-H0/-H1/-H3                     | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-200KTL-H2                             | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000-215KTL-H0                             | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000L-2KTL                                 | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000L-3KTL/-CN/-CN-4G                      | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000L-3.68KTL                              | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000L-4KTL/-CN/-CN-4G                      | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000L-4.125KTL-JP                          | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000L-4.6KTL                               | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000L-4.95KTL-JP                           | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000L-5KTL/-CN/-CN-4G                      | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN8000-500KTL                                | Modbus RTU (RS-485) | Huawei V.3                   |     |
| SUN2000 8-28KTL                               | Modbus RTU (RS-485) | Huawei SUN2000 8-28KTL*      |     |
| SUN2000 33-40KTL                              | Modbus RTU (RS-485) | Huawei SUN2000 33-40KTL*     |     |
| SUN2000 50-60KTL                              | Modbus RTU (RS-485) | Huawei SUN2000 50-60KTL*     |     |
| SUN2000 55-60KTL                              | Modbus RTU (RS-485) | Huawei SUN2000 55-60KTL*     |     |
| SUN2000 90-105                                | Modbus RTU (RS-485) | Huawei SUN2000 90-105KTL*    |     |
| SUN2000 100-125KTL                            | Modbus RTU (RS-485) | Huawei SUN2000 100-125M0-M2* |     |

**NOTE** If the inverters have the latest software, use the **Huawei V.3** protocol. For older software, you may need to use one of the protocols marked with a star.

### 3.1.19 Ingeteam

| Ingeteam          | Interface           | PV protocol          | COC |
|-------------------|---------------------|----------------------|-----|
| SUN 10 TL         | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 10 TL M       | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 15 TL         | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 15 TL M       | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 20 TL         | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 20 TL M       | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 33 TL         | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 33 TL M       | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 40 TL M480    | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 100 TL (360V) | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 100 TL (380V) | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 100 TL (400V) | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 100 TL (420V) | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |
| SUN 100 TL (440V) | Modbus RTU (RS-485) | Ingeteam 3Play - ABI | ●   |

**NOTE** *Ingeteam 3Play - ABI* previously called *Ingeteam 3Play*.

| Ingeteam/Ingecon | Interface           | PV protocol          | COC |
|------------------|---------------------|----------------------|-----|
| SUN 100 TL       | Modbus RTU (RS-485) | Ingeteam 3Play - ABS |     |
| SUN 160 TL M     | Modbus RTU (RS-485) | Ingeteam 3Play - ABS |     |

### 3.1.20 INVT

| INVT                                            | Interface           | PV protocol    | COC |
|-------------------------------------------------|---------------------|----------------|-----|
| iMars BG                                        | Modbus RTU (RS-485) | INVT BG series |     |
| XG 15-25kW Three-Phase On-Grid Solar Inverter   | Modbus RTU (RS-485) | INVT XG series |     |
| XG 25-40kW Three-Phase On-Grid Solar Inverter   | Modbus RTU (RS-485) | INVT XG series |     |
| XG 50-70kW Three-Phase On-Grid Solar Inverter   | Modbus RTU (RS-485) | INVT XG series |     |
| XG 100-136kW Three-Phase On-Grid Solar Inverter | Modbus RTU (RS-485) | INVT XG series |     |

### 3.1.21 Kaco

| Kaco                     | Interface      | PV protocol     | COC |
|--------------------------|----------------|-----------------|-----|
| Blueplanet 5.0-10.0 TL3* | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 15.0 TL3*     | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 20.0 TL3*     | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 50.0 TL3      | Modbus UDP/TCP | SunSpec Generic | ●   |

| Kaco                   | Interface      | PV protocol     | COC |
|------------------------|----------------|-----------------|-----|
| Blueplanet 60.0 TL3    | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 87.0 TL3    | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 92.0 TL3    | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 105 TL3     | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 125 TL3     | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 137 TL3     | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 150.0 TL3   | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 155 TL3     | Modbus UDP/TCP | SunSpec Generic | ●   |
| Blueplanet 165 TL3     | Modbus UDP/TCP | SunSpec Generic | ●   |
| Powador 18.0-20.0 TL3* | Modbus UDP/TCP | SunSpec Generic | ●   |
| Powador 60.0 TL3*      | Modbus UDP/TCP | SunSpec Generic | ●   |

**NOTE** \* These models are no longer available.

### 3.1.22 Kehua (科华)

| Kehua               | Interface                                             | PV protocol | COC |
|---------------------|-------------------------------------------------------|-------------|-----|
| SPI320K-B-H series  | Modbus 485 (Standard)<br>Modbus TCP (Option required) | Kehua SPI   |     |
| SPI250K-B-H series  | Modbus 485 (Standard)<br>Modbus TCP (Option required) | Kehua SPI   |     |
| SPI125K-B series    | Modbus 485 (Standard)<br>Modbus TCP (Option required) | Kehua SPI   |     |
| SPI33K-B X2 series  | Modbus 485 (Standard)<br>Modbus TCP (Option required) | Kehua SPI   |     |
| SPI23K-B X2 series  | Modbus 485 (Standard)<br>Modbus TCP (Option required) | Kehua SPI   |     |
| SPI12K-B X2 series  | Modbus 485 (Standard)<br>Modbus TCP (Option required) | Kehua SPI   |     |
| SP18000-B X2 series | Modbus 485 (Standard)<br>Modbus TCP (Option required) | Kehua SPI   |     |

### 3.1.23 Kostal

| Kostal     | Interface  | PV protocol     | COC |
|------------|------------|-----------------|-----|
| PIKO IQ    | Modbus TCP | SunSpec Generic |     |
| PLENTICORE | Modbus TCP | SunSpec Generic |     |

### 3.1.24 Kstar (科士达)

| Kstar   | Interface           | PV protocol | COC |
|---------|---------------------|-------------|-----|
| KSG1-60 | Modbus RTU (RS-485) | KStar       |     |

### 3.1.25 LIVOLTEK (利沃得)

| LIVOLTEK | Interface           | PV protocol      | COC |
|----------|---------------------|------------------|-----|
| GT1      | Modbus RTU (RS-485) | LIVOLTEK SunSpec |     |
| GT3      | Modbus RTU (RS-485) | LIVOLTEK SunSpec |     |

### 3.1.26 Matter Energy

| Matter Energy   | Interface                         | PV protocol               | COC |
|-----------------|-----------------------------------|---------------------------|-----|
| SPI 20k to 160k | Modbus RTU (RS-485) or Modbus TCP | Matter Energy SPI20k-160k |     |

### 3.1.27 Meteocontrol

| Meteocontrol | Interface                         | PV protocol | COC |
|--------------|-----------------------------------|-------------|-----|
| blue'Log XC  | Modbus RTU (RS-485) or Modbus TCP | Bluelog XC  |     |

### 3.1.28 Polycab

| Polycab | Interface           | PV protocol     | COC |
|---------|---------------------|-----------------|-----|
| 50-60kW | Modbus RTU (RS-485) | Polycab 50-60kW |     |

### 3.1.29 Power One

| Power One   | Interface           | PV protocol | COC |
|-------------|---------------------|-------------|-----|
| SGTU1K-100K | Modbus RTU (RS-485) | Power One   |     |

### 3.1.30 Refusol

| Refusol         | Interface           | PV protocol     | COC |
|-----------------|---------------------|-----------------|-----|
| 8-23K (kW only) | Modbus RTU (RS-485) | SunSpec Generic |     |
| 100K            | Modbus RTU (RS-485) | SunSpec Generic |     |

### 3.1.31 SAJ (三晶)

| SAJ       | Interface           | PV protocol | COC |
|-----------|---------------------|-------------|-----|
| R5 Series | Modbus RTU (RS-485) | SAJ C6      |     |
| R6 Series | Modbus RTU (RS-485) | SAJ C6      |     |
| C6 Series | Modbus RTU (RS-485) | SAJ C6      |     |

### 3.1.32 Schneider

| Schneider | Interface           | PV protocol               | COC |
|-----------|---------------------|---------------------------|-----|
| CL 20E    | Modbus RTU (RS-485) | Schneider Conext CL 20/25 | ●   |
| CL 25E    | Modbus RTU (RS-485) | Schneider Conext CL 20/25 | ●   |

| Schneider  | Interface           | PV protocol                | COC |
|------------|---------------------|----------------------------|-----|
| CL 25 NA   | Modbus RTU (RS-485) | Schneider Conext CL 20/25  | ●   |
| CL 30*     | Modbus RTU (RS-485) | Schneider CL 30/33/50/60   | ●   |
| CL 33*     | Modbus RTU (RS-485) | Schneider CL 30/33/50/60   | ●   |
| CL 36E*    | Modbus RTU (RS-485) | Schneider CL 30/33/50/60** | ●   |
| CL 50*     | Modbus RTU (RS-485) | Schneider CL 30/33/50/60   | ●   |
| CL 60 A/E* | Modbus RTU (RS-485) | Schneider CL 30/33/50/60** | ●   |

**NOTE** \* For the Schneider CL30-50 update, new CL inverters will be introduced, and old ones will be terminated. PV protocol previously *Schneider Conext CL 30/33/50/60*.

**NOTE** \*\* Previously *Schneider Conext CL 60*.

### 3.1.33 Sineng (上能)

| Sineng         | Interface | PV protocol   | COC |
|----------------|-----------|---------------|-----|
| SP-320K series | RS-485    | Sineng SP320K |     |

### 3.1.34 SMA

| SMA                                         | Interface           | PV protocol              | COC |
|---------------------------------------------|---------------------|--------------------------|-----|
| Cluster controller                          | Modbus TCP          | SMA cluster controller   |     |
| EDML-10 (SMA Data Manager L)                | Modbus TCP          | SMA Data Manager*        |     |
| EDMM-10 (SMA Data Manager M)                | Modbus TCP          | SMA Data Manager*        |     |
| EDMM-US-10 (SMA Data Manager M)             | Modbus TCP          | SMA Data Manager*        |     |
| EDML-10.A (SMA Data Manager M Lite)         | Modbus TCP          | SMA Data Manager*        |     |
| Core1                                       | Modbus UDP/TCP      | SunSpec Generic          |     |
| Core2                                       | Modbus UDP/TCP      | SunSpec Generic          |     |
| FSC                                         | Modbus TCP          | SMA FSC                  |     |
| SHP 75                                      | Modbus TCP          | SunSpec Generic          |     |
| SMA inverter with firmware v2.82 or earlier | Modbus RTU (RS-485) | SMA SunSpec before v2.82 |     |
| Solid Q50-60                                | Modbus RTU (RS-485) | SMA Solid-Q 50           |     |
| Solid-Q PRO 60                              | Modbus RTU (RS-485) | SMA Solid-Q PRO 60       |     |
| STP 5000-12000 TL                           | Modbus UDP/TCP      | SunSpec Generic          |     |
| STP 20000-25000 TL                          | Modbus UDP/TCP      | SunSpec Generic          |     |
| STP 60                                      | Modbus UDP/TCP      | SunSpec Generic          |     |

**NOTE** \* The DEIF controller cannot control the reactive power in the AC output for this protocol. The reactive power must be set up from the SMA Data Manager's web interface.

### 3.1.35 Sofar Solar (首航)

| Sofar Solar             | Interface           | PV protocol          | COC |
|-------------------------|---------------------|----------------------|-----|
| SOFAR 1000 to 3000TL    | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 10 to 20KTL       | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 30 to 40KTL       | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 50 to 70KTL       | Modbus RTU (RS-485) | Sofar Solar 50-70kW* |     |
| SOFAR 75 to 136KTL      | Modbus RTU (RS-485) | Sofar Solar 80-136kW |     |
| SOFAR 3 to 6KTLM        | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 7.5KTLM           | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 3 to 6KTLM-G2     | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 10 to 15KTL-G2    | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 20 to 33KTL-G2    | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 30 to 40KTL-G2    | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 50 to 70KTL-G2    | Modbus RTU (RS-485) | Sofar Solar 50-70kW* |     |
| SOFAR 1100 to 3300TL-G3 | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| SOFAR 3.3 to 12KTL-X    | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |

**NOTE** \* Tx write *fnc* (ASC-4 parameter 7564, AGC 150 parameter 17324) must be **Single register 0x06**. To use broadcast, the inverter firmware must be at least 2.40. *Broadcast ID* (ASC-4 parameter 7515, AGC 150 parameter 17313) must be **Enabled** and set to **136**.

| Sofar Solar                | Interface           | PV protocol | COC |
|----------------------------|---------------------|-------------|-----|
| SOFAR 15-24KTLX-G3 series  | Modbus RTU (RS-485) | Sofar -G3   |     |
| SOFAR 25K-50KTLX-G3 series | Modbus RTU (RS-485) | Sofar -G3   |     |
| SOFAR 80KTLX-G3 series     | Modbus RTU (RS-485) | Sofar -G3   |     |

### 3.1.36 SolarEdge

| SolarEdge | Interface           | PV protocol   | COC |
|-----------|---------------------|---------------|-----|
| SE17.3K   | Modbus RTU (RS-485) | SolarEdge     |     |
| SE27.6K   | Modbus RTU (RS-485) | SolarEdge     |     |
| SE33.3K   | Modbus RTU (RS-485) | SolarEdge     |     |
| SE55.5K   | Modbus RTU (RS-485) | SolarEdge     |     |
| SE66.6K   | Modbus RTU (RS-485) | SolarEdge     |     |
| SE82.8K   | Modbus RTU (RS-485) | SolarEdge     |     |
| SE100K    | Modbus RTU (RS-485) | SolarEdge     |     |
| SE120K    | Modbus RTU (RS-485) | SolarEdge     |     |
| PPC       | Modbus RTU (RS-485) | SolarEdge PPC |     |

### 3.1.37 SolaX Power

| SolaX Power | Interface           | PV protocol            | COC |
|-------------|---------------------|------------------------|-----|
| X3 FORTH    | Modbus RTU (RS-485) | Solax X3-FORTH/MEGA G2 |     |
| X3 MEGA G2  | Modbus RTU (RS-485) | Solax X3-FORTH/MEGA G2 |     |
| X3 MIC G2   | Modbus RTU (RS-485) | Solax MIC-G2/Pro-G2    |     |
| X3 PRO G2   | Modbus RTU (RS-485) | Solax MIC-G2/Pro-G2    |     |

### 3.1.38 Solis (锦浪(海外版))

| Solis (Ginlong)        | Interface                         | PV protocol       | COC |
|------------------------|-----------------------------------|-------------------|-----|
| Grid-tied inverters    | Modbus RTU (RS-485)*              | Solis (Ginlong)   |     |
| Grid-tied inverters    | Modbus RTU (RS-485)*              | Solis Logger      |     |
| Solis Logger NISE-610E | Modbus RTU (RS-485) or Modbus TCP | Solis Logger NISE |     |

**NOTE** \* Solis broadcast only works with newer Solis software.

### 3.1.39 Sungrow (阳光)

| Sungrow             | Interface                             | PV protocol         | COC |
|---------------------|---------------------------------------|---------------------|-----|
| COM100E             | Modbus RTU (RS-485) or Modbus UDP/TCP | Sungrow Logger 1000 |     |
| SunGrow Logger 2000 | Modbus RTU (RS-485) or Modbus TCP/IP  | Sungrow Logger 1000 |     |
| SunGrow Logger 4000 | Modbus RTU (RS-485) or Modbus TCP/IP  | Sungrow Logger 1000 |     |
| SunGrow Series      | Modbus RTU (RS-485)                   | Sungrow SG series*  |     |

**NOTE** \* In AGC 150 Hybrid, this is *Sungrow SG10\_60*.

### 3.1.40 Thea

| Thea | Interface           | PV protocol | COC |
|------|---------------------|-------------|-----|
| Thea | Modbus RTU (RS-485) | Thea        |     |

### 3.1.41 Vacon

| Vacon      | Interface           | PV protocol | COC |
|------------|---------------------|-------------|-----|
| Vacon 8000 | Modbus RTU (RS-485) | Vacon8000   |     |

### 3.1.42 Yaskawa

| Yaskawa         | Interface                         | PV protocol     | COC |
|-----------------|-----------------------------------|-----------------|-----|
| PVI 25TL-208    | Modbus RTU (RS-485) or Modbus TCP | SunSpec Generic |     |
| PVI 36TL-480-V2 | Modbus RTU (RS-485) or Modbus TCP | SunSpec Generic |     |
| PVI 50TL-480    | Modbus RTU (RS-485) or Modbus TCP | SunSpec Generic |     |
| PVI 60TL-480    | Modbus RTU (RS-485) or Modbus TCP | SunSpec Generic |     |

### 3.1.43 ZCS Azzurro

| ZCS Azzurro                    | Interface           | PV protocol          | COC |
|--------------------------------|---------------------|----------------------|-----|
| AZZURRO 1PH 1100TL-3000TL-V1   | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 1PH 1100-3300TL-V3     | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 1PH 3000-6000-V1       | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 3PH 10KTL-20KTL-V1     | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 3PH 30KTL-40-HV-V1     | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 3PH 3.3KTL-12KTL-V1    | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 1PH 3000-6000-V2       | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 3PH 20KTL-33KTL-V2     | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 3PH 10KTL-15KTL-V2     | Modbus RTU (RS-485) | Sofar Solar 1-40kW*  |     |
| AZZURRO 3PH 50KTL-70KTL-HV-V1  | Modbus RTU (RS-485) | Sofar Solar 50-70kW* |     |
| AZZURRO 3PH 80KTL-LV to 136-HV | Modbus RTU (RS-485) | Sofar Solar 80-136kW |     |

**NOTE** \* Tx write *fnc* (ASC-4 parameter 7564, AGC 150 parameter 17324) must be **Single register 0x06**. To use broadcast, the inverter firmware must be at least 2.40. *Broadcast ID* (ASC-4 parameter 7515, AGC 150 parameter 17313) must be **Enabled** and set to **136**.

## 4. Weather stations

### 4.1 Compatible weather stations and forecast systems

#### Weather stations

The weather stations are compatible with **iE 150 Solar**, **iE 150 Marine Solar**, **ASC 150 Solar** and **ASC-4 Solar** (parameter 7661). They are also compatible with **iE 150 Hybrid genset** and **AGC 150 Hybrid genset** (parameter 17422).

| Maker        | Type                                          | Interface           | ASC Weather prot.   |
|--------------|-----------------------------------------------|---------------------|---------------------|
| ABB          | TRIO VSN800                                   | Modbus RTU (RS-485) | ABBTRIO VSN800      |
| Delta        | GHI sensor Modbus                             | Modbus RTU (RS-485) | Delta Ohm           |
| Kipp & Zonen | RT1 Smart Rooftop Monitoring System           | Modbus RTU (RS-485) | Kipp and Zonen RT1  |
| Seven Sensor | Seven Sensor 3S                               | Modbus RTU (RS-485) | Seven Sensor 3S     |
| Seven Sensor | Seven Sensor 3S-TP GHI-Thermopile Pyranometer | Modbus RTU (RS-485) | Seven Sensor 3S-TP  |
| Seven Sensor | Seven Sensor 3S-CWS                           | Modbus RTU (RS-485) | Seven Sensor 3S-CWS |

#### Forecast systems

The forecast systems are compatible with **ASC-4 Solar**.

| Maker     | Type       | Interface  | ASC Forecast prot. (7631) |
|-----------|------------|------------|---------------------------|
| Reuniwatt | SkyInSight | Modbus TCP | Reuniwatt SkyInSight      |
| SteadySun | SteadyEye  | Modbus TCP | SteadySun SteadyEye       |

## 5. Power measurements

### 5.1 Power meter and genset controllers

Power measurements are required in single controller applications, as well as in open PMS applications. **iE 150 Battery**, **iE 150 Marine Battery**, **iE 150 Solar**, **iE 150 Marine Solar**, **ASC 150 Storage**, **ASC 150 Solar**, **ASC-4 Battery** and **ASC-4 Solar** controllers can receive measurements from compatible power meters, or compatible genset controllers.

Compatible power meters include these DEIF power meters:

- **MIB 8000C Multi-instrument** ([www.deif.com/products/mib-8000c](http://www.deif.com/products/mib-8000c))
- **MIC-2 MKII Multi-instrument** ([www.deif.com/products/mic-2-mkii](http://www.deif.com/products/mic-2-mkii))
- **MTR-4 Multi-transducer** ([www.deif.com/products/mtr-4](http://www.deif.com/products/mtr-4))

If your power meter or genset controller is not on the list, you can select the *Configurable power meter* protocol. You can then use the USW to set up the controller to use Modbus to read values from your power meter or genset controller. The DEIF controller can read P, Q, and up to four digital inputs.

### 5.2 Compatible power meters

The DEIF power meter system interface is Modbus RTU (RS-485). For ASC-4, you need option H2.8.

Use parameter 7721 to select the meter protocol for genset power, 7723 for PV/ESS power, and 7725 for mains power.

| Meter                      | Meter protocol            | P | Q | Breaker feedback | Notes                                                                                                                                                         |
|----------------------------|---------------------------|---|---|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ABB A43/44                 | ABB A43/A44               | ● | ● | -                |                                                                                                                                                               |
| ABB SACE Emax 2 protocol   | ABB SACE Emax 2           | ● | ● | ●                |                                                                                                                                                               |
| Accuenergy Acuvim-L series | Accuvim-L                 | ● | ● | -                |                                                                                                                                                               |
| Acrel ADL                  | Acrel ADL                 | ● | ● | ●                |                                                                                                                                                               |
| Configurable power meter   | Configurable power meter* | ● | ● | ●                | You can use the USW to set up the controller to use Modbus to read values from your power meter. The controller can read P, Q, and up to four digital inputs. |
| Diris A40                  | Socomec Diris A40         | ● | ● | -                |                                                                                                                                                               |
| Eastron Smart X96          | Eastron Smart X96         | ● | ● | -                |                                                                                                                                                               |
| Eastron Smart X96-5G       | Eastron Smart X96 with DI | ● | ● | ●                |                                                                                                                                                               |
| Eastron SDM630MCT series   | Eastron SDM630MCT         | ● | ● | -                |                                                                                                                                                               |
| EM6400                     | Schneider EM6400          | ● | ● | -                |                                                                                                                                                               |
| EDMI Genius                | EDMI                      | ● | ● | -                |                                                                                                                                                               |
| EDS MMCT3                  | EDS-MMCT3-E-C             | ● | ● | -                |                                                                                                                                                               |
| iEM3000                    | Schneider iEM3000         | ● | - | -                |                                                                                                                                                               |
| iEM6400                    | Schneider EM6400          | ● | ● | -                |                                                                                                                                                               |
| Mavolog Pro                | Gossen                    | ● | ● | -                |                                                                                                                                                               |
| MIB 7000                   | DEIF MIB7000C             | ● | ● | -                | This power meter is being phased out.                                                                                                                         |
| MIB 8000C                  | DEIF MIB8000              | ● | ● | ●                |                                                                                                                                                               |

| Meter                       | Meter protocol              | P | Q | Breaker feedback | Notes                                  |
|-----------------------------|-----------------------------|---|---|------------------|----------------------------------------|
| MIC-2 MK II                 | DEIF MIC-2                  | ● | ● | ●                |                                        |
| MIC (MIC4002)               | DEIF MIC4000                | ● | ● | ●                | This power meter is being phased out.  |
| MIC (MIC4224)               | DEIF MIC4000                | ● | ● | ●                | This power meter is being phased out.  |
| MTR-3                       | DEIF MTR-3/4                | ● | ● | -                | This power meters is being phased out. |
| MTR-4                       | DEIF MTR-3/4                | ● | ● | -                | Previously MTR-3.                      |
| Multis L40                  | Socomec Multis L40          | ● | ● | -                |                                        |
| PM2200 and PM5560           | Schneider PM5560            | ● | ● | -                |                                        |
| PMU-100                     | APS PMU-100                 | ● | ● | -                |                                        |
| Secure Elite 100/300 series | Secure Elite 100/300 series | ● | ● | -                | Previously Secure Elite XXX series.    |
| Secure Elite 440/500 series | Secure Elite 440/500 series | ● | ● | -                | Previously Secure Elite XXX series.    |

**NOTE** \* Only available for iE 150 Battery, iE 150 Marine Battery, iE 150 Solar, iE 150 Marine Solar, ASC 150 Solar, and ASC 150 Storage.

## 5.3 Compatible genset controllers

In single controller applications, **iE 150 Battery**, **iE 150 Marine Battery**, **iE 150 Solar**, **iE 150 Marine Solar**, **ASC 150 Storage**, **ASC 150 Solar**, **ASC-4 Battery** and **ASC-4 Solar** can get power measurements from a genset controller.

The DEIF power meter system interface is Modbus RTU (RS-485). For ASC-4, you need option H2.8.

Use parameter 7721 to select the meter protocol for genset power.

Use parameter 7725 to select the meter protocol for Mains power.

| Meter                         | Meter protocol                | P | Q | Breaker feedback |
|-------------------------------|-------------------------------|---|---|------------------|
| AGC-4 Mk II                   | DEIF Genset Control*          | ● | ● | ●*               |
| AGC-4**                       | DEIF Genset Control*          | ● | ● | ●*               |
| AGC 150                       | DEIF Genset Control*          | ● | ● | ●*               |
| iE 150                        | DEIF Genset Control*          | ● | ● | ●*               |
| CAT EMCP 4                    | CAT EMCP 4                    | ● | ● | ●                |
| CGC 400                       | DEIF Genset Control*          | ● | ● | ●*               |
| GPC-3                         | DEIF Genset Control*          | ● | ● | ●                |
| Cummins PC 3.x/PCC 3000       | Cummins PC 3.x/PCC 3000       | ● | ● | ●                |
| DSE 8xxx, 7xxx, 6xxx and 4xxx | DSE 8xxx, 7xxx, 6xxx and 4xxx | ● | ● | ●***             |
| Kohler APM403                 | Kohler APM403                 | ● | ● | ●                |

**NOTE** \* The battery/storage/solar controller reads the P, Q, and breaker feedbacks from the DEIF controller over an RS-485 connection.

**NOTE** \*\* This genset controller is being phased out.

**NOTE** \*\*\* The breaker feedback must be configured in the DSE controller.