DATA SHEET

Automatic Sustainable Controller
ASC-4

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1. ASC-4 Solar

1.1 Product information

The ASC-4 Solar is a controller designed to serve as a link between photovoltaic power plants and conventional power plants.


Minimum genset load

The ASC-4 Solar will in any operation mode automatically maximise sustainable power penetration, depending on the total load demand to the hybrid without compromising minimum genset load requirement.

This is to secure a certain amount of load on the gensets, eliminating the risk of reverse power situations and impure combustion and exhaust problems.

Spinning reserve

The ASC-4 Solar offers spinning reserve support as a percentage of the produced power, as part of an existing superior system (for instance an existing PLC system) or by means of short-term weather forecasting.

Ideal for self-consumption applications

While in grid parallel mode, the ASC-4 Solar is capable of feeding surplus PV energy to the grid and generate profit in accordance with grid operator feed-in tariffs. Alternatively, the ASC-4 Solar can regulate the PV production to match the self-consumption, thereby preventing any feed-in of PV power to the grid if prohibited by grid operator regulations.

Key features

- PV integration
- Self-consumption & IPP applications
- PV-genset-mains-energy storage system applications
- Minimum genset load requirement
- Spinning reserve generation
- Green & brown field applications
- Compatible with AGC-4, AGC 200, AGC 150, and ALC-4
- Power meter interfacing
- Inverter interfacing
- SunSpec support
- Forecast system interfacing
- Meteorological data representation
- Scalable & flexible
- Easy setup with free PC tool
- Plug & play HMI available

Hardware

DEIF-developed platform, manufactured in Denmark. Flexible configuration.

2. ASC-4 Battery

2.1 Product information

ASC-4 Battery, introduction

The ASC-4 Battery is designed to integrate electrical storage into hybrid power plants. It features a configurable charge scheme to determine charge/discharge levels as well as sources of energy which can be used for re-charging the battery.

The ASC-4 Battery can instruct all gensets to be stopped and supply the load from battery alone or in combination with sustainable power production.

Energy & power source

When acting as energy source (grid forming), the battery will seek to act as sole supplier without other sources connected. If the load level, battery capacity and state of charge conditions are fulfilled, the gensets are stopped. When battery is discharged or load increases beyond battery capacity, gensets will be reconnected.

When acting as a a power source (grid following), the battery is used as spinning reserve provider. The controller suppresses genset starts due to spinning reserve requested by the ASC-4 Solar.

AC- or DC-coupled

The ASC Battery is ideal for AC- as well as DC-coupled applications.

For AC-coupled systems, you can define battery charging and discharging scheme. Using the charge scheme, you'll also be able to define the energy sources (gensets, PV or mains) that you allow for charging purposes.

For DC-coupled systems, the battery is charged by its own PV bus and the controller is only responsible for the discharging scheme.

Key features

- Electrical storage integration
- Grid-tied and off-grid applications
- Micro-grid applications
- Grid-following and grid-forming mode
- AC- and DC-charged systems
- Configurable charge scheme
- Compatible with AGC-4, AGC 200, AGC 150 and ALC-4
- Spinning reserve provider
- PCS interfacing
- BMS interfacing
- Scalable & flexible
- Frequency response
- Easy setup with free PC tool

Hardware

DEIF-developed platform, manufactured in Denmark. Flexible configuration.

3. Applications

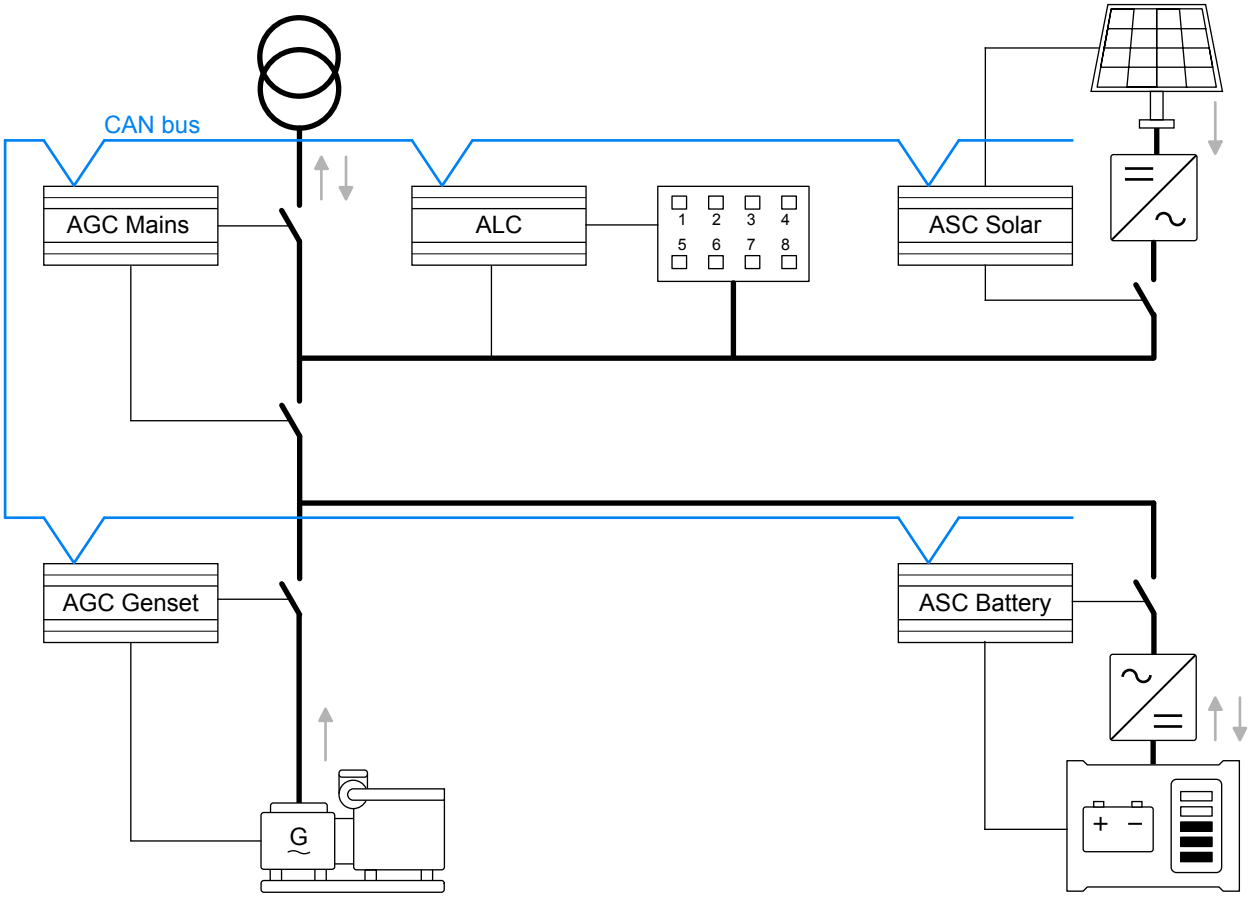
3.1 Grid-tied

The ASC-4 Solar and ASC-4 Battery controllers can integrate seamlessly into grid-tied applications using CAN bus communication.

The ASC-4 Solar can feed surplus PV energy to the grid, or charge the energy storage system (ESS). Alternatively, the ASC-4 Solar can regulate the PV production to match the self-consumption, thereby preventing any feed-in of PV power to the grid.

The ASC-4 Battery can use an ESS to take peak loads until generators are started. Alternatively the ASC-4 Battery can provide the spinning reserve for a PV-plant, thereby improving the green energy penetration to the grid.

Figure 3.1 Grid-tied application example



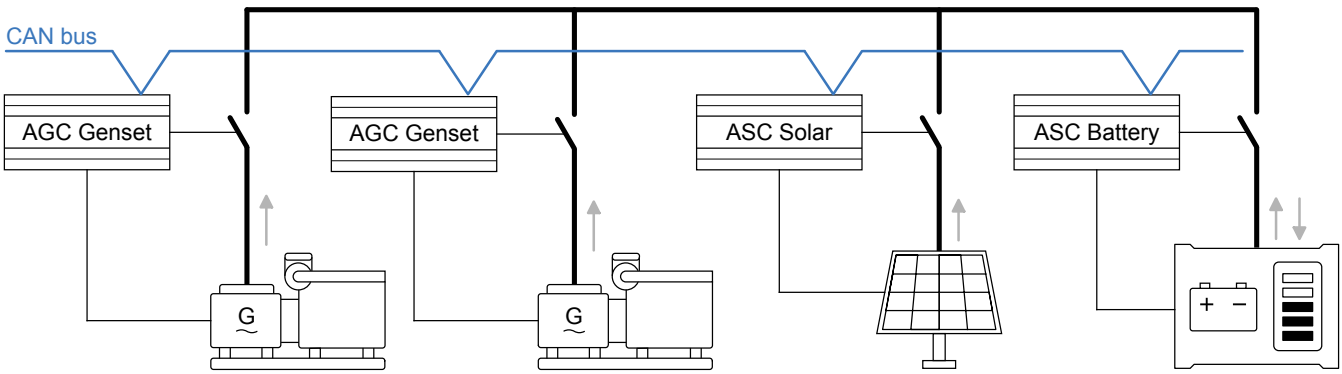
3.2 Off-grid

The ASC-4 Solar and ASC-4 Battery controllers provide flexibility for off-grid applications.

The ASC-4 Solar can work with AGC-4 and AGC 200 controllers to combine a PV power plant with a genset power plant. Alternatively the ASC-4 Solar can be stand-alone controller that calculates the power set points for the PV power plant based on power readings and breaker positions.

The ASC-4 Battery can supply peak loads while gensets start to improve power quality. If the ESS is designed to supply the busbar load, the ASC-4 Battery can work with AGC controllers to allow the ESS to be the only source connected to the busbar.

Figure 3.2 Off-grid application example



4. Technical information

4.1 Specifications and dimensions

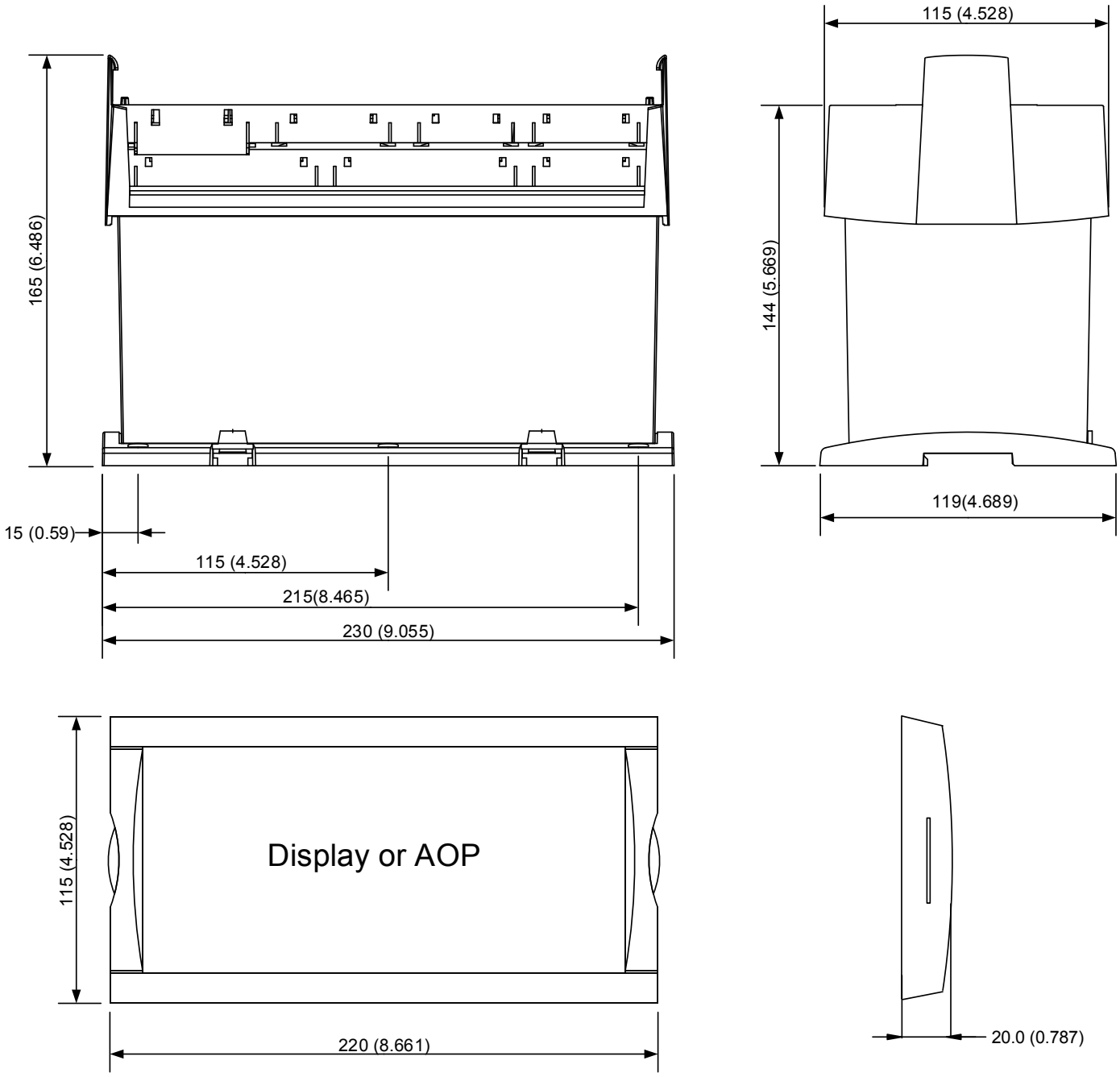
4.1.1 Technical specifications

Accuracy	Class 1.0 -25 to 15 to 30 to 70 °C Temperature coefficient: ±0.2 % of full scale per 10 °C Class 0.5 with option Q1 Averaged frequency: +/-10 mHz, 15 to 30 °C, 45 to 65 Hz Positive, negative and zero sequence alarms: Class 1 within 5 % voltage unbalance Class 1.0 for negative sequence current Fast over-current: 3 % of 350 %*In Analogue outputs: Class 1.0 according to total range Option EF4/EF5: Class 4.0 according to total range To IEC/EN 60688
Operating temperature	-25 to 70 °C (-13 to 158 °F) -25 to 60 °C (-13 to 140 °F) if Modbus TCP/IP (option N) is available in the controller (UL/cUL Listed: Max. surrounding air temperature: 55 °C/131 °F)
Storage temperature	-40 to 70 °C (-40 to 158 °F)
Climate	97 % RH to IEC 60068-2-30
Operating altitude	0 to 4000 m above sea level Derating 2001 to 4000 m above sea level: Max. 480 V AC phase-phase 3W4 measuring voltage Max. 690 V AC phase-phase 3W3 measuring voltage
Measuring voltage	100 to 690 V AC ±20 % (UL/cUL Listed: 600 V AC phase-phase) Consumption: Max. 0.25 VA/phase
Measuring current	-/1 or -/5 A AC (UL/cUL Listed: from CTs 1 to 5 A) Consumption: Max. 0.3 VA/phase
Current overload	4 × I_n continuously 20 × I_n, 10 sec (max. 75 A) 80 × I_n, 1 sec (max. 300 A)
Measuring frequency	30 to 70 Hz
Aux. supply	Terminals 1 and 2: 12/24 V DC nominal (8 to 36 V DC operational). Max. 11 W consumption Battery voltage measurement accuracy: ±0.8 V within 8 to 32 V DC, ±0.5 V within 8 to 32 V DC @ 20 °C Terminals 98 and 99: 12/24 V DC nominal (8 to 36 V DC operational). Max. 5 W consumption 0 V DC for 10 ms when coming from at least 24 V DC (cranking dropout) The aux. supply inputs are to be protected by a 2 A slow blow fuse. (UL/cUL Listed: AWG 24)
Digital inputs	Optocoupler, bi-directional ON: 8 to 36 V DC Impedance: 4.7 kΩ OFF: <2 V DC
Analogue inputs	-10 to +10 V DC: Not galvanically separated. Impedance: 100 kΩ (G3) 0(4) to 20 mA: Impedance 50 Ω. Not galvanically separated (M15.X)

Multi-inputs	0(4) to 20 mA: 0 to 20 mA, ±1 %. Not galvanically separated Digital: Max. resistance for ON detection: 100 Ω. Not galvanically separated Pt100/1000: -40 to 250 °C, ±1 %. Not galvanically separated. To IEC/EN60751 RMI: 0 to 1700 Ω, ±2 %. Not galvanically separated V DC: 0 to 40 V DC, ±1 %. Not galvanically separated
Relay outputs	Electrical rating: 250 V AC/30 V DC, 5 A. (UL/cUL Listed: 250 V AC/24 V DC, 2 A resistive load) Thermal rating @ 50 °C: 2 A: Continuously. 4 A: t_{on} = 5 sec, t_{off} = 15 sec (Unit status output: 1 A)
Open collector outputs	Supply: 8 to 36 V DC, max. 10 mA (terminal 20, 21, 22 (com))
Analogue outputs	0(4) to 20 mA and ±25 mA. Galvanically separated. Active output (internal supply). Load max. 500 Ω. (UL/cUL Listed: Max. 20 mA output) Update rate: Transducer output: 250 ms. Regulator output: 100 ms
Galvanic separation	Between AC voltage and other I/Os: 3250 V, 50 Hz, 1 min Between AC current and other I/Os: 2200 V, 50 Hz, 1 min Between analogue outputs and other I/Os: 550 V, 50 Hz, 1 min Between digital input groups and other I/Os: 550 V, 50 Hz, 1 min
Response times (delay set to min.)	**Busbar:** Over-/under-voltage: <50 ms Over-/under-frequency: <50 ms Voltage unbalance: <250 ms **Inverter:** Over-current: <250 ms Over-/under-voltage: <250 ms Over-/under-frequency: <350 ms Overload: <250 ms Digital inputs: <250 ms Emergency stop: <200 ms Multi-inputs: 800 ms Wire failure: <600 ms
Mounting	DIN rail mount or base mount with six M4 screws Tightening torque: 1.5 Nm for the six M4 screws (countersunk screws are not to be used)
Safety	To EN 61010-1, installation category (over-voltage category) III, 600 V, pollution degree 2 To UL 508 and CSA 22.2 no. 14-05, over-voltage category III, 600 V, pollution degree 2
EMC/CE	To EN 61000-6-2, EN 61000-6-4, IEC 60255-26
Vibration	3 to 13.2 Hz: 2 mm_{pp}. 13.2 to 100 Hz: 0.7 g. To IEC 60068-2-6 & IACS UR E10 10 to 58.1 Hz: 0.15 mm_{pp}. 58.1 to 150 Hz: 1 g. To IEC 60255-21-1 Response (class 2) 10 to 150 Hz: 2 g. To IEC 60255-21-1 Endurance (class 2) 3 to 8.15 Hz: 15 mmpp. 8.15 - 35 Hz 2g. To IEC 60255-21-3 Seismic (class 2)
Shock (base mount)	10 g, 11 ms, half sine. To IEC 60255-21-2 Response (class 2) 30 g, 11 ms, half sine. To IEC 60255-21-2 Endurance (class 2) 50 g, 11 ms, half sine. To IEC 60068-2-27
Bump	20 g, 16 ms, half sine. To IEC 60255-21-2 (class 2)
Material	All plastic materials are self-extinguishing according to UL94 (V1)

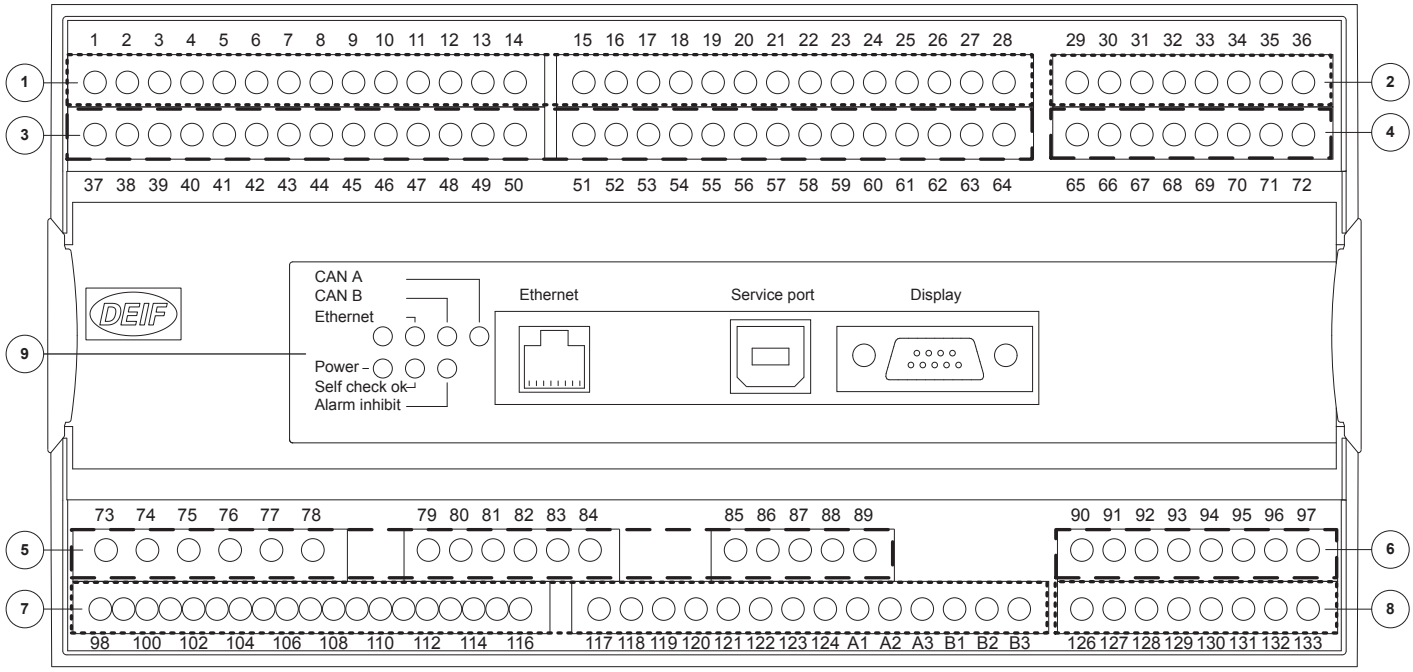
Plug connections	AC current: 0.2 to 4.0 mm^2 stranded wire. (UL/cUL Listed: AWG 18) AC voltage: 0.2 to 2.5 mm^2 stranded wire. (UL/cUL Listed: AWG 20) Relays: (UL/cUL Listed: AWG 22) Terminals 98-116: 0.2 to 1.5 mm^2 stranded wire. (UL/cUL Listed: AWG 24) Other: 0.2 to 2.5 mm^2 stranded wire. (UL/cUL Listed: AWG 24) Tightening torque: 0.5 Nm (5-7 lb-in) Display: 9-pole D-sub female Tightening torque: 0.2 Nm Service port: USB A-B	
Protection	Unit: IP20. Display: IP40 (IP54 with gasket: Option L). (UL/cUL Listed: Type Complete Device, Open Type). To IEC/EN 60529	
Approvals	UL/cUL Listed to UL508 Applies to VDE-AR-N 4105 See www.deif.com for the most recent approvals.	
UL markings	Wiring: Use 60/75 °C copper conductors only Mounting: For use on a flat surface of type 1 enclosure Installation: To be installed in accordance with the NEC (US) or the CEC (Canada) **AOP-2:** Maximum ambient temperature: 60 °C Wiring: Use 60/75 °C copper conductors only Mounting: For use on a flat surface of type 3 (IP54) enclosure. Main disconnect must be provided by installer Installation: To be installed in accordance with the NEC (US) or the CEC (Canada) **DC/DC converter for AOP-2:** Wire size: AWG 22-14 Tightening torque: 0.5 Nm (4.4 lb-in) Panel door mounting: 0.7 Nm D-sub screw: 0.2 Nm	
Supported inverters	**Solar** ABB EVVO solar Goodwe Schnieder Sungrow	Delta RPI Gamesa Huawei SMA SunSpec
	Battery Aggreko Qinous Sungrow	Enerflow SMA Tesla
	See **Common functions > Communication protocols** in the **Designer's reference handbook** for a list of supported communication protocols.	
Weight	Base unit: 1.6 kg (3.5 lbs) Option J1/J4/J6/J7: 0.2 kg (0.4 lbs) Option J2: 0.4 kg (0.9 lbs) Option J8: 0.3 kg (0.58 lbs) Display: 0.4 kg (0.9 lbs)	

4.1.2 Unit dimensions in mm (inches)



5. Hardware, software and options

5.1 Hardware, software and options, ASC-4 controller



(1) : The numbers in the drawing above refer to the slot numbers indicated in the table below.

Slot #	Option/standard	Description
1		**Terminal 1-28, power supply**
	Standard	8 to 36 V DC supply, 11 W; 1 × status output relay; 5 × relay outputs; 2 × pulse outputs (kWh, kvarh or configurable open collector outputs); 5 × digital inputs
2		**Terminal 29-36, communication**
	Standard (H2.2)	Modbus RTU (RS-485). Can work as slave or as master for inverter comm.
	M13.2	7 × binary inputs
	M14.2	4 × relay outputs
3		**Terminal 37-64, inputs/outputs**
	M12	13 × digital inputs; 4 × relay outputs
4		**Terminal 65-72, inputs/outputs**
	E2	2 × 0(4) to 20 mA outputs, transducer
	M13.4	7 × binary inputs
	M14.4	4 × relay outputs
5		**Terminal 73-89, AC measuring**
	Standard	3 × PV/ESS current; 3 × PV/ESS voltage + N; 3 × busbar voltage + N

Slot #	Option/standard	Description
6		**Terminal 90-97, inputs/outputs**
	F1	2 × 0(4) to 20 mA outputs, transducer
	M13.6	7 × digital inputs
	M14.6	4 × relay outputs
	M15.6	4 × 4 to 20 mA inputs
7		**Terminal 98-124-A1-A3-B1-B3, communication, inputs/outputs**
	M4	8 to 36 V DC supply; 3 × multi-inputs; 7 × digital inputs; 4 × relay outputs Power management communication, CAN port A and B
8		**Terminal 126-133, inputs/outputs**
	H2.8	Modbus RTU (RS-485). Can work as slave or as master for power meter comm.
	M13.8	7 × digital inputs
	M14.8	4 × relay outputs
	M15.8	4 × 4 to 20 mA inputs
9		**LED I/F**
	N	Modbus TCP/IP
Accessories		
		AOP-1
		DU-2
Additional options		
	Q1	Class 0.5 calibration
	I1	System emulation
	G5	Power management
	T1	Critical power
	W1	One-year extended warranty
	W2	Two-year extended warranty
	W3	Three-year extended warranty

INFO
There can only be one hardware option in each slot. For example, it is not possible to select option H2 and option M13.2 at the same time, because both options require a PCB in slot #2.

6. Ordering information

6.1 Order specifications and disclaimer

6.1.1 Order specifications

Variants

Type	Options specification				
Type	**Option**	**Option**	**Option**	**Option**	**Option**

Example:

Type	Options specification				
Type	**Option**	**Option**	**Option**	**Option**	**Option**
ASC-4 Solar	H2	M14.4	M13.6	M15.8	

6.1.2 Disclaimer

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