DATA SHEET

Automatic Load Controller
ALC-4

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

Document no.: 4921240568C
SW version: 4.11.x or later

1. General information

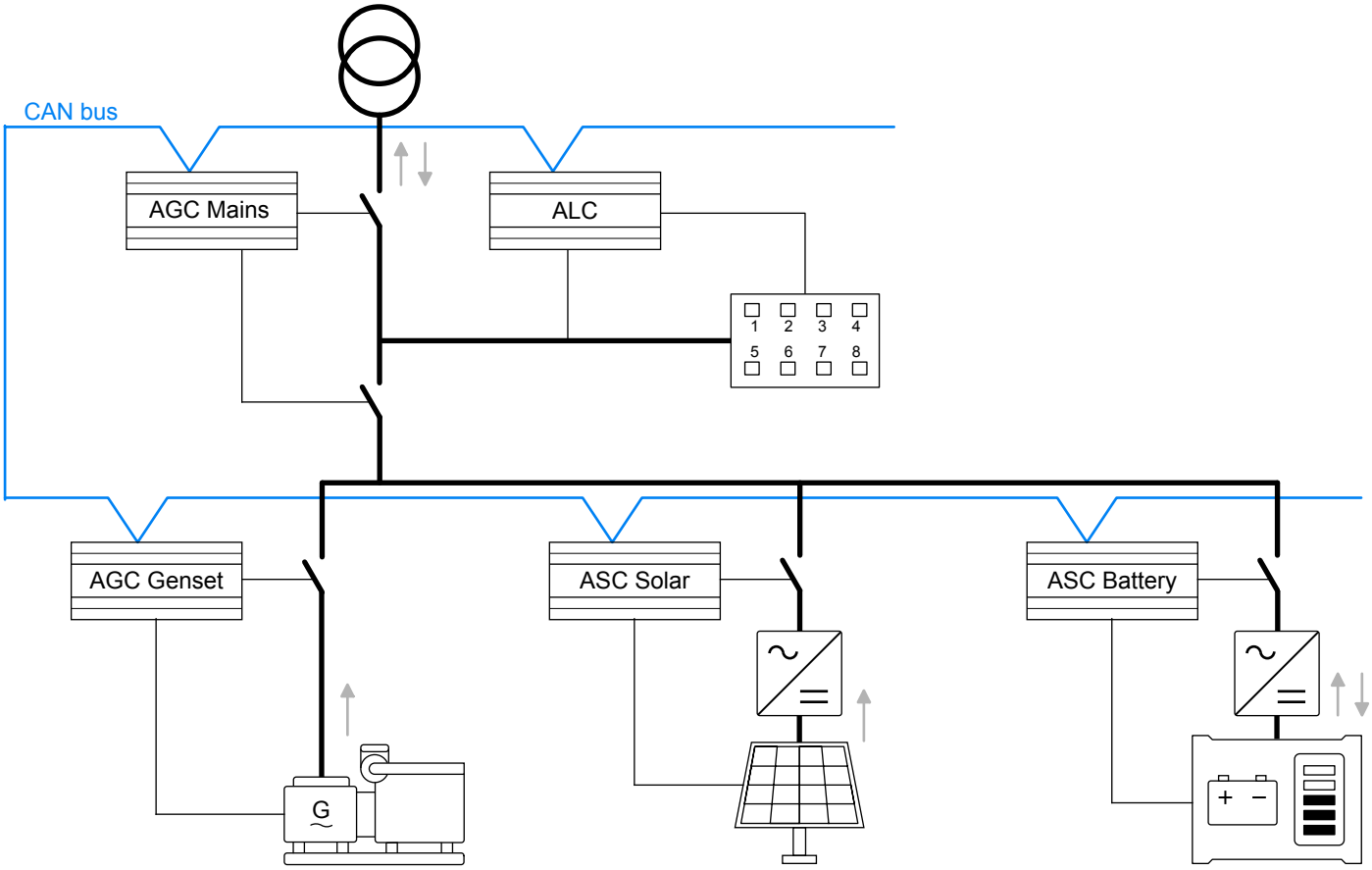
1.1 Automatic Load Controller, ALC-4

The Automatic Load Controller (ALC-4) is designed to take part in the control of a power plant together with other controllers, typically in a critical power installation. It works with AGC-4s, AGC 150, and ASC-4s (Solar and/or Battery) to provide a total solution.

The ALC can control up to 8 consumer feeders per unit. The ALC-4 both controls the feeder breaker and takes feedback for the feeders, as well as analogue signals for the consumption (1 per feeder). Each load group on the ALC-4 can be configured to be a Heavy consumer (HC), allowing for up to 8 heavy consumers on each ALC-4.

By prioritising each consumer, the ALC-4 calculates which load groups can be supplied, depending on the available power in the system.

Example energy management system



2. Application information

2.1 Application

The ALC-4 is intended for use in power management applications and cannot be used as stand-alone controller.

The following can be controlled:

- 32 gensets/mains with breakers
- 16 automatic sustainable controllers ASC-4 (solar and/or battery) (ID 25 to 40, ASC SW 4.0.6.0 or greater)
- 8 automatic load controllers ALC-4 (ID 25 to 40, ALC SW 4.01.0 or greater)

2.2 Power management

The ALC units receive information from the power management system regarding produced power, available power and stand-by power (non-running but ready generators)

This is based on the plant layout system in AGC power management. That means that the ALC not only knows about the power situation, but also where (on which busbar) it is placed in the system. It can also request power and start gensets if needed.

This enables the ALC to react on BTBs being opened and subsequent change of the power scheme.

The positions of the feeder breakers are a part of the USW plant setup.

2.2.1 Feeder disconnection

The system will, in case of power shortage, disconnect feeders in such a manner that the feeder with the highest priority number (= least important) is disconnected first.

The system is able to calculate how many feeders have to be disconnected to maintain power supply without overloading the generators. This calculation is carried out at all times, also taking BTB positions into consideration.

2.2.2 Feeder re-connection

The system will, in case of enough available power being present, re-connect feeders, starting with the feeder with the lowest number (=most important). Between cut-ins, the keyed-in delay is in operation.

2.2.3 Anticipated load-dependent start

In case feeders are disconnected, and a generator is standby, the generator is to be started and put online.

Once online, the system will calculate and connect the number of feeders possible without overloading the system.

2.2.4 Operating modes

AUTO

The feeders are automatically controlled by the ALC.

SEMI mode

The feeders can be controlled manually via the display or Modbus commands.

2.2.5 Heavy consumers

The heavy consumer function ensures that enough power is available when the heavy consumers need it. In addition, heavy consumer management minimises the disruption to the rest of the system when the heavy consumers connect. Each ALC-4 can manage up to eight heavy consumers, with one per load group. The controller manages the heavy consumer function across the DEIF network.

Heavy consumers are configured on the load groups. If a load group is selected to be a heavy consumer it does not take part in automatic priority based connection of the load groups. The load group requires an operator confirmation to close. However, it can still be selected to take part in automatic priority based disconnection of the load groups.

More information
See **ALC-4 Designer's handbook** for more information about Heavy consumers and how they are configured.

3. Connection

3.1 Connection

The ALC-4 needs to have the AC V BB connected to the busbar inputs where the feeders are connected.

The ALC cannot measure AC power and is done with external devices. There are no AC protections in the ALC.

This is needed for the ALC to detect if there is voltage (if not, no feeder connection). If the busbar is live, feeders are connected and the busbar then goes dead, the feeders will be disconnected.

For each feeder, the following information/commands are present:

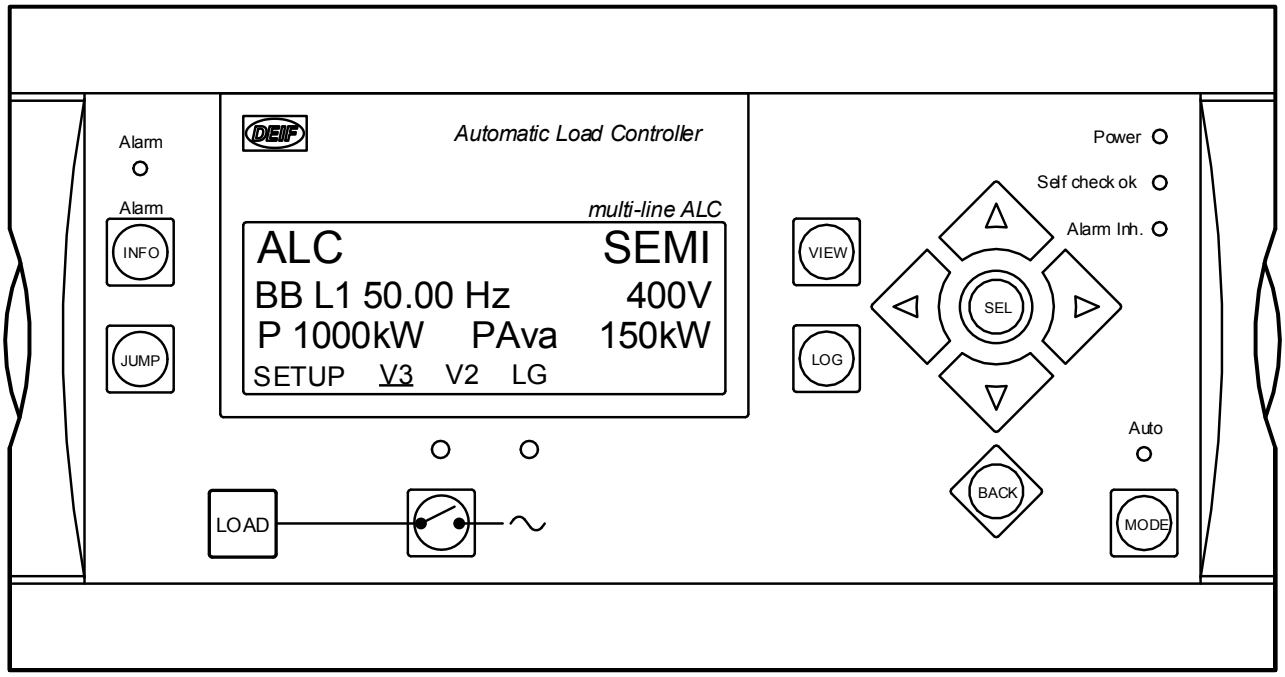
- Breaker on command (must be used)
- Breaker off command (optional)
- Breaker on feedback (must be used)
- Breaker off feedback (optional; if used, a position failure alarm is present)

For each feeder, parameter settings are available for:

- Nominal feeder power (kW)
- Feeder priority
- Feeder cut-in delay (delay after conditions are ready for closing until it actually takes place)
- Feeder cut-out power level (available power in % of feeder nominal power)
- Feeder cut-in power level (available power in % of feeder nominal power)
- Selection of analogue input or no feedback

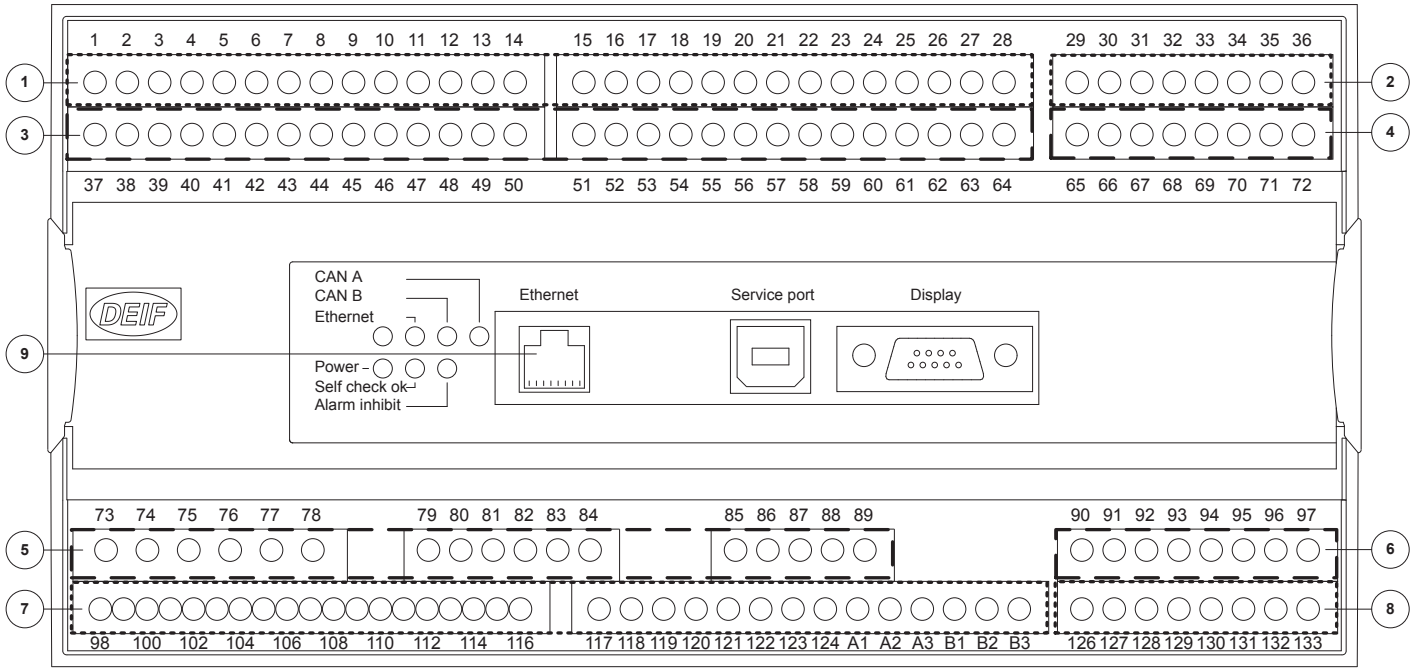
4. Display layout

4.1 ALC-4 display



5. Hardware, software and options

5.1 Hardware, software and options, ALC-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**
	H2	Modbus RTU (RS-485)
	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 79-89, AC measuring**
	Standard	3 × busbar voltage

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 98-125, communication, inputs/outputs**
	Standard	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**
	M13.8	7 × digital inputs
	M14.8	4 × relay outputs
	M15.8	4 × 4 to 20 mA inputs
9		**Terminal 73-78, LED I/F AC measuring**
	N	Modbus TCP/IP
Standard accessories		
		AOP-1
		DU-2
Additional options		
	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. Technical information

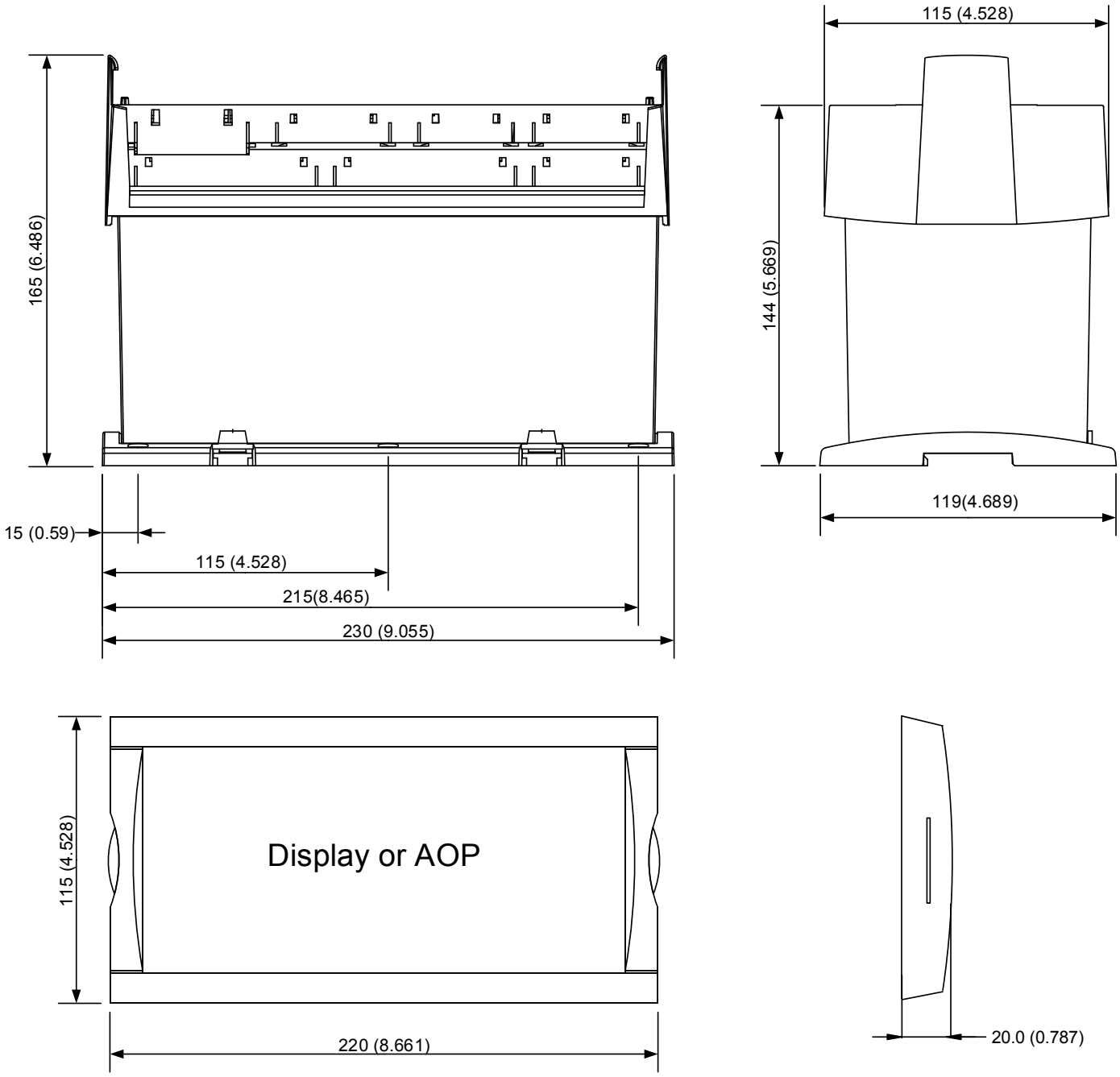
6.1 Specifications and dimensions

6.1.1 Technical specifications

Accuracy	Class 1.0 -25 to 15 to 30 to 70 °C Temperature coefficient: ±0.2 % of full scale per 10°C
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 frequency	30 to 70 Hz
Aux. supply	Terminals 1 and 2: 12/24 V DC (8 to 36 V continuously, 6 V 1 sec). Max. 11 W con- sumption 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 (8 to 36 V continuously, 6 V 1 sec). Max. 5 W con- sumption The aux. supply inputs are to be protected by a 2 A slow blow fuse. (UL/cUL Listed: AWG 24)
Binary 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 Binary: Max. resistance for ON detection: 100 Ω. Not galvanically separated Pt100/1000: -40 to 250 °C, ±1 %. Not galvanically separated. To IEC/EN60751. 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 resis- tive load) Thermal rating @ 50 °C: 2 A: Continuously. 4 A: ton = 5 sec, toff = 15 sec(Unit status output: 1 A)
Open collector outputs	Supply: 8 to 36 V DC, max. 10 mA (terminal 20, 21, 22 (com))
Galvanic separation	Between AC voltage and other I/Os: 3250 V, 50 Hz, 1 min Between analogue outputs and other I/Os: 550 V, 50 Hz, 1 min Between binary input groups and other I/Os: 550 V, 50 Hz, 1 min
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 mmpp. 13.2 to 100 Hz: 0.7 g. To IEC 60068-2-6 & IACS UR E10 10 to 60 Hz: 0.15 mmpp. 60 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)

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 voltage: 0.2 to 2.5 mm2stranded wire. (UL/cUL Listed: AWG 20) Relays: (UL/cUL Listed: AWG 22) Terminals 98-116: 0.2 to 1.5 mm2stranded wire. (UL/cUL Listed: AWG 24) Other: 0.2 to 2.5 mm2 stranded wire. (UL/cUL Listed: AWG 24) Tightening torque: 0.5 Nm (5-7 lb-in) Display: 9-pole Sub-D 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
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 Sub-D screw: 0.2 Nm
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)

6.1.2 Unit dimensions in mm (inches)



7. Ordering information

7.1 Order specifications and disclaimer

7.1.1 Order specifications

Variants

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

Example:

Type	Options specification				
Type	**Option**	**Option**	**Option**	**Option**	**Option**
ALC-4	H2	M14.4	M15.6	M15.8	

7.1.2 Disclaimer

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

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