

# ECO970 Series Charger Technical Data Sheet

The ECO970 is a series of modular battery chargers intended for motive power charging applications. Three cabinets are available:

- **ECO973:** this cabinet holds between one and three charger modules, with a single SB350 output connector, and is capable of up to 300A<sub>DC</sub> output.
- **ECO974:** this cabinet holds between one and six charger modules, with a single SB350 output connector, and is capable of up to 400A<sub>DC</sub> output.
- **ECO976:** this cabinet holds between one and six charger modules, with dual SB350 output connectors, and is capable of up to 600A<sub>DC</sub> output.

## Charger Cabinet Specifications

	ECO973	ECO974	ECO976
<b>Charger Module Models Supported</b>	E240, E480 and E600 1 to 3 modules	E480 and E600 1 to 6 modules	E480 and E600 1 to 6 modules
<b>DC Output Type</b>	Single SB350 connector, up to 300A <sub>DC</sub>	Single SB350 connector, up to 400A <sub>DC</sub>	Dual SB350 connectors, up to 600A <sub>DC</sub>
<b>Size</b>	314W x 363D x 282H mm	314W x 363D x 520H mm	314W x 363D x 520H mm
<b>Weight</b>	17 kg (three modules loaded)	32.5 kg (six modules loaded)	32.5 kg (six modules loaded)

The ECO970 series has a single model of charger module suitable for Australasian supply voltages, the E480.

## Charger Module AC Input Parameters

	E480
<b>Nominal Voltage Range (three phase, phase to phase)</b>	380 to 480V <sub>AC</sub>
<b>Frequency Range</b>	45 to 65Hz
<b>Maximum Efficiency</b>	97%

## Charger Module DC Output Parameters

	E480	
<b>Battery Voltage</b>	24, 36, 48, 72, 80 and 96V	
<b>Maximum Output Current</b>	100A <sub>DC</sub> @ 24V 100A <sub>DC</sub> @ 36V 85A <sub>DC</sub> @ 48V	50A <sub>DC</sub> @ 72V 50A <sub>DC</sub> @ 80V 42.5A <sub>DC</sub> @ 96V
<b>Short Circuit Coordination</b>	Current Foldback Protection	

The ECO970 series can communicate with other devices through the following interfaces:

## Communication Interfaces

Interface	Purpose	Optional / Standard
USB, Ethernet and Wi-Fi	Used to configure, monitor and download logs from the charger. Compatible with most laptops, desktops and tablets that support a web browser.	Standard
Advanced Battery Interface	Adds a CAN bus and pilot interface to charger. Used to perform charges that are controlled over CAN bus by the BMS of a battery.	Optional (one per charger)
IO Expansion	Adds three non-isolated general purpose inputs and outputs to the charger. Used to support accessories such as tower lights, remotes controls and auto-watering solenoids. Can also be used to drive relays for use with basic automation systems.	Optional (up to two per charger)

The model number, part number and serial number of the ECO970 is made up as shown:

## Charger Model Number Structure

**A111 B - 2 3**

Where:

- A111** is the cabinet type, options are E973, E974 and E976.
- B** is the optional interfaces installed, options are blank (no optional interfaces installed) or C (CAN bus interface installed).
- 2** is the module type, only option in 4 (E480).
- 3** is the number of modules installed, options are 1 to 3 for the E973, and 1 to 6 for the E974 or E976.

## Charger Part Number Structure

**A11A - 22 33 - BB44**

Where:

- A11A** is the cabinet type, options are E03C (E973), E04C (E974) and E06C (E976).
- 22** is the module type, options are 40 (no modules installed), and 44 (E480).
- 33** is the number of modules installed, options are 00 to 03 for the E973, and 00 to 06 for the E974 and E976.
- BB44** is the charger variant and includes what optional interfaces are fitted.

## Charger Serial Number Structure

**11 22 333333**

Where:

- 11** is the last two digits of the year of manufacture.
- 22** is the month of manufacture.
- 333333** is the serial number of the charger within that year and month.

The ECO970 series chargers have the following certifications:



**IEC EN 62477-1:** Safety Requirements for Power Electronic Converter Systems and Equipment – Part 1: General Requirements

**ETSI EN 300328:** Wideband Transmission Systems

**ETSI EN 301489-1:** EMC Standard for Radio Equipment and Services – Part 1: Common Technical Requirements

**ETSI EN 301489-17:** EMC Standard for Radio Equipment and Services – Part 17: Specific Conditions for Broadband Data Transmission Systems

**IEC EN 61000-6-2:** Electromagnetic Compatibility – Part 6-2: Immunity for Industrial Environments

**IEC EN 61000-6-4:** Electromagnetic Compatibility – Part 6-4: Emissions for Industrial Environments

### Charger Ratings – ECO973 Three Module Chargers

Model Number and Part Number	Modules Fitted	Maximum DC Output Current		Maximum AC Input Current
E973-41 E03U-4401	E480 x 1	100A <sub>DC</sub> at 24V 100A <sub>DC</sub> at 36V 85A <sub>DC</sub> at 48V	50A <sub>DC</sub> at 72V 50A <sub>DC</sub> at 80V 42A <sub>DC</sub> at 96V	7.9A <sub>AC</sub> at 400V <sub>AC</sub> 7.6A <sub>AC</sub> at 415V <sub>AC</sub>
E973-42 E03U-4402	E480 x 2	200A <sub>DC</sub> at 24V 200A <sub>DC</sub> at 36V 170A <sub>DC</sub> at 48V	100A <sub>DC</sub> at 72V 100A <sub>DC</sub> at 80V 85A <sub>DC</sub> at 96V	15.7A <sub>AC</sub> at 400V <sub>AC</sub> 15.1A <sub>AC</sub> at 415V <sub>AC</sub>
E973-43 E03U-4403	E480 x 3	300A <sub>DC</sub> at 24V 300A <sub>DC</sub> at 36V 255A <sub>DC</sub> at 48V	150A <sub>DC</sub> at 72V 150A <sub>DC</sub> at 80V 127A <sub>DC</sub> at 96V	23.5A <sub>AC</sub> at 400V <sub>AC</sub> 22.6A <sub>AC</sub> at 415V <sub>AC</sub>

## Charger Ratings – ECO974 Six Module Chargers

Model Number and Part Number	Modules Fitted	Maximum DC Output Current		AC Input Voltage and Maximum Current
E974-41 E04U-4401	E480 x 1	100A <sub>DC</sub> at 24V 100A <sub>DC</sub> at 36V 85A <sub>DC</sub> at 48V	50A <sub>DC</sub> at 72V 50A <sub>DC</sub> at 80V 42A <sub>DC</sub> at 96V	7.9A <sub>AC</sub> at 400V <sub>AC</sub> 7.6A <sub>AC</sub> at 415V <sub>AC</sub>
E974-42 E04U-4402	E480 x 2	200A <sub>DC</sub> at 24V 200A <sub>DC</sub> at 36V 170A <sub>DC</sub> at 48V	100A <sub>DC</sub> at 72V 100A <sub>DC</sub> at 80V 85A <sub>DC</sub> at 96V	15.7A <sub>AC</sub> at 400V <sub>AC</sub> 15.1A <sub>AC</sub> at 415V <sub>AC</sub>
E974-43 E04U-4403	E480 x 3	300A <sub>DC</sub> at 24V 300A <sub>DC</sub> at 36V 255A <sub>DC</sub> at 48V	150A <sub>DC</sub> at 72V 150A <sub>DC</sub> at 80V 127A <sub>DC</sub> at 96V	23.5A <sub>AC</sub> at 400V <sub>AC</sub> 22.6A <sub>AC</sub> at 415V <sub>AC</sub>
E974-44 E04U-4404	E480 x 4	400A <sub>DC</sub> at 24V 400A <sub>DC</sub> at 36V 340A <sub>DC</sub> at 48V	200A <sub>DC</sub> at 72V 200A <sub>DC</sub> at 80V 170A <sub>DC</sub> at 96V	31.3A <sub>AC</sub> at 400V <sub>AC</sub> 30.1A <sub>AC</sub> at 415V <sub>AC</sub>
E974-45 E04U-4405	E480 x 5	400A <sub>DC</sub> at 24V 400A <sub>DC</sub> at 36V 400A <sub>DC</sub> at 48V	250A <sub>DC</sub> at 72V 250A <sub>DC</sub> at 80V 212A <sub>DC</sub> at 96V	39.0A <sub>AC</sub> at 400V <sub>AC</sub> 37.6A <sub>AC</sub> at 415V <sub>AC</sub>
E974-46 E04U-4406	E480 x 6	400A <sub>DC</sub> at 24V 400A <sub>DC</sub> at 36V 400A <sub>DC</sub> at 48V	300A <sub>DC</sub> at 72V 300A <sub>DC</sub> at 80V 255A <sub>DC</sub> at 96V	46.8A <sub>AC</sub> at 400V <sub>AC</sub> 45.1A <sub>AC</sub> at 415V <sub>AC</sub>

## Charger Ratings – ECO976 Six Module Chargers

Model Number and Part Number	Modules Fitted	Maximum DC Output Current		AC Input Voltage and Maximum Current
E976-41 E06U-4401	E480 x 1	100A <sub>DC</sub> at 24V 100A <sub>DC</sub> at 36V 85A <sub>DC</sub> at 48V	50A <sub>DC</sub> at 72V 50A <sub>DC</sub> at 80V 42A <sub>DC</sub> at 96V	7.9A <sub>AC</sub> at 400V <sub>AC</sub> 7.6A <sub>AC</sub> at 415V <sub>AC</sub>
E976-42 E06U-4402	E480 x 2	200A <sub>DC</sub> at 24V 200A <sub>DC</sub> at 36V 170A <sub>DC</sub> at 48V	100A <sub>DC</sub> at 72V 100A <sub>DC</sub> at 80V 85A <sub>DC</sub> at 96V	15.7A <sub>AC</sub> at 400V <sub>AC</sub> 15.1A <sub>AC</sub> at 415V <sub>AC</sub>
E976-43 E06U-4403	E480 x 3	300A <sub>DC</sub> at 24V 300A <sub>DC</sub> at 36V 255A <sub>DC</sub> at 48V	150A <sub>DC</sub> at 72V 150A <sub>DC</sub> at 80V 127A <sub>DC</sub> at 96V	23.5A <sub>AC</sub> at 400V <sub>AC</sub> 22.6A <sub>AC</sub> at 415V <sub>AC</sub>
E976-44 E06U-4404	E480 x 4	400A <sub>DC</sub> at 24V 400A <sub>DC</sub> at 36V 340A <sub>DC</sub> at 48V	200A <sub>DC</sub> at 72V 200A <sub>DC</sub> at 80V 170A <sub>DC</sub> at 96V	31.3A <sub>AC</sub> at 400V <sub>AC</sub> 30.1A <sub>AC</sub> at 415V <sub>AC</sub>
E976-45 E06U-4405	E480 x 5	500A <sub>DC</sub> at 24V 500A <sub>DC</sub> at 36V 425A <sub>DC</sub> at 48V	250A <sub>DC</sub> at 72V 250A <sub>DC</sub> at 80V 212A <sub>DC</sub> at 96V	39.0A <sub>AC</sub> at 400V <sub>AC</sub> 37.6A <sub>AC</sub> at 415V <sub>AC</sub>
E976-46 E06U-4406	E480 x 6	600A <sub>DC</sub> at 24V 600A <sub>DC</sub> at 36V 510A <sub>DC</sub> at 48V	300A <sub>DC</sub> at 72V 300A <sub>DC</sub> at 80V 255A <sub>DC</sub> at 96V	46.8A <sub>AC</sub> at 400V <sub>AC</sub> 45.1A <sub>AC</sub> at 415V <sub>AC</sub>

## Battery Voltage and Capacity versus AC Supply Current – 24V Batteries

DC Output Current (A <sub>DC</sub> )	Battery Size (Ah)			Module Count	AC Supply Input Current (A <sub>AC</sub> )	
	16%	25%	40%		400V <sub>AC</sub>	415V <sub>AC</sub>
50	300	200	125	1	2.4	2.3
60	375	225	150	1	2.8	2.7
70	425	275	175	1	3.3	3.2
80	500	300	200	1	3.8	3.6
85	525	325	200	1	4.0	3.9
90	550	350	225	1	4.2	4.1
100	625	400	250	1	4.7	4.5
110	675	425	275	2	5.1	5.0
120	750	475	300	2	5.6	5.4
130	800	500	325	2	6.1	5.8
140	875	550	350	2	6.5	6.3
150	925	600	375	2	7.0	6.7
160	1000	625	400	2	7.4	7.2
170	1050	675	425	2	7.9	7.6
180	1125	700	450	2	8.3	8.0
190	1175	750	475	2	8.8	8.5
200	1250	800	500	2	9.3	8.9
210	1300	825	525	3	9.7	9.4
220	1375	875	550	3	10.2	9.8
230	1425	900	575	3	10.6	10.3
240	1500	950	600	3	11.1	10.7
250	1550	1000	625	3	11.6	11.1
260	1625	1025	650	3	12.0	11.6
270	1675	1075	675	3	12.5	12.0
280	1750	1100	700	3	12.9	12.5
290	1800	1150	725	3	13.4	12.9
300	1875	1200	750	3	13.8	13.3
310	1925	1225	775	4	14.3	13.8
320	2000	1275	800	4	14.8	14.2
330	-	1300	825	4	15.2	14.7
340	-	1350	850	4	15.7	15.1
350	-	1400	875	4	16.1	15.6
360	-	1425	900	4	16.6	16.0
370	-	1475	925	4	17.1	16.4
380	-	1500	950	4	17.5	16.9
390	-	1550	975	4	18.0	17.3
400	-	1600	1000	4	18.4	17.8
410	-	1625	1025	5	18.9	18.2
420	-	1675	1050	5	19.3	18.6
425	-	1700	1050	5	19.6	18.9
430	-	1700	1075	5	19.8	19.1
440	-	1750	1100	5	20.3	19.5
450	-	1800	1125	5	20.7	20.0
460	-	1825	1150	5	21.2	20.4
470	-	1875	1175	5	21.6	20.9
480	-	1900	1200	5	22.1	21.3
490	-	1950	1225	5	22.6	21.7
500	-	2000	1250	5	23.0	22.2
510	-	-	1275	6	23.5	22.6
520	-	-	1300	6	23.9	23.1
530	-	-	1325	6	24.4	23.5
540	-	-	1350	6	24.8	23.9
550	-	-	1375	6	25.3	24.4
560	-	-	1400	6	25.8	24.8
570	-	-	1425	6	26.2	25.3
580	-	-	1450	6	26.7	25.7
590	-	-	1475	6	27.1	26.2
600	-	-	1500	6	27.6	26.6

## Battery Voltage and Capacity versus AC Supply Current – 36V Batteries

DC Output Current (A <sub>DC</sub> )	Battery Size (Ah)			Module Count	AC Supply Input Current (A <sub>AC</sub> )	
	16%	25%	40%		400V <sub>AC</sub>	415V <sub>AC</sub>
50	300	200	125	1	3.5	3.4
60	375	225	150	1	4.2	4.1
70	425	275	175	1	4.9	4.7
80	500	300	200	1	5.6	5.4
85	525	325	200	1	5.9	5.7
90	550	350	225	1	6.3	6.1
100	625	400	250	1	7.0	6.7
110	675	425	275	2	7.7	7.4
120	750	475	300	2	8.3	8.0
130	800	500	325	2	9.0	8.7
140	875	550	350	2	9.7	9.4
150	925	600	375	2	10.4	10.0
160	1000	625	400	2	11.1	10.7
170	1050	675	425	2	11.8	11.4
180	1125	700	450	2	12.5	12.0
190	1175	750	475	2	13.2	12.7
200	1250	800	500	2	13.8	13.3
210	1300	825	525	3	14.5	14.0
220	1375	875	550	3	15.2	14.7
230	1425	900	575	3	15.9	15.3
240	1500	950	600	3	16.6	16.0
250	1550	1000	625	3	17.3	16.7
260	1625	1025	650	3	18.0	17.3
270	1675	1075	675	3	18.7	18.0
280	1750	1100	700	3	19.3	18.6
290	1800	1150	725	3	20.0	19.3
300	1875	1200	750	3	20.7	20.0
310	1925	1225	775	4	21.4	20.6
320	2000	1275	800	4	22.1	21.3
330	-	1300	825	4	22.8	22.0
340	-	1350	850	4	23.5	22.6
350	-	1400	875	4	24.2	23.3
360	-	1425	900	4	24.8	23.9
370	-	1475	925	4	25.5	24.6
380	-	1500	950	4	26.2	25.3
390	-	1550	975	4	26.9	25.9
400	-	1600	1000	4	27.6	26.6
410	-	1625	1025	5	28.3	27.3
420	-	1675	1050	5	29.0	27.9
425	-	1700	1050	5	29.3	28.3
430	-	1700	1075	5	29.7	28.6
440	-	1750	1100	5	30.3	29.2
450	-	1800	1125	5	31.0	29.9
460	-	1825	1150	5	31.7	30.6
470	-	1875	1175	5	32.4	31.2
480	-	1900	1200	5	33.1	31.9
490	-	1950	1225	5	33.8	32.6
500	-	2000	1250	5	34.5	33.2
510	-	-	1275	6	35.2	33.9
520	-	-	1300	6	35.8	34.5
530	-	-	1325	6	36.5	35.2
540	-	-	1350	6	37.2	35.9
550	-	-	1375	6	37.9	36.5
560	-	-	1400	6	38.6	37.2
570	-	-	1425	6	39.3	37.9
580	-	-	1450	6	40.0	38.5
590	-	-	1475	6	40.6	39.2
600	-	-	1500	6	41.3	39.8

## Battery Voltage and Capacity versus AC Supply Current – 48V Batteries

DC Output Current (A <sub>DC</sub> )	Battery Size (Ah)			Module Count	AC Supply Input Current (A <sub>AC</sub> )	
	16%	25%	40%		400V <sub>AC</sub>	415V <sub>AC</sub>
50	275	200	125	1	4.7	4.5
60	325	225	150	1	5.6	5.4
70	375	275	175	1	6.5	6.3
80	425	300	200	1	7.4	7.2
85	450	325	200	1	7.9	7.6
90	500	350	225	2	8.3	8.0
100	550	400	250	2	9.3	8.9
110	600	425	275	2	10.2	9.8
120	650	475	300	2	11.1	10.7
130	700	500	325	2	12.0	11.6
140	775	550	350	2	12.9	12.5
150	825	600	375	2	13.8	13.3
160	875	625	400	2	14.8	14.2
170	925	675	425	2	15.7	15.1
180	1000	700	450	3	16.6	16.0
190	1050	750	475	3	17.5	16.9
200	1100	800	500	3	18.4	17.8
210	1150	825	525	3	19.3	18.6
220	1200	875	550	3	20.3	19.5
230	1275	900	575	3	21.2	20.4
240	1325	950	600	3	22.1	21.3
250	1375	1000	625	3	23.0	22.2
255	1400	1000	625	3	23.5	22.6
260	1425	1025	650	4	23.9	23.1
270	1500	1075	675	4	24.8	23.9
280	1550	1100	700	4	25.8	24.8
290	1600	1150	725	4	26.7	25.7
300	1650	1200	750	4	27.6	26.6
310	1700	1225	775	4	28.5	27.5
320	1775	1275	800	4	29.4	28.4
330	1825	1300	825	4	30.3	29.2
340	1875	1350	850	4	31.3	30.1
350	1925	1400	875	5	32.2	31.0
360	2000	1425	900	5	33.1	31.9
370	-	1475	925	5	34.0	32.8
380	-	1500	950	5	34.9	33.7
390	-	1550	975	5	35.8	34.5
400	-	1600	1000	5	36.8	35.4
410	-	1625	1025	5	37.7	36.3
420	-	1675	1050	5	38.6	37.2
425	-	1700	1050	5	39.0	37.6
430	-	1700	1075	6	39.5	38.1
440	-	1750	1100	6	40.4	39.0
450	-	1800	1125	6	41.3	39.8
460	-	1825	1150	6	42.3	40.7
470	-	1875	1175	6	43.2	41.6
480	-	1900	1200	6	44.1	42.5
490	-	1950	1225	6	45.0	43.4
500	-	2000	1250	6	45.9	44.3
510	-	-	1275	6	46.8	45.1

## Battery Voltage and Capacity versus AC Supply Current – 72V Batteries

DC Output Current (A <sub>DC</sub> )	Battery Size (Ah)			Module Count	AC Supply Input Current (A <sub>AC</sub> )	
	16%	25%	40%		400V <sub>AC</sub>	415V <sub>AC</sub>
50	275	200	125	1	7.0	6.7
60	325	225	150	2	8.3	8.0
70	375	275	175	2	9.7	9.4
80	425	300	200	2	11.1	10.7
85	450	325	200	2	11.8	11.4
90	500	350	225	2	12.5	12.0
100	550	400	250	2	13.8	13.3
110	600	425	275	3	15.2	14.7
120	650	475	300	3	16.6	16.0
130	700	500	325	3	18.0	17.3
140	775	550	350	3	19.3	18.6
150	825	600	375	3	20.7	20.0
160	875	625	400	4	22.1	21.3
170	925	675	425	4	23.5	22.6
180	1000	700	450	4	24.8	23.9
190	1050	750	475	4	26.2	25.3
200	1100	800	500	4	27.6	26.6
210	1150	825	525	5	29.0	27.9
220	1200	875	550	5	30.3	29.2
230	1275	900	575	5	31.7	30.6
240	1325	950	600	5	33.1	31.9
250	1375	1000	625	5	34.5	33.2
260	1425	1025	650	6	35.8	34.5
270	1500	1075	675	6	37.2	35.9
280	1550	1100	700	6	38.6	37.2
290	1600	1150	725	6	40.0	38.5
300	1650	1200	750	6	41.3	39.8



## Battery Voltage and Capacity versus AC Supply Current – 80V Batteries

DC Output Current (A <sub>DC</sub> )	Battery Size (Ah)			Module Count	AC Supply Input Current (A <sub>AC</sub> )	
	16%	25%	40%		400V <sub>AC</sub>	415V <sub>AC</sub>
50	275	200	125	1	7.7	7.5
60	325	225	150	2	9.3	8.9
70	375	275	175	2	10.8	10.4
80	425	300	200	2	12.3	11.9
85	450	325	200	2	13.1	12.6
90	500	350	225	2	13.8	13.3
100	550	400	250	2	15.4	14.8
110	600	425	275	3	16.9	16.3
120	650	475	300	3	18.4	17.8
130	700	500	325	3	20.0	19.2
140	775	550	350	3	21.5	20.7
150	825	600	375	3	23.0	22.2
160	875	625	400	4	24.5	23.7
170	925	675	425	4	26.1	25.1
180	1000	700	450	4	27.6	26.6
190	1050	750	475	4	29.1	28.1
200	1100	800	500	4	30.6	29.5
210	1150	825	525	5	32.2	31.0
220	1200	875	550	5	33.7	32.5
230	1275	900	575	5	35.2	34.0
240	1325	950	600	5	36.8	35.4
250	1375	1000	625	5	38.3	36.9
260	1425	1025	650	6	39.8	38.4
270	1500	1075	675	6	41.3	39.8
280	1550	1100	700	6	42.9	41.3
290	1600	1150	725	6	44.4	42.8
300	1650	1200	750	6	45.9	44.3

## Battery Voltage and Capacity versus AC Supply Current – 96V Batteries

DC Output Current (A <sub>DC</sub> )	Battery Size (Ah)			Module Count	AC Supply Input Current (A <sub>AC</sub> )	
	16%	25%	40%		400V <sub>AC</sub>	415V <sub>AC</sub>
50	275	200	125	2	9.3	8.9
60	325	225	150	2	11.1	10.7
70	375	275	175	2	12.9	12.5
80	425	300	200	2	14.8	14.2
85	450	325	200	2	15.7	15.1
90	500	350	225	3	16.6	16.0
100	550	400	250	3	18.4	17.8
110	600	425	275	3	20.3	19.5
120	650	475	300	3	22.1	21.3
130	700	500	325	4	23.9	23.1
140	775	550	350	4	25.8	24.8
150	825	600	375	4	27.6	26.6
160	875	625	400	4	29.4	28.4
170	925	675	425	4	31.3	30.1
180	1000	700	450	5	33.1	31.9
190	1050	750	475	5	34.9	33.7
200	1100	800	500	5	36.8	35.4
210	1150	825	525	5	38.6	37.2
220	1200	875	550	6	40.4	39.0
230	1275	900	575	6	42.3	40.7
240	1325	950	600	6	44.1	42.5
250	1375	1000	625	6	45.9	44.3
255	1400	1000	625	6	46.8	45.1