ODEN AT
Primary Current Injection Test System

- **Most Advanced Primary Current Injection Test System to simplify all types of switchgear and CT commissioning, ground grid, circuit breaker testing and more**
- **Modular design to permit optimal user configuration of output current vs. unit size**
- **Compact transport cart facilitates portability into switchgear rooms with limited space**
- **Unique I/30 function allows the current to be pre-set using low current to prevent test sample heating, thus eliminating corruption of test result**

Description

This powerful test system is designed for primary injection testing of protective relay equipment and circuit breakers. It is also used to test the turns ratio of current transformers and for other applications that require high variable currents.

The system consists of a control unit together with one, two or three current units. There are three versions of the current unit: S, X and H. The S and X current units are identical except that the X unit has an additional 30/60 V output. The H unit is rated for even higher current. This makes it possible to configure an ODEN AT system in a suitable way. All parts are portable, and ODEN AT can be quickly assembled and connected.

The control unit has many advanced features – a powerful measurement section for example, that can display turns ratio as well as time, voltage and current. A second measurement channel can be used to test an additional current or voltage. Current transformer turns ratio, impedance, resistance, power, power factor (cos φ) and phase angle are calculated and shown in the display. Current and voltage can be presented as percentages of nominal value. The fast-acting hold function freezes short-duration readings on the digital display when the voltage or contact signal arrives at the stop input, the object under test interrupts the current or injection is stopped

Application

- **Primary current injection testing and breaker testing**

These tests require high currents and the ability to measure very short duration, current flow. Oden AT has been designed especially to meet these needs. No extra contacts are needed to measure the operating time of a low-voltage breaker. Testing stops at the instant when the main breaker contacts open to interrupt the current. Output current initiation is synchronized with the currents zero-crossover point to ensure good repeatability and minimized DC offset.

- **Testing current transformers**

For turns ratio testing, the primary current and either the secondary current or the turns ratio are displayed simultaneously. Since the turns ratio is displayed directly as the nominal value (1000/5 for example), no further calculation is needed. Burden of secondary circuits can be measured and presented in VA.

- **Polarity testing**

The currents phase displacement is shown, and the polarities of the outputs are clearly marked.

- **Heat runs**

Oden AT is ideal for performing heat runs. Current can be applied continuously or through programmable intervals. The times can be shown in minutes and hours which facilitates long-term testing capability.

- **Automatic reclosers and sectionalizers**

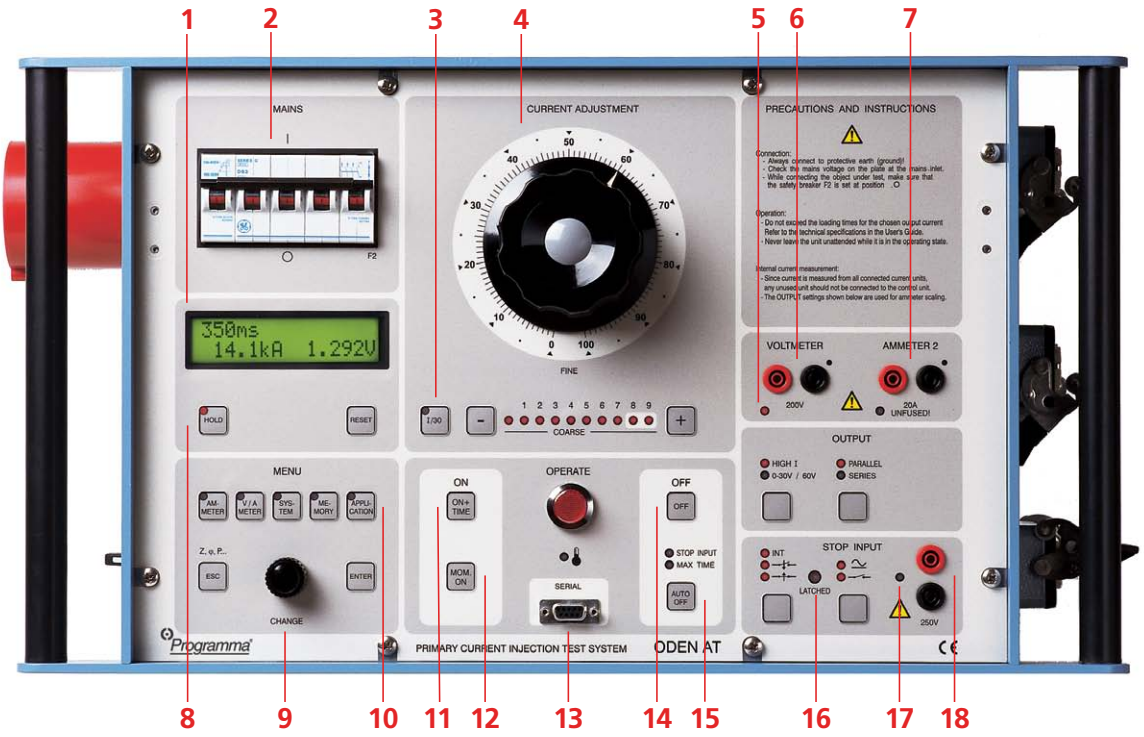
Oden AT can also be set to test circuit breakers with reclosing relays. Operating limits, partial times, total times and the number of operations before lockout can be measured. User-selectable reclosing sequences can be programmed for testing sectionalizers.

- **Testing integrity of ground grids and safety-ground devices**

One way to test ground grids is by injecting current between a reference ground and the ground to be tested and measuring the voltage drop and the percentage of current flowing through the ground grid. The type X current unit included with Oden AT is designed for this type of application. Personal safety grounds must be tested at rated current, a task for which Oden AT is well suited.

Features and Benefits

1. **Display.** The display presents time, output current, voltage, current shown on ammeter 2 and phase angle. You can scroll through entities Z, P, Q, R, X, S, power factor (cos φ) and I max.
2. **Miniature circuit breaker used for current output.** Interrupts output current. Can also be actuated manually for safe disconnection of load.
3. **Current reduction button.** Used during setting to reduce the output current to 1/30. Useful in order to avoid for example unintentional tripping and overheating.
4. **Fine adjustment knob.** Knob for fine adjustment of current and +/- buttons for coarse adjustment.
5. **Indicator lamps.** Indicate whether ammeter 2 or the voltmeter is enabled.
6. **Input for voltmeter.** Used to measure voltage and for microhmmeter measurement.
7. **Input for ammeter 2.** Used to measure current in an external circuit (in a current transformer´s secondary winding for example).
8. **Hold function.** This function freezes readings on the display.
9. **Selection/setting (CHANGE) knob.** Selects the desired menu option (shown in the display window). Also used to change numerical values.
10. **Setting buttons.** Personnel unfamiliar with ODEN AT can use the pre-defined settings very effectively, while experienced users can make their own basic settings.
    • **Ammeter.** Used to set the main current-output ammeter. You can select the desired range or select autoranging.
    • **V/A Meter.** Toggles between the voltmeter and ammeter 2. Also used to select the desired range or select autoranging.
    • **System.** Used for general settings.
    • **Memory.** Used to save or recall settings to or from the ten ODEN AT memories. One of these memories contains the default (pre-defined) settings that are invoked when ODEN AT is powered up.
    • **Application**. Used to invoke the desired measurement mode: automatic recloser, sectionalizer or microhmmeter.
    ODEN AT can also be set to generate pulse trains with user-selectable pulse and pause times.
11. **Injection.** Starts current injection and timing.
12. **Momentary Injection.** When this button is used, injection continues only as long as it is pressed. Useful in order to avoid for example overheating.
13. **RS232 for computer.** ODEN AT is equipped with a serial port for communication with PC (for transfer of test data for example).
14. **Manual shut-off.** Injection and timing are stopped when this button is pressed.
15. **Automatic injection stop.** Generation stops after a user-specified interval or when condition at the input is met. The diodes show the selected OFF condition.
16. **Stop-condition indicator.** Indicates that a contact connected to the input is closed or if voltage is present.
17. **Status indicator.** Indicates if a contact connected to the input is closed or if voltage is present.
18. **Stop input.** Used to freeze a reading or stop injection. Activated when current is interrupted by the object being tested, when an external contact is actuated or when a voltage is applied or removed.



Specifications ODEN AT

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

System designation

An ODEN AT-system consists of a control unit and one, two or three current units. There are three different versions of the current units: S-unit (standard), X-unit (extra 30/60 V outlet) and H-unit (high current). The system designation indicates the number and version of current units included.

Example: ODEN AT/2X
2 = Number of current units
X = Version of current unit (S, X or H)

Environment

Application field	The instrument is intended for use in high-voltage substations and industrial environments.
Temperature	
Operating	0°C to +50°C (+32°F to +122°F)
Storage & transport	-25°C to +55°C (-13°F to +127°F)
Humidity	5% – 95% RH, non-condensing

CE-marking

LVD	2006/95/EC
EMC	2004/108/EC

General

Mains voltage	240/400 V AC, 50/60 Hz 480 V AC / 60 Hz
Mains inlet	IEC 60309-2, 63 A
Input current	Output current x open circuit voltage / input voltage
Protection	The output transformer has a built-in thermal cut-out, and the primary side is protected by a miniature circuit breaker.
Dimensions	
Control unit AT	570 x 310 x 230 mm (22.4" x 12.2" x 9")
Current unit S, X H	570 x 310 x 155 mm (22.4" x 12.2" x 6")
Complete with cart	690 x 350 x 860 mm (27.2" x 13.8" x 33.9")
Weight	
Control unit AT	25 kg (55 lbs)
Current unit S	42 kg (92.6 lbs)
Current unit X	45 kg (99.3 lbs)
Current unit H	49 kg (108 lbs)
Cart	11 kg (24.3 lbs)
Display	LCD
Available languages	English, German, French, Spanish, Swedish.

Measurement section

Ammeters

Measurement method	AC, true RMS
Inaccuracy	1% of range ±1 digit

Ammeter 1

Ranges	0 – 4800 A / 0 –15 kA 0 – 9600 A / 0 – 30 kA 0 – 960 A / 0 – 3 kA

Ammeter 2

Ranges	0 – 2.000 A / 0 – 20.00 A
Maximum current	20 A (The input is not protected by a fuse)

Voltmeter

Measurement method	AC, true RMS
Ranges	0 – 0.2 V, 0 – 2 V, 0 – 20 V, 0 – 200 V, AUTO
Inaccuracy	1% of range ±1 digit
Input resistance (Rin)	240 kΩ (range 0 – 200 V) 24 kΩ (other ranges)
Dielectric withstand	2.5 kV

Timer

Presentation	In seconds, mains frequency cycles or hours and minutes
Ranges	0.000 – 999.9 s 0 – 9999 cycles 0.001 s – 99 h 59 min
Inaccuracy	±(1 digit + 0.01% of value) For the stop condition in INT-mode 1 ms shall be added to the specified measurement error.

Stop input

Max. input voltage	250 V AC / 275 V DC

Phase angle

Range	0 – 359°
Resolution	1°
Inaccuracy	±2° (for voltage and current readings that are higher than 10% of the selected range)

Z, P, R, X, S, Q and power factor (cos φ)

For these measurements the result is calculated using U, I and sometimes φ.

Imax

Stores highest current value that exists ≥100 ms

INT-level

Threshold indicating that current is interrupted. Can be set to 0.7% or 2.1% of Ammeter 1 range.

Outputs

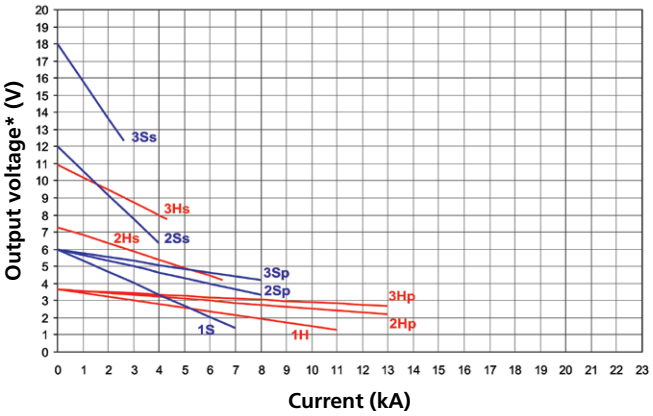
ODEN AT, 240 V mains voltage, 50 / 60 Hz					
		Open circuit voltage	**Max. continuous current [3]**	**Max. current, 3 minutes [3]**	**Max. current, 1 sec [3]**
ODEN AT/1S					
		6 V	1000 A	2000 A	7000 A
ODEN AT/2S					
	[1]	6 V	1680 A	3600 A	8000 A
	[2]	12 V	1000 A	2000 A	4000 A
ODEN AT/3S					
	[1]	6 V	2500 A	5200 A	8000 A
	[2]	18 V	840 A	1700 A	2600 A
ODEN AT/1X					
High current output		6 V	1000 A	2000 A	7000 A
Output 0 – 30/60 V					
30 V range		30 V	160 A	300 A	1200 A
60 V range		60 V	80 A	150 A	600 A
ODEN AT/2X					
High current output	[1]	6 V	1680 A	3600 A	8000 A
	[2]	12 V	1000 A	2000 A	4000 A
Output 0 – 30/60 V					
30 V range	[1]	30 V	320 A	600 A	1600 A
30 V range	[2]	60 V	160 A	300 A	800 A
60 V range	[2]	120 V	80 A	150 A	400 A
ODEN AT/3X					
High current output	[1]	6 V	2500 A	5200 A	8000 A
	[2]	18 V	840 A	1700 A	2600 A
Output 0 – 30/60 V					
30 V range	[1]	30 V	480 A	900 A	1600 A
30 V range	[2]	90 V	160 A	300 A	520 A
60 V range	[2]	180 V	80 A	150 A	260 A
ODEN AT/1H					
		3.6 V	1250 A	2600 A	11 kA
ODEN AT/2H					
	[1]	3.6 V	2500 A	5500 A	13 kA
	[2]	7.2 V	1250 A	2800 A	6500 A
ODEN AT/3H					
	[1]	3.6 V	3800 A	8000 A	13 kA
	[2]	10.7 V	1250 A	2800 A	4300 A

ODEN AT, 400 V mains voltage, 50 / 60 Hz					
		Open circuit voltage	**Max. continuous current [3]**	**Max. current, 3 minutes [3]**	**Max. current, 1 sec [3]**
ODEN AT/1S					
		6 V	1000 A	2000 A	7000 A
ODEN AT/2S					
	[1]	6 V	1900 A	4000 A	13 kA
	[2]	12 V	900 A	2000 A	6000 A
ODEN AT/3S					
	[1]	6 V	1900 A	4000 A	13 kA
	[2]	18 V	600 A	1400 A	4400 A
ODEN AT/1X					
High current output		6 V	1000 A	2000 A	7000 A
Output 0 – 30/60 V					
30 V range		30 V	160 A	300 A	1200 A
60 V range		60 V	80 A	150 A	600 A
ODEN AT/2X					
High current output	[1]	6 V	1900 A	4000 A	13 kA
	[2]	12 V	900 A	2000 A	6000 A
Output 0 – 30/60 V					
30 V range	[1]	30 V	320 A	600 A	2500 A
30 V range	[2]	60 V	160 A	300 A	1200 A
60 V range	[2]	120 V	80 A	150 A	600 A
ODEN AT/3X					
High current output	[1]	6 V	1900 A	4000 A	13 kA
	[2]	18 V	600 A	1400 A	4400 A
Output 0 – 30/60 V					
30 V range	[1]	30 V	380 A	850 A	2600 A
30 V range	[2]	90 V	120 A	290 A	880 A
60 V range	[2]	180 V	60 A	145 A	440 A
ODEN AT/1H					
		3.6 V	1250 A	2600 A	11 kA
ODEN AT/2H					
	[1]	3.6 V	2500 A	5300 A	21 kA
	[2]	7.2 V	1250 A	2500 A	10.9 kA
ODEN AT/3H					
	[1]	3.6 V	3800 A	7700 A	21.9 kA
	[2]	10.7 V	1250 A	2600 A	7200 A

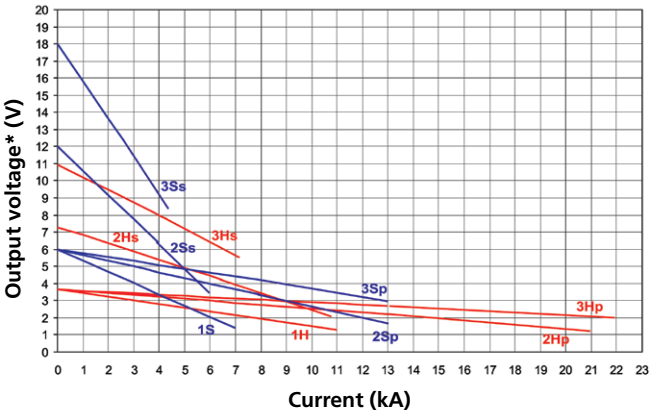
ODEN AT, 480 V mains voltage, 60 Hz					
		Open circuit voltage	Max. continuous current 3)	Max. current, 3 minutes 3)	Max. current, 1 sec 3)
ODEN AT/1S					
		7.2 V	1000 A	2000 A	7000 A
ODEN AT/2S					
	1)	7.2 V	1900 A	4000 A	13 kA
	2)	14.4 V	900 A	2000 A	6000 A
ODEN AT/3S					
	1)	7.2 V	1900 A	4000 A	13 kA
	2)	21.6 V	600 A	1400 A	4400 A
ODEN AT/1X					
High current output		7.2 V	1000 A	2000 A	7000 A
Output 0 – 30/60 V					
30 V range		36 V	160 A	300 A	1200 A
60 V range		72 V	80 A	150 A	600 A
ODEN AT/2X					
High current output	1)	7.2 V	1900 A	4000 A	13 kA
	2)	14.4 V	900 A	2000 A	6000 A
Output 0 – 30/60 V					
30 V range	1)	36 V	320 A	600 A	2500 A
60 V range	1)	272 V	160 A	300 A	1200 A
60 V range	2)	144 V	80 A	150 A	600 A
ODEN AT/3X					
High current output	1)	7.2 V	1900 A	4000 A	13 kA
	2)	21.6 V	600 A	1400 A	4400 A
Output 0 – 30/60 V					
30 V range	1)	36 V	380 A	850 A	2600 A
30 V range	2)	108 V	120 A	290 A	880 A
60 V range	2)	216 V	60 A	145 A	440 A
ODEN AT/1H					
		4.3 V	1250 A	2600 A	11 kA
ODEN AT/2H					
	1)	4.3 V	2500 A	5300 A	21 kA
	2)	8.7 V	1250 A	2500 A	10.9 kA
ODEN AT/3H					
	1)	4.3 V	3800 A	7700 A	21.9 kA
	2)	13.0 V	1250 A	2600 A	7200 A

1) Current units connected in parallel
2) Current units connected in series
3) Maximum possible current is also limited by the impedance in the test circuit. The current value can not exceed output voltage / impedance value.

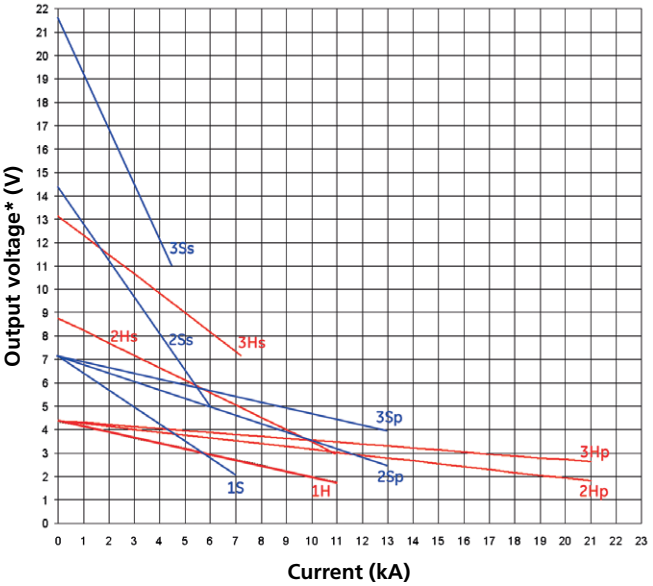
High current output - ODEN AT systems for 240 V, 50 Hz



High current output - ODEN AT systems for 400 V, 50 Hz



High current output - ODEN AT systems for 480 V, 60 Hz



S or X units
H units
p = units in parallel, s = units in series
***) Voltage between output terminals**

Optional accessories

HCP2000 — High Current Probe

The high current probe, HCP2000, is a tool that makes it possible to test Molded Case Circuit Breakers (MCCB), without removing/uninstalling the circuit breaker. The high current probe operates up to 2000 A trip current.

High current serial bar

For serial connecting of ODEN current units.

Current transformer switchbox

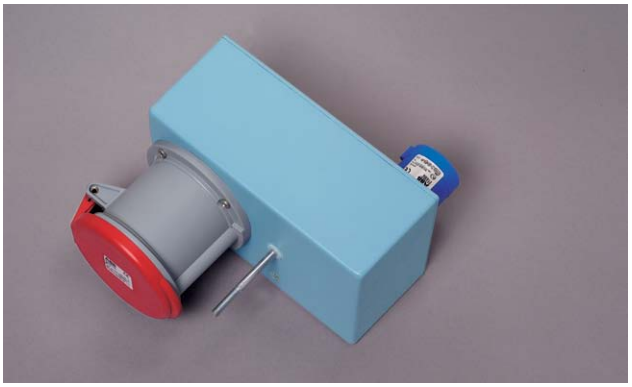
The Current Transformer (CT) Switchbox for ODEN AT is a tool that is used to facilitate CT testing. The secondary windings on the CT are connected to the CT Switchbox inputs and the CT Switchbox output is connected to ODEN AT Ammeter 2 terminals. The switch on the CT Switchbox is used to select which secondary winding on the CT that should be measured. The windings that aren't measured are short-circuited. The CT Switchbox can handle up to 5 secondary windings.

Multi-cable high current cable sets

Low-impedance multi-cable sets for higher output current. Available with 2, 3, 4 or 6 parallel cables, and in lengths of 0.5, 1.0, 1.5 or 2 meters.

Cable sets

See Ordering Information.



Input power adapter 240/400V

Used to run a 400 V ODEN AT at 240 V. Can only be used together with an ODEN AT.

Megger

Ordering information

Item	Art.No.
A cart (Art.No. 50-00092) is always included with purchase of a complete ODEN system. The cable set(s) for connection to the object under test must however be stated as a separate item in the order. Cable for connecting current units in series is included with purchase of a current unit.	
ODEN AT/1S	
240 V Mains voltage	BH-62411
400 V Mains voltage	BH-64011
480 V (60 Hz) Mains voltage	BH-64811
ODEN AT/2S	
240 V Mains voltage	BH-62412
400 V Mains voltage	BH-64012
480 V (60 Hz) Mains voltage	BH-64812
ODEN AT/3S	
240 V Mains voltage	BH-62413
400 V Mains voltage	BH-64013
480 V (60 Hz) Mains voltage	BH-64813
ODEN AT/1X	
240 V Mains voltage	BH-62421
400 V Mains voltage	BH-64021
480 V (60 Hz) Mains voltage	BH-64821
ODEN AT/2X	
240 V Mains voltage	BH-62422
400 V Mains voltage	BH-64022
480 V (60 Hz) Mains voltage	BH-64822
ODEN AT/3X	
240 V Mains voltage	BH-62423
400 V Mains voltage	BH-64023
480 V (60 Hz) Mains voltage	BH-64823
ODEN AT/1H	
240 V Mains voltage	BH-62431
400 V Mains voltage	BH-64031
480 V (60 Hz) Mains voltage	BH-64831
ODEN AT/2H	
240 V Mains voltage	BH-62432
400 V Mains voltage	BH-64032
480 V (60 Hz) Mains voltage	BH-64832
ODEN AT/3H	
240 V Mains voltage	BH-62433
400 V Mains voltage	BH-64033
480 V (60 Hz) Mains voltage	BH-64833

Item		Art.No.
Optional accessories		
HCP2000		AA-90165
Current Transformer Switchbox		BH-90130
High Current Serial Bar		BH-90102
Mains Adapter 240/400V Note: Can only be used together with an ODEN AT prepared for this feature. Contact Programma.		BH-90120
ODEN-Select Software tool for finding the best ODEN AT configuration. Free-ware, can be downloaded from the Programma web site.		
Multi-cable high current cable sets		
Length	***Impedance (Twisted-pair cables)***	
Cross section area: 240 mm^2 (2x120)		
2 x 0.5 m (1.6 ft)	0.21 mΩ	GA-12205
2 x 1 m (3.3 ft)	0.32 mΩ	GA-12210
2 x 1.5 m (4.9 ft)	0.42 mΩ	GA-12215
2 x 2 m (6.6 ft)	0.53 mΩ	GA-12220
Cross section area: 360 mm^2 (3x120)		
2 x 0.5 m (1.6 ft)	0.18 mΩ	GA-12305
2 x 1 m (3.3 ft)	0.25 mΩ	GA-12310
2 x 1.5 m (4.9 ft)	0.32 mΩ	GA-12315
2 x 2 m (6.6 ft)	0.39 mΩ	GA-12320
Cross section area: 480 mm^2 (4x120)		
2 x 0.5 m (1.6 ft)	0.16 mΩ	GA-12405
2 x 1 m (3.3 ft)	0.21 mΩ	GA-12410
2 x 1.5 m (4.9 ft)	0.27 mΩ	GA-12415
2 x 2 m (6.6 ft)	0.32 mΩ	GA-12420
Cross section area: 720 mm^2 (6x120)		
2 x 0.5 m (1.6 ft)	0.14 mΩ	GA-12605
2 x 1 m (3.3 ft)	0.18 mΩ	GA-12610
2 x 1.5 m (4.9 ft)	0.21 mΩ	GA-12615
2 x 2 m (6.56 ft)	0.25 mΩ	GA-12620
Cable set, 2 x 5 m (16 ft), 120 mm^2 Cross section area: 120 mm^2 Weight: 15.2 kg (33.5 lbs) Impedance: 2.2 mΩ		GA-12052
Cable set, 2 x 5 m (16 ft), 25 mm^2 Cross section area: 25 mm^2 For the 30/60 V output of current unit X. Weight: 4 kg (8.8 lbs)		GA-02052