ODEN AT

Primary Current Injection Test System

Programma®

A Megger Group Company

ODEN AT

Primary current injection test system

This powerful test system is designed for primary injection testing of protective relay equipment and circuit breakers. It is also used to test the transformation 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 transformation 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 current and time cycles. 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 current 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.

Automatic reclosers and sectionalizers

Oden AT can also be set to test direct-acting automatic reclosers and sectionalizers. 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.

Cable application

❶ **Miniature circuit breaker used for current output**
Interrupts output current. Can also be actuated manually for safe disconnection of load.

❷ **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.

❸ **Hold function**
This function freezes readings on the display.

❹ **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:
a) automatic recloser, b) sectionalizer or c) microhmmeter. ODEN AT can also be set to generate pulse trains with user-selectable pulse and pause times.

❺ **Selection/setting (CHANGE) knob**
Selects the desired menu option (shown in the display window). Also used to change numerical values.

❻ **Knob for fine adjustment of current and +/- buttons for coarse adjustment.**

❼ **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.

❽ **Injection**
Starts current injection and timing.

❾ **Momentary Injection**
When this button is used, injection continues only as long as it is pressed. Useful in order to avoid for example overheating.

❿ **RS232 for computer**
ODEN AT is equipped with a serial port for communication with personal computers (for transfer of test data).

⓫ **Manual shut-off**
Injection and timing are stopped when this button is pressed.

⓬ **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.

⓭ **Input for voltmeter**
Used to measure voltage and also for microhmmeter measurement.

⓮ **Indicator lamps**
Indicate whether ammeter 2 or the voltmeter is enabled.

⓯ **Input for ammeter 2**
Used to measure current in an external circuit (in a current transformer´s secondary winding for example).

⓰ **Stop-condition indicator**
Indicates that a contact connected to the input is closed or if voltage is present.

⓱ **Status indicator**
Indicates if a contact connected to the input is closed or if voltage is present.

⓲ **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.

To combine outstanding versatility with user-friendliness, ODEN AT's designers gave the front panel and user interface top priority. The clearly marked control panel is divided into sections. There are a number of pre-defined settings for frequently encountered applications. You can repeat any test by pressing a single button.

Optional accessories

HCP2000

The High Current Probe, HCP2000, is a tool that makes it possible to test automatic circuit breakers, also known as Moulded Case Circuit Breakers (MCCB), without removing/uninstalling the circuit breaker. These circuit breakers can for example be found in power plants and industry. The circuit breakers operates from 16 A up to 1500 A trip current.

HCP2000 - High Current Probe

Current transformer switchbox

The Current Transformer (CT) Switchbox to ODEN AT is a tool that is used to facilitate CT testing with ODEN AT. 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. 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.

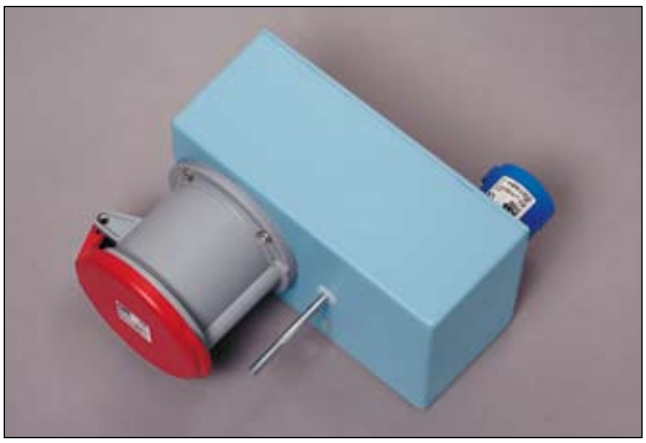
Current Transformer Switchbox

High current serial bar

For serial connecting of ODEN current units.

Mains adapter 240/400V

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



Mains adapter 240/400 V

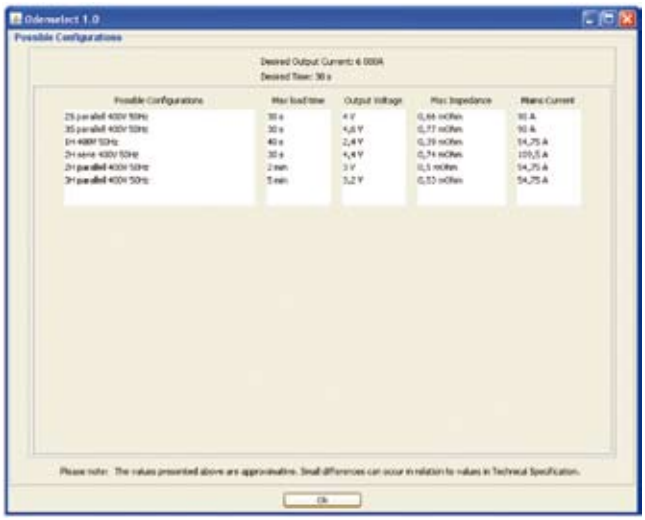
Cable sets

See Ordering information.

ODEN-Select

ODEN-select is a software tool for finding the best ODEN AT configuration. It is useful both when making a purchase and when you are going to make a test. You can easily see the configuration having the highest output voltage. The maximum impedance and the required mains current are also calculated.

ODEN-select is a free-ware and it can be downloaded from Programma's web site.



After entering the desired current and load time you will see a list over all ODEN AT configurations that fulfil the requirements.

Multi-cable high current cable set 6 x 120 mm²

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	Low Voltage Directive 73/23/ EEC am. by 93/68/EEC
EMC	EMC Directive 89/336/EEC am. by 91/263/EEC, 92/31/EEC and 93/68/EEC

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

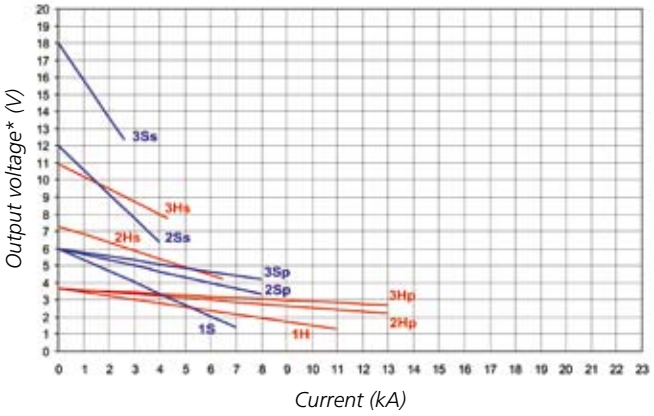
Threshold indicating that current is interrupted. Can be set to 0.7% or 2.1% of Ammeter 1 range.

Outputs

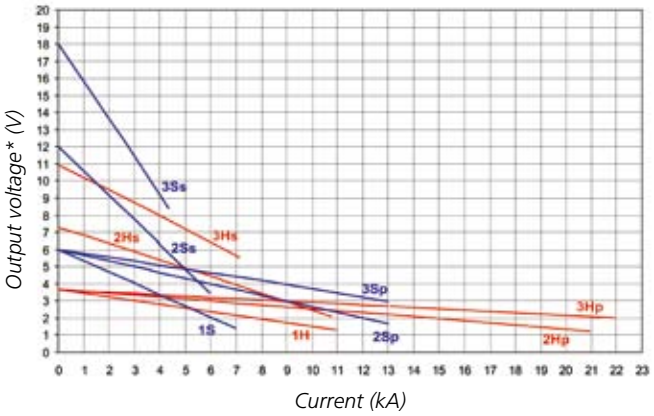
ODEN AT, 240 V mains voltage, 50 / 60 Hz

		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

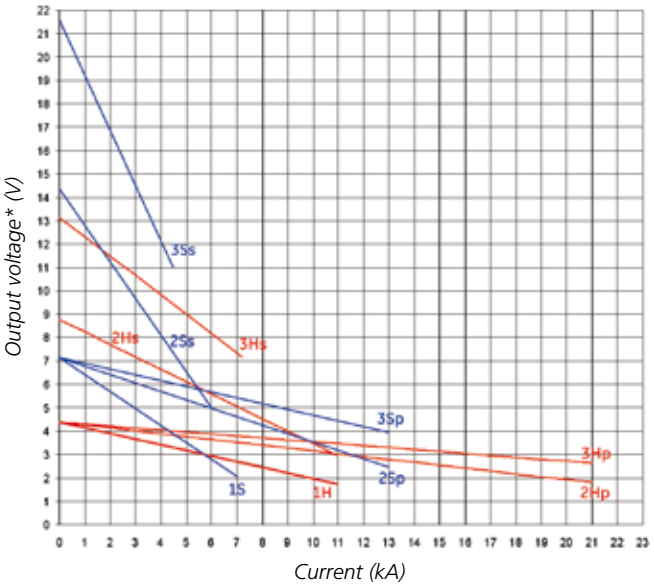
High current output - ODEN AT systems for 240 V, 50 Hz



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*

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.

Ordering information

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.

	Art.No.
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**

Optional accessories		Art.No.
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 mm² (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 mm² (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 mm² (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 mm² (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 mm² Cross section area: 120 mm² Weight: 15.2 kg (33.5 lbs) Impedance: 2.2 mΩ		**GA-12052**
Cable set, 2 x 5 m (16 ft), 25 mm² Cross section area: 25 mm² For the 30/60 V output of current unit X. Weight: 4 kg (8.8 lbs)		**GA-02052**

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