

# ODEN AT

## Primary Current Injection Test System

# Megger<sup>®</sup>



- **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 1/30 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 measure an additional current or voltage. Current transformer turns ratio, impedance, resistance, power, power factor ( $\cos \phi$ ) 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 current's zero-crossing 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 current's 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.

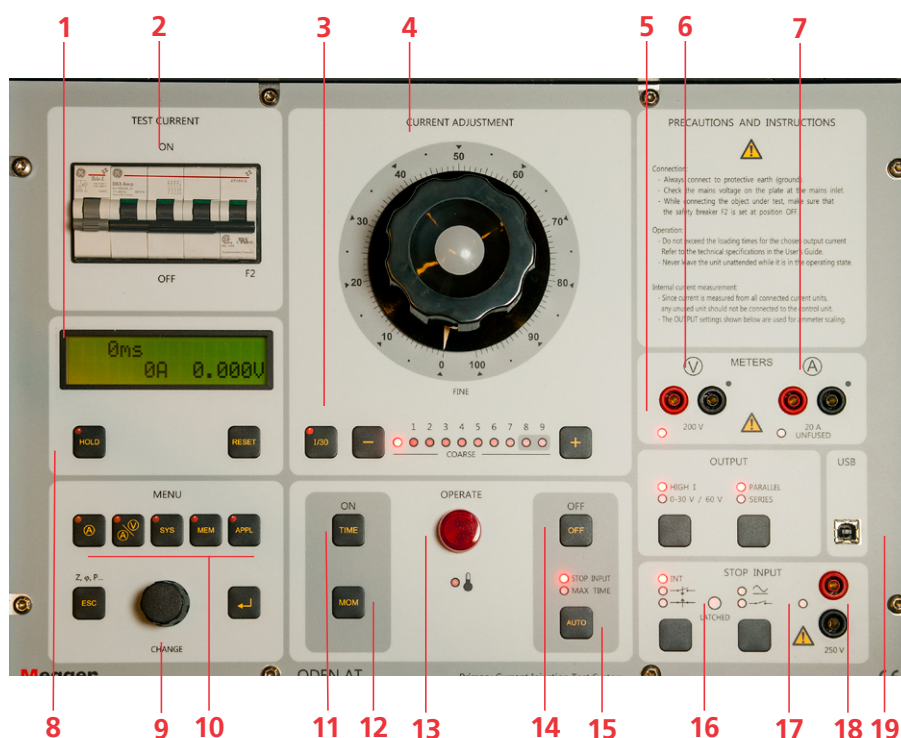
#### ■ Testing integrity of ground grids and safety-ground devices

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.

## ODEN AT Primary Current Injection Test System

### 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 ( $\cos \varphi$ ) 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 micro-ohmmeter 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.
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. **Red warning lamp,** lit during current generation.
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 stop condition is met, voltage or contact triggered.
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.
19. **USB port** for communication with PC (for transfer of test data).



# ODEN AT

## Primary Current Injection Test System

### 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	2014/35/EU
EMC	2014/30/EU
RoHS	2011/65/EU

#### 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

##### Ammeter 1

**Measurement method** AC, true RMS (or DC if function is activated)

**Inaccuracy** 1% of range ±1 digit

##### Ammeter 1 Low/High range

**Ranges** Current unit S, 0 – 4800 A / 0 – 15 kA  
 Current unit H, 0 – 9600 A / 0 – 30 kA  
 Current unit X, 0 – 960 A / 0 – 3 kA

Above valid for one current unit or units in parallel. For further information refer to section "11.8 Ammeter 1" in the user manual.

##### Ammeter 2 Low/High range

**Ranges** 0 – 2.000 A / 0 – 20.00 A

##### Voltmeter

**Measurement method** AC, true RMS (or DC if activated)

**Ranges** 0 – 9.999 V  
 10.00 – 99.99 V  
 100.0 – 200.0 V

**Inaccuracy** 1% of range ±1 digit

**Input resistance (R<sub>in</sub>)** 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.

##### I<sub>max</sub>

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.

# ODEN AT

## Primary Current Injection Test System

### Outputs

ODEN AT, 240 V mains voltage, 50/60 Hz					
		Open circuit voltage	Max. continuous current <sup>3)</sup>	Max. current, 3 minutes <sup>3)</sup>	Max. current, 3)
<b>ODEN AT/1S</b>					
		6 V	1000 A	2000 A	7000 A
<b>ODEN AT/2S</b>					
	1)	6 V	2000 A	3600 A	8000 A
	2)	12 V	1000 A	2000 A	4000 A
<b>ODEN AT/3S</b>					
	1)	6 V	2500 A	5200 A	8000 A
	2)	18 V	840 A	1700 A	2600 A
<b>ODEN AT/1X</b>					
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
<b>ODEN AT/2X</b>					
High current output	1)	6 V	2000 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
<b>ODEN AT/3X</b>					
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
<b>ODEN AT/1H</b>					
		3.6 V	1250 A	2600 A	11 kA
<b>ODEN AT/2H</b>					
	1)	3.6 V	2500 A	5500 A	13 kA
	2)	7.2 V	1250 A	2800 A	6500 A
<b>ODEN AT/3H</b>					
	1)	3.6 V	3800 A	8000 A	13 kA
	2)	10.7 V	1250 A	2800 A	4300 A

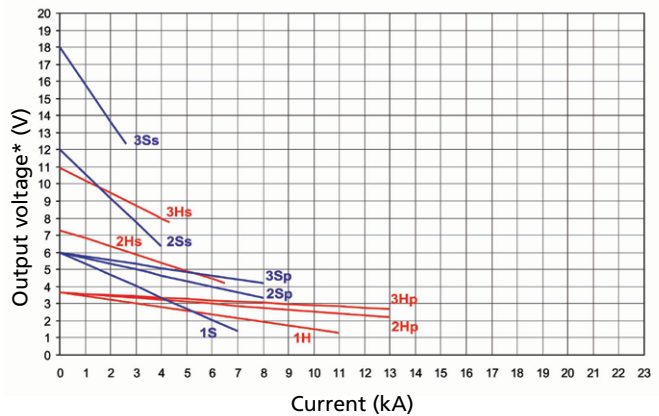
ODEN AT, 400 V mains voltage, 50/60 Hz					
		Open circuit voltage	Max. continuous current <sup>3)</sup>	Max. current, 3 minutes <sup>3)</sup>	Max. current, 3)
<b>ODEN AT/1S</b>					
		6 V	1000 A	2000 A	7000 A
<b>ODEN AT/2S</b>					
	1)	6 V	1900 A	4000 A	13 kA
	2)	12 V	900 A	2000 A	6000 A
<b>ODEN AT/3S</b>					
	1)	6 V	1900 A	4000 A	13 kA
	2)	18 V	600 A	1400 A	4400 A
<b>ODEN AT/1X</b>					
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
<b>ODEN AT/2X</b>					
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	2000 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
<b>ODEN AT/3X</b>					
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	2000 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
<b>ODEN AT/1H</b>					
		3.6 V	1250 A	2600 A	11 kA
<b>ODEN AT/2H</b>					
	1)	3.6 V	2500 A	5300 A	21 kA
	2)	7.2 V	1250 A	2500 A	10.9 kA
<b>ODEN AT/3H</b>					
	1)	3.6 V	3800 A	7700 A	21.9 kA
	2)	11 V	1250 A	2600 A	7200 A

## ODEN AT Primary Current Injection Test System

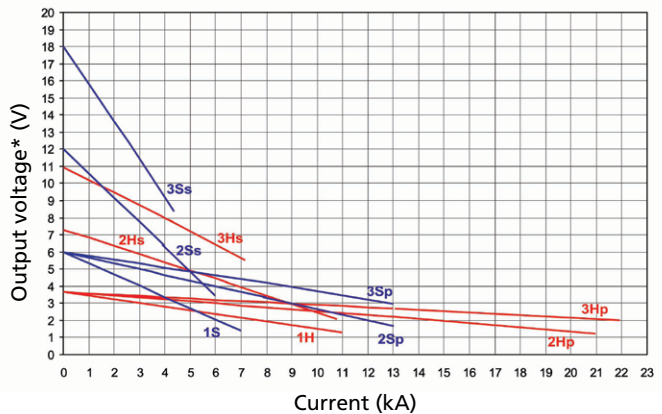
ODEN AT, 480 V mains voltage, 60 Hz				
	Open circuit voltage	Max. continuous current <sup>3)</sup>	Max. current, 3 minutes <sup>3)</sup>	Max. current, 3)
<b>ODEN AT/1S</b>				
	7.2 V	1000 A	2000 A	7000 A
<b>ODEN AT/2S</b>				
1)	7.2 V	1900 A	4000 A	13 kA
2)	14.4 V	900 A	2000 A	6000 A
<b>ODEN AT/3S</b>				
1)	7.2 V	1900 A	4000 A	13 kA
2)	21.6 V	600 A	1400 A	4400 A
<b>ODEN AT/1X</b>				
High current output	7.2 V	1000 A	2000 A	7000 A
<b>Output 0 – 30/60 V</b>				
30 V range	36 V	160 A	300 A	1200 A
60 V range	72 V	80 A	150 A	600 A
<b>ODEN AT/2X</b>				
High current output	1) 7.2 V	1900 A	4000 A	13 kA
	2) 14.4 V	900 A	2000 A	6000 A
<b>Output 0 – 30/60 V</b>				
30 V range	1) 36 V	320 A	600 A	2500 A
60 V range	1) 72 V	160 A	300 A	1200 A
60 V range	2) 144 V	80 A	150 A	600 A
<b>ODEN AT/3X</b>				
High current output	1) 7.2 V	1900 A	4000 A	13 kA
	2) 21.6 V	600 A	1400 A	4400 A
<b>Output 0 – 30/60 V</b>				
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
<b>ODEN AT/1H</b>				
	4.3 V	1250 A	2600 A	11 kA
<b>ODEN AT/2H</b>				
1)	4.3 V	2500 A	5300 A	21 kA
2)	8.7 V	1250 A	2500 A	10.9 kA
<b>ODEN AT/3H</b>				
1)	4.3 V	3800 A	7700 A	21 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.

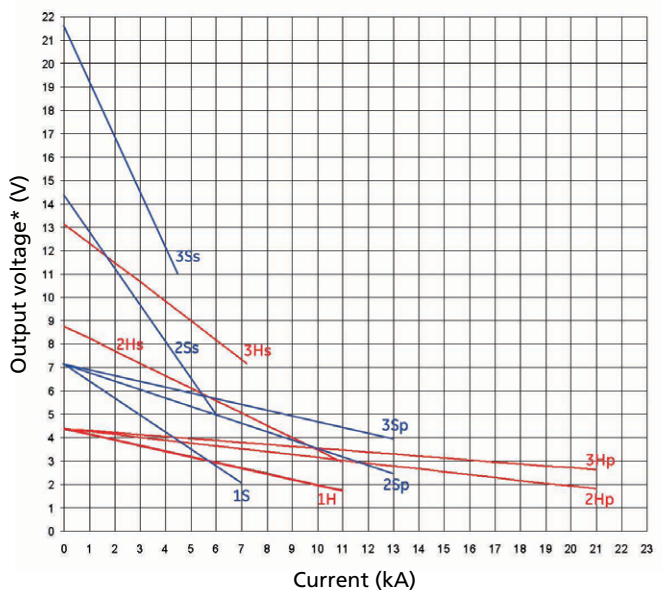
High current output - ODEN AT systems for 240 V, 50 Hz



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

## ODEN AT Primary Current Injection Test System

### INCLUDED ACCESSORIES

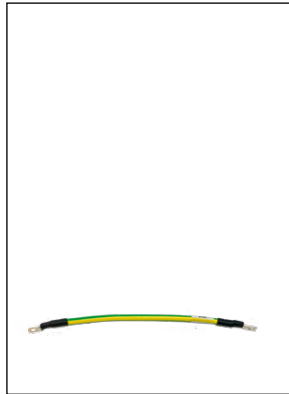


Ground cable GA-00204, 5m (16ft)

### INCLUDED ACCESSORIES



For ODEN SYSTEM 240 V Mains voltage 04-00094, 5 m



Additional ground cables when more than one current unit used. GA-00240 0.7 m  
GA-00230 0.22 m



For ODEN SYSTEM 400 V Mains voltage 04-00092, 5 m



For ODEN SYSTEM 480 V Mains voltage 04-00098, 5 m



Cable set GA-02052  
For the 30/60 V output of current unit X. Note: One (1) cable set included when ordering ODEN AT/-X system.

## ODEN AT Primary Current Injection Test System

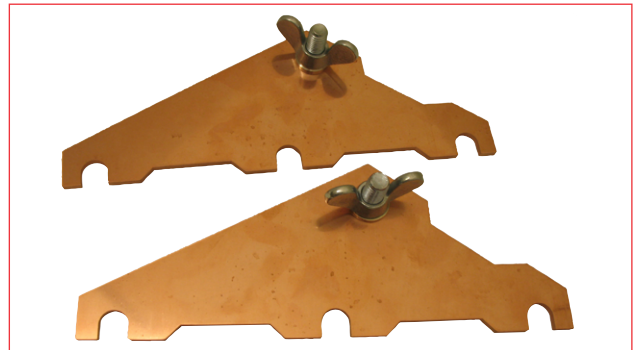
### OPTIONAL ACCESSORIES



**HCP2000 — High Current Probe AA-90165**  
The HCP2000, a tool to test Molded Case Circuit Breakers (MCCB), without removing/uninstalling the circuit breaker. It operates up to 2000 A trip current.



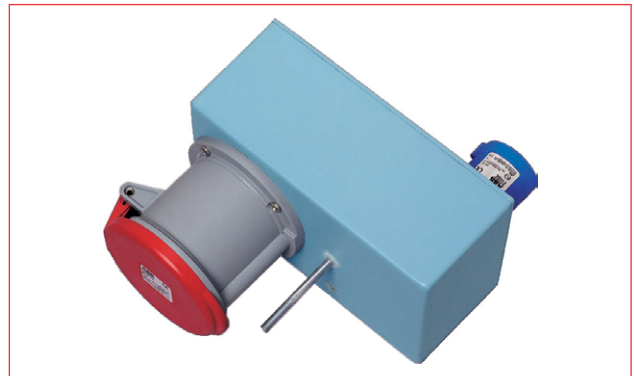
**High current serial bar BH-90102**  
For serial connecting of ODEN current units.



**High current parallel bars BH-90171**  
The parallel bars can be used when up to three current units are connected in parallel.



**Current transformer switchbox BH-90130**  
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 output is connected to ODEN AT Ammeter 2 terminals. The switch is used to select which secondary winding on the CT that should be measured. The windings that aren't measured are short-circuited. Up to five secondary windings can be handle.



**Mains adapter 240/400V BH-90120**  
Used to run a 400V ODEN AT at 240V.



**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 set GA-12052**  
Clamps with 100 mm jaw opening.

## ORDERING INFORMATION

Item	Cat. No.	Item	Cat. No.
<p>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. High current cable(s) for connecting current units in series is included with purchase of two or three current units.</p>		<p><b>Optional accessories</b></p>	
<p><b>ODEN AT/1S</b></p>		<p><b>HCP2000</b> AA-90165</p>	
240 V Mains voltage	BH-62411	<p><b>Current Transformer Switchbox</b> BH-90130</p>	
400 V Mains voltage	BH-64011	<p><b>High Current Serial Bar</b> BH-90102</p>	
480 V (60 Hz) Mains voltage	BH-64811	<p><b>High Current Parallel Bars</b> 2 pcs, weight 3 kg (6.6 lbs) BH-90171</p>	
<p><b>ODEN AT/2S</b></p>		<p><b>Mains Adapter 240/400V</b> Note: Can only be used together with an ODEN AT prepared for this feature. Contact Megger Sweden. BH-90120</p>	
240 V Mains voltage	BH-62412	<p><b>ODEN-Select</b> Software tool for finding the best ODEN AT configuration. Free-ware, can be downloaded from: <a href="http://www.megger.com">www.megger.com</a></p>	
400 V Mains voltage	BH-64012	<p><b>Multi-cable high current cable sets</b></p>	
480 V (60 Hz) Mains voltage	BH-64812	<p>Length                      Impedance (Twisted-pair cables)</p>	
<p><b>ODEN AT/3S</b></p>		<p><b>Cross section area: 240 mm<sup>2</sup> (2x120)</b></p>	
240 V Mains voltage	BH-62413	2 x 0.5 m (1.6 ft)	0.21 mΩ GA-12205
400 V Mains voltage	BH-64013	2 x 1 m (3.3 ft)	0.32 mΩ GA-12210
480 V (60 Hz) Mains voltage	BH-64813	2 x 1.5 m (4.9 ft)	0.42 mΩ GA-12215
<p><b>ODEN AT/1X</b></p>		2 x 2 m (6.6 ft)	0.53 mΩ GA-12220
240 V Mains voltage	BH-62421	<p><b>Cross section area: 360 mm<sup>2</sup> (3x120)</b></p>	
400 V Mains voltage	BH-64021	2 x 0.5 m (1.6 ft)	0.18 mΩ GA-12305
480 V (60 Hz) Mains voltage	BH-64821	2 x 1 m (3.3 ft)	0.25 mΩ GA-12310
<p><b>ODEN AT/2X</b></p>		2 x 1.5 m (4.9 ft)	0.32 mΩ GA-12315
240 V Mains voltage	BH-62422	2 x 2 m (6.6 ft)	0.39 mΩ GA-12320
400 V Mains voltage	BH-64022	<p><b>Cross section area: 480 mm<sup>2</sup> (4x120)</b></p>	
480 V (60 Hz) Mains voltage	BH-64822	2 x 0.5 m (1.6 ft)	0.16 mΩ GA-12405
<p><b>ODEN AT/3X</b></p>		2 x 1 m (3.3 ft)	0.21 mΩ GA-12410
240 V Mains voltage	BH-62423	2 x 1.5 m (4.9 ft)	0.27 mΩ GA-12415
400 V Mains voltage	BH-64023	2 x 2 m (6.6 ft)	0.32 mΩ GA-12420
480 V (60 Hz) Mains voltage	BH-64823	<p><b>Cross section area: 720 mm<sup>2</sup> (6x120)</b></p>	
<p><b>ODEN AT/1H</b></p>		2 x 0.5 m (1.6 ft)	0.14 mΩ GA-12605
240 V Mains voltage	BH-62431	2 x 1 m (3.3 ft)	0.18 mΩ GA-12610
400 V Mains voltage	BH-64031	2 x 1.5 m (4.9 ft)	0.21 mΩ GA-12615
480 V (60 Hz) Mains voltage	BH-64831	2 x 2 m (6.56 ft)	0.25 mΩ GA-12620
<p><b>ODEN AT/2H</b></p>		<p><b>Cable set, 2 x 5 m (16 ft), 120 mm<sup>2</sup></b> Cross section area: 120 mm<sup>2</sup> Weight: 15.2 kg (33.5 lbs) Impedance: 2.2 mΩ GA-12052</p>	
240 V Mains voltage	BH-62432	<p><b>Included accessories</b></p>	
400 V Mains voltage	BH-64032	<p>Cross section area: 25 mm<sup>2</sup> For the 30/60 V output of current unit X. Weight: 4 kg (8.8 lbs) system"</p>	
480 V (60 Hz) Mains voltage	BH-64832	<p>One (1) cable set included when ordering ODEN AT/-X system</p>	
<p><b>ODEN AT/3H</b></p>		<p style="text-align: right;">GA-02052</p>	
240 V Mains voltage	BH-62433		
400 V Mains voltage	BH-64033		
480 V (60 Hz) Mains voltage	BH-64833		

**Postal address**  
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