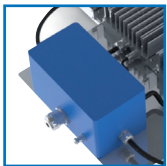
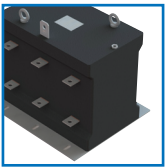




BW 151 -
Braking resistor
specifically for
Pitch Systems



REO components for wind power generation

Safe application for onshore and offshore installations

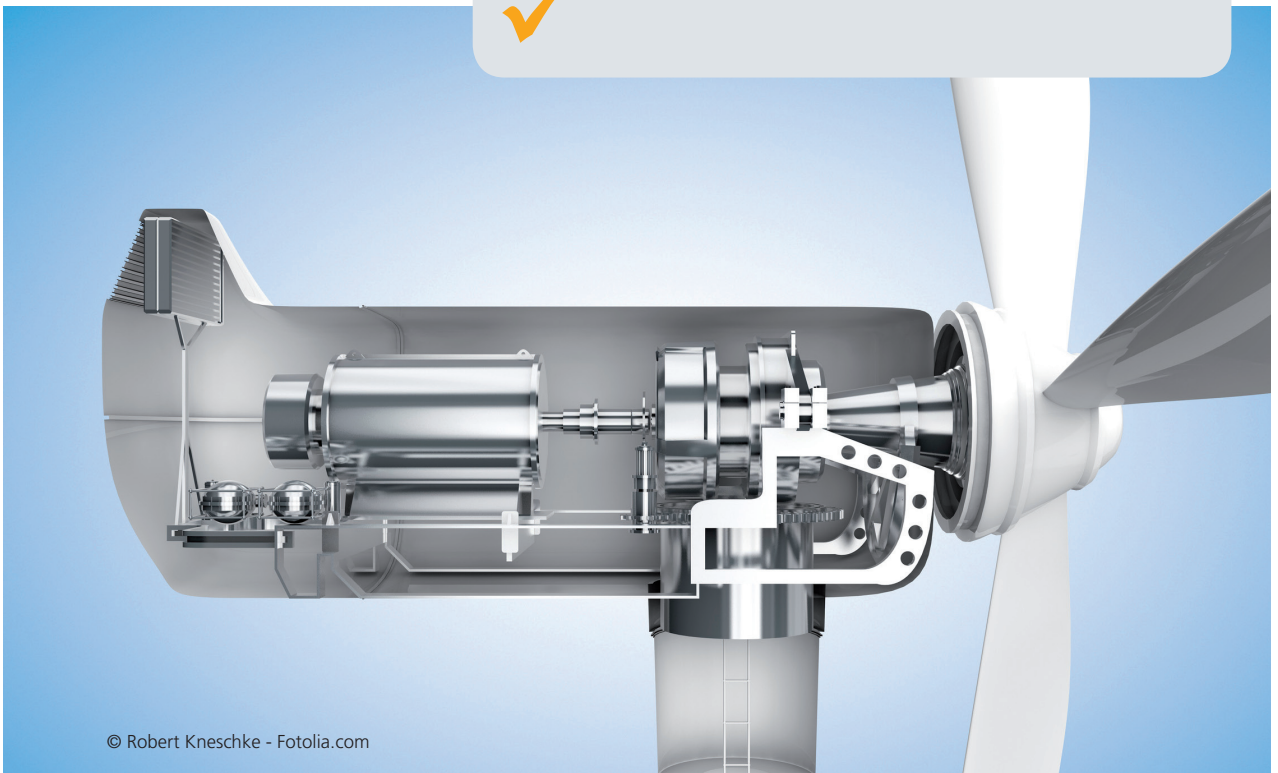
REO components for wind power generation

REO components are essential components for safe operation of modern wind turbines. REO Drive components can be used for yaw drives (tracking) or the pitch systems (leaf adjustment).

Furthermore REO produces all power reactors and high power EMC filters up to 3000 A, which can be used in the main circuit.

The advantages at a glance:

- ✓ **air- and liquid-cooled components**
- ✓ **high reliability and service life**
- ✓ **Protection from IP00 to IP65**
- ✓ **Components for offshore applications possible**
- ✓ **potted or encapsulated components - insensitive to moisture and dirt**
- ✓ **less susceptibility to dirt and vibrations**
- ✓ **low noise**

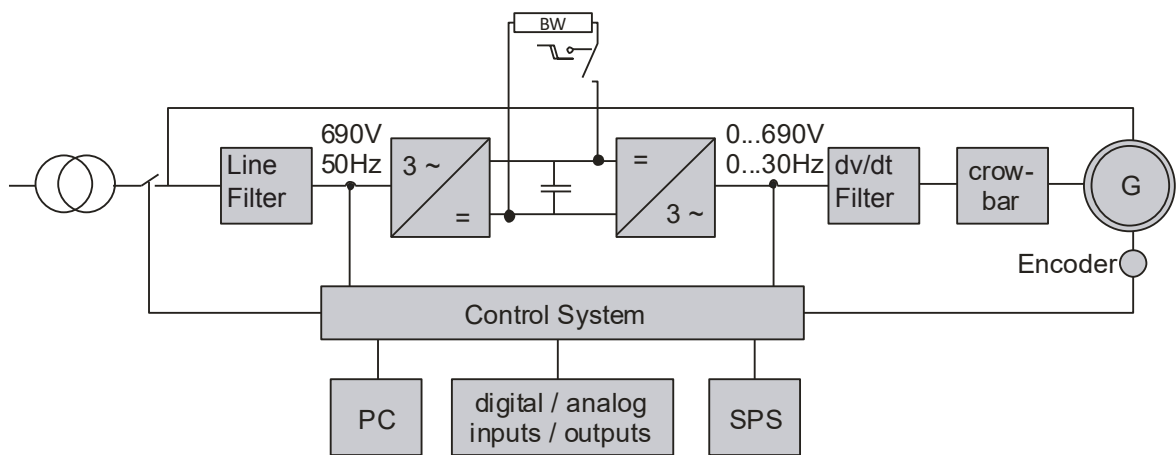


© Robert Kneschke - Fotolia.com

Circuit examples for wind turbines

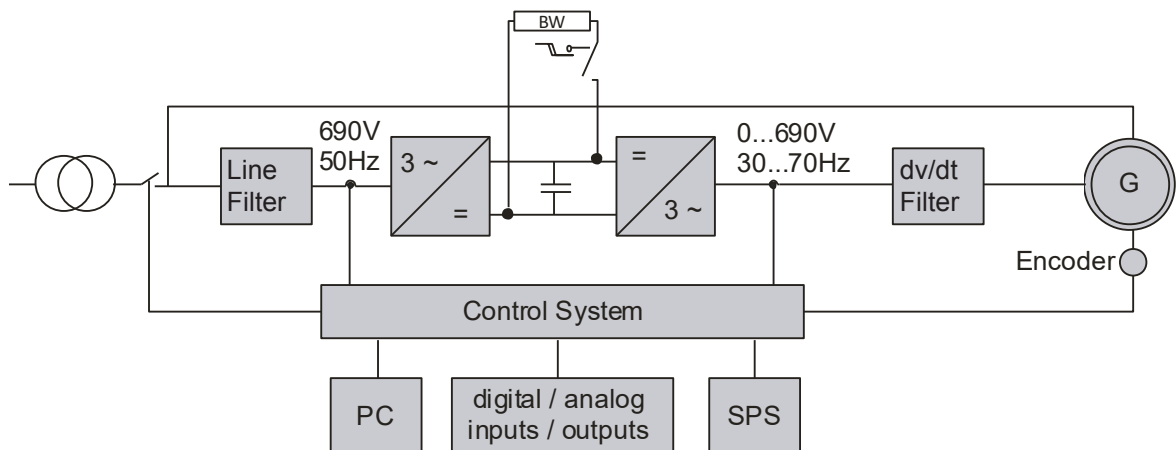
When using a double-fed asynchronous generator (DASM), the stator of the wind generator is directly connected to the mains. The rotor is connected to the inverter with DC link voltage by two controlled IGBT bridges. At the output of the grid-side inverter the power line filter is connected. The rotor of the generator is connected to the generator-side inverter via dv/dt choke.

System with double-fed asynchronous machine (DASM)

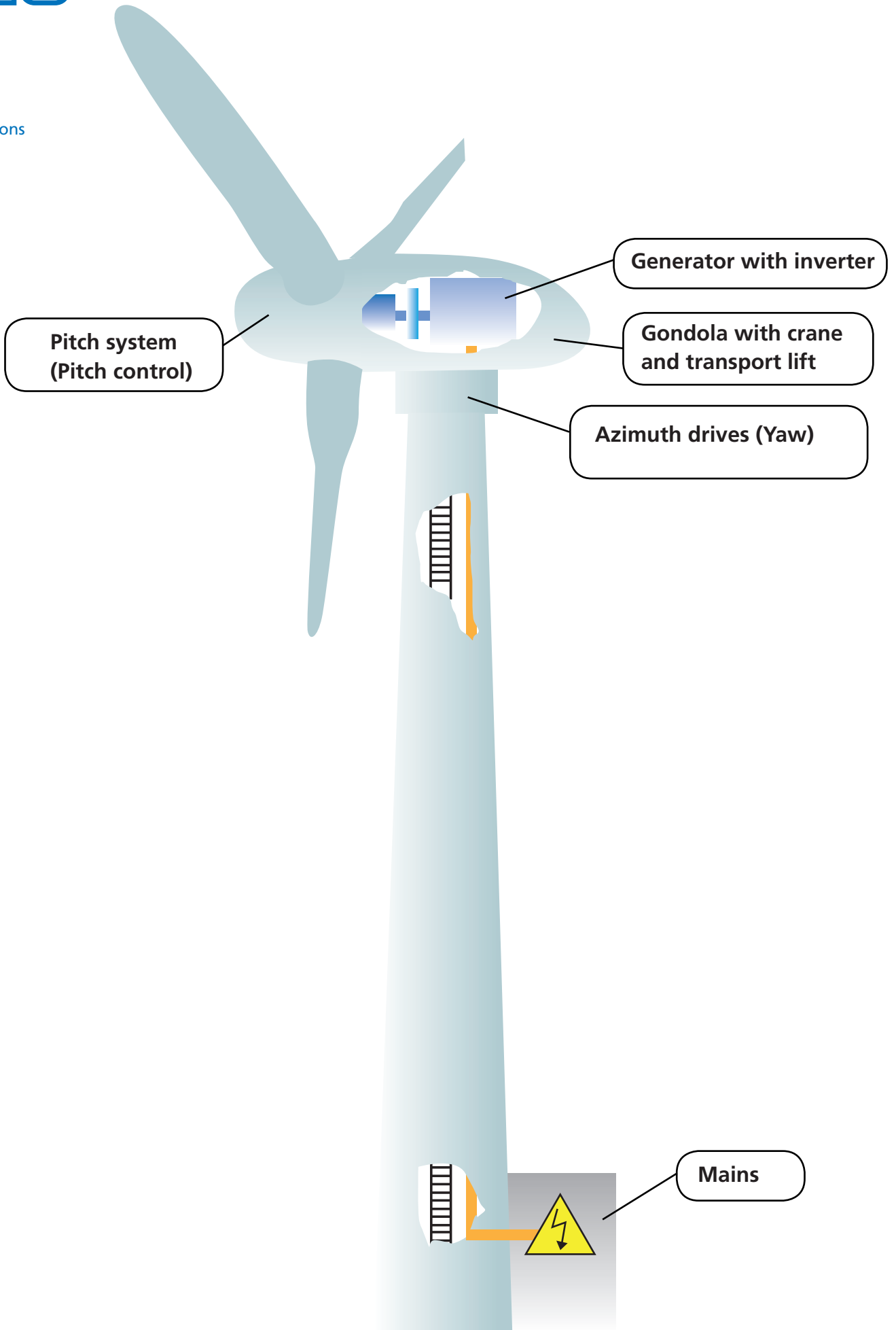


With the use of permanent-magnet synchronous generators, the stator of the wind generator is directly connected to the inverter with DC link voltage by two controlled IGBT bridges. At the output of the grid-side inverter the power line filter is connected. The generator is connected to the generator-side inverter via dv/dt filter.

System with permanent-magnet synchronous machine (PMSM)



Applications



Application	REO products
<p>Azimuth drives (Yaw)</p> <p>Electric drives for yawing the nacelle</p>	<p>REO EMC filters - Series CNW 543 / CNW 114</p> <p>REO Line chokes - Series CNW 903 / CNW M 903</p> <p>REOOhm Braking resistors - Series BW 156 / BW 155</p> <p>REO Output chokes - dv/dt filter, motor chokes, sinusoidal filter</p>
<p>Pitch-System (Pitch control)</p> <p>Electric drives for adjusting the rotor blades according to the wind speed and performance</p>	<p>REO EMC filters - Series CNW 543 / CNW 114</p> <p>REO line chokes - Series CNW 903 / CNW M 903</p> <p>REOOhm Braking resistors - Series BW 156 / BW 155</p> <p>REO Output chokes - dv/dt filter, motor chokes, sinusoidal filter</p>
<p>Service crane / Transport gondola lift</p> <p>Electric drives for crane or lift system for Transport of heavy loads in the nacelle</p>	<p>REO EMC filters - Series CNW 543 / CNW 114</p> <p>REO Line chokes - Series CNW 903 / CNW M 903</p> <p>REOOhm Braking resistors - Series BW 156 / BW 155</p> <p>REO Output chokes - dv/dt filter, motor chokes, sinusoidal filter</p>
<p>Inverter</p>	<p>REO EMC filters - Series CNW 107.3</p> <p>REO Line chokes - air cooled series CNW 903 / CNW M 903 - liquid cooled series CNW D 903 / CNW MD 903</p> <p>REOOhm Braking resistors - air cooled series BW 155 / BW 159 - liquid cooled series BW D 158</p> <p>REO Output chokes - air and liquid cooled dv/dt Filter - air and liquid cooled motor choke - air and liquid cooled sinusoidal filter</p>
<p>Mains connection</p>	<p>REO EMC filter - Series CNW 107.3</p> <p>REO Line chokes - air cooled series CNW 903 / CNW M 903 - liquid cooled series CNW D 903 / CNW MD 903</p> <p>REO Harmonic filter - series CNW 897</p>

Products for offshore applications

Offshore applications are becoming increasingly important. In this application the resistors of the material must be specially designed for environment.

With this kind of application the materials used must be specially designed for the environmental conditions. Protection class and salt spray tests are performed to ensure corresponding suitability.

Products for offshore applications	
<p>Braking resistor BW 155/9000/IP65</p> <p>Continuous output: 9000W Rated voltage: 1000V Duty cycle: 5 - 100% Protection class: IP65</p> <p>Braking resistor for use in offshore environments with increased salt-spray resistance and protection class IP</p>	
<p>EMC Line filter CNW 107.3</p> <p>Rated voltage: 480 V / 690 V Rated current: 280 – 3000 A</p> <p>EMC filter for use in offshore environments with increased salt-spray resistance</p>	

Liquid cooled components for wind power generation

Because wind turbines need to be increasingly effective and smaller and have to withstand difficult conditions such as offshore application, the demands on the cooling systems are different either.

Because processing and filtering of cooling air represent a growing effort, liquid-cooled components are an alternative solution. With optimized cooling, power losses can be minimized and the warming of the environment will be reduced to a minimum.

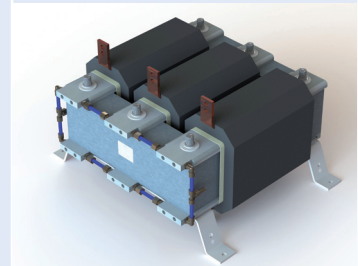
However, another option is to reduce the components dimensions and to work with high power losses. Whatever you prefer - REO offers a wide range of different liquid-cooled components.

Liquid cooled components

REO Line choke CNW MD 953

Rated current: 100 - 1200 A
Rated voltage: 500 - 800 V
Protection ratings: IP 00 - IP 65

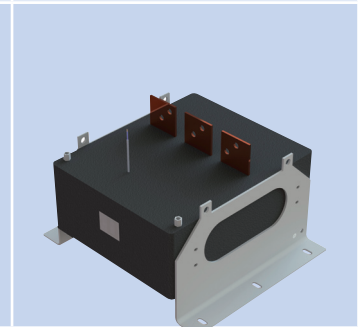
This liquid-cooled REO line choke is especially designed for the use with wind turbines. Because of the low heat generation through integrated liquid cooling, high power values can be achieved even in limited space. Hence, the surrounding components are not additionally heated. Usually, the water flow temperature is considerably lower than the ambient temperature.



REO dv/dt choke CNW MD 903

Rated current: 100 - 1200 A
Rated voltage: 500 - 800 V
Protection ratings: IP00 – IP54

By direct cooling of the winding and the iron core, the surface temperature can be reduced to values below 80°C, even at ambient temperatures up to 80°C. This results in a lower emission of additional heat energy to the environment, i.e. the component size doesn't need to be increased in order to reduce the choke temperatures.



Liquid-cooled REOhm series BW D 158

Output range: 3000 – 60000 W continuous output
Rated voltage: 1000 V
Duty cycle: 5 – 100 %
Protection ratings: IP20 – IP65

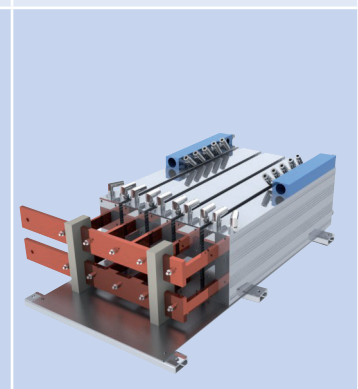
Water-cooled braking resistor of medium output for use in pitch systems and azimuth drives or as a braking resistor for the use in wind power plants. Furthermore it can be used as a charging, damping or absorption resistor (dump resistor).



Liquid-cooled REOhm load resistor R D 158

Continuous power: 5000 W
Rated voltage: up to 4200 V
Resistance value: 1 Ohm
Protection ratings: IP20 – IP65
Average pulse load:
1x per hour 20kW in 100ms
Maximum pulse load:
20x per year 120kW in 20ms

Water-cooled charge-resistance for high pulse energies





REO AG

Brühler Straße 100 · D-42657 Solingen
Tel.: +49 (0)212 8804 0 · Fax: +49 (0)212 8804 188

E-Mail: info@reo.de
Internet: www.reo.de

■ Divisions:

» REO Vibratory Feeding and Power Electronics Division

REO Vibratory Feeding and Power Electronics Division
Brühler Straße 100 · D-42657 Solingen
Tel.: +49 (0)212 8804 0 · Fax: +49 (0)212 8804 188
E-Mail: info@reo.de

» REO Train Technologies Division

REO Train Technologies Division
Erasmusstraße 14 · D-10553 Berlin
Tel.: +49 (0)30 3670236 0 · Fax: +49 (0)30 3670236 10
E-Mail: zentrale.berlin@reo.de

» REO Drives Division

REO Drives Division
Holzhausener Straße 52 · D-16866 Kyritz
Tel.: +49 (0)33971 485 0 · Fax: +49 (0)33971 485 90
E-Mail: zentrale.kyritz@reo.de

» REO Medical and Current Transformer Division

REO Medical and Current Transformer Division
Schuldhölzinger Weg 7 · D-84347 Pfarrkirchen
Tel.: +49 (0)8561 9886 0 · Fax: +49 (0)8561 9886 40
E-Mail: zentrale.pfarrkirchen@reo.de

» REO Test and PowerQuality Division

REO Test and PowerQuality Division
Brühler Straße 100 · D-42657 Solingen
Tel.: +49 (0)212 8804 0 · Fax: +49 (0)212 8804 188
E-Mail: info@reo.de

PRODUCTION + SALES:

■ China

REO Shanghai Inductive Components Co., Ltd
E-Mail: info@reo.cn · Internet: www.reo.cn

■ India

REO GPD INDUCTIVE COMPONENTS PVT. LTD
E-Mail: info@reogpd.com · Internet: www.reo-ag.in

■ USA

REO-USA, Inc.
E-Mail: info@reo-usa.com · Internet: www.reo-usa.com

SALES:

■ France

REO VARIAC S.A.R.L.
E-Mail: reovariac@reo.fr · Internet: www.reo.fr

■ Great Britain

REO (UK) Ltd.
E-Mail: main@reo.co.uk · Internet: www.reo.co.uk

■ Italy

REO ITALIA S.r.l.
E-Mail: info@reitalia.it · Internet: www.reitalia.it

■ Poland

REO CROMA Sp.zo.o
E-Mail: croma@croma.com.pl · Internet: www.croma.com.pl

■ Spain

REO ESPAÑA 2002 S.A.
E-Mail: info@reospain.com · Internet: www.reospain.com

■ Switzerland

REO ELEKTRONIK AG
E-Mail: info@reo.ch · Internet: www.reo.ch

■ Turkey

REOTURKEY ELEKTRONIK San. ve Tic. Ltd. Şti.
E-Mail: info@reo-turkey.com · Internet: www.reo-turkey.com