**AAG**

- **Stator Diameter (mm):** 108.0
- **Output Power (kW):**
  - 14V up to 0.50
  - 28V up to 0.50

**AAG Compact**

- **Stator Diameter (mm):** 108.0
- **Output Power (kW):**
  - 14V up to 1.05
  - 28V up to 1.20

**AAK**

- **Stator Diameter (mm):** 125.0
- **Output Power (kW):**
  - 14V up to 1.70
  - 28V up to 1.80

**AAK Compact**

- **Stator Diameter (mm):** 125.0
- **Output Power (kW):**
  - 14V up to 1.70
  - 28V up to 1.80

**AAL Compact**

- **Stator Diameter (mm):** 136.0
- **Output Power (kW):**
  - 14V up to 1.70
  - 28V up to 2.30

**AAN**

- **Stator Diameter (mm):** 142.0
- **Output Power (kW):**
  - 14V up to 2.80
  - 28V up to 3.40

**AAN Compact**

- **Stator Diameter (mm):** 142.0
- **Output Power (kW):**
  - 14V up to 2.80
  - 28V up to 3.40

**AAT**

- **Stator Diameter (mm):** 165.5
- **Output Power (kW):**
  - 14V up to 3.80
  - 28V up to 5.60
ALTERNATORS 14 V - output current at 1800/6000 RPM

ALTERNATORS 28 V - output current at 1800/6000 RPM
ALTERNATORS

Performance of Letrika alternators is based on long-term relationships with our customers, their high requirements and expectations and our own long-standing experience in development and production. Quality is guaranteed by applying procedures defined in the international standard ISO 9001. All business processes from customer requirements and expectations, through development and production to after-sales activities, are planned and controlled in detail. High operating reliability is assured by optimizing the design for use in different operating conditions, together with numerous validations of different alternators in our own laboratories and with field tests on vehicles.

The requirements of the Directive 2000/53/EC – End of Life Vehicles (ELV), amended by Commission Decisions 2005/438/EC and 2000/673/EC, which deal with prohibition and restriction of the use of some hazardous substances, entered into force on July 1, 2007, are fully met. As are the legal obligations under the EU regulation 1907/2006 on the registration, evaluation, authorization and registration of chemicals – REACH valid from June 1, 2007.

Full attention is paid to the environment as Letrika is also certified to the international standard ISO 14001.

APPLICATIONS

Letrika alternators are designed to meet a wide range of engineering specifications and applications. They are used on petrol and diesel engines in the automotive industry, on trucks, buses, agricultural and construction machinery and other applications. Different versions of our alternators are designed taking into account the demands of each application and are designed for long life, maintenance free operation under extreme conditions. External fan alternators are specially designed for operation in hard environmental conditions (dust, mud, salt, high vibrations level and high electrical and thermal load), for example agricultural and construction equipment. This is due to the design, which offers better protection of the alternator sub-assemblies giving the bearings and brushes a longer life, and includes the options of additional tubes for clean air in-take and trash screens. Compact alternators are designed for wide range of applications, where lower noise, compact design and operation at higher rotational speeds are specifically required; for example automotive and commercial vehicle applications. Special versions of alternators are also available; for example alternators for battery-less systems used as a power supply for A/C devices, 48V alternators are designed as a power supply for electric motors for E-cut, AC voltage alternators together with electronic controllers as a power supply for special purpose vehicles (fire trucks, ambulance, …, where an AC voltage 110V~–230V~ is needed), alternators for heating devices, ….
ALTERNATORS

MAIN FEATURES:

- High specific output power, high efficiency,
- Designed for long life, maintenance free operation under heavy duty conditions,
- High operating reliability is assured by optimizing the design for use in different operating conditions,
- High resistance to salt spray, humidity, water, mud, dust, vibrations, high and low temperatures and other environmental influences,
- Designed to meet electromagnetic compatibility and other international directives and standards,
- Produced using ecologically sound technologies and environmentally friendly materials,
- Designed to meet a wide range of engineering specifications and applications.

MAIN SUBASSEMBLIES:

Stator
The stator consists of 3-phase winding, which is wound on to a laminated stator pack. Electrical steel (cold rolled fully processed - Dynamo) of 0.5mm thickness, with controlled electrical and magnetic characteristics, is used as standard for alternators with higher performance requirements, to decrease electric and magnetic losses. Stators are specifically designed to achieve a high winding fill factor, to minimise electrical and magnetic losses, to lower winding temperatures and noise and to assure higher alternator output characteristics.

Rotor
The rotor excitation (field) winding fixed between the claw poles provides excitation of the alternator. The design of the rear part of the alternator (rotor, rear bracket, rectifier, regulator with brush holder) provides higher protection for the slip rings and brushes against environmental influences. Copper or bronze (CuSn5) slip rings together with metal-graphite brushes from established suppliers, are designed to meet long life requirements. The design of claw poles ensures efficient magnetic excitation and lower alternator noise.

Rectifier
The 3-phase full-wave rectifier bridge design with press-fit type power Zener diodes, ensures low temperatures at the rectifier diodes, high resistance to vibrations and over-voltage protection. Rectifiers are mounted on the outer or inner side of the rear end bracket, depending on the type of the alternator. Flexible arrangement of all types of terminals is ensured.

DESIGN

Alternators are air-cooled, 3-phase AC synchronous generators with specific claw-pole rotor design. The alternator range includes 6-pole pairs (AAG, AAK, AAL, AAN) and 8-pole pairs versions (AAT). The rotor contains an excitation (field) winding that is energized through slip rings and brushes. An internal electronic voltage regulator controls the amount of rotor field current in order to maintain the alternator output voltage within the required range. A 3-phase full-wave rectifier bridge rectifies the 3-phase AC voltage that is induced in the stator windings. Power Zener diodes of the press-fit type, which are built in rectifier bridge, provide over-voltage protection. Alternator cooling is provided by one external (classic alternators) or two internal fans (compact alternators). The negative terminal is normally grounded. Insulated ground versions, where the negative terminal is connected directly to the battery, are also available. Alternators are self-excited through excitation diodes (D+, diode trio) or directly from B+ terminal. Alternators are mounted on the internal combustion engine and driven by belt and pulley.

The alternator’s construction and approved materials assure improved performance, long life, and maintenance free operation. Alternators are also designed to operate under the harshest environmental conditions: high and low temperatures, salt spray, humidity, water, dust, vibrations, aggressive liquids etc.
Voltage Regulator
The voltage regulator with brush holder and brushes is fitted on the alternator rear bracket. It is electrically connected to the field winding, and rectifier. Different types are available and can be divided with regard to:

- **Electrical design**: 14V, 28V and 48V regulating voltage
- **Functions**: Mono-function with local or remote sensing, battery-less, ... and Multi-function with local or remote sensing, bus interface...
- **Technology**: Thick-Film Hybrid, Microelectronic,
- **Brush holder design** (different alternator families, different connection terminals, ...).

Different Regulation voltages and Temperature coefficients are available in order to match different applications.

Bearings
A range of specially sealed roller bearings makes it possible to design alternators for specific applications, operating in the harshest conditions whilst achieving long, maintenance free life. Different bearings types and dimensions are used on different alternator families taking into account the mechanical load, required rotational speed and operating temperature. In addition special needle bearings are used on the AAT alternator family.

Mounting Brackets - Protection covers - Pulleys
A wide range of different standard and special mounting brackets and pulleys are available. A variety of plastic protection covers for different electrical terminal configurations are also available. New designs, if necessary, are made according to customers’ requirements.

Electrical terminals
Electrical terminals can be screw or blade type in different configurations, alternatively connectors are offered. The main electrical terminals (B+, D+(L), W) may also be positioned on the side of protection covers. The position and the design of the electrical terminals can be adapted to the specific requirements of the customers. Output terminal B+ is a stud, M6, M8 and M10 are available.

Cooling
Efficient alternator cooling is a very important design issue, which allows high specific output power, lower operating temperatures, high reliability and a long alternator life. There are two different basic alternator designs due to the position of cooling fans:

- **External fan** (classic alternators) - the fan provides effective through cooling of the alternator and its subassemblies. Protection covers with the facility to mount additional hoses for clean air intake and trash screens for difficult environments are available,
- **Internal fans** (compact alternators) – two internal fans, positioned on the front and rear of the claw poles, provide more effective cooling particularly of the stator winding, allowing higher alternator rotational speed and lower acoustic noise. Greater protection against accidental contact is assured. Trash screens for protection against harsh environments are also available.

RESEARCH AND DEVELOPMENT
Letrika keeps abreast of all technical innovations in the field of alternators. New solutions are regularly applied to the design of new alternators. Energy conservation in vehicles is an absolute necessity. We are working continuously to optimize the design, increase specific output power and efficiency, and to incorporate the latest technology. The Letrika R&D laboratories are equipped to perform the majority of tests required in our and our customer’s test specifications. Outside laboratory facilities are used for other specific test requirements.
Applications

Applications with low electrical requirements and limited mounting space such as:

- Gen-sets,
- Small tractors,
- Small agricultural and construction machinery.

Features

- Small size,
- Dust-proof,
- CW or CCW rotation fan,
- Over-voltage protection,
- Different configurations and types of electrical terminals available,
- Different types of pulleys and mounting brackets available according to customer’s requirements,
- EMC approved and certified.

Design

- 3-phase 6-pole pairs synchronous generator with integrated rectifier and voltage regulator,
- Double insulated (G2) copper wire of temperature class > 200°C for stator and rotor windings,
- Rectifier with power press-fit type Zener diodes with operating temperature $T_j=215°C$ max,
- Mono-Function Regulator (14V, 28V):
  - Self-Excitation Supply (D+, diode trio),
  - Thick-Film Hybrid,
  - Metal-graphite brushes,
  - Copper slip rings,
  - External CW or CCW fan,
  - Special roller type sealed bearings.

Main technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>AAG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (V)</td>
<td>14</td>
</tr>
<tr>
<td>Rated Current (A)</td>
<td>33 - 35</td>
</tr>
<tr>
<td>Stator Diameter (mm)</td>
<td>108</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air cooling / External fan (CW or CCW)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>~3.5</td>
</tr>
<tr>
<td>Max Permanent / Short time Rotational Speed (RPM)</td>
<td>12.000 / 13.500</td>
</tr>
<tr>
<td>Voltage Regulator</td>
<td>Mono-Function (14V / 28V)</td>
</tr>
<tr>
<td>Power diodes Type</td>
<td>Press-fit Zener (35A (14V) / 50A (28V))</td>
</tr>
<tr>
<td>Over-voltage Protection</td>
<td>YES</td>
</tr>
<tr>
<td>Zener Voltage (V)</td>
<td>19-25 (14V) / 34-40 (28V)</td>
</tr>
<tr>
<td>Electrical terminals</td>
<td>B+, D+, W, B-</td>
</tr>
<tr>
<td>Drive end bearing / Rear bearing dimension</td>
<td>17X40X12 / 12x28x12</td>
</tr>
<tr>
<td>Protection of the Slip rings and Brushes Compartment</td>
<td>IP 54</td>
</tr>
<tr>
<td>Operating (Storage) Temperatures</td>
<td>- 40°C to + 110°C (+ 130°C)</td>
</tr>
<tr>
<td>EMC</td>
<td>Approved (Regulative ECE-R10 Rev.3: 2008-08)</td>
</tr>
</tbody>
</table>

Options

Marine versions available.
Regulator characteristics (Voltage settings - typical)

Mono-Function 14V

Mono-Function 28V

Performance curves

Test methods and conditions are based on standard ISO 8854.

Connection diagrams

Regulator characteristics (Voltage settings - typical)

Connection diagrams

Performance curves

Test methods and conditions are based on standard ISO 8854.

Note: Alternator thermal stabilized at 3000 RPM, I= Imax at $U_{b}= 13V$ (27V), Tamb= 23°C ± 5°C. Performance curves at higher ambient temperatures available.

<table>
<thead>
<tr>
<th>Type</th>
<th>$n_s$ (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>14V 33A</td>
<td>1150</td>
<td>15</td>
<td>32</td>
</tr>
<tr>
<td>14V 35A</td>
<td>1250</td>
<td>13</td>
<td>35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>$n_s$ (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>28V 18A</td>
<td>1200</td>
<td>8</td>
<td>18</td>
</tr>
</tbody>
</table>
AAG compact

Applications

Applications with higher electrical requirements and limited mounting space such as:

- Small tractors,
- Small agricultural and construction machinery,
- Gen-sets,
- Small passenger cars,
- Special design for racing cars.

Features

- Compact design and small size,
- Dust-proof,
- CW or CCW rotation fans,
- Multi-function regulator with additional functions (14V),
- Pulleys and mounting brackets available according to customer’s requirements
- High specific output power,
- Over-voltage protection,
- Higher protection against accidental contact,
- Lower noise level,
- Long life operation,
- EMC approved and certified.

Main technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>AAG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (V)</td>
<td>14</td>
</tr>
<tr>
<td>Rated Current (A)</td>
<td>45 - 75</td>
</tr>
<tr>
<td>Stator Diameter (mm)</td>
<td>108</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air cooling / Two internal fans (CW or CCW)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>~3.5</td>
</tr>
<tr>
<td>Max Permanent / Short time Rotational Speed (RPM)</td>
<td>13.000 / 15.000</td>
</tr>
<tr>
<td>Voltage Regulator</td>
<td>Mono-Function (14V, 28V) / Multi-Function (14V)</td>
</tr>
<tr>
<td>Power diodes Type</td>
<td>Press-fit Zener (35A (14V) / 50A (28V))</td>
</tr>
<tr>
<td>Over-voltage Protection</td>
<td>YES</td>
</tr>
<tr>
<td>Zener Voltage (V)</td>
<td>19-25 (14V) / 34-40 (28V)</td>
</tr>
<tr>
<td>Electrical terminals Mono/ Multi-function regulator</td>
<td>(B+, D+, W, B-) / (B+, L, W, B-, DFM)</td>
</tr>
<tr>
<td>Drive end bearing / Rear bearing dimension</td>
<td>17X40X12 / 12x28x12</td>
</tr>
<tr>
<td>Protection of the Slip rings and Brushes Compartment</td>
<td>IP 54</td>
</tr>
<tr>
<td>Operating (Storage) Temperatures</td>
<td>-40°C to +110°C (+130°C)</td>
</tr>
<tr>
<td>EMC</td>
<td>Approved (Regulative ECE-R10 Rev.3: 2008-08)</td>
</tr>
</tbody>
</table>

Options

Insulated ground (return).
Marine versions available.

1 without pulley
Regulator characteristics (Voltage settings - typical)

Performance curves

Test methods and conditions are based on standard ISO 8854.

Connection diagrams

Note: Alternator thermal stabilized at 3000 RPM, I= Imax at Ubc= 13V (27V), Tamb= 23°C ± 5°C. Performance curves at higher ambient temperatures available.
ALTERNATORS

AAK

Applications

- Agricultural and construction machinery (Mid-range).
- Gen-sets.
- Commercial vehicles.
- Older passenger cars.
- Special applications (air-cooled engines, alternators for heating devices).

Features

- Heavy-duty design,
- Dust-proof,
- CW or CCW rotation fan,
- Multi-function regulator with additional functions (14V),
- Safety fan for hand contact protection available,
- Over-voltage protection,
- Long life operation,
- Better protection of alternator sub-assemblies in harsh environment.
- Additional protective covers available for mounting an additional tube for clean air intake,
- EMC approved and certified.

Design

- 3-phase 6-pole pairs synchronous generator with integrated rectifier and voltage regulator.
- Double insulated (G2) copper wire of temperature class over 200°C for stator and rotor windings,
- Rectifier with power press-fit type Zener diodes with operating temperature Tj=215°C max mounted on inner or outer side of rear bracket,
- Mono-Function Regulator (14V, 28V):
  - Self-Excitation Supply (D+, diode trio),
  - Thick-Film Hybrid,
- Multi-Function Regulator (14V):
  - Direct Excitation Supply (b+),
  - Microelectronic,
  - Metal-graphite brushes and copper slip rings,
  - External CW or CCW fan,
  - Special roller type sealed bearings.

Main technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>AAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (V)</td>
<td>14</td>
</tr>
<tr>
<td>Rated Current (A)</td>
<td>45 - 120</td>
</tr>
<tr>
<td>Stator Diameter (mm)</td>
<td>125</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air cooling / External fan (CW or CCW)</td>
</tr>
<tr>
<td>Weight 1 (kg)</td>
<td>4.5 - 5.1</td>
</tr>
<tr>
<td>Max Permanent / Short time Rotational Speed (RPM)</td>
<td>13.000 / 15.000</td>
</tr>
<tr>
<td>Voltage Regulator</td>
<td>Mono-Function (14V / 28V) / Multi-Function (14V)</td>
</tr>
<tr>
<td>Power diodes Type</td>
<td>Press-fit Zener (35A, 50A (14V) / 50A (28V))</td>
</tr>
<tr>
<td>Over-voltage Protection</td>
<td>YES</td>
</tr>
<tr>
<td>Zener Voltage (V)</td>
<td>19-25 (14V) / 34-40 (28V)</td>
</tr>
<tr>
<td>Electrical terminals Mono/ Multi-function regulator</td>
<td>(B+, D+, W, B-) / (B+, L, W, B-, DFM) 2</td>
</tr>
<tr>
<td>Drive end bearing / Rear bearing dimension</td>
<td>17X47X14, 17x52X17 / 12x32x10</td>
</tr>
<tr>
<td>Protection of the Slip rings and Brushes Compartment</td>
<td>IP 54</td>
</tr>
<tr>
<td>Operating (Storage) Temperatures</td>
<td>- 40°C to + 110°C (+ 130°C)</td>
</tr>
<tr>
<td>EMC</td>
<td>Approved (Regulative ECE-R10 Rev.3: 2008-08)</td>
</tr>
</tbody>
</table>

Options

- Insulated ground (return).
- Marine versions available.

1 without pulley  
2 available also older type Multi-function regulator B+, B-, L, EX (Thick-Film Hybrid technology)
Regulator characteristics (Voltage settings - typical)

Mono-Function 14V

<table>
<thead>
<tr>
<th>Type</th>
<th>n₀ (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>14V 45A</td>
<td>1050</td>
<td>28</td>
<td>45</td>
</tr>
<tr>
<td>14V 55A</td>
<td>1000</td>
<td>35</td>
<td>55</td>
</tr>
<tr>
<td>14V 65A</td>
<td>1150</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>14V 75A</td>
<td>1250</td>
<td>34</td>
<td>74</td>
</tr>
<tr>
<td>14V 80A</td>
<td>1350</td>
<td>29</td>
<td>80</td>
</tr>
<tr>
<td>14V 90A</td>
<td>1300</td>
<td>36</td>
<td>90</td>
</tr>
<tr>
<td>14V 100A</td>
<td>1200</td>
<td>41</td>
<td>100</td>
</tr>
<tr>
<td>14V 120A</td>
<td>1400</td>
<td>29</td>
<td>117</td>
</tr>
</tbody>
</table>

Mono-Function 28V

<table>
<thead>
<tr>
<th>Type</th>
<th>n₀ (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>28V 35A</td>
<td>1100</td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>28V 40A</td>
<td>1450</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>28V 50A</td>
<td>1550</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>28V 55A</td>
<td>1250</td>
<td>21</td>
<td>55</td>
</tr>
<tr>
<td>28V 65A</td>
<td>1400</td>
<td>15</td>
<td>63</td>
</tr>
</tbody>
</table>

Note: Alternator thermal stabilized at 3000 RPM, I = Imax at Uᵦ₊ = 13V (27V), Tamb = 23°C ± 5°C. Performance curves at higher ambient temperatures available.

Performance curves

Test methods and conditions are based on standard ISO 8854.

Mono-Function 14V, 28V

Multi-Function 14V (older type)

Multi-Function 14V
**AAK compact**

**Applications**
- Agricultural and construction machinery (Mid-range).
- Gen-sets.
- Commercial vehicles.
- Passengers cars.
- Special applications (completely sealed version available).

**Features**
- Compact design.
- Dust-proof.
- CW or CCW rotation fans.
- Multi-function regulator with additional functions.
- Pulleys and mounting brackets available according to customer’s requirements.
- High specific output power.
- Over-voltage protection.
- Higher protection against accidental contact.
- Lower noise level.
- Long life operation.
- EMC approved and certified.

**Design**
- 3-phase 6-pole pairs synchronous generator with integrated rectifier and voltage regulator.
- Double insulated (G2) copper wire of temperature class over 200°C for stator and rotor windings.
- Rectifier with power press-fit type Zener diodes with operating temperature $T_j=215°C$ max.
- Mono-Function Regulator (14V, 28V):• Self-Excitation Supply (D+, diode trio),
  • Microelectronic,
- Multi-Function Regulator (14V, 28V):
  • Direct Excitation Supply (B+),
  • Microelectronic,
- Metal-graphite brushes and smaller diameter copper slip rings for higher brushes life,
- Two internal fans for CW or CCW rotation.
- Special roller type sealed bearings.

**Main technical data**

<table>
<thead>
<tr>
<th>Type</th>
<th>AAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (V)</td>
<td>14</td>
</tr>
<tr>
<td>Rated Current (A)</td>
<td>70 - 120</td>
</tr>
<tr>
<td>Stator Diameter (mm)</td>
<td>125</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air cooling / Two internal fans (CW or CCW)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>~ 5.3</td>
</tr>
<tr>
<td>Max Permanent / Short time Rotational Speed (RPM)</td>
<td>13.000 / 15.000</td>
</tr>
<tr>
<td>Voltage Regulator</td>
<td>Mono-Function (14V / 28V) / Multi-Function (14V/28V)</td>
</tr>
<tr>
<td>Power diodes Type</td>
<td>Press-fit Zener (35A, 50A (14V) / 50A (28V))</td>
</tr>
<tr>
<td>Over-voltage Protection</td>
<td>YES</td>
</tr>
<tr>
<td>Zener Voltage (V)</td>
<td>19-25 (14V) / 34-40 (28V)</td>
</tr>
<tr>
<td>Electrical terminals Mono/ Multi-function regulator</td>
<td>(B+, D+, W, B-) / (B+, L, W, B-, DFM), (B+, L, W, B-, DFM, 15, S)</td>
</tr>
<tr>
<td>Drive end bearing / Rear bearing dimension</td>
<td>17X47X14, 17X52X17 / 17x35x10</td>
</tr>
<tr>
<td>Protection of the Slip rings and Brushes Compartment</td>
<td>IP 54</td>
</tr>
<tr>
<td>Operating (Storage) Temperatures</td>
<td>- 40°C to + 110°C (+ 130°C)</td>
</tr>
<tr>
<td>EMC</td>
<td>Approved (Regulative ECE-R10 Rev.3: 2008-08)</td>
</tr>
</tbody>
</table>

**Options**
- Insulated ground (return).
- Marine versions available.

1. without pulley
2. Multi-function 28V
Regulator characteristics (Voltage settings - typical)

**Mono-Function 14V**

![Graph](image1)

**Mono-Function 28V**

![Graph](image2)

**Multi-Function 14V**

![Graph](image3)

**Multi-Function 28V**

![Graph](image4)

Performance curves

Test methods and conditions are based on standard ISO 8854.

<table>
<thead>
<tr>
<th>Type</th>
<th>( n_e ) (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>14V 70A</td>
<td>1000</td>
<td>47</td>
<td>70</td>
</tr>
<tr>
<td>14V 80A</td>
<td>1100</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>14V 85A</td>
<td>1000</td>
<td>47</td>
<td>84</td>
</tr>
<tr>
<td>14V 95A</td>
<td>1100</td>
<td>42</td>
<td>94</td>
</tr>
<tr>
<td>14V 120A</td>
<td>1400</td>
<td>30</td>
<td>115</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>( n_e ) (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>28V 40A</td>
<td>1000</td>
<td>23</td>
<td>40</td>
</tr>
<tr>
<td>28V 45A</td>
<td>1100</td>
<td>22</td>
<td>45</td>
</tr>
<tr>
<td>28V 50A</td>
<td>1200</td>
<td>22</td>
<td>50</td>
</tr>
<tr>
<td>28V 55A</td>
<td>1250</td>
<td>21</td>
<td>55</td>
</tr>
<tr>
<td>28V 60A</td>
<td>1400</td>
<td>18</td>
<td>60</td>
</tr>
</tbody>
</table>

Note: Alternator thermal stabilized at 3000 RPM, \( I = I_{\text{max}} \) at \( U_e = 13V \) (27V), \( T_{\text{amb}} = 23^\circ \text{C} \pm 5^\circ \text{C} \).

Performance curves at higher ambient temperatures available.
AAL compact

Applications
- Agricultural and construction machinery (Mid-High range),
- Gen-sets,
- Commercial vehicles,
- Passengers cars,
- Special applications.

Features
- Compact design,
- Dust-proof,
- CW or CCW rotation fans,
- Multi-function regulator with additional functions,
- Pulleys and mounting brackets available according to customer’s requirements
- High specific output power,
- Over-voltage protection,
- Higher protection against accidental contact,
- Lower noise level,
- Long life operation,
- EMC approved and certified.

Design
- 3-phase 6-pole pairs synchronous generator with integrated rectifier and voltage regulator,
- Double insulated (G2) copper wire of temperature class over 200°C for stator and rotor windings,
- Rectifier with power press-fit type Zener diodes with operating temperature Tj=215°C max,
- Multi-Function Regulator (14V, 28V):
  - Direct Excitation Supply (b+),
  - Microelectronic,
- Metal-graphite brushes and smaller diameter copper slip rings for higher brushes life,
- Two internal fans for CW or CCW rotation,
- Special roller type sealed bearings.

Main technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>AAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (V)</td>
<td>14</td>
</tr>
<tr>
<td>Rated Current (A)</td>
<td>120 - 150</td>
</tr>
<tr>
<td>Stator Diameter (mm)</td>
<td>136</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air cooling / Two internal fans (CW or CCW)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>~ 6.7</td>
</tr>
<tr>
<td>Max Permanent / Short time Rotational Speed (RPM)</td>
<td>13,000 / 15,000</td>
</tr>
<tr>
<td>Voltage Regulator</td>
<td>Multi-Function (14V / 28V)</td>
</tr>
<tr>
<td>Power diodes Type</td>
<td>Press-fit Zener (50A (14V) / 50A (28V))</td>
</tr>
<tr>
<td>Over-voltage Protection</td>
<td>YES</td>
</tr>
<tr>
<td>Zener Voltage (V)</td>
<td>19-25 (14V) / 34-40 (28V)</td>
</tr>
<tr>
<td>Electrical terminals</td>
<td>(B+, L, W, B-, DFM), (B+, L, W, B-, DFM, 1S, S)</td>
</tr>
<tr>
<td>Drive end bearing / Rear bearing dimension</td>
<td>17x52x17 / 17x35x10</td>
</tr>
<tr>
<td>Protection of the Slip rings and Brushes Compartment</td>
<td>IP 54</td>
</tr>
<tr>
<td>Operating (Storage) Temperatures</td>
<td>- 40°C to + 110°C (+ 130°C)</td>
</tr>
<tr>
<td>EMC</td>
<td>Approved (Regulative ECE-R10 Rev.3: 2008-08)</td>
</tr>
</tbody>
</table>

1 without pulley  
2 Multi-function 28V
Regulator characteristics (Voltage settings - typical)

Multi-Function 14V

Connection diagrams

Multi-Function 28V

Performance curves

Test methods and conditions are based on standard ISO 8854.

<table>
<thead>
<tr>
<th>Type</th>
<th>( n_e ) (RPM)</th>
<th>( I ) (A) at 1800 RPM</th>
<th>( I ) (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>14V 120A</td>
<td>1250</td>
<td>70</td>
<td>120</td>
</tr>
<tr>
<td>14V 150A</td>
<td>1300</td>
<td>80</td>
<td>150</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>( n_e ) (RPM)</th>
<th>( I ) (A) at 1800 RPM</th>
<th>( I ) (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>28V 60A</td>
<td>1200</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>28V 80A</td>
<td>1300</td>
<td>35</td>
<td>80</td>
</tr>
</tbody>
</table>

Note: Alternator thermal stabilized at 3000 RPM, \( I = I_{\text{max}} \) at \( U_p = 13\text{V} \) (27V), Tamb= 23°C ± 5°C. Performance curves at higher ambient temperatures available.
Applications

- Agricultural and construction machinery with higher electrical demand (Top-range):
  - High HP tractors,
  - Combines (Harvesters),
  - Wind-rovers, ...
- Commercial vehicles,
- Special applications.

Features

- Heavy-duty design,
- Dust-proof,
- High specific output power,
- Multi-function regulator with additional functions (14V),
- Over-voltage protection,
- Long life bearings and brushes,
- Long life operation,
- Better protection of alternator sub-assemblies in harsh environment,
- Additional protection covers available for additional tube mounting for clean air intake,
- Max Efficiency > 65%
- EMC approved and certified.

Main technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>AAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (V)</td>
<td>14</td>
</tr>
<tr>
<td>Rated Current (A)</td>
<td>125 - 200</td>
</tr>
<tr>
<td>Stator Diameter (mm)</td>
<td>142</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air cooling / External fan CW</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>~ 8.0</td>
</tr>
<tr>
<td>Rotational Speed (RPM)</td>
<td>10.000 / 12.000</td>
</tr>
<tr>
<td>Voltage Regulator</td>
<td>Mono-Function (28V) / Multi-Function (14V)</td>
</tr>
<tr>
<td>Power diodes Type</td>
<td>Press-fit Zener (50A, 80A (14V) / 50A (28V))</td>
</tr>
<tr>
<td>Over-voltage Protection</td>
<td>YES</td>
</tr>
<tr>
<td>Zener Voltage (V)</td>
<td>19-25 (14V) / 34-40 (28V)</td>
</tr>
<tr>
<td>Electrical terminals Mono/ Multi-function regulator</td>
<td>(B+, D+, W, B-) / (B+, L, W, B-, DFM)</td>
</tr>
<tr>
<td>Drive end bearing / Rear bearing dimension</td>
<td>17x52x17, 17x62x20 / 17x32x14</td>
</tr>
<tr>
<td>Protection of the Slip rings and Brushes Compartment</td>
<td>IP 54</td>
</tr>
<tr>
<td>Operating (Storage) Temperatures</td>
<td>- 40°C to + 110°C (+ 130°C)</td>
</tr>
<tr>
<td>EMC Approved (Regulative ECE-R10 Rev.3: 2008-08)</td>
<td>Approved</td>
</tr>
</tbody>
</table>

Options

- Insulated ground (return).
- Marine versions available.
Regulator characteristics (Voltage settings - typical)

Performance curves

Test methods and conditions are based on standard ISO 8854.

<table>
<thead>
<tr>
<th>Type</th>
<th>nₛ (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>14V 125A</td>
<td>1100</td>
<td>85</td>
<td>125</td>
</tr>
<tr>
<td>14V 150A</td>
<td>1200</td>
<td>75</td>
<td>155</td>
</tr>
<tr>
<td>14V 175A</td>
<td>1200</td>
<td>78</td>
<td>170</td>
</tr>
<tr>
<td>14V 200A</td>
<td>1400</td>
<td>70</td>
<td>200</td>
</tr>
</tbody>
</table>

Note: Alternator thermal stabilized at 3000 RPM, Iₘax at Uₑ= 13V (27V), Tamb= 23°C ± 5°C. Performance curves at higher ambient temperatures available.
**AAN compact**

### Applications
- Agricultural and construction machinery (Top-range).
- Heavy-duty applications.
- Passenger cars and commercial vehicles with higher electrical demand.
- Special applications:
  - 48V alternators.
  - 110V~, 230V~ AC voltage alternators.

### Design
- 3-phase 6-pole pairs synchronous generator with integrated rectifier and voltage regulator.
- Double insulated (G2) copper wire of temperature class over 200°C for stator and rotor windings.
- Rectifier with power press-fit type Zener diodes with operating temperature $T_j=225°C$ max.
- Mono-Function Regulator (14V, 28V):
  - Self-Excitation Supply (D+, diode trio).
  - Microelectronic.
- Multi-Function Regulator (14V):
  - Direct Excitation Supply (B+).
  - Microelectronic.
- Metal-graphite brushes and smaller diameter copper slip rings for higher brushes life.
- Two internal fans for CW or CCW rotation.
- Special roller type sealed bearings for high pulley loads.

### Features
- Compact design.
- Dust-proof.
- Trash screens available.
- CW or CCW rotation fans.
- Multi-function regulator with additional functions (14V).
- Pulleys and mounting brackets available according to customer’s requirements.
- High specific output power.
- Over-voltage protection.
- Higher protection against accidental contact.
- Lower noise level.
- Long life operation.
- Max Efficiency > 65%.
- EMC approved and certified.

### Main technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>AAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (V)</td>
<td>14</td>
</tr>
<tr>
<td>Rated Current (A)</td>
<td>125 - 200</td>
</tr>
<tr>
<td>Stator Diameter (mm)</td>
<td>142</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air cooling / Two internal fans (CW or CCW)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>~ 7.3</td>
</tr>
<tr>
<td>Max Permanent / Short time Rotational Speed (RPM)</td>
<td>13,000 / 15,000</td>
</tr>
<tr>
<td>Voltage Regulator</td>
<td>Mono-Function (14V / 28V) / Multi-Function (14V)</td>
</tr>
<tr>
<td>Power diodes Type</td>
<td>Press-fit Zener (65A, 80A (14V) / 50A (28V))</td>
</tr>
<tr>
<td>Over-voltage Protection</td>
<td>YES</td>
</tr>
<tr>
<td>Zener Voltage (V)</td>
<td>19-25 (14V) / 34-40 (28V)</td>
</tr>
<tr>
<td>Electrical terminals</td>
<td>Mono / Multi-function regulator</td>
</tr>
<tr>
<td>(B+, D+, W, B-) / (B+, L, W, B-, DFM)</td>
<td></td>
</tr>
<tr>
<td>Drive end bearing / Rear bearing dimension</td>
<td>17X52X17, 17x62X17 / 17x40X12</td>
</tr>
<tr>
<td>Protection of the Slip rings and Brushes Compartment</td>
<td>IP 56</td>
</tr>
<tr>
<td>Operating (Storage) Temperatures</td>
<td>-40°C to +110°C (+130°C)</td>
</tr>
<tr>
<td>EMC</td>
<td>Approved (Regulative ECE-R10 Rev.3: 2008-08)</td>
</tr>
</tbody>
</table>

1 without pulley

### Options
- Insulated ground (return).
- Marine versions available.
Regulator characteristics (Voltage settings - typical)

Mono-Function 14V

![Performance curve](image1)

Mono-Function 28V

![Performance curve](image2)

Multi-Function 14V

![Performance curve](image3)

Multi-Function 14V ("One-wire")

![Performance curve](image4)

Connection diagrams

Mono-Function 14V, 28V

![Connection diagram](image5)

Multi-Function 14V

![Connection diagram](image6)

Multi-Function 14V ("One-wire")

![Connection diagram](image7)

Performance curves

Test methods and conditions are based on standard ISO 8854.

![Performance curve](image8)

<table>
<thead>
<tr>
<th>Type</th>
<th>n₀ (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>14V</td>
<td>125A</td>
<td>1100</td>
<td>85</td>
</tr>
<tr>
<td>14V</td>
<td>150A</td>
<td>1200</td>
<td>75</td>
</tr>
<tr>
<td>14V</td>
<td>175A</td>
<td>1200</td>
<td>78</td>
</tr>
<tr>
<td>14V</td>
<td>200A</td>
<td>1400</td>
<td>70</td>
</tr>
<tr>
<td>28V</td>
<td>80A</td>
<td>1150</td>
<td>44</td>
</tr>
<tr>
<td>28V</td>
<td>100A</td>
<td>1250</td>
<td>42</td>
</tr>
<tr>
<td>28V</td>
<td>120A</td>
<td>1350</td>
<td>38</td>
</tr>
</tbody>
</table>

Note: Alternator thermal stabilized at 3000 RPM, I= Imax at Uᵣ = 13V (27V), Tamb= 23°C ± 5°C. Performance curves at higher ambient temperatures available.
AAT

Applications

AAT alternators were developed for heavy-duty and special applications with high electric load requirements, specially at idle speeds:

- Commercial vehicles as buses, trucks, ...
- Buses where required additional power supply for A/C.
- Top class agricultural and construction machinery (combiners ...),
- Other heavy-duty and special applications, where required high output power.

Design

- 3-phase 8-pole pairs synchronous generator with integrated rectifier and voltage regulator,
- Double insulated (G2) copper wire of temperature class over 200°C for stator and rotor windings,
- Bolt connections stator taps-rectifier ensure high reliability of connection,
- Rectifier with power press-fit type Zener diodes with operating temperature Tj=225°C max mounted bellow rear bracket (2 diodes in parallel per phase as standard).
- Mono-Function Regulator (14V, 28V):
  - Self-Excitation Supply (D+, diode trio),
  - Thick-Film Hybrid, Microelectronic,
- Multi-Function Regulator (14V):
  - Direct Excitation Supply (B+),
  - Microelectronic,
- Metal-graphite brushes of increased length and special bronze (CuSn5) slip rings,
- Big shaft diameter 22.2 or 30 mm,
- External Bi-directional fan or lower noise CW fan,
- Special roller type sealed bearings for high pulley loads and needle rear bearing.

Features

- Heavy-duty design,
- Dust-proof,
- High specific output power and high output at idle,
- Over-voltage protection,
- Long life bearings and brushes,
- Long life operation,
- Better protection of alternator sub-assemblies in harsh environment,
- Trash screens available,
- Additional protection covers available for additional tube mounting for clean air intake,
- Max efficiency >70%,
- EMC approved and certified.

Main technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>AAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (V)</td>
<td>14</td>
</tr>
<tr>
<td>Rated Current (A)</td>
<td>220 - 270</td>
</tr>
<tr>
<td>Stator Diameter (mm)</td>
<td>165.5</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air cooling / External fan Bi-directional or CW</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>13 - 15</td>
</tr>
<tr>
<td>Max Permanent / Short time Rotational Speed (RPM)</td>
<td>7,000 / 8,000</td>
</tr>
<tr>
<td>Voltage Regulator</td>
<td>Mono-function (14V, 28V), Battery-less (28V), Multi-function (14V)</td>
</tr>
<tr>
<td>Power diodes Type</td>
<td>Press-fit Zener (50A, 80A (14V) / 50A (28V))</td>
</tr>
<tr>
<td>Over-voltage Protection</td>
<td>YES</td>
</tr>
<tr>
<td>Zener Voltage (V)</td>
<td>19-25 (14V) / 34-40 (28V)</td>
</tr>
<tr>
<td>Electrical terminals Mono/ Multi-function regulator</td>
<td>(B+, D+, W, B-) / (B+, L, W, B-, DFM)</td>
</tr>
<tr>
<td>Drive end bearing / Rear bearing dimension</td>
<td>30x72x19, 30x72x27 / 20x28x13</td>
</tr>
<tr>
<td>Protection of the Slip rings and Brushes Compartment</td>
<td>IP 56</td>
</tr>
<tr>
<td>Operating (Storage) Temperatures</td>
<td>- 40°C to + 110°C (+ 130°C)</td>
</tr>
<tr>
<td>EMC</td>
<td>Approved (Regulative ECE-R10 Rev.3: 2008-08)</td>
</tr>
</tbody>
</table>
Regulator characteristics (Voltage settings - typical)

Mono-Function 14V

- Performance curves
  - Test methods and conditions are based on standard ISO 8854.

<table>
<thead>
<tr>
<th>Type</th>
<th>n, (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>14V 220A</td>
<td>1050</td>
<td>150</td>
<td>220</td>
</tr>
<tr>
<td>14V 250A</td>
<td>1450</td>
<td>90</td>
<td>248</td>
</tr>
<tr>
<td>14V 270A</td>
<td>1450</td>
<td>100</td>
<td>266</td>
</tr>
</tbody>
</table>

Mono-Function 28V

- Performance curves
  - Note: Alternator thermal stabilized at 3000 RPM, I= Imax at U= 13V (27V), Tamb= 23°C ± 5°C.
  - Performance curves at higher ambient temperatures available.

<table>
<thead>
<tr>
<th>Type</th>
<th>n, (RPM)</th>
<th>I (A) at 1800 RPM</th>
<th>I (A) at 6000 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>28V 120A</td>
<td>1000</td>
<td>82</td>
<td>115</td>
</tr>
<tr>
<td>28V 140A</td>
<td>1050</td>
<td>95</td>
<td>140</td>
</tr>
<tr>
<td>28V 160A</td>
<td>1150</td>
<td>88</td>
<td>160</td>
</tr>
<tr>
<td>28V 190A</td>
<td>1350</td>
<td>90</td>
<td>190</td>
</tr>
<tr>
<td>28V 200A*</td>
<td>1350</td>
<td>90</td>
<td>197</td>
</tr>
</tbody>
</table>

Connection diagrams

- Mono-Function 14V, 28V
- Battery-less operation
- Multi-Function 14V
- Multi-Function 14V ("One-wire")
- Multi-Function 14V ("One-wire")
Product requirements form

1. CUSTOMER DATA

Company: ____________________________
Address: ____________________________
Country: ____________________________
Responsible person: ____________________
Phone / Mobile: ______________________
Fax: _________________________________
E-mail: ______________________________

2. ENGINE DATA

Enquiry [ ] New project [ ] Modification

Project Name: ____________________________
Project No: ____________________________
Application:
- Automotive [ ]
- Commercial vehicles (trucks, buses, ...) [ ]
- Agriculture [ ]
- Construction [ ]
- Railway [ ]
- Marine [ ]
- Other: ________________________________

Brief description: ________________________
Planned quantity by year: Starting year: 1\textsuperscript{st} 2\textsuperscript{nd} 3\textsuperscript{rd} 4\textsuperscript{th}

Application: ____________________________

Engine data

- Petrol [ ]
- Diesel [ ]

No. of cylinders: ____________________________
No. of valves: ____________________________
Displacement Ltr.: ____________________________
Min. speed (idle): ____________________________ RPM
Rated output: ____________________________ kW
Nominal operating speeds: ____________________________ RPM
2/4 Stroke: ____________________________
Max speed: ____________________________ RPM
Compression: ____________________________

Alternator (actual used)

Supplier: ____________________________
Type: ____________________________
Rated voltage/current: ___________ V ___________ A

Drawing: [ ] YES [ ] NO

Other: ____________________________

3. ALTERNATOR DESIGN REQUIREMENTS

Electrical requirements

Rated voltage: ___________ V
Rated Current: ___________ A (1800 RPM) ___________ A (6000 RPM)

Alternator performance curves (attached): [ ] YES [ ] NO

Rated electrical power: ___________ kW
Isolated ground (return): [ ] YES [ ] NO

Electrical terminals (types, dimension)

B+: ____________________________
D+: ____________________________
L: ____________________________
W: ____________________________
B-: ____________________________
S: ____________________________
15: ____________________________
DFM: ____________________________

Connector: [ ] YES [ ] NO

Type: ____________________________

Other: ____________________________

Regulator (set-up) voltage U_{b+} = ___________ V
Tk = ___________ mV/°C
Regulator characteristic (attached): [ ] YES [ ] NO

Regulator type:
- Mono-function [ ]
- Multi-function [ ]
- Multi-function - bus (BSS, LIN, ... ) [ ]

Regulator characteristic (attached): [ ] YES [ ] NO
Vehicle electrical system requirements: __________________________________________
Battery type: ___________________________ Battery rated data: _______________________

Special electrical requirements: ________________________________________________

**Mechanical and fitting requirements**

Direction of alternator rotation: ☐ clockwise ☐ counterclockwise ☐ both directions
Transmission ratio between engine / alternator: 1: __________

Type of driving belt / pulley:
- ☐ One-groove, Belt width: _______ mm Angle: __________________________
- ☐ Two-groove, Belt width: _______ mm Dimension between grooves: _______ Angle: __________
- ☐ Poly V belt, No. of grooves: _______ Dimension between grooves: _______ Angle: __________

Diameter of the pulley: __________ mm Belt line dimension (Pulley overhang): __________
Overrunning pulley: ☐ YES ☐ NO Data: ________________________________
Other: __________________________

Type of installation:

Side view:

[Diagram of side view]

Back side view: Please draw direction, position of cables and terminals

Max alternator brackets diameter: _______ mm Max alternator length: _______ mm Max alternator weight _______ kg
Mounting requirements: To specify on sketch above or enclose drawing or 3D model

Other design requirements: __________________________

**Environmental requirements**

Grade of protection according IP (DIN 40050): IP ____________________________
Environmental conditions: ☐ Salt spray ☐ High temperature ☐ Low temperature ☐ Humidity
☐ Dust, mud ☐ Trash ☐ Water ☐ Other ____________________________

**Special requirements**

Customer test specification: ☐ YES ☐ NO Part No.: __________________________
Safety standards: __________________________
Other standards: __________________________

Date: __________________________ Signature: __________________________
Manufacturing and trading companies

HEADQUARTERS
Letrika d.d.
5290 Šempeter pri Gorici
Polje 15, Slovenia
T: +386 5 33 93 000
F: +386 5 33 93 801
E: info@letrika.com

BELARUS
Letrika Bel Ltd.
Ul. Dombrovskogo 69
230002 Grodno
T: +375 152 487 484
F: +375 152 487 485
E: info.by@letrika.com

BOSNIA AND HERZEGOVINA
Letrika Laktaši d.o.o.
Nemanjina 35
78250 Laktaši
T: +387 51 53 07 85
F: +387 51 53 53 15
E: info.bih@letrika.com

BRAZIL
Letrika do Brasil Ltda.
Rua Testa, no 81- Jardim Sao Sebastiao,
Jaguariuna - (SP)
CEP 13820-000
T: +55 19 3837 2363
F: +55 19 3837 3185
E: info.br@letrika.com

CHINA
Letrika Suzhou Co., Ltd.
Qujiang Road 11
Shuangfeng Town
Taicang City
T: +86 512 8160 6888
F: +86 512 8160 7799
E: info.cn@letrika.com

FRANCE
Letrika France S.A.S.
Za du Chapeau Rouge
56000 Vannes
T: +33 2 97 45 59 90
F: +33 2 97 45 59 99
E: info.fr@letrika.com

GERMANY
Letrika Deutschland GmbH
Danziger Straße 1
71691 Freiberg am Neckar
T: +49 714 1702 69 0
F: +49 714 1702 69 33
E: info.de@letrika.com

GREAT BRITAIN
Letrika UK Ltd.
Redlands
Ullswater Crescent, Coulsdon
Surrey CR5 2HT
T: +44 208 668 7141
F: +44 208 668 3108
E: info.uk@letrika.com

ITALY
Letrika Italia S.r.l.
Via Ragazzi del ’99 n.36
42124 Reggio Emilia
T: +39 0522 506 285
F: +39 0522 272 025
E: info.it@letrika.com

USA
Letrika USA Inc.
4814 American Road
Rockford, IL 61109
T: +1 800 474 1996
T: +1 815 874 4022
F: +1 815 874 4024
E: info.usa@letrika.com

www.letrika.com
January 2013 / 722.704.187