HELLA AUTOMOTIVE RELAYS

OPTIMUM PERFORMANCE

HELLA automotive relays (solid state) serve to control the function of vehicles components via a low-power signal. These components include spark plugs, engine fan motors, lights, heaters etc. Relays are basically electrically operated switches.

HELLA produces more than 100 million units per year in its own facilities. Production is optimised to ensure an attractive product and price. HELLA boast one of the lowest failure rates in the whole industry.

OEM quality:
HELLA develops and produces relays for AGCO, Claas, Daimler AG, Ford, VW, GM, JCB, Opel, Nissan, John Deere, Chrysler, Jaguar/Land Rover among others. We have been working with customers for decades.

FUNCTIONING
Relays are basically electrically operated switches which use an electromagnet to operate a switching mechanism mechanically. They are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

Normally Open - Relays
Are used to close the electric circuit between a power source and electrical load, i.e. the load is switched on. Relays are operated by means of switches, pulse generators or control devices. Typical applications are headlamps, auxiliary driving lamps and fog lamps, horns, heaters, air conditioners, etc.

Change Over - Relays
Change the load path from one electrical load to another. These relays are operated by a dashboard switch. By using only one output terminal, the relay can also be used as normally-open or normally-closed relay. It switches over from one application to another, e.g. for two speed appliances such as heated rear windows or engine fan motors etc.

ADVANTAGES
→ Ensures the reliable control of electrical or low-power loads in the vehicle.
→ Easy plug-and-play allows quick replacement.
→ Housings with brackets indemnify proven mounting.

MAINTENANCE
To ensure the correct relay for a particular application is fitted, please consider the information on the following pages.

Dear customer:
This HELLA brochure for relays and flasher units, provides a technical specification overview.

Information is reflected in a simplified manner in order to ensure ease of understanding.

The brochure is divided into two sections covering HELLA relays and flasher units and includes more detailed part specific information.

We trust you will find this brochure informative and enhance your understanding of how HELLA products function.

Your HELLA Automotive South Africa Team
### MAIN COMPONENTS

**Type of relay:**
- Normally open relay (n/o) dual output.
- Normally open relay (n/o) single output.
- Change over relay (c/o).
- Normally closed relay (n/c) - use c/o relay.

**Rated voltage**
- Passenger vehicle usually 12V.
- Truck usually 24V.

**Rated load (depends on application)**
- Resistive load (e.g. heater).
- Inductive load (e.g. engine).
- Capacitive load (e.g. lights, glow plug).

**Protection**
- There are also relays with coil resistors (or parallel diodes) are incorporated to prevent voltage counter-induction.

### OPERATING PRINCIPLE

**NORMALLY OPEN - RELAY**

**Fig. 1** The control circuit (86/85) is inactive and the return spring keeps the armature open. Therefore the working contacts are opened and the load circuit (30/87) is interrupted.

**Fig. 2** The control circuit (86/85) is active and the copper coil inducts a magnetic field which pulls the armature down. The working contacts are closed and therefore the load circuit (30/87) is closed.

**CHANGE OVER - RELAY**

The basic operating principle of a change over relay is actually the same as for the normally open relay. The only difference is that the armature is connected to a second (alternative) output in the normal status. As soon the control circuit is active, the armature is pulled down and the contact changes over from the one output to the other output.

Therefore the change over - relay can also be used as normal open or normal closed relay.

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**TECHNICAL SPECIFICATIONS**

- **Test voltage for 12V relays:** 13.5V
- **Test voltage for 24V relays:** 27V

**PERMISSIBLE AMBIENT TEMPERATURE**

-40°C to +85°C

**STORAGE TEMPERATURE**

-40°C to +125°C

**MECHANICAL SERVICE LIFE**

>10⁷ operations

All types of HELLA mini-relays are climatic and mechanical tested.

**VIBRATION TEST:**
DIN IEC 600 68-2-6 (sinusoidal) 20-200 Hz, 5g

**SHOCK TEST:**
DIN IEC 600 68-2-27 (half-sine) min. 10g

**CORROSION TEST:**
DIN IEC 600 68-2-42; 10 ± 2cm³/m³ SO₂, 10 days

**DAMP HEAT TEST, CYCLIC:**
DIN EN 600 68-2-30, Db, ver. 1; 6 cycles, upper temp. +85°C

**DAMP HEAT TEST, CONSTANT:**
DIN EN 600 68-2-14, Nb, 10 cycles; -40°C/+85°C (9° per min.)

**TEMPERATURE-CHANGE TEST:**
DIN EN 600 68-2-78; approx. 56 days; zupper temp. +35°C

**CONDENSATION-WATER TEST:**
EN ISO 6988, 6 cycles, Storage 8/16 h
TYPICAL APPLICATION

The most common automotive relay is the 4PIN normally open relay. In the illustrated example (see diagram) the relay serves to open and close the circuit which connects the horns to the battery. In the normal (inactive) setting, the solid state relay interrupts the circuit. As soon as the push-button switch is pressed (usually the wires are connected to the horn push-button) the coil in the relay builds up a magnetic induction and the armature closes the load circuit. The horns are tethered with current until the push-button is released and the return spring pulls back the armature which opens the working contacts.

(This is also explained in more detail under the headings on page 3: Main Components and Operating Principle)

To chose the correct applicable relay, always make sure that the relay is designed to bear the maximal load of your application. Consider the following different types of load (according to each application):

- **Resistive load (heater)**
  Primary offers resistance to the flow of the current (e.g. rear window heater or mirror heater)

- **Inductive load (engine)**
  The starting current increases rapidly to multiples of the rated current and then flattens off to the nominal current (e.g. start of a fan motor). When switching off, a voltage is induced by several 1 000 volts, which leads to an electric arc between the currently open relay contacts.

- **Capacitive load (lamp)**
  The starting current when switching on a cold lamp can be up to ten times of the rated current of the lamp (e.g. lights, glow plugs).

The HELLA disc horn set (B1910) and the trumpet horn set (B7424) includes a relay when purchased.
HELLA RELAY RANGE

NORMALLY OPEN RELAYS

<table>
<thead>
<tr>
<th>Description</th>
<th>Short Code</th>
<th>Part Number</th>
<th>Rated Voltage</th>
<th>Resistive load</th>
<th>Inductive load</th>
<th>Capacitive load</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINI RELAY (N/O) 4PIN 12V</td>
<td>C4003</td>
<td>4RA-95400-001</td>
<td>12V</td>
<td>n/o: 30A</td>
<td>n/o: 30A</td>
<td>n/o: 16A</td>
<td>95 Ω</td>
</tr>
<tr>
<td>MINI RELAY (N/O) 4PIN 24V</td>
<td>C4002</td>
<td>4RA-945400-031</td>
<td>24V</td>
<td>n/o: 30A</td>
<td>n/o: 30A</td>
<td>n/o: 16A</td>
<td>95Ω</td>
</tr>
<tr>
<td>MINI RELAY (N/O) 5PIN 12V/DUAL</td>
<td>C4006</td>
<td>4RA-933791-061</td>
<td>12V</td>
<td>n/o: 40A</td>
<td>n/o: 40A</td>
<td>n/o: 16A</td>
<td>85 Ω</td>
</tr>
<tr>
<td>RELAY (N/O) 4PIN 12V HD</td>
<td>C4047</td>
<td>4RA-003437-001</td>
<td>12V</td>
<td>n/o: 60A</td>
<td>n/o: 60A</td>
<td>n/o: 25A</td>
<td>85 Ω</td>
</tr>
<tr>
<td>RELAY (N/O) 4PIN 24V HD</td>
<td>C4048</td>
<td>4RA-003437-091</td>
<td>24V</td>
<td>n/o: 60A</td>
<td>n/o: 60A</td>
<td>n/o: 25A</td>
<td>316 Ω</td>
</tr>
</tbody>
</table>

- SAE Terminal arrangement.
- 4 x 6.3 mm blade

**Note:** Don’t interchange with 5PIN change-over relay: (B1/B2)

N/O: 2 x 87 | C/O: 87 + 87a

**Description**

- MINI RELAY (N/O) 4PIN 12V
  - C4003
  - Part Number: 4RA-95400-001
  - Rated Voltage: 12V
  - Resistive load: n/o: 30A
  - Inductive load: n/o: 30A
  - Capacitive load: n/o: 16A
  - Resistance: 95 Ω

- MINI RELAY (N/O) 4PIN 24V
  - C4002
  - Part Number: 4RA-945400-031
  - Rated Voltage: 24V
  - Resistive load: n/o: 30A
  - Inductive load: n/o: 30A
  - Capacitive load: n/o: 16A
  - Resistance: 95Ω

- MINI RELAY (N/O) 5PIN 12V/DUAL
  - C4006
  - Part Number: 4RA-933791-061
  - Rated Voltage: 12V
  - Resistive load: n/o: 40A
  - Inductive load: n/o: 40A
  - Capacitive load: n/o: 16A
  - Resistance: 85 Ω

- RELAY (N/O) 4PIN 12V HD
  - C4047
  - Part Number: 4RA-003437-001
  - Rated Voltage: 12V
  - Resistive load: n/o: 60A
  - Inductive load: n/o: 60A
  - Capacitive load: n/o: 25A
  - Resistance: 85 Ω

- RELAY (N/O) 4PIN 24V HD
  - C4048
  - Part Number: 4RA-003437-091
  - Rated Voltage: 24V
  - Resistive load: n/o: 60A
  - Inductive load: n/o: 60A
  - Capacitive load: n/o: 25A
  - Resistance: 316 Ω

**Diode parallel to coil**

**Skirted housing, weatherproof**

**Change Over Relays**

<table>
<thead>
<tr>
<th>Description</th>
<th>Short Code</th>
<th>Part Number</th>
<th>Rated Voltage</th>
<th>Resistive load</th>
<th>Inductive load</th>
<th>Capacitive load</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINI RELAY (C/O) 4PIN 12V</td>
<td>C4005</td>
<td>4RD-933332-041</td>
<td>12V</td>
<td>n/c: 20A</td>
<td>n/o: 30A</td>
<td>n/o: 16A</td>
<td>95 Ω</td>
</tr>
<tr>
<td>MINI RELAY (C/O) 5PIN 24V</td>
<td>C2061</td>
<td>4RD-933332-061</td>
<td>24V</td>
<td>n/c: 10A</td>
<td>n/o: 20A</td>
<td>n/o: 16A</td>
<td>85 Ω</td>
</tr>
<tr>
<td>MINI RELAY (C/O) 5PIN 24V DIODE</td>
<td>C2081</td>
<td>4RD-933332-081</td>
<td>24V</td>
<td>n/c: 10A</td>
<td>n/o: 20A</td>
<td>n/o: 16A</td>
<td>85 Ω</td>
</tr>
<tr>
<td>RELAY (C/O) 5PIN 24V W-PROOF</td>
<td>C8547</td>
<td>4RD-933332-207</td>
<td>24V</td>
<td>n/c: 10A</td>
<td>n/o: 20A</td>
<td>n/o: 16A</td>
<td>85 Ω</td>
</tr>
</tbody>
</table>

- SAE Terminal arrangement.
- 4 x 6.3 mm blade

**Note:** Don’t interchange with SAE terminal arrangement.

N/O: 2 x 87 | C/O: 87 + 87a

**Description**

- MINI RELAY (C/O) 4PIN 12V
  - C4005
  - Part Number: 4RD-933332-041
  - Rated Voltage: 12V
  - Resistive load: n/c: 20A | n/o: 30A
  - Inductive load: n/o: 16A
  - Capacitive load: n/o: 16A
  - Resistance: 95 Ω

- MINI RELAY (C/O) 5PIN 24V
  - C2061
  - Part Number: 4RD-933332-061
  - Rated Voltage: 24V
  - Resistive load: n/c: 10A | n/o: 20A
  - Inductive load: n/o: 16A
  - Capacitive load: n/o: 16A
  - Resistance: 85 Ω

- MINI RELAY (C/O) 5PIN 24V DIODE
  - C2081
  - Part Number: 4RD-933332-081
  - Rated Voltage: 24V
  - Resistive load: n/c: 10A | n/o: 20A
  - Inductive load: n/o: 16A
  - Capacitive load: n/o: 16A
  - Resistance: 85 Ω

- RELAY (C/O) 5PIN 24V W-PROOF
  - C8547
  - Part Number: 4RD-933332-207
  - Rated Voltage: 24V
  - Resistive load: n/c: 10A | n/o: 20A
  - Inductive load: n/o: 16A
  - Capacitive load: n/o: 16A
  - Resistance: 85 Ω

**Skirted housing, weatherproof**

**Socket**

<table>
<thead>
<tr>
<th>Description</th>
<th>Short Code</th>
<th>Part Number</th>
<th>Terminals</th>
<th>Wire</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEAL Socket for Skirted Relays</td>
<td>E7458</td>
<td>8JD-745801-001</td>
<td>5 x 6.3 mm blade terminals (B1)*</td>
<td>Connection lead 30 cm, 48 cm</td>
<td>To use with C8547</td>
</tr>
<tr>
<td>UNIVERSAL SOCKET for MINI RELAYS</td>
<td>E2700</td>
<td>8JA-003526-001</td>
<td>5 x 6.3mm &amp; 4 x 2.8 mm blade terminals</td>
<td>-</td>
<td>For MINI relays with SAE terminal arrangement</td>
</tr>
</tbody>
</table>

**Note:**
All terminals adhere to German standard norm ISO 8092.
*Refers to ISO 7588 standard in brackets.*
HELLA ELECTRONIC FLASHER UNITS

HELLA electronic flasher units basically involves a pulse and circuit breaker. In answer to market needs, HELLA offers a range of universal electronic flasher units.

FUNCTIONING

Most people are aware of motor vehicle turning / indicator or hazard flashing lights, however often little thought is given to the component which starts the process.

HELLA provides a simple and universal range of flasher units which covers the most common applications for passenger and commercial vehicles as well as trailers.

The HELLA range comprises two types of electronic flasher units. The classification is based on the number of internal current / control circuits via which the flasher lamps on the vehicle can be switched and controlled:

- **Single-circuit flasher units** (with single-circuit test circuit).
- **Double-circuit flasher units** (with double-circuit test circuit).

WHEN IT DOES NOT WORK

A faulty flasher will result in a indicator not working properly.

If one flasher light (e.g. left or right indicator) fails:

1. The flashing rate is doubled (E-control) or
2. Control lamp fails to respond (P-Control).

ADVANTAGES

- Ensures the reliable control of the electrical loads in the vehicle.
- Standard on most late model cars and light trucks.
- Original equipment design.
- Integrated circuit controlled reliability.
- LED support for popular applications.

MAINTENANCE

To make sure you obtain the correct flasher unit for your application when changing the unit, please consider the following differentiations:

- **Operating mode of flasher unit**
  - Thermal flasher unit.
  - Electro-mechanic flasher unit.
  - Electronic flasher unit.

- **Rated voltage**
  - The performance of the driven flash light must not exceed the rated capacity of the flasher unit. (Check load drop-off variant diagrams before use).

- **Load drop-off variant**
  - Single-, two- or three-test circuit.
  - Number and arrangement of consumers.
  - Capacity of consumers.

- **Rated voltage**
  - Passenger vehicle usually: 12V.
  - Commercial vehicle/Trailer usually: 24V.

- **Temperature**
  - Operating temperature: -40°C to 85°C.
  - Storage temperature: -40°C to 85°C.
  - Input terminal voltage: 0V to 100V.

Installation

- Number and arrangement of terminals.

Rated voltage

- Rated voltage for standard applications is 12V or 24V.
- For special applications, such as trailer lights, the rated voltage may be higher.

Load drop-off variant

- Single-, two- or three-test circuit.
- Number and arrangement of consumers.
- Capacity of consumers.
### Technical Specifications

**Test voltage**
- For 12V relays: 13V
- For 24V relays: 28V

**Operating Temperature**
- -30°C to +80°C

**Storage Temperature**
- -40°C to +90°C

**Flashing Rates**
- 90 ± flashes/min.

**Device Protection System**
- IP 53 DIN 40050

**Control Type**

**Voltage Drop**
- < 450 mV

### Main Components

- **Capacitors**
- **Electronic chip**
- **Return spring**
- **Armature**
- **Insulating plate**
- **Stranded copper wire**
- **Blade terminals**
- **Printed circuit board**
- **Resistors**
- **Core (inside the coil)**
- **Electromagnetic copper coil**
- **Working contacts**
- **Yoke**
- **Blade terminals**
- **E-Cu (Galvanized cathode copper)**

### Historic Flasher Development

Basically each flasher unit consists of a pulse and a circuit breaker. There are three different main operating principles.

The first **mechanical flasher** used a bimetallic strip to generate a delayed output, which was heated by a heating coil. The bimetallic strip was designed as a break contact with a heating coil connected in series.

Following developments a hot wire and a solenoid to generate the repetitive signal delayed output was used. However, as the working principle was based on mechanical characteristics such as tension of the wire and electrical resistance, these units were very sensitive to low voltage and humidity.

This was followed by the development of **electro-mechanic flasher** units. Those used a single capacitor and were dependent on mechanical characteristics susceptible to environmental influences.

Towards the end of the 1960’s, the first solely **electronic flasher** unit with dual capacitor was developed. These were much more accurate and lasted longer than all former flasher units.

In summary, generally today mechanical and electro-mechanical flasher units are only used in older motor vehicles or vintage cars.

In answer to modern vehicles requirements HELLA offers a range of reliable and long lasting universal **electronic flasher units**.

**Lifetime of Flasher Units**

- **Thermal**: 35-40h
- **Electro-mechanical**: 200-250h
- **Electronic**: 300-320h

### Vehicle Specific Flasher Units

Vehicle specific flasher units and flasher units with triple-circuit test circuits are available on request.

### History of Flasher Development

In answer to modern vehicles requirements HELLA offers a range of reliable and long lasting universal electronic flasher units.

**Lifetime of Flasher Units**

- **Thermal**: 35-40h
- **Electro-mechanical**: 200-250h
- **Electronic**: 300-320h

### Device Protection System

IP 53 DIN 40050

### Control Type


### Voltage Drop

< 450 mV

All types of HELLA flasher units comply with national and international regulations.

- StVZO § 54 turn indicator.
- ECE Directive 48 lighting equipment.
- SAE J 590 Turn signal flasher unit.
- SAE J 945 Hazard warning flasher unit.
THE SINGLE-CIRCUIT TEST CIRCUIT

There is only one test resistor for the entire flasher system in a single-circuit flasher unit. For this reason, the flasher unit cannot tell whether a flashing lamp on the motor vehicle or trailer is defective.

THE DOUBLE-CIRCUIT TEST CIRCUIT

In a two-circuit flasher unit, the test circuits are allocated to the vehicle and the trailer respectively. The use of multiple-circuit flasher units makes sense in heavy utility vehicles and buses to reduce test signal losses in the long cables and many plugged connections and ensure a reliable lamp failure signal.

CONNECTING AND CLAMPING
DESCRIPTION FOR CONTROL UNITS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1. Control lamp</td>
</tr>
<tr>
<td>C2</td>
<td>2. Control lamp</td>
</tr>
<tr>
<td>C3</td>
<td>3. Control lamp</td>
</tr>
<tr>
<td>15</td>
<td>Ignition plus</td>
</tr>
<tr>
<td>30</td>
<td>Battery plus</td>
</tr>
<tr>
<td>31</td>
<td>Earth</td>
</tr>
<tr>
<td>49</td>
<td>Input</td>
</tr>
<tr>
<td>49a</td>
<td>Output</td>
</tr>
</tbody>
</table>

Load drop-off variants and Control types

- 2 (4) x 21W + 5W 12V E/P
- 2+1 (6) x 21W + 5W 12V/24V EP/PP
- 3+1 (8) x 21W 12V/24V EP/PP
- 2+1+1 (8) x 21W 12V PPP

CONNECTING AND CLAMPING
DESCRIPTION FOR CONTROL UNITS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Indicator, left</td>
</tr>
<tr>
<td>R</td>
<td>Indicator, right</td>
</tr>
<tr>
<td>C</td>
<td>1. Control lamp</td>
</tr>
<tr>
<td>C2</td>
<td>2. Control lamp</td>
</tr>
<tr>
<td>15</td>
<td>Ignition plus</td>
</tr>
<tr>
<td>30</td>
<td>Battery plus</td>
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<td>31</td>
<td>Earth</td>
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<tr>
<td>49</td>
<td>Input</td>
</tr>
<tr>
<td>49a</td>
<td>Output</td>
</tr>
<tr>
<td>54L</td>
<td>Stop light, left</td>
</tr>
<tr>
<td>54R</td>
<td>Stop light, right</td>
</tr>
</tbody>
</table>

Load drop-off variants and Control types

- 2+1 (6) x 21W 12V/24V EP/PP
- 3+1 (8) x 21W 12V/24V EP/PP
# HELLA FLASHER UNIT RANGE

## ELECTRONIC FLASHER UNITS – SINGLE CIRCUIT

<table>
<thead>
<tr>
<th>Description</th>
<th>FLASHER UNIT 3PIN 12V</th>
<th>FLASHER UNIT 3PIN 24V</th>
<th>FLASHER UNIT 4PIN 12V</th>
<th>FLASHER UNIT 4PIN 24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Code</td>
<td>C3067</td>
<td>C1879</td>
<td>C0021</td>
<td>C3001</td>
</tr>
<tr>
<td>Part Number</td>
<td>4DB-003750-711</td>
<td>4AZ-001879-051</td>
<td>4DM-003360-021</td>
<td>4DW-004513-001</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12V (usable from 9V to 15V)</td>
<td>24V (usable from 22V to 30V)</td>
<td>12V (usable from 9V to 15V)</td>
<td>24V (usable from 22V to 30V)</td>
</tr>
<tr>
<td>Rated Capacity</td>
<td>21W</td>
<td>10W–140W</td>
<td>21W/5W</td>
<td>21W</td>
</tr>
<tr>
<td>Number of poles</td>
<td>3 blade terminals</td>
<td>3 blade terminals</td>
<td>4 blade terminals</td>
<td>4 blade terminals</td>
</tr>
<tr>
<td>Operating mode</td>
<td>Electronic / single circuit</td>
<td>Electronic / single circuit</td>
<td>Electronic / single circuit</td>
<td>Electronic / single circuit</td>
</tr>
<tr>
<td>Functions</td>
<td>Turn signal and hazard warning</td>
<td>Turn signal and hazard warning</td>
<td>Turn signal and hazard warning</td>
<td>Turn signal and hazard warning</td>
</tr>
</tbody>
</table>

## ELECTRONIC FLASHER UNITS – DOUBLE CIRCUIT

<table>
<thead>
<tr>
<th>Description</th>
<th>FLASHER UNIT 11PIN 24V</th>
<th>FLASHER UNIT 6PIN 12V/24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Code</td>
<td>C3094</td>
<td>C3096</td>
</tr>
<tr>
<td>Part Number</td>
<td>4DZ-002834-162</td>
<td>4DZ-004019-001</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>24V (usable from 20V-30V)</td>
<td>12V / 24V</td>
</tr>
<tr>
<td>Rated Capacity</td>
<td>18W/21W</td>
<td>18W/21W</td>
</tr>
<tr>
<td>Number of poles</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Operating mode</td>
<td>Electronic / two-circuit</td>
<td>Electronic / two-circuit</td>
</tr>
<tr>
<td>Functions</td>
<td>Turn signal, stop signal and hazard</td>
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</tr>
</tbody>
</table>