Product / Technical Information

OPTIMUM PERFORMANCE
RELAYS & FLASHER UNITS

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.

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 flashers 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

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.

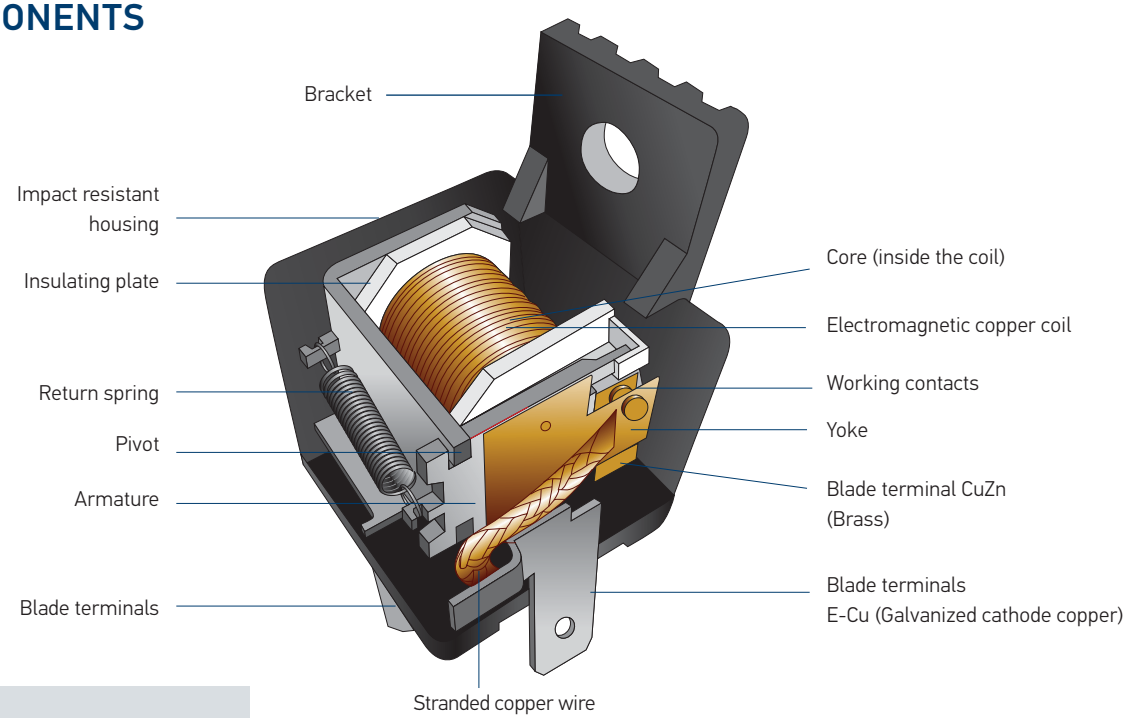
ADVANTAGES

- → 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:

MAIN COMPONENTS



High Power Relay

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.

Operating principle of a normally open relay

Fig. 1

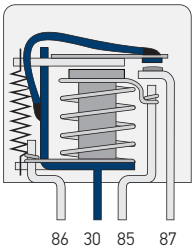
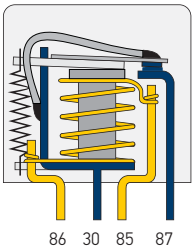


Fig. 2



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
$>10^7$ 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 ± 2cm^3/m^3 SO^2, 10 days

DAMP HEAT TEST; CYCLIC:
DIN IEC 600 68-2-30; Db, ver. 1;
6 cycles, upper temp. +55°C

DAMP HEAT TEST, CONSTANT:
DIN EN 600 68-2-78; approx. 56 days;
zupper temp. +55°C

TEMPERATURE-CHANGE TEST:
DIN IEC 600 68-2-14; Nb, 10 cycles;
-40°C/+85°C (5° per min.)

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)

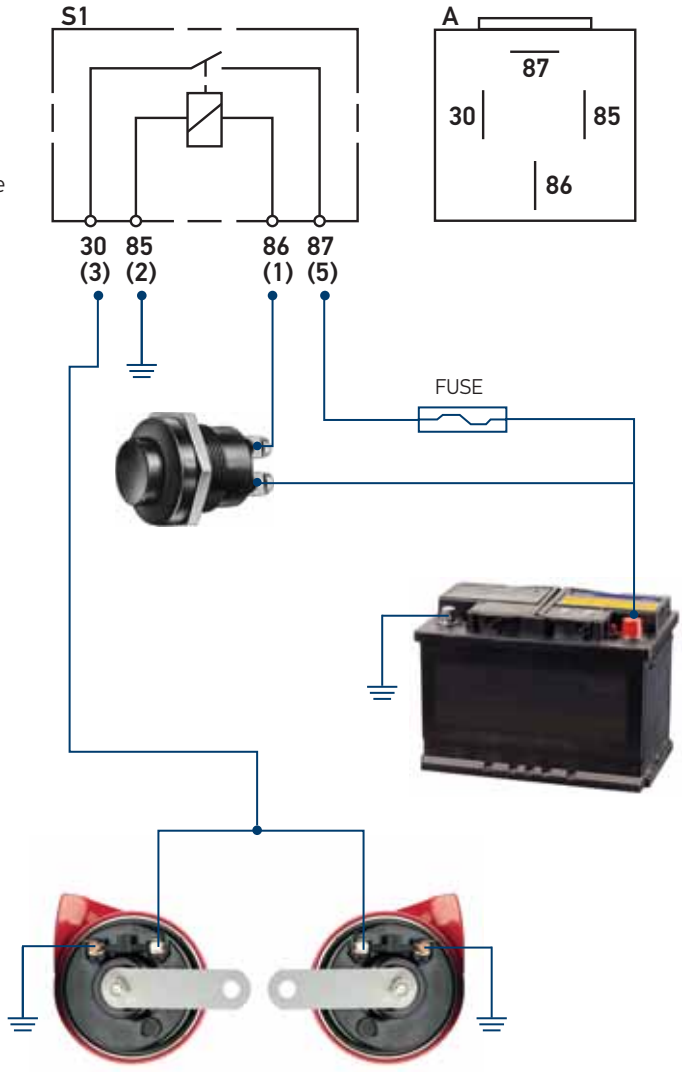
- **Inductive load (engine)**
  The starting current increases rapidly to multiples of the rated current and then flattens off to the nominal current (e.g. start of a fan motor). When switching off, a voltage is induced by several 1 000 volts, which leads to an electric arc between the currently open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

Diagram indicating wiring/current flow for HELLA B1910 (Disc horn set) or B7424 (Trumpet horn set).

HELLA 4Pin Relay (N/O) C4003 (12V) | C4002 (24V)

Terminal configuration	
30) Output	86) Coil trigger (+)
85) Coil trigger (-)	87) Battery (+)



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

HELLA RELAY RANGE

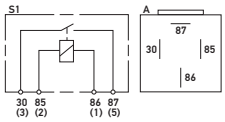
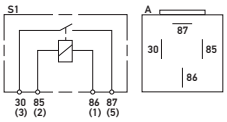
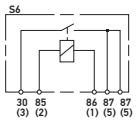
NORMALLY OPEN RELAYS

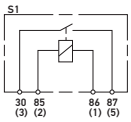
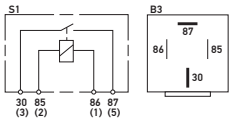
n/o: Normally open terminal 87





Description	MINI RELAY (N/O) 4PIN 12V	MINI RELAY (N/O) 4PIN 24V	MINI RELAY (N/O) 5PIN 12V DUAL	RELAY (N/O) 4PIN 12V HD	RELAY (N/O) 4PIN 24V HD
Short Code	C4003	C4002	C4006	C4047	C4048
Part Number	4RA-965400-001	4RA-965400-031	4RA-933791-061	4RA-003437-081	4RA-003437-091
Rated Voltage	12V	24V	12V	12V	24V
Resistive load	n/o: 30A	n/o: 30A	n/o: 40A	n/o: 60A	n/o: 60A
Inductive load	n/o: 30A	n/o: 16A	n/o: 30A	-	-
Capacitive load	n/o: 16A	n/o: 16A	n/o: 30A	n/o: 25A	n/o: 25A
Resistance	90 Ω	360 Ω	85 Ω	85 Ω	310 Ω
	SAE Terminal arrangement. 4 x 6.3 mm blade	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	SAE Terminal arrangement. 2 x 6.3 mm + 2 x 9.5 mm blade	SAE Terminal arrangement. 2 x 6.3 mm + 2 x 9.5 mm blade

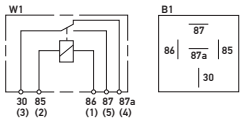
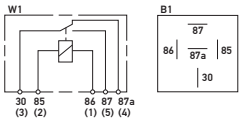
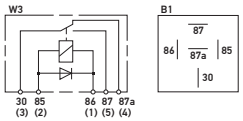
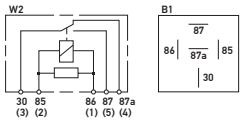
CHANGE OVER RELAYS



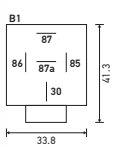
Diode parallel to coil

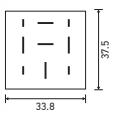
Skirted housing, weatherproof

Description	MINI RELAY (C/O) 5PIN 12V	MINI RELAY (C/O) 5PIN 24V	MINI RELAY (C/O) 5PIN 24V DIODE	RELAY (C/O) 5PIN 24V W-PROOF
Short Code	C4005	C2061	C2081	C8547
Part Number	4RD-933332-041	4RD-933332-061	4RD-933332-081	4RD-933332-207
Rated Voltage	12V	24V	24V	24V
Resistive load	n/c: 20A | n/o: 30A	n/c: 10A | n/o: 20A	n/c: 10A | n/o: 20A	n/c: 10A | n/o: 20A
Inductive load	n/c: 6A | n/o: 20A	n/c: 8A | n/o: 16A	n/c: 8A | n/o: 16A	n/c: 8A | n/o: 16A
Capacitive load	n/c: 10A | n/o: 20A	n/c: 5A | n/o: 15A	n/c: 5A | n/o: 15A	n/c: 5A | n/o: 15A
Resistance	85 Ω	350 Ω	350 Ω	350 Ω / 2,400 Ω suppression
	SAE Terminal arrangement. 5 x 6.3mm blade	SAE Terminal arrangement. 5 x 6.3mm blade	SAE Terminal arrangement. 5 x 6.3mm blade	SAE Terminal arrangement. 5 x 6.3mm blade (skirted)

SOCKETS

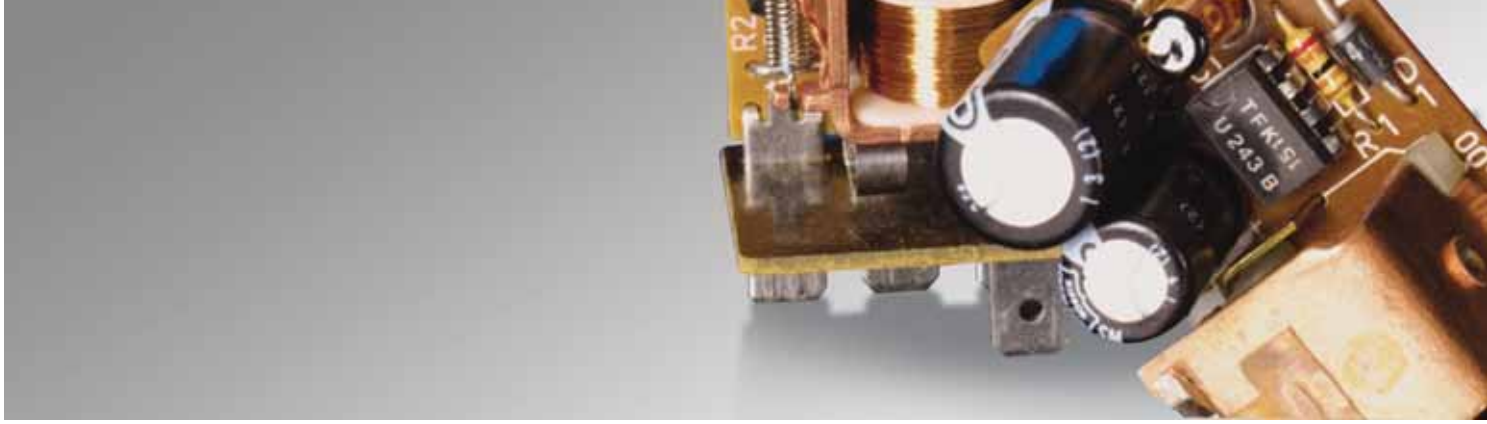


Description	SEALED SOCKET FOR SKIRTED RELAYS	UNIVERSAL SOCKET FOR MINI RELAYS
Short Code	E7458	E2700
Part Number	8JD-745801-001	8JA-003526-001
Terminals	5 x 6.3 mm blade terminals (B1)*	5 x 6.3mm & 4 x 2.8 mm blade terminals
Wire	Connection lead 30 cm, 48 cm	-
Application	To use with C8547	For MINI relays with SAE terminal arrangement

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.

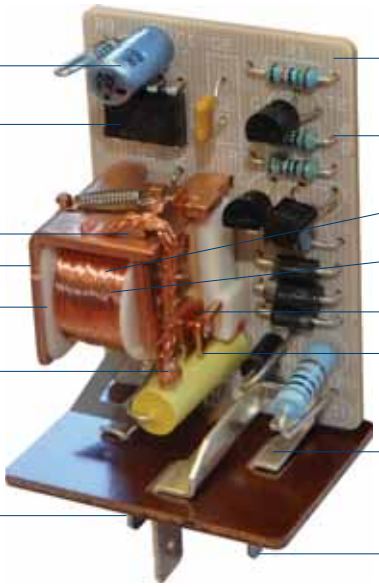
Rated voltage
→ Passenger vehicle usually: 12V.
→ Commercial vehicle/Trailer usually: 24V.

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).

Installation
→ Number and arrangement of terminals.

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

MAIN COMPONENTS



Electronic flasher unit - Single circuit

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

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 dependant on mechanical characteristics susceptible to environmental influences.

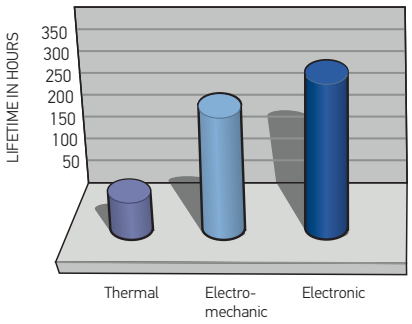
Towards the end of the 1960's, the first solely **electronic flasher** unit with dual capacitor was developed. These were much more accurate and lasted longer than all former flasher units.

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



*Comparative long-term stress tests by HELLA. All flashers were evaluated under the same operating conditions during February 2008.

Failure of a flasher lamp in a motorised vehicle or trailer must be indicated to the driver acoustically or by means of control lamps. HELLA flasher units ensure control by means of:

1. Doubling of the flashing rate (E control) or
2. Control lamp cutoff (P control).

TECHNICAL SPECIFICATIONS

Test voltage for 12V relays: 13V
Test voltage 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**
12V: E/P, EP, PP, PPP | 24V: EP, PP

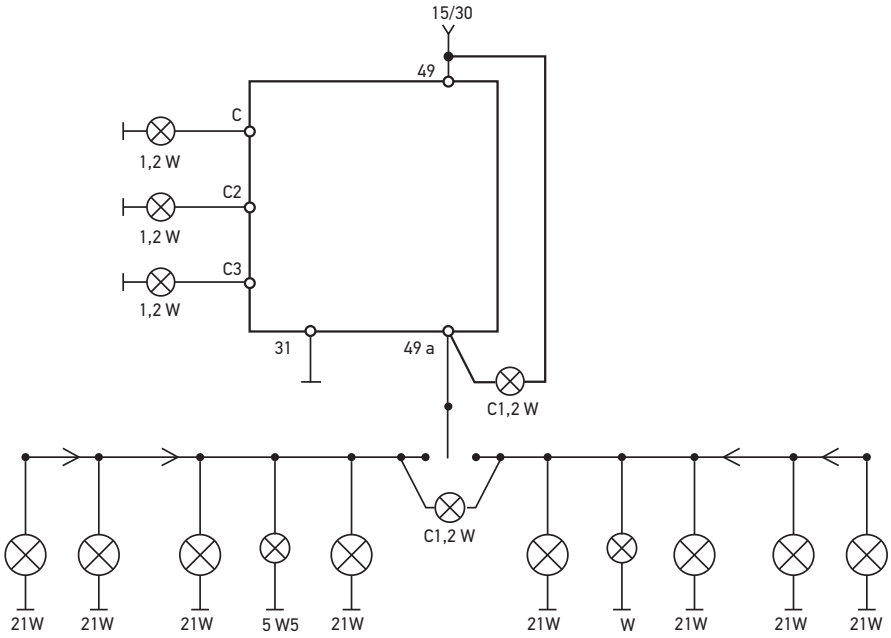
VOLTAGE DROP
49 → 49a
< 450 mV

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

- → StVZO § 54 turn indicator.
- → ECE Directive 48 lighting equipment.
- → EEC Directive 76/756 lighting equipment.
- → US Federal Standard FMVSS 108 lighting equipment.
- → SAE J 590 Turn signal flasher unit.
- → SAE J 945 Hazard warning flasher unit.
- → EEC Directive 72/245 radio interference suppression.

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.



CONNECTING AND CLAMPING DESCRIPTION FOR CONTROL UNITS

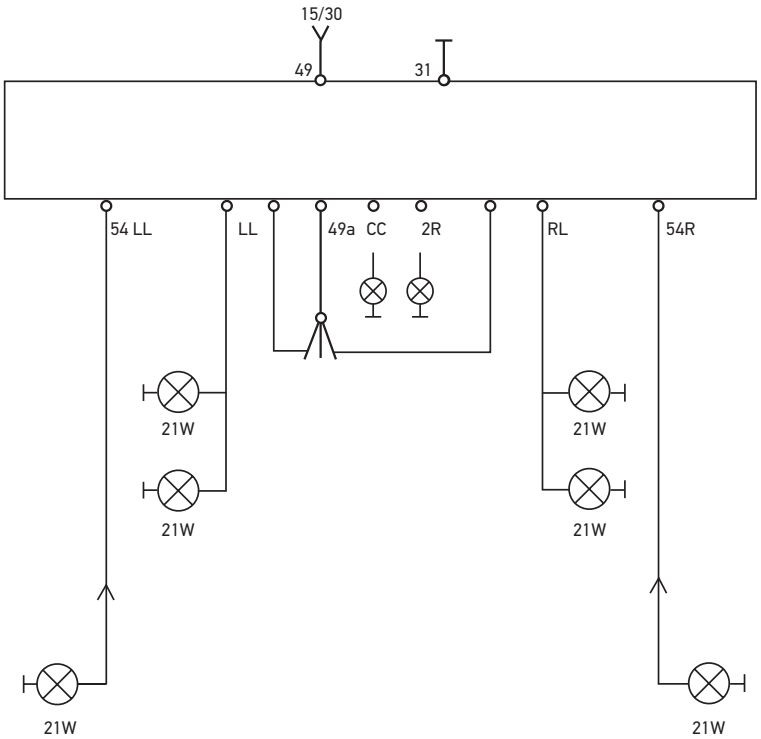
Terminal	Description
C	1. Control lamp
C2	2. Control lamp
C3	3. Control lamp
15	Ignition plus
30	Battery plus
31	Earth
49	Input
49a	Output

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 21 W 12V/24V	EP/PP
2+1+1 (8) x 21W 12V	PPP

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

Terminal	Description
L	Indicator, left
R	Indicator, right
C	1. Control lamp
C2	2. Control lamp
15	Ignition plus
30	Battery plus
31	Earth
49	Input
49a	Output
54L	Stop light, left
54R	Stop light, right

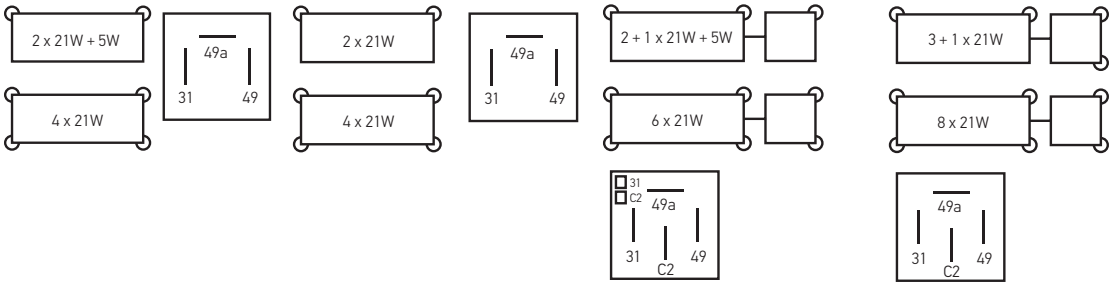
Load drop-off variants and Control types

2+1 (6) x 21W 12V/24V	EP/PP
3+1 (8) x 21W 12V/24V	EP/PP

HELLA FLASHER UNIT RANGE

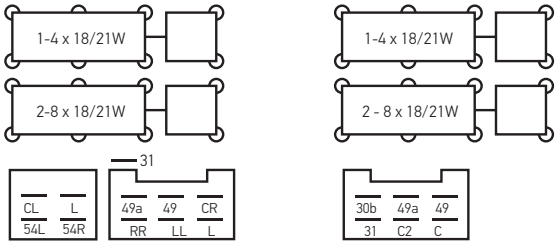
ELECTRONIC FLASHER UNITS – SINGLE CIRCUIT

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



ELECTRONIC FLASHER UNITS – DOUBLE CIRCUIT

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



Notes

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HELLA Automotive South Africa (Pty) Ltd.
P O Box 6130
Moselville, Uitenhage,
SOUTH AFRICA
6230

Sales Telephone: +27 (0) 41 996-5700
Sales Telefax: +27 (0) 41 996-5720
www.hella.co.za

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