RELAYS

PRODUCTS AND APPLICATIONS

Never say die

- In the non-automotive world, the **term relay** described changing horses on the post route. Today, the term is used for an electromagnetic remote-controlled switch.
- The electric relay was invented by **Joseph Henry** in 1835. He used it to send messages between his laboratory and the house. In 1837 the relay was used for a large project for the first time, to amplify signals for **Samuel Morse's** written telegraphs. Relays allowed telephones to spread everywhere and became an important safety factor in railway technology. In 1941 **Konrad Zuse** used 2,000 relays in the first digital calculator, his legendary Z3. In 1960 **Hella** produced its first automotive relay.
- 21st century: relays have been written off time and time again. But the automotive industry needs relays, since relay functions cannot always be replaced by control units. Only relays make **"galvanic isolation"** possible between input and output. Semi-conductors cannot manage this at the moment. Another positive factor is the **cost advantage** relays have compared with an electronic solution.
- In motor vehicles, relays are used to switch **high currents**. The engine control unit is switched by a relay, for example. Their **sturdiness** allows them to be installed near electric consumers. Only low control currents are required, the cable cross-sections can be kept small. The switching/amplifier function of a relay can only be achieved with a lot more effort and a lot less reliability using "modern" electronics. An additional advantage is that relay replacement is quick and easy. These characteristics guarantee that relays will have a **regular place in many vehicles** for a long time to come.

Trust in our quality relays

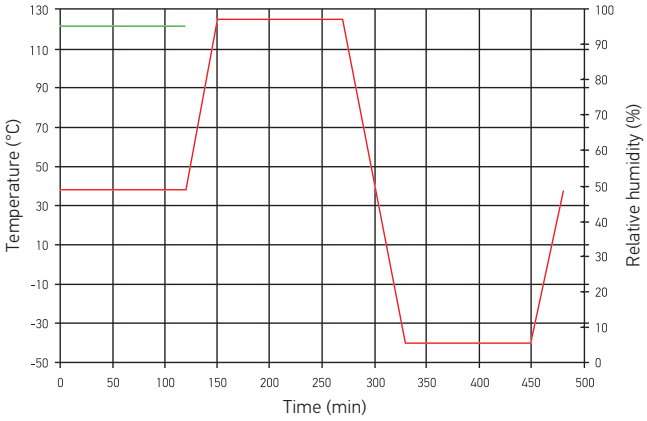
- **Production expertise:** Hella produces more than 100 million units per year in its own facilities. Thanks to optimised production at an attractive price for customers and with one of the lowest failure rates in the whole industry.
- **Flexibility:** Large volumes are produced fully automatically, smaller volumes semi-automatically. This means we are in a position to change over quickly to semi-automatic production.
- **OEM customers:** 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.
- **Production locations:** Berlin (Germany); Flora, Illinois (USA); Xiamen (China).

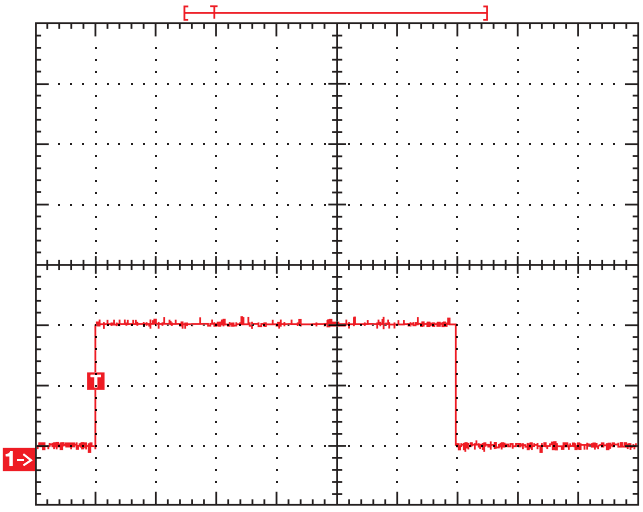
Hella relays – development progress

1960	A-relay with metal housing.
1965	E-relay: control relay for flasher unit.
1968	L-relay: first modular system.
1970	Bi-stable relay for switching between low beam and high beam.
1972	Q-relay with plastic base plate, also available with built-in fuse.
1973	V-relay: PCB relay for automatic placement.
1976	S1-relay: replacement for Q-relay. Can be produced fully automatically, also available with built-in fuse.
1978	H-relay: high-power relay for different motor loads.
1989	Round connector relay: specially produced for Daimler AG, with plastic housing.
1994	Micro relay: designed for fully automatic production.
1996	S2 relay: designed for fully automatic production.
2003	Bi-stable battery disconnect relay with flexible attachment system.
2005	High-current and bi-stable version.
2010	High-current micro changeover relay: 35 A/20 A.
201X	New and further development of products for CO_2 reduction.

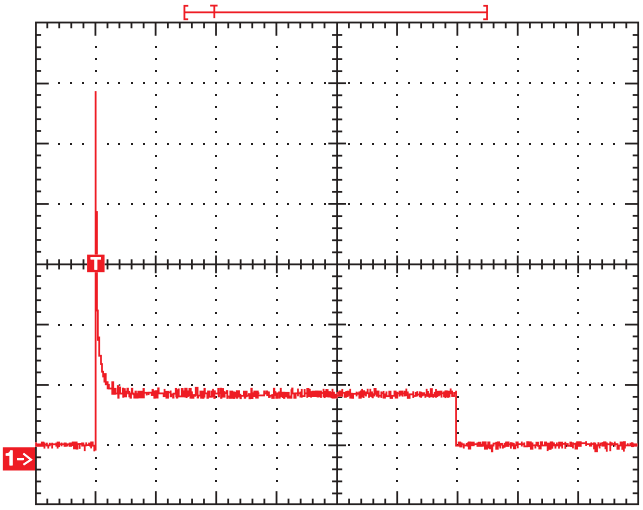
CONTENTS

This is how Hella checks and ensures quality





1) Load curve, 20 A resistive 10 A 500 ms



1) Load curve, 3 x high beam 10 A 500 ms

■ **Life tests:**

The relays are switched on/off in cycles on fully automated test racks. Original loads or simulated resistive, inductive, capacitive or combined loads are connected, the current characteristic of which was recorded at the original loads. In addition, the relays can be subjected to different ambient temperatures or temperature profiles. The test is documented continually.

■ **Electrical parameters:**

Within the context of product release starting voltage, dropout voltage, contact voltage drop, coil resistance and insulation resistance are tested, for example. Accompanying the manufacturing process, the electrical parameters are recorded at the end of the production process by End-of-Line testers. These can be evaluated statistically. This is one important factor for guaranteeing the constant high quality of the relays produced.

■ **Environment tests and mechanical tests:**

Every relay has to pass tests such as the alternating temperature test, salt spray fog test, mechanical shock test or drop test, as well as the vibration test within the context of the product release. These tests are carried out on Hella testing equipment.

■ **Analytical tests:**

Here, the materials used and the different connecting processes e.g. soldering and welding are tested. The tests are carried out randomly during incoming goods testing and following production.

■ **Certificates:**

Hella has been certified in different relevant areas e.g. DIN EN ISO 9001:2008, ISO / TS 16949:2009, ISO 14001. Hella relays also comply with the ROHS (2002/95/EC) and REACh standards.

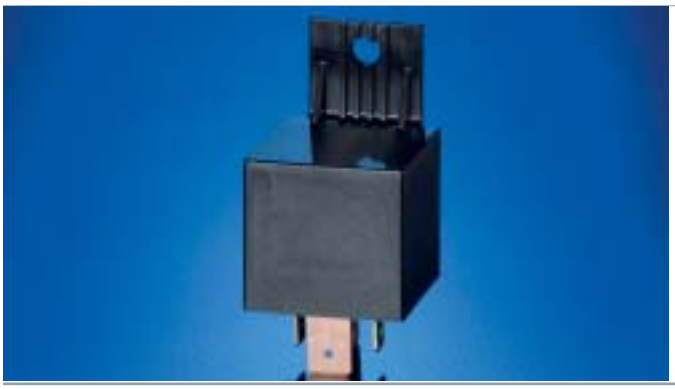
Mini relay

Mini relays in accordance with ISO 7588-1, male blade connectors in accordance with ISO 8092-1. Mini normally open relays with two outputs for connection of pairs of consumers e.g. auxiliary headlight sets are described as dual output.
Contact configurations: normally open contact, changeover contact, max. 40 A switching power (normally open contact), rated voltage: 12 V, 24 V,
Areas of application include: headlight, starter, fuel pump, fan motor, horns + fanfares.

Micro relay

Micro relays in accordance with ISO 7588-3, male blade connectors in accordance with ISO 8092-1.
Contact configurations: normally open contact, changeover contact, max. 20 A switching power (normally open contact), rated voltage: 12 V
Areas of application include: fuel pump, air conditioning, windscreen washer system, wiper motor.

High-power relay



Mini relay version with larger dimensions, male blade connectors in accordance with ISO 8092-1.
Contact configuration: normally open, changeover contact, max. 60 A switching power, rated voltage: 12 V, 24 V
Areas of application include: battery disconnect relay, starter motor, glow plugs, ignition, windscreen heating.

Solid state relay

Mini semiconductor relays in accordance with ISO 7588-1, male blade connectors in accordance with ISO 8092-1.
Contact configuration: normally open, max. 22 A switching power (normally open contact), rated voltage: 12 V
Areas of application include: vacuum pump for brake booster support, daytime running light.

MINI RELAY 12 V – NORMALLY OPEN WITH HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	15	100	–	–	15	100	–	–	15	100	–	–	**A**	**S10**	85	–	**4RA 003 530-001** with fuse insert 15 A
	25	100	–	–	25	100	–	–	25	100	–	–	**A**	**S10**	85	–	**4RA 003 530-042** with fuse insert 25 A
	30	100	–	–	30	100	–	–	15	100	–	–	**A**	**S1**	90	–	**4RA 965 400-001**
	40	100	–	–	35	100	–	–	30	100	–	–	**B**	**S2**	100	680	**4RA 007 791-021**
	40	100	–	–	30	100	–	–	30	100	–	–	**B2**	**S6**	85	–	**4RA 933 791-061** with dual output
	50	100	–	–	46	75	–	–	44	100	–	–	**B3**	**S2**	100	680	**4RA 007 793-041** with 9.5 mm load connections
	40	100	–	–	30	100	–	–	30	100	–	–	**B2**	**S8**	85	–	**4RA 933 791-091** with dual output and parallel diode

● Nominal switching current (A)

▲ No. of switchings (thous.)

MINI RELAY 12 V – NORMALLY OPEN WITHOUT HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	30	100	–	–	30	100	–	–	16	100	–	–	**A**	**S1**	90	–	**4RA 965 400-017**
	40	100	–	–	30	100	–	–	30	100	–	–	**B**	**S1**	85	–	**4RA 933 332-101**
	40	100	–	–	35	100	–	–	30	100	–	–	**B**	**S2**	100	680	**4RA 007 791-011**
	40	100	–	–	30	100	–	–	30	100	–	–	**B**	**S2**	85	560	**4RA 933 332-211**
	40	100	–	–	30	100	–	–	30	100	–	–	**B2**	**S6**	85	–	**4RA 933 332-151** with dual output
	50	100	–	–	46	75	–	–	44	100	–	–	**B3**	**S2**	100	680	**4RA 007 793-031** with 9.5 mm load connections

● Nominal switching current (A)

▲ No. of switchings (thous.)

MINI RELAY 12 V – CHANGEOVER CONTACT WITH HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	30	100	20	100	20	100	6	60	20	10	10	100	**B1**	**W1**	85	–	**4RD 933 332-011**
	30	100	20	100	20	100	6	60	20	10	10	100	**B1**	**W1**	85	–	**4RD 933 332-041**
	30	100	20	100	20	100	5	300	30	100	10	100	**B1**	**W2**	100	680	**4RD 007 794-031**
	30	100	20	100	20	100	6	60	20	100	10	100	**B1**	**W2**	85	560	**4RD 933 332-031** Dust and waterproof**
	30	100	20	100	20	100	6	60	20	10	10	100	**B1**	**W1**	85	–	**4RD 933 332-237***
	30	100	20	100	20	100	6	60	20	100	10	100	**B1**	**W3**	85	–	**4RD 933 332-277*** with parallel diode

● Nominal switching current (A)

▲ No. of switchings (thous.)

* Packaging unit usually individual packaging (1). Other packaging units on request e.g. industrial packaging (7).

** in connection with mating connector 8JD 745 801-001

MINI RELAY 12 V – CHANGEOVER CONTACT WITHOUT HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	30	100	20	100	20	100	6	60	20	100	10	100	**B1**	**W1**	85	–	**4RD 933 332-051**
	30	100	20	100	20	100	5	300	30	100	10	100	**B1**	**W2**	100	680	**4RD 007 794-021**
	30	100	20	100	20	100	5	300	30	100	10	100	**B1**	**W2**	100	680	**4RD 007 794-077***
	30	100	15	100	33	150	20	150	16	100	8	100	**A1**	**W3**	95	–	**4RD 965 400-027*** with parallel diode
	30	100	20	100	20	100	5	300	30	100	10	100	**B1**	**W3**	100	–	**4RD 007 794-041** with parallel diode
	30	100	20	100	20	100	6	60	20	100	10	100	**B1**	**W3**	85	–	**4RD 933 332-021** with parallel diode
	30	100	20	100	20	100	6	60	20	100	10	100	**B1**	**W2**	85	560	**4RD 933 332-177*** Dust and waterproof**

● Nominal switching current (A)

▲ No. of switchings (thous.)

* Packaging unit usually individual packaging (1). Other packaging units on request e.g. industrial packaging (7).

** in connection with mating connector 8JD 745 801-001

MINI RELAY 24 V – NORMALLY OPEN WITH HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	15	100	–	–	15	100	–	–	15	100	–	–	**A**	**S10**	315	–	**4RA 003 530-051** with fuse insert 15 A
	30	250	–	–	16	100	–	–	16	250	–	–	**A**	**S1**	360	–	**4RA 965 400-031**
	20	150	–	–	16	100	–	–	16	135	–	–	**B**	**S2**	305	1200	**4RA 007 957-011**
	20	250	–	–	16	100	–	–	16	250	–	–	**B2**	**S6**	350	–	**4RA 933 791-071** with dual output

● Nominal switching current (A)

▲ No. of switchings (thous.)

MINI RELAY 24 V – NORMALLY OPEN WITHOUT HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	20	250	–	–	16	100	–	–	16	250	–	–	**B**	**S1**	350	–	**4RA 933 332-111**
	20	150	–	–	16	100	–	–	16	135	–	–	**B**	**S2**	305	1200	**4RA 007 957-001**
	20	250	–	–	16	100	–	–	16	250	–	–	**B2**	**S6**	350	–	**4RA 933 791-081** with dual output

● Nominal switching current (A)

▲ No. of switchings (thous.)

MINI RELAY 24 V – CHANGEOVER CONTACT WITH HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	20	100	10	100	16	100	8	100	15	135	5	135	**B1**	**W1**	350	–	**4RD 933 332-061**
	20	100	10	100	16	100	10	100	16	135	5	135	**B1**	**W2**	305	1200	**4RD 007 903-011**
	20	100	10	100	16	100	8	100	15	135	5	135	**B1**	**W3**	350	–	**4RD 933 332-081** with parallel diode

● Nominal switching current (A)

▲ No. of switchings (thous.)

MINI RELAY 24 V – CHANGEOVER CONTACT WITHOUT HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	20	100	10	100	16	100	8	100	15	135	5	135	**B1**	**W1**	350	–	**4RD 933 332-071**
	20	100	10	100	16	100	10	100	16	135	5	135	**B1**	**W2**	305	1200	**4RD 007 903-001**
	20	100	10	100	16	100	8	100	15	135	5	135	**B1**	**W2**	350	1200	**4RD 933 332-261**
	20	100	10	100	16	100	10	100	16	135	5	135	**B1**	**W3**	305	–	**4RD 007 903-021** with parallel diode
	20	100	10	100	16	100	8	100	15	135	5	135	**B1**	**W3**	350	–	**4RD 933 332-091** with parallel diode

● Nominal switching current (A)

▲ No. of switchings (thous.)

HIGH-POWER RELAY 12 V –
NORMALLY OPEN WITH HOLDER / NORMALLY OPEN WITHOUT HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	60	100	–	–	50	100	–	–	25	50	–	–	**B3**	**S1**	85	–	**4RA 003 437-081**
	60	100	–	–	50	100	–	–	25	50	–	–	**B3**	**S5**	85	–	**4RA 003 437-101** with parallel and polarity reversal protection diode
	60	100	–	–	50	100	–	–	25	50	–	–	**B3**	**S1**	85	–	**4RA 003 437-111**

● Nominal switching current (A)

▲ No. of switchings (thous.)

HIGH-POWER RELAY 24 V –
NORMALLY OPEN WITH HOLDER / NORMALLY OPEN WITHOUT HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	60	100	–	–	50	100	–	–	25	50	–	–	**B3**	**S1**	310	–	**4RA 003 437-091**
	60	100	–	–	50	100	–	–	25	50	–	–	**B3**	**S1**	310	–	**4RA 003 437-121**

● Nominal switching current (A)

▲ No. of switchings (thous.)

MICRO RELAY 12 V –
NORMALLY OPEN WITH HOLDER / NORMALLY OPEN WITHOUT HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	20	150	–	–	15	150	–	–	16	150	–	–	**C**	**S2**	92	470	**4RA 007 813-021**
	20	150	–	–	15	150	–	–	16	150	–	–	**C**	**S2**	92	470	**4RA 007 813-011**
	20	100	–	–	20	100	–	–	20	10	–	–	**C1**	**L1**	2 x 75	–	**4RC 933 364-027*** Bi-stable

● Nominal switching current (A)

▲ No. of switchings (thous.)

* Packaging unit usually individual packaging (1). Other packaging units on request e.g. industrial packaging (7).

MICRO RELAY 12 V – CHANGEOVER CONTACT WITH HOLDER / CHANGEOVER CONTACT WITHOUT HOLDER

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	20	150	10	150	11	100	11	100	20	100	10	100	**C1**	**W2**	92	470	**4RD 007 814-031**
	20	150	10	150	11	100	11	100	20	100	10	100	**C1**	**W2**	92	470	**4RD 007 814-011**
	20	150	10	150	11	100	11	100	20	100	10	100	**C1**	**W2**	92	470	**4RD 007 814-087*** with locating lugs

● Nominal switching current (A)

▲ No. of switchings (thous.)

* Packaging unit usually individual packaging (1). Other packaging units on request e.g. industrial packaging (7).

BATTERY DISCONNECT RELAY 12 V – NORMALLY OPEN

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	180	15	–	–	180	15	–	–	180	15	–	–	**BDR1**	**L3**	2x5	–	**4RC 011 152-007** with parallel diode

● Nominal switching current (A)

▲ No. of switchings (thous.)

Battery disconnect relays in a nutshell

- Disconnects the vehicle electric system from the battery, as a component of vehicle electric system control units and pre-fuse devices
- Battery charge is maintained by avoiding quiescent current: large vehicle electric system parts are switched off during longer periods of vehicle standstill
- Voltage to the vehicle electric system or its parts is interrupted for maintenance work
- Safety switch-off in the event of an accident or cable damage to avoid fire hazard

Advantages:

- **Mechanically bi-stable control unit:**
  Impulse at the switch-on coil closes the contacts, these are stopped mechanically, impulse at the switch-off coil opens the contacts
- Contact bridge double breaking
- All load circuit components with large cross-section (>30 mm^2) for high steady current capability
- **4-pole plug-type connector:**
  2 x 2 coil connections, 2 load contacts and diagnosis connections
- 1 free wheeling diode per coil (optional)

Product photo	Resistive load				Inductive load				Bulb load				Plug matrix	Switching matrix	Coil resistance [Ohm]	Parallel resistance [Ohm]	Part number
	Normally open contact		Normally closed contact		Normally open contact		Normally closed contact		Normally open contact		Normally closed contact						
	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲					
	22	1000	–	–	22	1000	–	–	22	1000	–	–	**B**	**SSR1**	–	–	**4RA 007 865-031**

● Nominal switching current (A)

▲ No. of switchings (thous.)

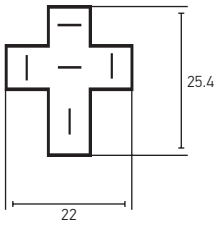
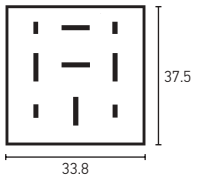
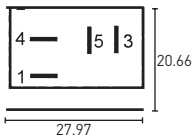
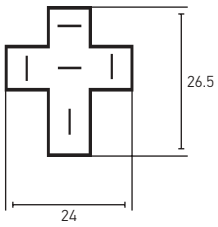
Solid state relays in a nutshell

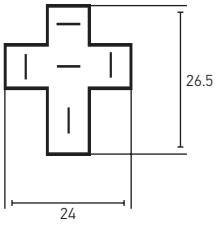
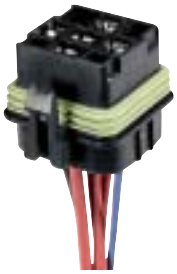
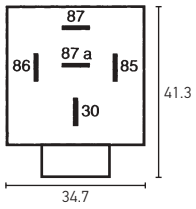
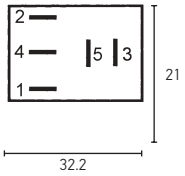
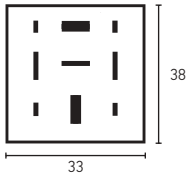
- Semi-conductor relays, designed for resistive, lamp, and inductive loads
- Pulse width modulation (PWM) makes controlled power regulation of loads up to 1 kHz with external stimulation possible
- Maximum switching safety, particularly suitable for all safety-related switching functions
- In terms of design size and plug matrix compatible with conventional ISO mini relays (standardised dimensions in accordance with ISO 7588-1)
- Silent switching e.g. in the passenger compartment
- Resistant to short-circuit and excess load
- Resistant to reverse polarity
- Impact and vibration-proof
- Cast waterproof
- Overheating protection
- Low quiescent current

The solid state relay is a modern semi-conductor switch and makes switching possible without moving parts. It can be connected via standardised pin bases.

With this development, Hella is doing justice to the increasing trend of controlling loads (e.g. fan motors, glow plugs, headlights and heaters) using power regulation. The increased switching frequency makes continual setting through pulse width modulation (PWM) possible e.g. for daytime running light.

The silent semi-conductor relay is particularly attractive for use inside vehicles. In addition, the wear and bounce-free switching means it can be used for applications with a high number of switching processes e.g. ABS or air-conditioning compressor clutch or vacuum pump for brake booster support in hybrid vehicles made by leading OEMs.

Product photo	Dimensional drawing	Product designation	suitable for	suitable blade slider	**Part number**
		Female pin housing, 5-pole	4RA 007 791-..., 4RA 007 794-..., 4RA 007 957-..., 4RD 007 903-..., 4RA 003 530-..., 4R.. 933 332-..., 4RA 933 791-..., 4RA 007 865-...	8KW 744 819-003, 8KW 701 235-..., 8KW 744 820-003	**8JA 715 606-101**
		Female pin housing, 9-pole, for use side-by-side	4RA 007 791-..., 4RA 007 794-..., 4RA 007 957-..., 4RD 007 903-..., 4RA 003 530-..., 4R.. 933 332-..., 4RA 933 791-..., 4RA 007 865-...	8KW 744 819-003, 8KW 701 235-..., 8KW 744 820-003	**8JA 003 526-001**
		Female pin housing, 5-pole, for use side-by-side	4RA 007 813-..., 4RD 007 814-..., 4RC 933 364-...	8KW 744 819-003, 8KW 701 235-..., 8KW 744 820-003, 8KW 733 815-003	**8JD 733 767-001**
		Female pin housing, 5-pole	4RA 007 791-..., 4RA 007 794-..., 4RA 007 957-..., 4RD 007 903-..., 4RA 003 530-..., 4R.. 933 332-..., 4RA 933 791-..., 4RA 007 865-...	8KW 719 874-007	**8JA 717 291-007**

Product photo	Dimensional drawing	Product designation	suitable for	suitable blade slider	**Part number**
		Female pin housing, 5-pole	4RA 007 791-..., 4RA 007 794-..., 4RA 007 957-..., 4RD 007 903-..., 4RA 003 530-..., 4R.. 933 332-..., 4RA 933 791-..., 4RA 007 865-...	Pin contacts already equipped	**8JA 733 963-001**
		Female pin housing, 5-pole	4RA 007 791-..., 4RA 007 794-..., 4RA 007 957-..., 4RD 007 903-..., 4RA 003 530-..., 4R.. 933 332-..., 4RA 933 791-..., 4RA 007 865-...	With pre-fitted cable assembly	**8JD 745 801-001**
		Female pin housing, 5-pole	4RA 007 813-..., 4RD 007 814-..., 4RC 933 364-...	Pin contacts already equipped	**8JD 733 962-001**
		Female pin housing, 9-pole, for use side-by-side	4RA 007 793-..., 4RA 003 437-...	8KW 744 819-003, 8KW 701 235-..., 8KW 744 820-003, 8KW 744 822-003	**8JA 183 161-002**

Burn-off reserve

Or crossing is the path the rotor takes after closing the normally open contacts to touch the magnetic core, measured at the contacts.

Dropout voltage

Voltage at the coil at which the relay moves back from the working position to the resting position (rotor drops out).
(see starting voltage)

Dropout time

Time between switching the coil current off and safe opening of the normally open contacts. It includes bounce time.

Rotor reset force

Force by which the contact pair is pulled apart when the normally open contact is opened, measured in the centre of the contact surface.

Response time

Time between switching the coil current on and safe closing of the normally open contacts. It includes bounce time.

Starting voltage

Voltage at the coil at which the relay moves from the resting position to the working position (closed working contacts) (rotor is activated).

Operating voltage

Voltage range within which safe working of the relays is guaranteed at the given temperature.

Steady current

Load current through the relay that can flow for any length of time without damaging the relay.

Switch-on current (inrush)

Load current carried by the relay contacts directly after closing.

Inductive load (motor)

The switch-on current increases quickly to a multiple of the nominal current and then levels off to nominal current (e.g. start-up of a fan motor). During switch-off, a voltage up to several 1000 volts is induced that leads to a light arc between the relay contacts just opened.

Contact spacing

Air gap between the opened contacts.

Contact force

Force with which the closed contacts are pushed against one another, measured at the centre of the contact surface.

Contact resistance

Resistance of the closed contacts, usually specified as drop in voltage over the contacts at a defined current (e.g. 10 A).

Storage temperature

Temperature range within which the relay can be stored without becoming damaged.

Bulb load

In the case of a cold bulb, switch-on current can be up to ten times the nominal current of the bulb (e.g. headlights, glow plugs)

Mechanical service life

Service life of the relays without electrical load of the contacts, the coil is triggered with 10 rectangular impulses per second during measurement.

Rated voltage

Voltage of the vehicle electric system, 12 V or 24 V.

Resistive load

The current remains about the same from switch-on to switch-off (e.g. rear window or mirror heating)

Bounce time

Time from the first contact (opening) of the contacts to the safe closing of the current circuit.

The bounce time for Hella relays is usually between 0-3 ms.

Test voltage

Voltage at which the service life and environment tests are carried out.

Test voltage winding/contact

Voltage up to which the galvanic isolation between stimulation and load circuit and between the opened male blade connectors of the load circuit is maintained.

Test temperature

Temperature at which the service life and environment tests are carried out.

No. of switchings

Number of possible switch-on and switch-off procedures for resistive, inductive or rated bulb load.

Protective category IP 5K4K

Hella relays are safe to touch and splashwater-proof, and comply with protective category IP 5K4K in accordance with DIN 40 050 in the mounting position male blade connector facing downwards.

Voltage drop

Loss of voltage in the relay when load current is applied and contacts are closed, measured at 10 A load current between the male blade connectors of the load circuit.

Permissible ambient temperature

Temperature range within which the relay fulfils the given data and works permanently without becoming damaged.

	Mini relay, 12 V		**Mini relay, 24 V**		**High-power relay**	
	4RA 003 530-... 4RA 007 791-... 4RD 007 794-...	4R.. 933 332-... 4RA 933 791-... 4R..965 400-...	4RA 003 530-... 4RA 007 957-... 4RD 007 903-...	4R.. 933 332-... 4RA 933 791-... 4R.. 965 400-...	**12 V** 4RA 003 437-...	**24 V** 4RA 003 437-...
General data						
Test voltage	13.5 V	13.5 V	27 V	27 V	13.5 V	27 V
Test temperature	+23 ±5°C	+23 ±5°C	+23 ±5°C	+23 ±5°C	+23 ±5°C	+23 ±5°C
Permissible ambient temperature	-40°C...+125°C	-40°C...+85°C	-40°C...+125°C	-40°C...+85°C	-40°C...+125°C	-40°C...+85°C
Storage temperature	-40°C...+130°C	-40°C.. +125°C	-40°C...+130°C	-40°C...+125°C	-40°C.. +125°C	-40°C.. +125°C
Male blade connector (in accordance with ISO 8092) 30 85 86 87 87a	 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm	 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm	 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm	 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm	 6.3 x 0.8 mm 9.5 x 1.2 mm 6.3 x 0.8 mm 9.5 x 1.2 mm -	 6.3 x 0.8 mm 9.5 x 1.2 mm 6.3 x 0.8 mm 9.5 x 1.2 mm -
Coil data						
Rated voltage	12 V	12 V	24 V	24 V	12 V	24 V
Operating voltage range at permissible ambient temperature	8 V...16 V	8 V...16 V	16 V...30 V	16 V...30 V	8 V...16 V	16 V...30 V
Starting voltage at test temperature	< 8 V	< 8 V	< 17 V	< 15.6 V	< 7.5 V	< 17 V
Dropout voltage at test temperature	> 1 V	> 1 V	> 3.5 V	> 3.5 V	> 1 V	> 5 V
Coil resistance at test temperature without parallel component	85/100 Ohm ± 10 %	85 Ohm ± 10 %	305/315 Ohm ± 10 %	350/360 Ohm ± 10 %	85 Ohm ± 10 %	310 Ohm ± 10 %
Response time	< 10 ms	< 10 ms	< 10 ms	< 10 ms	< 10 ms	< 10 ms
Dropout time	< 10 ms	< 15 ms	< 10 ms	< 15 ms	< 10 ms	< 15 ms
Insulation resistance Coil circuit/load circuit	> 100 MOhm	> 100 MOhm	> 100 MOhm	> 100 MOhm	> 100 MOhm	> 100 MOhm
Dielectric strength Coil circuit/load circuit	> 1000 VDC	> 1000 VDC	> 1000 VDC	> 1000 VDC	> 1000 VDC	> 1000 VDC
Contact data						
Drop in contact voltage at test voltage ... ... in new state normally open contact	< 10 mV/A	< 10 mV/A	< 10 mV/A	< 15 mV/A	< 3 mV/A	< 3 mV/A
... in new state normally closed contact	< 10 mV/A	< 10 mV/A	< 10 mV/A	< 15 mV/A	–	–
... after service life test normally open contact	< 10 mV/A	< 10 mV/A	< 10 mV/A	< 15 mV/A	< 10 mV/A	< 10 mV/A
... after service life test normally closed contact	< 10 mV/A	< 15 mV/A	< 15 mV/A	< 20 mV/A	–	–
Mechanical service life	'10^7	'10^7	'10^7	'10^7	'10^7	'10^7

	Power mini relay, 12 V	Micro relay, 12 V		Solid state relay	Battery disconnect relay
	4RA 007 793-...	4RA 007 813-... 4RA 007 814-...	4RC 933 364-...	12 V	12 V
General data					
Test voltage	13.5 V	13.5 V	13.5 V	13.5 V	13.5 V
Test temperature	+23 ±5 °C	+23 ±5°C	+23 ±5°C	+23 ±5°C	+23 ±5°C
Permissible ambient temperature	-40°C...+125°C	-40°C...+125°C	-40°C...+105°C	-40°C...+125°C	-40°C...+120°C
Storage temperature	-40°C...+130°C	-40°C...+130°C	-40°C...+125°C	-40°C...+150°C	-40°C...+120°C
Male blade connectors (in accordance with ISO 8092) 30 85 86 87 87a	 9.5 x 1.2 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 9.5 x 1.2 mm –	 6.3 x 0.8 mm 4.8 x 0.8 mm 4.8 x 0.8 mm 6.3 x 0.8 mm 4.8 x 0.8 mm	 6.3 x 0.8 mm 4.8 x 0.8 mm 4.8 x 0.8 mm 6.3 x 0.8 mm 4.8 x 0.8 mm	 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm 6.3 x 0.8 mm –	 –
Coil data					
Rated voltage	12 V	12 V	12 V	12 V	12 V
Operating voltage range at permissible ambient temperature	8 V...16 V	8 V...16 V	8 V...16 V	8 V...16 V	8 V...16 V
Starting voltage at test temperature	< 8 V	< 8 V	< 6 V	< 9 V	< 6 V
Dropout voltage at test temperature	> 1.3 V	> 1 V	> 6 V	–	> 7 V
Coil resistance at test temperature without parallel component	100 Ohm ± 10%	92 Ohm ± 10 %	2x75 Ohm ± 10 %	–	2x50 Ohm ± 10 %
Response time	< 10 ms	< 10 ms	< 5 ms	< 150 µs	< 20 ms
Dropout time	< 10 ms	< 10 ms	< 5 ms	< 75 µs	< 20 ms
Insulation resistance Coil circuit/load circuit	> 100 MOhm	> 100 MOhm	> 100 MOhm	–	> 100 MOhm
Dielectric strength Coil circuit/load circuit	> 1000 VDC	> 1000 VDC	> 800 VDC	–	> 500 VAC
Contact data					
Drop in contact voltage at test voltage ... ... in new state normally open contact	< 5 mV/A	< 10 mV/A	< 5 mV/A	< 6 mV/A	< 2.5 mV/A
... in new state normally closed contact	–	< 10 mV/A	–	–	–
... after service life test normally open contact	< 10 mV/A	< 10 mV/A	< 10 mV/A	–	–
... after service life test normally closed contact	–	< 10 mV/A	–	–	–
Mechanical service life	10^7	'10^7	'10^7	–	$2x10^5$

Vibration test

DIN EN 600 68-2-6; test: Fc (sinus-shape);
20 – 200 Hz, 5g, 6h per axis

Damp heat test, constant

DIN EN 600 68-2-78, test: Cab;
Upper temperature: +55°C, 93% rel. hum., 56 d

Shock test

DIN EN 600 68-2-27; test: Ea (semi-sinus-shape);
max. 50 g, 11 ms, 1,000 shocks

Alternating temperature test

DIN EN ISO 600 68-2-14, test; Nb;
-40°C / +85°C (5°C per minute), 10 cycles

Corrosion test

DIN EN 600 68-2-42; test: Kc;
10 ± 2 cm^3/m^3 SO2, + 25 °C, 75% rel. hum., 10 d

DIN IEC 600 68-2-43;
11 ± 0.3 cm^3/m^3 H2S, 10 days

Condensation test

DIN EN ISO 6988;
+40°C, 0.2 dm^3 SO2, 6 cycles (24 h cycle),
Storage: 8 h per cycle

Humid heat test, cyclic

DIN EN 600 68-2-30, test: Db, variant 1;
Upper temperature: +55°C, min. 90% rel. hum., 6 cycles
(24 h per cycle)

Protective category

IP 54 in accordance with DIN EN 60 529

Connection and terminal designation

Standard	ISO 7588	Description
86	1	Coil (+)
85	2	Coil (-), ground
30	3	Battery (+) terminal 15
87a	4	Output 2, normally closed contact
87	5	Output 1, normally open contact

Buses

ABS, starters, audio systems, indicators, stoplights, injection pump, fanfares, horns, interior lighting, air-conditioning system, signage control, rear fog lights, wiper systems, headlights, seat heating, seat adjustment, hazard warning lights ...

Trucks

Axle lift, ABS, low-speed traction control, starters, indicators, injection pump, fanfares, horns, loading area adjustment, loading bay cooling, loading ramp control, steering axle, wiper systems, headlights ...

Municipal vehicles

Starters, drive motors, worklights, cooling fans, injection pump, indicators, stoplights, horns, fanfares, rotating beacons, headlights, wipe/wash interval control, water pumps ...

Caravans/motor homes

Battery monitor, indicators, fanfares, heating control, horns, interior lighting, electricity for kitchen appliances, rear fog lights, wiper systems, headlights ...

Agricultural vehicles

Starters, drive motors, worklights, threshing assembly drives, pneumatic control, injection pump, worm screw drivers, gear control, headlights, heating control, horns, hydraulic control units, hoist control, air-conditioning system, corn tank emptying, fuel pumps, fans, engine control, cutting assembly drives, seat heating, seat adjustment, booster heating, drum drives, water pumps, wipe/wash interval control, centrifugal separator ...

Construction vehicles

Starters, worklights, stoplights, injection pump, radiator fans, hydraulic control units, fuel pump, horns, fanfares, headlights, gear control, engine control, air-conditioning system, wipe/wash interval control ...

Fork-lifts

Starters, worklights, injection pump, fanfares, horns, interior lighting, license plate lights, rotating beacons, searchlights, hazard warning lights, water pumps, auxiliary headlights, ignition system ...

Passenger cars

ABS, starters, audio system, petrol pump (fuel pump), indicators, stoplights, injection pump, fanfares, window lifters, windscreen heating, rear window heating, horns, interior lighting, air-conditioning system, radiator fans, fans, rear fog lights, radio antenna, wiper systems, headlights, sliding roof, electr. seat heating, seat adjustment, mirror heating, mirror adjustment, soft top control, wipe/wash interval control, central locking, ignition system ...

Marine, powersports

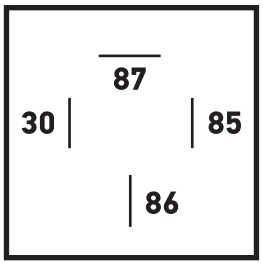
Starters, worklights, injection pump, fanfares, horns, interior lighting, license plate lights, rotating beacons, searchlights, hazard warning lights, water pumps, auxiliary headlights, ignition system ...

Made-to-measure

Car seats, window lifters, air-conditioning systems, safety stoplights, central locking, auxiliary headlights ...

NOTES

A



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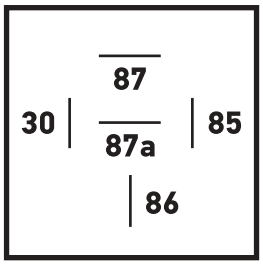

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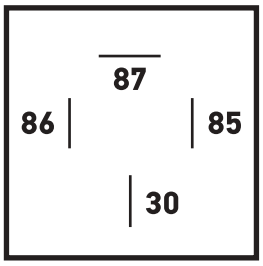

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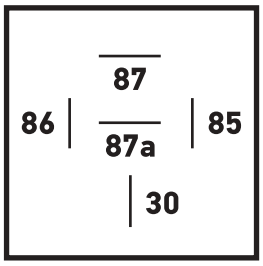

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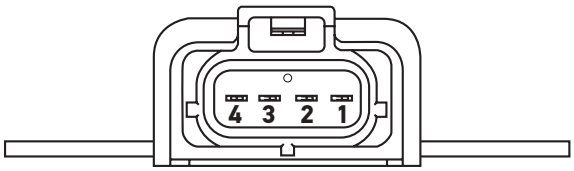

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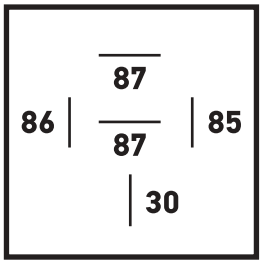

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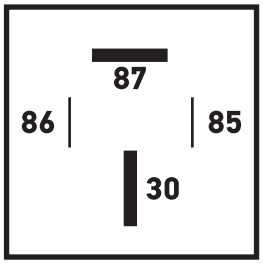

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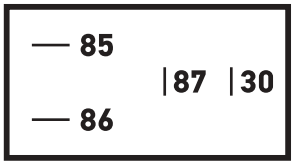

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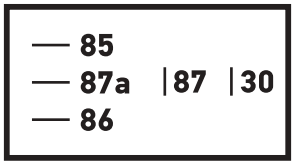

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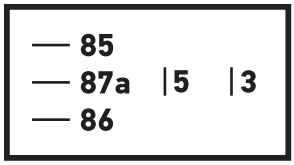

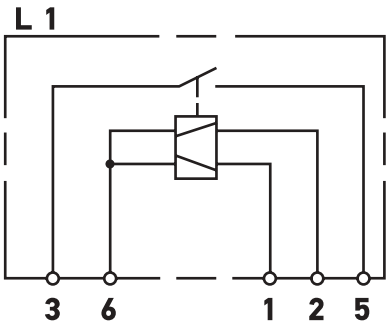
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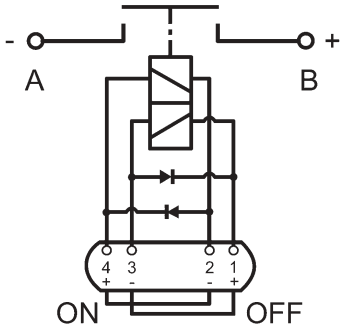
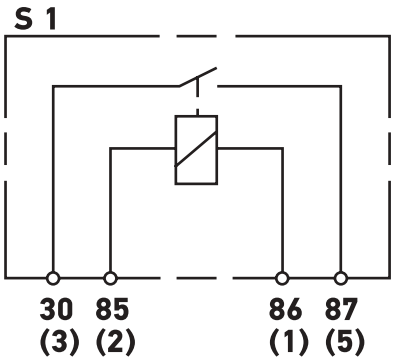

- +
A B
4 3 2 1
ON OFF


S 1
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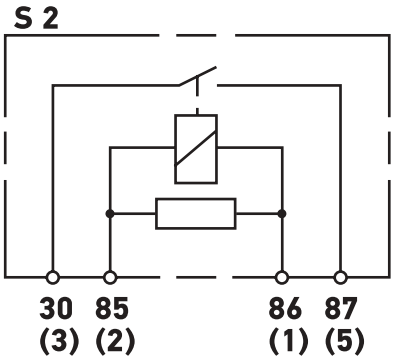
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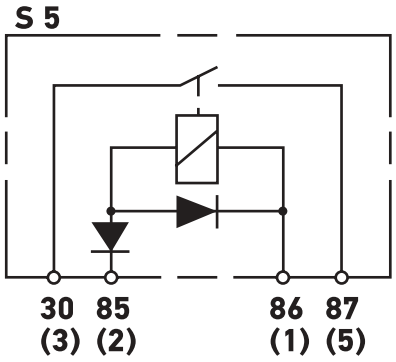
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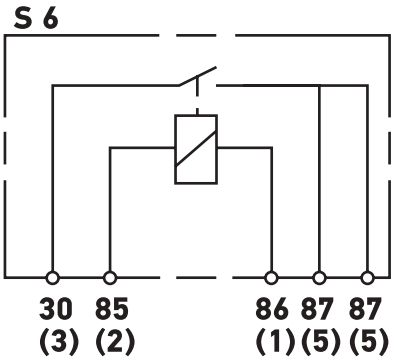
S 6
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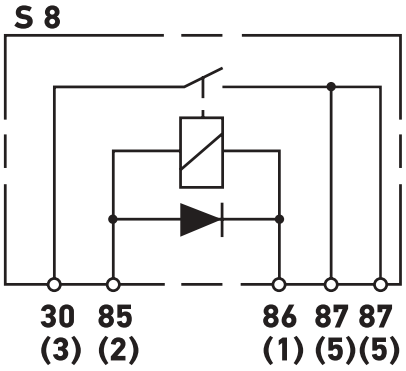
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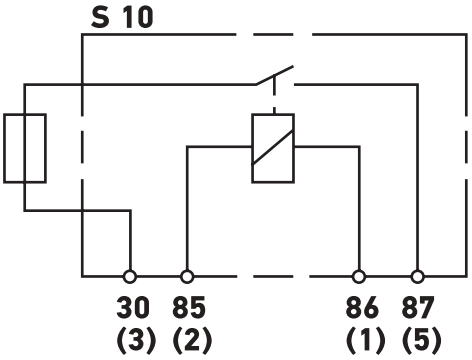
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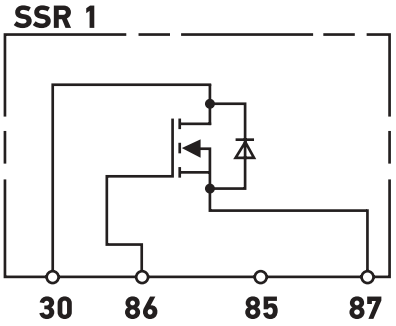
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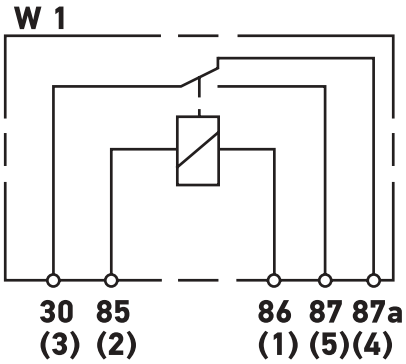
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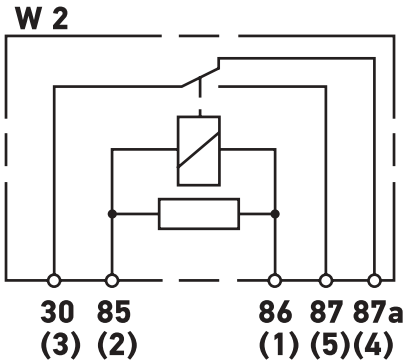
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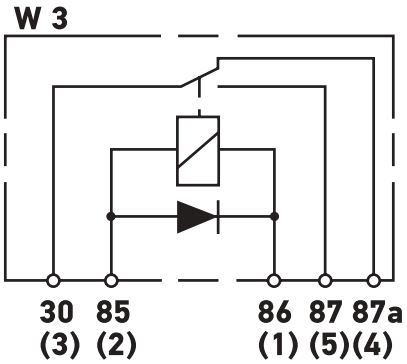
W 3
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(3) (2) (1) (5) (4)

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