

# **Technical Information**

## *Electronics – Relays*



*Ideas today for  
the cars of tomorrow*

## Relays



Relays are used to control electrical loads and are elementary components of modern vehicle control units. A relay is a remote-controlled switch operated by electrical current for switching circuits on, off or over.

In an electro-mechanical relay, an iron armature is attracted by the current flow in the electro-magnetic coil. Through its movement, the iron armature makes or breaks one or more contacts, which in turn makes, breaks or switches over a load circuit. The current intensity and electrical voltage in the load circuit can be much greater than that in the coil. This allows extremely high voltages and/or currents to be switched using comparatively small relays.

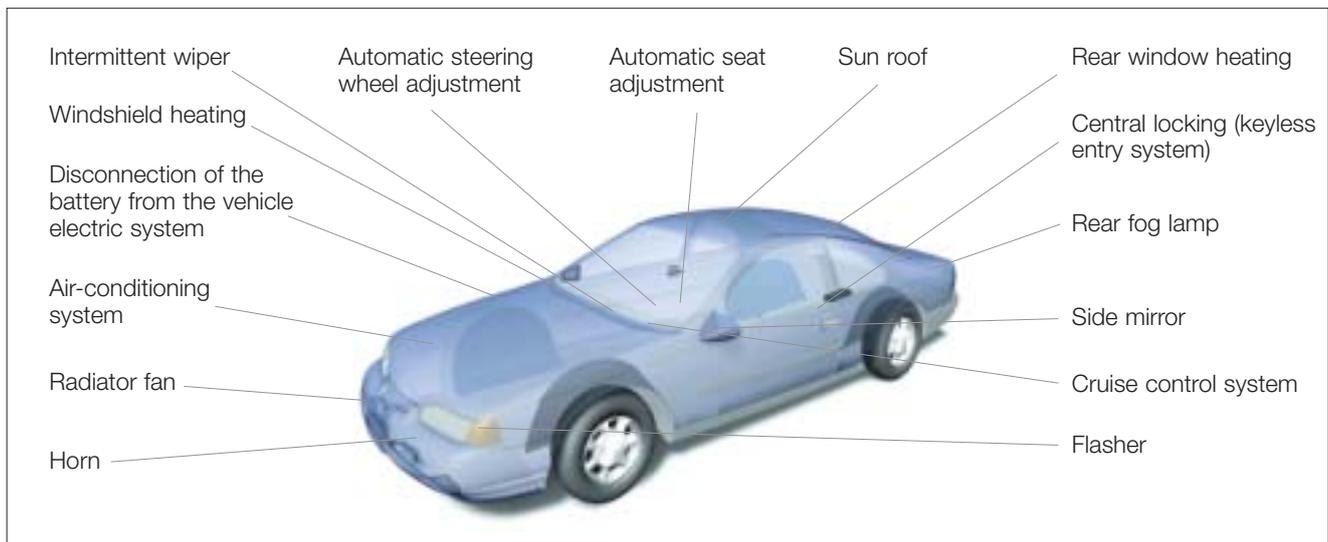
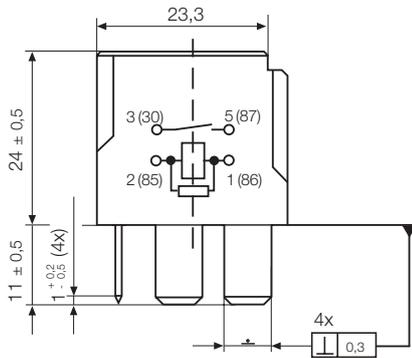
In solid-state relays, the loads are switched with the aid of semiconductor components, so electro-mechanical moving parts and contacts are no longer required. This guarantees extremely quick switching times and wear-free work, which leads to an almost unlimited service life.

The load current can be switched using a relay near the load, making short supply lines with low voltage drop possible.

Depending on the application, make-contact or changeover contact relays are used. Hella provides a comprehensive product range for both switching functions.

Make-contact relays are used if the focus is on loads being switched on and off. Examples of this are the switching of auxiliary headlamps, trumpet horns, fan motors etc.

Changeover contact relays make it possible to switch the load current from one contact to another. Two changeover contact relays can be used to realize an H-bridge to change the direction of rotation of a motor, which is required for lifting and lowering windows, for example. The changeover contact relay contains the two functions make-contact relay and break-contact relay in one unit, and can therefore also be wired as a simple make-contact or break-contact relay.



Relay applications



### Plug-in relays – Electro-mechanical relays

For many years now, the electro-mechanical plug-in relay has been one of Hella's core commodity products. Thanks to the consistent expansion of our international locations, our development and production activities are spread throughout the world, in Spain, the USA and China. As plug-in switch amplifiers for controlling electrical loads, these electro-mechanical relays can be triggered by control units. Standardization in accordance with ISO 7588-1 (mini-relays) and ISO 7588-3 (micro-relays) guarantees that Hella relays can be used wherever corresponding slots are available.



### PCB relays – Electro-mechanical relays

A wide variety of different PCB relays complete Hella's relay product portfolio. With its PCB relays Hella is following the trend toward smaller and smaller design spaces while at the same time increasing load currents and extending service-life. The product range covers relays for performance categories up to 30 A at application temperatures of up to +125 °C. PCB relays are used in particular for flasher functions, headlamp triggering or switching inductive loads such as central locking, keyless entry, tilt/slide sunroof and window lifter.

To accommodate the trend of using new processing technologies, Hella has extended its product portfolio by a series of reflow solderable relays for pin-in-paste and SMD technology.



### Solid-State Relays

Solid-state relays switch loads with the aid of semiconductor components in place of electro-mechanically moved parts and contacts. They work silently and stand out thanks to their long service-life and high reliability.

Depending on the application case, Hella solid-state relays achieve switch times of up to a few micro-seconds per switching process. They can be used particularly for the pulse width modulated (PWM) operation of loads.

On the basis of their wear-free and bounce-free working method, solid-state relays are suitable for applications where frequent switching takes place, e.g. ABS, fuel pump or air-conditioning compressor clutch. Their silent switching makes them particularly suitable for applications inside vehicles.

Hella solid-state relays have standardized housing dimensions and pin bases, allowing them to be used as an alternative to electro-mechanical relays inside vehicles. Hella supplies solid-state relays in both 12 V and 42 V vehicle electric system voltages.



**Battery disconnect relay**

### **Battery disconnect relays**

The battery disconnect relay is used to disconnect large sections of the vehicle electric system from the battery. This bistable high-current relay can be used as discharge protection for the battery, for example, to disconnect the battery during servicing or overseas transport and to switch the battery potential-free in the event of a problem. In this way, the battery disconnect relay makes a significant contribution to increasing vehicle safety. The battery disconnect relay has been designed for 12 V vehicle electric systems. Versions for 24 V/42 V vehicle electric systems are under development.

Hella combines know-how as a relay manufacturer with customer requirements by installing Hella relays in its high-quality electronic systems, from control units through central electronics to keyless entry systems. Hella relays stand out because of their high integration competence and they are a key component both within Hella technologies and in systems manufactured by other companies. Our customers benefit from the competence in the electronics sector that Hella has to offer from both manufacturer and user points of view. Due to long years of experience in relay development and production, Hella can guarantee top reliability and quality and consistently achieves minimum ppm rates thanks to sophisticated quality processes and innovative assembly technologies.

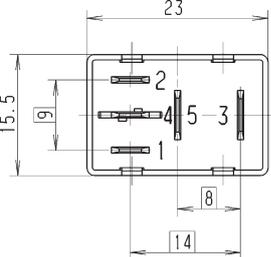
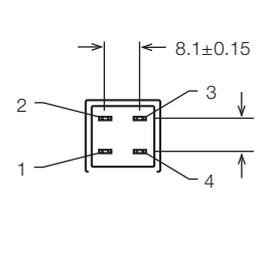
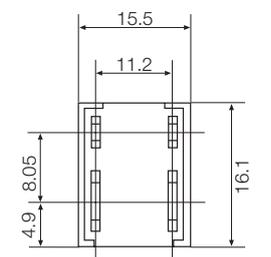
As part of a globally thinking and acting company, proximity to our customers is important and realized through international production and development sites. We have further extended our worldwide market presence through our joint venture in China and cooperation partner in Japan. Linked by a global Customer Support system, we are able to react quickly and flexibly to customer enquiries.

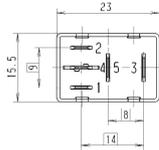
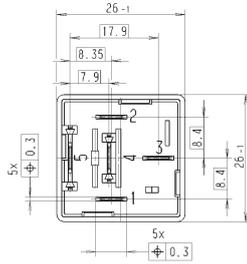
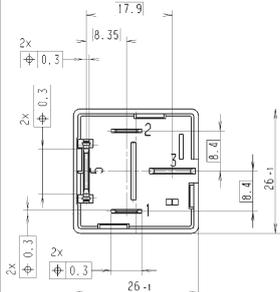
Hella manufactures more than 100 million relays for automotive applications every year and is one of the world's leading manufacturers. Our complete relay product portfolio ranges from plug-in relays and PCB relays in a wide range of different designs through solid-state relays to relays for special solutions such as battery disconnect relays and silent relays. The large range of different variants available allows their use in a wide range of different applications.

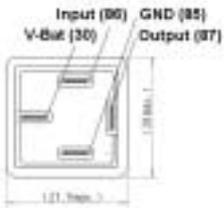
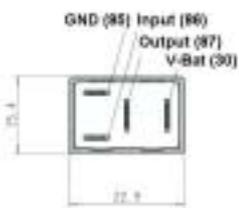
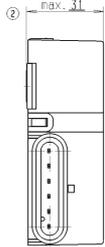
Functional designs which are straightforward to manufacture, state-of-the-art materials and assembly processes, and comprehensive testing guarantee the high quality of Hella relays.

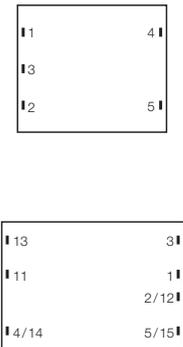
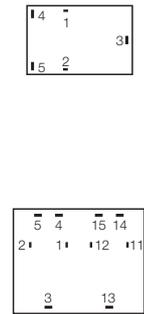
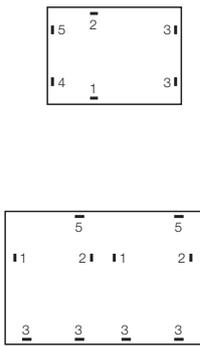
Further functions and components will be integrated in relays in the future, which will lead to the development of intelligent relays with safety functions, for example. Continuous reduction of the package space due to the expansion of electronic functions in vehicles will further push the trend toward miniaturization and simultaneous increase in load currents.

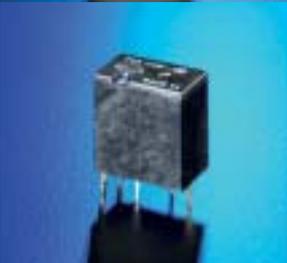
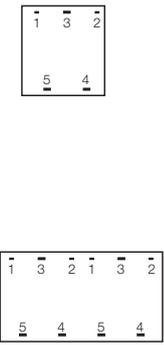
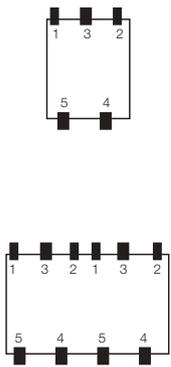
Hella is continually working on solutions to reduce power loss – and thus heat in relays – following the trend toward the “cold” relay. In addition, work is continuing on the development of relay applications for 42 V vehicle electric systems.

			
<b>Type</b>	<b>ISO Power Mikro</b>	<b>Space Saver</b>	<b>HCF</b>
<b>Max. continuous current in the operating temperature range</b>	30/20 A	20 A	40 A
<b>Inrush current</b>	100/60 A	80 A	150 A
<b>Nominal voltage</b>	12/24 V	12/24 V	12/24 V
<b>Coil resistance (coil only)</b>	140 Ω	150 Ω	160 Ω
<b>Relay resistance</b>	125 Ω	134 Ω	130 Ω
<b>Pull-in voltage</b>	<7.5 V	<7.5 V	<7.5 V
<b>Operating temperature range</b>	-40 °C to +135 °C	-40 °C to +135 °C	-40 °C to +135 °C
<b>Dimensions (L x W x H) mm</b>	23 x 15 x 25	15.7 x 16.4 x 16	15.5 x 16.1 x 25
<b>Weight</b>	21 g	15 g	20 g
<b>Contact arrangement</b>	1 A/1 C	1 A	1 A
<b>Pin diagram</b>			

			
Type	<b>ISO Mikro</b>	<b>ISO Mini</b>	<b>Power Mini</b>
<b>Max. continuous current in the operating temperature range</b>	25/10 A	40/20 A	70 A
<b>Inrush current</b>	100/50 A	150/100 A	200 A
<b>Nominal voltage</b>	12/24 V	12/24 V	12/24 V
<b>Coil resistance (coil only)</b>	92 Ω	100 Ω	100 Ω
<b>Relay resistance (coil only)</b>	85 Ω	92 Ω	92 Ω
<b>Pull-in voltage</b>	<7.5 V	<7.5 V	<7.5 V
<b>Operating temperature range</b>	-40 °C to +125 °C	-40 °C to +125 °C	-40 °C to +125 °C
<b>Dimensions (L x W x H) mm</b>	23 x 15 x 25	26 x 26 x 24	26 x 26 x 24
<b>Weight</b>	21 g	36 g	36 g
<b>Contact arrangement</b>	1 A/1 C	1 A/1 C	1 A/1 C
<b>Pin diagram</b>			

			
<b>Type</b>	<b>Solid-State Relay (Mini)</b>	<b>Solid-State Relays (Micro)</b>	<b>Battery Disconnect Relay</b>
<b>Max. continuous current in the operating temperature range</b>	22 A	11 A	190 A
<b>Inrush current</b>	250 A	250 A	800 A
<b>Nominal voltage</b>	12/42 V	12/42 V	12 V (24 V/42 V on request)
<b>Coil resistance (coil only)</b>	–	–	3 Ω
<b>Pull-in voltage</b>	8 V to 16 V	8 V to 16 V	>6V
<b>Operating temperature range</b>	–40 °C to +85 °C	–40 °C to +85 °C	–40 °C to +110 °C
<b>Dimensions (L x W x H) mm</b>	27x 27x 26	25 x 15 x 25 / o. 12.5	82 x 80 x 31
<b>Weight</b>	30 g	7.5 g	250 g
<b>Contact arrangement</b>	1 A	1 A	1 X
<b>Pin diagram</b>			

			
			
<b>Type</b>	<b>HA-family (quiet relay)</b>	<b>HB-family</b>	<b>HC-family</b>
<b>Load current</b>	25 A	25 A	30 A (40 A)
<b>Nominal voltage</b>	12 V	12 V	12 V
<b>Coil resistance</b>	100 Ω to 225 Ω	100 Ω to 225 Ω	110 Ω to 225 Ω
<b>Pull-in voltage</b>	5.5 V to 7.7 V	5.5 V to 7.7 V	5.5 V to 8.5 V
<b>Operating temperature range</b>	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +125 °C
<b>Dimensions (L x W x H) mm</b>	17 x 19.8 x 14 (HA1) 17 x 24.2 x 18.5 (HA2)	14 x 9.2 x 13.5 (HB1) 14 x 17.4 x 13.5 (HB2)	17.8 x 13 x 16 (HC1) 17.8 x 26 x 16 (HC2)
<b>Weight</b>	8 g (HA1) 13 g (HA2)	5 g (HB1) 9.5 g (HB2)	10 g (HC1) 20 g (HC2)
<b>Contact arrangement</b>	1 A / 1 C / H-bridge	1 A/1 C/2 x 1 A/ 2 x 1 C/H-bridge	1 A/1 C/1 U 2 x 1 A/2 x 1 C/2 x 1 U
<b>Technologies</b>	Wave soldering	Wave soldering pin-in-paste	Wave soldering
<b>Pin diagram</b>			

			
			
<b>Type</b>	<b>HE-family</b>	<b>HH-family</b>	<b>HH-family SMD</b>
<b>Load current</b>	25 A	25 A	25 A
<b>Nominal voltage</b>	12 V	12 V	12 V
<b>Coil resistance</b>	110 Ω to 160 Ω	160 Ω to 220 Ω	160 Ω to 220 Ω
<b>Pull-in voltage</b>	5.5 V to 6.5 V	6.5 V to 7.7 V	6.5 V to 7.7 V
<b>Operating temperature range</b>	-40 °C to +105 °C	-40 °C to +105 °C	-40 °C to +105 °C
<b>Dimensions (L x W x H) mm</b>	7.2 x 12 x 13.5 (HE1) 13.6 x 12 x 13.5 (HE2)	11 x 12 x 7.8 (HH1) 21.6 x 12 x 7.8 (HH2)	11 x 12 x 8.8 (HH1 SMD) 21 x 12 x 8.8 (HH2 SMD)
<b>Weight</b>	3.2 g (HE1) 6.3 g (HE2)	3 g (HH1) 6 g (HH2)	3 g (HH1) 6 g (HH2)
<b>Contact arrangement</b>	1 C/H-bridge	1 C/2 x 1 C	1 C/2 x 1 C
<b>Technologies</b>	Wave soldering pin-in-paste	Wave soldering	SMD
<b>Pin diagram</b>			

**Climatic and mechanical tests**

<b>Vibration</b>	DIN IEC 600 68-2-6 (sine pulse form) 20–200 Hz, 5g
<b>Shock</b>	DIN IEC600 68-2-27(half – sine pulse form) min. 10g
<b>Corrosive gas</b>	DIN IEC 600 68-2-42; 10±2cm <sup>3</sup> /m <sup>3</sup> SO <sub>2</sub> , 10 days
	DIN IEC 600 68-2-42; 11 ±0,3 cm <sup>3</sup> /m <sup>3</sup> H <sub>2</sub> S, 10 days
<b>Damp heat cyclic</b>	DIN IEC 600 68-2-30; Db, version 1; 6 cycles Upper temperature +55 °C
<b>Damp heat steady state</b>	DIN EN 600 68-2-78; Ca, 56 days Upper temperature +55 °C
<b>Change of temperature</b>	DIN IEC 600 68-2-14; Nb,10 cycles –40 °C/+85 °C (5 °C per minute)
<b>Climatic cycling with condensation</b>	EN ISO 6988, 6 cycles, storage 8/16 h

Annex: Map of the world



- ◆ HKGaA
- Subsidiaries
- ▲ Joint Venture

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