



Operating instructions

## Series 09 – I/O Universal Switch

*Operating instructions and safety instructions*

# Operating and safety instructions



Project	Series 09, 1901 Universal Switch (Hardwired Standard Version)
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### Change History

Version	Change Description	Status	Author	Date
01	initial	initial	HAS	13.01.2022
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### Referenced Documents

Reference	Document Number	Version	Author	Date
1901 product information	1901940001	08	EBJ	20.12.2021
EG/EC/CE Declaration of Conformity	-	-	ESF	29.11.2021

### Related Products

Related Products	Version
Series 09 Universal Switch	I/O Hardwired Standard Variant I/O Hardwired Dual Contact (redundant switching signal)

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## List of abbreviations and units

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DIN	Deutsches Institut für Normung/German institute for standardization
EN	European standard
EU	European Union
HMI	Human-Machine-Interface
IP	International Protection
ISO	International Organization for Standardization
LED	Light emitting diode
MOT	Ministry of Transport
OEM	Original Equipment Manufacturer
VDA	Verband der Automobilindustrie/German Association of the automotive industry

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## Used symbols



### **Caution!**

Indicates a hazardous situation which, if not avoided, may result in a minor or moderate injury

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### **Attention**

Describes information on installation which, if ignored, can lead to malfunctions

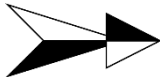
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### **Note**

Indicates a situation which, if not avoided, may result in property damage

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Indicates an executive activity

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Indicates an application tip

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# 1. Safety warnings

The safe system handling requires knowledge of the operating instructions.

	<p><b>Caution!</b></p> <p>Connect the power supply in accordance with the safety regulations for electrical equipment.</p> <ul style="list-style-type: none"><li>– Risk of injury</li><li>– Damage of the pushbutton/indicator</li></ul>
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	<p><b>Note</b></p> <p>Avoid shocks and impacts to the pushbutton/indicator during installation</p> <ul style="list-style-type: none"><li>– Damage to or destruction of the pushbutton/indicator</li></ul> <p>The supply voltage must not exceed the specified limit.</p> <ul style="list-style-type: none"><li>– Damage to or destruction of the pushbutton/indicator</li></ul> <p>Protect the connector from damages</p> <ul style="list-style-type: none"><li>– Damage to or destruction of the pushbutton/indicator</li></ul>
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## 1.1 Intended use

The S09 Universal Switches/indicators were developed for E1 applications in vehicles. The wide range of configuration and design features, as well as the possibility of easy adaptation to customer-specific requirements, make the units the ideal choice for use in vehicle interiors of passenger cars, special vehicles, trucks and buses.


The pushbuttons/indicators may only be operated within the parameters specified in the technical data.


The pushbuttons/indicators must be used in such a way that no persons are endangered, or machines or other equipment become damaged in the event of failure or malfunction.

Commissioning must be carried out by qualified personnel.

## 2. Proper environment

See 4 Technical specification.

	<p><b>Note</b></p> <p>If possible, avoid abrupt changes in the operating temperature of the pushbutton/indicator, cable and connector.</p> <ul style="list-style-type: none"><li>– Damage to the pushbutton/indicator, connector</li></ul>
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	<p><b>Caution!</b></p> <p>Do not operate the pushbutton/indicator in:</p> <ul style="list-style-type: none"><li>– Potentially explosive atmospheres</li><li>– Applications where the pushbutton/indicator and connector are completely or partly submerged and situations where the switch is exposed with a slug of liquid or splashes.</li><li>– Situations in which the pushbutton/indicator and connector are subjected to harsh external shocks and impacts</li><li>– Risk of injury</li><li>– Damage to the pushbutton/indicator, connector</li></ul>
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## 3. General description

The Series 09 Universal Switch family has been developed for E1 applications, includes an integrated connector recess and is ideally suited for use in vehicle interiors – in particular for various switching controls in passenger cars, electric vehicles, trucks, buses and special vehicles.

The S09 Universal Switch is available in different configurations and combinations for a large range of applications. Thanks to the diagnostic capability through resistance coding (Namur), for example cable breaks and switching states can be detected. There is also the option of two redundant switching signals.

- White symbol illumination with three, one or without red LED status indicator
- Red Symbol Illumination e.g. for use as a hazard warning light
- Indicator version without mechanical function with and without illumination
- Two different haptic variants (firm or soft haptic)
- Two different connector coding's
- ISO 7000 or customized symbols
- Standard Single Contact or Dual Contact (Two redundant switching signals)
- Optional diagnostic feature through resistance coding (Namur)



## **Typical applications**

Wide range of typical vehicle applications due to multi-status indication – in particular: Climate Control, Menu navigation, central locking, Seat Heating and many others.

The universal switch can be also used for safety-relevant applications, for example Hazard Warning Switch, Chassis- and Transmission Control or Parking Brake. Thanks to the diagnostic capability through resistance coding (Namur), cable breaks and switching states can be detected. The redundancy of the switching contacts of the dual-contact versions speaks for itself.

The customer must ensure the functional and product safety conformity of the integration of the switch. Therefore, the customer must perform all security activities at the integration level of the switch and confirm that all relevant functions are implemented to ensure that the application handles critical issues in a secure manner.

## **Advantages and Key features**

- Ideal for safety-relevant applications
- Wide range of designs and application-specific configuration options
- Ergonomic modular design with IP5K4 protection (frontside)
- ISO 7000 or customized symbols
- Developed and manufactured in accordance with IATF 16949
- White Symbol illumination and red Multi status indication
- Wide range of applications due to multi-status indication
- Snap-in mounting
- Two different haptic variants (firm or soft haptic)
- Single- or dual contact switching element
- Optional diagnosable switch (Namur circuit with double contacts)

## 4. Technical specification

### Options

Standard Switch	12 V or 24 V (optional with NAMUR)
Dual Contact Switch	NO/NO * or NO/NO-NC ** 12 V or 24 V (optional with NAMUR)

### Mechanical characteristics

- Actuation force: approx. 4.5 N (Soft (long travel) haptics) \*  
approx. 6.5 N (Firm (short travel) haptics) \*\*
- Overload: 250 N
- Mechanical lifetime: up to 250 000 cycles of operation

### Electrical characteristics

- Operating voltage range: 8-18 VDC (12 V variant)  
18-32 VDC (24 V variant)
- Maximal switching current: 50 mA (Total Power of 1 VA not be exceeded)
- Minimal switching current: 1 mA (Wetting Current)
- Maximal switching power: 1 VA (without Namur)  
0.25 VA (with Namur)
- Maximal switching voltage: 32 VDC
- Contact resistance: <math><10 \Omega</math> (without Namur)  
<math>106 \Omega</math> - <math>118 \Omega</math> (with Namur)

### Illumination

- LED symbol illumination
  - colour: White acc. CIE 1931,  
chromaticity coordinates P (x, y) on request  
Red (hazard warning version)  
 $\lambda_{\text{dom}} \sim 633 \text{ nm}$
  - Luminance: White: approx. 20 cd/m<sup>2</sup> at 28 VDC or 14 VDC,  
23 °C ± 2 K  
Red: approx. 90 cd/m<sup>2</sup> at 28 VDC or 14 VDC,  
23 °C ± 2 K
- LED indicator illumination
  - colour: Red  $\lambda_{\text{dom}} \sim 633 \text{ nm}$
  - Luminance: approx. 200 cd/m<sup>2</sup> at 28 VDC or 14 VDC,  
23 °C ± 2 K

### Symbols

- Standard: Symbols in accordance with ISO 7000
- Customized: Customer-specific symbols on request

\* NO/NO only as soft haptic version; \*\*  
NO/NO-NC only as firm haptic version

### Connections/interfaces

- Connector: TE 8P-1745000-3 or 8P-1745000-4 – 8 pole, Male
- Interface: hardwired interface with separate lines for symbol illumination and each indicator illumination

### Ambient conditions

- Operating temperature: -40 °C ... +85 °C
- Storage temperature: -40 °C ... +85 °C

### Protection degree

IP5K4 protection (front: IP5K4; back: IP20 without plugged connector). Protection degree for horizontal assembled situation in responsibility of customer application. The installation space of the switch must provide a drain for liquids on the plug contact side in order to protect the switch from being flooded.



#### Attention

The protection degree of up to IP5K4 to be achieved, depends on the front panel and type of mounting used, and must be ensured by the customer.

- Flooding might cause Risk of injury
- Damage to the pushbutton/indicator, connector

## 5. Scope of delivery

1 Universal Switch or Indicator, with TE-8 pole connector



### Note

The Symbols (ISO 7000 or customised) must be defined separately within the configuration of the switch.

## 6. Storage

See 4 Technical specification.



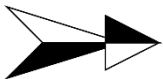
### Note

Avoid abrupt changes in the storage temperature of the Pushbutton or indicator as well as condensing environment.

- Damage to the pushbutton or indicator

Do not expose the open contacts of the unprotected connector to condensing air humidity.

- Damage to the pushbutton or indicator
- Corrosion of electrical contacts



Check the delivery immediately after unpacking regarding completeness and transport damages.

If any damage or incompleteness is found, please contact the supplier immediately.


## 7. Mechanical installation/ mounting

### 7.1 Installation in a panel by means of retaining clamps.

See drawing “1901940001 product information”

The switches are designed for one-time assembly. During disassembly, there is a risk of abrasion or breakage of the mounting clips. This can lead to a reduction in the holding force. We therefore recommend replacing the Universal Switch after it has been mounted/ dismounted and damages to the mounting clips are detectable to not endanger safe and tight fit.

The Switch/Indicator must be pressed evenly into the panel of the customer application, avoiding tilting. Do not overload the actuating surface of the cap, otherwise the mechanics and electronics inside the button/indicator may be damaged. While assembling take care of ESD protected environment and tools.

	<p><b>Note</b></p> <ul style="list-style-type: none"><li>– Damage to the buttons</li><li>– Damage to the tight fixation</li></ul>
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The plug-in connection must be established with a suitable connector. The plug-in connection can alternatively be established before or after mounting the Universal Switch into the panel.

### 7.2 Use outside closed vehicles

The S09 Universal Switch is designed for vehicle interiors, protected from environmental influences. The product is validated in accordance with ISO16750 and designed for this application scenario. Any other use is at the user’s own risk and out of warranty of EAO.

## 8. Electrical installation and pinning

Electrical installation shall only be done when the system is under no power.

Connection of the Pushbuttons is realized with the following components of Tyco Electronics:

- Tyco-Art.-No. for housing: 1745000-3, 1745000-4
- Tyco-Art.-No. for cage: 965601-2
- Tyco-Art.-No. for contacts: 5-963715-1 (0.5 – 0.75 mm<sup>2</sup>), 5-928999-1 (0.25 – 0.35 mm<sup>2</sup>)

Please refer to “1901940001 product information”.

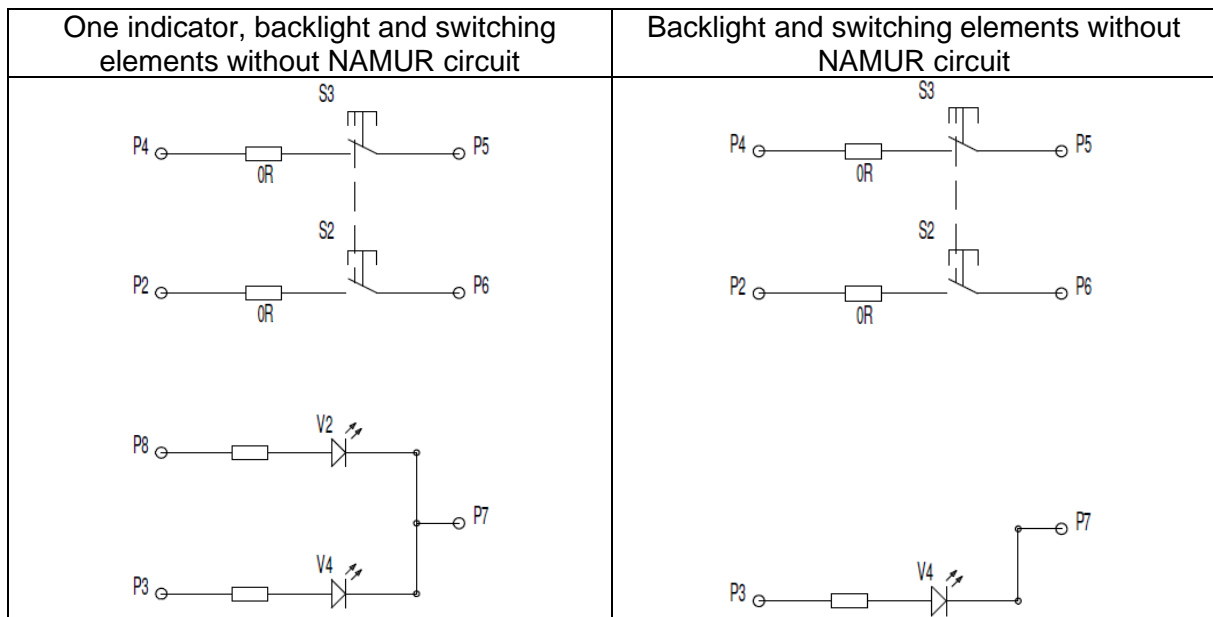
Following Picture 1 shows the internal electrical circuit of the Pushbutton. To reduce power dissipation and to prevent overheating of the Pushbutton, variants for 12 V (supply voltage range: 8 V – 16 V) are available. The pinning of the connector of these voltage variants are identically.

<p align="center"><b>three indicators, backlight and switching element standard</b></p>	<p align="center"><b>one indicator, backlight and switching element standard</b></p>
<p align="center"><b>backlight and switching element standard</b></p>	<p align="center"><b>three indicators, backlight standard</b></p>
<p align="center"><b>one indicator, backlight standard</b></p>	<p align="center"><b>backlight standard</b></p>

<p>Three indicators, backlight and switching element with NAMUR circuit</p>	<p>One indicator, backlight and switching element with NAMUR circuit</p>
<p>Backlight and switching element with NAMUR circuit</p>	<p>Three indicators, backlight with coding resistor</p>
<p>One indicator, backlight with coding resistor</p>	<p>Backlight with coding resistor</p>

One indicator, backlight and switching elements with NAMUR indicator	Backlight and switching elements with NAMUR circuit
One indicator, backlight and switching elements without NAMUR circuit	Backlight and switching elements without NAMUR circuit
One indicator, backlight and switching elements with NAMUR circuit	Backlight and switching elements with NAMUR circuit





Picture 1: Internal electrical circuit of the Series 09 Universal Switch.

The symbol and functional illumination of a button uses the same ground on pin 7 of TE 1745000-x. Each functional illumination can be switched on by connecting pin 2, 4, 8 of connector with positive power supply. The symbol illumination can be switched on by connecting pin 3 of the connector to positive power supply.

## 8.1 Internal resistor values

The values of the resistors for the buttons are:

Without Namur Circuit

- $R_p$  = not placed
- $R_s$  = 0  $\Omega$

With Namur Circuit

- $R_p$  = 1 k $\Omega$
- $R_s$  = 120  $\Omega$


Furthermore, it is necessary to debounce the switches. This can be done via software or hardware in the control unit connected to the keypad and is in customers responsibility. The debounce time should be greater than 10ms.

## 9. Typical failure modes and diagnosis option

Function Type	Failure Mode	Possible Root Cause	Diagnosis Option
Switching function	Wrong switching signal out of specification (limits see datasheet)	Switching system defective	Resistance Monitoring (values see technical specification)
		Fluid ingress	Resistance Monitoring (values see technical specification)
	No switching signal (on)	Switching system defective	Resistance Monitoring (values see technical specification)
		Fluid ingress	Resistance Monitoring (values see technical specification)
	No switching signal (off)	Switching system defective	Resistance Monitoring (values see technical specification)
		Fluid ingress	Resistance Monitoring (values see technical specification)
Haptic function	No provision/ revenge	Button stuck	Resistance Monitoring (values see technical specification) as a function of time
Backlight illumination	Nonfunctional backlight – off although should be on	Electronic defect	Monitoring current for symbol illumination circuit
		fluid ingress	Monitoring current for symbol illumination circuit
	Nonfunctional backlight – on although should be off	Electronic defect	Monitoring current for symbol illumination circuit
		fluid ingress	Monitoring current for symbol illumination circuit
Indicator illumination	Nonfunctional indicator illumination – on although should be off	Electronic defect	Monitoring current for symbol illumination circuit
		fluid ingress	Monitoring current for symbol illumination circuit
	Nonfunctional indicator illumination – off although should be on	Electronic defect	Monitoring current for symbol illumination circuit
		fluid ingress	Monitoring current for symbol illumination circuit
Assembly function	Switch cannot be mounted	Unsuitable mounting hole (too small, sharp edges, built-in-panel to thin)	-
		Damaged locking contour (too often disassembled, mounting hole to small, sharp edges, built-in-panel to thin)/ snap hooks damaged	-
	Holding force too small when installed	Unsuitable mounting hole (too small, sharp edges, bracket to thin, built-in panel to thin)	-
		Damaged locking contour (too often disassembled, mounting hole to small, sharp edges, built-in-panel to thin)/ snap hooks damaged	-

## 10. Cleaning

Cleaning the Pushbutton cap with water and commercially available soft cloths is possible. Do not use aggressive solvents or hose cleaning.

	<p><b>Attention</b></p> <p>Avoid contact with liquids on the plug contacts</p> <p>Avoid excessive use of liquids like splash</p> <ul style="list-style-type: none"><li>– Damage to the buttons</li><li>– Corrosion to electrical contacts</li></ul>
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## 11. Liability for quality defects

The general function of the pushbutton/indicator has been tested at the factory before delivery. However, if errors occur despite the careful quality control, they must be reported immediately to EAO or the dealer.

The liability for quality defects is 12 months for the delivered products. Within this period, faulty parts, except wear parts, the pushbutton/indicator has to be returned to EAO.

Damages caused by improper use, handling or the use of force are excluded from the liability for quality defects. Damages caused by repairs or modifications to the Pushbutton are also excluded. EAO is exclusively responsible for repairs to the pushbutton/indicator.

Further claims cannot be asserted. Claims arising from the purchase contract remain unaffected.

EAO is not liable for consequential damages. The right to design changes, in the sense of product improvement, is reserved by EAO.

### 11.1 Emergency Situations

No special measures are required in an emergency from the point of view of the Pushbutton. Required measures are to be evaluated by the customer on the customer application side and implemented to the application, if necessary.

## 12. Service, repair

In case of a defective Pushbutton or indicator, please contact your dealer. In case of malfunctions, the cause of which you cannot clearly identify, please send the defective device to the following address:

EAO Automotive GmbH & Co. KG  
Service  
Richard-Wagner-Strasse 3  
08209 Auerbach/ Vogtl.  
Tel: +49 (0)3744/ 8264-0  
Email: [service.esa@eao.com](mailto:service.esa@eao.com)  
[www.eao.com](http://www.eao.com)

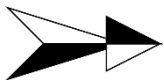
## 13. Market surveillance

The Pushbutton switch is intended for use in various customer applications and is used for a wide variety of functions in the applications. The manufacturer of these customer applications is therefore not EAO as the manufacturer of the switches or pushbutton products. The responsibility for market surveillance within the meaning of REGULATION (EU) 2019/1020 OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of June 20, 2019 on market surveillance and product conformity and amending Directive 2004/42/EC and Regulations (EC) No. 765/2008 and (EU) No. 305/2011 is therefore the responsibility of the manufacturer of the customer application.

## 14. Decommissioning, disposal

Disconnect the system from the power supply before the disconnection.

Do not pull at the cable when removing the connector.



Dispose of the device, components and accessories, packaging materials and documentation in accordance with the country-specific waste treatment and disposal regulations in the area of use.

## 15. Declaration of Conformity

The declaration of conformity certificate is available for download on the EAO Website [www.eao.com](http://www.eao.com) within the download section. The document valid for the product listed in this manual is:

**EG/EC/CE Declaration of Conformity, with release date 29.11.2021**

In case of further certificates are required, please ask your dealer.