

Series 09

Rugged Keypads

Rugged. Modular. Reliable.

www.eao.com/09



Company IATF 16949 certified



Series 09 Rugged Keypads

Rugged. Modular. Reliable.

<u>Designed for E1 applications with functional safety and</u> <u>CAN bus integration</u> – The robust control units with flexible illumination are ideally suited for use in heavy duty and special vehicle applications.

Series 09 Rugged Keypads offer high reliability: The modules are designed for E1 applications and functional safety in accordance with ISO 26262 ASIL B and EN ISO 13849 PL d as well as an intelligent control with CAN bus integration. The robust, modular design with sealing levels of up to IP6K7 and the ability to customise and individually select and arrange the keypad legends make these high-quality devices ideally suited for harsh use in heavy duty and special vehicles.

High reliability and functional safety are crucial to controlling safety-related applications in vehicles and machines – whether in construction machinery, construction vehicles, agricultural machinery or in special and commercial vehicles of various types. Harsh environments and low back panel depth require a robust and compact product design. The actuators and indicators must also be precisely configured, both mechanically and electronically, to suit the respective application. The high-quality Rugged Keypad and Rugged Rotary Cursor Controller meet these requirements with cutting-edge system integration.

Robust, innovative design

Robust and innovative construction is a feature of the Rugged Keypads design. The actuators and indicators are protected up to IP6K7 and work reliably at operating temperatures from –40 °C to +85 °C. The low back panel depth and robust clip-in or screw-in mounting allow easy, flexible installation, either vertically or horizontally. These high-quality devices also offer excellent tactile feedback, and are clearly visible in daylight and at night thanks to the



powerful RGB LED halo and LED symbol illumination. Attractive and configurable 4-segment halo button illumination is integrated (depending on the product variant). The customisable illumination – e.g. steady lighting, flashing, pulses, rotations or colour changes – provides the operator with excellent visual feedback, and is combined with a unique, contemporary design.

Functional safety and CAN bus integration

The Rugged Keypads feature a high reliability and are designed for functional safety in accordance with the EN ISO 13849 PL d and ISO 26262 ASIL B standards. Put simply, functional safety means that the system monitors whether the safety-related function is working properly. If a function error occurs, the system promptly informs the operator. Thanks to the CAN bus integration, the devices are intelligently and easily integrated into a bus system using a Deutsch DT series plug.

Manufacturing competence and IATF 16949

The Series 09 modules are produced in our automotive competence centre located in Germany. This allows us to apply years of comprehensive experience as an original equipment manufacturer (OEM) in the automotive industry to the heavy duty and special vehicle markets. At the same time, this offers EAO customers high quality, durable, and intuitive products and services. The development and production process is aligned and executed according to automotive standards (IATF 16949, 100 % product traceability, 100 % EOL testing, etc.).

More than an expert - A partner of the automotive industry

As a global partner to major automotive manufacturers and suppliers, we provide our customers with high-quality, products and services. Through many decades of commitment and consultation with the automotive industry, EAO is an established global supplier of operator control panels, subassemblies, switches, buttons and indicators.

Please not

Information on the availability of the fully validated and certified product according to ASIL B ISO 26262 and PL d ISO 13849 with CANopen Safety can be found at: www.eao.com/09-status

Advantages.

- Freely configurable 4-segment and RGB halo ring illumination
- Designed for functional safety: ISO 26262 and ISO 13849
- Intelligent HMIs with CAN bus integration
- Robust, ergonomic and innovative design sealed up to IP6K7 protection
- Interchangeable ISO 7000 or customised symbols

Typical applications

- Special vehicles including fire-fighting vehicles, road sweepers, cleaning vehicles, refuse trucks, snow removers and groomers
- Heavy duty vehicles including construction and agricultural equipment
- Machines at/around/on the vehicle

HMI functions

- Keypad 6 pushbuttons
- Rotary cursor controller with 2 pushbuttons

Mechanical characteristics

- Actuating force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime
- Pushbutton:
 up to 7 million cycles of operation (under ideal conditions)
- Joystick rotary cursor controller: up to 3 million rotational cycles (60 million positions)
- Impact resistance: IK07

Electrical characteristics

- Operating voltage range: 8-32VDC
- Quiescent current: <5 mA

Illumination

- LED symbol illumination
- Colour: white LED
- Luminance: approx. 20 cd/m² (dimmable)
- LED halo ring illumination with 4 segments, RGB or single color LED (depending on the product variant)
 Luminance: approx. 1500 cd/m²
- Illumination functions: steady lighting, flashing, pulses, rotations, colour changes
- Halo ring and symbol illumination can be configured independently

Symbols

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

Connections/interfaces

- Hardwired
- CAN interface (ISO 11898)
- CAN protocols: CANopen (CiA 401), CAN J1939, CANopen Safety according to EN 50325-5 (available at a later date)
- Baud rate 250 kBd and 500 kBd (software configurable)

Ambient conditions

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

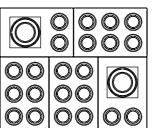
Protection degree

- IP6K7 protection (front and rear side) (basic version with IP20 on rear side)
- Up to IP6K7 protection (panel/screw-in)
- Up to IP5K4 protection (panel/clip-in)

Approvals and conformities

- Developed and produced according to IATF 16949
- E1 ECE R10/ECE R118 (pending)
- CE

Examples of unit combinations



Further information is available under www.eao.com/09



Features and benefits.





Sealing protection

Robust, resistant to weather and harsh environments, IP6K7 seals out dust, water, mud, salt, sand, oil.

Symbols

Interchangeable legends with LED backlit, symbols according to ISO 7000 or customer-specific.

Mounting options

Flexible vertical and horizontal installation as well as user-friendly clip-in and screw-in mounting.

Illumination*

Modern, trendy, innovative RGB 4-segment halo ring illumination in nearly unlimited variety of colours and visual effects. Symbol illumination and halo ring illumination working independently.

Modularity

Control units can be freely combined in horizontal or vertical arrays of modules thanks to the 2 to 3 aspect ratio.

Safety level

Designed for functional safety*: ISO 26262 ASIL B and ISO 13849 PLD.

Communication protocols*

Intelligent HMI with J1939, CANopen and CANopen Safety* integration.

Design

Smart, optimised ergonomic design with low panel depth mounting.

Feedback

Tactile and audible product feedback through optimised haptic design.

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^{*} depending on product variant

Optimal for your application.

Series 09 variants

The Series 09 Keypads and Rotary Cursor Controllers are available in a range of different variants. They all have the flexibility of interchangeable legends, but come with a choice of different halo illumination features, communication protocols and connector types for example.

This wide choice allows designers to specify only the HMI features they actually need for their vehicle or machine application, therefore minimising hardware costs and optimising the scope of their software development – optimal for your application.

Variants	Symbol backlight	Halo ring illumination	Communica- tion protocol	Switching element	IP protection	Connec- tor	Switching function/s	Functional safety standard
PREMIUM (h) (r) (r) (h) (e) (e)	White LED	4-segment RGB, freely configur- able	CANopen Safety	Electro- mechanical switching element	IP6K7 frontside and rear- side	Deutsch DT04-6P	Pushbutton	Functional safety ISO 26262 ASIL B and ISO 13849 PL d certi- fied*
SUPER	White LED	4-segment RGB, freely configur- able	CANopen, J1939	Electro- mechanical switching element	IP6K7 frontside and rear- side	Deutsch DT04-6P	Pushbutton	Design for functional safety: ISO 26262 ASIL B and ISO 13849 PL d
PLUS	White LED	Red LED (other colours on request)	CANopen, J1939	Electro- mechanical switching element	IP6K7 frontside and rear- side	Deutsch DT04-6P	Pushbutton	Switching function with diagnostic capability for ASIL QM (B) acc. to ISO 26262
BASIC (h) (r) (r) (h) (r) (h) (r)	White LED	Red LED (other colours on request)	N.A. (hardwired)	Electro- mechanical switching element	IP6K7 frontside	Würth Elektronik WR- MPC3, 16 pins	Pushbutton	Switching function with diagnostic capability for ASIL QM (B) acc. to ISO 26262

^{*} Available at a later date, see: www.eao.com/09-status



Variants	Symbol backlight	Halo ring illumination	Communica- tion protocol	Switching element	IP protection	Connector	Switching function/s	Functional safety standard
PREMIUM	White LED	4-segment RGB (push- button), freely con- figurable	CANopen Safety	Electro- mechanical switching element	IP6K7 frontside and rear- side	Deutsch DT04-6P	Pushbuttons: push RCC*: push, rotate, proportional input	Functional safety ISO 26262 ASIL B and ISO 13849 PL d certi- fied*
SUPER	White LED	4-segment RGB (push- button), freely con- figurable	CANopen, J1939	Electro- mechanical switching element	IP6K7 frontside and rear- side	Deutsch DT04-6P	Pushbuttons: push RCC*: push, rotate, proportional input	Design for functional safety: ISO 26262 ASIL B and ISO 13849 PL d
PLUS	White LED	Red LED (push- buttons)	CANopen, J1939	Electro- mechanical switching element	IP6K7 frontside and rear- side	Deutsch DT04-6P	Pushbuttons: push RCC*: push, rotate, proportional input	Switching function with diagnostic capability for ASIL QM (B) acc. to ISO 26262

 $^{^{\}ast}$ Functional safety certification applies to the switching signal of the two keypad pushbuttons.

Keypad PREMIUM.*



Mechanical characteristics

- Actuation force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime: 250 000 cycles of operation (under specific conditions of functional safety)
- Impact resistance: IK07

Electrical characteristics

■ Operating voltage range 8-32 VDC

llumination

- Halo ring and symbol illumination can be configured independently
- LED symbol illumination
 Colour: white
- Luminance:

max. approx. 20 cd/m², dimmable

- LED halo ring illumination with four freely configurable segments
- Multi-colour: RGB
- Luminance: approx. 1500 cd/m²
- Illumination functions: steady lighting, flashing, pulses, rotations, colour changes

Symbols

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

Connections/interfaces

- CAN interface (ISO 11898)
- CANopen Safety* (EN 50325-5),
- Baud rate 250 kBd and 500 kBd (software configurable)
- Connector Deutsch DT04-6P

Ambient conditions

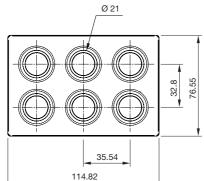
- Operating temperature -40°C ... +85°C
- Storage temperature: -40°C ... +85°C

Protection degree

- IP6K7 (front and rear side)
- Up to IP6K7 (panel/screw-in)
- Up to IP5K4 (panel/clip-in)

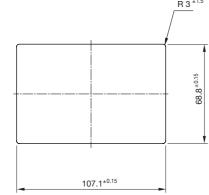
Dimensions

(All dimensions in mm)

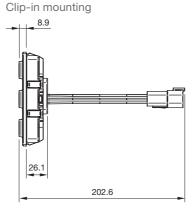


Mounting cut-out

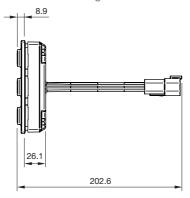
(Panel thickness 1.0 mm ... 4.0 mm)



Mounting



Screw-in mounting



* Information on the availability of the fully validated and certified product acc. to ASIL B ISO 26262 and PL d ISO 13849 with CANopen Safety can be found at:

www.eao.com/09-status

Keypad SUPER.



Mechanical characteristics

- Actuation force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime:
 up to 7 million cycles of operation (under ideal conditions)
- Impact resistance: IK07

Electrical characteristics

• Operating voltage range: 8-32VDC

Illumination

- Halo ring and symbol illumination can be configured independently
- LED symbol illumination
- Colour: white
- Luminance:
- max. approx. 20cd/m², dimmable
- LED halo ring illumination with four freely configurable segments
- Multi-colour: RGB
- Luminance: approx. 1500 cd/m²
- Illumination functions: steady lighting, flashing, pulses, rotations, colour changes

Symbols

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

Connections/interfaces

- CAN interface (ISO 11898)
- CAN protocols: CANopen (CiA 401), CAN J1939
- Baud rate 250 kBd and 500 kBd (software configurable)
- Connector Deutsch DT04-6P

Ambient conditions

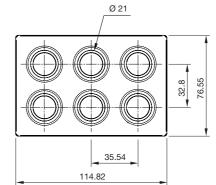
- Operating temperature:
 -40°C ... +85°C
- Storage temperature: -40°C ... +85°C

Protection degree

- IP6K7 (front and rear side)
- Up to IP6K7 (panel/screw-in)
- Up to IP5K4 (panel/clip-in)

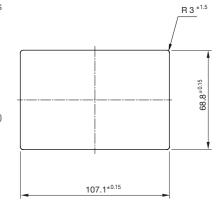
Dimensions

(All dimensions in mm)



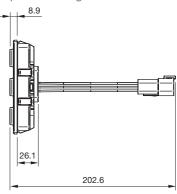
Mounting cut-out

(Panel thickness 1.0 mm ... 4.0 mm)

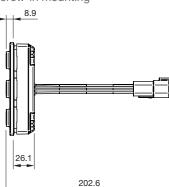


Mounting

Clip-in mounting



Screw-in mounting



Keypad PLUS.



Mechanical characteristics

- Actuation force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime: up to 7 million cycles of operation (under ideal conditions)
- Impact resistance: IK07

Electrical characteristics

Operating voltage range: 8–32VDC

Illumination

- LED symbol illumination
- Colour: white
- Luminance: max. approx. 20 cd/m², dimmable
- LED halo ring illumination
- Colour: red
- (other colours on request)
- Luminance: approx. 1500 cd/m²

Symbols

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

Connections/interfaces

- CAN interface (ISO 11898)
- CAN protocols: CANopen (CiA 401), CAN J1939
- Baud rate 250 kBd and 500 kBd (software configurable)
- Connector Deutsch DT04-6P

Ambient conditions

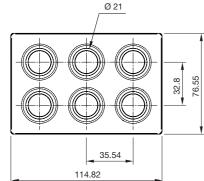
- Operating temperature: −40°C ... +85°C
- Storage temperature: -40°C ... +85°C

Protection degree

- IP6K7 (front and rear side)
- Up to IP6K7 (panel/screw-in)
- Up to IP5K4 (panel/clip-in)

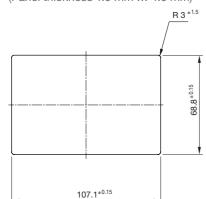
Dimensions

(All dimensions in mm)

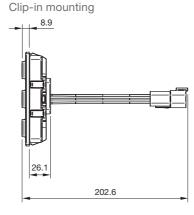


Mounting cut-out

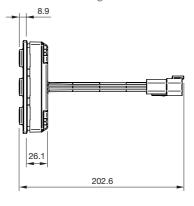
(Panel thickness 1.0 mm ... 4.0 mm)



Mounting



Screw-in mounting



Keypad BASIC.



Mechanical characteristics

- Actuation force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime: up to 7 million cycles of operation (under ideal conditions)
- Impact resistance: IK07

Electrical characteristics

 8-18 VDC or 18-32 VDC for operating voltage of the illumination for use in 12 V or 24 V applications. Optionally available with switch contacts with diagnostic capability

Illumination

- Halo ring and symbol illumination can be configured independently
- LED symbol illumination
- Colour: white
- Luminance: max. approx. 20 cd/m², dimmable
- LED halo ring illumination
- Colour: red
- (other colours on request)
- Luminance: approx. 750 cd/m²

Symbols

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

Connections/interfaces

 Connector: Würth Elektronik WR-MPC3, 16 Pins

Ambient conditions

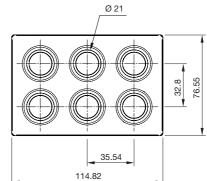
- Operating temperature: -40°C ... +85°C
- Storage temperature: -40°C ... +85°C

Protection degree

- IP6K7 (front side)
- IP20 (rear side)
- Up to IP6K7 (panel/screw-in)

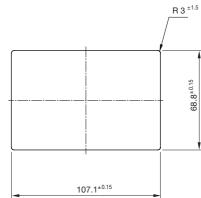
Dimensions

(All dimensions in mm)



Mounting cut-out

(Panel thickness 1.0 mm ... 4.0 mm)



Mounting

Clip-in mounting



Screw-in mounting



Rotary Cursor Controller PREMIUM.*



Rotary Cursor Controller functions

- Joystick functions
- With proportional input
- Digital input can be configured
- via CAN interface Rotary function
- 20 maintained positions
- Continuous rotation with no stop position
- Push function
- Momentary action with click-dome

Mechanical characteristics

- Overload: 250 N
- Actuation forces:
- approx. 6.5 N pushbuttons
- Turning the rotary cursor controller approx. 3 N
- Pressing the rotary cursor controller approx. 11 N
- Mechanical lifetime:
- 250 000 cycles of operation (under specific conditions of functional safety)
- Joystick Rotary Cursor Controller: up to 3 million rotation cycles (60 million detents)
- up to 1 million actuations (press)
- Rotation function: haptic with precise detent
- Joystick function: operating angle ~5°

Electrical characteristics

Operating voltage range: 8–32 VDC

- Halo ring and symbol illumination can be configured independently of each
- LED symbol illumination
- Color: white
- Luminance: max. approx. 20 cd/m² (dimmable)
- · LED halo ring illumination with four freely configurable segments
- Multi-color: RGB
- Luminance: approx. 1500 cd/m² (pushbutton)
- · Illumination: steady lighting, flashing, pulses, rotations, colour changes

Symbols (on pushbuttons, RCC without symbol)

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

Connectivity

- CAN interface (ISO 11898)
- CANopen Safety* (EN 50325-5).
- Baud rate 250 kBd and 500 kBd (software configurable)
- Connector Deutsch DT04-6P

Ambient conditions

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

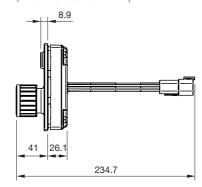
Protection degree

- IP6K7 (front and rear side) Up to IP6K7 (panel/screw-in)
- Up to IP5K4 (panel/clip-in)
- * Information on the availability of the fully validated and certified product acc. to ASIL B ISO 26262 and PL d ISO 13849 with CANopen Safety can be found at:

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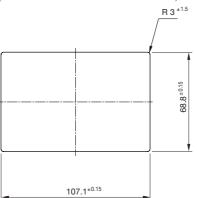
Functional safety certification applies to the switching signal of the two keypad pushbuttons.

(All dimensions in mm)



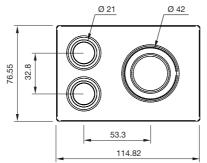
Mounting cut-out

(Panel thickness 1.0 mm ... 4.0 mm)



Mounting

Screw-in or clip-in mounting



Rotary Cursor Controller SUPER.

Rotary Cursor Controller Functions

- Joystick function
- With proportional input
- Digital input can be configured via CAN interface
- Rotary function
- 20 maintained positions
- Continuous rotation with no stop position
- Push function
- Momentary action with click-dome

Mechanical characteristics

- Overload: 250 N
- · Actuation forces:
- approx. 6.5 N pushbuttons
- Turning the rotary cursor controller approx. 3 N
- Pressing the rotary cursor controller approx. 11 N
- Mechanical lifetime:
- Pushbutton: up to 7 million cycles of operation (under ideal conditions)
- Joystick Rotary Cursor Controller: up to 3 million rotation cycles (60 million detents)
- up to 1 million actuations (press)
- Rotation function: haptic with precise detent
- Joystick function: operating angle ~ 5°

Electrical characteristics

Operating voltage range: 8-32VDC

- Halo ring and symbol illumination can be configured independently of each
- LED symbol illumination
- Color: white
- Luminance: max. approx. 20 cd/m² (dimmable)
- · LED halo ring illumination with four freely configurable segments
- Multi-color: RGB
- Luminance: approx. 1500 cd/m² (pushbutton)
- · Illumination: steady lighting, flashing, pulses, rotations, colour changes

Symbols (on pushbuttons, RCC without symbol)

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

Connectivity

- CAN interface (ISO 11898)
- · CAN protocols: CANopen (CiA 401), CAN J1939
- · Baud rate 250 kBd and 500 kBd (software configurable)
- Connector Deutsch DT04-6P

Ambient conditions

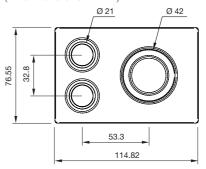
- Operating temperature:
- -40°C ... +85°C
- Storage temperature:
- -40°C ... +85°C

Protection degree

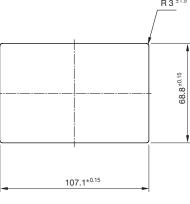
- IP6K7 (front and rear side)
- Up to IP6K7 (panel/screw-in)
- Up to IP5K4 (panel/clip-in)

Dimensions

(All dimensions in mm)

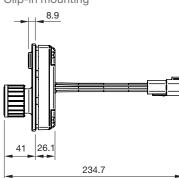


(Panel thickness 1.0 mm ... 4.0 mm)

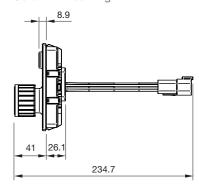


Mounting

Clip-in mounting



Screw-in mounting



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Rotary Cursor Controller PLUS.



Rotary Cursor Controller Functions

- Joystick function
- With proportional input
- Digital input can be configured via CAN interface
- Rotary function
- 20 maintained positions
- Continuous rotation with no stop position
- Push function
- Momentary action with click-dome

Mechanical characteristics

- Overload: 250 N
- Actuation forces:
- approx. 6.5 N pushbuttons
- Turning the rotary cursor controller approx. 3 N
- Pressing the rotary cursor controller approx. 11 N
- Mechanical lifetime:
- Pushbutton: up to 7 million cycles of operation (under ideal conditions)
- Joystick Rotary Cursor Controller: up to 3 million rotation cycles (60 million detents)
- up to 1 million actuations (press)
- Rotation function: haptic with precise detent
- Joystick function: operating angle ~ 5°

Electrical characteristics

Operating voltage range: 8–32 VDC

- LED symbol illumination
- Colour: white
- Luminance: max. approx. 20cd/m², dimmable
- LED halo ring illumination
- Colour: red
- (other colours on request)
- Luminance: approx. 1500 cd/m²

Symbols (on pushbuttons, RCC without symbol)

 Symbols in accordance with ISO 7000 • Customer-specific symbols on request

Connectivity

- CAN interface (ISO 11898)
- CAN protocols: CANopen (CiA 401), CAN J1939
- Baud rate 250 kBd and 500 kBd (software configurable)
- Connector Deutsch DT04-6P

Ambient conditions

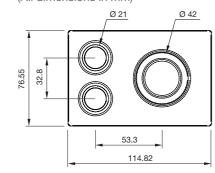
- Operating temperature:
- -40°C ... +85°C
- Storage temperature: -40°C ... +85°C

Protection degree

- IP6K7 (front and rear side)
- Up to IP6K7 (panel/screw-in)
- Up to IP5K4 (panel/clip-in)

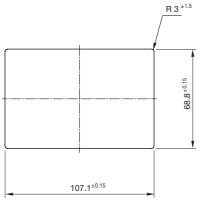
Dimensions

(All dimensions in mm)



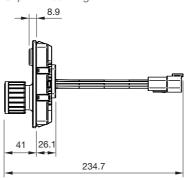
Mounting cut-out

(Panel thickness 1.0 mm ... 4.0 mm)

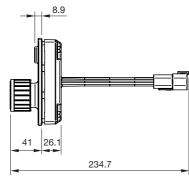


Mounting

Clip-in mounting



Screw-in mounting



New application possibilities.

Incremental status indication

The individual 4-segment and RGB Halo ring illumination of the Series 09 modules is ideal for dynamic status indication. Both the keypad and the rotary cursor controller thus open up many new application possibilities that require step-by-step control with incremental illumination in differing colours for intuitive operation. Four halo segments offer constant, flashing, pulsating, or rotating illumination and colour changes (depending on the product variant).

Application examples

- Air conditioning
- Heating/ventilation
- Seat heating
- Volume regulation
- Working temperature
- Speed of mixer/blender
- Speed of performance modes
- Windscreen wiper
- Lifting and lowering
- Release/hold
- Start/stop
- Navigation in user menus

Example of a step-by-step status indication









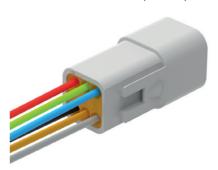
Level 4

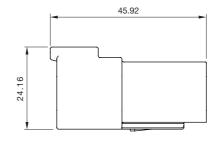


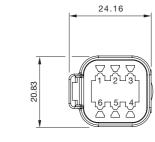
Level 2

Connector, symbol inserts, tool for legends.

Deutsch DT Series connector (DT04-6P)







Pin	Signal
1	GND
2	CAN High
3	WakeUp_Out
4	WakeUp_In
5	CAN low
6	Vcc

 ${\it Mates with Deutsch DT06-6S-connectors.}$

Interchangeable symbol inserts

All dimensions in mm.



Tool for legends



The new symbol insert tool with trendy design enables user-friendly fitting and removal of symbol inserts of the pushbuttons. The round tip layout without edges provides simple and damage-free installation and removal of the symbol inserts. The ergonomically adjusted surface with balance point in the middle offers optimal handling.



and CAN bus integration.

- Individual 4-segment and RGB halo ring illumination
- Designed for functional safety: ISO 26262 & ISO 13849
- Intelligent HMIs with CAN bus integration
- Robust design sealed up to IP67 protection
- Interchangeable ISO 7000 or customised symbols



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Founding year: 1947 Number of employees: 600 Headquarters: Olten, Switzerland Manufacturing Companies: Switzerland, Germany, North America, China Sales Companies: 10

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