

Series 09

Rugged Keypads

Rugged. Modular. Reliable.

www.eao.com/09



Company IATF 16949 certified



Series 09 Rugged Keypads

Rugged. Modular. Reliable.

Designed for harsh operating conditions and E1 applications with CAN bus integration – *The robust control units with intelligent 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 are suitable for safety-relevant applications in accordance with ISO 26262 and EN ISO 13849. The CAN bus connection ensures an intelligent and free programmability. The robust, modular design with sealing levels of up to IP6K9K 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 is crucial to controlling safety-related applications in vehicles and machines – whether in 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 Series 09 Rugged Keypads 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 with 6 or 8 pushbuttons are protected up to IP6K9K 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 freely 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 design that has received multiple awards for functionality and usability from renowned institutions.

Functional safety and CAN bus integration

The Rugged Keypads feature a high reliability and are suitable for safety-relevant applications in accordance with the EN ISO 13849 and ISO 26262. Integrated safety features, such as permanent function monitoring or the detection of blocked keys, actively support the customer in integrating the keypads into his security concept. 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, sub-assemblies, switches, buttons and indicators.



Advantages.

- Robust, ergonomic and innovative design sealed up to IP6K9K protection
- Suitable for functional safety applications according to ISO 26262 and EN ISO 13849
- Intelligent HMIs with CAN bus integration
- Programmable 4-segment RGB halo ring illumination for function feedback
- High flexibility due to 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 with 6 or 8 pushbuttons

Mechanical characteristics

- Actuating force:
6.5 N or 11 N (depending on variant)
- Overload: 250 N
- Mechanical lifetime:
up to 2 million cycles of operation
- Impact resistance:
IK07 according to IEC 62262

Electrical characteristics

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

Illumination

- LED symbol illumination
 - Colour: white LED
 - Luminance: approx. 20 cd/m² (dimnable)
- LED halo ring illumination with 4 segments, RGB or single colour LED (depending on the product variant)
 - Luminance: approx. 1 500 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
- 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

- Up to IP6K9K* 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
- CE

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



* Under extreme conditions, the symbol inserts may detach. These can be easily reinserted in the keypad. For further information, please refer to the operating instructions.

Features and benefits.



Sealing protection

Rugged and resistant according to IP6K9K. Complete protection against water, dust and salt allows cleaning even with increased water pressure. ^{*1}

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 ^{*2}

Modern, innovative RGB 4-segment halo ring illumination in nearly unlimited variety of colours and visual effects. The symbol illumination and halo ring illumination can be configured independently.

^{*1} for cleaning instructions, please refer to the operating instructions

^{*2} depending on product variant



Modularity

Control units can be freely combined in horizontal or vertical arrays of modules.

Safety level ^{*2}

Suitable for functional safety applications according to ISO 26262 and EN ISO 13849.

Communication protocols ^{*2}

Intelligent HMI with J1939, CANopen and CANopen Safety integration.

Design

Smart, optimised ergonomic design with low panel depth mounting.

Feedback





Tactile and visual feedback through optimised haptic design and versatile illumination options.

Optimal for your application.

Series 09 variants




The Series 09 Rugged Keypads are available with 6 and 8 pushbuttons and also in a range of different variants. All these have the flexibility of interchangeable legends, but come with a choice of different illumination features and connector types for example. Depending on the variant, the Rugged Keypads are also suitable for safety-relevant applications.

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 | Halo ring illumination | Communication protocol | Switching element | IP protection | Connector | Switching function/s | Functional safety standard |
|--|------------------------------------|------------------------|--------------------------------------|-------------------------------|-----------------------------------|----------------------|--|
| PREMIUM  | 4-segment RGB, freely configurable | CANopen Safety | Electro-mechanical switching element | IP6K7 frontside and rear-side | Deutsch DT04-6P | Pushbutton | CANOpen safety protocol and functional safety, developed according to ISO 26262 ASIL B and ISO 13849 PL d * |
| SUPER  | 4-segment RGB, freely configurable | CANopen, J1939 | Electro-mechanical switching element | IP6K7 frontside and rear-side | Deutsch DT04-6P | Pushbutton | Suitable for functional safety applications according to EN ISO 13849 |
| PLUS  | Red LED (other colours on request) | CANopen, J1939 | Electro-mechanical switching element | IP6K7 frontside and rear-side | Deutsch DT04-6P | Pushbutton | Suitable for functional safety applications according to EN ISO 13849 |
| BASIC  | Red LED | N.A. (hardwired) | Electro-mechanical switching element | IP6K7 frontside | Würth Elektronik WR-MPC3, 16 pins | Pushbutton | Suitable for functional safety applications due to diagnosable switching function for applications according to ISO 26262 and EN ISO 13849 |

* available at a later date.



| Variants | Halo ring illumination | Communication protocol | Switching element | IP protection | Connector | Switching function/s | Functional safety standard |
|---|------------------------------------|------------------------|--------------------------------------|--------------------------------|-----------------------------------|----------------------|--|
| SUPER  | 4-segment RGB, freely configurable | CANopen, J1939 | Electro-mechanical switching element | IP6K9K frontside and rear-side | Deutsch DT04-6P | Pushbutton | Suitable for functional safety applications according to EN ISO 13849 |
| PLUS  | Red LED (other colours on request) | CANopen, J1939 | Electro-mechanical switching element | IP6K9K frontside and rear-side | Deutsch DT04-6P | Pushbutton | Suitable for functional safety applications according to EN ISO 13849 |
| BASIC  | Red LED | N.A. (hardwired) | Electro-mechanical switching element | IP6K9K frontside | Würth Elektronik WR-MPC3, 20 pins | Pushbutton | Suitable for functional safety applications due to diagnosable switching function for applications according to ISO 26262 and EN ISO 13849 |

Keypad PREMIUM.*1



Mechanical characteristics

- Actuation force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime: up to 2 million cycles of operation
- Impact resistance: IK07 according to IEC 62262

Electrical characteristics

- Operating voltage range 8–32 VDC

Illumination

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

Symbols

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

Interfaces

- CAN interface (ISO 11898)
- CANopen Safety (EN 50325-5)
- Baud rate 250 kBd and 500 kBd (software configurable)

- Connector Deutsch DT04-6P
- Designed in accordance with the safety requirements of vehicles as per ISO 26262 ASIL B and EN ISO 13849 PL d

Ambient conditions

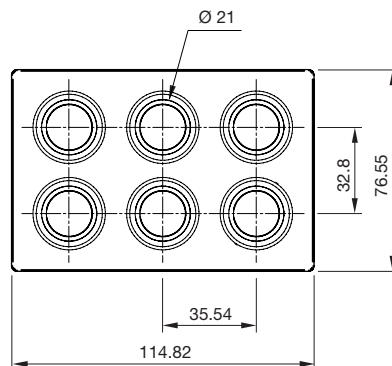
- Operating temperature –40 °C ... +85 °C
- Storage temperature: –40 °C ... +85 °C

Protection degree

- IP6K7 according to ISO 20653
- Up to IP6K7 (panel/screw-in version)
- Up to IP5K4 (panel/clip-in version)

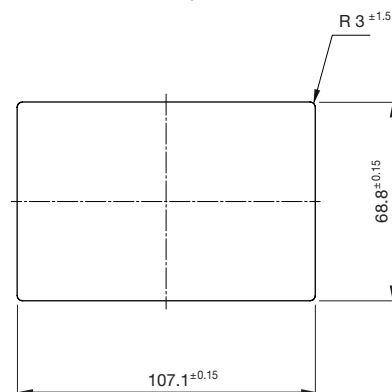
Dimensions

(All dimensions in mm)



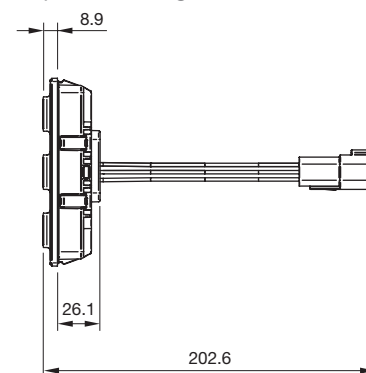
Mounting cut-out

(Front plate thickness 1.0 mm ... 4.0 mm) *2

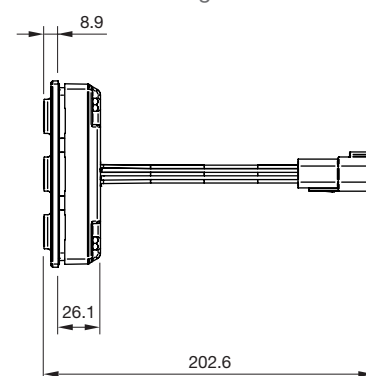


Mounting

Clip-in mounting



Screw-in mounting



*1 Availability of the PREMIUM variant for functional safety on request.

*2 For vibration-proof mounting, a front plate of at least 2 mm thickness is recommended.

Keypad SUPER.



Mechanical characteristics

- Actuation force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime: up to 2 million cycles of operation
- Impact resistance: IK07 according to IEC 62262

Electrical characteristics

- Operating voltage range: 8–32 VDC

Illumination

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

Symbols

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

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

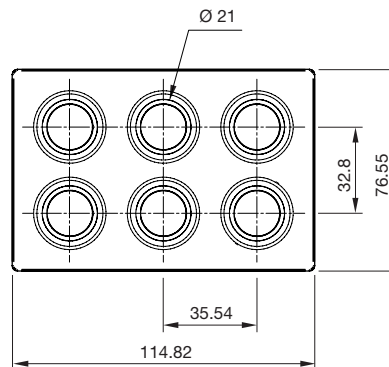
- Operating temperature: –40 °C ... +85 °C
- Storage temperature: –40 °C ... +85 °C

Protection degree

- IP6K7 according to ISO 20653
- Up to IP6K7 (panel/screw-in version)
- Up to IP5K4 (panel/clip-in version)

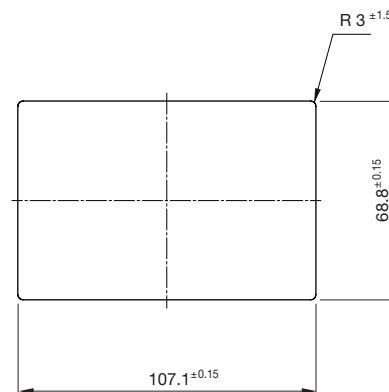
Dimensions

(All dimensions in mm)



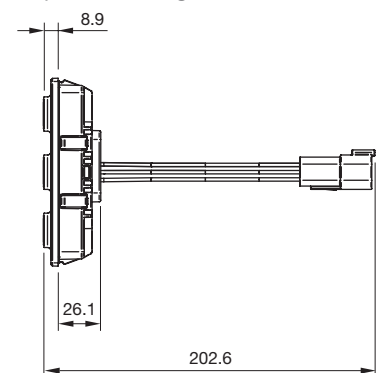
Mounting cut-out

(Front plate thickness 1.0 mm ... 4.0 mm) *

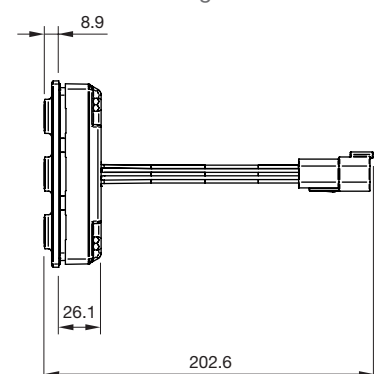


Mounting

Clip-in mounting



Screw-in mounting



* For vibration-proof mounting, a front plate of at least 2 mm thickness is recommended.

Keypad PLUS.



Mechanical characteristics

- Actuation force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime: up to 2 million cycles of operation
- Impact resistance: IK07 according to IEC 62262

Electrical characteristics

- Operating voltage range: 8–32 VDC

Illumination

- LED symbol illumination
 - Colour: white
 - Luminance: approx. 20 cd/m², (dimmable)
- LED halo ring illumination
 - Colour: red (other colours on request)
 - Luminance: approx. 750 cd/m² (dimmable)
- Illumination functions: lighting, flashing, pulses
 - Halo and symbol illumination can be configured individually

Symbols

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

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

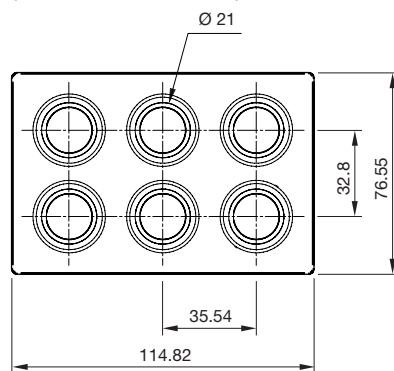
- Operating temperature: –40 °C ... +85 °C
- Storage temperature: –40 °C ... +85 °C

Protection degree

- IP6K7 according to ISO 20653
- Up to IP6K7 (panel/screw-in version)
- Up to IP5K4 (panel/clip-in version)

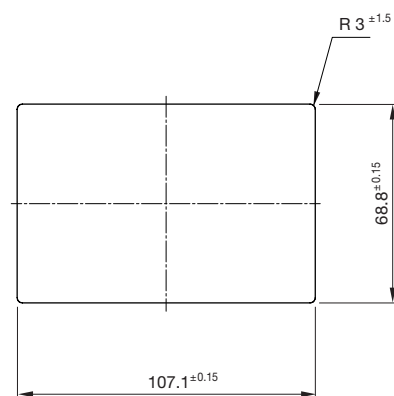
Dimensions

(All dimensions in mm)



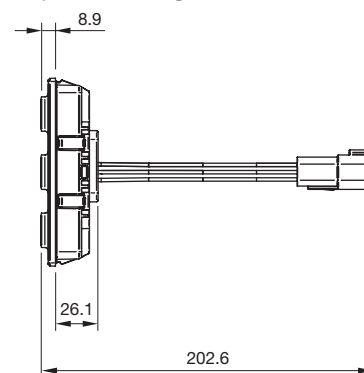
Mounting cut-out

(Front plate thickness 1.0 mm ... 4.0 mm) *

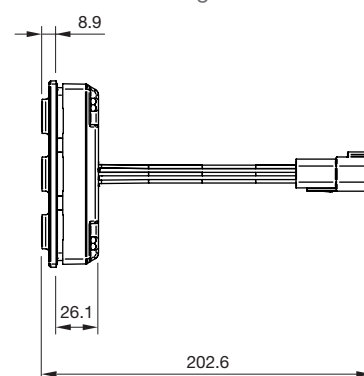


Mounting

Clip-in mounting



Screw-in mounting



* For vibration-proof mounting, a front plate of at least 2 mm thickness is recommended.

Keypad BASIC.



Mechanical characteristics

- Actuation force: approx. 6.5 N
- Overload: 250 N
- Mechanical lifetime: up to 2 million cycles of operation
- Impact resistance: IK07 according to IEC 62262

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: approx. 20 cd/m², (dimnable)
- LED halo ring illumination
 - Colour: red
 - (other colours on request)
 - Luminance: approx. 750 cd/m²
- Illumination functions
 - Halo and symbol illumination can be configured individually

Symbols

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

Interfaces

- Connector: Würth Elektronik WR-MPC3, 16 Pins

Ambient conditions

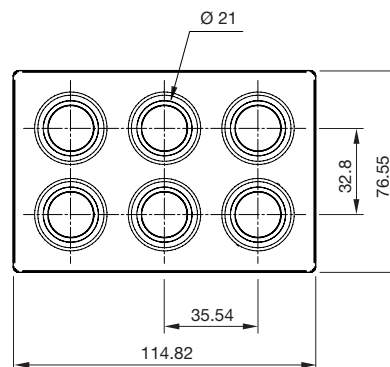
- Operating temperature: –40 °C ... +85 °C
- Storage temperature: –40 °C ... +85 °C

Protection degree

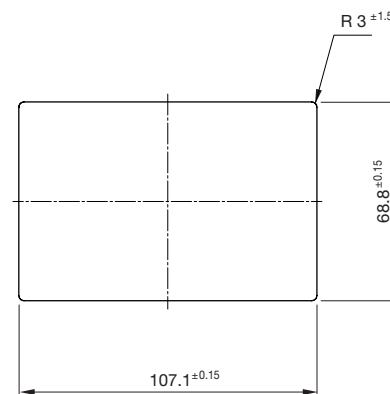
- IP6K7 (front side)
- IP20 (rear side) according to ISO 20653
- Up to IP6K7 (panel / screw-in version)
- Up to IP5K4 (panel / clip-in version)

Dimensions

(All dimensions in mm)

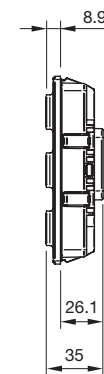


Mounting cut-out
(Front plate thickness 1.0 mm ... 4.0 mm) *

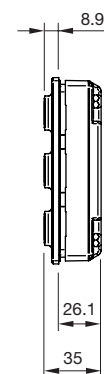


Mounting

Clip-in mounting



Screw-in mounting



* For vibration-proof mounting, a front plate of at least 2 mm thickness is recommended.

Keypad SUPER.



Mechanical characteristics

- Actuation force: approx. 11 N
- Overload: 250 N
- Mechanical lifetime: up to 2 million cycles of operation
- Impact resistance: IK07 according to IEC 62262

Electrical characteristics

- Operating voltage range: 8–32 VDC

Illumination

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

Symbols

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

Interfaces

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

Ambient conditions

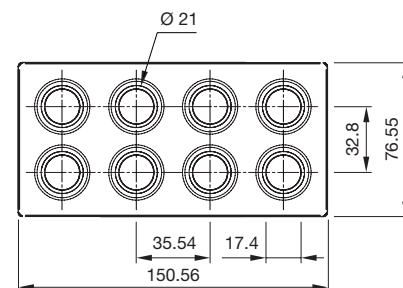
- Operating temperature: –40 °C ... +85 °C
- Storage temperature: –40 °C ... +85 °C

Protection degree

- IP6K9K according to ISO 20653 ^{*1}
- Up to IP6K9 (panel/screw-in version)
- Up to IP5K4 (panel/clip-in version)

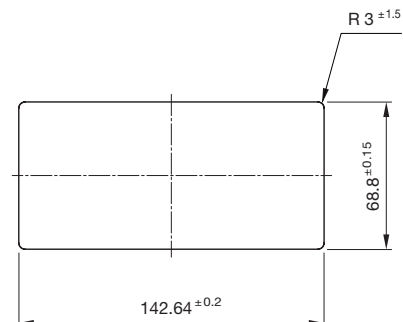
Dimensions

(All dimensions in mm)



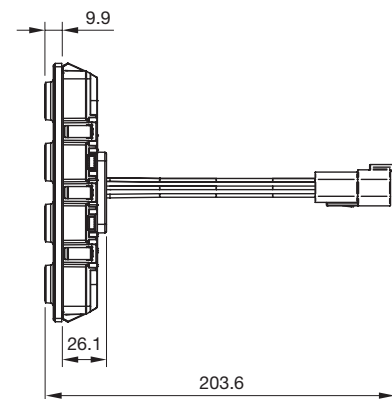
Mounting cut-out

(Front plate thickness 1.0 mm ... 4.0 mm) ^{*2}

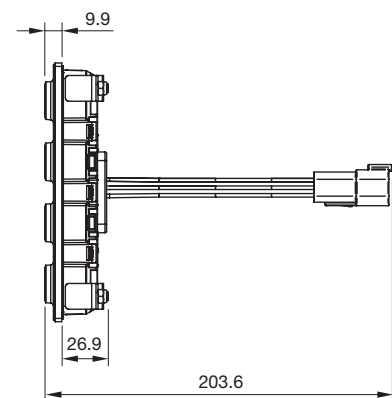


Mounting

Clip-in mounting



Screw-in mounting



^{*1} Under extreme conditions, the symbol inserts may detach. These can be easily reinserted in the keypad. For further information, please refer to the operating instructions.

^{*2} For vibration-proof mounting, a front plate of at least 2 mm thickness is recommended.

Keypad PLUS.



Mechanical characteristics

- Actuation force: approx. 11 N
- Overload: 250 N
- Mechanical lifetime: up to 2 million cycles of operation
- Impact resistance: IK07 according to IEC 62262

Electrical characteristics

- Operating voltage range: 8–32 VDC

Illumination

- LED symbol illumination
 - Colour: white
 - Luminance: approx. 20 cd/m², (dimable)
- LED halo ring illumination
 - Colour: red (other colours on request)
 - Luminance: approx. 750 cd/m² (dimable)
- Illumination functions: lighting, flashing, pulses
 - Halo and symbol illumination can be configured individually

Symbols

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

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

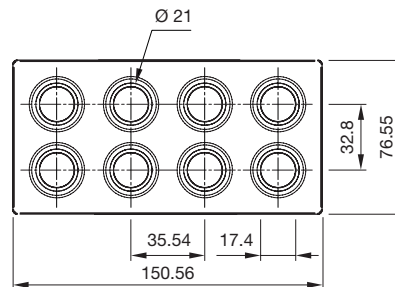
- Operating temperature: –40 °C ... +85 °C
- Storage temperature: –40 °C ... +85 °C

Protection degree

- IP6K9K according to ISO 20653 ^{*1}
- Up to IP6K7 (panel/screw-in version) ^{*1}
- Up to IP5K4 (panel/clip-in version)

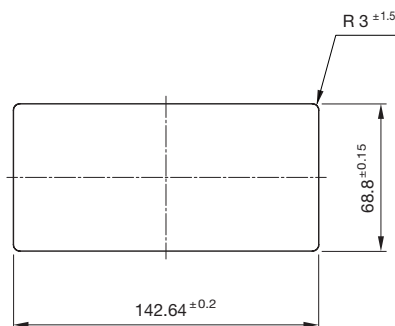
Dimensions

(All dimensions in mm)



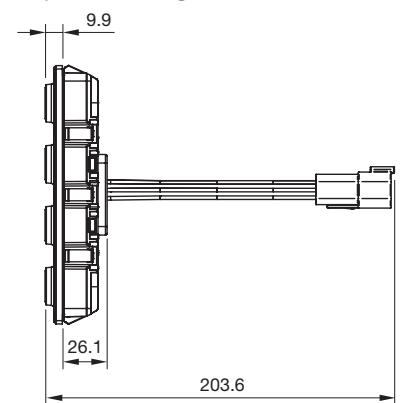
Mounting cut-out

(Front plate thickness 1.0 mm ... 4.0 mm) ^{*2}

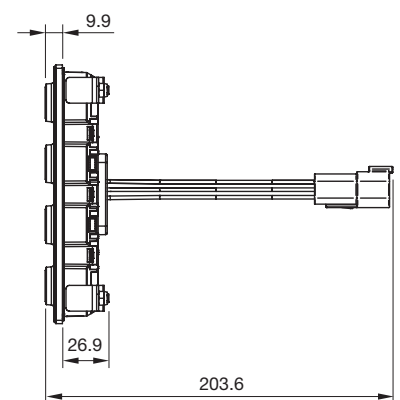


Mounting

Clip-in mounting



Screw-in mounting



^{*1} Under extreme conditions, the symbol inserts may detach. These can be easily reinserted in the keypad. For further information, please refer to the operating instructions.

^{*2} For vibration-proof mounting, a front plate of at least 2 mm thickness is recommended.

Keypad BASIC.



Mechanical characteristics

- Actuation force: approx. 11 N
- Overload: 250 N
- Mechanical lifetime: up to 2 million cycles of operation
- Impact resistance: IK07 according to IEC 62262

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

Symbols

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

Interfaces

- Connector: Würth Elektronik WR-MPC3, 20 Pins

Ambient conditions

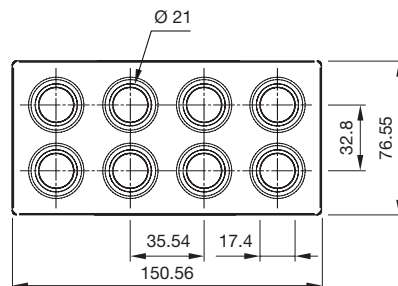
- Operating temperature: –40 °C ... +85 °C
- Storage temperature: –40 °C ... +85 °C

Protection degree

- IP6K9K (front side)
- IP20 (rear side) according to ISO 20653 ^{*1}
- Up to IP6K9K (panel/screw-in version)
- Up to IP5K4 (panel/clip-in version)

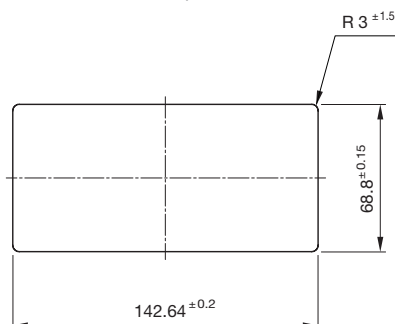
Dimensions

(All dimensions in mm)



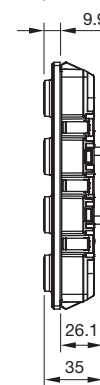
Mounting cut-out

(Front plate thickness 1.0 mm ... 4.0 mm) *

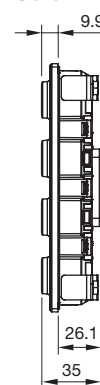


Mounting

Clip-in mounting



Screw-in mounting



^{*1} Under extreme conditions, the symbol inserts may detach. These can be easily reinserted in the keypad. For further information, please refer to the operating instructions.

^{*2} For vibration-proof mounting, a front plate of at least 2 mm thickness is recommended.

New application possibilities.

Status indication with halo segments

The 4-segment RGB halo ring illumination of the Rugged Keypads is ideal for dynamic status indications such as the display of fill levels or the gradual control of speed. This provides users with constant feedback on the current operating status. The distinguishing colours and the ability to make the four separate RGB segments light up, flash, pulsate or rotate guarantee intuitive operation and the intelligent integration into a customer-specific operating concept.

With the individually programmable LEDs it is possible to define different function layers and individual functions per segment – for even more functionality combined in one HMI.

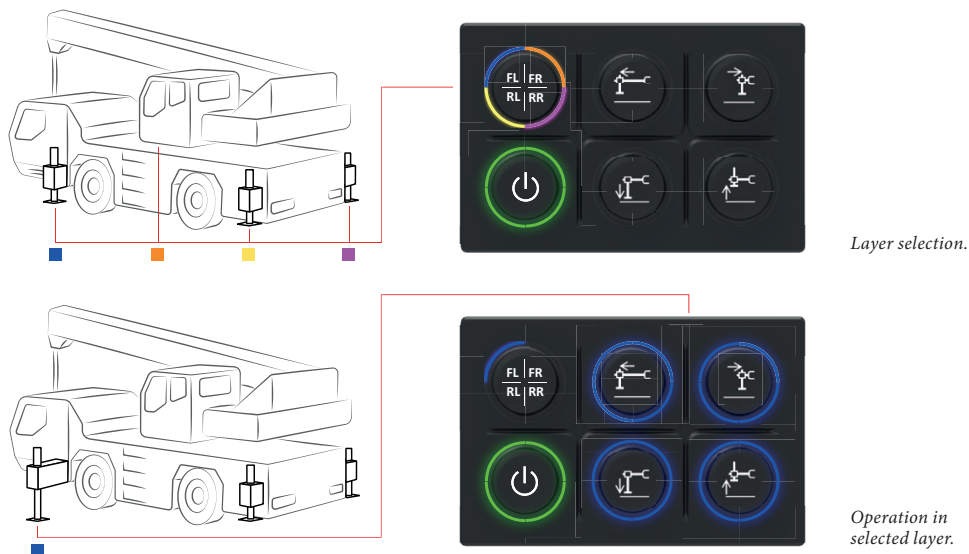
Application examples

- Speed of performance modes
- Lifting and lowering
- Release/hold
- Navigation
- Start/stop
- Menu control/different function levels
- Heating/ventilation

Customer-specific operating concept

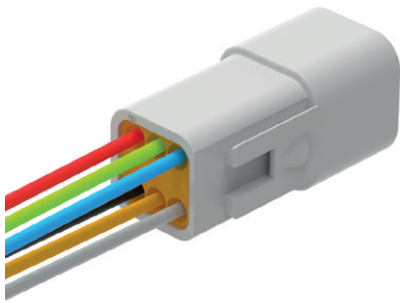


Example of a step-by-step operation



Connector, symbol inserts, tool for legends.

Deutsch DT Series connector (DT04-6P)



Interchangeable symbol inserts



The interchangeable symbol inserts are available with ISO 7000 or customer-specific symbols. In addition to the standard colour black, symbol inserts are also available in a variety of other colours.

Tool for legends



The symbol insert tool with trendy design enables userfriendly fitting and removal of symbol inserts of the pushbuttons.



Protective shroud



EAO offers protective shrouds as accessories for the Series 09 Rugged Keypads. These ensure that the 6 or 8 pushbuttons are protected against unintentional actuation, thus preventing safety-critical operating errors.





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Series 09 In-Cabin Keypads.

Also available in Series 09 – In-Cabin Keypads. Developed for E1 applications and ideally suited for use in vehicle interiors.

- Programmable RGB halo ring and symbol illumination
- High-quality modular design with IP5K4 front protection
- Developed according to recognised automotive standard IATF 16949
- Available with CAN bus connection or as hard-wired variants
- Interchangeable ISO 7000 or customer-specific symbols



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