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 harsh operating conditions and E1 applications with CAN bus integration</u> – *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 DIN 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 DIN EN ISO 13849 PLd. 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.

The PREMIUM version of the Series 09 Rugged Keypads are equipped with the CANopen Safety protocol and achieve Performance Level D (PLd).

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.).

Advantages.

- Robust, ergonomic and innovative design sealed up to IP6K9K protection
- Suitable for functional safety applications according to DIN 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 (dimmable)
- LED halo ring illumination with
  4 segments, RGB or single colour 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
- Baud rate 125, 250, 500, 1000 kBit/s
  (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
- DIN EN ISO 13849 PLd (PREMIUM variant)
- E1 ECE R10 / ECE R118
  (except PREMIUM variant)
- 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 DIN EN ISO 13849 PLd.

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	Communica- tion protocol	Switching element	IP protec- tion	Connec- tor	Switching function/s	Functional safety standard
PREMIUM	4-segment RGB, freely configur- able	CANopen Safety	Electro- mechanical switching element	IP6K7 frontside and rear- side	Deutsch DT04-6P	Pushbutton	CANOpen safety protocol and functional safety, certified according to DIN ISO 13849 PLd
SUPER	4-segment RGB, freely configur- able	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

Variants	Halo ring illumination	Communica-tion protocol	Switching element	IP protection	Connector	Switching function/s	Functional safety standard
SUPER	4-segment RGB, freely configur-able	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.

CANopen®
safety easy to use

Functional Safety
- Developed and certified according to the safety requirements of DIN EN ISO 13849-1:2023
- Performance Level d (PLd)
- MTTFd (in operating years): 183 (Loaddump B)
- PFH: <21 FIT (Loaddump B)
- DC: >90 %

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

Ilumination
- 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 LED
  – Luminance: approx. 1 500 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)
- CANopen Safety (EN 50325-5)
- Baud rate 125, 250, 500, 1000 kBit/s (software configurable) [1]
- 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
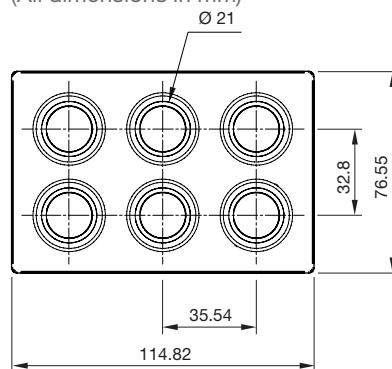
Ambient conditions
- Operating temperature −40 °C … +85 °C
- Storage temperature: −40 °C … +85 °C

Protection degree
- IP6K7 according to ISO 20653
- Up to IP6K7 (panel/screw-in version)
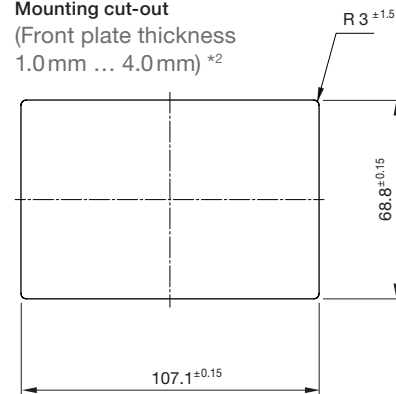- Up to IP5K4 (panel/clip-in version)
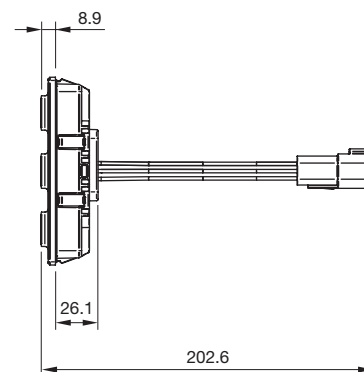
Dimensions
(All dimensions in mm)

Mounting cut-out
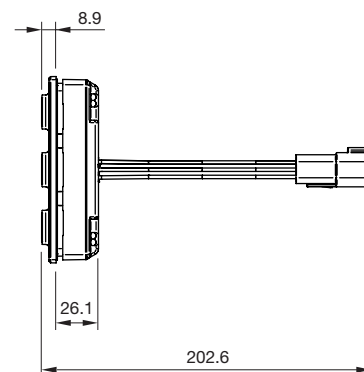(Front plate thickness 1.0 mm … 4.0 mm) [2]

Mounting
Clip-in mounting

Screw-in mounting

[1] In development
[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. 1 500 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 125, 250, 500, 1000 kBit/s
  (software configurable) [1]
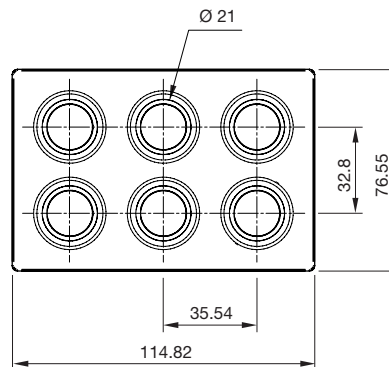- Connector Deutsch DT04-6P

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)
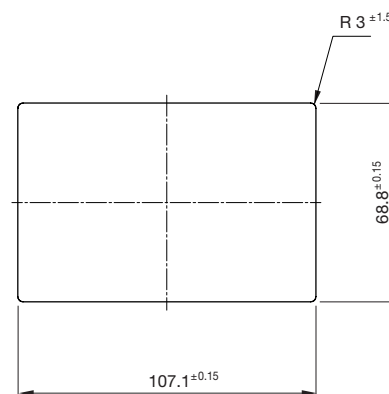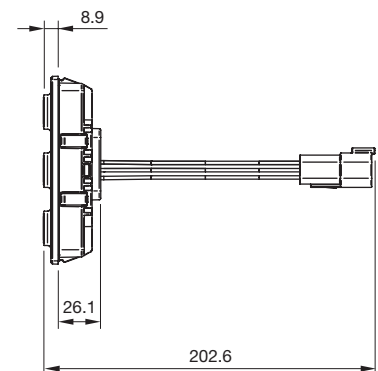- Up to IP5K4 (panel/clip-in version)

Dimensions
(All dimensions in mm)

Mounting cut-out
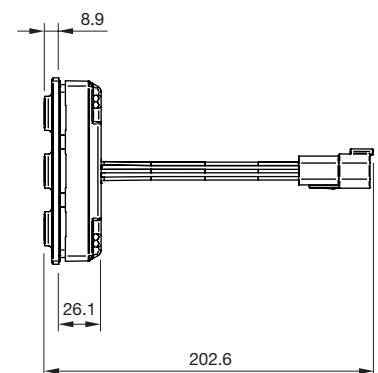(Front plate thickness
1.0 mm … 4.0 mm) [2]

Mounting
Clip-in mounting

Screw-in mounting

[1] In development
[2] 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
- 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 (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 125, 250, 500, 1000 kBit/s (software configurable) [1]
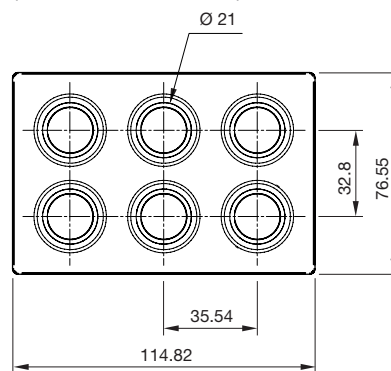- Connector Deutsch DT04-6P

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)
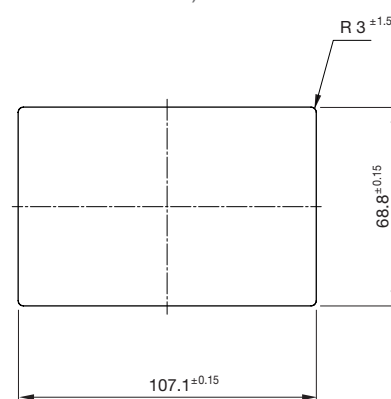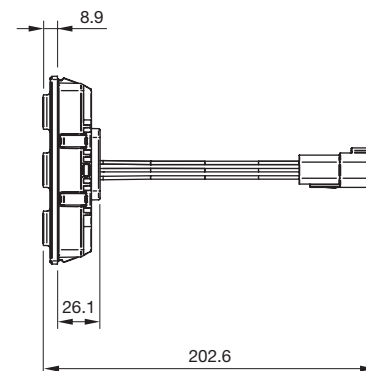- Up to IP5K4 (panel / clip-in version)

Dimensions
(All dimensions in mm)

Mounting cut-out
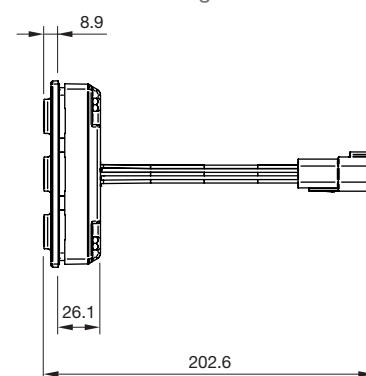(Front plate thickness
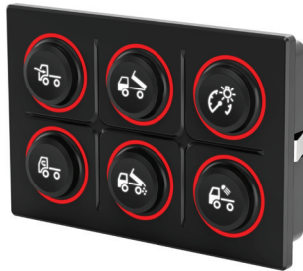1.0 mm … 4.0 mm) [2]

Mounting
Clip-in mounting

Screw-in mounting

[1] In development
[2] 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,
    (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
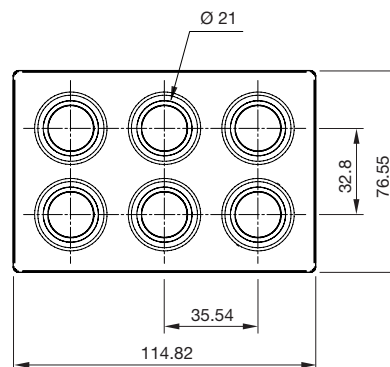 WR-MPC3, 16 Pins

Ambient conditions
- Operating temperature:
  –40 °C … +85 °C
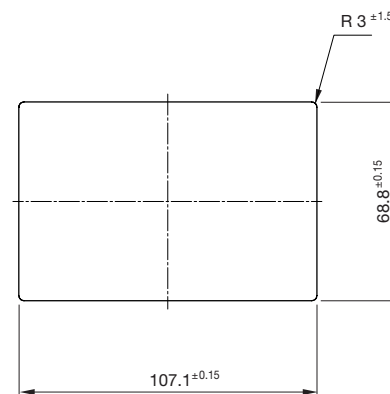- Storage temperature:
  –40 °C … +85 °C

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)
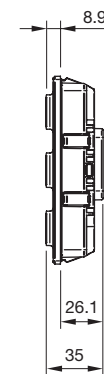
Dimensions
(All dimensions in mm)

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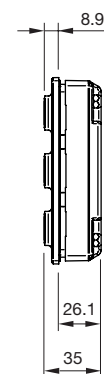(Front plate thickness
1.0 mm … 4.0 mm) *

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 (dimmable)
- LED halo ring illumination
  with four freely configurable segments
  – Multi-colour: RGB
  – Luminance: approx. 1 500 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 125, 250, 500, 1000 kBit/s
  (software configurable) *1
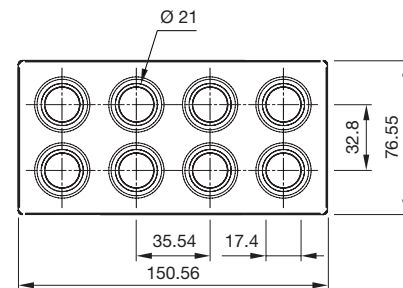- Connector Deutsch DT04-6P

Ambient conditions
- Operating temperature:
  −40°C … +85°C
- Storage temperature:
  −40°C … +85°C

Protection degree
- IP6K9K according to ISO 20653 *2
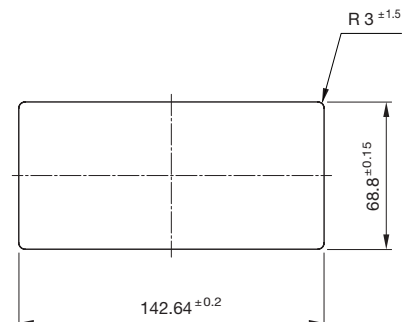- Up to IP6K9 (panel/screw-in version)
- Up to IP5K4 (panel/clip-in version)

Dimensions
(All dimensions in mm)

Mounting cut-out
(Front plate thickness
1.0 mm … 4.0 mm) *3

Mounting
Clip-in mounting
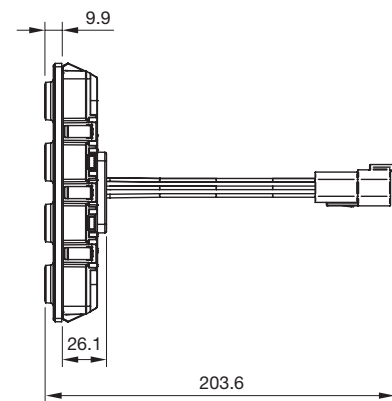
Screw-in mounting
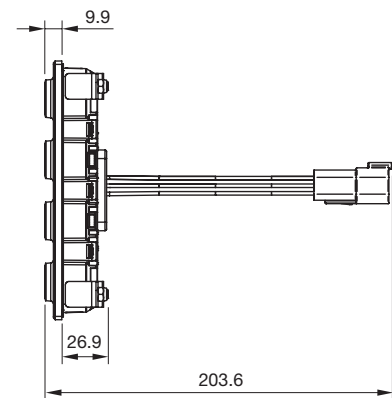
*1 in development

*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
- 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 (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 125, 250, 500, 1000 kBit/s (software configurable) *1
- 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 *2
- Up to IP6K7 (panel/screw-in version) *2
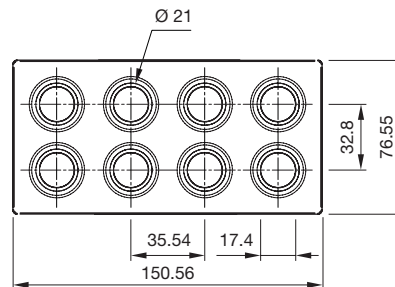- Up to IP5K4 (panel/clip-in version)

Dimensions
(All dimensions in mm)

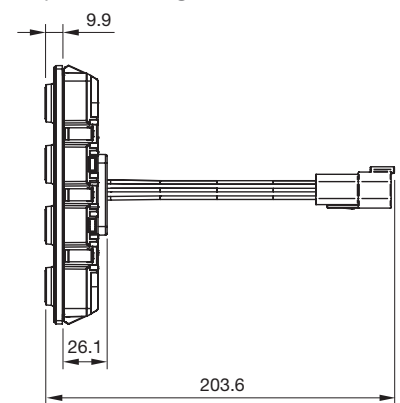### Mounting cut-out
(Front plate thickness
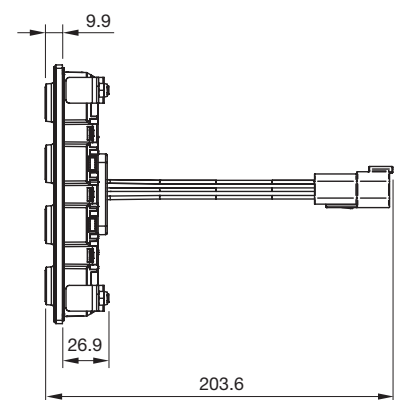1.0 mm … 4.0 mm) *3
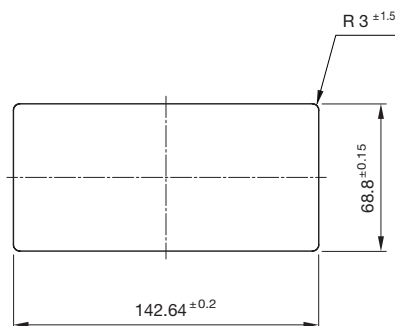
Mounting
Clip-in mounting

Screw-in mounting

*1 In development

*2 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.

*3 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
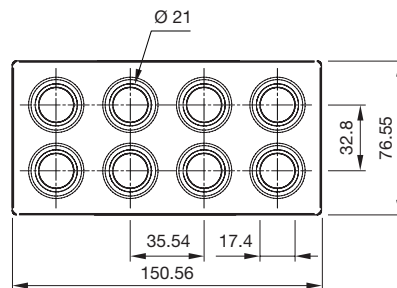 WR-MPC3, 20 Pins

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)

Ø 21

32.8

76.55

35.54   17.4

150.56

Mounting cut-out
(Front plate thickness
1.0 mm … 4.0 mm) *2

R 3 ±1.5

68.8 ±0.15

142.64 ±0.2

Mounting
Clip-in mounting

9.9

26.1

35

Screw-in mounting

9.9

26.1

35
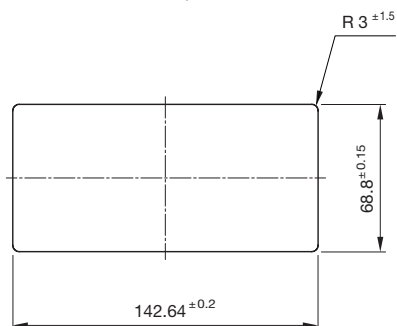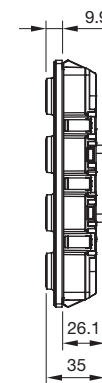
*1 Under extreme conditions, the
   symbol inserts may detach. These
   can be easily reinserted in the
   keypad. For further information,
   please refer to the operating
   instructions.

*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 segmen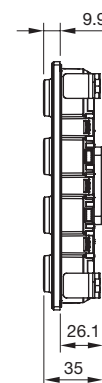ts light up, flash, pulsate or rotate guarantee intuitive operation and the intelligent integration into a customer-specific operating concept.

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

Visualisation
Dynamic

Control

Indication

Multifunctional programming.

Segments
S1 = off
S2 = off
S3 = on
S4 = on

Example of a step-by-step operation

Layer selection.

Operation in selected layer.
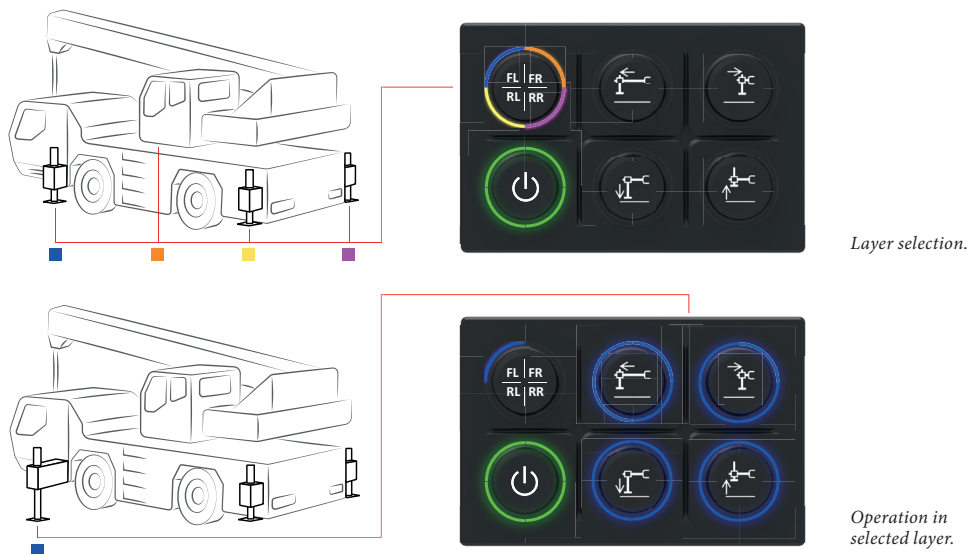
Connector, symbol inserts, tool for legends.

Deutsch DT Series connector (DT04-6P)
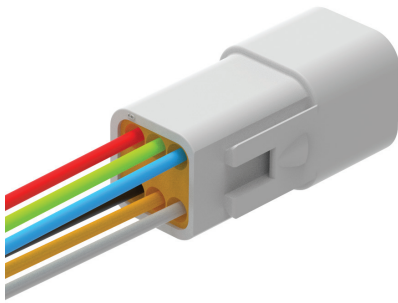
Interchangeable symbol inserts

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. In this way, the Series 09 protective shroud fulfils the requirements, as is the case, for example, with refuse collection vehicles, in accordance with DIN EN 1501-1.

Modular and reliable.
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

Expert manufacturers. EAO creates possibilities. Since 1947.

Founding year: 1947
Number of employees: 600
Headquarters: Olten, Switzerland
Manufacturing Companies: Switzerland, Germany, North America, China
Sales Companies: 10
Distribution countries: 50
Core markets: Transportation, Automotive, Heavy Duty & Special Vehicles, Machinery

EAO AG, a Swiss, family-owned company founded in 1947, has developed into one of the world's leading manufacturers of high-quality switches, keyboards, sophisticated control elements, and complete HMI control units and HMI Systems.

Efficient and modern development processes, effective global supply chains, and skilled project and consultation management represent additional services that we offer our customers and business partners around the world.

Your solution-focused expert and partner
We do much more than just manufacture individual control elements. As a solution-focused partner, we provide the option of technically and mechanically customising existing HMI Components in line with our customers' individual requirements. From simple control elements through to sophisticated HMI Systems, from serial production through to installation – we offer the entire range of HMI services and inspire the confidence of our customers.

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Your centre of excellence.

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