

BODAS DI4 display

Series 10

RE 95272

Edition: 02.2018

Replaces: 06.2016



- ▶ 7" color display with 800 × 480 pixels
- ▶ iMX6 Solo processor, 800 MHz
- ▶ 2 GB flash memory and 512 MB RAM
- ▶ Interfaces:
 - 2× CAN 2.0B
 - 1× USB 2.0
 - 3× digital/analog inputs
 - 2× digital outputs
 - 2× analog video inputs (PAL, NTSC)
- ▶ Integrated ambient light sensor
- ▶ 4× status-LEDs (1× multi-color, 3× single color)
- ▶ Real-time clock with power reserve (500 h)

Features

- ▶ Freely programmable visual HMI
 - Composition of display content, operating element functions and behavior with CODESYS V3.5 development environment
 - Variable lighting of operating elements and icons (color, intensity)
- ▶ Intuitive operation of the DI4
 - Ergonomic buttons and push-turn control with haptic feedback
 - Acoustic feedback via integrated loudspeaker / audio out
- ▶ Flexible installation in the cab
 - Alignment is possible in 90° steps
 - Standalone (RAM Mount® or customer-specific solution)
 - Integrated into the dashboard (mounting frame)
- ▶ Integration of BODAS-service functions
 - Search function for connected BODAS RC controllers in the CAN bus network
 - Representation and configuration of parameters and process variables
 - Import- / export-function for parameter files via USB-interface
 - Flashing of BODAS RC controllers via DI4
- ▶ DI4 professional version
 - Touchscreen
 - Ethernet

Content

Type code	2
Description	2
Technical data	5
DI4 dimensions	7
Connection diagram	8
Overview functions	9
Connector pinning on the display	10
Accessories	11
Additional offer and sales conditions	15
Safety instructions	16

Type code

01	02	03	04	05
DI	4	-	M	-
				/
				10

Type

01	Display	DI
----	---------	-----------

Version

02	Generation	4
----	------------	----------

Frame size

03	Mid (7")	M
----	----------	----------

Version

		STD	PRO	
04	Standard	●	-	STD
	Professional	-	●	PRO
	Operation			
	6+6 softkeys	●	●	
	2× hardkeys	●	●	
	Push-turn control	●	●	
	Touch	-	●	
	Interfaces			
	1× USB	●	●	
	2× CAN	●	●	
	3× Analog/Dig IN	●	●	
	2× Dig OUT	●	●	
	2× Video IN	●	●	
	1× Ethernet	-	●	
	Indicators			
	3× LED status (red/yellow/green)	●	●	
	1× Multi color LED (RGB)	●	●	
1× Loudspeaker or audio out	●	●		
Integrated real-time clock 500 h power reserve	●	●		
Ambient light sensor	●	●		
Configurable background lighting (RGB)	●	●		

Series

05	Series 1, index 0	10
----	-------------------	-----------

Note:

The BODAS DI4 is not functional without prior programming. A project must be created with CODESYS V3.5 development environment (PC tool from 3S-Smart Software Solutions GmbH) and transferred onto the DI4.

Description

With the BODAS display DI4, Bosch Rexroth is offering a freely programmable high-resolution color display with a powerful 32 bit processor and a 7" display.

Depending on the programming, the display enables, for example, process variables, static and dynamic graphic elements and the operation of machine functions to be displayed on one central unit.

The robust display DI4 has been developed specifically for use in mobile working machines and satisfies corresponding protection requirements regarding ambient temperatures, impermeability, shock and vibration and electromagnetic compatibility (EMC). It is intended for installation or assembly in the driver's cab and offers excellent readability, even in sunlight and harsh climatic conditions. The display page brightness is adjustable. An ambient light sensor automatically adjusts the backlighting. The color and brightness of the keys, the push-turn control and the icons can be changed and adapted to the machine manufacturer's individual design.

12 freely programmable function keys are available for user input and menu navigation (softkeys). The display features an ergonomically arranged central push-turn control for fast navigation on and between the different screens or menus or for changing of settings. The display additionally offers two other function keys (hardkeys), which can have fixed functionality occupancy (such as cancel, main menu) assigned to them comprehensively across projects. In the PRO version, a capacitive touch screen is also available. The front-glass of the display is prepared with an antifog-coating to avoid mist in case of rapidly changing temperatures.

The application-specific representation of screen pages, context menus, graphic elements and video signals is provided by the CODESYS programming environment. The integrated LEDs and the loudspeakers can be used as enhanced status indicators.

The display can read and process analog or digital input signals directly and can also control 2 digital outputs.

The BODAS display can be connected to a 12 V or 24 V on-board batterie-voltage. The internal real time clock is buffered against supply voltage interruption (approx. 500 h). Communication with the BODAS controllers of the current series and other electronic assemblies in the machine takes place via CAN bus. The DI4 PRO displays are equipped with an Ethernet interface, which is routed via a separate external connector.

The DI4 Display can be flashed via BODAS-service, faster and preferably via USB, or optional via Ethernet (PRO version). Moreover, the DI4 displays can also be used for gateway access to the BODAS RC controllers as a diagnosis and service interface for the configuration of BODAS RC controllers. The parameters that are stored in the BODAS controllers can be read, changed and written back to the BODAS via the DI4 CAN interface. It is possible to display the active and stored faults of a BODAS controller, as well as fault resetting using the integrated BODAS-service function.

The video interface allows direct connection of two PAL or NTSC video sources (e.g. BODAS color video cameras by Bosch Rexroth). The video signals transmitted from the cameras can be shown on the display as superimposed images (picture in-picture) or as full-screen, depending on the user interface configuration.

Programming

The DI4 is freely programmable using CODESYS V3.5 development environment from the supplier 3S-Smart Software Solutions GmbH. This standard tool is extended by a product-specific Bosch Rexroth software-package. A design template, libraries, the license documentation and a demo project in which core functions have been applied to help you get started are included, as well as a specific online help.

Each display page can be freely composed by the user on a PC in terms of the design, arrangement and number of elements. CODESYS Visualisation allows the easy integration of predefined or freely designed items and bitmaps (such as customer logos, display instruments, charts, etc.) in display screens designed by the user.

The development environment from 3S and the additional DI4-specific software-packages are available on demand from Bosch Rexroth.

The dynamic input parameters, which are analog, digital or based on the (J1939 and proprietary) CAN protocol, such as speed values, temperature, settings, etc. can be assigned to the relevant elements by CODESYS development environment.

The designed surfaces are shown on the PC during the definition process, so that there is no need to download the configuration file to the display. The individual programming, configuration and menu navigation can be easily simulated and tested on the PC.

Typical applications include driving and operating state indicator, system parametrization and diagnosis.

Applications and installation variants

The BODAS display can be used as a dashboard display and/or user interface. Installation can be either integrated into the control panel or can be done as a standalone device within the drivers cabin. A mounting frame is available for dashboard integration. A mounting flange for standalone installation is available on the back of the device. Mounting is done using defined screwing points and is compatible with the RAM Mount® system.



Technical data

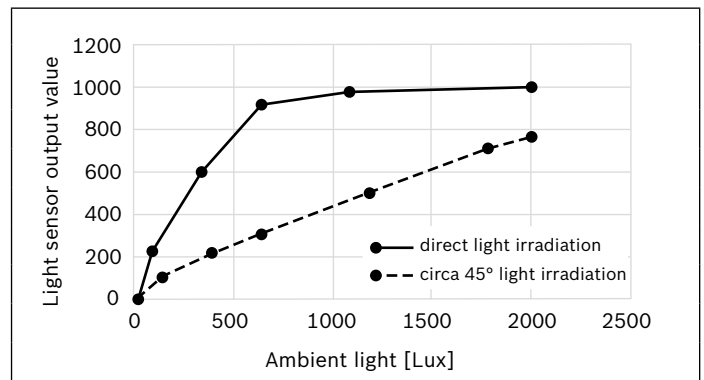
Type		DI4-M-STD	DI4-M-PRO
Nominal voltage	Vehicle electrical battery system	12 V and 24 V (nach ISO 16750)	
	Operating range	9 V to 32 V	
Power consumption		16 W	
Fuse (external)		5 A	
Interfaces	CAN 2.0 B (ISO11898)	2	
	USB 2.0	via wiring harness ¹⁾	
	Ethernet 10/100 Mbit/s, IEEE 802.3	–	Fitted
Signal inputs	Input 1 (frequency input)	0 to 14 V, 4 to 20 mA, max. 10 kHz	
	Input 2	0 to 14 V, 4 to 20 mA	
	Input 3	0 to 14 V, 4 to 20 mA	
Digital signal outputs		2 × 12 V, 300 mA	
Indicator signals	Single-color LED	3 (red, green and yellow)	
	Multi-color LED	1	
	Spaeker	1 Possible volume in 1 mtr. distance from integrated speaker: test tone 3 kHz: 95,2 dB, test tone 1 kHz: 86,2 dB	
	Audio out	1 Either audio out or the integrated speaker can be operated	
Control elements	Push-turn control	1 16 increments at 360 degree, endless, function and illumination freely programmable	
	Hardkeys	2 function and illumination freely programmable	
	Softkeys	12 function and illumination freely programmable	
	Touch display, capacitive	–	Fitted
Video	Video interface PAL, NTSC	2	
	Camera voltage supply	12 V, each 0.5 A max.	
Real-time clock		Power reserve approx. 500 h (Goldcap) - deviation <0.5 s/day	
Ambient light sensor		1	
Short circuit resistance when display is powered		against battery and ground for all inputs and outputs with the exception of the USB data-pins (maximum 6 Volt)	
Reverse polarity protection		Power supply / battery	
Microcontroller		iMX6 Solo, 800 MHz	
Memory	RAM	512 MByte	
	Flash	2 GByte	
	EEPROM	64 kByte	
Operating system		Linux	
Programming		Codesys V3.5	
Display		800 × 480 Pixel, RGB 16 Mio.	
Backlighting	Brightness	typical 400 cd/m ² , maximum 500 cd/m ²	
Display diagonal		7"	
Electromagnetic compatibility		UN ECE 10 Rev. 4, DIN EN 12895, DIN EN ISO 12999, DIN EN ISO 13309, DIN EN ISO 13766, DIN EN ISO 14982, EN 61000-6-2, EN 61000-6-4	
Electrostatic discharge	ISO 10605	8 kV direct contact discharge, 15 kV air discharge	
Vibration resistance	Broadband noise oscillations (ISO 16750-3)	32 h per axis, as per ISO 16750-3 profile	
Shock resistance	Transport shock (DIN EN 60068-2-27)	$a = 400 \text{ m/s}^2$; $t = 6 \text{ ms}$, 4000 cycles × 3 axes	

1) USB mass-storage devices need to provide signal levels compliant with existing USB specifications.
 USB-products compliant with these standards usually are marked with corresponding product labels on package or data-sheet.

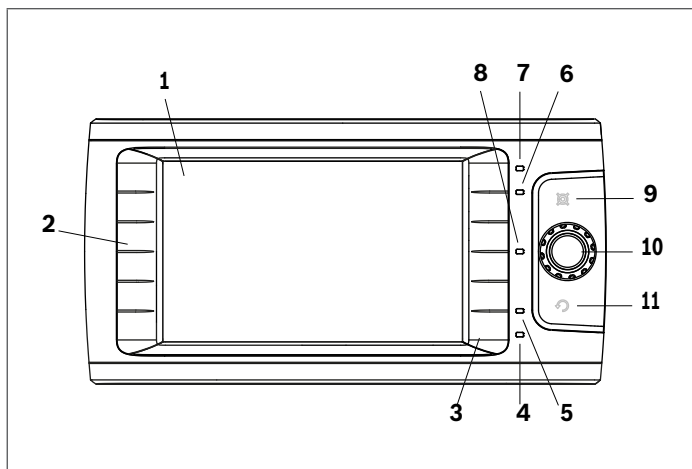
Type	DI4-M-STD	DI4-M-PRO
Medium compatibility ISO 16750-5	Cleaner, NPK fertilizer, RME(rape methylester), gasoline, diesel, further fluids on request	
Moisture resistance	3 cycles per 24 h	
Industrial climate (DIN 50018 SFW 2.0)	168 h	
Salt spray test (DIN ISO EN 9227)	4 cycles per 24 h	
Condensation water (EN ISO 6270-2)	300 h	
Type of protection ISO 20653	IP6KX / IPX5	
UV resistance EN ISO 4892-2	-30 °C +70 °C	
Operating temperature	-40 °C +85 °C	
Storage temperature	PC+ABS (Bayblend T45), PLEXIGLAS Satinice df23 8N, Silicone (Shin Etsu KE951U), Aluminum EN AC-ALSi11Cu2(Fe), Float glass, Polyester (label), Steel C45 (screws)	
Housing material	1.1 kg	
Weight approx.	267.2 mm × 135.9 mm × 65 mm	
Dimensions	acc. 2011/65/EU	
RoHS compliance		

Characteristic ambient light sensor (guidance factors)

Results at direct light irradiation		Results at circa 45° light irradiation	
Ambient light [Lux]	Sensor output value	Ambient light [Lux]	Sensor output value
20	0	20	0
100	220	150	100
350	590	400	210
650	900	650	300
1100	960	1200	490
2000	990	1800	700
		2000	750



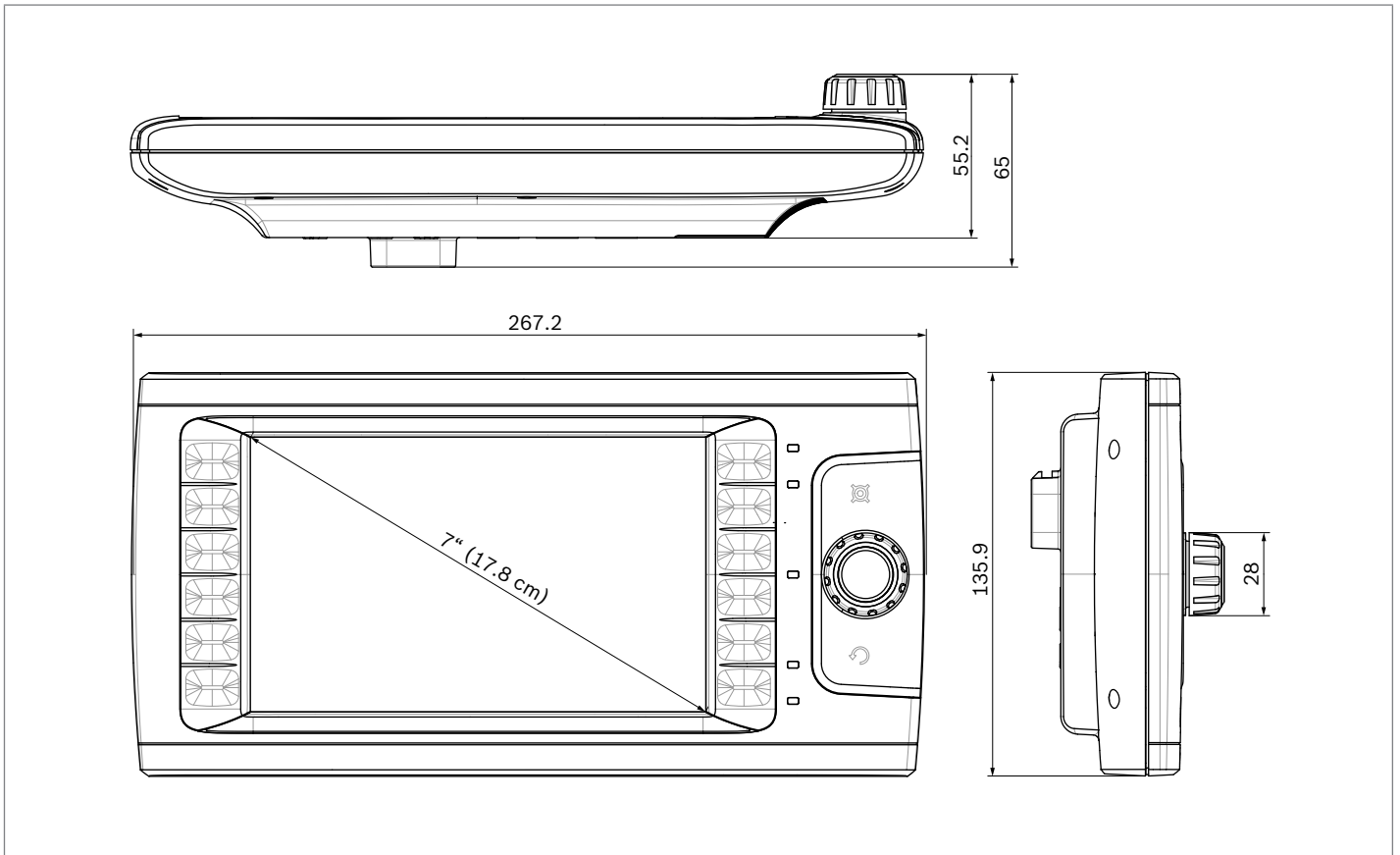
Control elements



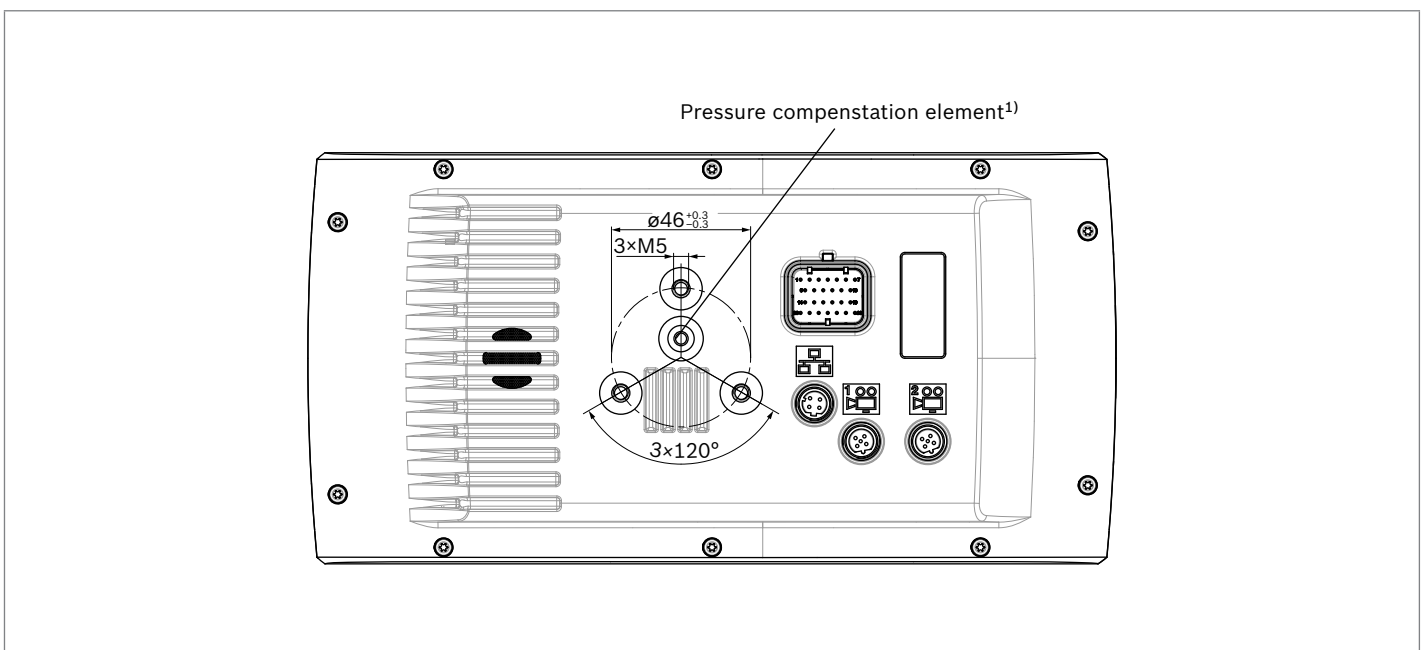
- 1 Display 7", 800 × 480 px
- 2 Button bar left side, 6 freely configurable softkeys
- 3 Button bar right side, 6 freely configurable softkeys
- 4 LED status green
- 5 LED status yellow
- 6 LED status red
- 7 Multi-color status LED
- 8 Ambient light sensor
- 9 "Home" button hardkey
- 10 Push-turn control
- 11 Back" button hardkey

DI4 dimensions

Front and side view



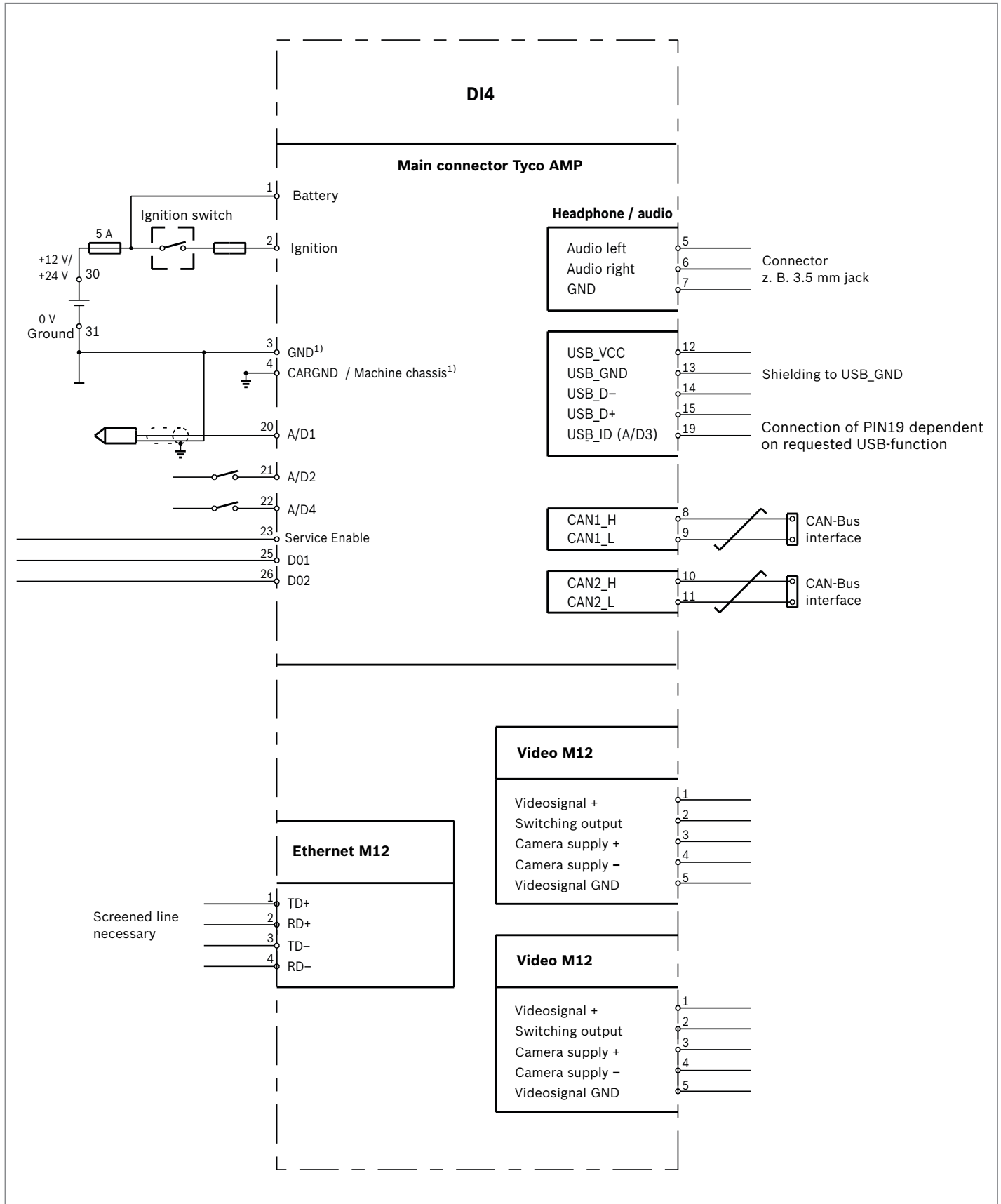
Back, housing cover with connection surface for mounting bracket



Tightening torque for RAM mount (M5): 4.5 Nm, tightening torque of M12 × 1 screw for connector: 0.6 Nm

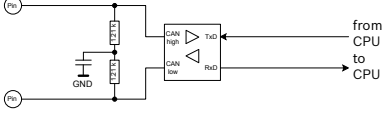
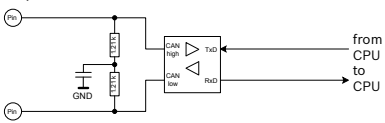
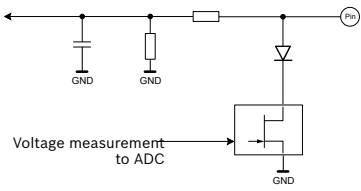
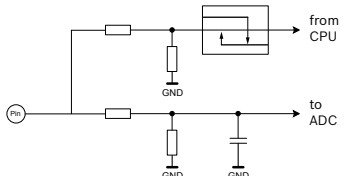
¹⁾ The pressure compensation element needs mechanical protection

Connection diagram



1) To assure the correct functionality of the product, both clamps GND and CARGND have to be connected.

Overview functions

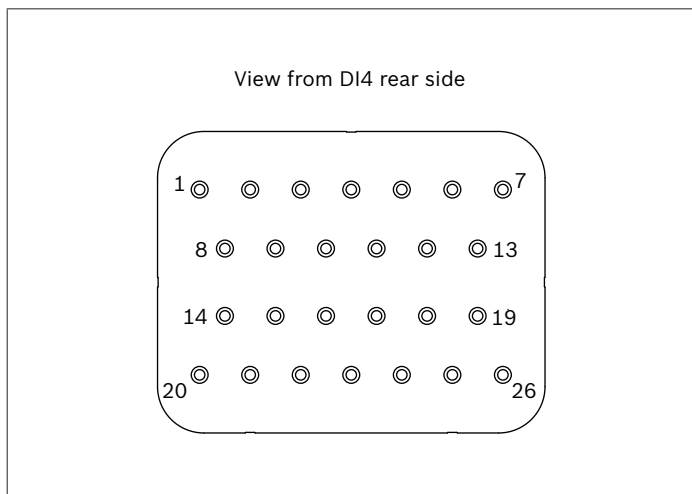
Pin	Description	Main function	Alternative function
1	Battery, KL 30	Battery positive operating range 9 V DC to 32 V DC	
	IGN / Ignition	Ignition, KL15	
3 ¹⁾	GND, KL31	Battery negative	
4 ¹⁾	CarGND	Vehicle chassis	
5, 6, 7	Output AUDIO_L, AUDIO_R, GND	Audio output	
8, 9	CAN-interface CAN1_H, CAN1_L	CAN-interface CAN 2.0 B, up to 1 Mbaud, terminating resistor external 120 Ω necessary, standard diagnosis interface with factory setting 250 kbaud	
			
10, 11	CAN-interface CAN2_H, CAN2_L	CAN-interface CAN 2.0 B, up to 1 Mbaud, terminating resistor external 120 Ω necessary	
			
	Ethernet interface	10BASE-T und 100BASE-TX	
12, 13, 14, 15, 19	USB-interface Pin 19 needs to be projected switchable to be able to use the USB main or alternative function if necessary. USB data pins (14, 15) not protected against voltage peaks > 6 Volt.	DI4 acts as MASTER USB-device is possible to be connected. Pin 19 (USB_ID) on GND	DI4 acts as SLAVE Control of DI4 via external host device. No operation of USB mass-storage devices possible. Pin 19 open
20, 21, 22	Multifunctional input A/D1, A/D2, A/D3, A/D4	Analog Voltage Input measurement range 0..14 V cut off frequency 72 Hz Apparent ohmic resistance 500 Ω current input 24 mA measurement range 4 .. 20 mA	Digital Input threshold calibratable via SW, maximum 14 V only Pin20: Frequency input Frequency input for active sensors up to 10 kHz low ≤ 2 V high ≥ 4 V, Hysteresis = 0.5 V
			
23	Service Enable SERV_EN	Dependent on specific use-cases requested for updates of software via USB.	Control input used in case of updates of the DI4 firmware. Connection to be considered switchable against battery supply.
25, 26	Digital output DO1, DO2	Digital switch against ground, maximum 300 mA	
			

1) To assure the correct functionality of the product, both pins GND and CARGND have to be connected.

Connectors on the display

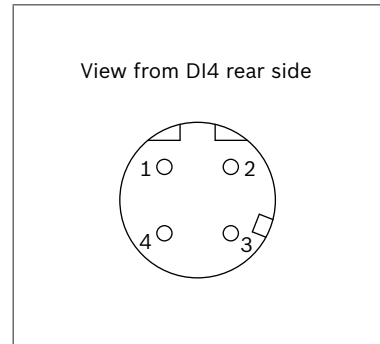
Main connector (Tyco AMP 1437288-6)

Pin	Assignment	Description
1	VCC	Battery plus, terminal 30
2	Ignition	Ignition, terminal 15
3 ¹⁾	GND	Battery minus, terminal 31
4 ¹⁾	CarGND	Vehicle chassis
5	AUDIO_L	Audio Out left
6	AUDIO_R	Audio Out right
7	AUDIO_GND	Audio Out GND
8	CAN1H	CAN 1 high
9	CAN1L	CAN 1 low
10	CAN2H	CAN 2 high
11	CAN2L	CAN 2 low
12	USB_VCC	USB supply +5V
13	USB_GND	USB supply GND
14	USB_D-	USB data low
15	USB_D+	USB data high
16	reserved	Bosch Rexroth use
17	reserved	Bosch Rexroth use
18	reserved	Bosch Rexroth use
19	A/D3	Multifunctional input or USB_ID
20	A/D1	Multifunctional input
21	A/D2	Multifunctional input
22	A/D4	Multifunctional input
23	Serv_EN	Service enable - necessary for updating BSP / firmware
24	N.a.	Bosch Rexroth use
25	DO1	Digital output
26	DO2	Digital output



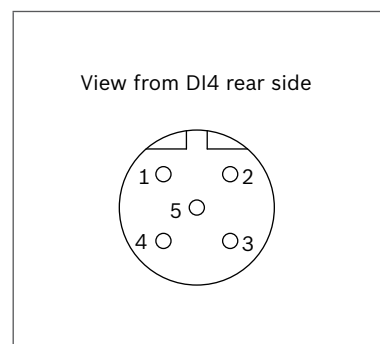
Ethernet connection (M12, D-coded)²⁾

Pin	Assignment
1	TD+
2	RD+
3	TD-
4	RD-



Video connection (M12, B-coded)²⁾

Pin	Assignment
1	Video signal +
2	Switching output
3	Camera supply +
4	Camera supply -
5	Video signal GND



Tightening torque of the M12 × 1 for connector ports: 0.6 Nm

1) To assure the correct functionality of the product, both pins GND and CARGND have to be connected.

2) M12 sockets at the time of delivery are sealed with a protection cap. As long as no connectors are coupled, the protection caps need to remain mounted (hand-screwed).

Accessories

The following accessories are available at Bosch Rexroth for commissioning, operation and service:

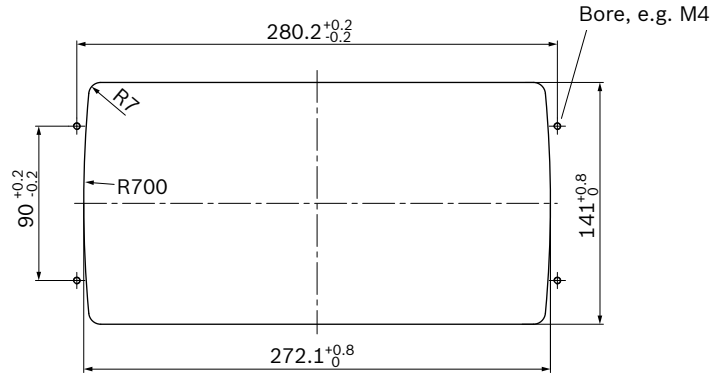
Designation	Order number
Mounting frame for DI4	R917010011
DI4 developer wiring harness set including Ethernet USB adapter ¹⁾	R917010012
DI4 video cable	R917010013
DI4 Ethernet cable ¹⁾	R917010014
DI4 RAM Mount® set	R917010015
DI4 USB port set	R917010016
DI4 main connector set	R917010017
DI4 demo setup ¹⁾	R917010019
BODAS camera STD	R902109630
BODAS cameraPRO	R902603837
BODAS camera connection cable	R902603838

¹⁾ Suitable for development only – not for series installation

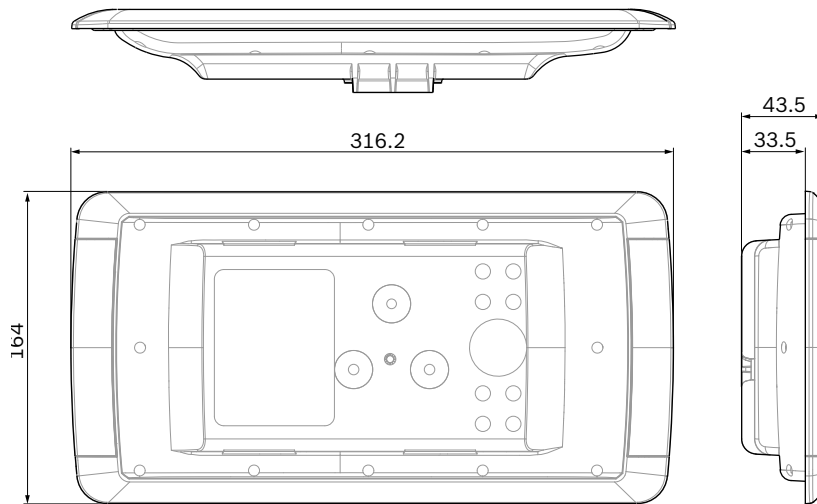
Mounting frame (R917010011)

Material for fixation of the mounting frame inside the dashboard is not scope of delivery.

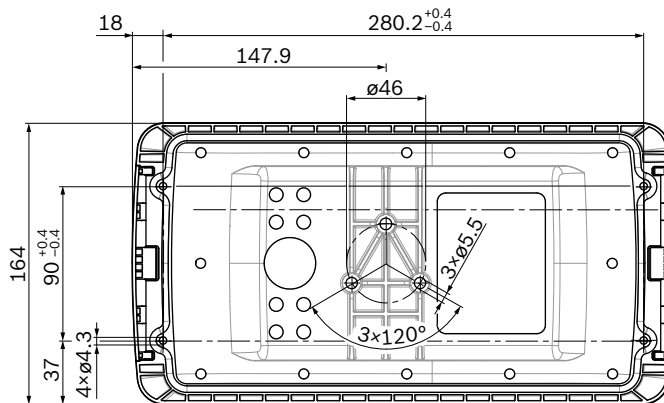
Recess



Front and side view



Back



For the mounting of the assembly frame the screw heads may not exceed a diameter of maximum $\varnothing 10.5$ mm and a maximum height of 3.4 mm. The recess and the material around need to be sufficiently stiff against deflection and must not increase vibrations.

BODAS camera (R902109630 or R902603837)



Transmission of video signals, for example for workspace monitoring. BODAS cameras are available in the Standard or PRO versions. For additional details, see data sheet 95280.

DI4 Ethernet cable (R917010014)¹⁾



The Ethernet cable consists on the one end of a RJ45 connector and on the other end of a M12 connector, male, 4-pin angular connector, D-coded according to EN61076-2-101. Length approx. 1 m.

DI4 video cable (R917010013)



Video camera mating connector for connection to the wiring harness. The video cable consists of a M12 connector, male, 5-pin, B-coded according to EN61076-2-101 and shows on the opposite side of the cable tin-plated tails. The cable is shielded. Length: approx. 1.5 m

DI4 RAM Mount® set (R917010015)



The set used for display installation the vehicle installation consists of 2x RAM®202U (RAM 2.5 inch round base mit AMPS hole pattern and 1.5 inch ball), one RAM-201U (double socket arm for 1.5" ball bases) and the corresponding screws.

¹⁾ Suitable for development only – not for series installation

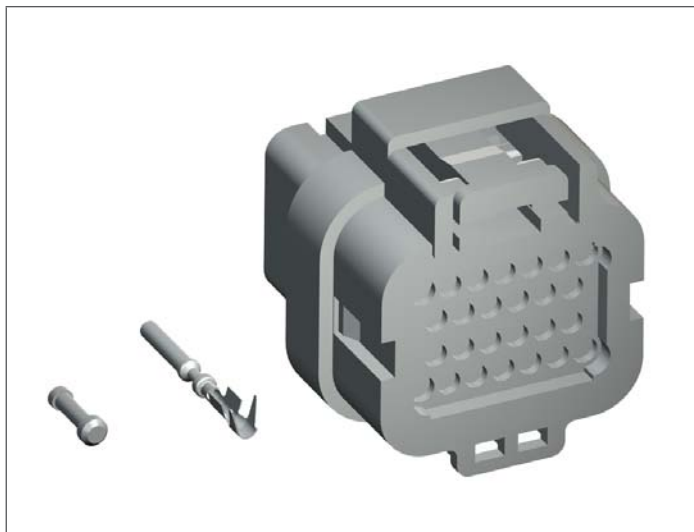
DI4 USB socket set (R917010016)



Port for access to the BODAS display and controller via USB, port via wiring harness.

- ▶ USB 2.0 plug connector, IP67, approximately 1 m of cable with tin-plated tails
- ▶ Dust protection cap with chain
- ▶ Counter nut including seal (IP67)

Main connector set (R917010017)



Main connector including 26-pin connector housing, contacts and sealing for the manual connector/cable assembly.

Demo case (R917010019)¹⁾



The DI4 demo kit consists of one DI4 PRO, developer cable harness, ethernet-cable, ethernet-usb-adapter, power supply unit, RAM Mount®, BODAS camera including a suitable camera cable and documentation placed inside an aluminum case.

¹⁾ Suitable for development only – not for series installation

Additional offer and sales conditions for used and contained software in the DI4

Open source software

- ▶ The DI4 software contains open source software and third party software under royalty-free licenses (“OSS”). The OSS scope that is used or is available at the time of market launch is in listed in an OSS appendix. If changes occur to the OSS scope over the service life of the product, the OSS system will be updated accordingly. A complete list of all the OSS used, depending on the development and production of the offered DI4, is available on request and will be delivered with the product as part of the Rexroth software package.
- ▶ The OSS included in the DI4 is subject to OSS license agreements (“OSS licenses”). Under these OSS licenses, Bosch Rexroth is obliged to pass on the conditions of these to you. You must comply with these terms and conditions and with the relevant obligations, unless you use the OSS in any manner other than simply installing it and allowing it to run internally on your machines, for example continuing to dispose of the product, for example by distributing it, selling it or otherwise transferring it to third parties. Should you distribute a copy of the product to third parties, the conditions granted under the OSS licenses applying to distribution shall apply (in some cases, the OSS license grants a direct license from the author/licensor of the OSS to the third party). Where there are numerous OSS licenses, Bosch Rexroth can neither grant you rights for these nor obtain such rights on your behalf. The applicable OSS licenses are available at the web address of the respective OSS provider or from Bosch Rexroth on request.
- ▶ You must, either expressly or in an implied manner, accept the applicable OSS licenses and take responsibility for complying with the applicable OSS licenses. You must also agree that updates or new versions of the software of product may contain different or additional OSS or changes to the OSS licenses. Bosch Rexroth will inform you of this fact at the time of delivery of updates, as well as of any additional or modified OSS licenses.
- ▶ The OSS itself has no effect on the retail price of the DI4 and is therefore made available free of charge.
- ▶ The sale of the DI4, unless otherwise agreed, does not include service or support by Bosch Rexroth with regard to the fulfilment of your obligations arising from the OSS licenses. Any such service or support provided by Bosch Rexroth shall require a separate agreement in which these services or support are specified and reasonable remuneration is paid for this purpose.

Written Offer

- ▶ This product contains software components that are licensed by the holder of the rights under GNU General Public License (GPL), GNU Lesser General Public License (LGPL) or any other Open Source Software license, which requires that source code be made available.
- ▶ The source code of these software components is not already delivered together with this product. You can obtain the source code for these software components on a physical medium (CD or DVD) by submitting a written request to our open source office address listed below or by sending an email to open.source@boschrexroth.de. When sending such a request, please name the relevant product and the date of purchase of the same.
Bosch Rexroth AG Open Source Office
Zum Eisengießer 1, 97816 Lohr am Main Germany
- ▶ We may charge you a fee to cover the cost of physical media and processing. You may send your request (i) within three (3) years from the date you received the product that included the binary that is the subject of your request or (ii) in the case of code licensed under the GPL v3 for as long as Bosch Rexroth offers spare parts or customer support for that product.

Bosch Rexroth BODAS-service

- ▶ Bosch Rexroth grants the customer the non-exclusive right to use the preinstalled BODAS-service diagnosis- and flash-software as single license exclusively with the DI4-unit (target hardware) acquired.
- ▶ This right of use is limited to the agreed period, if there is no such agreement the right of use is for an indefinite period.
- ▶ The “Supplementary Terms of Delivery (License Terms) for the Sale of Software of Bosch Rexroth AG (Version: 09.10.2017)” are to be observed.

Codesys Runtime-System

- ▶ By acquiring the product the user for indefinite period receives a single and non-transferable right to use the delivered Codesys Software.
- ▶ The conditions are defined with the “License Agreement for the Usage of the PLC Development System COD-ESYS” released by 3S-Smart Software Solutions GmbH, 87439 Kempten, Germany.

Cryptographic Software

- ▶ This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>).
- ▶ The special OpenSSL license agreement, which is provided as part of the Rexroth Software-package with the product or sent separately on special request, strictly needs to be observed.
- ▶ This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).
- ▶ This product includes cryptographic software written by Tim Hudson (tjh@cryptsoft.com).

Export Restrictions

- ▶ You acknowledge that Software is subject to export restrictions of various countries.
- ▶ In addition, you agree that you will comply with all applicable international and national laws that apply to the software, including all applicable laws and regulations with respect to export restrictions.

Safety instructions

General instructions

- ▶ The proposed circuits do not imply any technical liability for the system on the part of Bosch Rexroth.
- ▶ Work on the PC with CODESYS development environment measuring adapter in connection with a control unit or display in a machine or a vehicle may only be performed during commissioning of the machine were during service work. Appropriate safety measures must be provided against hazards caused by unexpected operational states.
- ▶ Changing parameters or loading (flash-programming) software onto the BODAS display DI4 may only be performed by trained and experienced specialists who are suitably familiarized with both the components used and the complete system.
- ▶ When performing flash-programming, the user is responsible for ensuring that the software to be flash-programmed is compatible with the BODAS display hardware for the vehicle in question.
- ▶ The unexpected reset of the device could be caused by a watchdog failure. This safety mechanism can be caused by overload, malfunction of the device or undervoltage of the supply.
The root cause needs to be determined and remedied before the device/ system is used again.
- ▶ Permanent high CAN bus load has to be avoided for consistent and reliable operation. A validation of the bus load should be determined in the overall system structure by the OEM.
- ▶ Faulty programming of the BODAS display DI4 may lead to dangers in the running operation of the machine. It is the responsibility of the machine manufacturer to identify hazards of this type in a hazard analysis and to bring them to the attention of the end user. Bosch Rexroth shall assume no liability for dangers of this kind.
- ▶ The display firmware and/or the board support package (BSP) must be installed and removed by Bosch Rexroth or by an authorized partner concerned in order to uphold the warranty.
- ▶ Unused connection ports are fitted with protection caps. If a mating plug or connection will not be used, the protection caps must be installed. (Ensure the O-ring is installed on the cap assembly and that the cap is tightened manually)

- ▶ Opening, modifying or repairing the BODAS display DI4 are prohibited. Modifications or repairs to the wiring could lead to dangerous malfunctions. Repair work on the BODAS display DI4 may be carried out by Bosch Rexroth or by suitable contracting partners.
- ▶ Make sure that the BODAS display DI4 configuration does not lead to safety-critical malfunctions of the complete system in the event of failure or malfunction. This type of system behavior may lead to danger to life and/or cause much damage to property.
- ▶ Ensure that the product has been tested by sufficient validation within the overall system, taking into account all possible combined ambient conditions and considering both normal use and misuse.
- ▶ When using cameras in conjunction with the BODAS display DI4, please note that the picture display can cause distortion, depending on the curvature of the camera lens (fish-eye effect). There may be decelerations in image response times when the processor workload is high. Take adequate account of these boundary conditions when planning and operating your system.
- ▶ Interference to the video picture may occur when operating the DI4 with NTSC cameras in rooms with 50 Hz lighting. This is not a device fault.
- ▶ System developments, installations and commissioning of electronic systems for controlling hydraulic drives must only be carried out by trained and experienced specialists who are sufficiently familiar with both the components used and the complete system.
- ▶ While commissioning the BODAS display DI4 respectively during use of the DI4 supported BODAS-service functionality, the machine may pose unforeseen hazards. During system commissioning or during use of the offered BODAS-service functionality, you must ensure that the vehicle and the hydraulic system are in a safe condition.
Use of the BODAS-service function for flashing DI4 or RC-controllers is only allowed during machine stand-still and maintenance activities.
- ▶ Make sure that nobody is in the machine's danger zone.
- ▶ No defective or incorrectly functioning components may be used. If the components should fail or demonstrate faulty operation, repairs must be performed immediately.
- ▶ No compressed air must be blown into the openings of the device (explosion risk).
- ▶ The back and the front glass of the display in particular may become hot during operation. There is a risk of burns.
- ▶ Noise hazards may occur through the integrated loudspeakers or with using the audio out signal, particularly at a short distance from the speaker. The overall system must be designed and verified to ensure that no health hazard is possible, even at the maximum level.
- ▶ The brightness of the status LEDs, buttons and encoder lighting, as well as the display brightness, must be so selected that no hazardous glare occurs. This can be done via manual level setting or by using the ambient light sensor. A time-delayed adjustment of the lighting level must be ensured when the ambient light sensor is used.
- ▶ The device must be taken out of service immediately if a smoke/vapor emission fault is observed.

Notes on the installation point and position

- ▶ Do not install the BODAS display DI4 in the vicinity of parts that generate considerable heat (e.g. the exhaust). Increased temperatures have a negative effect on the service life of the product.
- ▶ To avoid the risk of strokes of lightning do not mount the BODAS Display DI4 at exposed positions on the machine.
- ▶ The wiring harness should be attached mechanically in the area in which the BODAS display DI4 is installed (spacing < 150 mm).
Cables out of specification or too long cables can lead to improper stress on connections which can lead to failures. Ensure that connectors are securely latched in place and that the wiring and connectors are protected against moisture and water. For outdoor applications the main mating connector needs to have sealing plugs in unused pin locations and rear boot to prevent water ingress.
- ▶ Radio equipment and mobile telephones must not be used in the driver's cab without a suitable antenna or near the control electronics.
- ▶ A sufficiently large distance to radio systems must be maintained.
- ▶ All connectors must be unplugged from the electronics during electrical welding and painting operations.
- ▶ Cables/wires must be sealed individually to prevent water from entering the device.
- ▶ Standing and permanently running water are not permitted anywhere near the front glass, the button bar or the pressure compensation element (DAE). Remind that the device cannot be controlled and read while it is in frozen condition and that it needs to be de-iced by self-heating before being used.

- ▶ The hole to the pressure compensation element at the backside of the DI4 needs to be covered in such a way that a mechanical damage of the membrane can be avoided while ensuring there is room for sufficient ventilation.
- ▶ The mounting frame of the display should be well secured against loosening or untightening.
- ▶ The mounting frame does not secure completely against water ingress. The recess and the material around need to be sufficiently stiff against deflection and must not increase vibrations.
- ▶ Attention should be paid to ergonomics requirements when positioning the display and configuring the display contents. It must be ensured that it is possible to work in a fatigue-free way at all times. Direct sunlight may decrease the readability of the display. We recommend that you use a location without direct sunlight and display content with a contrast level that is sufficiently high.
- ▶ Ensure that the screw connections are tightened to the specified tightening torque and are protected against unexpected loosening. Ensure that the DI4 cannot drop suddenly when the RAM-Mount® clamping screws are loosened. Appropriate measures for this must be taken.

Notes on transport and storage

- ▶ If it is dropped, the BODAS display DI4 may not be used any longer as invisible damage can have a negative impact on reliability or function.
- ▶ Impacts with hard objects on the case or integrated front glass could cause the case or glass to break. In such cases, the BODAS display DI4 must be replaced without delay.
- ▶ Contamination of the BODAS display DI4, and especially of the keyboard and rotary control, should be eliminated immediately to ensure correct function.
- ▶ Do not expose the case or keyboard to extremely acidic or alkaline substances. Avoid prolonged contact with oils and grease.
- ▶ Only use clean water and a damp cloth to clean the front glass and keyboard.
- ▶ When cleaning the BODAS display DI4, do not use any coarse or abrasive cleaning utensils.
- ▶ A sudden large increase in air pressure may cause the front glass to break or lead to leaks. Suddenly large decrease in air pressure may cause an explosion. Take appropriate measures in these cases, for example when the device is being transported by air.

Notes on wiring and circuitry

- ▶ The BODAS display DI4 and the cameras must be powered from the same network. Powering the camera from a port on the display is recommended.
- ▶ To improve the EMC relevant behavior especially regarding radiation, it can be necessary to energize all wires with ferrite rings.
- ▶ Wires to cameras are recommended to be shielded. The shielding must be connected to the electronics on one side or to the machine or vehicle ground via a low-resistance connection.
- ▶ Electric supply for BODAS display DI4 and cameras is to be considered from the same source. Most optimal the cameras are powered by the DI4.
- ▶ Cables to the electronics must not be routed close to other power-conducting wires in the machine or vehicle.
- ▶ The wiring harness should be fixated mechanically in the area in which the BODAS display DI4 is installed (spacing < 150 mm). The wiring harness must be secured so that in-phase excitation with the display occurs (e.g. at the display bolting point).
- ▶ If possible, lines should be routed in the vehicle interior. If the lines are routed outside the vehicle, make sure that they are securely fixed.
- ▶ Lines must not be kinked or twisted, must not rub against edges and must not be routed through sharp-edged ducts without protection.
- ▶ Lines are to be routed with sufficient distance from hot or moving vehicle parts.

Intended use

- ▶ The BODAS display DI4 is designed for use in mobile working machines with 12 or 24 Volt battery supply provided no limitations / restrictions are made to certain application areas in this data sheet.
- ▶ Operation of the BODAS display DI4 must generally occur within the operating ranges specified and released in this data sheet, particularly with regard to voltage, temperature, vibration, shock and other described environmental influences. The specified limits must not have a permanent effect.
- ▶ Use outside of the specified and released boundary conditions may result in danger to life and/or cause damage to components which could result in consequential damage to the mobile working machine.

Improper use

- ▶ Any use of the BODAS display DI4 other than that described in the chapter “Intended use” is considered to be improper.
- ▶ The BODAS display DI4 is not suitable for use in functions relevant to safety.
- ▶ The BODAS display DI4 respectively the integrated operating elements (softkeys, hardkeys, push-turn-control) are not allowed for functions that are used to control a machine movement.
- ▶ Do not assign safety-related functions to the function keys or the push-turn control of the display. Separate switches are always to be used to control functions relevant to safety, e.g. emergency-off switch for immediate or controlled stop of the system.
- ▶ Make sure that the display configuration does not lead to safety-critical display failures or display malfunctions of the complete system in the event of failure or malfunction. This type of system behavior may lead to danger to life and/or cause much damage to property.
- ▶ Use in explosive areas is not permissible.
- ▶ Damages which result from improper use and/or from unauthorized, interference in the component not described in this data sheet render all warranty and liability claims with respect to the manufacturer void.

More detailed information

- ▶ Additional information on the BODAS display DI4 can be found under www.boschrexroth.com/mobile-electronics under the heading “Display”.
- ▶ Important information on programming the DI4 (software relevant) can be found in the help file (part of the Bosch Rexroth software download package for DI4) and in the corresponding “readme”.
- ▶ Pay regular visits to our home page for the latest product information and information about updates.

Bosch Rexroth AG

Mobile Hydraulics
Glockeraustrasse 4
89275 Elchingen, Germany
Tel. +49 93 52 40 50 60
info.bodas@boschrexroth.de
www.boschrexroth.com

© Bosch Rexroth AG 2018. All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights. The data specified within only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.