

BODAS Display DI5



- ▶ 5, 7 and 10.1 inch multitouch color displays with up to 1280 × 800 pixels
- ▶ iMX6 processors solo and dual with 800 MHz
- ▶ 4 GB flash memory and up to 1 GB RAM

Features

- ▶ Communication:
 - Up to 4 × CAN 2.0B (CANopen, J1939)
 - 2 × USB 2.0
 - RS232
 - Automotive Ethernet (T1)
 - 1 × acoustic speaker, 1 × audio-out
 - Real-time clock
 - Wake up signal
- ▶ Visualization
 - Adaptive brightness with light sensor
 - Anti-fogging display (optical bonding)
 - 1 × multicolor LED
- ▶ 12 V and 24 V supply
- ▶ Protection class IP 66
- ▶ Temperature: -30 ... +75 °C
- ▶ Freely programmable visual HMI
 - Composition of display content, operating element functions and behavior with CODESYS V3.5 development environment, C/C++ and Qt-Linux
- ▶ Flexible installation portrait or horizontal
- ▶ Integration into dashboard (mounting frame)
- ▶ CE conformity

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Type code

01	02	03	04
DI	5	–	–

Type

01	Display	DI
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Version

02	Generation	5
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Screen size

03	Screen size 5"	5
	Screen size 7"	7
	Screen size 10"	10

Version

04	Standard	STD
	CODESYS	CODESYS

Note:

The BODAS DI5 is not functional without prior programming. A project must be created with the CODESYS V3.x development environment (PC tool from 3S-Smart Software Solutions GmbH), Qt or C/C++ and transferred onto the DI5. A [software package](#) containing the DI5 development tools for both the Codesys and Qt environments is provided by Bosch Rexroth AG.

Designation	Material number
DI5-5 STD	R917014449
DI5-7 STD	R917014450
DI5-10 STD	R917014451
DI5-5 CODESYS	R917014459
DI5-7 CODESYS	R917014460
DI5-10 CODESYS	R917014461

Description

With the BODAS DI5 display family Bosch Rexroth is offering freely programmable high-resolution 5, 7 and 10.1 inch color multitouch displays with a powerful 800 MHz processor.

Depending on the programming, the displays enable, 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 DI5 has been developed specifically for use in mobile working machines and satisfies the relevant 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 brightness is adjustable. If desired, an ambient light sensor automatically adjusts the backlighting. The front-glass of the display has 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 or Qt programming environment. The integrated LEDs and the loudspeakers can be used as enhanced status indicators.

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 (2 weeks).

All displays are equipped with an automotive Ethernet interface.

The DI5 display can be flashed through three different methods:

- ▶ From a PC, using an Ethernet cable with a USB adapter, which plugs into the side USB port of the DI5. The Ethernet adapter is required to provide a network point, which is later configured in the PC settings (set IP and MAC address). Optionally, a second Ethernet-USB adapter can be added to use a USB port instead of the Ethernet port of the PC.
- ▶ From a PC, using an M-12 to Ethernet cable with a 100BASE-T1 media converter. The DI5 uses automotive Ethernet and therefore an adapter is required to connect it to the PC Ethernet port.

- ▶ Using a USB flash drive containing the pre-compiled software, which is plugged into the USB port of the DI5, which later needs to be started in service mode for starting the flashing process.

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

Programming

The DI5 is freely programmable using C/C++, Qt-Linux or CODESYS V3.x 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. The DI5 Developer Guide RE95273-50 is available as a support for programming in C/C++.

Each display page can be freely composed by the user on a PC in terms of the design, arrangement and number of elements. CODESYS Visualization 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 DI5-specific software packages are available on request 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 stand-alone device within the drivers cab. 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.

DI5 Toolbox

DI5 Toolbox enables the DI5 to be used as the gateway access to the BODAS RC/40 controllers to be used as a diagnostic and service interface for configuring and flashing software on the controllers or on the DI5 display itself. Parameters stored in the controllers can be read out, changed and written back via the CAN interface of the DI5. The visualisation of the active and stored J1939 DM1/DM2 errors of a BODAS RC/40 controller as well as the resetting of the errors are possible using the DI5 Toolbox via the DI5.

The DI5 Toolbox is part of the DI5 software package which is available in [myRexroth](#).

For questions regarding access authorisation, contact Onboarding.BODAS@boschrexroth.de

Technical data

Type	DI5-5 STD	DI5-5 CODESYS	DI5-7 STD	DI5-7 CODESYS	DI5-10 STD	DI5-10 CODESYS
Housing	Aluminium die cast powder coated					
Mounting	Landscape or portrait Standalone In-dash					
Display	TFT Color graphic LCD with LED backlight					
Type	TFT Color graphic LCD with LED backlight					
Size	5", 108 mm × 64.8 mm		7", 152.4 mm × 91.44 mm		10.1", 259 mm × 175 mm	
Resolution	800 x 480 px (WQVGA), 15:9		800 x 480 px (WQVGA), 15:9		1280 x 800 px (WQVGA), 15:9	
Colors	16.7 Mio					
Brightness (typical)	800 cd/m ²		800 cd/m ²		1000 cd/m ²	
Contrast ratio (typical)	700:1		700:1		800:1	
Input devices						
Touch	Capacitive touch					
Indicators and sensors	Light sensor 1 multicolor LED					
Electronics						
Processor platform	CPU	Freescle I.MX6®, 800 MHz	Freescle i.MX6®, 800 MHz Dual	Freescle i.MX6®, 800 MHz Dual		
	Mass storage (minus space for OS & application)	4 GB	4 GB	4 GB		
	RAM	512 MB	1 GB	1 GB		
	RTC	Buffered by gold cap Buffered for 2 weeks at tambien deviation max. 1 s/day				
Speaker	Up to 90 dB @ 10 cm distance (max. @ ~8kHz)					
Audio	1 x Audio output (left, right, GND) AC97 compatible Output power: approx. 50 mW					
Silent wake input	Input which can be used for silent-wake-on of the DI5 to reduce visible boot-time active on positive edge					
Power supply	System supplied through terminal 30 (battery +, see pinout) and 31 (battery -, see pinout) Terminal 15 (ignition) to be used to switch on/off					
	Operating voltage range	8 ... 36 V DC				
	Short circuit protection	Available				
	Over-voltage protection	Up to 48 V for max 5 min				
	Inverse polarity protection	Up to -48 V DC for max 5 min				
Connectors						
Main	Typo-AMP 1437288-6		Typo-AMP 1437288-6		Typo-AMP 1437288-6	
Mating connector (customer)	Typo-AMP 3-1437290-7		Typo-AMP 3-1437290-7		Typo-AMP 3-1437290-7	
Mating crimp contact (customer)	Typo-AMP 3-1447221-4		Typo-AMP 3-1447221-4		Typo-AMP 3-1447221-4	
Dummy Plug (customer)	Typo-AMP 4-1437284-3		-		Typo-AMP 4-1437284-3	
Video connector	M12 round connector, female, 5-pole, B-coded acc. to EN 61076-2-101					
Ethernet connector	M12 round connector, female, 4-pole, D-coded acc. to EN 61076-2-101					
Weight	660 g		775 g		1400 g	
Energy consumption	Current at					
Power mode	12 V	24 V	12 V	24 V	12 V	24 V
On	≤ 775 mA	≤ 380 mA	≤ 1200 mA	≤ 600 mA	≤ 1700 mA	≤ 850 mA
Sleep	≤ 85 mA	≤ 50 mA	≤ 110 mA	≤ 60 mA	≤ 160 mA	≤ 85 mA
Off	≤ 5 mA	≤ 4 mA	≤ 5 mA	≤ 4 mA	≤ 5 mA	≤ 4 mA

Type	DI5-5 STD	DI5-5 CODESYS	DI5-7 STD	DI5-7 CODESYS	DI5-10 STD	DI5-10 CODESYS
Interfaces						
CAN bus (according to ISO 11898)	2 × CAN-Interface		2 × CAN-Interface		4 × CAN-Interface	
CAN-specification	2.0 B active, up to 1 Mbit/s (default 250 kbit/s, possible 10 kbit/s, 20 kbit/s, 50 kbit/s, 83.3 kbit/s, 111.1 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s)					
RS232	1 × RS232-Interface					
Type	EIA232 (only RXD, TXD, GND)					
Speed	max. 115.200 kbps					
USB	Host 2.0					
Side connector	1 × Type A high speed guaranteed 900 mA @ 5V					
Back connector	1 × Type A high speed Guaranteed 900 mA @ 5V					
Ethernet interface	1 × Automotive Ethernet interface					
Video interface (PAL and NTSC format/standard)	1 × analog video input, 1 Vss	1 × analog video input, 1 Vss	1 × analog video input, 1 Vss	2 × analog video input, 1 Vss	2 × analog video input, 1 Vss	
	Camera control output (open drain) for special functionality (mirror, shutter, heating etc.) Camera supply output guaranteed 300 mA @ 12 VDC					
Software						
Operating system	Linux Kernel 4.14.0 or higher		Linux Kernel 5.43.53 or higher		Linux Kernel 4.14.0 or higher	
Application programming	-	CODESYS 3.x	-	CODESYS 3.x	-	CODESYS 3.x
	Qt					
	C/C++					
	ISO-VT		ISO-Horizon		ISO-Horizon	

Electrical		
Inverse polarity resistance	5 min @ -48 V (no defect)	
Over voltage resistance	5 min @ +48 V (no defect)	
Start behavior	Start over temperature Start at T_{Room} ; decrease in 5° steps to T_{min} ; go to T_{Room} ; increase in 5° steps to T_{High} ; Start DUT at each T ; Successful start expected	
Short circuit strength	Connect each pin of main, video and Ethernet connector for 5 min to GND and for 5 min to 36 V; FS: C	
Superimposed alternating voltage	Triangle signal, frequency sweep: 50 Hz-25 kHz-50 Hz inside 60 s; FS: A	
Level	12 V system	24 V system
AC peak-to-peak UPP1	1 VAC	4 VAC
AC peak-to-peak UPP2	2 VAC	4 VAC
AC peak-to-peak UPP3	3 VAC	10 VAC
De-/increase supply voltage	Sweep voltage $U_{Min}-0V-U_{Min}$ with 0.5 V/min; FS: D	
Drop in supply voltage	12 V system	24 V system
	$U_{Start} = U_{min}; U_S = 4.5 V$	$U_{Start} = U_{min}; U_S = 9 V$
	td = 100 ms; FS: B	td = 100 ms; FS: B
Battery less operation	$U_1 = 10 V; U_2 = 18 V;$	$U_1 = 20 V; U_2 = 38 V;$
	t = 5 min; FS: A	t = 5 min; FS: A

Mechanical			
Vibration, noise 32 h per axis; FS: A	Frequency [Hz]	PSD [(m/s²)/Hz]	
	10	20	
	20	36	
	30	36	
	141	1.64	
	200	1.93	
	300	1	
	2000	1	
Vibration, sinusoidal Resonance sweep 1 Octave/minute, 30 min per resonance	Frequency	Displacement	Acceleration
	2 Hz	+/- 1 mm (2 mm PtP)	(0.016 g)
	10 Hz	-	2 g
	2000 Hz	-	2 g
Endurance test 0.5 Octave/minute, 8 h per resonance. FS: A	Frequency	Displacement	Acceleration
	5 Hz	+/- 0.75 mm (1.5 mm PtP)	(0.075 g)
	57.5 Hz	-	-
	2000 Hz	-	5 g
Mechanical shock			
Part 1	300 m/s ² , 18 ms, 10 times per axis/direction; FS: A		
Part 2	500 m/s ² , 11 ms, 3 times per axis/direction; FS: A		
Part 3	500 m/s ² , 6 ms, 10 times per axis/direction; FS: A		
Part 4	400 m/s ² , 6 ms, 4000 times per axis/direction; FS: A		
Drop test	Drop the DUT on each side and each edge from a high of 1 m on a concrete floor. No damage or visible damage.		
Package			
Drop test	Drop the DUT inside the package on each side and each edge from a high of 1m on a concrete floor. No damage of the DUT No cracks to the package		

Testing and verification

CE Compliance		
EU Directive 2014/30/EU (EMC)		
according to	EN 13766-1 ¹⁾	Earth-moving and building construction machinery – electromagnetic compatibility (EMC) of machines with internal electrical power supply - Part 1: General EMC requirements under typical electromagnetic environmental conditions
	EN 13309 ²⁾	Construction machinery – electromagnetic compatibility of machines with internal electrical power supply
	EN ISO 14982	Agricultural and forestry machinery – electromagnetic compatibility – test methods and acceptance criteria
	EN 12895	Materials handling equipment – electromagnetic compatibility
	EN 50498	Electromagnetic compatibility (EMC) Product family standard for aftermarket electronic equipment in vehicles
	EN 61000-6-2	Electromagnetic compatibility (EMC) Generic standards – immunity for industrial environment
	EN 61000-6-4	Electromagnetic compatibility (EMC) Generic standards – emission standard for industrial environment

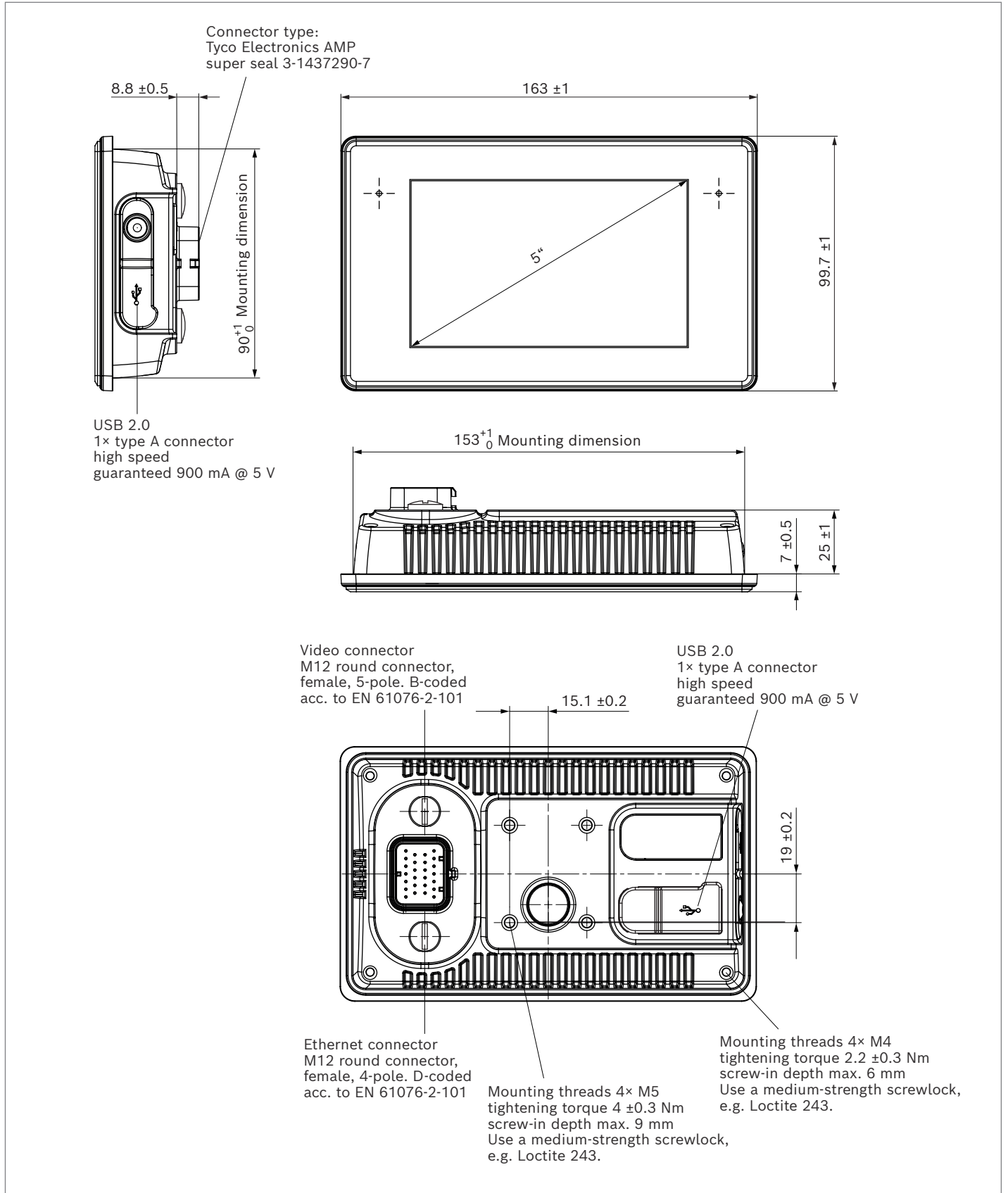
EMC Emission radiated		
30 ... 75 MHz	62 ... 52 ¹ dB (μV/m) – QP – 120 kHz 52 ... 42 ¹ dB (μV/m) – AV – 120 kHz	
75 ... 400 MHz	52 ... 63 ² dB (μV/m) – QP – 120 kHz 42 ... 53 ² dB (μV/m) – AV – 120 kHz	
400 ... 1000 MHz	63 dB (μV/m) – QP – 120 kHz 53 dB (μV/m) – AV – 120 kHz	
1000 ... 2500 MHz	73 dB (μV/m) – P – 120 kHz 53 dB (μV/m) – AV – 120 kHz	
2500 ... 6000 MHz	80 dB (μV/m) – P – 1000 kHz 60 dB (μV/m) – AV – 1000 kHz	
EMC Immunity radiated		
	20 MHz to 800 MHz with amplitude modulation 800 MHz to 6 GHz with pulse modulation 30 V/m for the radiated field (absorber lined chamber) testing method (ISO 11452-2) in vertical and horizontal polarization	
OR/AND	60 mA for the bulk current injection (BCI) testing method (ISO 11452-4)	
EMC Emission conducted	12 V system (maximum values)	24 V system (maximum values)
Positive slow pulses	+37 V	+37 V
Negative slow pulses	-75 V	-150 V
Positive fast pulses	+75 V	+150 V
Negative fast pulses	-112 V	-150 V
Test pulse 1	$U_s = 112$ V; FS: C	$U_s = 450$ V; FS: C
Test pulse 2a	$U_s = +55$ V; FS: B	$U_s = +55$ V; FS: B
Test pulse 2b	$U_s = +10$ V; FS: C	$U_s = +20$ V; FS: C
Test pulse 3a	$U_s = -165$ V; FS: A	$U_s = -220$ V; FS: A
Test pulse 3b	$U_s = +112$ V; FS: A	$U_s = +220$ V; FS: A
Test pulse 4 (Starting profile)	$U_{s6} = 6$ V; $U_s = 6.5$ V FS: B	$U_{s6} = 6$ V; $U_s = 10$ V FS: B
Load dump	$U_s = +79$ V; FS: C	$U_s = +151$ V; FS: C
Electrostatic discharge	+/- 8 kV contact discharge; FS: A +/- 15 kV air discharge; FS: A	
EMC Susceptibility conducted		
Frequency	150 kHz ... 80 MHz; U = 10 V; AM: 1 kHz, 80%; FS: A	
ISO 16750-2	Road vehicles – environmental conditions and tests for electrical and electronic equipment	
Burst	tr = 5 ns; td = 50 ns;	
Burst duration	15 ms	
Period	300 ms; t = 5 min; FS: B	
Power lines	US = +/- 2kV	
Signal lines	US = +/- 1kV	
Surge	tr = 1.2 us; td = 50 us	
Amount	5	
Wait time	60 s; FS: B	
Power lines	US = +/- 0.5 kV	
E1 – Type approval	EU Directive ECE R 10.4	
Protection level (IP Code)		
IP 66 according to ISO 20653	Road vehicles – degrees of protection (IP-Code) – protection of electrical equipment against foreign objects, water and access	
REACH according to regulation (EG) no. 1907/2006		
RoHS according to 2011/65/EU		
UKCA Certification		

QP: Quasi-peak **1:** Value decreases linearly with the logarithm of the frequency
 AV: Average **2:** Value increases linearly with the logarithm of the frequency
 P: Peak **FS:** Function Status

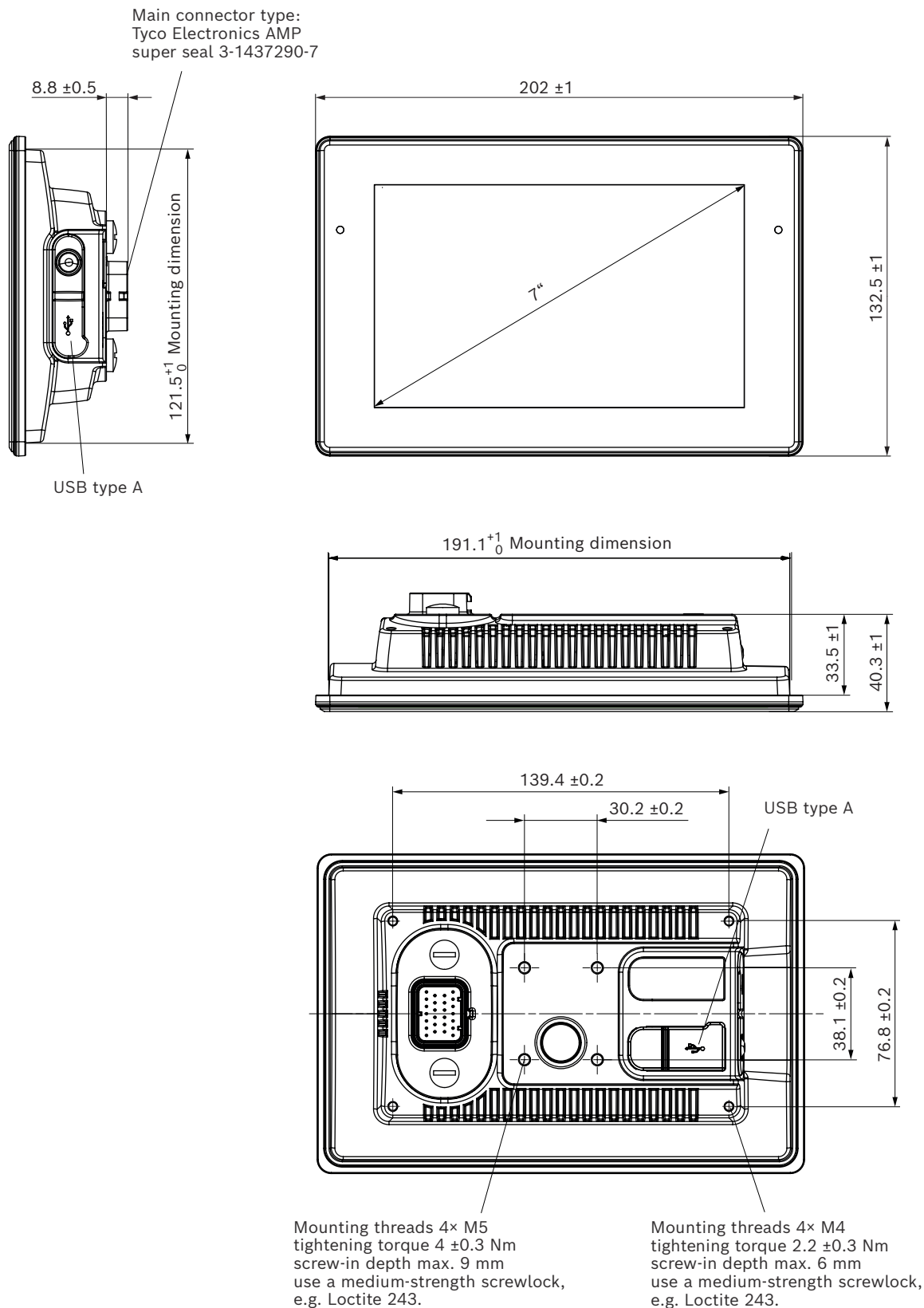
Climate	
Salt spray resistance	
Part 1	7 cycles at 24 h (8 h spraying; 16 h rest) salt concentration: 5%
Part 2	4 cycles at 168 h; 1 cycle:
Chemical resistance	<p>Apply once a day, for three days, the following chemicals with a brush over the exposed surface</p> <p>Inspect without rinsing immediately afterwards and after 100 h</p> <p>Alcohol, antifreeze liquid (ethyl glycol), diesel oil, domestic ammonia, gasoline, hydraulic oil 10W40, liquid lime, motor oil, NPK chemical fertilizers 20 10 20, windscreen cleaning mixture, ammonium nitrate and ammonium phosphate fertilizers, bovine effluent - (up to 5% propionic acid), diesel fuel, STOU (Super Tractor Universal Oil) lubricating oil</p>
Damp heat steady	21 days @ +40 °C and 93% r.H.; FS: C
Damp heat cyclic	6 cycles (each 24 h); $T_{Low} = +25\text{ °C}$; $T_{High} = +55\text{ °C}$
Humidity	$\geq 93\%$ r.H.; FS: A
Temperature/humidity cyclic	10 cycles (each 24 h); $T_{Low} = -10\text{ °C}$; $T_{High} = +65\text{ °C}$
Humidity	80...96% r.H. or uncontrolled.; FS: A
Operating temperature	24 h @ -30 °C ; FS: A 96 h @ $+75\text{ °C}$; FS: A Max. value with reduced backlight brightness
Storage temperature	24 h @ -40 °C ; FS: C 48 h @ $+85\text{ °C}$; FS: C
Temperature cycling	30 cycles (each 8 h); $T_{Low} = -30\text{ °C}$; $T_{High} = +75\text{ °C}$; FS: A
Temperature shock	100 cycles (each 2 h); $T_{Low} = -30\text{ °C}$; $T_{High} = +75\text{ °C}$; $T_{change} < 30\text{ s}$; FS: C
UV resistance	
Overall time	1500 h
Cycle	8 h UV at $+60\text{ °C}$, 4 h 95% r.H. No material damage, no visible change

Dimensions

Display DI5-5

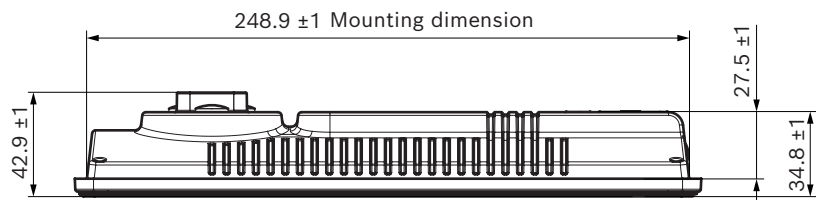
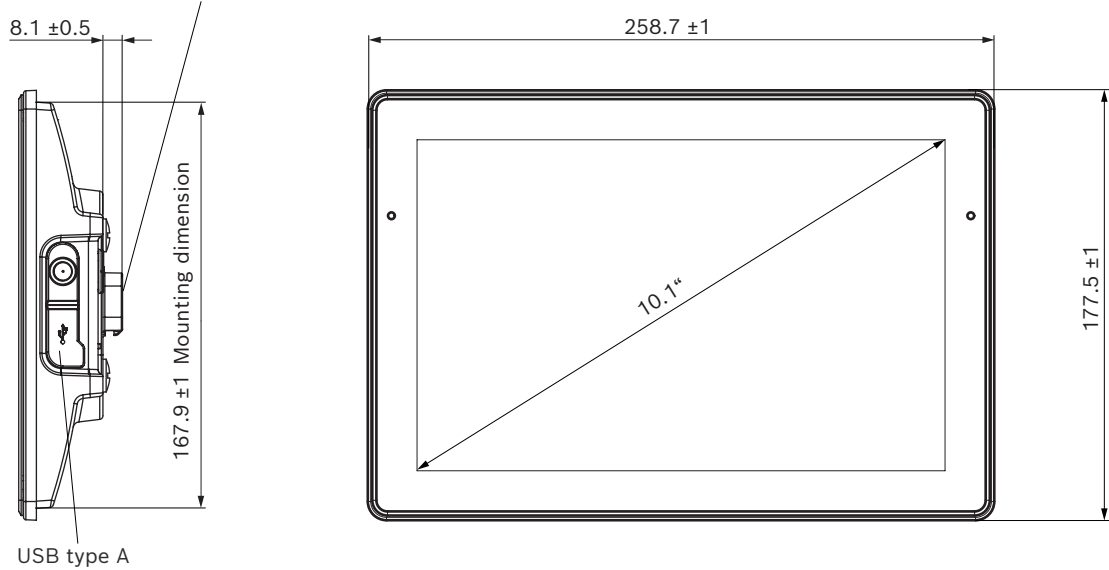


Display DI5-7

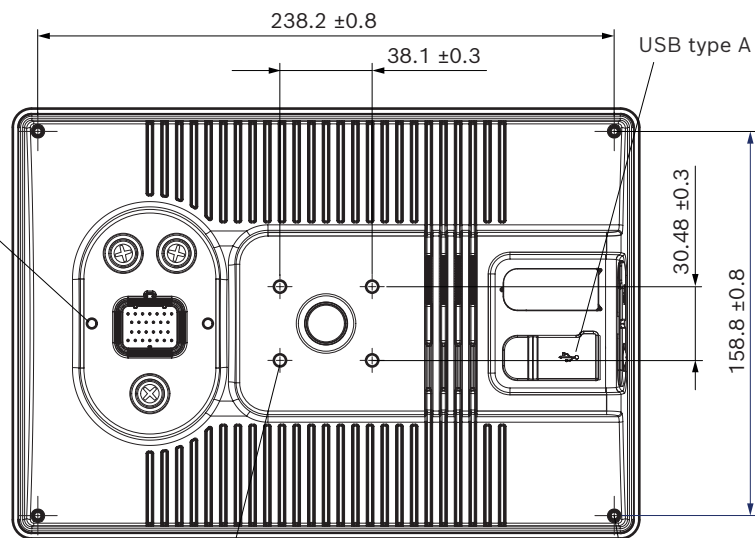


Display DI5-10

Connector type:
Tyco Electronics AMP
super seal 3-1437290-7



Mounting threads 2× M2
tightening torque 1.9 ± 0.3 Nm
screw-in depth max. 7 mm
use a medium-strength screwlock,
e.g. Loctite 243.



Mounting threads 4× M5
tightening torque 4 ± 0.3 Nm
screw-in depth max. 9 mm
use a medium-strength screwlock,
e.g. Loctite 243.

Mounting threads 4× M4
tightening torque 2.2 ± 0.3 Nm
screw-in depth max. 8 mm
use a medium-strength screwlock,
e.g. Loctite 243.

Connectors on the display

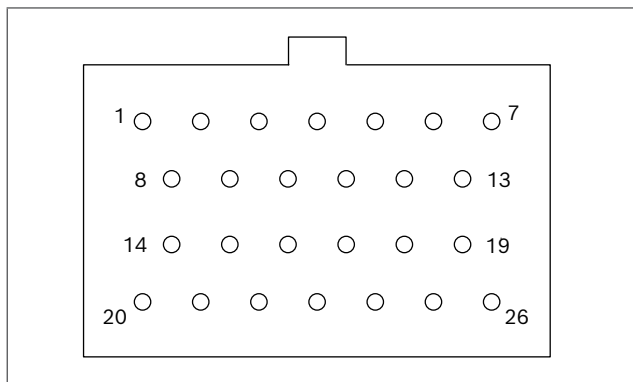
Main connector pinout DI5-5 and DI5-7

Pin	Assignment	Description
1	VCC	Supply voltage + (terminal 30)
2	Ignition input	Ignition input (terminal 15)
3	GND	Supply voltage – (terminal 31)
4	Wake	Wake input, “doorswitch”
5	Audio Out L	Audio line out, stereo
6	Audio Out R	Audio line out, stereo
7	Audio GND	Audio line out, ground
8	CAN1H	CAN 1 high
9	CAN1L	CAN 1 low
10	CAN2H	CAN 2 high
11	CAN2L	CAN 2 low
12	-	not connected
13	-	not connected
14	-	not connected
15	-	not connected
16	RS232 RxD	RS232 receive data
17	RS232 TxD	RS232 transmit data
18	RS232 GND	RS232 GND
19	-	not connected
20	-	not connected
21	-	not connected
22	-	not connected
23	SERV_EN	Service enable
24	-	not connected
25	-	not connected
26	-	not connected

Main connector pinout DI5-10

Pin	Assignment	Description
1	VCC	Supply voltage + (terminal 30)
2	Ignition input	Ignition input (terminal 15)
3	GND	Supply voltage – (terminal 31)
4	Wake	Wake input, “doorswitch”
5	Audio Out L	Audio line out, stereo
6	Audio Out R	Audio line out, stereo
7	Audio GND	Audio line out, ground
8	CAN1H	CAN 1 high
9	CAN1L	CAN 1 low
10	CAN2H	CAN 2 high
11	CAN2L	CAN 2 low
12	CAN3H	CAN 3 high
13	CAN3L	CAN 3 low
14	CAN4H	CAN 4 high
15	CAN4L	CAN 4 low
16	RS232 RxD	RS232 receive data
17	RS232 TxD	RS232 transmit data
18	RS232 GND	RS232 GND
19	-	not connected
20	-	not connected
21	-	not connected
22	-	not connected
23	SERV_EN	Service enable
24	-	not connected
25	-	not connected
26	-	not connected

▼ View on rear side of the DI5



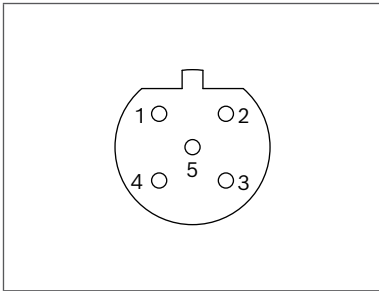
Video connector pinout

DI5-5, DI5-7 and DI5-10

Round connector, 5 pins, M12

1	Video signal +
2	Switching output
3	Power 12 V
4	Power GND
5	Video signal GND

▼ **Video connector, M12, female, 5 pins, B-coded,
View on rear side of the DI5**



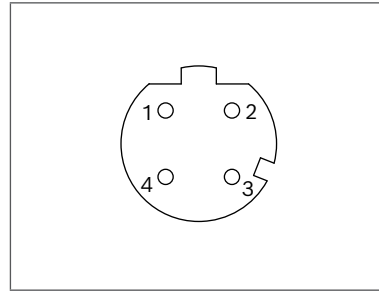
Ethernet connector pinout

DI5-5, DI5-7 and DI5-10

Automotive Ethernet Round connector, 4 pins, M12

1	D+
2	n.c.
3	D-
4	n.c.

▼ **Video connector, M12, female, 4 pins, D-coded,
View on rear side of the DI5**



Accessories

The following accessories are available at Bosch Rexroth:

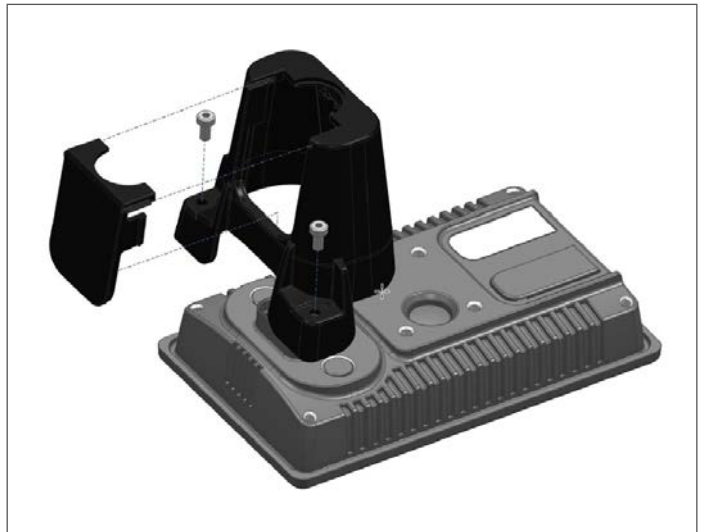
Designation	Order number
BODAS camera Standard	R902109630
BODAS camera Professional	R902603837
Cable camera	R917010013
RAM-Mount DI5-5 & DI5-7 set	R917014782
RAM-Mount DI5-10 & DI4 set	R917010015
Mounting frame DI5-5	R917014775
Mounting frame DI5-7	R917014776
Connector set DI5	R917010017
Connector Cover DI5-5 & DI5-7	R917014778
Cable Ethernet DI5	R917010014
USB socket DI5	R917014954
Developer wiring harness DI5	R917014784

Mounting frame DI5-5 (R917014775) and DI5-7 (R917014776)



Installation instructions mounting frame DI5-5 see RE95273-60-B and Installation instructions mounting frame DI5-7 see RE95273-61-B.

Connector Cover DI5-5 and DI5-7 (R917014778)



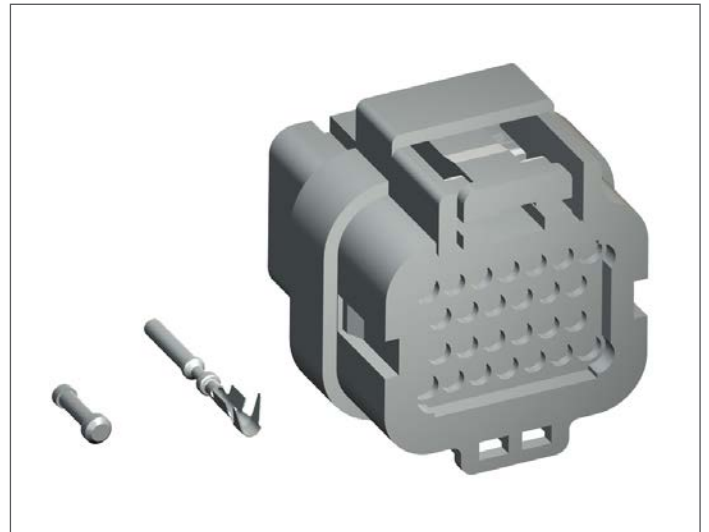
Connector Cover DI5-10 on request.

Cable camera (R917010013)



Cable 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. 5 m

Connector set DI5 (R917010017)



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

Cable Ethernet DI5 (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.

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.

¹⁾ Suitable for development only – not for series installation

RAM Mount® DI5-5 and DI5-7 set (R917014782)



The set used for display installation the vehicle installation consists of 1x RAM®103U (RAM round base with AMPS hole pattern and 1.0" ball as well as double socket arm for 1.0" ball bases), one RAM-347U (RAM square plate with AMPS hole pattern and 1.0" ball) and the corresponding screws.

RAM Mount® DI5-10 and DI4 set (R917010015)



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

USB socket DI5 (R917014954)



Port for access to the BODAS display and controller via USB

- ▶ USB 2.0 plug connector, approximately 1,5 m of cable
- ▶ Counter nut including seal.

Additional offer and sales conditions for used and contained software in the DI5

Open source software

- ▶ The DI5 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 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 DI5, is available on request and will be delivered with the product as part of the Rexroth software package.
- ▶ The OSS included in the DI5 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.
- ▶ The DI5 software contains open source software licensed under the LGPL-2.1 and GPL-2-0 (see folder / licenses in DI5 software package or license module for QT or CODESYS in DI5)

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- ▶ The source code version of some open source software is available under the terms of Mozilla Public License 1.0 (see folder / licenses in DI5 software package or license module for QT or CODESYS in DI5). To obtain it see Written Offer.
- ▶ 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 DI5 and is therefore made available free of charge.
- ▶ The sale of the DI5, 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.

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 CODESYS” 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/>)
- ▶ This product includes cryptographic software written by Eric Young (ey@cryptsoft.com)

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case of a licensing under the GNU General Public License version 3, the Affero General Public License version 3 or the GNU Lesser General Public License version 3.0 the offer remains valid as long as Bosch Rexroth offers spare parts or support for the product.

- The corresponding source code will include, to the extent required by the applicable license, all the source code needed to generate, install and (if it is an executable work) run the object code and to modify the work.
- Bosch Rexroth reserves the right to charge for performing the distribution of the corresponding source code the incidental costs of creating the data carrier (CD-ROM, DVD or USB memory stick) plus postage.
- Please state where the corresponding source code shall be sent to. Additional information to the product (e.g., product identification, serial number) would help us to identify the corresponding source code.
- ▶ For those software components or corresponding source code that are either licensed under Mozilla Public License (MPL) version 1.0, 1.1 or 2.0, the Common Development and Distribution License (CDDL) version 1.0, Nokia Open Source License (Nokia or NOKOS) Version 1.0a, Common Public Attribution License v.1.0 or fall under the exception of the Modified GPLv2 FreeRTOS License (Exception), the following applies:
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 - If Bosch Rexroth has modified preexisting source code, the corresponding source code of this modification will be provided (licensed under the terms of the applicable above-mentioned license) for at least 12 months after the first time it was made available to a third party, however at least 6 months after a subsequent version of the modification has been made available to a third party.
 - Please provide information to the product with which you have received the software components (e.g., product identification, serial number) in order to help us to identify the corresponding source code.

Safety instructions

General instructions

- ▶ Do not open the housing to avoid danger to high voltage. Before touching the electric assemblies make sure that the electricity is switched off completely. If the front panel is broken the device needs to be taken out of service due to risk of injury. If perceivable damages on the device exist that can compromise the functionality, it must be taken out of service due to the danger of malfunctions. These particularly include damages to the LCD display, damages to the keyboard, damages that compromise the protection level and damages to the encoder knobs.
- ▶ 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 DI5 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 DI5 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.
- ▶ Opening, modifying or repairing the BODAS display DI5 are prohibited. Modifications or repairs to the wiring could lead to dangerous malfunctions. Repair work on the BODAS display DI5 may be carried out by Bosch Rexroth or by suitable contracting partners.
- ▶ Make sure that the BODAS display DI5 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 DI5, 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 DI5 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 DI5 respectively during use of the DI5 Toolbox, the machine may pose unforeseen hazards.
During system commissioning or during use of the offered DI5 Toolbox functionality, you must ensure that the vehicle and the hydraulic system are in a safe condition. Use of the function for flashing DI5 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 and 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.

Mounting and Handling

- ▶ Do not use the cable as a handle to carry the device.
- ▶ Mounting in clean working environment only.
- ▶ Do not mount the device under the use of violence because it can cause damage.
- ▶ The device must be mounted by trained personnel only into especially designed and tested system.
- ▶ The device may not be opened or disassembled.
- ▶ The device is to be cleaned with a moist fuzz free cotton cloth. If necessary, a mild cleaning agent may be used. Do not use acid or abrasive cleaning agents.
- ▶ The device is to be stored in a cool and dry environment and to be protected against sunshine.
- ▶ If the environmental temperature is beneath 10 °C the reaction time of the display increases.

Notes on the installation point and position

- ▶ Do not install the BODAS display DI5 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 DI5 at exposed positions on the machine.
- ▶ 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.
- ▶ 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 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 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 DI5 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 DI5 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 DI5 must be replaced without delay.
- ▶ Contamination of the BODAS display DI5 should be eliminated immediately to ensure correct function.
- ▶ Do not expose 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.
- ▶ When cleaning the BODAS display DI5, 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 DI5 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 DI5 and cameras is to be considered from the same source. Most optimal the cameras are powered by the DI5.
- ▶ 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 DI5 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

- ▶ Operation of the BODAS display DI5 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 DI5 other than that described in the chapter “Intended use” is considered to be improper.
- ▶ The BODAS display DI5 is not suitable for use in functions relevant to safety.
- ▶ The BODAS display DI5 are not allowed for functions that are used to control a machine movement.
- ▶ 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.

Disposal

- ▶ Disposal of the display and packaging must be in accordance with the national environmental regulations of the country in which the display is used.

More detailed information

- ▶ Important information on programming the DI5 (software relevant) can be found in the help file (part of the Bosch Rexroth software download package for DI5) and in the corresponding “readme”.
- ▶ Pay regular visits to our home page for the latest product information and information about updates.

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