



Power Panel 15/21/35/41

User's Manual

Version: **2.3 (October 2011)**

Model No.: **MAPP01-E**

We reserve the right to change the contents of this manual without warning. The information contained herein is believed to be accurate as of the date of publication; however, Bernecker + Rainer Industrie-Elektronik Ges.m.b.H. makes no warranty, expressed or implied, with regards to the products or the documentation contained within this book. In addition, Bernecker + Rainer Industrie-Elektronik Ges.m.b.H. shall not be liable in the event of incidental or consequential damages in connection with or resulting from the furnishing, performance, or use of these products. The software names, hardware names, and trademarks used in this document are registered by the respective companies.





Chapter 1: General Information

Chapter 2: Introduction

Chapter 3: Power Panel 15

Chapter 4: Power Panel 21

Chapter 5: Power Panel 35

Chapter 6: Power Panel 41



Chapter 7: Accessories for PP21 / PP41

Chapter 8: Programming

Chapter 9: Maintenance / Servicing

Appendix A: Technical Appendix

Appendix B: Character Sets





Figure index

Table index

Index

Model number index



Chapter 1 • General Information	15
1. Manual history	15
2. Safety guidelines	16
2.1 Safety regulations	16
2.2 Introduction	16
2.3 Intended use	17
2.4 Transport and storage	17
2.5 Mounting	17
2.6 Operation	17
2.6.1 Protection against touching electrical parts	17
3. Organization of safety notices	18
4. Standards	18
5. Material number / serial number	18
Chapter 2 • Introduction	19
1. Features	19
1.1 General	19
1.2 Additional features of the PP21/PP41	19
2. Overview	20
3. Typical topology - distributed systems	21
3.1 PP15 / PP35	21
3.2 PP21 / PP41	22
Chapter 3 • Power Panel 15	23
1. Types	23
2. Power Panel 15-01	24
2.1 Photos	24
2.2 Order data	24
2.3 Technical data	25
2.4 Diagnostic LEDs	30
2.4.1 Status LED	30
2.4.2 I/O LEDs	31
2.4.3 Interface LEDs	31
2.5 Digital inputs	32
2.5.1 Terminal block connections	32
2.5.2 Connection examples	33
2.5.3 Input circuit diagram	35
2.6 Digital outputs	36
2.6.1 Terminal block connections	36
2.6.2 Connection example	37
2.6.3 Output circuit diagram	37

Table of contents

2.7 Variable declaration	38
2.7.1 Configuration register	39
2.7.2 Status register	40
2.7.3 DO back (status of digital outputs)	41
2.7.4 Counter settings	42
3. Power Panel 15-36	44
3.1 Photos	44
3.2 Order data	44
3.3 Technical data	45
3.4 Diagnostic LEDs	51
3.4.1 Status LED	52
3.4.2 I/O LEDs	52
3.4.3 Interface LEDs	52
3.5 Analog / digital inputs	53
3.5.1 Terminal block connections	53
3.5.2 Connection examples	54
3.5.3 Input circuit diagram	57
3.6 Analog / digital outputs	58
3.6.1 Terminal block connections	58
3.6.2 Connection examples	59
3.6.3 Output circuit diagram	60
3.7 Variable declaration	61
3.7.1 Configuration register	62
3.7.2 Status register	63
3.7.3 DO back (status of digital outputs)	64
3.7.4 Analog input	64
3.7.5 Analog output	65
3.7.6 Counter settings	65
4. Supply voltage	68
5. Interfaces	68
5.1 RS232 interface	68
5.2 CAN interface	68
6. Operating mode and node number switch	69
7. Dimensions	70
8. Set display contrast	71
9. Note regarding operation	72
10. Changing the battery	72
10.1 Battery data	72
10.2 Buffer duration	72
10.3 Steps for changing the battery	72
11. Mounting instructions	74
Chapter 4 • Power Panel 21	77
1. Photo	77
2. Order data	77
3. Technical data	78

4. Images	82
5. Dimensions	83
6. Component descriptions	83
6.1 Status LEDs	83
6.2 Power supply	84
6.3 Interfaces	84
6.3.1 CAN interface	84
6.3.2 RS232 interface	85
6.4 Operating mode switch	86
6.5 Programming System Flash	87
6.6 PCMCIA slot	87
6.6.1 Limitations when using memory cards	88
6.7 Power Panel interface	88
6.8 Screw-in module overview	89
6.9 Data/real-time buffering	90
6.10 Digital inputs	90
6.10.1 Terminal block connections	90
6.10.2 Connection example	91
6.10.3 Input circuit diagram	91
6.11 Digital outputs	92
6.11.1 Terminal block connections	92
6.11.2 Connection examples	92
6.11.3 Output circuit diagram	94
7. Changing the battery	94
7.1 Battery data	94
7.2 Buffer duration	95
7.3 Steps for changing the battery	95
8. Note regarding operation	97
9. Mounting instructions	98
Chapter 5 • Power Panel 35	101
1. PP35 types	101
2. Power Panel 35-01	102
2.1 Photos	102
2.2 Order data	102
2.3 Technical data	103
2.4 Diagnostic LEDs	108
2.4.1 Status LED	108
2.4.2 I/O LEDs	109
2.4.3 Interface LEDs	109
2.5 Digital inputs	110
2.5.1 Terminal block connections	110
2.5.2 Connection examples	111
2.5.3 Input circuit diagram	113

Table of contents

2.6 Digital outputs	114
2.6.1 Terminal block connections	114
2.6.2 Connection example	115
2.6.3 Output circuit diagram	115
2.7 Variable declaration	116
2.7.1 Configuration register	117
2.7.2 Status register	118
2.7.3 DO back (status of digital outputs)	119
2.7.4 Counter settings	120
3. Power Panel 35-36	122
3.1 Photos	122
3.2 Order data	122
3.3 Technical data	123
3.4 Diagnostic LEDs	129
3.4.1 Status LED	130
3.4.2 I/O LEDs	130
3.4.3 Interface LEDs	130
3.5 Analog / digital inputs	131
3.5.1 Terminal block connections	131
3.5.2 Connection examples	132
3.5.3 Input circuit diagram	135
3.6 Analog / digital outputs	136
3.6.1 Terminal block connections	136
3.6.2 Connection examples	137
3.6.3 Output circuit diagram	138
3.7 Variable declaration	139
3.7.1 Configuration register	140
3.7.2 Status register	141
3.7.3 DO back (status of digital outputs)	142
3.7.4 Analog input	142
3.7.5 Analog output	143
3.7.6 Counter settings	143
4. Supply voltage	146
5. Interfaces	146
5.1 RS232 interface	146
5.2 CAN interface	146
6. Operating mode and node number switch	147
7. Dimensions	148
8. Set display contrast	149
9. Note regarding operation	150
10. Changing the battery	150
10.1 Battery data	150
10.2 Buffer duration	150
10.3 Steps for changing the battery	150
11. Mounting instructions	152

Chapter 6 • Power Panel 41	155
1. Photo	155
2. Order data	155
3. Technical data	156
4. Images	160
5. Dimensions	161
6. Component descriptions	161
6.1 Status LEDs	161
6.2 Power supply	162
6.3 Interfaces	162
6.3.1 CAN interface	162
6.3.2 RS232 interface	163
6.4 Operating mode switch	164
6.5 Programming System Flash	165
6.6 PCMCIA slot	165
6.6.1 Limitations when using memory cards	166
6.7 Power Panel interface	166
6.8 Screw-in module overview	167
6.9 Data/real-time buffering	168
6.10 Digital inputs	168
6.10.1 Terminal block connections	168
6.10.2 Connection example	169
6.10.3 Input circuit diagram	169
6.11 Digital outputs	170
6.11.1 Terminal block connections	170
6.11.2 Connection examples	170
6.11.3 Output circuit diagram	172
7. Changing the battery	172
7.1 Battery data	172
7.2 Buffer duration	173
7.3 Steps for changing the battery	173
8. Note regarding operation	175
9. Mounting instructions	176
10. Power Panel expansion EX101	178
10.1 General information	178
10.2 Photo	178
10.3 Order data	178
10.4 Technical data	179
10.5 Dimensions	180
10.6 Dimensions PP41 + EX101	181
10.7 Installation	182

Chapter 7 • Accessories for PP21 / PP41	183
1. IF370 CAN interface module	183
1.1 General information	183
1.2 Photo	183
1.3 Order data	183
1.4 Technical data	184
1.5 Status LEDs	184
1.6 Pin assignments	185
1.7 Node number	185
 Chapter 8 • Programming	 187
1. Programming the PLC CPU	187
2. Visualization	187
 Chapter 9 • Maintenance / Servicing	 189
1. Battery change interval	189
 Appendix A • Technical Appendix	 191
1. Mylar (polyester foil)	191
 Appendix B • Character Sets	 193
1. Overview	193
2. English / Katakana character set	194
3. English / Cyrillic character set	196
4. European / Cyrillic character set	198
5. English / European character set	200

Chapter 1 • General Information

Information:

B&R does its best to keep the printed versions of its user's manuals as current as possible. However, sometimes a newer version of the user's manual can be downloaded in electronic form (Acrobat PDF format) from the B&R homepage www.br-automation.com.

1. Manual history

Version	Date	Comment
2.3	August 2011	<ul style="list-style-type: none"> Change to the chapter arrangement (chapter 1 and 2 were combined) Correction to the connection example for the digital outputs on the Power Panel 21/41 Information about the IF370 CAN interface module node number added
2.2	03.08.2007	<ul style="list-style-type: none"> Inserted Standards in technical data of PP15/PP35 Correction of spelling mistake: GHOST-R -> GOST-R Text „Power Panel PPxx“ changed in „Power Panel xx“ Note inserted: Some screw-in modules can only be operated in certain slots of Power Panel 21/41.
2.0	July 2005	<ul style="list-style-type: none"> Restructuring of the manual Update of PP21/PP41 PP15/PP35 added to the manual
1.4	22.05.2002	<p>Changes / new features</p> <ul style="list-style-type: none"> Safety guidelines added Error correction: Digital inputs for PP21/PP41: Electrical isolation for input - output Yes Error correction: Digital outputs for PP21/PP41: Electrical isolation for input - output Output - Input Yes Pin assignment for RS232 interface updated Guidelines for using PCMCIA memory cards regarding Tasks added Input and output circuit diagrams added Technical data regarding switching threshold for digital inputs for PP21 and PP41 removed
1.3	04.12.2001	<p>Changes / new features</p> <ul style="list-style-type: none"> Operating system updates using the MEMCARD and mode switch described in more detail
1.2	09.11.2001	<p>Changes / new features</p> <ul style="list-style-type: none"> PCMCIA interface description added 7AT324.70 screw-in module included "Mode switch" image replaced Battery buffer time improved (10 minutes guaranteed) Correction of description for the inputs and outputs (they are electrically isolated)

Table 1: Manual history

2. Safety guidelines

2.1 Safety regulations

Information:

The instructions listed, which refer to the wiring and devices used to ensure safety, must be precisely followed in all cases. Otherwise sources of danger can arise, which could cause the integrated safety equipment in the Power Panel to be bypassed.

Danger!

The corresponding safety guidelines for safety and accident regulations must also be reviewed for the respective situation in addition to and independent of this document.

2.2 Introduction

Programmable logic controllers, operating and monitoring devices (e.g. industrial PCs, Power Panels, Mobile Panels etc.) as well as the uninterruptible power supplies from B&R have all been designed, developed, and produced for conventional use in industry. They were not designed, developed and manufactured for any use involving serious risks or hazards that could lead to death, injury, serious physical damage, or loss of any kind without the implementation of exceptionally stringent safety precautions. In particular, such risks and hazards include the use of these devices to monitor nuclear reactions in nuclear power plants, as well as flight control systems, flight safety, the control of mass transportation systems, medical life support systems, and the control of weapons systems.

The safety precautions applying to industrial control systems (e.g. the provision of safety devices such as emergency stop circuits, etc.) in accordance with applicable national and international regulations must be observed both when using programmable logic controllers and when using operating and monitoring devices as control systems in conjunction with a Soft PLC (e.g. B&R Automation Runtime or comparable products) or a Slot PLC (e.g. B&R LS251 or comparable products). The same applies for all other devices connected to the system, such as drives.

All tasks such as installation, commissioning, and service may only be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, mounting, installation, commissioning and operation of the product and have the appropriate qualifications (e.g. IEC 60364). National accident prevention guidelines must be followed.

The safety guidelines, connection descriptions (type plate and documentation), and limit values listed in the technical data are to be read carefully before installation and commissioning and must be observed.

2.3 Intended use

Electronic devices are generally not failsafe. In the event of a failure on the programmable control system, operating or monitoring device, or uninterruptible power supply, the user is responsible for ensuring that other devices that may be connected, e.g. motors, are in a secure state.

2.4 Transport and storage

During transport and storage, devices must be protected from excessive stress (mechanical load, temperature, humidity, aggressive atmosphere, etc.).

2.5 Mounting

- Installation must take place according to the documentation using suitable equipment and tools.
- Devices may only be installed without voltage applied and by qualified personnel.
- General safety regulations and nationally applicable accident prevention guidelines must be observed.
- Electrical installation must be carried out according to the relevant guidelines (e.g. line cross section, fuse, protective ground connection).

2.6 Operation

2.6.1 Protection against touching electrical parts

To operate programmable logic controllers, operating and monitoring devices, and uninterruptible power supplies, certain components must carry dangerous voltage levels of over 42 VDC. A life-threatening electrical shock could occur if you come into contact with these parts. This could result in death, severe injury, or material damage.

Before turning on the programmable logic controller, the operational and monitoring devices and the uninterruptible power supply, ensure that the housing is properly grounded (PE rail). The ground connection must be established when testing the operating and monitoring devices or the uninterruptible power supply, even when operating them for only a short time.

Before turning the device on, make sure that all voltage-carrying parts are securely covered. During operation, all covers must remain closed.

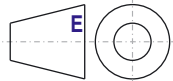
3. Organization of safety notices

The safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding the safety regulations and guidelines can be life-threatening.
Caution!	Disregarding the safety regulations and guidelines can result in severe injury or serious material damages.
Warning!	Disregarding the safety regulations and guidelines can result in injury or material damages.
Information:	Important information for preventing errors.

Table 2: Organization of safety notices

4. Standards



All dimension diagrams (e.g. dimension diagrams, etc.) are drawn according to European dimension standards.

5. Material number / serial number

Each B&R device is assigned a unique serial number label with a bar code, which allows the device to be clearly identified.

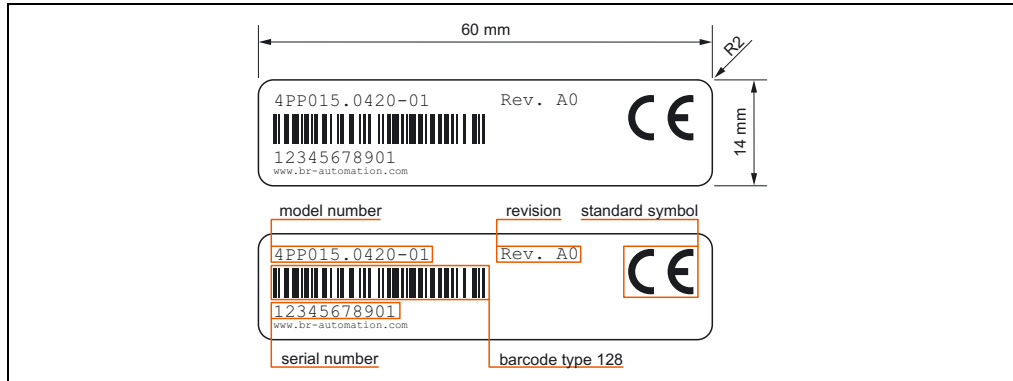


Figure 1: Material number / serial number

If you are a registered user on the B&R homepage (www.br-automation.com) can call up information regarding their products by material number or serial number. You have, for example, access to the revision history for the B&R products you have purchased.

Chapter 2 • Introduction

B&R offers the B&R Power Panel 15, 21, 35, and 41 for automation of small to midsize machines and systems. These Power Panels are a combination of operator panel and controller in one device.

A 4 x 20 character text display, a 3-inch display with 160 x 80 pixels, or a ¼ VGA graphic display can be selected. Each Power Panel is equipped with a powerful PLC CPU including integrated digital or analog I/O. The series PP21 and PP41 panels have an additional six slots for B&R SYSTEM 2003 screw-in modules. An expansion module is offered for the Power Panel 41 which allows the operation of B&R SYSTEM 2005 interface module inserts.

The visualization application is created using B&R Automation Studio™. B&R Automation Studio™ is used to program the CPU.

1. Features

1.1 General

- 24 VDC supply voltage
- RS232 interface
- CAN bus interface
- 8-16 digital inputs and outputs
- 0-12 analog outputs
- 0-24 analog inputs

1.2 Additional features of the PP21/PP41

- PCMCIA slot
- 1 potential-free relay contact
- 6 slots for B&R SYSTEM 2003 screw-in modules, 3 of which support additional functions (TPU) such as event counting, trigger functions, stepper motor control, frequency measurement or communication modules
- Expansion module for the Power Panel 41 which allows the operation of B&R SYSTEM 2005 interface module inserts

2. Overview







Short description														
Photo														
Model number	4PP015.0420-01	4PP015.0420-36	4PP015.C420-01	4PP015.E420-01	4PP015.E420-101	4PP015.C420-36	4PP015.E420-36	4P0420.00-490	4PP035.0300-01	4PP035.0300-36	4PP035.E300-01	4PP035.E300-36	4PP035.E300-136	4P3040.01-490
Page	24	44		24		44		77	102	122	102	122	155	
LCD display														
4 x 20 characters		✓			✓			✓		-		-		-
160 x 80 pixels		-			-			-		✓		✓		-
5.7" QVGA		-			-			-		-		-		✓
Character set														
English / Katakana		✓		-	-	-	-	✓		-		-		-
English / Cyrillic		-		✓	-	-	✓	-		-		-		-
English / European		-		-	✓	✓	-	✓		-		-		-
European / Cyrillic		-		-	-	-	-	-		✓		✓		-
Keys														
Total		16		8	16	8		34		16		8	26	40
With key LED		12						10		12			10	16
With insert strips		10						10		10			10	16
Inputs / Outputs														
Digital inputs		16	8		16	8		10		16	8	16	8	10
Digital outputs		16	8		16	8		8		16	8	16	8	10
Analog inputs		-	4		-	4		-		-	4	-	4	-
Analog outputs		-	4		-	4		-		-	4	-	4	-
Instruction cycle time														
0.8 µs					✓			-			✓			-
0.5 µs					-			✓			-			✓
Memory (SRAM / SystemPROM)														
300 kB / 448 kB					✓			-			✓			-
700 kB / 600 kB					-			✓			-			✓
FlashPROM														
1,0 MB		✓			-	✓		-		✓			-	-
1,4 MB		-			-	-		✓		-			-	✓
1,9 MB		-			✓	-		-		-			✓	-
Slot for ...														
B&R 2003 screw-in modules					-			6		-				6
B&R 2005 communication modules					-			1		-				1

Table 3: Power Panel overview

3. Typical topology - distributed systems

3.1 PP15 / PP35

In a distributed system, two or more Power Panel devices (PP15, PP35) are connected to each other over a CAN bus. Control programs run on each Power Panel. The sensors and actuators are connected to the integrated inputs and outputs as well as the remote CAN bus stations.

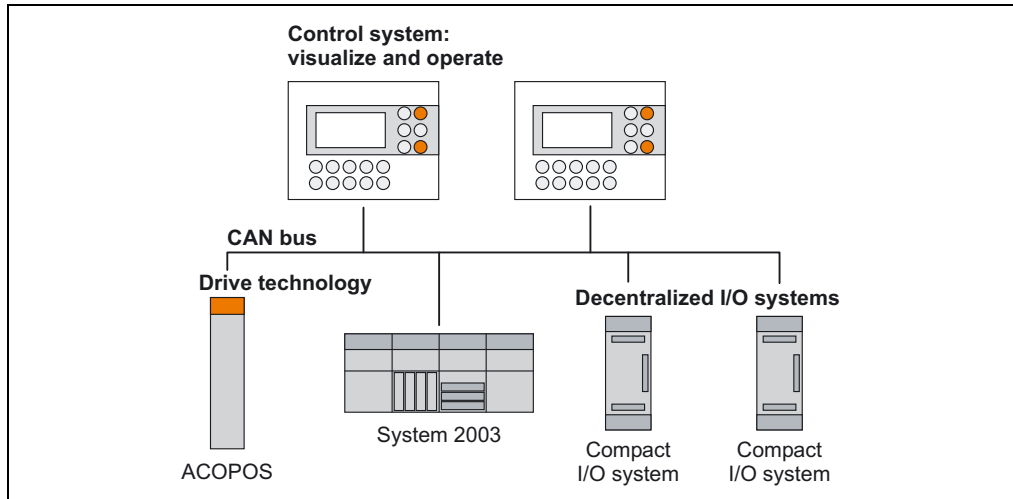


Figure 2: Power Panel topology - distributed systems with PP15/PP35

3.2 PP21 / PP41

In a distributed system, two or more Power Panel devices (PP21, PP41) are connected to each other over a CAN bus. Control programs run on each Power Panel. The sensors and actuators are connected to the integrated and insertable inputs and outputs as well as the remote CAN bus stations.

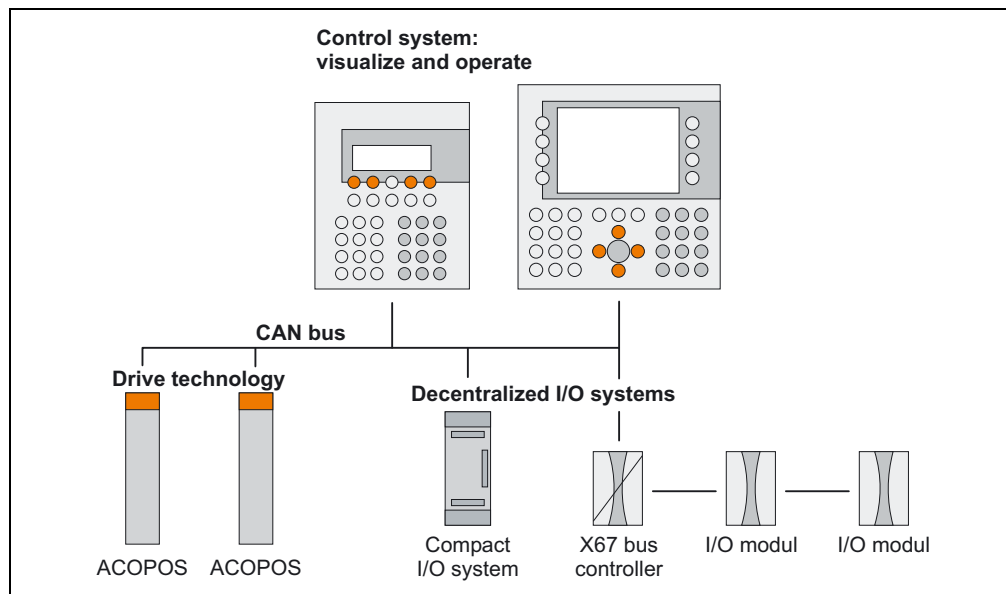


Figure 3: Power Panel topology - distributed systems with PP21/PP41

Chapter 3 • Power Panel 15

1. Types



Short description							
Photo							
Model number	4PP015.0420-01	4PP015.0420-36	4PP015.C420-01	4PP015.E420-01	4PP015.E420-101	4PP015.C420-36	4PP015.E420-36
Page	24	44	24			44	
LCD display							
4 x 20 characters	✓						
Character set							
English / Katakana	✓	-	-	-	-	-	-
English / Cyrillic	-	✓	-	-	✓	-	-
English / European	-	-	✓	-	-	✓	-
Keys							
Total	16		26				
With key LED	12		10				
With insert strips	10		10				
Inputs / outputs							
Digital inputs	16	8	16			8	
Digital outputs	16	8	16			8	
Analog inputs	-	4	-			4	
Analog outputs	-	4	-			4	
FlashPROM							
1,0 MB	✓			-		✓	
1,9 MB	-			✓		-	

Table 4: PP15 overview

2. Power Panel 15-01

2.1 Photos

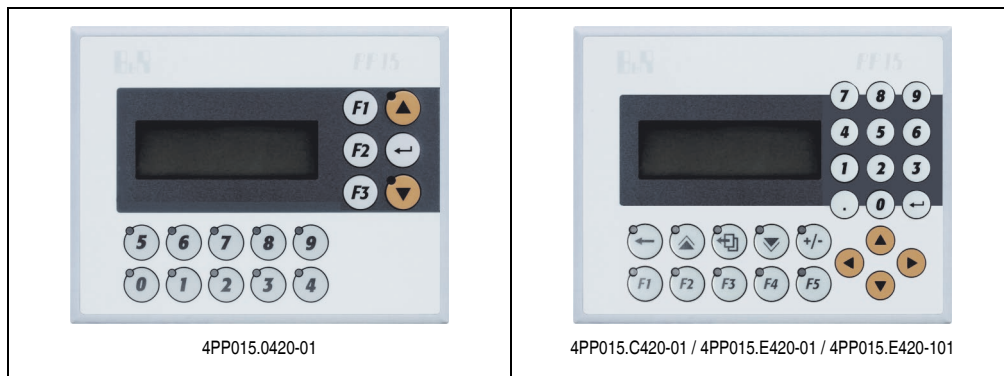


Figure 4: Power Panel 15-01 photos

2.2 Order data

Model number	Short description
4PP015.0420-01	Power Panel, 24 VDC, 153 x 120 mm, LC display, 4 x 20 characters, background lighting, English / Katakana character set, 16 keys, 300 KB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 16 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 16 digital outputs, 24 VDC, 0.5 A source, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
4PP015.C420-01	Power Panel, 24 VDC, 153 x 120 mm, LC display, 4 x 20 characters, background lighting, English / Cyrillic character set, 26 keys, 300 KB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 16 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 16 digital outputs, 24 VDC, 0.5 A source, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
4PP015.E420-01	Power Panel, 24 VDC, 153 x 120 mm, LC display, 4 x 20 characters, background lighting, English / European character set, 26 keys, 300 KB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 16 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 16 digital outputs, 24 VDC, 0.5 A source, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
4PP015.E420-101	Power Panel, 24 VDC, 153 x 120 mm, LC display, 4 x 20 characters, background lighting, English / European character set, 26 keys, 300 KB SRAM, 1984 kB FlashPROM, 1 RS232, 1 CAN interface, 16 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 16 digital outputs, 24 VDC, 0.5 A source, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
Note	
All parts required to install the Power Panel, including key legend sheets, are included in its delivery.	

Table 5: Power Panel 15-01 order data

Model number	Short description
Required accessories	
0TB103.9	Accessory terminal block, 3-pin, Screw clamp, 2.5 mm ² ; protected against vibration by the screw flange.
0TB103.91	Accessory terminal block, 3-pin, Cage clamps, 2.5 mm ² ; protected against vibration by the screw flange.
7TB718.9	Accessory terminal block, 18-pin, screw clamp, 1.5 mm ²
7TB718.91	Accessory terminal block, 18-pin, cage clamp, 1.5 mm ²
Optional accessories	
0AC201.9 ¹⁾	Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell
4A0006.00-000 ¹⁾	Lithium battery, 3 V / 950 mAh, button cell
4A0044.00-000	5 DIN A4 legend strips, 6 fields for a total of 30 devices
7AC911.9	Bus connector, CAN

Table 5: Power Panel 15-01 order data (Forts.)

1) Replacement part

2.3 Technical data

Product ID	Power Panel 15-01
General information	
Certification	CE, C-UL-US, GOST-R
Standards Temperature Shock / tests carried out Vibration / tests carried out Emission / tests carried out Immunity / tests carried out	IEC61131-2 / IEC60068-2-x IEC61131-2 / IEC60068-2-27 IEC61131-2 / IEC60068-2-6 EN61000-6-4 / EN55022 IEC 61131-2 / IEC 61000-4-x
Status display	I/O function for each channel, status
Diagnostics Status I/O function Interfaces	Yes, with status LED Yes, with LEDs Yes, with LEDs
Display	
Type	LCD b/w
Resolution	4 x 20 characters
Background lighting	LED
Character set 4PP015.0420-01 4PP015.C420-01 4PP015.E420-01 4PP015.E420-101	English / Katakana English / Cyrillic English / European English / European

Table 6: Power Panel 15-01 technical data

Power Panel 15-01 • Technical data

Product ID	Power Panel 15-01
Keys	
Total keys 4PP015.0420-01 4PP015.C420-01 4PP015.E420-01 4PP015.E420-101	16 (12 with LEDs) 26 (10 with LEDs) 26 (10 with LEDs) 26 (10 with LEDs)
System keys	Number block Control keys
Labeling	10 keys with insert strips
Processor	
Typical instruction cycle time	0.8 μ s, average value at 70% bit and 30% analog processing
Standard memory User RAM System PROM User PROM 4PP015.0420-01 4PP015.C420-01 4PP015.E420-01 4PP015.E420-101	300 kB SRAM 448 kB FlashPROM 1024 kByte FlashPROM 1024 kByte FlashPROM 1024 kByte FlashPROM 1984 kByte FlashPROM
Data buffering with backup battery	Lithium battery, 3 V / 950 mAh
Battery buffer current	Max. 60 μ A
Hardware Watchdog	Yes
Voltage monitoring	An NMI is triggered at a supply voltage of <15 VDC.
Real-time clock	1 s resolution, nonvolatile memory
System bus for expansions	No
Operating system	PP01x (version V 2.36 and higher)
Status display / diagnostics	
Status LED	Red / green
RS232 LED	Indicates if data is being transmitted or received
CAN LED	Indicates if data is being transmitted or received
I/O LED	Displays whether LEDs 1-16 indicate an input or output state.
01-16 LEDs	State of inputs and outputs

Table 6: Power Panel 15-01 technical data (Forts.)

Product ID		Power Panel 15-01	
Interfaces			
Application interface IF1 Type Design Electrical isolation Max. transfer rate Distance	RS232 9-pin DSUB plug No 115.2 kbit/s 15 m / 19,200 bit/s		
Application interface IF2 Type Design Electrical isolation Distance Max. transfer rate Bus length 60 m Bus length 200 m Bus length 1,000 m	CAN bus 9-pin DSUB plug Yes max. 1,000 m bus length 500 kbit/s 250 kbit/s 50 kbit/s		
Digital inputs			
Channels	1-3	4-16	
Additional functions for inputs	2 x event counter or 1 x incremental encoder ABR/AB or 2 x gate/period measurement		-
Input circuit	Sink or source	Sink or source	
Input voltage (nom./max.)	24 VDC / 30 VDC		24 VDC / 30 VDC
Input current at nominal voltage	ca. 10 mA	ca. 5 mA	
Switching threshold LOW HIGH	<5 V >15 V		
Input filter	<10 µs	<1 ms	
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No No	Yes No No	
Event counter operation			
Amount	2		
Counter 1/2	Input 1 / 2		
Counter size	32-bit		
Input frequency	Max. 50 kHz		
Signal form	Square wave pulse		
Evaluation	Positive or negative edge, cyclic counter		

Table 6: Power Panel 15-01 technical data (Forts.)

Power Panel 15-01 • Technical data

Product ID	Power Panel 15-01
Incremental encoder operation	
Amount	1
Type	ABR or AB
Counter size	32 bit
Input frequency	Max. 20 kHz
Evaluation	4x
Signal form	Square wave pulse
Gate measurement	
Number of gate measurements	2
Gate measurement on channel 1 and 2 Channel 1 Channel 2	Input 1 Input 2
Counter size	32-bit
Evaluation	Positive or negative edge
Input frequency	Max. 50 kHz
Pulse length	$\geq 10 \mu\text{s}$
Length of pauses between pulses	$\geq 10 \mu\text{s}$
Count frequency Internal External	4 MHz, 31.25 kHz Max. 50 kHz
Signal form	Square wave pulse
Period measurement	
Number of period measurements	2
Measurement on channel 1 and 2 Channel 1 Channel 2	Input 1 Input 2
Counter size	32-bit
Evaluation	Positive or negative edge
Input frequency	Max. 50 kHz
Count frequency Internal External	4 MHz, 31.25 kHz Max. 50 kHz
Signal form	Square wave pulse

Table 6: Power Panel 15-01 technical data (Forts.)

Product ID	Power Panel 15-01
Digital outputs	
Channels	16
Type	Highside driver (source)
Switching voltage	
Minimum	18 VDC
Nominal	24 VDC
Maximum	30 VDC
Nom. output current	0.5 A
Total current	8 A
Output circuit	Source
Max. switching frequency	100 Hz
Switching delay	max. 500 µs
Short-circuit protection	Yes
Overload protection	Yes
Internal protective circuit	VDR
Electrical isolation	
Channel - bus	No
Channel - channel	No
Group isolation	No
Power supply	
Supply voltage	
Minimum	18 VDC
Nominal	24 VDC
Maximum	30 VDC
Power consumption	Max. 6 W
Environmental conditions	
Temperature	
Operation	0°C to 50°C
Storage	-20°C to 60°C
Humidity	
Operation	10 to 90% (non-condensing)
Storage	5 to 95% (non-condensing)
Mechanics	
Protection	IP65 (from front)
Outer dimensions (B x H x T [mm])	153 x 120 x 46.1
Weight	0.5 kg

Table 6: Power Panel 15-01 technical data (Forts.)

2.4 Diagnostic LEDs

Multiple LEDs on the back of the device show the status of the Power Panel, the interfaces, and the digital I/O:

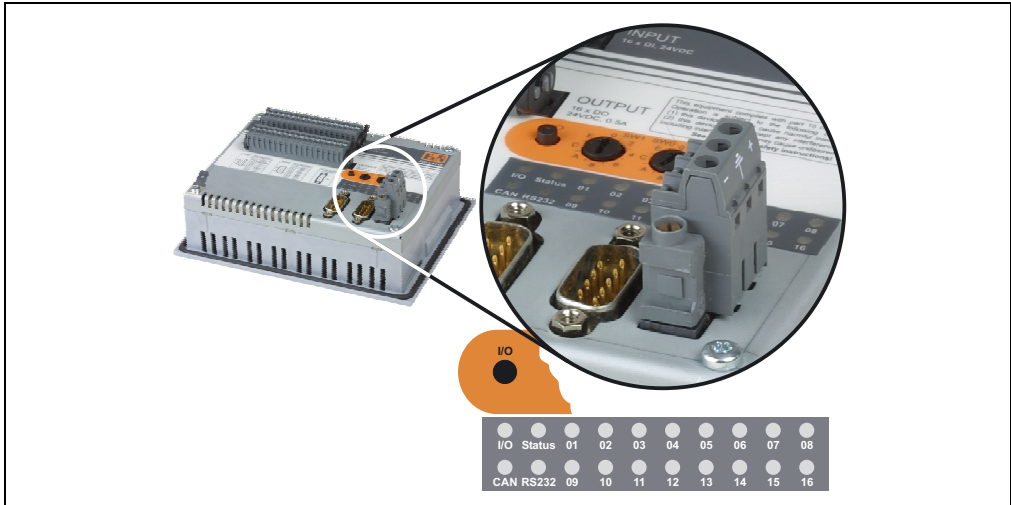


Figure 5: Power Panel 15-01 diagnostic LEDs

2.4.1 Status LED

The Power Panel status LED uses a blink code to indicate the operating state of the Power Panel:

Power Panel operating state	Color / blink code of the status LED	
Boot mode	Blinking yellow / green 1 Hz	
Flash programming	Blinking green / red 5 Hz	
Service mode / Diagnostic mode	Yellow	
Run	Green	
Error	Red	

Table 7: Power Panel 15-01 status LED

2.4.2 I/O LEDs

The I/O LED indicates whether the I/O LEDs (01 ... 16) show the state of the digital inputs or outputs. The display can be set appropriately using the I/O button.

I/O LED	LEDs 01 ... 16
Green	The state of the 16 digital inputs is indicated (LEDs are green).
Yellow	The state of the 16 digital outputs is indicated (LEDs are yellow).

Table 8: Power Panel 15-01 I/O LEDs

2.4.3 Interface LEDs

Interface LED	Description
CAN	Indicates if data is being transmitted or received.
RS232	Indicates if data is being transmitted or received.

Table 9: Power Panel 15-01 interface LEDs

2.5 Digital inputs

2.5.1 Terminal block connections

Inputs 1 - 3 are equipped with additional functions (event counter, ABR evaluation, etc.). The supply voltage for the digital inputs can be monitored with the application program.

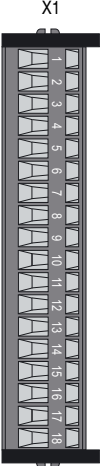
18-pin terminal block	Terminal	Assignment
 <p>X1</p> <p>7TB718.91</p>	1	COM si (GND in sink operation, 24 VDC in source operation)
	2	COM so (24 VDC in sink operation, GND in source operation)
	3	Input 1 / counter 1 / A
	4	Input 2 / counter 2 / B
	5	Input 3 / ext. CLK / R
	6	Input 4
	7	Input 5
	8	Input 6
	9	Input 7
	10	Input 8
	11	Input 9
	12	Input 10
	13	Input 11
	14	Input 12
	15	Input 13
	16	Input 14
	17	Input 15
	18	Input 16

Table 10: Power Panel 15-01 terminal assignments - X1 / digital inputs

2.5.2 Connection examples

Sink connection

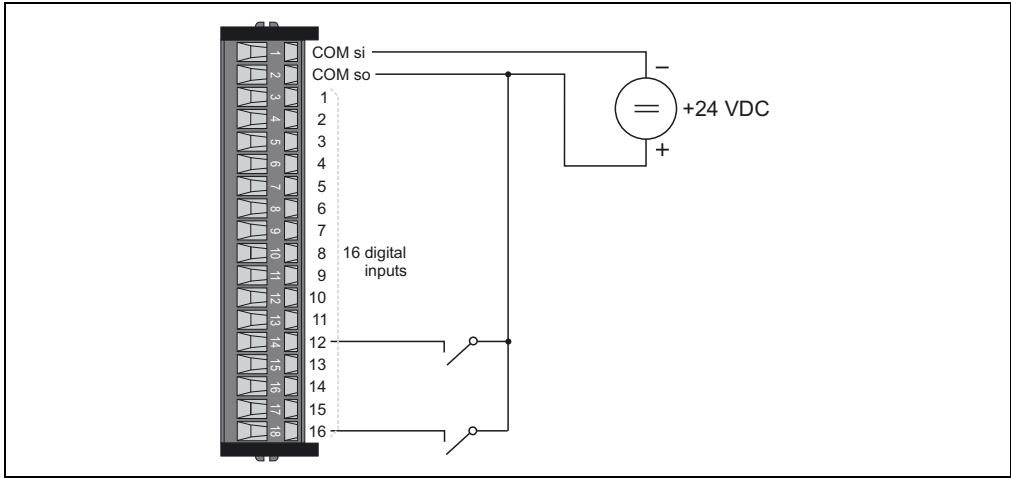


Figure 6: Power Panel 15-01 digital input connection examples (sink connection)

Source connection

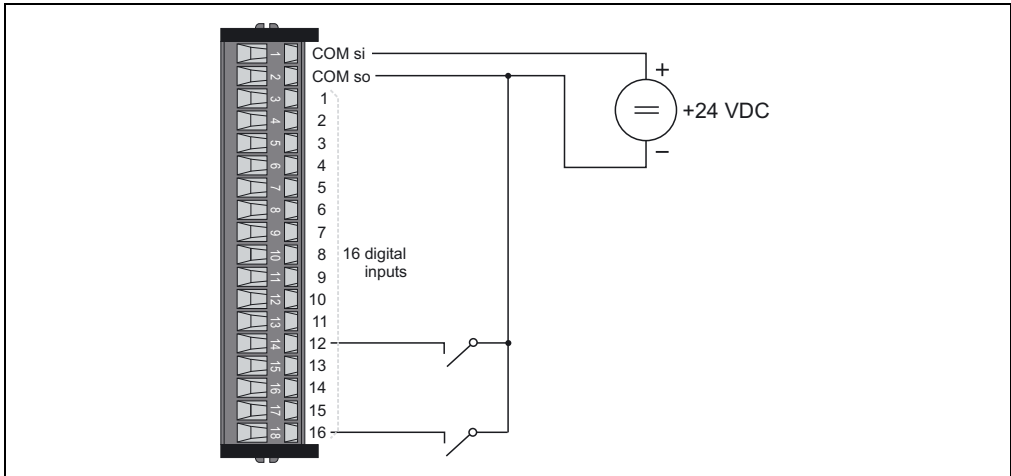


Figure 7: Power Panel 15-01 digital input connection examples (source connection)

Counter inputs

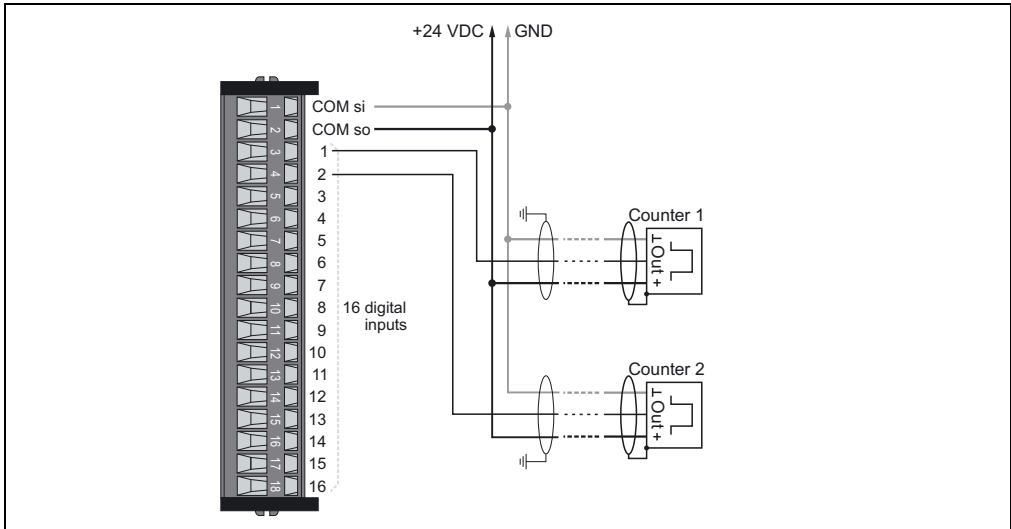


Figure 8: Power Panel 15-01 connection example - counter input

Period or gate measurement

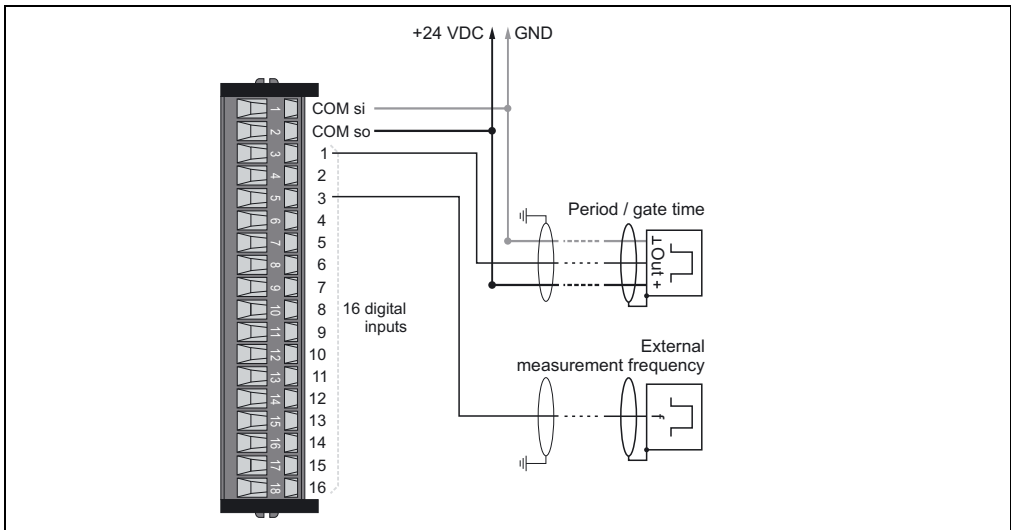


Figure 9: Power Panel 15-01 connection example - period and gate measurement

Incremental encoders

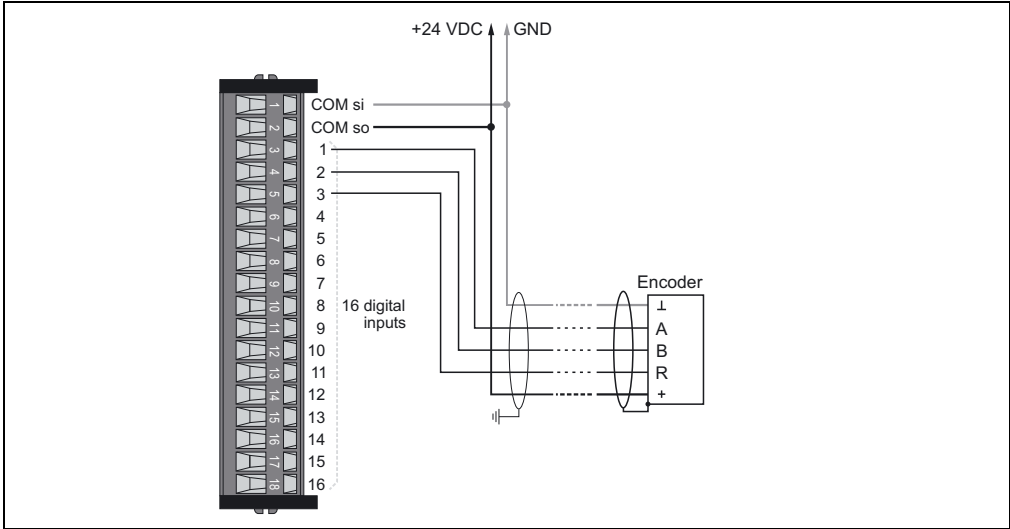


Figure 10: Power Panel 15-01 connection example - incremental encoder

2.5.3 Input circuit diagram

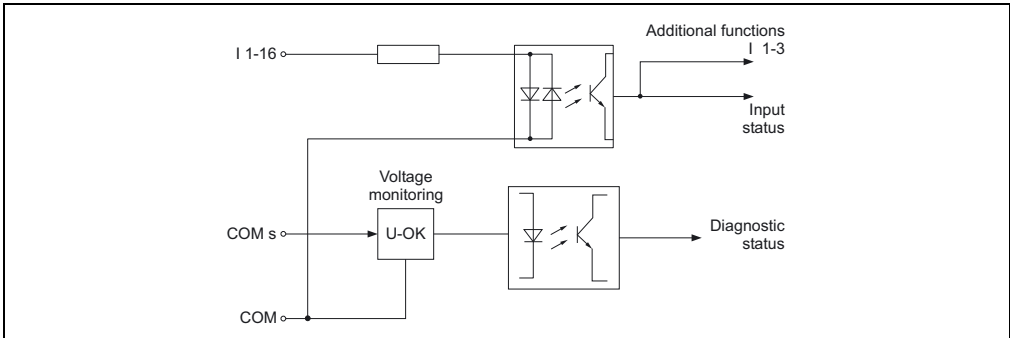


Figure 11: Power Panel 15-01 input circuit diagram - digital inputs

2.6 Digital outputs

2.6.1 Terminal block connections

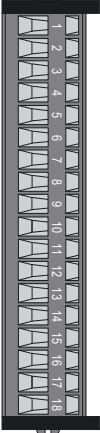
18-pin terminal block	Terminal	Assignment
 <p>X2</p> <p>7TB718.91</p>	1	GND
	2	24 VDC (DO supply)
	3	Output 1
	4	Output 2
	5	Output 3
	6	Output 4
	7	Output 5
	8	Output 6
	9	Output 7
	10	Output 8
	11	Output 9
	12	Output 10
	13	Output 11
	14	Output 12
	15	Output 13
	16	Output 14
	17	Output 15
	18	Output 16

Table 11: Power Panel 15-01 terminal assignments - X2 / digital outputs

2.6.2 Connection example

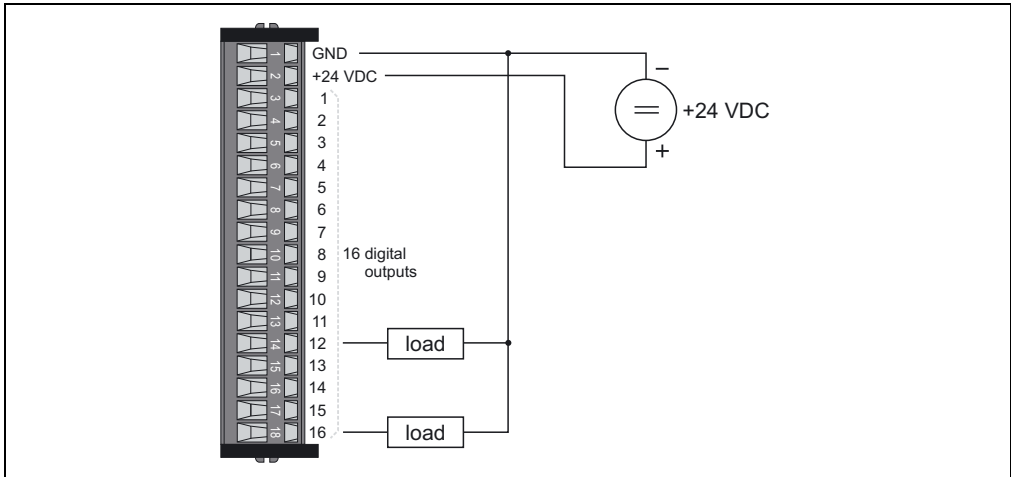


Figure 12: Power Panel 15-01 connection example - digital outputs

2.6.3 Output circuit diagram

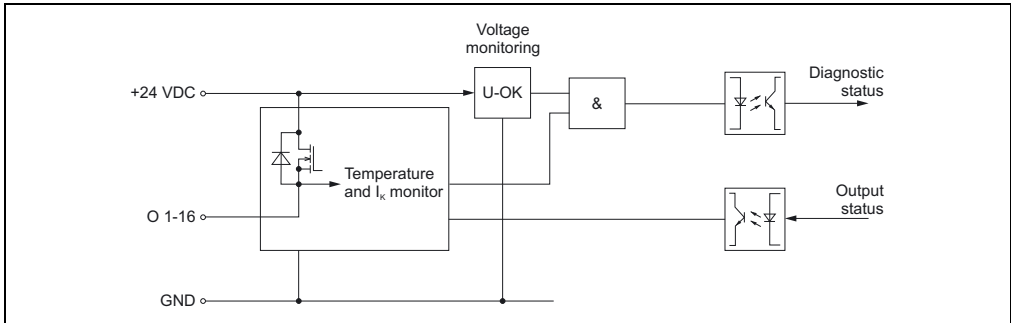


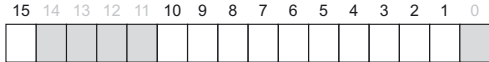
Figure 13: Power Panel 15-01 output circuit diagram - digital outputs

2.7 Variable declaration

Description	Name in Automation Studio	Data type	Description
Digital in 1 - 16	Digital input 01 - 16	BIT	Level of digital inputs 1 - 16
Digital out 1 - 16	Digital output 01 - 16	BIT	Level of digital outputs 1 - 16
Counter 1	Analog input 01	UDINT	Counter state 1 (bit 1 - bit 32)
Counter 2	Analog input 02	UDINT	Counter state 2 (bit 1 - bit 32)
DO back	Analog input 03	UINT	Actual state of the digital outputs 1 - 16
Status	Analog input 04	UINT	Status word
Config	Analog output 01	UINT	Configuration word

Table 12: Power Panel 15-01 variable declaration

2.7.1 Configuration register



Bit	Description
0	Reserved
1	This setting applies only in AB(R) mode (bit 4+5 set to 01): 0 ... R disabled 1 ... R enabled
2	Switch between period and gate measurement (only evaluated if bits 4+5 are set to 11): 0 ... Period measurement 1 ... Gate measurement
3	Beginning of period or gate measurement: 0 ... at rising (positive) edge 1 ... at falling (negative) edge
5-4	00 ... No counter operation 01 ... AB(R) counter 10 ... Event counter 11 ... Period or gate measurement
7-6	00 ... Counter frequency 4 MHz 01 ... External counter frequency 10 ... Counter frequency 31.25 kHz 11 ... Not allowed
8	0 ... At the reference impulse (positive edge) counter 1 is copied to counter 2 1 ... At the reference impulse (positive edge) counter 1 is reset to counter 0
9	Overrun recognition by counter 1 (only applies in period duration / gate time mode; see bit 4-5 and bit 2 of the configuration register): 0 ... Shut off overrun recognition and reset overrun bit of counter 1 (bit 9 in the status register). 1 ... overrun recognition of the continuous counter. The counter value is limited to \$0000FFFF.
10	Overrun recognition by counter 2 (only applies in period duration / gate time mode; see bit 4-5 and bit 2 of the configuration register): 0 ... Shut off overrun recognition and reset overrun bit of counter 2 (bit 10 in the status register). 1 ... overrun recognition of the continuous counter. The counter value is limited to \$0000FFFF.
14-11	Reserved
15	0 ... Reset time or counter 1 ... Enable time or counter (set this bit to 1 after counter has been configured)

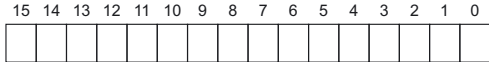
The reserve bits can only be written with the value 0.

2.7.2 Status register



Bit	Description
8-0	Reserved
9	Information regarding counter 1 at period or gate measurement (only applies when bit 9 is set in the configuration register): 0 ... The counter's value is within the range 0 - \$0000FFFF. 1 ... Counter overrun! Acknowledge by resetting bit 9 of the configuration register.
10	Information regarding counter 2 at period or gate measurement (only applies when bit 10 is set in the configuration register): 0 ... The counter's value is within the range 0 - \$0000FFFF. 1 ... Counter overrun! Acknowledge by resetting bit 10 of the configuration register.
11	Reserved
12	Monitoring of the 24 VDC input supply 0 ... Input supply OK 1 ... Error: input supply to low or missing
14-13	Reserved
15	Monitoring of the 24 VDC output supply 0 ... Output supply OK 1 ... Error: output supply to low or missing

2.7.3 DO back (status of digital outputs)



Bit	Description
0	0 ... Actual state of digital output 1: OUT 1 ... Actual state of digital output 1: IN
1	0 ... Actual state of digital output 2: OUT 1 ... Actual state of digital output 2: IN
2	0 ... Actual state of digital output 3: OUT 1 ... Actual state of digital output 3: IN
3	0 ... Actual state of digital output 4: OUT 1 ... Actual state of digital output 4: IN
4	0 ... Actual state of digital output 5: OUT 1 ... Actual state of digital output 5: IN
5	0 ... Actual state of digital output 6: OUT 1 ... Actual state of digital output 6: IN
6	0 ... Actual state of digital output 7: OUT 1 ... Actual state of digital output 7: IN
7	0 ... Actual state of digital output 8: OUT 1 ... Actual state of digital output 8: IN
8	0 ... Actual state of digital output 9: OUT 1 ... Actual state of digital output 9: IN
9	0 ... Actual state of digital output 10: OUT 1 ... Actual state of digital output 10: IN
10	0 ... Actual state of digital output 11: OUT 1 ... Actual state of digital output 11: IN
11	0 ... Actual state of digital output 12: OUT 1 ... Actual state of digital output 12: IN
12	0 ... Actual state of digital output 13: OUT 1 ... Actual state of digital output 13: IN
13	0 ... Actual state of digital output 14: OUT 1 ... Actual state of digital output 14: IN
14	0 ... Actual state of digital output 15: OUT 1 ... Actual state of digital output 15: IN
15	0 ... Actual state of digital output 16: OUT 1 ... Actual state of digital output 16: IN

2.7.4 Counter settings

To set the correct counter modes, the configuration register must be written. Counter 1 and counter 2 registers have different meanings for different modes.

Incremental encoder operation

If the homing input (input 3) is *enabled* in the configuration register, then the Power Panel is a 32-bit ABR counter whose actual value is found in counter 1 and the saved R value in counter 2.

If the homing input is disabled, a 32-bit AB incremental encoder counter input is read in counter 1.

- A = digital input 1
- B = digital input 2
- R = digital input 3

Event counter operation

If the counters in the configuration register are initialized as event counters, two 32-bit counters are available.

- Counter 1 = digital input 1
- Counter 2 = digital input 2

Period measurement

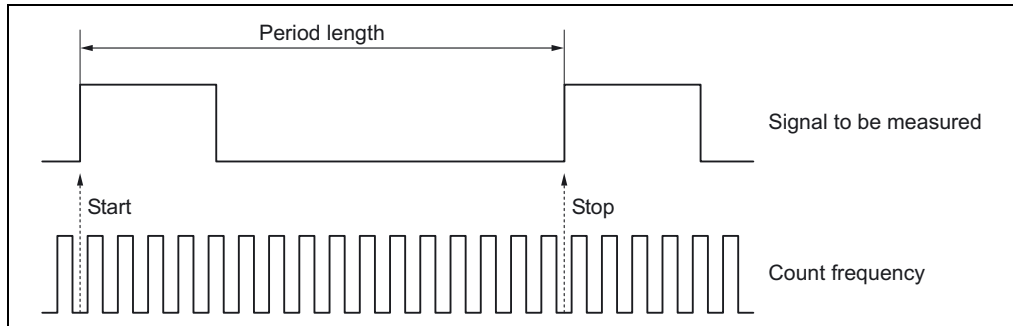


Figure 14: Power Panel 15-01 period measurement

The measurement can begin at the decreasing or increasing edge depending on the configuration register. The counter frequency can be set in two steps (4 MHz or 31.25 kHz) or with an external frequency. The external frequency must however be less than 50 kHz. The measured counter state is a 32-bit value and is displayed in counter 1 or counter 2. The value in the temporary register is only updated at the end of the measurement.

The frequency of the signal to be measured can be a maximum of 50 kHz.

- Counter 1 = digital input 1
- Counter 2 = digital input 2
- Ext. Counting frequency = digital input 3

A potential overrun of the continuous counter during the period measurement (e.g. due to an incorrect counter frequency), can be detected by reading bit 9 (counter 1) or bit 10 (counter 10) in the status register. However, the maximum value of counter is limited to \$0000FFFF as a result. The error bit in the status register is acknowledged by resetting bit 9 (counter 1) or bit 10 (counter 2) of the configuration register.

Gate measurement

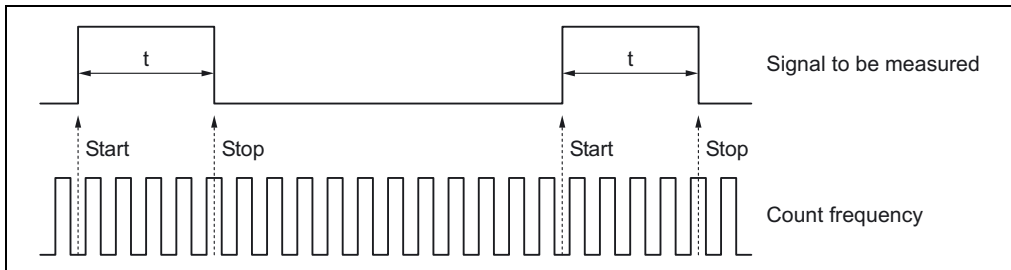


Figure 15: Power Panel 15-01 gate measurement

The measurement can be begin at the decreasing or increasing edge depending on the configuration register. The R enable bit must be 0. Measurement always occurs up to the next edge. The counter frequency can be set to one of two levels (4 MHz or 31.25 kHz) or with an external frequency. The external frequency must however be less than 50 kHz. The measured counter state is a 32 bit value and is displayed in counter 1 or counter 2. The value in the temporary register is only updated at the end of the active measurement.

The frequency of the signal to be measured can be a maximum of 50 kHz.

- Counter 1 = digital input 1
- Counter 2 = digital input 2
- Ext. Counting frequency = digital input 3

A potential overrun of the continuous counter during the gate measurement (e.g. due to an incorrect counter frequency), can be detected by reading bit 9 (counter 1) or bit 10 (counter 2) in the status register. However, the maximum value of counter is limited to \$0000FFFF as a result. The error bit in the status register is acknowledged by resetting bit 9 or bit 10 of the configuration register.

3. Power Panel 15-36

3.1 Photos

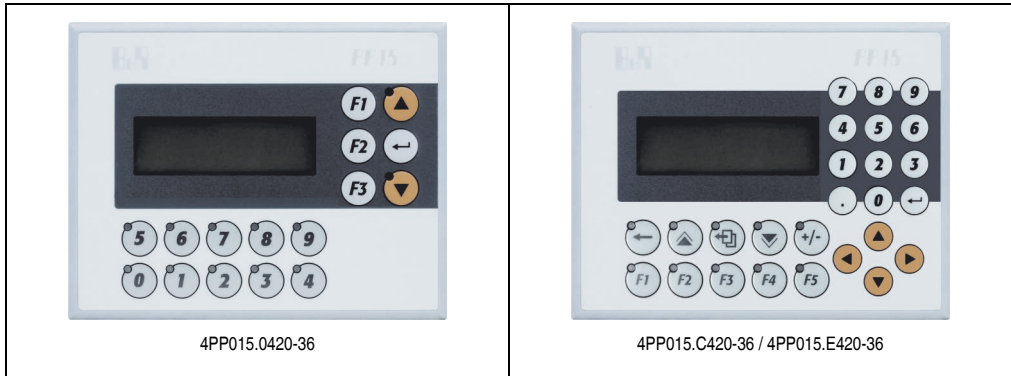


Figure 16: Power Panel 15-36 photos

3.2 Order data

Model number	Short description
4PP015.0420-36	Power Panel, 24 VDC, 153 x 120 mm, LC display, 4 x 20 characters, background lighting, English / Katakana character set, 16 keys, 300 KB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 8 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate -/period measurement, 8 digital outputs, 24 VDC, 0.5 A source, 4 analog inputs, ± 10 V, 12-bit, two of the analog inputs can be used as KTY10 or PT1000 inputs. 4 analog outputs, ± 10 V, 12 bit, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
4PP015.C420-36	Power Panel, 24 VDC, 153 x 120 mm, LC display, 4 x 20 characters, background lighting, English / Cyrillic character set, 26 keys, 300 KB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 8 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 8 digital outputs, 24 VDC, 0.5 A source, 4 analog inputs, ± 10 V, 12-bit, two of the analog inputs can be used as KTY10 or PT1000 inputs. 4 analog outputs, ± 10 V, 12 bit, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
4PP015.E420-36	Power Panel, 24 VDC, 153 x 120 mm, LC display, 4 x 20 characters, background lighting, English / European character set, 26 keys, 300 KB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 8 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 8 digital outputs, 24 VDC, 0.5 A source, 4 analog inputs, ± 10 V, 12-bit, two of the analog inputs can be used as KTY10 or PT1000 inputs. 4 analog outputs, ± 10 V, 12 bit, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
Note	
All parts required to install the Power Panel, including key legend sheets, are included in its delivery.	
Required accessories	
0TB103.9	Accessory terminal block, 3-pin, screw clamp, 2.5 mm ² , protection against vibration with the screw flange.
0TB103.91	Accessory terminal block, 3-pin, cage clamp, 2.5 mm ² , protection against vibration with the screw flange.
7TB718.9	Accessory terminal block, 18-pin, screw clamp, 1.5 mm ²
7TB718.91	Accessory terminal block, 18-pin, cage clamp, 1.5 mm ²

Table 13: Power Panel 15-36 order data

Model number	Short description
Optional accessories	
0AC201.9 ¹⁾	Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell
4A0006.00-000 ¹⁾	Lithium battery, 3 V / 950 mAh, button cell
4A0044.00-000	5 DIN A4 legend strips, 6 fields for a total of 30 devices
7AC911.9	Bus connector, CAN

Table 13: Power Panel 15-36 order data (Forts.)

1) Replacement part

3.3 Technical data

Product ID	Power Panel 15-36
General information	
Certification	CE, C-UL-US, GOST-R
Standards Temperature Shock / tests carried out Vibration / tests carried out Emission / tests carried out Immunity / tests carried out	IEC61131-2 / IEC60068-2-x IEC61131-2 / IEC60068-2-27 IEC61131-2 / IEC60068-2-6 EN61000-6-4 / EN55022 IEC 61131-2 / IEC 61000-4-x
Status display	I/O function for each channel, status
Diagnostics Status I/O function Interfaces	Yes, with status LED Yes, with LEDs Yes, with LEDs
Display	
Type	LCD b/w
Resolution	4 x 20 characters
Background lighting	LED
Character set 4PP015.0420-36 4PP015.C420-36 4PP015.E420-36	English / Katakana English / Cyrillic English / European
Keys	
Total keys 4PP015.0420-36 4PP015.C420-36 4PP015.E420-36	16 (12 with LEDs) 26 (10 with LEDs) 26 (10 with LEDs)
System keys	Number block Control keys
Labeling	10 keys with insert strips

Table 14: Power Panel 15-36 technical data

Power Panel 15-36 • Technical data

Product ID	Power Panel 15-36
Processor	
Typical instruction cycle time	0.8 μ s, average value at 70% bit and 30% analog processing
Standard memory User RAM System PROM User PROM 4PP015.0420-36 4PP015.C420-36 4PP015.E420-36	300 kB SRAM 448 kB FlashPROM 1024 kByte FlashPROM 1024 kByte FlashPROM 1024 kByte FlashPROM
Data buffering with backup battery	Lithium battery, 3 V / 950 mAh
Battery buffer current	Max. 30 μ A
Hardware Watchdog	Yes
Voltage monitoring	An NMI is triggered at a supply voltage of <15 VDC.
Real-time clock	1 s resolution, nonvolatile memory
System bus for expansions	No
Operating system	PP01x (version V 2.36 and higher)
Status display / diagnostics	
Status LED	Red / green
RS232 LED	Indicates if data is being transmitted or received
CAN LED	Indicates if data is being transmitted or received
I/O LED	Displays whether LEDs 1-16 indicate an input or output state.
01-16 LEDs	State of inputs and outputs
Interfaces	
Application interface IF1 Type Design Electrical isolation Max. transfer rate Distance	RS232 9-pin DSUB plug No 115.2 kbit/s 15 m / 19,200 bit/s
Application interface IF2 Type Design Electrical isolation Distance Max. transfer rate Bus length 60 m Bus length 200 m Bus length 1,000 m	CAN bus 9-pin DSUB plug Yes max. 1,000 m bus length 500 kbit/s 250 kbit/s 50 kbit/s

Table 14: Power Panel 15-36 technical data (Forts.)

Product ID	Power Panel 15-36	
Digital inputs		
Channels	1-3	4-8
Additional functions for inputs	2 x event counter or 1 x incremental encoder ABR/AB or 2 x gate/period measurement	-
Input circuit	Sink or source	Sink or source
Input voltage (nom./max.)	24 VDC / 30 VDC	24 VDC / 30 VDC
Input current at nominal voltage	ca. 10 mA	ca. 5 mA
Switching threshold LOW HIGH	<5 V >15 V	
Input filter	<10 µs	<1 ms
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No No	Yes No No
Event counter operation		
Amount	2	
Counter 1/2	Input 1 / 2	
Counter size	32-bit	
Input frequency	Max. 50 kHz	
Signal form	Square wave pulse	
Evaluation	Positive or negative edge, cyclic counter	
Incremental encoder operation		
Amount	1	
Type	ABR or AB	
Counter size	32-bit	
Input frequency	Max. 20 kHz	
Evaluation	4x	
Signal form	Square wave pulse	

Table 14: Power Panel 15-36 technical data (Forts.)

Power Panel 15-36 • Technical data

Product ID	Power Panel 15-36
Gate measurement	
Number of gate measurements	2
Gate measurement on channel 1 and 2 Channel 1 Channel 2	Input 1 Input 2
Counter size	32-bit
Evaluation	Positive or negative edge
Input frequency	Max. 50 kHz
Pulse length	$\geq 10 \mu\text{s}$
Length of pauses between pulses	$\geq 10 \mu\text{s}$
Count frequency Internal External	4 MHz, 31.25 kHz Max. 50 kHz
Signal form	Square wave pulse
Period measurement	
Number of period measurements	2
Measurement on channel 1 and 2 Channel 1 Channel 2	Input 1 Input 2
Counter size	32-bit
Evaluation	Positive or negative edge
Input frequency	Max. 50 kHz
Count frequency Internal External	4 MHz, 31.25 kHz Max. 50 kHz
Signal form	Square wave pulse

Table 14: Power Panel 15-36 technical data (Forts.)

Product ID	Power Panel 15-36
Digital outputs	
Channels	8
Type	Highside driver (source)
Switching voltage	
Minimum	18 VDC
Nominal	24 VDC
Maximum	30 VDC
Nom. output current	0.5 A
Total current	4 A
Output circuit	Source
Max. switching frequency	100 Hz
Switching delay	max. 500 µs
Short-circuit protection	Yes
Overload protection	Yes
Internal protective circuit	VDR
Electrical isolation	
Channel - bus	No
Channel - channel	No
Group isolation	No
Analog inputs	
Number of channels	4 differential inputs; 2 of which can be configured individually as temperature inputs
Input	±10 V
Value range / input signal	
10 V	\$7FFF
0 V	\$0000
-10 V	\$8001
Digital converter resolution	12-bit
Conversion time	150 µs for all channels
Input filter	
Hardware	Cut-off frequency 10 kHz / attenuation 60 dB
Software	-
Output format	INT
Input impedance in signal range	20 MΩ
Input circuit	IEC 61131-2
Electrical isolation	
Channel - Power Panel	Yes
Channel - channel	No
Group isolation	No

Table 14: Power Panel 15-36 technical data (Forts.)

Power Panel 15-36 • Technical data

Product ID	Power Panel 15-36
Temperature measurement	
Number of channels	Up to 2 (depending on the configuration)
Input	Resistance measurement using 2-line procedure with constant current measurement
Digital converter resolution	12-bit
Conversion time	150 μ s for all channels
Input filter Hardware Software	Cut-off frequency 10 kHz / attenuation 60 dB -
Output format	INT
Data format	16-bit 2s-complement (INT 16); 1 LSB = 0.1°C
Conversion of measurement values to temperature values	Automatic in the module
Sensor KTY10-6 PT1000	Can be set per channel -50°C to 125°C -200°C to 850°C
Resolution in °C KTY10-6 PT1000	0.13°C 0.56°C
Wiring	2-line
Measuring current	1 mA
Resistance measurement range	0 - 4000 Ω
Input circuit	IEC 61131-2
Electrical isolation	like analog inputs
Analog outputs	
Number of channels	4
Output	\pm 10 V
Value range / output signal 10 V 0 V -10 V	\$7FFF \$0000 \$8001
Max. load per output	\pm 10 mA (load 1 k Ω)
Digital converter resolution	12-bit
Conversion time	150 μ s for all channels
Switch on / switch off procedure	Internal enable relay for boot procedure and error
Basic accuracy	\pm 0.088% at 25°C based on the current output value
Output protection	Continuous short circuit protection
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No No

Table 14: Power Panel 15-36 technical data (Forts.)

Product ID	Power Panel 15-36
Power supply	
Supply voltage	
Minimum	18 VDC
Nominal	24 VDC
Maximum	30 VDC
Power consumption	Max. 6 W
Environmental conditions	
Temperature	
Operation	0°C to 50°C
Storage	-20°C to 60°C
Humidity	
Operation	10 to 90% (non-condensing)
Storage	5 to 95% (non-condensing)
Mechanics	
Protection	IP65 (from front)
Outer dimensions (B x H x T [mm])	153 x 120 x 46.1
Weight	0.5 kg

Table 14: Power Panel 15-36 technical data (Forts.)

3.4 Diagnostic LEDs

Multiple LEDs on the back of the device show the status of the Power Panel, the interfaces, and the digital I/O:

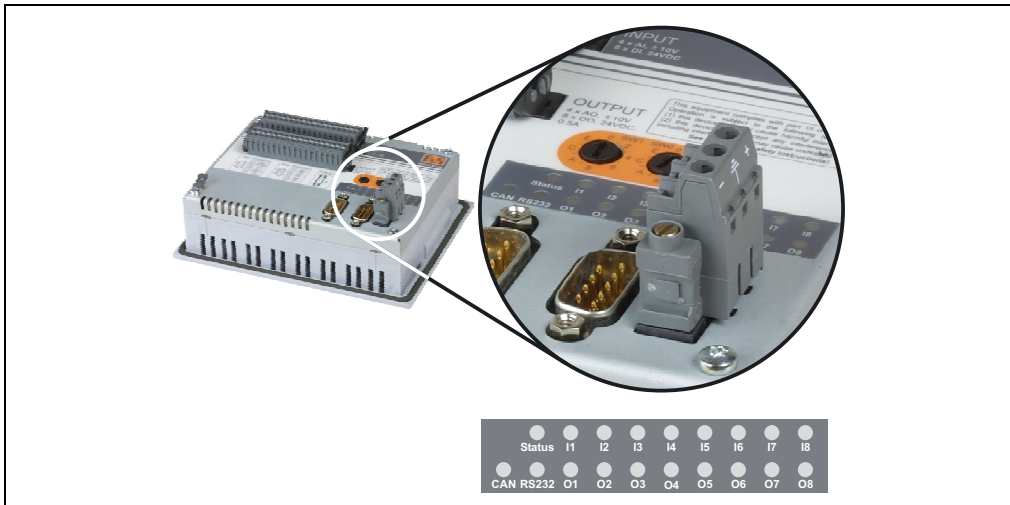


Figure 17: Power Panel 15-36 diagnostic LEDs

3.4.1 Status LED

The Power Panel status LED uses a blink code to indicate the operating state of the Power Panel:






Power Panel operating state	Color / blink code of the status LED	
Boot mode	Blinking yellow / green 1 Hz	
Flash programming	Blinking green / red 5 Hz	
Service mode / Diagnostic mode	Yellow	
Run	Green	
Error	Red	

Table 15: Power Panel 15-36 status LED

3.4.2 I/O LEDs

I/O LED	Description
I1 ... I8	State of the 8 digital inputs
O1 ... O8	State of the 8 digital outputs

Table 16: Power Panel 15-36 I/O LEDs

3.4.3 Interface LEDs

Interface LED	Description
CAN	Indicates if data is being transmitted or received.
RS232	Indicates if data is being transmitted or received.

Table 17: Power Panel 15-36 interface LEDs

3.5 Analog / digital inputs

3.5.1 Terminal block connections

Digital inputs 1 - 3 are equipped with additional functions (event counter, ABR evaluation, etc.). The supply voltage for the digital inputs can be monitored with the application program.

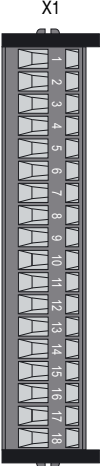
18-pin terminal block	Terminal	Assignment
	1	COM si (GND in sink operation, 24 VDC in source operation)
	2	COM so (24 VDC in sink operation, GND in source operation)
	3	+ Analog input 1
	4	- Analog input 1
	5	+ Analog input 2
	6	- Analog input 2
	7	+ Analog input 3
	8	- Analog input 3
	9	+ Analog input 4
	10	- Analog input 4
	11	Digital input 1 / counter 1 / A
	12	Digital input 2 / counter 2 / B
	13	Digital input 3 / ext. CLK / R
	14	Digital input 4
	15	Digital input 5
	16	Digital input 6
	17	Digital input 7
	18	Digital input 8

Table 18: Power Panel 15-36 terminal assignments - X1 / digital/analog inputs

3.5.2 Connection examples

Analog inputs

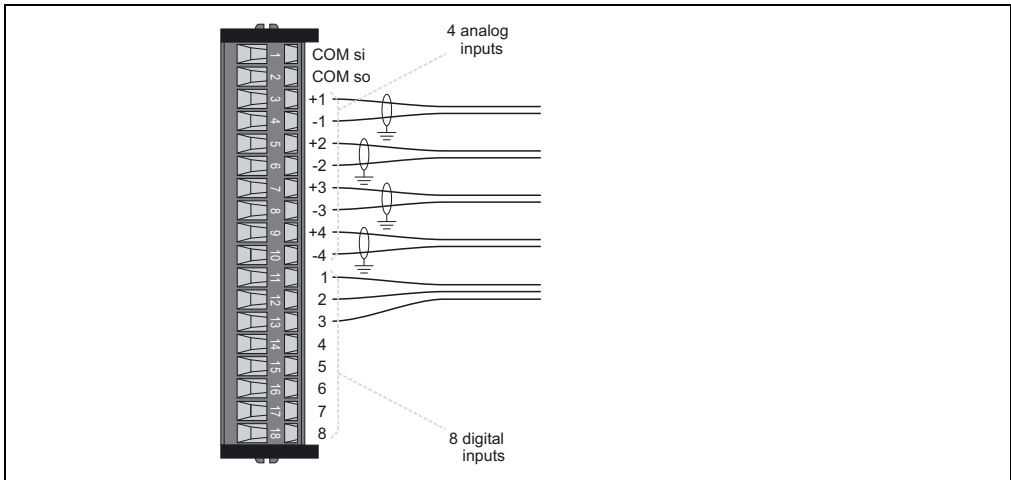


Figure 18: Power Panel 15-36 connection example - analog inputs

Digital inputs (sink connection)

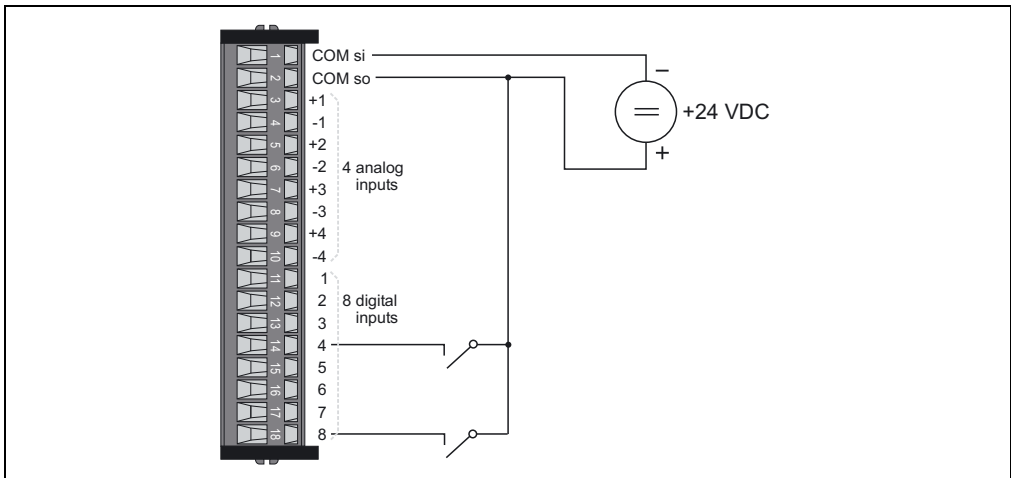


Figure 19: Power Panel 15-36 digital input connection example (sink connection)

Digital inputs (source connection)

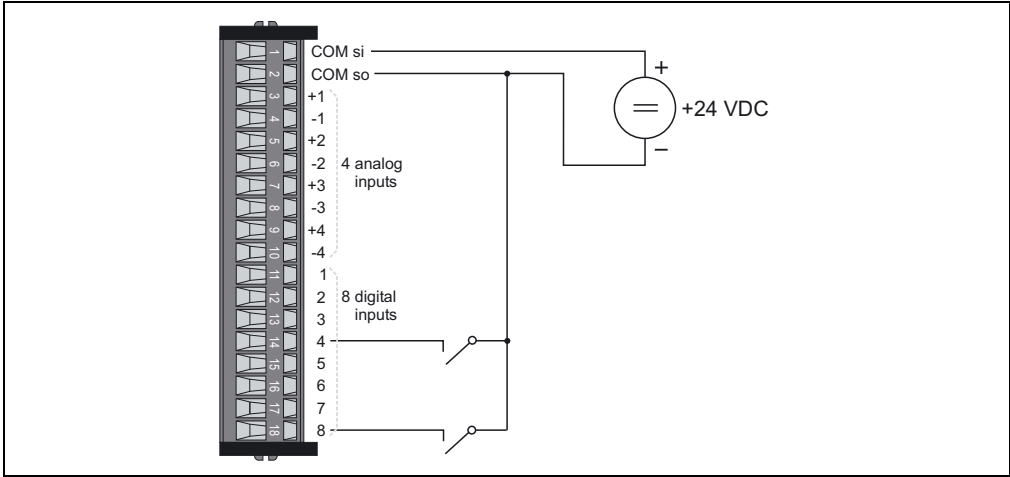


Figure 20: Power Panel 15-36 digital input connection examples (source connection)

Counter inputs

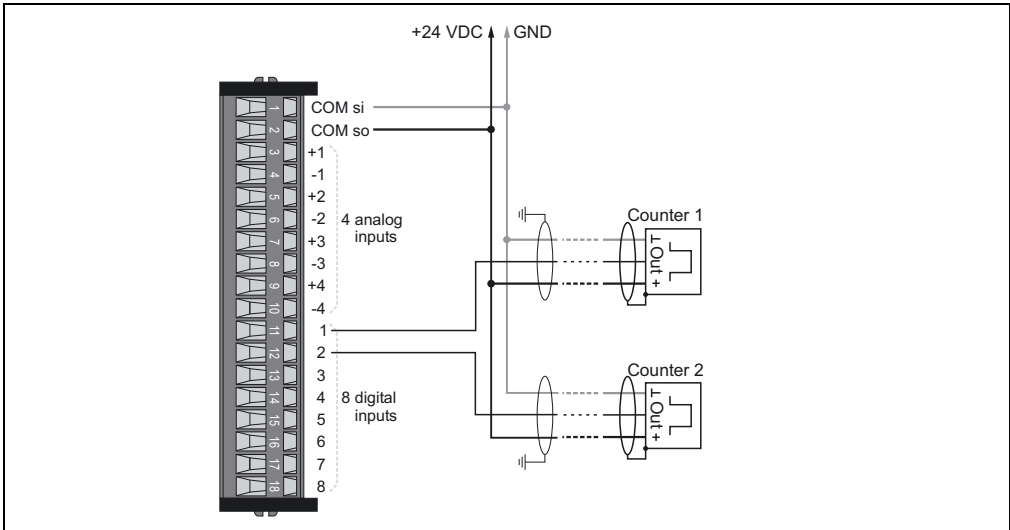


Figure 21: Power Panel 15-36 connection example - counter input

Period or gate measurement

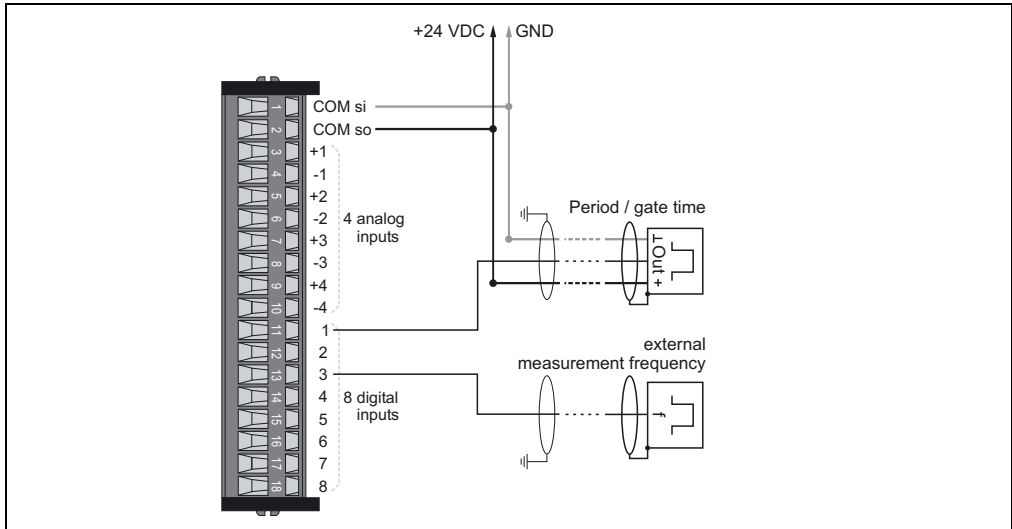


Figure 22: Power Panel 15-36 connection example - period and gate measurement

Incremental encoders

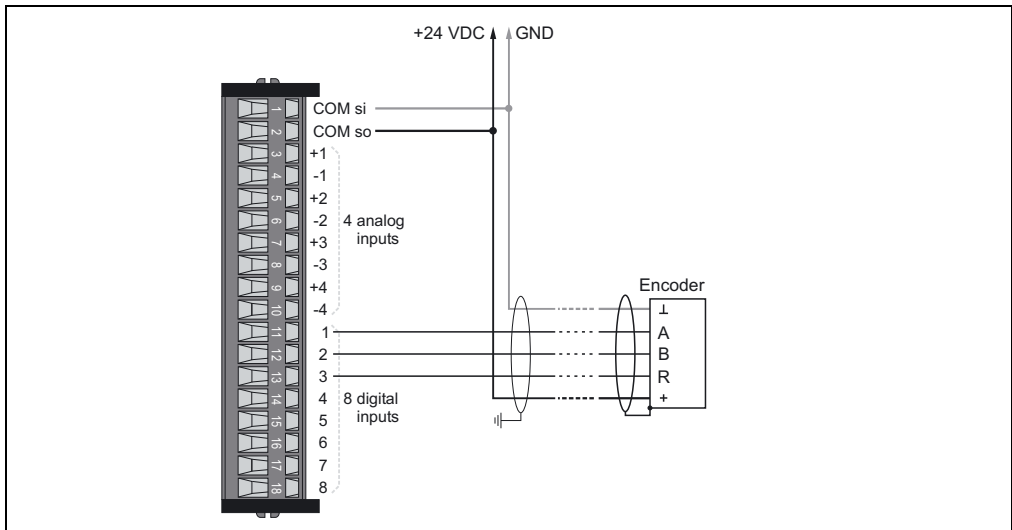


Figure 23: Power Panel 15-36 connection example - incremental encoder

3.5.3 Input circuit diagram

Analog inputs 1 + 2

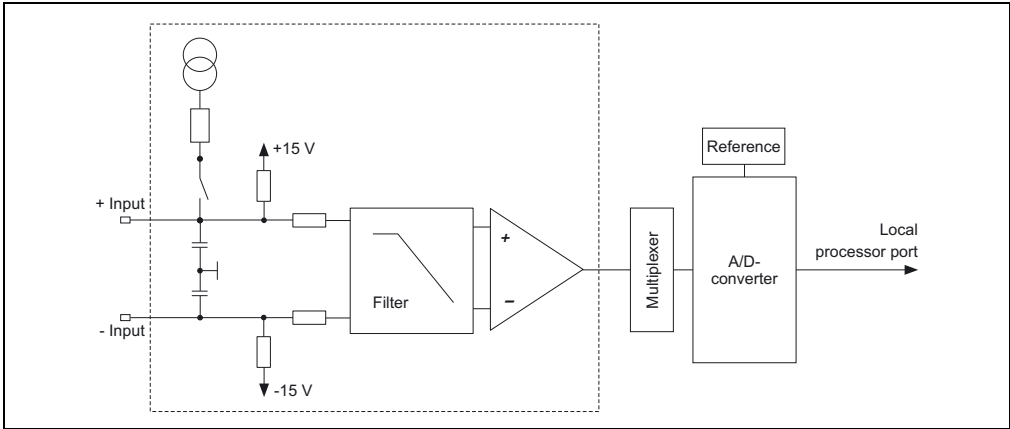


Figure 24: Power Panel 15-36 input circuit diagram - analog inputs 1 + 2

Analog inputs 3 + 4

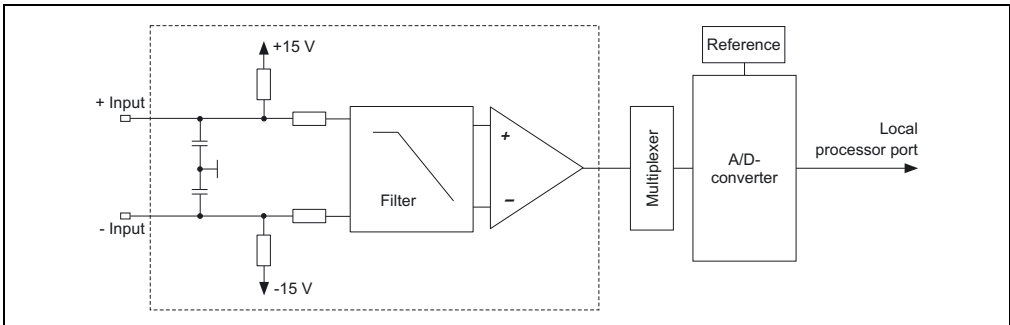


Figure 25: Power Panel 15-36 input circuit diagram - analog inputs 3 + 4

Digital inputs

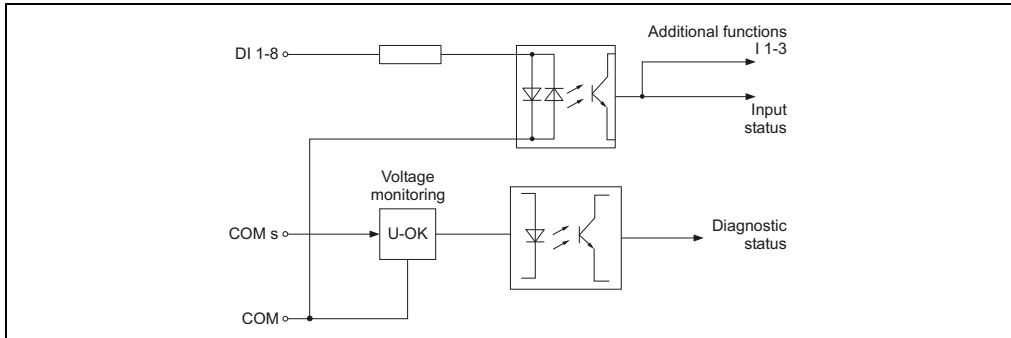


Figure 26: Power Panel 15-36 input circuit diagram - digital inputs

3.6 Analog / digital outputs

3.6.1 Terminal block connections

18-pin terminal block	Terminal	Assignment
	1	GND
	2	24 VDC (DO supply)
	3	+ Analog output 1
	4	⊥ Analog output 1
	5	+ Analog output 2
	6	⊥ Analog output 2
	7	+ Analog output 3
	8	⊥ Analog output 3
	9	+ Analog output 4
	10	⊥ Analog output 4
	11	Digital output 1
	12	Digital output 2
	13	Digital output 3
	14	Digital output 4
	15	Digital output 5
	16	Digital output 6
	17	Digital output 7
	18	Digital output 8

Table 19: Power Panel 15-36 terminal assignments - X2 / digital/analog outputs

3.6.2 Connection examples

Analog outputs

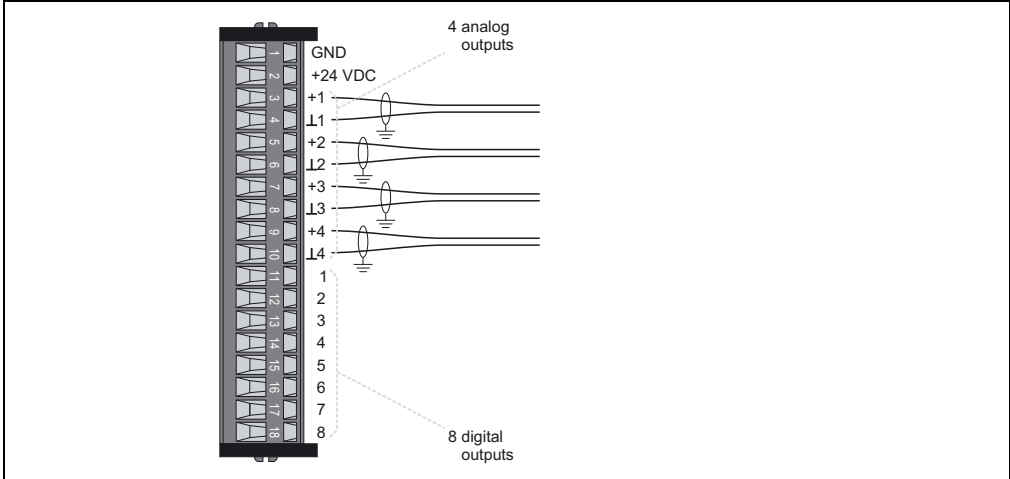


Figure 27: Power Panel 15-36 connection example - analog output

Digital outputs

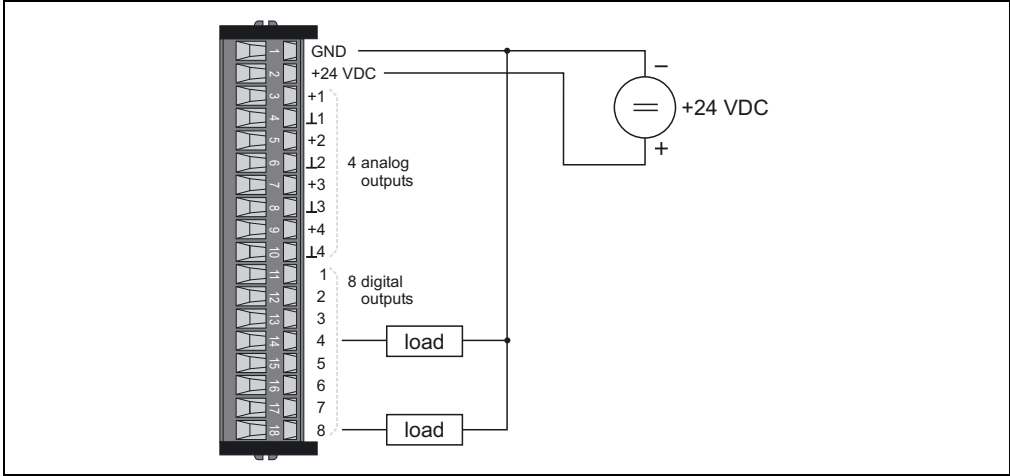


Figure 28: Power Panel 15-36 connection example - digital output

3.6.3 Output circuit diagram

Analog outputs

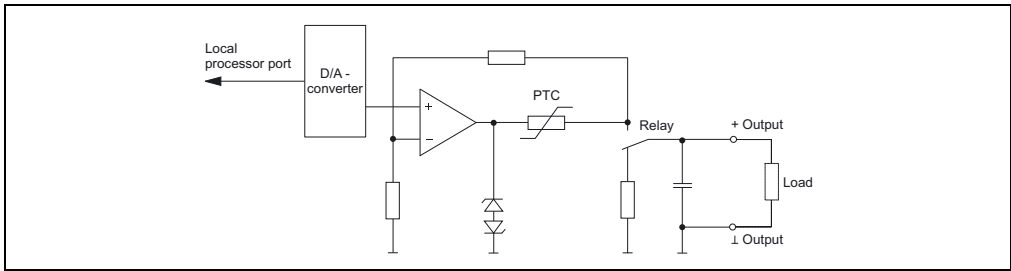


Figure 29: Power Panel 15-36 output circuit diagram - analog outputs

Digital outputs

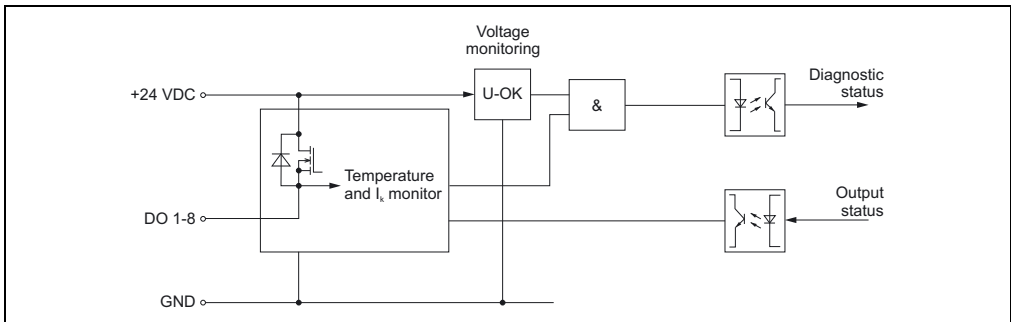


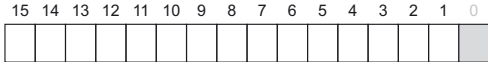
Figure 30: Power Panel 15-36 output circuit diagram - digital outputs

3.7 Variable declaration

Description	Name in Automation Studio	Data type	Description
Digital in 1 - 8	Digital input 01 - 08	BIT	Level of digital inputs 1 - 8
Digital out 1 - 8	Digital output 01 - 08	BIT	Level of digital outputs 1 - 8
Counter 1	Analog input 01	UDINT	Counter state 1 (bit 1 - bit 32)
Counter 2	Analog input 02	UDINT	Counter state 2 (bit 1 - bit 32)
DO back	Analog input 03	UINT	Actual state of the digital outputs 1 - 8
Status	Analog input 04	UINT	Status word
Config	Analog output 01	UINT	Configuration word
Analog in 1	Analog input 05	INT	Analog input 1 (± 10 V, temperature)
Analog in 2	Analog input 06	INT	Analog input 2 (± 10 V, temperature)
Analog in 3	Analog input 07	INT	Analog input 3 (± 10 V)
Analog in 4	Analog input 08	INT	Analog input 4 (± 10 V)
Analog out 1	Analog output 02	INT	Analog output 1 (± 10 V)
Analog out 2	Analog output 03	INT	Analog output 2 (± 10 V)
Analog out 3	Analog output 04	INT	Analog output 3 (± 10 V)
Analog out 4	Analog output 05	INT	Analog output 4 (± 10 V)

Table 20: Power Panel 15-36 variable declaration

3.7.1 Configuration register



Bit	Description
0	Reserved
1	This setting applies only in AB(R) mode (bit 4+5 set to 01): 0 ... R disabled 1 ... R enabled
2	Switch between period and gate measurement (only evaluated if bits 4+5 are set to 11): 0 ... Period measurement 1 ... Gate measurement
3	Beginning of period or gate measurement: 0 ... at rising (positive) edge 1 ... at falling (negative) edge
5-4	00 ... No counter operation 01 ... AB(R) counter 10 ... Event counter 11 ... Period or gate measurement
7-6	00 ... Counter frequency 4 MHz 01 ... External counter frequency 10 ... Counter frequency 31.25 kHz 11 ... Not allowed
8	0 ... At the reference impulse (positive edge) counter 1 is copied to counter 2 1 ... At the reference impulse (positive edge) counter 1 is reset to counter 0
9	Overrun recognition by counter 1 (only applies in period duration / gate time mode; see bit 4-5 and bit 2 of the configuration register): 0 ... Shut off overrun recognition and reset overrun bit of counter 1 (bit 9 in the status register). 1 ... Overrun recognition of the continuous counter. The counter value is limited to \$0000FFFF.
10	Overrun recognition by counter 2 (only applies in period duration / gate time mode; see bit 4-5 and bit 2 of the configuration register): 0 ... Shut off overrun recognition and reset overrun bit of counter 2 (bit 10 in the status register). 1 ... Overrun recognition of the continuous counter. The counter value is limited to \$0000FFFF.
12-11	Analog input 1: 00 ... Voltage measurement (default setting) 01 ... Temperature measurement - PT1000 10 ... Temperature measurement - KTY10-6 11 ... Resistance measurement 1 - 4000 Ω
14-13	Analog input 2: 00 ... Voltage measurement (default setting) 01 ... Temperature measurement - PT1000 10 ... Temperature measurement - KTY10-6 11 ... Resistance measurement 1 - 4000 Ω
15	0 ... Reset time or counter 1 ... Enable time or counter (set this bit to 1 after counter has been configured)

The reserve bits can only be written with the value 0.

3.7.2 Status register



Bit	Description
3-0	Reserved
4	0 ... Analog input 1 - OK 1 ... Analog input 1 - error
5	0 ... Analog input 2 - OK 1 ... Analog input 2 - error
6	0 ... Analog input 3 - OK 1 ... Analog input 3 - error
7	0 ... Analog input 4 - OK 1 ... Analog input 4 - error
8	Reserved
9	Information regarding counter 1 at period or gate measurement (only applies when bit 9 is set in the configuration register): 0 ... The counter's value is within the range 0 - \$0000FFFF. 1 ... counter overrun! Acknowledge by resetting bit 9 of the configuration register.
10	Information regarding counter 2 at period or gate measurement (only applies when bit 10 is set in the configuration register): 0 ... The counter's value is within the range 0 - \$0000FFFF. 1 ... counter overrun! Acknowledge by resetting bit 10 of the configuration register.
11	Reserved
12	Monitoring of the 24 VDC input supply 0 ... Input supply OK 1 ... Error: input supply to low or missing
14-13	Reserved
15	Monitoring of the 24 VDC output supply 0 ... Output supply OK 1 ... Error: output supply to low or missing

3.7.3 DO back (status of digital outputs)



Bit	Description
0	0 ... Actual state of digital output 1: OUT 1 ... Actual state of digital output 1: IN
1	0 ... Actual state of digital output 2: OUT 1 ... Actual state of digital output 2: IN
2	0 ... Actual state of digital output 3: OUT 1 ... Actual state of digital output 3: IN
3	0 ... Actual state of digital output 4: OUT 1 ... Actual state of digital output 4: IN
4	0 ... Actual state of digital output 5: OUT 1 ... Actual state of digital output 5: IN
5	0 ... Actual state of digital output 6: OUT 1 ... Actual state of digital output 6: IN
6	0 ... Actual state of digital output 7: OUT 1 ... Actual state of digital output 7: IN
7	0 ... Actual state of digital output 8: OUT 1 ... Actual state of digital output 8: IN
8-15	Reserved

3.7.4 Analog input

The analog inputs deliver data in 16-bit 2s complement (INT16 format). Analog inputs 1 and 2 can be used for voltage, temperature, or resistance measurement by writing to the configuration register.

Depending on these settings, the input data can be interpreted as follows:

Input type	1 LSB means ...	error appears in status register if ...
Voltage measurement	2.44 mV	Measurement range not reached (input voltage < -10 V) Measurement range exceeded (input voltage >10 V) Wire break
Temperature measurement PT1000	0.1°C	Measurement range not reached (temperature < -200°C) Measurement range exceeded (temperature >850°C) Wire break
Resistance measurement 1 - 4,000 Ω	122.074 mΩ	Measurement range not reached (resistance <1 Ω) Measurement range exceeded (resistance >4,000 Ω) Wire break

Relationship between numerical value and input voltage:

Numerical value (INT)		Voltage measurement
Hexadecimal	Decimal	
8001	-32767	-10 V
C001	-16383	-5 V
FFF8	-8	- 2.44 mV
0000	0	0 V
0008	8	2.44 mV
3FFF	16383	5 V
7FFF	32767	10 V

3.7.5 Analog output

The analog outputs are written in INT16 format (16 bit 2s complement) beschrieben. You won't need to change anything here.

Relationship between numerical value and output voltage:

Numerical value (INT)		Output voltage
Hexadecimal	Decimal	
8001	-32767	-10 V
C001	-16383	-5 V
FFF0	-16	- 4.88 mV
0000	0	0 V
0010	16	4.88 mV
3FFF	16383	5 V
7FFF	32767	10 V

3.7.6 Counter settings

To set the correct counter modes, the configuration register must be written. Counter 1 and counter 2 registers have different meanings for different modes.

Incremental encoder operation

If the homing input (input 3) is *enabled* in the configuration register, then the Power Panel is a 32-bit ABR counter whose actual value is found in counter 1 and the saved R value in counter 2.

If the homing input is disabled, a 32-bit AB incremental encoder counter input is read in counter 1.

- A = digital input 1
- B = digital input 2
- R = digital input 3

Event counter operation

If the counters in the configuration register are initialized as event counters, two 32-bit counters are available.

- Counter 1 = digital input 1
- Counter 2 = digital input 2

Period measurement

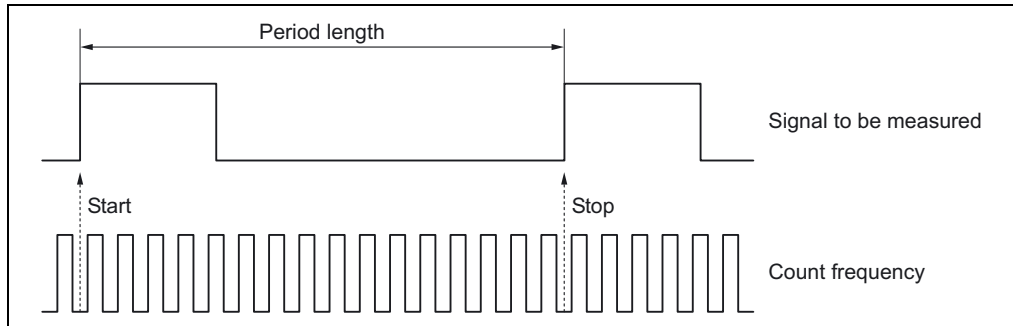


Figure 31: Power Panel 15-36 period measurement

The measurement can be begun at the decreasing or increasing edge depending on the configuration register. The counter frequency can be set in two steps (4 MHz or 31.25 kHz) or with an external frequency. The external frequency must however be less than 50 kHz. The measured counter state is a 32-bit value and is displayed in counter 1 or counter 2. The value in the temporary register is only updated at the end of the measurement.

The frequency of the signal to be measured can be a maximum of 50 kHz.

- Counter 1 = digital input 1
- Counter 2 = digital input 2
- Ext. Counting frequency = digital input 3

A potential overrun of the continuous counter during the period measurement (e.g. due to an incorrect counter frequency), can be detected by reading bit 9 (counter 1) or bit 10 (counter 10) in the status register. However, the maximum value of counter is limited to \$0000FFFF as a result. The error bit in the status register is acknowledged by resetting bit 9 (counter 1) or bit 10 (counter 2) of the configuration register.

Gate measurement

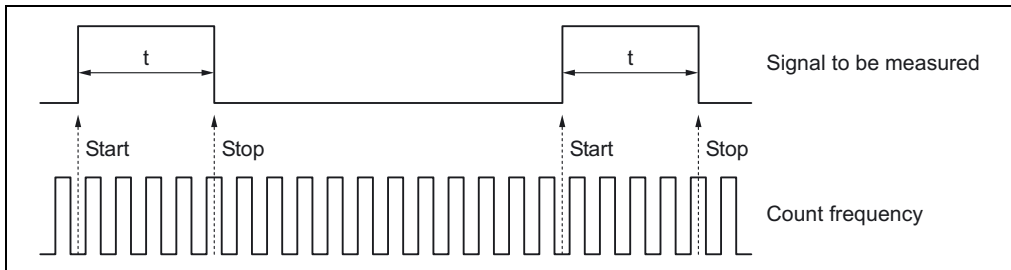


Figure 32: Power Panel 15-36 gate measurement

The measurement can be begin at the decreasing or increasing edge depending on the configuration register. The R enable bit must be 0. Measurement always occurs up to the next edge. The counter frequency can be set to one of two levels (4 MHz or 31.25 kHz) or with an external frequency. The external frequency must however be less than 50 kHz. The measured counter state is a 32-bit value and is displayed in counter 1 or counter 2. The value in the temporary register is only updated at the end of the active measurement.

The frequency of the signal to be measured can be a maximum of 50 kHz.

- Counter 1 = digital input 1
- Counter 2 = digital input 2
- Ext. Counting frequency = digital input 3

A potential overrun of the continuous counter during the gate measurement (e.g. due to an incorrect counter frequency), can be detected by reading bit 9 (counter 1) or bit 10 (counter 2) in the status register. However, the maximum value of counter is limited to \$0000FFFF as a result. The error bit in the status register is acknowledged by resetting bit 9 or bit 10 of the configuration register.

4. Supply voltage

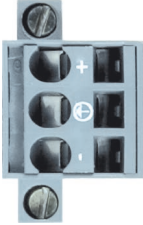
3-pin terminal block	Terminal	Assignment
 <p>OTB103.91</p>	1	24 VDC
	2	Ground
	3	GND

Table 21: Power Panel 15 terminal assignments X3 / voltage supply

5. Interfaces

5.1 RS232 interface

This non-electrically isolated interface is primarily intended for programming the CPU. The RS232 can also be used as a general interface (e.g. printer, bar code reader, etc.).

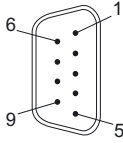
9-pin DSUB connector	Pin	Assignment
 <p>9-pin DSUB plug</p>	1	n.c.
	2	RXD
	3	TXD
	4	n.c.
	5	GND
	6	n.c.
	7	RTS
	8	CTS
	9	n.c.

Table 22: Power Panel 15 pin assignments IF1 / RS232

5.2 CAN interface

The electrically isolated standard fieldbus interface is used for the following tasks:

- Communication with other control systems
- Decentralization and remote I/O expansion using B&R 2003 components and a CAN bus controller

We recommend using the AC911 T-connector for connecting to a CAN network. A terminating resistance is integrated in the T-connector for the bus termination, which can be turned on or off. For more information on wiring CAN fieldbus systems, see chapter 2 "Installation", section "CAN Fieldbus", in the B&R SYSTEM 2003 User's Manual.

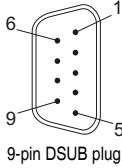
9-pin DSUB connector	Pin	Assignment
 <p>9-pin DSUB plug</p>	1	n.c.
	2	CAN_L
	3	CAN_GND
	4	n.c.
	5	n.c.
	6	n.c.
	7	CAN_H
	8	n.c.
	9	n.c.

Table 23: Power Panel 15 pin assignments - IF2 / CAN

6. Operating mode and node number switch

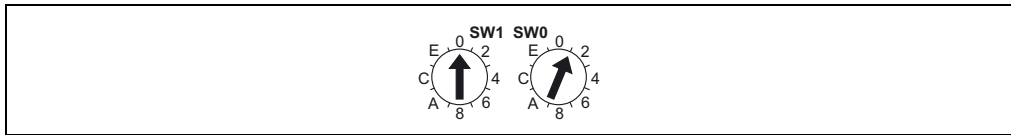


Figure 33: Power Panel 15 operating mode and node number switch

The Power Panel 15 is equipped with 2 hex switches, which are used as operating mode switches. The switch positions 01 - FE are used to set the CAN node number. The operating system only interprets the switch position when switched on.

All other switch positions are reserved for special functions.

Switch position	Description
00	In this switch position, the operating system can be programmed via the online interface. User FlashPROM is only deleted after the update begins.
01 - FE	Freely available for use in an application (e.g. CAN node number)
FF	Diagnostics mode: The CPU boots in Diagnostics mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostics mode, the CPU always boots with a cold restart.

Table 24: Power Panel 15 switch positions of the operating mode and node number switch

7. Dimensions

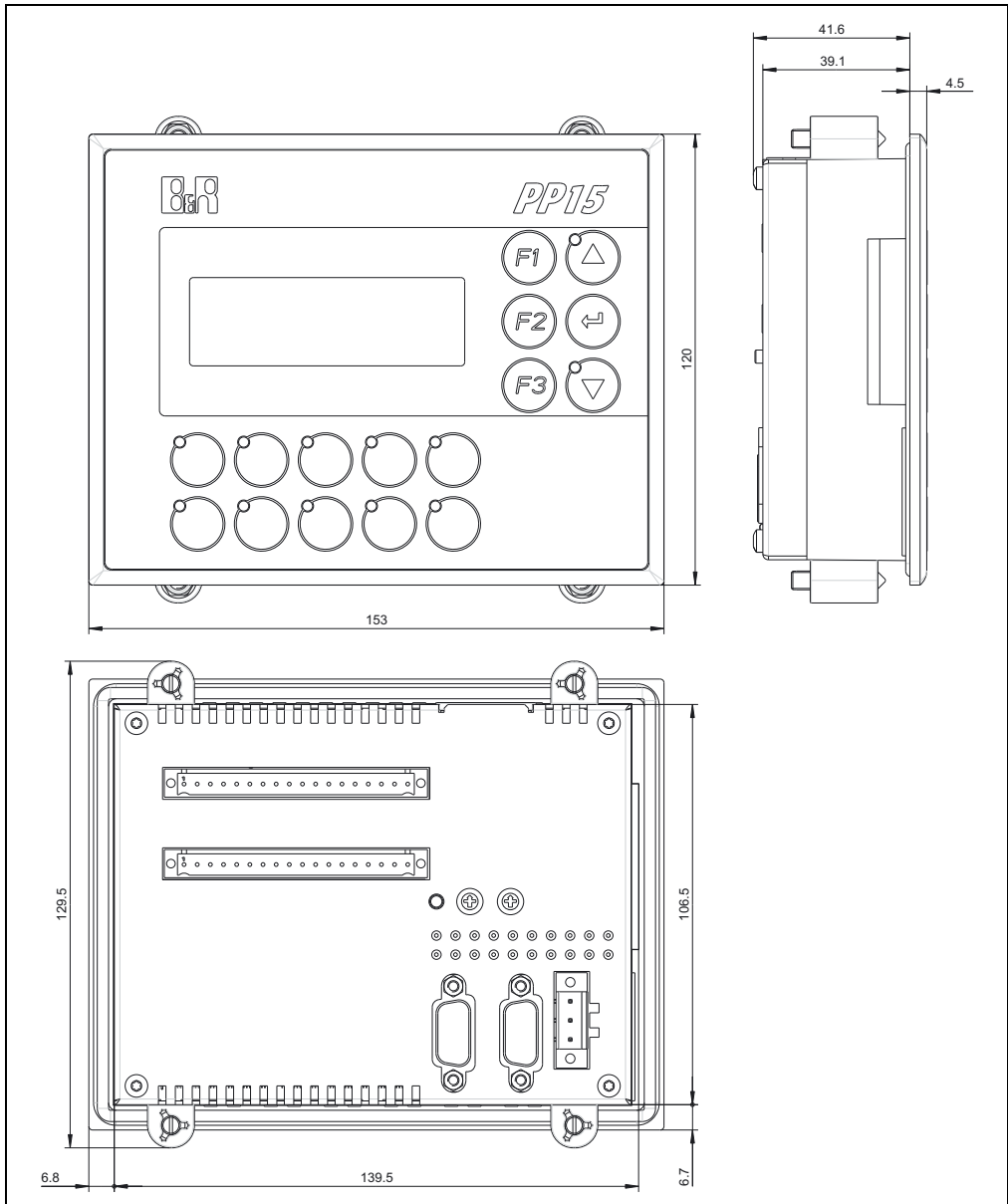


Figure 34: Power Panel 15 - Dimensions

Installation cutout: 141 mm x 108 mm (max. 4.5 mm plate thickness)

8. Set display contrast

The display contrast is set at the factory. However, the user can make a different contrast setting as desired. To do this, press "ENTER". While holding down this key, the "UP" and "DOWN" keys can be used to set the contrast:

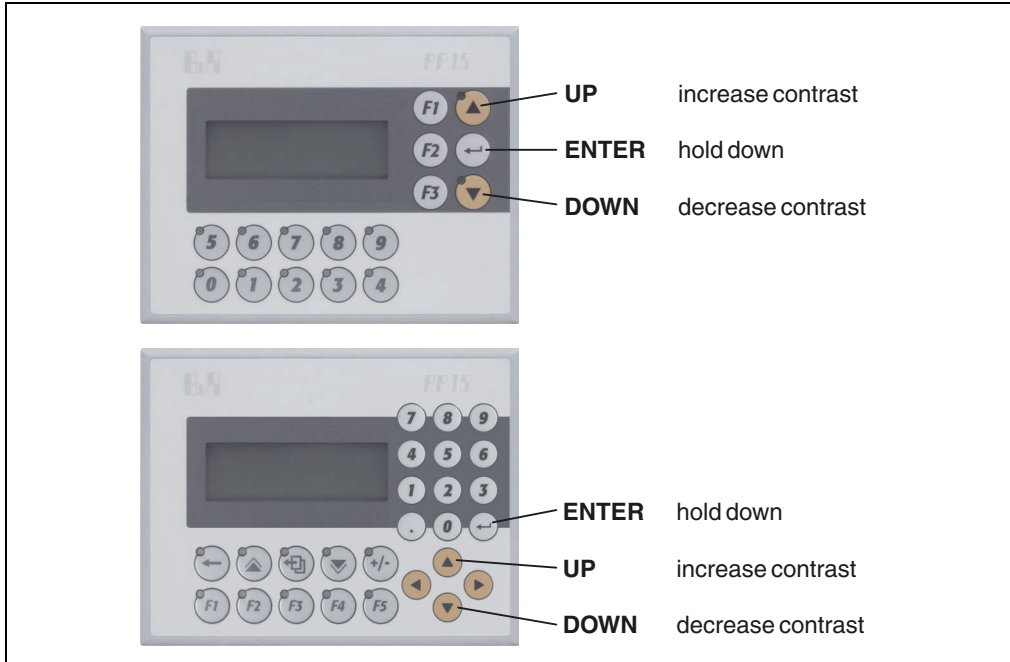


Figure 35: Power Panel 15 set display contrast

The contrast setting made in this way is placed in nonvolatile memory and is used from now on as the default value.

WARNING

The key codes for "UP" and "DOWN" are not sent to the controller as long as "ENTER" is being pressed. It is also not possible to use the key combinations ENTER + UP or ENTER + DOWN in the application project.

9. Note regarding operation

Caution!

Pressing several function or system keys at the same time may trigger unintended actions.

10. Changing the battery

10.1 Battery data

Lithium battery	3 V / 950 mAh
Model number	0AC201.9 (lithium batteries, 5 pcs.) 4A0006.00-000 (lithium battery, 1 pc.)
Storage time	Max. 3 years at 30° C
Humidity	0 to 95% (non-condensing)

Table 25: Power Panel 15 battery data

10.2 Buffer duration

Buffer current	Panel CPU
Typical	10 μ A
Maximum	200 μ A

Table 26: Power Panel 15 buffer duration

Information:

B&R recommends changing the batteries after five years of operation.

10.3 Steps for changing the battery

The product design allows the battery to be changed with the Power Panel switched on or off. In some countries, safety regulations do not allow batteries to be changed while the module is switched on.

Information:

Data stored in RAM will be lost if the battery is changed with the PLC switched off.

The battery is changed as follows:

- Touch the mounting rail or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
- Remove the cover from the lithium battery holder using a screwdriver.
- Remove the battery from the holder by pulling the removal strip (don't use uninsulated tools -> risk of short circuiting).

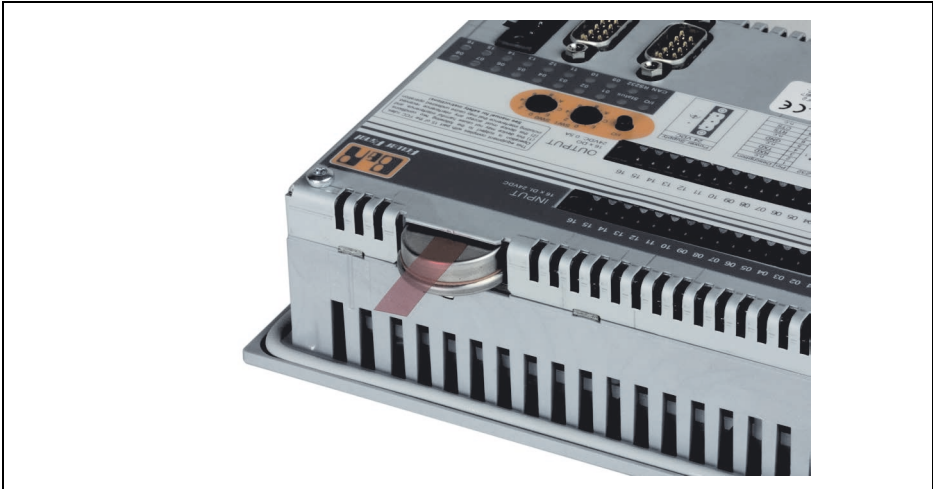


Figure 36: Power Panel 15 changing the battery

- The battery should not be held by its edges. **Insulated** tweezers may also be used for removing the battery.

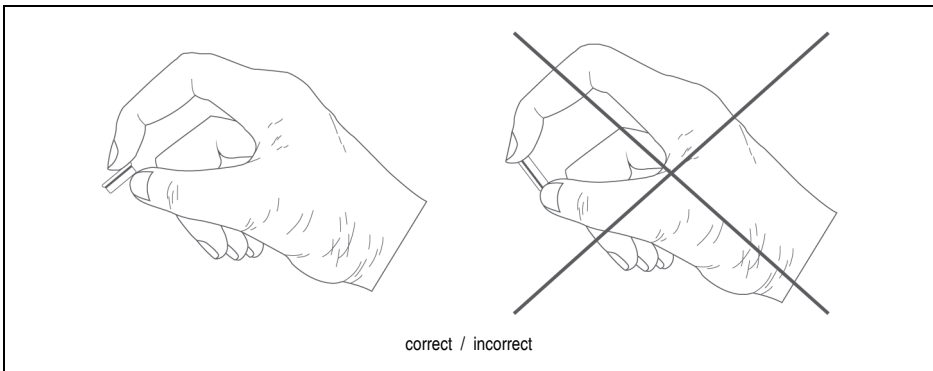


Figure 37: Power Panel 15 handling the battery

Power Panel 15 • Mounting instructions

- Insert the new battery with correct polarity. The removal strip should be protruding from the battery holder and the "+" side of the battery should be facing downward. In order to be able to remove the battery again in future, the removal strip **must** protrude from the upper side of the battery.
- Now wrap the end of the removal strip over the top of the battery and insert it underneath the battery so that it does not protrude from the battery holder.

Information:

Lithium batteries are considered hazardous waste. Used batteries should be disposed of accordingly.

11. Mounting instructions

The following mounting instructions should be noted:

- 1) The Power Panel 15 should be mounted with the four retaining clips (two left and two right), which are supplied in the delivery.
- 2) In order to guarantee proper air circulation, allow a distance of at least 20 mm (above and below) between the ventilation slots and all other objects.

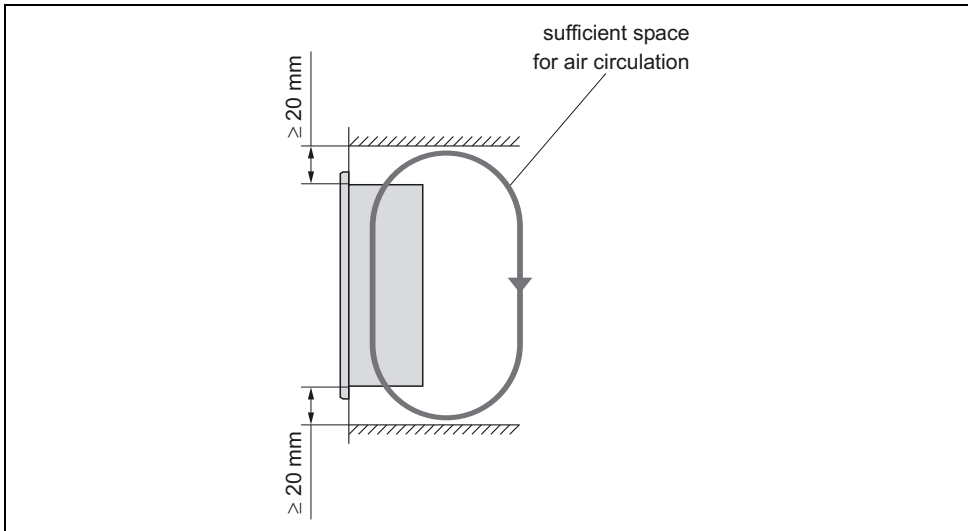


Figure 38: Power Panel 15 distance for air circulation

- 3) The Power Panel 15 can be mounted up to a maximum angle of $\pm 45^\circ$.

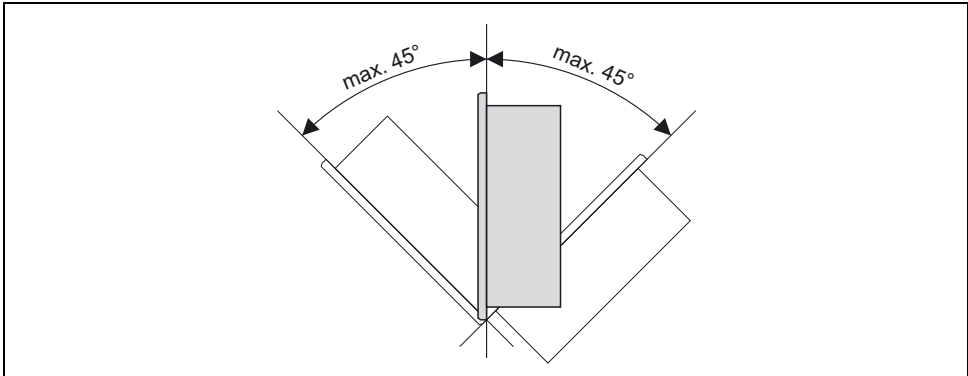


Figure 39: Power Panel 15 mounting angle

Chapter 4 • Power Panel 21

1. Photo

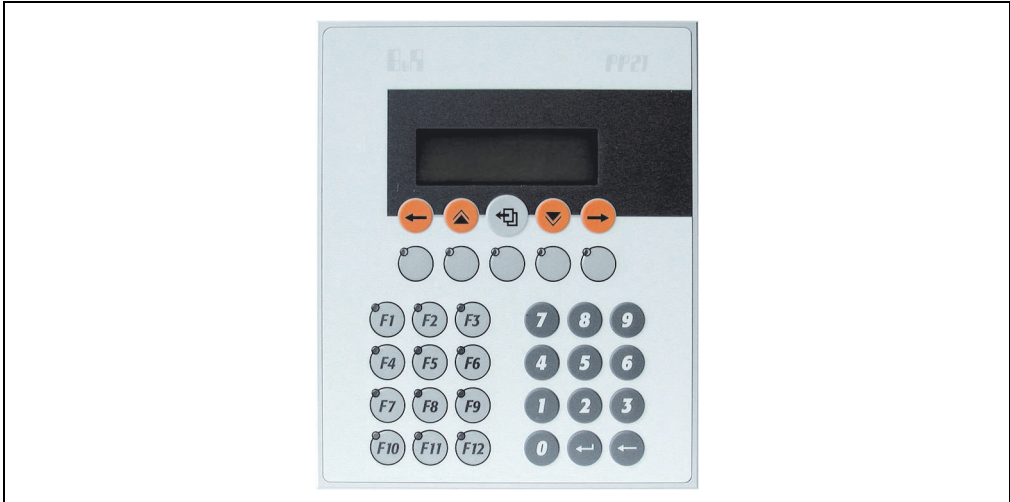


Figure 40: Power Panel 21 photo

2. Order data

Model number	Short description
4P0420.00-490	Power Panel 21, LC-display 4 x 20 characters, background lighting, 34 function keys, system compatible 2003 CPU, 700 KB SRAM, 1.4 MB FlashPROM, 1 PCMCIA slot, 1 RS232 interface, 1 CAN interface (electrically isolated, network capable), 6 slots for screw-in modules, 10 digital inputs 24 VDC, 8 digital outputs 24 VDC, 0.4 A, IP65 protection (from front), 155 x 190 mm (B x H), 24 VDC. Order TB712 terminal blocks separately!
Note	
All parts required to install the Power Panel, including key legend sheets, are included in its delivery. The backup battery and the 4 pin terminal block for the supply are also included. Two 12-pin terminal blocks must be ordered separately.	
Required accessories	
7TB712.9	Accessory terminal block, 12-pin, screw clamp, 1.5 mm ²
7TB712.91	Accessory terminal block, 12-pin, cage clamp, 1.5 mm ²

Table 27: Power Panel 21 order data

Power Panel 21 • Technical data

Model number	Short description
Optional accessories	
0AC201.9 ¹⁾	Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell
4A0006.00-000 ¹⁾	Lithium battery, 3 V / 950 mAh, button cell
0MC111.9	PCMCIA memory card, 2 MB FlashPROM
0MC211.9	PCMCIA memory card, 2 MB SRAM
4A0035.00-000	A4 legend strip template, for PP21 (4P0420.00-490); 2 sheets, 10 devices, with CorelDraw template.
7AC911.9	Bus connector, CAN

Table 27: Power Panel 21 order data (Forts.)

1) Replacement part

3. Technical data

Description	Power Panel 21
General information	
Certification	CE, C-UL-US, GOST-R
Standards	
Temperature	IEC61131-2 / IEC60068-2-x
Shock / tests carried out	IEC61131-2 / IEC60068-2-27
Vibration / tests carried out	IEC61131-2 / IEC60068-2-6
Emission / tests carried out	EN61000-6-4 / EN55022
Immunity / tests carried out	IEC 61131-2 / IEC 61000-4-x
Display	
Type	LCD b/w
Resolution	4 x 20 characters
Character set	English / Katakana
Reading angle	Approx. 60 °
Character height	4.75 mm
Keys	
Design	Mylar keypad with metallic snap-action disks
Front	Multi-layered cover with insertion slots for key legends
Total keys	34 membrane keys
Function keys	17, with LEDs, labeled with legend sheets
System keys	17 (number block, control keys)

Table 28: Power Panel 21 technical data

Description	Power Panel 21
Processor	
Additional I/O processor	Handles I/O data points
Typical instruction cycle time	0.5 µs (average value with 70% bit and 30% analog processing)
Standard memory User RAM SystemPROM User PROM	700 kB SRAM 600 kB FlashPROM 1.4 MB FlashPROM
Data buffering with backup battery	Lithium battery 3 V / 950 mAh
Data buffering / buffer current (typ./max.)	10 µA / 200 µA
Hardware Watchdog	Yes
Voltage monitoring	Internal supply monitored for overvoltage and undervoltage
Fans	No
Peripherals	
Real-time clock	1 s resolution, nonvolatile memory
Status display	LEDs
System bus for expansions	No
Slots for B&R 2003 screw-in modules Suitable for IF modules (without CAN) TPU functionality support Suitable for CAN communication	6 Slots 1 - 3 Slots 4 - 6 Slot 1 with interface module 4IF370.7
PCMCIA slot (see "PCMCIA slot", on Page 87) Memory size SRAM FlashPROM Standard Card height Card type	1 Max. 4 MB Max. 4 MB JEIDA V 4.0 or PCMCIA standard release 2.0 Max. 3 mm Memory cards
Standard communication interfaces	
Application interface IF1 Type Design Electrical isolation Max. transfer rate Max. distance	RS232 9-pin DSUB plug No 115.2 kbit/s 15 m / 19,200 bit/s
Application interface IF2 Type Design Electrical isolation Max. transfer rate Max. distance	CAN bus 9-pin DSUB plug Yes 500 kbit/s 1,000 m

Table 28: Power Panel 21 technical data (Forts.)

Power Panel 21 • Technical data

Description	Power Panel 21
Digital inputs	
Number of channels	10
Additional functionalities for inputs	4 x TPU
Input frequency (TPU)	50 kHz (incremental encoder operation)
Input circuit	Sink
Input voltage (min./nom./max.)	18 VDC / 24 VDC / 30 VDC
Input current at nominal voltage	Approx. 4 mA
Input filter	<1 ms (not TPU)
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No Input group - output group
Digital outputs	
Amount	8 + 1 floating relay contact
Type	Highside driver IC (transistor)
Switching voltage (min. /nom. /max.)	18 VDC / 24 VDC / 30 VDC
Output voltage	0.4 A
Total current	3.2 A
Output circuit	Source
Switching delay Log. 0 - log. 1 Log. 1 - log. 0	Max. 450 µs Max. 450 µs
Output protection	Overload protection
Internal protective circuit	Yes
Load for potential-free relay contact	Max. 0.5 A
Leakage current when switched off	12 µA
Switching on after overload cutoff	Automatically within seconds (depends on the panel temperature)
Permanent short circuit current	Typ. 4 A
Braking voltage when switching off inductive loads	47 V
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No Input group - output group
Power supply	
Input voltage (min./nom./max.)	18 VDC / 24 VDC / 30 VDC
Power consumption	Max. 20 W
Output power for screw-in modules and PCMCIA interface	10 W

Table 28: Power Panel 21 technical data (Forts.)

Description	Power Panel 21
Environmental conditions	
Temperature Operation Storage	0°C to 50°C -20°C to 60°C
Humidity Operation Storage	10 to 90% (non-condensing) 5 to 95% (non-condensing)
Operational conditions	
Mounting orientation	Vertical, ±45°
Altitude	Max. 3,000 m
Mechanics	
Protection	IP65 (from front)
Outer dimensions (B x H x T [mm])	155 x 190 x 84.4
Weight	1.25 kg

Table 28: Power Panel 21 technical data (Forts.)

4. Images

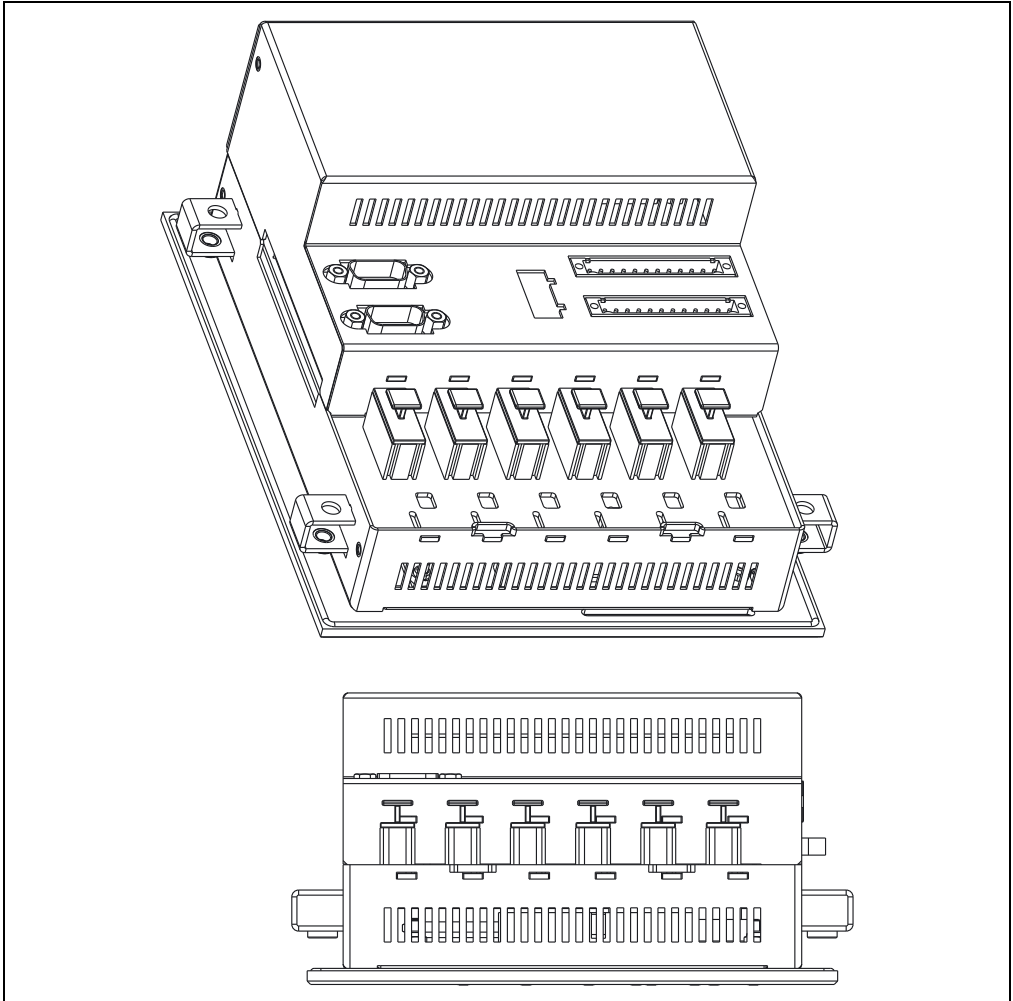


Figure 41: Power Panel 21 images

5. Dimensions

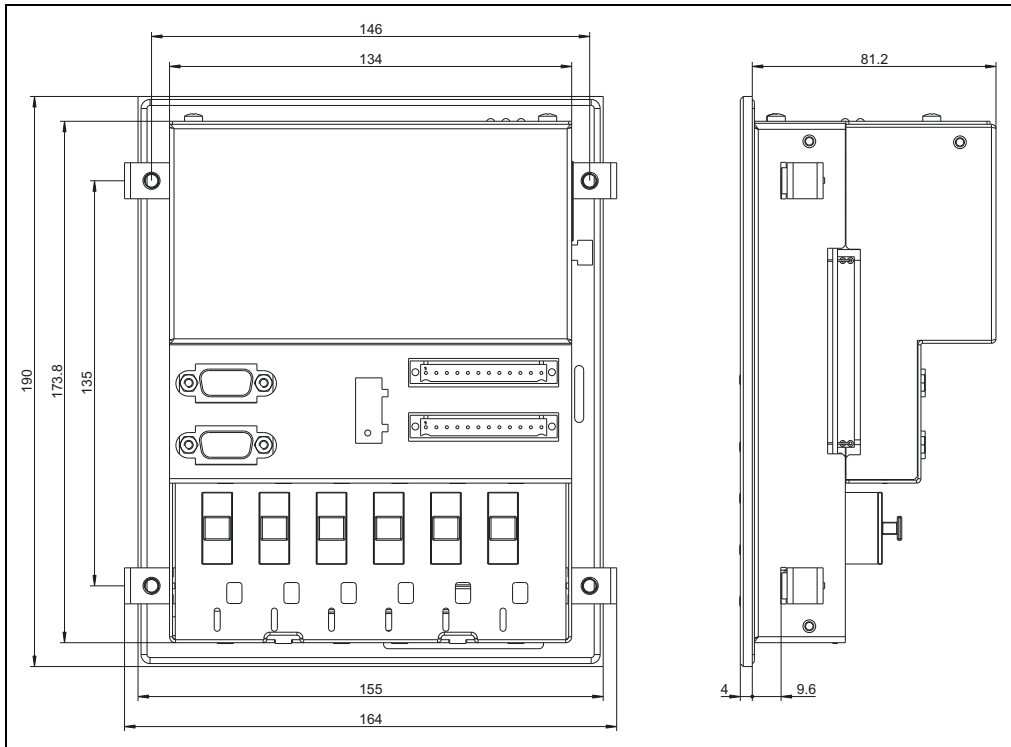


Figure 42: Power Panel 21 dimensions

Installation dimensions: 138 mm x 179 mm

6. Component descriptions

6.1 Status LEDs

LED	Color	Meaning
CAN	Yellow	Data transfer to or from CAN controller
RS232	Yellow	Indicates if data is being transmitted or received
ERR	Red	Lit when in Service mode
RUN	Green	Lit in RUN and in Service mode
MODE	Yellow	Lit when programming FlashPROM
READY	Yellow	Lit when in Service mode

Table 29: Power Panel 21 status LEDs

6.2 Power supply

The Power Panel 21 is equipped with a 24 VDC power supply. The pin assignment is printed on the housing.

Pin assignment - power supply ¹⁾	
Pin	Description
1	+
2	+
3	-
4	-

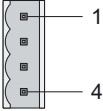


Table 30: Power Panel 21 pin assignment - power supply

1) Both "+" and "-" pins are connected to each other internally

6.3 Interfaces

The Power Panel has two interfaces:

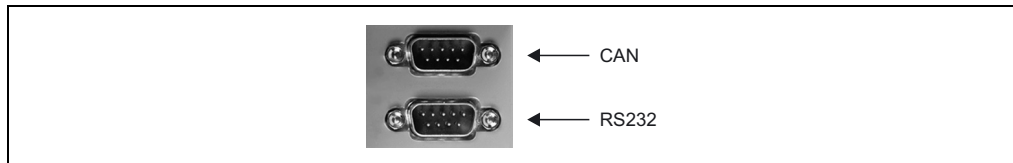


Figure 43: Power Panel 21 interfaces

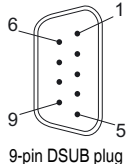
6.3.1 CAN interface

The electrically isolated standard fieldbus interface is used for the following tasks:

- Communication with other control systems
- Decentralization and remote I/O expansion using B&R 2003 components and a CAN bus controller

We recommend using the AC911 T-connector for connecting to a CAN network. A terminal resistance is integrated into the T-connector for the bus termination, which can be switched on or off. For more information on wiring CAN fieldbus systems, see chapter 2, "Installation", section "CAN fieldbus" of the B&R SYSTEM 2003 User's Manual.

Pin assignment for CAN interface	
Electrically isolated Assignment according to CIA DS 102-1	
Pin	Assignment
1	n. c.
2	CAN_L
3	CAN_GND
4	n. c.
5	n. c.
6	Reserved
7	CAN_H
8	n. c.
9	n. c.



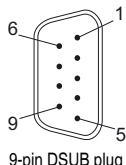
9-pin DSUB plug

Table 31: Power Panel 21 pin assignment - CAN interface

6.3.2 RS232 interface

This non-electrically isolated interface is primarily intended for programming the CPU. The RS232 can also be used as a general interface (e.g. printer, bar code reader, etc.).

Pin assignment - RS232 interface	
RS232 interface Not electrically isolated up to 115 kbit/s	
Pin	Assignment
1	CTS
2	RXD
3	TXD
4	5 VDC / max. 500 mA
5	GND
6	n. c.
7	RTS
8	CTS
9	GND



9-pin DSUB plug

Table 32: Power Panel 21 pin assignment - RS232 interface

6.4 Operating mode switch

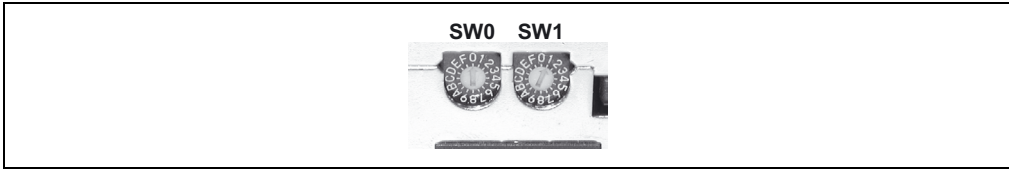


Figure 44: Power Panel 21 operating mode switch

The Power Panel 21 is equipped with 2 hex switches, which are used as an operating mode switch. Switch positions 01 - FC are available for any purpose in an application. The switch's position can be evaluated from an application program. The operating system only interprets the switch position when switched on.

All other switch positions are reserved for special functions.

Switch position	Description
00	In this switch position, the operating system can be programmed via the online interface. User FlashPROM is only deleted after the update begins.
01 - FC	Freely available for use in an application (e.g. CAN node number)
FD	This setting should not to be used. Update Mode - In this switch position, the Power Panel checks if an update memory card is inserted. If no card is inserted, the Power Panel goes into Service mode. Otherwise (depending on the Update configuration) the operating system and/or the user-ROM for the Power Panel is cleared and reinstalled from the memory card. If an error occurs during installation the red ERRor LED blinks. If installation has been successfully completed, the green RUN LED and the yellow READY LED blink.
FE	Reserved for B&R expansions – these setting is not allowed to be used!
FF	Diagnostics mode: The CPU boots in Diagnostics mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostics mode, the CPU always boots with a cold restart.

Table 33: Power Panel 21 switch settings for the MODE switch

6.5 Programming System Flash

The Power Panel is delivered without an operating system installed. An operating system can be downloaded or updated using the programming software. Installation of the operating system is possible with both programming systems. When downloading the operating system for the first time using B&R Automation Studio™, complete the following steps:

- 1) Turn off power to the PLC.
- 2) Set the MODE switch to 00.
- 3) Switch on the power supply again.
- 4) Make on-line connection to PC (physically).
- 5) Start B&R Automation Studio™ ("OFFLINE" is displayed in the status bar)
- 6) Select menu item "PROJECT" - "SERVICES" - "TRANSFER OPERATING SYSTEM"
- 7) A window named "Operating System Transfer" opens
- 8) The COM port can be changed in this window, if required. Only in this case (using the "Try to connect Bootstraploader" button) must the connection be reestablished. If several PLC SW versions are available, these can also be selected.
- 9) By clicking on "Next" in the new window CAN bus specific settings can be made.

6.6 PCMCIA slot

The Power Panels are equipped with one PCMCIA interface for B&R memory cards. PCMCIA memory cards conforming to JEIDA V4.0 Type I or PCMCIA Standard Release 2.0 (max. 3 mm high) are supported.

The memory on the PCMCIA card can be used with all types of B&R modules. Executable programs (Task) should not be stored on the PCMCIA card, because accessing the card takes considerably longer than accessing the Power Panel's onboard memory.

The Power Panel 21 supports memory cards with up to 4 MB SRAM or with up to 4 MB FlashPROM. The following memory cards can be ordered from B&R:

Model number	Short description	Power consumption
0MC111.9	PCMCIA memory card, 2 MB FlashPROM	Max. 0.8 W
0MC211.9	PCMCIA memory card, 2 MB SRAM	Max. 0.8 W

Table 34: Power Panel 21 order data - PCMCIA memory cards

The memory cards are used by the Power Panel as ROM type "MEMCARD".

6.6.1 Limitations when using memory cards

Access to memory cards is very slow.

- Internal variables cannot be stored on the memory card
- Memory cannot be allocated to the memory cards

The SRAM and FlashPROM memory cards can only be written to by the Power Panel. Therefore, it is not possible to program the system software or the application on a memory card directly on a PC with a PCMCIA interface.

6.7 Power Panel interface

The Power Panel 21 is equipped with six slots for B&R SYSTEM 2003 screw-in modules. The required screw-in modules are inserted into the Power Panel interface and screwed firmly into place. The screw-in interface modules can be operated in slots 1 - 3. Screw-in modules can be used in slots 4 - 6, which possess TPU functionality. The first slot has a second CAN port and allows a second CAN interface by using an IF370 module.

6.8 Screw-in module overview

A description of the B&R SYSTEM 2003 screw-in module can be found in the "B&R SYSTEM 2003 User's Manual " (model. no.: MASYS22003-E).

Module	Type	Description
4IF370.7	Interface	Power Panel interface module, 1 CAN interface, electrically isolated, network capable, screw-in module Note: This module can only be operated in slot 1.
7AI261.7	Analog IN	2003 analog input module, 1 input for evaluation of full-bridge strain gauge, 24-bit, screw-in module
7AI294.7	Analog IN	2003 analog input module, 4 inputs, potentiometer evaluation, 13-bit, screw-in module
7AI351.70	Analog IN	2003 analog input module, 1 input, ± 10 V or 0 to 20 mA, 12-bit + sign, screw-in module, 1 x TB712 terminal block sold separately.
7AI354.70	Analog IN	2003 analog input module, 4 inputs, ± 10 V, 12-bit + sign., screw-in module. Order 1 x TB712 terminal block separately.
7AI774.70	Analog IN	2003 analog input module, 4 inputs, 0 to 20 mA, 12-bit, screw-in module. Order 1 x TB712 terminal block separately.
7AM351.70	Analog IN Analog OUT	2003 analog mix module, 1 input, ± 10 V, 16-bit, 1 output, ± 10 V, 16-bit, screw-in module, terminal block 1 x TB712 sold separately.
7AO352.70	Analog OUT	2003 analog input module, 2 inputs, ± 10 V or 0-20 mA, 12-bit, screw-in module. Order 1 x TB712 terminal block separately.
7AT324.70	Analog in	2003 analog input module, 4 temperature inputs (2-line connection), KTY10 -50 to 150°C, KTY84 -40 to 300°C, PT100 -200 to 850°C, PT1000 -200 to 850°C, screw-in module, order terminal block 1 x TB712 separately.
7AT352.70	Analog IN	2003 analog input module, 2 inputs, PT100 (3-line connection), -200 to 850°C, screw-in module. Order 1 x TB712 terminal block separately.
7AT664.70	Analog IN	2003 analog input module, 4 inputs, thermal elements, -270 to 1768°C, screw-in module. Order 1 x TB712 terminal block separately.
7DI135.70	Digital IN	2003 digital input module, 4 inputs 24 VDC, sink, incremental encoder operation: 50 kHz, event counter operation: 100 kHz, 1 comparator output 24 VDC, screw-in module, order 1 x TB712 terminal block separately.
7DI138.70	Digital IN	2003 digital input module, 10 inputs 24 VDC, sink, 2 inputs for event counter operation, input frequency 20 kHz, screw-in module. Order 1 x TB712 terminal block separately.
7DI140.70	Digital IN	2003 digital input module, 10 inputs 24 VDC, sink, 2 inputs for event counter operation or for direction dependent position determination, input frequency 50 kHz, 4 inputs can be used as high speed inputs (e.g. gate, frequency measurement), screw-in module. Order 1 x TB712 terminal block separately.
7DO135.70	Digital OUT	2003 digital output module, 4 FET outputs 12 to 24 VDC, 0.1 A, screw-in module. Order 1 x TB712 terminal block separately.
7DO138.70	Digital OUT	2003 digital output module, 8 outputs 24 VDC, 0.5 A, short circuit protection, thermal overload protection, screw-in module. Order 1 x TB712 terminal block separately. Note: This module can only be operated in the slots 4 - 6.
7IF311.7	Interface	2003 interface module, 1 RS232 interface, screw-in module
7IF321.7	Interface	2003 interface module, 1 RS485/RS422 interface, electrically isolated, network capable, screw-in module
7IF361.70-1	Interface	2003 interface module, 1 RS485 interface, electrically isolated and network capable, transfer protocol: PROFIBUS-DP, screw-in module
7NC161.7	Encoder module	2003 encoder module, input frequency 100 kHz, incremental or absolute, 32-bit, encoder supply 5 VDC or 24 VDC, screw-in module

Table 35: Power Panel 21 screw-in module overview

6.9 Data/real-time buffering

The battery voltage is checked cyclically. The load test of the battery does not considerably shorten the battery life, instead it gives an early warning of weakened buffer capacity. The status information, "Battery OK" can be accessed using the B&R-TRAP function, "SYS_battery".

6.10 Digital inputs

6.10.1 Terminal block connections

Inputs 1 - 4 are equipped with additional functions (event counter, ABR evaluation, etc.). The supply voltage for the digital inputs can be monitored with the application program.

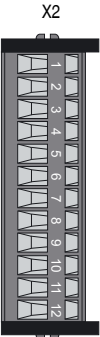
12-pin terminal block	Terminal	Assignment
 <p>X2</p> <p>TB712</p>	1	Input 1
	2	Input 2
	3	Input 3
	4	Input 4
	5	Input 5
	6	Input 6
	7	Input 7
	8	Input 8
	9	Input 9
	10	Input 10
	11	24 VDC
	12	GND

Table 36: Power Panel 21 terminal assignments - digital inputs

6.10.2 Connection example

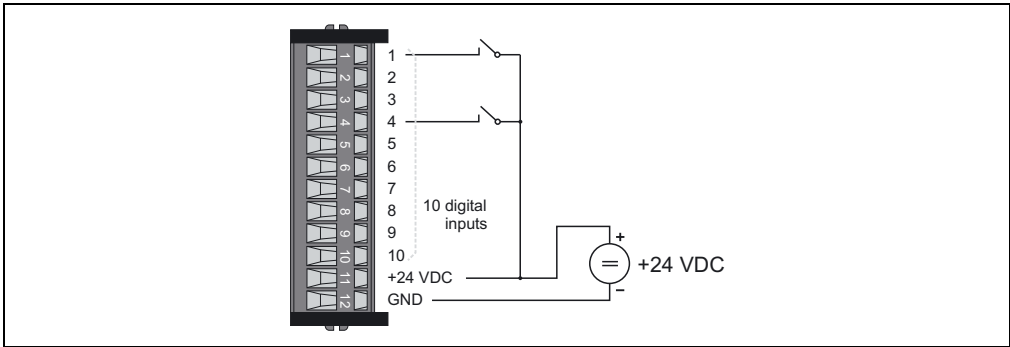


Figure 45: Power Panel 21 connection example - digital inputs

6.10.3 Input circuit diagram

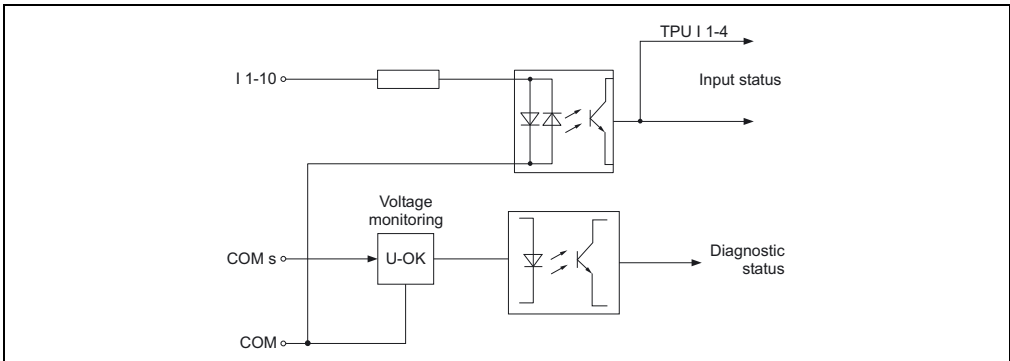


Figure 46: Power Panel 21 input circuit diagram - digital inputs

6.11 Digital outputs

6.11.1 Terminal block connections

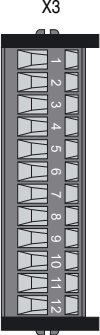
12-pin terminal block	Terminal	Assignment
	1	Output 1
	2	Output 2
	3	Output 3
	4	Output 4
	5	Output 5
	6	Output 6
	7	Output 7
	8	Output 8
	9	Potential-free relay contact
	10	Potential-free relay contact
	11	24 VDC, outputs 1 - 8
	12	GND, outputs 1 - 8

Table 37: Power Panel 21 terminal assignments - digital outputs

6.11.2 Connection examples

Outputs 1 - 8

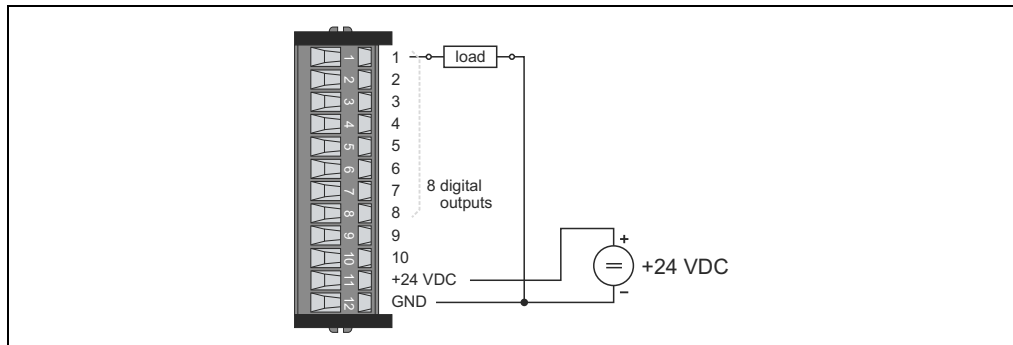


Figure 47: Power Panel 21 connection example - outputs 1 - 8

Potential-free relay contact

E-STOP circuit

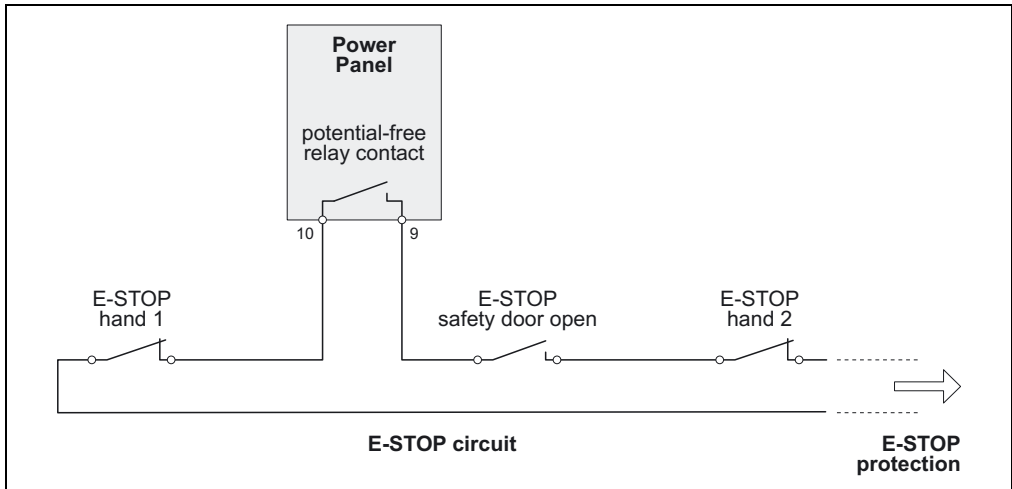


Figure 48: Power Panel 21 E-STOP circuit

Switching a load

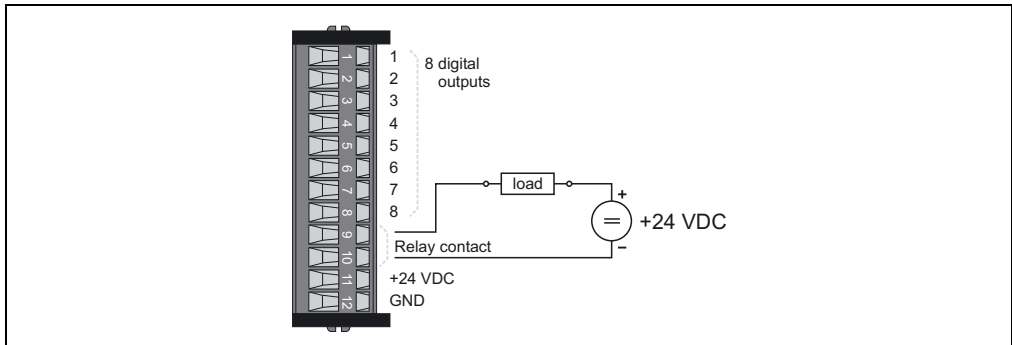


Figure 49: Power Panel 21 switching a load

6.11.3 Output circuit diagram

Digital outputs

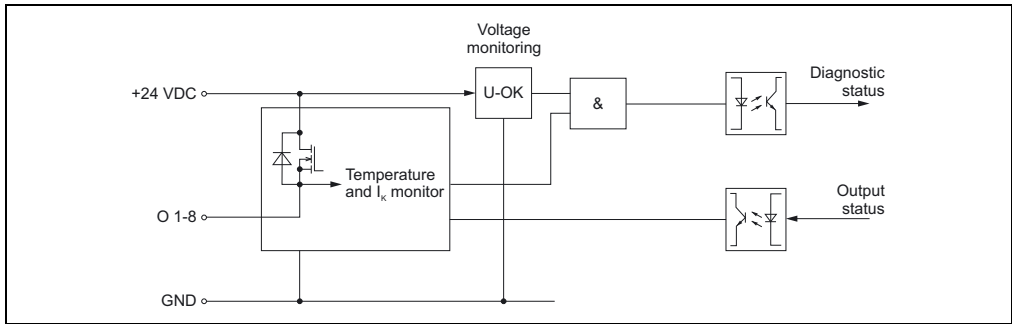


Figure 50: Power Panel 21 output circuit diagram - digital outputs

Potential-free relay contact

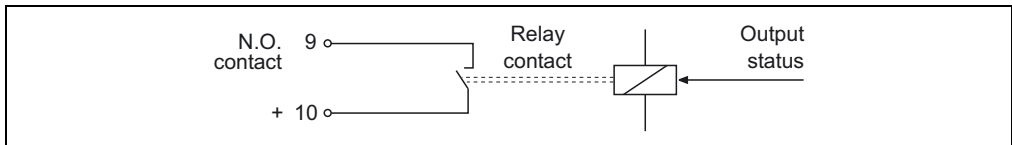


Figure 51: Power Panel 21 connection example - relay contact

7. Changing the battery

7.1 Battery data

Lithium battery	3 V / 950 mAh
Model number	0AC201.9 (lithium batteries, 5 pcs.) 4A0006.00-000 (lithium battery, 1 pc.)
Storage time	Max. 3 years at 30° C
Humidity	0 to 95% (non-condensing)

Table 38: Power Panel 21 battery data

7.2 Buffer duration

Buffer current	Panel CPU
Typical	10 μ A
Maximum	200 μ A

Table 39: Power Panel 21 buffer duration

Information:

B&R recommends changing the batteries after five years of operation.

7.3 Steps for changing the battery

The product design allows the battery to be changed with the Power Panel switched on or off. In some countries, safety regulations do not allow batteries to be changed while the module is switched on.

Information:

The data in RAM is buffered up to 10 min thanks to gold foil capacitors. During this time period, a battery change without data loss is guaranteed.

The battery is changed as follows:

- Touch the mounting rail or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
- Remove the cover from the lithium battery holder using a screwdriver.

Power Panel 21 • Changing the battery

- Remove the battery from the holder by pulling the removal strip (don't use uninsulated tools -> risk of short circuiting).



Figure 52: Power Panel 21 changing the battery

- The battery should not be held by its edges. **Insulated** tweezers may also be used for removing the battery.

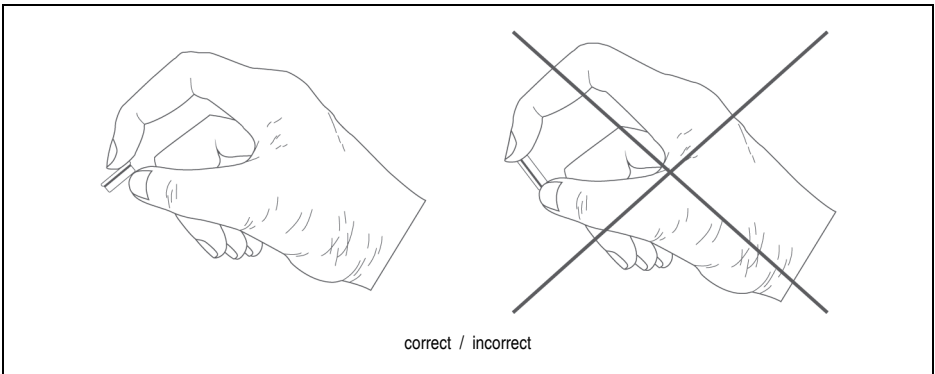


Figure 53: Power Panel 21 handling the battery

- Insert the new battery with correct polarity. The removal strip should be protruding from the battery holder and the "+" side of the battery should be facing downward. In order to be able to remove the battery again in future, the removal strip **must** protrude from the upper side of the battery.
- Now wrap the end of the removal strip over the top of the battery and insert it underneath the battery so that it does not protrude from the battery holder.

Information:

Lithium batteries are considered hazardous waste. Used batteries should be disposed of accordingly.

8. Note regarding operation

Caution!

Pressing several function or system keys at the same time may trigger unintended actions.

9. Mounting instructions

The following mounting instructions should be noted:

- 1) The Power Panel 21 should be mounted with the four retaining clips (two left and two right), which are supplied in the delivery.
- 2) In order to guarantee proper air circulation, allow a distance of at least 100 mm (above and below) between the ventilation slots and all other objects.

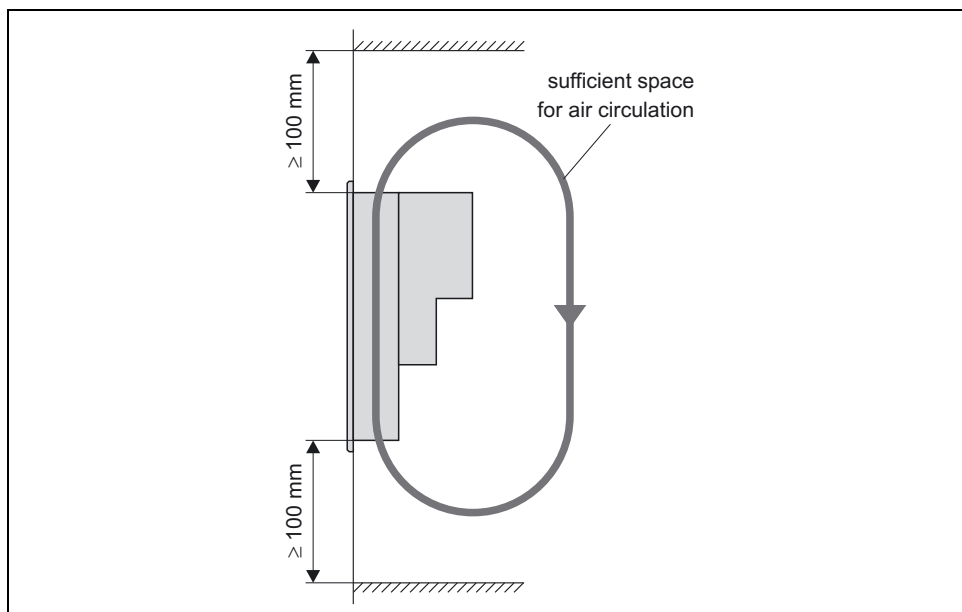


Figure 54: Power Panel 21 distance for air circulation

- 3) The Power Panel 21 can be mounted up to a maximum angle of $\pm 45^\circ$.

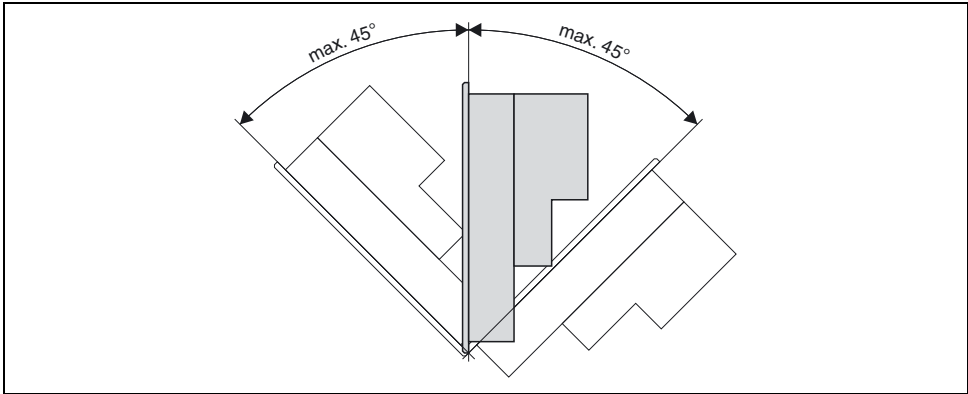


Figure 55: Power Panel 21 mounting angle

Chapter 5 • Power Panel 35

1. PP35 types



Short description					
Photo					
Model number	4PP035.0300-01	4PP035.0300-36	4PP035.E300-01	4PP035.E300-36	4PP035.E300-136
Page	102	122	102	122	
LCD display					
160 x 80 pixels	✓				
Character set					
European / Cyrillic	✓		✓		
Keys					
Total	16		26		
With key LED	12		10		
With insert strips	10		10		
Inputs / outputs					
Digital inputs	16	8	16	8	
Digital outputs	16	8	16	8	
Analog inputs	-	4	-	4	
Analog outputs	-	4	-	4	
FlashPROM					
1,0 MB	✓				-
1,9 MB	-				✓

Table 40: PP35 overview

2. Power Panel 35-01

2.1 Photos

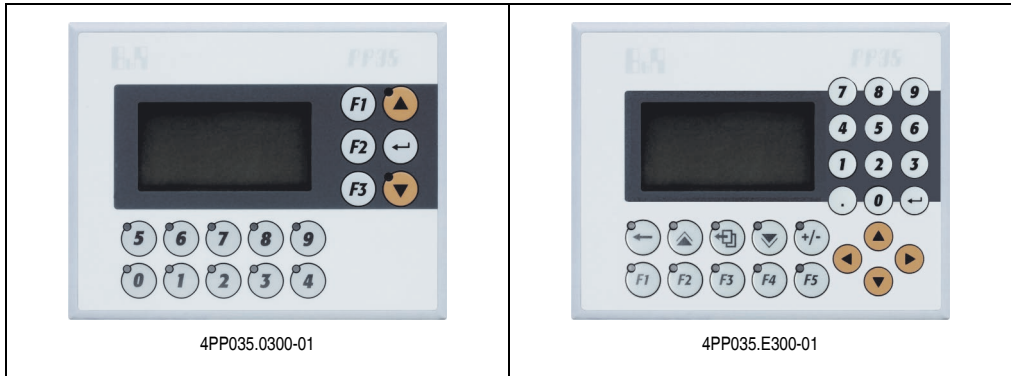


Figure 56: PP35-01 photos

2.2 Order data

Model number	Short description
4PP035.0300-01	Power Panel, 24 VDC, 153 x 120 mm, LC display, 160x80 Pixel, 3", background lighting, European / Cyrillic character set, 16 keys, 300 KB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 16 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 16 digital outputs, 24 VDC, 0.5 A source, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
4PP035.E300-01	Power Panel, 24 VDC, 153 x 120 mm, LC display, 160x80 Pixel, 3", background lighting, European / Cyrillic character set, 26 keys, 300 KB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 16 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 16 digital outputs, 24 VDC, 0.5 A source, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
Note	
All parts required to install the Power Panel, including key legend sheets, are included in its delivery.	
Required accessories	
0TB103.9	Accessory terminal block, 3-pin, Screw clamp, 2.5 mm ² ; protected against vibration by the screw flange.
0TB103.91	Accessory terminal block, 3-pin, Cage clamps, 2.5 mm ² ; protected against vibration by the screw flange.
7TB718.9	Accessory terminal block, 18-pin, screw clamp, 1.5 mm ²
7TB718.91	Accessory terminal block, 18-pin, cage clamp, 1.5 mm ²

Table 41: PP35-01 order data

Model number	Short description
Optional accessories	
0AC201.9 ¹⁾	Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell
4A0006.00-000 ¹⁾	Lithium battery, 3 V / 950 mAh, button cell
4A0044.00-000	5 DIN A4 legend strips, 6 fields for a total of 30 devices
7AC911.9	Bus connector, CAN

Table 41: PP35-01 order data (Forts.)

1) Replacement part

2.3 Technical data

Product ID	PP35-01
General information	
Certification	CE, C-UL-US, GOST-R
Standards Temperature Shock / tests carried out Vibration / tests carried out Emission / tests carried out Immunity / tests carried out	IEC61131-2 / IEC60068-2-x IEC61131-2 / IEC60068-2-27 IEC61131-2 / IEC60068-2-6 EN61000-6-4 / EN55022 IEC 61131-2 / IEC 61000-4-x
Status display	I/O function for each channel, status
Diagnostics Status I/O function Interfaces	Yes, with status LED Yes, with LEDs Yes, with LEDs
Display	
Type	LCD b/w
Resolution	160 x 80 pixels
Background lighting	LED
Character set	European / Cyrillic
Keys	
Total keys 4PP035.0300-01 4PP035.E300-01	16 (12 with LEDs) 26 (10 with LEDs)
System keys	Number block Control keys
Labeling	10 keys with insert strips

Table 42: PP35-01 technical data

Power Panel 35-01 • Technical data

Product ID	PP35-01
Processor	
Typical instruction cycle time	0.8 μ s, average value at 70% bit and 30% analog processing
Standard memory User RAM System PROM User PROM 4PP035.0300-01 4PP035.E300-01	300 kB SRAM 448 kB FlashPROM 1024 kByte FlashPROM 1024 kByte FlashPROM
Data buffering with backup battery	Lithium battery, 3 V / 950 mAh
Battery buffer current	Max. 60 μ A
Hardware Watchdog	Yes
Voltage monitoring	An NMI is triggered at a supply voltage of <15 VDC.
Real-time clock	1 s resolution, nonvolatile memory
System bus for expansions	No
Operating system	PP01x (version V 2.36 and higher)
Status display / diagnostics	
Status LED	Red / green
RS232 LED	Indicates if data is being transmitted or received
CAN LED	Indicates if data is being transmitted or received
I/O LED	Displays whether LEDs 1-16 indicate an input or output state.
01-16 LEDs	State of inputs and outputs
Interfaces	
Application interface IF1 Type Design Electrical isolation Max. transfer rate Distance	RS232 9-pin DSUB plug No 115.2 kbit/s 15 m / 19,200 bit/s
Application interface IF2 Type Design Electrical isolation Distance Max. transfer rate Bus length 60 m Bus length 200 m Bus length 1,000 m	CAN bus 9-pin DSUB plug Yes max. 1,000 m bus length 500 kbit/s 250 kbit/s 50 kbit/s

Table 42: PP35-01 technical data (Forts.)

Product ID	PP35-01	
Digital inputs		
Channels	1-3	4-16
Additional functions for inputs	2 x event counter or 1 x incremental encoder ABR/AB or 2 x gate/period measurement	-
Input circuit	Sink or source	Sink or source
Input voltage (nom./max.)	24 VDC / 30 VDC	24 VDC / 30 VDC
Input current at nominal voltage	ca. 10 mA	ca. 5 mA
Switching threshold LOW HIGH	<5 V >15 V	
Input filter	<10 µs	<1 ms
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No No	Yes No No
Event counter operation		
Amount	2	
Counter 1/2	Input 1 / 2	
Counter size	32-bit	
Input frequency	Max. 50 kHz	
Signal form	Square wave pulse	
Evaluation	Positive or negative edge, cyclic counter	
Incremental encoder operation		
Amount	1	
Type	ABR or AB	
Counter size	32-bit	
Input frequency	Max. 20 kHz	
Evaluation	4x	
Signal form	Square wave pulse	

Table 42: PP35-01 technical data (Forts.)

Power Panel 35-01 • Technical data

Product ID	PP35-01
Gate measurement	
Number of gate measurements	2
Gate measurement on channel 1 and 2 Channel 1 Channel 2	Input 1 Input 2
Counter size	32-bit
Evaluation	Positive or negative edge
Input frequency	Max. 50 kHz
Pulse length	$\geq 10 \mu\text{s}$
Length of pauses between pulses	$\geq 10 \mu\text{s}$
Count frequency Internal External	4 MHz, 31.25 kHz Max. 50 kHz
Signal form	Square wave pulse
Period measurement	
Number of period measurements	2
Measurement on channel 1 and 2 Channel 1 Channel 2	Input 1 Input 2
Counter size	32-bit
Evaluation	Positive or negative edge
Input frequency	Max. 50 kHz
Count frequency Internal External	4 MHz, 31.25 kHz Max. 50 kHz
Signal form	Square wave pulse

Table 42: PP35-01 technical data (Forts.)

Product ID	PP35-01
Digital outputs	
Channels	16
Type	Highside driver (source)
Switching voltage	
Minimum	18 VDC
Nominal	24 VDC
Maximum	30 VDC
Nom. output current	0.5 A
Total current	8 A
Output circuit	Source
Max. switching frequency	100 Hz
Switching delay	max. 500 µs
Short-circuit protection	Yes
Overload protection	Yes
Internal protective circuit	VDR
Electrical isolation	
Channel - bus	No
Channel - channel	No
Group isolation	No
Power supply	
Supply voltage	
Minimum	18 VDC
Nominal	24 VDC
Maximum	30 VDC
Power consumption	Max. 6 W
Environmental conditions	
Temperature	
Operation	0°C to 50°C
Storage	-20°C to 60°C
Humidity	
Operation	10 to 90% (non-condensing)
Storage	5 to 95% (non-condensing)
Mechanics	
Protection	IP65 (from front)
Outer dimensions (B x H x T [mm])	153 x 120 x 46.1
Weight	0.5 kg

Table 42: PP35-01 technical data (Forts.)

2.4 Diagnostic LEDs

Multiple LEDs on the back of the device show the status of the Power Panel, the interfaces, and the digital I/O:

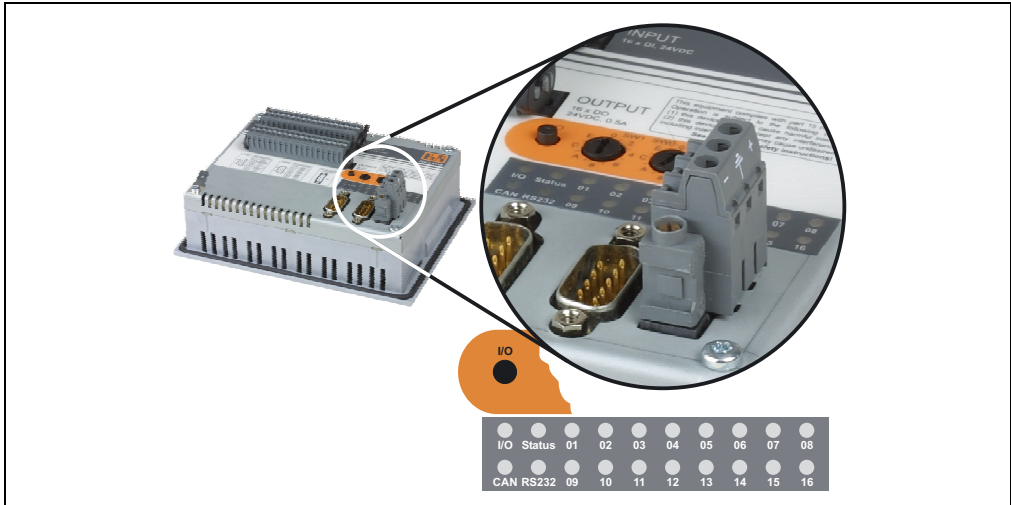


Figure 57: PP35-01 diagnostic LEDs

2.4.1 Status LED

The Power Panel status LED uses a blink code to indicate the operating state of the Power Panel:

Power Panel operating state	Color/blink code of the status LED	
Boot mode	Blinking yellow / green 1 Hz	
Flash programming	Blinking green / red 5 Hz	
Service mode / Diagnostic mode	Yellow	
Run	Green	
Error	Red	

Table 43: PP35-01 status LED

2.4.2 I/O LEDs

The I/O LED indicates whether the I/O LEDs (01 ... 16) show the state of the digital inputs or outputs. The display can be set appropriately using the I/O button.

I/O LED	LEDs 01 ... 16
Green	The state of the 16 digital inputs is indicated (LEDs are green).
Yellow	The state of the 16 digital outputs is indicated (LEDs are yellow).

Table 44: PP35-01 I/O LEDs

2.4.3 Interface LEDs

Interface LED	Description
CAN	Indicates if data is being transmitted or received.
RS232	Indicates if data is being transmitted or received.

Table 45: PP35-01 interface LEDs

2.5 Digital inputs

2.5.1 Terminal block connections

Inputs 1 - 3 are equipped with additional functions (event counter, ABR evaluation, etc.). The supply voltage for the digital inputs can be monitored with the application program.

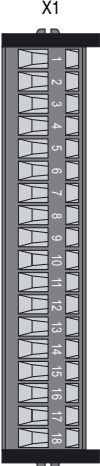
18-pin terminal block	Terminal	Assignment
 <p>X1</p> <p>7TB718.91</p>	1	COM si (GND in sink operation, 24 VDC in source operation)
	2	COM so (24 VDC in sink operation, GND in source operation)
	3	Input 1 / counter 1 / A
	4	Input 2 / counter 2 / B
	5	Input 3 / ext. CLK / R
	6	Input 4
	7	Input 5
	8	Input 6
	9	Input 7
	10	Input 8
	11	Input 9
	12	Input 10
	13	Input 11
	14	Input 12
	15	Input 13
	16	Input 14
	17	Input 15
	18	Input 16

Table 46: PP35-01 terminal assignments X1 / digital inputs

2.5.2 Connection examples

Sink connection

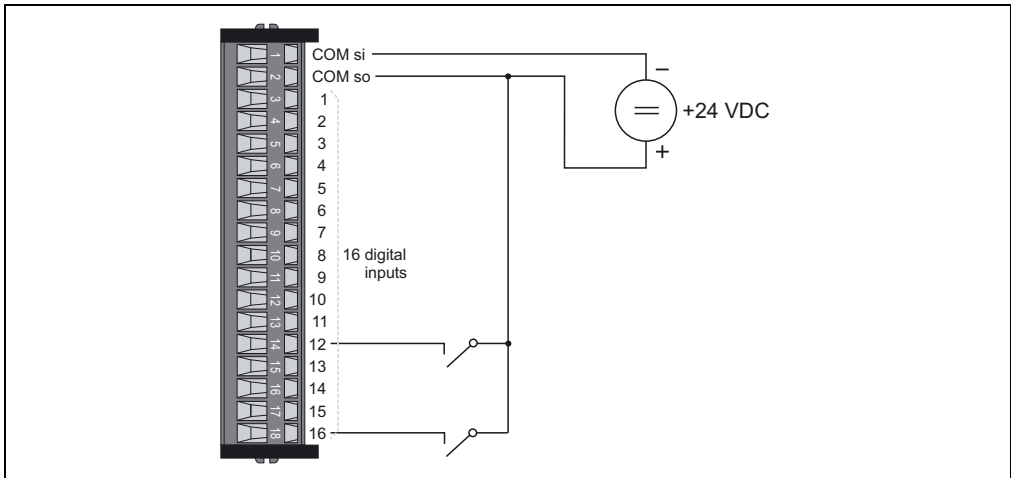


Figure 58: PP35-01 digital input connection examples (sink connection)

Source connection

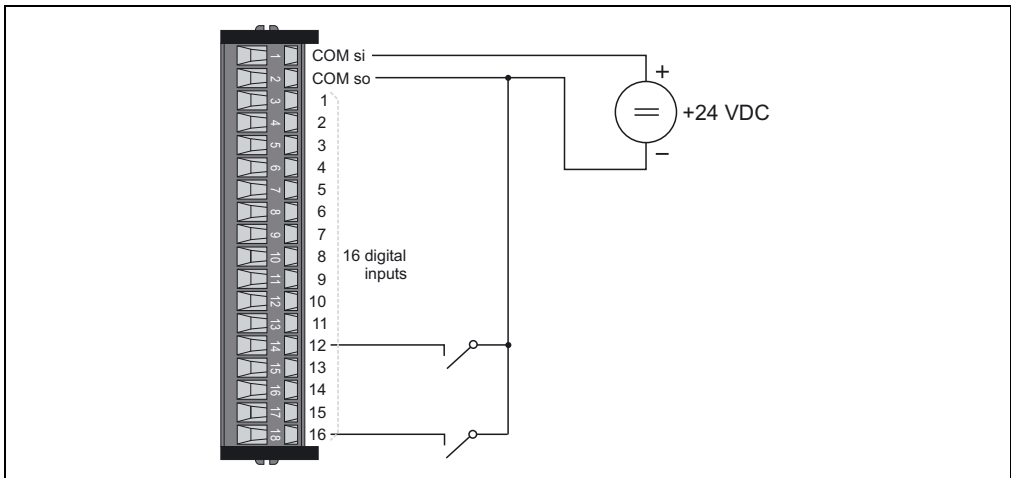


Figure 59: PP35-01 digital input connection examples (source connection)

Counter inputs

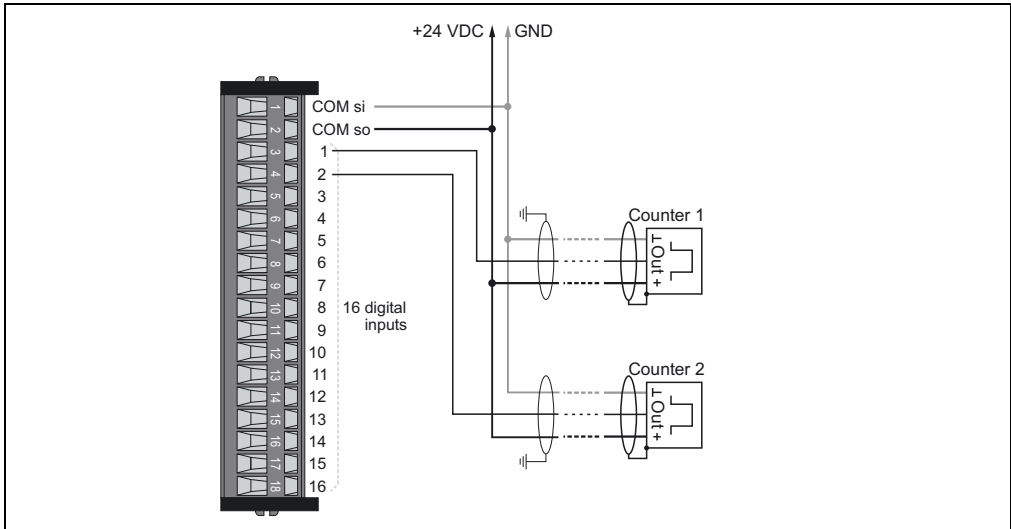


Figure 60: PP35-01 connection example - counter input

Period or gate measurement

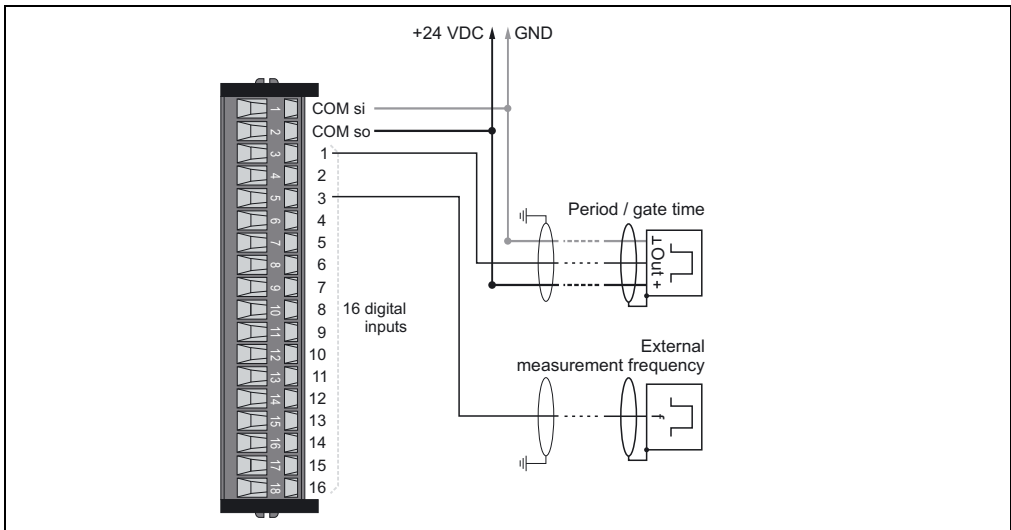


Figure 61: PP35-01 connection example - period and gate measurement

Incremental encoders

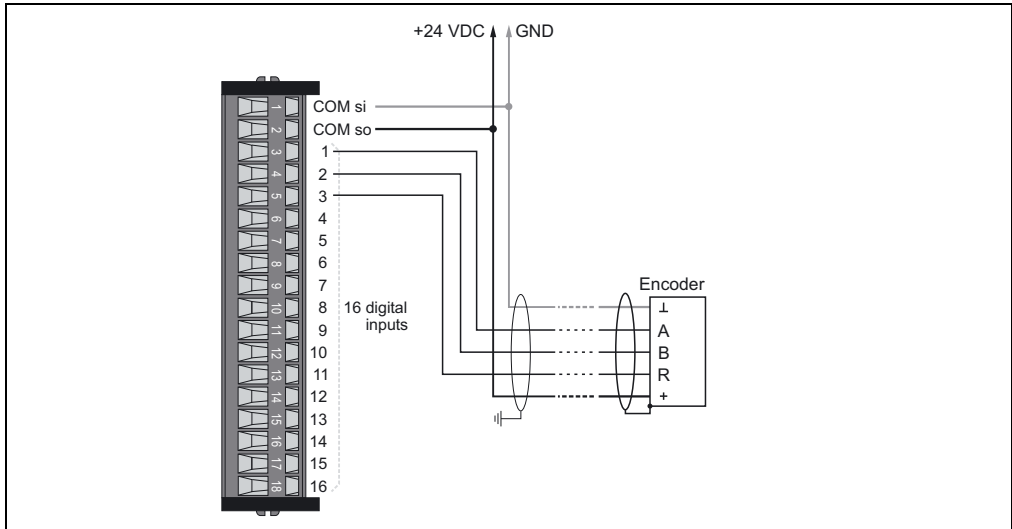


Figure 62: PP35-01 connection example - incremental encoder

2.5.3 Input circuit diagram

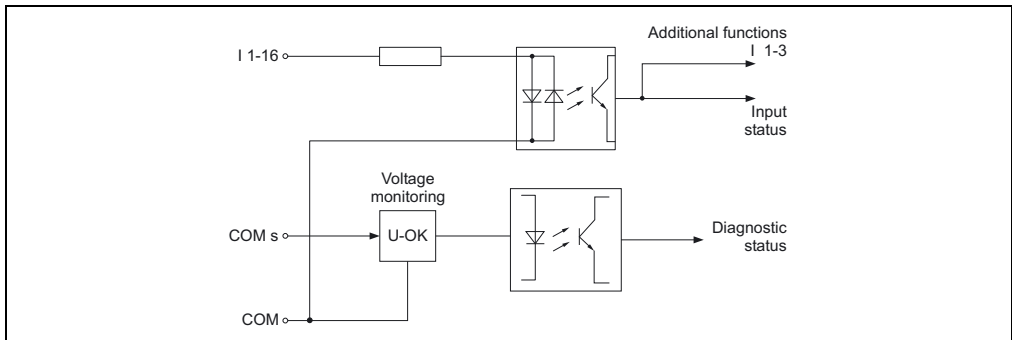


Figure 63: PP35-01 input circuit diagram - digital inputs

2.6 Digital outputs

2.6.1 Terminal block connections


18-pin terminal block	Terminal	Assignment
 <p>X2</p> <p>7TB718.91</p>	1	GND
	2	24 VDC (DO supply)
	3	Output 1
	4	Output 2
	5	Output 3
	6	Output 4
	7	Output 5
	8	Output 6
	9	Output 7
	10	Output 8
	11	Output 9
	12	Output 10
	13	Output 11
	14	Output 12
	15	Output 13
	16	Output 14
	17	Output 15
	18	Output 16

Table 47: PP35-01 terminal assignment - X2 / digital outputs

2.6.2 Connection example

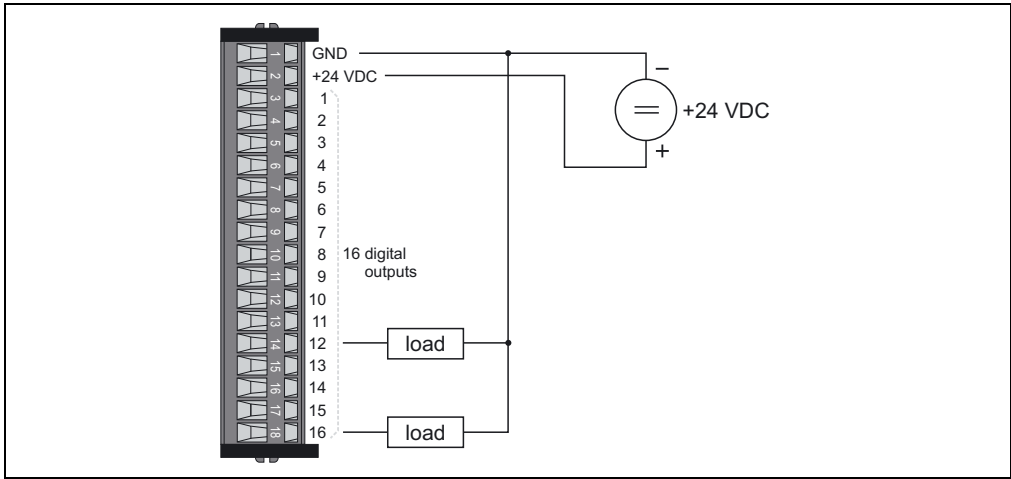


Figure 64: PP35-01 connection example - digital outputs

2.6.3 Output circuit diagram

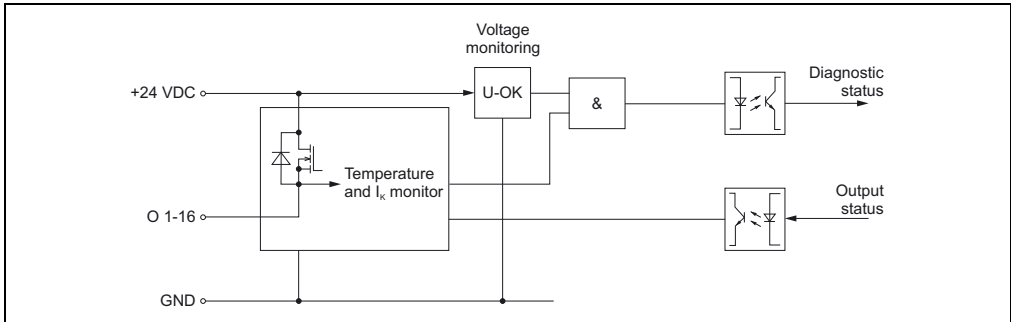


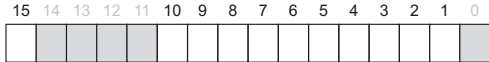
Figure 65: PP35-01 output circuit diagram - digital outputs

2.7 Variable declaration

Description	Name in Automation Studio	Data type	Description
Digital in 1 - 16	Digital input 01 - 16	BIT	Level of digital inputs 1 - 16
Digital out 1 - 16	Digital output 01 - 16	BIT	Level of digital outputs 1 - 16
Counter 1	Analog input 01	UDINT	Counter state 1 (bit 1 - bit 32)
Counter 2	Analog input 02	UDINT	Counter state 2 (bit 1 - bit 32)
DO back	Analog input 03	UINT	Actual state of the digital outputs 1 - 16
Status	Analog input 04	UINT	Status word
Config	Analog output 01	UINT	Configuration word

Table 48: PP35-01 variable declaration

2.7.1 Configuration register



Bit	Description
0	Reserved
1	This setting applies only in AB(R) mode (bit 4+5 set to 01): 0 ... R disabled 1 ... R enabled
2	Switch between period and gate measurement (only evaluated if bits 4+5 are set to 11): 0 ... Period measurement 1 ... Gate measurement
3	Beginning of period or gate measurement: 0 ... at rising (positive) edge 1 ... at falling (negative) edge
5-4	00 ... no counter operation 01 ... AB(R) counter 10 ... Event counter 11 ... Period or gate measurement
7-6	00 ... Counter frequency 4 MHz 01 ... External counter frequency 10 ... Counter frequency 31.25 kHz 11 ... Not allowed
8	0 ... At the reference impulse (positive edge) counter 1 is copied to counter 2 1 ... At the reference impulse (positive edge) counter 1 is reset to counter 0
9	Overrun recognition by counter 1 (only applies in period duration / gate time mode; see bit 4-5 and bit 2 of the configuration register): 0 ... Shut off overrun recognition and reset overrun bit of counter 1 (bit 9 in the status register). 1 ... Overrun recognition of the continuous counter. The counter value is limited to \$0000FFFF.
10	Overrun recognition by counter 2 (only applies in period duration / gate time mode; see bit 4-5 and bit 2 of the configuration register): 0 ... Shut off overrun recognition and reset overrun bit of counter 2 (bit 10 in the status register). 1 ... Overrun recognition of the continuous counter. The counter value is limited to \$0000FFFF.
14-11	Reserved
15	0 ... Reset time or counter 1 ... Enable time or counter (set this bit to 1 after counter has been configured)

The reserve bits can only be written with the value 0.

2.7.2 Status register



Bit	Description
8-0	Reserved
9	Information regarding counter 1 at period or gate measurement (only applies when bit 9 is set in the configuration register): 0 ... The counter's value is within the range 0 - \$0000FFFF. 1 ... counter overrun! Acknowledge by resetting bit 9 of the configuration register.
10	Information regarding counter 2 at period or gate measurement (only applies when bit 10 is set in the configuration register): 0 ... The counter's value is within the range 0 - \$0000FFFF. 1 ... counter overrun! Acknowledge by resetting bit 10 of the configuration register.
11	Reserved
12	Monitoring of the 24 VDC input supply 0 ... Input supply OK 1 ... Error: input supply to low or missing
14-13	Reserved
15	Monitoring of the 24 VDC output supply 0 ... Output supply OK 1 ... Error: output supply to low or missing

2.7.3 DO back (status of digital outputs)



Bit	Description
0	0 ... Actual state of digital output 1: OUT 1 ... Actual state of digital output 1: IN
1	0 ... Actual state of digital output 2: OUT 1 ... Actual state of digital output 2: IN
2	0 ... Actual state of digital output 3: OUT 1 ... Actual state of digital output 3: IN
3	0 ... Actual state of digital output 4: OUT 1 ... Actual state of digital output 4: IN
4	0 ... Actual state of digital output 5: OUT 1 ... Actual state of digital output 5: IN
5	0 ... Actual state of digital output 6: OUT 1 ... Actual state of digital output 6: IN
6	0 ... Actual state of digital output 7: OUT 1 ... Actual state of digital output 7: IN
7	0 ... Actual state of digital output 8: OUT 1 ... Actual state of digital output 8: IN
8	0 ... Actual state of digital output 9: OUT 1 ... Actual state of digital output 9: IN
9	0 ... Actual state of digital output 10: OUT 1 ... Actual state of digital output 10: IN
10	0 ... Actual state of digital output 11: OUT 1 ... Actual state of digital output 11: IN
11	0 ... Actual state of digital output 12: OUT 1 ... Actual state of digital output 12: IN
12	0 ... Actual state of digital output 13: OUT 1 ... Actual state of digital output 13: IN
13	0 ... Actual state of digital output 14: OUT 1 ... Actual state of digital output 14: IN
14	0 ... Actual state of digital output 15: OUT 1 ... Actual state of digital output 15: IN
15	0 ... Actual state of digital output 16: OUT 1 ... Actual state of digital output 16: IN

2.7.4 Counter settings

To set the correct counter modes, the configuration register must be written. Counter 1 and counter 2 registers have different meanings for different modes.

Incremental encoder operation

If the homing input (input 3) is *enabled* in the configuration register, then the Power Panel is a 32-bit ABR counter whose actual value is found in counter 1 and the saved R value in counter 2.

If the homing input is disabled, a 32-bit AB incremental encoder counter input is read in counter 1.

- A = digital input 1
- B = digital input 2
- R = digital input 3

Event counter operation

If the counters in the configuration register are initialized as event counters, two 32-bit counters are available.

- Counter 1 = digital input 1
- Counter 2 = digital input 2

Period measurement

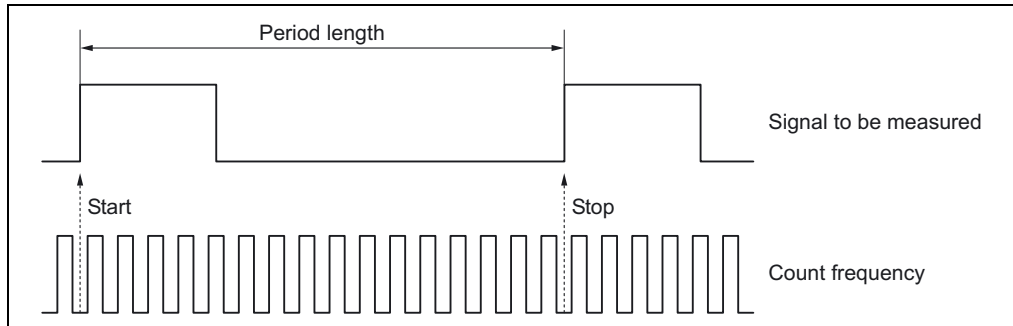


Figure 66: PP35-01 period measurement

The measurement can be begin at the decreasing or increasing edge depending on the configuration register. The counter frequency can be set in two steps (4 MHz or 31.25 kHz) or with an external frequency. The external frequency must however be less than 50 kHz. The measured counter state is a 32-bit value and is displayed in counter 1 or counter 2. The value in the temporary register is only updated at the end of the measurement.

The frequency of the signal to be measured can be a maximum of 50 kHz.

- Counter 1 = digital input 1
- Counter 2 = digital input 2
- Ext. Counting frequency = digital input 3

A potential overrun of the continuous counter during the period measurement (e.g. due to an incorrect counter frequency), can be detected by reading bit 9 (counter 1) or bit 10 (counter 10) in the status register. However, the maximum value of counter is limited to \$0000FFFF as a result. The error bit in the status register is acknowledged by resetting bit 9 (counter 1) or bit 10 (counter 2) of the configuration register.

Gate measurement

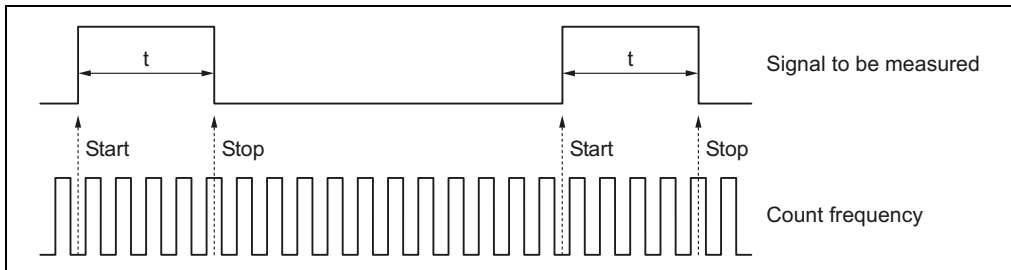


Figure 67: PP35-01 gate measurement

The measurement can be begin at the decreasing or increasing edge depending on the configuration register. The R enable bit must be 0. Measurement always occurs up to the next edge. The counter frequency can be set to one of two levels (4 MHz or 31.25 kHz) or with an external frequency. The external frequency must however be less than 50 kHz. The measured counter state is a 32-bit value and is displayed in counter 1 or counter 2. The value in the temporary register is only updated at the end of the active measurement.

The frequency of the signal to be measured can be a maximum of 50 kHz.

- Counter 1 = digital input 1
- Counter 2 = digital input 2
- Ext. Counting frequency = digital input 3

A potential overrun of the continuous counter during the gate measurement (e.g. due to an incorrect counter frequency), can be detected by reading bit 9 (counter 1) or bit 10 (counter 2) in the status register. However, the maximum value of counter is limited to \$0000FFFF as a result. The error bit in the status register is acknowledged by resetting bit 9 or bit 10 of the configuration register.

3. Power Panel 35-36

3.1 Photos

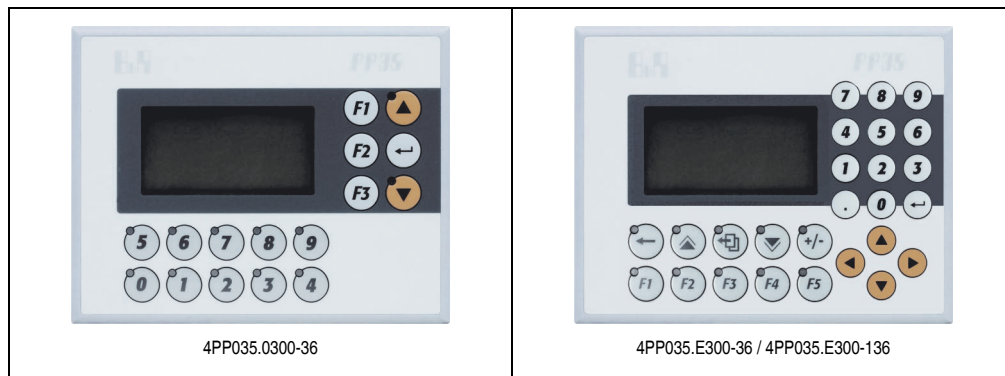


Figure 68: Power Panel 35-36 photos

3.2 Order data

Model number	Short description
4PP035.0300-36	Power Panel, 24 VDC, 153 x 120 mm, LC display, 160x80 pixels, 3", background lighting, European / Cyrillic character set, 16 keys, 300 kB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 8 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 8 digital outputs, 24 VDC, 0.5 A source, 4 analog inputs, ± 10 V, 12-bit, two of the analog inputs can be used as KTY10 or PT1000 inputs. 4 analog outputs, ± 10 V, 12-bit, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
4PP035.E300-36	Power Panel, 24 VDC, 153 x 120 mm, LC display, 160x80 pixels, 3", background lighting, European / Cyrillic character set, 26 keys, 300 kB SRAM, 1024 kB FlashPROM, 1 RS232, 1 CAN interface, 8 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 8 digital outputs, 24 VDC, 0.5 A source, 4 analog inputs, ± 10 V, 12-bit, two of the analog inputs can be used as KTY10 or PT1000 inputs. 4 analog outputs, ± 10 V, 12-bit, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
4PP035.E300-136	Power Panel, 24 VDC, 153 x 120 mm, LC display, 160x80 pixels, 3", background lighting, European / Cyrillic character set, 26 keys, 300 kB SRAM, 1984 kB FlashPROM, 1 RS232, 1 CAN interface, 8 digital inputs, 24 VDC, sink / source, 2 event counters, 1 incremental encoder or 2 gate-/period measurement, 8 digital outputs, 24 VDC, 0.5 A source, 4 analog inputs, ± 10 V, 12-bit, two of the analog inputs can be used as KTY10 or PT1000 inputs. 4 analog outputs, ± 10 V, 12-bit, IP65 protection (from front). 2 x TB718 and 1 x TB103 terminal blocks sold separately.
Note	
All parts required to install the Power Panel, including key legend sheets, are included in its delivery.	
Required accessories	
0TB103.9	Accessory terminal block, 3-pin, Screw clamp, 2.5 mm ² ; protected against vibration by the screw flange.
0TB103.91	Accessory terminal block, 3-pin, Cage clamps, 2.5 mm ² ; protected against vibration by the screw flange.
7TB718.9	Accessory terminal block, 18-pin, screw clamp, 1.5 mm ²
7TB718.91	Accessory terminal block, 18-pin, cage clamp, 1.5 mm ²

Table 49: Power Panel 35-36 order data

Model number	Short description
Optional accessories	
0AC201.9 ¹⁾	Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell
4A0006.00-000 ¹⁾	Lithium battery, 3 V / 950 mAh, button cell
4A0044.00-000	5 DIN A4 legend strips, 6 fields for a total of 30 devices
7AC911.9	Bus connector, CAN

Table 49: Power Panel 35-36 order data (Forts.)

1) Replacement part

3.3 Technical data

Product ID	Power Panel 35-36
General information	
Certification	CE, C-UL-US, GOST-R
Standards Temperature Shock / tests carried out Vibration / tests carried out Emission / tests carried out Immunity / tests carried out	IEC61131-2 / IEC60068-2-x IEC61131-2 / IEC60068-2-27 IEC61131-2 / IEC60068-2-6 EN61000-6-4 / EN55022 IEC 61131-2 / IEC 61000-4-x
Status display	I/O function for each channel, status
Diagnostics Status I/O function Interfaces	Yes, with status LED Yes, with LEDs Yes, with LEDs
Display	
Type	LCD b/w
Resolution	160 x 80 pixels
Background lighting	LED
Character set	European / Cyrillic
Keys	
Total keys 4PP035.0300-36 4PP035.E300-36 4PP035.E300-136	16 (12 with LEDs) 26 (10 with LEDs) 26 (10 with LEDs)
System keys	Number block Control keys
Labeling	10 keys with insert strips

Table 50: Power Panel 35-36 technical data

Power Panel 35-36 • Technical data

Product ID	Power Panel 35-36
Processor	
Typical instruction cycle time	0.8 μ s, average value at 70% bit and 30% analog processing
Standard memory User RAM System PROM User PROM 4PP035.0300-36 4PP035.E300-36 4PP035.E300-136	300 kB SRAM 448 kB FlashPROM 1024 kByte FlashPROM 1024 kByte FlashPROM 1984 kByte FlashPROM
Data buffering with backup battery	Lithium battery, 3 V / 950 mAh
Battery buffer current	Max. 30 μ A
Hardware Watchdog	Yes
Voltage monitoring	An NMI is triggered at a supply voltage of <15 VDC.
Real-time clock	1 s resolution, nonvolatile memory
System bus for expansions	No
Operating system	PP01x (version V 2.36 and higher)
Status display / diagnostics	
Status LED	Red / green
RS232 LED	Indicates if data is being transmitted or received
CAN LED	Indicates if data is being transmitted or received
I/O LED	Displays whether LEDs 1-16 indicate an input or output state.
01-16 LEDs	State of inputs and outputs
Interfaces	
Application interface IF1 Type Design Electrical isolation Max. transfer rate Distance	RS232 9-pin DSUB plug No 115.2 kbit/s 15 m / 19,200 bit/s
Application interface IF2 Type Design Electrical isolation Distance Max. transfer rate Bus length 60 m Bus length 200 m Bus length 1,000 m	CAN bus 9-pin DSUB plug Yes max. 1,000 m bus length 500 kbit/s 250 kbit/s 50 kbit/s

Table 50: Power Panel 35-36 technical data (Forts.)

Product ID	Power Panel 35-36	
Digital inputs		
Channels	1-3	4-8
Additional functions for inputs	2 x event counter or 1 x incremental encoder ABR/AB or 2 x gate/period measurement	-
Input circuit	Sink or source	Sink or source
Input voltage (nom./max.)	24 VDC / 30 VDC	24 VDC / 30 VDC
Input current at nominal voltage	ca. 10 mA	ca. 5 mA
Switching threshold LOW HIGH	<5 V >15 V	
Input filter	<10 µs	<1 ms
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No No	Yes No No
Event counter operation		
Amount	2	
Counter 1/2	Input 1 / 2	
Counter size	32-bit	
Input frequency	Max. 50 kHz	
Signal form	Square wave pulse	
Evaluation	Positive or negative edge, cyclic counter	
Incremental encoder operation		
Amount	1	
Type	ABR or AB	
Counter size	32-bit	
Input frequency	Max. 20 kHz	
Evaluation	4x	
Signal form	Square wave pulse	

Table 50: Power Panel 35-36 technical data (Forts.)

Power Panel 35-36 • Technical data

Product ID	Power Panel 35-36
Gate measurement	
Number of gate measurements	2
Gate measurement on channel 1 and 2 Channel 1 Channel 2	Input 1 Input 2
Counter size	32-bit
Evaluation	Positive or negative edge
Input frequency	Max. 50 kHz
Pulse length	$\geq 10 \mu\text{s}$
Length of pauses between pulses	$\geq 10 \mu\text{s}$
Count frequency Internal External	4 MHz, 31.25 kHz Max. 50 kHz
Signal form	Square wave pulse
Period measurement	
Number of period measurements	2
Measurement on channel 1 and 2 Channel 1 Channel 2	Input 1 Input 2
Counter size	32-bit
Evaluation	Positive or negative edge
Input frequency	Max. 50 kHz
Count frequency Internal External	4 MHz, 31.25 kHz Max. 50 kHz
Signal form	Square wave pulse

Table 50: Power Panel 35-36 technical data (Forts.)

Product ID	Power Panel 35-36
Digital outputs	
Channels	8
Type	Highside driver (source)
Switching voltage	
Minimum	18 VDC
Nominal	24 VDC
Maximum	30 VDC
Nom. output current	0.5 A
Total current	4 A
Output circuit	Source
Max. switching frequency	100 Hz
Switching delay	max. 500 µs
Short-circuit protection	Yes
Overload protection	Yes
Internal protective circuit	VDR
Electrical isolation	
Channel - bus	No
Channel - channel	No
Group isolation	No
Analog inputs	
Number of channels	4 differential inputs; 2 of which can be configured individually as temperature inputs
Input	±10 V
Value range / input signal	
10 V	\$7FFF
0 V	\$0000
-10 V	\$8001
Digital converter resolution	12-bit
Conversion time	150 µs for all channels
Input filter	
Hardware	Cut-off frequency 10 kHz / attenuation 60 dB
Software	-
Output format	INT
Input impedance in signal range	20 MΩ
Input circuit	IEC 61131-2
Electrical isolation	
Channel - Power Panel	Yes
Channel - channel	No
Group isolation	No

Table 50: Power Panel 35-36 technical data (Forts.)

Power Panel 35-36 • Technical data

Product ID	Power Panel 35-36
Temperature measurement	
Number of channels	Up to 2 (depending on the configuration)
Input	Resistance measurement using 2-line procedure with constant current measurement
Digital converter resolution	12-bit
Conversion time	150 µs for all channels
Input filter Hardware Software	Cut-off frequency 10 kHz / attenuation 60 dB -
Output format	INT
Data format	16-bit 2s-complement (INT 16); 1 LSB = 0.1°C
Conversion of measurement values to temperature values	Automatic in the module
Sensor KTY10-6 PT1000	Can be set per channel -50°C to 125°C -200°C to 850°C
Resolution in °C KTY10-6 PT1000	0.13°C 0.56°C
Wiring	2-line
Measuring current	1 mA
Resistance measurement range	0 - 4000 Ω
Input circuit	IEC 61131-2
Electrical isolation	like analog inputs
Analog outputs	
Number of channels	4
Output	±10 V
Value range / output signal 10 V 0 V -10 V	\$7FFF \$0000 \$8001
Max. load per output	±10 mA (load 1 kΩ)
Digital converter resolution	12-bit
Conversion time	150 µs for all channels
Switch on / switch off procedure	Internal enable relay for boot procedure and error
Basic accuracy	±0.088% at 25°C based on the current output value
Output protection	Continuous short circuit protection
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No No

Table 50: Power Panel 35-36 technical data (Forts.)

Product ID	Power Panel 35-36
Power supply	
Supply voltage	
Minimum	18 VDC
Nominal	24 VDC
Maximum	30 VDC
Power consumption	Max. 6 W
Environmental conditions	
Temperature	
Operation	0°C to 50°C
Storage	-20°C to 60°C
Humidity	
Operation	10 to 90% (non-condensing)
Storage	5 to 95% (non-condensing)
Mechanics	
Protection	IP65 (from front)
Outer dimensions (B x H x T [mm])	153 x 120 x 46.1
Weight	0.5 kg

Table 50: Power Panel 35-36 technical data (Forts.)

3.4 Diagnostic LEDs

Multiple LEDs on the back of the device show the status of the Power Panel, the interfaces, and the digital I/O:

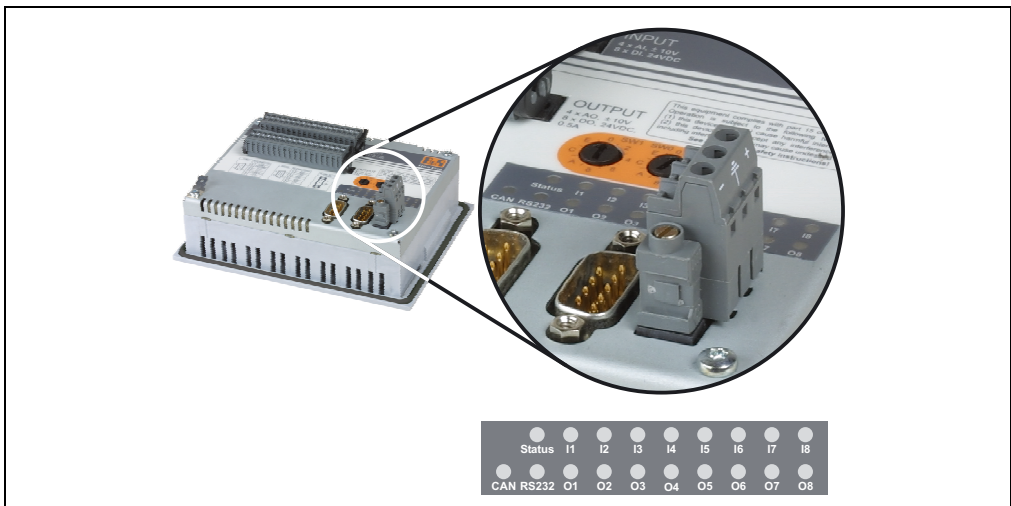


Figure 69: Power Panel 35-36 diagnostic LEDs

3.4.1 Status LED

The Power Panel status LED uses a blink code to indicate the operating state of the Power Panel:






Power Panel operating state	Color/blink code of the status LED	
Boot mode	Blinking yellow / green 1 Hz	
Flash programming	Blinking green / red 5 Hz	
Service mode / Diagnostic mode	Yellow	
Run	Green	
Error	Red	

Table 51: Power Panel 35-36 status LED

3.4.2 I/O LEDs

I/O LED	Description
I1 ... I8	State of the 8 digital inputs
O1 ... O8	State of the 8 digital outputs

Table 52: Power Panel 35-36 I/O LEDs

3.4.3 Interface LEDs

Interface LED	Description
CAN	Indicates if data is being transmitted or received.
RS232	Indicates if data is being transmitted or received.

Table 53: Power Panel 35-36 interface LEDs

3.5 Analog / digital inputs

3.5.1 Terminal block connections

Digital inputs 1 - 3 are equipped with additional functions (event counter, ABR evaluation, etc.). The supply voltage for the digital inputs can be monitored with the application program.

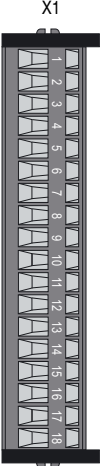
18-pin terminal block	Terminal	Assignment
 <p>X1</p> <p>7TB718.91</p>	1	COM si (GND in sink operation, 24 VDC in source operation)
	2	COM so (24 VDC in sink operation, GND in source operation)
	3	+ Analog input 1
	4	- Analog input 1
	5	+ Analog input 2
	6	- Analog input 2
	7	+ Analog input 3
	8	- Analog input 3
	9	+ Analog input 4
	10	- Analog input 4
	11	Digital input 1 / counter 1 / A
	12	Digital input 2 / counter 2 / B
	13	Digital input 3 / ext. CLK / R
	14	Digital input 4
	15	Digital input 5
	16	Digital input 6
	17	Digital input 7
	18	Digital input 8

Table 54: Power Panel 35-36 terminal assignments - X1 / digital/analog inputs

3.5.2 Connection examples

Analog inputs

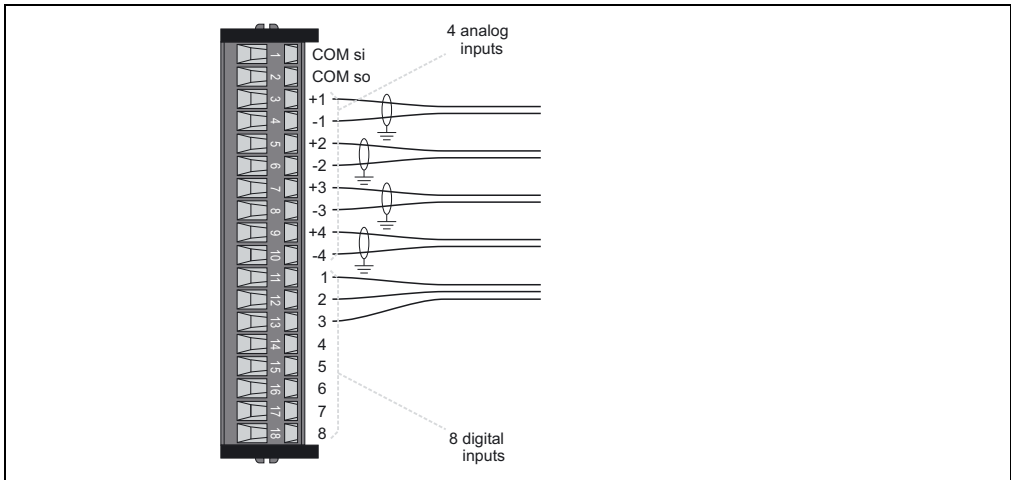


Figure 70: Power Panel 35-36 connection example - analog inputs

Digital inputs (sink connection)

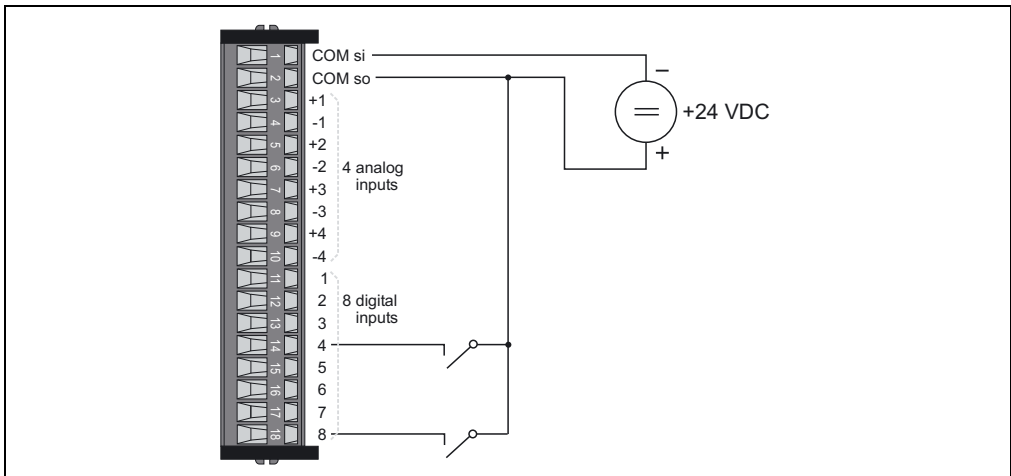


Figure 71: Power Panel 35-36 digital input connection examples (sink connection)

Digital inputs (source connection)

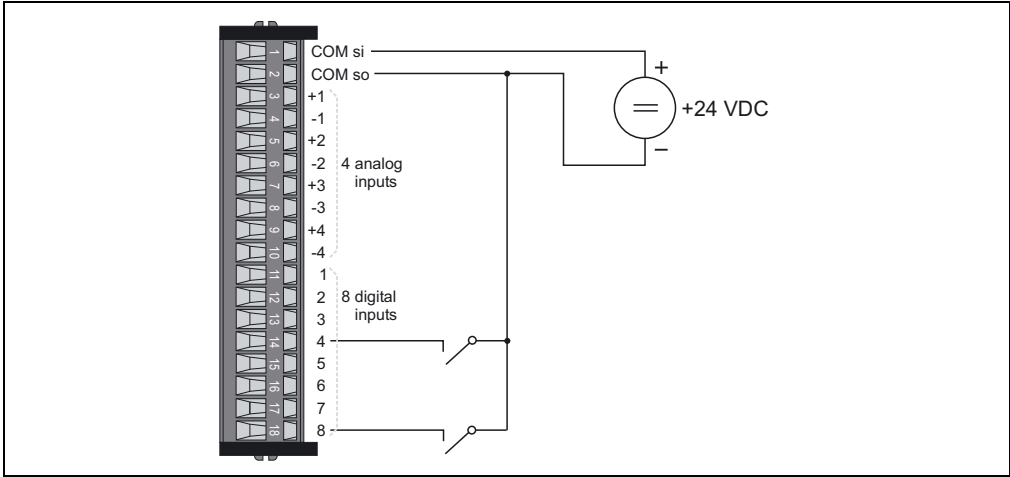


Figure 72: Power Panel 35-36 digital input connection examples (source connection)

Counter inputs

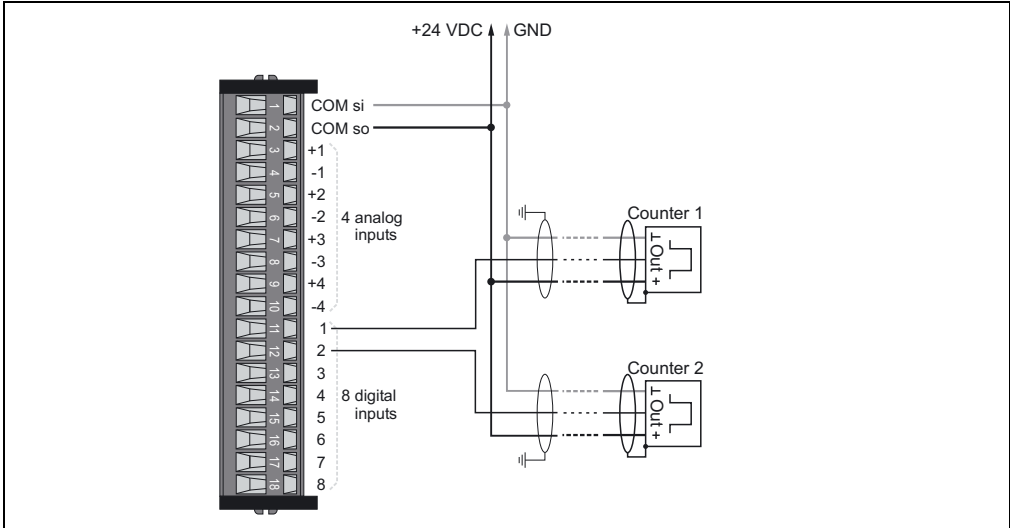


Figure 73: Power Panel 35-36 connection example - counter input

Period or gate measurement

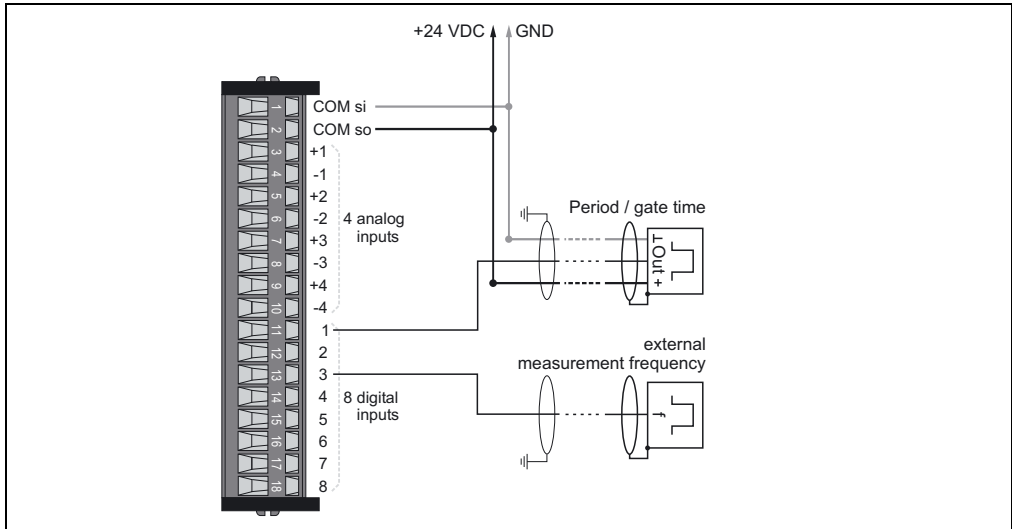


Figure 74: Power Panel 35-36 connection example - period and gate measurement

Incremental encoders

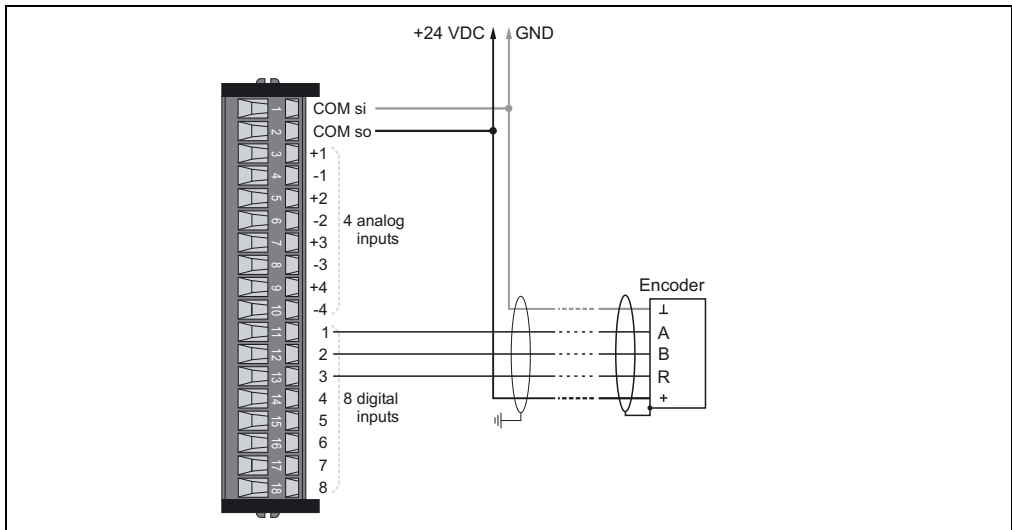


Figure 75: Power Panel 35-36 connection example - incremental encoder

3.5.3 Input circuit diagram

Analog inputs 1 + 2

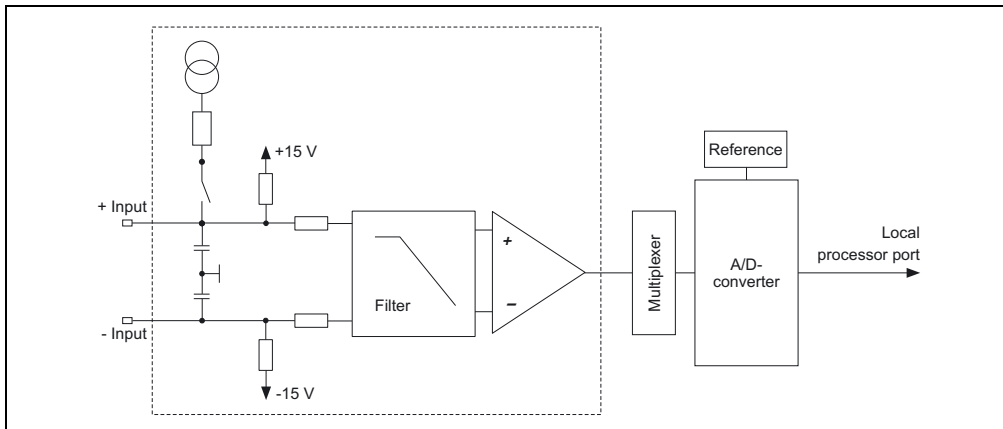


Figure 76: Power Panel 35-36 input circuit diagram - analog inputs 1 + 2

Analog inputs 3 + 4

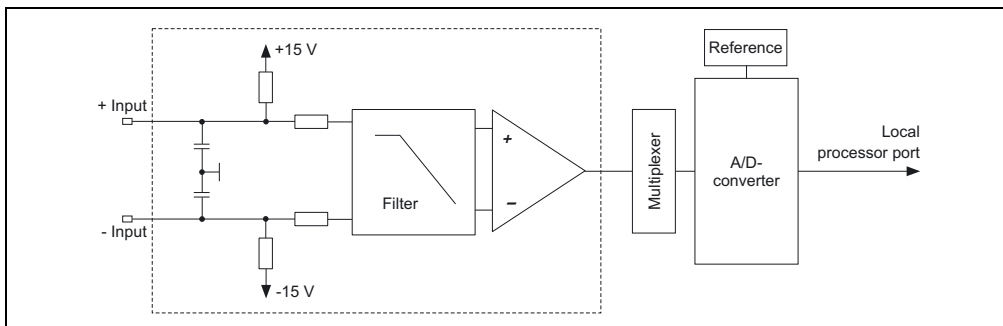


Figure 77: Power Panel 35-36 input circuit diagram - analog inputs 3 + 4

Digital inputs

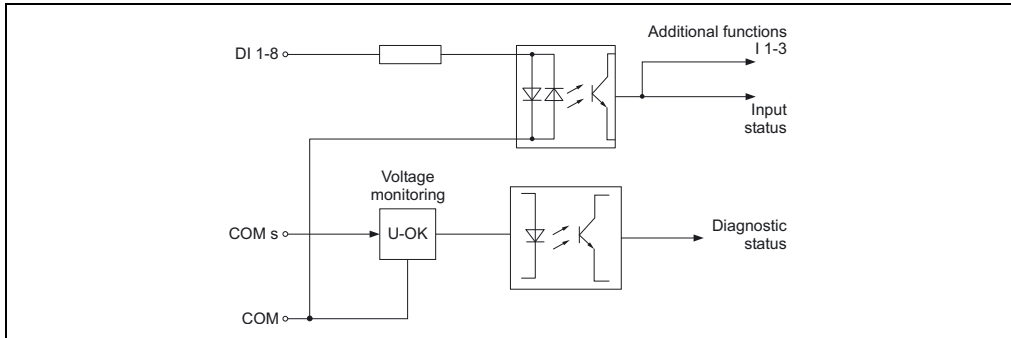


Figure 78: Power Panel 35-36 input circuit diagram - digital inputs

3.6 Analog / digital outputs

3.6.1 Terminal block connections

18-pin terminal block	Terminal	Assignment
<p>7TB718.91</p>	1	GND
	2	24 VDC (DO supply)
	3	+ Analog output 1
	4	⊥ Analog output 1
	5	+ Analog output 2
	6	⊥ Analog output 2
	7	+ Analog output 3
	8	⊥ Analog output 3
	9	+ Analog output 4
	10	⊥ Analog output 4
	11	Digital output 1
	12	Digital output 2
	13	Digital output 3
	14	Digital output 4
	15	Digital output 5
	16	Digital output 6
	17	Digital output 7
	18	Digital output 8

Table 55: Power Panel 35-36 terminal assignment - X2 / digital/analog outputs

3.6.2 Connection examples

Analog outputs

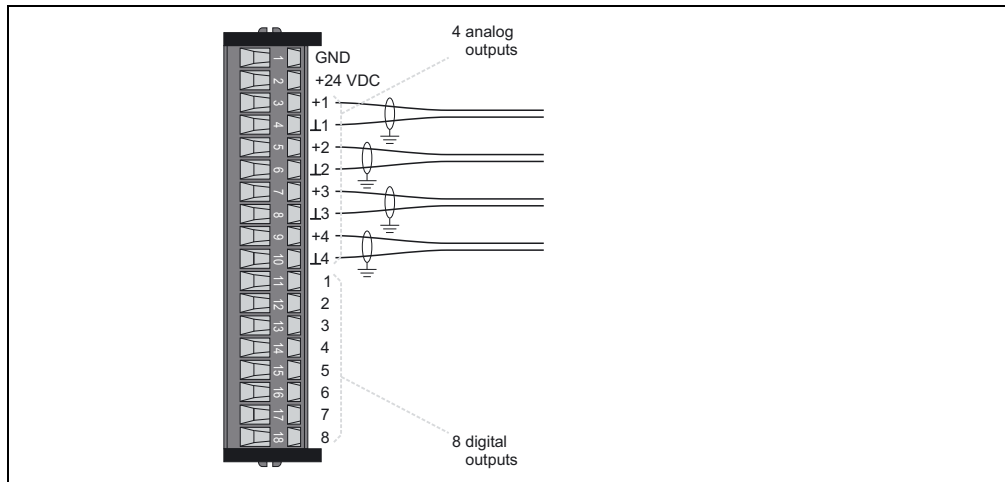


Figure 79: Power Panel 35-36 connection example - analog output

Digital outputs

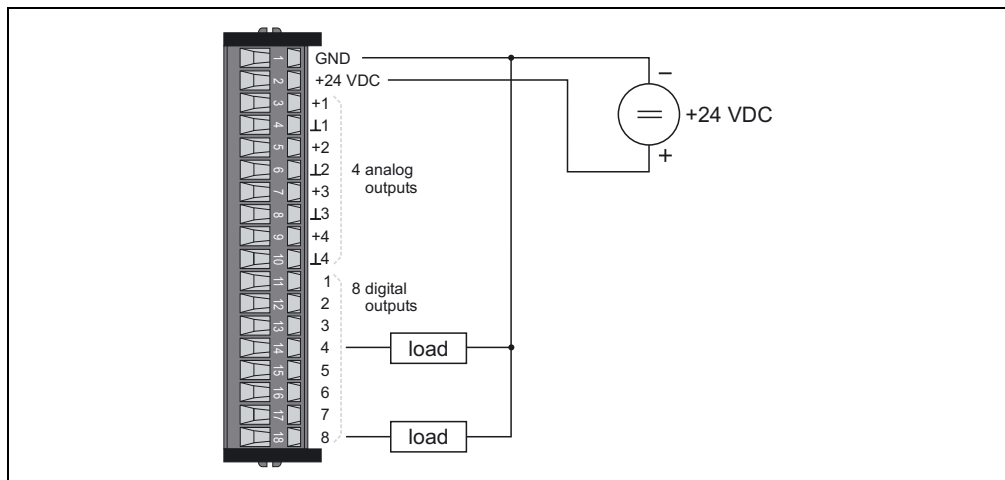


Figure 80: Power Panel 35-36 connection example - digital output

3.6.3 Output circuit diagram

Analog outputs

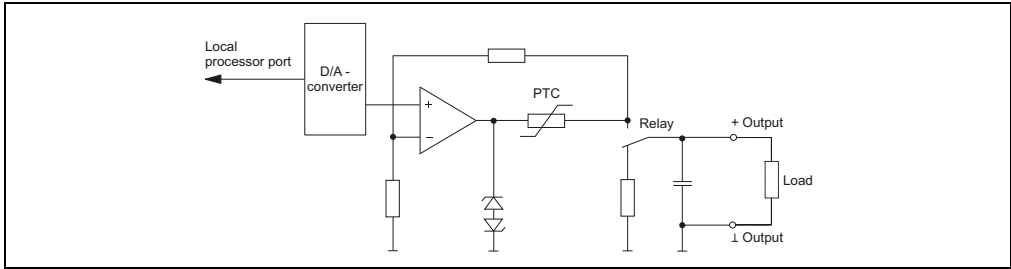


Figure 81: Power Panel 35-36 output circuit diagram - analog outputs

Digital outputs

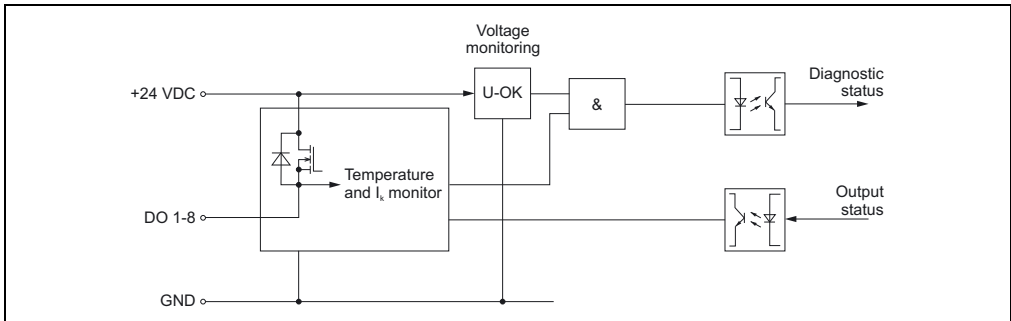


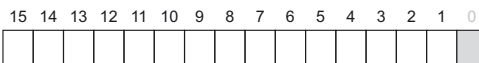
Figure 82: Power Panel 35-36 output circuit diagram - digital outputs

3.7 Variable declaration

Description	Name in Automation Studio	Data type	Description
Digital in 1 - 8	Digital input 01 - 08	BIT	Level of digital inputs 1 - 8
Digital out 1 - 8	Digital output 01 - 08	BIT	Level of digital outputs 1 - 8
Counter 1	Analog input 01	UDINT	Counter state 1 (bit 1 - bit 32)
Counter 2	Analog input 02	UDINT	Counter state 2 (bit 1 - bit 32)
DO back	Analog input 03	UINT	Actual state of the digital outputs 1 - 8
Status	Analog input 04	UINT	Status word
Config	Analog output 01	UINT	Configuration word
Analog in 1	Analog input 05	INT	Analog input 1 (± 10 V, temperature)
Analog in 2	Analog input 06	INT	Analog input 2 (± 10 V, temperature)
Analog in 3	Analog input 07	INT	Analog input 3 (± 10 V)
Analog in 4	Analog input 08	INT	Analog input 4 (± 10 V)
Analog out 1	Analog output 02	INT	Analog output 1 (± 10 V)
Analog out 2	Analog output 03	INT	Analog output 2 (± 10 V)
Analog out 3	Analog output 04	INT	Analog output 3 (± 10 V)
Analog out 4	Analog output 05	INT	Analog output 4 (± 10 V)

Table 56: Power Panel 35-36 variable declaration

3.7.1 Configuration register



Bit	Description
0	Reserved
1	This setting applies only in AB(R) mode (bit 4+5 set to 01): 0 ... R disabled 1 ... R enabled
2	Switch between period and gate measurement (only evaluated if bits 4+5 are set to 11): 0 ... Period measurement 1 ... Gate measurement
3	Beginning of period or gate measurement: 0 ... at rising (positive) edge 1 ... at falling (negative) edge
5-4	00 ... no counter operation 01 ... AB(R) counter 10 ... Event counter 11 ... Period or gate measurement
7-6	00 ... Counter frequency 4 MHz 01 ... External counter frequency 10 ... Counter frequency 31.25 kHz 11 ... Not allowed
8	0 ... At the reference impulse (positive edge) counter 1 is copied to counter 2 1 ... At the reference impulse (positive edge) counter 1 is reset to counter 0
9	Overrun recognition by counter 1 (only applies in period duration / gate time mode; see bit 4-5 and bit 2 of the configuration register): 0 ... Shut off overrun recognition and reset overrun bit of counter 1 (bit 9 in the status register). 1 ... Overrun recognition of the continuous counter. The counter value is limited to \$0000FFFF.
10	Overrun recognition by counter 2 (only applies in period duration / gate time mode; see bit 4-5 and bit 2 of the configuration register): 0 ... Shut off overrun recognition and reset overrun bit of counter 2 (bit 10 in the status register). 1 ... Overrun recognition of the continuous counter. The counter value is limited to \$0000FFFF.
12-11	Analog input 1: 00 ... Voltage measurement (default setting) 01 ... Temperature measurement - PT1000 10 ... Temperature measurement - KTY10-6 11 ... Resistance measurement 1 - 4000 Ω
14-13	Analog input 2: 00 ... Voltage measurement (default setting) 01 ... Temperature measurement - PT1000 10 ... Temperature measurement - KTY10-6 11 ... Resistance measurement 1 - 4000 Ω
15	0 ... Reset time or counter 1 ... Enable time or counter (set this bit to 1 after counter has been configured)

The reserve bits can only be written with the value 0.

3.7.2 Status register



Bit	Description
3-0	Reserved
4	0 ... Analog input 1 - OK 1 ... Analog input 1 - error
5	0 ... Analog input 2 - OK 1 ... Analog input 2 - error
6	0 ... Analog input 3 - OK 1 ... Analog input 3 - error
7	0 ... Analog input 4 - OK 1 ... Analog input 4 - error
8	Reserved
9	Information regarding counter 1 at period or gate measurement (only applies when bit 9 is set in the configuration register): 0 ... The counter's value is within the range 0 - \$0000FFFF. 1 ... Counter overrun! Acknowledge by resetting bit 9 of the configuration register.
10	Information regarding counter 2 at period or gate measurement (only applies when bit 10 is set in the configuration register): 0 ... The counter's value is within the range 0 - \$0000FFFF. 1 ... Counter overrun! Acknowledge by resetting bit 10 of the configuration register.
11	Reserved
12	Monitoring of the 24 VDC input supply 0 ... Input supply OK 1 ... Error: input supply to low or missing
14-13	Reserved
15	Monitoring of the 24 VDC output supply 0 ... Output supply OK 1 ... Error: output supply to low or missing

3.7.3 DO back (status of digital outputs)



Bit	Description
0	0 ... Actual state of digital output 1: OUT 1 ... Actual state of digital output 1: IN
1	0 ... Actual state of digital output 2: OUT 1 ... Actual state of digital output 2: IN
2	0 ... Actual state of digital output 3: OUT 1 ... Actual state of digital output 3: IN
3	0 ... Actual state of digital output 4: OUT 1 ... Actual state of digital output 4: IN
4	0 ... Actual state of digital output 5: OUT 1 ... Actual state of digital output 5: IN
5	0 ... Actual state of digital output 6: OUT 1 ... Actual state of digital output 6: IN
6	0 ... Actual state of digital output 7: OUT 1 ... Actual state of digital output 7: IN
7	0 ... Actual state of digital output 8: OUT 1 ... Actual state of digital output 8: IN
8-15	Reserved

3.7.4 Analog input

The analog inputs deliver data in 16-bit 2s complement (INT16 format). Analog inputs 1 and 2 can be used for voltage, temperature, or resistance measurement by writing to the configuration register.

Depending on these settings, the input data can be interpreted as follows:

Input type	1 LSB means ...	error appears in status register if ...
Voltage measurement	2.44 mV	Measurement range not reached (input voltage < -10 V) Measurement range exceeded (input voltage >10 V) Wire break
Temperature measurement PT1000	0.1°C	Measurement range not reached (temperature < -200°C) Measurement range exceeded (temperature >850°C) Wire break
Resistance measurement 1 - 4,000 Ω	122,074 mΩ	Measurement range not reached (resistance <1 Ω) Measurement range exceeded (resistance >4,000 Ω) Wire break

Relationship between numerical value and input voltage:

Numerical value (INT)		Voltage measurement
Hexadecimal	Decimal	
8001	-32767	-10 V
C001	-16383	-5 V
FFF8	-8	- 2.44 mV
0000	0	0 V
0008	8	2.44 mV
3FFF	16383	5 V
7FFF	32767	10 V

3.7.5 Analog output

The analog outputs are written in INT16 format (16-bit 2s complement) beschrieben. You won't need to change anything here.

Relationship between numerical value and output voltage:

Numerical value (INT)		Output voltage
Hexadecimal	Decimal	
8001	-32767	-10 V
C001	-16383	-5 V
FFF0	-16	- 4.88 mV
0000	0	0 V
0010	16	4.88 mV
3FFF	16383	5 V
7FFF	32767	10 V

3.7.6 Counter settings

To set the correct counter modes, the configuration register must be written. Counter 1 and counter 2 registers have different meanings for different modes.

Incremental encoder operation

If the homing input (input 3) is *enabled* in the configuration register, then the Power Panel is a 32-bit ABR counter whose actual value is found in counter 1 and the saved R value in counter 2.

If the homing input is disabled, a 32-bit AB incremental encoder counter input is read in counter 1.

- A = digital input 1
- B = digital input 2
- R = digital input 3

Event counter operation

If the counters in the configuration register are initialized as event counters, two 32-bit counters are available.

- Counter 1 = digital input 1
- Counter 2 = digital input 2

Period measurement

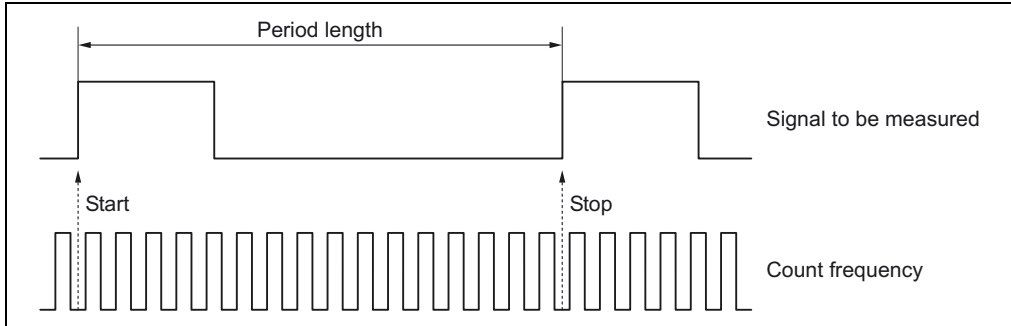


Figure 83: Power Panel 35-36 period measurement

The measurement can be begun at the decreasing or increasing edge depending on the configuration register. The counter frequency can be set in two steps (4 MHz or 31.25 kHz) or with an external frequency. The external frequency must however be less than 50 kHz. The measured counter state is a 32-bit value and is displayed in counter 1 or counter 2. The value in the temporary register is only updated at the end of the measurement.

The frequency of the signal to be measured can be a maximum of 50 kHz.

- Counter 1 = digital input 1
- Counter 2 = digital input 2
- Ext. Counting frequency = digital input 3

A potential overrun of the continuous counter during the period measurement (e.g. due to an incorrect counter frequency), can be detected by reading bit 9 (counter 1) or bit 10 (counter 10) in the status register. However, the maximum value of counter is limited to \$0000FFFF as a result. The error bit in the status register is acknowledged by resetting bit 9 (counter 1) or bit 10 (counter 2) of the configuration register.

Gate measurement

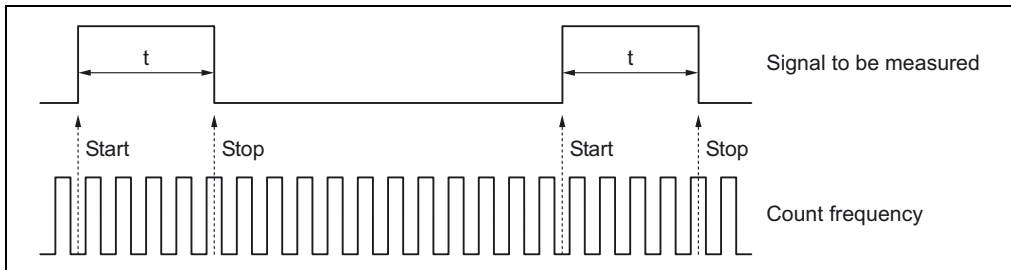


Figure 84: Power Panel 35-36 gate measurement

The measurement can be begin at the decreasing or increasing edge depending on the configuration register. The R enable bit must be 0. Measurement always occurs up to the next edge. The counter frequency can be set to one of two levels (4 MHz or 31.25 kHz) or with an external frequency. The external frequency must however be less than 50 kHz. The measured counter state is a 32-bit value and is displayed in counter 1 or counter 2. The value in the temporary register is only updated at the end of the active measurement.

The frequency of the signal to be measured can be a maximum of 50 kHz.

- Counter 1 = digital input 1
- Counter 2 = digital input 2
- Ext. Counting frequency = digital input 3

A potential overrun of the continuous counter during the gate measurement (e.g. due to an incorrect counter frequency), can be detected by reading bit 9 (counter 1) or bit 10 (counter 2) in the status register. However, the maximum value of counter is limited to \$0000FFFF as a result. The error bit in the status register is acknowledged by resetting bit 9 or bit 10 of the configuration register.

4. Supply voltage

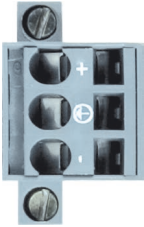
3-pin terminal block	Terminal	Assignment
 <p>OTB103.91</p>	1	24 VDC
	2	Ground
	3	GND

Table 57: Power Panel 35 terminal assignments X3 / voltage supply

5. Interfaces

5.1 RS232 interface

This non-electrically isolated interface is primarily intended for programming the CPU. The RS232 can also be used as a general interface (e.g. printer, bar code reader, etc.).

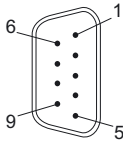
9-pin DSUB connector	Terminal	Assignment
 <p>9-pin DSUB plug</p>	1	n.c.
	2	RXD
	3	TXD
	4	n.c.
	5	GND
	6	n.c.
	7	RTS
	8	CTS
	9	n.c.

Table 58: Power Panel 35 pin assignments IF1 / RS232

5.2 CAN interface

The electrically isolated standard fieldbus interface is used for the following tasks:

- Communication with other control systems
- Decentralization and remote I/O expansion using B&R 2003 components and a CAN bus controller

We recommend using the AC911 T-connector for connecting to a CAN network. A terminating resistance is integrated in the T-connector for the bus termination, which can be turned on or off. For more information on wiring CAN fieldbus systems, see chapter 2 "Installation", section "CAN Fieldbus", in the B&R SYSTEM 2003 User's Manual.

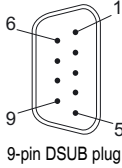
9-pin DSUB connector	Terminal	Assignment
 <p>9-pin DSUB plug</p>	1	n.c.
	2	CAN_L
	3	CAN_GND
	4	n.c.
	5	n.c.
	6	n.c.
	7	CAN_H
	8	n.c.
	9	n.c.

Table 59: Power Panel 35 pin assignments - IF2 / CAN

6. Operating mode and node number switch

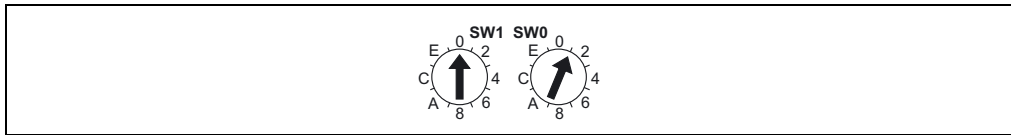


Figure 85: Power Panel 35 operating mode and node number switch

The Power Panel 35 is equipped with 2 hex switches, which are used as an operating mode switch. The switch positions 01 - FE are used to set the CAN node number. The operating system only interprets the switch position when switched on.

All other switch positions are reserved for special functions.

Switch position	Description
^	In this switch position, the operating system can be programmed via the online interface. User FlashPROM is only deleted after the update begins.
01 - FE	Freely available for use in an application (e.g. CAN node number)
FF	Diagnostics mode: The CPU boots in Diagnostics mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostics mode, the CPU always boots with a cold restart.

Table 60: Power Panel 35 switch positions of the operating mode and node number switch

7. Dimensions

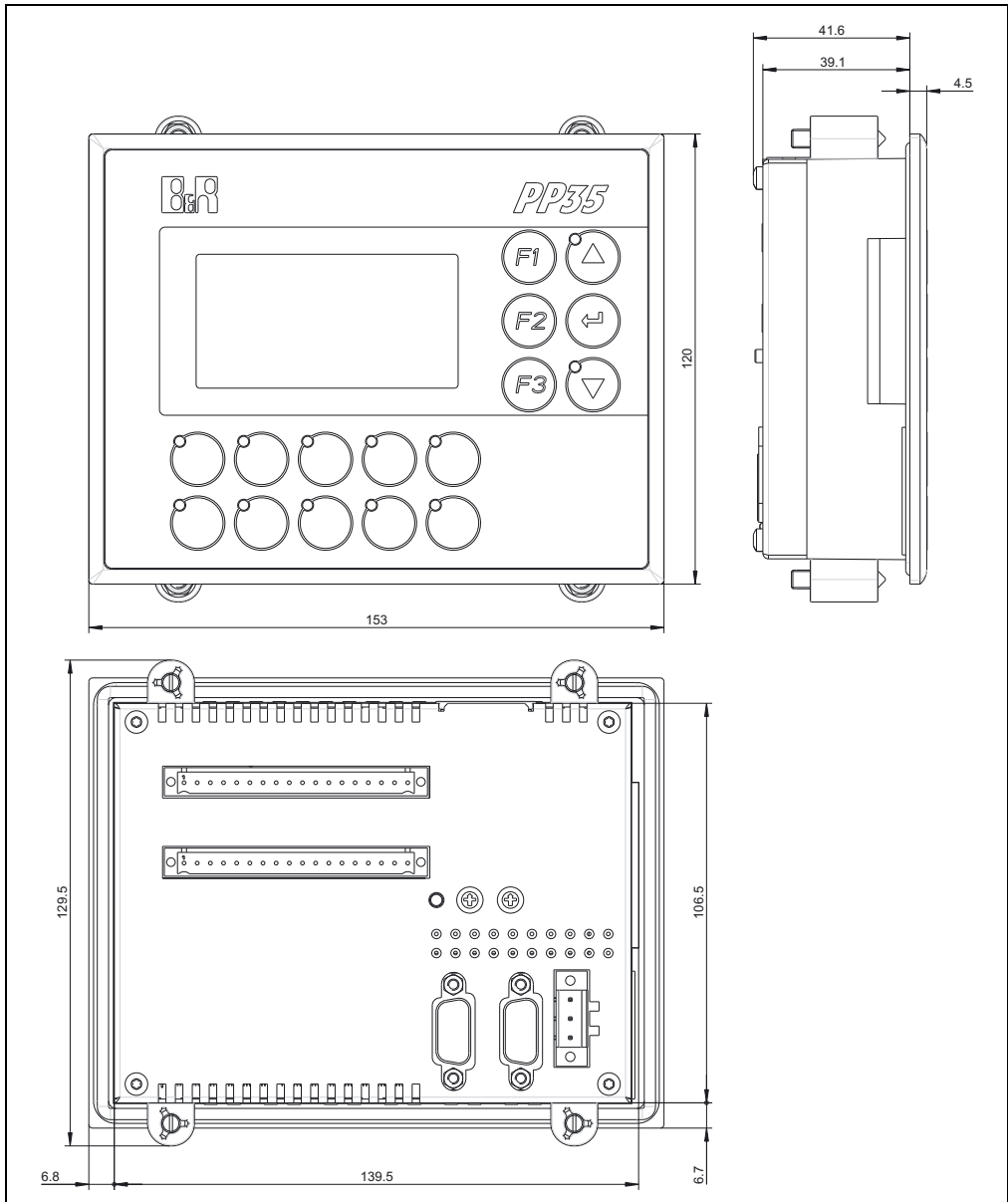


Figure 86: Power Panel 35 dimensions

Installation cutout: 141 mm x 108 mm (max. 4.5 mm plate thickness)

8. Set display contrast

The display contrast is set at the factory. However, the user can make a different contrast setting as desired. To do this, press "ENTER". While holding down this key, the "UP" and "DOWN" keys can be used to set the contrast:

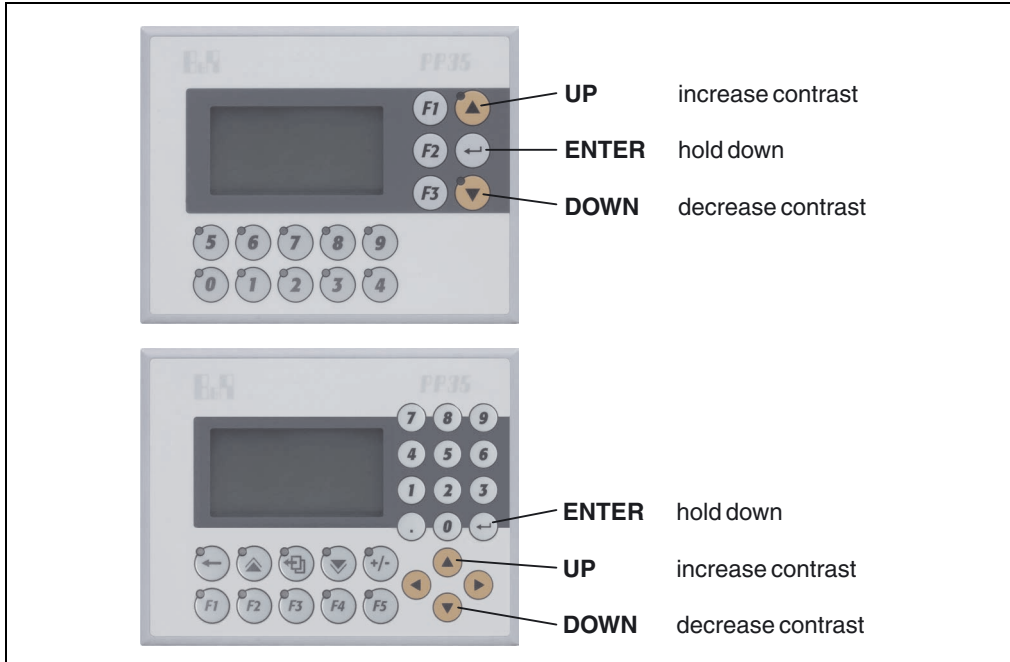


Figure 87: Power Panel 35 set display contrast

The contrast setting made in this way is placed in nonvolatile memory and is used from now on as the default value.

WARNING

The key codes for "UP" and "DOWN" are not sent to the controller as long as "ENTER" is being pressed. It is also not possible to use the key combinations ENTER + UP or ENTER + DOWN in the application project.

9. Note regarding operation

Caution!

Pressing several function or system keys at the same time may trigger unintended actions.

10. Changing the battery

10.1 Battery data

Lithium battery	3 V / 950 mAh
Model number	0AC201.9 (lithium batteries, 5 pcs.) 4A0006.00-000 (lithium battery, 1 pc.)
Storage time	Max. 3 years at 30° C
Humidity	0 to 95% (non-condensing)

Table 61: Power Panel 35 battery data

10.2 Buffer duration

Buffer current	Panel CPU
Typical	10 μ A
Maximum	200 μ A

Table 62: Power Panel 35 buffer duration

Information:

B&R recommends changing the batteries after five years of operation.

10.3 Steps for changing the battery

The product design allows the battery to be changed with the Power Panel switched on or off. In some countries, safety regulations do not allow batteries to be changed while the module is switched on.

Information:

Data stored in RAM will be lost if the battery is changed with the PLC switched off.

The battery is changed as follows:

- Touch the mounting rail or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
- Remove the cover from the lithium battery holder using a screwdriver.
- Remove the battery from the holder by pulling the removal strip (don't use uninsulated tools -> risk of short circuiting).

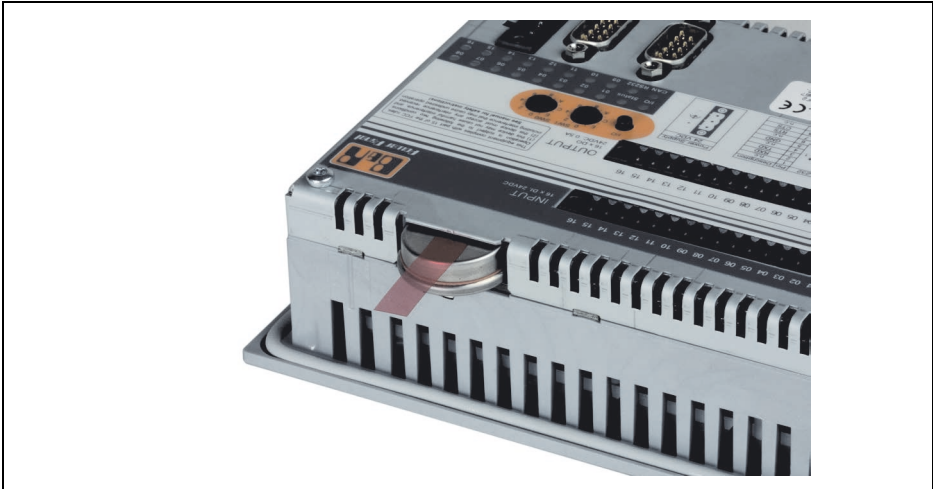


Figure 88: Power Panel 35 changing the battery

- The battery should not be held by its edges. **Insulated** tweezers may also be used for removing the battery.

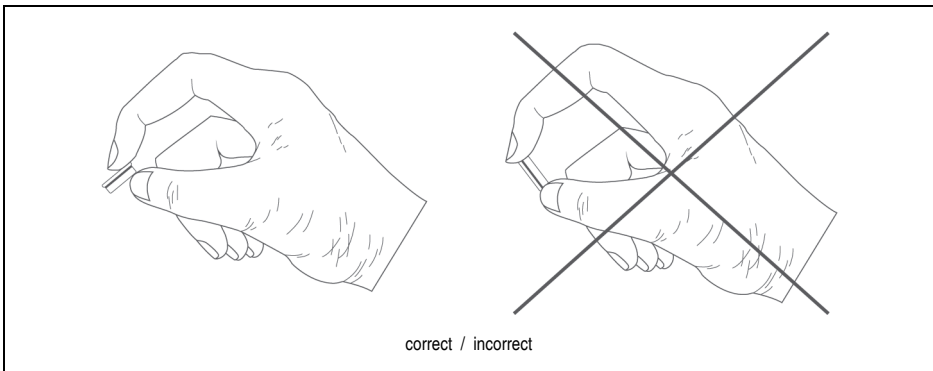


Figure 89: Power Panel 35 handling the battery

Power Panel 35 • Mounting instructions

- Insert the new battery with correct polarity. The removal strip should be protruding from the battery holder and the "+" side of the battery should be facing downward. In order to be able to remove the battery again in future, the removal strip **must** protrude from the upper side of the battery.
- Now wrap the end of the removal strip over the top of the battery and insert it underneath the battery so that it does not protrude from the battery holder.

Information:

Lithium batteries are considered hazardous waste. Used batteries should be disposed of accordingly.

11. Mounting instructions

The following mounting instructions should be noted:

- 1) The Power Panel 35 should be mounted with the four retaining clips (two left and two right), which are supplied in the delivery.
- 2) In order to guarantee proper air circulation, allow a distance of at least 20 mm (above and below) between the ventilation slots and all other objects.

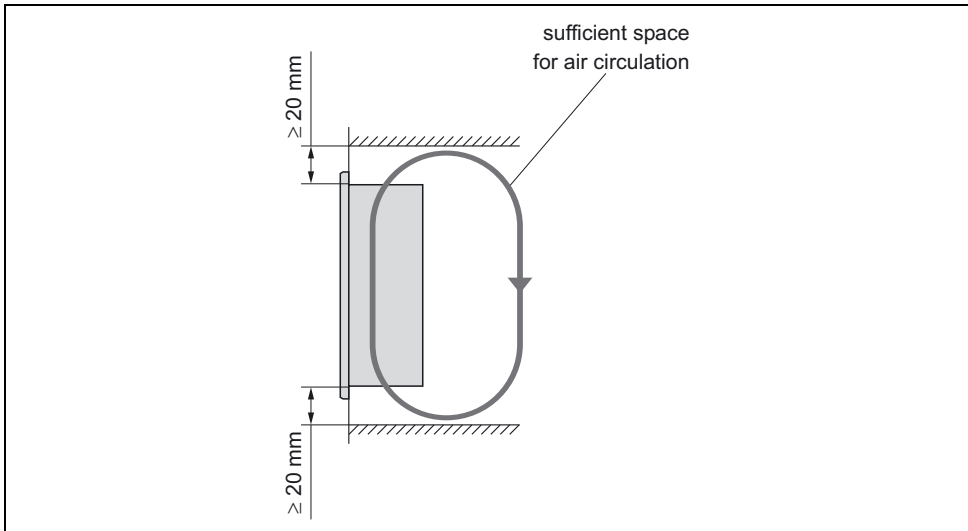


Figure 90: Power Panel 35 distance for air circulation

- 3) The Power Panel 35 can be mounted up to a maximum angle of $\pm 45^\circ$.

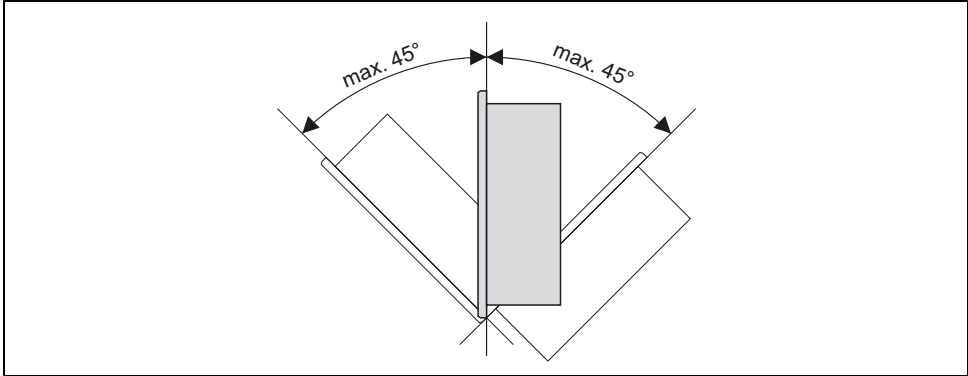


Figure 91: Power Panel 35 mounting angle

Chapter 6 • Power Panel 41

1. Photo

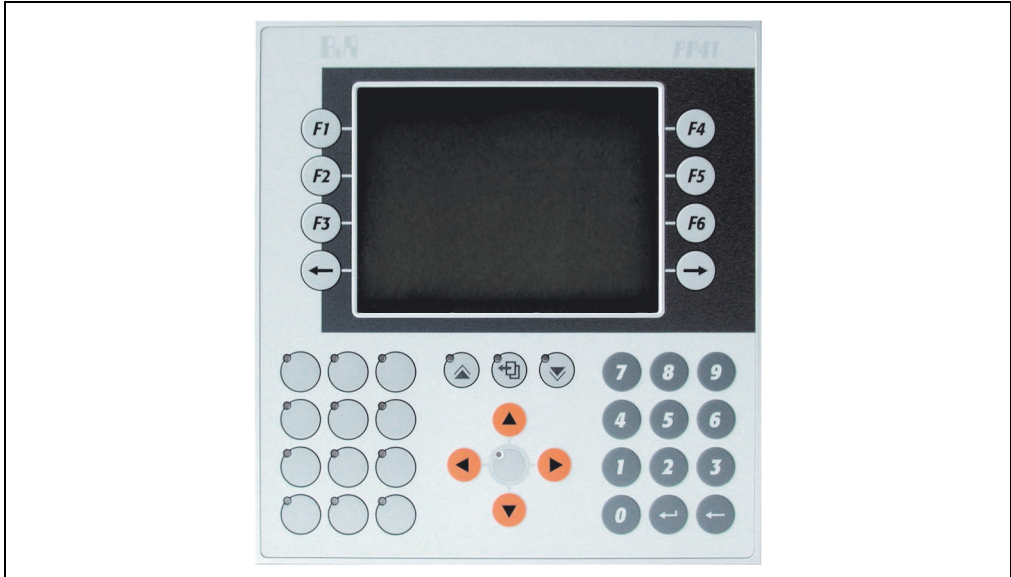


Figure 92: Power Panel 41 photo

2. Order data

Model number	Short description
4P3040.01-490	Power Panel 41, 5.7" QVGA b/w LCD, 8 soft keys and 32 function keys, system compatible 2003 CPU, 700 KB SRAM, 1.4 MB FlashPROM, 1 PCMCIA slot, 1 RS232 interface, 1 CAN interface (electrically isolated), network capable, 6 slots for screw-in module, 10 digital inputs 24 VDC, 8 digital outputs 24 VDC, 0.4 A, IP65 protection (from front), 205 x 220 mm (B x H), 24 VDC. Order TB712 terminal blocks separately!
Note	
All parts required to install the Power Panel, including key legend sheets, are included in its delivery. The backup battery and the 4-pin terminal block for the supply are also included. Two 12-pin terminal blocks must be ordered separately.	

Table 63: Power Panel 41 order data

Power Panel 41 • Technical data

Model number	Short description
Required accessories	
7TB712.9	Accessory terminal block, 12-pin, screw clamp, 1.5 mm ²
7TB712.91	Accessory terminal block, 12-pin, cage clamp, 1.5 mm ²
7TB712:90-02	Terminal block, 12-pin, 20 pcs., screw clamps
7TB712:91-02	Terminal block, 12-pin, 20 pcs., cage clamps
Optional accessories	
0AC201.9 ¹⁾	Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell
4A0006.00-000 ¹⁾	Lithium battery, 3 V / 950 mAh, button cell
0MC111.9	PCMCIA memory card, 2 MB FlashPROM
0MC211.9	PCMCIA memory card, 2 MB SRAM
4A0034.00-000	Set of legend strips for 4P3040.01-490 (for 10 devices)
4EX101.00	Power Panel expansion for PP41, 1 insert slot for interface module inserts
7AC911.9	Bus connector, CAN

Table 63: Power Panel 41 order data (Forts.)

1) Replacement part

3. Technical data

Description	Power Panel 41
General information	
Certification	CE, C-UL-US, GOST-R
Standards Temperature Shock / tests carried out Vibration / tests carried out Emission / tests carried out Immunity / tests carried out	IEC61131-2 / IEC60068-2-x IEC61131-2 / IEC60068-2-27 IEC61131-2 / IEC60068-2-6 EN61000-6-4 / EN55022 IEC 61131-2 / IEC 61000-4-x
Display	
Type	LCD b/w
Diagonal	5.7" (145 mm)
Resolution	QVGA, 320 x 240 pixels
Brightness	150 cd/m ²
Half-brightness time	50,000 h
Reading angle	Approx. 35 °

Table 64: Power Panel 41 technical data

Description	Power Panel 41
Keys	
Design	Mylar keypad with metallic snap-action disks
Front	Multi-layered cover with insertion slots for key legends
Total keys	40 membrane keys
Function keys	16, with LEDs, labeled with legend sheets
System keys	24 (number block, cursor block, control keys)
Processor	
Additional I/O processor	Handles I/O data points
Typical instruction cycle time	0.5 μ s (average value with 70% bit and 30% analog processing)
Standard memory User RAM SystemPROM User PROM	700 kB SRAM 600 kB FlashPROM 1.4 MB FlashPROM
Data buffering with backup battery	Lithium battery 3 V / 950 mAh
Data buffering / buffer current (typ./max.)	10 μ A / 200 μ A
Hardware Watchdog	Yes
Voltage monitoring	Internal supply monitored for overvoltage and undervoltage
Fans	No
Peripherals	
Real-time clock	1 s resolution, nonvolatile memory
Status display	LEDs
System bus for expansions	Expansion module EX101 1 insert slot for B&R SYSTEM 2005 interface module inserts
Slots for B&R 2003 screw-in modules Suitable for IF modules (without CAN) TPU functionality support Suitable for CAN communication	6 Slots 1 - 3 Slots 4 - 6 Slot 1 with interface module 4IF370.7
PCMCIA slot (see "PCMCIA slot", on Page 165) Memory size SRAM FlashPROM Standard Card height Card type	1 Max. 4 MB Max. 4 MB JEIDA V 4.0 or PCMCIA standard release 2.0 Max. 3 mm Memory cards

Table 64: Power Panel 41 technical data (Forts.)

Power Panel 41 • Technical data

Description	Power Panel 41
Standard communication interfaces	
Application interface IF1	
Type	RS232
Design	9-pin DSUB plug
Electrical isolation	No
Max. transfer rate	115.2 kbit/s
Max. distance	15 m / 19,200 bit/s
Application interface IF2	
Type	CAN bus
Design	9-pin DSUB plug
Electrical isolation	Yes
Max. transfer rate	500 kbit/s
Max. distance	1,000 m
Digital inputs	
Number of channels	10
Additional functionalities for inputs	4 x TPU
Input frequency (TPU)	50 kHz (incremental encoder operation)
Input circuit	Sink
Input voltage (min./nom./max.)	18 VDC / 24 VDC / 30 VDC
Input current at nominal voltage	Approx. 4 mA
Input filter	<1 ms (not TPU)
Electrical isolation	
Channel - bus	Yes
Channel - channel	No
Group isolation	Input group - output group

Table 64: Power Panel 41 technical data (Forts.)

Description	Power Panel 41
Digital outputs	
Amount	8 + 1 floating relay contact
Type	Highside driver IC (transistor)
Switching voltage (min. /nom. /max.)	18 VDC / 24 VDC / 30 VDC
Output voltage	0.4 A
Total current	3.2 A
Output circuit	Source
Switching delay Log. 0 - log. 1 Log. 1 - log. 0	Max. 450 µs Max. 450 µs
Output protection	Overload protection
Internal protective circuit	Yes
Load for potential-free relay contact	Max. 0.5 A
Leakage current when switched off	12 µA
Switching on after overload cutoff	Automatically within seconds (depends on the panel temperature)
Permanent short circuit current	Typ. 4 A
Braking voltage when switching off inductive loads	47 V
Electrical isolation Channel - bus Channel - channel Group isolation	Yes No Input group - output group
Power supply	
Input voltage (min./nom./max.)	18 VDC / 24 VDC / 30 VDC
Power consumption	Max. 20 W
Output power for screw-in modules and PCMCIA interface	11 W
Environmental conditions	
Temperature Operation Storage	0°C to 50°C -20°C to 60°C
Humidity Operation Storage	10 to 90% (non-condensing) 5 to 95% (non-condensing)
Operational conditions	
Mounting orientation	Vertical, ±45°
Altitude	Max. 3,000 m
Mechanics	
Protection	IP65 (from front)
Outer dimensions (B x H x T [mm])	205 x 220 x 110.4
Weight	1,95 kg

Table 64: Power Panel 41 technical data (Forts.)

4. Images

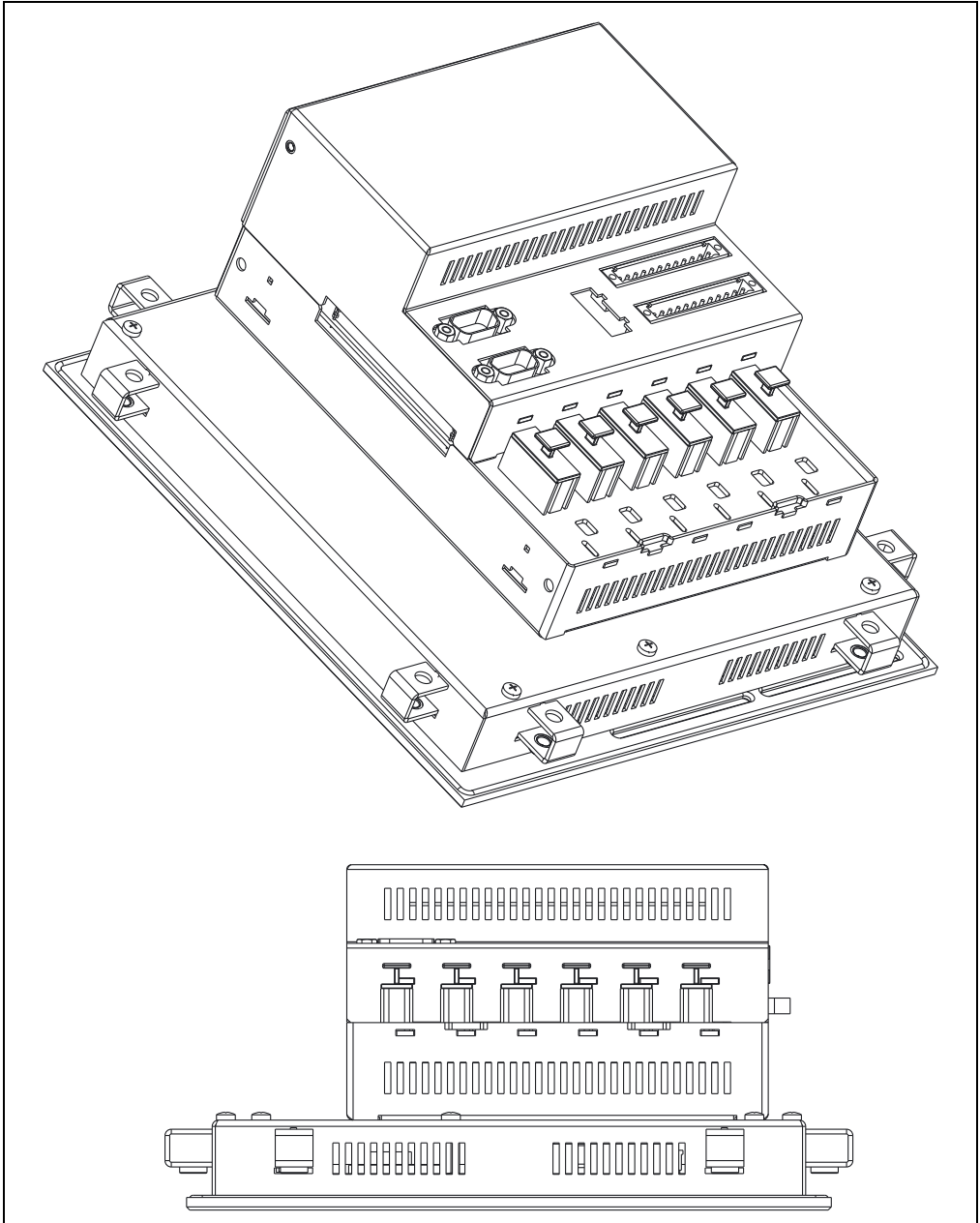


Figure 93: Power Panel 41 - Image

5. Dimensions

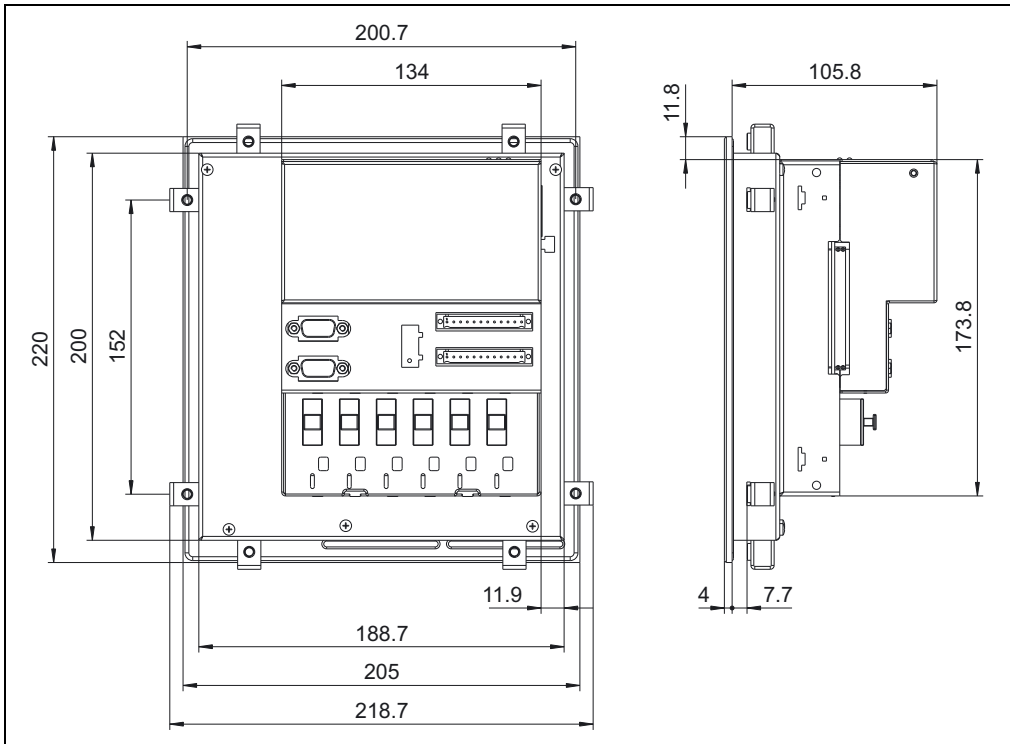


Figure 94: Power Panel 41 - Dimensions

Installation dimensions: 192 mm x 205 mm

6. Component descriptions

6.1 Status LEDs

LED	Color	Meaning
CAN	Yellow	Data transfer to or from CAN controller
RS232	Yellow	Indicates if data is being transmitted or received
ERR	Red	Lit when in Service mode
RUN	Green	Lit in RUN and in Service mode
MODE	Yellow	Lit when programming FlashPROM
READY	Yellow	Lit when in Service mode

Table 65: Power Panel 41 - Status LEDs

6.2 Power supply

The Power Panel 41 is equipped with a 24 VDC power supply. The pin assignment is printed on the housing.

Pin assignment - power supply ¹⁾	
Pin	Description
1	+
2	+
3	-
4	-

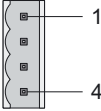


Table 66: Power Panel 41 pin assignment - power supply

1) Both "+" and "-" pins are connected to each other internally

6.3 Interfaces

The Power Panel has two interfaces:

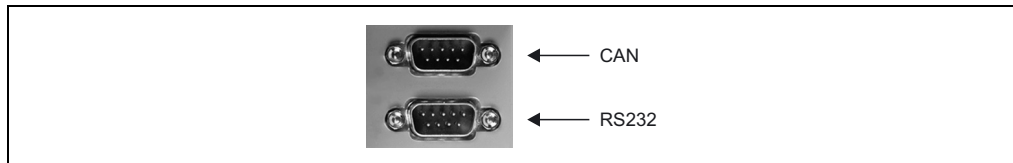


Figure 95: Power Panel 41 interfaces

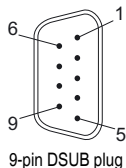
6.3.1 CAN interface

The electrically isolated standard fieldbus interface is used for the following tasks:

- Communication with other control systems
- Decentralization and remote I/O expansion using B&R 2003 components and a CAN bus controller

We recommend using the AC911 T-connector for connecting to a CAN network. A terminal resistance is integrated into the T-connector for the bus termination, which can be switched on or off. For more information on wiring CAN fieldbus systems, see chapter 2, "Installation", section "CAN fieldbus" of the B&R SYSTEM 2003 User's Manual.

Pin assignment for CAN interface	
electrically isolated Assignment according to CiA DS 102-1	
Pin	Assignment
1	n. c.
2	CAN_L
3	CAN_GND
4	n. c.
5	n. c.
6	Reserved
7	CAN_H
8	n. c.
9	n. c.



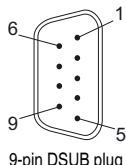
9-pin DSUB plug

Table 67: Power Panel 41 pin assignment - CAN interface

6.3.2 RS232 interface

This non-electrically isolated interface is primarily intended for programming the CPU. The RS232 can also be used as a general interface (e.g. printer, bar code reader, etc.).

Pin assignment - RS232 interface	
RS232 interface Not electrically isolated up to 115 kbit/s	
Pin	Assignment
1	CTS
2	RXD
3	TXD
4	5 VDC / max. 500 mA
5	GND
6	n. c.
7	RTS
8	CTS
9	GND



9-pin DSUB plug

Table 68: Power Panel 41 pin assignment - RS232 interface

6.4 Operating mode switch

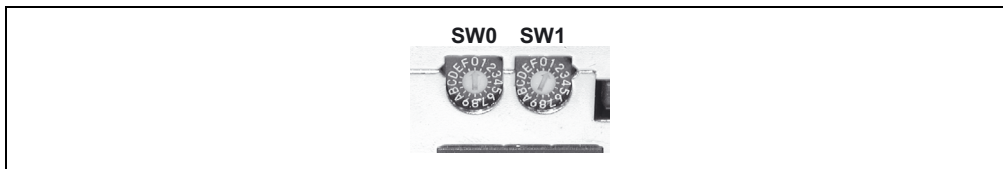


Figure 96: Power Panel 41 operating mode switch

The Power Panel 41 is equipped with 2 hex switches, which are used as an operating mode switch. Switch positions 01 - FC are available for any purpose in an application. The switch's position can be evaluated from an application program. The operating system only interprets the switch position when switched on.

All other switch positions are reserved for special functions.

Switch position	Description
00	In this switch position, the operating system can be programmed via the online interface. User FlashPROM is only deleted after the update begins.
01 - FC	Freely available for use in an application (e.g. CAN node number)
FD	This setting should not to be used. Update Mode - In this switch position, the Power Panel checks if an update memory card is inserted. If no card is inserted, the Power Panel goes into Service mode. Otherwise (depending on the Update configuration) the operating system and/or the user-ROM for the Power Panel is cleared and reinstalled from the memory card. If an error occurs during installation the red ERRor LED blinks. If installation has been successfully completed, the green RUN LED and the yellow READY LED blink.
FE	Reserved for B&R expansions – these setting is not allowed to be used!
FF	Diagnostics mode: The CPU boots in Diagnostics mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostics mode, the CPU always boots with a cold restart.

Table 69: Power Panel 41 switch settings for the MODE switch

6.5 Programming System Flash

The Power Panel is delivered without an operating system installed. An operating system can be downloaded or updated using the programming software. Installation of the operating system is possible with both programming systems. When carrying out operating system download for the first time using B&R Automation Studio™, complete the following steps:

- 1) Turn off power to the PLC.
- 2) Set the MODE switch to 00.
- 3) Switch on the power supply again.
- 4) Make on-line connection to PC (physically).
- 5) Start B&R Automation Studio™ ("OFFLINE" is displayed in the status bar)
- 6) Select menu item "PROJECT" - "SERVICES" - "TRANSFER OPERATING SYSTEM"
- 7) A window named "Operating System Transfer" opens
- 8) The COM port can be changed in this window, if required. Only in this case (using the "Try to connect Bootstraploader" button) must the connection be reestablished. If several PLC SW versions are available, these can also be selected.
- 9) By clicking on "Next" in the new window CAN bus specific settings can be made.

6.6 PCMCIA slot

The Power Panels are equipped with one PCMCIA interface for B&R memory cards. PCMCIA memory cards conforming to JEIDA V4.0 Type I or PCMCIA Standard Release 2.0 (max. 3 mm high) are supported.

The memory on the PCMCIA card can be used with all types of B&R modules. Executable programs (Task) should not be stored on the PCMCIA card, because accessing the card takes considerably longer than accessing the Power Panel's onboard memory.

The Power Panel 41 supports memory cards with up to 4 MB SRAM or with up to 4 MB FlashPROM. The following memory cards can be ordered from B&R:

Model number	Short description	Power consumption
OMC111.9	PCMCIA memory card, 2 MB FlashPROM	Max. 0.8 W
OMC211.9	PCMCIA memory card, 2 MB SRAM	Max. 0.8 W

Table 70: Power Panel 41 order data - PCMCIA memory cards

The memory cards are used by the Power Panel as ROM type "MEMCARD".

6.6.1 Limitations when using memory cards

Access to memory cards is very slow.

- Internal variables cannot be stored on the memory card
- Memory cannot be allocated to the memory cards

The SRAM and FlashPROM memory cards can only be written to by the Power Panel. Therefore, it is not possible to program the system software or the application on a memory card directly on a PC with a PCMCIA interface.

6.7 Power Panel interface

The Power Panel 41 is equipped with six slots for B&R SYSTEM 2003 screw-in modules. The required screw-in modules are inserted into the Power Panel interface and screwed firmly into place. The screw-in interface modules can be operated in slots 1 - 3. Screw-in modules can be used in slots 4 - 6, which possess TPU functionality. The first slot has a second CAN port and allows a second CAN interface by using an IF370 module.

6.8 Screw-in module overview

A description of the B&R SYSTEM 2003 screw-in module can be found in the "B&R SYSTEM 2003 User's Manual " (model. no.: MASYS22003-E).

Module	Type	Description
4IF370.7	Interface	Power Panel interface module, 1 CAN interface, electrically isolated, network capable, screw-in module Note: This module can only be operated in slot 1.
7AI261.7	Analog IN	2003 analog input module, 1 input for evaluation of full-bridge strain gauge, 24-bit, screw-in module
7AI294.7	Analog IN	2003 analog input module, 4 inputs, potentiometer evaluation, 13-bit, screw-in module
7AI351.70	Analog IN	2003 analog input module, 1 input, ± 10 V or 0 to 20 mA, 12 bit + sign, screw-in module, 1 x TB712 terminal block sold separately.
7AI354.70	Analog IN	2003 analog input module, 4 inputs, ± 10 V, 12-bit + sign., screw-in module. Order 1 x TB712 terminal block separately.
7AI774.70	Analog IN	2003 analog input module, 4 inputs, 0 to 20 mA, 12-bit, screw-in module. Order 1 x TB712 terminal block separately.
7AM351.70	Analog IN Analog OUT	2003 analog mix module, 1 input, ± 10 V, 16 bit, 1 output, ± 10 V, 16-bit, screw-in module, terminal block 1 x TB712 sold separately.
7AO352.70	Analog OUT	2003 analog input module, 2 inputs, ± 10 V or 0-20 mA, 12-bit, screw-in module. Order 1 x TB712 terminal block separately.
7AT324.70	Analog in	2003 analog input module, 4 temperature inputs (2-line connection), KTY10 -50 to 150°C, KTY84 -40 to 300°C, PT100 -200 to 850°C, PT1000 -200 to 850°C, screw-in module, order terminal block 1 x TB712 separately.
7AT352.70	Analog IN	2003 analog input module, 2 inputs, PT100 (3-line connection), -200 to 850°C, screw-in module. Order 1 x TB712 terminal block separately.
7AT664.70	Analog IN	2003 analog input module, 4 inputs, thermal elements, -270 to 1768°C, screw-in module. Order 1 x TB712 terminal block separately.
7DI135.70	Digital IN	2003 digital input module, 4 inputs 24 VDC, sink, incremental encoder operation: 50 kHz, event counter operation: 100 kHz, 1 comparator output 24 VDC, screw-in module, order 1 x TB712 terminal block separately.
7DI138.70	Digital IN	2003 digital input module, 10 inputs 24 VDC, sink, 2 inputs for event counter operation, input frequency 20 kHz, screw-in module. Order 1 x TB712 terminal block separately.
7DI140.70	Digital IN	2003 digital input module, 10 inputs 24 VDC, sink, 2 inputs for event counter operation or for direction dependent position determination, input frequency 50 kHz, 4 inputs can be used as high speed inputs (e.g. gate, frequency measurement), screw-in module. Order 1 x TB712 terminal block separately.
7DO135.70	Digital OUT	2003 digital output module, 4 FET outputs 12 to 24 VDC, 0.1 A, screw-in module. Order 1 x TB712 terminal block separately.
7DO138.70	Digital OUT	2003 digital output module, 8 outputs 24 VDC, 0.5 A, short circuit protection, thermal overload protection, screw-in module. Order 1 x TB712 terminal block separately. Note: This module can only be operated in the slots 4 - 6.
7IF311.7	Interface	2003 interface module, 1 RS232 interface, screw-in module
7IF321.7	Interface	2003 interface module, 1 RS485/RS422 interface, electrically isolated, network capable, screw-in module
7IF361.70-1	Interface	2003 interface module, 1 RS485 interface, electrically isolated and network capable, transfer protocol: PROFIBUS-DP, screw-in module
7NC161.7	Encoder module	2003 encoder module, input frequency 100 kHz, incremental or absolute, 32 bit, encoder supply 5 VDC or 24 VDC, screw-in module

Table 71: Power Panel 41 screw-in module overview

6.9 Data/real-time buffering

The battery voltage is checked cyclically. The load test of the battery does not considerably shorten the battery life, instead it gives an early warning of weakened buffer capacity. The status information, "Battery OK" is available from the B&R-TRAP function, "SYS_battery".

6.10 Digital inputs

6.10.1 Terminal block connections

Inputs 1 - 4 are equipped with additional functions (event counter, ABR evaluation, etc.). The supply voltage for the digital inputs can be monitored with the application program.

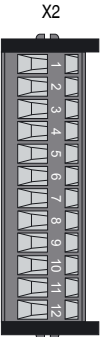
12-pin terminal block	Terminal	Assignment
	1	Input 1
	2	Input 2
	3	Input 3
	4	Input 4
	5	Input 5
	6	Input 6
	7	Input 7
	8	Input 8
	9	Input 9
	10	Input 10
	11	24 VDC
	12	GND

Table 72: Power Panel 41 terminal assignments - digital inputs

6.10.2 Connection example

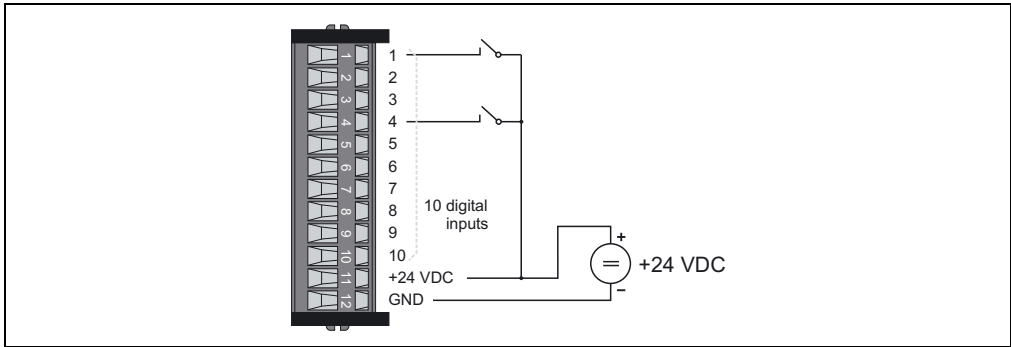


Figure 97: Power Panel 41 connection example - digital inputs

6.10.3 Input circuit diagram

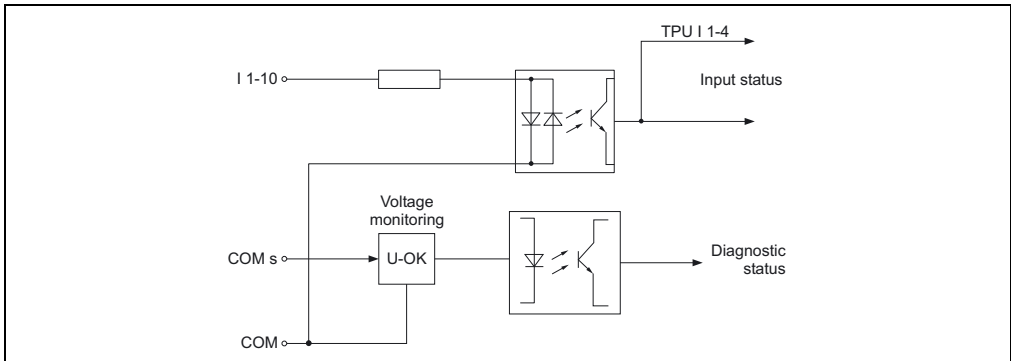


Figure 98: Power Panel 41 input circuit diagram - digital inputs

6.11 Digital outputs

6.11.1 Terminal block connections

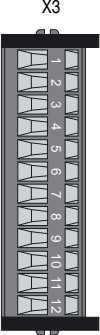
12-pin terminal block	Terminal	Assignment
	1	Output 1
	2	Output 2
	3	Output 3
	4	Output 4
	5	Output 5
	6	Output 6
	7	Output 7
	8	Output 8
	9	Potential-free relay contact
	10	Potential-free relay contact
	11	24 VDC, outputs 1 - 8
	12	GND, outputs 1 - 8

Table 73: Power Panel 41 terminal assignments - digital outputs

6.11.2 Connection examples

Outputs 1 - 8

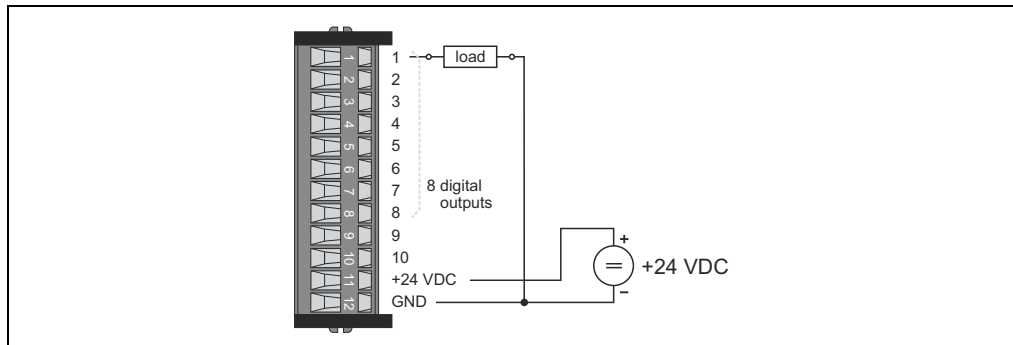


Figure 99: Power Panel 41 connection example - outputs 1 - 8

Potential-free relay contact

E-STOP circuit

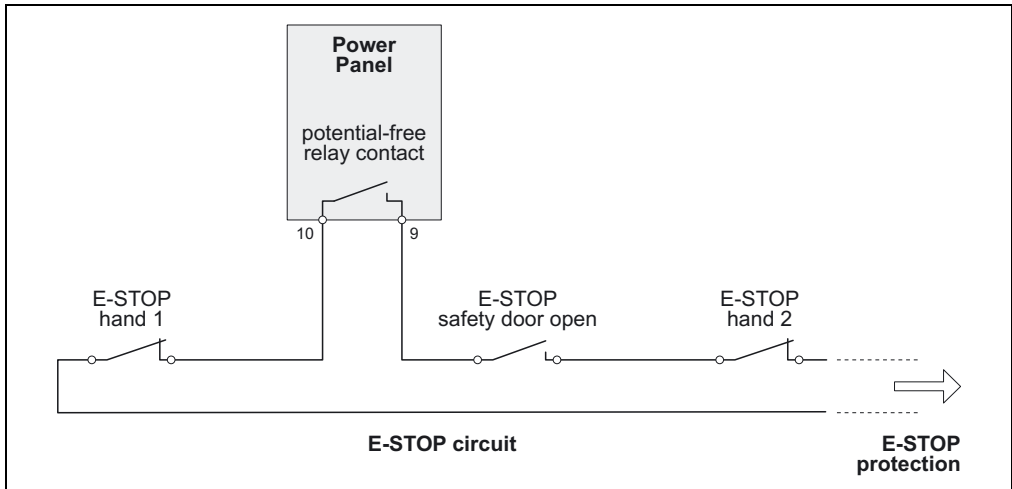


Figure 100: Power Panel 41 E-STOP circuit

Switching a load

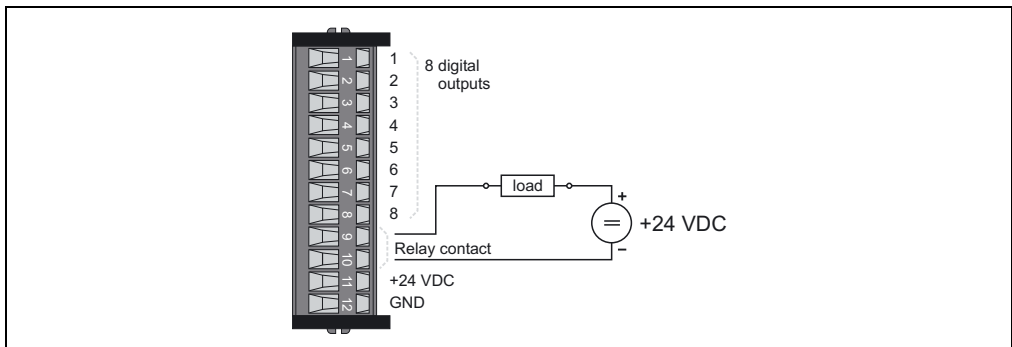


Figure 101: Power Panel 41 switching a load

6.11.3 Output circuit diagram

Digital outputs

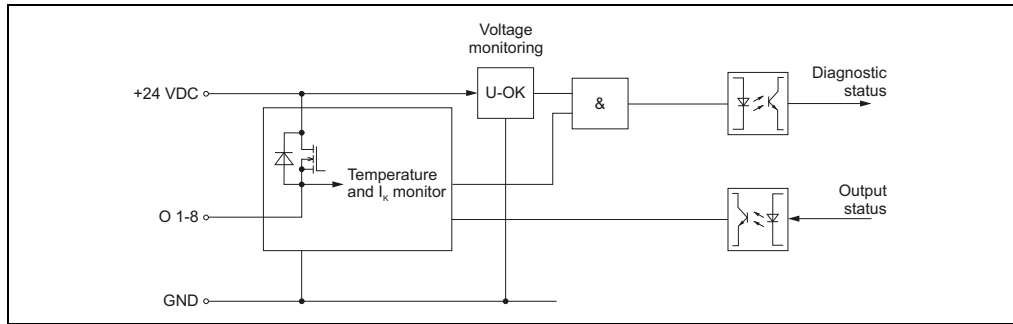


Figure 102: Power Panel 41 output circuit diagram - digital outputs

Potential-free relay contact

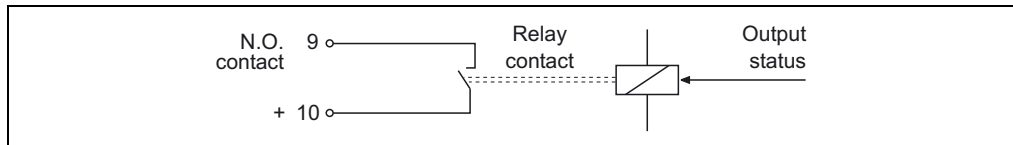


Figure 103: Power Panel 41 connection example - relay contact

7. Changing the battery

7.1 Battery data

Lithium battery	3 V / 950 mAh
Model number	0AC201.9 (lithium batteries, 5 pcs.) 4A0006.00-000 (lithium battery, 1 pc.)
Storage time	Max. 3 years at 30° C
Humidity	0 to 95% (non-condensing)

Table 74: Power Panel 41 battery data

7.2 Buffer duration

Buffer current	Panel CPU
Typical	10 μ A
Maximum	200 μ A

Table 75: Power Panel 41 buffer duration

Information:

B&R recommends changing the batteries after five years of operation.

7.3 Steps for changing the battery

The product design allows the battery to be changed with the Power Panel switched on or off. In some countries, safety regulations do not allow batteries to be changed while the module is switched on.

Information:

The data in RAM is buffered up to 10 min thanks to gold foil capacitors. During this time period, a battery change without data loss is guaranteed.

The battery is changed as follows:

- Touch the mounting rail or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
- Remove the cover from the lithium battery holder using a screwdriver.

Power Panel 41 • Changing the battery

- Remove the battery from the holder by pulling the removal strip (don't use uninsulated tools -> risk of short circuiting).



Figure 104: Power Panel 41 changing the battery

- The battery should not be held by its edges. **Insulated** tweezers may also be used for removing the battery.

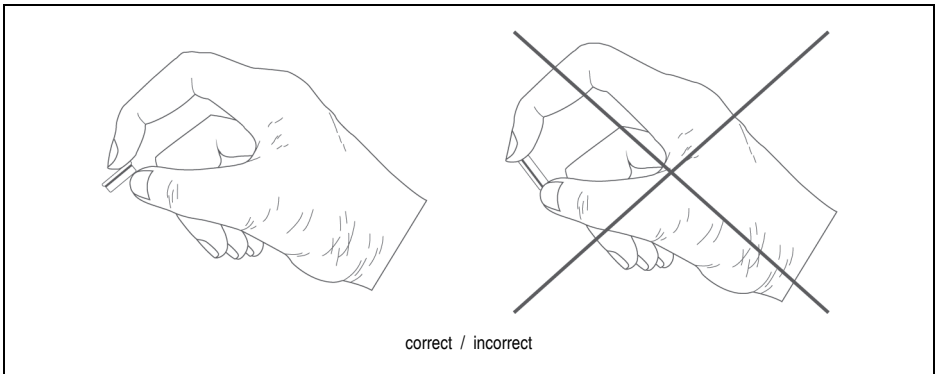


Figure 105: Power Panel 41 handling the battery

- Insert the new battery with correct polarity. The removal strip should be protruding from the battery holder and the "+" side of the battery should be facing downward. In order to be able to remove the battery again in future, the removal strip **must** protrude from the upper side of the battery.
- Now wrap the end of the removal strip over the top of the battery and insert it underneath the battery so that it does not protrude from the battery holder.

Information:

Lithium batteries are considered hazardous waste. Used batteries should be disposed of accordingly.

8. Note regarding operation

Caution!

Pressing several function or system keys at the same time may trigger unintended actions.

9. Mounting instructions

The following mounting instructions should be noted:

- 1) The Power Panel 41 should be mounted with the four retaining clips (two left and two right), which are supplied in the delivery.
- 2) In order to guarantee proper air circulation, allow a distance of at least 100 mm (above and below) between the ventilation slots and all other objects.

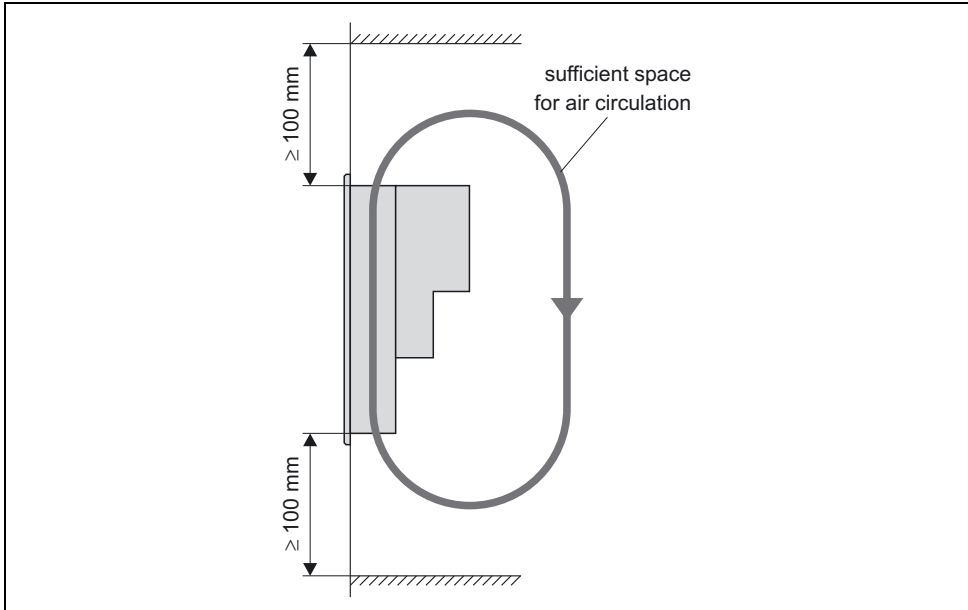


Figure 106: Power Panel 41 distance for air circulation

- 3) The Power Panel 41 can be mounted up to a maximum angle of $\pm 45^\circ$.

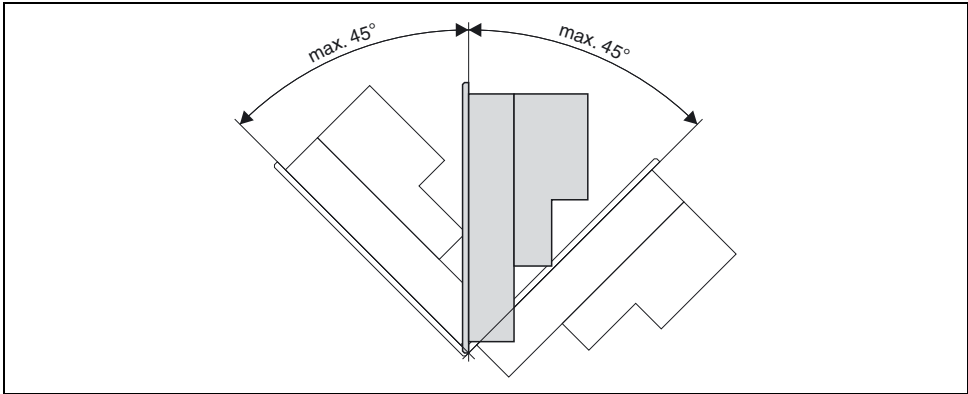


Figure 107: Power Panel 41 mounting angle

10. Power Panel expansion EX101

10.1 General information

The expansion module EX101 can be installed on the Power Panel 41. B&R SYSTEMS 2005 interface module inserts can be operated in the EX101 insert slot.

A description for interface module inserts can be found in the "B&R SYSTEM 2005 User's Manual" (model no.: MASYS22005-E).

10.2 Photo



Figure 108: EX101 photo

10.3 Order data

Model number	Short description
4EX101.00	Power Panel expansion for PP41, 1 insert slot for interface module inserts

Table 76: EX101 order data

The following B&R SYSTEM 2005 interface module inserts can be operated with the EX101 module:

Model number	Short description
3IF613.9	2005 interface module, 3 RS232 interfaces, CPU and IF module insert
3IF621.9	2005 interface module, 1 RS485/RS422 interface, 1 CAN interface, both electrically isolated and network capable, insert for CPU and IF modules
3IF622.9	2005 Interface Module, 1 RS232 interface, 2 RS485/RS422 interfaces electrically isolated, network capable, CPU and IF module insert
3IF661.9	2005 interface module, 1 RS485 interface, electrically isolated and network-capable, transfer protocol: PROFIBUS DP, insert for CPU and IF modules
3IF671.9	2005 interface module, 1 RS232 interface, 1RS485/RS422 interface, electrically isolated, network capable, 1 CAN interface, electrically isolated, network capable, CPU and IF module insert
3IF672.9	2005 interface module, 1 RS232 interface, 2 CAN interfaces, CAN: electrically isolated, network capable, CPU and IF module insert
3IF681.95	2005 interface module, 1 RS232 interface, 1 ETHERNET interface, with 10BASE2 CHEAPERNET BNC socket
3IF681.96	2005 interface module, 1 RS232 interface, 1 ETHERNET interface, with 10BASE-T twisted pair RJ45 socket

Table 77: EX101 interface modules that can be inserted in the module

10.4 Technical data

Description	EX101
General information	
Module type	Power Panel expansion - PP41
Peripherals	
Insert slots	1 (for interface module inserts)
Mechanical characteristics	
Dimensions	
Width	31 mm
Height	173 mm
Depth	81.4 mm

Table 78: EX101 technical data

10.5 Dimensions

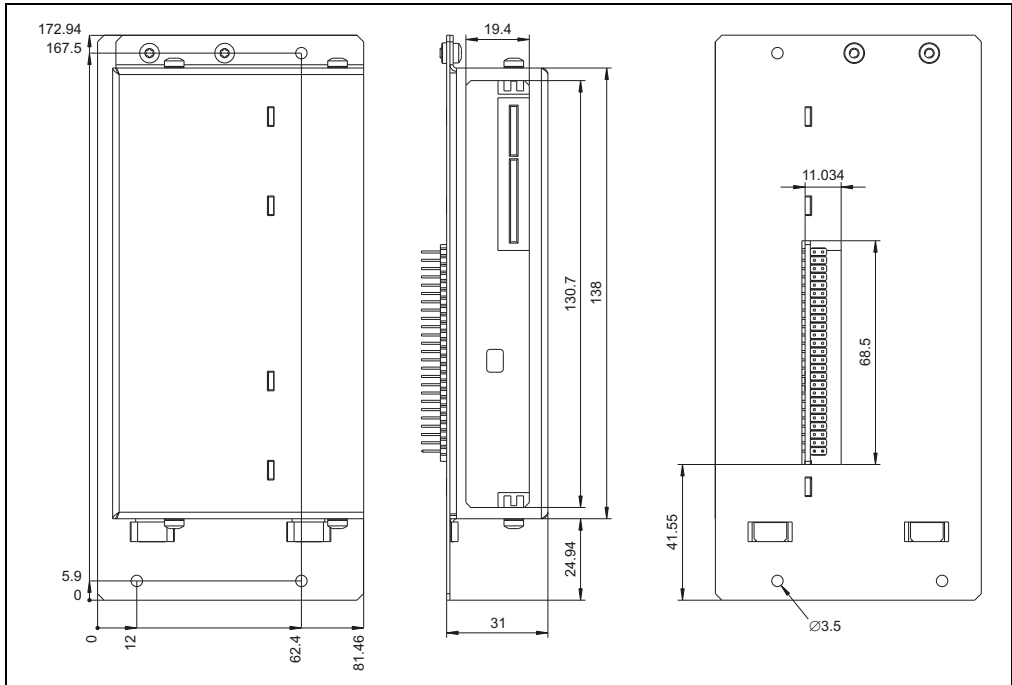


Figure 109: EX101 dimensions

10.6 Dimensions PP41 + EX101

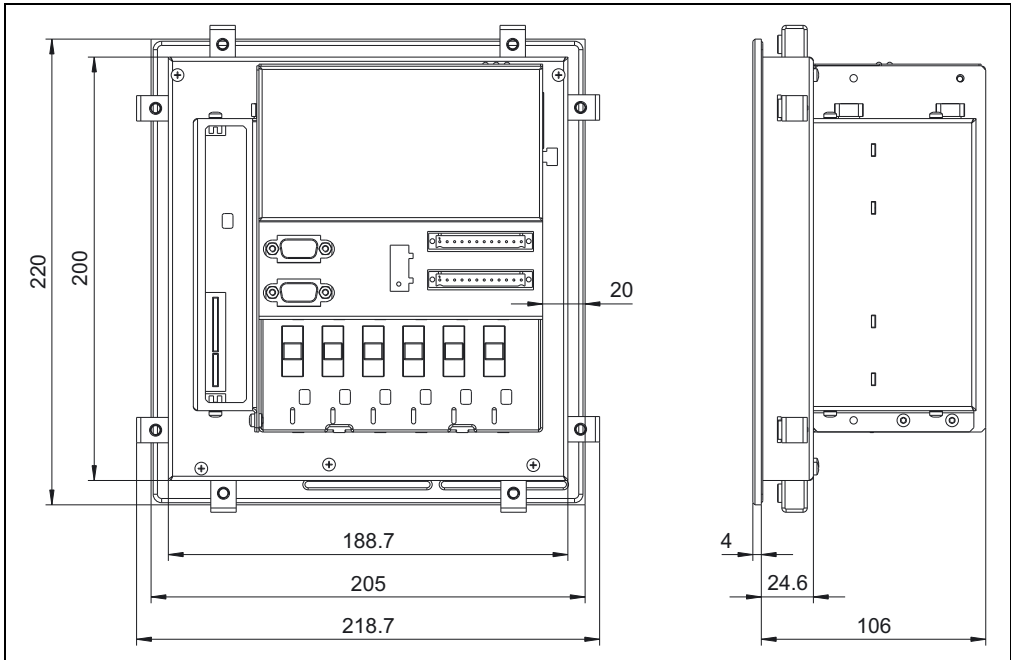


Figure 110: PP41 + EX101 dimensions

10.7 Installation

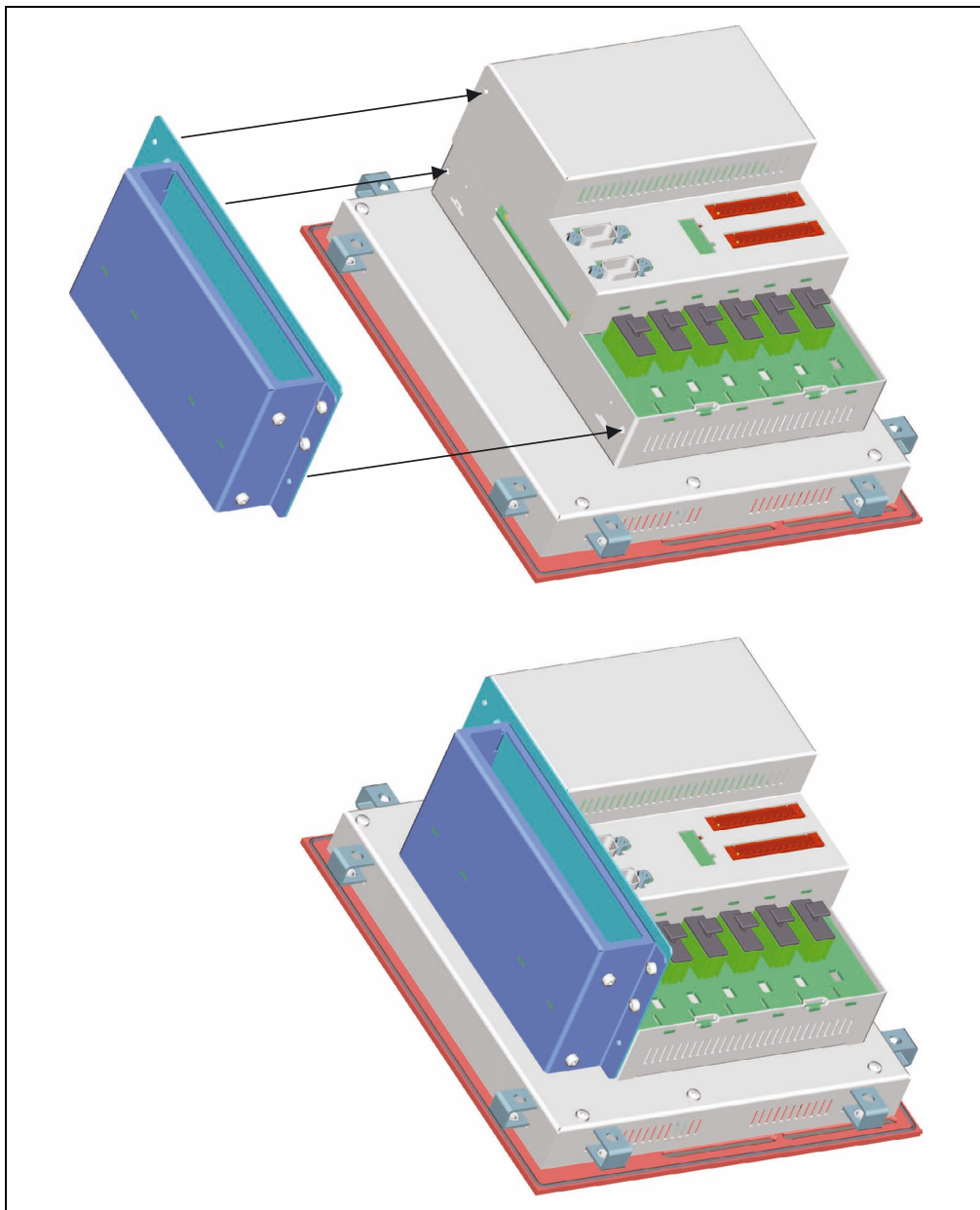


Figure 111: EX101 installation in Power Panel 41

Chapter 7 • Accessories for PP21 / PP41

1. IF370 CAN interface module

1.1 General information

The IF370 interface module is used for connecting the B&R Power Panel to a CAN network. It must always be operated in slot 1.

WARNING

The IF370 interface module is only suitable for operating with a B&R Power Panel 21/41. It should never be operated in a B&R SYSTEM 2003 module.

1.2 Photo



Figure 112: IF370 photo

1.3 Order data

Model number	Short description
4IF370.7	Power Panel interface module, 1 CAN interface, electrically isolated, network capable, screw-in module

Table 79: IF370

1.4 Technical data

Description	IF370
General information	
C-UL-US listed	In preparation
B&R ID code	\$44
Module type	B&R Power Panel screw-in module
Slot	Power Panel interface, slot 1
Power consumption	TBD
Standard communication interface	
Interface type	CAN
Electrical isolation	Interface - Power Panel
Design	9-pin DSUB plug
Status display	2 status LEDs
Maximum distance	1,000 m
Maximum transfer rate Bus length 10 – 60 m Bus length 100 – 200 m Bus length 800 – 1000 m	Max. 500 kbit/s Max. 250 kbit/s Max. 50 kbit/s
Network capable	Yes
Mechanical characteristics	
Dimensions	B&R Power Panel screw-in module

Table 80: IF370 technical data

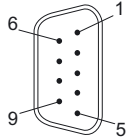
1.5 Status LEDs

Lit LEDs	Description
Yellow / Green	Data is being sent
Green	Data is being received

Table 81: IF370 status LEDs

1.6 Pin assignments

Pin assignment for CAN interface	
Pin	Assignment
1	NC
2	CAN_L
3	CAN_GND
4	NC
5	NC
6	Reserved
7	CAN_H
8	NC
9	NC



9-pin DSUB plug

Table 82: IF370 CAN interface pin assignments

1.7 Node number

The node number for the CAN interface on the IF370 interface module is derived from the onboard CAN interface on the Power Panel 21/41 by adding 1 to it.

Chapter 8 • Programming

1. Programming the PLC CPU

B&R Automation Studio™ is used to program the CPU. Several programming languages are available.

Automation Studio™
Automation Basic
ANSI C
IEC 1131 Ladder Diagram (LAD)
IEC 1131 Sequential function chart (SFC)
IEC 1131 Structured Text (ST)
IEC 1131 Instruction list (IL)

Table 83: Programming languages

2. Visualization

The visualization application is created using B&R Automation Studio™.

Chapter 9 • Maintenance / Servicing

1. Battery change interval

Display unit	Change interval	Additional information
PP15	5 years	Page 72
PP21	5 years	Page 94
PP35	5 years	Page 150
PP42	5 years	Page 172

Table 84: Battery change interval

Appendix A • Technical Appendix

1. Mylar (polyester foil)

The mylar used by B&R conforms to DIN 42 115 (section 2). This means it is resistant to exposure to the following chemicals for a 24 hour period with no visible signs of damage:

Ethanol Cyclohexanol Diacetone alcohol Glycol Isopropanol Glycerin Methanol Triacetin Dowandol DRM/PM	Formaldehyde 37% - 42% Acetaldehyde Aliphatic hydrocarbons Toluene Xylene White spirits	Trichloroethane Ethyl acetate Diethyl ether N-Butyl acetate Amyl acetate Butylcellosolve Ether
Acetone Methyl ethyl ketone Dioxan Cyclohexanone MIBK Isophorone	Formic acid <50% Acetic acid <50% Phosphoric acid <30% Hydrochloric acid <36% Nitric acid <10% Trichloroacetic acid <50% Sulphuric acid <10%	Sodium hypochlorite <20% Hydrogen peroxide <25% Potassium carbonate Washing powders Fabric conditioner Ferric chloride Ferrous chloride (FeCl ₂) Ferrous chloride (FeCl ₃) Dibutyl phthalate Diocetyl phthalate Sodium carbonate
Ammonia <40% Caustic soda <40% Potassium hydroxide Alkali carbonate Bichromate Potassium Acetonitrile Sodium bisulphate	Cutting oil Diesel oil Linseed oil Paraffin oil Blown castor oil Silicon oil Turpentine oil substitute Universal brake fluid Decon	Aviation fuel Petrol Water Sea water

Table 85: Resistance to chemicals

The mylar conforms to DIN 42 115 section 2 for exposure to glacial acetic acid <1 hour without any sign of visible damage.

Appendix B • Character Sets

1. Overview

Power Panel		Short description	Character set	
24	4PP015.0420-01	PP15	English / Katakana	194
44	4PP015.0420-36		English / Katakana	194
24	4PP015.C420-01		English / Cyrillic	196
44	4PP015.C420-36		English / Cyrillic	196
24	4PP015.E420-01		English / European	200
24	4PP015.E420-101		English / European	200
44	4PP015.E420-36		English / European	200
77	4P0420.00-490	PP21	English / Katakana	194
102	4PP035.0300-01	PP35	European / Cyrillic	198
122	4PP035.0300-36		European / Cyrillic	198
102	4PP035.E300-01		European / Cyrillic	198
122	4PP035.E300-36		European / Cyrillic	198
122	4PP035.E300-136		European / Cyrillic	198

Table 86: Character sets overview

Guidelines for using the character set tables:

- Each pair of the following pages presents a character set.
- All characters with a gray background are not permitted and cannot be used by the user.

2. English / Katakana character set

Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character
000	\$00		032	\$20		064	\$40	ア	096	\$60	`
001	\$01		033	\$21	!	065	\$41	A	097	\$61	a
002	\$02		034	\$22	"	066	\$42	B	098	\$62	b
003	\$03		035	\$23	#	067	\$43	C	099	\$63	c
004	\$04		036	\$24	\$	068	\$44	D	100	\$64	d
005	\$05		037	\$25	%	069	\$45	E	101	\$65	e
006	\$06		038	\$26	&	070	\$46	F	102	\$66	f
007	\$07		039	\$27	'	071	\$47	G	103	\$67	g
008	\$08		040	\$28	(	072	\$48	H	104	\$68	h
009	\$09		041	\$29	)	073	\$49	I	105	\$69	i
010	\$0A		042	\$2A	*	074	\$4A	J	106	\$6A	j
011	\$0B		043	\$2B	+	075	\$4B	K	107	\$6B	k
012	\$0C		044	\$2C	,	076	\$4C	L	108	\$6C	l
013	\$0D		045	\$2D	-	077	\$4D	M	109	\$6D	m
014	\$0E		046	\$2E	.	078	\$4E	N	110	\$6E	n
015	\$0F		047	\$2F	/	079	\$4F	O	111	\$6F	o
016	\$10		048	\$30	0	080	\$50	P	112	\$70	p
017	\$11		049	\$31	1	081	\$51	Q	113	\$71	q
018	\$12		050	\$32	2	082	\$52	R	114	\$72	r
019	\$13		051	\$33	3	083	\$53	S	115	\$73	s
020	\$14		052	\$34	4	084	\$54	T	116	\$74	t
021	\$15		053	\$35	5	085	\$55	U	117	\$75	u
022	\$16		054	\$36	6	086	\$56	V	118	\$76	v
023	\$17		055	\$37	7	087	\$57	W	119	\$77	w
024	\$18		056	\$38	8	088	\$58	X	120	\$78	x
025	\$19		057	\$39	9	089	\$59	Y	121	\$79	y
026	\$1A		058	\$3A	:	090	\$5A	Z	122	\$7A	z
027	\$1B		059	\$3B	;	091	\$5B	[	123	\$7B	[
028	\$1C		060	\$3C	<	092	\$5C	¥	124	\$7C	|
029	\$1D		061	\$3D	=	093	\$5D	]	125	\$7D]
030	\$1E		062	\$3E	>	094	\$5E	^	126	\$7E	→
031	\$1F		063	\$3F	?	095	\$5F	_	127	\$7F	←

Table 87: English / Katakana character set

Character Sets • English / Katakana character set

Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character
128	\$80		160	\$A0		192	\$C0	ツ	224	\$E0	α
129	\$81	ü	161	\$A1	□	193	\$C1	チ	225	\$E1	β
130	\$82		162	\$A2	〒	194	\$C2	ツ	226	\$E2	β
131	\$83		163	\$A3	┘	195	\$C3	テ	227	\$E3	ε
132	\$84	ü	164	\$A4	ゝ	196	\$C4	ト	228	\$E4	μ
133	\$85		165	\$A5	・	197	\$C5	ナ	229	\$E5	ε
134	\$86		166	\$A6	ヲ	198	\$C6	ニ	230	\$E6	ρ
135	\$87		167	\$A7	ア	199	\$C7	ヌ	231	\$E7	q
136	\$88		168	\$A8	イ	200	\$C8	ネ	232	\$E8	ℓ
137	\$89		169	\$A9	ウ	201	\$C9	ノ	233	\$E9	'
138	\$8A		170	\$AA	エ	202	\$CA	ハ	234	\$EA	j
139	\$8B		171	\$AB	オ	203	\$CB	ヒ	235	\$EB	*
140	\$8C		172	\$AC	カ	204	\$CC	フ	236	\$EC	φ
141	\$8D		173	\$AD	ユ	205	\$CD	ハ	237	\$ED	±
142	\$8E	Ä	174	\$AE	ヨ	206	\$CE	ホ	238	\$EE	ñ
143	\$8F		175	\$AF	ツ	207	\$CF	マ	239	\$EF	ö
144	\$90		176	\$B0	ー	208	\$D0	ミ	240	\$F0	p
145	\$91		177	\$B1	ア	209	\$D1	ム	241	\$F1	q
146	\$92		178	\$B2	イ	210	\$D2	メ	242	\$F2	θ
147	\$93		179	\$B3	ウ	211	\$D3	モ	243	\$F3	ω
148	\$94	ö	180	\$B4	エ	212	\$D4	ヤ	244	\$F4	Ω
149	\$95		181	\$B5	オ	213	\$D5	ユ	245	\$F5	Ü
150	\$96		182	\$B6	カ	214	\$D6	ヨ	246	\$F6	Σ
151	\$97		183	\$B7	キ	215	\$D7	ラ	247	\$F7	π
152	\$98		184	\$B8	ク	216	\$D8	リ	248	\$F8	∞
153	\$99	ö	185	\$B9	ケ	217	\$D9	ル	249	\$F9	∫
154	\$9A	ü	186	\$BA	コ	218	\$DA	レ	250	\$FA	〒
155	\$9B		187	\$BB	サ	219	\$DB	ロ	251	\$FB	〒
156	\$9C		188	\$BC	シ	220	\$DC	ワ	252	\$FC	〒
157	\$9D		189	\$BD	ズ	221	\$DD	ン	253	\$FD	÷
158	\$9E		190	\$BE	セ	222	\$DE	ン	254	\$FE	
159	\$9F		191	\$BF	ソ	223	\$DF	□	255	\$FF	■

Table 87: English / Katakana character set (Forts.)

3. English / Cyrillic character set

Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character
000	\$00		032	\$20		064	\$40	А	096	\$60	`
001	\$01		033	\$21	!	065	\$41	А	097	\$61	а
002	\$02		034	\$22	"	066	\$42	В	098	\$62	в
003	\$03		035	\$23	#	067	\$43	С	099	\$63	с
004	\$04		036	\$24	\$	068	\$44	Д	100	\$64	д
005	\$05		037	\$25	%	069	\$45	Е	101	\$65	е
006	\$06		038	\$26	&	070	\$46	Ф	102	\$66	ф
007	\$07		039	\$27	'	071	\$47	Г	103	\$67	г
008	\$08		040	\$28	(	072	\$48	Н	104	\$68	н
009	\$09		041	\$29	)	073	\$49	И	105	\$69	и
010	\$0A		042	\$2A	*	074	\$4A	Ј	106	\$6A	ј
011	\$0B		043	\$2B	+	075	\$4B	К	107	\$6B	к
012	\$0C		044	\$2C	,	076	\$4C	Л	108	\$6C	л
013	\$0D		045	\$2D	-	077	\$4D	М	109	\$6D	м
014	\$0E		046	\$2E	.	078	\$4E	Н	110	\$6E	н
015	\$0F		047	\$2F	/	079	\$4F	О	111	\$6F	о
016	\$10		048	\$30	0	080	\$50	Р	112	\$70	р
017	\$11		049	\$31	1	081	\$51	Q	113	\$71	q
018	\$12		050	\$32	2	082	\$52	Р	114	\$72	р
019	\$13		051	\$33	3	083	\$53	С	115	\$73	с
020	\$14		052	\$34	4	084	\$54	Т	116	\$74	т
021	\$15		053	\$35	5	085	\$55	U	117	\$75	u
022	\$16		054	\$36	6	086	\$56	У	118	\$76	у
023	\$17		055	\$37	7	087	\$57	W	119	\$77	w
024	\$18		056	\$38	8	088	\$58	X	120	\$78	x
025	\$19		057	\$39	9	089	\$59	Y	121	\$79	y
026	\$1A		058	\$3A	:	090	\$5A	Z	122	\$7A	z
027	\$1B		059	\$3B	;	091	\$5B	[	123	\$7B	и
028	\$1C		060	\$3C	<	092	\$5C	ё	124	\$7C	и
029	\$1D		061	\$3D	=	093	\$5D	]	125	\$7D	и
030	\$1E		062	\$3E	>	094	\$5E	^	126	\$7E	ѐ
031	\$1F		063	\$3F	?	095	\$5F	_	127	\$7F	ё

Table 88: English / Cyrillic character set

Character Sets • English / Cyrillic character set

Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character
128	\$80		160	\$A0	Б	192	\$C0	Ч	224	\$E0	Д
129	\$81	ü	161	\$A1	Г	193	\$C1	Ш	225	\$E1	Б
130	\$82		162	\$A2	Ё	194	\$C2	Ъ	226	\$E2	Щ
131	\$83		163	\$A3	Ж	195	\$C3	Ы	227	\$E3	А
132	\$84	ü	164	\$A4	Э	196	\$C4	Ь	228	\$E4	Ф
133	\$85		165	\$A5	И	197	\$C5	Э	229	\$E5	Ц
134	\$86		166	\$A6	Й	198	\$C6	Ю	230	\$E6	Ш
135	\$87		167	\$A7	Л	199	\$C7	Я	231	\$E7	'
136	\$88		168	\$A8	П	200	\$C8	«	232	\$E8	¨
137	\$89		169	\$A9	У	201	\$C9	»	233	\$E9	˘
138	\$8A		170	\$AA	Ф	202	\$CA	“	234	\$EA	ё
139	\$8B		171	\$AB	Х	203	\$CB	”	235	\$EB	ф
140	\$8C		172	\$AC	Ш	204	\$CC	№	236	\$EC	ü
141	\$8D		173	\$AD	Ъ	205	\$CD	¿	237	\$ED	•
142	\$8E	Ä	174	\$AE	Ы	206	\$CE	ƒ	238	\$EE	ö
143	\$8F		175	\$AF	Э	207	\$CF	€	239	\$EF	о
144	\$90		176	\$B0	Ю	208	\$D0	,	240	\$F0	к
145	\$91		177	\$B1	Я	209	\$D1	,	241	\$F1	л
146	\$92		178	\$B2	б	210	\$D2	„	242	\$F2	л
147	\$93		179	\$B3	в	211	\$D3	!!	243	\$F3	л
148	\$94	ö	180	\$B4	Г	212	\$D4	ž	244	\$F4	н
149	\$95	Ц	181	\$B5	ё	213	\$D5	ж	245	\$F5	˘
150	\$96		182	\$B6	ж	214	\$D6	ž	246	\$F6	л
151	\$97		183	\$B7	э	215	\$D7	ı	247	\$F7	н
152	\$98		184	\$B8	и	216	\$D8	ı	248	\$F8	н
153	\$99	ö	185	\$B9	й	217	\$D9	†	249	\$F9	н
154	\$9A	ü	186	\$BA	к	218	\$DA	‡	250	\$FA	н
155	\$9B		187	\$BB	л	219	\$DB	‡	251	\$FB	н
156	\$9C		188	\$BC	м	220	\$DC	‡	252	\$FC	н
157	\$9D		189	\$BD	н	221	\$DD	‡	253	\$FD	н
158	\$9E		190	\$BE	п	222	\$DE	‡	254	\$FE	н
159	\$9F		191	\$BF	т	223	\$DF	•	255	\$FF	■

Table 88: English / Cyrillic character set (Forts.)

4. European / Cyrillic character set

Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character
000	\$00		032	\$20		064	\$40	À	096	\$60	`
001	\$01		033	\$21	!	065	\$41	Á	097	\$61	a
002	\$02		034	\$22	"	066	\$42	Â	098	\$62	b
003	\$03		035	\$23	#	067	\$43	Ã	099	\$63	c
004	\$04		036	\$24	\$	068	\$44	Ä	100	\$64	d
005	\$05		037	\$25	%	069	\$45	Å	101	\$65	e
006	\$06		038	\$26	&	070	\$46	Æ	102	\$66	f
007	\$07		039	\$27	'	071	\$47	Ç	103	\$67	g
008	\$08		040	\$28	(	072	\$48	È	104	\$68	h
009	\$09		041	\$29	)	073	\$49	É	105	\$69	i
010	\$0A		042	\$2A	*	074	\$4A	Ê	106	\$6A	j
011	\$0B		043	\$2B	+	075	\$4B	Ë	107	\$6B	k
012	\$0C		044	\$2C	,	076	\$4C	Ï	108	\$6C	l
013	\$0D		045	\$2D	-	077	\$4D	Ì	109	\$6D	m
014	\$0E		046	\$2E	.	078	\$4E	Ó	110	\$6E	n
015	\$0F		047	\$2F	/	079	\$4F	Ô	111	\$6F	o
016	\$10	à	048	\$30	0	080	\$50	Õ	112	\$70	ö
017	\$11	á	049	\$31	1	081	\$51	Ö	113	\$71	ä
018	\$12	â	050	\$32	2	082	\$52	Ø	114	\$72	å
019	\$13	ã	051	\$33	3	083	\$53	Ù	115	\$73	š
020	\$14	ä	052	\$34	4	084	\$54	Ú	116	\$74	ţ
021	\$15	å	053	\$35	5	085	\$55	Û	117	\$75	ü
022	\$16	æ	054	\$36	6	086	\$56	Ü	118	\$76	v
023	\$17	ç	055	\$37	7	087	\$57	Ý	119	\$77	w
024	\$18	ć	056	\$38	8	088	\$58	Ÿ	120	\$78	x
025	\$19	č	057	\$39	9	089	\$59	Ź	121	\$79	y
026	\$1A	ď	058	\$3A	:	090	\$5A	Ž	122	\$7A	z
027	\$1B		059	\$3B	;	091	\$5B	Ɔ	123	\$7B	Ɔ
028	\$1C	ř	060	\$3C	<	092	\$5C	¥	124	\$7C	€
029	\$1D	š	061	\$3D	=	093	\$5D	Ź	125	\$7D	}
030	\$1E	ţ	062	\$3E	>	094	\$5E	ˆ	126	\$7E	ˆ
031	\$1F	ü	063	\$3F	?	095	\$5F	_	127	\$7F	

Table 89: European / Cyrillic character set

Character Sets • European / Cyrillic character set

Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character
128	\$80	Ɔ	160	\$A0	í	192	\$C0	В	224	\$E0	Э
129	\$81	Ĉ	161	\$A1	ó	193	\$C1	Г	225	\$E1	Ђ
130	\$82	ĉ	162	\$A2	ĝ	194	\$C2	Ė	226	\$E2	Т
131	\$83	Ċ	163	\$A3	ğ	195	\$C3	Ж	227	\$E3	Х
132	\$84	ċ	164	\$A4	ı	196	\$C4	Э	228	\$E4	Ф
133	\$85	ċ̇	165	\$A5	ı̇	197	\$C5	М	229	\$E5	Ψ
134	\$86	Ɔ̇	166	\$A6	€	198	\$C6	Ў	230	\$E6	Ω
135	\$87	Ɔ̈	167	\$A7	ı̈	199	\$C7	К	231	\$E7	α
136	\$88	Ɔ̇̈	168	\$A8	ĉ	200	\$C8	Л	232	\$E8	Σ
137	\$89	Ɔ̈̇	169	\$A9	ċ	201	\$C9	М	233	\$E9	γ
138	\$8A	Ɔ̇̈̇	170	\$AA	ł	202	\$CA	Н	234	\$EA	δ
139	\$8B	Ɔ̈̇̇	171	\$AB	ł̇	203	\$CB	П	235	\$EB	ε
140	\$8C	ı̇	172	\$AC	ĺ	204	\$CC	Т	236	\$EC	ζ
141	\$8D	ı̈	173	\$AD	ł̈	205	\$CD	Ч	237	\$ED	η
142	\$8E	ı̇̇	174	\$AE	ł̇̇	206	\$CE	Ш	238	\$EE	θ
143	\$8F	ı̈̇	175	\$AF	ł̈̇	207	\$CF	Ъ	239	\$EF	°
144	\$90	ı̇̈	176	\$B0	Е	208	\$D0	Ы	240	\$F0	ι
145	\$91	ı̈̈	177	\$B1	Ж	209	\$D1	ь	241	\$F1	κ
146	\$92	ı̇̈̇	178	\$B2	Э	210	\$D2	Э	242	\$F2	λ
147	\$93	ı̈̈̇	179	\$B3	М	211	\$D3	Ю	243	\$F3	μ
148	\$94	ı̇̈̈	180	\$B4	Ў	212	\$D4	Я	244	\$F4	ν
149	\$95	ı̈̈̈	181	\$B5	Л	213	\$D5	Д	245	\$F5	ξ
150	\$96	ı̇̈̈̇	182	\$B6	П	214	\$D6	У	246	\$F6	π
151	\$97	ı̈̈̈̇	183	\$B7	У	215	\$D7	Щ	247	\$F7	ρ
152	\$98	ı̇̈̈̈	184	\$B8	Ф	216	\$D8	Д	248	\$F8	σ
153	\$99	ı̈̈̈̈	185	\$B9	Ч	217	\$D9	Ф	249	\$F9	τ
154	\$9A	ı̇̈̈̈̇	186	\$BA	Ш	218	\$DA	У	250	\$FA	υ
155	\$9B	ı̈̈̈̈̇	187	\$BB	Ъ	219	\$DB	Щ	251	\$FB	φ
156	\$9C	ı̇̈̈̈̈	188	\$BC	Ы	220	\$DC	Г	252	\$FC	ψ
157	\$9D	ı̈̈̈̈̈	189	\$BD	Э	221	\$DD	Д	253	\$FD	ω
158	\$9E	ı̇̈̈̈̈̇	190	\$BE	Ю	222	\$DE	Ө	254	\$FE	ς
159	\$9F	ı̈̈̈̈̈̇	191	\$BF	Я	223	\$DF	А	255	\$FF	■

Table 89: European / Cyrillic character set (Forts.)

5. English / European character set

Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character
000	\$00		032	\$20		064	\$40	@	096	\$60	‘
001	\$01		033	\$21	!	065	\$41	Á	097	\$61	a
002	\$02		034	\$22	"	066	\$42	B	098	\$62	b
003	\$03		035	\$23	#	067	\$43	C	099	\$63	c
004	\$04		036	\$24	\$	068	\$44	D	100	\$64	d
005	\$05		037	\$25	%	069	\$45	E	101	\$65	e
006	\$06		038	\$26	&	070	\$46	F	102	\$66	f
007	\$07		039	\$27	'	071	\$47	G	103	\$67	g
008	\$08		040	\$28	(	072	\$48	H	104	\$68	h
009	\$09		041	\$29	)	073	\$49	I	105	\$69	i
010	\$0A		042	\$2A	*	074	\$4A	J	106	\$6A	j
011	\$0B		043	\$2B	+	075	\$4B	K	107	\$6B	k
012	\$0C		044	\$2C	,	076	\$4C	L	108	\$6C	l
013	\$0D		045	\$2D	-	077	\$4D	M	109	\$6D	m
014	\$0E		046	\$2E	.	078	\$4E	N	110	\$6E	n
015	\$0F		047	\$2F	/	079	\$4F	O	111	\$6F	o
016	\$10	±	048	\$30	0	080	\$50	P	112	\$70	p
017	\$11	≡	049	\$31	1	081	\$51	Q	113	\$71	q
018	\$12	¶	050	\$32	2	082	\$52	R	114	\$72	r
019	\$13	∕	051	\$33	3	083	\$53	S	115	\$73	s
020	\$14	/	052	\$34	4	084	\$54	T	116	\$74	t
021	\$15	l	053	\$35	5	085	\$55	U	117	\$75	u
022	\$16	∫	054	\$36	6	086	\$56	V	118	\$76	v
023	\$17	∫	055	\$37	7	087	\$57	W	119	\$77	w
024	\$18	/	056	\$38	8	088	\$58	X	120	\$78	x
025	\$19	∫	057	\$39	9	089	\$59	Y	121	\$79	y
026	\$1A	≠	058	\$3A	:	090	\$5A	Z	122	\$7A	z
027	\$1B		059	\$3B	;	091	\$5B	[	123	\$7B	{
028	\$1C	=	060	\$3C	<	092	\$5C	\	124	\$7C	|
029	\$1D	≈	061	\$3D	=	093	\$5D	]	125	\$7D	}
030	\$1E	≠	062	\$3E	>	094	\$5E	^	126	\$7E	~
031	\$1F	≠	063	\$3F	?	095	\$5F	_	127	\$7F	

Table 90: English / European character set

Character Sets • English / European character set

Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character	Dec.	Hex.	Character
128	\$80	Ɔ	160	\$A0	á	192	\$C0	ƒ	224	\$E0	γ
129	\$81	ü	161	\$A1	í	193	\$C1	Ƶ	225	\$E1	β
130	\$82	ñ	162	\$A2	ó	194	\$C2	ø	226	\$E2	δ
131	\$83	ð	163	\$A3	ú	195	\$C3	Ʒ	227	\$E3	ε
132	\$84	ü	164	\$A4	ç	196	\$C4	ƶ	228	\$E4	ζ
133	\$85	ü	165	\$A5	é	197	\$C5	†	229	\$E5	η
134	\$86	ü	166	\$A6	¥	198	\$C6	‡	230	\$E6	θ
135	\$87	Ɔ	167	\$A7	℞	199	\$C7	‡	231	\$E7	ι
136	\$88	ö	168	\$A8	ƒ	200	\$C8	‡	232	\$E8	κ
137	\$89	ö	169	\$A9	ı	201	\$C9	Γ	233	\$E9	λ
138	\$8A	ö	170	\$AA	ä	202	\$CA	Γ	234	\$EA	μ
139	\$8B	ı	171	\$AB	ä	203	\$CB	L	235	\$EB	ν
140	\$8C	ı	172	\$AC	ö	204	\$CC	J	236	\$EC	ξ
141	\$8D	ı	173	\$AD	ö	205	\$CD	.	237	\$ED	π
142	\$8E	ı	174	\$AE	ø	206	\$CE	Ø	238	\$EE	ρ
143	\$8F	ı	175	\$AF	ø	207	\$CF	Ø	239	\$EF	σ
144	\$90	ı	176	\$B0	.	208	\$D0	Ɔ	240	\$F0	τ
145	\$91	ı	177	\$B1	.	209	\$D1	†	241	\$F1	υ
146	\$92	ı	178	\$B2	°	210	\$D2	‡	242	\$F2	γ
147	\$93	ö	179	\$B3	´	211	\$D3	Ɔ	243	\$F3	ψ
148	\$94	ö	180	\$B4	´	212	\$D4	Γ	244	\$F4	ω
149	\$95	ö	181	\$B5	½	213	\$D5	Δ	245	\$F5	Ɔ
150	\$96	ü	182	\$B6	¼	214	\$D6	Ø	246	\$F6	Δ
151	\$97	ü	183	\$B7	×	215	\$D7	Λ	247	\$F7	
152	\$98	ü	184	\$B8	÷	216	\$D8	Σ	248	\$F8	
153	\$99	Ö	185	\$B9	≤	217	\$D9	Π	249	\$F9	
154	\$9A	Ü	186	\$BA	≥	218	\$DA	Σ	250	\$FA	
155	\$9B		187	\$BB	≠	219	\$DB	†	251	\$FB	
156	\$9C	ı	188	\$BC	≠	220	\$DC	Φ	252	\$FC	
157	\$9D	ı	189	\$BD	≠	221	\$DD	Ψ	253	\$FD	
158	\$9E	ı	190	\$BE	√	222	\$DE	Ω	254	\$FE	
159	\$9F	ı	191	\$BF	—	223	\$DF	α	255	\$FF	■

Table 90: English / European character set

Figure 1:	Material number / serial number	18
Figure 2:	Power Panel topology - distributed systems with PP15/PP35	21
Figure 3:	Power Panel topology - distributed systems with PP21/PP41	22
Figure 4:	Power Panel 15-01 photos.....	24
Figure 5:	Power Panel 15-01 diagnostic LEDs	30
Figure 6:	Power Panel 15-01 digital input connection examples (sink connection)	33
Figure 7:	Power Panel 15-01 digital input connection examples (source connection).....	33
Figure 8:	Power Panel 15-01 connection example - counter input	34
Figure 9:	Power Panel 15-01 connection example - period and gate measurement	34
Figure 10:	Power Panel 15-01 connection example - incremental encoder.....	35
Figure 11:	Power Panel 15-01 input circuit diagram - digital inputs	35
Figure 12:	Power Panel 15-01 connecton example - digital outputs	37
Figure 13:	Power Panel 15-01 output circuit diagram - digital outputs.....	37
Figure 14:	Power Panel 15-01 period measurement	42
Figure 15:	Power Panel 15-01 gate measurement	43
Figure 16:	Power Panel 15-36 photos.....	44
Figure 17:	Power Panel 15-36 diagnostic LEDs	51
Figure 18:	Power Panel 15-36 connection example - analog inputs.....	54
Figure 19:	Power Panel 15-36 digital input connection example (sink connection)	54
Figure 20:	Power Panel 15-36 digital input connection examples (source connection).....	55
Figure 21:	Power Panel 15-36 connection example - counter input	55
Figure 22:	Power Panel 15-36 connection example - period and gate measurement	56
Figure 23:	Power Panel 15-36 connection example - incremental encoder.....	56
Figure 24:	Power Panel 15-36 input circuit diagram - analog inputs 1 + 2	57
Figure 25:	Power Panel 15-36 input circuit diagram - analog inputs 3 + 4	57
Figure 26:	Power Panel 15-36 input circuit diagram - digital inputs	58
Figure 27:	Power Panel 15-36 connection example - analog output	59
Figure 28:	Power Panel 15-36 connecton example - digital output.....	59
Figure 29:	Power Panel 15-36 output circuit diagram - analog outputs	60
Figure 30:	Power Panel 15-36 output circuit diagram - digital outputs.....	60
Figure 31:	Power Panel 15-36 period measurement	66
Figure 32:	Power Panel 15-36 gate measurement	67
Figure 33:	Power Panel 15 operating mode and node number switch	69
Figure 34:	Power Panel 15 - Dimensions.....	70
Figure 35:	Power Panel 15 set display contrast.....	71
Figure 36:	Power Panel 15 changing the battery.....	73
Figure 37:	Power Panel 15 handling the battery	73
Figure 38:	Power Panel 15 distance for air circulation.....	74
Figure 39:	Power Panel 15 mounting angle	75
Figure 40:	Power Panel 21 photo.....	77
Figure 41:	Power Panel 21 images	82
Figure 42:	Power Panel 21 dimensions	83
Figure 43:	Power Panel 21 interfaces	84
Figure 44:	Power Panel 21 operating mode switch.....	86
Figure 45:	Power Panel 21 connection example - digital inputs	91
Figure 46:	Power Panel 21 input circuit diagram - digital inputs	91
Figure 47:	Power Panel 21 connection example - outputs 1 - 8	92

Figure index

Figure 48:	Power Panel 21 E-STOP circuit.....	93
Figure 49:	Power Panel 21 switching a load.....	93
Figure 50:	Power Panel 21 output circuit diagram - digital outputs.....	94
Figure 51:	Power Panel 21 connection example - relay contact.....	94
Figure 52:	Power Panel 21 changing the battery.....	96
Figure 53:	Power Panel 21 handling the battery.....	96
Figure 54:	Power Panel 21 distance for air circulation.....	98
Figure 55:	Power Panel 21 mounting angle.....	99
Figure 56:	PP35-01 photos.....	102
Figure 57:	PP35-01 diagnostic LEDs.....	108
Figure 58:	PP35-01 digital input connection examples (sink connection).....	111
Figure 59:	PP35-01 digital input connection examples (source connection).....	111
Figure 60:	PP35-01 connection example - counter input.....	112
Figure 61:	PP35-01 connection example - period and gate measurement.....	112
Figure 62:	PP35-01 connection example - incremental encoder.....	113
Figure 63:	PP35-01 input circuit diagram - digital inputs.....	113
Figure 64:	PP35-01 connecton example - digital outputs.....	115
Figure 65:	PP35-01 output circuit diagram - digital outputs.....	115
Figure 66:	PP35-01 period measurement.....	120
Figure 67:	PP35-01 gate measurement.....	121
Figure 68:	Power Panel 35-36 photos.....	122
Figure 69:	Power Panel 35-36 diagnostic LEDs.....	129
Figure 70:	Power Panel 35-36 connection example - analog inputs.....	132
Figure 71:	Power Panel 35-36 digital input connection examples (sink connection).....	132
Figure 72:	Power Panel 35-36 digital input connection examples (source connection).....	133
Figure 73:	Power Panel 35-36 connection example - counter input.....	133
Figure 74:	Power Panel 35-36 connection example - period and gate measurement.....	134
Figure 75:	Power Panel 35-36 connection example - incremental encoder.....	134
Figure 76:	Power Panel 35-36 input circuit diagram - analog inputs 1 + 2.....	135
Figure 77:	Power Panel 35-36 input circuit diagram - analog inputs 3 + 4.....	135
Figure 78:	Power Panel 35-36 input circuit diagram - digital inputs.....	136
Figure 79:	Power Panel 35-36 connection example - analog output.....	137
Figure 80:	Power Panel 35-36 connecton example - digital output.....	137
Figure 81:	Power Panel 35-36 output cirtuit diagram - analog outputs.....	138
Figure 82:	Power Panel 35-36 output circuit diagram - digital outputs.....	138
Figure 83:	Power Panel 35-36 period measurement.....	144
Figure 84:	Power Panel 35-36 gate measurement.....	145
Figure 85:	Power Panel 35 operating mode and node number switch.....	147
Figure 86:	Power Panel 35 dimensions.....	148
Figure 87:	Power Panel 35 set display contrast.....	149
Figure 88:	Power Panel 35 changing the battery.....	151
Figure 89:	Power Panel 35 handling the battery.....	151
Figure 90:	Power Panel 35 distance for air circulation.....	152
Figure 91:	Power Panel 35 mounting angle.....	153
Figure 92:	Power Panel 41 photo.....	155
Figure 93:	Power Panel 41 - Image.....	160
Figure 94:	Power Panel 41 - Dimensions.....	161

Figure 95: Power Panel 41 interfaces	162
Figure 96: Power Panel 41 operating mode switch.....	164
Figure 97: Power Panel 41 connection example - digital inputs	169
Figure 98: Power Panel 41 input circuit diagram - digital inputs	169
Figure 99: Power Panel 41 connection example - outputs 1 - 8	170
Figure 100: Power Panel 41 E-STOP circuit.....	171
Figure 101: Power Panel 41 switching a load	171
Figure 102: Power Panel 41 output circuit diagram - digital outputs.....	172
Figure 103: Power Panel 41 connection example - relay contact.....	172
Figure 104: Power Panel 41 changing the battery	174
Figure 105: Power Panel 41 handling the battery	174
Figure 106: Power Panel 41 distance for air circulation.....	176
Figure 107: Power Panel 41 mounting angle	177
Figure 108: EX101 photo	178
Figure 109: EX101 dimensions.....	180
Figure 110: PP41 + EX101 dimensions	181
Figure 111: EX101 installation in Power Panel 41	182
Figure 112: IF370 photo.....	183

Table 1:	Manual history.....	15
Table 2:	Organization of safety notices.....	18
Table 3:	Power Panel overview	20
Table 4:	PP15 overview	23
Table 5:	Power Panel 15-01 order data	24
Table 6:	Power Panel 15-01 technical data	25
Table 7:	Power Panel 15-01 status LED.....	30
Table 8:	Power Panel 15-01 I/O LEDs.....	31
Table 9:	Power Panel 15-01 interface LEDs.....	31
Table 10:	Power Panel 15-01 terminal assignments - X1 / digital inputs.....	32
Table 11:	Power Panel 15-01 terminal assignments - X2 / digital outputs.....	36
Table 12:	Power Panel 15-01 variable declaration	38
Table 13:	Power Panel 15-36 order data	44
Table 14:	Power Panel 15-36 technical data	45
Table 15:	Power Panel 15-36 status LED.....	52
Table 16:	Power Panel 15-36 I/O LEDs.....	52
Table 17:	Power Panel 15-36 interface LEDs.....	52
Table 18:	Power Panel 15-36 terminal assignments - X1 / digital/analog inputs.....	53
Table 19:	Power Panel 15-36 terminal assignments - X2 / digital/analog outputs.....	58
Table 20:	Power Panel 15-36 variable declaration	61
Table 21:	Power Panel 15 terminal assignments X3 / voltage supply	68
Table 22:	Power Panel 15 pin assignments IF1 / RS232	68
Table 23:	Power Panel 15 pin assignments - IF2 / CAN.....	69
Table 24:	Power Panel 15 switch positions of the operating mode and node number switch.....	69
Table 25:	Power Panel 15 battery data.....	72
Table 26:	Power Panel 15 buffer duration	72
Table 27:	Power Panel 21 order data	77
Table 28:	Power Panel 21 technical data	78
Table 29:	Power Panel 21 status LEDs	83
Table 30:	Power Panel 21 pin assignment - power supply	84
Table 31:	Power Panel 21 pin assignment - CAN interface.....	85
Table 32:	Power Panel 21 pin assignment - RS232 interface	85
Table 33:	Power Panel 21 switch settings for the MODE switch	86
Table 34:	Power Panel 21 order data - PCMCIA memory cards	87
Table 35:	Power Panel 21 screw-in module overview	89
Table 36:	Power Panel 21 terminal assignments - digital inputs	90
Table 37:	Power Panel 21 terminal assignments - digital outputs	92
Table 38:	Power Panel 21 battery data.....	94
Table 39:	Power Panel 21 buffer duration	95
Table 40:	PP35 overview	101
Table 41:	PP35-01 order data.....	102
Table 42:	PP35-01 technical data.....	103
Table 43:	PP35-01 status LED	108
Table 44:	PP35-01 I/O LEDs	109
Table 45:	PP35-01 interface LEDs	109
Table 46:	PP35-01 terminal assignments X1 / digital inputs.....	110

Table index

Table 47:	PP35-01 terminal assignment - X2 / digital outputs	114
Table 48:	PP35-01 variable declaration	116
Table 49:	Power Panel 35-36 order data	122
Table 50:	Power Panel 35-36 technical data	123
Table 51:	Power Panel 35-36 status LED	130
Table 52:	Power Panel 35-36 I/O LEDs	130
Table 53:	Power Panel 35-36 interface LEDs	130
Table 54:	Power Panel 35-36 terminal assignments - X1 / digital/analog inputs	131
Table 55:	Power Panel 35-36 terminal assignment - X2 / digital/analog outputs	136
Table 56:	Power Panel 35-36 variable declaration	139
Table 57:	Power Panel 35 terminal assignments X3 / voltage supply	146
Table 58:	Power Panel 35 pin assignments IF1 / RS232	146
Table 59:	Power Panel 35 pin assignments - IF2 / CAN	147
Table 60:	Power Panel 35 switch positions of the operating mode and node number switch	147
Table 61:	Power Panel 35 battery data	150
Table 62:	Power Panel 35 buffer duration	150
Table 63:	Power Panel 41 order data	155
Table 64:	Power Panel 41 technical data	156
Table 65:	Power Panel 41 - Status LEDs	161
Table 66:	Power Panel 41 pin assignment - power supply	162
Table 67:	Power Panel 41 pin assignment - CAN interface	163
Table 68:	Power Panel 41 pin assignment - RS232 interface	163
Table 69:	Power Panel 41 switch settings for the MODE switch	164
Table 70:	Power Panel 41 order data - PCMCIA memory cards	165
Table 71:	Power Panel 41 screw-in module overview	167
Table 72:	Power Panel 41 terminal assignments - digital inputs	168
Table 73:	Power Panel 41 terminal assignments - digital outputs	170
Table 74:	Power Panel 41 battery data	172
Table 75:	Power Panel 41 buffer duration	173
Table 76:	EX101 order data	178
Table 77:	EX101 interface modules that can be inserted in the module	179
Table 78:	EX101 technical data	179
Table 79:	IF370	183
Table 80:	IF370 technical data	184
Table 81:	IF370 status LEDs	184
Table 82:	IF370 CAN interface pin assignments	185
Table 83:	Programming languages	187
Table 84:	Battery change interval	189
Table 85:	Resistance to chemicals	191
Table 86:	Character sets overview	193
Table 87:	English / Katakana character set	194
Table 88:	English / Cyrillic character set	196
Table 89:	European / Cyrillic character set	198
Table 90:	English / European character set	200

A		IF370 CAN interface module 183
Accessories for PP21 / PP41 183		Interfaces
		Power Panel 15 68
		Power Panel 21 84
		Power Panel 35 146
		Power Panel 41 162
B		
Battery change interval 189		
C		
Character Sets 193		
English / Cyrillic 196		
English / European 200		
English / Katakana 194		
European / Cyrillic 198		
D		
Dimensions		
EX101 180		
Power Panel 15 70		
Power Panel 21 83		
Power Panel 35 148		
Power Panel 41 161		
Display contrast		
Power Panel 15 71		
Power Panel 35 149		
E		
EX101 178		
Dimensions 180		
General information 178		
Installation 182		
Order data 178		
Photo 178		
Technical data 179		
I		
IF370 183		
General information 183		
Order data 183		
Photo 183		
Pin assignments 185		
Status LEDs 184		
Technical data 184		
		Maintenance / Servicing 189
		Manual history 15
		Mylar 191
		M
		P
		Power Panel 15 23
		Buffer duration 72
		CAN interface 68
		Changing the battery 72
		Dimensions 70
		Display contrast 71
		Interfaces 68
		Mounting instructions 74
		Node number switch 69
		Operating mode switch 69
		RS232 interface 68
		Supply voltage 68
		Types 23
		Power Panel 15-01 24
		Diagnostic LEDs 30
		Digital inputs 32
		Digital outputs 36
		I/O LEDs 31
		Interface LEDs 31
		Order data 24
		Photos 24
		Status LED 30
		Technical data 25
		Variable declaration 38
		Power Panel 15-36 44
		Analog inputs 53
		Analog outputs 58
		Diagnostic LEDs 51
		Digital inputs 53
		Digital outputs 58
		I/O LEDs 52
		Interface LEDs 52

Index

Power Panel 15-36	44	Power Panel 35-01	102
Order data	44	I/O LEDs	109
Photos	44	Interface LEDs	109
Status LED	52	Order data	102
Variable declaration	61	Status LED	108
Power Panel 21	77	Technical data	103
Accessories	183	Variable declaration	116
Buffer duration	95	Power Panel 35-36	122
CAN interface	84	Analog inputs	131
Changing the battery	94	Analog outputs	136
Digital inputs	90	Diagnostic LEDs	129
Digital outputs	92	Digital inputs	131
Dimensions	83	Digital outputs	136
Interfaces	84	I/O LEDs	130
Mounting instructions	98	Interface LEDs	130
Operating mode switch	86	Order data	122
Order data	77	Photos	122
PCMCIA slot	87	Status LED	130
Photo	77	Technical data	123
Power Panel interface	88	Variable declaration	139
Power supply	84	Power Panel 41	155
Programming System Flash	87	Accessories	183
Real-time buffering	90	Buffer duration	173
RS232 interface	85	CAN interface	162
Screw-in modules	89	Changing the battery	172
Status LEDs	83	Digital inputs	168
Technical data	78	Digital outputs	170
Power Panel 35	101	Dimensions	161
Buffer duration	150	Interfaces	162
CAN interface	146	Mounting instructions	176
Changing the battery	150	Operating mode switch	164
Dimensions	148	Order data	155
Display contrast	149	PCMCIA slot	165
Interfaces	146	Photo	155
Mounting instructions	152	Power Panel interface	166
Node number switch	147	Power supply	162
Operating mode switch	147	Programming System Flash	165
RS232 interface	146	Real-time buffering	168
Supply voltage	146	RS232 interface	163
Types	101	Screw-in modules	167
Power Panel 35-01	102	Status LEDs	161
Diagnostic LEDs	108	Technical data	156
Digital inputs	110	Power Panel expansion	178
Digital outputs	114	Programming the PLC CPU	187

S

Safety notices	
Intended use	17
Introduction	16
Mounting	17
Operation	17
Organization	18
Transport and storage	17
Servicing	189

T

Technical appendix	191
Types	
Power Panel 15	23
Power Panel 35	101

V

Visualization	187
---------------------	-----

0

0AC201.925, 45, 78, 103, 123, 156
 OMC111.9 78, 156
 OMC211.9 78, 156
 0TB103.925, 44, 102, 122
 0TB103.9125, 44, 102, 122

3

3IF613.9 179
 3IF621.9 179
 3IF622.9 179
 3IF661.9 179
 3IF671.9 179
 3IF672.9 179
 3IF681.95 179
 3IF681.96 179

4

4A0006.00-00025, 45, 78, 103, 123, 156
 4A0034.00-000 156
 4A0035.00-000 78
 4A0044.00-00025, 45, 103, 123
 4EX101.00 156, 178
 4IF370.7 89, 167, 183
 4P0420.00-490 77
 4P3040.01-490 155
 4PP015.0420-0124
 4PP015.0420-36 44
 4PP015.C420-0124
 4PP015.C420-36 44
 4PP015.E420-0124
 4PP015.E420-10124

4PP015.E420-36 44
 4PP035.0300-01 102
 4PP035.0300-36 122
 4PP035.E300-01 102
 4PP035.E300-136 122
 4PP035.E300-36 122

7

7AC911.9 25, 45, 78, 103, 123, 156
 7AI261.7 89, 167
 7AI294.7 89, 167
 7AI351.70 89, 167
 7AI354.70 89, 167
 7AI774.70 89, 167
 7AM351.70 89, 167
 7AO352.70 89, 167
 7AT324.70 89, 167
 7AT352.70 89, 167
 7AT664.70 89, 167
 7DI135.70 89, 167
 7DI138.70 89, 167
 7DI140.70 89, 167
 7DO135.70 89, 167
 7DO138.70 89, 167
 7IF311.7 89, 167
 7IF321.7 89, 167
 7IF361.70-1 89, 167
 7NC161.7 89, 167
 7TB712.9 77, 156
 7TB712.91 77, 156
 7TB712:90-02 156
 7TB712:91-02 156
 7TB718.9 25, 44, 102, 122
 7TB718.91 25, 44, 102, 122

