PS352

Power Supply Module
in StackPC-PCI format

User Manual

Rev. 1.5

September 2017

The product described in this manual is compliant with all related CE standards.

Product Title: **PS352**
Document name: **PS352 User Manual**
Manual version: **1.5**

Revision history

Rev. Index	Brief Description of Changes	Board Index	Date of Issue
1.0	Initial version	PS352	November 2014
1.1	The following updates were made: power supply voltage, MTBF, dimensions, weight.	PS352	February 2015
1.2	Replacement of figure 5-1.	PS352	June 2015
1.3	Replacement of figure 5-1.	PS352	July 2015
1.4	Protection characteristics at module's output were added. Degree of full-load efficiency coefficient was adjusted. Modules photos were added.	PS352	June 2016
1.5	Compliance assessment	PS352	September 2017

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Ownership Rights

Notation conventions

Warning, ESD Sensitive Device!

This symbol draws your attention to the information related to electro static sensitivity of your product and its components. To keep product safety and operability it is necessary to handle it with care and follow the ESD safety directions.

Attention! Hot surface!

This symbol and title warns you about the danger, related the contact with hot surfaces of the device.

Attention!

Information marked by this symbol is essential for human and equipment safety.
Read this information attentively, be watchful.

Note:

This symbol and title marks important information to be read attentively for your own benefit.

Safety requirements

This Fastwel device was manufactured and tested in order to meet the electrical safety requirements. Design of the device offers a long-term fail-safe operation. The life cycle of the device can be sufficiently shortened due to the improper handling during unpacking and installation. Therefore, for your safety and in order to ensure proper operation of the device, you should observe the below recommendations.

Rules for safe handling with high voltage

Attention!

All works with this device should be performed only by personnel with sufficient qualifications.

Caution, high voltage!

Before installing the module to the system, make sure that the mains supply is off. This also applies to the installation of the expansion boards.
During installation, repair and maintenance of the product, there is a serious risk of electric shock, so always remove the power cord from the outlet during work. This also applies to other power supply cables.

Board Handling Instructions

ESD Sensitive Device!!

Electronic modules and their components are sensitive to static electricity. Even a non-perceptible by human being static discharge can be sufficient to destroy or degrade a component's operation! Therefore, all handling operations and inspections of this product must be performed with due care, in order to keep product integrity and operability:

- Don't leave the board inoperative and without a protective packaging.
- Whenever possible, always work with the card in workplaces equipped with protection from static electricity. If this is not possible, the user should remove the static charge before touching the product with his hands or tool. This is most conveniently done by touching the metal part of the system housing.
- It is especially important to observe precautions when the works on replacing expansion cards, jumpers, etc is carried out. Do not place the board on conductive surfaces, such as antistatic mats or sponges. They can cause a short circuit and lead to damage to the conductive circuits of the board.

Transportation, unpacking, inspection and handling

Please read the manual carefully before unpacking the module or mounting the device into your system. Keep in mind the following:

ESD Sensitive Device!

Electronic modules and their components are sensitive to static electricity. Even a non-perceptible by human being static discharge can be sufficient to destroy or degrade a component's operation! Therefore, all handling operations and inspections of this product must be performed with due care, in order to keep product integrity and operability:

- Preferably, unpack or pack this product only at EOS/ESD safe workplaces. Otherwise, it is important to be electrically discharged before touching the product. This can be done by touching a metal part of your system case with your hand or tool. It is particularly important to observe anti-static precautions when setting jumpers or replacing components.
- If the product contains batteries for RTC or memory back-up, ensure that the module is not placed on conductive surfaces, including anti-static mats or sponges. This can cause short-circuit and result in damage to the battery and other components.
- Store this product in accordance with IEC721 in its protective packaging while it is not used for operational purposes.

Transportation

The module must be transported in individual factory packages consisting of an individual antistatic bag and a cardboard box, in closed vehicles (in heated and airtight compartments of motor, railroad or airborne vehicles) in accordance with IEC721.

Packed modules must be transported pursuant to the cargo transportation rules applicable to this mode of transport.

During loading and unloading work and transportation, packed modules must not be exposed to jerks, falls, shocks and atmospheric precipitation. The stowage of packed modules in a vehicle must exclude their shifting.

Unpacking

The product is carefully packed in an antistatic bag and in a carton box to protect it against possible damage and harmful influence during shipping. Unpack the product indoors only at a temperature not less than +15°C and relative humidity not more than 70%. Please note, that if the product was exposed to the temperatures below 0°C for a long time, it is necessary to keep it at normal conditions for at least 24 hours before unpacking. Do not keep the product close to a heat source.

Following ESD precautions, carefully take the product out of the shipping carton box. Proper handling of the product is critical to ensure correct operation and long-term reliability. When unpacking the product, and whenever handling it thereafter, be sure to hold the module preferably by the front panel, card edges or ejector handles. Avoid touching the components and connectors.

Retain all original packaging at least until the warranty period is over. You may need it for shipments or for storage of the product.

Initial Inspection

Although the product is carefully packaged, it is still possible that shipping damages may occur. Careful inspection of the shipping carton can reveal evidence of damage or rough handling. Should you notice that the package is damaged, please notify the shipping service and the manufacturer as soon as possible. Retain the damaged packing material for inspection.

After unpacking the product, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact Fastwel's official distributor from which you have purchased the product for additional instructions. Depending on the severity of the damage, the product may even need to be returned to the factory for repair. DO NOT apply power to the product if it has visible damage. Doing so may cause further, possibly irreparable damage, as well as result in a fire or electric shock hazard.

If the product contains socketed components, they should be inspected to make sure they are seated fully in their sockets.

General rules for product usage

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

In order to keep Fastwel’s warranty, you must not change or modify this product in any way, other than specifically approved by Fastwel or described in this manual.

Technical characteristics of the systems in which this product is installed, such as operating temperature ranges and power supply parameters, should conform to the requirements stated by this document.

Retain all the original packaging, you will need it to pack the product for shipping in warranty cases or for safe storage. Please, pack the product for transportation in the way it was packed by the supplier.

When handling the product, please, remember that the module, its components and connectors require delicate care. Always keep in mind the ESD sensitivity of the product.

Manufacturer's Guarantees

Guarantee Liabilities

The Manufacturer hereby guarantees the product conformity with the requirements of Technical Specifications 4013-004-52415667-05 provided the Consumer abides by the conditions of operation, transportation, storage, installation and assembly established by the accompanying documents.

The Manufacturer hereby guarantees that the products supply thereby are free from defects in workmanship and materials, provided operation and maintenance norms were observed during the currently established guarantee period. The Manufacturer's obligation under this guarantee is to repair or replace free of charge any defective electronic component being a part of a returned product.

Products that broke down through the Manufacturer's fault during the guarantee period will be repaired free of charge. Otherwise the Consumer will be invoiced as per the current labor remuneration rates and expendable materials cost.

Liability Limitation Right

The Manufacturer shall not be liable for the damage inflicted to the Consumer's property because of the product breakdown in the process of its utilization.

Guarantee Period

The guarantee period for the products made by the manufacturer company is 36 months since the sale date (unless otherwise provided by the supply contract).

The guarantee period for the products made to special order is 60 months since the sale date (unless otherwise provided by the supply contract).

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Fastwel personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Fastwel.
2. Products, which have been subject to power supply reversal, misuse, neglect, accident, or improper installation.

Returning a product for repair

1. Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization.
2. Attach a failure inspection report with a product to be returned in the form, accepted by customer, with a description of the failure circumstances and symptoms.
3. Carefully package the product in the antistatic bag, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties. Then package the product in a safe container for shipping.
4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer.

1. INTRODUCTION

PS352 power supply module is the board implemented in StackPC-PCI form-factor that serves as an extension of the range of StackPC modules, manufactured by Fastwel Group. The modular design enables to create a system for particular application areas, thus optimizing the price / quality ratio. In particular, the PS352 can be used within a system with PSE (Power Sourcing Equipment) to power modules using PoE (Power over Ethernet) technology, where power is provided via Ethernet data transmission lines.

Stability of operation of PS352 enables to use it in all industrial applications. The components on the basis of which the PS352 is built, are carefully selected according to the applicability criteria in embedded systems, which makes the module suitable for work with systems having a long life cycle.

This user manual provides instructions for the proper and safe installation, activation and configuration of the module, connection and interaction with expansion modules or external devices.

For proper operation of the module within the specified service life, it is necessary first to read the contents of this user manual.

1.1 Main features of PS352

- Power supply voltage**:** 10 В – 36 V;
- **Output voltage:** 48 V ± 5 %;
- **Module consumption without load:** 2.4 W;
- Maximum power output**:** 75 W;
- **Peak-to-peak amplitude of output voltage pulsations at rated load in bandwidth of 20 MHz at output connector, no more than:** 300 mV;
- **Rated performance (at rated power supply voltage of 24V and output load of 100%):** 84%;
- **Input/output galvanic isolation:** 1500 V;
- **Galvanic isolation of StackPC-PCI interfaces from input/output** 1500 V;
- **Maximum load capacitance:** 330 μF;
- **Protection against short circuit, overloading and overvoltage at output**;
- **Protection against overheating**;
- **Operating temperature range:** from - 40°C to 85°C (with limitation of power output at the temperatures over 55°C). Depending on the ambient temperature, it requires either forced cooling or availability of the heat-spreader;
- **Weight, no more than:**
- PS352-01: 185 g;
- PS352-02: 155 g;
- **Maximum module's consumption current, exclusive of external load, no more than**
- 0.27 A;
- **Mean Time Between Failures (MTBF)**: no less than 280 000 hours;

- **Dimensions, no more than:**

- PS352-01: 91 mm × 96 mm x 23 mm;

- PS352-02: 91 mm × 96 mm x 15,5 mm.

2 Technical specifications

2.1 Versions of PS352

Versions of PS352 and designations (ordering information) in product catalogs of Fastwel Group are specified in the following table.

Table 2-1: Features of PS352 depending on module version

Name	Designation	Ordering designation	Note
Power Supply Module PS352	PS352	PS352-01	With StackPC and PCI connectors
		PS352-02	Without StackPC and PCI connectors
		PS352-01\ Coated	with StackPC and PCI connectors, with varnish coating
		PS352-02\ Coated	without StackPC and PCI connectors, with varnish coating

2.2 Delivery checklist of PS352

The delivery checklist of PS352:

1. PS352 Module – 1 piece;

2. Installation kit:

- WAGO connector p/n: 734-103 for XP1 connector – 1 piece.

- WAGO connector p/n: 734-102 for XP2 connector – 1 piece.

3. Packaging.

2.3 Packaging information

PS352 is packed in a box with the dimensions of 140 x 156 x 45 mm. The shipping weight of the module is no more than 0.35 kg.

Note

The antistatic and consumer packaging of the module should be retained till the end of the guaranteed service life.

2.4 Outside view and location of components

The following figures will help to identify the components, in understanding their mutual arrangement and functions. The module's versions may have minor differences, not specified in the figures.

2.4.1 Location of main components and dimensions PS352

The location of the connectors and module's main components, indicating the overall dimensions, is shown in Fig. 2-1.

The StackPC-PCI connectors (XS2 - PCI interface connector, XS1 and XP3 - StackPC connectors) are installed on the module for the version of PS352-01 (see subsection 3.2.1).

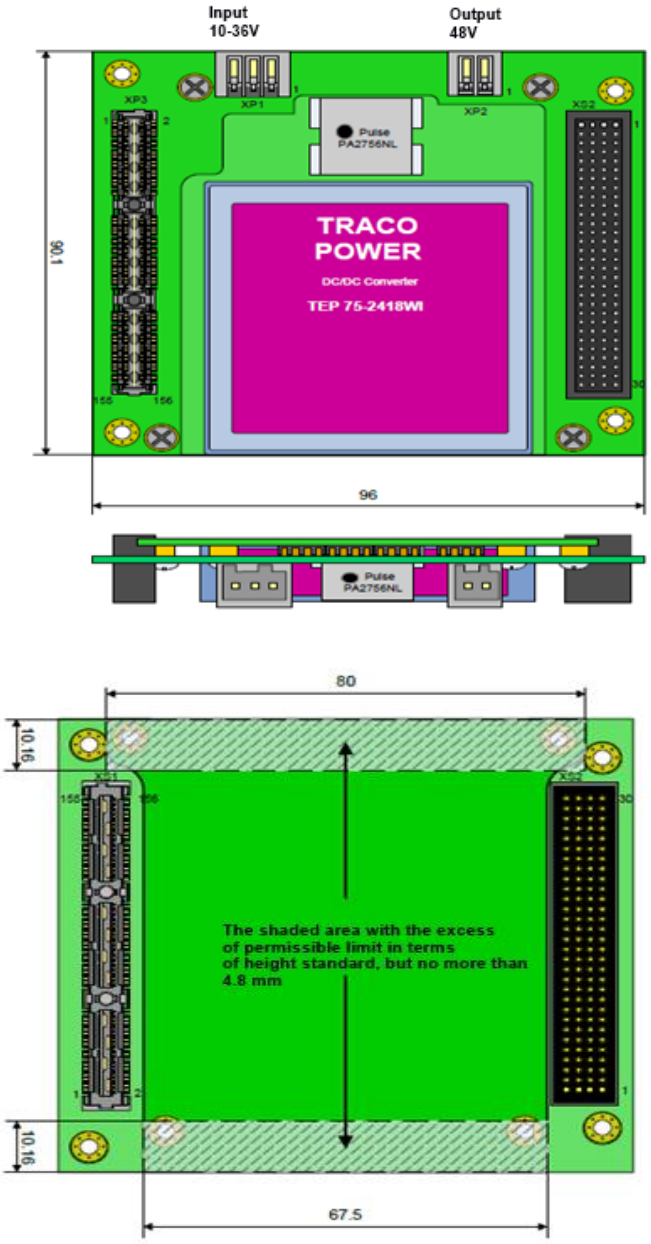


Fig. 2-1: Location of main components and overall dimensions of PS352

3 PS352 design and functioning

3.1 Block diagram

The module's block diagram is shown in the figure below:

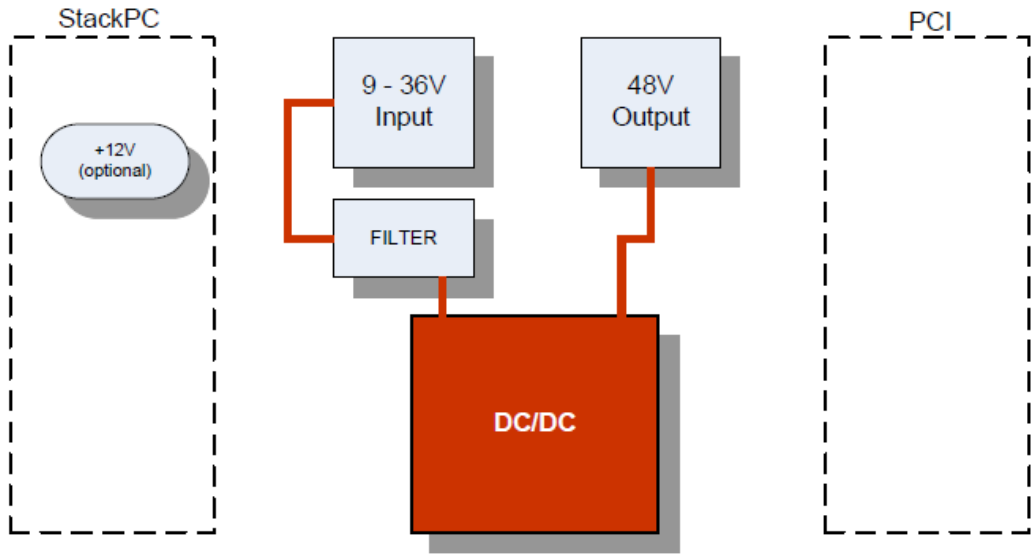


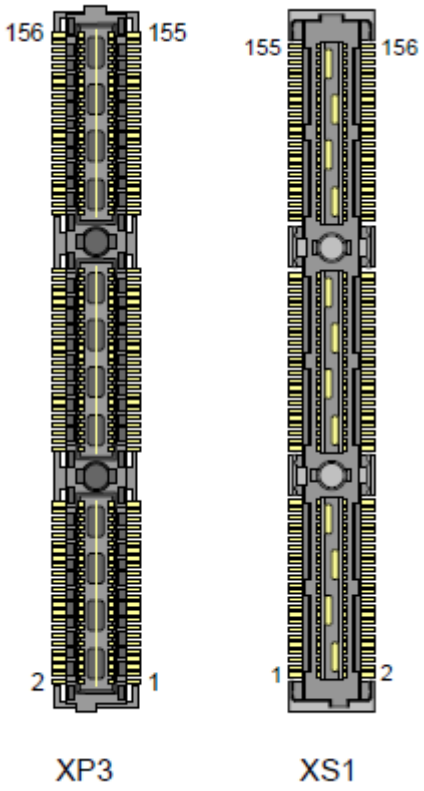
Fig. 3-1: Block-diagram PS352

The dashed lines indicate the nodes which depend on module's version (see subsection 2.1). PS352 module is implemented in StackPC-PCI format and in addition to the isolated DC/DC converter contains an input power supply filter. Output power supply insulation voltage from the input voltage is no less than 1500 V.

3.2 Module interfaces

3.2.1 StackPC connector

PS352 is developed in accordance with the StackPC-PCI specification (StackPC specification is available at http://www.stackpc.org/): XS2 - PCI interface connector, XS1 and XP3 - StackPC connectors. StackPC and PCI are bulkhead connectors and signals coming from them are not utilized in PS352. These connectors are installed for the PS352-01 version, designed for the use in stack systems. The PS352-02 module is designed for the use in systems where the module is not installed into stack, but in this case it is mounted to the same stack mounting holes.



The XS1 connector is located under XP3 on the back of the board. The location of the XS2 and XP3 connectors is shown in Fig. 2-1.

Fig. 3-2: StackPC connectors XP3 and XS1

3.2.1.1 Pin assignments for the StackPC XP3 and XS1 connectors

The contacts and the functionality of these connectors for StackPC module are described in the table below (StackPC connector pins are not used when PS352 is working).

Table 3-1: Purpose of XP13 and XS2 connectors contacts

Upper connector XP3				
#	Signal		Signal	#
1	USB_OC#	BANK1 (+5V)	PE_RST#	2
3	+3.3V		+3.3V	4
5	USB_1p		USB_0p	6
7	USB_1n		USB_0n	8
9	GND		GND	10
11	PEx1_1Tp		PEx1_0Tp	12
13	PEx1_1Tn		PEx1_0Tn	14
15	GND		GND	16
17	PEx1_2Tp		PEx1_3Tp	18
19	PEx1_2Tn		PEx1_3Tn	20
21	GND		GND	22
23	PEx1_1Rp		PEx1_0Rp	24
25	PEx1_1Rn		PEx1_0Rn	26
27	GND		GND	28
29	PEx1_2Rp		PEx1_3Rp	30
31	PEx1_2Rn		PEx1_3Rn	32
33	GND		GND	34
35	PEx1_1Clkp		PEx1_0Clkp	36
37	PEx1_1Clkn		PEx1_0Clkn	38
39	+5V_SB		+5V_SB	40
41	PEx1_2Clkp		PEx1_3Clkp	42
43	PEx1_2Clkn		PEx1_3Clkn	44
45	DIR		PWRGOOD	46
47	SMB_DAT		PE_x4_CLKp	48
49	SMB_CLK		PE_x4_CLKn	50
51	SMB_ALERT#		PSON#	52
53	STK0/WAKE#	BANK2 (+5V)	STK1/SATA_ACT#	54
55	Type_DETECT#		GND	56
57	ETH_1_MDI(0)p		PEx4_0T(0)p	58
59	ETH_1_MDI(0)n		PEx4_0T(0)n	60
61	GND		GND	62
63	NC		PEx4_0T(1)p	64
65	NC		PEx4_0T(1)n	66
67	GND		GND	68
69	ETH_1_MDI(1)p		PEx4_0T(2)p	70
71	ETH_1_MDI(1)n		PEx4_0T(2)n	72
73	GND		GND	74

Lower connector XS1				
#	Signal		Signal	#
2	PE_RST#	BANK1 (+5V)	USB_OC#	1
4	+3.3V		+3.3V	3
6	USB_0p		USB_1p	5
8	USB_0n		USB_1n	7
10	GND		GND	9
12	PEx1_0Tp		PEx1_1Tp	11
14	PEx1_0Tn		PEx1_1Tn	13
16	GND		GND	15
18	PEx1_3Tp		PEx1_2Tp	17
20	PEx1_3Tn		PEx1_2Tn	19
22	GND		GND	21
24	PEx1_0Rp		PEx1_1Rp	23
26	PEx1_0Rn		PEx1_1Rn	25
28	GND		GND	27
30	PEx1_3Rp		PEx1_2Rp	29
32	PEx1_3Rn		PEx1_2Rn	31
34	GND		GND	33
36	PEx1_0Clkp		PEx1_1Clkp	35
38	PEx1_0Clkn		PEx1_1Clkn	37
40	+5V_SB		+5V_SB	39
42	PEx1_3Clkp		PEx1_2Clkp	41
44	PEx1_3Clkn		PEx1_2Clkn	43
46	PWRGOOD		DIR	45
48	PE_x4_CLKp		SMB_DAT	47
50	PE_x4_CLKn		SMB_CLK	49
52	PSON#		SMB_ALERT#	51
54	STK1/SATA_ACT#	BANK2 (+5V)	STK0/WAKE#	53
56	GND		Type_DETECT#	55
58	PEx4_0T(0)p		ETH_0_MDI(0)p	57
60	PEx4_0T(0)n		ETH_0_MDI(0)n	59
62	GND		GND	61
64	PEx4_0T(1)p		ETH_1_MDI(0)p	63
66	PEx4_0T(1)n		ETH_1_MDI(0)n	65
68	GND		GND	67
70	PEx4_0T(2)p		ETH_0_MDI(1)p	69
72	PEx4_0T(2)n		ETH_0_MDI(1)n	71
74	GND		GND	73

Upper connector XP3				
#	Signal		Signal	#
75	NC	BANK2 (+5V)	NC	76
77	NC		NC	78
79	NC		ETH_1_LINK_ACT	80
81	SATA_T1p		SATA_T0p	82
83	SATA_T1n		SATA_T0n	84
85	GND		GND	86
87	USB_3p		USB_2p	88
89	USB_3n		USB_2n	90
91	GND		GND	92
93	USB_5p		USB_4p	94
95	USB_5n		USB_4n	96
97	GND		GND	98
99	NC		ETH_1_CTREF	100
101	SPI_SS0#		SPI_MOSI	102
103	SPI_SS1#		SPI_MISO	104
105	STK2/SPI_SCK	BANK3 (+12V)	LPC_CLK	106
107	SPI_SS2#		GND	108
109	ETH_1_MDI(2)p		PEx4_0R(0)p	110
111	ETH_1_MDI(2)n		PEx4_0R(0)n	112
113	GND		GND	114
115	NC		PEx4_0R(1)p	116
117	NC		PEx4_0R(1)n	118
119	GND		GND	120
121	ETH_1_MDI(3)p		PEx4_0R(2)p	122
123	ETH_1_MDI(3)n		PEx4_0R(2)n	124
125	GND		GND	126
127	NC		PEx4_0R(3)p	128
129	NC		PEx4_0R(3)n	130
131	PE_PRSNT1#		PE_PRSNT0#	132
133	SATA_R1p		SATA_R0p	134
135	SATA_R1n		SATA_R0n	136
137	GND		GND	138
139	FBUS_1p		FBUS_0p	140
141	FBUS_1n		FBUS_0n	142
143	GND		GND	144
145	LPC_AD0		LPC_DRQ#	146
147	LPC_AD1		LPC_SERIRQ#	148
149	GND		GND	150
151	LPC_AD2		LPC_FRAME#	152
153	LPC_AD3		*RTC_Battery*	154
155	FBUS_1RTS#		FBUS_0RTS#	156

Lower connector XS1				
#	Signal		Signal	#
76	PEx4_0T(3)p	BANK2 (+5V)	ETH_1_MDI(1)p	75
78	PEx4_0T(3)n		ETH_1_MDI(1)n	77
80	ETH_0_LINK_ACT#		ETH_1_LINK_ACT#	79
82	SATA_T0p		SATA_T1p	81
84	SATA_T0n		SATA_T1n	83
86	GND		GND	85
88	USB_2p		USB_3p	87
90	USB_2n		USB_3n	89
92	GND		GND	91
94	USB_4p		USB_5p	93
96	USB_4n		USB_5n	95
98	GND		GND	97
100	ETH_0_CTREF		ETH_1_CTREF	99
102	SPI_MOSI		SPI_SS0#	101
104	SPI_MISO		SPI_SS1#	103
106	LPC_CLK	BANK3 (+12V)	STK2/SPI_SCK	105
108	GND		SPI_SS2#	107
110	PEx4_0R(0)p		ETH_0_MDI(2)p	109
112	PEx4_0R(0)n		ETH_0_MDI(2)n	111
114	GND		GND	113
116	PEx4_0R(1)p		ETH_1_MDI(2)p	115
118	PEx4_0R(1)n		ETH_1_MDI(2)n	117
120	GND		GND	119
122	PEx4_0R(2)p		ETH_0_MDI(3)p	121
124	PEx4_0R(2)n		ETH_0_MDI(3)n	123
126	GND		GND	125
128	PEx4_0R(3)p		ETH_1_MDI(3)p	127
130	PEx4_0R(3)n		ETH_1_MDI(3)n	129
132	PE_PRSNT0#		PE_PRSNT1#	131
134	SATA_R0p		SATA_R1p	133
136	SATA_R0n		SATA_R1n	135
138	GND		GND	137
140	FBUS_0p		FBUS_1p	139
142	FBUS_0n		FBUS_1n	141
144	GND		GND	143
146	LPC_DRQ#		LPC_AD0	145
148	LPC_SERIRQ#		LPC_AD1	147
150	GND		GND	149
152	LPC_FRAME#		LPC_AD2	151
154	*RTC_Battery*		LPC_AD3	153
156	FBUS_0RTS#		FBUS_1RTS#	155

3.2.2 Power supply connectors

The electrical supply of the module should comply with the requirements given in subsection 1.1. The WAGO connectors are used for connecting input and output power cables. The below tables show the pin assignment of the input and output power connectors.

In order to connect input power from 10 to 36 V via XP1, the Wago 734-103 power outlet (included in the set of mounting parts supplied with the module) is used. GNDF contact is the frame ground of the DC / DC converter.

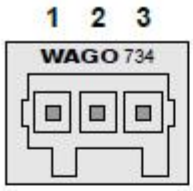


Fig. 3-3: XP1 power supply connector

Table 3-2: Purpose of XP1 power supply connector contacts

Contact number	Signal
1	GNDF
2	+ U_{BX}
3	- U_{BX}

Fig. 3-4: Photos of the module showing the location of the XP1 power supply connector

Attention!

An error in the polarity of the input power supply may damage the module. Be careful when connecting the module to the system.

The output power supply 48V is provided only via the XP2 connector. The maximum value of current consumption of external modules is 1.6 A.

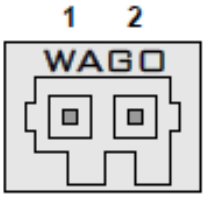


Fig. 3-5: XP2 power supply connector

Table 3-3: Purpose of XP2 power supply connector contacts

Contact number	Signal
1	+ 48B
2	GNDA

In order to connect power supply via XP1, a Wago 734-102 power outlet (included in the installation kit) is used.

4 Installation

When putting PS352 module into operation, it is necessary to strictly follow the rules, warnings and procedures listed below in order to properly install the module, to avoid damages to the product, system components, and personal injury.

4.1 Safety requirements

When handling the PS352, strictly follow the below safety requirements. Fastwel Group is not liable for any damages resulting from non-compliance with these requirements.

Caution!

When handling the operated module, be careful, since the transmitter enclosure can become very hot.

In addition, the module should not be placed on any surface or placed in any container until the module will be cooled down to the ambient temperature.

Attention!

Turn off the system before installing / removing the module. Violation of this rule can pose a threat to your health and life, and also lead to damages to the system or module.

Electrostatic-Sensitive Device (ESD)!

The module contains elements sensitive to electrostatic charges. To avoid damages to the module, the following precautions should be observed:

- Before touching the module, remove the static charge from the clothing, also remove the charge from the tools before using them.
- Do not touch the electronic components and connector contacts.
- If you’re working at your professional workplace equipped antistatic protection, do not neglect the opportunity to use such a protection.

4.2 Installation of PS352-01

The version PS352-01 is installed into StackPC-PCI connectors (see subsection 3.2.1). In which case the PS352-01 module should be securely fastened in the stack.

An example of PS352-01 assembly with the NIM354 module is shown in the user manual for NIM354.

Using a separate cable (the user has the opportunity to make it himself using Wago outlet from the delivery checklist), the power is supplied from the XP2 connector of the PS352-01 module to the power connector of the NIM354 module.

With increased mechanical loads, the module should be fixed using metal racks. The racks are attached to the mounting holes of the module.

4.3 Installation of PS352-02

Module PS352-02 (it has no StackPC-PCI connectors) is designed for use in systems where installation to the stack is not provided.

Installation of the module is carried out using fasteners, for this purpose the board is equipped with mounting holes.

5 Operational information

5.1 Power consumption of PS352

It is necessary to take into account certain requirements that are essential in order to ensure stability and reliability. The below tables show the maximum permissible voltages and currents on the power line, exceeding these values may lead to module damages. The power source with which the PS352 will be used, should be checked for the compliance with these requirements.

Table 5-1: Permissible power supply voltages of PS352

Range of power supply voltages	Range of power supply voltages
+24 V	From +10 V to +36 V

Consumption current of PS352 (exclusive of the power supply of external circuits) under maximum load does not exceed the values, specified in the table:

Table 5-2: Consumption current of PS352

Module type	Consumption current exclusive of the power supply of external circuits, in A, no more than		Consumption current inclusive of the power supply of external circuits, in A, no more than	
PS352	**+10 V**	**+36 V**	**+10 V**	**+36 V**
	1.6	0.4	11	2.6

5.2 Maximum starting current

Input consumption current at module's start does not exceed the values of 12 A under maximum load and no more than 1.6 A without load.

5.3 Compliance with safety requirements

PS352 complies with the general safety requirements imposed on IT equipment in accordance with the GOST R IEC 60950-2002.

5.4 Interference immunity of PS352

PS352 complies with the requirements to the immunity of IT equipment to electromagnetic interference in accordance with the GOST R standard 51318.22-99 (CISPR 22-97).

5.5 Operating conditions

The device remains operational under the following climatic and mechanical effects:

Table. 5-3: Parameters of climatic and mechanical effects

Type of the effect	Parameter name	Parameter value	Reference document
Change of temperatures (at a relative humidity of up to 80 %, no condensation)	Low temperature	- 40°C	GOST Standard 28209-89 (IEC 68-2-14-84)
	High temperature	+ 85°C	
Sinusoidal vibration	Range of frequencies (Hz)	10...500	GOST Standard 28203-89 (IEC 68-2-6-82)
	Acceleration, g	5	
Single shocks	Peak acceleration, g	100	GOST Standard 28213-89 (IEC 68-2-27-87)
Multiple shocks	Peak acceleration, g	50	GOST Standard 28215-89 (IEC 68-2-29-87)
	Number of shocks	1000	

The dependence of the maximum permissible output power per unit per PS352 module without a heat-spreader with a different cooling flow on the operating temperature conditions is shown in the graph:

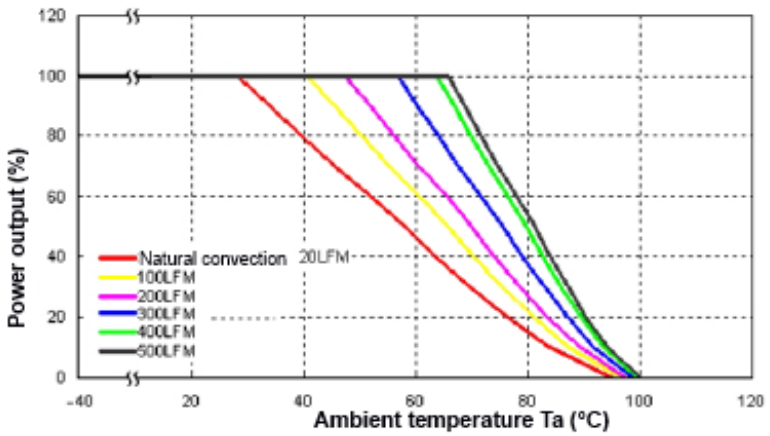


Fig. 5-1: dependence of the maximum load output power on the ambient temperature

Note

When connecting devices with high consumption, special attention should be paid to the relationship between the maximum total load and the external temperature, as well as to the removal of heat from the module.

5.6 Characteristics of protection against short circuit, overload and overvoltage at the output

The PS352 module has built-in protection methods against short-circuit, overload and overvoltage at the output.

In the event of a short circuit at the output, the module is safely disconnected, in which case in this state the module is safe. After eliminating the short circuit, the module automatically restores its normal operation.

The output current overload is possible within 110-140% of the nominal voltage value. If the current consumption (load level) is exceeded the values specified above, the module's safety shutdown is carried out. If the reasons for the overload are eliminated, the module automatically restores its normal operation.

Overvoltage protection contains a voltage monitoring circuit at the module output. If the output voltage exceeds 115-130% of the rated voltage, the module's safety shutdown is carried out.

APPENDIX B DISCLAIMER

This Disclaimer contains special operating conditions of Fastwel in the following areas: intellectual property, warranty policy, conditions of the order and delivery.

1 INTELLECTUAL PRORETY

1.1 If any infraction, interference, improper use, illegitimate exploitation and/or violation of the industrial and/or intellectual property rights of any third party and/or property, exploitation during the use of Fastwel Embedded Module will take place – Fastwel does not guarantee to replace the materials, computer programs, procedures or equipment affected by the complaint and under no circumstances doesn't bear responsibility in any form for possible refusal in case of such a replacement.

1.2 Use of the Fastwel products as well as the objects of intellectual property containing in them, in the ways and for the purposes, not provided by the present user manual and datasheet isn't allowed without preliminary written approval of Fastwel.

1.3 Fastwel is not responsible for possible incidents and losses, related to the operation of end devices, in which the original Fastwel equipment is used.

2 WARRANTY POLICY

2.1 When the detected flaws in an element can be corrected without decreasing the foreseen technical features and functionality for it, User may demand Fastwel the urgent correction of the failures in additionally agreed period and an increasing of the period of the guarantee of the element equal as the time elapsed from the formal request to repair the failures, until the receipt of the repaired element. All costs associated to the correction of failures, included those of assembly, dismantle, transport, tests, etc, if they exist, shall be prosecuted according the Warranty Policy of Fastwel.

3 ORDER AND DELIVERY CONDITIONS

3.1 The general rule is that all Fastwel equipment prices are determined with due consideration of delivery under the EXW terms and conditions (Incoterms 2010). Delivery of the products under other terms and conditions should be preliminary agreed and stated in writing between the parties.

3.2 Unless otherwise expressly agreed with Fastwel, all the deliveries of Fastwel equipment will be carried out only after the official purchase order is obtained and provided that the ordered products have been prepaid in full. Other terms and conditions of cooperation should be made in writing.

3.3 Any delivery of Fastwel electronics is submitted with the right package in accordance with the current rules and standards in the Member States of the European Economic Area. The purchaser independently bears all risks regarding the compliance of package and marking of Fastwel products with legislation requirements being in effect at the place of purchased products destination (in the buyer's country). The specified condition excludes unequivocally any liability of Fastwel for possible non-compliance of package and marking of products with the requirements of legislation of the country of products destination.

3.4 In general, all components of the supply are properly protected with respect to freight, in order to avoid any damage to the supply, third parties, environmental damages or unrelated goods, as consequence of wrong packaging.

3.5 Each package unit is labeled on the exterior area with the indications of product's Part Number and Serial Number.

3.6 The support documents for the order should be made either in English or in Russian unless otherwise agreed between parties in writing.

3.7 Fastwel does not pay penalties and does not cover costs associated with delay in the delivery of the products caused by actions of the third parties, force-majeure etc. - Fastwel doesn't bear any responsibility for non-execution or inadequate execution of the obligations in a case when it is caused by actions of the third parties (for example producers or suppliers of accessories), force majeure etc.

3.8 Fastwel declares that independently and at any time without damage, it has an exclusive right to define and change functionality architecture, bill of materials of its products without any preliminary coordination and approvals of the third parties.

4 OTHER CONDITIONS

4.1 Fastwel has the obligation to respect the current Russian legislation (including, but not limited to environmental, labor, social laws) in each moment and to apply it to its embedded electronics considering all and each execution phase, that is to say, from the design until the commissioning and subsequent maintenance. In this regard Fastwel is not liable to the user or other persons in connection with possible changes of the company's rules (including, but not limited to warranty, ordering policy) caused by changes of the Russian legislation.

4.2 Unless otherwise expressly agreed in writing, Fastwel provides no training for assembly\installation\adjustment\operation of its equipment.