SIGMATEK

HZS 536-1

100 kW Expansion Module

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Translation from German

Expansion Modules HZS 536-1

1 System Description

1.1 Configuration

- 4x relay outputs/230 V AC/3 A/3 pins each } **common fuse F1 (10 A)**
- 2x phase angle controls/230 V AC/1.1/3 pins each } **common fuse F2 (2.5 A)**
- 1x thermo element input (NiCr-Ni/0-1200 °C/2.0 °C/±5.0 °C/2-pin)
- 1x thermo resistor input (KTY 10-62/-25 … +100 °C/0.4 Ω/±1.0 Ω) (thermal couple compensation)
- 3x digital inputs (+24 V/5 ms/5 mA/3-pin)
- 230 V AC supply (in and output 2x 3-pin)
- CAN bus connection (2x 4-pin) with +24 V supply

The HZS 5361-1 100 kW expansion module is connected to the CPU (HZS 511) by the 4-pin Phoenix connector plug, over which the +24 V supply for the internal expansion modules and the CAN bus communication with the CPU is provided!

Contents

2 Technical Data

2.1 Controller Performance Data

Controller	AT90CAN32
Command execution time	circa 0.7 µs
Interfaces	1x CAN
Internal program memory	32 kbytes (Flash)
Internal data and/or program buffering (internal EEPROM)	1 kbyte (Flash) no battery buffering required

2.2 Power Supply

Power supply for the relay and internal electronics	230 V AC
Fuse	10 A relay outputs 2.5 A for phase angle control outputs
Internal electronics power supply	+24 V (from the HZS 511)
+24 V current consumption	maximum100 mA (without relays) maximum 140 mA (with relays)

2.3 Digital Outputs Specifications DO02-04: Relay outputs - 230 V AC/10 A

Number	3
Relay type	normally open
Relays	RT314024 WG
Switching range	16.8-30 V DC
Switching current	typically 11 mA at + 24 V
Switching time	circa 10 ms
Switching power	see data sheet: Tyco Shack RT1 series
Fuse	T 10 A
Connection technology	3x 3-pin, RM 5.08
Application	DO02: X4 DO03: X5 DO04: X6

2.4 Technical Data Relay RT314024 WG

TE connectivity RELAY PRODUCTS

General Purpose Relays
PCB Relays

SCHRACK

Power PCB Relay RT1

- 1 pole 12A/16A, 1 form C (CO) or 1 form A (NO) contact
- DC or AC coil
- 5kV/10mm coil-contact, reinforced insulation
- Ambient temperature 85°C (DC coil)
- WG version: product in accordance to IEC 60335-1
- Reflow version: for THR (Through-Hole Reflow) soldering process

Typical applications
Boiler control, timers, garage door control, POS automation, interface modules

Approvals
VDE Cert. No. 40007571, cULus E214025, cCSAus 1142018.
CQC in preparation
Technical data of approved types on request

Contact Data	12A	16A
Contact arrangement	1 form C (CO) or 1 form A (NO)	
Rated voltage	250VAC	
Max. switching voltage	400VAC	
Rated current	12A	16A
Limiting continuous current	12A	16A, UL: 20A
Limiting making current max. 4s, duty factor 10%	25A	30A
Breaking capacity max.	3000VA	4000VA
Contact material	AgNi 90/10, AgNi 90/10 gold plated	
Frequency of operation, with/without load		
DC coil	360/72000h^{-1}	
AC coil	360/36000h^{-1}	
Operate/release time max., DC coil	8/6ms	
Bounce time max., DC coil, form A/form B	4/6ms	
Electrical endurance	see electrical endurance graph [1]	

Contact ratings

Type	Contact	Load	Cycles
IEC 61810			
RT314 DC-coil	A (NO)	16A, 250VAC, cosφ=1, 85°C	30x10^3
RT314 DC-coil	C (CO)	16A, 250VAC, cosφ=1, 85°C	10x10^3
RT314 DC-coil	A (NO)	10A, 400VAC, cosφ=1, 85°C	150x10^3
RT114 DC-coil	A (NO)	12A, 250VAC, cosφ=1, 85°C	50x10^3
RT114 AC-coil	A (NO)	12A, 250VAC, cosφ=1, 70°C	100x10^3
UL 508			
RT314	A/B (NO/NC)	20A, 250VAC, general purpose, 85°C	6x10^3
RT334	A (NO)	16A, 250VAC, gen. purpose, 85°C	50x10^3
RT314	A (NO)	1hp, 240VAC, 40°C	1x10^3
RT314	A (NO)	FLA/LRA, 4.5/13.1A, 480VAC, 70°C	100x10^3
EN60947-5-1			
RT314 DC-coil	A/B (NO/NC)	2A, 24VDC, DC13	6.050
EN60730-1			
RT314 DC-coil	A (NO)	12(2)A, 250VAC, 85°C	100x10^3

1) For reflow solderable versions: actual contact performance may be influenced by the reflow soldering process.

Contact Data (continued)

Mechanical endurance	
DC coil	>30x10^6 operations
AC coil	>10x10^6 operations
AC coil, reflow version	>5x10^6 operations

Coil Data

Coil voltage range, DC coil/ AC coil	5 to 110VDC / 24 to 230VAC
Operative range, IEC 61810	2
Coil insulation system according UL	class F

Coil versions, DC coil

Coil code	Rated voltage VDC	Operate voltage VDC	Release voltage VDC	Coil resistance Ω±10% [2]	Rated coil power mW
005	5	3.5	0.5	62	403
006	6	4.2	0.6	90	400
009	9	6.3	0.9	200	400
012	12	8.4	1.2	360	400
020	20	14.0	2.0	952	420
024	24	16.8	2.4	1440	400
048	48	33.6	4.8	5520	417
060	60	42.0	6.0	8570 [3]	420
110	110	77.0	11.0	28800 [3]	420

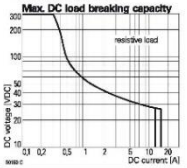
2) Coil resistance ±12%.
All figures are given for coil without pre-energization, at ambient temperature +23°C.
Other coil voltages on request.

Coil versions, AC coil 50/60 Hz

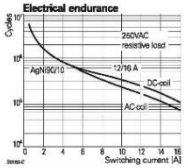
Coil code	Rated voltage VAC	Operate voltage VAC	Release voltage VAC	Coil resistance Ω±15% [3]	Rated coil power VA
524	24	18.0	3.6	350 [3]	0.76
615	115	86.3	17.3	8100	0.78
620	120	90.0	18.0	8800	0.75
700	200	150.0	30.0	24350	0.76
730	230	172.5	34.5	32500	0.74

3) Coil resistance ±10%.
All figures are given for coil without pre-energization, at ambient temperature +23°C, 50 Hz.
Other coil voltages on request.

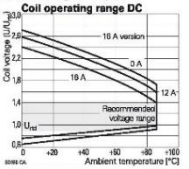
Max. DC load breaking capacity



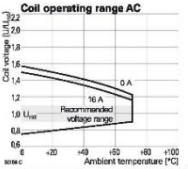
Electrical endurance



Coil operating range DC



Coil operating range AC



2.5 Digital Output Specifications DO01: Relay Output - 230 V AC/10 A

Number	1
Relay type	normally open
Relays	RT31L024 WG
Switching range	16.8-30 V DC
Switching current	typically 11 mA at + 24 V
Switching time	circa 10 ms
Switching power	see data sheet: Tyco Schrack RT1 series
Max. Output current	10 A output
Max. Inrush current	80 A or 20 ms 30 A for 4 s
Fuse	T 10 A
Connection technology	1x 3-pin, RM 5.08
Application	DO01: Vacuum turbine X3

2.6 Technical Data Relay RT31L024 WG

TE connectivity RELAY PRODUCTS

General Purpose Relays
PCB Relays

SCHRACK

Power PCB Relay RT1 Inrush

- 1 pole 16A, 1 form C (CO) or 1 form A (NO) contact
- For inrush peak currents up to 80A
- Mono- or bistable coil
- 5kV/10mm coil-contact
- Reinforced insulation
- Ambient temperature 85°C
- WG version: product in accordance to IEC 60335-1

Typical applications
Domestic appliances, heating control, lighting control

Approvals

VDE Cert. No. 40007571, UL E214025, cCSAus 1142018
Technical data of approved types on request

Contact Data

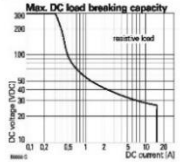
Contact arrangement	1 form C (CO) or 1 form A (NO)
Rated voltage	250VAC
Max. switching voltage	400VAC
Rated current	16A
Limiting continuous current	16A, UL: 20A (K-version)
Limiting making current, max. 4s, df 10%	30A
max. 20ms (incandescent lamps), RT33L version	80A
Breaking capacity max.	4000VA
Contact material	AgNi90/10, AgSnO
Frequency of operation, with/without load	360/72000h[1]
Operate/release time max., DC coil	9/6ms
Operate/Reset time max., bistable version	10/10ms
Bounce time max., form A/form B	3/6ms

Contact ratings

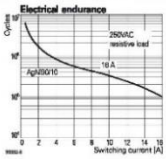
Type	Contact	Load	Cycles
IEC 61810			
RT33L	A (NO)	16A, 250VAC resistive, 85°C	$50x10^3$
RT33L	A (NO)	10A, 400VAC resistive, 85°C	$10x10^3$
RT31	C (CO)	16A, 250VAC resistive, 85°C	$6x10^3$
RT33K	A (NO)	16A, 250VAC resistive, 85°C	$30x10^3$
UL 508			
RT33K	A (NO)	20A, 277VAC general purpose, 40°C	$10x10^3$
RT33L	A (NO)	16A, 250VAC resistive, 85°C	$50x10^3$
RT31	C (CO)	16A, 250VAC resistive, 85°C	$6x10^3$
RT33L	A (NO)	1000W Tungsten, 120VAC, 60 Hz, 40°C	$6x10^3$
RT33L	A (NO)	1000W standard ballast, 120VAC, 60 Hz, 40°C	$6x10^3$

Mechanical endurance
monostable version >30x106 operations
bistable version >5x106 operations

Max. DC load breaking capacity



Electrical endurance



Coil Data, DC coil

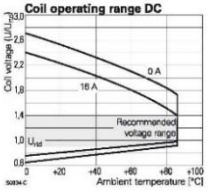
Coil voltage range	5 to 110VDC
Operative range, IEC 61810	2
Coil insulation system according UL	class F

Coil versions, DC coil

Coil code	Rated voltage VDC	Operate voltage VDC	Release voltage VDC	Coil resistance Ω±10%[1]	Rated coil power mW
005	5	3.5	0.5	62	403
006	6	4.2	0.6	90	400
012	12	8.4	1.2	360	400
024	24	16.8	2.4	1440	400
048	48	33.6	4.8	5520	417
060	60	42.0	6.0	8570[1]	420

1) Coil resistance ±12%.
All figures are given for coil without pre-energization, at ambient temperature +23°C.
Other coil voltages on request.

Coil operating range DC



Coil Data, bistable coils

	1 coil	2 coils
Magnetic system	polarized, bistable	
Coil voltage range	5 to 24VDC	
Operative range, IEC 61810	2	
Limiting voltage, % of rated coil voltage	120%	150%
Min./Max. energization duration	30ms/1min at <10% duty factor	
Coil insulation system according UL	class F	

2.7 Phase Angle Controller Specifications

Number of Triac outputs	2
Operation mode	phase angle control angle of ignition 0-155° value setting 0-255 (0-100 %) phase shift through load > -27° to < 72°
Solid state relay	Sharp S202 S11
Switching range	3-30 V
Switching current	typically 3 mA at +5 V
Switching time	<= 0.1 ms
Switching power	230 V/3.2 A at 0 °C ambient temperature 230 V/2.5 A at 30 °C ambient temperature 230 V/1.2 A at 80 °C ambient temperature details can be found in the S202 data sheet
Zero-point switching	no
Protective circuit	yes (Varistor on output)
Fuse	T 2.5 A
Connection technology	2x 3-pin, RM 5.08
Application	PO01: Phase angle control output X7 PO02: Phase angle control output X8

2.8 Technical Data S202S11 Relay

S102S11 Series
S202S11 Series

*Zero cross type is also available. (S102S12 Series/ S202S12 Series)

I_T(rms) ≤8A, Built-in snubber circuit
Non-Zero Cross type
SIP 4pin
Triac output SSR

■ Description

S102S11 Series and S202S11 Series Solid State Relays (SSR) are an integration of an infrared emitting diode (IRED), a Phototriac Detector and a main output Triac. These devices are ideally suited for controlling high voltage AC loads with solid state reliability while providing 4.0kV isolation (V_{iso}(rms)) from input to output.

■ Features

1. Output current, I_T(rms) ≤8.0A
2. Non-zero crossing functionary
3. 4 pin SIP package
4. High repetitive peak off-state voltage
   (V_{DRM} : 600V, S202S11 Series)
   (V_{DRM} : 400V, S102S11 Series)
5. Built-in snubber circuit
6. High isolation voltage between input and output (V_{iso}(rms) : 4.0kV)
7. Lead-free terminal components are also available (see Model Line-up section in this datasheet)
8. Screw hole for heat sink

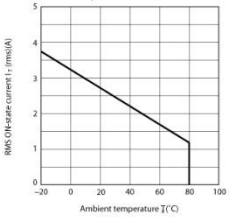
■ Agency approvals/Compliance

1. Recognized by UL508, file No. E94758 (as models No. S102S11/S202S11)
2. Approved by CSA 22.2 No.14, file No. LR63705 (as models No. S102S11/S202S11)
3. Package resin : UL flammability grade (94V-0)

■ Applications

1. Isolated interface between high voltage AC devices and lower voltage DC control circuitry.
2. Switching motors, fans, heaters, solenoids, and valves.
3. Phase or power control in applications such as lighting and temperature control equipment.

Fig.2 RMS ON-state Current vs. Ambient Temperature



■ Electro-optical Characteristics

(T_a=25°C)

Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	I_F=20mA	–	1.2	1.4	V
	Reverse current		I_R	V_R=3V	–	–	100	μA
Output	ON-state voltage		V_T(rms)	I_T(rms)=2A, Resistance load, I_F=20mA	–	–	1.5	V
	Minimum Operating current	S102S11	I_{OP}(rms)	V_{OUT}(rms)=120V	–	–	50	mA
		S202S11		V_{OUT}(rms)=240V	–	–	50	
	Open circuit leak current	S102S11	I_{leak}(rms)	V_{OUT}(rms)=120V	–	–	5	mA
		S202S11		V_{OUT}(rms)=240V	–	–	10	
	Critical rate of rise of OFF-state voltage		dV/dt	V_D=2/3•V_{DRM}	30	–	–	V/μs
	Critical rate of rise of OFF-state voltage at commutaion		(dV/dt)c	T_j=125°C, V_D=2/3•V_{DRM}, dI_T/dt=-4.0A/ms	5	–	–	V/μs
Transfer characteristics	Minimum trigger current		I_{FT}	V_D=12V, R_L=30Ω	–	–	8	mA
	Isolation resistance		R_{ISO}	DC500V, 40 to 60%RH	10^{10}	–	–	Ω
	Turn-on time	S102S11	t_{on}	V_D(rms)=100V, AC60Hz, I_T(rms)=2A, Resistance load, I_F=20mA	–	–	1	ms
		S202S11		V_D(rms)=200V, AC60Hz, I_T(rms)=2A, Resistance load, I_F=20mA	–	–	1	
	Turn-off time	S102S11	t_{off}	V_D(rms)=100V, AC60Hz, I_T(rms)=2A, Resistance load, I_F=20mA	–	–	9.3	ms
		S202S11		V_D(rms)=200V, AC60Hz, I_T(rms)=2A, Resistance load, I_F=20mA	–	–	9.3	
Thermal resistance			R_{th}(j-c)	Between junction and case	–	4.0	–	°C/W
			R_{th}(j-a)	Between junction and ambient	–	40	–	

2.9 NiCr-Ni Type K Analog Input Specifications

Number of channels	1
Sensor Type	NiCr-Ni Type K
Measurement range	0-1200 °C
Sensor range	0-48.8 mV
Resolution	2.0 °C
Measurement precision	±5.0 °C
Input resistance	20 KΩ
Input filter	30 ms
Connection technology	2-pin Phoenix plug RM 3.5 mm

2.10 KTY10-62 Analog Input Specifications (-25 … +100 °C)

Number of channels	1
Sensor Type	KTY10-62 (ohmic temperature sensor)
Measurement range	-25 … +100 °C
Sensor range	1308,9-3399,9 Ω
Resolution	0.4 °C
Measurement precision	±1.0 °C
typical current measurement	0.9 mA
Input resistance	8.2 kΩ
Input filter	100 ms
Connection technology	2-pin Phoenix plug RM 3.5 mm (optional)
Application	clamping point compensation the KTY sensor is located on the control

2.11 Digital Input Specifications

Input voltage	typically +24 V	maximum +30 V
Signal level	low: <+8 V	high: >+14 V
Switching threshold	typically +11 V	
Input current	5 mA at +24 V	
Input delay	typically 5 ms	
Number	3	
Connection technology	3-pin Phoenix plug RM 3.5 mm	

2.12 Terminal Requirements

Connection technology	**Connector terminals are not included in delivery!** The following spring terminal connectors are required: 8x 3-pin FKC 2.5/ 3-ST-5.08 Phoenix Contact spring terminal connector RM 5.08 2x 2-pin FK-MCP 1.5/ 2-ST-3.5 Phoenix Contact spring terminal connector RM 3.5 3x 3-pin FK-MCP 1.5/ 3-ST-3.5 Phoenix Contact spring terminal connector RM 3.5 2x 4-pin FK-MCP 1.5/ 4-ST-3.5 Phoenix Contact spring terminal connector RM 3.5

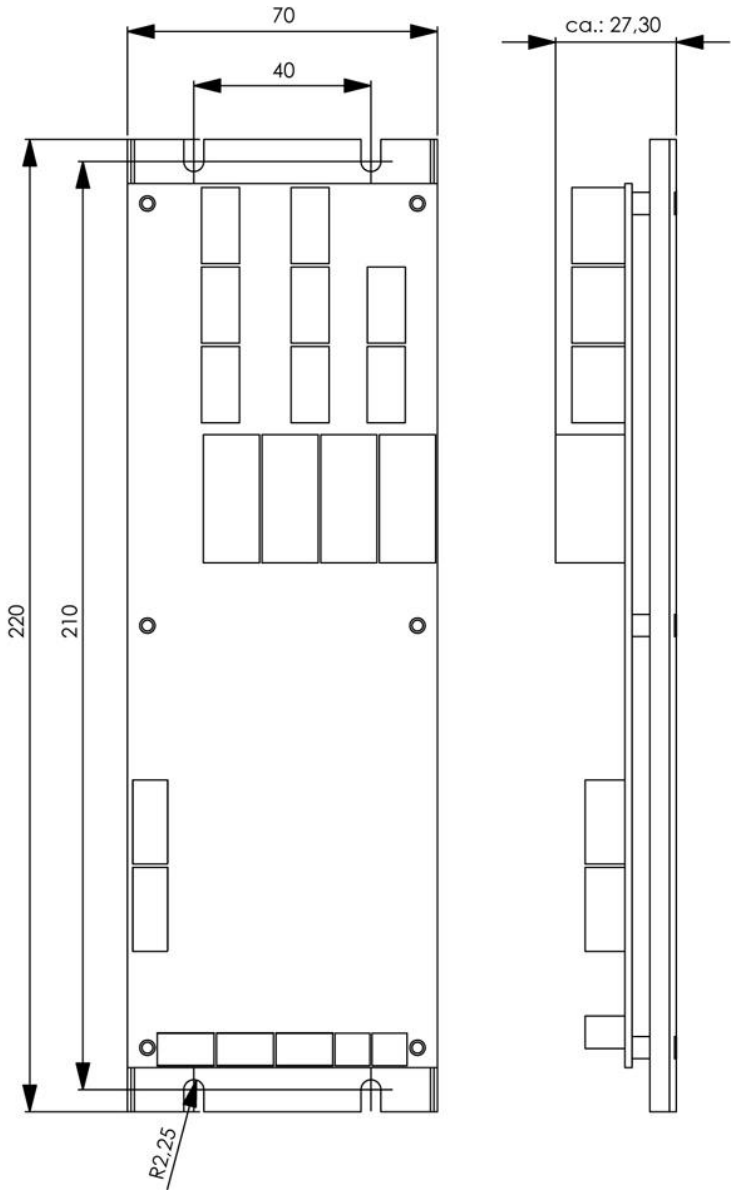
2.13 Miscellaneous

Article number	05-895-536-1
HW Version	1.x

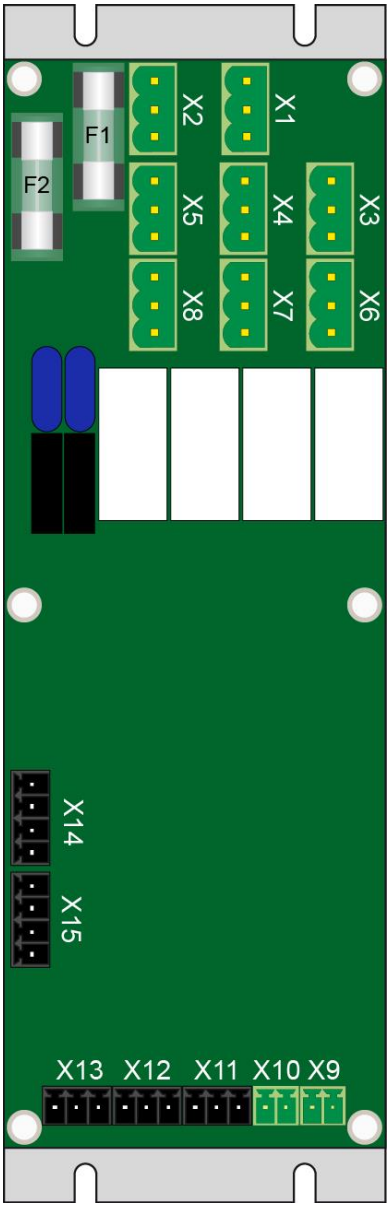
2.14 Environmental Conditions

Storage temperature	-20 ... +70 °C	
Operating temperature	0 ... +60 °C	
Humidity	0-95 %, non-condensing	
EMC stability	according to EN 61000-6-2:2001	
Shock resistance	EN 60068-2-27	150 m/s²

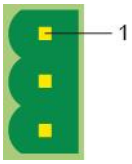
3 Mechanical Dimensions



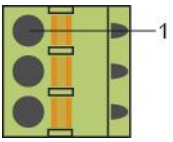
4 Connector Layout



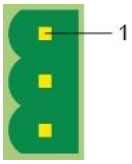
X1: 230 V AC Supply Line (3-pin Phoenix RM 5.08 spring terminal connector)



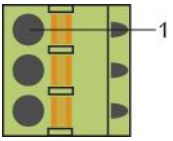
Pin	Signal	Function
1	L	Phase
2	N	Neutral
3	PE	Ground wire



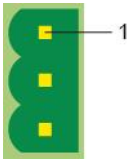
X2: 230 V AC Power Dissipation (3-pin Phoenix RM 5.08 spring terminal connector)



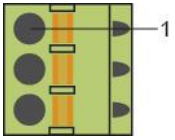
Pin	Signal	Function
1	L	Phase
2	N	Neutral
3	PE	Ground wire



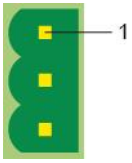
X3: 230 V AC Relay Output DO01 (3-pin Phoenix RM 5.08 spring terminal connector)



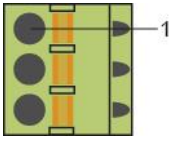
Pin	Signal	Function
1	L	Relay output
2	N	Neutral
3	PE	Ground wire



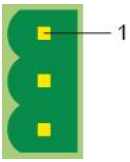
X4: 230 V AC Relay Output DO02 (3-pin Phoenix RM 5.08 spring terminal connector)



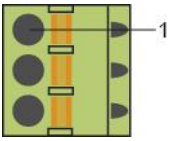
Pin	Signal	Function
1	L	Relay output
2	N	Neutral
3	PE	Ground wire



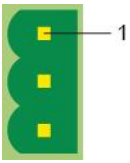
X5: 230 V AC Relay Output DO03 (3-pin Phoenix RM 5.08 spring terminal connector)



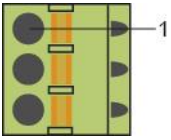
Pin	Signal	Function
1	L	Relay output
2	N	Neutral
3	PE	ground wire



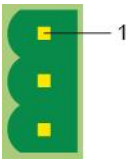
X6: 230 V AC Relay Output DO04 (3-pin Phoenix RM 5.08 spring terminal connector)



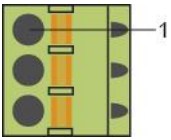
Pin	Signal	Function
1	L	Relay output
2	N	Neutral
3	PE	ground wire



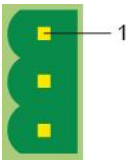
X7: 230 V AC Phase Angle Control Output PO01 (3-pin Phoenix RM 5.08 spring terminal connector)



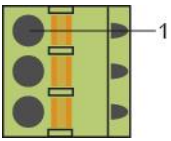
Pin	Signal	Function
1	L	Phase angle control output
2	N	Neutral
3	PE	Ground wire



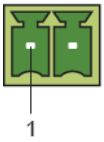
X8 230 V AC Phase Angle Control Output PO02 (3-pin Phoenix RM 5.08 spring terminal connector)



Pin	Signal	Function
1	L	Phase angle control output
2	N	Neutral
3	PE	Ground wire

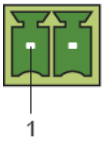


X9: Temperature Input (2-pin Phoenix RM 3.5 (AI1) spring terminal connector)

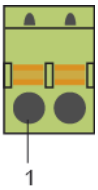


Pin	Signal	Function
1	AI1	Analog input AI1 NiCr-Ni Type J (0-1200 °C)
2	AGND	AGND

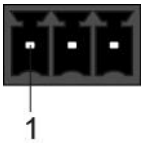
X10: Thermal Coupling Temperature Input (2-pin Phoenix RM 3.5 (AI2) spring terminal connector) (connector optional)



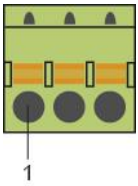
Pin	Signal	Function
1	AI2	Analog input AI2 KTY10-62 (-25 ... +100 °C)
2	AGND	AGND



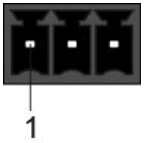
X11: Digital Input (3-pin Phoenix RM 3.5 (DI1) spring terminal connector)



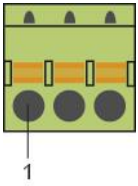
Pin	Signal	Function
1	+24 V	+24 V
2	DI	Digital Input
3	GND	GND connection



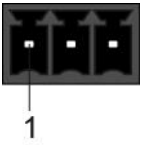
X12: Digital Input (3-pin Phoenix RM 3.5 (DI2) spring terminal connector)



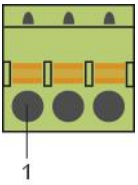
Pin	Signal	Function
1	+24 V	+24 V
2	DI	Digital Input
3	GND	GND connection



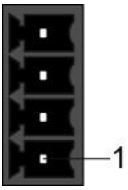
X13: Digital Input (3-pin Phoenix RM 3.5 (DI3) spring terminal connector)



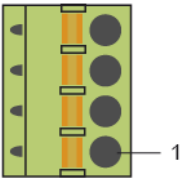
Pin	Signal	Function
1	+24 V	+24 V
2	DI	Digital Input
3	GND	GND connection



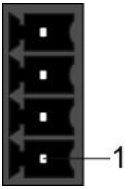
X14: CAN and Power Input (4-pin Phoenix RM 3.5 spring terminal connector)



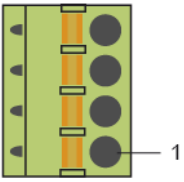
Pin	Signal	Function
1	+24 V	+24 V input
2	CAN A	CAN Low
3	CAN B	CAN High
4	GND	Ground



X15: CAN and Power Output (4-pin Phoenix RM 3.5 spring terminal connector)



Pin	Signal	Function
1	+24 V	(+24 V output)
2	CAN A	CAN Low
3	CAN B	CAN High
4	GND	Ground



4.1 Status LED

LED Status	Meaning
LED on	Controller runs, CAN bus communication to the CPU active.
LED blinks (1 Hz)	Controller runs, CAN bus communication to the CPU not active.
LED off	Controller does not run, no supply.

5 Wiring Guidelines

The signals recorded by the analog inputs are very small in comparison to the digital signals. To ensure error-free operation, a careful wiring method must be followed:

- The lines connected to the source of the analog signals must be as short as possible and parallel wiring to digital signal lines must be avoided.
- The signal lines must be shielded.
- 230 V AC lines (power circuit and relay outputs etc.) must not be wired parallel to analog and digital input lines.

5.1 Wiring Guidelines for Digital Inputs

The input filters used, which suppress noise signals, allow operation in harsh environmental conditions. A careful wiring method is also recommended to ensure error-free function.

The following guidelines should be observed:

- Avoid parallel connections between input lines and load bearing or AC circuits.
- Correct wiring to mass

5.2 General Information on the Relay Outputs

All relay coils are powered by the internal +24 V DC supply. The cross sectional area of the relay outputs is designed for the maximum continuous current at 230 V AC for each connected load as stated in the relay output specifications. It is important to note that at high currents, thermal loads affect the wiring and with continuous over loading, can lead to a break down! High voltages can cause current leakage or arcing between different potentials!

To ensure error-free operation, a careful wiring method must be followed.

- Avoid parallel wiring between input lines and load-bearing circuits.

6 CAN Bus Communication

A detailed description of the CAN bus communication can be found in the respective class description.

7 AT90CAN32 Port Assignment

PORT	I/O	Signal	Description of functions
PA0	I/O	N.C.	Not connected
PA1	I/O	N.C.	Not connected
PA2	I/O	N.C.	Not connected
PA3	I/O	N.C.	Not connected
PA4	I/O	N.C.	Not connected
PA5	I/O	N.C.	Not connected
PA6	I/O	N.C.	Not connected
PA7	I/O	N.C.	Not connected
PB0	Output	/START_RAMPE	Ramp start signal
PB1	Output	SCK	Clock signal for controller programming
PB2	Output	SEL_AI1	Select signal for AI1
PB3	Output	SEL_AI2	Select signal for AI2
PB4	I/O	N.C.	Not connected
PB5	I/O	N.C.	Not connected
PB6	I/O	N.C.	Not connected
PB7	Output	LED	LED control
PC0	Input	DI1	Digital input 1
PC1	input	DI2	Digital input 2
PC2	input	DI3	Digital input 3
PC3	I/O	N.C.	Not connected
PC4	I/O	N.C.	Not connected
PC5	I/O	N.C.	Not connected
PC6	I/O	N.C.	Not connected
PC7	I/O	N.C.	Not connected
PD0	Input	Start	Comparator start signal
PD1	input	AI	Comparator signal AI
PD2	input	STOP	Comparator stop signal
PD3	input	ZERCR	Zero crossing detection
PD4	I/O	N.C.	Not connected
PD5	Output	\CANTX	CAN send data
PD6	input	\CANRX	CAN receive data
PD7	I/O	N.C.	Not connected
PE0	input	PDI	serial data for the controller programming
PE1	Output	PDO	serial data for the controller programming
PE2	Output	TRIG-WD	Watch dog trigger
PE3	Output	N.C.	Not connected
PE4	Output	N.C.	Not connected
PE5	Output	/RESPER	Periphery setting input
PE6	Output	N.C.	Not connected
PE7	Output	N.C.	not connected

PF0	Input	AI01	Analog input 1: Lambda sensor LSM11
PF1	input	AI02	Analog input 2: CO sensor SGAS220
PF2	input	AI03	Analog input 3: Air volume sensor
PF3	input	AI04	Analog input: MUX
			Analog input 4: KTY81-110, boiler temperature -25 … +100 °C
			Analog input 5:KTY81-110, return flow temperature -25 … +100 °C
			Analog input 6: KTY81-110, ambient temperature -25 … +100 °C
			Analog input 7: PT1000 exhaust temperature -50 … +200 °C
			Analog input 8: not connected
			Analog input 9: not connected
			Analog input 10: not connected
			Analog input 11: KTY10-62, thermal couple temperature -25 … +100 °C
PF4	input	AI05	Analog input: MUX
			Analog input 12: not connected
			Analog input 13: not connected
			Analog input 14 - Air volume sensor
			Analog input 15: not connected
			Analog input 16: not connected
			Analog input 17: not connected
			Analog input 18: not connected
			Analog input 19: not connected
PF5	input	AI06	Analog input 20: not connected
PF6	input	AI07	Analog input 21: 0 - 10 V external regulator
PF7	Input	AI08	Analog input 22: not connected
PG0	Output	\WR	write signal
PG1	Output	\RD	read signal
PG2	I/O	N.C.	not connected
PG3	I/O	N.C.	Not connected
PG4	I/O	N.C.	Not connected

8 Flash Calibration Data

For the hardware, the offset, multiplier and divisor calibration values are determined at the manufacturer. These values are stored in a Flash in the AT90CAN32 controller.

Flash in the Controller

Address	Data	Description
		Organization of data in bytes
00	$xx	checksum from CDIAS header (addresses 1 to 5) = 5 bytes
01	123	identification
02	230	module group 230 = Biomass heating control
03	36	Variant: HZS536 100 kW internal expansion module
04	2	Number of channels HZS536 100 kW internal expansion module
05	$10	hardware version $XY ($10=HW 1.0, $32=HW 3.2)

Address	Data	Description
		organization of data in Words
$40	$xxxx	header checksum (2 words) + length of reference data (70 words) = 72 words
$42	12345	identification
$44	19	length of the reference data in Words
$46	36	Variant 36 HZS536 100 kW internal expansion module
$48	10054	Vref [mV] for converting AI to absolute voltage not supported since measurement is only possible from 0.6-3.3 V! E.g. for 0 to 48 mV, offset and gain from the amplifier are also required!
$4A	0	Vref [d] = Ramp Stop value at the time of calibration for the reference voltage compensation (drift of C) at 0 to 48 mV and 0 to 10 V, etc. not supported, since by the standardization of AI to Ramping value = Stop at 10000, a reference voltage correction already occurs.
$4C	637	Ramp start voltage [mV] /Vref [mV] * 10000 = the ratio Start/Vref for the resistance measurement
$4E	3293	Ramp stop voltage [mV] /Vref [mV] * 10000 = the ratio Start/Vref for the resistance measurement
$50	0	reserved
$52	0	reserved
$54	0	reserved
$56	0	reserved

$58	0	reserved
$5A	0	reserved
$5C	0	reserved
$5E	0	reserved
$60	-487	AI1 Offset NiCr-Nr Type K 0-1200 °C 0.0-48.828 mV
$62	10000	AI1 Multiplier
$64	8820	AI1 divisor
$66	8200	AI2 series resistance R79 [Ω] - KTY10-62 - -25 °C … +100 °C
$68	-4	AI2 offset
$6A	1	AI2 divisor

Calculating the analog input values for AI (0 to +1200 °C)

Example: NiCr-Ni measurement range -1200 °C to + °C

Offset -487 d
Gain Multiplier 10000 d (resolution fixed)
Gain Divisor -8820 d

Standardized VALUE = (read analog input values + Offset)*Gain multiplier /Gain divisor

Example: (Display)
Value for 0 °C:[487 + (-487)] x 10000 / 8820 = 0000 (*)
Value for +1200 °C: [9307 + (-487)] x 10000 / 8820 = 1000 (*)

(*) For these values, the correctly linearized temperatures must be assigned from the temperature table!
0 (0 °C/ 10000 (+1200 °C

Documentation Changes

Change date	Affected page(s)	Chapter	Note
27.01.2020	19	4.1 Status LED	Chapter added
24.04.2020	19	4.1 Status LED	Change in Status LED: LED on = CPU active/ LED blinks (1 Hz) = CPU not active