PHLEEN®

1200 Series Signal Board

User Manual (V1.0)



Shenzhen Phleen Electronic Technology Co., Ltd.
http://www.szphling.com

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Manual revision history

Revision date	Version	Remarks
August 2023	V1.0	Initial release of the 1200 Signal Board User Manual

Symbols

Symbol	Description
	Caution: Conditions that prevent normal device operation.
	Tip: Additional information to assist device use.

1. Overview

1200 series signal boards are plug-and-play and require no additional libraries. Add just 2 program networks to map the board resources to internal registers for direct CPU read/write access. Operation is almost identical to the original signal boards, with full compatibility. More I/O points and board types are available, with lower cost and stable performance.

2. Product features

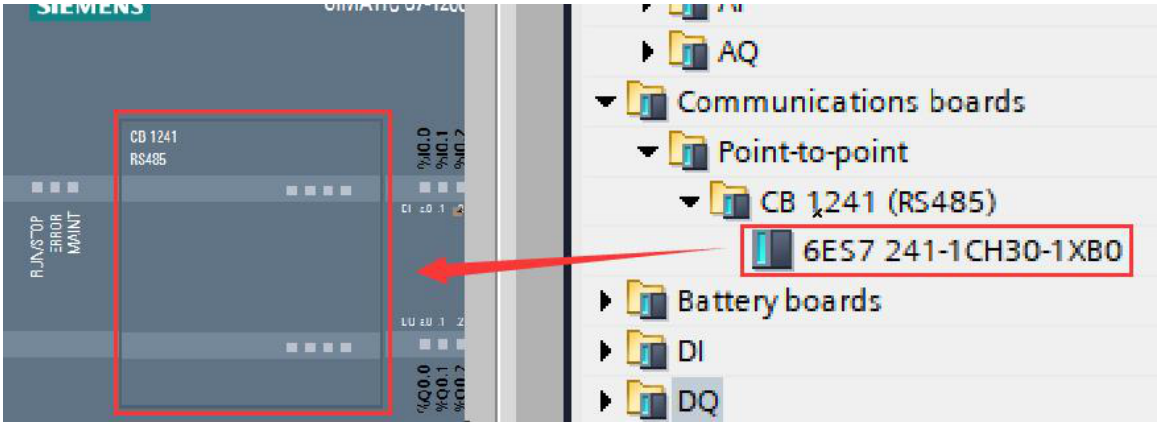
- Supports baud rates of 9.6k, 19.2k, and 187.5k for faster communication.
- Built-in error and fault detection, with status flags and LED indications for convenient commissioning and maintenance.
- Adjustable analog input filtering accommodates different applications.
- Configurable sensor types support a wider range of applications.
- Analog inputs accept positive and negative voltage or current signals over a wider input range.
- ESD-protected interfaces suit demanding industrial environments.
- Uses components from TI, NXP, Renesas, Samsung, TDK, Murata, and other established manufacturers for reliable operation.

3. Installing and removing the signal board

⚠ Caution: The 1200 CPU does not support hot swapping. Never install or remove a signal board while power is on.

4. Signal board configuration and programming

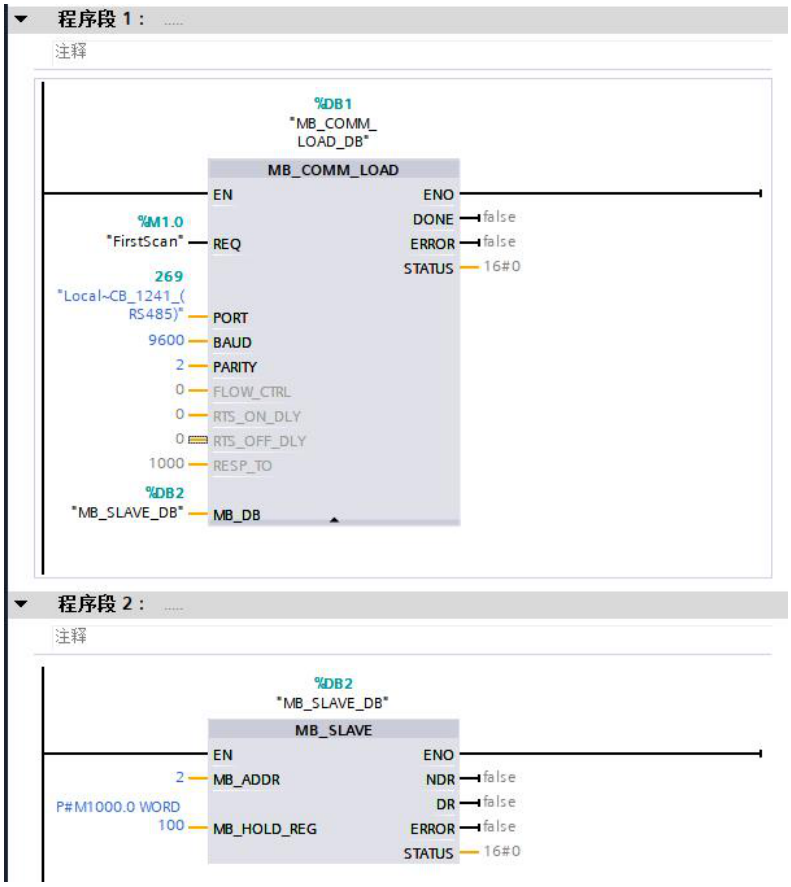
4.1. Phleen 1200 communication boards (CB 1241 RS485) and digital signal boards (SB 1221, 1222, 1223) operate in the same way as the original boards; the following instructions do not apply to them. 4.2. Configure Phleen 1200 analog signal boards in the software as CB 1241 (RS485) communication boards, as shown below:



Configure the 1200 CPU as a Modbus RTU slave. Add 2 program networks using the Modbus library, as shown below:



The communication program is shown below:



After configuration, read and write the analog I/O registers directly in the program. The SB 1234 2AI/2AQ example is shown below:



Notes:

1. After the above 2 program networks execute, signal board resources are automatically mapped into the 1200 CPU. See the next section for addresses.

2. Access the mapped registers directly to use the board resources. For example, with an SB 1241 2AI/2AQ board, analog input values are stored in QW1000 and QW1002. A value of 27648 represents an input of 10V or 20mA. Writing 27648 to QW1010 produces 10V or 20mA at analog output channel 0. Writing 13824 to QW1012

produces 5V or 10mA at analog output channel 1. 3. The analog signal board communicates with the 1200 CPU via Modbus RTU. The board is the master and the 1200 CPU is the slave; therefore, 2 Modbus RTU program networks are required. Set the baud rate to 9600, 19200, or 187500. The slave address must be 2. Board resources use Modbus area 0, which is mapped by default to the 1200 CPU Q area. The final register addresses therefore start at QW1000. The holding-register DB pointer MB_HOLD_REG in the Modbus RTU slave instruction specifies the start of area 4 and is unrelated to the board resource mapping, so its value can be chosen freely. 4. All analog signal boards have a DIGA LED. It changes from flashing to steady on when communication with the CPU is normal. 5. Download signal board example programs from the Phleen website (http://www.szphling.com) for testing.

5. Smart signal board selection

Communication signal boards	Description	Operation	Order number
CB 1241 RS485	1 RS485 port with ESD protection Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Same as the original board	241-1CH30-1XB0

Communication signal boards	Description	Operation	Order number
CB 1241 ISO RS485	1 isolated RS485 port with ESD protection Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Same as the original board	241-1CH30-i485
CB 1241 RS232	1 RS232 port with ESD protection Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Same as the original board	241-1CH30-R232

Digital signal boards	Description	Operation	Order number
SB 1221 4DI	4 digital inputs, 24VDC, supports bidirectional inputs Configure: Signal boards > DI > DI 4x24VDC > 6ES7 221-3BD30-0XB0	Same as the original board	221-3BD30-0XB0
SB 1222 4DO	4 sourcing digital outputs; switches 24V+ on or off Configure: Signal boards > DQ > DQ 4x24VDC > 6ES7 222-1BD30-0XB0	Same as the original board	222-1BD30-0XB0
SB 1223 2DI/2DO	2 digital 24VDC inputs (sinking inputs only; active when 24V+ is applied) and 2 digital 24VDC outputs, 0.5A (sourcing outputs; switches 24V+ on or off) Configure: Signal boards > DI/DQ > DI 2/DQ 2x24VDC > 6ES7 223-0BD30-0XB0	Same as the original board	223-0BD30-0XB0

Analog signal boards	Description	Operation	Order number
SB 1231 1AI	1 analog input (voltage or current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	231-5HA30-0XB0
SB 1231 2AI	2 analog inputs (voltage or current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	231-5HB30-0XB0
SB 1231 5AI	5 analog inputs (voltage or current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	231-5HE30-0XB0
SB 1232 1AQ	1 analog output (voltage or current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	232-5HA30-0XB0
SB 1232 2AQ	2 analog outputs (voltage or current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	232-5HB30-0XB0
SB 1232 4AQ	4 analog outputs (voltage or current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	232-5HD30-0XB0
SB 1234 2AI/1AQ	2 analog inputs (voltage or current), 1 output (voltage and current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	234-5HC30-0XB0
SB 1234 2AI/2AQ	2 analog inputs (voltage or current), 2 outputs (voltage and current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	234-5HD30-0XB0
SB 1234 4AI/1AQ	4 analog inputs (voltage or current), 1 output (voltage and current) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	234-5HE30-0XB0
Temperature signal boards	**Description**	**Configuration**	**24V supply**
SB 1231 2RTD	2 RTD inputs (3-wire or 2-wire sensors) Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	231-5PB30-0XB0
SB 1231 3TC	3 thermocouple (TC) inputs Configure: Communications boards > Point-to-point > CB 1241 (RS485) > 6ES7 241-1CH30-1XB0	Requires 2 program networks	231-5QC30-0XB0

6. Register mapping

Analog channel addresses	Description	Example
QW1000	Input channel 0 measured value	Example: For the SB 1234 2AI/2AQ signal board, analog input values are stored in QW1000 and QW1002. A value of 27648 represents an input of 10V or 20mA. Writing 27648 to QW1010 produces 10V at analog output channel 0 or 20mA. Writing 13824 to QW1012 produces 5V or 10mA at analog output channel 1. Example: For the SB 1231 2RTD signal board, temperature values are stored in QW1000 and QW1002. A value of 123 represents a temperature of 12.3 degrees; the measured value is scaled by 10.
QW1002	Input channel 1 measured value	
QW1004	Input channel 2 measured value	
QW1006	Input channel 3 measured value	
QW1008	Input channel 4 measured value	
QW1010	Output channel 0 measured value	
QW1012	Output channel 1 setpoint	
QW1014	Output channel 2 setpoint	
QW1016	Output channel 3 setpoint	
Q990.1	Special register: The module heartbeat toggles between 0 and 1 every second to indicate communication status.	
QB991-QB995	Special register: Alarm and diagnostic error flags for channels 0 to 5, accessible by the program.	
QB980-QB985	Special register: Module configuration register. Use the default configuration unless special settings are required.	

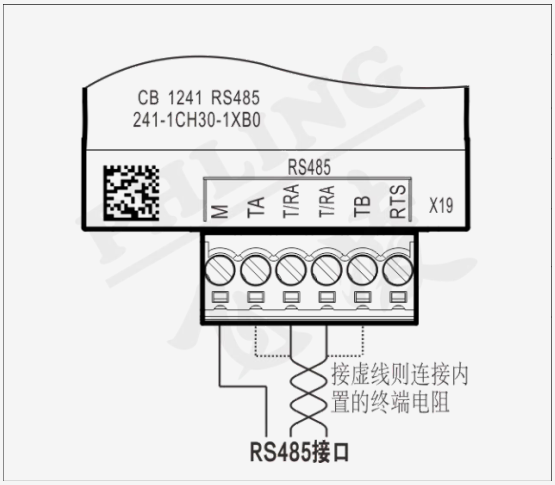
Tip: The mapping start address is printed on the back of the circuit board for quick reference.

7. LED indicators

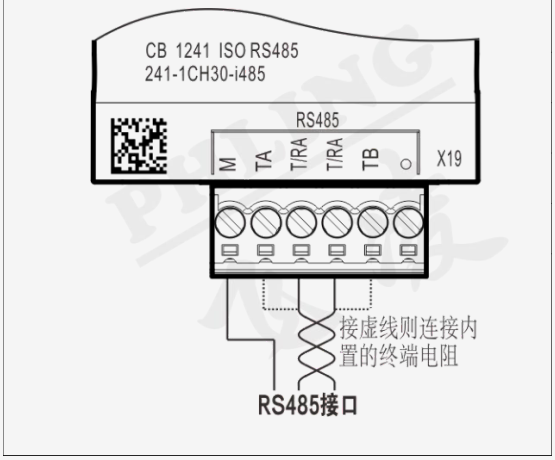
Parameter	Specification
DIAG LED status	Description
Steady green	Normal operation.
Flashing green	Signal board-to-PLC communication fault. Check the hardware configuration.
Flashing red	Input/output signal out of range, or sensor open circuit.
Off	Signal board not seated correctly or faulty. Contact after-sales support.

8. Wiring diagrams and DIP switches

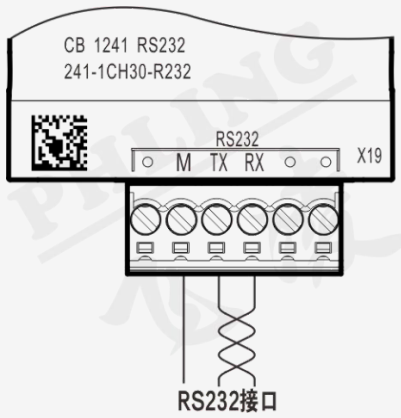
8.1 CB 1241 RS485

CB 1241 RS485 wiring diagram	Terminal definitions
	M: Shield ground; connect the shield of the shielded twisted-pair cable. TA: Connection for termination and bias resistors. T/RA: Siemens A, or RS485 B. T/RB: Siemens B, or RS485 A. TB: Connection for termination and bias resistors. RTS: Request to send. Note 1: Siemens and RS485 use opposite A/B designations. Swap wires A and B when connecting third-party instruments. Note 2: Connecting TRA to TA and TRB to TB connects the internal bias resistors (390 ohms) and termination resistor (150 ohms) to the circuit. Usually no jumper is needed. For long communication cables or excessive interference, try these connections to resolve communication issues.

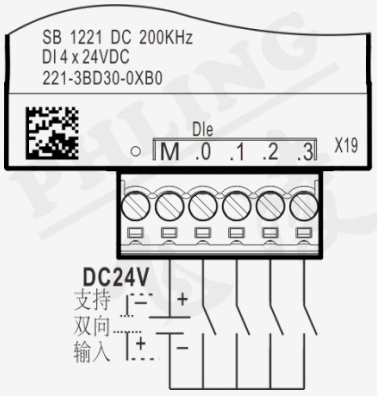
8.2 CB 1241 ISO RS485

CB 1241 ISO RS485 wiring diagram	Terminal definitions
	M: Shield ground; connect the shield of the shielded twisted-pair cable. TA: Connection for termination and bias resistors. T/RA: Siemens A, or RS485 B. T/RB: Siemens B, or RS485 A. TB: Connection for termination and bias resistors. O: Not connected Note 1: Siemens and RS485 use opposite A/B designations. Swap wires A and B when connecting third-party instruments. Note 2: Connecting TRA to TA and TRB to TB connects the internal bias resistors (390 ohms) and termination resistor (150 ohms) to the circuit. Usually no jumper is needed. For long communication cables or excessive interference, try these connections to resolve communication issues.

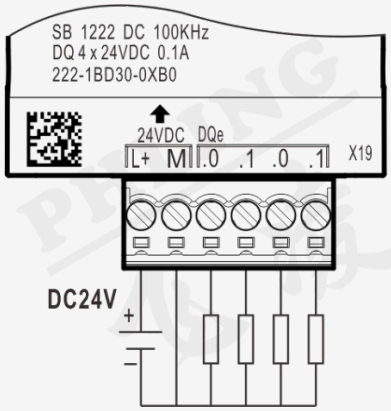
8.3 CB 1241 RS232

CB 1241 RS232 wiring diagram	Terminal definitions
	M: Signal ground; logic common.
	TX : RS232-Tx
	RX: RS232- Rx
	O: Not connected
	Note: Communication LED provided. Configure as SB CM01. Configure as: 6ES7 241-1CH30-1XB0

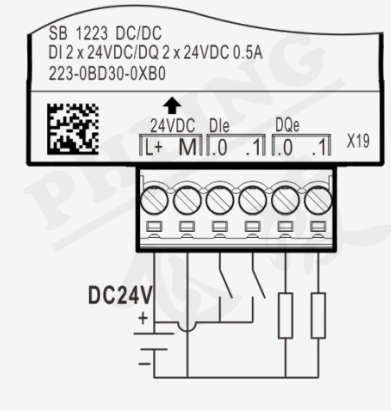
8.4 SB 1221 4DI

SB 1221 4DI wiring diagram	Terminal definitions	
	DIe: Input channel	M: 24 V supply common; bidirectional input, positive or negative.
		.0: Channel 1
		.1: Channel 2
		.2: Channel 3
		.3: Channel 4
	Note: Each channel has an LED. Configure as: 6ES7 221-3BD30-0XB0	

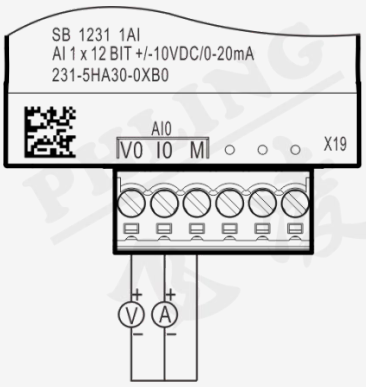
8.5 SB 1222 4DO

SB 1222 4DO Wiring diagram	Terminal definitions	
	DQe: Transistor output channel	.0: Channel 1
		.1: Channel 2
		.2: Channel 3
		.3: Channel 4
	L+	24V supply positive
	M	24V supply negative
	Notes: 1. Each channel has an LED. 2. Configure as: 6ES7 222-1BD30-0XB0 3. Digital transistor outputs are sourcing outputs (switch 24V+ on or off).	

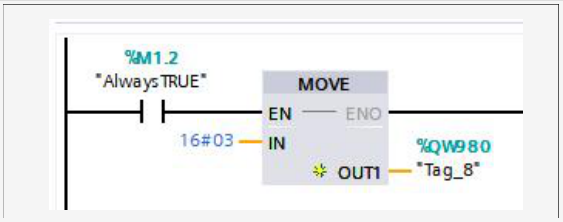
8.6 SB 1223 2DI/2DO

SB 1223 2DI/2DO wiring diagram	Terminal definitions	
	DQe: Transistor output channel	.0: Channel 1
		.1: Channel 2
	DIe: Input channel	.0: Channel 1
		.1: Channel 2
	L+	24V supply positive
	M	24V supply negative
	Notes: 1. Each channel has an LED. 2. Configure as: 6ES7 223-0BD30-0XB0. 3. Digital inputs support sinking input operation only (active when 24V+ is applied). 4. Digital transistor outputs are sourcing outputs (switch 24V+ on or off).	

8.7 SB 1231 1AI

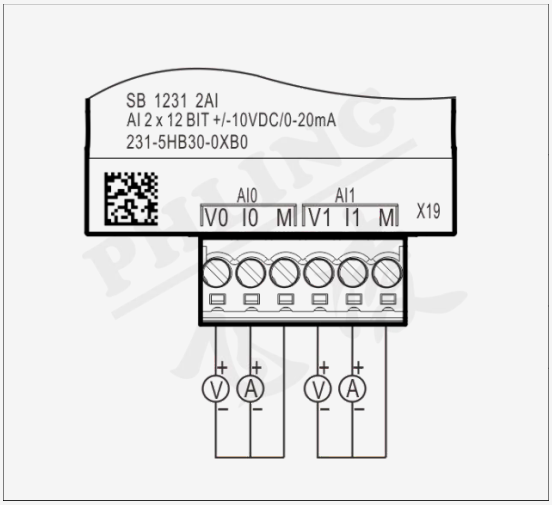
SB 1231 1AI wiring diagram	Terminal definitions	
	Channel 0	V0: Channel 1 voltage input
		I0: Channel 1 current input
		M: Channel 1 common
	Register mapping: QW1000	
	Note: Adjustable input filtering and built-in overrange detection with an LED. Supports voltage or current input, selected by wiring. Do not apply both voltage and current to the same channel. Configure as: 6ES7 241-1CH30-1XB0.	

Input filter depth setting															
QW980															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved				Reserved				Reserved				Channel 0			

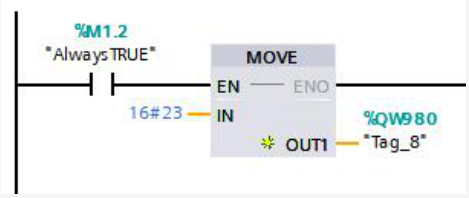
Code	Meaning	Example	Programming example
0	1 cycle	To set the channel 0 filter to 32 cycles, set the low 4 bits of QW980 to 3, as shown at right:	
1	4 cycles		
2	16 cycles		
3	32 cycles		
Note: If the application has no specific filtering requirements, this setting can be omitted.			

Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Input channel 0	QB991	Reserved				Overrange	Underrange	Reserved	
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

8.8 SB 1231 2AI

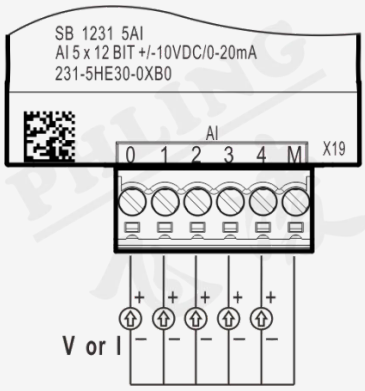
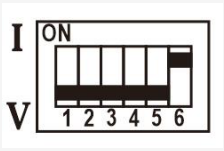
SB 1231 2AI wiring diagram	Terminal definitions	
	Channel 0	V0: Channel 1 voltage input
		I0: Channel 1 current input
		M: Channel 1 common
	Channel 1	V1: Channel 2 voltage input
		I1: Channel 2 current input
		M: Channel 2 common
	Register mapping: QW1000, QW1002	
	Note: Adjustable input filtering and built-in overrange detection with an LED. Supports voltage or current input, selected by wiring. Do not apply both voltage and current to the same channel. Configure as: 6ES7 241-1CH30-1XB0.	

Input filter depth setting															
QW980															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved				Reserved				Channel 1				Channel 0			

Code	Meaning	Example	Programming example
0	1 cycle	To set the channel 0 filter to 32 cycles and the channel 1 filter to 16 cycles, set QW620 to 16#23, as shown at right:	
1	4 cycles		
2	16 cycles		
3	32 cycles		
Note: If the application has no specific filtering requirements, this setting can be omitted.			

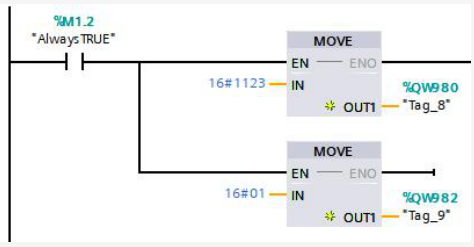
Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Input channel 0	QB991	Reserved				Overrange	Underrange	Reserved	
Input channel 1	QB992	Reserved				Overrange	Underrange	Reserved	
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

8.9 SB 1231 5AI

SB 1231 5AI wiring diagram	Terminal definitions	DIP switch settings
	0: Channel 0 1: Channel 1 2: Channel 2 3: Channel 3 4: Channel 4 M: Common	 Note: Adjustable input filtering and built-in overrange detection with LED indication. Select voltage or current input using the rear DIP switches. Each switch controls one channel: ON selects current; OFF selects voltage. Configure as: 6ES7 241-1CH30-1XB0.
	Register mapping: QW1000, QW1002, QW1004, QW1006, QW1008	

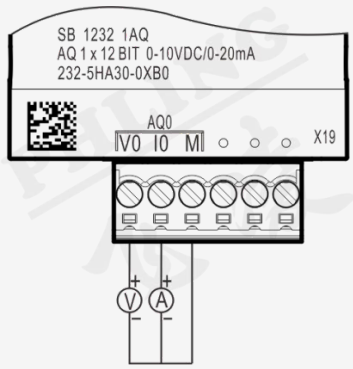
Input filter depth setting															
QW980															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Channel 3				Channel 2				Channel 1				Channel 0			

QW982															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved				Reserved				Reserved				Channel 4			

Code	Meaning	Example	Programming example
0	1 cycle	To set the channel 0 filter to 32 cycles, the channel 1 filter to 16 cycles, and all other channels to 4 cycles, set QW980 to 16#1123 and QW982 to 16#11, as shown at right:	
1	4 cycles		
2	16 cycles		
3	32 cycles		
Note: If the application has no specific filtering requirements, this setting can be omitted.			

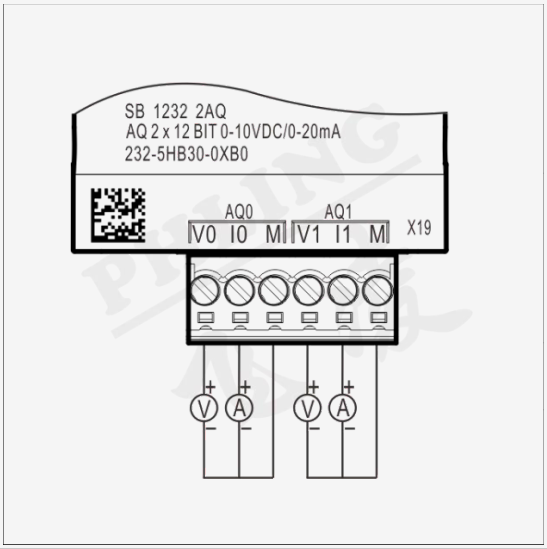
Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Input channel 0	QB991	Reserved				Overrange	Underrange	Reserved	
Input channel 1	QB992	Reserved				Overrange	Underrange	Reserved	
Input channel 2	QB993	Reserved				Overrange	Underrange	Reserved	
Input channel 3	QB994	Reserved				Overrange	Underrange	Reserved	
Input channel 4	QB995	Reserved				Overrange	Underrange	Reserved	
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

8.10 SB 1232 1AQ

SB 1232 1AQ wiring diagram	Terminal definitions	
	Channel 0	V0: Channel 1 analog voltage output
		I0: Channel 1 analog current output
		M: Analog output common
	Register mapping: QW1010	
	Note: Built-in overrange detection with LED indication and program-readable status flags. Supports simultaneous voltage and current outputs through separate terminals. Configure as: 6ES7 241-1CH30-1XB0.	

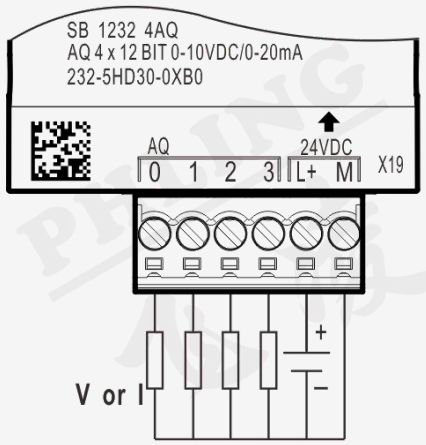
Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Output channel 0	QB995	Reserved				Overrange	Underrange	Reserved	
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

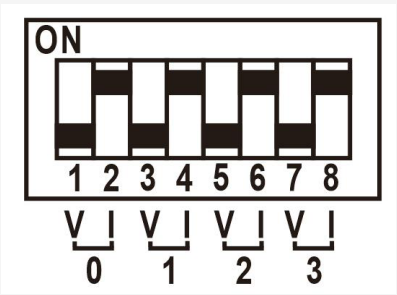
8.11 SB 1232 2AQ

SB 1232 2AQ wiring diagram	Terminal definitions	
	Channel 0	V0: Channel 1 analog voltage output
		I0: Channel 1 analog current output
		M: Analog output common
	Channel 1	V1: Channel 2 analog voltage output
		I1: Channel 2 analog current output
		M: Analog output common
	Register mapping: QW1010, QW1012	
	Note: Built-in overrange detection with LED indication and program-readable status flags. Supports simultaneous voltage and current outputs through separate terminals. Configure as: 6ES7 241-1CH30-1XB0.	

Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Output channel 0	QB991	Reserved				Overrange	Underrange	Reserved	
Output channel 1	QB992	Reserved				Overrange	Underrange	Reserved	
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

8.12 SB 1232 4AQ

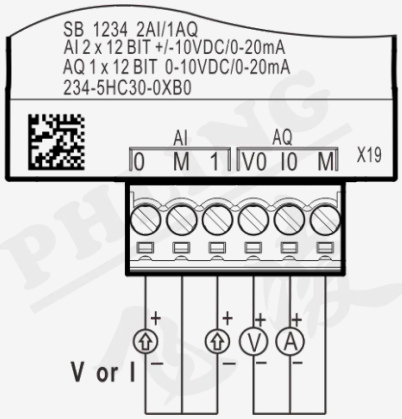
SB 1232 4AQ wiring diagram	Terminal definitions
	0: Analog output channel 0
	1: Analog output channel 1
	2: Analog output channel 2
	3: Analog output channel 3
	M: Analog output common
	L+: 24V supply positive
	M: 24V supply negative
	Register mapping: QW1010, QW1012, QW1014, QW1016.
	Note: Built-in overrange detection with LED indication and program-readable status flags. Supports voltage or current output, selected using the rear DIP switches. Configure as: 6ES7 241-1CH30-1XB0.

SB AQ04 DIP switches	Function	
	1: ON, 2: OFF - Channel 1 voltage output	Caution: Never set both 1 and 2 to ON.
	1: OFF, 2: ON - Channel 1 current output	
	3: ON, 4: OFF - Channel 2 voltage output	Caution: Never set both 3 and 4 to ON.
	3: OFF, 4: ON - Channel 2 current output	
	5: ON, 6: OFF - Channel 3 voltage output	Caution: Never set both 5 and 6 to ON.
	5: OFF, 6: ON - Channel 3 current output	
	7: ON, 8: OFF - Channel 4 voltage output	Caution: Never set both 7 and 8 to ON.
	7: OFF, 8: ON - Channel 4 current output	

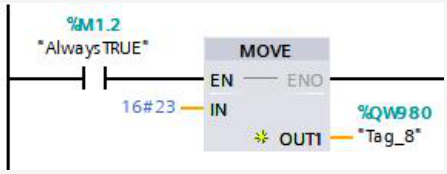
Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Output channel 0	QB991	Reserved				Overrange	Underrange	Reserved	
Output channel 1	QB992	Reserved				Overrange	Underrange	Reserved	
Output channel 2	QB993	Reserved				Overrange	Underrange	Reserved	

Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Output channel 3	QB994	Reserved				Overrange	Underrange	Reserved	
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

8.13 SB 1234 2AI/1AQ

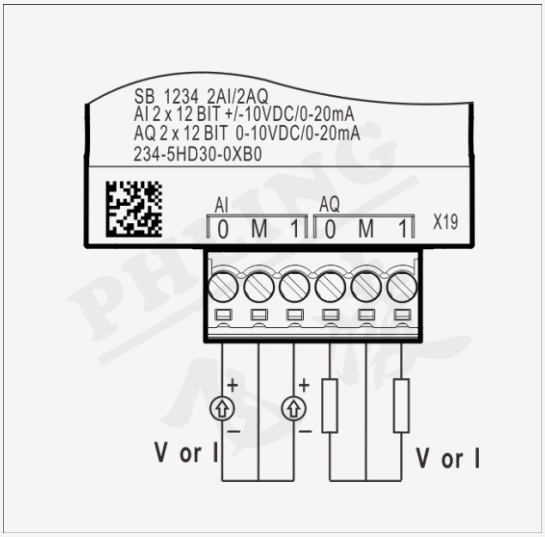
SB 1234 2AI/1AQ wiring diagram	Terminal definitions		DIP switch settings
	AI Analog input	0: Channel 0 1: Channel 1 M: Common	
	AQ Analog output	V0: Channel 0 voltage output I0: Channel 0 current output M: Common	
	Input register mapping: QW1000, QW1002 Output register mapping: QW1010		
	Note: Analog input filtering is adjustable. Select voltage or current with the rear DIP switches. Each switch controls one channel: ON selects current; OFF selects voltage. Analog outputs support simultaneous voltage and current through separate terminals. Both inputs and outputs provide overrange detection, LEDs, and program-readable status flags. Configure as: 6ES7 241-1CH30-1XB0.		

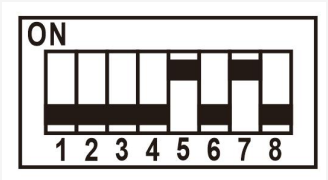
Input filter depth setting															
QW980															
Bit15	**Bit14**	**Bit13**	**Bit12**	**Bit11**	**Bit10**	**Bit9**	**Bit8**	**Bit7**	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Reserved				Reserved				Channel 1				Channel 0			

Code	Meaning	Example	Programming example
0	1 cycle	To set the channel 0 filter to 32 cycles and the channel 1 filter to 16 cycles, set QW620 to 16#23, as shown at right:	
1	4 cycles		
2	16 cycles		
3	32 cycles		
Note: If the application has no specific filtering requirements, this setting can be omitted.			

Alarm flags									
Channel	**Register**	**Register in binary**							
		Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Input channel 0	QB991	Reserved				Overrange	Underrange	Reserved	
Input channel 1	QB992	Reserved				Overrange	Underrange	Reserved	
Output channel 0	QB995	Reserved				Overrange	Underrange	Reserved	
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

8.14 SB 1234 2AI/2AQ

SB 1234 2AI/2AQ wiring diagram	Terminal definitions	
	AI Analog input	0: Channel 0
		1: Channel 1
		M: Common
	AQ Analog output	0: Channel 0
		1: Channel 1
		M: Common
	AI register mapping: QW1000, QW1002 AQ register mapping: QW1010, QW1012	
	Note: Analog input filtering is adjustable. Select voltage or current with the rear DIP switches. Each switch controls one channel: ON selects current; OFF selects voltage. Analog output voltage/current mode is selected using the rear DIP switches. Both inputs and outputs provide overrange detection, LEDs, and program-readable status flags. Configure as: 6ES7 241-1CH30-1XB0.	

DIP switch settings	Function	
	1: Channel 1 analog input; ON: Current, OFF: Voltage	
	2: Channel 2 analog input; ON: Current, OFF: Voltage	
	3: ON, 6: OFF - Channel 1 voltage output	Caution: Never set both 3 and 4 to ON.
	4: OFF, 6: ON - Channel 1 current output	
	5: ON, 8: OFF - Channel 2 voltage output	Caution: Never set both 5 and 6 to ON.
	6: OFF, 8: ON - Channel 2 current output	

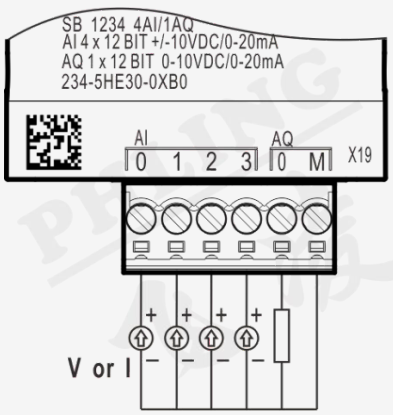
Input filter depth setting															
QW980															
Bit15	**Bit14**	**Bit13**	**Bit12**	**Bit11**	**Bit10**	**Bit9**	**Bit8**	**Bit7**	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Channel 3				Channel 2				Channel 1				Channel 0			

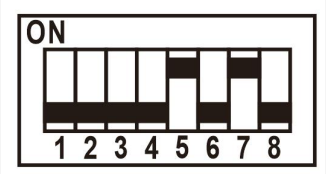
Code	Meaning	Example	Programming example
0	1 cycle	To set the channel 0 filter to 32 cycles and the channel 1 filter to 16 cycles and all other channels to 4 cycles, set QW980 to 16#1123, as shown at right:	
1	4 cycles		
2	16 cycles		
3	32 cycles		
Note: If the application has no specific filtering requirements, this setting can be omitted.			

Alarm flags									
Channel	**Register**	**Register in binary**							
		Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Input channel 0	QB991	Reserved				Overrange	Underrange	Reserved	
Input channel 1	QB992	Reserved				Overrange	Underrange	Reserved	

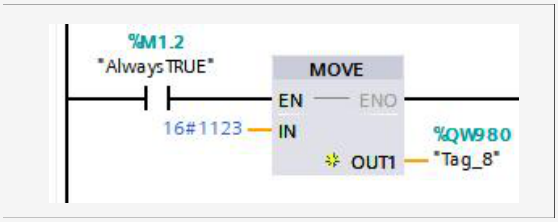
Alarm flags					
Channel	**Register**	**Register in binary**			
		Bit7 / Bit6 / Bit5 / Bit4	**Bit3**	**Bit2**	**Bit1 / Bit0**
Output channel 0	QB995	Reserved	Overrange	Underrange	Reserved
Output channel 1	QB996	Reserved	Overrange	Underrange	Reserved
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.					

8.15 SB 1234 4AI/1AQ

SB 1234 4AI/1AQ wiring diagram	Terminal definitions	
	AI Analog input	0: Channel 0
		1: Channel 1
		2: Channel 2
		3: Channel 3
	AQ Analog output	0: Channel 0
		M: Common
	AI register mapping: QW1000, QW1002, QW1004, QW1006 AQ register mapping: QW1010	
	Note: Analog input filtering is adjustable. Select voltage or current with the rear DIP switches. Each switch controls one channel: ON selects current; OFF selects voltage. Analog output voltage/current mode is selected using the rear DIP switches. Both inputs and outputs provide overrange detection, LEDs, and program-readable status flags. Configure as: 6ES7 241-1CH30-1XB0.	

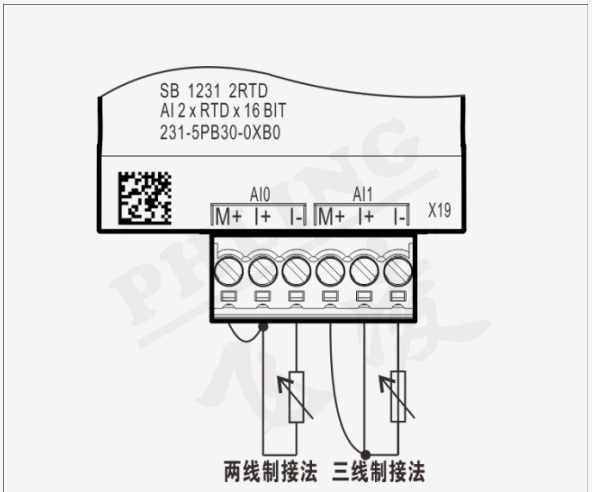
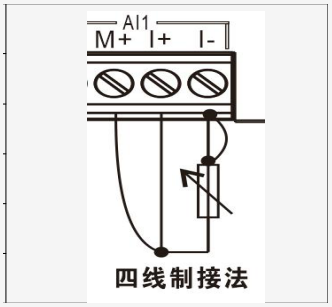
SB AM06 DIP switches	Function	
	1: Channel 1 analog input; ON: Current, OFF: Voltage	
	2: Channel 2 analog input; ON: Current, OFF: Voltage	
	3: Channel 3 analog input; ON: Current, OFF: Voltage	
	4: Channel 4 analog input; ON: Current, OFF: Voltage	
	5: ON, 6: OFF - Channel 1 voltage output	Caution: Never set both 5 and 6 to ON.
	5: OFF, 6: ON - Channel 1 current output	
	7: ON, 8: OFF - Channel 2 voltage output	Caution: Never set both 7 and 8 to ON.
	7: OFF, 8: ON - Channel 2 current output	

Input filter depth setting															
QW980															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Channel 3				Channel 2				Channel 1				Channel 0			

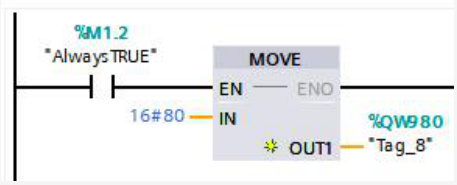
Code	Meaning	Example	Programming example
0	1 cycle	To set the channel 0 filter to 32 cycles and the channel 1 filter to 16 cycles and all other channels to 4 cycles, set QW980 to 16#1123, as shown at right:	
1	4 cycles		
2	16 cycles		
3	32 cycles		
Note: If the application has no specific filtering requirements, this setting can be omitted.			

Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Input channel 0	QB991	Reserved				Overrange	Underrange	Reserved	
Input channel 1	QB992	Reserved				Overrange	Underrange	Reserved	
Input channel 2	QB993	Reserved				Overrange	Underrange	Reserved	
Input channel 3	QB994	Reserved				Overrange	Underrange	Reserved	
Output channel 0	QB995	Reserved				Overrange	Underrange	Reserved	
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

8.16 SB 1231 2RTD

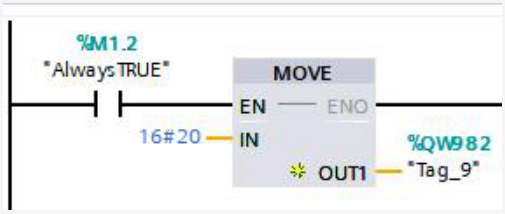
SB 1231 2RTD wiring diagram	Terminal definitions		4-wire connection
	Channel 0	M+: Lead resistance compensation I+: RTD terminal I-: RTD terminal	
	Channel 1	M+: Lead resistance compensation I+: RTD terminal I-: RTD terminal	
	Register mapping: QW1000, QW1002		
	Note: Supports 2-wire and 3-wire sensors. Sensor type, coefficient, temperature scale, and analog input filter depth can be set independently for each channel. Built-in fault detection provides LED indications and program-readable error flags. Configure as: 6ES7 241-1CH30-1XB0.		

Input type setting															
QW980															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved				Reserved				Channel 1				Channel 0			

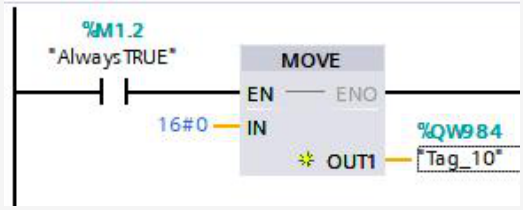
Code	Meaning	Example	Programming example
0	Channel disabled	If channel 0 is unused and channel 1 measures a 3-wire PT100 RTD, set QW980 to 16#80. No flashing alarm will occur when no sensor is connected to channel 0.	
5	3-wire resistance		
6	2-wire resistance		
8	3-wire RTD		
9	2-wire RTD		

Sensor type setting															
QW982															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

Reserved	Reserved	Channel 1	Channel 0

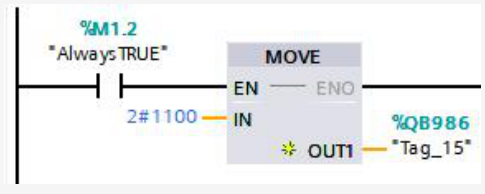
Code		Meaning	Example	Programming example
Resistance	0	48 ohms	Continuing the QW980 example, channel 0 is unused, so its sensor code can be set to 0. Channel 1 measures an RTD; select the PT100 code 2. Therefore, set QW982 to 16#20, as shown at right: For resistance measurement, select the range code according to the resistance to be measured.	
	1	150 ohms		
	2	300 ohms		
	3	600 ohms		
	4	3000 ohms		
RTD	0	PT 10		
	1	PT 50		
	2	PT 100		
	3	PT 200		
	4	PT 500		
	5	PT 1000		
	6	Ni 100		
	7	Ni 120		
	8	Ni 200		
	9	Ni 500		
	A	Ni 1000		
	B	Cu 10		
	C	Cu 50		
	D	Cu 100		
	E	LG-Ni 1000		

Sensor coefficient setting															
QW984															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved				Reserved				Channel 1				Channel 0			

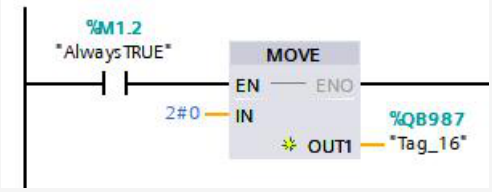
Code		Meaning	Example	Programming example
Platinum RTD (PT)	0	0.00385055	Continuing the QW622 example, channel 0 is disabled, so its coefficient code can be set freely. Channel 1 measures a PT100. If its temperature coefficient is 0.00385055, the corresponding code is 0. Therefore, set QW624 to 16#0, as shown at right:	
	1	0.003916		
	2	0.003902		
	3	0.003920		
	5	0.003910		
Nickel RTD (Ni)	6	0.006170		
	7	0.006720		
	8	0.006180		
	9	0.005000		
	A	Ni 1000		

Code		Meaning	Example	Programming example
Cu RTD	B	0.00426		
	C	0.00427		
	D	0.00428		

Filter depth setting							
Q986							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved		Reserved		Channel 1		Channel 0	

Code		Meaning	Example	Programming example
0	0	None (1 cycle)	Continuing the QW624 example, channel 0 is disabled, so its setting can be 00. Set the channel 1 filter to strong (32 cycles), using code 11. Therefore, set QB626 to 2#1100, as shown at right:	
0	1	Weak (4 cycles)		
1	0	Medium (16 cycles)		
1	1	Strong (32 cycles)		

Temperature unit setting							
QB987							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Reserved				Reserved	Reserved	Channel 1	Channel 0

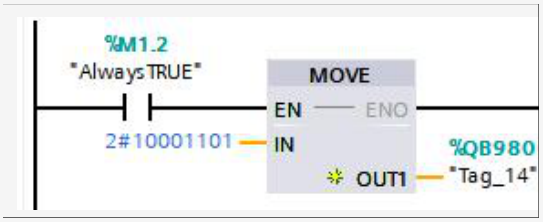
Code	Meaning	Example	Programming example
0	Celsius	Continuing the QB626 example, channel 0 is disabled, so its temperature unit code can be 0. If channel 1 uses Celsius, set its code to 0. Therefore, set QB987 to 2#00, as shown at right:	
1	Fahrenheit		
Note: When configuration registers QW980-QW987 are all 0, the default applies: all channels enabled, 3-wire PT100/0.00385055 sensors, no filtering, and Celsius. If the defaults meet the application requirements, these registers need not be configured.			

Alarm flags									
Channel	**Register**	**Register in binary**							
		Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Input channel 0	QB991	Reserved				Overrange	Underrange	Open wire	Reserved
Input channel 1	QB992	Reserved				Overrange	Underrange	Open wire	Reserved
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

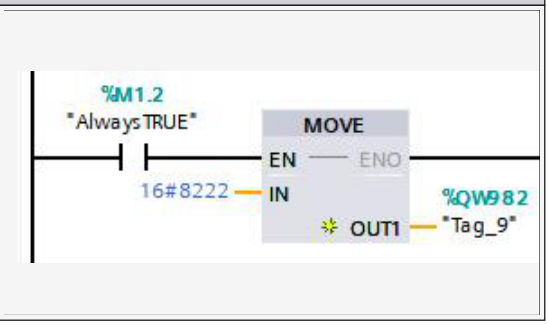
8.17 SB 1231 3TC

SB 1231 3TC Wiring diagram	Terminal definitions	
Wiring diagram not included in the supplied source.	Channel 0	0+: Positive
		0-: Negative
	Channel 1	1+: Positive
		1-: Negative
	Channel 2	2+: Positive
		2-: Negative
	Register mapping: QW1000, QW1002, QW1004	
	Note: Sensor type, coefficient, temperature scale, and analog input filter depth can be set independently for each channel. Built-in fault detection provides LED indications and program-readable error flags. Configure as: 6ES7 241-1CH30-1XB0.	

Temperature unit and channel enable settings							
QB980							
Temp. unit				CH enable			
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Reserved	Channel 2	Channel 1	Channel 0	Reserved	Channel 2	Channel 1	Channel 0

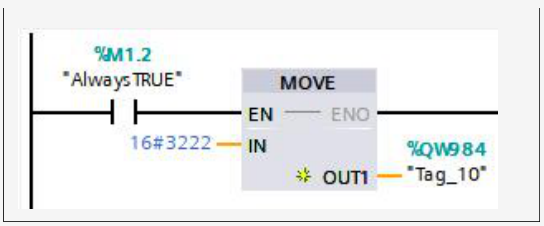
Code		Meaning	Example	Programming example
Temp. unit	0	Celsius	If channel 1 is unused, set bit1 of QB9800 to 0 to suppress its alarms. If channel 3 is to display Fahrenheit and the other channels are to display Celsius, with the other channels using Celsius, set QB980 to 2#10001101).	
	1	Fahrenheit		
CH enable	0	Disable channel		
	1	Enable channel		

Sensor type setting															
QW982															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Channel 3				Channel 2				Channel 1				Channel 0			

Code	Meaning	Example	Programming example
0	Type B	If channel 1 measures a type K thermocouple and the other channels measure type E thermocouples, set QW982 to 16#8222, as shown at right:	
1	Type N		
2	Type E		
3	Type R		
4	Type S		
5	Type J		

Code	Meaning	Example	Programming example
7	Type T		
8	Type K		
A	Type C		
B	Type TXK_XK		
C	Voltage		

Filter depth setting															
QW984															
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved				Channel 2				Channel 1				Channel 0			

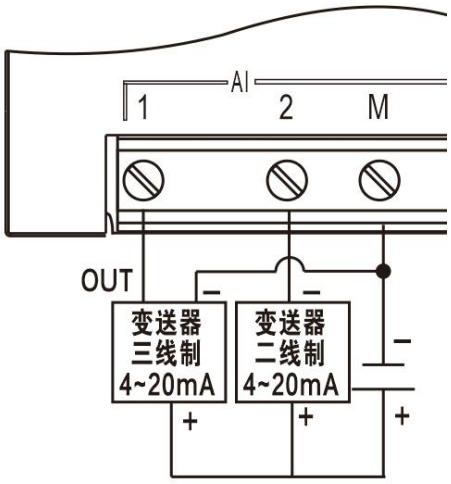
Code	Meaning	Example	Programming example
0	None (1 cycle)	To set the channel 3 filter to 32 cycles and all other channels to 16 cycles, set QW984 to 16#3222, as shown at right:	
1	Weak (4 cycles)		
2	Medium (16 cycles)		
3	Strong (32 cycles)		

Note: When configuration registers QW620-QW624 are all 0, the defaults apply: all channels enabled, type K thermocouples, no filtering, and Celsius. If the defaults meet the application requirements, these registers need not be configured.

Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Input channel 0	QB991	Reserved				Overrange	Underrange	Open wire	Reserved

Alarm flags									
Channel	Register	Register in binary							
		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Input channel 1	QB992	Reserved				Overrange	Underrange	Open wire	Reserved
Input channel 2	QB993	Reserved				Overrange	Underrange	Open wire	Reserved
Note: When an alarm occurs, the corresponding flag is set to 1 and the DIAG LED flashes red. Without an alarm, the flag is 0.									

8.18. Transmitter wiring diagrams



Tip: Set the corresponding DIP switch to current input before applying a current signal.

Special note: A high-temperature protective film covers the DIP switches. Pierce it with a pointed tool (such as tweezers), then gently move the switch. Switches may also be adjusted during factory testing. A punctured or missing protective film is normal.

9. Technical specifications

Digital signal boards	SB 1221 4DI	SB 1222 4DO	SB 1223 2DI/2DO
Order number	221-3BD30-0XB0	222-1BD30-0XB0	223-0BD30-0XB0
Number of channels	4 inputs	4 outputs	2 inputs / 2 outputs
Digital input type	Sinking or sourcing (bidirectional input; common may be connected to positive or negative)	--	Sinking only (active when 24V+ is applied)

Digital signal boards	SB 1221 4DI	SB 1222 4DO	SB 1223 2DI/2DO
Digital input voltage	Minimum voltage for logic 1: 10VDC at 2.9mA	--	Logic 1 minimum voltage: 15 VDC at 2.5 mA
	Maximum voltage for logic 0: 5VDC at 1.4mA	--	Logic 0 maximum voltage: 5 VDC at 1 mA
Digital input isolation	Internal electromagnetic isolation	--	Internal electromagnetic isolation
Digital output type	--	Transistor, sourcing (switches 24V+ on or off)	Transistor, sourcing (switches 24V+ on or off)
Maximum output current	--	0.1 A	0.5 A
Digital output isolation	--	Internal electromagnetic isolation	Internal electromagnetic isolation
L+, M rated voltage	--	24VDC (maximum 30VDC)	24VDC (maximum 30VDC)

Analog Input Specifications	SB 1231 1AI	SB 1231 2AI	SB 1234 2AI/2AQ	SB 1234 4AI/1AQ	SB 1231 5AI
Input channels	1 voltage or current channel	2 voltage or current channels		4 voltage or current channels	5 voltage or current channels
Measurement range	-10V~10V, -20mA-20mA				
Full-scale range	-27647~27648				
Accuracy	0.3% of full scale				
Resolution	12 bits				
Isolation	None				
Maximum cable length	100m shielded twisted pair				

Analog Output Specifications	SB 1232 1AQ	SB 1234 2AI/1AQ	SB 1234 5AI/1AQ	SB 1232 2AQ	SB 1234 2AI/2AQ	SB 1232 4AQ
Output channels	1 voltage or current channel			2 voltage or current channels		4 voltage or current channels
Resolution	12 bits					
Full-scale range (data word)	0 to 27,648 corresponds to 0-10V and 0-20mA					
Accuracy	0.3% of full scale					
Load impedance	Voltage: >=1000 ohms Current: <=600 ohms					
Isolation	None					

Analog Output Specifications	SB 1232 1AQ	SB 1234 2AI/1AQ	SB 1234 5AI/1AQ	SB 1232 2AQ	SB 1234 2AI/2AQ	SB 1232 4AQ
Maximum cable length	100m shielded twisted pair					

Communication Board Specifications	CB 1241 RS485	SB 1241 RS232	CB 1241 ISO RS485
RS485 functions	Cable length: 1000m; Isolation: None; ESD protection: Yes;	--	Cable length: 1000m; Isolation: Yes; ESD protection: Yes;
RS232 functions	--	Cable length: 10m; Isolation: None; ESD protection: Yes; -	--

Temperature signal boards	SB 1231 2RTD	SB 1231 3TC
Number of channels	2 channels	3 channels
Sensor type	See the RTD selection table below.	See the thermocouple selection table below.
Temperature measurement range		
Reading range		
Resolution		
Accuracy		
Open-circuit and overrange detection	Yes	Yes
Acquisition time	200ms	400ms
Cable length	Maximum 100m	Maximum 20m

RTD selection table							
Temperature coefficient	RTD type	Minimum (°C)	Rated lower limit (°C)	Rated upper limit (°C)	Maximum (°C)	Accuracy at 25 °C (°C)	Acc.@-20~60°C (°C)
Pt 0.003850 ITS90 DIN EN 60751	Pt 10	-243.0	-200.0	850.0	1000.0	±1.0	±2.0
	Pt 50	-243.0	-200.0	850.0	1000.0	±0.5	±1.0
	Pt 100						
	Pt 200						
	Pt 500						
	Pt 1000						

RTD selection table							
Temperature coefficient	**RTD type**	**Minimum (°C)**	**Rated lower limit (°C)**	**Rated upper limit (°C)**	**Maximum (°C)**	**Accuracy at 25 °C (°C)**	**Acc.@-20~60°C (°C)**
Pt 0.003902 Pt 0.003916 Pt 0.003920	Pt 100	-243.0	-200.0	850.0	1000.0	±0.5	±1.0
	Pt 200	-243.0	-200.0	850.0	1000.0	±0.5	±1.0
	Pt 500						
	Pt 1000						
Pt 0.003910	Pt 10	-273.2	-240.0	1100.0	1295.0	±1.0	±2.0
	Pt 50	-273.2	-240.0	1100.0	1295.0	±0.8	±1.6
	Pt 100						
	Pt 500						
Ni 0.006720	Ni 100	-105.0	-60.0	250.0	295.0	±0.5	±1.0

RTD selection table							
Temperature coefficient	**RTD type**	**Minimum (°C)**	**Rated lower limit (°C)**	**Rated upper limit (°C)**	**Maximum (°C)**	**Accuracy at 25 °C (°C)**	**Acc.@-20~60°C (°C)**
Ni 0.006180	Ni 120						
	Ni 200						
	Ni 500						
	Ni 1000						
LG-Ni 0.005000	LG-Ni 1000	-105.0	-60.0	250.0	295.0	±0.5	±1.0
Ni 0.006170	Ni 100	-105.0	-60.0	180.0	212.4	±0.5	±1.0
Cu 0.004270	Cu 10	-240.0	-200.0	260.0	312.0	±1.0	±2.0
Cu 0.004260	Cu 10	-60.0	-50.0	200.0	240.0	±1.0	±2.0
	Cu 50	-60.0	-50.0	200.0	240.0	±0.6	±1.2
	Cu 100						
Cu 0.004280	Cu 10	-240.0	-200.0	200.0	240.0	±1.0	±2.0
	Cu 50	-240.0	-200.0	200.0	240.0	±0.7	±1.4
	Cu 100						

Thermocouple selection table						
Input type	**Minimum (°C)**	**Rated lower limit (°C)**	**Rated upper limit (°C)**	**Maximum (°C)**	**Accuracy at 25 °C (°C)**	**Acc.@-20~55°C (°C)**
J	-210.0	-150.0	1200.0	1450.0	±0.3	±0.6
K	-270.0	-200.0	1372.0	1622.0	±0.4	±1.0
T	-270.2	-200.0	400.0	540.0	±0.5	±1.0
E	-270.0	-200.0	1000.0	1200.0	±0.3	±0.6

Thermocouple selection table						
Input type	**Minimum (°C)**	**Rated lower limit (°C)**	**Rated upper limit (°C)**	**Maximum (°C)**	**Accuracy at 25 °C (°C)**	**Acc.@-20~55°C (°C)**
R&S	-50.0	100.0	1768.0	2019.0	±1.0	±2.5
B	0.0	200.0	800.0	--	±2.0	±2.5
	--	800	1820	1820	±1.0	±2.3
N	-270.0	-200.0	1300.0	1550.0	±1.0	±1.6
C	40.0	100.0	2315.0	2500.0	±0.7	±2.7
TXK/XK(L)	-200.0	-150.0	800.0	1050.0	±0.6	±1.2
Voltage	-32512	-27648 -80mV	27648 80mV	32511	±0.05%	±0.1%

10. Frequently asked questions

10.1. Why must Phleen 1200 analog signal boards be configured as CB 1241?

Answer: The analog signal board communicates with the 1200 CPU via Modbus RTU. The board is the master and the CPU is the slave. This special configuration maps the board resources. The baud rate may be 9600, 19200, or 187500. The slave address must be 2. Registers are mapped from QW1000 and QW1010.

10.2. Do Phleen 1200 analog signal boards require library installation or additional programming?

Answer: No library installation is required. Add two program networks as described in section 4.

10.3. Can I read AIW and AQW registers directly for Phleen 1200 analog signal boards?

Answer: No. The analog signal board resources are mapped to the QW area. After adding the two program networks, read and write the mapped registers directly. Analog inputs start at QW1000 and analog outputs start at QW1010. See section 6 for details.

10.4. A Phleen 1200 analog signal board cannot communicate with the CPU.

Answer: Phleen analog signal boards operate differently from the original boards. See section 4. Check the front LED marked DIGA: steady on means normal communication; flashing means communication failure. Check the following: 1. Configure the Phleen analog signal board as CB 1241 RS485. 2. Add two Modbus slave program networks to the 1200 CPU. 3. Use the Modbus library, rather than the Modbus RTU library, when programming. See section 4. 4. Compile both hardware and software, then download both hardware and software. 5. If the problem persists, test using the example on our website.

11. Technical support and contact details

For further details, contact customer service or technical support.

Customer service: 0755-81483523

Technical support: 15112451246