# SP8/SPA8 User's Manual

1. Introduction

SP8/SPA8 is a device for remote monitoring and control via GSM network. SP8/SPA8 enables to watch 9 logical and 2 analog inputs (only SPA8) and remote control of 4 logical outputs (state change or pulse). SP8/SPA8 can react on inputs changes by sending an SMS and/or by a voice call. Names of inputs and outputs, their function, phone numbers, password and so on are fully configurable by a PC connected by USB cable or remotely using GSM data connection using program SPInit. This configuration program is on CD which is part of delivery. It's also possible to download program SPInit from the website www.seapraha.cz (English pages -> Support -> GSM-SP8 or GSM-SPA8).
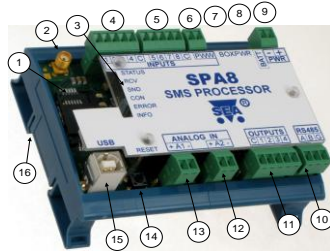
1) SIM card holder
2) Connector for GSM antenna (ANT05S is a part of standard package)
3) Indication LED
4) Logical Inputs connector (Din1 ... 4)
5) Logical Inputs (Din5 ... 8)
6) Power Watch connector (PWW)
7) Box flat cable connector (BOXPWR)
8) Switch Battery On/Off (BATT)
9) Power Supply connector (PWR) (8 ... 30VDC)
10) RS485 connector
11) Logical Outputs (DOut1 ... 4)
12) Analog Input (AIn2) *) (only SPA8)
13) Analog Input (AIn1) *) (only SPA8)
14) RESET Pushbutton
15) USB connector for PC connection for configuration and monitoring by SPInit
16) DIN-Rail Easy Mount Holder

*) One piece of temperature sensor is a part of standard package. The second sensor has to be ordered separately. Available types are GSM-C-T1 and GSM-C-T2.

2. Package

1 pc **GSM-SP8/SPA8** device in frame with DIN rail holder
1 pc antenna GSM-ANT05S
1 pc temperature sensor GSM-C-T2
4 pcs connector ETB4702G00 (only SPA8)
2 pcs connector ETB4702G00 (only SP8)
1 pc connector ETB8103G00
3 pcs connector ETB4705G00
1 pc USB cable
2 pcs jumper
1 pc screwdriver
1 pc printed documentation (this manual)
1 pc CD ROM with documentation and SPInit program

Accessories: GSM-SP-BOX-M or GSM-SP-BOX-V (has to be ordered separately)

3. Hardware
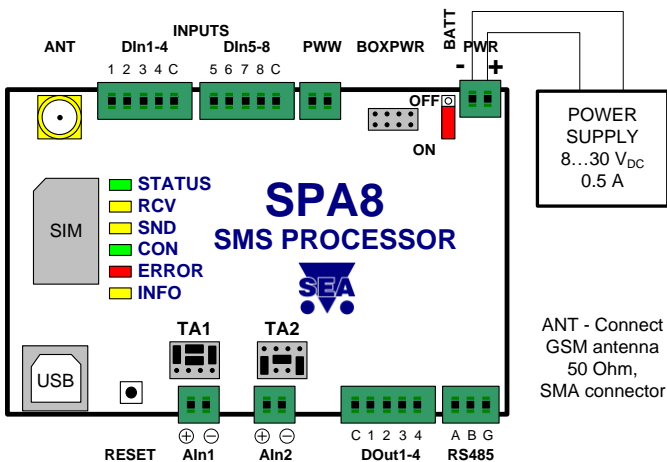
Warning

It's highly recommended to use extra power supply for SP8/SPA8 power, galvanic separated from power supply for input and output external circuitry, especially when I/O have long wires, that may be noisy.

3.1 DIn - Logical inputs, DOut - logical outputs

Logical inputs (SP8/SPA8 input signals) are connected to DIn1-4 and DIn5-8 connectors. Logical outputs (SP8/SPA8 output signals) are connected to Dout1-4 connector. Internal SP8/SPA8 circuitry and recommended external circuitry:
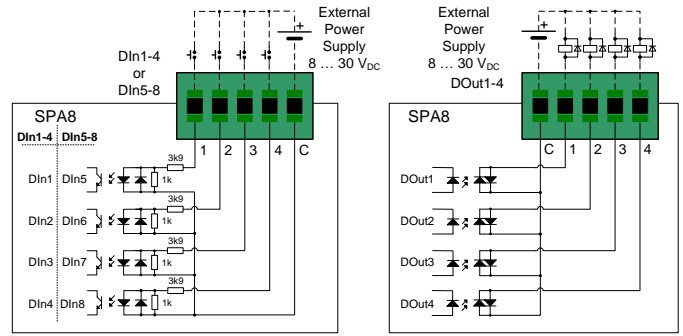
PWW (Power Watch) input can be used as 9th logical input if not used for power watch.

3.2 AIn - Analog Inputs (only SPA8): Voltage/Current/Temperature selection

SPA8 has 2 analog inputs - connectors AIn1 and AIn2. Measured variable selection can be done by jumpers. Each input has it's own jumpers field (see the picture Hardware)

Jumpers field TA1 is for input AIn1, jumpers field TA2 is for input AIn2. SPA8 box has to be opened (three plastic screw on front cover) before jumper settings changing.

General signals 0 ... +10 V or 0 ... 20 mA can be recalculated to users units, e. g. input current 4 ... 20 mA may be displayed and send in SMS like a pressure 0 ... 5 MPa.

Warning

When changing jumper settings it's highly important to make the same change in configuration program SPInit, otherwise SPA8 will not work correctly.

Value	Range/sensor	Jumpers
Voltage	0 ... +10 V	
Current	0 ... 20 mA	
Temperature	KTY 81-210 (-50°C ... +150°C)	
Temperature	Ni 5000 (-50°C ... +150°C)	
* **bi-polarity logical input with galvanic isolation**	Active when voltage > 8 V	

* Analog inputs acts for this setting as a standard isolated logical input: voltage 0 ... 4 V is log. 0, voltage 8 ... 30 V is logical 1. Any voltage polarity – isolated bipolar logical input.

3.3 Analog Inputs Factory Setting (only SPA8)

Input Name	Resolution	Input	Factory Setting	Jumpers
AIn1	12 bits	Temperature sensor	Temperature KTY 81-210	
AIn2	12 bits	Voltage	0 ... +10 V	

3.4 Front Panel

SP8/SPA8 front panel contains indication LED diodes, SIM card holder and USB connector for PC connection.

LED	COLOR	MEANING
STATUS	green	not used in this version
RCV	yellow	Receiving SMS or incoming data connection
SND	yellow	Sending SMS or outgoing voice call
CON	green	CONNECTED – any data connection GPRS, data, ...
ERROR	red	Red if any error occurred
INFO	yellow	One short blink if program state is normal

3.5 Battery switch - BATT

Battery switch must be ON (dot on switch is visible) for normal operation. It should be OFF only for SP8/SPA8 delivery and storing or for temporary discontinuing use of SP8/SPA8. If the battery switch is OFF and the power is brought at SP8/SPA8 POWER connector, SP8/SPA8 starts work, but it will signalize an error by red LED, that will stop after the switch is changed to ON.

3.6 RS485 serial channel

RS 485 communication port is transparent for data from and to the station making data call to SP8/SPA8 after accepting the data call and after both modems sends "CONNECT" string.

4. Functional Test

- ◆ To operate SP8/SPA8 any SIM card of any GSM operator is necessary. The SIM card has to be fully operational, with non zero credit in case of prepaid SIM card. It's recommended to make a test of a SIM card in a standard mobile phone: SMS sending and receiving and incoming and outgoing voice and data calls.
- ◆ It's recommended to deactivate PIN usage on a SIM card for the first test of SP8/SPA8 which can be done without changes in example configuration in SP8/SPA8. PIN usage can be deactivated in standard mobile phone: Menu -> Settings -> Mobile Security -> PIN
- ◆ Insert SIM card into SP8/SPA8.
- ◆ Connect an antenna to SMA connector ANT.
- ◆ Insert 2 pin connector with a temperature sensor KTY 81-210 into AIn1 analog input.
- ◆ Switch on the Battery switch BATT (dot on switch is visible).
- ◆ Connect a power supply for SP8/SPA8 (8 ... 30 VDC) into a PWR connector. If everything is OK the LED INFO on the front panel of SP8/SPA8 blinking once shortly and SP8/SPA8 is ready (approximately after 1 min from start). Notes: If an ERROR LED lights red, any problem occurred. Use your computer and USB cable to find out the cause of a problem.
- ◆ Send an SMS message from your mobile phone to a SIM card phone number in SP8/SPA8 in form "1234 STATE". SP8/SPA8 will send back an SMS with inputs and outputs status depending on factory configuration of SP8/SPA8.
- ◆ You will receive a status SMS will look like this: "Test SP8/SPA8: Window=CLOSED Elevator=OK HEATING=OFF Temperature=28'C MIDDLE SIGNAL=56%."

5. Configuration

## 5.1 First Configuration and Basic Functions Guide

First of all, please, install USB driver and program SPInit to your PC from delivered CD. Now connect SP8/SPA8 and PC with USB cable.

For the first test we recommend to use "**First Configuration Guide"**, which is automatically installed with program SPInit. Configuration Guide helps you to prepare basic configuration of SP8/SPA8 in just few steps. It helps you to set up important configuration items for the first test of SP8/SPA8 (phone

number, user name, and writes modified configuration to SP8/SPA8. After quitting the Guide, program SPInit stays running. You can use it to prepare complete configuration for practical use and to monitor SP8/SPA8. It's useful to test monitoring now. Press the pushbutton [Connect] and select an item "Analog inputs" on the card called [Monitoring]. You will see the actual temperature on the temperature sensor. Click on the item "Logical inputs". All of them will be in non active state. Activate an input DIn4 with bringing voltage 8 ... 30 VDC between pins C and 5 of DIn1-4 connector. Watch the inputs state change on your PC display. Now try to activate input DIn1 (pin C and 1). You will see the change on your PC display and SMS message will follow due to SP8/SPA8 factory configuration where the change of input DIn1 is set to send SMS message. Similarly is possible to send an SMS caused by increasing temperature on sensor over 30°C. Now try to switch on the output DOut1 by sending SMS from your mobile phone to phone number of a SIM card in SP8/SPA8 in form "1234 OUTPUT1 ON". You will see the change of an output in the item logical outputs. You will receive a confirmation SMS message on your mobile phone (supposing you didn't use the command "NOBACK" in the command SMS).

Now is possible to configure SP8/SPA8 for intended with program SPInit.

Example use of recalculation values on analog input to users units:
E.g. Analog input is set as a current input 0 ... 20 mA. A pressure sensor yields 4 mA by 0 MPa and 20 mA by 10 MPa.

The proper SPInit parameter settings are on the picture.
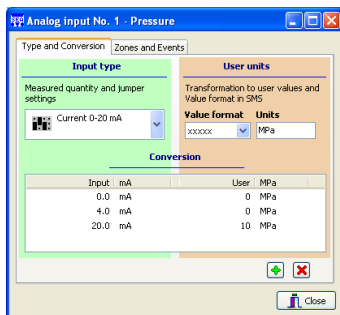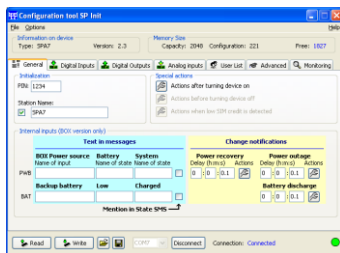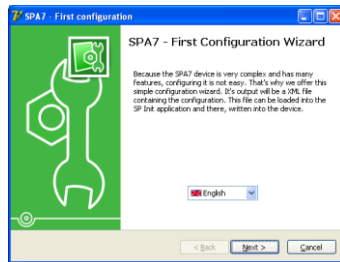
5.2 SPInit - Important Terms Explanation

PIN (Personal Identification Number – usually four digits number). Only persons with knowledge of PIN can operate a SIM card (in case the PIN usage on a SIM card was activated). Usage of the PIN can be deactivated. Insert the SIM card to your mobile phone and follow the instruction in the mobile phone manual. (Usually the PIN usage can be deactivated in Menu -> Security -> PIN).

ACCESS CODE = Password for SMS commands, configuration and monitoring of SP8/SPA8. SP8/SPA8 accepts only SMS with a valid access code. The password is requested also for connection of SP8/SPA8 with PC (via USB cable or remotely via data connection of GSM network). Factory setting of access code is "1234".

EVENT = level change in case of logical input, zone change in case of analog inputs. SP8/SPA8 can reacts on EVENTS by several ACTIONS if was setup this way. SP8/SPA8 can send SMS messages on selected phone numbers and to make voice calls on selected phone numbers.

ACTION = one voice call or one SMS to one user. Any EVENT can contain several ACTIONS.

USER LIST = List of all users and their phone numbers which are used for ACTIONS. User names are used only for better clarity. SP8/SPA8 does not use them in any way.

5.3 Remote Configuration

SP8/SPA8 can be configured remotely via GSM data connection in the same way like via USB cable. Just click in menu [Options] and in new window called "Options" set the "Station's phone" number for data connection to SP8/SPA8. Click [OK] to close the window.
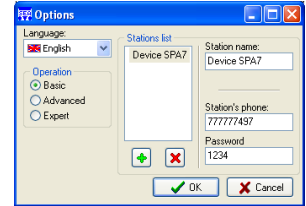
6. Remote Control

6.1 SMS Message control

SP8/SPA8 is controlled via SMS messages of GSM network. Command SMS messages are in form:
<PASSWORD> <COMMAND> [<RETURN COMMAND >]
Example:
1234 STATE ... SP8/SPA8 returns an SMS containing status
1234 DOUT1 ON ... SP8/SPA8 output1 will be switched on. Confirmation SMS will be returned
1234 DOUT8 PULSE NOBACK ... SP8/SPA8 pulse on output8 will be generated, no confirmation message will be send
It's possible to write more commands into one command SMS. For higher readability separate commands by semicolon ";" inside command use "=".
1234 OUTPUT0=ON; OUTPUT1=ON; OUTPUT3=PULSE;
Names of inputs and outputs are user definable by SPInit program. Command SMS may look like this:
1234 GATE=OPEN; HEATING=ON; LAMP=BLINK

6.2 Status SMS Text Message

Whenever command SMS contains valid password, SP8/SPA8 always returns status SMS. Status SMS contains following information:
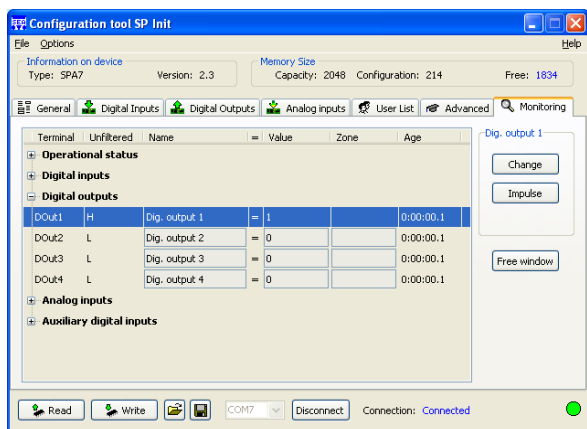<Device Name>: <LogInput1>=<LogInput1Status> <LogInput2>=<LogInput2Status> ...   <LogOutput1>=<LogOutput1Status>
<LogOutput2>=<LogOutput1Status> ... <GSM Signal Level>
Status SMS message contains information only about selected inputs and outputs. Selection is done in configuration program SPInit by checking the appropriate checkbox.

SP8/SPA8 Status SMS Example	Explanation
Device SP8/SPA8:	Device Name (user configurable)
DIn1=on	Logical Input 1 is on
DIn2=off	Logical Input 2 is off
DOut3=on	Logical Output 3 is on (closed)
Signal=58%	GSM Signal level in %

7. Monitoring

Program SPInit enables to watch status of inputs and outputs on PC monitor in tab "Monitoring". Monitoring can be local via USB cable or remote via GSM data connection. It's possible to switch on or off logical outputs by clicking on pushbutton [Change] or [Pulse]. It helps to check function of external circuitry.

A/D Converter Range	Zone	User Units	Event SMS (user defined text)	Status SMS
MAX	HIGH	100 kPa	Increase Over Critical Level! Decrease on Operational Level.	Name Zone X Value X PRESSURE HIGH 71kPa PRESSURE MIDDLE 69kPa
	MIDDLE			
Input Value			Increase on Operational Level. Decrease below Operational Level!	PRESSURE MIDDLE 31kPa PRESSURE LOW 29kPa
MIN	LOW	0 kPa		

8. Events

SP8/SPA8 can be set up to inform about events (= changes) on its logical and analog inputs. SP8/SPA8 sends information via SMS message or makes a voice call. By the SPInit program is possible to set several actions for each event specifying the phone number – user who will receive an SMS message and who will be called. A various SMS can be sent to and a voice call can be make to more phone numbers from the list. The order of SMS and voice calls depends on a list of actions for each action. Voice call rises the probability the user will not miss received SMS message.

First of all the Event has to be created in the configuration program SPInit. Click by a mouse on the symbol of a key 🔑. By a pushbutton [+ ADD] select requested action of SP8/SPA8 (SMS or voice call), write the text of SMS which has to be sent or insert the sequence of DTMF numbers in case of a voice call. Now select a user and add him to a list of users for this event by a click on an arrow [>>]. Please check carefully the number of users for an event. If case the number of users is zero nothing will happen.

9. Logical Inputs – Special Usage: Event number coding

"Events number coding" can activate more events than is the number of inputs. For this special function is possible to select several SP8/SPA8's input signals. (See. program SPInit – card "Advanced")

Typical usage is when the error numbers are sent as a code. This decreases the number of signals needed for communication with e. g. PLC. The signals with a code are called "data" signals. When these signals are valid, they are strobe by a signal called "data valid". On a rising edge of this signal, the "data signals" are evaluated and adequate event is generated.

Any combination of input "data" signal is an independent event which can send SMS and make a voice call (see chap. Inputs Events)

Example: If a combination of four inputs 1 1 0 1: means a serious failure it's possible to send following SMS "A serious failure in the city steam plant." to all technical stuff and to the head of the firm too. And then to make a voice call to all technicians to increase probability they will read the SMS. (See. The Advanced example configuration in the SPInit program).

The input signals for this function are selected beginning by input no 1. All other not used inputs keeps their former function. All 8 (7 data + 1 strobe) logical inputs of SP8/SPA8 is possible to use for this special function. It means up to 128 (2^7) events can be assigned.

10. Analog Inputs – Comparators (only SPA8)

Full range of A/D converter can be split into 2 or more zones (pushbutton [+] on a card Zones and Events) which can be named e. g. LOW, OK, HIGH, EMERGENCY. Now add the zone names set the border values and the hysteresis. select [Transition] for this. The border is set in user units (the same units as in SMS). Now is possible to create events for transition of analog value between these zones (in the same way like for logical inputs).

Analog input range can be separated into several zones. The names of these zones are used in SMS. When the input value goes over the zone border is caused an event in SPA8 and a prepared SMS is sent or a voice call on preset phone numbers is made. (see chap. Input Events).

Input value depends on analog input mode configuration. Voltage / current / temperature are available.
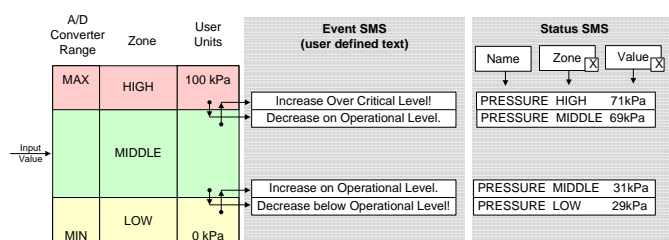
11. Technical specifications

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Dimensions	Width	w			112		mm
	Height	h			90		mm
	Depth (without antenna)	d			45		mm
Power supply	Voltage DC	VCC		8		30	V DC
	Current	ICC	VCC = 12V	0,1		0,4	A
Logical inputs DC any polarity	Count	-			8		-
	Voltage log. H	|VIN|		8	12	30	V
	Voltage log. L	|VIN|			<4	4	V
	Current	IIN	VIN = 12V		5		mA
Logical outputs DC, AC	Count	-			4		-
	Voltage	VOUT				50	V
	Current	IOUT				100	mA
Analog inputs A1 and A2 (only SPA8)	Count	-			2		-
	Measured values	-	voltage, current, temperature *), logical input (user selectable) *) Temperature value is not valid before the temperature condition on sensor is stable.				-
	Voltage measuring	-		0		10	V
	Input resistance	RIN	voltage		18		kΩ
	Current measuring	-		0		20	mA
	Input resistance	RIN	current		100		Ω
	Temperature measuring 1	sensor			KTY 81-210 +/- 1.5 …3 ℃		
	Temperature measuring 2	sensor			Ni 5000 +/- 0.1 …0.3 ℃		
	Logical input	See	logical	inputs			
	Resolution	-			12		bits
Temperature	Operational	tA		-20		+55	℃
Humidity	Operational	h_A				90	%

SP8/SPA8 is designed to be used inside a building only! For outdoor use you need accessories SP8 BOX!

12. Frequently Asked Questions

1. What is necessary to use SP8/SPA8 successfully?
- SIM card capable to send and receive SMS messages from standard mobile phone and voice / data call incoming and outgoing as well. Please test all these functions in your mobile phone. It's important to solve all possible problems before using SIM card in SP8/SPA8. Contact your mobile operator if necessary.
- Good quality GSM signal in area of installation of SP8/SPA8 (at least 2 or 3 bars on your mobile phone). If there is a problem with GSM signal quality, try to use another type of external antenna, which can be placed in proper place with better GSM signal and which is connected to SP8/SPA8 with several meters long coax cable with SMA connector.
- Sufficient Credit (in case of prepaid SIM card)
- Cancel all phone calls redirection for a SIM card in SP8/SPA8

2. What is a phone number of SCA (SCA = Service Center Address) of my mobile operator? (It's not possible to send an SMS)
- Contact your mobile operator for this piece of information.

3. I've tested SP8/SPA8 with my own SIM card. Now I cannot find SMS messages formerly stored on my SIM card.
- SMS from your SIM card were processed by SP8/SPA8 and then deleted. They were very probably canceled due to syntactical error.

4. Where can I find more information?
- See the website www.seapraha.cz English pages->Support->GSM-SP8/SPA8

13. Warranty

General warranty period is 12 months after purchase, when eventual malfunction device will be repaired free of charge in SEA company while shipping to SEA is paid by customer and SEA pays for shipping back to customer. For SW there is 24 months warranty under following conditions:
Both CPU and PC software is sold "as is". The software was created by the best software engineers in SEA and was carefully tested both in SEA and also by SEA customers using GSM applications products made in SEA. In spite of making all possible to get error free software it can happen, that the software in CPU or PC programming SW or their mutual interaction has some error under some specific conditions. If such error is found and the description of the problem including configuration file is sent by E-mail to SEA ltd., the error is removed free of charge and SEA will send new SW by E-mail to customer.

SEA ltd. has NO RESPONSIBILITY for any damage, lost, costs and any other problems direct or inducted, caused by such SW error, by eventual device malfunction from any reason or by undelivered SMS from the device.

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