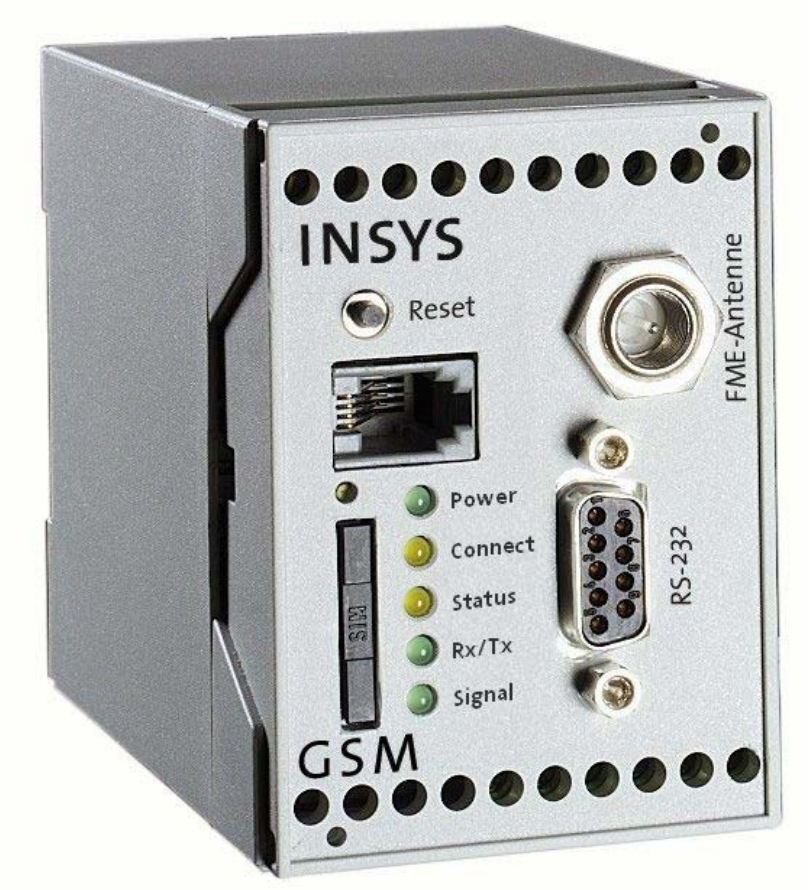
Operating Manual



INSYS GSM 4.0

Version 2.02 – 05.03

INSYS MICROELECTRONICS

Restrictions of guarantee

This manual contains a concise description of the INSYS GSM 4.0. The compilation of the text has been made with the utmost care. Despite all efforts, mistakes can never be prevented completely. No guarantee can therefore be given for the accuracy of the contents. We can neither take over a legal responsibility nor any liability for wrong information and their consequences. Suggestions for improvements and notification of errors are gladly accepted.

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9. revised edition, Version 2.02 – 05.03

0 Scope Of Delivery

Please check the scope of delivery before initial operation:

- INSYS GSM 4.0
- 9-pin serial cable for connection between PC and INSYS GSM 4.0 (RS232 cable)
- Printed manual (German/English). The latest editions of the manual and the AT command set are available for download at our internet site: http://www.insys-tec.com/manual

In case the content is not complete, please refer to your supplier.

Optional accessories:

- GSM antenna (outside mounted antenna or magnetic base antenna)
- CD with configuration software HS Comm (free) and manuals. The configuration software is also available for download at our internet site: http://www.insys-tec.com/configuration

Please check the device for shipping damage. Please refer to your supplier if damage exists.

Please keep the packaging material for dispatch or storage.

1 General

The INSYS GSM 4.0 is a terminal device according to ETSI GSM Phase 2/2+ for the transmission of data, voice, fax group 3 and SMS messages in 900 MHz and 1.800 MHz networks.

Design and interfaces

- Robust DIN rail housing
- Wide voltage range
- 5 Status LEDs (Power, Status, Connect, Rx/Tx, Signal)
- Serial interface via RS232 jack
- Screw terminals for supply, alarm inputs, switch output
- Connection for phone handset
- Control via AT commands
  - Locally (terminal)
  - Remote (only extended command set)
  - Via SMS (only extended command set)
- Integrated real time clock (RTC)
- Periodic alive SMS for operation monitoring
- Flash update locally and remote
- Event memory (history function) with 100 entries

Connection:

- Dualband GSM networks: Class 4 (2W @ 900MHz) , Class 1 (1W @ 1.800MHz)
- Automatic login into the network after power failures.
- Periodical logout and login again
- Extended data formats of the serial interface (10/11 bit)

Alarm input:

- 2 digital alarm inputs for monitoring operating states
- Dispatch of alarm messages via SMS, fax, e-mail and via data connection or establishing a voice connection
- Additional dispatch of the alarm message to up to 10 further recipients from a pool of 20 numbers
- Pulse input:
  - Distinction between 10 pulse sequences per input
  - Dispatch of an appropriate message to a number belonging to it via SMS

Switch output:

- 2 control outputs SPDT (single pole double throw)
- Control by
  - Alarm input, RING, GSM network failure
  - AT command locally and remote
  - SMS command
  - DTMF tone

Security and access protection

- Password protection for
  - Incoming data connections
  - Security Callback
  - Commands via SMS
  - Operation via DTMF
  - Remote configuration
- Selective call acceptance (CLIP)
- PIN of the SIM card stored in controller for automatic login

2 Technical Data

2.1 General

2.1.1 Features

- Mounting on DIN rail DIN EN 500 22
- Data, voice, fax, and SMS services (ETSI GSM phase 2/2+)
- Power supply 10..60 V DC, 5% ripple
  50..80 V DC, 5% ripple
- Level on V.24 interface according to V.28
- Protected V.24/V.28 interface with 9-pin SUB-D jack (screwed)
- MiniSIM card reader with integrated slot (3 V SIM card)
- FME antenna connection

2.1.2 Data Services

Serial interface

- Interface terminal adapter (TA) – terminal station (terminal equipment, TE)
- Compatible with RS232 (v.24/V.28)
- Baud rates: 300, 600, 1.200, 2.400, 4.800, 9.600, 14.400, 19.200, 28.800, 38.400, 57.600, 115.200 bps – standard: 19.200 bps
- No automatic baud rate detection (command AT**BAUD)

Data connection:

non-transparent asynchronous:

- V.22bis (2.400 bps)
- V.32/V.33/V.34 (4.800/9.600/14.400 bps)
- V.110 (2.400/4.800/9.600/14.400 bps)

The support of some data services in the GSM network depends on the GSM provider.

Fax transparent:

- Group 3: Class 1 and Class 2

Voice connection:

- HR/FR, EFR

2.1.3 Mechanical Features

Weight	270 g
Dimensions (maximum)	w x d x h = 55 x 110 x 75
Temperature range	0°C ..55°C
Protective class	Housing IP 40/ Terminal IP 20
Humidity	0 - 95% non-condensing

Note: The INSYS GSM 4.0 may not be used in wet environments.

2.2 System Requirements

The INSYS GSM 4.0 is designed for the system environment of mobile networks with 900 MHz and 1.800 MHz corresponding to ETSI GSM phase 2/2+. The access to a GSM network requires a SIM card of the network provider (see chap. 2.3.6).

2.3 Interfaces And Display Elements

Front view

2.3.1 Display Elements

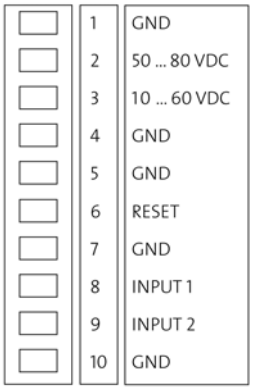
Name	Color	On	Off	Blinking	Flashing
Power	green	Supply OK	No supply		
Status	yellow	GSM engine logged into network*	GSM engine not logged into network*	Data connection alternate blinking with LED Connect: Factory settings loaded	Initialization, alarm processing, dispatch of periodic alive SMS and SMS polling
Connect	yellow	Data connection established	No data connection established	alternate blinking with LED Status: Factory settings loaded	
Rx/Tx	green	Data exchange via GSM	No data exchange		

Name	Color	On	Off	Blinking	Flashing
Signal	green	Best GSM signal (field strength)	GSM signal (field strength) too low*	Blinking interval depending on GSM signal (field strength)*: ON 25 .. 31 60 ms 23 .. 24 140 ms 21 .. 22 260 ms 19 .. 20 380 ms 17 .. 18 500 ms 15 .. 16 1000 ms 13 .. 14 OFF 0 .. 12, 99 For explanation of the values see chap. 3.3.1 Blinking in intervals of 1 second during flash process	

*) periodical query of the login state and the GSM field strength has to be active (command **AT**GSMREQ**)

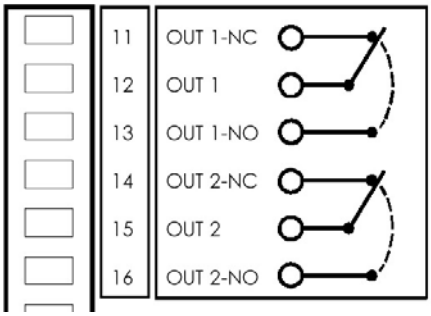
2.3.2 Terminal Layout

Top



	Terminal	
1	GND	Ground
2	50..80VDC	Supply 50V - 80V DC
3	10..60VDC	Supply 10V -60V DC
4	GND	Ground
5	GND	Ground
6	Reset	Reset
7	GND	Ground
8	Input 1	Alarm input 1
9	Input 2	Alarm input 2
10	GND	Ground

Bottom



	Terminal	
11	OUT1NC	Output 1 – normally open
12	OUT1COM	Output 1
13	OUT1NO	Output 1 – normally open
14	OUT2NC	Output 2 – normally open
15	OUT2COM	Output 2
16	OUT2NO	Output 2 – normally open

2.3.3 Digital Inputs And Outputs

Alarm input

The alarm inputs are designed as pull-up and are on HIGH in inactive, open state. The alarm inputs are activated by connecting to ground.

LOW active 0 .. 1 V

HIGH inactive 4 .. 12 V

The input current from LOW to internal +5V is typically 0.5 mA.

Switch output

The switch outputs are potential-free relay-activated SPDT (single pole double throw).

maximum switch voltage:30 V (DC) / 42 V (AC)

maximum current load: 1 A (DC) / 0,5 A (AC)

2.3.4 Supply

Voltage: 10..60 V DC or 50..80 V DC (5% ripple)

	Standby (logged in)	Connect	Unit
Power consumption approx.	1	2,1	W
Current consumption at 10VDC	90	200	mA
Current consumption at 24VDC	40	85	mA
Current consumption at 36VDC	30	60	mA

This values have been established for a signal field strength of 16 (**AT**SIGNAL?**). The current consumption and so the power consumption may increase for poor network conditions.

These are average values for estimating the current consumption. The used power supply unit should be able to supply up to 10 W at short notice (577 µs) to ensure a proper operation.

2.3.5 Serial Interface RS232 (V.24)

Description of the signals on the 9-pin D-SUB connector on DCE side (INSYS GSM):

9-pin D-Sub DCE Pin No.	Description	Function	CCITT V-24	EIA RS232	DIN 66020	E/A DCE to DTE
1	DCD	Data Carrier Detect	109	CF	M5	O
2	RXD	Receive Data	104	BB	D2	O
3	TXD	Transmit Data	103	BA	D1	I
4	DTR	Data Terminal Ready	108	CD	S1	I
5	GND	Ground	102	AB	E2	
6	DSR	Data set ready	107	CC	M1	O
7	RTS	Request to send	105	CA	S2	I
8	CTS	Clear to send	106	CB	M2	O
9	RI	Ring Indication	125	CE	M3	O

2.3.6 SIM Card

The INSYS GSM 4.0 requires a SIM card from a GSM provider for operation. The SIM card is the identification towards the network provider.

The slot for the SIM card is on the front of the INSYS GSM 4.0. Push the sunk yellow button above the card slot to unlock and pull out the insert. The visible contacts of the SIM card must face the top, when inserting the SIM card into the holder. Push the card holder back into the card reader (contacts of the SIM card to the right), until the card holder is flush with the housing.

Notes: Only 3V cards may be used.

Change the SIM card only when the device is switched off.

The GSM provider has to enable the desired services for the SIM card. A card can be enabled for voice and data services at the same time. The following cards and contracts are normally available:

Function	Prepaid card	Contract for voice transmission	Contract for data transmission
Outgoing data connection	✓	✓	✓
Incoming data connection	-	-	✓
SMS	✓	✓	✓
Voice connection	✓	✓	-

Note: Different phone numbers are generally assigned to the different services (voice, data connections with 2.400, 4.800 and 9.600 bps). The GSM network does not switch e.g. a data call to a phone number for voice connections.

2.3.7 Audio Interface

The INSYS GSM 4.0 has a 4-pin western jack at the front for connecting a phone handset.

Pin layout of the western jack

Pin	Usage
1	Microphone (-)
2	Speaker (-)
3	Speaker (+)
4	Microphone (+)

Reference type: Handset Siemens Gigaset

2.3.8 Antenna Interface

The antenna connector at the front of the INSYS GSM 4.0 is of type FME (male).

All commercial GSM antennas with a female FME connector can be used as antennas. Ensure that the frequency band corresponds with the one of the provider when using single band antennas (900 MHz or 1800 MHz).

2.3.9 Reset Key

The INSYS GSM 4.0 re-initializes after a reset. This takes approximately 30 seconds and is indicated by the flashing LED **`Status`** (see initial operation, chap. 3.2).

All data and voice connections are interrupted.

Reset

The device is reset to initial state by pressing the reset key shortly.

Factory settings

The device is reset to the factory settings for the extended AT commands by pressing the reset key for more than 25 seconds. This corresponds to the command **`AT**DEFAULT`**. The reset button can be released as soon as the LEDs **`Connect`** and **`Status`** blink alternately. The device executes a restart.

2.4 Approvals / CE

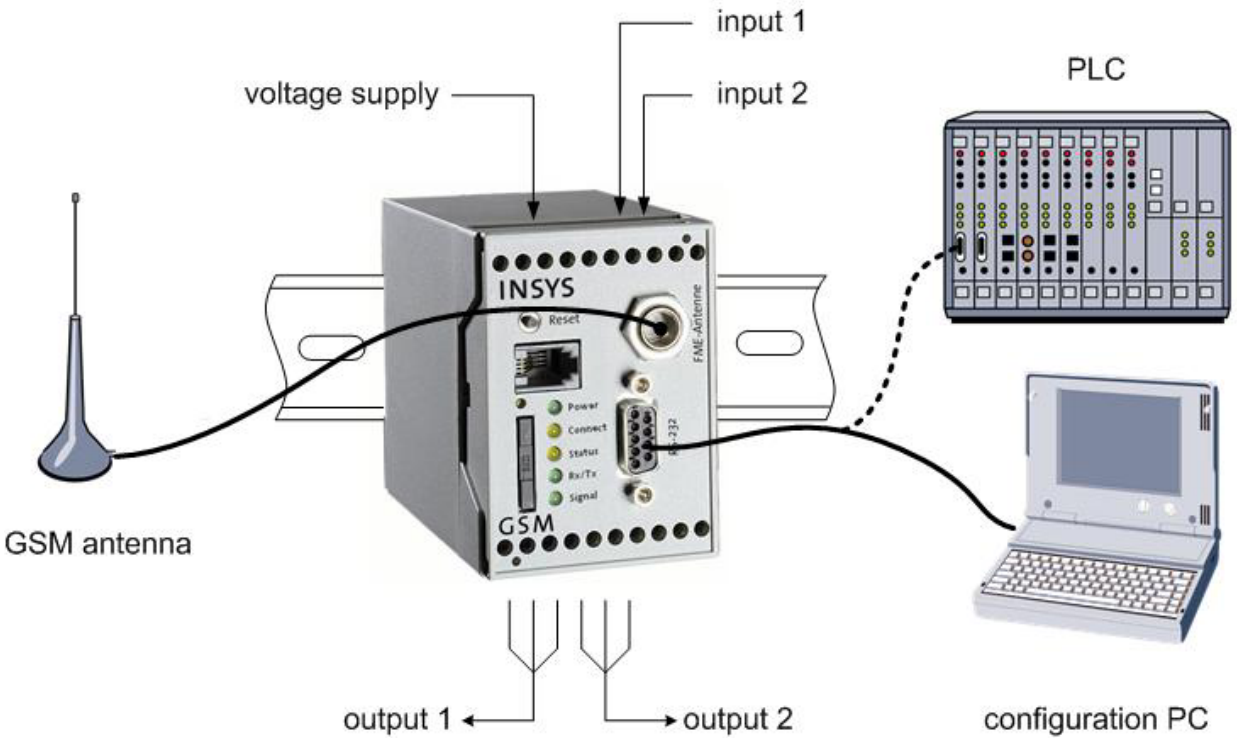
The INSYS GSM 4.0 bears the CE symbol of conformity. This symbol is a declaration, that on account of its design and implementation, the INSYS GSM 4.0 is in compliance with the currently valid versions of the following EC directives:

Directives:	89/336/EEC	(EMC directive)
	73/23/EEC	(low voltage directive)
	91/263/EEC	(telecommunications devices directive)
Standards:	ETS 300 342 1	

	EN 60950	
	EN 55022	(class B)
	EN 55024	
	EN 300 607-1	
	EN301 419-1	
	EN 3015011 V7.01	
	TBR 19, TBR 20	
Approvals:	CE	

3 Initial Operation

3.1 Installation Overview



The serial interfaces (RS 232) of the INSYS GSM and the configuration PC are connected for the initial operation and configuration. For the data communication during operation, the application (e.g. an SPS) is connected to the serial interface of the INSYS GSM (dashed line), instead of the PC. The configuration of the digital inputs and outputs is described in chap. 4.3/4.5.

3.2 Initial Operation

The initial operation may take place comfortably by the configuration software HSComm (see chap. 4) under Windows as well as directly by entering the AT commands by a terminal program (e.g. ProComPlus, HyperTerminal, terminal window of HSComm).

Carry out the following steps 1 to 4, 5a to 9a (HSComm) or 5b to 9b) (terminal), and 10 to 13:

1. Have SIM card (see chap. 2.3.6) and PIN number ready, but do not insert yet.
2. Connect INSYS GSM and PC with serial cable. Connect GSM antenna.
3. Connect power supply to terminals 10..60 VDC or 50..80 VDC and negative pole to GND and switch on. Requirements see chap. 2.3.4 – Attention: the given values are maximum values.
4. Initialization starts:

- LED **Connect** is on for approx. 4 seconds
- after further 8 seconds the LED **Status** starts to flash for approx. 20 seconds
- LED **Status** goes out afterwards, because no SIM card is inserted and no PIN is entered.
- The LED **Signal** is on or blinks depending on the strength of the GSM network.

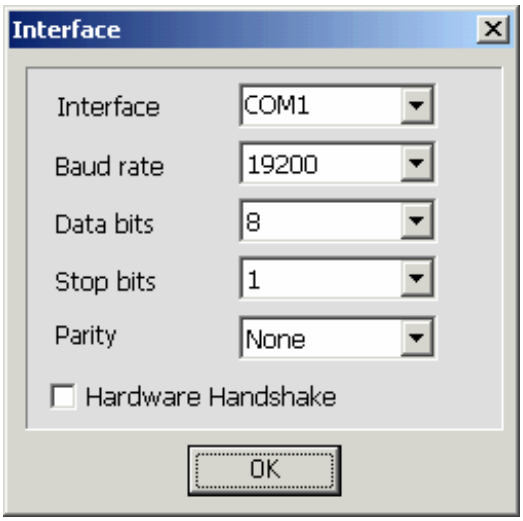
Continue either with the steps 5a to 9a with the configuration software HSComm or with the steps 5b to 9b with a terminal program. Subsequently insert the SIM card and execute a restart with the steps 10 to 13.

3.2.1 First Configuration By HSComm

Alternative: For direct configuration by AT commands from a terminal program see the steps 5b to 9b in chap. 3.2.2.

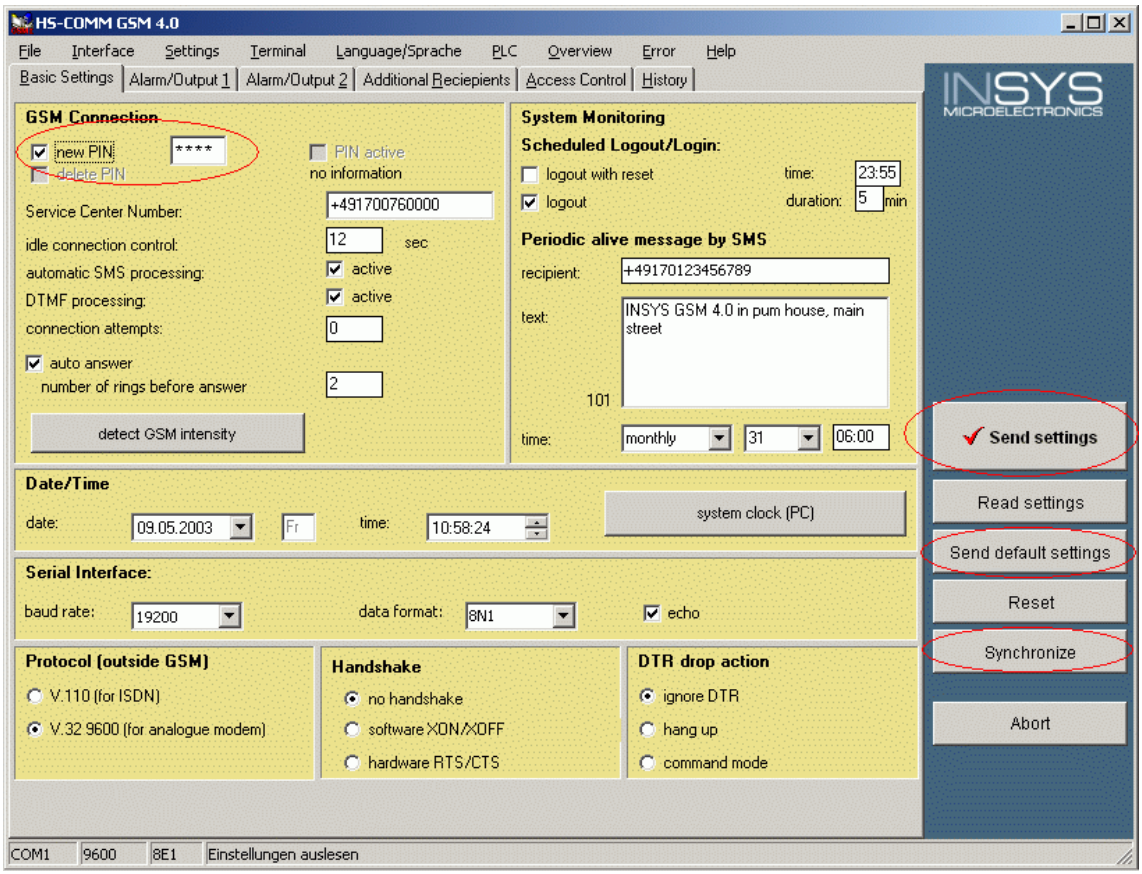
5a. Start HSComm under Windows:

6a. Select the following standard setting for the serial interface in the menu *Interface* at the configuration PC:

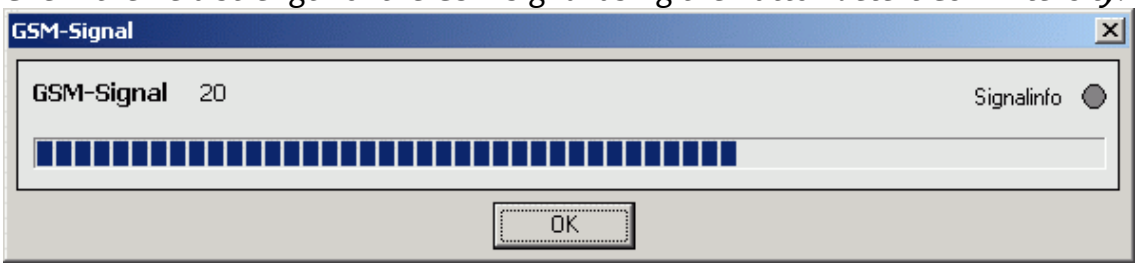


7a. If the INSYS GSM is in an undefined state, reset it optionally to the factory settings first (button *Send default settings*). If the INSYS GSM does not respond to the transmission of commands, select the button *Synchronize* to adapt baud rate and data format automatically.

8a. Enter the PIN number (will be stored in the INSYS GSM): Select the tab *Basic Settings*, select *new PIN* and enter the PIN belonging to the SIM card. The PIN is stored in the INSYS GSM and used for logging into the GSM network at every restart. Transfer settings by activating the button *Send settings*.



9a. Check the field strength of the GSM signal using the button *detect GSM intensity*.



The response should be a field strength of at least 12 – otherwise, the antenna location has to be changed. (see also chap. 3.3.1)

3.2.2 First Configuration By Terminal Program

Alternative: For configuration by the configuration software HSComm under Windows see the steps 5a to 9a in chap. 3.2.1.

5b. Start your terminal program or the terminal window of HSComm.

6b. Set the serial interface settings to the standard values: 19.200 baud, 8 data bits, 1 stop bit, no parity

7b. If the INSYS GSM is in an undefined state, reset it optionally to the factory settings first.

AT&F&WZ<CR>

ATDEFAULT**

8b. Store the PIN number (in the example below 1234 – to be replaced by your PIN) for the SIM card by the following command and end the enter <CR> (Enter or Return key):

ATPIN=1234<CR>**

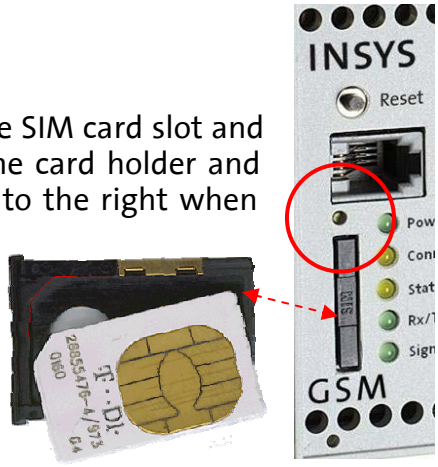
If the PIN of the SIM card is deactivated, enter only **AT**PIN=<CR>**.

9b. Check the field strength of the GSM signal:

ATSIGNAL?<CR>**

The response should be a field strength of at least 12 – otherwise, the antenna location has to be changed. (see also chap. 3.3.1)

3.2.3 Restart



10. Disconnect the power supply.
11. Press the sunk yellow button (see image) above the SIM card slot and take the card holder out. Put the SIM card into the card holder and insert it again. The contacts of the SIM card face to the right when inserting.
12. Connect the power supply.
13. The initialization process starts again (see point 4) : If the device has logged in successful, the LEDs **Power** and **Status** are on afterwards and the LED **Signal** indicates the strength of the GSM signal.

3.2.4 Connection Test

After this first configuration, you can simply check whether your INSYS GSM 4.0 is connected with the GSM network:

Dial from the terminal window of the HSComm or your terminal program a phone number (e.g. your mobile phone) with the command **ATD** followed by the number and if it rings, you see that it tries to establish a connection.

Attention: Make sure that your SIM card is enabled for incoming data connection if required (see chap. 2.3.6).

3.3 Troubleshooting

No response on commands

- INSYS GSM 4.0 and the terminal device (configuration PC or control) have to operate the serial interface with the same baud rate and the same data format (Default: 19.200 bps, 8N1).
- The INSYS GSM 4.0 can be reset to the factory settings by pressing the Reset key long (> 25 seconds) (see chap. 2.3.9)

No connection

- Sufficient signal quality of the GSM network: see chap. 3.3.1
- INSYS GSM logged in: see chap. 3.3.2
- SIM card enabled for data connections: see chap. 2.3.6
- Phone number for data (not voice) connection dialed: see chap. 2.3.6
- Sufficient power supply for sending: see chap. 2.3.4

Alarm SMS is not dispatched

- SMSC entered correctly: see chap. 4.2.1
- Deactivate DTR drop if no device is connected via the serial interface: see chap. 4.2.8
- Deactivate handshake if no device is connected via the serial interface: see chap. 4.2.7

3.3.1 Signal Quality

The query of the signal quality at the reception location takes place using the button *Detect field strength* at the tab *Basic settings* or using the AT command **AT**SIGNAL?**. The response should be more than 12 (maximum is 31). If required change the antenna location. The response 99 indicates that no field strength can be detected (e.g. for network failure, defective antenna).

The signal quality is indicated with an update interval of 1 minute (in idle state) by the LED **Signal**:

LED **Signal**	Response of **AT**SIGNAL?**	Quality of the radio link
always on	25 .. 31	optimum
60 ms	23 .. 24	very good
140 ms	21 .. 22	
260 ms	19 .. 20	good
380 ms	17 .. 18	
500 ms	15 .. 16	sufficient
1000 ms	13 .. 14	
always off	0 .. 12	not sufficient ➔ improve location
	99	not detectable

3.3.2 Log-In State In GSM Network

Check whether your SIM card and the entered PIN have been accepted by entering **AT+CREG?<CR>** in the terminal window. The responses mean:

0 not logged in, no GSM network search

1 logged in at standard provider

2 not logged in, GSM network search

3 refused

5 logged in, roaming

If you are not logged in, check whether the device expects a PIN by the command **AT+CPIN?<CR>** in the terminal window. The responses mean:

READY no further entry necessary

SIM PIN Enter PIN of the SIM card ➔ store the PIN for automatic dial-up of the INSYS GSM 4.0 (see chap. 4.2.1) and execute a reset.

SIM PUK Enter PUK of the SIM card ➔ the PIN has been entered wrong repeatedly and is locked now. The PUK, which you find in the contract documents of your GSM provider is needed to unlock. Remove the SIM card and enter the PUK using the menu of any mobile phone. Absolutely ensure afterwards that the correct PIN is stored in the INSYS GSM.

4 Configuration

4.1 Configuration Software HSComm

The software HSComm allows the configuration of the INSYS GSM 4.0 under Windows without explicit knowledge of the AT commands and their parameters. The settings are transmitted to the INSYS GSM on instructions only (button *Send settings*) or read out from there (button *Read settings*)

The configuration software HSComm is available for free download in the internet http://www.insys-tec.com/configuration

4.1.1 Help

The context sensitive is available via the key **F1** or the menu *Help*.

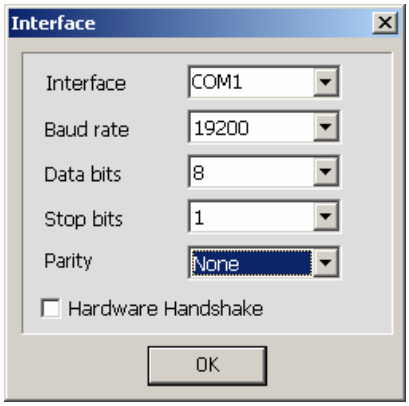
The help also contains the complete command reference for the extended INSYS AT commands.

4.1.2 Menus

File

The current settings, as displayed in the HSComm user interface, can be saved as a file and read out again.

Send file transfers a file to the INSYS GSM 4.0, e.g. for a flash update of the firmware (see chap. 5.8 – with hardware handshake)

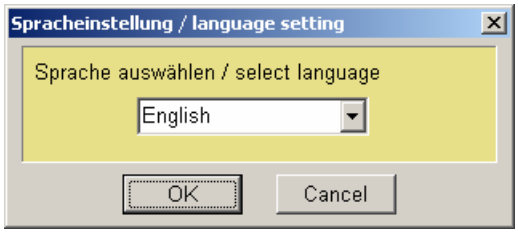


Interface

Setting of the serial interface which is used at the configuration PC. The baud rate and the format (data bits, stop bit, parity) have to match with the settings of the serial interface at the INSYS GSM (see chap.4.2.8).

Error

If the configuration was not successful plain text messages are displayed.



Language

Selection of the HSComm user interface language: German or English. The setting has no effect on the functionality of the INSYS GSM 4.0

PLC

Recommended settings and explanations for the use of the INSYS GSM with the PLCs of leading manufacturers. The INSYS GSM is typically used as communication device at the PLC. The settings can be adapted to own requirements.

These settings are only transmitted by pressing the button *configure modem/GSM at PLC side* at this page.

Overview

All current settings of the HSComm are displayed. The output extends over several screen pages and can be saved as text file.

Note: Read out the settings of your device and have this overview ready when contacting the hotline!

4.1.3 Status Bar

The status bar at the lower window border of the HSComm displays the setting and activities of the serial interface. RX and TX light up synchronous when receiving and sending data.

4.1.4 Buttons

Send settings

The current settings in the HSComm are transferred to the INSYS GSM 4.0.

The settings in the PLC window are only transferred on hitting the button *configure modem/GSM at PLC side*.

Read settings

The current settings of the INSYS GSM 4.0 are read out and displayed in the HSComm.

Send default settings

The factory default settings are loaded and a reset is executed. The device logs in into the GSM network again afterwards if the PIN is stored.

Reset

Software reset of the INSYS GSM 4.0. The device logs in into the GSM network again if the PIN is stored.

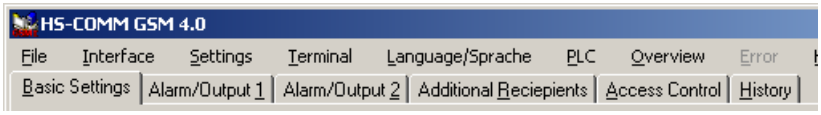
Synchronize

The serial interface of the INSYS GSM 4.0 and the connected device have to be configured equally. With synchronize, all possible settings of baud rates and data format at the PC side are tested through until both sides match.

Abort

Terminates an ongoing configuration process (*Send settings, Read settings, Send default settings* – indicated by the progress bar above the buttons).

4.1.5 Tabs



The settings of the basic and extended settings are spread across several pages, which can be selected via the tab titles. The settings are transmitted to the INSYS GSM 4.0 only after pressing the button *Send settings*.

The functions are described in detail in the chaps. 4.2 to 4.7.

4.2 Basic Settings

4.2.1 GSM Connection

PIN

The INSYS GSM 4.0 can store the PIN of the SIM card internally and logs in into the GSM network automatically when starting up.

To enter, activate *new PIN* and enter the PIN. Instead of the digits, only * are displayed. The default setting is "0000". If the INSYS GSM 4.0 has stored a PIN, the option *PIN active* is checked.

A PIN stored in the INSYS GSM 4.0 is deleted by *delete PIN*. So, the operation with SIM cards without PIN is also possible.

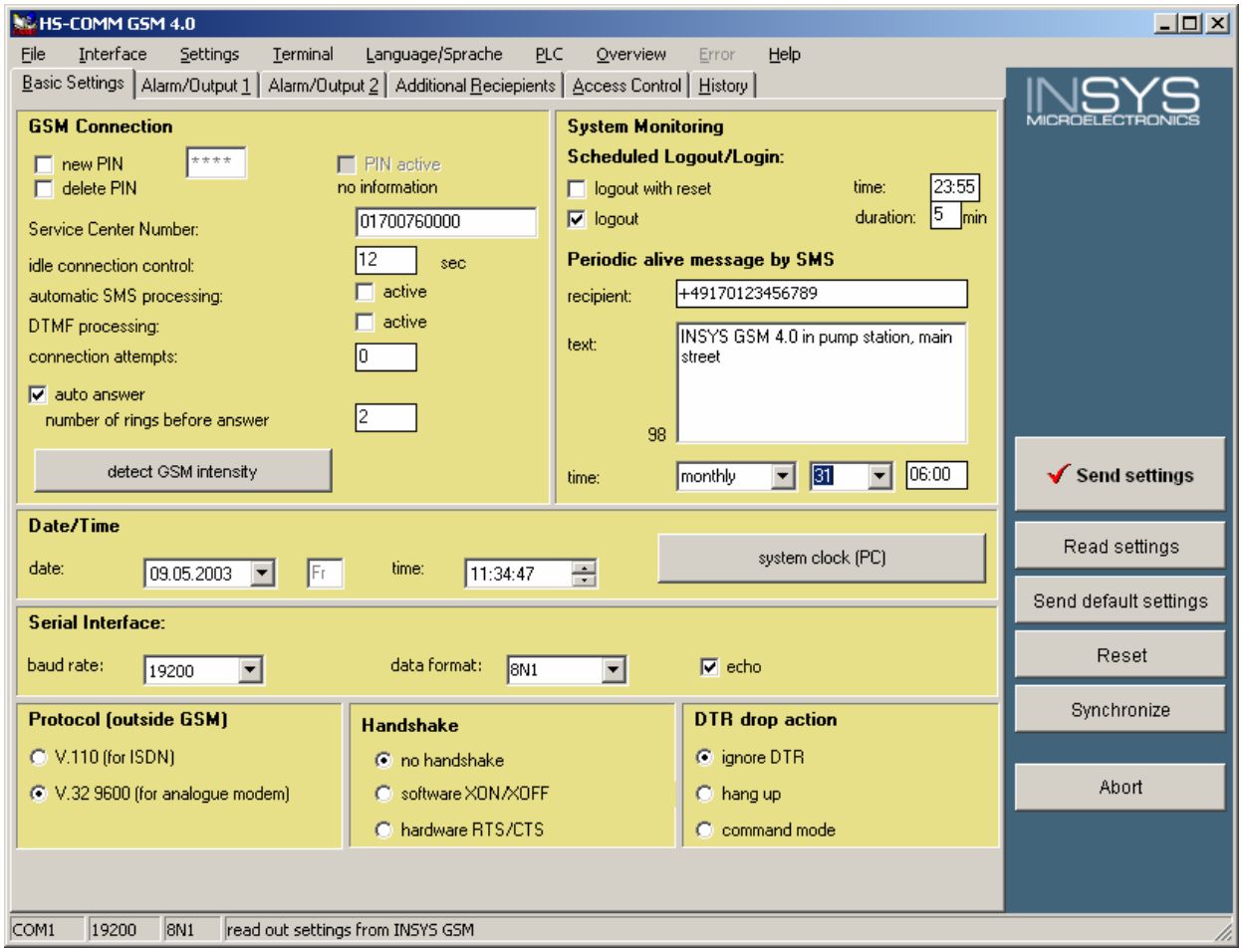
PIN active indicates that a PIN is stored. Below is the login state in the form:

GSM: registered	ready for operation
GSM: rejected	GSM network does not allow access
GSM: not registered	SIM accepted but no access to GSM network
GSM: network search	Radio contact with GSM network too poor ➔ relocate antenna position
PIN missing	Enter PIN number of the SIM card and restart device
PUK required	PIN of the SIM card is locked after repeated false attempts. You need the PUK, which you find in the contract documents of your GSM provider, to unlock. Take out the SIM card and enter the PUK using the menu of any mobile phone. Absolutely ensure afterwards that the correct PIN is stored in the INSYS GSM.

Service Center Number

Entering the number of the SMS service center (SMSC) of the own GSM provider is required for sending alarm messages via SMS. Enter the number in international format +49...

The data for your SIM card are in the contract documents of your GSM provider. Usual SMSCs are listed in chap. 7.



idle connection control

Hanging connections, over which no data is exchanged anymore, can be terminated automatically by the INSYS GSM after a waiting period.

Entry: Waiting time in seconds, after which a data connection is terminated automatically The timer will be reset by every character which is transmitted via the serial interface (both directions).

0	deactivated
1..255	activated

automatic SMS processing

Incoming SMS messages are read out once per minute. Each SMS is checked for usability (configurations, query alarm input, setting switch output) and possible validity (format, password, selective call acceptance). After processing, a response SMS is sent (if applicable) and the SMS is deleted from the storage location.

If the SMS is not usable, it will be deleted from the SMS buffer immediately.

The usage of the SMS reception by the user application is only possible in a restricted way – the user application must query the SMS before it is processed and deleted

automatically. The GSM engine is operated in the operation mode **`AT+CMGF=1`** (SMS text mode).

Any activity at the serial interface (AT commands) restarts the query interval without executing the query. No query is made during an active data connection.

During the SMS query commands, which come in at the serial interface, are ignored and the LED **`Status`** flashes. The query takes approx. 5 sec. without processing.

Incoming SMS messages are optionally protected by the remote configuration password (see chap. **4.6**).

DTMF processing

The INSYS GSM 4.0 is ready to detect and process incoming DTMF tones for a voice connection. (The number for voice connection has to be dialed.)

The following extended responses are displayed instead of **`RING`** for activated DTMF processing:

`+CRING: VOICE` for voice/DTMF connections

`+CRING: REL ASYNC` for data connections

The DTMF functions are optionally protected by the DTMF PIN (see chap. 4.6).

connection attempts

The number of attempts to connect if the remote terminal does not answer. This setting is effective for:

- Dispatch of messages (alarm or periodic alive SMS)
- Connection set-up for alarm messages via a data connection
- Connection set-up for security callback

Possible values are 1 .. 12, default is 3.

The dispatch will only be attempted once for an acknowledgement SMS after a configuration via SMS.

auto answer

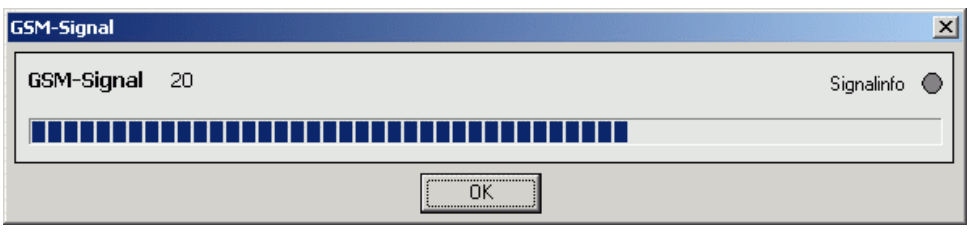
A data call is accepted by the INSYS GSM 4.0 after the set number of ring tones. (Incoming voice calls are automatically accepted with enabled DTMF processing.)

0 off

2..255 on

detect GSM intensity

The actual field strength of the GSM signal is read out and displayed graphically.



Values below 12 are poor – the antenna location should be improved. The value 99 stands for not ascertainable field strength, e.g. for network loss or damaged antenna.

4.2.2 System Monitoring

Scheduled Logout/Login

The INSYS GSM 4.0 logs out for a short period and logs in again daily to allow maintenance functions of the GSM provider. Enter the logout time and the duration (1 to 98 minutes). A reset can be executed after logout alternatively.

Subsequently, the INSYS GSM logs in into the GSM network again, if the PIN of the SIM card is stored.

Periodic alive message by SMS

The INSYS GSM can send a periodic alive message to the entered phone number as SMS message daily, weekly or monthly. The LED **`Status`** is flashing during the dispatch.

4.2.3 Date/Time

Setting date and time of the real time clock of the INSYS GSM 4.0 manually or to the system time of the configuration PC.

4.2.4 Echo

All commands which are transmitted to the INSYS GSM 4.0 via the serial interface are returned at the serial interface again to allow a better overview in terminal operation with echo.

4.2.5 Protocol (outside GSM)

For a data connection with a device outside the GSM network (analog modem or ISDN TA) the right protocol has to be selected. This setting is not important for data connections with a GSM device.

4.2.6 Handshake

The handshake controls the data flow at the serial interface while the data rate is too high at the moment. Software handshake controls the data flow by control characters (XON/XOFF) via the data lines, hardware handshake using separate control lines RTS/CTS.

Overflowing data is ignored without handshake.

Attention: Handshake has to be deactivated, if the INSYS GSM 4.0 is operated *standalone* – i.e. without connection via the serial interface.

4.2.7 DTR drop action

The control line DTR of the serial interface indicates whether a device (configuration PC, control) is connected with the INSYS GSM and active. The setting controls the behavior when the DTR signal is missing, e.g. when the terminal device (PC, control) is disconnected.

Attention: Reaction on DTR has to be inactive, if the INSYS GSM 4.0 is operated *standalone* – i.e. without connection via the serial interface.

4.2.8 Serial Interface

Settings of the serial interface of the INSYS GSM 4.0. The baud rate and the format (data bits, stop bit, parity) have to match with the settings of the serial interface at the connected device.

AT commands	
AT&D	Function type of the control line DTR
ATALIVE**	Periodic alive SMS
ATBAUD**	Baud rate of the serial interface
ATDATE**	Date
ATDAY**	Weekday
ATDIAL**	Dial-up attempts for periodic alive or alarm messages
ATDTC**	Idle connection control (Data Transmit Controller)
ATDTMF**	Enable DTMF processing
ATFORMAT**	Data format of the serial interface
ATGSMREQ**	Periodical query of the field strength and the login state in the GSM network
ATLOGOUT**	Timer-controlled logout / login again or device reset respectively
ATPIN**	PIN of the SIM card
ATSCN**	SMS service center number
ATSIGNAL**	GSM signal field strength
ATSMSRX**	Automatic SMS reception processing
ATTIME**	Time

AT commands	
AT\Q	Data flow control of the serial interface
ATE	Set command echo
ATS0	Automatic call acceptance

4.3 Alarm

The INSYS GSM 4.0 has two independent digital inputs for alarm detection. Alarms are triggered by connecting an alarm input to ground. The alarm input is on HIGH potential by a pull-up resistor in open state.

In case of an alarm, an alarm message can be dispatched or the switch output (see chap. 5.3) can be activated.

4.3.1 Alarm Trigger

Simple alarms are triggered by connecting the input to ground.

The INSYS GSM 4.0 can distinguish pulse sequences from 1 to 10 pulses as pulse counter and assign these to 10 different alarms. The pulses and pauses can have a length from 0,3 to 2 seconds.

4.3.2 Alarm Transmission By

SMS: Dispatch of an SMS to the entered phone number. For pulse input, the message text and the recipient number are used according to the number of pulses. An SMS can also be sent to a fax device or an e-mail address with support of the GSM provider.

For the fax dispatch, start the fax number with the fax prefix of your GSM provider (examples see chap. 7)

For the e-mail dispatch, send the SMS to the mail gateway of your GSM provider (examples see chap. 7) and start the SMS text with the e-mail address of the recipient, followed by one space character and the message.

Many network providers transmit SMS messages to fixed network numbers as voice messages.

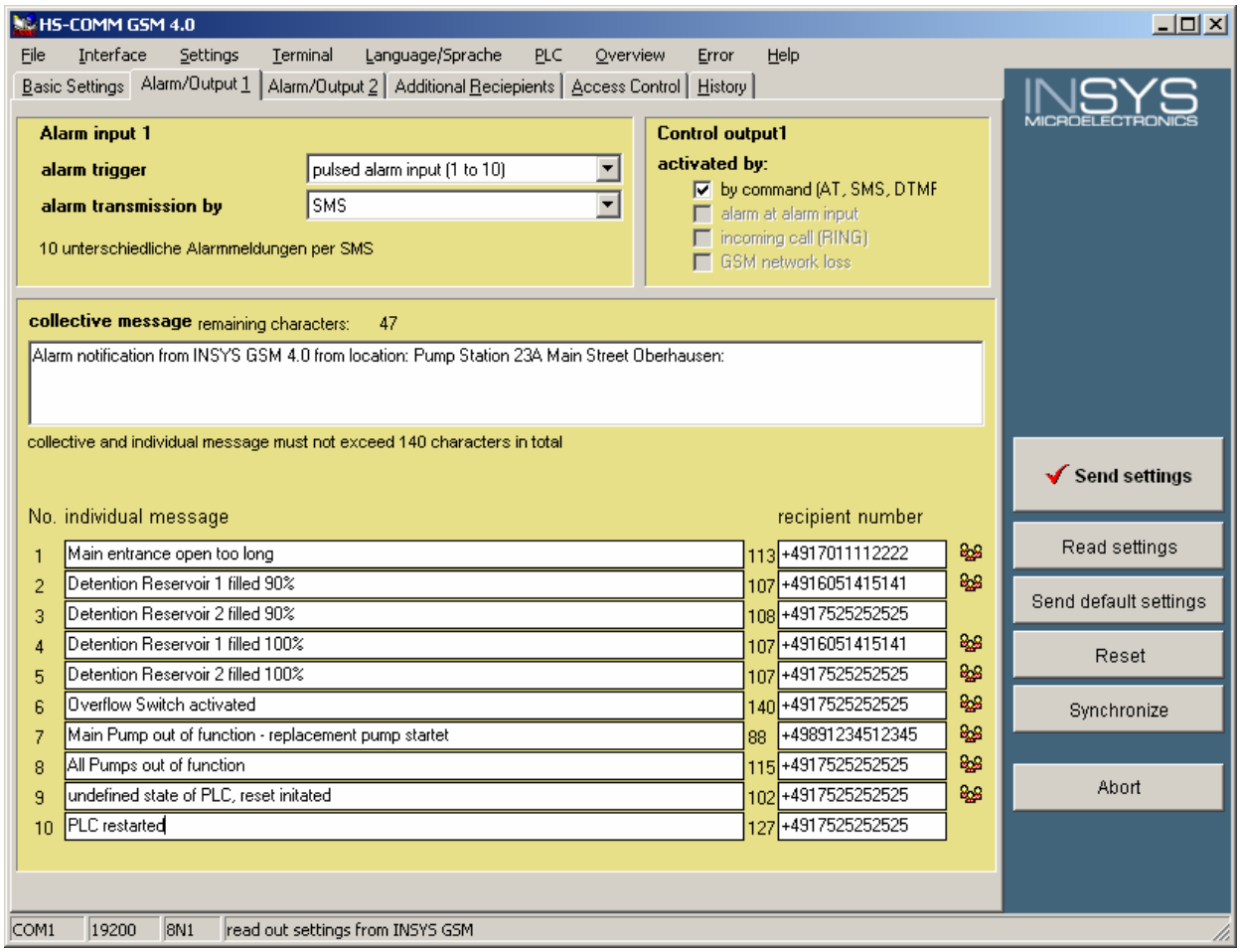
Data connection short: A data connection will be established and the message will be transmitted as plain text. After this, the connection will be terminated.

Data connection long: A data connection will be established and the message will be transmitted as plain text. The connection will be terminated when the alarm input is inactive again. The connection can also be terminated by the idle connection control (Data Transmit Controller) (chap. 4.2.1).

Voice: A voice connection will be established and is heldmaintained as long as the alarm input is active. The connection for a handset is on the front (chap. 2.3.7)

4.3.3 Individual Message

Alarm message – for pulse alarms 10 different texts according to the number of pulses.



4.3.4 Collective Message

All alarm messages start with this text for pulse alarm; the message text according to the number of pulses will be added. Collective message and individual messages may both have a length of up to 140 characters – but only the first 140 characters of the composed message will be sent.

4.3.5 Recipient Number

Phone number of the recipient.

Data connection:	GSM, ISDN or modem number
SMS:	Mobile phone or fixed network number*, fax prefix*+fax number, mail gateway* (*support of the GSM provider required, see chap. 7)
Voice:	Mobile phone or fixed network number

10 further recipients from the number pool (see chap. 4.4) can be assigned to each alarm.

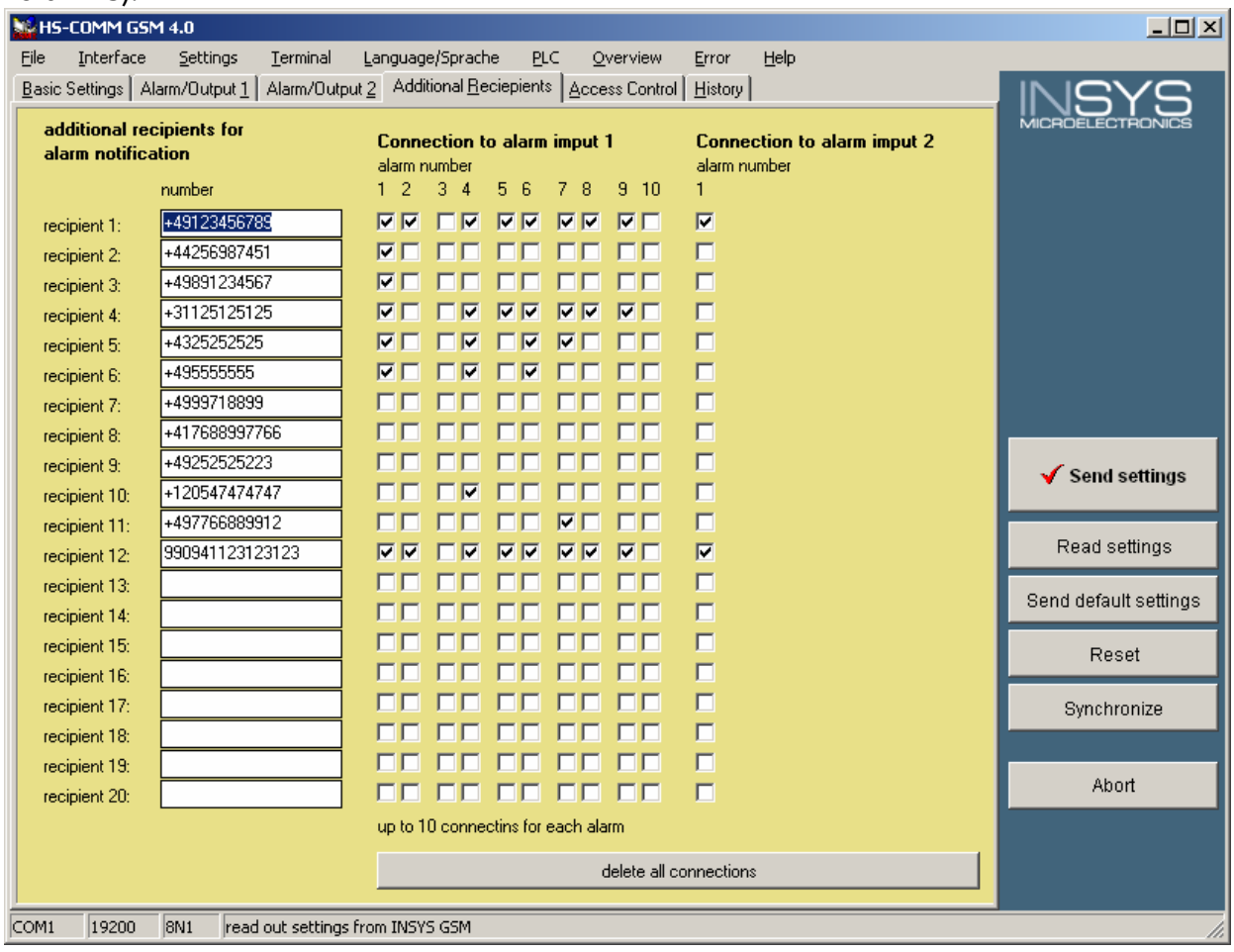
If further recipients are activated, the symbol  is displayed besides the phone number.

AT commands	
ATINPUT**	Configuration of the alarm inputs
ATMSG**	Alarm message texts
ATDST**	Main target number for alarm messages
ATSMS**	Manual SMS dispatch of the stored alarm messages

4.4 Additional Recipients

Each alarm, which is sent via SMS or short data connection, can be transmitted to 10 further recipients from the number pool besides the main recipient (see chap. 4.3). The number pool consists of 20 recipient numbers.

The additional recipients (in lines) are combined with the available alarm messages (in columns).



A maximum of 10 additional recipients can be assigned to each alarm message.

The button *delete all connections* deletes all entered combinations.

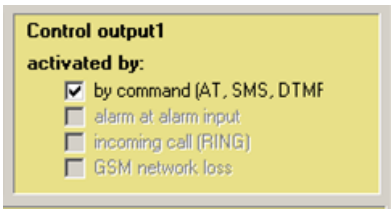
AT commands	
ATCOMBINE**	Combination of the alarm text with a target number from the number pool
ATPOOL**	Phone number pool for alarm messages

4.5 Switch Output

The INSYS GSM 4.0 provides two relay SPDT (single pole double throw), which can be switched via command or the state of the device. The settings for both switch outputs are independent of each other.

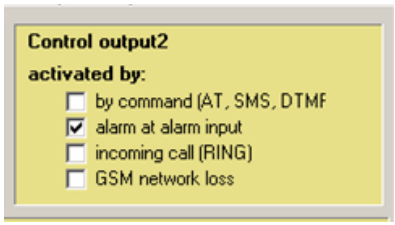
4.5.1 Activated By Command

If activated by AT command, SMS or DTMF is activated, the further options (4.5.2) can not be selected anymore. The operation of the switch output is described in chap. 5.3. The processing of SMS messages and DTMF tones has to be enabled under *Basic Settings* (see chap. 4.2.1).



4.5.2 Activated By State

These options can be selected only when explicit activation by AT command, SMS or DTMF is not enabled (4.5.1). The switch outputs are switched to normally open and updated when the next event occurs accordingly. The switch output becomes active (normally open) as soon as one of the following states occurs:



alarm at alarm input

The switch output will be activated during the processing of alarm functions (alarm input 1 → switch output 1, alarm input 2 → switch output 2). This allows to signal that the alarm input is busy to an external device.

incoming call (RING)

An incoming RING signal switches the switch output active. This allows to switch an external signal (lamp, horn).

GSM network loss

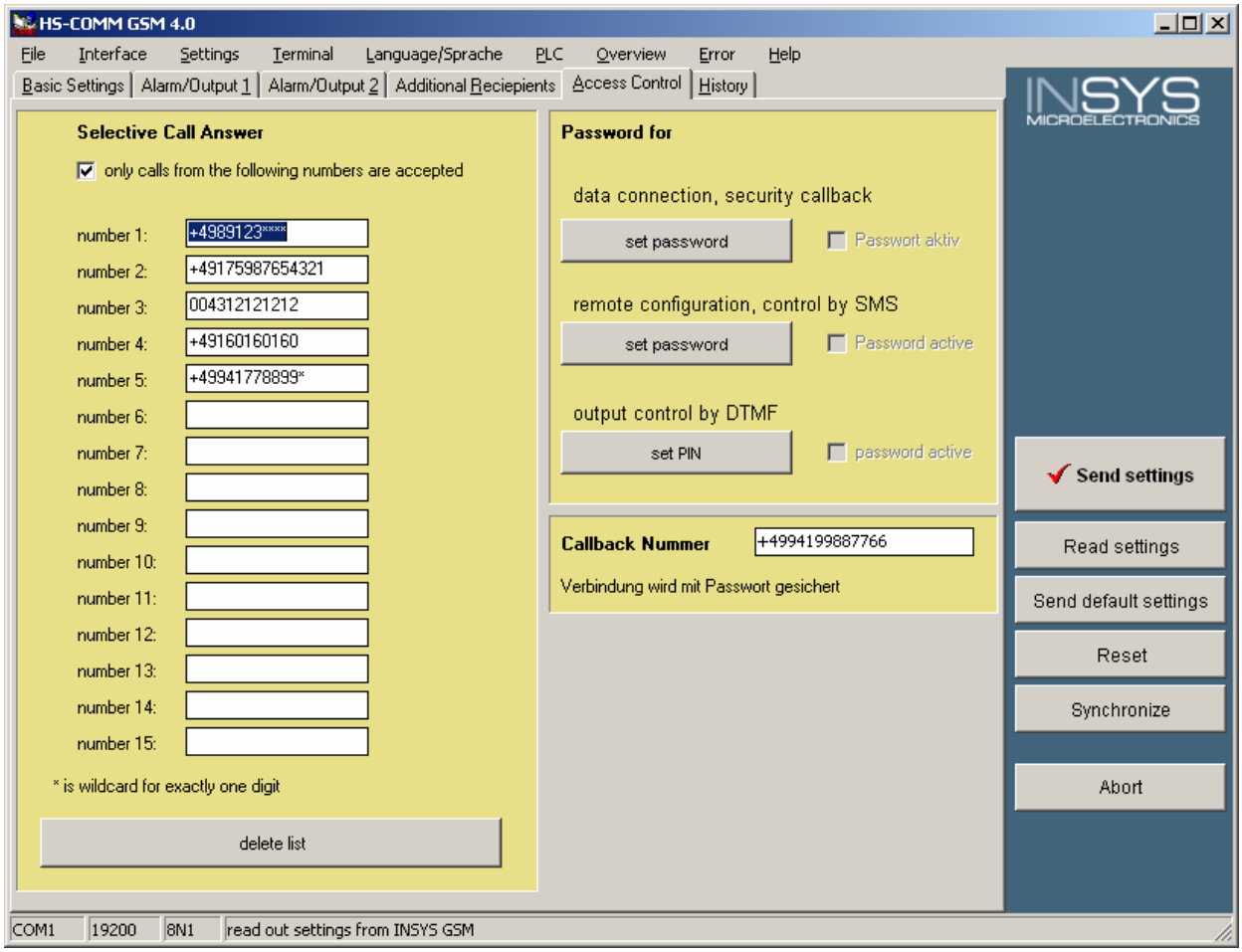
The output will be switched for GSM network loss. Update like LED **Status** (60 seconds) for inactivity.

AT commands	
ATOUTPUT**	Configuration of the switch outputs
ATOUT**	manual switching of the outputs

4.6 Access Control

4.6.1 Selective Call Answer

If this option is selected, only connections are accepted from the entered phone numbers. The caller has to activate the calling line identification presentation (CLIP). The selective call acceptance is also valid for data and voice connections as well as incoming SMS commands (see chap. 5.4.1).



Incoming calls of numbers which are not allowed are displayed until the caller ends the signaling. They can neither be accepted manually (**ATA**).

The selective call acceptance is active after a device reset only. The GSM engine works with the setting **AT+CLIP=1** then. Phone number of incoming calls are displayed additionally:

RING

```
+CLIP: "+49941560061",145,,,,0
```

The allowed number has to be entered in exactly the same format as it is output for a call with “+CLIP: ....” (without ””). The transmitted format of the number may depend on the provider – e.g. the leading “+49” may be replaced by “0049”. It is absolutely recommended to verify the number by a test call.

It is possible to allow whole blocks of numbers: The wildcard character „*****“ replaces one sinlge digit.

4.6.2 Passwords, DTMF PIN

Besides the PIN for the SIM card (see chap. 4.2.1), which controls the access to the GSM network, the INSYS GSM 4.0 manages three other passwords/PINs to control the access:

data connection, security callback

This password controls

- incoming data connections
- triggering the security callback (see chap.4.6.3)

The password consists of a maximum of 16 characters.

If an incoming connection is accepted and established, the caller is asked to enter the password after 2 seconds:

`SECURITY CALLBACK` (only when callback is active)

`REMOTE PASSWORD:`

If no valid password is entered within 60 seconds, the connection will be terminated. A valid password is acknowledged by **`OK`**.

If no security callback number is entered (see chap. 4.6.3), the connection is now free for data transmission.

If a security callback number is entered, the existing data connection will be terminated and a new connection to the security callback number will be established after 30 seconds. If this connection is established, the message **`CALLBACK IN PROGRESS`** will be transmitted after 2 seconds and after further 2 seconds the interface is free for data transmission. If the remote terminal is busy, the dial-up will be repeated according to the setting *connection attempts*.

The LED **`Status`** is flashing during the security callback process.

remote configuration, control by SMS

This password controls

- the change to remote configuration via data connection
- the acceptance of SMS messages to switch and query the inputs/outputs (see chaps. 5.2.5, 5.3)
- the acceptance of SMS messages with extended AT** commands

The password consists of a maximum of 16 characters.

The remote configuration mode is initiated by the escape sequence (default ***) during a data connection (see chap. 5.1.1).

output control by DTMF

The DTMF PIN controls the access to switch and query the inputs/outputs via DTMF tones during a voice connection. The DTMF PIN consists of 4 digits.

4.6.3 Security Callback

If a number is entered, the data password is queried for all incoming calls and the connection is terminated then. If the password has been entered correctly, the INSYS GSM 4.0 establishes a data connection to the entered number subsequently.

The security callback number is independent of the number of the caller, which triggers the security callback.

Outgoing calls from the INSYS GSM 4.0 are not affected.

AT commands	
ATPASS**	Password
ATCLIP**	Selective Call Answer
ATDIAL**	connection attempts
ATCALLBACK**	Target number security callback

4.7 History

The ring buffer contains the last 100 entries. The buffer will be deleted when resetting to factory settings. The entries are displayed on 1 to 2 pages in chronological order.

text export

The displayed data can be stored as text file. Have this data ready for technical support.

History

The current values from the internal history list are read out and displayed.

The INSYS GSM records the following events continuously in a ring buffer.

Cause	Detail	Meaning
SYSTEM	RTC ERROR	internal real time clock empty (time stamp empty)
	RTC RESET	internal real time clock has been reset since the goldcap was discharged (power reserve used up) time stamp: 00:00:00 01.01.03
	GSM ERROR	Instruction from controller to GSM engine could not be processed correctly (e.g. AT command, dial-up, SMS dispatch...)
	SIGNAL ERROR	Field strength not ascertainable (**AT**SIGNAL?**: 99)
	LOGOUT	GSM engine logged out (update interval like STATUS LED)
	LOGIN	GSM engine logged in (update interval like STATUS LED)
	REMOTE PARAM	Remote configuration starts (*** detected)
	ALIVE	Alive SMS process starts
	POWER UP	Power Up or reset executed
SECURITY	DPW ERROR	Data password has been entered wrong or timeout expired
	PPW ERROR	Configuration password has been entered wrong or timeout expired
	TPW ERROR	DTMF PIN has been entered wrong or timeout expired
	CLIP ERROR	Call with invalid (rejected) phone number
	SECURITY CALLBACK	Security callback process starts
ALARM	Start	Alarm at alarm input detected
	End	Alarm at alarm input processed
VOICE	Start	Outgoing voice connections Incoming voice connections for activated DTMF processing Number for outgoing calls Number for incoming calls for activated selective call acceptance
	End	Voice connection terminated
DATA	Start	Data connection outgoing or incoming; incoming number only available for activated selective call acceptance

Cause	Detail	Meaning
	End	Data connection terminated
SMS	- -	Alarm or periodic alive SMS dispatched
	PARAM	SMS for configuration has been received*
	QUITT	SMS with the text QUITT has been received*
	QUITT	SMS for acknowledging an configuration SMS has been sent*
DTMF	PARAM	DTMF command has been detected

*) automatic SMS processing has to be activated.

The following columns of the history list are displayed additionally:

Dir

Direction of the recorded event: IN stands for incoming, OUT for outgoing calls and SMS messages.

Number

The involved phone numbers, alarm inputs and number of pulses are recorded when applicable.

Time/Date

Time stamp of the internal clock

AT commands	
`AT**HISTORY`	Read out history list

5 Functional Description

5.1 Operating Modes

The INSYS GSM 4.0 provides the following three operating modes – the configuration mode of earlier versions has been dropped with the integration of the extended INSYS-AT** commands.

5.1.1 Command Mode

Offline

The online command mode is the state after switching on or resetting the INSYS GSM 4.0. The INSYS GSM 4.0 can be accessed by AT commands in the AT command mode.

Online

The INSYS GSM 4.0 can be changed to online command mode during a data connection by entering the escape sequence <1 second pause>**+++**<1 second pause> via the serial interface. The data connection remains established, but can be terminated by entering **ATH**. The INSYS GSM 4.0 changes back to connection mode by **ATO**.

Remote configuration

The INSYS GSM 4.0 can be changed to remote configuration mode during a data connection by entering the escape sequence <1 second pause>*******<1 second pause> via the data connection from the remote terminal. Extended INSYS AT** commands are processed at the remote INSYS GSM. The INSYS GSM 4.0 changes back to connection mode by **AT**EXIT**.

The remote configuration password is requeried before changing to the remote configuration mode if it has been set.

SMS configuration

If the INSYS GSM 4.0 is in command mode (offline), it can also receive extended INSYS AT** commands via SMS. Syntax see chap. 5.4.1

5.1.2 Connection mode (online)

In connection mode the asynchronous byte stream between the serial interface of the INSYS GSM and the remote terminal is exchanged transparently. The INSYS GSM 4.0 can change to command mode by the local escape sequence **+++** as well as to remote configuration mode by the remote escpace sequence ******* during a data connection.

Connection set-up

ATD015265241	Dial number to which a connection is to be set up (always with dialing code). The phone number is to be closed with a semicolon only for voice connections.
	The cursor is displayed, as long as the other phone rings.
CONNECT 9600/RLP	The call has been accepted. The data is exchanged over the GSM network.
+++	Changing from data mode to online AT command mode. The connection still remains, but no characters are transmitted to the other modem anymore.
ATH	Hang up (terminate connection)
ATO	Return to data mode.
NO CARRIER	The other party has terminated the connection.

Connection termination

Connections can be terminated as follows:

- manually by the **ATH** command in online command mode
- if the remote terminal hangs up
- by the idle connection control (Data Transmit Controller)
- by activating an alarm input
- by DTR drop

5.1.3 Alarm State

As soon as an alarm input of the INSYS GSM 4.0 has been activated, data and voice connections are terminated. Incoming commands are ignored during the processing of the alarm actions. If an input is activated while processing an alarm at the other input, the second alarm state is saved and executed subsequently.

If an connection cannot be established, a re-dial is attempted after 1 minute until the defined maximum number of dial-up attempts is reached.

The LED **Status** is flashing during the (attempted) connection set-up.

AT commands	
*******	Call of the remote configuration mode
+++	Call of the online command mode
ATEXIT**	Exiting the remote configuration mode
ATO	Exiting the online command mode
ATPASS**	Password for remote configuration

AT commands	
AT**ESC	Escape character for remote command mode

5.2 Alarm Functionality

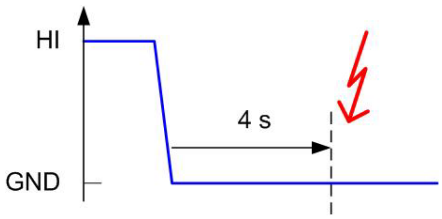
The INSYS GSM has 2 independent alarm inputs, which are pulled to HIGH by pull-up resistors in open (inactive) state. The alarm inputs are activated by connecting to ground.

5.2.1 Alarm Release

Each alarm input can be configured as simple alarm input or as pulse input (see chap. 4.3.1).

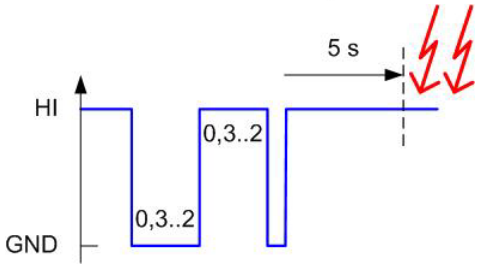
Simple alarm input

A simple alarm is triggered by changing the alarm input from HIGH to LOW/GND. The alarm is accepted after 0,3 seconds. Even in case it is configured as pulse input, a simple alarm is triggered as soon as the input is connected to ground for at least 4 seconds.



Pulse input

Sequences of up to 10 pulses can be detected as different alarms at the pulse input. Pulses and pauses may last from 0,3 to 2 seconds.



The pulse input can be used particularly to transmit several alarm states from small PLCs like SIEMENS Logo!™ or Moeller Easy™. A demonstration program for creating such pulse sequences with the PLC “Siemens Logo” is available on request (e-mail to insys@insys-tec.de).

5.2.2 Alarm Actions

When detecting an alarm state, the following actions can be configured (see chap. 4.3.1:

Alarm action	Simple alarm	Pulse alarm
Set-up of a long data connection (remains established after transmitting the message as long as the alarm is active)	✓	-
Set-up of a short data connection (will be terminated immediately after transmitting the message)	✓	✓
Dispatch of an alarm message as SMS	✓	✓
Set-up of a voice connection	✓	-
Switching the corresponding switch output	✓	✓

Requirements for sending an SMS are:

- valid number of the SMS service center SMSC (see chap. 4.2.1)
- valid recipient number

- text of the alarm message is defined
- existing connection with GSM network
- DTR behavior and handshake deactivated if no device is connected via the serial interface.

An existing data connection will be terminated before an alarm message will be dispatched via SMS or data connection or a voice connection will be established.

If no connection can be established, as much dial-up attempts will be made as configured under *basic settings* (chap. 4.2.1) in intervals of approx. 60 seconds.

The LED **`Status`** is flashing during the alarm processing.

5.2.3 Main Recipient Of An Alarm Message

The following terminal devices can be recipients of an alarm message:

- Mobile phone as SMS recipient in the GSM network or for voice connection
- Fax device (via SMS)
- E-mail recipient in the internet (via SMS)
- Fixed network phone as SMS recipient (voice output by network provider) or for voice connection
- Analog Modem, ISDN TA or GSM device for data connections

The SMS transmission to a fax device or an e-mail address requires the support by the network provider (see chap. 7). The voice output of SMS messages in the fixed network has to be supported by the network provider as well.

5.2.4 Further Recipients Of An Alarm Message

Each alarm message, which is dispatched by SMS or short data connection, can be sent additionally to 10 further recipients from a pool of 20 numbers.

The alarm messages to these additional recipients are all transmitted in the same way (via SMS or short data connection) as to the main recipient.

5.2.5 Querying The Alarm Inputs

The state of the alarm inputs can be queried via AT commands, SMS or DTMF:

AT command

Entering the command **`AT**IN? <CR>`** via a terminal program or the terminal window of HSComm. The responses mean:

OPEN	not activated, open
CLOSE	activated, connected to ground

SMS query (see chap.5.4.1)

The automatic processing of SMS messages has to be enabled (see chap. 4.2.1)

DTMF query (see chap.5.5)

The processing of DTMF tones has to be enabled (see chap. 4.2.1)

AT commands	
ATMSG**	Alarm message texts
ATDST**	Main target number for alarm messages
ATDIAL**	Dial-up attempts for periodic alive or alarm messages
ATSCN**	SMS service center number
ATCOMBINE**	Combination of the alarm text with a target number from the number pool
ATPOOL**	Phone number pool for alarm messages
ATIN**	Set/reset the alarm inputs
ATINPUT**	Configuration of the alarm inputs

5.3 Switch Outputs

The INSYS GSM 4.0 provides two potential-free relay SPDT (single pole double throw) (see chap. 2.3.3), which can be switched via command or the state of the device. Both switch outputs can be configured independently (see chap.4.5).

AT command

Entering the command **AT**OUT[<output>]=<status><CR>** via a terminal program or the terminal window of HSComm with the following parameters.

<output>	1, 2	Switch output OUT1 or OUT2
<status>	0	Switch output on normally open
	1	Switch output on normally open
	PULSE**<xx>**	Switch output is pulsed <xx> times
<xx>	01 .. 10	Number of pulses (two-digit)

This command can also be entered in remote configuration mode via an existing data connection (see chap.5.1.1).

SMS command (see chap. 5.4.1)

The automatic processing of SMS messages has to be enabled (see chap. 4.2.1)

DTMF query (see chap. 5.5)

The processing of DTMF tones has to be enabled (see chap. 4.2.1)

AT commands	
ATOUT**	Set/reset the switch outputs
ATOUTPUT**	Configuration of the switch outputs

5.4 SMS Functions

If the *automatic SMS processing* is activated, incoming SMS messages are checked, as soon as the INSYS GSM 4.0 is not busy with data connection, alarm processing and processing of AT commands for 60 seconds. Incoming SMS messages are optionally password protected (see chap. 4.6.2).

5.4.1 Commands Via SMS

Most of the extended AT commands as well as commands for switching the outputs and querying the alarm inputs can be transferred via SMS to the INSYS GSM 4.0. The response can be sent back via SMS to a user defined number.

Syntax for extended AT commands via SMS:

[<password>,]<command>[,CN: <reply>]

<password> Password for remote configuration and SMS query. If no password is set, the separating comma is dropped also.

<reply> Optional phone number, to which the response is sent via SMS

<command> Extended AT** command with parameters

Examples for switch outputs / alarm inputs:

<command>	AT**OUT1=OPEN	Switch output 1 to normally open
	AT**OUT2=CLOSE	Switch output 2 to normally open
	AT**OUT2=PULSE09	Output 9 pulses at switch output 2
	AT**IN?	Query state of the alarm inputs

5.4.2 SMS Acknowledgement

An SMS in the format of a command SMS, which contains only the text **QUITT** instead of an AT** command after the password, is entered with time stamp and calling number in the history list (see chap. 4.7) if automatic SMS processing is active.

5.4.3 Creating And Receiving An SMS

The INSYS GSM 4.0 can create as well as receive SMS messages via AT commands. The respective commands and parameters are listed in the separate document "AT Command Set For INSYS GSM 4.0" under http://www.insys-tec.com/manual.

Attention: The SMS messages are read out, processed and deleted once a minute by the INSYS GSM 4.0 by the automatic SMS processing.

AT commands	
ATSMSRX**	Automatic SMS reception processing
AT+CMGD	Delete SMS message
AT+CMGF	SMS message format
AT+CMGL	List SMS message
AT+CMGR	Read SMS message
AT+CMGS	Send SMS message
AT+CSCA	Number of the SMS service center
AT^SMGL	List SMS messages (without changing the state)
AT^SMGO	SMS overflow
AT^SMGR	Read SMS message (without changing the state)

5.5 DTMF Functions

DTMF tones (e.g. from a touch-tone phone) can be used via a voice connection to query alarm inputs and to switch outputs. The INSYS GSM 4.0 has to be called using the voice number.

These functions are optionally protected with a PIN (see chap. 4.6.2). If a PIN is set, the PIN (4 digits) has to be entered first after the connection establishment, which is acknowledged with **ERROR** or **OK**.

The following commands (keys) are defined:

0*	Terminate connection
1*1	Switch output 1 to normally open
1*0	Switch output 1 to normally open
2*1	Switch output 2 to normally open
2*0	Switch output 2 to normally open
3*	Query the alarm inputs: response state input 1 – pause – state input 2

Each command is acknowledged with **OK** first. The acoustic responses have the following meaning:

	acoustic	**corresponding keys**
OK	low (short) high (short)	* #

ERROR	low (long)	1
Input inactive (HIGH)	high (medium long)	D
Input activated (LOW)	low (medium long)	1

The processing of DTMF tones has to be enabled (see chap. 4.2.1). Incoming voice calls are automatically accepted for enabled DTMF processing.

AT commands	
ATDTMF**	Enable DTMF processing

5.6 Login / Logout

5.6.1 Automatic Login At Restart

The PIN number has to be stored in the controller to allow the INSYS GSM to log in automatically after a restart/reset (see chap. 3.2, 4.2.1).

The INSYS GSM 4.0 logs into the strongest GSM network by default at every restart or reset. If required, a preferred network can be pre-selected with the command **AT**PROVIDER** (syntax and parameters are listed in the separate document "AT Command Set For INSYS GSM 4.0" under http://www.insys-tec.com/manual).

SIM card change

The PIN must be already changed or deleted before inserting a new SIM card. Otherwise, the SIM card will be locked after three login attempts with the old PIN by the INSYS GSM 4.0.

5.6.2 Timer-Controlled Login / Logout

In order to allow changes in infrastructures and software updates by the network providers, the INSYS GSM 4.0 can be logged out daily at a given time. Subsequently, the device executes a reset or logs in again after a user defined pause. For settings see chap. 4.2.1. If an alarm is activated during this pause at an external alarm input or a periodic alive SMS is due, the module will login again immediately. If the logout time has not been expired, the INSYS GSM 4.0 logs out again afterwards.

The logout procedure will be postponed during active data connections. A voice connection and a communication in AT command mode will be interrupted immediately when logging out.

AT commands	
ATLOGOUT**	Time scheduled logout

5.7 Audio Interface / Voice Connections

The INSYS GSM 4.0 has a standard western jack at the front to connect a phone handset of reference type Handset Siemens Gigaset (see chap. 2.3.7).

The connection is set-up and closed either by AT commands in the terminal program or byan alarm input (*Medium for alarm transport: voice* see chap. 4.3.1).

AT commands	
ATD<nr>;	Set-up connection
ATH	Terminate connection
ATA	Accept call

5.8 Flash Update

The firmware of the INSYS GSM 4.0 can be loaded locally or using a data connection. The firmware exists as file with the suffix **MHX**.

The terminal baud rate has to be set to 19.200 bps for the local flash process. The following responses are returned with this fixed baud rate.

Hardware handshake is absolutely necessary. It has to be noted for remote flash (using the data connection) that hardware handshake is activated for both, the terminal program and the modem of the remote terminal.

ATFLASH**	Entry in terminal
Start Update with Esc, Reset with @	Flash process starts if the **ESC** key is pressed within 60 seconds. This prompt also appears for every restart (with a timeout of 2 seconds).
Expecting download with 8N1	Query for sending

The firmware has to be sent as ***.mhx file.

Settings of the terminal program:

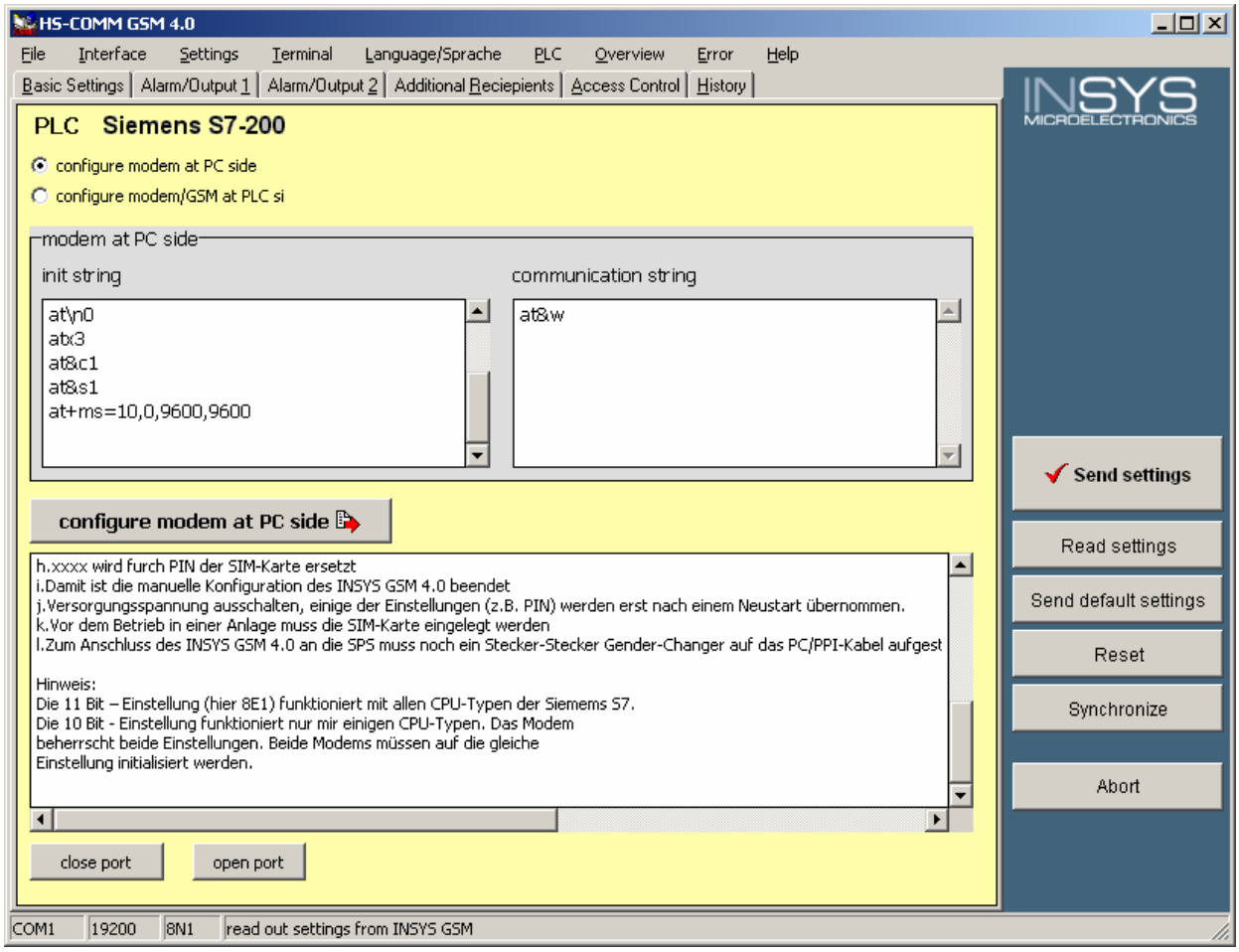
Protocol:	ASCII
Data format:	8N1
Handshake:	Hardware

After the flash process is completed, a full device reset is executed.

If necessary for the adaption, the settings are reset to factory settings.

AT commands	
AT**FLASH	Firmware update of the controller

5.9 Operation With PLCs



The INSYS GSM 4.0 has been tested for the most common PLC systems on the market. The documentation of the settings required for the respective PLC can be queried at INSYS (mailto: insys@insys-tec.de).

At the moment, documentations for the following PLC systems are available:

- Bosch SPS CL400
- Mitsubishi MELSEC FX 2N / 232BD
- OMRON SPS C200HX – CPU44
- PILZ SPS PSS3056
- Schiele SPS S400
- Siemens S7/200
- Systron S200, S250 and S400

6 AT Command Sets

The INSYS GSM 4.0 is configured and controlled using two AT command sets: The *standard AT commands* control the GSM engine to establish data connections using the GSM network. The *extended INSYS AT** commands* control the extensions implemented by INSYS for the digital inputs/outputs, alarm functions, security functions and timer-controlled functions.

The standard AT commands can be entered locally via the serial interface if the device is either in offline state (no active data connection) or on online command mode (interrupted data connection).

The extended INSYS AT** commands can be entered locally as well as remote (remote configuration) and in most cases also via SMS. The configuration via SMS is restricted to commands with responses of up to 140 characters.

The most important standard AT commands and all extended AT commands are listed in the document "AT Command Set For INSYS GSM 4.0" which is available from INSYS MICROELECTRONICS (e-mail to insys@insys-tec.de) and at the internet site http://www.insys-tec.com/manual. The complete command reference for the standard AT commands is also available on request.

The modem guideline V.25 ter is applicable as regards to the time sequence of interface commands. The AT standard is a line-oriented command language. The entry is not context-sensitive. All commands are closed with the carriage return character set with the command **ATS3** (default = <CR> = 0x0D).

Note: Lining up several commands per input line is not possible for the extended INSYS AT commands. Further commands can be sent only, after the processing of the previous command is finished, i.e. the response has been output.

For lining up standard AT commands please refer to the detailed command set of the GSM engine.

The IT commands implemented in INSYS GSM 2.0 are replaced by the extended INSYS AT** commands of the form **AT**name**, changing to configuration mode is not necessary anymore. A replacement table for the IT commands can be found in chap. 6.2.

6.1 Short Description INSYS AT Commands

Command	Short description	Configuration		
		Local	remote	SMS
ATALIVE**	Periodic alive SMS	X	X	S
ATBAUD**	Baud rate of the serial interface	X	X	X
ATCALLBACK**	Target number security callback	X	X	X
ATCLIP**	Selective call acceptance	X	X	S

Command	Short description	Configuration		
		Local	remote	SMS
ATCOMBINE**	Combination of the alarm text with a target number from the number pool (**AT**POOL**)	X	X	S
ATDATE**	Date	X	X	X
ATDAY**	Weekday	X	X	X
ATDEFAULT**	Factory settings of the INSYS AT** commands	X	X	X
ATDIAL**	Dial-up attempts for periodic alive or alarm messages	X	X	X
ATDST**	Main target number for alarm messages	X	X	S
ATDTC**	Idle connection control (Data Transmit Controller)	X	X	X
ATDTMF**	Enable DTMF processing	X	X	X
ATESC**	Escape character for remote command mode	X	X	X
ATEXIT**	Exiting the remote command mode		X	
ATFLASH**	Firmware update of the controller	X	X	
ATFORMAT**	Data format of the serial interface	X	X	X
ATGSMREQ**	Periodical query of the field strength and the login state in the GSM network	X	X	X
ATHISTORY**	History function (event memory)	X	X	S
ATIN**	Querying the alarm inputs	X	X	X
ATINPUT**	Configuration of the alarm inputs	X	X	X
ATLOGOUT**	Timer-controlled logout / login again or device reset respectively	X	X	X
ATMSG**	Alarm message texts	X	X	S
ATOUT**	Set/reset the switch outputs	X	X	X
ATOUTPUT**	Configuration of the switch outputs	X	X	X
ATPASS**	Password Protection	X	X	X
ATPIN**	PIN of the SIM card	X	X	X
ATPOOL**	Phone number pool for alarm messages	X	X	S
ATPROFILE**	Query of the settings of the INSYS AT** commands	X	X	
ATPROVIDER**	Manual GSM provider selection	X	X	X

Command	Short description	Configuration		
		Local	remote	SMS
ATRESET**	Device reset	X	X	X
ATSCN**	SMS service center number	X	X	X
ATSIGNAL**	GSM signal field strength	X	X	X
ATSMS**	Manual SMS dispatch of the stored alarm messages	X		X
ATSMSRX**	Automatic SMS reception processing	X	X	X
ATTIME**	Time	X	X	X
ATVERSION**	Query of the software version	X	X	X

X = completely implemented S = only setting implemented

6.2 Comparison IT Commands / INSYS AT** Commands

The IT commands implemented in INSYS GSM 2.0 are replaced by the extended INSYS AT** commands of the form **AT**name**, changing to configuration mode is not necessary anymore.

IT command	INSYS AT** command	new
ITA	**AT**OUTPUT** **AT**INPUT**	Configuration outputs Configuration inputs
ITA*	**AT**OUT**	Switching also possible locally via command
ITAS	**AT**OUTPUT** **AT**SMSRX**	Automatic SMS reception processing has to be enabled with **AT**SMSRX**
ITB	**AT**BAUD**	Common baud rate for controller and GSM engine
ITD	**AT**DST**	
ITDC	**AT**CALLBACK**	
ITE	not applicable	Standard AT command **ATE**
ITF	**AT**FORMAT**	Common data format for controller and GSM engine
ITI	**AT**IN**	Query also locally
ITM	**AT**DATE** **AT**DAY**	New: weekday with **AT**DAY**
ITN	**AT**MSG**	
ITO	**AT**LOGOUT**	Additional device reset possible

IT command	INSYS AT** command	new
ITP	AT**PIN	4 to 8 digit PIN possible
ITR	AT**PROFILE	
ITS	AT**SCN	
ITT	AT**TIME	Extended (with seconds)
ITU	AT**PROVIDER	
ITV	AT**DIAL	
ITW	AT**PASS	
ITX	AT**EXIT	
ITY	AT**SMS	
ITZ	AT**RESET	

7 Appendix: GSM Provider

In the following you find an overview about the most important mobile providers in Germany, Austria, and Switzerland (state 2002). No responsibility is accepted for the correctness and completeness of this information. The given numbers may only be valid for particular contracts with the network provider.

Please find the current data for your SIM card in your contract documents.

7.1 Service Numbers

Country	Provider	Network	SMS Service Center Number (SCN)	Fax Prefix	Number of the E-Mail Gateway
D	T-Mobile	T-D1	+49 171 076 0000 +49 171 209 2522	99 (German) 98 (English)	8000
D	Vodafone D2	D2 Vodafone	+49 172 227 0000 +49 172 227 0042 +49 172 227 0111 +49 172 227 0010 +49 172 227 0222 +49 172 227 0333	99	3400
D	E-Plus	E-Plus	+49 177 061 0000 +49 177 060 0000 +49 177 062 0000	1551	767 62 45
D	O2	O2	+49 176 0000 443 +49 176 0000 433	329	6245
D	Mobilcom	D1	+49 171 076 0315	1091	1090
D	Mobilcom	D2	+49 172 0227 0880	1091	
D	Mobilcom	E-Plus	+49 177 061 0000	1551	
A	Mobilkom	A1	+43 334 0501 +43 664 0501	-	-
A	max.mobil		+43 676 021	6762	6761
A	One (Connect)		+43 699 000 1999	-	-
CH	Orange	Orange	+41 78 777 7070		
CH	Swisscom	Swiss GSM	+41 79 499 900 0 +41 79 499 812 3		
CH	TDC	Sunrise	+41 76 598 0000		

7.2 SMS transmission to fax and e-mail

An SMS can also be sent to a fax device or an e-mail address with support of the GSM provider.

Examples:

In order to transmit a message via SMS from the T-D1 network to the fax number 0123/456789 select the following settings:

SMS service center:	+491710760000
Phone number:	**99**0123456789 (the leading + is replaced with 00 in international phone numbers)
Message:	160 characters

In order to transmit a message via SMS from the Vodafone network to the e-mail recipient **name@domain.de** select the following settings:

SMS service center:	+491722270000
Phone number:	**3400**
Message:	**name@domain.de** remaining text (a space character has to be after the e-mail address)