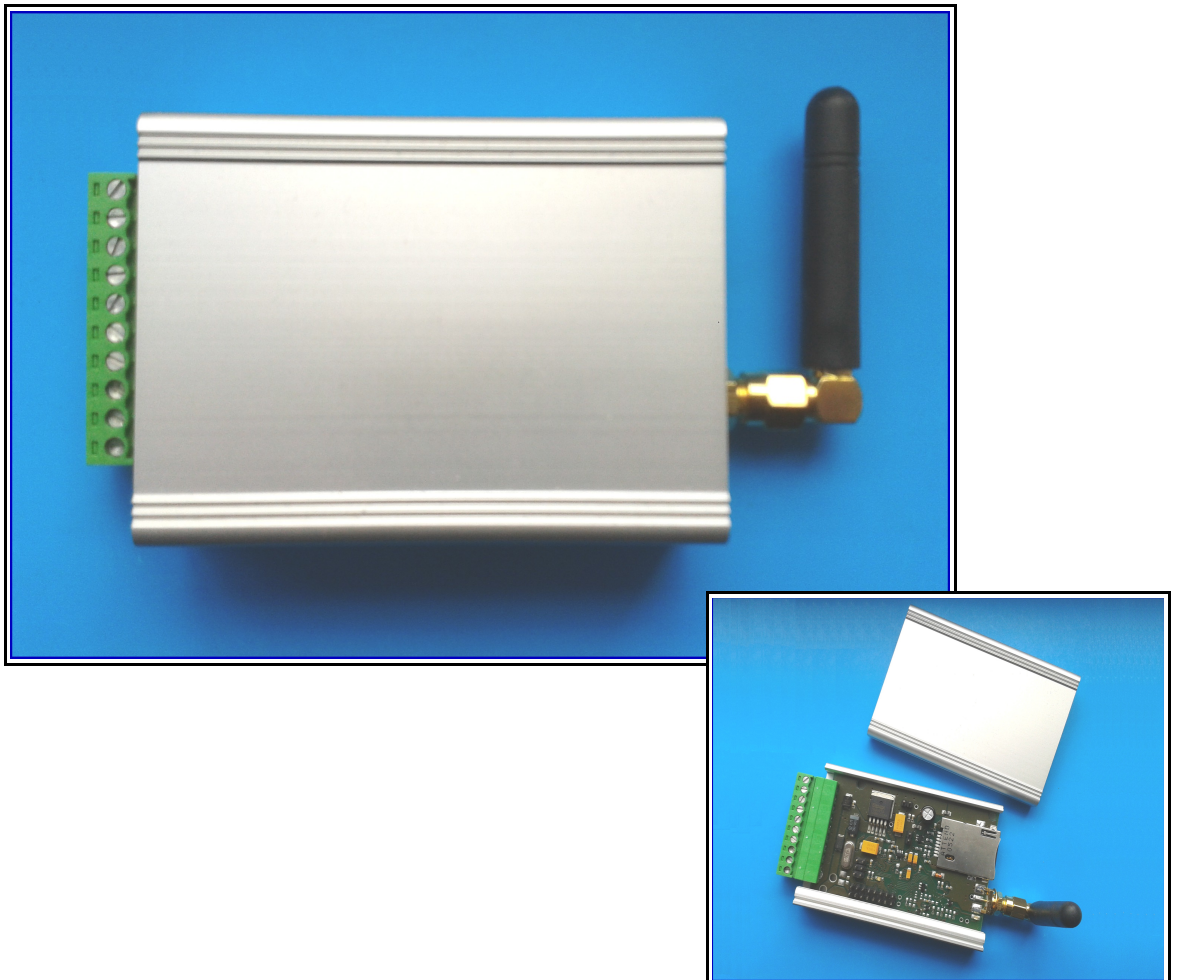Biene Electronics
www.bieneelectronics.com

GSM controller module
for SMS remote monitoring, alarming and control applications

BR900-ST

Preliminary data

Introduction

The BR900-ST controller is a low dimensions low cost GSM communications device that used for wireless alarming, monitoring and control of remote equipments and systems. Multiple users can interrogate the BR900-ST notified on configurable events. The built-in GSM module compatible with dual-band (900/1800Mhz) or quad-band (850/900/1800/1900Mhz) GSM networks.
You can use a mobile phone to - monitor the status of equipment or system, receive notification of events, send control commands to remote equipment, receive information of controlled object to your mobile phone.

GSM module BR900-ST

Features

- Dual or Quad band GSM module SIM900 or compatible
- 4 digital inputs
- 1 analogue input
- 1 Solid State Relay outputs (30V/0.5A max)
  optionally 2 (30V/0.5A max) Open-Drain Mosfet Outputs instead of 1 Solid-State Relay outputs
- On-board power supply voltage monitoring
- Remote programming using SMS
- User definable input alarming text descriptions
- Pluggable screw terminal block for external signal connections
- Push-Push SIM holder
- External stabilised +6...12VDC (14.5V max)
- Board dimensions: 50.5x77.5mm
- Enclosure: FISCHER ELEKTRONIK AKG 55 24 80 ME (optional)

Applications:

- Pumping
- Transformer Station
- Base Stations
- Power Generator
- Refrigerator
- Waster-water Treatment Station
- Unmanned Equipment and System

BR900 Versions

BR900-ST - Standard version
BR900-SMT - Temperature monitoring version
BR900-PT100 - Temperature monitoring version for Pt100 sensors
BR900-RF - RF-control version for wireless remote control switch AC power plugs
BR900-GATE - Gate opener version for Gate control
BR900-GPS - GPS version for position tracking
BR928-DL - Data logger version with extended inputs and outputs and with GPRS data transfer to WEB server
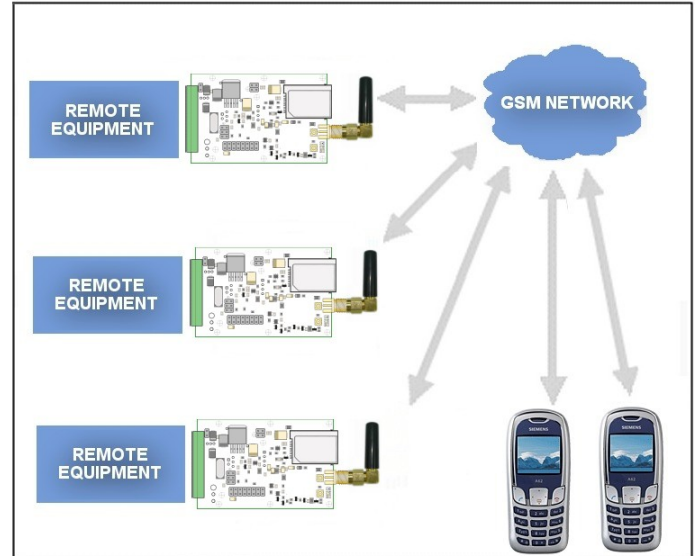
GSM module BR900-ST

SMS Function

SMS controller send an event SMS messages to up to 3 cell phones. Any cell phone can be used to send SMS commands to BR900. Mobile users can contact and request information from a BR900 GSM controller and up to 4 users can receive notification of events.

With the BR900 GSM controller you can use a mobile phone to:

- Monitor the status of equipment or systems
- Send control commands to remote equipment
- Receive notification of events to your mobile phone or WEB server (data logger version)

Any BieneRemote GSM controller can be used to send SMS commands to other BieneRemote GSM controller for remote control.
Any BR900 GSM controller can be programmed via SMS instruction.

Input Signal Monitoring

The BR900-ST has 4 digital inputs that can be configured as:
- 0-1 or 1-0 event input
- two inputs connect with pullup resistor to module power supply
     To receive SMS message by event on inputs, you need enter SMS message on a module (or SIM card) programming.

The BR900-ST has 1 analogue input.
- 0-10V 10 bit resolution Analogue Input
- additional implemented on-board power supply voltage monitoring – 15.5V maximum
          You can set minimum and maximum analogue signal threshold as events.

Output Control

The BR900-ST has 1 Solid State Relay outputs (30V/0.5A max)
Optionally 2 (30V/0.5A max) Open-Drain Mosfet Outputs instead of 1 Solid-State Relay output.
These may be controlled with SMS messages from approved users. To set any output as you like, you need only to send an SMS message.

Module to Module Control

The BR900 supports Module-to-Module management with SMS command.

Users and Administrator

The BR900 supports up to 3 users. Each user can interrogate the device for the current I/O status. Users can be notified based on changes to each input.

Security

The BR900 has a number of in-built security features. Caller ID security provide authentication for device interrogation and control.

Alarm

SMS messages can be sent to users when an input reaches an alarm state. The following setpoint configurations are available:
Alarm when 0-1 or 1-0 event at digital input.
Alarm when above set point at analogue input.
Alarm when below set point point at analogue input.
Alarm when inside set points point at analogue input.

Module Programming/Configuration

The BR900 can be configured (programming) remotely with SMS command.
Configuration options include Alarm Message Content, Users and Administrators Phone Numbers and other.

Technical Specification

BR900 series Hardware Specification

	BR900-ST	BR900-SMT	BR900-RF	BR900-GATE	BR900-GPS	BR928-DL
GSM band support	800/1900Mhz or 800/850/1800/1900Mhz					
Internal GSM module	Dual or Quad band GSM module SIM900 or compatible					
RF Transmit Power	Class 4 (2W) 850/900Mhz, Class 1 (1W) 1800/1900Mhz					
Data transmission	SMS	SMS	SMS	SMS	SMS/FTP/GPRS	SMS/FTP/GPRS
SIM card reader	Push-push					Simple
SIM card type	Phase 1 and phase 2+; SIM 3V / 1.8V					
Antenna Connection	50Ω SMA (f) Connector					
Digital inputs						
Digital inputs type	MOSFET transistor input (20V max)					Darlington transistor input
- Digital inputs	4	2	1	4	4	6
- Events digital inputs	4	2	1	4	4	12
- Digital inputs event	0-1 or 1-0	0-1 or 1-0		0-1 or 1-0	0-1 and 1-0	0-1 and 1-0
- Digital signal filter	Yes					
Temperature sensor inputs						
Temperature sensor	-	SMT160-30	-	-		SMT160-30
Temperature inputs	-	2	-	-		2
Temperature input events	-	min/norm/max	-	-		min/norm/max
Temperature range	-	-45 to +99°C	-	-		-45 to +99°C
Accuracy	-	1.7°C (1.5°C)	-	-		1.7°C (1.5°C)
- Temperature filter		Yes				Yes
Analogue inputs						
Analogue inputs	1	1	-	-	1	3
Analogue input range	0...10V	0...10V	-	-	0...10V	0-10V
Analogue input mode	-	-	-	-	-	0-5V/0-10V 0-20mA (optional)
- Analogue input events	min/norm/max	min/norm/max	-	-	min/norm/max	min/norm/max
- ADC resolution	10-bit	10-bit	-	-	10-bit	10-bit
Outputs						
- Relay Output	-	-	-	-	-	1 (125Vac/24Vdc/0.5A
- Solid State Relay outputs	1 (30V/1A max)	1 (30V/1A max)	-	1 (30V/1A max)	1 (30V/1A max)	-
- MOSFET Open Drain outputs	2 (30V) optionally instead of Solid-State Relay output	2 (30V) optionally instead of Solid-State Relay output	-	2 (30V) optionally instead of Solid-State Relay output	2 (30V) optionally instead of Solid-State Relay output	2 (20V)
- Wireless Outputs (AC remote switch control)	-	-	Up to 5			-
- Output control mode	On-Off; Pulse					
On-board monitoring						
Power supply voltage monitoring	Yes	Yes	Yes	Yes	Yes	Yes
Power supply voltage monitoring range	15.5V max	15.5V max	15.5V max	15.5V max	15.5V max	17.75V max
Temperature monitoring	-	-	Yes	-	-	-
Temperature range	-	-	-40 to +85°C	-	-	-

GSM module BR900-ST

	BR900-ST	BR900-SMT	BR900-RF	BR900-GATE	BR900-GPS	BR928-DL
Wiring						
Wiring Connections	10-way Pluggable Screw Terminal block	10-way Pluggable Screw Terminal block	5.5/2.1 power connector; 2 way pluggable screw terminal	10-way Pluggable Screw Terminal block	10-way Pluggable Screw Terminal block	2x10-way Double row pluggable Screw Terminal block
Power Supply						
Required Power External Supply	+6..12Vdc (14.5Vdc max) stabilised	+5Vdc stabilised	+5Vdc stabilised	+6..12Vdc (14.5Vdc max) stabilised	+6..12Vdc (14.5Vdc max) stabilised	+12Vdc stabilised (+11Vdc min +14.5Vdc max)
Power requirement	50mA typ, 250mA(rms) max, 2A peak typ. (3A max) peak during transmission					
Minimum current recommended	1.2A	1A	1A	1.2A	1.5A	1.5A
Voltage regulator	Internal voltage regulator					
Power protection	Reverse-polarity and over-voltage protection					
Environmental Conditions						
Operating temperature range	-40…+85°C					
Dimensions						
Board dimensions	77.5x50.5mm					
Enclosure	optional	optional	Yes	optional	optional	optional
Enclosure	aluminium	aluminium	aluminium	aluminium	aluminium	aluminium
Enclosure dimensions	80x55x24mm	80x55x24mm	80x55x24	80x55x24mm	80x55x24mm	80x55x32

BR900 series Firmware Specification

	BR900-ST	BR900-SMT	BR900-RF	BR900-GATE	BR900-GPS	BR928-DL
Quantity of controlled outputs	1 (2)	1 (2)	5	1 (2)	1 (2)	3
Quantity of digital event inputs	4	2	1	4	4	6
Quantity of analogue event inputs	1 (+power supply voltage)	1 (+power supply voltage)	-	power supply voltage	1 (+power supply voltage)	3 (+power supply voltage)
Quantity of readable analogue data	2	2	-	1	2	4
Quantity of temperature event inputs	0	2	1	-		2
Quantity of readable temperature data	0	2	1	-		2
Events cell phone numbers	4	4	4		6	7

Hardware

The BR900-ST module consists of the microprocessor, voltage regulator, inputs driver, MOSFET output transistors, built-in GSM module, push-push SIM-card holder, GSM antenna connector, pluggable 10-ways screw terminal for external power supply and input and output signal connection.
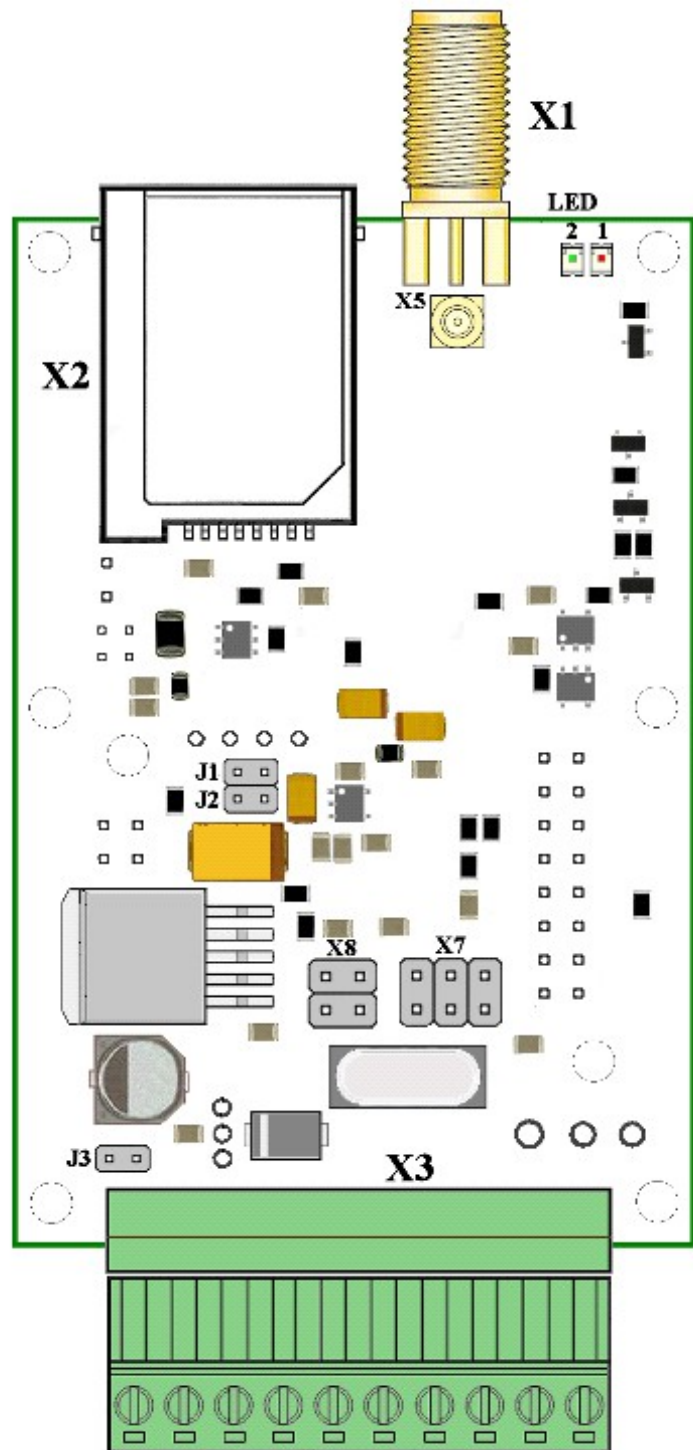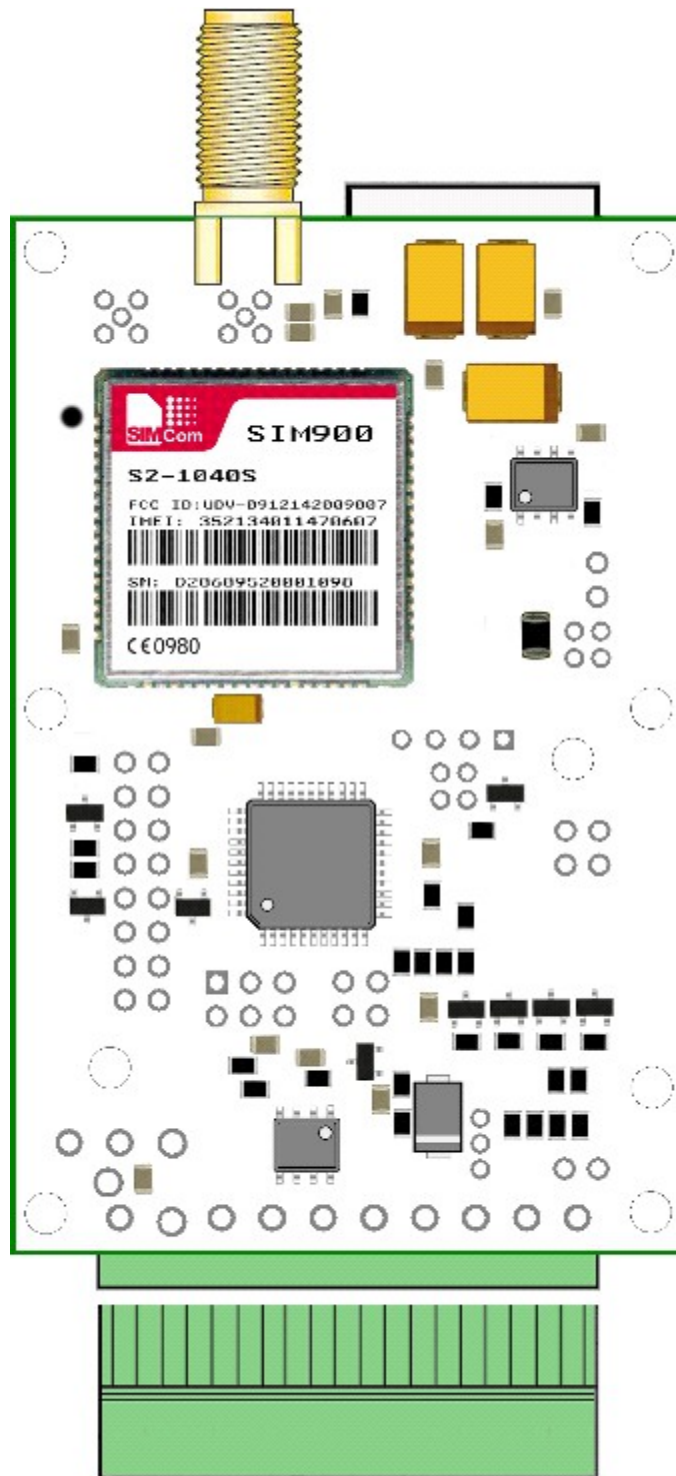
GSM module BR900-ST

Power Supply

The BR900-ST operates from a stabilized power source. It draws less then 50mA standby, less then 300mA rms and 2A peak typ. (3A peak max.). +12VDC/1.2A min switching stabilized power supply is recommended. Power supply input has reverse polarity and over-voltage protection. The BR900-ST can operates also from 6VDC to up to 14.5VDC stabilized power supply.

SIM Card

Small SIM-card with 3V/1.8V technology

Preparation of SIM card

1. Delete any SMS messages from SIM.
2. **Disable PIN code** request so it will not prompt for a PIN code on turning on.
3. First SMS to module **- 2345N1** from your cell phone (store your number)

Note:
- *The BR900 can only be used with small SIM-cards with 3V/1.8V.technology.*
- *For SIM card preparation you can use cell phone or external GSM modem.*
- *SIM card change if power turn off.*

LED indicators

- Module status indication - RED LED (LED1)
- GSM module SIM900 status indication - GREEN LED (LED2)

Module LED indication (Red LED)

LED status	Modem status
Permanently off	Device off
Short blinking after power on	SIM card read process
Short periodic blinking	Module in work
Permanently on	Module work with modem

GSM Module SIM900 LED GSM status indication (Green LED)

LED status	Modem status
Off	GSM module SIM900 is not running
64ms On / 800ms Off	GSM module does not find the network
64ms On / 3000ms Off	GSM module find the network
64ms On / 300ms Off	GPRS communication

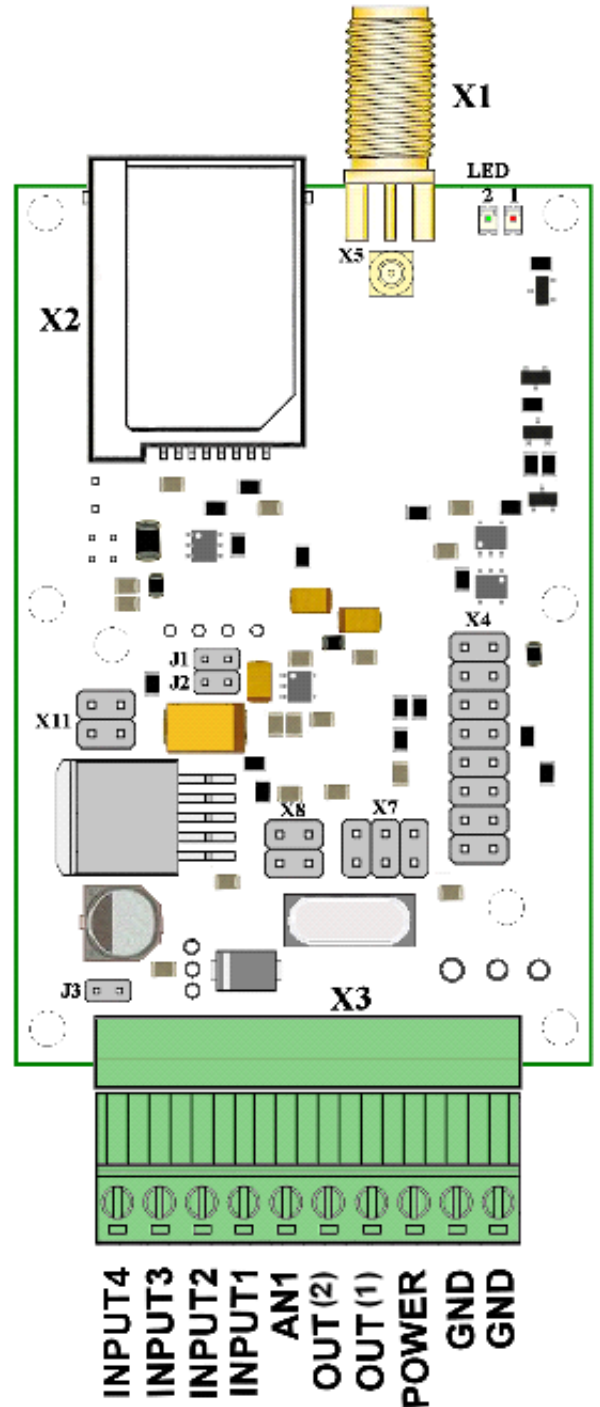## Connectors and Jumpers

The BR900-ST consist 10-way pluggable screw terminal for power supply, inputs and outputs connection, push-push SIM connector for SIM card, SMA (female) connector for GSM antenna connection and optional MMCX (female) connector for MMCX(male)-SMA(female) cable for GSM antenna connection. Optionally BR900 have also 2x8 pin header (X4) and 2x2 pin header (X11) for additional extended adapter board connection.

X1 – GSM antenna SMA (female) connector
X2 – Push-push SIM connector
X3 – Pluggable 10-ways terminal block for power supply and external inputs/outputs signal connection
X4, X11 – Pin headers for optional extension adapter board connection
X5 – optional MMCX (female) connector for MMCX to SMA bulkhead GSM antenna cable for any other enclosure
X7 – ISP interface connector for Firmware programming
X8 – control point
J1/J2 – Jumpers for firmware mode setting
J3 – Jumper for connection INPUT4 to GND.

Power Supply:	see "Power supply"
Digital Inputs:	NTR4003N MOSFET transistor 0-20V max)
Analogue Input:	0...15.5 max with resistive divider and diode protection
Digital outputs:	Solid State Relay outputs, 30V max / 1A max

Jumpers

Jumper J1   -   not used

Jumper J2   -   Set default password 2345:
                   set jumper
                   power ON
                   after 5sec power OFF
                   remove jumper

GSM antenna connector

GSM antenna must be connected to SMA female connector X1. Use only the 50Om antenna of the necessary frequency range. Base version completed with direct mount GSM antenna.
Optional X5 MMCX female connector used for connection MMCX(m) to SMA(f) cable for mounting to any other enclosure.

Note: It is very important that the antenna is installed on a location where the GSM-network coverage is sufficient. Please also check carefully that antennas are not installed nearby technical devices, cables etc. which could influence the GSM-radiation.

Inputs and Outputs connection

Digital inputs, analogue input, outputs and power supply must be connected with pluggable screw terminals blocks X3.

     Digital inputs - 4
     Analogue inputs – 1
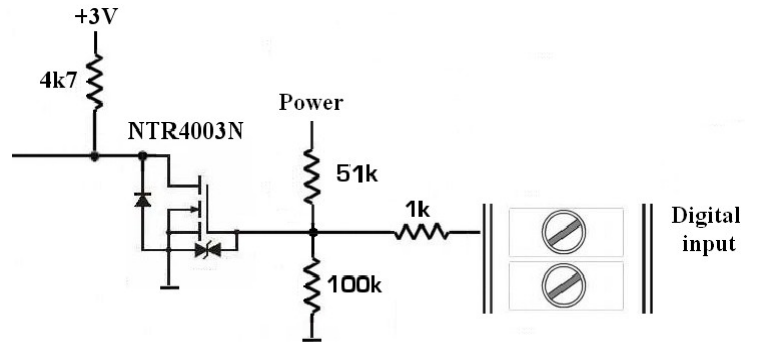   Solid State Relay outputs - 1

See "Inputs and Outputs"

## Inputs and Outputs

Inputs

Digital Transistor Inputs

Driver type: MOSFET transistor NTR4003
Connector: Pluggable screw terminal block
Inversion: Yes
Max input voltage: 20V
Free Input: logic "0"
Logic "0": 0V…+1V
Logic "1": +2V…+20V

Pull-up resistor: 51k – only for INPUT3 and INPUT4
INPUT1 and INPUT2 – without pull-up resistors

Analogue Inputs 1

Connector: Pluggable screw terminal block (for analog input1)
Input type: CMOS
Input Voltage: 0 to +10V: – ANALOG1
ADC resolution: 10-bit
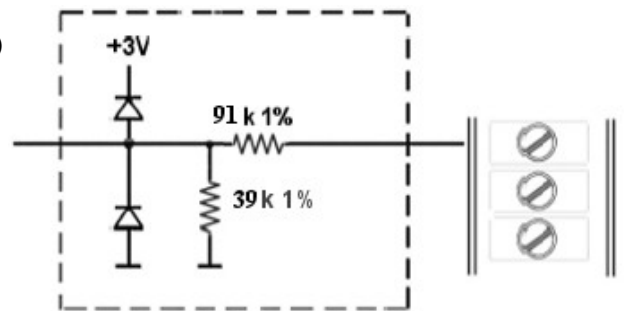
Outputs

Solid State Relay Outputs

Connector: Pluggable Screw terminal block
Solid State Relay: single-pole, normally open (1-Form-A) Solid State
Relay CPC1020N
Max. Voltage: 30V
Max. Current: 1A
On-resistance: 0.25om
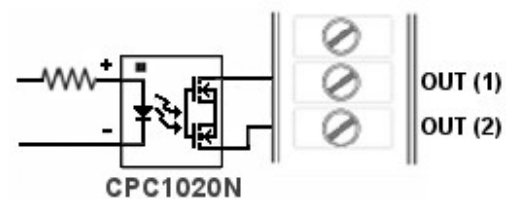
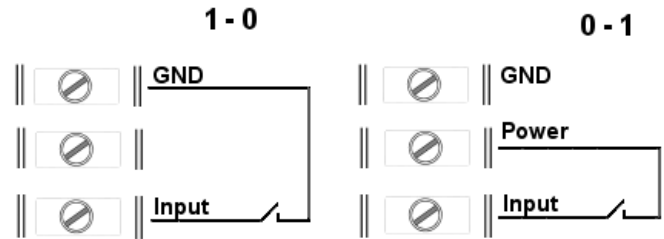### MOSFET Open Drain Outputs (optional)

Connector: Pluggable Screw terminal block
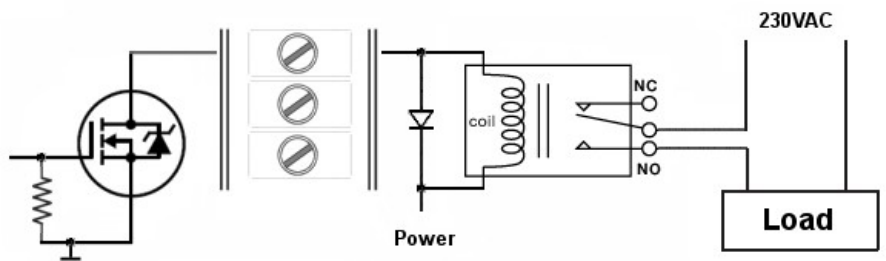MOSFET transistor: IRL6372PBF
Max. Voltage: 30V
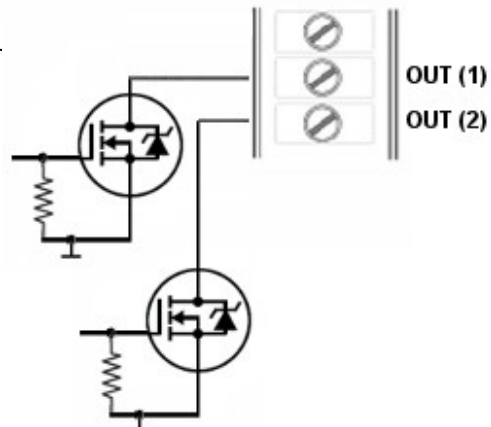
Connection Example

Connection example to Input Driver

1-0 and 0-1 event notification
You can use J2 pin header for in-board pull-up resistor connection.
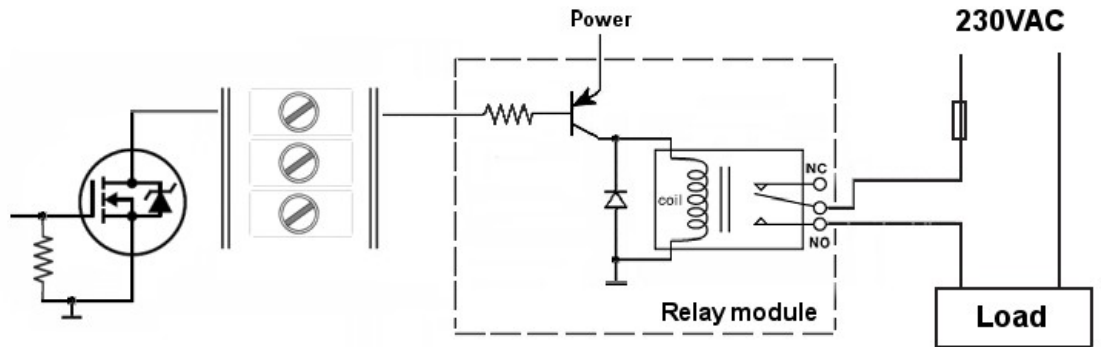

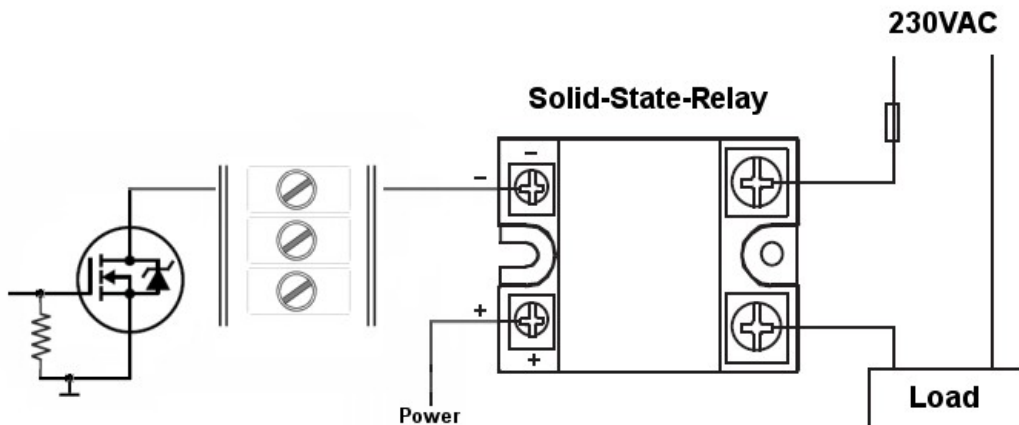### Connection example to MOSFET Open Drain Output

Electromechanical relay connection

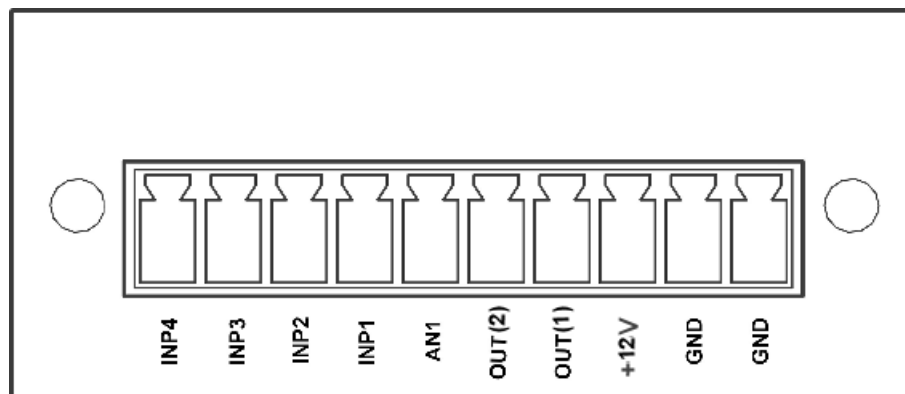Relay Module connection

Solid-state-relay (SSR) connection

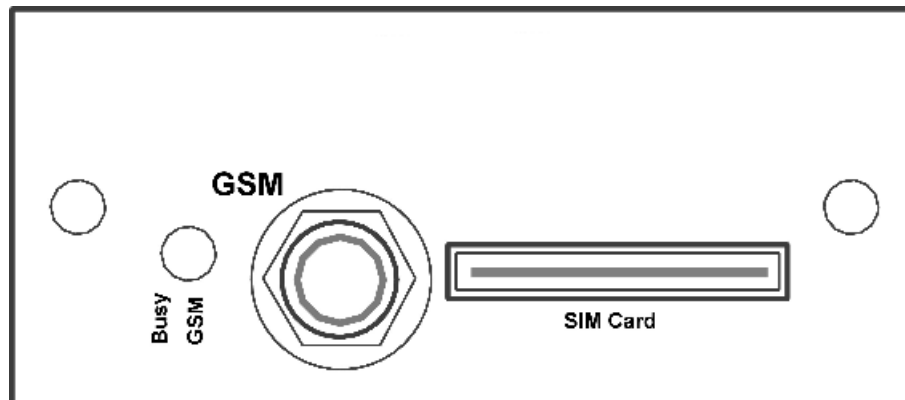**Enclosure**

For all BR900 version used Fischer Elektronik aluminium enclosure AKG 55 24 80 ME.

- BR900 Board dimensions: 50.5x77.5mm
- Enclosure AKG 55 24 80 ME dimension 54 x 80 x 24 mm

Programming

Digital signal monitoring

	Open input	Connection to GND	Connection to Power supply	Event all 0-1	Event all 1-0
Digital input 1	'0'	'0'	'1'	0-1	1-0
Digital input 2	'0'	'0'	'1'	0-1	1-0
Digital input 3	'1'	'0'	'1'	0-1	1-0
Digital input 4	'1'	'0'	'1'	0-1	1-0

Event 0-1 or 1-0 selected with SMS command 2345V0 and 2345V1

Analogue signal monitoring

Analogue input and supply voltage monitoring (default setting)

	Analogue input 1	Analogue 2 (internal) = Supply Voltage
Minimum set-point	00%	70%
Maximum set-point	00%	00% (set-point disable)
+5V	32.26%	32.26%
+10V	64.52%	64.52%
+10.85V	70.00%	70.00%
+12V	77.42%	77.42%
+15,5V	100%	100%

Can set minimum and maximum setpoints in % (for Analogue 1 and Analogue 2).

Analogue signal (in %)

0%	MIN level	MAX level	100%
< MIN	NORMAL	> MAX	
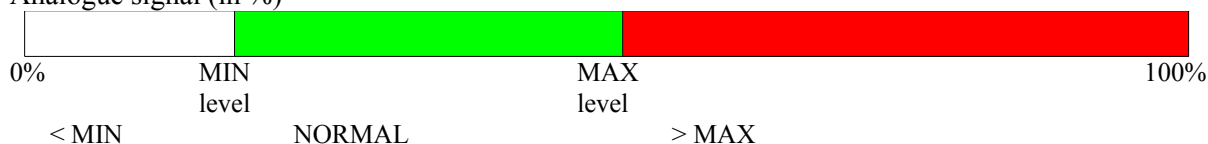
For supply voltage monitoring -

Alarm text SMS constantly:
Voltage low
Voltage normal
Voltage high

SMS command

	Digital and Analogue signal monitoring
SMS command	**Text** (length 16 characters)
	Default text
2345X0,text	Input event 1
2345X1,text	Input event 2
2345X2,text	Input event 3
2345X3,text	Input event 4
2345X4,text	Analogue low
2345X5,text	Analogue normal
2345X6,text	Analogue high
2345X7,text	(not used)
2345X8,text	(not used)
2345X9,text	(not used)

Note – If first character in text space, then disable alarm SMS for this event

SMS command	Answer SMS	Function
2345I	Status info	Read status SMS
2345N1 2345N2 2345N3 2345N4	Status info	Set up to 4 cell phone numbers for alarm SMS at position 1..4 Send SMS without number from cell phone 1,2,3,4
2345C1 2345C2 2345C3 2345C4	Status info	Clear number 1,2,3 or 4 Send SMS from any cell phone
2345P2010	Passw: 2010, 2010 – new password	Change password; **default password 2345** If forgot password, you can with jumper J2 restore default password 2345. Set jumper J2, power ON, wait 15-20 sec, power OFF, remove jumper J2 Note: J2 jumper for set password default = 2345
2345S1 2345S2 (optional)	Status info	Set output 1 Set output 2 (optional)
2345R1 2345R2 (optional)	Status info	Reset output 1 Reset output 2 (optional)
2345S3	Status info	Output 1 2 sec pulse
2345E1 2345E0 2345E	Status info	Enable alarm SMS, **default** enable Disable alarm SMS Disable alarm SMS
2345V1 2345V0 (or 2345V)	Status info	Digital event 1-0 Digital event 0-1

2345M1,20 2345M2,30	Status info:	Set minimum analogue set-point, Analog 1 - **default:** 00 (no event) Analog 2 - **default:** 75
2345A1,60 2345A2,00	Status info:	Set maximum analogue set-point, Analog 1 - **default:** 00 (no event) Analog 2 - **default:** 00 (no event)

Status info

I1=0 I2=0 I3=0 I4=0	outputs state
O1=OFF O2=OFF	input status
A=00.0%	analogue level
U=66,7% 12.0V	supply voltage
A:20 60	analogue level (set-points) in %
U:80 00	supply voltage level (set-points) in %

Password

Default password 2345

    If you forgot password, you can restore default password with jumper J2