GSM Controller BR160SM-6D-4A-A / BR161SM-6D-4A-A

Version for analog and digital signal monitoring
GSM module for SMS remote monitoring and control applications

Features

• Internal 2-band GSM900/1800 (BR160SM) or 4-band GSM850/900/1800/1900 (BR161SM) GSM-modem: SIM900R or SIM900
• 6 digital input (active 0-1 and 1-0 event) – see page 13
• 3 analog inputs (AN1,2,3) for 0-10V, 0-5V, 0-20mA, 4-20mA, ACS712 +/-5A, +/-20A, DC current sensor module, universal 0-10V and 4-20mA to real units conversion (selectable)
• 1 analog inputs (AN4) for battery voltage monitoring (up to 15VDC via external resistor) or internal BR160SM supply voltage (Jumper J0)
• 3 Open-Drain MOSFET output
• 1 Power Relay output (timer function available; activation for from 1 to 240 min)
• Notification, control and configuration with SMS
• Timer output (relay output 3); relay activation for from 1 to 240 min
• Internal control from digital and analog events (activation relay for default time duration)
• Operates from a 12VDC power source. It draws less then 70mA standby, less then 350mA rms and 2A peak typ. (3A peak max.). 12VDC/1.7A...2.5A switching stabilized power supply is recommended. Power supply input has reverse polarity and over voltage protection.
## Inputs and Outputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Digital inputs| Inp 1,2,3,4,5,6       | Digital Inputs 1,2,3,4,5,6  
Positive/negative level selectable with jumpers for all inputs; not individual. Individual selectable with pull-up jumpers for resistor - set open input from 0 to 1  
Digital Inputs 6 with inversion event |
| Analog inputs | AN1, AN2, AN3         | - custom 0-10V mode (default 0-120dB  
- custom 4-20mA mode (default 40-120dB  
- custom 4-20mA mode  
- Current sensor ACS712 +/-5A, +/-20A or +/-30A, result in A  
- 0-5V analog signal, (5V = 100%), result in %  
- 0-10V analog signal, (10V = 100%), result in % |
| Analog inputs | AN4                   | Battery voltage (15V maximum, via resistor 27k), result in V; or internal jumper (see Jumper J0) |
Preparation of SIM card

1) **Disable PIN code** request so it will not prompt for a PIN code on turning on.
2) **Small SIM-card with 3V / 1,8V technology**
3) **SIM card change if power turn off.**

LED indicators

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

Module LED indication (**Red LED**)

<table>
<thead>
<tr>
<th>LED status</th>
<th>Modem status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanently off</td>
<td>Device off</td>
</tr>
<tr>
<td>Short blinking after power on and after -</td>
<td>SIM card read process</td>
</tr>
<tr>
<td>periodic blinking</td>
<td></td>
</tr>
<tr>
<td>Short blinking</td>
<td>Module in work</td>
</tr>
<tr>
<td>Permanently on</td>
<td>Module work with modem</td>
</tr>
</tbody>
</table>

GSM Modem LED indication (**Green LED**)

<table>
<thead>
<tr>
<th>LED status</th>
<th>Modem status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanently off</td>
<td>Device off</td>
</tr>
<tr>
<td>Fast blinking (period 1s, ton 0,5s)</td>
<td>Net search / Not registered / Turning off</td>
</tr>
<tr>
<td>Slow blinking (period 3s, ton 0,3s)</td>
<td>Registered full service</td>
</tr>
</tbody>
</table>
Applications with

Analog inputs

Temperature and humidity sensor  Aw3005 and Aw3105

Output for Humidity: 0..5VDC  
Accuracy of humidity:  
+2%RH(10-95%RH, 25Celsius); <+-5%RH(-40..80Celsius)  
Hysteresis: +-0.3%RH  
Temperature sensor: DS18B20  
Accuracy for temperature: +-0.2Celsius(at 25Celsius)  
Output for Temperature: 0..5VDC  
Measuring temperature range: Customer can select measuring temperature range by dialing switches on PCB board: 0~50Celsius, -20~80Celsius, -40~60Celsius  
Electrical connection: Screw connector Max1.5mm²

DC Current sensors

DC Current Sensor Module 30A Range ACS712T ELC-30A Module  
DC Current Sensor Module 20A Range ACS712T ELC-20A Module  
DC Current Sensor Module 5A Range ACS712T ELC-5A Module

AC and DC Current sensor with 0-10V / 0-5V or 4-20mA output

AC current sensors CTA, CTV and CS  Series current sensors monitor the current flowing to electrical equipment or buildings. Self-powered inducing the supply from the monitored conductor. All of these sensors have jumper selectable input ranges 0-10, 20, 0-50A or 0-100, 0-200, 0-250A.

DC Current sensor with 0-5V output

DC current sensor CYHCT-C2TV Chen Yang Technologies GmbH & Co KG  
http://www.hallsensors.de/CYHCT-C2TV.pdf  
-50A...+50A ... -500A...+500A range.

Other sensors with 0-10V, 0-5V, 0-20mA, 4-20mA
## Setpoints

### Analog inputs

1) for current sensor

<table>
<thead>
<tr>
<th>MIN</th>
<th>Current low</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative current high</td>
<td>Positive current high</td>
<td></td>
</tr>
</tbody>
</table>

- setpoint only MAX
  - Current normal
  - Positive current high

- setpoints only MIN
  - Negative current high
  - Current normal

2) for analog signal 0-10V, 0-5V, 0-20mA

<table>
<thead>
<tr>
<th>MIN</th>
<th>Analog normal</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog low</td>
<td>Analog high</td>
<td></td>
</tr>
</tbody>
</table>

- setpoint only MAX
  - Analog normal
  - Analog high

- setpoints only MIN
  - Analog low
  - Analog normal
Analog signal mode

Analog mode (SMS command 2345w,abc)
a - for AN1, b for AN2, c - for AN3,
a,b,c - analog mode for analog AN1,AN2,AN3
0 - 0-5V / 0-20mA in %,
1 - 0-10V in %,
2 – 20A DC current sensor ACS712,
3 – 30A DC current sensor ACS712,
5 – 5A DC current sensor ACS712,
4 – 4-20mA in %
8 – 0-10V in custom units (see SMS command 2345M, 2345Y, 2345G); 0 – 120dB as default
9 – 4-20mA in custom units (see SMS command 2345M, 2345Y, 2345G)

Analog signal table

Example

4-20mA input  (analog mode 9)

<table>
<thead>
<tr>
<th>Signal</th>
<th>mA (4-20V)</th>
<th>Measurement area (example)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN (SMS command 2345M)</td>
<td>4</td>
<td>0000</td>
</tr>
<tr>
<td>MAX (SMS command 2345Y)</td>
<td>20</td>
<td>1200</td>
</tr>
</tbody>
</table>

0-10V input  (analog mode 8)

<table>
<thead>
<tr>
<th>Signal</th>
<th>V (0-10V)</th>
<th>Measurement area (example)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN (SMS command 2345M)</td>
<td>0</td>
<td>0000</td>
</tr>
<tr>
<td>MAX (SMS command 2345Y)</td>
<td>10</td>
<td>1200</td>
</tr>
</tbody>
</table>

Setpoints

Analog input mode 0-10V

<table>
<thead>
<tr>
<th>V (analog.inp)</th>
<th>%</th>
<th>Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0,0</td>
<td>0100</td>
</tr>
<tr>
<td>1,0</td>
<td>10,0</td>
<td>0250</td>
</tr>
<tr>
<td>2,5</td>
<td>50,0</td>
<td>0500</td>
</tr>
<tr>
<td>7,5</td>
<td>75,0</td>
<td>0750</td>
</tr>
<tr>
<td>9,9</td>
<td>99,0</td>
<td>0990</td>
</tr>
<tr>
<td>10,0</td>
<td>100,0</td>
<td></td>
</tr>
</tbody>
</table>
Battery voltage (Analog input 4), connection via serial resistor 51k (or internal voltage – set internal jumper J0)

<table>
<thead>
<tr>
<th>Battery voltage V</th>
<th>V (analog.inp)</th>
<th>Setpoint in V</th>
<th>Setpoint minimum</th>
<th>Setpoint maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0000</td>
<td>disable</td>
<td>disable</td>
</tr>
<tr>
<td>9V</td>
<td>6</td>
<td>0900</td>
<td>&lt; 10,2V</td>
<td></td>
</tr>
<tr>
<td>10,2V</td>
<td>6,8</td>
<td>0102</td>
<td>&lt; 10,5V</td>
<td></td>
</tr>
<tr>
<td>11,4</td>
<td>7,6</td>
<td>0114</td>
<td>&lt; 11,4V</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>0120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13,2</td>
<td>8,8</td>
<td>0132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14,4</td>
<td>9,6</td>
<td>0144</td>
<td>&gt; 14,4V</td>
<td></td>
</tr>
<tr>
<td>14,7</td>
<td>9,8</td>
<td>0147</td>
<td>&gt; 14,7V</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>0150</td>
<td>&gt; 15,0V</td>
<td></td>
</tr>
</tbody>
</table>

Note: if set jumper J0 – AN4 = internal voltage; B = real voltage – 0,3V; AN4 = 8V

DC Current sensors or 0-5V analog signal (analog input AN1, AN2, AN3)

<table>
<thead>
<tr>
<th>analog.input V (current sensor or 0-5V mode)</th>
<th>+/-5A sensor 185mV/1A</th>
<th>+/-20A sensor 100mV/1A</th>
<th>%</th>
<th>Setpoint minimum for 20A sensor</th>
<th>Setpoint maximum for 20A sensor</th>
<th>Setpoint minimum for 30A sensor</th>
<th>Setpoint maximum for 30A sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-25A</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0,5</td>
<td>-20A</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0,52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,5</td>
<td>-5,4A</td>
<td>-10A</td>
<td>30</td>
<td>&lt; -10A</td>
<td>&gt; -10A</td>
<td>&lt; -15,1A</td>
<td>&gt; -15,1A</td>
</tr>
<tr>
<td>1,58</td>
<td>-5A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-2,7A</td>
<td>-5A</td>
<td>40</td>
<td>&lt; -5A</td>
<td>&gt; -5A</td>
<td>&lt; -7,6A</td>
<td>&gt; -7,6A</td>
</tr>
<tr>
<td>2,4</td>
<td>-0,5A</td>
<td>-1A</td>
<td>48</td>
<td>&lt; -1A</td>
<td>&gt; -1A</td>
<td>&lt; -1,5A</td>
<td>&gt; -1,5A</td>
</tr>
<tr>
<td>2,45</td>
<td>-0,3A</td>
<td>-0,5A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,5</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>&lt; 0A</td>
<td>&gt; 0A</td>
<td>&lt; 0A</td>
<td>&gt; 0A</td>
</tr>
<tr>
<td>2,55</td>
<td>0,3A</td>
<td>0,5A</td>
<td></td>
<td>&lt; +0,5A</td>
<td>&gt; +0,5A</td>
<td>&lt; +1A</td>
<td>&gt; +1A</td>
</tr>
<tr>
<td>2,6</td>
<td>0,5A</td>
<td>1A</td>
<td>52</td>
<td>&lt; +1A</td>
<td>&gt; +1A</td>
<td>&lt; +1,5A</td>
<td>&gt; +1,5A</td>
</tr>
<tr>
<td>3</td>
<td>2,7A</td>
<td>5A</td>
<td>60</td>
<td>&lt; +5A</td>
<td>&gt; +5A</td>
<td>&lt; +7,6A</td>
<td>&gt; +7,6A</td>
</tr>
<tr>
<td>3,43</td>
<td>5A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,5</td>
<td>5,4A</td>
<td>10A</td>
<td>70</td>
<td>&lt; +10A</td>
<td>&gt; +10A</td>
<td>&lt; +15,1A</td>
<td>&gt; +15,1A</td>
</tr>
<tr>
<td>4</td>
<td>15A</td>
<td>80</td>
<td></td>
<td>&lt; +15A</td>
<td>&gt; +15A</td>
<td>&lt; +22,7A</td>
<td>&gt; +22,7A</td>
</tr>
<tr>
<td>4,48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,5</td>
<td>20A</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>25A</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Offset table
for fine zero level calibration (common for all current sensors)

<table>
<thead>
<tr>
<th>SMS command 2345QNN, NN = 00..99</th>
<th>Offset</th>
<th>Zero level in ADC</th>
<th>Offset in Amp for 20A sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>default</td>
<td>50</td>
<td>256</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>49</td>
<td>255</td>
<td>-0,1</td>
</tr>
<tr>
<td>51</td>
<td>257</td>
<td></td>
<td>0,1</td>
</tr>
</tbody>
</table>
Compatible current sensors

**ACS712: Fully Integrated, Hall-Effect-Based Linear Current Sensor IC**
with 2.1 kV RMS Voltage Isolation and a Low-Resistance Current Conductor

DC Current Sensor Module 20A Range ACS712T ELC-20A Module
DC Current Sensor Module 5A Range ACS712T ELC-5A Module

**DC Current Sensor Module 20A Range ACS712T ELC-20A Module**
1. the current sensor chips: ACS712ELC-20A;
2. pin 5V power supply, on-board power indicator;
3. the module can measure the positive and negative 20 amps, corresponding to the analog output 100mV/A;
4. no test current through the output voltage is VCC / 2;
5. PCB board size: 33 (mm) x 14 (mm);
Note: ACS712 is based on the principle of the Hall test, please use this field to avoid impact

**ACS712 Breakout x05B (5 Amp) version**
https://www.sparkfun.com/products/8882
This is a breakout board for the fully integrated Hall Effect based linear ACS712 current sensor. The sensor gives precise current measurement for both AC and DC signals. Thick copper conductor and signal traces allows for survival of the device up to 5 times overcurrent conditions.

### Pin-out Diagram

![Pin-out Diagram](image)

### Terminal List Table

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>IP+</td>
<td>Terminals for current being sampled; fused internally</td>
</tr>
<tr>
<td>3 and 4</td>
<td>IP−</td>
<td>Terminals for current being sampled; fused internally</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Signal ground terminal</td>
</tr>
<tr>
<td>6</td>
<td>FILTER</td>
<td>Terminal for external capacitor that sets bandwidth</td>
</tr>
<tr>
<td>7</td>
<td>VIOUT</td>
<td>Analog output signal</td>
</tr>
<tr>
<td>8</td>
<td>VCC</td>
<td>Device power supply terminal</td>
</tr>
</tbody>
</table>
For 0-10V, 0-5V, 0-20mA mode
(see SMS command 2345W)

You can set 0-10V or 0-5V or 0-20mA input AN1, AN2, AN3: separately. For 0-20mA mode required change resistor.

See Figure bellow (bottom PCB side)

For this mode need add 249Ω resistor on bottom PCB side.

AN1 - Analog Input 1 - R52 (249Ω added for 0/4-20mA mode)
AN2 - Analog Input 2 - R51 (249Ω added for 0/4-20mA mode)
AN3 - Analog Input 3 - R50 (249Ω added for 0/4-20mA mode)
AN4 - Analog Input 4 - R49 (249Ω added for 0/4-20mA mode)
## SMS command

<table>
<thead>
<tr>
<th>SMS command</th>
<th>Answer SMS</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog setpoints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2345L1,0400</td>
<td>(setting)</td>
<td>Set minimum analog level</td>
</tr>
<tr>
<td>2345L2,0000</td>
<td>(setting)</td>
<td>default: A1:0 A2:0 A3:0 A4:100</td>
</tr>
<tr>
<td>2345L3,0000</td>
<td>(setting)</td>
<td>0100 = 10% or 10V (for internal voltage)</td>
</tr>
<tr>
<td>2345L4,0100</td>
<td>(setting)</td>
<td>Set maximum analog level</td>
</tr>
<tr>
<td>2345H1,0800</td>
<td>(setting)</td>
<td>default: A1:0 A2:0 A3:0 A4:150</td>
</tr>
<tr>
<td>2345H2,0000</td>
<td>(setting)</td>
<td>0150 = 15% or 15V (for internal voltage)</td>
</tr>
<tr>
<td>2345H3,0000</td>
<td>(setting)</td>
<td></td>
</tr>
<tr>
<td>2345H4,0150</td>
<td>(setting)</td>
<td></td>
</tr>
<tr>
<td>Enable alarm SMS / disable alarm SMS (for digital inputs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2345E</td>
<td>PROTECTED</td>
<td>Enable alarm SMS for digital inputs, default enable; after restart enable</td>
</tr>
<tr>
<td>2345B</td>
<td>UNPROTECTED</td>
<td>Disable alarm SMS for digital inputs</td>
</tr>
<tr>
<td>2345F0 … 2345F9</td>
<td>(setting info)</td>
<td>Filter for digital inputs (see jumpers)</td>
</tr>
<tr>
<td>Get information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2345i</td>
<td>(Information)</td>
<td>Read information – analog inputs battery voltage inputs outputs output timer status</td>
</tr>
<tr>
<td></td>
<td>A1=0dB A2=0% A3=0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B= 12.0V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I1=0 I2=0 I3=0 I4=0 I5=0 I6=0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O1 OFF, O2 OFF, O3 OFF, O4 OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T: 15 ON</td>
<td></td>
</tr>
<tr>
<td>Set/Reset Outputs; Timer Outputs; only for Output 3 (relay)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2345S1 … 2345S4</td>
<td>(Information)</td>
<td>Set output</td>
</tr>
<tr>
<td>2345R1 … 2345R4</td>
<td>(Information)</td>
<td>Reset output</td>
</tr>
<tr>
<td>2345V,030</td>
<td>(information)</td>
<td>set duration for timeout = 30 min</td>
</tr>
<tr>
<td></td>
<td>Maximum 240 min. (default 15 min)</td>
<td></td>
</tr>
<tr>
<td>2345T,060</td>
<td>(information)</td>
<td>set output for timeout = 60 min</td>
</tr>
<tr>
<td></td>
<td>default timeout = 15 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum 240 min.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>set output for timeout = default ***</td>
<td></td>
</tr>
<tr>
<td>2345T</td>
<td>(information)</td>
<td>Pulse for output</td>
</tr>
<tr>
<td></td>
<td>O – output number 1,2,3 or 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S – pulse duration 0 … 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S=0: 1sec S=1: 3sec … S=9: 19sec</td>
<td></td>
</tr>
<tr>
<td>Internal control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2345K,DA</td>
<td>(setting info)</td>
<td>Internal control from digital inputs 1,2,3,4; internal control enable, then if event on digital input, start Relay ON on default time (see SMS command T)</td>
</tr>
<tr>
<td></td>
<td>A:400 800 A2:0,0 A3:0 0,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B:100 150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A.md:111</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O3ctr: 00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T3: 15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F:2</td>
<td></td>
</tr>
</tbody>
</table>
### Phone Numbers for alarm SMS

<table>
<thead>
<tr>
<th>Phone Numbers for alarm SMS</th>
<th>OK</th>
<th>Set number for alarm SMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345N1 ... 2345N4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2345C1 ... 2345C4</td>
<td></td>
<td>Clear number at position 1..4</td>
</tr>
</tbody>
</table>

### Alarm SMS text setting

<table>
<thead>
<tr>
<th>Command</th>
<th>Text Message Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345X01, Input 01</td>
<td>1: Input 01</td>
<td>Set text message for digital input 1...6 event 1-0 and 0-1, analog inputs 1...4 Text up to 14 characters (Text SMS message table on page 13) Clear text</td>
</tr>
</tbody>
</table>

### Analog Inputs (AN1, AN2, AN3 – analog mode)

<table>
<thead>
<tr>
<th>Command</th>
<th>Setting Info</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345W, 111</td>
<td>(setting info)</td>
<td>Set current sensor for AN1, AN2, AN3 0 – 0-5V analog input (5V = 100%) or 0-20mA input (20mA = 100%) 1 – 0-10V analog input (10V = 100%) 2 – +/-20A current sensor 4 – 4-20mA (4mA = 0%, 20mA = 100%) 5 – +/-5A current sensor 8 – 0-10V selectable for 10V value - see SMS command 2345Y 9 – 4-20mA selectable for 4 and 20mA value - see SMS command M, Y (default 111)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command</th>
<th>Setpoints Info</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345M, 0000</td>
<td>(setpoints info)</td>
<td>Set minimum value for measurement area (for A1, A2 or A3 - only for analog mode 9)</td>
</tr>
<tr>
<td>2345M, 0400</td>
<td>(setpoints info)</td>
<td>Set maximum value for measurement area (for A1, A2 or A3 - only for analog mode 8 and 9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command</th>
<th>Measurement Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345G, unit</td>
<td>Measurement unit</td>
<td>Measurement unit (4 char); only for analog mode 8 and 9</td>
</tr>
<tr>
<td>2345G, V</td>
<td>Measurement unit</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command</th>
<th>Setting Info</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345U</td>
<td>(setting info)</td>
<td>Get setpoints analog setpoints MIN MAX battery voltage setpoints MIN MAX an.inputs mode (Amd) and an.mask; Internal control, Output.3 timer (in min) Digital input filter (in sec)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command</th>
<th>Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345Q51</td>
<td>(information)</td>
<td>Set zero offset for current sensor (mode 2, 3, 5) 00..99 (see offset table on page 7)</td>
</tr>
<tr>
<td>2345O+200</td>
<td>(information)</td>
<td>Set offset for 4mA (only mode 9) from -240 to +240</td>
</tr>
</tbody>
</table>

### Password change

<table>
<thead>
<tr>
<th>Command</th>
<th>Change Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345P2013</td>
<td>Psw:2013</td>
<td>Change password; use only 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 default password 2345 if you forgot password, use jumper for restore default password 2345 (see paragraph JUMPERS)</td>
</tr>
</tbody>
</table>

*** You can set Output 3 (on board RELAY output) for time from 1 to 240 min (acc. 10%).
**Text SMS message**

<table>
<thead>
<tr>
<th>SMS command</th>
<th>Text (length 14 char)</th>
<th>Text (length 14 char)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345X01,</td>
<td>Input 1  1-0</td>
<td>Input 1  1-0</td>
</tr>
<tr>
<td>2345X02,</td>
<td>Input 2  1-0</td>
<td>Input 2  1-0</td>
</tr>
<tr>
<td>2345X03,</td>
<td>Input 3  1-0</td>
<td>Input 3  1-0</td>
</tr>
<tr>
<td>2345X04,</td>
<td>Input 4  1-0</td>
<td>Input 4  1-0</td>
</tr>
<tr>
<td>2345X05,</td>
<td>Input 5  1-0</td>
<td>Input 5  1-0</td>
</tr>
<tr>
<td>2345X06,</td>
<td>Input 6  1-0</td>
<td>Input 6  1-0</td>
</tr>
<tr>
<td>2345X07,</td>
<td>Input 1  0-1</td>
<td>Input 1  0-1</td>
</tr>
<tr>
<td>2345X08,</td>
<td>Input 2  0-1</td>
<td>Input 2  0-1</td>
</tr>
<tr>
<td>2345X09,</td>
<td>Input 3  0-1</td>
<td>Input 3  0-1</td>
</tr>
<tr>
<td>2345X10,</td>
<td>Input 4  0-1</td>
<td>Input 4  0-1</td>
</tr>
<tr>
<td>2345X11,</td>
<td>Input 5  0-1</td>
<td>Input 5  0-1</td>
</tr>
<tr>
<td>2345X12,</td>
<td>Input 6  0-1</td>
<td>Input 6  0-1</td>
</tr>
<tr>
<td>2345X13,</td>
<td>Analog 1 high</td>
<td>I1 pos. high</td>
</tr>
<tr>
<td>2345X14,</td>
<td>Analog 1 low</td>
<td>I1 neg. high</td>
</tr>
<tr>
<td>2345X15,</td>
<td>Analog 1 normal</td>
<td></td>
</tr>
<tr>
<td>2345X16,</td>
<td>Analog 2 high</td>
<td>I2 pos. high</td>
</tr>
<tr>
<td>2345X17,</td>
<td>Analog 2 low</td>
<td>I2 neg. high</td>
</tr>
<tr>
<td>2345X18,</td>
<td>Analog 2 normal</td>
<td></td>
</tr>
<tr>
<td>2345X19,</td>
<td>Analog 3 high</td>
<td>I3 pos. high</td>
</tr>
<tr>
<td>2345X20,</td>
<td>Analog 3 low</td>
<td>I3 neg. high</td>
</tr>
<tr>
<td>2345X21,</td>
<td>Analog 3 normal</td>
<td></td>
</tr>
<tr>
<td>2345X22,</td>
<td>Battery high</td>
<td>Battery high</td>
</tr>
<tr>
<td>2345X23,</td>
<td>Battery low</td>
<td>Battery low</td>
</tr>
<tr>
<td>2345X24,</td>
<td>Battery normal</td>
<td>Battery normal</td>
</tr>
</tbody>
</table>

**Example**

| Digital Input 1 | 2345X01,Door Open | 2345X07,Door Close | For not pulse input (door magnetic contact. ..) |
| Digital Input 2 | 2345X02,Alarm     | 2345X08,Alarm      | For short pulse input (motion detector...)      |

**Numbers**

Example for numbers in EEPROM (with SMS command 2345N and 2345C)

<table>
<thead>
<tr>
<th>Nr in EEPROM</th>
<th>numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+37122842913</td>
</tr>
<tr>
<td>2</td>
<td>+37122842914</td>
</tr>
<tr>
<td>3</td>
<td>+37122842915</td>
</tr>
<tr>
<td>4</td>
<td>+37122832798</td>
</tr>
</tbody>
</table>

Number consist + and country code before phone number
Timer Output

Timer output for Output 3 (Relay). Output 3 ON for time duration (SMS command 2345T).

T30 < 30 min >

Internal Control

Internal control for set Output 3 (Relay) ON on duration time if event digital input 1,2,3,4 or analog inputs 1,2,3,4 > MAX

<table>
<thead>
<tr>
<th>Digital Input event 1-0</th>
<th>Analog &gt; MAX</th>
<th>Internal control with Out.3 for default time</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 3 2 1</td>
<td>4 3 2 1</td>
<td></td>
</tr>
</tbody>
</table>

SMS command

<table>
<thead>
<tr>
<th>SMS command</th>
<th>Digital Input event 1-0</th>
<th>Analog &gt; MAX</th>
<th>Internal control with Out.3 for default time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345K,00</td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>disable</td>
<td></td>
</tr>
<tr>
<td>2345K,10</td>
<td>0 0 0 1 0 0 0 0</td>
<td>Out.3 ON if event digital input 1 1-0</td>
<td></td>
</tr>
<tr>
<td>2345K,20</td>
<td>0 0 1 0 0 0 0</td>
<td>Out.3 ON if event digital input 2 1-0</td>
<td></td>
</tr>
<tr>
<td>2345K,30</td>
<td>0 0 1 1 0 0 0</td>
<td>Out.3 ON if event digital input 1,2 1-0</td>
<td></td>
</tr>
<tr>
<td>2345K,40</td>
<td>0 1 0 0 0 0</td>
<td>Out.3 ON if event digital input 3 1-0</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2345K,F0</td>
<td>1 1 1 1 0 0 0</td>
<td>Out.3 ON if event digital input 1,2,3,4 1-0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SMS command</th>
<th>Digital Input event 1-0</th>
<th>Analog &gt; MAX</th>
<th>Internal control with Out.3 for default time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2345K,00</td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>disable</td>
<td></td>
</tr>
<tr>
<td>2345K,01</td>
<td>0 0 0 0 0 0 0 0 1</td>
<td>Out.3 ON if Analog Input 1 high</td>
<td></td>
</tr>
<tr>
<td>2345K,02</td>
<td>0 0 0 0 0 0 0 1 0</td>
<td>Out.3 ON if Analog Input 2 high</td>
<td></td>
</tr>
<tr>
<td>2345K,03</td>
<td>0 0 0 0 0 1 0 0</td>
<td>Out.3 ON if Analog Input 3 high</td>
<td></td>
</tr>
<tr>
<td>2345K,04</td>
<td>0 0 0 0 1 0 0</td>
<td>Out.3 ON if Analog Input 4 high</td>
<td></td>
</tr>
</tbody>
</table>

Out.3 OFF after default timeout (SMS command 2345V, 2345T)

Digital event < N min (default) >

For example – if motion detector active – Out.3 ON for N min (N = 001..240 min). To Out.3 (relay) you can connect car DVR or Siren.
Jumpers

Jumper J1

Change event 0-1 / 1-0 for digital input

Set password default (2345)
- set jumper, power on; after 5 sec power off, remove jumper.

Set digital input filter 1
Jumper set for filter up to 9 sec (see SMS command 2345F)
Jumper unset for filter 100ms

Enable two SMS if short pulse > 100ms
without jumper – see Filter 2
with jumper – enable two SMS (0-1 and 1-0 event if short pulse > 100ms)

Filter 2 from two SMS if short pulse
without jumper -
if 1-0-1 pulse – send SMS only 1-0 event if pulse < 10*n sec
if 0-1-0 pulse – send SMS only 0-1 event if pulse < 10*n sec
with jumper -
if 1-0-1 pulse – send SMS 1-0 event and 0-1 event if pulse > 1 - 5sec
if 0-1-0 pulse – send SMS 0-1 event and 1-0 event if pulse > 1 - 5sec
Jumper 2

Jumpers for pull-up resistor setting
only for digital inputs 1,2,3,4,5,6

Jumper 0 (see figure next page)

Connection to analog input 4 internal supply voltage.
Note: If Jumper J0 set, on AN4 = 8V.
Power Supply connection

+12VDC stabilised Power Supply must be connected with screw terminal block. We recommend use stabilised 1.7…2.5A 12VDC power supply. Power supply input has negative voltage and over voltage protection.

Internal +12VDC connection and Power Supply connection schematic.

Connection Example

Connection example to Input Driver (Input 1-5)

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

Relay connection example to Output Driver (Output 1, 2 and 4)

Electromechanical relay connection.
Solid-state-relay (SSR) connection.

Inputs / Outputs Schematic

Inputs

Digital Transistor Inputs

- Connector: Screw terminal block
- Inversion: Yes
- Protection: Yes
- Max input voltage: +12V without external limited resistor.
- Free Input: logic "0"
- Logic "0": 0V…+1V
- Logic "1": +1.5V…+12V
- J2 jumper – for pull-up resistor connections to +12V (+5V optional)

0-10V / 0-5V Analog Inputs

- Connector: Screw terminal block
- Input type: CMOS
- Input Voltage: 0 to +10V
- Maximum input voltage: 10VDC
- Input impedance: 57 KOhm.
- ADC resolution: 10-bit
- 249 Ohm resistor – optional for 0-20/4-20mA applications
Outputs

**MOSFET Open Drain Outputs**

Connector: Screw terminal block  
MOSFET transistor: Si9945 or IRF7103  
Max. Voltage: 50V

---

**Relay Output**

Connector: Screw terminal block  
Outputs: NO/COM/NC  
Relay: SPDT power relay  
Breaking capacity: 5 A 240VAC / 28VDC  
Min load: 0.1 A, 5VDC
# Technical Specification

## Hardware Specification

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BR160SM-6D-4A-A / BR161SM-6D-4A--A</strong></td>
<td></td>
</tr>
<tr>
<td><strong>GSM band support</strong></td>
<td>GSM900/1800 / GSM850/900/1800/1900</td>
</tr>
<tr>
<td><strong>Internal GSM modem</strong></td>
<td>SIM900R / SIM900</td>
</tr>
<tr>
<td><strong>RF Transmit Power</strong></td>
<td>Class 4 (2W) 900Mhz, Class 1 (1W) 1800Mhz, 1900Mhz</td>
</tr>
<tr>
<td><strong>Command and data transmission</strong></td>
<td>SMS</td>
</tr>
<tr>
<td><strong>SIM card reader</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>SIM card type</strong></td>
<td>Phase 1 and phase 2+, SIM 3V / 1.8V</td>
</tr>
<tr>
<td><strong>Antenna Connection</strong></td>
<td>50Ω SMA (f) Connector</td>
</tr>
<tr>
<td><strong>Firmware</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Digital inputs

- **Digital inputs type**: Voltage-free, transistor (*"0": 0...+1V; "1": +1.5...+12V without external limited resistor); Optional: +12V/+5V pull-up resistor for each input
- **Number of digital inputs**: 6
- **Events digital inputs**: 6
- **Digital inputs event**: 0-1 and 1-0
- **Protection**: Yes

### Analog inputs

- **Number of analog inputs**: 3+1
- **Maximum voltage**: 10VDC
- **Analog input event**: min / norm / max
- **ADC resolution**: 10-bit

### Outputs

- **Number of outputs**: 4
- **MOSFET Open Drain outputs**: 3 (50V max)
- **Relay outputs**: 1 (NO/COM/NC), 28VDC / 5A
- **Digital output control**: On-Off; Pulse (Standard and Gate version only)
- **Timer output**: Yes, Output 3

### Wiring

- **Wiring Connections**: Screw terminal blocks

### Power Supply

- **Required Power supply**: External +12 VDC stabilized
- **Power requirement**: 60mA typ, 300mA(rms) max, 2A typ. (3A max) peak during transmission
- **Voltage regulator**: Internal voltage regulator
- **Power protection**: Reverse-polarity and overvoltage protection

### Environmental Conditions

- **Operating temperature range**: -30...+85°C
- **Humidity**: 0-95% non-condensing

### Physical parameter

- **Board dimension**: 103 x 86.5 mm
- **Enclosure dimension**: 106 x 100 x 58 mm
- **Box**: DIN-rail mounting
- **Weight**: 75 g
### Firmware Specification

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of controlled outputs</td>
<td>4</td>
</tr>
<tr>
<td>Timer output</td>
<td>Output 3</td>
</tr>
<tr>
<td>Maximum timer duration</td>
<td>240 min</td>
</tr>
<tr>
<td>Digital event inputs</td>
<td>6</td>
</tr>
<tr>
<td>Setpoints</td>
<td>0-1 or 1-0</td>
</tr>
<tr>
<td>Analog event inputs</td>
<td>3+1</td>
</tr>
<tr>
<td>Events cell phone numbers</td>
<td>4</td>
</tr>
<tr>
<td>SMS events format</td>
<td>Text message</td>
</tr>
<tr>
<td>SMS message format for analog data</td>
<td>In A,V, %, … (custom with SMS command 2345G,unit)</td>
</tr>
</tbody>
</table>