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GSM Controller BR160SM-2FLOW-4A-A / BR161SM-2FLOW-4A-A

Preliminary data

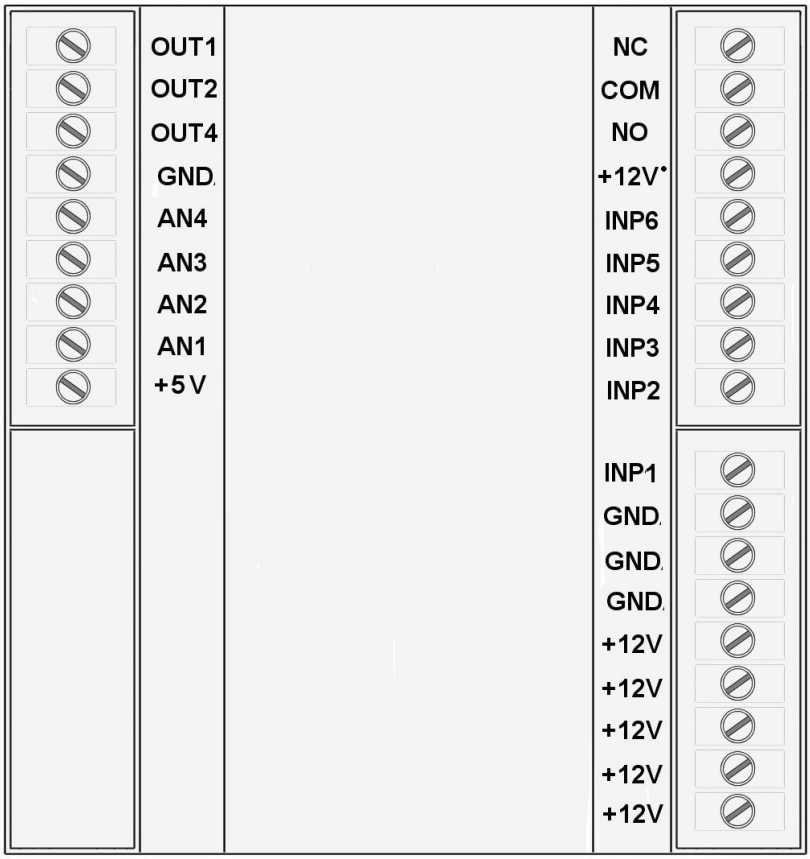
Version for flow (pulses), analog and digital signal monitoring
GSM module for SMS remote monitoring and control applications

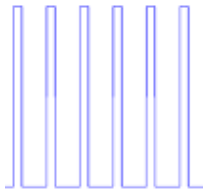
Features

- Internal 2-band GSM900/1800 (BR160SM) or 4-band GSM850/900/1800/1900 (BR161SM) GSM-modem SIM900
- 4 digital input (0-1 or 1-0 event)
- 2 pulse inputs (flow monitoring up to 300 pulse/min)
- 3 analog inputs (AN1,2,3) for ACS712 +/-5A, +/-20A DC current sensor module or 0-5V/0-20mA or 0-10V analog input (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 flow events (activation relay for default time duration)
- Operates from a 12VDC power source. It draws less then 40mA standby, 2A peak typ. 12VDC/1.2A minimum switching stabilized power supply is recommended. Power supply input has reverse polarity and over voltage protection.

Inputs and Outputs

Input	Name	
Digital inputs	Inp,1,2	Pulse inputs for flow monitoring
Digital inputs	Inp 3,4,5,6	Digital Inputs 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
Analog inputs	AN1,AN2, AN3	1) Current sensor ACS712 +/-5A, +/-20A or , result in A 2) 0-5V analog signal, (5V = 100%), result in % 3) 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**)

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

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

LED status	**Modem status**
Permanently off	Device off
Fast blinking (period 1s, ton 0,5s)	Net search / Not registered / Turning off
Slow blinking (period 3s, ton 0,3s)	Registered full service

Applications with

Pulse inputs

Liquid flow meter

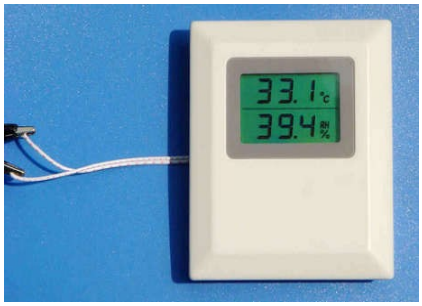
Water meter

Energy meter

Wind speed meter,
Anemometer

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 Max1.5mm^2

DC Current sensors

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.**

0-

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.

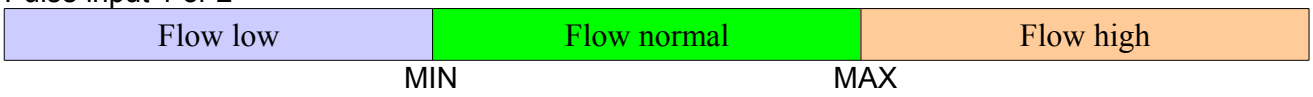
Pressure sensor with 0-5V or 4-20mA output

Setpoints

Pulse inputs (flow monitoring)
Digital inputs 1 and 2 – pulse inputs for flow monitoring up to 29999 pulse/hour.
Counter limit 65530.

1) for flow low or high monitoring

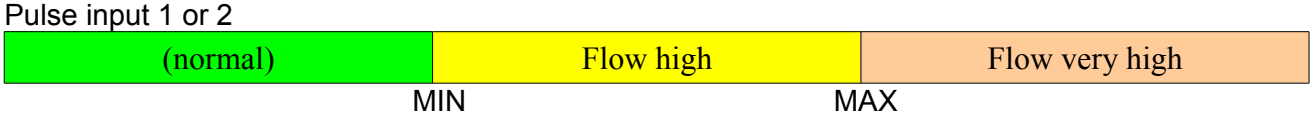
Pulse input 1 or 2



if only MAX

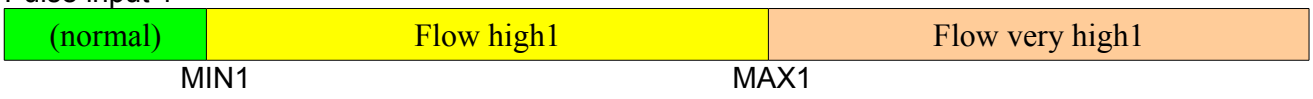
2) for flow high or very high monitoring

Pulse input 1 or 2

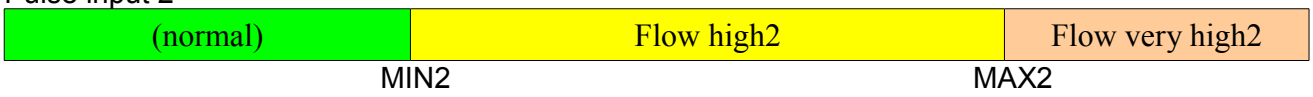


3) connect two pulse inputs together

Pulse input 1

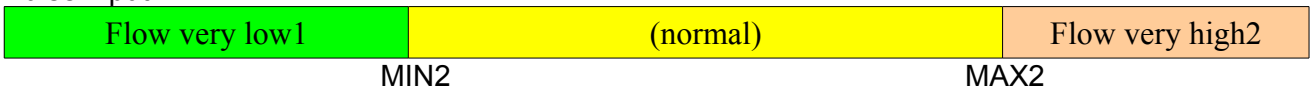


Pulse input 2



Pulse input 1

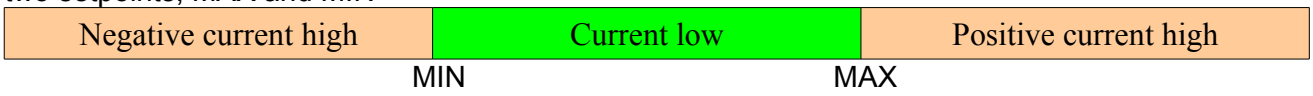
Pulse input 2



Analog inputs

1) for current sensor

two setpoints, MAX and MIN

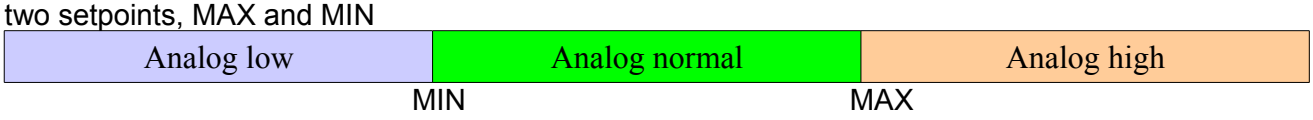


setpoint only MAX

setpoints only MIN

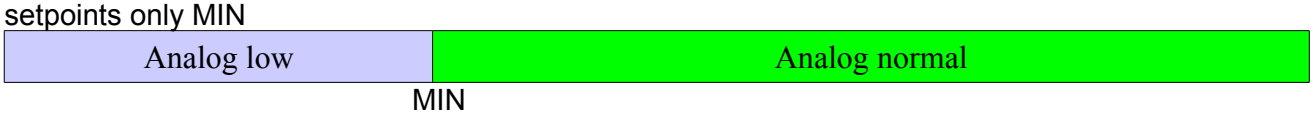
2) for analog signal 0-10V, 0-5V, 0-20mA

two setpoints, MAX and MIN

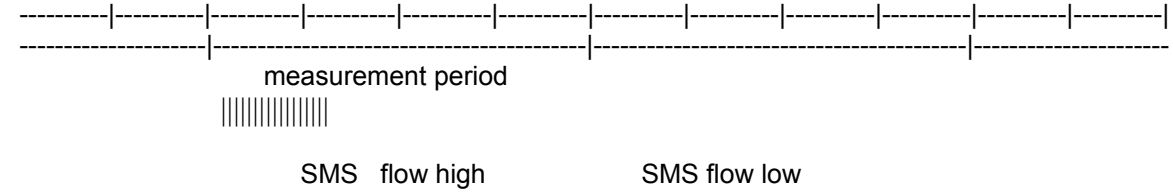


setpoint only MAX

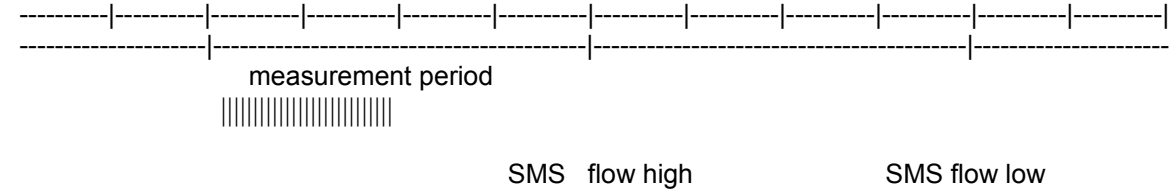
setpoints only MIN



Mode Flow alarm SMS immediately after Flow > MAX, or < MIN (SMS command 2345A1)



Mode Flow alarm SMS iafter end of measurement period (SMS command 2345A0)



Analog signal table

Battery voltage (Analog input 4), connection via serial resistor 27k (or internal voltage – set internal jumper 3)

Battery voltage V	V (analog.inp)	Setpoint in %	Setpoint minimum	Setpoint maximum
0	0	0	disable	disable
9V	6	60		
10,2V	6,8	68	< 10,2V	
10,5	7	70	< 10,5V	
11,4	7,6	76	< 11,4V	
12	8	80		
13,2	8,8	88		
14,4	9,6	96		> 14,4V
14,7	9,8	98		> 14,7V
15	10	99		

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)

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

Offset table

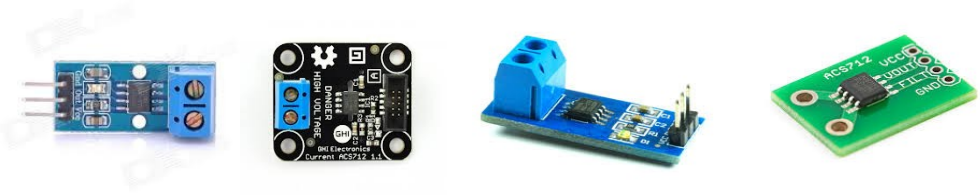
for fine zero level calibration (common for all current sensors)

SMS command 2345ONN, NN = 00..99	Offset	Zero level in ADC	Offset in Amp for 20A sensor
	51	257	0,1
default	50	256	0
	49	255	-0,1

Compatible DC current sensors

ACS712: Fully Integrated, Hall-Effect-Based Linear Current Sensor IC

with 2.1 kVRMS Voltage Isolation and a Low-Resistance Current Conductor
http://www.allegromicro.com/en/Products/Current-Sensor-ICs/Zero-To-Fifty-Amp-Integrated-Conductor-Sensor-ICs/ACS712.aspx



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

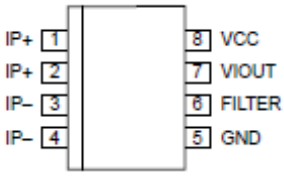
DC Current Sensor Module 20A Range ACS712T ELC-20A Module

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) x14 (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

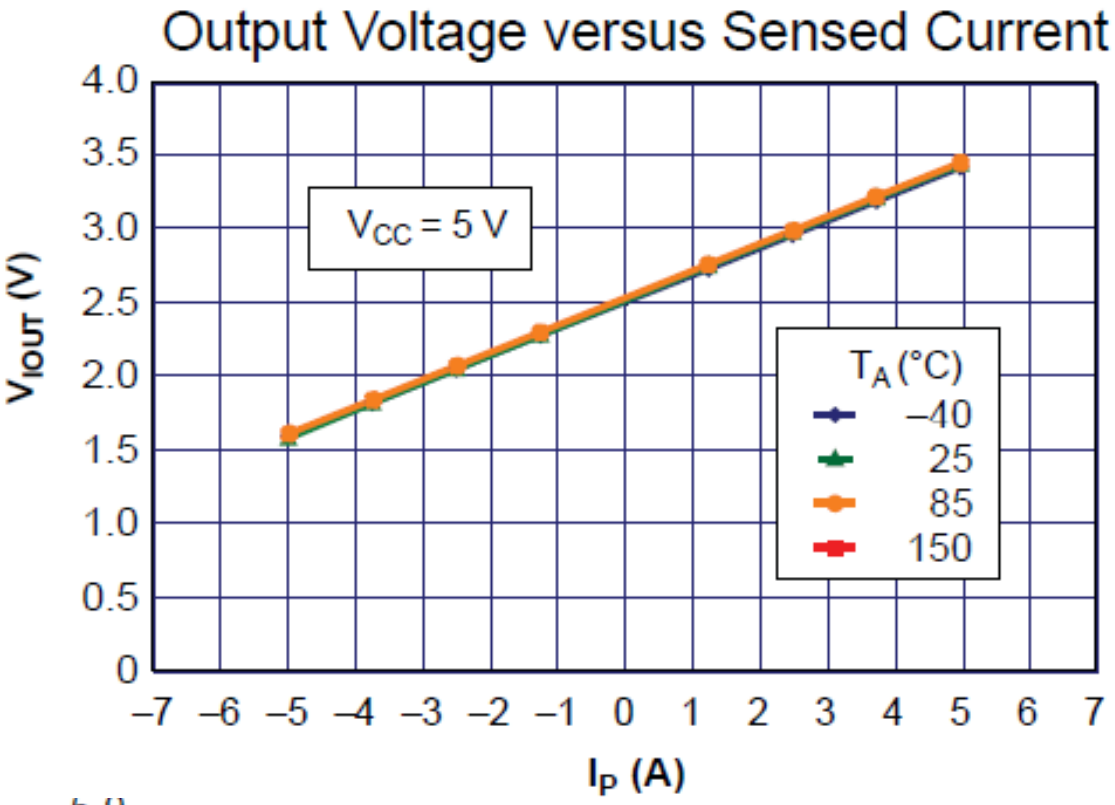
https://www.sparkfun.com/products/8882
This is a breakout board for the fully integrated Hall Effect based linear ACS712 current sensor. The sensor gives precise current measurement for both AC and DC signals. Thick copper conductor and signal traces allows for survival of the device up to 5 times overcurrent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

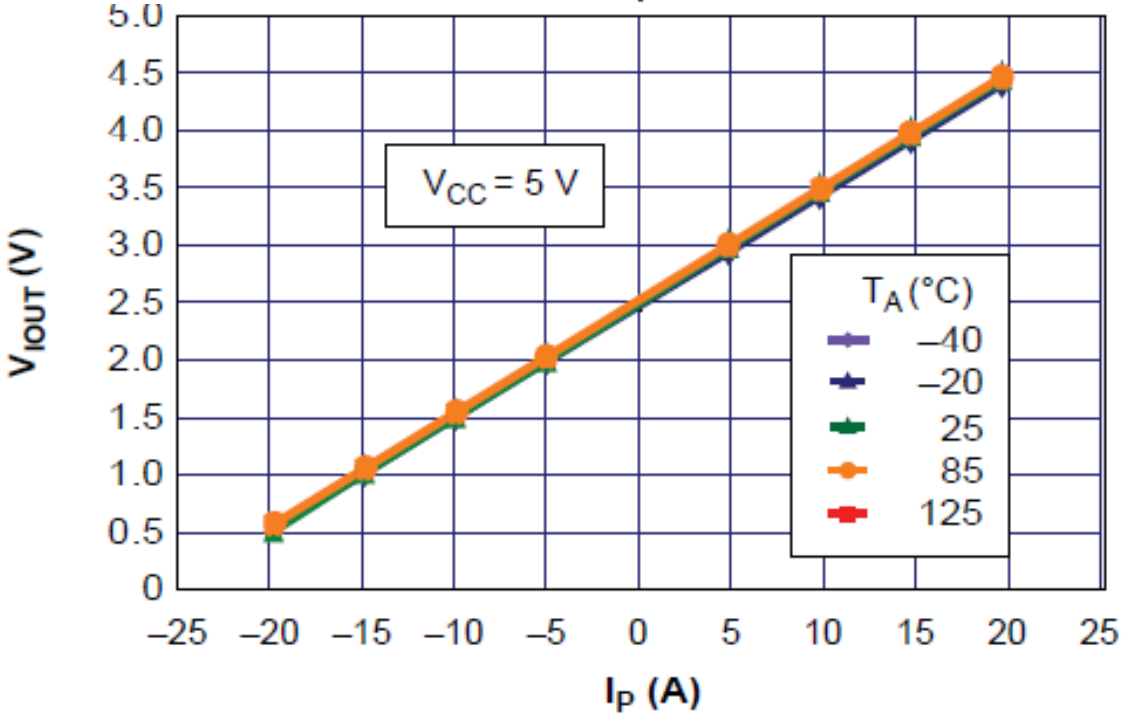
Pin-out Diagram



Terminal List Table

Number	Name	Description
1 and 2	IP+	Terminals for current being sampled; fused internally
3 and 4	IP–	Terminals for current being sampled; fused internally
5	GND	Signal ground terminal
6	FILTER	Terminal for external capacitor that sets bandwidth
7	VIOUT	Analog output signal
8	VCC	Device power supply terminal

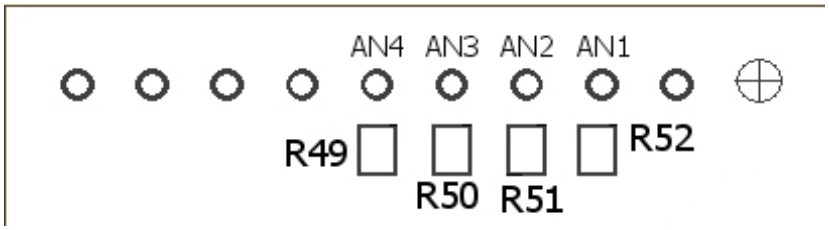

Output Voltage versus Sensed Current
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
VIOUT (V)
VCC = 5 V
TA (°C)
–40
25
85
150
–7 –6 –5 –4 –3 –2 –1 0 1 2 3 4 5 6 7
IP (A)


5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
VIOUT (V)
VCC = 5 V
TA (°C)
–40
–20
25
85
125
–25 –20 –15 –10 –5 0 5 10 15 20 25
IP (A)

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 249om resistor on bottom PCB side.

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

SMS command

SMS command	Answer SMS	Function
Flow setpoints		
2345L1,00000 2345L2,00050	(setpoints info)	Set minimum flow level **default:** F1: 0, F2: 0
2345H1,00500 2345H2,09000		Set maximum flow level **default:** F1: 0, F2: 0
2345O	(Information)	Clear counters
Enable alarm SMS / disable alarm SMS (for digital inputs)		
2345E	PROTECTED	Enable alarm SMS for digital inputs, **default** enable; after restart enable
2345B	UNPROTECTED	Disable alarm SMS for digital inputs
Get information		
2345i	(Information) F1= 53 F2= 0 C1= 273 C2= 0 A1=0% A2=0% A3=0% B= 12V I3=0 I4=0 I5=0 I6=0 O1 OFF, O2 OFF, O3 OFF, O4 OFF Timer ON	Read information – flow 1 flow 2 counter 1 counter 2 analog inputs battery voltage inputs outputs output timer status
Set/Reset Outputs; Timer Outputs; only for Output 3 (relay)		
2345S1 … 2345S4	(Information)	Set output
2345R1 … 2345R4	(Information)	Reset output
2345V,030	(information)	set duration for timeout = 30 min Maximum 240 min. (default 15 min)
2345T,060 2345T	(information)	set output for timeout = 60 min default timeout = 15 min Maximum 240 min. set output for timeout = default ***)
2345Zn	(information)	Output 3 pulse, n = 1...9 (sec)
Internal control		
2345K,AB	OK	Internal control from digital inputs 3,4,5,6; internal control enable, then if event on digital input, start Relay ON on default time (see SMS command T) A,B = 0,1,2...9,A...F,a..f; A – for digital inputs 3,4,5,6 B – for pulse inputs 1, 2 (table on page 15)
Phone Numbers for alarm SMS		
2345N1 … 2345N4	OK	Set number for alarm SMS
2345C1 … 2345C4	OK	Clear number at position 1..4
Set Date/Time		
2345D,13/05/11,13:45:00+00	(information)	Set Date-Time with SMS

Alarm SMS text setting		
2345X01,Input 01 2345X22	1:Input 01	Set text message for 4 digital, flow 1 and 2, analog 1 … 4 Text up to 15 characters (Text SMS message table on page 14) Clear text
Flow measurement period		
2345F,060	(setpoints info)	Set flow measurement period. Default 10 min; Maximum 240min
2345A1 2345A0	OK	Flow alarm SMS immediately after Flow > MAX, or < MIN Flow alarm SMS only after end of measurement period
Analog Inputs (AN1,AN2,AN3 – current sensor, AN4 – external voltage 0-15V)		
2345M1,35 2345M4,40	(setpoints info)	Set setpoints for minimum analog level for A1,A2,A3,A4 in % (table page 8) default: AN1,AN2,AN3 = 0%, AN4 = 60%
2345Y1,65 2345Y4,60	(setpoints info)	Set setpoints for maximum analog level for A1,A2,A3,A4 in % (table page 8) default: AN1,AN2,AN3 = 0%, AN4 = 95%
2345U	(setpoints info) F1:0 50 F2:0 0 A1:0 0 A2:0,0 A3:0 0, B:77 90 A.md:223 Fl.mp: 60 min O3ctr: 00 T3: 15 min	Get setpoints flow setpoints MIN MAX analog setpoints MIN MAX battery voltage setpoints MIN MAX an. inputs mode (Amode) and float measurement period (Fmp); Internal control and digital filter, Output timer (in min)
2345Q51	(information)	Set zero offset for current sensor (AN1, AN2, AN3) 00..99 (see offset table on page 8)
2345W523	(setpoints info)	Set current sensor for AN1,AN2,AN3 individual 5 – +/-5A current sensor 2 – +/-20A current sensor 1 – 0-10V analog input (10V = 100%) 0 – 0-5V analog input (5V = 100%) or 0-20mA input (20mA = 100%)
Password change		
2345P2013	Psw:2013	Change password; use only 0,1,2,3,4,5,6,7,8,9 **deault password 2345** if you forgot password, use jumper for restore default password 2345 (see paragraph JUMPERS)

***) You can set Output 3 (on board RELAY output) for time from 1 to 240 min.

Text SMS message

	For Analog Inputs (AN2, AN3, AN4)	For current sensors (AN1, AN2, AN3)
SMS command	**Text** (length 15 char)	**Text** (length 15 char)
2345X01,	Input 3	Input 3
2345X02,	Input 4	Input 4
2345X03,	Input 5	Input 5
2345X04,	Input 6	Input 6
2345X05,	Flow1 very high	Flow1 very high
2345X06,		
2345X07,	Flow1 high	Flow1 high
2345X08,	Flow2 high	Flow2 high
2345X09,	Flow2 low	Flow2 low
2345X10,	Flow2 normal	Flow2 normal
2345X11,	Analog 1 high	I1 pos. high
2345X12,	Analog 1 low	I1 neg. high
2345X13,	Analog 1 normal	
2345X14,	Analog 2 high	I2 pos. high
2345X15,	Analog 2 low	I2 neg. high
2345X16,	Analog 2 normal	
2345X17,	Analog 3 high	I3 pos. high
2345X18,	Analog 3 low	I3 neg. high
2345X19,	Analog 3 normal	
2345X20,	Battery high	Battery high
2345X21,	Battery low	Battery low
2345X22,	Battery normal	Battery normal

Numbers

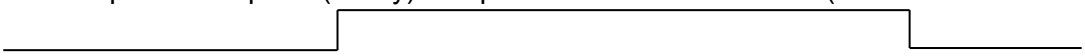
Example for numbers in EEPROM (with SMS command 2345N and 2345C)

Nr in EEPROM	numbers
1	+37122842913
2	+37122842914
3	+37122842915
4	+37122832798

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 and D).

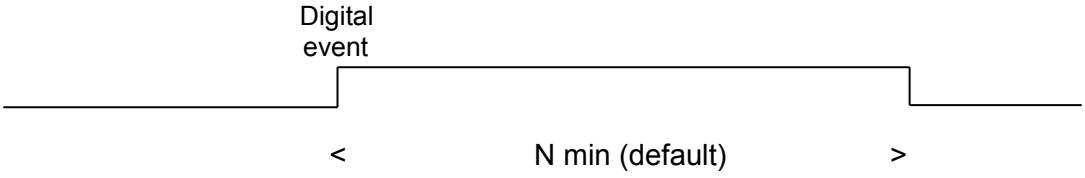


T30 < 30 min >

Internal Control

Internal control for set Output 3 (Relay) ON on duration time
if event digital input.1,2,3,4,5,6 (SMS command 2345K)

	Digital Input				Pulse Inp. (flow)				
			2	1	6	5	4	3	Internal control with Out.3 for default time
SMS command									
2345K,0x	0	0	0	0					disable
2345K,1x	0	0	0	1					Out.3 ON if event digital input 3
2345K,2x	0	0	1	0					Out.3 ON if event digital input 4
2345K,3x	0	0	1	1					Out.3 ON if event digital input 3,4
2345K,4x	0	1	0	0					Out.3 ON if event digital input 5
...									
2345K,Fx	1	1	1	1					Out.3 ON if event digital input 3,4,5,6
2345K,x1					0	0	0	1	Out.3 ON if event pulse input 1
2345K,x2					0	0	1	0	Out.3 ON if event pulse input 2
2345K,x3					0	0	1	1	Out.3 ON if event pulse input 1,2

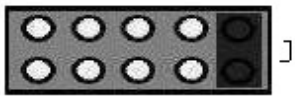


< N min (default) >

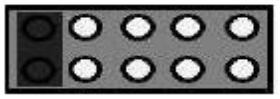
For example – if motion detector active – Out.3 ON for N min (N = 001..240 min). To Out.3 (relay) you can connect car DVR or Siren.

Jumpers

Jumper J1

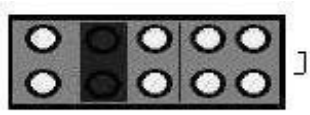


Change event 0-1 / 1-0 for digital input
(jumper set - 0-1 event)
for pulse input 1 and 2 only. For Inp.3,4,5,6 use SMS 2345J



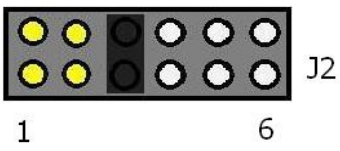
Set password default (2345) -

set jumper, power on; after 5 sec power off, remove jumper.



Set repeat SMS mode
If jumper set, alarm SMS once,
otherwise – alarm SMS periodic with flow measurement period
(2345F060 - flow measurement period)
Work only if set immediately mode (command 2345A1)

Jumper 2



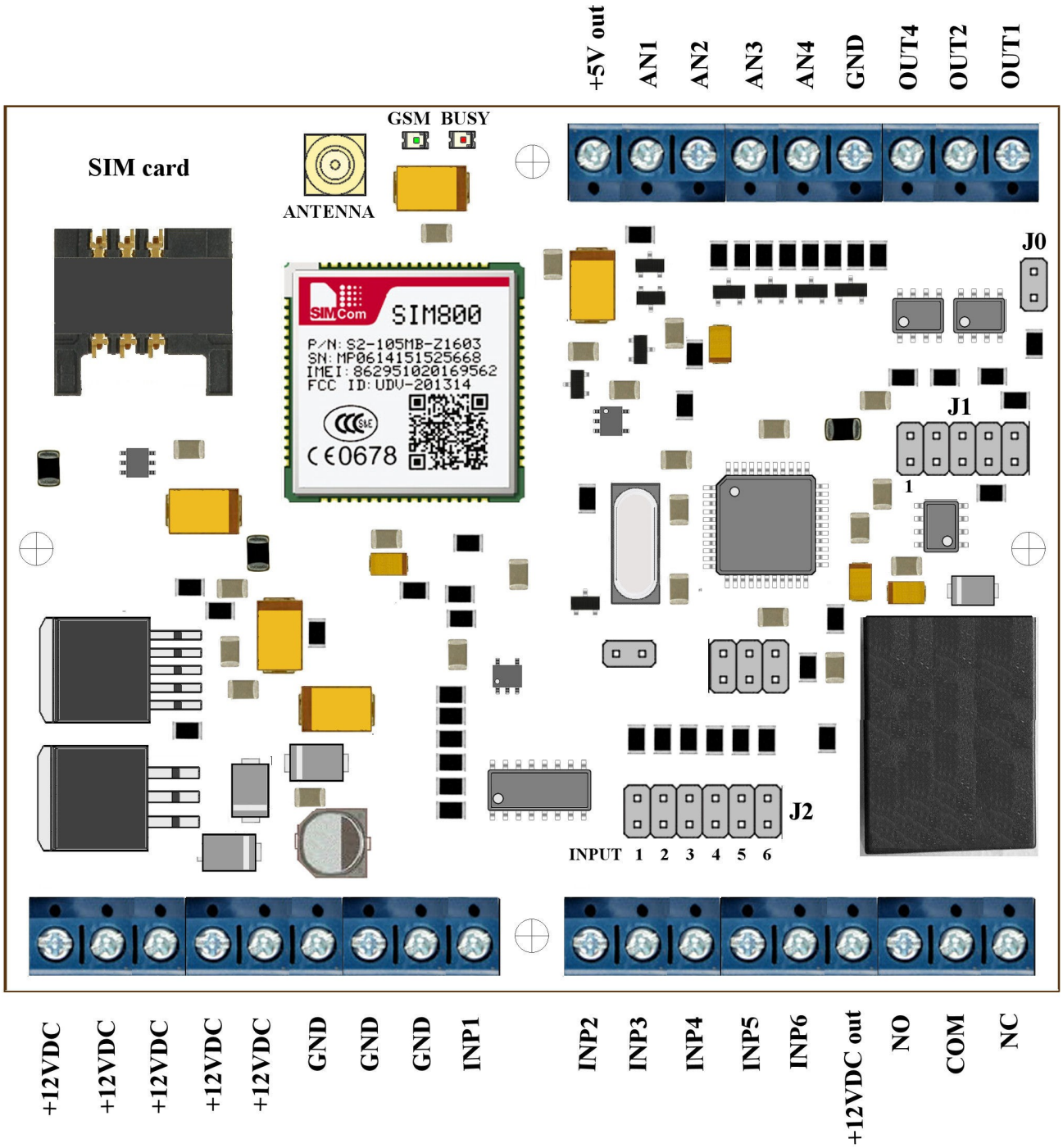
Jumpers for pull-up resistor setting
only for digital inputs 3,4,5,6

Not use jumper for input 1 and 2 for pulse inputs if pulse source not NO contact or not open collector output.

Jumper 0 (see figure next page)

Connection to analog input 4 internal supply voltage.
If Jumper J0 set, on AN4 = 8V.

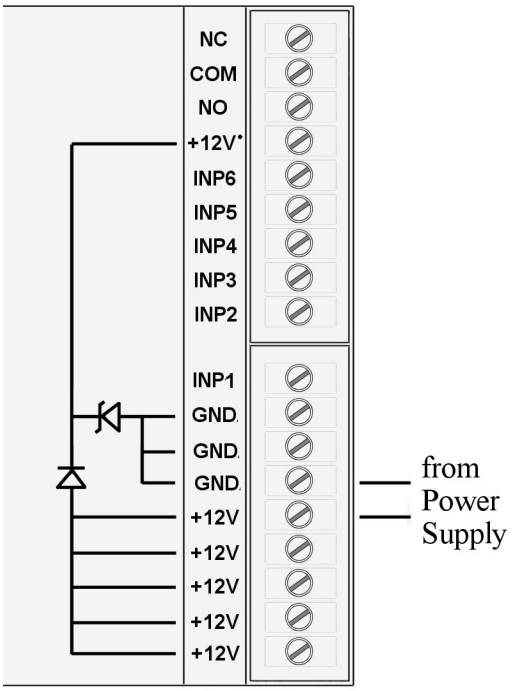
BR160SM board



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.

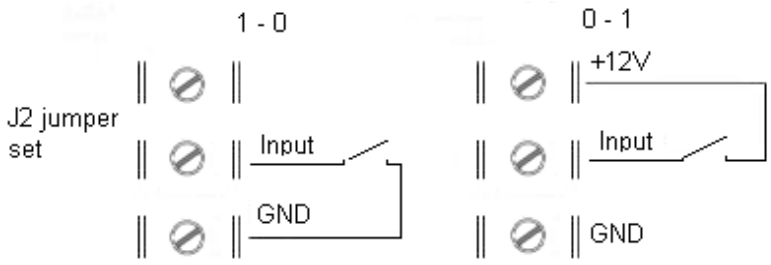
Internal +12VDC connection and Power Supply connection schematic.



Connection Example

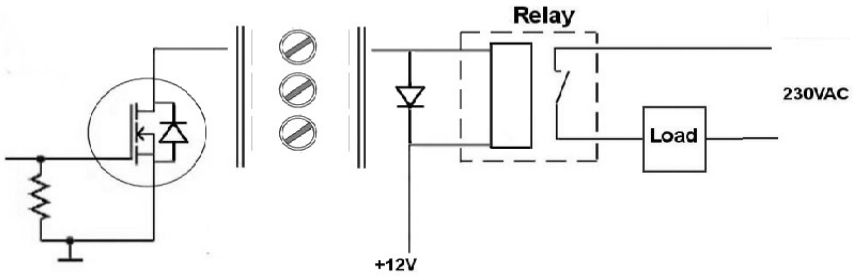
Connection example to Input Driver (Input 1-5)

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

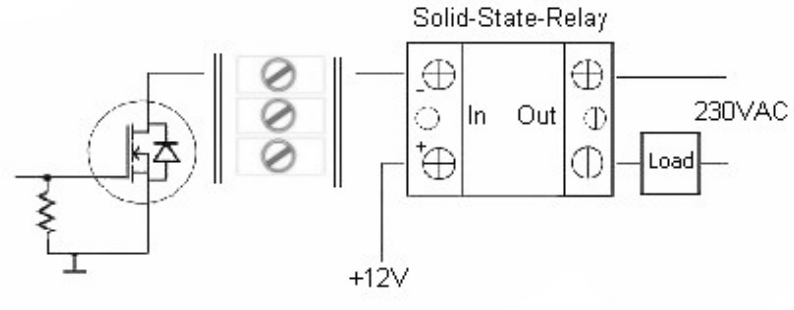


Relay connection example to Output Driver (Output 1, 2 and 4)

Electromechanical relay connection.



Solid-state-relay (SSR) connection.

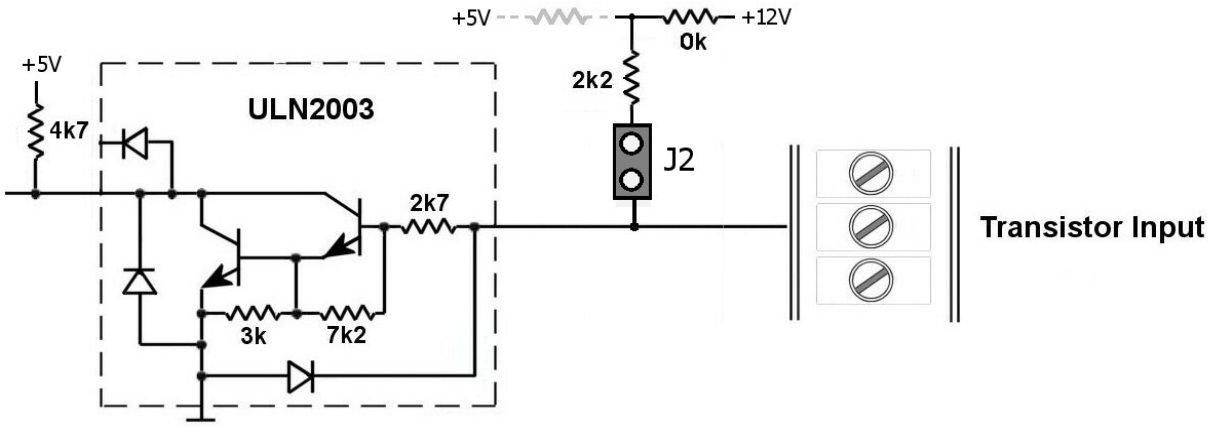


Inputs / Outputs Schematic

Inputs

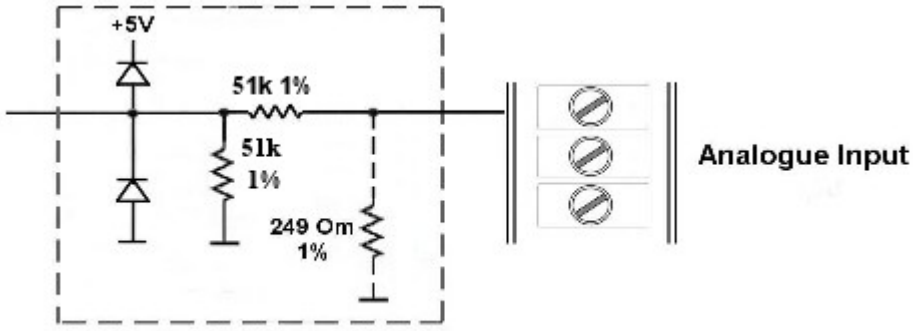
Digital Transistor Inputs

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

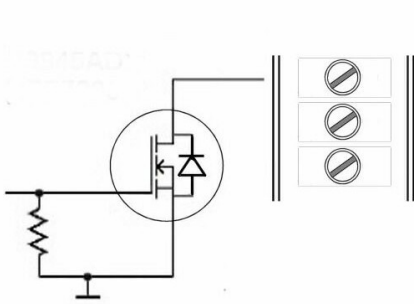
Connector: Screw terminal block
Input type: CMOS
Input Voltage: 0 to +10V
Maximum input voltage: 10VDC
Input impedance: 100 KOm.
ADC resolution: 10-bit
249 Om resistor – optional for 0-20/4-20mA applications



Outputs

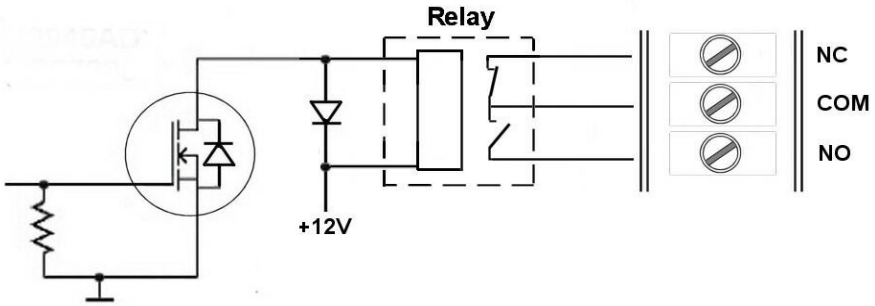
MOSFET Open Drain Outputs

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



Relay Output

Connector: Screw terminal block
Outputs: NO/COM/NC
Relay: SPDT power relay LEG-12F
Min load: 0.1 A, 5VDC



Technical Specification

Hardware Specification

	BR160SM-2FLOW-4A-A / BR161SM-FLOW-4A-A
GSM band support	GSM900/1800 / GSM850/900/1800/1900
Internal GSM modem	SIM900R / SIM900
RF Transmit Power	Class 4 (2W) 900Mhz, Class 1 (1W) 1800Mhz, 1900Mhz
Command and data transmission	SMS
SIM card reader	Yes
SIM card type	Phase 1 and phase 2+; SIM 3V / 1.8V
Antenna Connection	50Ω SMA (f) Connector
Firmware	Yes
Digital inputs	
Digital inputs type	Voltage-free, transistor ("0": 0...+1V; "1": +1.5…+12V without external limited resistor); Optional: +12V/+5V pullup resistor for each input
- Number of digital inputs	4
- Events digital inputs	4
- Digital inputs event	0-1 or 1-0
- Protection	Yes
Pulse inputs (Flow sensor)	
Number of pulse inputs	2
Flow event	min / norm / max
Flow range	0 – 18000 pulse/hour
Events Flow range	0 – 18000 pulse/hour
Protection	Yes
Analog inputs	
Number of analog inputs	4
- Maximimum 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 stabilised 1,2A minimum 12VDC (14.5VDC max.)
Power requirement	1.2A minimum, 2A peak during transmission (14.5VDC max.)
Power consumption	40mA in idle mode, 100mA peack in SMS transmit mode
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

	BR160SM-FLOW-4A-A / BR161SM-FLOW-4A-A
Number of controlled outputs	4
Timer output	Output 3
Maximum timer duration	240 min
Pulse inputs (flow)	2
Flow limit	300 pulse/min, 18000 pulse/hour
Counter limit	65530
Setpoints range	00000 – 29999 pulses in flow period (flow period 1 … 240 min)
Digital event inputs	4
Setpoints	0-1 or 1-0
Analog event inputs	4
Setpoints range for MIN and MAX	00 - 99
Events cell phone numbers	4
SMS events format	Text message
SMS message format for analog data	In A,V, %; setpoints 00 - 99 %