Signal Converter

OMC-184

Users Manual
Version no. 1.04

OBSERVATOR instruments B.V.
P.O. Box 60
2980 AB Ridderkerk
Rietdekkerstraat 6
2984 BM Ridderkerk
Phone ++31 (0)1804 63411
Telefax ++31 (0)1804 63510

Netherlands

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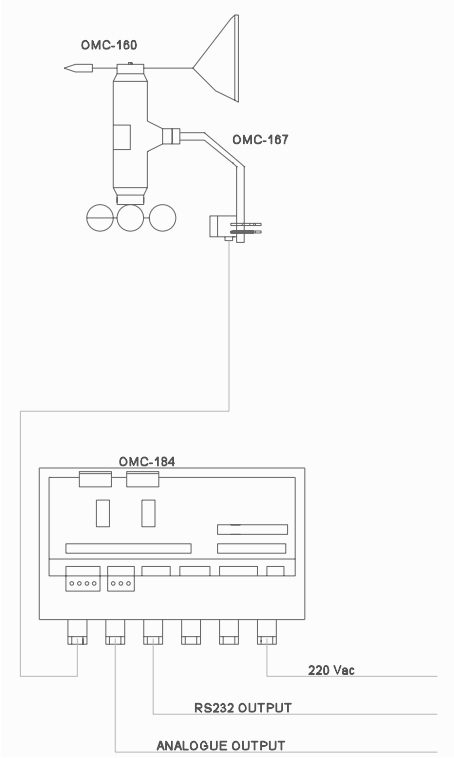
1. General

The OMC-184 Signal converter was developed to make an interface with digital sensors without the requirement to store sensor data. The data from the connected sensors is transmitted in one serial string or presented as analogue signals 0...10 volt or 4...20 mA. The serial information contains the measured parameters of the sensors connected. The span and offset for each channel can be set via a serial port provided. All this information is stored in EEprom.



1.1 Processor board

The processor board accepts the information from the Obsermet wind sensors. After conversion of the digital signal to analogue signals, outputs are provided via two analogue output channels on the processor board. The output signal can be set with jumper settings to 0...1 Volt, 0...10 Volt or 4...20 mA over a range that can be set in the software.

The processor board provides interface circuits for RS232, RS422 or RS485 outputs, The type of interface is selectable with jumper settings on the board.

The sensor information can be transmitted in certain protocols like OMC-2900, NMEA-183 or a copy of the message received from the OMC-160 windsensor.

A TTY output primary is provided for the transmission of all the captured input signals. The format used is identical to the OMC-2900 format. The transmission interval can be set in the software. The messages can contain the following information, Windspeed, Wind gust, Wind direction, Baro pressure , Solar radiation, Temperature, Humidity and precipitation.

The board has four digital inputs, passive switches can be connected to this inputs. The current through the contacts is ±10 mA the voltage 15 Volts. The inputs can be used for precipitation or wind speed transmitters with pulse output.

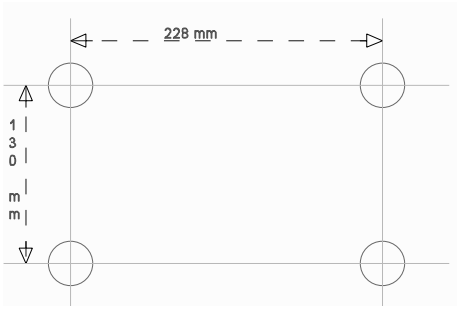
The processor board is provided with basic protection against voltage spikes caused by Electro Magnetic Pulse.

Specifications processor board,

Input 1	: Currentloop serial info 300 baud 8N1
Input 2	: 4 x digital input
Output1	: 2 analogue out 0...1 V, 0...10 V or 4…20 mA (max load 500 Ohm)
Output2	: Currentloop serial info 300, 1200, 2400, 4800 or 9600 baud
Output3	: RS232, RS422 or RS485 NMEA-183 protocol
Supply voltage	: 115 Vac, 220 Vac or 24 Vdc
Supply current	: by 24 Vdc 400 Ma
Housing	: Polycarbonate
Dimensions	: 160 x 240 x 90 mm
Weight	: 1.5 kg
Cable glands	: Max 12 size PG11

2. Installation

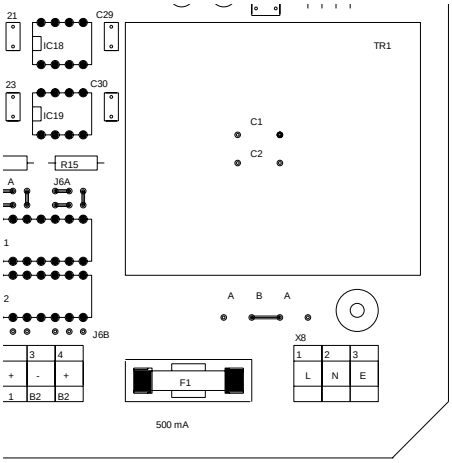
2.1 Mechanical



The OMC-184 is supplied in a wall mounted box. To install the unit against a wall 4 screws or bolts are needed. Where to locate the holes is shown in the drawing.

The box is provided with maximal 12 cable glands PG11 to support cables with a maximum diameter of 11 mm.

2.2 Electrical



The power supply is connected to the unit via a three core cable 3 x 1 mm^2. The connections are made to terminals,

X8.1 = Live
X8.2 = neutral
X8.3 = ground

The unit can be set to work with 115 Vac, 240 Vac or 24 Vdc. The choice is made on the processor board with some wires soldered just above the X8 connection terminal. For 220 Vac the connection marked "B" must be made, for 115 Vac the wires marked "A" must be installed. If the unit is supplied with 24 Vdc the transformer must be removed. Under the transformer the connections C1 and C2 must be made.

If 24 Volt dc power supply is used it has to be connected to the terminals,

X8.1 (L) = positive (+)
X8.2 (N) = negative (-)

2.3 Sensors connected to the processor board

2.3.1 Wind speed and direction OMC-160

The OMC-160 wind speed sensor is connected to the OMC-184 with a four core cable. Two cores for the power supply and two cores for the transport of the output signal. The power supply is controlled via a watch dog circuit. If no data is received from the OMC-160 the power on the terminals X5.1 and X5.2 is switched ON and OFF to restart the electronics inside the OMC-160.

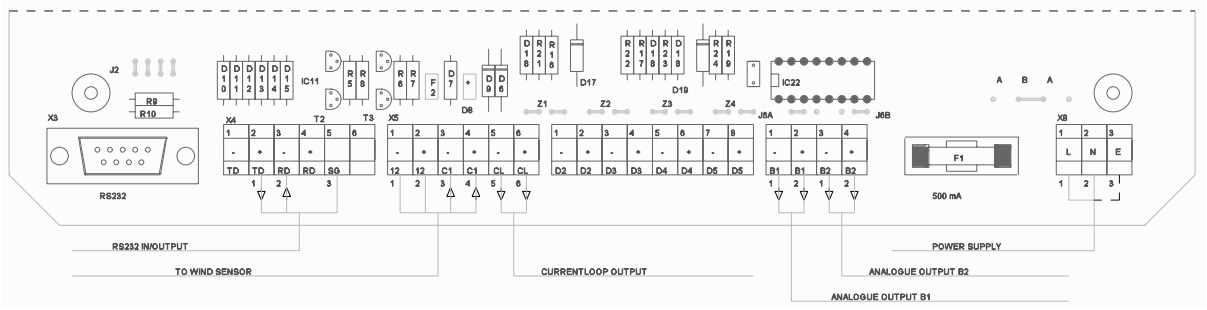
OMC-184 processor board X5.1	OMC-160 1 - supply
OMC-184 Processor board X5.2	OMC-160 2 + supply
OMC-184 processor board X5.3 (C1)	OMC-160 3 - currentloop output
OMC-184 Processor board X5.4 (C1)	OMC-160 4 + currentloop output

A closed currentloop is indicated by a LED D8 installed just above the terminal strip X5. If information is received the LED is flashing. With no information received the current in the loop is 20 mA and the LED in "ON".

2.3.2 Analogue output processor board

B1 = Wind speed 0...10 Volt or 4...20 mA = 0...40 m/s
B2 = wind direction 0...10 Volt or 4...20 mA = 0...360 Deg.

This are the standard settings, on customers request they can be set different. It is also possible for th e user to change the settings i.e. 0...10 volts = 0...60 m/s.



2.4 Serial in/outputs

2.4.1 Serial input C1

The serial input C1 is a currentloop input. The input is active and will provide 20 mA when the loop is closed. The input signal must be a signal with a baud rate of 300 baud, none parity, 8 bit word length and 1 stopbit (300 8N1). This input is connected to a watchdog circuit, if there is no information received from the windsensor the watchdog circuit starts to switch the supply voltage to the wind sensor ON and OFF with an intervaltime of 4 seconds. This function is build in to restart the processor unit in the wind sensor.

The input is dedicated for the Obsermet wind sensors OMC-160/162/164/165/170.

On request the input can be change to accept other signal which can be different in transmission parameter or in format of the message.

2.4.2 Serial output format

The OMC-184 can give information out on RS232, RS422 or currentloop levels. The protocols for the information sent out can be OMC-2900, NMEA or OMC-160 format. To protocol of the transmitted information can be selected with the command word INMO (INterface MOde). There are four different settings possible,

INMO 1 **OMC-2900 format.**

With this selection the information received from the windsensor is transmitted on the currentloop output and the RS232/RS422 output in the OMC-2900 format.

INMO 2 **NMEA format.**

With this selection the information received from the windsensor is transmitted in knots in NMEA-183 format on the RS232/RS422 output. On the currentloop output the incoming message from the windsensor is repeated en can be used as a daisy chain output.

INMO 3 **NMEA format.**

With this selection the wind information received from the windsensor is transmitted in m/s in NMEA-183 format on the RS232/RS422 output. On the currentloop output the incoming message from the windsensor is repeated en can be used as a daisy chain output.

INMO 4 **OMC-160 format.**

With this selection the information received from the windsensor is repeated on the RS232 output. On the currentloop output the incoming message from the windsensor is repeated en can be used as a daisy chain output.

2.4.3 Serial output CL

The currentloop output is normally used to transport the collected data from the currentloop input. Using the system in this way it is not necessary anymore to output the data as analogue signals which upgrade the performance and the accuracy. The data is transmitted with a speed of 300 baud but can be changed to higher speeds if necessary and if cable lengths used allow higher speeds. The other parameters are the same as from the currentloop input. (300 8N1)

The wind data transported in the OMC-2900 format looks as following,

<STX> <LF>V21.2<SP>CSCS<CR>
<LF>D156<SP>CSCS<CR> <EOT>

Every message starts with a start of text character after this the messages are transmitted. All messages start with a line feed followed with the identifier for the data, then the data and then a checksum for protection reasons, the message end with a carriage return.

All input channels can be transmitted in this way every second to any receiving station.

If the currentloop output signal from the OMC-160 is repeated by the OMC-184 the message looks as follows,

<LF>D125<sp>V234<sp>cscs<CR>

In the above message the transmitted wind direction is the number shown after the indent "D" 125 degrees, the windspeed in the message is shown after the indent "V" 234 is 23.4 m/s. The windspeed is transmitted without decimal point and must therefor be divided by 10 to get the correct windspeed.

The checksum is all information in the string added, the least significant byte is divided into high and low nibble and both nibbles are incremented by hexadecimal 30. This information is sent out as a checksum.

2.4.4 RS232/RS422 in/output channel

The RS232 signal is available on two different places, the 9 pin D-connector and the terminal strip X4. The selection can be made with jumpers on the board. Also it is possible to convert the RS232 signal s into RS422 or RS485. The RS422 or the RS485 signals are only available on the terminal strip X4. It is possible to use this channel in such a setup that the input channel is used on RS232 level and the output on RS422 or RS485 level.

The RS232 output can only be used when the cable length, between the OMC-184 and the computer, not longer is than 15 meters.

The OMC-2900 and the OMC-160 format on the RS232/RS422 looks the same as the format used in the currentloop output described paragraph 2.4.3,

The NMEA output looks as follows,

$IIMWV,123,R,5.8,N,A*24 Windspeed in knots
$IIMWV,123,R,5.8,M,A*27 Windspeed in meters per seconds

The RS232 channel is normally used to communicate with a computer to tell the OMC-184 which sensors are connected where and what the span and offset of the signal are.

If necessary it is possible to change the software of the OMC-184 to accommodate different protocols on customers request.

3. Setting up the unit

3.1 Available commands for communication

On the OMC-184 printed circuit board there are no potentiometers for adjustments. All adjustments ar e done in and with the software. For calibration a digital voltmeter and a voltage transmitter are needed. Connect a computer with a serial cord to the 9 pin D-connector on the processor board or to the terminal strip X4. Start a terminal program on the computer with the settings 300 baud 8N1. Type the letters "MENU" in capitals, the OMC-184 responds with the message "OMC-183 command interpreter" followed by the prompt ">"

Type the command "HELP" The following available commands are shown on your computer screen,

INEC Echo on/off of the OMC-184
INSP Sets the baud rate for communication
SAVE Save all settings in EEprom
STOP Leave the command interpreter
CHTY Channel type
CHTR Channel transmission
CHSC channel scaling
AOAS Analogue output assignment
AOSC Analogue output scaling
SYCA System calibration
AOST Analogue output set (for calibration purposes only)
AOCA Analogue output calibration
CSTY Checksum type
INMO Interface mode
INEC The command INEC (initialize echo) is used to set the echo of characters by the OMC-184 ON or OFF. The command is used as follows INEC 1 or INEC 0

INSP The command INSP (initialize speed) is used to set the communication speed (baudrate) for the RS232/RS422 in/output (E) and the Currentloop output (C), at the same time the transmission speed between the computer and the OMC-184 is changed. If the transmission speed is changed the transmission speed of the computer must be set to the same speed, otherwise communication is not possible. The command is used as follows, with the following possibilities,

INSP C,1	(Currentloop 300	baud)
INSP E,3	(RS232/RS422 1200/1200	baud)
INSP E,4	(RS232/RS422 2400	baud)
INSP E,5	(RS232/RS422 4800	baud)
INSP E,6	(RS232/RS422 9600	baud)

The command INSP without any parameter shows the current settings,

INSP<CR>
C,3 (Currentloop transmission speed 1200/1200 baud)
E,6 (RS232/RS422 transmission speed 9600 baud)

SAVE The command SAVE is used to save all settings into an EEprom. This means that settings that are changed are still available when the unit is switched on/off. After a setting is changed the command SAVE must be used to make this change permanent.

STOP When you are finished in the interactive mode, it is advisable to stop this mode by giving the "STOP" command. After this command it is not longer possible to use the 4 letter command words. When there are channels transmitting to the RS232 port you will see the values direct after the "STOP" command. In the interactive mode the transmission to the RS232 port is stopped.

CHTY The command CHTY (channel type) is used to set the channel specification for the serial currentloop input.

For the serial input the second parameter is not used and must be a "0". The third parameter can be any ascii character except "-". If the "-" is used this means that the channel is disabled.

CHTY C1,0,V (set C1 as input for wind speed)
CHTY C2,0,D (set C2 as input for wind direction)

CHTR The command CHTR (channel transmission) is used to set the transmission of certain received, measured or calculated values to the RS232 output or the currentloop output. The command starts with a channel number followed by an indent character followed by a direction number from 0...255. It is possible to send information to both outputs if necessary.

Bit 6 Send to currentloop ON=1 OFF=0
Bit 7 Send to RS232 port ON=1 OFF=0

The calculation for the mode is done as follows,

MODE = (bit 7 * 128) + (bit 6 * 64)

When you want to send information to the RS232 port bit 7 becomes "1", otherwise "0". The command is used as follows,

CHTR C1,V,128 (send value C1 with indent "V" to the RS232 port)
CHTR C1,V,64 (send value C1 with indent "V" to the currentloop output)

CHSC The command CHSC (channel scaling) is used to set offset, range and resolution of an input channel. The internal value in the OMC-184 = (real value * range) + offset. For the analogue inputs the internal value = (real value /2.5 * range) + offset. The number of digits behind the decimal point is only important when the channel is also used for output to a serial port or display. In case of a display you can't use more than 1 digit behind the decimal point. The Command is used as follows,

CHSC A3,-30,250,1
CHSC C1,0,0.1,1

AOAS The command AOAS (analogue output assignment) gives the possibility to assign an analogue output (B1...B8) to an input channel. The command is used as follows,

AOAS B1,A3 (value of A3 out on analogue output B1)

AOSC The command AOSC (analogue output scaling) sets zero offset and range of an analogue output. The offset gives the value at which the output is zero volts. The range gives the value plus the offset at which the output is maximum. The command is used as follows,

AOSC B1,-30,100 (output 0 volt by -30, and max. at +70)

SYCA The command SYCA (System calibration) is used to set the omc-184 in the calibration mode. The command is used as follows,

SYCA 1 (omc-184 set in calibration mode)
SYCA 0 (omc-184 set in the working mode)

AOST The command AOST (Analogue output set) is used to force a analogue output to a certain output value. The digital to analogue converter is a 12 bits converter using 4096 steps. With the command AOST 2047 the D/A convertor is forced to half the maximum output. This output must be measured with an accurate digital voltmeter. The command is used as follows,

AOST B1,1023 (output B1 gives a ¼ of the maximum output voltage)

AOCA The command AOCA (Analogue output calibration) is used to calibrate the analogue output. The command must be used together with the command AOST. The value measured with the digital voltmeter and the value that should be measured are the parameters for this command. The command is used as follows,

AOCA B1,5.123,5.000 (measured value,should be value)

INMO The command INMO (interface mode) is used to select what output signal and format is used on the RS232/RS422 and the currentloop output of the OMC-184. A description of the format is given in paragraph 2.4.

CSTY The command CSTY (checksum type) is used to select if the checksum over the messages transmitted by the OMC-184 should be in the old or in the new checksum type.

3.2 Calibration analogue output channels

1. Connect a computer to the serial input of the OMC-184
2. Type MENU from the terminal
3. The OMC-184 responds with a > as prompt
4. Input the command SYCA 1 (system calibration)

The OMC-184 is now in the calibration mode.

The command AOST (analogue output set) is used to force an analogue output to a certain value. The D/A converter used is a 12 bit D/A converter using 4096 steps. With the command AOST the output is force to a certain voltage which must be measured with a accurate digital voltmeter. The measured output in volts is than used in the command AOCA for calibration purposes.

1. Execute the command AOST B1,2047 the output voltage on output B1 should go to 5.000 volts. (depending on position jumper J4)
2. Measure the voltage present on the output B1 this is e.i. 5.234 volt.
3. Execute the command AOCA B3,5.234,5000 the first parameter is the measured voltage and the second the voltage that was expected after the AOST command.
4. Repeat the procedure for all analogue output channels.

When the calibration is finished give the command SYCA 0, the OMC-184 will leave the calibration mode. Give the command **SAVE** to store all the calibration information in the EEprom. If this is forgotten the OMC-184 will loose all his calibration information when the OMC-184 is switched off.

The commands AOCA and AOST can only be used when in the calibration mode if the command is given outside the calibration mode the OMC-184 responds with an error 300 message.

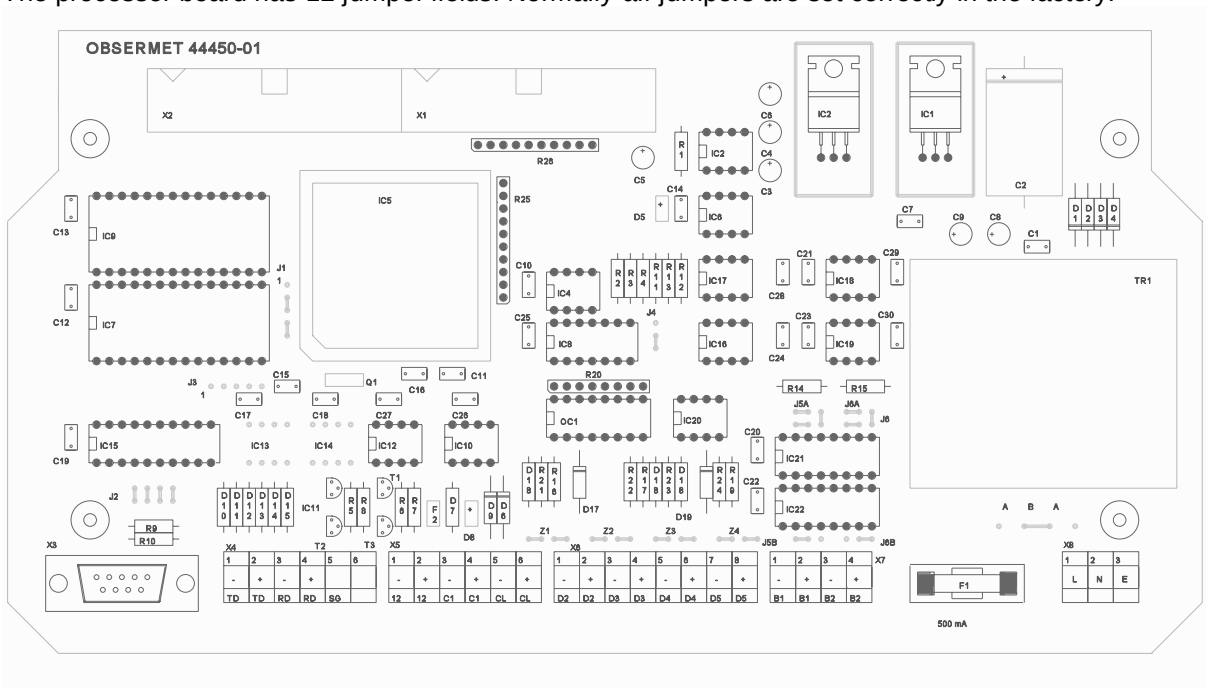
3.3 Default settings OMC-184

INSP	C,1	Currentloop input 300 baud
INSP	E,1	RS232 output 300 baud
CHSC	C1,0,0.1,1	Channel C1 set offset 0, gain 0.1 reading 00.0
CHSC	C2,0,1,0	Channel C2 set offset 0, gain 1, reading 000
CHTY	C1,0,V	Channel C1 coupled to value with indent "V"
CHTY	C2,0,D	Channel C2 coupled to value with indent "D"
CHTR	C1,V,192	Channel C1 value out on RS232 and the currentloop with indent "V"
CHTR	C2,D,192	Channel C2 value out on RS232 and the currentloop with indent "D"
AOAS	B1,C1	Analogue output B1 coupled to input C1
AOAS	B2,C2	Analogue output B2 coupled to input C2
AOSC	B1,-10,50	0...20 mA is set for -10...40 m/s
AOSC	B2,-90,450	0...20 mA is set for -90...360 deg.
INMO	2	Select serial output format

4. Jumper settings

4.1 Jumper settings processor board

The processor board has 12 jumper fields. Normally all jumpers are set correctly in the factory.



4.1.1 Jumper field J1 (between IC7 and IC5)

The jumper field J1 is telling the micro processor in what mode the processor is working. There are three possibilities,

1. Expanded mode / disable internal ROM
2. Expanded mode / use internal RAM
3. Single ship micro processor

On this board the micro processor is working in the Expanded mode with disabled internal ROM, the jumper must be placed as shown. (2-3 and 4-5)

4.1.2 Jumper field J2 (between IC15 and R9)

The RS232 connection on the processor board is normally connected via the 9 pin D-connecter installed on the lower left corner of the board. Normally this connection will only be used when programming the setup of the unit or to calibrate the unit. If a permanent connection is needed it is possible to connect the incoming RS232 cable to terminal strip X4 on the processor board. Doing it this way it is not necessary to disconnect the 9 pin D-connector to get the cable through the cable gland and then reconnect the plug again. If this option is used 4 jumpers must be placed in jumper field J2 as shown in the drawing and IC13 and IC14 must be removed.

The connection to terminal X4 are as follows,

Receive data RXD = X4.2 Transmit data TXD = X4.3 Ground GND = X4.5

4.1.3 Jumper field J3 (between IC7 and C17)

With the jumper field J3 it is possible to select a RS422 or RS485 output on the terminal X4 of the processor board.

4.1.4 Jumper field J4 (between IC8 and IC16)

With the jumper field J4 it is possible to set the output swing of the analogue output channels B1 and B2. With the jumper placed on position 1-2 the output voltage of B1 and B2 is 0...10 Volt. With the jumper on position 2-3 the output is 0...1 Volt.

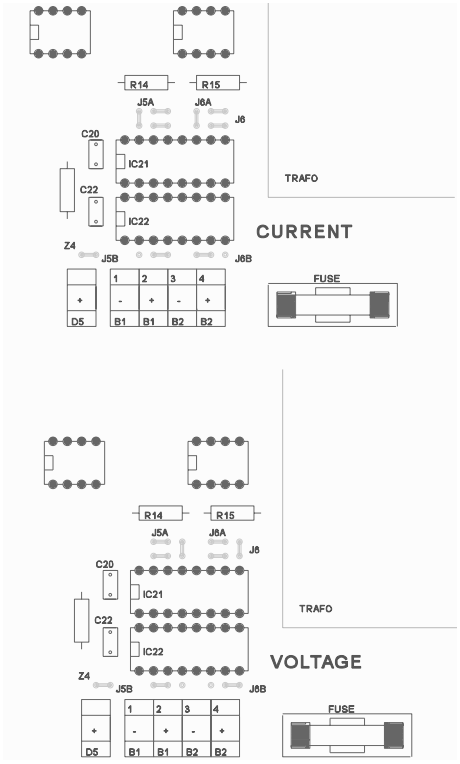
When a 4…20 mA output is selected the jumper on jumper field J4 must be set to position 2-3.

4.1.5 Jumper field J5/J6

The jumper fields J5 and J6 are divided in J5A/J5B and J6A/J6B. Jumpers in both field must be set correctly when a voltage or current output is selected.

With the aid of the jumper field J5 and J6 it is possible to select a voltage or a current output on the analogue outputs B1 and B2.

In the upper drawing the jumper settings shown are for current and in the lower drawing for voltage output.



4.1.6 Current output 4...20 mA

Keep in mind that if a current output is selected that the jumper on field J4 must be set to the position 2-3.

With the command AOSC (analogue output scaling) the range is always set over 0...20 mA and not for 4...20 mA. If 4...20 mA must represent 0...40 m/s the setting must be,

AOSC B1,-10,50 this will give an output of 0...40 m/s over 4...20 mA.
AOSC B2,-90,450 this will give an output of 0...360 degrees over 4…20 mA.

4.1.7 Voltage output 0...1 or 0...10 Volt

If voltage output is selected the settings set with the command AOSC are as follows,

AOSC B1,0,40 will give an output of 0...1 or 0...10 Volt over 0...40 m/s wind speed.
AOSC B2,0,360 will give an output of 0...1 or 0...10 Volt over 0...360 degrees wind direction.