The RS-232 and Analog converter

With the BoltSafe RS-232 and Analog converter it is easy to connect a BoltSafe CMS sensor (Continuous Monitoring System) directly to any Data acquisition system, computer, or PLC.

The RS-232 and Analog converter is available in two types of enclosures: a plastic DIN-rail enclosure for inside a control box and an aluminum enclosure that is watertight and dust-tight. The aluminum enclosure is fitted with connectors, which makes it a plug-and-play system, suitable for rough conditions.

The converter automatically scales the analog output to the attached sensor. By default, the maximum clamping load as mentioned on the sensor equals 100% of the analog output (5Vdc, 10Vdc or 20mA). If a small measuring range of the sensor is needed, the minimum and maximum clamping load of the sensor can be changed on request. That way, the preferred bandwidth of the output can be utilized.
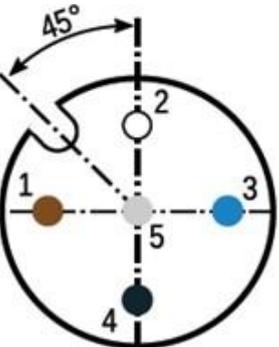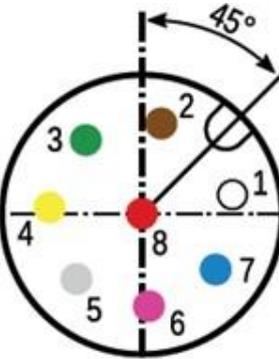
The free Windows-based software allows users to easily readout the load that is applied to the sensor. The software can also be used to adjust the moment when the BoltSafe RS-232 and Analog converter has to switch on or off (in kN or as percentage of full scale). This makes it possible to use the converter standalone; to activate an alarm or warning light.

The RS-232 and Analog converter can also be used to switch off a remote control or even a complete pump or (electric) torque tool. The complete serial communication protocol will be provided, which also enables users to use their own software and adjust settings via their computer or PLC.

Measuring bolt load accurately

Product specifications

Serial Communication	
Signal Protocol	RS-232 9600 baud, 8 bits, no parity, 1 stop bit
Analog Output	
Output levels	0-5Vdc, 0-10Vdc, 0-20mA and 4-20mA
Output resolution	12 bits (4.096 steps)
Output accuracy	± 0,25% of output span
Output update rate	50 ms
Output selection System calibration	DIP switch 10% and 100% of output by dipswitch
Relay Output	
Relay type Load rating	Normally open, programmable by RS-232 0,5A @ 125Vac, 1A @ 30Vdc
LED indicators	
Green Red	System running / Sensor connected Relay is activated
Power Input	
Serial communication and relay	5Vdc (trough USB)
0-5Vdc, serial and relay	12-30Vdc
All outputs	15-30Vdc
Max. power consumption	0,75W
Short circuit resistance	5Vdc and 12-30Vdc vs. GND
Reverse polarity protection	Analog output vs. GND and 5Vdc Sensor vs. GND
Insulation voltage Fuse	500Vdc 2 pieces of 125mA T, 5x20mm
Environmental	
Operating temperature	0°C to 55°C
Storage temperature Relative humidity	-40°C to 85°C 95% at 40°C, non-condensing

Electrical Connections

Sensor side	Plug-in screw-clamp	M12x1, 5P, Female connector
	1 = 5Vdc Sensor 2 = Data 3 = 5Vdc Probe 4 = GND	 1 = Brown 5Vdc Sensor 2 = White Data 3 = Blue 5Vdc Probe 4 = Black GND 5 = Grey NC
Outputs and supply	Plug-in screw-clamp	M12x1, 8P, Male connector
	1 = 5Vdc 2 = 12-30Vdc 3 = GND 4 = Analog Output 5 = RX (RS-232) 6 = TX (RS-232) 7 = Relay C1 8 = Relay C2	 1 = White 5Vdc 2 = Brown 12-30Vdc 3 = Green GND 4 = Yellow Analog Output 5 = Grey RX (RS-232) 6 = Pink TX (RS-232) 7 = Blue Relay C1 8 = Red Relay C2

The M12 thread from the sensor connector or the shield of the sensor cable must be connected to the ground (GND) of the converter. The sensor connector in the aluminum housing has already been grounded. If you use the plastic DIN rail housing, you must connect it in such a way that the shield is earthed.

RS-232 commands

BSl#	Load, rounded tot the standard step of the connected sensor
BSlr#	Load, rounded to whole numbers
BSsn#	Serial number of the connected sensor
BSsize#	Size of the connected sensor
BSrmin#	Lower limit of the sensor load range
BSrmax#	Upper limit of the sensor load range
BSks#	The steps in kN used to round the measuring value
BScal#	Calibration date of the sensor
BSsv#	Software version of the print

Bolt Safe

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Relay settings

The relay of the BoltSafe RS-232 and Analog converter can be used for a wide range of applications. Most common will be switching on a warning system if the bolt load dropped below a set value or switching off a bolt tightening system. The relay setting can be set with the software or with one command line:

BSR50@60@40@70@NCp

Switch point low ⎯⎯⎯⎯⎯⎯
(50 percent)

Switch point high ⎯⎯⎯⎯⎯
(60 percent)

Deadband low ⎯⎯⎯⎯⎯⎯⎯
(40 percent)

Deadband high ⎯⎯⎯⎯⎯⎯
(70 percent)

Value type
p = in percentage
k = in kN

Relay mode
NC = Normally closed
NC = Normally open
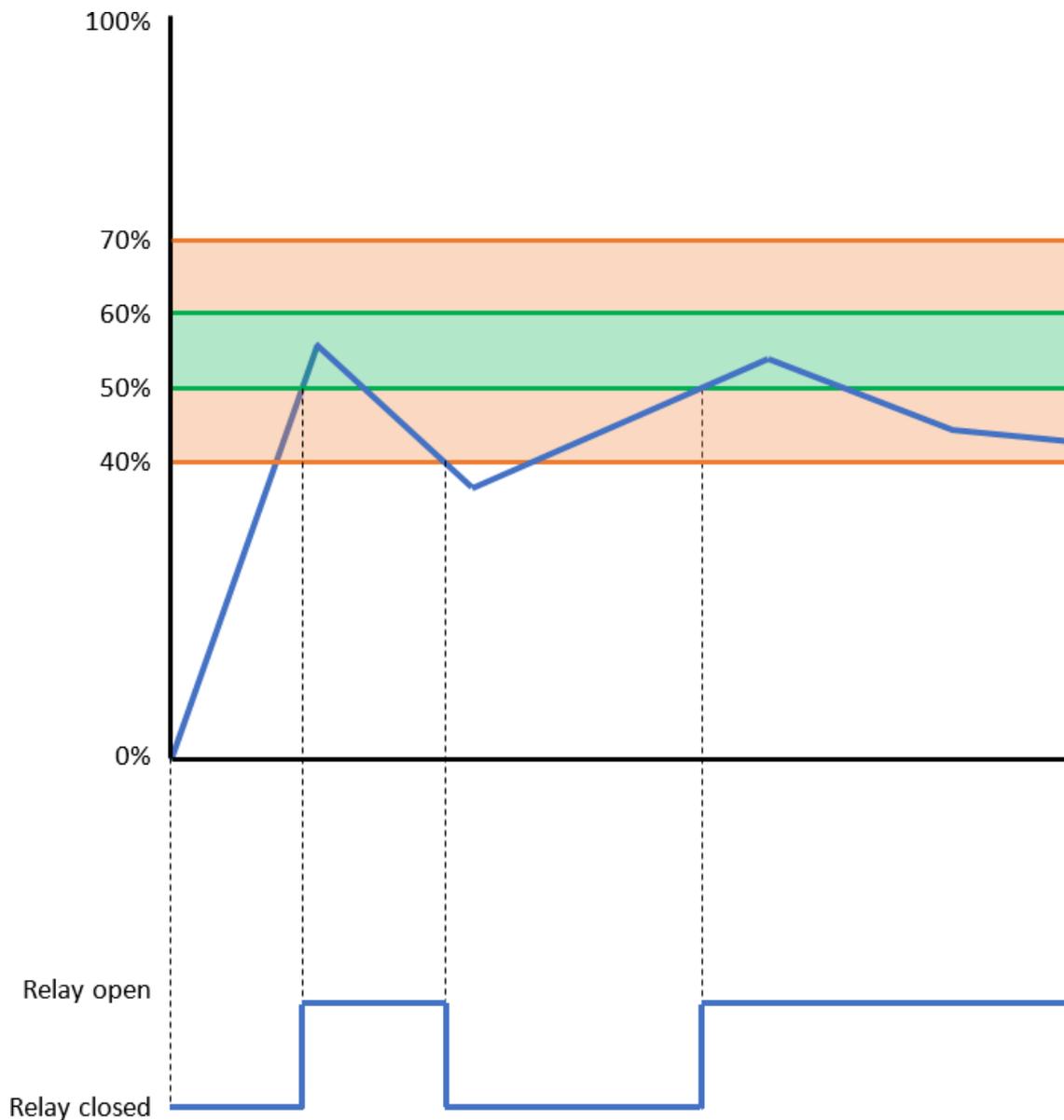
DIP Switch settings

The DIP Switch can be found behind the right top cap of the DIN-rails enclosure or behind the cover on the sensor side of the aluminum enclosure. The analog outputs can be forced to the minimum or maximum with the DIP switches. This way it is possible to test and calibrate reading equipment.

Analog mode	Below minimum	Proportionate scaling between:	
0 - 5 V	< 10% of FS = 0 V	10% of FSC = 0,5V	≥ 100 % of FSC = 5V
0 - 10 V	< 10% of FS = 0 V	10% of FSC = 1V	≥ 100 % of FSC = 10V
0 - 20 mA	< 10% of FS = 0 mA	10% of FSC = 0,2mA	≥ 100 % of FSC = 20mA
4 - 20 mA	< Min. of sensor = 0 mA	Min. of sensor = 4 mA	≥ 100 % of FSC = 20mA

|	Normal running	Min (10% or 4mA) output	Max (100%) output	RS-232 constant output
0-5 V				
0-10 V				
0-20 mA				
4-20 mA				

Software
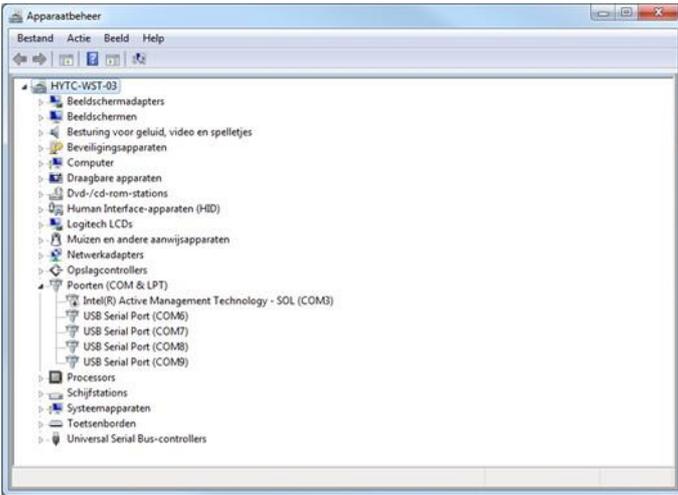
1. When the converter is connected by USB there will be a USB Serial Port created. Check the COM-port number in device manager.
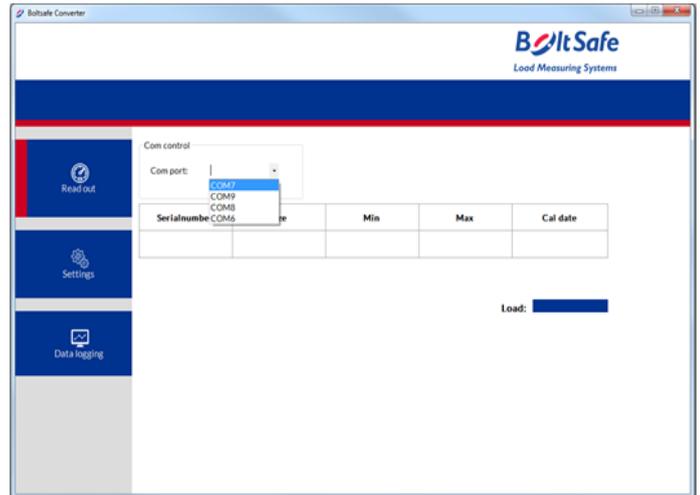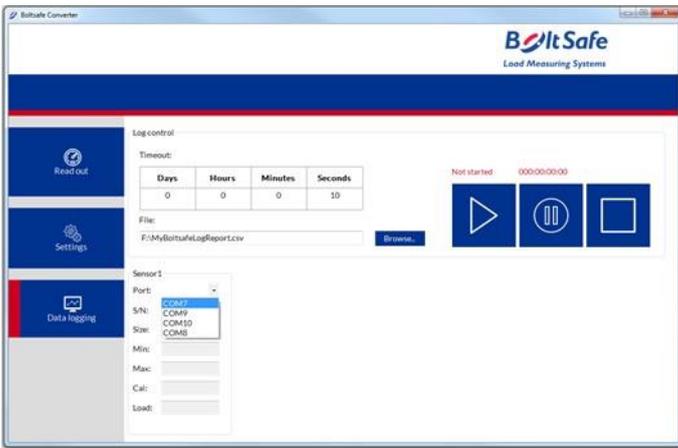

2. Select the COM-port of the converter where the sensor is connected to.
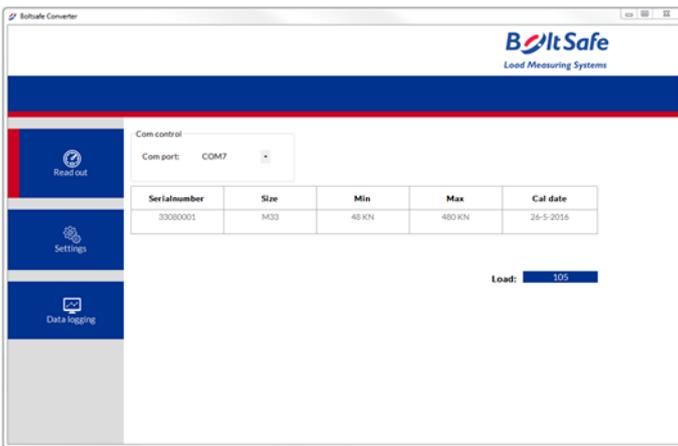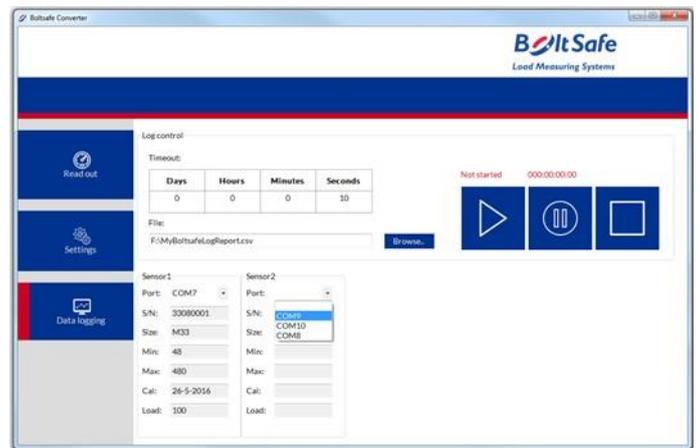

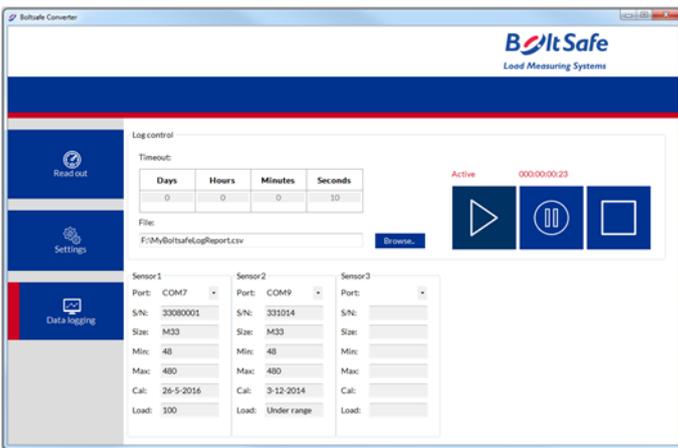3. On the read out screen you can see the properties of the connected sensor and the current load.
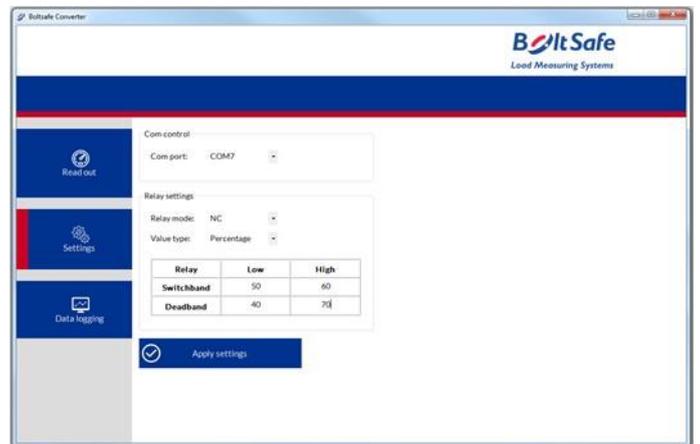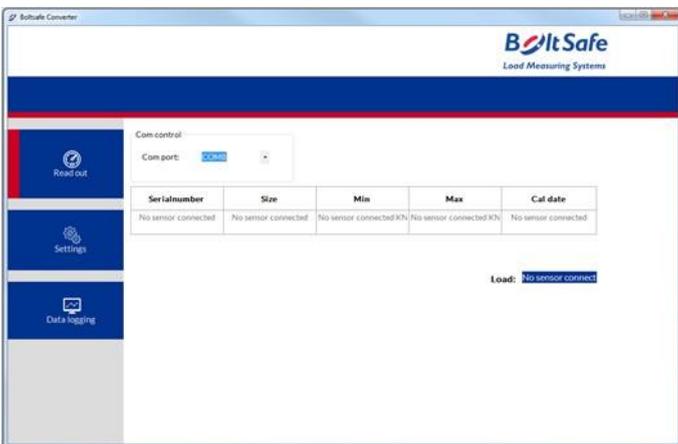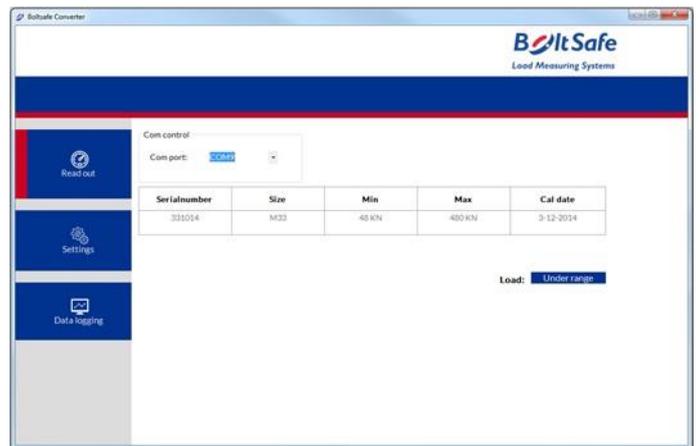
4. On the settings screen you can set the relay function. See chapter "Relay Setting"

5. The "Data logging" tab makes it possible to monitor multiple sensors at the same time.

6. Select the sensors/converter one by one by selecting the COM ports.

7. Create an export file location and name. And set the timeout between every measurement.

8. Example of the export file in Excel.