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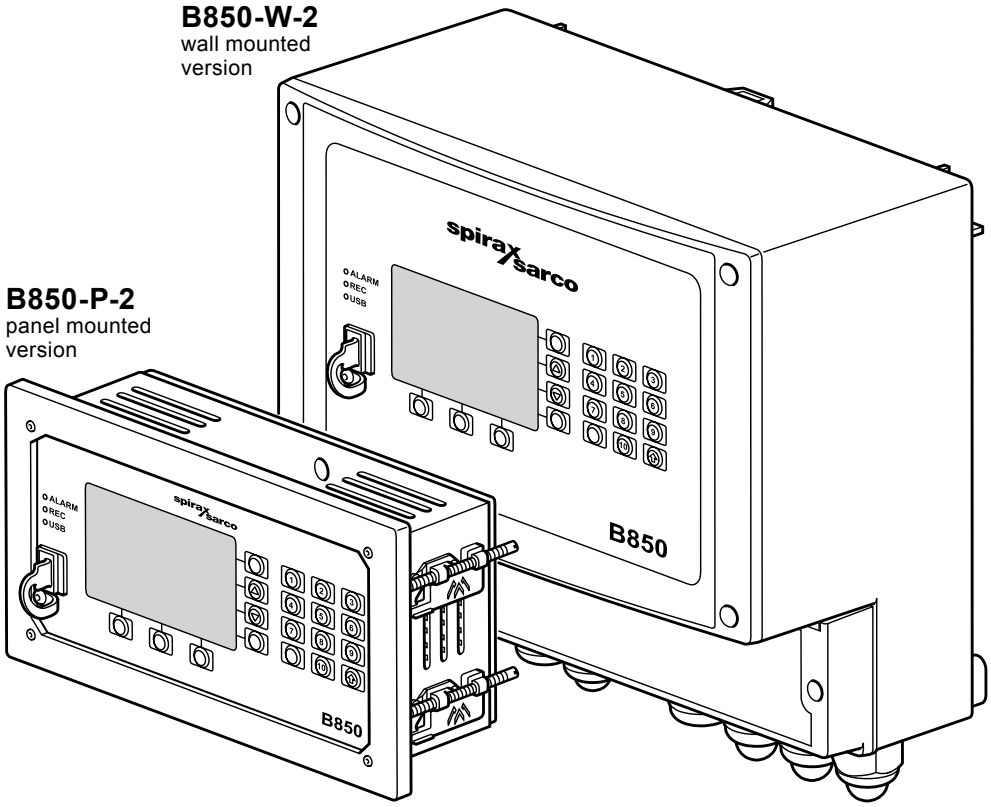
B850
Boiler House Energy Monitor



The B850 can calculate and display:

- Energy transfer efficiency from fuel to steam
- Potential energy losses from TDS and bottom blowdown applications
- Energy recovery from condensate return
- Steam flow and pressure
- Feedwater flow and temperature
- Fuel flow

For selection of the optimum unit for your application, please visit page 2 'Available options' before placing an order.

Description

The B850 is a flexible and easy to use Boiler House Energy Monitor that accurately calculates the efficiency of the boiler based on measured inputs from fuel, feedwater, steam output, condensate return and blowdown.

The B850 is a boiler house energy monitoring solution that has been designed for organisations operating boilers on an existing installed base and for boiler OEM's where customers specify a requirement for energy monitoring. The B850 calculates a boiler's 'real time' energy transfer efficiency from fuel to steam. It will also measure for energy losses from the boiler due to blowdown applications.

Being fully compatible with a wide range of Spirax Sarco flowmetering products the B850 is the heart of a fully integrated system that will provide Operating Managers in an increasing range of industries detailed information to be able to review boiler efficiency against past performance.

The unit is available for either wall or panel mounting. The **B850-W-2** wall mounted version is mains powered (100 to 250 Vac), while the **B850-P-2** panel mounting version is intended for direct connection to a Low Voltage power supply typically found inside PLC panels, i.e. 24 Vdc.

The B850 is supplied with a default configuration that makes configuration easy, either off-line with the free PC based software wizard provided with each product. When the configuration has been completed, it can be saved to file or to the free USB memory stick provided, from where it can be plugged in and up-loaded directly into the unit. Alternatively, commissioning can be carried out via a hierarchical menu structure through the front panel. Full commissioning details are included in the Installation and Maintenance Instructions (IMI) supplied with the unit.

Spirax Sarco offers a complete range of flowmeters for the measurement of: Gas, Feedwater, Steam and Condensate return.

For existing installed flowmeters the B850 can accept 4 - 20 mA, Pulse and RTD inputs.

The B850 is compatible with a large number of interfaces and protocols including: RS-485, Modbus RTU, BACnet MSTP, RJ-45 Ethernet, Modbus TCP / IP, BACnet IP, USB and Hosted http web.

A GSM module can be connected to the RS-485 port which enables transfer of information about failures, alarms and measurement values in the form of SMS text messages.

Standards and certification

This range of products fully comply with the requirements of the European Directives and carry the CE mark when so required.

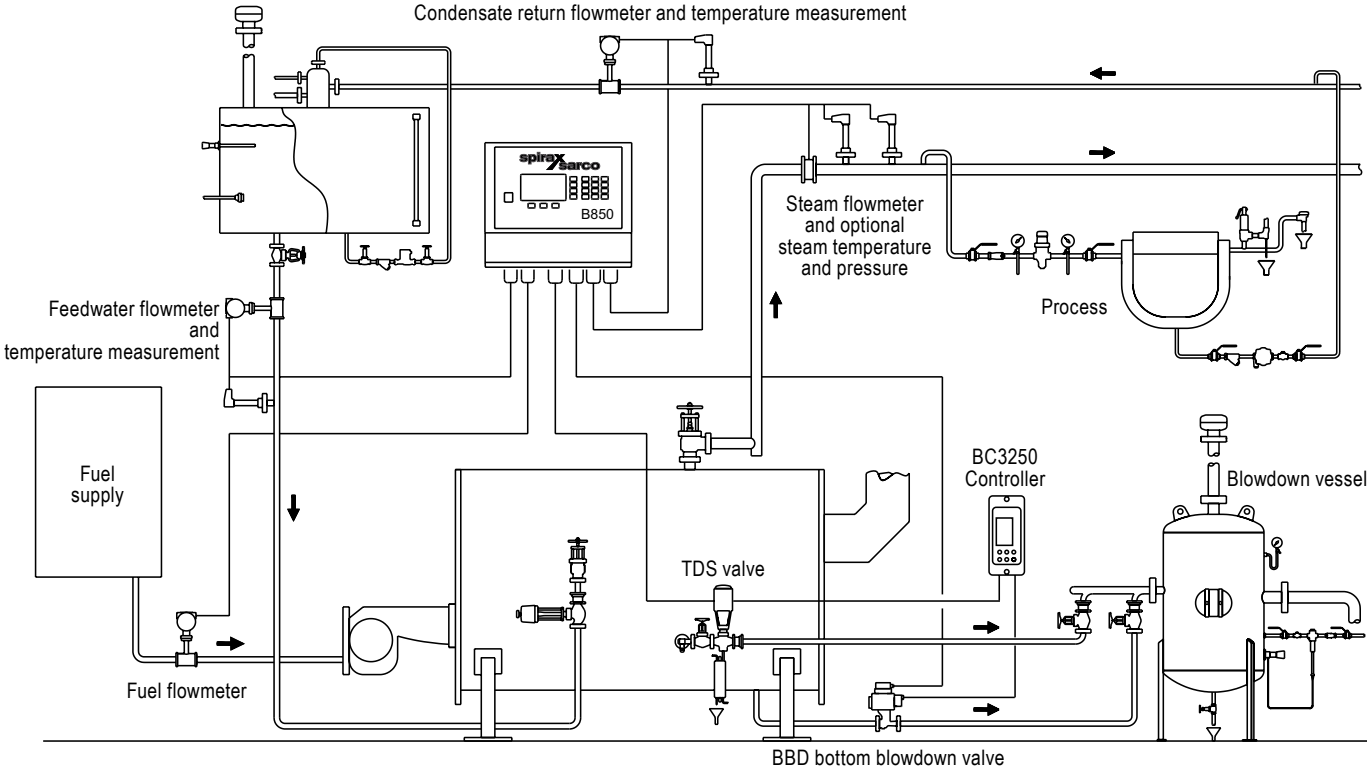
The B850 is available with the following certification:
- Uncertainty Certificate / Inspection Report.

Note: All certification / inspection requirements must be stated at the time of order placement.

Applications

Application	Proposed flowmeter (B850 is the example supplied)	Meter output
Gas (Oil, Coal)	Thermal mass flowmeter for gas (MTL10)	(0) 4 - 20 mA
Boiler feedwater	Magnetic flowmeter (ELM)	(0) 4 - 20 mA
Boiler steam output	Flowmeter (Gilflo, ILVA)	(0) 4 - 20 mA
Condensate return	Magnetic flowmeter (ELM)	(0) 4 - 20 mA
TDS blowdown	TDS valve	Relay (State)
BB blowdown	BBD valve	Relay (State)

Typical boiler house application



Available options

Both versions of the B850 series have the same functions and are available as follows:

B850-P for panel mounting and is powered by 24 Vdc.

B850-W for wall mounting and has been adapted to be powered by 100 / 240 Vac.

Each version is equipped with two analog outputs

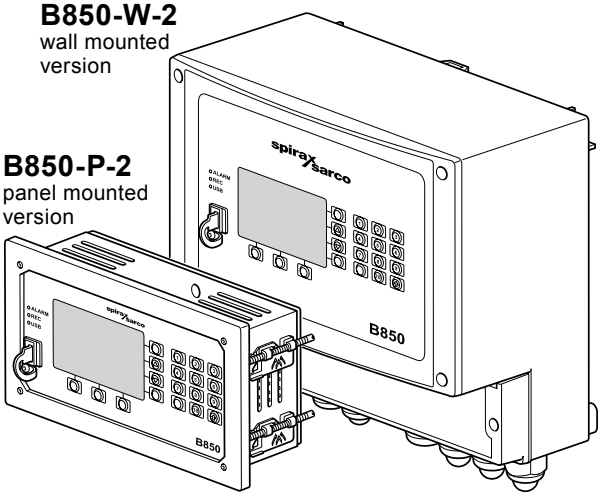
Offered versions of the instruments:

B850 -x -2

-P	**Panel mounted version**.
-W	**Wall mounted version**.
-2	Two analog **4 - 20 mA outputs**.

B850-W-2
wall mounted version

B850-P-2
panel mounted version



Technical data for the B850 series flow computers

User interface, front panel		
Display type	LCD TFT color, 3.5", with LED backlight	
Display size / resolution	43.8 mm x 77.4 mm / 272 (RGB) x 480 px,	
LED indication	3 two-color LEDs, red / green: ALARM, REC, USB	
Keyboard	19 membrane buttons	
Inputs organization		
Number of inputs	6 x I type (0/4-20 mA):	IN1, IN2, IN3, IN4, IN5, IN6
	3 x RTD (4-wire):	IN7, IN8, IN9
	3 x PULS:	IN10, IN11, IN12
I type (0/4-20 mA current loop analog inputs)		
Signal type	0-20 mA or 4-20 mA	
Transmitter connection	2-wire passive transmitter (supplied from B850) or active transmitter (current source transmitter)	
Input resistance	95 Ω ±10% (protected with PTC 50 mA fuse in series)	
Transmitters supply	24 Vdc +10% / -20%; max 22 mA per channel (protected with PTC 50 mA fuse and 100 Ω resistor in series)	
A/C converter resolution	18 bit (24 bit Sigma-Delta ADC)	
50 Hz / 60 Hz filter	Sinc3 digital filter	
Damping (1st order Low Pass Software Filter time constant)	2 s / 5 s / 10 s / 20 s / 30 s / 1 min / 2 min / 3 min / 5 min	
Measurement resolution	> 0.01% of FS	
Accuracy (at T_{amb} = +25°C / +77°F)	±0.1% of FS (typical Ω0.05% of FS)	
Temperature drift	Maximum ±0.02% of FS / °C	
Maximum input voltage	±40 Vdc	
Galvanic isolation between inputs	No; common potential of functional GND for all inputs	
Galvanic isolation to Analog Outputs, RS-485 / RS-422, Ethernet	250 Vac continuous; 1500 Vac for 1 minute	
RTD type (3 analog inputs for temperature sensors)		
Sensor types	Pt-100 x K; Ni-100 x K; where K = 1..11 (K – multiplier, e.g.: K = 2 for Pt-200)	
Measuring range	-200 .. +850°C / -328 .. +1562°F for Pt100 x K -60 .. +150°C / -76 .. +302°F for Ni100 x K	
Sensor connection	4-wire (2-wire with wire bridges)	
Wire resistance compensation	Automatic , additional manual in range -99.99 .. +99.99 Ω	
Maximum resistance of connecting wires	50 Ω	
A/C converter resolution	18 bit (24 bit Sigma-Delta ADC)	
50 Hz / 60 Hz filter	Sinc3 digital filter	
Damping (1st order Low Pass Filter time constant)	2 s / 5 s / 10 s / 20 s / 30 s / 1 min / 2 min / 3 min / 5min	
Measurement resolution	> 0.05% of reading or 0.1 Ω (TBV)	
Accuracy (at T_{amb} = +25°C / +77°F)	±0.5°C / ±0.9°F (typical ±0.3°C / ±0.54°F)	
Temperature drift	Maximum ±0.02°C / °C / 0.036°F / °F	
Max input voltage	±40 Vdc	
Galvanic isolation between inputs	No; common potential of functional GND for all inputs	
Galvanic isolation to Analog Outputs, RS-485 / RS-422, Ethernet	250 Vac continuous; 1500 Vac for 1 minute	

PULS type inputs (binary / pulse / frequency)	
Measuring range	0 .. 20 kHz (cut off for f < 0.001 Hz) (0 ..1 kHz with filter jumper J1 / J2 / J3 ON)
Minimum pulse width	25 µs (0.5 ms with filter jumper J1 / J2 / J3 ON)
Accuracy for frequency measurement (at T_{amb} = +25°C / +77°F)	0.02%
Maximum input voltage	±40 Vdc
Galvanic isolation between inputs	No; common potential of functional GND for all inputs
Galvanic isolation to Analog Outputs, RS-485/RS-422, Ethernet	250 Vac continuous; 1500 Vac for 1 minute
Configuration (default): OC or Contact open/closed	(Internal jumper J4 / J5 / J6 ON)
Open circuit voltage	5 Vdc
Short circuit current	5 mA
On / off threshold	2.7 V / 2.4 V
Configuration: Voltage Input	(Internal jumper J4 / J5 / J6 OFF)
Signal amplitude	4 .. 36 Vdc
On / off threshold	2.7 V / 2.4 V
Input resistance	≥10 kΩ
Compensated flow and heat energy measurement	
Calculation update rate	1 s
Total accuracy of compensated steam, water, other liquid or technical gas flow measurement	Typical: better then ±0.5% (worst case: better then ±2%)
4-20 mA analog outputs	
Number of outputs	2
Output signal	4-20 mA passive (external current loop supply required)
Resolution	16 bit DAC
Loop resistance (R_L) range for U_{cc} = 24 V	0 .. 600 Ω
Minimum loop power supply voltage	U_{CCmin} = RL x 0.022 + 8
Maximum loop power supply voltage	28 Vdc
Accuracy (at T_{amb} = +25°C / +77°F)	Better than ±0.2% of FS / °C
Temperature drift	Maximum ±0.02% of FS / °C
Galvanic isolation to Analog Inputs, RS-485 / RS-422, Ethernet	250 Vac continuous; 1500 Vac for 1 minute
Binary outputs (B850-W-2)	
Number of outputs	4
Type of outputs	3 pole (COM, NO, NC) electromechanical relay
Contact rating (resistive load)	3 A at 85 .. 250 Vac / 30 Vdc
Maximum switching voltage	250 Vac / 125 Vdc
Maximum switching power	750 VA / 90 W
Binary outputs (B850-P-2)	
Number of outputs	4
Type of outputs	2 pole Solid State Relay
Contact rating (resistive load)	0.1 A at 60 Vac/dc
Maximum ON resistance	20 Ω
Galvanic isolation (optoisolation)	250 Vac continuous; 1500 Vac for 1 minute

RS-485/422	
Transmission protocol	ASCII Modbus RTU, BACnet MSTP and GSM
Number of nodes in network	256
Maximum line length	1200 m (depends on quality of data cable and baud rate)
Baud rate	2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 115.2, 230.4 kbps
Parity control	Even, Odd, None
Frame	1 start bit, 8 data bits, parity 1 bit, 1 stop bit
Internal terminating resistor	Yes, activated with DIP switch
Maximum bus terminal voltages	-8 V … +13 V
Minimal driver differential output voltage	1.5 V (for R_L = 54 Ω)
Minimum receiver sensitivity	200 mV
Short-circuit / thermal protection	Yes
Galvanic isolation to Analog Inputs, Analog Outputs, Ethernet	250 Vac continuous; 1500 Vac for 1 minute
Ethernet port	
Transmission protocol	Modbus TCP, ICMP (ping), DHCP server, http server, BACnet IP
Interface	10 BaseT Ethernet
Data buffer	300 B
Number of opened connections (simultaneously)	4
Connection type	RJ-45
LED indication	2 (build in RJ-45 socket)
USB port	
Socket type	A type, according to USB standard
Version	USB 2.0
Recording format	FAT16 (within a limited scope)
Power supply (B850-W-2)	
Rated supply voltage	100-240 Vac; 50/60 Hz
Supply voltage range	85 .. 264 Vac; 47 .. 63 Hz
Power consumption	Maximum 20 VA
Power supply (B850-P-2)	
Rated supply voltage	24 Vdc
Supply voltage range	18 .. 36 Vdc
Power consumption	Maximum 8 W
Wire terminals (B850-W-2)	
Wire connection / terminals	Spring type terminal block
Conductor cross Section	Solid 0.2 .. 2.5 mm² Stranded 0.2 .. 1.5 mm² Stranded with ferrule 0.25 .. 1.5 mm² AWG 26 .. 12
Cable glands	4 glands type M20, 2 glands type M16
Wire terminals (B850-P-2)	
Wire connection / terminals	Screw type terminal blocks, plug type
Conductor cross Section	Solid 1.5 mm² max Stranded 1 mm² max Stranded with ferrule 0.25 .. 1.5 mm² AWG 30/14

Enclosure (B850-W-2)	
Enclosure type	Wall mounting, Polycarbonate material
Dimensions (height x width x depth)	216 mm x 260 mm x 125 mm (without cable glands) 246 mm x 260 mm x 125 mm (with cable glands) 290 mm x 300 mm x 165 mm (in cardboard box)
Weight net (gross)	approx. 1.7 kg (2.1 kg)
Protection class	IP65
Enclosure (B850-P-2)	
Enclosure type	Panel mounting, Lexan Resin 920 material
Dimensions (height x width x depth)	96 mm x 192 mm x 63.5 mm (without terminals) 96 mm x 192 mm x 72 mm (with terminals) 135 mm x 230 mm x 110 mm (in cardboard box)
Panel cut-out dimensions	186 mm x 92 mm
Panel thickness	1 .. 5 mm
Weight net (gross)	approx. 0.6 kg (0.7 kg)
Protection class (front / rear)	IP65 / IP20
Environmental conditions	
Ambient temperature	0 .. +55°C (32 .. 131°F)
Relative humidity	5 .. 95% (non-condensing)
Altitude	≤ 2000 m (6 562 ft) above sea level
Storage temperature	-30 .. +70°C
Overvoltage category	III
Pollution degree	3 Panel version (when installed in an enclosure) 3 Wall version
LVD (safety)	Electrical safety EN 61010-1
EMC	Immunity EN 61326-1 Table 2 Radiated and conducted emissions EN 55011 and EN 55022 to Class B

Dimensions / weights (approximate) in mm and kg

B850	A	B	C	D	E	Weight
Wall mounted	257	217	134	30*	-	1.70
Panel mounted	206	110	72.3	-	9.5	0.60

* Approximate dimension as the cable glands are adjustable.

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Installation notes:

1. The wall mounted B850-W-2 requires 3 mounting screws (not supplied) to mount to a wall or has optionally a DIN rail mounting.
2. The panel mounted B850-P-2 is supplied with mounting clamps.

Disposal

This product is recyclable. No ecological hazard is anticipated with the disposal of this product, provided due care is taken.

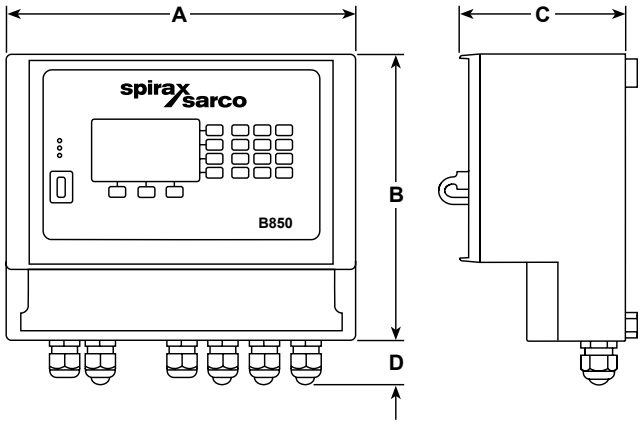
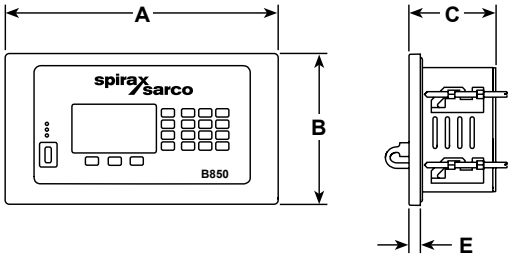
How to order

For the correct product nomenclature for the unit that best suits the intended application please revisit page 2 'Available options' before placing an order.
Example: 1 off B850-W-2 wall mounted energy monitor with two analog 4-20 mA outputs, 240 Vac supply.

Spare parts

There are no spare parts available for the B850 energy monitors.

B850-W-2 (wall mounted)



B850-P-2 (panel mounted)