

WellSim Marathon is designed to control sucker rod pumps (SRP unit). It enables to significantly reduce costs and increase oil production.

WellSim controls and diagnoses SRP unit and well condition, calculates flow rate without need to install additional flow meter, builds and analyzes dynagraphs, accounts electricity consumption, collects statistics, provides remote SRP unit control and data acquisition by SCADA system, prevents malfunctions, displays dynagraphs and other SRP unit operating parameters in a convenient graphical form on touch screen, retains 180-day history parameters, that can be sent to SCADA system.

WellSim is easy to install and maintain. Modular structure of the system allows to find a solution for any customer's needs and operating conditions.

WellSim allows integration with various auxiliary equipment, such as barometers, thermometers, sonars, etc. using provided data for simulation and/or transfer to host computer. Logical and mathematical transformation of acquired data is also available.

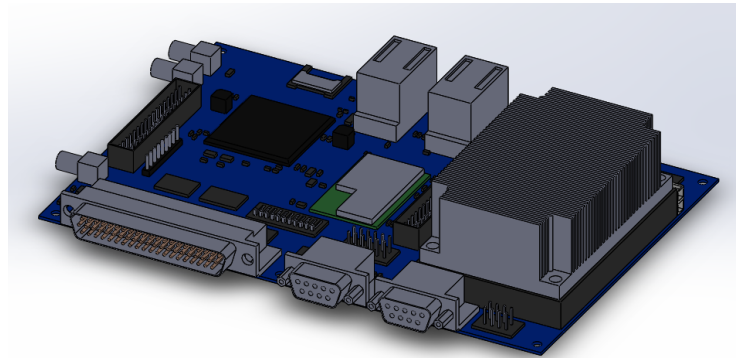


Fig. 1 WellSim Marathon

## Features:

- Flexible control of SRP unit in real-time mode:
  - by pump fillage
  - by pump intake pressure
  - by liquid level
  - by schedule
  - by timer
  - by remote commands from SCADA
  - by special algorithm on customer`s request
  - in manual mode.
- User-friendly multilingual GUI
- Precisely measured (not simulated) values of load and position
- SRP unit equipment diagnosis in real time, measuring load on components
- Reduced SRP unit equipment wear
- SRP unit equipment protection:
  - maximum/minimum load setpoints
  - minimum liquid load
  - short circuit and other electrical malfunctions protection
- Remote firmware update
- Firmware update failsafe
- Well equipment integration
- Emergency situations alert
- Repair crew notification
- Detailed work history and event logs for a long period of time
- Dynamic calculation of leakage
- Wide operating temperature range



Basic specifications:

Operating temperature	-40°C to +85°C
Humidity	10-90% non-condensating
Processor	667 MHz
RAM	1 Gb
Nonvolatile memory	512 Mb
Ports	2xRS232, 2xRS435, 2xEthernet, 2xCAN, 2xUSB, 16 digital inputs, 16 digital outputs, 8 analog inputs, 2 analog outputs
Protocols	TCP/IP, Modbus RTU, ASCII
Communications	WiFi, Ethernet, GPS, GPRS/UMTS, RF
Ethernet	10/100 Mbit/s
Compatibility	NaftaSCADA, XSPOC and other SCADA
GUI	Web-based, windows/linux/macOS compatible, LabView compatible

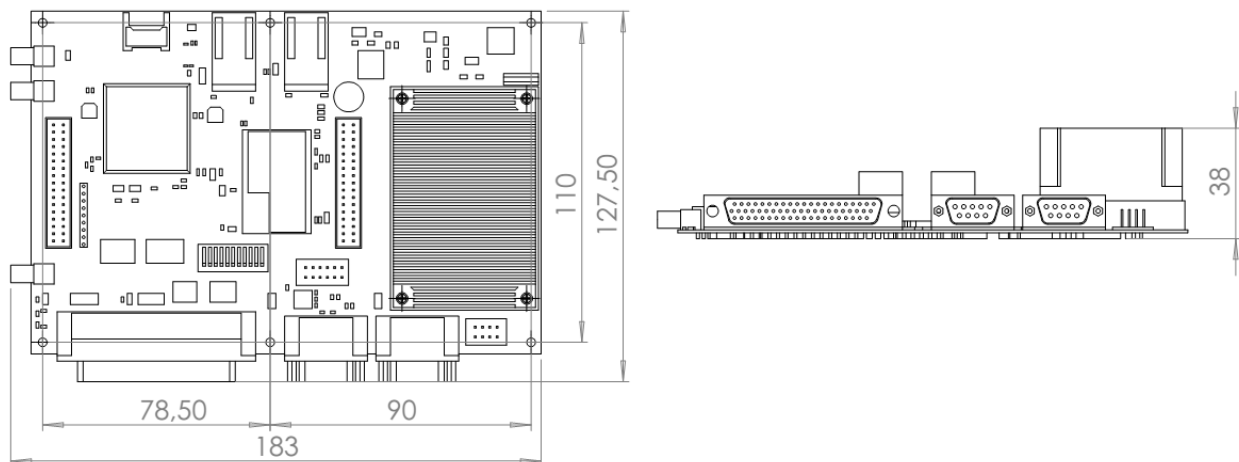


Fig. 2 WellSim Marathon dimensions in mm.

## SRP unit management modes:

- Automatic control of SRP unit by pump fillage (Sim-Fillage)

WellSim by using real-time model of the well determines percentage of pump fillage. In Sim-Fillage mode WellSim disables SRP unit for certain time when pump fillage percentage reaches control setpoint. Simultaneously with control by pump fillage, WellSim controls SRP unit by emergency setpoints.

- Automatic control of SRP unit by pump intake pressure (Sim-PIP)

WellSim by using real-time model of the well determines value of pump intake pressure. In Sim-PIP mode WellSim disables SRP unit for certain time when pump intake pressure reaches control setpoint. When pump intake pressure is low, pump fillage will diminish causing SRP unit to operate inefficiently. Simultaneously with control by pump intake pressure, WellSim controls SRP unit by emergency setpoints.

- Automatic control of SRP unit by timer (On/Off Timer)

When operating in timer mode, WellSim starts and stops SRP unit motor with a strictly defined intervals. In this mode SRP unit operates and idles within time intervals determined by user. Simultaneously with control by timer, WellSim controls SRP unit by emergency setpoints.

- Automatic control of SRP unit according to schedule

Schedule mode allows to customize the schedule of shutdowns and startups of SRP unit. Simultaneously with control by schedule, WellSim controls SRP unit by emergency setpoints.

- “Host” mode

Host mode allows to manage SRP unit remotely by SCADA. This mode can be set independently from the others, and allows user to control SRP unit remotely as well as on-site.

- Manual mode

Manual mode prohibits WellSim to interfere with the SRP unit functioning. In this mode WellSim continues to collect and store data about SRP unit operations, that data can be provided to user on-site or remotely by SCADA.

- Emergency setpoints

Emergency setpoints mode is part of all other modes except manual mode. When emergency setpoint is reached, WellSim counts continuous violations and after predetermined number of violations is reached shuts down SRP unit, trying to restart it after predetermined delay, and if it still reaches emergency setpoints, controller shuts down motor and alerts dispatcher and repair crew about malfunction.

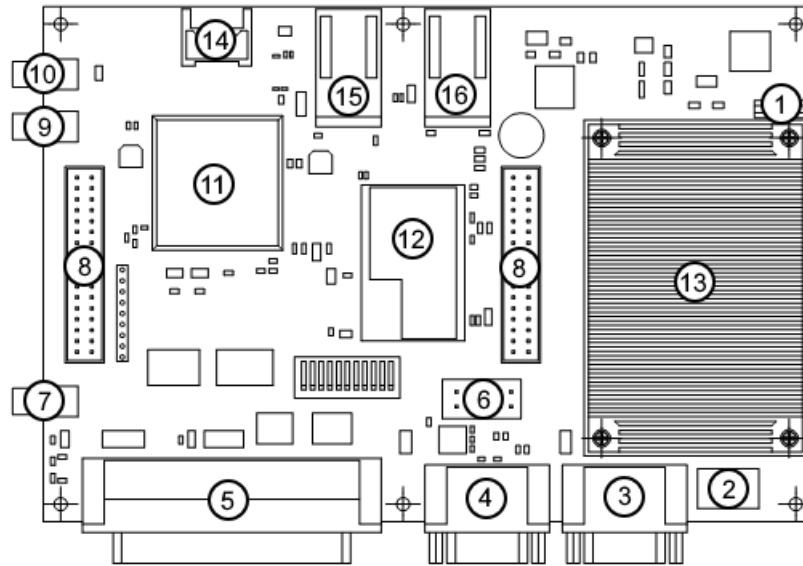


Fig. 3 Components of WellSim Marathon

1 – Power connector, 2 – RS485 connector, 3 – CAN connector, 4 – RS232 connector, 5 – signal connector, 6 – COM connector, 7 – WiFi antenna connector, 8 – radio module connectors, 9 – GPS antenna connector, 10 – UMTS/GPRS antenna connector, 11 – UMTS module, 12 – WiFi module, 13 – CPU, 14 – SIM card connector, 15 – Ethernet-a/USB connector 1, 16 – Ethernet-a/USB connector 2

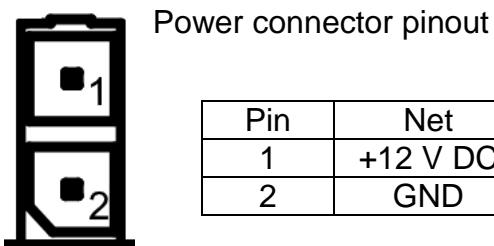


Fig.4 Power connector

RS485 connector pinout

Pin	Net
1	B1
2	GND
3	A1
4	GND
5	A2
6	GND
7	B2
8	GND

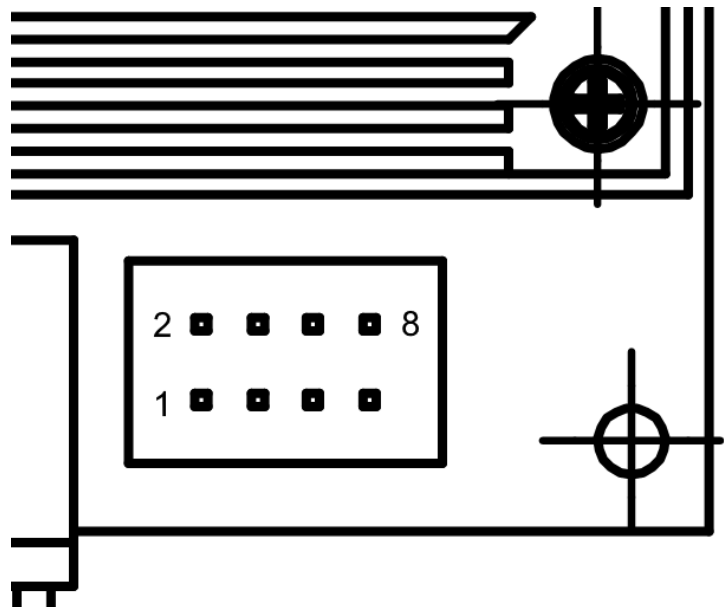


Fig.5 RS485 connector

CAN connector pinout

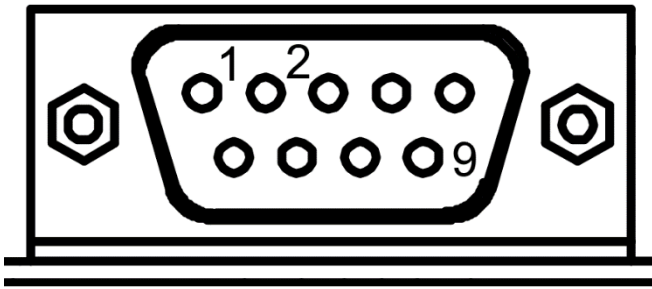


Fig. 6 CAN connector

Pin	Net
1	
2	CAN L
3	
4	
5	VREF
6	
7	CAN H
8	
9	

RS232 connector pinout

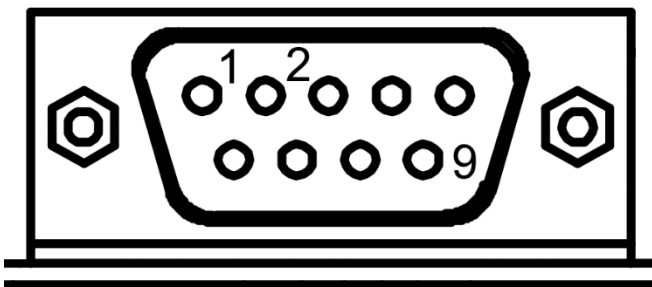


Fig. 7 RS232 connector

Pin	Net
1	COM2 DCD
2	COM2 RX
3	COM2 TX
4	COM2 DTR
5	GND
6	COM2 DSR
7	COM2 RTS
8	COM2 CTS
9	COM2 RI

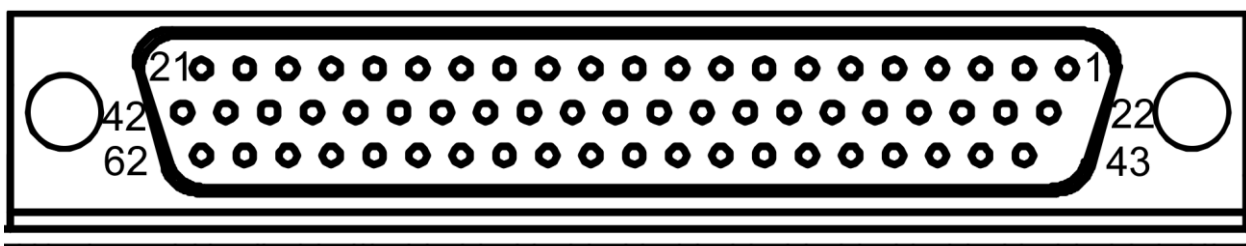


Fig. 8 Signal connector

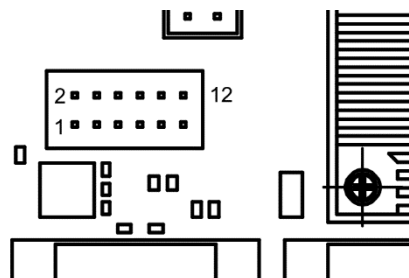


Fig. 9 COM connector

Signal connector pinout

Pin	1	2	3	4	5	6	7	8	9
Net	AI 4	AI 5	AI 6	AI 7	AI 8	DI 1	DI 2	DI 3	DI 4
Pin	10	11	12	13	14	15	16	17	18
Net	DI 5	DI 6	DI 7	DI 8	DI 9	DI 10	DI 11	DI 12	DI 13
Pin	19	20	21	22	23	24	25	26	27
Net	DI 14	DI 15	DI 16	GND	GND	GND	GND	GND	GND
Pin	28	29	30	31	32	33	34	35	36
Net	GND	GND	GND	GND	GND	GND	GND	GND	GND
Pin	37	38	39	40	41	42	43	44	45
Net	+10 V	AI 1	AI 2	AI 3	AO 1	AO 2	II 1	II 2	DO +
Pin	46	47	48	49	50	51	52	53	54
Net	DO 1	DO 2	DO 3	DO 4	DO 5	DO 6	DO 7	DO 8	DO 9
Pin	55	56	57	58	59	60	61	62	
Net	DO 10	DO 11	DO 12	HO +	HO 1	HO 2	LC -	LC +	

COM connector pinout

Pin	Net
1	RS232-1 TTL TX
2	RS232-1 TX
3	RS232-1 TTL RX
4	RS232-1 RX
5	GND
6	GND
7	GND
8	GND
9	RS232-2 TTL TX
10	RS232-2 TX
11	RS232-2 TTL RX
12	RS232-2 RX