WellSim control station Tantalum is customizable system designed to control sucker rod pumps (SRP unit). This is a system application that is developed 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 management and data acquisition by SCADA system, prevents malfunctions, displays dynagraphs and other SRP unit operating parameters in a convenient graphical form on touchscreen, retains 180-day history parameters which can be assigned to SCADA system.

Main feature of WellSim CS Tungsten is modular structure, that allows to customize it in wide range by installing additional protective, telecommunication, HMI and functional devices. Modular structure of the system allows to find a solution for any customer's needs and operating conditions. Also CS Tungsten has big HMI panel that allows to install multiple options.

SKD-15 Tungsten is compatible with defined set of options, however there is an opportunity to install additional devices by agreement.

SKD-15 Tungsten is designed for harsh environment and high power SRP motors. It is easy to install and maintain. Durable casing protects electrical components from unauthorized access and vandalic activity.

WellSim®

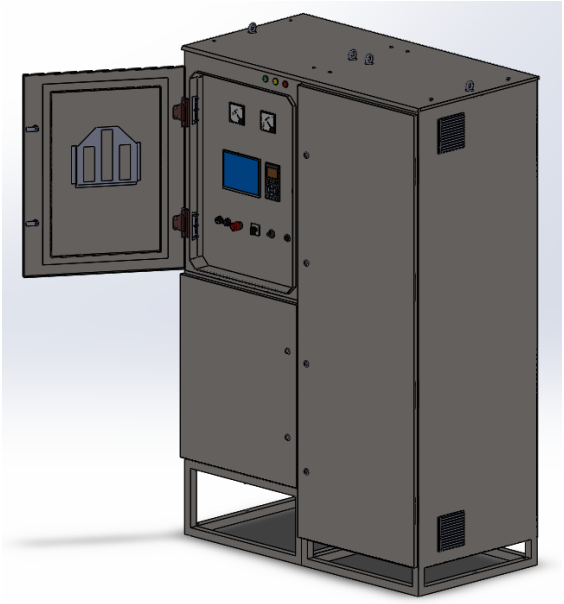

Fig. 1 WellSim CS Tungsten

Features:

•Modular structure that allows to alter configuration to match customers` needs
•Expanded HMI panel
•Segmented structure
•Separated access
•Flexible management of SRP unit in real-time mode.
•User-friendly multilingual GUI
•Precisely measured (not simulated) values of load and position
•SRP unit equipment diagnostics in real time, measuring load on components
•Integrated VFD (option)
•SCADA integration
•Secondary manual control
•RPC unit motor protection
•Reduced SRP unit equipment wear
•SRP unit equipment protection:
- maximum/minimum load setpoints
- minimum liquid load
- short circuit and other electrical malfunctions protection

•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 (-50 optional)°C to +70 (+85 optional)°C
Humidity	10-90% non-condensating
Casing	Full metal segmented enclosure, vandal proof, separated access
Processor	667 MHz
RAM	1 Gb
Nonvolatile memory	512 Mb
HMI	Touchscreen (optional), Manual controls panel, Front panel ports (optional), Working parameters indication (optional).
SRP unit equipment protection	Maximum/minimum load, Low fluid load, Pump-off, Load span, Against electric grid failure (optional), Staff protection from electric shock (optional).
Ports	2xRS232, 2xRS435, 2xEthernet, 2xCAN, 2xUSB, 16 digital inputs, 16 digital outputs, 8 analog inputs, 2 analog outputs
Protocols	TCP/IP, CAN, Modbus RTU, ASCII, RS232, RS485
Ethernet	10/100 Mbit/s
Communication	WiFi, Ethernet, GPS, GPRS/UMTS, RF
Compatibility	NaftaSCADA, XSPOC and other SCADA
GUI	Web-based, windows/linux/macos compatible, LabView compatible
Nominal power	Up to 110 kW (depends on configuration)

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.

Segmented structure

SCD-15 Tungsten consists of 3 modules in separated casings and can be supplied separately.

Controller module contains low-voltage control circuits and HMI elements on front panel. Controller module can work as part of third-party systems.

Power module contains hi-voltage power equipment, that can be accessed only by personnel with special training. In configurations with magnetic starter serves as SRP motor control device.

VFD module contains complex SRP motor control devices (variable frequency drive or soft starter) with separated cooling system.

Casing configuration depends on functionality and can be changed on site.

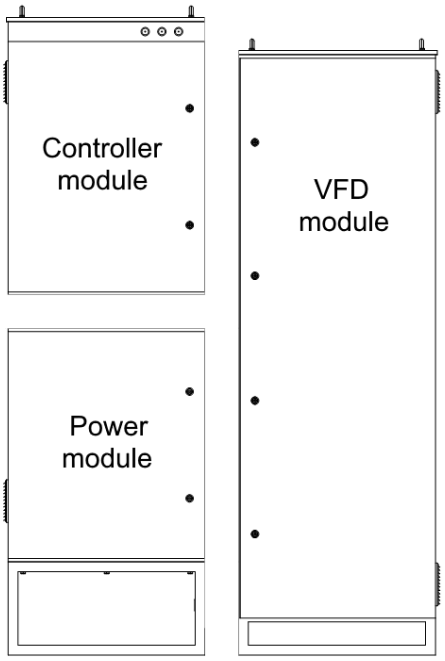

Fig. 2 WellSim CS Tungsten

HMI options (controller module)

Touchscreen	Color display that allows access to GUI right on site
Measuring devices	Voltmeter, ammeter, wattmeter Measuring devices are mounted on manual controls panel, that allows operator to easily monitor SRP unit work parameters on site. Configuration requires negotiation.
VFD control panel	LCD panel that displays VFD parameters and allows to tune it on site.
LED indication	Set of LED indicators that displays system current status. Configuration requires negotiation.
Easy access ports	Additional ports on front panel (USB, Ethernet, Com)

Climatic options

Additional heater	Increases working temperature range for work in extreme cold conditions.
Additional cooler	Increases working temperature range for work in extreme hot conditions.

Motor control options (power module)

Magnetic starter (up to 75 kW)	Allows control system to interact with SRP unit motor in on/off mode.
Reactive power compensation capacitor	Power capacitor protects electrical network from reactive consumption component.

Motor control options (VFD module)

Soft starter (up to 110 kW)	Complex device that allows control system to interact with SRP unit motor in on/off mode, at the same time providing additional protection.
Variable frequency drive (VFD) (up to 110 kW)	Complex device that allows control system to fine change SRP unit motor speed, at the same time providing additional protection.

Telecommunication options (controller module)

FM modem	Provides wireless long range communication.
Ethernet modem	Provides hi-speed communication.
WiFi module	Provides wireless short range hi-speed communication.
GPRS modem	Provides wireless long range communication by means of cellular network.
Broadband wireless access	Provides reliable wireless long range communication.

Protection options (power module)

Phase control relay	Provides additional SRP motor protection against the following factors: • lack of at least one phase ("loss of phase"); • voltage drop below the set point; • voltage increase above the set point; • wrong phase sequence; • broken zero conductor (in certain designs); • voltage and current dissymmetry (electrical imbalance)
Residual current circuit breaker	Provides staff protection from electric shock and monitors earth leakage.
Intrinsic safety barrier	Recommended for connection of external devices located in areas with possible presence of explosive gases.
Mechanical protection	Additional logic circuits for emergency shutdown in case of SRP construction damage.
Electricity meter	Provides measurement, recording, indication and storage of power consumption data (active and reactive component). It is also possible to maintain accounting technical losses in the network.

Connector	Description	Manufacturer, part number	Recommended mating connector
Power	4-pin, 100mm power connector	SCAME, OPTIMA 415.6367	SCAME, OPTIMA 218.6336
WellSim Control Stations are supplied with all other connectors			

Power connector pinout

Contact	Net
1	Phase A
2	Phase B
3	Phase C
4	N

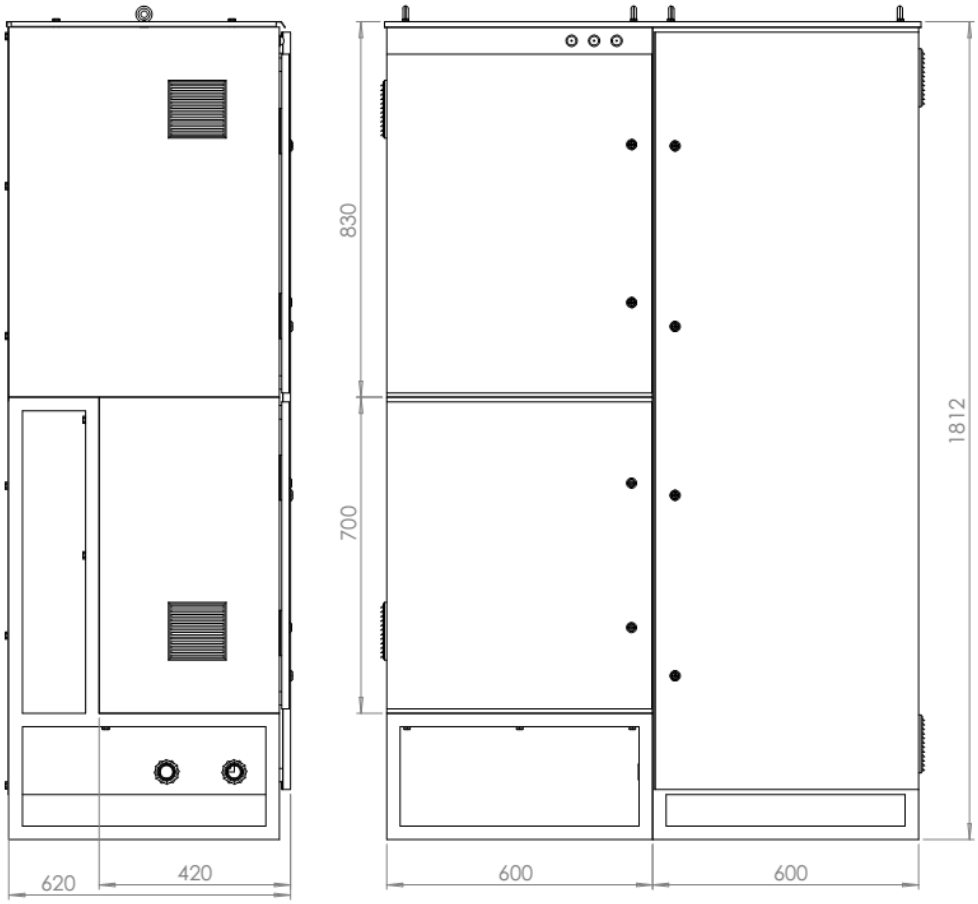

Fig. 3 WellSim CSTantalum dimensions in mm