



Sucker Rod Pumping Unit

High Performance Variable Frequency Drive

Voltage rating: 380V to 480V, 50/60Hz



Input power supply	3 phase 380V to 480V $\pm 10\%$, 50/60Hz $\pm 5\%$
Converter type	6 pulse diode rectifier or IGBT rectifier
Input low harmonic	Passive harmonic filter, THID $\leq 5\%$ at full load Ultra-low harmonic drive module integrated
Inverter type	IGBTs
Input current protection	Circuit breaker
Input surge suppression	IEC test classification / EN type: II/T2 Maximum continuous voltage: 350V(L-PE) I_{SCCR} : 50kA (max.200A gG) Voltage protection level: 1500V I_n : 20kA 8/20 μ s I_{max} : 40kA 8/20 μ s
Output voltage	The same as power supply
Output frequency	0 Hz to ± 598 Hz
Motor control	Direct Torque Control (DTC)
Motor technology	Induction Motor (IM) and Permanent Magnet Motor (PMM)
Efficiency	$>97\%$ at full load
Power factor	0.98 at nominal load
Handling regenerative energy	Brake chopper and brake resistors
Overload rating	150% for 1min/5min
Certifications	ISO9001, ISO14001
Enclosure rating	IP66 [equivalent to NEMA4]
Cooling method	Forced air cooling
Altitude	0 to 1000m without derating
Ambient operating Temp.	-20 degC to 50 degC
Relative humidity	20% to 95% maximum(noncondensing)
H ₂ S protection	Conformal-coated PCBs & bus bars
Material	Carbon steel, the thickness is 2.5mm
Power cable incoming and outgoing	From the bottom of the VFD
Operating interface	ABB control panel, 7" touched screen panel is option
Analog inputs/outputs	2 programmable analog inputs and expandable 2 programmable analog outputs and expandable
Digital inputs/outputs	6 programmable digital inputs 2 digital inputs/outputs 1 digital input interlock 3 programmable relay outputs

Increase production more than 20%

- + Increased production from maintaining a constant low fluid level with greater inflow from the formation.
- + Increased pump efficiency.

Longer pump lifetime and minimized downtime

- + Up to 20% reduction of maximum rod load.
- + 10-15% reduction of load span.
- + Reduction of number of across the line starts and stops per year by 100%.
- + The VFD protects the pumping unit for high or low pressure, rod string flotation, over temperature, minimum and maximum rod tension or pump torque.

Reducing energy consumption by 20-30% per produced barrel

- + Increased pump efficiency reduces energy consumption.
- + Reduction of demand power charges with no across the line starts.
- + Even more savings with changing from high slip motors to high efficiency motors.
- + Regenerative variants available.

Works with or without feedback from sensors

- + SVR VFD can be used without any feedback from sensors. However the use of a device indicating rod position (e.g. a proximity switch) is recommended. When needed, the VFD's built-in functions accept feedback from various measurement signals. These signals can for instance be tension measurement from a polished rod, and inclinometer signal of the rod position, or temperature measurement from pump intake or discharge

Advanced control features packed into compact unit

- + Variety of control options to optimize production while protecting the pump mechanics and maintaining sufficient fluid in the well.
- + The VFD calculates peak torque value of the upstroke and downstroke movements to achieve data that can help balance counterweight.
- + Pump specific identifications run for optimized production.
- + Suitable with various types of motors including induction and permanent magnet motors
- + Robust design with suitability to harsh environments and remote locations.
- + Ultra-low harmonic variants available.



ABB drive module

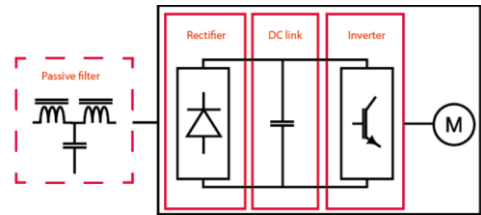


- + ABB flange (push through) mounting is designed for outdoor enclosure and harsh environment installations where dust and other impurities are present.
- + ABB drive modules' built-in sucker rod pumping unit control software optimizes pump operation to minimize wear and tear of the pump and to maximize oil production. This is achieved with automatic tuning of the pumping speed depending on the oil level so that the bottom hole pressure is kept constant, resulting in a increased inflow to the pump from the well. By automatically maintaining a constant bottom hole pressure the need to stop the pump is minimized.
- + Robust, long lifetime design for maximum reliability. Nine-year maintenance interval.
- + Coated circuit boards for harsh conditions. Each drive module factory-tested at full load.
- + Global product approvals, e.g. CE, UL, cUL, CSA, marine certifications, ATEX, support for various motor types, worldwide service and support.

Low harmonic solutions

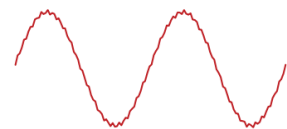
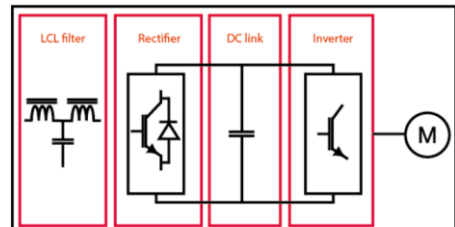
+ Passive Harmonic Filter solution

A passive filter VFD uses a combination of inductors and capacitors. The capacitors in the filter are charged from the power line. The drive module then draws its current from the capacitors when needed. The inductors between the capacitors and the power line prevent the current to the drive module from having a significant impact on the power line. This combination filters out the harmonic current distortion over a wide range but are generally tuned between the 5th and 7th harmonics where the highest magnitude of the harmonic content originates from.



+ Ultra-low harmonic solution

Instead of a conventional diode bridge, an ultra-low harmonic VFD has switching IGBT semiconductors on the supply side. The VFD can control the line current to a sinusoidal waveform. Additionally, the line filter used in an ultra-low harmonic VFD is designed to attenuate high-over voltage harmonics to achieve very low total distortion of both current and voltage.



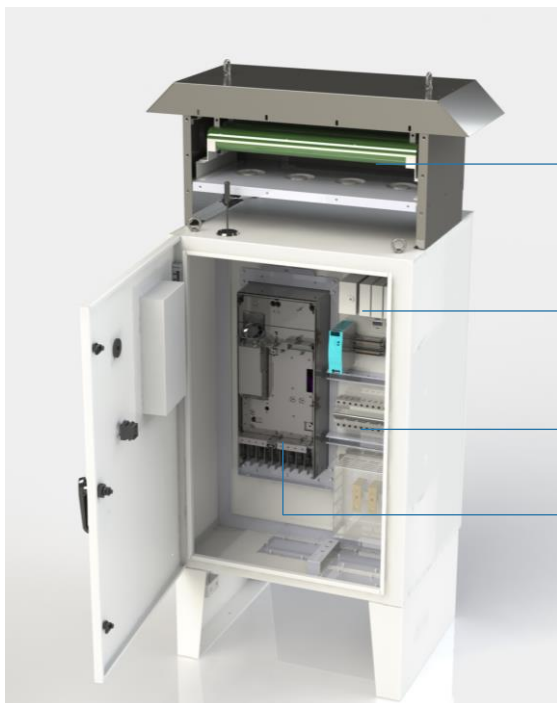


Main breaker
Emergency stop
ABB control panel

Brake resistors box

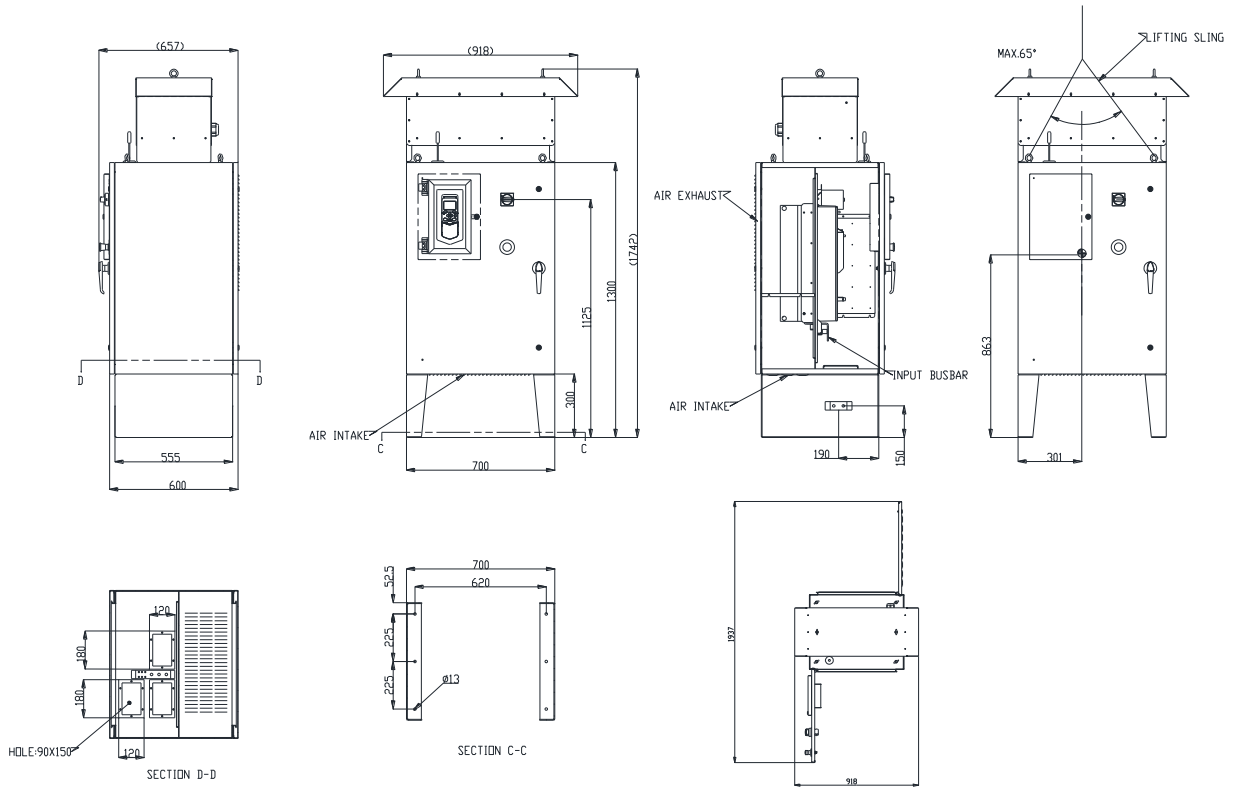


Air intake on the bottom of the heatsink section of VFD
Air exhaust of the heatsink section of VFD



Brake resistors
Breaker or switch
Electronic components
ABB drive module

- + The 6 pulse VFD solution is standard
- + Filtered 6 pulse VFD solution is option
- + Ultra-low harmonic VFDs are custom designed products
- + ABB ACS880 series drive module integrated
- + Standard brake chopper and brake resistors



VFD rating	25HP (19kW)	30HP (22kW)	40HP (30kW)	50HP (37kW)	60HP (45kW)
Output current 6 pulse VFD/ PHF 6 pulse VFD / ultra-low harmonic VFD	34A	40A	52A	65A	77A
Overload capacity	150% 1min/5min	150% 1min/5min	150% 1min/5min	150% 1min/5min	150% 1min/5min
Dimension (brake resistors box included) H×W×D [mm]	1742×918×657	1742×918×657	1742×918×657	1742×918×657	1742×918×657
Dimension H×W×D [mm]	1300×700×657	1300×700×657	1300×700×657	1300×700×657	1300×700×657



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