



Electrical Submersible Pump

# **12 pulse Variable Frequency Drive**

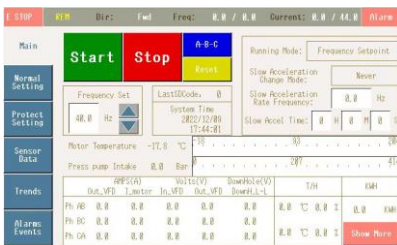
Voltage rating: 380V to 480V, 50/60Hz

# EVR 3 Series Variable Frequency Drives

Industry Power & Control for Artificial Lift Application

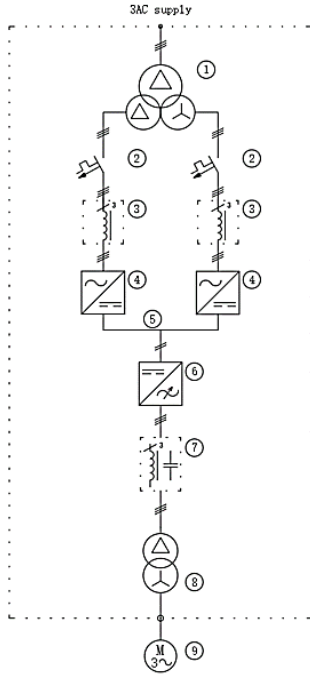


**Modular design, Cost effective, Easy-to-use and Easy-to-maintain Variable frequency drive**

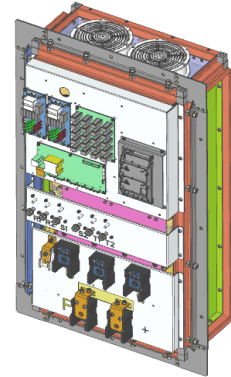


Input power supply	3 phase 380V to 480V ±10%, 50/60Hz ±5%
Converter type	12 pulse diode rectifier
Inverter type	IGBTs
Input current protection	Circuit breaker
Input surge suppression	IEC test classification / EN type: II/T2 Maximum continuous voltage: 350V(L-PE) $I_{SCCR}$ : 50kA (max.200A gG) Voltage protection level: 1500V $I_n$ : 20kA 8/20 $\mu$ s $I_{max}$ : 40kA 8/20 $\mu$ s
Input power balance	Standard input AC reactors
Output voltage	The same as power supply
Output frequency	0.1Hz to 90Hz
Output waveform	High performance Sinewave
Motor control	Constant or Variable Torque (V/F)
Motor technology	Induction motor (IM)
Efficiency	>96% at full load
Power factor	0.98 across entire speed range
Overload rating	120% for 1min/5min
Certifications	ISO9001, ISO14001, CE
Enclosure rating	Junction box & main power section: IP66 [ equivalent to NEMA4 ] Magnetics section: IP24 [ equivalent to NEMA3R ]
Cooling system	IP66: air-conditioning unit, heat sink IP24: forced air cooling
Altitude	0 to 1000m without derating
Ambient operating Temp.	-30 degC to 55 degC
Relative humidity	20% to 95% maximum(noncondensing)
H <sub>2</sub> S protection	Conformal-coated PCBs & bus bars
Material	Carbon steel, the thickness is 2.5mm
Line-side termination	Circuit breaker's lugs in power junction box
Load-side termination	Lugs in power junction box
Control termination	Mounting plate on the dedicated swing door
Safety features	Emergency stop button Electronic interlocks Separated power and control sections Backspin indication LED on the front door Prewired IO junction box
Analog inputs (AI)	Qty 2: 4-20mA, resolution 12 bits
Digital inputs (DI)	Qty 5: DC24V, sink wiring
Digital outputs (DO)	Qty 4: relay output, NO, up to 5A
Serial communication	Qty 1: RS485 Modbus Master (for DHS) Qty 1: RS485 Modbus Slave (for SCADA)

### 12 pulse drive module

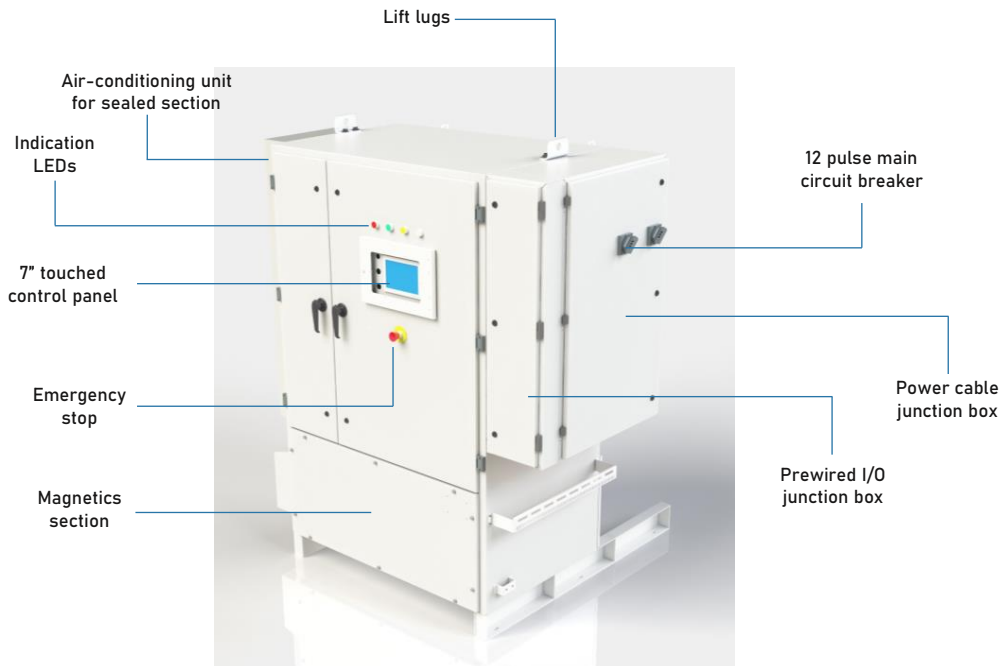


- ① 12 pulse phase shifting transformer
- ② 12 pulse main breakers
- ③ Input AC reactors
- ④ 6 pulse diode bridges
- ⑤ DC bus
- ⑥ Inverter
- ⑦ Output sine wave filter
- ⑧ Step-up transformer
- ⑨ Electrical Submersible Motor



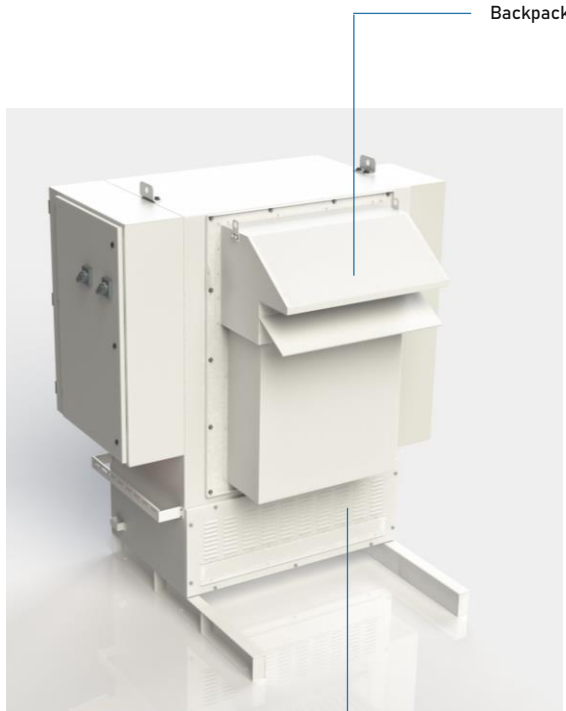
- + Single drive – there is only one drive module. The diode rectifier and inverter are sealed in a same enclosure.
- + Two separate, parallel 6-pulse diode bridges compose to 12 pulse rectifier in the input. Two input AC reactors are used to balance power supply.
- + Compared to two parallel 6 pulse drive modules solution, there is one output sine wave filter instead of two sine wave filters which are used to balance output current. Smaller footprint, lower cost and higher reliability.

### VFD introduction



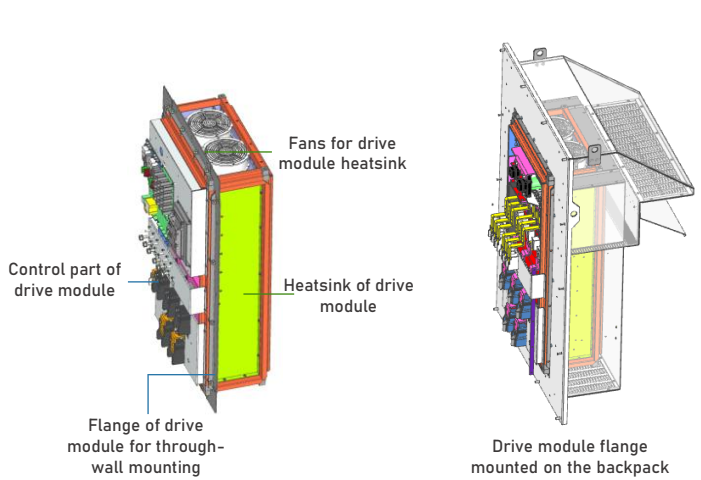
# VFD design

Industry Power & Control for Artificial Lift Application



Backpack

Sand sink



Control part of drive module

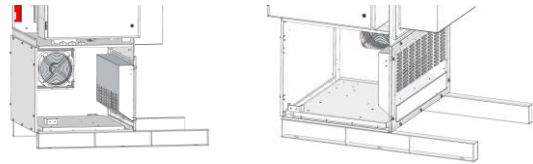
Fans for drive module heatsink

Heatsink of drive module

Flange of drive module for through-wall mounting

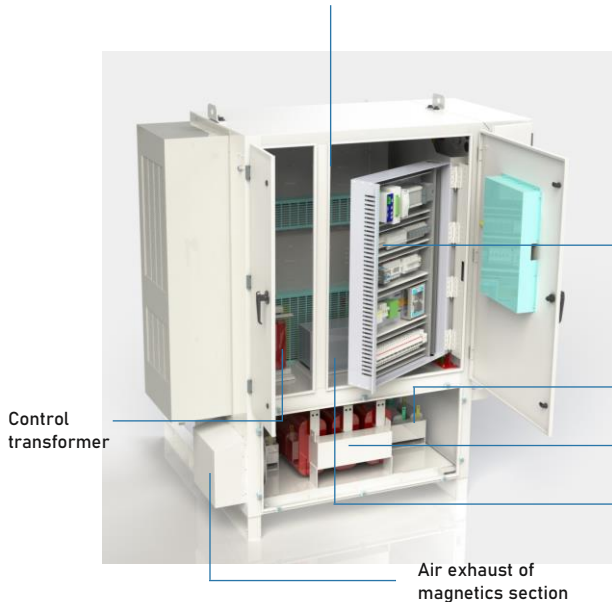
Drive module flange mounted on the backpack

- + 12 pulse drive module is flange mounted on the backpack
- + The control part and heat sink of drive module are separated. The control part of drive module is located in the sealed section of VFD and cooled by air conditioning unit and the heat sink is located in the backpack and cooled by fans.
- + The backpack is flange mounted on the back of the VFD. It is easy to maintenance or replace the drive module



Sealed section drive module's control part and electrical components are mounted in this section, cooled by air conditioning unit

- + The magnetics section is cooled by fan
- + Cooling air enters from the air inlet of the outer layer
- + The cooling air enters the VFD inside through the inner air inlet
- + The sand and dust will settle on the slope at the bottom of the sand sink
- + Open the outer movable baffle, the sand and dust will slide down the slope of the sand sink



Control transformer

Swing door Low voltage distribution panel and controller are mounted on it

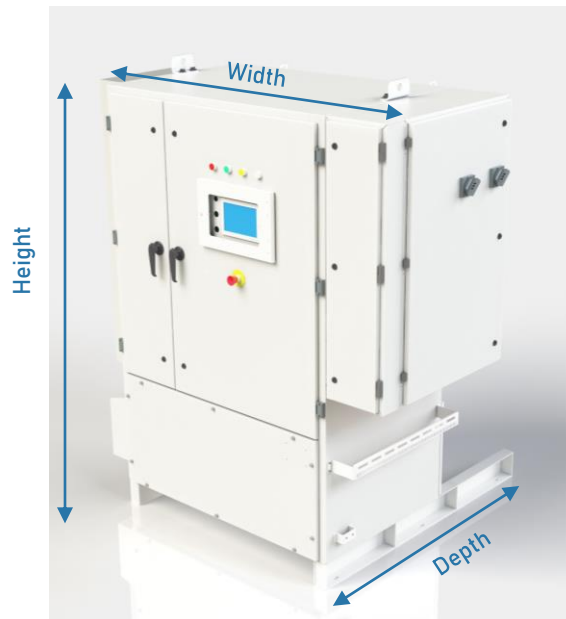
AC choke

Inductors of output sine wave filter

Capacitors of output sine wave filter

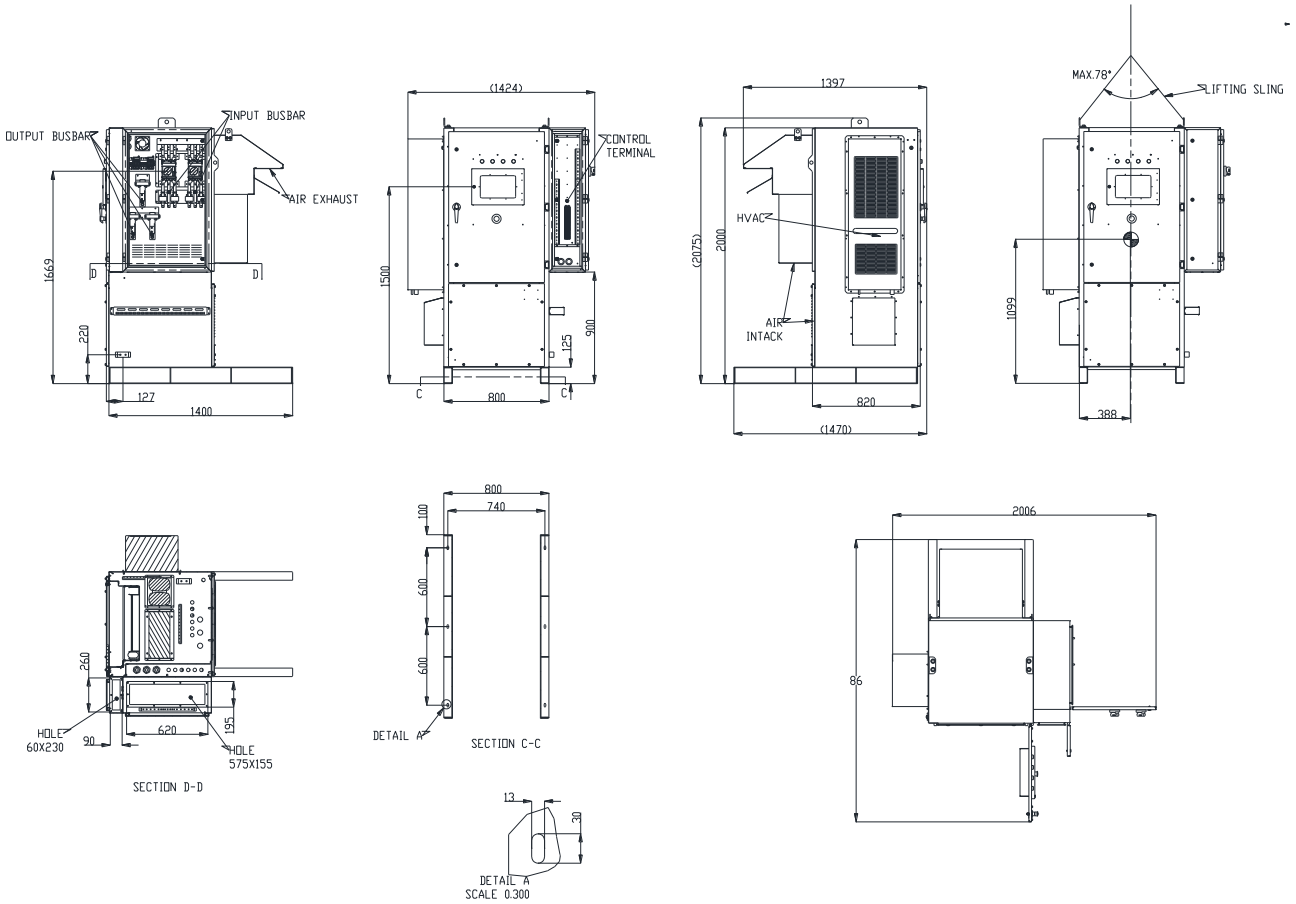
Air exhaust of magnetics section

VFD Type	Output Rating			Dimension [ mm ]			Approximately Weight [ kg ]
	A	kVA@380V	kVA@480V	Height	Width	Depth	
3 phase 380V to 480V $\pm 10\%$ , 50/60Hz $\pm 5\%$ , standard output sine wave filter							
EVR3-0169-SWD-12P-S	169	105	135	2075	1424	1470	796
EVR3-0208-SWD-12P-S	208	130	166	2075	1424	1470	823
EVR3-0248-SWD-12P-S	248	155	198	2075	1424	1470	852
EVR3-0298-SWD-12P-S	298	186	237	2075	1621	1470	898
EVR3-0350-SWD-12P-S	350	218	279	2075	1621	1470	924
EVR3-0410-SWD-12P-S	410	256	327	2075	1621	1470	960
EVR3-0510-SWD-12P-S	510	318	406	2075	1846	1470	1128
EVR3-0573-SWD-12P-S	573	357	457	2075	1846	1470	1274
EVR3-0640-SWD-12P-S	640	399	510	2075	2365	1670	1420
EVR3-0715-SWD-12P-S	715	446	570	2075	2365	1670	1574
EVR3-0810-SWD-12P-S	810	505	645	2075	2365	1670	1680
EVR3-1010-SWD-12P-S	1010	630	805	2075	2851	1670	2090

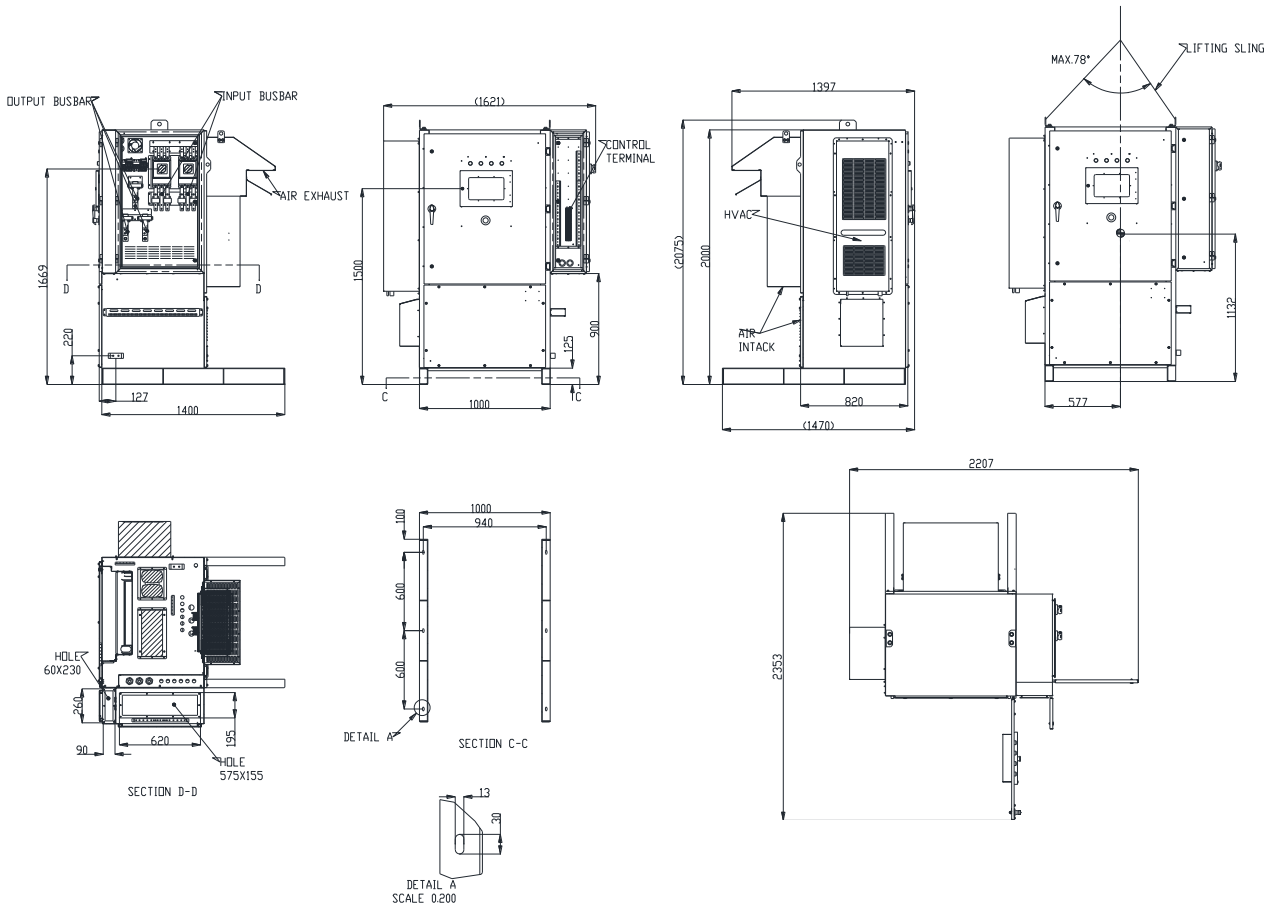


### Remark

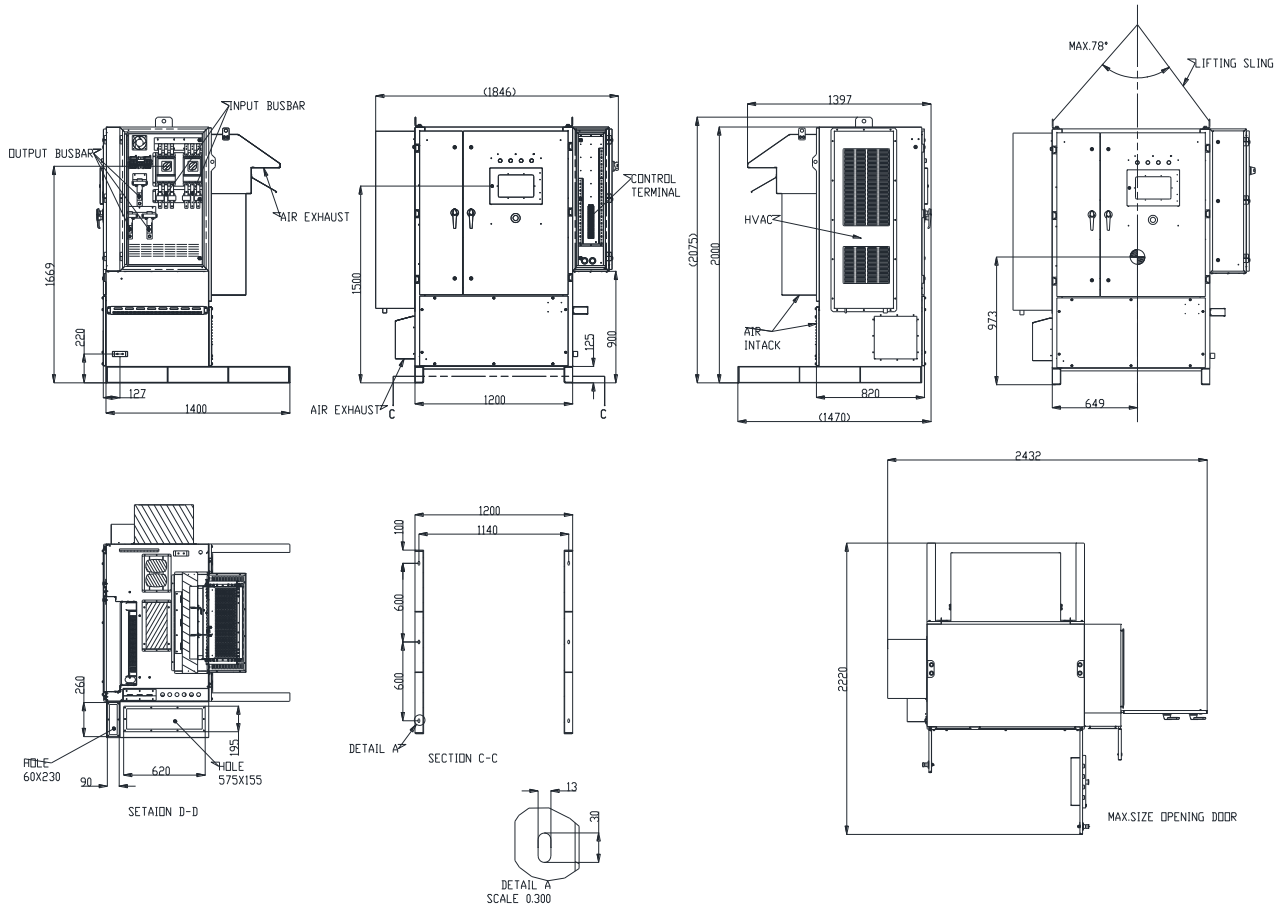
- + 6/12 pulse VFDs
- + There are two types of air conditioning units for your selection: one is T1 condition (The ambient operating temperature is up to 55 degC), the other one is T3 condition (The ambient operating temperature is up to 65 degC). T1 is standard and T3 is option.
- + We accept customized design of VFD dimensions to match the mesh skid or the skid container's dimensions in order to save the shipment cost.
- + We accept custom design of VFD dimensions for our OEM customers



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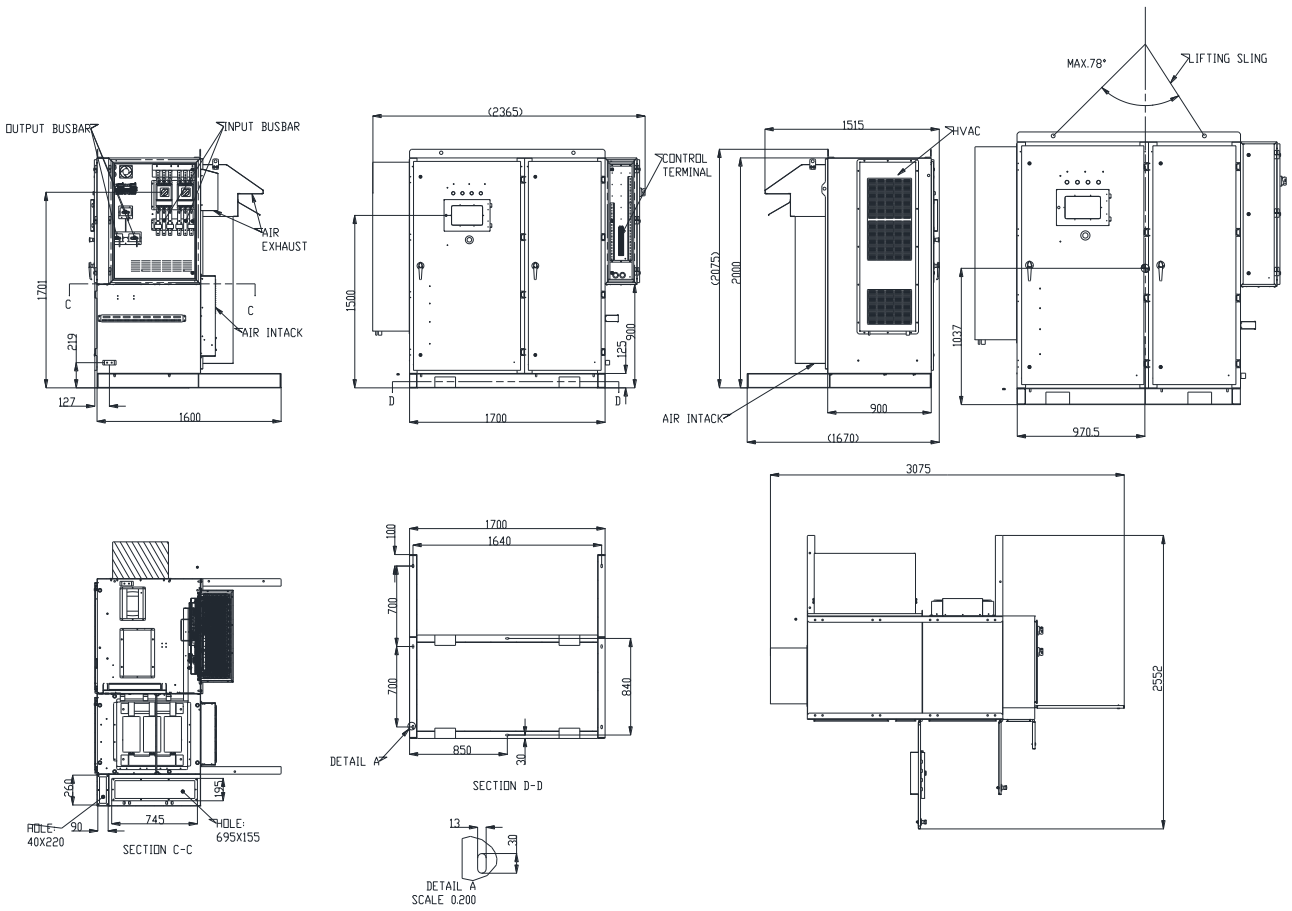


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EVR3-0350-SWD-12P-S	350	218	279	2075	1621	1470	924
<b>EVR3-0410-SWD-12P-S</b>	<b>410</b>	<b>256</b>	<b>327</b>	<b>2075</b>	<b>1621</b>	<b>1470</b>	<b>960</b>
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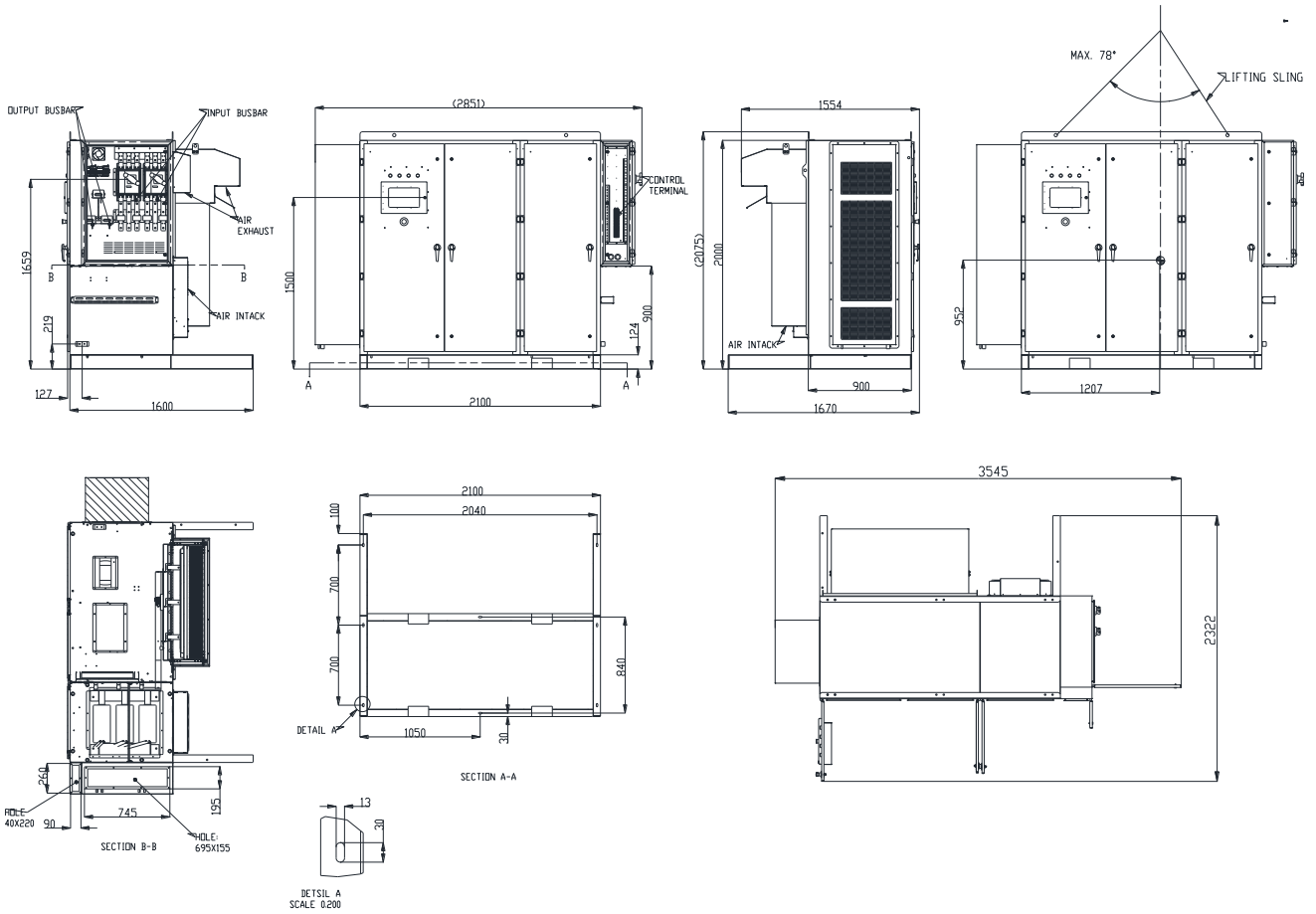


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**Tianjin DCUS Electrical Equipment Co., Ltd**

**[wangwei@dcus.cn](mailto:wangwei@dcus.cn)**

**[wangjian@dcus.cn](mailto:wangjian@dcus.cn)**