Sapphire TECHNOLOGIES

DATASHEET

D300 DC-COUPLED MOTOR DRIVE

300 kW Liquid-Cooled Variable Speed Drive

Sapphire Technologies develops and manufactures high-capacity, oil-free compressors and the power electronics that drive them. The D300 is a 300 kW, liquid-cooled, DC-coupled variable speed motor drive built on Sapphire's drive platform for compressor applications, producing a controlled three-phase AC output for precise speed and torque control.



D300 DRIVE CORE

The architecture eliminates the AC-input rectifier stage used in a conventional VFD and interfaces directly with a DC power source or common DC link. Pre-charge, main contactor control, and stored-energy discharge are integrated in the drive.

The D300 is suited to centrifugal and high-speed compressors in industrial and data center chillers, refrigeration and process compressors, and common DC bus systems. Every drive is assembled, load tested, and thermally screened at Sapphire's factory in Cypress, California.

Direct from the DC bus. With no AC-input rectifier stage, the D300 connects at 800 VDC to data center DC distribution, storage, and generation.

300 kW of controlled motor output. Up to 560 V_{RMS} and up to 500 A_{RMS} three-phase output continuous, with high-frequency PWM current control for precise speed and torque.

Liquid-cooled power stage. Liquid cooling carries the full 300 kW continuous load from a compact industrial cabinet. Low-cooling-flow protection supervises the coolant loop, and standby loss is less than 300 W.

Built-in control and protection. Modbus communications, 4 to 20 mA speed command, analog torque and speed feedback, and digital fault and E-stop interfaces, backed by DC-bus, overcurrent, overtemperature, overspeed, and cooling-flow protection.

D300 Specifications

DC INPUT

Nominal DC Bus Voltage	**800 VDC**
DC Bus Operating Window	720 to 850 VDC
DC Bus Configuration	Ungrounded
Integrated Functions	Pre-charge, main contactor control, discharge
Stored-Energy Discharge	800 VDC to less than 50 VDC within 5 minutes

MOTOR OUTPUT

Rated Output Power	**300 kW**
Output Voltage[1]	**Up to 560 VAC, 3-phase**
Continuous Output Current [1]	**Up to 500 Arms**
Overcurrent Protection	556 Arms
Efficiency	95% or greater
Switching / Control	High-frequency PWM, current control
Standby Loss	Less than 300 W

COOLING & ENVIRONMENT

Power-Stage Cooling	Liquid cooled
Cooling Supervision	Low-cooling-flow protection
Operating Ambient Temperature	0 to 45 °C (32 to 113 °F)
Storage Temperature	–20 to 60 °C (–4 to 140 °F)
Humidity	Up to 90% RH, non-condensing

Direct from the DC bus: No input rectifier. One DC link. Precise speed and torque control.

CONTROL & COMMUNICATIONS

Control Modes	Speed and torque
Communications	Modbus
Speed Command	4 to 20 mA analog
Feedback	Analog torque and speed
Digital Interfaces	Fault and E-stop

PROTECTION

Electrical	DC-bus undervoltage and overvoltage, motor overcurrent, output fault current
Thermal & Mechanical	Overtemperature, low cooling flow, overspeed
System	Pre-charge timeout, emergency-stop interface

PHYSICAL

Enclosure	Option for Hoffman industrial cabinet
Dimensions[2]	30″ × 28″ × 18″ (762 × 711 × 457 mm)

[1] Ratings apply to the controlled AC output on the motor side and are not AC-grid input ratings. Final motor compatibility, overload profile, DC-bus window, cooling conditions, and control parameters are confirmed for the specific compressor or chiller application.

[2] Core components.