Technology for Next Generation Fuel Cell Powered Automobile

Electrical Single Stage Air Compressor 25 kW

For more than one decade, Liebherr has been collaborating with major automotive manufacturers to develop the future generation of fuel cell vehicles. Liebherr's air bearings technology for centrifugal compressor developed for aerospace activities powered by a high-speed electric motor has been identified as the best candidate to supply compressed and pressurized air to the fuel cell system.

The motorized compressor by Liebherr complies with the severe requirements of fuel cell systems for the automotive industry: very robust and reliable, it does not require oil, it is compact in size, highly efficient, optimized in cost and noise emissions, and it features a fast dynamic response.
This has been demonstrated in the field where several hundreds vehicles using motorized turbo compressors by Liebherr have already run millions of miles without any failure since 2007.

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Main characteristics ETC 25 kW

Electrical compressor with turbine (ETC) characteristics	**Electrical compressor with turbo chargers**
HVDC range (full performance)	250 – 430 Vdc
HVDC range (power/speed derated performance)	150 – 250 Vdc 430 – 450 Vdc
HVDC max. voltage (not operational)	500 Vdc
Accelerations (0 to idle speed – including controller boot delay)	1 s max.
Accelerations (idle to 90 % max speed)	1 s (@ 35 kW peak)
Max. DC consumption @ idle speed	< 500 W
Ambient temperature range (full performance)	-40 °C to +85 °C
Liquid cooling temperatures (full performance)	-40 °C to +70 °C
Volume	16 l
Weight	22 kg
Protection level	IP 67
Motorized compressor (MC) characteristics	**Compressor with turbo charger**
Compressor air flow range	up to 210 g/s
Compressor pressure ratio	3.1 max.
Compressor and turbine stages	customizable
Technology	centrifugal
Bearings	Air (oil free)
Min. Speed (idle speed)	18,500 rpm
Max. speed	85,000 rpm
Acoustic (SPL – 1 m)	< 55 dB (min. speed) < 90 dB (max. speed)
Internal ventilation bleed (@ intercooler outlet)	8 %
Power electronics inverter (PE) characteristics	**Power electronics inverter**
Steady state power capability	25 kW @ 250 Vdc
Transient power capability	35 kW @ 250 Vdc (1 s)
HVDC diode (to prevent regeneration on DC)	Optional (implementation on request)
Passive discharge	< 60 V in 120 s
Active discharge (if no HV diode)	< 60 Vdc in 5 s
Motion control	Space vector PWM/sensorless with instant restart
Communication BUS	2 x CAN bus
Crash input request	CAN or discrete input signal
CAN download	Yes (on request)
Controller voltage range (full operational)	9 – 16 V

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