

EMRAX 268 / 268 VHML Technical Data Table (dynamometer test data)

Type Technical data	EMRAX 268 / 268 VHML High Voltage			EMRAX 268 / 268 VHML Medium Voltage			EMRAX 268 / 268 VHML Low Voltage		
	AC	LC	CC	AC	LC	CC	AC	LC	CC
Air cooled = AC Liquid cooled = LC Combined cooled = Air + Liquid cooled = CC									
Ingress protection	IP21	IP65	IP21	IP21	IP65	IP21	IP21	IP65	IP21
Cooling medium specification (Air Flow = AF; Inlet Water/glycol Flow = WF; Ambient Air = AA) If inlet WF temperature and/or AA temperature are lower, then continuous power is higher.	AF=20m/s ; AA=25°C	WF=8l/min at 50°C; AA=25°C	WF=8l/min at 50°C; AA=25°C	AF=20m/s ; AA=25°C	WF=8l/min at 50°C; AA=25°C	WF=8l/min at 50°C; AA=25°C	AF=20m/s ; AA=25°C	WF=8l/min at 50°C; AA=25°C	WF=8l/min at 50°C; AA=25°C
Weight [kg]	19,9	20,3	20,3	19,9	20,3	20,3	19,9	20,3	20,3
Diameter $\phi$ / width [mm]	268/91								
Maximal battery voltage [Vdc] and full load/no load RPM	700 Vdc (3200/3800 RPM)			680 Vdc (4700/5500 RPM)			130 Vdc (2300/2900 RPM) 250 Vdc (4500/5500 RPM)		
Peak motor power at max RPM (few min at cold start / few seconds at hot start) [kW]	160			230			115 (at 2300 RPM load); 220 (at 4500 RPM load)		
Continuous motor power (at 2000-4000 RPM) depends on the motor RPM [kW]	40 - 75	40 - 80	50 - 85	40 - 80	40 - 90	50 - 110	40 - 75	40 - 80	50 - 90
Maximal rotation speed [RPM]	4500 RPM (5500 RPM peak for a few seconds)								
Maximal motor current (for 2 min if it is cooled as described in Manual) [Arms]	270			400			1000		
Continuous motor current [Arms]	125			190			500		
Maximal motor torque (for a few seconds) [Nm]	500								
Continuous motor torque [Nm]	250								
Torque / motor current [Nm/1Aph rms]	2,0			1,4			0,5		
Maximal temperature of the copper windings in the stator and max. temperature of the magnets [°C]	120								
Motor efficiency [%]	92 - 98								
Internal phase resistance at 25 °C [m $\Omega$ ]	26			11,5			1,7		
Input phase wire cross-section [mm <sup>2</sup> ]	10,2			15,2			38		
Wire connection	star								
Induction in Ld/Lq [ $\mu$ H]	292/273			126/118			17/15,9		
Controller / motor signal	sine wave								
AC voltage between two phases [Vrms/1RPM]	0,2320			0,1520			0,0560		
Specific idle speed (no load RPM) [RPM/1Vdc]	5,4			8,2			22,2		
Specific load speed (depends on the controller settings) [RPM/1Vdc]	4,5 - 5,4			7 - 8,2			18 - 22,2		
Magnetic field weakening (for higher RPM at the same power and lower torque) [%]	up to 100								
Magnetic flux – axial [Vs]	0,1014			0,0664			0,0245		
Temperature sensor in the motor	kty 81/210								
Number of pole pairs	10								
Rotor inertia (mass dia=195mm, m=9,8kg) [kg*cm <sup>2</sup> ]	932								
Bearings (front:back) – SKF/FAG	6206:6206 (for radial forces) or 6206:7206 (for axial-radial forces; for pull mode; e.g. for air propeller) or 6206:3206 (for axial-radial forces; for pull-push mode; »O« orientation, $\alpha=25^\circ$ ); other bearings are possible (exceptionally)								
EMRAX 268 Very High Mechanical Loads (VHML)	stronger motor shaft and bearings (6207:6207 for radial forces)			stronger motor shaft and bearings (6207:3207 for radial-axial; for pull-push mode; »O« orientation, $\alpha=25^\circ$ and for pull mode; e.g. for air propeller)					

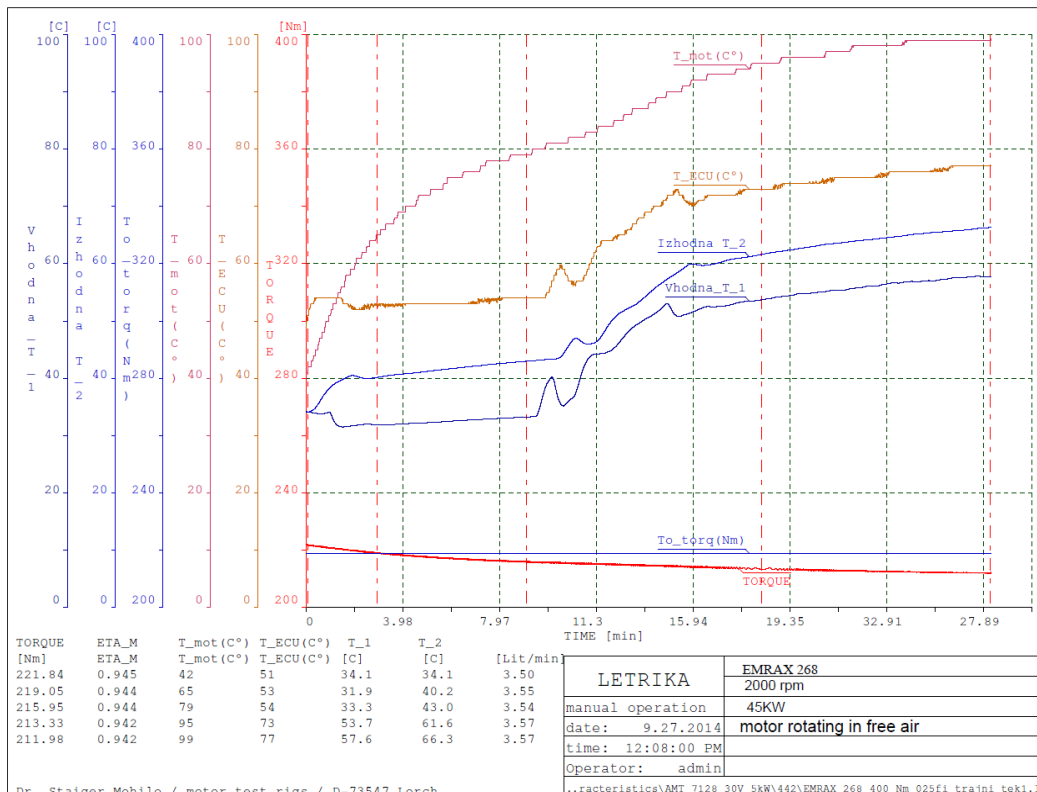
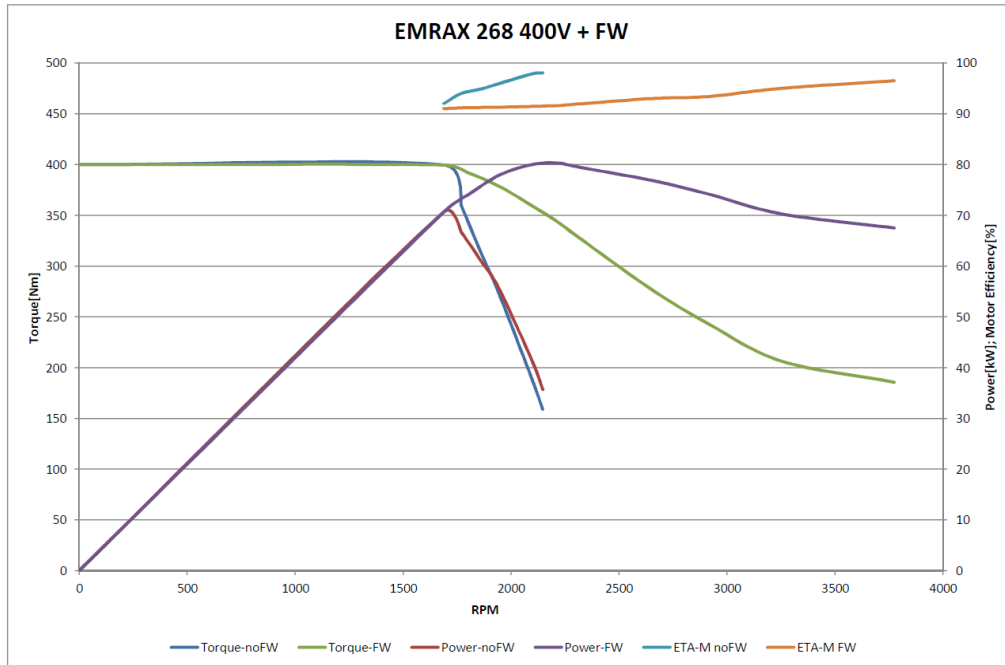
\*EMRAX 268 VHML Low Voltage version always has 2 sequences of phase connectors (2x UVW).

\*\*Controller for EMRAX 268 Low Voltage motor should have very high peak and continuous motor current (1000 Arms peak and 500 Arms continuous). It is difficult to find such a high current controller in the global market. The most suitable is emDrive 500 from the Emsiso Company, which has 500 Arms continuous and 800 Arms peak motor current. Another possibility to get a high enough motor current is to

connect 1 motor with 2 controllers by using 2 set of phase connectors (2x UWV) on the motor.

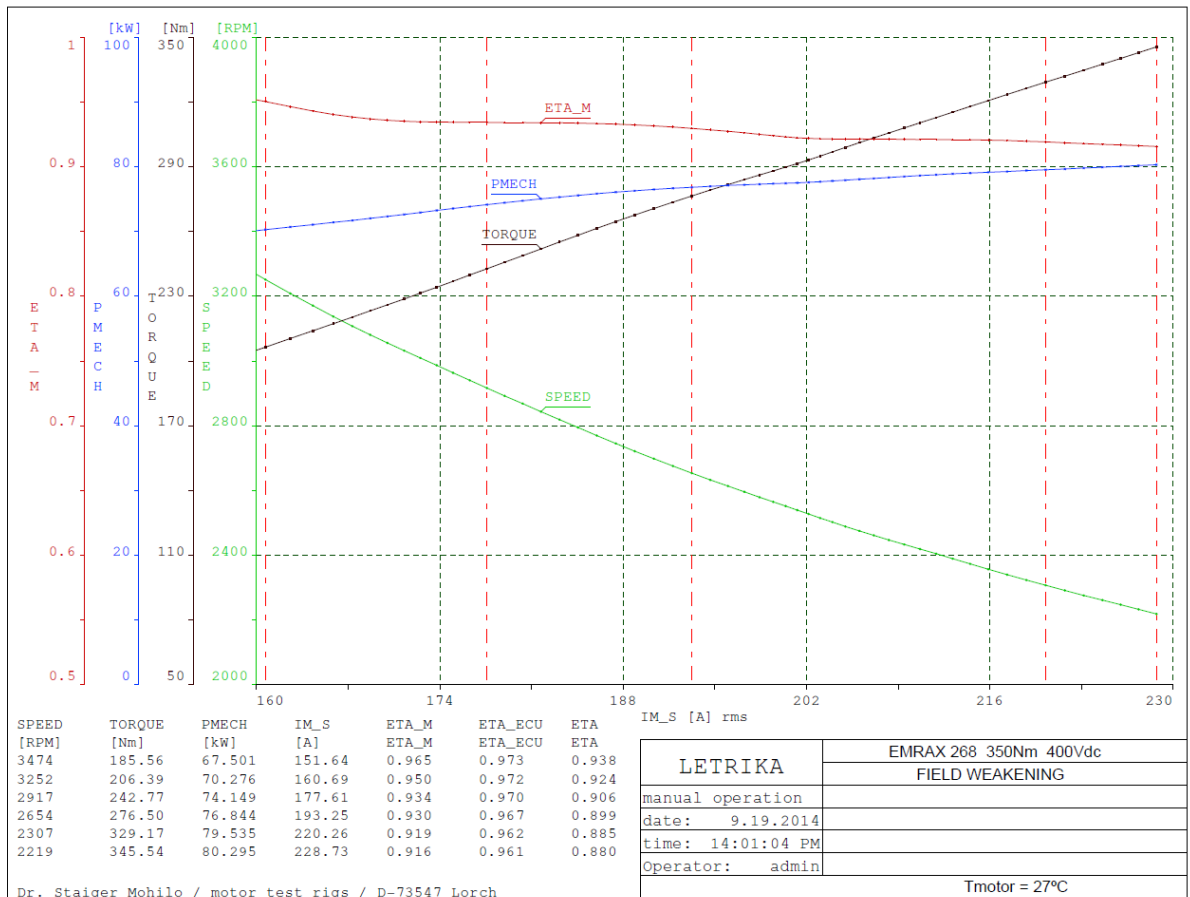
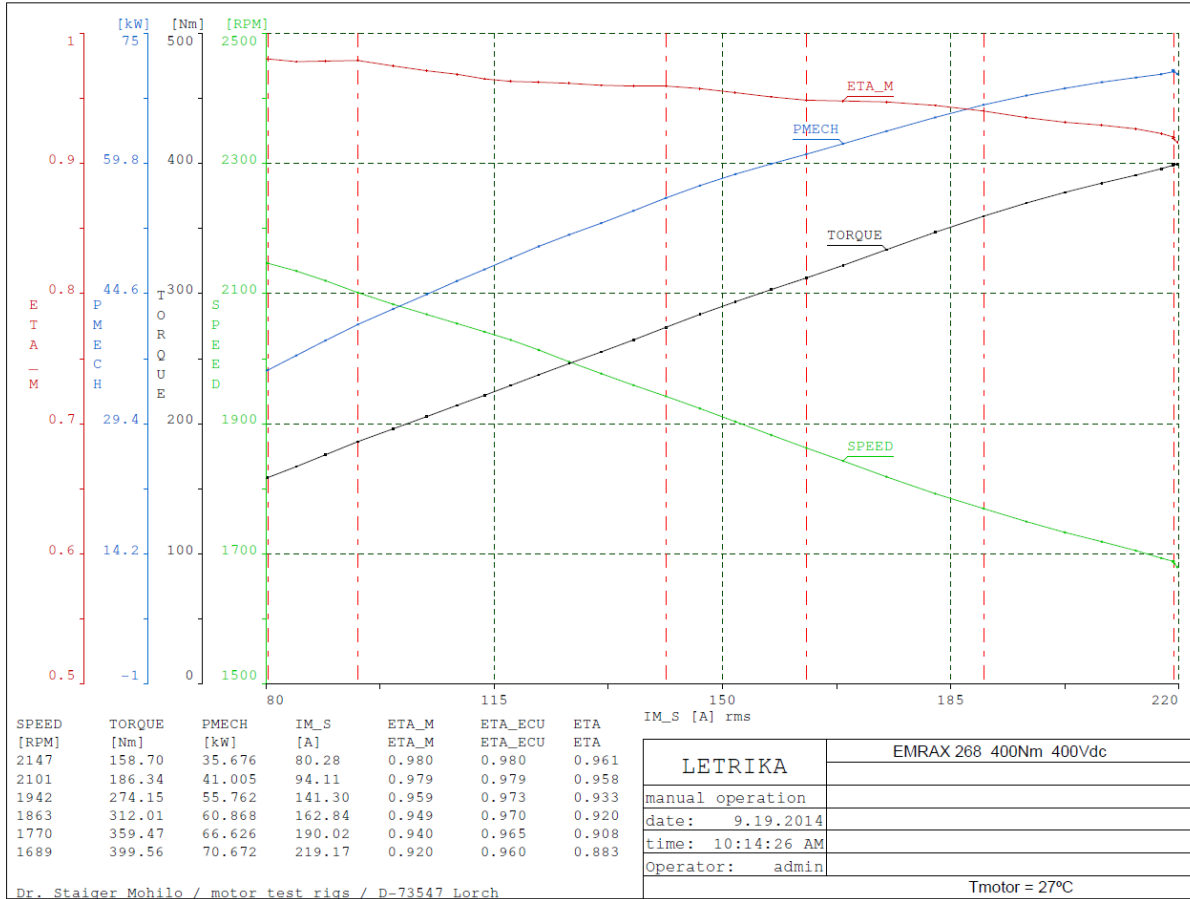
**Graphs valid for EMRAX 268 High Voltage Combined Cooled (CC):**

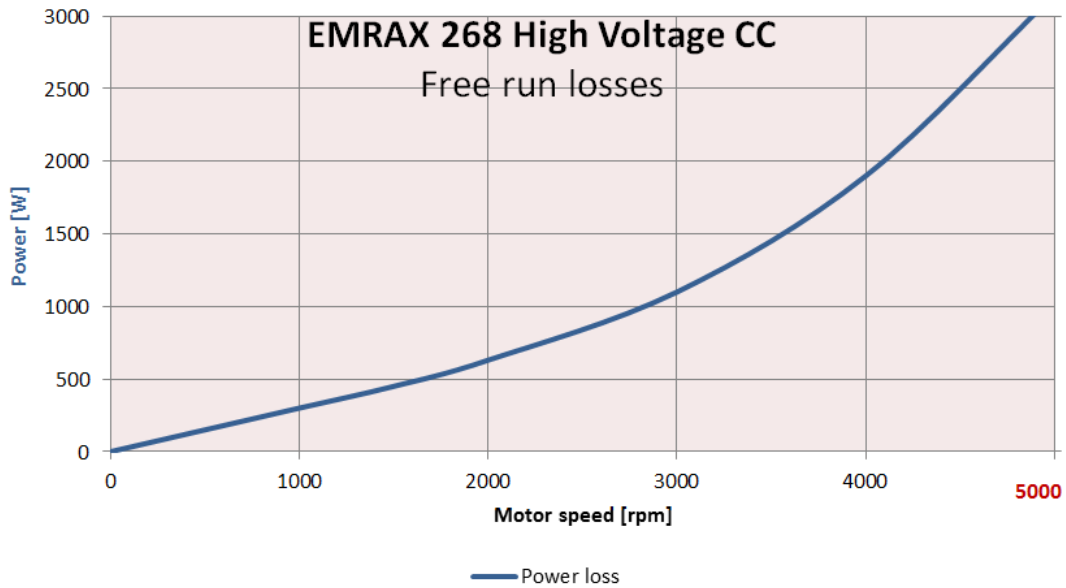
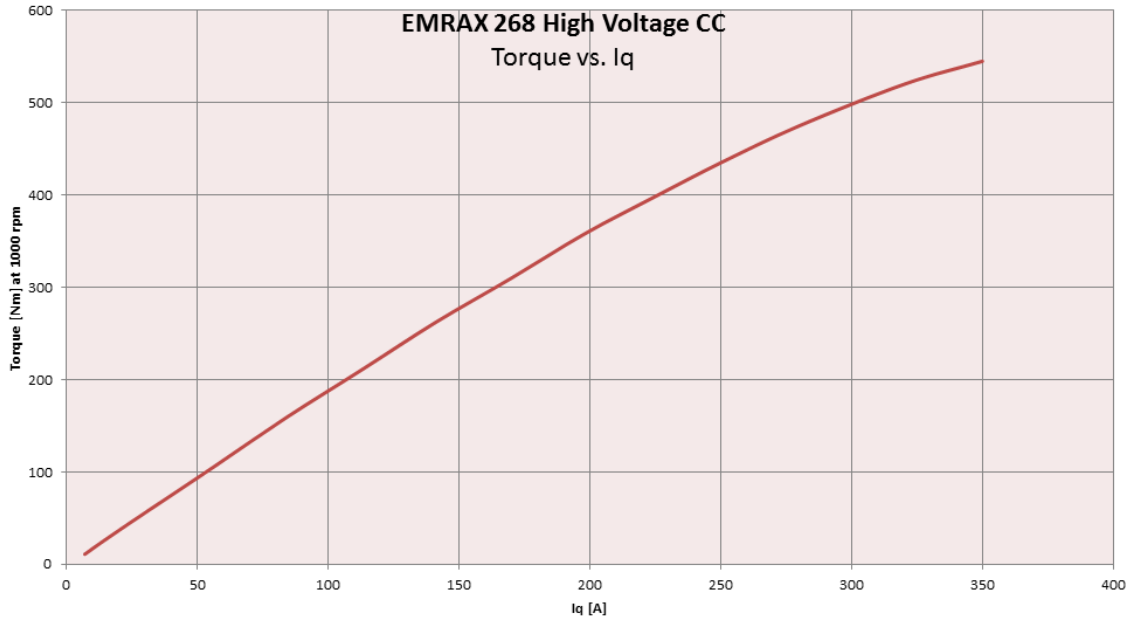
Graphs were made from tests, which were made by Letrika d.d. in 2014. The motor was tested only up to 400 Nm of torque, because the opposite generator on the test bench generated only 400 Nm of torque. DC voltage from the batteries was only 400 V, so we were able to run the EMRAX motor only at lower speed than the maximal motor speed. The motor was also tested with magnet field weakening setting in the controller – in this case we achieve significantly higher speed at the same power. Water/glycol flow was only 3,5 l/min, but it must be 6-8 l/min as it is written in the Technical Data Table.



Dr. Staiger Mohilo / motor test rigs / D-73547 Lorch

LETRIKA	EMRAX 268
manual operation	2000 rpm
date: 9.27.2014	45KW
time: 12:08:00 PM	motor rotating in free air
Operator: admin	





**Graphs of the EMRAX 268 Medium and Low voltage motor type:**

Graphs of EMRAX 268 Low Voltage and EMRAX 268 Medium Voltage are similar to graphs of EMRAX 268 High Voltage. The only differences are in the DC voltage and motor current. These two parameters can be read from the Technical Data Table for the EMRAX 268 Low and Medium Voltage motor.

Low Voltage motor needs 4 x higher current and 4 x lower DC voltage for the same power/torque and RPM, compared to the EMRAX 268 High Voltage motor.

Medium Voltage motor needs 1.52 x higher motor current and 1/3 lower DC voltage for the same power/torque and RPM, compared to the EMRAX 268 High Voltage motor.

**Graphs of the EMRAX 268 Liquid cooled (LC) and EMRAX 268 Air Cooled (CC):**

Continuous power of the liquid cooled or air cooled motor is 20% lower than continuous power of the combined cooled motor. The peak power is the same. Data is presented in the Technical Data Table.