

Motenergy - ME1616 - Liquid-cooled PMSM motor



Reference : MOT-ME1616-22KW-IP65

Brand : MOTENERGY

Options :

No variants

3D Model : Available

EAN-13 : 3705829147361

Manufacturer reference (MNP): **ME1616** - Brand: **Motenergy**

Liquid-cooled three-phase brushless permanent-magnet synchronous motor (PMSM/PMAC), low-voltage DC bus (up to 96 VDC in typical integration), 22.5 kW continuous / 48 kW peak (at 100 VDC), 5 V sin/cos encoder and KTY84-130 temperature sensor – Motenergy ME1616

General description

The **Motenergy ME1616** is a **brushless permanent-magnet synchronous motor** designed for **low-voltage battery** traction and drive systems. Its **liquid-cooled** design and **IP65** ingress protection make it a robust candidate for **on-board** applications (electric mobility, retrofits, mobile machinery) where thermal performance under sustained operation is a key sizing constraint.

The motor is operated via a **three-phase inverter** with **FOC** control and relies on a **5 V sin/cos position feedback** for torque/speed regulation, complemented by a **KTY84-130 sensor** for thermal protection and current/torque limiting strategies. Available performance (torque, power, efficiency) is sized at system level based on inverter limits, the DC bus, and the cooling circuit; nominal data are established with **100 VDC as reference**.

Key advantages

- **Liquid cooling + sealed IP65 housing**: integration suited to exposed on-board environments (splashes, dust), with thermal performance managed by the cooling circuit.
- **5 V sin/cos rotor sensor**: position feedback compatible with demanding FOC strategies (fine control, dynamic response).

- **Integrated KTY84-130 temperature sensor:** solid basis for torque/current limiting, derating, and over-temperature protection.
- **High current capability** (reference **250 A continuous, up to 600 A peak**): useful torque headroom for traction and load transients.
- **Documented motor constants** (K_t , K_e , Rphase, poles, inductance): speeds up inverter identification, modelling, and commissioning (efficiency/heating).
- **Industrializable power and signal interfaces:** large cross-section phase leads + **8-pin Metri-Pack 150** signal connector for sensors.

Technical specifications

| | |
|---|---|
| Technology | Permanent-magnet synchronous motor PMSM/PMAC, brushless, 3-phase |
| Cooling | Liquid (cooling ports 2 × 19 mm (3/4")) |
| DC bus / battery system (integration reference) | Up to 96 VDC (nominal data established at 100 VDC) |
| Torque (at 100 VDC, nominal) | 51 N·m continuous |
| Torque (max) | 120 N·m |
| Power (at 100 VDC, nominal) | 22.5 kW continuous |
| Power (peak) | 48 kW (600 A) ; additional reference 29 kW |
| Current (continuous / peak) | 250 A continuous; up to 600 A peak (endurance reference: 1 min at 550 A) |
| Speed (peak) | 6000 rpm |
| Max efficiency | 92% |
| Pole pairs | 5 (10 poles) |
| Torque constant (K_t) | 0.22 N·m/A |
| Voltage constant (K_e) | 0.026 V/RPM |
| Phase resistance | 0.0027 Ω at 25 °C |
| Inductance | 60–110 μH at 1000 Hz |
| Rotor sensor | 5 V sin/cos encoder (minimum amplitude indicated: 2 V AC peak-to-peak) |
| Temperature sensor | KTY84-130 ; max motor temperature 160 °C |
| Ingress protection | IP65 |
| Mass | 25.5 kg (without cables) |
| Rotor inertia | 0.096 kg·m² (equivalent to 960 kg·cm ²) |
| Power cabling | 3 × 35 mm² |
| Signal connector | 8-pin Metri-Pack 150 (12047937) |
| Mechanical interface (shaft) | Ø 22.23 mm (7/8") ; keyway referenced on drawing |
| Overall dimensions (approx. per drawing) | Ø 256 mm ; length excluding cables referenced ≈ 178 mm |

Power vs Voltage

Calculation assumption (order of magnitude, PMSM/FOC integration) : at a reference continuous current of **250 A RMS** (documented continuous current), available electrical power follows **$P_{elec} \approx VDC \times I$** ; usable mechanical power then depends on efficiency and the operating point (speed/torque/thermal).

| DC bus voltage (VDC) | Continuous current considered (A RMS) | Available electrical power (kW) | Typical mechanical power (kW) ($\eta \approx 0.92$) |
|----------------------|---------------------------------------|---------------------------------|---|
| 24 | 250 | 6.0 | 5.52 |
| 48 | 250 | 12.0 | 11.04 |
| 72 | 250 | 18.0 | 16.56 |
| 96 | 250 | 24.0 | 22.08 |
| 120 | 250 | 30.0 | 27.60 |

Typical applications

Low-voltage traction: karts, light utility vehicles, service platforms, special-purpose vehicles in retrofit (48–96 V DC bus).

Marine propulsion and auxiliaries: direct drive or via reduction gearbox, with thermal management via a liquid loop.

Mobile machinery: driving pumps, compressors, geared motor units for handling/conveying, high-torque dynamic AGVs/AMRs.

Motor/generator function: energy recovery / regenerative braking subject to inverter strategy and DC bus sizing.

Test bench

Characterization tests of the **Motenergy ME1616 motor** were carried out on the **EVEA test bench** to establish its torque and power performance across the full operating range. The tested motor was a **ME1616, S/N: #20.08.032** and it was driven by a **BLE4 96V – 700A inverter** (power supply **96 V**) during a campaign dated **18/03/2021**.

Maximum values obtained

| Indicator | Maximum | RPM (at peak) | RMS current (A) | Power (W) | Torque (N-m) |
|--------------------|---------------------|---------------|-----------------|-----------|--------------|
| Torque | 133.5 N-m | 500 | 607 | 6 991 | 133.5 |
| Motor power | 47 560 W (47.56 kW) | 3 580 | 577 | 47 560 | 126.9 |
| RMS current | 607 A | 500 | 607 | 6 991 | 133.5 |
| Speed | 6 000 rpm | 6 000 | 323 | 44 619 | 71.0 |

Results analysis

The protocol consisted of sweeping the motor speed over the **0 to 6,000 rpm** range while simultaneously tracking **speed**, **power**, and **torque**. The curves highlight a **maximum torque of 133.5 N-m** reached at **500 rpm**, as well as a **maximum power of 47.56 kW** observed around **3,580 rpm**.

Conclusion

The behavior is representative of a traction drive with a **stabilized torque** region centered around **~130 N·m** between **500 and 3,500 rpm**, followed by a region of **high, near-constant power** (on the order of **~43 to 48 kW**) up to **6,000 rpm**, at the cost of a **progressive decrease in torque** (down to **~71 N·m** at maximum speed). These results provide a usable basis for sizing and comparison with application requirements in the **96 V / BLE4 700A** configuration.

Integration recommendations

Inverter / sensor compatibility: verify support for **5 V sin/cos** (levels, calibration, electrical direction) and the **KTY84-130** input (or equivalent conversion/conditioning).

PMSM (FOC) parameter setup: enter the constants **pole pairs (5)**, **Kt 0.22 N·m/A**, **Ke 0.026 V/RPM**, **Rphase 0.0027 Ω**, and the **60–110 μH** inductance range to secure identification and limit overcurrents.

Cooling loop: design a stable liquid circuit (pump, heat exchanger, bleeding/degassing, leak monitoring) with **2 × 19 mm** connections; use a **water/glycol**-type coolant compliant with material constraints and corrosion protection.

Mechanical layout: rely on the drawing for the envelope (**Ø256 mm**) and the **Ø22.23 mm** shaft interface; control alignment and radial loads if using belt/chain transmission.

Mounting fasteners: comply with the thread depth constraint (reference **5/16-18, 19 mm depth**) and the maximum screw protrusion to avoid any internal contact.

Cables and power connections: size for **250 A continuous** and current peaks; prioritize compatible wire gauges, crimps, and routing, controlling voltage drop and heating.

Protection and safety chain: integrate fuses/breakers, DC contactor(s), precharge, emergency stop, and fallback strategies on sensor/thermal probe faults.

EMC best practices: separate power/signal wiring (8-pin connector), shielding/structured grounding, minimized loops on phases, and DC filtering at the inverter as per the architecture.

Diagnostics, maintenance, traceability: provide access to the signal connector, measurement points, and archiving of the inverter parameter set (firmware + settings) for series reproducibility.

Operating conditions and limits

Torque and power performance are achieved within the limits of **current, speed, and temperature**; continuous-duty capability depends directly on the **sizing of the cooling loop** and the thermal strategy based on the **KTY84-130**. The **IP65** rating must be maintained at system level through appropriate connectors, harness routing, and fastening compatible with the environment (vibration, splashes, mechanical constraints).

Final compliance (electrical safety, EMC, endurance, environmental resistance) results from the complete architecture: inverter, battery, protections, cabling, enclosure, cooling, and control software. Validation prior to commissioning remains the responsibility of the integrator.

Liability clause and technical disclaimer

The information presented is provided for technical guidance only, based on available documentary data. Performance, durability, and regulatory compliance depend on actual integration, configuration, and operating conditions. Final validation (functional, thermal, safety, and EMC) is required before commissioning, under the responsibility of the integrator.

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