

CIM TD

- Compact induction motor traction drive -

DSP-controlled MOSFET-based 42V battery supplied 2.2 kW induction motor traction drive for golf-car and manipulator applications.

CIM TD is the drive dedicated to low voltage, battery supplied traction drives using the squirrel cage induction motor for the electric propulsion. The inverter is based of Semicron MOSFET transistors, while the control executes on TMS320F243 digital signal processor. The options include

- sensorless operation, wherein the tractive force is controlled down to the standstill without the shaft sensors attached to the motor, and also
- the sensored operation, wherein the shaft sensors such as the optical encoders or electromagnetic resolvers give the possibility to keep the vehicle steady (in position) when stopped at a steep slope, or to perform various specific positioning of the vehicle, frequency required in the case of the warehouse manipulators.

The CIM TD is mounted on the aluminum heatsink and protected by the aluminum metal IP54 case. The unit has a unique power connector (for battery and the motor connections) and a dedicated signal connector (for commands and feedback signals). The drive, it's control board and the Semicron MOSFET power switches are shown below.



▶ TECHNICAL CHARACTERISTICS:

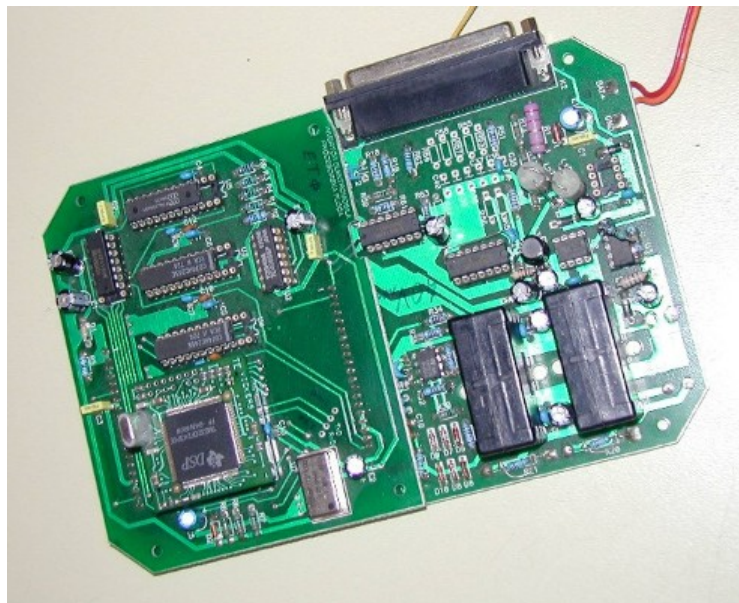
- Input voltage (battery) from 32V to 60V
- Output voltage $3 \times (0-28.3V)$ 0-250 Hz
- Maximum RMS line-to-line output voltage $U_I=28.3V$ with 42V DC battery
- Rated continuous duty output RMS current $I_s=90A$
- Peak stator current $I_{max}=165A$
- Rated continuous duty motor power $P_{nom}=2.2kW$
- Rated torque with 4-pole induction motor $T_{nom}=14Nm$
- Operating temperature from $-25^{\circ}C$ to $+60^{\circ}C$
- Isolation level between all the nodes 500V 50Hz, 60 sec. test

▶ PROTECTIONS:

- Battery overvoltage and undervoltage
- Short circuit between the motor phases
- Ground fault (phase wire to ground)
- Excessive slip frequency
- Overspeed (speed > MAX limit)
- I2T protection based on the motor thermal model
- I2T protection based on the heatsink thermal model
- Protection against interruption or short circuit between the command wires
- Overtemperature (PTC)



▶ CONTROL BOARD:



Control board comprises the sub-assembly modules such as:

- The auxiliary power supply, drawing the necessary +3.3V and +/-15V for the digital and analog hardware.
- LEM sensors and current amplifiers used for the stator current measurement.
- Buffers and line-drivers used for interfacing the I/O signals.
- The MOSFET gate-drivers for the on/off control of the power section.
- Digital signal processor TMS320F243 housing a 20MIPS 16-bit CPU with MAR-specialized architecture, incremental encoder interface, 10-bit 16-inputs A/D converter and versatile PWM unit with the lockout time generation.

▶ FEATURES:

- Besides digital and analog I/O, the board offers RS485 serial link interface. The DSP chip TMS320F243 has an on-board CAN 2.0B controller that may be use when required.
- Flash memory gives the ease of permanently storing the vital parameters and faults. When required, complete control software can be exchanged via RS485 serial link. This helps a lot the development phase, when frequent software changes are required.
Present CIM TD prototype drives the induction motor. The same way, by updating the software through the serial link, CIM TD can run the synchronous permanent magnet and synchronous reluctance traction motors. With the power section modification, control board can be uses as the bases for SR motor drive as well.