



THE DRIVING FORCE BEHIND POWERFUL IDEAS

### 3-PHASE AC MOTORS WITH BUILT-IN INVERTERS



**MEDHA<sup>TM</sup> Servo Drives Pvt. Ltd.**, established in 1984 is an R&D focussed company dedicated to railway products. Over last 25 years, MEDHA's inhouse design teams have developed various world class hi-tech products and systems for application in Locomotives, Coaches and Stations/ Yards. MEDHA's state of art Design Centre and Manufacturing facilities employs over 900 people who are constantly striving to apply latest technologies to create innovative products in wide range of fields like Control Electronics, Power Electronics, Electro-mechanical systems and Signaling Systems. All new developments and modifications go through stringent testing, validation and verification of both hardware and software, many times going beyond customer specification requirements.

MEDHA has well equipped manufacturing facilities that are **ISO 9001:2000** certified by American Quality Assessors (accredited by **ANAB**). Facilities include automated assembly of Surface Mounted Devices on PCBs, CNC machines, various test equipment and custom test jigs for in process and final inspection of all manufactured goods. MEDHA supplies products for Locomotives including IGBT based AC Traction Control Systems for Diesel Locomotives, various models of microprocessor based Locomotive Control Systems including control panel and electricals for Diesel and Electric locomotives, microprocessor based Governors, 180 kVA 3 phase Static Converters for Electric Locomotives, Speed and Event recorders, TFT LCD Driver Display screens, End of Train Telemetry, etc. For signaling applications, MEDHA has developed Electronic Interlocking system and Integrated Signaling Power Supplies. For coaches, MEDHA supplies various models of underslung naturally cooled inverters ranging from 2.5 kVA to 50 kVA.



**CYCLONIC FILTER DUST EXHAUSTER MOTOR WITH INVERTER**



**FUEL PUMP MOTOR WITH INVERTER**



**CRANK CASE EXHAUSTER MOTOR WITH INVERTER**

## 3-PHASE AC MOTORS WITH BUILT-IN INVERTERS

### Application

Medha's 3 Phase AC motors with built-in inverters are designed using a DSP (Digital Signal Processor) for control and IGBT semiconductor power devices in inverter. These AC Motor-Inverter combinations are a good retrofit alternative for failure prone and high maintenance DC Motors used for the same functions in older locomotives. The Inverter takes DC supply from locomotive batteries and provides required sinusoidal supply to 3-phase AC motors.

Three types of motors are used for different functions in the locomotive.

1. 1.5 HP Fuel Pump Motor with pump.
2. 0.87 HP Dust Exhauster Blower Motor with blower.
3. 0.5 HP Crank Case Blower Motor with blower.

These inverter motors are protected for input under voltage, input over voltage, output overload, output short circuit, input reverse polarity, over temperature. Surge protection as per IEC 571.

Inverter module is divided into two sections.

#### 1. Booster section:

It is used to generate stable DC link voltage for PWM inverter, which is independent of input voltage variations. The switching element of the Booster circuit consists of MOSFET module. All features of booster are monitored and controlled through DSP.

#### 2. Inverter section:

It uses three half bridge IGBT phase modules and a DSP control card. DSP controller circuit generates the inverter PWM signal for IGBTs to synthesize a Sine Weighted PWM voltage with required output frequency. The control card is responsible for overall system control through status monitoring, diagnostics and PWM waveform generation for inverter.

Specifications	Fuel Pump Motor	Crank Case Exhauster Motor	Cyclonic Filter Dust Exhauster Motor
Rating	1.5 HP continuous	0.5 HP continuous	0.87 HP continuous
Input Voltage	50 - 90V DC	50 - 90V DC	50 - 90V DC
Limited operation voltage	Down to 17V DC	Down to 20V DC	Down to 20V DC
Synchronous Speed	1800 RPM at 72V DC	3000 RPM at 72V DC	3000 RPM at 72V DC
Motor Voltage	115V AC 3-Phase	115V AC 3-Phase	115V AC 3-Phase
Motor Insulation	Class H	Class H	Class H
Load Power Factor	≥ 0.8	≥ 0.8	≥ 0.8
Motor + Inverter combined efficiency	> 80%	> 80%	> 80%
Type of Protection	IP-65 (Inverter) IP-54 (Motor)	IP-65 (Inverter) IP-54 (Motor)	IP-65 (Inverter) IP-54 (Motor)
Short term rating	150% of rated torque for 15 sec	150% of rated torque for 15 sec	150% of rated torque for 15 sec
Scope	Inverter, Motor, both side Pumps	Inverter, Motor, Blower (Aluminum)	Inverter, Motor, Blower (MS)
Delivery	5 kg/cm <sup>2</sup>	> 175 cfm, vacuum > 100 mm of water	385.5 cfm

