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SIEMENS

Motion Control Drives

MASTERDRIVES MC 6SE70

Specifications

I. SCOPE

This specification covers the requested Motion Control drive(s) design, operating, performance, testing, and support requirements as supplied by the vendor.

II. STANDARDS & CODES

Motion Control drive shall meet or exceed the following:

Environmental class:
3K3 & 3C2 per DIN IEC 721-3-3
Insulation:
DIN VDE 0110, Part 1 (Moisture and condensation are not permissible)
Overvoltage class:
Category III per DIN VDE 0110, Part 2
Overvoltage strength:
Class 1 per DIN VDE 0160
Degree of Protection:
DIN VDE 0470, Part 1 (EN 60 529)
standard: IP00, option: IP20
Class of protection:
Class 1 to DIN VDE 0106, Part 1
Shock protection:
DIN VDE 0106 Part 100 (VBG4) and EN 60204-1
RFI level:
To EN 61800-3
Standard: No RFI suppression
Options: Class A1, Class B1 on request; DIN VDE 0875, Part
UL/CSA/CE:
All VFD's shall carry the UL/CSA/CE labels for the entire power range.

Mechanical specs:
DIN IEC 68-2-6
For stationary applications:
Constant amplitude
- deflection: 0.075 mm in the frequency range 10 to 58 HZ.
- acceleration: 9.8 ms^2 (1xg) in the frequency range > 58 to 500 Hz.

During transport
- deflection: 3.5 mm in the frequency range of 5 to 9 Hz.
- acceleration: 9.8 ms^2 (1xg) in the frequency range > 9 to 500 Hz.

III. DOCUMENTATION

Motion Control drive manufacturer shall supply installation instructions, and operation manuals associated with the sold drive equipment. The documentation shall be enclosed and shipped with the drive.

Adjustable frequency drive manufacturer must provide start-up and maintenance software free of charge.

IV. OPERATING REQUIREMENTS

A. The Motion Control drive shall be capable of operating in the following voltage classifications:
- 380 to 460 +/- 15%
Frequency input must accept a 50/60Hz input with a tolerance of +/- 6%.

B. The drive shall have an overload rating of 1.6 times rated current for 30 Sec. or 300% for 250mSec for Compact Plus form factor.

C. The drive shall control the speed of synchronous or asynchronous servo motor. Motor to be of same manufacturer as drive.

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D. The drive shall be able to function in an environment, without de-rating, with values no higher than 104°F (40°C) - 113°F (45°C) for Compact Plus form factor. The drive shall be able to function, without de-rating, up to an altitude of 3300ft(1000m) above sea level. The relative humidity shall not be higher than 95% (non-condensing).
E. All inverter sections shall be of the PWM (pulse width modulated) type and consist of IGBT inverter bridge through entire power range (GTO or BJT devices not acceptable). Space vector modulation shall be utilized (six step modulation not acceptable). IGBT carrier frequency shall be adjustable for fixed frequency.
F. The drive shall operate with a minimum of 0.98 primary power factor and efficiency rating of 0.96 to 0.98.

V. FUNCTIONAL REQUIREMENTS

Variable frequency drive must provide the following minimum functionality as standard:

- Microprocessor based adjustable frequency drive with sinusoidal PWM current control
- One hardware platform to provide:
  - Closed Loop Position Control
  - Closed Loop Speed Control
  - V/Hz control
  - Torque control
- One control platform to accommodate ¾ - 250HP(0.55 – 200kW).
- IGBT inverter bridge through entire power range.
- One control platform to accommodate 380 – 460 VAC ±15%.
- Automatic voltage adjustment within the power range.
- Packaging capability to be ordered for common DC bus configurations. Non-regenerative or fully regenerative converter sections available as standard option.
- Ability to operate various speed/position feedback devices(Absolute Encoders, Optical encoders, Resolvers, and Pulse encoders).
- Able to operate various motors with one drive(Siemens synchronous servo, Siemens asynchronous servo, & standard inverter rated induction motor)
- Self Tuning (Measurement of Siemens synchronous, and asynchronous motor data & Current loop optimization)
- 4 complete control parameter sets
- 0.001 Hz set point resolution
- Dual Port Ram for efficient integration of option boards
- Flash E^2Prom on control board
- One analog input (+/- 10VDC / Ri=40kΩ)
- One analog output (+/- 10VDC @ 5mA)
- 4 programmable binary inputs or outputs(Two must be high speed inputs with ~0.1ms update time)
- 2 dedicated binary control inputs (24 VDC Control)
- 2 separately addressable serial interface ports: 1 for RS485 and 1 for RS232/485
- User digital interface panel with 4 digit, 7 segment LED display. Stop, start, parameter and speed control – forward/reverse on compact and chassis units(PMU) User digital interface panel with 4 digit, 7 segment LED display. Stop, start, parameter and speed control – forward/reverse on compact and chassis units(PMU).
- Over 100 Warning and Fault messages for comprehensive protection.
- Faults are shown on the digital operator panel (PMU).
- Control Source (START/STOP/Forward&Reverse/Quick Stop) at the following locations:
  - PMU (Keypad)
  - Terminal Block Inputs
  - Serial Port
  - OP1S (Optional Keypad with parameter storage memory)
- Frequency Reference Sources:
  - Digital Operator - Motor Potentiometer
  - Terminal Block - Motor Potentiometer
  - Terminal Block - Fixed References
  - Analog Inputs - Speed Pot
  - Serial Port
  - Technology Regulator (PID functionality)
  - Optional Keypad

Standard Operating Features

- 160% Overload for 30 seconds (300s cycle time)
- "Key coded" controlled access authorization to the individual parameters.
- Selectable motor operating mode
- Minimum Frequency adjustment
- Maximum Frequency adjustment

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- Constant Voltage Frequency adjustment
- Operating Source (Local, Remote, Serial)
- Voltage Boost/ Current Boost adjustment capabilities
- Motor Overload adjustment
- Overload Time
- Analog Scaling
- Acceleration Time adjustment
- Deceleration Time adjustment
- Ramp Rounding
- 4 Independently Adjustable Preset Speeds
- Adjustable Carrier Frequency
- Adjustable proportional Gain of Frequency/Speed Regulator
- Adjustable Integration Time of Frequency/Speed Regulator
- Individual adjustment of torque and current limits
- Space vector regulator method for IGBT's
- Band Stop Filter
- Dancer Control
- Tension Control
- Pressure/flow control
- Higher level PID
- Open/closed loop control blocks
- Arithmetic Functions (Boolean Logic)
- Cam controller outputs(High speed digital output controll)
- Braking Control
- Position Sensing
- Position Feed Forward
- Velocity Feed Forward
- Programmable Limit Switches

Technology Option Features

- Synchronization
  - Virtual Master
  - Real Master
  - Electronic Clutch (engage/disengage action)
  - Electronic Gearbox
  - Cam disk
  - Displacement Angle Setting
  - Position Correction, referencing (Print Mark Registration)
  - Catch-up mode
- Positioning
  - Homing Procedure
  - MDI Mode (Point to Point Positioning)
  - Automatic Positioning Mode
  - Roller Feed

Special Features for Compact Plus Form Factor

- Oversized rectifier in AC-AC unit to allow for the powering of additional DC-AC inverters via common DC Bus (separate 24V power supply required on DC-AC units).
- Built in Brake Chopper for the AC-AC units.
- Capable of 300% overload for 250ms (300s cycle time) in lieu of the standard overload.

Protection (minimum)

- DC Link Undervoltage Protection
- DC Link Overvoltage Protection
- Heat Sink Overtemperature Protection
- Inverter Overload Protection
- Inverter Overcurrent Protection
- Ground Fault Protection
- Motor Pullout Protection
- Ground Fault Check during start-up
- DC Link Limiter
- RAM/EPROM/EEPROM Malfunction

Standard Displays (Selectable)

- Frequency (Hz.)
- Motor Speed
- Output Frequency
- Speed Difference
- Output Current
- DC Link Voltage
- Output Power
- Motor Torque
- Motor Utilization
- Drive Utilization
- Drive operating Hours
- Output Voltage

- Can select any display parameter to be output via terminals for analog output.

Diagnostic Capability

VFD shall posses as standard the capability of recording events simulating an 8 channel oscilloscope. Items to be measured will be selectable with pre-trigger capability and variable length of time measurement.

VI. Optional Configurations

The VFD shall have the following possibilities for additional package and functional options.

Common DC Bus

VFD shall have capability of being purchased as a complete package (AC to AC) or as individual units (AC to DC and DC to AC).

Rectifier section (AC to DC): Rectifier section shall be available as regenerative or non-regenerative units. Rectifier sections shall be designed to allow for multiple units in parallel to increase output and 12 pulse designs or active front end unit. Rectifier sections shall be responsible for pre-charge of the DC link capacitors in the inverter sections. Regenerative Rectifiers shall have the capability via serial communications to reduce DC bus potential. No third party device for regeneration is acceptable.

Inverter section (DC to AC): Inverter shall have complete control and diagnostic capabilities. DC link capacitors shall be located in each inverter section.

Optional Feedback Sensor Boards

- SBM- **S**ensor **B**oard **M**ultiturn: feedback card for optical Multiturn & Single turn (Sin/Cos) encoders
- SBR1/2- **S**ensor **B**oard **R**esolver: feedback card for Resolvers without/with pulse encoder simulation
- SBP- **S**ensor **B**oard **P**ulse: feedback card for pulse encoders

Optional Communication Boards

- CBP- **C**ommunication **B**oard **P**rofibus: Profibus communication card (12 Mbaud)
- CBD- **C**ommunication **B**oard **D**eviceNet: DeviceNet Protocol Communication Card
- CBC- Communication Board Can: CAN Protocol Communication Card
- SCB1- **S**erial **C**ommunication **B**oard **1**: for additional I/O, in conjunction with SCI1 or SCI2, or peer to peer communications - Fiber-optic (N/A for Compact Plus Form Factor)
- SCB2- **S**erial **C**ommunication **B**oard **2**: for additional RS485 communication port or peer to peer communication –Copper (N/A for Compact Plus Form Factor)
- SLB- **S**imo**L**ink **B**oard: high speed fiber-optic peer to peer network 11Mb(used for synchronization & peer to peer)

Optional I/O Expansion Boards

- EB1- **E**xpansion **B**oard **1**: additional Binary and Analog I/O (Copper)
- EB2- **E**xpansion **B**oard **2**: additional Binary and Analog I/O with Relay Logic (Copper)
- SCB1- **S**erial **C**ommunication **I**nterface **1**: for additional DIN Rail Mounted I/O. Used in conjunction, by fiber optic link, with the SCB1 board (N/A for Compact Plus Form Factor)
- SCB2- **S**erial **C**ommunication **I**nterface **2**: for additional DIN Rail Mounted I/O. Used in conjunction, by fiber optic link, with the SCB1 board (N/A for Compact Plus Form Factor)

Optional Technology Boards

T100 - Dancer control
Tension control
Pressure/flow control
Arithmetic functions (Boolean Logic)
Higher level PID
USS-Bus
Peer-to-Peer
Open/closed loop control blocks
5 Analog Inputs
2 Analog Outputs

8 Binary Inputs
5 Binary Outputs
(N/A for Compact Plus Form Factor)

T300 - Configurable function blocks
Sectional
Winders
Position control (Linear & Angular)
Pulse encoder input (non-floating)
USS-Bus
Peer-to-Peer
7 Analog inputs
4 Analog outputs
16 Binary inputs
8 Binary outputs
(N/A for Compact Plus Form Factor)

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