



Type 4970.b—DC to DC Movable Structure Control Specifications

General Description

The control for all crane motions shall consist of an integrated solid state four quadrant static reversing control system incorporating state-of-the-art DC, IGBT based DC/DC PWM power converter/inverters to control series or shunt wound DC motors. The IGBT based motor amplifiers shall be fed from a common filtered DC bus supply.

The DC bus supply will consist of:

- Anti-regeneration blocking diode (to prevent pumping excess power back into the DC supply)
- Bus converter/filter to stabilize the bus voltage and protect against abnormal over-voltage and under-voltage conditions
- Dynamic braking unit which eliminates excess DC bus energy by shunting it to a Dynamic Braking Resistor to be dissipated as heat.

The individual motion controllers and amplifiers shall utilize current and velocity regulators. Velocity regulation from no-load to full-load shall not exceed 3% of commanded set-point when in open loop mode. When running in a closed loop mode, with motor mounted 1024 optical encoder, velocity control shall not exceed 0.001%. Amplifiers are equipped with embedded software specifically adapted for crane-hoist functions.

This software shall be capable of:

- Above base speed movement of empty/light hooks
- Electronic reverse-plugging
- Motor & brake torque proving
- Load float/micro speed operation (for precise positioning of loads)
- Torque limited rates for acceleration and deceleration
- Hoist overload detection
- Slack cable detection
- Uncommanded motion detection
- Automatic self-tuning to motor
- Keypad security lockout

Each amplifier shall be equipped with a backlit operator's 16-button keypad and two line 24-character LCD display. The keypad shall allow access to all tuning, adjustment, and diagnostic data available within the amplifier.

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The display shall indicate:

- speed (RPM)
- Output voltage (volts)
- Output current (amperes)
- DC bus voltage (volts)
- DC bus current (amperes)
- State or value, as appropriate, of all inputs and outputs.

Internal protection shall be provided by each amplifier, and shall include:

- Ground fault
- DC bus over-voltage
- DC bus under-voltage
- DC bus blown fuse detection
- Transient voltage suppression
- Electronic instantaneous over-current
- Electronic inverse time thermal overload
- Heat sink over-temperature
- IGBT fault
- Velocity following error
- Overspeed fault
- Loss of feedback
- Memory fault
- Processor running fault
- Serial communications fault

Motor Amplifier

When operated in the open loop (encoderless) mode, measuring the IR drop of the motor will adaptively compensate for changes in motor temperature to provide precise, predictable speed control for each point of reference. While running in the open loop mode, speed range will be 50 to 1. While running in the closed loop mode (encoder feedback), speed range will be 1000 to 1. Regardless of the operating mode, speeds while hoisting or lowering shall be controlled and consistent regardless of loading. The amplifier shall include a "zero servo" feature to set the brake when the structure is stopped. At the minimum, motor amplifiers shall have a continuous ampacity of 100% rated motor full load current and an overload ampacity of 180% rated motor full load current for one minute at 40 degrees C. ambient.

Additional Features

- RS-232/422/485 synchronous/asynchronous serial communications port
- Serial communications options: Remote I/O communications module
Modbus Plus communications module
ANSI communications module
- 15 V incremental encoder interface
- Up to 250% rated speed light hook raising and lowering
- Fault log—time and date stamp of last 50 faults.
- Service log—records number of lifts & tonnage

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