Quick Topics

Traction Controllers, PTC, VVMC, VFMC

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General

Systems described in this section can be used for geared traction elevators with DC or AC motors at speeds up to 350 fpm in simplex, duplex, or group system configurations.

PTC Programmable Traction Control provides low cost, easily programmable elevator controls for simplex or duplex applications. Combined digital/analog technology and closed loop (CL) velocity feedback deliver superior performance to 350fpm (1.78 m/s). PTC for AC applications at speeds below 150fpm (0.76m/s) uses an open loop (OL) configuration.

Standard VVMC-1000 or VFMC-1000 controls, dispatched by an M3 Group System, allow group configurations with 64 landings and as many as 12 cars.

Depending on project requirements, a consultant, contractor or building owner can choose which control system is appropriate for a specific application.

In This Section

Model PTC Recommended Use

These products can use SCR drives, VVVF drives, Flux Vector drives, or Motor- Generator shunt field control. PTC controllers are identified as either DC or AC systems. PTC, using proven solid state devices, provides “stepless” acceleration and deceleration for smooth elevator operation while significantly improving elevator service for most low-rise to mid-rise buildings. Use PTC for simplex or duplex applications with up to 32 landings where low cost and ease of field programmability are desired.

For DC geared applications to 350 fpm (1.78 m/s), where contract speed can be reached on a two floor run, use closed loop (CL) configuration with either SCR drive or MG drive.

For AC geared applications to 150 fpm (0.76 m/s), use open loop (OL) configuration with VVVF drive; for speeds over 150 fpm (0.76 m/s), use closed loop (CL) configuration with Flux Vector drive.

PTC uses discrete and fixed slowdown distances and is not recommended for buildings with short floors or buildings with substantial variation in floor heights. Consult MCE Sales Engineers for floor height limitations.

Specification Text, General, PTC, VVMC, VFMC

All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit or solid-state control failure shall not prevent application of the brake.

The automatic leveling zone shall not extend more than 6" (152.4 mm) above or below the landing level, nor shall the doors begin to open until the car is within 6" (152.4 mm) of the landing. In addition, the inner leveling zone shall not extend more than 3" (76.2 mm) above or below the landing. The car shall not move if it stops outside the inner leveling zone unless the doors are fully closed and locked.

The system shall use an automatic two-way leveling device to control the leveling of the car to within 0.25" (6.35 mm) or better above or below the landing sill. Overtravel, undertravel or rope stretch must be compensated for and the car brought level to the landing sill. (Except in the case of AC Series M open loop applications.)

The closed loop feedback power control shall be arranged to continuously monitor the actual elevator speed signal from the velocity transducer and compare it with the intended speed signal to verify proper and safe operation of the elevator. (Except in the case of AC Series M open loop applications.)

During operation of the elevator with an overhauling load (empty car up or loaded car down), precision speed control shall be obtained by the regulation system used in the power control. The power control shall have the capability to maintain regulation under varying loads. (Except in the case of AC Series M open loop applications.)

The controller shall provide stepless acceleration and deceleration and smooth operation at all speeds. The system shall provide the required electrical operation of the elevator control system including automatic application of the brake, which shall bring the car to rest in the event of a power failure.

The controller shall include absolute floor encoding which, upon power up, shall move the car to the closest floor to identify the position of the elevator. With absolute floor encoding it is not necessary to travel to a terminal to establish floor position.

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Optional - LS- STAN or LS-QUTE landing systems can be used with PTC, VVMC and VFMC controllers, Refer to Section 10 for details.

Optional - Failure of the brake to lift as detected by a mechanical switch (if provided) shall cause the control system to take the elevator out of service at the next stop where it shall remain out of service until the condition is corrected.

PTC-SCR Recommended Use

PTC-SCR, using a six-pulse SCR drive, is an ideal low cost, closed loop (CL) control solution for DC geared elevator applications to 350fpm (1.78 m/s). This control system provides high reliability and low maintenance cost.

To create a PTC-SCR system specification:

- See Section 2.
- See "Specification Text, General, PTC, VVMC, VFMC" on page 4-2.
- See "Specification Text, SCR using 6-PULSE SCR DRIVE" on page 4-3.
- See "Specification Text, PTC Programmable Logic" on page 4-7.

Specification Text, SCR using 6-PULSE SCR DRIVE

The controller shall use a six pulse regenerative solid-state drive unit using SCRs to control motor armature current. The solid-state power control shall be a closed loop feedback design. The controller shall be a compact, self-contained unit providing stepless acceleration, deceleration and regulation at all speeds.

Isolation transformers or line inductors, plus proper filtering to eliminate both electrical and audible noise of SCR drives, shall be provided. The controller shall use a solid-state drive unit with solid-state power devices to control the motor field and brake.

A means of sensing motor field current shall be provided which shall cause electric power to be removed from the armature and brake if the direct current flowing in the shunt field of the motor is insufficient to prevent motor overspeeding.

A contactor shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops. This contactor shall be monitored. The elevator shall not start again if the contactor has not returned to the de-energized position when the elevator stops.

All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit or solid-state control failure shall not prevent application of the brake.

The controller shall provide stepless acceleration and deceleration and smooth operation at all speeds.

The controls shall be arranged to continuously monitor elevator performance so that, if the car speed exceeds 150 fpm during access, inspection, or leveling, the car shall shut down immediately, requiring a reset operation.

The controller shall include absolute floor encoding which, upon power up, shall move the car to the closest floor to identify the position of the elevator. With absolute floor encoding it is not necessary to travel to a terminal to establish floor position.

PTC-AC Series M Recommended Use

PTC-AC Series M is the most versatile control solution for geared elevators with AC hoist motors. This easily installed and adjusted control system can be configured for most applications.

Use open loop (OL) VVVF drives to 150fpm (0.76 m/s); use closed loop (CL) FLUX VECTOR drives to 350fpm (1.78 m/s). PTC-AC Series M non-regenerative control systems use the latest in AC drive technology and, for many applications, existing motors can be reused. Consult your MCE Sales Representative for specific motor recommendations.

To create a PTC-AC Series M specification:

- See Section 2.
- See “Specification Text, General, PTC, VVMC, VFMC” on page 4-2.
- See “Specification Text, AC Series M using VVVF or Flux Vector Drive” on page 4-4.
- See “Specification Text, VVVF Drives” on page 4-9.
- See “Specification Text, PTC Programmable Logic” on page 4-7.

To create a PTC-AC Series M Flux Vector system specification:

- See Section 2.
- See “Specification Text, General, PTC, VVMC, VFMC” on page 4-2.
- See “Specification Text, AC Series M using VVVF or Flux Vector Drive” on page 4-4.
- See “Specification Text, Flux Vector Drive ” on page 4-10.
- See “Specification Text, PTC Programmable Logic” on page 4-7.

Specification Text, AC Series M using VVVF or Flux Vector Drive

The controller shall use a variable voltage, variable frequency drive to control three-phase AC induction motors.

The drive shall use a three-phase, full-wave bridge rectifier and capacitor bank to provide a DC voltage bus for the solid-state inverter.

The drive shall use power semiconductor devices and pulse width modulation with a carrier frequency of not less than 2 kHz to synthesize the three-phase, variable voltage, variable frequency output to operate the hoist motor in an essentially synchronous mode.

The drive shall have the capability of being adjusted or programmed to achieve the required motor voltage, current and frequency to properly match the characteristics of the AC elevator hoist motor.

The drive shall not create excessive audible noise in the elevator motor.

The drive shall be a heavy-duty type, capable of delivering sufficient current to accelerate the elevator to contract speed with rated load. The drive shall provide speed regulation appropriate to the motor type.

A means shall be provided for removing regenerated power from the drive DC power supply during dynamic braking. This power shall be dissipated in a resistor bank which is an integral part of the controller. Failure of the system to remove the regenerated power shall cause drive output to be removed from the hoist motor.

A contactor shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops. This contactor shall be monitored. The elevator shall not start again if the contactor has not returned to the de-energized position when the elevator stops.

All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit or solid-state control failure shall not prevent application of the brake.

The controller shall provide stepless acceleration and deceleration and smooth operation at all speeds.

The controls shall be arranged to continuously monitor the performance of the elevator so that, if car speed exceeds 150 fpm during access, inspection, or leveling, the car shall shut down immediately, requiring a reset operation.

The controller shall include absolute floor encoding which, upon power up, shall move the car to the closest floor to identify the position of the elevator. With absolute floor encoding it is not necessary to travel to a terminal to establish floor position.

The controller shall have an RFI Filter to reduce EMI and RFI noise.

PTC-MG Recommended Use

PTC-MG utilizes a field proven drive unit, manufactured by MCE, which employs an analog pattern generator and integrates control of the generator field, motor field and brake. PTC-MG is an ideal low cost closed loop (CL) control solution for DC geared elevator applications to 350fpm (1.78 m/s).

To create a PTC- MG system specification:

- See Section 2.
- See “Specification Text, General, PTC, VVMC, VFMC” on page 4-2.
- See “Specification Text, MG using Generator Field Control” on page 4-6.
- See “Specification Text, PTC Programmable Logic” on page 4-7.

Specification Text, MG using Generator Field Control

The controller shall use a static drive unit using SCRs to control the generator shunt field, hoist motor field and brake. The solid-state power control shall be a closed loop feedback design. The controller shall be a compact, self-contained unit and shall provide stepless acceleration, deceleration and regulation at all speeds.

The power control shall have the capability to drive the generator field, positive or negative, to the degree required to maintain regulation under varying loads.

The solid-state power control regulation system shall incorporate linear and/or proportional amplifiers, precise reference circuit boards, and speed feedback provided by the tachometer, with output voltage and current proportional to the actual speed of the traction motor. Regulator action shall be by electronic comparison of a reference signal to the feedback signal currents and, when any difference is present, the amplifier shall adjust to reduce the difference.

The controller shall use a solid-state drive unit with solid-state power devices to control the motor field, machine brake, and generator shunt field. A means of sensing motor field current shall be provided which shall cause electric power to be removed from the armature and brake, if the direct current flowing in the shunt field of the motor is insufficient to prevent motor overspeeding.

All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit or solid-state control failure shall not prevent application of the brake.

The controller shall provide stepless acceleration and deceleration and smooth operation at all speeds.

The controls shall be arranged to continuously monitor the performance of the elevator so that, if car speed exceeds 150 fpm during access, inspection, or leveling, the car shall shut down immediately, requiring a reset operation.

The controller shall include absolute floor encoding which, upon power up, shall move the car to the closest floor to identify the position of the elevator. With absolute floor encoding it is not necessary to travel to a terminal to establish floor position.

Specification Text, PTC Programmable Logic

All available options (consult your MCE Sales Representative) or parameters shall be field programmable without requiring external devices or knowledge of programming languages. Programmable options and parameters shall be stored in nonvolatile memory.

At a minimum, there shall be a 32-character alphanumeric display for programming and diagnostics. Programmable parameters and options shall include, but not be limited to, the following:

- Number of Stops/Openings Served (Each Car)
- Simplex/Duplex
- Single Automatic Pushbutton
- Selective Collective/Single Button Collective
- Programmable Fire Code Options
- Fire Floors (Main, Alternates)
- Floor Encoding (Absolute PI)
- Digital PIs/Single Wire PIs
- Programmable Door Times
- Programmable Motor Limit Timer
- Nudging
- Emergency Power
- Parking Floors
- Door Preopening
- Hall or Car Gong Selection
- Retiring Cam Option for Freight Doors.
- Independent Rear Doors
- MCE Standard Security
- Emergency Hospital Service
- Attendant Service
- Anti-nuisance - Light Load Weighing and Photo Eye

Field selectable, preprogrammed Fire Service operations compliant with the following Fire Codes:

- ASME A17.1
- California
- Hawaii
- Massachusetts
- City of Chicago
- City of Detroit
- City of Houston
- New York City
- Veterans Administration
- Washington DC
- Australia
- British
- Canadian B44

For duplex configurations, each elevator shall have its own computer and dispatching algorithm. Should one computer lose power or become inoperative, the other shall be capable of accepting and answering all hall calls. When both computers are in operation, only one shall assume the role of dispatching hall calls to both elevators.

The dispatching algorithm for assigning hall calls shall be real time, based on estimated time of arrival (ETA). In calculating the estimated time of arrival for each elevator, the dispatcher shall consider, but is not limited to, location of each elevator, direction of travel, existing hall call and car call demands, MG start up time, door time, flight time, lobby removal time penalty and coincidence calls.

The controller shall have field programmable outputs to activate different functions based on customer needs. These functions can be outputs such as those listed below.

- Fire Phase I Return Complete Signal
- Fire Phase II Output Signal
- Hall Call Reject Signal
- Emergency Power Return

The controller shall have field programmable inputs to initiate special operations based on customer needs. These functions can be inputs such as those listed below.

- Fire Phase I Bypass Input
- Fire Phase II Call Cancel Input
- Fire Phase II Hold Input
- MG Shut Down Input
- Attendant Service Input
- Building Security Input
- Hospital Emergency Operation Input

The controller shall include absolute floor encoding which, upon power up, shall move the car to the closest floor to identify the position of the elevator. With absolute floor encoding it is not necessary to travel to a terminal to establish floor position.

The controller shall have an RFI Filter to reduce EMI and RFI noise.

Optional - The controller shall have a serial port for communication with a data or computer terminal such as a CRT terminal, modem, etc.

Optional - The controller shall have a 3 Phase Line Inductor to match the minimum 3% line impedance recommended by various drive manufacturers.

Optional - The controller shall have a Drive Isolation Transformer, typically used to match line voltage to motor and drive voltage.

VVMC-1000 SCR Recommended Use

VVMC-1000 SCR used with an M3 Group System provides coordinated dispatching for up to 12 cars serving up to 64 landings. A six-pulse SCR drive provides an ideal, low cost, closed loop (CL) control solution for group operation of DC geared elevators to 350fpm (1.78 m/s). This control system provides high reliability and low maintenance cost.

To create a VVMC-1000 SCR Group system specification:

- See Section 2.
- See “Specification Text, General, PTC, VVMC, VFMC” on page 4-2.
- See “Specification Text, SCR using 6-PULSE SCR DRIVE” on page 4-3.

VFMC-1000 AC Recommended Use

VFMC-1000 AC used with an M3 Group System provides coordinated dispatching for up to 12 cars serving up to 64 landings. These reliable, value priced controls use VVVF or FLUX VECTOR drives for AC applications. VFMC-1000 AC is the most versatile control solution for group operation of geared elevators with AC hoist motors. This easily installed and adjusted control system can be configured for most applications.

Use open loop (OL) VVVF drives to 150fpm (0.76 m/s); use closed loop (CL) FLUX VECTOR drives to 350fpm (1.78 m/s). PTC-AC Series M non-regenerative control systems use the latest in AC drive technology and, for many applications, existing motors can be reused. Consult your MCE Sales Representative for specific motor recommendations.

To create a VFMC-1000 VVVF Group system specification:

- See Section 2.
- See “Specification Text, General, PTC, VVMC, VFMC” on page 4-2.
- See “Specification Text, AC Series M using VVVF or Flux Vector Drive” on page 4-4.
- See “Specification Text, VVVF Drives” on page 4-9.

To create a VFMC-1000 Flux Vector Group system specification:

- See Section 2.
- See “Specification Text, General, PTC, VVMC, VFMC” on page 4-2.
- See “Specification Text, AC Series M using VVVF or Flux Vector Drive” on page 4-4.
- See “Specification Text, Flux Vector Drive ” on page 4-10.

Specification Text, VVVF Drives

For VVVF applications (open loop), it is recommended that the AC motor have slip specifications between 8% and 12% or a NEMA rating of “D.”

The VVVF drive shall be capable of providing a braking pulse to use in the stopping sequence of the elevator. The braking pulse shall take the form of an adjustable DC current pulse applied to the AC motor for an adjustable period of time (0 to 0.75 second).

The VVVF drive shall allow programming different volts per hertz patterns to adjust drive control characteristics.

Specification Text, Flux Vector Drive

For Flux Vector applications (closed loop), it is recommended that the AC motor have a slip specification of 5% or less or a NEMA rating of “A” or “B.” The flux vector drive shall be capable of producing full torque at zero speed. The flux vector drive shall not require DC injection braking in order to control the stopping of the car. The flux vector drive shall use encoder feedback to regulate hoist motor speed. The encoder shall be mounted to the motor shaft.

VVMC-1000 MG Recommended Use

VVMC-1000 MG used with an M3 Group System provides coordinated dispatching for up to 12 cars serving up to 64 landings. VVMC-1000 MG uses a field proven drive unit, manufactured by MCE, which employs an analog pattern generator and integrates control of the generator field, motor field, and brake. VVMC-1000 MG is an ideal low cost, closed loop (CL) control solution for group operation of DC geared elevators to 350fpm (1.78 m/s).

To create a VVMC-1000 MG Group system specifications:

- See Section 2.
- See “Specification Text, General, PTC, VVMC, VFMC” on page 4-2.
- See “Specification Text, MG using Generator Field Control” on page 4-6.