

# FIRMWARE AND HARDWARE

## STANDARD

### Firmware 4.15c - standard firmware for SmartMotors

#### RS-232 & RS-485 Communication

RS-485 Line Data Control  
Printing to a COM Channel  
Reporting COM Channel Protocol

#### Input/Output

Software Selectable I/O Commands  
Analog Input, Digital Input, and Digital Output  
I/O initialization  
Motor I/O Connector types

#### Additions From Past Firmware Release

Directional Limit and Limit Trigger High/Low  
Addition of Coordinated Motion  
(Multi-axis contouring)

#### Motion Modes

Mode Follow w / Ratio & Offset  
Mode Step and Direction and Mode Step with Ratio  
Mode Cam  
Coordinated Motion

#### Programming Language

Variables-Variable and Arrays Names  
Initializing Variables and Arrays  
Long Term Variable Storage  
Control Flow  
System State Variables / Status Bits  
Report, Function Commands

#### Creating Motion

Position Mode, Velocity Mode and Torque Mode  
Computing SmartMotor™ Velocity, Acceleration, and WAIT Values  
Integral Brake Commands  
External Encoder & Primary Encoder Commands  
Gravity Constant (Gravity Feed Forward) for Vertical Axis Applications  
Directional Limit Inputs  
Motor and Load Protection Features  
Servo-amplifier OFF Command

## OPTIONAL

### Firmware "PLUS" (version 4.77)

\* Consult factory for other firmware options

"PLUS" firmware is available as an option. This new firmware can greatly increase performance in applications such as: Traverse-and-take-up, material transport, automatic reversal on soft limit, specialized coil winding and lapping of materials and high speed material inspection scanning. Here are the key features of Plus firmware:

#### New Fault Handler:

- Any motor protection must be reset via ZS or a specific command
- Any protection fault will either:  
End the running program or  
Call to a specific subroutine on interrupt

#### New Overtravel Limit Control:

- Positive and Negative Software Limits have been added
- Both Hardware and Software Limits are directional and active-high asserted. When reached, they can be set up to call a fault handler on interrupt as listed above

#### New Mode of Operation:

- Mode-Torque-Brake (MTB) allows smooth deceleration of loads in excess of 100:1 inertial load mismatch
- MTB is the default mode when any motor protection fault is triggered
- MTB draws no additional current from the power supply and generates no back-EMF

#### New CAM Mode Extensions:

- Relative CAM Mode
- Configurable Dwell at end/beginning of CAM table
- CAM Index out for position triggering

#### Output Option Added:

- Port C or G can be configured as automatic external brake-control

#### Input Option Added:

- Port G can be configured to call a separate interrupt handler on edge triggering

#### Option to Reverse Shaft Rotation for Given Commands

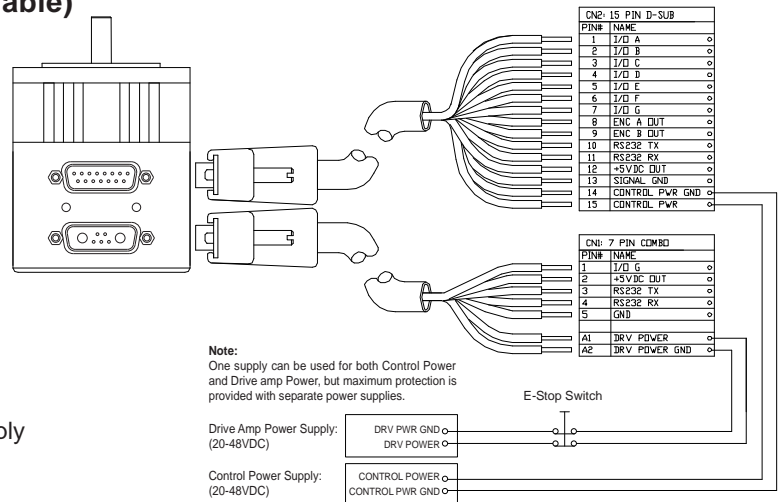
**Note:** To order, add "-PL" to the standard SM part number

## OPTIONAL

### Hardware - DE (Drive Enable)

The DE option allows the SmartMotor controller and drive-amplifier to be powered from separate 24-48 VDC power supplies.

- Controller can be powered from a standard 24 VDC supply
- Position will not be lost on loss-of-drive-power
- No need to re-home
- Load surges will not cause power surge on controller
- Standard battery options are made simpler



**Note:**  
One supply can be used for both Control Power and Drive amp Power, but maximum protection is provided with separate power supplies.

Drive Amp Power Supply:  
(20-48VDC)

Control Power Supply:  
(20-48VDC)

**Note:** To order, add "-DE" to the standard SM part number