

Class 5 Overview

Class 5 refers to a new series of products consisting of the existing motor line and hardware interface with a greatly improved processing capability. All Class 5 motors have the same cables and interconnectivity as existing Class 4 motors. They have the same I/O and serial port capabilities allowing the same cables, power supplies and interface adapters to be used. This enables users to maintain familiarity while gaining net performance and programmability.

Here is a short list of features:

- Faster Processor, 7 to 10 Times Faster than Existing Class 4 Motors
- Faster Communications Speeds, up to 115.2KBaud
- "Back Bone" Transparent Communications over CAN Bus (optional)
- Multi-Port Simultaneous Communications, RS-232/RS-485/CAN bus
- Enhanced Trap Mode and Sine Mode Commutation
- Higher Frequency PID update rate: down to 62useconds
- Expanded Math Function Capability
- Floating Point Math
- 8 Level Priority Stacked User Definable Interrupts
- 4 User Definable Independent Timers
- DE/Dt: Rate of Change of Following Error Limit
- Increased I/O Interrupt Assignments
- Software Programmable Limits can be set to trigger interrupts w/o fault
- Enhanced Parameter and Function Based Syntax
- Increased System Status Bit Registers for Advanced Diagnostics
- Optional On-board Expanded I/O : 10 Channels 24VDC Isolated Assignable as Inputs or Outputs



Back Bone Communications:

Animatics Corporation has introduced a new paradigm shift in Integrated Motor Technology. Often times the term Distributed Control is used when referring to Integrated Servo Technology referring to the ability to outsource machine control tasks to programmable drives or intelligent Integrated Servos so the Central Control or PLC will not be burdened with full machine control. In concept, this is good, but still leaves inter-communications of machine subsystems with much to be desired.

Class 5 SmartMotors™ have opened the door to communications between separate motors allowing multiple masters to coexist on the same machine with full deterministic arbitration and no loss of data packets. How is this done? Through a combination of standard CANopen and extended 29bit CAN addressing. The result is the ability to write a program in one motor that transparently accesses and modifies data and parameters in any other motor on the network. All communications is done on the "backbone CAN interface". No user setup is required other than setting of the node address and ensuring matched baud rates. The SmartMotor handles everything else. As a result, the user may have conditional command structures in one motor that poll and compare parameters from multiple other motors within one line of code.

Suppose Motor 1 that requires data from two other motors.

Example code:

```
IF (PA:2>PA:3) & (VA:4<2000)
  PRINT("Motor 2 has passed Motor 3 and Motor 4 has slowed down")
ENDIF
```

In the above example, Motor 1 is comparing the actual positions (PA) between Motor 2 and Motor 3 while checking the actual speed (VA) of Motor 4. The processor handles all communications across the "backbone" transparent to the user. As a result, the user is free to program multiple motors across the network from a single program within a single motor.

At any time, an additional motor may be added into the network without causing issues with the network. Even further, the extended 29Bit addressing allows non-Animatics CAN bus products to coexist on the same CAN network without causing communications errors.

Multi-Port Simultaneous Communications, RS-232/RS-485/CAN bus

Class 5 motors allow 3 port communications at the same time!

Com(0): RS-232 Primary Port

Com(1): RS-485 Secondary Port

Com(2): CANopen

Class 5 CANopen complies with 402 specifications.

Additionally, the motors meet the CANopen IP spec (Interpolation Protocol)

When run in contouring mode via CANopen, and X-Y 2 axis system can be updated every 800microseconds!

What does this mean? Extremely fast high resolution paths for advanced CNC applications!

When in Interpolation Protocol Mode, a 2-axis path may have Position points along that path to within 800 microsecond time intervals.

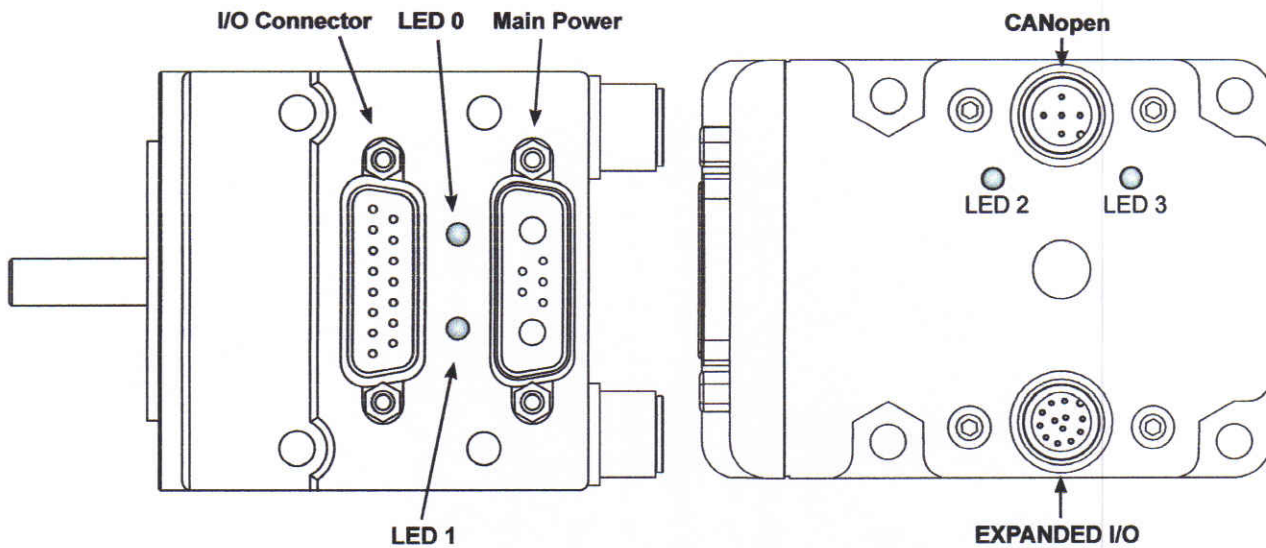
Enhanced Trap mode and Sine Mode commutation:

The motors may be operated with encoder-based commutation that allows for a more precise alignment and association of rotor to stator magnetic phases. The result is a smooth, quiet rotation with very low cogging. As a result, much slower commanded speeds may be achieved with little speed fluctuation.

Higher Frequency PID update rate:

User selectable PID update rate defaults to 125 microseconds. Optionally it may be slowed down or increased. The faster 62.5 microsecond update rate allows for smoother high speed operation and faster accel/decel correction under varying load conditions.

Class 5 LED's and Connectors



LED Status Power-up:

with no program

the travel limit inputs are not grounded:

LED0 will be solid RED indicating the motor is in a fault state due travel limit fault.

LED1 will be off

LED Status Power-up:

with no program

and the travel limits are hard wired to ground:

LED0 will be solid red for 500mseconds and then begin flashing Green.

LED1 will be off

LED Status Power-up:

with a program that only disables travel limits and nothing else

LED0 will be solid red for 500mseconds and then begin flashing Green.

LED1 will be off

LED0: Drive Status

OFF	:No Power
Solid Green	:Drive On
Flashing Green	:Drive Off
Flashing Red	:Watchdog Fault
Solid Red	:Major Fault
Alt. Red/Green	:In Boot Load, Needs Firmware

LED1: Trajectory Status

OFF	:Not Busy
Solid Green	:Drive On, Trajectory In Progress



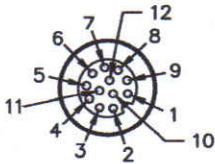
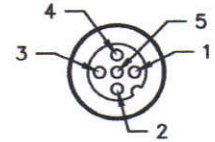
LED2 CAN Bus Network Fault (Red LED)

Off	:No Error
Single Flash.	:At least One Error exceeded Limit
Double Flash	:Heartbeat or Guard Error
Solid	:Busy Off State

LED3: CAN Bus Network Status (Green LED)

Blinking	:Pre-Operational State, (during boot-up)
Solid	:Normal Operation
Single	:Device is in Stopped State

Class 5 Connector Pinouts

PIN	MAIN POWER	Specifications:		
1	I/O – 6 "G" command or GP	25mAmpSink 25mAmp source 10Bit 0-5VDC A/D	Redundant connection on I/O connector	7W2 Combo D-sub Connectors 
2	RS-232 Transmit	50mAmps Max		
3	RS-232 Transmit	Com(0)	115.2KBaud Max	
4	RS-232 Transmit	Com(0)	115.2KBaud Max	
5	RS-232 Ground			
A1	Main Power: +20-48VDC			
A2	Ground			
PIN	I/O CONNECTOR (5VTTL I/O)	Specifications:		
1	I/O – 0 GP or Enc. A or Step Input	25mAmpSink 25mAmp source 10Bit 0-5VDC A/D	1.5MHz max as Enc or Step input	DB-15 D-sub Connector 
2	I/O – 1 GP or Enc. B or Dir. Input	25mAmpSink 25mAmp source 10Bit 0-5VDC A/D	1.5MHz max as Enc. Or Dir. Input	
3	I/O – 2 Positive Over Travel or GP	25mAmpSink 25mAmp source 10Bit 0-5VDC A/D		
4	I/O – 3 Negative Over Travel or GP	25mAmpSink 25mAmp source 10Bit 0-5VDC A/D		
5	I/O – 4 GP or RS-485 A Com(1)	25mAmpSink 25mAmp source 10Bit 0-5VDC A/D	115.2KBaud Max	
6	I/O – 5 GP or RS-485 B Com(1)	25mAmpSink 25mAmp source 10Bit 0-5VDC A/D	115.2KBaud Max	
7	I/O – 6 "G" command or GP	5mAmpSink 25mAmp source 10Bit 0-5VDC A/D	Redundant connection on Main Power Conenctor	
8	Phase A Encoder Output			
9	Phase B Encoder Output			
10	RS-232 Transmit Com(0)		115.2KBaud Max	
11	RS-232 Transmit Com(0)		115.2KBaud Max	
12	+5VDC Out	50mAmps Max		
13	Ground			
14	Ground			
15	Main Power: +20-48VDC	IF-DE Option, Control Power separate from Main Power		
PIN	Isolated 24VDC I/O Connector	Max Load (sourcing)		
1	IO – 16 GP	150mAmps		M12 5-PIN FEMALE END VIEW 
2	IO – 17 GP	150mAmps		
3	IO – 18 GP	150mAmps		
4	IO – 19 GP	150mAmps		
5	IO – 20 GP	300mAmps		
6	IO – 21 GP	300mAmps		
7	IO – 22 GP	300mAmps		
8	IO – 23 GP	300mAmps		
9	IO – 24 GP	300mAmps		
10	IO – 25 GP	300mAmps		
11	+24Volts Input	300mAmps		
12	GND-I/O			
PIN	GND-I/O	Connection:		
1	NC	NC		M12 5-PIN FEMALE END VIEW 
2	NC	NC		
3	GND_CAN	Isolated CAN ground		
4	CAN-H	1M Baud max		
5	CAN-L	1M Baud max		

Class 5 Specifications



Power & Encoder	
Drive Power:	24-48VDC
Control Power:	24-48VDC (must be supplied spritely when DE option is ordered)
Expanded I/O:	24VDC (must be supplied)
Commutation:	Trapazoidal Enhanced Trapazoidal based on Encoder Position Sineusoidal
Encoder Resolution	23 Frame: 4000 (Class 5) 34 Frame: 8000 (Class 5)

Processor/Clocks:		
Processor Clock Speed:	32MHz	
PWM Switching Frequency:	16KHz	
CPU Regulator Frequency:	140KHz +/-10% load dependant	
Drive Stage Regulator:	100MHz	
PID Update Rates:		
PID1	16KHz	62.5 usec update rate
(Default) PID2	8KHz	125 usec update rate
PID4	4KHz	250 usec update rate
PID8	2KHz	500 usec update rate

Programming:	
Code:	Command Interpretive Text Based
Program:	32K Program/32K Data Storage
Subroutines:	up to 1000
Stack Pointers:	10 deep for GOSUB RETURN's 10 Deep for Nested SWITCH statements 10 Deep for Nested WHILE Statements 3 Deep for Nested Trig Functions

Communications:		
RS-232:	2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud	9600 default
RS-485:	2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud	9600 default
(Optional) CAN Bus:	20K, 50K, 125K, 250K, 500K, 800K 1MBaud	125000 default



Class 5 Specifications



On Board I/O

7 Channels: 5V CMOS Logic, Configurable as Inputs/Outputs/10-Bit Analog Inputs

Input Impedance: 5K pull-up, must drive down w/ \geq 1mAmps to pull low

As Analog Input: 0-5VDC 10Bit A/D

Output Sourcing: 25mAmps

Output Sinking: 25mAmps

Note: Max. 150mAmps total all outputs driven

Ports A and B as Enc. Input: 1MHz maximum input frequency

DB-15 Pin# I/O Signal

1 Port A

2 Port B

3 Port C

4 Port D

5 Port E

6 Port F

7 Port G

8 Enc A Out

9 Enc B Out

Optional Expanded I/O: Isolated , Requires 24VDC at the connector

10 Channels: Configurable as Inputs/Outputs, 10 Bit Analog Inputs

Input Impedance: 100K

12 Pin Connector Pin # Max Load

1 I/O 0

150mAmp max load

2 I/O 1

150mAmp max load

3 I/O 2

150mAmp max load

4 I/O 3

150mAmp max load

5 I/O 4

300mAmp max load

6 I/O 5

300mAmp max load

7 I/O 6

300mAmp max load

8 I/O 7

300mAmp max load

9 I/O 8

300mAmp max load

10 I/O 9

300mAmp max load

11 24Volts In

12 GND-I/O