

with DeviceNet

## Integrated

### **MOTION CONTROL PRODUCTS**

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ANIMATICS<sup>®</sup>

**Defining the Future in Motion Control** 

#### **DeviceNet Overview**

DeviceNet is an open network standard that provides for reduced system complexity and significant reductions in wiring costs. DeviceNet allows a SmartMotor<sup>™</sup> to communicate with an array of industrial devices from other manufacturers; such as sensors, actuators, etc. The DeviceNet protocol allows these devices to work together on a single network, controlled by any number of commercially available DeviceNet master (or scanner) systems. DeviceNet may also provide communications links between subsystems or system-level components. The results are improved control communications between devices and important devicelevel diagnostics. The DeviceNet SmartMotor<sup>™</sup> can only be configured as a DeviceNet slave device, not a master.

DeviceNet is based on a broadcast-oriented, communications protocol called CAN (Controller Area Network). This protocol was originally developed for the European automotive market to replace expensive wire harnesses with low-cost network cable. As a result, CAN has a fast response time and is highly reliable. Consumer and commercial demand for CAN was a key factor in lowering the price and increasing the performance of CAN. With CAN, any node may transmit data if the bus is not busy. If two or more nodes begin transmitting at the same time, the message with the lowest CAN ID will complete the transmission. DeviceNet adds a layer above CAN that allows logical connections to exist among nodes and defines message formats. A single DeviceNet node may have up to 64 nodes, each with a unique address (MAC ID). DeviceNet supports baud rates of 125, 250, and 500 KB. As the baud rate increases, the maximum allowable distance of cable between any two devices decreases. There is only one baud rate allowed per network, and all devices must operate at the same baud rate. The table below lists some of the major features of DeviceNet.

Feature	Description			
Network Size	Up to 64 nodes			
Network Length	Selectable end-to-end network distance varies with speed			
	Baud Rate	Distance		
	125 Kbps	500 m (1640 ft)		
	250 Kbps	250 m (820 ft)		
	500 Kbps	100 m (328 ft)		
Data Packets	0-8 bytes			
Bus Topology	Linear (trunkline/dropline): power and signal on the same network cable			
Bus Addressing	Peer-to-Peer with Multicast (one-to-many);			
	Multi-Master and Master/Slave special case;			
	Polled or change-of-state (exception-based)			
System Features	Removal and replacement of devices from the network while energized			

#### How DeviceNet works with our SmartMotor™

The DeviceNet SmartMotor<sup>™</sup> is designed in a modular fashion, with the standard SmartMotor<sup>™</sup> module adapted to work in conjunction with a DeviceNet gateway. The DeviceNet gateway uses a separate dedicated controller for DeviceNet operation, which means that varying network traffic demands will not affect the ability of the SmartMotor<sup>™</sup> to handle motion and I/O tasks. The standard SM is equipped with two serial ports. These ports are configured such that one is RS-232 format and one is RS-485 format. On the DeviceNet version of the SmartMotor<sup>™</sup>, the RS-485 port has been retained for use with the DeviceNet gateway, **so the RS-485 port is no longer available for external use.** 

#### DeviceNet control of the SmartMotor™

To send and receive messages to and from the DeviceNet Smartmotor, the user must thoroughly understand the command structures used by DeviceNet. DeviceNet communications are via explicit messaging (GET/SET attribute) and/or I/O Polling. The I/O polling messages conform to a subset of the Position Controller Device Profile, specified in ODVA DeviceNet Specification Volume II Release 2.0 Errata 3, sections 3-12.4, 3-12.5, 6-24, and 6-25. Please refer to these specifications for detailed descriptions.

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## SMARTMOTOR 2300 DeviceNet Series

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			SM2310D-DN	SM2320D-DN	SM2330D-DN	SM2337D-DN	SM2337DT-DN	SM2340D-DN
Peak Torque <sup>2</sup>	Т <sub>р</sub>	oz-in <i>(N-m)</i>	53 0.37	90 0.64	125 0.88	110 <i>0.687</i>	200 1.412	125 0.88
Continuous Torque <sup>2</sup>	T <sub>c</sub>	oz-in <i>(N-m)</i>	20 0.141	38 0.268	50 0.353	35 0.249	59.1 0.417	55 0.388
Voltage Constant	K <sub>v</sub>	V/kRPM	4.11	6.60	9.32	5.62	10.95	10.26
No Load Speed	S <sub>nl</sub>	RPM	13,220	7,820	5,590	8,630	3,800	5,310
Torque Constant	К <sub>t</sub>	oz-in/amp <i>(N-m/amp)</i>	5.54 0.0391	8.82 0.0623	12.5 <i>0.0883</i>	5.60 <i>0.040</i>	14.8 <i>0.10</i> 6	13.9 <i>0.098</i>
Rotor Inertia	J <sub>m</sub>	oz-in-sec² (kg.m²)	0.00083 5.86x10 <sup>-6</sup>	0.00161 1.14x10⁻⁵	0.00239 1.69x10 <sup>-5</sup>	0.00190 1.34x10 <sup>-6</sup>	0.00190 1.34x10 <sup>-6</sup>	0.00317 2.24x10⁻⁵
Winding Resistance		Ohms	1.5	1.1	1.2	0.6	0.85	1.0
Weight	Wt	lbs <i>(kg)</i>	1.36 <i>0.6</i> 2	1.88 <i>0.85</i>	2.42 1.10	2.24 1.02	2.30 1.04	2.96 1.34
Number of Poles			4	4	4	8	8	4
Number of Slots			15	15	15	12	12	15
Length		inches <i>(mm)</i>	4.08 103.5	4.73 120.0	5.37 136.5	5.54 138.3	5.54 138.3	6.02 153.0
Width		inches <i>(mm)</i>	2.25 57.2	2.25 57.2	2.25 57.2	2.25 57.2	2.25 57.2	2.25 57.2
Nominal Continuous Power		hp <i>(kW)</i>	0.18 <i>0.13</i>	0.19 <i>0.14</i>	0.20 <i>0.15</i>	0.18 <i>0.13</i>	0.18 <i>0.13</i>	0.22 0.16
Default Thermal Limit		°C	70	70	70	70	70	70
Encoder Resolution		post-quad counts/rev	2,000	2,000	2,000	2,000	2,000	2,000

Note: 1. Values are nominal unless otherwise noted.

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2. Peak and continuous torque taken at 48 VDC with 10" x 10" x 1/4" aluminum mounting plate.



CE SmartMotor™ servos have CE certification

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## SMARTMOTOR 2300 DeviceNet Series





#### SMARTMOTOR™ SM2337DT-DN



#### SMARTMOTOR™ SM2340D-DN

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## SMARTMOTOR 3400 DeviceNet Series

			SM3410D-DN	SM3420D-DN	SM3430D-DN	SM3440D-DN	SM3450D-DN
Peak Torque <sup>2</sup>	Т <sub>р</sub>	oz-in <i>(N-m)</i>	180 1.27	540 3.81	575 4.06	625 4.41	750 5.30
Continuous Torque <sup>2</sup>	T <sub>c</sub>	oz-in <i>(N-m)</i>	45 0.32	100 <i>0.706</i>	155 1.09	210 1.48	250 1.77
Voltage Constant	κ <sub>v</sub>	V/kRPM	9.2	10.8	12.1 12.9		13.7
No Load Speed	S <sub>nl</sub>	RPM	5,060	4,310	3,850 3,609		3,398
Torque Constant	Kt	oz-in/amp <i>(N-m/amp)</i>	12.5 <i>0.0</i> 883	14.6 0.103	16.4 0.116	17.4 0.123	18.5 0.131
Rotor Inertia	J <sub>m</sub>	oz-in-sec² <i>(kg.m²)</i>	0.006 <i>4.2x10⁵</i>	0.013 9.2x10⁵	0.019 1.3x10⁴	0.025 1.8x10⁴	0.03 2.1x104
Winding Resistance		Ohms	2.3	1.2	0.7	0.6	0.6
Weight	Wt	lbs <i>(kg)</i>	3.11 <i>1.41</i>	4.30 1.96	5.48 2 <i>.49</i>	6.69 3.04	7.94 3.61
Number of Poles			4	4	4	4	4
Number of Slots			24	24	24	24	24
Length		inches <i>(mm)</i>	4.030 <i>102.4</i>	4.675 118.7	5.325 <i>135.3</i>	5.578 141.7	6.325 <i>168.3</i>
Width		inches <i>(mm)</i>	3.25 82.6	3.25 82.6	3.25 82.6	3.25 82.6	3.25 82.6
Nominal Continuous Power		hp <i>(kW)</i>	0.16 <i>0.12</i>	0.24 <i>0.18</i>	0.3 0.22	0.34 <i>0.26</i>	0.36 <i>0.27</i>
Default Thermal Limit		°C	70	70	70	70	70
Encoder Resolution		post-quad	4,000	4,000	4,000	4,000	4,000

Note: 1. Values are nominal unless otherwise noted.

2. Peak and continuous torque taken at 48 VDC with 10" x 10" x 1/4" aluminum mounting plate.



SmartMotor™ servos have CE certification

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## SMARTMOTOR 3400 DeviceNet Series

#### SMARTMOTOR™ SM3410D-DN

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#### SMARTMOTOR™ SM3420D-DN





#### SMARTMOTOR<sup>™</sup> SM3430D-DN





#### SMARTMOTOR™ SM3440D-DN



#### SMARTMOTOR™ SM3450D-DN

