

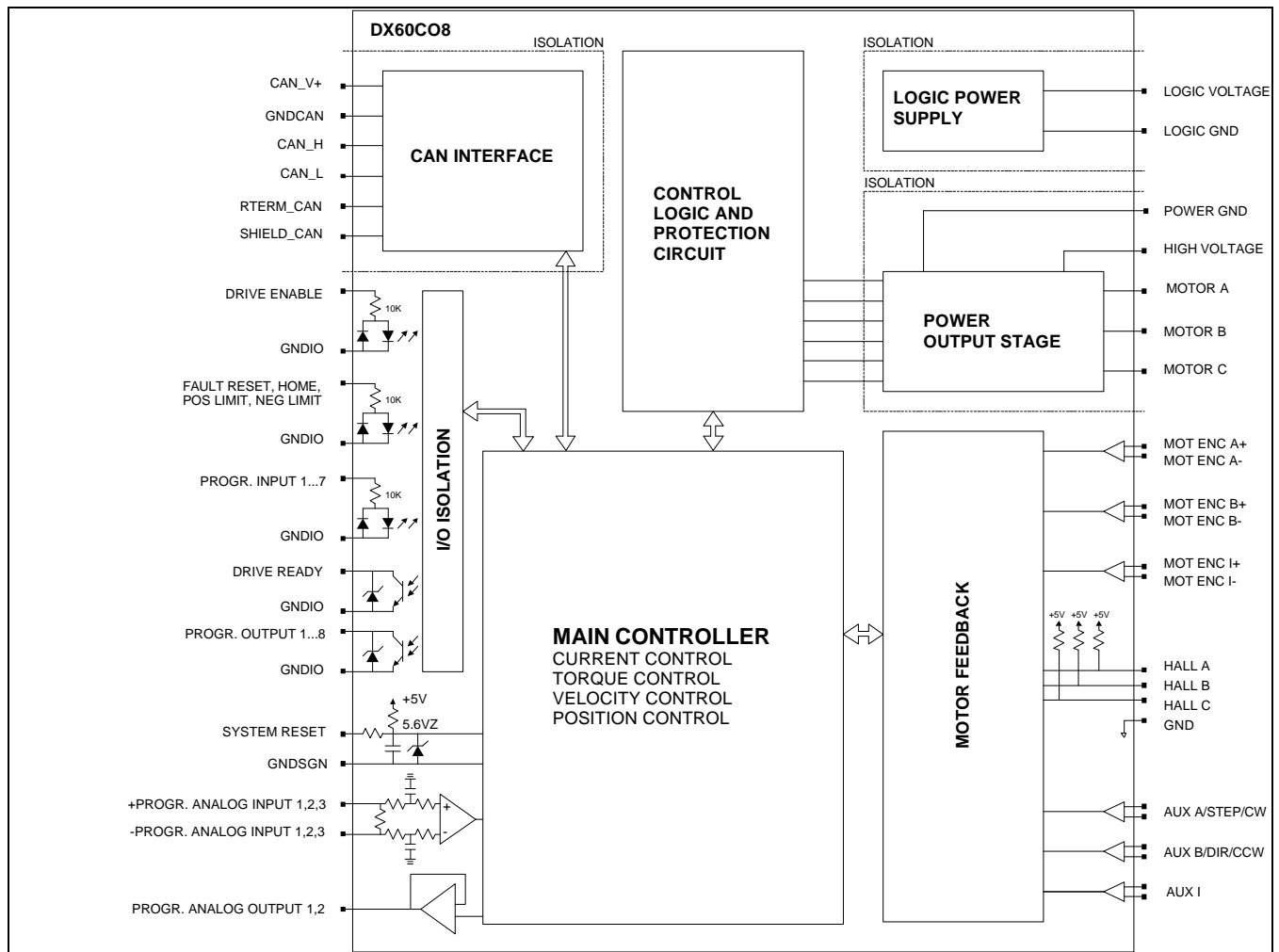
**DIGIFLEX® DIGITAL SERVO DRIVES  
WITH CANopen INTERFACE  
MODELS: DX60CO8, DX60CO8-SRC**

**FEATURES:**

- Fully digital, state-of-the-art DSP design
  - Brushed DC, brushless DC drive technology
  - Digital current, velocity, and position loops with programmable gain settings
  - Hall sensor commutation feedback for brushless motors
  - Surface-mount technology
  - Small size, low cost, ease of use
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- Isolated CAN bus interface for setup and networking
  - Supports CANopen communication protocol (DS301) and Device Profile for Drives and Motion Control commands (DSP-402)
  - CAN bus address and bit rate selection via DIP-switches
  - Windows® based DigiFlex® DriveWare setup software via CAN interface (operates with third party PC-to-CAN interface)
  - Operates in torque, velocity or position mode
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- Dual encoder input
  - 7 programmable isolated digital inputs (sinking), sourcing inputs optional (-SRC).
  - 8 programmable isolated digital outputs (sinking)
  - Dedicated isolated limit and home switch inputs
  - 3 programmable analog inputs (14-bit)
  - 2 programmable analog output (10-bit)
  - Four quadrant regenerative operation
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- Separate logic supply voltage (single supply optional)
  - Bi-color LED status indicator
  - Extensive built-in protection against:
    - over-voltage
    - under-voltage
  - short-circuit: phase-phase, phase-ground
    - over-current
    - over-temperature with pre-warning



**BLOCK DIAGRAM:**



**DESCRIPTION:**

The DX60CO8 Series digital PWM servo drives are designed to drive brushed and brushless servomotors. These fully digital drives can operate in torque, velocity, or position mode. Various feedback signals can be used to close the velocity and position loop. The command source can be generated internally or can be supplied externally. In addition to motor control, these drives feature dedicated and programmable digital and analog inputs and outputs to enhance interfacing with external controllers and devices.

DX60CO8 Series drives feature a single CAN interface which supports the CANopen protocol (DS301 and DSP402). This interface is used for drive configuration and setup as well as online operation in networked applications. Drive commissioning can be accomplished through DigiFlex® DriveWare, a fully graphical Windows© based application.

Torque, velocity, or position commands can be generated from an analog input, the auxiliary encoder input, a preset index table, or the CAN interface. The DX60CO8 also features an interpolated position mode with cubic interpolation for smooth, coordinated, multi-axis position control via the CAN interface. A homing routine based on the home switch input and/or the encoder index pulse is also implemented.

All drive and motor parameters are stored in non-volatile memory.

**SPECIFICATIONS:**

<b>POWER STAGE SPECIFICATIONS</b>	<b>DX60CO8, DX60CO8-SRC</b>
DC SUPPLY VOLTAGE	24...75 VDC
PEAK CURRENT	60 A (if heat sink temperature is <40°C)
MAXIMUM CONTINUOUS CURRENT	30 A
MINIMUM LOAD INDUCTANCE	250 µH
SWITCHING FREQUENCY	20 kHz
HEATSINK (BASEPLATE) TEMPERATURE RANGE	-25 to 65 °C, disables at 65 °C
POWER DISSIPATION AT CONTINUOUS CURRENT	40W
UNDER VOLTAGE SHUTDOWN	20 VDC
OVER-VOLTAGE SHUTDOWN	86 VDC

<b>LOGIC SUPPLY SPECIFICATIONS</b>	
DC SUPPLY VOLTAGE	20...80 VDC
MAXIMUM RIPPLE	10%
INPUT POWER	15W max.

<b>CAN INTERFACE SUPPLY SPECIFICATIONS</b>	
DC SUPPLY VOLTAGE	7.5 to 13 VDC
INPUT CURRENT	150 mA max.

<b>MECHANICAL SPECIFICATIONS</b>	
POWER CONNECTOR: P1	Screw terminals
MOTOR FEEDBACK CONNECTOR: P2	15-pin high density female D-sub
AUXILIARY ENCODER CONNECTOR: P3	9-pin female D-sub
I/O CONNECTOR: P4	44-pin high density female D-sub
COMMUNICATIONS INTERFACE (CAN): P5	9-pin male D-sub
SIZE	10.5 x 6.43 x 1.7 inches 266.7 x 163.4 x 43.3 mm
WEIGHT	

**PIN FUNCTIONS:**

P1 - Motor and Power Connector:

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
P1	1	GNDSGN	Logic supply ground	LSGNDN
	2	VLS	Logic supply voltage	I
	3	MOTOR A	Motor phase A	O
	4	MOTOR B	Motor phase B	O
	5	MOTOR C	Motor phase C	O
	6	POWER GND	Power ground.	GNDPWR
	7	HIGH VOLTAGE	DC power input	I

P2 - Motor Feedback Connector:

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
P2	1	MOT ENC A+	Differential Encoder Input	I
	2	MOT ENC A-		I
	3	MOT ENC B+	Differential Encoder Input	I
	4	MOT ENC B-		I
	5	GNDSGN	Signal ground	GNDSGN
	6	Hall A	Commutation sensor inputs. Internal 2K pull-up to +5VDC.	I
	7	Hall B		I
	8	Hall C		I
	9	-	Not connected	
	10	-	Not connected	
	11	MOT ENC I+	Differential Encoder Input	I
	12	MOT ENC I-		I
	13	+5V OUT	+5V @ 400mA max. Short-circuit protected.	O
	14	MOTOR OVER TEMP	TTL input	I
	15	SHIELD	Motor feedback cable shield. Internally connected to GNDSGN	SHLD

P3 – Auxiliary Encoder Connector:

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
P3	1	+AUX A / +STEP / +CW	Auxiliary encoder input Step and direction interface Clockwise/counterclockwise interface	I
	2	-AUX A / -STEP / -CW		I
	3	+AUX B / +DIR / +CCW		I
	4	-AUX B / -DIR / -CCW		I
	5	GNDSGN	Signal ground	GNDSGN

6	+5V OUT	+5V @ 400mA max. Short-circuit protected.	O
7	+AUX I	Auxiliary encoder index channel	I
8	-AUX I		I
9	SHIELD	Cable shield. Internally connected to GNDSGN	SHLD

P4 – I/O Connector:

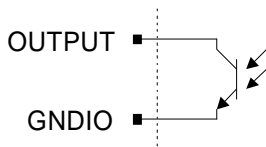
CONNECTOR	PIN	NAME	DESCRIPTION	I/O
P4	1	-	Reserved	
	2	+24V IN	+24V input pull-up (for sourcing inputs option only)	I
	3	PROG INPUT 2	Programmable digital input. Opto-isolated. See schematic below.	I
	4	PROG INPUT 4		I
	5	PROG INPUT 6		I
	6	DRIVE ENABLE	Drive enable input. Opto-isolated. See schematic below.	I
	7	PROG OUTPUT 1	Programmable digital output. Opto-isolated. See schematic below.	O
	8	PROG OUTPUT 3		O
	9	PROG OUTPUT 5		O
	10	GNDIO	Isolated ground	GNDIO
	11	+PROG ANALOG INPUT 1	Programmable analog input. See schematic below.	I
	12	+PROG ANALOG INPUT 2		I
	13	+PROG ANALOG INPUT 3		I
	14	SYSTEM RESET	TTL input. Pull to ground to reset drive (same as power cycle). Referenced to GNDSGN.	I
	15	SHIELD	Cable shield. Internally connected to GNDSGN	SHLD
	16	-	Reserved	
	17	+24V IN	+24V input pull-up (for sourcing inputs option only)	I
	18	PROG INPUT 1	Programmable digital input. Opto-isolated. See schematic below.	I
	19	PROG INPUT 3		I
	20	PROG INPUT 5		I
	21	PROG INPUT 7		I
	22	FAULT RESET	Fault reset input. Opto-isolated. See schematic below.	I
	23	PROG OUTPUT 2	Programmable digital output. Opto-isolated. See schematic below.	O
	24	PROG OUTPUT 4		O
	25	PROG OUTPUT 6		O
	26	+10V	+10V out, 5 mA max. Referenced to signal ground.	O
	27	-PROG ANALOG INPUT 1	See pin 11, 12, 13 above	I

28	-PROG ANALOG INPUT 2		I
29	-PROG ANALOG INPUT 3		I
30	GNDSGN	Signal ground	GNDSGN
31	-	Reserved	
32	-	Reserved	
33	POSITIVE LIMIT SWITCH	Positive limit switch input. Opto-isolated. See schematic below.	I
34	NEGATIVE LIMIT SWITCH	Negative limit switch input. Opto-isolated. See schematic below.	I
35	HOME SWITCH	Home switch input. Opto-isolated. See schematic below.	I
36	DRIVE READY	Drive ready output. Opto-isolated. See schematic below.	O
37	PROG OUTPUT 7	Programmable digital output. Opto-isolated. See schematic below.	I
38	PROG OUTPUT 8		I
39	GNDIO	Isolated ground	GNDIO
40	GNDIO	Isolated ground	GNDIO
41	-10V	-10V out, 5 mA max. Referenced to signal ground.	O
42	GNDA	Analog signal ground. Internally connected to GNDSGN	GNDA
43	PROG ANALOG OUTPUT 1	Programmable analog output. See schematic below.	O
44	PROG ANALOG OUTPUT 2	Programmable analog output. See schematic below.	O

I/O SCHEMATICS:

- Isolated Outputs

DRIVE READY, PROGRAMMABLE OUTPUT 1...8

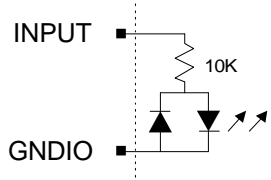


Active maximum voltage	+0.7 VDC
Active maximum current	200 mA
Inactive maximum voltage	+30 VDC
Inactive maximum current	0.01 mA

- Isolated Inputs

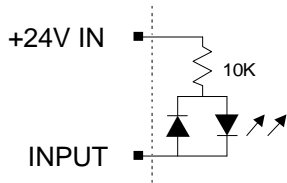
DRIVE ENABLE, FAULT RESET, HOME SWITCH, POSITIVE LIMIT SWITCH, NEGATIVE LIMIT SWITCH, PROGRAMMABLE INPUT 1...7

- Sinking Inputs (standard version)



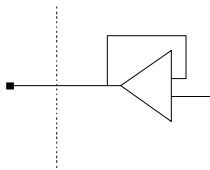
Active maximum voltage	+30 VDC
Active minimum voltage	+18 VDC
Inactive maximum voltage	+2.5 VDC
Inactive minimum voltage	-5VDC

- Sourcing Inputs (optional -SRC version)



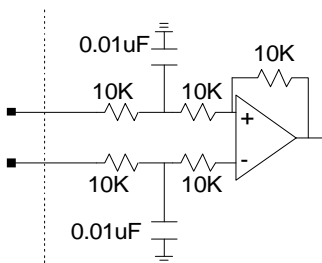
Active maximum voltage	+10VDC
Active minimum voltage	-5VDC
Inactive maximum voltage	+24VIN + 5VDC
Inactive minimum voltage	+24VIN -2.5VDC

- Programmable Analog Outputs



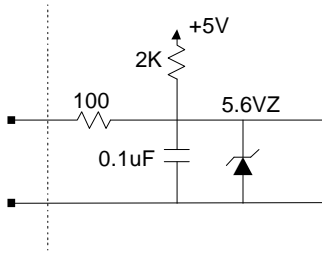
Voltage Range	-10V...+10V
Resolution	10-bit
Minimum Load Resistance	2K Ohm

- Programmable Analog Inputs



Voltage Range	10V...+10V
Resolution	14-bit

- System Reset Input



P5 - Communications Interface (CAN):

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
P5	2	CAN_L	CAN_L bus line (dominant low)	I
	3	CAN_GND	CAN ground	GND
	5	CAN_SHLD	CAN shield	SHLD
	7	CAN_H	CAN_H bus line (dominant high)	I
	8	CAN_TERM	Termination. Connect to CAN_H for CAN bus termination (120 Ohm)	GND
	9	CAN_V+	CAN external supply 7.5...13 VDC	I

**DIP SWITCH FUNCTIONS:**

- CAN Address Setting (factory default is 1)

Node-ID	SW1	SW2	SW3	SW4	SW5	SW6
Via CAN	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF
...						
63	ON	ON	ON	ON	ON	ON

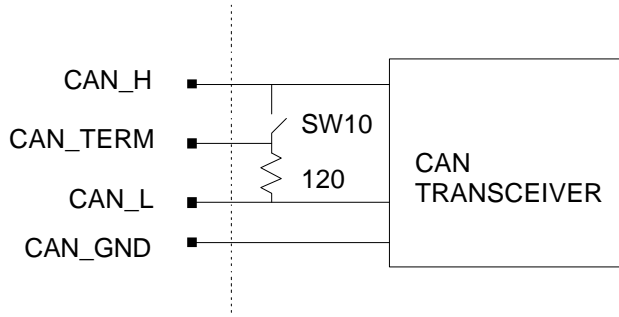
- CAN Bus Bit Rate Setting (factory default is 1000K)

Bit Rate (bits/sec)	SW7	SW8
Via CAN	OFF	OFF
500K	OFF	ON
250K	ON	OFF
125K	ON	ON



- CAN Bus Termination

SW10 can be used for CAN bus termination. Setting SW10 ON will internally connect the CAN\_H signal to CAN\_L via a 120Ω resistor. This can be used if the drive is the last node in a CAN network. Setting SW10 OFF will open this termination. Note: the CAN\_TERM pin can also be used for termination, see below.



**DIGIFLEX® DRIVEWARE:**

DigiFlex® DriveWare is a Windows® based application that can be used to setup and configure the DigiFlex® series of digital servo drives via the CAN interface. This application operates with the following PC-to-CAN interfaces:

Manufacturer	Part Number	Style	Manufacturer Contact Information
Advantech	PCL-841	ISA-bus	<a href="http://www.advantech.com">www.advantech.com</a>
ESD Electronics	CAN-PCC*	PC Centronics (parallel port)*	<a href="http://www.esd-electronics.com">www.esd-electronics.com</a>

\* Also operates with other PC-to-CAN interface cards (e.g. PCI, PC104, ...).

**CANopen OBJECT DICTIONARY:**

For more detailed information on CANopen, please visit <http://www.can-cia.org>, the official web site of CAN in Automation (CiA), the governing body of the CANopen standard.

I. Communication Profile Objects (DS301):

- 1000h: Device\_Type
- 1001h: Error\_register
- 1002h: Manufacturer\_Status\_Register
- 1008h: Manufacturer\_Device\_Name
- 1009h: Manufacturer\_Hardware\_Version
- 100Ah: Manufacturer\_Software\_Version
- 100Ch: guard-time
- 100Dh: life-time factor
- 1010h: store\_parameters
- 1400h: 1<sup>st</sup> receive pdo communication parameter
- 1401h: 2<sup>nd</sup> receive pdo communication parameter
- 1402h: 3<sup>rd</sup> receive pdo communication parameter
- 1403h: 4<sup>th</sup> receive pdo communication parameter
- 1404h: 5<sup>th</sup> receive pdo communication parameter
- 1414h: 21<sup>st</sup> receive pdo communication parameter
- 1415h: 22<sup>nd</sup> receive pdo communication parameter
- 1416h: 23<sup>rd</sup> receive pdo communication parameter
- 1417h: 24<sup>th</sup> receive pdo communication parameter

1600h: 1<sup>st</sup> receive pdo mapping parameter  
 1601h: 2<sup>nd</sup> receive pdo mapping parameter  
 1602h: 3<sup>rd</sup> receive pdo mapping parameter  
 1603h: 4<sup>th</sup> receive pdo mapping parameter  
 1604h: 5<sup>th</sup> receive pdo mapping parameter  
 1614h: 21<sup>st</sup> receive pdo mapping parameter  
 1615h: 22<sup>nd</sup> receive pdo mapping parameter  
 1616h: 23<sup>rd</sup> receive pdo mapping parameter  
 1617h: 24<sup>th</sup> receive pdo mapping parameter  
 1800h: 1<sup>st</sup> transmit pdo communication parameter  
 1802h: 3<sup>rd</sup> transmit pdo communication parameter  
 1803h: 4<sup>th</sup> transmit pdo communication parameter  
 1804h: 5<sup>th</sup> transmit pdo communication parameter  
 1814h: 21<sup>st</sup> transmit pdo communication parameter  
 1815h: 22<sup>nd</sup> transmit pdo communication parameter  
 1816h: 23<sup>rd</sup> transmit pdo communication parameter  
 1817h: 24<sup>th</sup> transmit pdo communication parameter  
 1818h: 25<sup>th</sup> transmit pdo communication parameter  
 1819h: 26<sup>th</sup> transmit pdo communication parameter  
 1A00h: 1<sup>st</sup> transmit pdo mapping parameter  
 1A02h: 3<sup>rd</sup> transmit pdo mapping parameter  
 1A03h: 4<sup>th</sup> transmit pdo mapping parameter  
 1A04h: 5<sup>th</sup> transmit pdo mapping parameter  
 1A14h: 21<sup>st</sup> transmit pdo mapping parameter  
 1A15h: 22<sup>nd</sup> transmit pdo mapping parameter  
 1A16h: 23<sup>rd</sup> transmit pdo mapping parameter  
 1A17h: 24<sup>th</sup> transmit pdo mapping parameter  
 1A18h: 25<sup>th</sup> transmit pdo mapping parameter  
 1A19h: 26<sup>th</sup> transmit pdo mapping parameter

## II. Drive Profile Objects (DSP402)

- Common Objects

6007h: abort\_connection\_option\_code  
 6402h: motor\_type  
 6403h: motor\_catalogue\_number  
 6404h: motor\_manufacturer  
 6410h: motor\_data  
 6510h: drive\_data  
 6502h: supported\_drive\_modes  
 6503h: drive\_catalogue\_number  
 6504h: drive\_manufacturer  
 208Fh: load\_inertia  
 2001h: user\_defined\_drive\_name  
 2002h: user\_units  
 2011h: commutation\_sensor\_selection\_code  
 2012h: hall\_sensor\_parameters  
 201Fh: hall\_sensor\_error\_option\_code  
 2031h: hall\_sensor\_error\_counter  
 2032h: hall\_sensor\_error\_counter\_limit  
 2013h: encoder\_parameters  
 2020h: encoder\_counter  
 2022h: encoder\_index\_counter  
 2027h: encoder\_error\_option\_code  
 2023h: encoder\_error\_counter

2024h: encoder\_error\_counter\_limit  
 2014h: auxiliary\_encoder\_parameters  
 2028h: auxiliary\_encoder\_counter  
 202Ah: auxiliary\_encoder\_index\_counter  
 2030h: auxiliary\_encoder\_error\_option\_code  
 202Bh: auxiliary\_encoder\_error\_counter  
 202Ch: auxiliary\_encoder\_error\_counter\_limit  
 20A0h: programmable\_digital\_inputs  
 20A1h: programmable\_digital\_outputs  
 20A2h : programmable\_analog\_inputs  
 20A3h: programmable\_analog\_outputs  
 20A4h: programmable\_digital\_inputs\_polarity  
 20A5h: programmable\_digital\_inputs\_function  
 20A8h: programmable\_digital\_outputs\_polarity  
 20A9h: programmable\_digital\_outputs\_function  
 20ACh : programmable\_analog\_input\_parameters  
 20AEh: programmable\_analog\_output\_parameters  
 20C1h: delay\_times  
 20C2h: power\_stage\_temperature  
 20C8h: communication\_control

- Device Control Objects

6040h: controlword  
 20C4h: controlword\_initial\_value  
 20C5h: auxiliary\_controlword  
 6041h: statusword  
 605Ah: quick\_stop\_option\_code  
 605Bh: shutdown\_option\_code  
 605Ch: disable\_operation\_option\_code  
 6060h: modes\_of\_operation  
 6061h: modes\_of\_operation\_display  
 2000h: statusword\_1  
 2004h: dedicated\_digital\_inputs  
 2005h: dedicated\_digital\_outputs  
 2049h: invert\_command  
 20C3h: motor\_overtemperature\_option\_code

- Factor Group Objects

6090h: velocity\_encoder\_resolution  
 608Fh: position\_encoder\_resolution  
 6093h: position\_factor  
 6094h: velocity\_encoder\_factor  
 6097h: acceleration\_factor  
 2079h: analog\_torque\_command\_factor  
 207Ah: digital\_torque\_command\_factor  
 2081h: analog\_velocity\_command\_factor  
 2082h: digital\_velocity\_command\_factor  
 2091h: analog\_position\_command\_factor  
 2092h: digital\_position\_command\_factor

- Profile Position Mode Objects

607Ah: target\_position  
 607Dh: software\_position\_limit

6086h: motion\_profile\_type  
607Fh: maximum\_profile\_velocity  
6081h: profile\_velocity  
6083h: profile\_acceleration  
6084h: profile\_deceleration

- Homing Mode Objects

607Ch: home\_offset  
6098h: homing\_method  
6099h: homing\_speeds  
609Ah: homing\_acceleration

- Position Control Function Objects

6062h: position\_demand\_value  
6063h: position\_actual\_value\*  
6064h: position\_actual\_value  
6067h: position\_window  
6068h: position\_window\_time  
6065h: following\_error\_window  
6066h: following\_error\_time\_out  
60F4h: following\_error\_actual\_value  
60FBh: position\_control\_parameter\_set  
60FCh: position\_demand\_value\*  
2090h: demand\_position\_offset  
2093h: position\_command\_low\_pass\_filter

- Profile Velocity Mode Objects

6069h: velocity\_sensor\_actual\_value  
606Ah: sensor\_selection\_code  
606Bh: velocity\_demand\_value  
606Ch: velocity\_actual\_value  
606Dh: velocity\_window  
606Eh: velocity\_window\_time  
606Fh: velocity\_threshold  
6070h: velocity\_threshold\_time  
60F9h: velocity\_control\_parameter\_set  
60FFh: target\_velocity  
2080h: demand\_velocity\_offset  
2083h: velocity\_command\_low\_pass\_filter  
2084h: velocity\_error

- Profile Torque Mode Objects

6071h: target\_torque  
6072h: max\_torque  
6074h: torque\_demand\_value  
6075h: motor\_rated\_current  
6076h: motor\_rated\_torque  
6077h: torque\_actual\_value  
6078h: current\_actual\_value  
6079h: dc\_link\_circuit\_voltage  
6087h: torque\_slope  
6088h: torque\_profile\_type

60F8h: torque\_control\_parameters  
2010h: rated\_voltage  
2078h: rated\_torque\_constant  
2070h: current\_control\_parameter\_set  
207Bh: torque command low pass filter

**ORDERING INFORMATION:**

Standard model: DX60CO8X

With sourcing inputs: DX60CO8X-SRC

X indicates the current revision letter.

