

## DIGIFLEX® DIGITAL SERVO DRIVES WITH CANopen INTERFACE MODEL: DC202EE25A20NAC

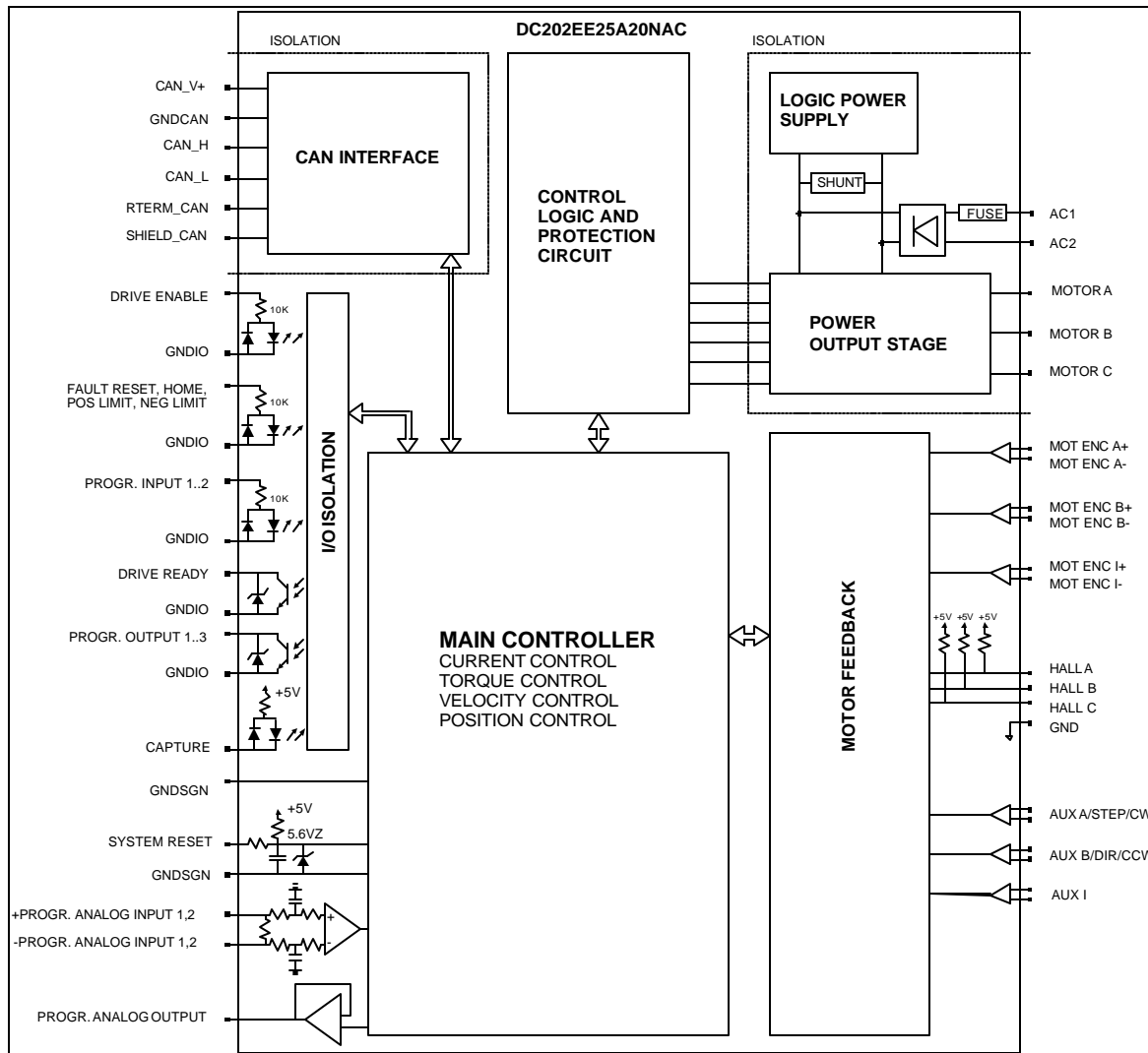
### FEATURES:

- Fully digital, state-of-the-art DSP design
- Brushed DC, brushless AC drive technology
- 10 kHz digital current loop, 5 kHz digital velocity loop, 5 kHz digital position loop with programmable gain settings
- Encoder and Hall sensor feedback for sinusoidal commutation
- Auxiliary encoder for dual loop control or electronic gearing
- High-speed capture input (<1µsec latency)
- Surface-mount technology
- Small size, low cost, ease of use
  
- 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
  
- Dual encoder input
- 2 programmable isolated digital inputs (sinking), sourcing inputs optional (-SRC).
- 3 programmable isolated digital outputs (sinking)
- Dedicated isolated limit and home switch inputs
- 1 high-speed capture input
- 2 programmable analog inputs (14-bit)
- 1 programmable analog output (10-bit)
  
- Four quadrant regenerative operation
- Bi-color LED status indicator
- Extensive built-in protection against:
  - over-voltage
  - under-voltage
  - short-circuit: phase-phase, phase-ground
  - over-current
  - over-temperature

\*Picture for reference only.



**BLOCK DIAGRAM:**



**DESCRIPTION:**

The DC201E 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.

DC201E 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, a preset index table, or the CAN interface. The DC201E Series also feature 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>DC202EE25A20NAC</b>
AC SUPPLY VOLTAGE	45 – 125 VAC, single phase, 50 – 60 Hz
PEAK CURRENT	25A (17.6Arms)
MAXIMUM CONTINUOUS CURRENT	12.5A (8.8Arms)
MINIMUM LOAD INDUCTANCE	600 $\mu$ H
SWITCHING FREQUENCY	20 kHz
HEATSINK (BASEPLATE) TEMPERATURE RANGE	0 to 65 °C, disables at 65 °C
POWER DISSIPATION AT CONTINUOUS CURRENT	150W
MIN. UNDER-VOLTAGE SHUTDOWN	60 VDC
MAX. OVER-VOLTAGE SHUTDOWN	195 VDC
BUS CAPACITANCE	3000 $\mu$ F
SHUNT RESISTOR	10 $\Omega$ @ 50W
SHUNT SWITCH-ON VOLTAGE	Programmable
SHUNT FUSE	3A Motor Delay @ 250VAC
BUS FUSE	15A Slow-Blow @ 250 VAC

<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	Removable screw terminal connector
AUX. FEEDABCK CONNECTOR: CN4*	9-pin female D-sub
MOTOR FEEDBACK CONNECTOR: CN3*	15-pin high density female D-sub
I/O CONNECTOR: CN2*	26-pin high density female D-sub
COMMUNICATIONS INTERFACE (CAN): CN1*	9-pin male D-sub
SIZE	7.42 x 6.19 x 2.58 188.5x 157.2 x 65.4 mm
WEIGHT	2 lbs. 1 Kg

\* Mating connectors are not included.

**PIN FUNCTIONS:**

P1 - Motor and Power Connector:

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
P1	1	MA	Motor phase A	O
	2	MB	Motor phase B	O
	3	MC	Motor phase C	O
	4	AC2	AC supply input	I
	5	AC1		I

CN4 - Auxiliary Encoder Connector:

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
CN4	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

CN3 - Motor Feedback Connector:

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
CN3	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

CN2 – I/O Connector:

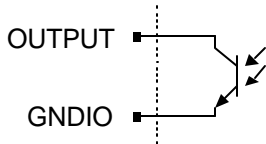
CONNECTOR	PIN	NAME	DESCRIPTION	I/O
CN2	1	+24V IN	+24V input pull-up (for sourcing inputs option only)	I
	2	PROG INPUT 1	Programmable digital input. Opto-isolated. See schematic below.	I
	3	PROG INPUT 3		I
	4	FAULT RESET	Fault reset input. Opto-isolated. See schematic below.	I
	5	PROG OUTPUT 2	Programmable digital output. Opto-isolated. See schematic below.	O
	6	-	Reserved	
	7	-PROG ANALOG INPUT 1	See pin 16, 17	I
	8	-PROG ANALOG INPUT 2		I
	9	GNDSGN	Signal ground.	GNDSGN
	10	+24V IN	+24V input pull-up (for sourcing inputs option only)	I
	11	HOME SWITCH	Home switch input. Opto-isolated. See schematic below.	I
	12	PROG INPUT 2	Programmable digital input. Opto-isolated. See schematic below.	I
	13	DRIVE ENABLE	Drive enable input. Opto-isolated. See schematic below.	I
	14	PROG OUTPUT 1	Programmable digital output. Opto-isolated. See schematic below.	O
	15	PROG OUTPUT 3		O
	16	+PROG ANALOG INPUT 1	Programmable analog input. Opto-isolated. See schematic below.	I
	17	+PROG ANALOG INPUT 2		I
	18	SYSTEM RESET	TTL input. Pull to ground to reset drive (same as power cycle). Referenced to GNDSGN.	I
	19	NEGATIVE LIMIT SWITCH	Negative limit switch input. Opto-isolated. See schematic below.	I
	20	POSITIVE LIMIT SWITCH	Positive limit switch input. Opto-isolated. See schematic below.	I
	21	DRIVE READY	Drive ready output. Opto-isolated. See schematic below.	O
	22	GNDIO	Isolated ground	GNDIO
	23	GNDIO	Isolated ground	GNDIO
	24	GNDA	Analog signal ground. Internally connected to GNDSGN	GNDA
	25	PROG ANALOG OUTPUT 1	Programmable analog output. See schematic below.	O

	26	SHIELD	Cable shield. Internally connected to GNDSGN	SHLD
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I/O SCHEMATICS:

- Isolated Outputs

DRIVE READY, PROGRAMMABLE OUTPUT 1...3

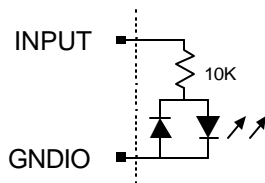


Active maximum voltage	+0.7 VDC
Active maximum current	200 mA
Inactive maximum voltage	+30 VDC
Inactive maximum current	0.01 mA

- Isolated Inputs

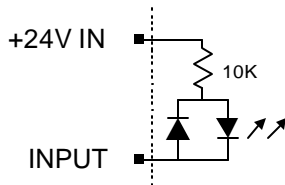
DRIVE ENABLE, FAULT RESET, HOME SWITCH, POSITIVE LIMIT SWITCH, NEGATIVE LIMIT SWITCH, PROGRAMMABLE INPUT 1...2

- Sinking Inputs (standard version)



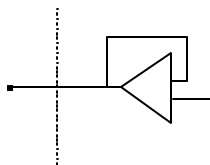
Active maximum voltage	+30 VDC
Active minimum voltage	+18 VDC
Inactive maximum voltage	+2.5 VDC
Inactive minimum voltage	-5VDC

- Sourcing Inputs (optional -SRC version)



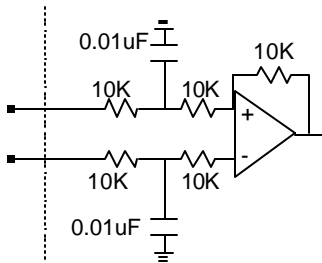
Active maximum voltage	+10VDC
Active minimum voltage	-5VDC
Inactive maximum voltage	+24VIN + 5VDC
Inactive minimum voltage	+24VIN -2.5VDC

- Programmable Analog Output



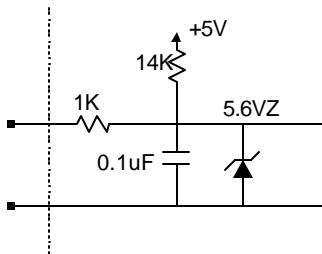
Voltage Range	-10V...+10V
Resolution	10-bit
Minimum Load Resistance	2K Ohm

- Programmable Analog Inputs



Voltage Range	10V...+10V
Resolution	12-bit

- System Reset Input



CN1 - Communications Interface (CAN):

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
CN1	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

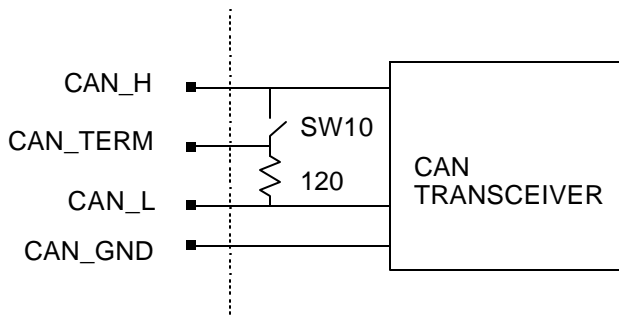
Node-ID	SW1	SW2	SW3	SW4	SW5	SW6
Via CAN	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF
...						
63	ON	ON	ON	ON	ON	ON

- CAN Bus Bit Rate Setting

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>
IXXAT	any	any	<a href="http://www.ixxat.com">www.ixxat.com</a>
Kvaser	any	any	<a href="http://www.kvaser.com">www.kvaser.com</a>
Vector	Any	Any	<a href="http://www.vector-cantech.com">www.vector-cantech.com</a>
ESD Electronics	any	any	<a href="http://www.esd-electronics.com">www.esd-electronics.com</a>

**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	6402h: motor_type
1001h: Error_register	6403h: motor_catalogue_number
1002h: Manufacturer_Status_Register	6404h: motor_manufacturer
1008h: Manufacturer_Device_Name	6410h: motor_data
1009h: Manufacturer_Hardware_Version	6510h: drive_data
100Ah: Manufacturer_Software_Version	6502h: supported_drive_modes
100Ch: guard-time	6503h: drive_catalogue_number
100Dh: life-time factor	6504h: drive_manufacturer
1010h: store_parameters	
1400h: 1 <sup>st</sup> receive pdo communication parameter	2001h: user_defined_drive_name
1401h: 2 <sup>nd</sup> receive pdo communication parameter	2002h: user_units
1402h: 3 <sup>rd</sup> receive pdo communication parameter	200Eh: active_non_fatal_errors
1403h: 4 <sup>th</sup> receive pdo communication parameter	200Fh: error_self_reset
1404h: 5 <sup>th</sup> receive pdo communication parameter	2011h: commutation_sensor_selection_code
1414h: 21 <sup>st</sup> receive pdo communication parameter	2012h: hall_sensor_parameters
1415h: 22 <sup>nd</sup> receive pdo communication parameter	201Fh: hall_sensor_error_option_code
1416h: 23 <sup>rd</sup> receive pdo communication parameter	2031h: hall_sensor_error_counter
1417h: 24 <sup>th</sup> receive pdo communication parameter	2032h: hall_sensor_error_counter_limit
1600h: 1 <sup>st</sup> receive pdo mapping parameter	2013h: encoder_parameters
1601h: 2 <sup>nd</sup> receive pdo mapping parameter	2020h: encoder_counter
1602h: 3 <sup>rd</sup> receive pdo mapping parameter	2021h: encoder_position
1603h: 4 <sup>th</sup> receive pdo mapping parameter	2022h: encoder_index_counter
1604h: 5 <sup>th</sup> receive pdo mapping parameter	2027h: encoder_error_option_code
1614h: 21 <sup>st</sup> receive pdo mapping parameter	2023h: encoder_error_counter
1615h: 22 <sup>nd</sup> receive pdo mapping parameter	2024h: encoder_error_counter_limit
1616h: 23 <sup>rd</sup> receive pdo mapping parameter	2014h: auxiliary_encoder_parameters
1617h: 24 <sup>th</sup> receive pdo mapping parameter	2028h: auxiliary_encoder_counter
1800h: 1 <sup>st</sup> transmit pdo communication parameter	2029h: auxiliary_encoder_position
1802h: 3 <sup>rd</sup> transmit pdo communication parameter	202Ah: auxiliary_encoder_index_counter
1803h: 4 <sup>th</sup> transmit pdo communication parameter	2030h: auxiliary_encoder_error_option_code
1804h: 5 <sup>th</sup> transmit pdo communication parameter	202Bh: auxiliary_encoder_error_counter
1814h: 21 <sup>st</sup> transmit pdo communication parameter	202Ch: auxiliary_encoder_error_counter_limit
1815h: 22 <sup>nd</sup> transmit pdo communication parameter	2040h: DIP-switch_settings
1816h: 23 <sup>rd</sup> transmit pdo communication parameter	20A0h: programmable_digital_inputs
1817h: 24 <sup>th</sup> transmit pdo communication parameter	20A1h: programmable_digital_outputs
1818h: 25 <sup>th</sup> transmit pdo communication parameter	20A2h : programmable_analog_inputs
1819h: 26 <sup>th</sup> transmit pdo communication parameter	20A3h: programmable_analog_outputs
1A00h: 1 <sup>st</sup> transmit pdo mapping parameter	20A4h: programmable_digital_inputs_polarity
1A02h: 3 <sup>rd</sup> transmit pdo mapping parameter	20A5h: programmable_digital_inputs_function
1A03h: 4 <sup>th</sup> transmit pdo mapping parameter	20A8h: programmable_digital_outputs_polarity
1A04h: 5 <sup>th</sup> transmit pdo mapping parameter	20A9h: programmable_digital_outputs_function
1A14h: 21 <sup>st</sup> transmit pdo mapping parameter	20ACh : programmable_analog_input_parameters
1A15h: 22 <sup>nd</sup> transmit pdo mapping parameter	20AEh: programmable_analog_output_parameters
1A16h: 23 <sup>rd</sup> transmit pdo mapping parameter	20C2h: power_stage_temperature
1A17h: 24 <sup>th</sup> transmit pdo mapping parameter	20C8h: communication_control
1A18h: 25 <sup>th</sup> transmit pdo mapping parameter	208Fh: load_inertia
1A19h: 26 <sup>th</sup> transmit pdo mapping parameter	

II. Drive Profile Objects (DSP402)

- Common Objects

- 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  
 2006h: dedicated\_digital\_inputs\_polarity  
 2007h: dedicated\_digital\_outputs\_polarity  
 2049h: invert\_command  
 20B0h: trigger\_at\_value  
 20B1h: capture\_value  
 20B3h: trigger\_signal  
 20B5h: capture\_signal  
 20B6h: capture\_event  
 20C1h: delay\_times  
 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  
 6085h: Quick\_stop\_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  
 2070h: current\_control\_parameter\_set  
 2074h: target\_current\_q  
 2075h: reference\_current\_q  
 2077h: reference\_torque  
 2078h: rated\_torque\_constant  
 207Bh: Torque command low pass filter

**ORDERING INFORMATION:**

Standard model: DC202EE25A20NACX

With sourcing inputs: DC202EE25A20NACX-SRC

X indicates the current revision letter.

**MOUNTING DIMENSIONS:**

