

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

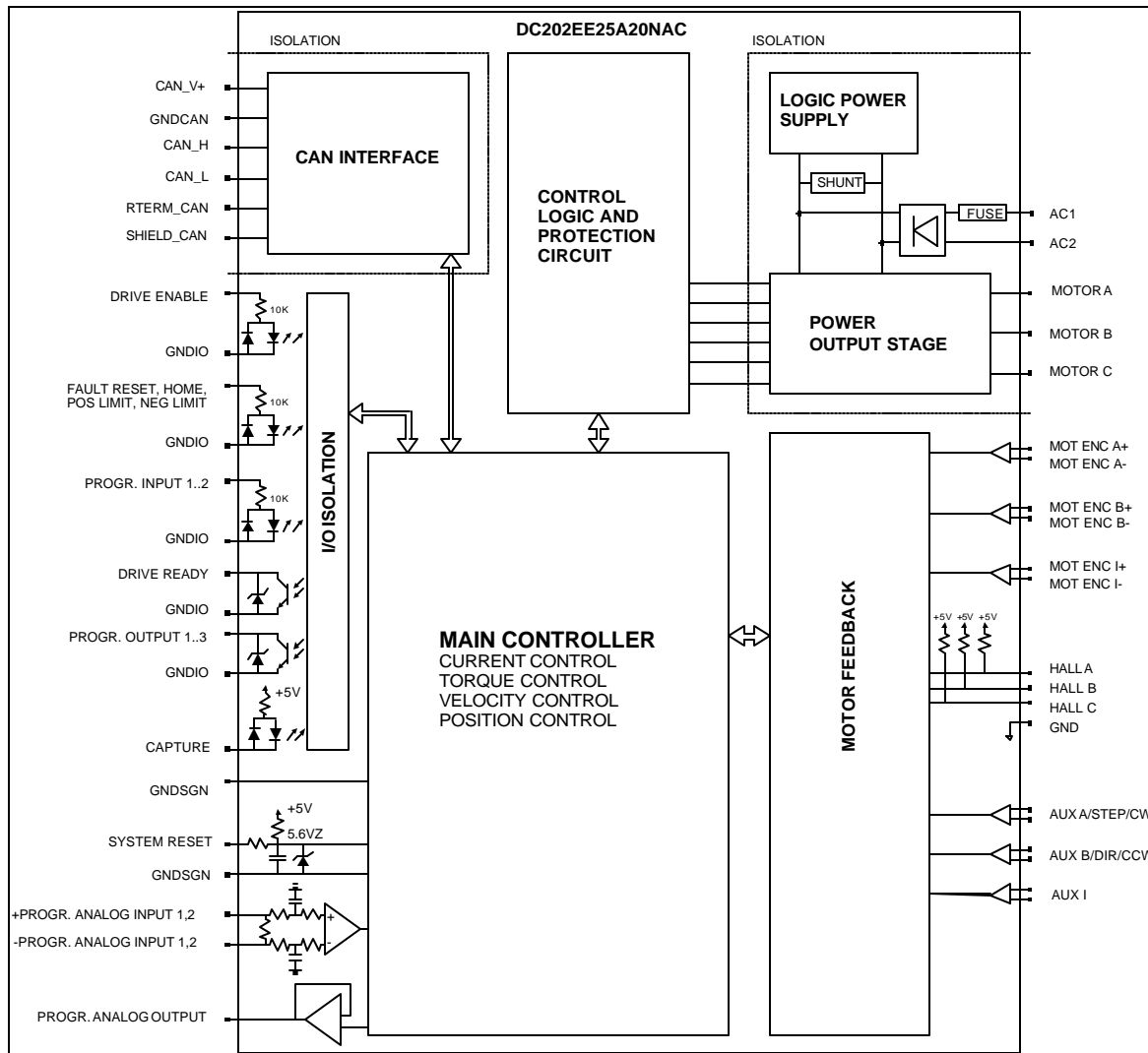
- Dual encoder input
- 2 programmable isolated digital inputs (sinking), sourcing inputs optional (-SRC).
- 3 programmable isolated digital outputs (sinking)
- Dedicated isolated limit and home switch inputs
- 1 high-speed capture input
- 2 programmable analog inputs (14-bit)
- 1 programmable analog 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:

| POWER STAGE SPECIFICATIONS | DC202EE25A20NAC |
|---|--|
| 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 μ 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 μ F |
| SHUNT RESISTOR | 10 Ω @ 50W |
| SHUNT SWITCH-ON VOLTAGE | Programmable |
| SHUNT FUSE | 3A Motor Delay @ 250VAC |
| BUS FUSE | 15A Slow-Blow @ 250 VAC |

| CAN INTERFACE SUPPLY SPECIFICATIONS | |
|--|---------------|
| DC SUPPLY VOLTAGE | 7.5 to 13 VDC |
| INPUT CURRENT | 150 mA max. |

| MECHANICAL SPECIFICATIONS | |
|--------------------------------------|--|
| 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:

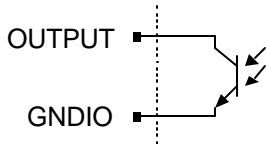
| CONNECTOR | PIN | NAME | DESCRIPTION | I/O |
|-----------|-----|-----------------------|---|--------|
| CN2 | 1 | +24V IN | +24V input pull-up (for sourcing inputs option only) | I |
| | 2 | PROG INPUT 1 | Programmable digital input. Opto-isolated. See schematic below. | I |
| | 3 | PROG INPUT 3 | | 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 |
|--|----|--------|--|------|

I/O SCHEMATICS:

- Isolated Outputs

DRIVE READY, PROGRAMMABLE OUTPUT 1...3

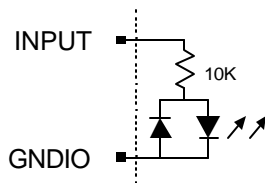


| | |
|--------------------------|----------|
| Active maximum voltage | +0.7 VDC |
| Active maximum current | 200 mA |
| Inactive maximum voltage | +30 VDC |
| Inactive maximum current | 0.01 mA |

- Isolated Inputs

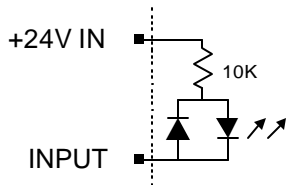
DRIVE ENABLE, FAULT RESET, HOME SWITCH, POSITIVE LIMIT SWITCH, NEGATIVE LIMIT SWITCH, PROGRAMMABLE INPUT 1...2

- Sinking Inputs (standard version)



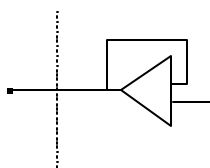
| | |
|--------------------------|----------|
| Active maximum voltage | +30 VDC |
| Active minimum voltage | +18 VDC |
| Inactive maximum voltage | +2.5 VDC |
| Inactive minimum voltage | -5VDC |

- Sourcing Inputs (optional -SRC version)



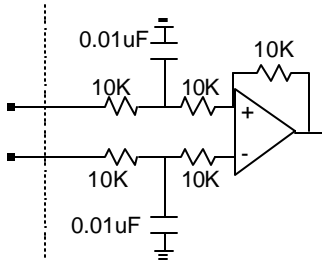
| | |
|--------------------------|----------------|
| Active maximum voltage | +10VDC |
| Active minimum voltage | -5VDC |
| Inactive maximum voltage | +24VIN + 5VDC |
| Inactive minimum voltage | +24VIN -2.5VDC |

- Programmable Analog Output



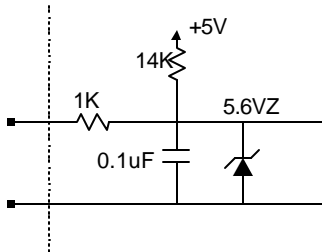
| | |
|-------------------------|-------------|
| Voltage Range | -10V...+10V |
| Resolution | 10-bit |
| Minimum Load Resistance | 2K Ohm |

- 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

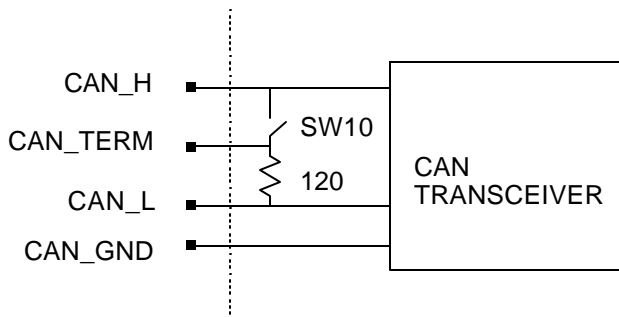
| Node-ID | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 |
|---------|-----|-----|-----|-----|-----|-----|
| Via CAN | OFF | OFF | OFF | OFF | OFF | OFF |
| 1 | ON | OFF | OFF | OFF | OFF | OFF |
| 2 | OFF | ON | OFF | OFF | OFF | OFF |
| 3 | ON | ON | OFF | OFF | OFF | OFF |
| ... | | | | | | |
| 63 | ON | ON | 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 | www.advantech.com |
| IXXAT | any | any | www.ixxat.com |
| Kvaser | any | any | www.kvaser.com |
| Vector | Any | Any | www.vector-cantech.com |
| ESD Electronics | any | any | www.esd-electronics.com |

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 st receive pdo communication parameter | 2001h: user_defined_drive_name |
| 1401h: 2 nd receive pdo communication parameter | 2002h: user_units |
| 1402h: 3 rd receive pdo communication parameter | 200Eh: active_non_fatal_errors |
| 1403h: 4 th receive pdo communication parameter | 200Fh: error_self_reset |
| 1404h: 5 th receive pdo communication parameter | 2011h: commutation_sensor_selection_code |
| 1414h: 21 st receive pdo communication parameter | 2012h: hall_sensor_parameters |
| 1415h: 22 nd receive pdo communication parameter | 201Fh: hall_sensor_error_option_code |
| 1416h: 23 rd receive pdo communication parameter | 2031h: hall_sensor_error_counter |
| 1417h: 24 th receive pdo communication parameter | 2032h: hall_sensor_error_counter_limit |
| 1600h: 1 st receive pdo mapping parameter | 2013h: encoder_parameters |
| 1601h: 2 nd receive pdo mapping parameter | 2020h: encoder_counter |
| 1602h: 3 rd receive pdo mapping parameter | 2021h: encoder_position |
| 1603h: 4 th receive pdo mapping parameter | 2022h: encoder_index_counter |
| 1604h: 5 th receive pdo mapping parameter | 2027h: encoder_error_option_code |
| 1614h: 21 st receive pdo mapping parameter | 2023h: encoder_error_counter |
| 1615h: 22 nd receive pdo mapping parameter | 2024h: encoder_error_counter_limit |
| 1616h: 23 rd receive pdo mapping parameter | 2014h: auxiliary_encoder_parameters |
| 1617h: 24 th receive pdo mapping parameter | 2028h: auxiliary_encoder_counter |
| 1800h: 1 st transmit pdo communication parameter | 2029h: auxiliary_encoder_position |
| 1802h: 3 rd transmit pdo communication parameter | 202Ah: auxiliary_encoder_index_counter |
| 1803h: 4 th transmit pdo communication parameter | 2030h: auxiliary_encoder_error_option_code |
| 1804h: 5 th transmit pdo communication parameter | 202Bh: auxiliary_encoder_error_counter |
| 1814h: 21 st transmit pdo communication parameter | 202Ch: auxiliary_encoder_error_counter_limit |
| 1815h: 22 nd transmit pdo communication parameter | 2040h: DIP-switch_settings |
| 1816h: 23 rd transmit pdo communication parameter | 20A0h: programmable_digital_inputs |
| 1817h: 24 th transmit pdo communication parameter | 20A1h: programmable_digital_outputs |
| 1818h: 25 th transmit pdo communication parameter | 20A2h : programmable_analog_inputs |
| 1819h: 26 th transmit pdo communication parameter | 20A3h: programmable_analog_outputs |
| 1A00h: 1 st transmit pdo mapping parameter | 20A4h: programmable_digital_inputs_polarity |
| 1A02h: 3 rd transmit pdo mapping parameter | 20A5h: programmable_digital_inputs_function |
| 1A03h: 4 th transmit pdo mapping parameter | 20A8h: programmable_digital_outputs_polarity |
| 1A04h: 5 th transmit pdo mapping parameter | 20A9h: programmable_digital_outputs_function |
| 1A14h: 21 st transmit pdo mapping parameter | 20ACh : programmable_analog_input_parameters |
| 1A15h: 22 nd transmit pdo mapping parameter | 20AEh: programmable_analog_output_parameters |
| 1A16h: 23 rd transmit pdo mapping parameter | 20C2h: power_stage_temperature |
| 1A17h: 24 th transmit pdo mapping parameter | 20C8h: communication_control |
| 1A18h: 25 th transmit pdo mapping parameter | 208Fh: load_inertia |
| 1A19h: 26 th 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.

