CLEARPATH-EC SOFTWARE REFERENCE

NEMA 23 AND NEMA 34 FRAME SIZES

VERSION 1.1.1 / JUNE 27TH, 2024

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INTRODUCTION

DOCUMENT OVERVIEW

Thank you for purchasing ClearPath-EC Industrial Servo Motor. This document is designed to act as a quick software reference for ClearPath-EC (CPM-ECXX-XXXXX-XXXX). For hardware, wiring, and ClearView 3.0 documentation, please see the ClearPath-EC User Manual. The ClearPath-EC User Manual can be found on the downloads page of Teknic's website or at the following link.

ClearPath-EC User Manual Link:
https://teknic.com/files/downloads/ClearPath-EC_User_Manual.pdf

INTRODUCTION TO CLEARPATH-EC

ClearPath-EC is used within an EtherCAT network, and implements the CiA402 Device Profile for drives and motion control. Supported operational modes include Cyclic Synchronous Position (CSP), Cyclic Synchronous Velocity (CSV), Cyclic Synchronous Torque (CST), and Homing (Hm) with various homing methods. Teknic recommends using the ClearView 3.0 motor setup software for initial product configuration. ClearView 3.0 has a helpful UI interface for setting up many ClearPath-EC features. If you intend to use any of the following features, please consult the ClearPath-EC User Manual for additional information and setup instructions.

- Auto-Tuning *(required after mounting to mechanics)*
- Homing
- Torque Limiting
- Limit Switch Setup
- Software Limits
- Disable and Stop Options
- Move Status Feedback *(i.e. In Range and Move Done)*
- Torque Foldback
- Regen Handling
- Power and Temperature Settings

TABLE OF CONTENTS

SAFETY INFORMATION

PRECAUTIONARY STATEMENT

Always follow appropriate safety precautions when installing and using automated motion control equipment. Motion control systems should be designed and utilized to prevent personnel from coming into contact with moving parts and electrical contacts that could cause injury or death. Read all cautions, warnings, and notes before attempting to install or operate this device. Follow all applicable codes and standards when using this equipment. Failure to use this equipment as described may impair or neutralize protections built into the product.

GENERAL DISCLAIMER

The User is responsible for determining the suitability of this product for his/her application. The User must ensure that Teknic's products are installed and utilized in accordance with all local, state, federal, and private governing bodies and meet all applicable health and safety standards.

Teknic has made all reasonable efforts to accurately present the information in the published documentation and shall not be responsible for any incorrect information which may result from unintentional oversights.

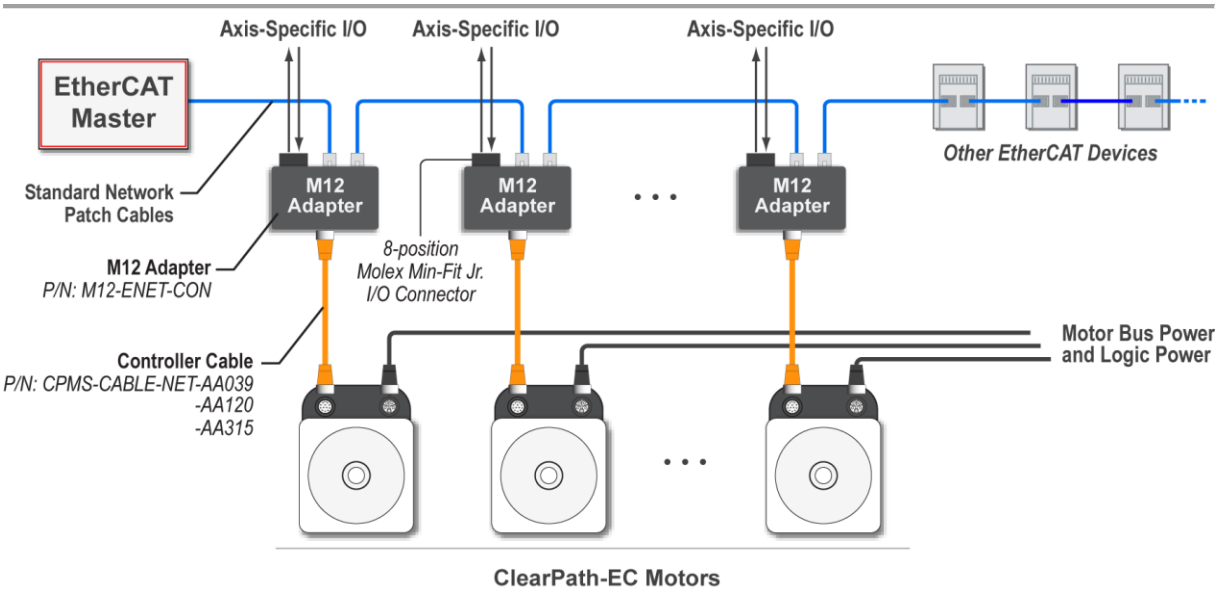
Due to continuous product improvements, the product specifications as stated in the documentation are subject to change at any time and without notice. The User is responsible for consulting a representative of Teknic for detailed information and to determine any changes of information in the published documentation.

Should Teknic's products be used in an application that is safety critical, the User must provide appropriate safety testing of the products, adequate safety devices, guarding, warning notices, and machine-specific training to protect the operator and/or bystanders from injury.

CONNECTING CLEARPATH-EC TO A MASTER

CONNECTING CLEARPATH-EC TO A NETWORK

ClearPath-EC components easily connect to any EtherCAT network.



ClearPath-EC EtherCAT System Overview

More information about integrating your ClearPath-EC motor into an EtherCAT network can be found in the ClearPath-EC User Manual.

MASTER SOFTWARE CONFIGURATION (ESI FILE)

Many EtherCAT Masters use EtherCAT Slave Information (ESI) files to load information about various devices on their network. The process of loading an ESI file is different for every master, but is typically one of the first steps when setting up a new device. You can download the ESI file for ClearPath-EC on the download page of Teknic's website HERE.

CLEARPATH-EC ENCODER RESOLUTION

ClearPath-EC motors have two resolution options for their high-precision optical encoder:

- **12,800 counts/revolution** for part numbers ending in **-RXXX**
- **51,200 counts/revolution** for part numbers ending in **-EXXX**

Ensure the EtherCAT master is configured appropriately using the resolution of your ClearPath-EC before commanding motion.

CLEARPATH-EC NETWORK TIMING

For the best performance with ClearPath-EC, **Teknic recommends setting the master to use Distributed Clocks (DC) with a cycle time interval set to a multiple of 250µs.** ClearPath-EC's Interpolation Time (0x60C2) should be set equal to the cycle time.

A few common cycle times and their corresponding Interpolation Time settings can be found in the table below.

Network Timing Examples:

Cycle Time (ms)	Time Period Value (0x60C2[1])	Time Index (0x60C2[2])
2 (default)	2 (default)	-3 (default)
1	1	-3
0.25*	25*	-5*
0.0625 (CST only)	63 (CST only)	-6 (CST only)

**Note: cycle times less than 1 ms may require changes to the DC sync pulse settings within the master for the CSP and CSV operating modes. Ensure sync pulses are always timed such that they are received after the datagram is received by ClearPath, not during.*

COMMUNICATING WITH CLEARPATH-EC

The data that can be transmitted between an EtherCAT master and ClearPath-EC is organized into parameters. Each parameter has a unique Index and various Sub-indices.

Cyclic data is exchanged via Process Data Objects (PDOs). The PDOs contain frequently updated or requested data such as motion targets, motor feedback, and digital I/O data. Service Data Objects (SDOs) are used for parameters that should not be exchanged cyclically or only need to be written or read occasionally.

SETTING A PDO

PDOs are used to communicate cyclically between the EtherCAT master and a ClearPath-EC motor. PDOs are split into receive PDOs and transmit PDOs. The receive PDOs (RxPDOs) contain the parameters sent from the master to a device. The transmit PDOs (TxPDOs) contain feedback parameters from the device to the master.

All ClearPath-EC PDOs can contain up to 8 parameters. The parameters contained in each PDO are defined in the PDO mapping objects. Parameters 0x1600 to 0x1603 are the mapping objects for the RxPDOs. Parameters 0x1A00 to 0x1A03 are the mapping objects for the TxPDOs. Sub-Index [0] of each mapping object defines the number of parameters that will be mapped. Parameters are added to a PDO using the following format:

PDO Mapping Value Breakdown:

Bit	31-16	15-8	7-0
Value	Index	Sub-Index	Length

For example, these are the parameters included in the combined operating mode PDOs, along with their corresponding PDO mapping values:

Default Combined Receive PDO (0x1600):

Index[Sub-IDX]	Name	Length [Hex (Bit)]	PDO Mapping Value
0x6040[00]	Controlword	0x10 (16)	0x60400010
0x6060[00]	Modes of Operation	0x08 (8)	0x60600008
0x6071[00]	Target Torque	0x10 (16)	0x60710010
0x607A[00]	Target Position	0x20 (32)	0x607A0020
0x60FE[01]	Digital Outputs	0x20 (32)	0x60FE0120
0x60FF[00]	Target Velocity	0x20 (32)	0x60FF0020

Default Combined Transmit PDO (0x1A00):

Index[Sub-IDX]	Name	Length [Hex (Bit)]	PDO Mapping Value
0x603F	Error Code	0x10 (16)	0x603F0010
0x6041	Statusword	0x10 (16)	0x60410010
0x6061	Modes of Operation Display	0x08 (8)	0x60610008
0x6064	Position Actual Value	0x20 (32)	0x60640020
0x606C	Velocity Actual Value	0x20 (32)	0x606C0020
0x6077	Torque Actual Value	0x10 (16)	0x60770010
0x60F4	Following Error Actual Value	0x20 (32)	0x60F40020
0x60FD	Digital Inputs	0x20 (32)	0x60FD0020

SETTING THE PDO ASSIGNMENT

A PDO must be part of the PDO Assignment for its data to actually be exchanged between the master and device. The RxPDO Assignment (0x1C12[0-3]) and TxPDO Assignment (0x1C13[0-3]) parameters define which PDOs will be exchanged.
To assign a PDO, set the value of a PDO Assignment sub-index to the desired PDO index. Set any remaining PDO Assignment sub-indices to 0.

SENDING AN SDO

The process of sending an SDO varies for each Master. If you experience difficulty executing SDO reads and writes, Teknic recommends contacting your EtherCAT master's manufacturer for technical support.

OPERATING MODES

ClearPath-EC Industrial Servo Motors support four operating modes:

- Cyclic Synchronous Position Mode (CSP)
- Cyclic Synchronous Velocity Mode (CSV)
- Cyclic Synchronous Torque Mode (CST)
- Homing (HM)

Each control mode is implemented according to the CiA402 profile specification.

CYCLIC SYNCHRONOUS POSITION MODE (CSP)

Cyclic Synchronous Position Mode (CSP) is the default control mode for ClearPath-EC. In CSP mode, the master sends an updated Target Position to ClearPath cyclically (at the PDO update cycle rate). ClearPath follows these provided target positions in real time. The master must "profile" the target positions to command the desired velocity and rate of acceleration (i.e. the rate of change of Target Position should ramp up and down to avoid abrupt changes in position).

Note: Homing mode can be used in addition to CSP mode when the application must find or set a zero position. Change to Homing mode when using any of ClearPath's automatic homing methods, then switch back to CSP mode to command typical position moves.

CONTROLWORD (CSP)

The master uses the Controlword to manipulate the state of ClearPath, allowing for the control of key functions (such as enabling or disabling the motor). The bits of the Controlword are unique for each operating mode.

Controlword Bitwise Breakdown:

Bit	Name
0	Switch On
1	Enable Voltage
2	Quick Stop
3	Enable Operation
4-6	Unused
7	Fault Reset
8	Halt
9	Unused
10	Reserved
11-15	Unused

Note: To enable a ClearPath-EC motor, the master must turn on bits 1 and 2 of the Controlword (Ready to Switch On) then set bits 0-3 of the Controlword high (Operation Enabled).

STATUSWORD (CSP)

The master uses the Statusword to obtain feedback about ClearPath's status. The bits of the Statusword are unique for each operating mode.

Statusword Bitwise Breakdown:

Bit	Name
0	Ready to Switch On
1	Switched On
2	Operation Enabled
3	Fault
4	Voltage Enabled
5	Quick Stop
6	Switch on Disabled
7	Warning
8	Unused
9	Remote
10	Reserved
11	Internal Limit Active
12	Drive Follows Command
13	Following Error
14	Move Done
15	In Range

CSP DEFAULT PDOS

The following is a list of parameters included in the default PDOs for CSP mode.

Default CSP Receive PDO (0x1601):

Index[Sub-IDX]	Name	PDO Mapping Value
0x6040	Controlword	0x60400010
0x607A	Target Position	0x607A0020
0x60FE[01]	Digital Outputs	0x60FE0120

Default CSP Transmit PDO (0x1A01):

Index[Sub-IDX]	Name	PDO Mapping Value
0x6041	Statusword	0x60410010
0x6064	Position Actual Value	0x60640020
0x60F4	Following Error Actual Value	0x60F40020
0x60FD	Digital Inputs	0x60FD0020
0x603F	Error Code	0x603F0010

CYCLIC SYNCHRONOUS VELOCITY MODE (CSV)

In CSV mode, the master sends an updated Target Velocity to ClearPath cyclically (at the PDO update cycle rate). ClearPath follows these provided target velocities in real time. The master must "profile" the target velocities to command the desired acceleration (i.e. the Target Velocity should ramp up and down to avoid abrupt changes in speed).

CONTROLWORD (CSV)

The master uses the Controlword to manipulate the state of the ClearPath, allowing for the control of key functions (such as enabling the motor). The bits of the Controlword are unique for each operating mode.

Controlword Bitwise Breakdown:

Bit	Name
0	Switch On
1	Enable Voltage
2	Quick Stop
3	Enable Operation
4-6	Unused
7	Fault Reset
8	Halt
9	Unused
10	Reserved
11-15	Unused

Note: To enable a ClearPath-EC motor, the master must turn on bits 1 and 2 of the Controlword (Ready to Switch On) then set bits 0-3 of the Controlword high (Operation Enabled).

STATUSWORD (CSV)

The master uses the Statusword to obtain feedback about ClearPath's status. The bits of the Statusword are unique for each operating mode.

Statusword Bitwise Breakdown:

Bit	Name
0	Ready to Switch On
1	Switched On
2	Operation Enabled
3	Fault
4	Voltage Enabled
5	Quick Stop
6	Switch on Disabled
7	Warning
8	Unused
9	Remote
10	Reserved
11	Internal Limit Active
12	Drive Follows Command
13	Unused
14	Move Done
15	In Range

CSV DEFAULT PDOS

The following is a list of parameters included in the default PDOs for CSV mode.

Default CSV Receive PDO (0x1602):

Index[Sub-IDX]	Name	PDO Mapping Value
0x6040	Controlword	0x60400010
0x60FF	Target Velocity	0x60FF0020
0x60FE[01]	Digital Outputs	0x60FE0120

Default CSV Transmit PDO (0x1A02):

Index[Sub-IDX]	Name	PDO Mapping Value
0x6041	Statusword	0x60410010
0x6064	Position Actual Value	0x60640020
0x606C	Velocity Actual Value	0x606C0020
0x60FD	Digital Inputs	0x60FD0020
0x603F	Error Code	0x603F0010

CYCLIC SYNCHRONOUS TORQUE MODE (CST)

Cyclic Synchronous Torque Mode (CST) is most appropriate for applications that do not require position or velocity control. In CST mode, the master sends a Target Torque to the ClearPath motor cyclically (at the PDO update cycle rate). This torque is then applied without consideration for the actual position or velocity.

CONTROLWORD (CST)

The master uses the Controlword to manipulate the state of ClearPath, allowing for the control of key functions (such as enabling or disabling the motor). The bits of the Controlword are unique for each operating mode.

Controlword Bitwise Breakdown:

Bit	Name
0	Switch On
1	Enable Voltage
2	Quick Stop
3	Enable Operation
4-6	Unused
7	Fault Reset
8	Halt
9	Unused
10	Reserved
11-15	Unused

Note: To enable a ClearPath-EC motor, the master must turn on bits 1 and 2 of the Controlword (Ready to Switch On) then set bits 0-3 of the Controlword high (Operation Enabled).

STATUSWORD (CST)

The master uses the Statusword to obtain feedback about ClearPath's status. The bits of the Statusword are unique for each operating mode.

Statusword Bitwise Breakdown:

Bit	Name
0	Ready to Switch On
1	Switched On
2	Operation Enabled
3	Fault
4	Voltage Enabled
5	Quick Stop
6	Switch on Disabled
7	Warning
8	Unused
9	Remote
10	Unused
11	Internal Limit Active
12	Drive Follows Command
13-15	Unused

CST DEFAULT PDOS

The following is a list of parameters included in the default PDOs for CST mode.

Default CST Receive PDO (0x1603):

Index[Sub-IDX]	Name	PDO Mapping Value
0x6040	Controlword	0x60400010
0x6071	Target Torque	0x60710010
0x60FE[01]	Digital Outputs	0x60FE0120

Default CST Transmit PDO (0x1A03):

Index[Sub-IDX]	Name	PDO Mapping Value
0x6041	Statusword	0x60410010
0x6064	Position Actual Value	0x60640020
0x6077	Torque Actual Value	0x60770010
0x60FD	Digital Inputs	0x60FD0020
0x603F	Error Code	0x603F0010

HOMING MODE (HM)

In many servo positioning applications, the moving element of the stage (i.e., the load) must be precisely positioned at a known location along the stroke of the axis before accurate positioning can begin. When a ClearPath motor is powered up, the motor does not know exactly where its load is positioned along the stroke. Thus, if an application requires the load to be in a specific location before operations begin, the motor must be homed. Homing ensures that an application will always begin in the same physical location regardless of the motor's position upon power-up.

ClearPath-EC has implemented several automatic homing methods to simplify the homing operation and allow for flexibility in the home target.

HOMING METHODS

Teknic recommends using ClearView 3.0 to configure your homing preferences and choose the optimal homing method. ClearView's homing interface will automatically configure the homing method based on your selected homing preferences. The table below can be used as a quick reference for the various homing methods.

ClearPath-EC Homing Methods:

Homing Method Value (0x6098)	Input Type	Direction
-2	Hard Stop	CW(-)
-1	Hard Stop	CCW(+)
17	Limit Switch	CW(-)
18	Limit Switch	CCW(+)
19	Home Sensor (*Turns On*)	CCW(+)
20	Home Sensor (*Turns Off*)	CW(-)
21	Home Sensor (*Turns On*)	CW(-)
22	Home Sensor (*Turns Off*)	CCW(+)
33	Shaft Angle	CW(-)
34	Shaft Angle	CCW(+)
37	Current Position	N/A

CONTROLWORD (HM)

The master uses the Controlword to manipulate the state of ClearPath, allowing for the control of key functions (such as enabling or disabling the motor). The bits of the Controlword are unique for each operating mode.

Controlword Bitwise Breakdown:

Bit	Name
0	Switch On
1	Enable Voltage
2	Quick Stop
3	Enable Operation
4	Start Homing
5-6	Unused
7	Fault Reset
8	Halt
9	Unused
10	Reserved
11-15	Unused

Note: To enable a ClearPath-EC motor, the master must turn on bits 1 and 2 of the Controlword (Ready to Switch On) then set bits 0-3 of the Controlword high (Operation Enabled).

STATUSWORD (HM)

The master uses the Statusword to obtain feedback about ClearPath's status. The bits of the Statusword are unique for each operating mode.

Statusword Bitwise Breakdown:

Bit	Name
0	Ready to Switch On
1	Switched On
2	Operation Enabled
3	Fault
4	Voltage Enabled
5	Quick Stop
6	Switch on Disabled
7	Warning
8	Unused
9	Remote
10	Target Reached
11	Internal Limit Active
12	Homing Attained
13	Homing Error
14	Move Done
15	In Range

HOMING MODE PROCEDURE

The following are instructions for homing a ClearPath-EC motor using the built-in homing mode. This homing mode can be configured using the ClearView 3.0 software.

1. To begin homing, change from your current operating mode to homing mode by setting the Modes of Operation parameter (0x6060) to 0x06.
2. The servo must be Enabled before it can follow any command. Enable the servo by setting the first four bits of the Controlword (bits 0-3) high.
3. Begin homing by setting the Controlword Start Homing bit (4) high. The motor will begin to move towards its home target (all methods except Method 37 “Current Position”).
4. The motor will signal that the selected homing operation is complete by raising the Homing Attained bit (12) of the Statusword.
5. Change from homing mode back to your desired operating mode by setting the Modes of Operation parameter (0x6060) to the appropriate value (e.g. 0x08 for CSP mode).

PARAMETER DESCRIPTIONS

This section contains detailed descriptions of commonly used parameters organized by functional group.

- Device Information
- PDO Configuration
- Motor Configuration
- Motion Command
- Motor Feedback
- Homing
- Quick Stop, Halt, and Disable Actions
- Power and Temperature
- Torque Limiting and Software Limits
- I/O
- Motor Tuning

Each functional group contains parameters used for a specific function. For a full list of all available parameters, see Appendix A.

DEVICE INFORMATION PARAMETER DETAILS

The Device Information functional group contains parameters with details for your ClearPath-EC Servo.

Device Type (0x1000):
This parameter specifies the type of device. The lower 16 bits contain the device profile number.

Manufacturer Device Name(0x1008):
This parameter contains the motor part number (e.g. CPM-ECHP-3411H-ELSB)

Hardware Revision (0x1009):
This parameter contains Teknic's device hardware revision number.

Software Revision (0x100A):
This parameter contains Teknic's device firmware revision number.

Identity Object (0x1018 [0-4]):
This object contains general information about the device.

- **Number of entries (x1018 [0]):** The number of entries in the identity object.
- **Vendor ID (x1018 [1]):** The Teknic vendor ID.
- **Product code (x1018 [2]):** The EtherCAT product code.
- **Revision number (x1018 [3]):** The EtherCAT product revision number.
- **Serial number (x1018 [4]):** The product's serial number.

On Time (0x201D):
Total powered on time of the motor in tenths of a second.

Position Encoder Resolution (0x608F [0-2]):
This object contains the data required to calculate the position encoder resolution.

- **Highest Subindex Supported (0x608F [0]):** The number of sub-indices supported by the Position encoder resolution parameter (x608F).
- **Encoder Increments (0x608F [1]):** The motor's configured encoder increments Note: *This value is 12800 for part numbers ending in RXXX or 51200 for part numbers ending in EXXX*.
- **Motor Revolutions (0x608F [2]):** The number of motor revolutions Note: *This value should be 1 for all ClearPath-EC motors*.

Position encoder resolution = encoder increments/motor revolutions.

Supported Drive Modes (0x6502):
This object provides information about supported drive modes.

Bit	31-10	9	8	7	6	5	4-0
Value	Reserved	CST	CSV	CSP	Reserved	Homing	Reserved

Version Number (0x67FE):
This object provides the version number of the CiA-402 profile implemented on this device.

Device Profile Number (0x67FF):
This object defines the specific drive type within a multi-device module
Note: This value will be identical to the Device Type in 0x1000.

PDO CONFIGURATION PARAMETER DETAILS

The PDO Configuration functional group contains the parameters used to map objects to PDOs and add the desired PDOs to the Sys Manager.

Receive PDO Mapping Parameter 1 (0x1600 [0-8]):
This object contains the mapped data objects for Receive PDO 1. For more information about mapping objects to a PDO see the Communicating with ClearPath-EC section.

- **Number of entries:** This is the number of entries.
- **Mapping Entry 1-8:** Each sub-index contains a mapped object.

Bit	31-16	15-8	7-0
Value	Object Index	Object Sub-Index	Object Length

Receive PDO Mapping Parameter 2 (0x1601 [0-8]):
This object contains the mapped data objects for Receive PDO 2. For more information about mapping objects to a PDO see the Communicating with ClearPath-EC section.

- **Number of entries:** This is the number of entries.
- **Mapping Entry 1-8:** Each sub-index contains a mapped object.

Bit	31-16	15-8	7-0
Value	Object Index	Object Sub-Index	Object Length

Receive PDO Mapping Parameter 3 (0x1602 [0-8]):
This object contains the mapped data objects for Receive PDO 3. For more information about mapping objects to a PDO see the Communicating with ClearPath-EC section.

- **Number of entries:** This is the number of entries.
- **Mapping Entry 1-8:** Each sub-index contains a mapped object.

Bit	31-16	15-8	7-0
Value	Object Index	Object Sub-Index	Object Length

Receive PDO Mapping Parameter 4 (0x1603 [0-8]):
This object contains the mapped data objects for Receive PDO 4. For more information about mapping objects to a PDO see the Communicating with ClearPath-EC section.

- **Number of entries:** This is the number of entries.
- **Mapping Entry 1-8:** Each sub-index contains a mapped object.

Bit	31-16	15-8	7-0
Value	Object Index	Object Sub-Index	Object Length

Transmit PDO Mapping Parameter 1 (0x1A00 [0-8]):
This object contains the mapped data objects for Transmit PDO 1. For more information about mapping objects to a PDO see the Communicating with ClearPath-EC section.

- **Number of entries:** This is the number of entries.
- **Mapping Entry 1-8:** Each sub-index contains a mapped object.

Bit	31-16	15-8	7-0
Value	Object Index	Object Sub-Index	Object Length

Transmit PDO Mapping Parameter 2 (0x1A01 [0-8]):
This object contains the mapped data objects for Transmit PDO 2. For more information about mapping objects to a PDO see the Communicating with ClearPath-EC section.

- **Number of entries:** This is the number of entries.
- **Mapping Entry 1-8:** Each sub-index contains a mapped object.

Bit	31-16	15-8	7-0
Value	Object Index	Object Sub-Index	Object Length

Transmit PDO Mapping Parameter 3 (0x1A02 [0-8]):
This object contains the mapped data objects for Transmit PDO 3. For more information about mapping objects to a PDO see the Communicating with ClearPath-EC section.

- **Number of entries:** This is the number of entries.
- **Mapping Entry 1-8:** Each sub-index contains a mapped object.

Bit	31-16	15-8	7-0
Value	Object Index	Object Sub-Index	Object Length

Transmit PDO Mapping Parameter 4 (0x1A03 [0-8]):
This object contains the mapped data objects for Transmit PDO 4. For more information about mapping objects to a PDO see the Communicating with ClearPath-EC section.

- **Number of entries:** This is the number of entries.
- **Mapping Entry 1-8:** Each sub-index contains a mapped object.

Bit	31-16	15-8	7-0
Value	Object Index	Object Sub-Index	Object Length

RxPDO Assignment (0x1C12 [0-4]):
This object is used to assign PDOs to the Sync Manager.

- **Number of assigned PDOs:** This sub-index contains the number of assigned PDOs.
- **RxPDO(1-4) Mapping Object:** These sub-indices contain the index of the assigned PDO.

TxPDO Assignment (0x1C13 [0-4]):
This object is used to assign PDOs to the Sync Manager.

- **Number of assigned PDOs:** This sub-index contains the number of assigned PDOs.
- **TxPDO(1-4) Mapping Object:** These sub-indices contain the index of the assigned PDO.

MOTOR CONFIGURATION PARAMETER DETAILS

The Motor Configuration functional group contains the parameters used to configure the motor. These parameters are typically set at the beginning of operation.

Store Parameters (0x1010 [0-1]):
This object supports the saving of EEPROM backed parameters in non-volatile memory. To avoid storage of parameters by mistake, storage is only executed when a specific signature ("save" [0x65766173]) is written to Sub-Index 1.

- **Highest sub-index supported (0x1010 [0]):** The number of supported sub-indices.
- **Save all parameters (0x1010 [1]):** This parameter is used to save values to non-volatile memory.

Application Config Register (0x2018):
The Application Config Register is used to enable features like Move Done Torque Foldback and change the behavior of Software Limits.

Bit	Value
0-22	Reserved

23	0 = Disable Move Done Torque Foldback 1 = Enable Move Done Torque Foldback
24	0 = Base Software Limits off the 0 position 1 = Base Software Limits off the 0 position plus the Home Offset (0x607C)
25-31	Reserved

Following Error Window (0x6065):
This parameter contains the allowed amount of Following Error before a Following Error Shutdown can occur.
Note: Entering a value of 0xFFFFFFFF will turn off the Following Error Shutdown.

Following Error Time Out (0x6066):
This object indicates the amount of time the Following Error can be outside the Following Error Window before a Following Error Shutdown occurs.

Position Window (0x6067):
This object indicates the position window the motor must maintain to be considered In Range (bit 15 of the Statusword).

Position Window Time 0(x6068):
This object indicates the amount of time the motor must be in the Position Window before it's considered In Range (bit 15 of the Statusword).

Polarity (0x607E):
This object is used to set the polarity of the position, velocity, or torque demand value (CCW =0, CW =1). The polarity of the torque demand value can be inverted by raising bit 6 or 7.

Bit	7	6	5-0
Value	Position (or Torque) Polarity	Velocity (or Torque) Polarity	Reserved

Max Motor Speed (0x6080):
This value indicates the maximum allowed motor velocity.

Interpolation Time Period (0x60C2 [0-2]):
This object indicates the time period between two updates of the target position/velocity/torque and is used for intercycle interpolation. Check out the ClearPath-EC Network Timing section for recommended settings.

- **Highest Sub-Index Supported (0x60C2 [0]):** Highest sub-index value supported
- **Interpolation Time Period Value (0x60C2 [1]):** The parameter is the time period value (no units are associated with this value).
- **Interpolation Time Index (0x60C2 [2]):** This parameter is the index for the time period.

The Time Period = $Interpolation\ Time\ Period\ Value^{Interpolation\ TIme\ Index}$

MOTION COMMAND PARAMETER DETAILS

The Motion Command functional group contains the parameters used to enable the motor and command motion.

Controlword (0x6040):

This object is used to Enable/Disable the motor and command stopping moves (i.e. Quick Stops and Halts) by transitioning through the Finite State Automaton (FSA) states. Check the Operating Modes section for a more detailed control word breakdown.

Modes of Operation (0x6060):

This object is used to select the desired operational mode.
Note: It only shows the requested operating mode, not the current operating mode.

Enter the following values to change operating modes:

- **Homing Mode:** 0x06
- **Cyclic Synchronous Position Mode:** 0x08
- **Cyclic Synchronous Velocity Mode:** 0x09
- **Cyclic Synchronous Torque Mode:** 0x0A

Target Torque (0x6071):

This object indicates the input value for the torque and is used to command the motor in cyclic synchronous torque mode. When this value is modified, the ClearPath will attempt to reach the new target torque before the next update cycle.

Target Position (0x607A):

This object contains the input value for the position controller and is used to command the motor in cyclic synchronous position mode. When this value is modified, the ClearPath will attempt to reach the new target position before the next update cycle.

Target Velocity (0x60FF):

This object contains the input value for the velocity controller and is used to command the motor in cyclic synchronous velocity mode. When this value is modified, the ClearPath will attempt to reach the new target velocity before the next update cycle.

MOTOR FEEDBACK PARAMETER DETAILS

The Motor Feedback functional group contains parameters that provide information about the motors state including error codes, sensor feedback, and motion data.

Error Register (0x1001):
The error register is a field of 8 bits, each for a certain error type. The appropriate bit will be set when an error occurs.

Bit	Value
0	Generic Error
1	Current
2	Voltage
3	Temperature
4	Communication Error (Overrun, Error State)
5	Device Profile Specific
6	Reserved
7	Manufacturer Specific

Alert Register (0x2009):
This parameter contains the motor's real-time alert register. Teknic recommends using ClearView 3.0 to identify the shutdown and troubleshoot the issue if an alert is encountered.

Bus Voltage Measured (0x2118):
The parameter represents the motor's current bus voltage.

Drive Temperature (0x2123):
The parameter contains the current drive temperature in degrees Celsius.

Mechanical Position (0x216F):
This parameter contains the current encoder index ranging from 0 to the encoder density (x2136).

RMS Level (0x230F):
The RMS level is a root means squared calculation of current usage (or torque) over time. If this value reaches 100%, the motor will go into fault.

Error Code (0x603F):
This parameter provides the error code for the last error that occurred. Teknic recommends using ClearView 3.0 to identify the shutdown and troubleshoot the issue if an alert is encountered.

Statusword (0x6041):
This object provides information about the motor's current state (e.g. enabled/disabled, fault) and status (e.g. limit switch state, in range, and move done). Check the Operating Modes section for a more detailed Statusword breakdown.

Modes of Operation Display (0x6061):
This object displays the current operating mode.

- 0x06 = Homing Mode
- 0x08 = Cyclic Synchronous Position Mode

- 0x09 = Cyclic Synchronous Velocity Mode
- 0x0A = Cyclic Synchronous Torque Mode

Position Demand Value (0x6062):
This object provides the position output from the trajectory generator.

Position Actual (0x6064):
This parameter contains the motor's current position (aka encoder feedback).

Velocity Demand Value (0x606B):
This object provides the demand velocity output by the trajectory generator.

Velocity Actual Value (0x606C):
This object contains the measured instantaneous velocity of the motor.

Torque Demand Value (0x6074):
This object provides the demand torque value output by the trajectory generator.

Torque Actual Value (0x6077):
This object provides the measured instantaneous torque of the motor.

DC Link Circuit Voltage (0x6079):
This object provides the instantaneous DC link voltage at the drive device.

Follow Error Actual Value (0x60F4):
This object contains the motor's real-time following error. Following Error is defined as the difference between the Position Actual Value (0x6064) and the Position Demand Value (0x6062).

HOMING PARAMETER DETAILS

The Homing functional group contains parameters used when the motor is in homing mode. Many of these parameters can be easily set in the Homing and Position Limits Setup window in ClearView 3.0. See the ClearPath-EC User Manual for details.

Hardstop Torque Maximum (0x216B):
The max allowed torque (as a percent of the motor's max torque) used when the motor is homing to a hardstop (0 means the default max torque (0x215E) will be used).

Physical Home Clearance (0x2201):
The move distance after the home position has been reached before the zero position is set. Teknic recommends setting this parameter equal to 1/4 of a rev when homing to a hardstop.

Shaft Homing Target (0x2300):

This parameter contains the shaft angle used as a homing target for homing methods 33 and 34

Home Offset (0x607C):
This object represents the difference between the zero position for the application and the machine's detected home position.

Homing Method (0x6098):
This object is used to set the active homing method.

Available Homing Methods	Input Type	Direction
-2	Hard Stop	CW(-)
-1	Hard Stop	CCW(+)
17	Limit Switch	CW(-)
18	Limit Switch	CCW(+)
19	Home Sensor (*Turns On*)	CW(-)
20	Home Sensor (*Turns Off*)	CCW(+)
21	Home Sensor (*Turns On*)	CW(-)
22	Home Sensor (*Turns Off*)	CCW(+)
33	Shaft Angle	CW(-)
34	Shaft Angle	CCW(+)
37	Current Position	N/A

Homing Speeds (0x6099 [0-2]):
This object indicates the commanded speeds used during homing.

- **Highest Subindex supported (0x6099 [0]):** Stores the number of supported sub-indices
- **Fast Homing Speed (0x6099 [1]):** The fast homing speed is used for the initial move towards the sensor in limit switch and sensor-based homing modes.
- **Slow Homing Speed (0x6099 [2]):** The slow homing speed is used for hardstop homing, shaft angle homing, and capturing a more accurate sensor position.

Homing Acceleration (0x609A):
This object contains the acceleration/deceleration used during homing.

Position Offset (0x60B0):
The motor will report this position value after homing is complete. *Note: This value does not affect the physical position of the motor.*

Supported Homing Methods (0x60E3 [0-11]):
This object indicates the drives supported homing methods.

- **Highest Subindex Supported (0x60E3 [0]):** The number of supported sub-indices.
  Note: This value also equals the number of supported homing methods.
- **1st Supported Homing Method (0x60E3 [1]):** 17 = Limit Switch CW(-)

- **2nd Supported Homing Method (0x60E3 [2]):** 18 = Limit Switch CCW(+)
- **3rd Supported Homing Method (0x60E3 [3]):** 19 = Home Sensor (Turns On) CW(-)
- **4th Supported Homing Method (0x60E3 [4]):** 20 = Home Sensor (Turns Off) CCW(+)
- **5th Supported Homing Method (0x60E3 [5]):** 21 = Home Sensor (Turns On) CW(-)
- **6th Supported Homing Method (0x60E3 [6]):** 22 = Home Sensor (Turns Off) CCW(+)
- **7th Supported Homing Method (0x60E3 [7]):** 37 = Current Position
- **8th Supported Homing Method (0x60E3 [8]):** -1 = Hard Stop CCW(+)
- **9th Supported Homing Method (0x60E3 [9]):** -2 = Hard Stop CW(-)
- **10th Supported Homing Method (0x60E3 [10]):** 33 = Shaft Angle CW(-)
- **11th Supported Homing Method (0x60E3 [11]):** 34 = Shaft Angle CCW(+)

QUICK STOP, HALT, AND DISABLE ACTIONS PARAMETER DETAILS

The Quick Stop, Halt, and Disable Actions functional group contains parameters used to configure these features.

Delay Disable Time (0x2170):
The delay between a disable command and the drive disabling.
Note: This object is commonly used to ensure a power off brake is engaged before the motor disables.

Abort Connection Option Code (0x6007):
This object indicates what action will be performed when connection is lost to the to the controller (i.e. an EtherCAT Master or ClearView), or when the device is reset.
Note: The motor will always abrupt stop in CSP mode.

Value	Stop Action
0	No Action: When this option is selected, the motor will continue to execute the last command sent by the controller.
1	Fault Reaction: When this option is selected, the motor will disable, engage the dynamic break, and change to the Finite State Automaton (FSA) fault state.
2	Disable Voltage Command: The motor will follow the Disable Operation Option Code when connection is lost or the motor is reset.
3	Quick Stop Command (*default*): The motor will follow the Quick Stop Option Code when connection is lost or the motor is reset.

Quick Stop Option Code (0x605A):

This object indicates what action is performed when the Quick Stop function is executed. To execute a Quick Stop, lower bit 2 of the Controlword (0x6040).

Value	Stop Action
0	Coast to Stop: The motor will spin freely, disable the drive, and transition to the SWITCH ON DISABLED Finite State Automaton (FSA) state.
-1	Dynamic Brake (*default*): The motor will engage the dynamic break, disable the drive, and transition to the SWITCH ON DISABLED Finite State Automation (FSA) state.
-2	Abrupt Stop: The motor will use power to abruptly stop, disable the drive after the Delay Disable Time (0x2170), and transition to the SWITCH ON DISABLED Finite State Automation (FSA) state.
2	Ramp to Stop: The motor will use power to decelerate to a stop using the Quick Stop Deceleration (0x6085), disable the drive after the Delay Disable Time (0x2170), and transition to the SWITCH ON DISABLED Finite State Automation (FSA) state.

Disable Operation Option Code (0x605C):
This object indicates what action is performed when the drive is disabled (transitions from OPERATION ENABLED to the SWITCHED ON Finite State Automation (FSA) state.

Value	Stop Action
0	Coast to Stop: The motor will spin freely, disable the drive, and transition to the SWITCH ON DISABLED Finite State Automaton (FSA) state.
-1	Dynamic Brake (*default*): The motor will engage the dynamic break, disable the drive, and transition to the SWITCH ON DISABLED Finite State Automation (FSA) state.
-2	Abrupt Stop: The motor will use power to abruptly stop, disable the drive after the Delay Disable Time (0x2170), and transition to the SWITCH ON DISABLED Finite State Automation (FSA) state.
1	Ramp to Stop: The motor will use power to decelerate to a stop using the Quick Stop Deceleration (0x6085), disable the drive after the Delay Disable Time (0x2170), and transition to the SWITCH ON DISABLED Finite State Automation (FSA) state.

Halt Option Code (0x605D):
This object indicates what action is performed when the halt function is executed. To execute a fault, raise bit 8 of the Controlword (0x6040).

Value	Stop Action

-1	Abrupt Stop: The motor will use power to abruptly stop. The motor will stay in the OPERATION ENABLED Finite State Automation (FSA) state after the stop is complete.
2	Ramp to Stop: The motor will use power to decelerate to a stop using the Quick Stop Deceleration (0x6085). The motor will stay in the OPERATION ENABLED Finite State Automation (FSA) state after the stop is complete.

Quick Stop Deceleration (0x6085):
This object indicates the deceleration used to stop the motor when an Abrupt Stop or Ramp to Stop is executed.

POWER AND TEMPERATURE PARAMETER DETAILS

The Power and Temperature functional group contains parameters used to configure the power and temperature limits.

Minimum Operating Volts (0x2242):
Minimum allowable operating voltage. If the bus voltage drops below this value, a motor alert will be triggered.

Max User Temp (0x2243):
Max drive temp before an overtemp warning/alert is triggered.

Bis Current Trip (0x2244):
Max allowed bus current before triggering an RMS alert.

TORQUE LIMITING AND SOFTWARE LIMITS PARAMETER DETAILS

The Torque Limiting and Software Limits functional group contains parameters used to limit the motor's torque output and configure the software limits.

Max Torque (0x6072):
This parameter is used to limit the amount of torque the motor can output in either direction. This value equals the maximum amount of torque the motor can use, 1000 = 100% of the motor's peak torque. *Note: The motor's maximum torque in each direction is limited to the smaller of the Max Torque and that direction's torque limit (Positive Torque Limit Value (0x60E0) or Negative Torque Limit Value (0x60E1)).*

Software Position Limit (0x607D [0-2]):
This object represents the absolute software position limits based on the machine's 0 position after homing. *Note: Homing must be complete for software limits to take effect.*

- **Highest sub-index supported (x607D [0]):** The number of sub-indices supported by the Software position limit object.
- **Min software position limit (x607D [1]):** Position limit lower bound.

- **Max software position limit (x607D [2]):** Position limit upper bound.

Positive Torque Limit Value (0x60E0):
This parameter is used to limit the amount of torque the motor can output in the positive direction. This value equals the maximum amount of torque the motor can use, 1000 = 100% of the motor's peak torque. *Note: The motor's maximum torque in the positive direction is limited to the smaller of the Max Torque (0x6072) and the Positive Torque Limit Value.*

Negative Torque Limit Value (0x60E1):
This parameter is used to limit the amount of torque the motor can output in the negative direction. This value equals the maximum amount of torque the motor can use, 1000 = 100% of the motor's peak torque. *Note: The motor's maximum torque in the negative direction is limited to the smaller of the Max Torque (0x6072) and the Negative Torque Limit Value.*

I/O PARAMETER DETAILS

The I/O Parameter functional group contains objects used to control ClearPath-EC's inputs, outputs, and high-powered brake. ClearPath-EC the I/O can be easily accessed through the 8-pin Molex connector on the M12 adapter. For wiring information, please reference the ClearPath-EC User Manual.

Input A Filter Time (0x2063):
The amount of time input A must be triggered before a state change is reported.

Input B Filter Time (0x2066):
The amount of time input B must be triggered before a state change is reported.

Digital Input Map (0x230E):
The Digital Input Map is used to define the mapping of external physical devices to inputs on the M12 Adapter.

Bit	Value
0-1	0 = Negative Limit Switch is unused 1 = Negative Limit Switch is mapped to input A 2 = Negative Limit Switch is mapped to input B
2	0 = Negative limit switch source is taken as-is 1 = Negative limit switch source is inverted
3-4	0 = Positive Limit Switch is unused 1 = Positive Limit Switch is mapped to input A 2 = Positive Limit Switch is mapped to input B
5	0 = Positive limit switch source is taken as-is 1 = Positive limit switch source is inverted
6-7	0 = Home Switch is unused

	1 = Home Switch is mapped to input A 2 = Home Switch is mapped to input B
8	Reserved
9-10	0 = Interlock is unused 1 = Interlock is mapped to input A 2 = Interlock is mapped to input B
11	0 = Interlock source is taken as-is 1 = Interlock source is inverted
12-14	Reserved
15	0 = Autobrake is off (no brake is hooked up to output B) 1 = Autobrake is on (a brake is hooked up to output B)

Touch Probe Function (0x60B8):
This object is used to configure ClearPath-EC's touch probe feature.

Bit	Value
0	0 = Switch off touch probe 1 1 = Enable touch probe 1
1	0 = Only trigger Touch Probe 1 on the first edge transition 1 = Trigger Touch Probe 1 on every edge transition
2	0 = Trigger Touch Probe 1 using input A 1 = Trigger with zero-pulse signal
3	Reserved
4	0 = Disable sampling at positive edge of Touch Probe 1 1 = Enable sampling at positive edge of Touch Probe 1
5	0 = Disable sampling at negative edge of Touch Probe 1 1 = Enable sampling at negative edge of Touch Probe 1
6-7	Reserved
8	0 = Switch off Touch Probe 2 1 = Enable Touch Probe 2
9	0 = Only trigger Touch Probe 2 on first edge transition 1 = Trigger Touch Probe 2 on every edge transition
10-	0 = Trigger Touch Probe 2 using input B 1 = Trigger with zero-pulse signal
11	Reserved
12	0 = Disable sampling at positive edge of Touch Probe 2 1 = Enable sampling at positive edge of Touch Probe 2
13	0 = Disable sampling on negative edge of Touch Probe 2 1 = Enable sampling at negative edge of Touch Probe 2
14-15	Reserved

Note: When enabled, Touch Probe 1 acts as a high-speed input and ignores the Input A Filter Time (0x2063).

Touch Probe Status (0x60B9):
This object contains touch probe status information and is used to verify the Touch Probe's configuration and identify when positions have been captured.

Bit	Value
0	0 = Touch Probe 1 is switched off 1 = Touch Probe 1 is enabled
1	0 = Touch Probe 1 no positive edge value stored 1 = Touch Probe 1 positive edge position stored
2	0 = Touch Probe 1 no negative edge value stored 1 = Touch Probe 1 negative edge position stored
3-7	Reserved
8	0 = Touch Probe 2 is switched off 1 = Touch Probe 2 is enabled
9	0 = Touch Probe 2 no positive edge value stored 1 = Touch Probe 2 positive edge position stored
10	0 = Touch Probe 2 no negative edge value stored 1 = Touch Probe 2 negative edge position stored
11-15	Reserved

Touch Probe Position 1 Positive Value (0x60BA):
This object contains the position value Touch Probe 1 captured at the last positive edge transition.

Touch Probe Position 1 Negative Value (0x60BB):
This object contains the position value Touch Probe 1 captured at the last negative edge transition.

Touch Probe Position 2 Positive Value (0x60BC):
This object provides the position value Touch Probe 2 captured at the last positive edge transition.

Touch Probe Position 2 Negative Value (0x60BD):
This object provides the position value Touch Probe 2 captured at the last negative edge transition.

Touch Probe 1 Positive Edge Counter (0x60D5):
This object provides a continuous counter that is incremented with each positive edge transition of Touch Probe 1. The counter is only valid if the touch probe input is enabled. For single event measuring, only the value of bit 0 shall be evaluated. For continuous measuring, the value is an unsigned 16-bit number with overflow.

Touch Probe 1 Negative Edge Counter (0x60D6):
This object provides a continuous counter that is incremented with each negative edge transition of Touch Probe 1. The counter is only valid if the touch probe input is enabled. For single event measuring, only the value of bit 0 shall be evaluated. For continuous measuring, the values is an unsigned 16-bit number with overflow.

Touch Probe 2 Positive Edge Counter (0x60D7):

This object provides a continuous counter that is incremented with each positive edge transition of Touch Probe 2. The counter is only valid if the touch probe input is enabled. For single event measuring, only the value of bit 0 shall be evaluated. For continuous measuring, the value is an unsigned 16-bit number with overflow.

Touch Probe 2 Negative Edge Counter (0x60D8):

This object provides a continuous counter that is incremented with each negative edge transition of Touch Probe 2. The counter is only valid if the touch probe input is enabled. For single event measuring, only the value of bit 0 shall be evaluated. For continuous measuring, the values is an unsigned 16-bit number with overflow.

Digital Inputs (0x60FD):

This object contains the current state of ClearPath-EC's digital inputs.

Bit	Value
0	0 = Negative Limit Switch not reached 1 = Negative Limit Switch reached
1	0 = Positive Limit Switch not reached 1 = Positive Limit Switch reached
2	0 = Home Sensor not reached 1 = Home Sensor reached
3	0 = Interlock not active (Motion disabled) 1 = Interlock Active (Motion allowed)
4-15	Reserved
16	0 = Input A line is off 1 = Input A line is on
17	0 = Input B line is off 1 = Input B line is on
18	0 = External brake (0x230E) should be engaged/Autobrake is engaged 1 = External brake (0x230E) should be disengaged/Autobrake is disengaged
19	0 = Communication with an EtherCAT network has not been established 1 = Communication with an EtherCAT network has been established

Digital outputs (x60FE [0-2]):

This object is used to control ClearPath-EC's digital outputs.

Bit	Value
0	0 = Enable brake 1 = Disable Brake
1-15	Reserved
16	0 = Output A off 1 = Output A on

17	0 = Output B off 1 = Output B on
18-31	Reserved

MOTOR TUNING PARAMETER DETAILS

Teknic recommends using the auto-tuner provided in the ClearView 3.0 software to tune your ClearPath-EC motor. You can download ClearView 3.0 from the downloads page on Teknic's website HERE. Additional information about ClearView 3.0 and the auto-tuning process can be found in the ClearPath-EC User Manual.

APPENDIX A: CLEARPATH-EC PARAMETER TABLE

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x1000	0	Device Type	0x20192		U32	RO					Device Info
x1001	0	Error Register			U8	RO					Motor Feedback
x1008	0	Manufacturer Device Name			STR[21]	RO					Device Info
x1009	0	Manufacturer Hardware Version			STR[3]	RO					Device Info
x100A	0	Manufacturer Software Version			STR[10]	RO					Device Info
x1010	Store Parameters										
x1010	0	Highest Subindex Supported			U8	RO					Motor Config
x1010	1	Save All Parameters	-		U32	RO*		0	4294967295		Motor Config
x1018	Identity Object										
x1018	0	Number Of Entries	4		U8	RO					Device Info
x1018	1	Vendor Id	0xC96		U32	RO					Device Info
x1018	2	Product Code	0x1		U32	RO					Device Info
x1018	3	Revision Number	1		U32	RO					Device Info
x1018	4	Serial Number			U32	RO					Device Info
x1600	Receive PDO Mapping Parameter 1										
x1600	0	Number Of Entries	8		U8	RO*		0	8		PDO Config
x1600	1	Mapping Entry 1	0x60400010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1600	2	Mapping Entry 2	0x60600008		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1600	3	Mapping Entry 3	0x607A0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1600	4	Mapping Entry 4	0x60FF0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1600	5	Mapping Entry 5	0x60710010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1600	6	Mapping Entry 6	0x60FE0120		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1600	7	Mapping Entry 7	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1600	8	Mapping Entry 8	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1601	Receive PDO Mapping Parameter 2										
x1601	0	Number Of Entries	8		U8	RO*		0	8		PDO Config
x1601	1	Mapping Entry 1	0x60400010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1601	2	Mapping Entry 2	0x607A0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x1601	3	Mapping Entry 3	0x60FE0120		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1601	4	Mapping Entry 4	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1601	5	Mapping Entry 5	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1601	6	Mapping Entry 6	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1601	7	Mapping Entry 7	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1601	8	Mapping Entry 8	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1602	Receive PDO Mapping Parameter 3										
x1602	0	Number Of Entries	8		U8	RO*		0	8		PDO Config
x1602	1	Mapping Entry 1	0x60400010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1602	2	Mapping Entry 2	0x60FF0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1602	3	Mapping Entry 3	0x60FE0120		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1602	4	Mapping Entry 4	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1602	5	Mapping Entry 5	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1602	6	Mapping Entry 6	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1602	7	Mapping Entry 7	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1602	8	Mapping Entry 8	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1603	Receive PDO Mapping Parameter 4										
x1603	0	Number Of Entries	8		U8	RO*		0	8		PDO Config
x1603	1	Mapping Entry 1	0x60400010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1603	2	Mapping Entry 2	0x60710010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1603	3	Mapping Entry 3	0x60FE0120		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1603	4	Mapping Entry 4	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1603	5	Mapping Entry 5	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1603	6	Mapping Entry 6	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1603	7	Mapping Entry 7	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1603	8	Mapping Entry 8	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A00	Transmit PDO Mapping Parameter 1										
x1A00	0	Number Of Entries	8		U8	RO*		0	8		PDO Config
x1A00	1	Mapping Entry 1	0x60410010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A00	2	Mapping Entry 2	0x60610008		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A00	3	Mapping Entry 3	0x60640020		U32	RO*		0x0	0xFFFFFFFF		PDO Config

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x1A00	4	Mapping Entry 4	0x606C0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A00	5	Mapping Entry 5	0x60770010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A00	6	Mapping Entry 6	0x60FD0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A00	7	Mapping Entry 7	0x60F40020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A00	8	Mapping Entry 8	0x603F0010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A01	Transmit PDO Mapping Parameter 2										
x1A01	0	Number Of Entries	8		U8	RO*		0	8		PDO Config
x1A01	1	Mapping Entry 1	0x60410010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A01	2	Mapping Entry 2	0x60640020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A01	3	Mapping Entry 3	0x60F40020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A01	4	Mapping Entry 4	0x60FD0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A01	5	Mapping Entry 5	0x603F0010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A01	6	Mapping Entry 6	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A01	7	Mapping Entry 7	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A01	8	Mapping Entry 8	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A02	Transmit PDO Mapping Parameter 3										
x1A02	0	Number Of Entries	8		U8	RO*		0	8		PDO Config
x1A02	1	Mapping Entry 1	0x60410010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A02	2	Mapping Entry 2	0x60640020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A02	3	Mapping Entry 3	0x606C0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A02	4	Mapping Entry 4	0x60FD0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A02	5	Mapping Entry 5	0x603F0010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A02	6	Mapping Entry 6	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A02	7	Mapping Entry 7	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A02	8	Mapping Entry 8	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A03	Transmit PDO Mapping Parameter 4										
x1A03	0	Number Of Entries	8		U8	RO*		0	8		PDO Config
x1A03	1	Mapping Entry 1	0x60410010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A03	2	Mapping Entry 2	0x60640020		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A03	3	Mapping Entry 3	0x60770010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A03	4	Mapping Entry 4	0x60FD0020		U32	RO*		0x0	0xFFFFFFFF		PDO Config

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x1A03	5	Mapping Entry 5	0x603F0010		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A03	6	Mapping Entry 6	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A03	7	Mapping Entry 7	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1A03	8	Mapping Entry 8	0x0		U32	RO*		0x0	0xFFFFFFFF		PDO Config
x1C00	Sync Manager Communication Type										
x1C00	0	Highest Subindex Supported	4		U8	RO					Device Info
x1C00	1	Sync Manager 0 Communication Type	1		U8	RO					Device Info
x1C00	2	Sync Manager 1 Communication Type	2		U8	RO					Device Info
x1C00	3	Sync Manager 2 Communication Type	3		U8	RO					Device Info
x1C00	4	Sync Manager 3 Communication Type	4		U8	RO					Device Info
x1C12	RxPDO Assignment										
x1C12	0	Number Of Assigned PDOs	4		U8	RO*		0	4		PDO Config
x1C12	1	Rxpdo1 Mapping Object	0x1601		U16	RO*		0x1600	0x1BFF		PDO Config
x1C12	2	Rxpdo2 Mapping Object	0x0		U16	RO*		0x1600	0x1BFF		PDO Config
x1C12	3	Rxpdo3 Mapping Object	0x0		U16	RO*		0x1600	0x1BFF		PDO Config
x1C12	4	Rxpdo4 Mapping Object	0x0		U16	RO*		0x1600	0x1BFF		PDO Config
x1C13	TxPDO Assignment										
x1C13	0	Number Of Assigned PDOs	4		U8	RO*		0	4		PDO Config
x1C13	1	Txpdo1 Mapping Object	0x1A01		U16	RO*		0x1600	0x1BFF		PDO Config
x1C13	2	Txpdo2 Mapping Object	0x0		U16	RO*		0x1600	0x1BFF		PDO Config
x1C13	3	Rxpdo3 Mapping Object	0x0		U16	RO*		0x1600	0x1BFF		PDO Config
x1C13	4	Rxpdo4 Mapping Object	0x0		U16	RO*		0x1600	0x1BFF		PDO Config
x1C32	RxPDO Synchronization										
x1C32	0	Number Of Synchronization Parameters	32		U8	RO					Device Info
x1C32	1	Synchronization Type	0		U16	RW		0	63		PDO Config
x1C32	2	Cycle Time	0	ns	U32	RW		0	4294967295		PDO Config
x1C32	3	Shift Time	0	ns	U32	RW		0	4294967295		PDO Config
x1C32	4	Synchronization Types Supported	7		U16	RO					Device Info
x1C32	5	Minimum Cycle Time	62500	ns	U32	RO					Device Info
x1C32	6	Calc And Copy Time	62500		U32	RO					Device Info
x1C32	7	Minimum Delay Time	0		U32	RO					Device Info

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x1C32	8	Get Cycle Time	0		U16	RW		0	3		PDO Config
x1C32	9	Delay Time	0		U32	RO					Device Info
x1C32	10	Sync0 Cycle Time	0		U32	RW		0	4294967295		PDO Config
x1C32	11	Smevent Missed	0		U16	RO					Device Info
x1C32	12	Cycle Time Too Small	0		U16	RO					Device Info
x1C32	13	Shift Time Too Short	0		U16	RO					Device Info
x1C32	14	Rxpdo Toggle Failed	0		U16	RO					Device Info
x1C32	15	Minimum Cycle Distance	0	ns	U32	RO					Device Info
x1C32	16	Maximum Cycle Distance	0	ns	U32	RO					Device Info
x1C32	17	Minimum Sm Sync Distance	0	ns	U32	RO					Device Info
x1C32	18	Maximum Sm Sync Distance	0	ns	U32	RO					Device Info
x1C32	19	Sync Error	0		BOOL	RO					Device Info
x1C33	TxPDO Synchronization										
x1C33	0	Number Of Synchronization Parameters	32		U8	RO					Device Info
x1C33	1	Synchronization Type	0		U16	RW		0	63		PDO Config
x1C33	2	Cycle Time	0	ns	U32	RO					Device Info
x1C33	3	Shift Time	300000	ns	U32	RW		0	4294967295		PDO Config
x1C33	4	Synchronization Types Supported	7		U16	RO					Device Info
x1C33	5	Minimum Cycle Time	62500	ns	U32	RO					Device Info
x1C33	6	Calc And Copy Time	62500		U32	RO					Device Info
x1C33	7	Minimum Delay Time	0		U32	RO					Device Info
x1C33	8	Get Cycle Time	0		U16	RW		0	65535		PDO Config
x1C33	9	Delay Time	0		U32	RO					Device Info
x1C33	10	Sync0 Cycle Time	0		U32	RO					Device Info
x1C33	11	Smevent Missed	0		U16	RO					Device Info
x1C33	12	Cycle Time Too Small	0		U16	RO					Device Info
x1C33	13	Shift Time Too Short	0		U16	RO					Device Info
x1C33	14	Rxpdo Toggle Failed	0		U16	RO					Device Info
x1C33	15	Minimum Cycle Distance	0		U32	RO					Device Info
x1C33	16	Maximum Cycle Distance	0		U32	RO					Device Info
x1C33	17	Minimum Sm Sync Distance	0		U32	RO					Device Info

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x1C33	18	Maximum Sm Sync Distance	0		U32	RO					Device Info
x1C33	19	Sync Error	0		BOOL	RO					Device Info
x2009	0	Alert Register			BYTE[12]	RO	Tx				Motor Feedback
x2017	0	Hw Config Register	-		U32	RW		0x0	0xFFFFFFFF	Yes	Motor Config
x2018	0	Application Config Register	0x0		U32	RW		0x0	0xFFFFFFFF	Yes	Motor Config
x201D	0	On Time		0.1s	U32	RO					Device Info
x2039	0	Ras Delay		ms	U16	RO					Motor Tuning
x2048	0	Internal Parameter 72	1000		U16	RW		0	8191	Yes	Motor Config
x204A	0	Internal Parameter 74	-		I32	RW		0	219999	Yes	Motor Config
x205C	0	Move Done Time	10	ms	I16	RW		0	8191	Yes	Motor Config
x2063	0	Input A Filter Time	5	ms	U16	RW		0	4850	Yes	I/O
x2066	0	Input B Filter Time	5	ms	U16	RW		0	4850	Yes	I/O
x2068	0	Internal Parameter 104			I32	RO					Motor Config
x2069	0	Internal Parameter 105	2000		U16	RW		0	10000	Yes	Motor Config
x206A	0	Internal Parameter 106	1000		U16	RW		0	10000	Yes	Motor Config
x206B	0	Internal Parameter 107	500		U16	RW		0	10000	Yes	Motor Config
x206F	0	Internal Parameter 111	300		U16	RW		0	8191	Yes	Motor Config
x2071	0	Internal Parameter 113	-		U16	RW		0	65535	Yes	Motor Config
x2072	0	Internal Parameter 114	-		U16	RW		0	65535	Yes	Motor Config
x2073	0	Internal Parameter 115	100		U16	RW		0	8191	Yes	Motor Config
x210B	0	Internal Parameter 267	-		I32	RW		0	2147483647	Yes	Motor Config
x210E	0	Internal Parameter 270	-		I32	RW		0	2147483647	Yes	Motor Config
x210F	0	Internal Parameter 271	-		U16	RW		0	123	Yes	Motor Config
x2113	0	Internal Parameter 275	-		I32	RW		0	2147483647	Yes	Motor Config
x2118	0	Bus Voltage Measured		V	U16	RO					Power & Temp
x2123	0	Drive Temperature	0	°C	I16	RO					Power & Temp
x2135	0	Internal Parameter 309	-		U16	RW		0	65535	Yes	Motor Tuning
x213E	0	Kip	-		U16	RW		0	65535	Yes	Motor Tuning
x213F	0	Kii	-		U16	RW		0	65535	Yes	Motor Tuning
x2143	0	Kr	-		I16	RW		0	32767	Yes	Motor Tuning
x2144	0	Internal Parameter 324	-		U16	RW		0	65535	Yes	Motor Tuning

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x2145	0	Tuning Config Register	0x21		U32	RW		0x0	0xFFFFFFFF	Yes	Motor Config
x2146	0	Kv	-		U32	RW		0	4294967295	Yes	Motor Tuning
x2147	0	Kp	-		U32	RW		0	4294967295	Yes	Motor Tuning
x2148	0	Ki	-		U32	RW		0	4294967295	Yes	Motor Tuning
x2149	0	Kfv	-		U32	RW		0	4294967295	Yes	Motor Tuning
x214A	0	Kfa	-		U32	RW		0	4294967295	Yes	Motor Tuning
x214B	0	Kfj	-		U32	RW		0	4294967295	Yes	Motor Tuning
x214D	0	Knv	-		U32	RW		0	4294967295	Yes	Motor Tuning
x214E	0	Internal Parameter 334	50		I16	RW		0	9430	Yes	Motor Config
x214F	0	Torque Bias	0	0.003%	I16	RW		0	32767	Yes	Motor Tuning
x2150	0	Internal Parameter 336	-		U16	RW		0	65535	Yes	Motor Config
x2151	0	Internal Parameter 337	-		U16	RW		0	65535	Yes	Motor Config
x2152	0	Internal Parameter 338	50		U16	RW		0	8191	Yes	Motor Config
x2153	0	Internal Parameter 339	-		U32	RW		0	4294967295	Yes	Motor Config
x2154	0	Internal Parameter 340	-		U32	RW		0	4294967295	Yes	Motor Config
x2155	0	Internal Parameter 341	-		U16	RW		0	65535	Yes	Motor Config
x2156	0	Internal Parameter 342	-		U16	RW		0	65535	Yes	Motor Config
x215A	0	Internal Parameter 346	-		I32	RW		0	2147483647	Yes	Motor Config
x215B	0	Internal Parameter 347	-		I32	RW		0	2147483647	Yes	Motor Config
x215C	0	Internal Parameter 348	-		I32	RW		0	2147483647	Yes	Motor Config
x215D	0	Fine Tuning Slider	19		U16	RW		0	31	Yes	Motor Tuning
x2163	0	Move Done Torque Foldback	0	0.1%	I16	RW		0	1000	Yes	Limits
x2164	0	Move Done Torque Foldback Tc	200	ms	I16	RW		0	10000	Yes	Limits
x2167	0	Internal Parameter 359	-		I32	RW		0	299999	Yes	Motor Config
x2168	0	Internal Parameter 360	-		I16	RW		0	1000	Yes	Motor Config
x2169	0	Internal Parameter 361	50		I16	RW		0	8191	Yes	Motor Config
x216A	0	Internal Parameter 362	-		I16	RW		0	1024	Yes	Motor Config
x216B	0	Hardstop Torque Maximum	-	0.1%	I16	RW		0	1000	Yes	Homing
x216C	0	Internal Parameter 364	-		U16	RW		0	32767	Yes	Motor Config
x216F	0	Mechanical Position		cnts	I32	RO					Motor Feedback
x2170	0	Delay Disable Time	-	ms	I16	RW		0	16383	Yes	Stop Actions

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x2172	0	Internal Parameter 370	10		I16	RW		0	275	Yes	Motor Config
x2173	0	Internal Parameter 371	-		I16	RW		0	1024	Yes	Motor Config
x2201	0	Physical Home Clearance	0		U32	RW		0	4294967295	Yes	Homing
x2209	0	Internal Parameter 521	500		I16	RW		1	8191	Yes	Motor Config
x2242	0	Minimum Operating Volts	-	V	I16	RW		0	92	Yes	Power & Temp
x2243	0	Max User Temp	-		I16	RW		0	93	Yes	Power & Temp
x2244	0	Bus Current Trip	-	A	I16	RW		0	9	Yes	Power & Temp
x2300	0	Shaft Homing Target	4294967295	cnts	U32	RW		0	4294967295	Yes	Homing
x2302	0	Last Home Location	-1	cnts	I32	RO					Homing
x230E	0	Digital Input Map	0x0		U16	RW		0x0	0xFFFF	Yes	I/O
x230F	0	Rms Level		0.1%	U16	RO	Tx				Motor Feedback
x6007	0	Abort Connection Option Code	3		I16	RW		0	3	Yes	Stop Actions
x603F	0	Error Code			U16	RO	Tx				Motor Feedback
x6040	0	Controlword	0		U16	RW	Rx	0	65535		Motion Command
x6041	0	Statusword			U16	RO	Tx				Motor Feedback
x605A	0	Quick Stop Option Code	-1		I16	RW		-2	6	Yes	Stop Actions
x605C	0	Disable Operation Option Code	-1		I16	RW		-2	1	Yes	Stop Actions
x605D	0	Halt Option Code	-1		I16	RW		-1	2	Yes	Stop Actions
x6060	0	Modes Of Operation	8		I8	RW	Rx	0	10	Yes	Motion Command
x6061	0	Modes Of Operation Display			I8	RO	Tx				Motor Feedback
x6062	0	Position Demand Value		cnts	I32	RO	Tx				Motor Feedback
x6063	0	Position Actual Internal Value		cnts	I32	RO	Tx				Motor Feedback
x6064	0	Position Actual Value		cnts	I32	RO	Tx				Motor Feedback
x6065	0	Following Error Window	-	cnts	U32	RW	Rx	0	4294967295	Yes	Motor Config
x6066	0	Following Error Time Out	0	ms	U16	RW	Rx	0	65535	Yes	Motor Config
x6067	0	Position Window	-	cnts	U32	RW		0	4294967295	Yes	Motor Config
x6068	0	Position Window Time	0	ms	U16	RW		0	65535	Yes	Motor Config
x606B	0	Velocity Demand Value		cnts/s	I32	RO	Tx				Motor Feedback
x606C	0	Velocity Actual Value		cnts/s	I32	RO	Tx				Motor Feedback
x606D	0	Velocity Window	-	cnts/s	U16	RW		0	65535	Yes	Motor Config
x606E	0	Velocity Window Time	0	ms	U16	RW		0	65535	Yes	Motor Config

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x6071	0	Target Torque	-	0.1%	I16	RW	Rx	-1000	1000		Motion Command
x6072	0	Max Torque	1000	0.1%	U16	RW	Rx	0	1000	Yes	Limits
x6074	0	Torque Demand Value		0.1%	I16	RO	Tx				Motor Feedback
x6077	0	Torque Actual Value		0.1%	I16	RO	Tx				Motor Feedback
x6079	0	DC Link Circuit Voltage		mV	U32	RO	Tx				Power & Temp
x607A	0	Target Position	-	cnts	I32	RW	Rx	-2147483648	2147483647		Motion Command
x607C	0	Home Offset	0	cnts	I32	RW	Rx	-2147483648	2147483647	Yes	Homing
x607D	Software Position Limit										
x607D	0	Highest Subindex Supported	2		U8	RO					Limits
x607D	1	Min Software Position Limit	0	cnts	I32	RW	Rx	-2147483648	2147483647	Yes	Limits
x607D	2	Max Software Position Limit	0	cnts	I32	RW	Rx	-2147483648	2147483647	Yes	Limits
x607E	0	Polarity	0x0		U8	RW	Rx	0x0	0xFF	Yes	Motor Config
x6080	0	Max Motor Speed	-	rpm	U32	RW	Rx	0	4294967295	Yes	Motor Config
x6085	0	Quick Stop Deceleration	-	cnts/s²	U32	RW	Rx	0	4294967295	Yes	Stop Actions
x608F	Position Encoder Resolution										
x608F	0	Highest Subindex Supported	2		U8	RO					Device Info
x608F	1	Encoder Increments		cnts	U32	RO					Device Info
x608F	2	Motor Revolutions		rev	U32	RO					Device Info
x6098	0	Homing Method	37		I8	RW	Rx	-3	37	Yes	Homing
x6099	Homing Speeds										
x6099	0	Highest Subindex Supported	2		U8	RO					Homing
x6099	1	Fast Homing Speed	-	cnts/s	U32	RW	Rx	213	536870911	Yes	Homing
x6099	2	Slow Homing Speed	-	cnts/s	U32	RW	Rx	213	536870911	Yes	Homing
x609A	0	Homing Acceleration	-	cnts/s²	U32	RW	Rx	0	4294967295	Yes	Homing
x60B0	0	Position Offset	0	cnts	I32	RW	Rx	-2147483648	2147483647	Yes	Motor Config
x60B1	0	Velocity Offset	0	cnts/s	I32	RW	Rx	-2147483648	2147483647	Yes	Motor Config
x60B2	0	Torque Offset	0	0.1%	I16	RW	Rx	-1000	1000	Yes	Motor Config
x60B8	0	Touch Probe Function	0x1313		U16	RW	Rx	0x0	0xFFFF	Yes	I/O
x60B9	0	Touch Probe Status			U16	RO	Tx				I/O
x60BA	0	Touch Probe Position 1 Positive Value		cnts	I32	RO	Tx				I/O
x60BB	0	Touch Probe Position 1 Negative Value		cnts	I32	RO	Tx				I/O

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x60BC	0	Touch Probe Position 2 Positive Value		cnts	I32	RO	Tx				I/O
x60BD	0	Touch Probe Position 2 Negative Value		cnts	I32	RO	Tx				I/O
x60C2	Interpolation Time Period										
x60C2	0	Highest Subindex Supported	2		U8	RO					Motor Config
x60C2	1	Interpolation Time Period Value	2	(10^i) s	U8	RO*		1	250	Yes	Motor Config
x60C2	2	Interpolation Time Index	-3		I8	RO*		-128	63	Yes	Motor Config
x60D5	0	Touch Probe 1 Positive Edge Counter			U16	RO	Tx				I/O
x60D6	0	Touch Probe 1 Negative Edge Counter			U16	RO	Tx				I/O
x60D7	0	Touch Probe 2 Positive Edge Counter			U16	RO	Tx				I/O
x60D8	0	Touch Probe 2 Negative Edge Counter			U16	RO	Tx				I/O
x60E0	0	Positive Torque Limit Value	1000	0.1%	U16	RW	Rx	0	1000	Yes	Limits
x60E1	0	Negative Torque Limit Value	1000	0.1%	U16	RW	Rx	0	1000	Yes	Limits
x60E3	Supported Homing Methods										
x60E3	0	Highest Subindex Supported	11		U8	RO					Homing
x60E3	1	1st Supported Homing Method	17		I8	RO					Homing
x60E3	2	2nd Supported Homing Method	18		I8	RO					Homing
x60E3	3	3rd Supported Homing Method	19		I8	RO					Homing
x60E3	4	4th Supported Homing Method	20		I8	RO					Homing
x60E3	5	5th Supported Homing Method	21		I8	RO					Homing
x60E3	6	6th Supported Homing Method	22		I8	RO					Homing
x60E3	7	7th Supported Homing Method	37		I8	RO					Homing
x60E3	8	8th Supported Homing Method	-1		I8	RO					Homing
x60E3	9	9th Supported Homing Method	-2		I8	RO					Homing
x60E3	10	10th Supported Homing Method	33		I8	RO					Homing
x60E3	11	11th Supported Homing Method	34		I8	RO					Homing
x60F4	0	Following Error Actual Value		cnts	I32	RO	Tx				Motor Feedback
x60FC	0	Position Demand Internal Value		cnts	I32	RO	Tx				Motor Feedback
x60FD	0	Digital Inputs			U32	RO	Tx				I/O
x60FE	Digital Outputs										
x60FE	0	Highest Subindex Supported	2		U8	RO					I/O
x60FE	1	Digital Outputs	0x0		U32	RW	Rx	0x0	0xFFFFFFFF	Yes	I/O

Index	Subindex	Name	Default Value	Unit	Type	Access (OP)	PDO	Lower Limit	Upper Limit	EEPROM	Group
x60FE	2	Output Mask	0xFFFFFFFF		U32	RW	Rx	0x0	0xFFFFFFFF	Yes	I/O
x60FF	0	Target Velocity	-	cnts/s	I32	RW	Rx	-2147483648	2147483647		Motion Command
x6502	0	Supported Drive Modes	0x3A0		U32	RO	Tx				Device Info
x67FE	0	Version Number	0x40100		U32	RO					Device Info
x67FF	0	Single Device Type	0x192		U32	RO					Device Info

*These parameters can only be written to in PREOP.

Teknic Incorporated
7650 Omnitech Pl
Victor, NY 14564

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