

### Related Documentation

For complete information on the Thyro-PX unit, see the user manual that accompanied the system. In particular, reference the safety information in Chapter 1 of the user manual for the Thyro-PX unit.

## ANYBUS ETHERCAT MODULE

The Anybus EtherCAT module is an optional accessory for the Thyro-PX power controller. The module allows the power controller to be integrated into complex installations via the field network.

### Related Links

- [“Hardware Description” on page 2](#)
- [“Configuring Process Control Software” on page 3](#)
- [“Configuring With Thyro-Tool Pro PC Software” on page 3](#)
- [“Installing Optional Modules” on page 6](#)
- [“EtherCat Parameter List” on page 8](#)
- [“AE Global Services” on page 28](#)

# HARDWARE DESCRIPTION

This module is compliant with the EtherCAT standard.

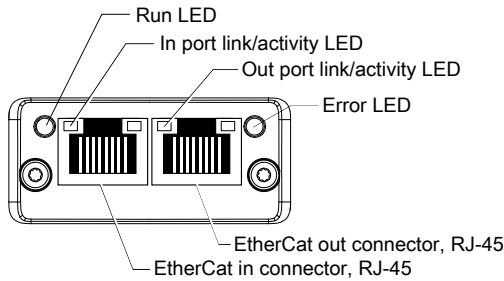


Figure 1. Hardware

Table 1. Run LED

LED State	Description
Off	Initialized or no power
Green	Operational
Green, 1 flash	Safe operational
Green, blinking	Pre operational
Red	Fatal event

Table 2. Error LED

LED State	Description
Off	No error
Red, blinking	Invalid configuration
Red, 1 flash	Unsolicited state change
Red, 2 flashes	Watchdog timeout
Red	Module controller failure
Flickering	Boot error

Table 3. Link/activity LED

LED State	Description
Off	No link
Green	Ethernet link established
Green, flickering	Ethernet link established, communication present

**Table 4. RJ-45 Ethernet pinout**

Pin	Description
1	TD+
2	TX-
3	RX+
6	RX-
4, 5, 7, 8	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit in the module.
Housing	Cable shield

## CONFIGURING PROCESS CONTROL SOFTWARE

The XML configuration file contains information about the capabilities of the unit, which can be used to configure the process control software. For online configuration, the process control software will upload the configuration file from the unit. For offline configuration, download the current configuration file from the AE website [http://www.advanced-energy.com/en/Anybus\\_modules\\_ThyroPX.html](http://www.advanced-energy.com/en/Anybus_modules_ThyroPX.html), and install the file in the process control software.

## CONFIGURING WITH THYRO-TOOL PRO PC SOFTWARE

You can configure the Thyro-PX power controller using either the Thyro-Tool Pro PC software or the Thyro-Touch display.

To configure the unit, you will:

- Adapt the Thyro-PX hardware configuration
- Connect the unit to the EtherCAT controller

If required, you can also:

- Select the configuration
- Configure the diagnostics
- Configure the flexible link parameters

### Adapting Thyro-PX Hardware Configuration

Open parameter file with the unit online in the **Port Explorer** tab of the Thyro-Tool Pro PC software, or use the Thyro-Touch display.

Set the Anybus module slot to **EtherCat** in the Thyro-PX device hardware configuration:

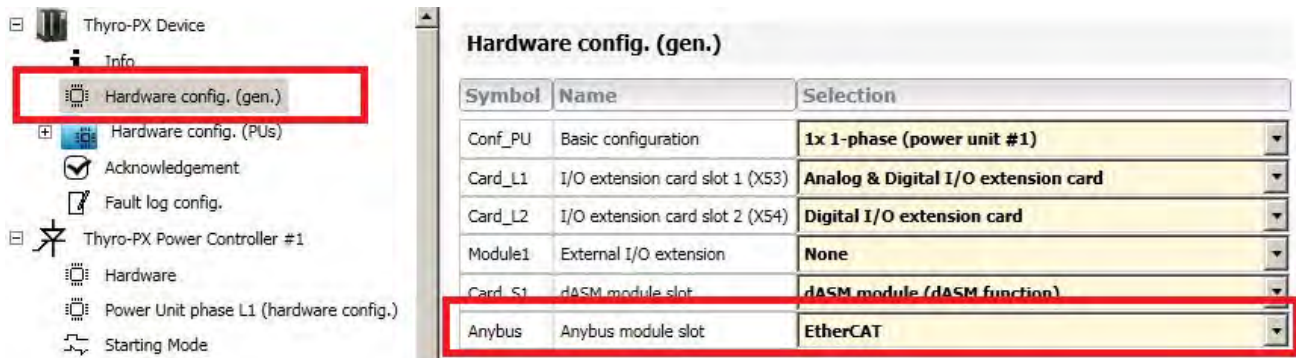


Figure 2. Menu tree

### Anybus Parameter Group

When the computer is connected to the Thyro-PX power controller, the Anybus parameter group will be added to the parameter list after updating the hardware configuration, as shown in the previous figure.

If the unit is not available for online configuration, the software can also be configured offline. Contact AE Global Services to obtain a parameter file appropriate to your hardware configuration.



Figure 3. Anybus parameter group

## Connecting to the EtherCAT controller

The process control software can scan the network to automatically detect and connect to EtherCAT devices.

## Selecting Configuration

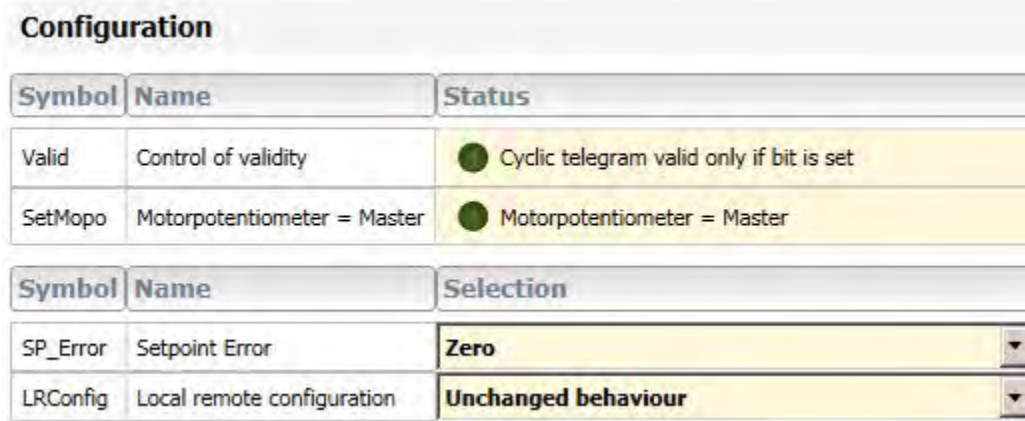


Figure 4. Select configuration

Each configuration name, status, and selection is described in the following table:

Table 5. Configuration

Name	Status/Selection	Description
<b>Control of validity</b>	<b>Cyclic telegram valid only if bit is set</b>	When enabled, the cyclic telegrams received from the master will only be considered as valid and processed if bit 15 of the Device Command (API # 41) is set. This function allows several settings to be changed one after another before enabling the complete change, thereby avoiding unwanted effects due to an incomplete change.
<b>Motorpotentiometer = Master</b>	<b>Motorpotentiometer = Master</b>	When enabled, the value of the motorpotentiometer continuously follows the master setpoint while in remote operation, so that no setpoint leap occurs during the switch-over to the local setpoint.
<b>Setpoint Error</b>	<b>Zero</b>	Zero is used as the setpoint when the master setpoint is missing.
	<b>Last valid master setpoint</b>	The last valid master setpoint is used as the setpoint when the master setpoint is missing.
	<b>Last valid error setpoint</b>	The last valid error setpoint is used as the setpoint when the master setpoint is missing.
<b>Local remote configuration</b>	<b>Unchanged behavior</b>	Configuration of the master's influence to the local remote behavior.
	<b>Automatic switch to local</b>	The unit will automatically switch to local mode when the communication with master is interrupted.
	<b>Ignore master in local</b>	When the unit is in local mode, data and commands from the master will be ignored.

## Configuring Diagnostics

The following two diagnostic events are supported:

**Table 6.** Diagnostic events

Event Code	Event
0x10 (= 16)	Error
0x40 (= 64)	Temperature

You can configure both events in the Thyro-Tool Pro PC software. You can add any Thyro-PX error or status message. Once an error or status message is added, the message will trigger the corresponding extended diagnosis event.

## Configuring Flexible Link Parameters

The flexible link parameters have been designed to allow access to Thyro-PX internal data, such as parameters and actual values, that are not listed in the parameter list.

There are 20 flexible link parameters for writing and 20 flexible link parameters for reading data.

The default read links are shown in the Thyro-Tool Pro PC software. These are not needed for EtherCAT, because the preconfigured values are already available in the parameter list.

Once the respective data point has been selected in the flexible link parameter configuration, it can be accessed on the EtherCAT using the respective flexible link parameter API that is listed in the parameter list (see [“EtherCat Parameter List”](#) on page 8).

## INSTALLING OPTIONAL MODULES



### **DANGER:**

**RISK OF DEATH OR BODILY INJURY.** Disconnect and lockout/tagout all sources of input power before working on this unit or anything connected to it.



### **DANGER:**

**RISQUE DE MORT OU DE BLESSURES CORPORELLES.** Débrancher et verrouiller/ étiqueter toutes les sources de puissance d'entrée avant de travailler sur cette unité ou sur tout élément qui y est raccordé.

The optional modules may be shipped separately.

1. Verify that the unit is disconnected from all power sources.
2. Unpack each optional module at an ESD safe work space.
3. Plug each optional module into the unit.

When an Anybus module is inserted into the unit, guide the module towards the left during insertion.

4. Secure each module with the two TORX® T8 screws provided with the module.

If an Anybus module must be removed from the unit, loosen the TORX T8 mounting screws 3 turns, and pry out the module with a small flat-bladed screwdriver, as shown in the following figure.



*Figure 5. Anybus module removal*

## ETHERCAT PARAMETER LIST

*Table 7. Parameter list*

API #	Com-muni-cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
1	Cyclic	Read	2001	Flexible link 01 r	UINT32 FLOAT	Flexible link number 01 - read
2	Cyclic	Read	2002	Flexible link 02 r	UINT32 FLOAT	Flexible link number 02 - read
3	Cyclic	Read	2003	Flexible link 03 r	UINT32 FLOAT	Flexible link number 03 - read
4	Cyclic	Read	2004	Flexible link 04 r	UINT32 FLOAT	Flexible link number 04 - read
5	Cyclic	Read	2005	Flexible link 05 r	UINT32 FLOAT	Flexible link number 05 - read
6	Cyclic	Read	2006	Flexible link 06 r	UINT32 FLOAT	Flexible link number 06 - read
7	Cyclic	Read	2007	Flexible link 07 r	UINT32 FLOAT	Flexible link number 07 - read
8	Cyclic	Read	2008	Flexible link 08 r	UINT32 FLOAT	Flexible link number 08 - read
9	Cyclic	Read	2009	Flexible link 09 r	UINT32 FLOAT	Flexible link number 09 - read
10	Cyclic	Read	200A	Flexible link 10 r	UINT32 FLOAT	Flexible link number 10 - read
11	Cyclic	Read	200B	Flexible link 11 r	UINT32 FLOAT	Flexible link number 11 - read
12	Cyclic	Read	200C	Flexible link 12 r	UINT32 FLOAT	Flexible link number 12 - read
13	Cyclic	Read	200D	Flexible link 13 r	UINT32 FLOAT	Flexible link number 13 - read
14	Cyclic	Read	200E	Flexible link 14 r	UINT32 FLOAT	Flexible link number 14 - read
15	Cyclic	Read	200F	Flexible link 15 r	UINT32 FLOAT	Flexible link number 15 - read
16	Cyclic	Read	2010	Flexible link 16 r	UINT32 FLOAT	Flexible link number 16 - read



**Table 7. Parameter list (Continued)**

API #	Com- muni- cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
17	Cyclic	Read	2011	Flexible link 17 r	UINT32 FLOAT	Flexible link number 17 - read
18	Cyclic	Read	2012	Flexible link 18 r	UINT32 FLOAT	Flexible link number 18 - read
19	Cyclic	Read	2013	Flexible link 19 r	UINT32 FLOAT	Flexible link number 19 - read
20	Cyclic	Read	2014	Flexible link 20 r	UINT32 FLOAT	Flexible link number 20 - read
21	Cyclic	Write	2015	Flexible link 01 w	UINT32 FLOAT	Flexible link number 01 - write
22	Cyclic	Write	2016	Flexible link 02 w	UINT32 FLOAT	Flexible link number 02 - write
23	Cyclic	Write	2017	Flexible link 03 w	UINT32 FLOAT	Flexible link number 03 - write
24	Cyclic	Write	2018	Flexible link 04 w	UINT32 FLOAT	Flexible link number 04 - write
25	Cyclic	Write	2019	Flexible link 05 w	UINT32 FLOAT	Flexible link number 05 - write
26	Cyclic	Write	201A	Flexible link 06 w	UINT32 FLOAT	Flexible link number 06 - write
27	Cyclic	Write	201B	Flexible link 07 w	UINT32 FLOAT	Flexible link number 07 - write
28	Cyclic	Write	201C	Flexible link 08 w	UINT32 FLOAT	Flexible link number 08 - write
29	Cyclic	Write	201D	Flexible link 09 w	UINT32 FLOAT	Flexible link number 09 - write
30	Cyclic	Write	201E	Flexible link 10 w	UINT32 FLOAT	Flexible link number 10 - write
31	Cyclic	Write	201F	Flexible link 11 w	UINT32 FLOAT	Flexible link number 11 - write
32	Cyclic	Write	2020	Flexible link 12 w	UINT32 FLOAT	Flexible link number 12 - write
33	Cyclic	Write	2021	Flexible link 13 w	UINT32 FLOAT	Flexible link number 13 - write
34	Cyclic	Write	2022	Flexible link 14 w	UINT32 FLOAT	Flexible link number 14 - write
35	Cyclic	Write	2023	Flexible link 15 w	UINT32 FLOAT	Flexible link number 15 - write

**Table 7. Parameter list (Continued)**

API #	Com- muni- cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
36	Cyclic	Write	2024	Flexible link 16 w	UINT32 FLOAT	Flexible link number 16 - write
37	Cyclic	Write	2025	Flexible link 17 w	UINT32 FLOAT	Flexible link number 17 - write
38	Cyclic	Write	2026	Flexible link 18 w	UINT32 FLOAT	Flexible link number 18 - write
39	Cyclic	Write	2027	Flexible link 19 w	UINT32 FLOAT	Flexible link number 19 - write
40	Cyclic	Write	2028	Flexible link 20 w	UINT32 FLOAT	Flexible link number 20 - write
41	Cyclic	Write	2029	Device Commands w	UINT16	Device command - write Bit 0: Clear energy counter power controller #1 Bit 1: Clear energy counter power controller #2 Bit 2: Clear energy counter power controller #3 Bit 3: Regulator lock power controller #1 Bit 4: Regulator lock power controller #2 Bit 5: Regulator lock power controller #3 Bit 6: Pulse lock power controller #1 Bit 7: Pulse lock power controller #2 Bit 8: Pulse lock power controller #3 Bit 9: External Error 1 Bit 10: External Error 2 Bit 11: External Error 3 Bit 12: Load parameters (from EEPROM to Flash) Bit 13: Save parameters (from Flash to EEPROM) Bit 14: Fault acknowledgement (Quit) Bit 15: "Only if bit set" (special function)
42			202A			
43	Cyclic	Read	202B	Device operating hours r	FLOAT	Operating hours - read
44	Cyclic	Read	202C	Device CPU temperature r	FLOAT	CPU temperature - read

**Table 7. Parameter list (Continued)**

API #	Com- muni- cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
45	Cyclic	Read	202D	Device error r	UINT32	Error - read Bit 0: Aux. supply error Bit 1: Parameter error Bit 2: Frequency error Bit 3: Internal communication error Bit 4: Temperature CPU too high Bit 8: Phase L1 missing Bit 9: Phase L2 missing Bit 10: Phase L3 missing Bit 11: Fuse 1 broken Bit 12: Fuse 2 broken Bit 13: Fuse 3 broken Bit 14: Thyristor 1 short-circuit Bit 15: Thyristor 2 short-circuit Bit 16: Thyristor 3 short-circuit Bit 17: External error 1 (customer-specific) Bit 18: External error 2 (customer-specific) Bit 19: External error 3 (customer-specific) Bit 21: Extension card X53 configuration error Bit 22: Extension card X54 configuration error Bit 23: External extension 1 configuration error Bit 24: External extension 2 configuration error Bit 25: dASM card configuration error Bit 26: Anybus configuration error Bit 27: Internal error

Table 7. Parameter list (Continued)

API #	Com- muni- cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
46	Cyclic	Read	202E	Device error extension r	UINT32	Error extension - read Bit 1: Extension card X53 error Bit 2: Extension card X54 error Bit 3: External extension 1 error Bit 4: External extension 2 error Bit 5: dASM card error Bit 6: Anybus module error Bit 8: dASM total power exceeded Bit 9: dASM count error
47			202F			
48	Cyclic	Read	2030	#1 Analog setpoint r	FLOAT	Power controller #1: Analog setpoint - read
49	Cyclic	Read	2031	#1 Motor pot. setpoint r	FLOAT	Power controller #1: Motor potentiometer setpoint - read
50	Cyclic	Write	2032	#1 Fieldbus setpoint w	FLOAT	Power controller #1: Fieldbus setpoint - write
51	Cyclic	Read	2033	#1 Actual setpoint r	FLOAT	Power controller #1: Actual setpoint - read
52	Cyclic	Write	2034	#1 Error setpoint w	FLOAT	Power controller #1: Error setpoint - write
53	Cyclic	Read	2035	#1 Total power r	FLOAT	Power controller #1: Total power - read
54	Cyclic	Read	2036	#1 Alpha r	FLOAT	Power controller #1: Alpha - read
55	Cyclic	Read	2037	#1 TimeOn r	FLOAT	Power controller #1: Time on - read
56	Cyclic	Read	2038	#1 Output r	FLOAT	Power controller #1: Output - read
57	Cyclic	Read	2039	#1 Frequency r	FLOAT	Power controller #1: Frequency - read
58	Cyclic	Read	203A	#1 Energy counter r	FLOAT	Power controller #1: Energy counter - read
59	Cyclic	Read	203B	#1 Error PC r	UINT32	Error PC - read Bit 4: Synchronization error Bit 5: Phase missing Bit 6: Fuse broken Bit 7: Thyristor short circuit Bit 16: Internal communication error Bit 17: U clipping Bit 18: I clipping Bit 19: Negative power Bit 20: Temperature probe error Bit 21: Overtemperature Bit 24: I/O error

**Table 7. Parameter list (Continued)**

API #	Communication	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
60	Cyclic	Read	203C	#1 Status PC r	UINT32	Power controller #1: Status PC - read Bit 0: Output (pulses) on Bit 1: Power controller OK Bit 2: Mains OK Bit 3: Remote setpoint Bit 6: Pulse lock (with ack.) Bit 7: Pulse lock (auto-ack.) Bit 8: Regulator lock Bit 12: Left rotation field Bit 13: Output restricted Bit 14: Max output reached Bit 16: Active limit Bit 17: U limit Bit 18: I limit Bit 19: I <sub>peak</sub> limit Bit 20: P limit Bit 21: Temperature limit Bit 22: Limit external feedback signal Bit 24: RAMP starting mode Bit 25: MOSI starting mode Bit 26: MOSI starting mode I <sub>RMS</sub> Bit 27: MOSI starting mode I <sub>peak</sub>

Table 7. Parameter list (Continued)

API #	Communication	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
61	Cyclic	Read	203D	#1 Monitoring PC r	UINT32	Power controller #1: Monitoring PC - read Bit 4: $U_{mains} < \text{minimum}$ Bit 5: $U_{mains} > \text{maximum}$ Bit 6: $U_{RMS} < \text{minimum}$ Bit 7: $U_{RMS} > \text{maximum}$ Bit 8: $U_{rect} < \text{minimum}$ Bit 9: $U_{rect} > \text{maximum}$ Bit 11: $U_{peak} > \text{maximum}$ Bit 14: $I_{RMS} < \text{minimum}$ Bit 15: $I_{RMS} > \text{maximum}$ Bit 16: $I_{rect} < \text{minimum}$ Bit 17: $I_{rect} > \text{maximum}$ Bit 19: $I_{peak} > \text{maximum}$ Bit 22: $P < \text{minimum}$ Bit 23: $P > \text{maximum}$ Bit 24: $R < \text{minimum}$ Bit 25: $R > \text{maximum}$ Bit 26: $T_{device} < \text{minimum}$ Bit 27: $T_{device} > \text{maximum}$ Bit 28: $R_{abs} < \text{minimum}$ Bit 29: $R_{abs} > \text{maximum}$ Bit 30: $R_{rel} < \text{minimum}$ Bit 31: $R_{rel} > \text{maximum}$
62			203E			
63	Cyclic	Read	203F	#1 L1 Umains r	FLOAT	Power controller #1: L1 $U_{mains}$ - read
64	Cyclic	Read	2040	#1 L1 Urms r	FLOAT	Power controller #1: L1 $U_{RMS}$ - read
65	Cyclic	Read	2041	#1 L1 Urect r	FLOAT	Power controller #1: L1 $U_{rect}$ - read
66	Cyclic	Read	2042	#1 L1 Upeak r	FLOAT	Power controller #1: L1 $U_{peak}$ - read
67	Cyclic	Read	2043	#1 L1 Irms r	FLOAT	Power controller #1: L1 $I_{RMS}$ - read
68	Cyclic	Read	2044	#1 L1 Irect r	FLOAT	Power controller #1: L1 $I_{rect}$ - read
69	Cyclic	Read	2045	#1 L1 Ipeak r	FLOAT	Power controller #1: L1 $I_{peak}$ - read
70	Cyclic	Read	2046	#1 L1 Power r	FLOAT	Power controller #1: L1 Power - read

**Table 7. Parameter list (Continued)**

API #	Com-muni-cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
71	Cyclic	Read	2047	#1 L1 Resistance r	FLOAT	Power controller #1: L1 Resistance - read
72	Cyclic	Read	2048	#1 L1 Temperature r	FLOAT	Power controller #1: L1 Temperature - read
73	Cyclic	Read	2049	#1 L1 External control r	FLOAT	Power controller #1: L1 External control - read
74			204A			
75	Cyclic	Read	204B	#1 L2 Umains r	FLOAT	Power controller #1: L2 $U_{mains}$ - read
76	Cyclic	Read	204C	#1 L2 Urms r	FLOAT	Power controller #1: L2 $U_{RMS}$ - read
77	Cyclic	Read	204D	#1 L2 Urect r	FLOAT	Power controller #1: L2 $U_{rect}$ - read
78	Cyclic	Read	204E	#1 L2 Upeak r	FLOAT	Power controller #1: L2 $U_{peak}$ - read
79	Cyclic	Read	204F	#1 L2 Irms r	FLOAT	Power controller #1: L2 $I_{RMS}$ - read
80	Cyclic	Read	2050	#1 L2 Irect r	FLOAT	Power controller #1: L2 $I_{rect}$ - read
81	Cyclic	Read	2051	#1 L2 Ipeak r	FLOAT	Power controller #1: L2 $I_{peak}$ - read
82	Cyclic	Read	2052	#1 L2 Power r	FLOAT	Power controller #1: L2 Power - read
83	Cyclic	Read	2053	#1 L2 Resistance r	FLOAT	Power controller #1: L2 Resistance - read
84	Cyclic	Read	2054	#1 L2 Temperature r	FLOAT	Power controller #1: L2 Temperature - read
85	Cyclic	Read	2055	#1 L2 External control r	FLOAT	Power controller #1: L2 External control - read
86			2056			
87	Cyclic	Read	2057	#1 L3 Umains r	FLOAT	Power controller #1: L3 $U_{mains}$ - read
88	Cyclic	Read	2058	#1 L3 Urms r	FLOAT	Power controller #1: L3 $U_{RMS}$ - read
89	Cyclic	Read	2059	#1 L3 Urect r	FLOAT	Power controller #1: L3 $U_{rect}$ - read
90	Cyclic	Read	205A	#1 L3 Upeak r	FLOAT	Power controller #1: L3 $U_{peak}$ - read
91	Cyclic	Read	205B	#1 L3 Irms r	FLOAT	Power controller #1: L3 $I_{RMS}$ - read
92	Cyclic	Read	205C	#1 L3 Irect r	FLOAT	Power controller #1: L3 $I_{rect}$ - read
93	Cyclic	Read	205D	#1 L3 Ipeak r	FLOAT	Power controller #1: L3 $I_{peak}$ - read
94	Cyclic	Read	205E	#1 L3 Power r	FLOAT	Power controller #1: L3 Power - read
95	Cyclic	Read	205F	#1 L3 Resistance r	FLOAT	Power controller #1: L3 Resistance - read
96	Cyclic	Read	2060	#1 L3 Temperature r	FLOAT	Power controller #1: L3 Temperature - read
97	Cyclic	Read	2061	#1 L3 External control r	FLOAT	Power controller #1: L3 External control - read
98			2062			
99	Cyclic	Read	2063	#2 Analog setpoint r	FLOAT	Power controller #2: Analog setpoint - read

**Table 7. Parameter list (Continued)**

API #	Com-muni-cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
100	Cyclic	Read	2064	#2 Motor pot. setpoint r	FLOAT	Power controller #2: Motor potentiometer setpoint - read
101	Cyclic	Write	2065	#2 Fieldbus setpoint w	FLOAT	Power controller #2: Fieldbus setpoint - write
102	Cyclic	Read	2066	#2 Actual setpoint r	FLOAT	Power controller #2: Actual setpoint - read
103	Cyclic	Write	2067	#2 Error setpoint w	FLOAT	Power controller #2: Error setpoint - write
104	Cyclic	Read	2068	#2 Total power r	FLOAT	Power controller #2: Total power - read
105	Cyclic	Read	2069	#2 Alpha r	FLOAT	Power controller #2: Alpha - read
106	Cyclic	Read	206A	#2 TimeOn r	FLOAT	Power controller #2: Time on - read
107	Cyclic	Read	206B	#2 Output r	FLOAT	Power controller #2: Output - read
108	Cyclic	Read	206C	#2 Frequency r	FLOAT	Power controller #2: Frequency - read
109	Cyclic	Read	206D	#2 Energy counter r	FLOAT	Power controller #2: Energy counter - read
110	Cyclic	Read	206E	#2 Error PC r	UINT32	Power controller #2: Error PC - read Bit 4: Synchronization error Bit 5: Phase missing Bit 6: Fuse broken Bit 7: Thyristor short circuit Bit 16: Internal communication error Bit 17: U clipping Bit 18: I clipping Bit 19: Negative power Bit 20: Temperature probe error Bit 21: Overtemperature Bit 24: I/O error



**Table 7. Parameter list (Continued)**

API #	Com- muni- cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
111	Cyclic	Read	206F	#2 Status PC r	UINT32	Power controller #2: Status PC - read Bit 0: Output (pulses) on Bit 2: Mains OK Bit 3: Remote setpoint Bit 6: Pulse lock (with ack.) Bit 7: Pulse lock (auto-ack.) Bit 8: Regulator lock Bit 12: Left rotation field Bit 13: Output restricted Bit 14: Max output reached Bit 16: Active limit Bit 17: U limit Bit 18: I limit Bit 19: I <sub>peak</sub> limit Bit 20: P limit Bit 21: Temperature limit Bit 22: Limit external feedback signal Bit 24: RAMP starting mode Bit 25: MOSI starting mode Bit 26: MOSI starting mode I <sub>RMS</sub> Bit 27: MOSI starting mode I <sub>peak</sub>

Table 7. Parameter list (Continued)

API #	Communication	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
112	Cyclic	Read	2070	#2 Monitoring PC r	UINT32	Power controller #2: Monitoring PC - read Bit 4: $U_{mains} < \text{minimum}$ Bit 5: $U_{mains} > \text{maximum}$ Bit 6: $U_{RMS} < \text{minimum}$ Bit 7: $U_{RMS} > \text{maximum}$ Bit 8: $U_{rect} < \text{minimum}$ Bit 9: $U_{rect} > \text{maximum}$ Bit 11: $U_{peak} > \text{maximum}$ Bit 14: $I_{RMS} < \text{minimum}$ Bit 15: $I_{RMS} > \text{maximum}$ Bit 16: $I_{rect} < \text{minimum}$ Bit 17: $I_{rect} > \text{maximum}$ Bit 19: $I_{peak} > \text{maximum}$ Bit 22: $P < \text{minimum}$ Bit 23: $P > \text{maximum}$ Bit 24: $R < \text{minimum}$ Bit 25: $R > \text{maximum}$ Bit 26: $T_{device} < \text{minimum}$ Bit 27: $T_{device} > \text{maximum}$ Bit 28: $R_{abs} < \text{minimum}$ Bit 29: $R_{abs} > \text{maximum}$ Bit 30: $R_{rel} < \text{minimum}$ Bit 31: $R_{rel} > \text{maximum}$
113			2071			
114	Cyclic	Read	2072	#2 L1 Umains r	FLOAT	Power controller #2: L1 $U_{mains}$ - read
115	Cyclic	Read	2073	#2 L1 Urms r	FLOAT	Power controller #2: L1 $U_{RMS}$ - read
116	Cyclic	Read	2074	#2 L1 Urect r	FLOAT	Power controller #2: L1 $U_{rect}$ - read
117	Cyclic	Read	2075	#2 L1 Upeak r	FLOAT	Power controller #2: L1 $U_{peak}$ - read
118	Cyclic	Read	2076	#2 L1 Irms r	FLOAT	Power controller #2: L1 $I_{RMS}$ - read
119	Cyclic	Read	2077	#2 L1 Irect r	FLOAT	Power controller #2: L1 $I_{rect}$ - read
120	Cyclic	Read	2078	#2 L1 Ipeak r	FLOAT	Power controller #2: L1 $I_{peak}$ - read
121	Cyclic	Read	2079	#2 L1 Power r	FLOAT	Power controller #2: L1 Power - read

**Table 7. Parameter list (Continued)**

API #	Com- muni- cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
122	Cyclic	Read	207A	#2 L1 Resistance r	FLOAT	Power controller #2: L1 Resistance - read
123	Cyclic	Read	207B	#2 L1 Temperature r	FLOAT	Power controller #2: L1 Temperature - read
124	Cyclic	Read	207C	#2 L1 External control r	FLOAT	Power controller #2: L1 External control - read
125			207D			
126	Cyclic	Read	207E	#3 Analog setpoint r	FLOAT	Power controller #3: Analog setpoint - read
127	Cyclic	Read	207F	#3 Motor pot. setpoint r	FLOAT	Power controller #3: Motor potentiometer setpoint - read
128	Cyclic	Write	2080	#3 Fieldbus setpoint w	FLOAT	Power controller #3: Fieldbus setpoint - write
129	Cyclic	Read	2081	#3 Actual setpoint r	FLOAT	Power controller #3: Actual setpoint - read
130	Cyclic	Write	2082	#3 Error setpoint w	FLOAT	Power controller #3: Error setpoint - write
131	Cyclic	Read	2083	#3 Total power r	FLOAT	Power controller #3: Total power - read
132	Cyclic	Read	2084	#3 Alpha r	FLOAT	Power controller #3: Alpha - read
133	Cyclic	Read	2085	#3 TimeOn r	FLOAT	Power controller #3: Time on - read
134	Cyclic	Read	2086	#3 Output r	FLOAT	Power controller #3: Output - read
135	Cyclic	Read	2087	#3 Frequency r	FLOAT	Power controller #3: Frequency - read
136	Cyclic	Read	2088	#3 Energy counter r	FLOAT	Power controller #3: Energy counter - read
137	Cyclic	Read	2089	#3 Error PC r	UINT32	Power controller #3: Error PC - read Bit 4: Synchronization error Bit 5: Phase missing Bit 6: Fuse broken Bit 7: Thyristor short circuit Bit 16: Internal communication error Bit 17: U clipping Bit 18: I clipping Bit 19: Negative power Bit 20: Temperature probe error Bit 21: Overtemperature Bit 24: I/O error

**Table 7. Parameter list (Continued)**

API #	Communication	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
138	Cyclic	Read	208A	#3 Status PC r	UINT32	Power controller #3: Status PC - read Bit 0: Output (pulses) on Bit 1: Power controller OK Bit 2: Mains OK Bit 3: Remote setpoint Bit 6: Pulse lock (with ack.) Bit 7: Pulse lock (auto-ack.) Bit 8: Regulator lock Bit 12: Left rotation field Bit 13: Output restricted Bit 14: Max output reached Bit 16: Active limit Bit 17: U limit Bit 18: I limit Bit 19: I <sub>peak</sub> limit Bit 20: P limit Bit 21: Temperature limit Bit 22: Limit external feedback signal Bit 24: RAMP starting mode Bit 25: MOSI starting mode Bit 26: MOSI starting mode I <sub>RMS</sub> Bit 27: MOSI starting mode I <sub>peak</sub>

Table 7. Parameter list (Continued)

API #	Communication	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
139	Cyclic	Read	208B	#3 Monitoring PC r	UINT32	Power controller #3: Monitoring PC - read Bit 4: $U_{mains} < \text{minimum}$ Bit 5: $U_{mains} > \text{maximum}$ Bit 6: $U_{RMS} < \text{minimum}$ Bit 7: $U_{RMS} > \text{maximum}$ Bit 8: $U_{rect} < \text{minimum}$ Bit 9: $U_{rect} > \text{maximum}$ Bit 11: $U_{peak} > \text{maximum}$ Bit 14: $I_{RMS} < \text{minimum}$ Bit 15: $I_{RMS} > \text{maximum}$ Bit 16: $I_{rect} < \text{minimum}$ Bit 17: $I_{rect} > \text{maximum}$ Bit 19: $I_{peak} > \text{maximum}$ Bit 22: $P < \text{minimum}$ Bit 23: $P > \text{maximum}$ Bit 24: $R < \text{minimum}$ Bit 25: $R > \text{maximum}$ Bit 26: $T_{device} < \text{minimum}$ Bit 27: $T_{device} > \text{maximum}$ Bit 28: $R_{abs} < \text{minimum}$ Bit 29: $R_{abs} > \text{maximum}$ Bit 30: $R_{rel} < \text{minimum}$ Bit 31: $R_{rel} > \text{maximum}$
140			208C			
141	Cyclic	Read	208D	#3 L1 Umains r	FLOAT	Power controller #3: L1 $U_{mains}$ - read
142	Cyclic	Read	208E	#3 L1 Urms r	FLOAT	Power controller #3: L1 $U_{RMS}$ - read
143	Cyclic	Read	208F	#3 L1 Urect r	FLOAT	Power controller #3: L1 $U_{rect}$ - read
144	Cyclic	Read	2090	#3 L1 Upeak r	FLOAT	Power controller #3: L1 $U_{peak}$ - read
145	Cyclic	Read	2091	#3 L1 Irms r	FLOAT	Power controller #3: L1 $I_{RMS}$ - read
146	Cyclic	Read	2092	#3 L1 Irect r	FLOAT	Power controller #3: L1 $I_{rect}$ - read
147	Cyclic	Read	2093	#3 L1 Ipeak r	FLOAT	Power controller #3: L1 $I_{peak}$ - read
148	Cyclic	Read	2094	#3 L1 Power r	FLOAT	Power controller #3: L1 Power - read

**Table 7. Parameter list (Continued)**

API #	Com-muni-cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
149	Cyclic	Read	2095	#3 L1 Resistance r	FLOAT	Power controller #3: L1 Resistance - read
150	Cyclic	Read	2096	#3 L1 Temperature r	FLOAT	Power controller #3: L1 Temperature - read
151	Cyclic	Read	2097	#3 L1 External control r	FLOAT	Power controller #3: L1 External control - read
152		Write	2098			
153	Cyclic	Write	2099	I/O Int LED 1-7 rd/gr w	UINT16	Internal I/O: LED 1-7 - red/green - write Bit 0: LED 1 green Bit 1: LED 1 red Bit 2: LED 2 green Bit 3: LED 2 red Bit 4: LED 3 green Bit 5: LED 3 red Bit 6: LED 4 green Bit 7: LED 4 red Bit 8: LED 5 green Bit 9: LED 5 red Bit 10: LED 6 green Bit 11: LED 6 red Bit 12: LED 7 green Bit 13: LED 7 red
154	Cyclic	Read	209A	I/O Int LED 1-7 rd/gr r	UINT16	Internal I/O: LED 1-7 - red/green - read Bit 0: LED 1 green Bit 1: LED 1 red Bit 2: LED 2 green Bit 3: LED 2 red Bit 4: LED 3 green Bit 5: LED 3 red Bit 6: LED 4 green Bit 7: LED 4 red Bit 8: LED 5 green Bit 9: LED 5 red Bit 10: LED 6 green Bit 11: LED 6 red Bit 12: LED 7 green Bit 13: LED 7 red

**Table 7. Parameter list (Continued)**

API #	Com- muni- cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
155	Cyclic	Write	209B	I/O Int Relay 1-3 w	UINT16	Internal I/O: Relay 1-3 - write Bit 0: Relay 1 Bit 1: Relay 2 Bit 2: Relay 3
156	Cyclic	Read	209C	I/O Int Relay 1-3 r	UINT16	Internal I/O: Relay 1-3 - read Bit 0: Relay 1 Bit 1: Relay 2 Bit 2: Relay 3
157			209D			
158			209E			
159	Cyclic	Read	209F	I/O Int Analog In 1 r	FLOAT	Internal I/O: Analog input 1 - read
160	Cyclic	Read	20A0	I/O Int Analog In 2 r	FLOAT	Internal I/O: Analog input 2 - read
161	Cyclic	Read	20A1	I/O Int Analog In 3 r	FLOAT	Internal I/O: Analog input 3 - read
162			20A2			
163	Cyclic	Write	20A3	I/O Int Analog Out 1 w	FLOAT	Internal I/O: Analog output 1 - write
164	Cyclic	Write	20A4	I/O Int Analog Out 2 w	FLOAT	Internal I/O: Analog output 2 - write
165	Cyclic	Write	20A5	I/O Int Analog Out 3 w	FLOAT	Internal I/O: Analog output 3 - write
166			20A6			
167			20A7			
168	Cyclic	Read	20A8	I/O Int Digital In 1-6 r	UINT16	Internal I/O: Digital input 1-6 - read Bit 0: Digital input 1 Bit 1: Digital input 2 Bit 2: Digital input 3 Bit 3: Digital input 4 Bit 4: Digital input 5 Bit 5: Digital input 6
169			20A9			
170			20AA			
171			20AB			
172			20AC			

**Table 7. Parameter list (Continued)**

API #	Com- muni- cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
173	Cyclic	Write	20AD	I/O Ext1 Relay w	UINT16	I/O Extension 1: Relay - write Bit 0: Relay 1 Bit 1: Relay 2
174	Cyclic	Read	20AE	I/O Ext1 Relay r	UINT16	I/O Extension 1: Relay - read Bit 0: Relay 1 Bit 1: Relay 2
175			20AF			
176	Cyclic	Read	20B0	I/O Ext1 Analog In 1 r	FLOAT	I/O Extension 1: Analog input 1 - read
177	Cyclic	Read	20B1	I/O Ext1 Analog In 2 r	FLOAT	I/O Extension 1: Analog input 2 - read
178	Cyclic	Read	20B2	I/O Ext1 Analog In 3 r	FLOAT	I/O Extension 1: Analog input 3 - read
179			20B3			
180	Cyclic	Write	20B4	I/O Ext1 Analog Out 1 w	FLOAT	I/O Extension 1: Analog output 1 - write
181	Cyclic	Write	20B5	I/O Ext1 Analog Out 2 w	FLOAT	I/O Extension 1: Analog output 2 - write
182	Cyclic	Write	20B6	I/O Ext1 Analog Out 3 w	FLOAT	I/O Extension 1: Analog output 3 - write
183			20B7			
184			20B8			
185	Cyclic	Read	20B9	I/O Ext1 Digital In r	UINT16	I/O Extension 1: Digital input - read Bit 0: Digital input 1 Bit 1: Digital input 2
186			20BA			
187	Cyclic	Write	20BB	I/O Ext1 Digital Out w	UINT16	I/O Extension 1: Digital output - write Bit 0: Digital output 1 Bit 1: Digital output 2
188	Cyclic	Read	20BC	I/O Ext1 Digital Out r	UINT16	I/O Extension 1: Digital output - read Bit 0: Digital output 1 Bit 1: Digital output 2
189			20BD			
190			20BE			
191			20BF			



**Table 7. Parameter list (Continued)**

API #	Com-muni-cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
192			20C0			
193	Cyclic	Write	20C1	I/O Ext2 Relay w	UINT16	I/O Extension 2: Relay - write Bit 0: Relay 1 Bit 1: Relay 2
194	Cyclic	Read	20C2	I/O Ext2 Relay r	UINT16	I/O Extension 2: Relay - read Bit 0: Relay 1 Bit 1: Relay 2
195			20C3			
196	Cyclic	Read	20C4	I/O Ext2 Analog In 1 r	FLOAT	I/O Extension 2: Analog input 1 - read
197	Cyclic	Read	20C5	I/O Ext2 Analog In 2 r	FLOAT	I/O Extension 2: Analog input 2 - read
198	Cyclic	Read	20C6	I/O Ext2 Analog In 3 r	FLOAT	I/O Extension 2: Analog input 3 - read
199			20C7			
200	Cyclic	Write	20C8	I/O Ext2 Analog Out 1 w	FLOAT	I/O Extension 2: Analog output 1 - write
201	Cyclic	Write	20C9	I/O Ext2 Analog Out 2 w	FLOAT	I/O Extension 2: Analog output 2 - write
202	Cyclic	Write	20CA	I/O Ext2 Analog Out 3 w	FLOAT	I/O Extension 2: Analog output 3 - write
203			20CB			
204			20CC			
205	Cyclic	Read	20CD	I/O Ext2 Digital In r	UINT16	I/O Extension 2: Digital input - read Bit 0: Digital input 1 Bit 1: Digital input 2
206			20CE			
207	Cyclic	Write	20CF	I/O Ext2 Digital Out w	UINT16	I/O Extension 2: Digital output - write Bit 0: Digital output 1 Bit 1: Digital output 2
208	Cyclic	Read	20D0	I/O Ext2 Digital Out r	UINT16	I/O Extension 2: Digital output - read Bit 0: Digital output 1 Bit 1: Digital output 2
209			20D1			
210	Cyclic	Read	20D2	dASM Total power r	FLOAT	dASM Total power - read

**Table 7. Parameter list (Continued)**

API #	Com-muni-cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
211	Cyclic	Read	20D3	dASM Count r	UINT8	dASM Count - read
212			20D4			
213	Cyclic	Write	20D5	#1 Starting mode w	UINT8	Power controller #1: Starting mode - write 0: None 1: Ramp 2: MOSI 3: MOSI and ramp
214	Cyclic	Write	20D6	#1 Operating mode w	UINT8	Power controller #1: Operating mode - write 0: TAKT (full wave) 1: VAR (phase angle)
215	Cyclic	Write	20D7	#1 Control mode w	UINT8	Power controller #1: Control mode - write 0: None 1: U 2: U <sup>2</sup> 3: I 4: I <sup>2</sup> 5: P
216	Cyclic	Write	20D8	#1 PID Kp w	FLOAT	Power controller #1: PID Kp - write
217	Cyclic	Write	20D9	#1 PID Ki w	FLOAT	Power controller #1: PID Ki - write
218	Cyclic	Write	20DA	#1 PID Kd w	FLOAT	Power controller #1: PID Kd - write
219			20DB			
220			20DC			
221			20DD			
222	Cyclic	Write	20DE	#2 Starting mode w	UINT8	Power controller #2: Starting mode - write 0: None 1: Ramp 2: MOSI 3: MOSI and ramp
223	Cyclic	Write	20DF	#2 Operating mode w	UINT8	Power controller #2: Operating mode - write 0: TAKT (full wave) 1: VAR (phase angle)

**Table 7. Parameter list (Continued)**

API #	Com-muni-cation	Read / Write	Index (hex)	Parameter Name	Type	Parameter Description
224	Cyclic	Write	20E0	#2 Control mode w	UINT8	Power controller #2: Control mode - write 0: None 1: U 2: U <sup>2</sup> 3: I 4: I <sup>2</sup> 5: P
225	Acyclic	Write	20E1	#2 PID Kp w	FLOAT	Power controller #2: PID Kp - write
226	Acyclic	Write	20E2	#2 PID Ki w	FLOAT	Power controller #2: PID Ki - write
227	Acyclic	Write	20E3	#2 PID Kd w	FLOAT	Power controller #2: PID Kd - write
228			20E4			
229			20E5			
230			20E6			
231	Cyclic	Write	20E7	#3 Starting mode w	UINT8	Power controller #3: Starting mode - write 0: None 1: Ramp 2: MOSI 3: MOSI and ramp
232	Cyclic	Write	20E8	#3 Operating mode w	UINT8	Power controller #3: Operating mode - write 0: TAKT (full wave) 1: VAR (phase angle)
233	Cyclic	Write	20E9	#3 Control mode w	UINT8	Power controller #3: Control mode - write 0: None 1: U 2: U <sup>2</sup> 3: I 4: I <sup>2</sup> 5: P
234	Acyclic	Write	20EA	#3 PID Kp w	FLOAT	Power controller #3: PID Kp - write
235	Acyclic	Write	20EB	#3 PID Ki w	FLOAT	Power controller #3: PID Ki - write
236	Acyclic	Write	20EC	#3 PID Kd w	FLOAT	Power controller #3: PID Kd - write

## AE GLOBAL SERVICES

Please contact AE Global Services if you have questions or problems that cannot be resolved by working through the provided troubleshooting. When you call Global Services, make sure to have the unit serial number and part number. These numbers are available on unit labels.



### Important

For returns and repairs, please call AE Global Services to get the correct shipping address.

**Table 8.** AE Global Services 24 X 7 contact information

Office	Contact
AE World Headquarters	Address: 1625 Sharp Point Drive Fort Collins, CO 80525 USA  Phone (24 hrs/day, 7 days/week): 800.446.9167 or +1.970.221.0108  Email: (We will respond to email by the next business day.) <a href="mailto:technical.support@aei.com">mailto:technical.support@aei.com</a>
Sekidenko thermal product support	Contact by phone or email: +1.360.694.7871 <a href="mailto:thermalapplications@aei.com">mailto:thermalapplications@aei.com</a>
Power Control Module product support	Contact by phone or email: +49 (0)2902 763 520 (technical support during German business hours) <a href="mailto:powercontroller@aei.com">mailto:powercontroller@aei.com</a>
High Voltage product support: HiTek Power, Ltd.	Contact by phone or email: +44 (0) 1903 712400 <a href="mailto:support.centre@aei.com">mailto:support.centre@aei.com</a>
High Voltage product support: UltraVolt, Inc.	Contact by phone or email: +1.631.471.4444 <a href="mailto:sales.support-uv@aei.com">mailto:sales.support-uv@aei.com</a>

*Table 8. AE Global Services 24 X 7 contact information (Continued)*

Office	Contact
Local or regional sales or service office	Visit the Advanced Energy website for current contact information:  <a href="http://www.advanced-energy.com">http://www.advanced-energy.com</a>

## TRADEMARKS

All Advanced Energy trademarks are the property of Advanced Energy Industries, Inc. For the list of Advanced Energy trademarks, visit <http://www.advanced-energy.com/en/Trademarks.html>. Any unauthorized use of Advanced Energy trademarks is prohibited.

All other trademarks are the property of their respective owners.