**SECURE, REAL-TIME PROCESS AUTOMATION AND ROBUST COMMUNICATION**

# ACE3600 REMOTE TERMINAL UNIT

Supervisory control and data acquisition (SCADA) systems are continuously relied on to support the most demanding mission critical applications and keep your operations running efficiently. Keep your assets connected to enhance productivity and safety across your operations with the ACE3600 Remote Terminal Unit (RTU).

The ACE3600 aims to make automation and monitoring of your complex processes robust and cohesive by connecting across a variety of communication media and data processing protocols. Enhanced security features also ensure your operations aren't compromised and productivity doesn't cease.

Modular design and abundant customization enables the ACE3600 to fit your specific SCADA needs. You can start small and grow, confident that the powerful processor can handle complex applications and keep your operations connected even as your needs or technologies evolve.

## KEY BENEFITS:

- High-performance, real-time processing for complex control and automation applications

- Robust communication media and protocol support for greater interoperability

- MDLC protocol support for more efficient data communication over narrowband or broadband

- Enhanced security features internationally tested and certified

## HIGH-PERFORMANCE, REAL-TIME PROCESSING POWER

Whether caused by a storm, theft or just aging infrastructure, disruptions to performance and the inability to pinpoint abnormalities decreases your productivity and can put personnel in harm's way. The ACE3600's processing power provides accurate data analysis and communication for the most critical, and demanding SCADA applications to ensure optimal operation.

A 32-bit processor, running at 200 MHz, delivers real-time processing with support for up to 110 I/O modules, while the substantial Flash and DRAM memory capacity provides plenty of storage for alarms, events, live data, historical reports and files. Both polling and event-based reporting are supported, peer-to-peer or RTU-to-host.

The ACE3600 can also be redundantly configured with a simple Ethernet interconnection. This ensures continuous operation if one CPU or power supply were to fail.

## VERSATILE COMMUNICATIONS CAPABILITIES

You want every opportunity to save money and optimize performance. The ACE3600 RTU is designed to use a variety of digital and analog interfaces so you are never locked into proprietary solutions. This flexible communications capability enables the ACE3600 to connect with several local devices, analyze the data and send that information to various other locations. Data transmission and processing is supported simultaneously across multiple communication media and industry standard data protocols including MODBUS, M-OPC, DNP 3 and IEC60870-5-101.

Motorola's own MDLC data processing protocol is specifically designed to enable more efficient data communication. Transmit data over your narrowband radio network or utilize a broadband network and realize significant data cost savings.

Furthermore, every RTU in your network can act as a communication node and/or a store and forward data repeater to extend radio frequency coverage and save you the much higher cost of a dedicated repeater.

## ENHANCED SECURITY

Apply the same state-of-the-art security features that Motorola provides for military and critical enterprise networks to your SCADA systems.

The ACE3600 supports a full range of best-practice security options directly within the RTUs for a self-contained, autonomously secure system including:

**Security Policy Enforcement** – Define and install a single, coherent, system-wide set of security configurations in every RTU.

**Built-In Firewall** – Filter IP communications by port, direction, protocol and IP address.

**Access Control** – User authentication tools, executed at the RTU or at the system server, verify specific user access and determine if use is legitimate and allowed.

**Role-Based Access Control** – The system administrator defines job roles and assigns different permissions so that each user is authorized to access only the parts of the system required for his or her job.

**Intrusion Detection System** – While allowing legitimate traffic, the ACE3600 identifies unauthorized access activities like an attempt to alter an RTU program or drop unauthorized data packets. It blocks these activities, logs the events and sends a report to the system administrator.

**Application Control Software** – Also known as "whitelisting," this software blocks unauthorized applications and code on PCs and RTUs. ACE3600 firmware protects user programs with this technique, and ACE3600 configuration management tools on PCs are protected with McAfee™ Solidifier.

**Encryption** – An algorithm makes data readable only by a device with a specific key to decrypt the message. Data stored within the ACE3600 is also encrypted using a 256-bit AES (Advanced Encryption Standard).

**Unused Port Deactivation** – Disable communication for any ports that are unused, closing a point of access that could be exploited by attackers.

**Time-Window Commands** – When an application generates a command, it assigns a time window; after the time expires, system components will not execute the command. This can prevent replicating errors and commands of questionable origin from affecting the network.

## GENERAL SPECIFICATIONS

| | | |
|---|---|---|
| Frames (* Depth including module panel) | No I/O slots - PS and CPU modules only, wall mount | 117 W x 209 H x 198* D mm (4.61" x 5.30" x 7.80"*), .95 Kg (2.1Lb) |
| | 2 I/O slots - PS, CPU and up to 2 I"L modules | 194 W x 244 H x 198 D- mm (7.64" x 9.61" x 7,80"), Approx. 1.6 Kg (3.56 lb) |
| | 3 I/O slots - PS, CPU and up to 3 I"L modules | 234 W x 244 H x 198* D mm (9.21" x 9.61" x 7.80" *), Approx. 1.9 Kg (4.19 Lb) |
| | 5 I/O slots - PS, CPU and up to 5 I/O modules | 314 W x 244 H x 198* D mm (12.36" x 9.61" x 7.80"*), Approx. 2.4 Kg (5.3 Lb) |
| | 7 I/O slots - PS, CPU and up to 7 I/O modules | 391 W x 244 H x 198* D mm (15.39" x 9.61" x 7.80" *), 3. Kg (6.6 Lb) |
| | 8 I/O slots - PS, CPU and up to 8 I/O modules | 435 W x 244 H x 198* D mm (17" x 9.61" x 7.80" *), Approx. 3.3 Kg (7.3 Lb) |
| I/O Expansion Frame | Number of I/O slots | 3, 5, 7, or 8 |
| | Default power supply | Expansion power supply |
| | Compatible power supplies | All except: 10.8-16V DC low-tier power supply |
| Metal Chassis | Large: For PS, CPU and up to 7 I.O slot frame, two radios and 6.5 or 10 Ah backup battery, wall mount, 448 W x 468 H x 200* D mm (17.64" x 18.43" x 7.88"*) | |
| | Medium: For PS, CPU and 3 I/O slot frame, one radio and 6.5 Ah backup battery, wall mount, 335 W x 355 H x 198* D mm (17.64" x 18.43" x 7.80"*) | |
| | Small: For PS, CPU, 2 I/O slot frame, 1 radio (or 1 accessory box), and 6.5Ah backup battery, wall mount, 264 W x 365 H x 200 D** mm (11.02"x 14.17" x 7.88"*) | |
| Housing | Large | Small |
| | NEMA 4/IP65 painted metal - up to 7 I/O slot frame, two radios and 6.5 or 10 Ah, backup battery, 500 W x 500 H x 210 D mm (19.7" x19.7" x 8.26" ) | NEMA 4/IP65 painted metal - up to 3 I/O slot frame one radio and 6.5 Ah backup battery, 380 W x 380 H x 210 D mm (15" x 15" x 8.26") |
| Power supply | 10.8-16 V DC | 18-72 V DC with 12 V smart battery charger |
| | 10.8-16 V DC low-tier | 100- 240 V AC, 50-60 Hz |
| | 18-72 V DC | 100- 240 V AC, 50-60 Hz, w/ 12 V smart charger |
| Backup Battery | 6.5 Ah - Sealed Lead-Acid | 10 Ah - Sealed Lead-Acid |
| Operating Temperature | -40 ºC to +70 ºC (-40 ºF to 158 ºF) | |
| | Notes: (1) when using a metal housing option, the maximum operating temp. outside the housing is +60 ºC (140 ºF). (2) Motorola radios and ACT module operating temp. range is: -30 ºC to +60 ºC (-22 ºF to 140 ºF). | |
| Storage Temperature | -55 ºC to +85 ºC (-67 ºF to 185 ºF) | |
| Operating Humidity | 5% to 95% RH @ 50 ºC without condensation | |
| Mechanical Vibrations | Per EIA/TIA 603 Base station, Sinusoidal 0.07mm @ 10 to 30 Hz, 0.035 mm @ 30-60 Hz | |
| Operating Altitude | -400m to +4000 meter (-1312 ft to + 13120 ft) above sea level Note:100-240 V AC and 18-72 V DC PS operating altitude is -400m to +3000 meter (-1312 ft to + 6560 ft) | |

## STANDARDS

| | | |
|---|---|---|
| Safety | UL 60950-1:2001 | IEC 60950-1 |
| | CSA 22.2-60950-1 | AS/NZS 60950 |
| Emission | Emission standards per: | EN61000-3-2 |
| | CFR 47 FCC part 15, subpart B (class A) | EN61000-3-3 |
| | EN55022:2003 Class A | |
| Immunity | Immunity standards for industrial environments per EN50082-2 /IEC 61000-6-2 | IEC 61000-4-5 |
| | IEC 61000-4-2 | IEC 61000-4-6 |
| | IEC 61000-4-3 | IEC 61000-4-8 |
| | IEC 61000-4-4 | IEC 61000-4-11 |

## COMMUNICATIONS

| | | |
|---|---|---|
| Communication Ports | Up to 9 ports per CPU | Ethernet - up to 3 x 10/100 MB ports and 1 x 10 MB port |
| | Serial - up to 4 x RS-232 ports | Two-way radio/analog trunked radio - up 2 x modem ports |
| | Multi-drop – up to 3 x RS-485 ports | |
| | USB - up to 2 x USB Host ports and 1 USB device port | |
| Motorola Radio Support | Conventional radios - XPR5350, DM4400, Xir M8620, DGM5000 (DMR) | |
| | Analog trunking radios – APX6500Li | |
| | Digital trunking radios – APX6500Li (P25), MTM5200 (TETRA), XPR5350, DM4400,Xir M8620, DGM5000 (DMR) | |
| Third Party Support | Two way radios, data radios, TETRA radio (PD) | |
| | Dial-up modems, cellular modems (dial mode & PD) | |
| Protocols | MDLC, TCP, UDP, IP, PPP, NTP, DHCP | |
| Third Party Protocol Support | MODBUS RTU: master on RS-232 / RS-485 / Ethernet, slave on RS-232 / RS-485 / Ethernet | |
| | DF1 (Allen Bradley): master on RS-232 | |
| | DNP 3.0 Plus: master & slave on RS-232 / RS-485 / Ethernet | |
| | IEC 60870-5-101: slave on RS-232 | |
| User Protocol (user program) | Possible on RS-232, RS-485 and Ethernet ports | |

## CPU 3680/CPU 3640 MODULES SPECIFICATIONS

| | | |
|---|---|---|
| Microprocessor | Freescale – Power PC II, MPC8720, 32-bit, extended communication capability, DMA and floating point calculation support, 200MHz clock | |
| Memory | 3640:<br>Flash: 16 MB<br>DRAM: 32 MB<br>SRAM plug-in board (optional): 4 MB | 3680:<br>Flash: 32 MB<br>DRAM: 128 MB<br>SRAM plug-in board (optional): 4 MB |
| Real-Time Clock | Full calendar with leap year support (Year, Month, Day, Hours, Minutes, Seconds) Time drift: max. 2.5 seconds per day (when power is on) | |
| SRAM and RTC Retention | 3 V Rechargeable lithium backup battery | |
| Serial Port 1 | Configurable RS-232C or RS-485 port:<br>- RS-232C: A synch, Full Flow Control, up to 230.4 kb/s, GPS receiver interface<br>- RS-485, multi-drop 2-Wire up to 230.4 kb/s | |
| Serial Port 2 | RS-232C, Asynch, Full Flow Control, up to 230.4 kb/s, GPS receiver interface | |
| Plug-in Port 1 | Supports the following Plug-In ports:<br>- Radio Modem, DPSK 1.2 kb/s, FSK 1.2 / 1.8 / 2.4 kb/s, DFM 2.4/3.6/4.8 kb/s<br>- RS-232, Sync/Asynch, Full Flow Control, up to 230.4 kb/s, GPS receiver interface<br>- RS-485, multi-drop 2-wire, up to 230.4 kb/s<br>- Ethernet 10/100 Mb/s | |
| Plus-in Port 2 | Supports the following Plug-In ports:<br>- Radio Modem, DPSK 1.2 kb/s, FSK 1.2 / 1.8 / 2.4 kb/s, DFM 2.4/3.6/4.8 kb/s and<br>- RS-232, Sync/Asynch, Full Flow Control, up to 230.4 kb/s, GPS receiver interface<br>- RS-485, multi-drop 2-Wire up to 230.4 kb/s<br>- Ethernet 10 Mb/s | |
| Ethernet Port 1 | 10/100 Mb/s | |
| USB Host Port 1, 2 (3680 only) | Type A host full speed 12 Mbs ports (HU1 on left and HU2 on right) for MDLC over IP communication via the MotoTrbo digital mode radio system. For MotoTrbo radio only; No other USB devices or USB Hubs are supported. | |
| USB Device Port 1 | USB device port, Type B connector (3680 only) | |
| Internal Port 1 | Ethernet 10/100 Mb/s (for redundant CPU configuration) (3680 only) | |
| LEDs Display | 4 CPU diagnostics LEDS, port status LEDs and user application LEDs | |
| Power Consumption | See ACE3600 Maximum Power Ratings below. | |
| Operating Voltage | 10. 8 -16 V DC (from the motherboard connector) | |
| Dimensions | 56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D) | |
| Weight | Approx. 0.38 Kg (0.84 Lb) | |

## 12 V DC POWER SUPPLY MODULE (DEFAULT)

| | |
|---|---|
| Input Voltage | 10.8 - 16 V DC |
| Outputs | Motherboard connector (to CPU and I/O modules): equal to input voltage, max. 4 A |
| | AUX1A/AUX1B: equal to input voltage, max. 8 A, on/off controlled by user program |
| | AUX2A/AUX2B (configurable): equal to input voltage (default), max. 8A, |
| | or 3.3, 5, 7.5, 9 V DC ±10%, max. 2.5A, on/off controlled by user program |
| | Note: max. 8 A total current consumption from all outputs |
| No Load Power Consumption | Max. 50 mA |
| | |
| Diagnostics LEDs | Status LED for: input voltage, AUX1 and AUX2 outputs, 12V control for DO modules |
| Input Protection | Internal Line Fuse, replaceable |
| Output Protection | AUX2A/B Short Circuit, automatic recovery on 3.3, 5, 7.5, 9 V |
| Dimensions | 56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D) |
| Weight | Approx. 0.443 Kg (0.95 Lb) |

## 12 V DC LOW-TIER POWER SUPPLY MODULE

| | |
|---|---|
| Input Voltage | 10.8 - 16 V DC |
| Outputs | Motherboard connector (to CPU and I/O modules): The same as input voltage / max. 4 A |
| | AUX1A/AUX1B: equal to input voltage max. 8A |
| | Note: max. 8 A total current consumption from all outputs |
| Input Protection | Internal Line Fuse, replaceable |
| Dimensions | 56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D) |
| Weight | Approx. 0.4 Kg (0.9 Lb) |

## 18 - 72 V DC POWER SUPPLY MODULES

| | |
|---|---|
| Input Voltage | 18 - 72 V DC |
| Total Power | 18-72 V DC: Max. 60 Watt continuous, Max. 105 Watt peak @ 25% duty cycle |
| Outputs | Motherboard connector (to CPU and I/O modules): 13.2 V DC ±20%, max. 4 A |
| | AUX1A/AUX1B: equal to input voltage, max. 8 A, on/off controlled by user program |
| | AUX2A/AUX2B (configurable): equal to input voltage (default), max. 8A, |
| | or 3.3, 5, 7.5, 9 V DC ±10%, max. 2.5A, on/off controlled by user program |
| | Note: max. 8 A total current consumption from all outputs |
| Battery Charger | 12 V Lead-Acid battery charger (in PS model with charger) |
| | Automatic charging of 6.5 or 10 Ah backup battery, battery temperature sensing, overcharging |
| | protection, battery capacity test and diagnostics, automatic battery switch-over |
| No Load Power Consumption | Max. 250 mA |
| Diagnostics LEDs | Status LED for: input voltage, AUX1 and AUX2 outputs, 12V control for DO modules and battery |
| Efficiency | 80% typical, 76% with full load |
| In-rush Current | 10 A maximum, for 2 mSec. Max, cold start at 25°C |
| Output Protection | AUX2A/B Short Circuit, automatic recovery on 3.3, 5, 7.5, 9 V |
| Dimensions | 56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D) |
| Weight | Approx. 1 Kg (2.2 Lb) |

## AC POWER SUPPLY MODULES

| | |
|---|---|
| Input Voltage | 100-240 V AC, 50/60 Hz |
| Total Power | Max. 60 Watt continuous, Max. 105 Watt peak @ 25% duty cycle |
| Outputs | Motherboard connector (to CPU and I/O modules): 13.2 V DC ±20%, max. 4 A |
| | AUX1A/AUX1B user connectors: 13.2V DC ±20%, max. 8 A, on/off controlled by user program |
| | AUX2A/AUX2B: 13.2 V DC ±20%, max. 8A or 3.3, 5, 7.5, 9 V DC ±10% (configurable), max. 2.5A , on/off controlled by user program |
| | Note: max. 8 A total current consumption from all outputs |
| Battery Charger | 12 V Lead-Acid battery charger (in PS with charger) |
| | Automatic charging of 6.5 or 10 Ah backup battery, battery temperature sensing, overcharging |
| | protection, battery capacity test and diagnostics, automatic battery switch-over |
| No Load Power Consumption | 130 mA @ 220 V AC |
| Diagnostics LEDs | Status LED for: input voltage, AUX1 and AUX2 outputs, 12V control for DO modules and battery |
| Efficiency | 80% typical @230 V AC, 76% typical @115 V AC (full load) |
| In-rush Current | 25 A maximum, for 2 mSec. Max, cold start at 25°C |
| Power Factor | 0.98 typical at 230 V AC, 0.99 typical at 115 V AC |
| Input Protection | Internal Line Fuse, replaceable |
| Output Protection | AUX2A/B Short Circuit, automatic recovery on 3.3, 5, 7.5, 9 V |
| Dimensions | 56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D) |
| Weight | Approx. 1 Kg (2.2 Lb) |

## 24 V DC PLUG-IN POWER SUPPLY

| | |
|---|---|
| Input Voltage | 10.8-16V (from I/O module) |
| Output | 24V floating, max. 150 mA |
| Efficiency | 75% typical |
| Protection | Automatic output shut down on over-voltage and over-current |
| Insulation | Input to output: 1500 V AC |
| Dimensions | 78 mm W x 15 mm H x 68 mm D (3.1" W x 0.6" H x 2.7" D) |
| Weight | Approx. 0.04 Kg (0.09 Lb) |

## 16/32 DI FAST 24 V MODULES

| | |
|---|---|
| Total Number of Inputs | 16 DI, 32 DI |
| Input Arrangement | Isolated groups of 16 inputs with shared common |
| Fast Counter Inputs | Inputs that can be used as fast counters:<br>- All inputs in 16 DI module<br>- First 20 inputs in 32 DI module |
| AC Input Frequency | 45 – 65 Hz |
| AC Input Delay | Maximum 0.2 mS |
| Fast Counter Input Frequency | 0 - 12.5 KHz, minimum pulse width 40 µS |
| Max. DC Input Voltage | Max. ±40 V DC (relative to input common) |
| "ON" DC Votage Range | +9 to +30 V DC, -30 to -9 V DC |
| "OFF" DC Voltage Range | -3 to +3 V DC |
| "ON" AC Voltage Range | 10 to 27 V AC (RMS) |
| "OFF" AC Voltage Range | 0 to 5 V AC (RMS) |
| Input Current | Max. 3.5 mA |
| Fast Capture Resolution | 1 mS (Interrupt upon change of state) |
| Event Time Tagging Resolution | 1 mS (Interrupt upon change of state) |
| Input Filtering | 0 to 50.8 mS (DC, programmable in 0.2 mSec steps) |
| Counter Input Filtering | 0 to 12.75 mS<br>(Programmable in 0.05 mSec steps for inputs configured as high speed counters) |
| 24 V DC Output | Supports optional isolated 24 V plug-in "Wetting" Power Supply<br>(One in 16 DI, two in 32 DI) |

| Diagnostics LEDs | Status LED per each input, module error LED, Plug-In 24V status LED |
|---|---|
| User Connection | 2 or 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG |
| Cable & TB Holder | 20 or 40 Wire cable with Terminal Block Holder connector, 26 AWG wires |
| Module Replacement | Hot swap replacement – module extraction/insertion under voltage |
| Input Isolation | 2.5 k V RMS between input and module logic per IEC60255-5 |
| Input Insulation | Insulation resistance 100 MΩ @ 500 V DC, per IEC60255-5 |
| Operating Voltage | 10.8 -16 V DC and 3.3 V DC (from the motherboard connector) |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) |
| Weight | 16 DI: approx. 0.28 Kg (0.62 Lb), 32 DI: approx. 0.29 Kg (0.63 Lb) |

## 16/32 DI FAST 24 V IEC 61131-2 TYPE II MODULES

| Total Number of Inputs | 16 DI, 32 DI |
|---|---|
| Input Arrangement | Isolated groups of 16 inputs with shared common |
| Fast Counter Inputs | nputs that can be used as fast counters: <br> - All inputs in 16 DI <br> - First 20 inputs in 32 DI |
| Fast Counter Input Frequency | 0 - 10 KHz, minimum pulse width 50 ìS |
| Max. DC Input Voltage | Max. ±40 V DC |
| "ON" DC Votage Range | +11 to +30 V DC, -30 to -11 V DC |
| "OFF" DC Voltage Range | -5 to +5 V DC |
| Input Current | 6-10 mA |
| Fast Capture Resolution | 1 mS (Interrupt upon change of state) |
| Event Time Tagging Resolution | 1 mS (Interrupt upon change of state) |
| Input Filtering | 0 to 50.8 mS (DC, programmable in 0.2 mSec steps) |
| Counter Input Filtering | 0 to 12.75 mS <br> (Programmable in 0.05 mSec steps for inputs used as high speed counters) |
| 24 V DC Output | Supports isolated 24 V plug-in "Wetting" Power Supply <br> (one in 16 DI, two in 32 DI) |
| Diagnostic LEDs | LED per each input status, module error LED, 24V Plug-In status LED |
| User Connection | 2 or 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG |
| Cable & TB Holder | 20 or 40 Wire Cable with Terminal Block Holder connector, 26 AWG |
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage |
| Input Isolation | 2.5 kV RMS between input and module logic per IEC60255-5 |
| Input Insulation | Insulation resistance 100 MÙ @ 500 V DC, per IEC60255-5 |
| Operating Voltage | 10.8 -16 V DC and 3.3 V DC (from the motherboard connector) |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) |
| Weight | 16 DI: approx. 0.28 Kg (0.62 Lb), 32 DI: approx. 0.29 Kg (0.63 Lb) |

## 16 DI 120/230 V MODULE

| Total Number of Inputs | 16 DI |
|---|---|
| Input Characteristics | IEC 61131-2 Type 1 |
| Input Arrangement | Two isolated groups of 6 inputs and one isolated group of 4 inputs. |
| AC Input Frequency | 47 - 63 Hz |
| AC Input Delay | Maximum 25.0 mS |
| Max. DC Input Voltage | Max. ±264 V DC (relative to input common) |
| "ON" DC Votage Range | +79.0 V DC to +264.0 V DC, -79.0 V DC to -264.0 V DC |
| "OFF" DC Voltage Range | -40 to +40 V DC |
| "ON" AC Voltage Range | 79.0 to 264.0 V AC (RMS) |
| "OFF" AC Voltage Rand | 0 to +40 V AC (RMS) |

| Input Current | At 110VDC 1.0 to 3.0 mA | At 110VAC > 2.0 mA RMS |
| --- | --- | --- |
| | At 230VDC 0.4 to 2.0 mA | At 230VAC > 3.0 mA RMS |
| Input Filtering | 0 to 50.8 mS (DC, programmable in 0.2 mSec steps), minimum effective filter value - 7.0 msec. | |
| Diagnostic LEDs | LED per each input status, module error LED | |
| User Connection | 3 Terminal Blocks (5.00mm pitch), Maximum 14 AWG | |
| Cable & TB Holder | 30 Wire Cable with Terminal Block Holder connector, 20 AWG wires | |
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage | |
| Input Isolation | 2.5 kV RMS between input and module logic per IEC60255-5 | |
| Input Insulation | Insulation resistance 100 MÙ @ 500 V DC | |
| Operating Voltage | 10.8 -16 V DC and 3.3 V DC ±10% (from the motherboard connector) | |
| Power Consumption | See ACE3600 Maximum Power Ratings below. | |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) | |
| Weight | Approx. 0.367 Kg (0.80 Lb) | |

## 8/16 RELAY OUTPUT MODULES

| Total Number of Outputs | 8 EE relay outputs | 8 ML relay outputs |
| --- | --- | --- |
| | 16 EE relay outputs | 16 ML relay outputs |
| Output Arrangement | 8 DO: 3 X Form C (SPDT) and 5 X Form A (SPST) | |
| | 16 DO: 6 X Form C (SPDT) and 10 X Form A (SPST) | |
| Contact Voltage Ratings | Max. 60 V DC, or 30 V AC RMS (42.4 V peak) | |
| Contact Power Ratings | 2A @ 30 V DC, 0.6A @ 60V DC or 0.6A @ 30V AC (resistive load) | |
| Relay Back Indication | Contact position - hardware back indication | |
| DO Frequency | Max. 10 Hz | |
| Diagnostics LEDs | LED per each output status, module error LED | |
| User Connection | 2 or 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG | |
| Cable & TB Holder | 20 or 40 Wire Cable with Terminal Block Holder connector, 26 AWG | |
| Fail State | Configurable relay state on CPU fail: On, Off or 'last value' | |
| All Relays Disable/Enable | Selectable per module, controlled from the power supply | |
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage | |
| Output Isolation | Between open contacts: 1kV, between contact and coil: 1.5 kV, between contact sets: 1.5 kV | |
| Insulation | Insulation resistance 100 MÙ @ 500 V DC per IEC60255-5, | |
| | Insulation impulse 1.5 kV per IEC60255-5 | |
| Operating Voltage | 10.8 -16 V DC and 3.3 V DC (from the motherboard connector) | |
| Power Consumption | See ACE3600 Maximum Power Ratings below. | |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) | |
| Weight | 8 DO: approx. 0.29 Kg (0.64 Lb), 16 DO: approx. 0.32 Kg (0.7 Lb) | |

## 12 HV OUTPUT MODULES

| Total Number of Outputs | 12 EE relay outputs | 12 ML relay outputs |
| --- | --- | --- |
| Output Arrangement | 12 x 1 Form A | |
| Contact Power Ratings | 3A @ 250 V AC, 3A @ 30 V DC, or 0.20A @ 125 V DC (resistive load) | |
| Minimum Contact Load Current | 10.0 mA @+5.00 V DC | |
| Maximum Switching Current | 3.00 A | |
| Relay Back Indication | Contact position - hardware back indication | |
| DO Frequency | Max. 10 Hz (resistive load) | |
| Diagnostics LEDs | LED per each output status, module error LED | |
| User Connection | 3 Terminal Blocks (5.00mm pitch), Maximum 14 AWG | |
| Cable & TB Holder | 30 Wire Cable with Terminal Block Holder connector, 20 AWG wires | |
| Fail State | Configurable relay state on CPU fail: On, Off or 'last value' | |
| All Relays Disable/Enable | Selectable per module, controlled from the power supply | |
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage | |

| | |
|---|---|
| Output Isolation | Between output and module logic: 2.5 kV, per IEC60255-5 |
| Insulation | Insulation resistance 100 MÙ @ 500 V DC per IEC60255-5 |
| | Insulation impulse 5 kV per IEC60255-5 |
| Operating Voltage | 10.8 -16 V DC and 3.3 V DC ±10% (from the motherboard connector) |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) |
| Weight | approx. 0.423 Kg (0.90 Lb) |

## 8/16 ANALOG INPUT MODULES

| | | |
|---|---|---|
| Total Number of Inputs | 8 AI, ±20 mA | 8 AI, ±5 V |
| | 16 AI, ±20 mA | 16 AI, ±5 V |
| Input Configuration | Isolated (floating) analog inputs | |
| A to D Resolution | 16 Bit (including sign) | |
| Input Accuracy | ±0.1% of full scale | |
| Input Sampling Time | 10 mSec @ 50 Hz filtering | 8.33 mSec @ 60 Hz filtering |
| Smoothing | Selectable input averaging: 1, 2, 4, 8, 16, 320, 64 or 128 samples (x10 mS) | |
| Permitted Potential Between Inputs | 75 V DC, 60 V AC (RMS) | |
| Input Impedance | ±20 mA input: Rin < 250Ω | ±5 V input: Rin > 1 MΩ |
| Crosstalk Rejection | Better than 80 dB between any pair of inputs | |
| Temperature Stability | Better than ±25 PPM/ºC | |
| Interference Suppression | Selectable 50 or 60 Hz filtering | Differential mode rejection > 50 dB |
| | Common mode rejection > 80 dB | |
| 24 V DC Output | Supports optional isolated 24V Plug-in Power Supply (one in 8 DI, two in 16 DI) | |
| Diagnostics LEDs | Overflow and Underflow LED per each input, module error LED, 24V Plug-In status LED | |
| | The module Overflow and Underflow levels can be configured to: | |
| | Current inputs: ±20mA/4-20 mA | |
| | Voltage inputs: ±5 V/0-5 V/1-5 V | |
| User Connection | 2 or 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG | |
| Cable & TB Holder | 20 or 40 Wire Cable with Terminal Block Holder connector, 26 AWG | |
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage | |
| Input Isolation | 1.5 kV RMS between input and module logic, per IEC60255-5 | |
| Input Insulation | Insulation resistance 100 MΩ @ 500 V DC, per IEC60255-5 | |
| Operating Voltage | 10.8-16 V DC and 3.3 V DC (from the motherboard connector) | |
| Power Consumption | See ACE3600 Maximum Power Ratings below. | |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) | |
| Weight | 8 AI: approx. 0.32 Kg (0.71 Lb), 16 AI: approx. 0.34 Kg (0.75 Lb) | |

## 4 ANALOG OUTPUT MODULE

| | | |
|---|---|---|
| Total Number of Inputs | 4 | |
| Output Configuration | Isolated floating channels, each channel can be connected as 0 -20 mA or 0-10 V DC voltage | |
| D to A Resolution | 14 Bit | |
| Output Accuracy | ±0.1% of full scale @25°C | |
| Temperature Stability | Better than ±25 PPM/°C | |
| Internal Setling Time | Max. 1 ms | |
| Output Load | Voltage: > 1.0 kΩ, < 1.0 µf, Current: < 750 Ω (internal power source) | |
| Crosstalk Rejection | Better than 50 dB between any pair of outputs | |
| Interference Suppression | Common Mode Rejection: > 60 dB | |
| Output Protection | Voltage output: short-circuit current, max. 30 mA | Current output: No-load voltage max. 22 V DC |
| Diagnostics LEDs | Module Error LED. Voltage mode LED, Current mode LED, Calibration LED per channel | |
| User Connection | 2 Terminal Blocks (3.5mm pitch), Maximum 18 AWG | |
| Cable & TB Holder | 20 Wire Cable with Terminal Block Holder connector, 26 AWG | |

| | |
|---|---|
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage |
| Isolation | 1.5 kV between output and module logic |
| Insulation | Insulation resistance 100 MΩ @ 500 V DC, per IEC60255-5 |
| Operating Voltage | 10.8 -16 V DC and 3.3 V DC (from the motherboard connector) |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) |
| Weight | 0.29 Kg (0.64 Lb) |

## MIXED 4 ANALOG OUTPUT 8 ANALOG INPUT MODULES

| | | |
|---|---|---|
| Total Number of I/Os | 4 AO + 8 AI (AI: ±20 mA or ±5 V DC) | |
| I/O Arrangement | AO - each channel can be connected as 0 -20 mA or 0-10 V, AI - Isolated (floating) analog inputs | |
| AO D to A Resolution | 14 Bit | |
| AO Accuracy | ±0.1% of full scale @25°C | |
| AO Temperature Stability | Better than ±25 PPM/°C | |
| AO Internal Settling Time | Max. 1 ms | |
| AO Load | Voltage: > 1.0 kΩ, < 1.0 µf, Current: < 750 Ω | |
| AO Crosstalk Rejection | Better than 50 dB between any pair of outputs | |
| AO Interference Suppression | Common Mode Rejection: > 60 dB | |
| AO Voltage Output Protection | Short-circuits protection, max. 30 mA (all other operating channels remain fully functional) | |
| AO Current output no-load voltage | Max. 22 V DC | |
| AO Isolation | 1.5 kV between output and module logic | |
| AO Insulation | Insulation resistance 100 MΩ @ 500 V DC, per IEC60255-5 | |
| AI A to D Resolution | 16 Bit (including sign) | |
| AI Accuracy | ±0.1% of full scale @ -40ºC to +70ºC | |
| AI Sampling Time | 10 mSec @ 50 Hz filtering | 8.33 mSec @ 60 Hz filtering |
| AI Smoothing | Selectable input averaging: 1, 2, 4, 8, 16, 32, 64 or 128 samples (x10 mS) | |
| Permitted Potential between Inputs | 75 V DC, 60 V AC (RMS) | |
| AI Input Impedance | ±20 mA input: Rin < 250 Ω | ±5 V input: Rin > 1 MΩ |
| AI Crosstalk Rejection | Better than 80 dB between any pair of inputs | |
| AI Temperature Stability | Better than ±25 PPM/ºC | |
| AI Interference Suppression | Selectable 50 or 60 Hz filtering, Common mode rejection > 80 dB, | Differential mode rejection > 50 dB |
| 24 V DC Output | Supports one optional isolated 24V Plug-in Power Supply | |
| Diagnostics LEDs | AO - Voltage mode LED, Current mode LED, Calibration LED per channel | |
| | AI - Overflow and Underflow LED per each input, 24V Plug-in status LED | |
| | The module Overflow and Underflow levels can be configured to: ±20mA/4-20 mA or ±5 V/0-5 V/1-5 V General - Module error LED | |
| AI Input Isolation | 1.5 kV between input and module logic | |
| AI Input Insulation | Insulation resistance 100 MΩ @ 500 V DC, per IEC60255-5 | |
| User Connection | 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG | |
| Cable & TB Holder | 40 Wire Cable with Terminal Block Holder connector, 26 AWG | |
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage | |
| Operating Voltage | 10.5-16 V DC and 3.3 V DC (from the motherboard connector) | |
| Power Consumption | See ACE3600 Maximum Power Ratings below. | |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) | |
| Weight | Approx. 0.34 Kg (0.75 Lb) | |

## 16/32 DIGITAL OUTPUT/DIGITAL INPUT MODULES (16/32 DO/DI)

| | |
|---|---|
| Total Number of I/Os | 16/32 |
| I/O Arrangement | 2/4 groups of 8 I/Os with shared common |
| | Each group can be configured to function as FET DO or dry contact DI |
| Counter Inputs | 20 first inputs can be used as counter inputs |
| Counter Input Frequency | 0 - 1 KHz, minimum pulse width 500 µS |
| Max. DC Input Voltage | Max. 30 V DC (relative to input common) |
| Input "ON" Resistance | 0-4 kΩ |
| Input "OFF" Resistance | ≥50 kΩ |
| Fast Capture Resolution | 1 mS (Interrupt upon change of state) |
| Event Time Tagging Resolution | 1 mS (Interrupt upon change of state) |
| Input Current | Max. 0.3 mA (when the input is shorted) |
| Input Filtering | 0 to 50.8 mS (programmable in 0.2 mSec steps) Not relevant, minimum allowed is 1mSec |
| Counter Input Filtering | 0 to 12.75 mS (programmable in 0.05 mSec steps) Not relevant, minimum allowed is 1mSec |
| Output Type | MOSFET |
| Output Voltage Range | 5-30 V DC (user-supplied voltage) |
| DO Frequency | Max. 1 KHz (resistive load) |
| DO Output current | Max. 500 mA sink current (resistive load) |
| Output Fail State | Configurable output state on CPU fail: On, Off or 'last value' |
| Diagnostics LEDs | LED per each input/output status, module error LED |
| User Connection | 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG |
| Cable & TB Holder | 20 or 40 Wire Cable with Terminal Block Holder connector, 26 AWG |
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage |
| Input/Output Isolation | 2.5 kV between input/output and module logic |
| Input Insulation | Insulation resistance 100 MÙ @ 500 V DC per IEC60255-5 |
| Operating Voltage | 10.8-16 V DC and 3.3 V DC (from the motherboard connector) |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) |
| Weight | Approx. 0.25 Kg (0.55 Lb) |

## MIXED I/O 16DI + 4 DO + 4AI MODULES

| | |
|---|---|
| Total Number of I/Os | 16 Digital Inputs + 4 EE Relay Outputs + 4 Analog Inputs, ±20 mA |
| | 16 Digital Inputs + 4 ML Relay Outputs + 4 Analog Inputs, ±20 mA |
| I/O Arrangement | 1 group of 16 DIs with shared common, 4 relay outputs - Form C, 4 isolated analog inputs |
| DI Counter Inputs | The first 12 inputs can be configured as fast counters. |
| DI Frequency | 0 - 1 KHz |
| DI Fast Counter Frequency | 0 - 5 KHz minimum pulse width 100 ìS |
| DI Max. DC Voltage | Max. 40 V DC |
| DI "ON" DC Voltage Range | +11 to +30 V DC, -30 to -11 V DC |
| DI "OFF" DC Voltage Range | -5 to +5 V DC |
| DI Current | 6-10 mA |
| Fast Capture Resolution | 1 mS (Interrupt upon change of state) |
| Event Time Tagging Resolution | 1 mS (Interrupt upon change of state) |
| DI Filtering | 0 to 50.8 mS (DC, programmable in 0.2 mSec steps) |
| DI Counter Filtering | 0 to 12.75 mS (programmable in 0.05 mSec steps for inputs configured as high speed counters) |
| DO Contact Voltage Ratings | Max. 60 V DC or 30 V AC RMS (42.4 V peak) |
| DO Contact Power Ratings | 2A @ 30 V DC, 0.6A @ 60V DC or 0.6A @ 30V AC (resistive load) |
| DO Relay Back Indication | Contact position - hardware back indication |
| DO Fail State | Configurable relay state on CPU fail: On, Off or 'last value' |
| AI Resolution | 16 Bit (including sign) |

| | |
|---|---|
| AI Accuracy | ±0.1% @ -40°C to +70°C |
| AI Sampling time | 10 mSec @ 50 Hz filtering, 8.33 mSec @ 60 Hz filtering |
| AI Smoothing | Selectable input averaging: 1, 2,4,8, 16, 32, 64 or 128 samples (x10 mS) |
| AI max. Potential between AIs | 75 V DC, 60 V AC (RMS) |
| AI Impedance | Rin < 250Ω |
| AI Crosstalk Rejection | Better than 80 dB between any pair of inputs |
| AI Temperature Stability | Better than ±25 PPM/°C |
| AI Interference Suppression | Selectable 50 or 60 Hz filtering, common mode rejection > 80 dB, differential mode rejection > 50 dB |
| Diagnostics LEDs | LED per each input/output status, module error LED, 24V Plug-in status LED |
| 24 V DC Output | Supports one isolated 24V plug-in "Wetting" Power Supply |
| User Connection | 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG |
| Cable & TB Holder | 40 Wire Cable with Terminal Block Holder connector, 26 AWG |
| Module Replacement | Hot swap replacement– module extraction/insertion under voltage |
| Input / Output Isolation | DI: 2.5 kV RMS between input and module logic per IEC60255-5 |
| | DO: Between open contacts: 1kV, between output and module logic: 1.5 kV, per IEC60255-5 |
| | AI: 1.5 kV between input and module logic per IEC60255-5 |
| Input Insulation | Insulation resistance 100 MÙ @ 500 V DC per IEC60255-5 |
| Operating Voltage | 10.8-16 V DC and 3.3 V DC (from the motherboard connector) |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| | EE Relay on : 0.2 W typical (15 mA @ 13.8 V DC at PS) |
| | (Not including 24 V Plug-in Power Supply) |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) |
| Weight | Approx. 0.31 Kg (0.68 Lb) |

## DO SBO RELAY MODULE

| | |
|---|---|
| Total Number of Outputs | 8 DO: 8 EE relay outputs |
| | 16 DO: 16 EE relay outputs |
| Output Arrangement | 8 DO: 2 X Form A (SPST) - (two normally open contacts per DO) |
| | 16 DO: 6 X Form C (SPDT and 10 X Form A (SPST) |
| Contact Voltage Ratings | Max. 60 V DC or 30 V AC RMS (42.4 V peak) |
| Contact Voltage Power Ratings | 2A @ 30 V DC, 0.6A @ 60V DC or 0.6A @ 30V AC (resistive load) |
| Relay Back Indication | Contact Back Indication: Indicating contact position |
| Relay Select Back Indication | Indicating relay selection before relay activation |
| DO Frequency | Max. 10 Hz |
| Diagnostic LEDs | LED per each output status, module error LED, Controlled DO LED |
| | Controlled DO LED states:<br>  a. OFF - 12V is not controlled<br>  b. ON - 12V is controlled and exists<br>  c. Blinking - 12V is controlled and does not exist |
| User Connection | 4 Terminal Blocks (3.5mm pitch), Maximum 18 AWG |
| Cable and TB Holder | 40-wire cable braid with Terminal Block holder connector, 26 AWG |
| All Relays Disable/Enable | Selectable per module, controlled from the power supply |
| Module Replacement | Hot swap replacement - module extraction/insertion under voltage |
| Output Isolation | Between open contacts: 1kV<br>Between contact and coil: 1.5 kV<br>Between contact sets: 1.5 kV |
| Insulation | Insulation resistance 100MΩ @ 500 V DC per IEC60255-5 |
| | Insulation impulse 1.5 kV per IEC60255-5 |
| Operating Voltage | 10.8 - 16 V DC and 3.33 V DC (from the motherboard connector) |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) |
| Weight | Approx. 0.32 Kg (0.7 Lb) |

## EXPANSION POWER SUPPLY MODULE

| | |
|---|---|
| Input Voltage | DC 10.8-16 V |
| Outputs | To Motherboard connector – +10.80 to +16.00 VDC, max. 4A |
| | To cascaded expansion power supply - +10.80 to +16.00 VDC, max. 8A |
| Over Current Protection | 4.0 A (Slow blow fuse), protecting the expansion frame |
| | 8.0 A (Slow blow fuse), protecting the cascaded expansion power supply |
| Maximum Current via Power IN/ OUT Circuit | 8.0 A (Slow blow fuse) |
| Over Voltage Protection | +17.00 ±1 VDC (protecting the expansion frame) |
| Absolute Maximum Voltage | +18.00 VDC |
| Dimensions | 56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D) |
| Weight | Approx. 0.43Kg (0.94 Lb) |

## EXPANSION MODULE

| | |
|---|---|
| Microprocessor | Freescale – Power PC II, MPC8720, 32-bit, 200 MHz Clock |
| Serial Port | RS232C Asynch, Full Flow Control port, up to 230.4 kb/s; used for STS only |
| Ethernet Port | 10/100 Mb/s – connection to the main frame |
| LAN Cable | Category 5E shielded (FTP), up to 50 meter |
| LEDs Display | 4 CPU diagnostic LEDs, Port status LEDs and Expansion Address LEDs |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| Operating Voltage | 10.8-16 V DC (from the motherboard connector) |
| Dimensions | 56 mm W x 225 mm H x 180 mm D (2.2" W x 8.7" H x 7.1" D) |
| Weight | Approx. 0.38 Kg (0.84 Lb) |

## EXPANSION LAN SWITCH

| | |
|---|---|
| Ethernet Port 1-8 | 8 on board 10/100 Mb/s Ethernet ports (Auto crossover) |
| LEDs Display | Error LED, Port status LEDs |
| Power Consumption | See ACE3600 Maximum Power Ratings below. |
| Module Replacement | Hot swap replacement – module extraction/insertion under voltage |
| Operating Voltage (from the motherboard connector) | 10.8-16 V DC, 3.30 VDC +/-10% |
| User Connection (Ethernet Ports) | 8 shielded RJ45 connectors |
| LAN Cable | Category 5E shielded (FTP), up to 50 meter |
| Operating Voltage | 10.8-16 V DC (from the motherboard connector) |
| Dimensions | 37 mm W x 225 mm H x 180 mm D (1.5" W x 8.7" H x 7.1" D) |
| Weight | Approx 0.32 Kg (0.7 Lb) |

## ACE3600 MAXIMUM POWER RATINGS

The tables below list the typical maximum power consumption (at room temperature) for each of the ACE3600 RTU building blocks (CPU, Power Supply, I/O modules, radios, etc.) and the maximum peak power allowed for a fully loaded RTU, based on the housing type.

The values in the tables below are derived by using the power supply (AC: 100 to 240 VAC or DC: 18 to 72 VDC and 13.8 VDC) and have the power supply efficiency factor included in them.

Before deploying your RTU, add up the power consumption of all components of your system to verify that it is within the maximum peak power for your housing type. In systems with I/O expansion, consider all modules which consume power from their respective AC/DC main power sources when calculating the required power requirements.

**Maximum Peak Power Allowed for Fully Loaded RTU**

| | |
|---|---|
| 19" Rack (w/out metal enclosure) | 100 W |
| Large NEMA metal housing (50x50 cm) | 120* W |
| Small NEMA metal housing (40x40 cm) | 105* W |

**Power Consumption per RTU Module**

| Module | Self Power Consumption, no active I/O (Watts) | Maximum Power Consumption, per active I/O (Watts) | Self Power Consumption, no active I/O (Watts) | Maximum Power Consumption, per active I/O (Watts) | Maximum Power Consumption, all I/Os, LEDs active (Watts) |
|---|---|---|---|---|---|
| | AC: 100 to 240 VAC DC: 18 to 72 VDC | | Vin = +13.8 VDC | | |
| Power Supply (maximum) | 12.60 | N/A | 2.20 (156 mA) (12 VDC Power Supply Module ONLY) | N/A | N/A |
| Power Supply (Expansion) | 0.0 | N/A | 0.0 | N/A | N/A |
| CPU (3680/3640) | 5.20 | N/A | 4.20 (304 mA) | N/A | 4.00 (290 mA) |
| Expansion Module | 5.20 | N/A | 4.20 (304 mA) | N/A | 4.00 (290 mA) |
| Expansion LAN Switch | 1.50 | 0.220 | 1.20 (87 mA) | 0.176 (12.75 mA) | 3.10 (225 mA) (x8 ports ON) |
| Digital Input Fast 24V (x16/x32) | 0.100 | 0.100 (powered by internal 24V PS) | 0.080 (5.8 mA) | 0.100 (7 mA) (powered by internal 24V PS) | 3.50 (254 mA) (x32 inputs ON powered by x1 internal 24V PS) |
| Digital Input Fast 24V IEC Type 2 (x16/x32) | 0.100 | 0.230 (powered by internal 24V PS) | 0.080 (5.8 mA) | 0.230 (17 mA) (powered by internal 24V PS) | 8.20 (594 mA) (x32 inputs ON powered by x2 internal 24V PS) |
| Digital Input 120/230V | 0.100 | 0.015 | 0.080 (5.8 mA) | 0.012 (1 mA) | 0.524 (38 mA) (x16 inputs ON) |
| Digital Output ML Relay (x8/x16) | 0.120 | 0.010 | 0.100 (7.2 mA) | 0.008 (0.5 mA) | 0.483 (35 mA) (x16 relays ON) |
| Digital Output EE Relay (x8/x16) | 0.170 | 0.200 | 0.136 (10 mA) | 0.160 (11.6 mA) | 3.26 (236 mA) (x16 relays ON) |
| Digital Output ML Relay 120/230V | 0.200 | 0.006 | 0.160 (11.6 mA) | 0.005 (0.4 mA) | 0.248 (18.0 mA) (x12 relays ON) |
| Digital Output EE Relay 120/230V | 0.290 | 0.260 | 0.232 (17 mA) | 0.210 (0.15 mA) | 3.12 (226 mA) (x12 relays ON) |
| FET Digital Output/ Digital Input | 0.120 | DI = 0.014 (per input channel) DO = 0.014 (per output channel) | 0.100 (7.2 mA) | DI = 0.011 (per input channel) DO = 0.011 (per output channel) | 0.552 (40 mA) (x32 LEDs/ inputs ON) |
| Mixed I/O (DO ML +DI IEC Type 2) | 0.480 | DI = 0.250 (powered by internal 24V PS) DO = 0.010 | 0.384 (28 mA) | DI = 0.250 (powered by internal 24V PS) DO = 0.008 | 4.70 (341 mA) (x4 relays ON, x16 inputs ON, x4 AI ON, powered by internal 24V PS) |
| Mixed I/O (DO EE + DI IEC Type 2) | 0.480 | DI = 0.250 (powered by internal 24V PS) DO = 0.200 | 0.384 (28 mA) | DI = 0.250 (powered by internal 24V PS) DO = 0.160 | 5.50 (400 mA) (x4 relays ON, x16 inputs ON, x4 AI ON, powered by internal 24V PS) |
| Analog Output | 1.10 | 0.600 (per output channel @20.0 mA) | 0.880 (64 mA) | 0.480 (35 mA) (per output channel @20.0 mA) | 3.33 (241 mA) (x4 outputs sourcing 20.0 mA) |

| Module | Self Power Consumption, no active I/O (Watts) | Maximum Power Consumption, per active I/O (Watts) | Self Power Consumption, no active I/O (Watts) | Maximum Power Consumption, per active I/O (Watts) | Maximum Power Consumption, all I/Os, LEDs active (Watts) |
|---|---|---|---|---|---|
| | AC: 100 to 240 VAC DC: 18 to 72 VDC | | Vin = +13.8 VDC | | |
| Analog Input Current/ Voltage (x8/x16) | 0.530 | N/A | 0.440 (32.0 mA) | N/A | 0.870 (63.0 mA) |
| 24V Floating Plug-In Power Supply (No load) | 0.410 | N/A | 0.328 (24 mA) | N/A | N/A |
| 24V Floating Plug-In Power Supply (externally loaded 150 mA) | 4.80 | N/A | 3.84 (278 mA) | N/A | N/A |

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