

CONTROL MODES

- Indexer, Point-to-Point, PVT
- Camming, Gearing, Position, Velocity, Torque

COMMAND INTERFACE

- CANopen/DeviceNet
- ASCII and discrete I/O
- Stepper commands
- $\pm 10V$ position/velocity/torque command
- PWM velocity/torque command
- Master encoder (Gearing/Camming)

COMMUNICATIONS

- CANopen/DeviceNet
- RS-232
- RS-422/485

FEEDBACK

- Digital quad A/B encoder
- Aux encoder / emulated encoder out
- Analog sin/cos encoder (-S versions)
- Resolver (-R versions)
- Digital Halls

I/O - DIGITAL

- 12 inputs, 4 outputs

ACCESSORIES

- External regen resistors
- External edge filter

DIMENSIONS: mm [in]

- 191 x 140 x 64 [7.5 x 5.5 x 2.5]



| Model | Vac | Ic | Ip |
|------------|-----------|----|----|
| R10-230-18 | 100 - 240 | 6 | 18 |
| R10-230-36 | 100 - 240 | 12 | 36 |
| R10-230-40 | 100 - 240 | 20 | 40 |

Add -S to part numbers above for sin/cos feedback
Add -R for resolver feedback

DESCRIPTION

Xenus R10 is a ruggedized, AC powered servo drive for position, velocity, and torque control of AC brushless and DC brush motors. It operates on a distributed control network, as a stand-alone indexing drive, or with external motion controllers.

Indexing mode simplifies operation with PLC's that use outputs to select and launch indexes and inputs to read back drive status. A single serial port on the PLC can send ASCII data to multiple drives to change motion profiles as machine requirements change. DeviceNet capability enables multiple Xenus R10 drives to be controlled from Allen-Bradley PLC's.

CAN bus operation supports Profile Position, Profile Velocity, Profile Torque, Interpolated Position, and Homing. Up to 127 Xenus R10 drives can operate on a single CAN bus and groups of drives can be linked via the CAN so that they execute motion profiles together. Operation in torque (current), velocity, and position modes with external motion controllers is supported. Input command signals are ± 10 Vdc (torque, velocity, position), PWM/Polarity (torque, velocity), or Step/Direction (position).

RUGGEDIZED STANDARDS CONFORMANCE

| | | |
|------------------------|---------------|---------------------------------|
| Ambient Temperature | Non-Operating | -50°C to 85°C |
| | Operating | -40°C to 70°C |
| Thermal Shock | Operating | -40°C to 70°C in 1 minute |
| Relative Humidity | Non-Operating | 95% non-condensing at 60°C |
| | Operating | 95% non-condensing at 60°C |
| Vibration | Operating | 5 Hz to 500 Hz, up to 3.85 grms |
| Altitude | Non-Operating | -400 m to 12,200 m |
| | Operating | -400 m to 5,000 m |
| Shock | Crash Safety | 75 g peak acceleration |
| | Operating | 40 g peak acceleration |
| MIL-STD specifications | MIL-STD- | 461, 704, 810, 1275, 1399 |
| IEC specifications | IEC- | 60068, 60079 |

Xenus R10

GENERAL SPECIFICATIONS

Test conditions: Wye connected load: 2 mH line-line. Ambient temperature = 25 °C. Power input = 230 Vac, 60 Hz, 1Ø

| MODEL | R10-230-18 | R10-230-36 | R10-230-40 | Same specs for -S and -R models |
|--|---|----------------------------|------------|---|
| OUTPUT CURRENT | | | | |
| Peak Current | 18 (12.7) | 36 (25.5) | 40 (28.3) | Adc (Arms, sinusoidal) |
| Peak time | 1 | 1 | 1 | s |
| Continuous current (Note 1) | 6 (4.24) | 12 (8.5) | 20 (14.1) | Adc (Arms, sinusoidal) |
| INPUT POWER | | | | |
| Mains voltage, phase, frequency | 100~240 | 100~240 | 100~240 | Vac, ±10%, 1Ø or 3Ø, 47~63 Hz |
| Mains current | 20 | 20 | 20 | Arms |
| +24 Vdc Control power | | +20 to +32 Vdc, 500 mA max | | Required for operation |
| DIGITAL CONTROL | | | | |
| Digital Control Loops | Current, velocity, position. 100% digital loop control | | | |
| Sampling rate (time) | Current loop: 15 kHz (67 µs), Velocity & position loops: 3 kHz (333 µs) | | | |
| Bus voltage compensation | Changes in bus or mains voltage do not affect bandwidth | | | |
| Minimum load inductance | 200 µH line-line | | | |
| COMMAND INPUTS (NOTE: DIGITAL INPUT FUNCTIONS ARE PROGRAMMABLE) | | | | |
| <i>Distributed Control Modes</i> | | | | |
| CANopen | Position, Velocity, Torque, Homing, Profile, and Interpolated profile modes | | | |
| DeviceNet® | Compatible with Allen-Bradley PLC's | | | |
| ASCII | Multiple drives accessible from a single RS-422 port | | | |
| <i>Stand-alone mode</i> | | | | |
| Analog torque, velocity, position reference | ±10 Vdc, 12 bit resolution | | | Dedicated differential analog input |
| Input impedance | 74.8 kΩ | | | Between Ref(+), Ref(-) |
| Digital position reference | Pulse/Direction, CW/CCW | | | Stepper commands (2 MHz maximum rate) |
| | Quad A/B Encoder | | | 2 M line/sec, 8 Mcount/sec (after quadrature) |
| Digital torque & velocity reference | PWM, Polarity | | | PWM = 0% - 100%, Polarity = 1/0 |
| | PWM 50% | | | PWM = 50% ±50%, no polarity signal required |
| | PWM frequency range | | | 1 kHz minimum, 100 kHz maximum |
| | PWM minimum pulse width | | | 220 ns |
| Indexing | Up to 32 programs can be launched from inputs or ASCII commands. Each program can consist of moves, I/O commands, time delays, and other programmable operations. | | | |
| Camming | Master quadrature encoder provides position as index to cam table. Digital inputs initiate cam functions. | | | |
| DIGITAL INPUTS | | | | |
| Number | 12 | | | |
| All inputs | 74HC14 Schmitt trigger operating from 5.0 Vdc with RC filter on input, 10 kΩ to +5 Vdc or ground (selectable) | | | |
| Logic levels | Vin-LO < 1.35 Vdc, Vin-HI > 3.65 Vdc | | | |
| Pull-up, pull-down control | Inputs are divided into four groups with selectable connection of input pull-up/down resistor to +5 Vdc or ground for each group: [IN1,2,3], [IN4,5], [IN6,7,8], [IN9,10,11,12] | | | |
| Enable [IN1] | 1 dedicated input with 330 µs RC filter for drive enable. Active level programmable, +24 Vdc max | | | |
| GP [IN2,3,4,5,11,12] | 6 General Purpose inputs with 330 µs RC filter, programmable functions, and active level select, +24 Vdc max | | | |
| HS [IN6,7,8,9,10] | 5 High-Speed Inputs inputs with 100 ns RC filter, programmable functions, and active level select, +12 Vdc max | | | |
| DIGITAL OUTPUTS (NOTE 2) | | | | |
| Number | 4 | | | |
| [OUT1], [OUT2], [OUT3] | Current-sinking MOSFET with 1 kΩ pullup to +5 Vdc through diode | | | |
| Current rating | 1 Adc max, +40 Vdc max. Functions programmable | | | |
| | External flyback diode required if driving inductive loads | | | |
| Brake [OUT4] | Opto-isolated, current-sinking with flyback diode to +24 Vdc, 1 Adc max | | | |
| MULTI-MODE ENCODER PORT | | | | |
| As Input | Secondary digital quadrature encoder (A, /A, B, /B, X, /X), 121 Ω terminating resistors | | | |
| | 18 M-counts/sec, post-quadrature (4.5 M-lines/sec) | | | |
| As Output | Quadrature encoder emulation with programmable resolution to 4096 lines (65,536 counts) per rev from analog sin/cos encoders or resolvers. Buffered signals from digital quad A/B/X primary encoder | | | |
| | A, /A, B, /B, X, /X, from 26LS31 differential line driver | | | |
| RS-232 PORT | | | | |
| Signals | RxD, TxD, Gnd in 6-position, 4-contact RJ-11 style modular connector | | | |
| Mode | Full-duplex, DTE serial communication port for drive setup and control, 9,600 to 115,200 baud | | | |
| Protocol | Binary and ASCII formats | | | |
| RS-422 PORT | | | | |
| Signals | XMT-A, XMT-B, RCV-A, RCV-B, in a 6-position, 6-contact RJ-11 style modular connector | | | |
| Mode | Full-duplex, DTE serial communication port for drive setup and control, 9,600 to 115,200 baud | | | |
| Protocol | Binary and ASCII formats | | | |
| CAN PORTS | | | | |
| Signals | CANH, CANL, Gnd in 8-position RJ-45 style modular connector, wired as per CAN Cia DR-303-1, V1.1 | | | |
| Format | CAN V2.0b physical layer for high-speed connections compliant | | | |
| Data | CANopen Device Profile DSP-402 | | | |
| Address selection | 16 position rotary switch on front panel with 3 additional address bits available as digital inputs or programmable to flash memory (7-bit addressing, 127 nodes per CAN network) | | | |
| STATUS INDICATORS | | | | |
| Drive Status | Bicolor LED, drive status indicated by color, and blinking or non-blinking condition | | | |
| CAN Status | Bicolor LED, status of CAN bus indicated by color and blink codes to CAN Indicator Specification 303-3 | | | |

Xenus R10

GENERAL SPECIFICATIONS (CONTINUED)

REGENERATION

| | | |
|------------------|---|--|
| Operation | Internal solid-state switch drives external regen resistor (see Ordering Guide for types) | |
| Cut-In Voltage | +HV > 390 Vdc | Regen output is on, (optional external) regen resistor is dissipating energy |
| Drop-Out Voltage | +HV < 380 Vdc | Regen output is off, (optional external) regen resistor not dissipating energy |
| Tolerance | ±2 Vdc | For either Cut-In or Drop-Out voltage |
| Hysteresis | 10 ±0.5 Vdc | Differential between Cut-In & Drop-Out voltage |

NOTES:

1. Heatsinking and/or forced-air cooling is required for continuous output power rating
2. Brake [OUT4] is programmable as motor brake, or as general purpose digital output

PROTECTIONS

| | | |
|-----------------------------------|--|--|
| HV Overvoltage | +HV > 400 Vdc | Drive PWM outputs turn off until +HV is less than overvoltage |
| HV Undervoltage | +HV < 60 Vdc | Drive PWM outputs turn off until +HV is greater than undervoltage |
| Drive over temperature | IGBT > 80 °C ±3 °C | Drive PWM outputs turn off until IGBT temperature is below threshold |
| Short circuits | Output to output, output to ground, internal PWM bridge faults | |
| I ² T Current limiting | Programmable: continuous current, peak current, peak time | |
| Motor over temperature | Drive shuts down when motor over-temperature switch changes to high-resistance state, or opens | |
| Feedback power loss | Fault occurs if feedback is removed or +5 V is <85% of normal | |

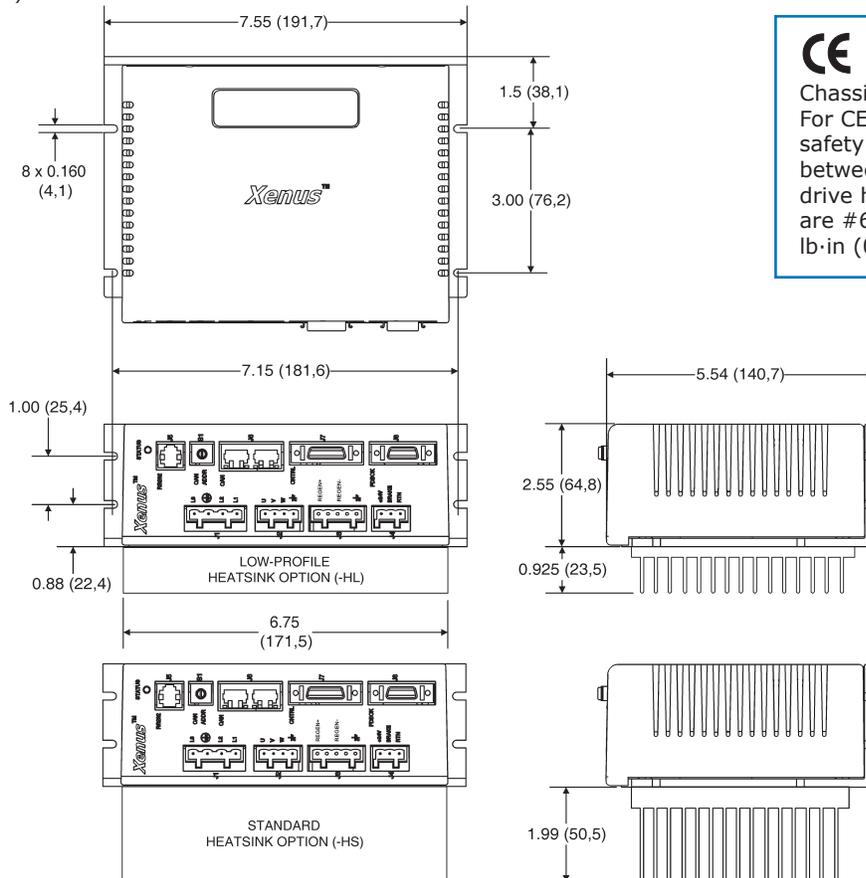
MECHANICAL

| | |
|---------|--|
| Size | 7.55 in (191,8 mm) X 5.57 in (141,5 mm) X 2.57 in (65,3 mm) |
| Weight | 3.0 lb (1.36 kg) for drive without heatsink 1.9 lb (0.86 kg) for XSL-HS heatsink, 1.26 lb (0.57 kg) for XSL-HL heatsink |
| Cooling | Heat sink and/or forced air cooling required for continuous power output |

AGENCY STANDARDS CONFORMANCE

| | |
|--------------------------|---|
| EN 55011 : 1998 | CISPR 11 (1997) Edition 2/Amendment 2: Limits and Methods of Measurement of Radio Disturbance Characteristics of Industrial, Scientific, and Medical (ISM) Radio Frequency Equipment |
| EN 61000-6-1 : 2001 | Electromagnetic Compatibility Generic Immunity Requirements <i>Following the provisions of EC Directive 89/336/EEC:</i> |
| EN 61010-1 2nd Ed.: 2004 | Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory use <i>Following the provisions of EC Directive 2006/95/EC:</i> |
| UL 508C 3rd Ed.: 2002 | UL Standard for Safety for Power Conversion Equipment |

DIMENSIONS
Inches (mm)



CE
Chassis Grounding:
For CE compliance and machine safety use *external tooth* lockwashers between mounting screw head and drive heatplate. Recommended screws are #6-32 (M3.5) torqued to 8~10 lb·in (0.79~1.02 N·m).

Xenus R10

FEEDBACK SPECIFICATIONS

ENCODER

DIGITAL ENCODER

| | |
|-----------|---|
| Type | Quadrature, differential line driver outputs |
| Signals | A, /A, B, /B, (X, /X, index signals optional) |
| Frequency | 5 MHz line frequency, 20 MHz quadrature count frequency |

ANALOG ENCODER

| | |
|---------------|--|
| Type | Sin/cos, differential line driver outputs, 0.5 V _{peak-peak} (1.0 V _{peak-peak} differential) centered about 2.5 Vdc typical. Common-mode voltage 0.25 to 3.75 Vdc |
| Signals | Sin(+), sin(-), cos(+), cos(-) |
| Frequency | 230 kHz maximum line (cycle) frequency |
| Interpolation | 10 bits/cycle (1024 counts/cycle) |

DIGITAL HALLS

| | |
|-----------|---|
| Type | Digital, single-ended, 120° electrical phase difference |
| Signals | U, V, W |
| Frequency | Consult factory for speeds >10,000 RPM |

ENCODER POWER SUPPLY

| | |
|--------------|---|
| Power Supply | +5 Vdc @ 400 mA to power encoders & Halls |
| Protection | Current-limited to 750 mA @ 1 Vdc if overloaded |
| | Encoder power developed from +24 Vdc so position information is not lost when AC mains power is removed |

MOTOR CONNECTIONS

| | |
|----------------------|--|
| Phase U, V, W | PWM outputs to 3-phase ungrounded Wye or delta connected brushless motors |
| Hall U, V, W | Hall signals |
| Digital Encoder | A, /A, B, /B, X, /X, on standard models |
| Analog Encoder | Sin(+), sin(-), cos(+), cos(-), X, /X, on -S versions (X & /X index signals are digital) |
| Hall & encoder power | +5 Vdc @ 400 mA maximum |
| Motemp [IN5] | Motor overtemperature sensor input, 4.99 kΩ to +5 Vdc or ground |
| Signal ground | Return for encoder, Halls, and temperature sensor |
| Brake [OUT4] | Current-sinking motor brake driver |
| +24 Vdc | From drive +24 Vdc power supply to power motor brake |
| Frame ground | For motor cable shield |

RESOLVER

RESOLVER

| | |
|---------------------------|--|
| Type | Brushless, single-speed, 1:1 to 2:1 programmable transformation ratio |
| Resolution | 14 bits (equivalent to a 4096 line quadrature encoder) |
| Reference frequency | 7.5 kHz |
| Reference voltage | 2.8 V _{rms} , auto-adjustable by the drive to maximize feedback |
| Reference maximum current | 100 mA |
| Maximum RPM | 10,000+ |

ENCODER EMULATION

| | |
|--------------------------|--|
| Resolution | Programmable to 16,384 counts/rev (4096 line encoder equivalent) |
| Buffered encoder outputs | 26C31 differential line driver |

MOTOR CONNECTIONS

| | |
|---------------|--|
| Phase U, V, W | PWM outputs to 3-phase ungrounded Wye or delta connected brushless motors |
| Resolver | R1, R2, S1, S2, S3, S4 |
| Motemp [IN5] | Motor overtemperature sensor input. Active level programmable. 4.99 kΩ to +5 Vdc or ground |
| | Disables drive when motor over-temperature condition occurs |
| | Same input circuit as GP digital inputs |
| Signal ground | Return for temperature sensor |
| Brake [OUT4] | Current-sinking motor brake driver |
| +24 Vdc | From drive +24 Vdc power supply to power motor brake |
| Frame ground | For motor cable shield |

Xenus R10

COMMAND INPUTS

CANOPEN

As an intelligent node on a distributed-control network the drive operates in current, velocity, or position modes with all control loops closed in the drive. Using Copley's CMO (Copley Motion Objects) or CML (Copley Motion Libraries) software, multiple drives can be controlled from high-level languages such as Visual Basic or C++. CANopen operation supports Profile Position, Profile Velocity, Profile Torque, Interpolated Position, and Homing modes. In addition to these operating modes, all of the drive configuration parameters are available in CAN mode offering great flexibility of operation and control.

ASCII

RS-232 communications provides a simple hardware control capability for Xenus R10 in applications that don't require the power or flexibility provided by CANopen operation. And, while RS-232 does not support multi-drop connections like RS-485, multiple Xenus R10 (or other Copley CANopen drives) can be controlled from a single COM port. This is done by setting the CAN address of the drive that connects to the COM port to "0", and then using CAN cables to connect other Copley drives in daisy-chain fashion. The "0" drive now acts as a CAN bus master communicating with the other drives over the CAN. The effect is to have the ability to communicate with multiple drives from a single RS-232 port.

DEVICENET

DeviceNet operation is a communications protocol that uses the CAN bus for the hardware layer. It is employed by Allen-Bradley PLC's and enables Xenus R10 drives to be controlled directly from A-B PLC's.

INDEXING

As an indexing drive, Xenus R10 can be controlled from digital I/O lines or via CANopen, ASCII, or DeviceNet communications. Up to 32 sequences can be addressed with an additional priority sequence that can be launched from a single input or data-command. A sequence can consist of moves, homing, gain changes, time delays, wait-for-input, set-output, or camming, with each containing combinations of these. Additional flexibility is provided by the ability to replace program constants (i.e. move distance) with register addresses. A register is a storage location in drive RAM memory and can be changed via RS-232,

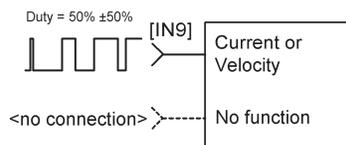
CANopen, or DeviceNet communications. Using this technique a PLC can launch an index with digital I/O, and change the parameters over an ASCII link to find-tune the machine operation without changing the basic PLC program.

CAMMING

In camming mode Xenus R10 synchronizes its motion with the encoder of an external device using cam tables that are stored in flash memory. A cam-table consists of two columns of numbers the first of which contains master encoder position values, and the second of which contains slave positions. When the cam profile is initiated position feedback from the external master encoder is compared to entries in the master column. When the master encoder position equals a value in the master column, the position in the slave column is sent to the drive's position loop. In this way, non-linear motion profiles can be executed from an encoder that tracks the position of moving machinery. Initiation of a camming move can be done with the master-encoder's index signal or from a digital input. For testing or stand-alone operation the master encoder can be internal to Xenus R10 where it's frequency is programmable. Up to 10 cam tables can be stored in Xenus R10 and each can have its own master encoder, trigger source and offsets.

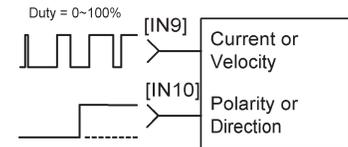
DIGITAL REFERENCE INPUTS

In stand-alone mode, digital reference inputs control drive current or velocity in the same fashion as the analog reference input, but do it using digital signals. Digital inputs [IN9] and [IN10] have high-speed input filters and can be programmed for signals in several formats. Current (torque, force) or velocity commands can be in one or two-wire format. In the one-wire format (50% PWM), a single input takes a square waveform that has a 50% duty cycle when the drive output should be zero. Thereafter, increasing the duty cycle toward 100% will command a maximum positive output, and decreasing the duty cycle toward 0% will produce a maximum negative output.



50% PWM Format

In two-wire format (PWM/Direction), one input takes a PWM waveform of fixed frequency and variable duty cycle, and the other input takes a DC level that controls the polarity of the output current. A 0% duty cycle will command zero current, and a 100% will produce a maximum. The direction of the force or torque produced will depend on the polarity of the DC signal on the direction input. In either mode, inputs are programmable to treat 0% or 100% inputs as faults as a safety measure should a cable break.



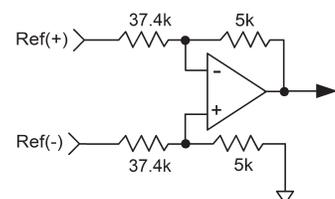
PWM/Direction Format

PWM U-V REFERENCE INPUTS

In most applications Xenus R10 uses encoder and/or Hall feedback for the motor for commutation. This is the process by which motor currents are constantly adjusted so that they produce a magnetic field in the windings that is at ±90 degrees electrical with the magnetic field of the permanent-magnets so that torque or force is produced in proportion to the magnitude of the currents. For controllers that perform this function externally to the drive, the PWM U-V mode is provided. This provides control of the magnitude and polarity of the currents in the U & V phases of the motor, and sets the W phase current equal to the sum of the U-V currents times (-1).

ANALOG REFERENCE INPUT

A single ±10 Vdc differential input takes inputs from controllers that use PID or similar compensators, and outputs a current command to the drive. Drive output current or velocity vs. reference input voltage is programmable.



Xenus R10

COMMUNICATIONS

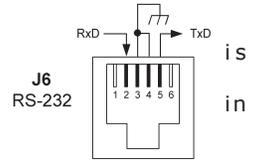
CME 2 SOFTWARE

Drive setup is fast and easy using *CME 2* software. All of the operations needed to configure the drive are accessible through this powerful and intuitive program. Auto-phasing of brushless motor Hall sensors and phase wires eliminates "wire and try". Connections are made once and *CME 2* does the rest thereafter. Encoder wire swapping to establish the direction of positive motion is eliminated. Motor data can be saved as .ccm files. Drive data is saved as .ccx files that contain all drive settings plus motor data. This eases system management as files can be cross-referenced to drives. Once a drive configuration has been completed systems can be replicated easily with the same setup and performance.

RS-232 COMMUNICATION

Xenus R10 is configured via a three-wire, full-duplex RS-232 port that operates from 9,600 to 115,200 Baud as a DTE device. *CME 2* software communicates with the drive over this link for commissioning and adjustments.

When operating as a stand-alone drive that takes command inputs from an external controller, *CME 2* used for configuration. When operated as a CAN node, *CME 2* can be used for programming before and after installation a CAN network. *Xenus R10* can also be controlled via *CME 2* while it is in place as a CAN node. During this process, drive operation as a CAN node is suspended. When adjustments are complete, *CME 2* relinquishes control of the drive and returns it to the CAN node state. Multiple drives can communicate over a single RS-232 port by daisy-chaining the master drive to other drives using CAN cables. The master drive does the RS-232 communication with the system and echoes the commands to the other drives over the CAN bus.



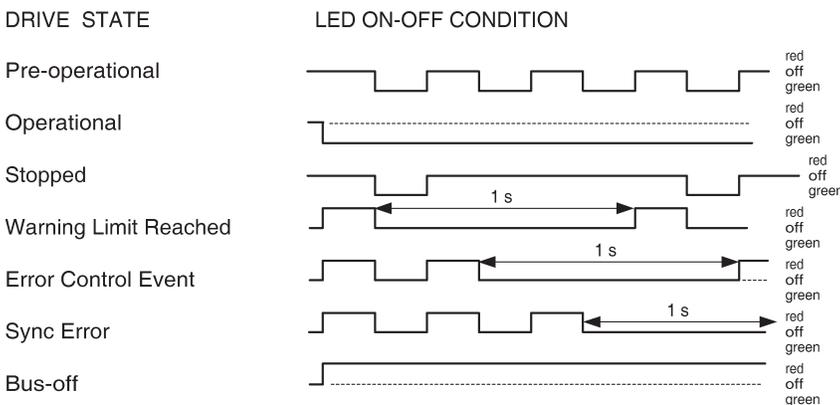
CANOPEN NETWORKING

Based on the CAN V2.0b physical layer, a robust, two-wire communication bus originally designed for automotive use where low-cost and noise-immunity are essential, CANopen adds support for motion-control devices and command synchronization. The result is a highly effective combination of data-rate and low cost for multi-axis motion control systems. Device synchronization enables multiple axes to coordinate moves as if they were driven from a single control card.

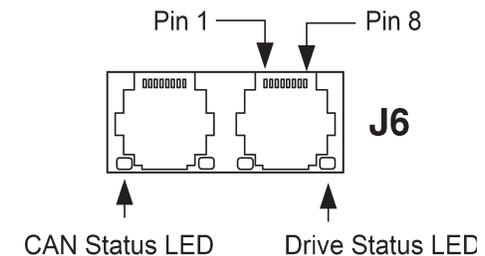
CANOPEN COMMUNICATION

Xenus R10 uses the CAN physical layer signals CANH, CANL, and GND for connection, and CANopen protocol for communication. Before installing the drive in a CAN system, it must be assigned a CAN address. A maximum of 127 CAN nodes are allowed on a single CAN bus. The rotary switch on the front panel controls the four lower bits of the seven-bit CAN address. When the number of nodes on a bus is less than sixteen, the CAN address can be set using only the switch. For installations with sixteen or more CAN nodes on a network *CME 2* can be used to configure *Xenus R10* to use the rotary switch, or combinations of digital inputs and programmed offset in flash memory to configure the drive with a higher CAN node address.

CAN STATUS LED



Note: Red & green led on-times do not overlap.
LED color may be red, green, off, or flashing of either color.



- Drive Fault conditions:
- Over or under-voltage
 - Motor over-temperature
 - Encoder +5 Vdc fault
 - Short-circuits from output to output
 - Short-circuits from output to ground
 - Internal short circuits
 - Drive over-temperature

Faults are programmable to be either transient or latching

DRIVE STATUS LED

A single bi-color LED gives the state of the drive by changing color, and either blinking or remaining solid. The possible color and blink combinations are:

- **Green/Solid:** Drive OK and enabled. Will run in response to reference inputs or CANopen commands.
- **Green/Slow-Blinking:** Drive OK but NOT-enabled. Will run when enabled.
- **Green/Fast-Blinking:** Positive or Negative limit switch active. Drive will only move in direction not inhibited by limit switch.
- **Red/Solid:** Transient fault condition. Drive will resume operation when fault is removed.
- **Red/Blinking:** Latching fault. Operation will not resume until drive is Reset.

Xenus R10

INPUT / OUTPUT

DIGITAL INPUTS

Xenus R10 has twelve digital inputs, eleven of which have programmable functions. Input [IN1] is dedicated to the drive Enable function. This is done to prevent accidental programming of the input in such a way that the controller could not shut it down.

Two types of RC filters are used: GP (general purpose) and HS (high speed). Input functions such as Pulse/Dir, CW/CCW, Quad A/B are wired to inputs having the HS filters, and inputs with the GP filters are used for general purpose logic functions, limit switches, and the motor temperature sensor. Programmable functions of the digital inputs are:

- Amplifier Enable
- Positive Limit switch
- Negative Limit switch
- Drive Reset
- Motor over-temperature
- Home switch
- Motion Abort
- Reference input attenuation select (zero or divide by eight)
- PWM Sync Input
- CAN address
- PWM/Polarity or PWM 50% commands for current/velocity control
- Pulse/Direction or CW/CCW stepper pulses, or quad A/B encoder signals for position control and camming

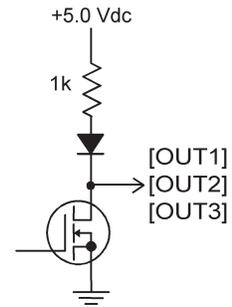
In addition to the active level and function for each programmable input, the input resistors are programmable in four groups to either pull up to +5 Vdc, or down to ground. Grounded inputs with HI active levels interface to PLC's that have PNP outputs that source current from +24 Vdc sources. Inputs pulled up to +5 Vdc work with open-collector, or NPN drivers that sink current to ground.

DIGITAL OUTPUTS

The digital outputs are open-drain MOSFETs with 1 kΩ pull-up resistors in series with a diode to +5 Vdc. They can sink up to 1 Adc from external loads operating from power supplies to +30 Vdc.

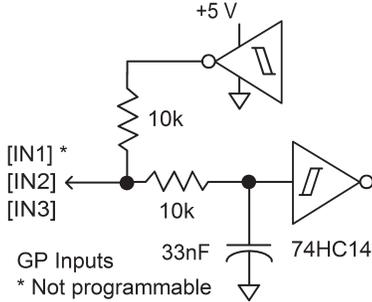
The output functions are programmable. The active state of the outputs is programmable to be on or off.

When driving inductive loads such as a relay, an external fly-back diode is required. The internal diode in the output is for driving PLC inputs that are opto-isolated and connected to +24 Vdc. The diode prevents conduction from +24 Vdc through the 1 kΩ resistor to +5 Vdc in the drive. This could turn the PLC input on, giving a false indication of the drive output state.

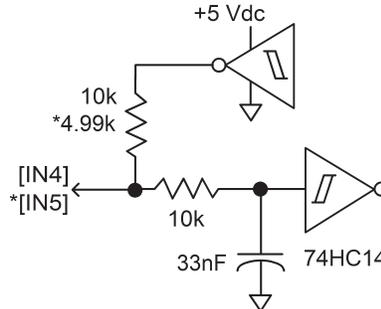


DIGITAL INPUT CIRCUITS

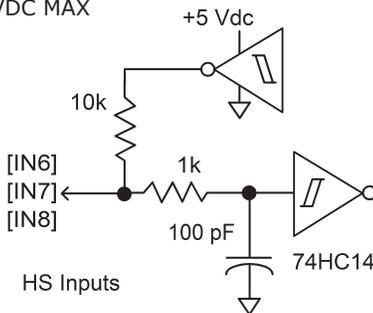
24VDC MAX



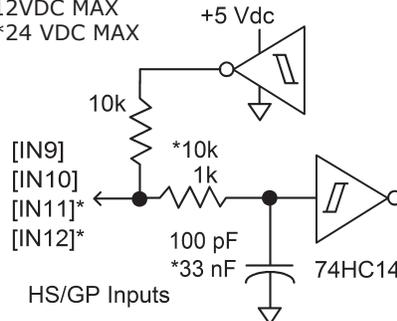
24VDC MAX



12VDC MAX



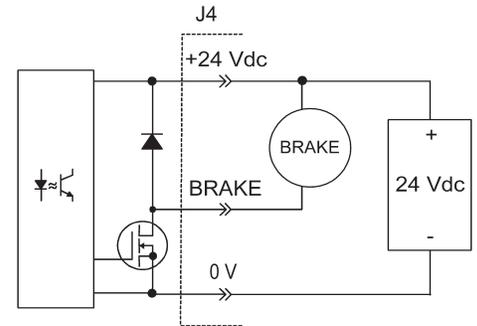
12VDC MAX *24 VDC MAX



BRAKE OUTPUT [OUT4]

This output is an open-drain MOSFET with an internal flyback diode connected to the +24 Vdc input. It can sink up to 1A from a motor brake connected to the +24 Vdc supply.

The operation of the brake is programmable with CME 2. It can also be programmed as a general-purpose digital output.



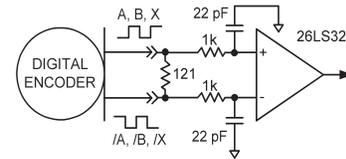
MOTOR CONNECTIONS

Motor connections are of three types: phase, feedback, and thermal sensor. The phase connections carry the drive output currents that drive the motor to produce motion. A thermal sensor that indicates motor overtemperature is used to shut down the drive to protect the motor. Feedback can be digital quad A/B encoder, analog sin/cos encoder, resolver or digital Halls, depending on the version of the drive.

DIGITAL ENCODERS

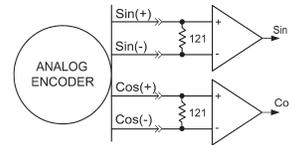
The quad A/B encoder interface is a differential line-receiver with R-C filtering on the inputs. Encoders with differential outputs are required because they are less susceptible to noise that can degrade single-ended outputs. Encoder cables should use twisted-pairs for each signal pair: A & /A, B & /B, X & /X. An overall shield should be used, and for longer cables, shields for individual pairs may be necessary to guarantee signal integrity.

The encoder signals are made available to the controller via the signal connector J7, where they are re-transmitted by differential line-drivers. This eliminates split cables that would have to route the motor encoder signals to both drive and controller, as well as providing a good signal quality termination of the encoder signals at the drive.



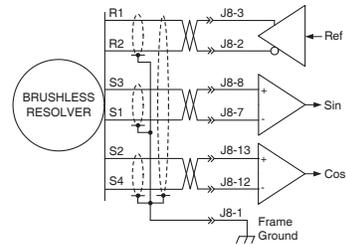
ANALOG ENCODERS

Xenus R10 supports analog encoder signals for position feedback. The Sin and Cos inputs are differential with 121 Ω terminating resistors and accept 1.0 Vp-p signals in the A/B format used by encoders with analog outputs such as Heidenhain, Stegman, and Renishaw. When Copley's ServoTube motors are used the analog encoder supplies both commutation and incremental position feedback.



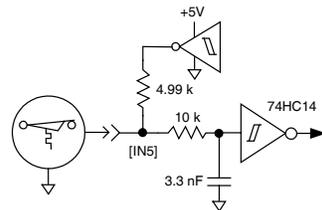
RESOLVERS

Connections to the resolver should be made with shielded cable that uses three twisted-pairs. Once connected, resolver set up, motor phasing, and other commissioning adjustments are made with CME 2 software. There are no hardware adjustments.



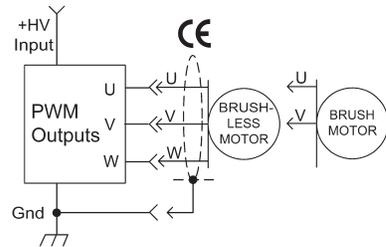
MOTOR TEMPERATURE SENSOR

Digital input [IN5] is for use with a motor overtemperature switch. The input should be programmed as a pull-up to +5 Vdc if the motor switch is grounded when cold, and open or high-impedance when over-heating.



MOTOR PHASE CONNECTIONS

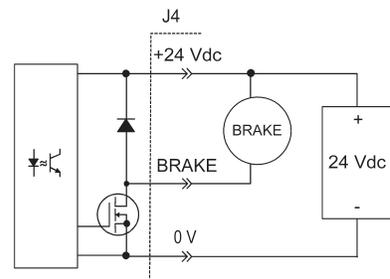
The drive output is a three-phase PWM inverter that converts the DC buss voltage (+HV) into three sinusoidal voltage waveforms that drive the motor phase-coils. Cable should be sized for the continuous current rating of the motor. Motor cabling should use twisted, shielded conductors for CE compliance, and to minimize PWM noise coupling into other circuits. The motor cable shield should connect to motor frame and the drive frame ground terminal (J2-1) for best results.



BRAKE OUTPUT [OUT4]

This output is an open-drain MOSFET with an internal flyback diode connected to the +24 Vdc input. It can sink up to 1A from a motor brake connected to the +24 Vdc supply.

The operation of the brake is programmable with CME 2. It can also be programmed as a general-purpose digital output.



CE = SHIELDED CABLES REQUIRED FOR CE COMPLIANCE

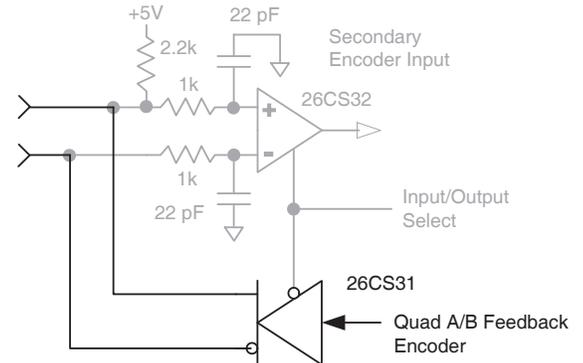
MULTI-MODE ENCODER PORT

This port consists of three differential input/output channels that take their functions from the Basic Setup of the drive.

On drives with quad A/B encoder feedback, the port works as an output buffering the signals from the encoder. With resolver or sin/cos encoder versions, the feedback is converted to quad A/B signals with programmable resolution. These signals can then be fed back to an external motion controller that closes the position or velocity loops. As an input, the port can take quad A/B signals to produce a dual-loop position control system or use the signals as master-encoder feedback in camming mode. In addition, the port can take stepper command signals (CU/CD or Pulse/Direction) in differential format.

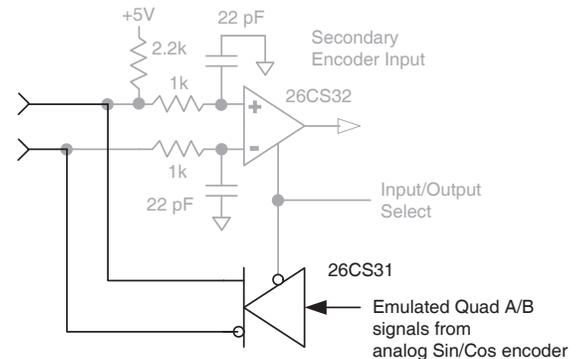
AS BUFFERED OUTPUTS FROM A DIGITAL QUADRATURE FEEDBACK ENCODER

When using a digital quadrature feedback encoder, the A/B/X signals drive the multi-mode port output buffers directly. This is useful in systems that use external controllers that also need the motor feedback encoder signals because these now come from J7, the Control connector. In addition to eliminating "Y" cabling where the motor feedback cable has to split to connect to both controller and motor, the buffered outputs reduce loading on the feedback cable that could occur if the motor encoder had to drive two differential inputs in parallel, each with it's own 121 ohm terminating resistor.



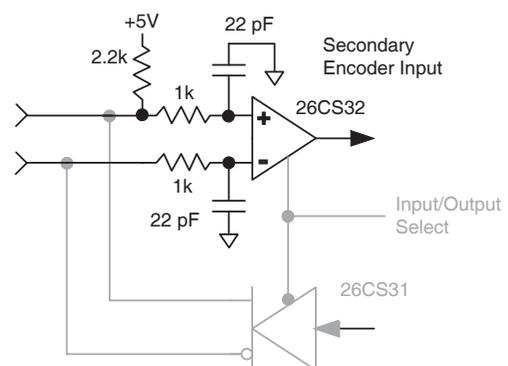
AS EMULATED QUAD A/B/X ENCODER OUTPUTS FROM AN ANALOG SIN/COS FEEDBACK ENCODER

Analog sin/cos signals are interpolated in the drive with programmable resolution. The incremental position data is then converted back into digital quadrature format which drives the multi-mode port output buffers. Some analog encoders also produce a digital index pulse which is connected directly to the port's output buffer. The result is digital quadrature A/B/X signals that can be used as feedback to an external control system.



AS A MASTER OR CAMMING ENCODER INPUT FROM A DIGITAL QUADRATURE ENCODER

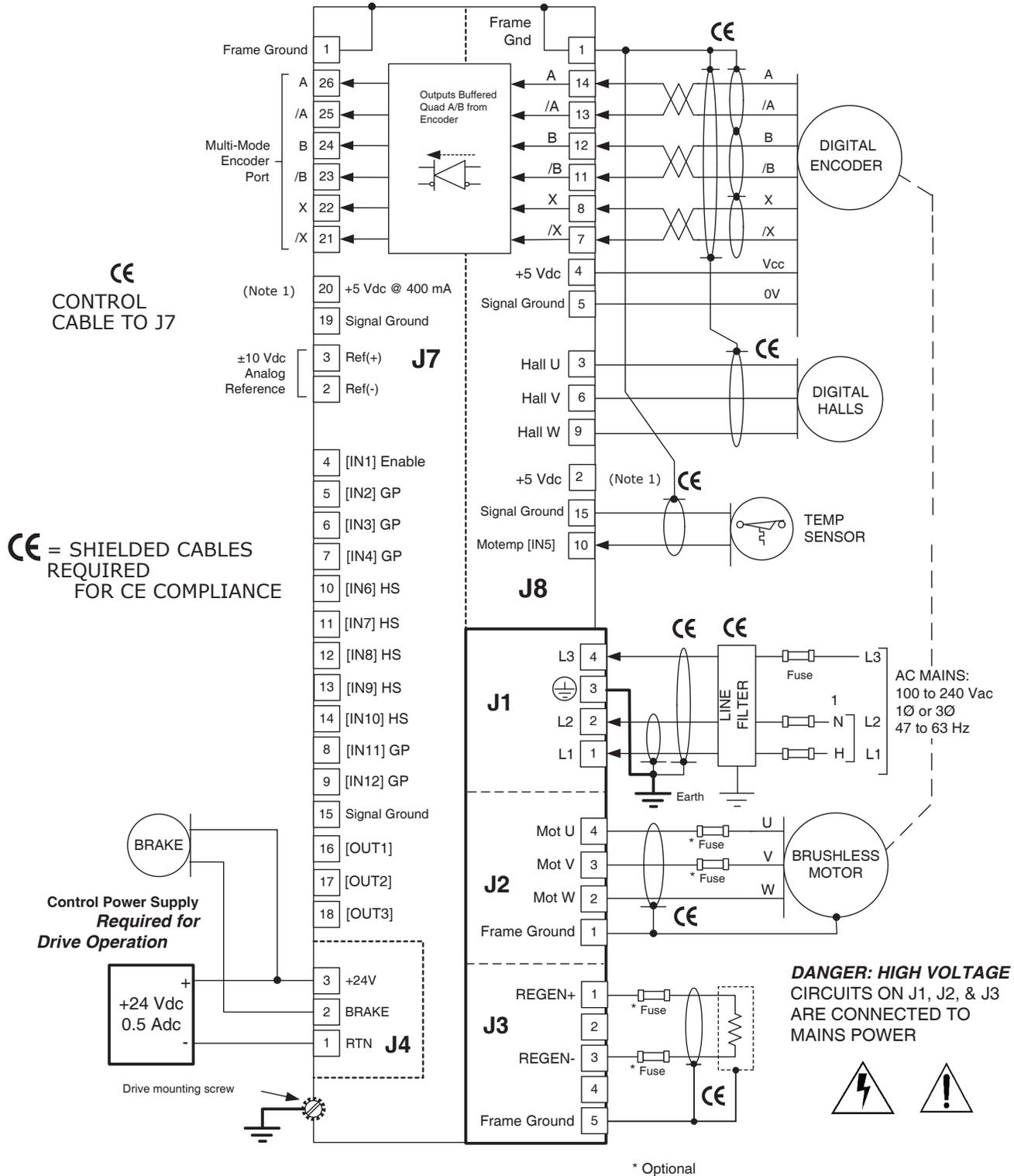
When operating in position mode the multi-mode port can accept digital command signals from external encoders. These can be used to drive cam tables, or as master-encoder signals when operating in a master/slave configuration.



AS DIGITAL COMMAND INPUTS IN PULSE/DIRECTION, PULSE-UP/PULSE-DOWN, OR DIGITAL QUADRATURE ENCODER FORMAT

The multi-mode port can also be used when digital command signals are in a differential format. These are the signals that typically go to [IN9] and [IN10] when they are single-ended. But, at higher frequencies these are likely to be differential signals in which case the multi-mode port can be used.

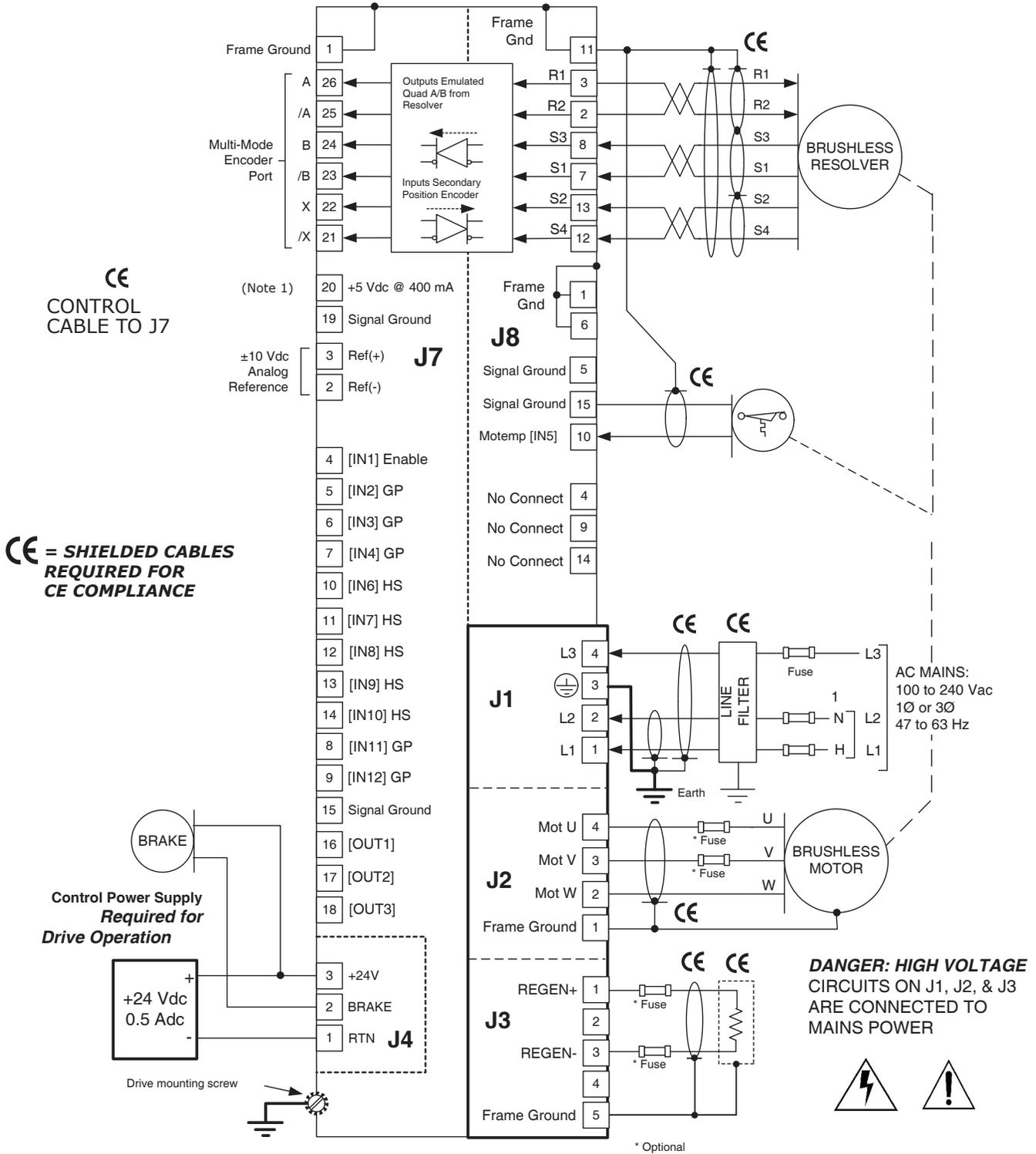
CONNECTIONS



Notes:

- 1) The total output current from the +5 Vdc supply to J7-20 cannot exceed 400 mA
- 2) Line filter is required for CE

CONNECTIONS



Notes:

- 1) The total output current from the +5 Vdc supply to J7-20 cannot exceed 400 mAdc
- 2) Line filter is required for CE

GROUNDING & SHIELDING FOR CE

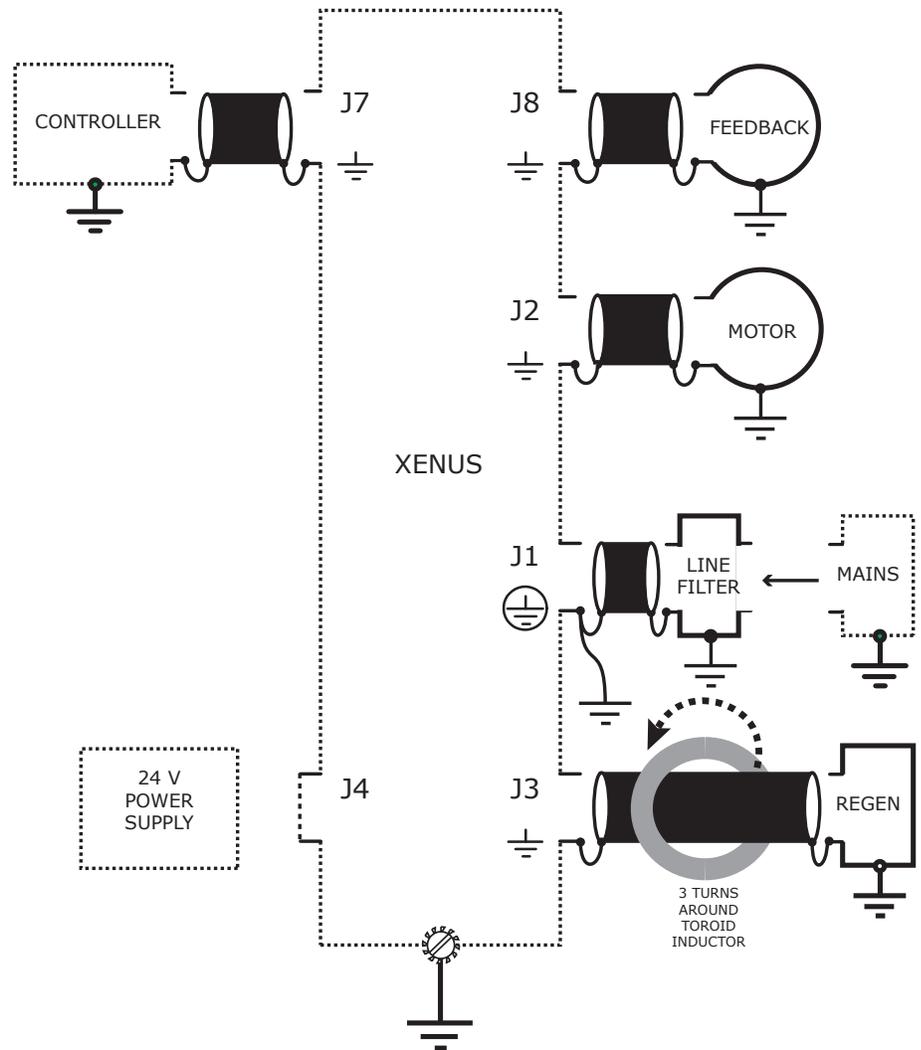
Grounding and shielding are the means of controlling the emission of radio frequency energy from the drive so that it does not interfere with other electronic equipment.

The use of shielded cables to connect the drive to motors and feedback devices is a way of extending the chassis of the drive out to these devices so that the conductors carrying noise generated by the drive are completely enclosed by a conductive shield.

The process begins at the mains connector of the drive, J1. The ground terminal here has a circle around it indicating that this is the safety or "bonding" ground connection. This should be connected with wire that is the same gauge as that used for the mains. In the case of a short-circuit in the drive the function of this ground connection is to carry the fault current to earth ground until the safety device (fuse or circuit breakers) disconnects the drive from the mains. This connection ensures that the heatplate of the drive remains at earth potential and eliminating a shock hazard that could occur if the chassis were allowed to float to the potential of the mains.

While this connection keeps the heatplate at earth potential the high frequency noise generated by switching circuits in the drive can radiate from the wire used for the safety ground connection. In order to keep the path between the heatplate and earth as short as possible it's also recommended to mount the drive to the equipment panel using external-toothed lock washers. These will penetrate the anodized finish of the heatplate (which is an electrical insulator) and make good electrical contact with the aluminum plate. Grounding the heatplate in this way shortens the path from drive to earth ground and further reduces emissions.

The heatplate also connects directly to the frame ground terminals on the motor, feedback, and regen connectors. Note that the ground symbols for these do not have a circle around them which indicates that these are for shielding and not for safety grounding. Motors and their feedback devices (which are typically in the motor case) should be grounded by mounting to equipment that is grounded as a safety ground. By connecting the shields for these devices at the drive and at the device, the connection is continuous and provides a return path for radio-frequency energy to the drive.



Notes:

- 1) Shielded cables required for CE are shown in the diagram above.
- 2) Line filter required for CE
- 3) Ferrite core required for shielded cable to regen resistor which must be in shielded enclosure.



WARNING: Hazardous voltages exist on connections to J1, J2, & J3 when power is applied, and for up to 30 seconds after power is removed.



J1 MAINS CONNECTIONS

J1 CABLE CONNECTOR:

Wago: 51118287 or 721-204/026-045/RN01-0000
Euro-style 7,5 mm pluggable female terminal block with preceding ground receptacle
Cable: AWG 12, 600 V recommended for R10-230-36-R and R10-230-40-R models, AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

| Signal | Pin |
|-------------------|-----|
| Mains Input L3 | 4 |
| Protective Ground | 3 |
| Mains Input L2 | 2 |
| Mains Input L1 | 1 |

J2 MOTOR OUTPUTS

J2 CABLE CONNECTOR:

Wago: 51118008 or 721-104/026-047/RN01-0000
Euro-style 5,0 mm pluggable female terminal block
Cable: AWG 12, 600 V recommended for R10-230-36-R and R10-230-40-R models, AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

| Signal | Pin |
|---------------|-----|
| Motor Phase U | 4 |
| Motor Phase V | 3 |
| Motor Phase W | 2 |
| Cable Shield | 1 |

J3 REGEN RESISTOR

J3 CABLE CONNECTOR:

Wago: 51111277 or 721-605/000-043/RN01-0000
Euro-style 5,0 mm pluggable male terminal block
Cable: AWG 12, 600 V recommended for R10-230-36-R and R10-230-40-R models, AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

| Signal | Pin |
|----------------|-----|
| Regen Resistor | 1 |
| No Connection | 2 |
| Regen Resistor | 3 |
| No Connection | 4 |
| Cable Shield | 5 |

Wire Insertion/Extraction Tool:
Used on J1, J2, J3, & J4
Wago 231-131

ISOLATED CIRCUIT

NOTE: AN EXTERNAL
+24 VDC POWER SUPPLY
IS REQUIRED FOR OPERATION

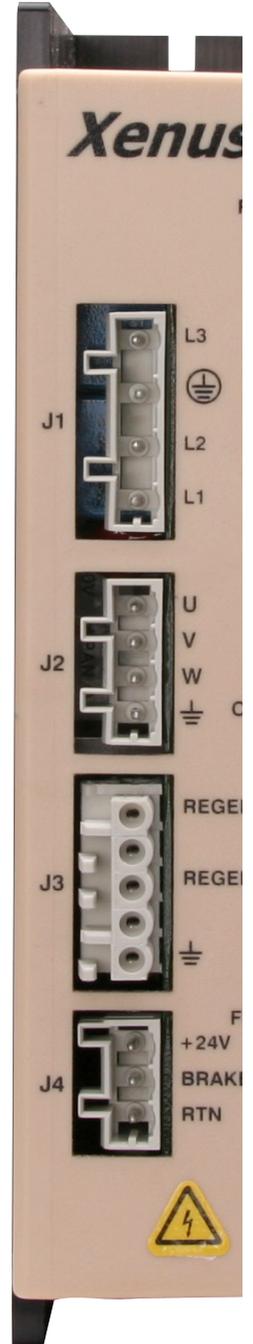
J4 CABLE CONNECTOR:

Wago: 51117974 or 721-103/026-047/RN01-0000
Euro-style 5,0 mm pluggable terminal block

J4 +24 VDC & BRAKE

| Signal | Pin |
|-----------------------|-----|
| +24 Vdc Control Power | 3 |
| Brake Output [OUT4] | 2 |
| 0V (+24 Vdc Return) | 1 |

ISOLATED CIRCUIT



Xenus R10



J5 RS-232 (DTE)

| Pin | Signal |
|-----|------------|
| 6 | No connect |
| 5 | TxD Output |
| 4 | Ground |
| 3 | Ground |
| 2 | RxD Input |
| 1 | No connect |

J5 CABLE CONNECTOR:

RJ-11 style, male, 6 position
Cable: 6-conductor modular type

Notes:

- CAN circuits are opto-isolated from drive circuits.
- CAN_GND connects to drive Signal Ground.
- CAN_SHLD and CAN_V+ are wired-thru on both J6 connectors and have no connection to the drive.

J6 CAN BUS

| Pin | Signal |
|-----|---------------|
| 1 | CAN_H |
| 2 | CAN_L |
| 3 | CAN_GND |
| 4 | No connection |
| 5 | No connection |
| 6 | (CAN_SHLD) |
| 7 | CAN_GND |
| 8 | (CAN_V+) |

• ISOLATED CIRCUIT •

J6 CABLE CONNECTOR:

RJ-45 style, male, 8 position
Cable: 8-conductor modular type

J7 CONTROL SIGNALS

| Pin | Signal | Pin | Signal | Pin | Signal |
|-----|--------------|-----|------------|-----|------------------|
| 1 | Frame Gnd | 10 | [IN6] HS | 19 | Signal Gnd |
| 2 | Ref(-) | 11 | [IN7] HS | 20 | +5 Vdc (Note 1) |
| 3 | Ref(+) | 12 | [IN8] HS | 21 | Multi Encoder /X |
| 4 | [IN1] Enable | 13 | [IN9] HS | 22 | Multi Encoder X |
| 5 | [IN2] GP | 14 | [IN10] HS | 23 | Multi Encoder /B |
| 6 | [IN3] GP | 15 | Signal Gnd | 24 | Multi Encoder B |
| 7 | [IN4] GP | 16 | [OUT1] | 25 | Multi Encoder /A |
| 8 | [IN11] GP | 17 | [OUT2] | 26 | Multi Encoder A |
| 9 | [IN12] GP | 18 | [OUT3] | | |

J7 CABLE CONNECTOR:

High-Density D-Sub, 26 Position, Male

J8 MOTOR FEEDBACK

| Pin | Signal | Pin | Signal | Pin | Signal |
|-----|-----------------|-----|--------------|-----|------------|
| 1 | Frame Gnd | 6 | Hall V | 11 | Encoder /B |
| 2 | +5 Vdc (Note 1) | 7 | Encoder /X | 12 | Encoder B |
| 3 | Hall U | 8 | Encoder X | 13 | Encoder /A |
| 4 | +5 Vdc (Note 1) | 9 | Hall W | 14 | Encoder A |
| 5 | Signal Gnd | 10 | [IN5] Motemp | 15 | Signal Gnd |

J8 CABLE CONNECTOR:

High-Density D-Sub, 15 Position, Male

Notes:

- The total current drawn from the +5 Vdc outputs cannot exceed 400 mA



WARNING: Hazardous voltages exist on connections to J1, J2, & J3 when power is applied, and for up to 30 seconds after power is removed.



J1 MAINS CONNECTIONS

J1 CABLE CONNECTOR:

Wago: 51118287 or 721-204/026-045/RN01-0000
Euro-style 7,5 mm pluggable female terminal block with preceding ground receptacle

Cable: AWG 12, 600 V recommended for R10-230-36-R and R10-230-40-R models, AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

| Signal | Pin |
|-------------------|-----|
| Mains Input L3 | 4 |
| Protective Ground | 3 |
| Mains Input L2 | 2 |
| Mains Input L1 | 1 |

J2 MOTOR OUTPUTS

J2 CABLE CONNECTOR:

Wago: 51118008 or 721-104/026-047/RN01-0000
Euro-style 5,0 mm pluggable female terminal block

Cable: AWG 12, 600 V recommended for R10-230-36-R and R10-230-40-R models, AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

| Signal | Pin |
|---------------|-----|
| Motor Phase U | 4 |
| Motor Phase V | 3 |
| Motor Phase W | 2 |
| Cable Shield | 1 |

J3 CABLE CONNECTOR:

Wago: 51111277 or 721-605/000-043/RN01-0000
Euro-style 5,0 mm pluggable male terminal block

Cable: AWG 12, 600 V recommended for R10-230-36-R and R10-230-40-R models, AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

J3 REGEN RESISTOR

| Signal | Pin |
|----------------|-----|
| Regen Resistor | 1 |
| No Connection | 2 |
| Regen Resistor | 3 |
| No Connection | 4 |
| Cable Shield | 5 |

Wire Insertion/Extraction Tool:
Used on J1, J2, J3, & J4
Wago 231-131

ISOLATED CIRCUIT

NOTE: AN EXTERNAL
+24 VDC POWER SUPPLY
IS REQUIRED FOR OPERATION

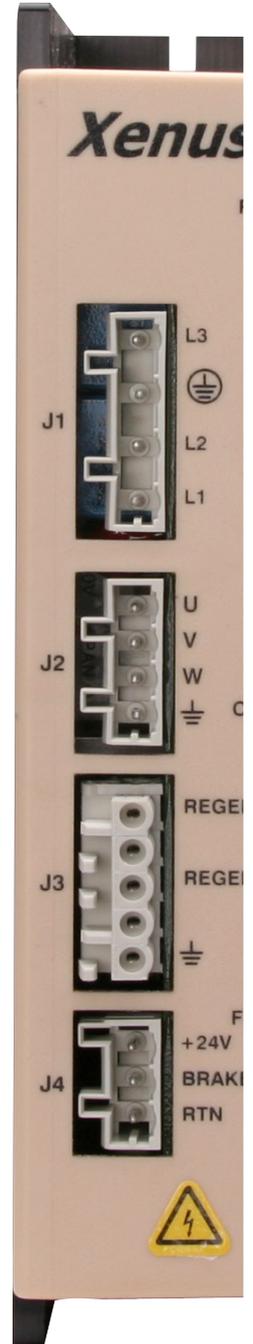
J4 Cable Connector:

Wago: 51117974 or 721-103/026-047/RN01-0000
Euro-style 5,0 mm pluggable terminal block

J4 +24 VDC & BRAKE

ISOLATED CIRCUIT

| Signal | Pin |
|-----------------------|-----|
| +24 Vdc Control Power | 3 |
| Brake Output [OUT4] | 2 |
| 0V (+24 Vdc Return) | 1 |





J5 RS-232 (DTE)

| Pin | Signal |
|-----|------------|
| 6 | No connect |
| 5 | TxD Output |
| 4 | Ground |
| 3 | Ground |
| 2 | RxD Input |
| 1 | No connect |

J5 CABLE CONNECTOR:

RJ-11 style, male, 6 position
Cable: 6-conductor modular type

Notes:

- CAN circuits are opto-isolated from drive circuits.
- CAN_GND connects to drive Signal Ground.
- CAN_SHLD and CAN_V+ are wired-thru on both J6 connectors and have no connection to the drive.

J6 CAN BUS

| Pin | Signal |
|-----|---------------|
| 1 | CAN_H |
| 2 | CAN_L |
| 3 | CAN_GND |
| 4 | No connection |
| 5 | No connection |
| 6 | (CAN_SHLD) |
| 7 | CAN_GND |
| 8 | (CAN_V+) |

ISOLATED CIRCUIT

J6 CABLE CONNECTOR:

RJ-45 style, male, 8 position
Cable: 8-conductor modular type

J7 CONTROL SIGNALS

| Pin | Signal | Pin | Signal | Pin | Signal |
|-----|--------------|-----|------------|-----|------------------|
| 1 | Frame Gnd | 10 | [IN6] HS | 19 | Signal Gnd |
| 2 | Ref(-) | 11 | [IN7] HS | 20 | +5 Vdc (Note 1) |
| 3 | Ref(+) | 12 | [IN8] HS | 21 | Multi Encoder /X |
| 4 | [IN1] Enable | 13 | [IN9] HS | 22 | Multi Encoder X |
| 5 | [IN2] GP | 14 | [IN10] HS | 23 | Multi Encoder /B |
| 6 | [IN3] GP | 15 | Signal Gnd | 24 | Multi Encoder B |
| 7 | [IN4] GP | 16 | [OUT1] | 25 | Multi Encoder /A |
| 8 | [IN11] GP | 17 | [OUT2] | 26 | Multi Encoder A |
| 9 | [IN12] GP | 18 | [OUT3] | | |

J7 CABLE CONNECTOR:

High-Density D-Sub, 26 Position, Male

J8 MOTOR FEEDBACK

| Pin | Signal | Pin | Signal | Pin | Signal |
|-----|-----------------|-----|--------------|-----|----------------|
| 1 | Frame Gnd | 6 | Hall V | 11 | Encoder Cos(-) |
| 2 | +5 Vdc (Note 1) | 7 | Encoder /X | 12 | Encoder Cos(+) |
| 3 | Hall U | 8 | Encoder /X | 13 | Encoder Sin(-) |
| 4 | +5 Vdc (Note 1) | 9 | Hall W | 14 | Encoder Sin(+) |
| 5 | Signal Gnd | 10 | [IN5] Motemp | 15 | Signal Gnd |

J8 CABLE CONNECTOR:

High-Density D-Sub, 15 Position, Male

Notes:

- The total current drawn from the +5 Vdc outputs cannot exceed 400 mA



WARNING: HAZARDOUS VOLTAGES EXIST ON CONNECTIONS TO J1, J2, & J3 WHEN POWER IS APPLIED, AND FOR UP TO 30 SECONDS AFTER POWER IS REMOVED.



J1 MAINS CONNECTIONS

J1 CABLE CONNECTOR:

Wago: 51118287 or 721-204/026-045/RN01-0000
Euro-style 7,5 mm pluggable female terminal block
with preceding ground receptacle

Cable: AWG 12, 600 V recommended
for R10-230-36-R and R10-230-40-R models,
AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

| Signal | Pin |
|-------------------|-----|
| Mains Input L3 | 4 |
| Protective Ground | 3 |
| Mains Input L2 | 2 |
| Mains Input L1 | 1 |

J2 MOTOR OUTPUTS

J2 CABLE CONNECTOR:

Wago: 51118008 or 721-104/026-047/RN01-0000
Euro-style 5,0 mm pluggable female terminal block

Cable: AWG 12, 600 V recommended
for R10-230-36-R and R10-230-40-R models,
AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

| Signal | Pin |
|---------------|-----|
| Motor Phase U | 4 |
| Motor Phase V | 3 |
| Motor Phase W | 2 |
| Cable Shield | 1 |

J3 CABLE CONNECTOR:

Wago: 51111277 or 721-605/000-043/RN01-0000 J3 REGEN RESISTOR
Euro-style 5,0 mm pluggable male terminal block

Cable: AWG 12, 600 V recommended
for R10-230-36-R and R10-230-40-R models,
AWG 14, 600V for R10-230-18-R
Shielded cable required for CE compliance

| Signal | Pin |
|----------------|-----|
| Regen Resistor | 1 |
| No Connection | 2 |
| Regen Resistor | 3 |
| No Connection | 4 |
| Cable Shield | 5 |

Wire Insertion/Extraction Tool:
Used on J1, J2, J3, & J4
Wago 231-131

ISOLATED CIRCUIT

**NOTE: AN EXTERNAL
+24 VDC POWER SUPPLY
IS REQUIRED FOR OPERATION**

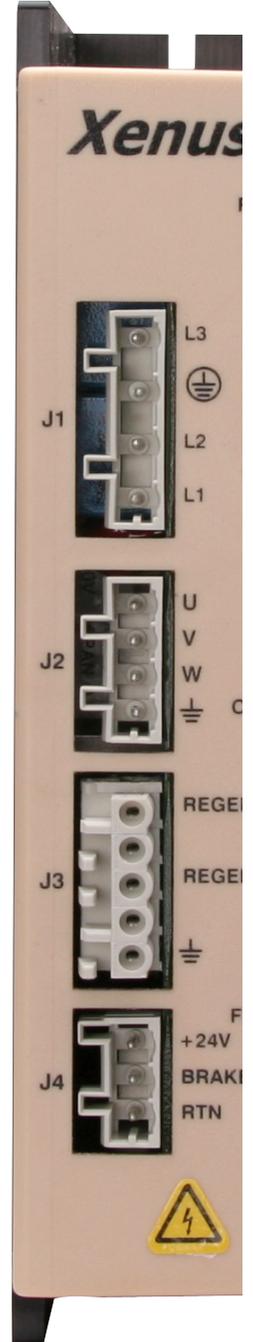
J4 CABLE CONNECTOR:

Wago: 51117974 or 721-103/026-047/RN01-0000
Euro-style 5,0 mm pluggable terminal block

J4 +24 VDC & BRAKE

ISOLATED CIRCUIT

| Signal | Pin |
|-----------------------|-----|
| +24 Vdc Control Power | 3 |
| Brake Output [OUT4] | 2 |
| 0V (+24 Vdc Return) | 1 |





J5 RS-232 (DTE)

| Pin | Signal |
|-----|------------|
| 6 | No connect |
| 5 | TxD Output |
| 4 | Ground |
| 3 | Ground |
| 2 | RxD Input |
| 1 | No connect |

J5 CABLE CONNECTOR:

RJ-11 style, male, 6 position
Cable: 6-conductor modular type

Notes:

- CAN circuits are opto-isolated from drive circuits.
- CAN_GND connects to drive Signal Ground.
- CAN_SHLD and CAN_V+ are wired-thru on both J6 connectors and have no connection to the drive.

J7 CONTROL SIGNALS

| Pin | Signal | Pin | Signal | Pin | Signal |
|-----|--------------|-----|------------|-----|------------------|
| 1 | Frame Gnd | 10 | [IN6] HS | 19 | Signal Gnd |
| 2 | Ref(-) | 11 | [IN7] HS | 20 | +5 Vdc (Note 1) |
| 3 | Ref(+) | 12 | [IN8] HS | 21 | Multi Encoder /X |
| 4 | [IN1] Enable | 13 | [IN9] HS | 22 | Multi Encoder X |
| 5 | [IN2] GP | 14 | [IN10] HS | 23 | Multi Encoder /B |
| 6 | [IN3] GP | 15 | Signal Gnd | 24 | Multi Encoder B |
| 7 | [IN4] GP | 16 | [OUT1] | 25 | Multi Encoder /A |
| 8 | [IN11] GP | 17 | [OUT2] | 26 | Multi Encoder A |
| 9 | [IN12] GP | 18 | [OUT3] | | |

J7 CABLE CONNECTOR:

High-Density D-Sub, 26 Position, Male

J6 CAN BUS

| Pin | Signal |
|-----|---------------|
| 1 | CAN_H |
| 2 | CAN_L |
| 3 | CAN_GND |
| 4 | No connection |
| 5 | No connection |
| 6 | (CAN_SHLD) |
| 7 | CAN_GND |
| 8 | (CAN_V+) |

ISOLATED CIRCUIT

J6 CABLE CONNECTOR:

RJ-45 style, male, 8 position
Cable: 8-conductor modular type

J8 MOTOR FEEDBACK

| Pin | Signal | Pin | Signal | Pin | Signal |
|-----|------------------|-----|-----------------|-----|-----------------|
| 1 | Frame Gnd | 6 | Frame Gnd | 11 | Frame Gnd |
| 2 | Ref(-) Output R2 | 7 | Sin(-) Input S1 | 12 | Cos(-) Input S4 |
| 3 | Ref(+) Output R1 | 8 | Sin(+) Input S3 | 13 | Cos(+) input S2 |
| 4 | N.C. | 9 | N.C. | 14 | N.C. |
| 5 | Signal Gnd | 10 | [IN5] Motemp | 15 | Signal Gnd |

J8 CABLE CONNECTOR:

High-Density D-Sub, 15 Position, Male

Notes:

- The total current drawn from the +5 Vdc output cannot exceed 400 mA

Xenus R10

DRIVE POWER SOURCES

An external +24 Vdc power supply is required, and powers an internal DC/DC converter that supplies all the control voltages for drive operation. Use of an external supply enables CAN communication with the drive when the mains power has been removed.

Power distribution in Xenus R10 is divided into four sections: +24 Vdc, CAN, signal, and high-voltage. Each is isolated from the other and all are isolated from the chassis.

EXTERNAL +24 VDC

The primary side of the DC/DC converter operates directly from the external +24 Vdc supply and is isolated from other drive power sections. The Brake output [OUT4] operates in this section and is referenced to the +24 Vdc return (0V). It sinks current from an external load connected to the external +24 Vdc power source.

INTERNAL SIGNAL POWER

The signal power section supplies power for the DSP controller as well as logic inputs and outputs. Motor feedback signals such as Halls, encoder, and temperature sensor operate from this power source. All signal circuits are referenced to signal ground. This ground should connect to the control system circuit ground or common so that drive and controller inputs and output voltage levels work properly with each other.

MAINS POWER

Mains power drives the high-voltage section. It is rectified and capacitor-filtered to produce +HV which the PWM stage converts into voltages that drive either three phase brushless or DC brush motors. An internal solid-state switch together with an external power resistor provides dissipation during regeneration when the mechanical energy of the motor is converted back into electrical energy that must be dissipated before it charges the internal capacitors to an overvoltage condition. All the circuits in this section are "hot", that is, they connect directly to the mains and must be considered high-voltages and a shock hazard requiring proper insulation techniques during installation.

GROUNDING

A grounding system has three primary functions: safety, voltage-reference, and shielding. As a safety measure, the primary ground at J1-3 will carry fault-currents from the mains in the case of an internal failure or short-circuit of electronic components. Wiring to this is typically done with the green conductor with yellow stripe using the same gauge wire as that used for the mains. The pin on the drive at J1-3 is longer than the other pins on J1 giving it a first-make, last-break action so that the drive chassis is never ungrounded when the mains power is connected. This wire is a 'bonding' conductor that should connect to an earthed ground point and must not pass through any circuit interrupting devices.

All of the circuits on J1, J2, and J3 are mains-connected and must never be grounded. The ground terminals at J1-3, J2-1, and J3-5 all connect to the drive chassis and are isolated from all drive internal circuits.

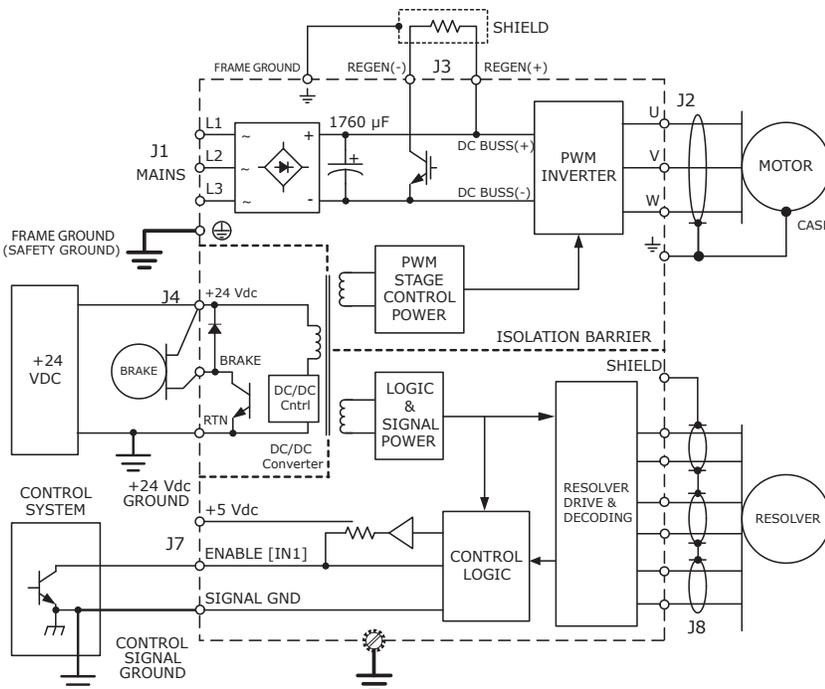
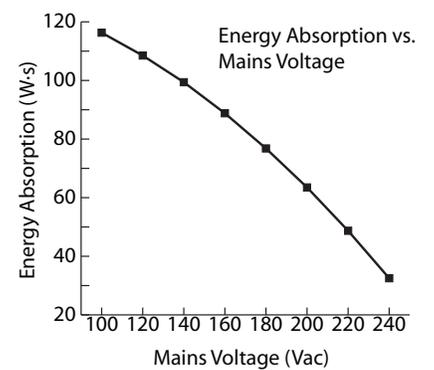
Signal grounding references the drive control circuits to those of the control system. These controls circuits typically have their own earth connection at some point. To eliminate ground-loops it is recommended that the drive signal ground be connected to the control system circuit ground. When this is done the drive signal voltages will be referenced to the same 0 V level as the circuits in the control system. Small currents flow between controller and drive when inputs and outputs interact. The signal ground is the path for these currents to return to their power sources in both controller and drive.

Shields on cables reduce emissions from the drive for CE compliance and protect internal circuits from interference due to external sources of electrical noise. Because of their smaller wire gauge, these should not be used as part of a safety-ground system. Motor cases can be safety-grounded either at the motor, by earthing the frame, or by a grounding conductor in the motor cable that connects to J2-1. This cable should be of the same gauge as the other motor phase cables.

For CE compliance and operator safety, the drive should be earthed by using external tooth lockwashers under the mounting screws. These will make contact with the aluminum chassis through the anodized finish to connect the chassis to the equipment frame ground.

REGENERATION

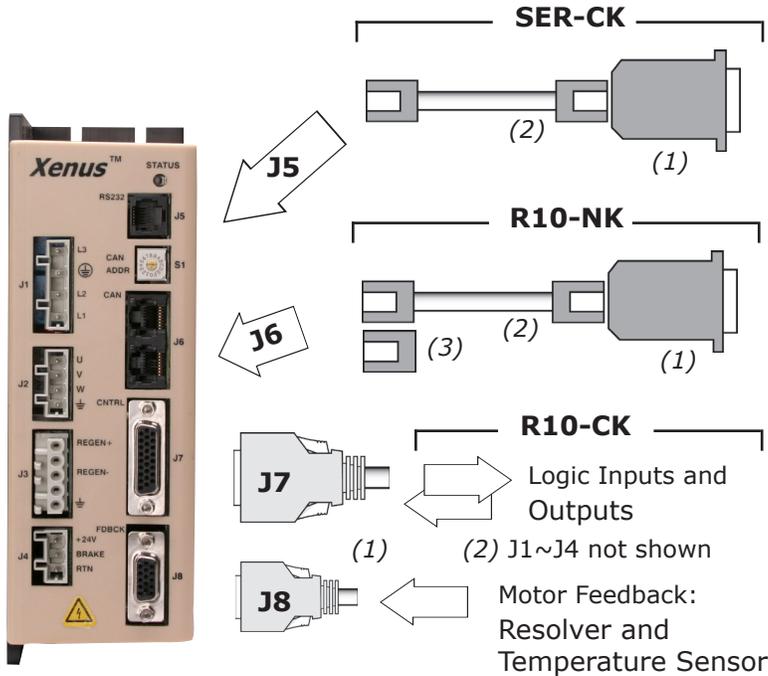
The chart below shows the energy absorption in W-s for a Xenus R10 drive operating at some typical mains voltages. When the load mechanical energy is greater than these values an external regen resistor is available as an accessory.



Xenus R10

SINGLE-DRIVE SETUP FOR CANOPEN POSITION CONTROL

Xenus R10 operates as a CAN node. All commands are passed on the CAN bus. CME 2 is used for setup and configuration before installation as CAN node.



Serial Cable Kit SER-CK

Connects a PC serial port to Xenus R10 RX-232 connector J5
 (1) RS-232 9-pin D-Sub to RJ-11 adapter
 (2) 6 ft (2 m) RJ-11 cable

CANopen Network Kit R10-NK

Connects a CAN card to Xenus R10 connector J6 and includes terminator for 'last' drive on CAN bus
 (1) CAN card 9-pin D-Sub to RJ-45 adapter
 (2) 6 ft (2 m) RJ-45 cable
 (3) CAN terminator

Connector/Cable Kit R10-CK

Includes connectors for J1~J4, J7, J8:
 (1) Soldercup connectors for J7 & J8
 (2) Wago connectors for J1~J4

See diagram on page 10 for connections to:

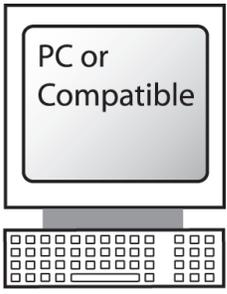
- J1 AC mains power
- J2 Motor phases
- J3 Regen resistor
- J4 +24 Vdc Aux Power



**COM1
COM2
COMx**



**CAN
CARD**



**PC or
Compatible**



CML C++ Libraries
Windows™ 98, 2000, ME, NT, and Linux



CMO Copley Motion Objects
Windows™ 98, 2000, ME, NT, and Linux



CME 2
Windows® 98, 2000, ME, and NT

Computer:
 PC or compatible with
 166MHz with 64MB RAM minimum
 266 MHz with 128MB RAM recommended
 Serial port (RS-232)
 CAN bus interface
 Using the minimum requirements will allow CME 2 to run but the performance will be significantly reduced.

Ordering Guide

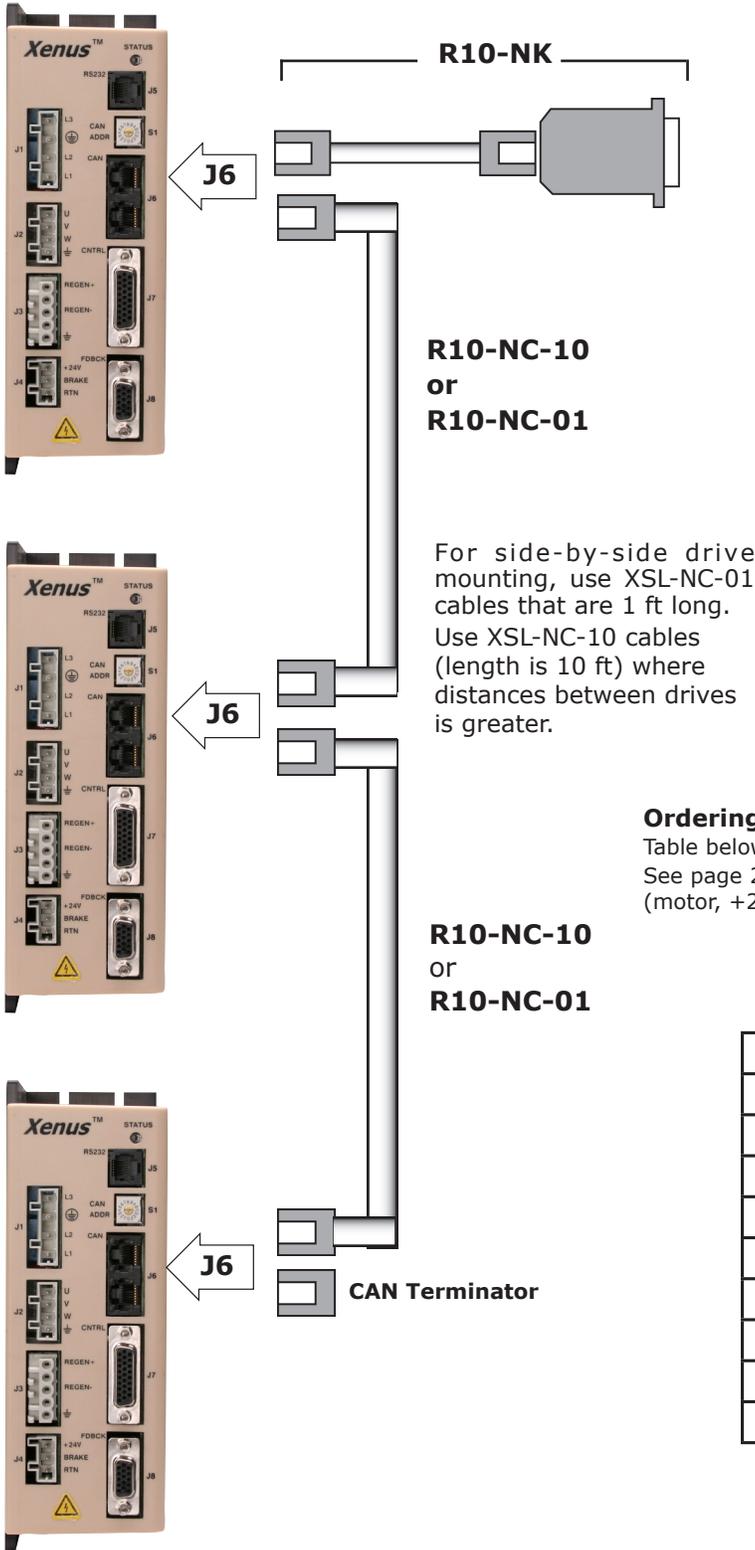
Table below shows parts to order for the configuration on this page. See page 19 for other parts required (motor, +24 Vdc power supply, etc.) .

| Part number | description |
|-------------|------------------------------------|
| R10-230-18 | Xenus R10 Servodrive 6/18 A |
| R10-230-36 | Xenus R10 Servodrive 12/36 A |
| R10-230-40 | Xenus R10 Servodrive 20/40 A |
| R10-nk | CANopen Network Kit |
| R10-ck | Xenus R10 Solder-Cup Connector Kit |
| cme2 | CME 2 Configuration Software CD |
| ser-ck | CME 2 RS-232 Cable Kit |

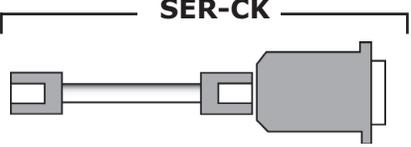
Add -S to part numbers above for sin/cos feedback, or add -R for resolver feedback models.

Xenus R10

MULTIPLE-DRIVE SETUP FOR CANOPEN POSITION CONTROL



For multiple-drive installations, use the ordering guide on this page. Computer equipment is the same as for single-drive installations. And Serial Cable Kit SER-CK is used when CME 2 is in use for drive set up and configuration.



SER-CK

Ordering Guide

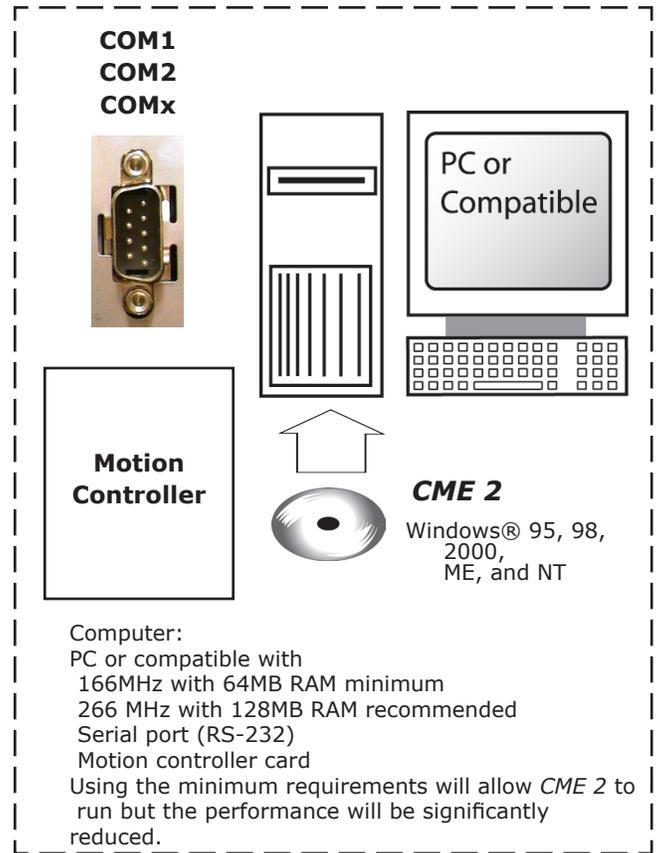
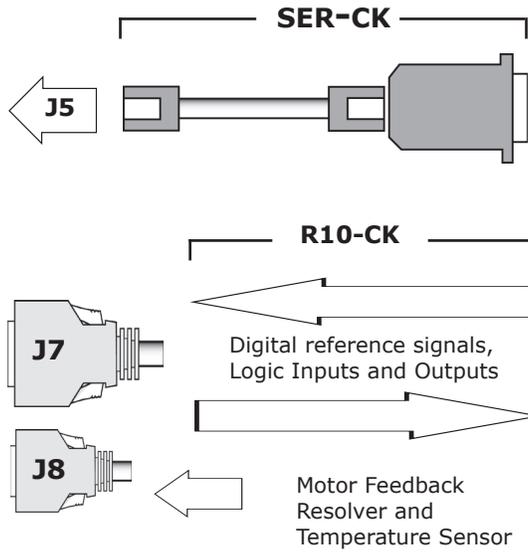
Table below shows parts to order for the configuration on this page
See page 24~25 for other parts required
(motor, +24V power supply, etc.)

| Part number | description |
|-------------|------------------------------------|
| R10-230-18 | Xenus R10 Servodrive 6/18 A |
| R10-230-36 | Xenus R10 Servodrive 12/36 A |
| R10-230-40 | Xenus R10 Servodrive 20/40 A |
| R10-nk | CANopen Network Kit |
| R10-NC-10 | CAN Network Cable,10 ft (3 m) |
| R10-NC-01 | CAN Network Cable,1 ft (0.3 m) |
| R10-ck | Xenus R10 Solder-Cup Connector Kit |
| cme2 | CME 2 Configuration Software CD |
| ser-ck | CME 2 RS-232 Cable Kit |

Add -S to part numbers above for sin/cos feedback, or add -R for resolver feedback models.

STAND-ALONE OPERATION

Xenus R10 takes digital position commands in Pulse/Direction, or CW/CCW format from an external controller or quadrature encoder signals from a master-encoder for electronic gearing. Velocity or torque control can be from $\pm 10V$, digital PWM signals. CME 2 used for setup and configuration.



ORDERING GUIDE

This table shows parts to order for the configuration on this page
See page 24~25 for other parts required (motor, +24 Vdc power supply, etc.)

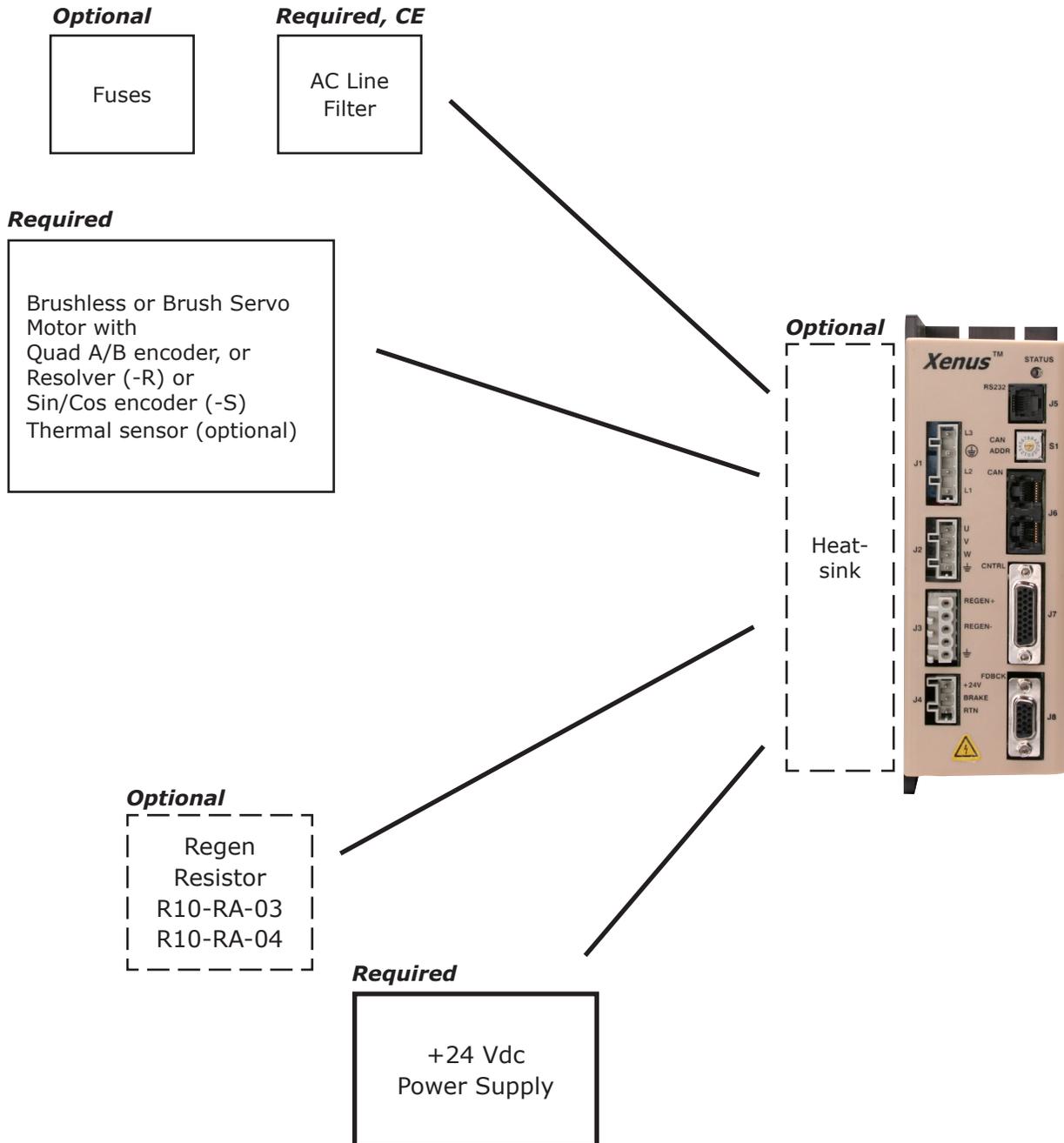
| Part number | description |
|-------------|---------------------------------|
| R10-230-18 | Xenus R10 Servodrive 6/18 A |
| R10-230-36 | Xenus R10 Servodrive 12/36 A |
| R10-230-40 | Xenus R10 Servodrive 20/40 A |
| R10-ck | Xenus Solder-Cup Connector Kit |
| cme2 | CME 2 Configuration Software CD |
| ser-ck | CME 2 RS-232 Cable Kit |

Add -S to part numbers above for sin/cos feedback, or add -R for resolver feedback models.

Xenus R10

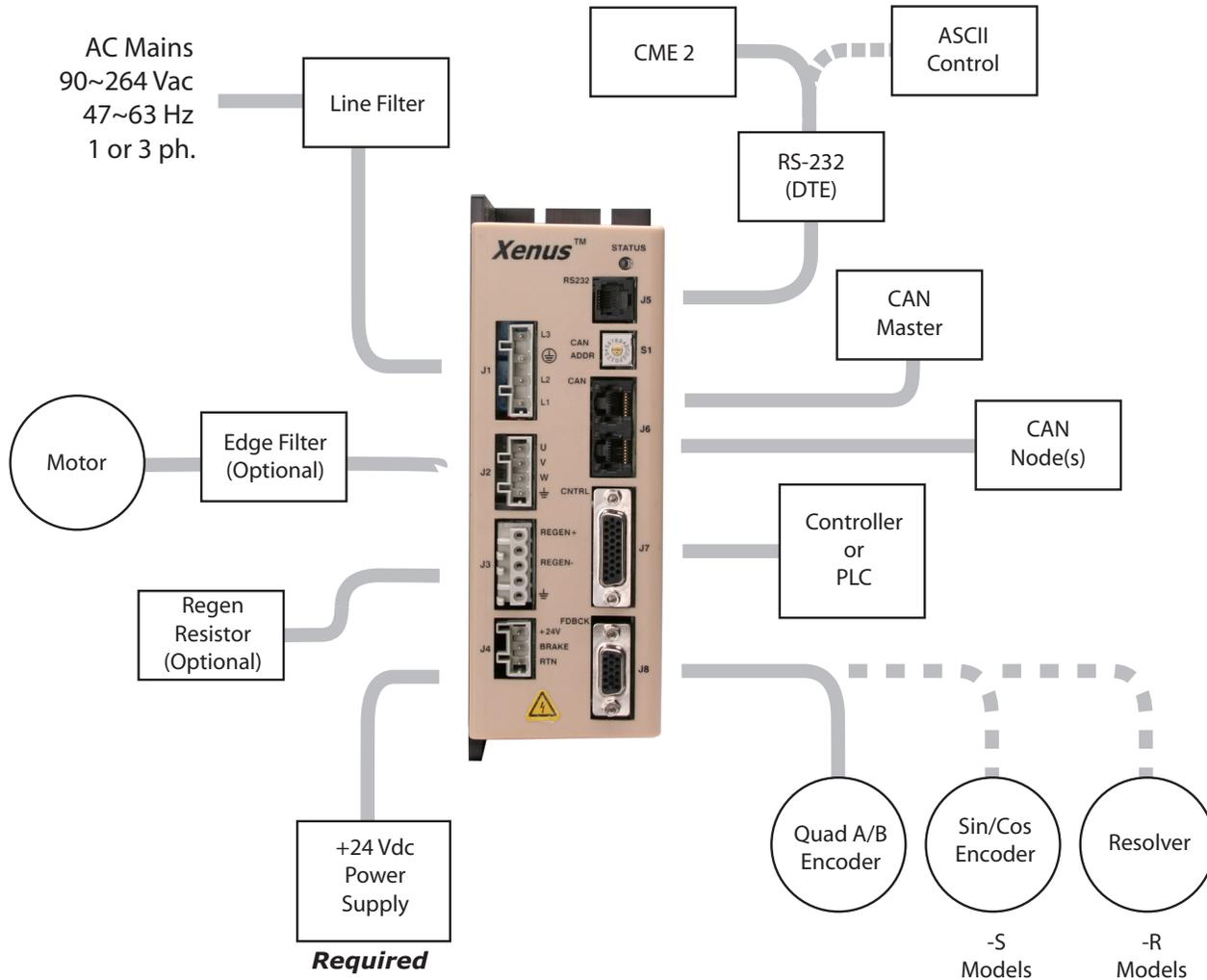
PARTS USED IN ALL CONFIGURATIONS

Each component is labeled *Required*, *Optional*, or *CE*.
Required components are necessary for operation of Xenus R10 in all cases.
Optional components depend on the particular application.
CE after *Required* indicates that these parts are necessary for CE compliance.

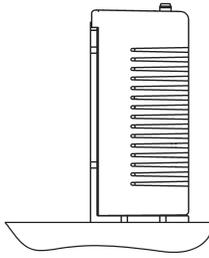


Xenus R10

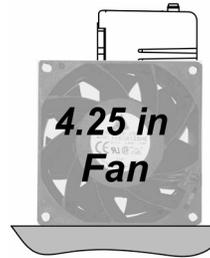
INSTALLATION



HEATSINK & FAN CONFIGURATIONS

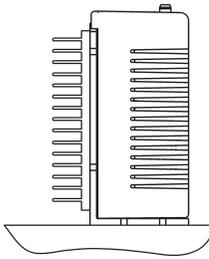


**NO HEATSINK
NO FAN**

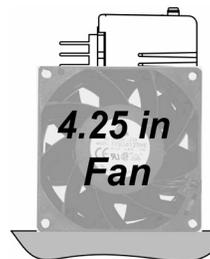


**NO HEATSINK
WITH FAN**

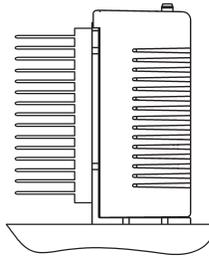
**NOTE: FANS ARE NOT INCLUDED
WITH HEATSINKS OR HEATSINK
KITS**



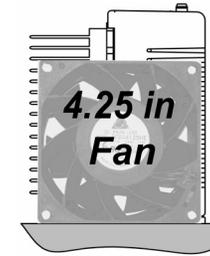
**LOW-PROFILE
HEATSINK
NO FAN**



**LOW PROFILE HEATSINK
WITH FAN**



**STANDARD HEAT-
SINK
NO FAN**



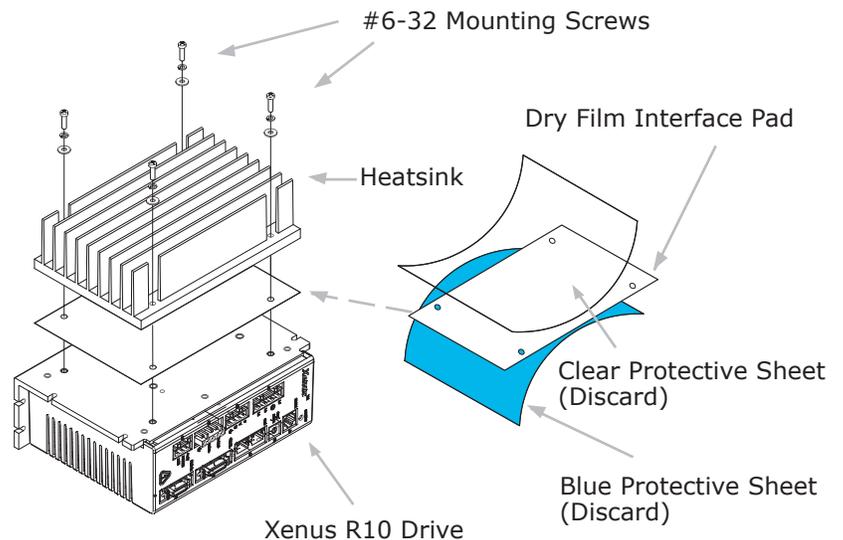
**STANDARD HEATSINK
WITH FAN**

HEATSINK MOUNTING

A dry-film interface pad is used in place of thermal grease. The pad is die-cut to shape and has holes for the heat sink mounting screws. There are two protective sheets, blue on one side and clear on the other. Both must be removed when the interface pad is installed.

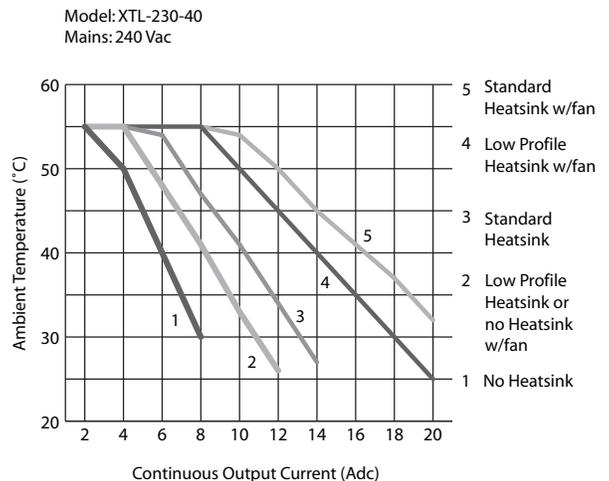
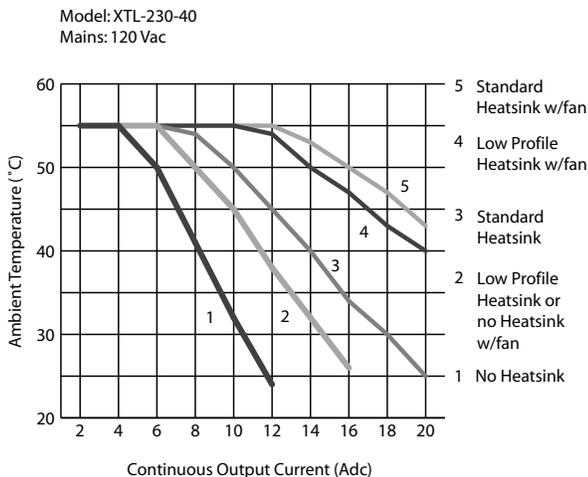
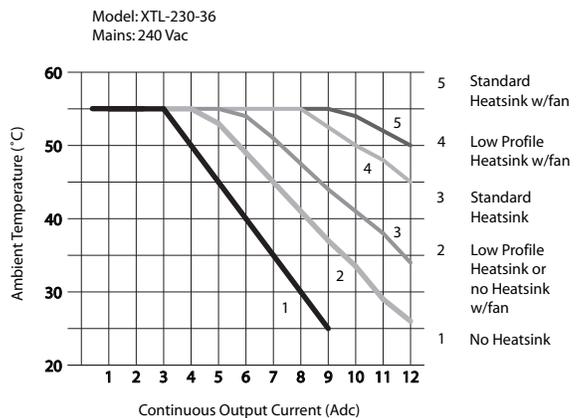
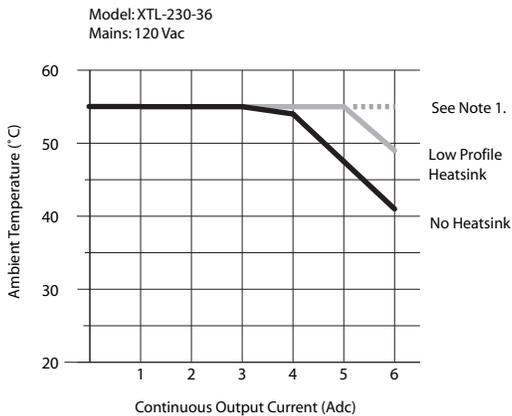
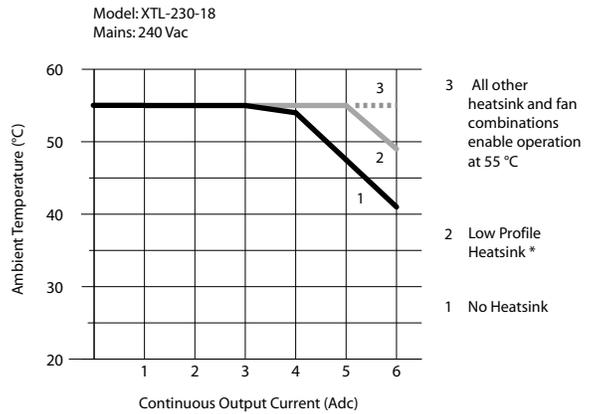
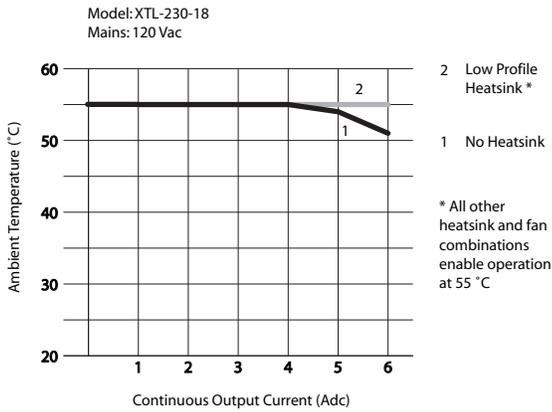
STEPS TO INSTALL

1. Remove the blue protective sheet from one side of the pad and place the pad on the drive. Make sure that the holes in the pad align with the holes on the drive.
2. Remove the clear protective sheet from the pad.
3. Mount the heatsink onto the drive taking care to see that the holes in the heatsink, pad, and drive all line up.
4. Torque the #6-32 mounting screws to 8~10 lb-in (0.9~1.13 N·m).



MAXIMUM OPERATING TEMPERATURE VS HEATSINK TYPE & AIR CIRCULATION

The charts below show that maximum ambient temperature vs. continuous output current for the Xenus R10 models. The cooling options are no heatsink, standard heatsink, and low-profile heatsink. For each of these the drive can be operated with convection or forced-air cooling.



Xenus R10

ORDERING GUIDE Add -S to part numbers above for sin/cos feedback or add -R for resolver feedback models.

| | |
|------------|---------------------------------|
| R10-230-18 | Xenus R10 Servo Drive 6/18 Adc |
| R10-230-36 | Xenus R10 Servo Drive 12/36 Adc |
| R10-230-40 | Xenus R10 Servo Drive 20/40 Adc |

ACCESSORIES

| | Qty | Ref | Description | Manufacturers Part Number |
|--|------------------|------|--|--|
| R10-CK Connector Kit with Solder Cup Connectors for J7 & J8 | 1 | J1 | Plug, 4 position, 7.5 mm, female | Wago: 51118287 or 721-204/026-045/RN01-0000 |
| | 1 | J2 | Plug, 4 position, 5.0 mm, female | Wago: 51118008 or 721-104/026-047/RN01-0000 |
| | 1 | J3 | Plug, 5 position, 5.0 mm, male | Wago: 51111277 or 721-605/000-043/RN01-0000 |
| | 1 | J4 | Plug, 3 position, 5.0 mm, female | Wago: 51117974 or 721-103/026-047/RN01-0000 |
| | 4 | J1~4 | Tool, wire insertion & extraction (for J1~4) | Wago: 231-131 |
| | 1 | J7 | Connector, 26 position, solder-cup | High Density D-Sub Male, 26 position connector |
| | 1 | | Back shell, for 26 position connector | Backshell for above |
| | 1 | J8 | Connector, 15 position, solder cup | High Density D-Sub Male, 15 position connector |
| | 1 | | Back shell, for 15 position connector | Backshell for above |
| | CME 2 | J5 | CME 2 Drive Configuration Software (CD-ROM) | |
| SER-CK | RS-232 Cable Kit | | | |

Connectors & Software for CANopen Operation

| | | | | |
|-----------|---|----------------------------|-------------------------------------|--|
| R10-NK | 1 | J6 | D-Sub 9F to RJ-45 Adapter | |
| | 1 | | CAN bus RJ-45 terminator | |
| | 1 | | CAN bus network cable, 10 ft (3 m) | |
| R10-CV | 1 | | D-Sub 9F to RJ-45 Adapter | |
| R10-NC-10 | 1 | | CAN bus Network Cable, 10 ft (3 m) | |
| R10-NC-01 | 1 | | CAN bus Network Cable, 1 ft (0.3 m) | |
| R10-NT | 1 | CAN bus Network Terminator | | |
| CMO | CD with CMO Software | | | |
| CML | CD with CML Software (Note: license fee required) | | | |

Heatsink Kits for Field Installation (Optional)

| | | | |
|---------------------------------------|---|---------------------------|--|
| R10-HL Heatsink Kit Low-Profile | 1 | Heatsink, low-profile | |
| | 1 | Heatsink thermal material | |
| | 4 | Heatsink hardware | |
| R10-HS Heatsink Kit Standard | 1 | Heatsink, standard | |
| | 1 | Heatsink thermal material | |
| | 4 | Heatsink hardware | |

Regeneration Resistors (Optional)

| | |
|-----------|--|
| XTL-RA-03 | Regeneration resistor assembly (for R10-230-18), 30 Ω |
| XTL-RA-04 | Regeneration resistor assembly (for R10-230-36 & R10-230-40 models), 15 Ω |

Edge Filter (Optional)

| | | | |
|--|-------------|--|---|
| XTL-FA-01 | Edge filter | | |
| Edge Filter Connector Kit XTL-FK | 1 | Plug, 4 position, 5.0 mm, female | Wago: 51118008 or 721-104/026-047/RN01-0000 |
| | 1 | Plug, 5 position, 5.0 mm, male | Wago: 51111277 or 721-605/000-043/RN01-0000 |
| | 2 | Tool, wire insertion & extraction (for J1~4) | Wago: 231-131 |

Example: Order one Xenus R10 drive, resolver version, 6/18 A with solder-cup connector Kit, CME 2 CD, serial cable kit and small heatsink fitted at the factory:

| Qty | Item | Remarks |
|-----|-----------------|-----------------------|
| 1 | R10-230-18-R-HS | Xenus R10 servo drive |
| 1 | R10-CK | Connector Kit |
| 1 | CME 2 | CME 2 CD |
| 1 | SER-CK | Serial Cable Kit |

Note: The heatsink can be fitted at the factory by adding an "-HS" or "-HL" to the drive part number to specify the standard or low-profile type. For fitting a heatsink to an drive in the field, complete kits are available (XSL-HS and XSL-HL). These kits contain the heatsink, mounting hardware, and dry-film interface.