Lexium SD218P

Schneider Electric

Important information

The drive systems described here are products for general use that conform to the state of the art in technology and are designed to prevent any dangers. However, drives and drive controllers that are not specifically designed for safety functions are not approved for applications where the functioning of the drive could endanger persons. The possibility of unexpected or un-braked movements can never be totally excluded without additional safety equipment. For this reason personnel must never be in the danger zone of the drives unless additional suitable safety equipment prevents any personal danger. This applies to operation of the machine during production and also to all service and maintenance work on drives and the machine. The machine design must ensure personal safety. Suitable measures for prevention of property damage are also required.

Qualification of personnel

Only technicians who are familiar with and understand the contents of this manual and the other relevant documentation are authorized to work on and with this drive system. The technicians must be able to detect potential dangers that may be caused by setting parameters, changing parameter values and generally by the operation of mechanical, electrical and electronic equipment.

The technicians must have sufficient technical training, knowledge and experience to recognise and avoid dangers.

The technicians must be familiar with the relevant standards, regulations and safety regulations that must be observed when working on the drive system.

Intended Use

The drive systems described here are products for general use that conform to the state of the art in technology and are designed to prevent any dangers. However, drives and drive controllers that are not specifically designed for safety functions are not approved for applications where the functioning of the drive could endanger persons. The possibility of unexpected or unbraked movements can never be totally excluded without additional safety equipment.

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In all cases the applicable safety regulations and the specified operating conditions, such as environmental conditions and specified technical data, must be observed.

The drive system must not be commissioned and operated until completion of installation in accordance with the EMC regulations and the specifications in this manual. To prevent personal injury and damage to property damaged drive systems must not be installed or operated.

Changes and modifications of the drive systems are not permitted and if made all no warranty and liability will be accepted.

The drive system must be operated only with the specified wiring and approved accessories. In general, use only original accessories and spare parts.

The drive systems must not be operated in an environment subject to explosion hazard (ex area).

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1 Introduction

Drive system

The SD218P is a universally applicable stepper motor drive with on-board programmable motion controller. Reference values are set via RS 485 communications. Together with selected Schneider Electric stepper motors, SD218P is a very compact, high performance drive system that can be used without PLC.

Control

The SD218P can be parameterised and controlled via the RS 485 interface.

Eight different 24 V signals are also available. They can be used as input or output.

Supply voltage

SD218P can be operated with a voltage range of 24 to 48 V.

Connection technologies

The SD218P has the following connections:

- Power supply
- Multifunction interface
- Communication interface
- Motor interface

1.1 Lexium SD218P versions

The Lexium SD218P is available in the following power ranges and flange sizes:

+24 to +48 VDC

- 3.0 A RMS, 4.2 A Peak
- 5.0 A RMS, 7.0 A Peak

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1.3 Product identification

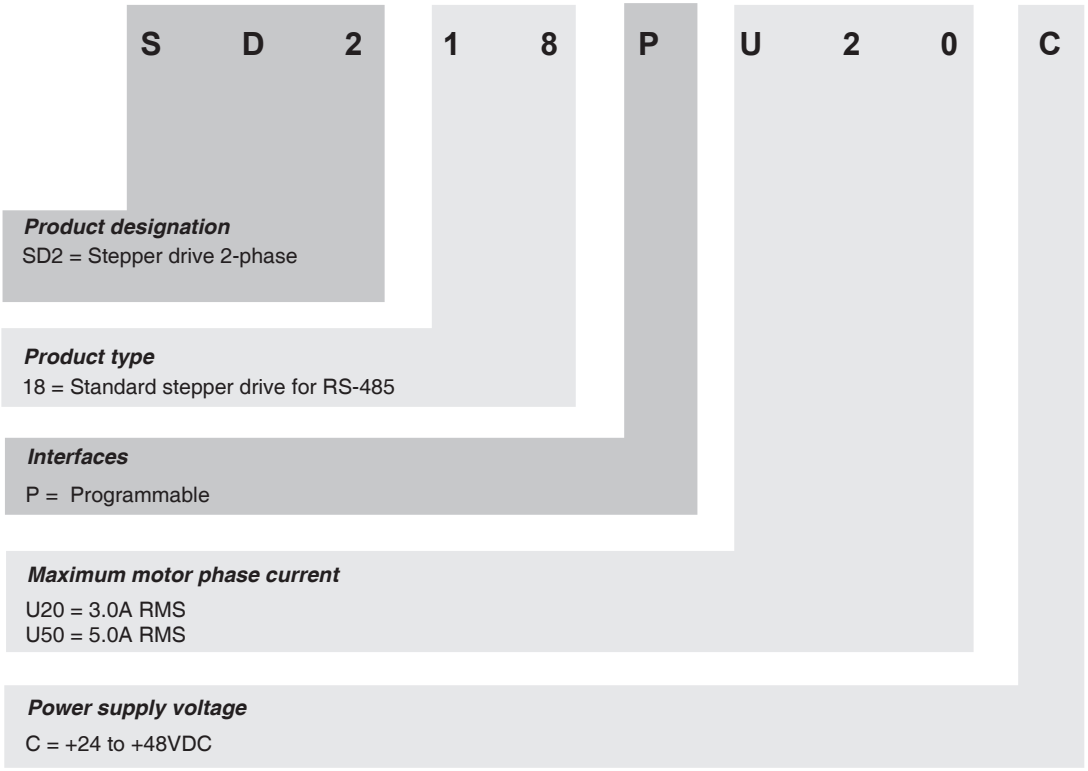

Figure 1.1 Standard product options

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1.2 Documentation reference

The following user's manuals are available for the Lexium SD218P:

- Product hardware manual (Manual reference: 0198441113814), describes the technical data and installation of the product.
- Product software manual(Manual reference: 0198441113776), describes the configuration and programming of the product.

This documentation is also available for download from the Schneider Electric web site at http://www.schneider-electric.com

1.4 Product software

1.4.1 Communications converter drivers

If using the Schneider Electric communications converter, drivers are required, these drivers are available for download from the Schneider Electric web site at http://www.schneider-electric.com.

1.4.2 ASCII program editor and ANSI terminal emulator

The Lexium SD218P can be configured and programmed using any standard ANSI terminal emulator and ASCII text editor.

The recommended tool is the Lexium CT-ILP integrated terminal and program editor. Lexium CT-ILP features color-coded editor, multiple-function keys and is pre-configured to operate using the Lexium SD218P default settings

Installation and usages instructions are to be found in MCode software manual.

This software may be downloaded from http://www.schneider-electric.com.

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2 Safety

2.1 Qualification of personnel

Only technicians who are familiar with and understand the contents of this manual and the other relevant documentation are authorized to work on and with this drive system. The technicians must be able to detect potential dangers that may be caused by setting parameters, changing parameter values and generally by the operation of mechanical, electrical and electronic equipment.

The technicians must have sufficient technical training, knowledge and experience to recognise and avoid dangers.

The technicians must be familiar with the relevant standards, regulations and safety regulations that must be observed when working on the drive system.

2.2 Intended Use

The drive systems described here are products for general use that conform to the state of the art in technology and are designed to prevent any dangers. However, drives and drive controllers that are not specifically designed for safety functions are not approved for applications where the functioning of the drive could endanger persons. The possibility of unexpected or unbraked movements can never be totally excluded without additional safety equipment.

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The drive systems must not be operated in an environment subject to explosion hazard (ex area).

2.3 Hazard Categories

Safety notes and general information are indicated by hazard messages in the manual. In addition there are symbols and instructions affixed to the product that warn of possible hazards and help to operate the product safely.

Depending on the seriousness of the hazard, the messages are divided into three hazard categories.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

2.4 General safety instructions

⚠ DANGER

EXPOSED SIGNALS

Hazardous voltage levels may be present if using an open frame power supply to power the product.

Failure to follow these instructions will result in death or serious injury.

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⚠ WARNING

LOSS OF CONTROL

- Observe the accident prevention regulations. (For USA see also NEMA ICS1.1 and NEMA ICS7.1)
- The system manufacturer must take the potential error possibilities of the signals and the critical functions into account to ensure a safe status during and after errors. Some examples are: emergency stop, final position limitation, power failure and restart.
- The assessment of error possibilities must also include unexpected delays and the failure of signals or functions.
- Suitable redundant control paths must be in place for dangerous functions.
- Check that measures taken are effective.

Failure to follow these instructions can result in death or serious injury.

⚠ CAUTION

HOT PLUGGING!

Do not connect or disconnect power, logic, or communications while the device is in a powered state.

Remove DC power by powering down at the AC side of the DC power supply.

Failure to follow these instructions can result in equipment damage.

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3 Interfacing DC power

⚠ DANGER

EXPOSED SIGNALS

Hazardous voltage levels may be present if using an open frame power supply to power the product.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

MAXIMUM VOLTAGE INPUT

Do not exceed the maximum rated voltage of the device! Motor Back EMF, power supply ripple and high line must be taken into account when selecting a power supply voltage level.

Failure to follow these instructions may result in damage to system components!

⚠ CAUTION

GENERAL POWER SUPPLY PRACTICE

Do not connect or disconnect the power supply while power is applied.

Disconnect the AC side to power down the DC supply.

For battery operated systems connect a “transient suppressor” across the switch to prevent arcs and high-voltage spikes.

Failure to follow these instructions may result in damage to system components!

⚠ CAUTION

HOT PLUGGING!

Do not connect or disconnect power, logic, or communications while the device is in a powered state.

Remove DC power by powering down at the AC side of the DC power supply.

Failure to follow these instructions may result in damage to system components!

Detailed specifications, voltage limits, current requirements and connectivity information are located in the product detail section corresponding to the Lexium SD218P model you purchased.

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3.1 Applicability

3.2 Selecting a power supply (+V)

Proper selection of a power supply to be used in a motion system is as important as selecting the drive itself. When choosing a power supply for a stepping motor driver, there are several performance issues that must be addressed. An undersized power supply can lead to poor performance and possibly even damage to your drive.

3.2.1 Power supply — motor relationship

Motor windings can basically be viewed as inductors. Winding resistance(R) and inductance(L) result in an L/R time constant that resists the change in current. To effectively manipulate the rate of charge, the voltage applied is increased. When traveling at high speeds, there is less time between steps to reach current. The point where the rate of commutation does not allow the driver to reach full current is referred to as voltage mode. Ideally you want to be in current mode, which is when the drive is achieving the desired current between steps. Simply stated, a higher voltage will decrease the time it takes to charge the coil and, therefore, will allow for higher torque at higher speeds.

Another characteristic of all motors is back EMF. Back EMF is a source of current that can push the output of a power supply beyond the maximum operating voltage of the driver. As a result, damage to the stepper driver could occur over a period of time. This is especially prevalent with overhauling loads.

3.2.2 Power supply — driver relationship

The Lexium SD218P is very current efficient as far as the power supply is concerned. Once the motor has charged one or both windings of the motor, all the power supply has to do is replace losses in the system. The charged winding acts as an energy storage in that the current will recirculate within the bridge and in and out of each phase reservoir. This results in a less than expected current draw on the power supply.

Stepping motor drivers are designed with the intent that a user's power supply output will ramp up to greater than or equal to the minimum operating voltage of the drive. The initial current surge is substantial and could damage the driver if the supply is undersized. The output of an undersized power supply could fall below the operating range of the driver upon a current surge. This could cause the power supply to start oscillating in and out of the voltage range of the driver and result in damage to either the supply, the driver, or both.

There are two types of supplies commonly used, regulated and unregulated, both of which can be switching or linear. Each have advantages and disadvantages.

3.2.3 Regulated vs unregulated

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An unregulated linear supply is less expensive and more resilient to current surges, however, the voltage decreases with increasing current draw. This may cause problems if the voltage drops below the working range of the drive.

Fluctuations in line voltage are also a point of concern. These fluctuations may cause the unregulated linear supply to be above or below the anticipated or acceptable voltage.

A regulated supply maintains a stable output voltage, which is good for high speed performance. These supplies are also not affected by line fluctuations, however, they are more expensive. Depending on the current regulation, a regulated supply may crowbar or current clamp and lead to an oscillation that, as previously stated, can cause damage to the driver and/or supply. Back EMF can cause problems for regulated supplies as well. The current regeneration may be too large for the regulated supply to absorb. This could lead to an over voltage condition which could damage the output circuitry of the Lexium SD218P.

See the product detail section of this document for specific power supply voltage and current requirements and recommended power supplies.

3.3 Power supply cabling best practices and recommendations

⚠ CAUTION

EMI and RFI

These recommendations will provide optimal protection against EMI and RFI. The actual cable type, wire gauge, shield type and filtering devices used are dependent on the customer's application and system.

The length of the DC power supply cable to an Lexium SD218P should not exceed 15.0 m.

Always use shielded/twisted pairs for the Lexium SD218P DC supply cable and the AC supply cable.

Failure to follow these instructions may result in damage to system components!

Cable length, wire gauge and power conditioning devices play a major role in the performance of your Lexium SD218P.

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Figure 3.1 illustrates the recommended cable configuration for DC power supply cabling under 15,0 m. If cabling of 15,0 m or longer is required, the additional length may be gained by adding an AC power supply cable (see Figures 3.2 and 3.3).

Correct AWG wire size is determined by the current requirement plus cable length. Please see Table 3.1.

3.3.1 DC Cabling Under 15,0 m

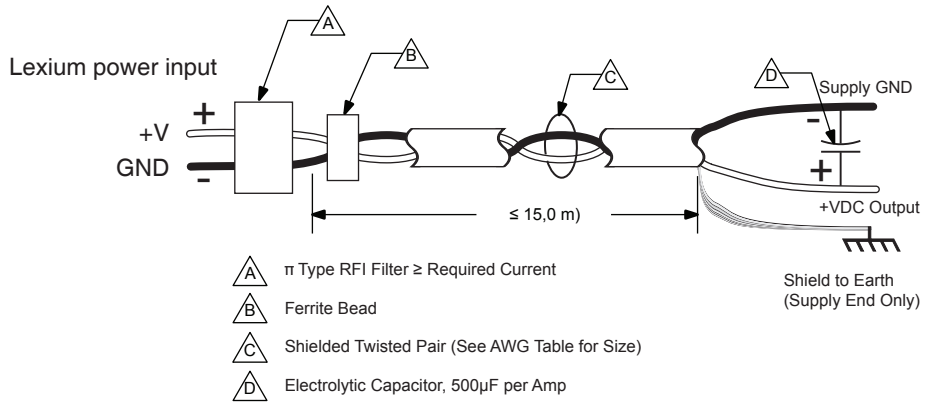

Figure 3.1 DC power supply cabling under 15,0 m

3.3.2 15,0 m or greater, AC power to full wave bridge

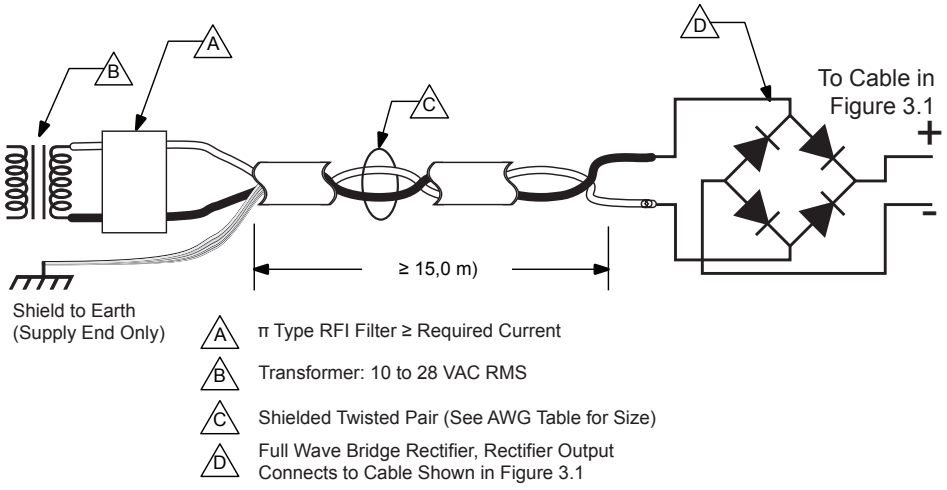

Figure 3.2 15,0 m or greater, AC power to full wave bridge

3.3.3 15,0 m or greater, AC power DC supply

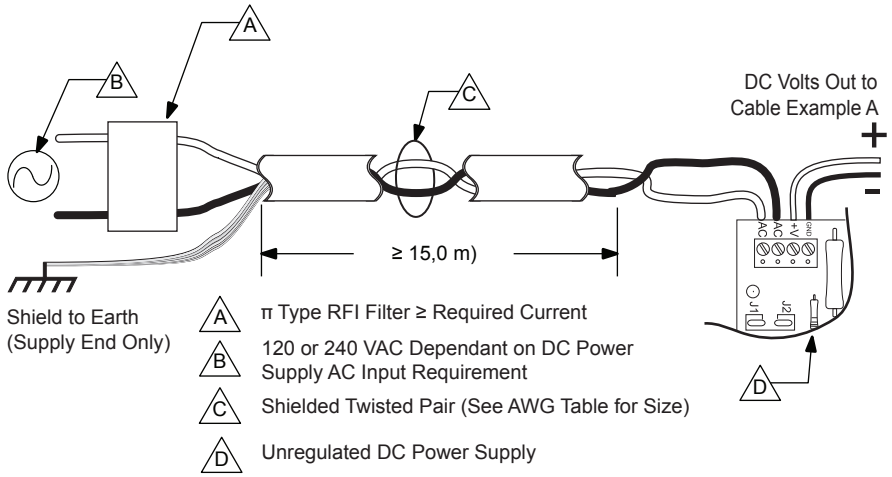

Figure 3.3 15,0 m or greater, AC power to DC supply

3.3.4 Recommended power supply cable wire gauges

For cable lengths exceeding 15,0 m, use the cable configurations shown in Figures 3.2 and 3.3.

Cable Length: Meters	3,0	8,0	15,0	23,0	30,0
Amps Peak	**Minimum AWG**				
1 Amp Peak	20	20	18	18	18
2 Amps Peak	20	18	16	14	14
3 Amps Peak	18	16	14	12	12
4 Amps Peak	18	16	14	12	12

Table 3.1 Power supply cable AWG recommendations

Detailed specifications, voltage limits and connectivity information are located in the product detail section corresponding to the Lexium SD218P model you purchased.

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4 Interfacing a stepper motor

⚠ DANGER

EXPOSED SIGNALS

Hazardous voltage levels may be present if using an open frame power supply to power the product.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

MOTOR TEMPERATURE

Although stepping motors will run hot when configured correctly, damage may occur to a motor if a higher than specified current is used. In most cases, the specified motor currents are maximum values and should not be exceeded!

Failure to follow these instructions may result in damage to system components!

4.1 Selecting a motor

The Lexium SD218P is a bipolar driver which works equally well with both bipolar and unipolar motors (i.e. 8 and 4 lead motors, and 6 lead center tapped motors).

To maintain a given set motor current, the Lexium SD218P chops the voltage using a variable chopping frequency and a varying duty cycle. Duty cycles that exceed 50% can cause unstable chopping. This characteristic is directly related to the motor's winding inductance. In order to avoid this situation, it is necessary to choose a motor with a low winding inductance. The lower the winding inductance, the higher the step rate possible.

4.1.1 Winding inductance

Since the Lexium SD218P is a constant current source, it is not necessary to use a motor that is rated at the same voltage as the supply voltage. What is important is that the Lexium SD218P is set to the motor's rated current.

The higher the voltage used the faster the current can flow through the motor windings. This in turn means a higher step rate, or motor speed. Care should be taken not to exceed the maximum voltage of the driver. Therefore, in choosing a motor for a system design, the best performance for a specified torque is a motor with the lowest possible winding inductance used in conjunction with highest possible driver voltage.

The winding inductance will determine the motor type and wiring configuration best suited for your system. While the equation used to size a motor for your system is quite simple, several factors fall into play at this point.

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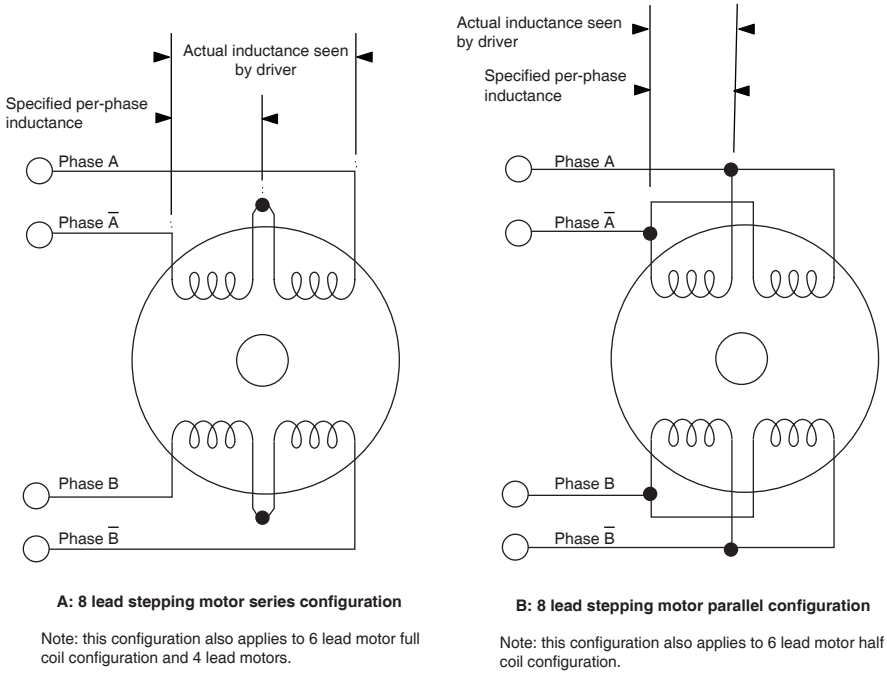
The winding inductance of a motor is rated in milliHenrys (mH) per Phase. The amount of inductance will depend on the wiring configuration of the motor.

The per phase winding inductance specified may be different than the per phase inductance seen by your Lexium SD218P depends on the wiring configuration used. Your calculations must allow for the actual inductance that the driver will see based upon the wiring configuration.



A: 8 lead stepping motor series configuration

Note: this configuration also applies to 6 lead motor full coil configuration and 4 lead motors.

B: 8 lead stepping motor parallel configuration

Note: this configuration also applies to 6 lead motor half coil configuration.

Figure 4.1 Motor winding inductance

Figure 4.1A shows a stepper motor in a series configuration. In this configuration, the per phase inductance will be 4 times that specified. For example: a stepping motor has a specified per phase inductance of 1.47mH. In this configuration the driver will see 5.88 mH per phase.

Figure 4.1B shows an 8 lead motor wired in parallel. Using this configuration the per phase inductance seen by the driver will be as specified below.

Using the following equation we will show an example of sizing a motor used with an unregulated power supply with a minimum voltage (+V) of 24 VDC:

.2 x min power supply voltage (VDC) = min. inductance (mH/phase)

.2 X 24 = 4.8 mH

The recommended per phase winding inductance we can use is 4.8 mH.

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4.2 Recommended motor cable configurations

⚠ CAUTION

EMI AND RFI

These recommendations will provide optimal protection against EMI and RFI. The actual cable type,wire gauge, shield type and filtering devices used are dependent on the customer's application and system.

Always use Shielded/Twisted Pairs for the Motor Cable

Failure to follow these instructions may result in damage to system components!

Cable length, wire gauge and power conditioning devices play a major role in the performance of the system.

NOTE: The length of the cable between the Lexium SD2 and the motor should not exceed 15,0 m.

4.2.1 demonstrates the recommended cable configuration for the Lexium SD2 to motor cabling under 15,0 m. If cabling of 15,0 m or longer is required, the additional length can be gained with the cable configuration in 4.2.2.

Correct AWG wire size is determined by the current requirement plus cable length. Please see the motor cable AWG table at the end of this subsection.

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4.2.1 Motor cabling under 15,0 m

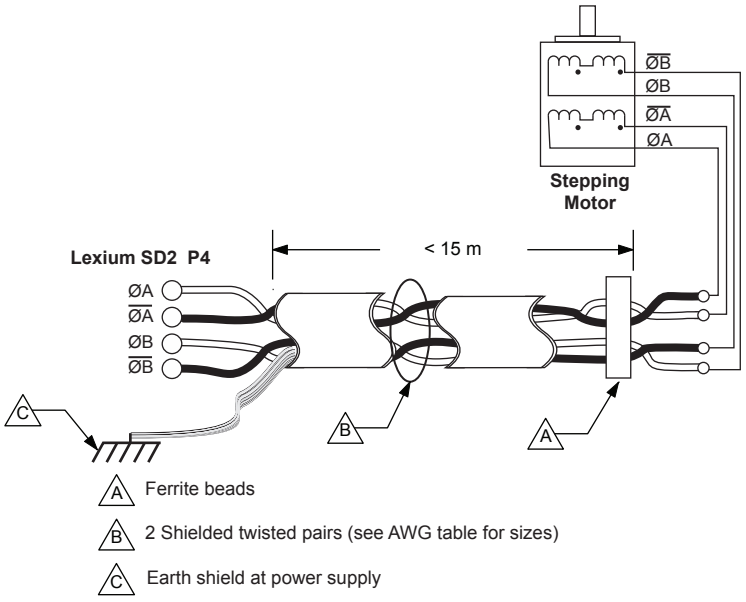

Figure 4.2 Motor cabling under 15,0 m

4.2.2 Motor cabling over 15,0 m

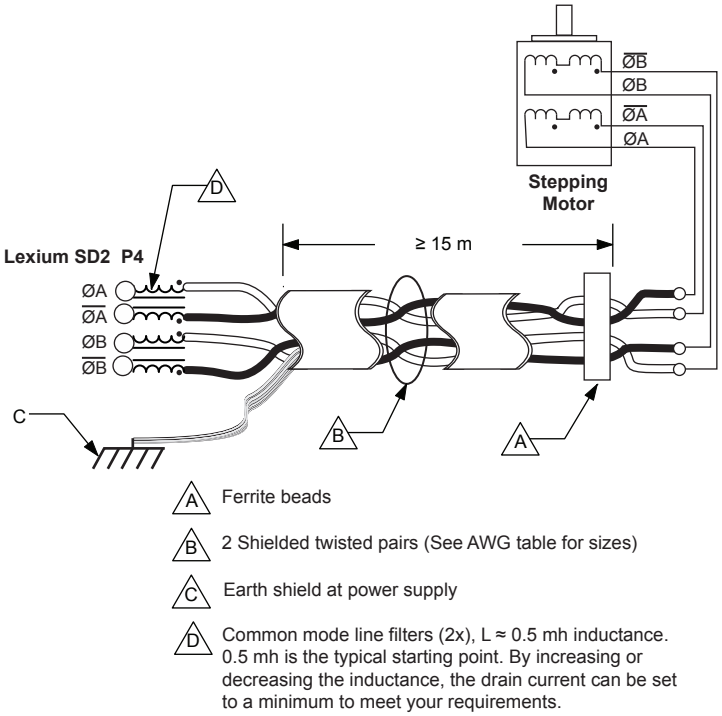

Figure 4.3 Motor cabling over 15,0 m

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4.2.3 Recommended motor cable wire gauges

For cable lengths exceeding 15,0 meters, use the cable configurations shown in 4.2.2

Cable Length: meters	3.0	8,0	15,0	23,0	30,0
Amps Peak	**Minimum AWG**				
1 Amp Peak	20	20	18	18	18
2 Amps Peak	20	18	16	14	14
3 Amps Peak	18	16	14	12	12
4 Amps Peak	18	16	14	12	12

Table 4.1 Motor cable AWG recommendations

4.3 Wiring configurations for various motor types

⚠ CAUTION

CORRECT WIRING

Ensure that the motor phase leads are connected to the corresponding connector pins to avoid Phase A to Phase B crossover.

Failure to follow these instructions may result in damage to system components!

4.3.1 8-lead motors

8 lead motors offer a high degree of flexibility to the system designer in that they may be connected in series or parallel, thus satisfying a wide range of applications.

Series connection

A series motor configuration would typically be used in applications where a higher torque at lower speeds is required. Because this configuration has the most inductance, the performance will start to degrade at higher speeds. Use the per phase (or unipolar) current rating as the peak output current, or multiply the bipolar current rating by 1.4 to determine the peak output current.

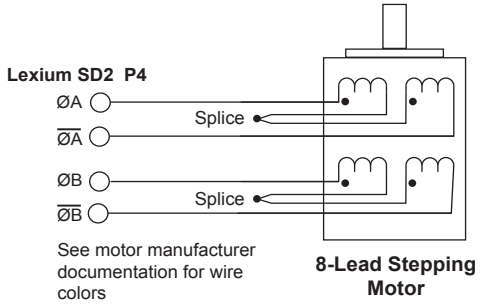

Figure 4.4 8-lead motor series connection

Parallel connection

An 8 lead motor in a parallel configuration offers a more stable, but lower torque at lower speeds. But because of the lower inductance, there will be higher torque at higher speeds. Multiply the per phase (or unipolar) current rating by 1.96, or the bipolar current rating by 1.4, to determine the peak output current.

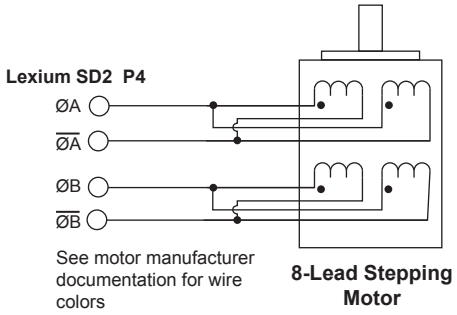

Figure 4.5 8-lead parallel connection

4.3.2 6-lead motors

Like 8 lead stepping motors, 6 lead motors have two configurations available for high speed or high torque operation. The higher speed configuration, or half coil, is so described because it uses one half of the motor's inductor windings. The higher torque configuration, or full coil, uses the full windings of the phases.

Half coil configuration

As previously stated, the half coil configuration uses 50% of the motor phase windings. This gives lower inductance, hence, lower torque output. Like the parallel connection of 8 lead motor, the torque output will be more stable at higher speeds. This configuration is also referred to as half copper. In setting the driver output current multiply the specified per phase (or unipolar) current rating by 1.4 to determine the peak output current.

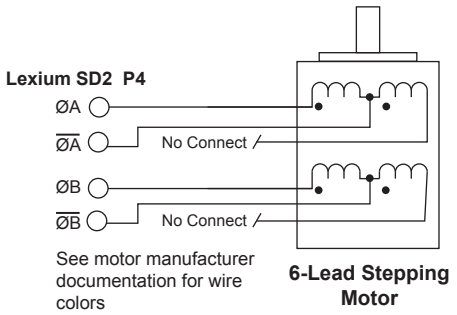

Figure 7.6 6-lead half coil configuration

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Full coil configuration

The full coil configuration on a six lead motor should be used in applications where higher torque at lower speeds is desired. This configuration is also referred to as full copper. Use the per phase (or unipolar) current rating as the peak output current.

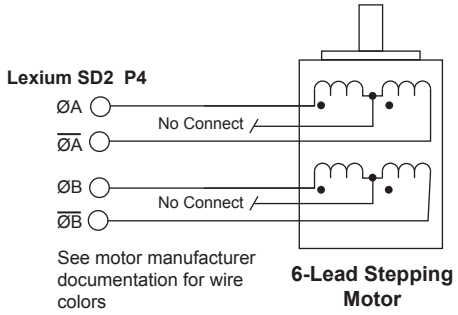

Figure 4.7 6-lead motor full coil configuration

7.3.3 4-lead motors

4 lead motors are the least flexible but easiest to wire. Speed and torque will depend on winding inductance. In setting the driver output current, multiply the specified phase current by 1.4 to determine the peak output current.

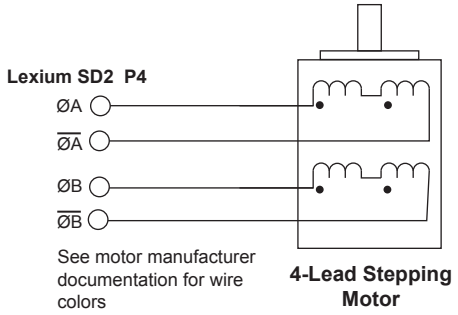

Figure 4.8 4-lead motor connection

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5 Interfacing serial communications

The Lexium SD218P communicates to the host using the RS-422/485 protocol. Communications may be configured as either half duplex (RS-485) or full duplex (RS-422) using the EM (Echo Mode) Instruction. RS-422/485 may be used in two ways: either to communicate to a single Lexium SD218P, or to address up to 62 individually named nodes in a multidrop system.

5.1 Applicability

This section applies to all Lexium SD218P models with an RS-422/485 communications interface.

5.2 USB to RS-422/485 isolated communications converter cables

To simplify the wiring and connection process Schneider Electric offers an electrically isolated USB to RS-422/485 communications cables for the Lexium SD218P. These convenient 3.6 m accessory cables connect a PC's USB port to the Lexium SD218P P2 connector. An in-line RS-422/485 converter enables parameter setting to a single Lexium SD218P. Cable purchase recommended with first order.

There are two communications converter cables available depending on the connector type:

USB to 10-pin wire crimp..... Part No. VW3L1R402

5.2.2 Driver installation procedure

These Installation procedures are written for Microsoft Windows XP Service Pack 2. Users with earlier versions of Windows please see the alternate installation instructions at the Schneider Electric web site (http://www.schneider-electric.com).

The installation of the cable requires the installation of two sets of drivers:

- Drivers for the USB to RS-422 converter hardware.
- Drivers for the Virtual Communications Port (VCP) used to communicate to your device.

Therefore the Hardware Update wizard will run twice during the installation process.

The full installation procedure will be a two-part process: Installing the Cable/VCP drivers and Determining the Virtual COM Port used.

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Installing the Cable/VCP Drivers

1) Download the VW3L1R40x communications converter drivers from http://www.schneider-electric.com. Extract to a folder on your hard drive.
2) Plug the USB converter cable into the USB port of the VW3L-1R40x.
3) Plug the other end of the USB cable into an open USB port on your PC.
4) Your PC will recognize the new hardware and open the Hardware Update dialog.
5) Select “No, not this time” on the radio buttons in answer to the query “Can Windows Connect to Windows Update to search for software?” Click “Next”.
6) Select “Install from a list or specific location (Advanced)” on the radio buttons in answer to the query “What do you want the wizard to do?” Click “Next”.
   - Select “Search for the best driver in these locations.”
   - Check “Include this location in the search.”
   - Browse to the download location on your hard drive.
7) Click Next.
8) The drivers will begin to copy.
9) On the Dialog for Windows Logo Compatibility Testing, click “Continue Anyway”.
10) The Driver Installation will proceed. When the Completing the Found New Hardware Wizard dialog appears, Click “Finish”.
11) Upon finish, the Welcome to the Hardware Update Wizard will re-appear to guide you through the second part of the install process. Repeat steps 1 through 9 above to complete the cable installation.
12) Your Schneider Electric VW3L1R40x is now ready to use.

Determining the Virtual COM Port (VCP)

The VW3L1R40x uses a Virtual COM Port to communicate through the USB port to the Lexium SD218P. A VCP is a software driven serial port which emulates a hardware port in Windows.

The drivers for the VW3L1R40x will automatically assign a VCP to the device during installation. The VCP prt number will be needed when Lexium CT-ILP is set up in order that Lexium CT-ILP will know where to find and communicate with your Lexium SD218P.

To locate the Virtual COM Port.

1) Right-Click the “My Computer” Icon and select “Properties”.
2) Browse to the Hardware Tab, Click the Button labeled “Device Manager”.
3) Look in the heading “Ports (COM & LPT)” Schneider Electric USB to RS-422 Converter Cable (COMx) will be listed). The COM # will be the Virtual COM Port connected. You will enter this number into your Lexium CT-ILP configuration.

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5.3 Interfacing single mode communications

⚠ CAUTION

HOT PLUGGING!

Do not connect or disconnect communications while the device is in a powered state.

Failure to follow these instructions may result in damage to system components!

5.3.1 Full duplex (RS-422)

To interface the Lexium SD218P using RS-422 protocol you will need one of the following:

- A PC equipped with RS-422 Interface.
- A PC RS-232 to RS-422/485 converter.
- VW3L1R40x or equivalent communications converter.

Use the following diagram to connect RS-422 communications to the Lexium SD218P (not required if using the recommended converter.)

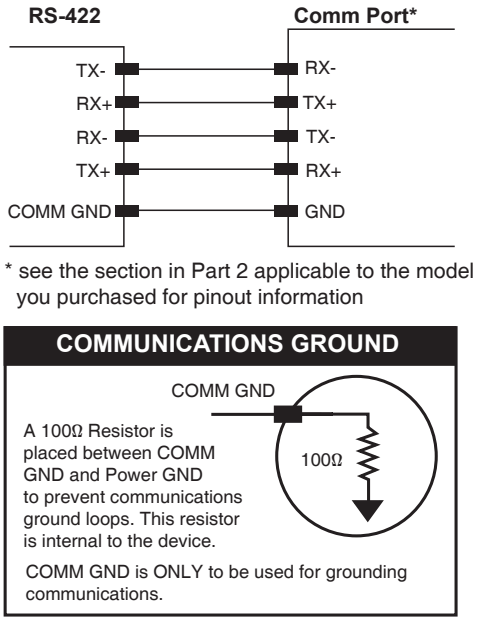

Figure 5.2 Full duplex RS-422 connection.

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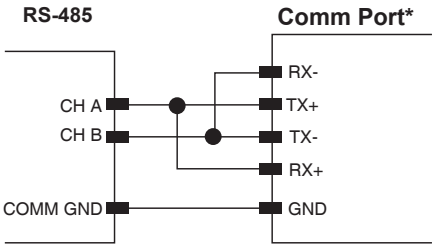
5.3.2 Half duplex (RS-485)

The Lexium SD218P can be operated in a two wire RS-485 communication bus. Before connecting the two wire RS-485, download your program and setup instructions using the standard four wire RS-422 communications cable. If a program is not being used, download and save any setup parameters. To ensure the Lexium SD218P responds only to commands specifically meant for it, set the unit in party mode

The Echo Mode command (EM) must be set to the value of 1 (EM=1). This will set the Lexium SD218P communication into “half duplex” mode. Connect the driver in the two wire RS-485 configuration. The following diagram illustrates how to connect the four wire RS-485 to operate as a two wire system.



* see the section in Part 2 applicable to the model you purchased for pinout information

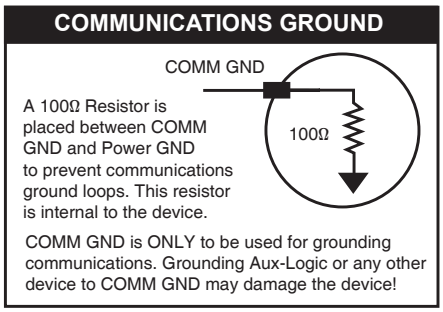


Figure 5.3 Half duplex RS-485 connection.

5.4 interfacing party mode communications

⚠ CAUTION

HOT PLUGGING!

Do not connect or disconnect communications while the device is in a powered state.

Failure to follow these instructions may result in damage to system components!

⚠ CAUTION

COMMUNICATIONS GROUND LOOPS

To avoid ground loops in the system only connect communications ground to the first Lexium SD218P in the system. Do not connect communications ground on subsequent Lexium SD218Ps.

Failure to follow these instructions may result in damage to system components!

DEVICE NAME

Each unit in a party mode system must have a unique identifier, or device name. Each unit MUST be connected and communicated with in single mode communications and given a name using the DN command

5.4.1 Mutli-drop communications using the VW3L1R402

Required:

- VW3L1R402 communications converter cable
- VW3L3D02R30 prototype development cable(s)

Used in conjunction with the VW3L1R402 communications converter cable to facilitate multi-drop RS-422/485 communications.

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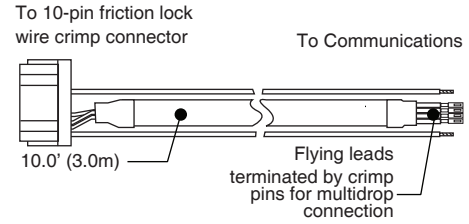


Wire Colors	Function
White/Red Stripe	Aux-Logic
White/Blue Stripe	TX+
Blue/White Stripe	TX-
White/Orange Stripe	RX+
Orange/White Stripe	RX-
Green/White Stripe	GND

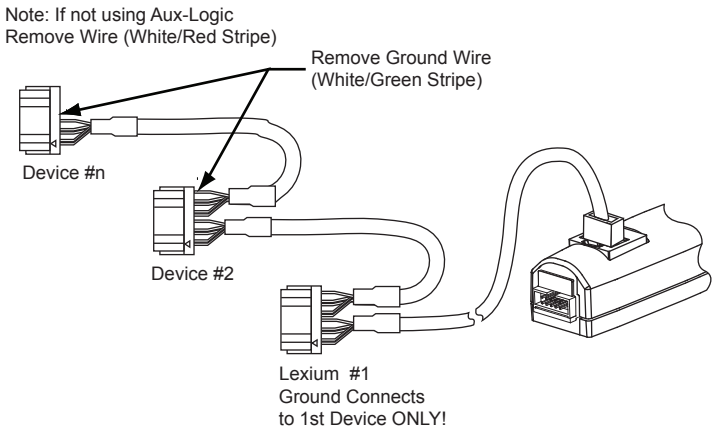


Figure 5.4 Multi-drop communications using the VW3L3D02R30

Procedure

1) Remove ground wire (unless this is the first system Lexium SD218P, green/white stripe)
2) Remove aux-logic (if not used, red/white stripe)
3) Connect pre-crimped flying leads as shown in Figure 5.5 below

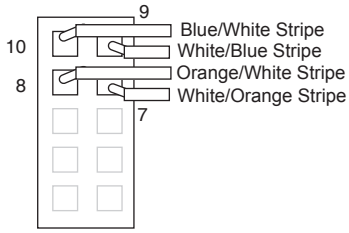


Figure 5.5 Wiring a second VW3L3D02R30 into the 10-pin wire crimp connector.

5.4.2 Mutli-drop communications connection

Figure 5.6 illustrates the connection schematic for a multi-drop communications system, note that communications ground only connects to the first system Lexium SD218P.

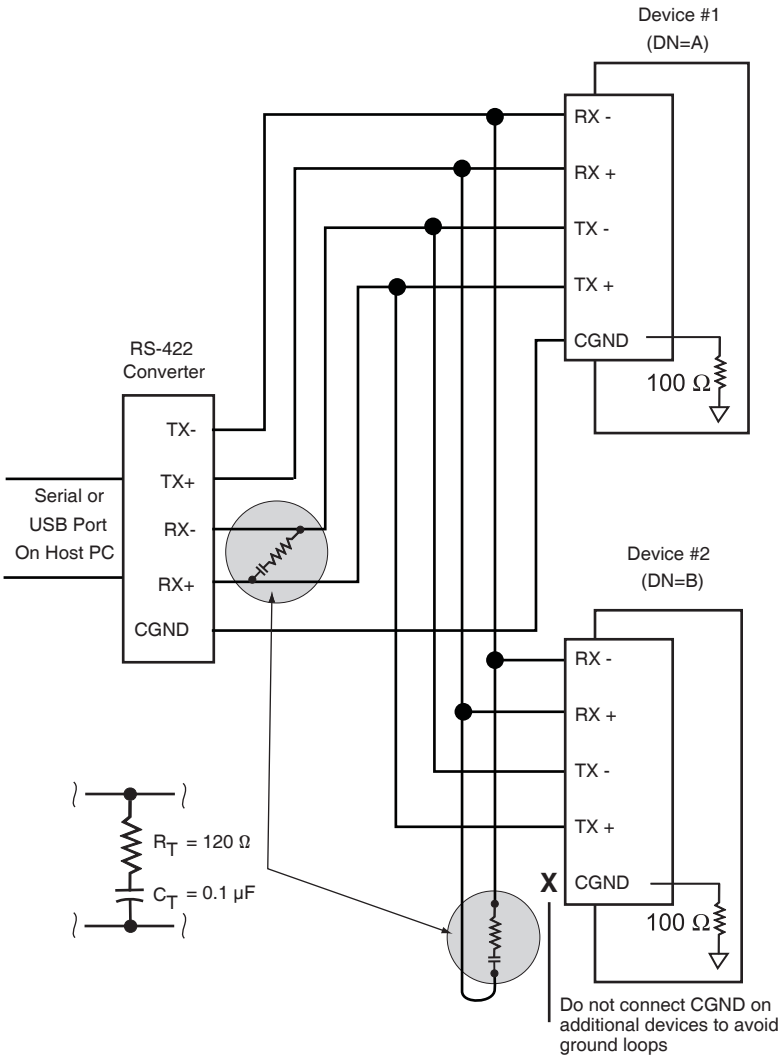


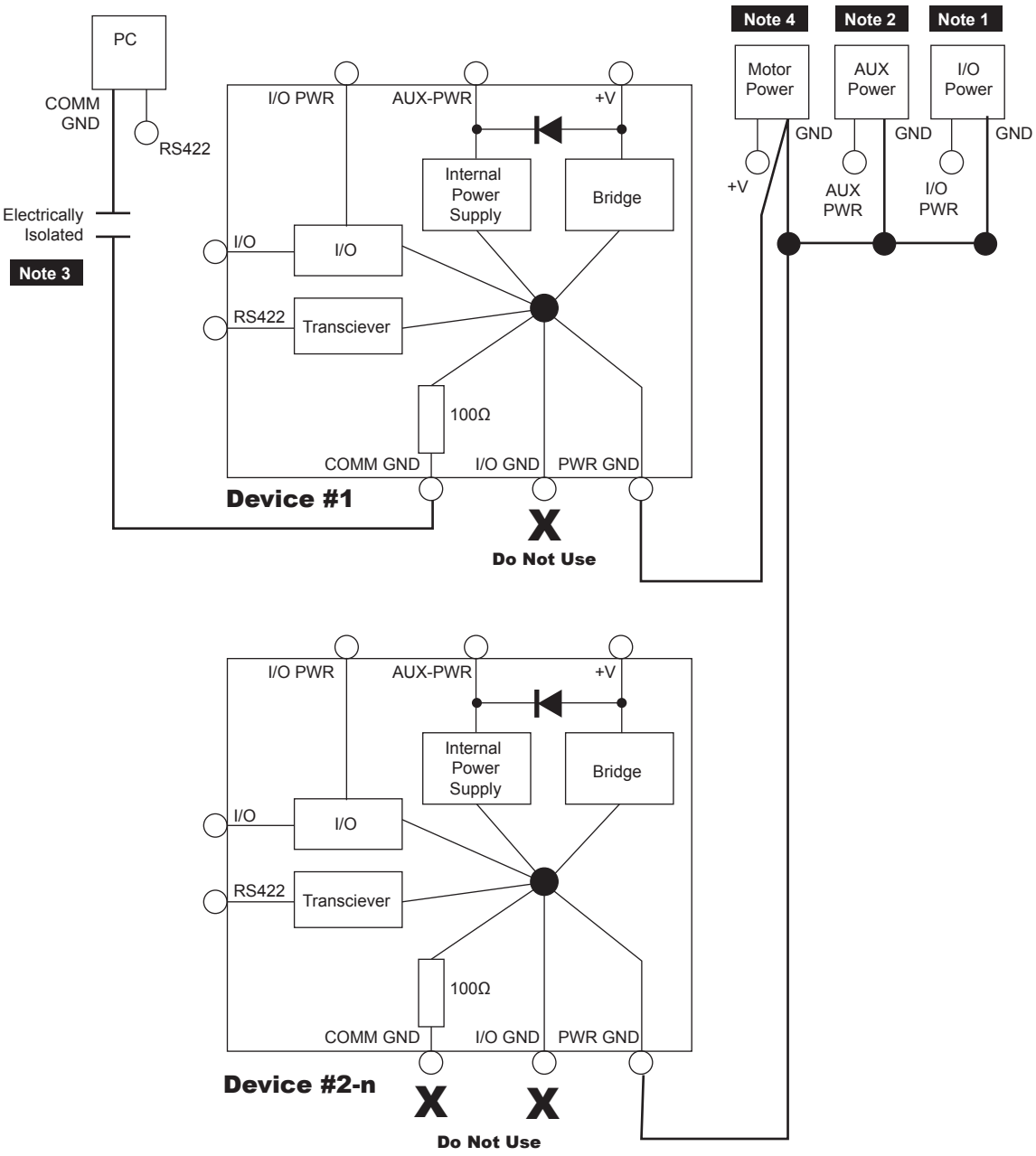
Figure 5.6 Interface for party-mode operation

Data Cable Termination Resistors

Data cable lengths greater than 4,5 m are susceptible to signal reflection and/or noise. Schneider Electric recommends 120 Ω termination resistors in series with 0.1µf capacitors at both ends of the receive lines of the communications cables. An example of resistor placement is shown in Figure 5.8. For systems with data cables 4,5 m or less, the termination resistors are generally not required.

5.4.3 System power connection for a multi-drop system

The power connection schematic in Figure 5.7 represents the recommended power configuration for avoiding communications ground loops



Note 1 Use AUX-PWR only if position information is needed when motor power is lost AND the device has an encoder

Note 2 Use I/O Power only if sourcing outputs are required.

Note 3 The isolated communication converter's common MUST be connected to ONLY one device.

Note 4 If multiple motor power supplies are used connect the commons together and refer to note three.

Figure 5.7 Power interface for eliminating communications ground loops

5.4.4 Software configuration

Party mode communications requires extensive software configuration and has a specific communications and response format.

This is documented in detail in the MCode software and programming manual, Section 7.

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6 Interfacing I/O

⚠ CAUTION

ELECTRICAL OVERSTRESS

The general purpose I/O is tolerant to +24 VDC. The following listed I/O points are TTL level and only tolerant to +5 VDC:

1) Step Clock
2) Direction
3) Capture/Trip

Do not exceed +5 VDC on these points.

Failure to follow these instructions can result in equipment damage.

⚠ CAUTION

HOT PLUGGING!

Do not connect or disconnect power, logic, or communications while the device is in a powered state.

Remove DC power by powering down at the AC side of the DC power supply.

Failure to follow these instructions may result in damage to system components!

CONNECTOR OPTIONS

The Lexium SD218P product family has an extensive set of connector options. The purpose of this section is to give a general overview of the I/O interface methods and practices.

Please see the section specific to the Lexium SD218P product you purchased in the second part of this document for connectors, pin configurations and connectivity options.

I/O FUNCTIONS AND PARAMETERS

The functions and operational parameters of the Lexium SD218P I/O MUST be configured in software.

For detailed specifications and instruction please reference the MCode Software and Programming manual.

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6.1 I/O configurations

The Lexium SD218P product line is available with the following I/O configuration

I/O set	
General purpose	IO1, IO2, IO3, IO4, IO9, IO10, IO11, IO12 (Sinking or sourcing inputs or outputs
Dedicated	Capture input/trip output. step/direction I/O
Analog input	AIN1

Table 6.1 Lexium SD218P I/O configurations

6.1.2 I/O States

The digital I/O may be defined as either active HIGH or active LOW. When the I/O is configured as active HIGH, the level is +5 to +24 VDC and the state will be read/set as a “1”. If the level is 0 VDC, then the state will be read/set as “0”. Inversely, if configured as active LOW, then the state of the I/O will be read/set as a “1” when the level is LOW, and “0” when the level is HIGH.

The active HIGH/LOW state is configured by the third parameter of the I/O Setup (S1-4, S9-12) variable. The goal of this I/O configuration scheme is to maximize compatibility between the Lexium SD218P and standard sensors and switches.

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6.2 General purpose I/O

The general purpose +5 to +24 VDC I/O must be configured and programed to general or reserved functions in software. The I/O cannot be exercised without configuration parameters being set:

6.2.1 General purpose input functions

Function	*Description*
User defined	Input function used to control program branches, subroutine calls or BCD functions when the input bank is used as a group.
Home	Homing input
Limit +	Positive limit input
Limit -	Negative limit input
G0	Executes program at memory address 1 on activation
Soft stop	Stops motion with deceleration and halts program execution
Pause	Pause/resume program execution with motion
Jog +	Jog positive direction
Jog -	Jog negative direction
Reset	Reset program, equivalent to a ^C terminal input.

Table 6.2 General purpose input functions

6.2.2 General purpose output functions

Function	*Description*
User defined	Output function which can be set to trigger external events from within a program
Moving	Input will be in an active state when the motor is moving
Fault	Activates on an error.
Stall	Activates when a stall is detected (encoder required)
Velocity changing	Activates when accelerating or decelerating

Table 6.3 General purpose output functions

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6.2.2 Interfacing sinking inputs

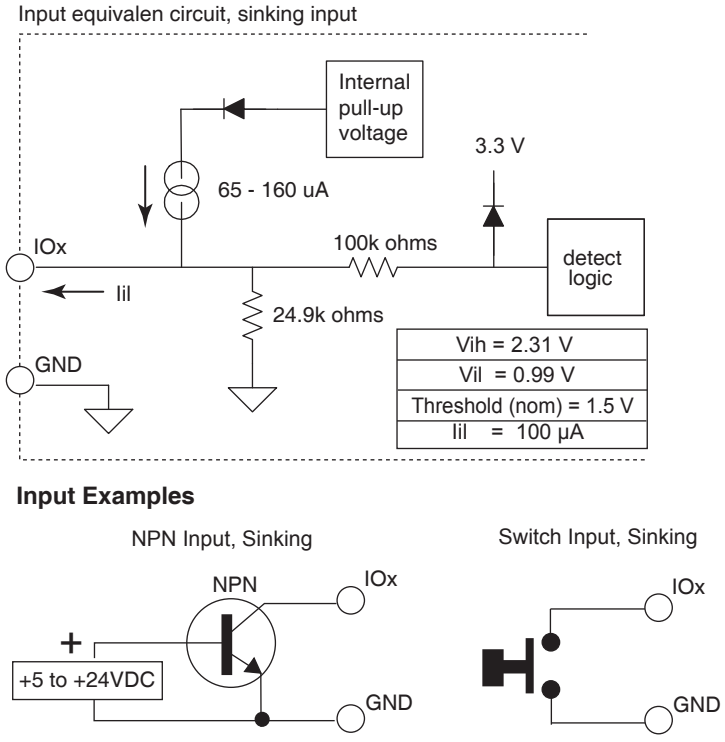

Figure 6.1 Sinking input equivalent circuit and interface examples

6.2.3 Interfacing sinking outputs

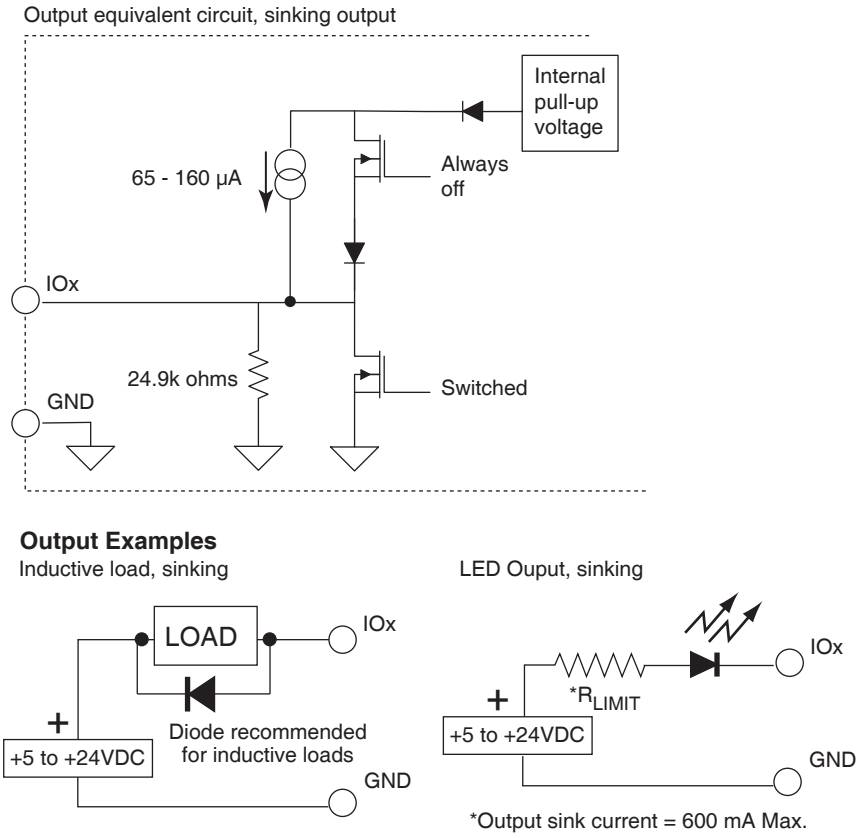

Figure 6.2 Sinking output equivalent circuit and interface examples

6.2.4 Interfacing sourcing inputs

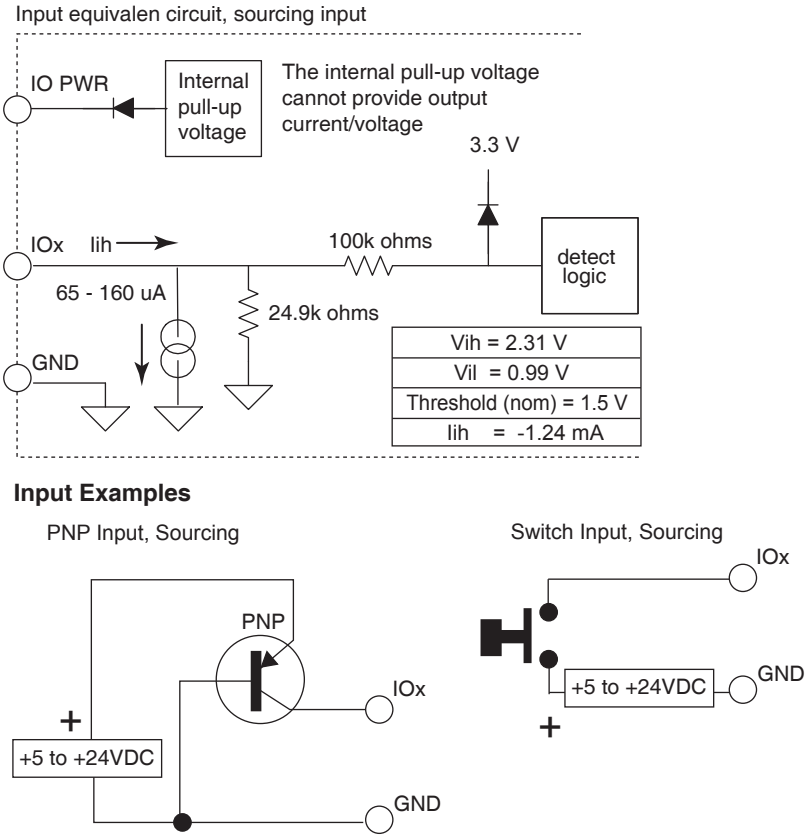

Figure 6.3 Sourcing input equivalent circuit and interface examples

6.2.5 Interfacing sourcing outputs

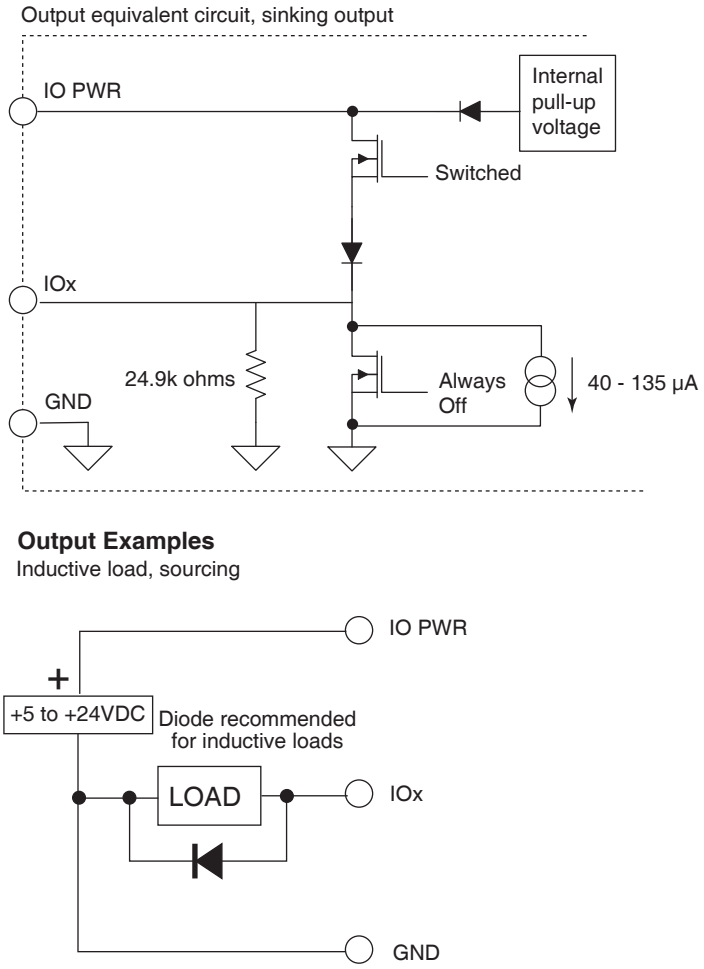

Figure 6.4 Sourcing output equivalent circuit and interface examples

6.2.5 Mixed I/O example

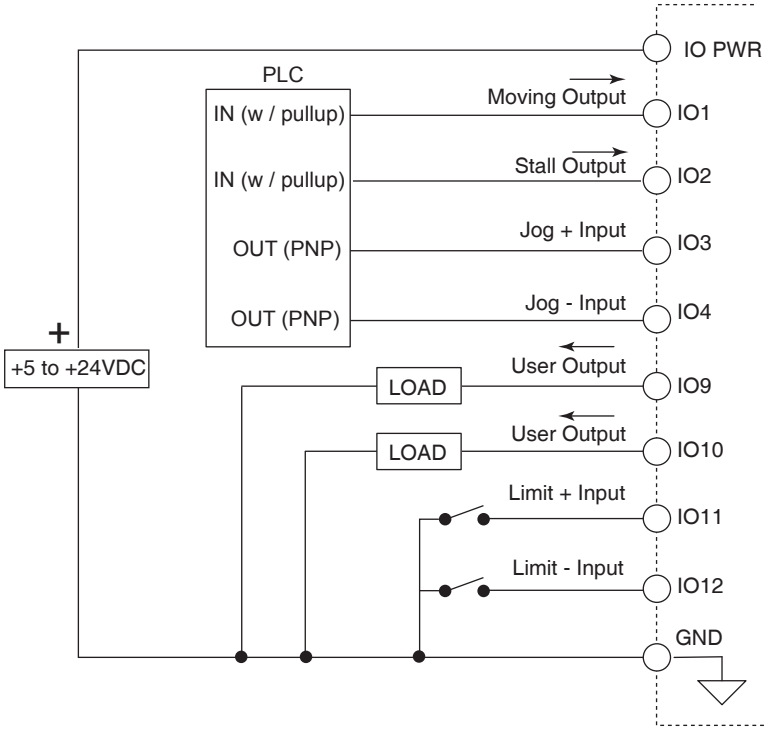

Figure 6.6 Mixed inputs and outputs, Lexium SD218P with industrial connectors.

6.2.6 Interfacing to a bank of I/O points

The I/O can be interfaced to as a bank of inputs or outputs. Available banks are:

Standard ..... Bank 1: IO1-O4

Industrial connectors ..... Bank 1: IO1-IO4, Bank 2: IO9-IO12

This feature gives the user to implement sophisticated process control applications by triggering events based upon the BCD state of the I/O.

Binary coded decimal inputs

Figure 6.7 illustrates a TTL interface to I/O banks 1 and 2 on an Lexium SD218P with the expanded I/O set. These are set to be user defined inputs and the state is read using the following software commands as a binary number. When reading the state of the bank to a terminal it will display as decimal:

- IL — will read the lower input group (IO1 - IO4) where IO1 is the LSB and IO4 is the MSB
- IH — will read the upper input group (IO9 - IO12) where IO9 is the LSB and IO12 is the MSB
- IT — will read both input groups (IO1 - IO12) where IO1 is the LSB and IO12 is the MSB

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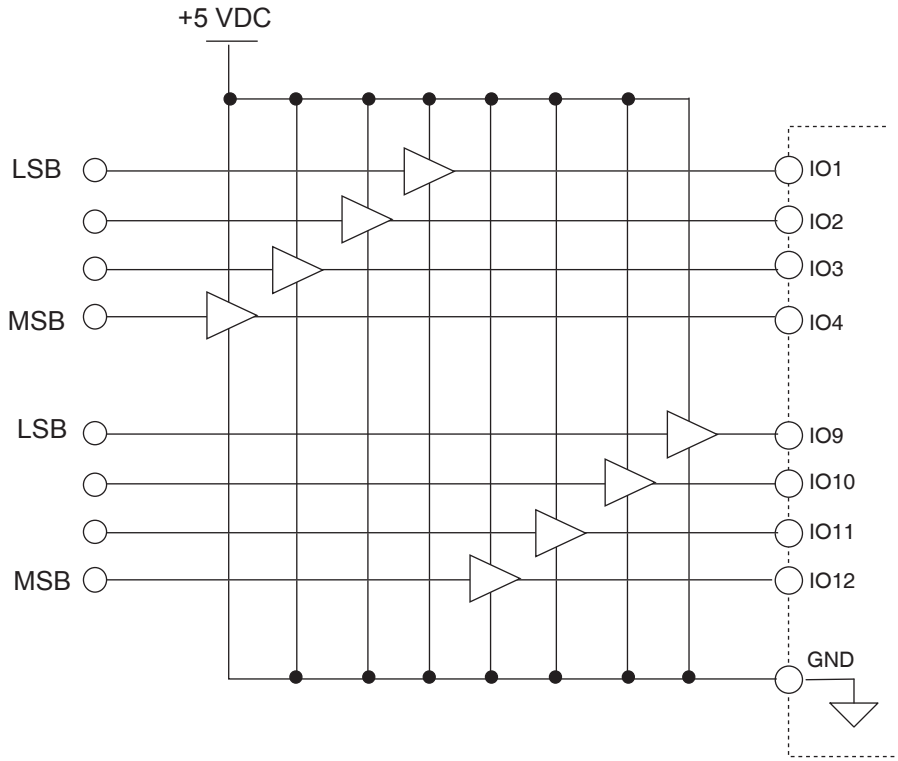

Figure 6.7 TTL interface to I/O banks as a group for BCD program control

Binary coded decimal outputs

Figure 6.8 illustrates an LED interface to I/O banks 1 and 2 on an Lexium SD218P with industrial connectors. This is one possible interface method for illustration purposes. A more practical application would be to interface the outputs to a PLC input module to control external processes from within an Lexium SD218P program. These are configured as user defined outputs and the state is set using the following software commands as a decimal number. When write the state of the outputs they will be set as a binary number.

- OL — will set the lower output group (IO1 - IO4) where IO1 is the LSB and IO4 is the MSB
- OH — will set the upper output group (IO9 - IO12) where IO9 is the LSB and IO12 is the MSB
- OT — will set both output groups (IO1 - IO12) where IO1 is the LSB and IO12 is the MSB

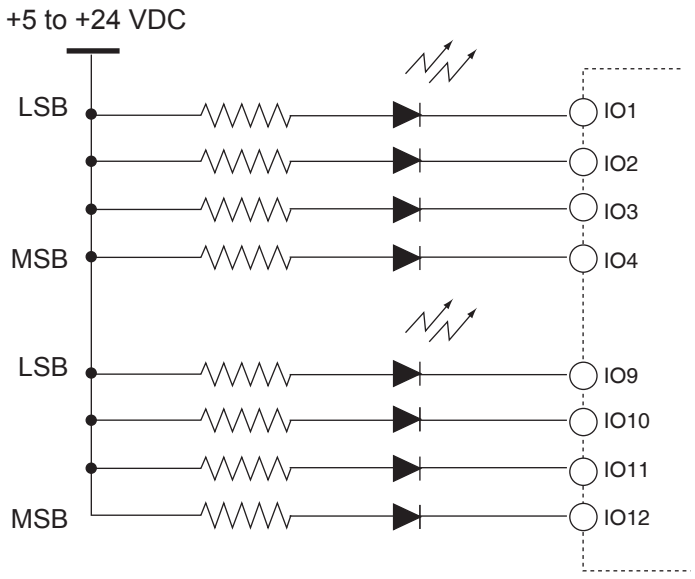

Figure 6.8 Output interface to I/O banks as a group for BCD process control

6.3 Dedicated I/O

These I/O points are only available on the Lexium SD218P devices with industrial connectors.

⚠ CAUTION

ELECTRICAL OVERSTRESS

The I/O points detailed in this subsection are TTL level and only tolerant to +5 VDC:

1) Capture/Trip
2) Step/direction clock I/O

Do not exceed +5 VDC on these points.

Failure to follow these instructions can result in equipment damage.

6.3.1 Capture input/trip output

The Capture Input/Trip Output point is a high speed I/O point which can be used for time critical events in motion applications.

Capture Input When configured as a capture input I/O point 13 has programmable filtering with a range of 50nS to 12.9 µS and has a resolution of 32 bits. The capture input needs to be pulled up to TTL using a 10k ohm resitor.

Trip Output When configured as a trip output I/O 13 trip speed is 150 nS with 32 bit resolution.

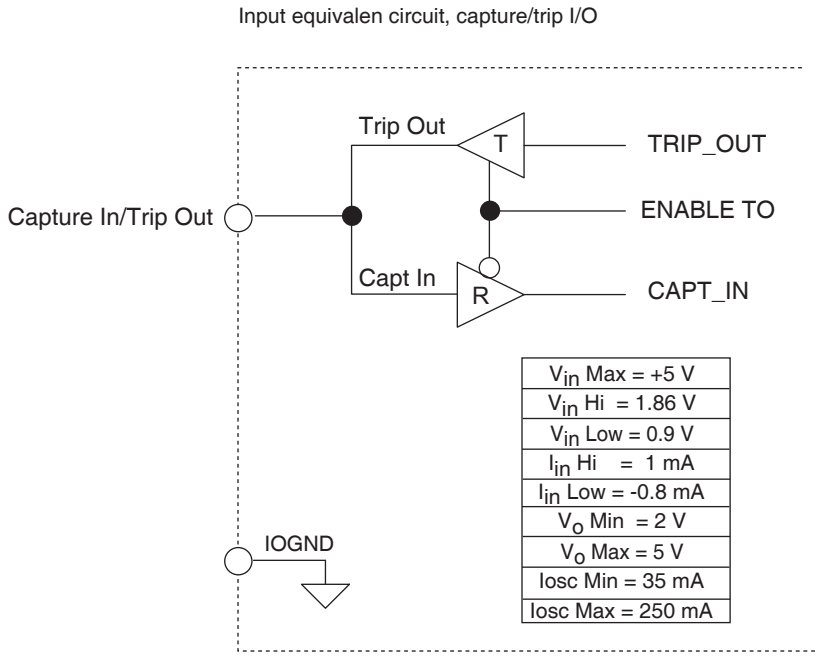

Figure 6.9 Input equivalent circuit, capture/trip I/O

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6.3.2 Step/direction clock I/O

These dedicated I/O lines are used to receive clock inputs from an external device or provide clock outputs to an external device such as a counter or a second Lexium SD218P in a system. The Clock I/O can be configured as one of three clock types using the S7 and S8 variable:

1) Step/Direction
2) Quadrature
3) Up/Down

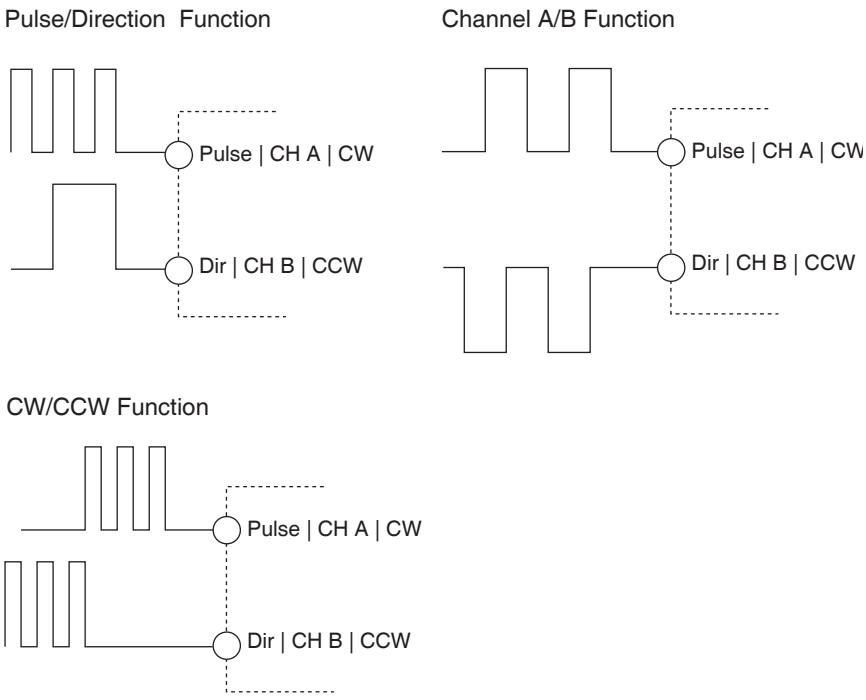

Figure 6.10 Input clock types: step/direction, quadrature and CW/CCW

Step/Direction The step/direction function would typically be used to receive step and direction instructions from a second system device or secondary controller. When configured as outputs the Lexium SD218P can provide step and direction control to another system drive for electronic gearing applications

.

Quadrature The Quadrature clock function would typically be used for following applications where the Lexium SD218P would either be a master or slave in an application that would require two devices to move the same distance and speed.

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CW/CCW The Up/Down clock would typically be used in a dual-clock direction control application, or to increment/decrement an external counter.

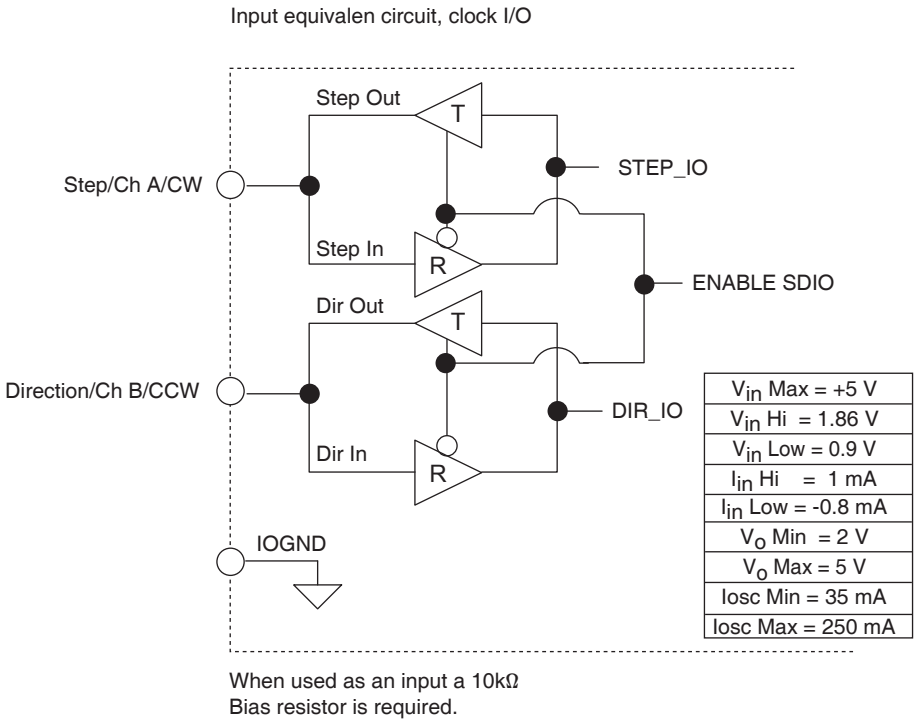

Figure 6.11 Input equivalent circuit, clock I/O

6.4 Analog input

The analog input of the Lexium SD218P is configured from the factory as a 0 to 5V, 10 bit resolution input). This offers the user the ability to receive input from temperature, pressure, or other forms of sensors, and then control events based upon the input.

The input can receive input from 0 to +5 VDC, 0 to +10 VDC, 4 to 20 mA and 0 to 20 mA devices.

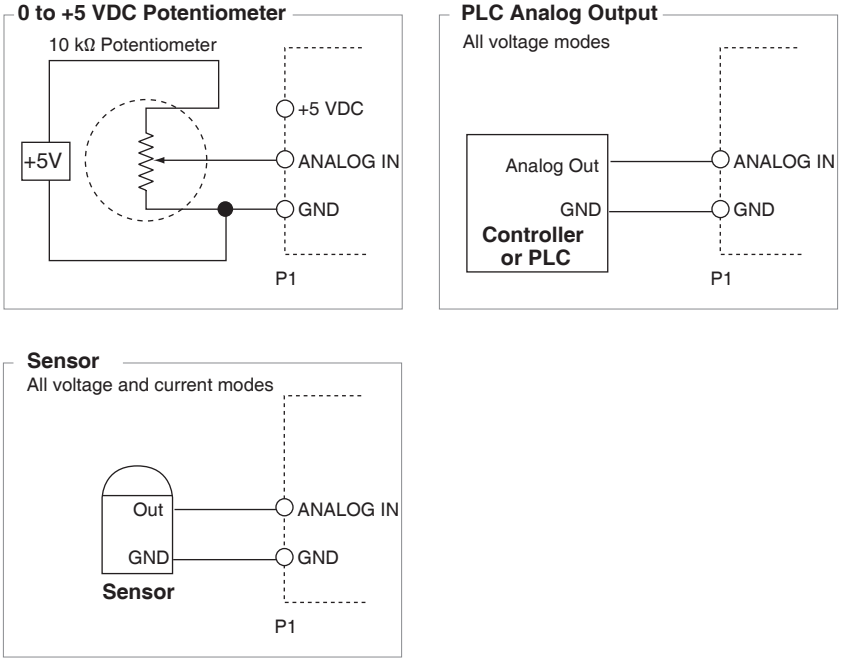

Figure 6.12 Analog input interface

Lexium SD218P

Part 2: Detailed specifications and connectivity information

1. SD218PU20C
2. SD218PU50C

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Lexium SD218PU20C

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1 Introduction

The **Lexium SD218PU20C** offers system designers a cost effective, full featured programmable motion controller integrated with a +24 up to +48 VDC microstepping driver.

1.1 Lexium SD218PU20C unit overview

The unsurpassed smoothness and performance delivered by the Lexium SD218PU20C are achieved through advanced 2nd generation current control. By applying innovative techniques to control current flow through the motor, resonance is significantly dampened over the entire speed range and audible noise is reduced.

The Lexium SD218PU20C accepts a broad input voltage range from +24 up to +48 VDC, delivering enhanced performance and speed. Oversized input capacitors are used to minimize power line surges, reducing problems that can occur with long cable runs and multiple drive systems. An extended operating range of –40° to +85°C provides long life, trouble free service in demanding environments.

Standard features include eight +5 to +24 volt general purpose I/O lines, one 10 bit analog input, 0 to 5MHz step clock rate, 20 microstep resolutions up to 51,200 steps per revolution, and full featured easy-to-program instruction set.

The Lexium SD218PU20C communicates over RS-422/485 which allows for point-to-point or multiple unit configurations utilizing one communication port. Addressing and hardware support up to 62 uniquely addressed units communicating over a single line. Baud rate is selectable from 4.8 to 115.2kbps.

The Lexium SD218PU20C is a compact, powerful and cost effective motion control solution that will reduce system cost, design and assembly time for a large range of brushless step motor applications.

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1.2 Product identification

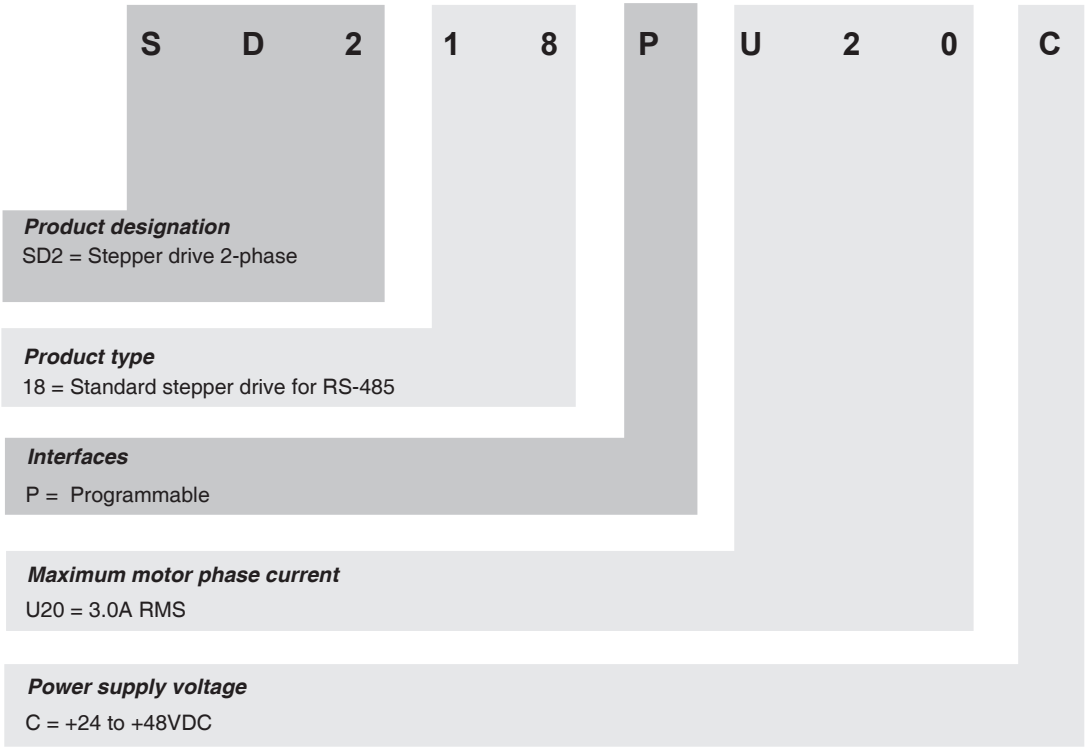

Figure 1.1 Standard product options

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1.3 Documentation reference

The following user's manuals are available for the Lexium SD-218PU20C:

- Manual reference: (0198441113814), describes the technical data, installation and configuration of the product.
- Manual reference:(0198441113776) MCode Programming Manual.

This documentation is available for download from the Schneider Electric web site at http://www.schneider-electric.com

1.4 Product software

The Lexium SD218PU20C integrated controller and driver may be programmed using any standard ASCII txt editor and ANSI terminal emulated. The recommended environment is the Lexium CT-ILP, which is a combined terminal/program editor tailored for use with Schneider Electric motion control products. This free software may be downloaded from http://www.schneider-electric.com.

Installation and usages instructions are to be found in the MCode Programming Manual, which is correlated to this document.

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2 Specifications

2.1 Mechanical specifications

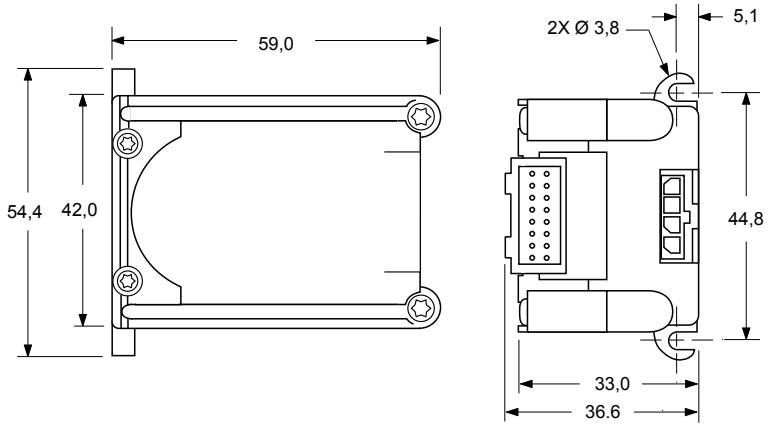

Figure 2.1 Lexium SD218PU20C mechanical specifications

2.2 General specifications

2.2.1 Electrical specifications

	Condition	Min	Typ	Max	Unit
Input voltage range	—	+24	—	+48	VDC
Power supply current	—	—	—	3	A
Aux-Logic Input Voltage	—	+12	—	+24	VDC
Max Aux-Logic Supply Current (Per Lexium SD218PU20C)**	—	—	194	mA	

**per Lexium SD218PU20C, Actual current depends on voltage and load.*
*** Maintains power to control and feedback circuits [only] when input voltage is removed*

Table 2.1 Electrical specifications

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2.2.2 I/O specifications

	Condition	Min	Typ	Max	Unit
General Purpose I/O - Number and Type					
I/O Points 1-4, 9-12	—	8 I/O points (4 if configured for remote encoder) configurable as sinking or sourcing inputs or outputs			
General Purpose I/O - Electrical					
Inputs	Sinking or Sourcing	TTL	—	+24	VDC
Outputs	Sinking	—	—	+24	VDC
	Sourcing	+12		+24	VDC
Output Sink Current (Plus)	One channel	—	—	600	mA
Motion I/O					
Electronic gearing	Range	0.001	—	2.000	
	Resolution	—	—	32	bit
	Threshold	—	—	TTL	VDC
	Filter range			50 nS to 12.9 µS (10 MHz to 38.8 kHz	
	Secondary clock out ratio				1:1
High speed position capture	Filter range			50 nS to 12.9 µS (10 MHz to 38.8 kHz	
	Resolution	—	—	32	bit
High speed trip output	Speed	—	—	150	nS
	Resolution	—	—	32	bit
	Threshold	—	—	TTL	VDC
Analog Input					
Resolution	—				
Range	Voltage Mode			0 to +5 VDC, 0 to +10 VDC	
	Current Mode			4 to 20 mA, 0 to 20mA	
Clock I/O					
Types	—	Step/Direction, Up/Down, Quadrature			
Logic Threshold	—	+5 VDC TTL Input, TTL Output (with 2 kΩ Load to Ground			
Trip Output/Capture Input					
Logic Threshold	—	+5 VDC TTL Input, TTL Output (with 2 kΩ Load to Ground			

Table 2.2 I/O specifications

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2.2.3 Communications specifications

	Condition	Min	Typ	Max	Unit
RS-422/485 (standard)					
BAUD rate	—	4.8		115.2	kbps

Table 2.3 Communications specifications

2.2.4 Thermal specifications

		Min	Typ	Max	Unit
Heat sink temperature	non-condensing humidity	-40	—	+85	ºC
Motor temperature	non-condensing humidity	-40	—	+100	ºC

Table 2.4 Thermal specifications

2.2.5 Motion specifications

Microstep Resolution - Open Loop	
Number of microstep resolutions	20

Available microsteps per revolution

200	400	800	1000	1600	2000	3200	5000	6400	10000
12800	20000	25000	25600	40000	50000	51200	36000[1]	21600[2]	25400[3]

1=0.01 deg/µstep 2=1 arc minute/µstep *3=0.001 mm/µstep
** 1" per revolution lead screw*

Microstep resolution (closed loop configuration - (optional)	
Steps Per Revolution (Fixed)	51200
Position Resolution	2048
Differential encoder (internally mounted)	
Type	Internal, Magnetic
Resolution (Lines)	512
Resolution (Edges)	2048
Counters	
Counter 1 (C1) Type	Position
Counter 2 (C2) Type	Encoder
Resolution	32 bit
Maximum Edge Rate	5 MHz
Velocity	
Range	±5,000,000 Steps/Sec.
Resolution	0.5961 Steps/Sec.
Acceleration/Deceleration	
Range	1.5×10^9 Steps/Sec.^{2}
Resolution	90.9 Steps/Sec.^{2}

Table 2.5 Motion specifications

2.2.6 Software specifications

Program Storage Type/Size	Flash/6384 Bytes
User Registers	(4) 32 Bit
User Program Labels and Variables	192
Math, Logic and Conditional Functions	+, -, x, ÷, <, >, =, ≤, ≥, AND, OR, XOR, NOT
Branch Functions	Branch and Call (Conditional)
Party Mode Addresses	62
Predefined I/O Functions	
Input Functions	Home, Limit+, Limit -, Go, Stop, Pause, Jog+, Jog-, Analog Input
Output Functions	Moving, Fault, Stall, Velocity Changing
Trip Functions	Trip on Input, Trip on Position, Trip on Time,

Table 2.6 Software specifications

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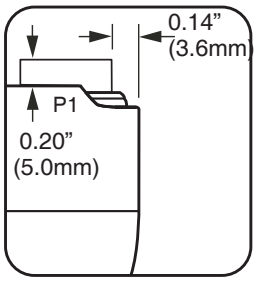
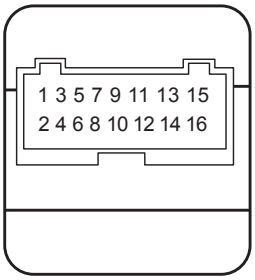
2.3 Connectivity specifications/pin assignments

2.3.1 Power and I/O





Connectivity Options
Prototype development cable::
VW3L3D05R30

Mating connector kit:
VW3L5C10N05

Mfg P/N:
Shell
JST PADP-16V-1-S

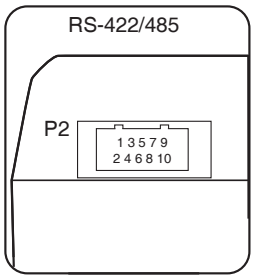
Pins
JST SPH-001T0.5L

Pin #	Function	Description
1	I/O power	I/O Power, used with sourcing inputs or outputs.
2	I/O GND	Non-isolated I/O Ground. Common with Power Ground.
3	I/O 1	0 to +24 VDC Programmable I/O Point 1
4	I/O 2	0 to +24 VDC Programmable I/O Point 2
5	I/O 3	0 to +24 VDC Programmable I/O Point 3
6	I/O 4	0 to +24 VDC Programmable I/O Point 4
7	I/O 9	0 to +24 VDC Programmable I/O Point 9
8	I/O 10	0 to +24 VDC Programmable I/O Point 10
9	I/O 11	0 to +24 VDC Programmable I/O Point 11
10	I/O 12	0 to +24 VDC Programmable I/O Point 12
11	Capture/trip I/O	High Speed Capture Input or Trip Output. +5 VDC Logic Level.
12	Analog in	0 to 10 V / 4 to 20 mA / 0 to 20 mA Analog Input.
13	Step/clock I/O	Step clock i/o. Can also be configured as quadrature or clock up/down. +5 VDC logic level.
14	Direction/ clock I/O	Direction i/o. Can also be configured as quadrature or clock up/down. +5 VDC logic level.
15	+V	+24 to +48 VDC motor power supply input.
16	Power/aux ground	Power and auxiliary ground

Table 2.8 P1 communications, power and I/O, 16-pin locking wire crimp

2.3.2 RS-422/485 communications

10-pin friction lock wire crimp



Connectivity Options
USB to RS-422/485 Converter:
VW3L1R402

Mating connector kit:
VW3L5C02N05

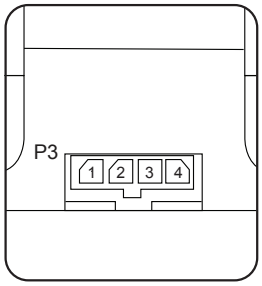
Mfg P/N:
Shell
Hirose DF11-10DS-2C

Pins
Hirose: DF11-2428SC

Pin #	Function	Description
1	TX +	Transmit plus
2	Comm GND	Communications ground only. Do not ground aux-logic to this pin.
3	RX -	Receive minus
4	TX -	Transmit minus
5	Aux-Logic	Auxiliary logic maintains power to the logic circuitry in the absence of motor power. +12 to +24 VDC input
6	RX +	Receive plus
7	RX +	Receive plus
8	RX -	Receive minus
9	TX +	Transmit plus
10	TX -	Transmit minus

Table 2.9 P2 communications, 10-pin locking wire crimp

2.3.3 Motor



Connectivity Options
Prototype development cable
VW3L3M02R30

Mating connector kit:
VW3L5C06N05

Mfg P/N:
Shell
Tyco 1445022-4
Pins
Tyco 1-794610-1

Pin #	Function	Description
1	$\overline{\varnothing A}$	Phase A return
2	$\varnothing A$	Phase A output
3	$\overline{\varnothing B}$	Phase B return
4	$\varnothing B$	Phase B output

Table 2.10 P3 motor, 4-pin locking wire crimp

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2.4 Connectivity

Communication Converters

Electrically isolated, in-line converters pre-wired with mating connectors to conveniently set/program communication parameters for a single Lexium SD218PU20C product via a PC's USB port. Length 3.6 m.

Mates to connector:

P1 10-pin wire crimp.....VW3L1R402

Prototype Development Cables

Speed test/development with pre-wired mating connectors that have flying leads other end. Length 3.0 m.

Mates to connector:

P1 16-pin wire crimp..... VW3L5C02N05

P3 4-pin wire crimp.....VW3L3M02R30

Mating Connector Kits

Use to build your own cables. Kit contains 5 mating shells with pins. Cable not supplied. Manufacturer's crimp tool recommended.

Mates to connector:

P1 16-pin wire crimp..... VW3L5C10N05

P2 10-pin wire crimp..... VW3L5C02N05

P3 4-pin wire crimp..... VW3L5C06N05

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3 Mounting and connection recommendations

⚠ DANGER

EXPOSED SIGNALS

Hazardous voltage levels may be present if using an open frame power supply to power the product.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

SWITCHING DC POWER/HOT PLUGGING

Do not connect or disconnect power, logic, or communications while the device is in a powered state.

Remove DC power by powering down at the AC side of the DC power supply.

Failure to follow these instructions can result in equipment damage.

⚠ CAUTION

LEAD RESTRAINT

Some Lexium SD218PU20C mounting configurations require that the Lexium SD218PU20C move along the screw. Ensure that all cabling is properly restrained to provide strain relief on connection points..

Failure to follow these instructions can result in equipment damage.

⚠ CAUTION

THERMAL MANAGEMENT

Do not remove the thermal pad attached to the mounting surface of the MicroDrive. It is essential to maintaining a sife driver temperature at full current..

Failure to follow these instructions can result in equipment damage.

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3.1 Mounting

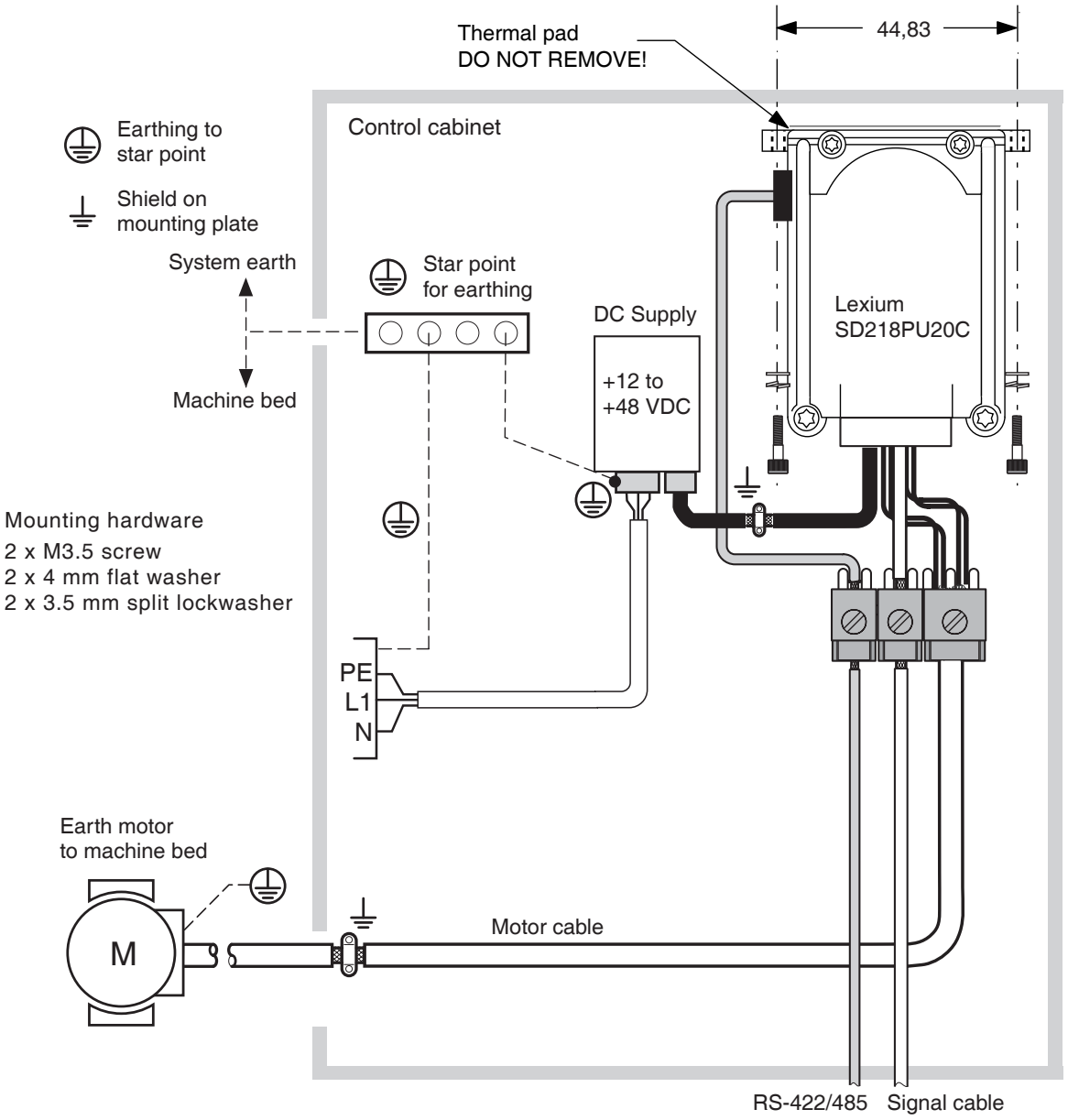

Figure 3.1 Lexium SD218PU20C mounting

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3.2 Layout and interface guidelines

Logic level cables must not run parallel to power cables. Power cables will introduce noise into the logic level cables and make your system unreliable.

Logic level cables must be shielded to reduce the chance of EMI induced noise. The shield needs to be grounded at the signal source to earth. The other end of the shield must not be tied to anything, but allowed to float. This allows the shield to act as a drain.

Power supply leads to the Lexium SD218PU20C need to be twisted. If more than one driver is to be connected to the same power supply, run separate power and ground leads from the supply to each driver.

3.2.1 Rules of wiring

- Power supply and motor wiring should be shielded twisted pairs, and run separately from signal-carrying wires.
- A minimum of one twist per inch is recommended.
- Motor wiring should be shielded twisted pairs using 20 gauge, or for distances of more than 2 m, 18 gauge or better.
- Power ground return should be as short as possible to established ground.
- Power supply wiring should be shielded twisted pairs of 18 gauge for less than 4 amps DC and 16 gauge for more than 4 amps DC.

3.2.2 Rules of shielding

- The shield must be tied to zero-signal reference potential. It is necessary that the signal be earthed or grounded, for the shield to become earthed or grounded. Earthing or grounding the shield is not effective if the signal is not earthed or grounded.
- Do not assume that Earth ground is a true Earth ground. Depending on the distance from the main power cabinet, it may be necessary to sink a ground rod at the critical location.
- The shield must be connected so that shield currents drain to signal-earth connections.
- The number of separate shields required in a system is equal to the number of independent signals being processed plus one for each power entrance.
- The shield should be tied to a single point to prevent ground loops.
- A second shield can be used over the primary shield; however, the second shield is tied to ground at both ends.

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3.3 Recommended wiring

The following wiring/cabling is recommended for use with the Lexium SD218PU20C:

Logic wiring..... 22 AWG

Wire strip length..... 6.0 mm

Power and ground See Table 3.2 in Part 1, Section 3 of this document

3.3.1 Recommended mating connectors and pins

Power and I/O

16-pin locking wire crimp connector shell.... JST PN PADP-16V-1-S

Crimp pins ..... JST PN SPH-001T-P0.5L

Communications

10-pin wire crimp connector shell..... Hirose PN DF11-10DS-2C

Crimp pins ..... Hirose PN DF 11-2428SC

Motor

4-pin locking wire crimp connector shell..... Tyco PN 1445022-4

Crimp pins ..... Tyco PN 1-794610-1

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4 Connection and interface

⚠ DANGER

EXPOSED SIGNALS

Hazardous voltage levels may be present if using an open frame power supply to power the product.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

SWITCHING DC POWER/HOT PLUGGING

Do not connect or disconnect power, logic, or communications while the device is in a powered state.

Remove DC power by powering down at the AC side of the DC power supply.

Failure to follow these instructions can result in equipment damage.

4.1 Interfacing RS422-485 communications

For general RS422/485 single and party mode communications practices please see Part 1 Section 5 of this document.

⚠ CAUTION

COMMUNICATIONS GROUND LOOPS

To avoid ground loops in the system only connect communications ground to the first Lexium SD218PU20C in the system. Do not connect communications ground on subsequent Lexium SD218PU20Cs.

Failure to follow these instructions may result in damage to system components!

⚠ CAUTION

HOT PLUGGING!

Do not connect or disconnect communications while the device is in a powered state.

Failure to follow these instructions may result in damage to system components!

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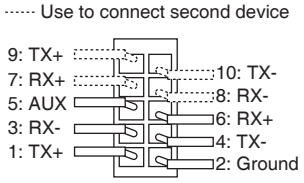
4.1.1 P2 — 10-pin friction lock wire crimp

⚠ CAUTION

GROUNDING!

Do not ground AUX-LOGIC to communications ground. the return of the +12 to +24 VDC suxiliary supply, if used, must be grounded to DC power ground at the DC supply.

Failure to follow these instructions may result in damage to system components!



Pin #	Function	Description
1	TX +	Transmit plus
2	Comm GND	Communications ground only. Do not ground aux-logic to this pin.
3	RX -	Receive minus
4	TX -	Transmit minus
5	Aux-Logic	Auxiliary logic maintains power to the logic circuitry in the absence of motor power. +12 to +24 VDC input. Ground to DC power ground.
6	RX +	Receive plus
7	RX +	Receive plus (connect to second device if using party mode)
8	RX -	Receive minus (connect to second device if using party mode)
9	TX +	Transmit plus (connect to second device if using party mode)
10	TX -	Transmit minus (connect to second device if using party mode)

Table 4.1 P2 communications, 10-pin locking wire crimp

Connectivity accessories

Mating connector kit VW3L5C02N05
(contains 5 connector shells, ribbon cable not included)

Communications converter cable 3,0 m VW3L1R402

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4.2 Interfacing DC power

See part 1 of this document, section 3, for recommended power cable configurations.

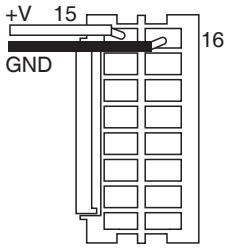
> **⚠ CAUTION**
>
> OVER VOLTAGE
>
> The DC voltage range for the Lexium SD218PU20C is +24 to +48 VDC. Ensure that motor back EMF is factored into your power supply size calculations.
>
> Allow 1.0 A maximum power supply output current per Lexium SD218PU20C in the system. Actual power supply current will depend on voltage and load.
>
> **Failure to follow these instructions can result in equipment damage.**

4.2.2 Recommended wire gauge

Cable Length: meters	3,0	8,0	15,0	23,0	30,0
Amps Peak	**Minimum AWG**				
1 Amp Peak	20	20	18	18	18
2 Amps Peak	20	18	16	14	14
3 Amps Peak	18	16	14	12	12

Table 4.2 Recommended power supply wire gauge

4.2.3 P1 — 16-pin locking wire crimp interface



Pin #	*Signal*	*Wire colors*
		VW3L3D02R30
16	Power ground	Black
15	+24 to + 48 VDC	Red

Table 4.3 Power and ground connections, 16-pin locking wire crimp

Connectivity accessories

Mating connector kit VW3L5C10N05
(contains 5 connector shells and the appropriate quantity of pins to make 5 cables)

Prototype development cable (3,0 m)..... VW3L3D02R30

Manufacturer (JST) part numbers

Connector shell..... PADP-16V-1-S

Pins..... SPH-001T0.5L

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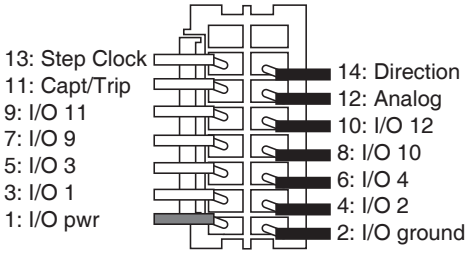
4.3 Interfacing I/O

See part 1 of this document, section 6, for I/O interface configurations and methods.

4.3.1 P1 — 16-pin locking wire crimp interface (expanded I/O)



Pin Numbers	*Signal*	*Prototype development cable wire colors (twisted pairs)*	
1	I/O power	Red	Pair
2	I/O ground	White	
3	General purpose I/O 1	Orange	Pair
4	General purpose I/O 2	Black	
5	General purpose I/O 3	Brown	Pair
6	General purpose I/O 4	Black	
7	General purpose I/O 9	Yellow	Pair
8	General purpose I/O 10	Black	
9	General purpose I/O 11	Blue	Pair
10	General purpose I/O 12	Black	
11	Capture output/trip input	Green	Pair
12	Analog input	Black	
13	Step clock I/O	White	Pair
14	Direction clock I/O	Black	

Table 4.4 I/O connections, 16-pin locking wire crimp

Connectivity accessories

Mating connector kit VW3L5C10N05
(contains 5 connector shells and the appropriate quantity of pins to make 5 cables)

Prototype development cable (3,0 m)..... VW3L3D02R30

Manufacturer (JST) part numbers

Connector shell.....PADP-16V-1-S

Pins..... SPH-001T0.5L

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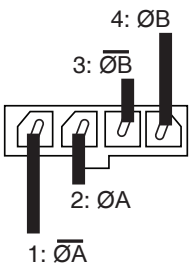
4.4 Interfacing the motor

See part 1 of this document, section 5, for motor selection and interface configurations.

4.4.1 P1 — 4-pin locking wire crimp interface



Pin Numbers	*Signal*	*Prototype development cable wire colors*
1	Phase A return	White
2	Phase A output	Green
3	Phase B return	Black
4	Phase B output	Red

Table 4.5 Motor connections, 4-pin locking wire crimp

Connectivity accessories

Mating connector kit VW3L5C06N05
(contains 5 connector shells and the appropriate quantity of pins to make 5 cables)

Prototype development cable (3,0 m)..... VW3L3M02R30

Manufacturer (Tyco) part numbers

Connector shell..... Tyco 1445022-4

Pins..... Tyco 1-794610-1

4.5 Connectivity accessory details

4.5.1 Communications converter

USB to 10-pin wire crimp connector P2
P/N: VW3L1R402

Electrically isolated in-line USB to RS-422/485 converter pre-wired with mating connector to conveniently program and set configuration parameters

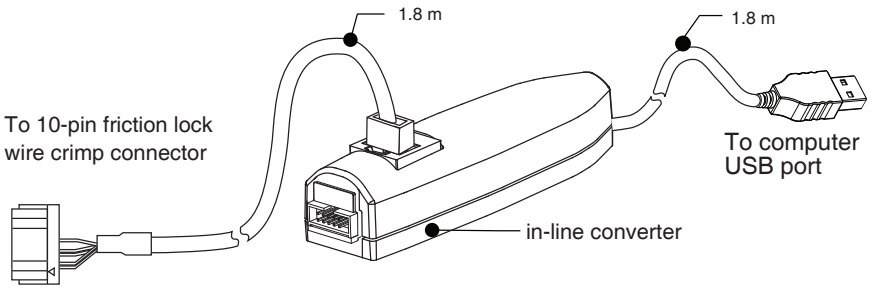


Figure 4.1 Prototype development cable VW3L1R402

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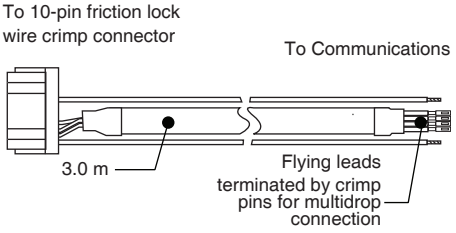
4.4.2 Prototype development cable

Flying leads to10-pin wire crimp connector P2 -P/N: VW3L3D02R30

Used in conjunction with the VW3L1R402 communications converter cable to facilitate multi-drop RS-422/485 communications.



Wire Colors	Function
White/Red Stripe	Aux-Logic
White/Blue Stripe	TX+
Blue/White Stripe	TX-
White/Orange Stripe	RX+
Orange/White Stripe	RX-
Green/White Stripe	GND

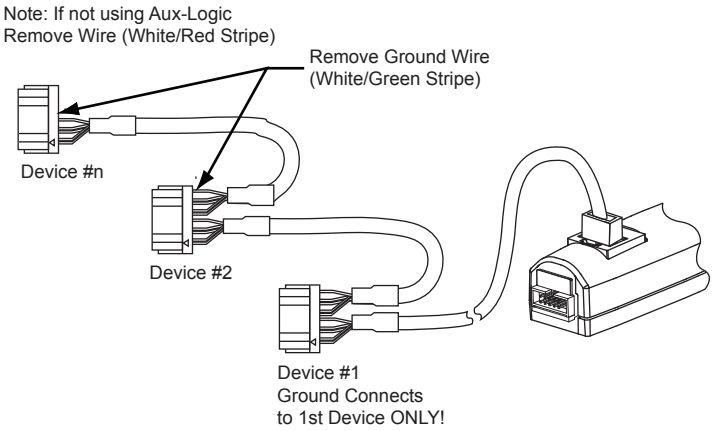


Figure 4.2 Multi-drop communications using the VW3L3D02R30

Procedure

1) Remove ground wire (unless this is the first system Lexium SD-218PU20C, green/white stripe)
2) Remove aux-logic (if not used, red/white stripe)
3) Connect pre-crimped flying leads as shown in Figure 4.3 below

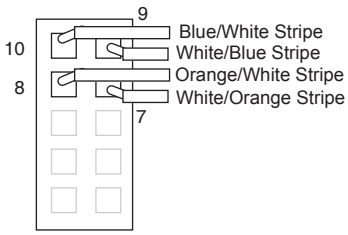
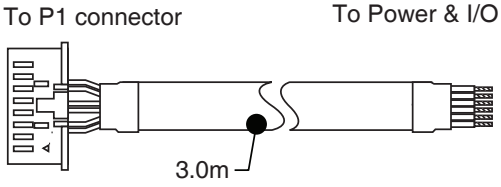


Figure 4.3 Wiring a second VW3L3D02R30 into the 10-pin wire crimp connector.

Prototype development cable VW3L3P02R30

Description: Pre-wired mating connector interfaces to an Lexium SD-218PU20C's 16-pin wire crimp connector, with flying leads other end, for quick test/development.

Function: I/O and Power Interface.



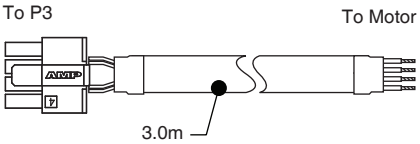
Pair	Wire Colors	Function
1	Black	Direction
	White	Step Clock
2	Black	Analog In
	Green	Capt/Trip
3	Black	I/O12
	Blue	I/O11
4	Black	I/O10
	Yellow	I/O9
5	Black	I/O4
	Brown	I/O3
6	Black	I/O2
	Orange	I/O1
7	White	I/O Ground
	Red	I/O Power
8	Black	Power GND
	Red	+V

Figure 4.4 Prototype development cable VW3L3P02R30

Prototype development cable VW3L3M02R30

Description: Pre-wired mating connector interfaces to an Lexium SD-218PU20C's 4-pin wire crimp connector, with flying leads other end, for quick test/development.

Function: Motor Interface.



Wire Colors	Function
Green	Phase A
White	Phase A\
Red	Phase B
Black	Phase B\

Figure 4.5 Prototype development cable VW3L3M02R30

4.5 Mating connector kits

Use to build your own cables. Kit contains 5 mating shells with pins. Cable not supplied. Manufacturer's crimp tool recommended.

Mates to connector:

P1 16-pin wire crimp..... VW3L5C10N05

P2 10-pin wire crimp..... VW3L5C02N05

P3 4-pin wire crimp..... VW3L5C06N05

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Lexium SD218PU50C

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1 Introduction

The **Lexium SD218PU50C** offers system designers a cost effective, full featured programmable motion controller integrated with a +24 up to +48 VDC microstepping driver.

1.1 Lexium SD218PU50C unit overview

The unsurpassed smoothness and performance delivered by the Lexium SD218PU50C are achieved through advanced 2nd generation current control. By applying innovative techniques to control current flow through the motor, resonance is significantly dampened over the entire speed range and audible noise is reduced.

The Lexium SD218PU50C accepts a broad input voltage range from +24 up to +48 VDC, delivering enhanced performance and speed. Oversized input capacitors are used to minimize power line surges, reducing problems that can occur with long cable runs and multiple drive systems. An extended operating range of –40° to +85°C provides long life, trouble free service in demanding environments.

Standard features include eight +5 to +24 volt general purpose I/O lines, one 10 bit analog input, 0 to 5MHz step clock rate, 20 microstep resolutions up to 51,200 steps per revolution, and full featured easy-to-program instruction set.

The Lexium SD218PU50C communicates over RS-422/485 which allows for point-to-point or multiple unit configurations utilizing one communication port. Addressing and hardware support up to 62 uniquely addressed units communicating over a single line. Baud rate is selectable from 4.8 to 115.2kbps.

The Lexium SD218PU50C is a compact, powerful and cost effective motion control solution that will reduce system cost, design and assembly time for a large range of brushless step motor applications.

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1.2 Product identification

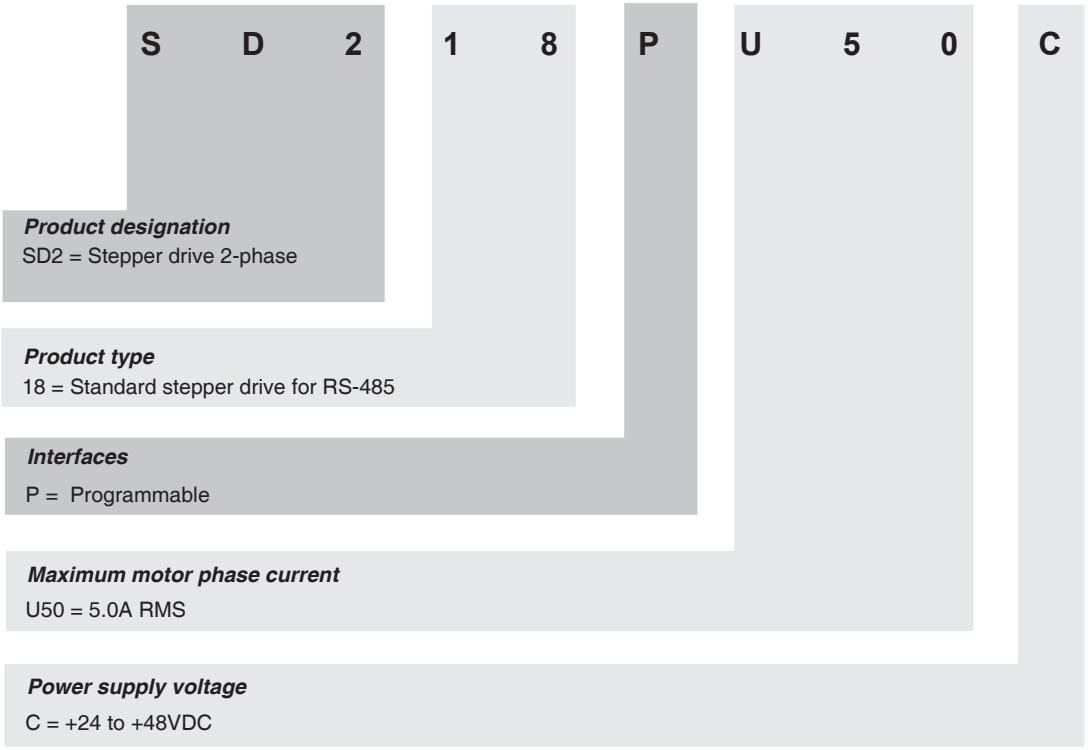

Figure 1.1 Standard product options

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1.3 Documentation reference

The following user's manuals are available for the Lexium SD-218PU50C:

- Manual reference:(0198441113814), describes the technical data, installation and configuration of the product.
- Manual reference:(0198441113776), MCode Programming Manual.

This documentation is available for download from the Schneider Electric web site at http://www.schneider-electric.com

1.4 Product software

The Lexium SD218PU50C integrated controller and driver may be programmed using any standard ASCII txt editor and ANSI terminal emulated. The recommended environment is the Lexium CT-ILP, which is a combined terminal/program editor tailored for use with Schneider Electric motion control products. This free software may be downloaded from http://www.schneider-electric.com.

Installation and usages instructions are to be found in the MCode Programming Manual, which is correlated to this document.

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2 Specifications

2.1 Mechanical specifications

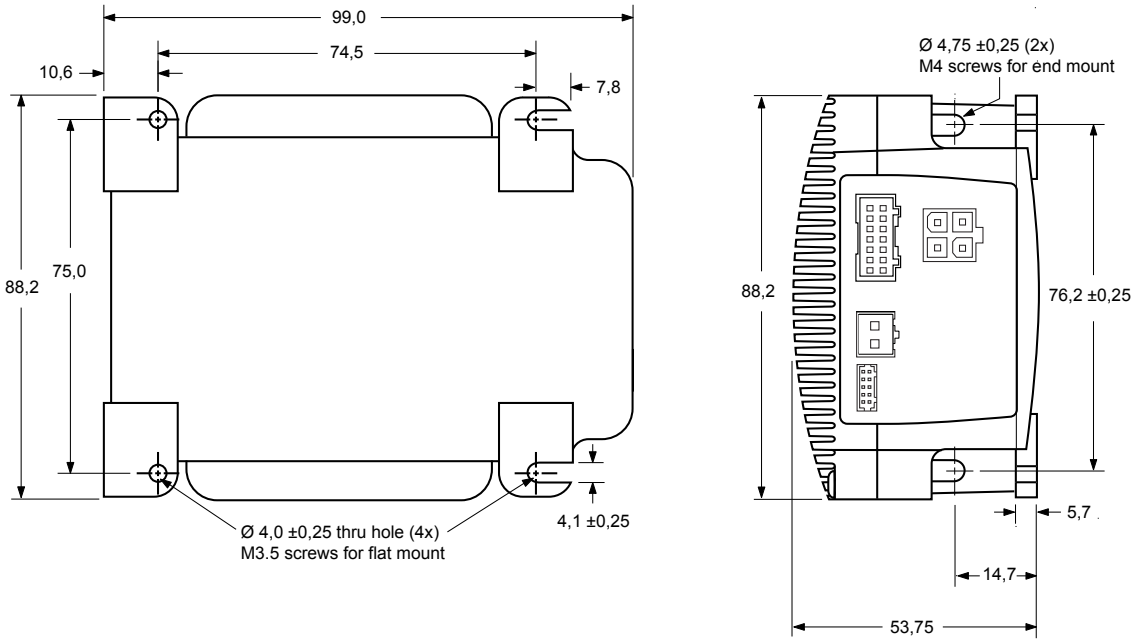

Figure 2.1 Lexium SD218PU50C mechanical specifications

2.2 General specifications

2.2.1 Electrical specifications

	Condition	Min	Typ	Max	Unit
Input voltage range	—	+24	—	+48	VDC
Power supply current	—	—	—	5	A
Aux-Logic Input Voltage	—	+12	—	+24	VDC
Max Aux-Logic Supply Current (Per Lexium SD218PU50C)**	—	—	194	mA	

**per Lexium SD218PU50C, Actual current depends on voltage and load.*
*** Maintains power to control and feedback circuits [only] when input voltage is removed*

Table 2.1 Electrical specifications

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2.2.2 I/O specifications

	Condition	Min	Typ	Max	Unit
General Purpose I/O - Number and Type					
I/O Points 1-4, 9-12	—	8 I/O points (4 if configured for remote encoder) configurable as sinking or sourcing inputs or outputs			
General Purpose I/O - Electrical					
Inputs	Sinking or Sourcing	TTL	—	+24	VDC
Outputs	Sinking	—	—	+24	VDC
	Sourcing	+12		+24	VDC
Output Sink Current (Plus)	One channel	—	—	600	mA
Motion I/O					
Electronic gearing	Range	0.001	—	2.000	
	Resolution	—	—	32	bit
	Threshold	—	—	TTL	VDC
	Filter range			50 nS to 12.9 µS (10 MHz to 38.8 kHz	
	Secondary clock out ratio				1:1
High speed position capture	Filter range			50 nS to 12.9 µS (10 MHz to 38.8 kHz	
	Resolution	—	—	32	bit
High speed trip output	Speed	—	—	150	nS
	Resolution	—	—	32	bit
	Threshold	—	—	TTL	VDC
Analog Input					
Resolution	—				
Range	Voltage Mode			0 to +5 VDC, 0 to +10 VDC	
	Current Mode			4 to 20 mA, 0 to 20mA	
Clock I/O					
Types	—	Step/Direction, Up/Down, Quadrature			
Logic Threshold	—	+5 VDC TTL Input, TTL Output (with 2 kΩ Load to Ground			
Trip Output/Capture Input					
Logic Threshold	—	+5 VDC TTL Input, TTL Output (with 2 kΩ Load to Ground			

Table 2.2 I/O specifications

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2.2.3 Communications specifications

	Condition	Min	Typ	Max	Unit
RS-422/485 (standard)					
BAUD rate	—	4.8		115.2	kbps

Table 2.3 Communications specifications

2.2.4 Thermal specifications

		Min	Typ	Max	Unit
Heat sink temperature	non-condensing humidity	-40	—	+85	ºC

Table 2.4 Thermal specifications

2.2.5 Motion specifications

Microstep Resolution - Open Loop	
Number of microstep resolutions	20

Available microsteps per revolution

200	400	800	1000	1600	2000	3200	5000	6400	10000
12800	20000	25000	25600	40000	50000	51200	36000[1]	21600[2]	25400[3]

1=0.01 deg/µstep 2=1 arc minute/µstep *3=0.001 mm/µstep
** 1" per revolution lead screw*

Microstep resolution (closed loop configuration - (optional)	
Steps Per Revolution (Fixed)	51200
Position Resolution	2048
Differential encoder (internally mounted)	
Type	Internal, Magnetic
Resolution (Lines)	512
Resolution (Edges)	2048
Counters	
Counter 1 (C1) Type	Position
Counter 2 (C2) Type	Encoder
Resolution	32 bit
Maximum Edge Rate	5 MHz
Velocity	
Range	±5,000,000 Steps/Sec.
Resolution	0.5961 Steps/Sec.
Acceleration/Deceleration	
Range	1.5×10^9 Steps/Sec.^{2}
Resolution	90.9 Steps/Sec.^{2}

Table 2.5 Motion specifications

2.2.6 Software specifications

Program Storage Type/Size	Flash/6384 Bytes
User Registers	(4) 32 Bit
User Program Labels and Variables	192
Math, Logic and Conditional Functions	+, -, x, ÷, <, >, =, ≤, ≥, AND, OR, XOR, NOT
Branch Functions	Branch and Call (Conditional)
Party Mode Addresses	62
Predefined I/O Functions	
Input Functions	Home, Limit+, Limit -, Go, Stop, Pause, Jog+, Jog-, Analog Input
Output Functions	Moving, Fault, Stall, Velocity Changing
Trip Functions	Trip on Input, Trip on Position, Trip on Time,

Table 2.6 Software specifications

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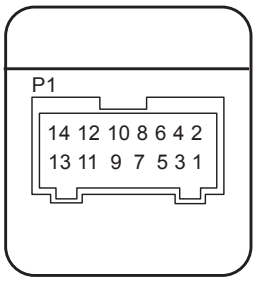
2.3 Connectivity specifications/pin assignments

2.3.1 I/O



Connectivity Options
Prototype development cable::
VW3L3D05R30

Mating connector kit:
VW3L5C09N05

Mfg P/N:
Shell
JST PADP-14V-1-S

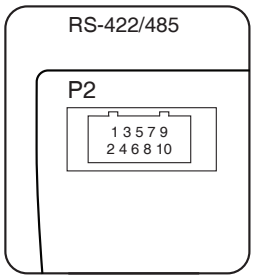
Pins
JST SPH-001T0.5L

Pin #	Function	Description
1	I/O power	I/O Power, used with sourcing inputs or outputs.
2	I/O GND	Non-isolated I/O Ground. Common with Power Ground.
3	I/O 1	0 to +24 VDC Programmable I/O Point 1
4	I/O 2	0 to +24 VDC Programmable I/O Point 2
5	I/O 3	0 to +24 VDC Programmable I/O Point 3
6	I/O 4	0 to +24 VDC Programmable I/O Point 4
7	I/O 9	0 to +24 VDC Programmable I/O Point 9
8	I/O 10	0 to +24 VDC Programmable I/O Point 10
9	I/O 11	0 to +24 VDC Programmable I/O Point 11
10	I/O 12	0 to +24 VDC Programmable I/O Point 12
11	Capture/trip I/O	High Speed Capture Input or Trip Output. +5 VDC Logic Level.
12	Analog in	0 to 10 V / 4 to 20 mA / 0 to 20 mA Analog Input.
13	Step/clock I/O	Step clock i/o. Can also be configured as quadrature or clock up/down. +5 VDC logic level.
14	Direction/ clock I/O	Direction i/o. Can also be configured as quadrature or clock up/down. +5 VDC logic level.

Table 2.8 P1 communications, power and I/O, 14-pin locking wire crimp

2.3.2 RS-422/485 communications

10-pin friction lock wire crimp



Connectivity Options
USB to RS-422/485 Converter:
VW3L1R402

Mating connector kit:
VW3L5C02N05

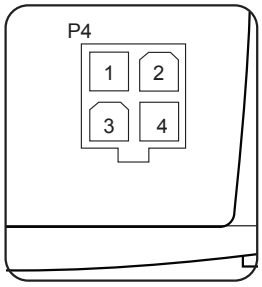
Mfg P/N:
Shell
Hirose DF11-10DS-2C

Pins
Hirose: DF11-2428SC

Pin #	Function	Description
1	TX +	Transmit plus
2	Comm GND	Communications ground only. Do not ground aux-logic to this pin.
3	RX -	Receive minus
4	TX -	Transmit minus
5	Aux-Logic	Auxiliary logic maintains power to the logic circuitry in the absence of motor power. +12 to +24 VDC input
6	RX +	Receive plus
7	RX +	Receive plus
8	RX -	Receive minus
9	TX +	Transmit plus
10	TX -	Transmit minus

Table 2.9 P2 communications, 10-pin locking wire crimp

2.3.3 Motor



Connectivity Options
Prototype development cable
VW3L3M01R30

Mating connector kit:
VW3L5C07N05

Mfg P/N:
Shell
Molex 39-01-2045
Pins
Molex 44476-3112

Pin #	Function	Description
1	∅A	Phase A output
2	$\overline{\varnothing A}$	Phase A return
3	∅B	Phase B output
4	$\overline{\varnothing B}$	Phase B return

Table 2.10 P4 motor, 4-pin locking wire crimp

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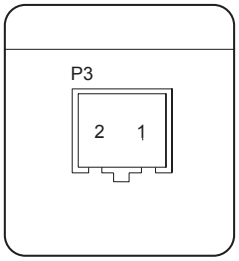
2.3.4 Power



Pin #	Function	Description
1	+V	+24 to +48 VDC
2	Ground	Power supply return

Table 2.11 P3 power, 2-pin locking wire crimp

Connectivity Options
Prototype development cable
VW3L3P03R30

Mating connector kit:
VW3L5C05N05

Mfg P/N:
Shell
Molex 510-67-0200
Pins
Molex 502-17-91011

2.4 Connectivity

Communication Converters

Electrically isolated, in-line converters pre-wired with mating connectors to conveniently set/program communication parameters for a single Lexium SD218PU50C product via a PC's USB port. Length 3.6 m.

Mates to connector:

P1 10-pin wire crimp.....VW3L1R402

Prototype Development Cables

Speed test/development with pre-wired mating connectors that have flying leads other end. Length 3.0 m.

Mates to connector:

P1 14-pin wire crimp..... VW3L5C02N05

P3 2-pin wire crimp..... VW3L3P03R30

P4 4-pin wire crimp.....VW3L3M01R30

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Mating Connector Kits

Use to build your own cables. Kit contains 5 mating shells with pins. Cable not supplied. Manufacturer's crimp tool recommended.

Mates to connector:

P1 14-pin wire crimp..... VW3L5C09N05

P2 10-pin wire crimp..... VW3L5C02N05

P3 2-pin wire crimp..... VW3L5C05N05

P4 4-pin wire crimp..... VW3L5C07N05

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3 Mounting and connection recommendations

⚠ DANGER

EXPOSED SIGNALS

Hazardous voltage levels may be present if using an open frame power supply to power the product.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

SWITCHING DC POWER/HOT PLUGGING

Do not connect or disconnect power, logic, or communications while the device is in a powered state.

Remove DC power by powering down at the AC side of the DC power supply.

Failure to follow these instructions can result in equipment damage.

⚠ CAUTION

LEAD RESTRAINT

Some Lexium SD218PU50C mounting configurations require that the Lexium SD218PU50C move along the screw. Ensure that all cabling is properly restrained to provide strain relief on connection points..

Failure to follow these instructions can result in equipment damage.

⚠ CAUTION

THERMAL MANAGEMENT

Do not remove the thermal pad attached to the mounting surface of the MicroDrive. It is essential to maintaining a sife driver temperature at full current..

Failure to follow these instructions can result in equipment damage.

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3.1 Mounting

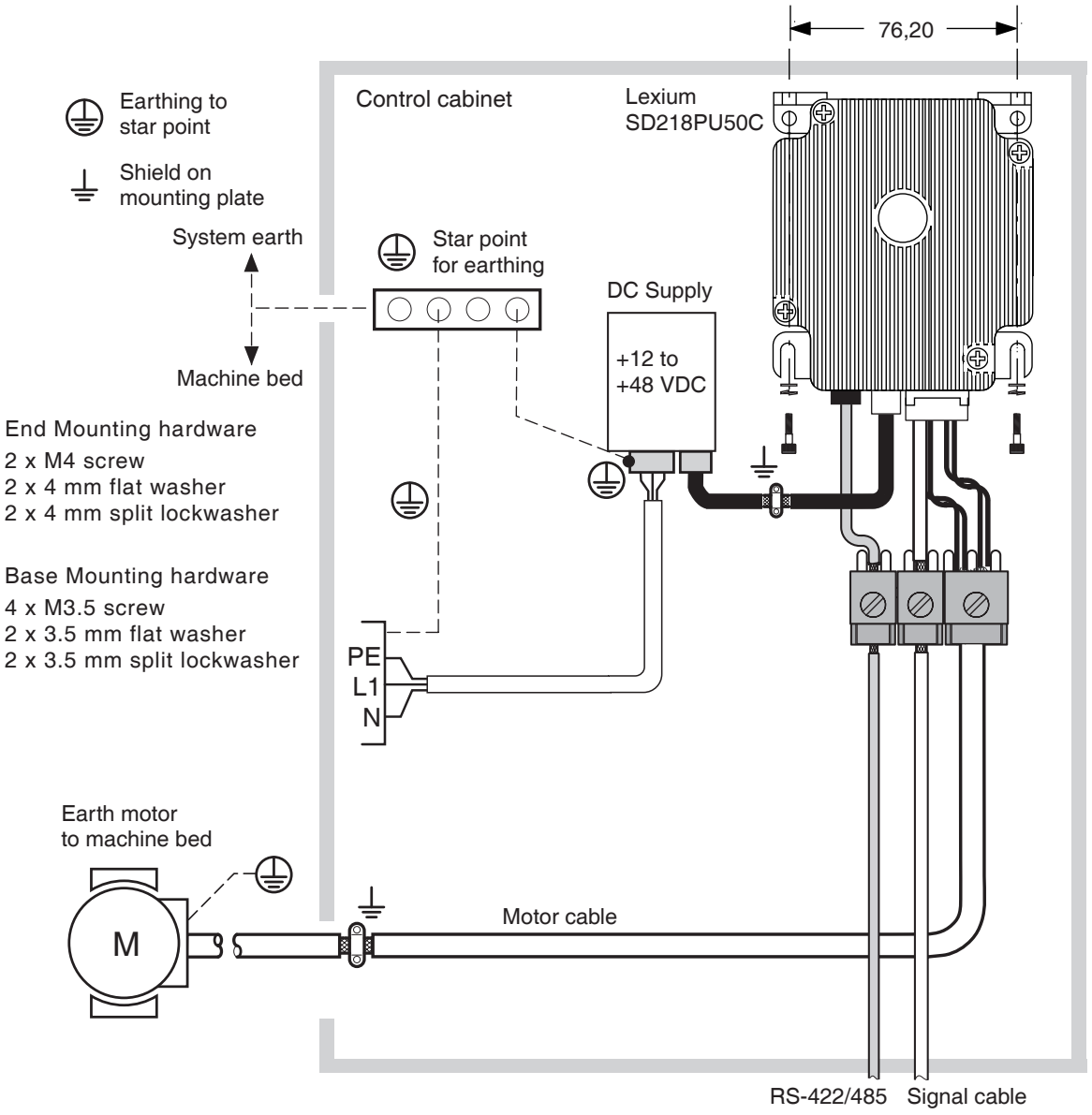

Figure 3.1 Lexium SD218PU50C mounting

3.2 Layout and interface guidelines

Logic level cables must not run parallel to power cables. Power cables will introduce noise into the logic level cables and make your system unreliable.

Logic level cables must be shielded to reduce the chance of EMI induced noise. The shield needs to be grounded at the signal source to earth. The other end of the shield must not be tied to anything, but allowed to float. This allows the shield to act as a drain.

Power supply leads to the Lexium SD218PU50C need to be twisted. If more than one driver is to be connected to the same power supply, run separate power and ground leads from the supply to each driver.

3.2.1 Rules of wiring

- Power supply and motor wiring should be shielded twisted pairs, and run separately from signal-carrying wires.
- A minimum of one twist per inch is recommended.
- Motor wiring should be shielded twisted pairs using 20 gauge, or for distances of more than 2 m, 18 gauge or better.
- Power ground return should be as short as possible to established ground.
- Power supply wiring should be shielded twisted pairs of 18 gauge for less than 4 amps DC and 16 gauge for more than 4 amps DC.

3.2.2 Rules of shielding

- The shield must be tied to zero-signal reference potential. It is necessary that the signal be earthed or grounded, for the shield to become earthed or grounded. Earthing or grounding the shield is not effective if the signal is not earthed or grounded.
- Do not assume that Earth ground is a true Earth ground. Depending on the distance from the main power cabinet, it may be necessary to sink a ground rod at the critical location.
- The shield must be connected so that shield currents drain to signal-earth connections.
- The number of separate shields required in a system is equal to the number of independent signals being processed plus one for each power entrance.
- The shield should be tied to a single point to prevent ground loops.
- A second shield can be used over the primary shield; however, the second shield is tied to ground at both ends.

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3.3 Recommended wiring

The following wiring/cabling is recommended for use with the Lexium SD218PU50C:

Logic wiring..... 22 AWG

Wire strip length..... 6.0 mm

Power and ground See Table 3.2 in Part 1, Section 3 of this document

3.3.1 Recommended mating connectors and pins

I/O 14-pin locking wire crimp connector shell.... JST PN PADP-14V-1-S

Crimp pins ..... JST PN SPH-001T-P0.5L

Communications 10-pin wire crimp connector shell..... Hirose PN DF11-10DS-2C

Crimp pins .....Hirose PN DF 11-2428SC

Power 2-pin locking wire crimp connector shell..... Molex 51067-0200

Crimp pins ..... Molex 51027-9101

Motor 4-pin locking wire crimp connector shell..... Molex 39-01-2045

Crimp pins ..... Molex 44476-3112

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4 Connection and interface

⚠ DANGER

EXPOSED SIGNALS

Hazardous voltage levels may be present if using an open frame power supply to power the product.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

SWITCHING DC POWER/HOT PLUGGING

Do not connect or disconnect power, logic, or communications while the device is in a powered state.

Remove DC power by powering down at the AC side of the DC power supply.

Failure to follow these instructions can result in equipment damage.

4.1 Interfacing RS422-485 communications

For general RS422/485 single and party mode communications practices please see Part 1 Section 5 of this document.

⚠ CAUTION

COMMUNICATIONS GROUND LOOPS

To avoid ground loops in the system only connect communications ground to the first Lexium SD218PU50C in the system. Do not connect communications ground on subsequent Lexium SD218PU50Cs.

Failure to follow these instructions may result in damage to system components!

⚠ CAUTION

HOT PLUGGING!

Do not connect or disconnect communications while the device is in a powered state.

Failure to follow these instructions may result in damage to system components!

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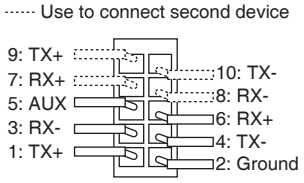
4.1.1 P2 — 10-pin friction lock wire crimp

⚠ CAUTION

GROUNDING!

Do not ground AUX-LOGIC to communications ground. the return of the +12 to +24 VDC suxiliary supply, if used, must be grounded to DC power ground at the DC supply.

Failure to follow these instructions may result in damage to system components!



Pin #	Function	Description
1	TX +	Transmit plus
2	Comm GND	Communications ground only. Do not ground aux-logic to this pin.
3	RX -	Receive minus
4	TX -	Transmit minus
5	Aux-Logic	Auxiliary logic maintains power to the logic circuitry in the absence of motor power. +12 to +24 VDC input. Ground to DC power ground.
6	RX +	Receive plus
7	RX +	Receive plus (connect to second device if using party mode)
8	RX -	Receive minus (connect to second device if using party mode)
9	TX +	Transmit plus (connect to second device if using party mode)
10	TX -	Transmit minus (connect to second device if using party mode)

Table 4.1 P2 communications, 10-pin locking wire crimp

Connectivity accessories

Mating connector kit VW3L5C02N05
(contains 5 connector shells, ribbon cable not included)

Communications converter cable 3,0 m VW3L1R402

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4.2 Interfacing DC power

See part 1 of this document, section 3, for recommended power cable configurations.

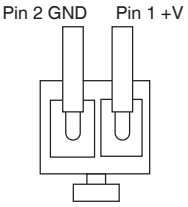
> **⚠ CAUTION**
>
> OVER VOLTAGE
>
> The DC voltage range for the Lexium SD218PU50C is +24 to +48 VDC. Ensure that motor back EMF is factored into your power supply size calculations.
>
> Allow 4.0 A maximum power supply output current per Lexium SD218PU50C in the system. Actual power supply current will depend on voltage and load.
>
> **Failure to follow these instructions can result in equipment damage.**

4.2.2 Recommended wire gauge

Cable Length: Meters	3,0	8,0	15,0	23,0	30,0
Amps Peak	**Minimum AWG**				
1 Amp Peak	20	20	18	18	18
2 Amps Peak	20	18	16	14	14
3 Amps Peak	18	16	14	12	12
4 Amps Peak	18	16	14	12	12

Table 4.2 Recommended power supply wire gauge

4.2.3 P3 — 2-pin locking wire crimp interface



Pin #	***Signal***	***Wire colors***
		VW3L3D03R30
1	+24 to + 48 VDC	Red
2	Power supply return (ground)	Black

Table 4.3 Power and ground connections, 2-pin locking wire crimp

Connectivity accessories

Mating connector kit VW3L5C05N05
(contains 5 connector shells and the appropriate quantity of pins to make 5 cables)

Prototype development cable (3,0 m)..... VW3L3D03R30

Manufacturer (JST) part numbers

Connector shell.....51067-0200

Pins.....50217-9101

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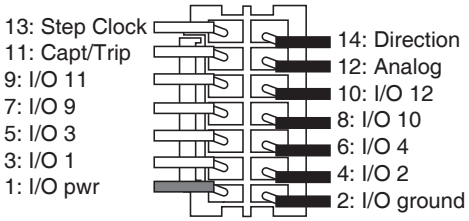
4.3 Interfacing I/O

See part 1 of this document, section 6, for I/O interface configurations and methods.

4.3.1 P1 — 14-pin locking wire crimp interface (expanded I/O)



Pin Numbers	*Signal*	*Prototype development cable wire colors (twisted pairs)*	
1	I/O power	Red	Pair
2	I/O ground	White	
3	General purpose I/O 1	Orange	Pair
4	General purpose I/O 2	Black	
5	General purpose I/O 3	Brown	Pair
6	General purpose I/O 4	Black	
7	General purpose I/O 9	Yellow	Pair
8	General purpose I/O 10	Black	
9	General purpose I/O 11	Blue	Pair
10	General purpose I/O 12	Black	
11	Capture output/trip input	Green	Pair
12	Analog input	Black	
13	Step clock I/O	White	Pair
14	Direction clock I/O	Black	

Table 4.4 I/O connections, 16-pin locking wire crimp

Connectivity accessories

Mating connector kit VW3L5C09N05
(contains 5 connector shells and the appropriate quantity of pins to make 5 cables)

Prototype development cable (3,0 m)..... VW3L3D05R30

Manufacturer (JST) part numbers

Connector shell.....PADP-14V-1-S

Pins..... SPH-001T0.5L

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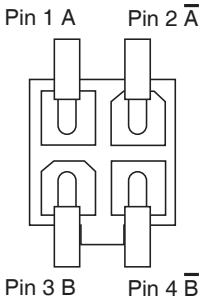
4.4 Interfacing the motor

See part 1 of this document, section 5, for motor selection and interface configurations.

4.4.1 P1 — 4-pin locking wire crimp interface



Pin Numbers	*Signal*	*Prototype development cable wire colors (twisted pairs are labled)*
1	Phase A output	Black (pair 2)
2	Phase A return	White (pair 2)
3	Phase B output	Black (pair 1)
4	Phase B return	White (pair 1)

Table 4.5 Motor connections, 4-pin locking wire crimp

Connectivity accessories

Mating connector kit VW3L5C07N05
(contains 5 connector shells and the appropriate quantity of pins to make 5 cables)

Prototype development cable (3,0 m)..... VW3L3M01R30

Manufacturer (Molex) part numbers

Connector shell..... Molex 39-01-2045

Pins..... Molex 44476-3112

4.5 Connectivity accessory details

4.5.1 Communications converter

USB to 10-pin wire crimp connector P2
P/N: VW3L1R402

Electrically isolated in-line USB to RS-422/485 converter pre-wired with mating connector to conveniently program and set configuration parameters

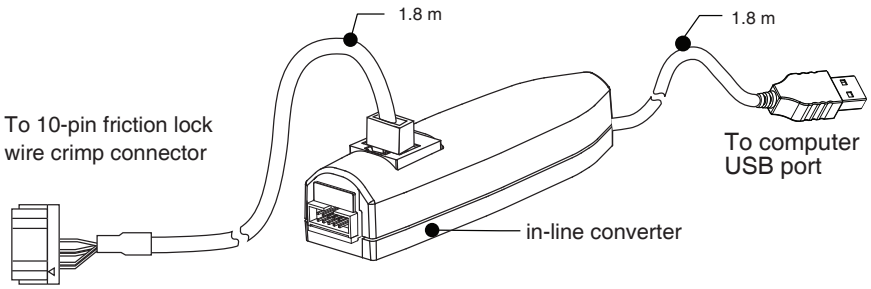
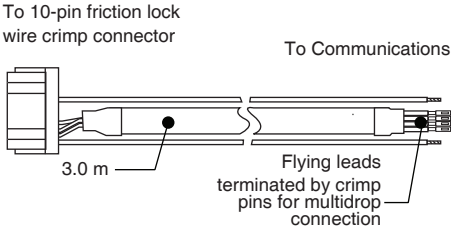


Figure 4.1 Prototype development cable VW3L1R402

4.4.2 Prototype development cable

Flying leads to10-pin wire crimp connector P2 -P/N: VW3L3D02R30

Used in conjunction with the VW3L1R402 communications converter cable to facilitate multi-drop RS-422/485 communications.



Wire Colors	Function
White/Red Stripe	Aux-Logic
White/Blue Stripe	TX+
Blue/White Stripe	TX-
White/Orange Stripe	RX+
Orange/White Stripe	RX-
Green/White Stripe	GND

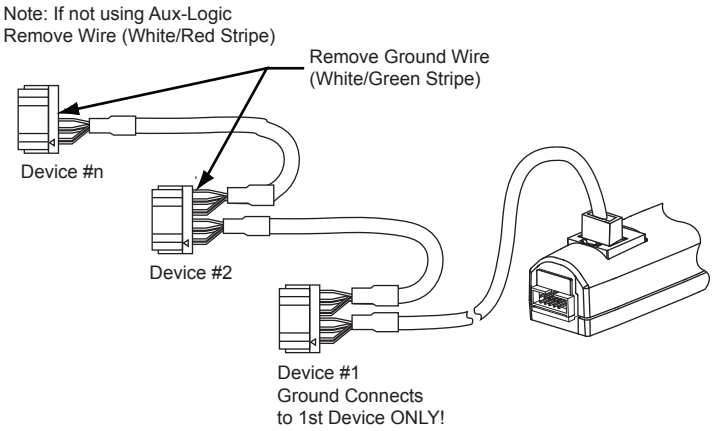


Figure 4.2 Multi-drop communications using the VW3L3D02R30

Procedure

1) Remove ground wire (unless this is the first system Lexium SD-218PU50C, green/white stripe)
2) Remove aux-logic (if not used, red/white stripe)
3) Connect pre-crimped flying leads as shown in Figure 4.3 below

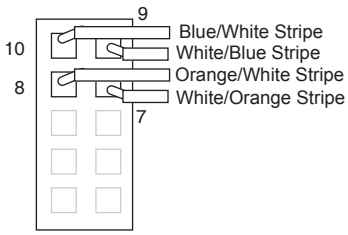
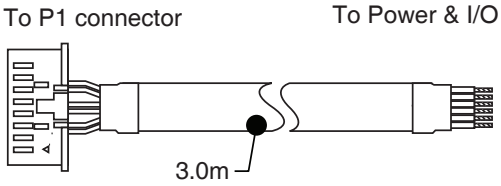


Figure 4.3 Wiring a second VW3L3D02R30 into the 10-pin wire crimp connector.

Prototype development cable VW3L3D05R30

Description: Pre-wired mating connector interfaces to an Lexium SD-218PU50C's 16-pin wire crimp connector, with flying leads other end, for quick test/development.

Function: I/O interface.



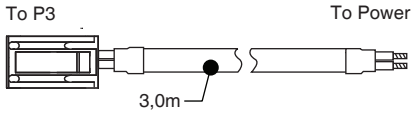
Pair	Wire Colors	Function
1	Black	Direction
	White	Step Clock
2	Black	Analog In
	Green	Capt/Trip
3	Black	I/O12
	Blue	I/O11
4	Black	I/O10
	Yellow	I/O9
5	Black	I/O4
	Brown	I/O3
6	Black	I/O2
	Orange	I/O1
7	White	I/O Ground
	Red	I/O Power

Figure 4.4 Prototype development cable VW3L3D05R30

Prototype development cable VW3L3M01R30

Description: Pre-wired mating connector interfaces to an Lexium SD-218PU50C's 2-pin wire crimp connector, with flying leads other end, for quick test/development.

Function: Power Interface.



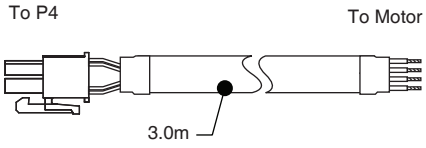
Wire Colors	Function
Black	Power Ground
Red	+V

Figure 4.5 Prototype development cable VW3L3M01R30

Prototype development cable VW3L3P03R30

Description: Pre-wired mating connector interfaces to an Lexium SD-218PU50C's 4-pin wire crimp connector, with flying leads other end, for quick test/development.

Function: Motor Interface.



Wire Colors	Function
Black (Pair 1)	Phase B
White (Pair 1)	Phase B\
Black (Pair 2)	Phase A
White (Pair 2)	Phase A\

Note that pairs are marked with the pair number.

Figure 4.6 Prototype development cable VW3L3P03R30

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4.5 Mating connector kits

Use to build your own cables. Kit contains 5 mating shells with pins. Cable not supplied. Manufacturer's crimp tool recommended.

Mates to connector:

P1 14-pin wire crimp..... VW3L5C09N05

P2 10-pin wire crimp..... VW3L5C02N05

P3 4-pin wire crimp..... VW3L5C05N05

P4 4-pin wire crimp..... VW3L5C07N05

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