Lexium Controller

Axis controller

Installation Manual

Retain for future use

Schneider Electric

Contents

NOTE

While every precaution has been taken in the preparation of this document, Schneider Electric SA assumes no liability for any omissions or errors it may contain, nor for any damages resulting from the application or use of the information herein.

The products and options described in this document may be changed or modified at any time, either from a technical point of view or in the way they are operated. Their description can in no way be considered contractual.

Important information

PLEASE NOTE

Please read these instructions carefully and examine the equipment in order to familiarize yourself with the device before installing, operating or carrying out any maintenance work on it.

The following special messages that you will come across in this document or on the device are designed to warn you about potential risks or draw your attention to information that will clarify or simplify a procedure.

The addition of this symbol to a "Danger" or "Warning" safety label indicates that there is an electrical risk that will result in injury if the instructions are not followed.

This is a safety warning symbol. It warns you of the potential risk of injury. You must comply with all safety messages that follow this symbol in order to avoid the risk of injury or death.

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.

PLEASE NOTE:

Only qualified staff are authorized to carry out maintenance work on electrical equipment. Schneider Electric accepts no responsibility for the consequences of using this device. This document does not constitute an instruction manual for inexperienced personnel.

Documentation structure

Installation Manual

This manual describes:
- How to install the controller
- How to connect the controller

Optional Graphic Display Terminal User's Manual

This manual describes:
- How to install the graphic display terminal
- How to connect the graphic display terminal
- How to program the controller via the graphic display terminal

Easy Motion - Programming Manual

Supplied preinstalled in the Lexium Controller, the application model associated with Easy Motion mode is a user-friendly tool that can be used for:
- Rapid axis configuration
- Use of Manual/Automatic mode
- Creating positioning tasks
- Editing cam profiles
- Backup and recovery of the machine parameters
- Diagnostics of the motion controller and the various axes

This programming manual also contains a table of the parameters that can be accessed via the communication protocols.

Motion Pro - Programming Manual

The Motion Pro Programming Manual is included in the software online help.
This online help describes:
- The software interface
- IEC 1131 programming
- The function libraries (standard functions, motion control functions, application functions)
- The Lexium controller configuration screens

Modbus, Ethernet, PROFIBUS DP, and DeviceNet manuals

These manuals describe:
- Connection to the bus or network
- Diagnostics
- Software setup
- The protocol communication services

Introduction

Presentation

The Lexium Controller performs axis synchronization and coordination, via fieldbuses, for applications requiring control of up to 8 synchronized axes.

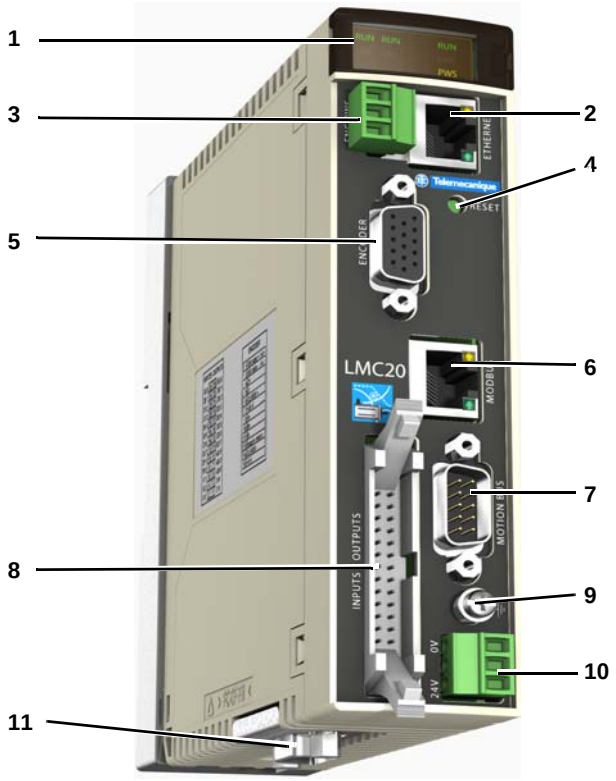
It includes the following standard motion control functions:
- Speed control
- Relative and absolute positioning
- Cam profiles
- Electronic gearing function for speed and position
- Linear and circular interpolation (2½D)
- Master axis via external encoder
- Distance measurement and position capture on high-speed discrete input (30 µs)

It can be easily integrated into the standard architectures available on the market. It can be connected directly via the Modbus, CANopen, Ethernet, PROFIBUS DP, and DeviceNet communication ports.

Models

References	Number of logic inputs	Number of logic outputs	Integrated communication			
			Modbus	CANopen	Ethernet network	Third-party bus
LMC 10	8 24 V ⎓	8 24 V ⎓	Yes	-	-	-
LMC 20	8 24 V ⎓	8 24 V ⎓	Yes	Yes	Yes	-
LMC 20A1307	8 24 V ⎓	8 24 V ⎓	Yes	Yes	Yes	PROFIBUS
LMC 20A1309	8 24 V ⎓	8 24 V ⎓	Yes	Yes	Yes	DeviceNet

Description of LMC10/LMC20



1 Signaling and diagnostic LEDs

2 Ethernet connector (LMC 20 only)

3 Encoder power supply

4 Reset button

5 Master encoder input

6 Modbus or graphic display terminal connector

7 Motion bus connector

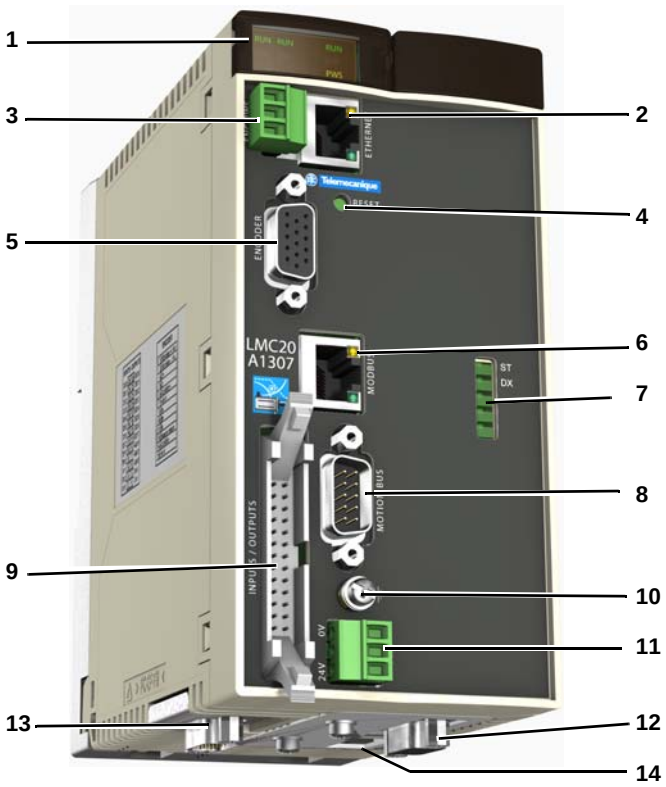
8 Connector for logic I/O

9 Equipment grounding conductor connection

10 24 V power supply terminals

11 CANopen connector (LMC 20 only)

Description of LMC20A●●●●



1 Signaling and diagnostic LEDs

2 Ethernet connector

3 Encoder power supply

4 Reset button

5 Master encoder input

6 Modbus or graphic display terminal connector

7 LEDs for:
- PROFIBUS on LMC20A1307
- DeviceNet on LMC20A1309

8 Motion bus connector

9 Connector for logic I/O

10 Equipment grounding conductor connection

11 24 V power supply terminals

12 Connector for:
- PROFIBUS on LMC20A1307
- DeviceNet on LMC20A1309

13 CANopen connector

14 Address configuration switches

On receipt

- Check that the device reference marked on the label is the same as that on the delivery note corresponding to the purchase order.
- Open the packaging and check that the device has not been damaged in transit.
- Check that the device is complete. The packaging must contain:
  - The Lexium Controller
  - A bag containing three removable connectors (24 V power supply, encoder power supply, I/O)
  - A CD-ROM containing the documentation
  - A quick reference guide

⚠ CAUTION

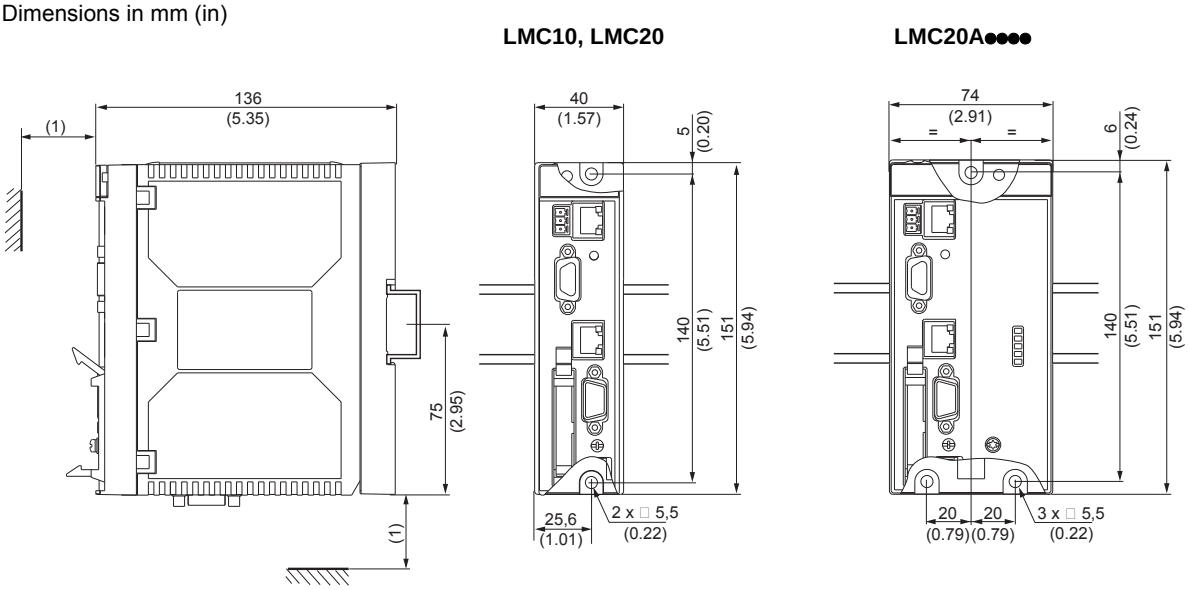
DAMAGED EQUIPMENT

Do not install or operate any controller that appears damaged.
Failure to follow this instruction can result in equipment damage.

Mounting

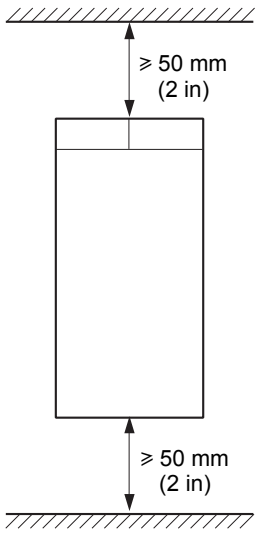
Fasten using M5 screws, or on ⊓⊔ rail (35 mm)

Dimensions in mm (in)



(1) Leave sufficient space for the connectors used.

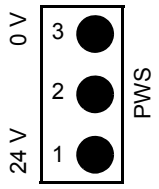
Installation recommendations



- Install the unit vertically.
- Leave at least 50 mm (2 in) free space above and below the device to allow for cooling.
- Max. ambient temperature: LMC10: 60°C
  LMC20: 50°C
- Protect from condensation and keep away from any heat sources.

Connecting the power supply

Use the connector supplied in the bag:
- Max. connectable cross-section: 1.5 mm^2 - AWG 16
- Max. tightening torque: 0.3 Nm

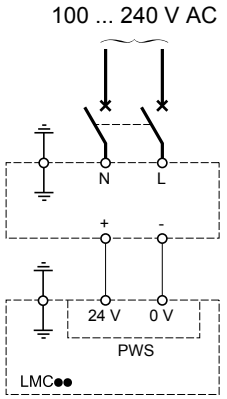


Terminal	Function
3	0 V
2	not connected
1	+ 24 V

Characteristics of the power supplies

	LMC10	LMC20	LMC20A ●●●●
Nominal voltage	24 V ⎓	24 V ⎓	24 V ⎓
Voltage limit (including ripple)	19 ... 30 V ⎓	19 ... 30 V ⎓	19 ... 30 V ⎓
Nominal input current	0.3 A	0.4 A	0.5 A

Example circuit



24 V power supply
ABL7 RE2402

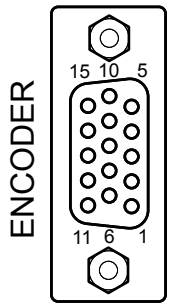
Note: If the LMC●●● controller is left without a power supply for around 20 days, the clock will have to be reset.

Connection to a master encoder

The Lexium Controller has a 15-way female HD SUB-D connector for connecting an encoder.
The VW3M4701 option (to be ordered separately) consists of a male connector with a 1-meter cable, with no connector on the other end, and can be used to connect the encoder to an intermediate screw terminal block.

The master encoder input is compatible with encoders :
- RS422
- 5 V push-pull
- 5 V open collector
- SSI

Female SUB-D connector



Description	Encoder terminal	Pin	VW3M4701 option - wire colors
Incremental encoder	A+	1	red/white
	A-	2	brown
	Z+	4	orange
	Z-	5	yellow
	B+	10	white
	B-	11	purple
Absolute encoder	SSI data +	1	red/white
	SSI data -	2	brown
	CLKSSI +	6	green
	CLKSSI -	14	light brown
5 V encoder	+ 5 V	15	light purple
	0 V	8	pink
24 V encoder	+ 24 V	7	blue
	0 V	8	pink
Encoder power supply feedback (1)	Supply return	13	light green
			black = shielding

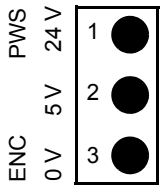
(1) For monitoring the encoder power supply and the presence of the encoder cable. The Lexium Controller trips on a fault if the encoder power supply feedback is missing.

Characteristics of the master encoder input

Power supply	Nominal voltage	**V**	5 ⎓ or 24 ⎓
	Nominal current	**mA**	500
Input limit values	Voltage	**V**	5.5 ⎓
	Current	**mA**	12
Input impedance for nominal U		**kΩ**	2
Isolation		**V**	2500
Incremental encoder	Type of signal		A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$
	Maximum operating frequency		250 kHz per input x 4, or 1 MHz for counting
SSI serial absolute encoder	Number of bits		32, with configurable frame (number of turns, number of bits/turn, binary or gray format, parity, etc)
	Clock frequency	**kHz**	200
	Clock voltage	**V**	5

Encoder power supply

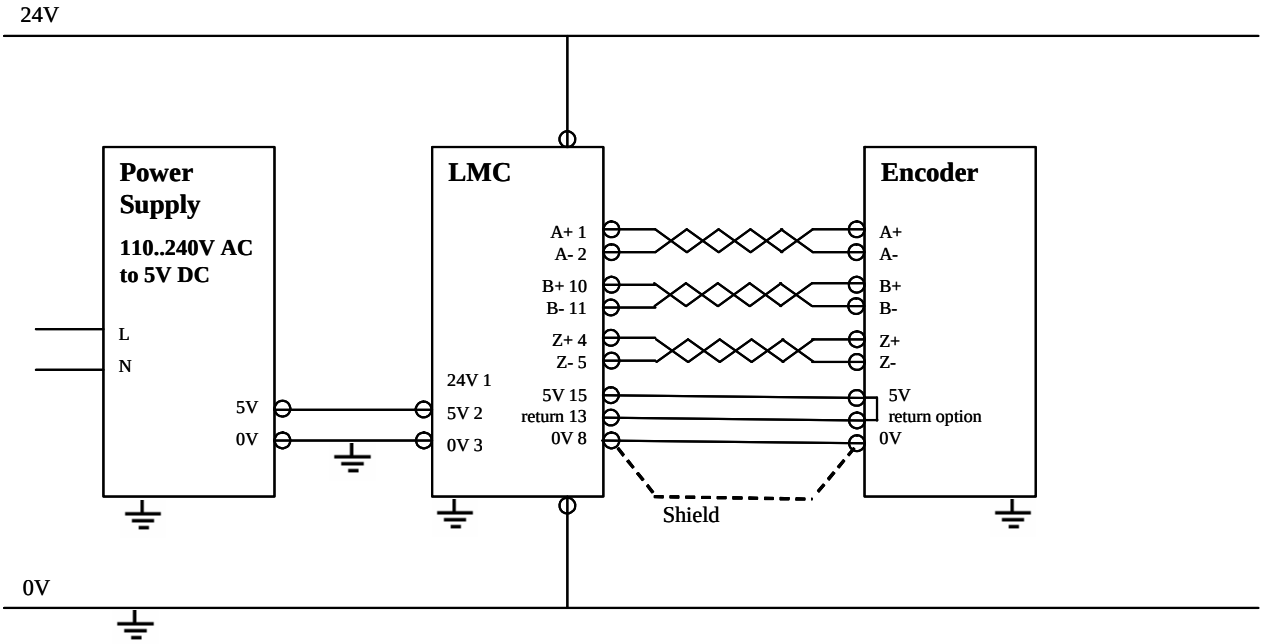
Use the connector supplied in the bag:
- Max. connectable cross-section: 1.5 mm^2 - AWG 16
- Max. tightening torque: 0.3 Nm



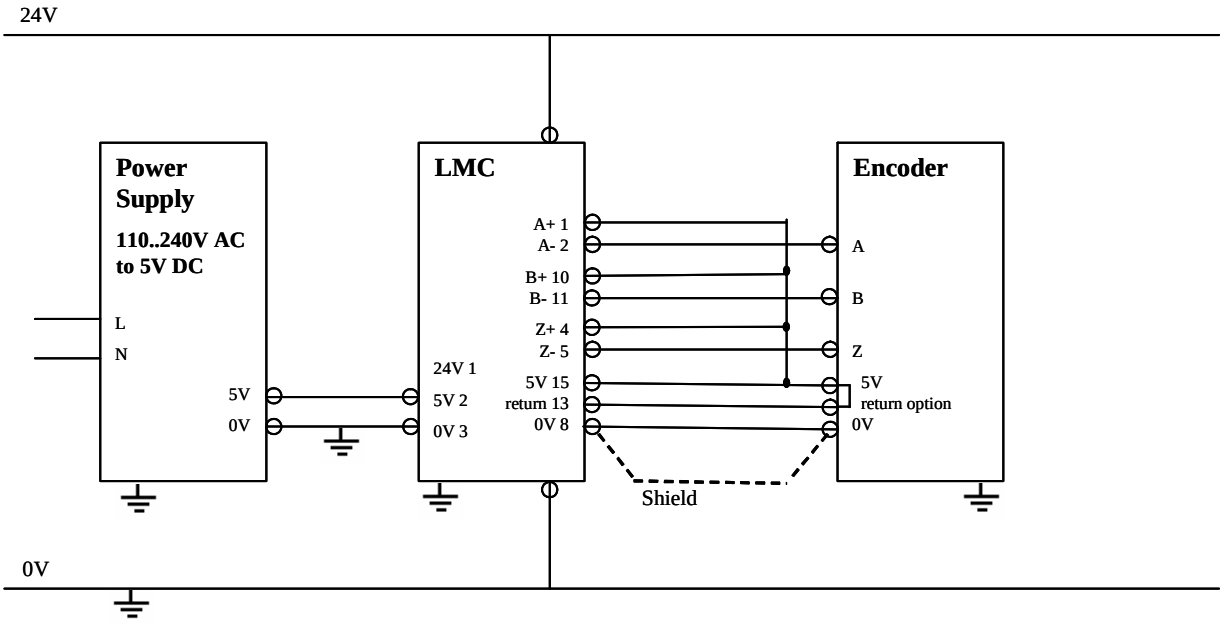
Terminal	Function	Power
1	+ 24 V	Depends on the type of encoder used
2	+ 5 V	
3	0 V	

Example circuits

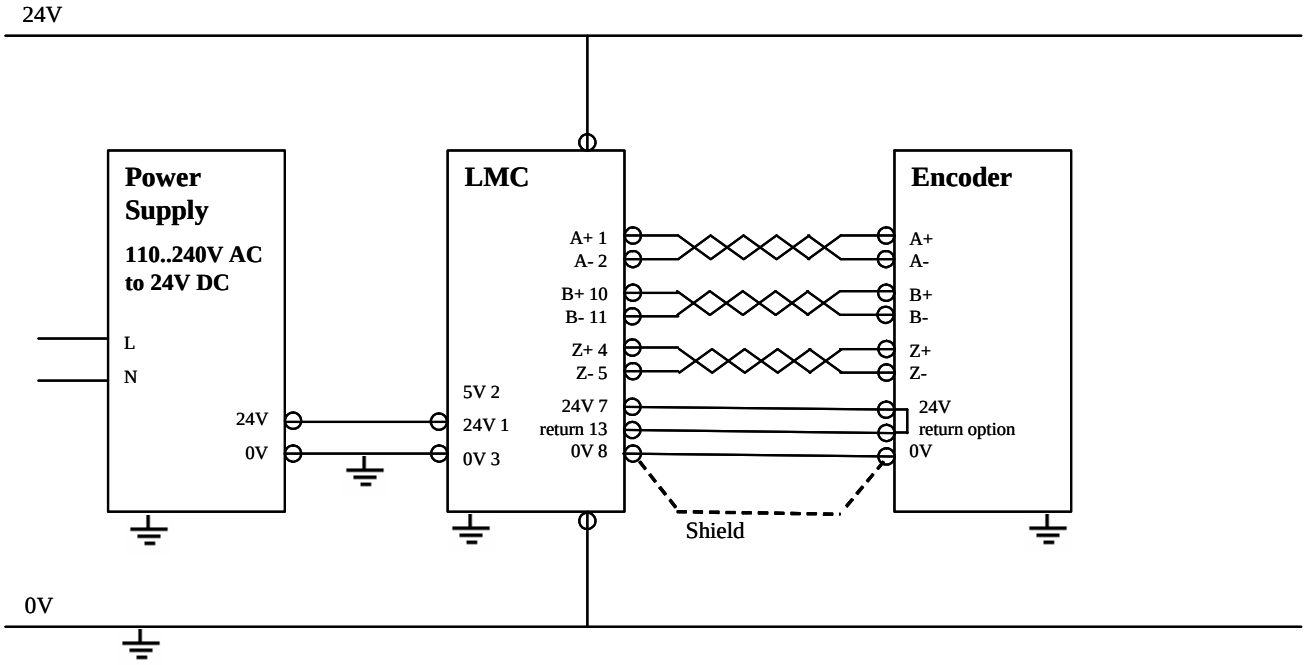
Incremental encoder 5 V - RS422 or Push-Pull output



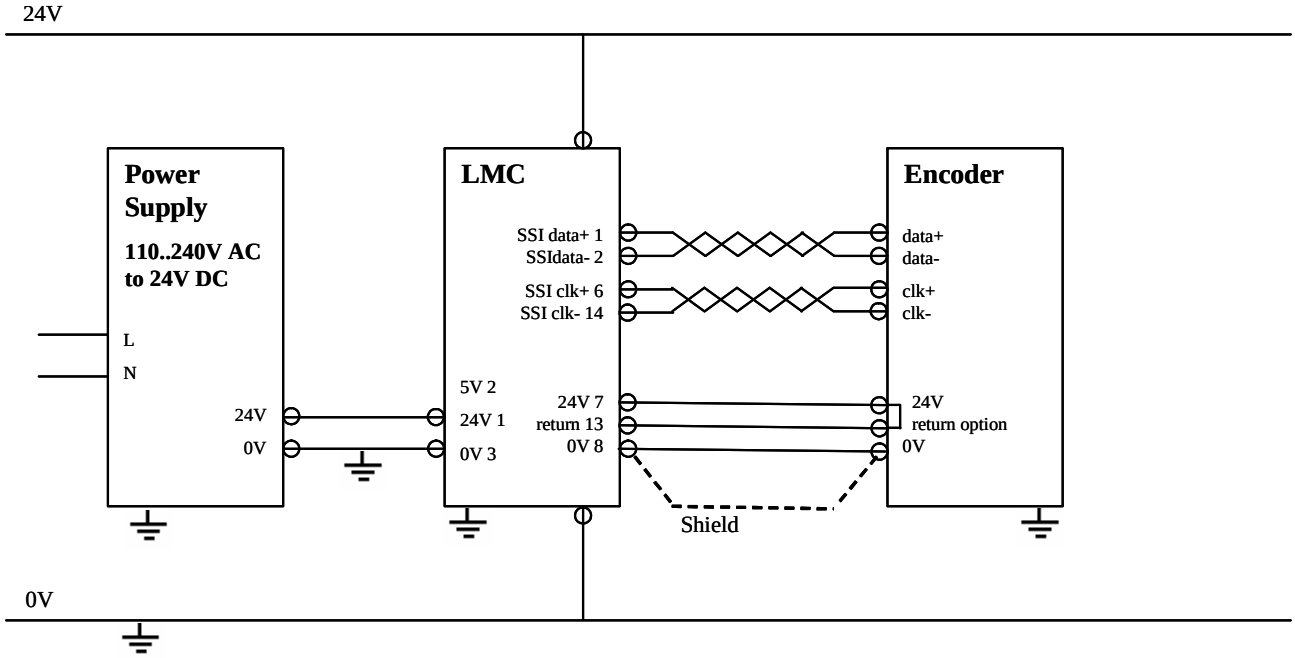
Incremental encoder 5 V - Open collector A, B, Z



Incremental encoder 24 V - RS422 output

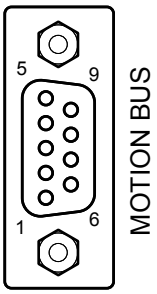


SSI encoder 24 V - RS422 output



Connecting the Motion bus 9-way SUB-D connector

Male SUB-D connector.



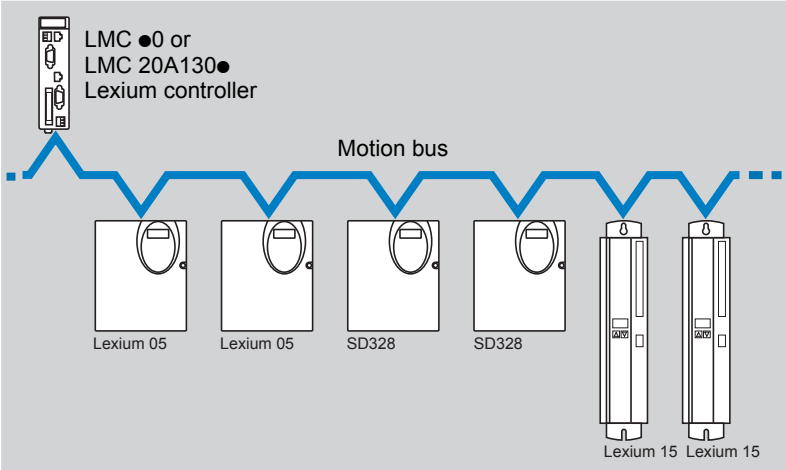
Terminal	Description
1	not connected
2	CAN_L
3	CAN_GND
4	not connected
5	not connected
6	CAN_GND
7	CAN_H
8	not connected
9	not connected

The CANopen connection dedicated to the Motion bus provides the option of connecting up to 8 Lexium 05, Lexium 15 and SD328 servo drives.
The Motion bus is used to control the movement of these 8 axes.
The network cycle ensures the position setpoints are updated for axis synchronization.

LMC 10, LMC 20 and LMC 20A130● Lexium Controllers integrate the CANopen protocol dedicated to the Motion bus as standard.

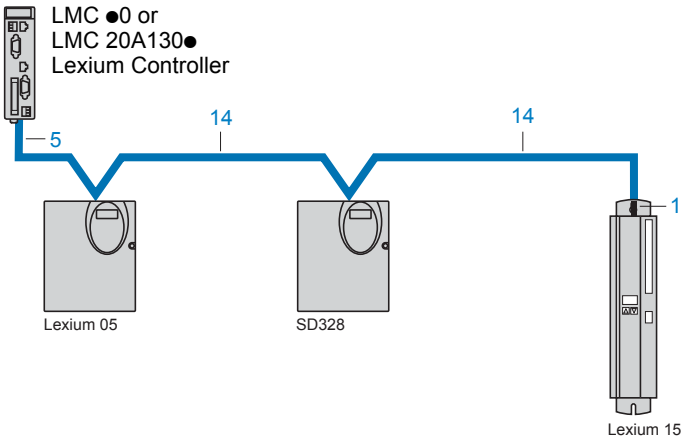
To guarantee the performance of the Motion bus, it is advisable to set it up in a daisy-chain formation, without any tap-offs; our range of connection accessories has been extended with this in mind.

Example of architecture with the CANopen machine bus dedicated to the Motion bus

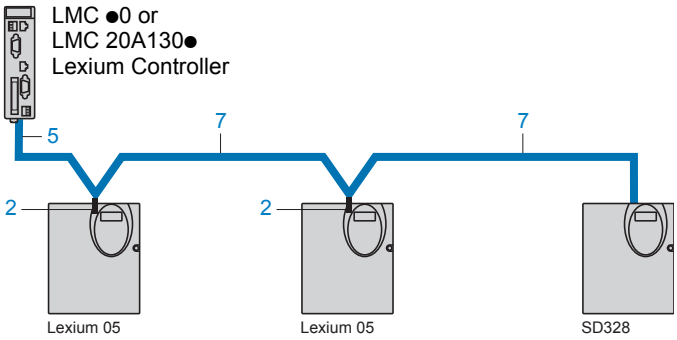


Examples of connection to the Motion bus

For Lexium 05, Lexium 15 and SD328 for customer assembly



For Lexium 05, SD328 prewired



Connection accessories

Connectors and junction boxes

Description	Use	No.	Reference
Connector, 9-way female SUB-D with line terminator	Connection of Lexium 15	1	**VW3 M3 802**
Tap (3) with 3 RJ45 connectors	Daisy-chain connection of Lexium 05, SD328	2	**TCS CTN023F13M03**

Cordsets and connection cables

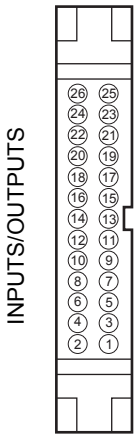
Description	Use		No.	Length	Reference
	From	To		m	
Cordset with one 9-way female SUB-D connector and one RJ45 connector with line terminator	LMC Lexium controller	Lexium 05, SD328 Tap TCS CTN023F13M03	5	1	**VW3 M3 805R010**
CANopen cordsets (1) with one RJ45 connector at each end	Tap TCS CTN023F13M03	Tap TCS CTN023F13M03	7	0.3	**TSX CAN CARR 03**
CANopen IP 20 cables (1)			14		
Standard cables, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)				50	**TSX CAN CA 50**
				100	**TSX CAN CA 100**
				300	**TSX CAN CA 300**
UL certification, CE marking Flame retardant (IEC 60332-2)			14	50	**TSX CAN CB 50**
				100	**TSX CAN CB 100**
				300	**TSX CAN CB 300**
Cable for harsh environment (2) or mobile installation, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)			14	50	**TSX CAN CD 50**
				100	**TSX CAN CD 100**
				300	**TSX CAN CD 300**

(1) Please refer to the catalog
(2) Harsh environment:
- Resistance to hydrocarbons, industrial oils, detergents, solder splashes
- Relative humidity up to 100%
- Saline atmosphere
- Significant temperature variations
- Operating temperature between - 10°C and + 70°C

(3) Available 4th quarter 2007

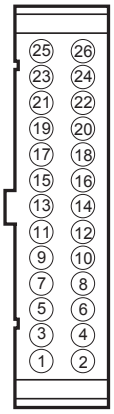
Connecting the I/O

Controller
male connector



Terminal	Description
25	Logic output DO0
23	Logic output DO1
21	Logic output DO2
19	Logic output DO3
17	Logic output DO4
15	Logic output DO5
13	Logic output DO6
11	Logic output DO7
9	+ 24 V
7	+ 24 V
5	+ 24 V
3	0 V
1	0 V

Female connector
plug side view



Terminal	Description
26	Logic input DI0
24	Logic input DI1
22	Logic input DI2
20	Logic input DI3
18	Logic input DI4
16	Logic input DI5
14	Logic input DI6
12	Logic input DI7
10	Position capture TP1
8	Position capture TP2
6	Event input EI1
4	Event input EI2
2	0 V

Input characteristics

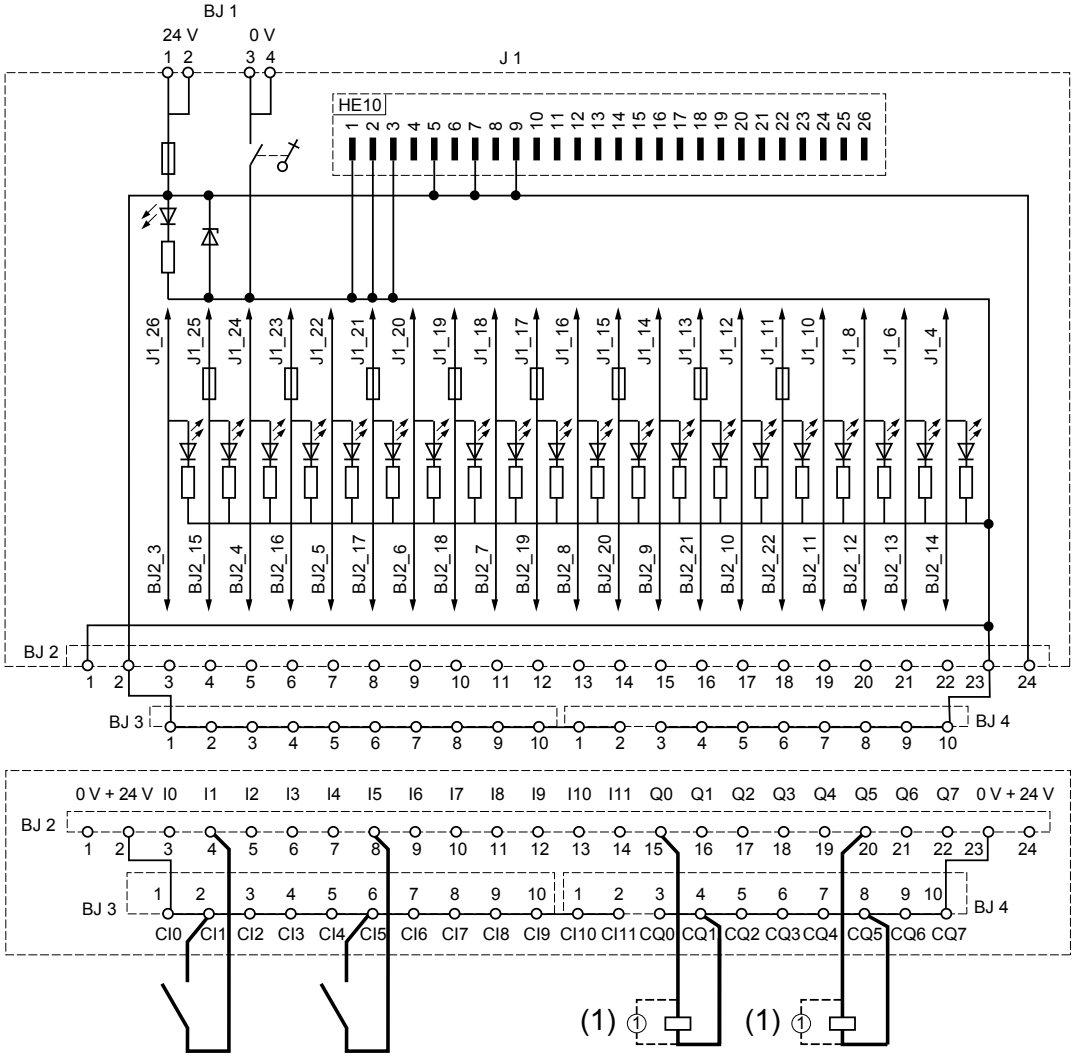
Type of base		LMC10	LMC20
Number of channels		8 Logic Inputs / 2 Position Capture Inputs / 2 Event Inputs	
Nominal voltage		24 V ⎓ (positive logic)	
Voltage limits		19 V ... 30 V ⎓	
Nominal input current		7 mA	
Impedance		3 kΩ	
Logic Input filtering time	At state 1	15 µs	
	At state 0	70 µs	
Position capture Input and Event Input filtering time	At state 1	1 µs	
	At state 0	0.5 µs	
Isolation		No isolation between channels, isolation with internal logic via opto-isolators	

Output characteristics

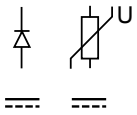
Type of base		LMC10	LMC20
Number of channels		8 x 24 V ⎓ open collector (source) logic outputs, compatible with level 1 PLC, standard IEC 65A-68 Maximum switching voltage: 30 V	
Nominal voltage		24 V ⎓ (positive logic)	
Limit voltages		19 V ... 30 V ⎓	
Output current		0.2 A per channel	
Filtering time	At state 1	150 µs	
	At state 0	250 µs	

I/O connection example

Using a Telefast sub-base **ABE 7B20MPN22**:



(1) Install interference suppressors on inductive circuits such as relays.



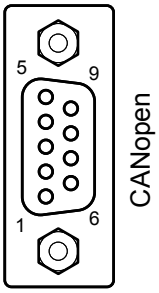
A prefabricated connection cable with two HE10 connectors can be used to connect the Lexium Controller and the Telefast sub-base:

- **ABF T26B050** 0.5 m
- **ABF T26B100** 1 m
- **ABF T26B200** 2 m

Connecting the CANopen 9-way SUB-D connector

Refer to the Easy Motion and Motion Pro software online help.

Male SUB-D connector



Terminal	Description
1	not connected
2	CAN_L
3	CAN_GND
4	not connected
5	not connected
6	CAN_GND
7	CAN_H
8	not connected
9	not connected

Speed and length of the CANopen bus

It is essential to make sure that all devices connected to the CANopen bus operate at the same transmission speed.

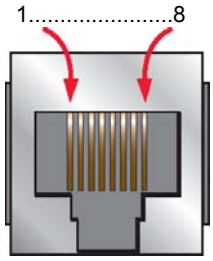
The maximum length of the CANopen bus depends on the transmission speed on this bus.
The table below indicates the maximum lengths permitted according to the transmission speed:

Transmission speed	50 kbps	125 kbps	250 kbps	500 kbps	1 Mbps
Max. length of bus	1,000 m	500 m	250 m	80 m	15 m

Connecting the RJ45 Ethernet connector

Refer to the Ethernet User's Manual.

View from sub-base side



ETHERNET

Terminal	Description
1	TD+
2	TD-
3	RD+
4	not connected
5	not connected
6	RD-
7	not connected
8	not connected

Configuration Ethernet par defaut

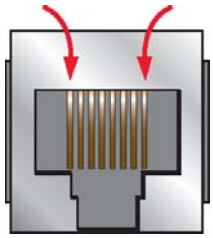
	LMC firware <= V01.02IE02	LMC firware > V01.02IE02
IP address	[0.0.0.0]	[192.168.100.10]
IP Mask	[0.0.0.0]	[255.255.255.0]

Connecting the Modbus RJ45 connector or graphic display terminal

Refer to the Modbus User's Manual or the Graphic Display Terminal User's Manual.

View from sub-base side

1.....8



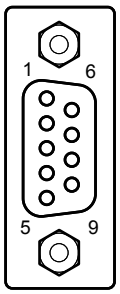
MODBUS

Terminal	Description
1	not connected
2	not connected
3	not connected
4	B signal (RS485) = V1 signal (Modbus)
5	A signal (RS485) = V0 signal (Modbus)
6	not connected
7	Modbus VP signal 12 V DC power supply provided by the Motion Controller (only for supplying an RS485/RS232 converter or a graphic display terminal)
8	Modbus common signal 0V

Connecting the PROFIBUS bus 9-way SUB-D connector (LMC20A1307)

Refer to the PROFIBUS User's Manual.

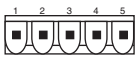
Female SUB-D connector

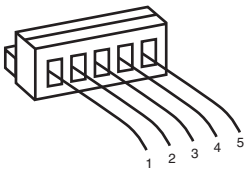


Terminal	Description
1	not connected
2	not connected
3	RxD/TxD-N (Reception/Transmission -)
4	not connected
5	DGND (ground)
6	VP (5 volts)
7	not connected
8	RxD/TxD-P (Reception/Transmission +)
9	not connected

Connecting the DeviceNet terminals (LMC20A1309)

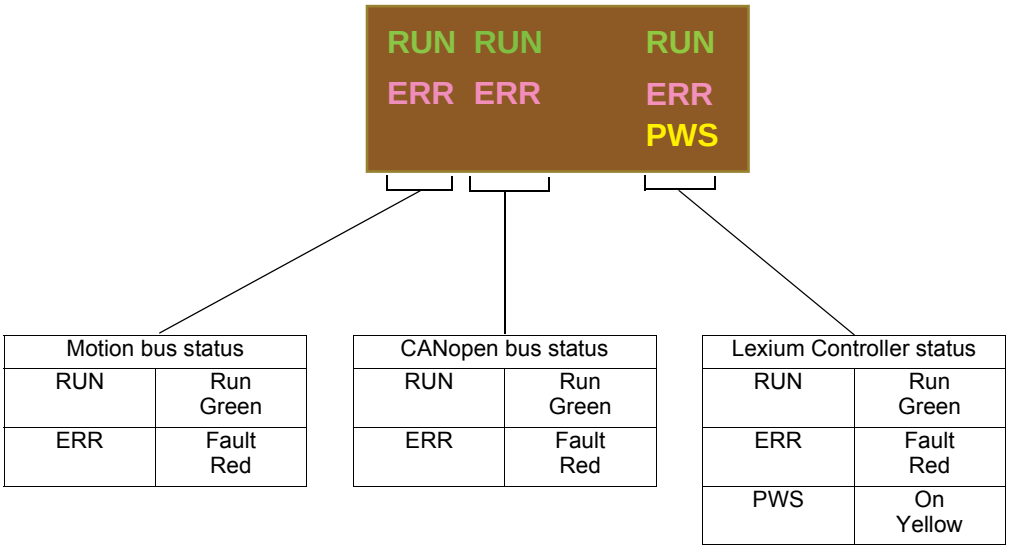
Refer to the DeviceNet User's Manual.



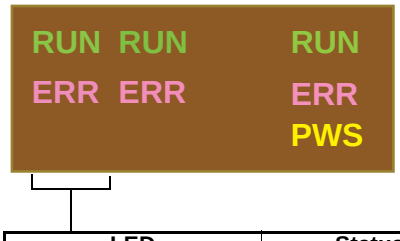


Terminal	Name	Color	Function
1	V-	black	common
2	CAN_L	blue	signal
3	SHIELD	none	shielding
4	CAN_H	white	signal
5	V+	red	power supply

LEDs

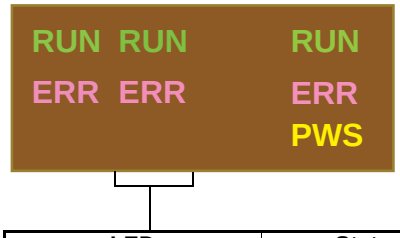


Motion bus status LEDs



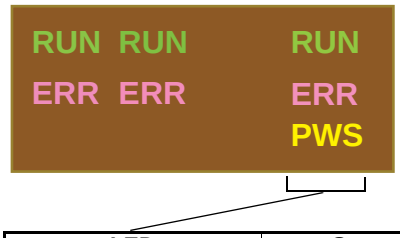
LED		Status	Meaning
RUN	Green	Off	No CAN master configured
		Flashing	The Motion bus is in initialization phase
		1 flash per second	The Motion bus is stopped
		On	The Motion bus is operational
ERR	Red	Off	No Motion bus fault
		Flashing	Motion bus fault

CANopen bus status LEDs



LED		Status	Meaning
RUN	Green	Off	No CAN master configured
		Flashing	The CANopen bus is in initialization phase
		1 flash per second	The CANopen bus is stopped
		On	The CANopen bus is operational
ERR	Red	Off	No CANopen fault
		Flashing	CANopen configuration not valid
		1 flash per second	Alarm threshold exceeded (too many errors)
		2 flashes per second	A "Node Guarding" or "Heartbeat" event has occurred
		On	The CANopen bus is stopped (BUS OFF)

Lexium Controller status LEDs



LED		Status	Meaning
RUN	Green	Off	The Lexium Controller is not configured (application missing, invalid or incompatible)
		Flashing	The Lexium Controller is in STOP state or locked by a software error. The application program is not executed.
		On	The Lexium Controller is in RUN state. The application program is executed.
ERR	Red	Off	No fault
		Flashing	Minor Lexium Controller fault or application fault (event-triggered task cycle time too long, encoder supply fault, etc.).
		On	Lexium Controller hardware fault or serious application fault (watchdog, etc.)
PWS	Yellow	Off	Lexium Controller off
		On	Lexium Controller on

PROFIBUS (LMC20A 1307) LEDs

Refer to the PROFIBUS User's Manual

DeviceNet (LMC20A 1309) LEDs

Refer to the DeviceNet User's Manual.