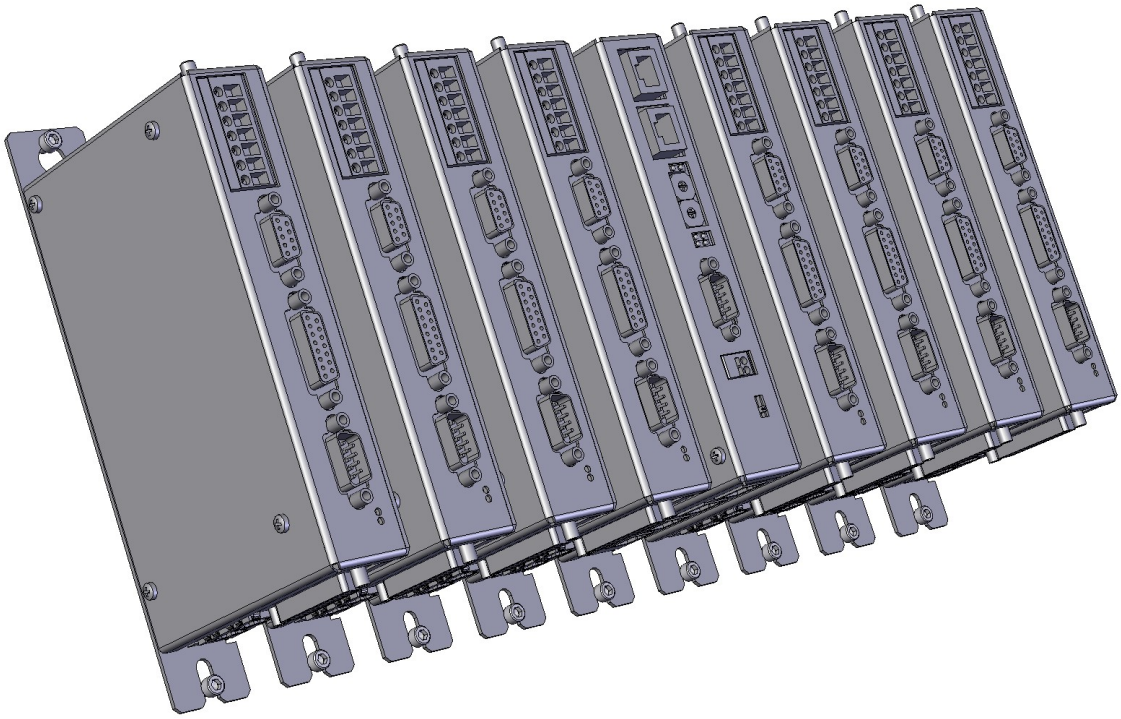
LinMot®



MotionLink System

Installation Guide

This document applies to the following controllers:

B8050-ML-PL

B8050-ML-EC

B8050-ML-IP

B8050-ML-PN

B8050-ML-SC

B1150-ML(-HC, -XC)

Document version 1.0 / mk, September 2010

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1 Installation Guide B1150-ML-xx

1.1 Important notes for B1150 series controllers

C A U T I O N !

In order to assure a safe and error free operation, and to avoid severe damage to system components, all system components must be directly attached to a single ground bus that is earth or utility grounded.

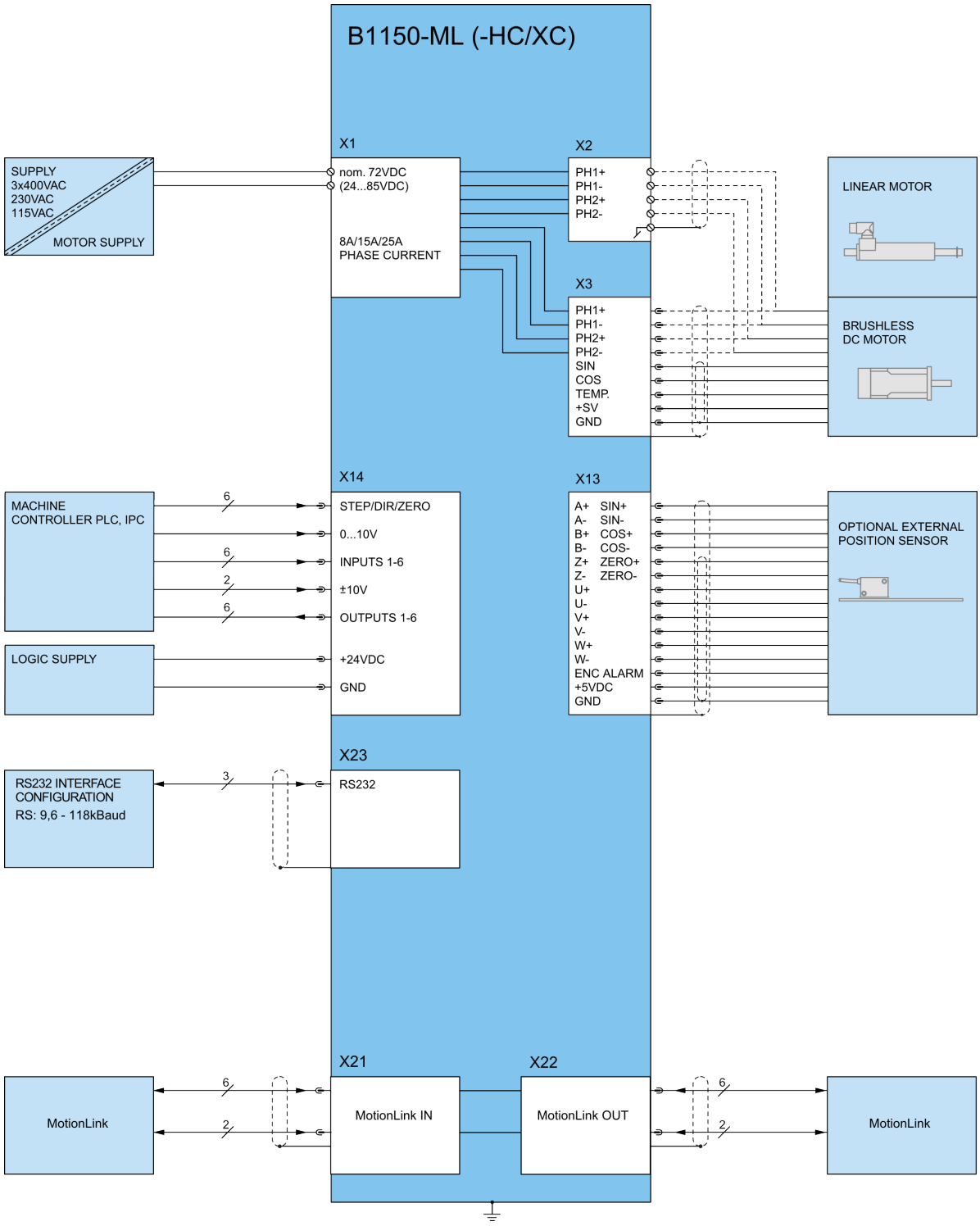
Each system component should be tied directly to the ground bus (star pattern), rather than daisy chaining from component to component. (LinMot motors are properly grounded through their power cables when connected to LinMot controllers).

All connectors must not be connected or disconnected while DC voltage is applied. Do not disconnect system components until all LinMot controllers LEDs have turned off. (Capacitors in the power supply may not fully discharge for several minutes after input voltage has been disconnected). Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or controllers.

Do not switch Power Supply DC Voltage. All power supply switching and E-Stop breaks should be done to the AC supply voltage of the power supply.

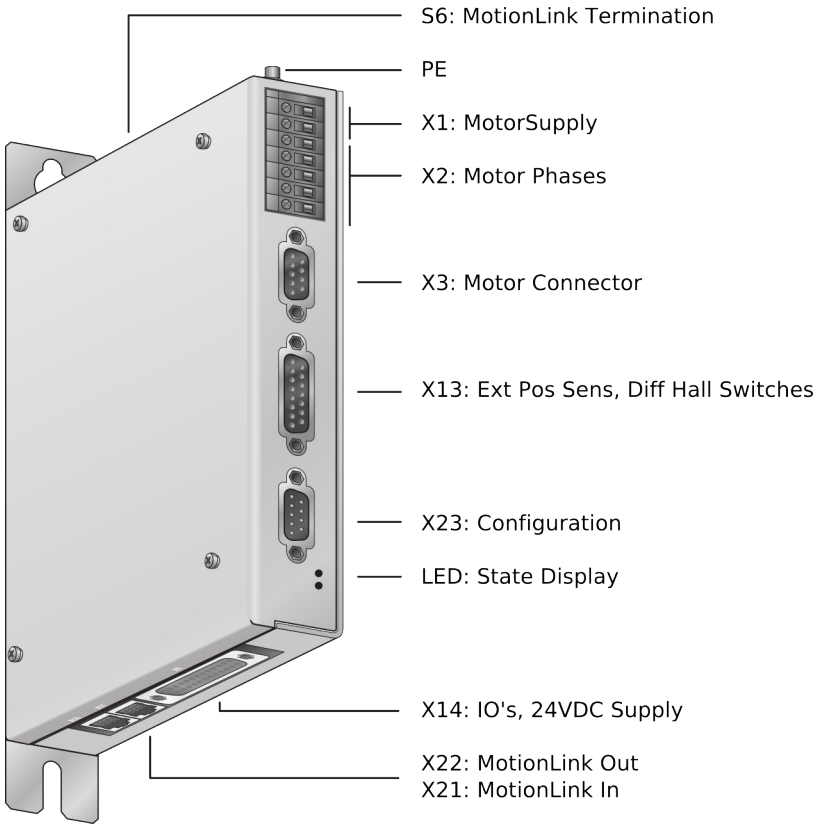
Do not connect or disconnect the motors from controllers while voltage is applied. Wait to connect or disconnect motors until all LinMot controllers LEDs have turned off. (Capacitors may not fully discharge for several minutes after power has been turned off).
Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or controllers.

1.2 System Overview



Typical servo system B1150-ML-xx: Servo controller, motor and power supply.

1.3 B1100 Interfaces



		B1150-ML-XX
Connector		
X1	Motor Supply	•
X2	Motor Phases (Screw Terminals)	•
X3	Motor / Motor Signals	•
X13	External/Simulated Position Encoder Diff Hall Switches	•
X14	6 Digital Inputs 6 Digital Outputs Analog In 0..10V Analog In –10V.. +10V Diff Step Dir zero 24V Logic Supply	•
X21	MotionLink In	•
X22	MotionLink Out	•
X23	Com / Config RS232	•
LED	State Indicator	•
S6	MotionLink Termination	•

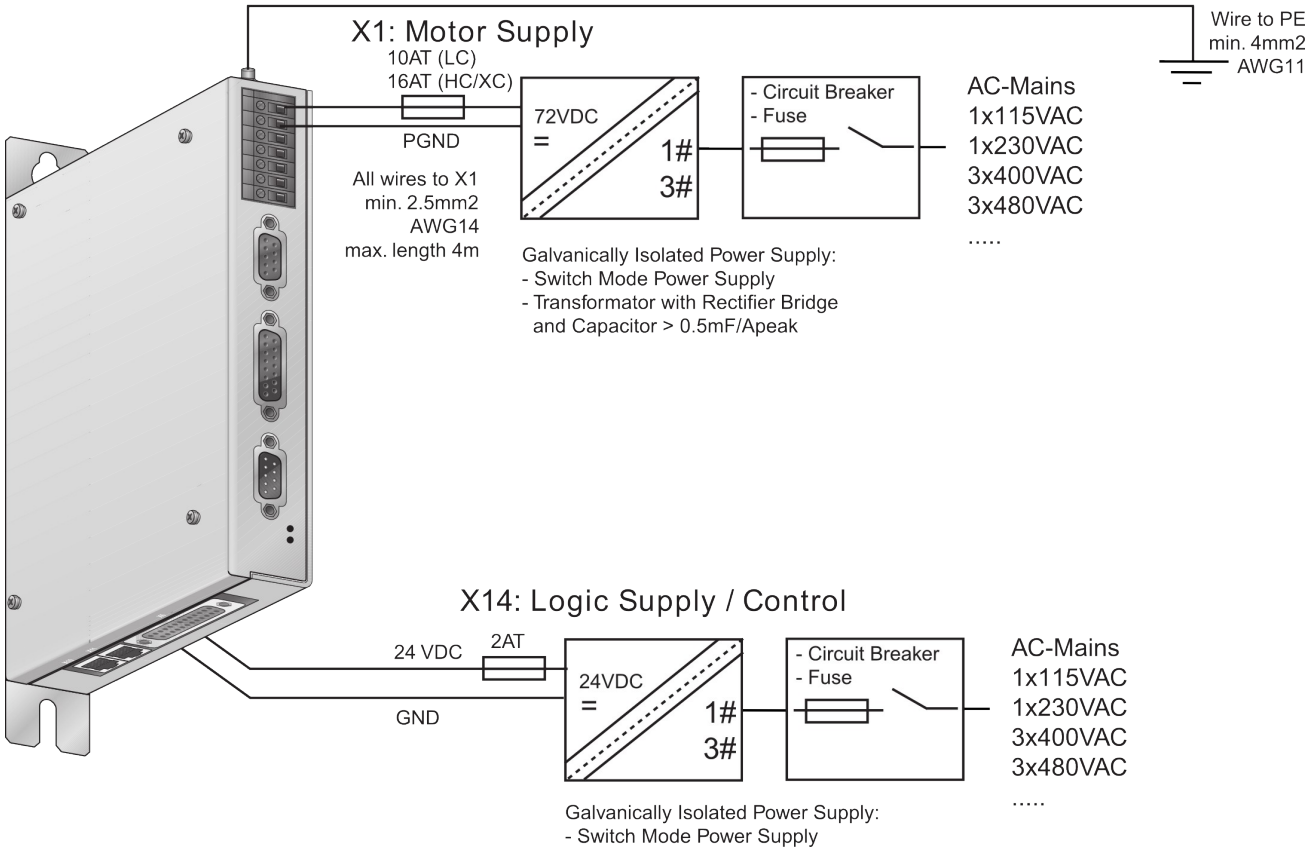
1.4 Functionality

	B1150-ML	B1150-ML-HC	B1150-ML-XC
Supply Voltage			
Motor Supply 72VDC (24...85VDC)	•	•	•
Logic Supply 24VDC (22...26VDC)	•	•	•
Motor Phase Current			
$8A_{peak}$ / $6A_{rms}$	•		
$15A_{peak}$ / $9A_{rms}$		•	
$25A_{peak}$ / $12A_{rms}$			•
Controllable Motors			
LinMot P01-23x…	•	•	•
P01-37x…	•	•	•
P01-48x…	•	•	•
DC Motors	•	•	•
Brushless DC / EC Motors	•	•	•
Command Interface			
Easy Steps Max. 6 Commands	•	•	•
+/-10V Current Command Interface	•	•	•
Step Direction Indexer Interface	•	•	•
Cmd Tab IO Interface (X14-IOs) (with EasySteps)	•	•	•
MotionLink	•	•	•
External Position Sensor			
Incremental RS422 up to 2 MHz	•	•	•
Position Indexer Input			
Step Dir Zero/ ABZ RS422 up to 2 MHz	•	•	•
Position Encoder Simulation			
AB RS422 up to 2.5 MHz	•	•	•
Configuration			
RS232 Configuration	•	•	•
MotionLink Bus-ID			
Automatically obtained via Cable Select	•	•	•

1.5 Software

The configuration software LinMot-Talk is free of charge and can be downloaded from the LinMot homepage (www.LinMot.com).

1.6 Power Supply and Grounding



In order to assure a safe and error free operation and to avoid severe damage to system components, **all system components* must be well grounded to either a single earth or utility ground.** This includes both LinMot and all other control system components to the same ground bus.

Each system component* should be tied directly to the ground bus **(star pattern)**, rather than daisy chaining from component to component. (LinMot motors are properly grounded through their power cables when connected to LinMot controllers.)

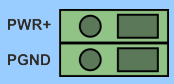
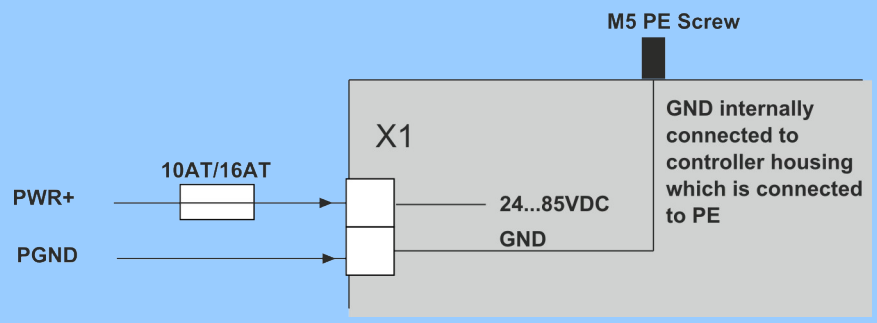
Power supply connectors must not be connected or disconnected while DC voltage is present. Do not disconnect system components until all LinMot controllers LEDs have turned off. (Capacitors in the power supply may not fully discharge for several minutes after input voltage has been disconnected). Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or controllers.

Do not switch Power Supply DC Voltage. All power supply switching and E-Stop breaks should be done to the AC supply voltage of the power supply. Failure to observe these precautions may result in severe damage to controller.

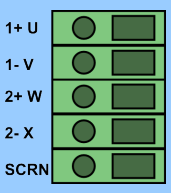
* Inside of the B1150 controller the *PWR motor GND* and *PWR signal GND* is connected together and to the GND of the controller housing. It is recommended that the *PWR motor GND* is NOT grounded at another place than inside of the controller to avoid circular currents.

1.7 Description of the connectors / Interfaces

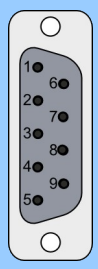
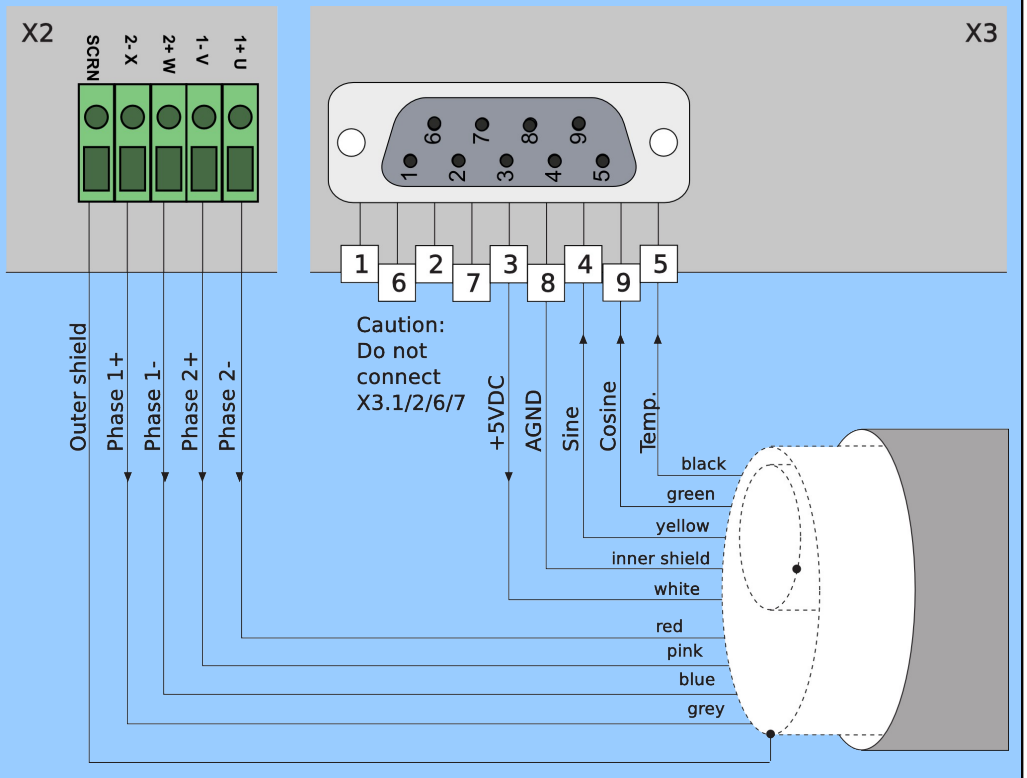
1.7.1 X1

X1	Motor Supply
	
Screw Terminals	Motor Supply: 72VDC nominal, 24...85VDC Absolute max. Rating: 72VDC +20%. External Fuse: 10AT for LC (8Apeak), 16AT for HC and XC (15A/25Apeak) servos. If motor supply voltage exceeds 90VDC, the controller will go into error state. - Tightening Torque: min 0.4Nm - Screw Thread: M 2,5 - Use 60/75°C copper conductors only - Conductor Cross-Section 2.5mm² (AWG14) max Length 4m

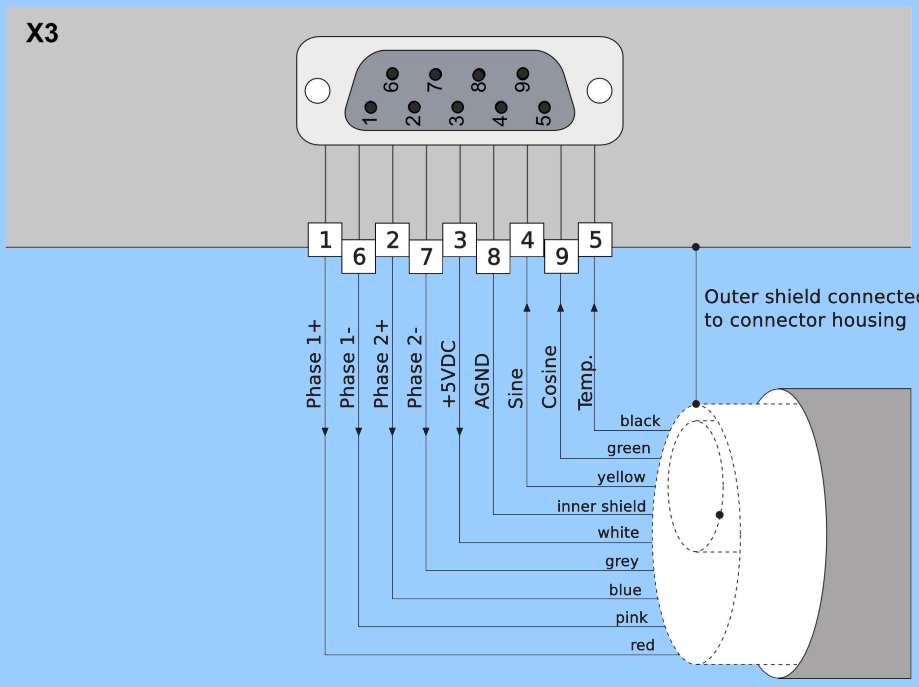
1.7.2 X2

X2	Motor Phases		
	PH1+ /U PH1- /V PH2+ /W PH2- SCRN	**LinMot Motor:** Motor Phase 1+ red Motor Phase 1- pink Motor Phase 2+ blue Motor Phase 2- grey Shield	**3-phase EC-Motor:** Motor Phase U Motor Phase V Motor Phase W
Screw Terminals	The motor phases are present at X2 and X3. It is recommended to use X2. It is only allowed to use X3 for connecting motor phases if RMS current is below 2A and peak current is below 4A. Never connect motor phases on X2 and X3! - Tightening Torque: min 0.4Nm - Screw Thread: M 2,5 - Conductor Cross-Section: max. 2.5mm² - Use 60/75°C copper conductors only		

1.7.3 X3

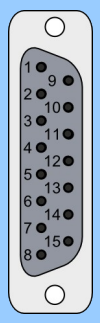
X3	Motor		
		**LinMot Motor:**	**3-phase EC-Motor:**
	1	Motor Phase 1+	
	2	Motor Phase 2+	
	3	+5VDC	+5VDC (Hall Supply)
	4	Sensor Sine	Hall 1
	5	Temp. In	Hall 3
	6	Motor Phase 1-	
	7	Motor Phase 2-	
	8	AGND	AGND (Hall Supply)
	9	Sensor Cosine	Hall 2
	case	Shield	
DSUB-9 (f)	Note: Use +5V (X3.3) and AGND (X3.8) only for motor internal hall sensor supply (max. 100mA). Caution: Do NOT connect AGND (X3.8) to ground or earth! It is only allowed to use X3 for connecting the motor phases if RMS current is below 2A and peak current below 4A.		
Motor Wiring for Phase Currents above 2A RMS or 4A peak (recommended general wiring)			
			
	Important: **If motor phase current exceeds $2A_{RMS}$ or $4A_{peak}$, motor phases must be wired to X2!**		

Motor wiring for Phase Currents below 2A RMS and 4A peak

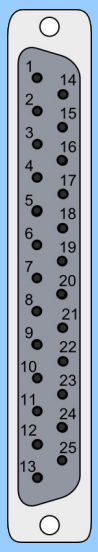
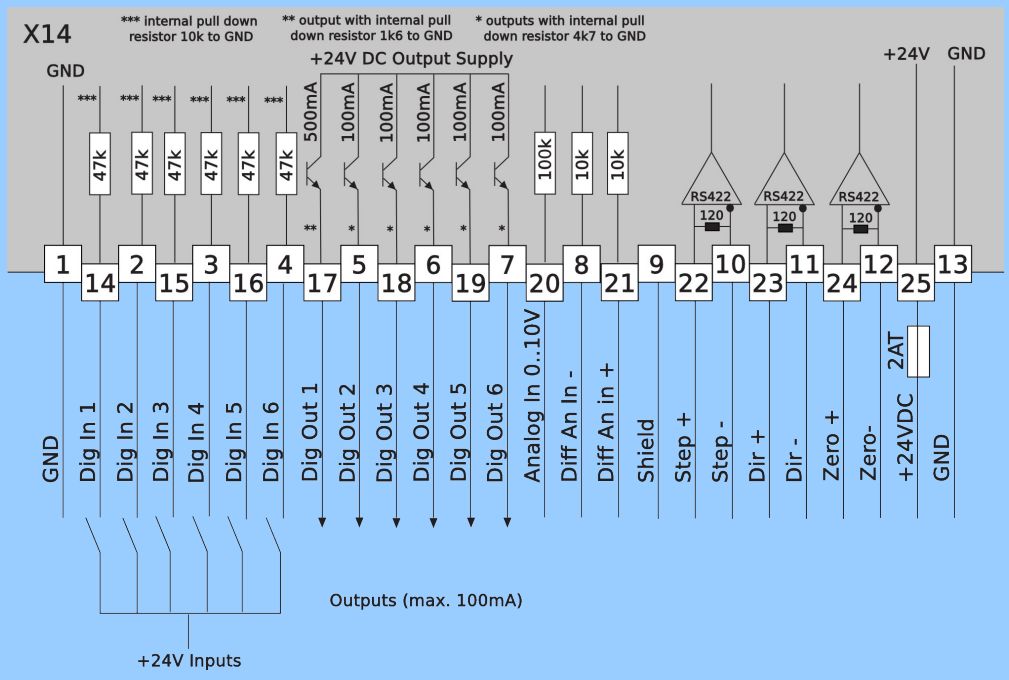


Important:
Motor phases may only be connected to X3 if RMS current is below 2A and peak current is below 4A!

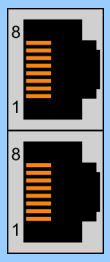
1.7.4 X13

X13	External Position Sensor Differential Hall Switches	
	1	+5V DC
	9	A+
	2	A-
	10	B+
	3	B-
	11	Z+
	4	Z-
	12	Encoder Alarm
	5	GND
	13	U+
	6	U-
	14	V+
	7	V-
	15	W+
	8	W-
	case	Shield
DSUB-15 (f)	Position Encoder Inputs (RS422): Max Input Frequency: 2MHz, 4 M counts/s with quadrature decoding, 240ns edge separation Encoder Simulation Outputs (RS422): Max Output Frequency: 2.5MHz, 5 M counts/s with quadrature decoding, 200ns edge separation Differential Hall Switch Inputs (RS422): Input Frequency: <1kHz Enc. Alarm In: 5V / 1mA Sensor Supply: 5VDC max 100mA	

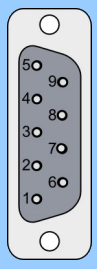
1.7.5 X14

X14	24VDC Supply and IOs
	
DSUB-25 (f)	Logic Supply: Switch Mode Power Supply: 24VDC (22...26VDC) External Fuse: 2AT All Digital Inputs: Direct interfacing to digital 24VDC PLC outputs. Input Current: 1mA Logic Levels: Low Level: guaranteed: -5 to 5VDC, typically < 8VDC High Level guaranteed: 20..30VDC, typically > 16VDC Sample Rate: 400us All Digital Outputs: Short circuit and overload protected high side switches. Voltage: 24VDC Update Rate: 400us Max. Current: 100mA / 500mA for X14.17 Peak Current: 370mA / 1100mA for X14.17 Outputs may directly drive inductive loads. Do not connect any capacity because of the peak current! Analog Input on X14.20: Range: 0V..+10V 10Bit ADC Sample Rate: 400us Differential Analog Input on X14.8 X14.21 X14.9 Shield: Range: -10V..+10V 10Bit ADC Sample Rate: 400us Differential Step Dir Zero: Indexer Inputs: RS422, Max. Input Frequency: 2MHz, 4 M counts/s with quadrature decoding, 240ns edge separation

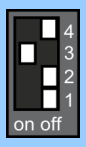
1.7.6 X21-X22

X21 - X22	MotionLink	
	1 2 3 4 5 6 7 8 case	ML1+ ML1- ML2+ Cable Select GND ML2- ML3+ ML3- Shield
RJ-45	Use MotionLink cables (Art.-No. 0150-3308)	

1.7.7 X23

X23	RS Config	
	1 2 3 4 5 6 7 8 9 case	(Do not connect) RS232_Tx RS232_Rx (Do not connect) GND (Do not connect) (Do not connect) (Do not connect) (Do not connect) Shield
DSUB-9 (m)	RS232:	Configuration on all controllers: use 1:1 connection cable to PC with only Pins 2,3 and 5 connected. Use LinMot RS Config Cable (Art.-No. 0150-3307)

1.7.8 S6

S6	MotionLink Termination	
	S6	Switch 4: Bootstrap Switch 3: Termination A on/off Switch 2: Termination B on/off Switch 1: Not used Factory settings: Switch 3 “on”, all other switches “off”

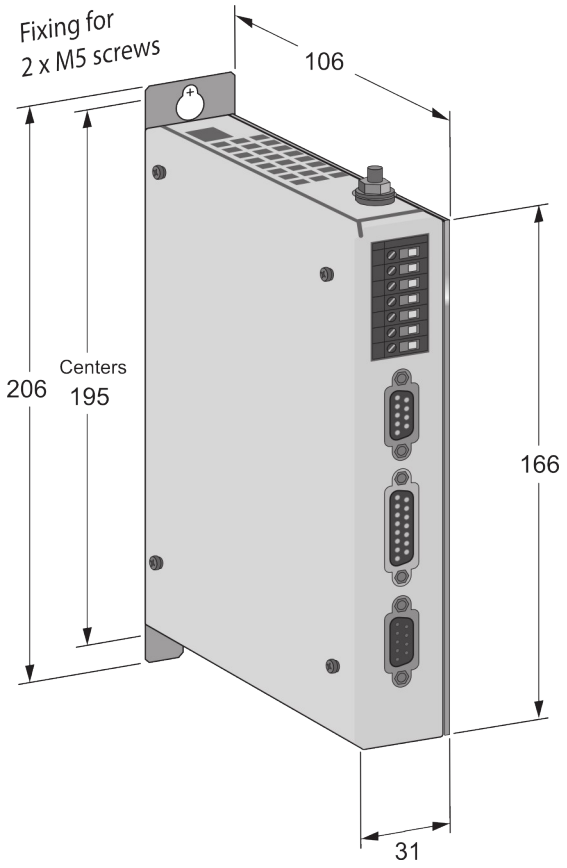
1.7.9 LED

LED	State Display	
	Green Red	24V Logic Supply OK Error

1.8 MotionLink Termination Settings

Termination A (S6.3) has to be set on every B1150 controller of a MotionLink connection.

1.9 Physical Dimension



***B1150** Single axis controller*		
Width	mm (in)	31 (1.3)
Height	mm (in)	166 (6.6)
Height with fixings	mm (in)	206 (8.1)
Depth	mm (in)	106 (4.2)
Weight	g (lb)	700 (1.6)
Case	IP	20
Storage Temperature	°C	-25…40
Transport Temperature	°C	-25…70
Operating Temperature	°C	0…40 at rated data 40…50 with power derating
Relative humidity		95% (non-condensing)
Max. Case Temperature	°C	70
Max. Power Dissipation	W	30
Distance between Controllers	mm (in)	15 (0.8) left/right 50 (2) top 100 (4) bottom 90 (3.5) front

1.10 Power Supply Requirement

Motor Power Supply

The calculation of the needed power for the motor supply depends on the application and the used motor. The nominal supply voltage is 72 VDC. The possible range is from 24 to 85 VDC.

ATTENTION: The motor supply can rise up to 95 VDC when braking. This means that everything connected to that power supply needs a voltage rating of 100 VDC. (Additional capacitors, etc…)

To provide short circuit power limitation, it is required to use an external fuse (10AT for blank labeled (LC) and 16AT for HC and XC labeled controllers).

Recommended Power supplies:

Item	Description	Art. No.
T01-72/420	72VDC, 15A peak, 420VA, 3x400VAC	0150-1966
T01-72/420-US	72VDC, 15A peak, 420VA, 3x230VAC	0150-1967
T01-72/900	72VDC, 30A peak, 900VA, 3x400VAC	0150-1842
T01-72/900-US	72VDC, 30A peak, 900VA, 3x230VAC	0150-1843
T01-72/1500	72VDC, 2x30A peak, 1500VA, 3x400VAC	0150-1844
T01-72/1500-US	72VDC, 2x30A peak, 1500VA, 3x230VAC	0150-1845
S01-72/500	72VDC, 500W, 750W peak, 1x100..120VAC/200..240VAC	0150-1874
S01-72/1000	72VDC, 1000W, 2000W peak, 3x380..500VAC	0150-1872

Signal Power Supply

The logic supply needs a regulated power supply with a nominal voltage of 24 VDC. The voltage must be between 22 and 26 VDC.

Current Consumption

Min. 200mA (no load on the outputs)
Typ. 0.5A (all 6 outputs “on” with 50mA load and /Break with no load)
Max. 1.2A (all 6 outputs “on” with 100mA load and /Break with 0.5A load)

**To limit the power in case of malfunction,
it is required to use an external fuse (2AT)!**

1.11 Ordering Information

Servo Controller	Description		Art. No.
B1150-ML	MotionLink Controller	72VDC / 8A	0150-1796
B1150-ML-HC	MotionLink Controller	72VDC / 15A	0150-1797
B1150-ML-XC	MotionLink Controller	72VDC / 25A	0150-1798
Accessories	**Description**		**Art. No.**
RS232 Config Cable	AC01-Df/Df-2-RS1 RS232 Config Cable DSUB9 f/f 2m (2-2/3-3/5-5)		0150-3307
Motion Link Cable	AC01-RJ45/RJ45-0.2-ML1 MotionLink Cable 0.2m		0150-3308

1.12 International Certifications

Certifications	
Europe CE	See chapter “1.13 Declaration of Conformity CE-Marking“

1.13 Declaration of Conformity CE-Marking

Manufacturer: NTI AG *LinMot* ®
Haerdlistrasse 15
8957 Spreitenbach
Switzerland
Tel.: +41 (0)56 419 91 91
Fax: +41 (0)56 419 91 92

Products: *LinMot* ® Controllers

Type	Art.-No.	Type	Art-No.	Type	Art.-No.
B1150-ML	0150-1796				
B1150-ML-HC	0150-1797				
B1150-ML-XC	0150-1798				

The product must be mounted and used in strict accordance with the installation instruction contained within the Installation Guide, a copy of which may be obtained from NTI Ltd.

I declare that as the authorized representative, the above information in relation to the supply/manufacture of this product is in conformity with the stated standards and other related documents in compliance with the protection requirements of the Electromagnetic Compatibility (EMC) Directive 2004/108/EC.

Standards Complied with:

EN 61000-6-2			Immunity for industrial environment
	EN 61000-4-2	Class B	Electrostatic discharge immunity (ESD)
	EN 61000-4-3	Class A	Radiated electromagnetic field immunity
	EN 61000-4-4	Class B	Fast transients / burst immunity (EFT)
	EN 61000-4-5	Class B	Slow transients immunity (Surges)
	EN 61000-4-6	Class A	Conducted radio frequency immunity
EN 61000-6-4			**Emission for industrial environment**
	EN 55022	Class A	Radiated Emission

Company
NTI Ltd.

Spreitenbach, September 07, 2010

R. Rohner / CEO NTI AG

2 Installation Guide B8050-ML-xx

2.1 Important notes for B8000 series controllers

C A U T I O N !

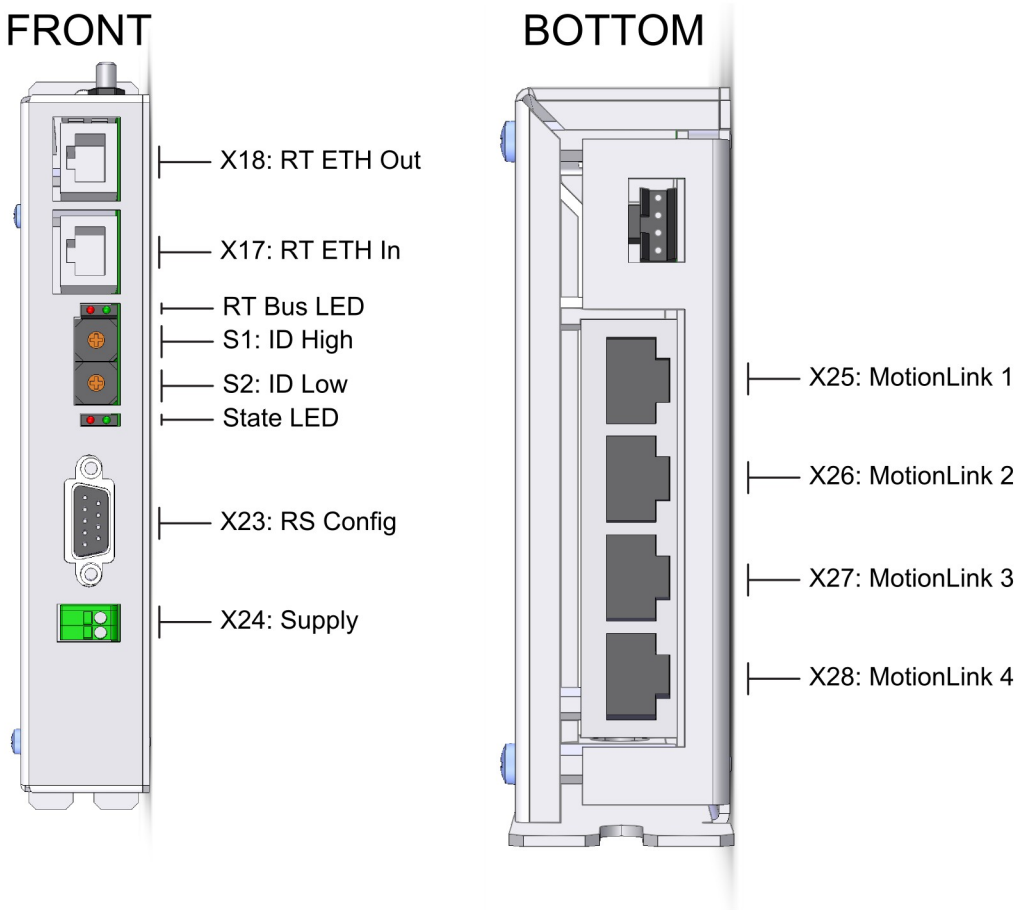
In order to assure a safe and error free operation, and to avoid severe damage to system components, all system components must be directly attached to a single ground bus that is earth or utility grounded (see chapter Power Supply and Grounding).

Each system component should be tied directly to the ground bus (star pattern), rather than daisy chaining from component to component. (see chapter Power Supply and Grounding).

All connectors must not be connected or disconnected while DC voltage is applied. Do not disconnect system components until all LinMot controller LEDs have turned off. (Capacitors in the power supply may not fully discharge for several minutes after input voltage has been disconnected). Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or controllers.

Do not switch Power Supply DC Voltage. All power supply switching and E-Stop breaks should be done to the AC supply voltage of the power supply.

2.2 B8000 Interfaces



		B8050-ML-XX
Connector		
X17	RT ETH In	•
X18	RT ETH Out	•
X23	RS Config	•
X24	Supply	•
X25	MotionLink 1	•
X26	MotionLink 2	•
X27	MotionLink 3	•
X28	MotionLink 4	•
RT Bus LED	RT Bus Indicator	•
State LED	State Indicator	•
S1	ID Switch High	•
S2	ID Switch Low	•

2.3 Functionality

	B8050-ML-PL	B8050-ML-PN	B8050-ML-SC	B8050-ML-IP	B8050-ML-EC
Supply Voltage					
Logic Supply 24VDC (22...26VDC)	•	•	•	•	•
Command Interface					
POWERLINK	•				
PROFINET		•			
SERCOS III			•		
ETHENET IP				•	
ETHERCAT					•
Motion Interface					
MotionLink	•	•	•	•	•
Configuration Interface					
RS232	•	•	•	•	•

2.4 MotionLink Multi-Axes Cabling

All components of a MotionLink system must be referenced to the same ground! The same 24VDC supply must be used for all components!

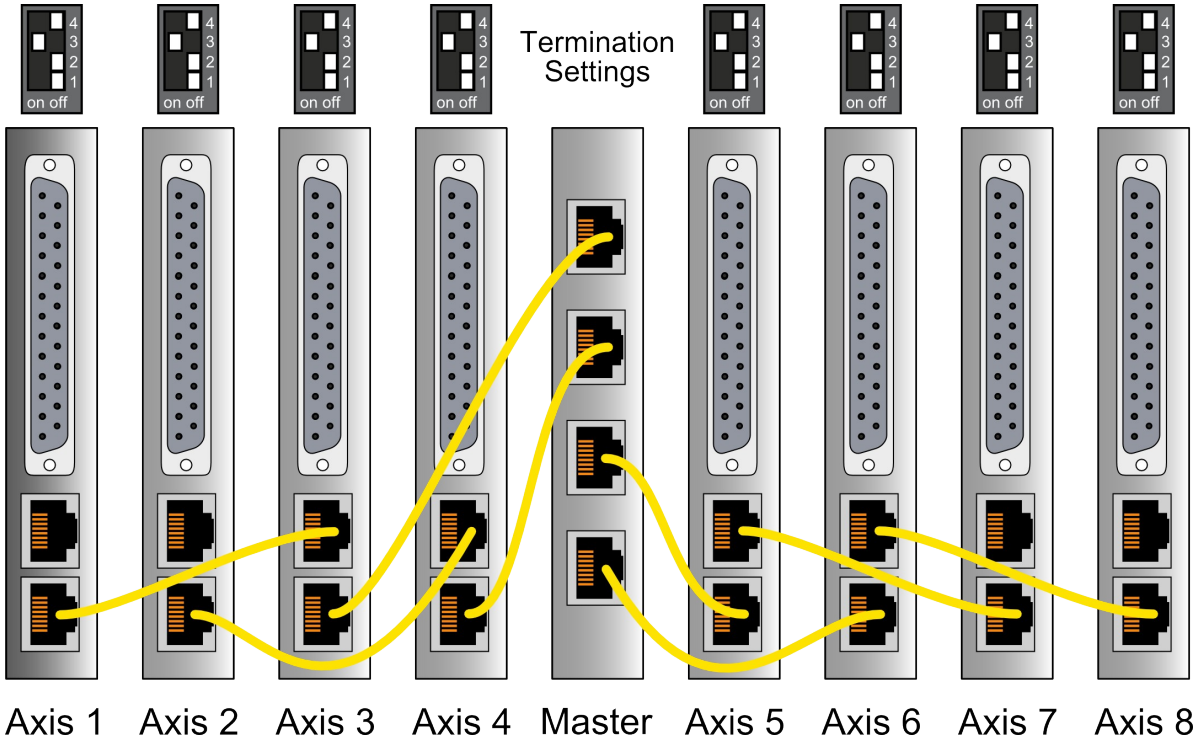
Use only LinMot MotionLink cable (Art.-No. 0150-3308) to connect MotionLink devices! Longer cables must not be used!

For configuration via RS232 use 1:1 connection cable to PC with only Pins 2, 3 and 5 connected!
Use LinMot RS Config Cable (Art.-No. 0150-3307).

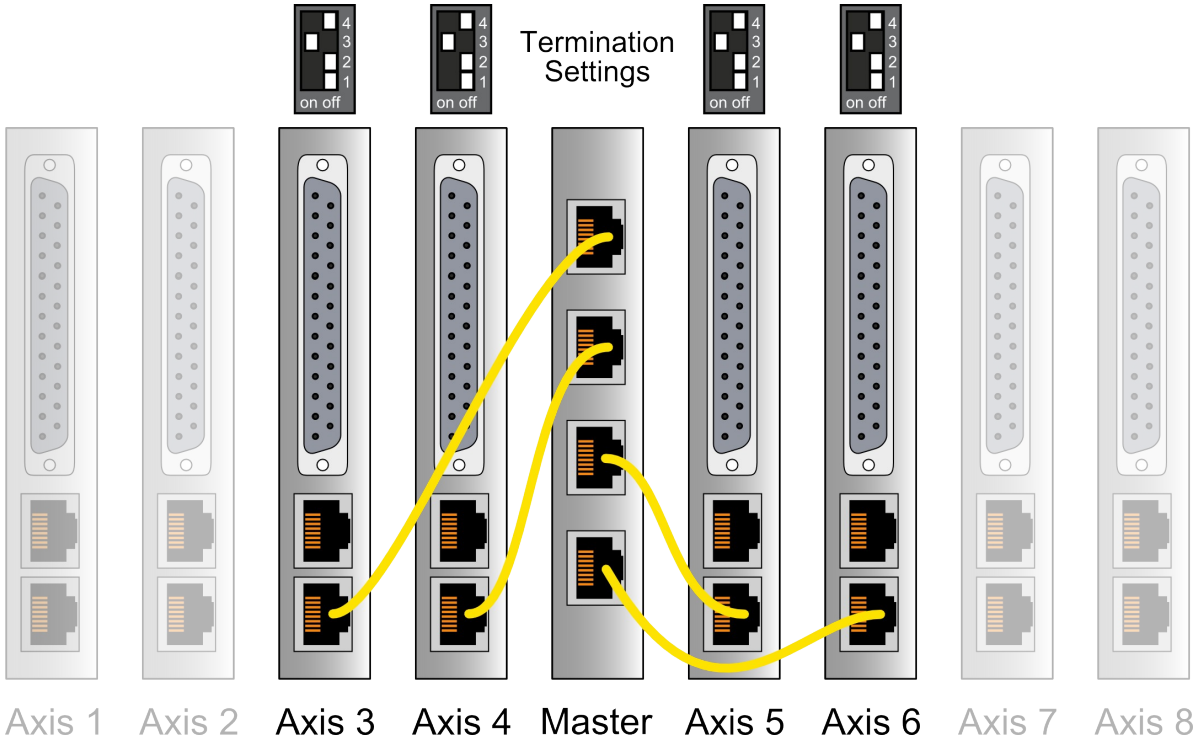
Cabling has to be done exactly as depicted in this chapter!

Do not connect more than two devices per MotionLink connector!

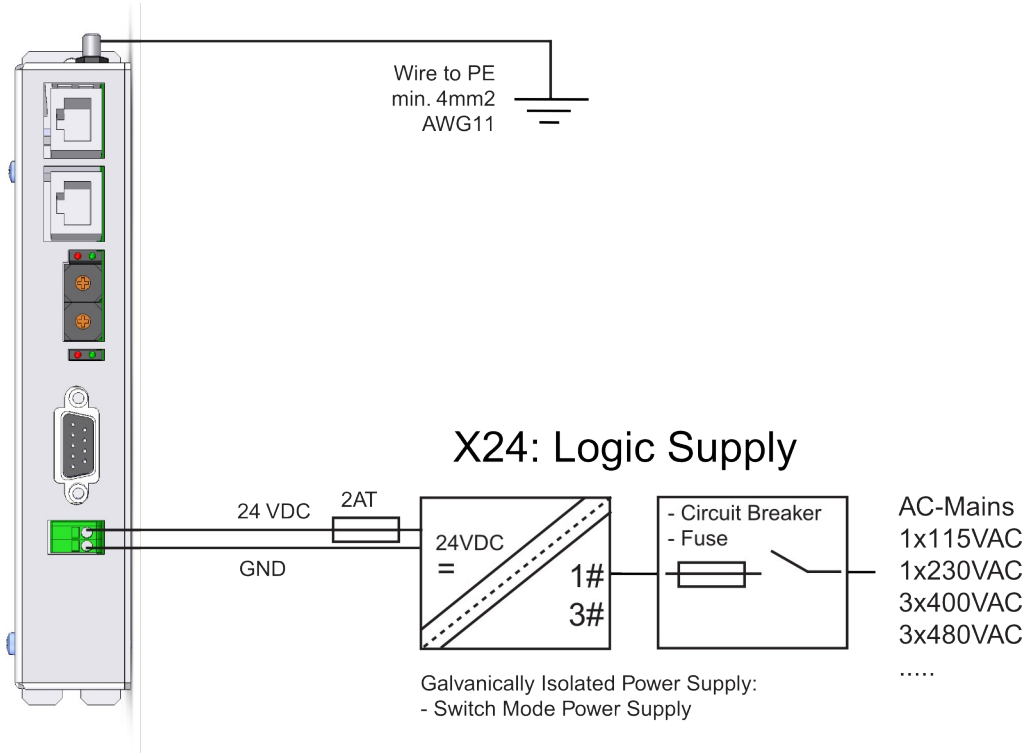
2.4.1 8 Axes System



2.4.2 4 Axes System



2.5 Power Supply and Grounding



In order to assure a safe and error free operation, and to avoid severe damage to system components, **all system components must be well grounded to either a single earth or utility ground.** This includes both LinMot and all other control system components to the same ground bus.

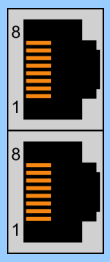
Each system component should be tied directly to the ground bus **(star pattern)**, rather than daisy chaining from component to component.

Power supply connectors must not be connected or disconnected while DC voltage is present. Do not disconnect system components until all LinMot controller LED's have turned off. (Capacitors in the power supply may not fully discharge for several minutes after input voltage has been disconnected). Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or controllers.

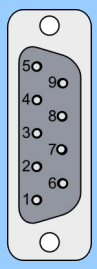
Do not switch Power Supply DC Voltage. All power supply switching and E-Stop breaks should be done to the AC supply voltage of the power supply. Failure to observe these precautions may result in severe damage to controller.

2.6 Description of the connectors / Interfaces

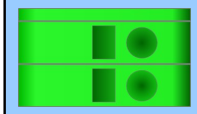
2.6.1 X17-X18

X17 - X18	RealTime Ethernet 10/100Mbit/s	
	X17 RT ETH In X18 RT ETH Out	Specification depends on RT-Bus type. Please refer to according documentation.

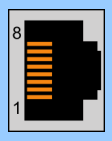
2.6.2 X23

X23	RS Config	
	1 2 3 4 5 6 7 8 9 case	(Do not connect) RS232_Tx RS232_Rx (Do not connect) GND (Do not connect) (Do not connect) (Do not connect) (Do not connect) Shield
DSUB-9 (m)	RS232:	Configuration on all controllers: use 1:1 connection cable to PC with only Pins 2,3 and 5 connected. Use LinMot RS Config Cable (Art.-No. 0150-3307)

2.6.3 X24

X24	Supply	
	2 1	+24VDC Supply (22 – 26VDC) GND Supply
Phoenix, SPT 1,5/2-H-3,5	Supply 24V / typ. 150mA - Stripping Length: 10mm - Connection in acc. with standard: EN-VDE - Use 60/75°C copper conductors only - Conductor cross-section max. 1.5mm^2	

2.6.4 X25 - X28

X25 - X28	MotionLink 1 (X25) / MotionLink 2 (X26) / MotionLink 3 (X27) / MotionLink 4 (X28)	
	1 2 3 4 5 6 7 8 case	MLConn 1 MLConn 2 MLConn 3 MLConn 4 MLConn 5 MLConn 6 MLConn 7 MLConn 8 Shield
RJ-45	 **Use only LinMot MotionLink cable 0.2m for cabling! (0150-3308)** **Longer cables must not be used!** All devices, which are connected to X25 / X26 / X27 / X28 must be referenced to the same ground! 	

2.6.5 S1 - S2

S1 - S2	Address Selectors	
	S1	Bus ID High (0 … F)
	S2	Bus ID Low (0 … F)
	The use of these switches depends on the type of fieldbus which is used. Please see the corresponding manual for further information.	

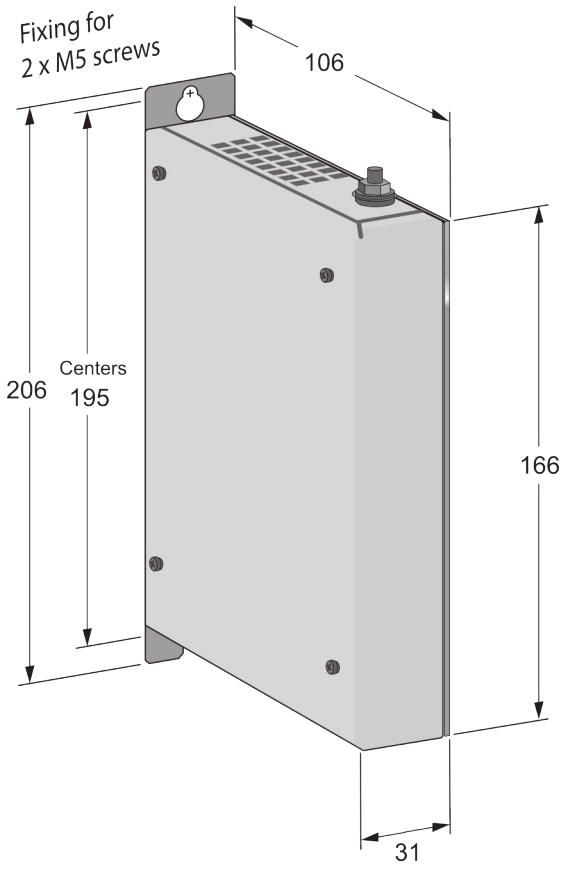
2.6.6 LED

LED	State Display	
	Green Red	24V Logic Supply OK Error

2.6.7 RT BUS LED

RT Bus LED	RT Bus State Display	
	Green Red	OK Error
	The use of these LEDs depends on the type of fieldbus which is used. Please see the corresponding manual for further information.	

2.7 Physical Dimension



B8000 Series *MotionLink controller*		
Width	mm (in)	31 (1.3)
Height	mm (in)	166 (6.6)
Height with fixings	mm (in)	206 (8.1)
Depth	mm (in)	106 (4.2)
Weight	g (lb)	650 (1.5)
Case	IP	20
Storage Temperature	°C	-25…40
Transport Temperature	°C	-25…70
Operating Temperature	°C	0…40 at rated data
Relative humidity		95% (non-condensing)
Max. Case Temperature	°C	70
Max. Power Dissipation	W	6
Distance between Controllers	mm (in)	15 (0.8) left/right 50 (2) top 100 (4) bottom 90 (3.5) front

2.8 Power Supply Requirement

Signal Power Supply

The logic supply needs a regulated power supply with a nominal voltage of 24 VDC. The voltage must be between 22 and 26 VDC.

Current Consumption

Min. 100mA
Typ. 150mA
Max. 250mA

2.9 Ordering Information

Servo Controller	Description	Art. No.
B8050-ML-PL	POWERLINK MotionLink Master	0150-1877
B8050-ML-EC	ETHERCAT MotionLink Master	0150-1878
B8050-ML-IP	ETHERNET IP MotionLink Master	0150-1879
B8050-ML-PN	PROFINET MotionLink Master	0150-1880
B8050-ML-SC	SERCOS III MotionLink Master	0150-1881
Accessories	**Description**	**Art. No.**
RS232 Config Cable	AC01-Df/Df-2-RS1 RS232 Config Cable DSUB9 f/f 2m (2-2/3-3/5-5)	0150-3307
Motion Link Cable	AC01-RJ45/RJ45-0.2-ML1 MotionLink Cable 0.2m	0150-3308

2.10 International Certifications

Certifications	
Europe CE	See chapter “2.11 Declaration of Conformity CE-Marking“

2.11 Declaration of Conformity CE-Marking

Manufacturer: NTI AG *LinMot* ®
Haerdlistrasse 15
8957 Spreitenbach
Switzerland
Tel.: +41 (0)56 419 91 91
Fax: +41 (0)56 419 91 92

Products: *LinMot* ® Controllers

Type	Art.-No.	Type	Art-No.	Type	Art.-No.
B8050-ML-PL	0150-1877	B8050-ML-PN	0150-1880		
B8050-ML-EC	0150-1878	B8050-ML-SC	0150-1881		
B8050-ML-IP	0150-1879				

The product must be mounted and used in strict accordance with the installation instruction contained within the Installation Guide, a copy of which may be obtained from NTI Ltd.

I declare that as the authorized representative, the above information in relation to the supply/manufacture of this product is in conformity with the stated standards and other related documents in compliance with the protection requirements of the Electromagnetic Compatibility (EMC) Directive 2004/108/EC.

Standards Complied with:

EN 61000-6-2			**Immunity for industrial environment**
	EN 61000-4-2	Class B	Electrostatic discharge immunity (ESD)
	EN 61000-4-3	Class A	Radiated electromagnetic field immunity
	EN 61000-4-4	Class B	Fast transients / burst immunity (EFT)
	EN 61000-4-5	Class B	Slow transients immunity (Surges)
	EN 61000-4-6	Class A	Conducted radio frequency immunity
EN 61000-6-4			**Emission for industrial environment**
	EN 55022	Class A	Radiated Emission

Company
NTI Ltd.

Spreitenbach, September 07, 2010

R. Rohner / CEO NTI AG

3 Contact Addresses

SWITZERLAND

NTI AG
Haerdlistr. 15
CH-8957 Spreitenbach

Sales and Administration:	+41-(0)56-419 91 91 office@linmot.com
Tech. Support:	+41-(0)56-544 71 00 support@linmot.com
Tech. Support (Skype) :	skype:support.linmot
Fax:	+41-(0)56-419 91 92
Web:	http://www.linmot.com/

USA

LinMot, Inc.
5750 Townline Road
Elkhorn, WI 53121

Sales and Administration:	877-546-3270 262-743-2555
Tech. Support:	877-804-0718 262-743-1284
Fax:	800-463-8708 262-723-6688
E-Mail:	us-sales@linmot.com
Web:	http://www.linmot-usa.com/

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