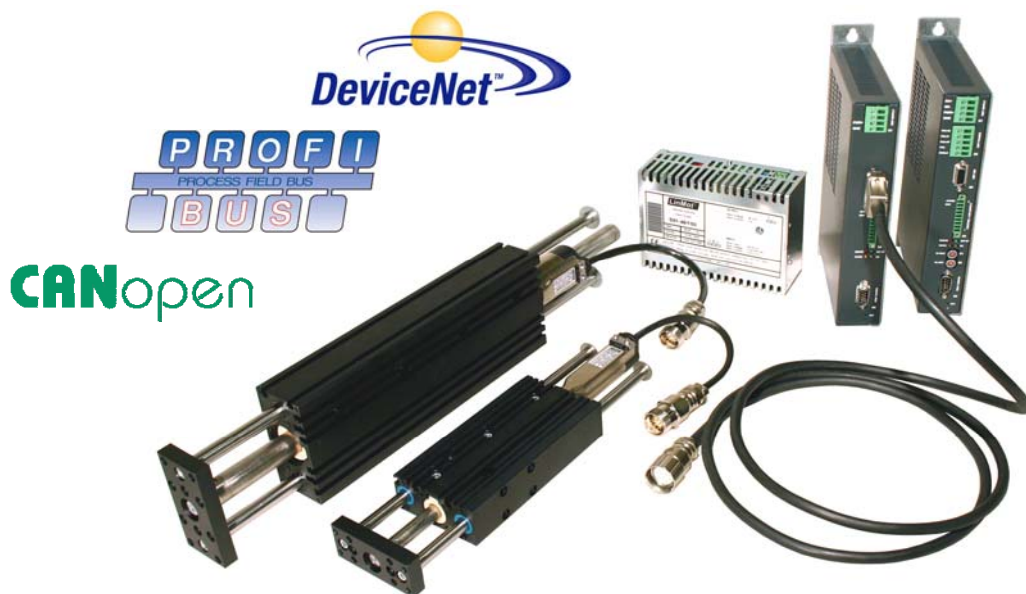

LinMot®



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Servo Controller Installation Guide

E1100-CO(-HC), E1100-DN(-HC), E1130-DP(-HC), E1100-GP(-HC), E1100-RS(-HC)

Document version: 1.0f / FM 04.01.2007

Important notes for E1100 series controllers**CAUTION!**

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. (LinMot motors are properly grounded through their power cables when connected to LinMot controllers) (see chapter Power Supply and Grounding).



All 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 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 with voltage present. Wait to connect or disconnect motors until all LinMot controllers LED's 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.

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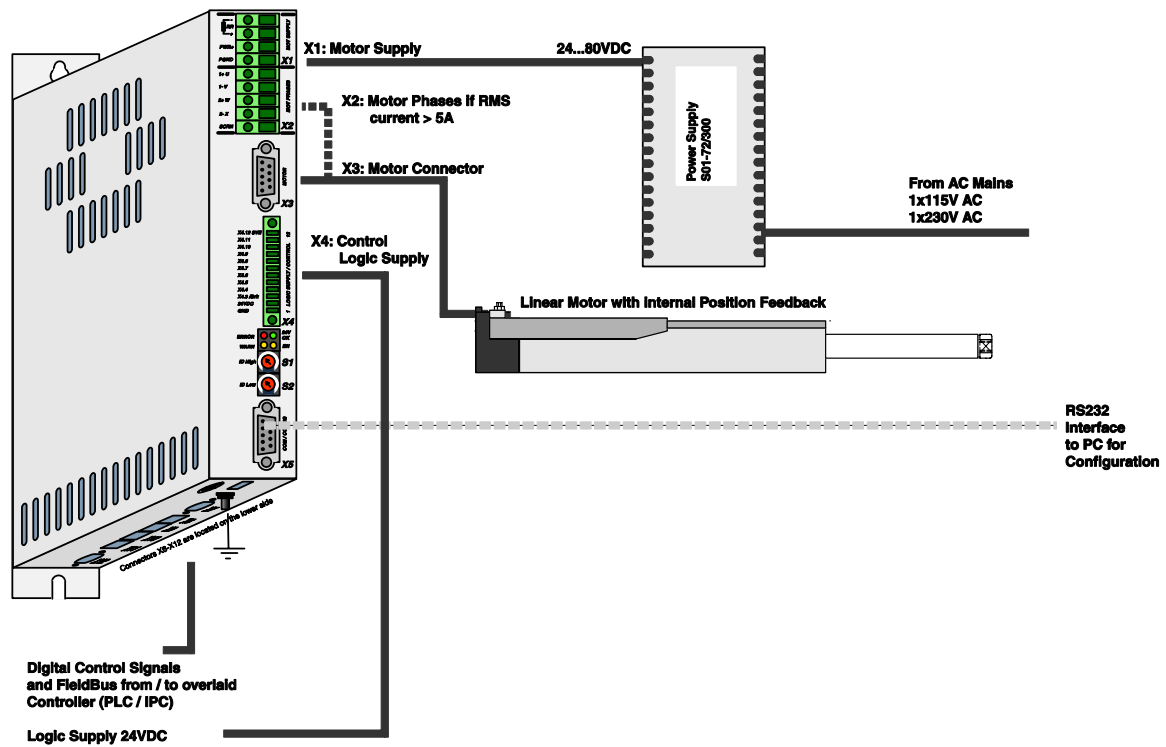
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Note

The information in this documentation reflects the stage of development at the time of press and is therefore without obligation.

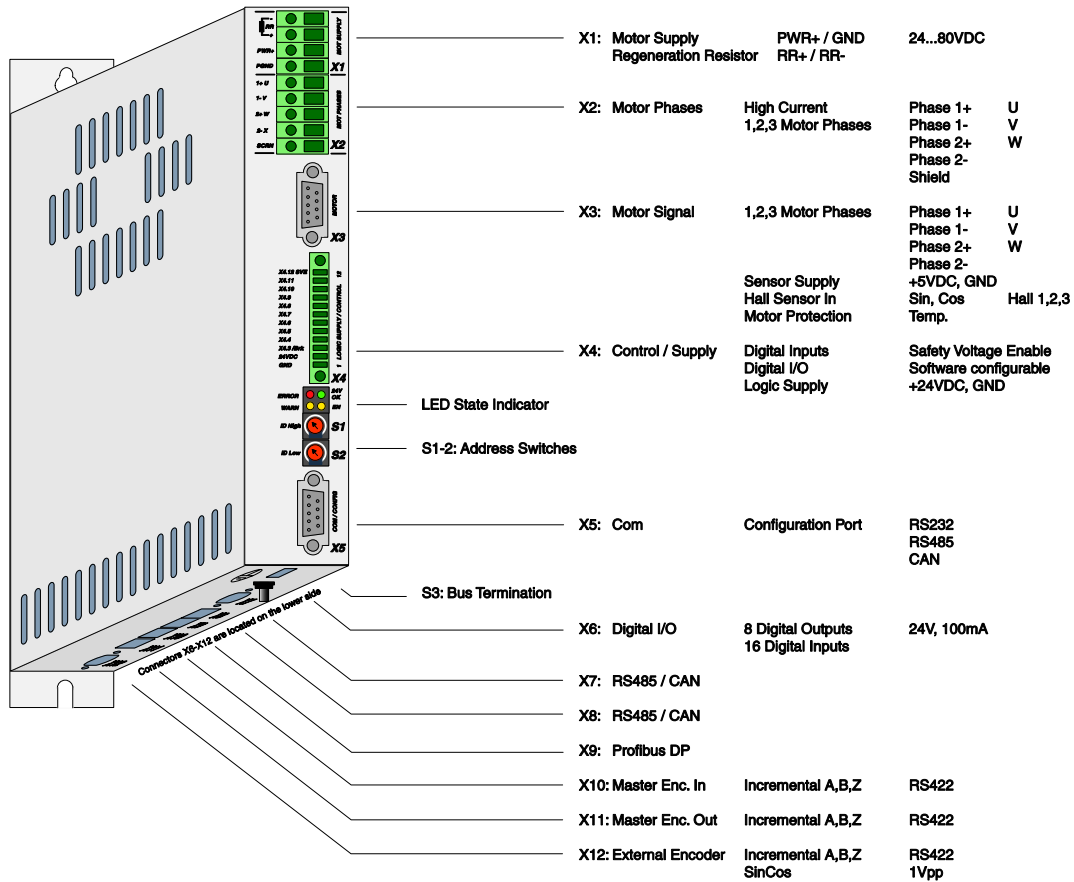
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System Overview



Typical Servo System E1100-XX: Servo Controller, Linear Motor and Power Supply.

E1100 Interfaces

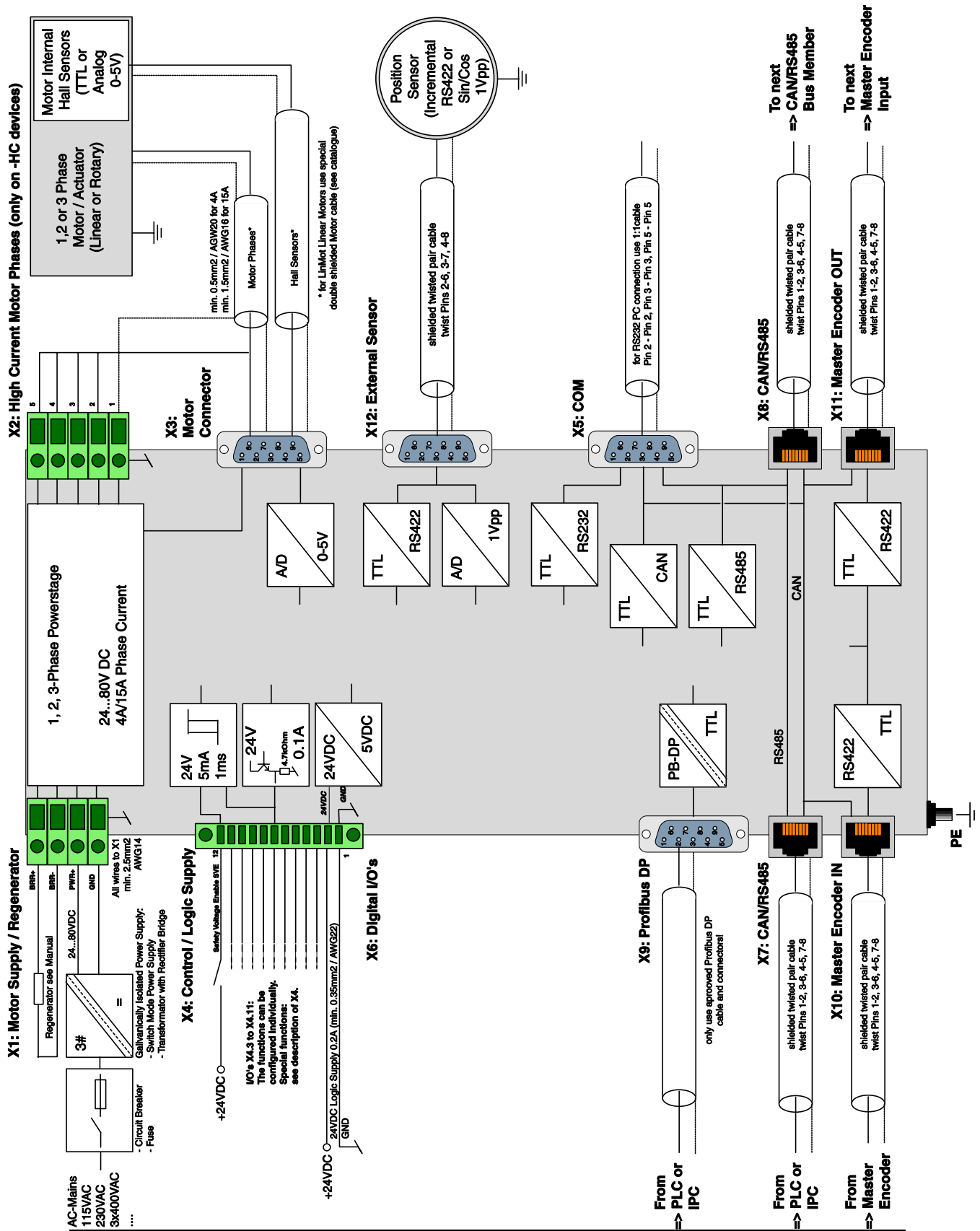


		E1100-MP	E1100-MP-HC	E1100-MT	E1100-MT-HC	E1100-RS	E1100-RS-HC	E1100-CO	E1100-CO-HC	E1100-DN	E1100-DN-HC	E1130-DP	E1130-DP-HC	E1100-GP	E1100-GP-HC
Connector															
X1	Motor Supply	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Regeneration Resistor	•	•	•	•	•	•	•	•	•	•	•	•	•	•
X2	Motor Phases (Screw Terminals)		•	•	•	•	•	•	•	•	•	•	•	•	•
X3	Motor / Motor Signals	•	•	•	•	•	•	•	•	•	•	•	•	•	•
X4	Logic Supply / Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•
X5	Com	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	RS232			•	•	•	•	•	•	•	•	•	•	•	•
	RS485			•	•	•	•	•	•	•	•	•	•	•	•
	CAN			•	•	•	•	•	•	•	•	•	•	•	•
X6	Digital I/O	•	•	•	•									•	•
X7	RS485 / CAN In					•	•	•	•	•	•	•	•		
X8	RS485 / CAN Out					•	•	•	•	•	•	•	•		
X9	PROFIBUS DP											•	•		
X10	Master Encoder In			•	•	•	•	•	•	•	•	•	•	•	•
X11	Master Encoder Out			•	•	•	•	•	•	•	•	•	•	•	•
X12	External Position Encoder			•	•	•	•	•	•	•	•	•	•	•	•
LED	State Indicator	•	•	•	•	•	•	•	•	•	•	•	•	•	•
S1	Switch High			•	•	•	•	•	•	•	•	•	•	•	•
S2	Switch Low			•	•	•	•	•	•	•	•	•	•	•	•
S3	Bus Termination			•	•	•	•	•	•	•	•	•	•	•	•

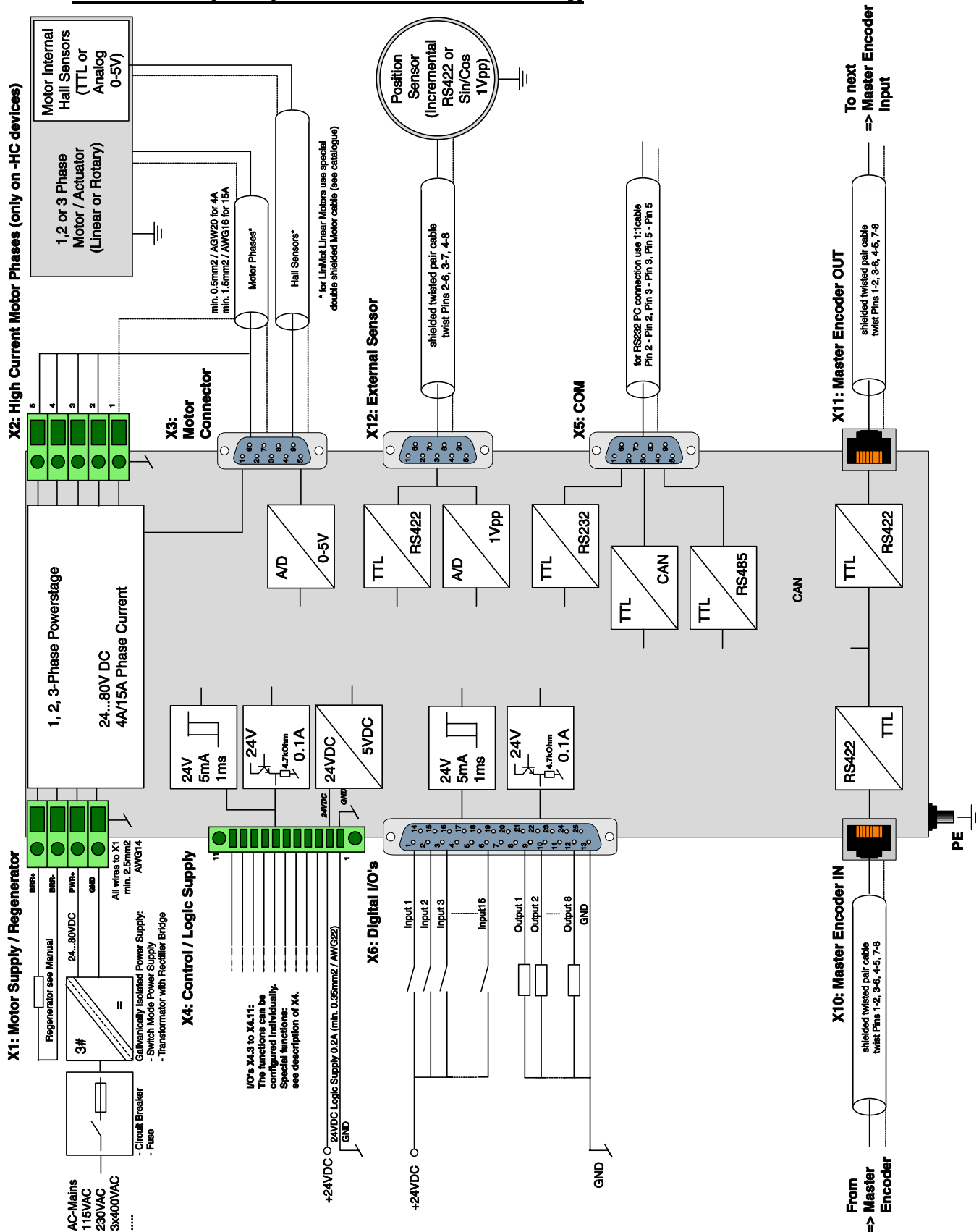
Functionality

	E1100-MP	E1100-MP-HC	E1100-MT	E1100-MT-HC	E1100-RS	E1100-RS-HC	E1100-CO	E1100-CO-HC	E1100-DN	E1100-DN-HC	E1130-DP	E1130-DP-HC	E1100-GP	E1100-GP-HC
Supply Voltage														
Motor Supply 72VDC (24...80VDC)	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Logic Supply 24VDC (22...26VDC)	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Motor Phase Current														
4A _{peak}	•		•		•		•		•		•		•	
15A _{peak}		•		•		•		•		•		•		•
Controllable Motors														
LinMot P01-23x...	•	•	•	•	•	•	•	•	•	•	•	•	•	•
P01-37x...	•	•	•	•	•	•	•	•	•	•	•	•	•	•
P01-48x...	•	•	•	•	•	•	•	•	•	•	•	•	•	•
DC Motors					•	•	•	•	•	•	•	•	•	•
Brushless DC / EC Motors					•	•	•	•	•	•	•	•	•	•
Command Interface														
MPC with 8 Commands	•	•	•	•									•	•
MPC with 256 Commands			•	•									•	•
RS232 up to 115.2 kBaud					•	•					•	•	•	•
RS485 up to 115.2 kBaud					•	•					•	•	•	•
CANOpen up to 1MBaud							•	•			•	•	•	•
DeviceNet 125, 250, 500 kBaud									•	•	•	•	•	•
PROFIBUS DP up to 12 MBaud											•	•		
External Position Sensor														
Incremental RS422 up to 2 MHz			•	•	•	•	•	•	•	•	•	•	•	•
SinCos 1Vpp up to 10 kHz			•	•	•	•	•	•	•	•	•	•	•	•
Synchronisation														
Master Encoder In/Out RS422 up to 2 MHz					•	•	•	•	•	•	•	•	•	•
Configuration														
RS232 Configuration	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CAN Multi Axes Configuration			•	•	•	•	•	•	•	•	•	•	•	•

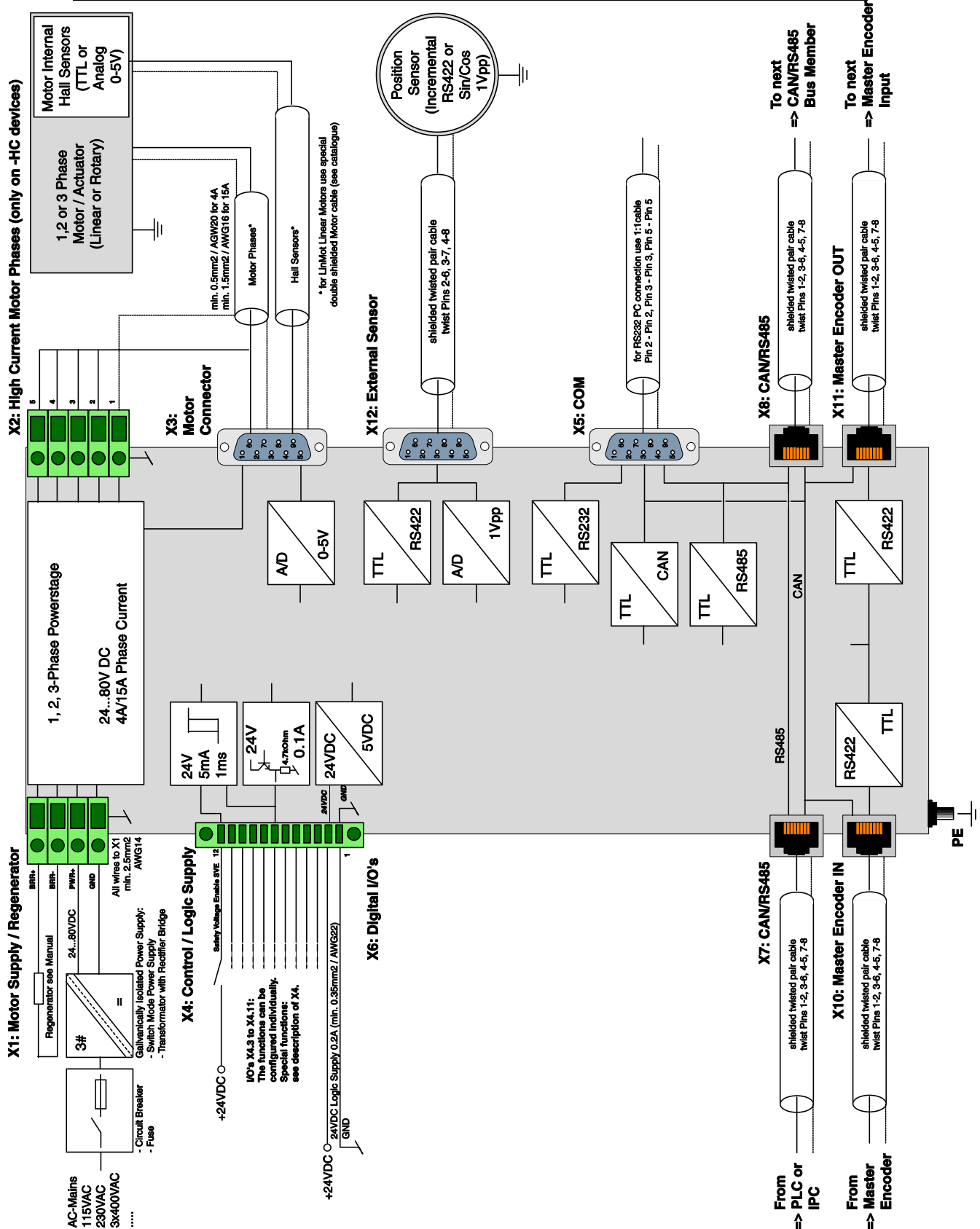
E1130-DP(-HC) Functions and Wiring



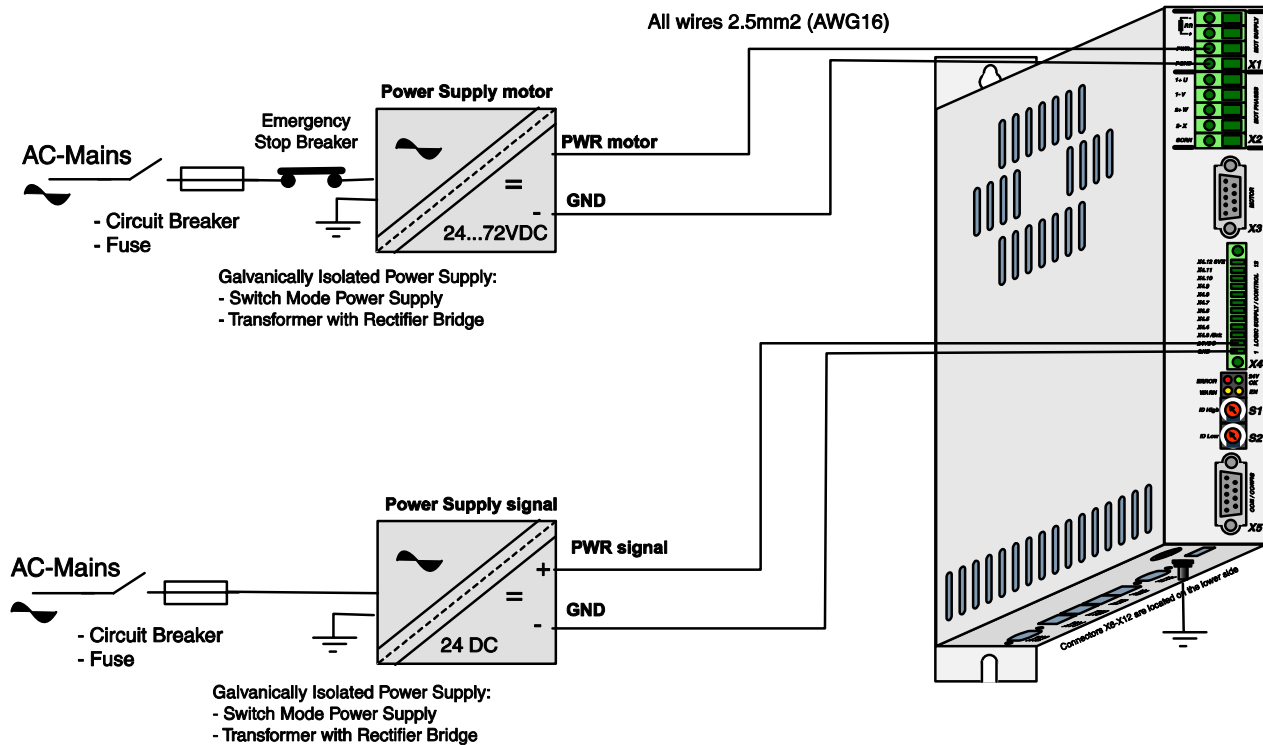
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E1100-CO(-HC), -DN(-HC), -RS(-HC) Functions and Wiring



Power Supply and Grounding



*Inside of the E1100 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 reduce circular currents.



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.)

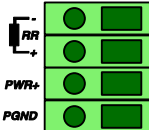
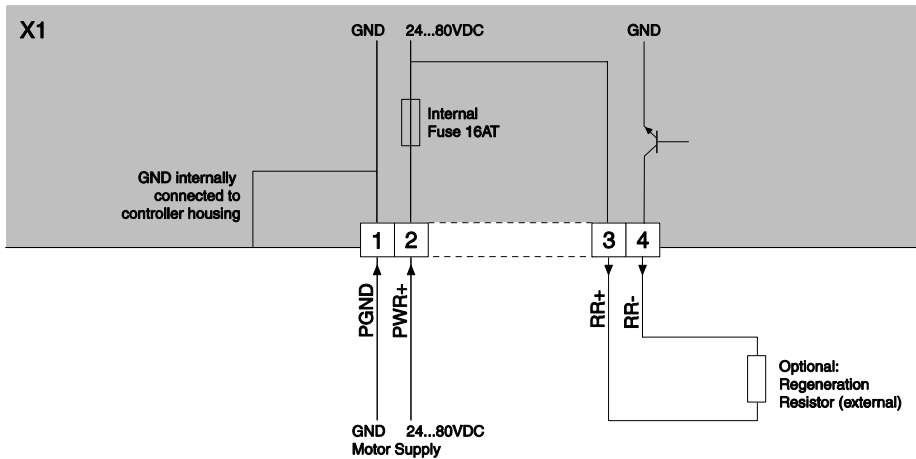
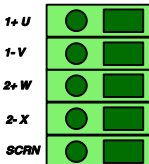
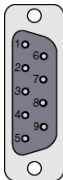


Power supply connectors must not be connected or disconnected while DC voltage is present. Do not disconnect system components until all LinMot controller LED's have turned off. (Capacitors in the power supply may not fully discharge for several minutes after input voltage been disconnected). Failure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

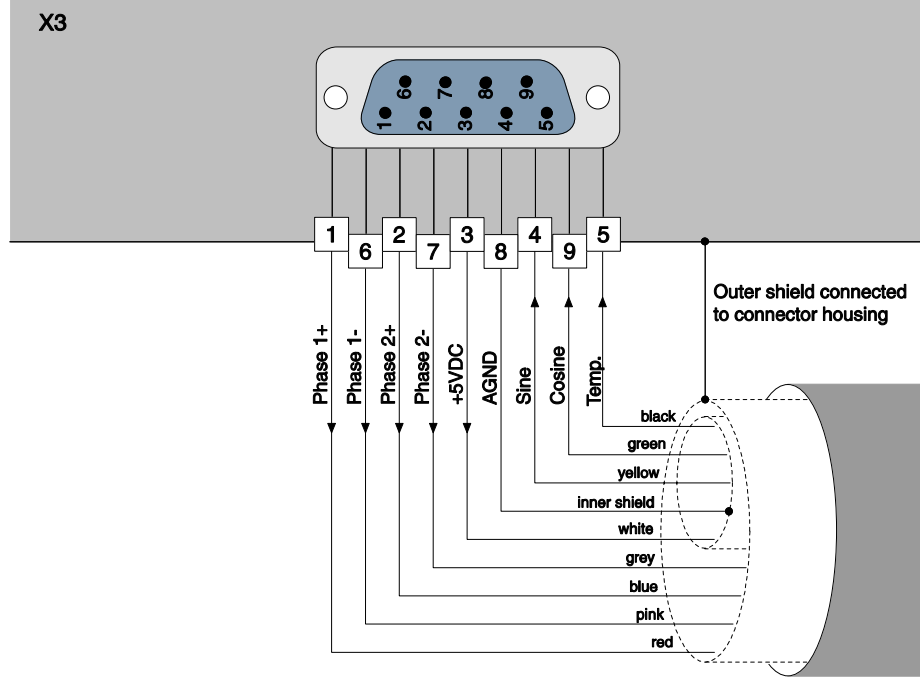


Do not switch Power Supply DC Voltage. All power supply switching and E-Stop breaks should be done to the AC supply voltage of the power supply. Failure to observe these precautions may result in severe damage to controller.

Description of the connectors / Interfaces

X1:	Motor Supply / Regeneration Resistor		
			
Screw Terminals	<p>External Regeneration Resistor (RR01-10/60, Art. Nr. 0150-3088)</p> <p>Motor Supply 24...80VDC Absolute max. Rating 72VDC +20%.</p> <p>If motor supply voltage is exceeding 90VDC, the controller will go into error state.</p> <p>Wiring: 2.5mm² (AWG14)</p>		
X2:	Motor Phases		
	<p>PH1+ /U PH1- /V PH2+ /W PH2- /X SCRN</p>	<p>LinMot Motor:</p> <p>Motor Phase 1+ red Motor Phase 1- pink Motor Phase 2+ blue Motor Phase 2- grey Shield</p>	<p>3-phase EC-Motor:</p> <p>Motor Phase U Motor Phase V Motor Phase W</p>
Screw Terminals	<p>The motor phases are present at X2 and X3. If the RMS current is higher than 5A RMS, the phases must be connected to X2 and not to X3. Never connect both.</p> <p>Wiring: 1.5-2.5mm² (AWG16-14)</p>		
X3:	Motor		
	<p>1 2 3 4 5 6 7 8 9 case</p>	<p>LinMot Motor:</p> <p>Motor Phase 1+ Motor Phase 2+ +5VDC Sensor Sine Temp. In Motor Phase 1- Motor Phase 2- AGND Sensor Cosine Shield</p>	<p>3-phase EC-Motor:</p> <p>+5VDC (Hall Supply) Hall 1 Hall 3 AGND (Hall Supply) Hall 2</p>
DSUB-9 (f)	<p><u>Note:</u> Use +5V (X3.3) and AGND (X3.8) only for motor internal Hall Sensor supply (max. 100mA).</p> <p><u>Caution:</u> Do NOT connect AGND (X3.8) to ground or earth! Use X2 for motor phases controllers if RMS current exceeds 5Arms.</p>		

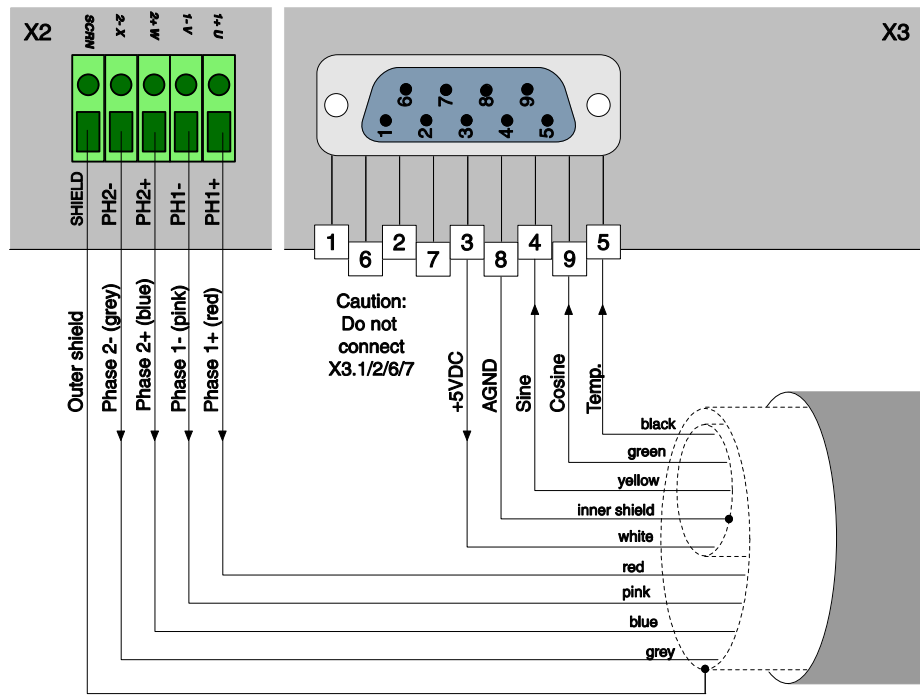
Motor wiring for Series E1100 Controllers (low current version without –HC extension)



Important:

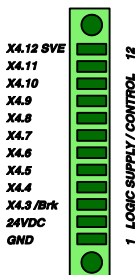
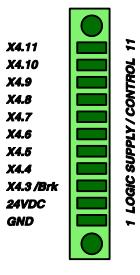

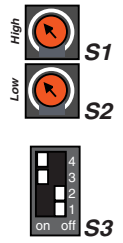

Motor Phases may be connected to X3 up to $5A_{rms}$ or $7.5A_{peak}$ phase current.

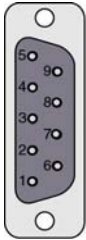
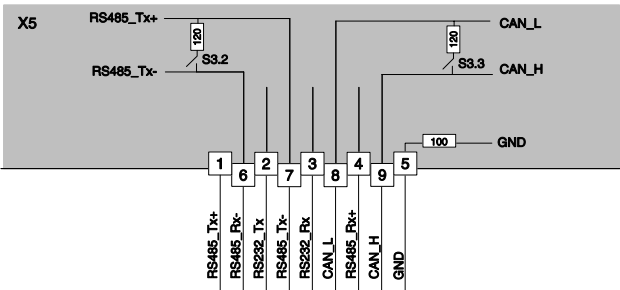
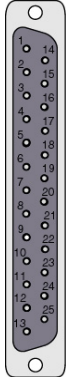
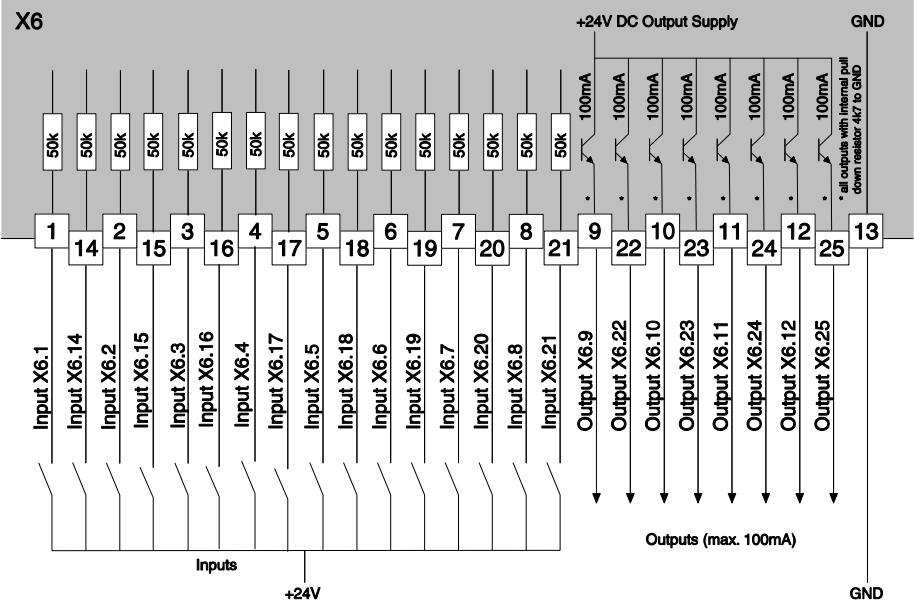
Motor Wiring for High Current Controller E1100-xx-HC

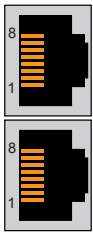
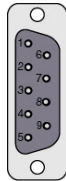



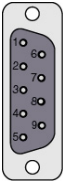
Important:

If motor phase current exceeds $5A_{rms}$ or $7.5A_{peak}$, motor phases must be wired to X2.


X4: 12pin		Control / Supply (E1130-DP(-HC), E1100-CO(-HC), E1100-DN(-HC), E1100-RS(-HC))		
	12	Input	Safety Voltage Enable	Power Stage Enable (HW Enable)
	11	I/O	X4.11	Configurable IO, PTC2 Input
	10	I/O	X4.10	Configurable IO, PTC1 Input
	9	I/O	X4.9	Configurable IO
	8	I/O	X4.8	Configurable IO
	7	I/O	X4.7	Configurable IO
	6	I/O	X4.6	Configurable IO, Trigger Input
	5	I/O	X4.5	Configurable IO
	4	I/O	X4.4	Configurable IO, Analog Input
	3	I/O	X4.3/Brk	Configurable IO, Brake Driver 1A
	2	+24VDC	Supply	Logic Supply 22-26 VDC
	1	GND	Supply	Ground
Phoenix MC1,5/12-STF- 3,5		Inputs 24V / 1mA (Low Level: -0.5 to 5VDC, High Level: 15 to 30VDC) Outputs 24V / max.100mA Brake Output 24V / max.1.0A Supply 24V / typ. 400mA / max. 2.1A (if all outputs "on" with max. load.) Wiring: 0.25-1.5mm² (AWG24-16)		
X4: 11pin		Control / Supply (E1100-GP(-HC))		
	11	I/O	X4.11	Configurable IO, PTC2 Input
	10	I/O	X4.10	Configurable IO, PTC1 Input
	9	I/O	X4.9	Configurable IO
	8	I/O	X4.8	Configurable IO
	7	I/O	X4.7	Configurable IO
	6	I/O	X4.6	Configurable IO, Trigger
	5	I/O	X4.5	Configurable IO
	4	I/O	X4.4	Configurable IO, Analog Input
	3	I/O	X4.3/Brk	Configurable IO, Brake Driver 1A
	2	+24VDC	Supply	Logic Supply 22-26 VDC
	1	GND	Supply	Ground
Phoenix MC1,5/11-STF- 3,5		Inputs 24V / 1mA (Low Level: -0.5 to 5VDC, High Level: 15 to 30VDC) Outputs 24V / max.100mA Brake Output 24V / max.1.0A Supply 24V / typ. 400mA / max. 3.0A (if all outputs "on" with max. load.) Wiring: 0.25-1.5mm² (AWG24-16)		
LED		State Display		
		Green	24V Logic Supply OK	
		Yellow	Motor Enabled	
		Yellow	Warning	
		Red	Error	
S1-3:		Address Selectors / Bus Termination		
	S1	Bus ID High	(0...F)	HEX-Switches for Bus ID (Address range 0...255)
	S2	Bus ID Low	(0...F)	
	S3	Switch 4: Interface on/off (All field bus interfaces) Switch 3: Termination RS485 on/off Switch 2: Termination RS485 on/off Switch 1: RS232 (switch "off" / RS485 "on")		Factory setting: all switches "off" Select serial RS232 or RS485
		To use field bus functionality the switch S3.4 has to be set to position "on"! In position "off" the field bus is deactivated.		

X5:	COM		
	<div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div><div>8</div><div>9</div><div>case</div></div>	<div><div>RS485_Tx+</div><div>RS232_Tx</div><div>RS232_Rx</div><div>RS485_Rx+</div><div>GND</div><div>RS485_Rx-</div><div>RS485_Tx-</div><div>CAN_L</div><div>CAN_H</div><div>Shield</div></div> <div><div>Y</div><div>A</div><div>B</div><div>Z</div></div>	
DSUB-9 (m)	<u>RS232:</u> Configuration on all Controllers: use 1:1 connection cable to PC		
X6:	Digital I/O		
			
DSUB-25 (f)	<div><div>All Inputs:</div><div>Direct interfacing to digital 24VDC PLC outputs.</div><div>Input current: 1mA Sample rate: 1ms</div></div> <div><div>All Outputs:</div><div>Short circuit and overload protected high side switches</div><div>Voltage: 24VDC Max. current: 100mA</div><div>Update rate: 1ms</div></div> <div>Outputs may directly drive inductive loads.</div>		

X7 - X8		RS485/CAN		
	1	RS485_Rx+	A	
	2	RS485_Rx-	B	
	3	RS485_Tx+	Y	
	4	GND		
	5	GND		
	6	RS485_Tx-	Z	
	7	CAN_H		
	8	CAN_L		
	case	Shield		
RJ-45		<p>Use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring.</p> <p>The built in CAN and RS485 terminations can be activated by S3.2 and S3.3.</p> <p>X7 internally connected to X8 (1:1 connection)</p>		
X9:		Profibus DP		
	1	Not connected		
	2	Not connected		
	3	RxD/TxD-P		
	4	CNTR-P		
	5	GND	(isolated)	
	6	+5V	(isolated)	
	7	Not connected		
	8	RxD/TxD-N		
	9	Not connected		
	case	Shield		
DSUB-9 (f)		Max. Baud rate: 12Mbaud		
X10 / X11		Master Encoder IN (X10) / Master Encoder OUT (X11)		
	1	<u>Incremental:</u> A+	<u>Step/Direction:</u> Step+	<u>EIA/TIA 568A colors:</u> Green/White
	2	A-	Step-	Green
	3	B+	Direction+	Orange/White
	4	Z+	Zero-	Blue
	5	Z-	Zero+	Blue/White
	6	B-	Direction-	Orange
	7	CAN_H (GP)	CAN_H (GP)	Brown/White
	8	CAN_L (GP)	CAN_L (GP)	Brown
	case	Shield	Shield	
RJ-45		<p>Use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring.</p> <p><u>Master Encoder Inputs:</u> Differential RS422, max. Input Frequency 2MHz, 240ns edge separation</p> <p><u>Master Encoder Outputs:</u> Amplified RS422 differential signals from Master Encoder IN (X10)</p> <p>CAN internally connected to X7, X8</p> <p>The CAN signals on X10/X11 are only available on GP controllers. With the -DP, -RS, -DN and CO controllers use X7/X8 for connection the CAN bus instead.</p> <p>All devices, which are connected to X10/X11 must be referenced to the same ground.</p>		

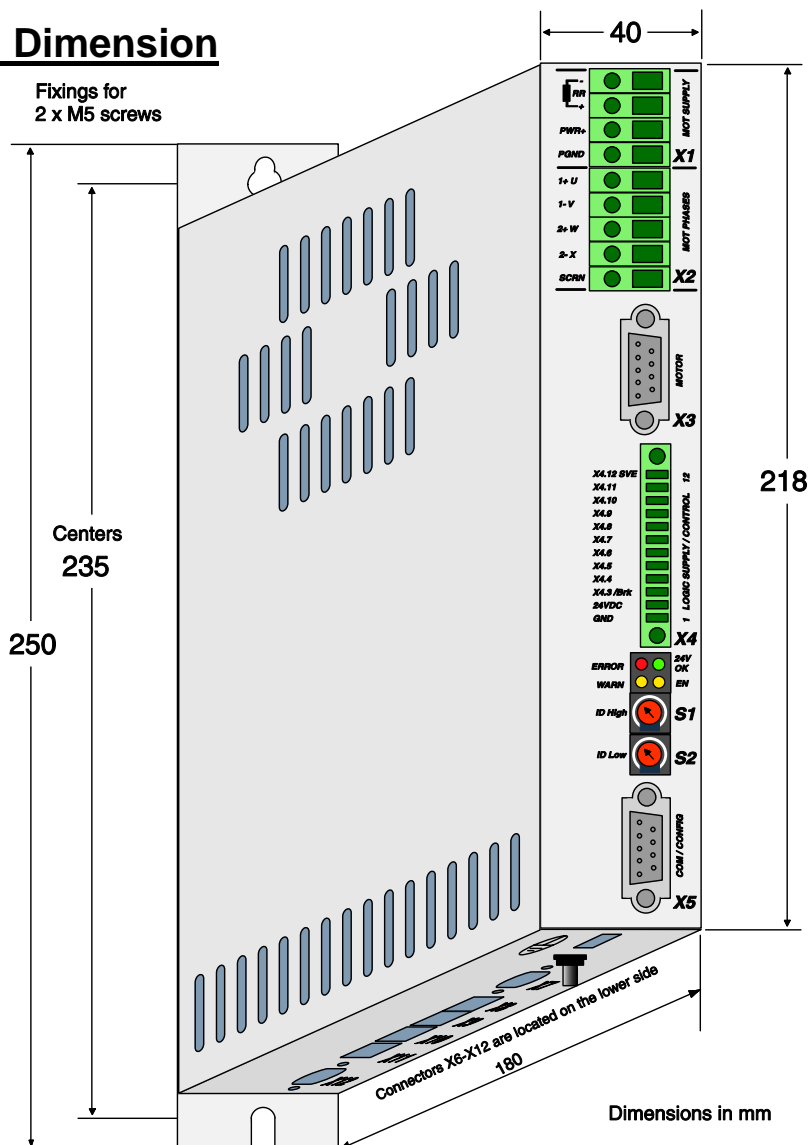
X12:		External Position Sensor	
		<u>Incremental:</u>	<u>Sin/Cos:</u>
	1	+5V DC	+5V DC
	2	A-	SIN-
	3	B-	COS-
	4	Z-	ZERO-
	5	GND	GND
	6	A+	SIN+
	7	B+	COS+
	8	Z+	ZERO+
	9	Enc. Alarm	Enc. Alarm
	case	Shield	Shield
DSUB-9 (f)	<p>Max. Input Frequency: 2MHz (Incremental RS422), 240ns edge separation 10kHz (Analog 1Vpp), 10Bit AD converted</p> <p>Sensor Supply (max. 100mA)</p> <p>Encoder Inputs:</p> <ul style="list-style-type: none"> - Incremental: RS422 - Sin/Cos: 1Vpp <p>Enc. Alarm In: 5V / 1mA</p>		

Error Codes:

			Description
ERROR	WARN	EN	
OFF	Warning	Operation Enabled	Normal Operation. Warnings and Operation Enabled are displayed
On	● ~ 2Hz 0..7 x Error Code Low Nibble	● ~ 2Hz 0..7 x Error Code High Nibble	Error: The Error Code is shown by a blink code with "WARN" and "EN". The Error Byte is divided into Low and High Nibble. "WARN" and "EN" are blinking together. The error can be acknowledged. (ex.: WARN blinks 3x, EN blinks 2x; Error Code = 32h)
● ~ 2Hz	● ~ 2Hz 0..7 x Error Code Low Nibble	● ~ 2Hz 0..7 x Error Code High Nibble	Fatal Error: The Error Code is shown by a blink code with "WARN" and "EN". The Error Byte is divided into Low and High Nibble. "WARN" and "EN" are blinking together. Fatal Errors can only be acknowledged by a reset or power cycle (ex.: WARN blinks 3x, EN blinks 2x; Error Code = 32h)
● ~ 4Hz	● ~ 2Hz 0..7 x Error Code Low Nibble	● ~ 2Hz 0..7 x Error Code High Nibble	System Error. Please reinstall firmware or contact support.

The meaning of the Error Codes can be found in the Usermanual_MotionCtrl_Software_E1100 and the user manual of the loaded interface software. This documents are provided together with LinMot-Talk 1100 and can be downloaded from www.linmot.com.

Physical Dimension



E1100		
Single axes controller		
Width	mm (in)	40 (1.6)
Height	mm (in)	250 (9.9)
Height without fixings	mm (in)	228 (9)
Depth	mm (in)	180 (7.1)
Weight	Kg (lb)	1.5 (3.3)
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
Max. Case Temperature	°C	65
Max. Power Dissipation	W	30
Distance between Controllers	mm (in)	20 (0.8) left/right 50 (2) top/bottom

() dimensions in inch

Power Supply Requirement

Power Supply motor

The calculation of the needed power for the Motor supply is depending on the application and the used motor. The nominal supply voltage is 72 VDC. The possible range is from 24...80VDC.



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...)

For the same reason, the 24VDC supply for the signal, shall not be connected together with the motor supply. If the motor is supplied with 24 VDC, this must be an additional, independent power supply.

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

Power Supply signal

The logic supply needs a regulated power supply of 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. 1.1A (all 10 outputs "on" with 100mA load and /Break with no load)
 max. 2.1A (all 10 outputs "on" with 100mA load and /Break with 1A load)

Regeneration of Power / Regeneration Resistor

There are two possibilities to deal with power regeneration:

Option A: Connect an additional capacitor to the motor power supply. It is recommended to use a capacitor $\geq 10'000 \mu\text{F}$ (install capacitor close to the power supply!)

Option B: Install a Regeneration Resistor to X1 (RR+ and RR-). The threshold value of the voltage depends on the used motor voltage power supply. The max. threshold value must not exceed 88 VDC.

Item	Description	Art. No.
Capacitor	Capacitor 10'000 μF / 100 V	0150-3075
Regeneration Resistor	RR01-10/60 (10 Ohm, 60 W)	0150-3088
Regeneration Resistor	RR01-10/150 (10 Ohm, 150 W)	0150-3090

Ordering Information

Servo Controller	Description		Art. No.
E1130-DP	Profibus Servo Controller	72VDC/4A	0150-1667
E1130-DP-HC	Profibus Servo Controller	72VDC/15A	0150-1668
E1100-RS	RS232/485 Controller	72VDC/4A	0150-1677
E1100-RS-HC	RS232/485 Controller	72VDC/15A	0150-1678
E1100-CO	CANopen Controller	72VDC/4A	0150-1681
E1100-CO-HC	CANopen Controller	72VDC/15A	0150-1682
E1100-DN	DeviceNet Controller	72VDC/4A	0150-1679
E1100-DN-HC	DeviceNet Controller	72VDC/15A	0150-1680
E1100-GP	General Purpose	72VDC/4A	0150-1665
E1100-GP-HC	General Purpose	72VDC/15A	0150-1666

Declaration of Conformity CE-Marking

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Products: *LinMot*[®] Controllers

Type	Art.-No.	Type	Art.-No.	Type	Art.-No.
E1130-DP	0150-1667	E1100-DN	0150-1679		
E1130-DP-HC	0150-1668	E1100-DN-HC	0150-1680		
E1100-GP	0150-1665				
E1100-GP-HC	0150-1666				
E1100-RS	0150-1677				
E1100-RS-HC	0150-1678				
E1100-CO	0150-1681				
E1100-CO-HC	0150-1682				

The product must be mounted and used in strict accordance with the installation instruction contained within the User's Manual, 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 EMC Directive (89/336/EEC) and is marked in accordance with the CE Marking Directive (93/68/EEC).

Standards Complied with:

EN 61000-6-2			Immunity for industrial environment
	EN 61000-4-2	Class A	Electrostatic discharge immunity (ESD)
	EN 61000-4-3	Class A	Radiated electromagnetic field immunity
	EN 61000-4-4	Class A	Fast transients / burst immunity (EFT)
	EN 61000-4-5	Class A	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.

Zurich, December 16, 2004



 R. Rohner / CEO NTI AG

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