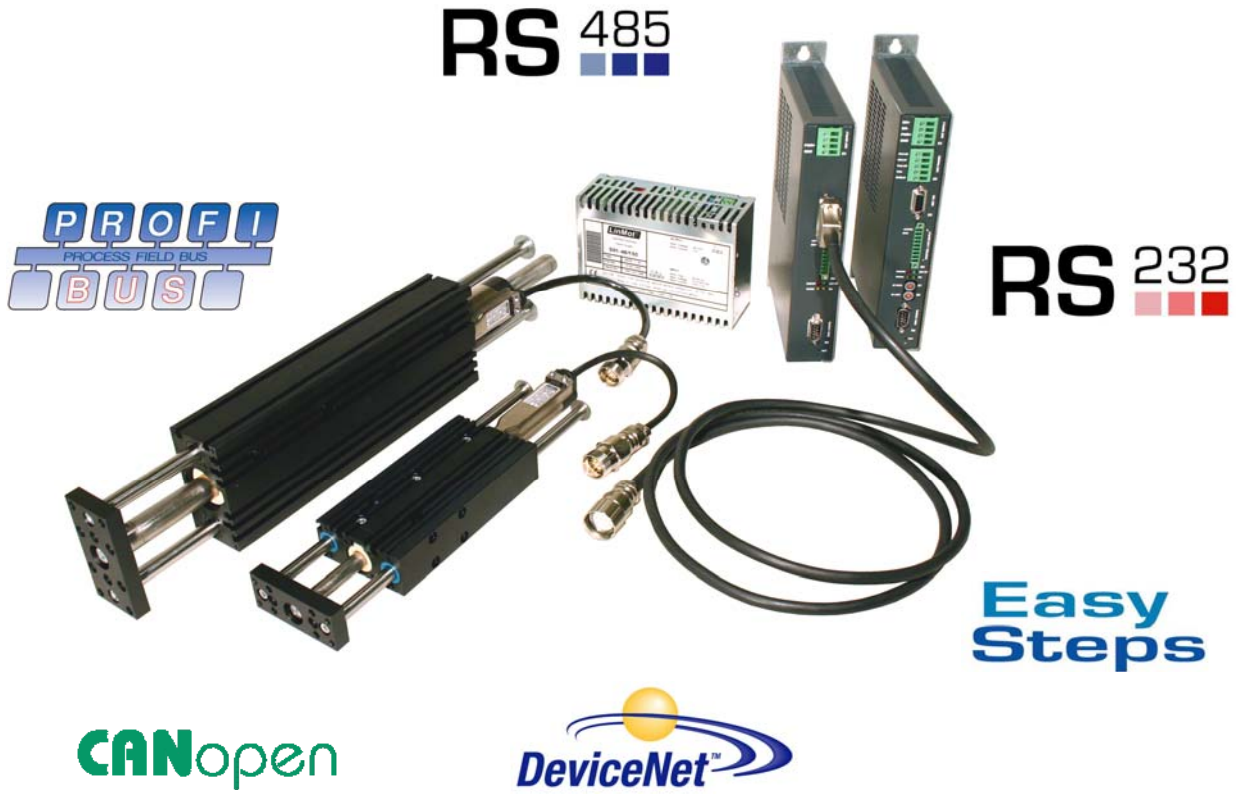
LinMot®

Documentation for Installing the following Controllers:

- **E1100-CO (-HC, -XC)**
- **E1100-DN (-HC, -XC)**
- **E1100-DP (-HC, -XC)**
- **E1100-RS (-HC, -XC)**
- **E1100-GP (-HC)**



Servo Controller Data Sheet & Installation Guide

Document version: 1.0k / Ro 6.12.2007

Note
The information in this documentation reflects the stage of development at the time of press and is therefore without obligation.
NTI AG reserves itself the right to make changes at any time and without notice to reflect further technical advance or product improvement.

Table of Content

Important notes for E1100 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).

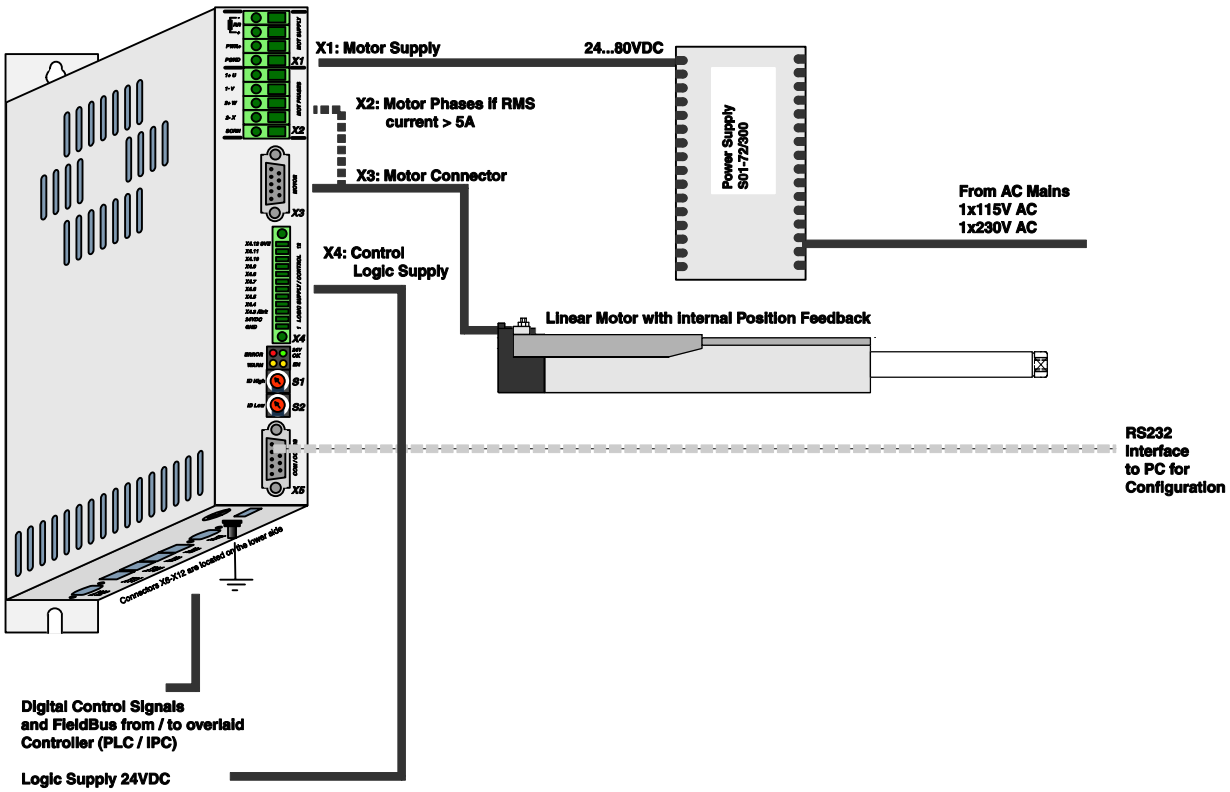
Each system component should be tied directly to the ground bus (star pattern), rather than daisy chaining from component to component. (LinMot motors are properly grounded through their power cables when connected to LinMot controllers) (see chapter Power Supply and Grounding).

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 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.

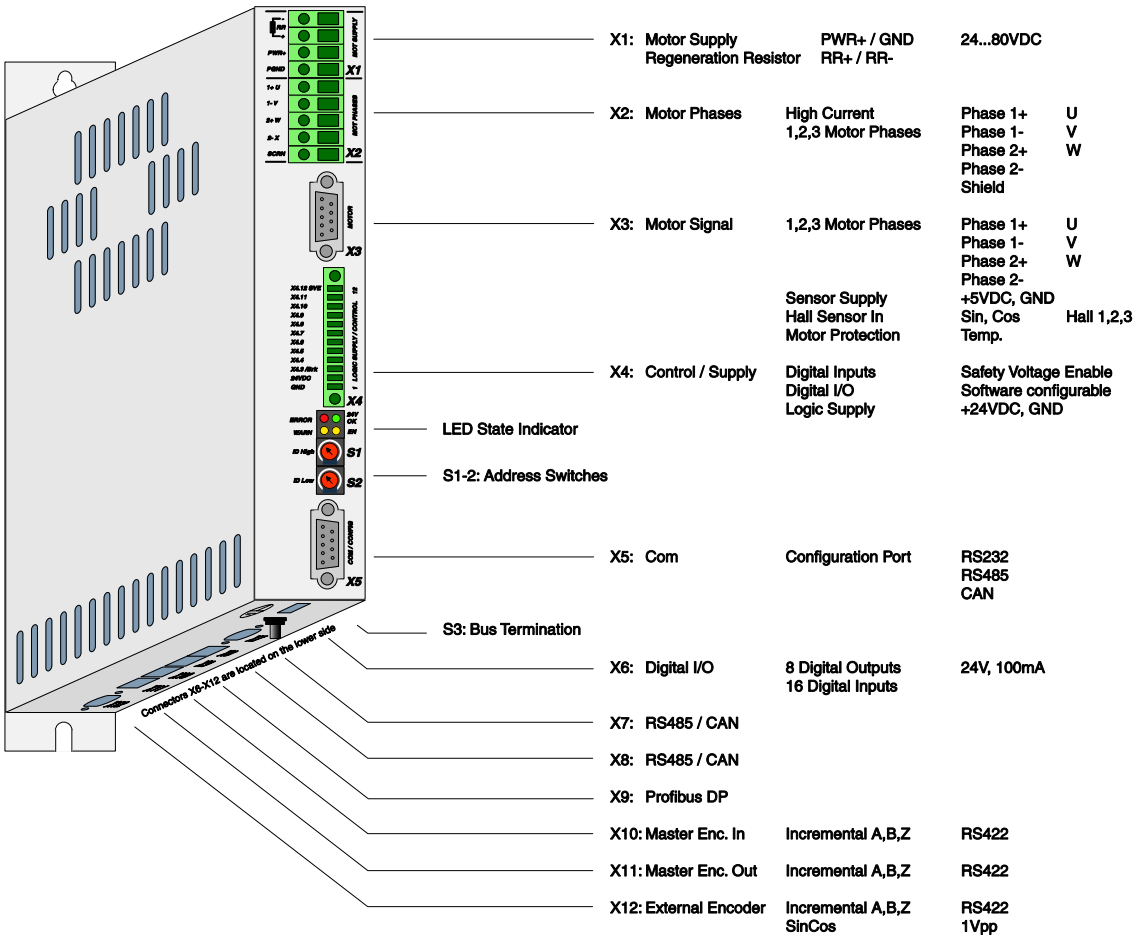
Do not connect or disconnect the motors from controllers with voltage present. Wait to connect or disconnect motors until all LinMot controllers LED's have turned off. (Capacitors may not fully discharge for several minutes after power has been turned off).
Failure to observe these precautions may result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

System Overview



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

E1100 Interfaces

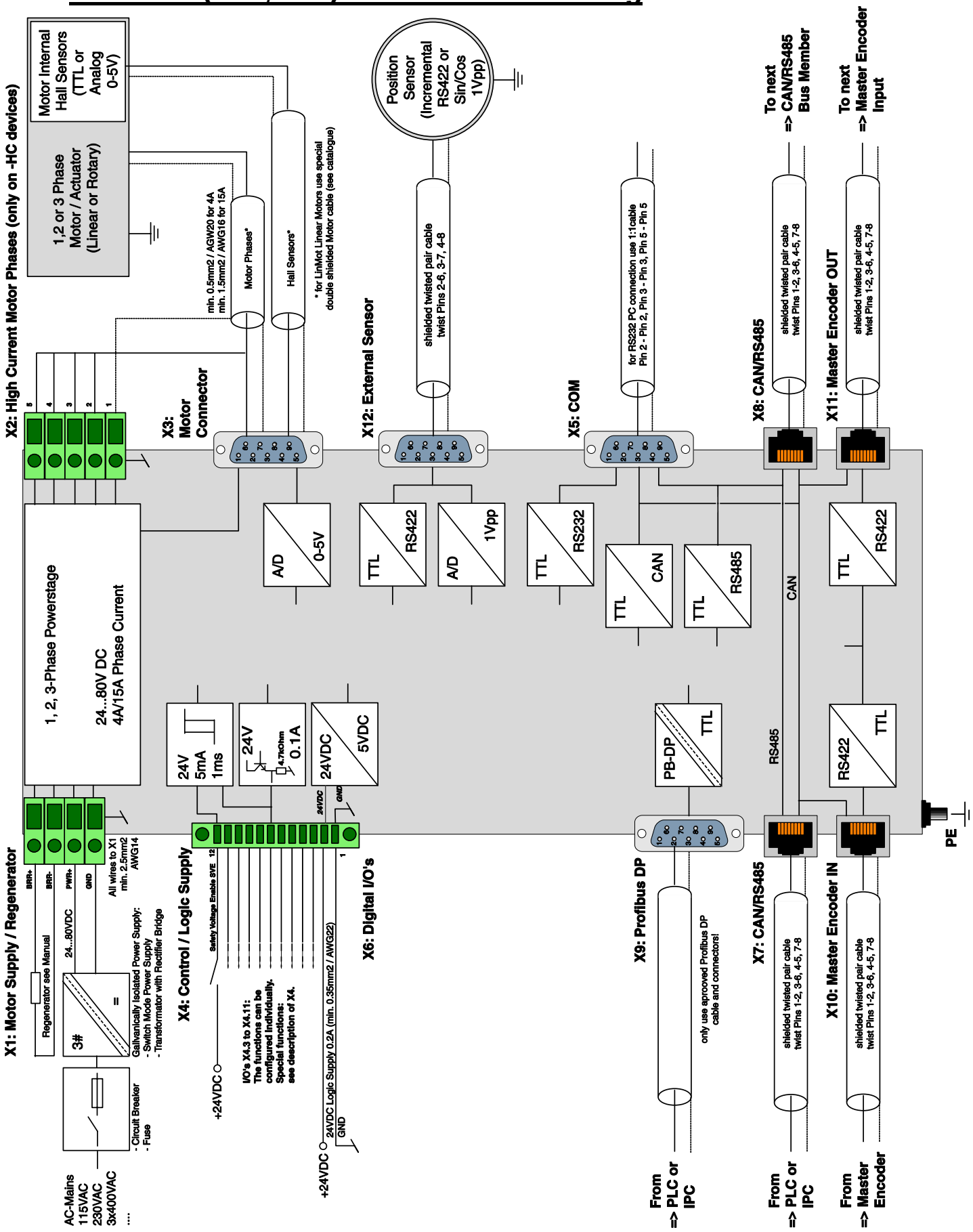


		E1100-MP	E1100-MP-HC	E1100-MT	E1100-MT-HC	E1100-RS	E1100-RS-HC/XC	E1100-CO	E1100-CO-HC/XC	E1100-DN	E1100-DN-HC/XC	E1130-DP	E1130-DP-HC/XC	E1100-GP	E1100-GP-HC
Connector															
X1	Motor Supply	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Regeneration Resistor	●	●	●	●	●	●	●	●	●	●	●	●	●	●
X2	Motor Phases (Screw 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			●	●	●	●	●	●	●	●	●	●	●	●

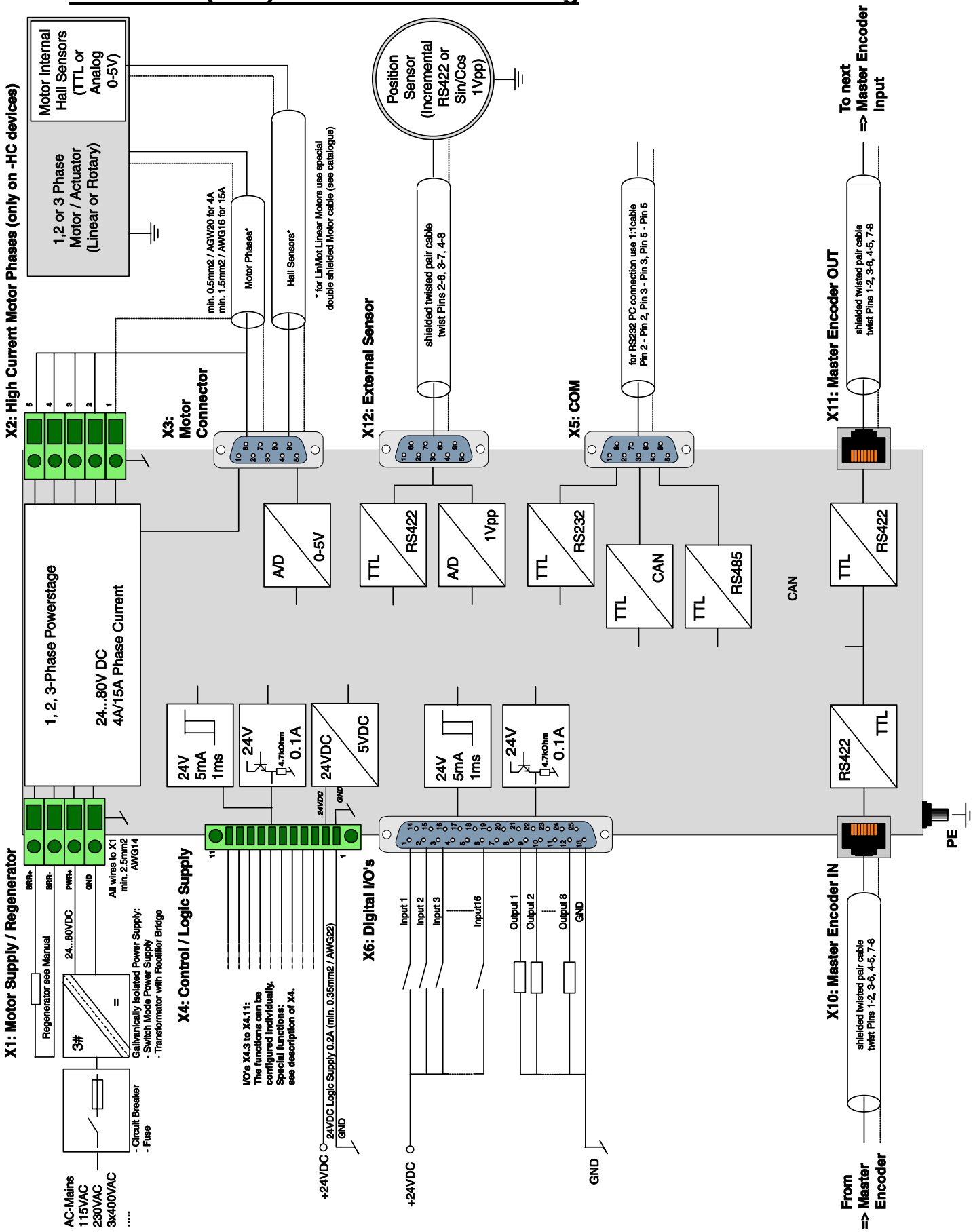
Functionality

	E1100-RS	E1100-RS-HC	E1100-RS-XC	E1100-CO	E1100-CO-HC	E1100-CO-XC	E1100-DN	E1100-DN-HC	E1100-DN-XC	E1130-DP	E1130-DP-HC	E1130-DP-XC	E1100-GP	E1100-GP-HC	E1100-GP-XC
Supply Voltage															
Motor Supply 72VDC (30...85VDC)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Logic Supply 24VDC (22...26VDC)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Motor Phase Current															
4A $_{peak}$	●			●			●			●			●		
15A $_{peak}$		●			●			●			●			●	
20A $_{peak}$			●			●			●			●			●
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	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Sin/Cos 1Vpp up to 10 kHz	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Synchronisation															
Master Encoder In/Out RS422 up to 2 MHz	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Configuration															
RS232 Configuration	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CAN Multi Axes Configuration	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

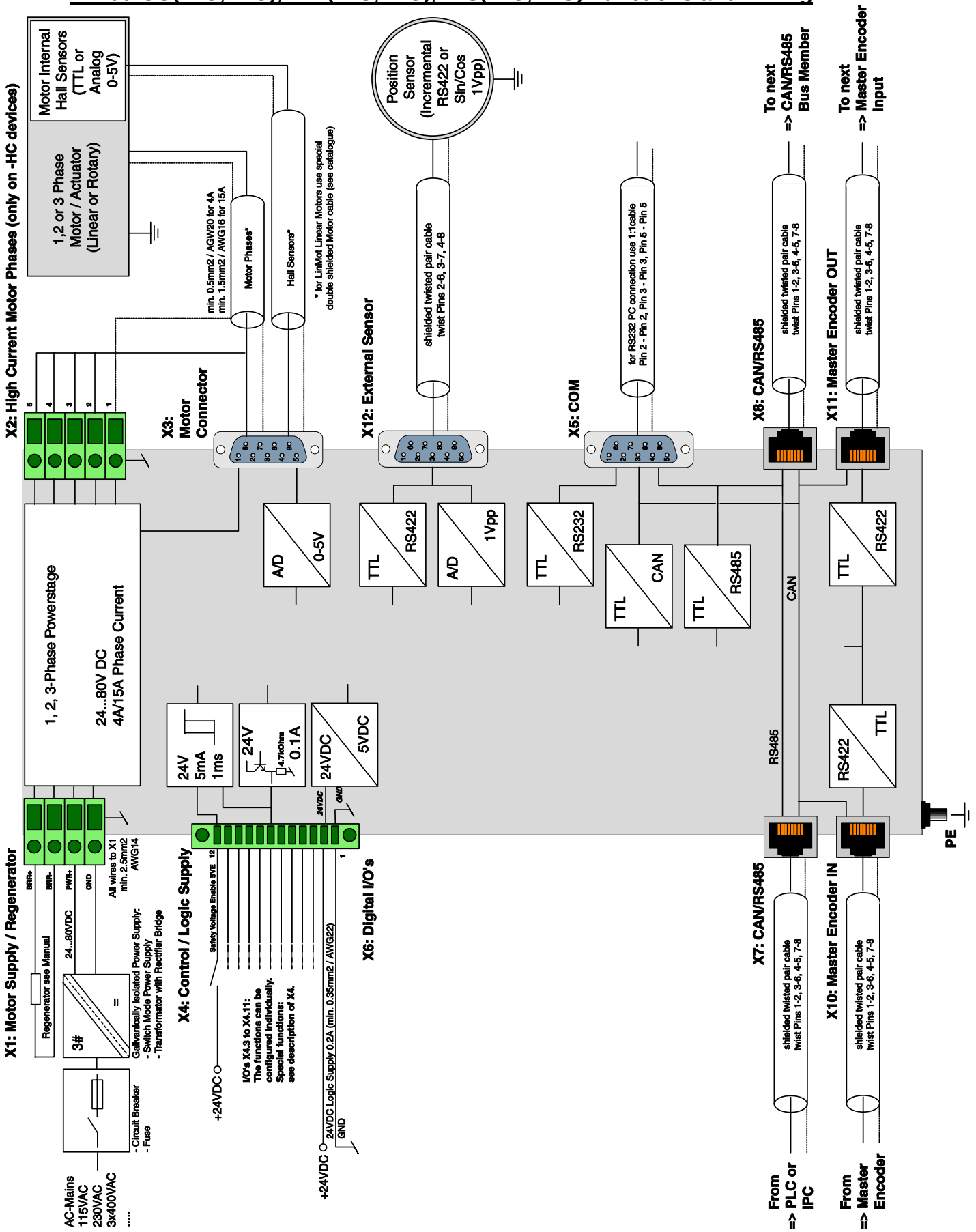
E1130-DP(-HC, -XC) Functions and Wiring



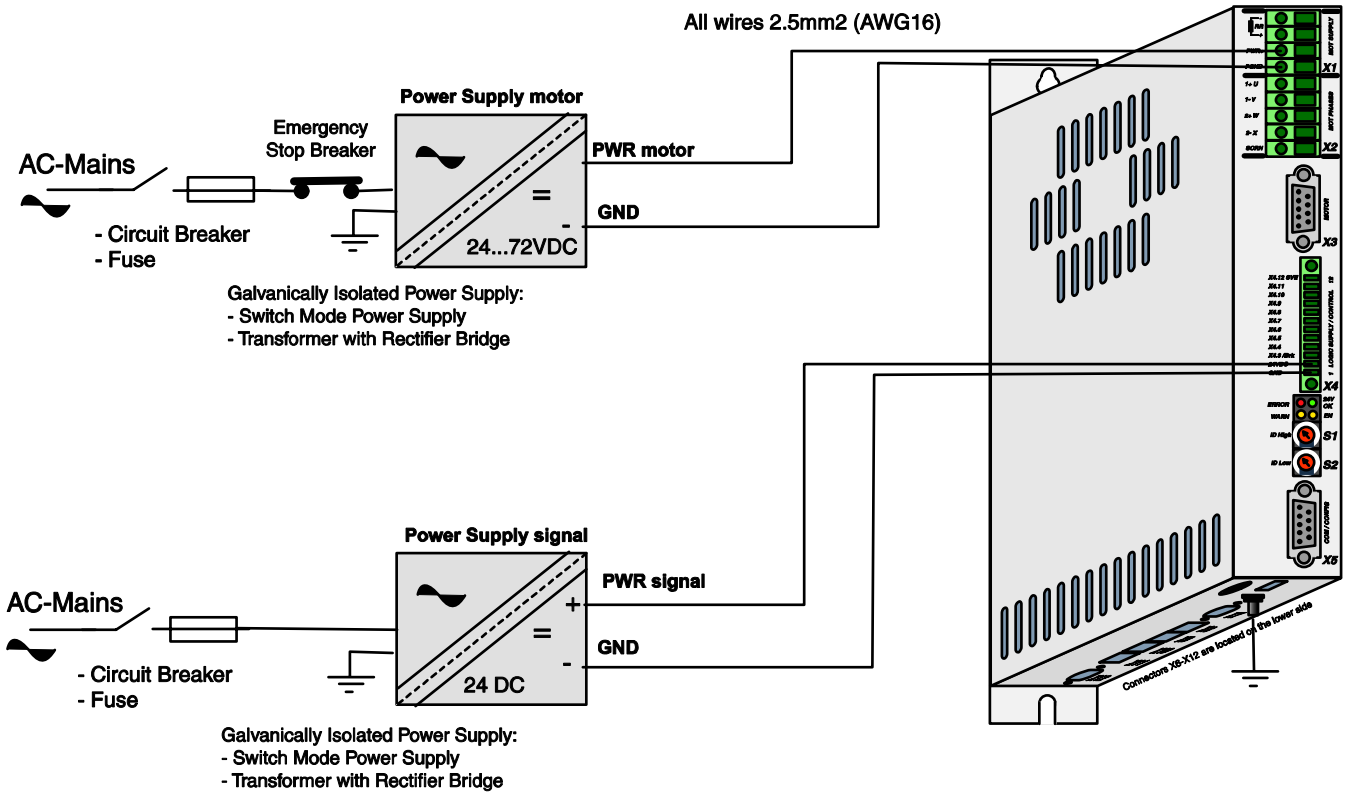
E1100-GP(-HC) Functions and Wiring



E1100-CO(-HC, -XC), -DN(-HC, -XC), -RS(-HC, -XC) 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.

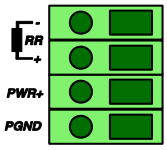
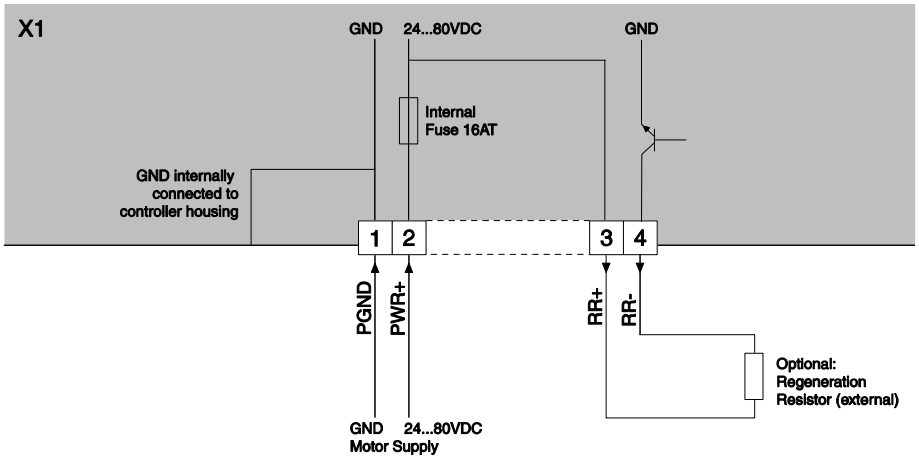
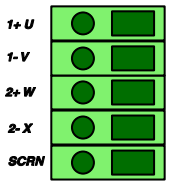
In order to assure a safe and error free operation, and to avoid severe damage to system components, **all system components* must be well grounded to either a single earth or utility ground.** This includes both LinMot and all other control system components to the same ground bus.

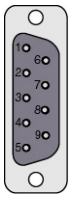
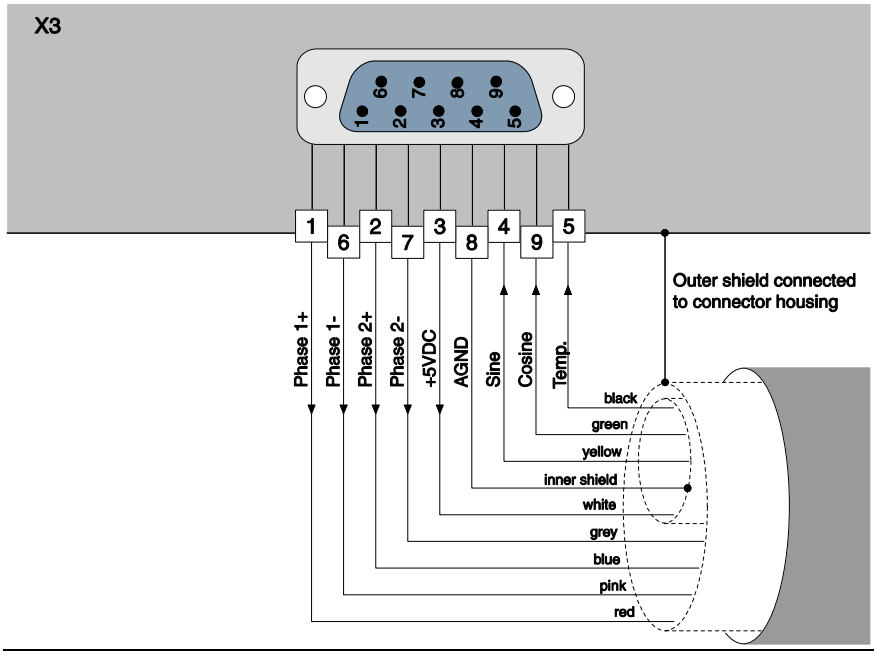
Each system component* should be tied directly to the ground bus **(star pattern**), rather than daisy chaining from component to component. (LinMot motors are properly grounded through their power cables when connected to LinMot controllers.)

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 has been disconnected). Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or controllers.

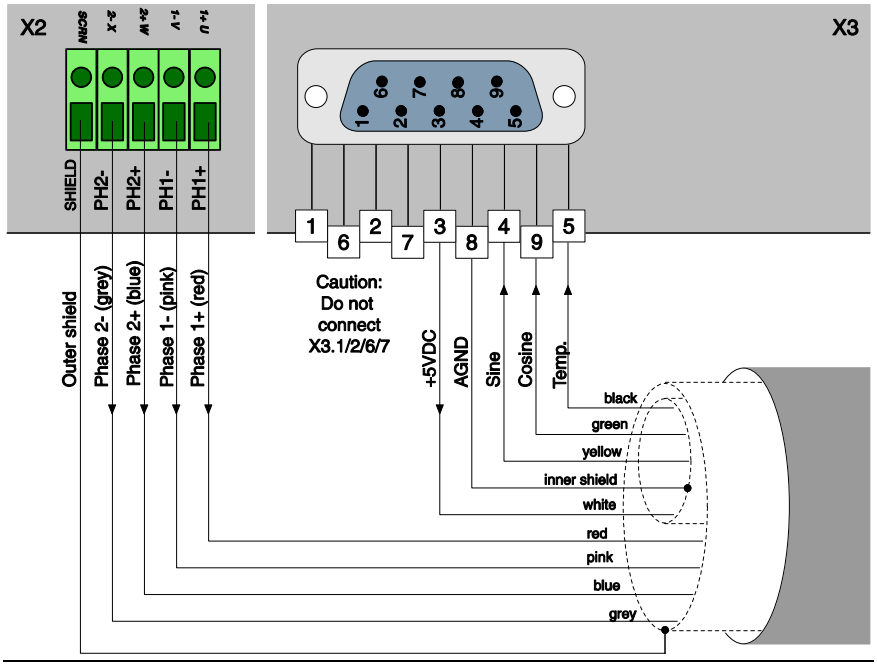
Do not switch Power Supply DC Voltage. All power supply switching and E-Stop breaks should be done to the AC supply voltage of the power supply. Failure to observe these precautions may result in severe damage to controller.

Description of the connectors / Interfaces

X1:	Motor Supply / Regeneration Resistor
	 Internal Fuse (F300): 16AT (slow blow, Schurter SMD-SPT, 0001.2716.xx, UL File Number: E41599) The fuse is directly soldered onto the PWB. Replacement is only possible by qualified personnel with appropriate equipment. CAUTION: For continued protection against risk of fire, replace only with same type and rating of fuse.
Screw Terminals	External Regeneration Resistor (RR01-10/60, Art. Nr. 0150-3088) Motor Supply 24...85VDC Absolute max. Rating 72VDC +20%. If motor supply voltage is exceeding 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 max. 2.5mm^2
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. If the RMS current is higher than 5A RMS, the phases must be connected to X2 and not to X3. Never connect both. - Tightening torque: min 0.4Nm - Screw thread: M 2,5 - Use 60/75°C copper conductors only - Conductor cross section max. 2.5mm^2

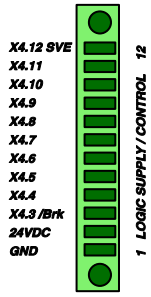
X3:	Motor		
		**LinMot Motor:**	**3-phase EC-Motor:**
	1	Motor Phase 1+	
	2	Motor Phase 2+	
	3	+5VDC	+5VDC (Hall Supply)
	4	Sensor Sine	Hall 1
	5	Temp. In	Hall 3
	6	Motor Phase 1-	
	7	Motor Phase 2-	
	8	AGND	AGND (Hall Supply)
	9	Sensor Cosine	Hall 2
	case	Shield	
DSUB-9 (f)	Note: Use +5V (X3.3) and AGND (X3.8) only for motor internal Hall Sensor supply (max. 100mA). Caution: Do NOT connect AGND (X3.8) to ground or earth! Use X2 for motor phases controllers if RMS current exceeds 5Arms.		
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

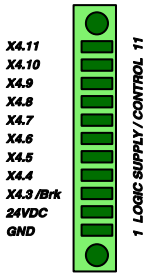
Phoenix MC1,5/12-STF-3,5

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.)

- Tightening torque: min 0.22Nm
- Screw thread: M2
- Use 60/75°C copper conductors only
- Conductor cross section max. $1.5mm^2$

Internal Fuse (F2): 3AT (slow blow, Schurter OMT125, 3404.0118.xx, UL File Number: E41599)
The fuse is directly soldered onto the PWB. Replacement is only possible by qualified personnel with appropriate equipment.
CAUTION: For continued protection against risk of fire, replace only with same type and rating of fuse.

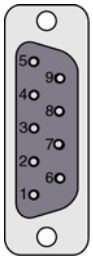
X4: 11pin	Control / Supply (E1100-GP(-HC))			
	11 10 9 8 7 6 5 4 3 2 1	I/O X4.11 I/O X4.10 I/O X4.9 I/O X4.8 I/O X4.7 I/O X4.6 I/O X4.5 I/O X4.4 I/O X4.3/Brk +24VDC Supply GND Supply	Configurable IO, PTC2 Input Configurable IO, PTC1 Input Configurable IO Configurable IO Configurable IO Configurable IO, Trigger Configurable IO Configurable IO, Analog Input Configurable IO, Brake Driver 1A Logic Supply 22-26 VDC 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.) - Tightening torque: min 0.22Nm - Screw thread: M2 - Use 60/75°C copper conductors only - Conductor cross section max. 1.5mm^2			
LED:	**State Display**			
	Green Yellow Yellow Red	24V Logic Supply OK Motor Enabled / Error Code Low Nibble Warning / Error Code High Nibble Error		
S1, S2:	**Baud Rate / Address Selectors**			
	S1 S2	Bus ID High / Baud Rate (0…F) Bus ID Low (0…F) The switches S1 and S2 define the baud rate and MAC ID depending on the interface and parameter settings. The following description is only valid for default configurations, otherwise see in the interface specific documentation for more information. S1: Baud Rate selector for CO, DN and RS interface:		

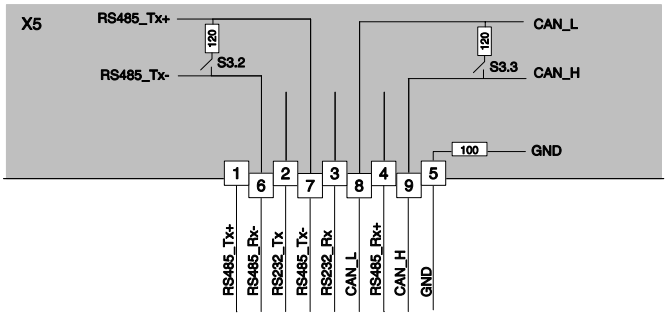
S1 Pos	CO:	DN:	RS:
0:	undefined	undefined	undefined
1:	125 kBit/s	125 kBit/s	4800 Bit/s
2:	250 kBit/s	250 kBit/s	9600 Bit/s
3:	500 kBit/s	500 kBit/s	19200 Bit/s
4:	1 MBit/s	undefined	38400 Bit/s
5:	undefined	undefined	57600 Bit/s
6:	undefined	undefined	115200 Bit/s
7..F:	undefined	undefined	undefined

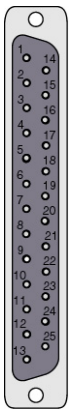
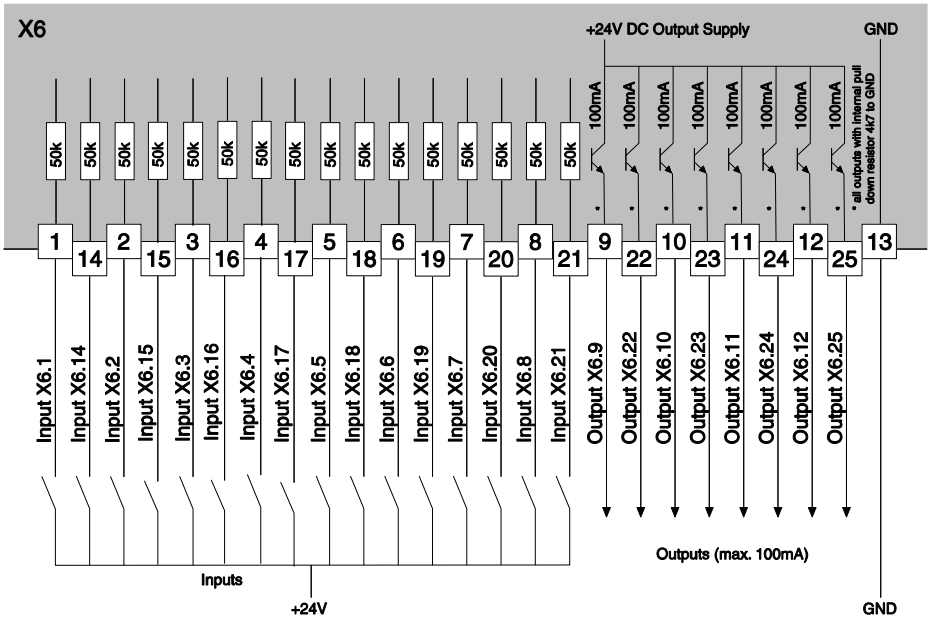
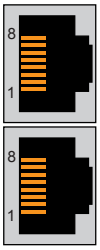
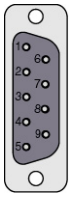
S2: MACID for CO, DN, RS interface and CANTalk[1)]:
Position value is equal to MACID (e.g. position 7 → MACID 0x07h)

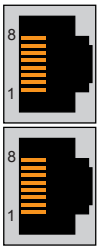
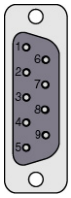
In case of Profibus DP the switches S1 and S2 define the node address, whereas S1 is the high nibble and S2 the low nibble.

NOTE: The baud rate and MACID will only be set if the interface switch S3.4 is set to “on”. In case of CO or DN interfaces, the OS (operating system) sets up the CAN bus baud rate according to the interface settings, but only if the interface is activated (S3.4). Otherwise the baud rate will be set to 500kBaud. The CAN-Talk ID is always taken from both switches S1 and S2.

S3:	Bus Termination		
	S3	Switch 4: Interface on/off (All field bus interfaces) Switch 3: Termination CAN on/off Switch 2: Termination RS485 on/off Switch 1: RS232 (switch “off” / RS485 “on”) Select serial RS232 or RS485 Factory setting: all switches “off”	
		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**		
	1 2 3 4 5 6 7 8 9 case	RS485_Tx+ RS232_Tx RS232_Rx RS485_Rx+ GND RS485_Rx- RS485_Tx- CAN_L CAN_H Shield	Y A B Z
DSUB-9 (m)	RS232:	Configuration on all Controllers: use 1:1 connection cable to PC	



X6:	Digital I/O
	
DSUB-25 (f)	<u>All Inputs:</u> Direct interfacing to digital 24VDC PLC outputs. Input current: 1mA Sample rate: 1ms <u>All Outputs:</u> Short circuit and overload protected high side switches Voltage: 24VDC max. current: 100mA Update rate: 1ms Outputs may directly drive inductive loads.
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	Use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring. The built in CAN and RS485 terminations can be activated by S3.2 and S3.3. X7 is internally connected to X8 (1:1 connection)
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)			
		Incremental:	Step/Direction:	EIA/TIA 568A colors:
	1	A+	Step+	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	Use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring. Master Encoder Inputs: Differential RS422, max. Input Frequency 2MHz, 240ns edge separation Master Encoder Outputs: Amplified RS422 differential signals from Master Encoder IN (X10) CAN internally connected to X7, X8 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. All devices, which are connected to X10/X11 must be referenced to the same ground.			
X12:	**External Position Sensor**			
		Incremental:	Sin/Cos:	
	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)	Max. Input Frequency: 2MHz (Incremental RS422), 240ns edge separation 10kHz (Analog 1Vpp), 10Bit AD converted Sensor Supply (max. 100mA) Encoder Inputs: - Incremental: RS422 - Sin/Cos: 1Vpp Enc. Alarm In: 5V / 1mA			

Error Codes

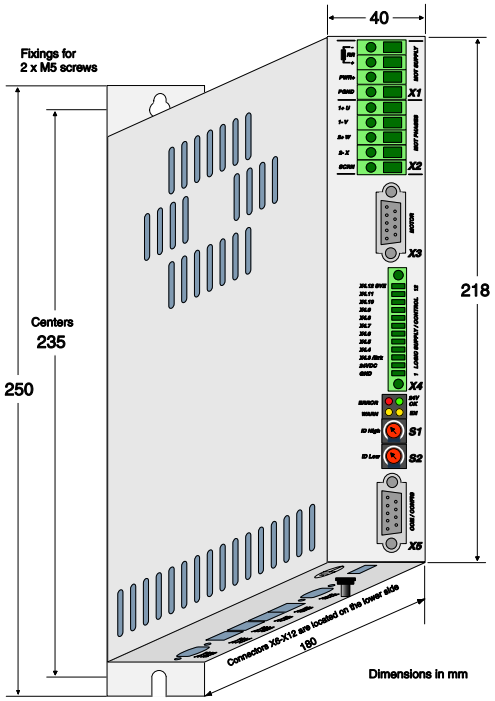
Error / Warn / 24V OK / EN			Description
ERROR	**WARN**	**EN**	
OFF	**Warning**	**Operation Enabled**	Normal Operation. Warnings and Operation Enabled are displayed
On	**● ~ 2Hz 0..15 x Error Code High Nibble**	**● ~ 2Hz 0..15 x Error Code Low Nibble**	Error: The Error Code is shown by a blink code with “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..15 x Error Code High Nibble**	**● ~ 2Hz 0..15 x Error Code Low 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..15 x Error Code High Nibble**	**● ~ 2Hz 0..15 x Error Code Low 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. These 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…85VDC.

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…)

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 >= 10’000 µF (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
E1130-DP-XC	Profibus Servo Controller	72VDC/20A	0150-1861
E1100-RS	RS232/485 Controller	72VDC/4A	0150-1677
E1100-RS-HC	RS232/485 Controller	72VDC/15A	0150-1678
E1100-RS-XC	RS232/485 Controller	72VDC/20A	0150-1862
E1100-CO	CANopen Controller	72VDC/4A	0150-1681
E1100-CO-HC	CANopen Controller	72VDC/15A	0150-1682
E1100-CO-XC	CANopen Controller	72VDC/20A	0150-1683
E1100-DN	DeviceNet Controller	72VDC/4A	0150-1679
E1100-DN-HC	DeviceNet Controller	72VDC/15A	0150-1680
E1100-DN-XC	DeviceNet Controller	72VDC/20A	0150-1863
E1100-GP	General Purpose Controller	72VDC/4A	0150-1665
E1100-GP-HC	General Purpose Controller	72VDC/15A	0150-1666

International Certifications

Certifications	
Europe CE	See chapter “declaration of conformity CE-Marking”.

Declaration of Conformity CE-Marking

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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.
E1130-DP	0150-1667	E1100-DN	0150-1679		
E1130-DP-HC	0150-1668	E1100-DN-HC	0150-1680		
E1100-GP	0150-1665	E1130-DP-XC	0150-1861		
E1100-GP-HC	0150-1666	E1100-CO-XC	0150-1683		
E1100-RS	0150-1677	E1100-DN-XC	0150-1863		
E1100-RS-HC	0150-1678	E1100-RS-XC	0150-1862		
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

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