LinMot®

A1100 Servo Drive
Installation Guide

Eine Deutsche Version kann unter http://www.linmot.com bezogen werden!
Please visit http://www.linmot.com to check for the latest version of this document!

This document applies to the following drives:

A1100-GP-LC-0S-xxx

Document version 6.1.1 / mk/Ro, April 2014

Table of Content

1 Important Safety Instructions

For your personal safety
Disregarding the following safety measures can lead to severe injury to persons and damage to material:

- Only use the product as directed.
- Never commission the product in the event of visible damage.
- Never commission the product before assembly has been completed.
- Do not carry out any technical changes on the product.
- Only use the accessories approved for the product.
- Only use original spare parts from LinMot.
- Observe all regulations for the prevention of accidents, directives and laws applicable on site.
- Transport, installation, commissioning and maintenance work must only be carried out by qualified personnel.
    - Observe IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and all national regulations for the prevention of accidents.
    - According to the basic safety information, qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.
- Observe all specifications in this documentation.
    - This is the condition for safe and trouble−free operation and the achievement of the specified product features.
    - The procedural notes and circuit details described in this documentation are only proposals. It is up to the user to check whether they can be transferred to the particular applications. NTI AG / LinMot does not accept any liability for the suitability of the procedures and circuit proposals described.
- LinMot servo drives and the accessory components can include live and moving parts (depending on their type of protection) during operation. Surfaces can be hot.
    - Non−authorized removal of the required cover, inappropriate use, incorrect installation or operation create the risk of severe injury to persons or damage to material assets.
    - For more information, please see the documentation.
- High amounts of energy are produced in the drive. Therefore it is required to wear personal protective equipment (body protection, headgear, eye protection, hand guard).

Application as directed
- Drives are components which are designed for installation in electrical systems or machines. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000−3−2.
- When drives are installed into machines, commissioning (i.e. starting of the operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 98/37/EC (Machinery Directive); EN 60204 must be observed.
- Commissioning (i.e. starting of the operation as directed) is only allowed when there is compliance with the EMC Directive (2004/108/EC).
- The technical data and supply conditions can be obtained from the nameplate and the documentation. They must be strictly observed.

Transport, storage
- Please observe the notes on transport, storage, and appropriate handling.
- Observe the climatic conditions according to the technical data.

Installation

- The drives must be installed and cooled according to the instructions given in the corresponding documentation.
- The ambient air must not exceed degree of pollution 2 according to EN 61800−5−1.
- Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.
- Drives contain electrostatic sensitive devices which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

- When working on live drives, observe the applicable national regulations for the prevention of accidents.
- The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross−sections, fuses, PE connection). Additional information can be obtained from the documentation.
  - This product can cause high-frequency interferences in non industrial environments which can require measures for interference suppression.

Operation

- If necessary, systems including drives must be equipped with additional monitoring and protection devices according to the valid safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents). The drives can be adapted to your application. Please observe the corresponding information given in the documentation.
- After the drive has been disconnected from the supply voltage, all live components and power connections must not be touched immediately because capacitors can still be charged. Please observe the corresponding stickers on the drive. All protection covers and doors must be shut during operation.

Protection of persons

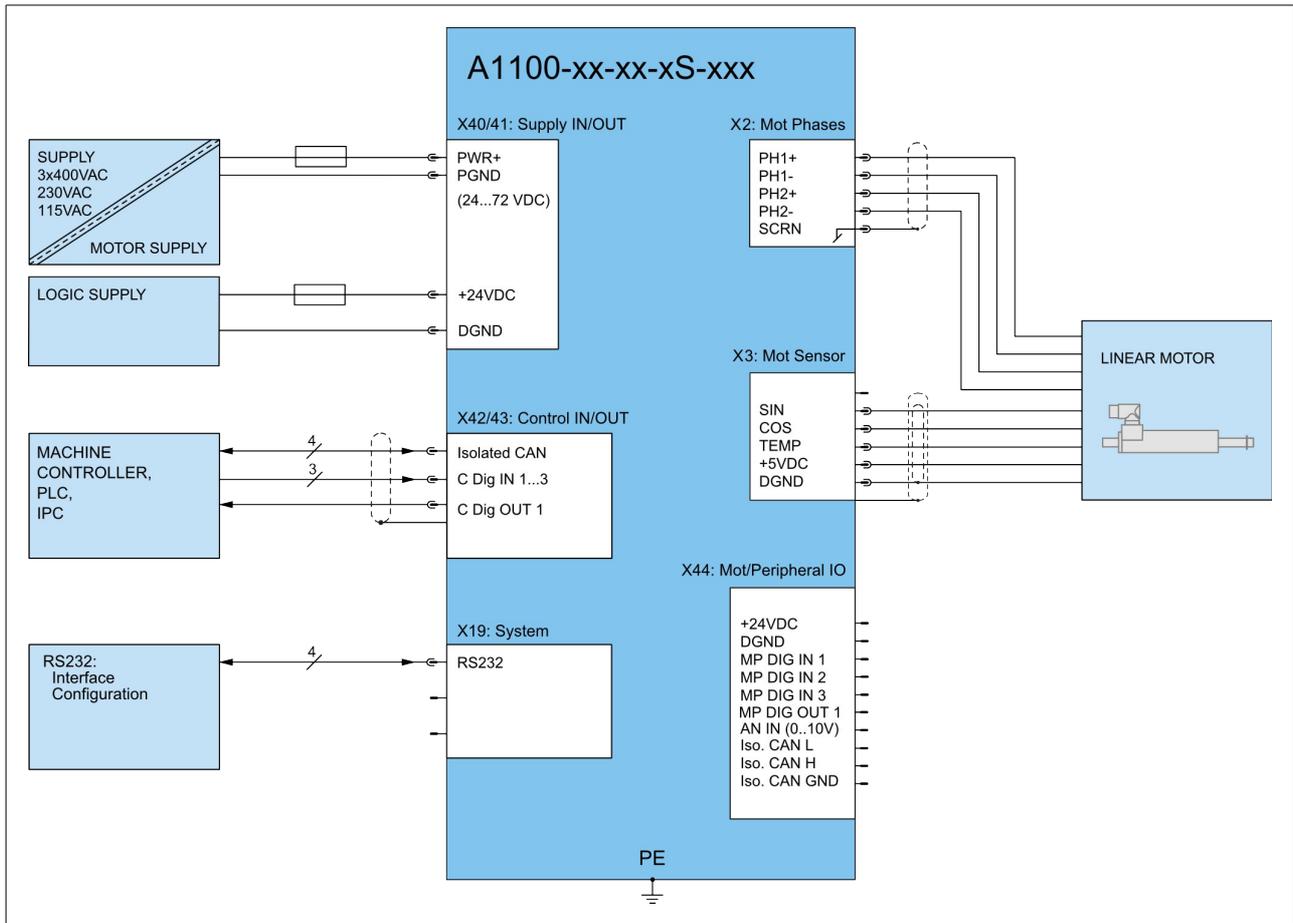- The power terminals Ph1+, Ph1-, Ph2+, Ph2- and PWR+ remain live for at least 5 minutes after disconnecting from the power supplies.
- Before servicing, disconnect supply, wait 5 minutes and measure between PWR+ and PGND to be sure that the capacitors have discharged below 42VDC

- The heat sink of the drive can have an operating temperature of > 80 °C: Contact with the heat sink results in burns.

2 System Overview

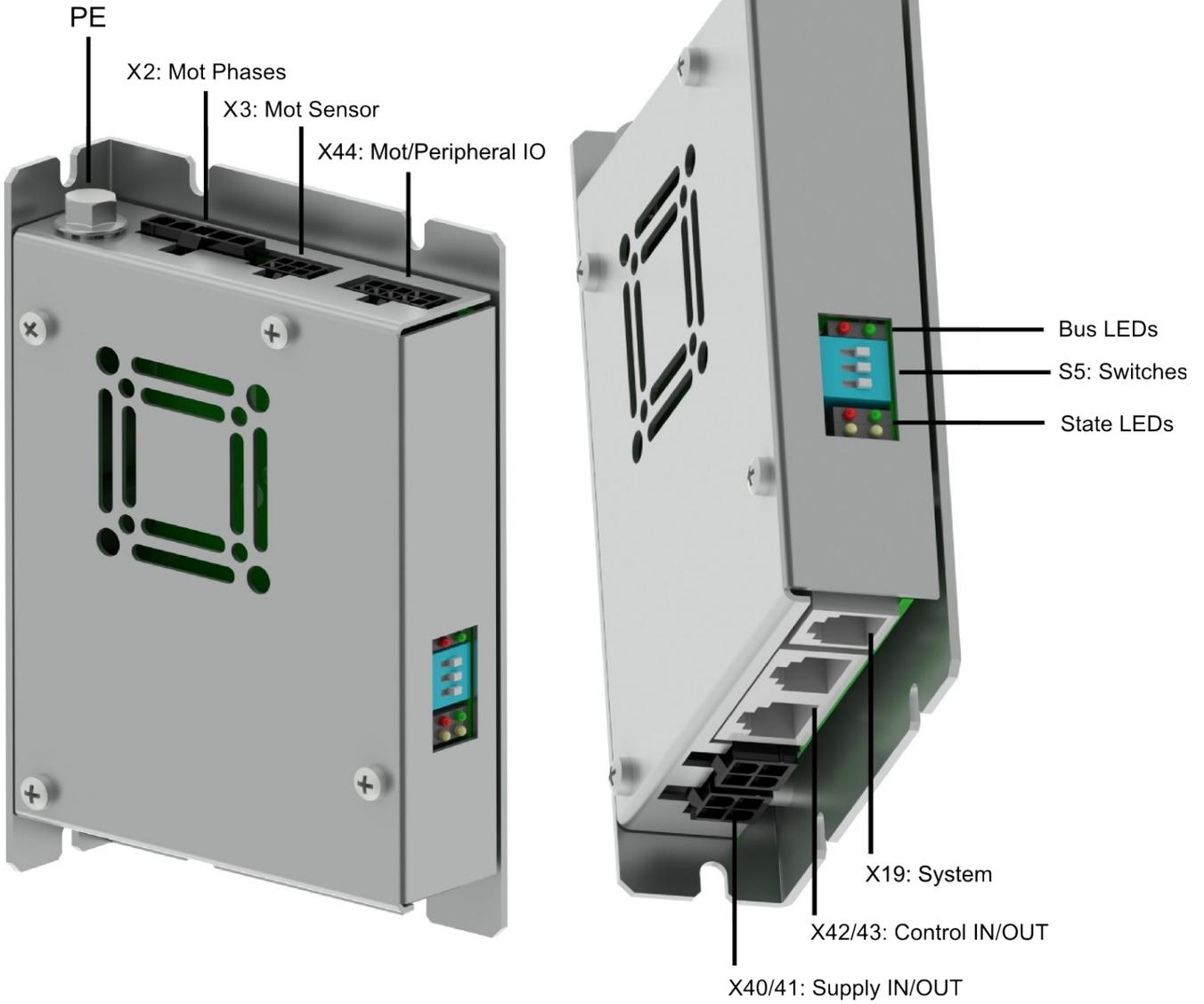

A1100-xx-xx-xS-xxx

SUPPLY
3x400VAC
230VAC
115VAC

MOTOR SUPPLY

LOGIC SUPPLY

MACHINE CONTROLLER, PLC, IPC

RS232:
Interface Configuration

X40/41: Supply IN/OUT
PWR+
PGND
(24...72 VDC)
+24VDC
DGND

X42/43: Control IN/OUT
Isolated CAN
C Dig IN 1...3
C Dig OUT 1

X19: System
RS232

X2: Mot Phases
PH1+
PH1-
PH2+
PH2-
SCRN

X3: Mot Sensor
SIN
COS
TEMP
+5VDC
DGND

LINEAR MOTOR

X44: Mot/Peripheral IO
+24VDC
DGND
MP DIG IN 1
MP DIG IN 2
MP DIG IN 3
MP DIG OUT 1
AN IN (0..10V)
Iso. CAN L
Iso. CAN H
Iso. CAN GND

PE

Typical servo system A1100: Servo drive, motor and power supply

3   Interfaces

A1100-xx-xx-xS-xxx

PE

X2: Mot Phases

X3: Mot Sensor

X44: Mot/Peripheral IO

Bus LEDs

S5: Switches

State LEDs

X19: System

X42/43: Control IN/OUT

X40/41: Supply IN/OUT

A1100 Installation Guide

4 Functionality

	A1100-GP-LC-0S-xxx
Supply Voltage	
Motor Supply 72VDC (24...85 VDC) (30...72 VDC for UL)	●
Logic Supply 24VDC (22...26 VDC)	●
Motor Phase Current	
8A $_{peak}$ / 6A $_{rms}$	●
Controllable Motors	
LinMot P01-23x…	●
P01-37x…	●
P01-48x…	●
Command Interface	
Easy Steps Application Layer	
Sinoide Application Layer	●
Cmd Tab IO Interface	
RS232 up to 115.2 kBaud	●
RS485 up to 115.2 kBaud	
CANOpen up to 1MBaud	●
DeviceNet 125, 250, 500 kBaud	
Programmable Motion Profiles (Curves)	
Up to 49 Motion Profiles, up to 8110 Curve Points	●
Programmable Command Table	
Command Table with up to 255 entries	●
Configuration	
RS232 Configuration	●
CAN Multi Axes Configuration	

5 Software

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

6 Power Supply and Grounding
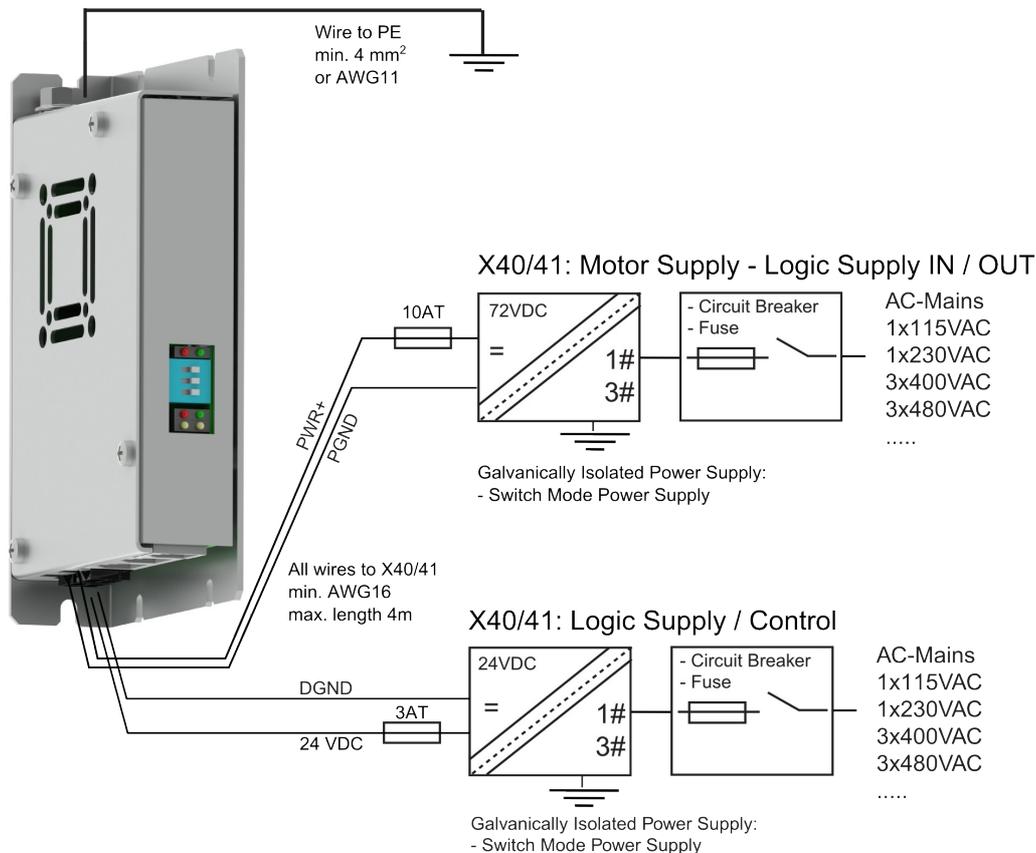
In order to assure a safe and error free operation and to avoid severe damage to system components, all system components[1] must be well grounded to either a single earth or utility ground. This includes both LinMot and all other control system components to the same ground bus.

Each system component[1] 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 drives.)

Power supply connectors must not be connected or disconnected while DC voltage is present. Do not disconnect system components until all LinMot drive 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 drives.

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 drive.

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1 Inside of the A1100 drive the power motor ground *PGND* and signal ground *DGND* are connected together and also to the GND of the drive housing. It is recommended that the *PWR motor GND* is NOT grounded at another place than inside of the drive to avoid circular currents.

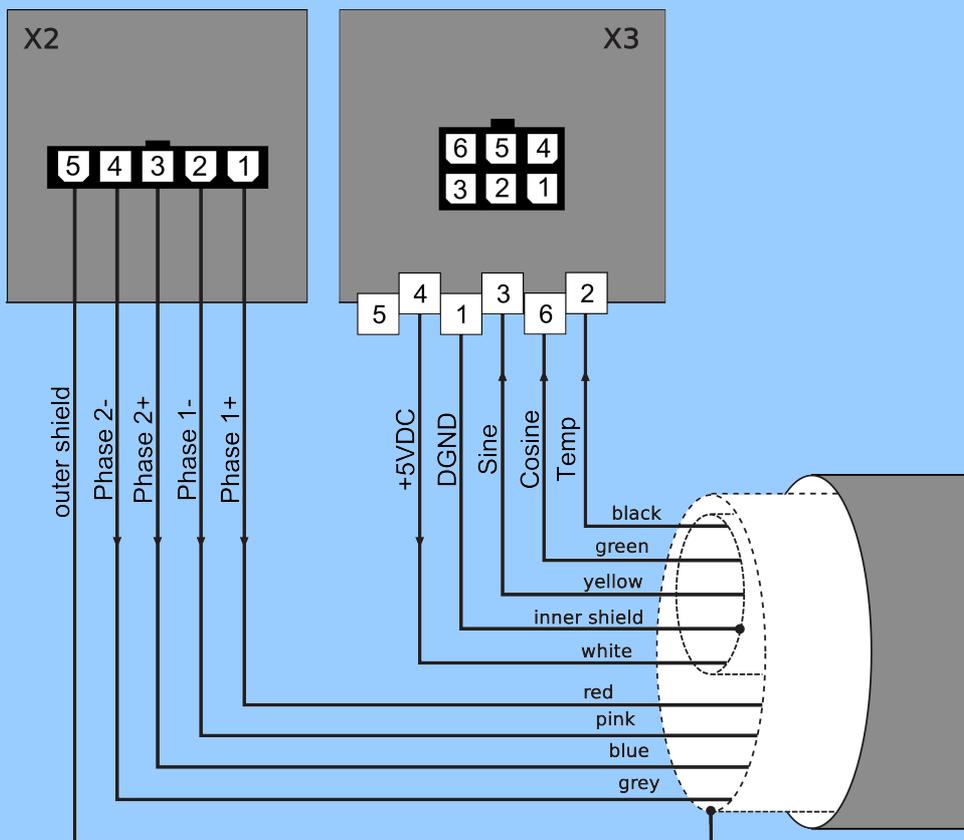# 7 Description of the connectors / Interfaces

7.1 X2

X2	Motor Phases			
1 2 3 4 5		1 PH1+ U 2 PH1- V 3 PH2+ W 4 PH2- X 5 SCRN		**LinMot Motor:** Motor Phase 1+ red Motor Phase 1- pink Motor Phase 2+ blue Motor Phase 2- grey Shield
Molex Mini-Fit Jr.™ Molex Art.Nr.: 50-36-1747	- Use 60/75°C copper conductors only - 13A max. current per circuit when header is mated to a receptacle loaded with a 45750 Mini-Fit® Plus HCS Crimp Terminal crimped to a 16 AWG wire			

7.2 X3

X3	Motor Sensor	
4 1 5 2 6 3		**LinMot Motor:** 1 DGND 2 Temp 3 Sensor Sine 4 +5VDC 5 (Do not connect) 6 Sensor Cosine
Molex Micro-Fit 3.0™ Molex Art.Nr.: 43045-0600	• Use +5V (X3.4) and DGND (X3.1) only for motor internal hall sensor supply (max. 100mA) • Cable length < 30m • **Caution: Do NOT connect DGND (X3.1) to ground or earth!**	

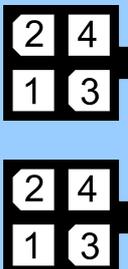**Recommended general wiring with LinMot Motor cable (K-, KS- and KR-types):**

X2

X3

Pin	Signal
5	outer shield
4	Phase 2-
3	Phase 2+
2	Phase 1-
1	Phase 1+

X3:
- 5 → +5VDC
- 4 → DGND
- 1 → Sine
- 3 → Cosine
- 6 → Temp
- 2 → Temp

Cable colors:
- black
- green
- yellow
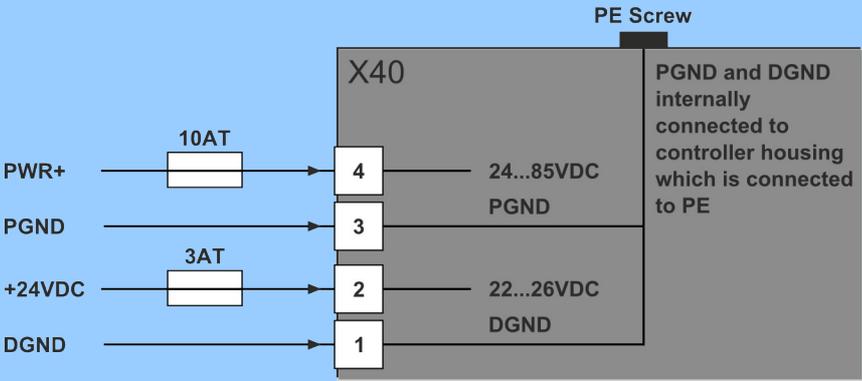- inner shield
- white
- red
- pink
- blue
- grey

- • For the connection between the linear motor and servo drive, only the specially shielded LinMot cables of type K, KS or KR should be used.
- • The length of the cable can be up to 30 m between the linear motor and the servo drive.
- • Motor cables fabricated by the customer are to be tested with a test voltage of 1500VDC.
- • An improperly fabricated motor cable can damage both the linear motor and the servo drive.
- • The minimum bend radius is to be observed for stationary cables as well as for moving motor cables.
- • The motor cable must not be plugged in or unplugged while under voltage.
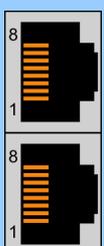
7.3 X19

X19	System		
	1	RS232 Tx	
	2	GND	
	3	GND	
	4	RS232 Rx	
	5	(Do not connect)	
	6	(Do not connect)	
RJ12 6P6C unshielded			

7.4   X40 / X41
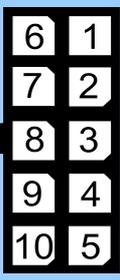
X40 / X41	Supply IN / OUT

Molex Mini-Fit Jr.™ Molex Art.Nr.: 50-36-2306	• Motor Supply: 72VDC nominal, 24...85VDC • Absolute max. Rating: 72VDC +20% • External Fuses: Motor Supply = 10AT (10A slow blow) / min. 100VDC • Logic Supply = 3AT (3A slow blow) / min. 100VDC • If motor supply voltage exceeds 90VDC, the drive will go into error state • Use 60/75°C copper conductors only • 13A max. current per circuit when header is mated to a receptacle loaded with a 45750 Mini-Fit® Plus HCS Crimp Terminal crimped to a 16 AWG wire

7.5   X42 / X43

X42 - X43	Control IN / OUT	
	1 C Dig IN 1 2 C Dig IN 2 3 C Dig IN 3 4 CAN GND 5 CAN GND 6 C Dig OUT 1 7 Isolated CAN H 8 Isolated CAN L case Shield	Input high voltage: Vin > 16VDC, Input low voltage: Vin < 8VDC Input high voltage: Vin > 16VDC, Input low voltage: Vin < 8VDC Input high voltage: Vin > 16VDC, Input low voltage: Vin < 8VDC Open Collector Output, 100k Pull-Up to +24VDC
RJ-45 shielded	• Use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring • X42 is internally connected to X43 (1:1 connection) • Cable length < 30m. • Galvanically isolated CAN transceiver meets the specifications of the ISO11898-2 standard Note: A termination resistor of 120 Ohm can be connected drive internally with the switch S5.1.	

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7.6   X44

X44	Motor Peripheral I/O		
	1	DGND	
	2	MP Dig IN 1	Input high voltage: Vin > 16VDC, Input low voltage: Vin < 8VDC
	3	MP Dig IN 2	Input high voltage: Vin > 16VDC, Input low voltage: Vin < 8VDC
	4	CANGND	
	5	Isolated CAN H	
	6	+24VDC OUT	Max. Current: 2.5A
	7	MP Dig OUT 1	Open Collector Output, No Pull-Up, Max. Current: 1.4A
	8	MP Dig IN 3	Input high voltage: Vin > 16VDC, Input low voltage: Vin < 8VDC
	9	AN IN (0..10V)	Analog Input 0V..10V
	10	Isolated CAN L	
Molex Micro-Fit 3.0™ Molex Art.Nr.: 43045-1000	• Galvanically isolated CAN transceiver meets the specifications of the ISO11898-2 standard • The CAN bus on X44 is the same one as on X42/43 Note: A termination resistor of 120 Ohm can be connected drive internally with the switch S5.1.		

7.7   LEDs

LEDs	State Display	
Error ● ● 24VOK Warn ● ● EN	Green Yellow Yellow Red	24V Logic Supply OK Motor Enabled / Error Code Low Nibble Warning / Error Code High Nibble Error

7.8   BUS LEDs

Bus LEDs	Bus State Display	
BUS ● ● BUS Error OK	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.	

7.9   S5

S5		
	S5.3 S5.2 S5.1	Bootstrap (Default = off) Parameter Default (Default = off) CAN Termination (Default = on)
	The use of these switches depends on the type of fieldbus which is used. Please see the corresponding manual for further information.	

8 Error Codes

| Error Codes			
Error 🔴 🟢 24VOK Warn 🟡 🟡 EN			
Error	**Warn**	**EN**	**Description**
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 (= 4 bit). "WARN" and "EN" are blinking together. The error can be acknowledged. (e.g.: 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. (e.g.: 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.
● ~0.5Hz	● ~0.5Hz	On	**Signal Supply 24V too low:** The error and warn LEDs blink alternating if the signal supply +24V (X4.2) is less than 18VDC.
Off	M●●●	●M●●	**Plug&Play Communication Active** This sequence (Warn on, then En on, then both off, complete sequence of the 4 states ca. 1Sec) signalizes the state when the plug and play parameters are being read from the motor.

The meaning of the error codes can be found in the Usermanual_MotionCtrl_Software_SG5 and the user manual of the installed interface software. These documents are provided together with LinMot-Talk configuration software and can be downloaded from *www.linmot.com*.

9   Physical Dimension

Backside
for mounting
A1100-XX-XX-0S

Dimensions [mm]
A1100-XX-XX-0S
Top Side
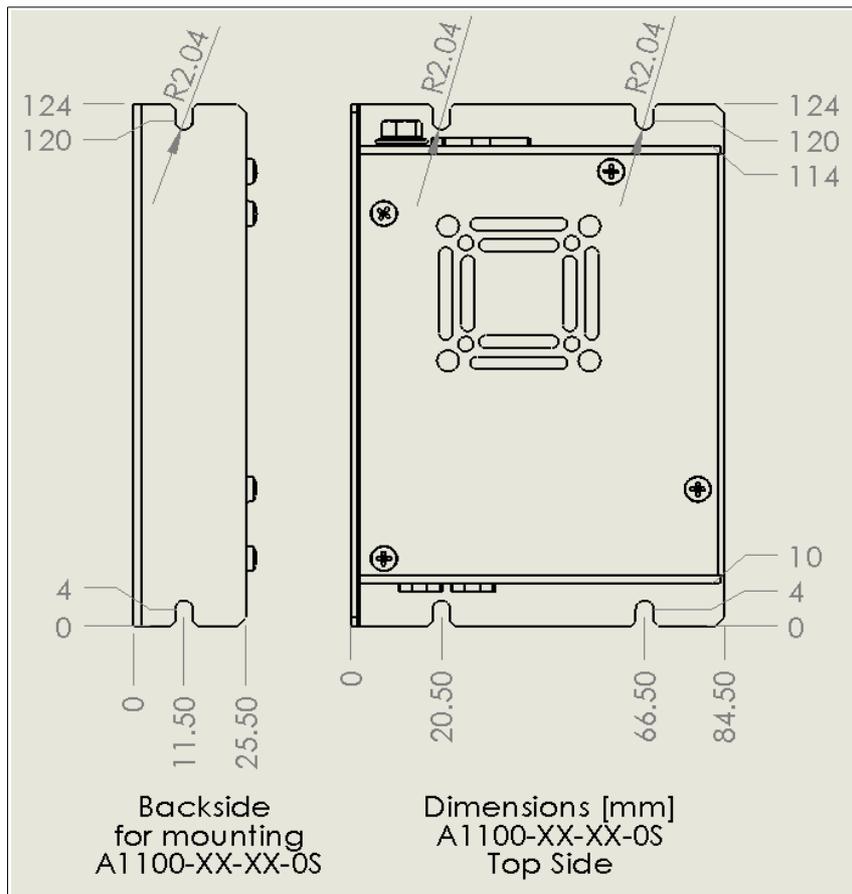
A1100 *Single axis drive*		
Width	mm (in)	25.6 (1.0)
Height	mm (in)	124 (4.9)
Depth	mm (in)	84.5 (3.3)
Weight	g (lb)	340 (0.75)
Case	IP	20
Storage Temperature	°C	-25…40
Transport Temperature	°C	-25…70
Operating Temperature	°C	0…40 at rated data (UL) 40…50 with power derating
Relative humidity	%	95 (non-condensing)
Pollution	IEC/EN 60664-1	Pollution degree 2
Max. Case Temperature	°C	70
Max. Power Dissipation	W	???
Distance between Drives	mm (in)	20 (0.8) horizontal 50 (2) vertical

10 Power Supply Requirement

Motor Power Supply

The calculation of the needed power for the Motor supply is depending on the application and the used motor. The nominal supply voltage is 72VDC. The possible range is from 24 to 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...). Due to high braking voltage and sudden load variations of linear motor applications, **only specially designed power supplies can be used.**

Signal Power Supply

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. 0.5A	(no load on the outputs)
typ. 0.7A	(all outputs "on" with 100mA load and Break with no load)
max. 1.7A	(all outputs "on" with 100mA load and Break with 1A load)

Do not connect the safety relays to the 24VDC Signal Supply! Use a separate power supply for the safety circuit!

11 Regeneration of Power

If the power supply rises too high when breaking, connect an additional capacitor to the motor power supply. It is recommended to use a capacitor >= 10'000 µF (install capacitor close to the drive supply!)

12 Ordering Information

Drive	Description	Art. No.
A1100-GP-LC-0S-000	General Purpose Drive 72VDC / 8A$_{peak}$	0150-2052
Accessories	**Description**	**Art. No.**
RS232 configuration cable	AC01-RJ12/Df-2.5-RS1, Length 2.5m	0150-3544
Supply cable for X40	AC01-MiniFit-jr./f 4 circuits, dual row - open end, Length 4m	0150-3545
Daisy Chain Supply cable for X40/41	AC01-MiniFit-jr./f 4 circuits, dual row - MiniFit-jr./f 4 circuits, dual row, Length 15cm	0150-3552
I/O cable for X44	AC01-MicroFit 3.0/f 10circuits, dual row - open end, Length 4m	0150-3553

13 International Certifications

Certifications	
Europe	See chapter "Declaration of Conformity CE-Marking"
USA / Canada	All products marked with this symbol are tested and recognized by Underwriters Laboratories and the production facilities are checked quarterly by an UL inspector. This mark is valid for the USA and Canada and eases certification of your machines and systems in these areas. File number E316095 UL 508C Power Conversion Equipment CSA C22.2 Industrial Control Equipment

14 Safety notes for the installation according to UL

Markings:

- Wiring terminal markings:
  See markings on the enclosure and the corresponding chapters in the installation guide!

- Cautionary Marking:
  See markings on the enclosure and the corresponding chapters in the installation guide!

- Motor overload protection must be provided externally in the end-use. Motor Overload protection can alternatively be provided when the connected motor has a thermal sensor rated 5V DC, max. 100mA which is connected to the drive thermal sensor input (X3).

- The transients have to be limited to max. 0.8kV on the line side of the drive.

- The 24VDC supply for the control circuit must be protected with an external UL Listed 3A DC Fuse.

- Proposed ratings, to be evaluated in the end-use:
  - Input Voltage: 72VDC
  - Input current: 5A
  - Output Voltage: 61.5V rms
  - Output Current: 5.7A rms max.
  - Number of Phases: 2 by 1 Phase
  - Frequency range: 0-500Hz
  - Duty cycle rating: 10%
  - Control Power (X40-2, X41-2): 24VDC
    protected with an external UL Listed 3A DC Fuse
  - Surrounding Air Temperature: max. 50°C

15 Declaration of Conformity CE-Marking

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declares under sole responsibility the compliance of the products:
- **Drives of the Series A1100-GP-LC-0S-xxx**

with the **EMC Directive 2004/108/EC**.

Applied harmonized standards:

– **EN 61000-6-2: 2005 (Immunity for industrial environments)**

– **EN 61000-6-4: 2007 (Emission for industrial environments)**

– **EN 61326-3-1: 2008 (Functional safety)**

According to the EMC directive, the listed devices are not independently operable products.

Compliance of the directive requires the correct installation of the product, the observance of specific installation guides and product documentation. This was tested on specific system configurations.

The safety instructions of the manuals are to be considered.

These products are intended for installation in machines. Operation is prohibited until it has been determined that the machines in which these products are to be installed, conforms to the above mentioned EC directive.

The product must be mounted and used in strict accordance with the installation instructions contained within the installation guide, a copy of which may be obtained from NTI AG.

Company: NTI AG
Spreitenbach, March 13, 2014

Dr. Ronald Rohner / CEO NTI AG

A1100 Installation Guide

16 Contact Addresses

SWITZERLAND	**NTI AG** Haerdlistr. 15 CH-8957 Spreitenbach	
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	Tech. Support:	+41-(0)56-544 71 00 support@linmot.com
	Tech. Support (Skype):	skype:support.linmot
	Fax: Web:	+41-(0)56-419 91 92 http://www.linmot.com/

USA	**LinMot USA Inc.** 204 E Morrissey Dr. 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: Web:	usasales@linmot.com http://www.linmotusa.com/

Please visit http://www.linmot.com/ to find the distributor closest to you.

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