LinMot®

Linear Motor Series P10-70

Peak force up to 2´500N

Velocity up to 5m/s

Acceleration up to 100g

Free positioning

Long life: Linear direct drive

The linear motor technology for industrial applications

High Force Linear Motor System

With the Linear Motor Family P10-70 LinMot extends the product range with bigger and more powerful actuators for 3x400VAC for forces up to 2'500N. Five different motor sizes from 500N to 2'500N will cover a wide range of high power applications with heavy loads. The motors are controlled by the new Series E1400 Servo Drives with Field bus and industrial Ethernet Interfaces. The E1400 Drives are directly supplied from the AC mains with a 3x340…480VAC input range.

LinMot industrial linear motors are design elements that offer significant advantages over typical elements such as pneumatic cylinders, servomotors with spindles and belts, or mechanical solutions such as cam, discs or crank designs. LinMot industrial linear motors are new design elements that enable innovative solutions for new functional units, modules, or entire machines that were previously impractical using traditional elements. The high level of integration (bearings and position sensors are integrated in the motor) and the ability to integrate LinMot systems into a wide range of control systems shorten the design-in time.

Since the form factor of LinMot linear motors is similar to that of pneumatic cylinders, they are often used are replacements for pneumatic cylinders. This is especially the case when more than two positions are required, if the positions need to be changed via software, or if the dynamics or lifespan of the pneumatic cylinder is not sufficient.

The new LinMot Linear Motors size P10-70 will open the LinMot technology for new applications with higher forces and higher loads

Linear Motors
Series P10-70

LinMot linear motors employ a direct electromagnetic principle. Electromagnetic force provides direct linear movement without the use of cams, gears, belts, or other mechanical devices. The motor consists of only two parts: the slider and the stator. The slider is a precision assembly that consists of a stainless steel tube, which is filled with neodymium magnets, that has threaded attachment holes on each end. The stator, consisting of coils, the bearing for the slider, position sensors and a microprocessor, is designed for use in harsh industrial environments.

The internal position sensors measure and monitor the current position of the linear motor, both at rest and in motion.

Deviations from desired position are captured immediately and reported to the control system. This guaran-
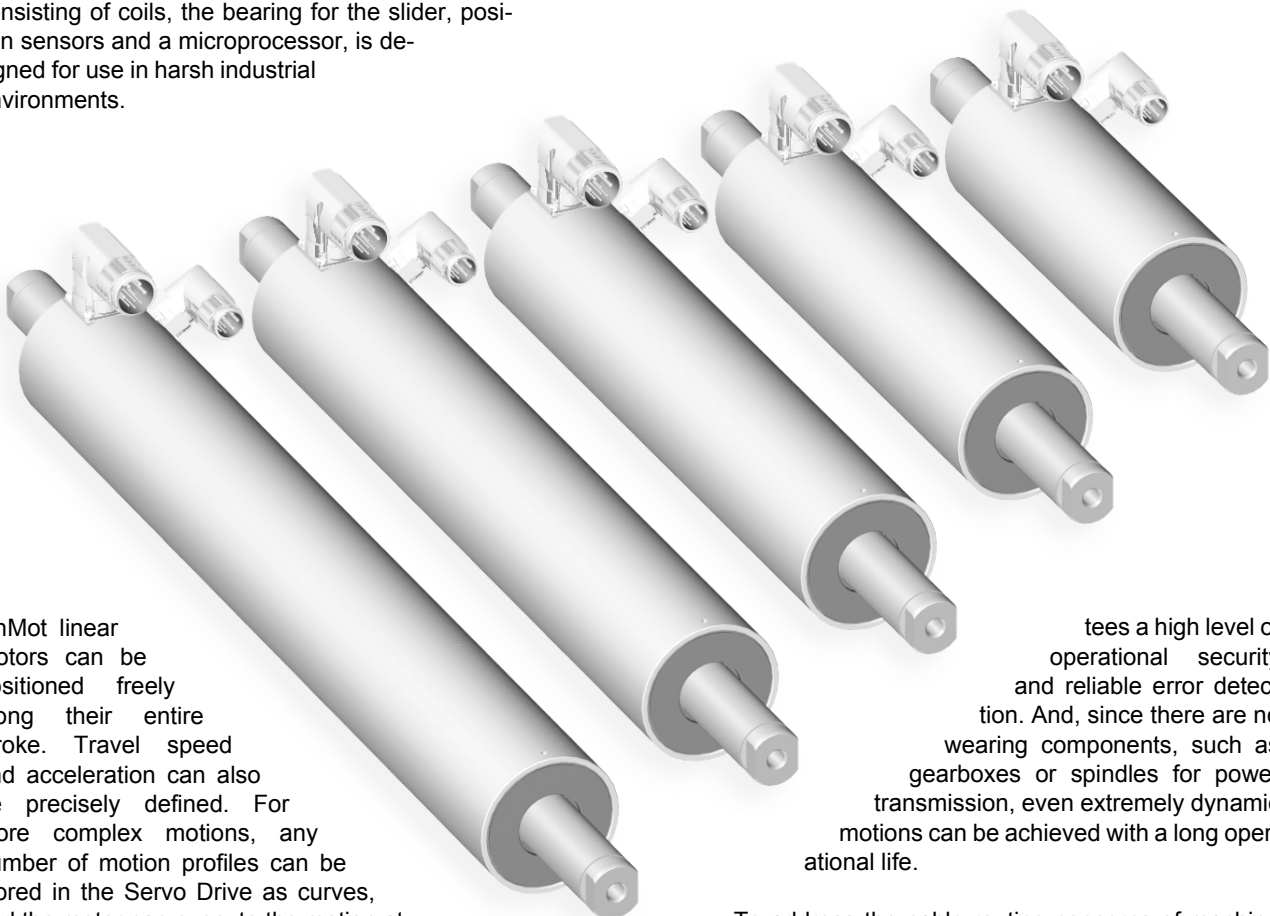
LinMot linear motors can be positioned freely along their entire stroke. Travel speed and acceleration can also be precisely defined. For more complex motions, any number of motion profiles can be stored in the Servo Drive as curves, and the motor can execute the motion at the desired speed. The motion of the linear motor can also be synchronized with another rotary or linear motion.

tees a high level of operational security and reliable error detection. And, since there are no wearing components, such as gearboxes or spindles for power transmission, even extremely dynamic motions can be achieved with a long operational life.

Extremely dynamic motions can be achieved with industrial linear motors. Velocities over 5m/s and accelerations of well over 100g provide very short positioning times and high cycle rates. With the elimination of components afflicted by mechanical play, such as gearboxes or gear racks, linear motors can be positioned as precisely as desired, consistent with the resolution of the measurement system.

To address the cable routing concerns of machine designers, LinMot provides motors with two rotatable IP67 connectors for signal and power mounted right on the motor.

The 3x400VAC motors are available in 5 different sizes with peak forces of from 500 to 2'500 N and strokes up to 1770 mm. In addition, the modular design of LinMot motors allows custom designs even in moderate quantities.

Motor Specification

		P10-70x80	P10-70x160	P10-70x240	P10-70x320	P10-70x400
Maximum stroke	mm	1770	1690	1610	1530	1450
Peak force	N	557	1104	1617	2162	2703
Continuous stall force [1]	N	65	126	183	250	312
Continuous stall force [2]	N	99	191	279	381	479
Continuous stall force [3]	N	174	337	488	673	862
Max. velocity	m/s	7.4	6.8	6.5	5.9	4.7
Max. acceleration	m/s^2	409	603	882	939	975

Electrical Specification

		P10-70x80	P10-70x160	P10-70x240	P10-70x320	P10-70x400
Nominal DC-Link Voltage	Vdc	560	560	560	560	560
Maximum DC-Link Voltage	Vdc	750	750	750	750	750
Peak current	A_{pk}	11	20	28	34	34
Peak current	A_{rms}	7.8	14.1	19.8	24.0	24.0
Continuous stall Current [1]	A_{rms}	0.9	1.7	2.3	2.9	2.9
Continuous stall Current [2]	A_{rms}	1.4	2.5	3.5	4.4	4.4
Continuous stall Current [3]	A_{rms}	2.5	4.5	6.2	7.8	8.0
Force constant	N/A_{rms}	71.6	78.1	81.6	89.9	112.4
Back EMF constant (ph-ph)	V_{pk}/(m/s)	60.5	66	69	76	95
Resistance @ 25°C (ph-ph)	Ohm	12.8	8.1	6.2	5.4	6.8
Resistance @ 100°C (ph-ph)	Ohm	16.54	10.47	8.01	6.98	8.79
Inductance (ph-ph)	mH	26	15.6	11.6	10.2	12.8

Thermal Specification

		P10-70x80	P10-70x160	P10-70x240	P10-70x320	P10-70x400
Max. winding temp.	°C	90	90	90	90	90
Max. Duration with peak current	s	4.2	4.1	4.2	4.6	4.6
Max. power dissipation [1/2/3]	W	21/49/153	42/98/306	63/146/447	85/196/611	106/250/809
Thermal resistance [1/2/3]	°C/W	2.6/1.12/0.36	1.3/0.56/0.18	0.87/0.377/0.123	0.65/0.28/0.09	0.52/0.22/0.068
Thermal time constant [1/2/3]	s	4200/1000/100	4200/1000/100	4200/1000/100	4200/1000/100	4200/1000/100
Thermal winding capacity [1]	°C/J	50	101	157	220	277

Mechanical Specification

		P10-70x80	P10-70x160	P10-70x240	P10-70x320	P10-70x400
Stator length	mm	180	260	340	420	500
Stator diameter	mm	70	70	70	70	70
Stator mass	kg	2.85	4.2	5.55	6.9	8.25
Slider length (min/max)	mm	290/1990	390/1990	390/1990	490/1990	590/1990
Slider diameter	mm	28	28	28	28	28
Slider mass	kg/m	4.7	4.7	4.7	4.7	4.7
Magnetic period (el. cycle)	mm	40	40	40	40	40

1) Passvie Cooling @ 25°C
2) Fan Cooling @ 25°C
3) Liquid Cooling @ 25°C
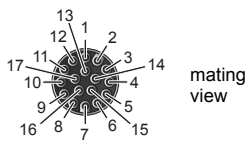
Power Connector
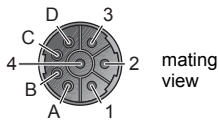
Connector:
Intercontec
SpeedTec Series 923
BEDC 110 NN00 0001 01 000
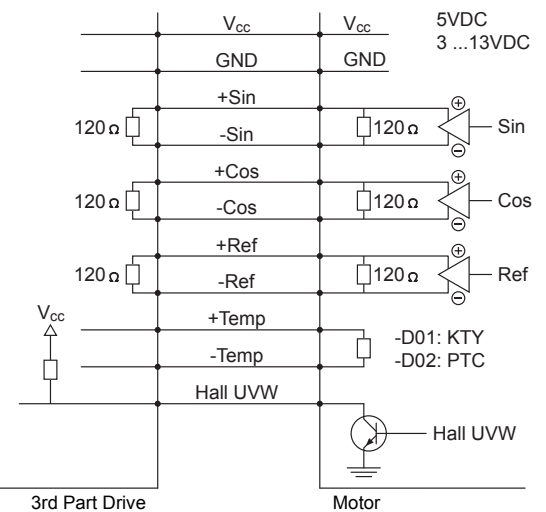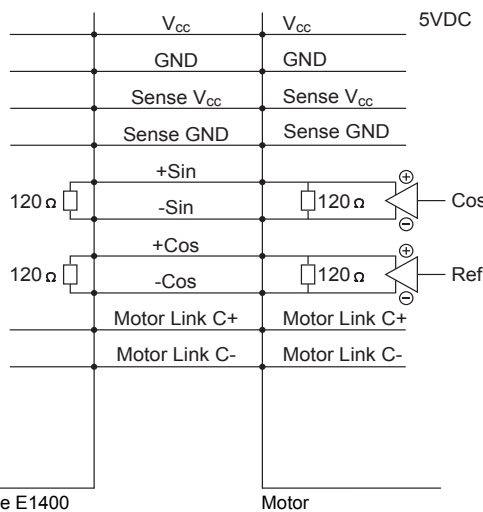Cable:
screened motor cable
wire diameter =1.5mm²
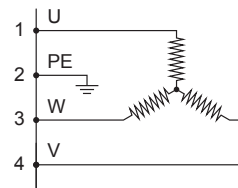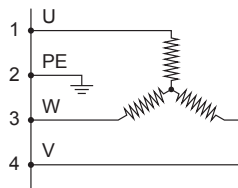
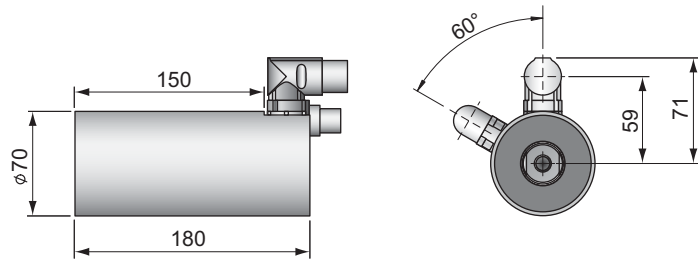|	**PS10-70x...**	**PS10-70x...-D01 and -D02**
1	Phase U	Phase U
2	Protective Earth	Protective Earth
3	Phase W	Phase W
4	Phase V	Phase V
A	n.c.	n.c.
B	n.c.	n.c.
C	n.c.	n.c.
D	n.c.	n.c.

Encoder Connector

Connector:
Intercontec
SpeedTec, Series 617
AEDA 874 NN00 0005 1A 000

Cable:
screened twisted pair
encoder cable,
wire diameter =0.5mm²

	PS10-70x...	**PS10-70x...-D01 and -D02**
1	+5VDC	3...13VDC
2	GND	GND
3	Sense +5V	Sense Vcc (optional)
4	Sense GND	Sense GND (optional)
5	Motor Link C+	n.c.
6	Motor Link C-	n.c.
7	Sin+	Sin+
8	Sin-	Sin-
9	Cos+	Cos+
10	Cos-	Cos-
11	n.c.	Ref.+
12	n.c.	Ref.-
13	n.c.	Hall U
14	n.c.	Hall V
15	n.c.	Hall W
16	n.c.	Temp+ (-D01: KTY984/130 -D02: PTC)
17	n.c.	Temp- (-D01: KTY984/130 -D02: PTC)

PS10-70x80

150

⌀70

180

60°

59

71

PS10-70x160

230

⌀70

260

60°

59

71

PS10-70x240

310

⌀70

340

60°

59

71

PS10-70x320

390

⌀70

420

60°

59

71

PS10-70x400

470

⌀70

500

60°

59

71

Dimensions in mm
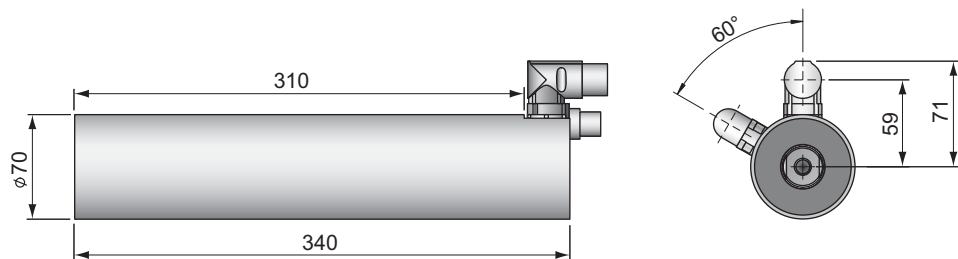
Strokes

25   15   Stroke

Dimensions in mm
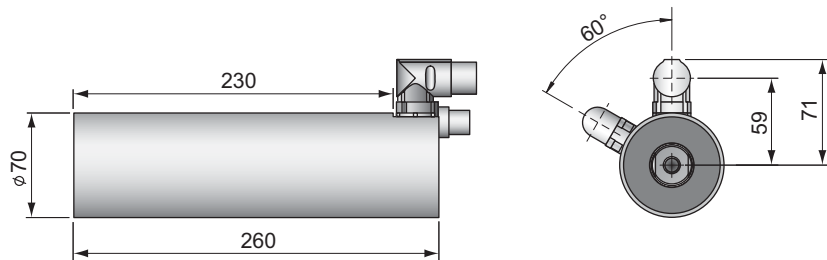
Stator	PS10-70x80	PS10-70x160	PS10-70x240	PS10-70x320	PS10-70x400
Slider			Stroke in mm		
PL10-28x290/240	70				
PL10-28x390/340	170	90	10		
PL10-28x490/440	270	190	110	30	
PL10-28x590/540	370	290	210	130	50
PL10-28x690/640	470	390	310	230	150
PL10-28x790/740	570	490	410	330	250
PL10-28x890/840	670	590	510	430	350
PL10-28x990/940	770	690	610	530	450
PL10-28x1190/1140	970	890	810	730	650
PL10-28x1390/1340	1170	1090	1010	930	850
PL10-28x1590/1540	1370	1290	1210	1130	1050
PL10-28x1790/1740	1570	1490	1410	1330	1250
PL10-28x1990/1940	1770	1690	1610	1530	1450

Ordering information

| Item	Description	Part Number
Stator Series PS10-70		
PS10-70x80U-BL-QJ	Stator 3x400VAC, LinMot Encoder	0150-1291
PS10-70x160U-BL-QJ	Stator 3x400VAC, LinMot Encoder	0150-1292
PS10-70x240U-BL-QJ	Stator 3x400VAC, LinMot Encoder	0150-1293
PS10-70x320U-BL-QJ	Stator 3x400VAC, LinMot Encoder	0150-1284
PS10-70x400U-BL-QJ	Stator 3x400VAC, LinMot Encoder	0150-1294
Stator Series PS10-70-D01 and -D02		
PS10-70x80U-BL-QJ-D01	Stator 3x400VAC, SinCos Encoder 1Vpp, KTY	0150-2282
PS10-70x160U-BL-QJ-D01	Stator 3x400VAC, SinCos Encoder 1Vpp, KTY	0150-2283
PS10-70x240U-BL-QJ-D01	Stator 3x400VAC, SinCos Encoder 1Vpp, KTY	0150-2284
PS10-70x320U-BL-QJ-D01	Stator 3x400VAC, SinCos Encoder 1Vpp, KTY	0150-2285
PS10-70x400U-BL-QJ-D01	Stator 3x400VAC, SinCos Encoder 1Vpp, KTY	0150-2286
PS10-70x80U-BL-QJ-D02	Stator 3x400VAC, SinCos Encoder 1Vpp, PTC	0150-2360
PS10-70x160U-BL-QJ-D02	Stator 3x400VAC, SinCos Encoder 1Vpp, PTC	0150-2361
PS10-70x240U-BL-QJ-D02	Stator 3x400VAC, SinCos Encoder 1Vpp, PTC	0150-2362
PS10-70x320U-BL-QJ-D02	Stator 3x400VAC, SinCos Encoder 1Vpp, PTC	0150-2343
PS10-70x400U-BL-QJ-D02	Stator 3x400VAC, SinCos Encoder 1Vpp, PTC	0150-2363
Slider Series PL10-28		
PL10-28x290/240	Slider for P10-70 "standard"	0150-2193
PL10-28x390/340	Slider for P10-70 "standard"	0150-2194
PL10-28x490/440	Slider for P10-70 "standard"	0150-2195
PL10-28x590/540	Slider for P10-70 "standard"	0150-2196
PL10-28x690/640	Slider for P10-70 "standard"	0150-2197
PL10-28x790/740	Slider for P10-70 "standard"	0150-2198
PL10-28x890/840	Slider for P10-70 "standard"	0150-2199
PL10-28x990/940	Slider for P10-70 "standard"	0150-2203
PL10-28x1190/1140	Slider for P10-70 "standard"	0150-2204
PL10-28x1390/1340	Slider for P10-70 "standard"	0150-2205
PL10-28x1590/1540	Slider for P10-70 "standard"	0150-2206
PL10-28x1790/1740	Slider for P10-70 "standard"	0150-2207
PL10-28x1990/1940	Slider for P10-70 "standard"	0150-2208

Flanges and ventilator

Item	Description	Part Number
Flanges PF10-70		
PF10-70x110	Flange for PS10-70x80	0150-2272
PF10-70x190	Flange for PS10-70x160	0150-2273
PF10-70x270	Flange for PS10-70x240	0150-2274
PF10-70x350	Flange for PS10-70x320	0150-2275
PF10-70x430	Flange for PS10-70x400	0150-2276
PF10-70x110-FC	Flange for PS10-70x80 fluid cooling	0150-2291
PF10-70x190-FC	Flange for PS10-70x160 fluid cooling	0150-2292
PF10-70x270-FC	Flange for PS10-70x240 fluid cooling	0150-2293
PF10-70x350-FC	Flange for PS10-70x320 fluid cooling	0150-2294
PF10-70x430-FC	Flange for PS10-70x400 fluid cooling	0150-2295
Ventilator		
HV01-37/48	Ventilatorkit for H01-37/48 & PF02-37/48	0150-5051

Cable

Item	Description	Part Number
Sensor Cable KSS05		
KSS05-02/08-D15/J-3	High Flex cable Sensor D15/J, 3m	0150-2263
KSS05-02/08-D15/J-5	High Flex cable Sensor D15/J, 5m	0150-2262
KSS05-02/08-D15/J-8	High Flex cable Sensor D15/J, 8m	0150-2264
KSS05-02/08-D15/J-12	High Flex cable Sensor D15/J, 12m	0150-2265
KSS05-02/08-D15/J-L	Special cable KSS05-02/08-D15/J	0150-3389
Power Cable KPS15		
KPS15-04-L/Q-3	High Flex cable Power L/Q, 3m	0150-2266
KPS15-04-L/Q-5	High Flex cable Power L/Q, 5m	0150-2261
KPS15-04-L/Q-8	High Flex cable Power L/Q, 8m	0150-2267
KPS15-04-L/Q-12	High Flex cable Power L/Q, 12m	0150-2268
KPS15-04-L/Q-L	Special cable KPS15-04-L/Q	0150-3388

Servo Drive Series E1400
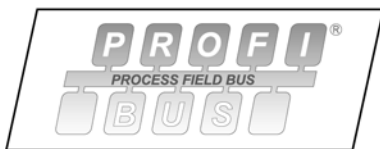
Servo Drive Series E1400

Series E1400 Servo Drives are modular axis drives, with 32-bit position resolution and an integrated power stage 3x400VAC, for linear motors and rotary motors.

The drives are suitable for simplest, standard, and high-end positioning tasks, across the entire force range of the LinMot product range.

Connection to Machine Drive

The Series E1400 Servo Drives can be actuated by machine controls from any manufacturer or brand, via digital inputs and outputs, RS232 or RS485 serial interface, CanBus CANopen and DeviceNet interfaces, Profibus DP, or industrial ETHERNET.

Process and Safety Interfaces

Fast process interfaces for direct processing of sensor signals are available as freely programmable analog and digital inputs, a fast trigger input, and a capture input.

The safety Interface on Servo Drive with fieldbus interfaces or industrial ETHERNET allows safe stop of the drives via control signals, per EN 954-1, without interrupting the power supply.

Logic and Power Supply

The Servo Drives have two separate power supply inputs for the logic and power elements.

In an E-stop and safe stop of the drive, only the power element supply is cut off from the drive. The logic supply and the drive continue to run.

This has the advantage that the drive and linear motor do not need to be reinitialized when the machine is restarted, since all process data, including the current position of the linear motor, are still up to date.

Fieldbusses and interfaces to the overlaid control

Digital I/O´s	RS232 RS485	CAN open	Device-Net	Profibus DP	ProfiNet	Sercos III	Power Link	Ethernet IP	Ether CAT

Supply and Safety

- Logic Supply
- Motor Supply 3x400VAC
- Safety
- Regeneration Resistor

Fast Prozess Inputs

- Trigger Inputs
- Capture
- Analog Inputs

Config.
- ETHERNET (RS232)

Synch.
- Master Encoder In

Linmot Servo Drive Series E1400

Position Drive:
- 32 Bit Position Value
- Resolution 0.1µm

Run Modes:
- VA Interpolated Moves
- Analog Position
- Run Curves
- Two Point Trigger Moves
- Master Encoder Synchronisation
- Streaming P, PV
- Step, Direction

Internal stored Curves:
- Max. 99 Curves
- Up to 15´000 set points

Command Table:
- Up to 255 Commands

Optional Limit and Home Switches

- Limit - Switch
- Home Switch
- Limit + Switch

LinMot Linear Motor or other Servo motor (AC Servo, Voice Coil,...)

Optional Brake

External Position Sensor

Optional external Position Sensor

Config. ETHERNET

Synch. Master Encoder Out

System Integration

Flexible hardware enables control of any 1/2/3-phase motors. Thus, low-power rotary servomotors, such as brushless DC motors, can be integrated in the same controls concept.

Additionally, the drives can be equipped with optional peripherals, such as reference and end stop switches, high-precision external position sensors, or a mechanical holding brake.

Series E1400 Servo Drives have analog and digital inputs and outputs, serial interfaces, fieldbusses, and ETHERNET connections. The user is therefore not dependent on the selection of the overlaid drive. An appropriate interface is available, with associated protocols, for any PLC or IPC solution.

With flexibility and a compact form factor, LinMot Series E1400 Servo Drives provide a complete solution for a flexible drive concept in single and multiple axis applications, with linear motors and other actuators.

Technology Functions

Technology functions are functional blocks that provide a complete solution for standard applications and frequently encountered, customer-specific problems. Technology functions can, for example, handled the complete sequence for winding textile yarns or glass fiber cables, or high-precision joining processes with force control can be implemented directly in the drive.

Master Encoder

For synchronization to a mechanical master shaft, or a rotating main drive, the Axis (linear motors and rotary motors) can be coupled to an electronic main shaft via the Master Encoder Interface.

The encoder signal from the main shaft can be passed through by the Master Encoder Interface, so that any number of linear motors can be synchronized to the main shaft.

Motor Interfaces

E1400 Servo Drives provide all necessary interfaces to operate linear or rotary motors with optional external peripherals, such as end position and reference switches, a mechanical brake, or a high-resolution external position sensor.

Configuration

Parameterization and configuration of the Servo Drive is done via the Ethernet interface on the front side for simultaneous configuration of several drives.

LinMot Talk user-friendly PC software is available for configuration. In addition to online documentation, LinMot Talk provides extensive debugging tools, such as an oscilloscope and an error inspector, for simple and rapid start-up of the Axis.

Fieldbus and ETHERNET drives can also be configured directly by the overlaid control.

Interpolated Moves

Stroke [mm]

Goto   100mm
v_{max} = 2,5m/s
a_{max} = 3,0m/s^2

Time[ms]
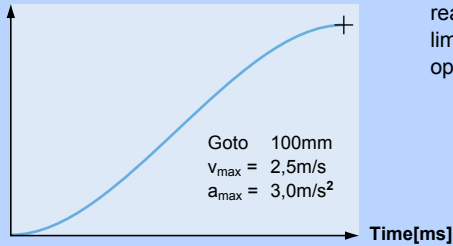
For direct position targets, using absolute or relative positioning, the desired position is reached using acceleration and velocity-limited motion profiles or jerk optimized profiles (jerk limited and Bestehorn). Positioning commands can be invoked via the serial interfaces, CAN-open, DeviceNet, Profibus, Ethernet or a trigger input.

Stroke range:	±100m
Position Resolution:	0.1µm (32Bit)
Velocity Resolution:	1.0µm/s (32Bit)
Velocity Resolution:	10.0µm/s^2 (32Bit)

Time Curves

Stroke [mm]

Start Curve 1

Curve 1

Time[ms]
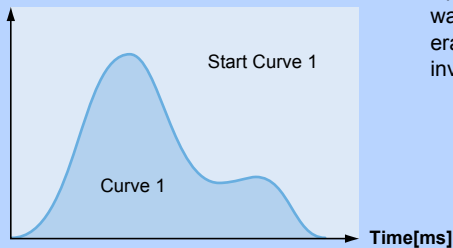
Up to 100 different time curves can be stored Series E1400 drives, with up to 16,000 individual waypoints. The motor can thus travel along time curves of any complexity, such as those generated by CAD programs and stored in the drive (Excel CSV format). The time curves can be invoked via the serial interface, fieldbusses, ETHERNET, or the trigger input.

Stroke range:	±100m
Position Resolution:	0.1µm (32Bit)
Motion profiles:	Max. 100 Time Curves
Curve points:	Max. 16'000 points

Profiled Moves

Stroke [mm]

Goto Pos 125mm
with Profil 1

Curve 1

Time[ms]
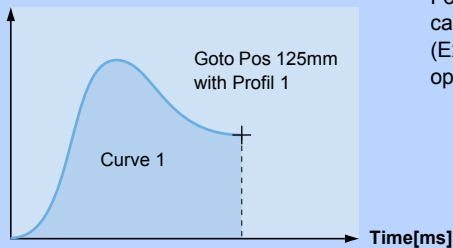
For travel to an absolute position, or shifting by a relative position, any desired motion rules can be stored besides the VA interpolator. They are stored in the drive as motion profiles (Excel CSV format). The positions can be approached, for example, with a sinusoidal motion to optimize power loss, or special reverse optimized motion profiles.

Stroke range:	±100m
Position Resolution:	0.1µm (32Bit)
Motion profiles:	Max. 100 Time Curves
Curve points:	Max. 16'000 points

Setpoint Streaming

Stroke [mm]

Time[ms]
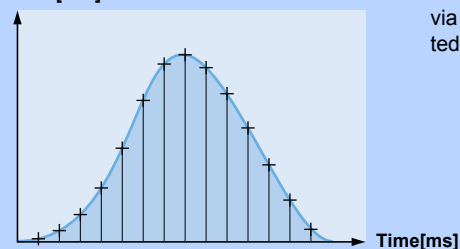
Overlaid NC drives with fieldbus or ETHERNET interfaces communicate with the Servo Drives via "Position Streaming". The position and velocity calculated in the overlaid control is transmitted to the Servo Drive cyclically. The P, PV, or PVT mode is available for this transmission.

Position Resolution:	32 Bit
Velocity Resolution	32 Bit
Interpolator:	10 kHz
cycle times:	0.4-5ms

Easy Steps

Input 1	Pos 125mm
Input 2	Pos 250mm
Input 3	Curve 1
Input 4	Pos -30mm
Input 5	Pos +12,5mm
Input 6	Curve 2
Input 7	Pos 2mm
Input 8	Pos -12,5mm

With the Easy Steps function, up to 8 positions or independent travel commands can be stored on the drive, and addressed via 8 digital inputs or fieldbus interfaces/ETHERNET.

Digital inputs:	max. 8
Interface:	X4
Scanning rate:	200µsec

## Command Table

Start
↓
Wait Input
↓
Pos 12mm
↓
Rule 1 → Terminate A
↓
Stop
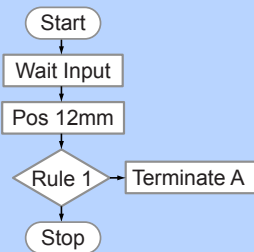
Entire motion sequences with up to 255 individual motion commands can be stored in the Command Table. This is primarily advantageous if complete motion sequences need to be executed very quickly, without dead time from the overlaid drive. In the Command Table, the programmer has access to all motion commands, internal parameters, and digital inputs and outputs.

Commands:	max. 255
Cycle time:	100µsec

Master Encoder Synchronization (MT)

Stroke [mm]

Curve 1

0°　90°　180°　270°　360°　**Time[ms]**
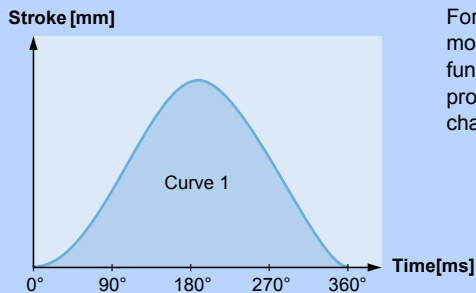
For synchronization to an external main or master shaft, the linear motor travels along the motion profiles stored in the drive, at the machine speed (machine angle 0…360°). Using this function, mechanical cam discs can be replaced with highly dynamic linear motors. The motion profiles can be freely defined, and the correct motion profile can be invoked during product changeover with no changeover time.

|	
Motion profiles	Max. 100 curve profiles
Curve points:	Max. 16'000 points
Encoder Counter:	32 Bit
Encoder Input:	A/B/Z (RS422)
Max. counting frequency	Max. 4.5 MHz

Belt Synchronization

v [m/s]

counts/sec

v_{Belt}

Time[ms]
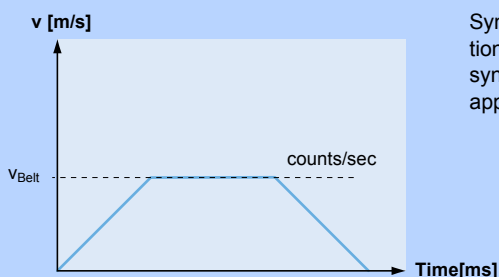
Synchronization to a belt speed can be done using the Master Encoder Interface or Step/Direction/Zero interface. Applications such as the "flying saw", synchronous loading or unloading, synchronous filling or labeling of bottles or containers on a conveyor belt, and many other applications can be implemented in this way.

|	
Encoder Counter:	32 Bit
Encoder Input:	A/B/Z (RS422), max. 5 MHz
	STEP/DIR/ZERO
Max. counting frequency	Max. 4.5 MHz

Analog Position
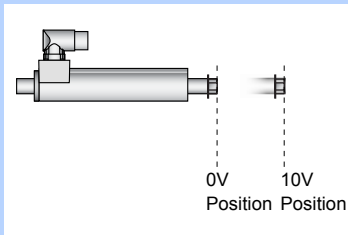
For an analog position target, the linear motor travels to a position proportional to the input voltage. The position is either scanned continuously, or only after a rising edge of the trigger signal. In order to prevent uncontrolled jumps in position, the motor travels to the positions with a programmable maximum acceleration and velocity (VA interpolator).

Inputs:	Analog Input X4 or X20
Voltagvte range:	0-10VDC or ±10V
Resolution:	12 Bit
Scanning rate:	>=100µsec (adjustable)

## Easy Steps Parameter Scale

Maximum Force [0...10V => 0...100%]

100%

0%

⇒ Force Max

Time[ms]
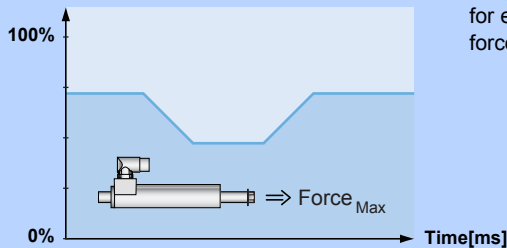
Easy Steps provide the ability to parameterize internal parameters using two analog inputs. If, for example, the maximum motor current is read at an analog input, then the maximum motor force can be provided as analog for freely programmable joining processes.

Inputs:	2 x Analog (X4.4, X4.7)
Voltage range:	0-10VDC
Resolution:	12 Bit
Resolution	200µsec

Closed Loop Force Control

F Mot = 0,1...580N

0...10V F one
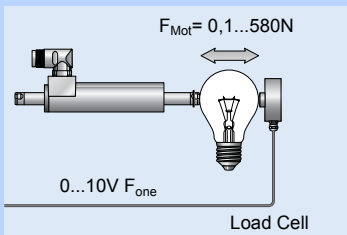
Load Cell

Using the force control technology function, precise joining processes can be implemented reliably and reproducibly with high-precision force control. For force control, the current motor force is measured with a load cell and controlled in the drive. Joining process or quality checks with high requirements for applied force can be implemented.

Analog Input:	0-10V or ±10V
Resolution:	12 Bit
Min. Force Resolution:	0.1N

Winding Application
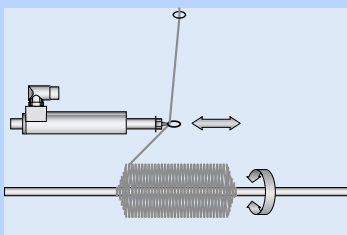
For winding textile yarns, glass fiber optics, or wires, a complete functional block is available that controls the entire sequence of a complete winding process.
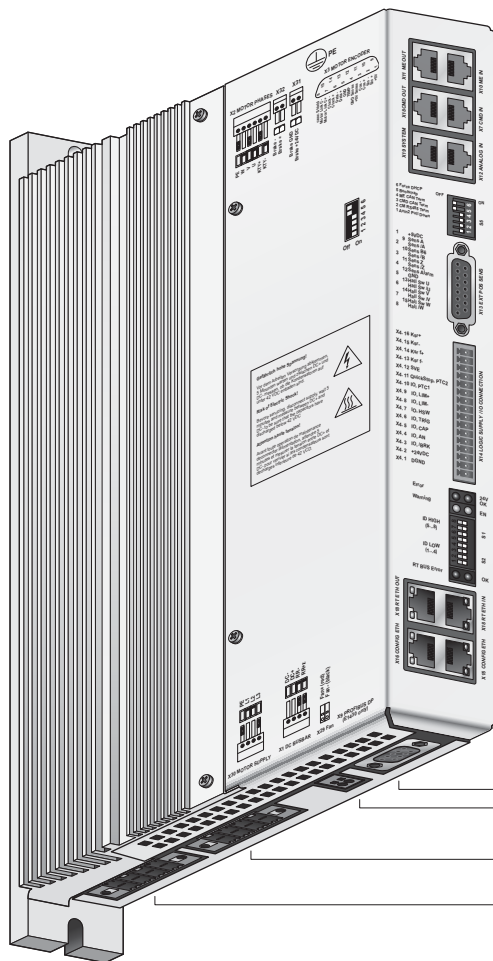
X10: Master Encoder IN
X11: Master Encoder OUT

X7: CMD (RS485 / CAN)
X8

X19: System
X20: Anlalog IN

S5: Bus Termination

X13: External Positionssensor

X4: Logic Supply / IO Connection

LED State Display

S1-2: Adress Selectors

LED RT Bus State Display

X17-: RealTime ETHERNET
X18

X15-: ETHERNET Configuration
X16

X9: Profibus (only -DP)

X29: Fan

X1: DC Busbar / Regeneration Resistor

X30: Motor Suply Mains

	E1400-GP-QN	E1430-DP-QN	E1450-PL-QN	E1450-EC-QN	E1450-PN-QN	E1450-IP-QN	E1450-SC-QN	E1450-SE-QN
Interfaces								
CANopen	●	●	●	●	●	●	●	●
LinRS	●	●	●	●	●	●	●	●
PROFIBUS-DP		●						
POWERLINK			●					
ETHERCAT				●				●
PROFINET					●			
ETHERNET IP						●		
SERCOS III							●	
SERCOS over EtherCAT				●			●	●
Config. ETHERNET	●	●	●	●	●	●	●	●

E1400-GP-QN
E1430-DP-QN
E1450-PL-QN
E1450-EC-QN
E1450-PN-QN
E1450-IP-QN
E1450-SC-QN

PROFINET
INDUSTRIAL ETHERNET

PROFIBUS
PROCESS FIELD BUS

EtherNet/IP™

ETHERNET
POWERLINK

|||SERCOS
interface

EtherCAT®

✓ Absolute & Relative Positioning

✓ Travel Along Time Curves

✓ Positioning using Motion Profiles

✓ Internally stored Motion Commands

✓ Internally stored Motion Sequences

✓ Master Encoder Synchronization

✓ Synchronization to Belt Speed

✓ Position Streaming

✓ Analog Position Target

✓ Analog Parameter Scaling

✓ Winding Function Block

✓ Force Control Technology Function

✓ Customer-Specific Functions
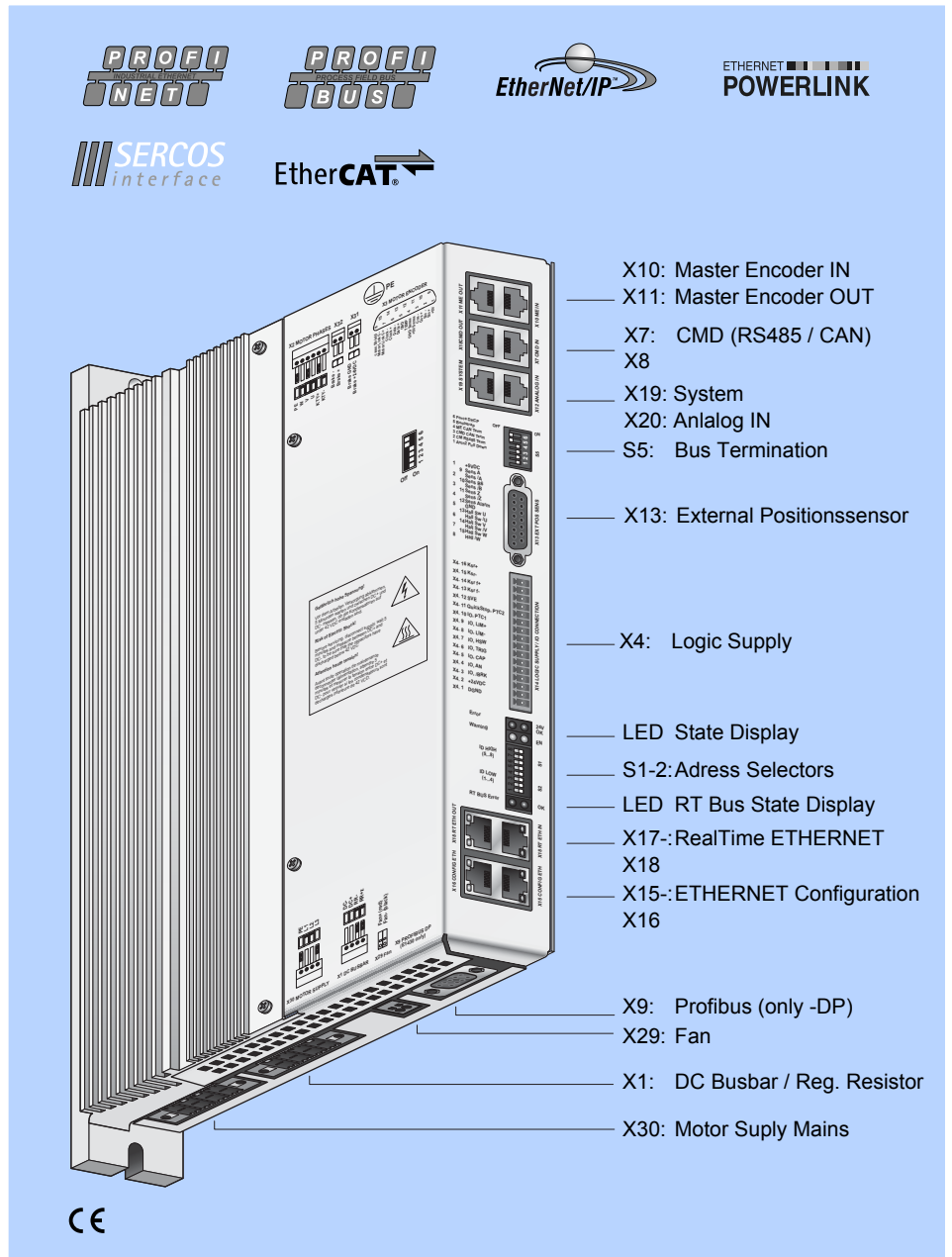

X10: Master Encoder IN
X11: Master Encoder OUT
X7: CMD (RS485 / CAN)
X8:
X19: System
X20: Anlaog IN
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LED State Display
S1-2: Adress Selectors
LED RT Bus State Display
X17-: RealTime ETHERNET
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X15-: ETHERNET Configuration
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X9: Profibus (only -DP)
X29: Fan
X1: DC Busbar / Reg. Resistor
X30: Motor Suply Mains

CE

Industrial ETHERNET

Series E1400 drives allow integration of LinMot linear motors in controls concepts with industrial ETHERNET interfaces. The user can integrate Series E1400 drives regardless of the provider of the overlaid control.

LinMot drives are available with common industrial ETHERNET protocols. Since all ETHERNET drives have the same motion command interface, and the control and status word are identical, software blocks that have been implemented once can be transferred to other drives without a problem.
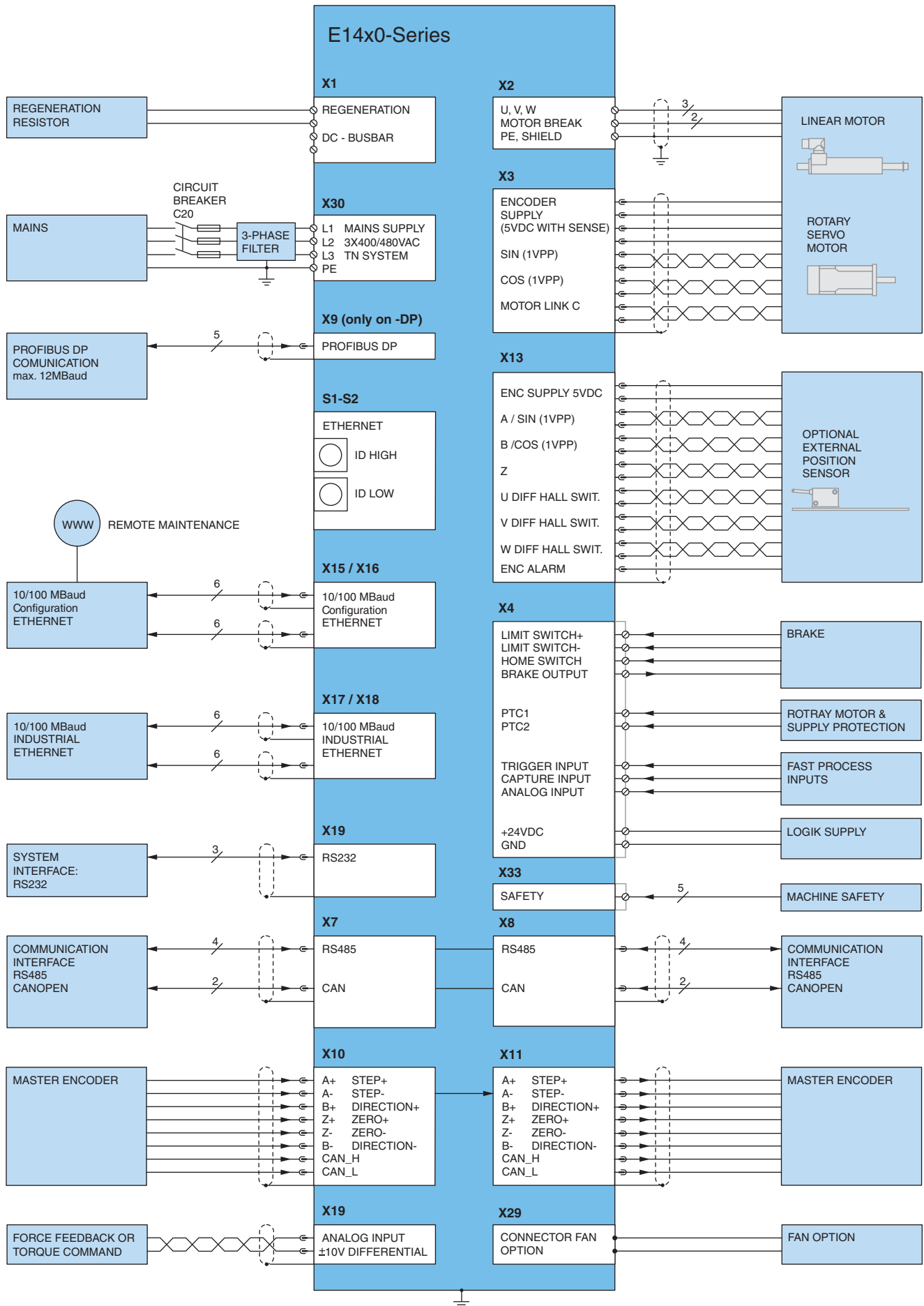
Series 1200 Servo Drives support the following industrial ETHERNET protocols:

- Profinet
- Industrial IP
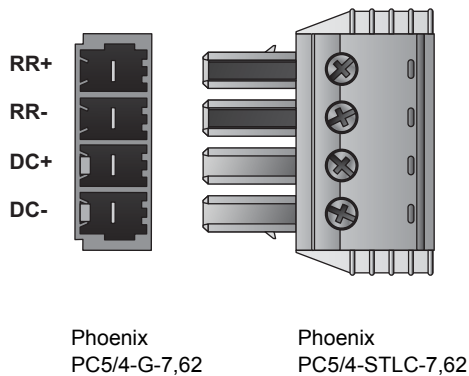- PowerLink
- EtherCat
- Sercos III

The appropriate drive is available for each protocol.

Technical Data

Type:	Realtime ETHERNET
Switch/Hub:	Integrated 2-Port Hub/Switch
Transfer rate:	10/100MBit/sec

LinMot ®

E14x0-Series

X1
REGENERATION RESISTOR — REGENERATION

DC - BUSBAR

X30
MAINS — CIRCUIT BREAKER C20 — 3-PHASE FILTER

L1   MAINS SUPPLY
L2   3X400/480VAC
L3   TN SYSTEM
PE

X9 (only on -DP)
PROFIBUS DP COMUNICATION max. 12MBaud — 5 — PROFIBUS DP

S1-S2
ETHERNET

◯ ID HIGH

◯ ID LOW

WWW   REMOTE MAINTENANCE

X15 / X16
10/100 MBaud Configuration ETHERNET — 6 — 10/100 MBaud Configuration ETHERNET — 6

X17 / X18
10/100 MBaud INDUSTRIAL ETHERNET — 6 — 10/100 MBaud INDUSTRIAL ETHERNET — 6

X19
SYSTEM INTERFACE: RS232 — 3 — RS232

X7
COMMUNICATION INTERFACE RS485 CANOPEN — 4 — RS485
— 2 — CAN

X10
MASTER ENCODER
A+   STEP+
A-   STEP-
B+   DIRECTION+
Z+   ZERO+
Z-   ZERO-
B-   DIRECTION-
CAN_H
CAN_L

X19
FORCE FEEDBACK OR TORQUE COMMAND — ANALOG INPUT
±10V DIFFERENTIAL

X2
U, V, W
MOTOR BREAK
PE, SHIELD — 3 / 2 — LINEAR MOTOR

X3
ENCODER SUPPLY (5VDC WITH SENSE)

SIN (1VPP)

COS (1VPP)

MOTOR LINK C — ROTARY SERVO MOTOR

X13
ENC SUPPLY 5VDC

A / SIN (1VPP)

B /COS (1VPP)

Z

U DIFF HALL SWIT.

V DIFF HALL SWIT.

W DIFF HALL SWIT.
ENC ALARM — OPTIONAL EXTERNAL POSITION SENSOR

X4
LIMIT SWITCH+
LIMIT SWITCH-
HOME SWITCH
BRAKE OUTPUT — BRAKE

PTC1
PTC2 — ROTRAY MOTOR & SUPPLY PROTECTION

TRIGGER INPUT
CAPTURE INPUT
ANALOG INPUT — FAST PROCESS INPUTS

+24VDC
GND — LOGIK SUPPLY

X33
SAFETY — 5 — MACHINE SAFETY

X8
RS485 — 4 — COMMUNICATION INTERFACE RS485 CANOPEN
CAN — 2

X11
A+   STEP+
A-   STEP-
B+   DIRECTION+
Z+   ZERO+
Z-   ZERO-
B-   DIRECTION-
CAN_H
CAN_L — MASTER ENCODER

X29
CONNECTOR FAN OPTION — FAN OPTION

LinMot ®

X1   DC Busbar / Regeneration Resistor

RR+
RR-
DC+
DC-

Phoenix
PC5/4-G-7,62

Phoenix
PC5/4-STLC-7,62

Edition 16
subject to change

Nr.	Designation
DC+	DC busbar +
DC-	DC busbar -
RR+	Positive connection for Regeneration Resistor
RR-	Negative connection for Regeneration Resistor

Screw Terminals:
- 0.25 - 4mm² (depends on Motor current) / AWG 24-12
- Tightening torque: 0.7 - 0.8 Nm
- Use a cross-head screw driver (PH1)
- Use 60/75°C copper conductors only
- Stripping length 10mm

X30   Motor Supply Mains

L3
L2
L1
PE

Phoenix
PC5/4-G-7,62

Phoenix
PC5/4-STLC-7,62
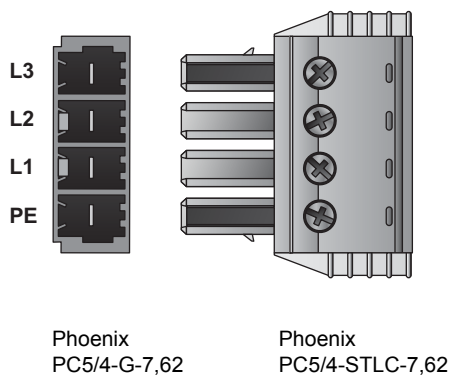
Nr.	Designation
L1	
L2	3x400 / 3x480VAC 50/60 Hz
L3	
PE	PE, Protective Earth

Screw Terminals:
- 2.5 - 4mm² (depends on Motor current) / AWG 24-12
- Tightening torque: 0.7 - 0.8 Nm
- Use a cross-head screw driver (PH1)
- Use 60/75°C copper conductors only
- Stripping length 10mm

X2   Motor Phases

PE
W
V
U
T+
T-

Phoenix
PC5/6-G-7,62

Phoenix
PC5/6-STLC-7,62
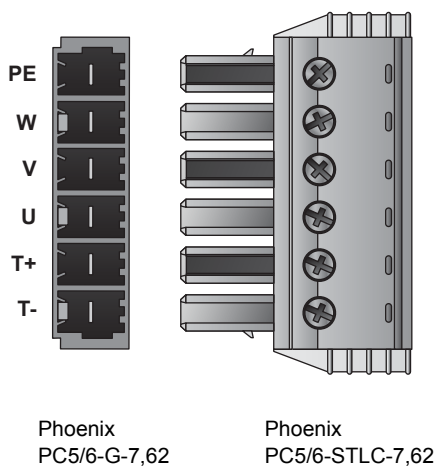
Nr.	Designation
PE	Protective Earth and Cable Shield
W	Motor Phase W
V	Motor Phase V
U	Motor Phase U
T+	Temperature Sensor positive
T-	Temperature Sensor negative

Screw Terminals:
- 0.25 - 4mm² (depends on Motor current) / AWG 24-12
- Tightening torque: 0.7 - 0.8 Nm
- Use a cross-head screw driver (PH1)
- Use 60/75°C copper conductors only
- Stripping length 10mm

X3-V2 — Motor Encoder (Motor Link C / BISS)
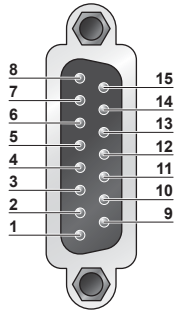
DSUB-15 (m)

Nr	Description	
8	Motor Link C-	
15	Motor Link C+	
7	Clock-	
14	Clock+	
6	Data-	
13	Data+	
5	GND	
12	Temp	
4	GND Sense	
11	+5V Sense	
3	Cos-	
10	Cos+	
2	Sin-	
9	Sin+	
1	+5V	
case	shield	

Motor Link C is a high speed serial communication protocol to the motor encoder

X33: 8pin — Safety Relays (only for -1S)

X33. 4/8 Ksr+
X33. 3/7 Ksr-
X33. 2/6 Ksr f+
X33. 1/5 Ksr f-

X33 STO RELAYS

Nr	Description	
4 / 8	Ksr +	Safety Relay 1 / 2 Input possitive
3 / 7	Ksr -	Safety Relay 1 / 2 Input negative
2 / 6	Ksr f+	Safety Relay 1 / 2 feedback positive
1 / 5	Ksr f-	Safety Relay 1 / 2 feedback negative

X4: 11pin — Logic Supply / IO Connection

X4. 11 QuickStop, PTC2
X4. 10 IO, PTC1
X4. 9 IO, LIM+
X4. 8 IO, LIM-
X4. 7 IO, HSW
X4. 6 IO, TRIG
X4. 5 IO, CAP
X4. 4 IO, AN
X4. 3 IO, /BRK
X4. 2 +24VDC
X4. 1 DGND

X14 LOGIC SUPPLY / IO CONNECTION

Nr	Description		
11	Input	Quickstop	Quickstop, PTC2 Input
10	I/O	X4.10	Configurable IO, PTC 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 (configurable as high imp. Input)
3	I/O	X4.3/Brk	Configurable IO, Brake Driver 1A
2	+24VDC	Supply	Logic Supply 22-26 VDC
1	GND	Supply	Ground

X7-X8 | CMD (RS485/CAN)
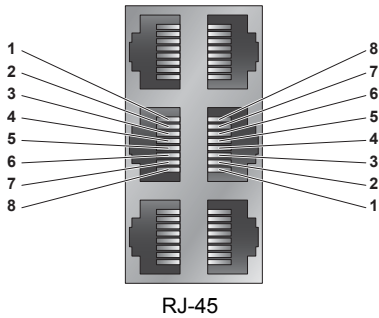
Nr		
1	RS485_Rx+	A
2	RS485_Rx-	B
3	RS485_Tx+	Y
4	GND	
5	GND	
6	RS485_Tx-	Z
7	CAN_H	
8	CAN_L	
Case	Shield	

RJ-45

- X7 internally connected to X8 (1:1 connection)
- 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 S5.2 and S5.3.
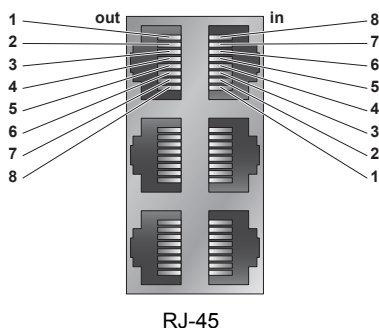
X9 | Profibus DP (only available on E1430-DP-QN)
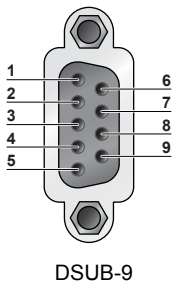
Nr		
1	-	
2	-	
3	RxD/TxD-P	
4	CNTR-P	
5	GND	(galvanically seperated)
6	+5V	(galvanically seperated)
7	-	
8	RxD/TxD-N	
9	-	
Case	Shield	

DSUB-9

Max. Baud rate: 12 Mbaud

X10-X11 | Master Encoder IN (X10) / Master Encoder OUT (X11)

Nr	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	CAN_H	Brown/White
8	CAN L	CAN_L	Brown
Case	Shield	Shield	*only on E1400-GP

RJ-45

- All devices, which are connected to X10/X11 must be referenced to the same ground.
- CAN Termination can be turned on by S5.4
- Use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring.
- Master Encoder Inputs: Differential RS422, max. 25 M counts/s, 40ns edge separation
- Master Encoder Outputs: Amplified RS422 differential signals from Master Encoder IN (X10)

X13 — External Position Sensor Commutation
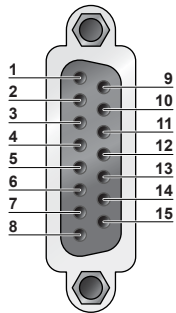
DSUB-15 (f)

Nr	Description	
1	+5V DC	
9	A+	Encoder
2	A-	Encoder
10	B+	Encoder
3	B-	Encoder
11	Z+	Encoder
4	Z-	Encoder
12	Encoder Alarm	
5	GND	
13	U+	Commutation (Hall Switch)
6	U-	Commutation (Hall Switch)
14	V+	Commutation (Hall Switch)
7	V-	Commutation (Hall Switch)
15	W+	Commutation (Hall Switch)
8	W-	Commutation (Hall Switch)
case	Shield	

Position Encoder Inputs: RS422, Max Input Frequency: 12.5MHz, 25 Mio counts/s with quadrature decoding, 40ns edge separation

Encoder Simulated Outputs: RS422, Max Output Frequency: 12.5MHz, 25 Mio counts/s with quadrature decoding, 40ns edge separation
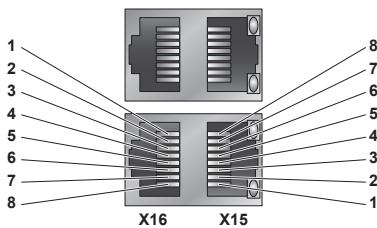
Differential Hall Switch Inputs: RS422, Max Input Frequency: <1kHz

Enc. Alarm In: 5V / 1mA

Sensor Supply: 5VDC, max 100mA / 9VDC 100mA (SW selectable)

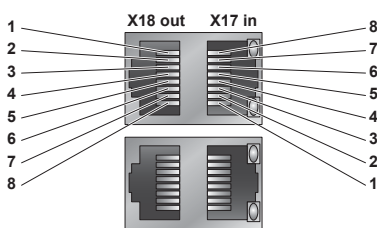## X15-X16 — Ethernet Configuration 10/100Mbit/s

RJ-45

Nr	
X15	Internal 2-Port 10BASE-T and 100BASE-TX Ethernet Switch with Auto MDIX.
X16	

LED

LEDs on the lower side of the device indicate "Link/Activity" per port, the upper ones are not used.
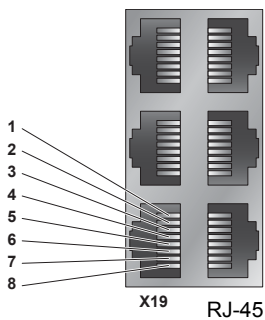
X17-X18 — RealTime Ethernet 10/100 Mbit/s

X18 out   X17 in

RJ-45

Nr	
X17	RT ETH In
X18	RT ETH Out

Specification depends on RT-Bus Type. Please refer to according documentation.

X19 — System

	Nr	Bez.
	1	Reserved, do not connect
	2	Reserved, do not connect
	3	RS232 RX
	4	GND
	5	GND
	6	RS232 TX
	7	Reserved, do not connect
	8	Reserved, do not connect
	case	Shield

Use adapter cable AC01-RJ45/Df-2.5-RS1 (Art.-No. 0150-2143) for configuration over RS232.

X20 — Analog In (+-10V Differential Analog Input)
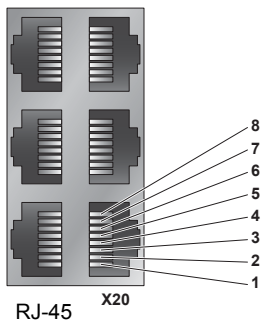
	Nr	Bez.
	1	n.c.
	2	n.c.
	3	Analog In-
	4	GND
	5	GND
	6	Analog In+
	7	n.c.
	8	n.c.
	case	Shield

X29 — Connector for Fan Option
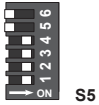

	Nr	Bez.
	-	black
	+	red

Spring cage terminal block for connecting the external fan option (Art. Nr. 0150-xxxx).
Output: 24 VDC / 0.4 A (Short circuit protected, current monitored)
Stripping length: 8mm
Conductor cross section: 0.2 – 1.5 mm2 (AWG 24 - 16)

S5	Bus Termination / AnaIn2 Pull Down

Switch	E1400
S5	Switch 6: Override Configuration Ethernet to DHCP
	Switch 5: Bootstrap: Must be off for normal operation
	Switch 4: CAN termination on ME (120R between pin 7 and 8 on X10/X11) on/off
	Switch 3: CAN termination on CMD (120R between pin 7 and 8 on X7/X8) on/off
	Switch 2: Termination resistor for RS485 on CMD (120R between pin 1 and 2 on X7/X8) on/off
	Switch 1: AnIn2 pull down (4k7 Pull down on X4.4). Set to ON, if X4.4 is used as digital output.
	Factory settings: all switches "off"

LED	State Display

Green:

24VDC Logic Supply OK

Stat A Yellow:

Motor Enabled/ Error Code Low Nibble

Stat B Yelllow:

Warning / Error Code High Nibble

Red:
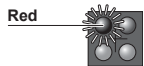
Error

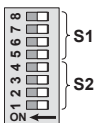| LED	RT Bus LED

Green:

OK

Red:

Error

The use of these LEDs depends on the type of fieldbus which is used. Please see the corresponding manual for further information.
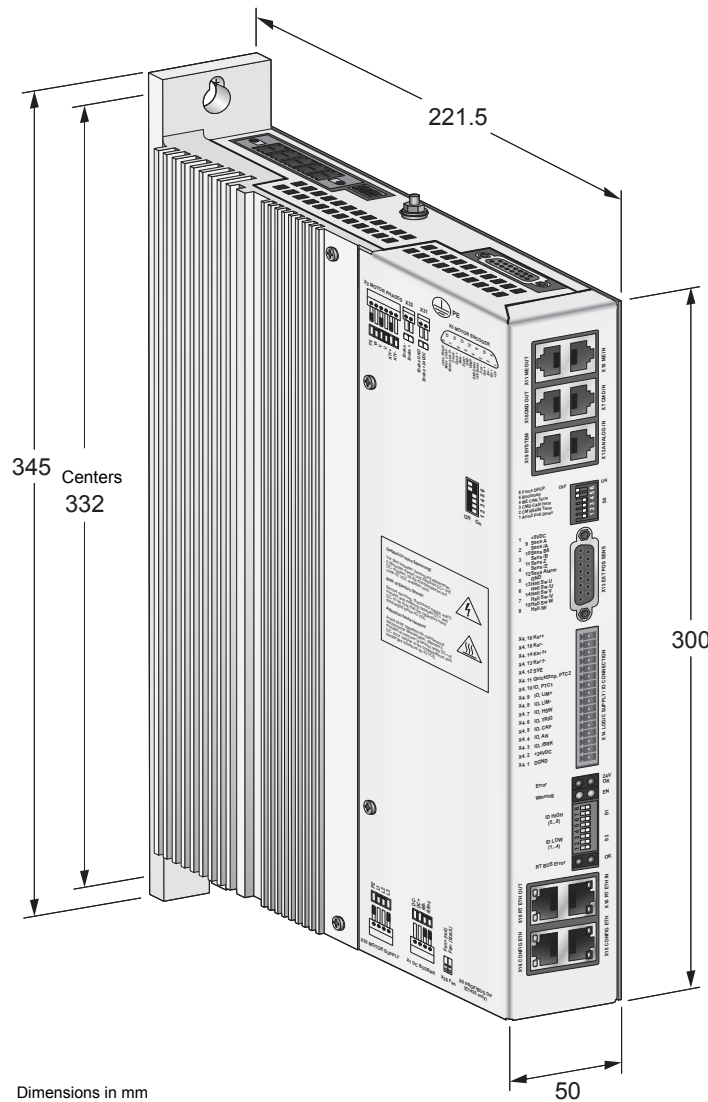
S1 -S2	Address Selectors

Switch	
S1 (5...8)	Bus ID High (0…F) Bit 5 is the LSB, bit 8 the MSB
S2 (1...4)	Bus ID Low (0…F) Bit 1 is the LSB, bit 4 the MSB

The use of these switches depends on the type of fieldbus which is used. Please see the corresponding manual for further information.

345
Centers
332

221.5

300

50

Dimensions in mm

Servo Drives Series E1400			
Width	mm (in)	40	(1.6)
Height	mm (in)	270	(10.6)
Height without fixings	mm (in)	233	(9.2)
Depth	mm (in)	180	(7.1)
Weight	kg (lb)	1.5	(3.3)
IP Protection class	IP	20	
Storage temperature	°C	-25...40	
Transport temperature	°C	-25...70	
Operating temperture	°C	0...40 at rated date	
		40...50 with power derating	
Max. case temperature	°C	90	
Max. power dissipation	W	100	
Min. distance between drives	mm (in)	20 (0.8) left/right	
		50 (2) top/bottom	

Item	Description	Part Number
E1400-GP-QN-0S	General Purpose Drive (3x400V/28A)	0150-1779
E1430-DP-QN-0S	Profibus DP Drive (3x400V/28A)	0150-1786
E1450-EC-QN-0S	EtherCAT Drive (3x400V/28A)	0150-1784
E1450-IP-QN-0S	Ethernet/IP Drive (3x400V/28A)	0150-1782
E1450-PL-QN-0S	POWERLINK Drive (3x400V/28A)	0150-1791
E1450-PN-QN-0S	ProfiNet Drive (3x400V/28A)	0150-1783
E1450-SC-QN-0S	Sercos III Drive (3x400V/28A)	0150-1785
E1450-SE-QN-0S	Sercos over EtherCAT Drive (3x400V/28A)	0150-1899
E1400-GP-QN-1S	General Purpose Drive (3x400V/28A), STO	0150-2351
E1430-DP-QN-1S	Profibus DP Drive (3x400V/28A), STO	0150-2352
E1450-EC-QN-1S	EtherCAT Drive (3x400V/28A), STO	0150-2353
E1450-IP-QN-1S	Ethernet/IP Drive (3x400V/28A), STO	0150-2354
E1450-PL-QN-1S	POWERLINK Drive (3x400V/28A), STO	0150-2355
E1450-PN-QN-1S	ProfiNet Drive (3x400V/28A), STO	0150-2356
E1450-SC-QN-1S	Sercos III Drive (3x400V/28A), STO	0150-2357
E1450-SE-QN-1S	Sercos over EtherCAT Drive (3x400V/28A), STO	0150-2358
EV01-E1400	Ventilatorkit for Servo Drives Series E1400	0150-5055
RR01-68/100	Regeneration Resistor 100W for E1400	0150-3373
NF01-FN258-16-07	3-phase line filter for E1400	0150-2359
DC01-E1400/X4/X30	Drive Conector for E1400-0S	0150-3452
DC01-E1400/X4/X30/X33	Drive Conector for E1400-1S	0150-3453
DC01-E1400/X1	Drive Conector Regeneration/Busba	0150-3445
DC01-E1400/X2	Drive Conector Motor Phases	0150-3446
DC01-E1400/X4	Drive Conector 24VDC & Logic	0150-3447
DC01-E1400/X29	Drive Connector Fan	0150-3448
DC01-E1400/X30	Drive Conector 3x400VAS Supply	0150-3449
DC01-E1400/X33	Drive Conector Safety	0150-3449
DC01-E1400/X31/X33	Drive Conector Brake	0150-3450