Servo Drive Series E1400

PROFINET INDUSTRIAL ETHERNET
EtherNet/IP
ETHERNET POWERLINK
PROFIBUS PROCESS FIELD BUS
RS 485
SERCOS interface
CANopen
EtherCAT

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.

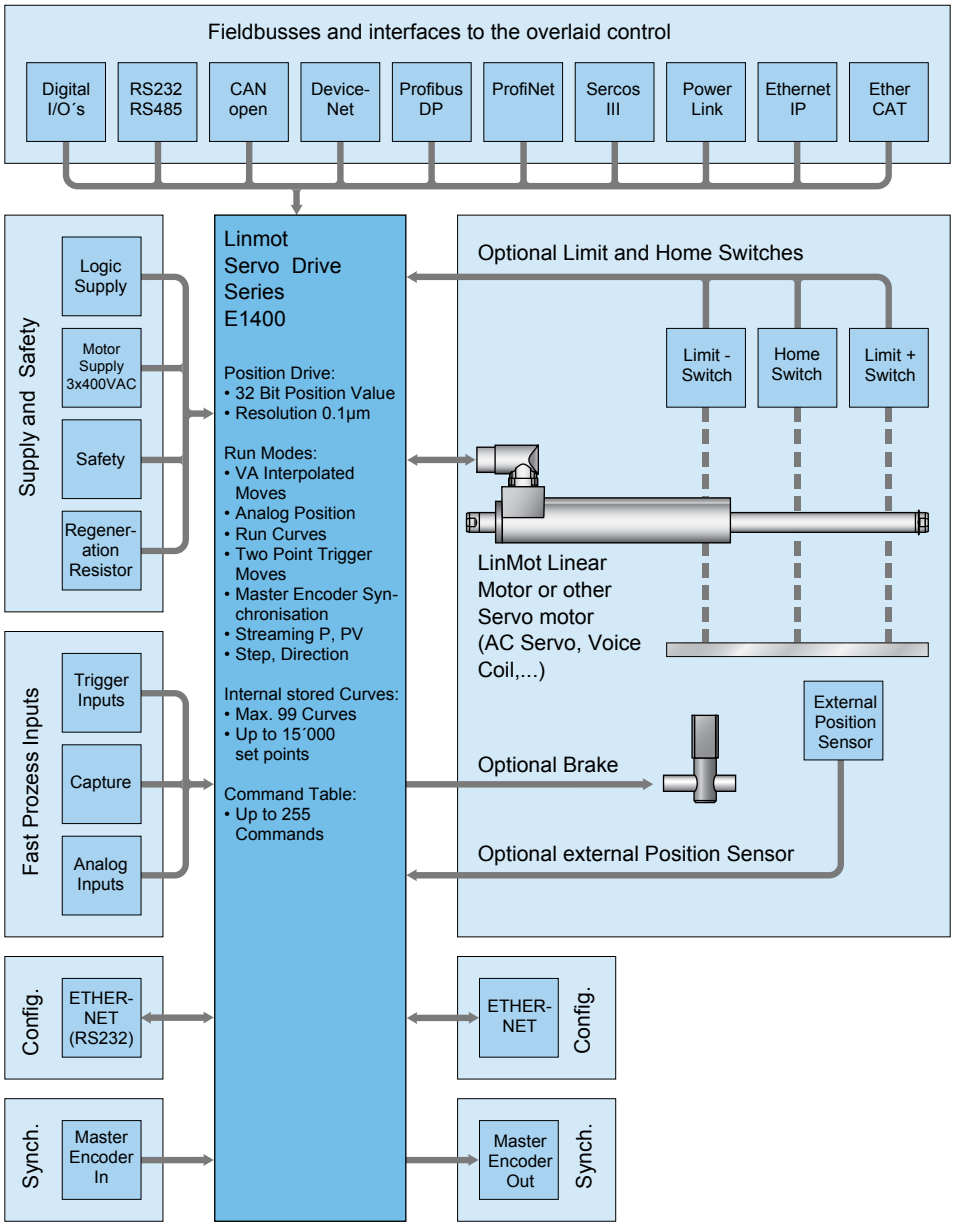
The safety Interface on Servo Drive with fieldbus interfaces or industrial ETHERNET allows safe stop of the drives via control signals, per EN 954-1, without interrupting the power supply.

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.



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.

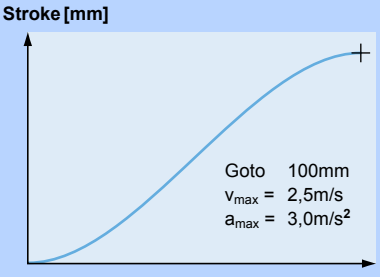
Configuration

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.

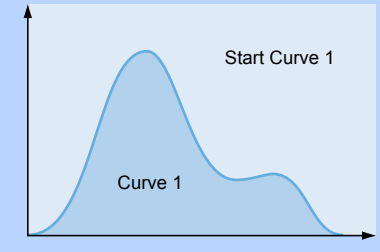
Interpolated Moves



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/s² (32Bit)

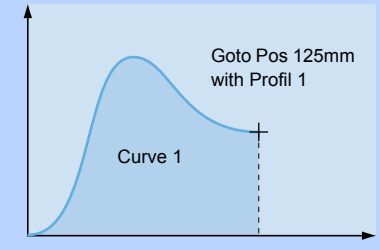
Time Curves



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

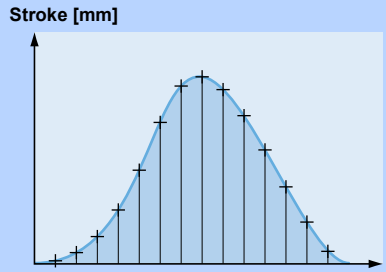
Profiled Moves



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



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

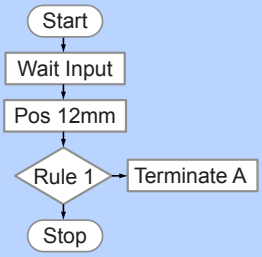
Easy Steps

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

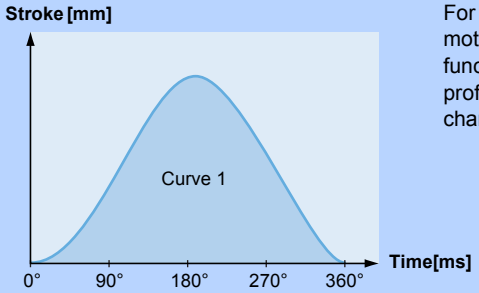
Command Table



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

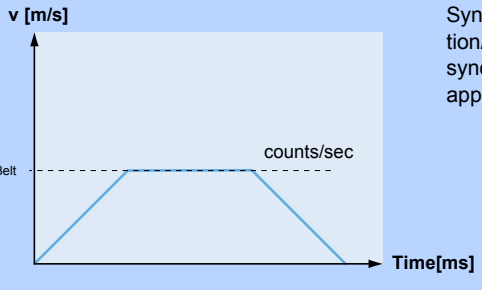
Master Encoder Synchronization (MT)



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

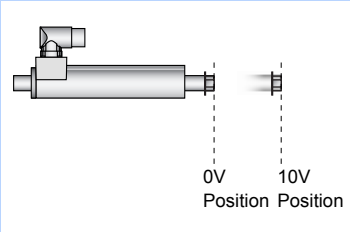
Belt Synchronization



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

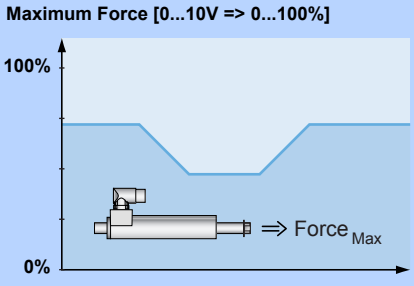
Analog Position



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)

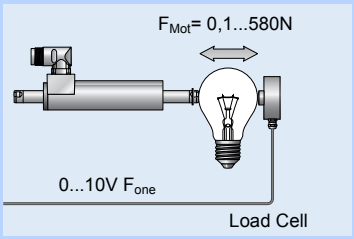
Easy Steps Parameter Scale



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

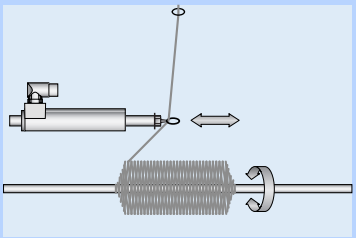
Closed Loop Force Control



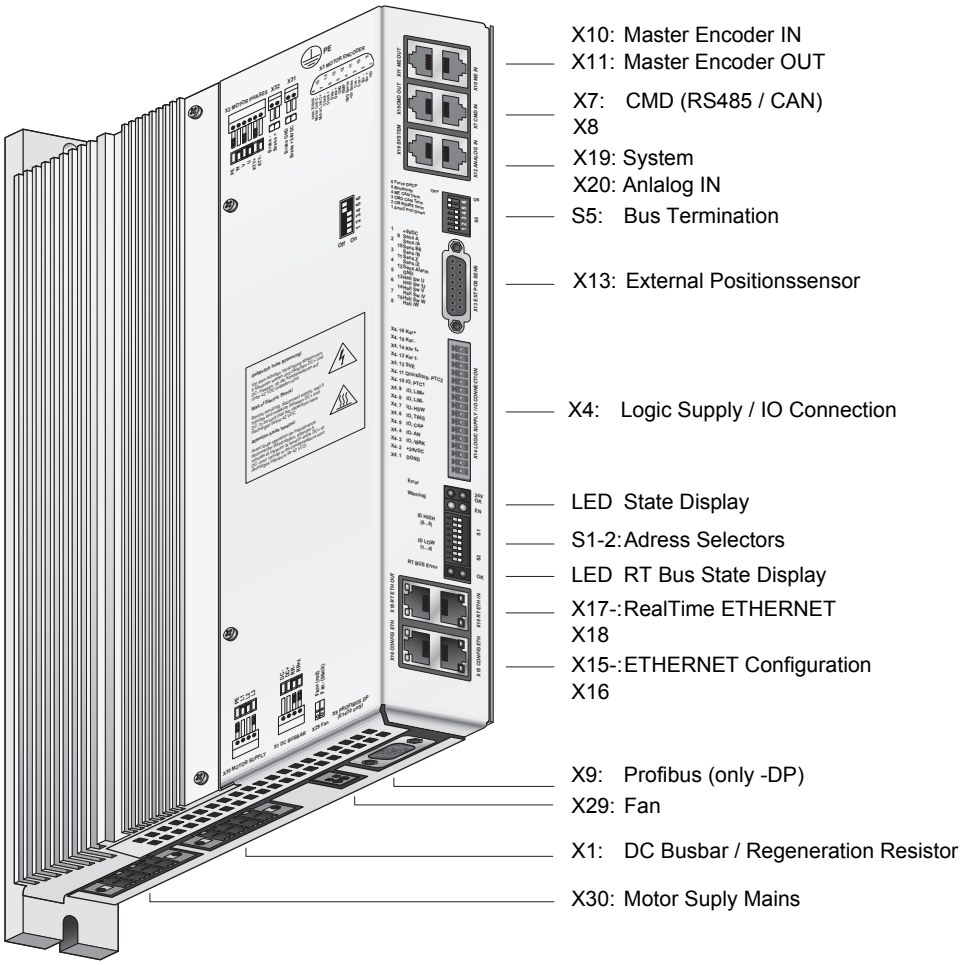
Using the force control technology function, precise joining processes can be implemented reliably and reproducibly with high-precision force control. For force control, the current motor force is measured with a load cell and controlled in the drive. Joining process or quality checks with high requirements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



	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

- 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

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.

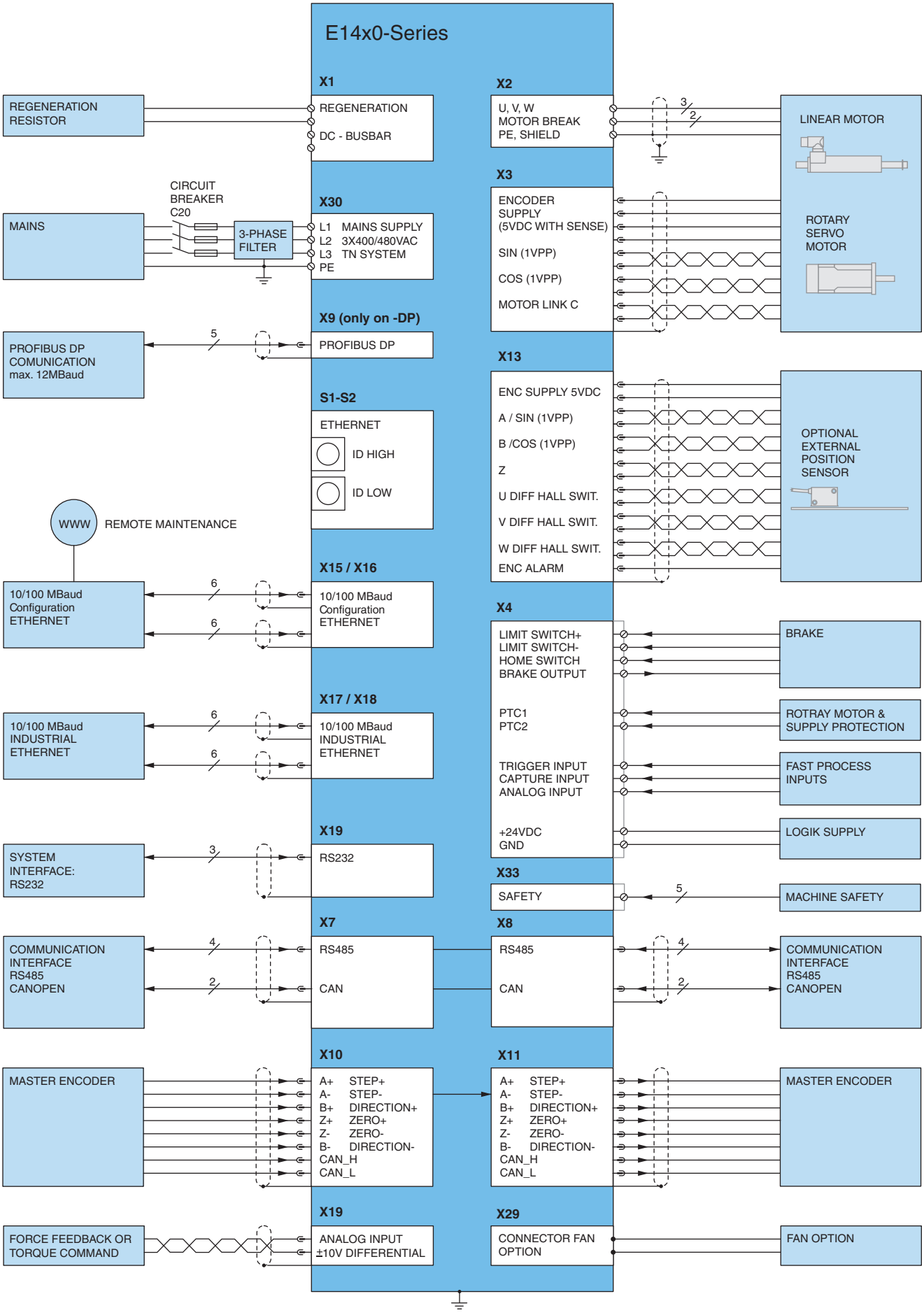
Series 1200 Servo Drives support the following industrial ETHERNET protocols:

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

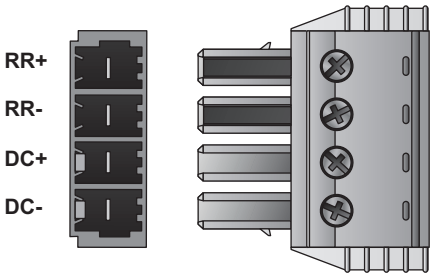
The appropriate drive is available for each protocol.

Technical Data

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


E14x0-Series
X1
REGENERATION
DC - BUSBAR
REGENERATION RESISTOR
X2
U, V, W
MOTOR BREAK
PE, SHIELD
LINEAR MOTOR
X3
ENCODER SUPPLY (5VDC WITH SENSE)
SIN (1VPP)
COS (1VPP)
MOTOR LINK C
ROTARY SERVO MOTOR
CIRCUIT BREAKER C20
MAINS
3-PHASE FILTER
X30
L1 MAINS SUPPLY
L2 3X400/480VAC
L3 TN SYSTEM
PE
X9 (only on -DP)
PROFIBUS DP
PROFIBUS DP COMUNICATION max. 12MBaud
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
S1-S2
ETHERNET
ID HIGH
ID LOW
WWW
REMOTE MAINTENANCE
X15 / X16
10/100 MBaud Configuration ETHERNET
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
X17 / X18
10/100 MBaud INDUSTRIAL ETHERNET
X19
RS232
SYSTEM INTERFACE: RS232
X33
SAFETY
MACHINE SAFETY
X7
RS485
CAN
COMMUNICATION INTERFACE RS485 CANOPEN
X8
RS485
CAN
COMMUNICATION INTERFACE RS485 CANOPEN
X10
A+ STEP+
A- STEP-
B+ DIRECTION+
Z+ ZERO+
Z- ZERO-
B- DIRECTION-
CAN_H
CAN_L
MASTER ENCODER
X11
A+ STEP+
A- STEP-
B+ DIRECTION+
Z+ ZERO+
Z- ZERO-
B- DIRECTION-
CAN_H
CAN_L
MASTER ENCODER
X19
ANALOG INPUT ±10V DIFFERENTIAL
FORCE FEEDBACK OR TORQUE COMMAND
X29
CONNECTOR FAN OPTION
FAN OPTION

X1 DC Busbar / Regeneration Resistor



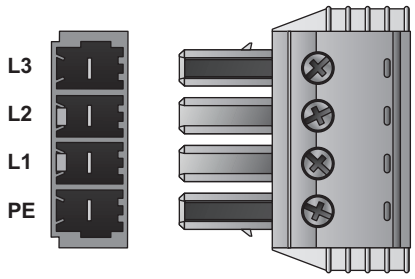
Phoenix
PC5/4-G-7,62

Phoenix
PC5/4-STLC-7,62

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



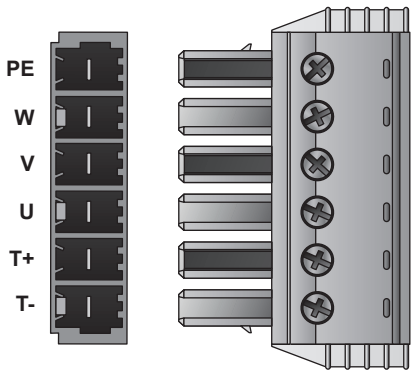
Phoenix
PC5/4-G-7,62

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



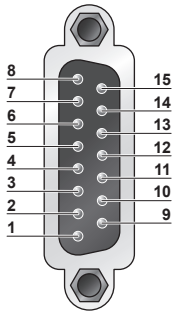
Phoenix
PC5/6-G-7,62

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)

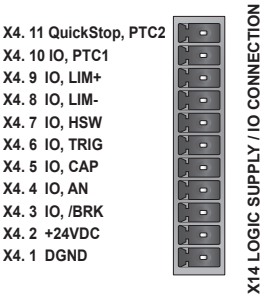
Nr		Description
8		Motor Link C-
	15	Motor Link C+
7		Clock-
	14	Clock+
6		Data-
	13	Data+
5		GND
	12	Temp
4		GND Sense
	11	+5V Sense
3		Cos-
	10	Cos+
2		Sin-
	9	Sin+
1		+5V
case		shield

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

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

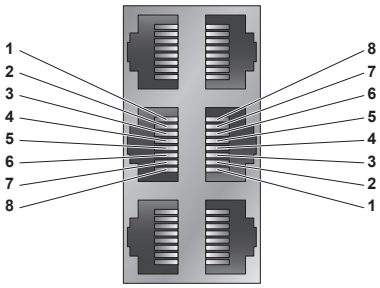
Nr	Description	
4 / 8	Ksr +	Safety Relay 1 / 2 Input possitive
3 / 7	Ksr -	Safety Relay 1 / 2 Input negative
2 / 6	Ksr f+	Safety Relay 1 / 2 feedback positive
1 / 5	Ksr f-	Safety Relay 1 / 2 feedback negative

X4: 11pin | Logic Supply / IO Connection



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)

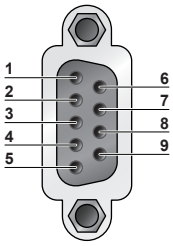


RJ-45

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	

- 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)

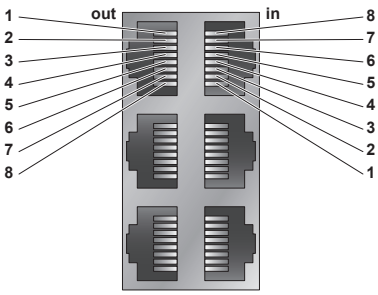


DSUB-9

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	

Max. Baud rate: 12 Mbaud

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



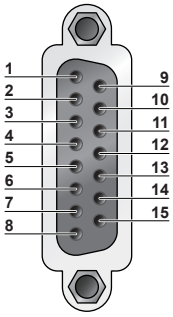
RJ-45

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

- 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

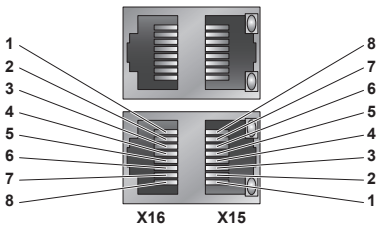
Encoder Simulated Outputs:RS422, Max Output Frequency: 12.5MHz, 25 Mio counts/s with quadrature decoding, 40ns edge separation

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



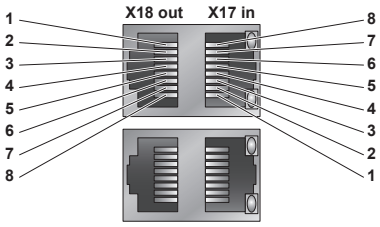
RJ-45

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

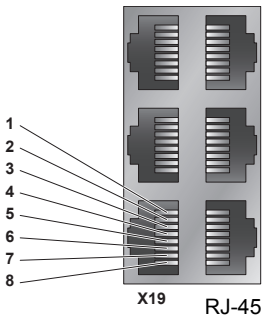


RJ-45

Nr	
X17	RT ETH In
X18	RT ETH Out

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

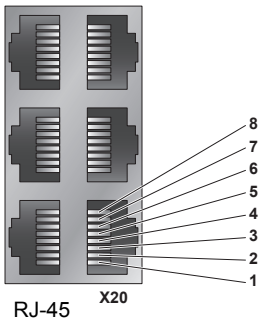
X19 System



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)



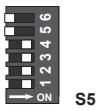
Nr	Bez.
1	n.c.
2	n.c.
3	Analog In-
4	GND
5	GND
6	Analog In+
7	n.c.
8	n.c.
case	Shield

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

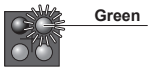


S5

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”

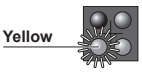
LED State Display

Green:



24VDC Logic Supply OK

Stat A Yellow:

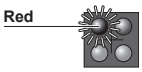


Motor Enabled/ Error Code Low Nibble

Stat B Yelllow:

Warning / Error Code High Nibble

Red:



Error

LED RT Bus LED

Green:

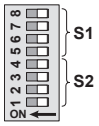
OK

Red:

Error

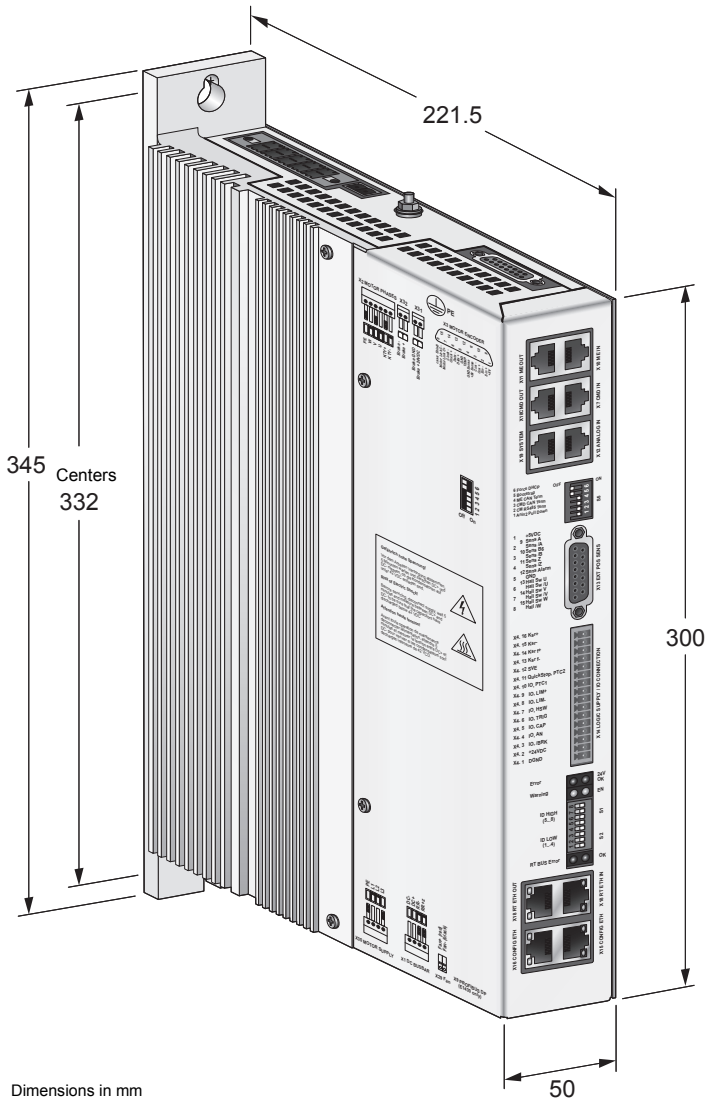
The use of these LEDs depends on the type of fieldbus which is used. Please see the corresponding manual for further information.

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.



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
E1400-DP-QN-0S	Profibus DP Drive (3x400V/28A)	0150-1786
E1400-EC-QN-0S	EtherCAT Drive (3x400V/28A)	0150-1784
E1400-IP-QN-0S	Ethernet/IP Drive (3x400V/28A)	0150-1782
E1400-PL-QN-0S	POWERLINK Drive (3x400V/28A)	0150-1791
E1400-PN-QN-0S	ProfiNet Drive (3x400V/28A)	0150-1783
E1400-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
E1400-DP-QN-1S	Profibus DP Drive (3x400V/28A), STO	0150-2352
E1400-EC-QN-1S	EtherCAT Drive (3x400V/28A), STO	0150-2353
E1400-IP-QN-1S	Ethernet/IP Drive (3x400V/28A), STO	0150-2354
E1400-PL-QN-1S	POWERLINK Drive (3x400V/28A), STO	0150-2355
E1400-PN-QN-1S	ProfiNet Drive (3x400V/28A), STO	0150-2356
E1400-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
RR01-69/100	Regeneration Resistor 100W for E1400	0150-3373