HIWIN®

DRIVES

DRIVES

Drives & accessoires

As well as linear, torque and servo motors, the HIWIN product range includes suitable drives for the dynamic, high-precision positioning. Drives are available in different versions for different applications.

DOWNLOADS AND **APPLICATIONS**

Assembly instructions

CAD configurator

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1. Product overview

Drive ED1 (230 VAC) Page 12

- Supply voltage 230 VAC
- Rated power 400 W to 2.000 W
- Step/direction, EtherCAT, PROFINET
- Supports motor types AC servo motor, linear and torque motor
- STO safety function (=Safe Torque Off)
- CE, UL- and CSA-certified

Drives ED1 (400 VAC) Page 19

- Supply voltage 400 VAC
- Rated power 5.000 W and 7.500 W
- Step/direction, EtherCAT, PROFINET
- Supports motor types AC servo motor, linear and torque motor
- STO safety function (=Safe Torque Off)
- CE, UL- and CSA-certified

Accessories for drives Page 26

- Excellent Smart Cube (ESC)
- Cables
- Braking resistor
- Mains filter

2. Authorisations of the drives

Table 2.1 **Authorisations**

HIWIN drives	Authorisation			
	EU guidelines		**UL authorisation**	
	EMC guidelines EN 61800-3:2018 IEC 61800-3: 2017 BS EN 61800-3: 2018 (Category C3)	Low voltage guidelines EN 61800-5-1: 2007+ A1:2017 IEC 61800-5-1: 2007 + A1:2016 BS EN 61800-5-1: 2007; A1: 2017+A11: 2021 (PD2, OVC III)	UL 61800-5-1 CSA C22.2 Nr. 274-17	
ED1□-□□-0422-□□	CE		cULus	
ED1□-□□-1022-□□				
ED1□-□□-2022-□□				
ED1□-□□-5033-□□			UL 61800-5-1	
ED1□-□□-7533-□□				
Content	Element			
STO **(Safe torque off)**	IEC 61508 parts 1-7: 2010 IEC 61800-5-2: 2017 IEC 62061+AC:2010+A1:2013 +A2:2015 EN ISO 13849-1: 2015 IEC 60204-1: 2016 (in extracts)	TÜVRheinland CERTIFIED Functional Safety www.tuv.com ID 0000000000		
Excellent Smart Cube (ESC) Model	Element			
	EU guidelines		Federal Communications Commission	
	EMV guidelines IEC / EN 61800-3: 2004/A1: 2012 (Category C3)	Low voltage guidelines IEC / EN 61800-5-1: 2007 (PD2, OVC III)	Conducted interference emission ANSI C63.4-2014, FCC Teil 15 Subsection B, KDB174176 CISPR PUB. 22	Radiated interference emission ANSI C63.4-2014, FCC Teil 15 Subsection B, KDB174176 CISPR PUB. 22
ESC-□□-□□□	CE		FC	

Note:
EN = European standard
CE refers to European standards. (Publication of harmonised standards within the framework of Union harmonisation legislation)
IEC: International Electrotechnical Commission
The certificate and the declaration of conformity can be downloaded from the HIWIN GmbH website (hiwin.de).

3. General information

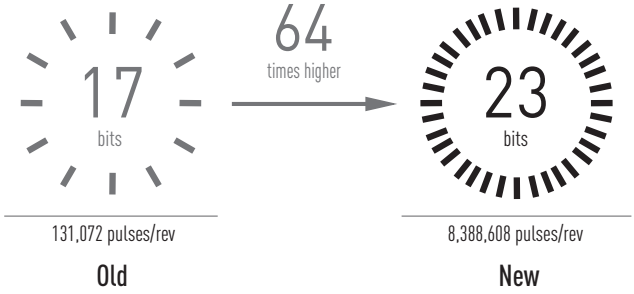
3.2 General information about drives ED1

The HIWIN ED1 drives are specially matched to the HIWIN EM1 servomotors and HIWIN linear and torque motors. Different versions and power classes are available depending on the application.

- Power range from 400 W to 7,500 W
- Step/direction, ±10 V, EtherCAT, PROFINET
- Multi encoder interface (TTL, Analog sin/cos, EnDat 2.1/2.2., BiSS-C)
- Safety function STO (= Safe Torque Off)
- For AC servo, linear and torque motors

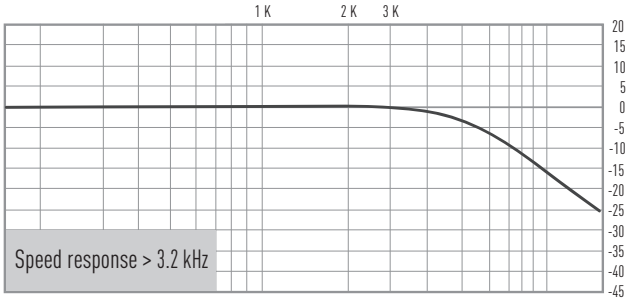
3.1 General properties of drives ED1

– Improved processing accuracy



– 3.2 kHz speed response

Higher speed response, faster settling and higher throughput.

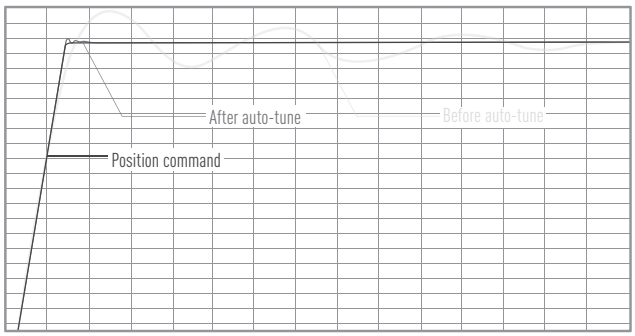


– Support variety motors

One drive type for linear motor, AC servo motor and direct-drive motor.

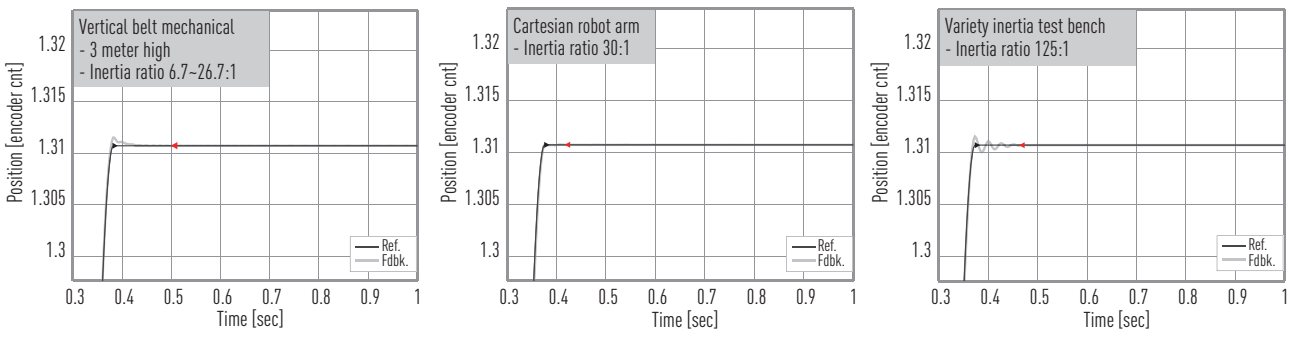
– Advanced auto-tune function

Automatic gains tuning, filters adjustment, model following control activation, vibration and resonance suppression to optimize machine performance.



– Tuneless function

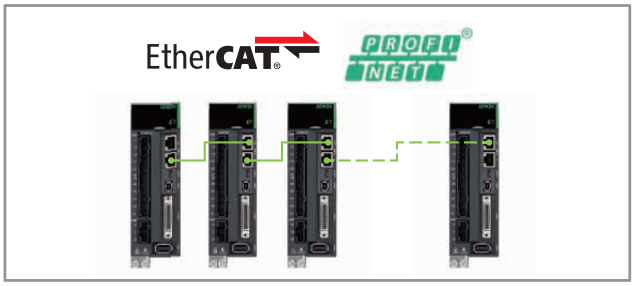
Brings good performance and stable movement with inertia ratio up to 250:1. Adaptive gain tuning in accordance with load changes.



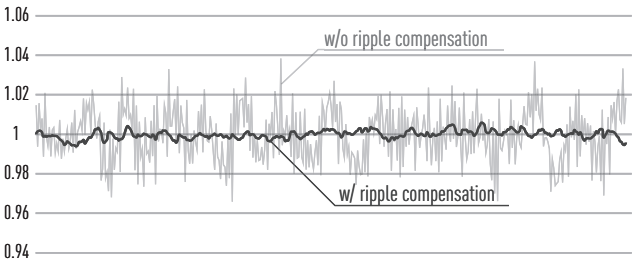
Drives

Authorisations of the drives

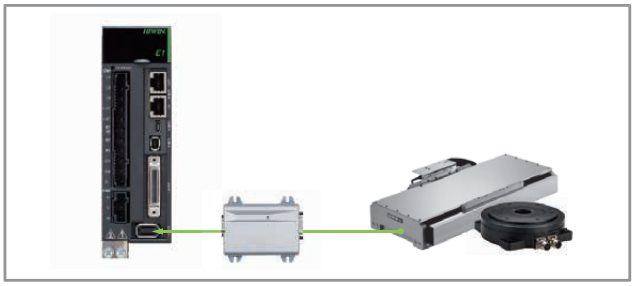
– **Network connectivity**
Supports EtherCAT and PROFINET.



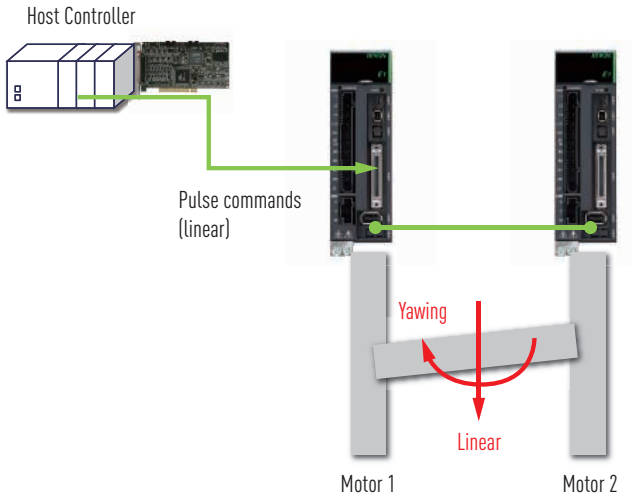
– **Ripple compensation**
Delivers more smooth movement by reducing velocity ripple caused by motor cocking. Servo loop gains are not necessary to change.



– **Feedback interface**
Built-in digital AqB and serial encoder interface for Tamagawa encoder.
With the Excellent Smart Cube (ESC) resp. the encoder box E1 drive is able to support analogue SIN/COS, EnDat and BiSS-C encoder.



– **Gantry application**
Combines two ED1 drives to realize gantry algorithm which contains linear and yawing control.



– **Built-in safe torque off (STO)**
Motor power is cut-off when STO is activated.

4. Overview of the performance classes ED1

400 W
(230 V / 1 P)

1 kW
(230 V / 1 P)

1.5 kW (2 kW)*
(230 V / 1 P)
(230 V / 3 P)

5 kW
(400 V / 3 P)

7.5 kW
(400 V / 3 P)

Table 4.1 **Overview of performance classes ED1**

Type	Performance (W)	Continuous current (A_{eff})	Peak current (A_{eff})	Supply voltage
ED1☐-☐☐-0422-☐1	400	2.5	10	1 Ø 230 VAC
ED1☐-☐☐-1022-☐1	1,000	5.6	23.3	1 Ø 230 VAC
ED1☐-☐☐-2022-☐1	1,500 (2,000)*	9 (12)*	42	1Ø 230 VAC (3Ø 230 VAC)
ED1☐-☐☐-5033-☐1	5,000	16	42	3 Ø 400 VAC
ED1☐-☐☐-7533-☐1	7,500	27.4	85	3 Ø 400 VAC

*Power W and continuous current A_{eff} with 3-phase 200 VAC – 240 VAC power supply.

5. Drives (230 VAC)

5.1 Order code

ED1	S	E	N	04	2	2	A	1

Series:
ED1

Type:
S: Standard
F: Fieldbus

Control interface:
V: Step/direction [1]
E: EtherCAT CoE [2]
P: PROFINET [2]

Special function:
N: Without Gantry-Mode
G: Gantry-Mode

Performance class:
04: 400 W
10: 1,000 W
20: 2,000 W

Number of phases:
2: 1 or 3 phases

Supply voltage:
2: 230 VAC

Motor type:
A: AC servo motor
0: AC servo-, linear und torque motor

Safety functions:
1: STO (Safe torque off)

[1] Type S = Standard
[2] Type F = Fieldbus

6. Performance specification (230 VAC)

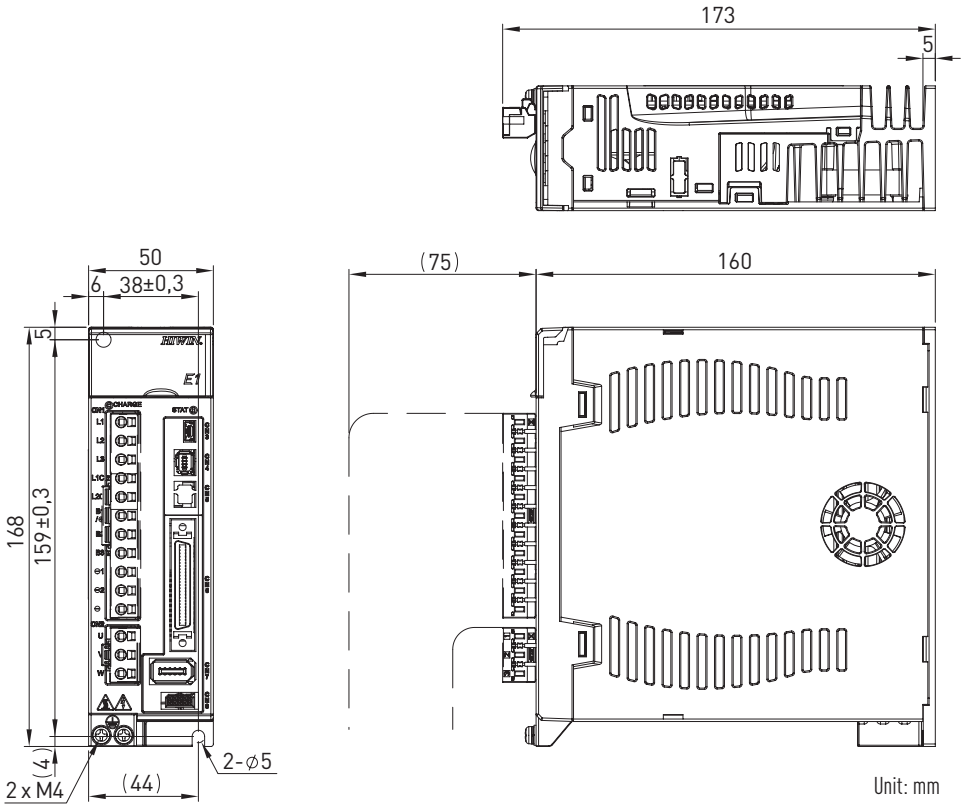
Table 6.1 **Drives 230 VAC**

Nennleistung			**400 W**	**1 kW**	**1.5 kW (2 kW)***
Input power	Single-phase main power	Nominal voltage (line to line)	AC 100 – 120 Vrms, 50 – 60 Hz AC 200 – 240 Vrms, 50 – 60 Hz		AC 200 – 240 Vrms, 50 – 60 Hz
		Rated current (Amp)	2.9	6.58	11.1
	Three-phase main power	Nominal voltage (line to line)	AC 200 – 240 Vrms, 50 – 60 Hz		
		Rated current (Amp)	1.46	3.3	11.3
	Standard power	1 Ø/AC 100 – 120 Vrms, 50 – 60 Hz 1 Ø/AC 200 – 240 Vrms, 50 – 60 Hz			
	Inrush current of the main power (Apk)		14.2	23.4	24.0
	Inrush current of the control power (Apk)		17.7	17.7	17.7
Output power	Phase Voltage		3 Ø/AC 240 Vrms max.		
	Maximum rated power (W)		400	1 k	2 k
	Peak current (Amp)		10	23.3	42
	Rated current (Amp)		2,5	5,6	9 (12)*
Data on power loss (W)			< 40	< 80	< 160
PWM modulation frequency			16 kHz		8 kHz
Dynamic brake			– Built-in dynamic braking circuit – 400 W/500 W: No built-in dynamic braking resistor – Delay time of the relay: 20 ms		
Built-in resistor for dynamic brake			–	5.1 Ohm/ 7 W	6 Ohm/ 10 W
Protection of the braking energy	Braking resistor		– 400 W/500 W: Without built-in braking resistor Connect with an external braking resistor if required. – 1 kW/1,2 kW/2 kW/4 kW: With built-in braking resistor. Connection to external braking resistor to increase the braking capacity.		
	Built-in braking resistor		–	40 Ohm/40 W	12 Ohm/60 W
	Power Capacity [uF]		820	1,410	2,240
	Braking resistor protection activated		+HV > 370 VDC		
	Braking resistor protection deactivated		+HV < 360 VDC		
	Overvoltage protection		390 VDC		
Environment	Operating temperature		0 – 45°C (45 – 50°C are permissible if a throttled value is used.)		
Weight (kg)			1.1	1.6	1.9

*Power W and continuous current A_{eff} with 3-phase 200 VAC – 240 VAC power supply.

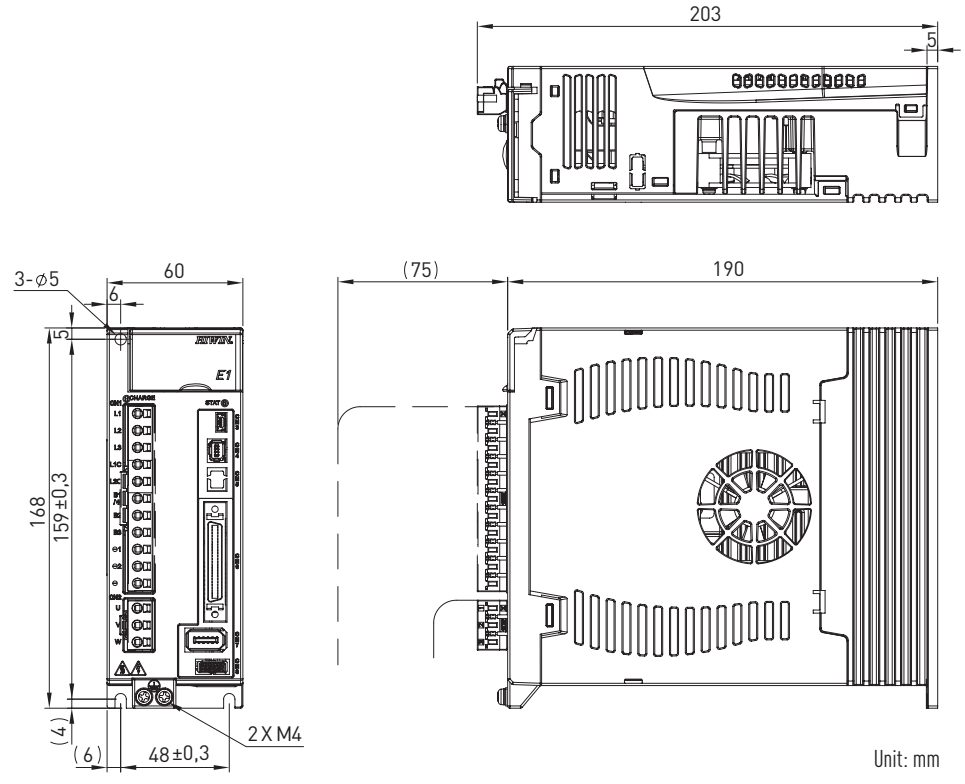
6.1 Dimensions ED1 (standard)

– **ED1S – 400 W**



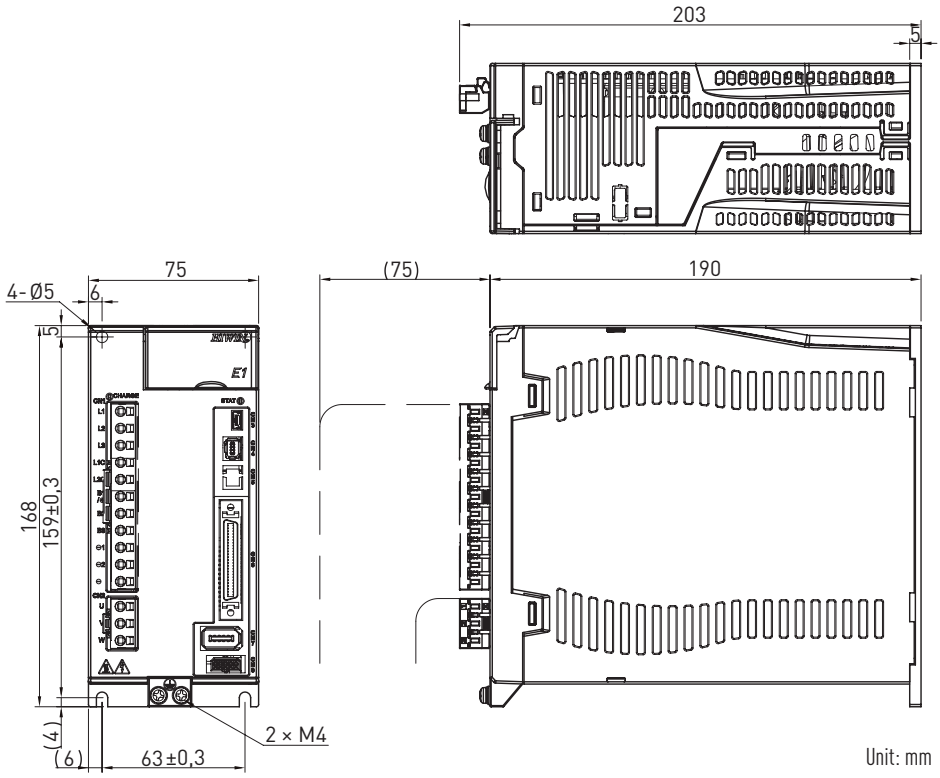
Unit: mm

– **ED1S – 1,000 W**



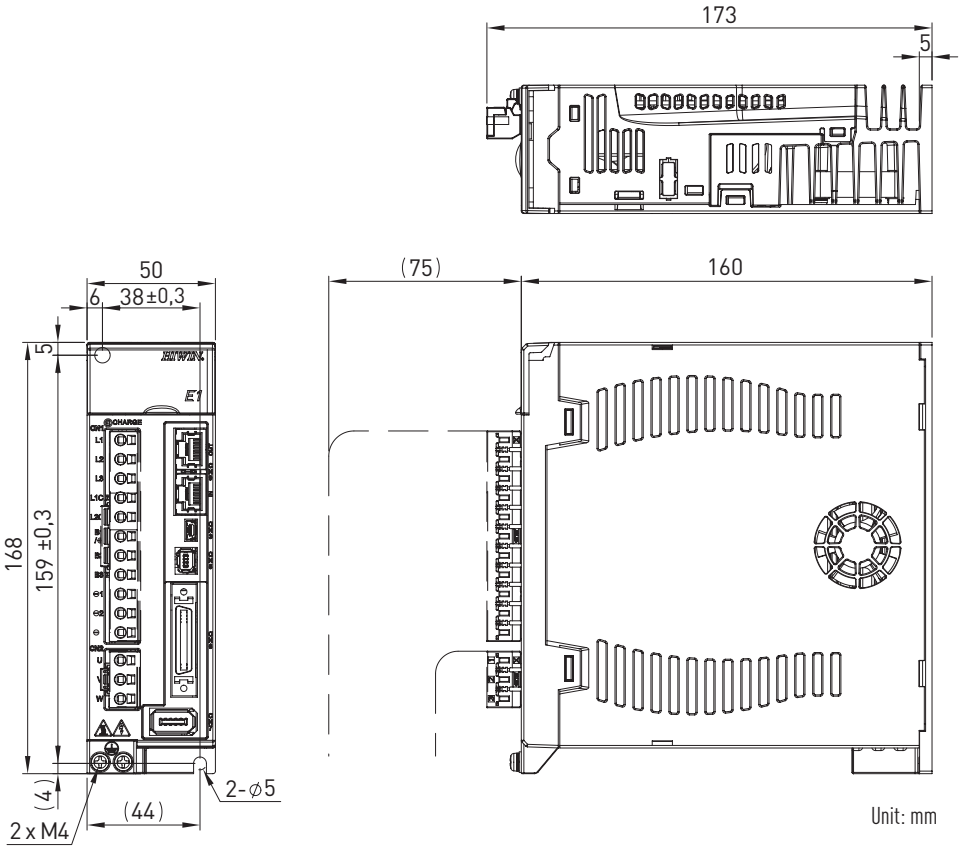
Unit: mm

– **ED1S – 1,500 W (2,000 W)**



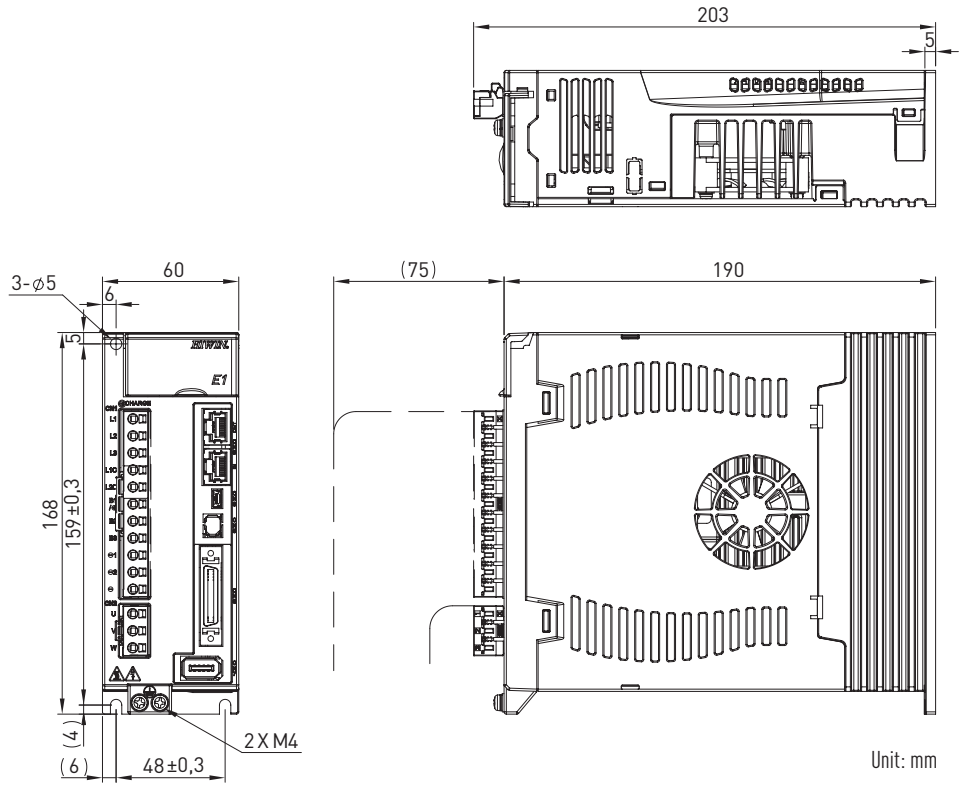
6.2 Dimensions ED1 (fieldbus)

– **ED1F – 400 W**



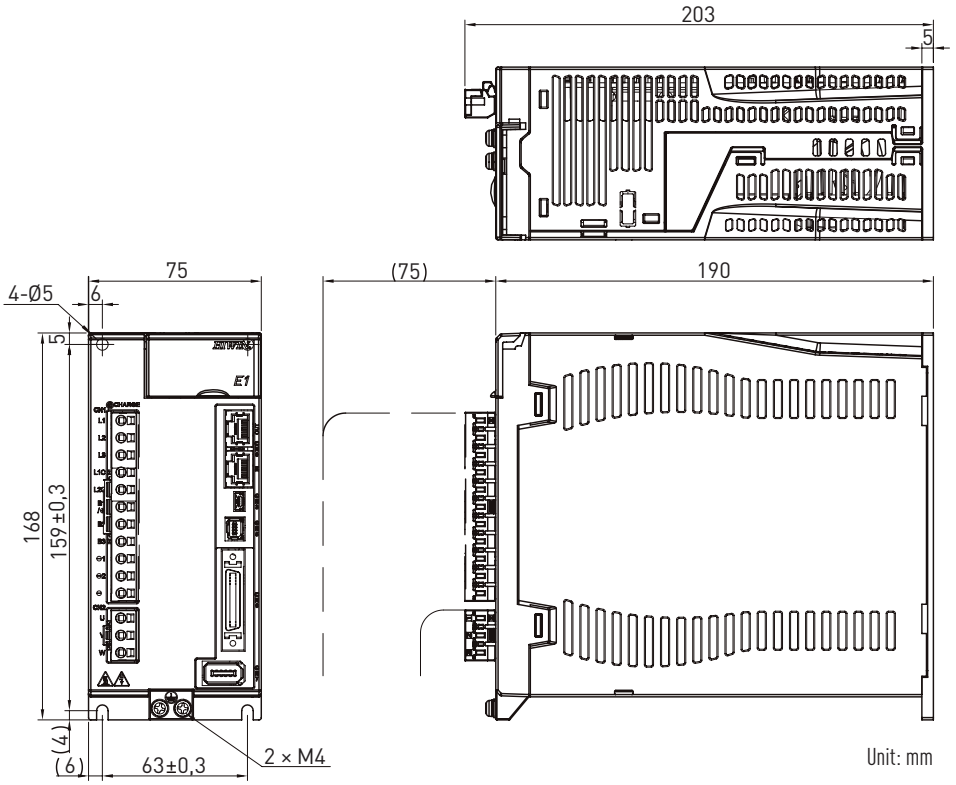
Unit: mm

– **ED1F – 1,000 W**



Unit: mm

– **ED1F – 1,500 W (2,000 W)**

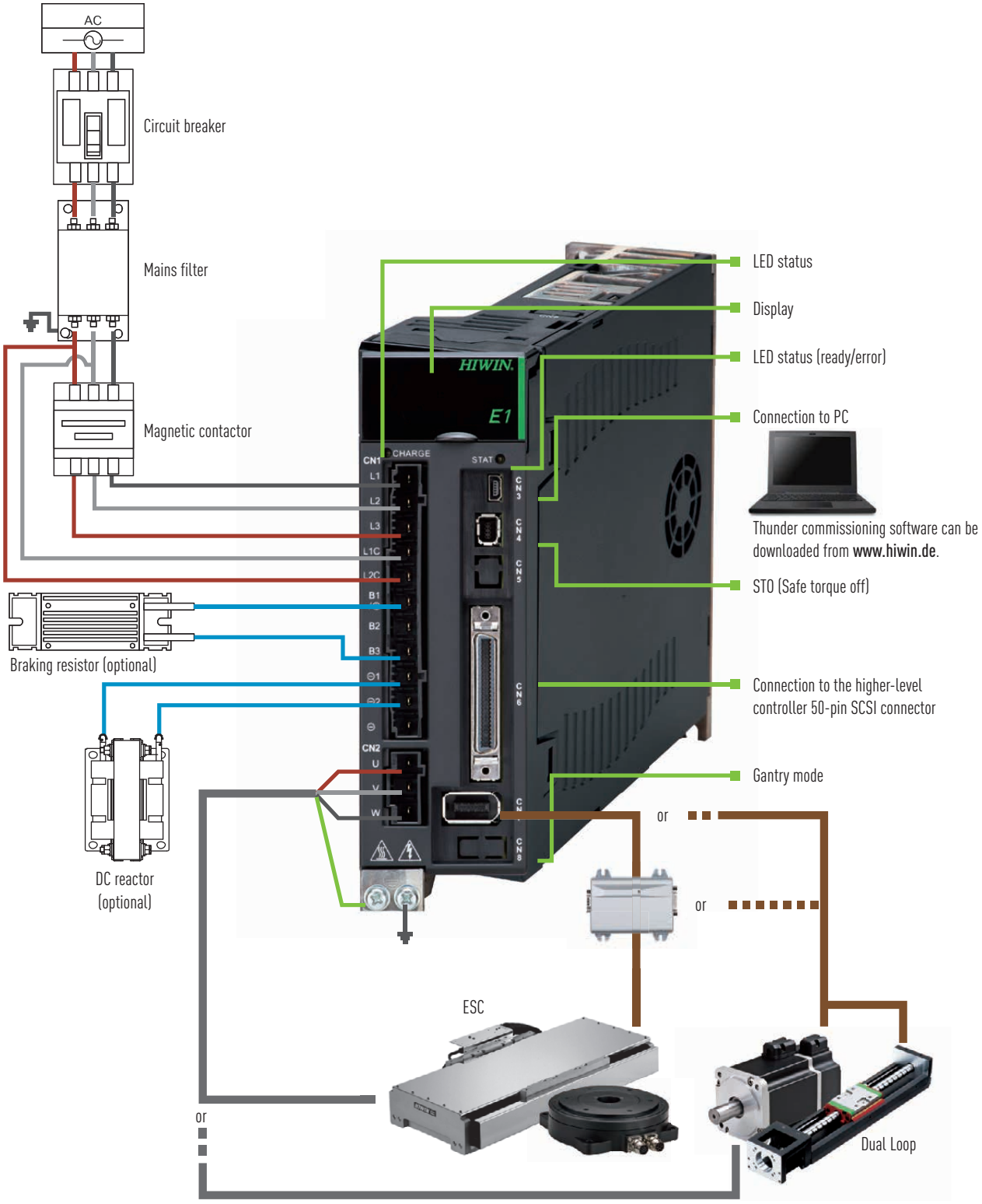


7. Interfaces (230 VAC)

The vector-controlled, fully digital ED1 drive amplifiers with STO safety function are specially designed for HIWIN EM1 servomotors and HIWIN linear and torque motors. For multi-axis systems in particular, the ED1 series offers a gantry mode function for dynamic, highly accurate and synchronised positioning of parallel axes.

This also applies to HIWIN belt and spindle axes.
Ready-made motor and encoder cables as well as the freely available HIWIN commissioning software „Thunder" are available for easy installation and commissioning.

7.1 Circuit diagram



8. Drives (400 VAC)

8.1 Order code

ED1	S	E	N	05	3	3	0	1

Baureihe:
ED1

Type:
S: Standard
F: Fieldbus

Control interface:
V: Step/direction [1]
E: EtherCAT CoE [2]
P: PROFINET [2]

Special function:
N: Without Gantry-Mode
G: Gantry-Mode

Safety functions:
1: STO (Safe torque off)

Motor type:
0: AC servo-, linear und torque motor

Supply voltage:
3: 400 VAC

Number of phases:
3: 3 Phasen

Performance class:
50: 5,000 W
75: 7,500 W

[1] Type S = Standard
[2] Type F = Fieldbus

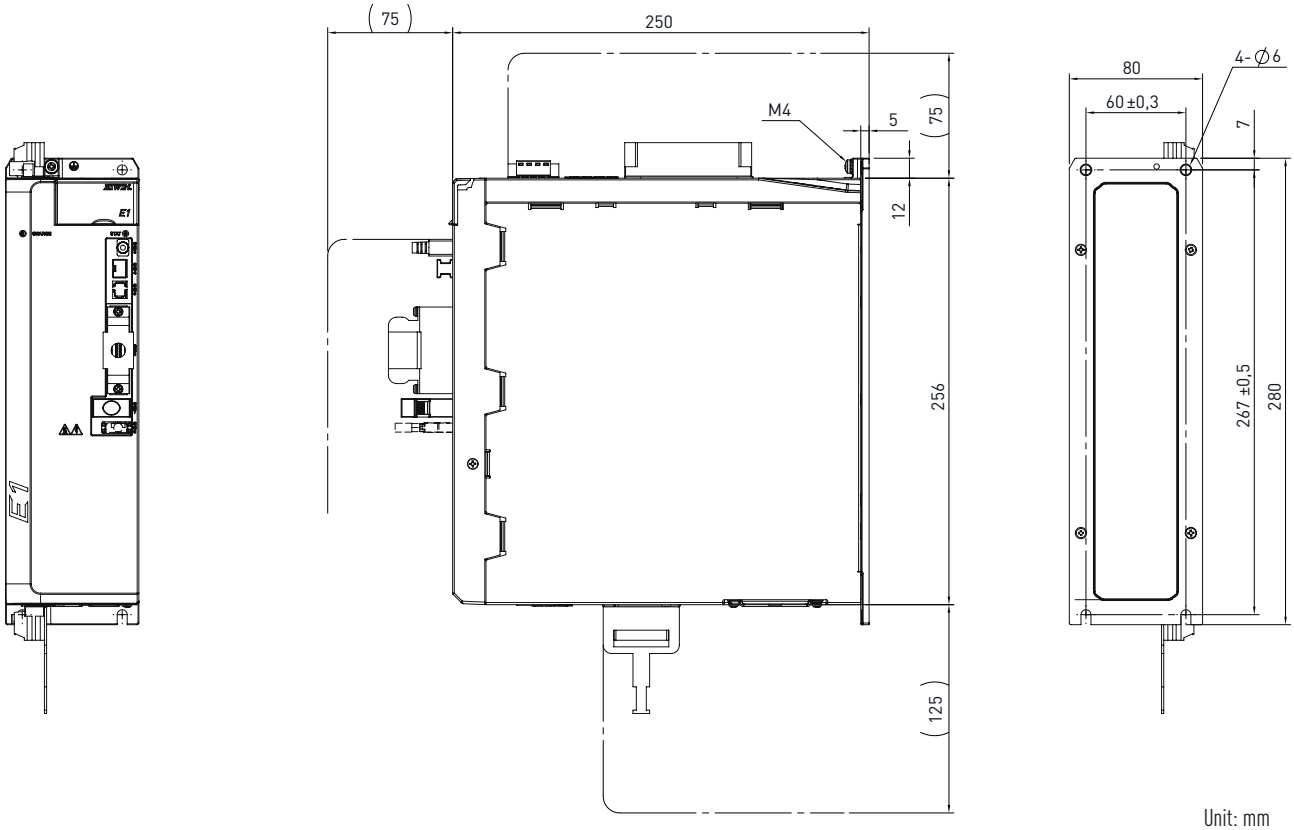
9. Performance specification (400 VAC)

Table 9.1 **Drive 400 VAC**

Rated power			**5,000 W**	**7,500 kW**
Input power	Three-phase main power	Nominal voltage (line to line)	AC 380 – 480 Vrms, 50 – 60 Hz	
		Rated current (Amp)	12.6	17.6
		Inrush current (Apk)	50	
	Standard power	DC 24 V±15 %, 2 A		
Output power	Phase Voltage		3 Ø/AC 480 Vrms max.	
	Maximum rated power (W)		5 k	7.5 k
	Peak current (Amp)		42	85
	Rated current (Amp)		16	27.4
Data on power loss (W)			< 250	< 525
PWM modulation frequency			8 kHz	
Dynamic brake			– Built-in dynamic braking circuit – No built-in dynamic braking resistor – Delay time of the relay: 20 ms	
Lowest permissible value for external dynamics – Braking resistor			10 Ohm	
Protection of the braking energy	Braking resistor		– 5 kW: With built-in braking resistor. Connection to external braking resistor to increase the braking capacity. – 7.5 kW: Without built-in braking resistor. Connect to an external braking resistor if required.	
	Built-in braking resistor		27 Ohm/180 W	–
	Power Capacity [uF]		560	840
	AC 380 V	Protection of the brake resistor activated	+HV > 620 VDC	
		Braking resistor protection deactivated	+HV < 600 VDC	
	AC 480 V	Braking resistor protection activated	+HV > 770 VDC	
		Braking resistor protection deactivated	+HV < 755 VDC	
	Overvoltage protection		800 VDC	
Environment	Operating temperature		0 – 40 °C	
Weight (kg)			4.0	5.3

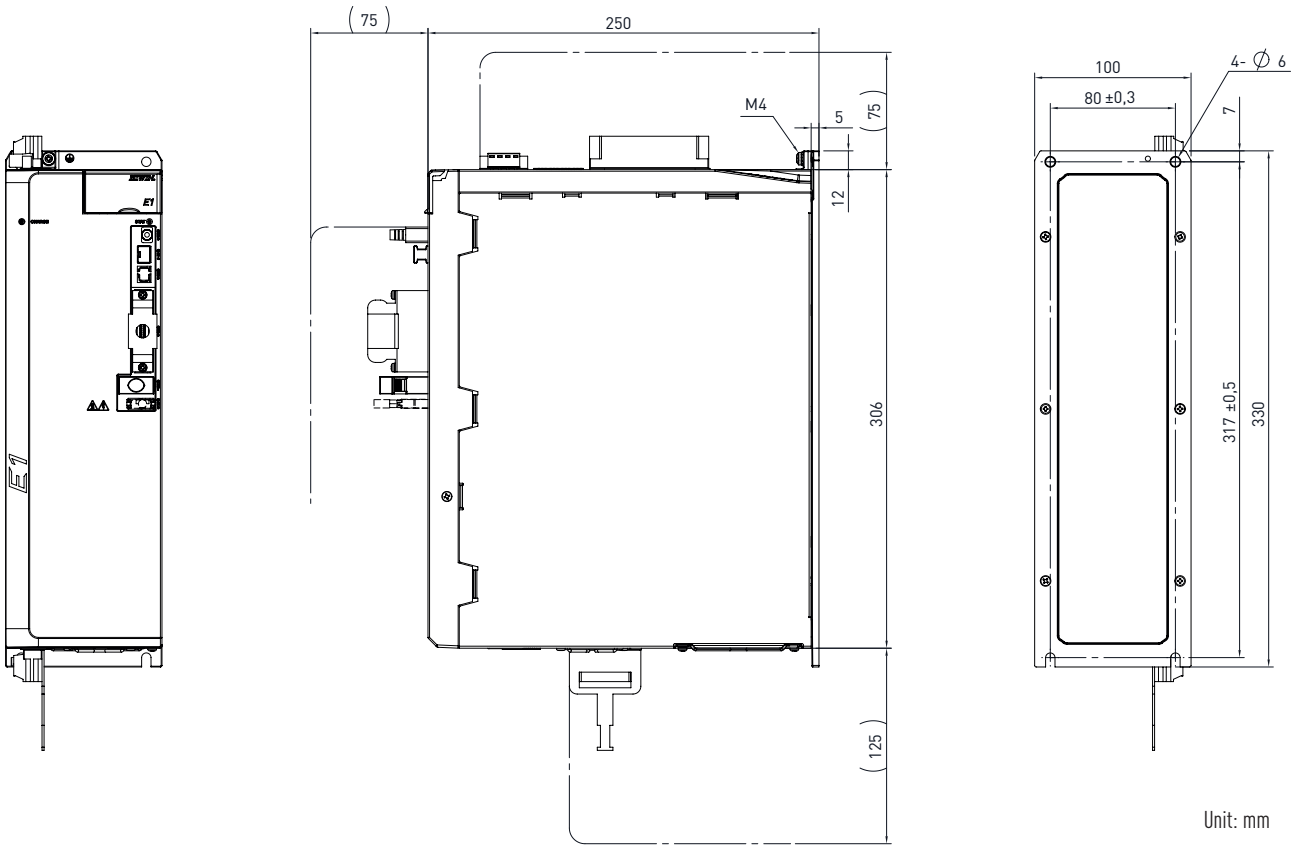
9.1 Dimensions ED1 (standard)

– **ED1S – 5,000 W**



Unit: mm

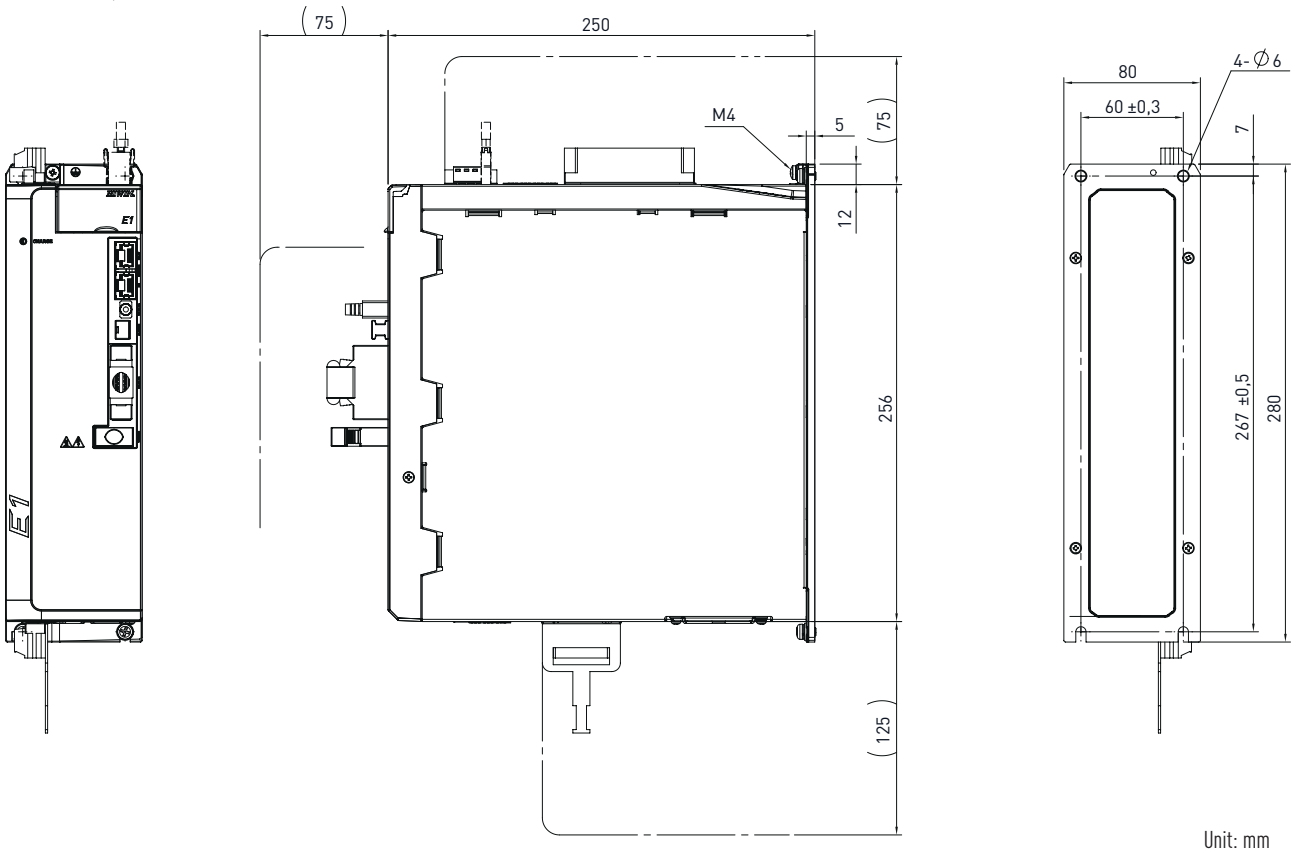
– **ED1S – 7,500 W**



Unit: mm

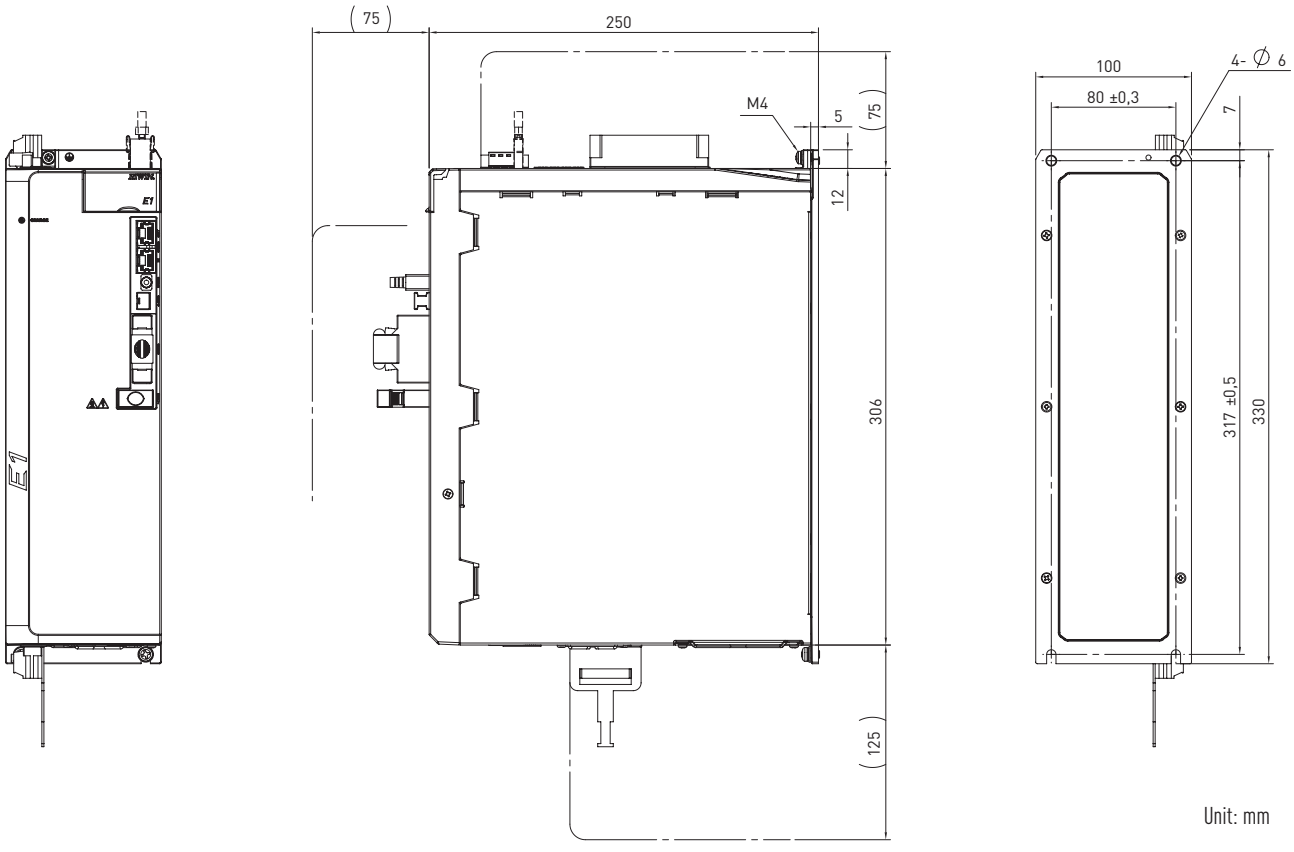
9.2 Dimensions ED1 (fieldbus)

– **ED1F – 5,000 W**



Unit: mm

– **ED1F – 7,500 W**



Unit: mm

10. Interfaces (400 VAC)

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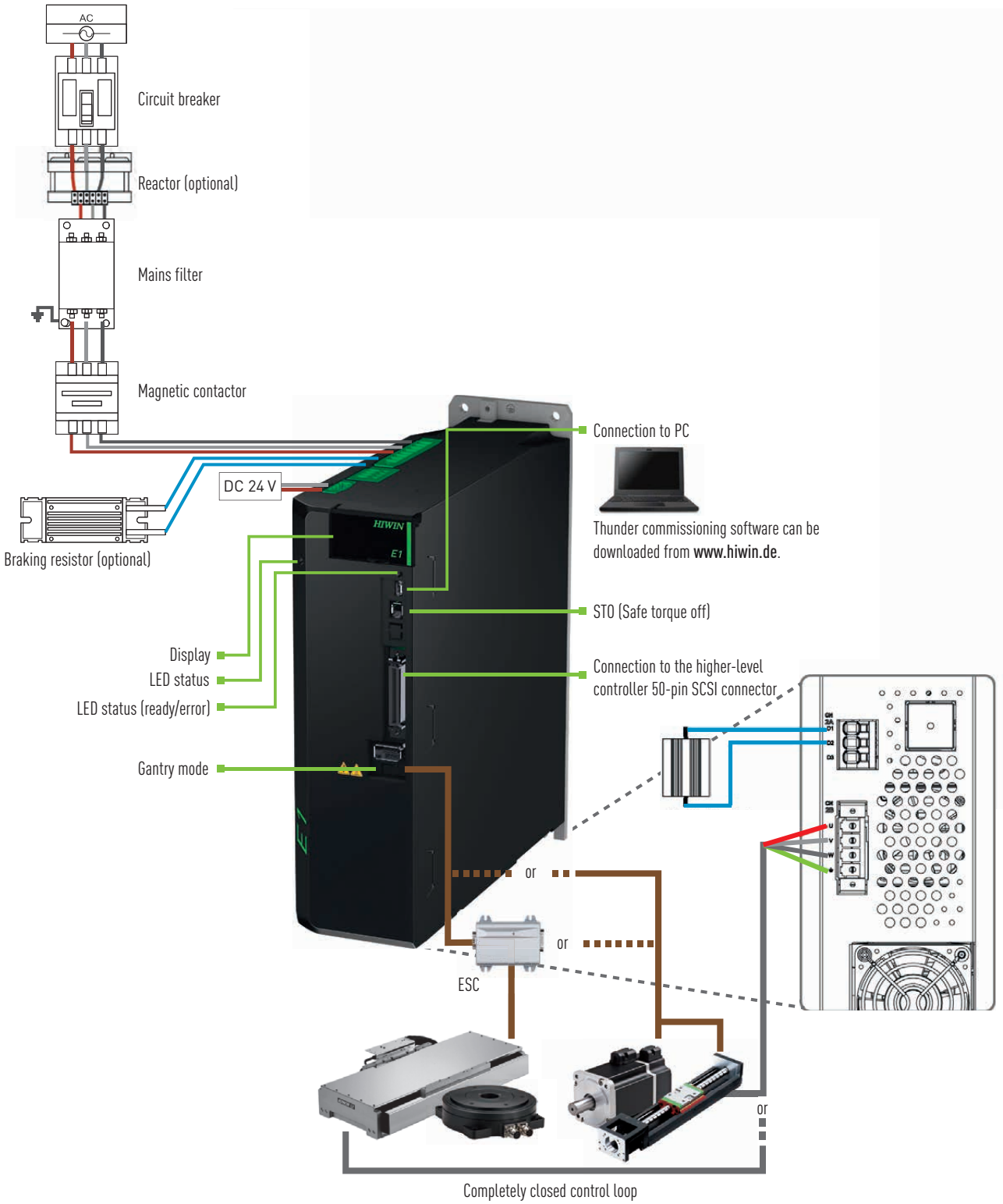
10.1 Circuit diagram



11. Specifications of the drives

The general specifications for the drives of the ED1 series are described in the following table.

Table 11.1 **General specifications of the drives**

Category				Specification of the drive
Cooling method				Fan cooling
Control procedure				IGBT-PWM space vector control
Applicable motor				AC/DM/LM (depending on the encoder type, an Excellent Smart Cube (ESC) may be required)
STAT LED display				– Flashing red: Error – Flashing green: Ready – Green: Activated – There is no STAT LED display on the fieldbus drive amplifier.
CHARGE LED display				– Red: The device is supplied with power. – No light: The device is not supplied with power.
Analogue output				– Channel: 2 – Resolution: 12 Bit – Output voltage range: ±10 V – Precision: ±2 % – Maximum output current: ± 10 mA
Control function	Position Mode	Command Source		Pulse command from the controller
		Signal type		– Pulse/direction – CW/CCW – AqB
		Isolated circuit		Optical high-speed coupler
		Input signal		Differential input (2.8 V ⩽ high and low potential difference ⩽ 3.7 V) or unbalanced input (12 – 24 VDC)
		Maximum input bandwidth		– Differential: 5 Mpps – Single-End: 200 kpps
		Electronic gearbox		Gear ratio: Impulses/Counts Impulses: 1 – 1.073.741.824 Counts: 1 – 1.073.741.824
	Velocity Mode	Command Source		DC voltage command from the controller
		Analogue input	Impedance	14 kΩ
			Signal format	±10 VDC
			Maximum input bandwidth	100 Hz
			Specification	16-bit A/D input (V-REF+/-)
	Torque Mode	Command Source		DC voltage command from the controller
		Analogue input	Impedance	14 kΩ
			Signal format	±10 VDC
			Maximum input bandwidth	100 Hz
			Specification	16-bit A/D input (T-REF+/-)
Control type				1 Position Mode 2 Velocity Mode 3 Torque Mode 4 Full-closed Loop Mode (Dual Loop Mode)
Computer communication	Standard USB2.0 (mini-USB type)			Connect the drive amplifier to your computer to set parameters, monitor physical variables and carry out a test run via Thunder.

Encoder	Power supply		+5.1 VDC ± 5 %, 700 mA
	Signal format		– Serial signal Resolution: 23 bit (single-turn/multi-turn absolute encoder) Bandwidth: 5 MHz – Incremental signal (digital TTL differential signal) AqB and Z-phase signals The maximum input bandwidth of each phase is 5 MHz. Quadruple frequency, 20 Mcounts/s
	Safety function		– Detection of faults in the encoder output – Short-circuit protection – Undervoltage protection – Overvoltage protection – Encoder alarm protection (digital TTL differential signal)
	Position counting range		-2,147,483,648~2,147,483,647 (32 bit)
	Linear motor/direct drive motor		Depending on the encoder type, an Excellent Smart Cube (ESC) may be required.
Encoder output	Emulated encoder output (fieldbus is not supported by the drive amplifier)	Z-phase	1 Serial encoders and incremental encoders (AqB, sin/cos) are supported. 2 The width of the output signal can be set by parameter. 3 Digital differential signal output 4 Z-phase open collector output is supported. 5 Two output methods can be selected. – Outputs only one Z-phase signal for the entire travel distance. – Outputs one Z-phase signal per revolution.
		A/B-phase	1 Serial encoders and digital encoders (AqB) are supported. Differential signal output. 2 The maximum output bandwidth is 18 Mcount/s. 3 The scaling of the output can be customised. For example: ten encoder counts = 1 emulated encoder count.
	Output of the buffered encoder	Z-phase	1 Supports only digital encoders (AqB). 2 Differential signal output 3 Supports the open collector output of the Z-phase
		A/B-phase	1 Supports only digital encoders (AqB). 2 Differential signal output, maximum output bandwidth 20 Mcount/s
Multi-purpose I/O	Input		The functions of the multi-purpose inputs (optocouplers) can be defined by the user. The ED1 series drive amplifier has ten multi-purpose inputs (I1 to I10). The fieldbus drive amplifier only has eight multi-purpose inputs (I1 to I8) 24 V/5 mA (each input pin).
	Output		The functions of the multi-purpose outputs (optocouplers) can be defined by the user. The drive amplifiers of the ED1 series have five multipurpose outputs (O1 to O5) 24 V/0.1 A (each output pin).
	Position trigger (PT)		The pins for the PT output function are CN6-46 and 47 (differential signal). Differential 3.3 V, maximum current 20 mA, maximum output bandwidth 10 MHz.
Optional function			Function for controlling the gantry synchronisation
Environment	Storage temperature		-20°C – 65°C
	Air humidity		Operating and storage temperature: 20 to 85 % RH (non-condensing)
	Altitude		Altitude 1,000 m or less above sea level (1,000 – 2,000 m are permissible if a throttled value is applied.)
	Vibration		Less than 0.5 G Frequency 10 to 500 Hz (No continuous operation below the resonant frequency)
	IP rating		IP20

12. Accessories

12.1 Excellent Smart Cube (ESC)

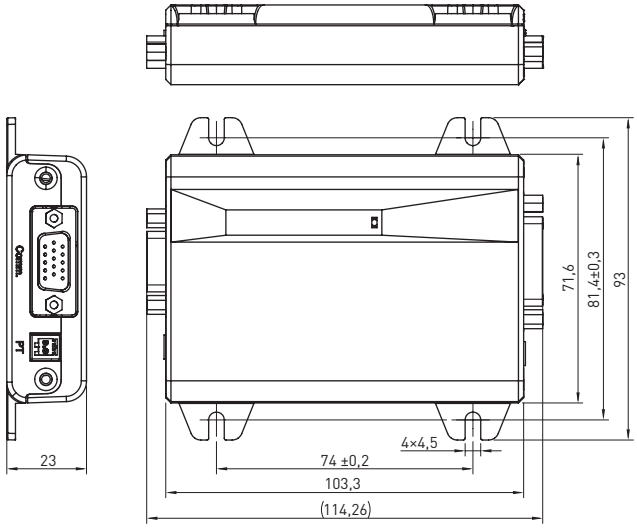
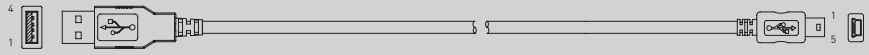
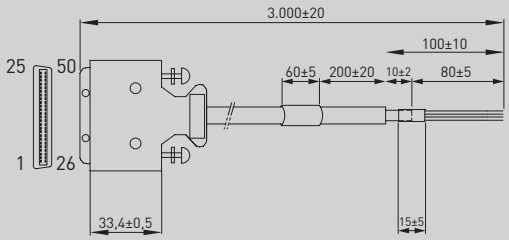
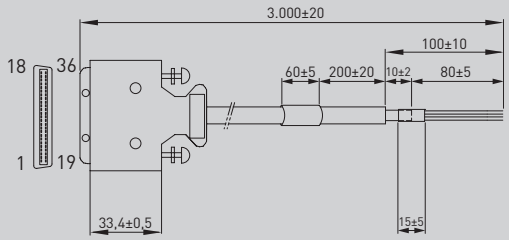
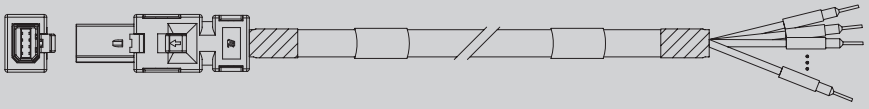
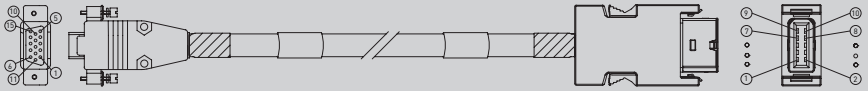


Table 11.2 **Technical data ESC**

Item number	80050247 (ESC-SS-S02)					
Supply voltage	+5 VDC ±5 %					
Peak current (input)	1,000 mA					
Peak current (output)	650 mA					
	Digital Hall	**Incremental**		**Absolute**		
Encoder type	Hall U/V/W	SIN/COS/Reference	A/B/Index	BiSS-C	EnDat 2.1 / 2.2	Tamagawa
Signal frequency	2 kHz	1 MHz	4 MHz	5 MHz	4 MHz	5 MHz
Signal resolution	—	Multiplication factor 4096	—	32 bits (ST + MT)		
Input signal	5 VDC CMOS / TTL	Differential (RS422)		Differential (RS485)		
Temperature monitoring (motor)	PTC					
Ambient temperature	0 °C to +45 °C					
Storage temperature	–20 °C to +65 °C					
IP protection class	IP20					

12.2 Cables

Table 12.1 **Cables for drive ED1**

Item number	Designation	Plug	Illustration	Length
8-10-0864	USB parameterisation cable	CN3		2 m
8-10-1619	50-pin I/O cable for ED1S (standard)	CN6		3 m
8-10-1608	36-pin I/O cable for ED1F (fieldbus)	CN6		3 m
8-10-1620	Gantry communication cable for ED1	CN8		0,5 m
8-10-1899	STO cable for ED1	CN4		3 m
8-10-1610	ESC cable	CN7		3 m

12.3 Connectors

Table 12.4 **Connectors for drive ED1**

Item number	Designation	Plug	Description	Qty.
8-10-1917	ED1 CK1 accessory kit (400 W – 2 kW Standard)	CN1	AC main input power terminal, control input power terminal, terminal for regenerative resistor and terminal for DC reactor (11 pins, TE 1-2229794-1-PT1)	1
		CN2	Motor power connector (3 pins, TE 3-2229794-1)	1
		CN4	STO connector (TE 1971153-1)	1
		CN6	Control signal connector (50 pins welded type EUMAX XDR-10350AS)	1
			Headers and wire housings for CN1 and CN2 connectors (TE 1981045-1)	2
8-10-1918	ED1 CK2 accessory kit (400 W – 2 kW Fieldbus)	CN1	AC main input power terminal, control input power terminal, terminal for regenerative resistor and terminal for DC reactor (11 pins, TE 1-2229794-1-PT1)	1
		CN2	Motor power connector (3 pins, TE 3-2229794-1)	1
		CN4	STO connector (TE 1971153-1)	1
		CN6	Control signal connector (36 pins welded type EUMAX XDR-10336AS)	1
			Headers and wire housings for CN1 and CN2 connectors (TE 1981045-1)	2

12.4 Braking resistor

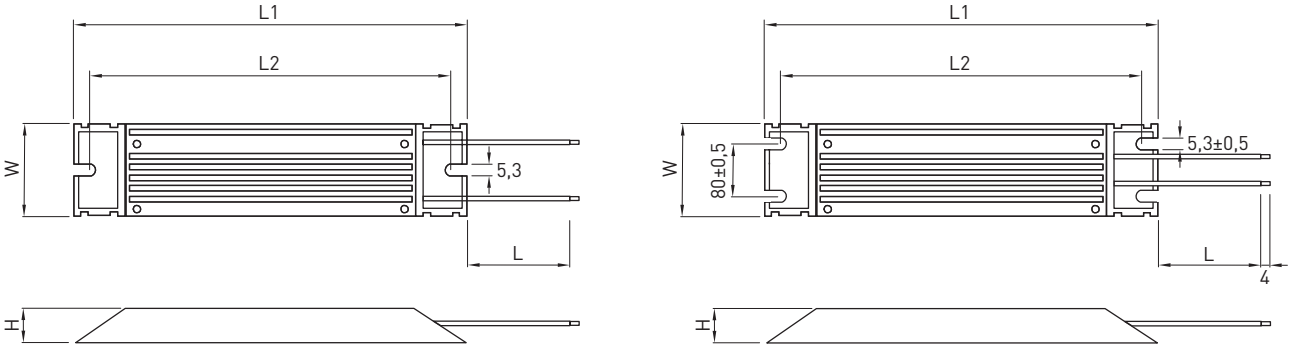


Table 12.2 **Braking resistor for drive ED1**

Article number	Designation	Resistance [Ω]	Nominal power [W]	L [mm]	L1 ±2 [mm]	L2 ±2 [mm]	W [mm]	H [mm]
80069484	Brake resistor	68	100	500	165	150	40 ±0.5	20 ±0.5
80069493	Brake resistor	190	1,000	200±20	400	385	100 ±1	50 ±1
80069489	Brake resistor	50	150	50	175	190	20	40
80069488	Brake resistor	120	300	500	215	200	60	30
80069492	Brake resistor	50	600	500	390	364	60	28

Unit: mm

12.5 Mains filter

Table 12.3 **Mains filter for drive ED1**

Article number	Designation	Type	Nominal current [A]	Leakage current [mA]
8-09-0670	ED1 mains filter, 1-phase, 400 to 1,000 W	FN2090-10-06	10	0.67
80114244	ED1 mains filter, 1-phase, 1,200 to 2,000 W	FN2090-16-06	16	0,93
80029045	ED1 mains filter, 3-phase, 5,000 W	FN3270HQ1-20-44	20	0.40
80029046	ED1 mains filter, 3-phase, 7,500 W	FN3270HQ1-35-33	35	0.40

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Note:
The technical data in this catalogue may
be changed without prior notice.