DRIVES AND CONTROLS

Powering machine innovations

MicroFlex e190 and e-Series motors

Every detail and feature is reimagined with users in mind, to deliver one of the most flexible and dynamic servo drive-motor packages available. The package helps address the most demanding needs of system integrators, OEMs and machine builders. It provides unprecedented levels of productivity and performance improvements to the smart factory of today and tomorrow.

One drive, one motor, many possibilities

Matched servo package delivers highly dynamic motion control for absolute precision and productivity

A compact, highly dynamic motion control package, comprising ABB's new MicroFlex e190 servo drive and e-Series servo motor (eSM) provides fully compatible, matched and tested components from a single supplier. In addition, integrated Ethernet technologies and intelligent programming options provide a versatile platform for next generation smart factories and processes.

Matched performance ensures machine builders, OEMs and system integrators can optimize machine design for motion applications in industries such as packaging, metal cutting and forming, plastics and rubber and woodworking.

The package is suited to single axis intelligent applications as well as centralized motion for use with any controller supporting EtherCAT®, POWERLINK, EtherNet/IP™, Modbus TCP and PROFINET I/O.

Configuration is streamlined by an intuitive drive configuration toolset that simplifies commissioning, tuning and motion programming when using the optional motion programming function.

The package provides a lower total cost of ownership through efficient installation, commissioning, operation and maintenance. It is backed up by ABB's global service and support network.


ABB
L1
L2
L3
UDC-
R-
R+/
UDC+
X1
U
V
W
X2
5 Min
DRIVE STATUS
HI
LO
SW1
ABB
L1
L2
L3
UDC-
R-
R+/
UDC+
X1
U
V
W
X2
5 Min
DRIVE STATUS
HI
LO
SW1

MicroFlex e190

The MicroFlex e190 servo drive provides precision control of rotary and linear servo motors in a wide range of high-performance motion applications.

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01 The MicroFlex e190 is a compact high-performance servo drive, reimagined for future machine designs.
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02 The package complies with the latest safety regulations, including improved machine and operator safety.

Single axis motion applications benefit from a powerful programming option that combines with the Ethernet interface, digital and analog I/O, buffered encoder output and dual encoder input to create a single device solution. Multi-axis, tightly coupled systems are powered by EtherCAT or POWERLINK. As such, programmable intelligent drives and PLC controlled servo drives are provided in the same compact package.

Specification
- 0.4 kW to 3 kW
- 105 to 240 V AC single and three phase
- IP20, flush mount, side-by-side
- 200 and 300 percent overload modes
- Universal feedback interface
- Dual encoder and buffered encoder out
- Digital and analog I/O
- Integrated selectable Ethernet protocols
- 2 x high speed registration inputs
- EMC bonding plate that simplifies cable management
- Analog and Pulse Train Output (PTO) control modes
- Multi-tasking motion programming option

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01

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02

e-Series servo motor (eSM)

The eSM motors offer high resolution absolute encoders for precise dynamic performance that results in greater productivity and better end product quality.

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03 Motors matched are based on achieving full peak torque. In some cases smaller drives may be used to achieve 200 percent rated torque.

The motors feature magnetic materials and compact windings that provide a maximum torque density and low loss design, combined with peak overload torque capability of up to 300 percent.

The result is higher dynamic acceleration capability, combined with system stiffness and low settling times afforded by higher resolution encoders. Machine cycle times can be reduced by shorter movement times delivering higher productivity and end product quality.

Specification
- 100 W to 7.5 kW
- 40, 60, 80, 130 and 180 mm frame sizes
- High-performance encoder as standard
- Optional multi-turn absolute encoder

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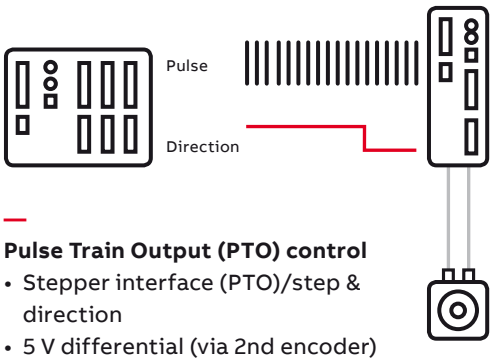
03

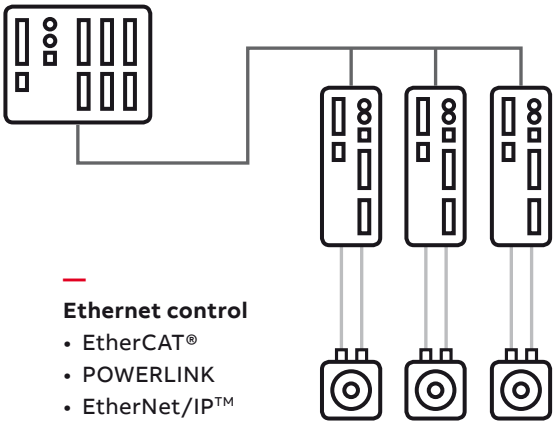
The Design Engineer
Simplifying machine build

MicroFlex e190 provides a single scalable solution that adapts to many different control modes. Operating in PTO, analog control, or from one of the selectable built-in Ethernet protocols, the e190 is a versatile choice for solving different levels of machine control. The e190 also operates as a self-contained programmable motion controller, with support for functions such as HMI, communications, simple position tasks and geared motion to a master (line shaft) encoder.



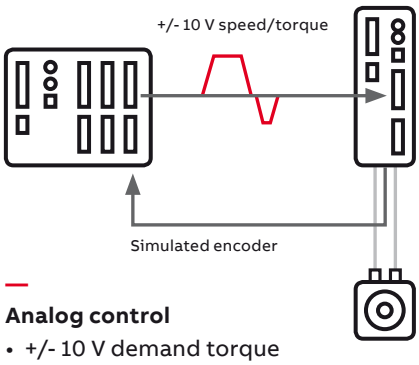
Pulse Train Output (PTO) control

- Stepper interface (PTO)/step & direction
- 5 V differential (via 2nd encoder)
- 12-24 V via fast inputs



Ethernet control
- EtherCAT®
- POWERLINK
- EtherNet/IP™
- Modbus TCP
- PROFINET I/O

Programmable motion drive
Installing a motion license memory unit unlocks powerful programmable machine control features. These help solve simple motion tasks or create a self-contained solution to a flying shear or labelling control with HMI and registration.



Analog control
- +/- 10 V demand torque or speed
- Buffered/simulated encoder output

The Design Engineer
Optimizing performance and productivity

The MicroFlex e190 features flexible Ethernet technologies that are highly integrated to optimize performance. Multiple protocols are supported and fully built-in and can be selected during commissioning. They require no additional hardware to be installed in the drive. This makes the e190 the perfect choice for machine builders and integrators supporting multiple Ethernet protocol solutions for different customers and geographic markets.

Multiple Ethernet protocols built-in
- Integrated real-time Ethernet+ additional TCP/IP connection for configuration and other protocols

Real-time protocols
- EtherCAT®
- Powerlink

Standard protocols
- Ethernet/IP™
- Modbus TCP
- PROFINET I/O

All major feedback types supported
Universal Encoder Interface (UEI) provides wide range of motor feedback support including:

- SmartAbs/ Smart Inc
- Incremental + Halls
- EnDat 2.2
- Hiperface (5V/8V)
- SinCos
- BiSS B
- Resolver[1]

2nd encoder input or simulated encoder out
2nd encoder input

- for dual loop control to compensate mechanical errors
- line-shaft encoder input for electronic gearing applications

Simulated encoder out

- for analog control. Note the UEI on front face supports two encoder inputs at the same time as simulated encoder out on this connection.

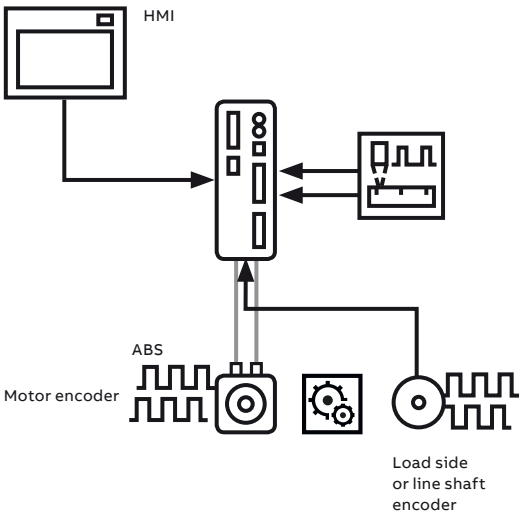
The Design Engineer
Improved precision and flexibility

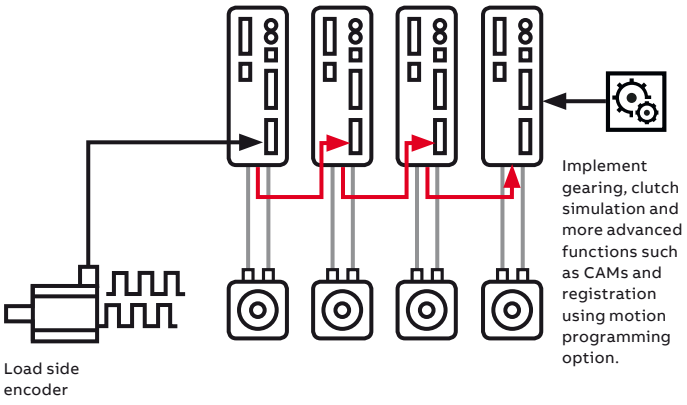
In precision applications such as CNC milling or grinding, errors introduced by mechanical transmission can be compensated by load side encoders. MicroFlex e190 supports dual encoder inputs for this purpose.

Flying shears, labelling systems, and many other applications require accurate tracking of product or print. These 'line shaft' encoder applications are also supported by the dual encoder interface of the MicroFlex e190.

For simple multi-axis systems, the buffered encoder output of one drive can be connected to a second encoder input to the next drive, creating cascaded electronically geared motion of 1 to many axes, without the need for a motion controller to perform this task.

Combined with the powerful motion programming option, a variety of line-shaft controlled solutions can be created.

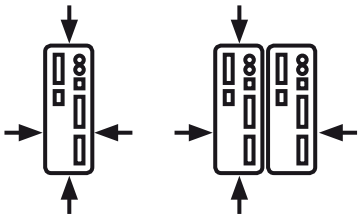




- Eliminate errors introduced by mechanical transmission
- Improve precision of control and process

The Installation Engineer
Quick and easy to fit

The MicroFlex e190 features numerous improvements that make the installation of the servo drive easier. For instance, no high density specialized connectors are used as all functions are split separately, using solder-free connector types.



Compact, narrower size
Combined with side-by-side flush mounting to reduce panel space

Two fixings eyelet mount
Reduced install time and hands-free mounting

Easy to wire connectors
No soldering, no high-density connectors and simple standard types that are easier to use and service. Separate motor power and STO connectors provide ease of isolation during start-up/service: Separate, pluggable connectors for:

- AC / DC power and braking resistor
- Motor power
- Digital and analog I/O
- Master (2nd encoder input)
- Safe Torque Off (STO)
- Universal Encoder Interface
- Real-time Ethernet dual-port
- Ethernet service port
- 24 V backup input

The Commissioning Engineer
Intuitive drive configuration

Through the MINT WorkBench, the MicroFlex e190 provides a high level multi-tasking language that is tailored for motion applications. This simple programming language provides control of communications, logic, motion and HMI interactions enabling the configuration of cut-to length, flying shears, CAMs, labelers and other applications.

PE connection and shield EMC bonding
The EMC bonding plate offers easier shield bonding using standard P-clips. This simplifies wiring and provides built-in cable management by mechanically supporting motor power and other I/O cables.

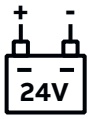
Intuitive and convenient drive configuration
Configuration and programming tools make drive commissioning simple. All configuration, firmware and optional motion programs are stored on the drive's memory unit. Prepare drive settings off-site[1], manage functionality levels or move settings from one drive to another.

1. Prepare offline - simply configure an identical drive offline and 'plug-in' the new settings anywhere in the world

The Operations and Maintenance Engineer
Minimizing downtime, maximizing output

Ensuring high levels of productivity and maximizing uptime demands fast resolution to system issues or failures. The MicroFlex e190's memory unit contains all configuration and firmware which can be swapped to a new drive within minutes. No specialist training or access to software tools is needed.

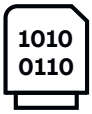
The drive can be configured offline and the memory unit is simply plugged in with the new settings. Ultimately, the same support and service network can be utilized for the entire system, ensuring ownership and simplified support.



24V back-up supply input
- Maintain control electronics while safely removing main AC power for operator safety and saving energy

Integrated and replaceable fans
- Fully integrated and meeting UL standards for USA
- Included in 3, 6 and 9 A variants
- Not required in 1.6 A unit

Conformal coated boards
- Increase resilience and reliability in harsh environments



PC-free maintenance - Memory unit for backup with easy swap-out
- No need for PC or latest software access, or skilled maintenance operator. Simply swap the memory unit to the replacement drive to be back up and running within minutes

The Safety Engineer
Conforming to the latest standards

MicroFlex e190 considers safety on many levels. Its conformal coated boards offer resilience when used in harsh environments while best-in-class EMC bonding ensures trouble-free installation and operation. Safe Torque Off (STO) comes as standard and removes the need for power cycles in emergency situations, thereby reducing start-up times while protecting operators, machinery and end-product.

Safety
- STO SIL3 PLe
- Color coded STO connector
  - Separate connector allows STO to be disconnected leaving I/O connections intact
  - STO daisy chain to multiple drives is possible
- 2 x LED Network status/error

EMC bonding
- Minimizes EMC-related start-up and reliability issues by providing effective, easy to use, EMC bonding and cable support

Convenient PE/EMC bonding plate
- No need for additional EMC brackets
- Motor power shield and strain relief in one
- Motor UVW can be unplugged and Protective Earth (PE) remains connected for safety
- Fast inputs - screened pairs easily bonded
- P-clip or ring-crimp fixing support
- AC power PE on top of the drive heatsink

The applications
Managing motion wherever you are

—
01 High resolution absolute feedback provides smooth precise control.
—
02 Dynamic performance for precision applications such as printing or packaging.
—
03 Line-shaft encoder following, registration inputs and motion programming for tasks such as labeling, printing and packaging.
—
04 Integrated safety and selectable Ethernet technologies for future-proof digital factory solutions.

Metal forming and converting machinery
The MicroFlex e190 drive and eSM motor must operate to tight tolerances and respond to changing inertial loads in many applications, including:
- Grinding and milling
- Drilling and polishing
- Press back-gauge control
- Laser and water-jet cutters

As such, the MicroFlex e190 provides:
- Dynamic control for rotary and linear servo motors with up to 300 percent overload
- Trapezoidal- and S-shaped velocity profiles which allow machine throughput to be maximized by optimizing parameters such as acceleration, deceleration and velocity forming
- Highly integrated connectivity to various feedback devices as standard
- Real-time communication over Ethernet that ensures the machine performs smoothly without delays

Packaging machinery
MicroFlex e190 features high performance servo control for dynamic motion, with tightly integrated Ethernet control and feedback devices. These provide the high throughput, repeatable product quality, and minimum downtime demanded by:
- Horizontal form fill seal (flow wrappers)
- Vertical form fill seal
- Labeling systems

The MicroFlex e190 provides:
- Safe Torque Off (STO) as standard which eliminates costly power cycles, with immediate restart if an operator opens a machine guard
- High speed registration inputs for precision labeling applications

These advantages can be applied to many other industries and applications including:
- Electronics
  - Assembly and test
  - Bond testers
  - Pick and place
- Pharmaceutical
  - sample storage & retrieval
- X-ray inspection machines
- Printing machines
- Material handling

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Technical specifications

Matched performance drive and motor packages

Motor type and rating			Drive type and ratings		Package rating				
Type code	Cont Current (A)	Peak Current (A)	Drive Type	Mode[1]	Rated Amps (A)	Peak Amps (A)	Cont Torque (N·m)	Peak Torque (N·m)	Rated Power (W)
ESM04X-101-302-xxN0A00	1.1	3.2	MFE190-04UN-01A6-2	200%	1.6	3.2	0.32	0.93	**100**
ESM06X-201-302-xxx0A00	1.6	4.8	MFE190-04UN-01A6-2	300%	1.6	4.8	0.64	1.91	**200**
ESM06X-401-302-xxx0A00	2.7	8.1	MFE190-04UN-03A0-2	200%	3	6	1.27	2.83	**400**
			MFE190-04UN-06A0-2[1]	200%	6	12	1.27	3.82	**400**
ESM08X-751-302-xxx0A00	4.3	14	MFE190-04UN-06A0-2	300%	5.25	15.75	2.39	7.77	**750**
ESM08B-751-302-xxx0A00	3.8	11.3	MFE190-04UN-06A0-2	200%	6	12	2.42	7.20	**750**
ESM13B-102-202-xxx0A00	5.1	15.3	MFE190-04UN-06A0-2	200%	6	12	4.77	11.22	**1000**
			MFE190-04UN-09A0-2[1]	200%	9	18	4.77	14.31	**1000**
ESM13B-152-302-xxx0A00	6.9	20.7	MFE190-04UN-06A0-2	200%	6	12	4.15	8.30	**1300**
			MFE190-04UN-09A0-2[1]	300%	7.5	22.5	4.77	14.31	**1500**
ESM13B-202-202-xxx0A00	9	27	MFE190-04UN-09A0-2	200%	9	18	9.55	19.09	**2000**
			MFE190-04UN-09A0-2	300%	7.5	22.5	7.95	23.86	**1700**

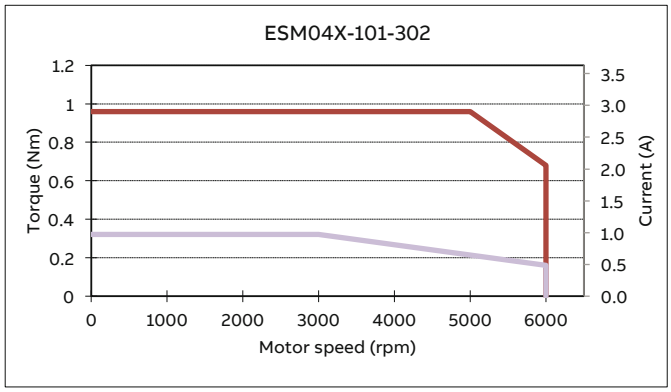
[1] e190 drives offer a 200% and 300% rating mode offering higher peak torques at a slightly reduced rms rating. Highlighted rows will provide full peak and continuous torque of the motor. If full peak torque is not required by the application, a lower rating drive can be selected in some cases for a more cost effective solution.

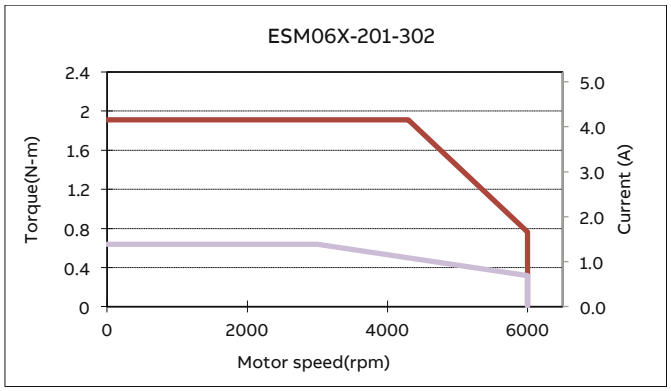
e-Series performance and specification - 220 V motors

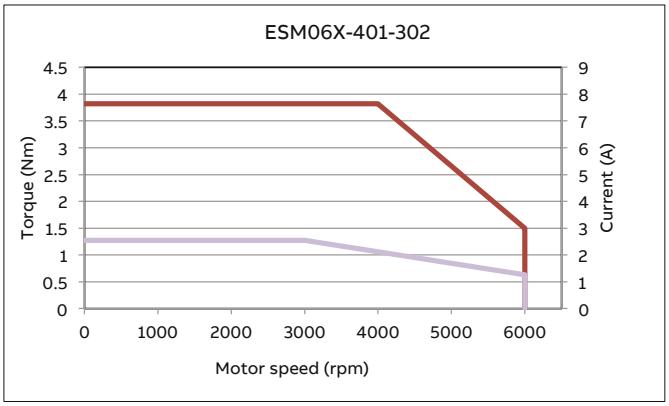
Frame size		ESM04	ESM06		ESM08		ESM13		
Catalog Number		**X-101-302**	**X-201-302**	**X-401-302**	**X-751-302**	**B-751-302**	**B-102-202**	**B-152-302**	**B-202-202**
Rated Power	**Watts**	**100**	**200**	**400**	**750**	**750**	**1000**	**1500**	**2000**
General									
Peak torque	N·m	0.95	1.91	3.81	7.16	7.17	14.31	14.31	28.65
Peak current	A	3.0	4.8	8.1	14.0	11.3	15.3	20.7	27.0
Continuous stall	N·m	0.32	0.64	1.27	2.39	2.39	4.78	4.78	9.55
Continuous	Arms	1.0	1.6	2.6	4.3	3.8	5.1	6.9	9.0
Rated speed	rpm	3000	3000	3000	3000	3000	2000	3000	2000
Rated Voltage	V								
Electrical									
Torque constant	N·m/A	0.32	0.46	0.47	0.56	0.77	1.02	0.74	1.14
Voltage constant	Vrms/krpm	23.7	28.0	32.8	37.3	42.5	61.7	44.7	68.9
Resistance	ohms	20.50	6.40	3.15	1.48	2.18	1.22	0.65	0.58
Inductance	mH	27.5	16.2	11.0	10.1	7.7	6.7	3.6	3.8
Electrical time	ms	1.22	2.53	3.50	5.74	3.53	5.49	5.48	6.52
Mechanical									
Rotor inertia with brake	kg·cm²	NA	0.23	0.34	1.03	2.39	6.96	6.96	12.84
Rotor inertia without brake	kg·cm²	0.04	0.17	0.28	0.90	2.26	6.26	6.26	12.14
Max. speed	rpm	6000	6000	6000	5000	3800	2800	4000	2800
Mechanical time	ms	1.01	3.36	0.83	0.59	1.64	1.10	1.24	0.86
Number of	-				8				
Weight with brake	kg	NA	1.4	1.9	3.8	4.0	8.1	8.1	11.8
Weight without brake	kg	0.5	1.0	1.4	2.4	3.2	6.5	6.5	10.2
Brake data									
Rated voltage	VDC ±10%				24				
Current	A	NA	0.26		0.43		0.82		
Input power	W		6.3		10.4		19.5		
Static friction torque	N·m (min)		2		3		20		
Armature release time	ms (max)		17		35		27		
Armature pull-in time	ms (min)		32		25		76		

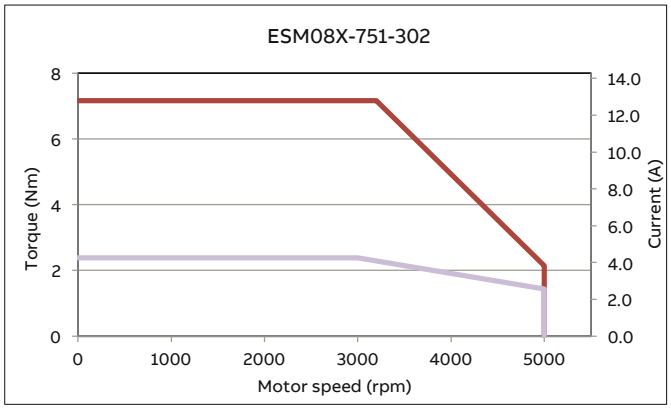
Technical specifications

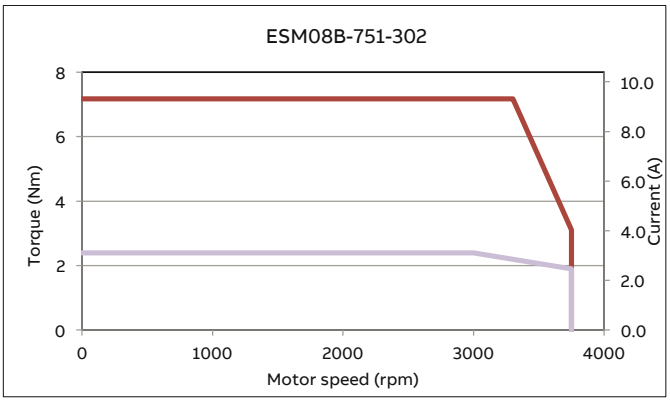
e-Series 220 V torque curves for MicroFlex drives

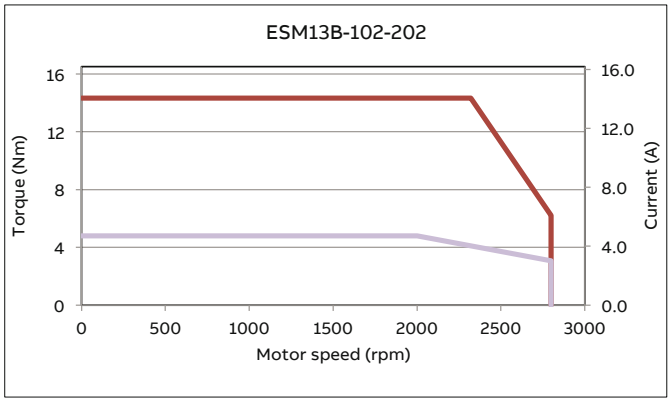


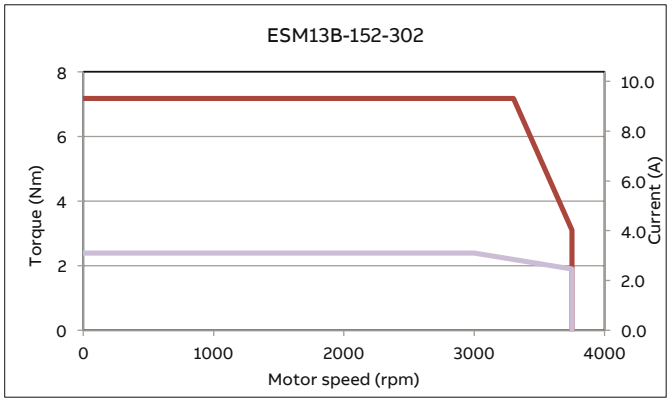


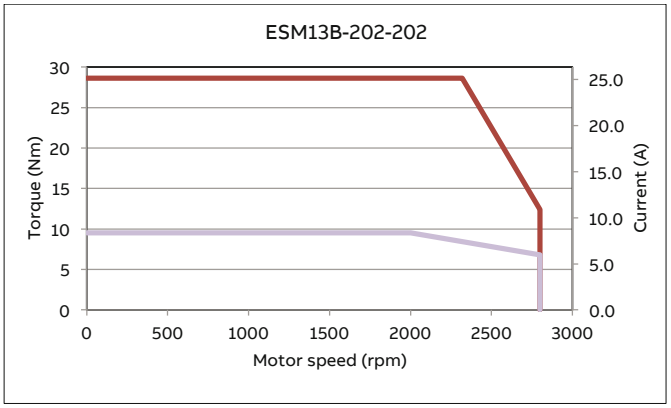






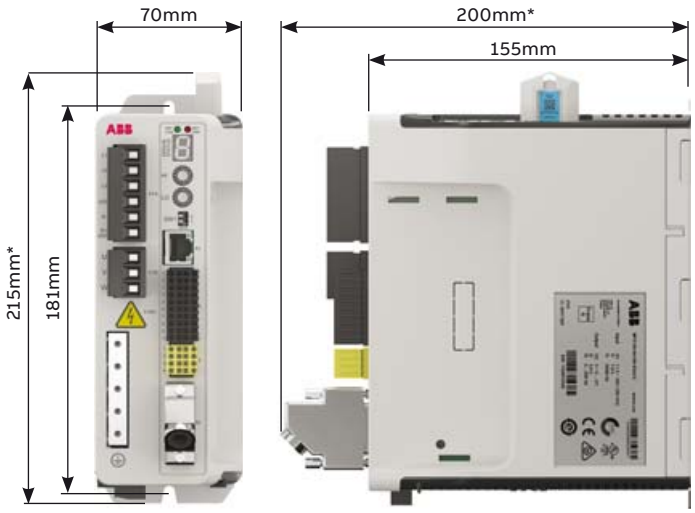






Technical specifications

MicroFlex e190



*Approximate dimensions. Allow extra space for feedback and other control cables

Technical specification	
Voltage/Frequency	Single- or three-phase 105-264 V AC/ 48-63 Hz
Efficiency	>95%
PWM switching frequency / control	8 kHz / Space Vector Modulation
Motor types	Asynchronous motors (standard induction, servo) and synchronous motors (servo, high torque), linear servo motors
Braking resistor (external)	0.25 kW nominal/ 2.7 kW peak 10% duty with 57 W nominal (min 39 W max 100 W)
Product compliance	
Approvals	CE, cUL CE, cUR
EMC	EN61800-3 C2 emissions with external filter (50 m motor cable limit)
Environmental limits	
Operating temperature	1.6 A unit 0-50°C (de-rating applies to 45 to 50°C max) 3 / 6 /9 A units 0-55°C no derating
Altitude	Rated 1000 m / 3300 ft De-rate 1.1% / 100 m (330 ft) > 1000 m (3300 ft)
Degree of Protection	IP20 cabinet installation
Safety	
Safe torque-off (STO) as standard	Two-channel STO to IEC 61800-5-2, SIL3 PLe
I/O	
4 x digital inputs	Opto-isolated 24 V 2 inputs can be programmed as fast position latch inputs 1 µs (feedback device dependent) or pulse direction inputs (max 2 MHz)
3 x digital outputs	Opto-isolated 24 V PNP. 50 mA per channel Configurable / programmable function
1 x ±10 V analog inputs 1 x ±10 V analog output	12 bit (16 bit with oversampling). Analog speed / torque control with emulated encoder output.
7 segment status display with sequenced error codes	For error and communications notification to quickly identify problems and minimize downtime
NET RUN & NET ERR LEDs	Indicate EtherCAT status of operation in accordance with EtherCAT Technology Group (ETG) guidelines

Technical specification	
Communications	
EtherCat (E2=IN E1=Out)	2 x RJ45 for daisy chain connection LED indication built into RJ45 sockets Drive profile: DS402/ IEC61800-7-1
Powerlink (E2=IN E1=Out)	2 x RJ45 for daisy chain connection LED indication built into RJ45 sockets Drive profile: DS402/ IEC61800-7-1
PROFINET IO	Communication with PLCs / Industrial PCs Drive operation can be customized with a MINT program
EtherNet/IP (E3 port only)	Note: CIP™ sync not supported Drive operation can be customized with a MINT program
Modbus TCP (E3 port only)	Communication with PLCs / Industrial PCs / IO / HMIs. Drive operation can be customized with a MINT program
E3 Ethernet configuration port	MINT PC support tools for host PC interfacing in Visual Basic, Visual C, LabView
Motor feedback	
Universal digital feedback	Incremental encoder + Halls, SSI (Synchronous Serial Interface), BiSS B, EnDat 2.1/2.2, 1 V pk-pk Sin/Cos, SmartAbs, SmartInc, Hiperface (8 V)
Dual encoder input	For line shaft following or dual loop control (position / velocity and commutation) to eliminate mechanical errors
Ethernet and motor encoder feedback interfaces	Highly integrated with minimal latency, optimized for demanding motion applications
Resolver	Support by option OPT-MF-201 adapter

Technical specifications

MicroFlex e190 accessories

Description	Catalog number
Memory unit standard network CN operation. For replacement only, supplied with each drive as standard.	MFE190-MU-OCU
Motion programming license (replaces the standard memory unit supplied with the drive)	MFE190-MU-OCU+N8020
Resolver adapter - in-line adapter in the D-shell housing	OPT-MF-201
Encoder splitter - connection break-out for dual encoder wiring	OPT-MF-200
Mint WorkBench - programming and commissioning	Download from - abb.com/motion

Regen resistors

Description	Catalog number
100 W regen resistor 39 Ohms	RGJ139
100 W regen resistor 60 Ohms	RGJ160
200 W regen resistor 60 Ohms	RGJ260
300 W regen resistor 60 Ohms	RGJ360

EMC filters

	Rated Amps	Leakage current (mA) @ 40°C	Weight kg (lbs)	Compatible with MFE190-04UN-				Description	Catalog number
				01A6-2	03A0-2	06A0-2	09A0-2		
230 VAC 1 phase	20	12	0.72 (1.59)	•	•	•	•	Foot-mount filter with pre-drilled drive mounting holes and shielded AC input cable, suitable for all ratings. Saves space and install time	OFI-01
	8	0.7	0.33 (0.73)	•	•			Compact filter with low leakage current	OFI-02
230 VAC 3 phase	7	33	0.5 (1.1)	•	•			Compact filter	OFI-03
	16	33	0.8 (1.76)			•	•	Compact filter	JFI-02

All filters meet EN 61800-3, category C2 with motor cables <50m

Ethernet communication cables

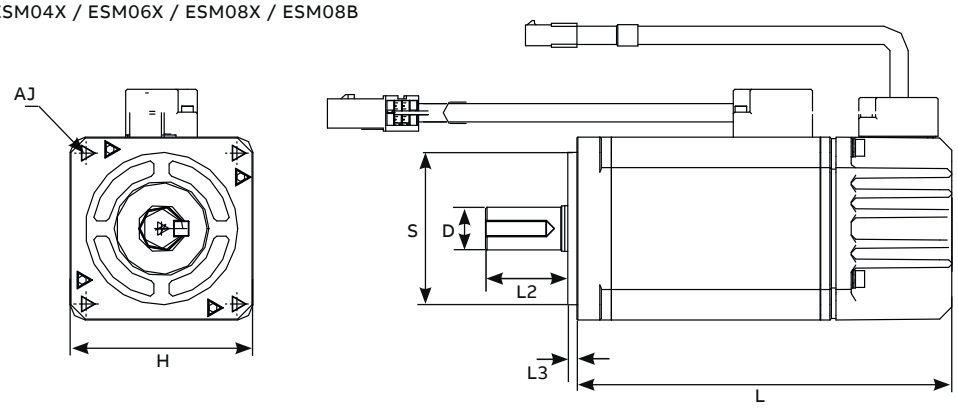
Description	Catalog number
Ethernet cable: shielded cat5e RJ45 0.2 m/0.7 ft.	CBL002CM-EXS
Ethernet cable: shielded cat5e RJ45 0.5 m/1.6 ft.	CBL005CM-EXS
Ethernet cable: shielded cat5e RJ45 1.0 m/3.2 ft.	CBL010CM-EXS
Ethernet cable: shielded cat5e RJ45 2.0 m/6.5 ft.	CBL020CM-EXS
Ethernet cable: shielded cat5e RJ45 5.0 m/16.3 ft.	CBL050CM-EXS
Ethernet cable: shielded cat5e RJ45 10.0 m/32.6 ft.	CBL100CM-EXS

A large selection of resolver and encoder motor feedback cables are also available

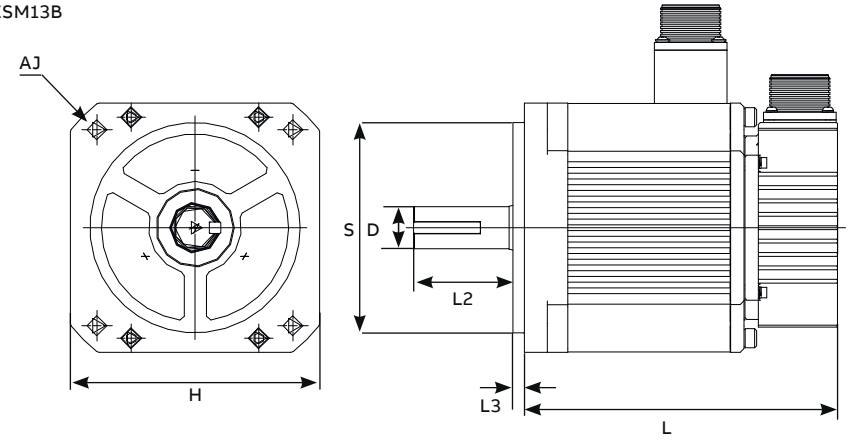
Technical specifications

e-Series motor drawings

ESM04X / ESM06X / ESM08X / ESM08B



ESM13B



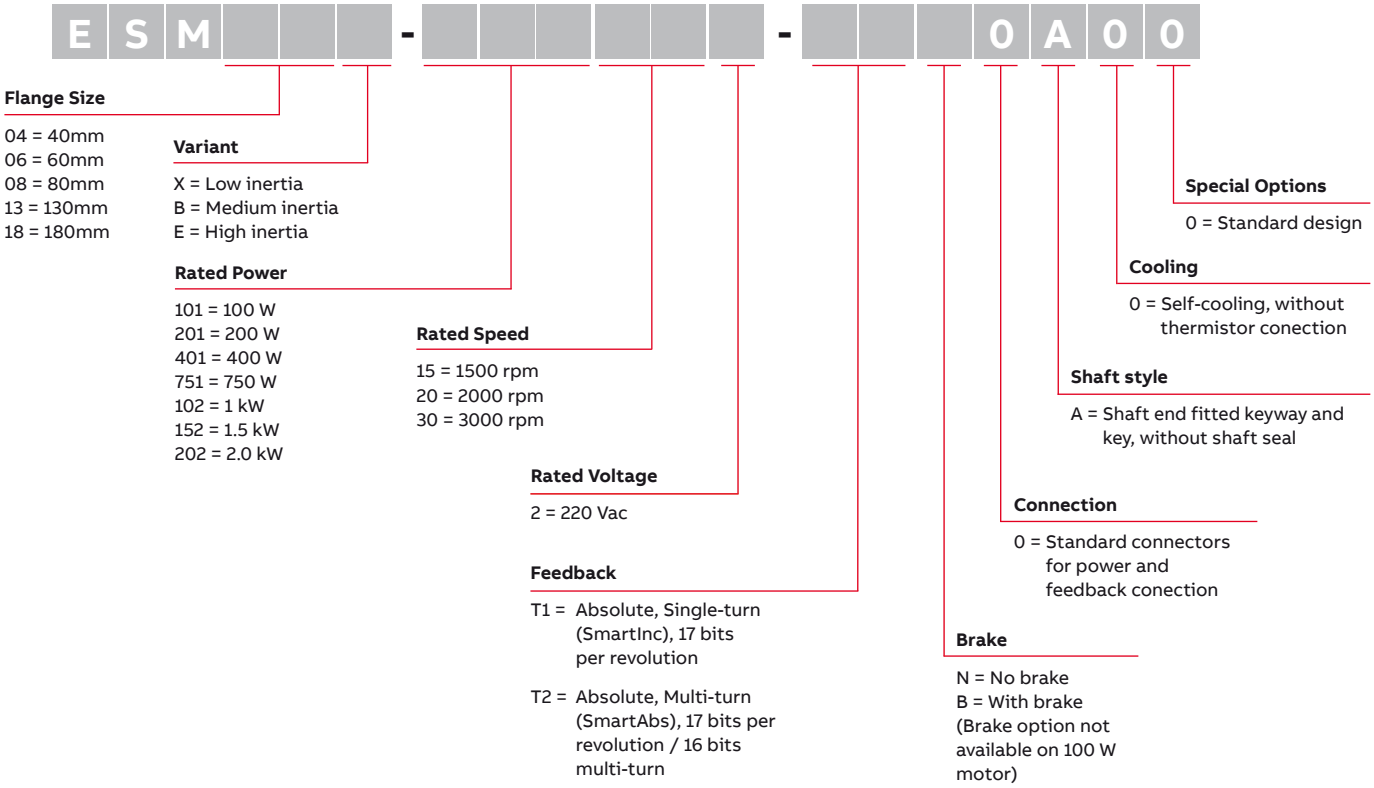
e-Series motor dimensions

Catalog number	Motor length (L) mm		Shaft		Frame	Spigot		Mounting holes	
	W/O brake	W/brake	Length (L2) mm	Diameter (D) mm	Width (H) mm	Depth (L3) mm	Diameter (S) mm	Diameter (AJ) mm	PCD mm
ESM04X-101-302-xxx0A00	98.5	NA	25	8	40	2.5	30	4.5	46
ESM06X-201-302-xxx0A00	101	139.5	30	14	60	3	50	5.5	70
ESM06X-401-302-xxx0A00	123	161.5	30	14	60	3	50	5.5	70
ESM08X-751-302-xxx0A00	122.2	160.5	40	19	80	3	70	6.5	90
ESM08B-751-302-xxx0A00	147.5	182.7	35	16	86	3	80.4	6.5	100
ESM13B-102-202-xxx0A00	163.8	218.3	58	22	130.4	6	110	9	145
ESM13B-152-302-xxx0A00	164.8	219.3	58	22	130.4	6	110	9	145
ESM13B-202-202-xxx0A00	213.8	268.3	58	22	130.4	6	110	9	145

Technical specifications

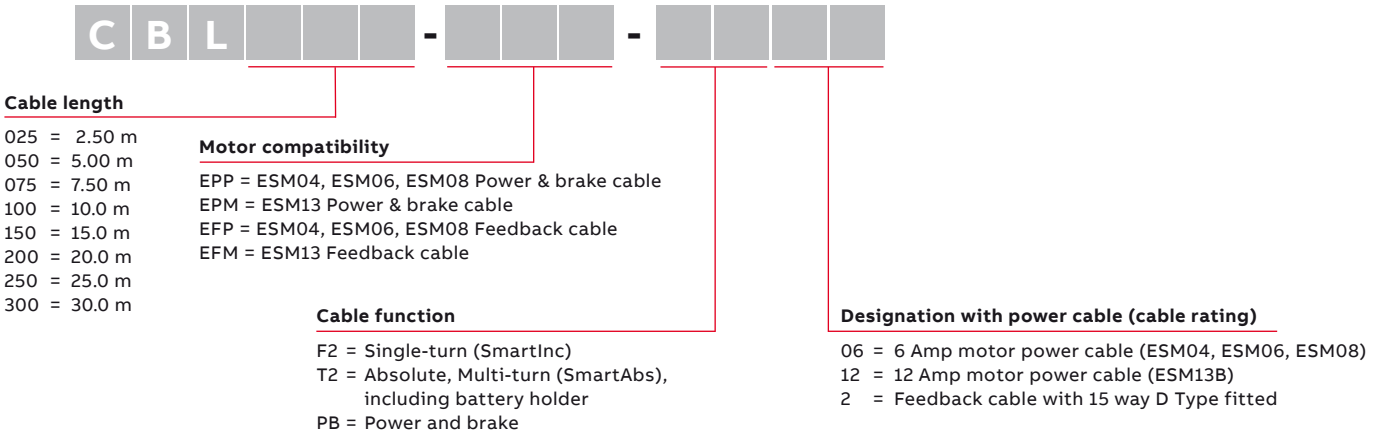
e-Series ordering information

Select the motor from the table on page 20 and complete the motor part number by selecting from the optional motor brake and feedback types of single and multi-turn absolute shown in the part code structure below:



e-Series cable ordering information

Motor power and feedback cables are available in lengths from 2.5 m to 30 m to complete the drive and motor package and can be configured from the part code structure below:



The standard motor power and feedback cables for ESM04, ESM06 and ESM08 motors comply with EN55011 Class A Group 1 (Industrial) standard. To enable compliance with EN55011 Class B Group 1 (Domestic) EMC standards the plastic connectors should be replaced by metallic circular connectors, or housed in a suitable metal junction box providing complete screening with suitable screen terminations in both the plug and socket of an inline connector.

Additional information
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB AG does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

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