



Screwdriving technology

Automation

Air motors

Air tools

DEPRAG

Screwdriver Spindles electric

NANOMAT-EC torque ranges between 0.02 - 0.12 Nm

MICROMAT-EC torque ranges between 0.03 - 0.8 Nm

MINIMAT-EC torque ranges between 0.24 - 18 Nm

Screwdriver Spindles

The flexible EC screwdriver for the highest standards

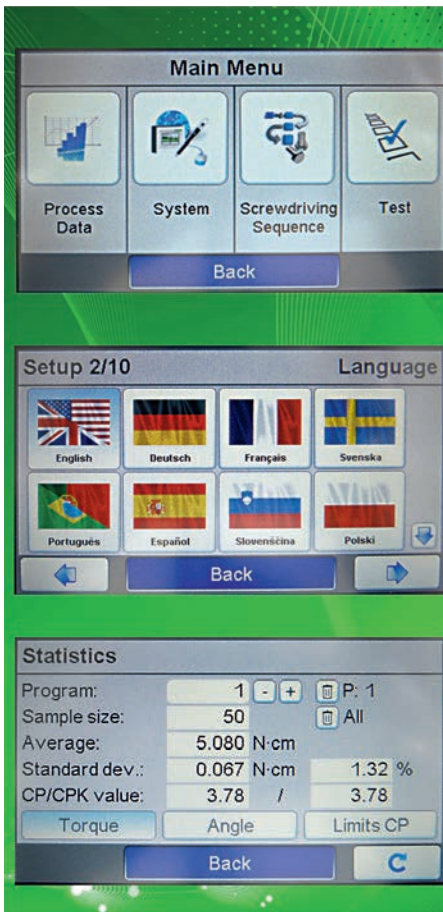
- flexible
- documentation features
- high precision

The EC screwdriver spindle with brushless drive technology combined with the AST6 or AST11 screwdriver controller offers maximum flexibility and process control.

The integrated torque and angle measurement system enables precise control of the

screw assembly process and guarantees the highest accuracy and reliable documentation of important process parameters.

Through the combination of different screwdriving strategies with flexible tightening parameters, multi step screw run-down sequences can be realised in one assembly cycle.



Screwdriving System consisting of the components:

- EC Screwdriver Spindle
- Sequence Controller
- Motor cable
- Power supply cable

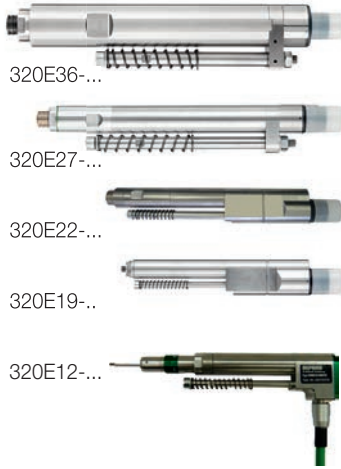
Controller AST6

Controller AST11



ADVANTAGES

DEPRAG EC SCREWDRIVER - the flexible EC screwdriver for the highest demands



The DEPRAG EC screwdrivers allow free programming of the screw tightening process. Within the power range of the selected tool, the torque value, speed, stand-by and direction of rotation can be adjusted individually to the assembly requirement.

Outstanding features of stationary EC screwdrivers are their high torque precision and the large range of control functions – perfect conditions for process security and control on highest level.

The brushless electric motors provide low maintenance operation. They are ideally suited for the tightening of screws due to their outstanding dynamics and an achievement of high peak torque values.

The integrated torque control - based upon precise measurement of the motor current along with the evaluation of other dynamic factors - as well as angle measurement, allows precise control of multistage screw-driving processes and documentation of the resulting values.

The DEPRAG screwdrivers based on EC technology enable a torque accuracy of < 2% standard deviation, which can be relied upon after millions of cycles.

Thus, a Cmk value of ≥ 1.67 with a tolerance requirement of $\pm 10\%$ in reference to 6 Sigma is reached.

A Cmk value of 1.67 means that the error rate is less than 0.6 per one million screw assemblies.

DEPRAG SEQUENCE CONTROLLER AST6 – compact size for torque ranges up to 2 Nm



AST6-1

- highest precision for lowest torque ranges
- small size for confined spaces
- colour touch screen with 4.3" TFT display
- torque control/angle monitoring
- angle control/torque monitoring
- tightening procedure using friction values
- 100 user-tagable sequence programs
- for stationary applications
- available communication ports: field bus, input/output



ASTi6-1 for the installation into a switch cabinet

The DEPRAG sequence controller AST6 is the ideal controller for stationary screw assemblies in combination with the tried and tested DEPRAG EC screwdrivers of the NANOMAT-EC, MICROMAT-EC and MINIMAT-EC (size 22) series within a torque range of 0.02 Nm – 0.2 Nm. When choosing the option ASTi6-1 for integration into the switch cabinet, the software panel DAST (→D3350E) can be used for operation and visualisation of the controller. In that case the system controller additionally provides the range of functions available on the AST6-1 display.

Operator friendly: The sequence controller already includes standard screwdriving programs for tightening to torque and loosening to angle. Parameters can be directly altered to suit screwdriving tasks using the touch screen. The AST6 allows free programming of your screwdriving sequences. When needed these can be made available from the integrated web server user interface, and efficiently and comfortably created and parameterized.

High number of programs: Use the colour TFT touch screen for fast access to the 100 programmable standard programs. Individual application profiles are free selectable using the program number or a user defined program name (tag).

Based on web browser: Use an established web browser or the touch screen to set parameters and access controller functions. Additional software is not required.

Small size: Due to its small size the controller is particularly suitable for stationary applications where there are confined spaces.

Storage, documentation and evaluation: The AST6 records the screwdriving results for the last 7 production days. Additional features include the graphic display of screwdriving graphs, integrated PLC functions, comprehensive analysis options and the option of combination with an automatic screw feeding machine.

A software update service is optionally available. Also available are comprehensive software packages for screw joint analysis, documentation and process data collection.

ADVANTAGES

Examples of the functions display on the AST6



Main menu



Graphic display of screwdriving graphs



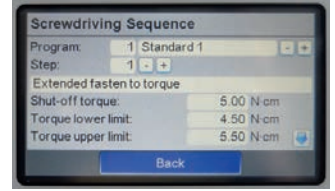
Statistics display



Language selection



Program selection



Program set-up

DEPRAG SEQUENCE CONTROLLER AST11 – flexible EC technology for the highest standards

- highest precision over the entire torque range
- torque control/angle monitoring
- angle control/torque monitoring
- friction-torque testing and friction-controlled fastening to torque
- 16 freely programmable sequence programs
- comprehensive analysis functions
- communication port: Ethernet - for parameterisation of the web server
- PLC: inputs/outputs
- integrated RS232 port with varied options:
 - 4 fieldbuses available: Profibus, Profinet, EtherCat, EthernetIP
 - direct connection of a barcode scanner
 - connection of a serial printer
- integrated functions for process control
- can be used in combination with DEPRAG feeders
- for manual and stationary applications



The DEPRAG controller AST11 is the ideal sequence controller for manual and stationary screw assemblies together with the tried and tested DEPRAG EC screwdrivers MICROMAT-EC and MINIMAT-EC.

Operator friendly: The sequence controller already includes standard screwdriving programs for tightening to torque and loosening to angle. Parameters can be directly altered to suit screwdriving tasks using the controller's keypad. The AST10 allows free programming of your screwdriving sequences for hand-held or stationary screwdriving tools. If required, further screwdriving programs can quickly and easily be set-up using the already existing basic program.

Freely programmable: Fast access to the 16 programmable screwdriving programs is enabled by the integrated display- and operating unit.

Based on web server: To set parameters and access additional control functions, simply use any common web browser or the integrated key pad. Additional software is not required.

Various communication options: Several communication options, especially for stationary use, via PLC and optionally RS232, Profinet, Profibus, EtherCat, Ethernet IP.

Saving, documentation and evaluation: The AST10 displays the screwdriving results of the last 7 production days. Additional software modules offer graphic display of screwdriving graphs, integrated PLC functions, comprehensive analysis options via a PC. Combination with an automated DEPRAG screw feeder is also possible. A software update service is optionally available.

SYSTEM COMPONENTS

NANOMAT-EC Screwdriver spindle, Straight handle design, size 12

Screwdriver	Type	320E12-0012
	Part no.	420400 B
Torque min.	Nm / in.lbs	0.02 / 0.18
Torque max. *)	Nm / in.lbs	0.12 / 1.06
Speed min.	rpm	120
Speed max. *)	rpm	1500
Diameter	mm / in.	17.5 / 0.68
Length	mm / in.	150 / 5.85
Weight	kg / lbs	0.2 / 0.44
Noise level	dB (A)	56
Line voltage (DC)	V	24
Internal hex. drive DIN ISO 1173		B3 (3 mm)
Suitable inserting tools and connection parts with inserting end DIN ISO 1173		A3 (3 mm)

*) as per VDI/VDE 2647 Directive

The motor cable, 2.5 meters long, is solidly connected to the screwdriver

MICROMAT-EC Screwdriver spindle, Straight handle design, size 19

Screwdriver	Type	320E19-0002	320E19-0005	320E19-0008
	Part no.	405024 A	405024 C	405024 B
Torque min.	Nm / in.lbs	0.03 / 0.27	0.08 / 0.7	0.15 / 1.3
Torque max. *)	Nm / in.lbs	0.2 / 1.8	0.5 / 4.4	0.8 / 7.1
Speed min.	rpm	150	120	100
Speed max. *)	rpm	1500	1200	1000
Diameter	mm / in.	19 / ¾	19 / ¾	19 / ¾
Length	mm / in.	190 / 7 ³¹ / ₆₄	190 / 7 ³¹ / ₆₄	190 / 7 ³¹ / ₆₄
Weight	kg / lbs	0.25 / 0.55	0.25 / 0.55	0.27 / 0.59
Noise level	dB (A)	60	60	60
Line voltage (DC)	V	48	48	48
Internal hex. drive DIN ISO 1173		B3 (3 mm)	B3 (3 mm)	B3 (3mm)
Suitable inserting tools and connection parts with inserting end DIN ISO 1173		A3 (3 mm)	A3 (3 mm)	A3 (3mm)

*) as per VDI/VDE 2647 Directive

SYSTEM COMPONENTS

MINIMAT-EC Screwdriver spindle, Straight handle design, size 22

Screwdriver	Type	320E22-00120	320E22-00200
	Part no.	420988 D	420988 E
Torque min.	Nm / in.lbs	0.24 / 7.67	0.4 / 3.54
Torque max. *)	Nm / in.lbs	1.2 / 10.62	2.0 / 17.7
Speed min.	rpm	50	30
Speed max. *)	rpm	900	550
Diameter	mm / in.	22 / 7/8	22 / 7/8
Length	mm / in.	202 / 7 ⁶¹ /64	202 / 7 ⁶¹ /64
Weight	kg / lbs	0.55 / 1.21	0.55 / 1.21
Noise level	dB (A)	60	60
Line voltage (DC)	V	24	24
Internal hex. drive DIN ISO 1173		F6.3 (1/4")	F6.3 (1/4")
Suitable inserting tools and connection parts with inserting end DIN ISO 1173		E6.3 (1/4")	E6.3 (1/4")

*) as per VDI/VDE 2647 Directive

MINIMAT-EC Screwdriver spindle, Straight handle design, size 27

Screwdriver	Type	320E27-0010-D	320E27-0018-D	320E27-0024-D	320E27-0042-D
	Part no.	416500 B	416500 H	416500 C	416500 D
Torque min.	Nm / in.lbs	0.15 / 1.3	0.4 / 3.5	0.4 / 3.5	0.7 / 6.2
Torque max. *)	Nm / in.lbs	1.0 / 8.85	1.8 / 15.9	2.4 / 21.2	4.2 / 37.2
Speed min.	rpm	50	100	50	40
Speed max. *)	rpm	1000	1000	700	400
Diameter	mm / in.	27 / 1 ¹ /16	27 / 1 ¹ /16	27 / 1 ¹ /16	27 / 1 ¹ /16
Length	mm / in.	254 / 9.9	251 / 9.8	251 / 9.8	263 / 10.3
Weight	kg / lbs	0.75 / 1.65	0.75 / 1.65	0.75 / 1.65	0.75 / 1.65
Noise level	dB (A)	60	60	60	60
Line voltage (DC)	V	48	48	48	48
Internal hex. drive DIN ISO 1173		B3 (3 mm)	F6.3 (1/4")	F6.3 (1/4")	F6.3 (1/4")
Suitable inserting tools and connection parts with inserting end DIN ISO 1173		A3 (3 mm)	E6.3 (1/4")	E6.3 (1/4")	E6.3 (1/4")

*) as per VDI/VDE 2647 Directive

Straight handle design, size 36

Screwdriver	Type	320E36-0040-D	320E36-0060-D	320E36-0090-D	320E36-0120-D	320E36-0180-D
	Part no.	416600 E	416600 A	416600 F	416600 B	416600 C
Torque min.	Nm / in.lbs	0.5 / 7.1	1 / 8.85	2 / 17.7	2 / 17.7	3 / 26.6
Torque max. *)	Nm / in.lbs	4 / 35.4	6 / 53.1	9 / 79.7	12 / 106.2	18 / 159.3
Speed min.	rpm	100	70	50	35	25
Speed max. *)	rpm	1000	740	550	380	280
Diameter	mm / in.	36 / 1 ²⁷ /64	36 / 1 ²⁷ /64	36 / 1 ²⁷ /64	36 / 1 ²⁷ /64	36 / 1 ²⁷ /64
Length	mm / in.	298 / 11.6	298 / 11.6	298 / 11.6	298 / 11.6	298 / 11.6
Weight	kg / lbs	1.2 / 2.64	1.2 / 2.64	1.2 / 2.64	1.2 / 2.64	1.2 / 2.64
Noise level	dB (A)	60	60	60	60	60
Line voltage (DC)	V	48	48	48	48	48
Internal hex. drive DIN ISO 1173		F6.3 (1/4")	F6.3 (1/4")	F6.3 (1/4")	F6.3 (1/4")	F6.3 (1/4")
Suitable inserting tools and connection parts with inserting end DIN ISO 1173		E6.3 (1/4")	E6.3 (1/4")	E6.3 (1/4")	E6.3 (1/4")	E6.3 (1/4")

*) as per VDI/VDE 2647 Directive

SYSTEM COMPONENTS

MOTOR CABLE

Motor cable for screwdrivers, size 19, 22, 27 and 36		straight connection	with 90° angle connection
Length 2.5 m / 8.2 ft. (standard)	Part no.	385442 A	385442 E
Length 5 m / 16.4 ft.	Part no.	385442 B	385442 F
Length 8 m / 26.2 ft.	Part no.	385442 C	385442 G
Length 12 m / 39.4 ft.	Part no.	385442 D	385442 H

SEQUENCE CONTROLLER AST6

for screwdriver	NANOMAT-EC MICROMAT-EC MINIMAT-EC		320E12-.. (page 4) 320E19-.. (page 4) 320E22-.. (page 5)
Sequence controller with integrated performance electronics	Type Part no.	AST6-1 428001 A	ASTi6-1 428004 A
Power supply (DC)	V		24
Power consumption	VA		150
Display		TFT colour display 4.3"	without display
24V input/output interface			14 inputs / 8 outputs
Ethernet			yes
Number of connectable screwdriver			1
Dimensions (W x H x D)	mm in.		162 x 143 x 65 6 ³ / ₈ x 5 ⁵ / ₈ x 2 ⁹ / ₁₆
Weight	kg / lbs		1.5 / 3.3
Power supply unit	Part no.	2041061 (included in delivery)	optional accessories

Required Accessories

Power supply cable 230 V Length 1.8 m / 5.9 ft.	Part no.	812587	-
Power supply cable 115 V Length 1.8 m / 5.9 ft.	Part no.	812295	-

SEQUENCE CONTROLLER AST11

for screwdriver	MICROMAT-EC MINIMAT-EC	320E19-.. (page 4) 320E22-.. and 320E27-.. (page 5)	320E36-..(page 5)		
Sequence controller	Type Part no.	AST11-1 390041 A	AST11-1-S 390041 B	AST11-2 390042 A	AST11-2-S 390042 B
Module „safety stop“		no	yes	no	yes
Power unit (AC)	V / Hz	100 - 240 / 50 / 60		100 - 240 / 50 / 60	
Power consumption	VA	350		600	
Insulation		IP 54		IP 54	
LC-display		4 x 20		4 x 20	
24V input/output interface		12 inputs / 8 outputs		12 inputs / 8 outputs	
Membrane keyboard		yes		yes	
RS 232 Interface		yes		yes	
Ethernet		yes		yes	
Amount of connectable screwdrivers		1		1	
Dimensions (W x H x D)	mm / in.	160 x 295 x 200 / 6 ¹⁹ / ₆₄ x 11 ³⁹ / ₆₄ x 7 ⁷ / ₈		160 x 295 x 200 / 6 ¹⁹ / ₆₄ x 11 ³⁹ / ₆₄ x 7 ⁷ / ₈	
Weight	kg / lbs	5.8 / 12.76		6 / 13.2	

Required Accessories

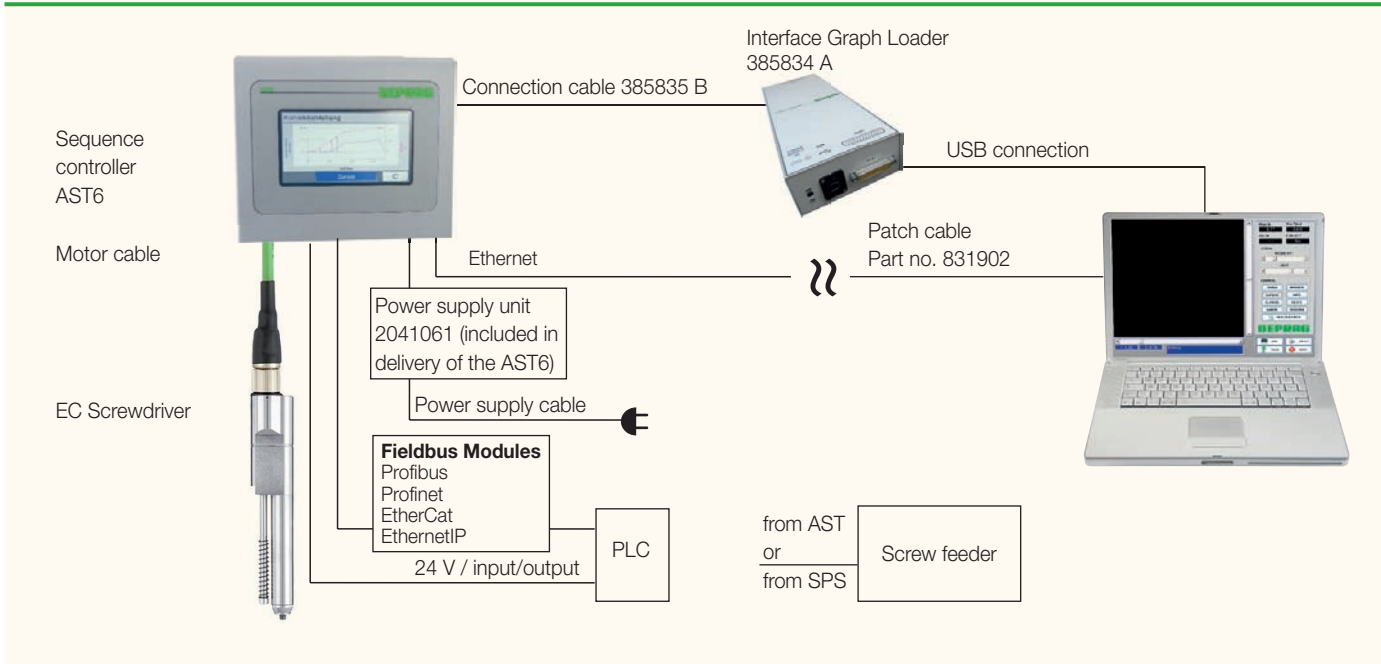
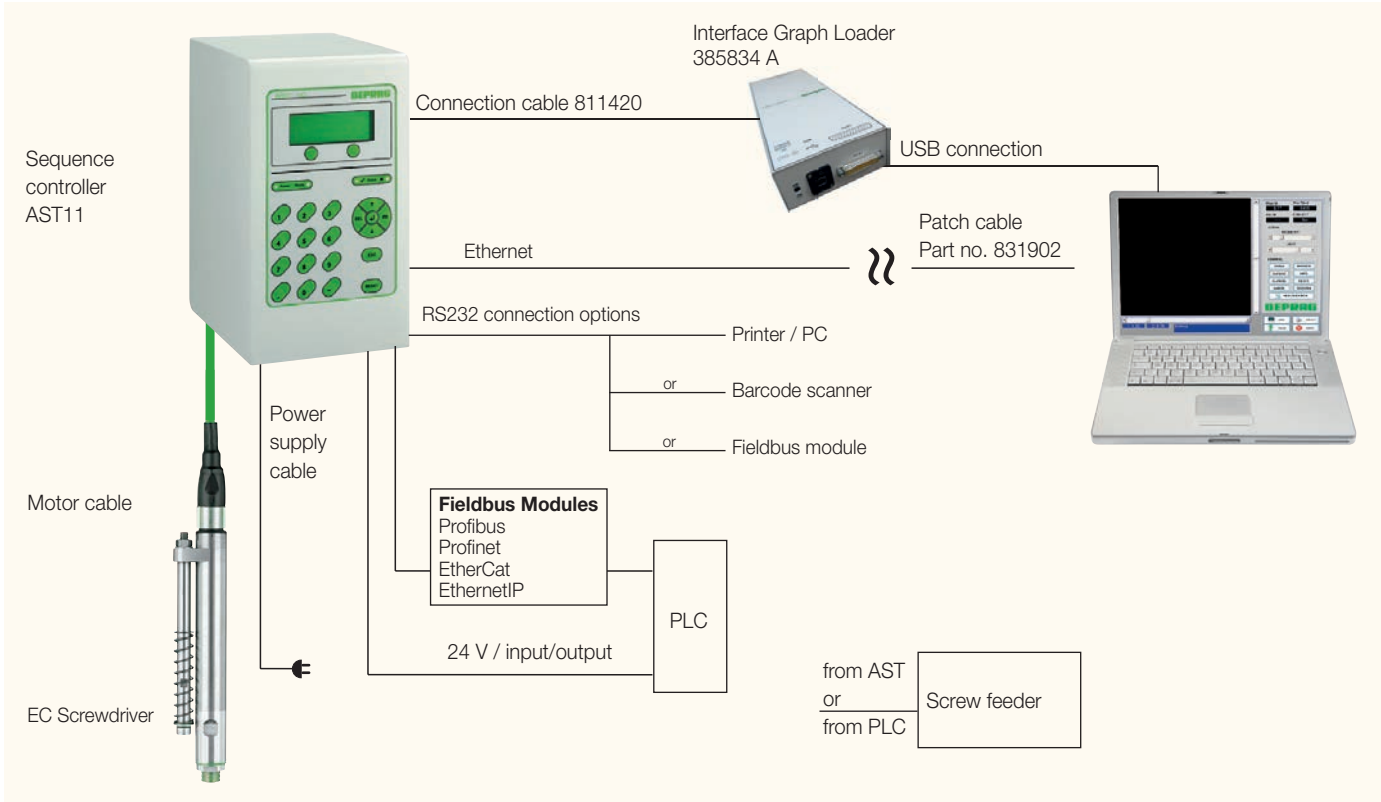
Power supply cable Length 1.8 m/5.9 ft. (EU)	Part no.	385443 A
Power supply cable Length 1.8 m/5.9 ft. (USA)	Part no.	385443 B
Power supply cable Length 2.5 m/8.2 ft. (China)	Part no.	385443 C

SYSTEM COMPONENTS

Optional Accessories

for sequence controller		AST6-1	ASTi6-1	AST10
Patch cable (2m) (connection ASTx -PC)	Part no.	831902 (included in delivery)		831902
Plug RJ45-IP54	Part no.	-		385453 A
Part sensor capacitive M18	Part no.	-		354841 C
Base	Part no.	416004 A		405278 A
Cable socket (slide connector voltage supply)	Part no.	-	810122 (included in delivery)	-
ASTi6-1 reset plug	Part no.	-	428005 A (included in delivery)	-
Power supply unit + power supply cable 230 V	Part no.	-	2041061 + 812587	-
Power supply unit + power supply cable 115 V	Part no.	-	2041061 + 812295	-
Touch pen	Part no.	832190		-
Slide connector 26pol. for input/output interface	Part no.	832625		-
Printer Type ND 100	Part no.	-		823476
Field bus module Profibus	Part no.	385816 A		428010 A
Field bus module Profinet	Part no.	385816 B		428010 B
Field bus module EtherCat	Part no.	385816 C		428010 C
Field bus module Ethernet IP	Part no.	385816 D		428010 D
Required accessories:				207725 A (EU)
Connection cable AST11 to field bus module	Part no.	-		207725 B (US)
Motor cable extension for MICROMAT-EC (size 19)				
Length 2.5 m / 8.2 ft.	Part no.	385478 A		385478 A
Length 5.5 m / 18.0 ft.	Part no.	385478 B		385478 B
Length 9.5 m / 31.2 ft.	Part no.	385478 C		385478 C
Software Graph 10E (release code)	Part no.	202698		202698
Software Statistics (release code)	Part no.	206081		206081
Software Datalogger (release code)	Part no.	202699		202699
The software „Datalogger“ offers the possibility to record and archive the final-values of up to 10 sequence controllers. This storage format corresponds with the required format of the software „Statistics“, so that the data sets can be analyzed with the software „Statistics“. It can be selected whether the data is collected automatically while the program is running, or whether the data reading should be triggered manually. The connection to the controllers is done by Ethernet and TCP/IP. The software is available in several different languages.				
Software Friction value screwdriving (release code)	Part no.	201820		201820
With the friction-value process, it is possible to measure and compensate varying friction-values (e.g. on self-forming screw-joints). Additionally, this procedure can be used for verification purposes..				
Software ASTxx Serial Remote (release code) for the simple storage of screwdriving curves and result data to a PC	Part no.	206565		206565
The program ASTxx Serial Remote is started on a PC and is controlled by commands over a serial interface (COM-Port). With this program, screwdriving curves and result-data can be transferred fast and simply onto a PC. The PLC controls when and which data should be stored. The storage place (also the directory) on the PC is determined by the PLC as well. The directory is setup automatically on the PC.				
Interface Graph Loader (Hardware and Software)	Part no.	385834 A		385834 A
Connection cable (ASTxx - Graph Loader)	Part no.	385835 B		811420
The storage of screwdriving graphs and end value data sets (e.g. torque, angle etc.) for manual work stations and screwdriving stations can be carried out automatically using the Interface Graph-Loader. The corresponding software enables immediate display on the computer screen of the current screwdriving graph, the screw assembly can be evaluated straight after completion and *.csv and *.bin files can be saved in individual directories.				

EXAMPLE



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