

MINIMAT-EC-Servo Screwdriver Spindles

Maximum Flexibility and Process Control

Straight Spindle Form - Torque range from 0.2 Nm - 500 Nm

- powerful
- flexible
- high precision
- full documentation capability

MINIMAT-EC-Servo screwdriver spindles in connection with the sequence controller AST40 allow free programming of the screw tightening process and offer maximum flexibility, accuracy and process control. Torque, speed, angle, drive direction and sequence delay times can be customized to the individual screwdriving task within the power range of the selected screwdriver spindle.

The integrated torque and angle sensor module employs non contact signal transmission techniques and enables precise control of the screwdriving process as well as the documentation of the screwdriving results and process parameters and also guarantees the highest shut-off accuracy.

The EC-Servo screwdriver is suitable for applications with the most demanding quality requirements – where direct measurement and control methods are required.



ADVANTAGES

- **High power density**
- **High shut-off accuracy**
- **Flexible**
- **Noise immunity**
- **Comprehensive documentation options**
- **System diagnostics**
- **Extensive integration and control options**

The application of a brushless servomotor with high power density is essential to the maintenance free operation of the EC drive. It also delivers excellent dynamics and high peak torque in a compact form – ideally suited to the screw tightening process.

The DEPRAG screwdrivers based on EC technology enable a torque accuracy of < 1% standard deviation, which can be relied upon after millions of cycles.

Thus, a Cmk value of ≥ 1.67 with a tolerance requirement of $\pm 5\%$ 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.

The screwdriving system consists of the EC screwdriver spindle, AST40 screwdriver sequence controller and a single connection cable that has been tested for extreme loading conditions. The single connection cable services the power and signal transmission functions between the screwdriver and controller using digital technology as most suitable for longer cable lengths.

Extensive programming, control and documentation interfaces offer maximum flexibility for integration into existing process environments. Several communication options include input/output, various field bus interface options, a 7" touch panel and an integrated web server for online screwdriver program configuration, data backup and screwdriver graph analysis via Ethernet. All common screw assembly sequence programs are embedded in the AST40 screwdriver controller in the form of commands with parameters. Commissioning of an application can be completed in just a few steps. All required programming and setup functions are made available through the web interface so that no additional software is required, only a PC with a browser.

SYSTEM OVERVIEW



MINIMAT-EC-Servo, straight spindle form		size 27 with quick change chuck			
Screwdriver	Type	311E27-0010	311E27-0020	311E27-0050	311E27-0120
	Part no.	413400A	413400B	413400C	413400E
Torque min.	Nm / in.lbs	0.2 / 1.77	0.4 / 3.54	1 / 8.85	2.4 / 21.24
Torque max.	Nm / in.lbs	1 / 8.85	2 / 17.7	5 / 44.25	12 / 106.2
Speed min.	rpm	100	60	40	20
Speed max.	rpm	1600	1500	800	400
Diameter	mm / in.	27 / 1.05	27 / 1.05	27 / 1.05	27 / 1.05
Length	mm / in.	360 / 14.05	360 / 14.05	360 / 14.05	360 / 14.05
Weight	kg / lbs	1.2 / 2.64	1.2 / 2.64	1.2 / 2.64	1.2 / 2.64
Noise level	dB(A)	68	68	68	68
Internal hex. drive DIN ISO 1173		F6.3	F6.3	F6.3	F6.3
Suitable tool inserts and connecting components with a drive as per DIN ISO 1173		E6.3	E6.3	E6.3	E6.3

MINIMAT-EC-Servo, straight spindle form		size 36 with quick change chuck		
Screwdriver	Type	311E36-0150	311E36-0300	311E36-0500
with quick change chuck	Part no.	205000A	205000C	205000D
Torque min.	Nm / in.lbs	3 / 26.55	6 / 53.1	10 / 88.5
Torque max.	Nm / in.lbs	15 / 132.75 *)	30 / 265.5 *)	50 / 442.5 *)
Speed min.	rpm	50	30	20
Speed max.	rpm	1000	600	380
Diameter	mm / in.	36 / 1.4	36 / 1.4	36 / 1.4
Length	mm / in.	476 / 18.56	476 / 18.56	476 / 18.56
Weight	kg / lbs	2.8 / 6.2	2.8 / 6.2	2.8 / 6.2
Noise level	dB(A)	62	62	62
Internal hex. drive DIN ISO 1173		F6.3	F11.2	F11.2
Suitable tool inserts and connecting components with a drive as per DIN ISO 1173		E6.3	E11.2	E11.2

MINIMAT-EC-Servo, straight spindle form		size 42 with quick change chuck		size 63		
Screwdriver	Type	311E42-0300	311E42-0800	311E63-1800	311E63-3500	311E63-5000
with quick change chuck	Part no.	206000B	206000D	416400D	416400F	416400H
Torque min.	Nm / in.lbs	6 / 53.1	16 / 141.6	36 / 318.6	70 / 619.5	100 / 885
Torque max.	Nm / in.lbs	30 / 265.5	80 / 708	180 / 1593	350 / 3097.5	500 / 4425
Speed min.	rpm	50	20	15	10	10
Speed max.	rpm	890	330	300	155	90
Diameter	mm / in.	42 / 1.64	42 / 1.64	63 / 2.46	63 / 2.46	63 / 2.46
Length	mm / in.	478 / 18.64	478 / 18.64	617 / 24.06	617 / 24.06	617 / 24.06
Weight	kg / lbs	4.2 / 9.24	4.2 / 9.24	12.9 / 28.38	12.9 / 28.38	12.9 / 28.38
Noise level	dB(A)	66	66	73	73	73
Internal hex. drive DIN ISO 1173		F11.2	F11.2	-	-	-
External square drive DIN 3121		-	-	F20 (3/4")	F20 (3/4")	F20 (3/4")
Suitable tool inserts and connecting components with a drive as per DIN ISO 1173		E11.2	E11.2	-	-	-
with a drive as per DIN 3121		-	-	H20 (3/4")	H20 (3/4")	H20 (3/4")

*) With a voltage below 180V the maximum torque will be reduced to 80% of the specified value.

Optional Accessories

Machine Capability Study Torque *)	Part no.	000717	- Evaluation of 50 measured values - Idle speed, Average - Standard deviation, Cm-Value, Cmk-Value
Machine Capability Study Torque angle *)	Part no.	000718	

*) Additional services, e.g. calibration of screwdrivers, can be found in our catalog D3330E.

Motor Cable

Length	Part no.
5 m/16.4 ft (standard)	8337252
8 m/26.2 ft	8337253
12 m/39.4 ft	8337254

▶ The screwdriver spindles size 27 and type 311E36-0150 (size 36) can also be delivered with an automatic screw feed system. Please contact us for more information!

SYSTEM COMPONENTS

Sequence Controller		AST40		ASTi40	
		for screwdriver 311E27/36/42	for screwdriver 311E63	for screwdriver 311E27/36/42	for screwdriver 311E63
Sequence controller Basic version with input/output interface	Type Part no.	AST40-1 385588A	AST40-2 387022A	ASTi40-1 428006A	ASTi40-2 387044A
Sequence controller with fieldbus module Profibus port	Type Part no.	AST40-1 PB 385588B	AST40-2 PB 387022B	ASTi40-1 PB 428006B	ASTi40-2 PB 387044B
Sequence controller with fieldbus module Profinet port	Type Part no.	AST40-1 PN 385588C	AST40-2 PN 387022C	ASTi40-1 PN 428006C	ASTi40-2 PN 387044C
Sequence controller with fieldbus module EtherCat port	Type Part no.	AST40-1 EC 385588D	AST40-2 EC 387022D	ASTi40-1 EC 428006D	ASTi40-2 EC 387044D
Sequence controller with fieldbus module Ethernet IP port	Type Part no.	AST40-1 E/IP 385588E	AST40-2 E/IP 387022E	ASTi40-1 E/IP 428006E	ASTi40-2 E/IP 387044E
Sequence controller with interface AST40 RS232 for data output, format programmable via web page	Type Part no.	AST40-1 RS232 385588F	AST40-2 RS232 387022F	ASTi40-1 RS232 428006F	ASTi40-2 RS232 387044F
Power unit (AC)	V / Hz	100 - 240 / 50/60		100 - 240 / 50/60	
Insulation		IP54		IP54	
TFT-display (touch)		7", 800x480		-	
24V input/output interface		27 inputs / 30 outputs		27 inputs / 30 outputs	
Dimensions (W x H x D)	mm / in.	232 x 315 x 205 / 9.05 x 12.3 x 8		232 x 315 x 205 / 9.05 x 12.3 x 8	
Weight	kg / lbs	approx. 13 / 28.6		approx. 13 / 28.6	
Number of screwdriving programs via 24V I/O interface		120		120	
Number of screwdriving programs via fieldbus		unlimited		unlimited	
Included in delivery					
ASTi40 reset plug	Part no.	-		425080A	
Patch cable (connection cable ASTi40-PC)	Part no.	-		831902	



AST40 with 7"
touch display



ASTi40 for installation
into a switch cabinet

Description:

The sequence controller AST40/ASTi40 is a controller with integrated power supply. Within the performance range of each spindle torque, speed, waiting period and rotational direction can be individually customized to the screw assembly task.

Extensive programming, control and documentation interfaces offer maximum flexibility for integration into existing process environments. Several communication options include input/output, various field bus interface options and an integrated web server for online screwdriver program configuration, data backup and screwdriver graph analysis via Ethernet.

All common screw assembly sequence programs are embedded in the AST40 screwdriver controller in the form of commands with parameters. Commissioning of an application can be completed in just a few steps. All required programming and setup functions are made available through the web interface so that no additional software is required, only a PC with a browser.

*) ASTi40 without touch display

SYSTEM COMPONENTS

Required Accessories

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

Optional Accessories

Interface Graph Loader (hardware and software)	Part no.	385834A
Connection cable (AST40 - Graph Loader)	Part no.	385835D

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



Interface Graph Loader

Software ASTxx Serial Remote (release code) for the simple storage of screwdriving curves and result-data to a PC	Part no.	206565
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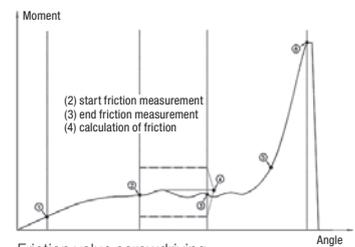
The program ASTxx Serial Remote is started on a PC and is controlled by commands over a serial interface (COM-Port). With this program, screwdriving curves and result-data can be transferred fast and simply onto a PC. The PLC controls when and which data should be stored. The storage place (also the directory) on the PC is determined by the PLC as well. The directory is setup automatically on the PC.



ASTxx Serial Remote

Software Friction value screwdriving (release code)	Part no.	201820
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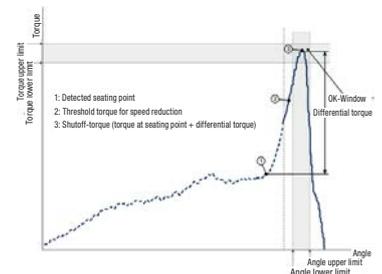
With the friction-value process, it is possible to measure and compensate varying friction-values (e.g. on self-forming screw-joints). Additionally, this procedure can be used for monitoring of predetermined friction values at verification processes.



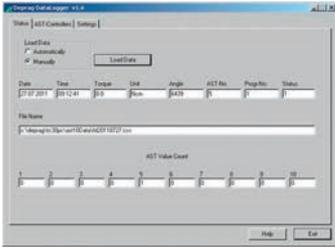
Software DEPRAG Clamp Force Control - DEPRAG CFC (release code)	Part no.	109108
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The screwdriving procedure **Clamp Force Control** enables reliable recognition of the seating of the screw. This, in combination with a subsequent screw assembly to differential torque or angle, facilitates a significantly improved constancy of the clamp force in comparison to torque controlled tightening procedures.

Typical areas of application are direct screw assemblies in plastics or metal.



DEPRAG Clamp Force Control
Screw assembly to differential torque
relating to head contact recognition



Datalogger



Statistics

Optional accessories

Software Datalogger (release code)	Part no.	202699
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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 Statistics (release code)	Part no.	206081
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The software „Statistics“ offers the possibility to produce statistical evaluations for the screwdriving results, that are made available by the software „Datalogger“. In order to be able to use the software „Statistics“, the software „Datalogger“ must be installed as well!

For sequence controller	Type	AST40	AST140
Software Graph10E (release code)	Part no.	–	202698
Software DAST100	Part no.	–	815641
Software DAST200	Part no.	–	815642

The software-panel for EC and EC Servo Systems. DAST is used to supervise the operation and visualisation of the screwdriver sequence controller (AST series) through the system control.

Table stand	Part no.	300085A	–
Patch cable 2 m	Part no.	301902	–
Touch pen	Part no.	832190	–

Handle with quick change chuck

For EC-Servo screwdriver spindles		311E27-xxxx	311E36-0150	311E36-0300 311E36-0500
Handle	Part no.	425800A	425900A	425900B
Internal hex. drive DIN ISO 1173		F6.3	F6.3	F11.2

Handle with vacuum connection

For EC-Servo screwdriver spindles		311E27-xxxx	311E36-0150	311E36-0300 311E36-0500
Handle	Part no.	425800E	425900F	425900G
Internal hex. drive DIN ISO 1173		F6.3	F6.3	F11.2

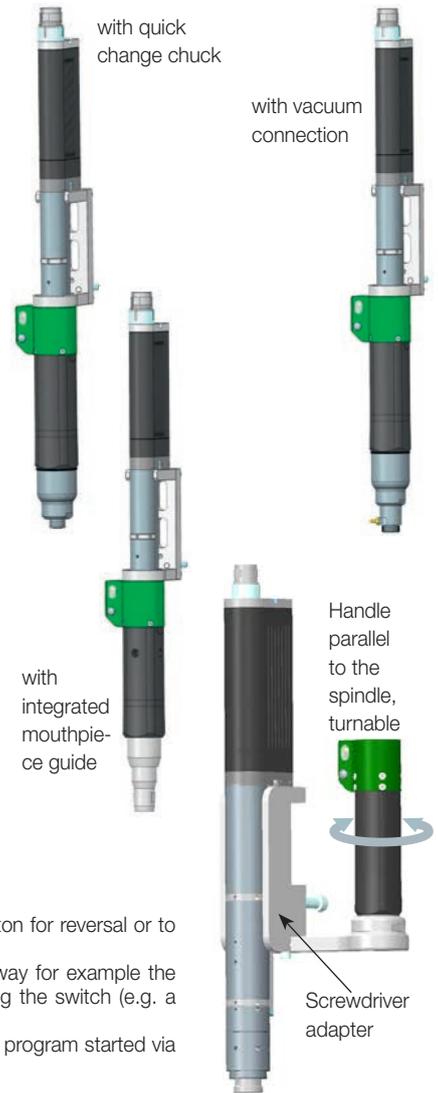
Handle with integrated mouthpiece guide for the use in connection with an automatic screw feeder

For EC-Servo screwdriver spindles		311E27-xxxx	311E36-0150
Handle, Length of stroke 80 mm	Part no.	4258001B	425900C
Handle, Length of stroke 100 mm	Part no.	4258001C	425900D
Handle, Length of stroke 120 mm	Part no.	4258001D	425900E

Handle at side of spindle

For EC-Servo screwdriver spindles		311E42-xxxx
Handle	Part no.	1029831A

All the handles have an LED status display (OK/NOT OK), an ergonomic start lever and an additional button for reversal or to start a screwdriving program. Operating elements can be adapted to a specific application by selecting the operating mode. In this way for example the tool can be pre-programmed so that a second screwdriving program can be started directly by pressing the switch (e.g. a loosening program). Alternatively the mode can be selected so that the button is used for the pre-selection of the screwdriving program started via lever.



Required Accessories

For EC-Servo screwdriver spindles		311E27-xxxx	311E36-xxxx	311E42-xxxx
Screwdriver adapter for the attachment to a linear stand (suitable for all handle variants)	Part no.	4008333C	4008333B	102982A
Connection cable to AST40	Part no.	385584A	385584A	385584A
Connection cable to PLC	Part no.	385584B	385584B	385584B

The suitable linear stands and balancers can be found in our brochure D3345E.



Optional Accessories

For EC-Servo screwdriver spindles		311E27-xxxx	311E36-xxxx
Turn fixture	Part no.	917333A	on request

The rotary unit is integrated between the screwdriver adaptor and handle and enables rotation of the handle. Ergonomic handling is therefore guaranteed even on larger work surfaces.

Please note: When using the rotary unit with the version of the handle with quick change chuck or vacuum connection the holder on the handle must be replaced by the holder part number 917695 which must be ordered separately.



Support ring	Part no.	398704A	398704A
The support ring can not be used in connection with handle with integrated mouthpiece guide.			
Support ring	Part no.	398704C	398704C
suitable for handle with integrated mouthpiece guide			



DEPRAG

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