

MINIMAT-EC-Servo Screwdriver Spindles

Maximum Flexibility and Process Control

Straight Spindle Form - Torque range from 0.2 N·m - 500 N·m

Angle Head Design - Torque range from 5 N·m - 70 N·m

- 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.

DEPRAG SCREWDRIVING CONTROLLER AST40/ASTi40

- Torque range: 0.2 - 500 N·m
- For MINIMAT-EC-SERVO screwdriver spindles
- Number of multi-level screw sequences: 120 (via input/output interface)
- Documentation options: internal storage, output via RS232 or Ethernet (Datalogger), printer interface
- PLC interface: input/output, Profibus, Profinet, EtherCAT, EthernetIP

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.

When choosing the option ASTi40 for integration into the switch cabinet, the software panel DAST is required for operation and visualisation of the controller. In that case the system controller additionally provides the range of functions available on the AST40 display.



AST40 with 7" touch display



ASTi40 for installation into a switch cabinet

EC-SERVO SCREWDRIVER SPINDLE

4 available sizes in straight spindle design



311E27-xx 311E36-xx 311E42-xx 311E63-xx

NEW

size 36 now available in angle head design



For assembly in confined spaces.

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
Screwdriver with redundant measuring system for torque and angle	Type	311ER27-0010	311ER27-0020	311ER27-0050	311ER27-0120
	Part no.	101624A	101624B	101624C	101624E
Torque min.	N·m/in.lbs	0.2 / 1.77	0.4 / 3.54	1 / 8.85	2.4 / 21.24
Torque max.	N·m/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 311E / 311ER	mm/in.	360/14.05 / 433/16.9	360/14.05 / 433/16.9	360/14.05 / 433/16.9	360/14.05 / 433/16.9
Weight 311E / 311ER	kg/lbs	1.2/2.64 / 1.4/3.1	1.2/2.64 / 1.4/3.1	1.2/2.64 / 1.4/3.1	1.2/2.64 / 1.4/3.1
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

		size 36 with quick change chuck		
Screwdriver	Type	311E36-0150	311E36-0300	311E36-0500
	Part no.	205000A	205000C	205000D
Screwdriver with redundant measuring system for torque and angle	Type	311ER36-0150	311ER36-0300	311ER36-0500
	Part no.	108717A	108717C	108717D
Screwdriver with integrated off-set gearing (to minimize the center distance)	Type	311E36-0160-SV1 **)	-	-
	Part no.	104472A	-	-
Torque min. 311E / 311ER 311E36-0160-SV1	N·m/in.lbs	3 / 26.55 3.2 / 28.32	6 / 53.1	10 / 88.5
Torque max. 311E / 311ER 311E36-0160-SV1	N·m/in.lbs	15 / 132.75 *) 16 / 141.6 *)	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 311E / 311ER 311E36-0160-SV1	mm/in.	473/18.45 / 575/22.42 487/ 19	476/18.56 / 578/22.54	476/18.56 / 578/22.54
Weight 311E / 311ER 311E36-0160-SV1	kg/lbs	2.8/6.2 / 3.2/7.04 3.6/7.92	2.8/6.2 / 3.2/7.04	2.8/6.2 / 3.2/7.04
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

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

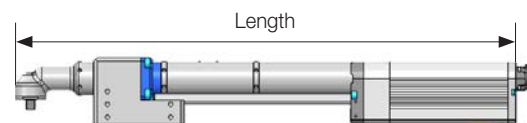
**) For assembly in confined spaces.

		size 42 with quick change chuck		size 63		
Screwdriver	Type	311E42-0300	311E42-0800	311E63-1800	311E63-3500	311E63-5000
	Part no.	206000B	206000D	416400D	416400F	416400H
Screwdriver with redundant measuring system for torque and angle	Type	311ER42-0300	311ER42-0800	311ER63-1800	311ER63-3500	311ER63-5000
	Part no.	101625B	101625D	107200D	107200F	107200H
Torque min.	N·m/in.lbs	6 / 53.1	16 / 141.6	36 / 318.6	70 / 619.5	100 / 885
Torque max.	N·m/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 311E / 311ER	mm/in.	478/18.64/81/22.66	478/18.64/81/22.66	617/24.06/745/29.1	617/24.06/745/29.1	617/24.06/745/29.1
Weight 311E / 311ER	kg/lbs	4.2/9.24 / 5/11	4.2/9.24 / 5/11	12.9/28.38 / 15/33	12.9/28.38 / 15/33	12.9/28.38 / 15/33
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 with a drive as per DIN 3121		E11.2	E11.2	-	-	-
		-	-	H20 (3/4")	H20 (3/4")	H20 (3/4")

SYSTEM COMPONENTS

MINIMAT-EC-Servo, angle head design

		size 36		
Screwdriver	Type Part no.	311EW36-0220-F10 108121A	311EW36-0420-F10 108121B	311EW36-0700-F12.5 108121C
Torque min.	N·m/in.lbs	5 / 44.25	9 / 79.65	14 / 123.9
Torque max.	N·m/in.lbs	22 / 194.7	42 / 371.7	70 / 619.5
Speed min.	rpm	35	20	10
Speed max.	rpm	650	350	200
Diameter	mm/in.	36 / 1.4	36 / 1.4	36 / 1.4
Length	mm/in.	554 / 21.6	554 / 21.6	557.5 / 21.74
Weight	kg/lbs	4.8 / 10.56	4.8 / 10.56	5.1 / 11.22
Noise level	dB(A)	68	62	62
External square drive	DIN 3121	F10	F10	F12.5
Suitable tool inserts and connecting components with a drive as per DIN 3121		G10	G10	G12.5



Optional Accessories

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

*) 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!

Sequence Controller		AST40		ASTi40	
for screwdriver		311E(R)27/36/42 311EW36	311E(R)63	311E(R)27/36/42 311EW36	311E(R)63
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

Sequence Controller		AST40	ASTi40
Technical data:			
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

Required Accessories for ASTi40

Control and Operating Unit	Type	DPU100	DPU200
DEPRAG Processing Unit	Part no.	8099722	8134992
Display		touch panel 6.5", colour	15" TFT display with touch screen, colour
Resolution		VGA (640 x 480 pixels)	VGA (1024 x 768 pixels)
Voltage		24V DC	24V DC
Current consumption	A	0.75	approx. 4.5
Power input	W	18	80 / 110 with USV
Additional functions	- Membrane keys - Emergency stop button	12 membrane keys with green and red LED yes	12 membrane keys with green and red LED yes
CPU		Intel Atom, 1.6 GHz	Intel Celeron 2000E 2.2 GHz
Port		1xEthernet, 1xEtherCat, 2xUSB 2.0	1xEthernet, 1xEtherCat, 2xUSB 2.0 Front, 1xUSB 2.0 in rear plate
Working storage		1 GB DDR2 RAM	2GB DDR3L-RAM
Mass storage		1GB Compact Flash	Hard disk, 2.5 Zoll 320 GB
Operating system		Windows CE	Windows 7 Ultimate
Operating temperature	°C	0 to 55	0 to 45
Housing - protection class		IP65 (splash proof)	IP65 (splash proof)
Dimensions (WxHxD)	mm/in.	290x225x50 / 11.3x8.8x1.9	426x395x95 / 16.6x15.4x3.7
Weight	kg/lbs	approx. 4.5/9.9	approx. 13/28.6
Remote maintenance		optional (Ethernet, modem)	optional (Ethernet, modem)
Programming		IEC61131-3 (AWL, KOP, FUP, ST, AS und CFC)	IEC61131-3 (AWL, KOP, FUP, ST, AS und CFC)
Suitable software packages	Type Part no.	DAST100 815641	DAST200 815642

alternative

Description

DPU100

This high performance controller can guide axis systems with up to three axes. Complex manual work stations with operator guidance, sequence and screw position visualisation as well as fully automatic machines with several part stations such as rotary indexing machines with up to 4 user stations can be realised. This controller adds the option of connecting a database such as a BDE or ERP system. The DPU100 can be used in combination with all standard DSEC control cabinets.

DPU200

The DPU200 is the most efficient controller of the DPU series. The controller has a 15" display with XGA resolution (1024 x 768 pixels) for improved image visualisation. It can control complex fully automatic machines such as axis systems with more than three axes. It offers unproblematic connection to databases such as BDE or ERP systems. There are various interfaces and protocols available e.g. OPC, OPC-UA or TCP/IP. The DPU200 can also be used in conjunction with all DSEC control cabinets.

DAST100/200

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. The functionality matches the performance capability of the relevant system control.

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 additional Software

Interface Graph Loader (hardware and software)	Part no.	385834A
Connection cable (AST40 - Graph Loader)	Part no.	385835D
Software ASTxx Serial Remote (release code) for the simple storage of screwdriving curves and result-data to a PC	Part no.	206565
Software Datalogger (release code)	Part no.	202699
Software Friction value screwdriving (release code)	Part no.	201820
Software DEPRAG Clamp Force Control - DEPRAG CFC (release code)	Part no.	109108
Software Statistics (release code)	Part no.	206081
Software Graph10E (release code)	Part no.	202698
Software GRAPH10 BIN-> CSV	Part no.	201992



Interface Graph Loader

Description of the software

1) Interface Graph Loader (hardware and software)

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.

2) Software ASTxx Serial Remote (release code)

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.

3) Software Datalogger (release code)

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.



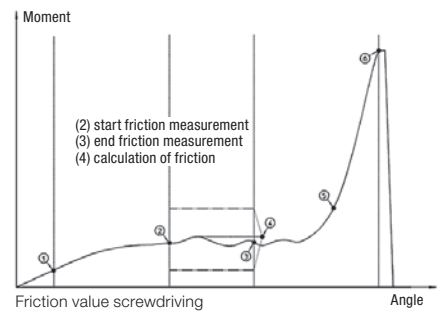
ASTxx Serial Remote

SYSTEM COMPONENTS

Description of the software

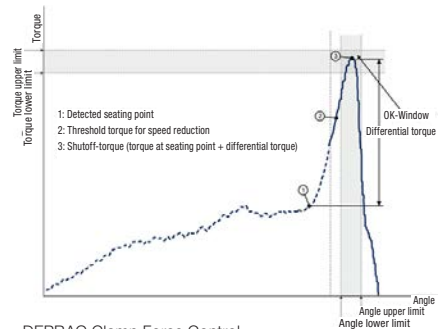
4) Software Friction value screwdriving (release code)

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.



5) Software DEPRAG Clamp Force Control - DEPRAG CFC (release code)

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.



6) Software Statistics (release code)

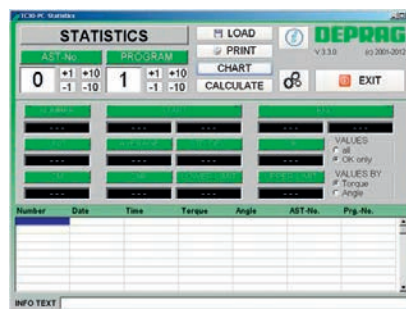
The software „Statistics“ offers the possibility to produce statistical evaluations for the screwdriving results, that are made available by the software „Datalogger“. In order to be able to use the software „Statistics“, the software „Datalogger“ must be installed as well!

7) Software GRAPH10 BIN-> CSV

The software converts your binary files into csv files for further processing.



Datalogger



Statistics



At DEPRAG, we are committed to constantly improving our software solutions. To harness these benefits, we recommend regularly updating to the latest edition. For more information, please contact our service department at service@deprag.de.

Optional Accessories

Suitable for controller	Type	AST40	ASTi40
Table stand	Part no.	300085A	—
Patch cable 2 m	Part no.	831902	—
Touch pen	Part no.	832190	—



with quick
change chuck

with integrated
mouthpiece
guide

with
vacuum
connection

Handle with quick change chuck

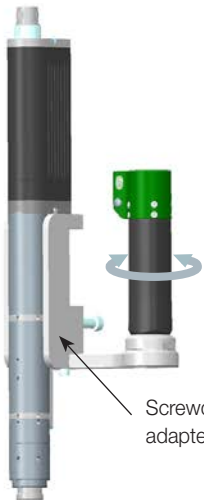
For EC-Servo screwdriver spindles		311E27-xxxx	311E36-0150	311E36-0300 311E36-0500
Handle	Part no.	425800A	425900A	425900B
Internal hex. drive DIN ISO 1173		F6.3	F6.3	F11.2

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 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



Screwdriver
adapter

Handle parallel to the spindle,
turnable

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.

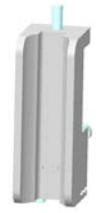
Operating elements can be adapted to a specific application by selecting the operating mode. In this way for example the tool can be pre-programmed so that a second screwdriving program can be started directly by pressing the switch (e.g. a loosening program).

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 the use as handheld screwdrivers

For EC-Servo screwdriver spindles		311E27-xxxx	311E36-xxxx	311E42-xxxx
Weight of the screwdriver spindle	311E	1.2 kg/2.64 lbs	2.8 kg/6.16 lbs	4.2 kg/9.24 lbs
Linear stand	Part no.	408010A	408010B	408010C
for torque reaction up to	N·m/in.lbs	20/177	50/443	150/1328
Weight of the horizontal arm	kg/lbs	2/4.4	6.7/14.74	13.7/30.14
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. In order to select the appropriate balancer please consider the weight of the horizontal arm, the weight of the screwdriver and additionally a mass of 1 kg for the screwdriver adapter and the handle. To split the weight we highly recommend to use 2 balancers.



Screwdriver adapter 102982A

Optional Accessories

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



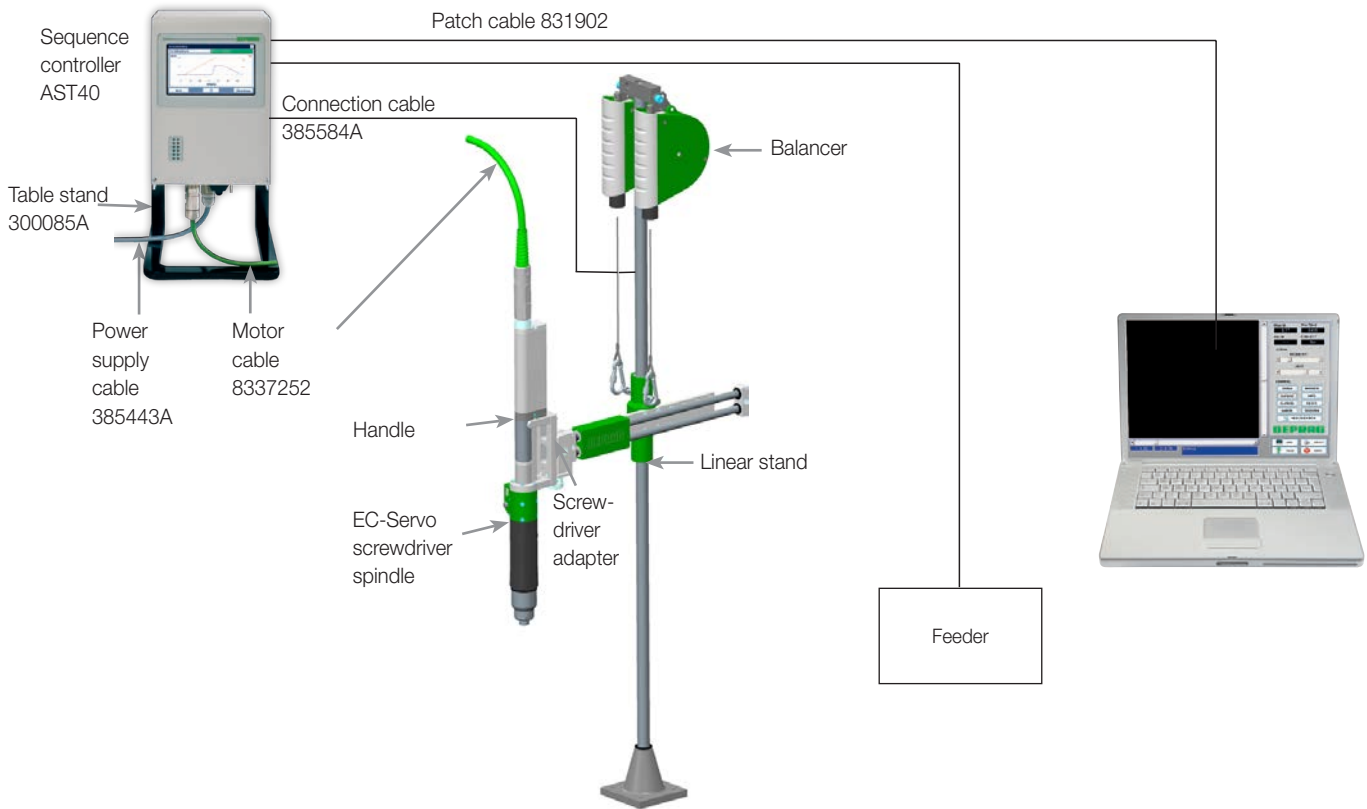
Turn fixture 917333A



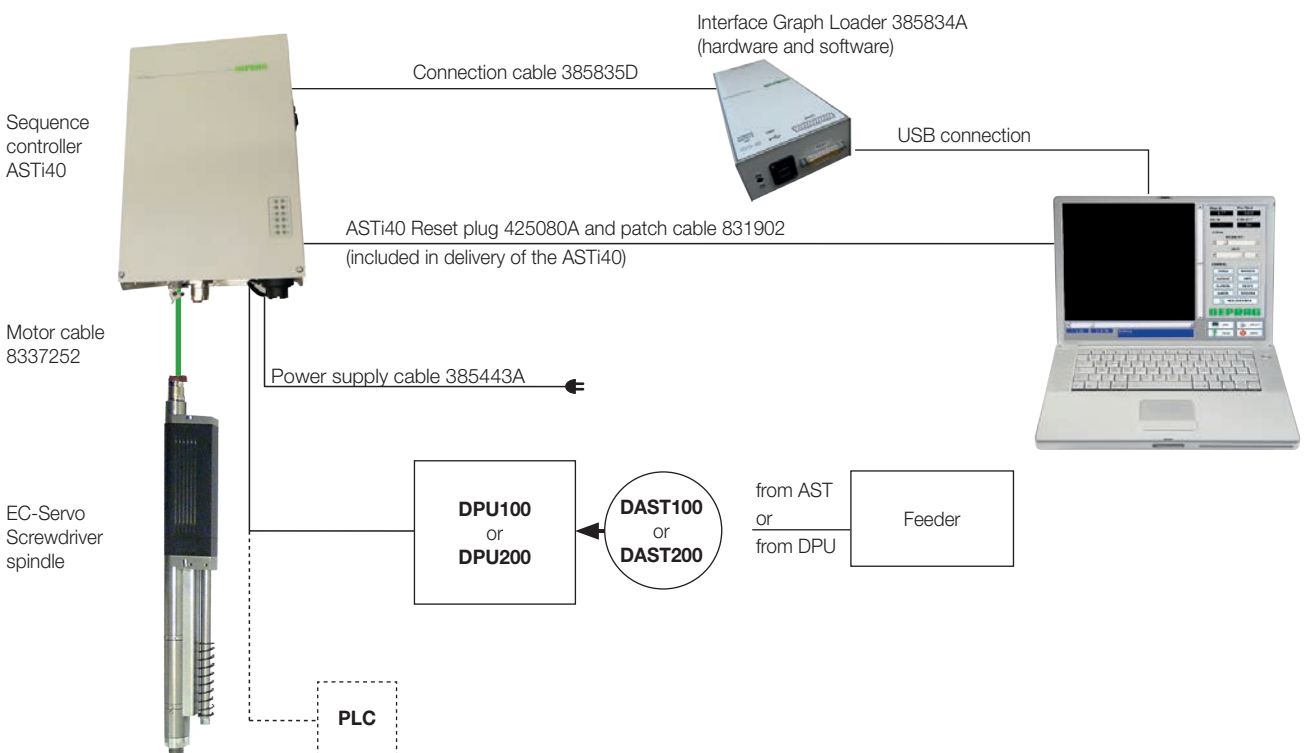
Support ring 398704A

Please note: when used as a handheld screwdriver only 3 screwdriving programs are available

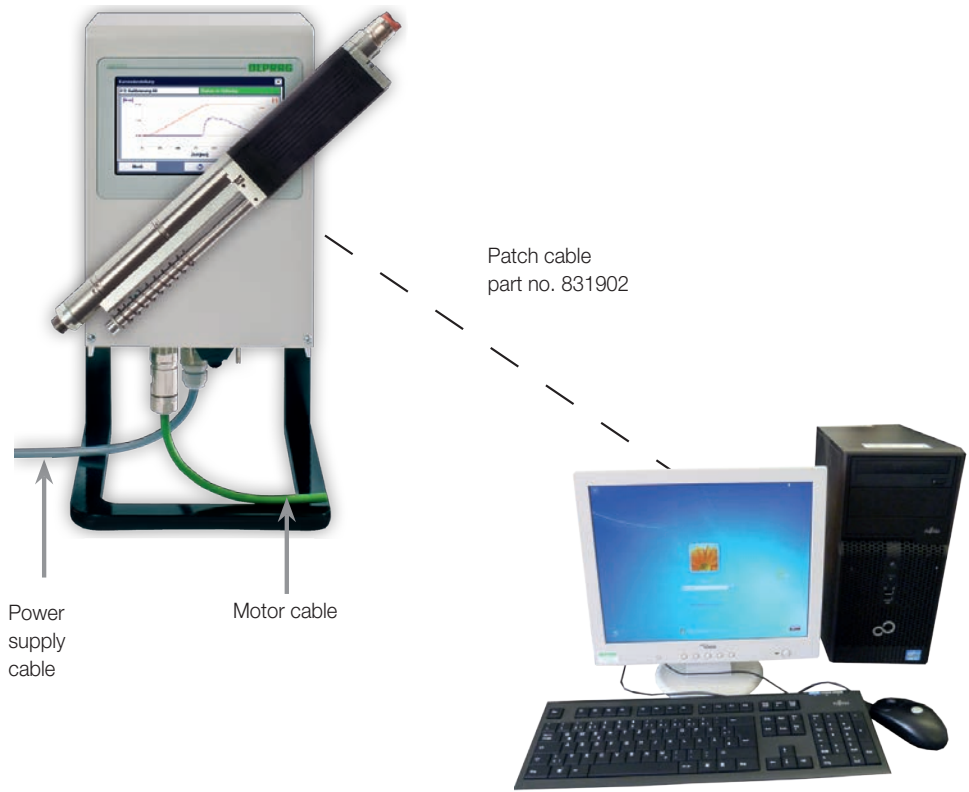
SYSTEM OVERVIEW when used in manual work stations



SYSTEM OVERVIEW in connection with ASTi40



Sequence controller AST40
connected to the screwdriver
via motor cable



DEPRAG

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CERTIFIED AS PER DIN EN ISO 9001
