Screwdriving Technology
Automation
Air Motors
Air Tools

DEPRAG
machines unlimited

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 0.15 - 25 Nm
Screwdriver Spindles

The flexible EC screwdriver for the highest standards

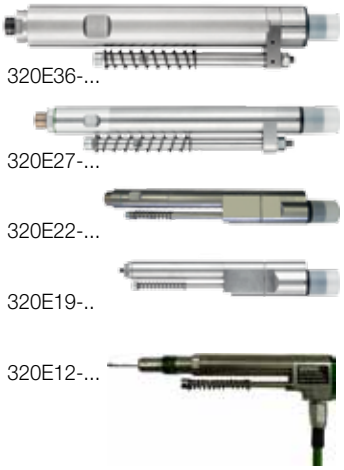
- **flexible**
- **documentation features**
- **high precision**

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 measure-ment 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.

Screwdriver Spindles electric

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 ±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 is required 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.

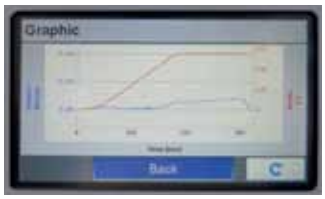
Small size: Due to its small size the controller is particularly suitable for stationary applications where there are confined spaces.

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

Screwdriver spindle, Straight handle design		NANOMAT-EC, size 12	MICROMAT-EC, size 19		
Screwdriver	**Type**	**320E12-00012 1)**	**320E19-0002**	**320E19-0005**	**320E19-0008**
	Part no.	420400B	405024A	405024C	405024B
Torque min.	Nm / in.lbs	0.02 / 0.18	0.03 / 0.27	0.08 / 0.7	0.15 / 1.3
Torque max. *)	Nm / in.lbs	0.12 / 1.06	0.2 / 1.8	0.5 / 4.4	0.8 / 7.1
Speed min.	rpm	120	150	60	100
Speed max. *)	rpm	1500	1500	1200	1000
Diameter	mm / in.	17.5 / 0.68	19 / ¾	19 / ¾	19 / ¾
Length	mm / in.	150 / 5.85	190 / 7 31/64	190 / 7 31/64	190 / 7 31/64
Weight	kg / lbs	0.2 / 0.44	0.25 / 0.55	0.25 / 0.55	0.27 / 0.59
Noise level	dB (A)	56	60	60	60
Line voltage (DC)	V	24	48	48	48
Internal hex. drive DIN ISO 1173		B3 (3 mm)	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 (3 mm)	A3 (3mm)

Screwdriver spindle, Straight handle design		MINIMAT-EC, size 22		MINIMAT-EC, size 27			
Screwdriver	**Type**	**320E22-00120**	**320E22-00200**	**320E27-0010-D**	**320E27-0018-D**	**320E27-0024-D**	**320E27-0042-D**
	Part no.	420988D	420988E	416500B	416500H	416500C	416500D
Torque min.	Nm / in.lbs	0.18 / 1.59	0.4 / 3.54	0.15 / 1.3	0.4 / 3.5	0.4 / 3.5	0.7 / 6.2
Torque max. *)	Nm / in.lbs	1.2 / 10.62	2.0 / 17.7	1.0 / 8.85	1.8 / 15.9	2.4 / 21.2	4.2 / 37.2
Speed min.	rpm	50	30	50	100	50	40
Speed max. *)	rpm	900	550	1000	1000	700	400
Diameter	mm / in.	22 / 7/8	22 / 7/8	27 / 1 1/16	27 / 1 1/16	27 / 1 1/16	27 / 1 1/16
Length	mm / in.	202 / 7 61/64	202 / 7 61/64	254 / 9.9	251 / 9.8	251 / 9.8	263 / 10.3
Weight	kg / lbs	0.55 / 1.21	0.55 / 1.21	0.75 / 1.65	0.75 / 1.65	0.75 / 1.65	0.75 / 1.65
Noise level	dB (A)	60	60	60	60	60	60
Line voltage (DC)	V	24	24	48	48	48	48
Internal hex. drive DIN ISO 1173		F6.3 (1/4")	F6.3 (1/4")	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		E6.3 (1/4")	E6.3 (1/4")	A3 (3 mm)	E6.3 (1/4")	E6.3 (1/4")	E6.3 (1/4")

Screwdriver spindle, Straight handle design		MINIMAT-EC, size 36					
Screwdriver	**Type**	**320E36-0040-D**	**320E36-0060-D**	**320E36-0090-D**	**320E36-0120-D**	**320E36-0180-D**	**320E36-0250-D**
	Part no.	416600E	416600A	416600F	416600B	416600C	416600G
Torque min.	Nm / in.lbs	0.8 / 7.1	1 / 8.85	2 / 17.7	2 / 17.7	3 / 26.6	5 / 44.25
Torque max. *)	Nm / in.lbs	4 / 35.4	6 / 53.1	9 / 79.7	12 / 106.2	18 / 159.3	25 / 221.25
Speed min.	rpm	100	70	50	35	25	20
Speed max. *)	rpm	1000	740	550	380	280	220
Diameter	mm / in.	36 / 1 27/64	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	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	1.2 / 2.64
Noise level	dB (A)	60	60	60	60	60	62
Line voltage (DC)	V	48	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")	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")	E6.3 (1/4")

*) as per VDI/VDE 2647 Directive

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

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.	385442A	385442E
Length 5 m / 16.4 ft.	Part no.	385442B	385442F
Length 8 m / 26.2 ft.	Part no.	385442C	385442G
Length 12 m / 39.4 ft.	Part no.	385442D	385442H

Optionally available: motor cable extension, suitable for all screwdriver sizes

Length 2.5 m / 8.2 ft.	Part no.	385478A
Length 5.5 m / 18.0 ft.	Part no.	385478B
Length 9.5 m / 31.2 ft.	Part no.	385478C

The total length including the motor cable extension must not exceed 12 meters.

SEQUENCE CONTROLLER AST6/ASTi6

for screwdriver	NANOMAT-EC	320E12-.. (page 4)	
	MICROMAT-EC	320E19-.. (page 4)	
	MINIMAT-EC	320E22-.. (page 5)	
Sequence controller	**Type**	**AST6-1**	**ASTi6-1**
with integrated performance electronics	Part no.	428001A	428004A
Sequence controller	**Type**	**AST6-1 PB**	**ASTi6-1 PB**
with fieldbus module Profibus port	Part no.	428001B	428004B
Sequence controller	**Type**	**AST6-1 PN**	**ASTi6-1 PN**
with fieldbus module Profinet port	Part no.	428001C	428004C
Sequence controller	**Type**	**AST6-1 EC**	**ASTi6-1 EC**
with fieldbus module EtherCat port	Part no.	428001D	428004D
Sequence controller	**Type**	**AST6-1 E/IP**	**ASTi6-1 E/IP**
with fieldbus module Ethernet IP port	Part no.	428001E	428004E
Power supply (DC)	V	24	
Power consumption	W	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	–

Required Accessories for ASTi6

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		12 membrane keys with green and red LED		12 membrane keys with green and red LED
- Emergency stop button		yes		yes
CPU		Intel Atom, 1.6 GHz	alternative	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		1GB DDR2 RAM		2GB DDR3L-RAM
Mass storage		1GB Compact Flash		Hard disk, 2.5“ 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 (W x H X D)	mm / in.	290 x 225 x 50 / 11.3 x 8.8 x 1.9		426 x 395 x 95 / 16.6 x 15.4 x 3.7
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 and CFC)		IEC61131-3 (AWL, KOP, FUP, ST, AS and CFC)
Necessary software packages	**Type/**Part no.	**DAST100 /** 815641		**DAST200 /** 815642

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

SEQUENCE CONTROLLER AST11

for screwdriver	MICROMAT-EC MINIMAT-EC	320E19-.. (page 4) 320E22-.. and 320E27-.. (page 5)		320E36-..(page 5)	
Sequence controller	**Type**	**AST11-1**	**AST11-1-S**	**AST11-2**	**AST11-2-S**
	Part no.	390041A	390041B	390042A	390042B
Module „safety stop“		no	yes	no	yes
Power unit (AC)	V / Hz	100 - 240 / 50 / 60		100 - 240 / 50 / 60	
Power consumption	W	400		400	
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.	160x295x200 / $6^{19}/_{64}$ x $11^{39}/_{64}$ x $7^{7}/_{8}$		160x295x200 / $6^{19}/_{64}$ 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.	385443A
Power supply cable Length 1.8 m/5.9 ft. (USA)	Part no.	385443B
Power supply cable Length 2.5 m/8.2 ft. (China)	Part no.	385443C

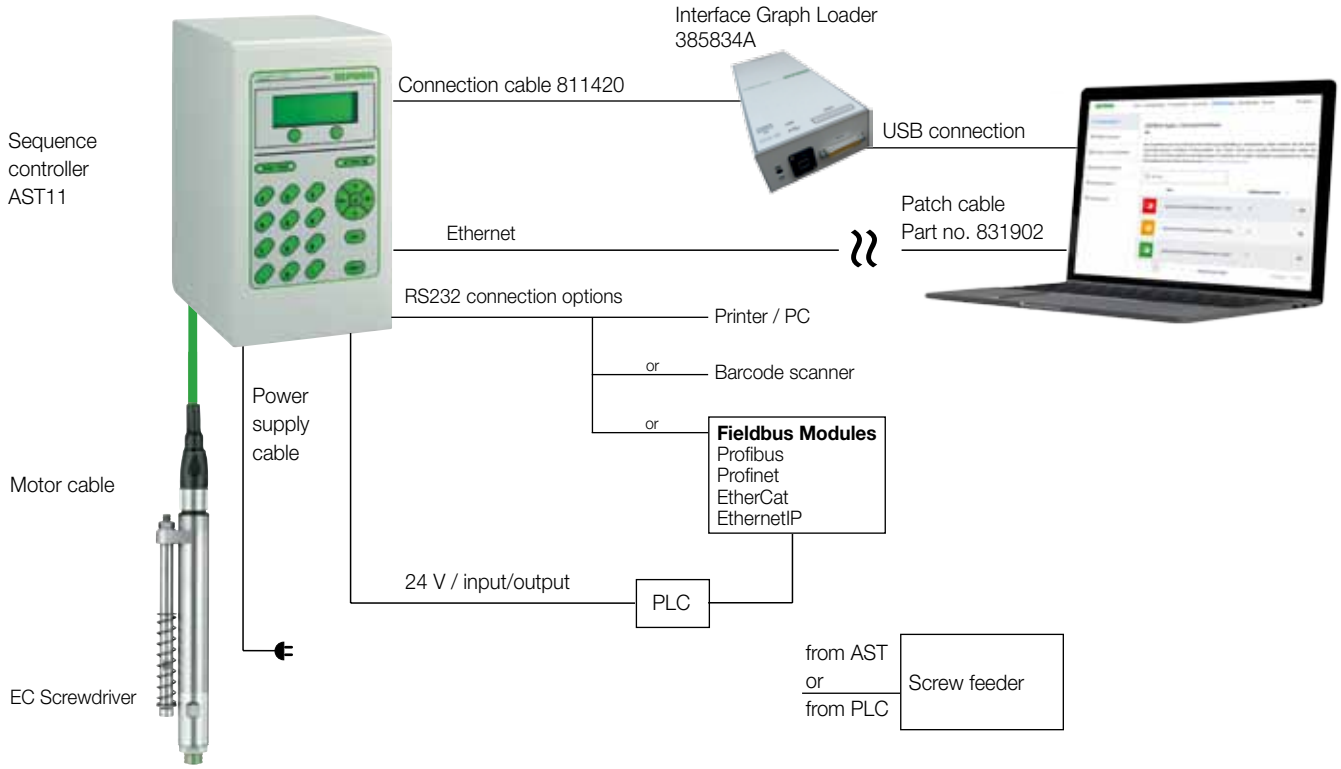
Optional Accessories for sequence controller		**AST6-1**	**ASTi6-1**	**AST11**
Patch cable (2m) (connection ASTx -PC)	Part no.	831902 (included in delivery)		831902
Plug RJ45-IP54	Part no.	–		385453A
Part sensor capacitive M18	Part no.	–		354841C
Base	Part no.	416004A		405278A
Cable socket (slide connector 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 ND350	Part no.	–		112462A
Field bus module Profibus	Part no.	–		428010A
Field bus module Profinet	Part no.	–		428010B
Field bus module EtherCAT	Part no.	–		428010C
Field bus module EtherNet/IP	Part no.	–		428010D
Required accessories: Connection cable AST11 to field bus module	Part no.	–		207725A (EU) 207725B (US)

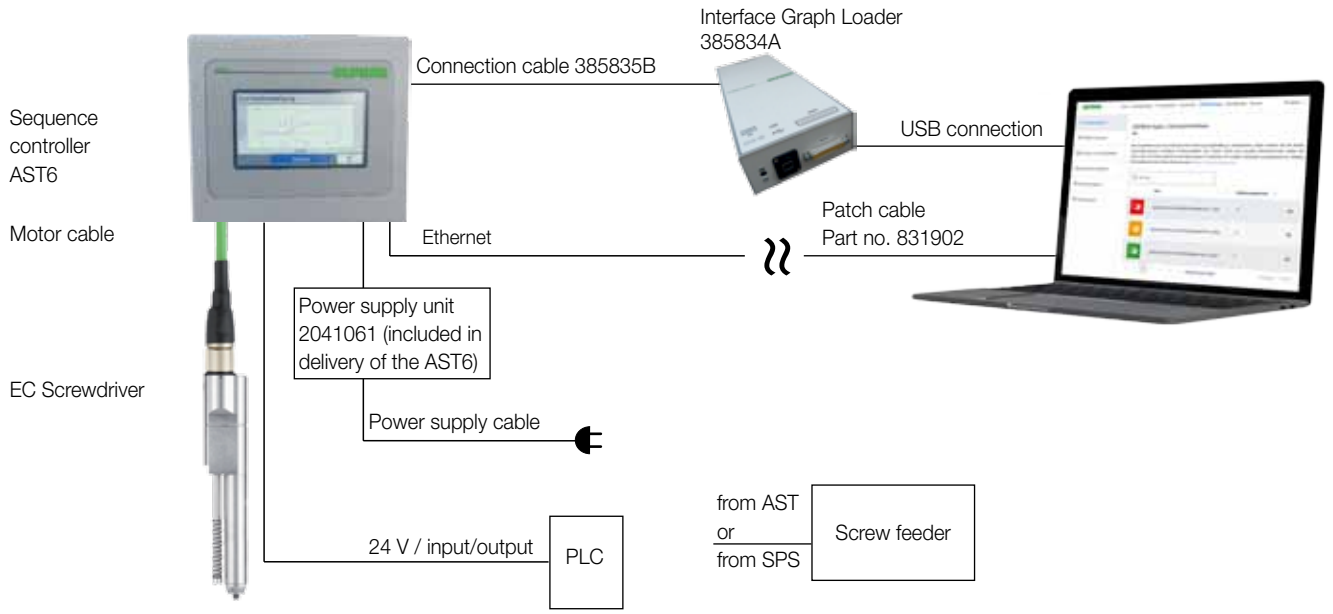
Optional additional software for sequence controller		**AST6-1**	**ASTi6-1**	**AST11**
Interface Graph Loader (Hardware and Software) | activation key	Part no.	385834A | 118742		385834A | 118742
Connection cable (ASTxx - Graph Loader)	Part no.	385835B		811420
Software ASTxx Serial Remote (activation key) for the simple storage of screwdriving curves and result data to a PC	Part no.	206565		206565
Software Statistics (activation key)	Part no.	206081		206081
Software Datalogger (activation key)	Part no.	202699		202699
Software Friction value screwdriving (activation key)	Part no.	201820		201820
Software Graph Viewer for sequence controller AST (activation key)	Part no.	128901		128901
Software DEPRAG Data eXchange for sequence controller AST (activation key)	Part no.	132680		132680
Software TIA Link (activation key)	Part no.	135839		135839
Software TwinCAT Link (activation key)	Part no.	140996		140996

For more details to the software products, please see brochure D3900E.

Our software solutions undergo continuous improvements. We recommend that you regularly update your software. In this way you will always receive the most up-to-date security updates, upgraded features and drivers. With the most current version of the software you can be sure that your device is optimally prepared for Industry 4.0.

EXAMPLE


Interface Graph Loader
385834A
Connection cable 811420
USB connection
Sequence
controller
AST11
Patch cable
Part no. 831902
Ethernet
RS232 connection options
Printer / PC
or
Barcode scanner
Power
supply
cable
or
Fieldbus Modules
Profibus
Profinet
EtherCat
EthernetIP
Motor cable
24 V / input/output
PLC
from AST
or
from PLC
Screw feeder
EC Screwdriver


Interface Graph Loader
385834A
Connection cable 385835B
Sequence
controller
AST6
USB connection
Patch cable
Part no. 831902
Motor cable
Ethernet
Power supply unit
2041061 (included in
delivery of the AST6)
EC Screwdriver
Power supply cable
from AST
or
from SPS
Screw feeder
24 V / input/output
PLC

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DEPRAG

CERTIFIED AS PER DIN EN ISO 9001