

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 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.

Screwdriver Spindles electric

Screwdriving System consisting of the components:

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

Controller AST6

Controller AST11



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	0.24 / 2.12	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

SEQUENCE CONTROLLER AST6/ASTi6

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 428001A	ASTi6-1 428004A
Sequence controller with fieldbus module Profibus port	Type Part no.	AST6-1 PB 428001B	ASTi6-1 PB 428004B
Sequence controller with fieldbus module Profinet port	Type Part no.	AST6-1 PN 428001C	ASTi6-1 PN 428004C
Sequence controller with fieldbus module EtherCat port	Type Part no.	AST6-1 EC 428001D	ASTi6-1 EC 428004D
Sequence controller with fieldbus module Ethernet IP port	Type Part no.	AST6-1 E/IP 428001E	ASTi6-1 E/IP 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 - 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		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

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

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 390041A	AST11-1-S 390041B	AST11-2 390042A	AST11-2-S 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:				207725A (EU)
Connection cable AST11 to field bus module	Part no.	-		207725B (US)
Motor cable extension for MICROMAT-EC (size 19)				
Length 2.5 m / 8.2 ft.	Part no.	385478A		385478A
Length 5.5 m / 18.0 ft.	Part no.	385478B		385478B
Length 9.5 m / 31.2 ft.	Part no.	385478C		385478C

Optional additional software	for sequence controller	AST6-1 und ASTi6-1	AST11
Interface Graph Loader (Hardware and Software)	Part no.	385834A	385834A
Connection cable (ASTxx - Graph Loader)	Part no.	385835B	811420
Software ASTxx Serial Remote (release code) for the simple storage of screwdriving curves and result data to a PC	Part no.	206565	206565
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
Software Friction value screwdriving (release code)	Part no.	201820	201820
Software GRAPH10 BIN-> CSV	Part no.	201992	201992
Software Graph Viewer for sequence controller AST / activation	Part no.	128900 / 128901	128900 / 128901
Software DEPRAG Data eXchange for sequence controller AST / activation	Part no.	132679 / 132680	132679 / 132680

Interface Graph Loader (hardware and software)

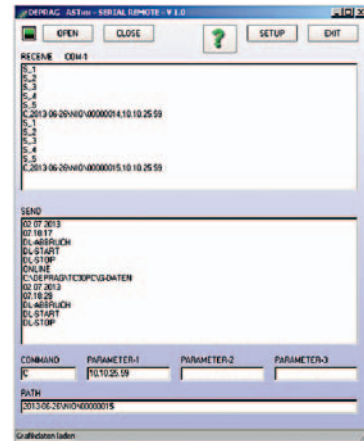
The storage of screwdriving graphs and end value data sets (e.g. torque, angle etc.) for manual work stations and screwdriving stations can be carried out automatically using the Interface Graph-Loader. The corresponding software enables immediate display on the computer screen of the current screwdriving graph, the screw assembly can be evaluated straight after completion and *.csv and *.bin files can be saved in individual directories.



Interface Graph Loader

Software ASTxx Serial Remote (release code)

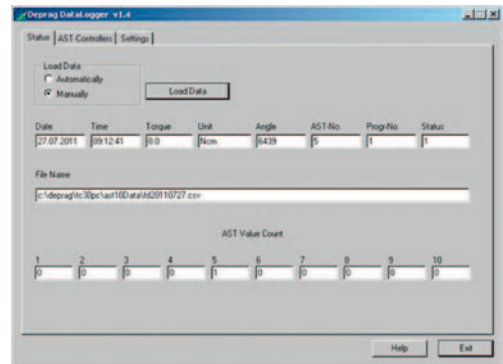
The program ASTxx Serial Remote is started on a PC and is controlled by commands over a serial interface (COM-Port). With this program, screwdriving curves and result-data can be transferred fast and simply onto a PC. The PLC controls when and which data should be stored. The storage place (also the directory) on the PC is determined by the PLC as well. The directory is setup automatically on the PC.



ASTxx Serial Remote

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.



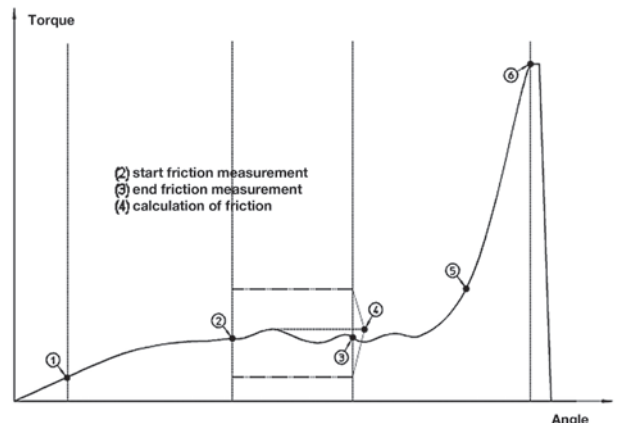
Datalogger

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 verification purposes.

Software GRAPH10 BIN-> CSV

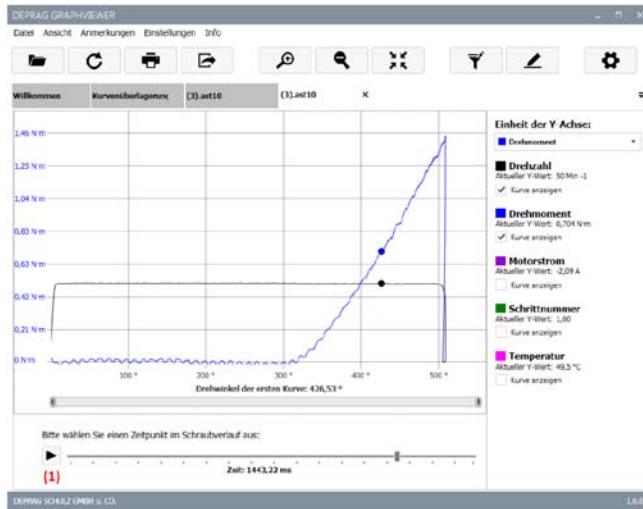
The software converts your binary files into csv files for further processing.



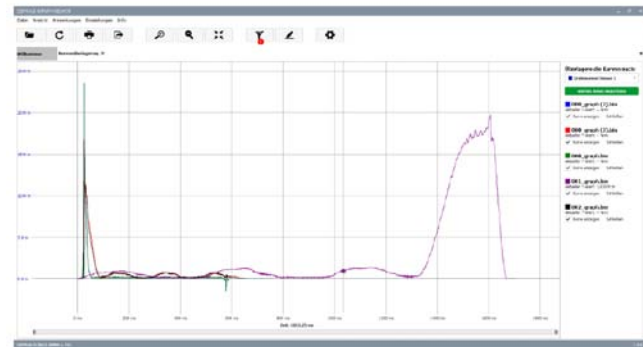
Friction value screwdriving

DESCRIPTION OF THE SOFTWARE

Software Graph Viewer for evaluation of screwdriving curves



Visualisation over angle



Superposition over time

• Additional features

- Add individual texts and reference arrows
- Zoom
- Conversion of units
- Multi-language (German, English)
- Save and load files
- Print curve data
- Export files
- Download directly from controller

• System prerequisites

- Windows 7, 8, 10
- The software is available as a download and requires activation

➤ Use with current AST software version is recommended.

During each screw assembly when using a sequence controller AST, the relevant measurement values are recorded in a file. There is now a new software product: the DEPRAG Graph Viewer, to simply and easily evaluate and analyse these measurement values.

Visualisation of measurement values over time

In this visualisation, various measurement sizes can be shown in relation to the screwdriving procedure. All available measurement values can be displayed in chronological order.

Visualisation of measurement values over angle

In this visualisation, the angle can be analysed in relation to the screwdriving procedure. The y-axis can be freely chosen by the user. This can e.g. enable analysis of angle in relation to torque or angle in relation to motor current, etc. In order to precisely analyse the screw assembly, a video can be played in visualisation over angle. Use the “start” and “pause” buttons in the same way as a video player to visualise the curve sequence of the screwdriving process. Individual sequences can be selected and displayed using the time bar.

Superposition of measurement values over time / over angle

As well as visualisation over angle and visualisation over time, there is also an option to display several curves at the same time in order to draw correlations and recognise trends. Any number of curves can be added. It is also possible to align curves to specific synchronisation points and hide or show screwdriving steps.

- **Simple filtering and synchronisation in search history**
Screwdriving curves can be filtered according to program step or by torque. All displayed curves can be coordinated to one synchronisation point.
- **Easy operation**
The required units, sizes and contents can be flexibly selected by the user.
- **Several display views at one time**
In order to compare several curves, more than one screwdriving curve can be opened at the same time.
- **Usability & “touch first”**
The new software has been developed to be “touch first” and allows easy operation – without mouse or keyboard.

Software Deprag Data eXchange for AST sequence controllers enables DEPRAG graphic files to be exported either as csv or Excel files

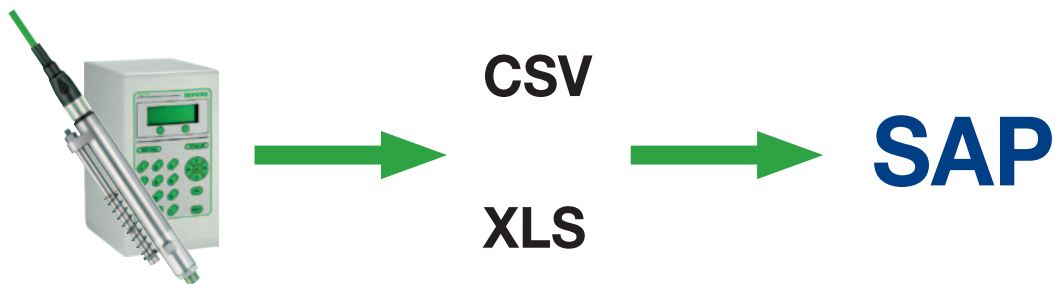
AST sequence controllers, the adaptive screwdriving system ADAPTIVE DFS and the ComCenter document relevant processing data for every screw assembly, which is then saved in a distinctive DEPRAG format. The so-called "graphic files" contain all screw curves, end values and details relating to the screwdriving process and are only readable by DEPRAG's own software solutions.

In order to use and analyse this data in other systems, it is necessary to transform the internal format into a universal machine-readable format. The new software solution DEPRAG Data eXchange enables DEPRAG graphic files to be exported either as csv or Excel files.

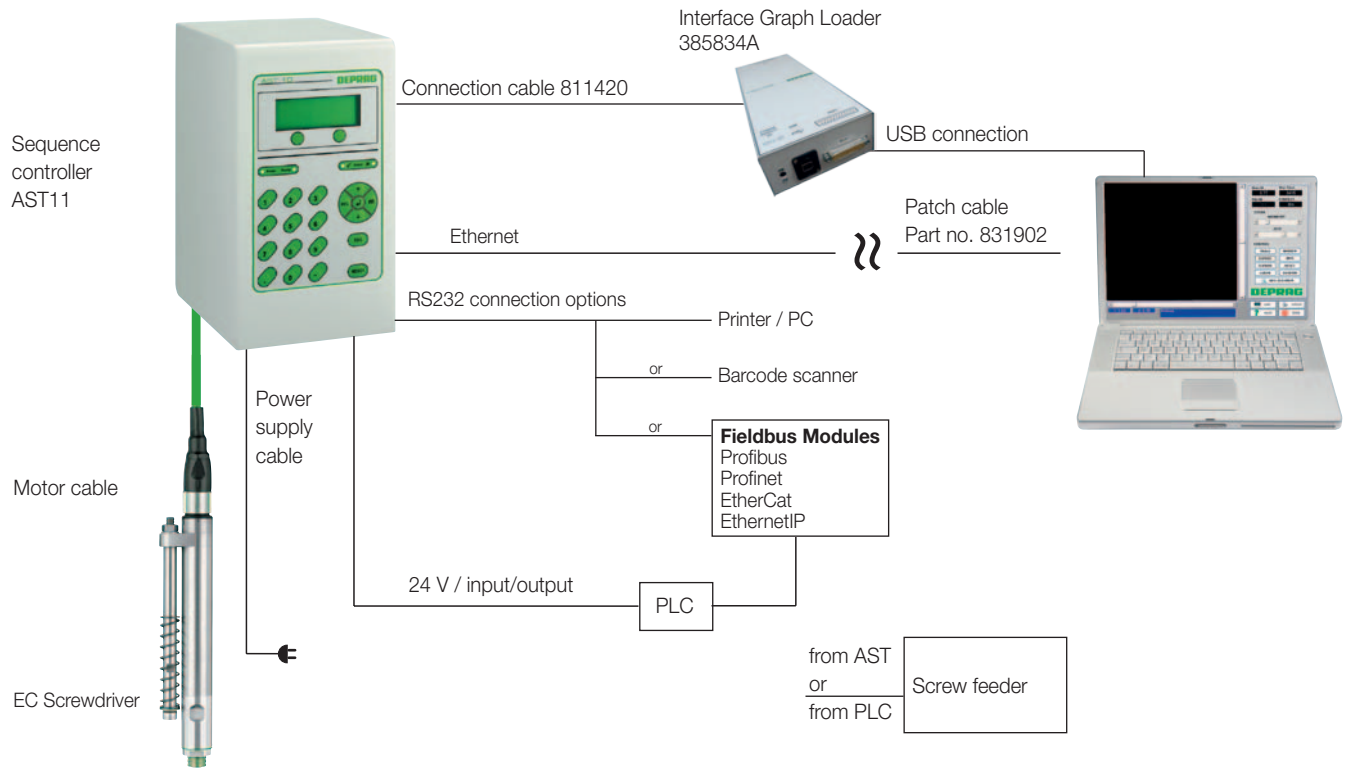
This data can now be used in other software solutions. Optional areas of application include:

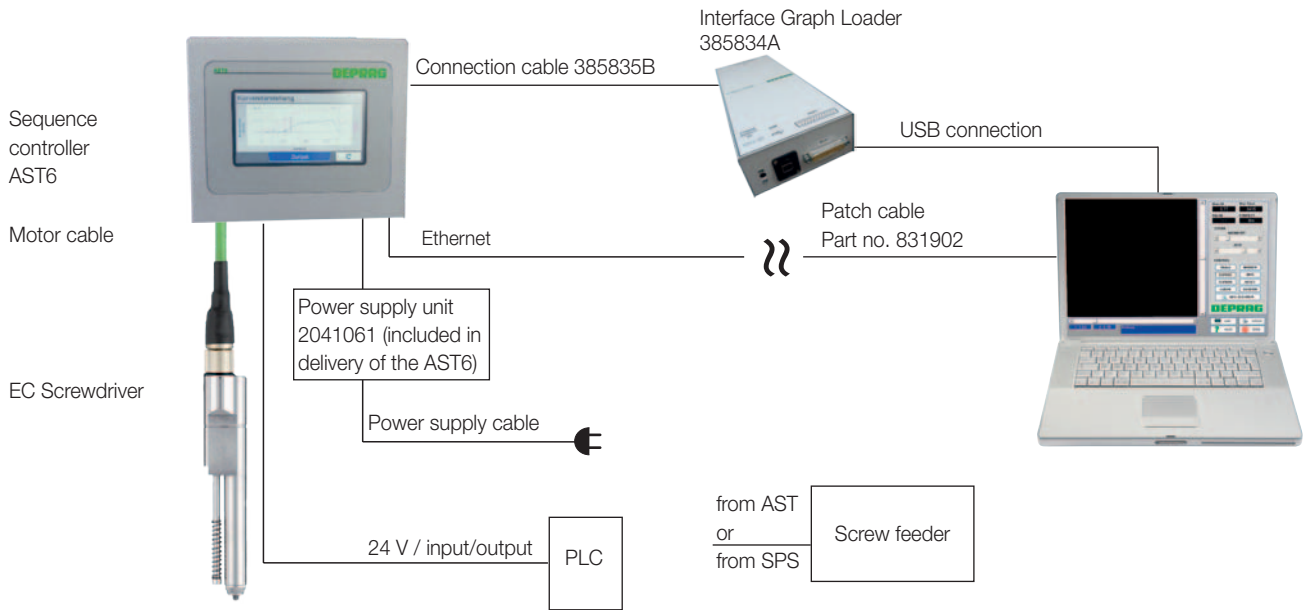
- integration in a databank
- analysis in Matlab
- SAP integration
- filing in customer-specific processing software

Compatibility: all Windows systems (7, 8, 10) without any need for configuration. The software configures itself and is ready to run with just one click.



EXAMPLE





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CERTIFIED AS PER DIN EN ISO 9001
