



Screwdriving technology

Automation

Air motors

Air tools

**DEPRAG**

**MINIMAT**  
**MICROMAT**

## Stationary Screwdriver Spindles

### CONTROL SCREWDRIVERS

from 0.02 - 180 Nm (3 in.oz. - 1594 in.lbs)  
The air-operated shut-off Screwdriver with integrated Function Control

### SENSOR SCREWDRIVERS

from 0.05 - 80 Nm (7 in.oz. - 708 in.lbs)  
The air-operated shut-off Screwdriver with integrated Transducer for Torque and Angle Measurement

### SENSOMAT SCREWDRIVERS

from 0.3 - 5 Nm (3 in.lbs - 44 in.lbs)  
The air-operated Screwdriver with special clutch for applications where the driving torque is higher than the seating torque

### EC-ELECTRIC SCREWDRIVERS

from 0.03 - 18 Nm (0.3 in.lbs - 159.3 in.lbs)  
Shut-off through current control – has integrated torque and angle control for the freely programmable screw assembly

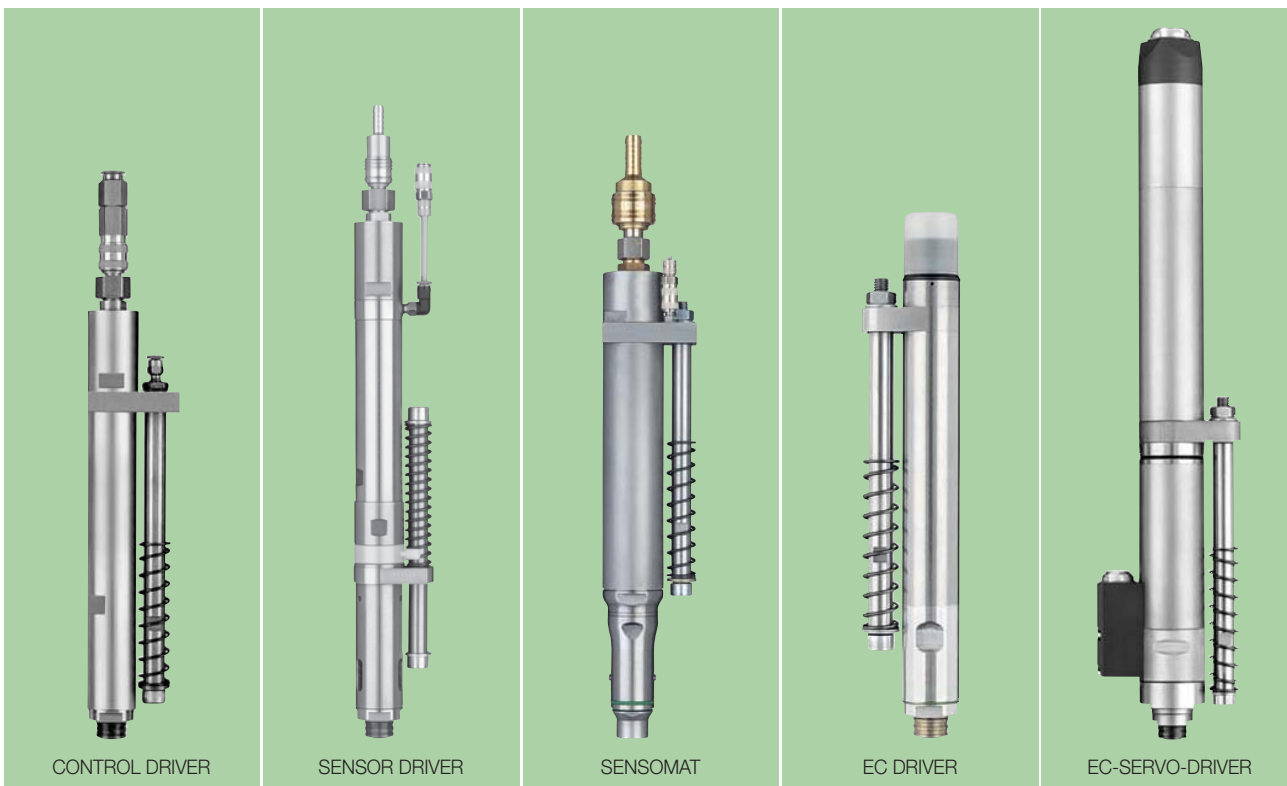
### EC-SERVO SCREWDRIVERS

from 0.2 - 270 Nm (2 in.lbs - 2390 in.lbs)  
EC-electric Screwdriver – has integrated transducer, torque and angle control for the freely programmable screw assembly

Stationary Screwdriver Spindles are a DEPRAG specialty. A large spectrum makes customer-specific solutions possible in a technically sophisticated and economical way. The selection includes:

- low-cost air operated Screwdriver Spindles with extremely accurate automatic shut-off clutches of the MICROMAT- and MINIMAT series;
- our programmable EC-Electric screwdriver technology with the MICROMAT-E and MINIMAT-E series using a brushless electric drive;
- simple and practical function controls;
- use of standard bits and sockets;
- optimum data acquisition and statistical process.

Whatever the screw assembly process, we offer a tailor-made package, optimized for your application.



CONTROL DRIVER

SENSOR DRIVER

SENSOMAT

EC DRIVER

EC-SERVO-DRIVER



## Stationary Screwdriver Spindles for:

### – Screwdriving Function Modules

### – Multi Spindle Assembly Units

### – Robotic Screwdrivers

Wherever a stationary Screwdriver Spindle is required to achieve highly accurate tightening processes, the air-operated DEPRAG MICROMAT- and MINIMAT series have been established worldwide and already for many years.

Our MICROMAT-E and MINIMAT-E Screwdriver Spindles, both with a brushless EC-drive, offer a real alternative wherever it is necessary to fulfill requirements as to cycle flexibility and data processing of the screw-driving result.

### The Right Drive Pneumatic vs. Electric

This question cannot be answered in general. It should however be answered after careful consideration of your application and the end result you are trying to achieve. With DEPRAG Screwdriver Spindles you will always achieve the best possible assembly solution – focussed to its task.

The air motor is the basis of the excellent power to weight/size ratio, needed in today's mass production tools. With higher rpm and a relatively low investment, these pneumatic drivers offer an unbeatable price/performance ratio in a torque range from 0.02 - 180 Nm (3 in.oz. - 1594 in.lbs).

If a single assembly process requires multiple torque settings or a special torque/angle scenario, we offer our brushless EC motors. Software adjustment of torque and/or angle parameters eliminate the need for mechanical intervention and therefore offer a flexible solution. Available in a torque range from 0.03 - 270 Nm (0.3 in.lbs - 2390 in.lbs).

## Air Operated Automatic Screwdriver Spindles

DEPRAG Screwdriver Spindles are available in three different series:

- Control Spindles
- Sensor Spindles or
- Sensomat Spindles

They all offer the following advantages:

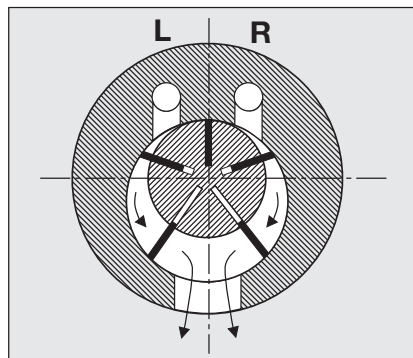
- driving + controlling at the same time
- guaranteed high torque accuracy
- repeatability, independent from air pressure fluctuations and screw joint (hard or soft)
- operate only during the actual assembly process
- low noise level
- multiple rpm ranges

If statistical data acquisition and documentation is required, our Sensor Spindles with Torque Transducers are used and where applicable our angle encoders are possible.

For critical assemblies, such as thread forming screws, where the initial driving torque may be higher than the seating torque (Torque Curve), the use of our Sensomat Spindles drive the screw to depth, utilizing full motor power. Shortly before the screw is seated, the clutch is activated and the driver shuts off at correct torque and depth.

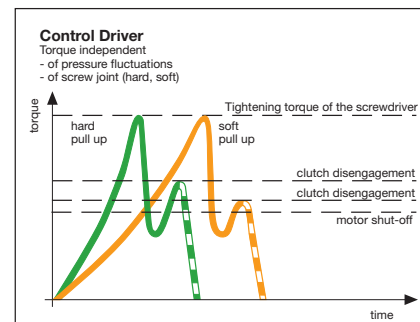
### Vane Type Air Motor

All drivers are equipped with a vane type air motor. This Motor has an excellent power/rpm to weight/size ratio, as well as a robust and simple design. It is therefore the perfect solution for high usage tools in an industrial environment.



## Independent of Air Pressure Fluctuations and Type of Screw Joint

The DEPRAG MICROMAT- and MINIMAT clutch transfers the preset torque value onto the screw, up to the target value. After the target torque is already applied the special design of the Minimat clutch reduces the torque output of the driver, despite the continued rotation of the motor, and shuts-off the motor at approximately 50 % of the target value. This design eliminates the varying effect of kinetic energy, caused by speed fluctuations and changing screw joints (hard or soft) and/or air pressure fluctuations and eliminates uncontrollable torque output variations. For torque calibration, we recommend our "Piezo Electronic Torque Measurement" devices.



### Simultaneous Tightening and Verification

The high torque accuracy, obtained by our Screwdrivers, is generally determined by the MICROMAT/MINIMAT clutch, which reaches in many cases a standard deviation clearly below  $\pm 3\%$  over millions of assemblies.

This accuracy is the requirement to obtain today's frequently demanded machine capability value ( $C_{mk}$ ) of 1.67. On special request, DEPRAG will provide a corresponding machine capability certificate for each Screwdriver Spindle.

To optimally reach the potential of the highly accurate shut-off clutch, it is recommended avoiding extreme hard screw joints, using the clutch in the lowest torque range, applying extreme high speed, or installing reduction gears, extensions or joints. Special attention should be given in choosing the correct configuration of Screwdrivers and Assembly Systems. Please use our highly trained assembly specialists to your benefit.

The integrated function control of all Screwdriver Spindles, indicates the driver start and with the driver shut-off the achieved pre-adjusted torque value. Additionally a proximity switch is controlling the screw depth over the linear compensation.

Naturally, all necessary process parameters, such as torque and angle, can be obtained, stored, transferred, printed and statistically processed, when using our Sensor Screwdriver Spindles in connection with our Measuring Electronic.

**Oilfree or Lubricated Use – no exhaust problems**

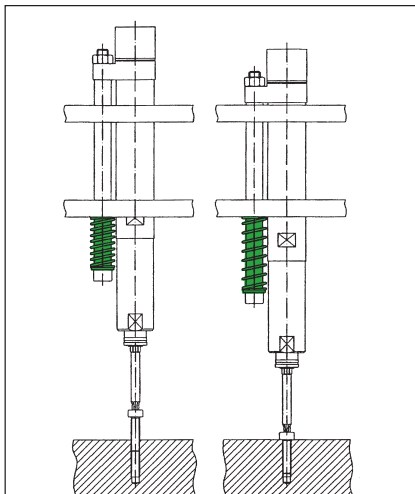
The oilfree use of all Screwdriver Spindles is possible. Naturally, lubrication improves life expectancy and application behavior. In both cases the processing of the compressed air, such as drying, filtration and possible lubrication, is recommended. Instead of air mist lubrication we suggest to use our highly precise "Point-Of-Use Oiler".

The lateral exhaust with corresponding exhaust hose and its connection to an exhaust filter/silencer is always recommended as an effective addition. Exhaust air - with or without oil - is directed away from the work area.



**Axial Spring Load without the need for special "Inline" Bit shaft Adapters**

Multi Spindle Screwdrivers always require a stroke compensation. All of our screwdriver spindles are therefore equipped with a lateral guide bolt and spring to regulate the "end load pressure" of each drive spindle. We do not use custom made and/or spring loaded bits or sockets. Internationally available and "standard" bits and sockets are compatible.



**Automatic Screwdriver Spindles with brushless EC-electric motor**

The DEPRAG EC-electric screwdriving technology offers two different systems:

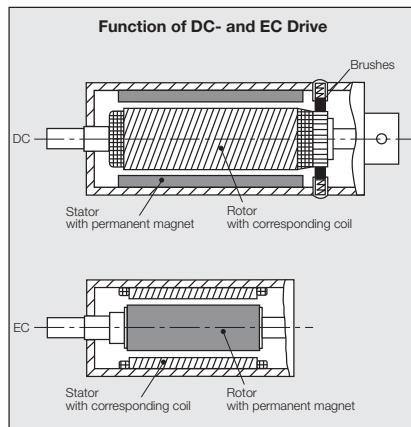
- EC-electric Screwdriver with torque shut-off based on tool's motor current
- EC-electric Servo Screwdriver with integrated torque/angle transducer

Their common features are:

- simultaneous driving + controlling
- guaranteed high torque accuracy
- control torque and/or angle
- supervise all process parameters
- freely programmable
- quiet operation

**The brushless Electric Drive**

The special characteristic of our electric drive is the design of the rotor, made with a permanent magnet rare earth components (Samarium / Cobalt), as well as the external stator with its corresponding coil. The Power Unit inputs an electronically computed (EC) field to the coil. This principle does not require the normally utilized "brushes" for voltage transfer to the rotor, and is therefore almost free of wear and tear. Furthermore, the motor is able to achieve high torque values, even at low speed or at stand still. With its compact construction and high energy output, the driver offers an outstanding dynamic and achieves high peak torque-values – ideally suited for the tightening of screws.



**Sequence Controller**

The EC Spindle requires a sequence controller with an integrated power supply.



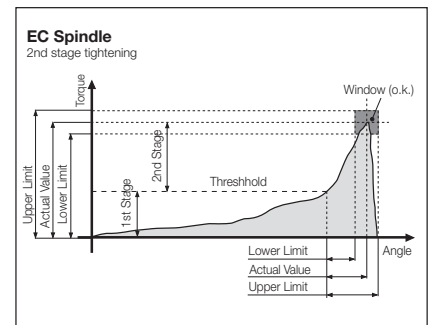
The sequence controller can be programmed with any combination of screwdriving parameters. Four standard programs are built into the controller:

1. Tightening and shut-off at torque.
2. Tightening and shut-off at torque with additional monitoring of the angle.
3. Tightening and shut-off at angle with additional monitoring of the torque.
4. Loosening and shut-off at angle.

These standard programs can be adjusted by setting the parameters that are specific to the assembly being produced (i.e. shut-off torque, speed, etc.). A multi-stage assembly process can be created by entering any combination of standard programs. An example is given below:

Step 1: tightening with full speed to torque (2 Nm) without angle monitoring.

Step 2: tightening with 10 % of speed to torque (5 Nm) with additional angle monitoring.



All program information is stored in the sequence controller. The programs are downloaded from a PC. The controller AST2 also allows programs to be entered from the integral numeric keypad. When the controller is used in automatic mode, the machine's PLC provides the cycle start signal.

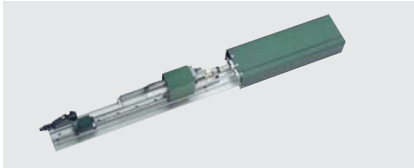
**Fail-Safe Operation**

When the EC Spindle is mounted in a Screwdriving Function Module (SFM), it creates a total control package exactly as with our pneumatic stationary screwdriver spindles. The sequence controller monitors torque and angle while the SFM monitors the depth and allows automatic feeding of the screws. EC-electric stationary Screwdrivers are especially well suited for the simple integration into Multi-Spindle Systems.



**DEPRAG SFM  
(Screwdriving Function Module)**

A screwdriving function module (SFM) is a device that positions the spindle relative to the mouthpiece/ nosepiece assembly, and allows both to be mounted to the machine's framework. Through the use of pneumatic cylinders, it provides movement of the mouthpiece/nosepiece assembly relative to your work surface to allow insertion of the work piece, and movement of the spindle relative to the mouthpiece/nosepiece assembly to allow feeding of the screw. While the stroke of these cylinders can be tailored to meet individual requirements, a wide variety of standard components can be combined to fit most applications, keeping delivery time to a minimum.



**SFM are available in the following versions:**

**N (Normal)**

This SFM is for the operation of one, two or three spindles. It may be mounted either horizontally or vertically. It is compact, durable, and allows easy replacement of wear parts, such as bits.

**S (Strong)**

This SFM has all of the features of the normal unit, but is designed for three or more spindles. It is also suitable for driving screws vertically from below the part.

**L (Light)**

This SFM is designed to be attached to a robotic arm and may be used in any position. It generally holds only one spindle with one cylinder, which provides the driving stroke. The robot positions the unit.

**XS (Extra Small)**

This reduced weight screwdriving function module has been specially developed for use with freely programmable low capacity screwdriving systems and robots. The SFM-XS weighs 30 % less than our SFM-L.

**All designs offer the following functions:**

- Cylinder end position signals (standard on all cylinders)
- Double screw depth control
- Spindle run signal
- Vacuum pick-up control (optional)

**DEPRAG SCHULZ GMBH u. CO.**

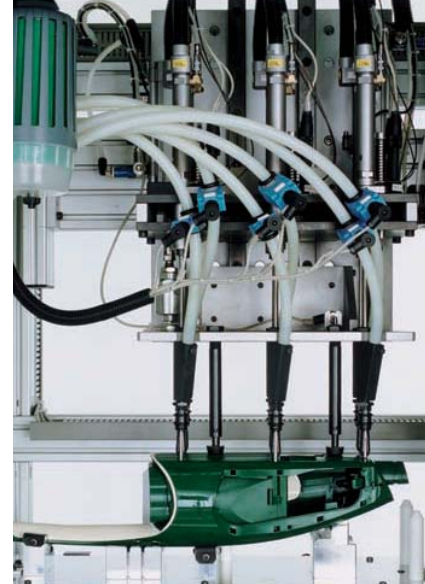
P.O. Box 1352, D-92203 Amberg, Germany  
Kurfürstenring 12-18, D-92224 Amberg

**RATIONAL ASSEMBLY WITH  
DEPRAG-SCREWDRIVER SPINDLES**

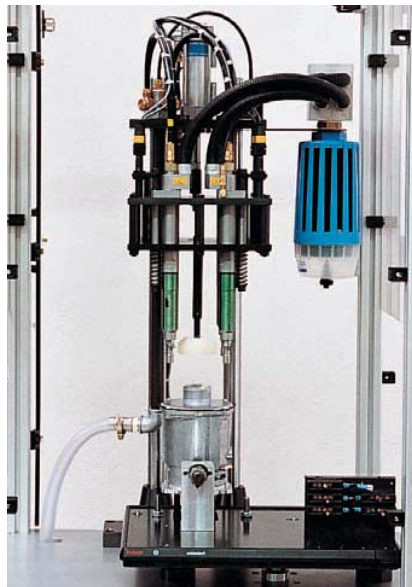
**Examples:**



**CONTROL SCREWDRIVER SPINDLE**  
with SFM-L and X-Y Position



**CONTROL SCREWDRIVER SPINDLES**  
with SFM-S Multi Spindle Station



**SENSOMAT SCREWDRIVER SPINDLES**  
with 2 Spindle Assembly Unit



**CONTROL SCREWDRIVER SPINDLES**  
for hand guided Multi Spindle Station

Phone (096 21) 371-0, Fax (096 21) 371-120  
www.deprag.com  
info@deprag.de

CERTIFIED AS PER DIN EN ISO 9001