



Screwdriving technology

Automation

Air motors

Air tools

# DEPRAG

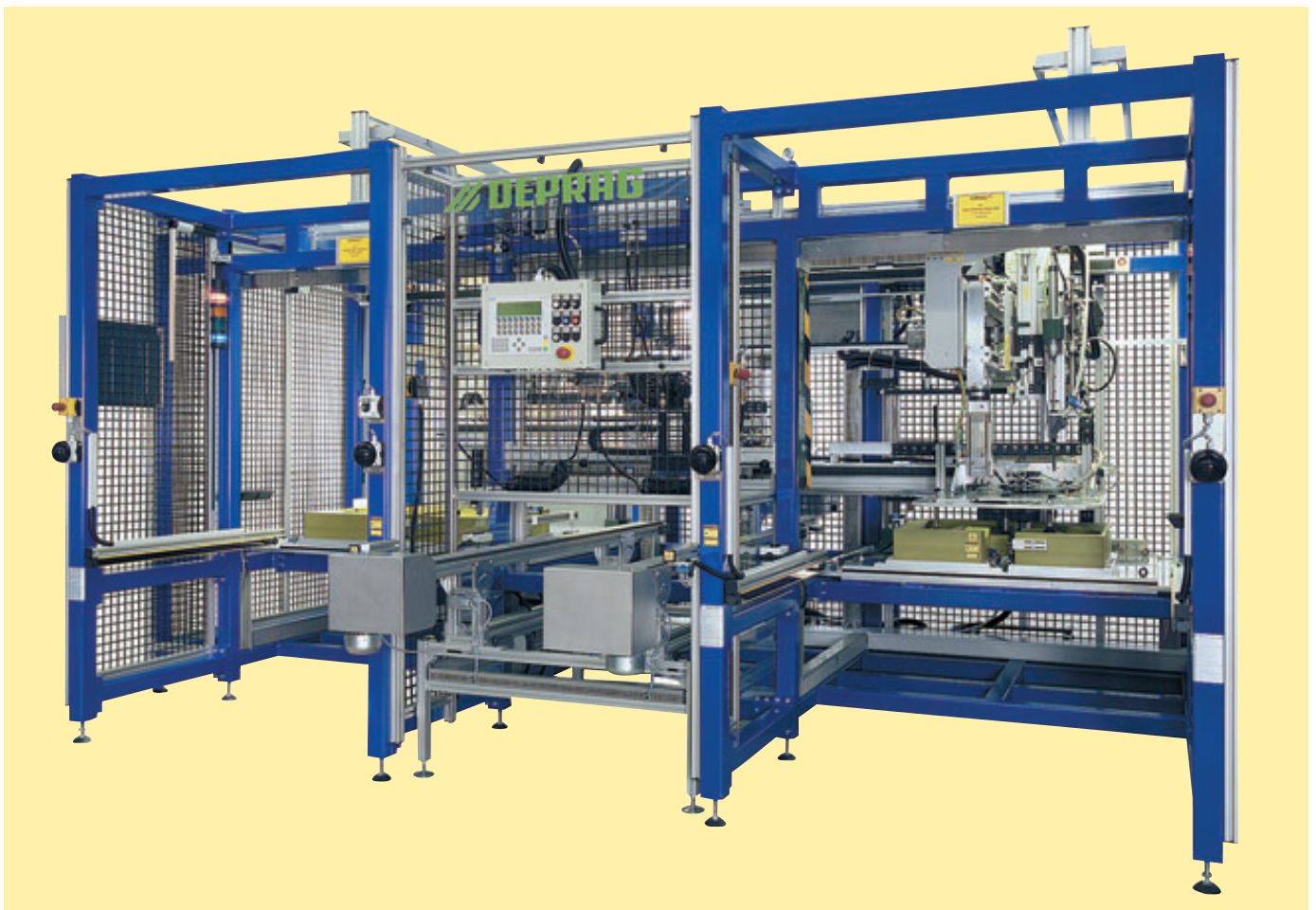
## Screwdriving Stations and Assembly Systems



- **Efficiency**
- **Quality Assurance**
- **Flexibility**
- **Durability**
- **Ergonomics**

Throughout the world, the most variable products imaginable, are assembled with DEPRAG Screwdriving Stations and Assembly Systems, such as: VCR's, door locks, gas meters, satellite dishes, electric windows, TV's switches, dish washers, com-

puters, lamps, clothes washers, contactors, video cassettes, CD-players, relays, batteries, ovens, oil pressure switches, shower heads, air volume gauges, electric shavers, clocks, cylinder heads, chain saws, carburetors, pumps, calculators, kitchen appliances, toy cars, ABS brakes, computer hard drives, garden trimmers, remote controls, head lights, printers, hand drills, fuel injection systems, blenders, electronic control boxes, phones, car engines, programmable controllers, answering machines, etc.





## 1. Competence through experience

### 1.1 Experience

Make use of the extensive experience of our engineers and manufacturing personnel to meet your assembly requirements! Since our founding in 1801, DEPRAG has developed sophisticated, state of the art products with a century of industrial experience. DEPRAG started the design and production of pneumatic equipment in 1918, and the production of DEPRAG pneumatic tools in 1931. From this grew the development and construction of custom machinery and assembly equipment that, by the late 70's, has become the heart of our product line. Whatever your need may be, we can call on over 30 years of experience in the field of screwdriving and assembly stations to be certain you get the best possible solution.

### 1.2 Qualified Production

Because of our tradition as a manufacturer, our background is not limited to just extensive product and design knowledge, but extends to the production area as well. A total solution requires not only engineering, but also the knowledge and ability to turn theory into practice. Our production facility is equipped with highly modern and flexible production machinery, run by qualified craftsmen.



### 1.3 Design Capability

Our extensive experience in the design and construction of assembly equipment combined with in-depth product knowledge allows our engineers to offer a total, economical solution to even the most complex problem. Modern design tools, such as CAD, project management; FEMA, etc. are all used to ensure successful completion of the project.





# DEPRAG WORLDWIDE

## 1.4 Proficiency in basic technologies

Feeding plays a central role in almost all assembly stations. Often, proper feeding is the key to achieving efficiency, productivity and return on investment. Unlike individual system integrators, who must buy components and fit them together, we use only our own components, with which we have extensive experience. Our feeder knowledge combined with our expertise in a broad range of screwdriving spindles eliminates potential problems resulting from component conflicts between various suppliers and the integrator.

## 1.5 Worldwide Coverage

We have positioned ourselves as our customer's total assembly solutions partner, especially for the precision engineering, telecommunications, automotive sub-supplier, electric, and electronic industries. Worldwide, DEPRAG achieves design and service competence through an international structure, including direct subsidiaries in the US, Sweden, Czech Republic, France, China and Korea, and powerful partners in all relevant markets in the world.

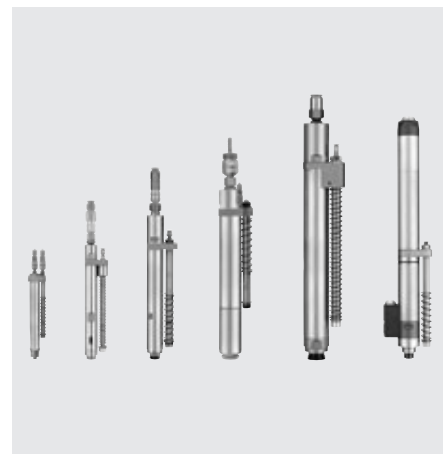
## 2. Components of the DEPRAG Assembly System

### 2.1 Machine Base

We use universal aluminum profiles, which are constructed to provide maximum machine stability. If dynamic NC-axes with high inertial loads are used, we can produce a welded steel machine base. Normally, safety covers made out of clear polycarbonate panels and safety doors with interlocks are integrated as well.

### 2.2 Screwdriver Spindles

Our reliable Screwdriver Spindles are the main components used in most screwdriving stations. The spindles have a torque range from 0.02 Nm (3 in.oz ) to 500 Nm (4425 in.lbs) and are available in many different designs. As required, we use our programmable, flexible, and brushless EC-spindles or our fast and low cost pneumatic spindles. Common to all our air-operated screwdriver spindles, is the highly accurate disengagement and shut-off clutch, with a torque accuracy of  $\pm 3\%$  per standard deviation. The torque accuracy is independent of fluctuations in air pressure and screw joint. The spindles feature push-to-start option, shut-off at pre-set torque and an integrated function control.





### 2.3 "SFM"-Screwdriving Function Module

To optimize the use of the DEPRAG Screwdriver Spindle, we use as mounting basis our "SFM"-Screwdriving Function Module.

All, for the assembly process necessary sensors and switches, are fully integrated into a SFM. Because of the modular design, which utilizes standard components, it is possible to obtain many different varieties, while using only a minimum of engineering- and manufacturing efforts.



### 2.4 Feeding

The feeding of all small parts, such as screws, nuts, pins, washers, bolts, snap-fit parts, etc., is accomplished by the use of our reliable DEPRAG feeding equipment. The parts are generally transported through calibrated feedhoses and mouth-pieces to the assembly position or presented into a pick-and-place fixture. Our feeders can be equipped with distributors, to feed components to up to six spindles. Two basic systems are available, the vibratory feeder and the sword feeder. Each of these is available in different fill-capacities. Additionally, we can provide belt hoppers for automatic refill, increasing times between refills by the operators.

For feeding of adhesive components, which can be presented on a reel, we use our tape-on-reel feeders.



### 2.5 Measuring Technology

If your process requires continuous documentation of torque or torque and angle, we offer our measuring screwdriver spindles with integrated transducer. When connected with the corresponding measuring instrument, all necessary requirements for documentation, data acquisition and statistics can be fulfilled.

## 2.6 Controllers

Standard screwdriving stations can be controlled with our specifically designed electronic logic control. If free programmable NC-axes are part of a system, we use our electronic logic control. Both controllers contain all necessary basic programming parts, as well as user portals. This way they are a standard component, reducing the cost of integration.

If additional requirements for handling, communication or programming are needed, we use a commercially available PLC. Integration with a subordinated controller or additional controls (i.e. part recognition) is standard for us. It is also possible to control the screwdriving station with your existing PLC. In this case, wiring is an I/O bus and you receive an I/O listing and

functional diagram in addition to the general documentation.

To reduce service and maintenance requirements, we generally use manifolds with plug connections and signal ready displays. For the pneumatics, we integrate valve stacks with external multi-pole connectors whenever possible. For larger units, it is possible to use decentralized valve stacks with ASI- or field-bus connectors, allowing short exhaust times and reduced cycle times. We insure the following safety requirements of the CE-guidelines are met:

- 98/37/EC: Machine guideline
- 73/23/EC: Low voltage guideline
- 89/336/EC: EMV guideline, including current changes



## 2.7 DCAM

For assembly systems requiring programmable NC-axes, which fall within a work area of 600 x 600 x 150 mm (23 x 23 x 6 in.), we use our DEPRAG-Compact-Assembly Module-DCAM. The DCAM is a pre-designed standard assembly module so there is little design involved for a specific unit. This means we can offer an exceptionally short delivery time for individual workstations, or even for conveyor-integrated stations to handle multiple factory specified assembly tasks.



## 2.8 DCAM-XS

The Micro-Assembly-System DCAM-XS fulfills all market requirements for a modern machine. It is extremely small, fast, precise and flexible.

**COMPACT** 450 x 802 x 680 mm

**PRECISE** Exact positioning  $\pm 1\mu\text{m}$

**FLEXIBLE**  
unrivalled short conversion time to a different production process or product

**FAST**  
 $V_{\text{max}} = 3,7 \text{ m/s}$   
 $a_{\text{max}} = 90 \text{ m/s}^2$   
by linear servo motors

**SIMPLE**  
easy to operate using intuitive operating guide

Screwdriving, labelling, palletising, clipping, laser inscribing, welding, testing and gluing of the smallest components – the new assembly machine can carry out numerous functions.

Many small component parts must be assembled when manufacturing a mobile phone, an electric toothbrush or a razor... the DCAM-XS can be converted in just a few minutes for various assembly steps.

The standard assembly platform is suitable for the most varied of assembly and test tasks: For production of micro-systems in the electrical industry or medical technology, for the production of micro-systems in the pharmaceutical and diagnostics industry and for the handling of the smallest connection elements; e.g. for screw assembly of mobile phones.



**Assembly in the smallest of work areas – the new DCAM-XS is a giant achievement!**

Whenever parts are so small that automatic handling is necessary



### **3. Feasibility of DEPRAG Assembly Stations**

#### **3.1 Tasks**

DEPRAG Assembly Stations handle many different applications and requirements. Possible tasks are: insertion, removal, testing, adjustment, press-fitting of small parts, feeding of small parts, bonding, press-insertion, and many other integrated parts handling requirements.

#### **3.2 Planning Parameter**

In the pre-planning of specialized assembly equipment, there are certain parameters that must be defined. Please refer to the questionnaire located on the back page of this brochure, which will guide you in providing the information we need to do a feasibility study. Naturally, our specialists and project engineers are also happy to assist you define additional details. They are able to draw from a pool of past experience with standard components, allowing quick and accurate quotations.

#### **3.3 Technology Evaluation**

Our project engineers can also assist you with technical testing prior to the product design stage. We have extensive test equipment for screw joint analysis. Pre-testing, combined with our many years of experience, allows us to provide project or product layout tips before the actual design is started.

#### **3.4 Service**

Once the assembly station order is received, we support our customers by offering a complete customer service package. The integration of customer specifications, acceptance at DEPRAG before delivery, or even integration into your production line by DEPRAG can be considered part of the order. If it becomes necessary during the years to perform maintenance or refitting, our experienced service technicians are readily available to help. On special demand a custom response time can be agreed upon in advance. The customer can also schedule required maintenance or service calls. Using the telephone or a remote access module, it is possible to provide faster and more effective service.

#### **3.5 Certified Planning System**

DEPRAG is ISO 9001 certified. This applies not only to manufacturing, but also to all aspects of the project, including customer consultation, quoting, design, and testing.

### **4. Design Executions of the DEPRAG Screwdriving and Assembly Stations**

#### **4.1 Adapted Automation**

Depending on the assembly requirement, we offer several degrees of automation. This allows you to buy exactly what you need to do the job. Please take a minute to look at the design examples and pictures included in this brochure.

#### **4.2 Manual Workstation**

One or more screwdriver spindles are mounted in a pair of support plates and attached to a 2-column stand. A hand lever accomplishes the spindle stroke and part presentation is done by hand.

#### **4.3 Hand-Guided Multi Spindle Unit**

Multiple screwdriver spindles are mounted separately in a pair of support plates and suspended from a balancer or supported by a pneumatic cylinder. They are positioned over the part by hand.

#### **4.4 Screwdriving Station with "SFM" Screwdriving Function Module**

These stations are similar to the manual workstation, except that the support plate is replaced with a "SFM" (see paragraph 2.3 for a description of a "SFM"). This allows greater process control and the option of automatic screwfeeding. It is possible to combine several "SFM's" in one assembly cell. These machines can be made to run completely automatically upon request.

#### **4.5 Multi Spindle Screwdriving Station**

If multiple screws in the same plane need to be tightened, we use a similar system or the "SFM", but the construction unit has multiple spindles. The spindles (and mouth-piece plates if equipped with feeding) are located to match the products' screw hole-pattern. This can be done with almost any number of spindles. The spring-loaded stroke compensation allows one cylinder to control the movement of all spindles. Multi Spindle Units allow the highest possible productivity, with the shortest possible cycle times. These types of units are generally controlled by a PLC.

We can also access "underfloor" (inverted) applications, utilizing additional advance- or lockout strokes.

#### 4.6 DCAM

The DCAM is a fully programmable handling system with a work area of maximum 600 x 600 x 150 mm (23 x 23 x 6 in.). Depending on the application, we offer models with 1, 2 or 3 axes and with either a stepper- or servo drive.

#### 4.7 Linear Screwdriving Robot

For larger products and multiple screw hole patterns, we use our fully programmable NC system in combination with one or more construction units. The machine consists of 1 - 4 NC linear axes, which can be mounted in different kinetic arrangements. The controller is a DEPRAG motion control.

#### 4.8 Portal Screwdriving Robot

For even larger products or work area requirement, we use a portal (gantry) structure, stepper motors, gear drives, and a suitable PLC-controller.

#### 4.9 Other Assembly Stations

Our experience in design and construction of screwdriving stations can often be applied to other assembly requirements. We continually design and manufacture innovative assembly equipment, such as indexing machines or even transport machines without screwdriving.

### 5. Advantages of DEPRAG Assembly Stations in Manufacturing

#### 5.1 Efficiency

Mechanization and automation is the most efficient solution to accomplish tasks such as screw insertion, due to reduced handling and continuous operation.

#### 5.2 Quality Assurance

Automatic assembly assures quality through integrated testing sequences: screw presence control, screwdriver start, screw depth, screwdriver stop, torque, angle, insertion depth, analog distance measurement, optical surveillance system and much more. Unrecognized errors are practically impossible. The cycle process can be continually documented and recorded.

#### 5.3 Flexibility

Although a human being possesses the highest degree of flexibility, DEPRAG assembly stations are designed to respond to production needs and product mix. Optional control of individual screwdrivers, automatic or manual refitting of different sensors, the use of readily available standard components for everything from hand held units up to the free programmable screwdriving robot, are all examples of this flexibility.

#### 5.4 Human Factor

Often, hand held assembly stations are fatiguing to the operator, creating an uncomfortable and potentially harmful environment. This situation can be eliminated by automation. Additionally, some products cannot be assembled by hand because of their small size. Here, an automatic unit surpasses the human factor in the assembly area.

#### 5.5 Convenience

Our expertise in building durable spindles, feeders, and fully developed systems combined with our extensive experience in producing equipment for a wide variety of applications makes DEPRAG Assembly Stations both useful and reliable. Since all manufacturing is done in-house, spare parts are readily available, should a breakdown occur.

**Expect everything from one source – DEPRAG!**

## Examples:

### Manual Workstation

**Picture 4.2.1** Assembly of bicycle sprockets with Minimat-Spindle and Reduction Gear mounted into Lever-Operated Screwdriver Stand.



4.2.1

**Picture 4.2.2** Partially automated manual assembly with cycle supervision

DEPRAG Assembly-System, designed as a 2-Operator manual Workstation for the manual assembly of a PC-board into a housing – to take place either on one or two workstations – including an integrated test-unit, which controls torque, angle, part-fixture and assembly status. This station is part of a comprehensive, conveyor-integrated assembly line, where the pallet is transported from station to station.

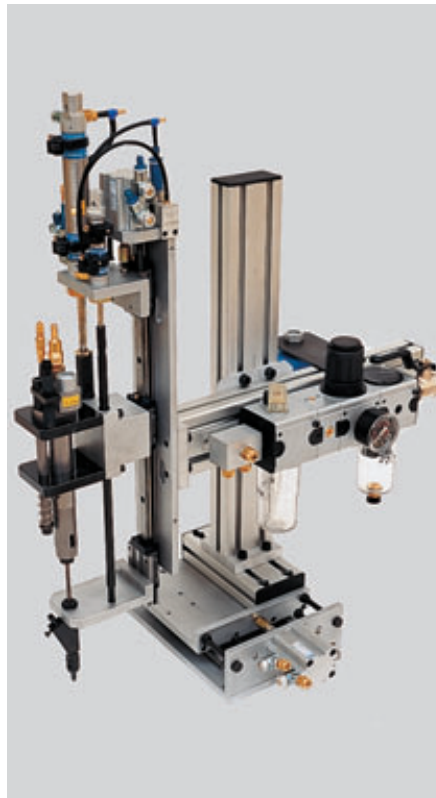


4.2.2





4.3



4.4.1

**Hand-Guided Multi-Spindle Screwdriving Stations**

**Picture 4.3** Hand-Guided 9-Spindle Unit for the assembly of oilpans for diesel engines. Attached to a pneumatic cylinder. Stroke and start by lever on handle.

**Screwdriving Stations with "SFM" Screwdriving Function Module**

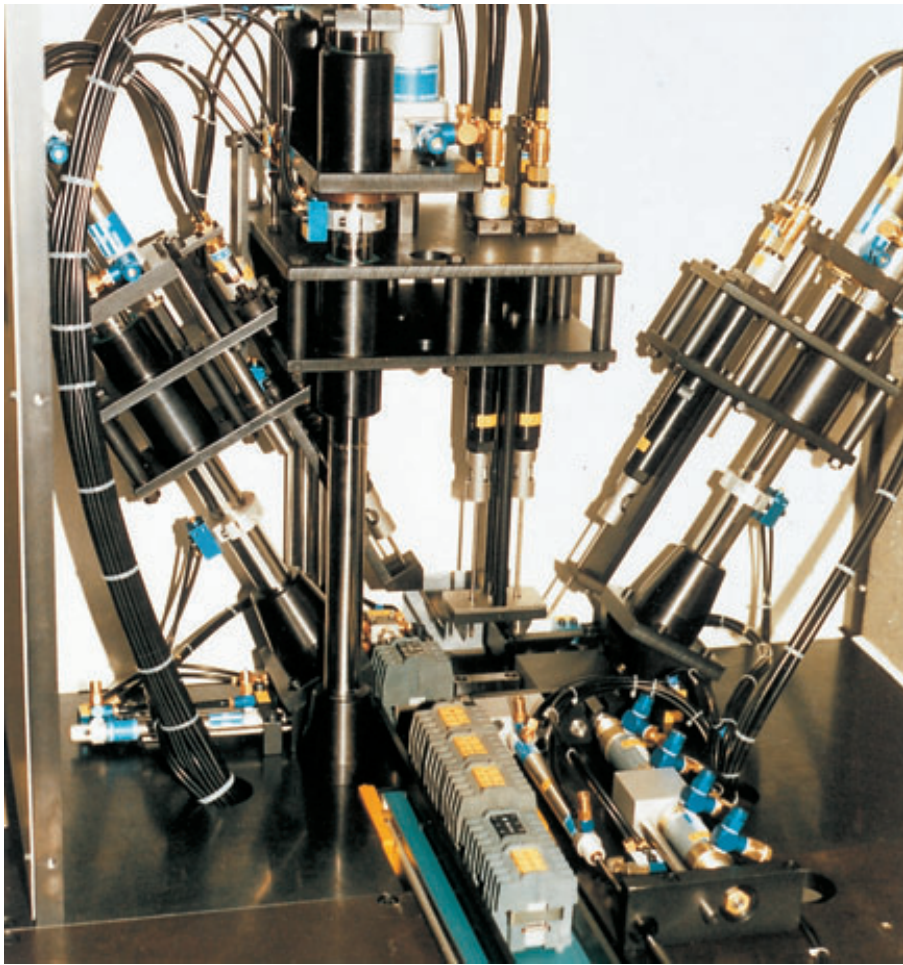
**Picture 4.4.1** Single Spindle SFM in standard execution mounted on adjustable Profile-Aluminium Stand.

This stand allows fast and easy adjustment in X-Y and Z-axis. In addition, the complete unit is mounted to a horizontal slide to allow access to a 2nd screw-position.



4.4.2

**Picture 4.4.2** Turnkey Assembly Cell for the simultaneous, automatic and inverted tightening of 4 screws into a motor- and pump housing.



4.5.1

### Multi-Spindle Screwdriving Stations

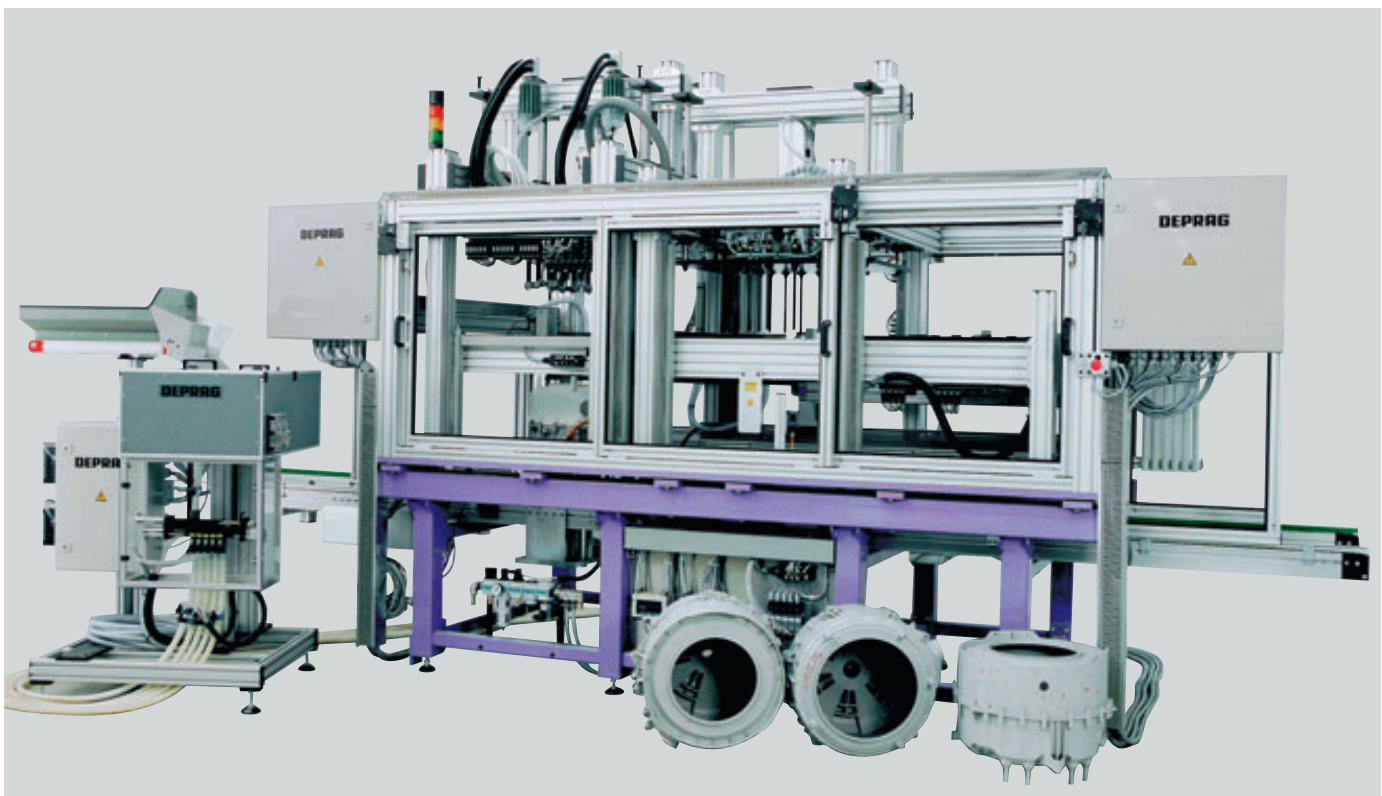
**Picture 4.5.1** 4-Spindle Unit for the dis-assembly of contact screws on electric switches after final control.

Six parts with different height, two different hole pattern and one or two rows of screws are brought to this station and individually indexed. The two slanted drivers are automatically activated for two-row switches. The two vertical drivers are pneumatically adjusted to the required switch-height and the corresponding hole-pattern. After the disassembly, the switches are sorted by size and forwarded to the end-user with easy to connect loose screws. Cycle time: approximately 4 seconds with maximum 16 screws.

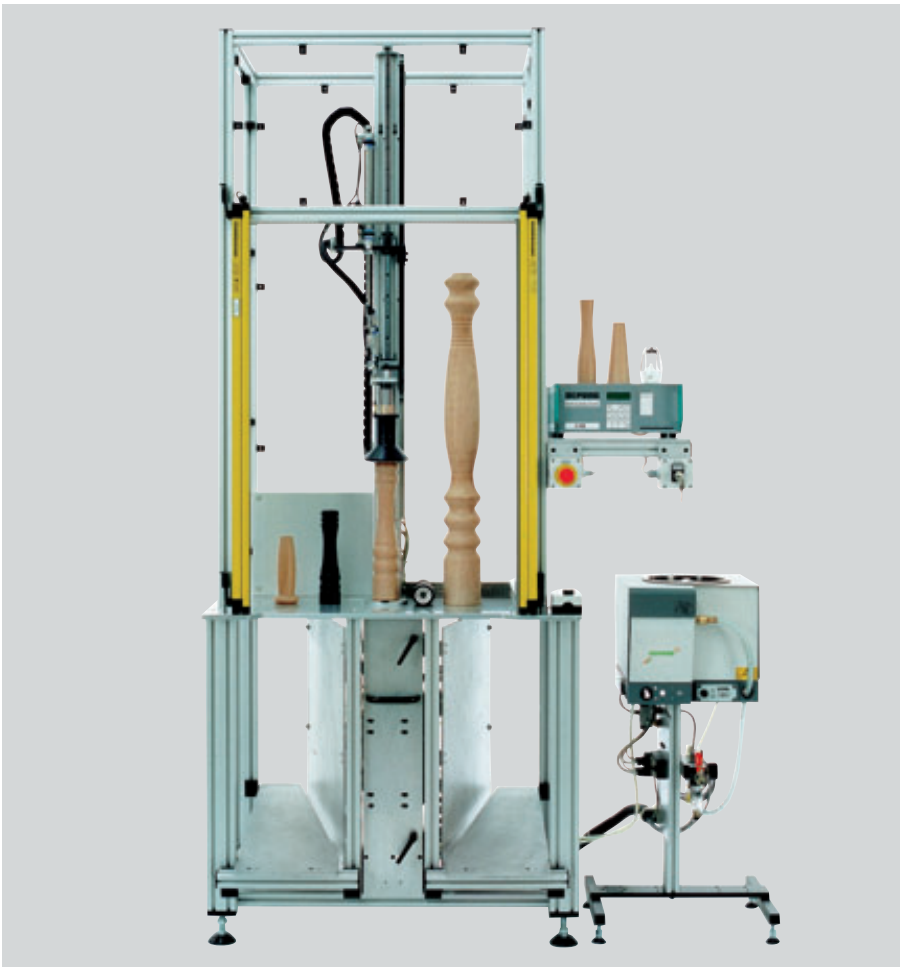
**Picture 4.5.2** Conveyor-Integrated Multi-Spindle Screwdriving Station.

16-spindle unit for the assembly of plastic drums for a clothes washer.

Sixteen screws are fed into a positioning-mask and inserted into the screw location by magnetic push rods. Then all sixteen screws are simultaneously driven to the specified torque value.



4.5.2  
10



4.5.3

**Picture 4.5.3** Hand-Loaded 2-Spindle-Unit

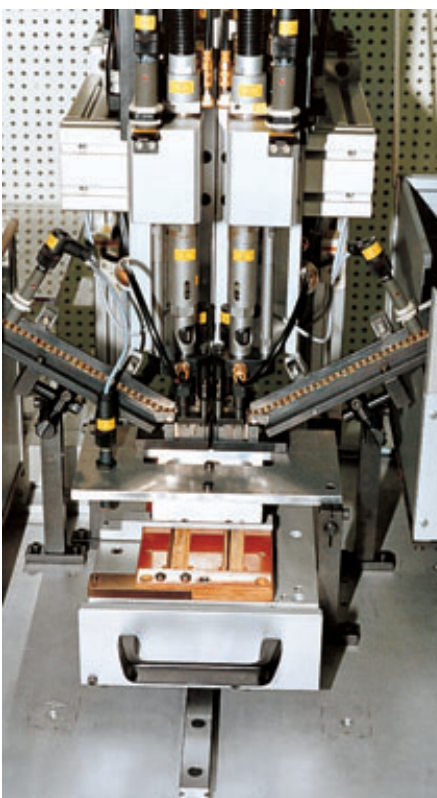
2-spindle inverted screwdriving station for the assembly of salt- and pepper grinders. The grinding element of the salt or pepper grinder is manually inserted into a locating fixture and the grinder housing is hand loaded on top of it.

A pneumatic hold-down compresses the parts during the inverted screw assembly. The fixture can be manually adjusted to accommodate different grinder housings. A light curtain assures operator safety during hold-down operation.

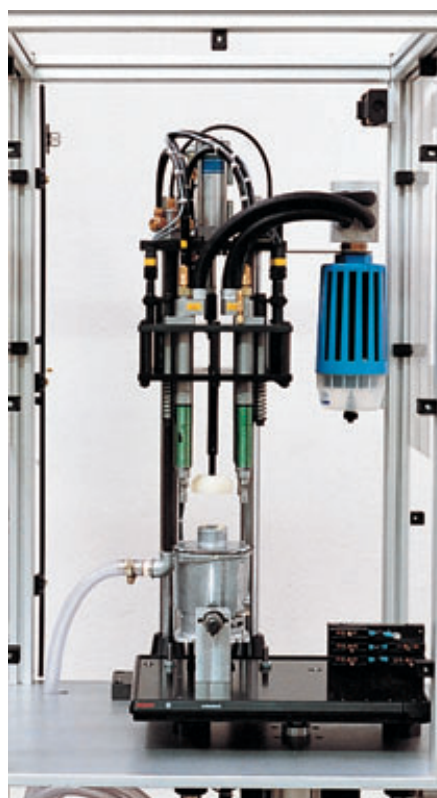
The controller is a DEPRAG C-48 PLC.

**Picture 4.5.4** 2-Spindle Assembly Unit for the assembly of different long terminal strips with clamping screws and captive square washer.

The screws are fed out of two vibratory bowls, over two slanted rails into two pick-and-place nests. The pick-slide moves underneath the spindles to correctly position the screws for pick-up, then captures them by vacuum suction and subsequently screws are assembled to correct torque and depth. A special program allows furthermore the assembly of terminal strips with different length. The corresponding length of the terminal strip is automatically scanned and does not require a program change.



4.5.4



4.5.5

**Picture 4.5.5** Conveyor integrated 4-Spindle Assembly Unit with DEPRAG SENSOMAT spindles for the assembly of appliance plastic-housings.

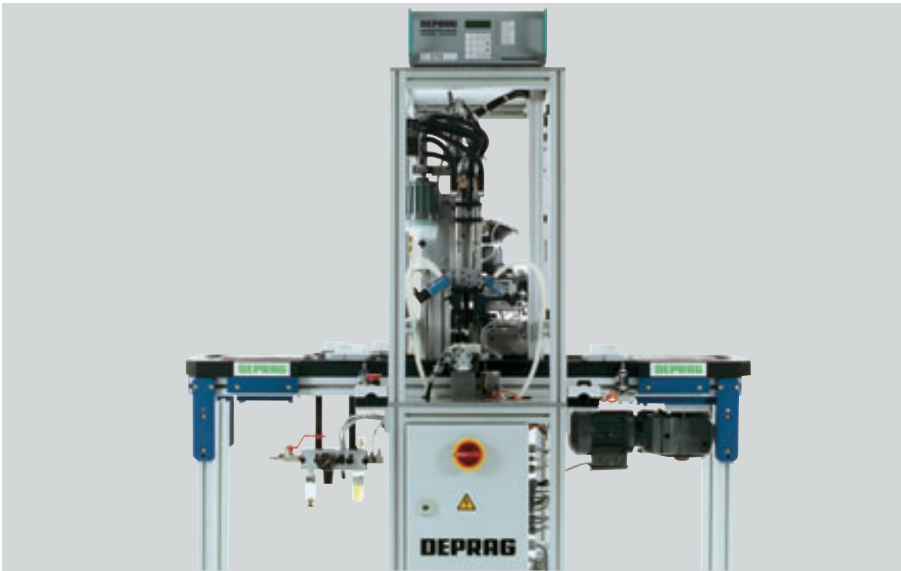
The problem with this application is the already pre-started screws, which require a critical seating torque close to the driving torque. This problem was solved by the use of the SENSOMAT spindle, which drives the screws at full motor power. Shortly before seating of screw, the accurate clutch is released and shuts-off exactly at the preset torque.



4.5.6

**Picture 4.5.6** 2-Spindle Test Station for operational testing of contactors and dis-assembly to a certain height.

Two screws are simultaneously assembled to preset depth. If depth is O.K., the driver reverses and the threads, during reverse, are counted. The contactors are completed with the clamping screws at exact height. Cycle time for 2 screws: 1.8 seconds.

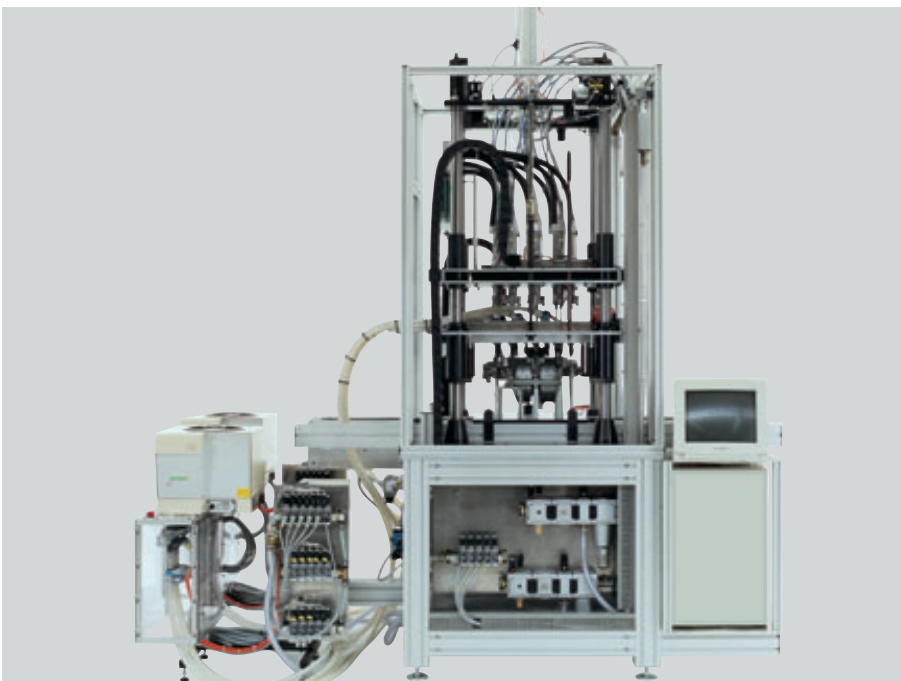


4.5.7

**Picture 4.5.7** Conveyor integrated 3-Spindle Screwdriving Station with automatic screwfeeding and controller C 72.

Assembly of measuring-tape housing with 3 screws.

This station is extremely compact and needs a base-area of only 700 x 430 mm (27<sup>1</sup>/<sub>2</sub> x 16<sup>15</sup>/<sub>16</sub> in.)

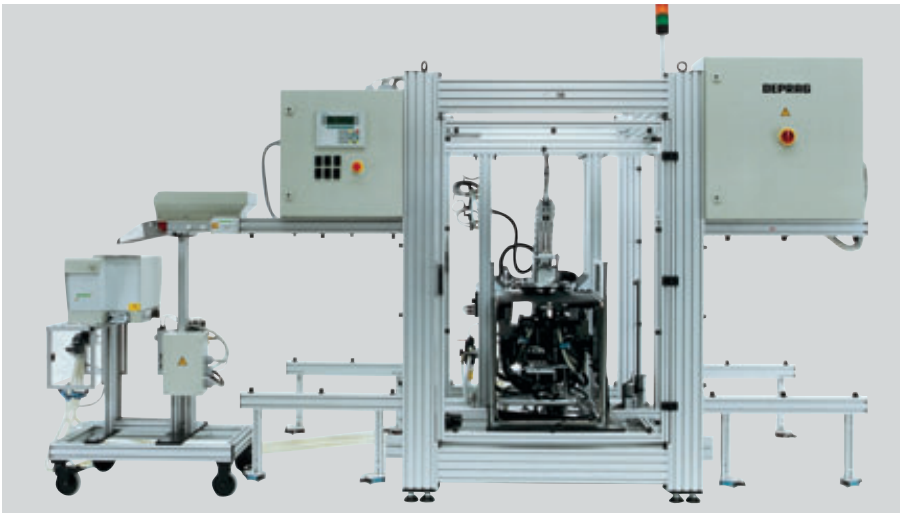


4.5.8

**Picture 4.5.8** Conveyor integrated 9-Spindle Screwdriving Station for the assembly of suction module.

This station is equipped with Piezo Spindles for the continued torque- and angle control, as well as screwfeeding machines with multi-distributors.

The torque-results are displayed on the color monitor of the integrated PC and are simultaneously printed on the central printer, which is connected to a network.



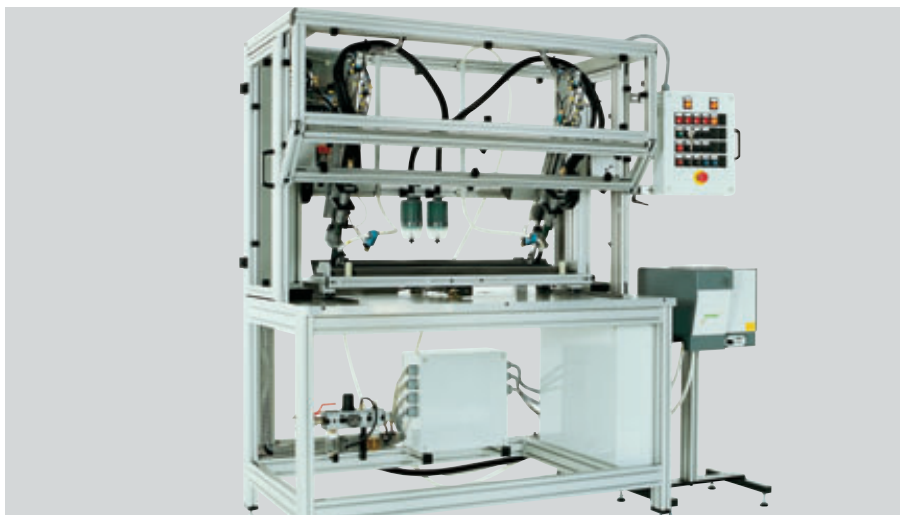
4.5.9

**Picture 4.5.9** Conveyor integrated 4-Spindle inverted (underfloor) Screwdriving Station for the assembly of a dishwasher output shaft.

The screws are fed to the screwdrivers by a mobile screwfeeder with integrated belt-driven hopper.

The palletized housing parts are assembled after they are lifted, positioned into a holding fixture and located with downholders.

The pallets are coded accordingly.



4.5.10

**Picture 4.5.10** 2-Spindle Screwdriving Station with automatic feeding for the assembly of an automotive rear-window shelf, using SENSOMAT Spindles.

The rear-window shelf is loaded into a parts fixture and pneumatically located.

The shelf-hinges are manually loaded and their correct positioning is tested prior to assembly.

To allow an ergonomic loading of the parts, the parts fixture is integrated into a slide-table.



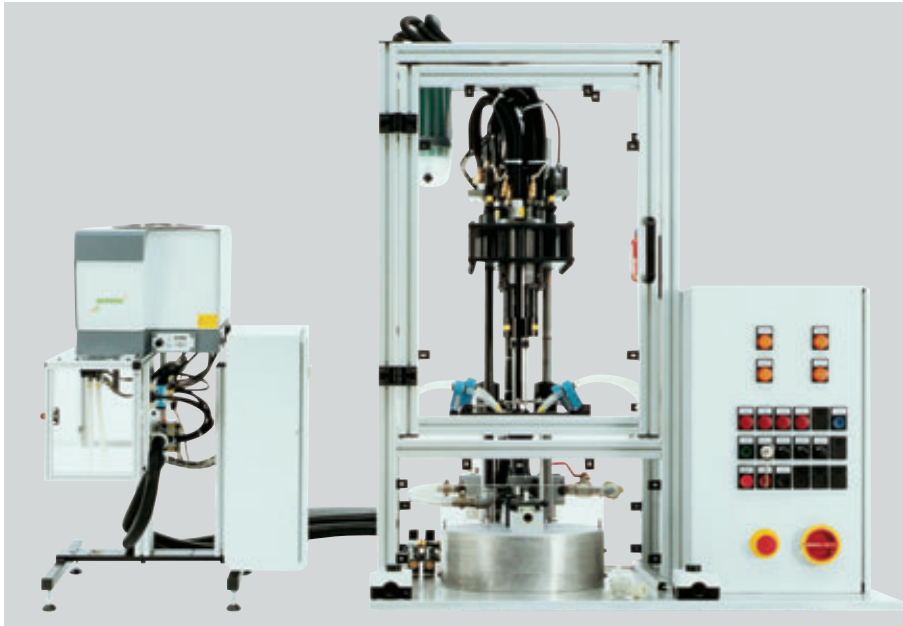
4.5.11

**Picture 4.5.11** Conveyor integrated 4-Spindle Screwdriving Station with automatic feeding for the assembly of an instrument panel. Because of the varying height of screw-positions, the spindles are mounted to several screwdriver-plates.

Since the unit is being operated in the south of Europe, the control box is air-conditioned.

The palletized housing parts are assembled after they are lifted, positioned into a holding fixture and located with downholders.

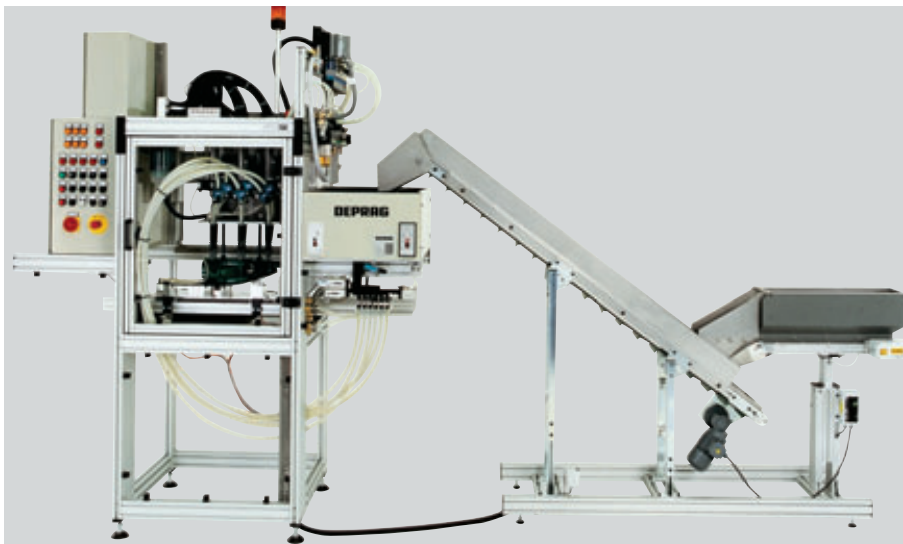
This station is extremely compact because of the feeder and display panel being mounted right next to the screwdriving station. Furthermore, the control box utilizes the available space underneath the conveyor.



4.5.12

**Picture 4.5.12** 4-Spindle Screwdriving Station, vertical, with automatic feeding for the assembly of cloth-washer valves.

The parts are loaded by hand into the part fixture located on an indexing table. The 2-hand safety start-buttons activate the indexing table, move the parts to the screwdriving station and assemble 4 screws. The operator unloads the completed part and reloads a new part. Because of a very tight hole-pattern, Screwdriver Spindles with Offset-Gears are used. The Screwfeeder is mounted on a floor-stand and located behind the screwdriving station.



4.5.13

**Picture 4.5.13** Conveyor integrated 6-Spindle Screwdriving Station, with automatic feeding.

This 6-Spindle Screwdriving Station assembles vacuum cleaner housings. The 60 mm long screws are loaded by a belt-driven hopper with elevator-belt into the screwfeeder. The separator and a six-fold distributor blast the screws into the mouthpieces. Because of the extreme length of the screws and the recessed screw-positions, extra long driver- and mouthpiece strokes are needed. To monitor the torque of the screwdriver spindles, Piezo Spindles with inline torque sensing are used. The cycle time is 10 seconds.



## DCAM

**Picture 4.6** Hand-Loaded DCAM  
– DEPRAG Compact Assembly Module

Loading cell phone display components, including speaker and view-screen, into a DEPRAG 2-axis DCAM. The components (frame, speaker and view-screen) are hand-loaded by the operator into a parts fixture. A vacuum gripper removes the components from the part fixture and attaches them onto a self-adhesive tape. Subsequently, the tape is processed and correctly positioned by a DEPRAG tape-on reel feeder.

4.6



4.7.1

### Linear Screwdriving Robot

**Picture 4.7.1** 4-Spindle-X-Y-Z Screwdriving Robot with 2-Position Tilt-Feature.

Assembles four different razors, which require two different access angles. The linear axis system is arranged in a C-frame around the conveyor system and because of the highly dynamic operational demands, the frame is made from a solid steel-welded construction.

At the inlet position of the assembly system, the MC-Controller recognizes the particular razor needing to be assembled on the WT-coding.

All necessary process parameters are submitted through a serial communication.



4.7.2

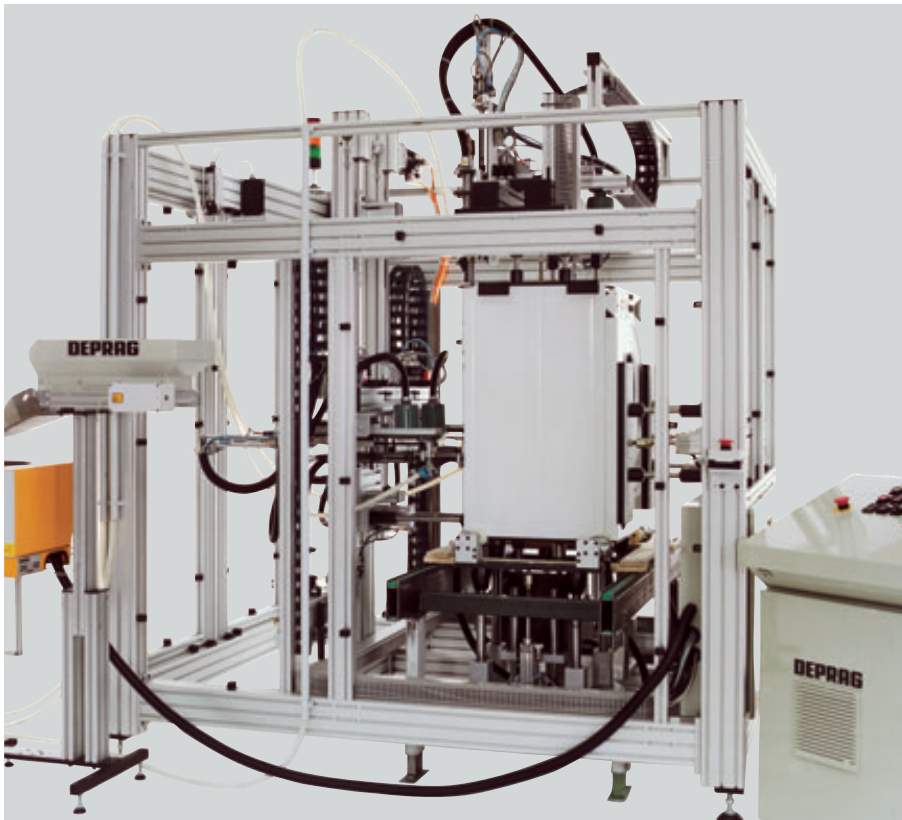
**Picture 4.7.2** 1-Spindle-X-Y-Z Screwdriving Robot with Bit Quick-Change Feature.

Because of the numerous torque requirements in connection with different screw-head drives, we use a DEPRAG EC-Electric Screwdriver Spindle with a Quick-Change feature for the bit. The unit processes seven different screws, which are fed from seven individual feeders through a combo-distributor to a central feedhose.

The processing data (torque, angle, screw depth) is continually acquired and stored in the screwdriving controller.

The screwdriving system is designed to process a total of 31 different parts.





### Gantry Screwdriving Cell

**Picture 4.8.1** Robotic Cell for integration into an automatic assembly line, featuring two free programmable axes and automatic feeding for the assembly of cloth-washer housing.

The housings are correctly positioned and located by a lift-/locate-, positioning- and alignment station.

For the vertical assembly, one free-programmable x- and y-axis single-spindle unit indexes into 2-positions. For the horizontal assembly, one free-programmable z-axis double-spindle unit indexes into one position.

We assemble FDS-screws, which are fed from a screwfeeder equipped with a belt-driven hopper.

4.8.1



**Picture 4.8.2** For larger work areas (up to 2 m x 1.5 m / 6.6 ft. x 4.9 ft) and for the integration of several Screwdriving Units. These Screwdriving Cells can be used as individual workstations or for integration into linear transfer systems.

4.8.2



4.9.1

## Assembly Systems

**Picture 4.9.1** Tooling Station for Riveter, with 13 feed-systems of 9 different bolts, as well as 4 special components. The highly reliable feedsystem design meets the requirement for total availability and short cycle times.



4.9.2

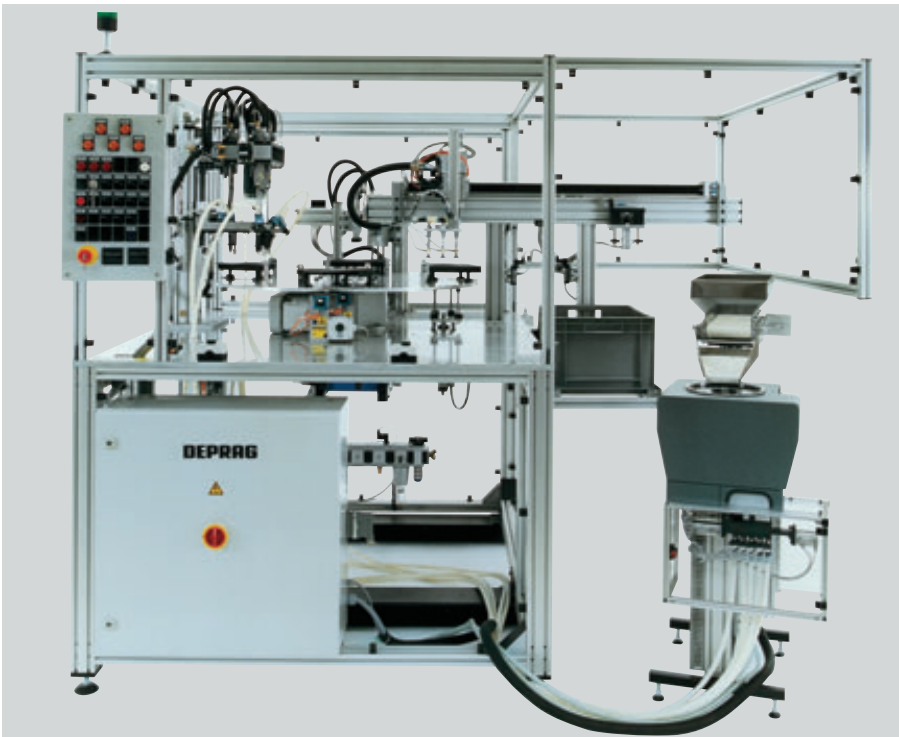
**Bild 4.9.2** 2-Spindle X-Y-Z Screwdriving Station using a Cartesian robotic design.

The unit assembles 39 screws, using the same fastener – but two different torque values – into automotive control panels. Because of the geometry of the panel, each SFM Screwdriving Function Module is equipped with a split-jaw swivel device.

The base panel is inserted into the part fixture by hand, several switch and control elements are attached to the panel and then the Operator places a template over the parts. This template combines three functions:

1. part presence sensor
2. positioning and fine-adjustment
3. guidance for the screws

Any NOT O.K. assembly is displayed using red LED's, which are arranged in accordance to the actual panel and screw-locations, on a display panel.



4.9.3

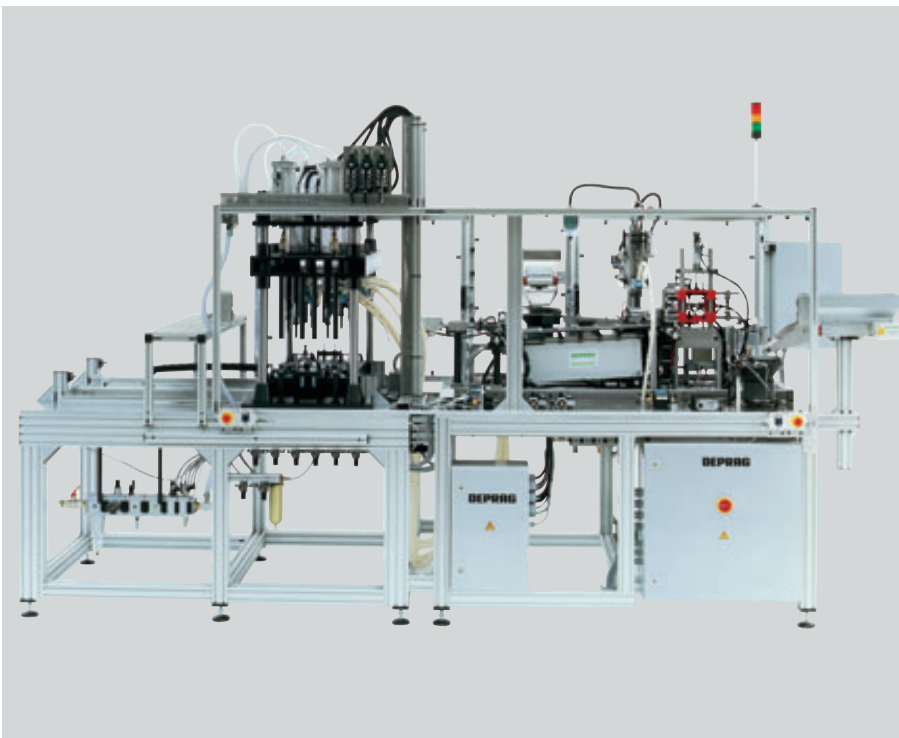
**Picture 4.9.3** Assembly Station with 4-position indexing table and screwfeeder with a five-fold distributor.

A robot removes a control-box cover from the injection-molding machine and loads the cover into the part fixture on the 1<sup>st</sup> position of the indexing table. The cover's correct position is then verified.

At the 2<sup>nd</sup> position of the indexing table, five screws are assembled to correct torque and depth.

At the 3<sup>rd</sup> station of the indexing table, a molding neck is removed by a DEPRAG plier.

At the 4<sup>th</sup> station of the indexing table, the parts are removed by a vacuum suction-device and positioned by a linear axis onto the conveyor belt. If part is not o.k. the cover is dropped into a rework container.



4.9.4

**Picture 4.9.4** Assembly Station for the insertion of a screw/sleeve combination into a plastic cover.

This station consists of two parts:

The first step consists of feeding and driving the screws into the sleeves (cycle time = 1 second). The sleeves are then loaded by a moving-device into an 8-rail storage buffer.

The second step consists of feeding eight sleeves with screws to press-spindles, where they are pressed-in and their bottom depth is verified.

A robot loads and unloads the plastic parts to and from a slide table.

Total cycle time is 8 seconds.

# Projection of Screwdriving Stations

Company:	Date:
Designer:	Part Description:
Phone:	(Samples/Drawings!)
Fax:	Project name (if any):

## Hole Pattern:

Number and position of screw holes (sketch):

Interference on part:

For automatic Feeding:

Screws, Nuts (Samples, Drawings)

Head Diameter: ( ) mm or ( ) in.

Head Height: ( ) mm or ( ) in.

Head Form:

Cap Screw ( ), countersunk ( )

Pan Head ( ),

Shaft Diameter: ( ) mm or ( ) in.

Shaft Length: ( ) mm or ( ) in.

## Requirements:

Torque: ( ) Nm or ( ) in.lbs

Assembly +

Transport Time: ( ) seconds

Driving Time: ( ) seconds

Total Cycle Time is Assembly-, + Transport,  
+ Driving Time

Sketch:

## Measuring Electronic:

for Torque documentation: ( )

For Torque/Angle documentation: ( )

## Controls:

without magnetic valves and

without I/O Bus ( )

with magnetic valves and wired

to I/O Bus ( )

with DEPRAG Components

and Controller ( )

with PLC and programming ( )

Display/Switch Panel integrated ( )

Display/Switch Panel separate ( )

## Service:

with remote access module

Order Volume:	Stand-Alone Unit	for Conveyor/ Rotary Table integration
Screwfeeding	( )	( )
Mounting Structure	( )	( )
Safety Cover	( )	( )
Part Fixture	( )	( )
Slide Table	( )	( )
Slide Table Stop		( )
Lift Station		( )
Marking System		( )
Special Requirements (heavy execution)	yes	no
Pneumatic	( )	( )
Electric	( )	( )
PLC	( )	( )
Installation at customers facility by DEPRAG	( )	( )

# DEPRAG DEPRAG

## DEPRAG INC.

P.O. Box 1554 · Lewisville, Texas 75067 - 1554  
640 Hembry Street · Lewisville, Texas 75057 - 4726  
Phone (972) 221 - 8731 · FAX (972) 221 - 8163  
TOLL FREE (800) 4 DEPRAG  
www.deprag.com  
deprag@depragusa.com

## DEPRAG SCHULZ GMBH u. CO.

P.O. Box 1352, D-92203 Amberg, Germany  
Kurfürstenring 12-18, D-92224 Amberg  
Phone (096 21) 371-0, Fax (096 21) 371-120  
www.deprag.com  
info@deprag.de



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