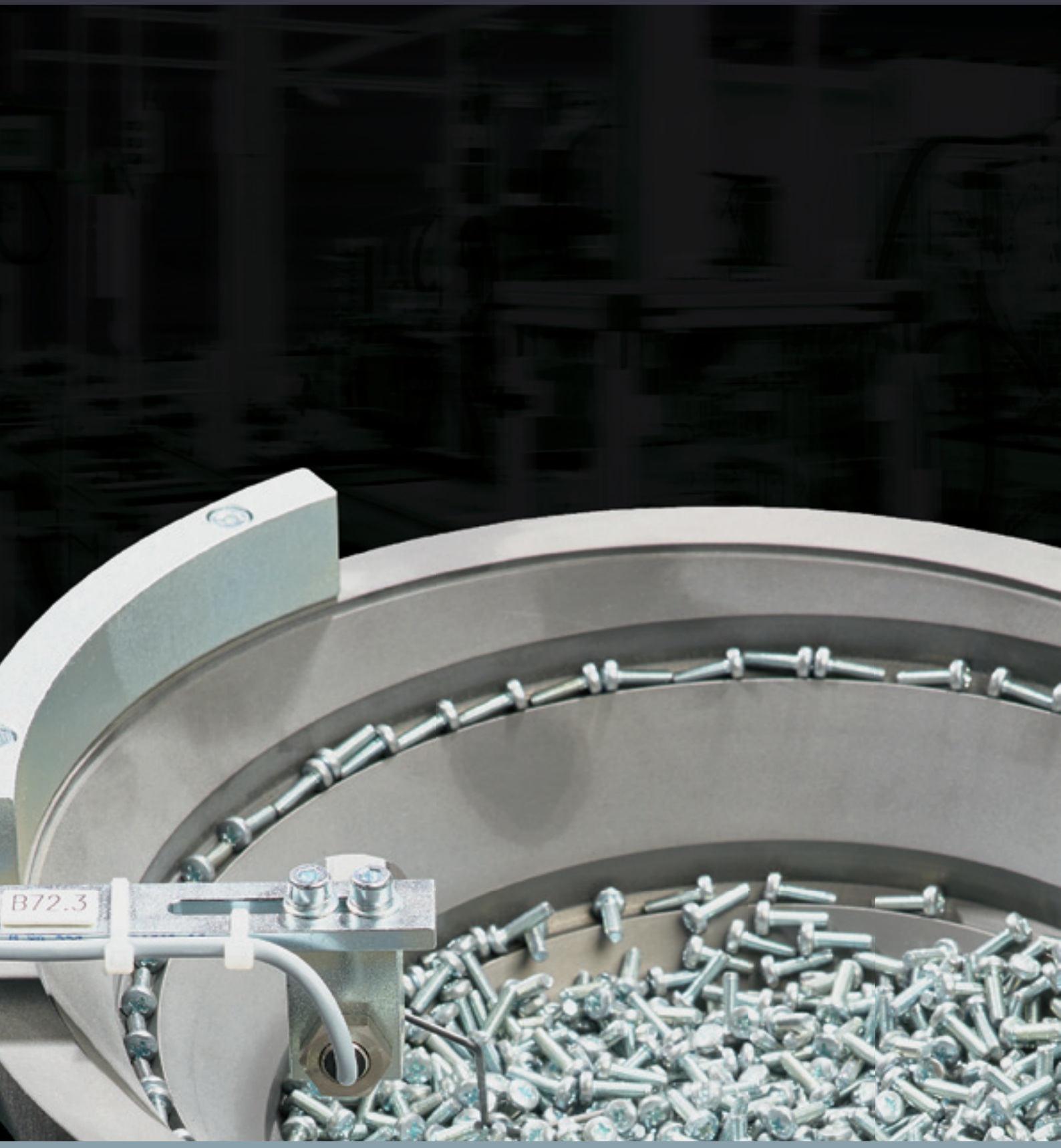
INTELLIGENT
EFFICIENT
FEEDING

DEPRAG

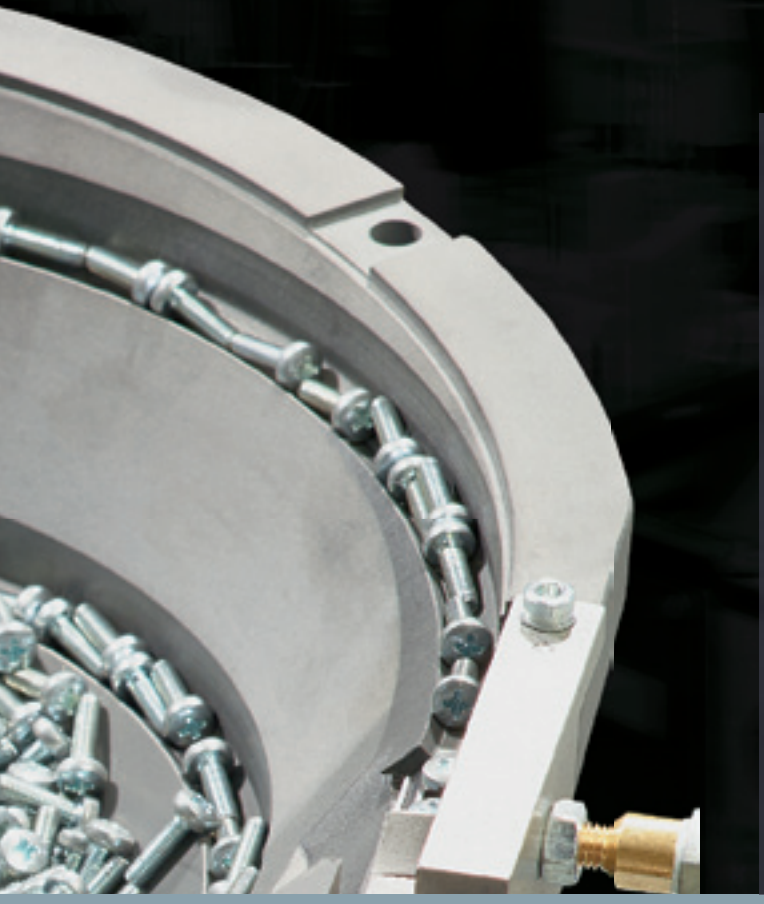
FEEDING TECHNOLOGIES

DEPRAG

Experts in Feeding Technology



- More than 40 years of experience
- More than 35,000 feeders produced
- Worldwide availability
- One single source
- Quality
- Industry 4.0 compatible
- Technical cleanliness
- Modular design



The perfect solution for your application:

Vibratory bowl feeder
Sword feeders
Linear conveyors
Pick-and-Place devices
Tape-on-reel feeders
Screw presenters
Storage devices
Press-insertion systems
Individual solutions

Worldwide Availability

We have a network of exclusive partners in every essential industrial country of the world and are always close at hand for our globally operating clients. Our customers benefit from the entire technical knowledge of our experts in addition to the regional experience of our local representatives. Solutions are successfully developed and then quickly and reliably passed on through our worldwide production locations.

International availability and service guaranteed!

DEPRAG Inc., USA

DEPRAG headquarters in Germany

DEPRAG CZ a.s., Czech Republic

DEPRAG Assembly Technologies Co., Ltd., China

- DEPRAG headquarters in Germany
- DEPRAG subsidiaries
- DEPRAG sales partners

One Single Source

Your end-to-end solution: application consultancy, operator training, fully developed system components, screwdrivers, feeders, controllers and process monitoring. All components are designed to be compatible with each other and have been tried and tested over many years.

In-house developed and manufactured!

Quality

More than 40 years of experience in the design and manufacturing of feeding machines. The certified standards of our production sites guarantee consistently high quality.

More than 35,000 devices produced!

Ready for immediate use

Before delivery, your feeder undergoes a continuous test in a simulation of series production, replicating your production cycle. Each device endures comprehensive testing – 100%.

Outstanding reliability and efficiency

- High feed rate
- Even complex components are correctly oriented
- Option for two screwdrivers or multi-spindles in one device
- Storage systems, such as hoppers, increase refill intervals

Production and choice of materials

The high level of vertical integration, the use of specially hardened, wear-resistant materials, as well as specific coating methods, ensure the outstanding quality and reliability of our products.

Industry 4.0 Compatible

We fulfill your requirements for intelligent integrated components with the innovative controller PFCi100; this allows remote control, documentation, and interaction with the DEPRAG feeding machines. Your device can be monitored and controlled at any time, from anywhere in the World.

Feeding 4.0

Operating platform DPU

The DPU (DEPRAG Processing Unit) is exceptionally user-friendly. Settings can be performed on the touchscreen by using the provided slide-bars.

PFCi100 integrated functions

- External master IPC (e.g., DPU100) is the operating platform
- External control and communication
- Bus interface
- Parameter adjustment via IPC (DPU100)
- Communication via TCP/IP
- Programming via an integrated web browser

DPU setting options

- Frequency
- Amplitude
- Acceleration-rate
- Soft-start
- Waveform

Technical Cleanliness

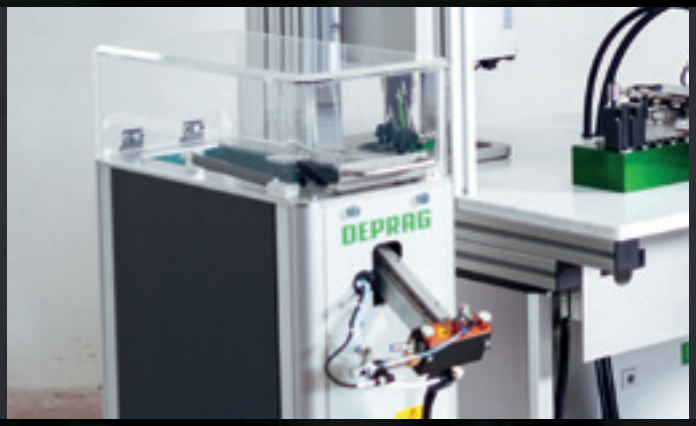
The DEPRAG CleanFeed concept permeates each processing step – from screwdriver handling and the feeding process, through to screw assembly itself – avoid, reduce and remove abrasion.

The CleanFeed concept – a universal solution!

Avoid Abrasion

The aim is to avoid the creation of particle deposits when feeding the fastener and during the actual screwdriving process. For this reason, we recommend using a sword feeder over a vibratory feeder, because the sword feeder guarantees a gentle and low-wear transportation of screws.

The DEPRAG CleanFeed concept provides an all-encompassing solution.



Reduce Abrasion

If the screw is fed directly to the assembly, particle contamination cannot be ruled out. We developed the DEPRAG Particle Killer for issues such as these. This system cleans the blast-air used for feeding the screw and additionally removes left-over particles at the end-tooling where the screw is retained before actual screwdriving. Furthermore, we also offer screwdriving function modules [SFM] for underfloor [inverted] screw assembly, where gravity alone keeps dirt particles from getting to the screw location.

Remove Abrasion

Dirt particles are targeted and removed via vacuum suction. The cleaned fastener is then fed into the screwdriving module or is ready for pick-up from a pick & place device.

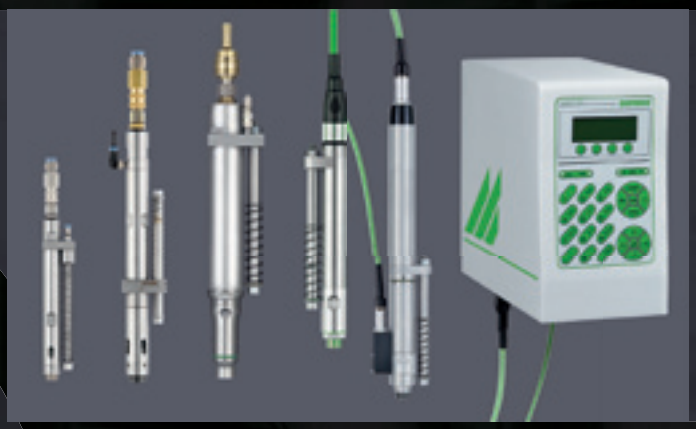
Modular Design

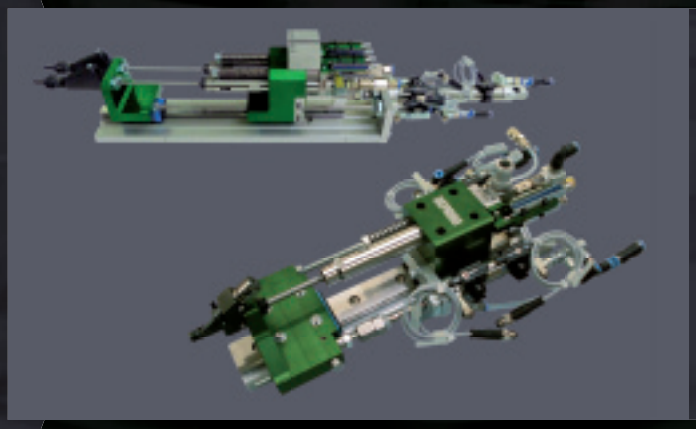
In the development of your assembly machine, we turn to components from our comprehensive, coordinated, and modular product line – resulting into a fast availability, efficiency, tried and tested functionality, and continuous improvement. Configuration over construction!

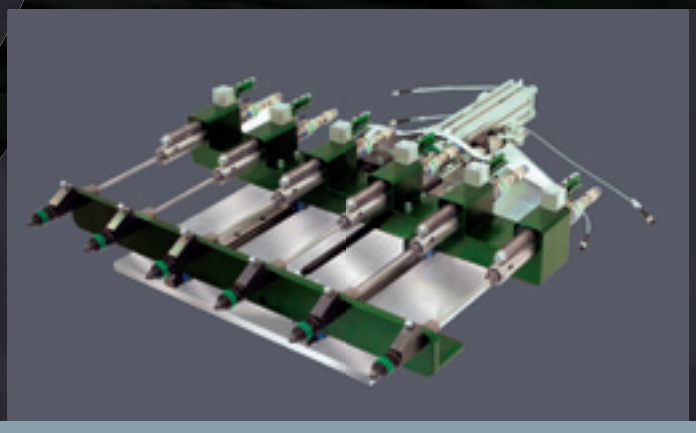
Handheld Applications

Stationary Applications

No interface issues



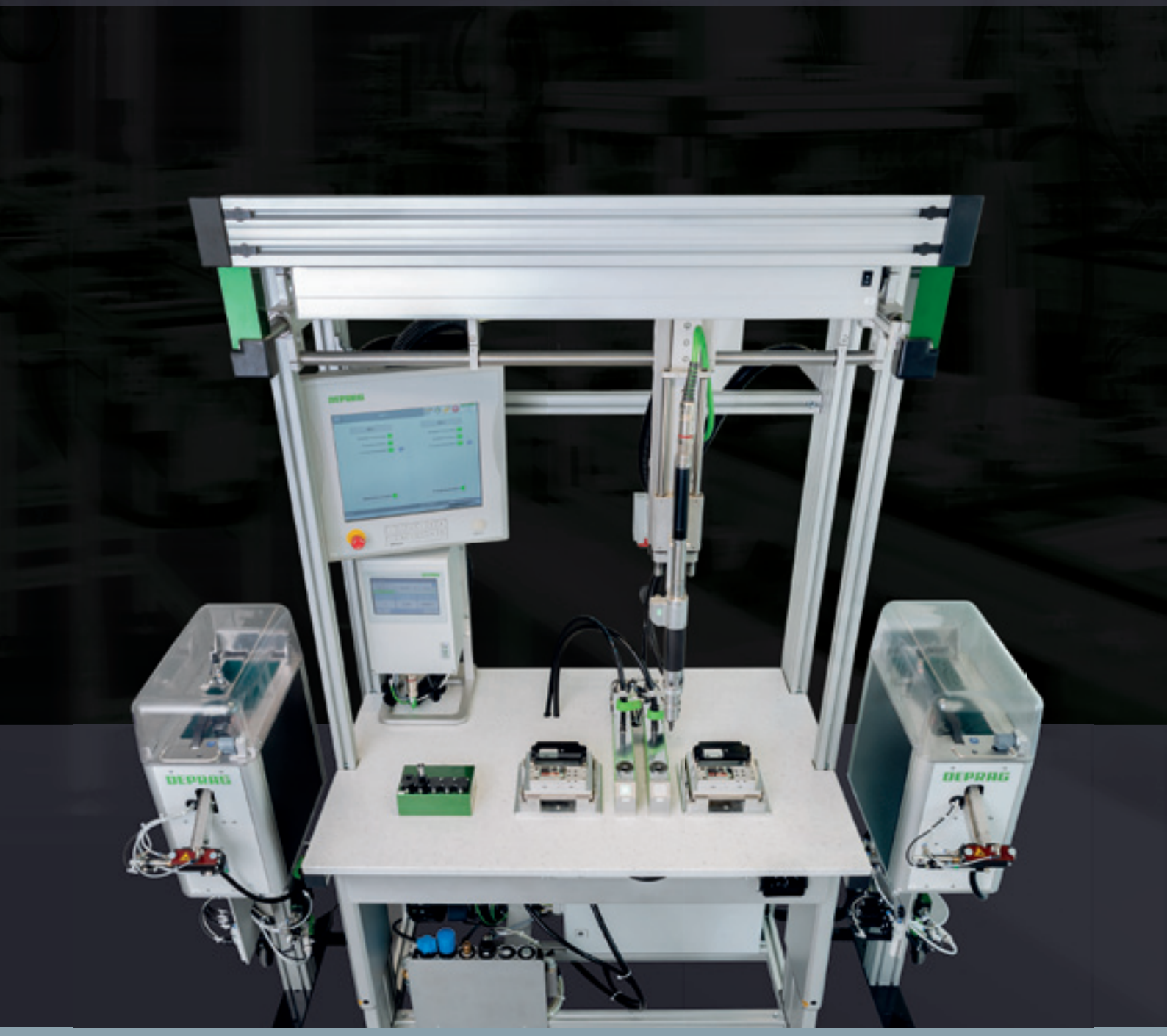




Feeding Technology for Your Manual Work Station

A comprehensive program of vibratory bowl feeders, sword (segment) feeders, and screw presenters is ready to optimize your manual assembly process. Combine these with systems for position-controlled tool guidance to increase the processing reliability of your manual work station. The DEPRAG Processing Unit (DPU) provides visualization, the Position Control Gantry allows position-controlled screw assembly, and Pick-to-Light ensures targeted fastener pick-up.

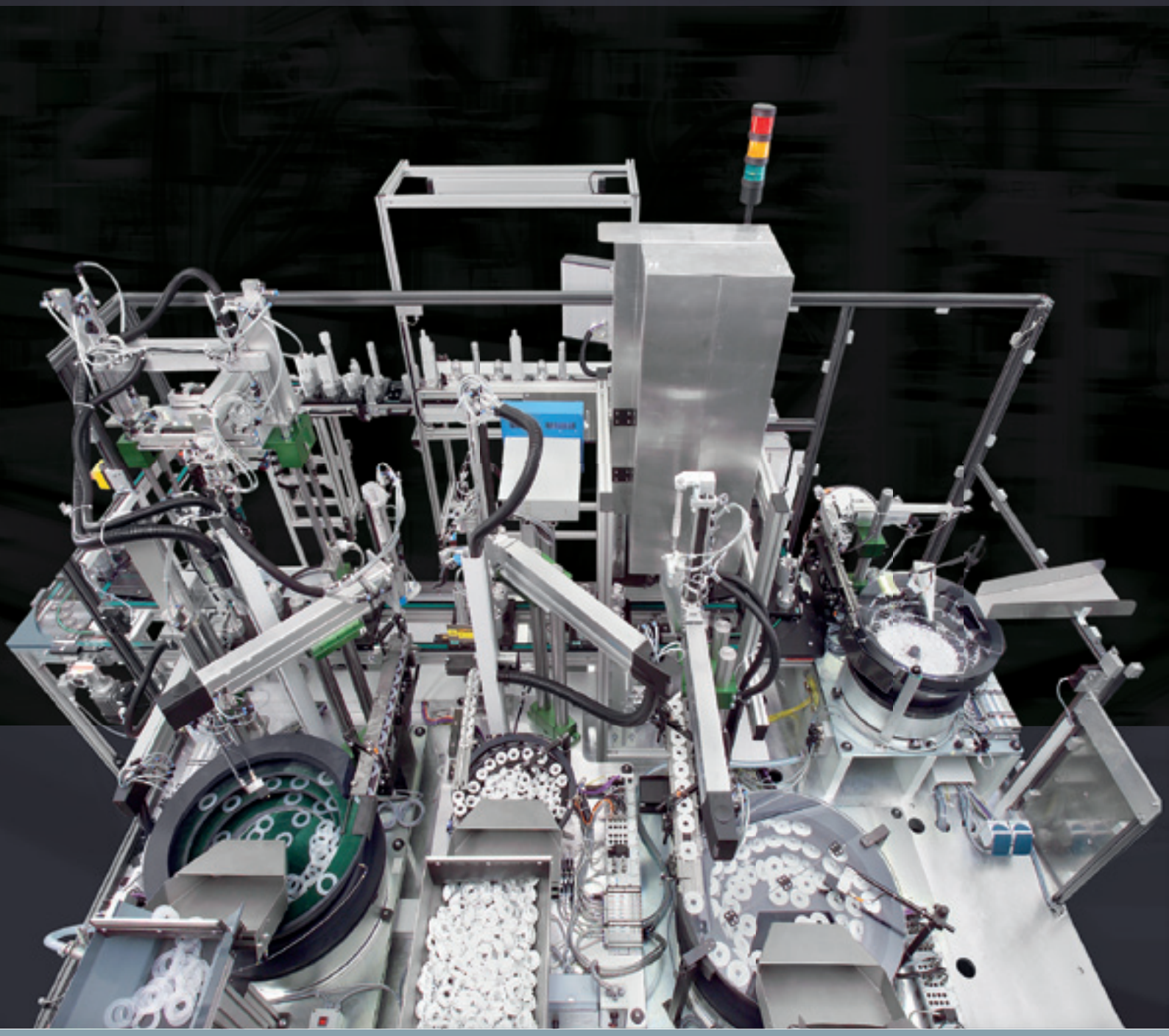
Extendable up to intelligent manual work stations!



Feeding Technology for Your Stationary Application

Our feeding systems have been designed for the reliable supply of fasteners to enable outstanding accuracy and productivity of your assembly system. Integration into your control system is particularly convenient and straightforward. Our feeder line includes vibratory bowl feeders, sword (segment) feeders, linear conveyors, storage systems, tape-on-reel feeders and screw presenters.

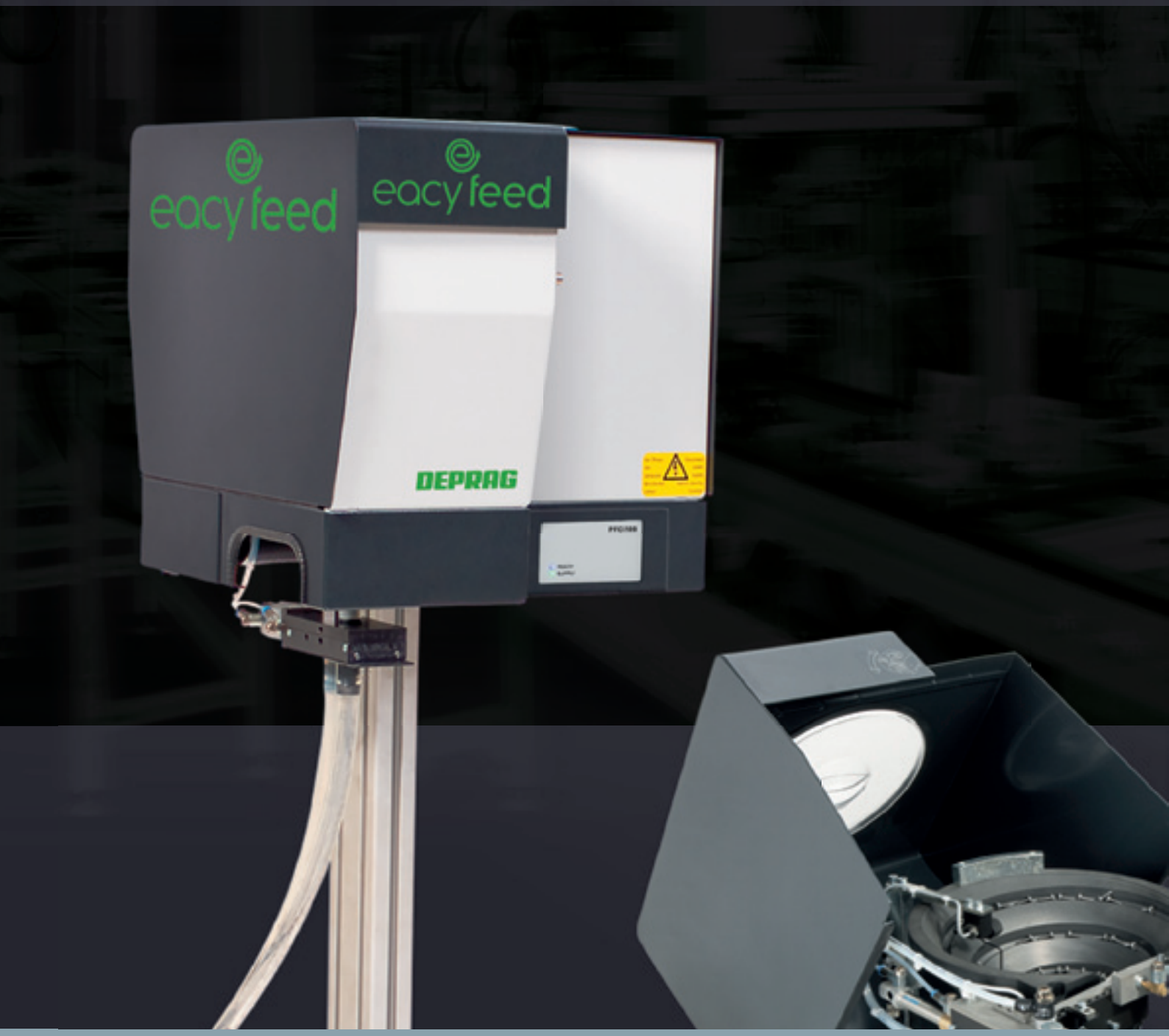
100 % reliability ► productivity + system uptime!



Vibratory Feeder – eacy feed

The vibratory feeder is our most utilized feeding device. The eacy feed system combines the ideal fundamentals for sustainable production of the future: energy, efficiency, and intelligent communication.

The new generation vibratory feeder!



Approx. 80 % energy savings

The revolutionary controller and the new drive provide the exceptional energy efficiency of the eacy feed.

24 V oscillating magnets achieve significantly reduced power consumption, meaning an energy saving of approx. 80 %.

Intelligent communication

The revolutionary controller allows remote control and communication.

The eacy feed is accessible from anywhere in the World via TCP/IP.

All settings can be displayed and adjusted at any time.

The eacy feed devices are particularly well-suited for Industry 4.0 systems.

Reduced consumption, increased flexibility

The revolutionary controller allows for approx. 80 % less power consumption.

The new controller and vibratory drive are based on 24 V/DC operating voltage.

Universal power supply (115 V – 230 V).

Independent to local AC frequency.

One design for all markets.

Perfect vibration intensity

An acceleration sensor is mounted on the vibratory drive to monitor and regulate vibration intensity, ensuring that output remains stable and consistent, independent from all fill-levels.

No need for readjustments.

Maintains ideal vibration behavior and minimizes wear and tear on the materials.

Simplifies refill procedures & supports all bowl sizes.

For any application

The eacy feed system is available in four fill sizes: 0.15-, 0.75-, 1.2-, and 2.5-liter capacity - both in single and double spiral design.

A large variety of components can be processed by the eacy feed system: screws, nuts, threaded pins, o-rings, cleanroom parts, and many more!

Standard feeders are adaptable to your specific installation environment for integration into individually customized assembly systems.

Sword Feeder

Sword feeders or segment feeders are particularly suitable for use in cleanroom environments. One advantage of the sword feeder is the very gentle, low abrasion part feeding.

Technical cleanliness!

Correctly oriented sorting

The parts in the supply bin are scooped up into a segmented rail by a tilting motion. The parts slide along this rail through mechanical- and directional components and arrive correctly sorted in the storage rail.

Self-regulated feed intensity

A sensor in the storage rail regulates the number of stroke movements required. The required fasteners are perfectly timed and positioned ready for assembly.

Low noise level

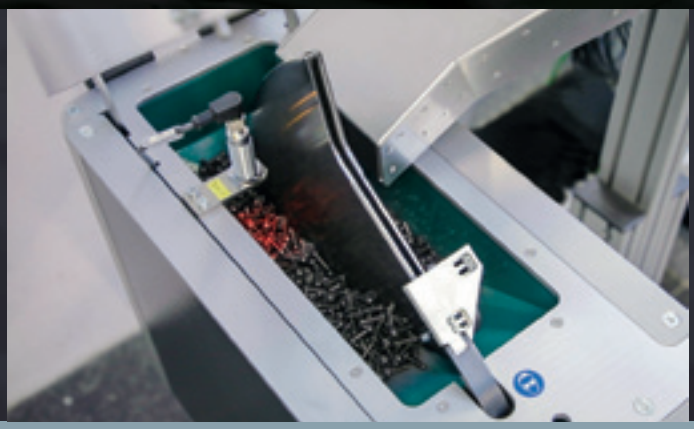
The production operators favor the low noise-level of the sword feeder. Due to the specially designed separator and the adapted controller sequence, the sword feeders are especially quiet.

Efficient production

The high level of vertical integration, the use of specially hardened, wear-resistant materials, as well as specific coating methods, ensure the outstanding quality, reliability, and efficiency of the sword feeder.

Customized design

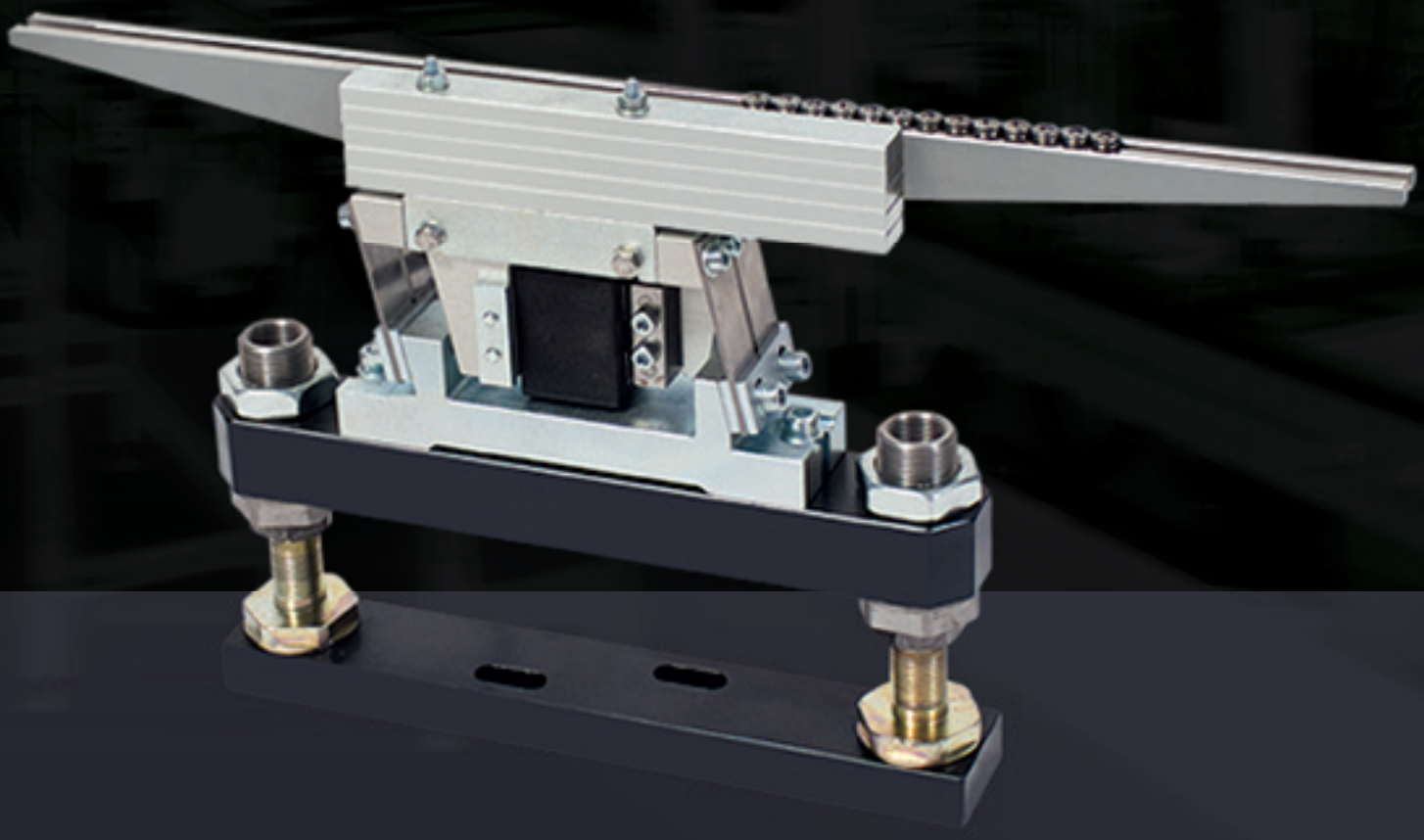
If you need to integrate a feeding system into an application with challenging dimensional conditions, we can adapt our standard devices to fit your operating environment.

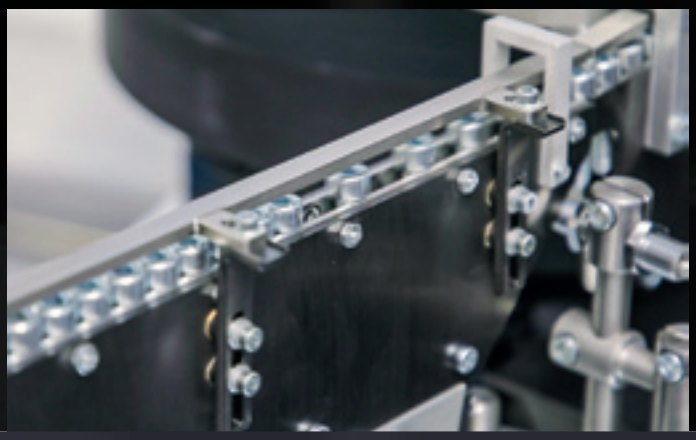


Linear Conveyors

Our linear conveyors are part of a sophisticated feeding system, which can, for example, be coordinated with your application when combined with vibratory feeder or Pick-and-Place systems.

A valuable addition to your feeding operation!





The linear conveyor fulfills several functions:

- Bridging distances
- Provisioning of part buffers
- Optimizing the flow process

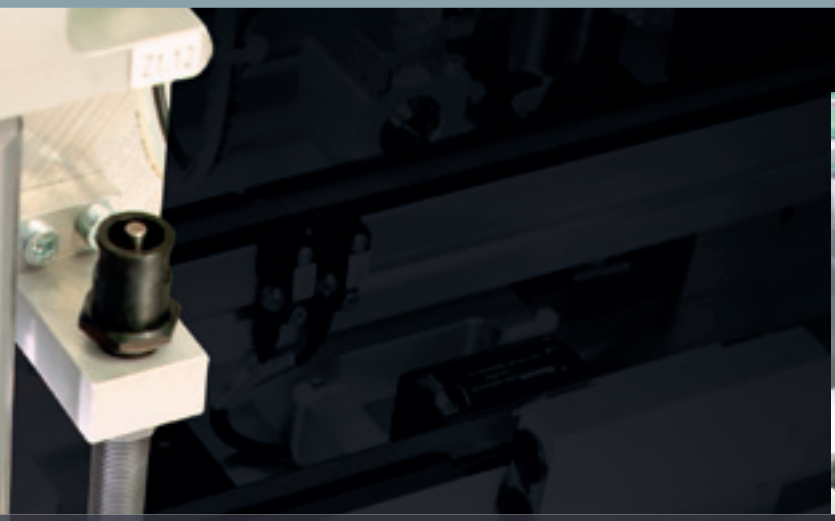
If you need to integrate a feeding system with a linear feeder into your assembly system where current dimensional conditions must be taken into consideration, we can adapt our standard devices to fit your operating environment. You profit from our specialist knowledge and receive a sophisticated, tried and tested feeding system at a particularly attractive price-performance ratio.

- **Gentle, low abrasion feeding**
- **Outstanding reliability of the entire system**
- **Remarkably efficient part transportation**

Pick-and-Place Method

Feeding to a Pick-and-Place position is often the most attractive solution for screws with very short shafts, rivets with large collar diameters, and parts with complex external geometries.

The alternative to feeding through a hose – independent from the part's geometry!



For stationary applications, either vacuum technology or grippers are predominately used on Pick & Place devices. The release- and reload procedure, is controlled by a PLC using sensor monitoring.

For handheld applications, we recommend utilizing a vacuum procedure or pick-up by a magnetic tool. A presence sensor, integrated into the pick-up receptacle, generates a reload signal when the part is released and automatically prepares the next one.

Accurate, reliable part positioning

When using the Pick-and-Place method parts are accurately and reliably placed in the assembly position.

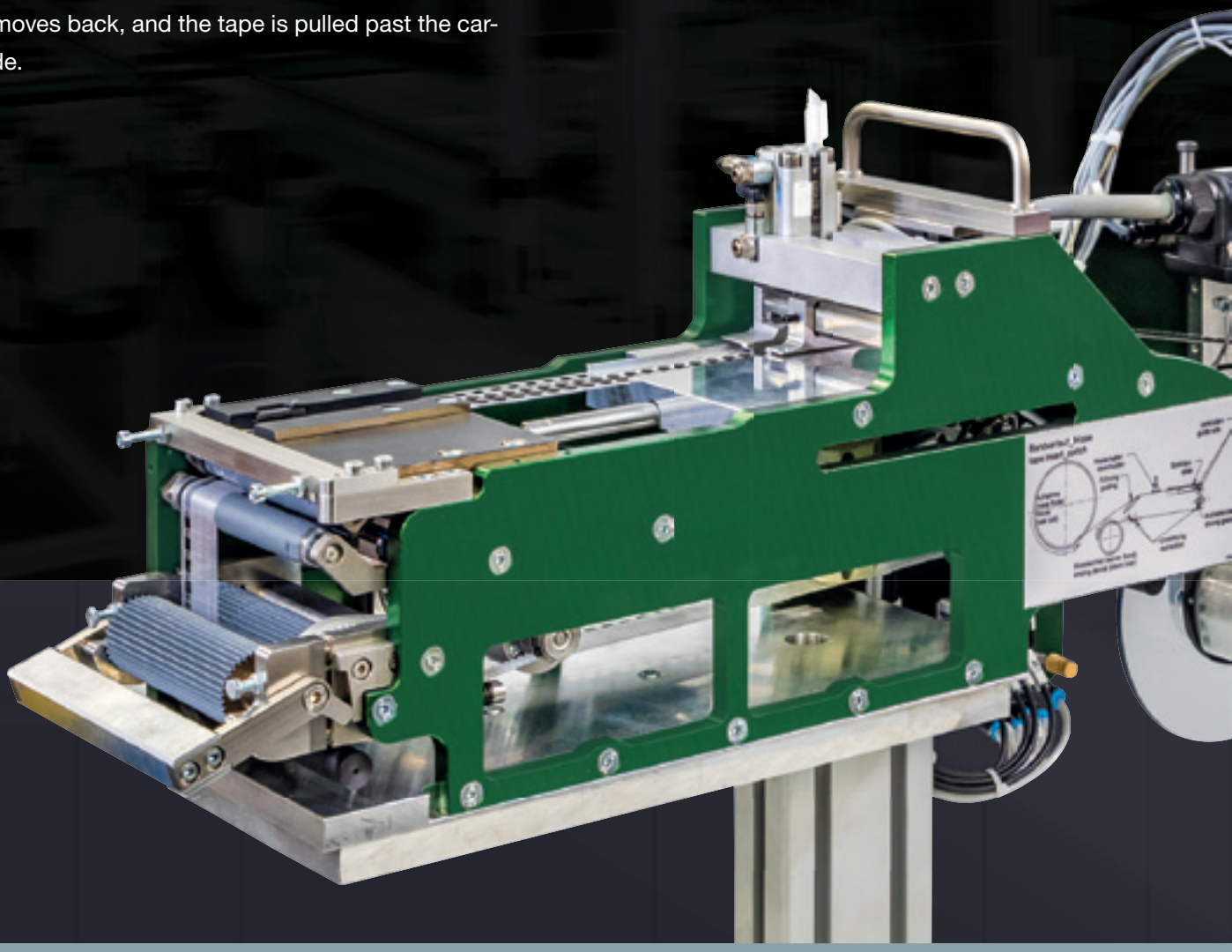
Tape-on-Reel Feeding

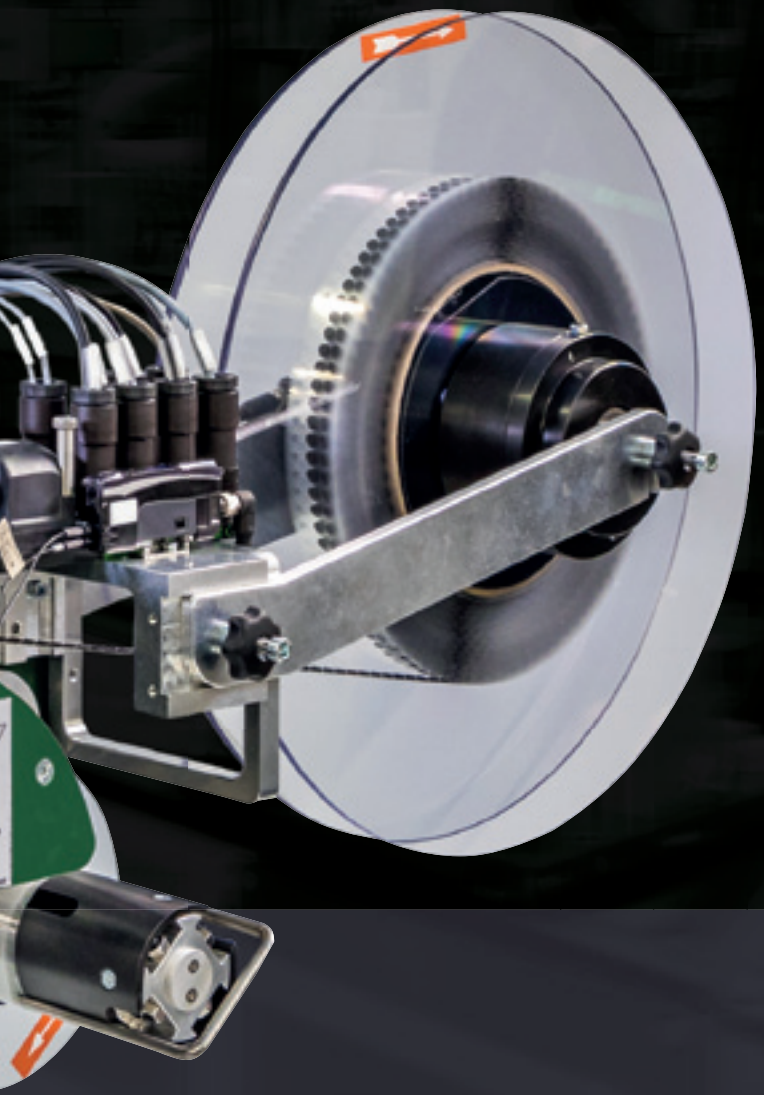
DEPRAG tape-on-reel feeders are used to process components that are loaded on single- and/or double- sided adhesive tape reels.

Precise and reliable supply of components!

Tape-on-reel feeding technology uses a tape reel inserted in a rolling receptacle. The unwinder pulls the tape until the next component is in the detached position. Once the sensor detects that the piece has reached the detached position, a downholder secures and holds the tape. Once the pick-up tooling (e.g., a vacuum gripper) is ready to proceed (i.e., vacuum suction ON), the slide carriage moves back, and the tape is pulled past the carriage blade.

The components are loosened from the tape and are now ready for processing. Once the pick-up tooling has moved away from the pick-up position, the holder retracts, the slide carriage runs forward again, and the winder moves the next component on the tape reel into the pick-up position.





Precise supply of components

The high-precision sensors and short cycle time of the device mean that our part feeders achieve consistently accurate supply of components with high repeatability.

Robust and reliable

User-friendly features

Adjusting the pick position in X and Y directions is simple.

Quick release of the reel's drive and presence sensor.

Fast & easy integration into any existing system.

Customized design

Screw Presenters

Screw presenters are particularly suitable for the automated supply of screws, both in preparation for manual pick-up and stationary integrated screwdrivers. Are you looking to automate your assembly? Screw presenters are a fast, cost-effective solution...

...for assembly of small production batches!

Gentle & quiet feeding

Screw feeding via two lift segments in the screw bin, enabling gentle & quiet feeding. Screws fall onto a vibrating guide rail and are then brushed into the correct position and transported onwards.

Stand-alone operation

The integrated controller in the device enables stand-alone operation.

Screw supply is accurate and reliable due to the regulated sequence controller using light barrier and microswitch.

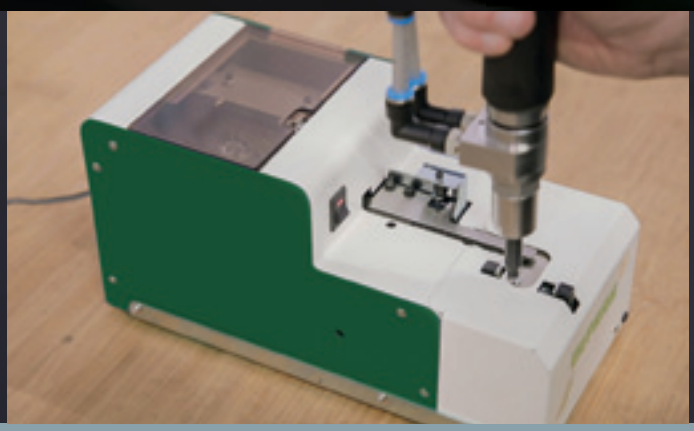
Compact design

If required, several DEPRAG screw presenter can be arranged even into confined workspaces due to its compact design.

Special solutions on request

User-friendly

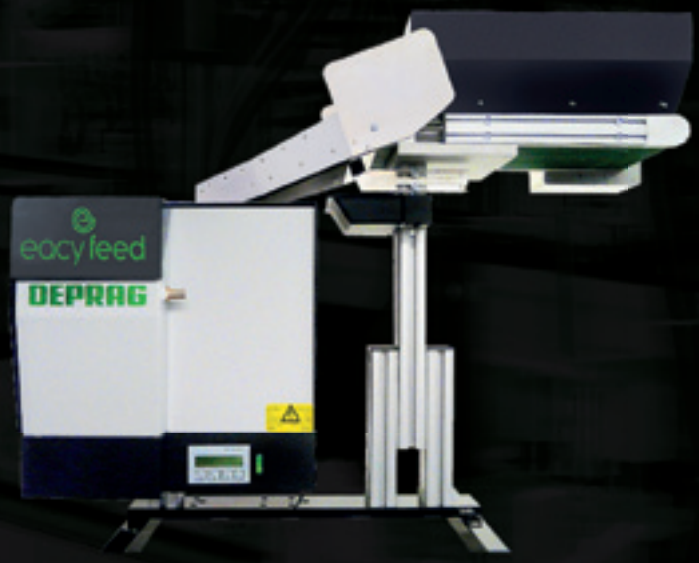
Secure, fast pick-up of supplied screws using magnetic bit or vacuum.



Storage Systems

Significantly decrease the number of refills by adding a storage system to your feeder.

Optimize processing by maintaining a constant fill level – No need to adjust the feed rate!



Flexible

No need for costly modifications when using a variety of feeders. The hopper outlet is adjustable to the size of the component. Additional regulating possibilities allow the hopper to be adjustable into two different directions.

Low noise and wear-resistant

The outflow-chute is enclosed, resulting into a substantial reduction in noise.

Noise-barriers are available as a special accessory for all vibratory feeders; they are specifically designed for use together with a hopper.

Simple operation and easy set-up

The DEPRAG hoppers come with a 24-volt gear motor. They can be operated merely via an output on the higher-level PLC.

Gentle component handling

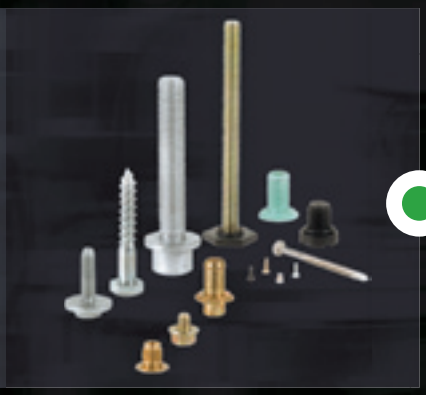
Gentle component handling minimizes the waiting time of feed parts in the vibratory system.

Material to Be Conveyed

Screws or o-rings, nuts or threaded pins, rivets or balls: Different components and fasteners require different feeding methods. Special provisions come into play for applications requiring technical cleanliness and for sensitive parts requiring particularly gentle handling.

Screws

A vibratory feeder or a sword feeder can be used for the processing of screws, depending on screw size. Our screw presenter is ideal for the first step in screw supply automation.



Threaded pins

A vibratory feeder is most suited to the processing of threaded pins. There are handheld and stationary options for the processing of threaded pins.

Nuts

A vibratory feeder is well-suited for the processing of nuts. There are handheld and stationary solutions for the presentation of nuts.

Press-insertion components

We supply standardized press-insertion systems, consisting of a press-in device that is combined with a vibratory or sword feeder, to process rivets, pins, sleeves, and balls.

MATERIAL

CONVEYED

Different components

Wide-ranging component designs can be processed using a vibratory feeder in combination with a linear-conveyor system. We can utilize sensors so that the most varied of component geometries can be processed, particularly in stationary feeding systems.

O-Rings

A vibratory feeder is the best-suited device for the processing of O-rings into an assembly solution. In a stationary application: The O-ring is supplied to a pick-up position, stretched and assembled.

Labels, etc.

The DEPRAG tape-on-reel feeder predominately retrieves labels, stickers, and a protective film arriving on a tape-reel, by utilizing vacuum assistance.

Small parts on backing film

Small parts attached to a backing film on a tape-reel needing to be picked-up by vacuum or gripper, can be processed by a DEPRAG tape-on-reel feeder. It is even possible to process components on both single- and double-sided adhesive tapes.

Feedability Criteria for Screws

1. Analysis of screw geometry

The screw geometry decisively influences the selection of the appropriate feeding technology. Automated feeding using a feed hose is suitable for all shaft-heavy screws with a circular head which fulfill the criteria in image 1.

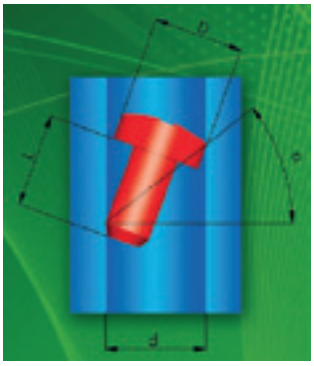
The approximation formula is used to determine that screws cannot reliably be fed through a hose if the angle **a** is less than 30° or the ratio of diameter **D** to shaft length **L** is less than 0.866.

2. Screw quality

The reliability of feeding depends on the quality of the screws.
Your processing-reliability specifications determine the screw's required quality level. The degree of purity defines the quality level; for example, a degree of purity of 10 ppm ("parts per million"), means that in 100,000 screws there is only one defective part, which may cause the feeder to malfunction.

3. Which feeding principle is most suited to your application?

The vibratory feeder is particularly well-suited for screws with tricky dimensions or if there are high demands on the feed rate. The sword feeder is more suitable where gentle handling or quiet feeding is required. If feeding via feed hose is not an option, a Pick-and-Place method can be used.



feedability criteria:
a > 30°

d ~ D + 0.5 mm

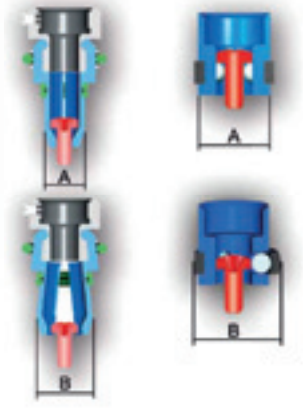
approximation formula:
L > D + 2 mm

d = feed hose ID
D = screw head-Ø
L = shaft length

Image 1: Criteria and parameters for the feedability of screws.

Split-type nosepiece

Ball-type nosepiece



D = screw head-Ø
d = shaft-Ø
n = space required to open

A = D + 2.5 mm
B = A + D - d

B = 3D - 2d + 5 mm

n = A x B

n = ø B

Image 2: Example of standard nosepieces.

Image 3: Tiltable mouthpiece for the feeding of very short screws.

4. Tooling selection

At the end of the mouthpiece, there are so-called guiding jaws (split-type nosepiece) or sleeves (ball-type nosepiece), designed to support and position the screw (image 2).
When working with very short screws or applications where a socket is used, tiltable or active mouthpieces are utilized (image 3).

5. Accessing the work piece

The physical accessibility of a workpiece is an essential consideration for the effective implementation of handheld screw feeders. Clear space around the screw head is required for the use of a ball-type- or split-type nosepiece or a vacuum finder. Flat surfaces simplify accessing the screw-location and reduce the downforce needed to activate the tool. If the geometry of the screw location does not allow precise positioning or the opening of a locking jaw, then a screw template is recommended (images 4 and 5).

Even curved surfaces with recessed screw-locations can be securely accessed. Using a screw template with handheld assemblies can significantly reduce the cycle time for workpieces having multiple screw-positions.

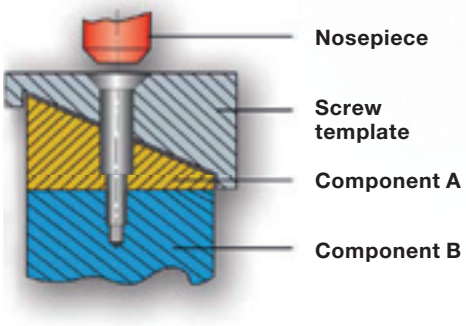


Image 4: Screw templates simplify precise positioning of the screw and the accessibility of the guiding jaws or sleeves.

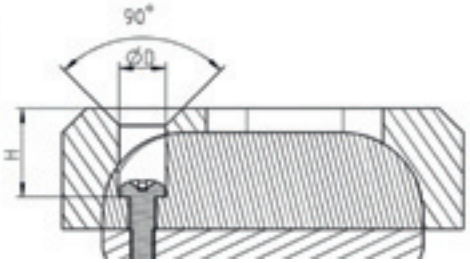


Image 5: When adapting to a customer's template, the dimension H is required to select the correct screwdriver stroke.

Feedability Criteria for Screws

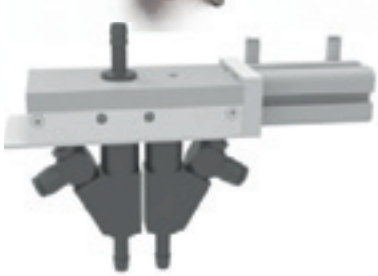
6. Single- or multiple feeding?

There is a distinct difference in feeding between single, twin, or multiple feeding-systems. For dual feeding, the feed bowl comes with a twin spiral. One feeder can, therefore, supply two separate workstations with fasteners, which decreases investment cost.

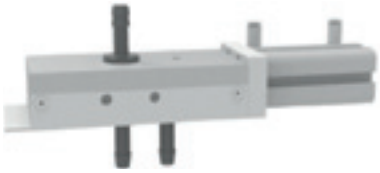
In general, any feeder with only one exit point can be adapted using a distributor (image 6) to supply several hose outlets. If one feeder needs to provide more than two outlet points, additional distributors are added to the separator. That way, the feed-components can be directed to up to six different hose outlets.

For example: If a twin spiral bowl is used together with two six-fold distributors, up to twelve hose outlets can be supplied by one individual unit. The separation generally occurs at the end of the feed-rail, depending on the geometry of the feed components (image 7).

To reduce the feeding cycle, distributors with a pre-separator can be implemented; this aligns the sorting and separation of the feed components to the required processing time. Components are pre-loaded into each hose outlet at the same time; this version is also used when feeding against gravity (e.g., underfloor or inverted). It is also possible to link several feeders to one screwdriver.

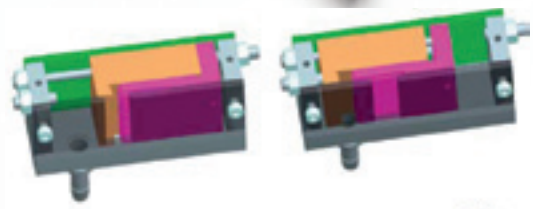


Distributor with hose nozzles that connect to an additional air-blast

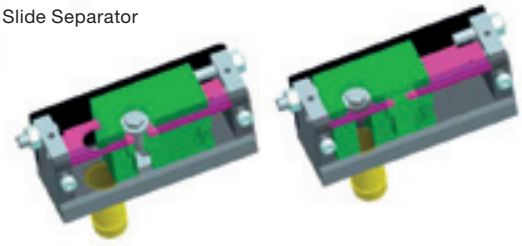


Distributor with standard hose nozzles

Image 6: Two distributor design examples.



Slide Separator



Blade Separator

Image 7: In multiple feeding systems, the separator supplies the feed-components to the required positions.

7. Feeder Design Specifications

For the exact design of a screwfeeder, the following information is required:

- Screw type
- Screw shaft-Ø
- Shaft length
- Head-Ø
- Head shape & height
- Screw tolerances
- Required cycle time
- Screw templates with drawings
- Required feed-hose length
- Number of screwdrivers or work stations to be supplied
- Required control options

Additionally, a sufficient amount of feed components, related sample parts as well as drawings are required to determine the feedability and to test the system thoroughly.

Our qualified product-specialists are on hand to assist you with the layout and design of your feeding system.

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