

- Screwdriving technology
- Automation
- Air motors
- Air tools

DEPRAG

Preventive maintenance and repair of air-operated tools

By selecting a DEPRAG product, you have acquired a tool, which was developed and manufactured for use in a heavy industrial environment.

Highest precision in production ensures the highest degree of efficiency and the extraordinary reliability of our products.

The final fine-tuning with an accuracy of less than 1/1000 mm is performed on DEPRAG tools in our state of the art grinding shop.

Our flexibility is evident in our machinery. Fast convertibility, simple programming and high geometric flexibility are paramount to our success.





Products	Page 3
Worldwide partner for complete solutions	Page 3
Maintenance	Page 4
Air quality	Page 5
The correct operating air pressure	Page 5
Lubricated or non-lubricated operation of tools?	Page 6
Maintenance intervals	Page 6 / 7
DEPRAG repair or maintenance procedure	Page 7
The do-it-yourself repair	Page 7 / 8 / 9
General repair tips	Page 9
In-house training offered by DEPRAG	Page 10
Basic equipment for tool assembly	Page 11
Tachometer	Page 11
Closing comments / Contact	Page 11

Our products – Tools and solutions from specialists

Screwdriving technology

We provide superior technology in all product areas. Our screwdriving technology solutions benefit from the extreme torque accuracy of our shut-off clutch and the renowned robust and reliable design of all our screwdrivers. Screwdriving perfection is our guiding principle and we command undisputed market leadership in many applications.



Automation

Our experience in assembly technology has enabled us to develop first-class solutions. Countless DEPRAG products, such as measuring instruments, controllers and in particular the successful feeding technology, are utilised in our customers' applications.

In conjunction with the long-standing experience of our project engineers, we produce assembly machines for a wide variety of client requirements.



Air motors

Today as ever, air motors are of utmost importance as a drive element for machines and equipment. As market leader in this field we provide an extremely versatile programme for the most varied of applications from the food industry to medical technology.



Air tools

Classic industrial tools such as grinding machines, drills and sheet metal tools are the roots of our company. High performance, reliability and outstanding ergonomic design are the distinguishing characteristics of DEPRAG tools.



Worldwide partner for complete solutions

DEPRAG has production facilities in Germany, the Czech Republic and China as well as distribution and service subsidiaries in France, Sweden, the USA and United Kingdom.

We have a network of exclusive partners in every important 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 combined with the regional experience of our local representatives. Solutions are successfully developed and then quickly and reliably passed on through our worldwide production locations.



Preventive maintenance

The benefit of preventive maintenance is without question. An unforeseen machinery breakdown is accompanied by a production shutdown, a loss of income and may even force a delivery limitation.

Correct maintenance, as well as properly planned and precise implementation of necessary repair, saves time and money.

How do you carry out maintenance?

Detailed information about the maintenance of your pneumatic tool can be found in the instruction manual. If you no longer have the manual in your possession then you can request either a printed or pdf-file version from us at any time.

Maintenance and repair – Service for your screwdriving technology

Our screwdriving products are readily available and have a long operating life. Maximum productivity and minimum downtime can be achieved with regular service intervals. Customer specific procedures and deadlines can also be taken into consideration with a maintenance contract.

Our service personnel can support and advise you with preventative maintenance and upkeep as well as conversion and software modifications.

Maintenance/replacement part service – Worldwide, on-site or via a remote maintenance module – Service for your systems

- short reaction time
- readily available replacement parts
- remote maintenance
- efficient and reliable

Every DEPRAG system is designed to require minimum maintenance to ensure that your production is reliable and economic. Regular preventative maintenance is however a firm basis for operation without faults or breakdowns. DEPRAG specialists are available worldwide to provide comprehensive support.

Our trained personnel can carry out any maintenance, upgrades, modifications and inspections directly on site at your facilities. Service and maintenance contracts can be drawn up so that we can work flexibly to your wishes and requirements.

If acute problem solving is necessary our comprehensive product and processing technical documentation and ready availability of replacement parts guarantee quick repair times. If you have any questions you can call our Service-Hotline: 24 hours a day - 365 days a year. Of course we also provide remote maintenance which can be flexibly adapted to your schedule.

So that you can react flexibly to internal changes we also offer, professional product training for your employees covering the required knowledge of maintenance, processing documentation, troubleshooting and product replacement.

The continuous correct running of your systems is very important to us. Therefore we are always looking for ways to further optimise our replacement part and maintenance services.

We can offer replacement parts under warranty flexibly for up to 2 years and confirm the availability of spare and wear parts for up to 10 years after delivery.

Standard parts are delivered promptly. We also have unrivalled delivery times for special parts which can be prepared in the quickest time possible. This is due to our various on-site production facilities e.g. laser welding or eroding which save on processing and transport time.

Maintenance / replacement part service – For your air motors

Our BASIC LINE air motors have a patented vane exchange system which allows replacement of vanes within a couple of minutes without disassembly of the motor - there is no need for trained specialists.

We would be pleased to carry out the regular maintenance or repair of your air motors for you.

Please ask us for a quotation for an all-inclusive maintenance or repair package.

We also have air motors replacement part and maintenance kits available, please contact us for more information.

Maintenance – Air tools DEPRAG INDUSTRIAL

Our pneumatic tools fulfil even the highest requirements for quality, precision and long lifespan.

We always have the most important replacement parts on stock.

Air quality

The quality of the compressed air is a critical factor for the lifespan of an air tool. The integration of a water separator as well as a central air dryer protects not only the air system, but also the air tool from corrosion.

The use of an air filter is just as important. Dirty air can block the vanes and damage the motor.

In regard to air quality according to ISO 8573-1, we recommend:

	Class	Residue of Oil		particle size mm	Residue of Dust		pressure dew-point °C	Residue of Water	
		mg/m ³	oz./cu. ft		max. concentration	max. concentration			
		mg/m ³	oz./cu. ft	mg/m ³	oz./cu. ft	g/m ³	oz./cu. ft		
Dry Air	6/3/3	1	1.03 · 10 ⁻⁶	5 *)	5	5.14 · 10 ⁻⁶	-20	0.88	0.90 · 10 ⁻³
Lubrication Air	-/4/4	5	5.14 · 10 ⁻⁶	25	10	10.28 · 10 ⁻⁶	+3	6	6 · 10 ⁻³

*) for tools that are operated without lubrication, it is sufficient to use a filter with 8µm.

To attain the proper air quality, we recommend the DEPRAG maintenance units with 1/4" to 1 1/2" connection threads and a corresponding airflow.

A regular inspection of the air filter for impurities and a lubricator volume adjustment is necessary.

The correct operating air pressure

An often-underrated factor is the use of the correct operating pressure. All statements regarding power output, speed, torque and air consumption normally refer to a nominal pressure (air volume) of 6 bar/85 PSI or 6.3 bar/90 PSI. Deviating from the correct pressure affects this data.

Operating pressure too low

If operating pressure is too low it is usually due to the use of connecting fittings positioned behind the maintenance unit such as an air distributor, pneumatic valves, quick release coupling or air hoses which have too small a cross section for the air inlet.

No noticeable fall in pressure is recorded on the pressure gauge in the maintenance unit during operation. However if a pressure gauge is fixed in between, directly to the screwdriving tool/air motor then a lower flow pressure is displayed. The hose cross-section required for each machine can be found in your DEPRAG instruction manual. Hose length should also not exceed 3m.

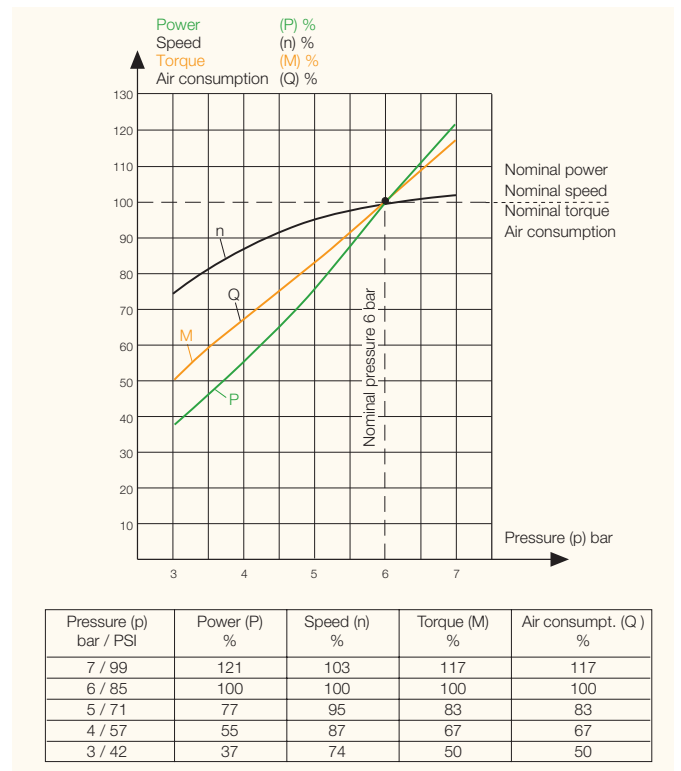
These small air channel cross-sections have a direct influence on the performance of your pneumatic screwdriver or air motor. When screwdriving with low flow pressure the clutch may ratchet or not shut-off.

A drop in pressure of 1 bar can cause a drop in power of 23%. The correlation between operating pressure and power is illustrated in the right-hand diagram.

Operating pressure too high

If operating pressure is too high (over 7 bar) it can cause increased wear. Make sure you have a pressure regulator valve with sufficient flow rate.

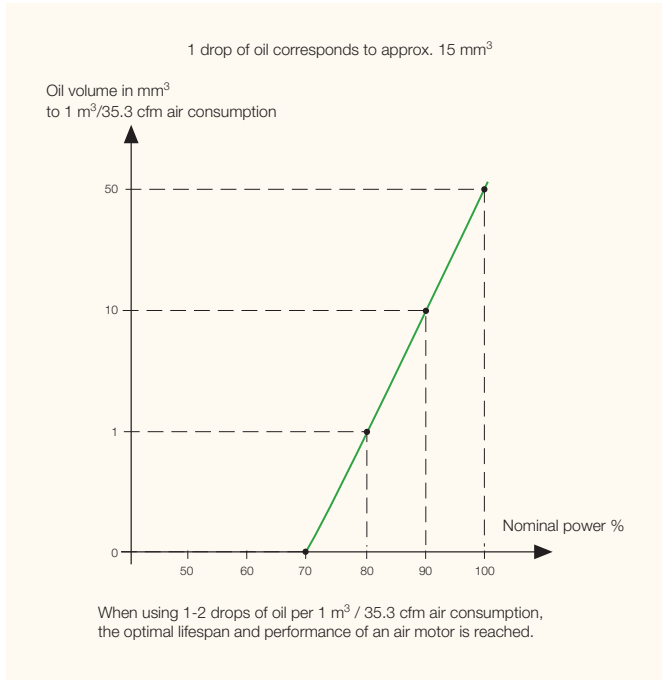
The idle speed of the air tool also increases if flow pressure is too high and on unregulated grinders the allowable circumferential speed of the grinding tool may be exceeded. Damaged grinding tools can cause injuries!



Influence of operating pressure

Lubricated or non-lubricated operation of tools?

DEPRAG pneumatic screwdrivers, air motors and vane operated tools can be operated without lubricant. This causes a reduction in power of approx. 15%. The optimum life-span and performance of an air vane motor is achieved by 1-2 drops of oil in 1 m³ air consumption. A larger amount of oil does not bring any advantages, it just increases the use of oil and burden on the environment. The air consumption data for your machine can be found in the relevant brochure.



Effect of lubricated air

Advantages of oiled compressed air:

- Lubrication prevents the direct contact and therefore wear of components which slide against each other.
- Lubricated operation protects against corrosion. Compressed air with a high residual water content causes corrosion in the air tools. A film of oil on the components prevents this.
- Lubricated compressed air improves the motor sealing. DEPRAG air tools are machines with top production quality and fine tolerances. The smaller the clearances the smaller the chances of leakage and loss of power.

We recommend the DEPRAG approved lubricant (Special oil „DEPRAG OIL“, Part no. 790081 E/F/G, contents 0.25/5/10 litre) in combination with a suitable compressed air oiler for oil mist lubrication or injection oilers.

The use of injection oilers enables the optimum life-span of the screwdriving tools to be reached with minimum oil consumption. The solution is a particularly suitable compromise between completely dry operation and lubricated operation with oil mist lubrication for screwdriving tools with a long duty cycle and where oil leakage is prohibited.

Impact tools such as hammers and scalers as well as air vane motors with > 1.6 kW power should be operated exclusively with lubricated air.

The correlation between lubricated and non-lubricated air in respect of the power of an air tool is shown in the graph on the left.

Maintenance intervals

Air operated machines are extremely robust. The inner over-pressure prevents the penetration of dust and dirt. Normally, only the low cost vanes require exchanging as wear parts. An estimate of the time period of required maintenance intervals however, cannot be made simply.

The following conditions have to be checked to determine the required interval of the maintenance intervals:

- Have the requirements of chapter "Air Quality" (page 5) been fulfilled?
- Does the air tool operate oil-free or is a lubricant used?
- At which speed does the tool operate?
- At which power level does the tool operate?
- What is the duration of the cycle time of the air-tool?

Maintenance intervals

An example of how to determine the required maintenance interval of a screwdriver spindle follows. The screwdriver spindle is used under the following operational conditions:

- The air quality fulfils the demanded requirement.
- The screwdriver spindle is operated oil-free.
- The screwdriver spindle is operated at its medium power level.
- The cycle time for one assembly is two seconds.

Using the formula (see below), a maintenance interval every 2 million cycles is necessary, which equals about 1100 operating hours.

The maintenance interval changes when operating conditions change. When lubricated air is used, the maintenance interval is extended considerably. The air filter must be regularly checked for contamination and the oiler for the correct adjustment.

$$\frac{2 \text{ million cycles} \cdot 2 \text{ seconds}}{3600} = 1111.11 \text{ operating hours}$$

DEPRAG repair or maintenance procedure

When a pneumatic tool is repaired it must go through the following stages:

After the arrival of machine at our factory it is completely inspected by the technicians in our repair department. Once these findings are completed you receive a cost estimate.

When you have approved this cost estimate then the machine is repaired.

All data for each individual machine is recorded in our system. The traceability of every machine through its serial number is hereby guaranteed.

After repair we return the machine to you in mechanically mint condition. Components which are only optically no longer as new can also be replaced on request.

The do-it-yourself repair

Inspection and maintenance of the pneumatic tool can be carried out by the operating personnel.

Due to our patented vane exchange system the vanes in the BASIC LINE air motors can be replaced in minutes without disassembly of the motor – trained specialists are not required.

We would be pleased to carry out the regular maintenance or repairs of your air tool. Do not hesitate to contact us for more information.

The instruction manual of your air tool holds further information about repair and maintenance. Do not forget to take note of the safety instructions. If you no longer have access to the instruction manual then you can request a replacement version from us at any time.

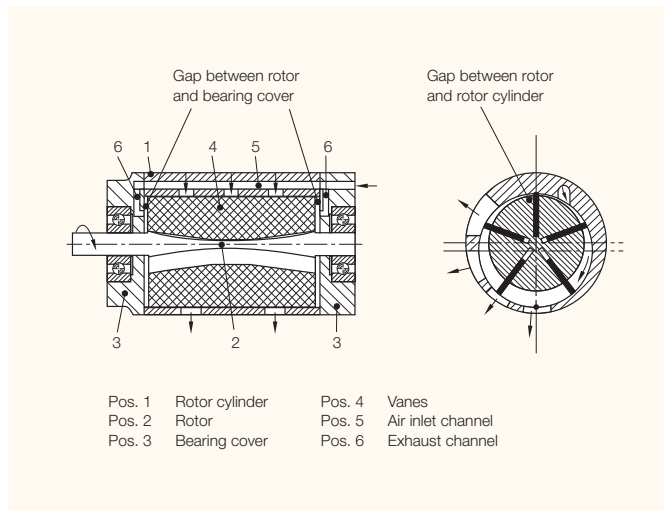
We recommend that assembly and disassembly of the machine should only be carried out by trained employees.

We offer a customer-specific training programme, which is adapted to your application and products. We can provide training for the repair and maintenance of your DEPRAG assembly system, for the implementation of air motors in your machine or service training of a screwdriving or air tool.

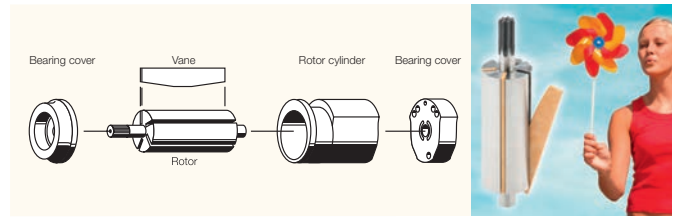
This can take place either at your facilities or here in our factory, we are flexible to your wishes. You can find more information about these assembly operator courses on page 10 of this brochure.

How to repair an air vane motor

Components of the vane motor



Air vane motor



All vane motors essentially consist of the rotor, which circulates in an eccentrically offset perforation of the rotor cylinder. Because of this eccentrically offset perforation, the vanes form working-chambers, the volume of which increases in the turn direction. Because the expansion of the compressed supply air, the pressure energy is converted into kinetic energy, and therefore, results into the rotation of the rotor.

You can find more information about the function of the DEPRAG air vane motors in our brochure D6000E.

After the dismantling of the vane motor and thorough cleaning of all parts, the following parts must be evaluated closely regarding further usability:

– Rotor Cylinder:

The rotor cylinder must be exchanged if deep grooves or indentations are found on the surface of the rotor cylinder, which are signs of polluted compressed air! The rotor cylinder can be used again, if its surface contains only slight, just visible tracks.

– Vanes:

Generally, vanes are exchanged with each repair, since they are considered wear parts.

– Ball Bearings:

Ball bearings can only be re-installed if they rotate perfectly. Usually, ball bearings are replaced after long-term use, in order to guarantee their functionality.

During reassembly of the vane motor, check to make sure that the new vanes move freely in the rotor slot. Also, observe that the vanes are ridge free and their height as well as length does not overrun the provided slot on the rotor. If necessary, vanes must be carefully retreated on a cushioned surface using 180 grit sandpaper.

Press the ball bearings into both bearing covers. Press the front bearing cover onto the rotor, using a punch (matched in size to the internal and external ring on the ball bearing) and then insert the vanes into the rotor slots. After the placement of the rotor cylinder, the rear bearing cover should be mounted. (Attention: between the rear bearing cover and the rotor cylinder there is a locking bearing pin).

After this assembly, the bearing covers should not have any side-to-side movement. The motor package is put into a fixture; the rotor must move freely and be easy to rotate by hand when applying low axial pressure or axial pull. If necessary, carefully re-press the internal ring of the ball bearing, using an arbor, to reduce the side-to-side movement. If this is not guaranteed, the rotor may rotate top heavy.

An axial balancing of the rotor is not necessary in tools with integrated start rings.

How to repair an air vane motor

Components of the planetary gear

DEPRAG air tools mainly use planetary gear drives, to achieve a high torque capability. During repair as well as maintenance, the following parts must be tested for wear and if necessary replaced:

– Gear Support:

The encased bearing pins in the gear supports must be surface tested for grooves. If the bearing pins show grooves or unevenness, then the complete gear support must be replaced. (Bearing pins may not be exchanged separately). If gear supports equipped with pinions show deep grooves on the pinion tooth, the complete gear support must be replaced as well.

– Planetary Gears:

The play (gap) between the bearing pins and the bore of the planetary gear must be tested. If an existing "play" is perceptible, the planetary gear must be exchanged. As with the gear support, planetary gears must also be replaced, if the teeth show deep grooves.

– Tooth Ring:

The internal tooth-arrangement must be evaluated. If the teeth are worn out, the tooth ring must be replaced.

– Ball Bearings:

Ball bearings can only be re-installed if they rotate perfectly. Usually, ball bearings are replaced after long-term use, in order to guarantee their functionality.

In principle, all parts of the gear assembly should be replaced when one gear part is replaced, to prevent a worn gear part wearing out a new gear part prematurely. When evaluating gear parts, the use of a magnifying glass is very helpful in making judgements the naked eye cannot.

During assembly and greasing of gear parts or open ball bearings, it is important to only fill the available space with one third of capacity with grease. Over greasing leads to overheating.

For gear lubrication, we recommend our special grease part no. 807293 (100 gr/0.22 lbs. tube).

General repair tips

- Before the dismantling or re-assembly of air tools, carefully read the respective operation instruction booklets. Observe assembly indicators and use the necessary repair tools.
- Before re-assembly, thoroughly clean and grease all parts, and then push parts together by hand.
- For press fit, use suitable arbor and presses.
- Tighten thread connections evenly to the required torque.
- After assembly completion, test for smooth rotation. Drive spindles of gearless machines must rotate freely by hand (this is no longer possible with tools containing a gear mechanism, especially strong reduction gears).
- Reconnect the tool to compressed air, turn tool and test the free speed. The measured value should be according to the operation instruction booklet $\pm 10\%$. If the values agree, the tool is considered operational.

Functional test of a shut-off-driver

A functional test regarding the shut-off behaviour of automatic screwdrivers is required after a completed assembly and speed test. If an audible ratcheting can be heard, the required valve pin measurement must be checked in accordance with the operating instruction booklet. If, despite proper valve pin length, there is no improvement, the clutch claw ring, the intermediate ring, the clutch shaft and the shutoff pin of the clutch must be checked for grooves as well as rounded off corners.

After exchange of the worn out part, retest the driver for proper shut-off behaviour. A single unique shut-off sound (click) of the clutch should be audible (be aware that too little airflow causes a ratcheting of the clutch). Adjust the driver to the required torque. There are several ways to check torque.

DEPRAG manufactures highly accurate measuring systems. We offer extensive PC based measuring systems, where screw-joint analysis and angle measurements can be processed. To test the torque directly at the area where the driver is in operation, a portable battery operated measuring instrument can be used.

Please contact your DEPRAG representative to have an in-house demonstration of the different measuring systems, which can be used in any combination with each other.

In-House Training offered by DEPRAG



To facilitate the seamless integration of our tools and machines at your facility, DEPRAG offers in-house training courses, which are intended to train maintenance and repair personnel.

The course is hands-on on purpose. This allows each participant to put the verbal instructions into actual practice.

For further inquiries please contact your local DEPRAG representative.

Course subjects and Training topics

Maintenance and upkeep for air operated screwdrivers

1. Structural design of the various screwdriver types with practical exercises in disassembly and reassembly.
2. Possible sources of interference and systematic detection with practical exercises.
3. Torque range, torque setting, spring exchange, torque checking, and function test with practical exercises.
4. Connection to the power network, flow pressure test, maintenance units and their settings with practical exercises.
5. Torque repeatability, demonstration.
6. Assembly aids: All special tools for assembly and disassembly are demonstrated in use and a list of these tools is handed out.

Maintenance and upkeep for feeders

1. DEPRAG feeding machines for handheld and stationary applications; structure, function, settings, maintenance and troubleshooting.
2. Stationary screwdriving stations; function control, setting and maintenance.

Maintenance and upkeep for air motors

1. Identification of the right air motor for your application
2. Adjustment of air motors
3. Installation of air motors
4. Maintenance of air motors

Maintenance and upkeep for air tools

Please contact your local DEPRAG representative.

You can register to a training course by using the online application form (for example: www.deprag.com/en/training.html), or e-mail to: info@deprag.de, or by phone.

After we receive your registration, we will respond with a training-confirmation showing the exact training dates. Your course participation includes mails and detailed teaching support materials (technical data sheets, presentations, interface descriptions, etc.), which are loaded on an USB-stick that will be handed to you for future reference and use.

A personalized training certificate confirms your participation.

Should you request a training that requires an overnight stay, then we are happy to assist with hotel reservations.

The cost for lodging and travel is not included in the cost of your training.

We are looking forward to your attendance! Additional information can be located in our service brochure D3330E.

Basic equipment for tool assembly

Lever Press Part no. 807417

maximum pressure 10 000 N / 2240 lbs.
Surface plate swivels and contains 4 recess areas.



Clamping Strip Part no. 460228

To be used as a clamping device of cylindrical parts with different diameters (Ø 5 mm to Ø 15 mm).



Press Block Part no. 460477

with 4 thru-bores Ø 7 mm/9/32" to Ø 20 mm/5 1/64".
To be used as a base for pressure insertion or removal of parts.



Fixture Part no. 461743

To be used as a positioning device of cylindrical parts with the same diameter (i.e. motor, gearing, air inlet parts, etc.) which thereafter will be pushed as a complete package into the suitable motor housing. The thru-bore is intended for the removal of a pin.



Press Block Part no. 461429

Base with mounting bores, suitable for the different gear supports of motor size 0/1/ 2.5 and 3. To be used as a base for the pressure insertion of ball bearings or pinions.



Please note that the above equipment is only the basic equipment.
As well as this you will also need the assembly tools listed in the instruction manual of your machine.

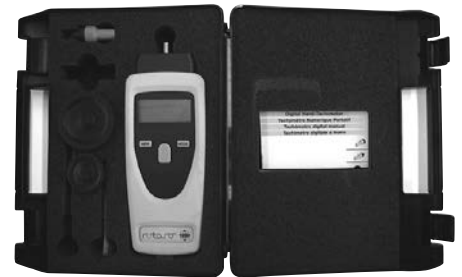
Tachometer

Tachometer Part no. 830390

The measuring instrument for the touch free speed recording with a light ray (Measuring range 1 - 99 999 rpm) and for the mechanical speed recording with measuring tip or measuring wheel. (Measuring range 1 - 19 999 rpm).

Additionally, speeds and lengths can be acquired mechanically. A measurement unit selection (metric/imperial) is possible.

The storage function indicates the last measurement (MIN/MAX). The compact measuring instrument possesses a digital display and is powered by two 1.5 V Mignon batteries.



Closing Comments

This brochure only refers to general instructions regarding tool repair.

For information regarding specific tool repair, please follow the operating instruction booklet of the respective tool.

If questions or clarifications are required for special repair tools or the repair process, please contact your DEPRAG representative (listed on the last pages) or DEPRAG directly.

Our qualified technicians will answer all your questions and can be reached also via our service hotline +49 (0) 700 00 371 371.

Contact:

www.deprag.com



DEPRAG

DEPRAG SCHULZ GMBH u. CO.

P.O. Box 1352, D-92203 Amberg, Germany
Carl-Schulz-Platz 1, D-92224 Amberg
Phone (+49) 9621 371-0, Fax (+49) 9621 371-120
www.deprag.com
info@deprag.de



CERTIFIED AS PER DIN EN ISO 9001
