



Diprofil Di-PRO[®] Polishing/Filing Machine



WARNING:

Give this operation guide to the operator of the machine.
To reduce the risk of injury the operator must read and fully understand the Instructions in the Operation Guide before using or repairing the machine.

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INTRODUCTION

Congratulations on the purchase of your new ***DI-PRO*** low vibrating Polishing/Filing machine. The machine is designed for polishing and finishing applications of moulds and dies, but may also be used for other fine mechanical applications such as de-burring and filing.

The following safety and operation guidelines are intended for your safety and to get the maximum value from your machine in terms of efficiency, life expectancy and ergonomics.

Before using the machine, the operator must read and fully understand the instructions included in this operation guide.

List of spare-parts available at www.diprofil.com

DIPROFIL DI-PRO MACHINES - AVAILABLE MODELS

A. FLEXIBLE SHAFT-DRIVEN MACHINES

Type FXK-N, FXS-N and FXH-N

B. AIR DRIVEN MACHINE

Type FXL-N

C. MICRO MOTOR-DRIVEN MACHINES

Type FXM-N and FXM/EJ-N

PACKAGE INCLUDES:

1 x Di-PRO polishing/filing machine

1 x bottle of lubrication oil type FNA-K

3 x Counterweight inserts (1 is fitted in the machine upon delivery)

1 x 2,5 mm Allen-key

1 x 3 mm Allen-key

1 x 4 mm Allen-key

1 x FXA-104 tool-holder extension pipe

2 x FXA-106 spare lubricating felts

2 x FXA-103 spare guide bushings

2 x 42055 spare tool locking screws

1 x SGX-100 maintenance tool

1 x SGX-101 maintenance tool

1 x SGX-102 maintenance tool

SAFETY INSTRUCTIONS

WARNING = Indicates a potentially hazardous situation which, if not avoided, may result in a serious injury.

CAUTION = Indicates a potentially hazardous situation which, if not avoided, may result in a minor or moderate injury.

MACHINE AND TOOL HAZARDS

CAUTION

Starting the machine without the machine covers may cause personal injury.

CAUTION

Starting the machine when changing tool or stroke length may cause personal injury.

CAUTION

An incorrectly inserted tool may result in the tool slipping out during operation and cause personal injury. Before inserting the tool make sure that the shank dimension is correct. Because of the multi-functional tool holder it is important that the chosen tool is tightened properly and that the speed chosen is not too high. Try to avoid using heavier tools and longer stroke length than necessary for the specific application.

CAUTION

Unintentional start of the machine may cause injury.

PROJECTILE HAZARD

CAUTION

During lapping or filing, particles from the working material or tools can become projectiles and cause injuries to eyes or skin. Use approved personal protective equipment, including safety glasses.

NOISE HAZARD

CAUTION

Noise \leq 75 dB(A) at 7.000 strokes/min.

For lengthy use ear protection is recommended.

VIBRATION HAZARD

WARNING

Normal and proper use of the machine exposes the operator to vibration.

Regular and frequent exposure to vibration may cause, contribute to, or aggravate injury or disorders of the operator's fingers, hands, wrists, arms, shoulders and/or permanent injuries or disorders that may develop gradually over periods of weeks, months or years. Such injury or disorder may include damage to the blood circulatory system, damage to the nervous system, damage to joints and possibly damage to other body structures.

If numbness, tingling, pain, clumsiness, weakened grip, whitening of the skin or other symptoms occur at any time, when operating or not operating the machine, do not resume operation of the machine, but seek medical attention. Continued use of the machine after the occurrence of any such symptom may increase the risk of symptoms becoming more severe and/or permanent.

WARNING Vibration overload:

If the machine starts to make a clattering sound it has been overloaded by using a tool that is too heavy in reference to the speed.

If the machine starts to make a clattering sound the speed needs to be reduced immediately, as this will increase the levels of unwanted vibrations and may also cause permanent damage to the machine.

WARNING

Never hold hand or fingers on moving machine parts or tools. Moving tools or parts of the tool holder have, when touched, very high levels of vibration.

These vibrations values have been measured and we have obtained the following results:

Note! On the moving tool and at recommended speed: 5.000-6.000 rpm the vibration values are very high. At stroke length 1 mm, approx. 20-28 m/s², at stroke length 2 mm approx. 35-50 m/s², at stroke length 3 mm approx. 55-75 m/s² and at stroke length 4 mm approx. 70-100 m/s².

CAUTION

To keep the vibrations as low as possible it is also of utmost importance to work as parallel as possible in reference to the surface on which the machine and tool will be used. Flexible tools generate less vibration than hard tools (not flexible tools).

Let the tool do the job. Use minimum possible hand grip consistently with proper control for safe operation.

Note! For information about vibrations and the responsibilities of the manufacturer, the employer and the operator respectively, please see information on page 20.

ADDITIONAL SAFETY INSTRUCTIONS

- Machines and accessories must only be used for their intended purpose.
- Only qualified and trained personnel may operate or maintain the machine.
- The maximum permissible machine using data must not be exceeded.

TECHNICAL DATA

A. FLEXIBLE SHAFT-DRIVEN MACHINES

Type FXK-N, FXS-N and FXH-N

TECHNICAL DATA

Driving:	The FXK-N, FXS-N and FXH-N models are driven by an electrical motor with speed control and a flexible-shaft with slip-joint (European standard) or ball-joint connection (US standard) e.g. Diprofil type DSE-47. Corresponding motors of other brands may also be used.
Speed (maximum):	7.000 rpm.
Speed (recommended):	5.000 – 6.000 rpm
Stroke length:	0 – 6 mm. (recommended 0,5 – 3 mm). NOTE! At stroke lengths exceeding 4 mm we recommend a maximum speed of 5.000 rpm.
Tool holder:	Ø 6,4 mm. (suitable for tool shanks Ø 2 - Ø 6,4 mm)
Weight of inserted tool:	Maximum 34 g. Recommended 1-15 g
Applied feed force:	2-12N (depending on inserted tool type and dimension).
Machine weight:	Approx. 700 g. (depending on model)
Noise level:	Not exceeding 75 dB(A) at 7.000 rpm.
Vibration levels:	Please see page 17



B. AIR-DRIVEN MACHINE

Type FXL-N

TECHNICAL DATA

Driving:	The FXL-N model is driven by compressed and oil mist lubricated air. PLEASE NOTE! The built-in air-motor may be damaged, if operated with un-lubricated air.
Connection:	The Diprofil quick-coupling HSL-M and fog lubrication unit MFB should be used for connection to your compressed air system. PLEASE NOTE! Protect the air inlet from dust and dirt, when not in operation.
Oil consumption:	Minimum 30 mm ³ /min. at maximum speed (about 2 drops/min.).
Air pressure:	4 bar (57 psi).
Air consumption:	Approx. 60 l/min at 7.000 rpm
Speed (maximum):	7.000 rpm.
Speed (recommended):	5.000 – 6.000 rpm
Stroke length:	0 – 6 mm (recommended 0,5 – 3 mm). NOTE! At stroke lengths exceeding 4 mm we recommend a maximum speed of 5.000 rpm.
Tool-holder:	Ø 6,4 mm. (suitable for tool shanks Ø 2 - Ø 6,4 mm)
Weight of inserted tool:	Maximum 34 g. Recommended 1-15 g
Applied feed force:	2-12 N (depending on inserted tool type and dimension).
Machine weight:	Approx. 900 g.
Noise level:	Not exceeding 75 dB(A) at 7.000 rpm
Vibration levels:	Please see page 17



C. MICRO MOTOR-DRIVEN MACHINES

Type FXM-N (Diprofil connector) and FXM/EJ-N (Eneska 3-1 connector)

TECHNICAL DATA

Driving:	The FXM-N and FXM/EJ-N models are driven by a built-in micro-motor, which is connected to, and controlled by, the power unit DIPROFIL DPU-3 or TPU-20 or corresponding. Output: DC 0-32V. (The needed voltage at a certain rpm is depending on the micro motor and the power unit).
Speed (maximum):	7.000 rpm.
Speed (recommended):	5.000 – 6.000 rpm
Stroke length:	0 – 6 mm (recommended 0,5 – 3 mm). NOTE! At stroke lengths exceeding 4 mm we recommend a maximum speed of 5.000 rpm.
Tool-holder:	Ø 6,4 mm. (suitable for tool shanks Ø 2 - Ø 6,4 mm)
Weight of inserted tool:	Maximum 34 g. Recommended 1-15 g
Applied feed force:	2-12 N (depending on inserted tool type and dimension).
Machine weight:	Approx. 860 g.
Noise level:	Not exceeding 75 dB(A) at 7.000 rpm.
Vibration levels:	Please see page 17



Warning

NOTE! Please keep in mind that higher speed, longer stroke length and heavier tools will generate higher levels of unwanted vibrations.

More information available at www.diprofil.com

OPERATING INSTRUCTIONS:

All types of polishing/filing machines wear out faster if they are used at high rpm and with heavy tools. The applied feed force and dirt coming into the machine also affects the life expectancy.

FIXATION OF TOOLS:

Place the tool in the tool-holder locking it with the screw (42055). Also see Fig.1.

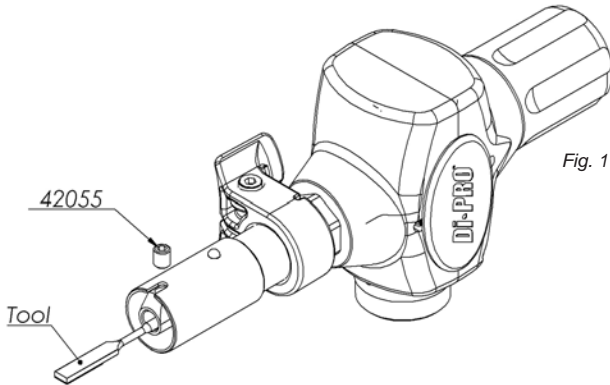


Fig. 1

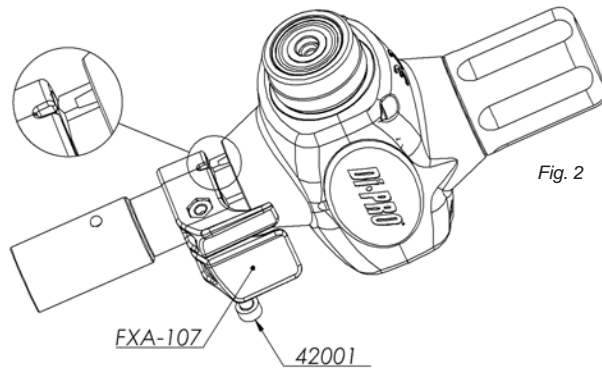


Fig. 2

STEERING BLOCK:

The tool-holder may be used in both a locked and a swiveling mode. To release the guide block (FXA-107): Loosen the screw (42001), pull out the steering block approx. 3 mm and tighten it with the locking pin in it's new position. Also see Fig.2.

STROKE LENGTH ADJUSTMENT:

Remove both of the rubber covers (FXA-3) at the sides of the machine housing.

PLEASE NOTE! Never operate the machine without re-assembling the rubber covers.

Loosen the screw (42055) on the lower eccentric by means of the 2,5 mm Allen-key. Then set the eccentric inner part at the required stroke length and lock it in its new position. Repeat the same steps on the upper eccentric. Please put the machine upside down when adjusting the stroke length for the upper counterweight. Make sure that the eccentric inner part is locked at the same stroke length as the lower eccentric.

PLEASE NOTE! To minimize unwanted vibrations it is crucial TO SET BOTH ECCENTRICS AT THE EXACT SAME STROKE LENGTH. Ref. Figs.3 and 4.

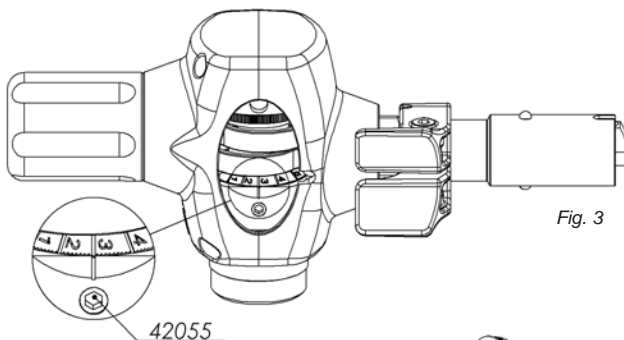


Fig. 3

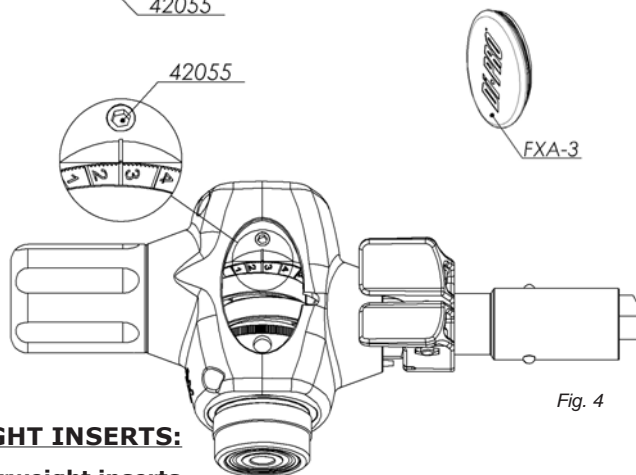


Fig. 4

CHANGING OF COUNTERWEIGHT INSERTS:

NOTE! When changing the counterweight inserts (FXA-19) please ensure that they are screwed firmly to the bottom so that they can not unscrew themselves when the machine is in operation.

Unscrew the counterweight casing (FXA-16). Mount or remove the counterweight inserts (FXA-19) to your liking by means of a 4 mm Allen-key. NOTE!: To keep the counterweight (FXA-U) from rotating, please keep it in a locked position by means of a universal screw spanner or a 20 mm spanner. **PLEASE NOTE! For maximum reduction of unwanted vibrations the counterweights should be used according to the below table. Also see Fig.5.**

Weight of the used tool. No. of counterweight inserts (FXA-19) to be mounted in the machine.

2 – 10 grams	No insert
10 – 18 grams	1 insert
18 – 26 grams	2 inserts
26 – 34 grams	3 inserts

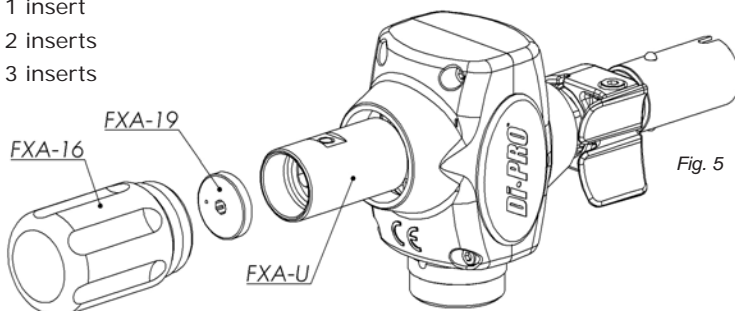


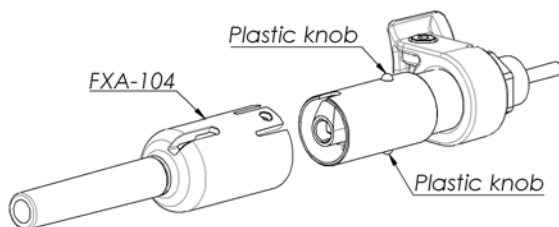
Fig. 5

THE TOOL-HOLDER EXTENSION PIPE:

The machine comes with an included tool-holder extension pipe (FXA-104). The extension pipe will facilitate the use of longer tools as it will still be possible to guide the tool close to the working surface without the need for putting your fingers on moving tools and/or machine parts. The extension pipe can easily be cut to the desired length to suit different tools.

To assemble the extension pipe simply push it onto the tool-holder making sure that it is locked in position by the small plastic knobs on the actual tool-holder.

To remove the extension pipe, twist it slightly and pull it off.



SERVICE AND MAINTENANCE

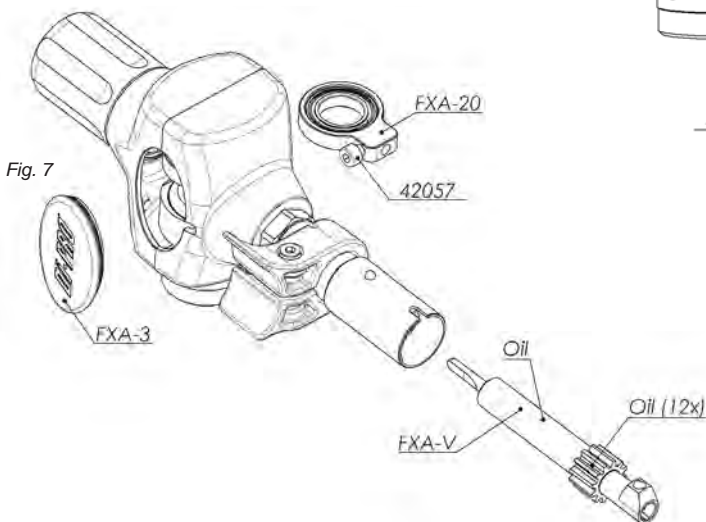
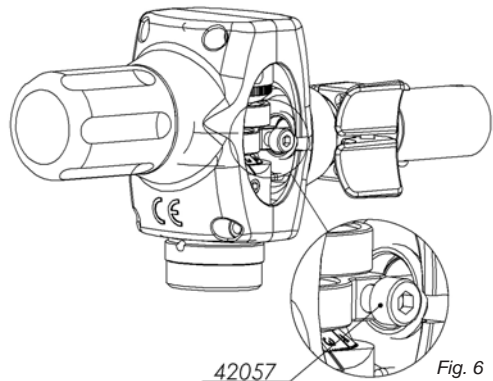
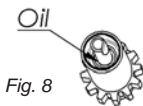
Regular maintenance is a prerequisite for keeping the machine safe and effective. Carefully follow the operating instructions as well as the daily maintenance guidelines.

Exchange worn parts, like tool holder, ball bearings, etc. Worn parts increase the vibration levels in the machine.

DAILY MAINTENANCE:

The below procedure should be made every **8 hours of operation**.

1. Remove both of the rubber covers (FXA-3). **PLEASE NOTE! Never operate the machine without reassembling the rubber covers.**
2. Loosen the connecting rod screw (42057) to release the piston rod and toolholder (FXA-V) by sliding it out of the machine. **Please make sure not to loosen the screw too much.** Also see Fig.6 and 7.
3. Clean the piston rod and tool-holder carefully with a soft cloth and apply a few drops of lubrication oil type Diprofil FNA-K or equivalent according to fig. 7 and 8.
4. Reassemble the piston rod and tool-holder into the machine housing making sure that the piston rod goes all the way to the bottom of the connecting rod (FXA-20) and lock it with connecting rod screw (42057).
5. Reassemble the rubber covers (FXA-3).



6. Unscrew the counterweight casing (FXA-16), and eventual counterweight inserts (FXA-19). Also see Fig.9
7. Apply a few drops of oil type FNA-K or equivalent on both sides of the needle-bearing (44040) in the counterweight (FXA-U). According to fig. 9
8. Reassemble the counterweight inserts (FXA-19) and counterweight casing (FXA-16).

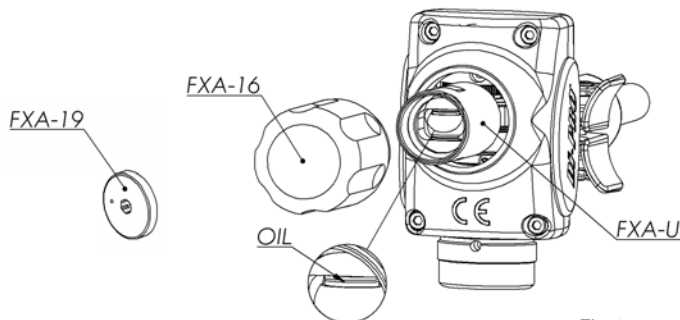


Fig. 9

REPLACEMENT OF THE LUBRICATING FELT AND THE PLASTIC GUIDE BUSHING.

1. Remove the machine covers and the piston rod and tool-holder according to the description for daily maintenance.
2. Slide the tool (SGX-102) onto the tool-holder.
3. Squeeze/compress the tool (SGX-100) and put it inside the tool-holder making sure that it gets a sufficient grip of the guide bushing (FXA-103).
4. Make sure that the 2 screws (42000) are perfectly aligned with the plastic knobs on the actual tool-holder. Tighten both screws all the way to the bottom by means of a 2,5 mm Allen-key to release the guide bushing (FXA-103) from the outer sleeve of the tool-holder.
5. Then pull the guide bushing out of the tool-holder.
6. Remove the old lubricating felt (FXA-106) and replace it with a new one (make sure that it is drenched in oil, type Diprofil FNA-K or equivalent).

See Fig. 10

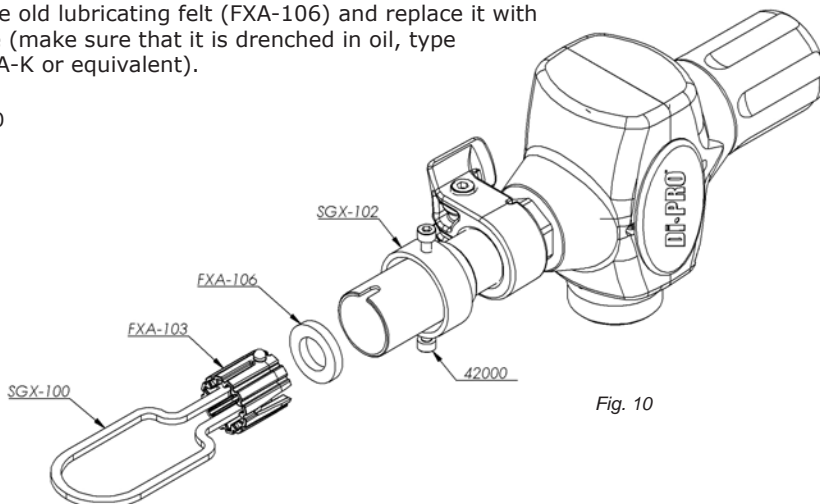
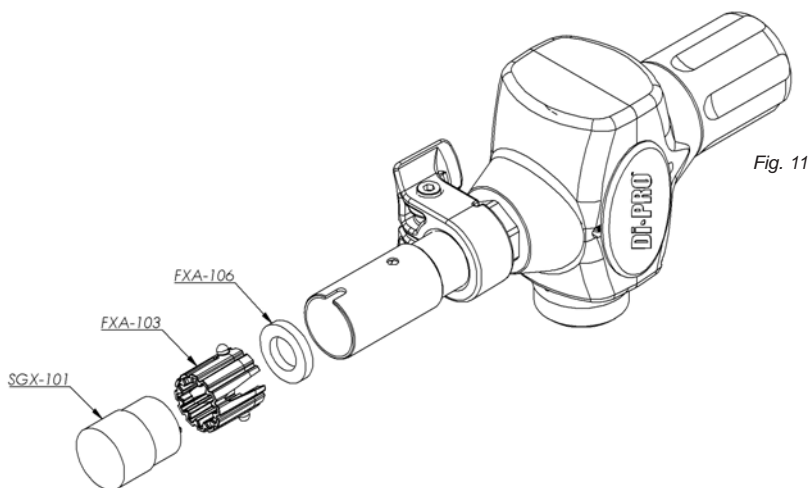


Fig. 10

7. Squeeze/compress the new guide bushing (FXA-103) and press it about 5 mm into the tool-holder (the knobs should be pointing inwards and towards the machine housing).
8. Then push it all the way to the bottom by means of the tool (SGX-101) making sure that both the plastic knobs are popping out of the small holes on the outer sleeve of the tool-holder. If you are experiencing problems with aligning the knobs with the holes, use the tool (SGX-100) to swivel the guide bushing until they become aligned and the knobs pop out of the holes.
9. Reassemble the machine covers and the piston rod and tool-holder according to the description for daily maintenance.

See fig. 11



VIBRATION EMISSION

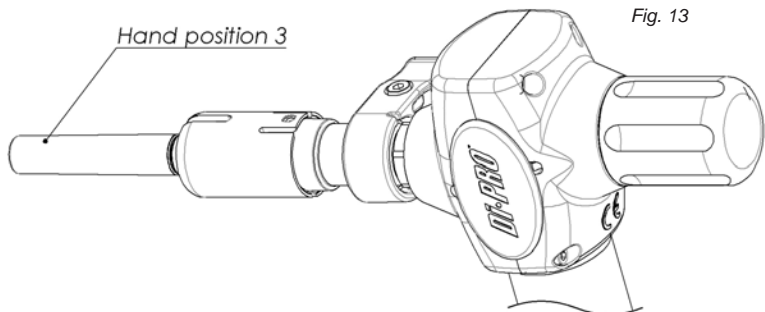
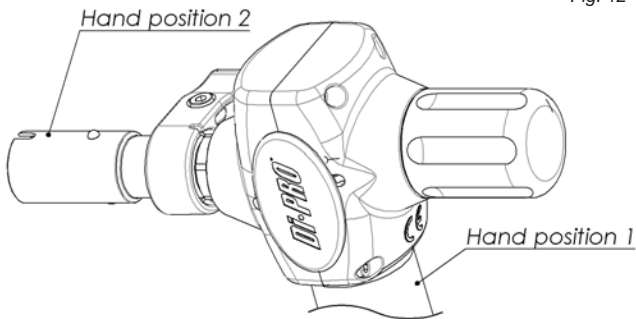
Warning

The vibration emission value for this machine has been measured at three different hand positions (also see fig. 12 and 13) according to the valid standard, ISO 28927-8:2009/AMD 1:2014 Polishing and filing machines with reciprocating movement. It is expressed in m/s^2 .

The uncertainty value (K) is also expressed in m/s^2 and is intended to compensate for different batches, production variations etc.

Measured vibration emission values:

Hand position 1:	1,55 m/s^2	(K = 0,65 m/s^2)
Hand position 2:	5,08 m/s^2	(K = 1,00 m/s^2)
Hand position 3:	3,64 m/s^2	(K = 0,86 m/s^2)



VIBRATION DECLARATION STATEMENT

GENERAL INFORMATION:

Reciprocating machines all generate potentially harmful vibrations to different extents.

Note! The size and weight of the used tool affects the vibrations very much. Therefore it's important to use as small and lightweight tools as possible.

The following factors all affect the level of unwanted and potentially harmful vibrations transmitted to the hand of the operator.

- 1. The speed (number of strokes / minute).** This is the factor which has the biggest affect on the vibration levels and when operating the machine, it should not be used at speed levels higher than required.
- 2. The stroke length. The stroke length should be kept as short as possible** and adapted to the application.
- 3. The weight of the used inserted tool. The heavier the tool the higher levels of unwanted vibrations.** Using a heavier tool normally means that the speed and the stroke length must be reduced.
- 4. The angle in which the machine (working tool) is held against the working surface and the tool type:** To keep the vibrations as low as possible it is also of utmost importance to work as parallel as possible to the surface on which the machine and tool will be used.

Flexible tools as Fibre Stones or articulated tools as Ball-rods together with Lapping Bits and similar generate less vibration than hard tools as Polishing Stones, Diamond files, etc.

Never hold hand or fingers on moving machine parts or tools.

Worn out parts generate vibrations and needs to be replaced regularly.

ADDITIONAL VIBRATION INFORMATION

This power tool may cause hand-arm vibration syndrome, if not adequately used. This additional vibration information may be of assistance to employers in meeting their obligations e.g. under national law or regulations based on the EU directive 2002/44/EC, to assess the risks to their workers arising from hand-arm vibration exposure associated with the use of this machine.

VIBRATIONS AND THE ISSUE OF HAVS (HAND ARM VIBRATION SYNDROME)

- The EU directive (2002/44/EC) concerning vibration exposure was approved by the member states and EU parliament in July 6, 2002 and should have been introduced into national laws not later than by July 6, 2005.
- Minimizing the vibration exposure is the responsibility of the manufacturer, the vendor, the employer and the operator respectively.
- When using machines resulting in an exposure exceeding 2,5 m/s² it is the responsibility of the employer to make an action plan on how to minimize the vibration exposure for the operators. This also includes regular scheduled health inspections.
- Vibrations emission exceeding 2,5 m/s² limits the time of operation.

CLASSIFICATION OF INJURY RISKS (ACCORDING TO SWEDISH INSTITUTE OF INDUSTRIAL RESEARCH)

MAXIMUM DAILY EXPOSURE	PROCESS VIBRATIONS IN m/s²
8 HOURS (FULL WORKING DAY)	BELOW 2,5
4 HOURS	2,6-3,5
2 HOURS	3,6-4,9
1 HOUR	5,0-7,0
30 MINUTES	7,1-9,9
15 MINUTES	10,0-14,0
7,5 MINUTES	14,1-19,8
BELOW 7,5 MINUTES	ABOVE 19,9

The risk for injuries such as "white fingers" is estimated to be less than 14%, if the stated recommendations are followed. This is presuming that the total time of exposure, in regular use and for the specific individual, is max. 10 years. If the exposure continues over a longer period of time, the risk of injuries increases, i.e. after 15 years of daily exposure the risk for injuries is estimated to be max. 30%, if the recommendations are followed.

We recommend a programme of health surveillance to detect early symptoms, which may be related to vibration exposure, making it possible to modify management procedures in order to prevent significant disability.

There are three parties responsible for keeping the vibrations exposure to a minimum: the Manufacturer, the Employer and the Operator.

THE RESPONSIBILITY OF THE MANUFACTURER

The responsibility of the manufacturer is regulated according to the Machinery Directive (2006/42/EC). This directive deals with essential health and safety requirements of machinery.

The Machinery Directive requires the manufacturer to declare the vibration emission from his machines. The values shall be declared in accordance with the appropriate test code. Machines are declared according to the EN ISO 28927-series of standards. Diamantprodukt AB have declared the vibration emission according to ISO 28927-8:2009/AMD 1:2014.

Declared vibration values are based on measurements made under laboratory conditions. The power tool is often run under artificial conditions. The aim is repeatable and reproducible results.

THE RESPONSIBILITY OF THE EMPLOYER

The employer is responsible for the safety of his employees.

The employer must follow the national law regarding health and safety for his operators. All employers are responsible for the safety and health of his operators and must themselves be aware of the laws. With the new directive the law is basically the same in all countries in the European Union. The employer must keep the vibration exposure to a minimum level and perform vibration exposure assessments according to the Physical Agents (Vibration) Directive 2002/44/EC. (We recommend all parties involved to obtain this directive).

NOTE! The action value is 2.5 m/s² averaged over an 8-hour working day. For employees exposed to vibrations higher than the action value an action plan must be initiated to reduce the vibration exposure. A health surveillance program also has to be incorporated in the action plan. The action value is active from the day the national laws took effect.

The limit value is 5 m/s² averaged over an 8-hour working day. It will not be allowed to expose an operator to vibrations exceeding the limit value.

Once the action value 2.5 m/s² is exceeded the employer shall establish and implement a programme of technical and/or organizational measures intended to reduce to a minimum exposure to mechanical vibration and attendant risks, taking into account in particular:

- a) The choice of appropriate work equipment with ergonomic design producing the least possible vibration (like the Diprofil low vibration machine type Di-Pro)
- b) Other working methods that require less exposure to mechanical vibration
- c) We recommend a program of health surveillance to detect early symptoms which may relate to vibration exposure, so the management procedures can be modified to help prevent future impairment.

THE RESPONSIBILITY OF THE OPERATOR

The operator is responsible for using the power tools according to given instructions and to react when he or she has reason to believe that vibrations are unusually high. The operator is also the person exposed to vibrations and therefore the one to be protected from unnecessary vibration exposure.

DIPROFIL[®]

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