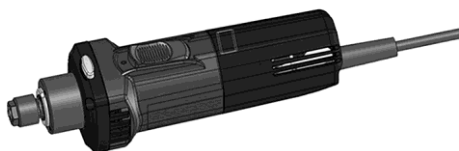


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<b>de</b>	Fräsmotor	Originalbetriebsanleitung	8
<b>en</b>	Milling motor	Translation of the original operating instructions	21
<b>fr</b>	Moteur de fraisage	Traduction de la notice d'emploi originale	34
<b>it</b>	Motore di fresatura	Traduzione delle istruzioni d'uso originali	47
<b>nl</b>	Freesmotor	Vertaling van de originele gebruiksaanwijzing	60
<b>es</b>	Motor de fresado	Traducción del manual de instrucciones original	73
<b>fi</b>	Jyrsinmoottori	Käännös alkuperäiskäyttöohjeesta	86
<b>sv</b>	Fräsmotor	Översättning av originalbruksanvisningen	99
<b>da</b>	Fræsemotor	Oversættelse af den originale betjeningsvejledning	112
<b>ru</b>	Фрезерный двигатель	Перевод оригинальной инструкции по эксплуатации	125
<b>pl</b>	Silnik frezarski	Tłumaczenie oryginalnej instrukcji obsługi	139
<b>cs</b>	Motor na frézování	Překlad původního provozního návodu	152
<b>sl</b>	Motor rezkalnika	Prevod izvirnih navodil za uporabo	165



MAF02163/a



MAF02193/a

**WARNING**

**Lesen Sie alle Sicherheitshinweise und Anweisungen.** Versäumnisse bei der Einhaltung der Sicherheitshinweise und Anweisungen können elektrischen Schlag, Brand und/oder schwere Verletzungen verursachen. **Bewahren Sie alle Sicherheitshinweise und Anweisungen für die Zukunft auf.**

**WARNING**

**Please read all safety instructions and directions.** Failure to comply with the safety instructions and directions can cause electric shock, fire and/or serious injuries. **Please retain all safety instructions and directions for future reference.**

**AVERTISSEMENT**

**Veillez lire toutes les consignes de sécurité et instructions.** Tout non-respect des consignes de sécurité et instructions risque d'être à l'origine de décharges électriques, d'incendies et/ou de blessures graves. **Conservez toutes les consignes et instructions pour pouvoir les relire à tout moment.**

**AVVERTENZA**

**Leggere tutte le avvertenze di sicurezza e le istruzioni.** La mancanza del rispetto delle avvertenze di sicurezza e delle istruzioni possono causare scossa elettrica, incendio e/o gravi lesioni. **Conservare tutte le avvertenze di sicurezza e le istruzioni per il futuro.**

## **WAARSCHUWING**

**Lees alle veiligheidsaanwijzingen en instructies.** Nalatigheid bij het naleven van de veiligheidsinstructies en aanwijzingen kan elektrische schok, brand en/of ernstige letsels veroorzaken. **Bewaar alle veiligheidsaanwijzingen en instructies voor later gebruik.**

## **ADVERTENCIA**

**Lea todas las indicaciones de seguridad e instrucciones.** Si no se cumplen las indicaciones de seguridad e instrucciones, se pueden producir descargas eléctricas, incendios y/o lesiones graves. **Guarde todas las indicaciones de seguridad e instrucciones para el futuro.**

## **VAROITUS**

**Lue kaikki turvaohjeet ja käyttöohjeet.** Laiminlyönti turvaohjeiden ja käyttöohjeiden noudattamisessa voi aiheuttaa sähköiskun, tulipalon ja/tai vakavia vammoja. **Säilytä kaikki turvaohjeet ja käyttöohjeet tulevaisuuden varalle.**

## **WARNING**

**Läs alla säkerhetsanvisningar och anvisningar.** Underlåtenhet att följa säkerhetsanvisningar och anvisningar kan orsaka elstötar, brand och/eller allvarliga personskador. **Behåll alla säkerhetsanvisningar och anvisning för framtida användning.**

## **ADVARSEL**

**Læs alle sikkerhedshenvisninger og instruktioner.** En manglende overholdelse af sikkerhedshenvisningerne og instruktionerne kan føre til elektrisk stød, brand og/eller alvorlige kvæstelser. **Opbevar alle sikkerhedshenvisninger og instruktioner til fremtidig brug.**

## **ПРЕДУПРЕЖДЕНИЕ**

**Прочитайте все правила и инструкции по технике безопасности.** Несоблюдение этих правил и инструкций по технике безопасности может привести к поражению электрическим током, возгоранию и/или другим серьезным травмам. **Сохраните все правила и инструкции по технике безопасности для дальнейшего использования.**

## **OSTRZEŻENIE**

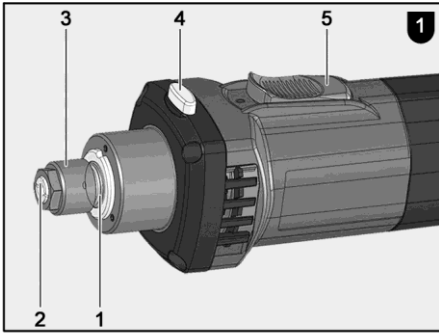
**Przeczytać wszystkie przepisy bezpieczeństwa i wskazówki.** Zaniedbanie przestrzegania przepisów bezpieczeństwa i wskazówek może prowadzić do porażenia prądem, pożaru i/lub ciężkich zranień. **Zachować wszystkie przepisy bezpieczeństwa i wskazówki na przyszłość.**

## **UPOZORNĚNÍ**

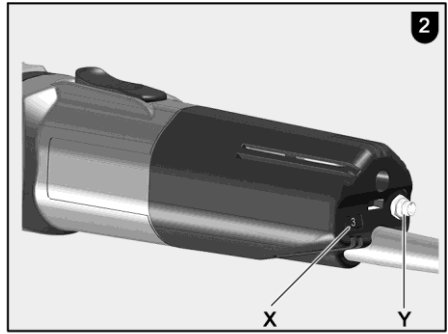
**Přečtěte si všechna bezpečnostní upozornění a pokyny.** Zanedbání bezpečnostních upozornění a pokynů může způsobit zásah elektrickým proudem, požár a/nebo vážná zranění. **Všechna bezpečnostní upozornění a pokyny si ponechejte pro pozdější použití.**

## **OPOZORILO**

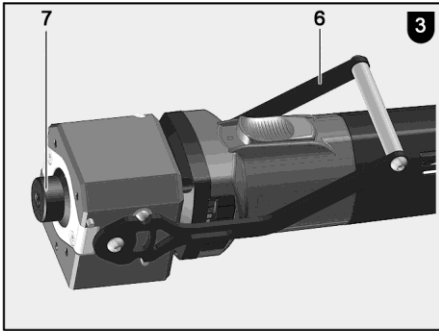
**Preberite vsa varnostna opozorila in napotke.** Neupoštevanje varnostnih opozoril in napotkov lahko povzroči udar električnega toka, požar in/ali hude telesne poškodbe. **Vsa varnostna opozorila in napotke shranite za prihodnjo uporabo.**



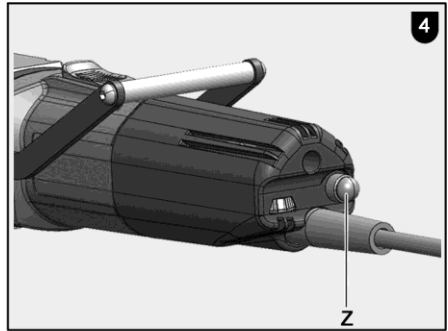
MAF02165/a



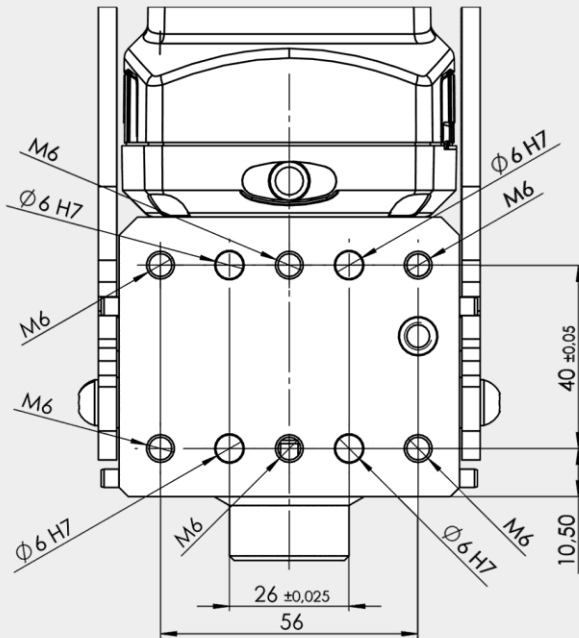
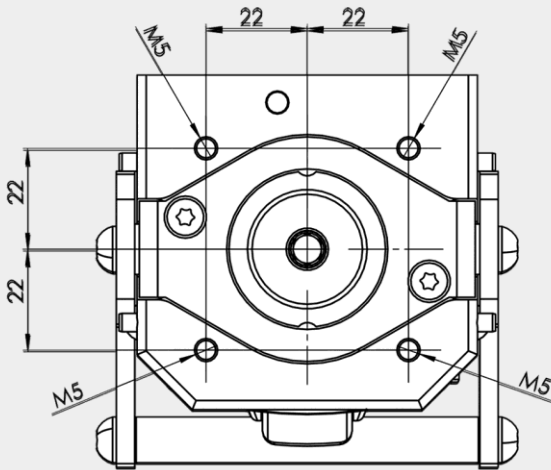
MAF02164/b



MAF02192/a



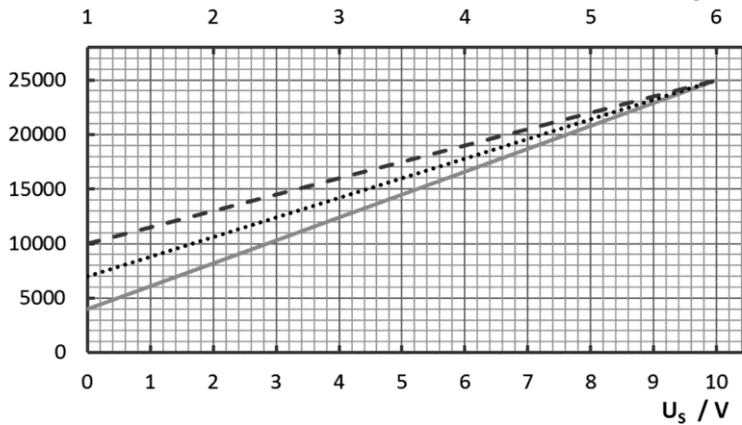
MAF02281/a






MAF02194/b

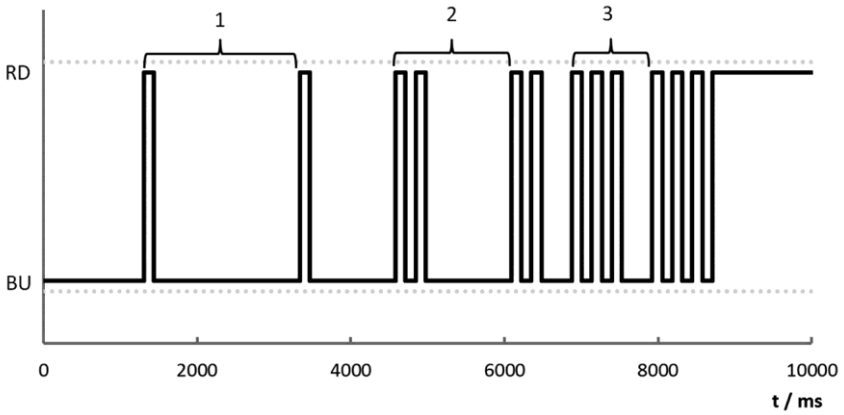
$n / \text{min}^{-1}$  $PS_s$ 

6

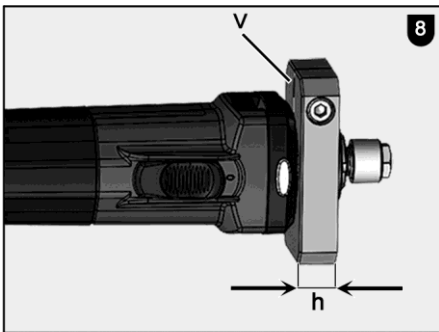


MAF02195/b

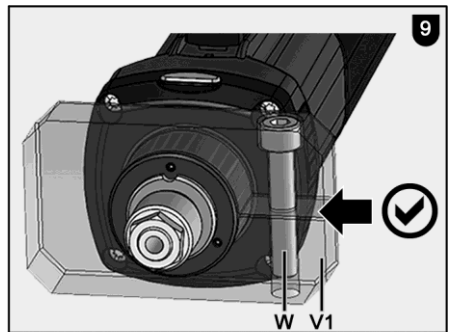
$PS_s$	$U_s / \text{V}$	FM 800 (230 V)	FM 1000 (230 V) FM 1000 WS (230 V) FM 1000 PV (230 V) FM 1000 PV-ER (230 V) FM 1000 PV-WS (230 V)	FM 1000 (120 V)
		 $n / \text{min}^{-1}$	 $n / \text{min}^{-1}$	 $n / \text{min}^{-1}$
1	0	7000	4000	10000
2	2	10600	8200	13000
3	4	14200	12400	16000
4	6	17800	16600	19000
5	8	21400	20800	22000
6	10	25000	25000	25000



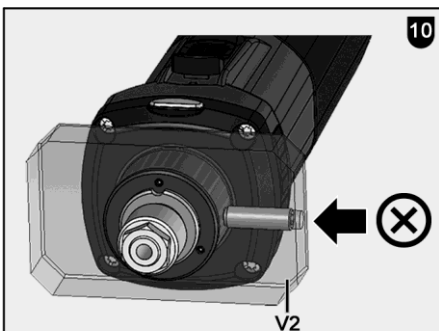
MAF02282/a



MAF02298/a



MAF02299/a



MAF02300/a

#### D - EG Konformitätserklärung

Wir bescheinigen hiermit, dass die Maschine FM 800/1000 WS/PV/ER den angeführten EU-Richtlinien entspricht. Bei Konstruktion und Bau wurden die gelisteten Normen angewendet. Bevollmächtigter für die Zusammenstellung der technischen Unterlagen: Mafell AG

#### GB - EC Declaration of Conformity

We herewith confirm that the machine FM 800/1000 WS/PV/ER complies with the EU directives quoted. The standards listed were used for design and construction. Empowered person for the configuration of the technical documents: Mafell AG

#### F - Déclaration CE de conformité

Nous déclarons par la présente que la machine FM 800/1000 WS/PV/ER est conforme aux directives CE applicables comme suit. Lors de la construction, les règlements suivants ont été utilisés. Plénipotentiaires pour l'assemblage des documentations techniques: Mafell AG

#### I - Dichiarazione di conformità CE

Con la presente certifichiamo che la macchina FM 800/1000 WS/PV/ER è conforme alle seguenti direttive CE applicabili. Nella progettazione e la costruzione sono state applicate le seguenti norme. Responsabile per la composizione della documentazione tecnica: Mafell AG

#### NL - EG conformiteitsverklaring

Wij bevestigen hiermede dat de machine FM 800/1000 WS/PV/ER aan de vermelde EU-richtlijnen beantwoord. Bij constructie en bouw werden de vermelde normen toegepast. Gemachtigde voor de samenstelling van de technische documenten: Mafell AG

#### E - Declaración de conformidad CE

Con la presente se certifica que la máquina FM 800/1000 WS/PV/ER cumple las directivas europeas mencionadas, las cuales forman la base tanto del diseño constructivo como de los procesos de fabricación. Apoderado legal para la compilación de la documentación técnica: Mafell AG

#### FIN - EY-vaatimustenmukaisuusvakuutus

Vakuutamme täten, että kone FM 800/1000 WS/PV/ER vastaa mainittujen EU-direktiivien vaatimuksia. Sen suunnittelussa ja valmistuksessa on sovellettu luettelossa ilmoitettuja standardeja. Teknisten asiakirjojen laatimiseen valtuutettu henkilö: Mafell AG

#### S - EG Konformitetsförklaring

Vi intygar härmed att maskinen FM 800/1000 WS/PV/ER uppfyller angivna EU direktiv. De angivna normerna användes vid konstruktion och tillverkning.

Befullmäktigad för sammanställningen av den tekniska dokumentationen: Mafell AG

#### DK - EU overensstemmelseserklæring

Vi attesterer hermed, at maskinen FM 800/1000 WS/PV/ER opfylder de angivene EU-direktiver. Konstruktion og bygning er udført iht. de angivene standarder. Person, der er befuldmægtiget til at sammenstille det tekniske materiale: Mafell AG

#### RUS - Сертификат соответствия ЕС

Настоящим подтверждаем, что машина FM 800/1000 WS/PV/ER отвечает требованиям указанных директив ЕС. При проектировании и изготовлении применялись перечисленные нормы. Уполномоченный представитель по составлению технической документации: Mafell AG

#### PL - Deklaracja zgodności UE

Niniejszym potwierdzamy, że maszyna FM 800/1000 WS/PV/ER spełnia wymagania wyszczególnionych dyrektyw UE. W trakcie konstrukcji urządzenia zastosowano przedstawione normy. Pełnomocnik odpowiedzialny za zestawienie dokumentacji technicznej: Mafell AG

#### CZ - PROHLÁŠENÍ O SHODĚ

Tímto prohlašujeme, že stroj FM 800/1000 WS/PV/ER splňuje pokyny uvedených směrnic EU. Při plánování a sestavení byly využity uvedené normy.

Za sestavení technických podkladů zodpovídá: Mafell AG

#### SLO - ES izjava o skladnosti

S tem izjavljamo, da stroj FM 800/1000 WS/PV/ER ustreza navedenim direktivam EU. Pri konstrukciji in izdelavi so uporabili našeti standardi.

Za sestavo tehnične dokumentacije je pooblaščen o podjetje: Mafell AG



2006/42/EG  
2014/30/EU  
2011/65/EG

FM 800  
FM 1000  
FM 1000 PV / ER  
FM 1000 WS  
FM 1000 PV -WS

Mafell AG

D - 78727 Oberndorf, den 08.11.19

Dipl.-Ing. Matthias Krauss  
Vorstandsvorsitzender / CEO

EN 60745-1, EN 55014-1, EN 61000-3-2, EN 61000-3-3,  
EN 61000-4-2, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6,  
EN 12100

Art.-Nr. 9M0010, 9M0030, 9M0031  
Art.-Nr. 9M0001, 9M0020, 9M0021  
Art.-Nr. 9M0201, 9M0401  
Art.-Nr. 9M0101  
Art.-Nr. 9M0301

i. V. Dipl.-Ing. Harald Schmid, MBA  
Leitung Entwicklung und Konstruktion

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## 1 Signs and symbols



This symbol appears at places where you will find instructions for your own safety.

Non-compliance with these instructions may result in very serious injuries.



This symbol indicates a potentially hazardous situation.

If this situation is not avoided, the product or objects in its vicinity may get damaged.



This symbol indicates tips for the user and other useful information.

## 2 Product information

### Model

FM 800  
FM 1000  
FM 1000 PV  
FM 1000 PV-ER  
FM 1000 WS  
FM 1000 PV-WS

### Art.-No.

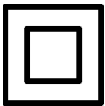
9M0010, 9M0030, 9M0031  
9M0001, 9M0020, 9M0021, 9M0023  
9M0201, 9M0223  
9M0401, 9M0423  
9M0101  
9M0301, 9M0323

### 2.1 Manufacturer's data

MAFELL AG, Beffendorfer Straße 4, D-78727 Oberndorf / Neckar, Phone +49 (0)7423/812-0, Fax +49 (0)7423/812-218

### 2.2 Machine identification

All details required for machine identification are available on the attached rating plate.



Protection class II



CE symbol to document compliance with the basic safety and health requirements according to Appendix I of the Machinery Directive.



For EU countries only

Do not dispose of milling motors together with domestic waste!

In accordance with the European directive 2002/96/EC on waste electrical and electronic equipment and transposition into national law, obsolete milling motors must be collected separately and recycled in an environmentally-compatible manner.



To reduce the risk of injury, please read the operating instructions.

## 2.3 Technical data

	FM 800	FM 1000	FM 1000 PV	FM 1000 PV-ER	FM 1000 WS	FM 1000 PV-WS	FM 1000 (120 V)
Operating voltage / V	230	230	230	230	230	230	120
Mains frequency / Hz	50	50	50	50	50	50	60
Input power / W	800	1000	1000	1000	1000	1000	1000
Nominal current / A	4.0	4.6	4.6	4.6	4.6	4.6	8.3
Supply voltage / V*	-	-	8 - 56	8 - 56	-	8 - 56	-
Control voltage for speed specification / V*	-	-	0 - 10	0 - 10	-	0 - 10	-
Display remaining runtime / V*	-	-	0 - 5	0 - 5	-	0 - 5	-
Power consumption / mA*	-	-	3 - 5	3 - 5	-	3 - 5	-
Idling speed / rpm	7000 – 25000	4000 – 25000	4000 – 25000	4000 – 25000	4000 – 25000	4000 – 25000	10000 – 25000
Tool holding fixture with collet ø / mm	6	8	8	8	8	8	6.35 (1/4")
Tool shank / mm	3 - 8	3 - 8	3 - 8	3 - 8	3 - 8	3 - 8	3 - 8
Milling cutter ø, max. / mm	36	36	36	36	36	36	36
Grinding tool ø, max. / mm	40	40	40	40	40	40	40
Weight without mains cable / kg	1.6	1.6	1.6	1.6	2.8	2.8	1.6
Length of connecting cable / m	1	4	0.75 + 4	0.75 + 4	4	0.75 + 4	4
Dimensions (W x L x H) / mm	73 x 254 x 79	73 x 254 x 79	73 x 254 x 79	73 x 254 x 79	92 x 280 x 85	92 x 280 x 85	73 x 254 x 79

\* Specifications for the portal interface (PV interface)

## 2.4 Emissions

The values stated are emission levels. Although there is a correlation between emission and imission level, it cannot be reliably derived from this whether additional precautions are necessary. Factors influencing the current imission level existing at the workplace comprise the duration of exposure, the room characteristic, other sources of noise, etc. such as e.g. the number of machines and other adjacent machining operations. In addition, the permissible imission level may differ from country to country. This information is nevertheless suitable for providing the machine user with an improved assessment of the hazard and risk.

## 2.4.1 Noise emission specifications

Noise emission values determined according to DIN EN ISO 3744:

Sound pressure level  $L_{PA} = 71 \text{ dB (A)}$

Uncertainty  $K_{PA} = 3 \text{ dB (A)}$

Sound power level  $L_{PA} = 82 \text{ dB (A)}$

Uncertainty  $K_{PA} = 3 \text{ dB (A)}$

The noise measurement was done without tool at idling speed.

## 2.5 Scope of supply

	FM 800	FM 1000	FM 1000 PV	FM 1000 PV-ER	FM 1000 WS	FM 1000 PV-WS
Operating manual	x	x	x	x	x	x
Open-ended spanner AF 17	x	x	x	-	-	-
Open-ended spanner AF 25	-	-	-	x	-	-
Collet OZ $\varnothing$ / mm	6	8	8	-	-	-
Collet ER 16	-	-	-	8	-	-
Cable / m	1	4	0.75 + 4	0.75 + 4	4	0.75 + 4
Covering cap Z	-	-	x	x	-	x

## 2.6 Use according to intended purpose

- The milling motor is intended for permanent installation in guiding portal systems with  $\varnothing 43 \text{ mm}$  clamping collar.
- The milling motor with quick tool clamping can be flanged directly to a portal system using six screws (M6 thread) according to the specifications of the portal system (Fig. 5).
- The milling motor is not designed for continuous industrial operation.
- The milling motor is considered an incomplete machine. The milling motor may only be commissioned once it has been determined that the portal system into which the milling motor is to be incorporated complies with the provisions of the current and valid Machinery Directive. Please also note the corresponding warranty conditions for the milling motor and any supplementary appliances.

## 2.7 Residual risks



### Danger

Even if used in accordance with its intended purpose and despite conforming with the safety instructions, residual risks caused by the intended use that can lead to health consequences will always remain.

- Breakage of the rotating tool.
- Breakage of the tools and risk of the tools or parts of them being hurled away.
- Touching live parts with the housing open and the mains plug not removed.
- Hearing can be impaired when working for long periods without ear protectors.
- Emission of hazardous or potentially explosive dusts (all types) during longer lasting operation without extraction. Please note the safety data sheet of the material to be machined.

### 3 Safety instructions



#### **Danger**

Always observe the following safety instructions and the safety regulations applicable in the respective country of use!

#### **General instructions:**

- Children and adolescents must not operate this machine. This rule does not apply to young persons receiving training and being supervised by an expert.
- Never work without the guards of the portal system into which the power tool is inserted and that are prescribed for each operation. Do not make any changes to the portal system and the milling motor that could compromise safety.
- Damaged cables or plugs must be immediately replaced. Replacement may only be carried out by Mafell or an authorised MAFELL service workshop in order to avoid safety hazards.
- Avoid sharp bends in the cable. Do not wind the cable around the milling motor especially when transporting and storing the milling motor.
- The use of the power tool with water or conductive liquids is prohibited.
- We exclude the use as hand-guided milling motor.
- Keep the milling motor away from rain or moisture. The penetration of water into the milling motor increases the risk of electric shock.

#### **Do not use:**

- Damaged tools or tools that have changed their shape.
- Blunt tools due to the excessive motor load.
- Tools that are not suitable for the milling motor speed during idling.

#### **Instructions on the use of personal protective equipment:**

- Always wear ear protectors during work.
- Always wear a dust mask during work.
- Always wear protective goggles during work.

#### **Instructions on operation:**

- Do not reach with your hands into the danger zone of the tool.
- Examine the workpiece for foreign objects.
- Monitor the speed. If an uncontrolled speed increase or speed jump occurs, the power supply must be switched off immediately.

## Instructions on service and maintenance:

- Regular cleaning of the milling motor is an important safety factor.
- Only original MAFELL spare parts and accessories may be used. Otherwise, the manufacturer will not accept any warranty claims and cannot be held liable.

## 4 Setting / Adjustment

### 4.1 Mains connection

Prior to initial operation, make sure that the mains voltage agrees with the operating voltage stated on the milling motor's rating plate.

### 4.2 Selection of tools

Only use the collets/adaptor sleeves listed in the chapter "Optional accessories". Tools are selected depending on the materials to be processed and the capacity of the feed drives. Please take into account the milling motor capacity at maximum tool diameter and anticipated machining depth.

### 4.3 Tool change



#### Danger

Pull the power plug during all service work.



Wear protective gloves during a **tool change**. The insertion tool can get very hot during longer operation and/or the insertion tool's cutting edges are sharp.

#### 4.3.1 Tool clamping by means of collet

The spindle **1** (Fig. 1) of the milling and grinding motor is equipped with a precision collet **2** (Fig. 1) to hold the tools. The spindle lock is triggered by the locking button **4** and facilitates tightening and loosening of the union nut **3** (Fig. 1).

Proceed as follows for the tool change:

- Lock the spindle **1** (Fig. 1) to unclamp the tool by pressing the locking button **4** (Fig. 1).
- Detach the union nut **3** with an open-ended spanner AF 17 or wrench ER 16 M.
- Pull off the tool to the front.
- Push the new tool into the tool holding fixture up to the limit stop.
- Check the tool's seat.
- Spindle **1** (Fig. 1) is locked when the tool is clamped.
- The union nut **3** is tightened with the open-ended spanner AF 17 / wrench ER 16 M.

#### 4.3.2 Quick tool clamping



- Switch on the milling motor only when the lever **6** (Fig. 3) is not in the tool change position.
- Do not actuate lever **6** (Fig. 3) until the milling motor is at a standstill.

The spindle **7** (Fig. 3) of the quick tool clamping device is equipped with a precision holding fixture for a tool shank  $\varnothing 8$ .

Proceed as follows for the tool change:

- To unclamp the tool, move lever 6 (Fig. 3) forward up to the stop.
- Pull off the tool to the front.
- Push the new tool into the tool holding fixture up to the limit stop.
- Check the tool's seat.
- To clamp the tool, move the lever back to its original position.

#### 4.4 Collets



##### **Danger**

To protect the thread, only screw the union nut 3 (Fig. 1) lightly onto the spindle 1 (Fig. 1), but do not tighten when no tool is inserted. Collet 2 (Fig. 1.) could get pressed together too much and be damaged in the process.

##### 4.4.1 Information on the use of collets:

- Please always use the correct milling cutter size for OZ collets (DIN 6388) and also for ER16 collets (DIN 6499).
- Please always click the collet into the union nut first, then insert the milling cutter.
- If jammed, please loosen the collet with a square timber or rubber hammer with a light blow from behind (no metal tool!).
- Please oil the collet collets at the beginning as well as after longer use as otherwise they can get stuck.
- A significantly better concentricity can also be achieved by using a solid lubricant (e.g. Molykote P-40) or by lightly greasing the collets.

##### 4.4.2 Recommended tightening torques (observe overall system)

Tightening torque for union nut / collet = 10 -11 Nm

Tightening torque for clamping collar 43 mm = 7 Nm

The Euro neck mount "V" should not be smaller than dimension "h" (Fig. 8). Dimension "h" amounts to 20 mm.

Clamp the milling motor as far as possible across the entire mounting diameter in the Euro neck mount "V1" (Fig. 8). Tighten clamping screw „W“ with max. 7 Nm. (Fig. 9)

As far as possible, avoid punctual clamping (for instance using a grub screw) in the Euro neck mount „V2“ (Fig. 10).

##### 4.4.3 Maximum speed when using a collet adapter

The recommended maximum speed for the use of the collet chuck adapter OZ and the collet chuck adapter ER is max. 16000 rpm.

## 5 Operation

### 5.1 Initial operation

Personnel entrusted to work with the milling motor must be made aware of the operating manual, calling particular attention to the chapter "Safety instructions".

This operating manual only deals with the milling motor and does not consider the installation situation. Please take note of any other operating manuals.

### 5.1.1 Switching on

Push the power switch 5 (Fig. 1) forward until it engages. If the milling motor is connected to the mains voltage, the setting wheel X (Fig. 2) lights up in blue (BU) and the milling motor accelerates to the previously set speed after 0.2 s with a soft start. The duration of the soft start depends on the set speed and is approx. 1.2 s at maximum speed.

### 5.1.2 Switching off

Push onto the rear end of the power switch 5 (Fig. 1). The switch audibly jumps back to off position. The lighting on the setting wheel X (Fig. 2) goes out and the motor coasts to a standstill.

## 5.2 PV design

With the PV design Y (Fig. 2) you can control the speed via the PV interface and automatically monitor the remaining runtime in the event of overload.

To protect the user and the connected systems, the PV interface is electrically isolated from the power supply of the drive train (safety isolation). All signal and operating voltages refer to the reference potential "GND".

As soon as the supply pin "U<sub>PV</sub>" of the PV interface is supplied with voltage in accordance with the specification, the milling motor switches to "portal mode".

The bottom status table 3 shows all possible control constellations.

Input						Output	
HS / -	U <sub>AC</sub> / V	U <sub>PV</sub> [V]	PS <sub>s</sub>	U <sub>s</sub> [V]	U <sub>0</sub> / V	Operating mode	n [rpm]
OFF	N/A	N/A	N/A	N/A	N/A	Out of operation	0
ON	0	N/A	N/A	N/A	N/A	Out of operation	0
ON	198-253	< 6	1	N/A	N/A	Manual mode	4000
ON	198-253	< 6	6	N/A	N/A	Manual mode	25000
ON	198-253	8 - 56	N/A	0	0 - 1	Portal mode	4000
ON	198-253	8 - 56	N/A	10	0 - 1	Portal mode	25000
ON	198-253	8 - 56	N/A	0 - 10	1.5 - 5	Overload mode	4000 - 25000

Table 3: Possible control constellations

## Legend:

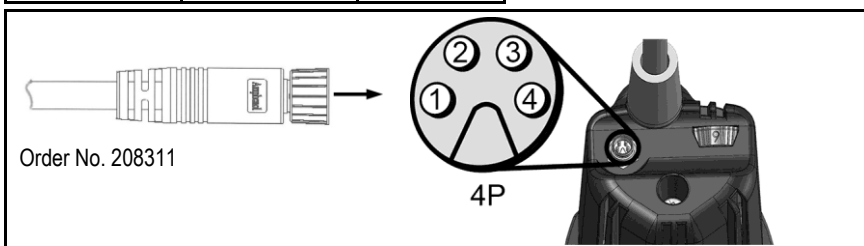
Unit	Meaning
HS	= power switch
$U_{AC}$	= mains voltage
$U_{PV}$	= power supply (PV interface)
PSs	= position setting wheel
$U_s$	= control voltage speed (PV interface)
$U_o$	= display remaining runtime in overload mode (PV interface)
GND	= reference potential for voltages of the PV interface
n	= speed of the working spindle
N/A	= not applicable or not relevant

When the PV interface is not in use, protect it against dirt with the supplied covering cap Z (Fig. 4).

### 5.2.1 Assignment portal connector

All pins on the portal connector are protected against reverse polarity. At voltages above 30 V, continuous operation with reversed polarity must be avoided as this can lead to failure of the PV interface.

Pin No.	Parameter	Colour of wire Order No. 208311
1	$U_{PV}$	Brown
2	$U_s$	White
3	$U_o$	Black
4	GND	Blue



### 5.3 Speed specification

With the setting wheel X (Fig. 2) you can adjust the speed continuously. The concrete speed values of individual stages can be found in the table on page 5 or on the speed sticker on the housing.

Until the motor characteristic is reached, the built-in electronics readjust to the set speed.



### 5.3.1 Speed setting in PV design

In “portal mode”, the position of the setting wheel **X** (Fig. 2) for the speed setting is ignored. The speed can only be changed by the voltage at the pin “**Us**“. If you wish to set the speed by means of the setting wheel **X** (Fig. 2), “portal mode” must first be deactivated by switching off the power supply at the pin “**Upv**“ or by removing the PV control cable.

The correlation between speed and control voltage is illustrated in formulae (1) and (2).

$$U_s = \frac{n - 4000 \text{ min}^{-1}}{2100 \frac{\text{min}^{-1}}{\text{V}}} \quad (1)$$

$$n = U_s * 2100 \frac{\text{min}^{-1}}{\text{V}} + 4000 \text{ min}^{-1} \quad (2)$$

### 5.4 Overload protection



#### Danger

If you carry out any work on the working spindle after the overload protection has triggered, the mains plug must first be removed.

To protect the milling motor, the operating parameters current, speed and temperature are dynamically monitored and the power tool is switched off if necessary. Shortly before the overload protection is tripped, the illumination of the setting wheel **X** (Fig. 2) changes to a permanent red (RD).

To put the milling motor back into operation, you must open and close power switch 5 (Fig. 1). The milling motor goes into operation and the illumination of the setting wheel **X** (Fig. 2) changes to blue (BU).

#### 5.4.1 Optical display of the remaining runtime

Triggering of the overload protection during operation leads to breakage of the milling tool, damage to the workpiece or even damage to the portal system. You can prevent this by paying attention to the visual output signals at the setting wheel **X** (Fig. 2).

As long as the milling motor is **not** overloaded in terms of performance, the setting wheel lights up permanently in blue (BU).

If the milling motor is overloaded, the calculated remaining runtime is displayed flashing in red (RD). On page 6 (Fig. 7) you can see the temporal arrangement of the pulses in overload mode. The correlation between the flashing behaviour and the associated remaining runtime is shown in the bottom table 4 on page 31.

If the remaining runtime is not sufficient for your application, reduce the load or feed rate to be able to switch back to continuous operation.

#### 5.4.2 Display of the remaining runtime in the PV design

If the milling motor is in “portal mode”, the remaining runtime can be queried via the PV interface in addition to the visual display.

The bottom table shows the correlation between the remaining runtime and the associated output variables.

Operating mode	Remaining runtime / s	Display remaining runtime U <sub>0</sub> / V	Setting wheel illumination
Continuous operation	unlimited	0	Blue (BU), permanent
Overload mode (motor is running)	< 160	1.5	1 x red pulse (RD)
	< 80	2.5	
	< 40	3	2 x red pulse (RD)
	< 20	4	
	< 10	4.5	3 x red pulse (RD)
	< 5	5	Red (RD), permanent
Switch-off	0	5	

Table 4: Correlation between the remaining runtime and the associated output variables

## 6 Service and maintenance



### Danger

Pull the power plug during all service work.

MAFELL machines are designed to be low in maintenance.

Replace the carbon brushes at the latest after 125 - 150 operating hours. The spare parts can be referenced in chapter 9.

The ball bearings used are greased for life. When the machine has been in operation for a longer period of time, we recommend to hand the machine in at an authorised MAFELL customer service shop for inspection.

### 6.1 Storage

If the milling motor is out of service for a lengthy period of time, it should be thoroughly cleaned. Spray bright metal parts with a rust inhibitor. Close the portal connector with the supplied covering cap Z (Fig. 4).

## 7 Troubleshooting



### Danger

Determining the causes for existing defects and eliminating these always requires increased attention and caution. Pull the mains plug beforehand!

Some of the most frequent defects and their causes are listed in the following chart. In case of other defects, please contact your dealer or the MAFELL customer service directly.

Defect	Cause	Elimination
The milling motor cannot be switched on The setting wheel does <b>not</b> light up	There is no mains voltage	Check the power supply
	The mains fuse is defective	Replace the mains fuse

<b>Defect</b>	<b>Cause</b>	<b>Elimination</b>
The milling motor cannot be switched on. The setting wheel lights up in <b>blue</b> (BU)	The carbon brushes are worn	Take the milling motor to the MAFELL customer service
The milling motor stops during operation. The setting wheel does <b>not</b> light up	Mains failure	Check the mains back-up fuses
The milling motor stops during operation. The setting wheel lights up in <b>red</b> (RD)	The overload protection was triggered	Switch off the power switch. Clear the working spindle before initial operation Switch on the power switch and continue operation with reduced load/feed rate
The speed cannot be adjusted at the setting wheel	The milling motor is in portal mode	Switch off the power supply of the PV interface Remove the external connection of the PV interface
The speed cannot be controlled via the PV interface	The power supply of the PV interface is missing / is inadequate	Switch on the power supply of the PV interface in accordance with the specification
	The contacting to the portal connector is insufficient	Check the contacting
	The PV control cable is defective	Replace the PV control cable
	The assignment of the PV interface is incorrectly connected with the portal system	Connect the PV control cable according to chapter "Assignment portal connector"

## 8 Optional accessories

- Collet OZ $\varnothing$ 3 mm	Order No. 093731
- Collet OZ $\varnothing$ 4 mm	Order No. 093732
- Collet OZ $\varnothing$ 6 mm	Order No. 093733
- Collet OZ $\varnothing$ 8 mm	Order No. 093734
- Collet $\varnothing$ 1/8" (3.175 mm)	Order No. 093735
- Collet $\varnothing$ 1/4" (6.35 mm)	Order No. 093736
- Collet OZ $\varnothing$ 3 mm + union nut	Order No. 093737
- Collet $\varnothing$ 1/8" (3.175 mm) + union nut	Order No. 093738
- Collet ER 16 $\varnothing$ 3 mm	Order No. 093753
- Collet ER 16 $\varnothing$ 4 mm	Order No. 093754
- Collet ER 16 $\varnothing$ 6 mm	Order No. 093755
- Collet ER 16 $\varnothing$ 8 mm	Order No. 093756
- Collet ER 16 $\varnothing$ 3.175 mm (1/8")	Order No. 093757
- Union nut OZ	Order No. 093729
- Union nut ER 16 M	Order No. 093758
- Adapter sleeve $\varnothing$ 3 mm	Order No. 207944
- Adapter sleeve $\varnothing$ 1/8" (3.175 mm)	Order No. 207945
- Adapter sleeve $\varnothing$ 4 mm	Order No. 207949
- Adapter sleeve $\varnothing$ 6 mm	Order No. 207946
- Collet adapter OZ incl. union nut OZ	Order No. 207943
- Collect adapter ER 16 incl. union nut ER 16	Order No. 208109
- PV control cable M8 / 4-pol, 5 m	Order No. 208311

## 9 Exploded drawing and spare parts list

The corresponding information in respect of spare parts can be found on our homepage: [www.mafell.com](http://www.mafell.com)