

Test report

Number T251-0633/22 M1 **Project file:** C20212616
Date: 2023-01-23
Pages: 6

Product: Surface-restoration grinder

Type reference: RG 130 ECI

Ratings: 120 V~; 60 Hz
Protection class: II

Trademark: **FESTOOL**

Applicant: Festool GmbH
Wertstrasse 20, 73240 Wendlingen, Germany

Manufacturer: Festool GmbH
Wertstrasse 20, 73240 Wendlingen, Germany

Place of manufacture: See page 3

Summary of testing

Testing method: 47 CFR FCC Part 1.1307(b)(1)(B) in conjunction with Part 1.1310(d)(2), 2.1093(d)(2) and KDB 447498 D01 General RF Exposure Guidance v06

Testing location: SIQ Ljubljana
Mašera-Spasičeva ulica 10, SI-1000 Ljubljana, Slovenia

Remarks: Date of receipt of test items: 2022-03-23
Number of items tested: 1
Date of performance of tests: 2022-08-17
The test results presented in this report relate only to the items tested.
The test items were tested in the condition as received.
The product complies with the requirements of the testing methods.

Tested by: Luka Tosetto

Approved by: Marjan Mak

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1 GENERAL

History sheet			
Date	Report No.	Change	Revision
2022-08-19	T251-0633/22	Initial Test Report issued.	--
2023-01-23	T251-0633/22 M1	Update of test report issued due to added new calculations upon provided new data.	1.0

Places of manufacture:

- Festool GmbH, Weilheimer Strasse 32, 73272 Neidlingen, Germany,
- Festool s.r.o., Chelčického 1932, 470 37 Česká Lípa, Czech Republic,
- Festool GmbH, Johannes-Rau-Strasse 1, 73235 Weilheim an der Teck, Germany

1.1 Equipment under test

Surface-restoration grinder

Type: **RG 130 ECI**

Environment: Uncontrolled / General Public

Assessment distance: minimum → 10 mm (assessment distance used with 8 mm tolerance to predict most conservative worst-case distance)

FCC ID: **2AL2E-RG130**

Purpose of use of Bluetooth® module:

The Bluetooth® module is used for connection with a dust extractor. When the machine is started, the dust extractor is started too. The Bluetooth button on the machine is not used for pairing with a dust extractor. It is used for a service purpose only.

Adaptive / non-adaptive equipment	non-adaptive equipment
Modulation type	GFSK
Operating mode	Single antenna
Operating temperature range	-20 °C to +80 °C
Maximum RF Output power	4 dBm
Operating frequency	2402 MHz – 2480 MHz
Number of channels	40
Antenna type and gain	-3.6 dBi @ 2402 MHz, -4.9 dBi @ 2400 MHz, -5.58 dBi @ 2480 MHz
Antenna Beamforming	/
Nominal channel bandwidth	1 MHz, 2 MHz
Firmware:	10358243
Software:	720680

1MBit modulation:

Data transmission: maximum at 265 bytes packets (Preamble 1 byte + Access address 4 bytes + 2 bytes Header + 251 bytes user data payload + 4 bytes MIC + 3 bytes CRC) considering the shortest ACK.

$(265 \text{ [bytes]} / (1\text{Mbit}) \text{ [us]}) * 8 = 2120 \text{ us transmission time}$

ACK payload: 1 byte preamble + 4 byte address + 2 byte header + 3 byte CRC = 10 bytes = 80 us
transmission time + 150 us TIFS

ACK = 80 us + 150 us = 230 us

One sequence = (150 us + 2120 us) + (150 us + 80 us) = 2500 us

The total time of modulated TX output is (40 us + 2120 us) = 2160 us

Worst-case duty cycle: $2160 \text{ us} / 2500 \text{ us} = 0.864 \rightarrow$ **duty cycle: 86.4 %**

2MBit modulation:

Data transmission: maximum at 266 bytes packets (Preamble 2 byte + Access address 4 bytes + 2 bytes Header + 251 bytes user data payload + 4 bytes MIC + 3 bytes CRC) considering the shortest ACK.

$(266 \text{ [bytes]} / (2\text{Mbit [us]}) * 8 = 1064 \text{ us transmission time}$

ACK payload: 2 byte preamble + 4 byte address + 2 byte header + 3 byte CRC = 11 bytes = 44 us
transmission time + 150 us TIFS

ACK = 44 us + 150 us = 194 us

One sequence = (150 us + 1064 us) + (150 us + 44 us) = 1408 us

The total time of modulated TX output is (40 us + 1064 us) = 1104 us

Worst-case duty cycle: $1104 \text{ us} / 1408 \text{ us} = 0.784 \rightarrow$ **duty cycle: 78.4 %**

In process, reviewed test report T251-0347/22 M1 from SIQ Ljubljana and documentation provided by manufacturer.

2 ASSESSMENT PROCEDURE

According to 1.1307(b)(1)(B):

Prepare an evaluation of the human exposure to RF radiation pursuant to § 1.1310 and include in the application a statement confirming compliance with the limits in § 1.1310.

According to 1.1310(d)(2):

For operations within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 in paragraph (e)(1) of this section, may be used instead of whole-body SAR limits as set forth in paragraphs (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part, except for portable devices as defined in § 2.1093 of this chapter as these evaluations shall be performed according to the SAR provisions in § 2.1093.

According to 2.1093(d)(2):

Evaluation of compliance with the SAR limits can be demonstrated by either laboratory measurement techniques or by computational modeling. The latter must be supported by adequate documentation showing that the numerical method as implemented in the computational software has been fully validated; in addition, the equipment under test and exposure conditions must be modeled according to protocols established by FCC-accepted numerical computation standards or available FCC procedures for the specific computational method. Guidance regarding SAR measurement techniques can be found in the Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB).

KDB 447498 D01 General RF Exposure Guidance v06 Clause 4.3.1. Standalone SAR test exclusion considerations

SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, is (are) satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

3 MEASUREMENTS / CALCULATIONS

Values for each configuration are listed in the following table:

1 MHz and 2 MHz bandwidth:

Frequency (MHz)	Test distance (mm)	Maximum* output power of a channel with tune-up (dBm)	Maximum* output power of a channel with tune-up (mW)	SAR Test Exclusion Threshold (mW)
2402	10	1.5	1.41	19.36
2440	10	0.6	1.15	19.21
2480	10	0.72	1.18	19.05

* Gated power with Duty Cycle calculated in

** maximum tolerance provided from manufacturer is ± 2 dB.

Conclusion: PASS; SAR Evaluation is not required due to SAR Test Exclusion Thresholds are met.

There is no simultaneous transmission between any other transmitter.