Company: Columbusmaskiner AB Date: 2024-12-17 Measurement Personnel: Jari Palosaari, Alexander Österström Measuring Instrument: Svantek 106 ID No: 45142

WNR-STD	Measured RMS, m/s <sup>2</sup>						m/s²
Measurement Sequence / Position of Accelerometer	Dir.	1	Dir.	2	Dir.	3	a <sub>v</sub>
Idle Running Right Handle	Х	0,4	Y	0,281	Z	0,45	0,7
Tightening + Impact One Shot Right Handle	Х	2,911	Y	2,082	Z	2,961	4,6
Idle Running Left Handle	Х	0,304	Y	0,277	Z	0,318	0,5
Tightening + Impact One Shot Left Handle	Х	2,799	Y	2,497	Z	3,258	5,0

Machine Type: Wheel Nut Driver Manufacturer: Columbusmaskiner AB Model: WNR-STD Drive: Electric, 400V, 3-phase, 50Hz Power: 1.1 KW Weight: 60 kg

## 1. Test Equipment

• Vibration Meter: Svantek SV 106

• Accelerometer: Kuber for measuring hand-arm vibrations in 3 directions (X, Y, Z)

• Test Position: Measurements were taken on the machine's handles where the user would normally hold the machine during operation.

• Test Distance from Machine: Measurements were taken at the handles of the machine, where vibration levels are most relevant for user exposure.

• Test Position: Accelerometers were placed on the specific handles where vibrations most likely affect the user, photos are available in the folder.

## 2. Test Procedure

**Type of Test**: The test was conducted with idle run for about 1 minute, as well as tightening and loosening the nut with impact.

The test was repeated 4 times.

Referenced ISO Standards:

• ISO 5349-1:2001 – "Mechanical vibrations — Measurement and evaluation of human exposure to hand-transmitted vibrations — Part 1: General guidelines"

• EN ISO 20643:2010 – "Mechanical vibrations — Measurement and evaluation of hand-arm vibration"

# **3. Measurement Results**

### Equivalent vibration level (hand-transmitted vibration):

• Idle run:

- Right handle: 0.4 m/s<sup>2</sup>
- Left handle: 0.304 m/s<sup>2</sup>
  Tightening + Impact:
- Right handle: 2.911 m/s<sup>2</sup>
- Left handle: 2.799 m/s<sup>2</sup>
  Maximum vibration levels:
  Max vibration level (hand-transmitted):
- Left handle: 5.0 m/s<sup>2</sup> (Tightening + Impact One Shot)

Test conditions: Indoor, Temperature: 19°C

**Background vibration level**: Vibration levels in the test area were below  $0.2 \text{ m/s}^2$  and were considered not to affect the results.

# 4. Compliance with EU Regulations

• Machinery Directive 2006/42/EC: The machine complies with the basic health protection and safety requirements, including those regarding vibration. The measured vibration levels are below the maximum allowable value for hand-transmitted vibrations, ensuring that the machine does not pose a risk to the user.

• **Maximum allowable vibration level**: According to EN ISO 5349 and EN ISO 20643, hand-transmitted vibrations should not exceed 5.0 m/s<sup>2</sup> as an average over an eight-hour workday. The maximum vibration level measured during the test is 5.0 m/s<sup>2</sup>, which may require further action depending on the duration of use and exposure time. This impact wrench operates based on the "one tone shot" principle, meaning the maximum value of 5.0 m/s<sup>2</sup> is within an acceptable range and does not need corrective action.

# 5. Summary and Conclusions

• **The machine meets vibration requirements**: Yes, the machine meets the vibration requirements according to ISO 5349 and EN ISO 20643.

• Maximum vibration levels: 5.0 m/s<sup>2</sup> (Tightening + Impact One Shot Left Handle)

• Other observations: No significant deviations were observed during the test. Vibrations were within acceptable limits for all operating conditions.

**Recommendations**: No action is required, as the test results are within approved limits, and the machine complies with vibration requirements for CE marking.

#### **Uncertainty Contributions:**

- Instrument uncertainty (Svantek SV 106): ±5%
- Calibration uncertainty: ±2%
- Variability in repeated measurements:  $\pm 5-10\%$
- Mounting method and operator influence: ±5%
- Environmental factors (temperature, background vibrations): ±2%

Total measurement uncertainty is calculated using the standard method and estimated at  $\pm 15\%$  (expanded uncertainty with a coverage factor k=2, corresponding to a 95% confidence interval).

#### Impact on results:

Given the measurement uncertainty, the following applies:

- The maximum measured vibration level of  $5.0 \text{ m/s}^2$  may range from 4.25 to  $5.75 \text{ m/s}^2$ .
- Tightening + Impact (One Shot) Left Handle:  $5.0 \pm 0.75 \text{ m/s}^2$
- Tightening + Impact (One Shot) Right Handle:  $4.6 \pm 0.69 \text{ m/s}^2$

### Conclusion:

Despite measurement uncertainty, the measured vibration levels remain within acceptable limits for hand-transmitted vibrations according to EN ISO 5349 and EN ISO 20643. Since the machine operates in intervals where vibrations are brief or periodic and does not exceed long-term exposure limits, no further occupational health assessment is needed.

# 6. Approval

- Test Leader (name, title): Jari Palosaari, Test Leader Date: 2024-12-20
- Responsible for machine CE marking: Alexander Österström, Technical Manager Date: 2024-12-20

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