Vibration

Vibration Intro

- 10-20% of workforces in OECD countries are exposed to hand-held tools that vibrate for more than 4 hours per day
- Hand Arm Vibration damage is IRREVERSABLE and accumulates over the years
- Hand Arm Vibration causes damage to nerves, blood circulation and muscles
- Vibration reducing gloves can be very beneficial but, in some cases, harmful if the wrong gloves are used

Vibration Basics!

1. Vibration ”Strength”

Vibration ”Strength” is measured in average acceleration m/s^2 (meter per second square measured in 3 dimensions (X, Y, Z))

2. Frequency of Vibration

The frequency of vibration of a tool is measured in Hz (oscillations per second)!
Machine rotation is usually measured in Rotations Per Minute (rpm)

100 Hz = 6 000 rpm
500 Hz = 30 000rpm

3. Different Frequencies

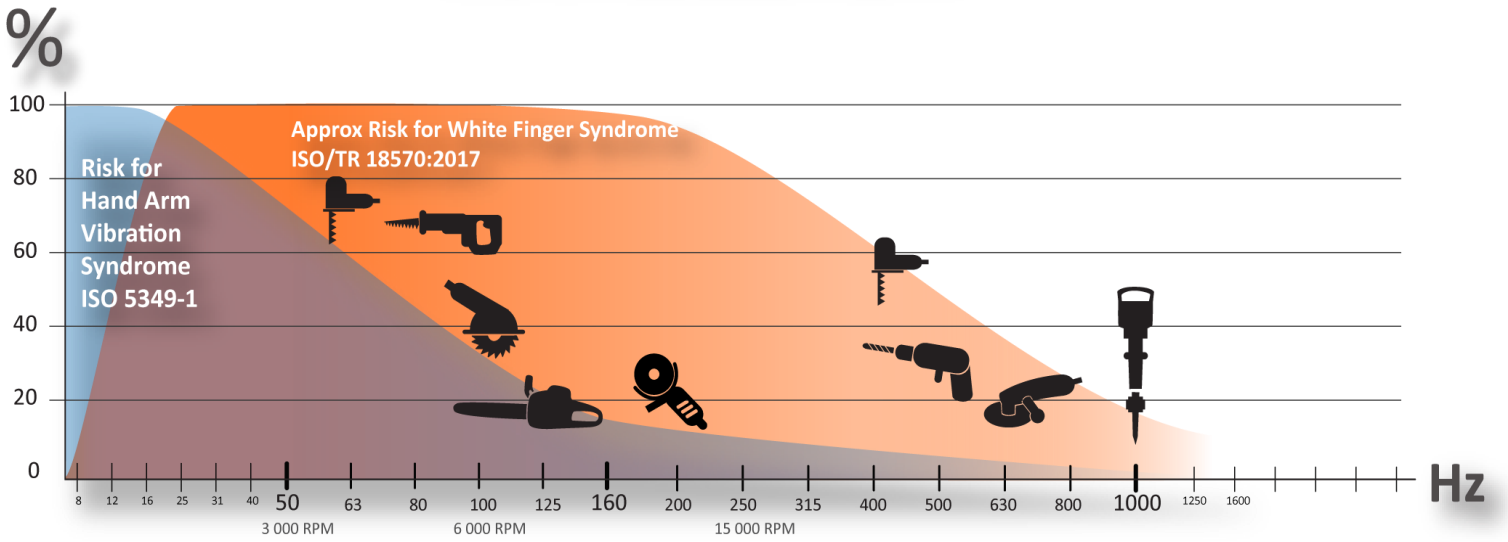
Different Frequencies affect the body differently! Blue and orange regions in the graph below show their potential hazard to humans when exposed!

a) Traditionally all tools and measurements are weighted according to the blue curve. This represent the arm and wrist problems.

b) Fingers absorb more energy and are more exposed between ~50-300Hz, represented by the area in orange.

4. High frequencies and acceleration peaks

High frequencies and acceleration peaks with short duration (impact wrenches and similar) are more dangerous than average exposure indicate!



Legislation

1. Vibrations

Vibrations are regulated by the EU directive 2002/44/EC and measured according to ISO 5349-1.
It is also covered in the PPE regulation EU 2016/425.

2. Details of EU legal framework

a) In cases where the average exposure to a weighted acceleration value of 2,5m/s^2 occurs, the employer must engage!

b) an average exposure to a weighted acceleration value of **5 m/s^2 is the absolute legal limit.**

3. Measurement & Glove standard

The measurements, glove standard, and the directive, warn about the need to consider other factors in addition to the average weighted acceleration.

Max exposure time and weighted average acceleration

Acceleration [m/s^2]	5 min	15 min	30 min	1h	2h	3h	4h	5h	6h	8h	10h
40	267	800	1600	3200	6400	9600	12800	16000	19200	25600	32000
30	150	450	900	1800	3600	5400	7200	9000	10800	14400	18000
25	104	313	625	1250	2500	3750	5000	6250	7500	10000	12500
20	67	200	400	800	1600	2400	3200	4000	4800	6400	8000
19	60	181	361	722	1444	2166	2888	3610	4332	5776	7220
18	54	162	324	648	1296	1944	2592	3240	3888	5184	6480
17	48	145	289	578	1156	1734	2312	2890	3468	4624	5780
16	43	128	256	512	1024	1536	2048	2560	3072	4096	5120
15	38	113	225	450	900	1350	1800	2250	2700	3600	4500
14	33	98	196	392	784	1176	1568	1960	2352	3136	3920
13	28	85	169	338	676	1014	1352	1690	2028	2704	3380
12	24	72	144	288	576	864	1152	1440	1728	2304	2880
11	20	61	121	242	484	726	968	1210	1452	1936	2420
10	17	50	100	200	400	600	800	1000	1200	1600	2000
9	14	41	81	162	324	486	648	810	972	1296	1620
8	11	32	64	128	256	384	512	640	768	1024	1280
7	8	25	49	98	196	294	392	490	588	784	980
6	6	18	36	72	144	216	288	360	432	576	720
5,5	5	15	30	61	121	182	242	303	363	484	605
5	4	13	25	50	100	150	200	250	300	400	500
4,5	3	10	20	41	81	122	162	203	243	324	406
4	3	8	16	32	64	96	128	160	192	256	320
3,5	2	6	12	25	49	74	98	123	147	196	245
3	2	5	9	18	36	54	72	90	108	144	180
2,5	1	3	6	13	25	38	50	63	75	100	125
2	1	2	4	8	16	24	32	40	48	64	80

"Eureka has taken action on the instructions of the EU directive!"

EU 2016/425 : 3.1.3.

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Legislation II

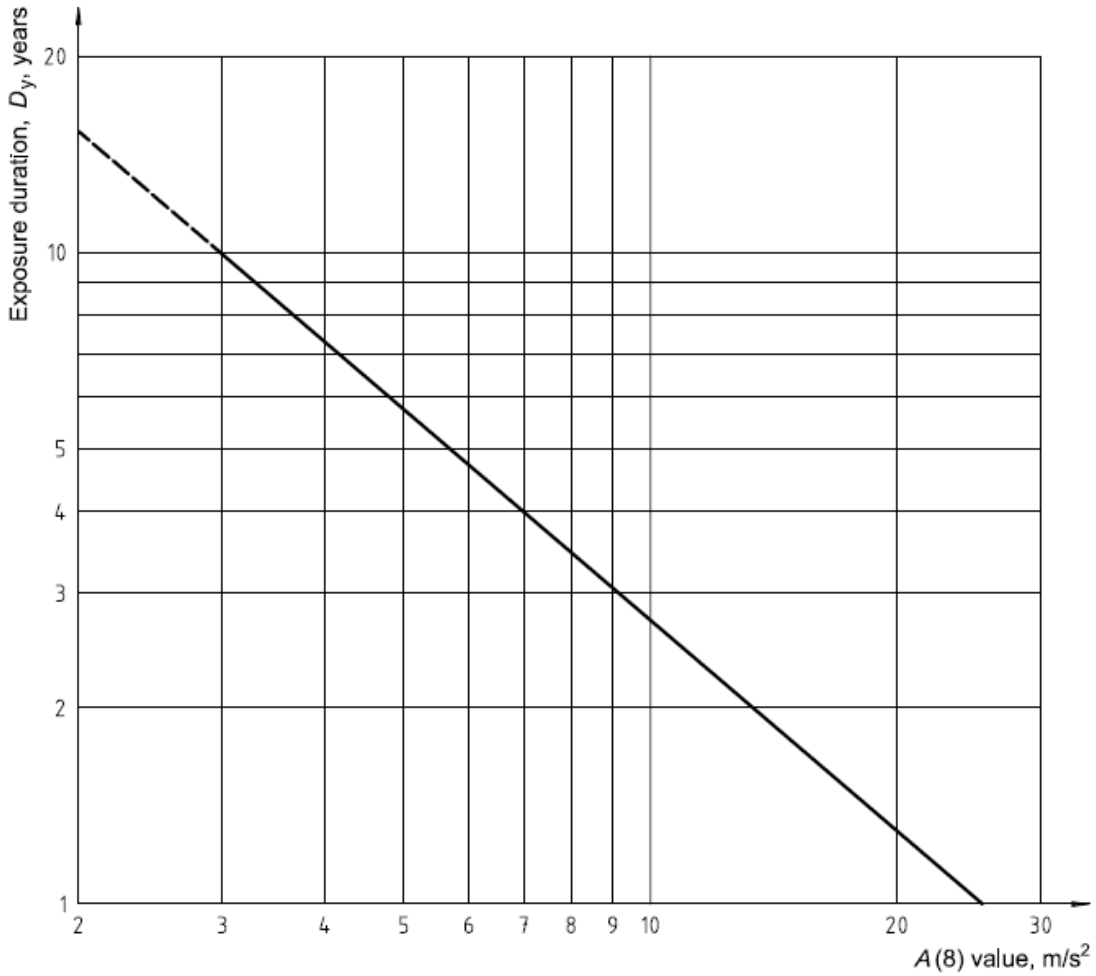


Figure C.1 — Vibration exposure for predicted 10 % prevalence of vibration-induced white finger in a group of exposed persons

Standards & Measurments

1. ISO 10819:2013

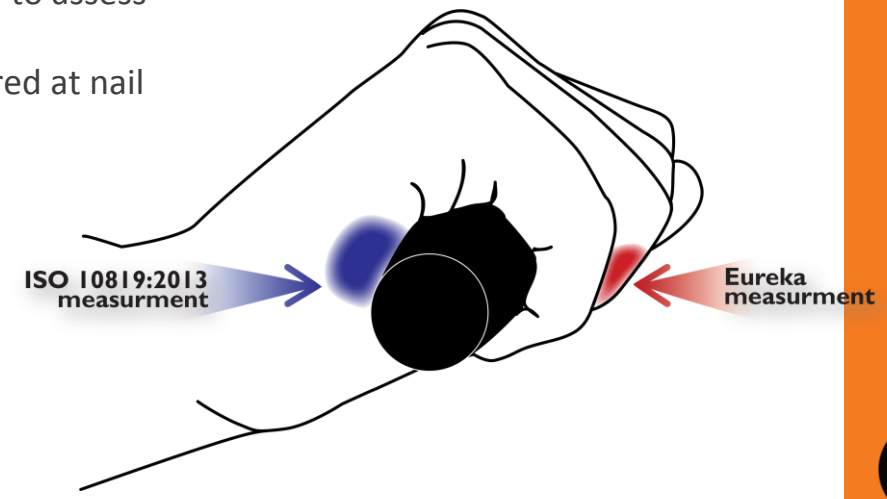
The vibration glove standard ISO 10819:2013 measures vibration reduction.
Vibration transmission through safety gloves, in palm ONLY while gripping a 40 mm diameter pipe with a pushing force of 50N and grip force of 30N.
The test is divided into to frequency ranges, ”TRm” =31,5-200Hz and ”TRh” 200-1000Hz.

TRm average transmission to hand should be below 0,9 (90%)
TRh average transmission to hand should be below 0,6 (60%)

Note! There can be many harmful peaks within these frequencies that the standard does not account for!

2. The Eureka Method

The Eureka method has used a modified version of the ISO 10819 standard to assess the vibration
reduction at the most sensitive part of the hand; the ring fingertip (measured at nail by use of laser).



”Eureka is using complementary measurements on the fingertips in ADDITION to the ISO 10819 test”

Glove conclusions

1. Every glove has Pros & Cons
2. The fingers are almost always the limiting factor
3. Correct glove must be used with correct tool
4. Worst glove-tool combination must be avoided

GLOVE GUIDE

Crude estimation of typical tools into the normal working condition

TOOL TYPE	FLEXI	AMPLITUDE	VIBRATION	TRANSIENT
Rivet guns, Impact wrenches, Impact hammers				
High speed multi tools				
Angle grinders				
Sanders & Grinders				
Nutrunner				
Mower, Hedge trimmer, Leaf blower				
Circular & Jig saws				

Disclaimer: Results are approximate and high risk work situations should be measured on site

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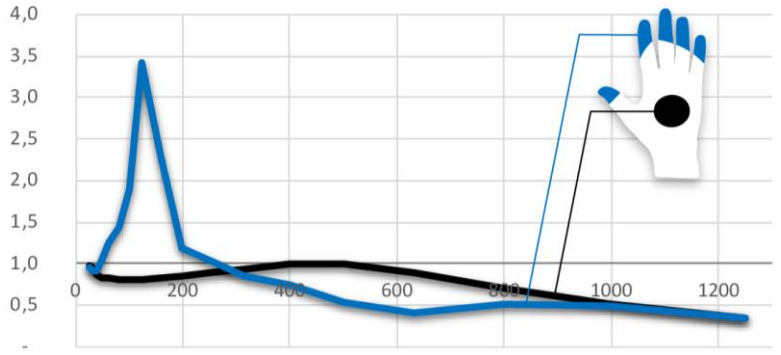
The Eureka solution

15-1 Transient Vibration

Thin glove for high frequency and impacting tools (>600 Hz)
Best in class comfort and dexterity
Long lasting and accels in oily environments
ISO10819:2013 TRm=0,855, TRh=0,904

EN388 4332B

ANSI CUT A2



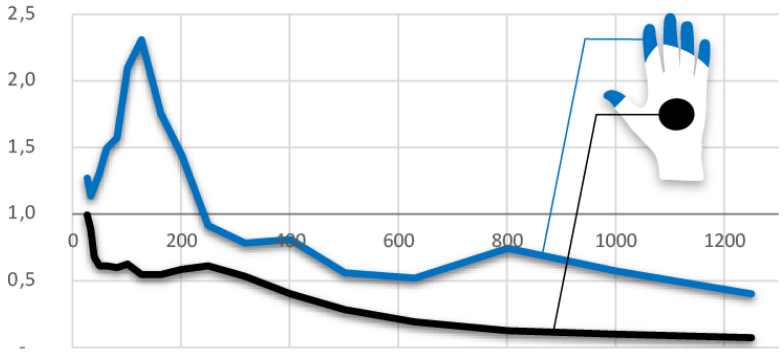
Impact Vibration & Winter

High comfort vibration reducing glove for high frequency and impacting tools (>~250 Hz)
Educational print in palm with high grip
ISO10819:2013 TRm=0,68, TRh=0,47

EN388 3X31C

EN10819 X

ANSI CUT A3



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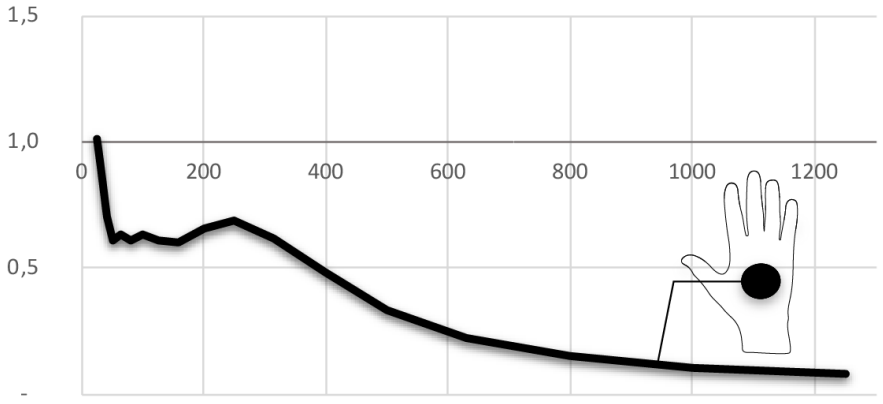
The Eureka solution

Impact Vibration Flexi

High comfort vibration reducing glove for
low to mid frequency tools (~50-~400 Hz)
Optimized design to minimize finger resonance
Educational print in palm with high grip
ISO10819:2013 TRm=0,71, TRh=0,53

EN388
2221X



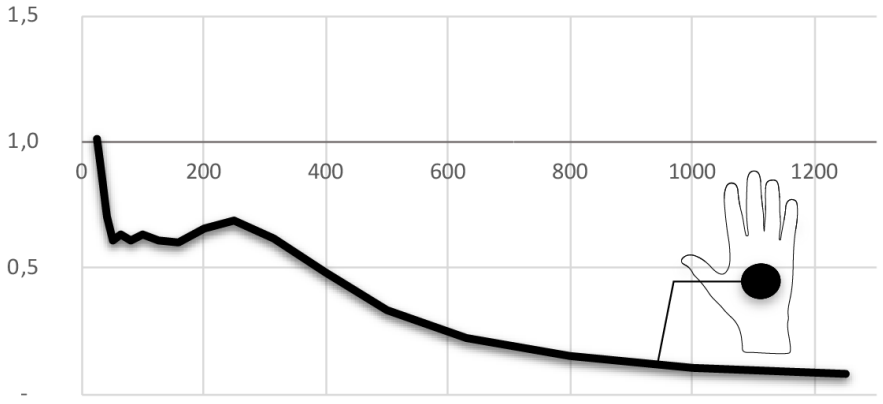
Impact Vibration Leather

High comfort vibration reducing glove for
low to mid frequency tools (~50-~400 Hz)
Educational print in palm with high grip
Perfect for working environments where sparks may occur
ISO10819:2013 TRm=0,71, TRh=0,53

EN388
3X23B

EN407
43XXXX

ANSI CUT
A2



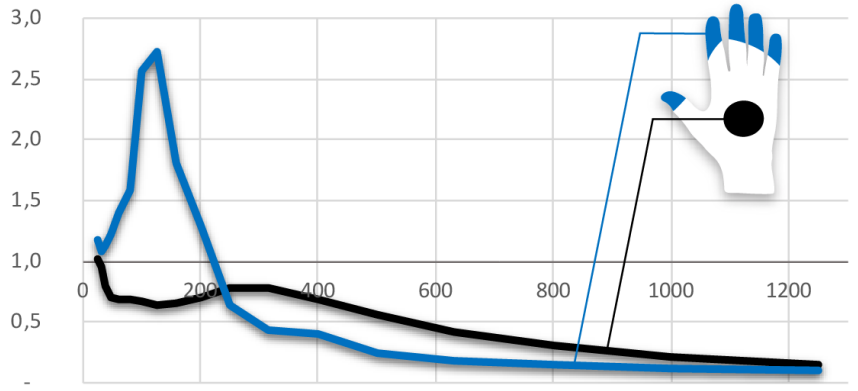
The Eureka solution

15-4 Amplitude Vibration

State of the art vibration reducing glove for hand, arm and fingers (>~200 Hz)
Patent 3515222 (SE, BE, FR, DE, GB)
ISO 10819:2013 TRm=0,76, TRh=0,67

EN388 4X41F

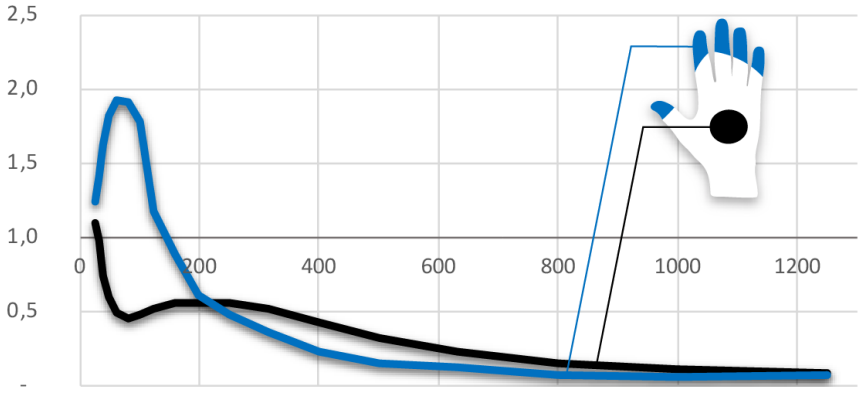
ANSI CUT A6



Impact Vibration Amplitude

State of the art vibration reducing glove for hand, arm and fingers (>~160 Hz)
Patent 3515222 (SE, BE, FR, DE, GB)
ISO10819:2013 TRm=0,67, TRh=0,45

EN388 2121X



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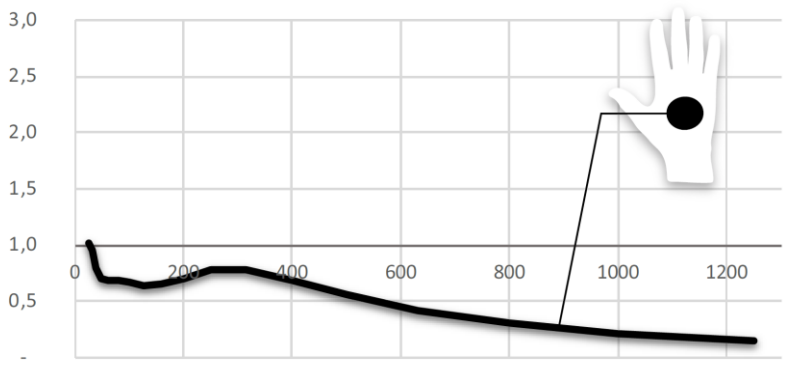
The Eureka solution

15-4 Flexi Vibration

High comfort vibration reducing glove for low to mid frequency tools (~5-~400 Hz)
Best in class comfort and dexterity
ISO 10819:2013 TRm=0,76, TRh=0,67

EN388
4X41D

ANSI CUT
A4



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Customer measuring report

1. Tool measurement

Power tools are measured on-site.

2. Calculation and recommendation

After measurements, the results are sent to our headquarters for processing. From the data we are able to determine the best suited glove model for a specific task/tool to maximize protection.

Company	**XXXX**
Date	**2019-01-25**
Data Mesurements by…….	
Data Analysis	**JB 2019-01-29**
Workstations / location	**XXXX**

Angle grinder "xx rpm" Working task	15-1TVIB	IMPVIBWIN	15-4AMP	IMPVIBAMP	IMPVIBFLEXI
Palm protection (residual exposure)	92%	78%	85%	79%	81%
Finger protection (residual exposure)	125%	115%	110%	81%	100%
Effect on injuries (square of mean)	118%	93%	95%	64%	82%

Working task	15-1TVIB	IMPVIBWIN	15-4AMP	IMPVIBAMP	IMPVIBFLEXI
Palm protection (residual exposure)	89%	74%	80%	70%	76%
Finger protection (residual exposure)	98%	100%	91%	75%	100%
Effect on injuries (square of mean)	88%	76%	73%	53%	77%

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Thank you!