

Stretching Testing Method for Flexible Hybrid Electronics

Naotsugu Ando, R&D, YUASA SYSTEM

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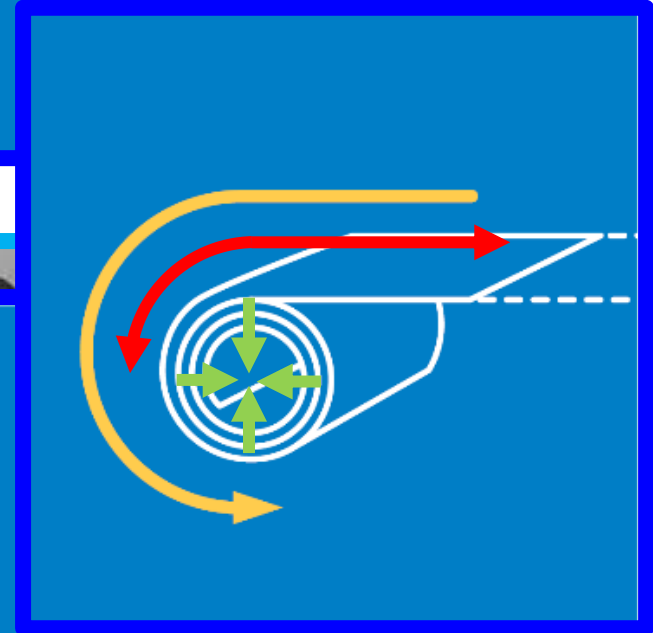
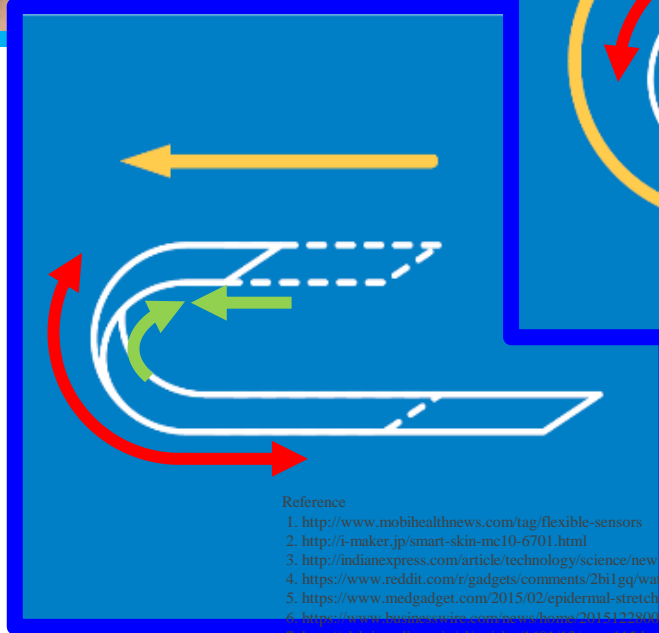
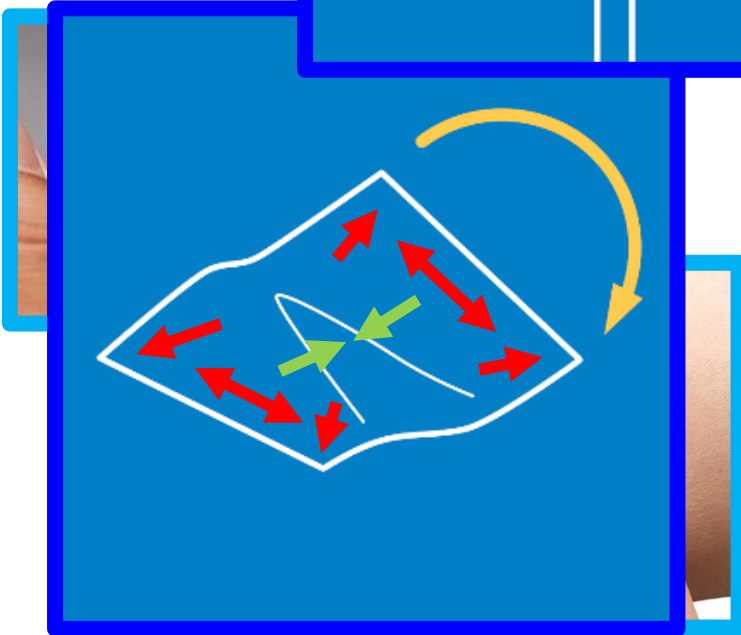
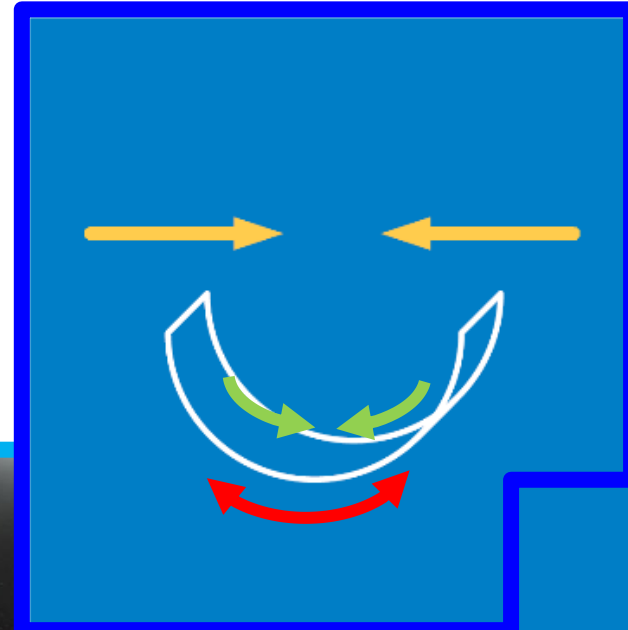
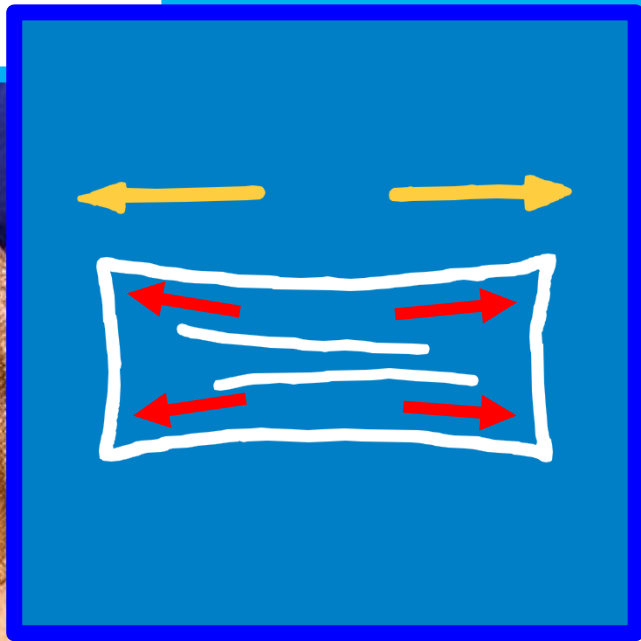
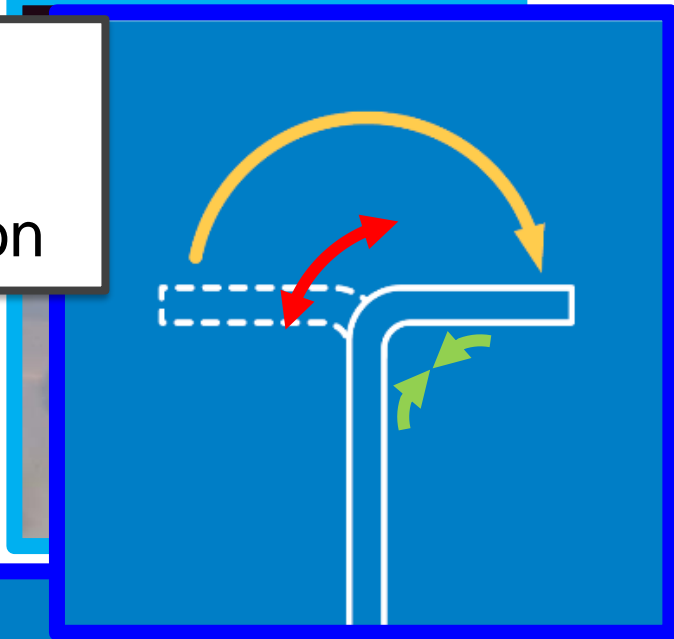
YUASA SYSTEM

naotsugu.andou@yuasa-system.jp

#YUASASYSTEM

MECHANICAL STRAIN TESTING

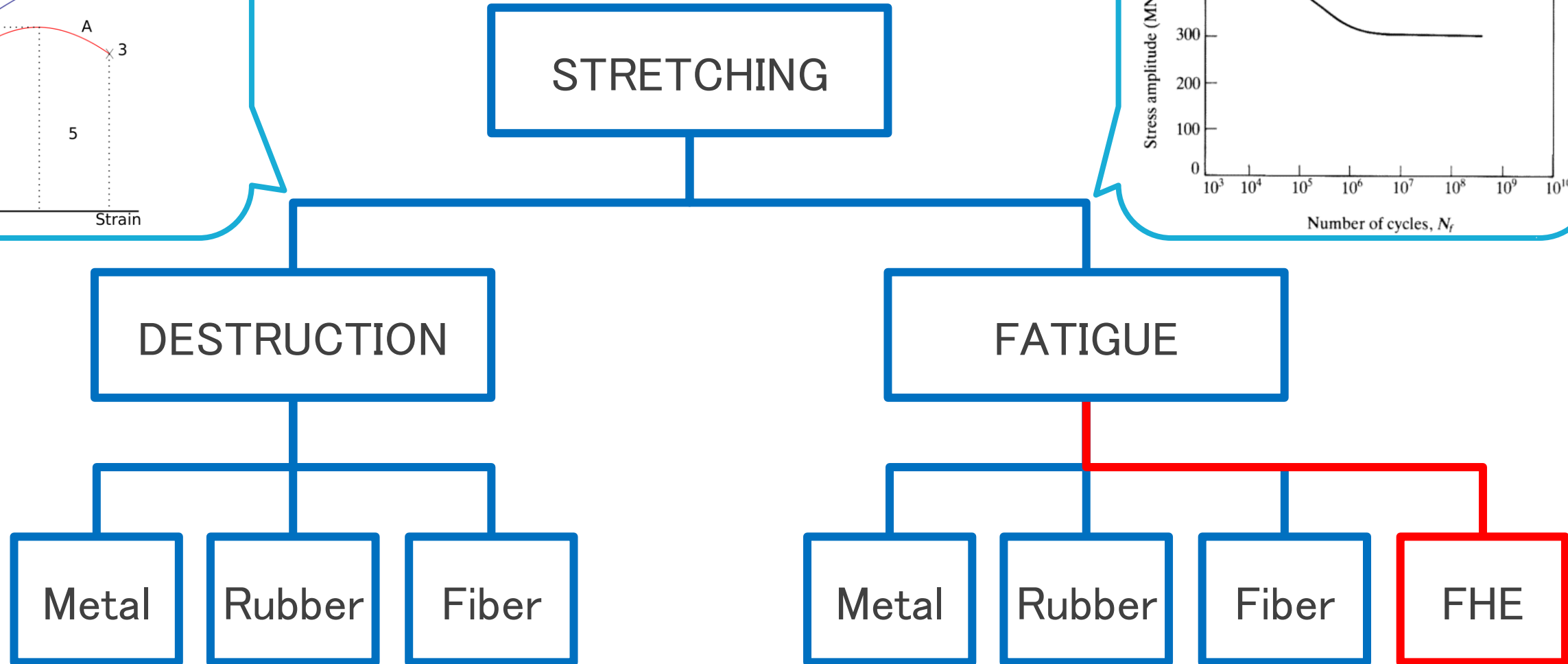
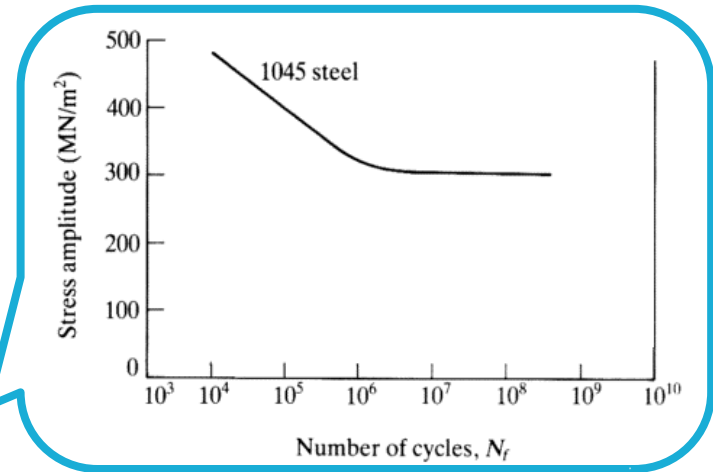
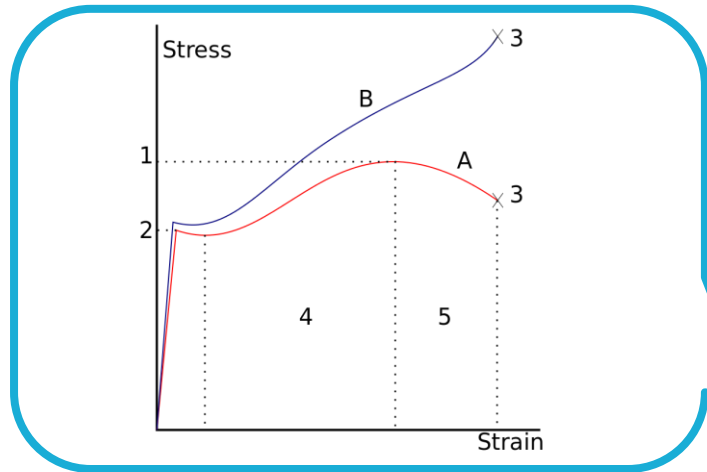
- ← Motion
- ← Tension
- ← Compression



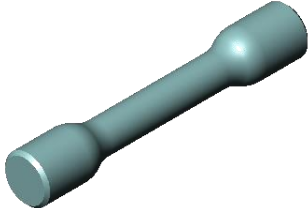
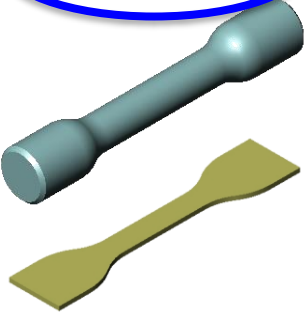
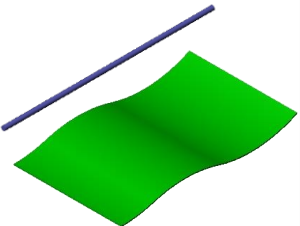
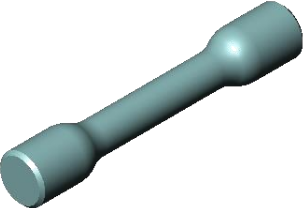
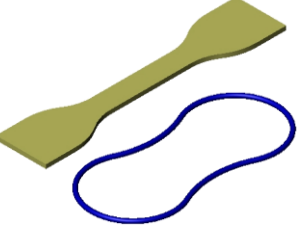
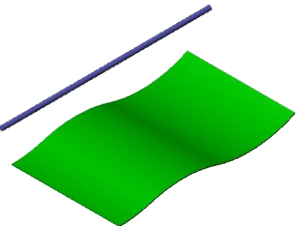
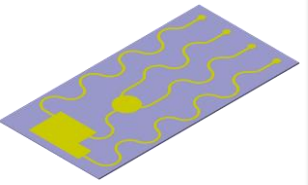
Reference

1. <http://www.mobihealthnews.com/tag/flexible-sensors>
2. <http://i-maker.jp/smart-skin-mc10-6701.html>
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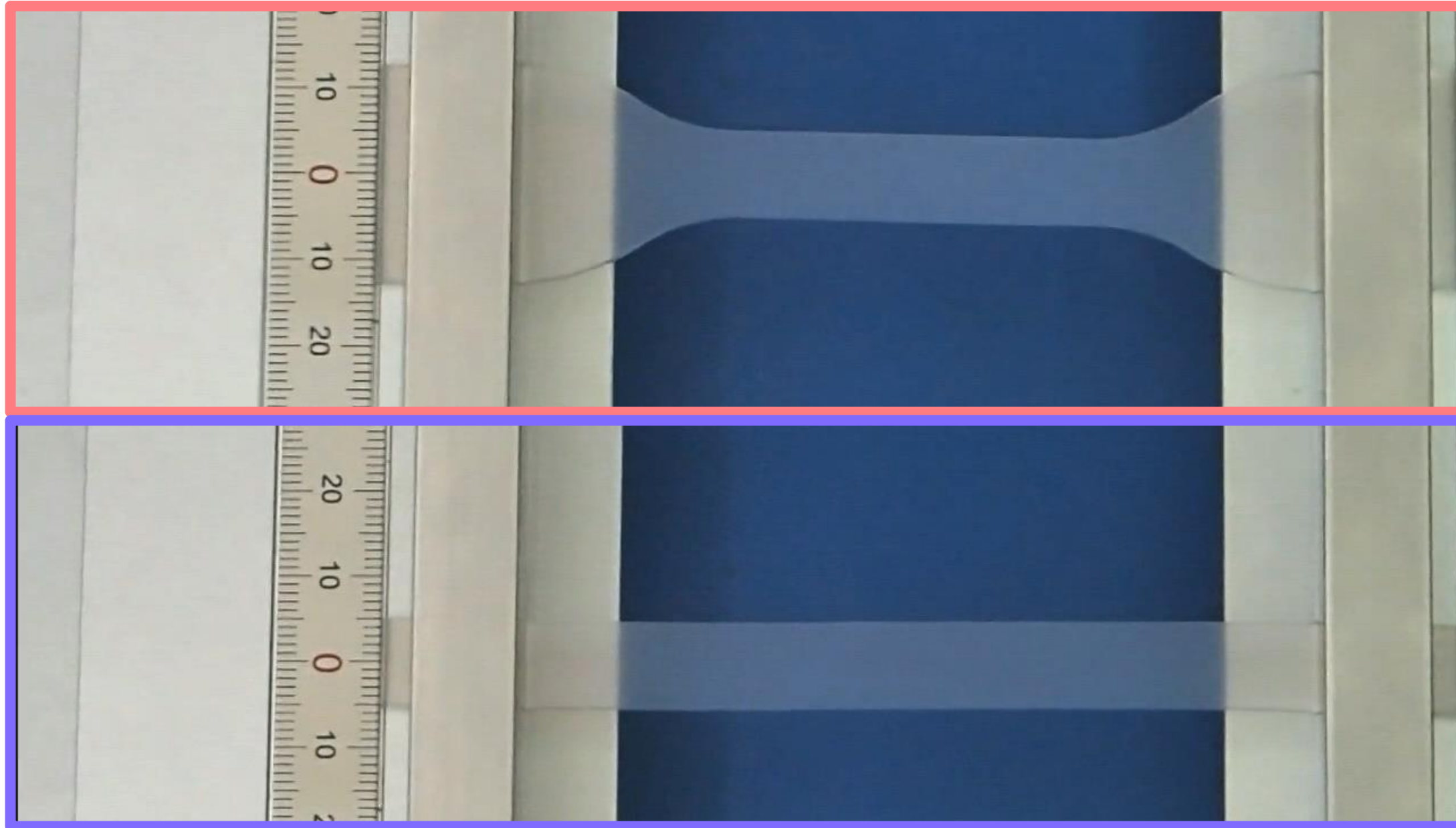
STRETCHING STANDARDS & TESTERS



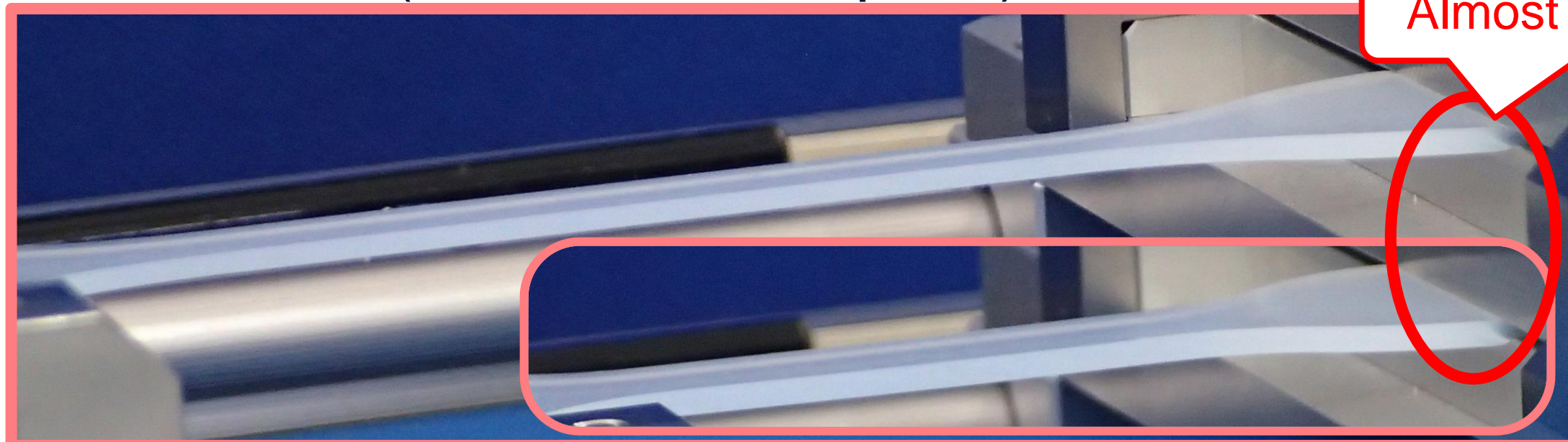
EXAMPLE of SPECIFICATIONS: STRETCHING TESTERS

	DESTRUCTION			FATIGUE			
MATERIAL	Metal	Rubber	Fiber	Metal	Rubber	Fiber	FHE
TIMES	1	1	1	Many	Many	Many	Many
TENSION [kN]	Max. 600	Max. 100	Max. 100	Max. 500	Max. 50	Max. 50	Max. 0.5
STRAIN	Low	High	Middle	Low	High	Middle	High
SAMPLE (SHAPE)	Dumbbell 	Dumbbell 	Line / Square 	Dumbbell 	Dumbbell / Ring 	Line / Square 	Square? 

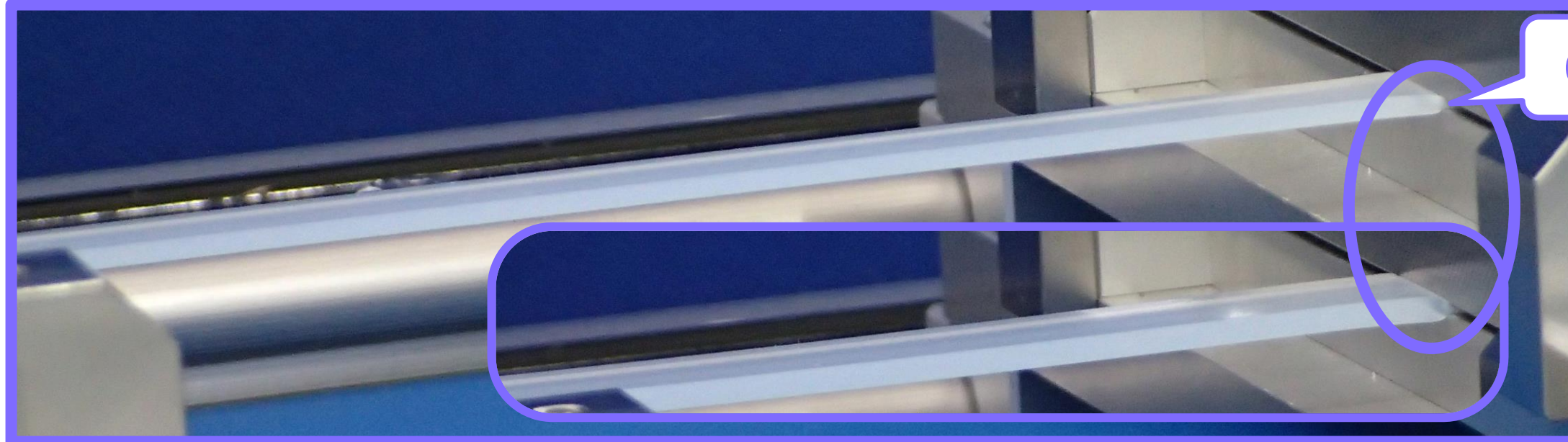
SHAPE of SAMPLE (Dumbbell vs Square)



SHAPE of SAMPLE (Dumbbell vs Square)

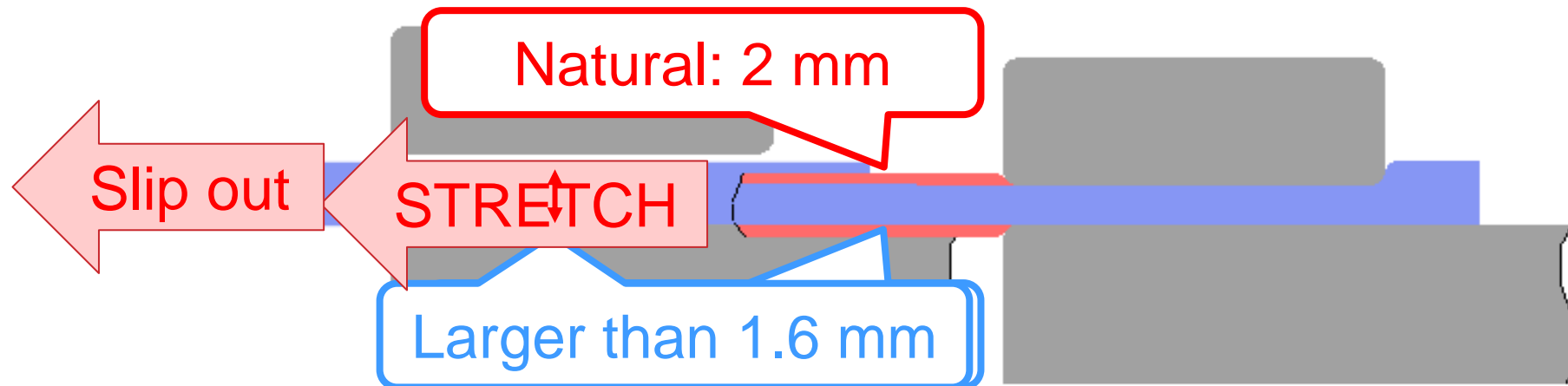
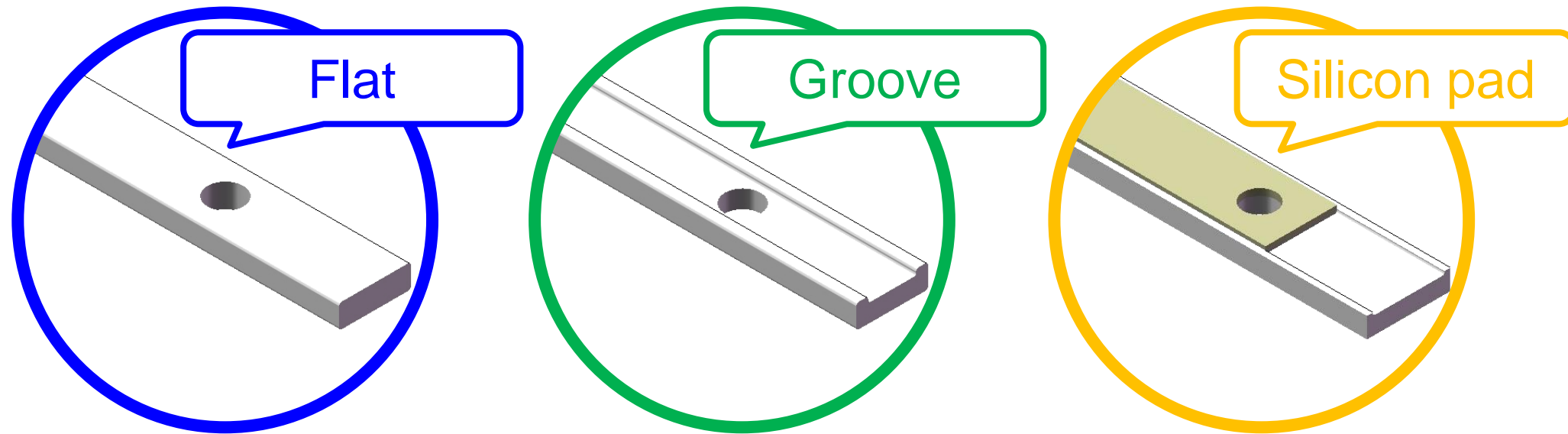


Almost unchanging

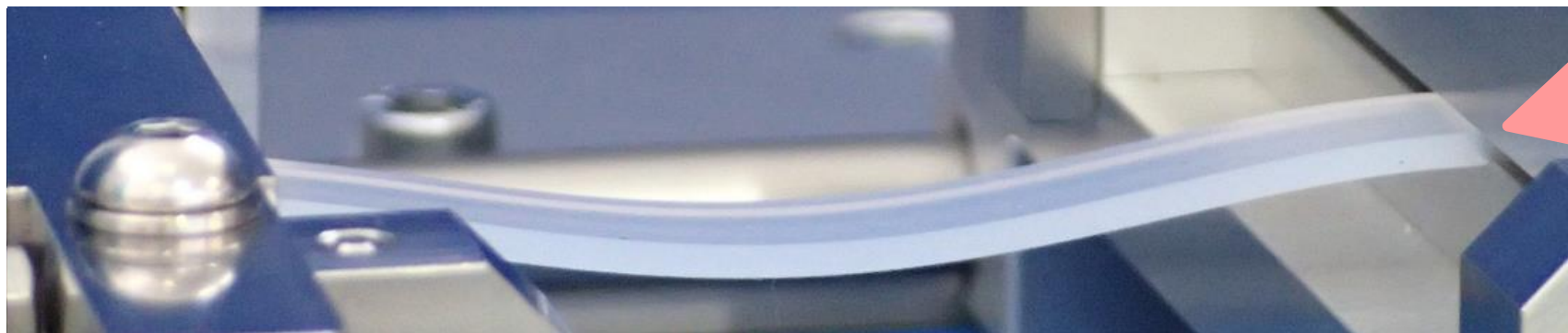
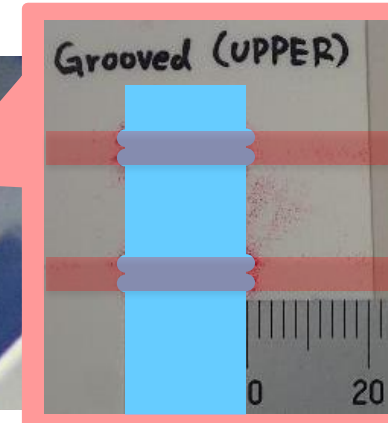
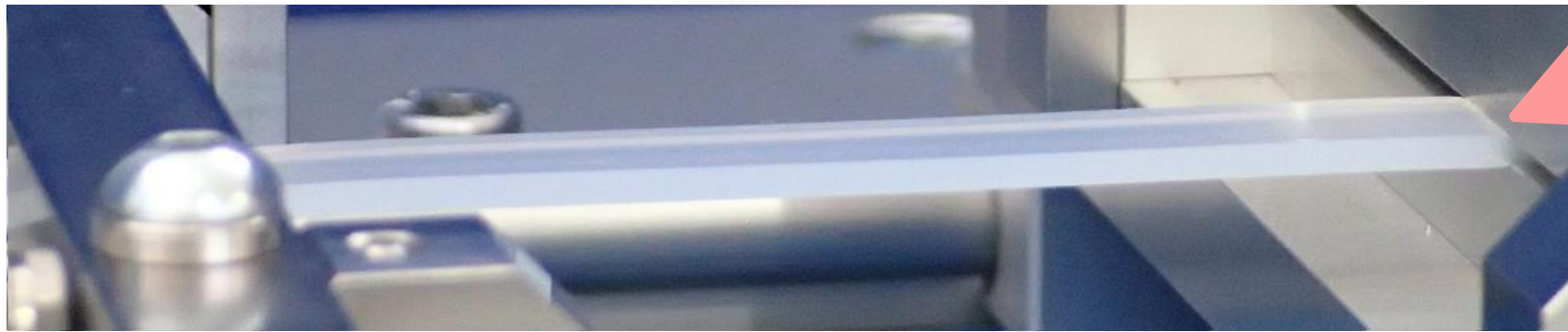
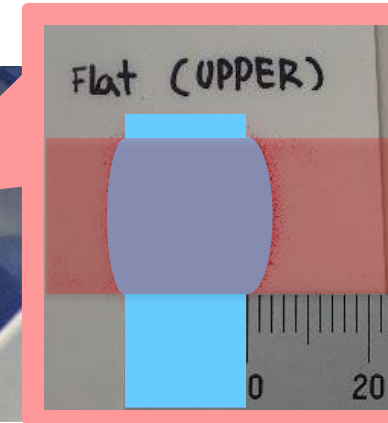
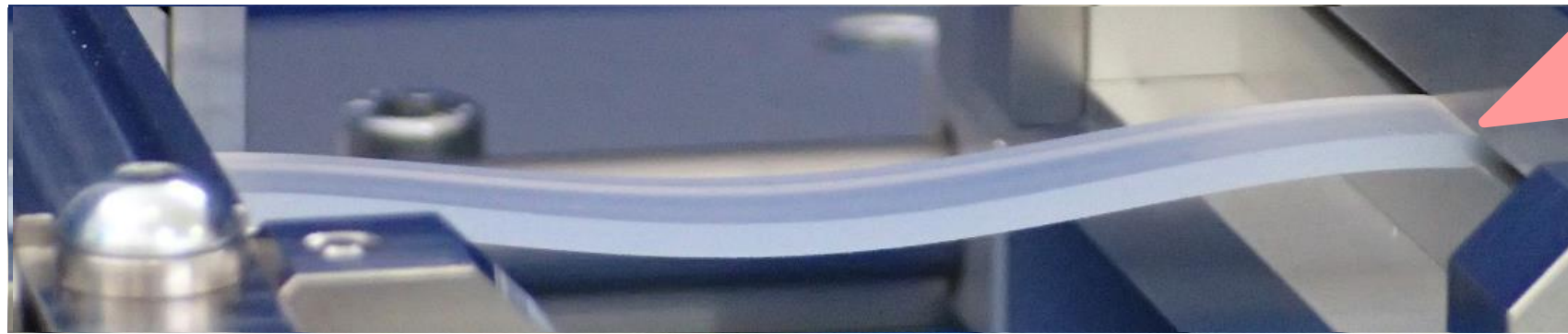


Changing

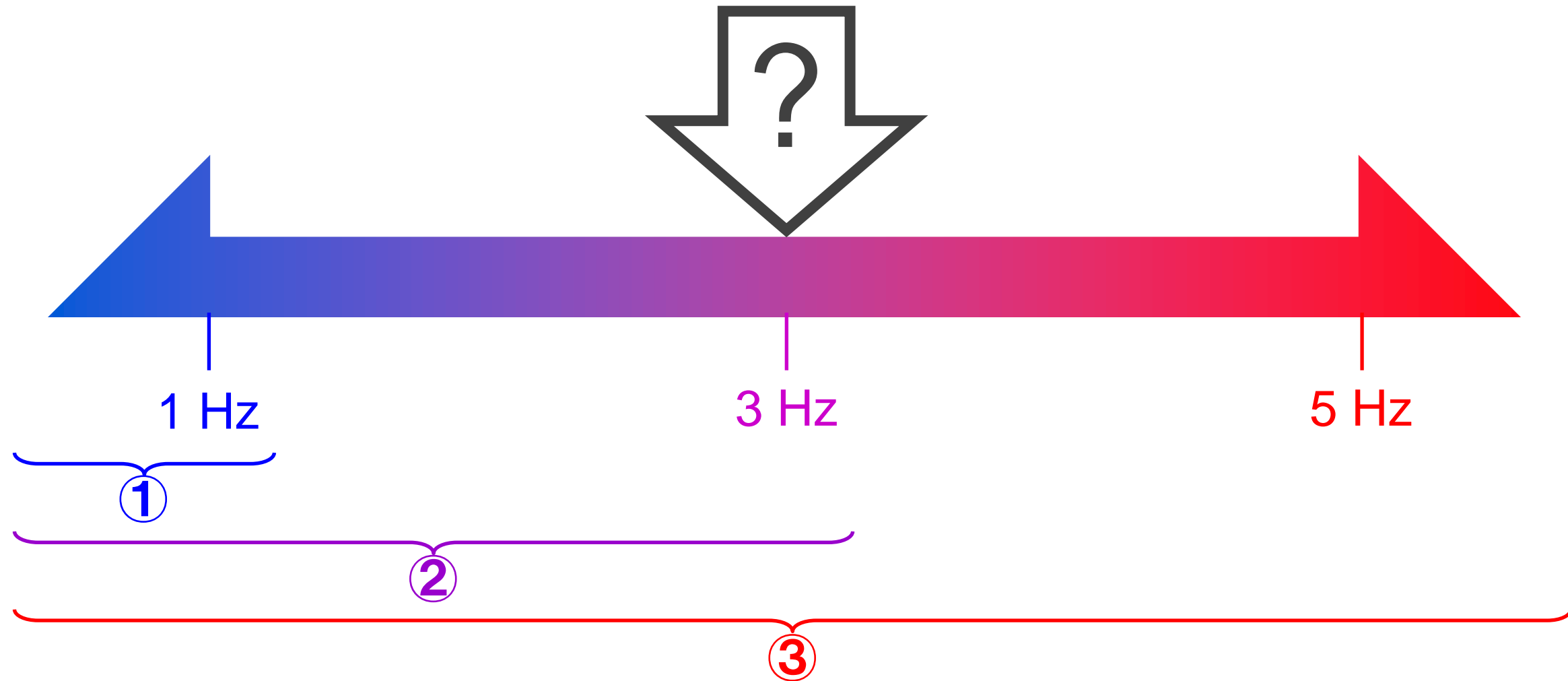
CLAMPER



CLAMPER

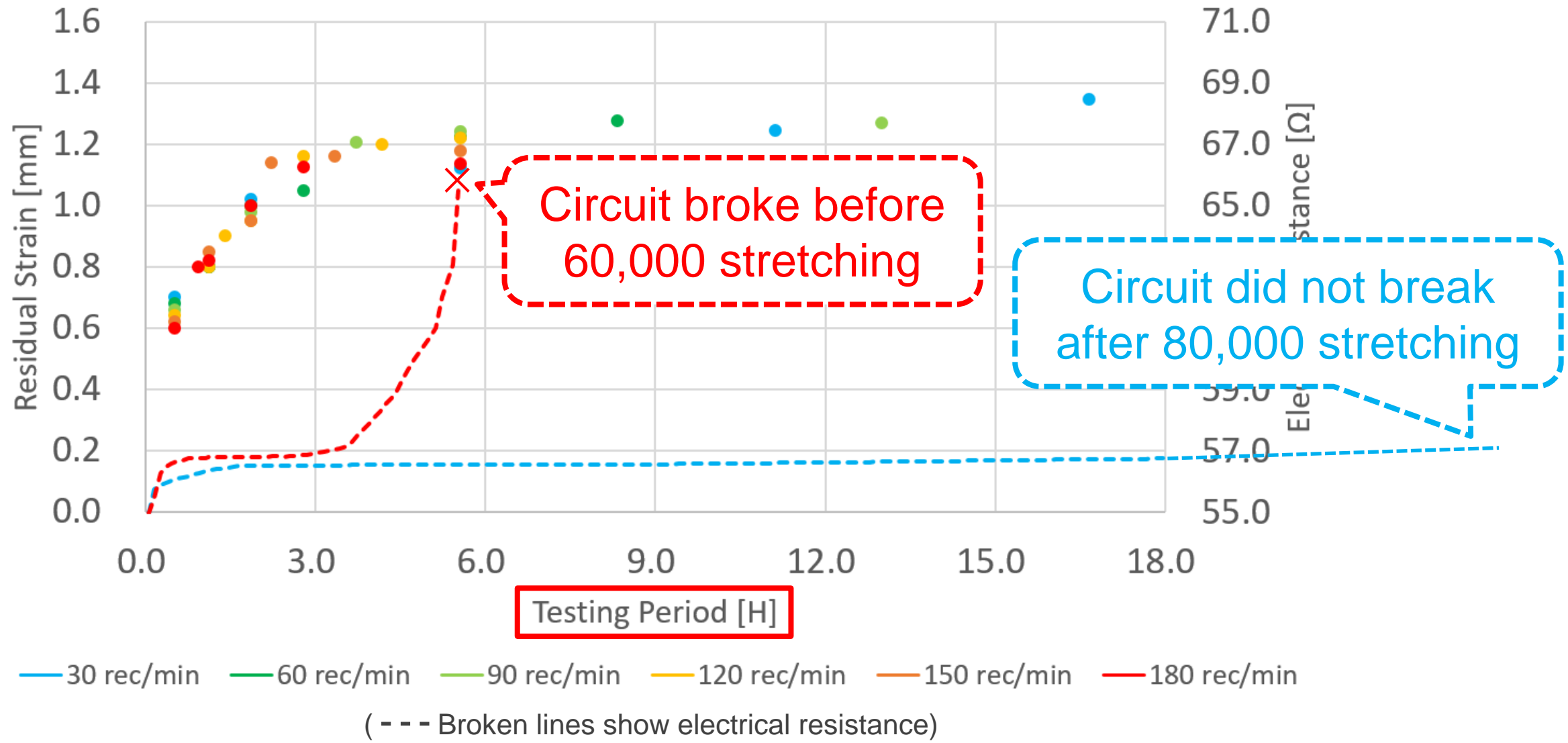


STRETCHING SPEED

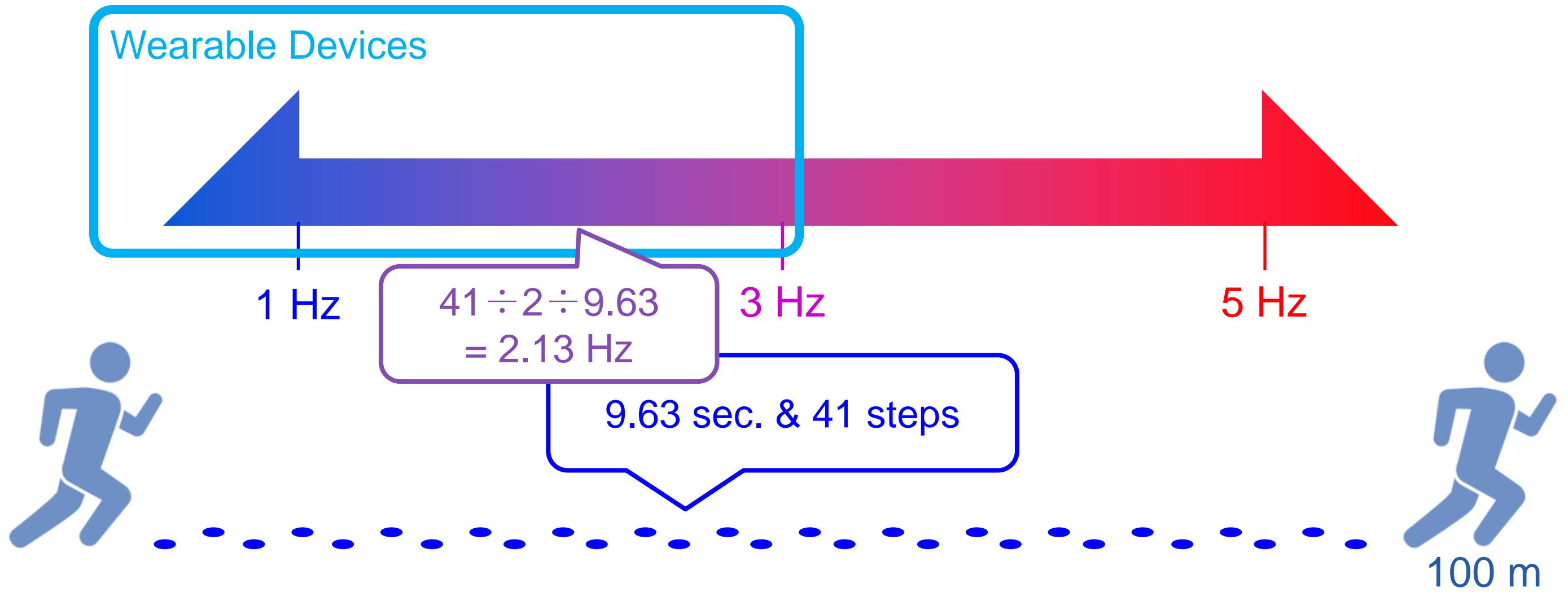


1 Hz = 60 reciprocation/minute

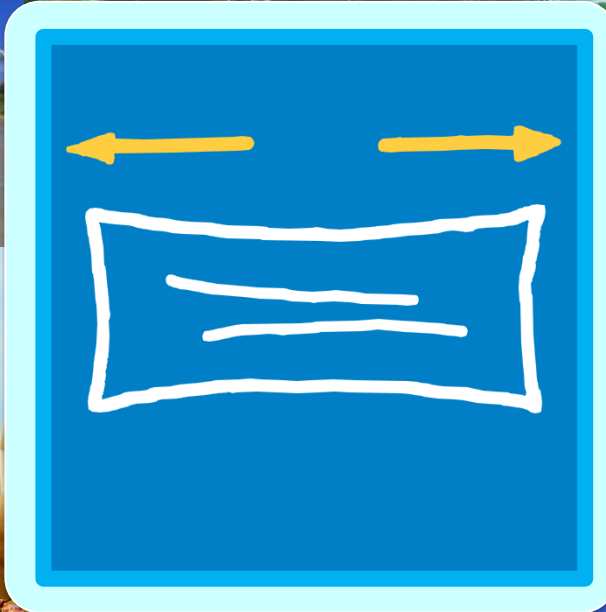
STRETCHING SPEED



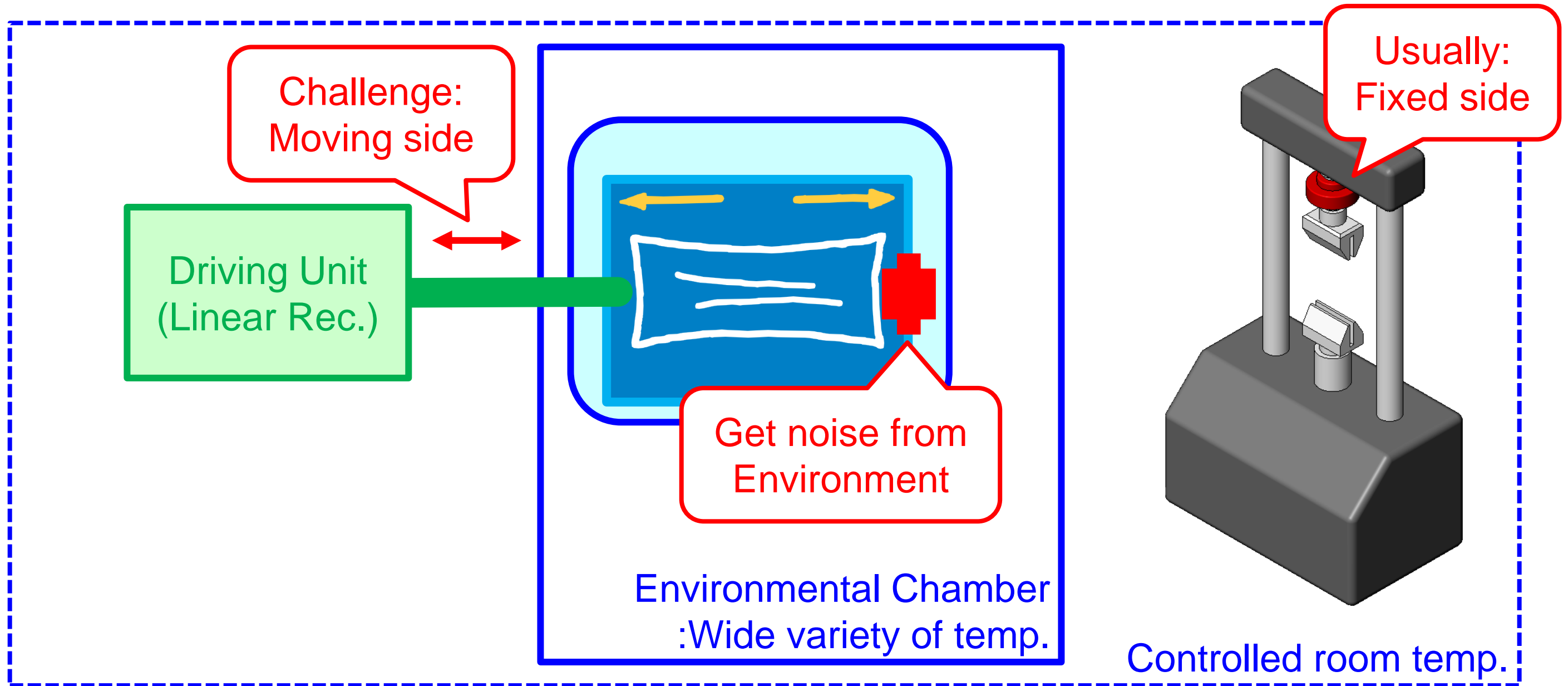
STRETCHING SPEED



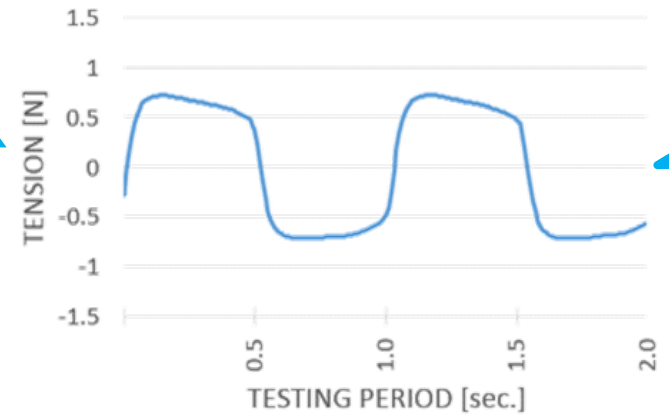
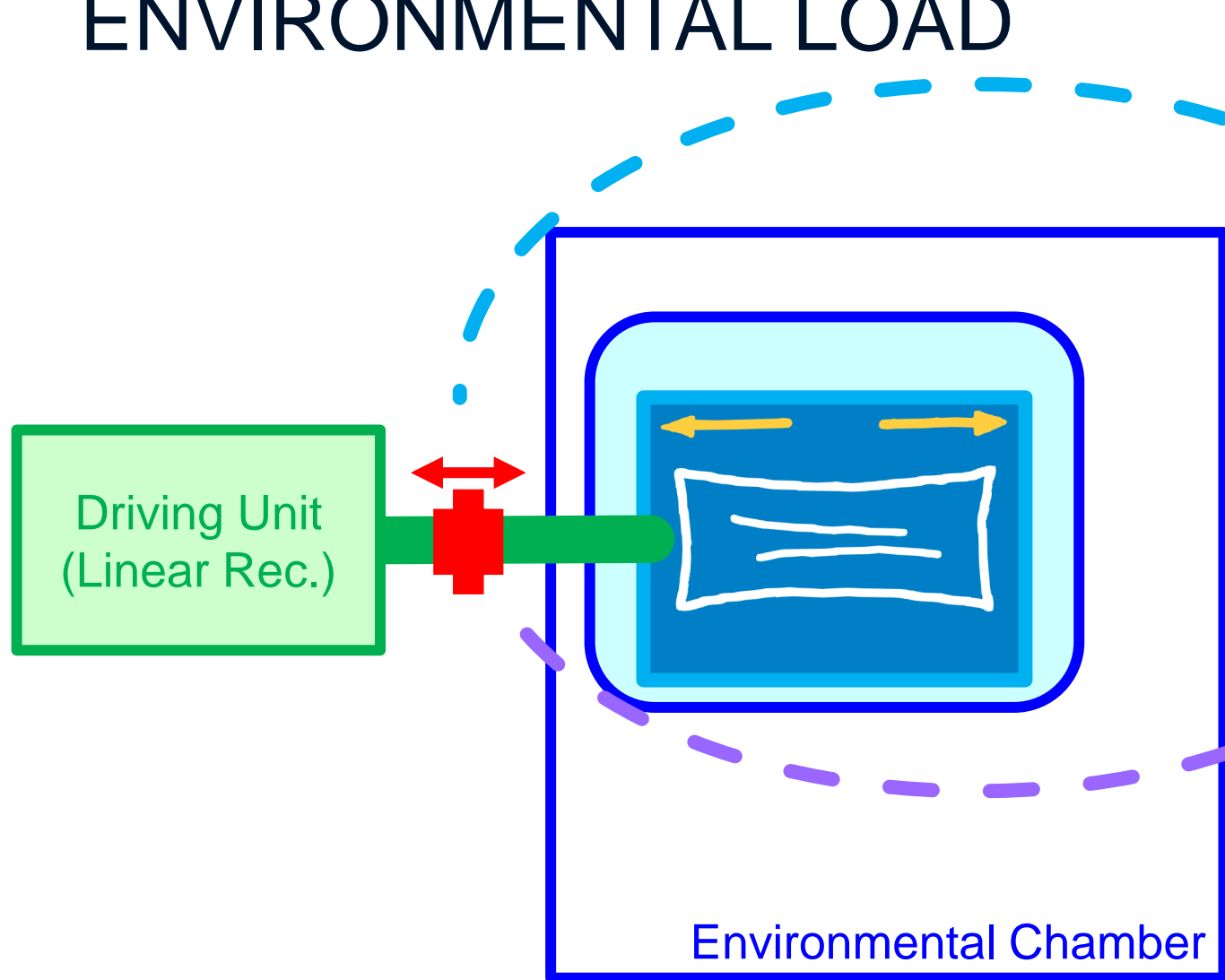
ENVIRONMENTAL LOAD



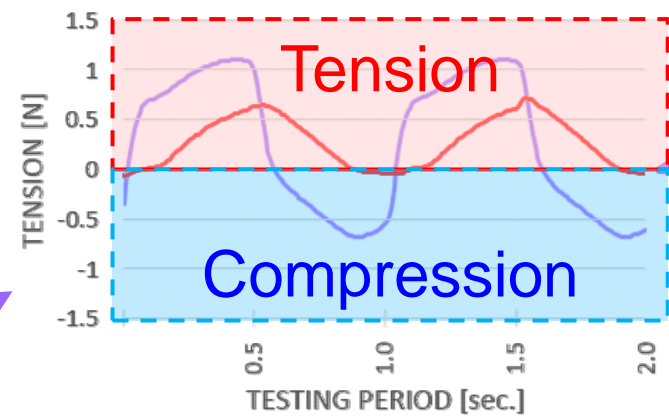
ENVIRONMENTAL LOAD



ENVIRONMENTAL LOAD



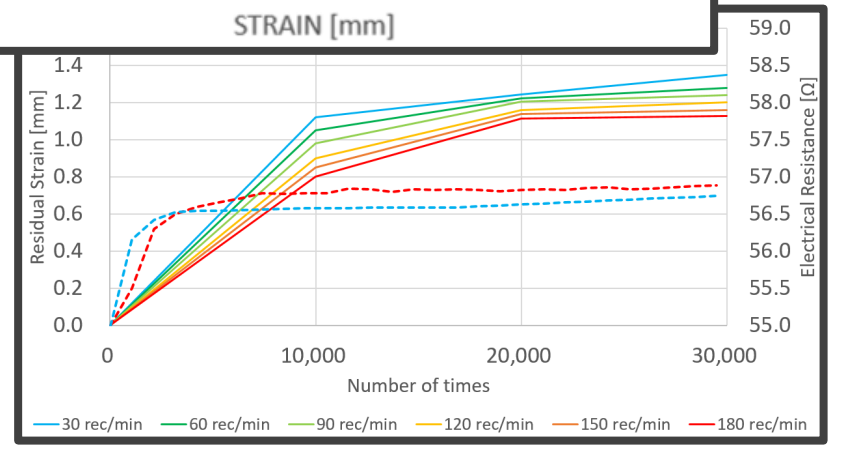
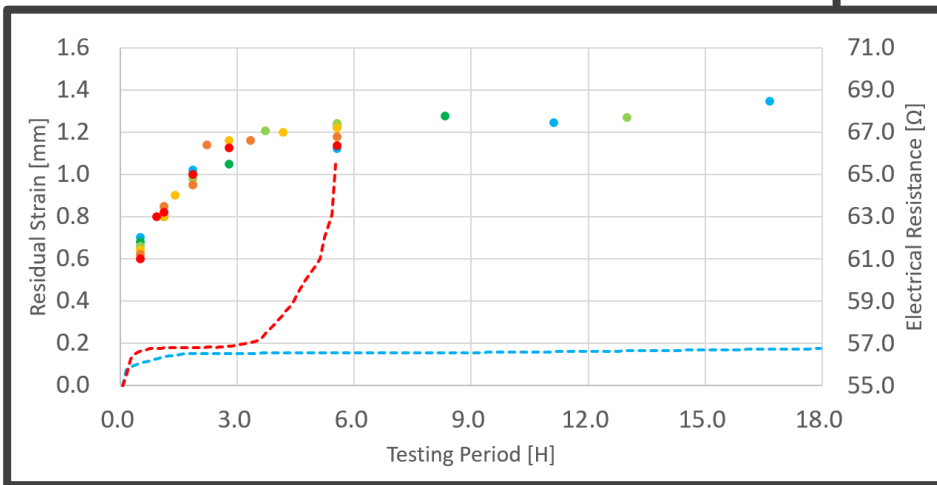
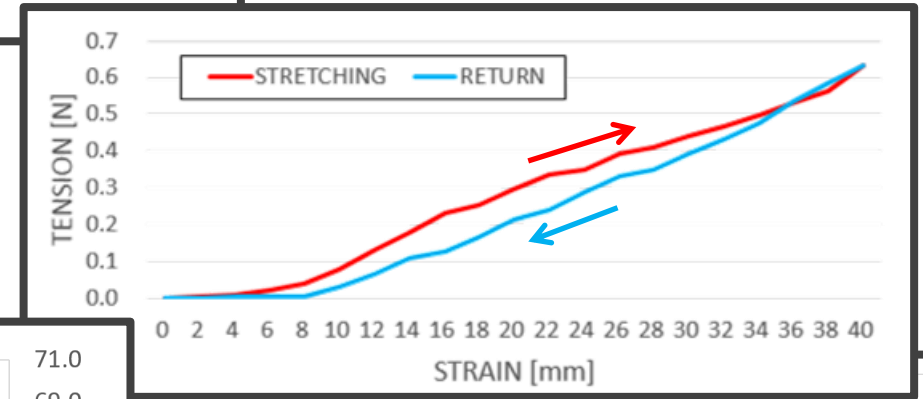
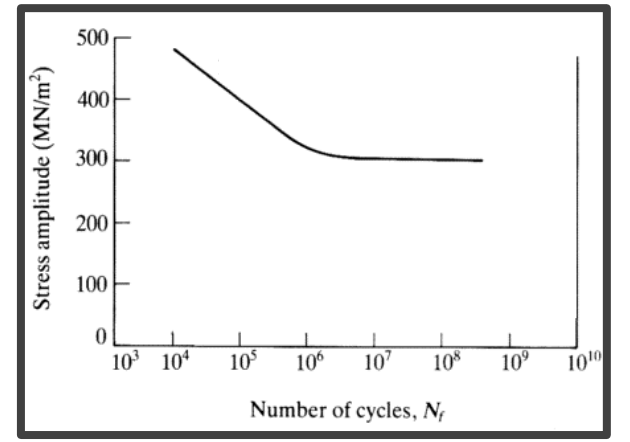
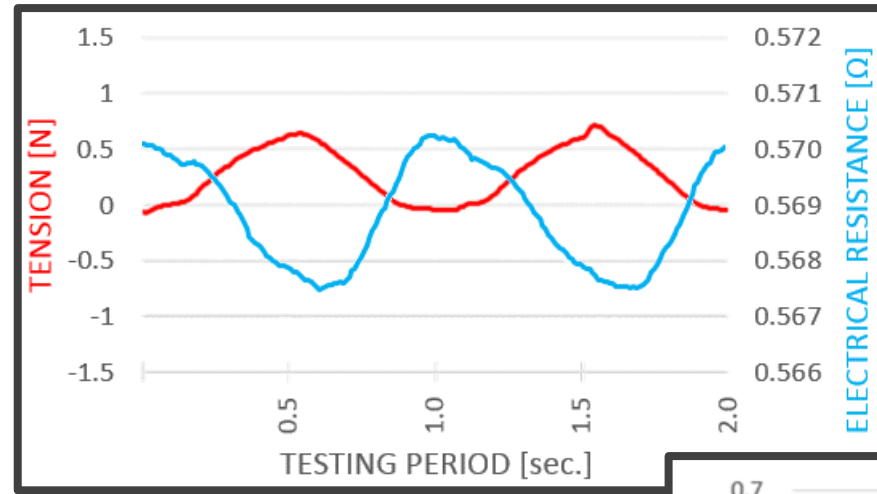
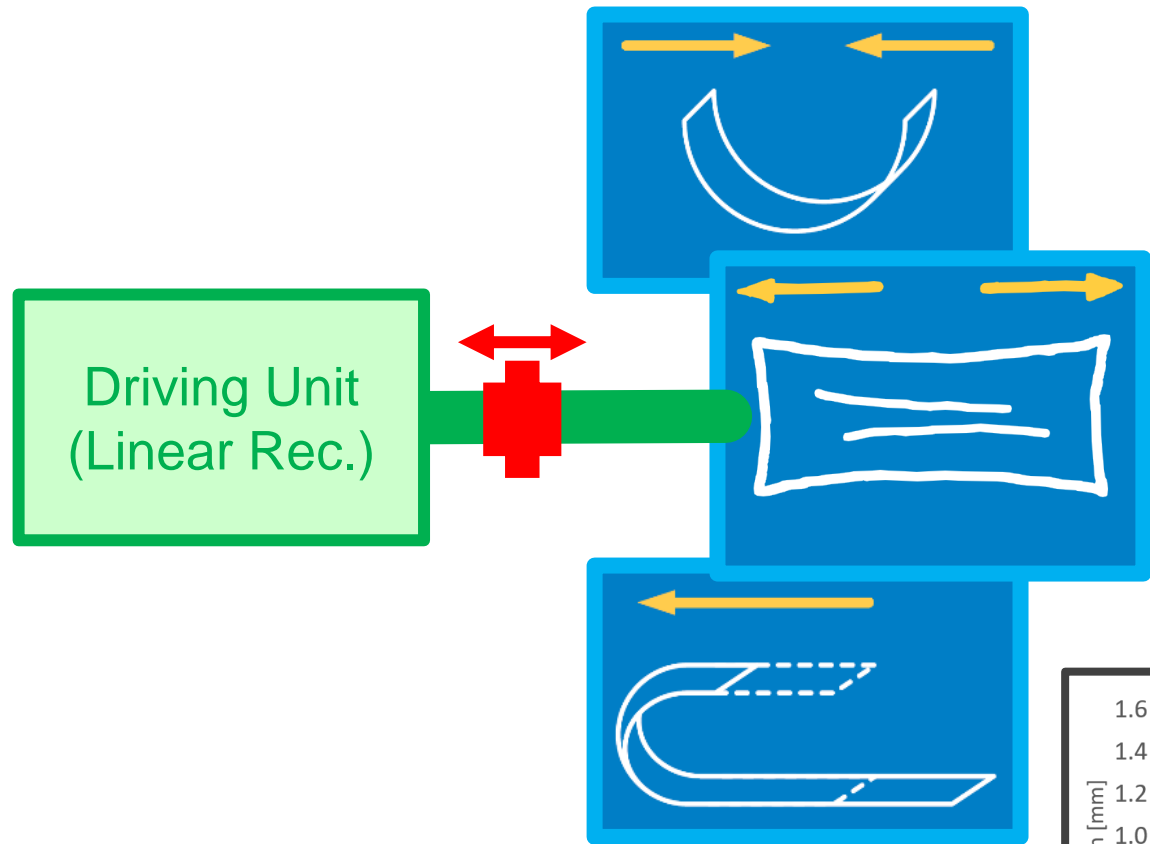
Idling Data
(Without Sample)



Mechanical noise
included

Ideal Data
(Only Sample)

FORCE MEASUREMENT SYSTEM



SUMMARY and OUTLOOK

- ◇ Should stretch not only devices but also each material in various conditions.
- ◆ Should study the clamping method for almost every sample.
- ◇ Should decide the stretching speed according to the end device (usage).
- ◆ Should stretch the sample under various environment.
- ◇ Why don't you stretch the sample with the load-cell and/or other measurement systems (strain, electrical resistance, etc.)?

Prototype

Max. sample: W 100 mm

Max. strain: 240 mm

Max. tension: 100 N

Max. speed: 1.5 Hz

Output:

Number of Stretching

Max. tension: 400 N

Max. speed: 3.0 Hz

For wider samples

For more complex samples

For unknown samples

Measure the Tension,
Electrical resistance, etc.