**ISO/TC 123/SC 6 "Terms and common items"**
Secretariat: **JISC**
Committee manager: **Miyahara Yoshitaka Mr**

# NWIP Terminology related to aerostatic bearings

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ISO/TC 123/SC6

# *Terminology related to aerostatic bearings*

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Background of aerostatic bearings
- Basic structure
- Features
- Usage example1 : Manufacturing equipment
- Usage example2 : High-speed rotating spindles
- Products of aerostatic bearings

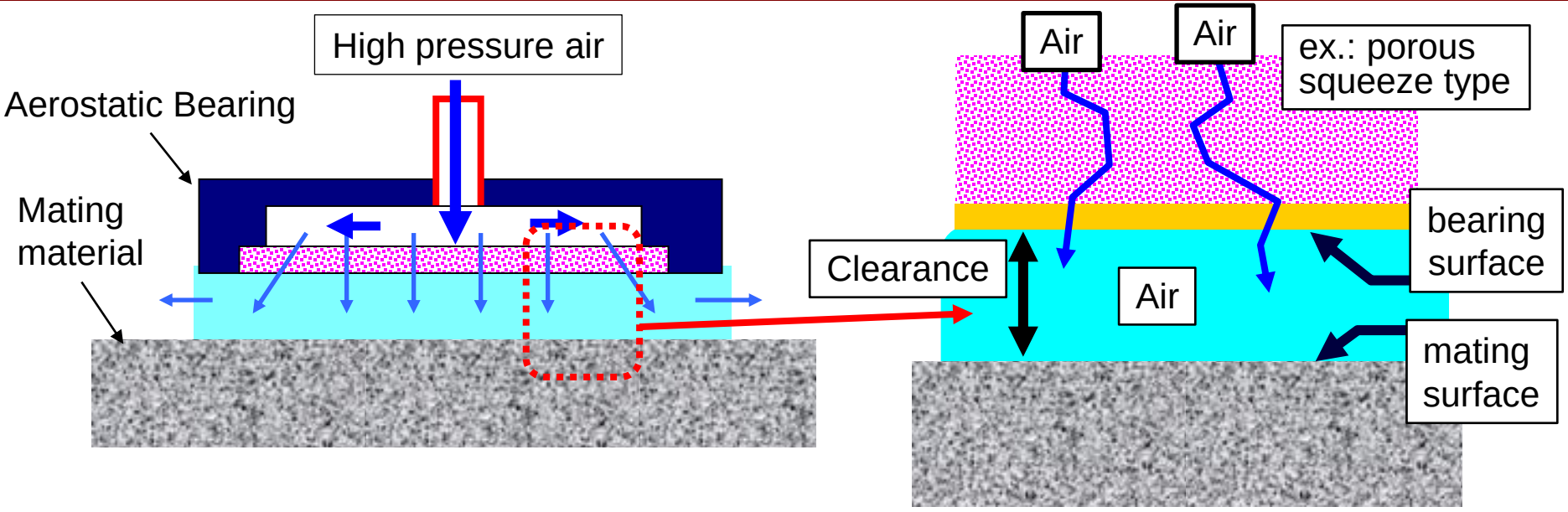
Significance of standardization

Proposed scope

Reference

Discussion

# Background - Basic structure

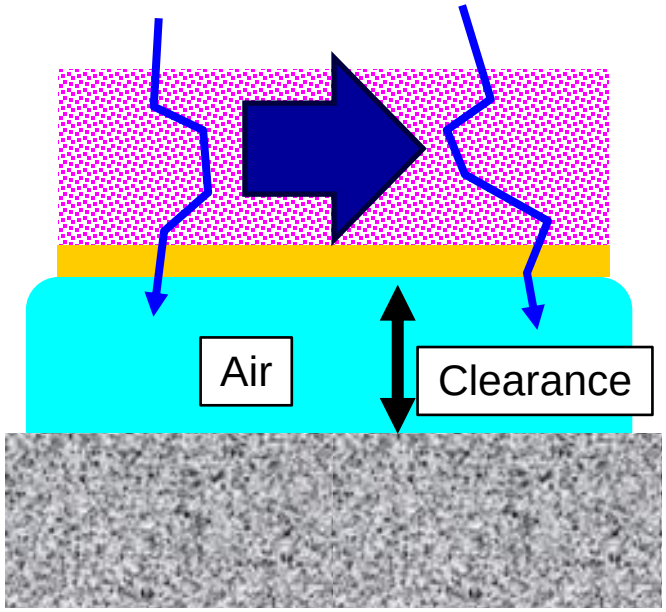



- High pressure air is supplied from the outside into the clearance.
- As long as air is supplied, the bearing (or the mating material) can always move without contact (aerostatic lubrication).
- Both the bearing surface and the mating surface require a highly accurate machined surface with flatness (or cylindricity) less than the clearance.

# Background - Features

The bearing and/or the mating material can always move while keeping a non-contact state. As the result…

- Friction force is almost zero
- No wear

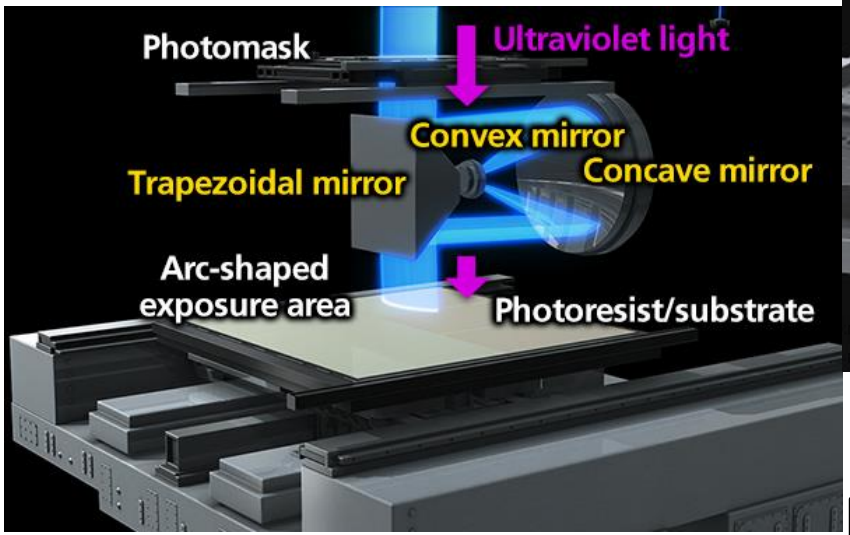



And more…

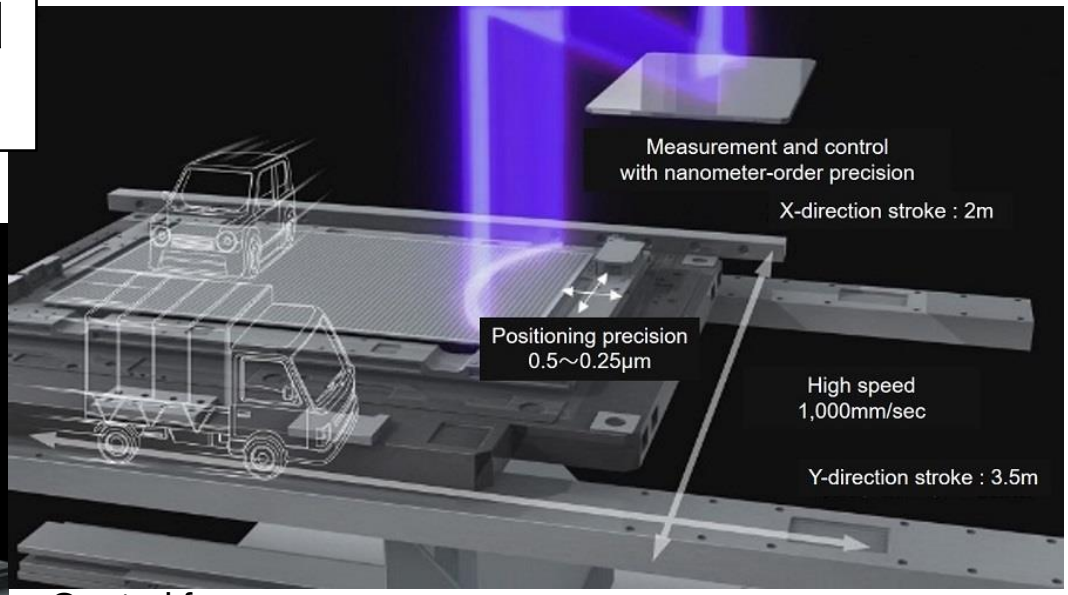
- No static friction
- No stick-slip
- Surface roughness has little effect on slide movement
- Heat generation is relatively small during high-speed movement
- No change in repeated positioning accuracy
- Maintenance is minimal or unnecessary

# Background - Usage example 1 : Manufacturing equipment

Aerostatic bearings are used for precision positioning



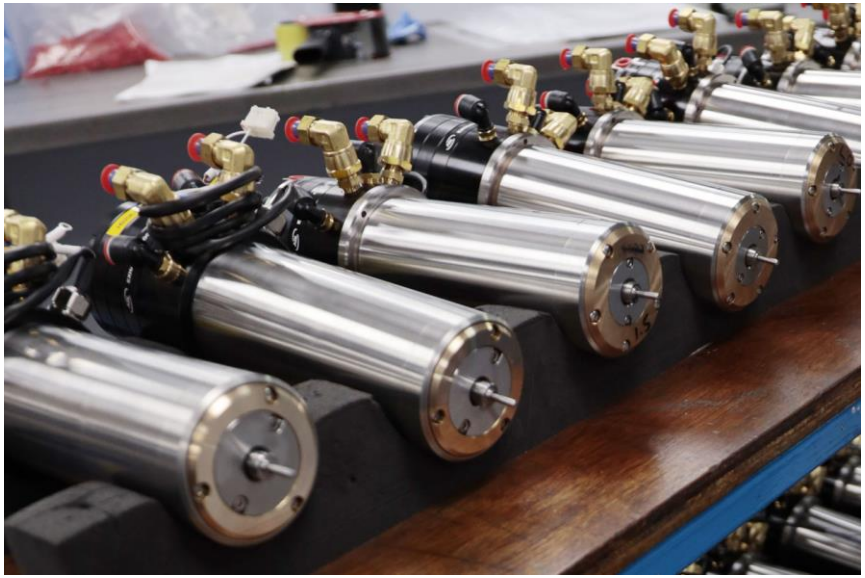

Quoted from
https://global.canon/en/technology/fpd2021s.html



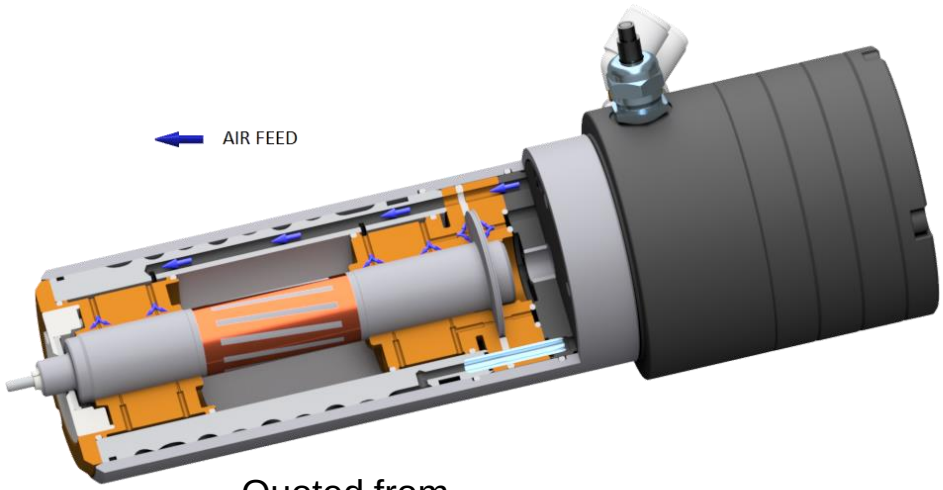

Quoted from
https://global.canon/en/technology/fpd2021s.html

By using aerostatic bearings, such devices have almost no friction, have high repeatability in positioning and enable micro and/or nano-order measurement and control.

# Background - Usage example 2 : High-speed rotating spindles



Quoted from
https://airbearings.co.uk/products/




Quoted from
https://airbearings.co.uk/#open

Heat generation is kept low during high-speed rotation, and the whirling accuracy of the shaft center is superior to that when using rolling bearings.

# Background - Products of aerostatic bearings

Quoted from
https://canon.jp/business/solution/indtech/ab/custom-made


Quoted from
https://www.nsk.com/content/dam/nsk/jp/ja/catalogs/pdf/precision/1389.pdf

Quoted from
https://jp.toto.com/products/ceramics/air/product/

Quoted from
https://www.newwayairbearings.com/catalog/air-spindles/

Provided by Sekigahara seisakusyo, Japan

Quoted from
https://www.oiles.co.jp/en/products/bearing/catalog/index.php /

# Significance of standardization

Aerostatic bearings are used in fields that require high performance, such as

- Precision positioning devices
- Semiconductor manufacturing equipment
- High-speed rotating spindles of machine tools

As globalization is progressing, demand of aerostatic bearings is increasing not only in established markets but also in emerging markets.

International standards are required across different countries and regions, but there are no standards for aerostatic bearings, especially for terminology.

# Significance of standardization

If terminology for aerostatic bearings is standardized,
it can be used by manufacturers and users

- to improve technical consistency and reliability
- to make it easier to compare products when selecting them, allowing them to select the appropriate product

It is also expected

- communication between engineers will be smoother
- making joint development and technical cooperation more efficient
- terminology will be more widely used in the field of aerostatic bearings, as it will contribute to smoother international cooperation and transactions

# Proposed scope

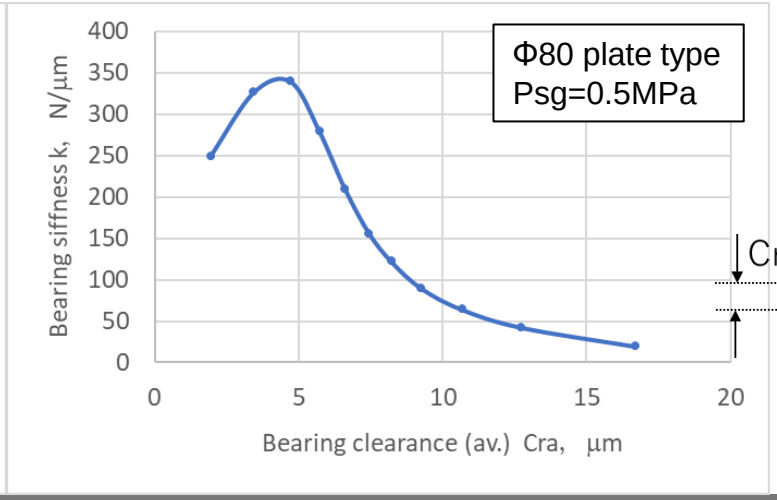
- This document specifies the terms relating to aerostatic bearings with their definitions and classification.

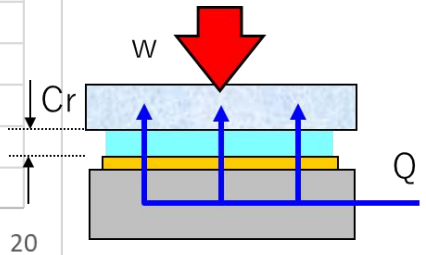
- For some terms and word combinations, their short forms are given, which can be used where they are unambiguous.

# Reference :
# About aerostatic bearings (1)

As mentioned before, aerostatic bearings are used for precision positioning and for high-speed rotating spindle applications.

The performance of aerostatic bearings is expressed by load-displacement characteristics on the order of microns (or even submicrons), and it is also important to understand the minute vibration characteristics caused by non-contact motion.

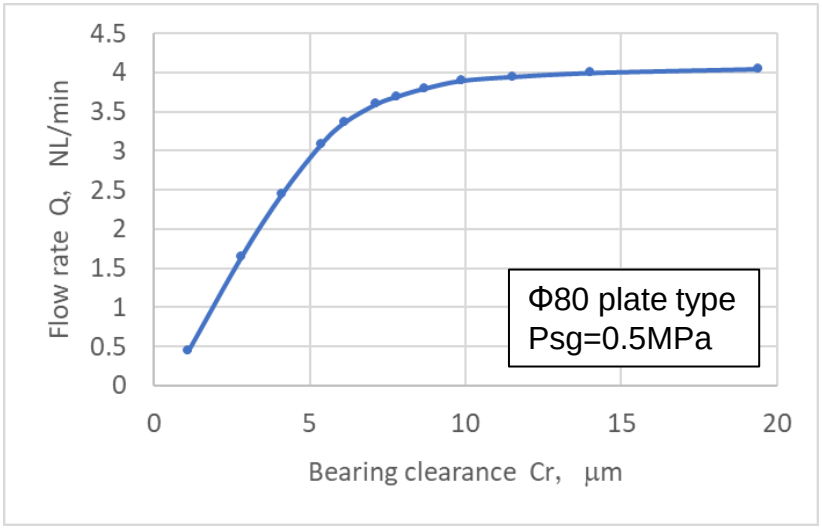



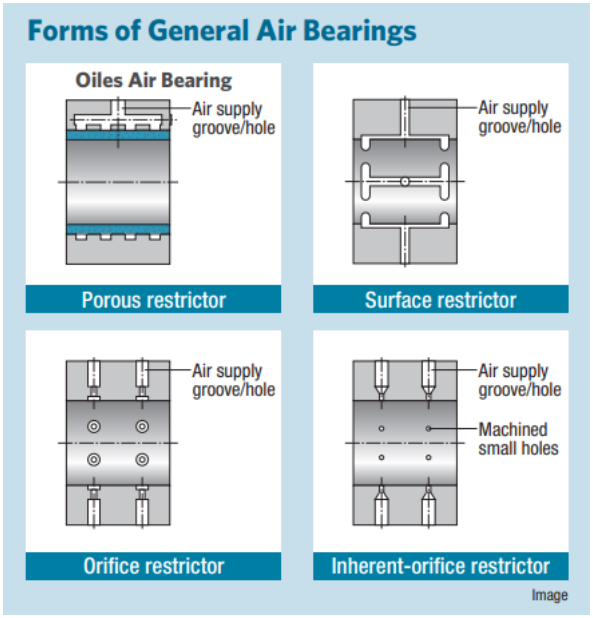



# Reference :
# About aerostatic bearings (2)

In addition, the performance is also determined by indicators such as supply pressure and flow rate because they are used by supplying air from the outside.

And there are various methods of supplying air into the bearing clearance to achieve a non-contact state. The terminology to describe them is also diverse.



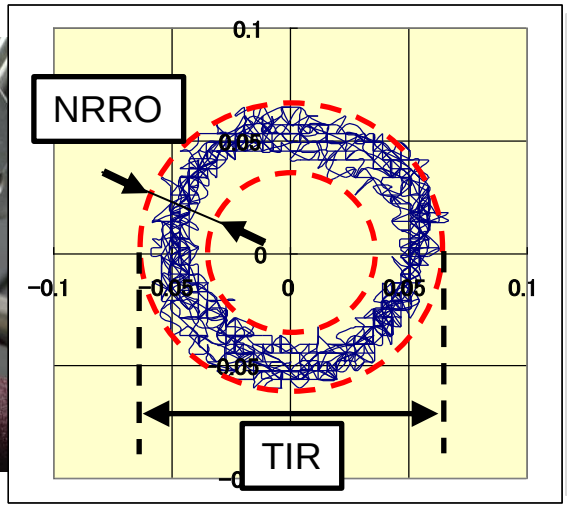

Methods of supplying air into the bearing clearance

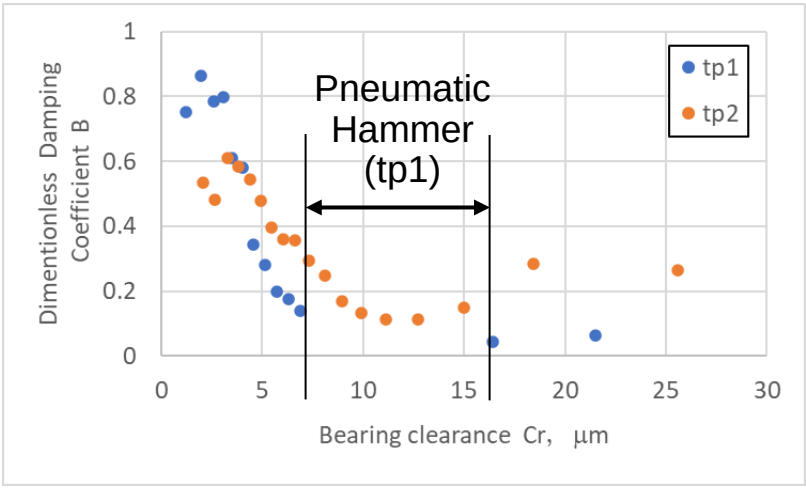
Quoted from https://www.oiles.co.jp/en/products/bearing/catalog/index.php /

# Reference :
# About aerostatic bearings (3)

Since the bearing surface of an aerostatic bearing moves without contact, the vibration damping and whirling characteristics during movement and when stopped can be important.

In addition, the design must avoid self-excited vibration
(it's called "pneumatic hammer") which starts just when air is supplied.



# Discussion

- Advice on Scope and Contents

- Any other comments

Thank you for your kind attention.