

Pneumatic spring lifts - lengths and forces

1. Application area

The purpose of this operating standard is to document the requirements and procedures for determining the operation-relevant lengths and forces that can occur during the correct use of a pneumatic spring column in seating furniture.

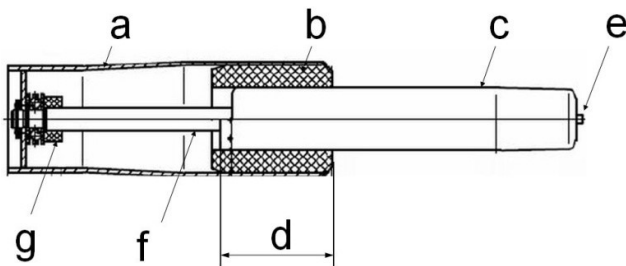
2. Responsibility

The quality control, product development and purchasing departments are responsible for compliance with and implementation of these operating standards.

3. Change service

Changes are implemented by the quality control and product development departments.

4. Pneumatic spring lift design (informative)



- a. outer tube
- b. guide sleeve
- c. pressure tube
- d. guide length
- e. release pin
- f. piston rod
- g. buffer (only relevant in the retracted end position)

5. Test conditions

- Universal track-compression force testing machine
- Device for continuous release of pneumatic spring
- Alignment of the pneumatic spring during the testing: outer tube down
- Measurements A, B, C without cover cap
- The test object must be at room temperature (between 18°C - 23°C) for at least 4 hours before the measurement.

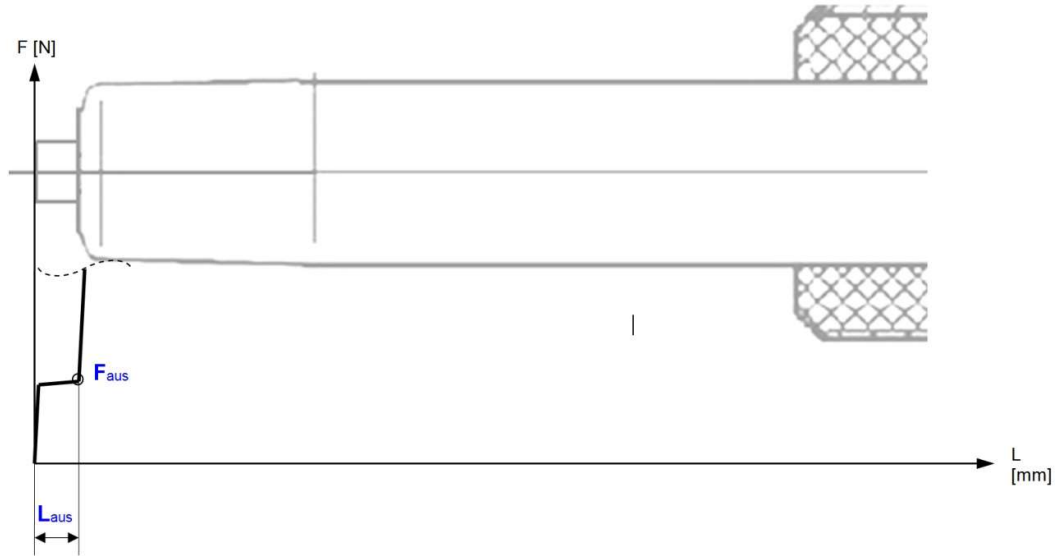
6. Measuring procedures

The following measuring procedures are described in these operating standards:

- Measurement **A**. Force and stroke of the release system.
- Measurement **B**. Operating lengths and forces of a released pneumatic spring.
- Measurement **C**. Operating length of an extended, locked pneumatic spring.

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6.1.1 Measurement A. Force and stroke of the axial release



L_{aus}

Release stroke that is required to open the valve completely.

F_{aus}

Release force that is required to release the lock in an unstressed pneumatic spring (no outside force applied to the pneumatic spring) **(drawing dimension)**. The release force is a linear function of the release stroke.

The release force depends on the release point (extended or retracted).

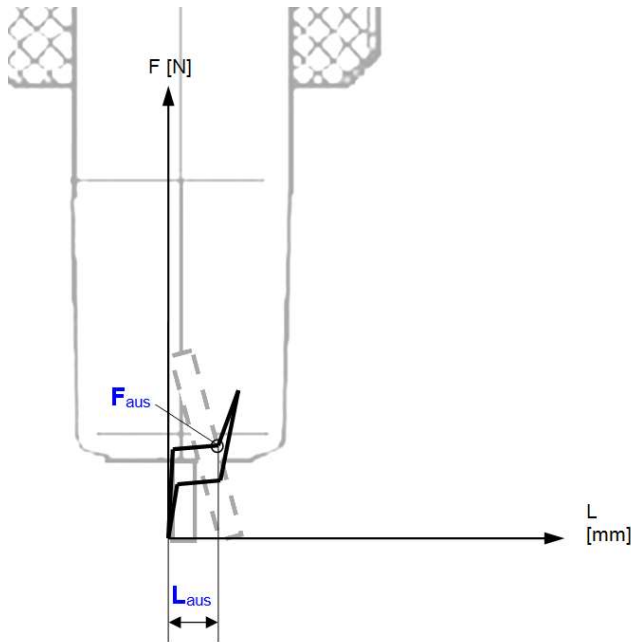
Measuring process:

The pressure tube of the pneumatic spring to be tested is to be retracted 2/3 of the range and stored for at least 24 hours.

- Position the pneumatic spring in a vertical position with the outer tube down on the machine table.
- Determining the release force in a measuring cycle (force-controlled).
- End of testing: $F = 300\text{N}$ or $L = 5\text{mm}$
- Measuring point for L_{aus} : End of the hysteresis curve linear area
- Measuring point for F_{aus} : the changeover point at which the release valve is open completely and the pressure tube retracts
- $n = 1$; $v = 15\text{ mm/min}$
- Evaluate the L_{aus1} and F_{aus1} measured variables and save them in the measurement log.
- Immediately retract the pressure tube 2/3 of the way after the L_{aus1} and F_{aus1} measurements and determine the release force in a second measuring cycle controlled by force.
- Evaluate the L_{aus2} and F_{aus2} measured variables and save them in the measurement log.

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6.1.2 Measurement A1. Force and stroke of the radial release.



L_{aus}
 F_{aus}

Release stroke that is required to open the valve completely.
Release force that is required to release the lock for an unstressed pneumatic spring (no outside force applied to the pneumatic spring) (drawing dimension). The release force is a linear function of the release stroke. The release force depends on the release point (extended or retracted).

Measuring process:

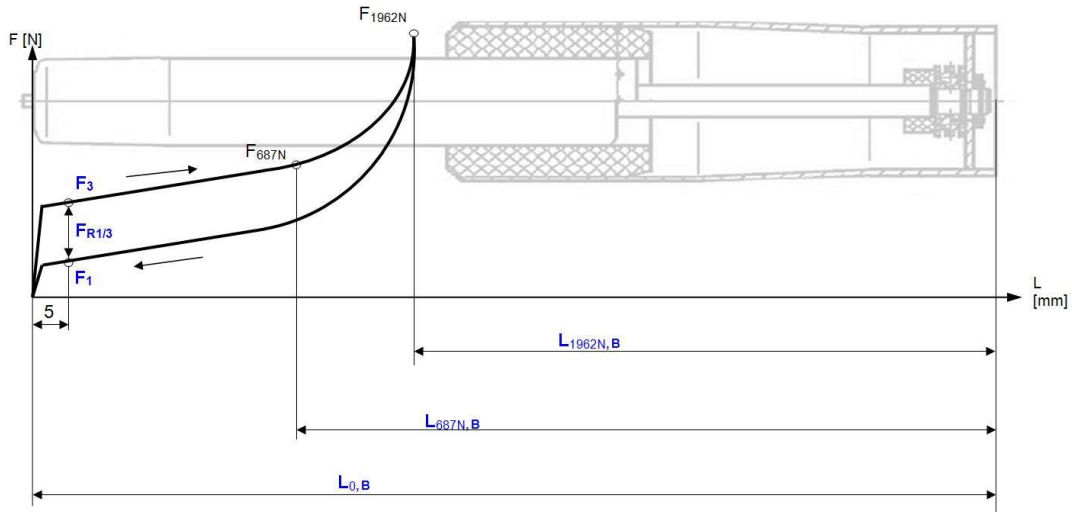
The pressure tube of the pneumatic spring to be tested is to be retracted 2/3 of the range and stored for at least 24 hours.

Position the pneumatic spring in a horizontal position on the machine table using the E_9034694 holder; see annex.

- The release force is determined in a hysteresis-shaped measuring cycle (force-controlled).
- The point of application of force for F_{aus} : on the side, 2 mm below the top edge of the release pin
- Measuring point L_{aus} : Refer to the drawing
- Measuring point F_{aus} corresponds to L_{out}
- End of testing: Force increase of 350 N/mm
- $n=1$
- $v = 15$ mm/min
- Evaluate the L_{aus1} and F_{aus1} measured variables and save them in the measurement log.

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6.2 Measurement B. Operating length of a released pneumatic spring including F_1 , F_3 and friction F_R



- $L_{0,B}$ maximum length of an unstressed, released pneumatic spring (**drawing dimension**)
- $L_{687N, B}$ Length of a released pneumatic spring under a test load of 687 N. This corresponds to the minimum seat height in accordance with EN 1335-1 (**drawing dimension**)
- $L_{1962N,B}$ Length of a released pneumatic spring under a test load of 1,962 N. This corresponds to the minimum seat height for a dynamic overload (**drawing dimension** for a collision check)
- F_3 Force that is necessary to retract the pressure tube (retraction force) 5 mm after reaching the preliminary force ($L_{0, B} - 5\text{mm}$)
- F_1 Force that is necessary to stop the pressure tube that is to be extended 5 mm before the end of testing ($L_{0, B} - 5\text{mm}$) (extension force) (**drawing dimension**).
- F_R Static friction between the pressure tube and the guide sleeve $F_R = F_3 - F_1$ (**drawing dimension**)

Measuring process:

Determine the length L_0 . Fasten the 969442 continuous release device to the pressure tube (see annex) and establish the continuous release.

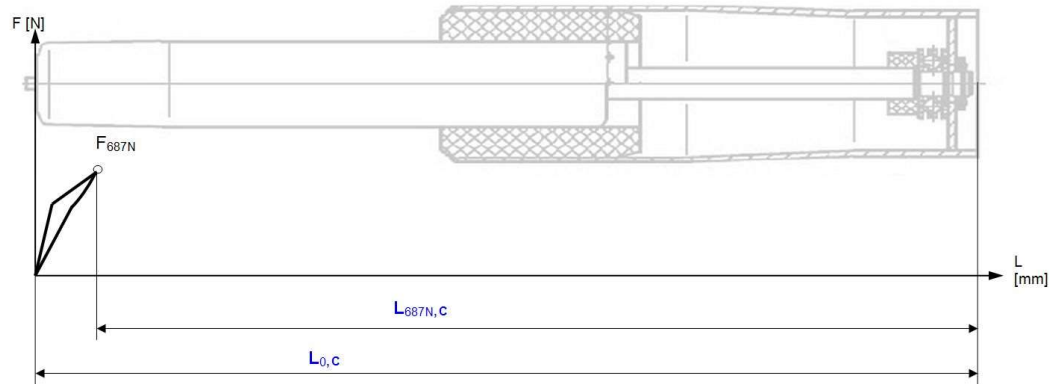
Position the pneumatic spring in a vertical position on the machine table.

- The pressure tube is subjected to two setting cycles (force-controlled).
n=2; $F=687\text{ N}$; $v = 480\text{ mm/min}$
- The pressure tube is subjected to a measuring cycle (force-controlled).
n=1; preliminary force: 5 N ; $F=1,962\text{ N}$; $v = 60\text{ mm/min}$; dwell time: 5 s .
Record the measured variables $L_{687N, B}$; $L_{1962N, B}$; F_3 and F_1
- Determine the friction force F_R : $F_R = F_3 - F_1$

Save measured variables $L_{687N, B}$; $L_{1962N, B}$; F_3 , F_1 and F_R in the measurement log

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6.3 Measurement C. Length of an extended, locked pneumatic spring loaded with 687N



$L_{687N, c}$ Length of an extended, locked pneumatic spring under a test load of 687N. This corresponds to the maximum seat height in accordance with EN 1335-1 (**drawing dimension**)

Measuring process:

Activate the pneumatic spring to extend fully. Attach test adapter 969442 (see attachment) to the pressure tube and relieve the trigger (pneumatic spring is blocked). Position the pneumatic spring vertically on the machine bench with the column facing downwards.

- Subject the pressure tube to a measuring cycle (force-controlled).
n=1; F=687 N; v = 60 mm/min
- Record the measured value $L_{687N, c}$ and save it in the measurement log

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7. Permitted force and path of the axial release.

To ensure the pneumatic spring-supported operation of the height adjustment in seating furniture in different conditions, the trigger path and trigger force of a pneumatic spring with axial triggering as described in section 6.1.1 must not exceed the following values:

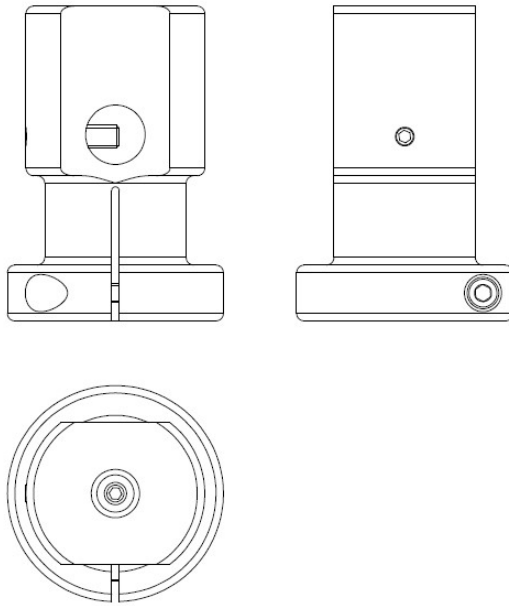
Characteristic	Maximum permitted value
L_{aus1} , mm	2,5
F_{aus1} , N	100

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8. Applicable documentation

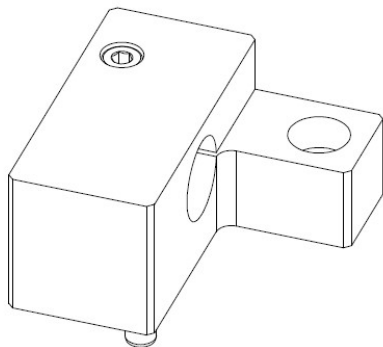
- Drawing of the additional tool for measurements A, B, D: 969442 "Test adapter for the pneumatic spring"

Image: Pneumatic spring test adapter 969442



- Drawing of the additional tool for measurement A: E_9034694

Image: Pneumatic spring inspection holder E_9034694



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