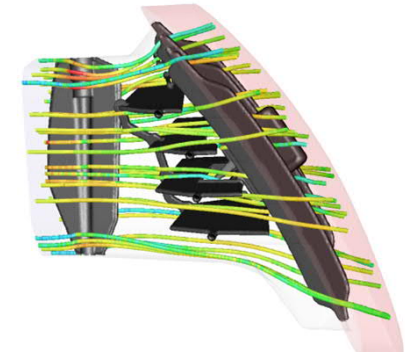
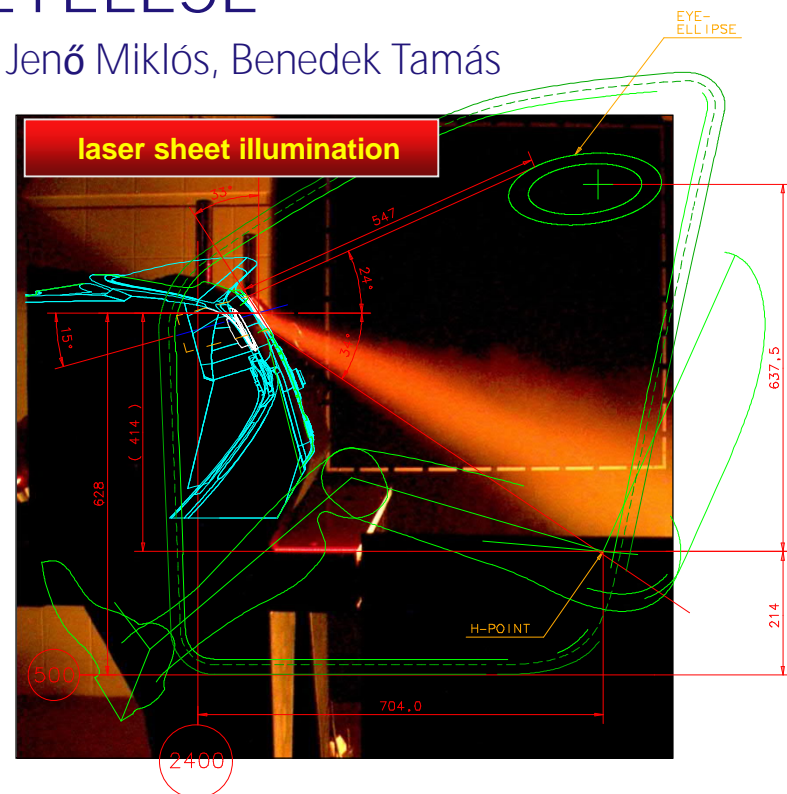
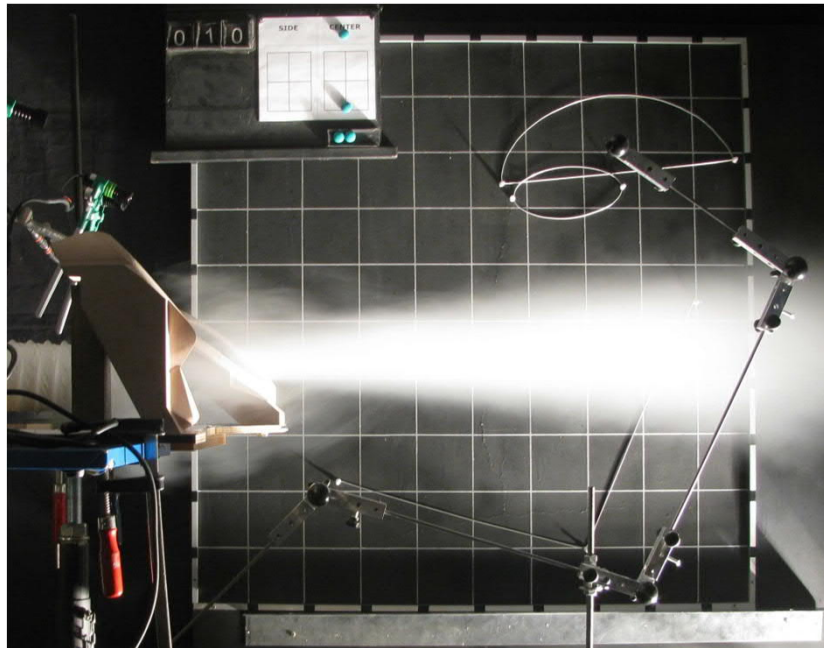


Gépészmérnök mesterszak (MSc)
BMEGEÁTMG01 Hő- és áramlástan
MÉRÉSI FELADAT BEMUTATÓ

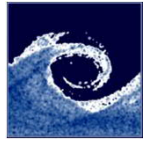


H07 SZEMÉLYAUTÓ UTASTÉRI LÉGBEFÚVÓK TESZTELÉSE

Mérésfelelős: Dr. Suda Jenő Miklós, Benedek Tamás



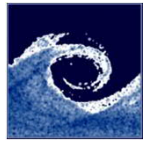
C307 - OVAL REGISTER
THEORETICAL INVESTIGATION
AIRFLOW DIRECTION
CENTRE REGISTERS



BEVEZETÉS

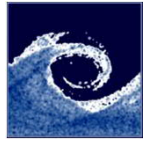
UTASTÉRI LÉGBEFÚVÓK:

- Utastéri komfort biztosítása klimatizált levegő befúvásával
- Befúvás = levegő szabadsugar minden előnyével és hátrányával
- Előírások a befúvás mennyiségére:
 - előírt q_v térfogatáram (minél kisebb nyomásveszteséggel)
 - zárt állapotban minimális résveszteség (előírt $q_{v,rés}$)
- Előírások a befúvás minőségére: légsugar 3D kiterjedése (lamellák)
- Egyéb (nem áramlástan paraméterekre vonatkozó) előírások
- Autóipari beszállítónak szigorú előírásoknak kell megfelelnie



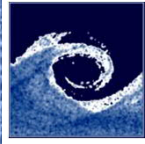
BEVEZETÉS TESZTELT UTASTÉRI LÉGBEFÚVÓK:





BEVEZETÉS TESZTELT UTASTÉRI LÉGBEFÚVÓK:

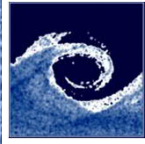




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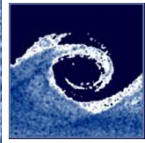
MIT JELENT?

„General Check”

Check parts with **naked eye** for visual damage. Upon arrival at the place of assembly the parts must not show any kind of damage (mechanism and assembly failures) and must be free from burrs, sharp edges and other conditions that could cause injury during handling, assembly or use. The parts must also contain no unspecified material, dirt, packaging debris or grease.

The visible area of Register assy should neither have sink marks nor tool marks. Finish, grain gloss level and colour should be according to styling sample.

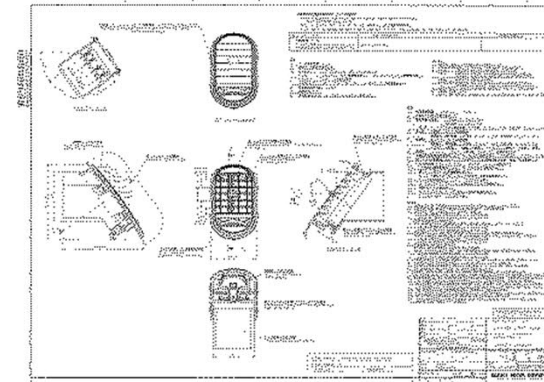
Move operating levels from stop to stop; the individual parts of the register assembly should make no noise in any position (creak and crackle, squeak and rattle).



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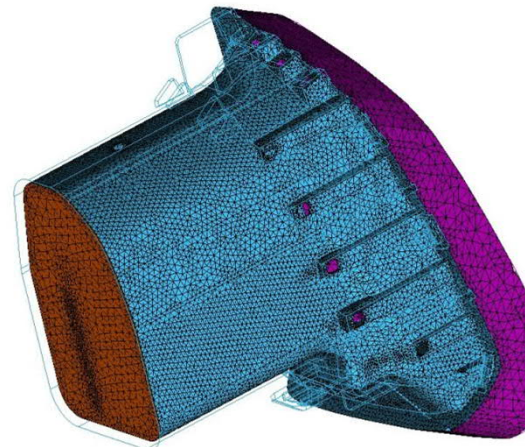
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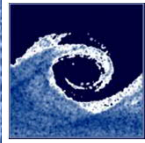


MIT JELENT?

„Dimensional Inspection”

1. Determine that all parts are identified with the Cavity Number.
2. Check and record all dimensions for one part from each cavity against the CAD data, or if available the detail drawings





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MIT JELENT?

„Performance Group”

- **QUALITY OF FEEL**

Directional Control: Take the register under test and move the control(s) through the entire range of travel, for horizontal and vertical adjustment; the vanes must engage simultaneously and no free play is acceptable. In addition the effort should be smooth and the register should have a solid quality feel such that during adjustment there is no flex in the register assembly.

Shutoff Control: Repeat the above test and requirements with the shut off door, link arm and knob or thumbwheel system

- **OPERATING EFFORTS**

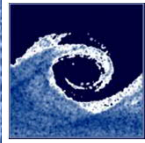
-Operate all elements 2 times from stop to stop prior to the test
 -Note: To achieve the operating efforts, the use of grease is not permissible

-Test after 8 weeks from build

- testing in laboratory with fixture at

-40°C	20°C	90°C
-------	------	------

P1	SHUTOFF
P1-1	SHUTOFF closed stop to open position
P1-2	SHUTOFF opened stop to closed position
P2	HORIZONTAL MOVEMENT left/right
P2-1	HORIZONTAL MOVEMENT over center location to left
P2-2	HORIZONTAL MOVEMENT over center location to right
P3	HORIZONTAL MOVEMENT up and down



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MIT JELENT?

„Air leakage”

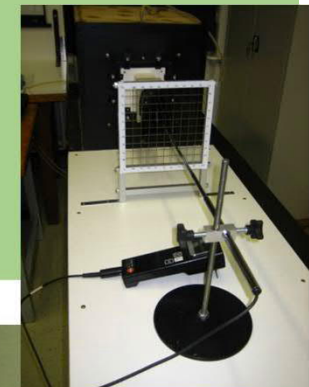
Test procedure

The measurement of air leakage must be carried out with **shut off doors closed**, at distance of 100 mm in front of air register housing at which the centre point of X – Y axis is the centre point of register opening. The X – axis and Y – axis are divided in 10 mm distances. The differential pressure should have a continuous value of **500 N/m²**.

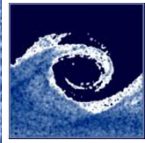
Temperature 20° +/- 3° C. The test is to be repeated after the durability test.

Requirements

No-audible whistle noise should be occur.
Permissible air leakage 0,56 l/sec.
Speed of air leakage 0,55 m/sec. Max.



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SZIGORÚ ELŐÍRÁSOK

Performance Group

Operation Efforts / Feel

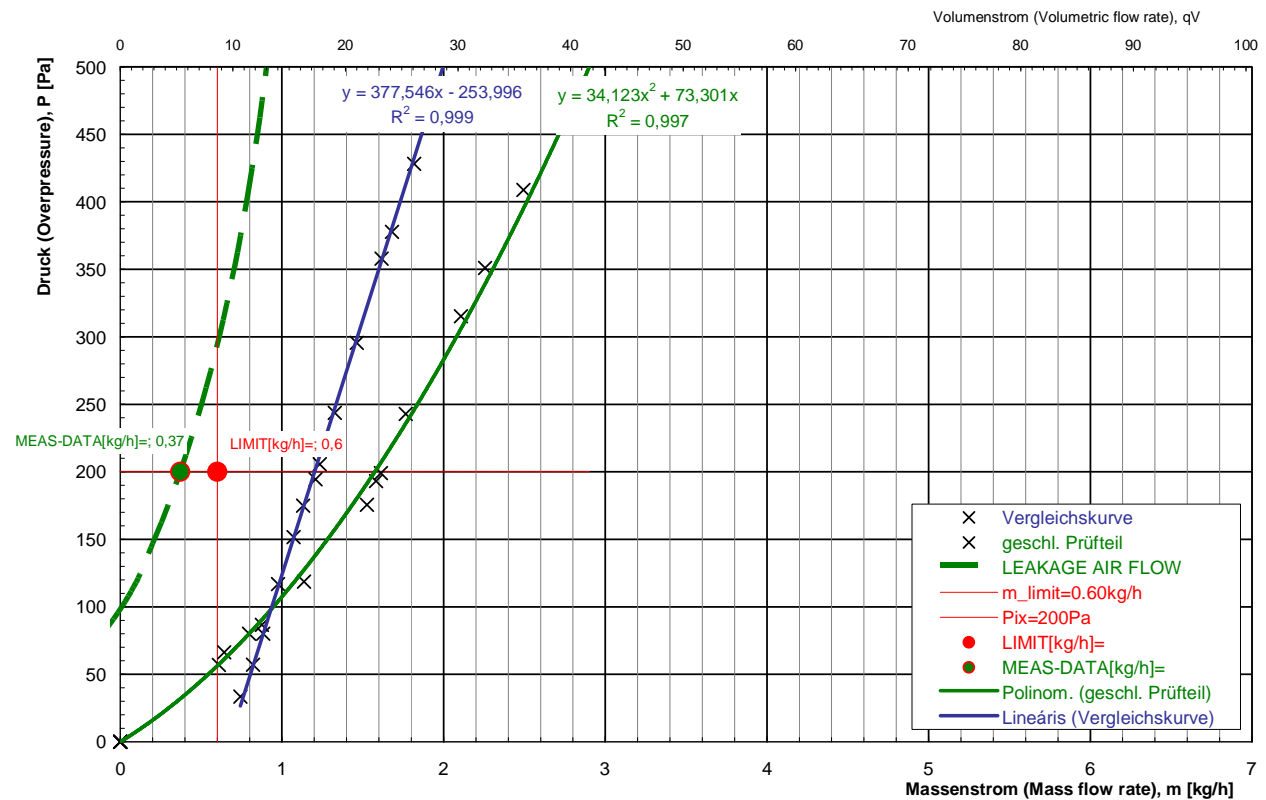
Air Leakage

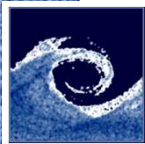
Air Register Distribution List

Airflow pressure drop requirements

Self adjustment of air flaps

Noise level measurement

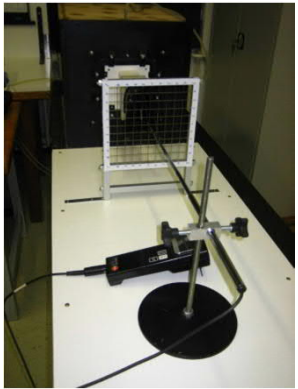
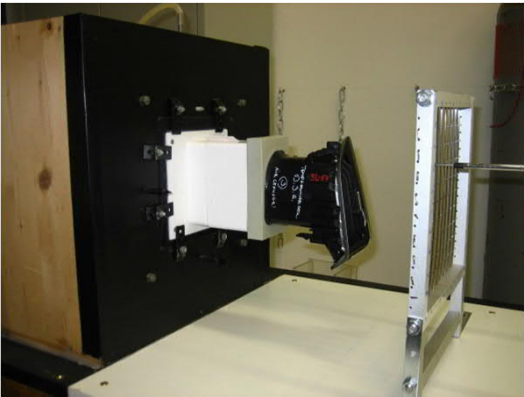




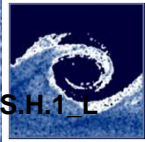
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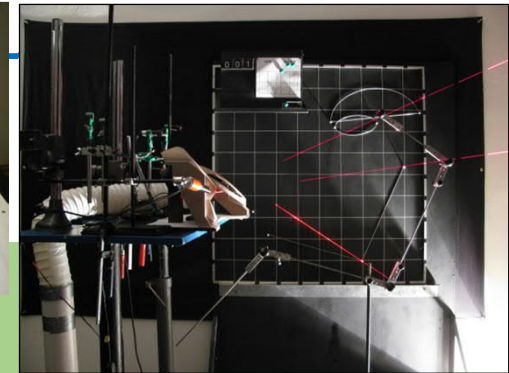
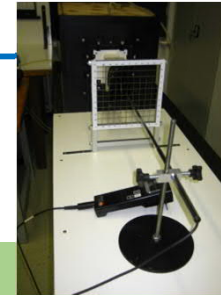
CL-07	VELOCITY v [m/s]	qV=	3,34	[lit/s]	FAIL	v _{av} =	0,10	m/s	CL-07	EVALUATION (PASS/FAIL)	WHISTLE=	1	0=NO 1=LOW 2=MED 3=HIGH	
	-80 -60 -40 -20 0 20 40 60 80									-80 -60 -40 -20 0 20 40 60 80				
80	0 0 0 0 0 0 0 0 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS				80
60	0 0 0 0 0 0 0 0 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS				60
40	0 0,01 0,06 0,07 0,09 0,02 0,01 0 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS				40
20	0 0,09 0,28 0,53 0,44 0,03 0,02 0,01 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS				20
0	0 0,04 0,11 0,32 0,23 0,05 0,04 0,01 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS				0
-20	0 0,01 0,03 0,12 0,11 0,05 0,03 0,04 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS				-20
-40	0 0,02 0,05 0,12 0,69 0,62 0,08 0,02 0									PASS PASS PASS PASS FAIL FAIL PASS PASS PASS				-40
-60	0 0,01 0,03 0,09 0,89 0,74 0,09 0,02 0									PASS PASS PASS PASS FAIL FAIL PASS PASS PASS				-60
-80	0 0,01 0,05 0,09 0,69 1,06 0,08 0,04 0									PASS PASS PASS PASS FAIL FAIL PASS PASS PASS				-80
	-80 -60 -40 -20 0 20 40 60 80									-80 -60 -40 -20 0 20 40 60 80				



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MIT JELENT?

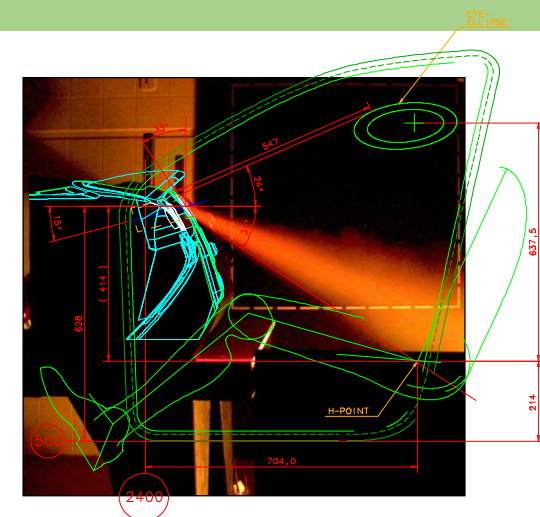
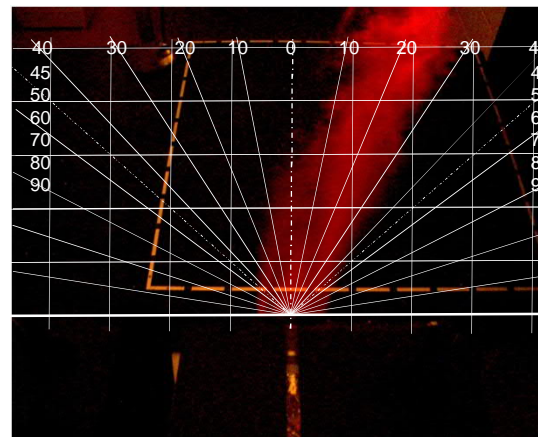
„Air Register Distribution”

AIR REGISTER DISTRIBUTION LIMIT LINE

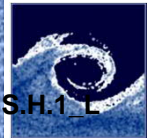
The following directions are based on a left hand based vehicle

The air distribution from the outboard registers and the center registers must be capable of being adjusted (left and right) such that it can reach the **drivers/passengers right and left shoulder/head** with the seat in the rearwards position

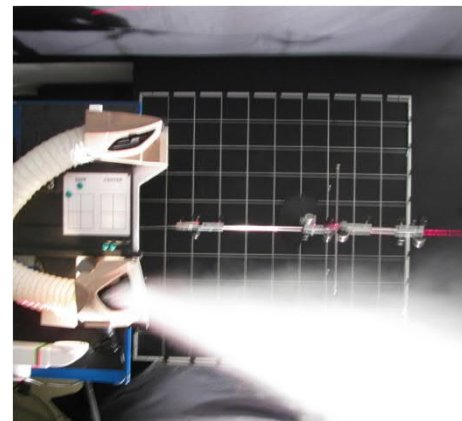
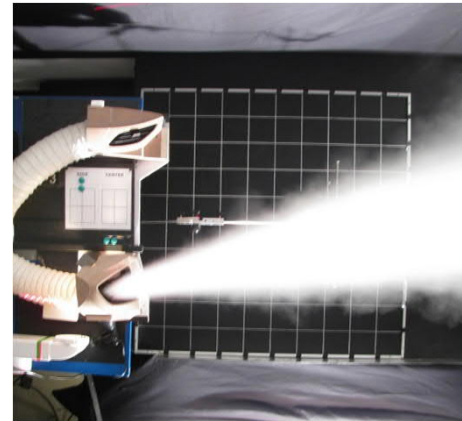
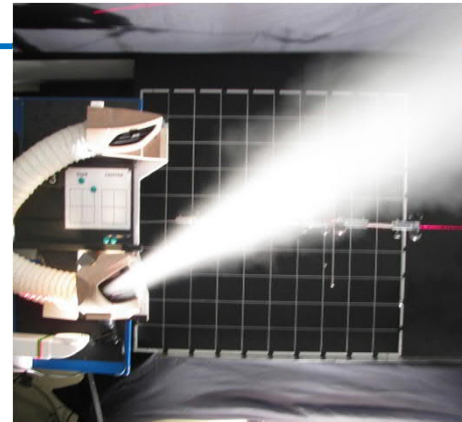
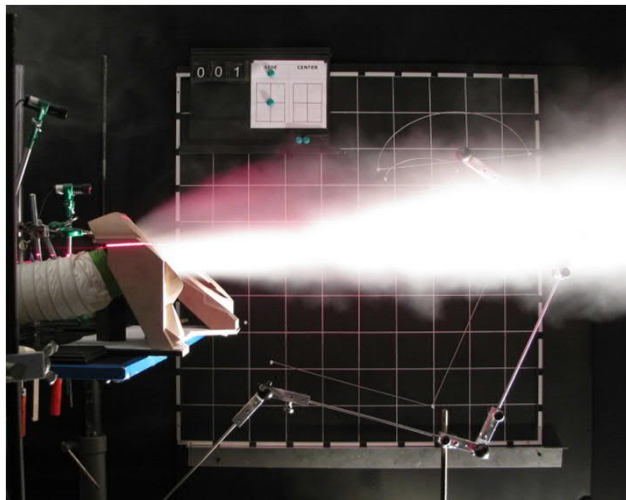
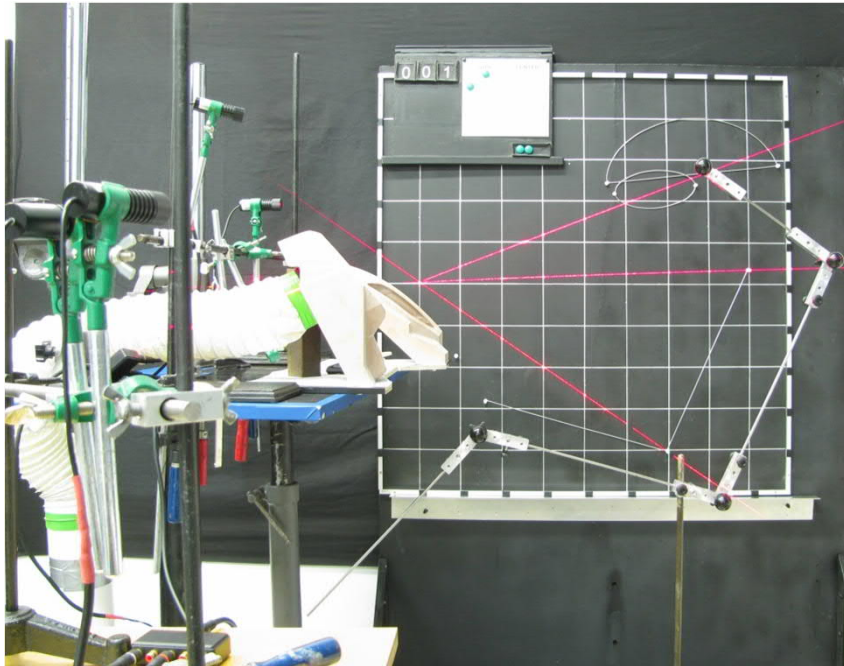
The air distribution from the outboard registers and the center registers must be capable of being adjusted (up and down) such that it can reach the **drivers/passengers H-point and eye-ellipse** “target zone” with the seat in the rearwards position

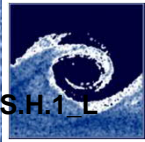


C307 - OVAL REGISTER THEORETICAL INVESTIGATION AIRFLOW DIRECTION CENTRE REGISTERS



H07 SZEMÉLYAUTÓ UTASTÉRI LÉGBEFÚVÓ TESZT





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MIT JELENT?

„Airflow pressure drop”

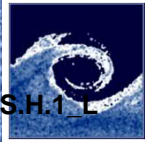
The **static pressure drop** measured through the register must not exceed 8 mm (78,5 Pa) water **at a volumetric flow rate** of 37,5 l/sec. Measured with the register in a nominal position.

b) Air flow to be supplied with a suitable fan via 10 cm x 10 cm square section pipe 2 m long.

An **orifice plate**, where the flow rate will be measured, is connected half way down. The pipe is then connected to an expansion or reduction= transition piece to the inlet of the register.

c) The first **piton tube**, positioned at right angles to the flow, is mounted within the register transition piece. The second **piton** is positioned on a 2D traverse 15 cm from the outside exhaust face of the register. The difference in the two static pressures is measured using an inclined water manometer. Allowance is made for the restriction of the transition piece by repeating the test with the register removed and subtracting the static pressure loss. The register must exhaust into a 5 equal sided box a least 20 register diameter in length.





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MIT JELENT?

„DURABILITY”

1. DURABILITY TEST

a) Test Procedure

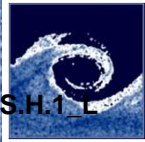
The register assy of each design must fulfil: 200 cycles at -40°C , 1000 cycles at 90°C , and 12,000 cycles at 24°C . Operating efforts to be measured after each cycling episode under simulated function conditions. (1 cycle = movement from stop to stop)

Frequency: 6 +/- 2 cycles per minute.

b) Requirements

After test, the operating efforts must fulfil the requirements of point III.B. no squeak and rattle noise during operation permissible. Leakage as III.C.2. Self-Adjustment of air flaps as III.C.5.





SZIGORÚ ELŐÍRÁSOK

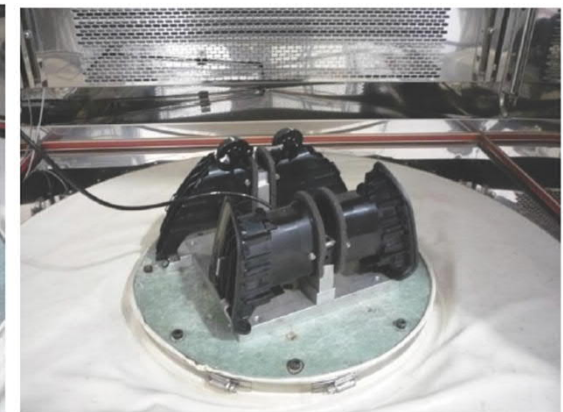
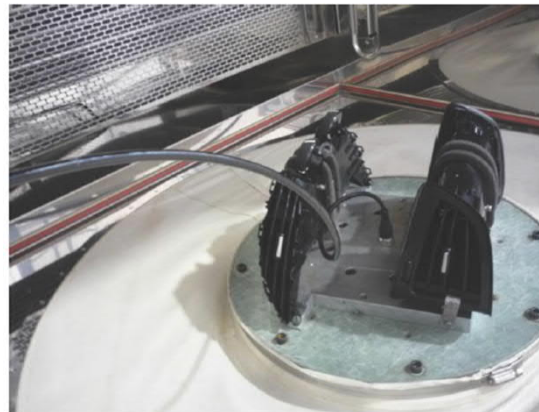
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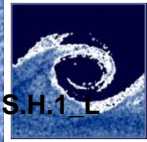
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MIT JELENT?

„VIBRATION”

- a) Select 5 registers at random and a further 5. Mount in a vibration fixture to represent the correct orientation of the assembly in the vehicle application.
- b) Assembly is to be environmentally tested for 40 hours of vibration.
 - 1) 5 hours of vibration run at -40°C .
 - 2) 10 hours of vibrations run initially at -40°C , uniform warm up to 90°C .
 - 3) 5 hours of vibration run at 90°C .
 - 4) 10 hours of vibration run initially at 90°C , uniform cool down to -40°C .
 - 5) 10 hours of vibration will be run at ambient temperature.
- c) Complete 40 hours of vibration from 3 to 65 to 3 Hz on a 3 minute cycle with an acceleration of 4 g.
- d) During the test, the register must not emit any rattle noises. (check the register for rattles periodically every 30 minutes).....
- e) These assemblies should be tested with the vanes, battles and shut off flaps in different positions to best represent the range over which they can move. Theses positions should be recorded in the test result.
- f) After test no squeak and rattle noise permissible. No self-adjustment of flaps according to point III.C.7. during or after the test is permissible.





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MIT JELENT?

„Environmental Resistance”

TEMPERATURE & HUMIDITY CYCLING

The register is to be conditioned for 24 hours at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ relative humidity. Then the parts must resist the following cycles 3 times:

- 3 hours at $+90^\circ \pm 1^\circ\text{C}$
- 1 hour at room temperature
- 3 hours at $-40^\circ \pm 1^\circ\text{C}$.
- 1 hour at room temperature
- 16 hours at $38^\circ \pm 1^\circ\text{C}$ and $98 \pm 2\%$ relative humidity.

2) Requirements:

After the test the Register must be fully operational and must not show any deformation, cracks and other defects or any changes in appearance. The operating effort must achieve III.C.3. and Air leakage as III.C.4.

HEAT AGEING

12 hours with ambient temperature of $90^\circ \pm 1^\circ\text{C}$.



RESISTANCE TO LOW TEMPERATURE

12 hours to -40°C temperature

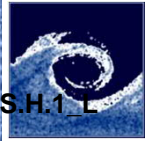


THERMAL SHOCK

The register assy fixed to a gauge and have to withstand 20 cycles of the following test to simulate climate usages.

- 2 hours at $+90^\circ\text{C}$
- 1 hour at -18°C





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- Instruction and Notes
- Appendix

MIT JELENT?

„**Robustness**”

1 LOAD REQUIREMENTS

The following tests should be conducted at the temperature, 90°C, 20°C and –40°C. The component should be heat soaked at the test temperature for minimum of 2 hours.

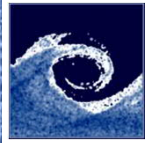
2 VANE DEFLECTION TESTS

a) VANE RIGIDITY

- 1) Apply a 10 ± 0.5 N force perpendicular to the plane of the vane, using an effort gauge. The test should be conducted on all vanes.
- 2) The vane should not deflect more than 2.0mm, and should return without permanent deformation to its original form.

b) VANE AND FINGER GRIP / KNOB RETENTION

- 1) Apply sufficient force to permanently deform, break or disengage the vane / finger grip. Perform on all vanes.
- 2) The vane should not fail before a 67N force is achieved. Record the force at which the failure subsequently occurs



MÉRÉSI FELADAT CÉLJA:

1. Részveszteség $q_{V,rés}=?[m^3/s]$ meghatározása
adott $\Delta p[Pa]$ túlnyomás esetén.

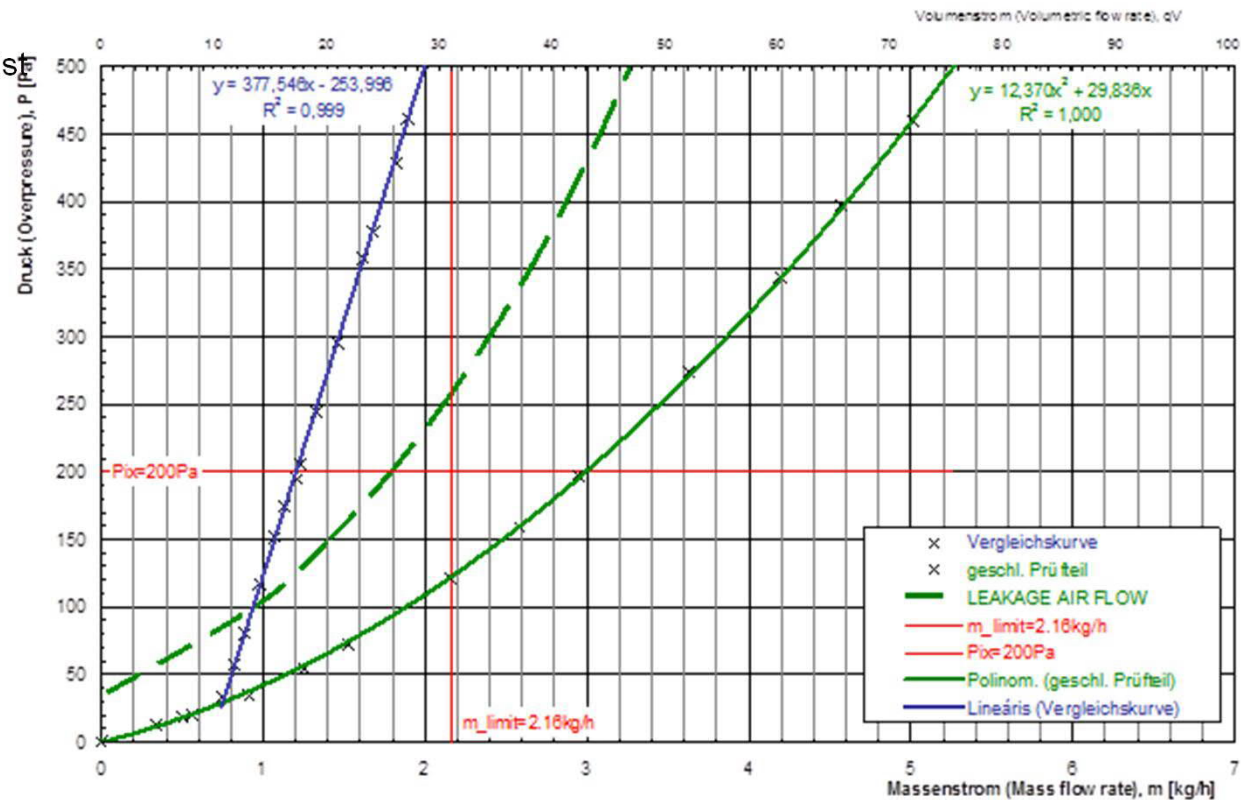


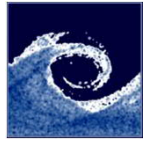
Performance Group

Operation Efforts / Feel

Air Leakage

Air Register Distribution List



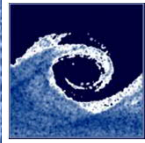


MÉRÉSI FELADAT CÉLJA:

1. Résveszteség $q_{V,rés}=?[m^3/s]$ meghatározása adott $\Delta p[Pa]$ túlnyomás esetén.

$q_{V,rés}$ mérése : szabványos átfolyó mérőperemmel

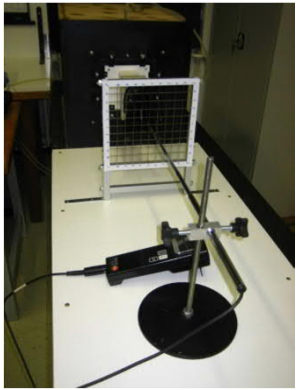
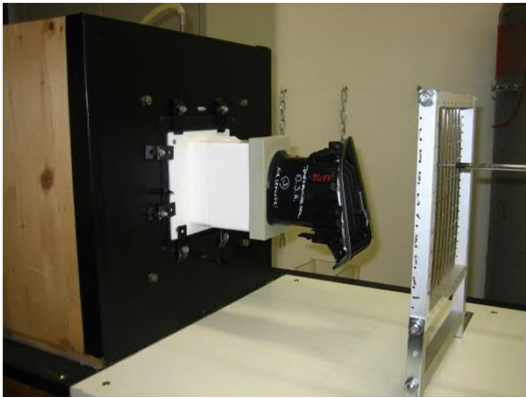




MÉRÉSI FELADAT

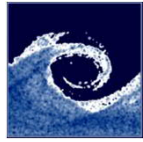
2. Sebességeloszlás és
térfogatáram meghatározása
zárt/nyitott légbefúvó esetén:

$v ? v_{limit}$ és $q_v = ? [m^3/s]$



Performance Group
Operation Efforts / Feel
Air Leakage

CL-07	VELOCITY v [m/s]	qV=	3,34	[lit/s]	FAIL	v _{av} =	0,10	m/s	CL-07	EVALUATION (PASS/FAIL)	WHISTLE=	1	<small>0=NO 1=LOW 2=MED 3=HIGH</small>
	-80 -60 -40 -20 0 20 40 60 80									-80 -60 -40 -20 0 20 40 60 80			
80	0 0 0 0 0 0 0 0 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS			80
60	0 0 0 0 0 0 0 0 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS			60
40	0 0,01 0,06 0,07 0,09 0,02 0,01 0 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS			40
20	0 0,09 0,28 0,53 0,44 0,03 0,02 0,01 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS			20
0	0 0,04 0,11 0,32 0,23 0,05 0,04 0,01 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS			0
-20	0 0,01 0,03 0,12 0,11 0,05 0,03 0,04 0									PASS PASS PASS PASS PASS PASS PASS PASS PASS			-20
-40	0 0,02 0,05 0,12 0,69 0,62 0,08 0,02 0									PASS PASS PASS PASS FAIL FAIL PASS PASS PASS			-40
-60	0 0,01 0,03 0,09 0,89 0,74 0,09 0,02 0									PASS PASS PASS PASS FAIL FAIL PASS PASS PASS			-60
-80	0 0,01 0,05 0,09 0,69 1,06 0,08 0,04 0									PASS PASS PASS PASS FAIL FAIL PASS PASS PASS			-80
	-80 -60 -40 -20 0 20 40 60 80									-80 -60 -40 -20 0 20 40 60 80			

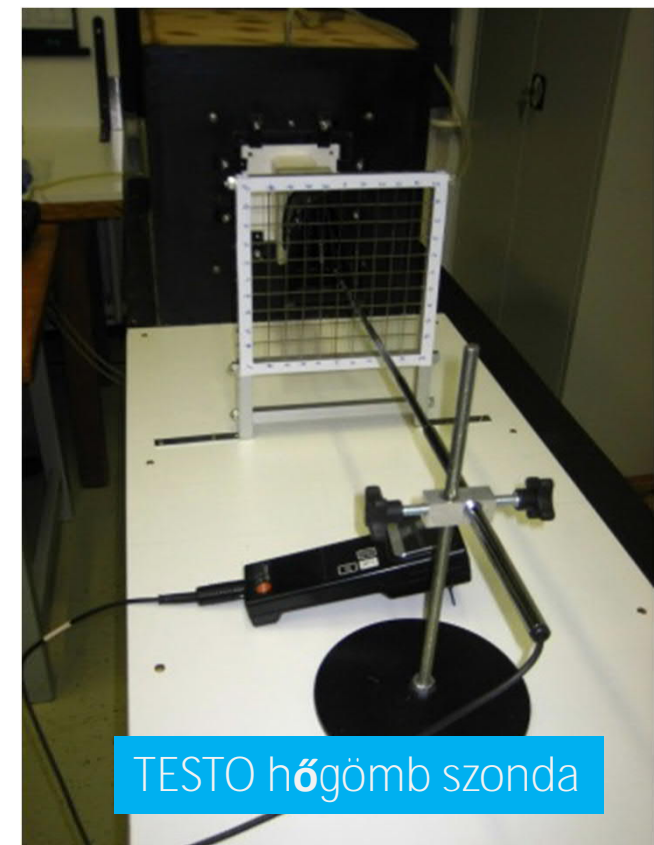
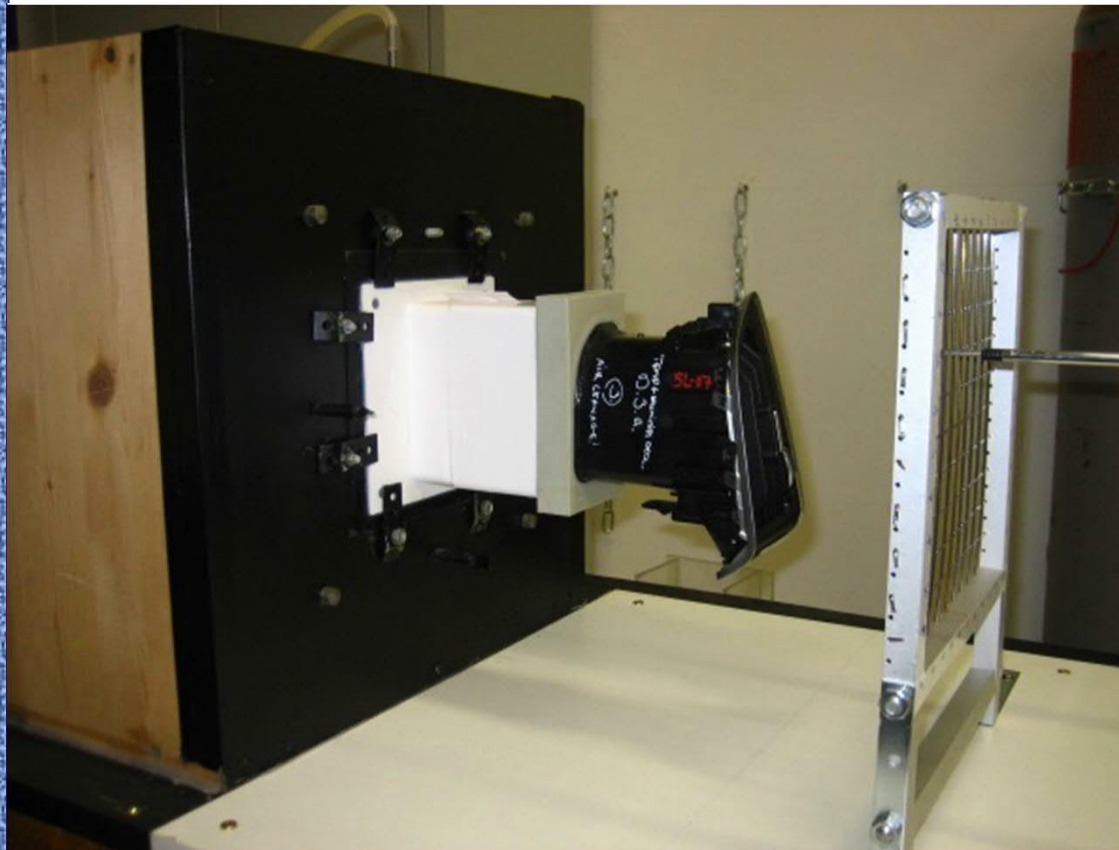


MÉRÉSI FELADAT

2. Sebességeloszlás mérése és térfogatáram meghatározása
zárt/nyitott légbefúvó esetén: v ? v_{limit} és $q_V = ?$ [m³/s]

ZÁRT állás: kis sebességek esetén TESTO hőgömb szondával

NYITOTT állás: max. térfogatáramnál Prandtl-csővel



TESTO hőgömb szonda