

# UN Regulation No. 90 – CoP

## Annex 9 – 3.1.1 (HCV)

Document replacing GRVA-09-41 and GRVA-07-52

Additional Supporting Data

# The new proposal – Annex 9 / 3.1.1. - HCV

## Current Requirement

Components no longer commercially available

- 3.1.1. The machine shall be equipped with a disc brake of the **fixed calliper type with a cylinder diameter of 60 mm and a solid (not ventilated) brake disc** having a diameter of  $278 \pm 2$  mm and a thickness of  $12 \text{ mm} \pm 0.5$  mm. A rectangular piece of the friction material with an area of  $44 \text{ cm}^2 \pm 0.5 \text{ cm}^2$  and a thickness of at least 6 mm shall be attached to the backing plate

# The new proposal – Annex 9 / 3.1.1. - HCV

## New Proposal

**Keep 3.1.1. unchanged and add a new paragraph:**

**3.1.1.1.** Alternatively the machine may be equipped with a disc brake and corresponding brake disc having a diameter of  $278 \pm 2$  mm such as to allow a rectangular piece of the friction material with a surface area of  $44\text{cm}^2 \pm 0.5\text{cm}^2$  and a thickness of at least 6 mm to be attached to the backing plates of the disc brake.

In this case the Registered Values of friction to be used for ongoing COP checks shall be established in accordance with the technical service by comparative tests using the same batch of friction material with the test hardware specified in 3.1.1 and the alternative hardware.

The applicant shall provide the values for the friction behavior resulting from the use of alternative test hardware in accordance with Annex 9 para 3.4.1 of this Regulation and the results shall be attached to the type-approval report

Removes restriction on type of

- Brake calliper
- Brake disc

Change of hardware requires back to back tests to determine effect (if any) on Registered Values

Existing Registered Friction Values either re-confirmed or new values established

# Points of Discussion

- 1) Use of alternative type of brake calliper – *Agreed*
- 2) Use of alternative type of brake disc
  - Vented rotor will result in lower EOS temperatures – will these be lower than temperature range experienced on approval tests ?

## CLEPA position

- Annex 9 /3.2.2. specifies start temperatures - no requirement for EOS
- Annex 9 /3.2.2. is an industry CoP test with surrogate parts, not an approval test – no requirement for temperature matching
- EOS temperature is a product/test variable not a control parameter

# Typical EOS temperatures on R90 HCV Approval Tests

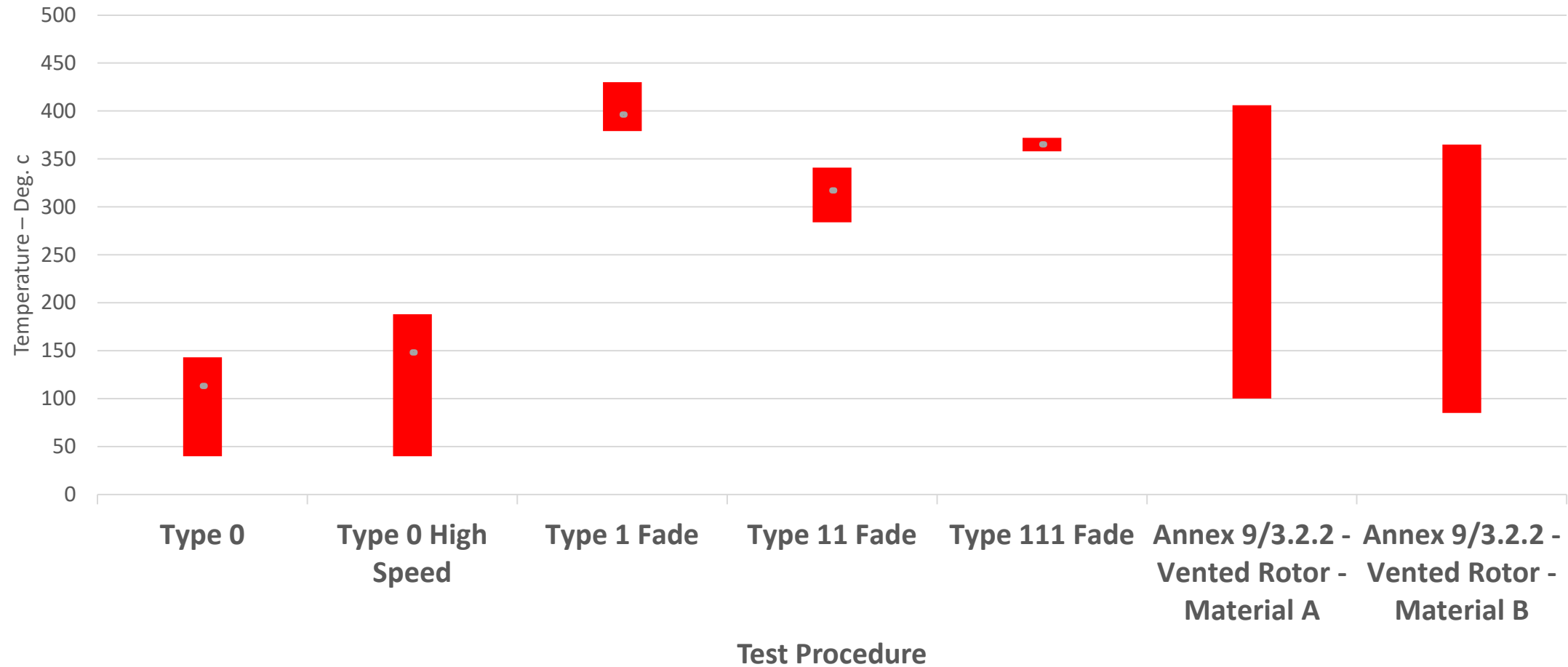
Test No	Disc/Drum	Diameter (mm)	Thick / Width (mm)	Type 0 EOS (Deg. C)	Type 0 HS EOS (Deg. C)	Type 1 Max (Deg. C)	Type 11 Max (Deg. C)	Type 111 Max (Deg. C)
1	Disc – Vent	334	30	129	161	379	284	N/A
2	Disc - Vent	377	45	143	155	394	341	372
3	Disc - Vent	434	45	79	121	430	307	N/A
4	Disc - Vent	434	45	72	116	387	331	N/A
5	Drum	410	178	140	188	392	322	358
Mean Values				113	148	396	317	365
Overall Mean Range				113 > 396 Deg. C				

# Annex 9 – 3.2.2. Tests with Solid & Vented Discs

Cycle	IBT – Deg C	Friction Material A – Higher Mu / Low Fade			Friction Material B – Lower Mu / Higher Fade *		
		Solid	Vented	% Diff	Solid	Vented	% Diff
1	100	218	205	6%	132	96	27%
2	<200	384	342	11%	295	212	28%
3	200	385	342	11%	336	270	20%
4	<300	433	375	13%	347	306	12%
5	300	459	389	15%	343	325	6%
6	250	265	260	2%	235	248	5%
7	200	248	224	10%	211	206	2%
8	150	214	194	9%	178	170	5%
9	100	285	244	14%	230	194	16%
10	<300	393	385	2%	372	320	14%
11	300	484	406	16%	370	343	7%

\* Average of 6 tests on each brake disc form

# Temperature Profiles



Annex 9 / 3.2.2. tests with vented rotors broadly cover the temperature spectrum seen on R90 Approval tests

# Registered Friction Values

	Friction Material A – High Mu/ Low Fade		Friction Material B – Lower Mu/ Higher Fade *	
	Solid Disc	Vented Disc	Solid Disc	Vented Disc
Mu Op 1	0.49	0.52	0.31	0.30
Mu Op 2	0.46	0.49	0.39	0.39
Mu Min	0.35	0.36	0.17	0.2
Mu Max	0.53	0.54	0.43	0.43

\* Average of 6 tests on each disc form

- 1) Friction values not significantly changed by disc form
- 2) **Characterisation of products not affected by disc form**