

# Test Procedure of UN-R139 Brake Assist Systems (BAS)

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1. Test track and equipment
2. BAS categories and overview
3. Test1  
Reference test to determine  $F_{ABS}$  and  $a_{ABS}$
4. Test 2  
For activation of BAS

1. **Test track and equipment**

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# Test Track



- Road surface affording good adhesion
- Flat and level, straight-line pavement
- Suitable road width and lane marker for braking points
- The track is used for R13H Braking, R13H ABS and R139 BAS



# Equipment for R13H ABS and R139 BAS

	Check points	Service braking	ABS	BAS
Thermocouples	Braking temperature before braking	○	○	○
Speed sensor ( G sensor )	Initial braking speed	○	○	○
	Mean fully developed deceleration	○		
Measuring gauge of control force	Force applied to control	○	○	○
Wheel speed sensor	Wheel lockup at speeds exceeding 15km/h	○	○	
Visual check	Vehicle behavior	○	○	
Measuring unit (Generated from data)	Deceleration time		○	○
Steering angle sensor	Control angle		○	
Pressure sensor	Deceleration sensor			

# Accuracy for measurement

<i>Variable range system</i>	<i>Typical operating range of the transducers</i>	<i>Recommended maximum recording errors</i>
Pedal force	0 to 2,000 N	$\pm 10$ N
Brake temperature	0 – 1,000 °C	$\pm 5$ °C
Brake pressure*	0 – 20 MPa*	$\pm 100$ kPa*

\* Applicable as specified in paragraph 8.2.5.

- Filter technique
  - Sampling rate
- ISO 15037-1:2006  
At least 500Hz

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2.6. "Brake Assist System (BAS)" means a function of the braking system that deduces an emergency braking event from a characteristic of the driver's brake demand and, under such conditions:

- (a) Assists the driver to **deliver the maximum achievable braking rate**; or
- (b) Is sufficient to cause **full cycling of the Anti-lock Braking System**.

2.6.1. "Category A Brake Assist System" means a system which detects an emergency braking condition based primarily on **the brake pedal force** applied by the driver;

2.6.2. "Category B Brake Assist System" means a system which detects an emergency braking condition based primarily on **the brake pedal speed** applied by the driver;



## Procedure of overview

Test 1: Reference test to determine  $F_{ABS}$  and  $a_{ABS}$

The driver apply the force on the brake pedal **slowly** without activation of BAS providing a constant increase of deceleration until ABS is fully cycling.



From maF curve data, determine  $F_{ABS}$  and  $a_{ABS}$

Test 2: For activation of BAS

The driver apply the force on the brake pedal **quickly** in order to activate BAS until ABS is fully cycling.

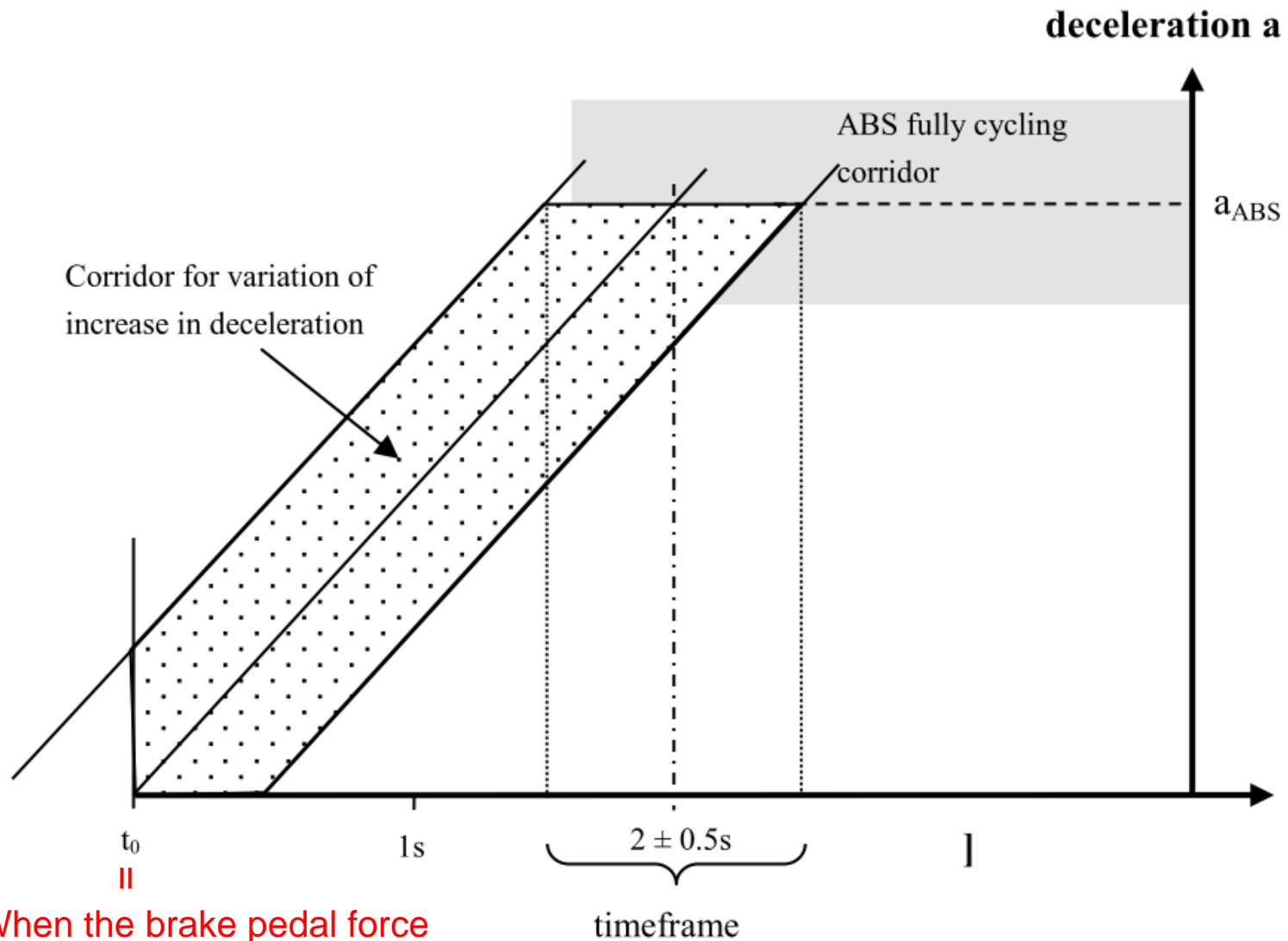
After this the driver keep the force on the brake pedal within the  $F_{ABS}$  area.



Data assessment of the pedal force and acceleration within the phase of BAS- evaluation

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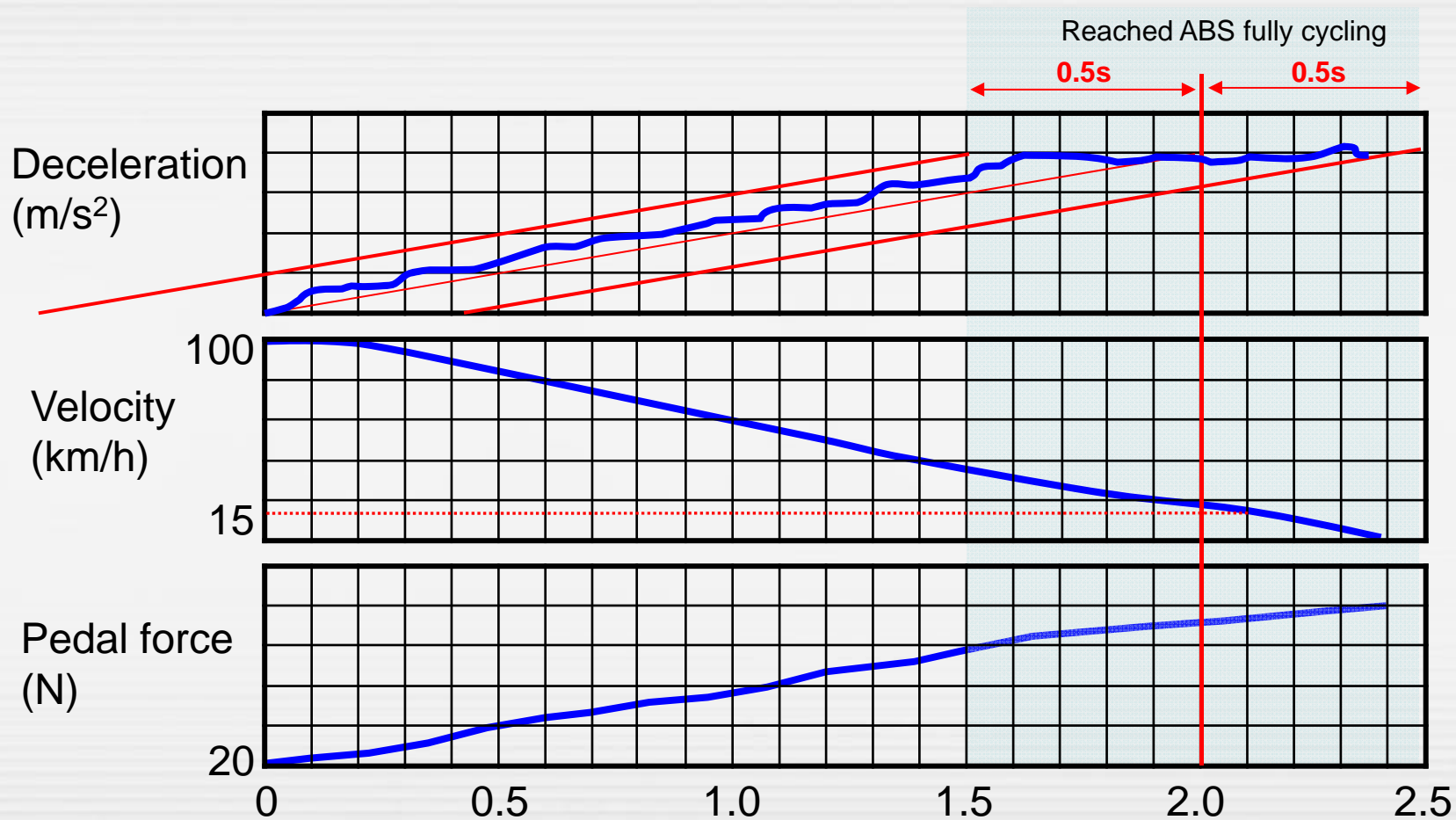
# Test 1: Reference test to determine $F_{ABS}$ and $a_{ABS}$



When the brake pedal force reaches 20 N.



# Test 1: Reference test to determine $F_{ABS}$ and $a_{ABS}$



II  
When the brake pedal force reaches 20 N.

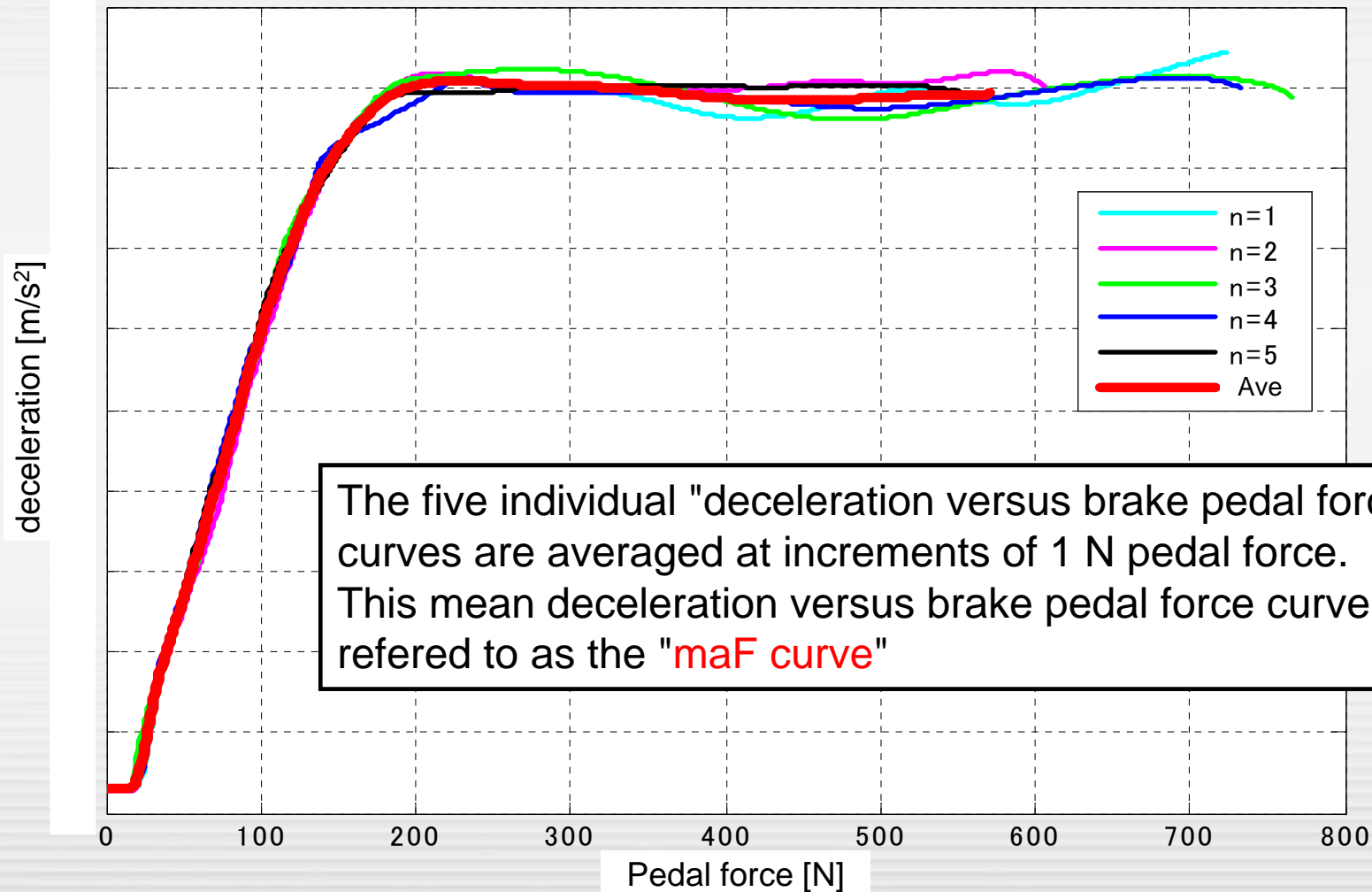
Test speed

:  $100 \pm 2$  km/h

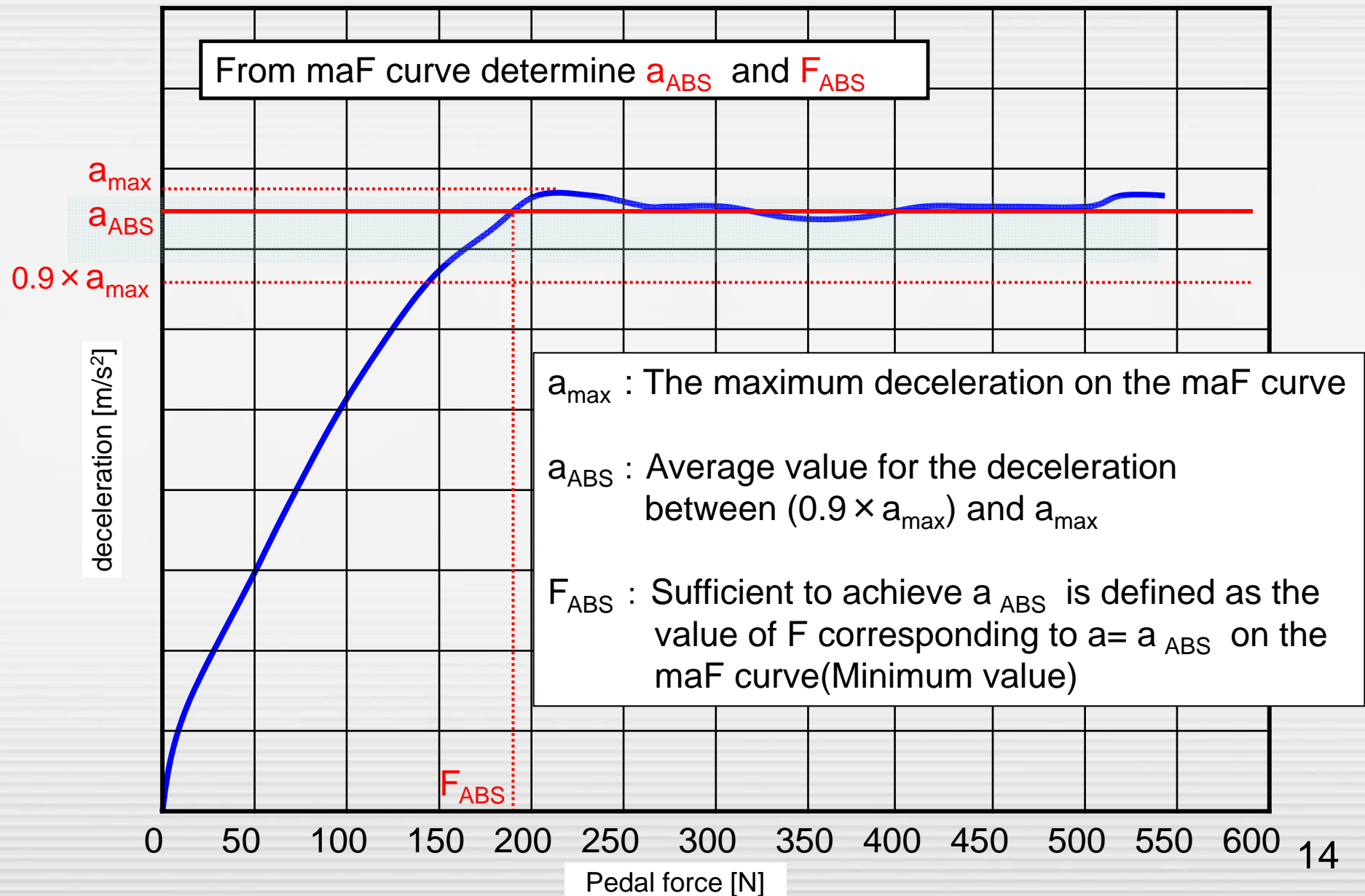
Lining temperature before braking :  $65-100^\circ\text{C}$



## Test 1: Reference test to determine $F_{ABS}$ and $a_{ABS}$



# Test 1: Reference test to determine $F_{ABS}$ and $a_{ABS}$



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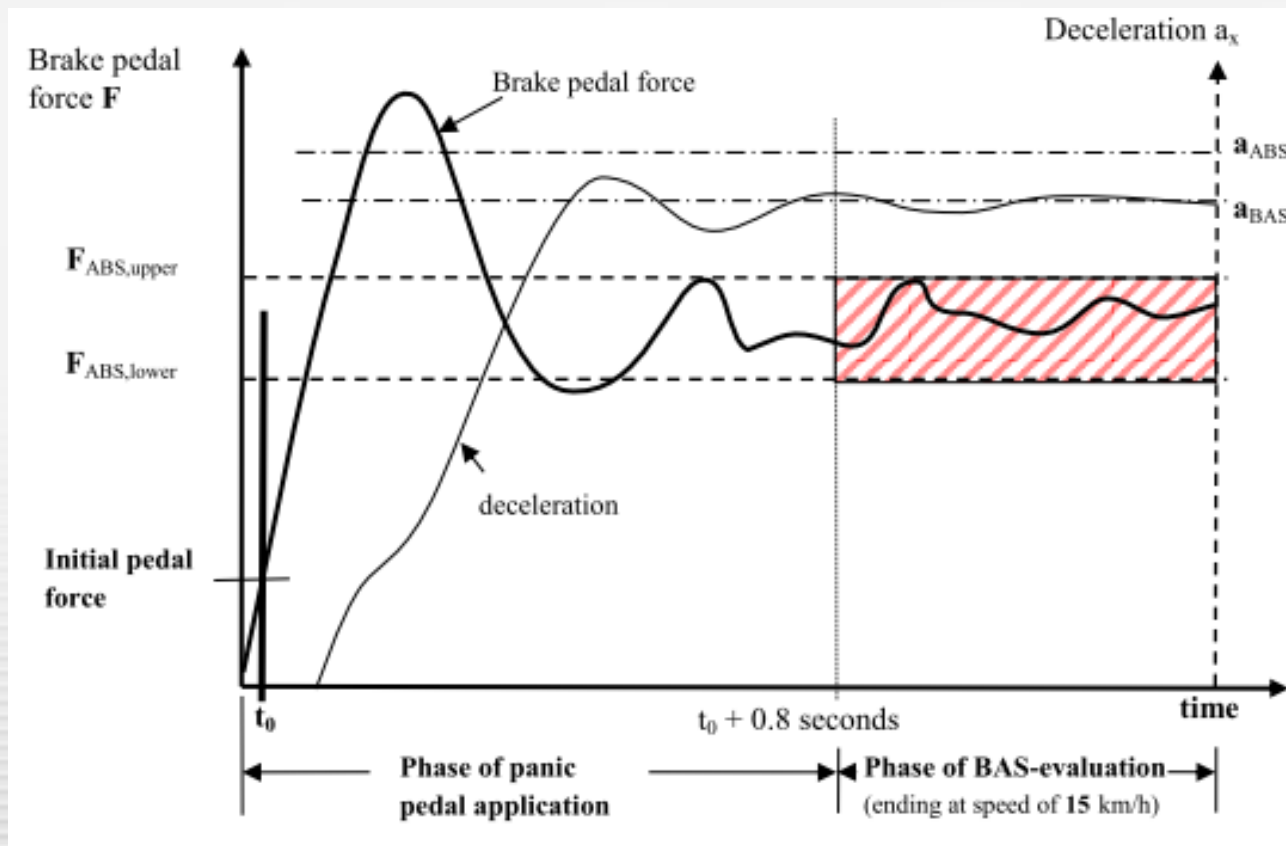
## Test 2: For activation of BAS

### Assessment of the pedal force and acceleration within the phase BAS-evaluation

Phase of BAS-evaluation

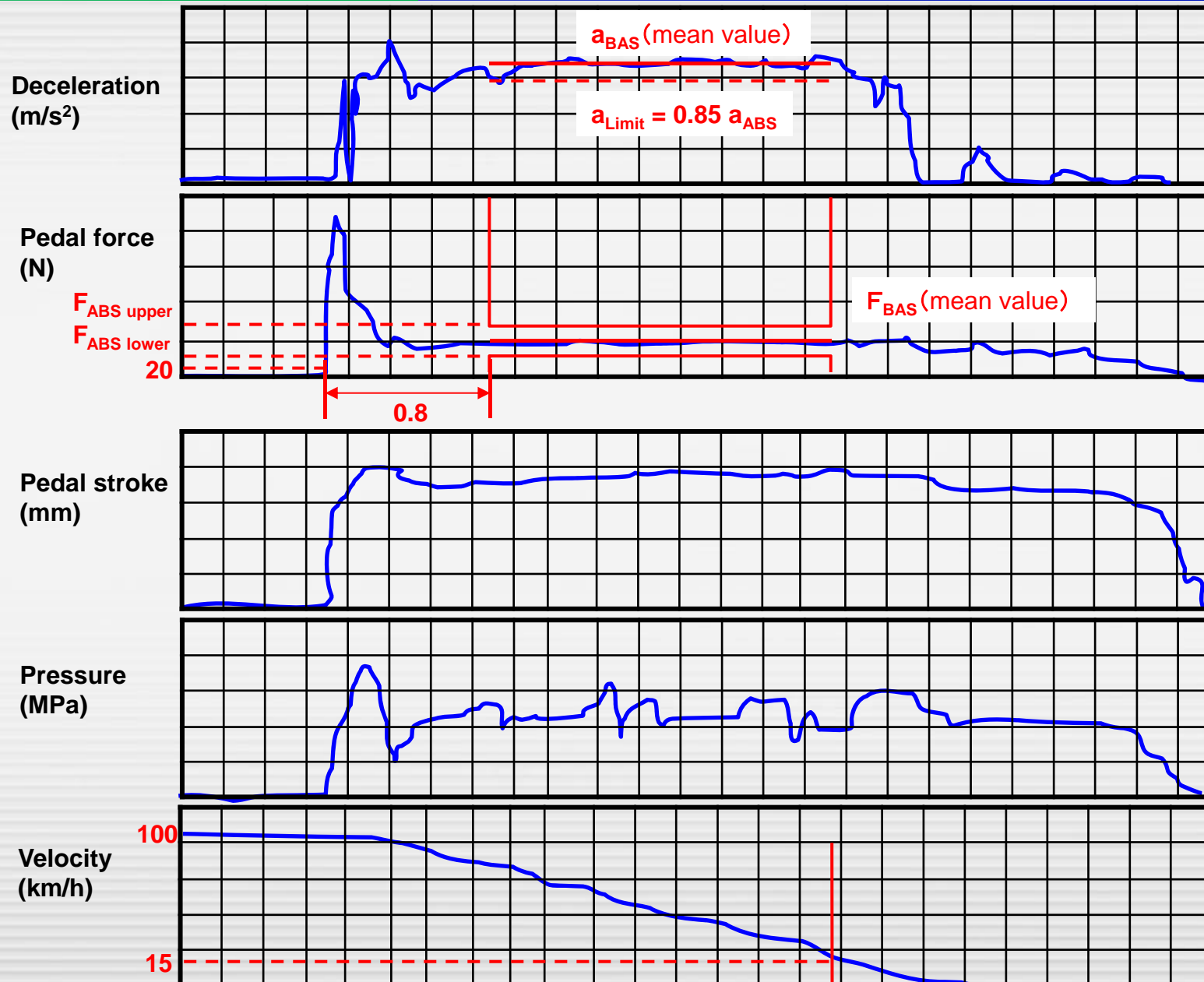
Upper force :  $F_{BAS} < F_{ABS, upper} = 0.7 \cdot F_{ABS}$   
 Lower force :  $F_{BAS} > F_{ABS, lower} = 0.5 \cdot F_{ABS}$   
 a mean deceleration :  $a_{BAS} \geq 0.85 \cdot a_{ABS}$

The presence of BAS 'B' is demonstrated





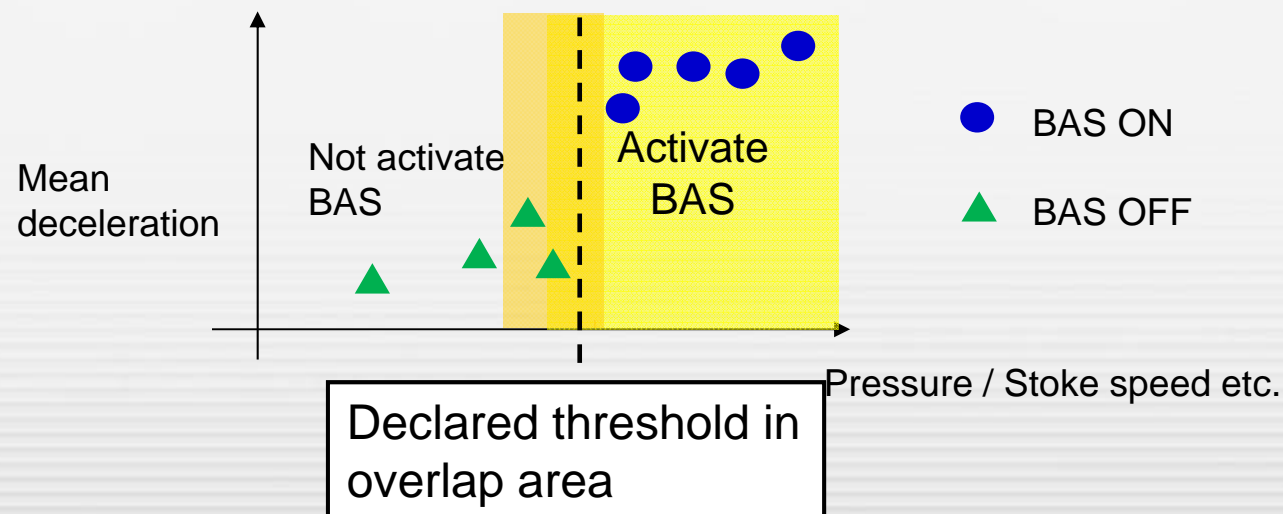
# Test 2: For activation of BAS



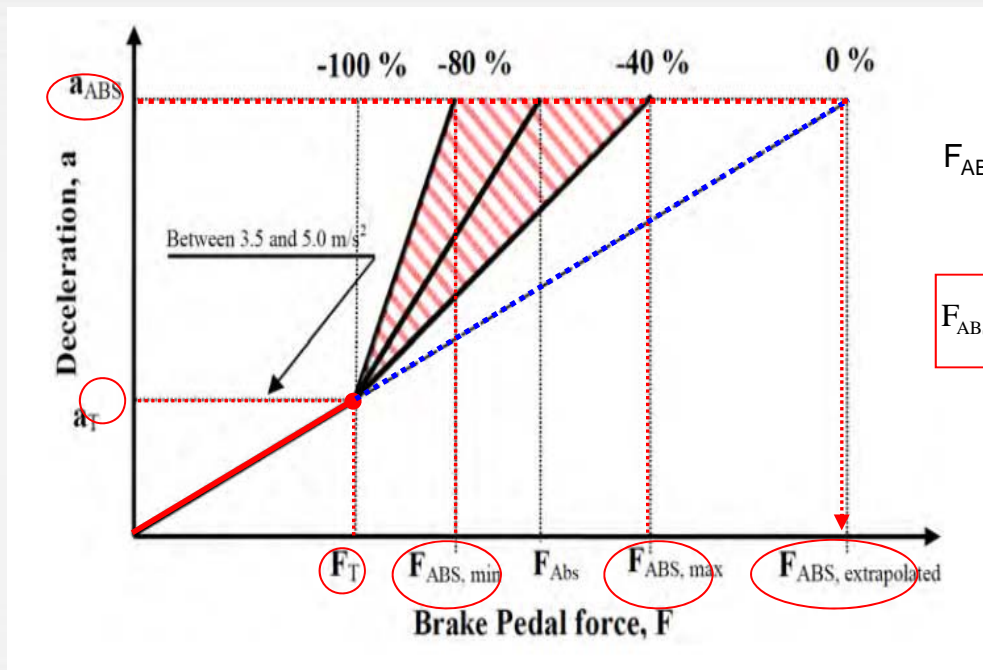
## Additional test(optional) : proving BAS

### Proving BAS

This check is optional and a kind of confirmation the declared thresh value by the vehicle manufacturer to activation with BAS and without BAS.



# Assessment of the presence of category A



$F_{ABS, extrapolated}$  Calculation

$$F_{ABS, extrapolated} = \frac{F_T \cdot a_{ABS}}{a_T}$$

- $F_{TABS}$  : Declared by manufacturer (Activation value)
- $a_{TABS}$  : Declared by manufacturer (Activation value)
- $a_{ABS}$  : From maF curve

where  $3.5 \leq a_T \leq 5.0 \text{ m/s}^2$

## <Requirements>

$$F_{ABS, min} \leq F_{ABS} \leq F_{ABS, max}$$



$$F_T + (F_{ABS, extrapolated} - F_T) \times 0.2 \leq F_{ABS} \leq F_T + (F_{ABS, extrapolated} - F_T) \times 0.6$$

$$\left( \begin{array}{l} F_{ABS, max} - F_T \leq (F_{ABS, extrapolated} - F_T) \times 0.6 \\ \text{かつ、} \\ F_{ABS, min} - F_T \geq (F_{ABS, extrapolated} - F_T) \times 0.2 \end{array} \right)$$



Thank very much for your attention.