

PAS 301:2017

PAS 301 is a test method for a civilian armoured vehicle (CAV) to assess capabilities for, acceleration, maximum speed, through gear acceleration, handling, braking and run flat.

9 Run flat test method

9.1 Principle

The run flat test assesses the ability of the run flat system of a test vehicle to complete an escape at a specified speed over a specified distance loaded to GVM. The run flat test includes three phases: the manoeuvre phase, escape phase and liaison phase, in this order.

The test is completed twice, the first test is with one front tyre only deflated, the second test is with one rear tyre only deflated and assessed in accordance with Table 13. The choice on which tyre to deflate is dictated by the highest tyre loading determined during the payload test (see Clause 5). Each phase starts within 60 s (including any inspection time) from the end of the previous phase.

9.2 Run flat (RF) test level

The run flat test shall be conducted in accordance with Table 12.

Table 12 – Run flat (RF) test level

	Distance km	Run flat speed
Manoeuvre phase	1	Maximum speed achievable on manoeuvre circuit
Escape phase	3	60% of maximum test vehicle speed as determined in maximum speed test, or 160 km/h (whichever is less)
Liaison phase	100 or point of failure, whichever is the lesser	30% of maximum test vehicle speed as determined in maximum speed test, or 80 km/h (whichever is less)

9.3 Test setup

9.3.1 General

9.3.1.1 The run flat test shall be conducted at $(20 \pm 15)^\circ\text{C}$. The wind conditions shall be ≤ 18 km/h (≤ 5 m/s), Beaufort scale 3, gentle breeze.

NOTE There are no humidity constraints but this information should be recorded in the test log (see Annex E).

9.3.1.2 The track surface shall be smooth, clean and constructed from solid paved concrete or asphalt.

NOTE Track irregularities and undulations, such as dips and large cracks, are unsuitable.

9.3.1.3 The test track surface condition (3.1.12) shall be dry or damp. The test shall be postponed when the track is assessed as wet or flooded.

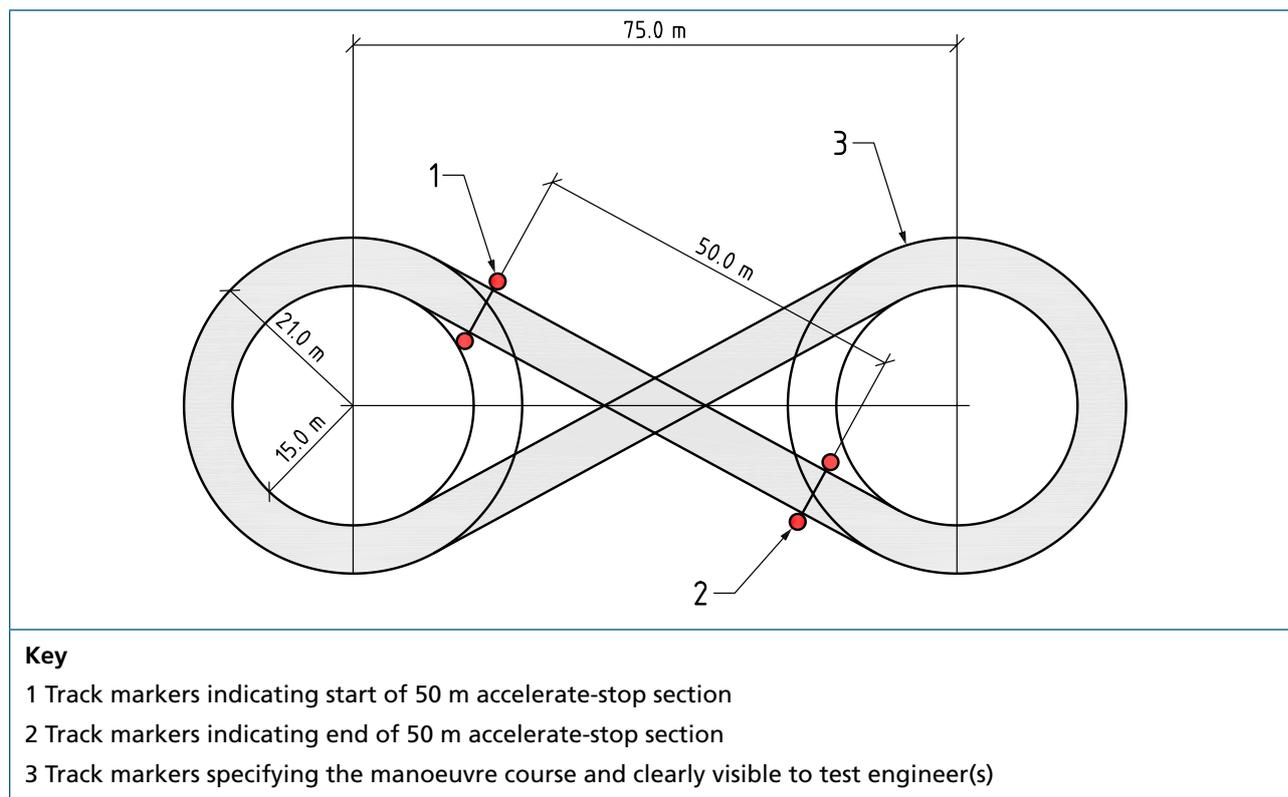
9.3.1.4 The test track surface temperature shall be $(20 \pm 15)^\circ\text{C}$.

9.3.1.5 The track gradient in the direction of travel shall be $\leq 2\%$.

9.3.2 Manoeuvre course layout

The manoeuvre course shall be set up in accordance with Figure 4. The straight sections shall be used for acceleration and braking into the corners.

Figure 4 – Manoeuvre course



9.3.3 Escape and liaison course layout

The escape and liaison course shall be set up on a straight track (or banked track that simulates similar vehicle dynamic forces experienced on a straight track). The setup shall allow the test vehicle to be driven over the distance and speed selected in accordance with Table 12.

9.4 Test vehicle preparation

9.4.1 The test vehicle operational kerb mass (3.1.6) shall be correctly configured.

9.4.2 The test vehicle shall be ballasted to GVM.

NOTE The test vehicle loading should take into account the mass of the test engineer(s) and test equipment installed on the test vehicle.

9.4.3 The test apparatus in accordance with Clause 4 shall be installed on the test vehicle to facilitate data collection in accordance with 9.5.

NOTE 1 The installation method may be determined by the test site provided the data collection can be completed successfully.

NOTE 2 The test vehicle loading should take into account the mass of the test engineer(s) and test equipment installed on the test vehicle.

9.4.4 Using the tyre pressure gauge (4.10) the tyre pressures shall be checked cold and adjusted to the manufacturer's specified pressure.

9.4.5 Check the tyres, wheels and run flats and replace if damaged.

9.5 Test procedure

NOTE 1 Testing should conform with the test site local safety procedures at all times.

NOTE 2 The test procedure described in 9.5 requires test vehicles to complete manoeuvres and to be driven at speeds that could be hazardous.

NOTE 3 For some tests, observers track side or in a chase vehicle may be used to provide additional feedback information to the test engineers conducting the tests.

NOTE 4 During the test a second test engineer may also occupy the test vehicle to facilitate the recording of observations.

9.5.1 General

9.5.1.1 Prepare a test log to record data in accordance with Annex E.

9.5.1.2 Prepare the test vehicle in accordance with 9.4

9.5.1.3 Using the infrared temperature sensor (4.4) measure and record the test track surface temperature and track surface condition (3.1.12) in accordance with 9.3.1.3 to 9.3.1.5 in the test log (see Annex E).

9.5.1.4 If at any stage during the test the tyres become unserviceable the test is stopped.

NOTE *Unserviceable is a where the run flat system has failed and it is deemed that the test cannot be continued. For example, the tyre becomes detached from the rim, or if the tyre catches fire, or the test vehicle cannot be controlled safely.*

9.5.2 Manoeuvre phase

9.5.2.1 Position the front of the test vehicle at the start of the manoeuvre course, position 1 (see Figure 4).

9.5.2.2 Deflate the specified tyre and remove the valve core and record the tyre position in the test log (see Annex E).

9.5.2.3 Start the recording system (4.7) and check that it is recording.

9.5.2.4 Accelerate the test vehicle forward as quickly as possible from position 1, bringing it to a halt as quickly as possible with the front of the test vehicle coming to rest at position 2 (see Figure 4).

9.5.2.5 Immediately accelerate rearwards as quickly as possible, bringing the test vehicle to a halt as quickly as possible with the front of the test vehicle coming to rest at position 1 (see Figure 4).

9.5.2.6 Immediately accelerate forward, driving the test vehicle at the fastest speed possible but staying within the specified limits (9.3.2) of the manoeuvre course.

9.5.2.7 When the 1 km is reached, or the test vehicle becomes unserviceable, bring the test vehicle to a halt.

9.5.2.8 Drive the test vehicle at (8 ± 1) km/h and position the front of the test vehicle at the start of the manoeuvre course, position 1.

9.5.2.9 Accelerate the test vehicle forward as quickly as possible from position 1, bringing it to a halt as quickly as possible with the front of the test vehicle coming to rest at position 2 (see Figure 4).

9.5.2.10 Immediately accelerate rearwards as quickly as possible, bringing the test vehicle to a halt as quickly as possible with the front of the test vehicle coming to rest at position 1 (see Figure 4).

9.5.2.11 Stop the recording system and save the data.

9.5.2.12 Record the qualitative observations in accordance with Table 13 in the test log (see Annex E).

9.5.2.13 Visually check and record the conditions of the tyres and if serviceable proceed to the escape phase. The test vehicle is not left stationary for more than (25 ± 5) s prior to moving to the next phase.

9.5.3 Escape phase

9.5.3.1 Drive the test vehicle at (20 ± 5) km/h to the start of the escape course and bring the test vehicle to a halt.

9.5.3.2 Record the odometer reading and time in the test log (see Annex E).

9.5.3.3 Start the recording system (4.7) and check it is recording.

9.5.3.4 Accelerate the test vehicle up to the specified escape speed and maintain this speed for the specified distance.

9.5.3.5 When 3 km is reached, or the test vehicle becomes unserviceable, bring the test vehicle to a halt.

9.5.3.6 Stop the recording system and save the data.

9.5.3.7 Record the odometer reading and time in the test log (see Annex E).

9.5.3.8 Record the qualitative observations in accordance with Table 13 in the test log (see Annex E).

9.5.3.9 Visually check and record the conditions of the tyres in the test log and if serviceable proceed to the liaison phase. The test vehicle is not left stationary for more than (25 ± 5) s prior to moving to the next phase.

9.5.4 Liaison phase

9.5.4.1 Drive the test vehicle at (20 ± 5) km/h to the start of the liaison course and bring the test vehicle to a halt.

9.5.4.2 Record the odometer reading and time in the test log (see Annex E).

9.5.4.3 Start the recording system (4.7) and check it is recording.

9.5.4.4 Accelerate the test vehicle up to the specified liaison speed and maintain this speed for the specified distance.

9.5.4.5 When 100 km is reached, or the test vehicle becomes unserviceable, bring the test vehicle to a halt.

9.5.4.6 Stop the recording system and save the data.

9.5.4.7 Record the odometer reading and time in the test log (see Annex E).

9.5.4.8 Record the qualitative observations in accordance with Table 13 in the test log (see Annex E).

9.5.4.9 Visually check and record the conditions of the tyres in the test log (see Annex E).

9.5.4.10 Replace the tested wheel/tyre/run flat system with a new set.

9.5.4.11 Repeat steps 9.5.2.1 to 9.5.4.10 for the second test.

9.6 Expression of results

When the run flat test has been completed in accordance with 9.5, score the test vehicle in accordance with the criteria given in Table 13 and record the results in the test log (see Annex E).

Table 13 – Run flat (RF) score criteria

Parameter	Score criteria			
	1	2	3	4
Traction	None/ undriveable	—	—	Good/ driveable
Stability/control	Uncontrollable	—	—	Solid/stable
Vibration and shimmy	Substantial	—	—	No vibration/shimmy
Tyre mounting	Tyre off rim	Bead detached from rim	Bead loose	Tyre normal
Tyre damage	Substantial/ Uncontrollable	—	—	No damage/ Remains controllable
Wheel rim damage	Substantial/ Uncontrollable	—	—	No damage/ Remains controllable
Smoke/fire	Heavy smoke/ flames visible	—	—	No smoke
Observed test vehicle malfunctions	High likelihood of stopping the test vehicle	—	—	Very low likelihood of stopping the test vehicle
Tyres become unserviceable	Manoeuvre or escape phase	Liaison distance ($\geq 0 < 50$) km	Liaison distance ($\geq 50 < 100$) km	Liaison distance ≥ 100 km

9.7 Report

As a minimum requirement the party completing the testing shall submit a test log and category results in accordance with Annex F.

A certificate shall be issued stating as a minimum:

- a) certificate number;
- b) test vehicle number/identifier (e.g. build configuration);
- c) test dates and report issue date;
- d) test party details (organization);
- e) test apparatus details and calibration declaration;
- f) test level and category;
- g) test report number; and
- h) statement that the test only applies to the test vehicle configuration tested.

NOTE *In addition, supporting evidence may be included, for example photographs, video or data printouts from the recording system.*