

TEST REPORT

TW-TT13-MT550a

Benchmarking tests of 205/55R16 studless winter tyres

TW-TT13-MT550a

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1. Objective

The objective of the project was to test the performance of different studless winter tyres. The project consisted of tests on ice, snow, dry and wet surfaces.

2. Tyres

2.1. Tyre information

The tyre selection in the project was the following

Brand	Specification	Size	LI/SI	DOT	Date
Continental	ContiVikingContact 5	205/55R16	94T	CP0F NVX1	5012
Goodyear	Ultragrip Ice+	205/55R16	94T	H30F LA1R	4612
Goodyear	Ultragrip Ice 2	205/55R16	94T	A50F PY1R	4103
Michelin	X-Ice XI3	205/55R16	94H	H1WC 033X	2313
Nokian	Hakkapeliitta R2	205/55R16	94R	YLCP	3313

- All tyres were delivered and run in by the customer
- Separate tyre sets were used for ice/snow and wet/dry tests to avoid wear problems

2.2. Tread pattern photos



Continental



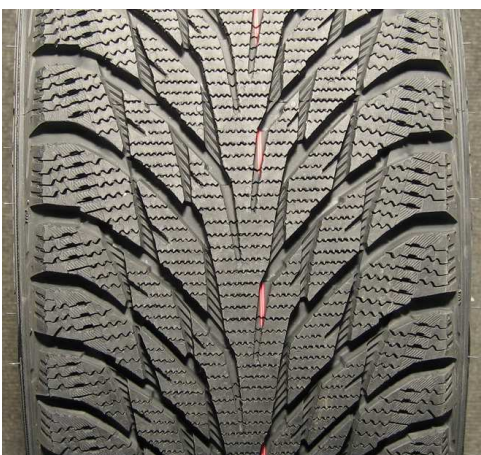
Goodyear Ice+



Goodyear Ice2



Michelin



Nokian

3. Tests

The following tests were carried out.

3.1. Ice tests

Test	Method
Braking	Measurement of braking distance
Acceleration	Measurement of acceleration
Handling, objective	Measurement of lap times on a circuit track
Handling, subjective	Subjective analysis of tyre behaviour

3.2. Snow tests

Test	Method
Braking	Measurement of braking distance
Acceleration	Measurement of acceleration time
Handling, objective	Measurement of lap times on a circuit track
Handling, subjective	Subjective analysis of tyre behaviour

3.3. Wet tests

Test	Method
Braking	Measurement of braking distance
Aquaplaning resistance	Measurement of tyre slip vs. speed
Handling, objective	Measurement of lap times on a circuit track
Handling, subjective	Subjective analysis of tyre behaviour

3.4. Dry tests

Test	Method
Braking	Measurement of braking distance
Handling, subjective	Subjective analysis of tyre behaviour

3.5. Environment and comfort tests

Test	Method
Noise	Subjective inside car noise
Rolling resistance	Indoor rolling resistance on drum

4. Test cars

The test car for all tests was VW Golf VI front wheel drive. Different engine models were used.

5. Test tracks

The tests were performed at three locations in different temperatures suitable for winter tyre testing.

Tests	Track	Test time	Test temperatures
Ice and snow	Test World Ltd, Ivalo, Finland	November-December 2013	-5 ... -10 °C
	Colmar-Berg, Luxembourg and		+1 ... +7 °C
Wet and dry	Wittlich, Germany	November 2013	

6. Test team

Tests were carried out by Test World personnel, except of aquaplaning and rolling resistance, which were performed by Goodyear under Test World observation.

7. Results

Test results are displayed as

Index – larger index = better performance (reference tyre 100)

Grade – subjective grade between 4 = unacceptable to 10 = excellent

Speed – aquaplaning speed

Coefficient – rolling resistance coefficient

7.1. Ice tests

7.1.1. Ice braking

Tyre	Index
Goodyear Ice+	100
Michelin	100
Goodyear Ice 2	99
Nokian	93
Continental	91

7.1.2. Ice acceleration

Tyre	Index
Goodyear Ice+	100
Goodyear Ice 2	100
Michelin	98
Nokian	97
Continental	92

7.1.3. Ice handling, objective

Tyre	Index
Nokian	110
Goodyear Ice 2	109
Goodyear Ice+	100
Continental	94
Michelin	93

7.1.4. Ice handling, subjective

Tyre	Grade
Nokian	8.5
Goodyear Ice 2	8.0
Goodyear Ice+	7.5
Continental	7.0
Michelin	7.0

7.2. Snow tests

7.2.1. Snow braking

Tyre	Index
Continental	101
Goodyear Ice+	100
Goodyear Ice 2	100
Nokian	99
Michelin	97

7.2.2. Snow acceleration

Tyre	Index
Goodyear Ice+	100
Goodyear Ice 2	100
Nokian	99
Continental	97
Michelin	96

7.2.3. Snow handling, objective

Tyre	Index
Goodyear Ice 2	102
Nokian	102
Continental	101
Goodyear Ice+	100
Michelin	100

7.2.4. Snow handling, subjective

Tyre	Grade
Goodyear Ice 2	9.0
Nokian	8.0
Continental	8.0
Goodyear Ice+	7.0
Michelin	7.0

7.3. Wet tests

7.3.1. Wet braking

Tyre	Index
Goodyear Ice 2	105
Nokian	101
Goodyear Ice+	100
Continental	99
Michelin	97

7.3.2. Aquaplaning resistance

Tyre	Speed
Goodyear Ice +	77
Goodyear Ice2	72
Continental	65
Michelin	64
Nokian	64

7.3.3. Wet handling, objective

Tyre	Index
Goodyear Ice 2	104
Nokian	103
Continental	101
Goodyear Ice+	100
Michelin	98

7.3.4. Wet handling, subjective

Tyre	Grade
Goodyear Ice 2	8.0
Goodyear Ice+	7.0
Nokian	6.5
Continental	6.0
Michelin	6.0

7.4. Dry tests

7.4.1. Dry braking

Tyre	Index
Goodyear Ice 2	102
Goodyear Ice+	100
Continental	100
Nokian	99
Michelin	98

7.4.2. Dry handling, subjective

Tyre	Grade
Goodyear Ice 2	8.5
Goodyear Ice+	8.0
Nokian	7.5
Continental	7.5
Michelin	7.0

7.5. Environment and comfort tests

7.5.1. Noise

Tyre	Grade
Goodyear Ice 2	9.0
Goodyear Ice+	8.0
Nokian	8.0
Continental	8.0
Michelin	8.0

7.5.2. Rolling resistance

Tyre	Coeff
Nokian	8.31
Continental	8.32
Michelin	8.34
Goodyear Ice 2	8.38

8. Test protocols

8.1. Braking

8.1.1. Results

- Braking distance for a selected speed interval
- Ice 20-5 km/h
- Snow 35-5 km/h
- Wet asphalt 80-5 km/h
- Dry asphalt 100-5 km/h
- Snow and ice tests done 2-3 times, final result average of test runs

8.1.2. Car systems

- ABS on

8.1.3. Measurements

Ice and snow

- Reference tyre used after two test tires (REF-A-B-REF-C-D-REF)
- 12-16 brakings per tyre
- Brakings always on a new spot

Wet and dry

- Reference tyre used in the beginning and at the end (REF-A-B-C-D-REF)
- 8 brakings per tyre
- Brakings always on the same spot

8.1.4. Driving protocol

- Accelerate the vehicle over the chosen speed
- Put the clutch down and let the vehicle roll freely for a short time
- Brake hard, from 2-3 km/h over the target speed
- Steer straight
- Wait for the vehicle to stop
- Check the data after each braking
- Mark and repeat any faulty measurements

8.1.5. Measuring unit

- Racelogic VBox

8.2. Acceleration

8.2.1. Results

- Acceleration time for a selected speed interval
- Ice 5-20 km/h
- Snow 5-35 km/h
- Snow and ice tests done 2-3 times, final result average of test runs

8.2.2. Car systems

- Traction control on

8.2.3. Measurements

- Reference tyre used after two test tires (REF-A-B-REF-C-D-REF)
- 12-16 accelerations per tyre
- Accelerations always on a new spot

8.2.4. Driving protocol

- Stay still
- First gear, clutch down
- Lift clutch, throttle bottom
- Steer straight
- Wait for the vehicle to accelerate 2-3 km/h over the chosen speed
- Check the data after each acceleration
- Mark and repeat any faulty measurements

8.2.5. Measuring unit

- Racelogic VBox

8.3. Handling

8.3.1. Results

- Sector times
- 2-4 sectors on a track
- Subjective comments
- Snow and ice tests done 2-3 times, final result average of test runs

8.3.2. Car systems

- ABS on
- Traction control on
- ESC off

8.3.3. Measurements

Ice and snow

- Reference tyre used after two test tires (REF-A-B-REF-C-D-REF)
- 3-4 laps (12-16 sector times) per tyre

Wet

- Reference tyre used in the beginning and at the end (REF-A-B-C-D-REF)
- 2-3 laps (12-16 sector times) per tyre

Dry

- No timing for dry

8.3.4. Driving protocol

- Drive normally finding the limit of grip
- No left foot braking / hand brake etc allowed
- Subjective comments of
 - steering
 - controllability on and over limit
 - behaviour during acceleration/braking in straight/curves

8.3.5. Measuring unit

- Racelogic VBox

8.4. Aquaplaning

8.4.1. Results

- Aquaplaning speed for straight acceleration when tyre slip exceeds 15%
- Aquaplaning water depth 7mm

8.4.2. Car systems

- ABS on
- Traction control off
- ESC off

8.4.3. Measurements

- Reference tyre used in the beginning and at the end (REF-A-B-C-D-REF)
- 6-8 measurements per tyre

8.4.4. Driving protocol

- Drive at constant speed
- Start accelerating when arriving in water pool
- Increase the speed at 2-3 km/h for every pass

8.4.5. Measuring unit

- Racelogic VBox III (100 Hz)

8.5. Noise

8.5.1. Results

- Subjective analysis of inside car tyre noise

8.5.2. Car systems

- All systems on

8.5.3. Measurements

- Reference tyre used after two test tires (REF-A-B-REF-C-D-REF)

8.5.4. Driving protocol

- Accelerate until 100 km/h
- Change to neutral gear
- Steer straight
- Let the car coast down freely until 40 km/h

8.5.5. Measuring unit

- Racelogic VBox for speed control

8.6. Rolling resistance

8.6.1. Results

- Rolling resistance coefficient

8.6.2. Measuring unit

- Rolling resistance drum

8.7. Result calculation methods

8.7.1. Indexes

- In all tests the reference tyre was given an index of 100%
- Values above 100% = better
- Values below 100% = worse

8.7.2. Grades

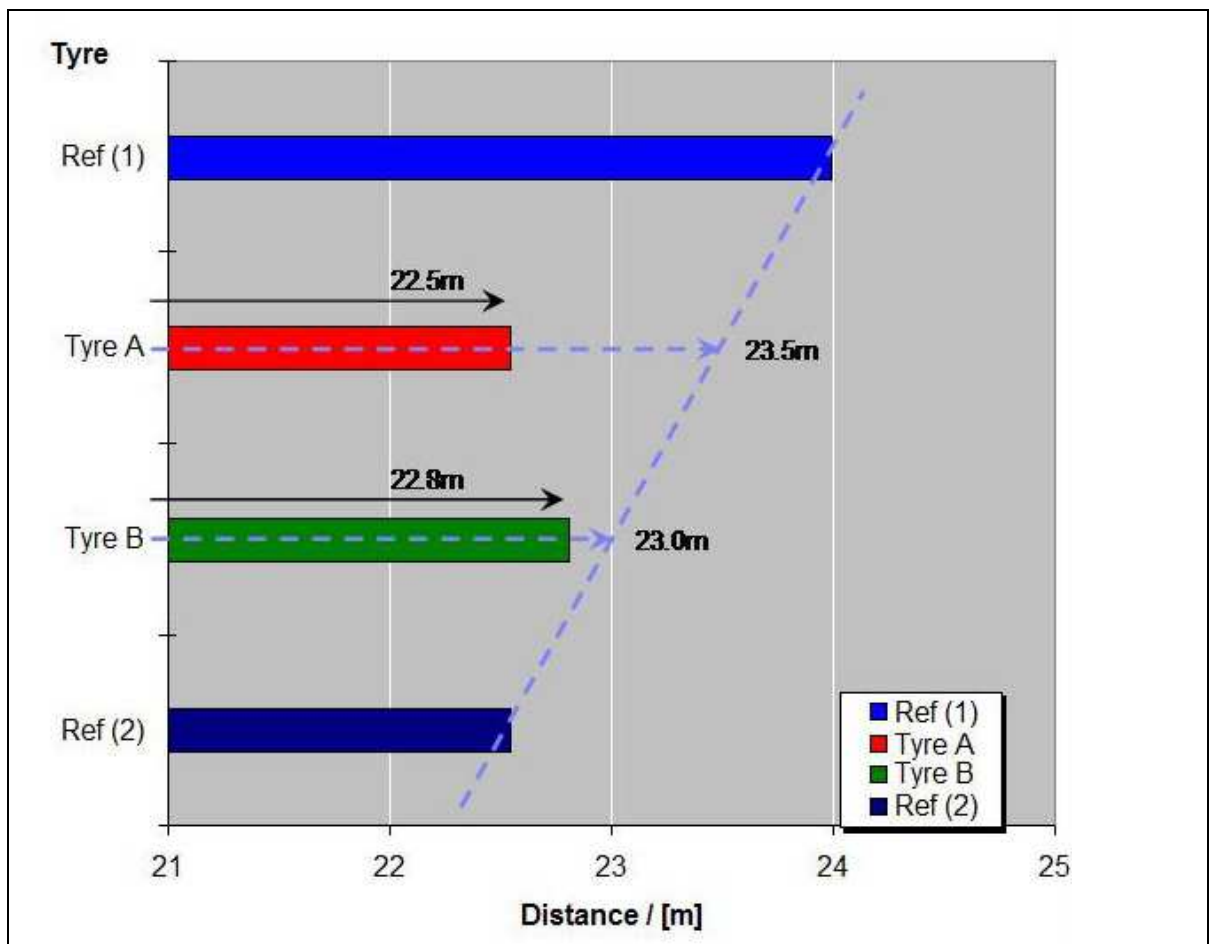
- In subjective tests a grading scale was used.
- The scale is from 4 = unacceptable to 10 = excellent.
- A one point grade difference can normally be recognized by a normal driver

8.7.3. Position correction

- In all tests position correction was applied
- In the method, any systematic effects caused by the track are eliminated

8.7.4. Reference calculation

- In all tests the reference method was used in calculations
- In the method, a reference tyre is driven at certain intervals to control any change in conditions



9. Conclusion

All tests have been executed applying Test World quality systems and requirements for test conditions, deviation, methods and security. Tests were executed using the same test methods as normally for magazines.

Test World Ltd hereby claims that the test results are representative for the tyre selection when tested under outlined conditions, cars, tracks and methods. Test World Ltd does not take responsibility for any liabilities from the conclusions drawn from the test results.

Ivalo, 23.12.2013



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