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भारतीय मानक मसौदा

मानक मार्गदर्शी सिद्धान्त — माइक्रोडॉट पद्धतियां — उत्पाद विशिष्टि

Draft Indian Standard

Guideline Standard — Microdot Systems — Product Specification

ICS: 43.040

**Automotive Body, Chassis and Accessories Sectional Committee,
TED 06**

**Last date for receipt of
comments is 16/09/2024**

FOREWORD

(Formal clauses will be added later)

This standard is based on AIS-155: Microdot Systems: Product Specification

In preparation of this standard considerable assistance has been derived from:

- SANS 534-1:2010 Edition 2: Vehicle security- Whole-of-vehicle marking (Part 1: Microdot System)
- SANS 534-1:2017 Edition 4: Vehicle security- Whole-of-vehicle marking (Part 1: Microdot System)
- JIS D0205: Test method of weather ability for Automotive Parts
- ASTM D4060: Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
- ISO 16750-5: Road vehicles -- Environmental conditions and testing for electrical and electronic equipment - Part 5: Chemical loads

The composition of the Committee responsible for formulating this standard is given in **Annex C (Will be added later)**.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*)'. This shall be given in standards on methods of test, Sampling, code of practice, etc.

Draft Indian Standard

Guideline Standard — Microdot Systems — Product Specification

1 SCOPE

1.1 The standard recommends the minimum performance requirements of the adhesive and microdots used to affix as microdot identifiers on motor vehicle and their parts, components, assemblies, etc.

1.2 This standard also specifies the guidelines for the characteristics and recommends the positions to affix the unique identification carriers, called microdots.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS/ISO/Other No.</i>	<i>Title</i>
14272 : 2011	Automotive vehicles — Types — Terminology
9000 (Part 11) : 1983	Basic Environmental Testing Procedures for Electronic and Electrical items: Part XI Salt Mist
ISO 9001: 2015	Quality management systems — Requirements
ISO 16750-5:2023	Road vehicles — Environmental conditions and testing for electrical and electronic equipment Part 5: Chemical loads
ASTM D 4060 : 2019	Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
JIS D 0205:1987	Test method of weather ability for automotive parts
AIS 136: 2017	Construction Equipment Vehicles or Earth - moving Vehicles / Machinery — Product Identification Numbering system
AIS 065: 2017	Statutory Plates and Inscriptions for Motor Vehicles, their Location and Method of attachment — Vehicle Identification Numbering System
AIS 117: 2011	Statutory Plates and Inscriptions for Agricultural Tractors, their Location and Method of Attachment – Agricultural Tractor Identification Numbering System

3 DEFINITIONS

For the purpose of this standard, the following terms and definitions shall apply.

3.1 **Marking** — Positions including recommended positions of marking to motor vehicle and their parts, components, assemblies, etc.

3.2 **Microdot** — Micro-particle that bears a visual readable identifier. Micro particles are typically of size ranging from 0.5 mm to 1.8 mm.

3.3 **Microdot Identifier** — Microdot identifier should be a unique number also called PIN or VIN or ATIN or P-DIN.

3.3.1 **Product Identification Number (PIN)** — The product identification number is a unique combination of characters assigned to each construction equipment vehicle or earth-moving vehicle / machinery by the manufacturer (*see 4.2*).

3.3.2 **Vehicle Identification Number (VIN)** — The vehicle identification number is a unique combination of characters assigned to each vehicle by the manufacturer (*see 4.2*).

3.3.3 Agricultural Tractor Identification Number (ATIN) —The agricultural tractor identification number is a unique combination of characters assigned to each agricultural tractor by the manufacturer (*see 4.2*).

3.3.4 Predetermined Identification Number (P-DIN) —The predetermined identification number is a unique identification number on the microdot (*see 4.2*).

3.4 Microdot Supplier —For the purpose of this standard supplier can be manufacturer / importer or distributor, certified by the Test Agency.

3.5 Microdot Installer — Organization that will affix the microdots to motor vehicle and their parts, components, assemblies, etc. (including vehicle manufacturers or microdot suppliers).

3.6 Test Agency —Test agency is an organization specified in rule 126 of CMVR, 1989

4 REQUIREMENTS OF MICRODOTS

4.1 Text Content of Microdots

4.1.1 All the text on every microdot shall be legible with equipment that magnifies the text at least 60 times

4.1.2 Characters on the microdot shall be consecutive and not separated by spaces. The microdot identifier shall appear at least once on every microdot. If the text on the microdot is repeated, every occurrence shall be separated by an asterisk (*) from the next occurrence.

4.1.3 The microdot identifier shall be included in the text uniquely brought onto the dot during its manufacture. Any other legible logo or text may be displayed in a different optically readable format.

4.2 Text on The Microdot: Microdot Identifier

4.2.1 *When the Microdot Identifier is a PIN (see AIS-136)*

In the case where the microdot identifier is a PIN, the microdot text shall contain the PIN.

4.2.2 *When the Microdot Identifier is a VIN (see AIS-065)*

In the case where the microdot identifier is a VIN, the microdot text shall contain the VIN.

4.2.3 *When the Microdot Identifier is a ATIN (see AIS-117)*

In the case where the microdot identifier is ATIN, the microdot text shall contain the ATIN.

4.2.4 When the Microdot Identifier is a P-DIN

The microdot text shall contain:

- a) A minimum of 10 alpha-numeric characters, of which the letters shall be Roman capitals excluding I, O and Q (except in the case of the two-character country code) and numerals shall be Arabic 0 to 9.
- b) Recommended Coding in following sequence:
 - 1) OEM code (3(three) Characters);
 - 2) Category of Vehicle code (1(one) Characters);
 - 3) Microdot supplier Code (1(one) Characters); and
 - 4) Unique number (remaining).

At the choice of the manufacturer, OEM code and microdot supplier code can be included as part of the background design.

4.3 Uniqueness

The uniqueness of the microdot shall be enforced through the uniqueness of the microdot identifier.

The microdot supplier shall:

- a) Ensure that all the microdots in the container bear the same microdot identifier;
- b) Never manufacture a microdot bearing a microdot identifier that was previously borne by any microdot in another container; and
- c) Ensure all information regarding the manufacture and the supply of microdots shall be recorded in the information system by microdot supplier.

4.4 Authenticity

The microdot supplier may add covert features to the microdot. The features may be proprietary. Covert features shall be declared, verified and recorded during testing.

4.5 Adhesive and Coating Material

The adhesive and coating material shall readily coat the microdots and cause them to adhere to motor vehicle and their parts, components, assemblies, etc. in such a manner that ensures compliance with the accelerated ageing and withstand the removal tests specified in **8**.

4.5.1 The adhesive and coating material shall allow for the selective removal of a small number of individual microdots (but not the en-mass removal of microdots).

4.5.2 The adhesive and coating material shall allow for easy detection by incorporating a trace element that enables its presence to be detected using an ultraviolet light source with a wavelength in the range of between 365 nm and 400 nm (inclusive).

4.5.3 The adhesive and coating material shall not affect the integrity of the base material onto which the microdots are applied / affix.

4.6 Container

The container in which microdots are supplied shall bear information regarding the microdots in the container including the microdot identifier in legible alpha-numeric characters. The container shall be tamperproof and shall signify that it might have been used or that its integrity has been compromised if certain seals are broken.

Used / unused container shall be managed / controlled and destroy in controlled conditions.

4.7 Notification Label / Marking

A label / marking may be affixed on the motor vehicle and their parts, components, assemblies, etc. by the microdot supplier in a position where it may easily be read. In case of motor vehicle, it may easily be read from outside the motor vehicle and shall not obstruct the view of the driver. The purpose of the label / marking on motor vehicles is to alert that microdots have been affixed to the motor vehicle.

The notification label / marking may be supplied separately from the container and shall not bear the microdot identifier referred to in **4.2**.

5 TESTING

The microdot supplier shall ensure that adhesive and coating material pass the entire test procedure specified in 8.

Test report from test agency as notified under CMV Rule No. 126 shall be obtained and held.

ANNEX A refers to the list of tests applicable.

ANNEX B refers to the checklist: Technical specifications to be submitted at the time of testing.

6 QUALITY MANAGEMENT SYSTEMS

Every microdot supplier shall implement and maintain a quality management system for all aspects of its operations regarding the microdot system as described in this standard.

The microdot supplier shall obtain and maintain certification that such quality management system complies with a recognized standard such as ISO 9001 or an equivalent. Such certification shall at least include the following aspects:

- a) Document control;
- b) Record control;
- c) Internal audit;
- d) Corrective action;
- e) Preventive action; and
- f) Control of non-conforming product.

7 RECOMMENDED POSITIONS OF FITMENT OF MICRODOTS

Surface preparation

The surfaces to which the microdots are to be applied shall allow the adhesive to adhere. If required, the surfaces shall be prepared and cleaned, and especially all dust, wax and oil shall be removed.

All category at least 5,000 Microdots, except for L and E-rickshaw / E-cart where at least 2,000 microdots, shall be applied.

Minimum positions: 05 (five).

For parts, components, assemblies, etc. at least 1 000 microdots shall be applied.

7.1 In the case of a vehicle, excluding special vehicles and vehicles of categories M2, M3, N2, N3, T, C, A, L and E-rickshaw / E-cart.

Recommended Positions:

- a) The information/ Registration plate; if not attached, the position of the chassis number or the VIN;
- b) The chassis or frame;
- c) The inside boot reinforcing (where applicable);
- d) Inside / Beneath front and rear bumpers;
- e) The front and rear suspension components;
- f) The motor/engine, engine head, engine base, bell housing, gearbox and drive shafts (where applicable);
- g) The rear axle and differential (where applicable);
- h) Parts of the floor pan and structural and reinforcing members;
- j) Inside openings in body structural members;
- k) Part of the underside of the body;
- m) Behind roof panel;
- n) All tyre rim;
- p) Front and rear light cluster panel;

- q) Behind dashboard assembly;
- r) The inside bonnet reinforcing;
- s) Traction batteries (where applicable).

7.2 In the case of a category T trailers,

Recommended Positions:

- a) The information/ registration plate; if not attached, the position of the chassis number or the VIN;
- b) The chassis or frame – corner, middle;
- c) The axles;
- d) Suspension components;
- e) Inside openings in body structural members;
- f) Part of the underside of the body;
- g) Behind roof panel (wherever applicable);
- h) All tyre rim;
- j) Front and rear light cluster panel;
- j) Behind dashboard assembly;
- k) Traction batteries (where applicable).

7.3 In the case of a category E-rickshaw / E-Cart and L vehicles,

Recommended Positions:

- a) The information / registration plate; if not attached, the position of the chassis number or the VIN;
- b) The chassis or frame;
- c) Drive components (for example drive shaft, rear swing-arm);
- d) Suspension components;
- e) Instrumentation panel;
- f) Engine / motor control unit;
- g) Engine head, engine base, motor, hub;
- h) Behind roof panel (wherever applicable);
- j) All tyre rim;
- k) Front and rear light cluster panel;
- l) Traction batteries (where applicable).

7.4 In the case of category M2, M3, N2, N3, C and A.

Recommended Positions:

- a) The information / registration plate; if not attached, the position of the chassis number or the VIN;
- b) Inside front / rear bumpers;
- c) The front and rear suspension components including axle and differential/s;
- d) The engine head, engine base, bell housing, gearbox and drive shafts;
- e) Parts of the cab (if fitted) under body, floor pan, chassis members and cross members and structural reinforcement;
- f) Inside openings in body structural members;
- g) Engine components:
 - 1) Engine block and cylinder head;
 - 2) Fuel pump;
 - 3) Alternator and air conditioner compressor (if fitted);
 - 4) Starter motor; and
 - 5) Side members of radiator and intercooler (if fitted).

- h) Behind roof panel wherever applicable;
- j) All tyre rim;
- k) Front and rear light cluster panel;
- m) Behind dashboard assembly;
- n) Traction batteries (where applicable); and
- p) Motor / controller (where applicable).

7.5 In the case of a special vehicle,

Recommended Positions:

- a) The information plate; if not attached, the position of the chassis number or the VIN;
- b) The front and rear suspension components;
- c) The engine head, bell housing, gearbox and drive shafts (where applicable);
- d) The rear axle and differential (where applicable);
- e) Parts of the floor pan and structural and reinforcing members;
- f) Inside openings in body structural members;
- g) Part of the underside of the body.

7.6 Optional positions of fitment:

In addition to the positions given in above clauses of this standard, microdots may be affixed / applied to following positions:

- a) The insides of the doors (including rear hatches, where applicable);
- b) Inside the boot and engine bay including openings in the boot and engine bay areas that lead into structural areas of the body;
- c) The rear of the instrument panel;
- d) The undersides of front seats;
- e) The undersides of and behind rear seats;
- f) Inside door pillars and behind door pillar trims;
- g) Under floor covering area;
- h) Behind the roof lining;

7.7 In the case of parts, components and assemblies, component manufacturers shall suitably ensure location. The location may be suitably declared.

7.8 Prohibited areas of fitment

Microdots shall not be fitted in positions that negatively affects the following:

- a) Warranty (for example electrical components), and
- b) Safety of the motor vehicle (glass or friction areas).

7.9 Part replacement

If a part to which microdots were applied in accordance with this standard is replaced, it is not compulsory to reapply microdots to the replacement part.

8 ACCELERATED AGEING AND REMOVAL TESTS

8.1 General

The intention of the tests in this clause is to ensure that the fitted microdots, being tested, comply with the specifications and will remain on the motor vehicle and parts, components and assemblies etc. in a readable condition for at least 15 years after fitment.

Under normal operating conditions, it is intended that at least 50% of the microdots applied as prescribed in the instruction manual of the Microdot supplier will be present and will be readable for up to 15 years.

Normal operating conditions include high pressure cleaning with hot or cold water, the use of common detergents for cleaning and exposure to salt mist or spray etc.

8.2 Preparation of Test Specimens

8.2.1 They shall be prepared as per the clauses mentioned below and shall be done prior to the application of the microdot and adhesive system under test:

8.2.1.1 Type 1

- a) A mild steel plate;
- b) Of thickness minimum 0.5 mm;
- c) Square plates, of length and width 150 mm; and
- d) Fully coated with a typical minimum rust-proof coating / standard coating as declared by manufacturer, as per exposed surface;

8.2.1.2 Type 2 — Type 2 are Type 1 plate, additionally fully coated to replicate a typical automotive cosmetic surface.

8.2.2 14 (fourteen) test specimens of each type shall be prepared to enable new test specimens to be used for each of the accelerated ageing treatments and subsequent removal test.

8.3 Testing Environment

A controlled atmosphere with a temperature of (23 ± 5) °C and a relative humidity of (50 ± 5) %, unless otherwise specified.

8.4 Application of Microdot Test Sample

8.4.1 Apply the microdot test sample on one side of every specimen plate. Attempt to fully cover the selected side of the specimen plate. The fitment of the microdot test sample need not be carried out in the test environment as prescribed in 8.3. Once the microdots have been applied this side is known as the "prepared side".

Once the fitment has been completed, use an appropriate ultraviolet light to measure and note the coverage. When the coverage is calculated, ensure that not less than 90% of the surface of the specimen plate is covered. Discard any specimen plate with less than 90% coverage and prepare a replacement specimen plate.

Execute the entire test on an access-controlled site.

No equipment or other specimen plate may touch the prepared side of the specimen plate during the test, except for the removal of microdots as required for reading

Condition every specimen plate by storing it in the test environment for at least 24 hours with the prepared side fully exposed, before continuing with the accelerated ageing treatment.

8.5 Accelerated Ageing Treatments

8.5.1 High Air Temperature

Two of each type of test specimen (Types 1 and 2) shall be placed into an air circulating oven preheated to $(110 \pm 1)^\circ\text{C}$ and maintained at this oven temperature for a period of 168 hours.

8.5.2 High Humidity

Two of each type of test specimen shall be placed in a humidity cabinet at $38^\circ\text{C} \pm 1^\circ\text{C}$ with a relative humidity of 97% to 100% and maintained in this environment for 168 hours.

8.5.3 Low Air Temperature

Two of each type of test specimen shall be placed in a freezer at $-30^\circ\text{C} \pm 2^\circ\text{C}$ for 4 hours.

8.5.4 Salt Mist Spray

Two of each type of test specimen shall be subjected for 7 days to the salt mist spray described in IS 9000 Part XI.

8.5.5 Weatherability Test

Two of each type of test specimen shall be subjected for Xenon arc lamp system weather ability test (JIS D 0205 Table 1-2 to 2-2).

8.5.6 Combined Environmental and Vibration

For components normally mounted on the vehicle, two of each type of test specimen shall be subjected to 10 Hz to 500 Hz with maximum amplitude of ± 5 mm and maximum acceleration of 3 g.

For components intended for attachment to the engine, two of each type of test specimen shall be subjected to the frequency shall be variable from 20 Hz to 300 Hz with maximum amplitude of ± 2 mm and maximum acceleration of 15 g (0-peak).

The frequency variation is 1 octave/min.

The number of cycles is 10; the test shall be performed along each of the 3 axes.

The vibrations are applied at low frequencies at maximum constant amplitude and at a maximum constant acceleration at high frequencies

Temperature at 55°C and 98% relative humidity to be maintained during vibration.

8.5.7 Melting Temperature

Two of each type of test specimen shall be placed in a furnace and tested for 10 minutes at minimum $(400 \pm 10)^\circ\text{C}$. Specimens shall be then examined. The area still covered with the microdots in the adhesive/coating material shall be assessed visually. Then temperature should be increased by 100°C and raised till maximum temperature of $(900 \pm 10)^\circ\text{C}$.

Maximum temperature at which following conditions are not met shall be noted and recorded in test report.

8.5.8 The prepared side (for **8.5.1** to **8.5.7**) shall be fully exposed during this period. After the treatment, test specimens shall be allowed to return to the testing environment conditions, before proceeding with **8.6**.

8.6 Attempted Removal Tests

8.6.1 High Pressure Cold Water and Detergent Cleaner Test

8.6.1.1 This test consists of cleaning of each type of the test specimens as mentioned in the ANNEX A of this standard using high-pressure cold-water cleaner with a detergent injection

8.6.1.1.1 Cleaning: Place the specimen plates on a flat horizontal surface with the prepared sides facing upwards.

Apply and maintain a pressure measured by a calibrated in-line pressure transducer at (11.5 ± 0.5) MPa using an outlet nozzle that creates a fan type spray, the spray being directed at an angle of 25° to clean the specimen plates. Place the outlet nozzle at (130 ± 5) mm from and perpendicular to the test specimen surfaces and move slowly back and forth across the entire specimen plate surfaces for a period of at least 5 minutes such that all areas get approximately the same exposure to the cleaning jet.

8.6.1.2 The spray shall be a high-pressure cold-water jet with detergent injection. The detergent shall be

- a) A commercially available degreasing detergent for use in high-pressure cold-water cleaners, and
- b) Injected at the rate recommended by the detergent or high-pressure cold-water cleaner manufacturer

8.6.2 High-Pressure Hot Water Cleaner Test

8.6.2.1 This test consists of cleaning of each type of the test specimens as mentioned in the ANNEX A of this standard using a high-pressure hot water cleaner (sometimes referred to a steam cleaner).

8.6.2.1.1 See **8.6.1.1.1** for Cleaning.

8.6.2.2 The spray shall be a high-pressure hot water jet with an outlet temperature of (65 ± 5) °C.

8.6.3 Chemical Test

8.6.3.1 This test consists of cleaning of each type of the test specimens as mentioned in the ANNEX A using chemicals defined in ISO 16750-5.

8.6.3.2 The test specimen shall be placed on a flat horizontal surface and the treated side subjected to application of chemicals defined in ISO 16750-5 for 1 hour at room temperature.

8.6.4 Abrasion Test

8.6.4.1 This test consists of abrading of each type of the test specimens as mentioned in the ANNEX A using method defined in ASTM D4060.

8.6.4.2 The test specimen shall be subjected to test as per ASTM D4060.

No. of cycles: 1

8.7 Acceptance Criteria

Each test specimen shall be allowed to dry and then examined under an ultraviolet light. The area still covered with the microdot identification system as indicated by the response of the UV tracer in the adhesive and coating material shall be assessed visually, after the tests mentioned in **8.5.1** to **8.6.4** (except **8.5.7**).

Test is deemed to have been passed, if:

- a) The measured coverage is 75 % or more;
- b) The microdot identifier on at least 50% of microdots (microdots being on the specimen plate or microdots that were removed) can be read successfully; and
- c) The microdot identifier on at least one microdot removed from every specimen plate can be read successfully.

Failure of one specimen plate is deemed to be a complete failure of the assessed microdot product.

ANNEX A

(Clause 5, 8.6.1.1, 8.6.2.1, 7.6.3.1 and 8.6.4.1)

LISTS OF TESTS APPLICABLE

Sample Type	Sample No.	Test Name										
		High Air Temperature	High Humid.	Low Air Temperature	Salt Mist	Weatherability	Combined Environmental and Vibration	Melting Temperature	High Pressure Cold Water	High Pressure Hot Water	Chemical	Abrasion
Type 1	S1-1	X							X		X	
	S1-2	X								X		X
	S1-3		X						X		X	
	S1-4		X							X		X
	S1-5			X					X		X	
	S1-6			X						X		X
	S1-7				X				X		X	
	S1-8				X					X		X
	S1-9					X			X		X	
	S1-10					X				X		X
	S1-11						X					
	S1-12						X					
	S1-13								X			
	S1-14								X			

Sample Type	Sample No.	Test Name										
		High Air Temperature	High Humid.	Low Air Temperature	Salt Mist	Weatherability	Combined Environmental and Vibration	Melting Temperature	High Pressure Cold Water	High Pressure Hot Water	Chemical	Abrasion
Type 2	S2-1	X							X		X	
	S2-2	X								X		X
	S2-3		X						X		X	

S2-4		X							X		X
S2-5			X					X		X	
S2-6			X						X		X
S2-7				X				X		X	
S2-8				X					X		X
S2-9					X			X		X	
S2-10					X				X		X
S2-11						X					
S2-12						X					
S2-13							X				
S2-14							X				

ANNEX B
 (Clause 5)

CHECKLIST: TECHNICAL SPECIFICATIONS TO BE SUBMITTED AT THE TIME OF TESTING

General information	
Name and address of Microdots Supplier with contact persons' name, designation, email, phone nos. etc.	
Importers Name and address of Microdots Supplier with contact persons' name, designation, email, phone nos. etc.	
Name(s) and address (es) of manufacturing plants	
¹⁾ Material of Microdot	
¹⁾ Adhesive/Lacquer Composition (with certificate of analysis)	
¹⁾ Size of Microdot	
¹⁾ Shape of Microdot (Hexagon, Circular, etc.)	
¹⁾ Type of Applicator (Canister, Pen, etc.)	
¹⁾ Covert / Proprietary Features	
Microdot Identifier mentioned on Microdot	
¹⁾ Vehicle Category	
Details of parts, components, assemblies, etc.	
ISO Certification/Quality Standard details (supporting documents to be submitted)	
Any Additional Information	

¹⁾Note: Specify all, in case of more than one.

ANNEX C
(Foreword)

COMMITTEE COMPOSITION

Automotive Body, Chassis and Accessories Sectional Committee, TED 06

Will be added later