الهيئة السعودية للمواصفات والمقاييس والجودة
Saudi Standards, Metrology and Quality Org. (SASO)

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Retro-reflective Number Plates (Plastics) for Vehicles and Its Methods of Test

ICS : 43.020

Foreword

The technical team for " Plastics " of Saudi Standards, Metrology and Quality Organization (SASO) has prepared the Saudi Standard " Retro-reflective Number Plates (Plastics) for Vehicles and Its Methods of Test " based on relevant Standards and references

1. Scope

This Saudi standard is specifies with the general requirements and test methods , and characteristics of Plastic plates ,numbers and letters, formed by extrusion or injection molding of Retro-reflective Number Plates (Plastics) for Vehicles.

2. Normative references

2.1 SASO-GSO-ISO-11664-1: Colorimetry — Part 1: CIE standard colorimetric observers

2.2 SASO-ISO-CIE-11664-2: Colorimetry — Part 2: CIE standard illuminants

2.3 SASO-ISO-1519: Paints and varnishes - Bend test (cylindrical mandrel)

2.4 SASO-ISO-11998: Paints and varnishes - Determination of wet-scrub resistance and cleanability of coatings

2.5 SASO-ISO-4532: Vitreous and porcelain enamels - Determination of the resistance of enamelled articles to impact - Pistol test

2.6 SASO ISO 4611 : Plastics — Determination of the effects of exposure to damp heat, water spray and salt mist

2.7 SASO-ISO-4892-2 : Plastics - Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps

2.8 SASO-ASTM-D903 : Standard Test Method for Peel or Stripping Strength of Adhesive Bonds

2.9 SASO-ISO-139 Textiles - Standard atmospheres for conditioning and testing

2.10 SASO-ASTM-D968 Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

3. Requirements:

3.1 Plastic plate materials

The retro-reflective outer background of the finished plate is required to be flat and smooth. The number plate is processed using high-density polyethylene (HDPE). The retro-reflective material shall be applied to a corrosion-resistant substrate. This ensures a durable bond between the retro-reflective material and the substrate, allowing it to resist impacts and bending. Additionally, the reflective material used should be capable of being embossed to a minimum height of 1 mm. This embossing feature enables the formation of raised letters and digits in relief on the surface of the plate, aiding readability and recognition, The HDEP resin properties shall be accordance with Table (1).

Table 1 - HDEP resin properties

Test	Requirements	Test Method
MFR @ 190°C, 21.6kg	20-45 g/10min	ASTM D1238
Density	0.950-0.960 g/cm3	ASTM D2839
Ash	<1000ppm	ASTM D5630

3.2 Retro-reflective Number Plates :

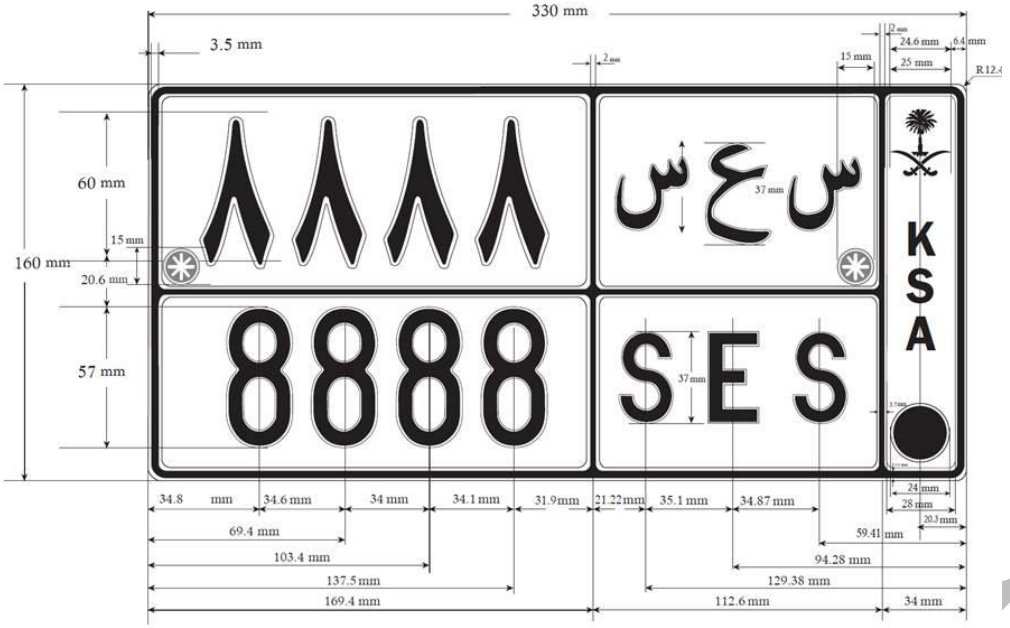
Compliance with national regulations for dimensions, shape, letters and numerals shall be checked on a completely finished plate by the competent authorities. Compliance with this standard shall be determined by laboratory testing of representative samples of the plates

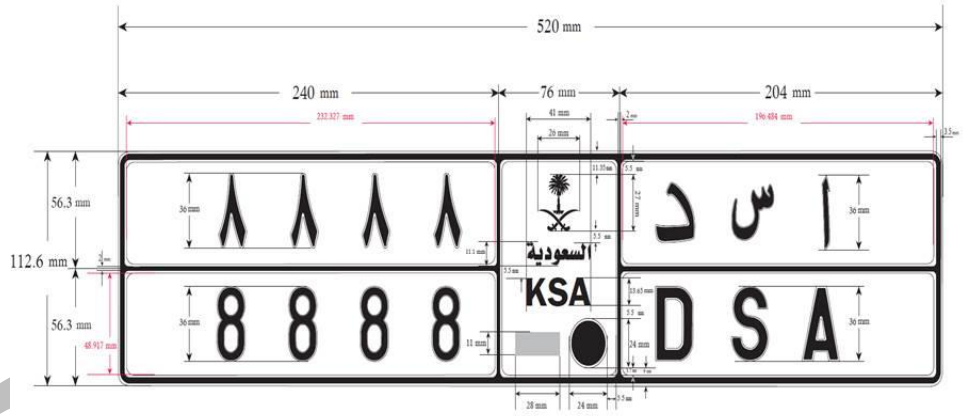
When measured in accordance with blank plates shall be rectangular, with corners rounded, shall be free from sharp edges and burrs, and shall be of one of the following sizes:

- Short vehicles number plate (160 *330) mm.
- Long vehicles number plate (112.6*520) mm.
- Motor cycles number plate (112.6 *202) mm.
- Sport car number plate (80 *300) mm.
- Nominal thickness 1 mm

3.3 Inspection of the dimensions and the typeface

The legibility of the UV print is tested with a light source in the UVA range .





3.4 Specific reflectance values

When illuminating the retro-reflective sheeting or film composite with standard illuminant A according to item 2.2, the coefficient of retro-reflection R' in candelas per m^2 per lx ($cd.m^{-2}.lx^{-1}$) of the retro-reflective areas in new condition shall be at least as indicated in Table 3

Table 3 — Specific reflectance values

Surface colour	Illumination angle	Specific reflectance values
White	+ 5°	70
	+ 30°	30
Yellow	+ 5°	50
	+ 30°	20
Blue	+ 5°	16
	+ 30°	7
Red	+ 5°	10
	+ 30°	4
Green	+ 5°	16
	+ 30°	7

3.5 Colorimetry

The Chromaticity of the retro-reflective shall be as shown in Table 3

Table 3
Daylight chromaticity and luminance factor limits

Colour	Axes	Coordinate				Luminance factor
		1	2	3	4	
White	*x* *y*	0.355 0.355	0.305 0.305	0.285 0.325	0.335 0.375	≥0.34
Yellow	*x* *y*	0.545 0.454	0.487 0.423	0.427 0.483	0.465 0.534	0.27 ≤ β ≤ 0.40
Blue	*x* *y*	0.105 0.271	0.181 0.094	0.270 0.245	0.230 0.275	0.1 ≤ β ≤ 0.20
Red	*x* *y*	0.720 0.258	0.735 0.265	0.665 0.335	0.643 0.335	≥ 0.03
Green	*x* *y*	0.210 0.275	0.280 0.385	0.180 0.520	0.080 0.310	0.13 ≤ β ≤ 0.22

3.6 Mechanical properties

3.6.1 Impact and shock resistance

Place the sample plate with the reflective side up on a solid support base such as concrete or a 12,5mm plate and allow a steel ball of 25mm diameter to drop from a height of 2 m onto a flat section of the sample. The retro-reflective material shall show no cracking or separation from the substrate outside of a distance of 5 mm from the impacted area.

3.6.2 Resistance to bending

When a number plate is tested in accordance with below procedure, and the front surface is examined from a
distance of 250 mm, there shall be no visible cracking or loss of adhesion of the retro-reflective material, the number plate or border, or similar defects that would affect the functionality of the number plate.

- Place the specimen with the protective side of the number plate against amandrel of diameter 75 mm ± 2 mm that the line of maximum bending coincides with the vertical centre-line of a letter or a numeral.
- Taking about 3 s, bend the specimen through an angle of 90° ± 2° over the mandrel.
- Immediately following this procedure, and taking about 3 s, so bend the specimen back through the same angle that it is in approximately its original alignment

3.7 Environmental resistance tests

3.7.1 Salt spray test

The salt spray test shall be carried out in accordance to item 2.6 .

3.7.2 Weathering resistance test

The seal-sticker or sticker-holder shall be exposed to xenon arc radiation and moisture in a testing device for a period of 480 h. A xenon arc lamp with optical filters whose relative spectral irradiance corresponds to method A (global radiation) according to item 2.7 shall be used as the radiation source.

The test is performed in accordance with cycle number 1 of the stress method with temperature control specified according to item 2.7

3.7.3 Resistance to fuels

A section of a sample unit not less than 300 mm long shall be immersed in a mixture of

n-heptane and toluene , 70 per cent and 30 per cent by volume, for one minute.

After removal, the surface shall be wiped dry with a soft cloth and shall not show any visible

change which would reduce its effective performance.

3.8 Adhesion strength of the reflective sticker

The adhesion strength test of the reflective sticker to the surface of the number plate shall be according to the test method mentioned in item 2.8.

3.9 Abrasion resistance test

The test is conducted according to method (A) contained in the standard mentioned in item No **2.10.**

3.10 Washing resistance test

The seal-stickers and sticker-holders shall be tested in according to the standard mentioned in item 2.4 with 2000 scrub cycles under wetting with a 0.25 % solution of Na-n-dodecylbenzene sulphonate for resistance to washing and abrasion.

3.11 High pressure resistance test

The seal-sticker or sticker-holder is sprayed under normal installation conditions for 60 seconds continuously under the following test conditions:

a) Water/washing solution pressure: (8 ± 0,2) MPa;
b) Water/washing solution temperature: (60° – 5) °C;
c) Water/washing solution flow rate: (7 ± 1) l/min
d) Distance between the lance tip and the retro-reflecting surface: (600 ± 20) mm;
e) the lance of the pressure washer may be held at an angle no greater than 45° to the vertical to the surface;
f) use of a 40° nozzle to provide a wide jet.

3.12 Temperature resistance test

The seal-sticker or the seal-sticker glued to a sticker-holder shall be successively exposed in the glued-on condition:

a) 8 hours continuously to a temperature of (65 ± 2) °C at a relative humidity below 10 %.

b) 1 h to standard climate according to the standard mentioned in item 2.9

c) 20 hours conteniously to a temperature of (20± 2) °C at a relative humidity below 50 %.

3.13 Tamper protection test

After the removal attempts of the seal-stickers / sticker-holders from the respective substrate under the conditions described under 3.13.1 to 3.13.2, the visibility of tampering signs to the naked eye must be tested from the reference viewing distance

3.13.1 Removability by means of cold and heat

The seal-stickers and sticker-holders must be tested in two temperature ranges to ensure that they are tamper-proof when exposed to cold and heat:

a) at + 70 °C with a tolerance of ± 2 °C

b) at room temperature.

The removal attempts are performed immediately after achieving the specified temperatures on the surface of the substrate (registration plate, sticker-holder) using a glass scraper and scalpel.

3.13.2 Mechanical removability

Removal attempts by means of glass scraper and scalpel. Subsequent visual inspection for apparent, non-reversible changes to the seal-sticker compared to the seal-sticker in its original glued-on state.

3.14 Product-specific safety testing

3.14.1 Nondetectability of the hidden security code on the seal-sticker

a) The seal-sticker is visually inspected with the naked eye from the reference viewing distance .

b) Transmitted light testing: To test opaqueness, the samples are held in front of a 15 Volt, 150 Watt halogen cold light lamp and irradiated with maximum intensity from the front and back.

3.14.2 Testing for irreversible exposure of the seal-sticker

By means of a visual inspection with the naked eye from the reference viewing distance, it must be verified whether at least 1/3 of the printed image information on the seal-sticker was irreversibly destroyed with the exposure of the hidden security code or whether the exposure became irreversibly visible by means of other suitable technical measures.

4 Sampling

Nine test samples of each colour shall be submitted to the laboratory for approval testing. One of the samples shall be a completely finished plate ready to be mounted on a vehicle and representative of current production. lt shall be used for checking the dimensions, shape, letters and numerals for compliance with the existing regulations by the competent national authority. A second sample shall be a completely finished plate but with no legend, to be used for the check on uniformity of retroreflection. The seven other test samples shall be finished plates representative of current production but with only one letter and two
numerals located in the centre and leaving on the sides free areas of at least 100 cm2 for the various tests, Where clearcoating of the outer surface of the plate is necessary, the test samples must be clear-coated.

5 Marking

Retro-reflective Number Plates shall be legibly and indelibly marked with the following information in Arabic or in both Arabic and English:

5.1 the manufacturer's logo deposited with the inspection agency;

5.2 Year of manufacture;

5.3 optional: electronic, machine-readable security feature for unambiguous allocation between plate, License number and seal-sticker.

The labelling must be an integral part of the retro-reflective sheeting or film composite, i.e. it must not be printed on and must not be removable without destroying the retro-reflective sheeting or film composite or the plate.

The legibility of the License plate inscription must not be impaired by the above labelling.

References

- lSO7591-1982 - Road vehicles Retro-reflective registration plates for motor vehicles and trailers Specification

- DIN 74069 Retro-reflective registration plates, seal-sticker and sticker-cover for motor vehicles and their trailers

- SANS 1116-3:2008 “Retro-reflective number plates for motor vehicles – Part 3: Blank plates (plastics)

- SANS 1116-4:2016 “Retro-reflective number plates for motor vehicles – Part 4: Number plates (plastics)