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## Testing of Variable Message Traffic Sign in accordance with EN12966-1

(2 appendices)

SP Technical Research Institute of Sweden has performed testing of the photometric properties of one red VMS module in accordance of applicable parts of EN 12966-1:2005 + A1:2009 Variable message traffic signs.

### Test object

One red test module (ID no. 1) consisting of a printed circuit board with LED and an anti-reflective plastic front screen.

### Summary of result

Tested module has received the following result after the photometric measurements:

Red module:	Colour class	C2
	Luminance	L3
	Luminance ratio	R3
	Beam width	B4
	Visible flicker	OK

### Identification

Your reference: Markus Karwin, 2011-12-19

The test module consists of 21 rows with 21 red LEDs in each

Total size of module: 420 × 420 × 50 mm

Number of LEDs: 441 pcs in module

Status at arrival: The module was in good condition, no remarks.

### Measurement date

10 January 2012.

### Measurement conditions

The measurements are made in temperature stabilized laboratories where the temperature is 23 °C ±2 °C. The test modules are connected to a 24 VDC source. Measurement of luminance, luminous intensity and illuminance are performed with well correlated V(λ) detectors/instruments. The illumination of the test modules is done with a 1000-W Xenon radiation source with a colour temperature of 5510 K.

Instrument code: Goniometer, LMT L1009, Hagner S4

### Measurement accuracy

Luminance:	± 2 cd/m <sup>2</sup> at 10 up to 1000 cd/m <sup>2</sup>
	± 20 cd/m <sup>2</sup> at 1000 up to 10000 cd/m <sup>2</sup>

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Chromaticity coordinates:  $\pm 0.005$   
Luminous intensity:  $\pm 2$  cd at 10 cd up to 1000 cd  
 $\pm 20$  cd at 1000 up to 10000 cd

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2$ , which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with EAL Publication EA-04/2.

### Measurement method

The measurement method follows in applicable parts EN 12966-1, Chapter 7 *Visual performance*.

#### 7.2 Colour

The following ranges of test angles hor/ver are examined:  $0^\circ/0^\circ$ ,  $\pm 10^\circ/0^\circ$ ,  $0^\circ/-10^\circ$ .

#### 7.3 Luminance

The measuring aperture of the luminance meter is  $3^\circ$ .

The aperture of the luminance meter as seen from the test module is  $\leq 0.5^\circ$ .

The beam divergence of the solar simulator is limited to  $\leq 3^\circ$ .

The aperture of the solar simulator as seen from the test module is  $\leq 2^\circ$ .

The angle of incidence of the light is vertical  $+10^\circ$  relative the reference axis.

The external illumination uniformity within the measurement area is within  $\pm 10$  %.

#### 7.4 Luminance ratio

Luminance ratio was measured at a circular area of  $\geq \varnothing 100$  mm including 21 LEDs of the matrix. Separation was measured to  $s_v = s_h = 20$  mm. The illuminance level transferred is 40 000 lx. Testing at lower levels is not performed since the module does not have the ability to reduce its luminance. The luminance ratio is calculated by using the formula  $L_a = (L_a - L_b) / L_b$ , where  $L_a$  is the measured luminance of the module in the ON-state when under external illumination and  $L_b$  is the measured luminance of the module in the OFF-state when under external illumination.

Measurement angles corresponding to Beam Width class B4 were used.

#### 7.5 Beam width

The beam luminous intensity was measured in the horizontal interval  $\pm 30^\circ$  and the vertical interval  $+1^\circ$  --  $-11^\circ$ .

#### 7.6 Uniformity

The uniformity has not been tested.

#### 7.7 Visible flicker

The visible flicker is tested by visual inspection only.

### Measurement result

The measurement results are presented in relation to the requirements of EN 12966-1.

#### 7.1 Classification.

There are no levels requested by the customer.

#### 7.2 Colour

Possible class designations are C1 and C2 with C2 as the most restrictive class.

The results are presented in Table 1 and diagram in appendix 1.

*Table 1. Measured chromaticity coordinates. See also diagram in Appendix 1.*

Test angle hor/ver	Chromaticity coordinates		Remark
	x	y	
0°/0°	0.6924	0.3066	Fulfil class C2
+10°/0°	0.6926	0.3066	
-10°/0°	0.6927	0.3066	
0°/-10°	0.6926	0.3066	

The test module fulfils Class C2.

7.3 Luminance

Possible class designations are L1, L2, and L3 with L3 having the highest luminance.

The results are presented in Table 2 for illumination angle 10°.

*Table 2. Measured Luminance.*

Sign illuminance (lx)	Luminance (cd/m <sup>2</sup> )		Remark
	Measured	Requirements L3 min/max	
40 000	8 430	3 100/15 500	Fulfil class L3

The test module fulfils class L3 at maximum illuminance, lower illuminance levels are not tested.

7.4 Luminance ratio

Possible class designations are R1, R2, and R3 with R3 having the highest luminance ratio.

The results at 40 000 lx illuminance are presented in Table 3. Lower illuminance levels are not tested.

*Table 3. Measured Luminance ratio at 40 000 lx sign illuminance.*

Luminance ratio (LR)		Requirement R3 min		Remark
On axis	Off axis	On axis	Off axis	
6.5	5.8/6.8/2.8	4.2	2.1	Fulfil class R3

The test module fulfils class R3 at maximum illuminance, lower illuminance levels are not tested.

7.5 Beam width

Possible class designations are B1, B2, B3, B4, B5, B6, and B7 with B7 having the widest beam. The results are presented in Table 4.

*Table 4. Measured Luminous intensity at different angles determining the beam width class.*

Test angles B4 hor/ver	Luminous intensity (cd)		
	Measured	Maximum	Minimum
0°/0°	2 078	-	-
+10°/0°	1 407	3 117	1 039
-10°/0°	1 251	3 117	1 039
0°/-10°	1 154	3 117	1 039

The test module fulfils the requirement for class B4.

#### 7.6 Uniformity

Uniformity is not tested.

#### 7.7 Visible flicker

No visible flicker was detected. The test module fulfils the requirements.

#### **Remark**

Presented test results are only valid for the tested object.

### **SP Technical Research Institute of Sweden Measurement Technology - Communication**

Mikael Lindgren  
Technical Manager/Officer

#### **Appendices**

Colour diagram

Photo of test object

**Colour diagram - VMS in accordance with EN 12966-1  
class C2**

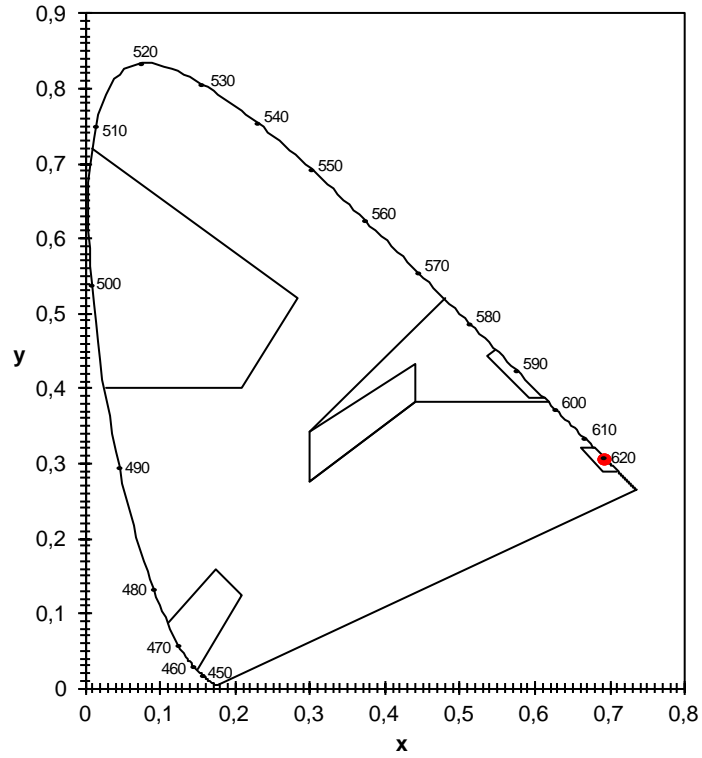


Photo of test object

