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Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	ADSS004663 ADSS004837	Auftragsdatum: <i>Order date:</i>	14.05.2018 30.05.2018	
Auftraggeber: <i>Client:</i>	Ficosa International S.A. P.I. Can Mitjans s/n, 08232 Viladecavalls, Espania			
Prüfgegenstand: <i>Test item:</i>	Camera Monitor System - CMS			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	VAS C-BEV / 092 BEVQ6 V7			
Auftrags-Inhalt: <i>Order content:</i>	Test according to UN Regulation No. 46 (ECE/TRANS/WP.29/2015/84) Paragraph 3.4, 6.2.2.3., 16.1.3., 16.1.4.			
Prüfgrundlage: <i>Test specification:</i>	UN Regulation No. 46 UN Regulation No. 46 (ECE/TRANS/WP.29/2015/84) Paragraph 3.4, 6.2.2.3., 16.1.3., 16.1.4. (incl. ECE/TRANS/WP.29/GRSG/2017/2 dated 01.02.2017)			
Wareneingangsdatum: <i>Date of receipt:</i>	02.02.2018 20.04.2018 / 22.05.2018			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000187986-001 A000195139-001 / -002			
Prüfzeitraum: <i>Testing period:</i>	02.02.2018 – 30.05.2018			
Ort der Prüfung: <i>Place of testing:</i>	Köln			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland LGA Products GmbH			
Prüfergebnis*: <i>Test result*:</i>	Siehe Sonstiges / See Other			
geprüft von / tested by:				
04.06.2018 Timo Blasczyk / SV		04.06.2018 H.-J. Herrmann / SV		
Datum Name / Stellung Unterschrift		Datum Name / Stellung Unterschrift		
<i>Date</i> <i>Name / Position</i> <i>Signature</i>		<i>Date</i> <i>Name / Position</i> <i>Signature</i>		
Sonstiges / Other: This test report replaces test report 21287866_001 dated 28.03.2018, 21287866_002 dated 04.05.2018 and 21287866_003 dated 04.06.2018. For test result see this test report in the following. Note remarks of page 14.				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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Liste der verwendeten Prüfmittel
List of used test equipment

Prüfmittel <i>Test equipment</i>	Prüfmittel-Nr. / ID-Nr. <i>Equipment No. / ID-No.</i>	Nächste Kalibrierung <i>Next calibration</i>
02.02.2018 – 30.05.2018 / GU.42		
Imaging colorimeter	2726513	08.12.2019
Spectroradiometer	2722997	01.12.2018
Luminance meter	2723462	24.04.2020
Illuminance meter	2723282	26.04.2020
ConoScopic measurement system	2723162	01.02.2019
Measuring tape	2724551	01.07.2018
Measuring tape	2723495	01.10.2018
Laser distance meter	2732524	01.02.2019
Caliper	2727445	21.06.2018
Multimeter	2722511	01.10.2018
Oscilloscope	2731841	01.02.2019
Environmental conditions	2726984	01.11.2018
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Produktbeschreibung
Product description

1 Produktdetails <i>Product details</i>	CMS for covering the field of vision of Class III main rear-view device for vehicles of categories M ₁ . PART NUMBER: Camera: 4KE 980 545 (left) 4KE 980 546 (right) ECU: 4KE 907 181 (left) 4KE 907 182 (right)
2 Zielfahrzeug <i>Target vehicle</i>	Audi Etron
3 Spannungsversorgung <i>Supply voltage</i>	Supply of the CMS with 12 VDC
4 Hardware/Software Version <i>Hardware/Software Version</i>	For the camera: HW: H03; SW: X002 (acc. type lable and technical specification) For the monitor: HW: H15; SW: X310 (acc. reading by CANbus)
5 Sichtfeld <i>Field of view</i>	Tested in "default view" with 80 % zoom.
6 Zubehör <i>Accessories</i>	For testing purposes: Notebook with PEAKCAN USB device to simulate the vehicle CAN bus.
<p style="text-align: center;">Picture 1: camera</p>	
	<p style="text-align: center;">Picture 2: monitor</p>
	
<p style="text-align: center;">Picture 3: cables</p>	<p style="text-align: center;">Picture 4: -</p>
	

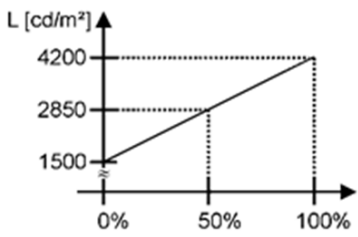
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3.4.	The CMS shall be provided by the applicant with the following documents: (a) Technical specification of the CMS; and (b) Operator's manual.	a) Technical specification present. (P) b) Operator's manual present. (P)	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.2.2.3.	Functional requirements for camera-monitor devices of Classes I to IV (see Annex 12). Unless otherwise specified in this Regulation, the definitions and symbols used in paragraph 6.2.2.3. are in accordance with ISO 16505:2015, Chapters 3 and 4. Unless otherwise specified in this Regulation, the requirements given in paragraph 6.2.2.3. shall be verified according to the test procedures given in ISO 16505:2015, Chapter 7, where available.		
6.2.2.3.1	Luminance adjustment It shall be possible to adjust the average luminance of the monitor either manually or automatically to the ambient conditions.	For testing manual adjustment of brightness (standard and high brightness mode) was used. – see technical specification clause 5.4.	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.2.2.3.2	Operating readiness (System availability) If the system is not operational (e.g. CMS failure), it shall be indicated to the driver by i.e. warning indication, display information, absence of status indicator. The operator's manual shall explain the information indicated.	Indication of a failure is given by indicator light of instrument cluster. Discription about failure is given in the operator's manual.	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.2.2.3.3	Image quality		
6.2.2.3.3 .1.	Monitor isotropy The monitor shall conform to optical requirements over the range of viewing directions that is specified in the following paragraphs.		
6.2.2.3.3 .1.1.	Directional uniformity When driven by an artificial 70 per cent grey-scale image, the deviation of the monitor luminance from the luminance white level with specific viewing direction $(\Theta, \Phi) = (\Theta_{monitor/D}, \Phi_{monitor/D})$ shall be such that the ratio relative to the luminance white level for the same specific viewing direction $L(\Theta_{monitor/D}, \Phi_{monitor/D})$ does not exceed 35 per cent of the luminance white level for the monitor standard isotropy range and shall not exceed 50 per cent of the luminance white level for the monitor extended isotropy range.	Driver side, MSIR: $\leq 35\%$ Driver side, MEIR: $\leq 50\%$ Passenger side, MSIR: $\leq 35\%$ Passenger side, MEIR: $\leq 50\%$ NOTE: MSIR : monitor standard isotropy range MEIR : monitor extended isotropy range	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.2.2.3.3 .1.2.	Lateral uniformity The luminance white lateral dependency shall not exceed 35%; see Paragraph 6.2.2.3.3.1.2.	Lateral uniformity: $\leq 35\%$	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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6.2.2.3.3 .2.	<p>Luminance and contrast rendering For luminance and contrast rendering the following requirements shall apply:</p> <p>(a) The minimum luminance contrast at the monitor (including any screen protector) reproducing a high contrast pattern shall be:</p> <ul style="list-style-type: none"> (i) For direct sunlight condition: 2:1; (ii) For day condition with diffuse ambient light: 3:1; (iii) For sunset condition: 2:1; (iv) For night condition: 10:1 except in the case of Mirror and CMS dual function system of class I: 5:1. <p>(b) The night condition for the camera's field of view is replicated in a dark environment such that the maximum illuminance on the objects to be measured shall not exceed 2.0 lx;</p> <p>(c) The background luminance of the monitor shall be limited under the night condition. The maximum background luminance under the night condition shall be less than 2.0 cd/m²;</p> <p>(d) The instructions for use shall contain a note that sunlight or light from other intense light source upon the monitor reduces the luminance contrast which may require the driver to be particularly alert and attentive.</p>	<p>(a)</p> <ul style="list-style-type: none"> (i) For direct sunlight condition tested in high brightness mode: > 2:1 (P) (ii) For day condition with diffuse ambient light tested in high brightness mode: > 3:1 (P) (iii) For sunset condition: > 2:1 (P) (iv) For night condition: > 10:1 (P) <p>(b) Considered (P)</p> <p>(c) Background luminance under the night condition: < 2 cd/m² (P)</p> <p>(d) The required information is given by the operator's manual. (P)</p>	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>

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6.2.2.3.3 .2.1.	<p>Day condition with diffuse sky-light exposure test For the day condition with diffuse sky-light exposure, the test method given in ISO 16505:2015, sub clause 7.8.2., Test 2 shall be applied, but a value of 4,000 to 4,200 cd/m² for luminance diffuse illuminator shall be used.</p> <p>At the request of the manufacturer, the value for luminance diffuse illuminator may be determined by using the diagram of figure below.</p> <p style="text-align: center;">Luminance of the diffuse illuminator</p>  <p style="text-align: center;">Ratio of the projected area leaving the vehicle</p> <p>Ratio of projected area vs. luminance of the diffuse illuminator</p>	<p>Ratio of projected area leaving the vehicle: 0% (acc. Technical specification)</p> <p>A maximum luminance of 1500 cd/m² is considered.</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>
6.2.2.3.3 .3.	<p>Grey scale rendering A CMS shall have a sufficient grey scale rendering. CMS shall display a tonal range of at least eight distinguishable different grey tonal steps on the monitor.</p>	<p>Range of distinguishable different grey tonal steps: > 8</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>
6.2.2.3.3 .4.	<p>Colour rendering For colour rendering, the hue angle of reproduced colour of the chart patches on the monitor shall satisfy the following requirements. The colour coordinates are described based in the CIE 1976 uniform colour space:</p> <p>(a) Red colour coordinates shall not exceed the range of (0°, 44.8°) or (332.2°, 360°); (b) Green colour coordinates shall not exceed the range of (96.6°, 179.9°); (c) Blue colour coordinates shall not exceed the range of (209.9°, 302.2°); (d) Yellow colour coordinates shall not exceed the range of (44.8°, 96.6°); (e) To distinguish from the white colour, define distance from white as $R_i \geq 0.02$, where R_i is the chromatic distance of each colour patch (i = Red, Green, Blue, Yellow), relative to white (i = White). (f) Amber, blue and red light signals shall be distinguishable from each other.</p>	<p>(a) Red: ok (b) Green: ok (c) Blue: ok (d) Yellow: ok</p> <p>(e) R_{red}: ok R_{green}: ok R_{blue}: ok R_{yellow}: ok</p> <p>(f) Checked by visual inspection of LED-light signals under laboratory conditions with representative users and at night conditions: amber, blue and red light signals are distinguishable. Test result should be verified during driving tasks.</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>

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6.2.2.3.3 .5.	<p>Artefacts The operator's manual shall refer to possible artefacts and their impact on the partial occlusion of the field of view and of the objects which may require the driver to be particularly alert and attentive.</p>	<p>Required information are given with attention remark in operator's manual.</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>
6.2.2.3.3 .5.1.	<p>Smear Smear shall be transparent and not be more than 10 per cent of the maximum luminance value of the displayed glare source luminance level, which causes smear effect.</p>	<p>There is no smear.</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>
6.2.2.3.3 .5.2.	<p>Blooming and lens flare The total area of disturbing blooming and lens flare areas shall not cover more than 25 per cent of the displayed camera image.</p>	<p>Blooming and lens flare artefacts cover $\leq 25\%$ of the displayed camera image.</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>
6.2.2.3.3 .5.3.	<p>Point light sources The CMS shall have an operation mode in which the driver of the vehicle equipped with CMS can recognize two point light sources (e.g. passing beam headlights) rendered as two distinguishable separate point light sources.</p> <p>In this operation mode, a set of two point light sources corresponding to a vehicle passing beam headlamp each having a reference luminous intensity 1,750 cd and being separated each other laterally by 1.3 m and located at a distance of 250 m away from the CMS shall be distinguishable as two point light source. This requirement is applicable to Class I, Class II and Class III devices for indirect vision.</p> <p>The point light source detection factor (PLSDF) shall be at least 2.7 or the point light source contrast factor (PLSCF) shall be at least 0.12, whichever is satisfied by the CMS test under the conditions and the test procedure described in Annex 12, paragraph 1.3.</p> <p>If the system is in a mode where point light sources are not rendered as described above, this shall be indicated to the driver. The information indicated shall be explained in the operator's manual.</p>	<p>PLSDF: ≥ 2.7 (P) or PLSCF: ≥ 0.12 (P)</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>

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6.2.2.3.3 .6.	Sharpness and depth of field		
6.2.2.3.3 .6.1.	<p>Sharpness</p> <p>The sharpness is represented by the $MTF50_{(1:1)}$ and it shall satisfy:</p> <p>(a) Horizontal and vertical $MTF50_{(1:1)}$ at center</p> $MTF50_{(1:1)} \geq \frac{1}{2} MTF10_{MIN(1:1)} \text{ [LW/PH]}$ <p>(b) Horizontal and vertical $MTF50_{(1:1)}$ at corners (70 per cent of image height)</p> $MTF50_{(1:1)} \geq \frac{1}{2} \left(\frac{1}{2} MTF10_{MIN(1:1)} \right) \text{ [LW/PH]}$	<p>Required calculated value for the center for the driver side (more restrictive than passenger side):</p> $\frac{1}{2} MTF10_{MIN(1:1)/hor} = 208$ <p>LW/PH</p> $\frac{1}{2} MTF10_{MIN(1:1)/ver} = 131$ <p>LW/PH</p> <p>Result:</p> $MTF50_{(1:1)/hor} \geq 208 \text{ LW/PH}$ $MTF50_{(1:1)/ver} \geq 131 \text{ LW/PH}$ <p>Required calculated value for the corner measurement points for the driver side (more restrictive than passenger side):</p> $\frac{1}{4} MTF10_{MIN(1:1)/hor} = 104$ <p>LW/PH</p> $\frac{1}{4} MTF10_{MIN(1:1)/ver} = 65$ <p>LW/PH</p> <p>Result:</p> $MTF50_{(1:1)/hor} \geq 104 \text{ LW/PH}$ $MTF50_{(1:1)/ver} \geq 65 \text{ LW/PH}$	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>

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6.2.2.3.3 .6.2.	<p>Depth of field The CMS shall enable the driver to observe the occupied space by the object and perceive the content shown within the range of interest with detailed resolution. The $MTF10_{(1;1)}$, when measured at different distances to the object, shall satisfy at least the minimum resolution for the following points:</p> <p>(a) Resolution at point 1 (10 m as representative point for infinity) and point 2 (middle distance at 6 m) $MTF10_{(1;1)} \geq 0.9 \cdot MTF10_{MIN(1;1)}$ [LW/PH]</p> <p>(b) Resolution at point 3 (Close distance at 4 meters) $MTF10_{(1;1)} \geq \frac{1}{2} MTF10_{MIN(1;1)}$ [LW/PH]</p>	<p>a) Required calculated value at the center for the driver side at 10 m and 6 m distance (more restrictive than passenger side): $0,9 * MTF10_{MIN(1;1)/hor} =$ 375 LW/PH</p> <p>$0,9 * MTF10_{MIN(1;1)/ver} =$ 235 LW/PH</p> <p>Result: $MTF10_{(1;1)/hor} \geq 375$ LW/PH $MTF10_{(1;1)/ver} \geq 235$ LW/PH</p> <p>b) Required calculated value at the center for the driver side at 4 m distance (more restrictive than passenger side): $\frac{1}{2} MTF10_{MIN(1;1)/hor} =$ 208 LW/PH</p> <p>$\frac{1}{2} MTF10_{MIN(1;1)/ver} =$ 131 LW/PH</p> <p>Result: $MTF10_{(1;1)/hor} \geq 208$ LW/PH $MTF10_{(1;1)/ver} \geq 131$ LW/PH</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>
6.2.2.3.3 .7.	<p>Geometric distortion For CMS of Classes I, II and III the maximum distortion within the minimum required field of view shall not exceed 20 per cent relative to recto-linear or pinhole projection.</p>	<p>$\leq 20\%$</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>
6.2.2.3.3 .8.	Further image quality requirements		
6.2.2.3.3 .8.1.	<p>Flicker The entire image area of the monitor shall be free of flicker according to the test method of Annex 12, paragraph 1.2.</p>	<p>$E_{obs} < E_{pred}$ at every frequency < 120 Hz.</p>	<p>P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/></p>

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6.2.2.3.4 .	Time behaviour		
6.2.2.3.4 .1.	<p>Frame rate</p> <p>Movements of objects in front of the camera shall be rendered smooth and fluid. The minimum frame rate of the system (update rate of the image information) shall be at least 30 Hz. At low light conditions or while maneuvering at low speed, the minimum frame rate of the system (i.e. update rate of the image information) shall be at least 15 Hz.</p>	<p>Frame rate ≥ 30 Hz.</p> <p>For low light condition frame rate ≥ 15 Hz.</p>	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>
6.2.2.3.4 .2.	<p>Image formation time</p> <p>The image formation time of the monitor shall be less than 55 ms at a temperature of $22^{\circ}\text{C} \pm 5^{\circ}\text{C}$.</p>	Image formation time < 55 ms	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>
6.2.2.3.4 .3.	<p>System latency</p> <p>A CMS shall have a sufficient short latency to render the scenery nearly at the same time. The latency shall be lower than 200 ms at room temperature $22^{\circ}\text{C} \pm 5^{\circ}\text{C}$.</p>	System latency < 200 ms	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>
6.2.2.3.5 .	Quality and further ergonomic requirements		
6.2.2.3.5 .1.	<p>Glare due to high luminance of the monitor</p> <p>In order to avoid glare from a high luminance of the monitor, the luminance shall be dimmable in the night condition either manually or automatically.</p>	Automatic adjustment of luminance.	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>

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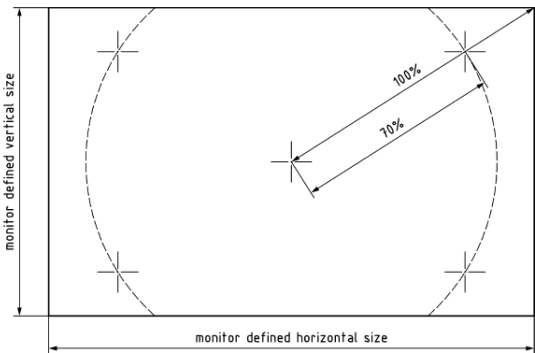
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16.1.3.	Magnification and resolution		
16.1.3.1.	<p>Magnification factor</p> <p>The minimum and the average magnification factors of the CMS, in both horizontal and vertical directions shall not be lower than the magnification factors indicated below.</p> <p>The minimum magnification factor shall not be less than:</p> <p>(a) for Class I: 0.31; (b) for Class II (driver's side): 0.26; (c) for Class III (driver's side): 0.29; (d) for Class IV (driver's side): 0.054; (e) for Class II (passenger's side): 0.13; (f) for Class III (passenger's side): 0.19; (g) for Class IV (passenger's side): 0.016.</p> <p>The average magnification factor shall not be less than:</p> <p>(h) for Class I: 0.33; (i) for Class II (driver's side): 0.31; (j) for Class III (driver's side): 0.31; (k) for Class IV (driver's side): 0.091; (l) for Class II (passenger's side): 0.16; (m) for Class III (passenger's side): 0.20; (n) for Class IV (passenger's side): 0.046.</p>	<p>Result for the minimum magnification factor:</p> <p><u>Driver's side:</u> $M_{system/hor/min} \geq 0.29$ (P) $M_{system/ver/min} \geq 0.29$ (P)</p> <p><u>Passenger's side:</u> $M_{system/hor/min} \geq 0.19$ (P) $M_{system/ver/min} \geq 0.19$ (P)</p> <p>Result for the average magnification factor:</p> <p><u>Driver's side:</u> $M_{system/hor/avg} \geq 0.31$ (P) $M_{system/ver/avg} \geq 0.31$ (P)</p> <p><u>Passenger's side:</u> $M_{system/hor/avg} \geq 0.20$ (P) $M_{system/ver/avg} \geq 0.20$ (P)</p>	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>

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<p>16.1.3.2. Resolution (MTF) The resolution (MTF) defines the minimum distinguishable details observable in an image as is represented by the MTF10. For reasons of simplicity the requirement is defined assuming an aspect ratio of 1:1.</p> <p>Resolution MTF10, at the center of the monitor defined size shall fulfil the following requirements: $MTF10_{(1:1)/hor} \geq MTF10_{MIN(1:1)/hor}$ in horizontal direction, $MTF10_{(1:1)/ver} \geq MTF10_{MIN(1:1)/ver}$ in vertical direction</p> <p>Resolution MTF10, at the corner measurement points as illustrated in the figure below shall fulfil the following requirements: $MTF10_{(1:1)/hor} \geq \frac{1}{2} MTF10_{MIN(1:1)/hor}$ in horizontal direction, $MTF10_{(1:1)/ver} \geq \frac{1}{2} MTF10_{MIN(1:1)/ver}$ in vertical direction.</p> 	<p>Required calculated value at the center for the driver side (more restrictive than passenger side):</p> $MTF10_{MIN(1:1)/hor} = 417 \text{ LW/PH}$ $MTF10_{MIN(1:1)/ver} = 261 \text{ LW/PH}$ Result: $MTF10_{(1:1)/hor} \geq 417 \text{ LW/PH}$ $MTF10_{(1:1)/ver} \geq 261 \text{ LW/PH}$ <p>Required calculated value at the corner measurement points for the driver side (more restrictive than passenger side):</p> $\frac{1}{2} MTF10_{MIN(1:1)/hor} = 208 \text{ LW/PH}$ $\frac{1}{2} MTF10_{MIN(1:1)/ver} = 131 \text{ LW/PH}$ Result: $MTF10_{(1:1)/hor} \geq 208 \text{ LW/PH}$ $MTF10_{(1:1)/ver} \geq 131 \text{ LW/PH}$	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>
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<p>16.1.4.</p> <p>Magnification aspect ratio In the required field of view, the difference between the average magnification factor for horizontal and vertical direction of a CMS shall satisfy the following equations depending on the individual mirror classes.</p> <p>For devices Class I the acceptable range shall be:</p> $-0.34 \leq 1 - \frac{M_{system/hor/avg}}{M_{system/ver/avg}} \leq 0.25$ <p>For devices Class II the acceptable range shall be:</p> $-0.42 \leq 1 - \frac{M_{system/hor/avg}}{M_{system/ver/avg}} \leq 0.3$ <p>For devices Class III the acceptable range shall be:</p> $-0.34 \leq 1 - \frac{M_{system/hor/avg}}{M_{system/ver/avg}} \leq 0.25$ <p>For devices Class IV no restriction in magnification ratio is required.</p>	<p>Magnification aspect ratio for the driver side / passenger side is within:</p> $-0.34 \leq 1 - \frac{M_{system/hor/avg}}{M_{system/ver/avg}} \leq 0.25$	<p>P <input checked="" type="checkbox"/></p> <p>F <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p> <p>N/T <input type="checkbox"/></p>
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Remarks:

- a) Both samples are configured as master (left side with left hand drive configuration and right side with right hand drive configuration).
- b) For installation and before operation it must be ensured, that HBM (high brightness mode) is switched on under day condition with diffuse ambient light and under direct sunlight condition in order to fulfill the luminance contrast requirements.
- c) Colour rendering of light signals: Test result according to 6.2.2.3.3.4. should be verified during driving tasks.

Figures

Label Monitor left side (driver side)



Label Monitor right side (passenger side)



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Label Camera left side (driver side)



Label Camera right side (passenger side)



Hardware version ECU (Monitor):

Main Diagnostic Window

Request

Source Address: 0x780, Target Address: 0xCS, Channel: 1, Send Tester Present: ON/OFF

CAN ID: 0x17FC00C5, DLC (dec): 3, Data Bytes (hex): 22F1A3

Response

Bytes (dec): 6, Response Description: Positive Response

Byte index: 1, Response Data (hex): 62 F1 A3 48 31 35

Result: HEX: 48 31 35 → ASCII: H15

Software version ECU (Monitor):

Main Diagnostic Window

Request

Source Address: 0x780, Target Address: 0xCS, Channel: 1, Send Tester Present: ON/OFF

CAN ID: 0x17FC00C5, DLC (dec): 3, Data Bytes (hex): 22F1AB

Response

Bytes (dec): 31, Response Description: Positive Response

Byte index: 1, Response Data (hex): 62 F1 AB 58 33 31 30 58 33 31 30 58 33 31 30 58 33 31 30 2D 2D 2D 2D 2D 2D

Result: HEX: 58 33 31 30 → ASCII: X310

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Technical specification:

- a) Ficoso: 092 BEVQ6 V7 Audi CMS Technical Specification, dated 31.05.2018 (57 pages)
- b) Samsung: e-mirror S-Gamma information, dated 14.03.2018 (5 pages)
- c) Audi: VAS Abstände Ergonomie Augpunkte, dated 02.03.2018 (4 pages)
- d) Samsung: Display specification model: AMS700EQ04-0, dated 24.10.2017 (55 pages)
- e) Ficoso: Blackprimer_Activearea_points_Azimuthal drawing by Ficoso, dated 26.02.2018 (1 page)
- f) Ficoso: Drawing 4KE_907_181 / 4KE_907_182, dated 20.10.2017, updated 18.01.2018 (1 page)
- g) Ficoso: Drawing C00001660 – GA_AUDI_VAS, dated 26.07.2017, updated 18.12.2017 (1 page)
- h) Ficoso: Drawing 4KE.980.545 / 4KE.980.546, dated 28.06.2017 (1 page)
- i) Ficoso: Drawing 4KE_857_409 / 4KE_857_410, dated 27.03.2017, updated 06.11.2017 (1 page)
- j) Omnivision: camera sensor specification model: OX01A10 version 1.08, dated April 2018 (215 pages)

Operator's manual:

- a) Audi: Virtueller_Außenspiegel_Audi_etron_Draft_4 - page 7 and 8 of operator's manual, dated 20.04.2018 (2 pages)
- b) Audi: Fahrerhinweise - excerpt of operator's manual - indicator lights of instrument cluster, dated 21.04.2018 (1 page)

Accessories and Set-up:

Notebook with PEAKCAN USB device to simulate the vehicle CAN bus

End of test report