



Verification Services

Project No. 4787070113-8
Report No. 4787070113-8a
Report Issued Date: 2016-04-26



Test Report

| | | | |
|---|-------------|-----------------------|-----------------|
| Customer Company & Address: | | | |
| SORAA Inc ADD: 6500 Kaiser Dr, Fremont, CA 94555 | | | |
| Contact Person: | Steve Yang | | |
| Phone Number: | 510-4567183 | Email Address: | SYang@soraa.com |

| | | | |
|----------------------------------|-------------------------------|--|--|
| Relevant Standards: | IES LM-79-2008 | | |
| Product Description: | Integral LED Lamp, PAR16 GU10 | | |
| Brand Name: | SORAA | | |
| Tested Model Number: | SM16GA-07-25D-940-03 | | |
| Product Family: | N/A | | |
| Allowable Variations: | N/A | | |
| Electrical Specification: | 120 V AC, 60 Hz, 7.5 W | | |

| | | | |
|---|-----------------|-------------|-----------------|
| Test Laboratory & Address: | | | |
| UL Verification Services (Guangzhou) Co., Ltd. ADD: Building A1, 1F & 2F, Nansha Science and Technology Innovation Center, No. 25, South Huanshi Avenue , Nansha District, Guangzhou 511458, China | | | |
| Telephone: | +86 20 28667188 | Fax: | +86 20 83486605 |

| | | | |
|-------------------------------|------------|-------------------|------------|
| Sample Reception Date: | 2015-10-13 | Test Date: | 2015-10-15 |
|-------------------------------|------------|-------------------|------------|

| Tested By | Approved By |
|--|--|
|  / Derek Zhang |  / Candy Zhang |
| Signatory & Test Personnel Name | Signatory & Approval Name |

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.



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Statement of Results

| Test Flow | Test Item | Sample ID (Lab) | Pass/Fail/NA |
|-----------|-------------------------|-----------------|----------------------|
| 1 | Integrating Sphere Test | 2225380-S001 | Evaluate by customer |
| 2 | Goniophotometer Test | 2225380-S001 | Evaluate by customer |

Deviation from Test Method (if any)

N/A

Remark (if any)

This report shall not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the US government.



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Test Flow 1: Integrating Sphere Test

Environmental Conditions

Temperature: 25.1°C

Test Equipment

| Equipment ID | Equipment Name | Last Calibration Date | Calibration Due Date |
|--------------|---------------------------|-----------------------|----------------------|
| GVS-LE-PE002 | Integrating Sphere | Before Use | Before Use |
| GVS-LE-FS019 | Measurement Standard Lamp | 2015-08-21 | 2016-08-19 |

Test Sample

2225380-S001

Test Method

The sample was tested according to the IES LM-79-2008.

Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$.

The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Test Results

| Test Type | Voltage (V AC) | Frequency (Hz) | Current (A) | Power Factor | Power (W) |
|-----------|----------------|----------------|-------------|--------------|-----------|
| Input | 120.07 | 60 | 0.065 | 0.958 | 7.5 |

| Test Type | CCT (K) | CRI | Lumen Output (lm) | Luminous Efficacy (lm/W) |
|-----------|---------|-----|-------------------|--------------------------|
| Output | 4022 | 96 | 467 | 62.4 |



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Test Condition

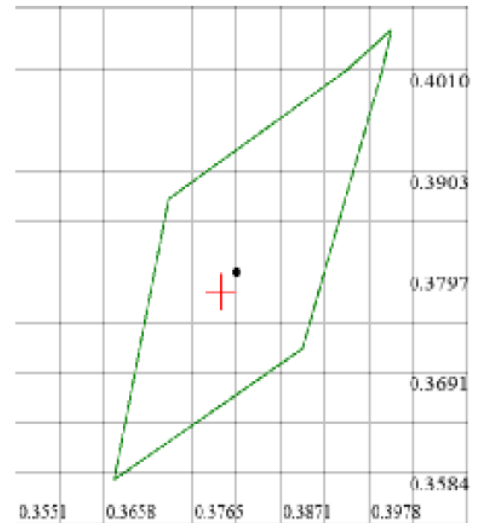
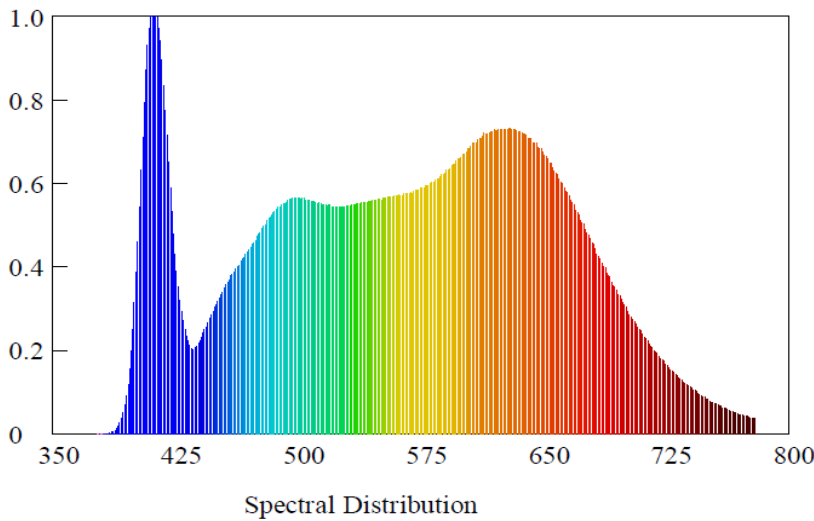
Temperature: 25.1°C

RH: ----%

Spectrum Range: 380-780 nm

Scan Step: 1 nm

Spectroradiometric Parameters



Nominal CCT: LED_4000K
x0=0.3799 y0=0.3776

Chromaticity Coordinates: $x=0.3799$ $y=0.3776$ $u'=0.2244$ $v'=0.5019$

Correlated Color Temperature: 4022 K

Dominant Wavelength: 577.0 nm(E)

Luminous Flux: 466.706 lm

Purity: 0.2735

Chromaticity Difference: +0.00055Duv

Peak Wavelength: 413.5 nm

Color Ratio: $K_r=37.5\%$ $K_g=49.5\%$ $K_b=13.0\%$

Bandwidth: 18.3nm

Radiant Flux: 1.899 W

Rendering Index: $R_a=96.0$

R1=95 R2=97 R3=97 R4=95 R5=94 R6=93 R7=98 R8=98

R9=95 R10=92 R11=92 R12=82 R13=96 R14=99 R15=97



Test Report

Test Flow 2: Goniophotometer Test

Environmental Conditions

Temperature: 25.1°C

Test Equipment

| Equipment ID | Equipment Name | Last Calibration Date | Calibration Due Date |
|--------------|---------------------------|-----------------------|----------------------|
| GVS-LE-GS001 | Goniophotometer | Before Use | Before Use |
| GVS-LE-FS019 | Measurement Standard Lamp | 2015-08-21 | 2016-08-19 |

Test Sample

2225380-S001

Test Method

The sample was tested according to the IES LM-79-2008.
 Photometric parameters were measured using a type C goniophotometer and software.
 The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample.
 The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 0.5° vertical intervals and 22.5° horizontal intervals.

Test Results

| Test Type | Voltage (V AC) | Frequency (Hz) | Current (A) | Power Factor | Power (W) |
|-----------|----------------|----------------|-------------|--------------|-----------|
| Input | 120.03 | 60 | 0.064 | 0.958 | 7.3 |

| Test Type | Lumen Output (lm) | Center Beam Candle Power (cd) | Field angle (10%) | | Beam angle (50%) | | Luminous Efficacy (lm/W) |
|-----------|-------------------|-------------------------------|-------------------|-----------------|-------------------|-----------------|--------------------------|
| | | | Horizontal Spread | Vertical Spread | Horizontal Spread | Vertical Spread | |
| Output | 465 | 2772 | 39.6 | 39.6 | 19.3 | 19.3 | 63.5 |



Test Report



NVLAP Lab Code: 200952-0



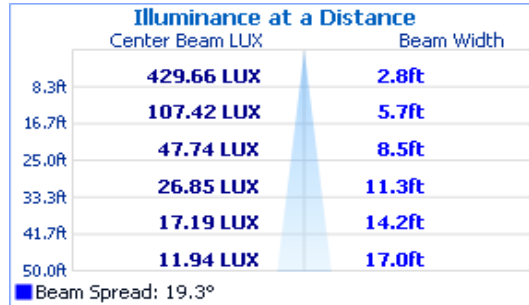
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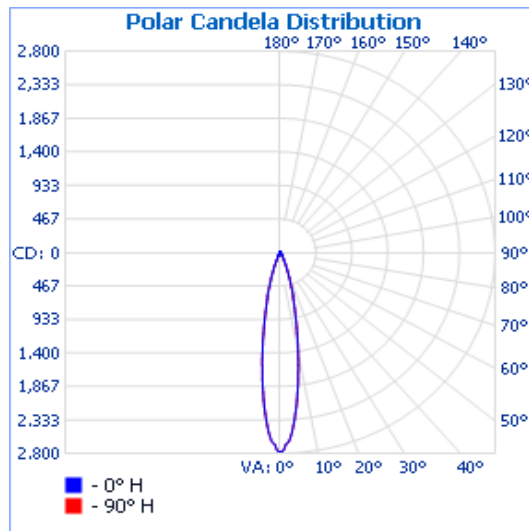
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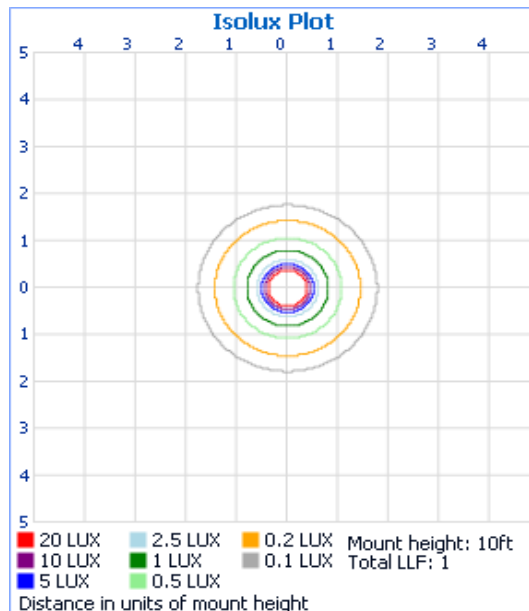
Illuminance at a Distance



Polar Candela Distribution



Isolux Plot





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Zonal Lumen Tabulation

Zonal Lumen Summary

| Zone | Lumens | % Luminaire |
|--------|--------|-------------|
| 0-30 | 415.7 | 89.5% |
| 0-40 | 432.4 | 93.1% |
| 0-60 | 453.5 | 97.6% |
| 60-90 | 10.5 | 2.3% |
| 70-100 | 4.2 | 0.9% |
| 90-120 | 0.1 | 0% |
| 0-90 | 464.0 | 99.9% |
| 90-180 | 0.6 | 0.1% |
| 0-180 | 464.6 | 100% |

Lumens Per Zone

| Zone | Lumens | % Total | Zone | Lumens | % Total |
|-------|--------|---------|---------|--------|---------|
| 0-5 | 59.7 | 12.8% | 90-95 | 0.0 | 0% |
| 5-10 | 124.0 | 26.7% | 95-100 | 0.0 | 0% |
| 10-15 | 109.3 | 23.5% | 100-105 | 0.0 | 0% |
| 15-20 | 71.5 | 15.4% | 105-110 | 0.0 | 0% |
| 20-25 | 35.1 | 7.6% | 110-115 | 0.0 | 0% |
| 25-30 | 16.1 | 3.5% | 115-120 | 0.0 | 0% |
| 30-35 | 9.6 | 2.1% | 120-125 | 0.0 | 0% |
| 35-40 | 7.1 | 1.5% | 125-130 | 0.0 | 0% |
| 40-45 | 6.2 | 1.3% | 130-135 | 0.0 | 0% |
| 45-50 | 5.7 | 1.2% | 135-140 | 0.0 | 0% |
| 50-55 | 4.9 | 1.1% | 140-145 | 0.1 | 0% |
| 55-60 | 4.2 | 0.9% | 145-150 | 0.1 | 0% |
| 60-65 | 3.5 | 0.8% | 150-155 | 0.1 | 0% |
| 65-70 | 2.8 | 0.6% | 155-160 | 0.1 | 0% |
| 70-75 | 2.1 | 0.4% | 160-165 | 0.1 | 0% |
| 75-80 | 1.3 | 0.3% | 165-170 | 0.0 | 0% |
| 80-85 | 0.6 | 0.1% | 170-175 | 0.0 | 0% |
| 85-90 | 0.2 | 0.0% | 175-180 | 0.0 | 0% |



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Intensity Data(cd)

| Candela Table - Type C | | | | | | | | | | | | | | | | | |
|------------------------|------|------|------|------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|
| | 0 | 22.5 | 45 | 67.5 | 90 | 112.5 | 135 | 157.5 | 180 | 202.5 | 225 | 247.5 | 270 | 292.5 | 315 | 337.5 | 360 |
| 0 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 | 2772 |
| 0.5 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 | 2770 |
| 1 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 | 2745 |
| 2 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 | 2657 |
| 3 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 | 2570 |
| 4 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 | 2423 |
| 5 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 | 2256 |
| 6 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 | 2073 |
| 7 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 | 1883 |
| 8 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 |
| 9 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 | 1498 |
| 10 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 | 1323 |
| 11 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 | 1148 |
| 12 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 |
| 13 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 | 856 |
| 14 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 |
| 15 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 | 643 |
| 16 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 |
| 17 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 | 464 |
| 18 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 | 397 |
| 19 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| 20 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 | 269 |
| 25 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| 30 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 35 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 40 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| 50 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| 55 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 60 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 65 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 70 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 75 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 80 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 85 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 95 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 115 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 135 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 155 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 165 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 175 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



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Photos of sample



End of Test Report