

SEMI F-47 Test Compliance Test Report

Standard:

SEMI F47-0200

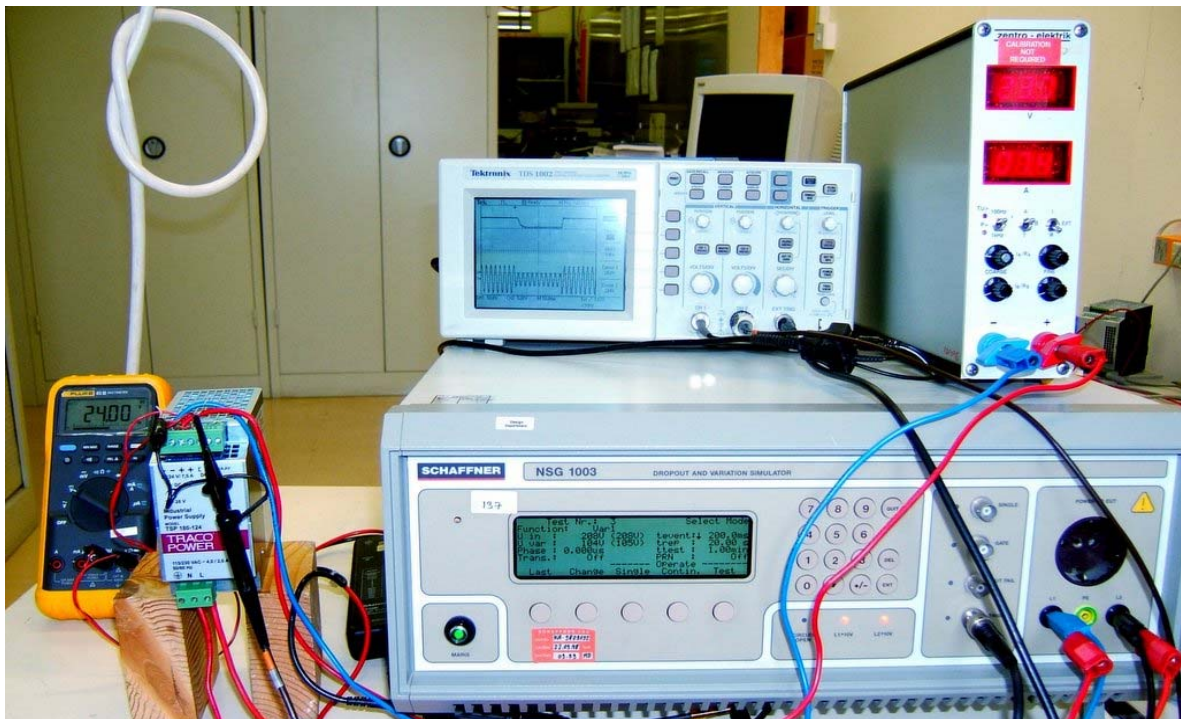
**Specification for Semiconductor Processing Equipment
Voltage Sag Immunity**

Test Procedure Standard:

**Semi F42 : Test method for Semiconductor Processing Equipment.
Voltage Sag Immunity**

1. Test Setup

Sag Generator: Schaffner NSG1003: Dropout and Variation Simulator
Tektronics: TDS1002



2. Test Units

| Units Name | Nominal Voltage [VAC] | Output Voltage [V] | Output Current [A] |
|-------------|--------------------------|-----------------------|-----------------------|
| TSP070-112 | 115-240 | 12 | 6 |
| TSP090-124* | 115-240 | 24 | 3.75 |
| TSP140-112 | 115/230 | 12 | 12 |
| TSP180-124 | 115/230 | 24 | 7.5 |
| TSP360-124 | 115/230 | 24 | 15 |
| TSP600-124 | 115/230 | 24 | 25 |

*model reference can be followed by alphanumeric code which relate to customer references.

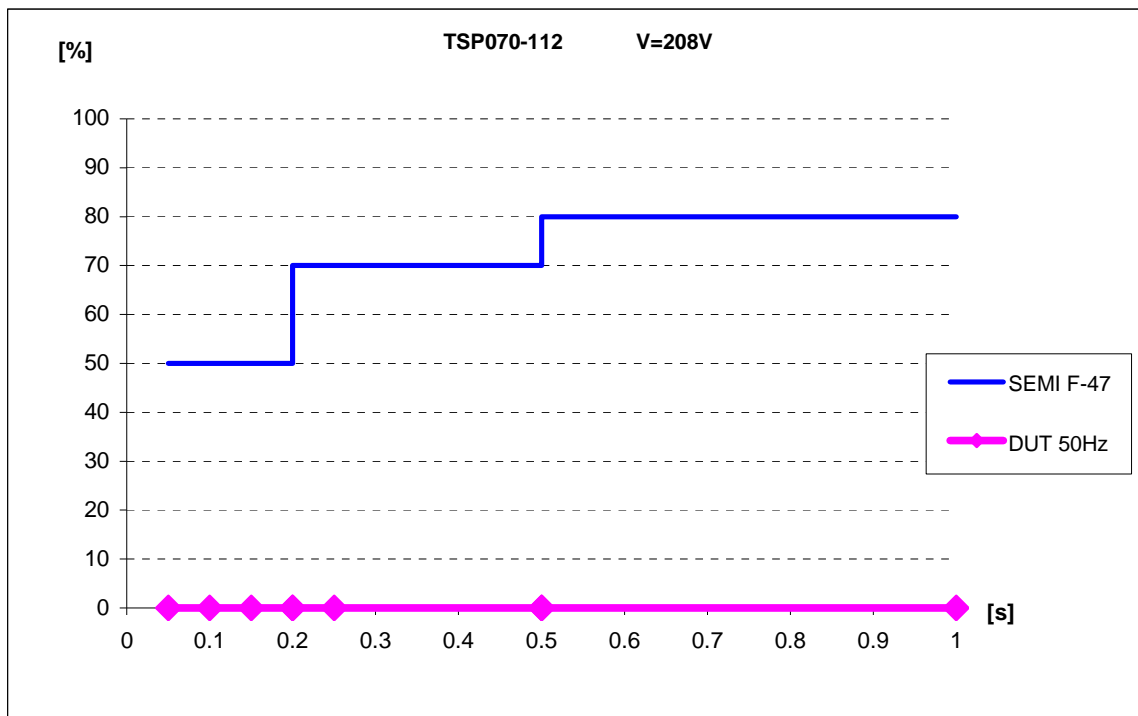
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|------|--------|----------|-------|-------|----------|------|------------------------|------------------|
| | | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | | | Sheet/of 1/14 |
| Iss. | Change | Date | Name | | | | | |

3. Test Report

3.1 TSP070-112

- Input Voltage V=208VAC
Output: V=12VDC/6A

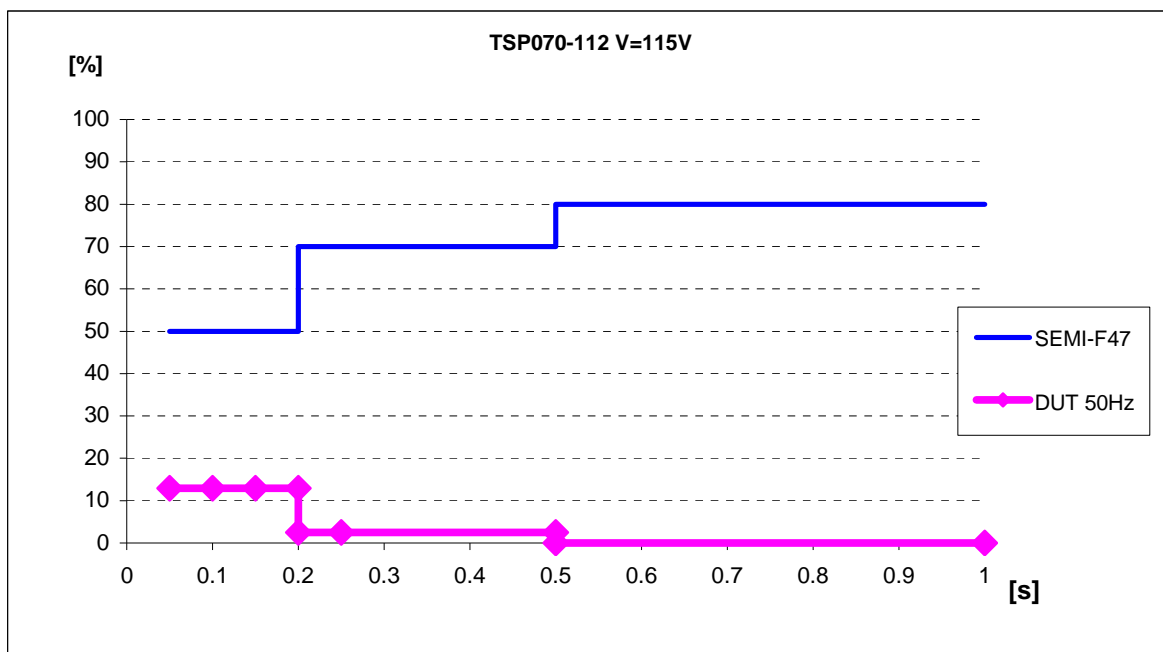
| Voltage Sag | | Duration | | Output Voltage | | Percent of Nominal | | Result |
|-------------|------|----------|------|----------------|--------------|--------------------|--|--------|
| [V] | [s] | Cycles | [V] | DUT 50Hz [%] | SEMI F47 [%] | | | |
| 166.4 | 1 | 50 | 12.0 | 0.0 | 80 | | | PASS |
| 166.4 | 0.5 | 25 | 12.0 | 0.0 | 80 | | | PASS |
| 145.6 | 0.5 | 25 | 12.0 | 0.0 | 70 | | | PASS |
| 145.6 | 0.25 | 12.5 | 12.0 | 0.0 | 70 | | | PASS |
| 145.6 | 0.2 | 12.5 | 12.0 | 0.0 | 70 | | | PASS |
| 104 | 0.2 | 10 | 12.0 | 0.0 | 50 | | | PASS |
| 104 | 0.15 | 7.5 | 12.0 | 0.0 | 50 | | | PASS |
| 104 | 0.1 | 5 | 12.0 | 0.0 | 50 | | | PASS |
| 104 | 0.05 | 2.5 | 12.0 | 0.0 | 50 | | | PASS |
| 104 | 0.02 | 1 | 12.0 | 0.0 | 50 | | | PASS |
| 0 | 0.02 | 1 | 12 | 0.0 | 0 | | | PASS |



| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 2/14 |
| Iss. | Change | Date | Name | | | | |

- **TSP070-112**
Input Voltage V=115VAC
Output: V=12VDC/6A

| Voltage Sag [V] | Duration [s] | Cycles | Output Voltage [V] | Percent of Nominal | | Result |
|--------------------|-----------------|--------|-----------------------|--------------------|--------------|--------|
| | | | | DUT 50Hz [%] | SEMI F47 [%] | |
| 92 | 1 | 50 | 12.0 | 0.0 | 80 | PASS |
| 92 | 0.5 | 25 | 12.0 | 0.0 | 80 | PASS |
| 80.5 | 0.5 | 25 | 11.4 | 2.5 | 70 | PASS |
| 80.5 | 0.25 | 12.5 | 11.4 | 2.5 | 70 | PASS |
| 80.5 | 0.2 | 12.5 | 11.4 | 2.5 | 70 | PASS |
| 57.5 | 0.2 | 10 | 8.9 | 12.9 | 50 | PASS |
| 57.5 | 0.15 | 7.5 | 8.9 | 12.9 | 50 | PASS |
| 57.5 | 0.1 | 5 | 8.9 | 12.9 | 50 | PASS |
| 57.5 | 0.05 | 2.5 | 8.9 | 12.9 | 50 | PASS |
| 57.5 | 0.02 | 1 | 10.4 | 6.7 | 50 | PASS |
| 0 | 0.02 | 1 | 10.4 | 6.7 | 0 | PASS |

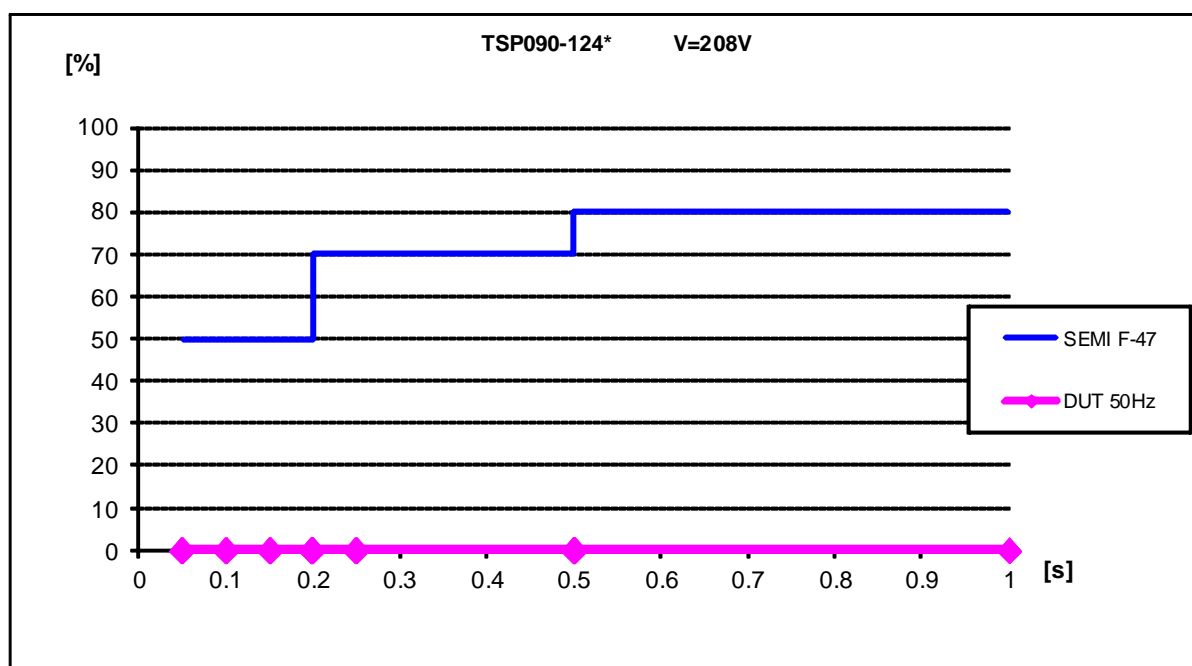


| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 3/14 |
| Iss. | Change | Date | Name | | | | |

3.2 TSP090-124*

- Input Voltage V=208VAC
Output: V=24VDC/3.75A

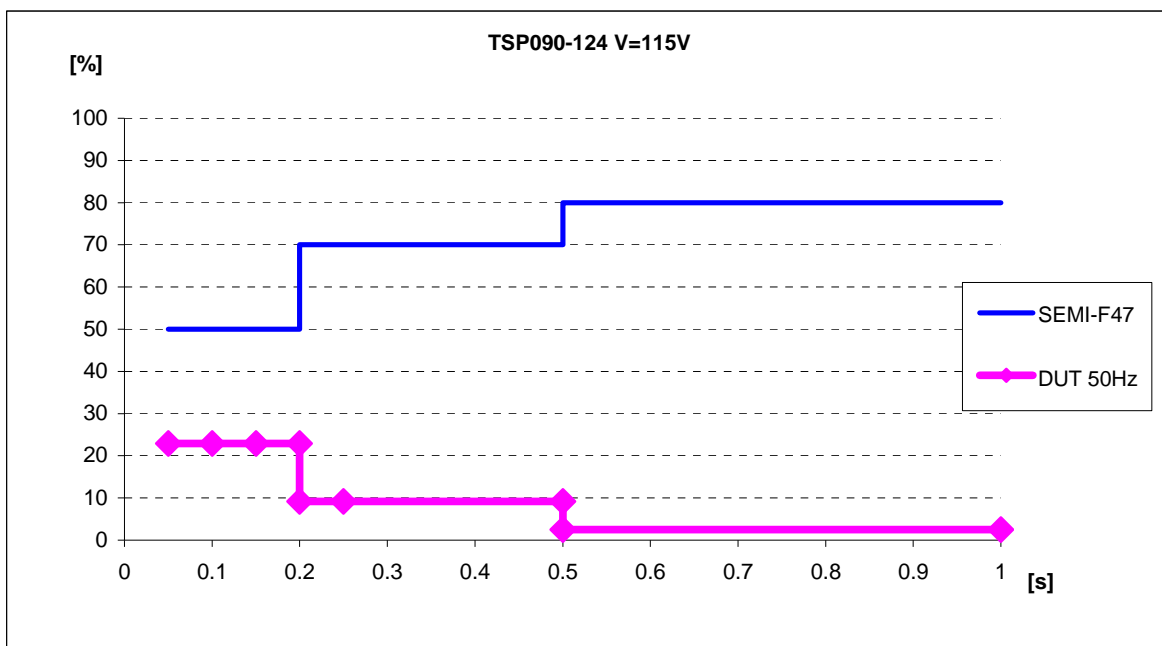
| Voltage Sag [V] | Duration | | Output Voltage [V] | Percent of Nominal | | Result |
|--------------------|----------|--------|-----------------------|--------------------|--------------|--------|
| | [s] | Cycles | | DUT 50Hz [%] | SEMI F47 [%] | |
| 166.4 | 1 | 50 | 24.0 | 0.0 | 80 | PASS |
| 166.4 | 0.5 | 25 | 24.0 | 0.0 | 80 | PASS |
| 145.6 | 0.5 | 25 | 24.0 | 0.0 | 70 | PASS |
| 145.6 | 0.25 | 12.5 | 24.0 | 0.0 | 70 | PASS |
| 145.6 | 0.2 | 12.5 | 24.0 | 0.0 | 70 | PASS |
| 104 | 0.2 | 10 | 24.0 | 0.0 | 50 | PASS |
| 104 | 0.15 | 7.5 | 24.0 | 0.0 | 50 | PASS |
| 104 | 0.1 | 5 | 24.0 | 0.0 | 50 | PASS |
| 104 | 0.05 | 2.5 | 24.0 | 0.0 | 50 | PASS |
| 104 | 0.02 | 1 | 24.0 | 0.0 | 50 | PASS |
| 0 | 0.02 | 1 | 24 | 0.0 | 0 | PASS |



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|------|--------|----------|-------|----------|------|------------------------|------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 4/14 |
| Iss. | Change | Date | Name | | | | |

- **TSP090-112**
Input Voltage V=115VAC
Output: V=24VDC/3.75A

| Voltage Sag | Duration | | Output Voltage | Percent of Nominal | | |
|-------------|----------|--------|----------------|--------------------|--------------|--------|
| [V] | [s] | Cycles | [V] | DUT 50Hz [%] | SEMI F47 [%] | Result |
| 92 | 1 | 50 | 23.4 | 2.5 | 80 | PASS |
| 92 | 0.5 | 25 | 23.4 | 2.5 | 80 | PASS |
| 80.5 | 0.5 | 25 | 21.8 | 9.2 | 70 | PASS |
| 80.5 | 0.25 | 12.5 | 21.8 | 9.2 | 70 | PASS |
| 80.5 | 0.2 | 12.5 | 21.8 | 9.2 | 70 | PASS |
| 57.5 | 0.2 | 10 | 18.5 | 22.9 | 50 | PASS |
| 57.5 | 0.15 | 7.5 | 18.5 | 22.9 | 50 | PASS |
| 57.5 | 0.1 | 5 | 18.5 | 22.9 | 50 | PASS |
| 57.5 | 0.05 | 2.5 | 18.5 | 22.9 | 50 | PASS |
| 57.5 | 0.02 | 1 | 18.5 | 22.9 | 50 | PASS |
| 0 | 0.02 | 1 | 18.4 | 23.3 | 0 | PASS |

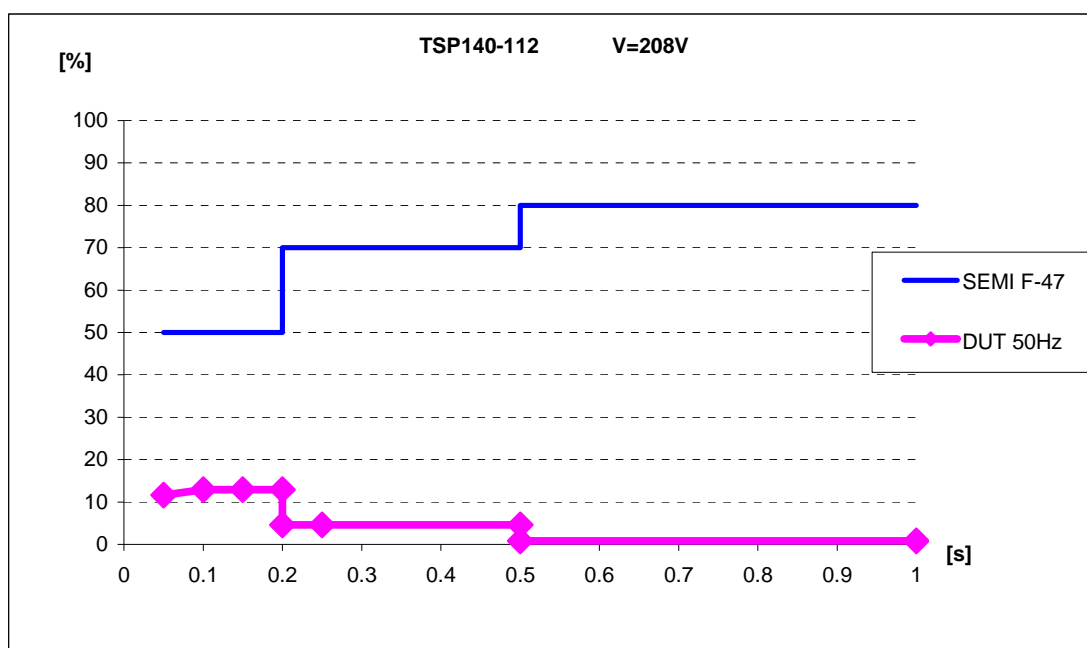


| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 5/14 |
| Iss. | Change | Date | Name | | | | |

3.3 TSP140-112

- Input Voltage V=208VAC
Output: V=12VDC/6.0A

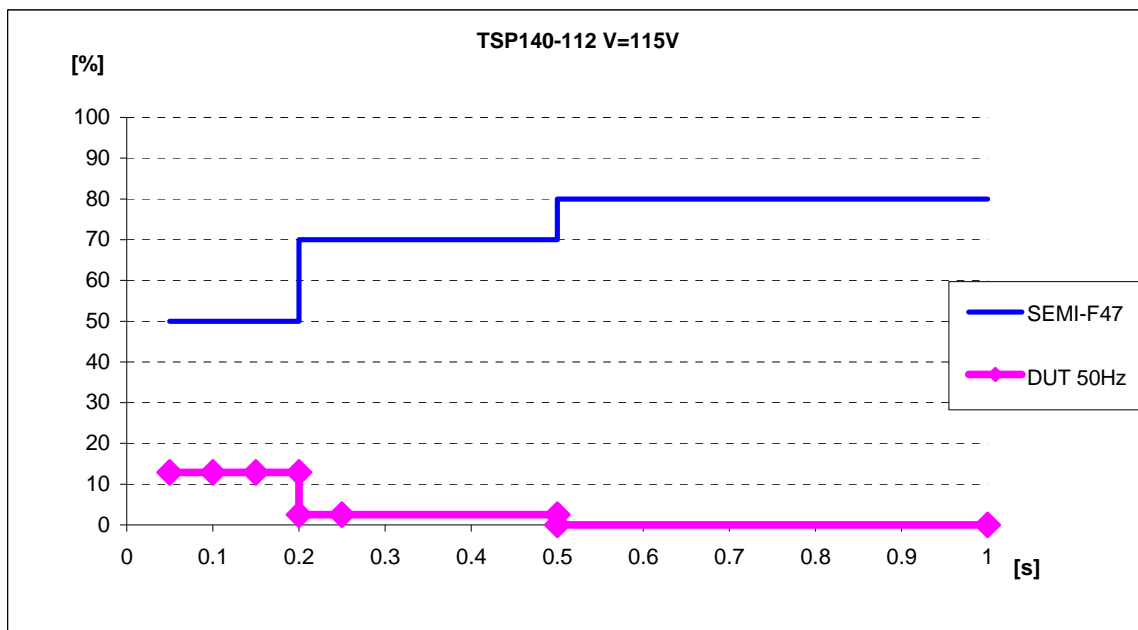
| Voltage Sag [V] | Duration | | Output Voltage [V] | Percent of Nominal | | Result |
|--------------------|----------|--------|-----------------------|--------------------|--------------|--------|
| | [s] | Cycles | | DUT 50Hz [%] | SEMI F47 [%] | |
| 166.4 | 1 | 50 | 11.8 | 0.8 | 80 | PASS |
| 166.4 | 0.5 | 25 | 11.8 | 0.8 | 80 | PASS |
| 145.6 | 0.5 | 25 | 10.9 | 4.6 | 70 | PASS |
| 145.6 | 0.25 | 12.5 | 10.9 | 4.6 | 70 | PASS |
| 145.6 | 0.2 | 12.5 | 10.9 | 4.6 | 70 | PASS |
| 104 | 0.2 | 10 | 8.9 | 12.9 | 50 | PASS |
| 104 | 0.15 | 7.5 | 8.9 | 12.9 | 50 | PASS |
| 104 | 0.1 | 5 | 8.9 | 12.9 | 50 | PASS |
| 104 | 0.05 | 2.5 | 9.2 | 11.7 | 50 | PASS |
| 104 | 0.02 | 1 | 11.8 | 0.8 | 50 | PASS |
| 0 | 0.02 | 1 | 11.8 | 0.8 | 0 | PASS |



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|------|--------|----------|-------|----------|------|------------------------|------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 6/14 |
| Iss. | Change | Date | Name | | | | |

- **TSP140-112**
Input Voltage V=115VAC
Output: V=12VDC/7.5A

| Voltage Sag | Duration | | Output Voltage | Percent of Nominal | | |
|-------------|----------|--------|----------------|--------------------|--------------|--------|
| [V] | [s] | Cycles | [V] | DUT 50Hz [%] | SEMI F47 [%] | Result |
| 92 | 1 | 50 | 12.0 | 0.0 | 80 | PASS |
| 92 | 0.5 | 25 | 12.0 | 0.0 | 80 | PASS |
| 80.5 | 0.5 | 25 | 11.1 | 3.8 | 70 | PASS |
| 80.5 | 0.25 | 12.5 | 11.1 | 3.8 | 70 | PASS |
| 80.5 | 0.2 | 12.5 | 11.1 | 3.8 | 70 | PASS |
| 57.5 | 0.2 | 10 | 8.6 | 14.2 | 50 | PASS |
| 57.5 | 0.15 | 7.5 | 8.6 | 14.2 | 50 | PASS |
| 57.5 | 0.1 | 5 | 8.6 | 14.2 | 50 | PASS |
| 57.5 | 0.05 | 2.5 | 9.0 | 12.5 | 50 | PASS |
| 57.5 | 0.02 | 1 | 12.0 | 0.0 | 50 | PASS |
| 0 | 0.02 | 1 | 12.0 | 0.0 | 0 | PASS |

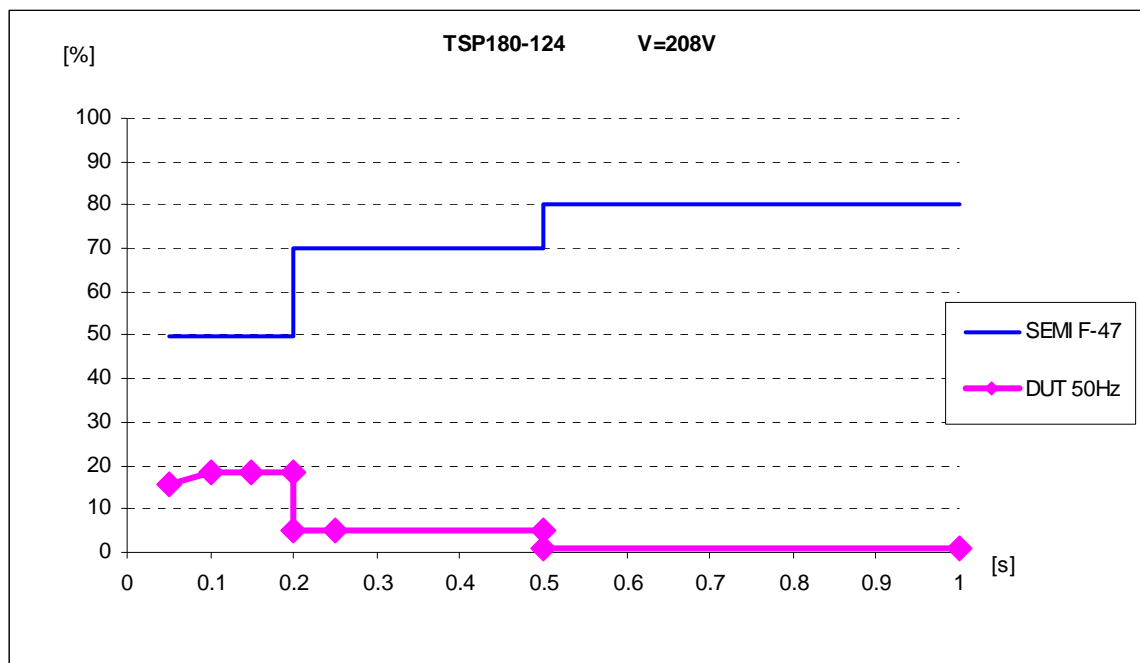


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|------|--------|----------|-------|----------|------|------------------------|------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 7/14 |
| Iss. | Change | Date | Name | | | | |

3.4 TSP180-124

- Input Voltage V=208VAC
Output: V=24VDC/7.5A

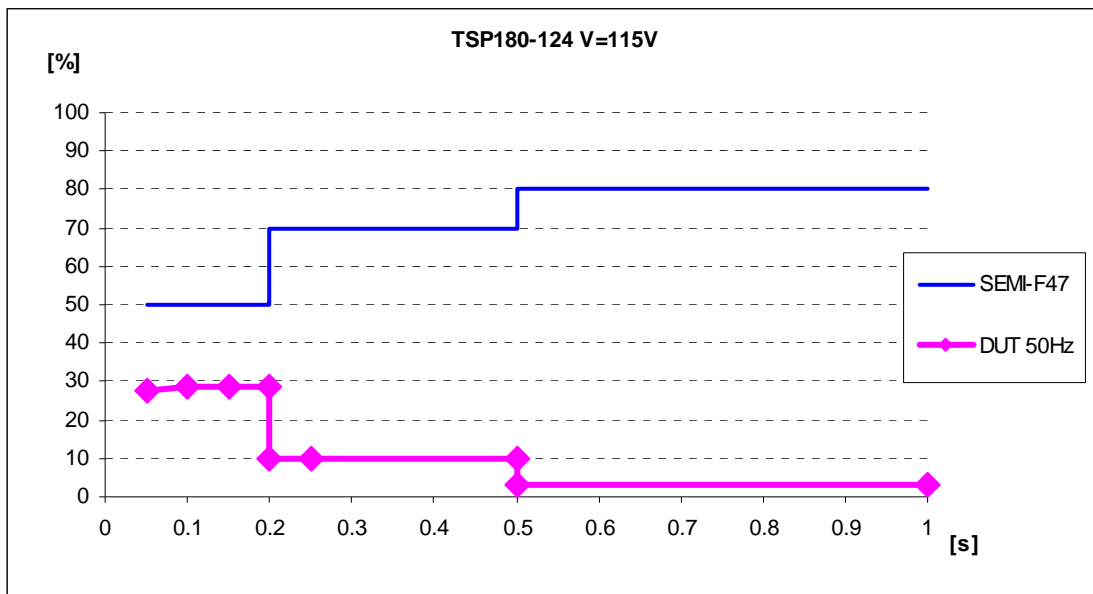
| Voltage Sag [V] | Duration [s] | | Output Voltage [V] | Percent of Nominal | | Result |
|-----------------|--------------|--------|--------------------|--------------------|--------------|--------|
| | | Cycles | | DUT 50Hz [%] | SEMI F47 [%] | |
| 166.4 | 1 | 50 | 23.8 | 0.8 | 80 | PASS |
| 166.4 | 0.5 | 25 | 23.8 | 0.8 | 80 | PASS |
| 145.6 | 0.5 | 25 | 22.8 | 5.0 | 70 | PASS |
| 145.6 | 0.25 | 12.5 | 22.8 | 5.0 | 70 | PASS |
| 145.6 | 0.2 | 12.5 | 22.8 | 5.0 | 70 | PASS |
| 104 | 0.2 | 10 | 19.6 | 18.3 | 50 | PASS |
| 104 | 0.15 | 7.5 | 19.6 | 18.3 | 50 | PASS |
| 104 | 0.1 | 5 | 19.6 | 18.3 | 50 | PASS |
| 104 | 0.05 | 2.5 | 20.2 | 15.8 | 50 | PASS |
| 104 | 0.02 | 1 | 22.2 | 7.5 | 50 | PASS |
| 0 | 0.02 | 1 | 22.2 | 7.5 | 0 | PASS |



| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 8/14 |
| Iss. | Change | Date | Name | | | | |

- **TSP180-124**
Input Voltage V=115VAC
Output: V=24VDC/7.5A

| Voltage Sag | Duration | | Output Voltage | Percent of Nominal | | |
|-------------|----------|--------|----------------|--------------------|--------------|--------|
| [V] | [s] | Cycles | [V] | DUT 50Hz [%] | SEMI F47 [%] | Result |
| 92 | 1 | 50 | 23.3 | 2.9 | 80 | PASS |
| 92 | 0.5 | 25 | 23.3 | 2.9 | 80 | PASS |
| 80.5 | 0.5 | 25 | 21.6 | 10.0 | 70 | PASS |
| 80.5 | 0.25 | 12.5 | 21.6 | 10.0 | 70 | PASS |
| 80.5 | 0.2 | 12.5 | 21.6 | 10.0 | 70 | PASS |
| 57.5 | 0.2 | 10 | 17.1 | 28.8 | 50 | PASS |
| 57.5 | 0.15 | 7.5 | 17.1 | 28.8 | 50 | PASS |
| 57.5 | 0.1 | 5 | 17.1 | 28.8 | 50 | PASS |
| 57.5 | 0.05 | 2.5 | 17.4 | 27.5 | 50 | PASS |
| 57.5 | 0.02 | 1 | 22.8 | 5.0 | 50 | PASS |
| 0 | 0.02 | 1 | 22.8 | 5.0 | 0 | PASS |

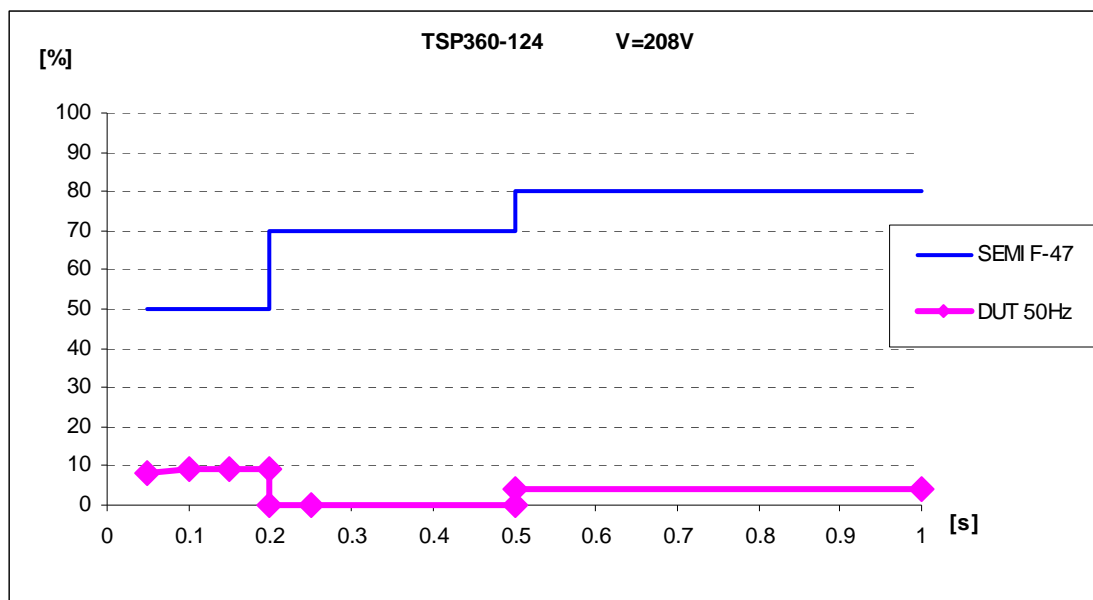


| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 9/14 |
| Iss. | Change | Date | Name | | | | |

3.5 TSP360-124

- Input Voltage V=208VAC
Output: V=24VDC/15A

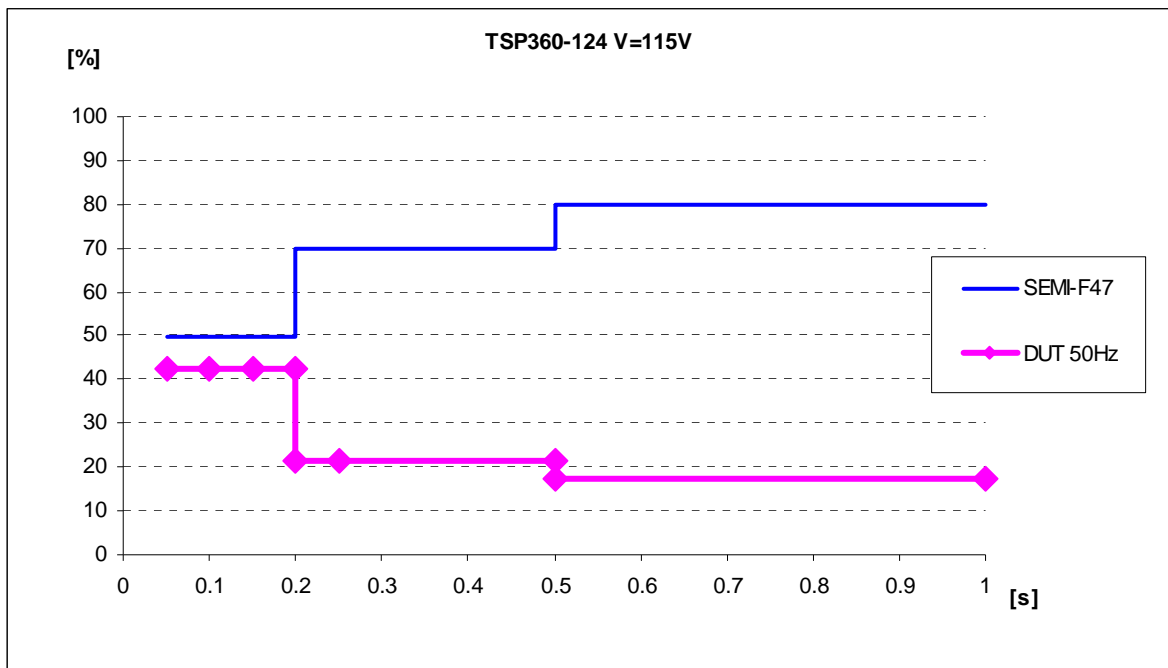
| Voltage Sag | Duration | | Output Voltage | Percent of Nominal | | Result |
|-------------|----------|--------|----------------|--------------------|--------------|--------|
| [V] | [s] | Cycles | [V] | DUT 50Hz [%] | SEMI F47 [%] | |
| 166.4 | 1 | 50 | 23.0 | 4.2 | 80 | PASS |
| 166.4 | 0.5 | 25 | 23.0 | 4.2 | 80 | PASS |
| 145.6 | 0.5 | 25 | 24.0 | 0.0 | 70 | PASS |
| 145.6 | 0.25 | 12.5 | 24.0 | 0.0 | 70 | PASS |
| 145.6 | 0.2 | 12.5 | 24.0 | 0.0 | 70 | PASS |
| 104 | 0.2 | 10 | 21.8 | 9.2 | 50 | PASS |
| 104 | 0.15 | 7.5 | 21.8 | 9.2 | 50 | PASS |
| 104 | 0.1 | 5 | 21.8 | 9.2 | 50 | PASS |
| 104 | 0.05 | 2.5 | 22.0 | 8.3 | 50 | PASS |
| 104 | 0.02 | 1 | 22.4 | 6.7 | 50 | PASS |
| 0 | 0.02 | 1 | 22.4 | 6.7 | 0 | PASS |



| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|-------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 10/14 |
| Iss. | Change | Date | Name | | | | |

- **TSP360-124**
Input Voltage V=115VAC
Output: V=24VDC/15A

| Voltage Sag | Duration | | Output Voltage | Percent of Nominal | | |
|-------------|----------|--------|----------------|--------------------|--------------|--------|
| [V] | [s] | Cycles | [V] | DUT 50Hz [%] | SEMI F47 [%] | Result |
| 50 | 1 | 50 | 19.8 | 17.5 | 80 | PASS |
| 92 | 0.5 | 25 | 19.8 | 17.5 | 80 | PASS |
| 80.5 | 0.5 | 25 | 18.8 | 21.7 | 70 | PASS |
| 80.5 | 0.25 | 12.5 | 18.8 | 21.7 | 70 | PASS |
| 80.5 | 0.2 | 12.5 | 18.8 | 21.7 | 70 | PASS |
| 57.5 | 0.2 | 10 | 13.8 | 42.5 | 50 | PASS |
| 57.5 | 0.15 | 7.5 | 13.8 | 42.5 | 50 | PASS |
| 57.5 | 0.1 | 5 | 13.8 | 42.5 | 50 | PASS |
| 57.5 | 0.05 | 2.5 | 13.8 | 42.5 | 50 | PASS |
| 57.5 | 0.02 | 1 | 19.2 | 20.0 | 50 | PASS |
| 0 | 0.02 | 1 | 19.2 | 20.0 | 0 | PASS |

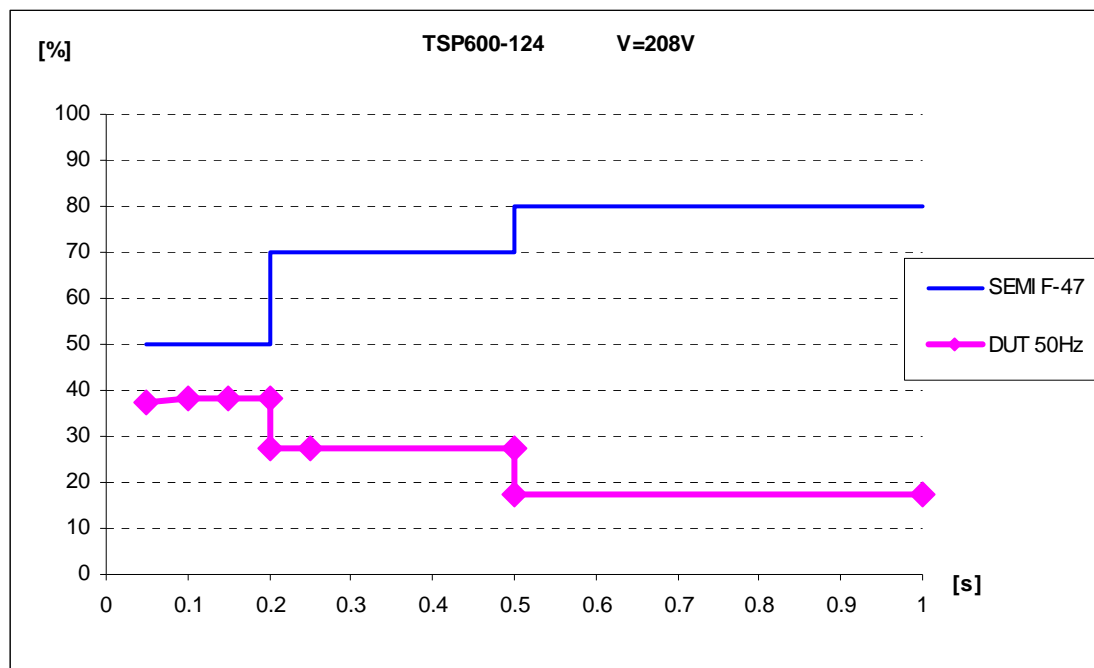


| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|-------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 11/14 |
| Iss. | Change | Date | Name | | | | |

3.6 TSP600-124

- Input Voltage V=208VAC
Output: V=24VDC/25A

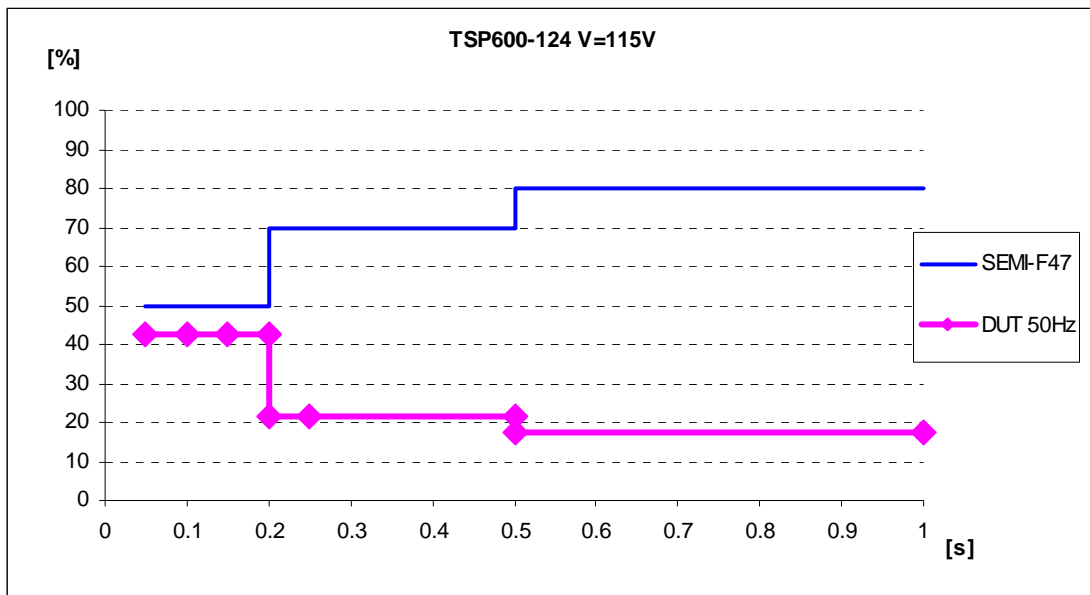
| Voltage Sag | Duration | | Output Voltage | Percent of Nominal | | |
|-------------|----------|--------|----------------|--------------------|--------------|--------|
| [V] | [s] | Cycles | [V] | DUT 50Hz [%] | SEMI F47 [%] | Result |
| 166.4 | 1 | 50 | 19.8 | 17.5 | 80 | PASS |
| 166.4 | 0.5 | 25 | 19.8 | 17.5 | 80 | PASS |
| 145.6 | 0.5 | 25 | 17.4 | 27.5 | 70 | PASS |
| 145.6 | 0.25 | 12.5 | 17.4 | 27.5 | 70 | PASS |
| 145.6 | 0.2 | 12.5 | 17.4 | 27.5 | 70 | PASS |
| 104 | 0.2 | 10 | 14.8 | 38.3 | 50 | PASS |
| 104 | 0.15 | 7.5 | 14.8 | 38.3 | 50 | PASS |
| 104 | 0.1 | 5 | 14.8 | 38.3 | 50 | PASS |
| 104 | 0.05 | 2.5 | 15.0 | 37.5 | 50 | PASS |
| 104 | 0.02 | 1 | 19.6 | 18.3 | 50 | PASS |
| 0 | 0.02 | 1 | 19.6 | 18.3 | 0 | PASS |



| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|-------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 12/14 |
| Iss. | Change | Date | Name | | | | |

- **TSP600-124**
Input Voltage V=115VAC
Output: V=24VDC/25A

| Voltage Sag | Duration | | Output Voltage | Percent of Nominal | | |
|-------------|----------|--------|----------------|--------------------|--------------|--------|
| [V] | [s] | Cycles | [V] | DUT 50Hz [%] | SEMI F47 [%] | Result |
| 92 | 1 | 50 | 19.8 | 17.5 | 80 | PASS |
| 92 | 0.5 | 25 | 19.8 | 17.5 | 80 | PASS |
| 80.5 | 0.5 | 25 | 17.2 | 28.3 | 70 | PASS |
| 80.5 | 0.25 | 12.5 | 17.2 | 28.3 | 70 | PASS |
| 80.5 | 0.2 | 12.5 | 17.2 | 28.3 | 70 | PASS |
| 57.5 | 0.2 | 10 | 12.8 | 46.7 | 50 | PASS |
| 57.5 | 0.15 | 7.5 | 12.8 | 46.7 | 50 | PASS |
| 57.5 | 0.1 | 5 | 12.8 | 46.7 | 50 | PASS |
| 57.5 | 0.05 | 2.5 | 13.2 | 45.0 | 50 | PASS |
| 57.5 | 0.02 | 1 | 20.8 | 13.3 | 50 | PASS |
| 0 | 0.02 | 1 | 20.8 | 13.3 | 0 | PASS |



| | | | | | | | |
|------|--------|----------|-------|----------|------|------------------------|-------------------|
| | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | SEMI F47 Compliance | Sheet/of 13/14 |
| Iss. | Change | Date | Name | | | | |

4. Conclusion

All of the units were tested at 208V and at 115V at full nominal resistive load. The deviation of the output voltage is noted in the tables (DUT50 Hz).

For all tests the TSP units passed F-47 standard.

They passed also the recommended F-47 tests for sag duration below 50ms as indicated in the tables.

At all conditions the units continued to deliver power to the output without any restart. The deviation of the output voltage was always smaller then the deviation of the input AC.

| | | | | | | | | |
|------|--------|----------|-------|-------|----------|------|------------------------|-------------------|
| | | | | | Date | Name | TEST REPORT TSP SERIES | |
| | | | | Prep. | 18.10.05 | S.D. | | |
| 1 | | 28.02.13 | Wendy | | | | SEMI F47 Compliance | Sheet/of 14/14 |
| Iss. | Change | Date | Name | | | | | |