



Equipment Tested

	<p>Fixture Manufacturer: ETC</p> <p>Fixture Model Number: Navis FTW</p> <p>Device Type: Fixture (with integral driver)</p> <p>Dimming Type: Low Voltage (with transformer)</p> <p>Fixture Voltage: 48VDC</p> <p>Nominal Power: 16W</p> <p>Quantity Tested Per Transformer: 1</p>
	<p>Transformer Manufacturer: ETC</p> <p>Transformer Model Number: Navis Sidekick</p> <p>Transformer Voltage: 120V</p> <p>Maximum Power Rating: 20W</p> <p>Measured Power (Lamp+ Transformer): 20.3W</p> <p>Quantity Tested: 1</p> <p>Other Notes</p>

Results Summary

Best ETC Performer: ERP 300W Dimmer

Performance: Mostly smooth and stable dimming down to 0.01%.

- See test results for more details on performance with this and other dimmers, as well as which settings to use for best performance.

Testing Equipment

- Tektronix TBS1064 Oscilloscope
- Fluke 80i-110s Current Probe
- Tektronix P5200A High Voltage Probe
- UDT 211 Photometric Sensor
- UDT TRAMP Transimpedance Amplifier
- NI USB-6002 Data Acquisition Interface
- Custom LabVIEW Software
- Custom Inrush Test Device

Results Summary

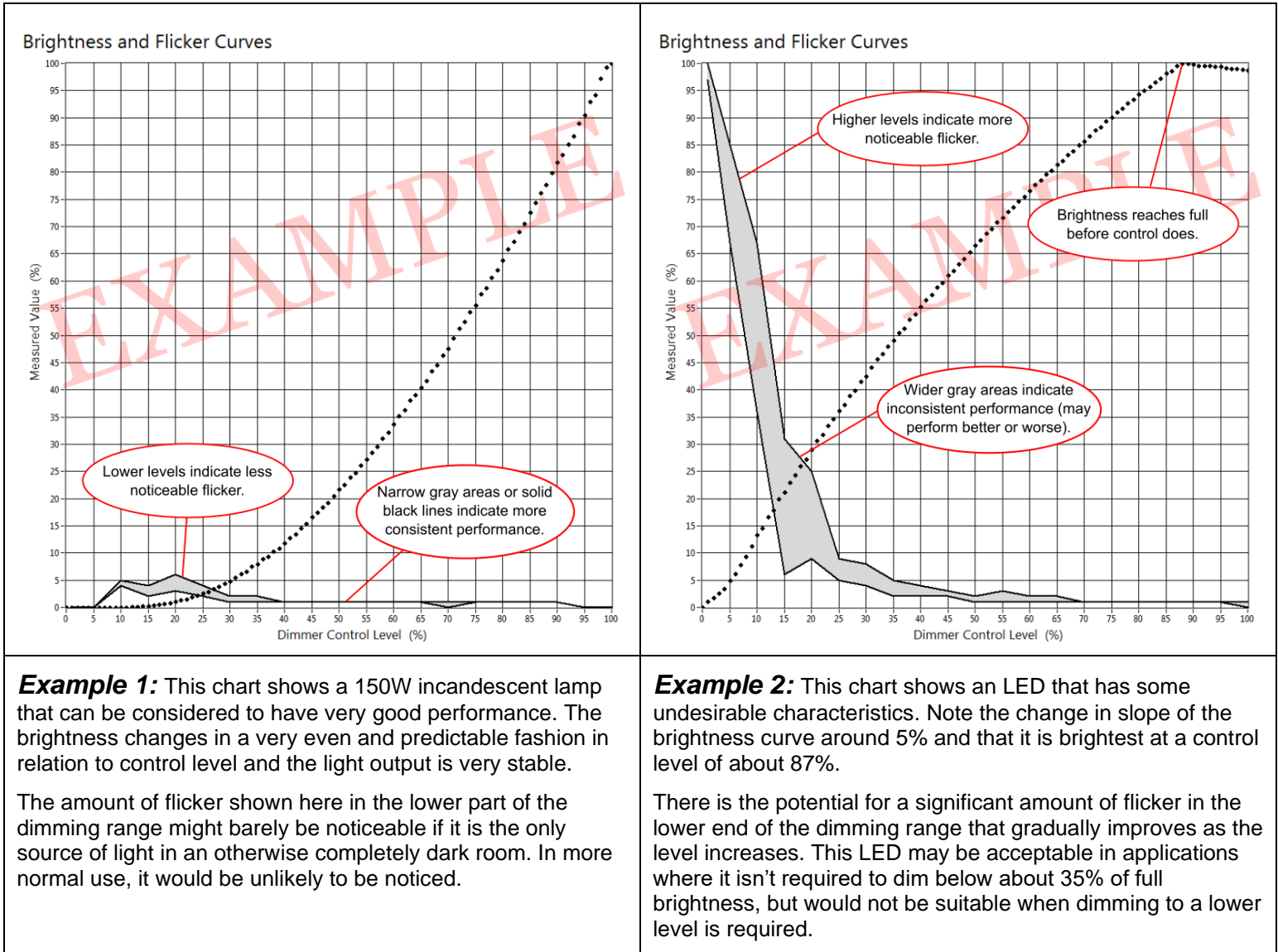
<i>Dimmer Name</i>	<i>Min Stable Level</i>	<i>Fade Performance</i>
<i>Sensor 3 with D20 Module</i>	1.13%	A
<i>Sensor 3 with ELV10-S Module</i>	0.04%	A
<i>Sensor 3 with LED10 Module (PhaseAdept)</i>	0.03%	A
<i>Unison DRd with D20 Module</i>	0.17%	A
<i>Unison DRd with ELV10 Module</i>	0.01%	A
<i>Unison DRd with LED10 (PhaseAdept)</i>	0.01%	A
<i>Unison Legacy DR with D20 Module</i>	0.18%	A
<i>Unison Legacy DR with LED10 (PhaseAdept)</i>	25.4%	A
<i>ERP 300W Dimmer</i>	0.01%	A
<i>Echo ELVD G-2 600W Dimmer</i>	0.01%	A
<i>Unison Foundry 600W Dimmer</i>	0.04%	A

Fade Grades Summary

A	Smooth and continuous (up and down) through the entire dimming range; no noticeable bump when fading to or from off.
B	Smooth and continuous dimming (up and down) through the entire dimming range; minimally noticeable but not disruptive bump when fading to or from off. Acceptable bump is based on the specified minimum level of the driver or fixture.
C	Minor stepping during fading (up or down) or noticeable bump (outside of specified fixture or driver range) when fading to or from off.
D	Inconsistent or irregular fade performance, but otherwise compatible
NR	Does not fade or is incompatible with the dimmer.

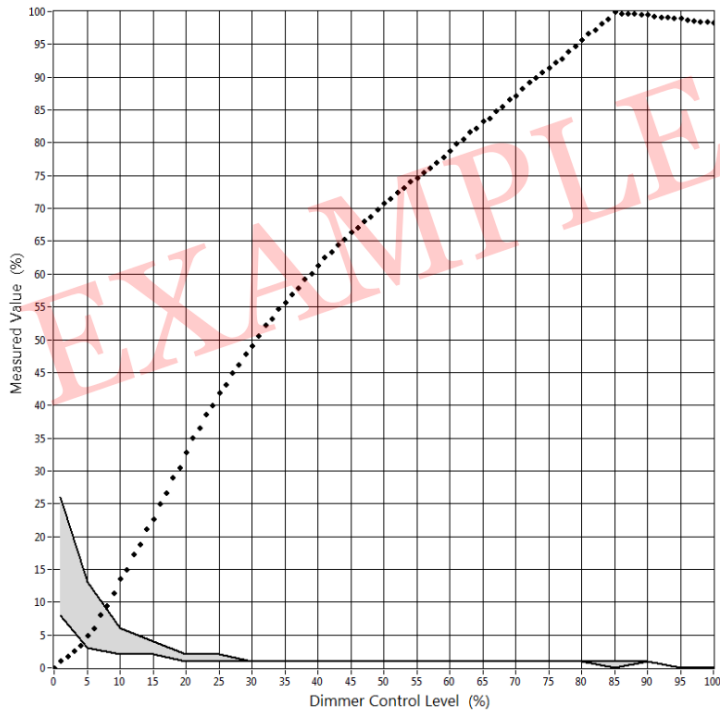
How to Interpret Dimming Performance Results

- The dotted line in the charts below represents brightness measured at 1% control level increments, and is shown as a percent of the brightest level measured.
- The solid lines show the probability that a person will notice undesirable variations in the light level (flicker/shimmer/flashing) measured at 5% control level increments. Since flicker is often intermittent, this test is run three times with the highest and lowest values for each control level plotted and the space between filled with gray.
- A wider gray area means the lamp behaved very differently from one test to the next. A thin line means the lamp behaved the same in all tests. Note that lamps with inconsistent behavior may behave better or worse in actual use than what is shown here.



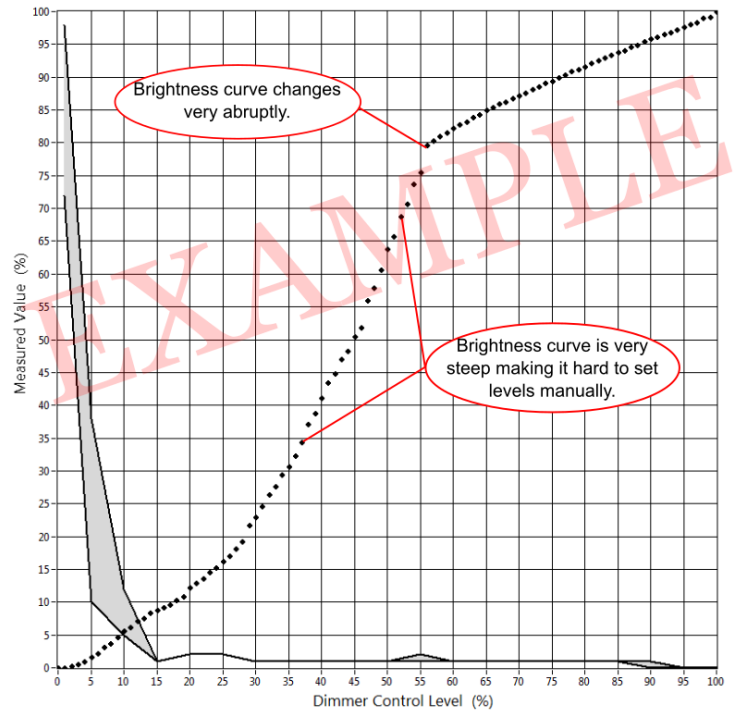
How to Interpret Dimming Performance Results (continued)

Brightness and Flicker Curves



Example 3: This LED has a similar brightness curve as example 2, but has less flicker overall. It could be acceptable in cases where dimming below about 20-25% of full brightness is not required.

Brightness and Flicker Curves



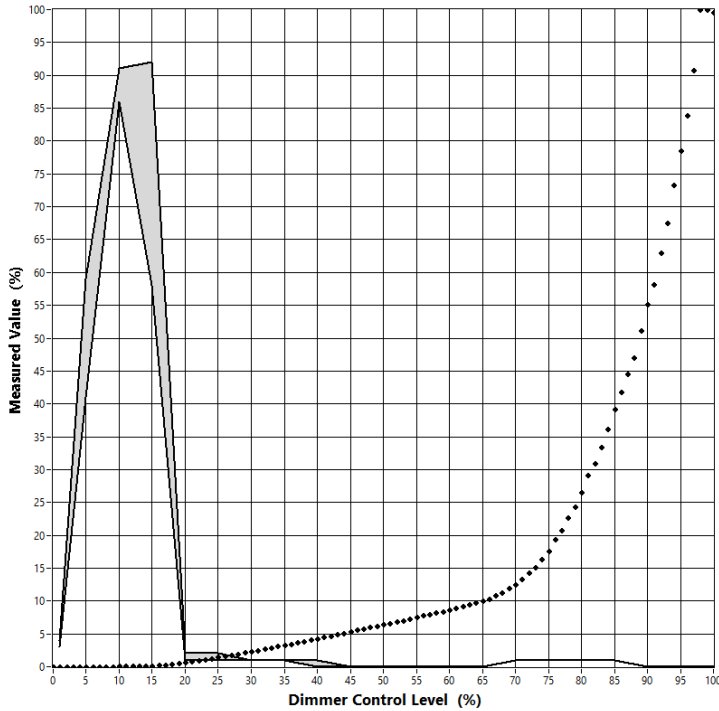
Example 4: This LED has a very irregular brightness curve and that could make it difficult to accurately set a desired level. It also has flicker in the lower end of the dimming range, but gets more stable above about 9% of full brightness.

Additional Information:

- The LEDs are set to full for 30 minutes at the start of the automated tests in order to let them warm up to normal operating conditions. Behavior that only happens when the LED is cold may not be captured by these tests.
- The ability of a human eye to perceive flicker is dependent upon the amount of flicker relative to the total amount of light in its field of vision. An application where an LED is used as an accent will be less sensitive to flicker than one where the LED is the primary source of light in a room.
- The following pages show test results for many of our dimming products. If you are using a product not listed in this report, please contact ETC Application Engineering for guidance on which product shown here will be most similar to the one you are using.

Sensor 3 D20

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 1.13%

Fade Performance: Smooth.

Dimmer Settings: Normal firing, with smoothing control, a linear curve, 1% threshold, a min scale of 24%, no regulation, and DC Output Prevent on.

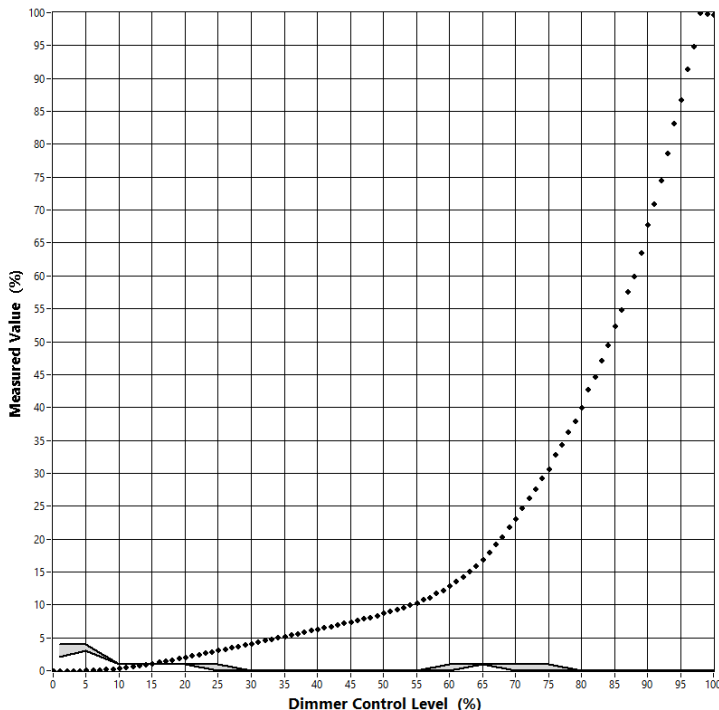
Max Quantity per Circuit: 118

Capacitive Effects: N/A

Other Notes: N/A

Sensor 3 ELV10-S

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.04%

Fade Performance: Smooth.

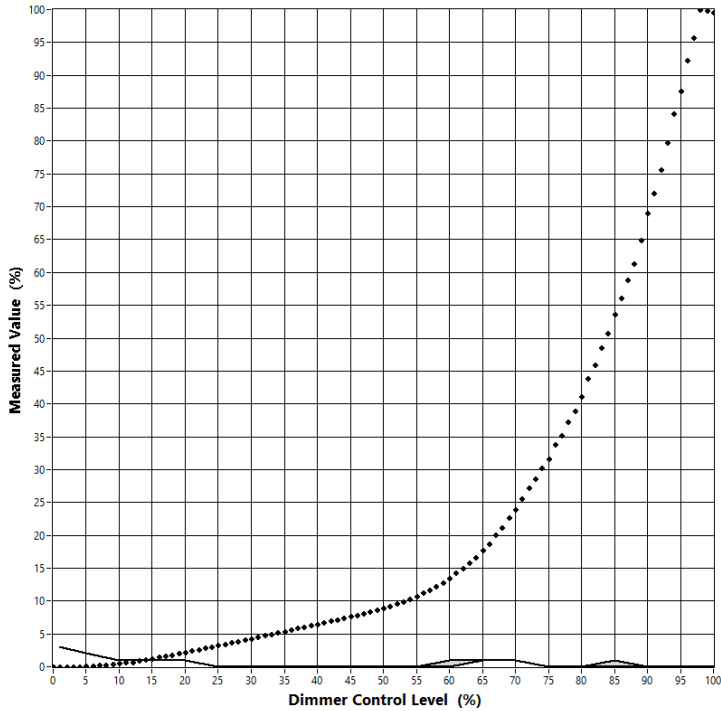
Dimmer Settings: Rack mode, Reverse firing, with smoothing control, a linear curve, 1% threshold, a min scale of 27%, no regulation, and DC Output Prevent on.

Max Quantity per Circuit: 59

Other Notes: N/A

Sensor 3 LED10

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.03%

Fade Performance: Smooth.

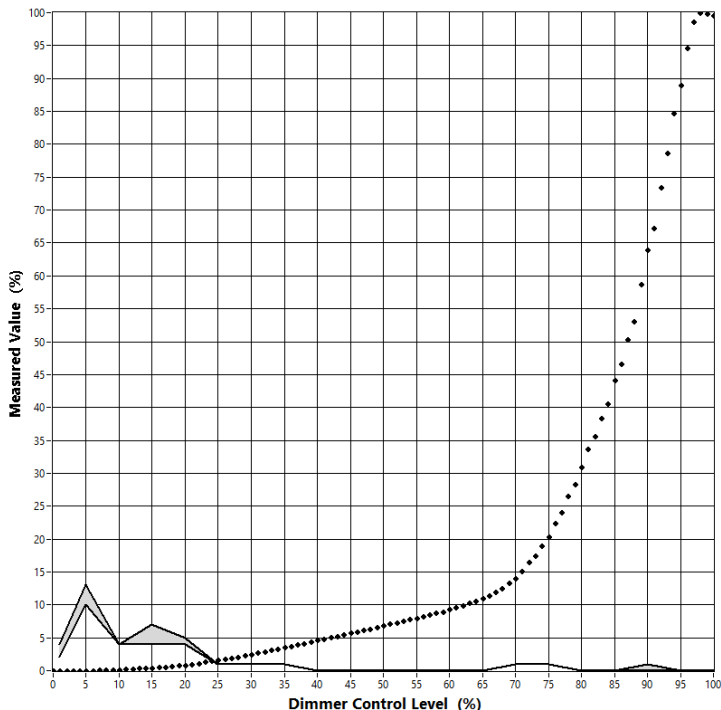
Dimmer Settings: Reverse firing, with smoothing control, a linear curve, 1% threshold, a min scale of 27%, no regulation, and DC Output Prevent on.

Max Quantity per Circuit: 59

Other Notes: N/A

DRd D20

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.17%

Fade Performance: Smooth.

Dimmer Settings: LED smoothing forward phase mode, with a linear curve, 0% threshold, regulation off, a min scale of 36V, and transformer mode on.

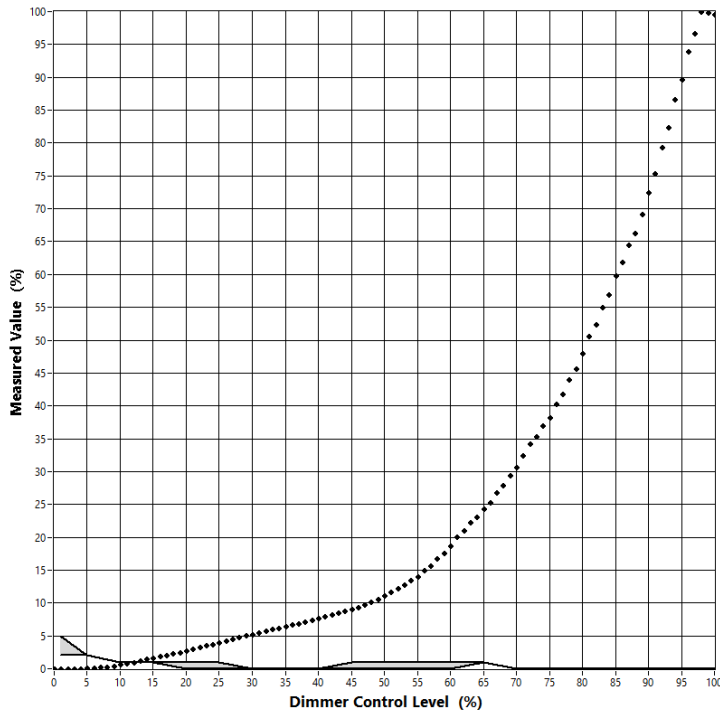
Max Quantity per Circuit: 118

Capacitive Effects: N/A

Other Notes: N/A

DRd ELV10

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.01%

Fade Performance: Smooth.

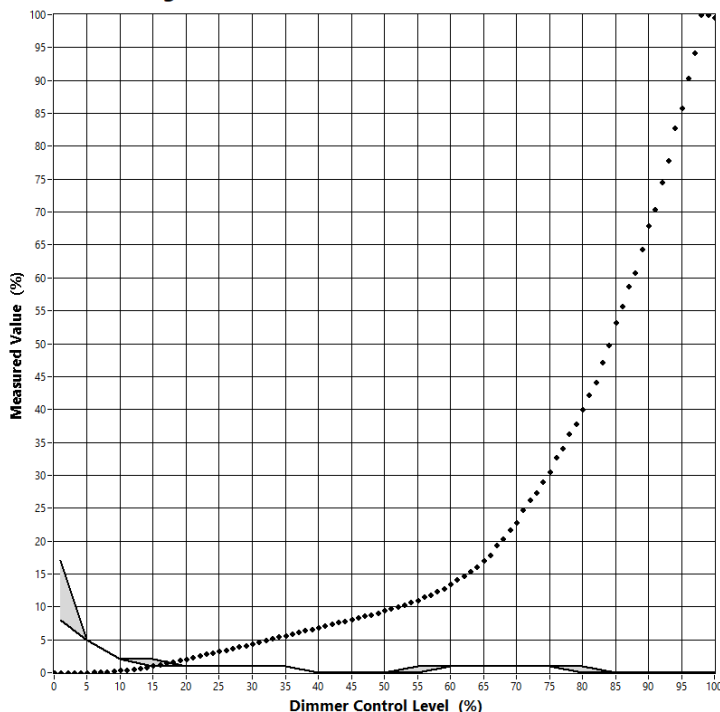
Dimmer Settings: LED smoothing Reverse phase mode, with a linear curve, 0% threshold, regulation off, a min scale of 38V, and transformer mode on.

Max Quantity per Circuit: 59

Other Notes: N/A

DRd LED10

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.01%

Fade Performance: Smooth.

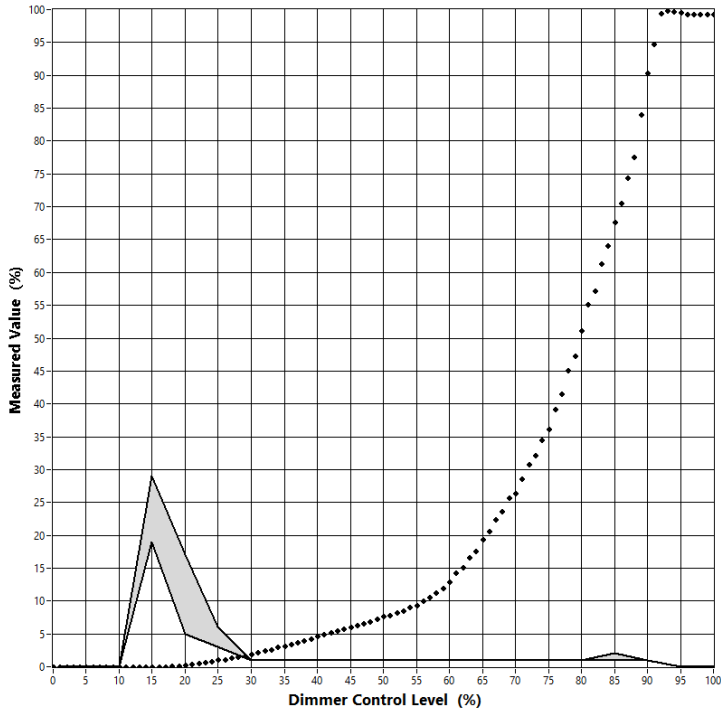
Dimmer Settings: Rack mode, LED smoothing Reverse phase mode, with a linear curve, 0% threshold, regulation off, a min scale of 42V, and transformer mode on.

Max Quantity per Circuit: 59

Other Notes: N/A

Legacy Unison D20

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.18%

Fade Performance: Smooth.

Dimmer Settings: Incandescent

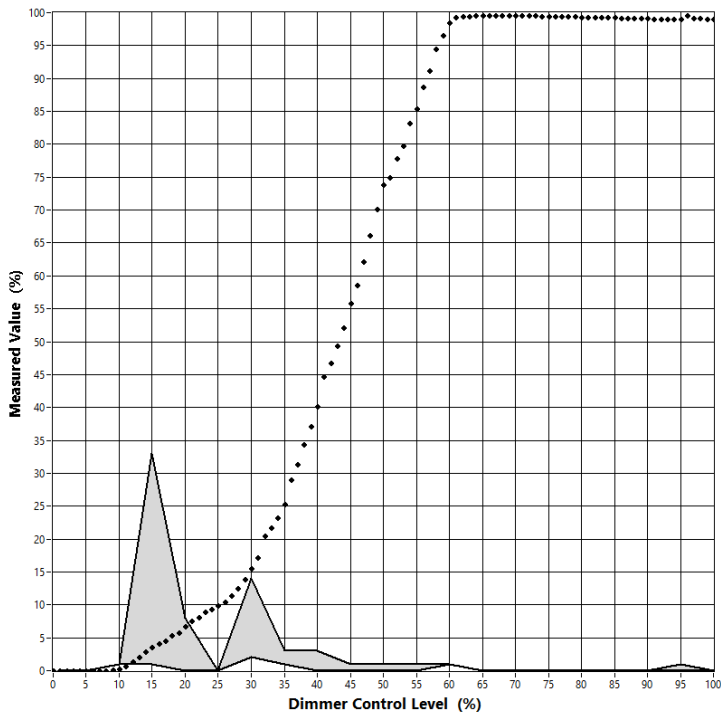
Max Quantity per Circuit: 118

Capacitive Effects: LegacyD20CapacitiveEffectsValue

Other Notes: N/A

Legacy Unison LED10

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 25.4%

Fade Performance: Smooth.

Dimmer Settings: Local control, Reverse phase, a min scale of 10%, Incandescent

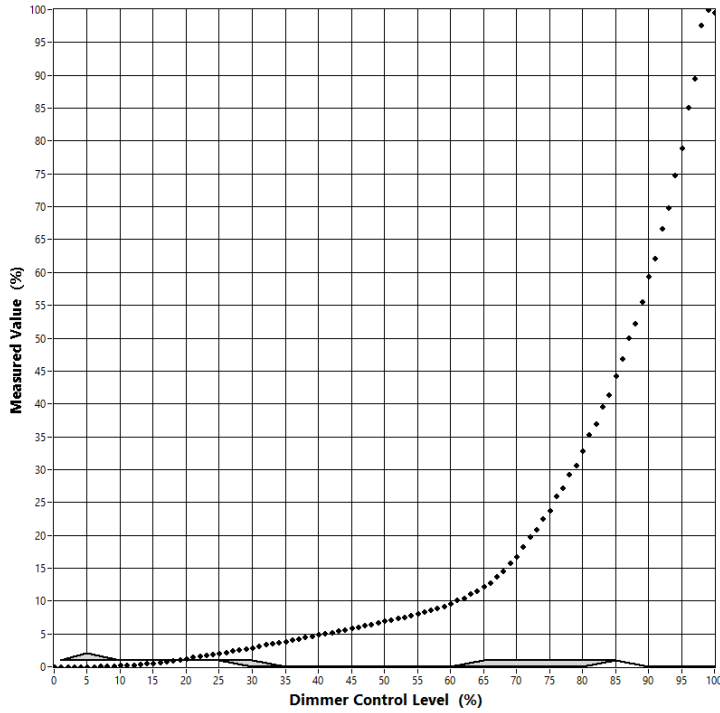
Max Quantity per Circuit: 59

Other Notes: N/A

ERP 300W Dimmer

Best ETC Performer

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.01%

Fade Performance: Smooth.

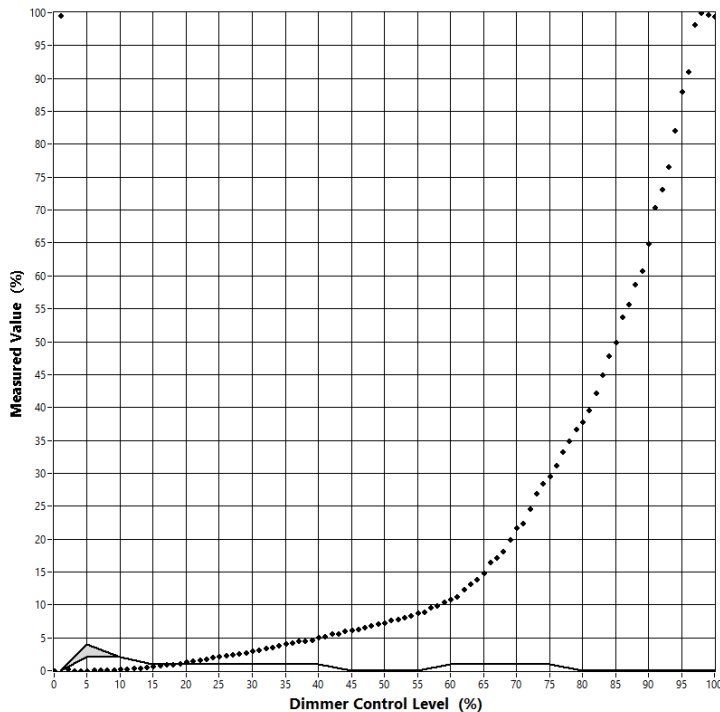
Dimmer Settings: Auto with 33% Min Scale.

Max Quantity per Circuit: 15

Other Notes: N/A

Echo ELVD G-2

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.01%

Fade Performance: Smooth.

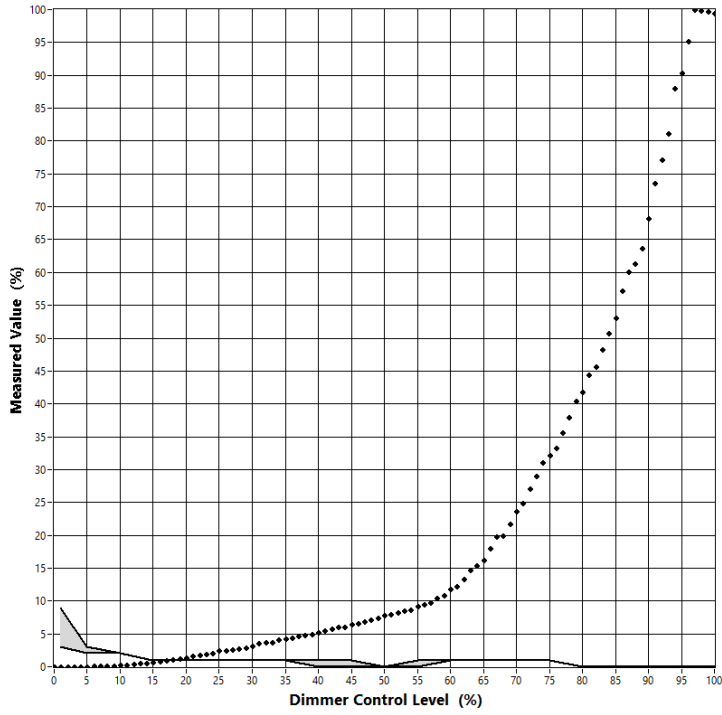
Dimmer Settings: Auto curve, fluorescent mode with a min scale of 30%.

Max Quantity per Circuit: 30

Other Notes: N/A

Unison Foundry Dimmer

Static Level Brightness and Flicker Curves



Minimum Stable Brightness: 0.04%

Fade Performance: Smooth.

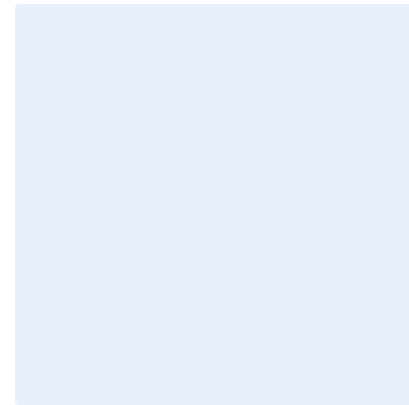
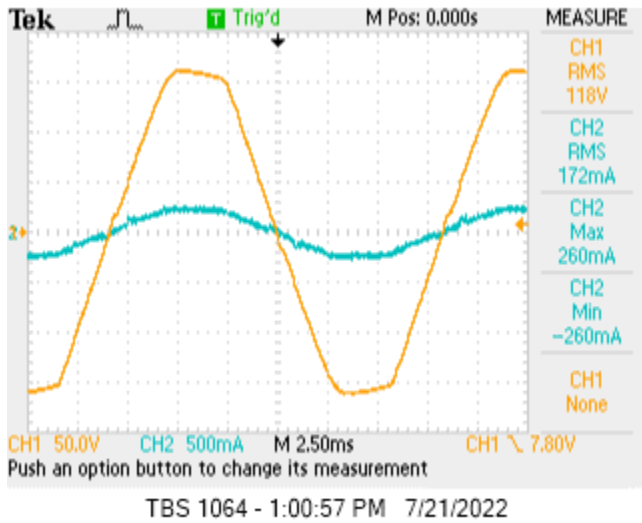
Dimmer Settings: Auto with a linear curve and a minimum level of 30%.

Max Quantity per Circuit: 30

Other Notes: N/A

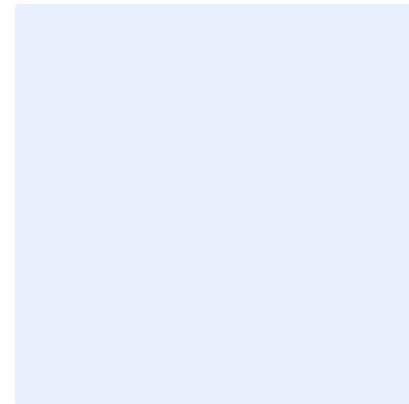
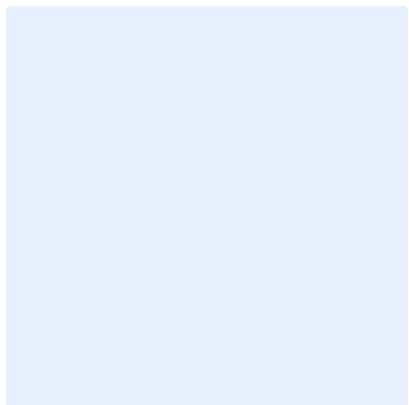
Capacitive Effects

- The fixture was tested for capacitive effects (which can cause SCR misfiring) by observing the relationship between the current and voltage waveforms.
- Voltage is on Channel 1 in orange, and current is on Channel 2 in teal.



1 Fixture, 1 Transformer, 20.3W

X Fixtures, X Transformers, XW



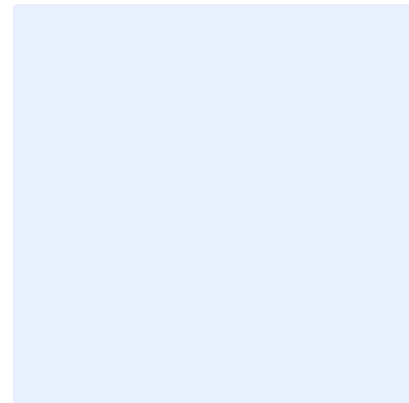
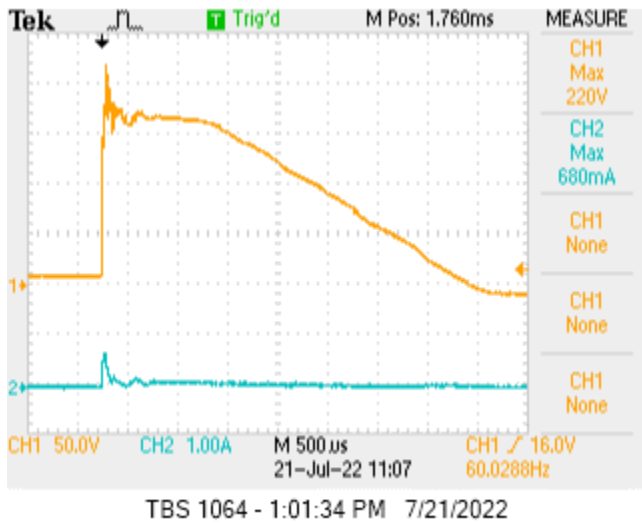
X Fixtures, X Transformers, XW

X Fixtures, X Transformers, XW

Capacitive effects were not observed with this fixture.

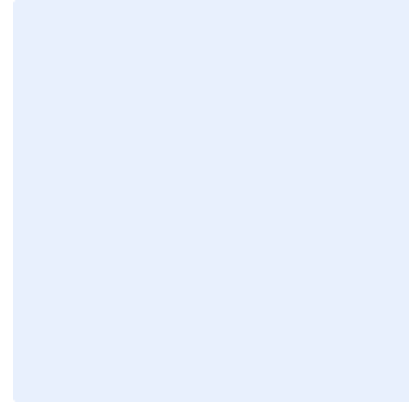
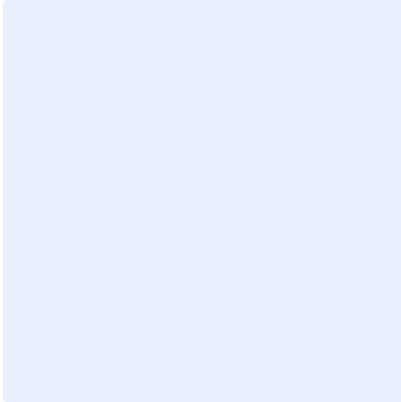
Voltage Distortion Testing

- The fixture was tested for voltage distortion that could result from an interaction with the choke in a D20 module.
- In some products this has been observed to cause poor dimming performance or the possibility of premature LED failure.



1 Fixture, 1 Transformer, D20 at 50%

X Fixtures, X Transformers, D20 at 50%



X Fixtures, X Transformers, D20 at 50%

X Fixtures, X Transformers, D20 at 50%

The type of voltage distortion observed here may cause problems with D20 dimming if it continues to get worse as more fixtures are added to the circuit.