



INDUSTRIAL TESTING LABORATORY

Report No.: 200914-08F

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TEST REPORT

Report Date: 11 November 2020

Test Component: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps
One (1) Flash Pattern (Single Pulse)Submitted by: ENGESIG INDÚSTRIA E COMÉRCIO LTDA
SÃO FRANCISCO - MOGI DAS CRUZES, SP. - CEP: 08735-285Test Laboratory: Calcoast ☐ ITL
San Leandro, CA 94577Samples Tested: One (1) each Micro D-MAX04x-CL and one (1) red &
one (1) blue Micro D-MAX04x-SL submitted 14 Sept 2020**SUMMARY**

Specifications: SAE J595 MAR14 and J845 FEB19

Photometric Test ☐

SAE J595 MAR14 Class 1 (SAE W-1)

Micro D-MAX04x-CL (Red, Blue, White & Amber)Passed

Micro D-MAX04x-SL (Red & Blue)Passed

Note: Clear Lens Red exceeds 500 Cd at HV.

SAE J845 FEB19 Class 1 [SAE WS3-1(xx)]

Micro D-MAX04x-CL [Red($\pm 30^\circ$), Blue($\pm 25^\circ$), White($\pm 20^\circ$), Amber($\pm 25^\circ$)] .PassedFlash Characteristics ☐

SAE J595 & J845Passed

Environmental (Flash Rate) Tests - SAE J595 & J845.....Passed

Mechanical Tests - SAE J575 AUG18

(4.2 Vibration, 4.5 Warpage, 4.9 H₂O, 4.11 Dust, 4.12 NaCl).....Passed

(4.14 Chemical Resistance)Passed

Color Test - SAE J578 APR20.....Passed

Lens Material - SAE J576 AUG17.....Unknown

Signature of Responsible Laboratory Official:

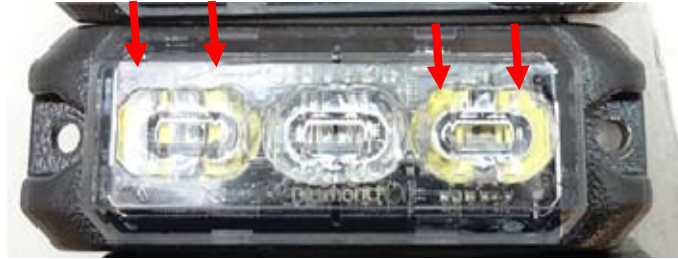
Mark A. Evans
Laboratory Director

DESCRIPTION SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Submitted directional warning lamps contained four (4) LEDs with two LEDs behind two outboard optical elements.

See photo below.

**LAMP DESCRIPTION****MARKINGS:**

Lens: "DIAMOND", "DIAMOND"

Reflector: N/A

Housing/Base: None

DESCRIPTION:**LENS:**

Material: Polycarbonate, Clear
Lens material formulation, pigment, and coating must comply with SAE J576 AUG17.

Method of Mounting: Unknown

Gasket: None

HOUSING:

Material: Metal

Method of Mounting: Two (2) screws to vehicle

Gasket: None Submitted

LIGHT SOURCE:

Type: LED

Quantity: 4 per module

Color: Red, Blue, Amber or White LED

Voltage: 12V

Current: Red - 0.56Apeak per module
Blue - 0.68Apeak per module
Amber - 0.67Apeak per module
White - 0.68Apeak per module

PHOTOMETRIC SUMMARY SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

PHOTOMETRIC TESTS

Specification(s): SAE J595 MAR14 and J845 FEB19

Tests performed by: MAE

Date: 21-24 October 2020

Meets requirements for:

SAE J595 MAR14 Class 1 (SAE W-1)

Micro D-MAX04x-CL (Red, Blue, White & Amber)

Micro D-MAX04x-SL (Red & Blue)

SAE J845 FEB19 Class 1 [SAE WS3-1(xx)]

Micro D-MAX04x-CL [Red($\pm 30^\circ$), Blue($\pm 25^\circ$), White($\pm 20^\circ$), Amber($\pm 25^\circ$)

NIST Reference Detector: P181-2

Test distance: 100 feet

Device operated at 12.80V until 3% stabilization (SAE J595/J845 methodology).

Devices were tested in FP1 simultaneous single mode for SAE

Lamp Operation (Simultaneous Flash)

The modules are designed to have the equivalent peak current and peak luminous intensity (Candela) in each simultaneous flash pattern at start up. The peak intensity degradation is dependent on the relative power of the flash pattern mode (the greater the power the greater the degradation). Peak luminous intensity was determined with the lamps in FP1 Single Pulse flash pattern. These results were then compared to requirements for SAE Class determination.

The Optical Power (Cd-sec/min) differs for each of the flash patterns and is proportional to the time degradation, flash pattern frequency and total activation time (sum of the pulses). Although the devices have only one flash pattern (Single Pulse) the frequency and duty cycle differed.

Color	Lens Type	f (Hz)	Active (Sec)	Duty Cycle (%)
Red	Clear	1.642	0.204	33.5
Blue	Clear	1.908	0.211	40.2
White	Clear	1.971	0.204	40.2
Amber	Clear	1.949	0.206	40.2
Red	Smoke	1.618	0.207	33.5
Blue	Smoke	1.930	0.208	40.2

Flash Pattern Requirements

SAE J845 & J595 Req. (see 3.10 and 6.7)

Flash rate = 1-4 Hz

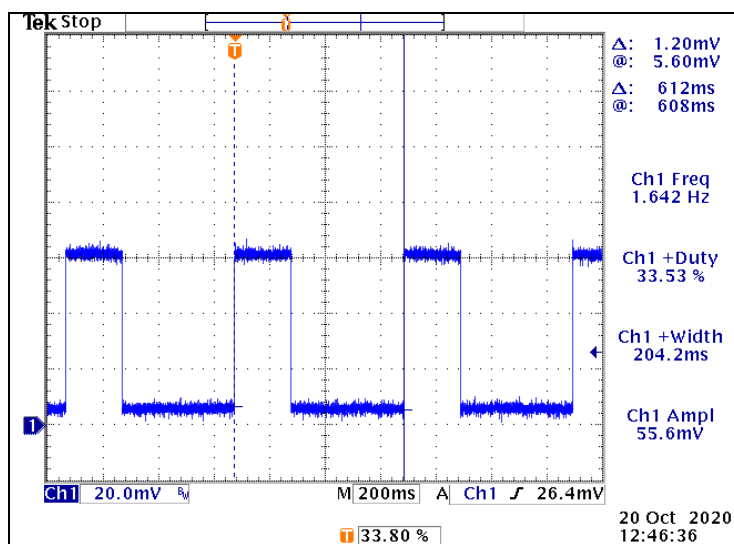
Period = 250 □ 1000ms

On-Time = N/A

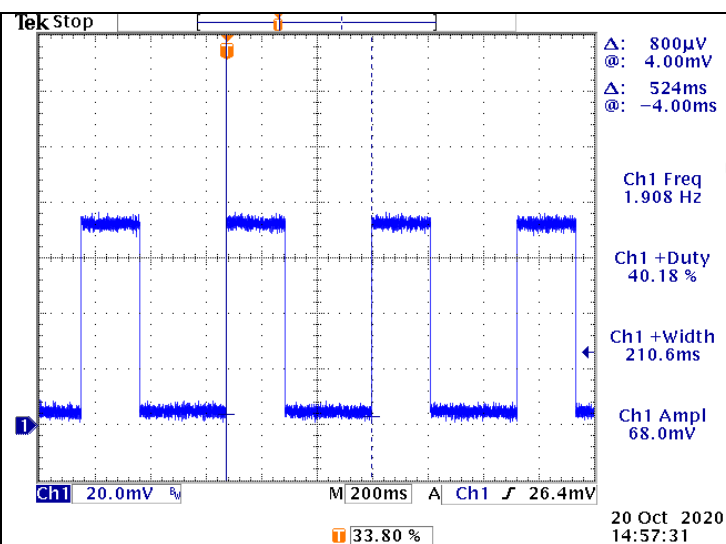
Off-Time $\geq$ 160msPulse Separations $\leq$ 100ms

FLASH PATTERN DATA SHEET

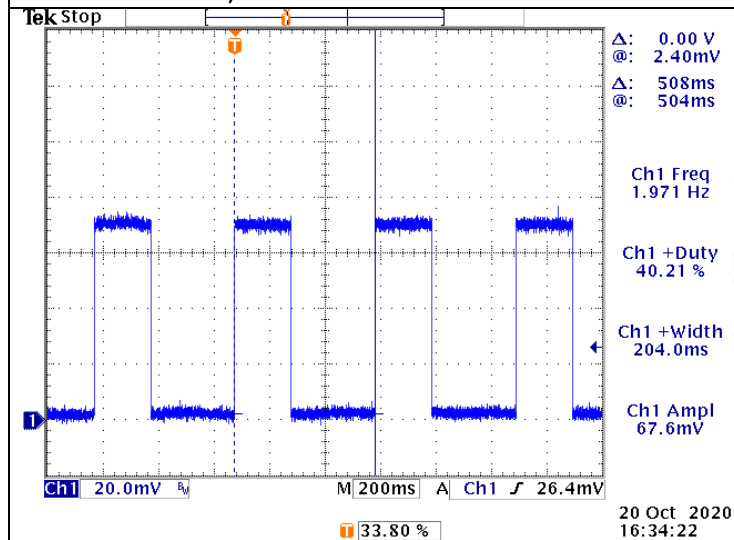
Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)



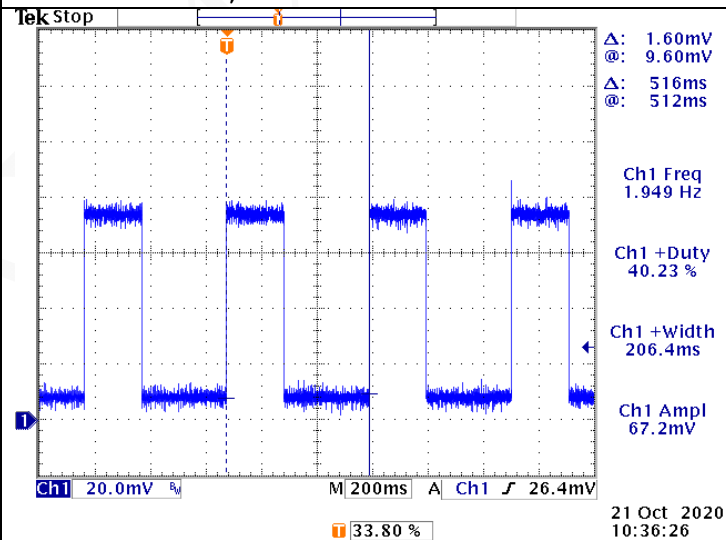
Red, Micro D-MAX04R-CL



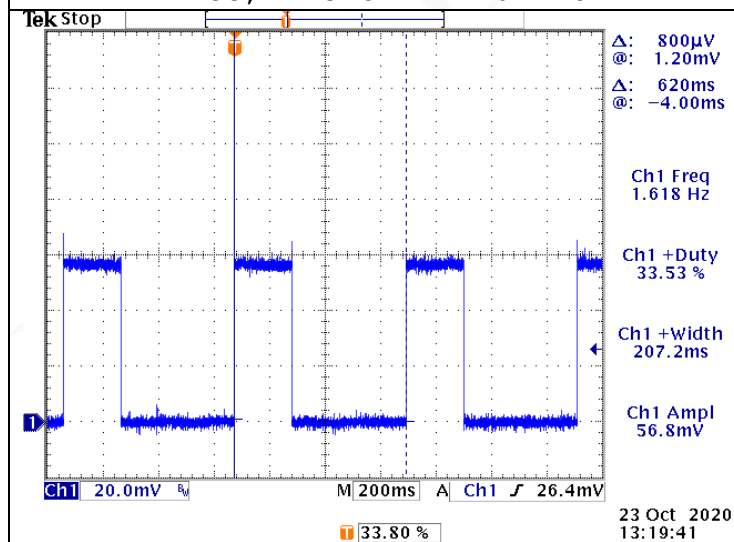
Blue, Micro D-MAX04B-CL



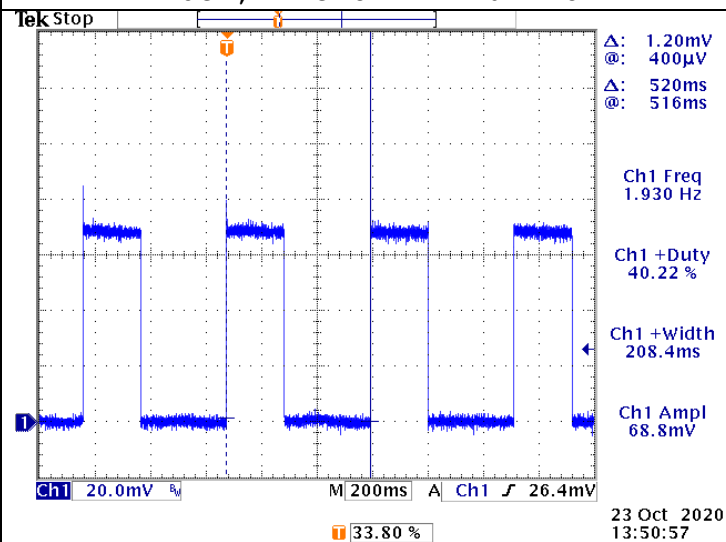
White, Micro D-MAX04W-CL



Amber, Micro D-MAX04A-CL



Red, Micro D-MAX04R-SL

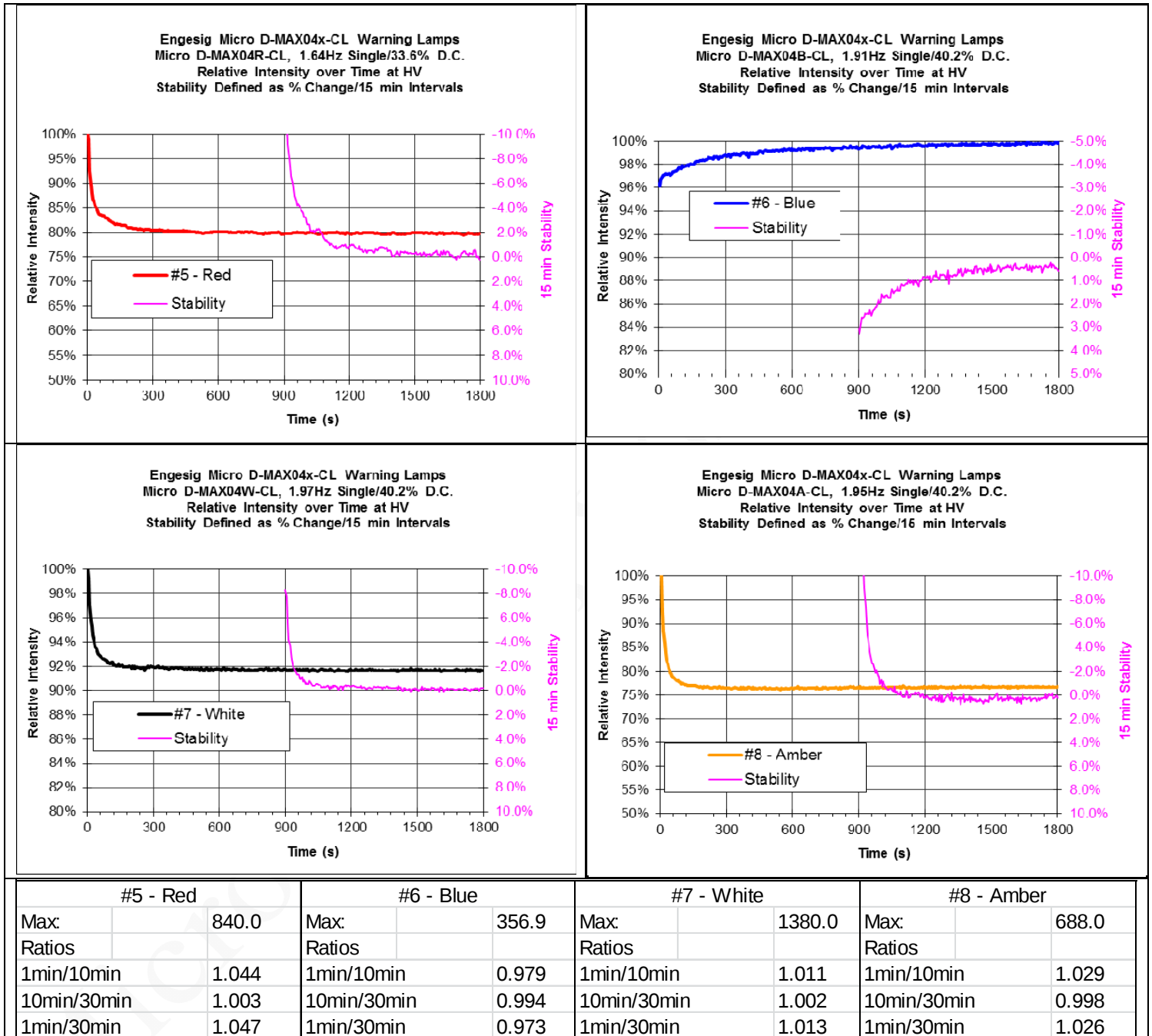


Blue, Micro D-MAX04B-SL

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Timelog:



All devices reached 3% stabilization prior to 30 minute test period.
Smoke lens version uses same LEDs as the clear lens version.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: Red, Micro D-MAX04R-CL

Specification: SAE J595 MAR14 (Directional LED Warning Lamp □ Red)

Micro D-MAX04R-CL		Orientation:	Horizontal	Power:	High
Color:	Red		Flash Mode:	FP1 Single	
Frequency:	1.642		On Time:	0.204 s	
				J595 (Class 1)	
	Cd	Cd-Sec	Cd-Sec/Min	Cd	Cd-Sec/Min
10U/5L	404.8	82.6	8136	20	480
10U/V	420.6	85.8	8454	50	1200
10U/5R	365.3	74.5	7342	20	480
5U/20L	223.1	45.5	4485	20	480
5U/10L	472.8	96.5	9502	50	1200
5U/5L	580.3	118.4	11664	100	2400
5U/V	615.1	125.5	12362	150	3600
5U/5R	550.3	112.3	11060	100	2400
5U/10R	447.5	91.3	8994	50	1200
5U/20R	228.8	46.7	4599	20	480
H/20L	223.3	45.6	4488	30	720
H/10L	506.0	103.2	10170	75	1800
H/5L	661.0	134.8	13284	200	4800
H/V	687.8	140.3	13824	300	7200
H/5R	661.0	134.8	13284	200	4800
H/10R	526.6	107.4	10583	75	1800
H/20R	233.4	47.6	4691	30	720
5D/20L	186.3	38.0	3744	20	480
5D/10L	409.6	83.6	8231	50	1200
5D/5L	536.0	109.4	10773	100	2400
5D/V	586.7	119.7	11791	150	3600
5D/5R	544.0	111.0	10933	100	2400
5D/10R	422.2	86.1	8486	50	1200
5D/20R	207.8	42.4	4176	20	480
10D/5L	307.3	62.7	6175	20	480
10D/V	335.2	68.4	6738	50	1200
10D/5R	300.3	61.3	6035	20	480
Zone 1	1515.0	309.1	30449	170	4080
2	1190.7	242.9	23931	90	2160
3	1622.4	331.0	32607	275	6600
4	3211.6	655.2	64546	1000	24000
5	1620.8	330.7	32576	275	6600
6	942.7	192.3	18947	90	2160
7	1539.7	314.1	30945	170	4080

Meets requirements for SAE J595 Class 1 Red.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: Blue, Micro D-MAX04B-CL

Specification: SAE J595 MAR14 (Directional LED Warning Lamp □ Blue)

Micro D-MAX04B-CL		Orientation:	Horizontal	Power:	High
Color:	Blue		Flash Mode:	FP1 Single	
Frequency:	1.908		On Time:	0.211 s	
			J595 (Class 1)		
	Cd	Cd-Sec	Cd-Sec/Min	Cd	Cd-Sec/Min
10U/5L	236.1	49.8	5702	20	480
10U/V	218.9	46.2	5288	50	1200
10U/5R	192.9	40.7	4660	20	480
5U/20L	178.0	37.6	4299	20	480
5U/10L	357.7	75.5	8641	50	1200
5U/5L	406.7	85.8	9824	100	2400
5U/V	363.8	76.8	8789	150	3600
5U/5R	276.3	58.3	6673	100	2400
5U/10R	220.5	46.5	5326	50	1200
5U/20R	126.9	26.8	3065	20	480
H/20L	192.9	40.7	4660	30	720
H/10L	440.3	92.9	10635	75	1800
H/5L	483.1	101.9	11670	200	4800
H/V	435.7	91.9	10525	300	7200
H/5R	310.3	65.5	7496	200	4800
H/10R	257.9	54.4	6230	75	1800
H/20R	149.5	31.6	3612	30	720
5D/20L	178.9	37.7	4320	20	480
5D/10L	385.3	81.3	9306	50	1200
5D/5L	417.3	88.1	10081	100	2400
5D/V	429.6	90.7	10378	150	3600
5D/5R	331.8	70.0	8014	100	2400
5D/10R	269.1	56.8	6499	50	1200
5D/20R	147.1	31.0	3552	20	480
10D/5L	262.9	55.5	6351	20	480
10D/V	261.3	55.1	6311	50	1200
10D/5R	236.5	49.9	5713	20	480
Zone 1	1292.7	272.8	31227	170	4080
2	647.9	136.7	15651	90	2160
3	1264.3	266.8	30540	275	6600
4	2022.6	426.8	48857	1000	24000
5	865.9	182.7	20917	275	6600
6	760.8	160.5	18376	90	2160
7	913.0	192.7	22055	170	4080

Meets requirements for SAE J595 Class 1 Blue.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: White, Micro D-MAX04W-CL

Specification: SAE J595 MAR14 (Directional LED Warning Lamp □ White)

Micro D-MAX04W-CL		Orientation:	Horizontal	Power:	High
Color:	White		Flash Mode:	FP1 Single	
Frequency:	1.971		On Time:	0.204 s	
			J595 (Class 1)		
	Cd	Cd-Sec	Cd-Sec/Min	Cd	Cd-Sec/Min
10U/5L	858.6	175.2	20714	80	1920
10U/V	871.3	177.7	21020	200	4800
10U/5R	803.3	163.9	19379	80	1920
5U/20L	593.0	121.0	14306	80	1920
5U/10L	1144.9	233.6	27620	200	4800
5U/5L	1334.6	272.3	32197	400	9600
5U/V	1340.9	273.6	32350	600	14400
5U/5R	1117.9	228.1	26970	400	9600
5U/10R	929.8	189.7	22432	200	4800
5U/20R	469.7	95.8	11330	80	1920
H/20L	616.7	125.8	14878	120	2880
H/10L	1317.2	268.7	31778	300	7200
H/5L	1475.3	301.0	35593	800	19200
H/V	1408.9	287.4	33990	1200	28800
H/5R	1061.0	216.5	25597	800	19200
H/10R	969.3	197.7	23385	300	7200
H/20R	487.0	99.4	11749	120	2880
5D/20L	567.7	115.8	13696	80	1920
5D/10L	1092.6	222.9	26360	200	4800
5D/5L	1189.1	242.6	28688	400	9600
5D/V	1227.1	250.3	29603	600	14400
5D/5R	1065.8	217.4	25712	400	9600
5D/10R	931.4	190.0	22469	200	4800
5D/20R	453.8	92.6	10949	80	1920
10D/5L	781.1	159.4	18845	80	1920
10D/V	836.5	170.7	20181	200	4800
10D/5R	795.4	162.3	19189	80	1920
Zone 1	4014.9	819.0	96858	680	16320
2	2533.2	516.8	61113	360	8640
3	3840.9	783.6	92663	1100	26400
4	6513.3	1328.7	157133	4000	96000
5	3153.1	643.2	76068	1100	26400
6	2413.0	492.3	58215	360	8640
7	3271.7	667.4	78929	680	16320

Meets requirements for SAE J595 Class 1 White.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: Amber, Micro D-MAX04A-CL

Specification: SAE J595 MAR14 (Directional LED Warning Lamp □ Amber)

Micro D-MAX04A-CL		Orientation:	Horizontal	Power:	High
Color:	Amber		Flash Mode:	FP1 Single	
Frequency:	1.949		On Time:	0.206 s	
			J595 (Class 1)		
	Cd	Cd-Sec	Cd-Sec/Min	Cd	Cd-Sec/Min
10U/5L	543.4	111.9	13090	40	960
10U/V	557.5	114.8	13429	100	2400
10U/5R	534.0	110.0	12863	40	960
5U/20L	341.4	70.3	8223	40	960
5U/10L	620.1	127.7	14938	100	2400
5U/5L	635.8	131.0	15316	200	4800
5U/V	631.1	130.0	15202	300	7200
5U/5R	631.1	130.0	15202	200	4800
5U/10R	571.6	117.7	13769	100	2400
5U/20R	298.0	61.4	7179	40	960
H/20L	364.9	75.2	8789	60	1440
H/10L	649.9	133.9	15655	150	3600
H/5L	671.8	138.4	16183	400	9600
H/V	571.6	117.7	13769	600	14400
H/5R	543.4	111.9	13090	400	9600
H/10R	563.7	116.1	13580	150	3600
H/20R	317.9	65.5	7657	60	1440
5D/20L	347.6	71.6	8374	40	960
5D/10L	610.7	125.8	14712	100	2400
5D/5L	617.0	127.1	14863	200	4800
5D/V	626.4	129.0	15089	300	7200
5D/5R	613.8	126.5	14787	200	4800
5D/10R	579.4	119.4	13957	100	2400
5D/20R	308.0	63.5	7420	40	960
10D/5L	529.3	109.0	12750	40	960
10D/V	566.8	116.8	13655	100	2400
10D/5R	529.3	109.0	12750	40	960
Zone 1	2284.7	470.7	55038	340	8160
2	1634.8	336.8	39382	180	4320
3	1902.6	391.9	45833	550	13200
4	3044.2	627.1	73333	2000	48000
5	1808.6	372.6	43570	550	13200
6	1625.4	334.8	39156	180	4320
7	2074.9	427.4	49982	340	8160

Meets requirements for SAE J595 Class 1 Amber.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: Red, Micro D-MAX04R-SL

Specification: SAE J595 MAR14 (Directional LED Warning Lamp □ Red)

Micro D-MAX04R-SL		Orientation:	Horizontal	Power:	High
Color:	Red		Flash Mode:	FP1 Single	
Frequency:	1.618		On Time:	0.207 s	
			J595 (Class 1)		
	Cd	Cd-Sec	Cd-Sec/Min	Cd	Cd-Sec/Min
10U/5L	178.6	37.0	3589	20	480
10U/V	200.7	41.6	4034	50	1200
10U/5R	191.4	39.6	3845	20	480
5U/20L	127.9	26.5	2571	20	480
5U/10L	214.7	44.5	4315	50	1200
5U/5L	252.8	52.3	5079	100	2400
5U/V	307.5	63.7	6179	150	3600
5U/5R	296.9	61.5	5966	100	2400
5U/10R	276.9	57.3	5565	50	1200
5U/20R	153.5	31.8	3084	20	480
H/20L	128.4	26.6	2580	30	720
H/10L	208.0	43.1	4180	75	1800
H/5L	244.8	50.7	4920	200	4800
H/V	321.0	66.5	6451	300	7200
H/5R	353.8	73.2	7109	200	4800
H/10R	328.8	68.1	6607	75	1800
H/20R	163.5	33.8	3285	30	720
5D/20L	117.5	24.3	2361	20	480
5D/10L	192.5	39.8	3868	50	1200
5D/5L	229.4	47.5	4609	100	2400
5D/V	272.2	56.4	5470	150	3600
5D/5R	298.6	61.8	6001	100	2400
5D/10R	275.4	57.0	5534	50	1200
5D/20R	149.5	30.9	3004	20	480
10D/5L	166.9	34.6	3354	20	480
10D/V	189.7	39.3	3811	50	1200
10D/5R	200.7	41.6	4034	20	480
Zone 1	781.1	161.7	15696	170	4080
2	570.7	118.1	11468	90	2160
3	690.2	142.9	13870	275	6600
4	1499.3	310.4	30129	1000	24000
5	924.3	191.3	18573	275	6600
6	557.2	115.4	11198	90	2160
7	1018.7	210.9	20471	170	4080

Meets requirements for SAE J595 Class 2 Red.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: Blue, Micro D-MAX04B-SL

Specification: SAE J595 MAR14 (Directional LED Warning Lamp □ Blue)

Micro D-MAX04B-SL		Orientation:	Horizontal	Power:	High
Color:	Blue		Flash Mode:	FP1 Single	
Frequency:	1.93		On Time:	0.208 s	
			J595 (Class 1)		
	Cd	Cd-Sec	Cd-Sec/Min	Cd	Cd-Sec/Min
10U/5L	132.7	27.6	3197	20	480
10U/V	136.8	28.5	3295	50	1200
10U/5R	119.6	24.9	2880	20	480
5U/20L	99.9	20.8	2405	20	480
5U/10L	164.6	34.2	3964	50	1200
5U/5L	202.4	42.1	4875	100	2400
5U/V	221.3	46.0	5330	150	3600
5U/5R	192.0	39.9	4625	100	2400
5U/10R	143.8	29.9	3462	50	1200
5U/20R	85.0	17.7	2047	20	480
H/20L	101.0	21.0	2432	30	720
H/10L	183.0	38.1	4407	75	1800
H/5L	222.3	46.2	5353	200	4800
H/V	239.1	49.7	5760	300	7200
H/5R	207.0	43.1	4986	200	4800
H/10R	163.0	33.9	3926	75	1800
H/20R	87.0	18.1	2096	30	720
5D/20L	84.2	17.5	2029	20	480
5D/10L	134.6	28.0	3242	50	1200
5D/5L	164.6	34.2	3964	100	2400
5D/V	178.8	37.2	4307	150	3600
5D/5R	166.7	34.7	4016	100	2400
5D/10R	140.7	29.3	3388	50	1200
5D/20R	78.0	16.2	1879	20	480
10D/5L	95.2	19.8	2294	20	480
10D/V	101.3	21.1	2439	50	1200
10D/5R	98.7	20.5	2376	20	480
Zone 1	584.2	121.5	14072	170	4080
2	389.1	80.9	9373	90	2160
3	550.0	114.4	13246	275	6600
4	1068.6	222.3	25738	1000	24000
5	521.7	108.5	12567	275	6600
6	295.1	61.4	7109	90	2160
7	534.4	111.2	12872	170	4080

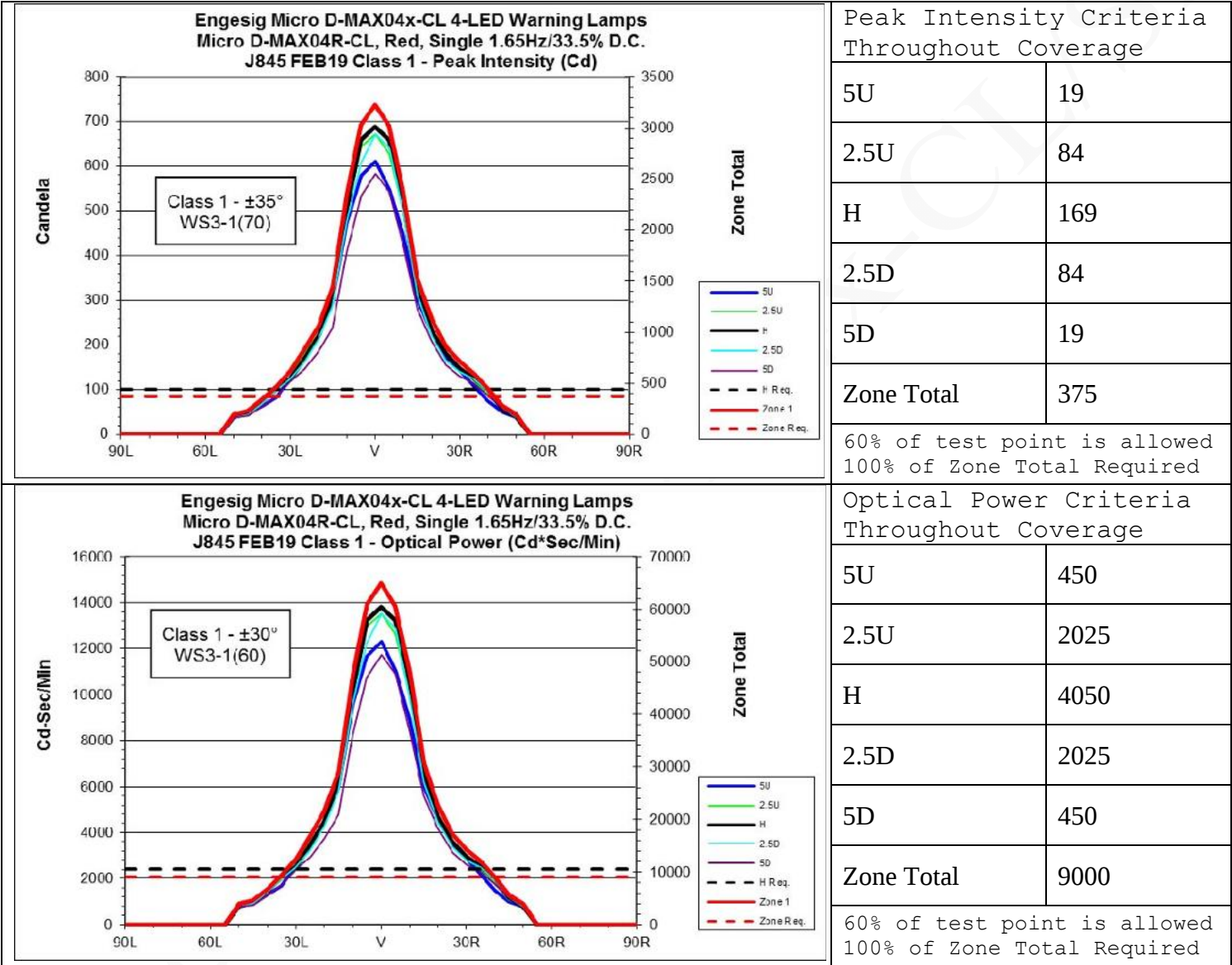
Meets requirements for SAE J595 Class 2 Blue.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: Red, Micro D-MAX04R-CL

Specification: SAE J845 FEB19 (Selective Coverage, Symmetrical Pattern)
Color: Red, Class 1



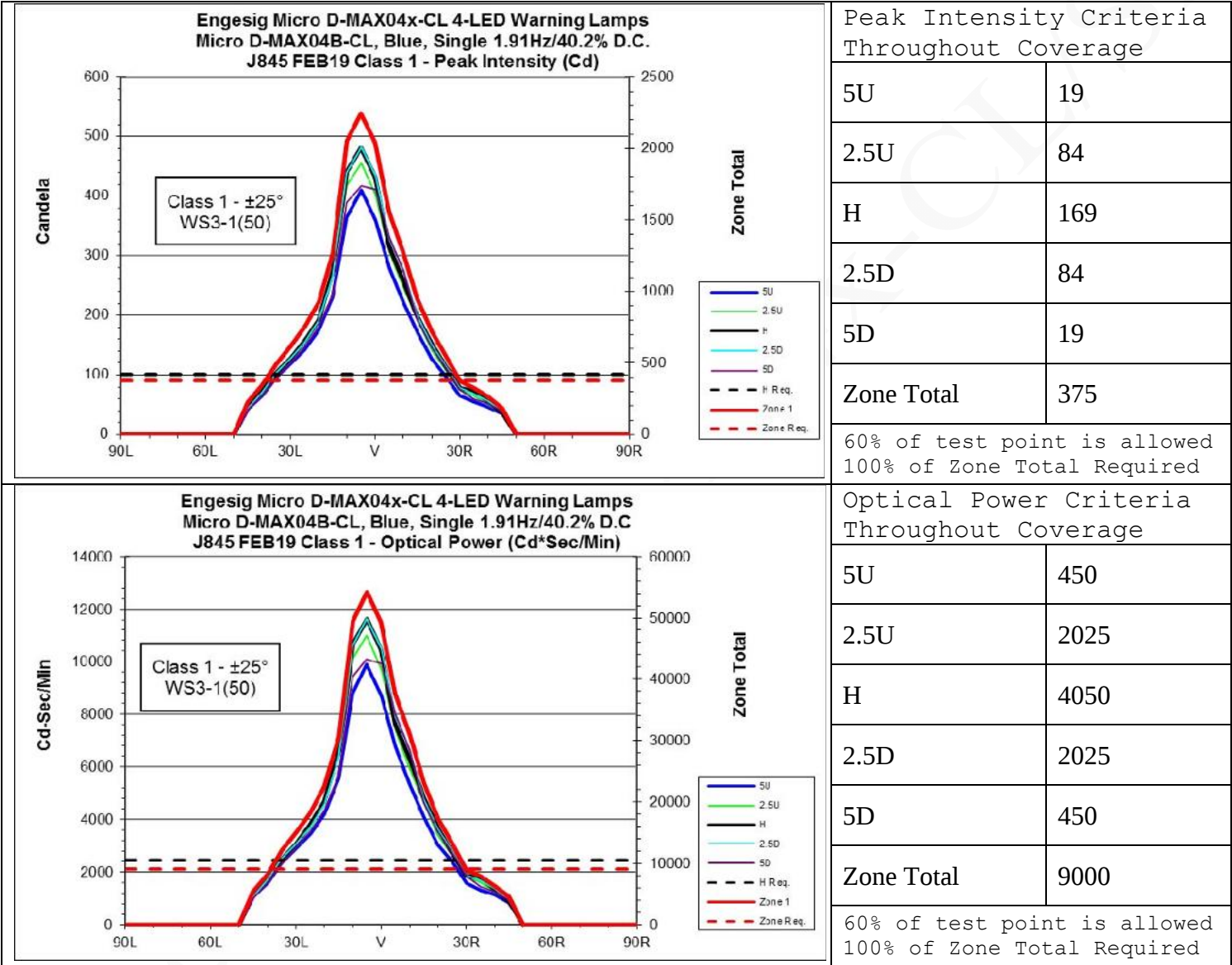
Meets SAE J845 Class 1 Red Selective Coverage requirements at all points $\pm 30^\circ$.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: Blue, Micro D-MAX04B-CL

Specification: SAE J845 FEB19 (Selective Coverage, Symmetrical Pattern)
Color: Blue, Class 1



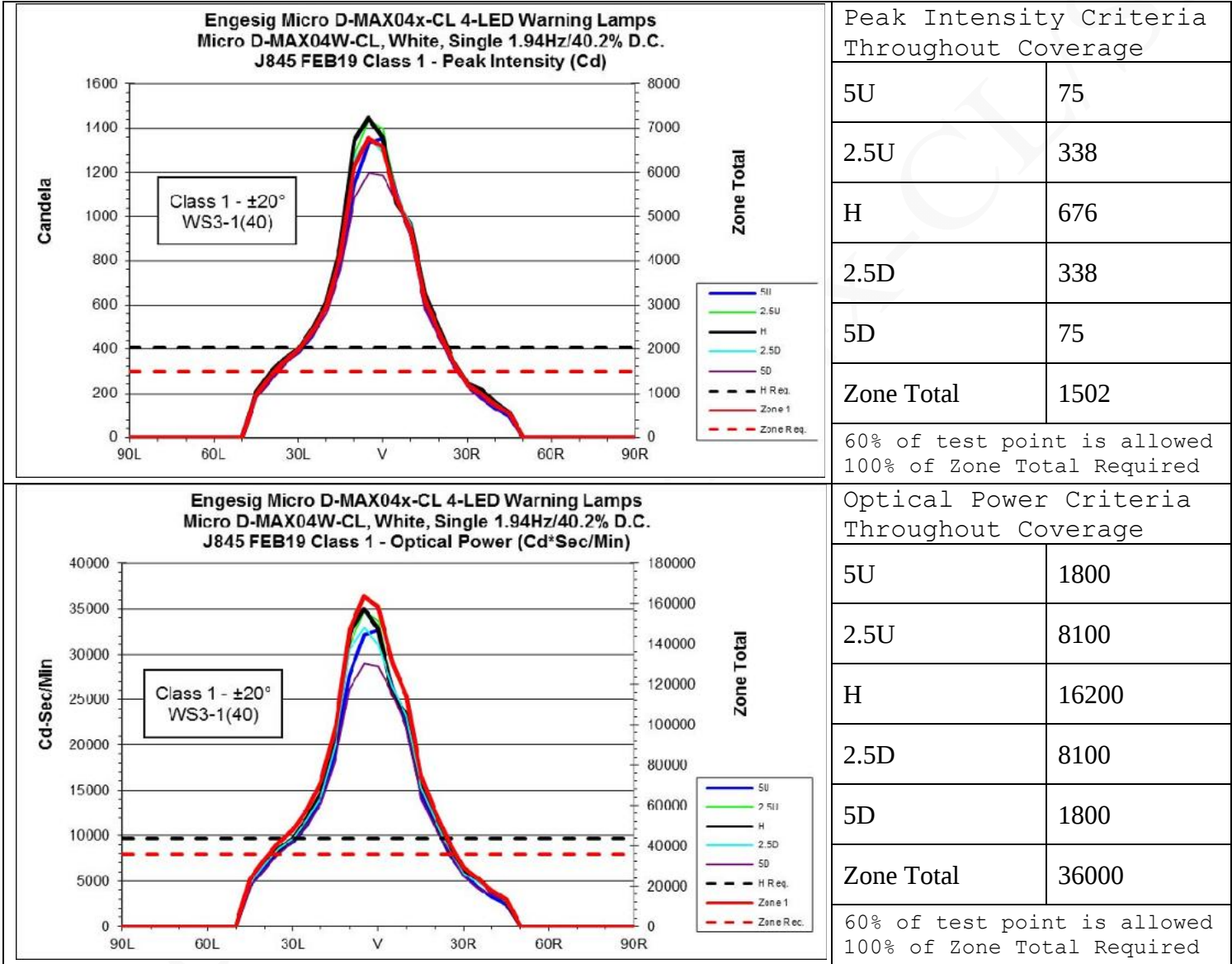
Meets SAE J845 Class 1 Blue Selective Coverage requirements at all points $\pm 25^\circ$.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: White, Micro D-MAX04W-CL

Specification: SAE J845 FEB19 (Selective Coverage, Symmetrical Pattern)
Color: White, Class 1



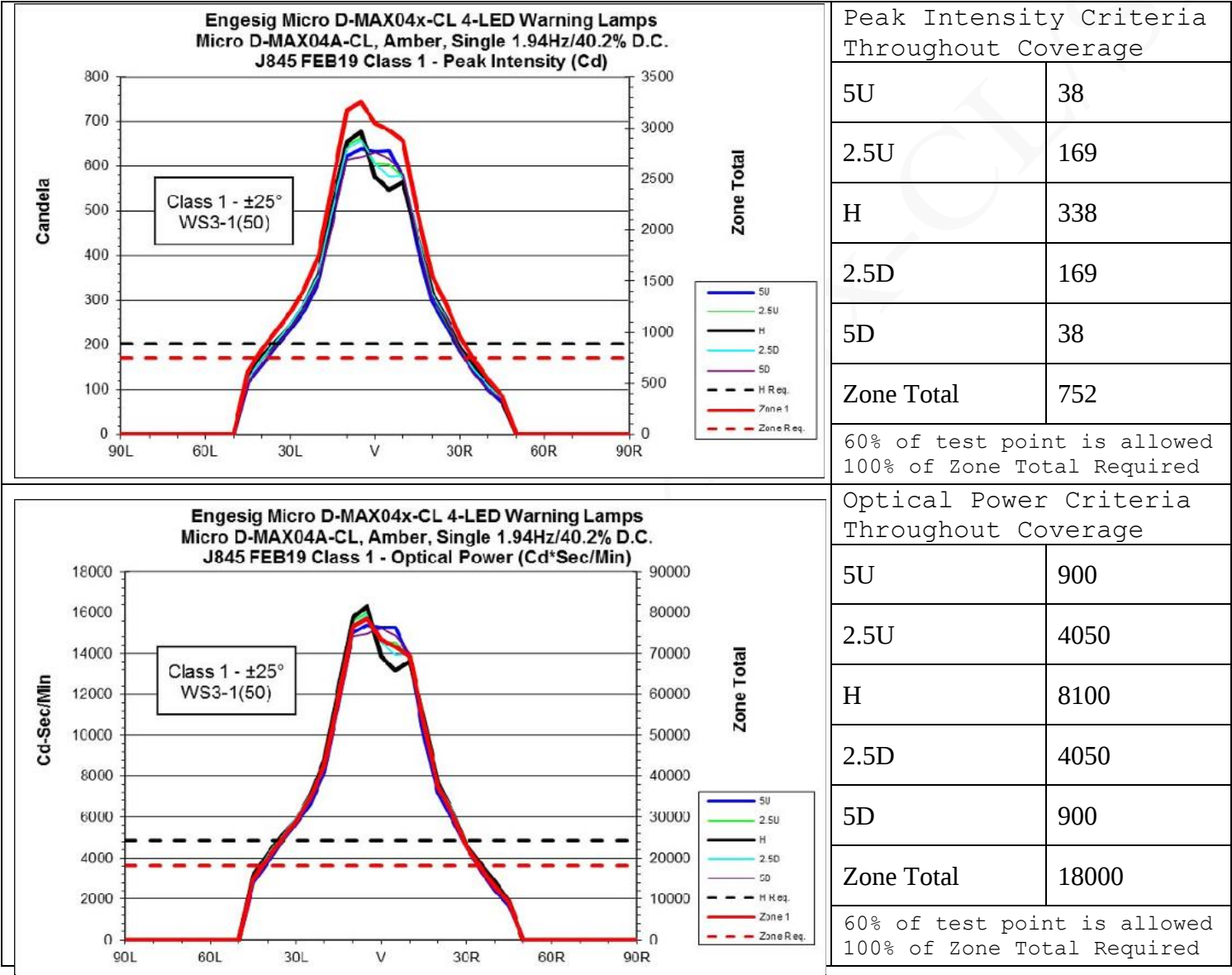
Meets SAE J845 Class 1 White Selective Coverage requirements at all points $\pm 20^\circ$.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: Amber, Micro D-MAX04A-CL

Specification: SAE J845 FEB19 (Selective Coverage, Symmetrical Pattern)
Color: Amber, Class 1



Meets SAE J845 Class 1 Amber Selective Coverage requirements at all points $\pm 25^\circ$

ENVIRONMENTAL (FLASH RATE) DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

ADDITIONAL TESTS (SAE J595 and J845)

Tests performed by: MAE

Date: 21-30 October 2020

High Temperature Flash Rate Passed

At a temperature of 50°C for six hours.

One hour "off" - Five hours "on"

Sample	Amber, Micro D-MAX04A-CL
0 hour	1.96 Hz
1 hour	1.94 Hz
6 hours	1.93 Hz
SAE Required 1 □ 4 Hz, $\Delta f \leq 20\%$	

Low Temperature Flash Rate Passed

At a temperature of -30°C for six
hours. Five hours "off" - One hour
"on"

Sample	Amber, Micro D-MAX04A-CL
0 hour	1.96 Hz
5 hours	1.96 Hz
6 hours	1.96 Hz
Start Time	0 sec
SAE Required 1 □ 4 Hz, $\Delta f \leq 20\%$	
Start Time ≤ 5 Sec	

Durability Passed

At an ambient temperature of 23°C for two
hundred hours. Cycled at 50 minutes "on"
ten minutes "off"

Sample	Blue, Micro D-MAX04B-CL
0 hour	1.92 Hz
100 hours	1.93 Hz
200 hours	1.91 Hz
SAE Required 1 □ 4 Hz, $\Delta f \leq 20\%$	

Devices meet all flash rate test requirements.

MECHANICAL TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

MECHANICAL TESTS (SAE J575 AUG2018)

Tests performed by: MAE/DGC

Date: 21-31 October 2020

4.2 Vibration Test (J575 1hr Shock): Passed
Red, Micro D-MAX04R-CL tested.

Samples vibrated on SAE J577 vibration machine for 1 hour.

There was no observed rotation, displacement, cracking, or rupture of parts of the device which would result in failure of any other tests. There was no looseness of parts as evidenced by rattling heard when the part assembly is shaken. There was no cracking or rupture of parts of the device affecting its mounting.

After test completed, sample was energized at 12.8V.
All LEDs operational.

4.5 Lens Warpage Test: Passed
Photometry Samples tested.

Light source were operated at design voltage in a steady state mode while in the highest wattage flash pattern for one hour.

There was no observed warpage of plastic components that would cause the device to fail any other requirements.

4.9 Moisture Test: Passed
White, Micro D-MAX04W-CL tested.

Sample subjected to a solid cone of precipitation of 0.1 in/min at a delivery angle of 45° while rotating about their vertical axis at a rate of 4 rpm for 12 hours. After a 1 hour drain period, samples were examined for moisture accumulation.

There was 0cc of moisture accumulation inside the device.
(≤ 2cc Required)

4.11 Dust Test: Passed
White, Micro D-MAX04W-CL tested.

Sample mounted in dust chamber and subjected to Portland Cement powder agitated by a 2 second period projected blast of compressed air every 15 minutes for 5 hours. Exterior surface of samples then cleaned.

No observed dust penetration.

MECHANICAL TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

MECHANICAL TESTS (SAE J575 AUG2018)

Tests performed by: MAE/DGC

Date: 21-31 October 2020

4.12 Corrosion Test (240 hrs): Passed
Spare Equivalent Device tested.

Sample subjected to a 5% NaCl fog solution per ASTM B117
consisting of 10 periods of 23 hours exposure followed by 1 hour
drying time.

There was no observed corrosion which would cause the
device to fail any other requirements.

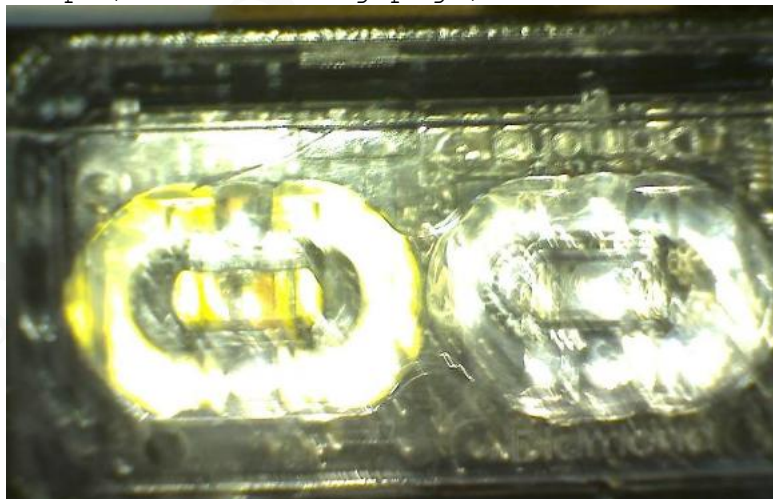
4.14 Chemical Resistance Test: Passed
White, Micro D-MAX04W-CL tested.

The drivers side of the sample subjected to the following
chemicals with 48 hour set aside periods: Windshield washer
fluid (50% concentration by volume of methanol/detergent base,
0.16% ethanolamine), Antifreeze (50% concentration by volume of
ethylene glycol in water), Simulated unleaded gasoline (test
fluid ASTM D 471-79 Reference fuel □D□), Simulated unleaded E85
fuel (85% ethanol and 15% fuel □D□).

At the conclusion of the last 48 hour period the sample was
wiped clean and photometered.

There was no visible surface deterioration, delamination,
fractures, deterioration of bonding materials, color
bleeding, or color pickup as a result of exposure to the
test fluids.

The photometric values measured after the chemical
resistance test meet the photometric requirements for the
lamp (see following page)



Devices meet all mechanical test requirements.

PHOTOMETRIC TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

Sample Number: White, Micro D-MAX04W-CL
Post SAE J575 4.14 Chemical Resistance

Specification: SAE J595 MAR14 (Directional LED Warning Lamp □ White)

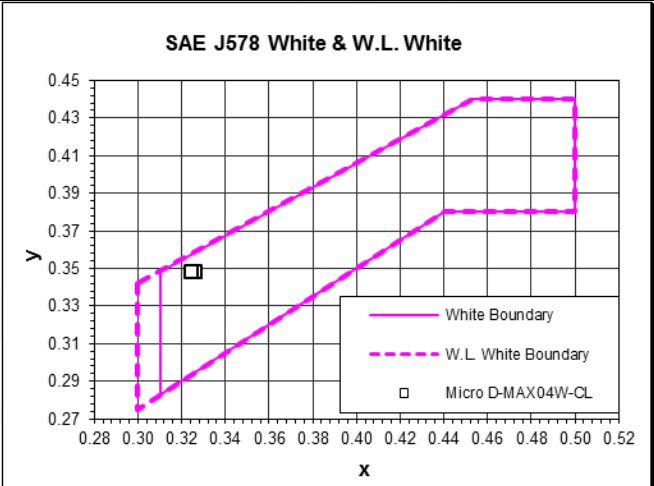
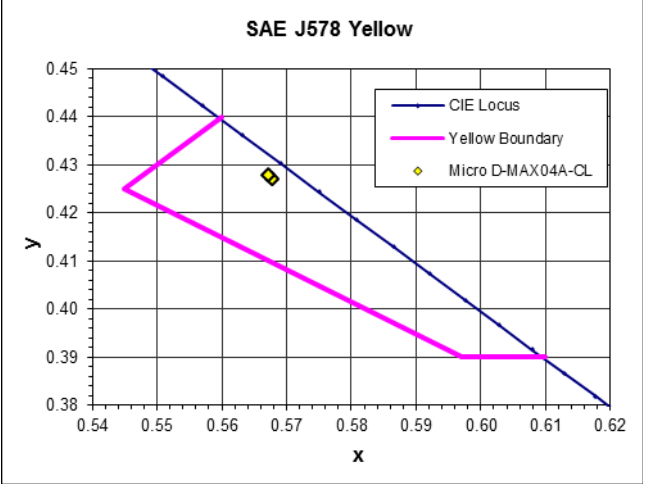
Micro D-MAX04W-CL		Orientation:	Horizontal	Power:	High
Color:	White		Flash Mode:	FP1 Single	
Frequency:	1.971		On Time:	0.204 s	
				J595 (Class 1)	
	Cd	Cd-Sec	Cd-Sec/Min	Cd	Cd-Sec/Min
10U/5L	825.4	168.4	19914	80	1920
10U/V	830.1	169.4	20027	200	4800
10U/5R	760.6	155.2	18349	80	1920
5U/20L	578.7	118.1	13962	80	1920
5U/10L	1117.9	228.1	26970	200	4800
5U/5L	1296.7	264.5	31282	400	9600
5U/V	1291.9	263.6	31167	600	14400
5U/5R	1064.2	217.1	25674	400	9600
5U/10R	882.4	180.0	21287	200	4800
5U/20R	455.4	92.9	10986	80	1920
H/20L	597.7	121.9	14421	120	2880
H/10L	1280.8	261.3	30900	300	7200
H/5L	1408.9	287.4	33990	800	19200
H/V	1310.9	267.4	31625	1200	28800
H/5R	1023.1	208.7	24682	800	19200
H/10R	929.8	189.7	22432	300	7200
H/20R	476.0	97.1	11483	120	2880
5D/20L	547.1	111.6	13199	80	1920
5D/10L	1043.6	212.9	25178	200	4800
5D/5L	1143.3	233.2	27582	400	9600
5D/V	1135.3	231.6	27390	600	14400
5D/5R	1016.8	207.4	24529	400	9600
5D/10R	872.8	178.1	21057	200	4800
5D/20R	447.5	91.3	10796	80	1920
10D/5L	746.4	152.3	18006	80	1920
10D/V	801.7	163.6	19341	200	4800
10D/5R	763.8	155.8	18426	80	1920
Zone 1	3885.2	792.6	93731	680	16320
2	2416.2	492.9	58290	360	8640
3	3720.7	759.0	89763	1100	26400
4	6170.1	1258.7	148855	4000	96000
5	3010.7	614.2	72634	1100	26400
6	2311.8	471.6	55773	360	8640
7	3134.1	639.4	75610	680	16320

Meets requirements for SAE J595 Class 1 White.

TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

COLOR TEST: SAE J578 APR2020 (Modified White)
 Spectroradiometric method using Photo Research PR650
 Test Performed By: MAE
 Test Distance: 15ft
 Voltage: 12.80V
 Location: HV
 Mode: FP1 ☐ Single Flash

Color	Measured (x, y)	Required	Chart
White	Micro D-MAX04W-CL t = 0min (0.3262, 0.3478) t = 30min (0.3246, 0.3477)	$0.30 \leq x \leq 0.50$ $0.38 \leq y \leq 0.44$ $y \geq 0.75x + 0.05$ $y \leq 0.64x + 0.15$	 SAE J578 White & W.L. White The chart displays the CIE color space for white. The x-axis ranges from 0.28 to 0.52, and the y-axis ranges from 0.27 to 0.45. A solid magenta line represents the White Boundary, and a dashed magenta line represents the W.L. White Boundary. A small square symbol indicates the measured data point for Micro D-MAX04W-CL, which is located within the acceptable white region.
Yellow (Amber)	Micro D-MAX04A-CL t = 0min (0.5679, 0.4269) t = 30min (0.5672, 0.4279)	$y \geq 0.39$ $y \geq 0.79 - 0.67x$ $y \leq x - 0.12$	 SAE J578 Yellow The chart displays the CIE color space for yellow. The x-axis ranges from 0.54 to 0.62, and the y-axis ranges from 0.38 to 0.45. A solid magenta line represents the Yellow Boundary, and a blue line with diamond markers represents the CIE Locus. A small yellow diamond symbol indicates the measured data point for Micro D-MAX04A-CL, which is located within the acceptable yellow region.

White - The color of the light emitted through the lens falls within the acceptable limits for white.

Yellow - The color of the light emitted through the lens falls within the acceptable limits for yellow (amber).

TEST DATA SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)

COLOR TEST: SAE J578 APR2020

Spectroradiometric method using Photo Research PR650

Test Performed By: MAE

Test Distance: 15ft

Voltage: 12.80V

Location: HV

Mode: FP1 ☐ Single Flash

Color	Measured (x, y)	Required	Chart
Red	Micro D-MAX04R-CL t = 0min (0.6860, 0.3123) t = 30min (0.6870, 0.3113) Micro D-MAX04R-SL t = 0min (0.6834, 0.3124) t = 30min (0.6850, 0.3104)	$y \leq 0.335$ $y \geq 0.98 - x$	SAE J578 Red The chart displays the CIE Locus (blue line) and the Red Boundary (magenta line) on a grid of x (0.64 to 0.74) and y (0.25 to 0.34). Two data points are plotted: Micro D-MAX04R-CL (red diamond) at (0.6860, 0.3123) and Micro D-MAX04R-SL (red square) at (0.6834, 0.3124). Both points fall within the Red Boundary.
Blue	Micro D-MAX04B-CL t = 0min (0.1206, 0.1018) t = 30min (0.1191, 0.1066) Micro D-MAX04B-SL t = 0min (0.1203, 0.1053) t = 30min (0.1185, 0.1108)	$y \leq 0.320$ $x \leq 0.160$ ☐ $x \leq 0.400 - y$ $x \geq 0.60y + 0.130$ ☐ if $y > 0.24$	SAE J578 Blue The chart displays the CIE Locus (blue line), Blue Boundary (magenta line), Signal Blue region (dashed blue line), and Restricted Blue region (dotted blue line) on a grid of x (0.00 to 0.25) and y (0.00 to 0.35). Two data points are plotted: Micro D-MAX04B-CL (blue diamond) at (0.1206, 0.1018) and Micro D-MAX04B-SL (blue square) at (0.1191, 0.1066). Both points fall within the Blue Boundary.

Red - The color of the light emitted through the lens falls within the acceptable limits for red.

Blue - The color of the light emitted through the lens falls within the acceptable limits for signal blue.

Note: The SAE Emergency Warning Lamps & Devices Committee is intending to limit the allowable blue color to the Restricted Blue boundary in future SAE J595 and SAE J845 specifications.

PHOTOGRAPH SHEET

Device Name: Engesig Micro D-MAX04x-CL/SL 4-LED Warning Lamps (SAE WW3)



Micro D-MAX04x-CL (Clear Lens)



Micro D-MAX04x-SL (Smoked Lens)



Post Chemical Resistance Lens