

Bidal Electricals Pvt Ltd

TEST REPORT

SCOPE OF WORK

FAA Certification - L-823 Style 2 and 9

REPORT NUMBER

103832252CRT-001

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5-May-2020

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NA
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Test Report

Company Name	Bildal Electricals Pvt Ltd	Test Location	Intertek Testing Services NA
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Client Contact	Naveen Goel	Quote Number	Qu-00938190
Phone	+91-9811013857	Test Start Date	9/24/2019
Email	bildal@airfieldlight.in	Completion Date	5/5/2020

Standard(s)

U.S. Department of Transportation, Federal Aviation Administration, Advisory Circular, FAA Specification for L-823 Plug and Receptical, Cable Connectors, AC No. 150/5345-26D dated September 30, 2008.

Spec.	Test name	Clause	Result	
			Style 2	Style 9
26D	Visual Examination	Sec. 3	Pass	Pass
26D	Dielectric Test	4.2.2	Pass	
26D	Bond Test	4.2.3	Pass	Pass
26D	Mechanical Connection Test	4.2.4	Pass	
26D	Electrical Connection Test	4.2.5	Pass	
26D	Weathering	4.2.6	Pass	
26D	Metal Bond Test	4.2.7	Pass	Pass

Results Key

Pass	Compliant
Fail	Non-compliant
TBD	Compliance not determined
NT	Not tested in this project
NA	Test not applicable



Jennifer Barnoski
Project Engineer
Lighting



Christopher W. Metcalf
Engineering Supervisor
Lighting

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Sample Information				
Date Rec.	Intertek ID	Description	Condition	Model No.
3/11/19	CRT1903111051-001-32 - -40	(9) Style 2 Type I Class A Plugs	Production	BE10P
3/11/19	CRT1903111051-001-41 - -49	(9) Style 9 Type I Class A Recp.	Production	BE10R
3/11/19	CRT1903111051-001-50 - -57	Style 2 Pins	Production	NA
3/11/19	CRT1903111051-001-58 - -65	Style 9 Sockets	Production	NA
3/11/19	CRT1903111051-001-66 - -71	(6) Molding Material Slabs	NA	NA
3/11/19	CRT1903111051-001-72	Paired Style 2 and 9	Production	NA
8/28/19	CRT1908281033-001-19 - -24	(6) Style 2 Type I Class A Plugs	Production	BE10P
8/28/19	CRT1908281033-001-25 - -30	(6) Style 9 Type I Class A Recp.	Production	BE10R
8/28/19	CRT1908281033-001-31 - -36	(6) Pin & Socket Pairs (Style 2 & 9)	Production	NA
12/10/19	CRT1912101011-001-1 - -6	(6) Style 2 Type I Class A Plugs	Production	BE10P
12/10/19	CRT1912101011-001-7 - -12	(6) Style 9 Type I Class A Recp.	Production	BE10R

Further Sample Description	
Type:	Type I
Class:	A
Style:	2 and 9
Molding Material:	Exxon Mobile, Santoprene 101-73 TPV

Sample Modification Log	
Date	Modification description
8/28/19	Changed adhesive to Chemlok 487 A/B, correct the "L" Length
12/10/19	None

Picture(s)

Style 2



Style 9



Style 2 and 9 pin and socket





Visual Examination

Ref. Para.	Requirement for L-823 Connectors	Style 2		Style 9	
		Measured or Observed	Result (P/F)	Measured or Observed	Result (P/F)
3.4.1 General	Does each connector conform to the dimensional and construction requirements shown on the applicable figure?	Measured	P	Measured	P
3.4.2 Housing	Is the connector housing molded from natural and/or synthetic elastomeric materials serving both as insulation and sheath to fully enclose the pins and sockets of the connectors?	Observed	P	Observed	P
	Do material compounds used in connector housings contain more than 25 pounds (11 kg) of carbon black per 100 pounds (45 kg) of elastomer?	Observed	P	Observed	P
3.4.3 Pins and Housing	Are the pins and sockets designed to conform to the dimensional and construction requirements as indicated on the applicable figure of this specification?	Observed	P	Observed	P
	Are the sockets slotted and spring loaded to insure good electrical contact as required by Paragraph 3.3.1?	Observed	P	Observed	P
	Are pins and sockets made of materials that contain at least 98 percent copper?	Observed	P	Observed	P
	Are sockets fully annealed and supplied with a copper beryllium sleeve-type spring which assures adequate contact pressure and protects the socket slots from filling with insulating compound during assembly and subsequent use?	Observed	P	Observed	P
	Are the pins made from material at least "half hard" with the crimping section full annealed?	Observed	P	Observed	P
	Is the contact portion of the pin left "stock hard"?	Observed	P	Observed	P
	Is the hardness transition limited to the locking section of the pin?	Observed	P	Observed	P
	Are the pin and socket electro-plated with tin or other suitable material to provide good electrical contact?	Observed	P	Observed	P
	Is the pin for the Style 3 connector provided with a visual indication that verifies proper assembly position?	NA	NA	NA	NA
3.4.4.1 Class A	Are pins and sockets held perpendicular to the face of the block?	Observed	P	Observed	P
	Are suitable electrical conductors mechanically and electrically connected to the pin(s) or socket(s), and then is the housing molded per 3.4.2?	Observed	P	Observed	P
	Do the pins of the Type II plugs meet the pinch/pull requirements of par. 3.4.4.1?	NA	NA	NA	NA
3.4.5 Marking	Are each plug and receptacle marked with the manufacturer's identification and L-823 designation with style number, i.e., L-823, Style 4?	Observed	P	Observed	P
3.4.6 Caps	Are caps supplied with Class A connectors to protect plugs and receptacles prior to final connection?	Observed	P	Observed	P
	When a series short circuiting plug-type cap is required for a receptacle, are jumpers connected to the proper pins?	NA - not Type II	NA	NA - not Type II	NA
	Are the mating dimensions the same as the corresponding plug?	Observed	P	Observed	P
	Is the short circuit cap permanently marked with an "S"?	NA - not Type II	NA	NA - not Type II	NA

Style:	2	Type:	I	Class:	A			
Sample:	-32	-33	-34	-35	-36	-37	Specified	Specified
Dimen.	Measured	Measured	Measured	Measured	Measured	Measured	Min(in.)	Max(in.)
D	1.059	1.065	1.053	1.047	1.070	1.065	1.047	1.077
E	0.186	0.187	0.186	0.186	0.186	0.186	0.185	0.187
I	0.595	0.606	0.605	0.603	0.600	0.607	0.593	0.608
J	0.612	0.607	0.610	0.609	0.613	0.611	0.604	0.614
K	0.917	0.916	0.918	0.920	0.919	0.907	0.906	0.937
Pass/Fail	P	P	P	P	P	P		

Style:	9	Type:	I	Class:	A			
Sample:	1	2	3	4	5	6	Specified	Specified
Dimen.	Measured	Measured	Measured	Measured	Measured	Measured	Min(in.)	Max(in.)
L	0.563	0.568	0.569	0.564	0.565	0.564	0.563	0.583
M	0.597	0.601	0.594	0.599	0.595	0.593	0.593	0.608
Pass/Fail	P	P	P	P	P	P		

Complies: YES NO

Tested By:	J. Barnoski	Signature or initials:	
Engineer:	J. Barnoski	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	
Test Equipment Used:	1	Sample No:	CRT1903111051-001-32 - -37 CRT1903111051-001-41 - -46
Amb (°C):	NA	RH%	NA
		Completion Date:	3/12/2019 / 5/5/2020

Dielectric Test

After the conclusion of the test in paragraph 4.2.2.1, each plug and receptacle being tested must be mated and immersed in a tap water bath at room temperature, (68 - 77° F (20-25 °C)). Immerse not more than 2 feet (0.6 m) of cable, 1 foot (0.3 m) of the plug, and 1 foot (0.3 m) of the receptacle.

While immersed, each connector assembly must be manually flexed for 2 minutes and then left immersed for a minimum of 24 hours with its cable leads flexed and maintained 180° from its longitudinal axis.

Measure the insulation resistance between conductors of each connected assembly after the 24 hour soaking period. The resistance measurements must be taken 1 minute after a test voltage of 4.7 kV dc has been applied for 5 minutes to Type II connectors and 15 kV dc to Type I connectors. The minimum resistance between conductors must be 25,000 megohms.

Heat the tap water to 149° F (65° C) without removing the assemblies and maintain this temperature for at least 1 hour.

Again measure the resistance between the conductor(s) and water, and between conductors with a 500-volt source. The minimum acceptable resistance after the heated soaking period must be 10,000 megohms.

Results - Style 4 & 11

Initial Water Temperature	
Requirement	Measured
20°C - 25°C	23.9 °C

Manually Flexed for Two Minutes					
Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
x	x	x	x	x	x

20°C - 25°C Soak Period						
Start				Complete		
Date	Time	Water Temperature	°C	Date	Time	Water Temperature
12/26/19	9:00	23.9	°C	12/27/19	9:00	22.1 °C

Insulation Resistance after 20°C - 25°C Soak Period							
Sample	Test Voltage	Test Condition		Measured		Requirement	(P/F)
-1 + -7	15KVdc for Five Minutes	One Minute Rest	500V Source	195500	MΩ	25,000 Megaohms	P
-2 + -8				398700	MΩ		P
-3 + -9				259900	MΩ		P
-4 + -10				284800	MΩ		P
-5 + -11				414800	MΩ		P
-6 + -12				223400	MΩ		P

65°C Soak Period						
Start				Complete		
Date	Time	Water Temperature	°C	Date	Time	Water Temperature
12/27/19	9:30	22.1	°C	12/27/19	10:30	65.3 °C

Insulation Resistance after 65°C Soak Period							
Sample	Test Voltage	Test Condition		Measured		Requirement	(P/F)
-1 + -7	None	500V Source	500V Source	205500	MΩ	10,000 Megaohms	P
-2 + -8				386400	MΩ		P
-3 + -9				264100	MΩ		P
-4 + -10				269000	MΩ		P
-5 + -11				417100	MΩ		P
-6 + -12				229100	MΩ		P

Complies: YES NO

Tested By:	S. Hammond	Signature or initials:	<i>S.H.</i>
Engineer:	J. Barnoski	Signature or initials:	<i>J.B.</i>
Reviewed By:	cwm	Signature or initials:	<i>C.W.M.</i>
Test Equipment Used:	4,23,24,25,26	Sample No:	CRT1912101011-001-1 - -6 CRT1912101011-001-7 - -12
Amb (°C):	20.4	RH%	23.8
		Completion Date:	12/27/2019

Bond Test

The molded bond between cable and Class A connector must be subjected to a static longitudinal pull load of the magnitude per paragraph 3.3.2. When testing Class A, Type II, connectors of any style the two conductors must be pulled as a single cable, not as individual conductors. The connector must be held in a manner that does not impart a crimping or clamping action to the connector that would affect the pull test. The connector molding cavity, or a similarly shaped fixture, is acceptable for holding the connector. Separation between the molded on connector and the cable jacket or conductor insulation exceeding .03 inches must be cause for rejection.

Referencing 3.3.2 Bonding Strength. The completed Class A connector assembly must withstand a longitudinal pull of at least 30,000 pounds per square inch (psi) (207 Megapascals (MPa)), 75 percent of an average tensile strength of 40,000 psi, (276 MPa) for all wire sizes. Calculation of tensile strength should be done by considering the cross sectional area of the conductor only. Separation between the molded on connector and the cable must not exceed 0.03 inches (0.8 mm). The wires must be per with ASTM Specification B 33 and B 189.

Results - Style 2

Individual Conductors per Cable	19	Number of Cables	1
Diameter of Single Conductor (in)	0.025	Total Conductor Area (in ²)	0.010
Longitudinal Pull Load (psi)	30000	Longitudinal Pull Load (lbs)	288.7

Sample	Type	Force Applied	Post Test Visual Inspection	(P/F)
-19	I	288.9 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-20	I	289.5 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-21	I	288.5 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-22	I	290.0 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-23	I	300.5 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-24	I	290.1 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P

Results

Individual Conductors per Cable	19	Number of Cables	1
Diameter of Single Conductor (in)	0.025	Total Conductor Area (in ²)	0.010
Longitudinal Pull Load (psi)	30000	Longitudinal Pull Load (lbs)	288.7

Sample	Type	Force Applied	Post Test Visual Inspection	(P/F)
-25	I	289.0 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-26	I	298.1 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-27	I	288.9 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-28	I	289.1 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-29	I	296.4 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P
-30	I	288.6 lbs.	No separation of the molded on connector and the cable jacket or conductor insulation was observed	P

Complies: YES NO

Tested By:	S. Hammond	Signature or initials:	<i>SH</i>
Engineer:	J. Barnoski	Signature or initials:	<i>JB</i>
Reviewed By:	cwm	Signature or initials:	<i>AM</i>
Test Equipment Used:	4,22	Sample No:	CRT1908281033-001-19 --24 CRT1908281033-001-25 --30
Amb (°C):	23.3	RH%	41.2
		Completion Date:	9/27/2019

Mechanical Connection Test

Each plug and receptacle intended for mating must be connected together and subjected to the static pull load per paragraph 3.3.3. Any evidence of separation of the connection must be cause for rejection. An increasing load must be applied to the connector assembly until separation occurs. No damage must occur to the mating components when the connected plug and receptacle are separated by the greater static pull load. Any evidence of damage to plugs, receptacles, conductors, and/or the connector bond will be cause for rejection.

Results - Style 2 & 9

Sample	Static Pull		Pull to Disconnected		Evauation	
	Applied	Separation	Approx. Break Force		Damage	(P/F)
-19 + -25	10 Lbs.	None	22	Lbs.	None	P
-20 + -26		None	25	Lbs.	None	P
-21 + -27		None	27	Lbs.	None	P
-22 + -28		None	24	Lbs.	None	P
-23 + -29		None	25	Lbs.	None	P
-24 + -30		None	24	Lbs.	None	P

Complies: YES NO

Tested By:	S. Hammond		Signature or initials:	<i>SH</i>
Engineer:	J. Barnoski		Signature or initials:	<i>JB</i>
Reviewed By:	cwm		Signature or initials:	<i>cwm</i>
Test Equipment Used:	15,4		Sample No:	CRT1908281033-001-19 - -24 CRT1908281033-001-25 - -30
Amb (°C):	22.8	RH%	52.5	Completion Date: 9/24/2019

Electrical Connection Test

The voltage drop measurements must be made across mated connectors while conducting their rated current. The contacts of six sample plugs and six certified receptacles (six contact pairs for Type I connectors and twelve contact pairs for Type II connectors) are measured with 20 A for type II and 25 A for type I flowing through the conductors. The voltage drop across the contacts of a connected plug and receptacle must not exceed 7.5 mV for the Type I connectors and must not exceed 6.0 mV for the Type II connectors.

Results

Sample	Type	Spec. min. Rating	Type I 7.5mV	Measured Current	Measured Voltage Drop (mV)	Pass/Fail
		Type I	Max. Voltage drop			
	I	5000V Req.	7.5 mV Req.	25A Req.	Large Pin	
-31	I	5000V	7.5 mV	25	3.34	P
-32	I	5000V	7.5 mV	25	2.13	P
-33	I	5000V	7.5 mV	25	5.39	P
-34	I	5000V	7.5 mV	25	3.57	P
-35	I	5000V	7.5 mV	25	2.14	P
-36	I	5000V	7.5 mV	25	4.55	P

Complies: YES NO

Tested By:	S. Hammond	Signature or initials:	<i>SH</i>
Engineer:	J. Barnoski	Signature or initials:	<i>JB</i>
Reviewed By:	cwm	Signature or initials:	<i>AM</i>
Test Equipment Used:	7,18,19,20	Sample No:	CRT1908281033-001-31 - -36
Amb (°C):	20.6	RH%	49.7
		Completion Date:	9/25/2019

Weathering

Xenon Arc : Subject sample pairs of connectors and five flat slabs of connector housing material measuring 1" x 6" to Xenon Arc radiation for 720 hours in accordance with UL 2556 Section 4.2.3 . The sample pairs of connectors were examined visually for evidence of cracking or deterioration. Tensile must be tested in accordance with UL 1581 Section 1200.15 using the five conditioned slabs and five unconditioned slabs.

Ozone: Subject sample pairs of connectors and two flat slabs of connector housing material measuring 1" x 6" to ozone in accordance with ASTM D1149 with 50 ppm concentration of ozone, 38°C, 20% sample slab extension for 100 hours exposure.

Xenon Arc Exposure Results

Test Set Up	
Duration	720 Hours (360 Cycles)
Light Segment (per cycle)	102 Minutes
Light Segment with Water Spray (per	18 Minutes
Chamber setting	0.35 w/m2 @ 340nm.
Black Panel temperature	63 degrees C
Chamber temperature	na
Relative Humidity	na
Filter Outer	Inner Daylight Boro
Filter Inner	Outer Daylight Boro

Test Parameters	
Xenon Lamp S/N	K1363310
Hour Meter "Start"	0
Hour Meter "Stop"	720

Post Test Inspection	
Item	Yes/No
Deterioration	No
Alteration	No

Unconditioned Test Samples		
Sample	Ultimate Elongation (%)	Tensile strength (psi)
1	141.6	1100.0
2	130.1	1100.0
3	146.1	1040.0
4	161.4	1130.0
5	149.3	1060.0

Post Sun Exposure Test Samples		
Sample	Ultimate Elongation (%)	Tensile strength (psi)
6	127.9	1050.0
7	117.9	1040.0
8	110.1	1050.0
9	135.7	1040.0
10	132.0	1060.0

Average Ultimate Elongation Unconditioned	145.7	%
Average Ultimate Elongation Post Sun Exposure	124.7	%
Ratio	0.86	
Required	0.80	
Pass/Fail	Pass	

Average Tensile Strength Unconditioned	1086.0	%
Average Tensile Strength Post Sun Exposure	1048.0	%
Ratio	0.97	
Required	0.80	
Pass/Fail	Pass	

Post Test Pictures



Complies: YES NO

Tested By:	Mike Guy	Signature or initials:	<i>Mike Guy</i>
Engineer:	J. Barnoski	Signature or initials:	
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Test Equipment Used:	27,28,29,30,31	Sample No:	CRT1903111051-001-66 - -71 CRT1903111051-001-72
Amb (°C):	21.6	RH%	24.2
		Completion Date:	3/24/2020

Ozone Exposure Results

Chamber Temperature (°C)	Measured Ozone (ppm)	Hour Meter "Start"	Hour Meter "Stop"
38.1	49.7	100	0

Sample	Sample Length	Loaded Sample Length	Percent Extension	Req (%)
Dogbone 1	1" benchmark	1.2" benchmark	20%	20%
Dogbone 2	1" benchmark	1.2" benchmark	20%	20%
Dogbone 3	1" benchmark	1.2" benchmark	20%	20%
Dogbone 4	1" benchmark	1.2" benchmark	20%	20%

Post Test Inspection		
Sample	Item	Yes/No
Dogbone 1	Deterioration	No
	Alteration	No
Dogbone 2	Deterioration	No
	Alteration	No
Dogbone 3	Deterioration	No
	Alteration	No
Dogbone 4	Deterioration	No
	Alteration	No
Toroid 1	Deterioration	No
	Alteration	No
Toroid 2	Deterioration	No
	Alteration	No
Connector 001-22	Deterioration	No
	Alteration	No
Connector 001-23	Deterioration	No
	Alteration	No
Connector 001-28	Deterioration	No
	Alteration	No
Connector 001-30	Deterioration	No
	Alteration	No

Post Test Pictures



Complies: YES NO

Tested By:	Christopher Duhan	Signature or initials:	<i>CD</i>
Engineer:	J. Barnoski	Signature or initials:	<i>JB</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Test Equipment Used:	27	Sample No:	CRT1903111051-001-66 - -71
Amb (°C):	38.1	RH%:	NA
		Completion Date:	3/2/2020

Metal Bond Test

Class A assemblies must have their connector plug and receptacle placed in water, with 20 psi air pressure applied from the free end of the cable, for 10 minutes per paragraph 4.2.7. There must be no air bubbles emanating from the assembly observed in the water.

Results

Sample	Applied pressure (PSI)	Air Pressure Start	Air Pressure Stop	Bubbles Present (Y/N)	P/F
-19	20	20	20	N	P
-20	20	20	20	N	P
-21	20	20	20	N	P
-22	20	20	20	N	P
-23	20	20	20	N	P
-24	20	20	20	N	P

Sample	Applied pressure (PSI)	Air Pressure Start	Air Pressure Stop	Bubbles Present (Y/N)	P/F
-25	20	20	20	N	P
-26	20	20	20	N	P
-27	20	20	20	N	P
-28	20	20	20	N	P
-29	20	20	20	N	P
-30	20	20	20	N	P

Complies: YES NO

Tested By:	S. Hammond	Signature or initials:	<i>SH</i>
Engineer:	J. Barnoski	Signature or initials:	<i>JB</i>
Reviewed By:	cwm	Signature or initials:	<i>CWM</i>
Test Equipment Used:	4,16,17	Sample No:	CRT1908281033-001-19 - -24 CRT1908281033-001-25 - -30
Amb (°C):	22.8	RH%	52.5
		Completion Date:	9/30/2019

Equipment list				
#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	N1394	Caliper 0-6"	Westward	18-Feb-2020
2	N786	Digital Micrometer	Mitutoyo	15-Mar-2019
3	F363A	Force Gauge	Imada Inc.	27-Apr-2019
4	L190	Hygro-Thermometer	Testo	26-Feb-2020
5	N1419	Stopwatch	Control Co	31-Aug-2019
6	M266	Pressure Gauge	U.S. Gauge	19-Oct-2019
7	L190	Hygro-Thermometer	Testo	26-Feb-2020
8	E431	Portable DC Test Set	VLF Hipot Instruments	20-Jul-2019
9	V338	Megohmmeter	AMEC	17-Jan-2020
10	M309	Stopwatch	Control Company	03-Nov-2019
11	M236	Multimeter, Digital	Fluke	28-Apr-2019
12	M176	Digital Multimeter	Keithley	12-Apr-2019
13	A186	CT	Pearson	20-Nov-2020
14	S/N 82718	Load Cell	Tinius - Olsen	01-May-2019
15	F363A	Force Gauge	Imada Inc.	22-Mar-2020
16	M312	Stopwatch	Control Company	02-Feb-2020
17	P439	Pressure Gauge	USG	10-Jul-2020
18	A198	Current Monitor, Wideband	Pearson Electronics Inc	08-Jul-2022
19	M244	Multimeter, Digital	Fluke	26-Mar-2020
20	M176	Digital Multimeter	Keithley	12-Jun-2020
21	V338	Megaohmmeter	AMEC	17-Jan-2020
22	F544	Hanging Crane Scale	Ametek	31-Jan-2020
23	T804	Thermometer, Digital	Fluke	18-Jul-2020
24	M309	Stopwatch	Control Company	06-Nov-2020
25	E431	Portable DC Test Set	VLF Hipot Instruments	06-Nov-2020
26	V338	Megaohmmeter	AMEC	17-Jan-2020
27	H131	Ozone chamber	O3DM-100	27-Aug-2020
28	B035	UV chamber	Atlas	06-May-2020
29	D639	Die cutter	~~~	24-Feb-2021
30	K4186	Load cell/Extensometer	Tinius - Olsen	30-Apr-2020
31	L190	Hygro-Thermometer	Testo	05-Dec-2020
32				
33				

Note: For measurement uncertainty, refer to the calibration certificates for all the test equipment located in the equipment files