Accelerated Weathering Test Chamber – EQNA-UV

Accelerated weathering test simulates atmosphere with inicidence of UVA and UVB light, dew, thermal shock and temperatura on samples or proof bodies, predicting damages in non metallic materials (deterioration, aging, erosion, mechanicals and phisics of changes, hur and bright

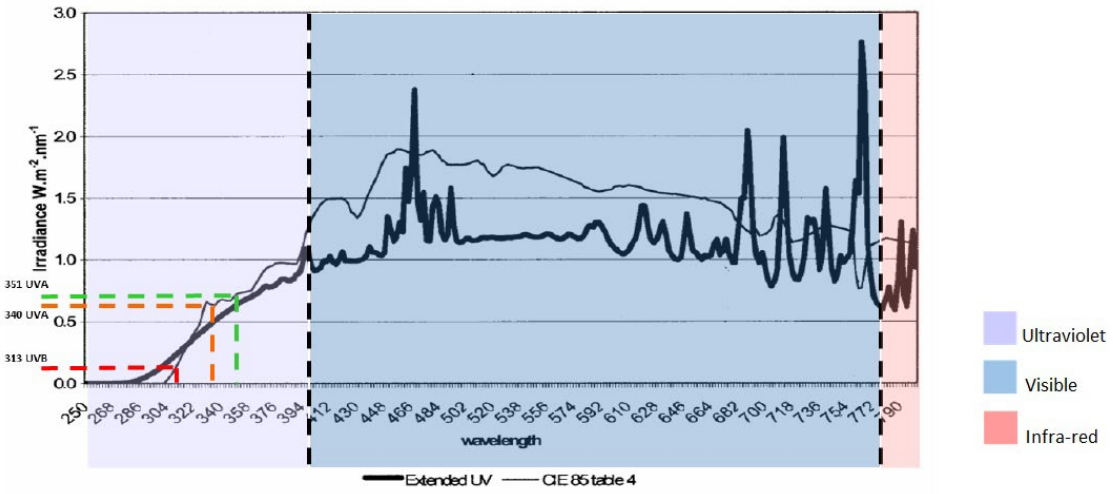
ness) and reduce losses. The results of teses has confity, fastly results and matching according with technical standards as ASTM D4329, ASTM G154, ASTM G151, ASTM G53, SAE J2020, ISO 4892-3 and others.

UVA and UVB irradiation with weather action act as the main cause of physical / chemical damage in relation to the intensity and wavelength of light in the solar spectrum. According to SAE J2412, the CIE 85 of the solar spectrum collected in natural weather in the graph below, shows UV irradiation between 250 to 400 nm, visible light from 400 to 780 nm and infrared above 780 nm.

When we use an acceleration of the aging process in non-metallic materials we use ultraviolet fluorescent lamps within the wavelength scales between 290 to 400 nm, this wavelength range is more harmful for non-metallic materials, so much so that the technical standards - Xenon Test (Wheather o meter), recommends the calibration of xenon equipment, exactly in this range of harmfulness of the spectrum 250 ~ 400 nm.

When analyzing the irradiance intensity provided by the solar spectrum collected in natural weather in relation to the wavelength 313 nm is approximately 0.15 W / m2.nm, for 340 nm irradiance of 0.6 W / m2.nm and 351 nm approximately 0.8 W / m2.nm of irradiance. To ensure the accelerated action of the range of non-metallic materials, Equilam provides UVA and UVB fluorescent lamps that ensure the intensity sometimes higher than the solar spectrum in natural weather, optimizing the test time inside the laboratory and strictly meeting the standards accelerated weathering test techniques.

The evidence and comparisons between laboratory and real tests are validated in natural weather for a longer time of testing, to prove the safety of the result collected effectively.



Source: Image modified from SAE J2412 EN, 2005.

INTERNATIONAL APPLICATION

EQNA -UV chamber accelerates the degradation and aging of some materials, causing loss of gloss and color, mechanical resistance, blisters, disintegration, oxidation.

EQNA-UV chamber helps the development of new materials and improvement of current materials and they are regularly used by industries as:

- Automotive Industries
- Varnish and Paints
- Textile
- Wood
- Cosmetic
- Research Center
- Universities
- Petrochemical
- Plastic and Rubber

In the automotive industry in general can highlight the support with the use of Accelerated Weathering Test Chamber with lamps that send UV light, this being from 300 nm to 400 nm, designated for checking and validating the use of materials, identifying their maximum wear.

PERFORMANCE

The EQUV series contains 4 different models, providing the maximum to meet the Accelerated Weathering reference standards, highlighting the EQNA - UV model + Condensation + Spray / UV + Spray (Thermal Shock) that meets cycle 7 specified in the ASTM G154 Standard (as shown in the table above in annex 1) encompassing high technology with excellent performance, in a controlled and automatic way.

	Model		
SPECIFICATIONS	**EQNA - UV** **(UVa and UVb)**	**EQNA - UV** **UVa / UVb + Condensation**	**EQNA – UV** **UVa / UVb + Condensation + Spray + Spray /UV**
Temperature adjustment - UV MODE	Room Temperature Range: +9°F to +176°F (Room temp: +5°C - +80°C)		
Temperature adjustment - CONDENSATION MODE	-	Room temperature Range: +9°F - +140°F (Ambient temperature +5°C - +60°C)	
Temperature adjustment – SPRAY MODE	-	-	Room temperature
UV + SPRAY MODE or SPRAY MODE (Automatic control with pump – Flow rate = 16 l/min – without necessary of rotametro, incluse in the spray tank)	-	-	Included
Tank to use in the Spray Mode– 92.46 gal (Optional)	-	-	**15 min** **(max. time)**
Command Panel	PLC		
Specimen Capacity	48 specimens + 2 sets of Black Panel		
"EQNAUV CONTROL" software - Monitoring and control of UVa and UVb irradiation, saving lamp life, ensuring irradiance performance during the test.	Included		
"EQUV CAL" Software with Radiometer - Validation and Calibration of fixed monitoring sensors (ISO 17025 traceability). **Sensor failure indication.**	Included		
"BP CAL" - Validation and Calibration of temperature sensors (two) - (ISO 17025 traceability)	Optional		
Two Black Panels (side A and side B) - Ensuring uniformity and safety (EXCLUSIVITY EQUILAM)	Included		
Alarm / Service Messages with a simple touch on the screen	Included		

• UVa and UVb irradiation emitted through 8 fluorescent lamps (Types: UVa 340 and 351 (40W); UVb 313 (40W); UVa 340 + and 351 + and UVb 313 +;

• External office built in Fiber Glass (where there is no incidence of UVa and UVb irradiation;

• Test cabinet built in special aluminum alloy with high reflectance index, with resistance to corrosion and ultraviolet light;

• Water purification system, with consumption varying between 4 to 10 liters / test days.

TECHNICAL SPECIFICATIONS

	Models		
SPECIFICATIONS	**EQNA-UV**	**EQNA-UV + Condensation**	**EQNA-UV + Condensation + Spray + Spray/UV**
Avaliable Radiation Intensity Units	W/m²/nm – W/m² - J/m² - kJ/m²/nm		
Available Temperature Units	°F - °C		
Irradiation Uniformity	+/- 4% of specimens surface		
UVA and UVB fluorescent lamps are monitored for irradiation consistency during test, automatic power compensation system for lamps depreciation, without user interference. Ensuring longer lamp life.	Included 4 UVA/UVB sensors (2 for each side for each pair of lamps) Software "EQNAUV CONTROL"		
User Interface Platform	Touch screen color		
Self-diagnosis function: Temperature alarm (high and low) and error details.	Yes	Yes	Yes
Self-diagnosis function: Tray low water alarm and error details.	-	Yes	Yes
Self-diagnosis function: Pressurized water shortage alarm and error details.	-	-	Yes
Self-diagnosis function: Lamp depreciation alarm (irradiation power) and error details.	Yes		
End of test's alarm	Yes		
20 test programs with 100 segments (4 programs unlocked + 16 programs locked with password)	Yes		

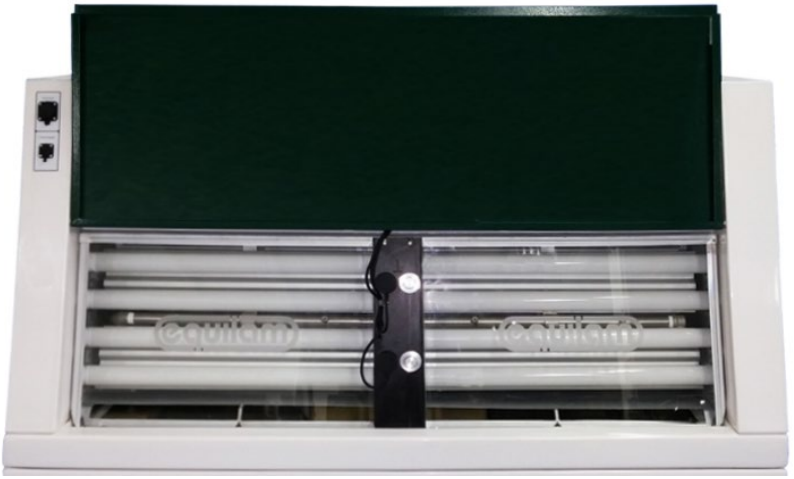
Timer for each programmed Mode	Mode: UV; Condensation; Spray e Spray + UV
Program in two languages	English and portuguese
Allows you to work with UVa and UVb Fluorescent Lamps	Fluorescent lamps with wavelength of: 313 nm – 340 nm – 351 accordance to standard ASTM G154
Data aquisition software and/or data report	Two types: PC (USB or RS 232) or SD Card
Diagnostic Function: **Stores date and time of alarms and preventive maintenance.**	Included
Total exposure area of samples	6.000 cm^2 (4 quadrants of 1500 cm^2)
UV intensity uniformity area	21 x 90 cm / Total area = 1890 cm^2 According to SAE J 2020 (Fig.3)
Maximum irradiation 340 and 351 nm (UVa)	1,70 W/ m^2.nm
Maximum irradiation 313 nm (UVb)	1,25 W/ m^2.nm
Condensation mode tray made of polymeric material with protection against UVa and UVb irradiation.	Elimination of contamination by encrusting minerals in the tray, avoiding corrosion pits due to leaks.
Standard sample size	Capacity: 48 pieces 75 x 150 mm and thickness up to 20 mm.
Automatic restart after power failure	If it is the customer's responsibility, it is possible to enable the function.
Lid opening safety system	Switching off the heating and irradiation functions and pausing the programming, making it easier to replace the lamps safely.
Electrical Supply	208 or 230Vac 1Ø 60/50 Hz – 16 FLA

Water Quality	ASTM D 1193 Tipo IV		
DEI water – Spray Mode	-	-	16 l/min – 14 - 21 psi (1.0 - 1.5 gf/cm²)
Water Input Ø – Condensation Mode	-	1/4”	1/4”
Water Input Ø – Spray Mode	-	-	1”
Chamber’s drain	-	1/2”	-
Spray Mode’s drain	-	-	1”
Cable Port for calibration. **Automatic Irradiation calibration via radiometer, 313 nm, 340nm and 351 nm**			
Black Panel A and B side with independent sensors improving the temperature’s control and stability. **“BPCAL” Calibrator (Optional), PT100 Class A sensor RTD.** **Temperature range: Room temperature Range: +9°F - +176°F (Room temp: +5°C - +80°C)**			
Control of water level on tray	-	Yes	Yes
Stainless steel heater	Yes	Yes	Yes
UVA or UVB shall work on either side but not mixed on same side	Yes	Yes	Yes

Independent timer for each mode with indication of run time and adjusted value	Yes	Yes	Yes
Timer of total time of test, with indication of run time and adjusted total value from 0 up to 99,999 hours.	Yes	Yes	Yes
5 (five) partial timers of test, each one from 0 to 999 hours	Yes	Yes	Yes
External dimensions W x D x H	55.9”x 26.4”x 53.5” (1,420 x 670 x 1,360 mm)		
Box dimensions W x D x H	59.0”x 29.5”x 57.1” (1,500 x 750 x 1,450 mm)		
Net Weight – approx.	222.7 lbs (101 kg)		
Gross Weight (with create)- approx.	321.9 lbs (146 kg)		
Access Required	Approximate 39” (1m) around perimeter.		
Lab condition - temperature	+63°F - +82°F (17°C - 28°C)		
Lab condition – relative humidity	40% - 85% (without condensation)		

POSSIBILITY OF WORKING WITH UVa AND UVb LAMPS AT THE SAME TIME

EQUV chambers can perform the test with UVa lamps on one side and UVb lamps on the other side, or UVa lamps on both sides with different wavelengths and intensities, as long as the temperature and test time are the same, providing greater optimization between cycles of tests with dissimilar lamps. The software technology - ''EQNAUV CONTROL" developed over 10 years ago, allows the control and adjustment for each chosen wavelength (UVa and UVb) effectively.



Source: Author.

INTENSITY AND IRRADIANCE ASSURANCE DURING THE TEST - SOFTWARE "EQNAUV CONTROL"

Efficiently and safely, EQNAUV chambers come with "EQNAUV CONTROL" software and an irradiation sensor for each pair of lamps, which controls and monitors the intensity of irradiance throughout the test, ensuring constant uniformity of irradiance. Increasing the lamp life and generating cost optimization in lamp expenses, all the technology provided directly on a Touch Screen, with friendly software.

Source: Author.

IRRADIANCE VALIDATION AND CALIBRATION SYSTEM - SOFTWARE "EQNAUV CAL"

Many irradiance calibration technologies prioritize sensors already installed in the chamber and which are directly close to the exposure region, however over time it is noticeable the dissimilarity between the results collected after a few years of life, due to its aging. With this, Equilam provides the software "EQNAUV CAL" promoting through the Radiometer the communication between sensors installed in the chamber and the calibrated external sensor of the radiometer, providing the instant calibration of the chamber sensors.

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The advantages of using the Radiometer are:

- **Coherent results;**
- **Easy calibration without moving the equipment;**
- **Accuracy of irradiance;**
- **Safe and fast system;**
- **Cable communication between equipment and calibrator;**
- **Reference in calibration method.**

LAMPS SPECIFICATIONS

The EQUV series works with lamps with wavelengths of 340, 351 and 313 within the irradiance scale required by the standards: ASTM G 154, ASTM G 151, ASTM G 53, SAE J 2020, ISO 4892, among others.

The ensures of a safe test result is its working range within the spectrum of lamps developed by Equilam, if this is met the result will be consistent with an analysis with accelerated weather in accordance with technical standards.

	Types: Fluorescents lamps UVA and UVB – Equilam NA					
	340 (40 W)	**340 +**	**351 (40 W)**	**351 +**	**313 (40 W)**	**313 +**
Maximum irradiation intensity of the lamps (W/m^2. nm)	**1,05**	**2,02**	**1,73**	**2,35**	**1,25**	**1,50**
Maximum irradiation intensity * ASTM G 154 (W/m^2. nm)	**1,55**	**1,55**	**1,55**	**1,55**	**0,71**	**0,71**
Irradiation intensity representative* ASTM G 154 (W/m^2. nm)	**0,89**	**0,89**	**0,89**	**0,89**	**0,49**	**0,49**

*** The values of representative and maximum irradiation intensity used above can be considered according to a wide range of technical standards of accelerated weathering by fluorescent lamp UVA and UVB.**

Source: Author.

The durability of 340 +, 351 + and 313 + lamps:

- Through the monitoring of the "EQNAUV CONTROL" software, **with a set point adjustment of the maximum irradiation intensity supported by lamps with continuous use**, it will have a useful life of approximately **750 hours.**
- Through the monitoring of the "EQNAUV CONTROL" software, **with set point adjustment of the maximum irradiation intensity ASTM G154 with continuous use**, it will have a useful life of approximately **1,500 hours.**
- Through the monitoring of the "EQNAUV CONTROL" software, **with set point adjustment of the typical irradiation intensity ASTM G 154 with continuous use**, it will have a useful life of approximately **8,000 hours.**

The values in bold above are not guaranteed, as there are external factors that can modify.

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TABLE X2.1 Some Historical Exposure Conditions

Cycle	Lamp	Typical Irradiance	Approximate Wavelength	Exposure Cycle	Original Reference and Application, Where Known
1	UVA-340	0.89 W/(m^2 • nm)	340 nm	8 h UV at 60 (±3) °C Black Panel Temperature; 4 h Condensation at 50 (±3) °C Black Panel Temperature	D4329 cycle A for general Plastics; D4587 Cycle 4 for general metal coatings; C1442 for sealants
2	UVB-313	0.71 W/(m^2 • nm)	310 nm	4 h UV at 60 (±3) °C Black Panel Temperature; 4 h Condensation at 50 (±3) °C Black Panel Temperature	Unknown
3	UVB-313	0.49 W/(m^2 • nm)	310 nm	8 h UV at 70 (±3) °C Black Panel Temperature; 4 h Condensation at 50 (±3) °C Black Panel Temperature	SAE J2020
4	UVA-340	1.55 W/(m^2 • nm)	340 nm	8 h UV at 70 (±3) °C Black Panel Temperature; 4 h Condensation at 50 (±3) °C Black Panel Temperature	Unknown
5	UVB-313	0.62 W/(m^2 • nm)	310 nm	20 h UV at 80 (±3) °C Black Panel Temperature; 4 h Condensation at 50 (±3) °C Black Panel Temperature	Unknown
6	UVA-340	1.55 W/(m^2 • nm)	340 nm	8 h UV at 60 (±3) °C Black Panel Temperature; 4 h Condensation at 50 (±3) °C Black Panel Temperature.	Unknown
7	UVA-340	1.55 W/(m^2 • nm)	340 nm	8 h UV at 60 (±3) °C Black Panel Temperature; 0.25 h water spray (no light), temperature not controlled; 3.75 h condensation at 50 (±3) °C Black Panel Temperature	Unknown
8	UVB-313	28 W/m^2	270 to 700 nm	8 h UV at 70 (±3) °C Black Panel Temperature; 4 h Condensation at 50 (±3) °C Black Panel Temperature	Unknown

Source: ASTM G154.

TANK TO SPRAY TEST

The Water Spray or Thermal Shock at EQUV has a tank to receive purified water (DEI) and filling regulation providing an automatic test when selecting the Spray mode or UV / Spray or Spray mode (Thermal Shock), being our reference equipment on the market for allowing 15 minutes of testing without interruptions or the need to refill the tank. The system also has a high-performance pump that provides the pressure necessary to supply the spray nozzles on both sides of the chamber evenly.

We recommend that the DEI water used during the Spray MODE be eliminated along with possible contaminants that may interfere with the test results, ensuring that there is no recirculation of the contaminated DEI water, according to ASTM G154.

The Spray tank has a lack of water alarm and a maximum and minimum level of filling, promoting its automatic shutdown in cases of lack of water in the supply line. There is no need for a rotameter, as this includes a pump with constant flow, ensuring uniform wettability, follow glass for verification.

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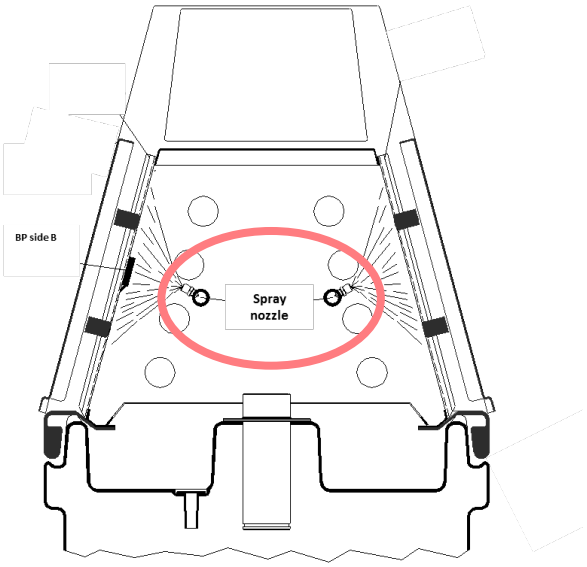


Source: Author.

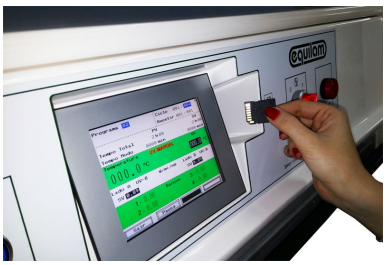
TEMPERATURE VALIDATION AND CALIBRATION - BP CAL - Optional

The EQUV series provides a system for validating the temperature of the BLACK PANEL of the chamber on both sides, allowing through communication between the "**BP CAL"** (Calibrated ISO 17025) and the BP of the chamber. Ensuring temperature homogeneity in the UV and Condensation modes on both sides of the chamber. Another advantage is the ease of calibration - checking the BP temperature without moving the chamber.

Source: Author.

DATA AQUISITION - OPTIONAL

Possibility to export temperature data during the test, irradiance and UV mode, Condensation, Spray and UV + Spray using two optional technologies in the equipment:



• **SD Card** - Easy and fast method that allows you to check the equipment's behavior after hours of testing, exporting the file in Excel format; without the need for a notebook.

• **DataAquisition** - Software that allows communication via RS 232 or USB input, to view equipment conditions in real time, export data at the end of the test and generate graphs, fully interactive and technological.

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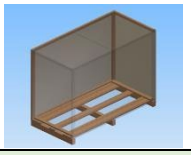
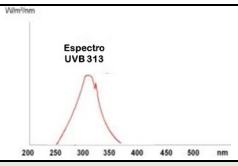
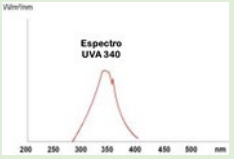
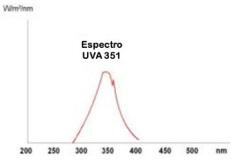
OPTIONAL ACESSORIES

EQOP.0005	Special fixture	
EQOP. 0013	DI Water (Complete Assembly)	
EQOP. 0014	Spare DI water column	
EQOP. 0015	Spare active charcoal filter	
EQOP. 0027	Wood export crate	
EQOP. 0036	Equipment's Certificate – Temperature and Irradiance	
EQOP. 0037	Data Acquisition Software - - By PC - RS 232 and/ USB	
EQOP. 0048	UVb 313 Lamps (40W) – box with 12 lamps	
EQOP. 0049	UVa 340 Lamps (40W) – box with 12 lamps	
EQOP. 0050	UVa 351 Lamps (40W) – box with 12 lamps	
EQOP. 0051	Tank with DI water pressurization for Spray MODE – Software and pump included. Ext. Dim. L x W x H: 66.9" x 35.4" x 37.8". Tank Volume 100 gal (380L). Weight Net: 176 lbs. (80 Kg)	

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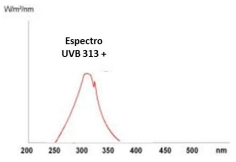
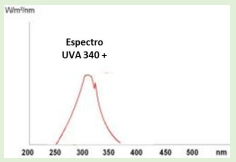
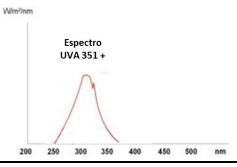
EQOP. 0086	Data Acquisition software by SD Card 8 GB	
EQOP. 0087	Black panel calibration instrument – with traceability calibration	
EQOP. 0164	Support 3D – For samples in three dimensions. L X W X H : 19,68” X 13,78” X 2,75”.	
EQOP. 0165	Support 3D – For samples in three dimensions. L X W X H: 19,68” X 13,78” X 5,90”.	
EQOP. 0162	UVb 313 + Lamps – (high intensity of irradiance) Box with 12 lamps	
EQOP. 0057	UVa 340 + Lamps - (high intensity of irradiance) Box with 12 lamps	
EQOP. 0058	UVa 351 + Lamps - (high intensity of irradiance) Box with 12 lamps	

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TECHNICAL STANDARDS MAIN TO WEATHERING TESTS

GENERAL	PAINTS	ADHESIVES	PLASTIC	TEXTILE	PHOTOVOLTAIC	RUBBER	SELANTS
ASTM G53	ASTM D3794	ASTM C24.35.31	ASTM D4329	ATCC-M-186	ASTM E3006	ASTM B1148	ASTM C1257
ASTM G151	ASTM D 4587	ASTM C1442	ASTM D4674	CFFA		ASTM D4811	ASTM C1442
ASTM G154	M598	ASTM D904	ASTM D5208			ASTM D750	ASTM C732
JIS D0205	Nissan M007	ASTM D5215	ISO 4892-3			ASTM D925	ASTM C734
SAE J2020		UNE 104.281.88	UNF 53104				
ISO 4892-3			ANSI C57.12.28				
ABNT NBR 9512			ANSI A 14.5				
ISO 11507							
DIN 53384							
BS 2782							
GM 9125P							
ASTM D6662							

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WARRANTY

1 (One) Year Parts Warranty against manufacturing defects from date of delivery at customer's site. This assumes equipment is used under normal operating conditions in accordance to the instruction manual. This warranty does not apply to glassware (lamps). In case of non-warranty issues during warranty period, actual expenses shall apply.

Note 1: All our equipment is delivered with Installation, Maintenance, and User Manuals. We believe this material is enough for the correct use of the equipment. We are available for further questions and clarifications. If necessary, we provide the service of assembling and staff training at client's site (Cost for this service available upon request).

Note 2: Appearance and specifications of equipment are subject to change without prior notice.

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ANNEX I

3D support with the possibility of testing parts larger than 70 mm or 150 mm, ease of work and obtaining analyzes on samples with three dimensions.

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