Technical information sheet

LV 124 - Electrical and electronic components in motor vehicles up to 3.5t

LV 124 - General requirements, test conditions and tests

The manufacturers of electrical and electronic automotive assemblies not only have to deal with the increasing complexity and higher quality requirements but also with the manufacturers' specifications, which must be met. The early 2000s saw the emergence of an effort by leading automotive manufacturers in Germany to set out the requirements for manufacturers of electrical and electronic automotive assemblies in so-called delivery specifications (Liefervorschriften or LV). LV 124 therefore signifies a quality and reliability standard. LV 124 was created for "electrical and electronic components in motor vehicles up to 3.5 t" and adopted into the respective in-house standards (e.g. VW 80000, BMW GS 95024-3-1).

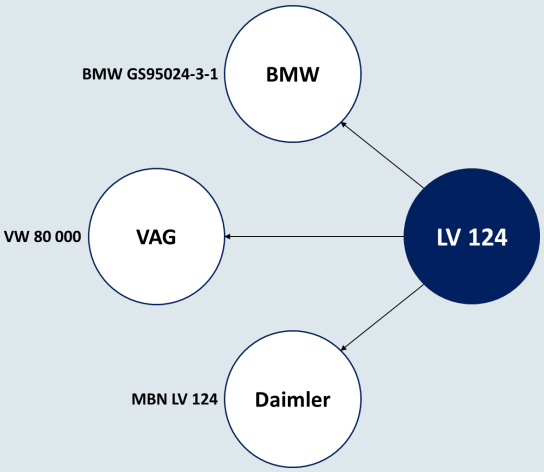
Application: The LV 124 standard specifies the requirements, test conditions and tests for electrical, electronic and mechatronic components and systems for the 12-volt electrical system in motor vehicles up to 3.5t.

LV 124 is divided into *two parts:*

Part I: Electrical requirements
This part consists of 24 electrical requirements and tests in the automotive sector

Part II: Environmental requirements
The environmental requirements are divided into four further categories.

- 9 Mechanical requirements and tests
- 19 Climatic requirements and tests
- Chemical requirements and tests
- 3 Service life tests



This delivery regulation is obligatory for all suppliers of the German OEMs - **weiss**technik has therefore made it its duty to support the suppliers in fulfilling the regulations since the announcement.

As a result, **weiss**technik can support the majority of environmental requirements with its existing product portfolio.

The following pages list examples of weiss*technik *brand device types that can assist you in performing the specific tests. If you can't find what you are looking for, please contact us! We can also provide LV 124 support for special equipment!

LV 124 – Part 1: Electrical requirements

E-01 Long-term overvoltage
E-02 Transient overvoltage
E-03 Transient undervoltage
E-04 Jump start
E-05 Load dump
E-06 Superimposed alternating voltage
E-07 Slow decrease and increase of the supply voltage
E-08 Slow decrease, quick increase of the supply voltage
E-09 Reset behavior
E-10 Short interruptions
E-11 Start pulses
E-12 Voltage curve with electric system control
E-13 Pin interruption
E-14 Connector interruption
E-15 Reverse polarity
E-16 Ground offset
E-17 Short circuit in signal circuit and load circuits
E-18 Insulation resistance
E-19 Closed-circuit current
E-20 Dielectric strength
E-21 Backfeeds
E-22 Overcurrents
E-23 Equalizing currents of multiple supply voltages
E-24 ON/OFF duration test

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LV 124 – Part 2: Environmental requirements

Mechanical requirements and tests

Test	Aim/benefit:	Standards:	Are fulfilled, for example, by:
M-01 Free fall	This test simulates the free fall of a component to the ground, which may occur during the entire process chain until the component is installed as intended. It serves to ensure that a component that is externally undamaged in a fall and is therefore installed in the vehicle does not have any hidden damage or previous damage, e.g. internal component detachments or cracks.		
M-02 Stone impact test	This test simulates the mechanical stress on the component caused by the impact of stones. It is used to ensure the component's resistance to defect patterns such as deformation and cracks.	**IEC 20567-1**	
M-03 Dust test	This test simulates the exposure the component has to dust while the vehicle is in use. It is used to ensure the component's resistance to electrical and mechanical defect patterns.	**IEC 20653**	**DustEvent**
M-04 Vibration test	This test simulate the vibration stress placed on the component during driving. It is used to ensure the component's resistance to defect patterns such as component delamination and material fatigue.	**IEC 60068-2-6** (sinusoidal-) **IEC 60068-2-64** (broadband vibration excitation)	**ShakeEvent**
M-05 Mechanical shock	This test simulates the mechanical stress on the component, e.g. when driving over curbs etc. or in the event of accidents. It is used to ensure the component's resistance to defect patterns such as cracks and component delamination.	**IEC 60068-2-27**	
M-06 Continuous mechanical shock	This test simulates the acceleration forces of components installed in doors or flaps that experience high accelerations during opening and closing. It is used to ensure the component's resistance to defect patterns such as component delamination and material fatigue	**IEC 60068-2-27**	

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	Test	Aim/benefit:	Adapted standards:	Are fulfilled, for example, by:
Mech. requirements and tests	**M-07** Coolant circuit pressure pulsation test	This test simulates the stress on the component caused by fluctuations in coolant pressure, as well as conditions during the post-heating phase and negative pressure filling of the cooling system. It must be used exclusively for components connected to a coolant circuit. It is used to verify the mechanical strength of the components affected by pressure fluctuations in the coolant circuit (e.g. cooling plates of the power module).		
	M-08 Protection against foreign bodies – IP0x to IPx4, A, B, C, D	This test is used to prove that the component is adequately protected against the ingress of foreign bodies.	**IEC 20653**	**DustEvent**
	M-09 Leak test	The required impermeability of a component in relation to the self-contained electronics compartment with respect to the environment or other compartments, for example that of the coolant channel of a coolant circuit, is described as the impermeability requirement. A leak test is used to verify that the electronics compartment of a component complies with the limit leakage rate defined for that component.		
Climatic requirements and tests	**K-01** High-/low-temperature storage	This test simulates the thermal stress on the component during storage and transport. It is used to demonstrate resistance to storage at high or low temperatures, such as during transport of the component (aircraft, shipping container). If the test is performed at the beginning of a test sequence, it also serves to align all the components to the same initial conditions.	**IEC 60068-2-1** **IEC 60068-2-2**	**ClimeEvent** **LabEvent**
	K-02 Incremental temperature test	This test simulates the operation of the component at different ambient temperatures. It is used to protect the component against malfunctions that may occur within a small interval of the operating temperature range.	**IEC 16750-4**	**ClimeEvent** **LabEvent**
	K-03 Low-temperature operation	This test simulates the stress on the component at low temperatures. It is used to ensure that the component functions properly after a long period of parking or driving at extremely low temperatures.	**IEC 60068-2-1**	**ClimeEvent** **LabEvent** **ShockEvent** **ShakeEvent**
	K-04 Repainting temperature	This test simulates the stress on the component during repainting. It is used to safeguard the component with regard to thermally induced defect patterns, e.g. cracking in soldered, glued, bonded and welded joints and on seals and housings.		**ClimeEvent** **LabEvent** **TempEvent**

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Climatic requirements and tests

Test	Aim/benefit:	Adapted standards:	Are fulfilled, for example, by:
K-05 Thermal shock (component)	This test simulates the thermal stress on the component caused by sudden temperature changes during vehicle operation. It is used to ensure that the component is protected against thermally induced defects, e.g. cracking in soldered, glued, bonded and welded joints and on seals and housings.	**IEC 60068-2-14 Na 60068-2-14 Nc MIL-STD-810H**	**ShockEvent**
K-06 Salt spray test with operation, exterior	This test simulates the component's exposure to salty air and water, which may occur in certain regions of the world and in winter road conditions. It is used to ensure that the component is protected against malfunction when exposed to salt, e.g. due to short circuits and leakage currents caused by salt penetrating the component.	**IEC 60068-2-11 Ka IEC 60068-2-52 IEC 9227**	**SaltEvent**
K-07 Salt spray test with operation, interior	This test simulates the exposure of the component to salty air, which may occur in certain regions of the world. It is used to ensure that the component is protected against malfunction when exposed to salt, e.g. due to short circuits and leakage currents caused by salt penetrating the components.	**IEC 60068-2-11 Ka IEC 60068-2-52 IEC 9227**	**SaltEvent**
K-08 Damp heat, cyclic	This test simulates the thermal stress on the component caused by cyclic temperature changes at high humidity during vehicle operation. It is used to ensure the component's resistance to humid heat.	**IEC 60068-2-30**	**ClimeEvent ShakeEvent**
K-09 Damp heat, cyclic (with frost)	This test simulates the thermal stress (including freezing) of the component due to cyclic temperature changes at high humidity during vehicle operation. It is used to ensure the components' resistance to humid heat.	**IEC 60068-2-38**	**ClimeEvent ShakeEvent**
K-10 Water protection – IPX0 to IPX6K	This test simulates the exposure of the component to water. It serves to protect the function of the component, e.g. when exposed to condensation water, rain, splash water.	**IEC 20653**	**Type SWT**
K-11 High-pressure/steam-jet cleaning	This test simulates the exposure of the component to water while the vehicle is being cleaned. It is used to ensure the functionality of the component during high pressure/steam-jet cleaning.	**IEC 20653**	**Type SWT**

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Climatic requirements and tests

Test	Aim/benefit:	Adapted standards:	Are fulfilled, for example, by:
K-12 Thermal shock with splash water	This test simulates the exposure of the component to splashing water when driving through puddles. It is used to safeguard the function of the component in the event of shock cooling by water.	**IEC 12103-1**	**splash water test TS SW**
K-13 Thermal shock immersion	This test simulates the stress on the component when immersed in water. The test serves to ensure the function of the component in case of immediate cooling by immersing the heated component.	**IEC 20653**	**Ice water shock test TS AS**
K-14 Damp heat, constant	This test simulates the exposure of the component to humid heat. It is used to ensure the resistance of the component with regard to defect patterns caused by humid heat, e.g. corrosion, migration/dendrite growth, swelling and degradation of plastics, sealants and potting compounds.	**IEC 60068-2-78** **IEC 60068-2-67**	**ClimeEvent** **LabEvent**
K-15 Condensation test with modules	This test simulates condensation on electronic assemblies in motor vehicles. It is used to evaluate the robustness of the electronic module against condensation.	**GS 95011-4** **IEC 60068-2-30** **IEC 60068-2-38**	**ClimeEvent**
K-16 Thermal shock (without housing)	This technology test does not simulate real stress. Rather, it is used to find weak points around mechanical connections on assemblies, such as solder joints. The test must be performed exclusively with the component assembly without the housing and mechanical parts.	**IEC 60068-2-14 Na** **MIL-STD-810H**	**ClimeEvent** **LabEvent** **ShockEvent**
K-17 Solar radiation	This test simulates the influence of sunlight and UV light on the component. It is used to ensure the component's resistance to damage caused by material fatigue, such as cracks and discoloration.	**IEC 75220** **IEC 60068-2-5**	**SunEvent**
K-18 Harmful gas test	This test simulates the influence of harmful gases on the component, especially on its plug contacts and switches. It is used to ensure the resistance of the component to defect patterns such as corrosion and component damage.	**IEC 60068-2-60** **Method 4**	**AirEvent**

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	Test	Aim/benefit:	Relevant standards:	Are fulfilled, for example, by:
	K-19 Climatic test for components with watertight housing	This test simulates, in a streamlined manner, the exposure of the component to humid heat, taking into account the protective effect of waterproof housings during the life of the vehicle. It is used to ensure the quality and reliability of the component with regard to defect patterns caused by humid heat, such as the corrosion, swelling and degradation of plastics, sealants and potting compounds.	**IEC 60068-2-78**	**ClimeEvent** **LabEvent** **ShakeEvent**
	Chemical requirements and tests	This test simulates the exposure of the component to various chemicals. It is used to ensure that the component is protected against chemical changes to the housing and an impairment of the function due to chemical reactions.	**IEC 60068-2-45**	
Service life tests	**L-01** Service life test Mechanical/hydraulic durability test-	This test simulates the function/actuation cycles of the component during the life of the vehicle. It is used to ensure the quality and reliability of the component in terms of function actuation cycles such as brake actuations, seat adjustment cycles, switch/button actuations, etc.		**ClimeEvent** **TempEvent** **Walk-in Chambers**
	L-02 Service life test – high-temperature durability testing	This test simulates the thermal stress on the component during the vehicle's service life. It is used to ensure the quality and reliability of the component with regard to thermally induced defect patterns such as diffusion, migration and oxidation.	**IEC 60068-2-2**	**Pump endurance test bench**
	L-03 Service life test – temperature cycle durability testing	This test simulates the thermomechanical stress on the component caused by temperature changes during the vehicle's service life. It is used to ensure the quality and reliability of the component with regard to thermomechanically induced defect patterns, e.g. aging and cracking in soldered, glued, bonded and welded joints, on seals and housings.	**IEC 60068-2-14**	**Pump endurance test bench**

Source: (LV124 - Elektrische und elektronische Komponenten in Kraftfahrzeugen bis 3,5t - Allgemeine Anforderungen, Prüfbedingungen und Prüfungen, 2021)

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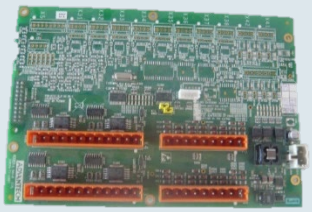
How can **weiss**technik provide you with LV124 support? Suitable features for a test from the LV124!

Additional **4 digital I/O inputs/outputs**



The connection includes the digital inputs/outputs. You can use the connection to control the test specimen and to receive or record feedback signals from the test specimen on customer equipment. Controlling the test specimen is only possible during a test. It is controlled via the user interface or the S!MPATI® software.

The digital inputs/outputs are connected to sockets/terminals "IOC-X8/2" in the control cabinet/external terminal box. The digital inputs can be used within a program in conjunction with the "Wait function". At the "Wait points", the program waits until the set condition is fulfilled. The states of the inputs are archived during a S!MPATI® measurement recording. The digital outputs can be set either in the operating instructions on the control panel or as part of a program at any time. The outputs can be used for customer functions. When the "Stop" test is performed, the outputs are switched off. The states of the outputs are archived during a S!MPATI® measurement recording.

Relevant standards:

- IEC 60068-2-38

Use case:

Customer equipment can be operated automatically during the test run with the additional feature "4 digital I/O inputs/outputs". This eliminates the need for manual intervention by the tester. When the test is performed, the additional digital inputs and outputs can be used to define, for example, that a circuit board is only continued after X boot processes, but also after X switching processes or X motor runs.

Advantage of the feature:

- Possibility of automated testing
- External, customer-supplied controls become superfluous
- Test reproducibility is guaranteed

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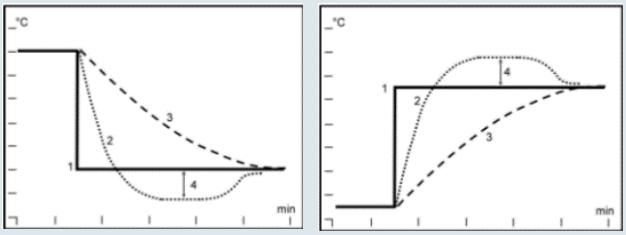
LV 124 - Electrical and electronic components in motor vehicles up to 3.5t

How can **weiss**technik provide you with LV124 support? Suitable features for a test from the LV124!

Temperature measurement on the test specimen - can be switched over to a control sensor

The temperature is controlled by the built-in supply air sensor as standard. When using the "control/measure" temperature control sensor, temperature control for temperature tests can be performed via the actual temperature value at any point in the test chamber.

The temperature response of the test specimen can be influenced via the "Temperature allowance" control value. The temperature control waits until the test specimen, and not the test chamber air, has reached the temperature setpoint. The temperature allowance is therefore the maximum possible difference between the temperature setpoint and the actual temperature of the test chamber air. The displayed actual temperature value is the actual value of the active temperature control sensor. You can also retrieve the measured values via the interfaces RS 232, RS 485, Ethernet or via the free analog outputs using the S!MPATI® software or print them out via a recording device.



1 Temperature setpoint (controlled variable "Temperature")
2 Test chamber air temperature (measured value "T.test chamber")
3 Temperature on the test specimen (measured value "T.test specimen")
4 Temperature allowance (control value "Temp.allowance")

Relevant standards:

- IEC 60068-2-14

Use case:

The purpose of a thermal cycling test is to determine the effects of a temperature change or a sequence of temperature changes on the test specimen. Depending on the test specimen and standard tests, maximum temperatures apply to the test specimens, but temperatures are also stipulated for the test runs. To prevent the destruction of the test specimen, the additional feature *"Temperature measurement on the test specimen - switchable as control probe"* can be used. The temperature is now no longer measured in the supply air or exhaust air and readjusted, but measured directly on the test specimen.
This gives the tester benefits during standard test runs, depending on the sensitivity, size and nature of the test specimen.

Advantage of the feature:

- Possibility of performing the temperature measurement directly on the test specimen
- Non-destructive testing is guaranteed