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Test Report of Swivel-Head Lamp AccuLux HL25 EX

Electrical, optical and mechanical tests on *HL25 EX* accumulator lights of Witte und Sutor have been performed in June 2011 at Fraunhofer IZM. Several complete lamps including chargers were investigated. Additional lithium secondary batteries which are used in the lamps were tested separately. The tests were carried out at a 56-channel battery tester *Maccor series 4000* and an optical test bed with Luxmeter LX-1108. The lamp is designed for use in explosion protected areas. Assessments according to EC directive 94/9EG ATEX were performed by TÜV-A which issued a certificate on October 8th 2010 on the AccuLux HL25EX.

The following results have been obtained:

1. The lamps are fully functional. All technical specifications and sub-functions have been fulfilled.
2. The lighting flux was obtained based on the angle of radiation and measuring the illuminance at different distances. The resulting flux value was 190 Lumen. Under continuous operation of the main lamp the light flux does not drop more than 10 % for the total use time. Based on the most advanced power LED technology the lamps feature an outstanding brightness.
3. Secondary batteries: High quality lithium ion batteries are used which are encapsulated together with the fuse and the safety circuit. During full charge-discharge cycles the capacity drops only 0.052 % per cycle. After 500 cycles 70 % of the nominal capacity remains. Low weight and low self discharge rates are further advantages of the lithium batteries.
4. Charging: A constant current constant voltage charging regime is used to achieve long battery life-time. The charging time is within specifications. Charging can be carried out at 230 Volts AC as well as 12 and 24 Volts DC. If the input voltage falls below the 12 or 24 Volt threshold values, the charging stops.
5. Discharging: Fuel gauging is performed at high accuracy. The LCD capacity indicator features four segments which indicate 5 %, 35 % and 70 % of discharge time. The automatic switching to pilot-

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LED and low-voltage-disconnect performs reliably.

A lighting time of 5.25 hours or more was achieved when the battery was discharged continuously with the main power LED.

6. For evaluating the mechanical robustness a drop-test was performed. For these tests the lamps fall down from a height of 1.5 meters on concrete in such a way that each of the six sides one after the other hit the ground. All lamps passed. Only some scratches occurred on the plastic housing.
7. Leakage test: For testing the tightness an under water bubble test was performed at a depth of 0.5 meters. All lamps passed. This is achieved by sealing with O-rings of all movable parts and ultrasonic welding of all connected parts of the housing.
8. Test and evaluation of the lamps exhibited a mature technology. The micro controller based electronic circuit and the components are of high quality and reliability. The most advanced product of the solid state lighting industry is used. These power LEDs feature innovative SMD (Surface Mounted Device) packaging-technology. They are mounted on aluminium IMS-substrates (Insulated Metallic Substrate). The IMS substrates facilitate electrical interconnection of both LEDs and the heat removal at the same time. Thus sufficient cooling and long term stability of the lamps are assured.

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