

Scale Manufacturers Association

(SMA)

STANDARD

**Environmental
Design
Standards
For
Scales**

**(SMA EDS-1104)
First Edition**



Approved: November 12, 2004

Definitions Of Terms Used Within This Document

Device: - A scale or weighing system, in whole or in part, that is used in an application where special consideration is to be given based on the environmental conditions of that location. A weighing system includes all parts including individual components subjected to the environmental conditions.

DIN - Deutsches Institut für Normung e.V.

DIN 40050, Part 9 – A standard that describes a test for protection against foreign objects, water and access, generally associated with road vehicles but is used in this standard to define an additional protection level.

EN - European Standard (EUROPÄISCHE NORM)

EN 60529 - A standard that describes a system for classifying the degree of protection provided by an enclosure of electrical equipment.

Hot Water – Unless otherwise specified in this document, Hot water is defined as any water that has a temperature greater than 5°C of the temperature of the sample model being tested. Hot water temperature for sanitizing is 180 degrees F according to FSIS (Food Safety Inspection Service.)

IP - Ingress Protection

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1. Scope

To specify a range of environmental conditions that would enable an end-user of a device covered by this SMA document to determine the suitability for their application. The standards allow a manufacturer to define a range of test criteria that would enable product testing to realistic application-environment conditions.

European standard EN 60529¹ and DIN 40050 Part 9² in combination form a complete set of standards for the “Degrees of protection provided by enclosures (IP code)”. The *Object* of these standards is to give:

- a. *Definitions* for degrees of protection provided by enclosures of electrical equipment as regards:
 - a.1 Protection of persons against access to hazardous parts inside the enclosure;
 - a.2 Protection of the equipment inside the enclosure against ingress of solid foreign objects;
 - a.3 Protection of the equipment inside the enclosure against harmful effects due to the ingress of water.
- b. *Designations* for these degrees of protection.
- c. *Requirements* for each designation.

The above standards make no consideration for possible chemical contamination. In determining suitability for use of a scale in a given environment, additional consideration must be made for the chemicals used in the environment. Chemicals can be classified as those used to clean the scale and those being weighed by the scale and therefore likely to contact the scale and scale components.

European Standard EN 60529 and DIN 40050 Part 9 are adopted in their entirety for all conditions covered by a. through c. above. Additional cleaning and chemical issues are addressed separately by this standard.

1. Self Administration

The Scale Manufacturers Association designed this standard to be self-administrating. It is the responsibility of each manufacturer to validate his claim by evidence of testing and positive testing results, that the model meets or exceeds the requirements mentioned in or referenced in this document.

This evidence may be in the form of a design file that must include, at a minimum:

¹ EN 60529 is the European standard describing the various levels of protection and the marking system used to indicate a specific level.

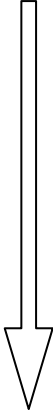
² DIN 40050 Part 9 specifically applies to road vehicles; its applicability to scales is pertinent in emphasizing the harsh environments often encountered by scales and associated devices. Special Position of the Letter "K": The supplementary letter "K" has a special position within the IP code. This special position is specified and explained in standard DIN 40050 Part 9. This standard applies to the IP protection for electrical equipment on road vehicles. The supplementary letter "K" is used to indicate the special requirements for dust protection (characteristic numerals 5 and 6) and water protection (characteristic numerals 4, 6, and 9) within the standard. In this SMA recommendation, only the extension for water protection according to standard DIN 40050 Part 9 is considered. The SMA uses the extension for water protection to emphasize the high level of resistance to water necessary in certain environments. The special position of this supplementary letter is also clear from its assignment within the IP code. The supplementary letter "K" *must not* be separated from the relevant characteristic numeral. This means that it cannot be placed in alphabetical order with the supplementary letters.

- detailed design and construction drawings containing sufficient detail to facilitate inspection and review of on-going production units to the original design tested.
- drawings and specification on parts determined to be critical to the testing and continued compliance of the model.

3. Wash Down Environments Classification

The table below is considered exemplary. The intent of this standard is that the device be specified using the full capabilities of EN 60529 with additional “chemical (C)” and “special (S)” designations. A summary of EN 60529 can be found in Annex I

INCREASING SEVERITY	Class	Description	Detailed description	Protection (IP) Standard:	Examples
	1	WD	Wipe down	IP50	Office
	1C	WDC	Wipe down with mild cleaning solutions		Warehouse Clean room
	2	LS	Light water spray	IP63	Food preparation
	2C	LSC	Light water spray May include soap or mild cleaner		Deli Seafood, Pharmaceutical Dusty areas
	3	HD	Hose down, all angles, low pressure	IP65	Food preparation
	3C	HDC	Hose down, all angles, low pressure May include soap or mild cleaner		Pharmaceutical Dusty areas
	4	HDS	Protection against strong jet water at increased pressure	IP66K	Meat and poultry preparation rooms Dairy
	4C	HDSC	Protection against strong jet water at increased pressure May include sanitizing agent, hot water and steam		

	5	HI	Temporary immersion water	IP67	Pharmaceutical Chemical Petrochemical
	5C	HIC	Temporary immersion in hot water May include sanitizing agents		
	5S	HIS	Temporary immersion in hot water May include cleaning agents		
	6	HP	High pressure wash down	IP69K	
	6C	HPC	High pressure wash down May include cleaning agents		
	6S	HPS	High pressure wash down Steam cleaning May include cleaning agents		

4. Product Compliance Marking

Marking of the product, used to show compliance, is accomplished by using the letters "SMA" followed by the Class designation as defined in the table located in Section 3 Wash Down Environments Classification.

For example:

Marking Applied to Product	Description of Compliance
SMA - Class 1	Marking indicates that the product has been tested to the Class 1 level of protection, as defined in the table located in Section 3 - Wash Down Environments Classification, and meets the requirements for Wipe down protection.
SMA - Class 4C	Marking indicates that the product has been tested to the Class 4C level of protection, as defined in the table located in Section 3 - Wash Down Environments Classification, and meets the requirements for protection against strong jet water at increased pressure.

The use of compliance marking is limited to only those models that are identical in design and construction to the sample or samples that have undergone the compliance testing and where the manufacturer has proof that the sample or samples passed the testing for the indicated protection levels.

5. Marketing of Compliance

For the purpose of marketing compliance to this standard; it is acceptable to include the same markings, as is applied to the model, in the models sales brochure, data sheet, operators manual, and technical manual.

6. Testing Requirements

6.1 General Testing Requirement

The purpose of this section is to define the test parameters used to determine if a device or a family of devices are in conformance to the specification defined in this standard.

Compliance to the technical requirements of this standard is confirmed by testing methods defined in this document. The actual testing may be performed by the manufacturer or by the use of an outside or third party laboratory that is properly equipped to perform the tests.

6.2 Test Record Retention

Test records shall be maintained for each specified Model. Records shall be maintained in compliance with company record retention policies.

In addition, calibration and corrective action records shall be maintained in accordance to established internal procedures.

7. Testing Procedures

It is not the intent of this document to develop new testing methods. Compliance testing is to be performed as defined in the latest revision of EN 60529 for the equivalent IP rating, unless identified in the exceptions listed below.

Exceptions:

- Testing to SMA Class 4 and Class 6 requires additional testing for the supplemental letter “K”. Supplemental testing is to be performed as defined in Table 8 of the DIN 40050 standard.
- Water temperature for performing compliance testing to IP69K is to be 80°C (176°F) with a tolerance range of $\pm 5^{\circ}\text{C}$ (9°F).
- Testing to SMA Classes ending with the letter “C” include the addition of soap, a mild cleaning agent, chemical based cleaning agent, or a sanitizing agent. These agents may also be included with the use of hot water or steam. It is outside the scope of this document to identify these agents by name. It is only necessary to identify those agents used during the conduct of the test.

Acceptable criteria for the determination of a pass or fail outcome is as defined in the standard used for the conduct of the actual testing. Pass and fail criteria for tests including additional cleaning, chemical, or sanitizing agents are to be determined by the needs or limitations of the intended application environment or other standards developed by a third party specifying the environment and specific agents.

ANNEX I – Degrees of Protection for Electrical Equipment (Brief summary of EN 60529)

The scope of protection (degree of protection) of the housing is demonstrated using standardized test methods. In the following, the scope of protection is referred to as the degree of protection of the housing. A designation system is used to classify different types of housing according to their degree of protection. The designation system consists of the code letters IP followed by two characteristic numerals. These characteristic numerals are determined using tables.

The first characteristic numeral indicates the level of protection against contact and foreign bodies, while the second indicates the protection provided by the housing to prevent the penetration of water. The following tables contain short descriptions and definitions of the individual characteristic numerals of the IP code.

First Numeral	Brief Description	Definition
0	Non-protected	
1	Protected against solid foreign objects 50 mm diameter and larger	The object probe, sphere of 50 mm shall not fully penetrate
2	Protected against solid foreign objects 12.5 mm diameter and larger	The object probe, sphere of 12.5 mm shall not fully penetrate
3	Protected against solid foreign objects 2.5 mm diameter and larger	The object probe, sphere of 2.5 mm shall not fully penetrate
4	Protected against solid foreign objects 1.0 mm diameter and larger	The object probe, sphere of 1.0 mm shall not fully penetrate
5	Dust Protected	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety
6	Dust-tight	No ingress of dust

Second Numeral	Brief Description	Definition
0	Non-protected	
1	Protected against drips	Vertically falling drops must not cause damage.
2	Protected against drips if the housing is bent at an angle of 15°	Vertically falling drops must not cause damage if the housing is bent at an angle of 15° either side of the vertical.
3	Protected against spray-water	Water that is sprayed at an angle of up to 60° either side of the vertical must not cause damage.
4	Protected against splash-water.	Water that is splashed against the housing from every direction must not cause damage
4K	Protected against splash-water at increased pressure	Water that is splashed against the housing from every direction at increased pressure must not cause damage (only applies to DIN 40050 Part 9 testing).

5	Protected against jet- water	Water that is sprayed against the housing as a jet from every direction must not cause damage.
6	Protected against strong jet-water.	Water that is sprayed against the housing as a strong jet from every direction must not cause damage
6K	Protected against strong jet-water at increased pressure	Water that is sprayed against the housing as a jet from every direction at increased pressure must not cause damage (only applies to DIN 40050 Part 9 testing).
7	Protected against the effects of temporary submersion in water	Water must not penetrate in a quantity, which causes damage if the housing is temporarily submerged in water under standard pressure and time conditions.
8	Protected against the effects of permanent submersion in water	Water must not penetrate in a quantity, which causes damage if the housing is submerged under water continuously under conditions to be agreed between the manufacturer and user. However, the conditions must be more stringent than those of characteristic numeral 7.
9K	Protected against water during high pressure/ steam cleaning	Water that is sprayed against the housing from every direction at very high pressure must not cause damage (only applies to DIN 40050 Part 9 testing).

Meaning of the First Characteristic Numeral (See note 1)

The first characteristic numeral indicates the extent to which the housing prevents people from accessing (touching) hazardous parts. This protection is provided by preventing or limiting a body part or an object held by a person from penetrating into the housing. At the same time, the housing protects equipment by preventing the penetration of solid foreign bodies.

Meaning of the Second Characteristic Numeral (See note 1)

The second characteristic numeral indicates the degree of protection of the housing in terms of potential damage to the equipment caused by the penetration of water into the housing. A housing type should only be given the first characteristic numeral (protection against penetration) for a specific degree of protection if it also meets the requirements of *all lower* degrees of protection. This condition also applies to the second characteristic numeral (protection against water) up to degree of protection 6K. However, a housing type given the second characteristic numeral 7, 8 (protection against submersion) or 9K (protection against steam cleaning) is not viewed as protected against jet-water (characteristic numeral 5 or 6). This means that the housing does not have to meet the conditions of characteristic numerals 5 or 6. Only a housing type with a double designation meets the conditions for protection against both jet-water and submersion.

Note 1: If one of the characteristic numerals is not required, an "X" should be entered into the appropriate position of the IP code.

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