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IS 1941-1 (1976): Functional requirements for electric motor sirens, Part 1: ac 3 phase 50 hz, 415 volts type [CED 22: Fire Fighting]



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FUNCTIONAL REQUIREMENTS FOR
ELECTRIC MOTOR SIRENS

PART I AC, 3-PHASE, 50 Hz, 415 VOLTS TYPE

(Second Revision)

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FUNCTIONAL REQUIREMENTS FOR ELECTRIC MOTOR SIRENS

PART I AC, 3-PHASE, 50 Hz, 415 VOLTS TYPE

(*Second Revision*)

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Indian Standard

FUNCTIONAL REQUIREMENTS FOR ELECTRIC MOTOR SIRENS

PART I AC, 3-PHASE, 50 Hz, 415 VOLTS TYPE

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Part I) (Second Revision) was adopted by the Indian Standards Institution on 8 June 1976, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Electric motor sirens are intended to be installed at fire stations and service stations and also for civil defence operation. This standard covering the requirement of sirens was first issued in 1961 and revised in 1965 and covered three types of sirens. The second revision has been prepared on the basis of recommendation of the Expert Committee set up by the Ministry of Home Affairs and covers only sirens of 415 volts type. The requirements of other types of sirens will be published in subsequent parts.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part I) covers the details regarding construction and performance requirements of electric motor sirens up to 3.75 kW ac, 3-phase, 50 Hz, 415 volts type.

NOTE — The requirements of other types of sirens, that is, dc 240 volts, universal and 6/12 V battery operated are being drafted separately.

*Rules for rounding off numerical values (revised).

2. GENERAL REQUIREMENTS

2.1 The sirens shall be either horizontal or vertical, complete with one wall mounted type direct-on-line starter.

2.2 The sirens shall be compact in design and reliable in operation. They shall be suitable for installation in open as well as in exposed positions anywhere in this country. If a housing is provided for protection against rains, it shall not effect the sound output at a distance. This can be judged by measuring the sound pressure with/without housing.

2.3 To prevent external objects dropping vertically in the sirens head, it shall be protected suitably by provisions of a grill. Such a grill shall have no aperture larger than 20 mm in any direction and shall be fixed rigidly to the siren head.

2.4 The sirens and the motor for automatic relay shall be capable of working satisfactorily with a voltage 10 percent below the rated voltage.

2.5 Each siren shall be provided with a control unit suitable for local control as well as for central control.

2.6 A small lock-up of suitable size, which may be secured to the unit, shall be provided to store spare carbon brushes, springs, etc.

3. ELECTRIC MOTOR

3.1 The electric motor shall conform to the following requirements:

- | | |
|---------------------|--|
| a) Supply system ac | (415 volts), 3-phase, 50 Hz |
| b) No. of poles | Two |
| c) Power | Not exceeding 3.75 kW |
| d) Performance | Capable of delivering the rated hp at the rated speed within 10 seconds of the start |

3.2 The electric motor shall be totally enclosed with greased sealed ball bearings and shall conform to IS: 325-1970*. The temperature rise after 15 minutes continuous operation of the motor shall not exceed the specified limit. The starter relay and the wailing switch motor may be operated on single phase 240 V where required for the purpose of remote control. The windings of the motor shall be suitably insulated and impregnated to withstand very damp and moist climate, specially that obtaining during the monsoons.

*Specification for three-phase induction motors (*third revision*).

4. SIREN HEADS

4.1 The motor shall be fitted with two blower heads, properly balanced and mounted on the same or opposite side of the motor shaft and having unequal number of slots on the stators capable of producing a basic note from 400 to 1 000 Hz. The stator and rotors shall comprise of aluminium alloy or similar suitable material.

5. AUTOMATIC EQUIPMENT FOR PRODUCING A WARBLING NOTE

5.1 Controlled by motor-driven cam or any other suitable device, the automatic relay may work on 240 volts, single phase, 50 Hz, ac. The device shall be capable of producing automatic warbling note of 4 seconds on and four seconds off cycle. During the four seconds off cycle, the fall in the frequency should be of the order of 10 to 15 percent of the basic frequency of 400 to 1 000 Hz (that is the steady state value). The motors, if any, shall be as per IS:996-1964*. The device shall be capable of operating for 20 000 cycles of operation without failure.

6. STARTER

6.1 The motor starter shall comply with the requirements laid down in IS : 1822-1967†.

6.2 The construction of sirens shall permit instant starting and attainment of the full speed within a period of not more than 10 seconds with a supply of 10 percent below rated voltage by switching on to the supply mains. In the case of a motor provided with a commutator, there shall be no detrimental sparking or injury to the commutator or brushes at the time of starting and running.

6.3 The equipment shall be given a finishing coat of steel grey paint. Parts liable to rust shall be protected by nickel plating, galvanizing or by suitable painting.

7. ACOUSTIC POWER

7.1 When determined according to the method given in 7.1.1 or 7.1.2 the siren shall be capable of producing acoustic power of not less than 200 W corresponding to a power level of 143 dB with reference to 10^{-12} W.

*Specification for single-phase small ac and universal electric motors (revised).

†Specification for AC motor starters of voltage not exceeding 1 000 volts (first revision).

7.1.1 The acoustic power of a siren can be determined by measuring the sound pressure level created in a reverberant room from the following formula:

$$10 \log_{10} \frac{W}{W_0} = 20 \log_{10} \frac{P_m}{P_0} - 10 \log_{10} \frac{T}{T_0} + 10 \log_{10} \frac{V}{V_0} - 14$$

where

W = acoustic output of the siren in watts,

$W_0 = 10^{-12}$ watts,

$20 \log_{10} \frac{P_m}{P_0}$ = mean sound pressure level due to the siren,

$P_0 = 2 \times 10^{-5}$ N/m² (2×10^{-6} dynes/cm²),

T = reverberation time of the room in seconds,

$T_0 =$ one second,

V = volume of the room in m³, and

$V_0 =$ one m³.

7.1.2 The acoustic power output of the siren can also be determined using a reference source of known acoustic power. The reference source can be siren of similar type. Acoustic power of the reference source can be determined separately by a testing laboratory. The acoustic power W of the siren under test can be obtained from the following formula:

$$10 \log_{10} \frac{W}{W_0} = 10 \log_{10} \frac{W_r}{W_0} + 20 \log_{10} \frac{P_m}{P_0} - 20 \log_{10} \frac{P_r}{P_0}$$

where

W = acoustic output of the siren in watts,

$W_0 = 10^{-12}$ watts,

$10 \log_{10} \frac{W_r}{W_0}$ = acoustic power level of the reference source in reference to 10^{-12} watts,

$20 \log_{10} \frac{P_m}{P_0}$ = mean sound pressure level due to the siren,

$20 \log_{10} \frac{P_r}{P_0}$ = mean sound pressure level due to the reference source, and

$P_0 = 2 \times 10^{-5}$ N/m².

The above formula can be stated in a simplified form as 'acoustic power level of the siren under test in dB is equal to acoustic power level in dB of the reference source plus the sound pressure level in dB due to the siren minus sound pressure level in dB to the reference source'.

8. MARKING

8.1 Each siren shall be clearly and permanently marked with the following information:

- a) Name of manufacturer or trade-mark, if any;
- b) Type of siren as mentioned under 2.1;
- c) Year of manufacture;
- d) Speed of motor; and
- e) Motor rating in kW.

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