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*Indian Standard*  
SPECIFICATION FOR  
FORMOTHION TECHNICAL SOLUTIONS

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# Indian Standard

## SPECIFICATION FOR FORMOTHION TECHNICAL SOLUTIONS

### 0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 April 1976, after the draft finalized by the Pest Control Sectional Committee had been approved by the Agricultural and Food Products Division Council and the Chemical Division Council.

0.2 Formothion is a contact and systemic insecticide and acaricide and is used in controlling pests of agricultural crops,

0.3 Formothion is the common name accepted by the International Organization for Standardization (ISO) for S-(N-formyl-N-methyl-carbamoyl-methyl) dimethyl phosphorothiolothionate. The empirical and structural formulae and molecular weight are as given below:

<i>Empirical Formula</i>	<i>Structural Formula</i>	<i>Molecular Weight</i>
$C_6H_{12}NO_4PS_2$	$  \begin{array}{c}  \text{CH}_3\text{O} \\  \diagdown \\  \text{P} \cdot \text{S} \cdot \text{CH}_2 \cdot \text{CO} \cdot \text{N} \begin{array}{l} \diagup \text{CH}_3 \\ \diagdown \text{C H O} \end{array} \\  \diagup \\  \text{CH}_3\text{O} \\  \parallel \\  \text{S}  \end{array}  $	257.0

0.4 Formothion is a very unstable compound. For this reason, even though a material of over 90 percent purity can be manufactured, it is commercially marketed containing 50 percent active ingredient at which level it is stabilized.

0.5 In the preparation of this standard, due consideration has been given to the provisions of the Insecticides Act, 1968, and Rules framed thereunder. However, this standard is subject to the restrictions imposed under these, wherever applicable.

0.6 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 or analysis, 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,

\*Rules for rounding off numerical values (revised).

## 1. SCOPE

**1.1** This standard prescribes the requirements and the methods of sampling and test for formothion technical solutions, employed in the preparation of different formulations,

## 2. REQUIREMENTS

**2.1 Description** — The material consisting, essentially, of a solution of formothion in an organic solvent shall be in the form of a dark brown, clear liquid, free from extraneous impurities.

**2.2** The material shall comply with the requirements as specified in Table 1.

**TABLE 1 REQUIREMENTS FOR FORMOTNION TECHNICAL SOLUTIONS**

Sl. No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST, REF TO	
			APPENDIX OF THIS STANDARD	CL No. OF IS : 6940-1973*
(1)	(2)	(3)	(4)	(5)
i)	Formothion content, percent by mass, <i>Min</i>	50.0	A	—
ii)	Specific gravity at 25/25°C, <i>Min</i>	1.05	—	5
iii)	Water content, percent by mass, <i>Max</i>	0.1	—	4.1
iv)	Material insoluble in acetone, percent by mass, <i>Max</i>	0.1	—	9
v)	Acidity ( as $H_2SO_4$ ), percent by mass, <i>Max</i>	3.0	—	11.3

\*Methods of tests for pesticides and their formulations.

## 3. PACKING AND MARKING

**3.1 Packing** — The material shall be packed in clean and dry mild steel containers suitably lacquered.

**3.2 Marking** — The containers shall be securely closed and shall bear legibly and indelibly the following information and any other information as necessary under the Insecticides Act and Rules:

- a) Name of the material,
- b) Name of the manufacturer,
- c) Batch number,

- d) Date of manufacture,
- e) Net volume of contents,
- f) Formothion content, and
- g) The minimum cautionary notice worded as under:
  - ‘ AVOID CONTAMINATION OF FOODSTUFFS AND ANIMAL FEEDS, AND INHALATION OF DUSTS AND MISTS MADE FROM THIS INSECTICIDE. IF IT COMES IN CONTACT WITH SKIN, WASH WITH SOAP AND WATER. DO NOT USE THIS CONTAINER FOR ANY OTHER PURPOSE EXCEPT FOR STORAGE OF PESTICIDES. IN CASE OF POISONING CALL PHYSICIAN. ANTIDOTE-ATROPINE SUPPORTED BY P-PAM ( 2 PYRIDINE-2-ALDOXINE-N-METHYL-IODIDE ).’

3.2.1 In addition to the above, the containers shall also be marked with the symbol for danger of poisoning as specified in IS : 1260 ( Part I )-1973\*.

3.2.2 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

#### 4. SAMPLING

4.1 Representative samples of the material shall be drawn as prescribed in ‘ Indian Standard methods for sampling of pesticides and their formulations ( under preparation )’.

NOTE — Till such time, the standard under preparation is published, the matter shall be as agreed to between the concerned parties.

#### 5. TESTS

5.1 Tests shall be carried out by the methods referred to in col 4 and col 5 of Table 1.

5.2 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water ( see IS : 1070-1960† ) shall be employed in the tests.

NOTE — ‘ Pure chemicals’ shall mean chemicals that do not contain impurities which affect the results of analysis.

\*Pictorial marking for handling and labelling of goods: Part I Dangerous goods ( first revision ).

†Specification for water, distilled quality ( revised ).

## APPENDIX A

## [ Table 1, Item (i) ]

## DETERMINATION OF FORMOTHION CONTENT

## A-1. PRINCIPLE

**A-1.1** The method is based on hydrolysis of formothion to methylamine, distillation of the latter into a known excess of standard hydrochloric acid and back titration of the excess with alkali.

## A-2. REAGENTS

A-2.1 **Glycerine** — 50 percent (*v/v*), diluted with water.

A-2.2 **Methyl Red Indicator Solution** — Aqueous, 1 percent (*m/v*).

A-2.3 **Sodium Hydroxide Solution** — 40 percent (*m/m*).

A-2.4 **Standard Hydrochloric Acid Solution** — 0.1 N.

A-2.5 **Standard Sodium Hydroxide Solution** — 0.1 N.

## A-3. APPARATUS

A-3.1 A recommended assembly of apparatus is shown in Fig. 1.

## A-4. PROCEDURE

A-4.1 **Hydrolysis** — Weigh accurately a sufficient amount of the sample in a small glass ampoule to contain approximately 500 mg of formothion and introduce it into a 500-ml reaction flask. Add 2 glass beads and fix the flask to the equipment as indicated in Fig. 1.

A-4.1.1 Dip the discharge tube into the 250-ml beaker (narrow form), containing exactly 40 ml of standard hydrochloric acid solution. Start cooling water in both the condensers. Each condenser should have a separate water supply. It should be ensured that all joints of the equipment are tight.

A-4.1.2 With the help of a funnel, add through the thermometer opening 200 ml of diluted glycerine and 40 ml of standard sodium hydroxide solution. Close immediately the opening with the thermometer and heat gently to boiling in an oil-bath maintained at 140 to 150°C. The temperature of the reaction solution will be 108 to 109°C. Continue heating under reflux for 20 minutes in order to complete the hydrolysis. Now stop water circulation in the reflux condenser and increase the oil-bath temperature to 180°C.

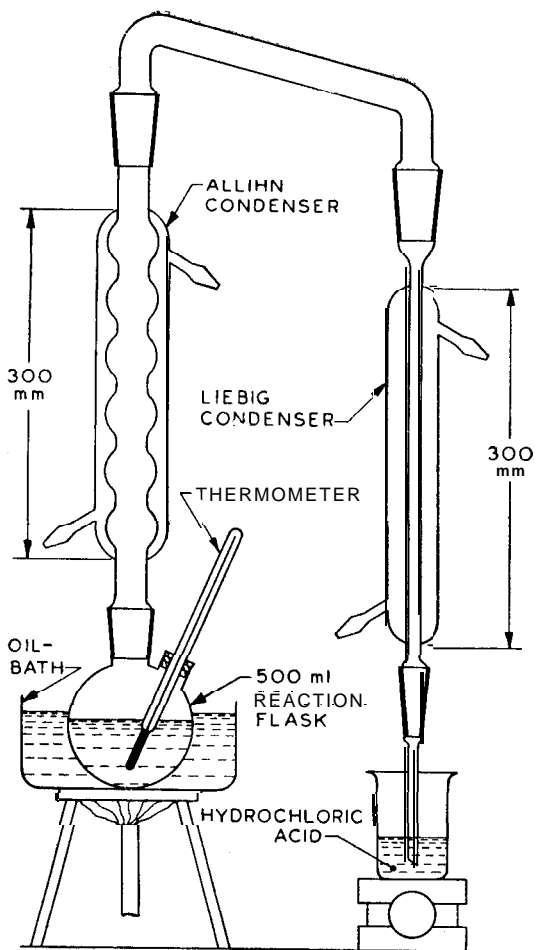


FIG. 1 APPARATUS FOR DETERMINATION OF FORMOTHION CONTENT

**A-4.2 Distillation** — Distil for about 60 minutes from the time the cooling water is stopped. The temperature of the distillation residue will be about 115°C.

A-4.2.1 Disconnect the equipment and rinse the condenser dipping in the beaker with distilled water.

**A-4.3 Titration** — Add a few drops of methyl red indicator solution to the distillate in the beaker and titrate the excess acid with standard sodium hydroxide solution till the colour changes to yellow.

**NOTE** -The titration can also be carried out potentiometrically to a pH of 7.

## A-5. CALCULATION

**A-5.1** Calculate the active ingredient content as follows:

$$\text{Formothion content, percent by mass} = \frac{(40 - V) N \times 2.57}{M}$$

where

$V$  = volume in ml of standard sodium hydroxide solution used (see A-4.3),

$N$  = normality of the standard sodium hydroxide solution, and

$M$  = mass in g of sample taken for the test.

TO

IS:8024-1976 SPECIFICATION FOR FORMOTHION  
TECHNICAL SOLUTIONSAlterations \_ \_

(Page 6, clause 3.1) - Substitute the following for the existing clause:

'3.1 Packing - The **material shall** be packed according to the requirements given in **IS:8190(Part II)-1980\***.'

[Page 7, (clause 3.2(g))] - Substitute the following for the existing matter:

'g) The minimum cautionary notice as worded in the Insecticides Act and Rules.'

(Page 7, clause 5.2, line 2) - Substitute '(see IS:1070-1977†)' for '(see IS:1070-1960†)'.

(Page 7, foot-note with '†' mark) - Substitute the following for the existing foot-note:

'+Specification for water for general laboratory use (second **revision**).'

(Page 10, clause A-5.1, formula) - Substitute the following for the existing formula:

$$\text{'Formothion content, percent by mass} = \frac{(40 - I) \times NX}{M} \quad 25.7$$

Addendum .

(Page 6, *foot-note*) - Add the following new foot-note **at** the end:

'\*Requirements for packing of **pesticides:Part II** Liquid pesticides **(first revision).**' .

(AFCD 6)