Table 3

Description of tests and checking	Para number of		Types of test	
	Technical requirements	Methods of tests	Approval tests	Periodic type test
11. Checking of the effect of inclination	1.3.6	3.11	+	+
12. Checking of the smoothness of movement and position of pointer	1.3.7 1.3.8	3.12	+	+
13. Checking of variance	1.3.9	3.13	-	+
14. Checking of damping time	1.3.10	3.14	-	+
15. Checking of error of measuring device at temperature -60°C	1.3.1	3.15	+	
16. Checking of error of measuring device at temperature +50°C	1.3.1	3.16	+	+
17. Checking of electric insulation resistance	1.3.11a	3.17	+	+
18. Checking of electric insulation strength	1.3.12a	3.18	+	+
19. Checking of luminous (luminous paint) intensity	1.3.13	3.19	+	+
20. Checking of durability of luminiscenec (luminous paint)	1.3.14	3.20	++	+
21. Checking of effects on compass	1.3.15	3.21	-	+
22. Checking of error and endurance against cold at temperature -60°C	1.3.16	3.22	-	+
23. Checking of reliability against the action of frost and dew	1.3.17	1.23	-	+
24. Checking of heat resistance	1.3.18	3.24	-	+
25. Checking of heat resistance of insulation	1.3.19	3.25	-	+

Description of tests and checking	Para number of		Types of test	
	Technical requirements	Methods of tests	Approval tests	Periodic & type test
26. Checking of stability against linear loading	1.3.20	3.26	-	+
27. Checking of vibration strength	1.3.21	3.27	-	+
28. Checking of impact strength	1.3.23	3.28	-	+
29. Checking of stability against impact	1.3.24	3.29	-	+
30. Checking of strength during transportation	1.3.25	3.30	-	+
31. Checking of stability against cyclic action of temperature	1.3.26	3.31	-	+
32. Checking of overloading strength	1.3.27	3.32	-	+
33. Checking of moisture-proofness of electrical insulation	1.3.11c	3.33	-	+
34. Checking of electrical insulation strength at 95% humidity	1.3.120	3.34	-	+
35. Checking of splash-proof quality	1.3.28	3.35	-	+
36. Checking of strength and quality of coating Coating	1.3.29	3.36	-	+
37. Checking for confirmity to design	1.1	3.37	-	+

Remarks:

1. "+" sign indicates that the test is carried out.
   "-" sign indicates that the test is not carried out
2. Tests as per Ref. Nos 23 and 26 belongs to the category of type tests ~~are~~ carried out once on the samples of main batch.

2.4. All thermometer errors and also the conformity of the thermometers to the requirements of these specifications, excluding the cases specially mentioned in these technical specifications are determined and checked ~~xxxxxxxxxxxxxx~~ at standard conditions. The standard conditions are as follows;
ambient temperature (20 ± 5°C).
atmospheric pressure 96 ÷ 103 kPa (720-780MM of Mercury column).
Relative humidity - 30 to 80%.
Position of measuring device, corresponding to vertical position of dial.

Constant vibration with acceleration 0.1 to 0.3g or buzzer (singing).

2.5. The measuring devices used in the tests should ensure that these tests are carried out in accordance with requirements of technical specifications and should be accompanied with metrological laboratory certificate where the date of their ~~xx~~ checking is indicated. Measuring devices, used for determining main error, should be checked at least once in a month, the remaining measuring devices should be checked regularly in accordance with approved program of checking.

List of measuring devices and equipments used to checking and testing of thermometers is given in appendix 3.

2.6. Approval tests are carried out by T.I.D of manufacturing plant ~~of~~ the time of production of measurings devices. Those tests are carried out on all 100% of measuring devices under production.

10% of measuring devices from a batch are subjected to tests by customer's representative while accepting.

Measuring devices are presented in batches of minimum ~~to~~ units and maximum ~~too~~ units. The specified quantity ~~is~~ may be changed in some cases by approval of customer's representative.

The measuring devices, undergone approval tests should have TID stamp.

While carrying out approval tests the measuring devices fail to satisfy even if one of the points, listed in table 3, then such measuring devices considered "failure" and are returned to shop for analysing the cause of rejection, its rectification and resubmission to TID and customer's representative.

The devices are retested to the full extent of approval tests and their results are considered final.

2.7. Periodic tests are carried out by T.I.D of manufacturing plant along with customer's representative twice in a year for assessing the conformity of delivered thermometers to the set requirements, the period of such test is determined by the time schedule (graph) approved by customer's representative and plant chief engineer.

These tests are carried out on 3 thermometers from the batch accepted by TID and customer's representative, while carrying out periodic tests if the thermometers fail to satisfy even if one of the requirements of points listed in table 3 then acceptance and dispatch of thermometer are stopped till elimination of the causes of failure and defects in production and process stock. After rectification of the observed defects double number of samples (thermometers) are retested to the full extent or as per decision of customer's representative i.e., only for the point for which the failure occured.

If during retesting thermometers fail to satisfy even if one of the points of table 3 then testing should be stopped.

The decision about further production, acceptance and carrying out of periodic test is taken jointly by the chiefs of manufacturing plant and head of customer's representative office.

On getting positive results of retesting the acceptance of thermometers is resumed.

2.8. Type tests are carried out by manufacturing plant, Customer's representative is consulted whenever there are modifications in design, materials or technological process affecting metrological and technical characteristics or efficienty of thermometer.

These tests are carried out on minimum three thermometers.

While carrying out type tests if thermometers fail to satisfy even if the requirement of one point of table 3 then testing is stopped and modification is not introduced. Thermometers manufactured with the modifications are subjected to disassembly.

3. TEST METHODS

3.1. Completeness is checked by comparing the thermometers presented and related documentation with requirements of technical specification.

3.2. Appearance (points 1.1, 1.2.1, 1.2.2, 1.2.4, 1.5.1.) is checked by inspecting in day light or standard ~~xxxxxxx~~ artificial illuminations and by taking at random measurements of main dimensions with measuring tools and comparing with the approved sample.

Following is checked during this:

a) absence of defects on the body and other parts of measuring device, affecting the appearance;

b) absence of impurities (foreign particles) inside the measuring device.

c) correctness of marking and sealing

ca) compliance of main overall dimensions of meter with drawing;

d) correctness of entries in the certificate;

e) confirmity of packing and marking to drawing.

3.3. Vibration stability (P 1.3.22) is checked on three figured graduation of operating range of scale. The energized measuring device is vibrated for 2 hours observing the condition as per point 3.26a.

The pointer oscillation is determined as half of the cutting of arc of scale, marked in millimeters within the range of which the pointer oscillates during vibration.

One sided deflection (drift) of pointer is determined as difference between positions of pointer when the vibration is switched off and its mean position around which it oscillates during vibration.

During periodic tests vibration stability is checked during test as per point 3.2.7.

3.4. Thermometer accuracy (P 1.3.1) is checked on markings of 0°C and 100°C, for which measuring device should be in surroundings of -60 ± 3°C, +25 ± 5° and +50 ± 3°C for not more than 2 hours and thermometer sending unit at °C or 100°C correspondingly.

The error at marking 0°C and 100°C can be determined when measuring device both directly in chamber or thermostat as well as outside the chamber as per method of parts 3.15, 3.16.

Error of thermometer should not exceed the values specified in para 1.3.1.

3.5. Consumption current (para 1.3.2) is checked by milliameter connected in series with the supply circuit. (as per para 1.3.2). Supply voltage should be 27V. Inspection devices, used for checking purpose may be of any class of accuracy.

3.6. Interchangeability (para 1.3.3) of measuring devices and sending units is checked while determining thermometer error by means of connecting various receivers (transducers) at same temperature (100°C) to each measuring device in succession or by connecting various measuring devices to the same sending units.

Results are considered satisfactory if the reading does not go beyond the limits of thermometer main error (para 1.3.1).

3.7. Thermometer operation of 25000M (at pressure of 18.6 MM of mercury column) (para 1.3.4) is checked in a hermetic chamber by means of creating pressure condition in the chamber corresponding to the height of 25000 M (18.6 MM of Mercury column).

Temperature of -20 ± 5°C is maintained in the chamber. Thermometer is kept in specified conditions for 20 minutes and on switching on the supply the pointer should be deflected along the scale after which main thermometer error is checked in normal condition outside the chamber. (Para 1.3.1).

3.8. Weight (para 1.2.5) is checked by weighing on scientific balance with accuracy ±5gm.

3.9. The main error of measuring device (para 1.3.1) is the maximum difference between readings of measuring device and actual value under measurement at 27V. It is allowed to determine main error of measuring device only on digital markings of scale.

Total error (main and variation in reading due to variation in voltage (para 1.3.5) is determined similarly on voltages 24.3 and 29.7V and should not exceed ±5°C within the measuring range of minus 40°C to plus 130°C.

Checking is carried out on the device with the help of standard resistance box.

Voltage (Para 1.2.3) is measured with an instrument having class of accuracy not less than 1.0.

3.10. Voltage effect (para 1.3.5) is checked with the help of standard resistance box at any marking of scale by gradual variation of voltage, supplied to measuring device.

Voltage is varied from 27 to 29.7V then from 27 to 24.3V. Variation in measuring device reading, caused by supply voltage variation is determined with the help of standard resistance box as the maximum difference of readings at nominal voltage of 27V and when it is increased or decreased by 2.7V. The voltage should

be measured by a device with class of accuracy 0.5 minimum.

3.11. The effect of inclination of moving portion of measuring device is checked when it is connected in operating circuit on special stand (equipment) which allows it to incline (move) to the right (clockwise), to the left (counter clockwise) and by 90° from itself from normal position. The maximum value of the difference of readings of measuring device at inclination of 90° and at normal position gives the variation in reading as a result of inclinition.

Checking is carried out on any marking of the scale.

3.12. Smoothness of pointer movement is checked during the testing of measuring device as per item 3.9, 3.15, 3.16.

For this purpose, reneostatic resistance (gradually adjustable resistor) is used in place of sending unit.

The position of pointer relative to scale marking (para 1.3.8 is checked simultaneously.

3.13. Variation in the reading of measuring device (para 1.3.9) is checked on non-vibrating base by bringing the pointer of the measuring device under test to the marking $50^{\circ}C$ from the left and right (clockwise and anti-clockwise) using a reheostatic resistance. (gradually adjustable resistance). Resistance is measured in both cases and to find difference in resistance values on the basis of which variance in degree centigrades is determined (0.4 ohm corresponds to $1^{\circ}C$).

Resistance is measured by a bridge with class of accuracy min 1.

3.14. Damping is checked with the help of stop watch.

Voltage supply to measuring device contacts should ensure deflection of pointer to the geometric centre of scale. Starting of measuring device circuit and starting of stop watch should be simultaneous. Damping time is computed from the moment the voltage is supplied to the measuring device till the moment pointer does not deflect from its final position by more

~~by more~~ than 1% of scale length.

3.15. The reading error of measuring device at temperature minus (-) 60 ± 3°C (para 1.3.1) is checked after keeping the device in cold chamber for 2 hours. The error can be determined directly inside the chamber as well as outside of it. In case ~~if~~ if the error is determined outside the chamber then the articles are kept in cold chamber in thermal insulated container in batches of 15 pieces max.

During this, the time for checking the batch should not exceed 10 min and temperature of last measuring device to be checked from the batch should be not above minus 57°C.

The measuring device error can be determined only on numerical markings of scale.

The difference of readings of measuring device on markings to be checked and corresponding reading on graduated scale of the stand determines the error of measuring device.

After testing at temperature of minus 60°C the measuring devices are subjected to drying for 1 hour at 50°C.

3.16. The reading error of measuring device at temperature of 50 ± 3°C (item 1.3.1) is checked after keeping it for 2 hours in the thermostat. Error is determined in the similar fashion as in the para 3.15, only in case of checking the article outside of thermostat they are heated in free conditions without thermal insulated containers.

Temperature of last device from the batch under checking should be not less than 47°C.

3.17. Insulation resistance (item 1.3.11a) is checked by meggar of 500v rating in between plug contacts connected together and body of the device. The error should not exceed ± 20%.

The meggar reading is taken one minute after the voltage is applied device under test.

3.18. Electrical insulation strength (para ~~1.3pa~~ 1.3.12a) is checked on special device.

It is necessary to start checking at voltage nearer to zero and to gradually increase it to test voltage of 500V with speed which allows to take reading of voltmeter of the test stand. One minute after attaining the test voltage the voltage is gradually reduced and the circuit is switched off.

Measuring device is considered to have withstood the test if insulation breakdown and flash over have not occured, which are characterised by abrupt drop in voltage on test stand voltmeter.

3.19. Luminous paint intensity (para 1.3.13) of luminous compound, which is effective for short period, is checked in dark room by visual comparison with signs of inspection sample.

Measuring devices under test and inspection sample should be in dark room for the period necessary for it i.e., the observer should get accustomed to the darkness, he cannot observe their luminiscence.

Luminous compound should be exposed to ultraviolate rays to Min.

Clarity of visibility of marking, code, pointer coated with white paint is checked when they are illuminated with red light by visually comparing with the signs of inspection sample.

If the visibility of the signs of the device under test is similar to that of inspection sample then results of test are considered satisfactory.

Remark:- Inspection samples are approved by chief engineer of the plant and customer's representative and are replaced not later than after 6 months.

3.20. Durability of luminous compound is checked (para ~~1.3.4~~ 1.3.14) visually after the measuring device having undergone complete cycle of approval tests. Absence of peeling, cracks of luminous compound on dials and pointers of measuring device are checked during inspection.