

	Standard	Technology
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1. INTRODUCTION

The quality of field installation of control and instrumentation equipment forms a vital part in the life cycle costing of the plant and in effective and efficient maintenance regimes.

1.1 INTENDED AUDIENCE

1.1.1 Generation

C&I Maintenance

1.1.2 Engineering

C&I Engineering

1.1.3 Projects

C&I Contractors

1.2 ADDITIONAL MATERIAL

1.3 RELATED PROCESSES

All field equipment installation shall firstly comply with 240-56355754 Field Instrument Installation Standard, and then all requirements of this standard.

1.4 DEVIATIONS

Deviation from this standard is subject to written approval by Eskom. Special or unique applications not covered by this standard must be presented with recommendations to Eskom

2. SUPPORTING CLAUSES

2.1 SCOPE

2.1.1 Purpose

The Standard covers the minimum requirements for the installation of temperature instrumentation.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 Normative

None

2.2.2 Informative

None

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2.2.3 Disclosure Classification

Controlled Disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.3 ABBREVIATIONS

Abbreviation	Description
C&I	Control And Instrumentation
CED	Capital Expansion Department
IEC	International Electrotechnical Commission
ISA	Industry Standard Architecture
RTD	Electrical Resistance Thermometers

2.4 ROLES AND RESPONSIBILITIES

None

2.5 PROCESS FOR MONITORING

None

2.6 RELATED/SUPPORTING DOCUMENTS

None

3. DOCUMENT CONTENT

3.1 REFERENCE DOCUMENTS

Where specific references are made to specifications this shall imply the latest revision of that specification.

- IEC 61515: Mineral insulated thermocouple cables and thermocouples
- ISA- MC96.1: Temperature measurement thermocouples
- IEC 60751: Industrial Platinum Resistance Thermometer Sensors

3.2 INSTALLATION REQUIREMENTS

3.2.1 Temperature Sensing

Bi-metallic, 130mm diameter, all angle dial thermometers shall be installed for local indication.

Temperature switches shall not be used.

Thermocouples are the preferred means of temperature measurements for centralised control and indication, for multipoint indication or recording. Resistance thermometers may be installed in selected cases:

Where accuracy of measurement is required greater than obtainable with a thermocouple, a resistance thermometer shall be installed.

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Resistance thermometers shall not be installed where high frequent vibration is present, e.g. in high velocity steam or gas streams.

Where narrow range duty is required i.e. less than 100°C range a resistance thermometer shall be installed.

Thermocouples and resistance thermometers pocket assemblies shall be provided with terminal heads certified for the appropriate area classification and afford environmental protection to IP65.

The distance between the end of the thermowell and the head shall be such that no bending of the thermocouple shall occur. Where longer lengths are required additional sheathed supports for the head shall be installed

All thermocouples shall be 6mm in diameter. All exceptions shall be approved by Eskom.

Head caps shall be screw on and secured with a chain to the head body.

Terminal heads shall contain terminal blocks made of insulating material and used to support and join termination of conductors.

Terminal head shall be a housing that encloses the terminal block and shall be provided with threaded openings for attachment to a protection tube and for attachment of a conduit.

Protection tube shall be used to protect the sensor from damaging environmental effects. Ceramic materials, such as mullite, high purity alumina shall be used in high temperature applications. High purity alumina tubes are required with platinum thermocouples above 1200°C because mullite contains impurities that can contaminate platinum at these temperatures.

Temperature detecting elements shall be installed in thermowells and direct exposure of temperature-sensing devices to the process is not allowed. Spring loading shall be used to ensure good contact between all temperature detecting elements and the bottom of their wells.

3.2.2 Thermowells

All thermowells shall comply with Eskom Specification **NWS 1451**.

Thermowells shall either be welded into to process lines or screwed into the process line.

Thermowell process thread shall be ½” BPS tapered and instrument thread shall be ½” BPS parallel with suitable breakable seals.

The materials selected for thermowells must be suitable for the temperature and corrosion environments in which they are applied.

The preferred temperature nozzle orientation shall be vertical (top) on horizontal lines and horizontal (side) on vertical lines.

Thermowells installed in lines through which fluid flows at high velocities shall be suitable for the stresses resulting from stream velocity conditions. The wake frequency shall not exceed 66 percent of the thermowells natural frequency.

3.2.3 Thermocouples

Thermocouples shall be:

Chromel-alumel (Type K) for temperatures between –70°C and +1300°C.

Platinum / 10% rhodium platinum (Type S) for temperatures in excess of 1300°C.

Use of any other thermocouple type shall be subject to Eskom approval.

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Thermocouples shall be mineral insulated according to IEC 61515, sheathed to 6mm with hot junction insulated from the sheath. Metal-sheathed thermocouples provide longer life and improved long-term accuracy.

Thermocouple head terminals shall be marked with positive and negative symbols.

The correct type of extension wire for the particular thermocouple must be used to connect the thermocouple to the instrument. To minimize temperature lag the thermocouple must be in direct contact with bottom of the well.

A special application of thermocouple is measurement of temperature of the skin or tube-metal surface of furnace tubes and shall be subject to Eskom review. Such installations require careful attention to ensure that the thermocouple is properly attached to the tube and is shielded from furnace radiation.

3.2.4 Electrical Resistance Thermometers (RTD)

Resistance thermometer elements shall comply with IEC 60751 and have a resistance of 100Ω at 0°C, with a fundamental interval of 38.5Ω. They shall be of the grade of accuracy appropriate to the application.

Resistance thermometers shall be sheathed in a 316 stainless steel tube, 6mm outside diameters.

To compensate for changes in ambient temperature, resistance thermometers shall be connected to measuring or transmitting instruments by a three wire system, unless special accuracy applications dictate four wire.

3.2.5 Pyrometers

Purge facilities shall be provided for cooling and keeping the optical lens clean.

Pyrometer units shall be installed with due regard for accessibility and where required it shall be possible to swing the measurement unit 90 degrees from the line of sight to allow maintenance access.

3.2.6 Transmitters

All transmitters shall be 4-20mA with HART protocol. Head mounted temperature transmitters shall be installed where possible for all applications with thermocouples or RTDs. The output signal shall be linear with respect to temperature.

If high temperatures are a problem with head-mounted temperature transmitters, the transmitters shall be remote mounted, with short lengths of compensating or triad cable.

Where access to the thermowell is restricted resulting in inaccessibility to head-mounted temperature transmitters, the transmitters shall be remote mounted, with short lengths of compensating or triad cable.

3.2.7 Access Requirements

Temperature instruments shall be located to be accessible from grade, permanent platform or fixed ladder. Access should be within 2 metres of grade or permanent platform or 4 metres, provided access is available from mobile platform or lift.

Where access from normal operational platforms is not practical, additional access facilities shall be provided.

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4. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
	Document Approved by TDAC ROD 13 March 2013

5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2012	0	E. Motsoatsoe	Draft document for Review created from FIIS 7
May 2013	1	E. Motsoatsoe	Final Approved document for Publication

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- None

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