AS ISO 18434.1:2014
ISO 18434-1:2008

AS ISO 18434.1:2014

Australian Standard®

Condition monitoring and diagnostics of machines—Thermography

Part 1: General procedures



This Australian Standard® was prepared by Committee ME-087, Machine Condition Monitoring.
It was approved on behalf of the Council of Standards Australia on 11 March 2014.
This Standard was published on 7 April 2014.

The following are represented on Committee ME-087:

- Asset Institute
- Australasian Railway Association
- Australian Industry Group
- Australian Institute for Non-Destructive Testing
- Australian Professional Thermography Association
- Bureau of Steel Manufacturers of Australia
- Crane Industry Council of Australia
- Engineers Australia
- Institute of Electrical Inspectors
- International Council for Machinery Lubrication
- Queensland University of Technology

This Standard was issued in draft form for comment as DR AS ISO 18434.1.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting **www.standards.org.au**

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at **mail@standards.org.au**, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard®

Condition monitoring and diagnostics of machines—Thermography

Part 1: General procedures

First published as AS ISO 18434.1:2014.

COPYRIGHT

© Standards Australia Limited

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968.

Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 978 1 74342 675 3

PREFACE

This Standard was prepared by the Standards Australia Committee ME-087, Machine Condition Monitoring.

The objective of this Standard is to provide an introduction to the application of infrared thermography (IRT) to machinery condition monitoring and diagnostics, where 'machinery' includes machine auxiliaries such as valves, fluid and electrically powered machines, and machinery related heat exchanger equipment. In addition, IR applications pertaining to machinery performance assessment are addressed.

This Standard is identical with and has been reproduced from ISO 18434-1:2008, *Condition monitoring and diagnostics of machines—Thermography*, Part 1: *General procedures*.

As this Standard is reproduced from an International Standard, the following applies:

(a) In the source text 'this part of ISO 18434' should read 'this Australian Standard'.

(b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

Reference to International Standard		*Australian Standard*	
ISO		AS ISO	
13381	Condition monitoring and diagnostics of machines—Prognostics	13381	Condition monitoring and diagnostics of machines—Prognostics
13381-1	Part 1: General guidelines	13381.1	Part 1: General guidelines
17359	Condition monitoring and diagnostics of machines—General guidelines	17359	Condition monitoring and diagnostics of machines—General guidelines

Only normative references that have been adopted as Australian or Australian/New Zealand Standard have been listed.

The term 'informative' has been used in this Standard to define the application of the annex to which it applies. An 'informative' annex is only for information and guidance.

CONTENTS

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **2**

4 Thermography techniques **4**

5 Comparative thermography **4**
5.1 Types of comparative thermography **4**
5.2 Comparative quantitative thermography **5**
5.3 Comparative qualitative thermography **5**

6 Non-contact thermometry using infrared thermography cameras **6**

7 Baseline measurements **6**

8 Safety **6**

9 Calibration **6**

10 Data collection **6**

11 Customer responsibilities **7**

12 Field measurements of reflected temperature and emissivity and attenuating media **7**

13 Temperature severity assessment criteria **8**
13.1 Establishing severity assessment criteria **8**
13.2 Temperature difference criteria **8**
13.3 Maximum permissible temperature criteria **8**

14 Profile assessment criteria **9**

15 Diagnosis and prognosis **9**
15.1 Survey intervals **9**
15.2 Image interpretation **9**
15.3 Fault identification process **10**

16 Test report **10**

17 Qualification of personnel **11**

Annex A (normative) **Field measurements of reflected apparent temperature and emissivity** **12**

Annex B (informative) **Example safety rules and guidelines** **17**

Annex C (informative) **Case history examples** **18**

Bibliography **24**

INTRODUCTION

This part of ISO 18434 provides guidance on the use of infrared thermography (IRT) as part of a programme for condition monitoring and diagnostics of machines. IRT can be used to identify and document anomalies for the purposes of condition monitoring of machines. These anomalies are usually caused by such mechanisms as operation, improper lubrication, misalignment, worn components or mechanical loading anomalies.

IRT is based on measuring the distribution of radiant thermal energy (heat) emitted from a target surface, and converting this to a map of radiation intensity differences (surface temperature map) or *thermogram*. The thermographer therefore requires an understanding of heat, temperature and the various types of heat transfer as essential prerequisites when undertaking an IR programme. Thermal energy is present with the operation of all machines. It can be in the form of friction or energy losses, as a property of the process media, produced by the actual process itself or any combination thereof. As a result, temperature can be a key parameter for monitoring the performance of machines, the condition of machines, and the diagnostics of machine problems. IRT is an ideal technology to do this temperature monitoring because it provides complete thermal images of a machine, or a machine component, with no physical attachments (non-intrusive), requires little set-up, and provides the results in a very short period of time.

An important advantage of radiation thermometers over contact thermometers is their speed of response. The measured energy travels from the target to the sensor at the speed of light. The response of the instrument can then be in milliseconds or even microseconds. Another advantage is the sensitivity of the instruments in that they can detect and display a thermal “picture” composed of the very subtle temperature differences of the target.

Although extremely useful, IRT has a limitation in that radiometric sensing is susceptible to unacceptable error when used on most low emissivity surfaces.

AUSTRALIAN STANDARD

Condition monitoring and diagnostics of machines—Thermography

Part 1:
General procedures

1 Scope

This part of ISO 18434 provides an introduction to the application of infrared thermography (IRT) to machinery condition monitoring and diagnostics, where “machinery” includes machine auxiliaries such as valves, fluid and electrically powered machines, and machinery related heat exchanger equipment. In addition, IR applications pertaining to machinery performance assessment are addressed.

This part of ISO 18434:

— introduces the terminology of IRT as it pertains to condition monitoring and diagnostics of machines;

— describes the types of IRT procedures and their merits;

— provides guidance on establishing severity assessment criteria for anomalies identified by IRT;

— outlines methods and requirements for carrying out IRT of machines, including safety recommendations;

— provides information on data interpretation, and assessment criteria and reporting requirements;

— provides procedures for determining and compensating for reflected apparent temperature, emissivity and attenuating media.

This part of ISO 18434 also encompasses the testing procedures for determining and compensating for reflected apparent temperature, emissivity and attenuating media when measuring the surface temperature of a target with a quantitative IRT camera.

NOTE It is intended that future parts will address application-specific analysis guidelines.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 13372, *Condition monitoring and diagnostics of machines — Vocabulary*

ISO 13379, *Condition monitoring and diagnostics of machines — General guidelines on data interpretation and diagnostics techniques*

ISO 13381-1, *Condition monitoring and diagnostics of machines — Prognostics — Part 1: General guidelines*

ISO 17359, *Condition monitoring and diagnostics of machines — General guidelines*

© Standards Australia