

---

---

**Non-destructive testing — Pulsed  
eddy current testing of ferromagnetic  
metallic components**

*Essais non destructifs — Contrôle par courants de Foucault pulsés de  
composants métalliques ferromagnétiques*

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

[ISO 20669:2017](https://standards.iteh.ai/catalog/standards/iso/a1a166ff-8676-43d6-8277-d6309a243ed9/iso-20669-2017)

<https://standards.iteh.ai/catalog/standards/iso/a1a166ff-8676-43d6-8277-d6309a243ed9/iso-20669-2017>



**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO 20669:2017](https://standards.iteh.ai/catalog/standards/iso/a1a166ff-8676-43d6-8277-d6309a243ed9/iso-20669-2017)

<https://standards.iteh.ai/catalog/standards/iso/a1a166ff-8676-43d6-8277-d6309a243ed9/iso-20669-2017>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
[copyright@iso.org](mailto:copyright@iso.org)  
[www.iso.org](http://www.iso.org)

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 General principles</b> .....	<b>2</b>
4.1 Principles of PEC testing.....	2
4.2 Characteristics of PEC testing.....	4
4.2.1 Advantages.....	4
4.2.2 Limitations.....	4
4.3 Influence factors.....	5
4.3.1 Coating.....	5
4.3.2 Tested component.....	5
4.3.3 Temperature.....	5
4.3.4 Probe.....	5
4.3.5 Reference zone.....	5
4.3.6 Other factors.....	5
<b>5 Qualification of personnel</b> .....	<b>6</b>
<b>6 Equipment</b> .....	<b>6</b>
6.1 Testing system.....	6
6.2 PEC instrument.....	6
6.3 Probe.....	6
6.4 Sensitivity adjustment.....	6
6.5 Test pieces.....	7
6.5.1 Reference blocks.....	7
6.5.2 Spacers.....	8
6.5.3 Metal sheet cover.....	8
6.6 Maintenance and verification of equipment.....	8
<b>7 On-site testing</b> .....	<b>8</b>
7.1 Preparation of documentation.....	8
7.1.1 Document prerequisites.....	8
7.1.2 Site investigation.....	8
7.1.3 Preparation of testing procedure and record sheets.....	8
7.2 Preparation of the component to be tested.....	9
7.2.1 Surface preparation.....	9
7.2.2 Identification.....	9
7.3 Selection of the references.....	9
7.3.1 Principles.....	9
7.3.2 Reselection of references.....	10
7.3.3 Record of references.....	10
7.4 Performing test.....	10
7.5 Safety.....	10
<b>8 Interpretation and evaluation of test results</b> .....	<b>10</b>
<b>9 Verification of test results</b> .....	<b>10</b>
<b>10 Documentation</b> .....	<b>11</b>
10.1 General.....	11
10.2 General written testing procedure.....	11
10.3 Testing record.....	12
10.4 Testing report.....	12
<b>Bibliography</b> .....	<b>13</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 4, *Eddy current methods*.

ISO 20669:2017

<https://standards.iteh.ai/catalog/standards/iso/a1a166ff-8676-43d6-8277-d6309a243ed9/iso-20669-2017>

# Non-destructive testing — Pulsed eddy current testing of ferromagnetic metallic components

## 1 Scope

This document specifies the pulsed eddy current (PEC) testing technique used to perform thickness measurement on ferromagnetic metallic components with or without the presence of coating, insulation and weather sheeting.

This document applies to the testing of in-service components made of carbon steel and low-alloy steel in the temperature of  $-100\text{ °C}$  to  $500\text{ °C}$  (temperature measured at metal surface). The range of wall thickness of components is from 3 mm to 65 mm and the range of thickness of coatings is from 0 mm to 200 mm. The tested components also include piping of diameter not less than 50 mm.

The technique described in this document is sensitive to the geometry of the component and applying the technique to components outside of its scope will result in unpredictable inaccuracy. This document does not apply to the testing of crack defects and local metal loss caused by pitting.

This document does not establish evaluation criteria. The evaluation criteria shall be specified by the contractual agreement between parties.

## 2 Normative references

The following documents are referred to in text in such a way that some or all of their content constitutes requirements 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 15548-3, *Non-destructive testing — Equipment for eddy current examination — Part 3: System characteristics and verification*

ISO 16809, *Non-destructive testing — Ultrasonic thickness measurement*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12718 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1

#### coating

material which covers the surface of a tested component in the forms of adhesive, adsorbed layer, bundle, twine or inlay, etc. such as paint, plastic, asphalt, rock-wool, foam, metal mesh, cement, carbon (glass) fibre, marine organism, etc.

Note 1 to entry: For the purpose of this document, the word coating is used to describe any protective or insulative layer on the component to be tested.

### 3.2

#### cover

sheet metal protective layer on the outside of the coating

**3.3  
excitation pulse duration**

time needed for the energy to travel through the actual thickness of the component

Note 1 to entry: It needs to be long enough to penetrate the full thickness

**3.4  
decay rate**

rate of change in electromagnetic field measured by the receiver sensor after the transmitter has been switched off

Note 1 to entry: For example, the bending point of one of the typical measurement methods (see [Figure 1](#)).

**3.5  
bending point**

point where the received signal decay rate changes from linear to exponential

**3.6  
characteristic time**

time measured between the end of the excitation pulse and the bending point

Note 1 to entry: Its value is proportional to the magnetic permeability, electrical conductivity and the thickness squared.

**3.7  
pulse repetition frequency**

prf  
number of pulses generated per second, expressed in Hertz (Hz)

**4 General principles**

**4.1 Principles of PEC testing**

According to ISO 12718, pulsed eddy currents are eddy currents generated by a pulsed electromagnetic field.

Similar to sinusoidal eddy currents, induced pulsed eddy currents are modified by any local variation in the material properties.

The pulse is characterized by its duration (T), which enables to generate induced currents with a very high intensity.

The time interval between two measurements is linked to the material thickness.