INTERNATIONAL STANDARD

**ISO 18943**

First edition
2014-12-01

# Imaging materials — Magnetic hard drives used for image storage — Care and handling

*Matériaux d'imagerie — Disques durs magnétiques utilisés pour le stockage d'images — Soins et manipulation*

Reference number
ISO 18943:2014(E)

© ISO 2014



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2014

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
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

# Contents

Page

**Foreword** ..... **v**

**Introduction** ..... **vi**

**1 Scope** ..... **1**

**2 Terms and definitions** ..... **1**

**3 HDD components** ..... **4**
3.1 Disks ..... 4
3.2 Motor and spindle ..... 4
3.3 Read/Write head ..... 4
3.4 Servo head ..... 4
3.5 Control electronics ..... 4
3.6 Interconnections ..... 4

**4 Possible physical configurations** ..... **5**
4.1 Disk arrays ..... 5
4.2 Single HDD ..... 5

**5 Access and usage options** ..... **5**
5.1 Online HDDs (connected and powered) ..... 5
5.2 Online but inactive HDDs (connected, not spinning) ..... 5
5.3 Off-line (not connected, not spinning) ..... 5

**6 Reliability** ..... **5**

**7 Data quality** ..... **6**

**8 Interoperability/Compatibility** ..... **6**

**9 Migration** ..... **6**

**10 Environmental factors** ..... **6**
10.1 Temperature and humidity ..... 6
10.2 Condensation ..... 7
10.3 Acclimatisation ..... 7
10.4 Magnetic fields ..... 7

**11 Possible failure mechanisms** ..... **7**
11.1 Physical shock ..... 7
11.2 Plugging/unplugging connectors ..... 7
11.3 Head-to-disk stiction ..... 8
11.4 Heat ..... 8
11.5 Humidity ..... 8
11.6 Air quality and particulates ..... 8
11.7 Magnetic degradation ..... 8
11.8 Run time ..... 8
11.9 Shelf life ..... 8

**12 Obsolescence issues** ..... **8**
12.1 Software ..... 8
12.2 Hardware ..... 9

**13 Transportation and shipping** ..... **9**
13.1 Freighting ..... 9
13.2 Shipping containers ..... 9
13.3 Time out of storage ..... 9

© ISO 2014 – All rights reserved

**14 Disaster** ..... **9**
14.1 Initial handling following a disaster ..... 9
14.2 Fire ..... 9
14.3 Earthquakes ..... 10
14.4 Heat and temperature extremes ..... 10
14.5 Smoke, soot, and contamination ..... 10
14.6 Water and moisture ..... 10
**15 Staff training** ..... **10**
15.1 Purpose ..... 10
15.2 Training paths ..... 10
15.3 Schedule for training ..... 10
15.4 Update of training ..... 11
15.5 Content of training ..... 11
**16 Minimum handling requirements checklist** ..... **11**
**Annex A** (normative) **RAID and MAID levels** ..... **12**
**Annex B** (informative) **Websites and general information** ..... **13**
**Bibliography** ..... **14**

 © ISO 2014 – All rights reserved

# 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).

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).

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 42, *Photography*.

© ISO 2014 – All rights reserved

# Introduction

Magnetic hard disk drives (HDD) are used widely for short and extended-term storage of data, including audio, still, and moving images. HDDs are popular because they are small, inexpensive, self-contained, and have very high storage capacities. The most common form of HDD comes in a semi-sealed metal housing that measures 25 mm × 100 mm × 130 mm. Each unit has a connector for power and a connector for receiving and transmitting data and commands. Each HDD of this form contains one to as many as five 89 mm diameter magnetic disks (sometimes called platters) coated on an aluminium substrate. The location of working HDDs can be internal or external to computer workstations, and can be connected singly or in groups.

There are three broad categories of HDDs.

a) Consumer. Consumer HDDs are the most common types of HDDs. They are low in cost and are made for consumer and office work.

b) Enterprise. Enterprise HHDs cost more, are subjected to additional testing at the factory, and are intended for higher performance and reliability, and more intensive usage. They are typically used as part of data centre storage systems. They usually run at a higher rotational speed.

c) Miniature. Miniature HDDs have disks with smaller diameters and are used in mobile computers, including laptop computers and mobile consumer electronic devices.

There are several operating modes for HDDs, and these are described in Clause 3. In general, the three most common modes of HDDs are

a) online,

b) online but inactive, and

c) off-line.

The main longevity issues for HDDs are failures due to natural disasters, manufacturing defects, faulty electronic components, or obsolescence of the software interface. Proper care and handling helps reduce the risk of failure from physical impact, environmental extremes, and contamination, but proper care and handling by itself will not prevent failure. Migration and the making of backup copies are also strategies to mitigate against failure. Many HDD users migrate their entire digital collections every five years. Medium- and long-term storage of data on HDDs is not endorsed. Medium- and long-term storage of data on HDDs requires frequent backup copying, system mirroring, or other procedure to mitigate the significant problems posed by the use of HDDs.

HDDs used for storage purposes should not be left inactive for several years as no experience documents the reliability of HDDs in an extended idle storage mode. Also, all electronic media, including HDDs, have the possibility of failure. Therefore, all data shall be duplicated.

This International Standard focuses on the care and handling of HDDs, as well as the preservation of data stored on HDDs. The physical media is only one component in the preservation of data on HDDs. Data preservation is dependent on a total system to ensure data integrity.


© ISO 2014 – All rights reserved

# Imaging materials — Magnetic hard drives used for image storage — Care and handling

## 1 Scope

This International Standard concerns the storage, care, and handling of HDDs. It recommends handling procedures to maximise the effective life of the data written on magnetic HDDs. Faulty care and handling methods can cause damage to a disk and the contents written thereon. It also recommends storage practices to preserve both the hard disk media and the content encoded thereon.

The recommendations in this International Standard apply where the desired result is extended-term retention of the data encoded on the disk. The use of the phrase "care and handling" in this International Standard is restricted to the physical domain or hardware aspects of the HDD. This International Standard is not intended to address associated or relative system aspects of HDDs. With recognition that the scope of systems is covered in other standards, this International Standard precisely aims to fill a void of information on HDDs as physical media with failure mechanisms and handling risks.

This International Standard does not promote or advocate that proper physical care and handling represents the only element on the path to extended-term usage (more than two years), but rather is part of a comprehensive set of practices to mitigate risks in the long term preservation of content stored on HDDs.

## 2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**2.1**
**advanced technology attachment**
**ATA**
type of protocol that interfaces the hard disk drive with the computer

Note 1 to entry: Also, see SATA.

**2.2**
**backup**
duplicate of stored data

Note 1 to entry: It is recommended to store the back-ups at a remote site in case of a disaster.

**2.3**
**BLER**
number of erroneous blocks per second measured at the input of the C1 decoder (see ISO/IEC 60908) during playback at the standard (x 1) data rate averaged over a 10 second measuring period

Note 1 to entry: Standards ISO/IEC 10149 and ANSI/NAPM IT9.21-1996 specify a maximum BLER rate of 220.

**2.4**
**cartridge**
housing for recording media

Note 1 to entry: Cartridges for removable HDDs contain only the disk and not the read/write heads or interface electronics.

**2.5**
**disk array**
multiple HDDs with a common controller and file system

© ISO 2014 – All rights reserved