

BS ISO 24035:2014



BSI Standards Publication

# Belt drives — V-belts and the corresponding pulleys for agricultural machineries — Dimensions

**bsi.**

...making excellence a habit.™

**National foreword**

This British Standard is the UK implementation of ISO 24035:2014.

The UK participation in its preparation was entrusted to Technical Committee MCE/10, Belts & Pulley Drive.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014. Published by BSI Standards Limited 2014

ISBN 978 0 580 71247 0

ICS 65.060.01

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2014.

**Amendments issued since publication**

Date	Text affected
------	---------------

---

INTERNATIONAL  
STANDARD

**ISO**  
**24035**

First edition  
2014-05-01

---

---

**Belt drives — V-belts and the  
corresponding pulleys for agricultural  
machineries — Dimensions**

*Transmissions par courroies — Courroies trapézoïdales et poulies  
correspondantes pour les machines agricoles — Dimensions*



Reference number  
ISO 24035:2014(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](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
Foreword .....	iv
<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 Symbols .....</b>	<b>1</b>
<b>5 Belt cross-sections and nominal dimensions .....</b>	<b>1</b>
<b>6 Belt lengths .....</b>	<b>3</b>
<b>7 Belt length measurement method — Manufactured belt dimensions .....</b>	<b>8</b>
<b>8 Specifications for pulleys used with V-belts and V-ribbed belts .....</b>	<b>9</b>
<b>Bibliography .....</b>	<b>10</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 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 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 1, *Friction*.

# Belt drives — V-belts and the corresponding pulleys for agricultural machineries — Dimensions

## 1 Scope

This International Standard provides dimensional details of the V-drive belts used on agricultural machinery. It is intended to reflect practice (at the time of publication) in the design of such drives and to provide, where practicable, links to International Standards for similar belts used on industrial machinery.

NOTE All dimensions in this International Standard are in millimetres (mm).

## 2 Normative references

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

ISO 1081, *Belt drives — V-belts and V-ribbed belts, and corresponding grooved pulleys — Vocabulary*

ISO 4183, *Belt drives — Classical and narrow V-belts — Grooved pulleys (system based on datum width)*

ISO 5290, *Belt drives — Grooved pulleys for joined narrow V-belts — Groove sections 9N/J, 15N/J and 25N/J (effective system)*

ISO 5291, *Belt drives — Grooved pulleys for joined classical V-belts — Groove sections AJ, BJ, CJ and DJ (effective system)*

ISO 9982, *Belt drives — Pulleys and V-ribbed belts for industrial applications — PH, PJ, PK, PL and PM profiles: Dimensions*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1081 apply.

## 4 Symbols

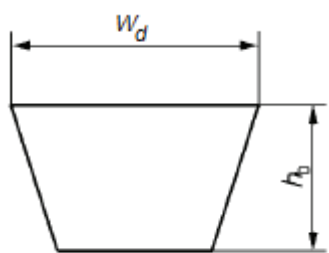
For the purposes of this document, the symbols given in ISO 1081 apply.

## 5 Belt cross-sections and nominal dimensions

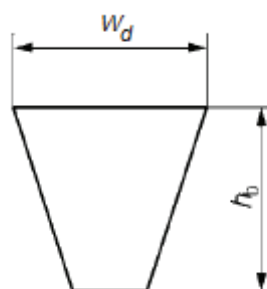
The belt cross-section is characterized by the top width,  $W$ , and height,  $h_b$ . In the case of joined V-belts and V-ribbed belts, the cross-section spacing is also relevant. The angle of the belt sides is usually  $40^\circ$  except in the case of variable speed belts where the angle is commonly  $32^\circ$  but may be different on some applications.

The nominal dimensions of belt cross-sections are shown in [Table 1](#) and [Figure 1](#).

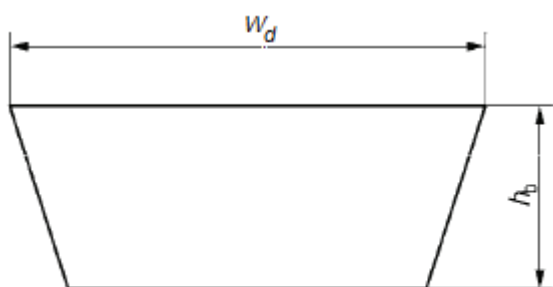
The belt cross-sections supplied by different manufacturers may vary slightly due to manufacturing methods and/or the tooling used. All belts of a given cross-section shall work in the pulley grooves specified in this International Standard for that section.



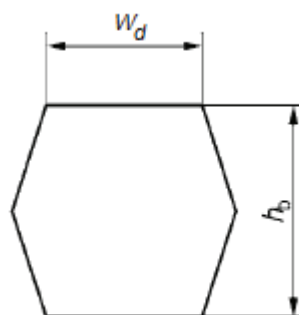
a) Classical section V-belts



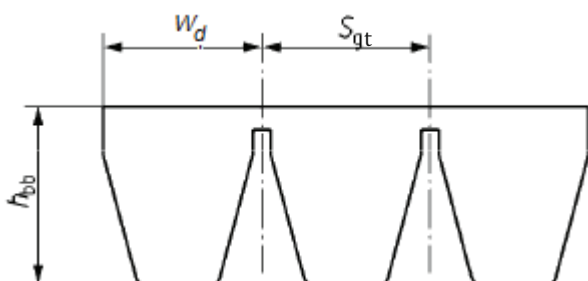
b) Narrow or wedge section V-belts



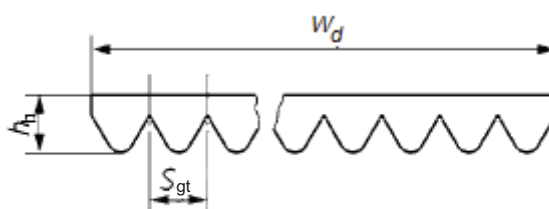
c) Variable speed drive belts



d) Hexagonal section V-belts



e) Joined V-belts



f) V-ribbed belts

Figure 1 — Belt types



$$W_d = N_e \times S_{gt} \quad (1)$$

where

$N_e$  is the number of ribs;

$S_{gt}$  is the specified sheave groove spacing;

$W_d$  is the width of the belt;

$W_2$  is the dimension of variable speed belts and hexagonal belts.

**Table 1 — Nominal dimensions of cross-sections**

Dimensions in millimetres

Belt type	Cross-section	$W$	$W_d$	$T$	$h_b^a$	$S_{gt}^b$
Classical V-belts	HA	12	11	8	9,9	15,88
	HB	17	14	11	13,0	19,05
	HC	22	19	14	16,2	24,40
	HD	32	27	20	22,4	36,53
Wedge/narrow V-belts	SPZ	10	8,5	8	10,5	12,00
	SPA	13	11	10	12,5	15,00
	SPB	17	14	14	15,6	19,00
	SPC	22	19	18	22,6	25,50
	3V/9N	9		8	10,0	10,30
	5V/15N	15		14	16,0	17,50
	8V/25N	25		23	25,5	28,60
Hexagonal V-belts	HAA	13	11	10		
	HBB	17	14	13		
	HCC	22	19	17		
Variable speed V-belts	HI	25,4	23,6	12,7		
	HJ	31,8	29,6	15,1		
	HK	38,1	35,5	17,5		
	HL	44,5	41,4	19,8		
	HM	50,8	47,4	22,2		
	HN	57,2	53,2	23,9		
	HO	63,5	29,1	25,4		
V-ribbed belts	PJ	See <a href="#">Figure 1</a>		4		2,34
	PL			8		4,70
	PM			15		9,40

NOTE The “H” prefix in the description of classical V-belts, hexagonal section V-belts, and variable speed V-belts indicates that belts can be manufactured to a higher specification to meet specific application criteria than standard industrial belt specifications.

<sup>a</sup> Classical and wedge/narrow V-belts are also available in the joined or banded configuration as illustrated in [Figure 1](#).

<sup>b</sup> Specified groove spacing.

## 6 Belt lengths

**6.1** V-belts, banded, or joined belts and variable speed belts for agricultural machinery traditionally identify length using “effective outside length” whereas similar belts for industrial machinery may use “datum length”.

Effective outside length shall be measured at a position on the measuring pulleys where the groove top width is a closely specified value (see [Table 5](#)).

Datum length shall be measured at a position within the grooves of the measuring pulleys where the datum width is a closely specified value. The datum width is set to coincide approximately with the neutral axis of the belt section.

There is a direct relationship between the belt effective outside length and its datum length. Please consult the belt manufacturer.

**6.2 Hexagonal section V-belts for agricultural machinery identify length using “effective length”.**

Effective length shall be measured on the same pulleys used for measuring classical section belt effective outside length and is close to the length of the belt at the widest point of the section.

**6.3 Ribbed belts identify length using “effective length”.**

Effective length shall be measured at the outside diameter of the measuring pulleys and is therefore close to the belt length at the bottom of the grooves between the ribs.

**Table 2 — Effective length ranges**

Dimensions in millimetres

Classical section V-belts <sup>a</sup>		Wedge section V-belts <sup>a</sup>		Variable speed V-belts		Hexagonal section V-belts		Ribbed belts	
Section	Range	Section	Range	Section	Range	Section	Range	Section	Range
HA	635 to 3 300	SPZ	635 to 3 550	HI	1 020 to 3 175	HAA	1 270 to 3 300	PJ	455 to 2 540
HB	760 to 7 620	SPA	732 to 4 500	HJ	1 270 to 4 065	HBB	1 270 to 7 620	PL	1 270 to 3 685
HC	1 400 to 9 270	SPB	1 250 to 8 000	HK	1 525 to 4 570	HCC	2 160 to 9 270	PM	2 285 to 9 270
HD	3 050 to 9 270	SPC	2 000 to 12 500	HL	1 780 to 5 080				
		3V/9N	635 to 3 560	HM	2 030 to 5 080				
		5V/15N	1 270 to 9 020	HN	2 160 to 5 080				
		8V/25N	2 540–15 240	HO	2 285–5 080				

<sup>a</sup> Includes joined or banded belts.

**Table 3 — Effective length tolerance (all belt types)**

Dimensions in millimetres

Effective length range	Effective length tolerance
Up to and including 1 300	±10
Over 1 300 and including 2 500	±13
Over 2 500 and including 3 150	±16
Over 3 150 and including 4 000	±20
Over 4 000 and including 5 000	±25
Over 5 000 and including 6 300	±32
Over 6 300 and including 8 000	±40
Over 8 000 and including 10 000	±50

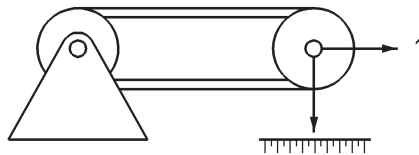
**Table 4 — Limits of difference in effective length for matching sets**

Dimensions in millimetres

Effective length range	Matching limits for one set	
	Normal belt construction	High-modulus belt construction <sup>a</sup>
Up to and including 1 375	4	2
Over 1 375 up to and including 2 820	6	3
Over 2 820 up to and including 6 000	10	5
Over 6 000 up to and including 10 000	16	6

NOTE Matched set tolerances are not applicable to joined V-belts or V-ribbed belts as they are designed to be a single unit.

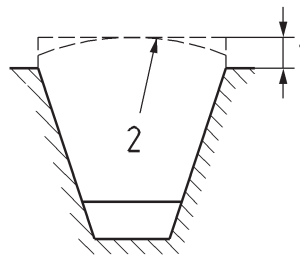
<sup>a</sup> Examples of high-modulus belt constructions are those with reinforcing cords made from aramid, glass fibre or steel.



**Key**

- 1 total measuring force

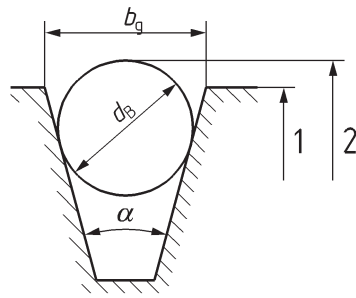
**Figure 2 — Layout of measuring fixture**



**Key**

- 1 belt ride out
- 2 variations to corner contours

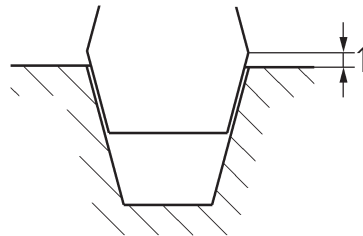
**Figure 3 — Measuring belt ride out, V-belt**



**Key**

- 1 outside diameter
- 2 diameter over balls

**Figure 4 — V-belt measuring pulley groove**



**Key**

- 1 belt ride out

**Figure 5 — Measuring belt ride out, hexagonal V-belt**

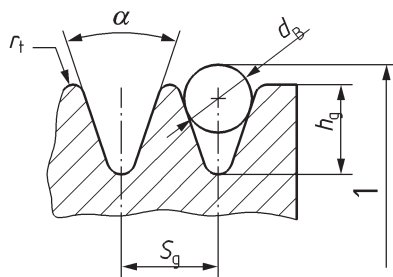
Table 5 — Data for use in measuring belt effective length

Dimensions in millimetres

Belt cross-section	Pulley datum or outside diameter $\pm 0,10$	Pulley effective circumference	Pulley groove angle $\pm 0,25^\circ$	Pulley groove top width $b_g$	Dia meter ball or rod $d_B$ $\pm 0,01$	Dia meter over balls or rods $\pm 0,10$	Groove depth $h_g$ min.	Total measuring force per belt N	Maximum ride position of belt with respect to top of groove	
									Not joined	Joined
HA	95,5	300	34	13,0	12,5	108,2	12	300	2,5	4,5
HB	143,2	450	34	16,5	15,5	157,7	14	450	2,5	5,0
HC	222,8	700	34	22,4	21,0	242,2	19	850	2,5	6,5
HD	318,3	1 000	36	32,8	30,5	346,6	26	1 800	3,0	7,0
HAA	95,5	300	34	13,0	12,5	108,2	12	300	0,8	
HBB	143,2	450	34	16,5	15,5	157,7	14	450	0,8	
HCC	222,8	700	34	22,4	21,0	242,2	19	850	0,8	
SPZ	95,5 <sup>a</sup>	300	38	9,91			11	360	1,1	
SPA	143,2 <sup>a</sup>	450	38	12,96			14	560	1,3	
SPB	191,0 <sup>a</sup>	600	38	16,45			17,5	900	1,4	
SPC	318,3 <sup>a</sup>	1 000	38	22,35			23,8	1 500	1,5	
3V/9N-J	95,5	300	38	8,89	8,5	104,3	8,5	445	2,5	5,1
5V/15N-J	191,0	600	38	15,24	15,0	207,8	15,0	1000	3,0	6,4
8V/25N-J	318,3	1 000	38	25,40	25,0	346,3	25,1	2225	4,1	7,6
HI	127,3	400	26	25,40	24,5	150,7	20	800	4,1	
HJ	159,2	500	26	31,75	30,5	187,8	23	1 300	4,1	
HK	191,0	600	26	38,10	36,5	224,8	26	1 800	4,6	
HL	222,8	700	26	44,45	42,5	261,7	29	2 500	5,1	
HM	254,6	800	26	50,80	48,5	298,7	32	3 300	5,1	
HN	286,5	900	26	57,00	54,5	336,4	34	3 300	5,6	
HO	318,3	1 000	26	63,00	60,0	372,1	37	3 300	5,6	

NOTE See [Figure 2](#).

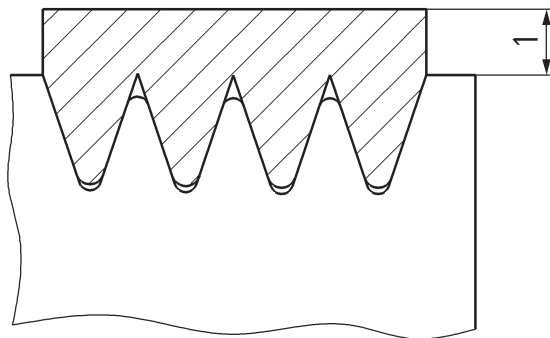
<sup>a</sup> These diameters are datum diameters. All other diameters in this column are outside diameters.



**Key**

1 diameter over balls

**Figure 6 — V-ribbed belt measuring groove**



**Key**

1 belt ride out

**Figure 7 — Measuring belt ride out, V-ribbed belt**

**Table 6 — Data for use in measuring V-ribbed belt effective length and ride**

Dimensions in millimetres

Cross-section	Pulley outside diameter reference	Pulley effective circumference	Pulley groove angle, degrees °	Pulley groove spacing $S_{gt}$	Diameter ball or rod $d_B$ ±0,01	Diameter over ball or rod ±0,10	Groove depth $h_g$ min.	Top radius $r_t$ +0,15 -0,00	Total measuring force per rib N	Max. ride of belt with respect to top of groove
PJ	95,5	300	40	2,34 ±0,03	1,50	97,5	2,06	0,20	50	2,50
PL	159,2	500	40	4,70 ±0,05	4,00	163,5	4,92	0,40	200	5,60
PM	254,6	800	40	9,40	7,00	259,2	10,03	0,75	450	7,60

## 7 Belt length measurement method — Manufactured belt dimensions

7.1 Belt length shall be determined using a measuring fixture as illustrated in [Figure 2](#), consisting of two pulleys of equal diameter having groove dimensions as specified in [Tables 5](#) and [6](#). Both pulleys are

free to rotate. One of the pulleys has a fixed centre while the other can slide horizontally under the action of a measuring force applied horizontally through the sliding pulley centre.

**7.2** The apparatus should have a means of accurately measuring the distance between the pulley centres and applying the measuring force.

**7.3** The belt to be measured shall be mounted on the measuring pulleys and the measuring force shall be applied to the sliding pulley. The pulleys are rotated through at least two revolutions to seat it properly and to equalize the tension between the two spans of the belt.

**7.4** The belt length shall be determined by adding the circumference of one of the measuring pulleys to twice the centre distance between the two pulleys.

**7.5** The belt ride dimension is checked by measuring the distance from the top of the belt to the top of the measuring pulley groove (see [Figures 3, 5 and 7](#)). This dimension should be within the maximum shown in [Tables 5 and 6](#).

## 8 Specifications for pulleys used with V-belts and V-ribbed belts

**8.1** Make reference to the International Standards shown in [Table 7](#) for the pulley groove dimensions appropriate to the belt under consideration.

**Table 7**

Belt section	International Standard
Classical sections — single belts HA, HB, HC, HD	ISO 4183
Classical sections — joined belts HA, HB, HC, HD	ISO 5291
Narrow or wedge sections — single or joined SPZ, SPA, SPB, SPC 3V/9N/9J, 5V/15N/15J, 8V/25N/25J	ISO 4183 ISO 5290
Hexagonal sections HAA, HBB, HCC	ISO 4183
V-ribbed sections PJ, PL, PM	ISO 9982
NOTE 1 If there is any uncertainty concerning the latest issue of any of the International Standards mentioned, please consult with your national standards body.	
NOTE 2 It is recommended that the belt manufacturer be consulted where the drive design necessitates special situations such as “quarter turn”. It might be important to use pulleys with deeper than normal grooves.	
NOTE 3 Pulley materials and constructions are detailed in the International Standards mentioned.	

**8.2** Pulleys formed from sheet metal are permissible provided the groove dimensions are uniform throughout the circumference of the pulley, and that the thickness of the metal used is such that the groove profile will not change under the pressures exerted by the belt.

## Bibliography

- [1] ISO 5289, *Agricultural machinery — Endless hexagonal belts and groove sections of corresponding pulleys*









# British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

## About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

## Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at [bsigroup.com/standards](http://bsigroup.com/standards) or contacting our Customer Services team or Knowledge Centre.

## Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at [bsigroup.com/shop](http://bsigroup.com/shop), where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

## Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to [bsigroup.com/subscriptions](http://bsigroup.com/subscriptions).

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

**PLUS** is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit [bsigroup.com/shop](http://bsigroup.com/shop).

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email [bsmusales@bsigroup.com](mailto:bsmusales@bsigroup.com).

## BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

## Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

## Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

## Useful Contacts:

### Customer Services

**Tel:** +44 845 086 9001

**Email (orders):** [orders@bsigroup.com](mailto:orders@bsigroup.com)

**Email (enquiries):** [cservices@bsigroup.com](mailto:cservices@bsigroup.com)

### Subscriptions

**Tel:** +44 845 086 9001

**Email:** [subscriptions@bsigroup.com](mailto:subscriptions@bsigroup.com)

### Knowledge Centre

**Tel:** +44 20 8996 7004

**Email:** [knowledgecentre@bsigroup.com](mailto:knowledgecentre@bsigroup.com)

### Copyright & Licensing

**Tel:** +44 20 8996 7070

**Email:** [copyright@bsigroup.com](mailto:copyright@bsigroup.com)



...making excellence a habit.™