

AS 3584.1:2021



STANDARDS
Australia



Diesel engine systems for underground coal mines

Part 1: Fire protected — Heavy duty

currently in preview, click buy full version

AS 3584.1:2021

This Australian Standard® was prepared by ME-018, Mining Equipment. It was approved on behalf of the Council of Standards Australia on 14 April 2021.

This Standard was published on 28 May 2021.

The following are represented on Committee ME-018:

- Australasian Institute of Mining & Metallurgy
- Australian Chamber of Commerce and Industry
- Australian Industry Group
- Chamber of Minerals and Energy of Western Australia
- Construction and Mining Equipment Industry Group
- Department of Mines, Industry Regulation and Safety, WA
- Department of Regional NSW
- Department of Resources, Qld
- Engineers Australia
- Minerals Council of Australia
- Mining Electrical and Mining Mechanical Engineering Society
- WorkSafe New Zealand

This Standard was issued in draft form for comment as DR AS 3584.1:2020

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

www.standards.org.au

ISBN 978 1 76113 356 5

Diesel engine systems for underground coal mines

Part 1: Fire protected — Heavy duty

Originates as AS/NZS 3584.1:2005.
Previous edition 2008.
Revised and redesignated as AS 3584.1:2021.

© Standards Australia Limited 2021

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 (Cth).

Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-018, Mining Equipment, to supersede AS/NZS 3584.1:2008.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this document as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this document is to promote the safety of fire-protected diesel engine systems that are used underground in coal mines.

A list of all parts in this series can be found in the Standards Australia online catalogue.

This document introduces the requirements for a fire ignition hazard assessment and functional safety assessment to be performed on the fire-protected diesel engine system. Emissions requirements for fire-protected diesel engine systems have been removed from this document and are included in AS 3584.4.

The major changes in this document are as follows:

- (a) [Section 3](#) Design and construction of this document now includes all performance requirements.
- (b) The test appendices now include all test requirements.
- (c) Rated torque speed has been replaced with intermediate speed.
- (d) References to product certification schemes have been removed.

The terms “normative” and “informative” have been used in this document to define the application of the appendix to which they apply. A “normative” appendix is an integral part of a document, whereas an “informative” appendix is only for information and guidance.

Contents

Preface	ii
Section 1 Scope and general	1
1.1 Scope.....	1
1.2 Normative references.....	1
1.3 Terms and definitions.....	2
1.4 New designs and innovations.....	5
Section 2 Hazard identification and control	6
2.1 General.....	6
2.2 Fire ignition hazard assessment.....	6
2.3 Fire ignition control measures.....	7
2.3.1 General.....	7
2.3.2 Safety functions.....	7
2.3.3 Risk reduction required.....	7
2.3.4 Assessment and validation.....	8
2.3.5 Safety components.....	8
2.4 Designated safe area barrier.....	8
2.5 Methane detection.....	8
2.6 Fire suppression.....	8
Section 3 Design and construction	9
3.1 Engine types.....	9
3.2 Condition monitoring.....	9
3.3 Surface temperature.....	9
3.4 Uncontrolled combustion.....	9
3.5 Materials.....	9
3.5.1 Non-metallic materials.....	9
3.5.2 Light metals.....	9
3.5.3 External thermal insulation.....	10
3.6 Vee-pulleys.....	10
3.7 Transmission belts.....	10
3.8 Engine breather.....	10
3.9 Starting aids.....	10
3.10 Fuel systems.....	10
3.11 Air inlet systems.....	10
3.12 Air compressors.....	11
3.13 Cooling systems.....	11
3.14 Engine on to down systems.....	11
3.14.1 Engine safety shutdown system.....	11
3.14.2 Emergency stop safety function.....	12
3.14.3 Manual fuel shut-off valve.....	12
3.14.4 Engine start and restart.....	13
3.15 Exhaust systems.....	13
3.15.1 General.....	13
3.15.2 Exhaust systems.....	13
3.15.3 Spark arrester.....	13
3.15.4 Exhaust cooling systems.....	14
3.15.5 Replaceable element-type particulate filters.....	14
3.16 Electrical systems.....	14
Section 4 Compliance plate	15
Section 5 Testing	16
5.1 Type testing.....	16
5.1.1 General.....	16
5.1.2 Replaceable element-type particulate filters.....	16
5.2 Water flow testing.....	16

5.3	Routine commissioning tests.....	16
5.3.1	General.....	16
5.3.2	Test results.....	17
5.4	Management system.....	17
Section 6	Documentation.....	18
6.1	Documentation to be supplied.....	18
6.1.1	General.....	18
6.1.2	Documentation to be supplied to the testing authority.....	18
6.1.3	After assessment.....	18
6.1.4	Purchase documentation.....	18
6.2	General arrangement drawings.....	19
Appendix A	(normative) Test apparatus.....	21
Appendix B	(normative) Determining load speed characteristics.....	23
Appendix C	(normative) Determining duration, temperature and fluid usage.....	26
Appendix D	(normative) Testing engine protection systems.....	28
Appendix E	(normative) Testing spark arrester components.....	30
Appendix F	(normative) Testing replaceable particulate filter components.....	32
Appendix G	(informative) Warning labels.....	37
Bibliography	39

Australian Standard®

Diesel engine systems for underground coal mines

Part 1: Fire protected — Heavy duty

Section 1 Scope and general

1.1 Scope

This document specifies safety requirements for fire-protected diesel engine systems (FpDES) that are designed for use in designated safe areas in underground coal mines. It applies to diesel engine systems with heavy duty applications.

NOTE Whether a particular application is heavy duty will need to be determined by the end user and the manufacturer, using risk management processes.

Safety requirements include the following:

- (a) The control of surface temperature, to avert ignition of coal dust that could settle on a hot surface or fluid fires.
- (b) Containment or elimination of flames and sparks that could initiate a fire.

FpDES are not explosion protected and are not designed to operate in flammable or explosive atmospheres.

This document nominates the means by which identified hazards may be managed. It is intended for designers, manufacturers, users, regulatory authorities, testing authorities and associated interests.

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1019, *Internal combustion engines—Spark emission control devices*

AS 4024.1201, *Safety of machinery — Electrical equipment of machines, Part 1201: General requirements (IEC 60204-1:2016 (ED 6.0) MOD)*

AS 4024.1501, *Safety of machinery, Part 1501: Design of safety related parts of control systems—General principles for design*

AS 4024.1502, *Safety of machinery, Part 1502: Design of safety related parts of control systems—Validation*

AS 4024.1503, *Safety of machinery, Part 1503: Safety-related parts of control systems—General principles for design*

AS 4024.1601, *Safety of machinery, Part 1601: Design of controls, interlocks and guarding—Guards—General requirements for the design and construction of fixed and movable guards*

AS 5062, *Fire protection for mobile and transportable equipment*

AS 61508.1, *Functional safety of electrical/electronic/programmable electronic safety-related systems, Part 1: General requirements*

AS 62061, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061:2005+AMD1:2012+AMD2:2015 CSV (ED.1.2)/COR1:2015 MOD)*

AS/NZS 3584.3, *Diesel engine systems for underground coal mines, Part 3: Maintenance*

AS/NZS 4024.1604, *Safety of machinery, Part 1604: Design of controls, interlocks and guarding — Emergency stop — Principles for design (ISO 13850:2017 (ED.3.0), MOD)*

AS/NZS 4871.1, *Electrical equipment for mines and quarries, Part 1: General requirements*

AS/NZS 4871.5, *Electrical equipment for mines and quarries, Part 5: Battery powered electrical mobile machines*

AS/NZS 4871.6, *Electrical equipment for mines and quarries, Part 6: Diesel powered machinery and ancillary equipment*

AS/NZS 60079.29.1, *Explosive atmospheres, Part 29.1: Gas detectors—Performance requirements of detectors for flammable gases*

AS ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 1813, *Belt drives — V-ribbed belts, joined V-belts and V-belts including wide section belts and hexagonal belts — Electrical conductivity of antistatic belts: Characteristics and methods of test*

ISO 8178-1, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 1: Test-bed measurement systems of gaseous and particulate emissions*

ISO 9563, *Belt drives — Electrical conductivity of antistatic endless synchronous belts — Characteristics and test method*

ISO 13849-1, *Safety of machinery — Safety related parts of control systems — Part 1: General principles for design*

ISO 13849-2, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

ASTM D1298 12b, *Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method*

1.3 Terms and definitions

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

1.3.1

catalytic converter

equipment that modifies the constituents of an exhaust gas stream by means of a catalyst

1.3.2

designated safe area

place in which there is a minimum likelihood of an explosive atmosphere being present, which would require special precautions while a diesel engine is operated, serviced or maintained

Note 1 to entry: It cannot be assumed that areas of a mine that are not classified as being explosion risk zones are designated safe areas.

Note 2 to entry: Legislation, regulations or requirements by the relevant statutory authority may define a designated safe area in greater detail.

1.3.3

engine safety shutdown system

protection system that automatically causes an engine to stop in the event of an unsafe condition occurring

1.3.4

emergency safety shutdown system

system fitted to stop the diesel engine in the event of the failure of the other systems to stop the engine