



## 2. Standards and Legislation

### GAS DETECTOR FUNCTIONAL SAFETY OVERVIEW COURSE



Mod 2 Rev 0 16 April 2018

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### Purpose

Outlines the applicability of functional safety standards to gas detection and the legal requirements to comply

### TOPICS

Relationship between standards and legislation

Standards

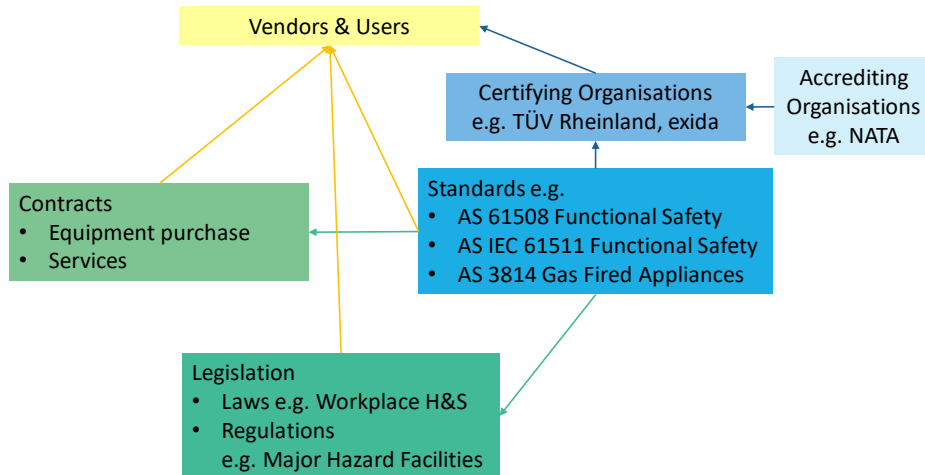
- Functional Safety
- Gas Detection

Compliance with legal requirements

# IICA gas Detector Functional Safety Course

## 2. Standards & Legislation

### Standards and Legislation



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### Standards

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## What is a Standard?

A Standard describes “acceptable engineering practice” for a particular process, device or system

Not necessarily best practice

Consensus amongst experts

International standards may or may not be adopted in each country

- Australian policy is to contribute to international standards and then adopt them unchanged

## Technologies used during the last 200 years

Mechanical technology

- governors, pressure relief valves

Pneumatic, Hydraulic

- turbomachinery, actuators

Electromechanical (relay) based technology

- replacement of hydraulic and pneumatic shutdown systems

Electronic (solid state) technology

- replacement of relay based safety systems

Programmable electronic technology

- replacement of solid state safety systems



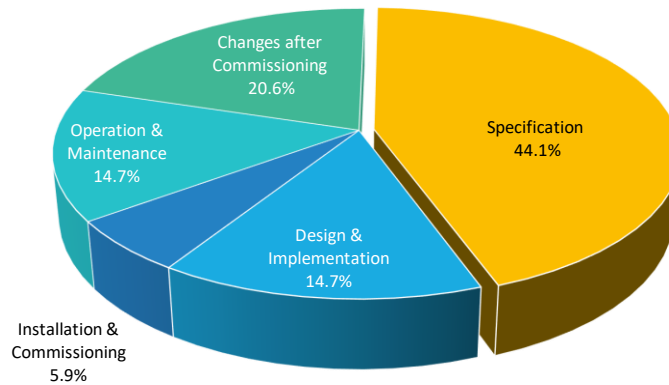
New standards required !

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### Motivation for IEC 61508

Primary causes of control system failure



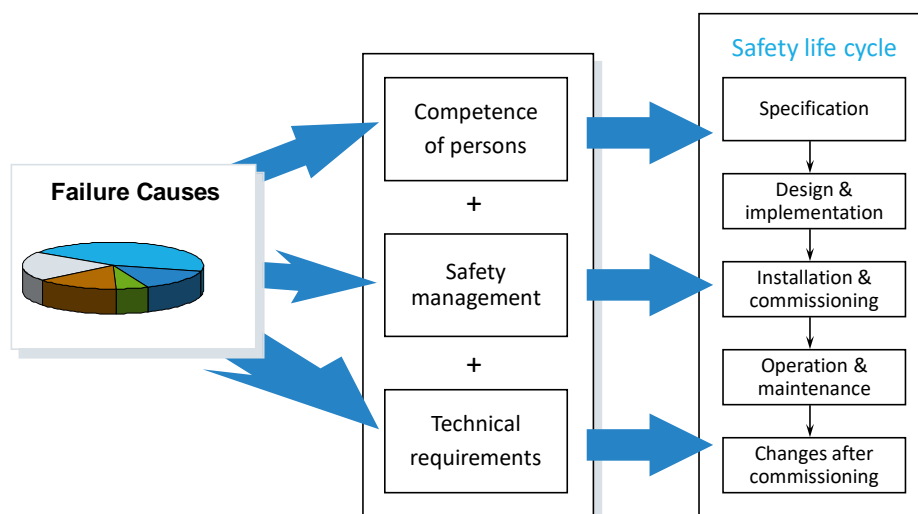
Based on 34 investigated incidents in the UK : "Out of Control", HSE

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### Strategy to achieve functional safety



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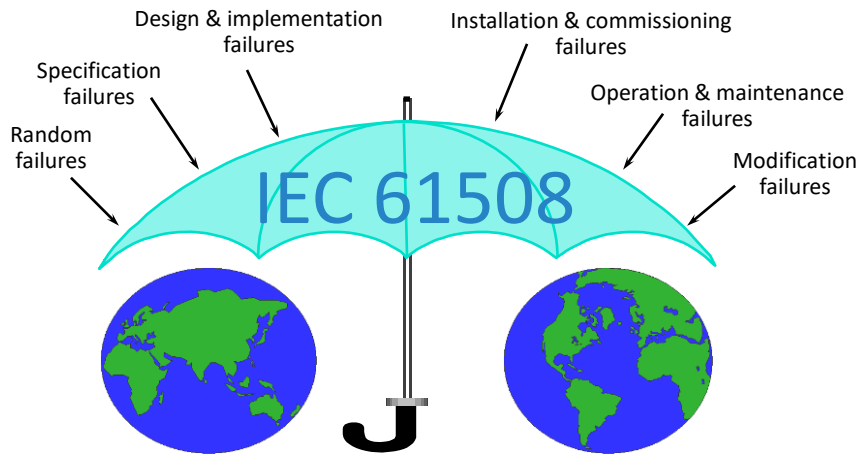
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#### IEC 61508 - A safety umbrella for the world



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#### IEC 61508 – Functional Safety Basic Standard

IEC 61508-x:2010 Ed.2 *Functional safety of electrical/electronic/programmable electronic safety-related systems*

- Seven parts plus an introduction (x is 1-7)
- first published in 1998

Introduced the term “Functional Safety”

- lots of other specialized terminology
- “Basic Safety Standard” – other standards refer to it

Adopted unchanged in Australia as AS 61508.x – 2011 Standards

Australia committee IT-006 provided significant input

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## IEC 61511 – Process Industries Standard

IEC 61511-x:2017 Ed.2.1 *Functional safety: Safety Instrumented Systems for the process industry sector*

- Three parts (x is 1-3)
- first published 2003

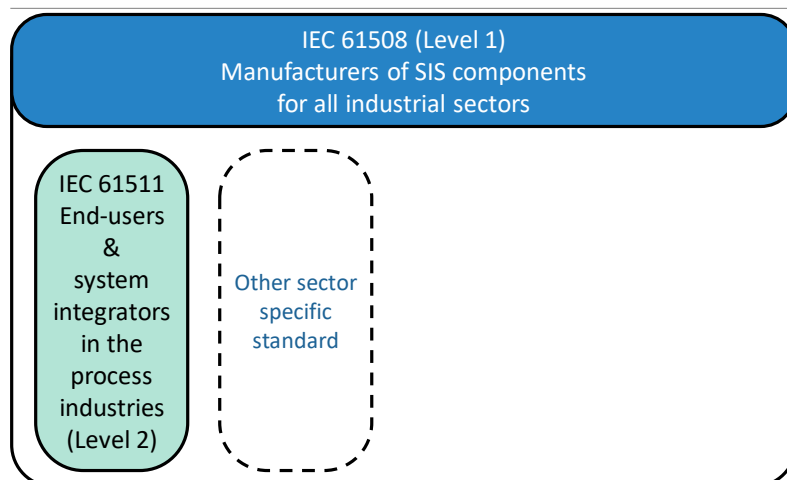
Adapted the requirements of IEC 61508 to the process industry sector

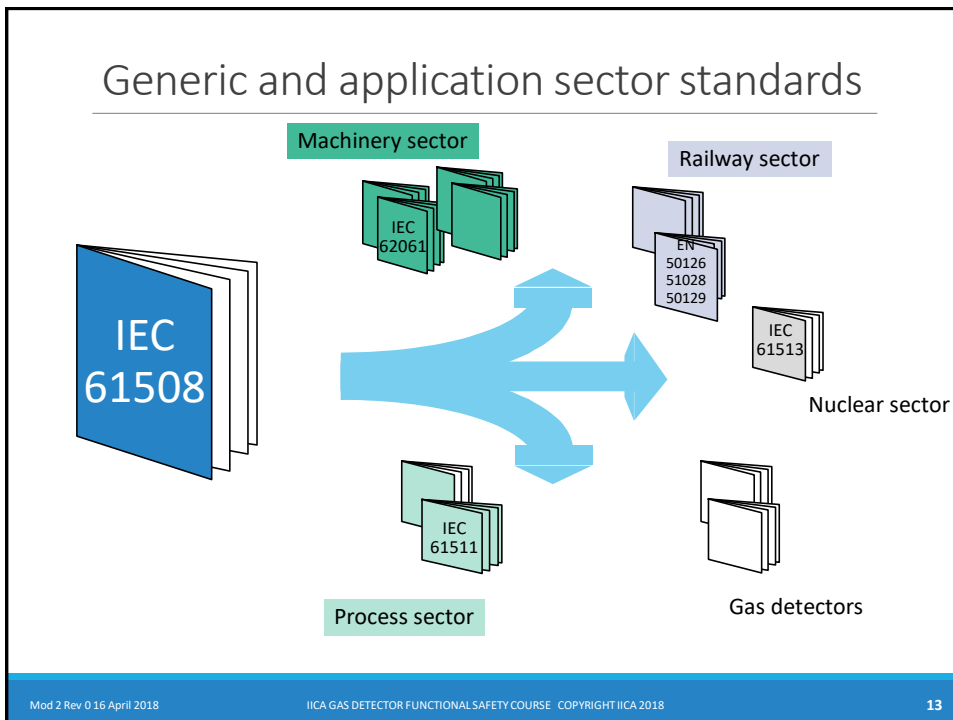
- greatly simplified as we use PLCs not general purpose computers

Adopted unchanged in Australia as AS IEC 61511.x – 2018 Ed. 2

Standards Australia committee IT-006 provided significant input

## Relationship IEC 61508 to IEC 61511





### Gas Detector Standards incl Functional Safety

Adapts IEC 61511 for system integrators

- AS/NZS 60079.29.3:2016 *Gas detectors - Guidance on functional safety of fixed gas detection systems*

Adapts IEC 61508 for manufacturers of gas detectors

- EN 50402:2017 *Electrical apparatus for the detection and measurement of combustible or toxic gases or vapours or of oxygen — Requirements on the functional safety of gas detection systems*
- EN 50545-1:09.2011 *Electrical Apparatus For The Detection And Measurement Of Toxic And Combustible Gases In Car Parks And Tunnels*
- EN 50271:2010 *Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen — Requirements and tests for apparatus using software and/or digital technologies*
- EN 50104:2010 *Electrical apparatus for the detection and measurement of oxygen. Performance requirements and test methods*

Guidance on application of IEC 61511 (ANSI ISA S84) to gas detection

- ISA-dTR84.00.07-2017 *Guidance on the Evaluation of Fire, Combustible Gas and Toxic Gas System Effectiveness* (Draft technical report; earlier version available)

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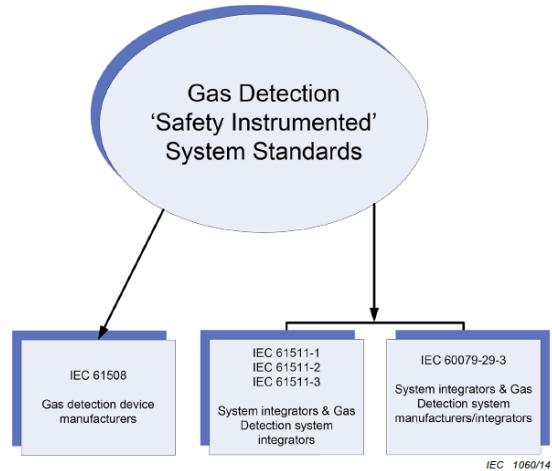
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### 2. Standards & Legislation

#### IEC 60079.29.3

Based on principles in  
and adapts  
IEC 61508/61511

Some special  
requirements



#### Compliance



## Legislation referring to Functional Safety

### Australia

- Work Health and Safety Laws and Regulations
  - individual states, “harmonised” partially!
- Major Hazard Facilities Regulations
  - onshore facilities: States (MHF part of WHS regs)
  - offshore facilities: Federal (OPGGS regulated by NOPSEMA)
- Gas Fired Appliance Regulations (states)

### International

- Occupational Safety and Health Act 29 USC 651 (USA)
- Clean Air Act 42 USC 7401 (USA)
- Seveso III Directive (EU)
- ATEX Directive (EU)
- BRZO 1999 (Dutch)
- CCC-F (China Compulsory Certification for F&G)

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## Harmonised WHS Legislation in Australia

Model Work Health and Safety (WHS) Act and Regulations promulgated by the Commonwealth in 2011

Basis for “harmonised” legislation in each state

Harmonised WHS legislation adopted in all states from 2012 except:

- Victoria – retains existing OH&S Legislation administered by WorkSafe
- Western Australia – harmonised legislation proposed but not yet adopted (June 2017)

Each state has adjusted the harmonised legislation to suit its working environment

- see Safe Work Australia website for summary of differences in each state:  
<http://www.safeworkaustralia.gov.au/sites/swa/model-whs-laws/pages/jurisdictional-progress-whs-laws>

Process Safety and MHF requirements are largely consistent

- Principles are also similar in Victoria

## WHS Legal Requirements

“Person Conducting a Business or Undertaking” (PCBU) must:

- identify reasonably foreseeable hazards
- eliminate risks to health & safety so far as is reasonably practicable (SFAIRP)
- if can’t eliminate, minimise risks SFAIRP (in decreasing priority):
  - substitute the hazard
  - isolate the hazard from exposed personnel
  - implement engineering controls
- maintain & review implemented control measures

Requirements for managing Major Hazard Facilities (MHF)

- A facility is a MHF if the quantities of “hazardous chemicals” present onsite exceed the limits in the schedule
- Detailed specific requirements for MHFs are specified
- Offshore MHFs are managed separately by the Commonwealth (NOPSEMA)

## Compliance With Standards

To comply with an IEC (or ISO or European) standard you must comply with ALL “Normative” clauses

- e.g. IEC 61508 Parts 1 to 4 or IEC 61511 Part 1
- Similarly for Australian versions of IEC standards
- Other standards may use different terminology

An Australian Standard is only a legal requirement if

- compliance is required by government regulations
- compliance is required through a commercial contract

Compliance with IEC 61511 should meet legal requirement for compliance with IEC 61508 but only

- as far as IEC 61511 is applicable
- when part of a contract, if agreed by the parties; if in doubt check!

## Wise words from a lawyer

Engineers should remember that in the eyes of the courts, in the absence of any legislative or contractual requirement, **an Australian Standard amounts only to an expert opinion** about usual or recommended practice. Also, that in the performance of any design, **reliance on an Australian Standard does not relieve an engineer from the duty to exercise his or her own skill and expertise.**

Paul Wentworth, Minter Ellison

## Summary

Outlines the applicability of functional safety standards to gas detection and the legal requirements to comply

Standards describe “acceptable engineering practice”

Compliance is legally required when

- called up in a law or regulation
- required as part of a contract

Compliance with normative clauses only is required

IEC 61508 is the basic functional safety standard

- other standards are based on it
- IEC 61511 for the process industries
- IEC 60079.29.3 for gas detector integrators

Questions?

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