kinesys
A TAIT Company

Considerations when specifying Elevation and Apex products

An overview of applicable EN17206 Use Cases for deployment of Elevation or Apex hoists

elevation

apex

Key question

Is my investment in Elevation redundant due to updates in applicable standards?

Short answer: no, but the applications are now limited in some territories (see page 4), but Kinesys offers other solutions.

Key terms

HARA (Hazard Analysis & Risk Assessment)
The journey of eliminating risk starts with identification and analysis of the hazards and assessment of the risks associated with those hazards.

MTBF (Mean Time Between Failure)
MTBF can be calculated as the arithmetic mean (i.e. average) time between failures of a system or component

MTTFd (Mean Time to Dangerous Failure)

PFHd (Probability of Failure)

System overviews

elevation

Console (K2 or Vector) or Navigator with RS4

Power with E-Stop

Drive

Hoist

apex

Console (K2, Vector or Navigator)

Safety controller

Drive

Hoist

Legislation and best-practice has changed over 20yrs

HARA
(Hazard Analysis & Risk Assessment)

EN 17206 supersedes BS7905 (UK) / CWA 15902-1:2008 and national standards

It has always been the case that a HARA will determine the suitability of equipment for an application. EN17206 provides additional guidance on the required safety functions for a given application

Apex wasn't created just to meet new standards, it builds on many years of Elevation shows with new features to make touring safer and more efficient.

Current Geographical Scope

Europe	EN 17206 and EN 14492-2 (harmonised) SQP2 (D8+)
UK	Varies on a show-by-show basis, typically EN standards
Middle East / Asia	Local requirements often vary by venue
Australia	Largely follows EN standards
North America	Not yet

Application types – informs HARA

LOAD TYPE	STATICALLY DETERMINATE LOAD	STATICALLY INDETERMINATE LOAD
Definition	Loads on the hoists can be calculated precisely at any point e.g. single hoist or two hoists on a line or three hoists in a circle/triangle.	Load on each hoist cannot be calculated easily. e.g. multiple hoists configured such that the load cannot be pre-determined (includes: four hoist lifts, three or more hoists in a line)
Typical requirement (determined by HARA)	Load monitoring does not have to automatically halt motion	**Safety-rated** load monitoring must **automatically** stop the hoists
Is Elevation suitable?	**YES** (if not above people)	**NO**

EN 17206 requirement

A HARA for each axis identifies the safety function(s) required, and to which level(i.e. SIL2 or SIL3).

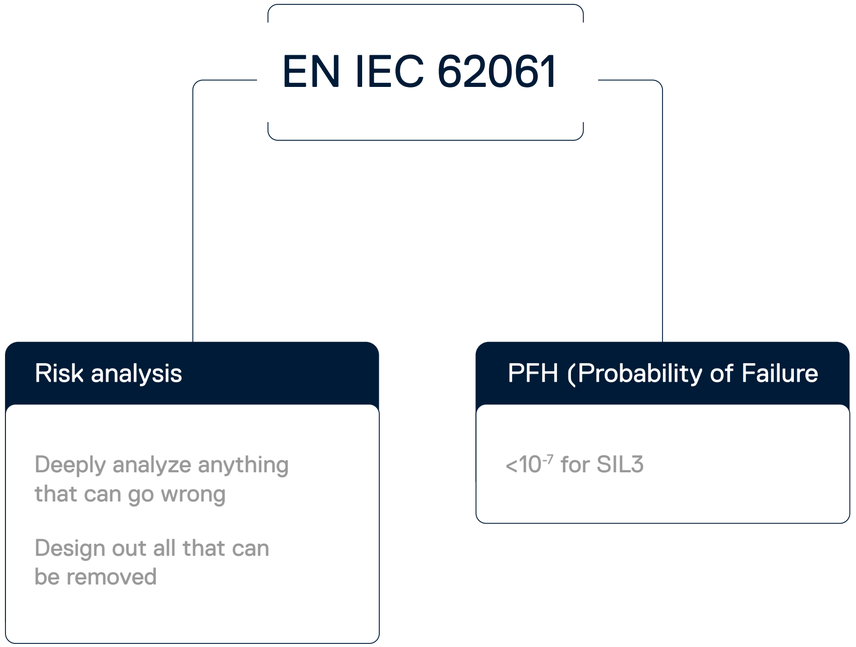
What is a SIL3 system?

SIL3 is not a simple feature tick-box (i.e. adding one SIL3 sensor doesn't make a machine itself SIL3), instead the HARA is performed on the whole system. Each safety feature is independently evaluated, for instance you may need safe load monitoring but not require safe position in all applications.

Components are "safety rated" if they have a sufficiently low PFHd (Probability Of Failure) according to an appropriate safety standard (e.g. IEC 61508, SIL3)

Risk of failure is reduced to an acceptable level by redundancy and monitoring: *e.g.* ***dual*** *brakes* ***with*** *check-back*

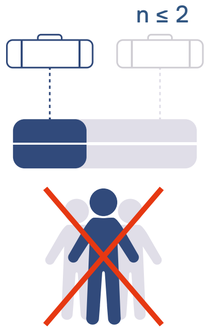
A safety-rated PLC is used to control the system and perform automatic stops.



EN 17206 Applications are defined as “Use Cases” as follows:

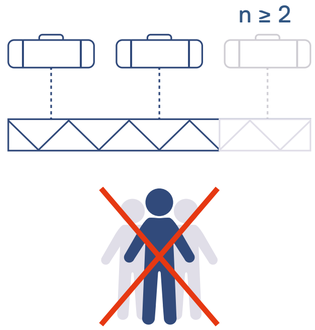
UC 1

Statically Determinate ≤ 0.2m/s



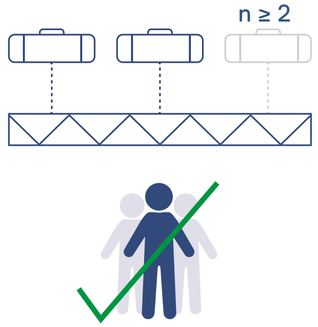
UC 2

Statically Indeterminate

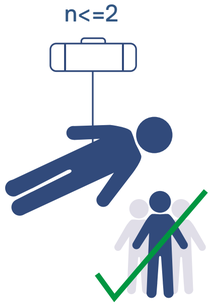


UC 3

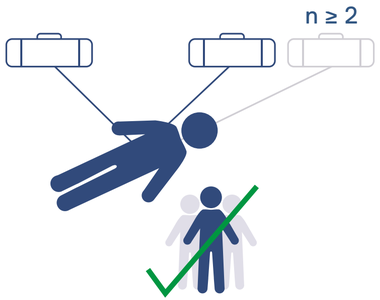
UC 4



UC 5



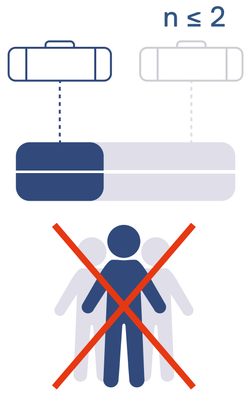
UC 6



Use cases for which Elevation remains an option

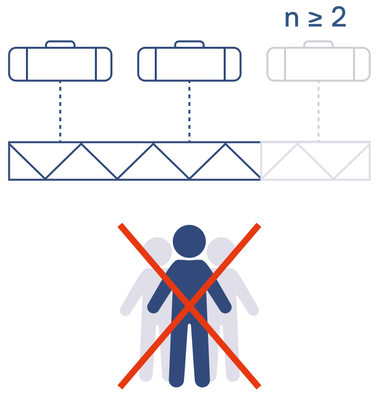
UC 1

Statically
Determinate
≤ 0.2m/s



UC 2

Statically
Indeterminate

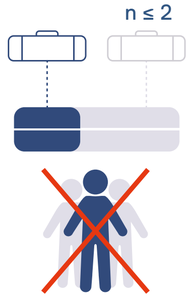


UC1, UC2 lifting not above people

EN17206 Use cases where risk is mitigated using Apex

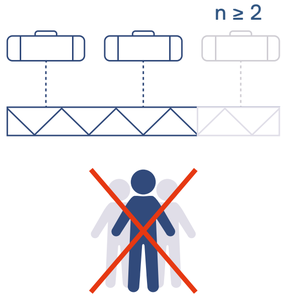
UC 1

Statically Determinate ≤ 0.2m/s



UC 2

Statically Indeterminate



Notes UC1 and UC2:

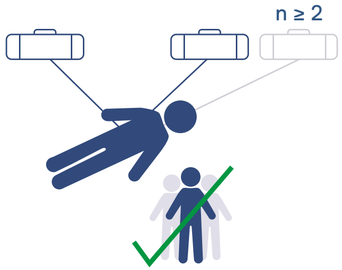
- A SIL3 hold to run may be required, determined by HARA
- However, hoists must be speed-limited to 200mm/s
  be aware that Elevation 500kg hoists can perform up to 400mm/s
- Hoists must have an appropriate Safety Factor (see page 12)

Notes UC5 and UC6:

- A Rescue plan is always required for performer flying.

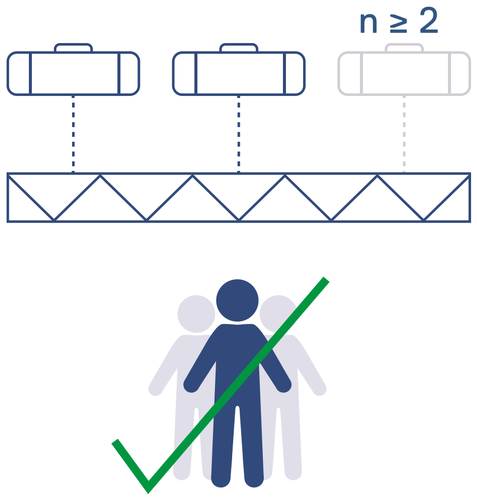
UC 5

UC 6



Example of risk mitigation using Apex

UC 4



- (Safety-rated) Load monitoring would detect any overload or underload resulting from a lack of synchronization
- Position / speed are monitored by the Safety PLC in the apex drive An automatic halt of all motion will be performed when appropriately configured in the Mentor safety controller (see page 3).

Limits

“Most limits on stock chain hoists remain unset for the life of the hoist”

Ultimate limits for machine-protection are factory set.

If the HARA determines that limits should be set during commissioning then this is straightforward with Apex.

Apex Benefits

DETAIL	BENEFIT / APPLICATION	ELEVATION	APEX
SIL3 features built in	Compliance under toughest regulations	NO	YES
DGUV 17 (BGV C1) compliant	Compliance under toughest regulations	NO	YES
Built-in safety-rated loadcell	Removed need for external loadcell	NO	YES
Quiet brakes	Silence from rig during shows	NO	YES
Safety-rated absolute position encoder	Compliance under toughest regulations	NO	YES
Zero-Speed Hold	Enables super-smooth motion start/stop	NO	YES
Integrated temperature monitoring	Safety monitoring for high duty-cycle applications	NO	YES
Safety factor (depends on hoist)	8:1 required for compliance with EN 17206	Not all models	YES

Additional benefits of Apex over Elevation

- All safety features have redundancy and are fully monitored by the Safety PLC
- Brake monitoring (safety-rated)
- Speed, position and all other I/O (e.g. brake-checkback) are monitored by the Safety PLC
- Absolute Position encoders – including absolute position to SIL3
- Easier power and network connection
- Smoother operation because Apex can ramp up from zero-speed, with no minimum speed (i.e. no step-change between “stop” and “slow”).
- Simplified cabling due to safety-over-Ethernet
- Apex drives work with 30mA RCDs, without “nuisance tripping”, simplifying power distribution

Summary

Is my investment in Elevation redundant due to updates in applicable standards?

Looking for more information on this topic, or guidance on what this means for you and your projects?

Please get in touch with one of our team.

support@kinesys.com

Answer

It depends on:

Location (See page 4)

Use case (see page 8)

Elevation can still be used in limited cases

An upgrade to Apex will enable other Use Case deployments.

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