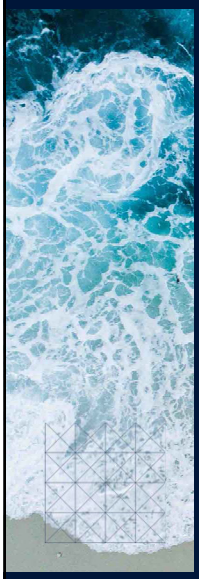

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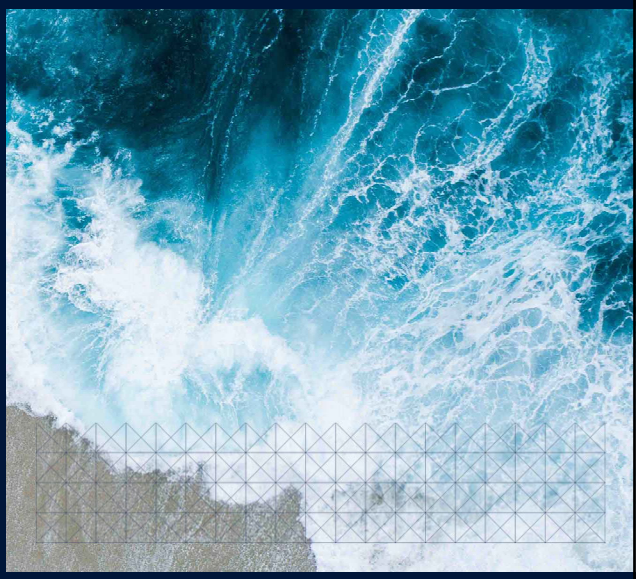
SAFETY



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Safety

References

- Kongsberg K-Safe Product Description, 163875/G
- Kongsberg Functional Design Document Safety, Offshore, 1032518/D
- K-Safe Operator Manual, 343964/A

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Content

- Safety system description
- K-Safe hierarchy
- F & G
- ESD
- Interface / Topology
- Safety View Topology
- Safety Mimic
- Online C&E View
- Safety Indications
- Safety Operations
- F&G Operation Steps

K-Safe

K-Safe is the Kongsberg product for operation of a Safety Instrumentation System (SIS), also referred to as SAS (Safety Automation System).

Our goal is to teach the operators how to operate the K-Safe system in a safe and efficient way.

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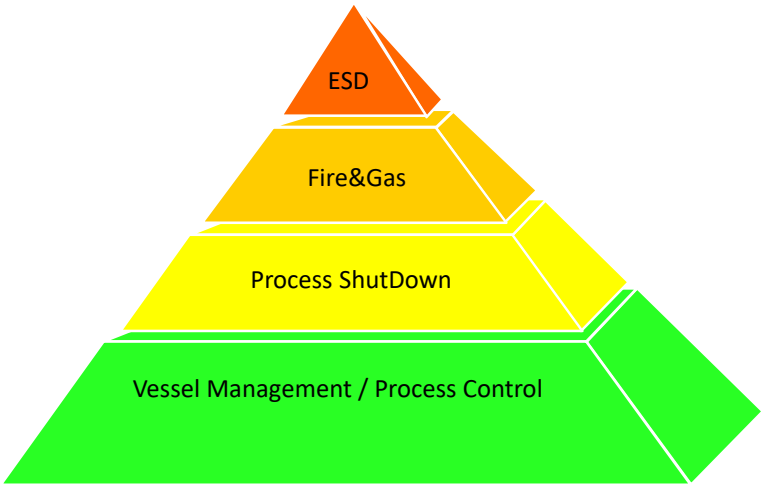
Safety System Description

The safety system is defined as an independent system.

- ✓ The safety system, K-Safe, is a part of the integrated control & safety system delivered from KM, K-Chief 700
- ✓ The systems will share information and use the same operation stations (OS):
  - an event in the control system will not prevent the safety system from bringing the installation to the safe state

K-Safe Hierarchy



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Application – Emergency ShutDown System

Purpose:

- Ensure the safest possible condition of the installation
- To minimize the consequences due to uncontrolled releases of hydrocarbons

Typical Inputs:

- The ESD system processes input signals
- Manual pushbuttons
- Field mounted transmitters
- Confirmed fire/gas from F&G (project specific)

Application – Emergency ShutDown System

Typical ESD levels:

- AVS / ESD 0
- ESD High / ESD 1
- ESD Low / ESD 2

Cascade function:

- Higher level activate a lower level
- AVS activate ESD1 & 2

Each ESD level has a C&E diagram:

- Shows the relation between inputs to ESD level and corresponding actions
- One pushbutton may close valves and trip switchboards

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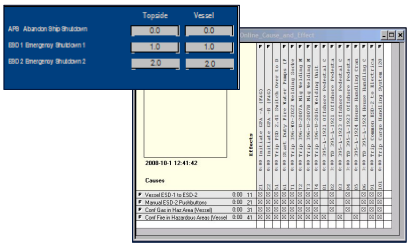
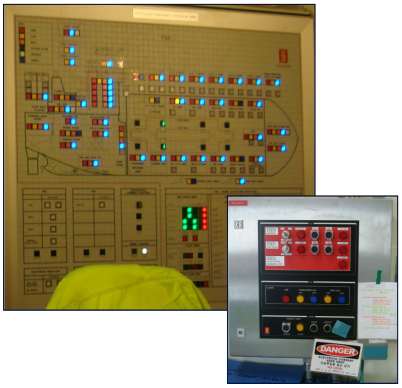
Application – Emergency ShutDown System

Operator Interfaces:

- Operator Station(s)
- CAAP - Critical Action & Alarm Panel (hardwired)





Application – Fire & Gas System

Purpose:

- Provide early and reliable detection of fire or gas, wherever such events are likely to occur
- Initiate alarm, initiate protective actions, shutdown equipment and alert personnel
- Limit the fire escalation, by the zone's placement and boundary

Typical Inputs:

- Signals from the field mounted detectors, addressable detectors, manual call points and ESD

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Application – Fire & Gas System

Typical Outputs:

- Alert personnel
- Release fire fighting system
- Stop flow of minor hydrocarbon sources
- Isolate local electric equipment
- Ventilation shutdown
- Close watertight doors and fire doors

Application – Fire & Gas System

F&G levels:

- Classified as Hazardous/Non-Hazardous areas
- Each section of the installation will be divided into fire zones to limit the fire escalation

Each fire zone shall include:

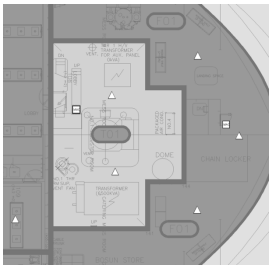
- Fire detection (smoke/heat/flame detectors or manual alarm buttons)
- Gas detection (if gas may reach the area)
- Fire protection equipment

Each Fire Zone has a C&E diagram

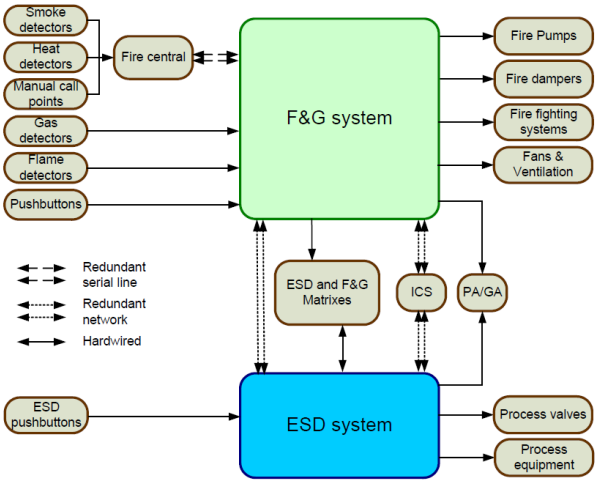
Application – Fire & Gas System

Operator Interfaces:

- Operator Station(s)
- CAAP - Critical Action & Alarm Panel (hardwired)
- Fire Central



F & G and ESD Interface



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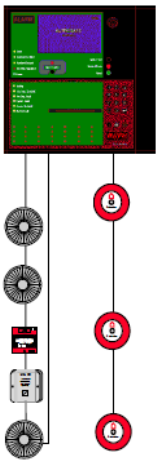
Fire central and Loops

- Autrosafe4 Fire central
- Addressable units connected in loops
- Manual call points, smoke detectors and heat detectors
- All status and commands to be shown and executed from the K-Safe system



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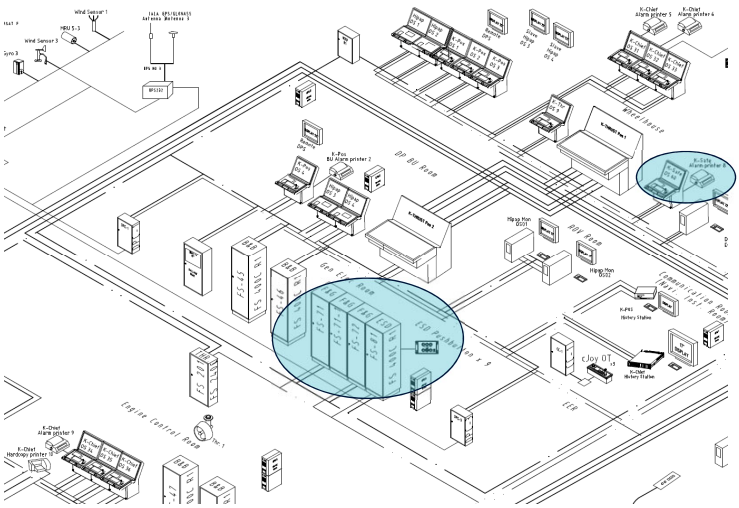
Topology



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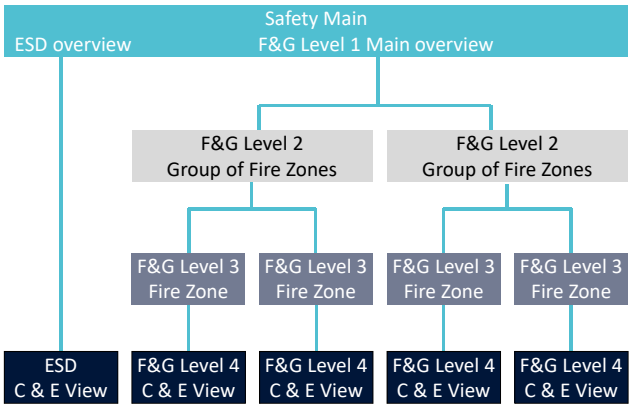
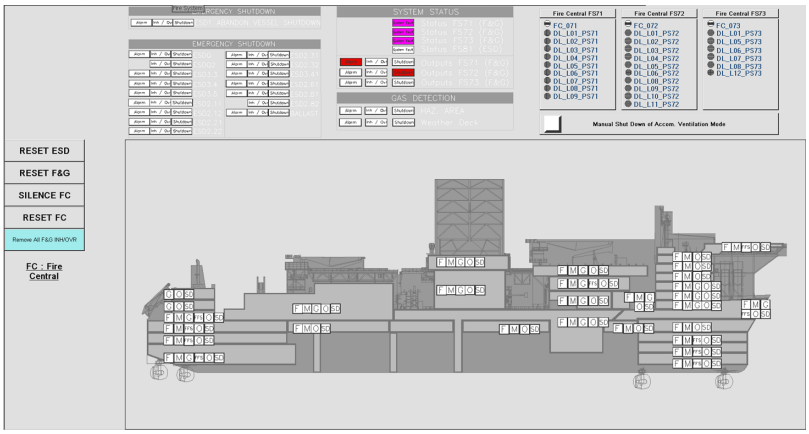
K-Safe view topology

- The view topology is built like a tree structure
- Level one contains the main displays
- Level two shows the group of fire zones, e.g. one deck
- Level three shows the detailed fire zone
- Level four shows C&E



F&G Main (with ESD)

Overview (Level 1)



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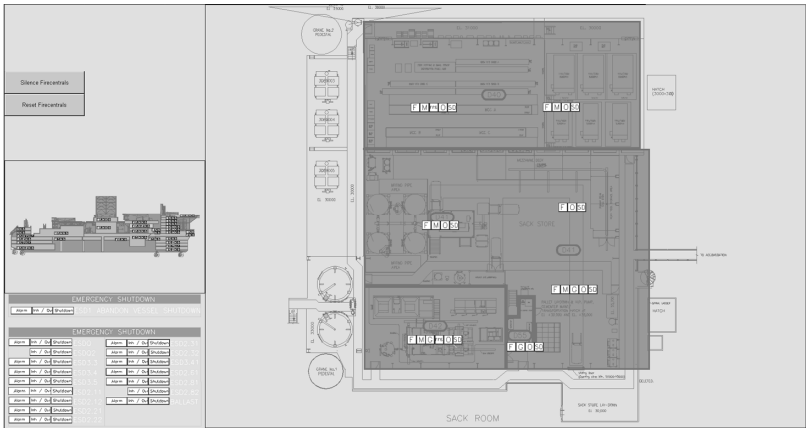
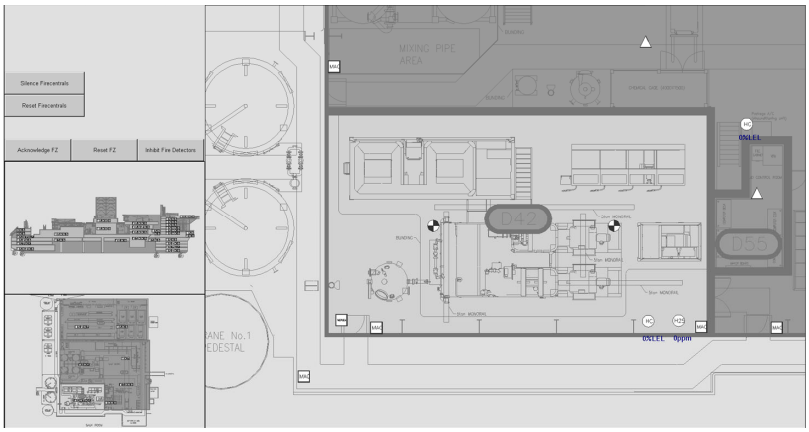
F&G Mimic

Deck view (Level 2)



F&G Mimic

Fire Zone / Detector view (Level 3)



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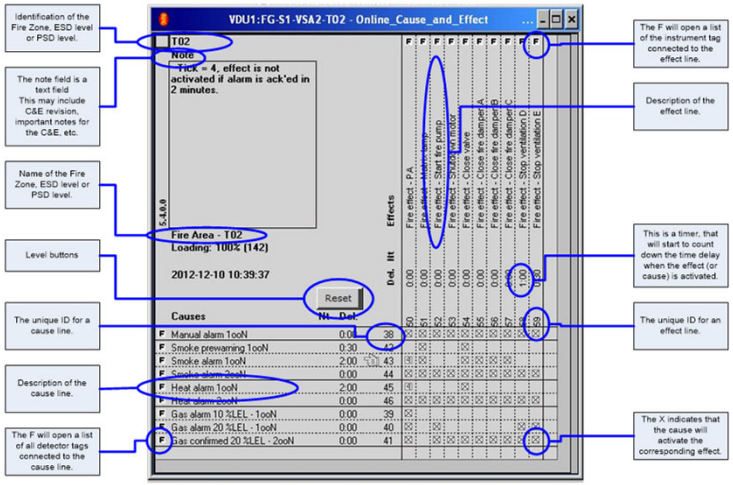
F&G Mimic

Online Cause & Effect view (Level 4)



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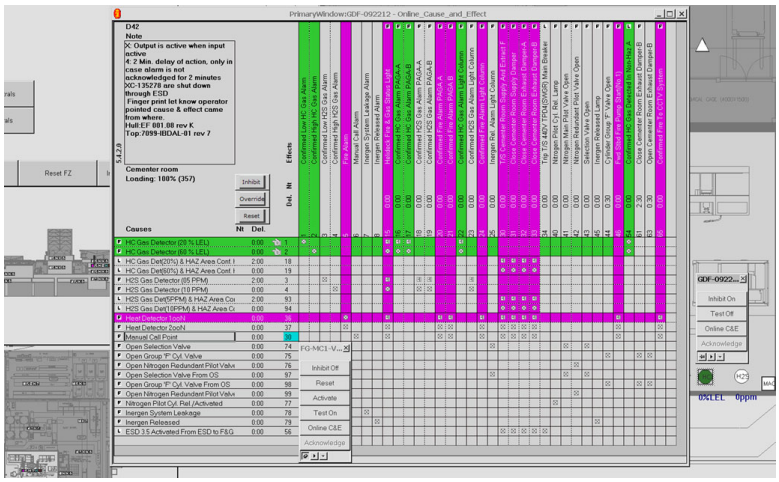
Online Cause & Effect

Opened from a detector operator menu.



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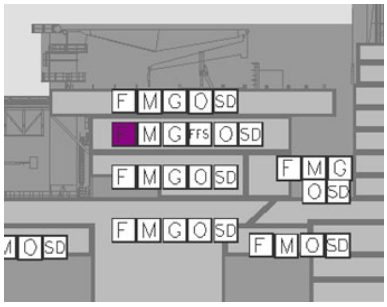
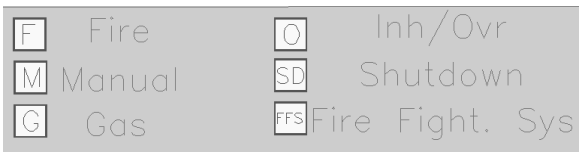
Safety Indications

- Alarm status lamp for each level
- Alarm colour will reflect the alarm with highest priority
- Shutdown status lamps – defined by project
- Inhibit/override status lamps (or border) – cyan

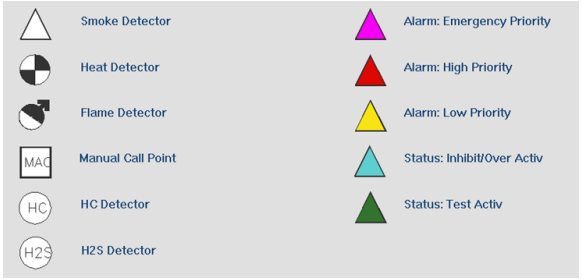


Legend

Level 1 and 2:



Level 3:



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Alarm Priority (KFDD Drilling)

Pri	Description	ESD	F&G
Emergency	Safety Critical Alarms (MAGENTA)	ESD Activated Redundancy deviation Network failure	Fire Detection Gas Detection Redundancy deviation Network failure
High	Safety Alarms (RED)	Feedback errors on outputs I/O failure Conflict Faults	Feedback errors on outputs I/O failure Conflict Faults
Low	Non Critical Warning Alarm (YELLOW)	Pre-warning	Pre-warning
UnPri	Non Critical System Alarms (WHITE)		

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F&G Operation Steps

(for smoke and heat detectors)

- Acknowledge alarms

  For a single smoke detector, if not acknowledge within 2 minutes, PAGA sound
  - Acknowledge from Detector or Alarm Line
- Normalize input from the field e.g. clear smoke
- Reset Fire Central
  - Reset Fire Central from Safety Main mimic
- Reset Effect
  - Reset from Cause & Effect view or Safety Main mimic

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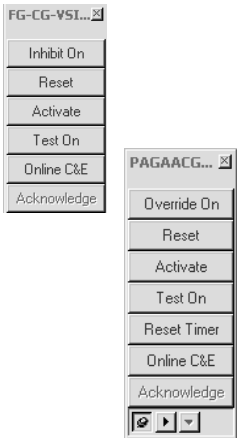
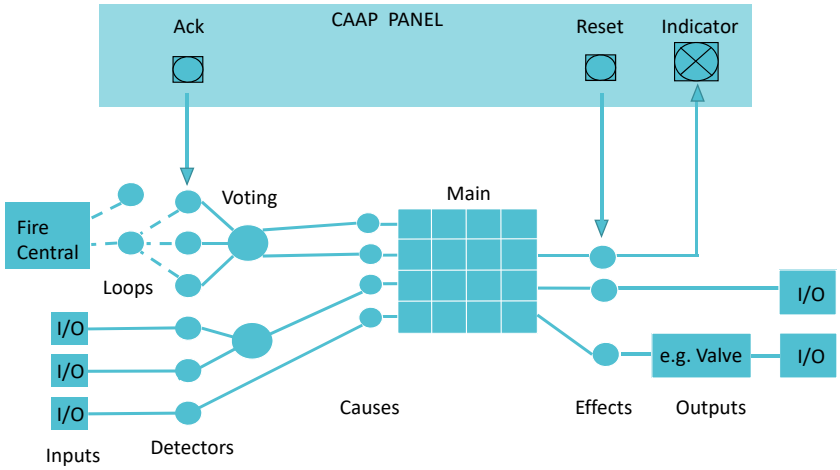
Safety Operations

- Test function to simulate shutdown
- Acknowledge Alarms
- Inhibit detector or cause line to block a shutdown
- Override effect to block a shutdown
- Activate shutdown from the cause line or effect line
- Inhibit/override/activate requires Access control

Note: Test function may not work between PS´s



Typical F&G Software configuration



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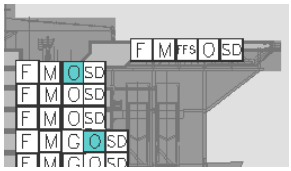
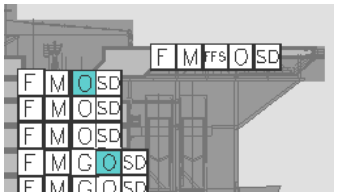
Inhibit

- Inhibit is a way of stopping the signal that normally will be sent from a detector when a situation occur, but the alarm will be activated
- Inhibit is performed from a detector operation menu or cause line operation menu
- Inhibit is indicated on level 1 and 2
  In addition: if the inhibit is set from a detector, the detector symbol will have tagmark “i” and cyan colour
- Inhibit is normally used when doing "hot work" in an area



Override

- Override is preventing the effect of a situation
- Override is used in test and maintenance to prevent a shutdown, where the operator wants to see that the system is performing according to specifications
- Override is performed from the effect line operation menu
- The operator can still manually activate the output without removing the override
- Override is indicated on level 1 and 2



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Exercises:

- Safety

Learning Objectives

- Identify ESD and F&G as two independent systems
- Identify the main units belonging to K-Safe
- Recognise the four levels of safety views
- Carry out navigation between the safety views
- Explain the safety symbols
- Explain the alarm priority and colour codes used in K-Safe
- Interpret the information given in online C&E
- Perform normalization of the K-Safe
- Carry out inhibit for a detector
- Carry out inhibit for a cause line
- Predict consequences of inhibit
- Carry out override for an effect line
- Predict consequences of override
- Identify Inhibit/override status in K-Safe
- Conclude on which equipment are inhibited or overridden


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End of the presentation
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