



12



WorkSafe

Protect your people and property

Specify superior escape route management technology in complex buildings with Eaton's unique adaptive **emergency lighting evacuation system**.

Risk management for commercial buildings is evolving rapidly. An increasingly urbanised and complex environment, combined with a rising diversity of safety threats, compels the owners and managers of buildings to re-evaluate the way they protect the people, property and business continuity that may be at risk in an emergency. It is not only a legal obligation but a moral, financial and reputational imperative. In situations involving fire, terrorism, major crime, extreme weather and civil unrest, buildings must be able to detect, alert and evacuate. The safe and timely completion of this process is dependent on planning, equipment, training and infrastructure being in place. However, evacuation poses particular challenges when a proportion of occupants are unfamiliar with layout and procedures, and particularly if they are in large, densely-populated, high-risk or complex premises such as railway stations, shopping centres, airports, stadia, government buildings or leisure facilities. Research into crowd behaviour and advances in scenario-modelling technology have highlighted the need for evacuation strategies that are more adaptable to differing circumstances and buildings. In particular, fixed emergency exit routes, indicated by static signage, can lead to congestion, delays and, in some instances, may direct people towards a hazard. Panic is heightened and decision-making can be impaired. Eaton has developed an Adaptive Evacuation System that is capable of identifying the safest exit route in a given circumstance and guiding people towards it via digital signage. The ability of such systems to enhance safety has been confirmed by academic research and technical organisations.

Adaptive evacuation

Adaptive:

Capable of changing in response to changes in environment.

Building upon decades of expertise in the delivery of life safety systems, and particularly emergency lighting technologies, Eaton's Adaptive Evacuation System enables faster, safer and more agile evacuations, particularly when deployed alongside a public address/voice alarm solution that provides additional guidance. When installed, the system is programmed with a range of potential exit routes. Based on information from CCTV, fire detection and other devices that pinpoint the nature and location of a hazard, it can select the safest and fastest route for occupants and an appointed system operator within the building is given the opportunity to accept or reject this recommendation, so that occupants can be directed accordingly. Unlike 'active' and 'dynamic' systems, Eaton's technology is fully adaptable and its instructions can be modified in real-time. It has been extensively tested and conforms with current regulatory requirements, although the technology is so new that standards are still to be fully defined.

Adaptive escape sign luminaires for building evacuation as a supportive system-technical measure.

Aim of protection:

Safe self-rescue to ensure that rescue forces can take care of injured or disabled persons.

Facing the diverse risks of fire, terrorism, violent crime, extreme weather and civil unrest, the owners and managers of commercial buildings must ensure the ability to detect, alert and evacuate, which is dependent on planning, equipment, training and infrastructure being in place. However, evacuation poses additional challenges when occupants may include visitors who are not familiar with layout and procedures, and particularly if they are in large, highly-populated, high-risk or complex premises such as railway stations, shopping centres, airports, stadia, government buildings or leisure facilities. Fixed emergency exit routes, denoted by static signage, are inflexible to changing circumstances and may inadvertently direct people towards danger, as in the case of the deadly attack on Nairobi's Westgate shopping mall in 2013. Building upon decades of expertise in the delivery of life safety systems, Eaton has pioneered the development of an Adaptive Evacuation System, which is capable of switching between a number of predefined routes and guiding people towards the safest available exit in a given scenario.

Benefits:

- More efficient, quicker and safer evacuation
- Escape routing adapt continuously to the risk
- Assistance to save oneself
- Relief of the rescuers
- Possible compensation measure for constructional scarcities

In hazard situations caused by e.g. fire, attacks, technical plant faults (e.g. gas accidents) and natural catastrophes, only safe escape routes can be used.

Static escape route guidance:

Exit sign luminaires designate the escape route out of the building always in the same direction, **independently** of a danger situation.

no change



Dynamic escape route guidance:

Exit sign luminaires **block** unsafe escape routes in evacuation situations, thereby guiding those fleeing out of the building via the safe escape routes.

State 1



State 2



Adaptive escape route guidance:

Exit sign luminaires **block** unsafe escape routes and **release these as soon as they become safe again**. This enables dynamic hazard situations (e.g. in case of fire or attacks) to be flexibly responded to.

Normal



Blocked



Open again

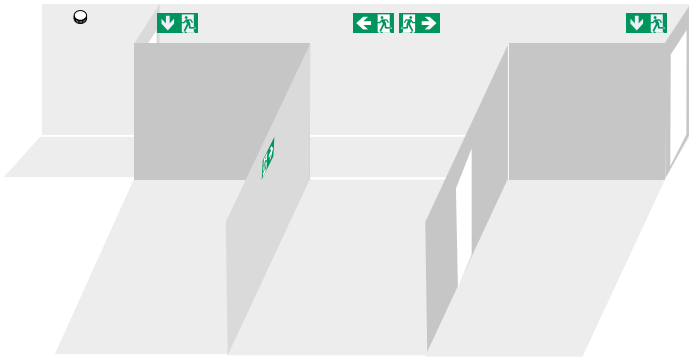


Adaptive Evacuation

Benefits of adaptive Evacuation

Representation of an adaptive Evacuation:

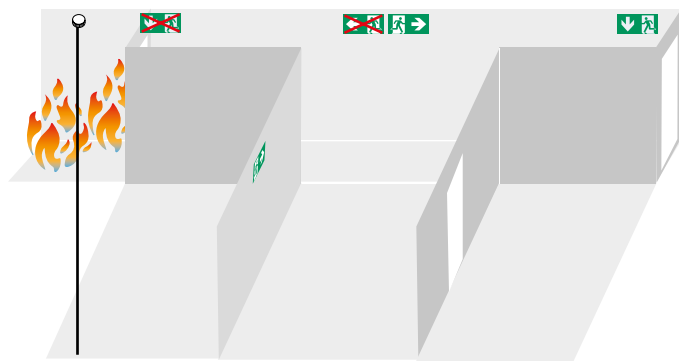
Before the occurrence:



Exit sign luminaires show the fastest exit route.

12

During the occurrence:

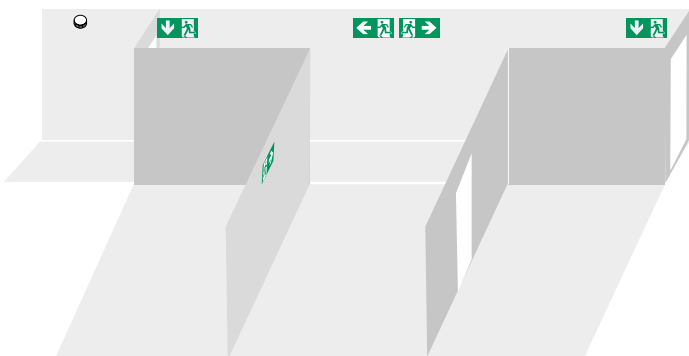


Exit sign luminaires block the unsafe exit route as they receive information of e.g. a fire detector, video monitoring, locking systems, evacuation systems. The safest exit route out of the building is now shown.

Alarm e.g. via:

Fire detector,
video monitoring,
locking systems,
evacuation systems

After the occurrence:



Once the exit route is open again, the exit sign luminaire shows it. Therefore it can be flexibly and dynamically reacted to hazards e.g. fire or attacks.

Benefits of adaptive Evacuation:



- AE-CU technology in combination with GuideLed DXC exit sign luminaires enable dynamic danger situations such as in cases of fire, attacks or natural catastrophes to be actively responded to
- Decentral configuration of the AE-CU for up to 240 GuideLed DXC exit sign luminaires. This enables flexible, low-cost planning.
- Short circuit and open circuit resistant loop bus technology. This means no E30 cable routing of the loop bus line is required because these are fail-safe with the first fault case.
- Separate operating units for safety lighting and for the programming of scenarios provides increased safety with subsequent modifications.
- Due to separate cable routing of the 230V end circuits and 24V loop bus line to the adaptive GuideLed DXC exit sign luminaires, the hybrid operation of static and adaptive exit sign luminaires and the integration of escape luminaires and luminaires for general lighting is possible in the same circuit.
- An integrated search function automatically detects all GuideLed DXC exit sign luminaires connected up during installation.
- Self-addressing of the connected DXC luminaires simplifies the process for installation and commissioning.
- The control unit with nonvolatile program memory and large touch display automatically monitors and controls all components in the AE-CU system as well as the functionality of the connected adaptive luminaires.
- Connection of central visualization is possible via an interface.
- Networking the AE-CU with EATON fire detection technology provides system integrity between alerting and evacuation
- Already installed ZB-S and LP-STAR systems could be expanded with the AE-CU



From static to adaptive escape route guidance

System-technical measures for ensuring self-rescue in cases of evacuation have top priority in dynamic hazard situations. AE-CU technology in combination with GuideLed DXC exit sign luminaires enable dynamic danger situations such as in cases of fire, attacks or natural catastrophes to be actively responded to. The shortest route out of a building is not always the safest.

The AE-CU system reliably triggers up to 240 adaptive exit sign luminaires via a short circuit and open circuit resistant loop bus.

The hazard scenario can be freely assigned to each adaptive exit sign luminaire via the AE-CU.

The control unit with nonvolatile program memory and large touch display automatically monitors and controls all components in the AE-CU system as well as the functionality of the connected adaptive luminaires. Faults occurring are shown on the display, forwarded via signal contacts and saved to an inspection book.

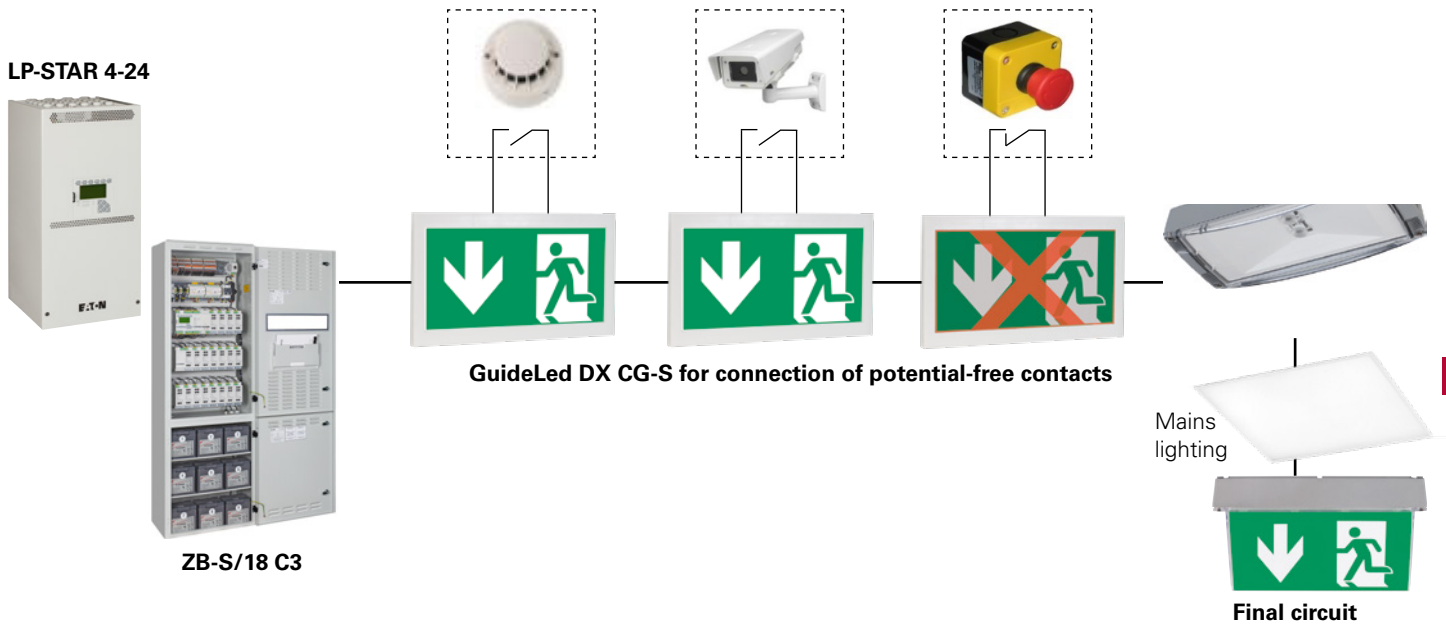
An integrated search function automatically detects all GuideLed DXC exit sign luminaires connected up during installation. Connection of central visualization is possible via an interface.

The solution for simple structured applications

Application example:

Triggering of GuideLed DX luminaires via potential-free contacts:

Potential-free signal contacts of fire detectors, CCTV or key switches to indicate areas as „locked, blocked or unsafe“. As an example for areas where entry is forbidden for a specific time due to construction measures. Parallel connection of the DX inputs is not possible.

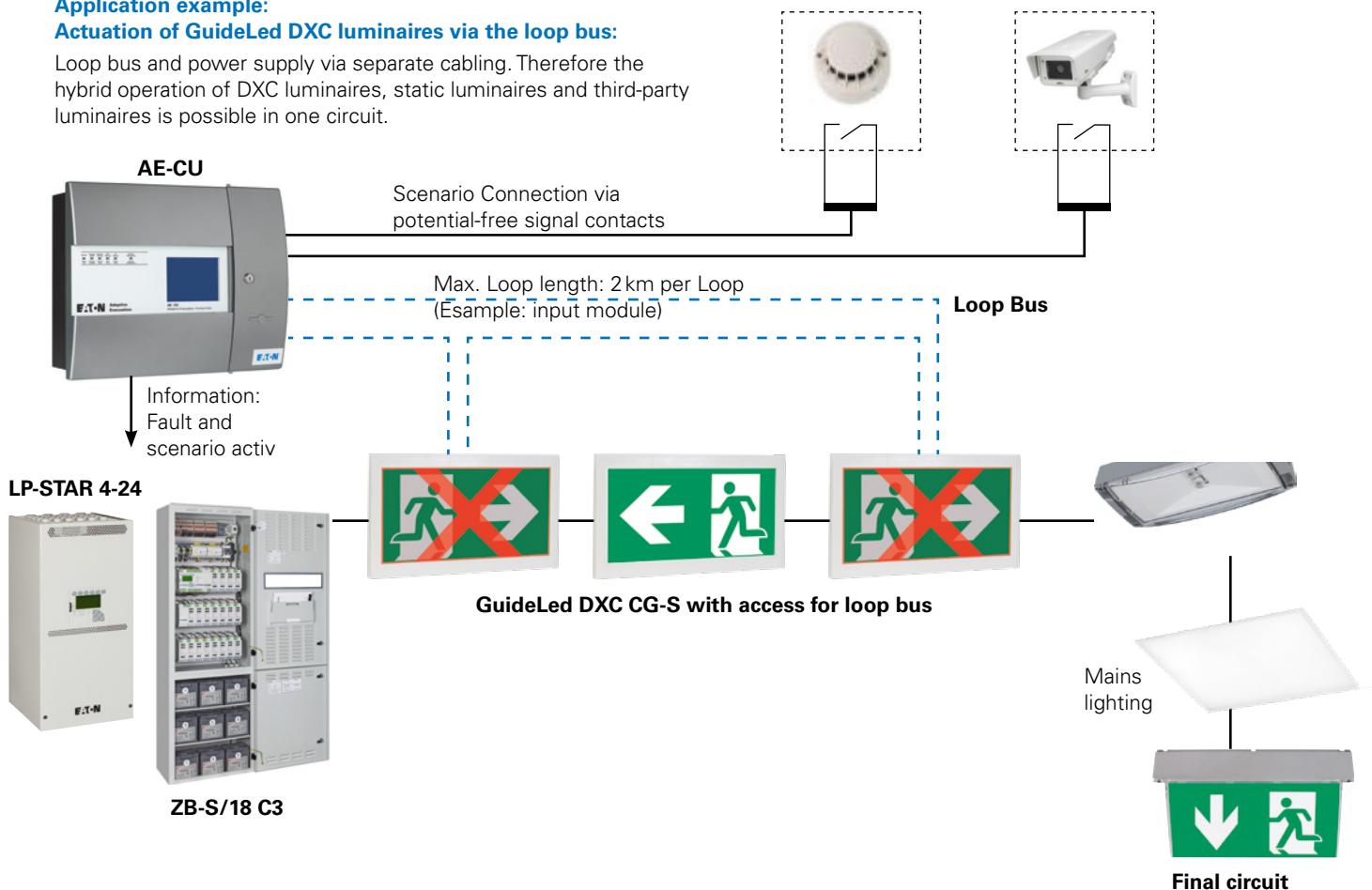


The solution for simple and complex structured applications

Application example:

Actuation of GuideLed DXC luminaires via the loop bus:

Loop bus and power supply via separate cabling. Therefore the hybrid operation of DXC luminaires, static luminaires and third-party luminaires is possible in one circuit.



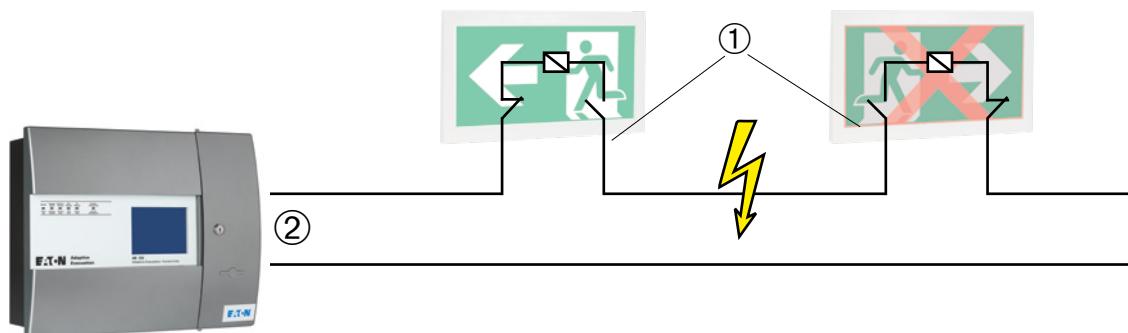
Adaptive Evacuation

Control matrix

Application example:

Short circuit and open circuit resistant loop bus technology

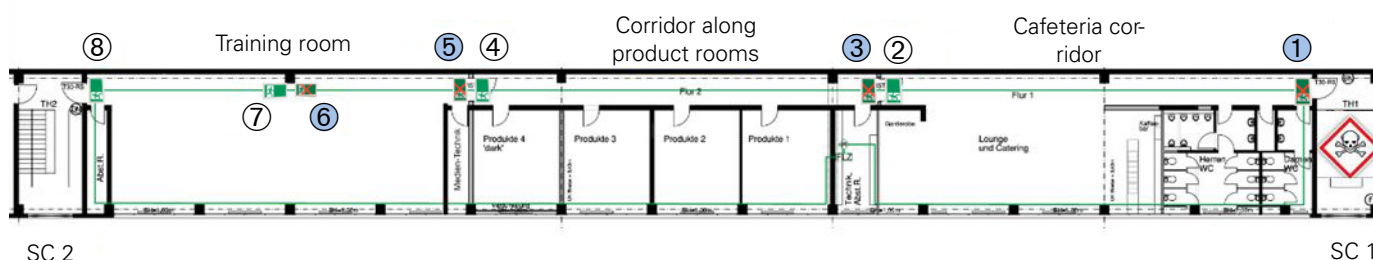
- ① short circuit-isolated separation
- ② **still** safeguarded via loop communication after isolation of the short circuit



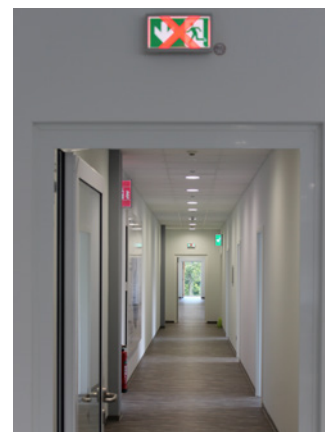
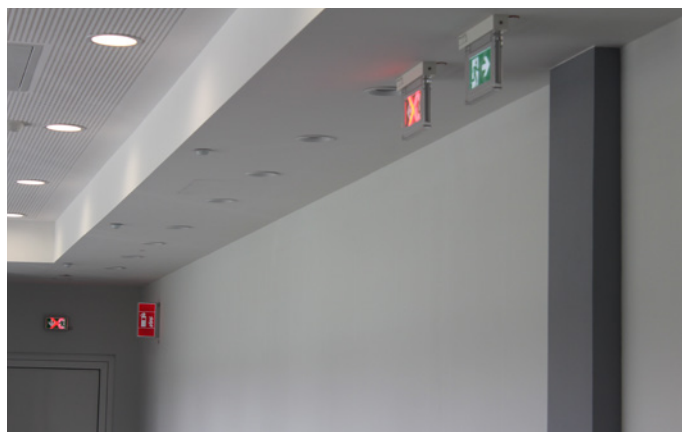
12

AE-CU control matrix

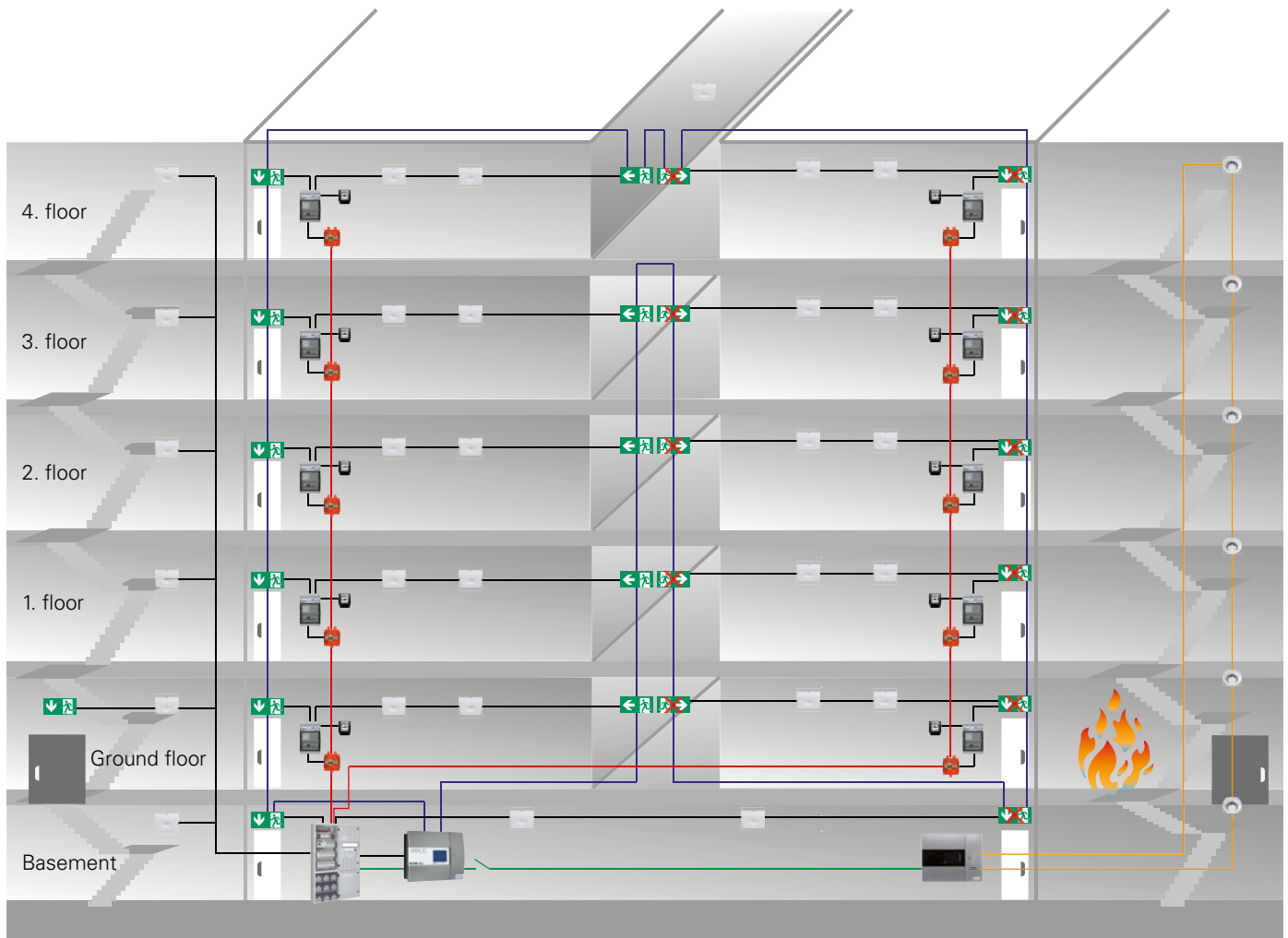
Example: Client training center at a workplace



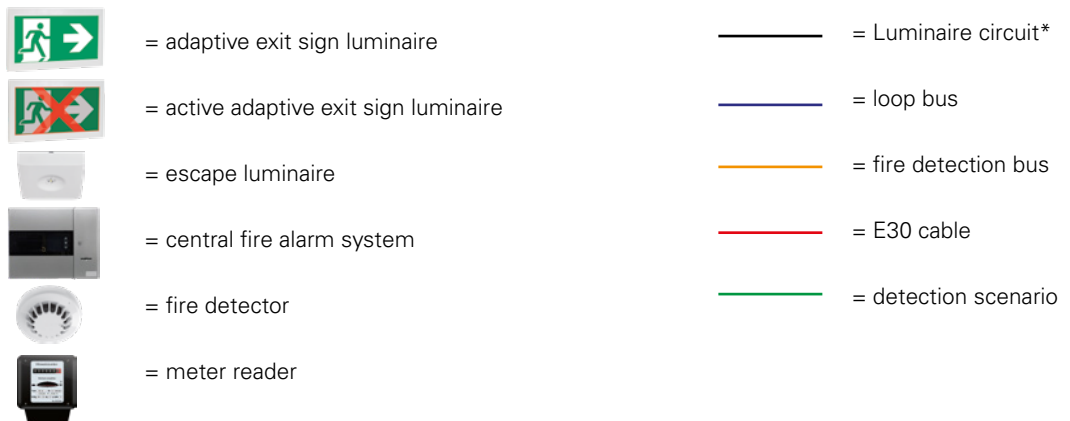
No.	Luminaire description:	Scenario:	SC 1 blocked	Corridor 1 + Cafeteria blocked	Corridor 2 + product rooms blocked	Training room blocked	SC 2 blocked
①	Corridor 1, at door to SC 1		X				
②	Corridor 1, at door to corridor 2				X	X	X
③	Corridor 2, at door to corridor 1		X	X			
④	Corridor 2, at door to training room					X	X
⑤	Training room at door to corridor 2		X	X	X		
⑥	Training room middle direction corridor 2		X	X	X		
⑦	Training room middle direction SC 2						X
⑧	Training room at door to SC 2						X



Adaptive evacuation – installation example



* Due to simplification, only one circuit is shown pro fire zone/staircase/flat



Adaptive Evacuation

AE-CU-W wall housing

AE-CU-W



AE-CU-W

Adaptive Evacuation Control Unit for wall mounting with integrated battery-supported power supply using loop technique for controlling addressable adaptive exit sign luminaires with 230V / 216V AC/DC technology for safety lighting systems acc. to DIN VDE 0100-560, DIN EN 50172 and V DIN V VDE 0108-100. With automatic testing device and monitoring of loop bus communication and individual display of condition and name of loop BUS connection per GuideLed DXC luminaire.

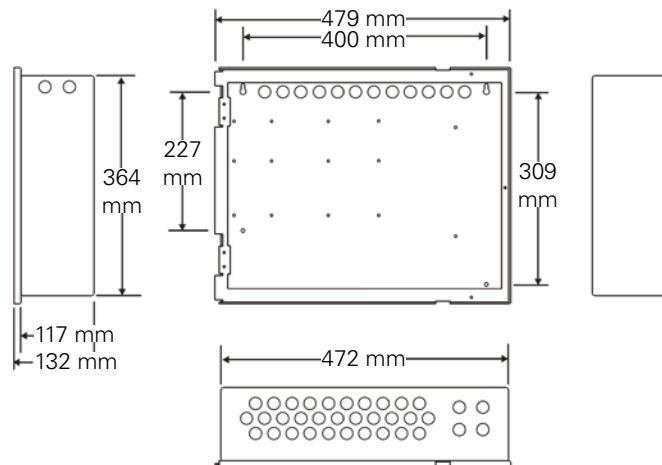
- Adaptive system – Escape routing adapt continuously to the risk
- Self-addressing of the connected DXC luminaires simplifies the process for installation and commissioning
- Simple handling by Touch Display and optional PC programming software
- AE-CU for the adaptive control of up to 240 GuideLed DXC luminaires
- Four short circuit and open circuit resistant loop lines each with 60 GuideLED DXC luminaires
- Two scenarios freely programmable for building evacuation, factory provided integrated. More than two scenarios on request
- A maximum of six ZB-S/US-S or LP-STAR systems can be connected per AE-CU. More than six ZB-S or LP-STAR systems on request
- Automatic software address-setting of all GuideLed DXC luminaires for scenario control
- Number of scenarios could be extended via scenario boxes with 8 or 16 scenarios
- Number of scenario inputs individual extendable
- Functionality also at power failure by inbuilt battery supply
- Universal applicable and with hazard alert systems combinable by potential free scenario inputs
- No E30 cable routing of the loop bus line is required because these are fail-safe with the first fault case

Primary rated voltage	230 V AC +10%, -15%
Primary rated current	75 mA
Nominal frequency	50 Hz
Protection rating	IP 30
Insulation class	I
Ambient temperature	-5°C to +40°C
Secondary rated voltage	18,5 V - 29,5 V
Battery	2 x 12 V / 12 Ah
Max. battery current	3.5 A
Charge characteristic	Constant voltage temperature-compensated
Min. backup power time	30 h
Weight with battery	14 kg
Dimensions (HxWxD in mm)	395 x 495 x 180
Basic housing material	Sheet steel, powder-coated
Material of front	Plastic
Inputs	
Addressable loop line	4
Scenario active inputs	2 (more on request)
Maximum ring length	2,000 m / I(ST)Y 4 x 2 x 0.8 mm
Maximum number of GuideLed DX/DXC luminaires per loop	60
Outputs	
Zero-potential changeover contact	2
Contact load	24 V / 1 A
Fuse	1.35 A

Ordering details

Type	Scope of supply	Order No.
AE-CU-W	Surface- / Recessed mounted wall housing	40071361359

Dimensions in mm



1 LED displays:

Power On, Scenario Active, General Fault, CPU Fault, Power Fault, General Disablement

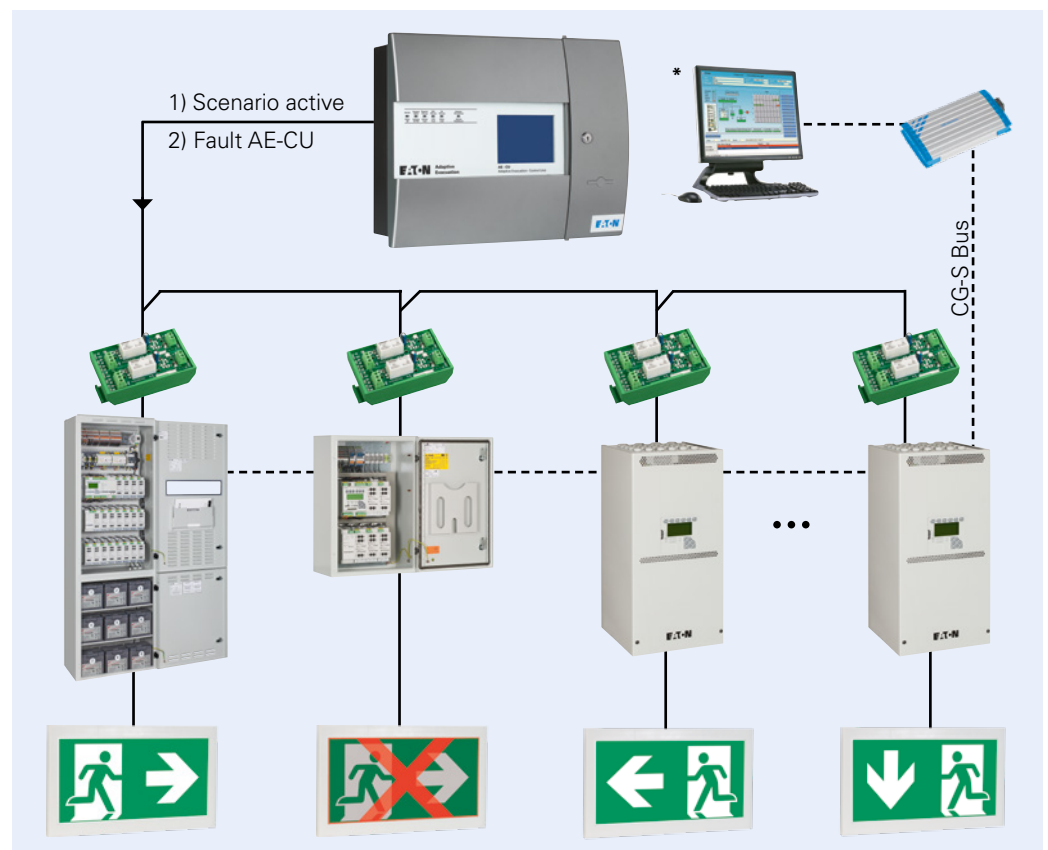
2 Touch display, operating messages:

Scenario Active, Fault, Disablement

3 Fault messages:

Battery fault (AE-CU wall assembly), double address, earth fault, loop short circuit, charge fault, mains fault, loop communication fault, loop driver fault, trouble fault relay, CPU fault, loop overload, loop break at address, break-loop +loop

12



* At connection of a CGVision the messages „Scenario active” and „sum failure AE-CU” are shown on the control unit of the systems and on the CGVision. This messages are also listed in the test book with date and time.

Adaptive Evacuation

AE-CU-E installation variant

AE-CU-E



AE-CU-E

Adaptive Evacuation Control Unit for assembly in ZB-S/18-AE units using loop technique for controlling addressable adaptive exit sign luminaires with 230V / 216V AC/DC technology for safety lighting systems acc. to DIN VDE 0100-560, DIN EN 50172 and V DIN VDE 0108-100. With automatic testing device and monitoring of loop bus communication and individual display of condition and name of loop BUS connection per GuideLed DXC luminaire.

Primary rated voltage	28.5 V/DC
Primary rated current	4.2 A
Protection rating	IP 20
Insulation class	I
Ambient temperature	-5°C to+40°C
Secondary rated voltage	18.5 V- 29.6 V
Weight	8 kg
Dimensions (HxWxD in mm)	200 x 500 x 190
Material	Sheet steel, powder-coated

Inputs

Addressable loop line	4
Scenario active inputs	2 (more on request)
Maximum ring length	2,000 m / I(ST)Y 4 x 2 x 0.8 mm
Maximum number of GuideLed DX/DXC luminaires per loop	60

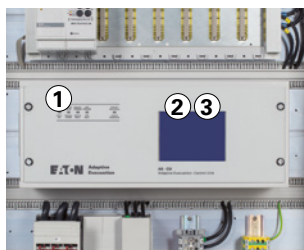
Outputs

Zero-potential changeover contact	2
Contact load	24 V / 1 A
Fuse	1.35 A

Ordering details

Type	Scope of supply	Order No.
*AE-CU-E	Installation variant for ZB-S/18-AE	40071361360

*note: not suitable for ATS+ and LP-STAR systems



1 LED displays:

Power On, Scenario Active, General Fault, CPU Fault, Power Fault, General Disablement

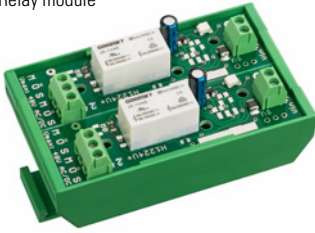
2 Touch display, operating messages:

Scenario Active, Fault, Disablement

3 Fault messages:

Battery fault (AE-CU wall assembly), double address, earth fault, loop short circuit, charge fault, mains fault, loop communication fault, loop driver fault, trouble fault relay, CPU fault, loop overload, loop break at address, break-loop +loop

Relay module



Relay module

Information units ,scenario active' and ,fault' are reported to the ZB-S or LP-STAR by the AE-CU via the relay module (installed in a ZB-S/US-S). Six ZB-S/US-S can be connected per AE-CU. More on request.

Ordering details

Type	Scope of supply	Order No.
Relay module	Relay module connection set for use per ZB-S/US-S or LP-STAR systems for connection to a AE-CU	40071361422

*Note: Relay module must be mounted externally at sub stations with functional integrity.