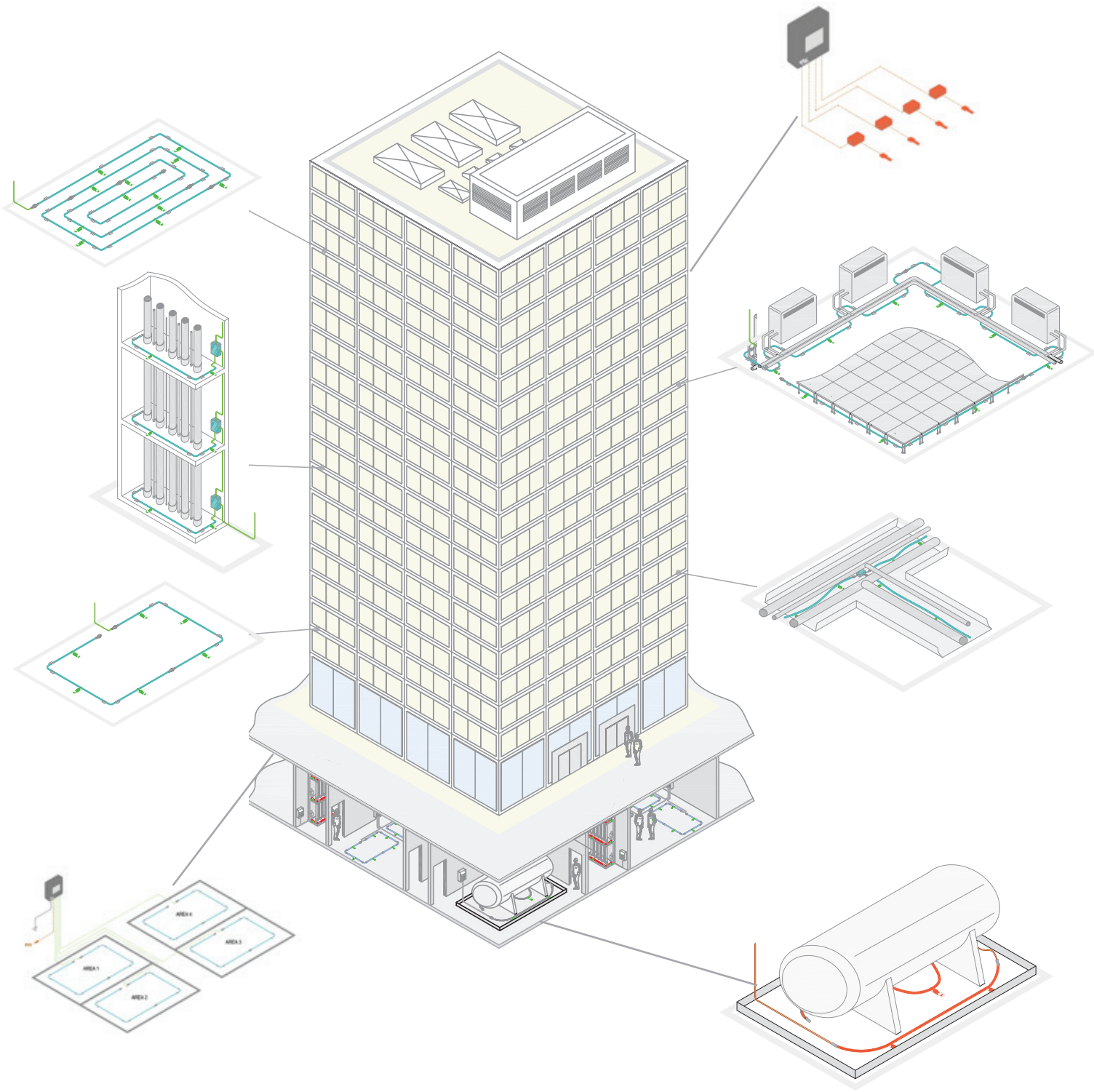
LIQUID LEAK DETECTION SYSTEMS

DESIGN & APPLICATION GUIDE

Digital Liquids Leak Detection Systems For Indoor Applications



INTRODUCTION

TTK Leak Detection and Locating Systems For Indoor Design and Application Guide is mainly addressed to engineering consultants, contractors and end users. This guide, illustrated with a great quantity of drawings and diagrams, showing the TTK leak detection and locating systems as FG-NET, FG-BBOX, FG-ALS4's typical layouts and applications in building environment.

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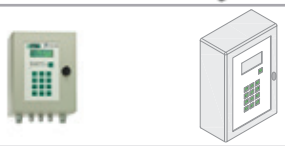
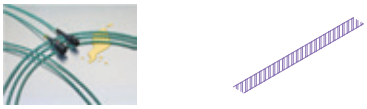
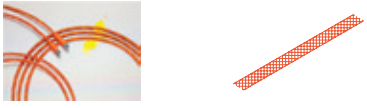
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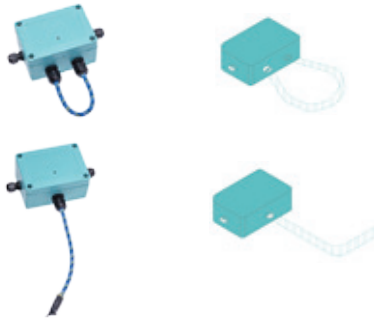
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PRODUCTS LIST

Belowing table lists all products you will find in this guide. For each item, a real product photo, its 3D view in drawings as well as a brief introduction are presented to ease your reading.

Product Photo & 3D View	Reference	Description
Alarm Units		
	FG-NET	Digital touch-screen leak detection panel, it serves as a control alarm panel, it activates audible alarm, display location of the initial point of the leak, active the relays associated. Compatible with water, bases, acid and hydrocarbon leak detection digital sense cables.
	FG-NET-LL	The principal difference with FG-NET panel is, FG-NET-LL is designed to be used with hydrocarbon FG-OD range of sense cables / point sensors exclusively, for industry Long Line 'LL' applications. For more details, ref to «TTK Fuel Leak Detection Airport / Pipeline / Storage Tank Design Guide».
	FG-ALS4	Four zones alarm & locating unit, it is designed to be used with analog sense cables / point sensors for water and acids leak detection.
	FG-ALS4-OD	The principal difference with FG-ALS4 is, FG-ALS4-OD alarm unit is designed to be connected with hydrocarbon FG-OD range of sense cables / point sensors exclusively.
	FG-SYS	Digital leak detection panel, it serves as a control alarm panel, it activates audible alarm, display location of the initial point of the leak, active the relays associated. Compatible with water, bases and acid leak detection sense cables / point sensors only.
	FG-A	Analog leak detection panel without location, it is designed to be used with analog sense cables / point sensors for water and acids leak detection.
Satellite Devices		
	FG-BBOX	FG-NET's satellite device - 2 circuits 'black box'. It expands FG-NET to manage two additional circuits of sense cables with up to 1200 metres of additional sense cables.
	FG-BBOX-LL	The principal difference with FG-BBOX is, FG-BBOX-LL is designed to be connected with hydrocarbon FG-OD range of digital sense cables / point sensors exclusively, for industry Long Line 'LL' applications. For more details, ref to «TTK Fuel Leak Detection Airport / Pipeline / Storage Tank Design Guide».
	FG-RELAYS	FG-NET's satellite device - 'External relays box'. It adds a set of 24 configurable external relays to the FG-NET, thus allows FG-NET to drive external devices.
Sense Cables		
	FG-EC	Preterminated digital water and bases sense cable with location; it exists in 3, 7 and 15 metres.
	FG-AC	Preterminated digital acid sense cable with location; it exists in 3, 7 and 15 metres.
	FG-OD	Preterminated digital hydrocarbon/oil sense cable, with location; it exists in 3, 7, 12 and customerized up to 20 metres. For oil sense cable applications, ref to «TTK Fuel Leak Detection Airport / Pipeline / Storage Tank Design Guide».
	FG-ECS	Preterminated digital water sense cable, with location; it exists in 3, 7, 15 metres and in 400 metre random.

PRODUCTS LIST (FOLLOWING)

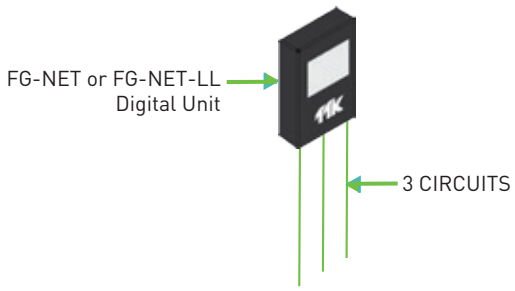
Product Photo & 3D View	Reference	Description
Point Sensors		
	FG-ECP	Point sensor for water and base leak detection. Available in two models: sense cable in ''U'' form and ''L'' form to suit different environments.
	FG-ODP	Point sensor for liquid hydrocarbon and non-conductive solvent leak detection.
Boxes		
	FG-DTC	Diversion box for 'TTK BUS 8723', allows breaking up a detection circuit into two parts.
	FG-DTCS	Addressable box for one water or acids cable, on 'TTK BUS 8723' (sector mode), allows creating an address on the panel for the sense cable connected.
	FG-DCTL	Addressable box allows the connection of one analog sense cable (1 to 45m, ''Cut-To-Length'') to the main BUS wire from the digital panel.
	FG-DOD	OD BUS interface box, for Integration of FG-OD cables on a water & acids 'TTK BUS 8723'.
	FG-DOP	Point sensor diversion box. It is a connection box for integration of point sensor FG-ODP on an OD BUS 8771.
	FG-DEx	OD BUS diversion box. This diversion box allows breaking up a detection circuit into two parts. Use only with end plugs reference FG-TMOX.
Accessories		
	FG-CLC	Leader cable on 'TTK BUS 8723', for connecting FG-NET/FG-SYS/FG-BBOX digital unit and first sense cable or between two water / acids digital sense cables in a non-risk area.
	FG-CLOD	The difference with FG-CLC is, FG-CLOD is a leader cable on 'OD BUS 8771', for connecting FG-NET-LL or FG-BBOX-LL digital unit and first hydrocarbon sense cable or between two hydrocarbon sense cables in a non-risk area..
	CF-EC100 CF-OD50	Hold down clips with cold glue to fix sense cable lengths. Recommended at corner and every 1.5 metres.
	ES-EC (green) ES-OD (orange)	Tags, for caution use, recommended every 3 metres or where needed.
	FG-TMC (black) FG-TMOD (orange) FG-TMOX (orange)	Modular end termination plug is used to terminate each circuit of sense cables.

PART I DESIGN LAYOUTS

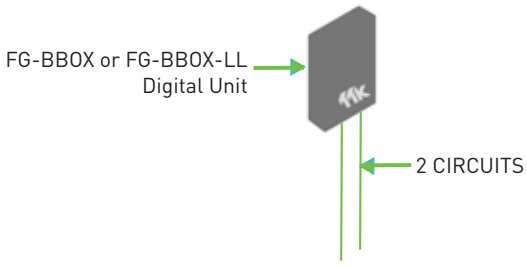
This part offers layout examples of locating and non-locating systems in building environment, classified by alarm unit.

1.1 General Description

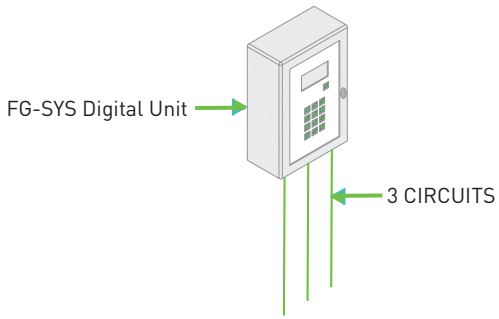
Below are some technical limits of the capacity of principal control panels:



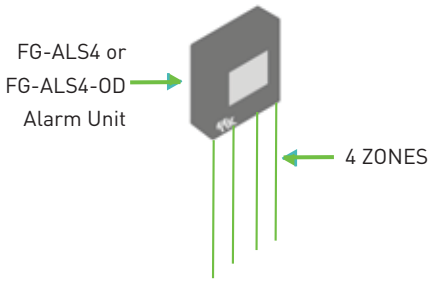
- For FG-NET, up to **40** sense cables can be connected on each circuit.
- For FG-NET-LL, up to **59** sense cables can be connected on each circuit.



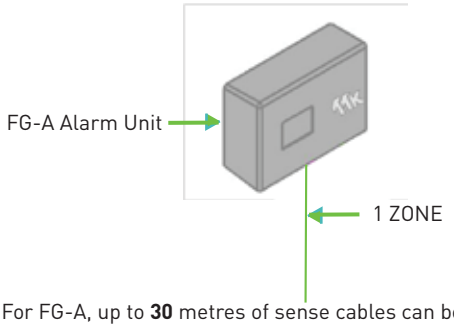
- For FG-BBOX, up to **40** sense cables can be connected on each circuit.
- For FG-BBOX-LL, up to **59** sense cables can be connected on each circuit.



- For FG-SYS, up to **40** sense cables can be connected on each circuit.



- For FG-ALS4, up to **45** metres of sense cables can be connected on each circuit.
- For FG-ALS4-OD, up to **4** lengths of sense cables can be connected on the unit, no matter how the 4 cables are connected (on each zone or all in one zone).



- For FG-A, up to **30** metres of sense cables can be connected.

Figures 1.1 Capacity of principal control panels

	Control Panels	Numbers of Integrated Circuits	Maximum Capacity Per Circuit
Water & Acids Leak Detection Panels	FG-NET	3	40 cables
	FG-SYS	3	40 cables
	FG-BBOX	2	40 cables
	FG-ALS4	4	45 metres
	FG-A	1	30 metres
Hydrocarbon Leak Detection Panels	FG-NET-LL	3	59 cables
	FG-BBOX-LL	2	59 cables
	FG-ALS4-OD	4	48 metres (with no sense cables in 3 other circuits)

1.2.1 Digital Unit: FG-NET

FG-NET locating system includes basically: (figure 1.2.1)

- FG-NET digital unit.
- TTK BUS 8723 jumper cable (for connecting between panel and the first sense cables in this layout).
- Digital sense cable (FG-EC in this layout, standard lengths are 3, 7 and 15 metres).
- End termination (used at end of last sense cables, mark the termination of one circuit).
- Accessories:
  - Hold-down clips (fix sense cable, stick on the floor);
  - Tags (caution use).

- Each circuit can connect < = 40 sense cables
- Each circuit can connect < = 600 metres of sense cables

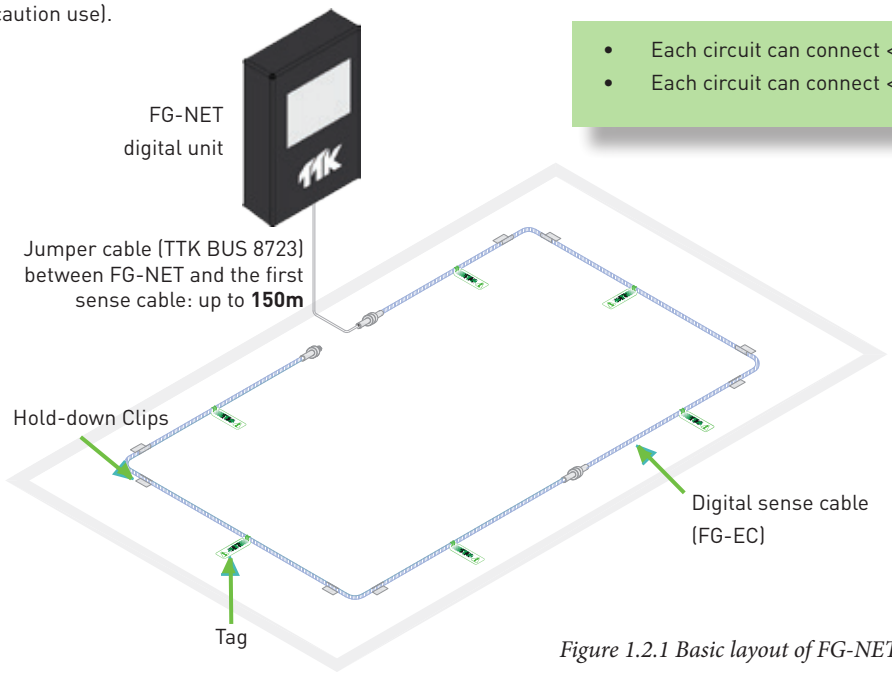


Figure 1.2.1 Basic layout of FG-NET with 1 circuit

In below example of 3 circuits layout with FG-NET, there are:

- FG-NET digital unit.
- TTK BUS 8723 jumper cable:
  - for connecting panel and the first water / acids sense cables for circuits 2&3;
  - for connecting panel and interface box FG-DOD (explanation see 4 lines below) in circuit 1 in this layout.
- Digital sense cables:
  - Water sense cable FG-EC; acids sense cable FG-AC (standard lengths are 3, 7 and 15 metres) in circuit 2 & 3;
  - Hydrocarbon sense cable FG-OD (standard lengths are 3, 7 and 12 metres) in circuit 1.
- Interface box FG-DOD in circuit 1: it splits TTK BUS 8723 into 2 outputs including OD BUS 8771 for FG-OD sense cable connection.
- End termination and accessories same as figure 1.2.1.

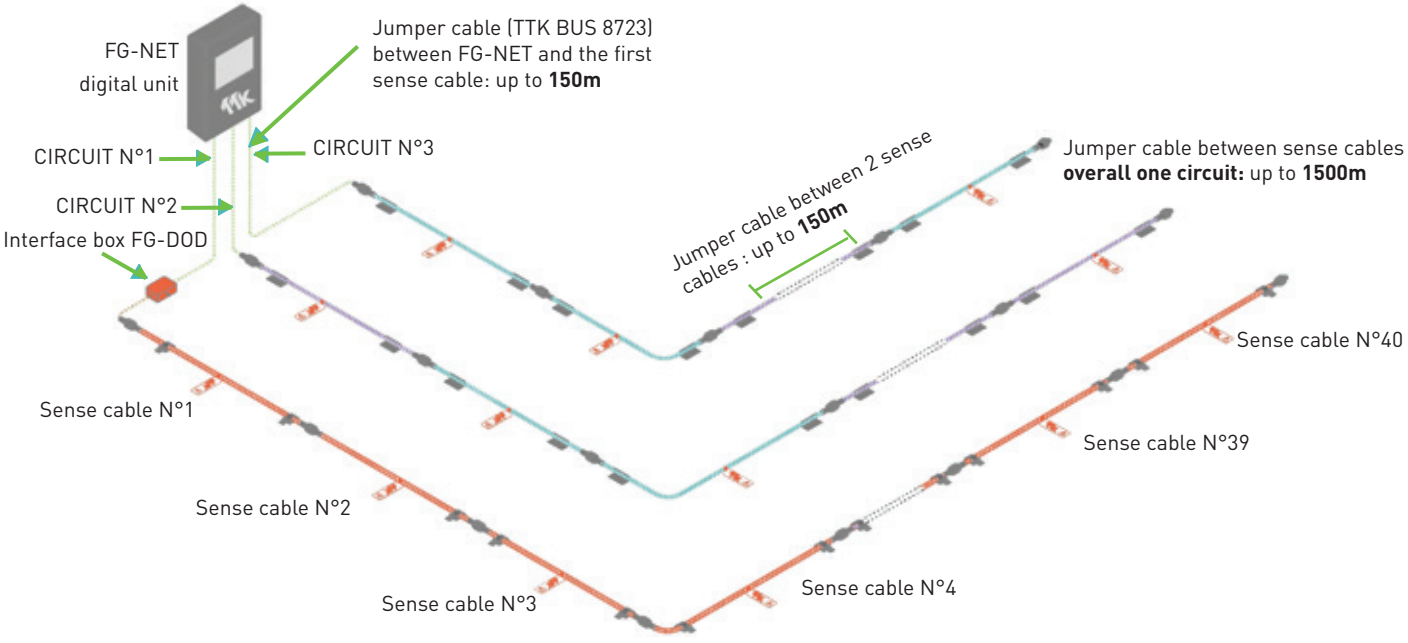


Figure 1.2.1.1 Basic layout of FG-NET with 3 circuits

FG-NET-LL digital unit uses the same principal. It has OD BUS 8771 output. It is designed to be connected to hydrocarbon FG-OD range of sense cables / point sensors exclusively, for industry Long Line 'LL' applications.
For more details, ref to «TTK Fuel Leak Detection Airport / Pipeline / Storage Tank Design Guide».

1.2.2 Digital Unit: FG-SYS

Concerning to design layout, FG-SYS digital unit is very similar to FG-NET digital unit, they have the same technical limit on cable lengths.
The difference is FG-SYS is designed for water and acids leak detection, thus not compatible with hydrocarbon sense cables / hydrocarbon point sensors.
Water and acids sense cables can be mixed in the same circuit.

- Each circuit can connect < = 40 sense cables
- Each circuit can connect < = 600 metres of sense cables

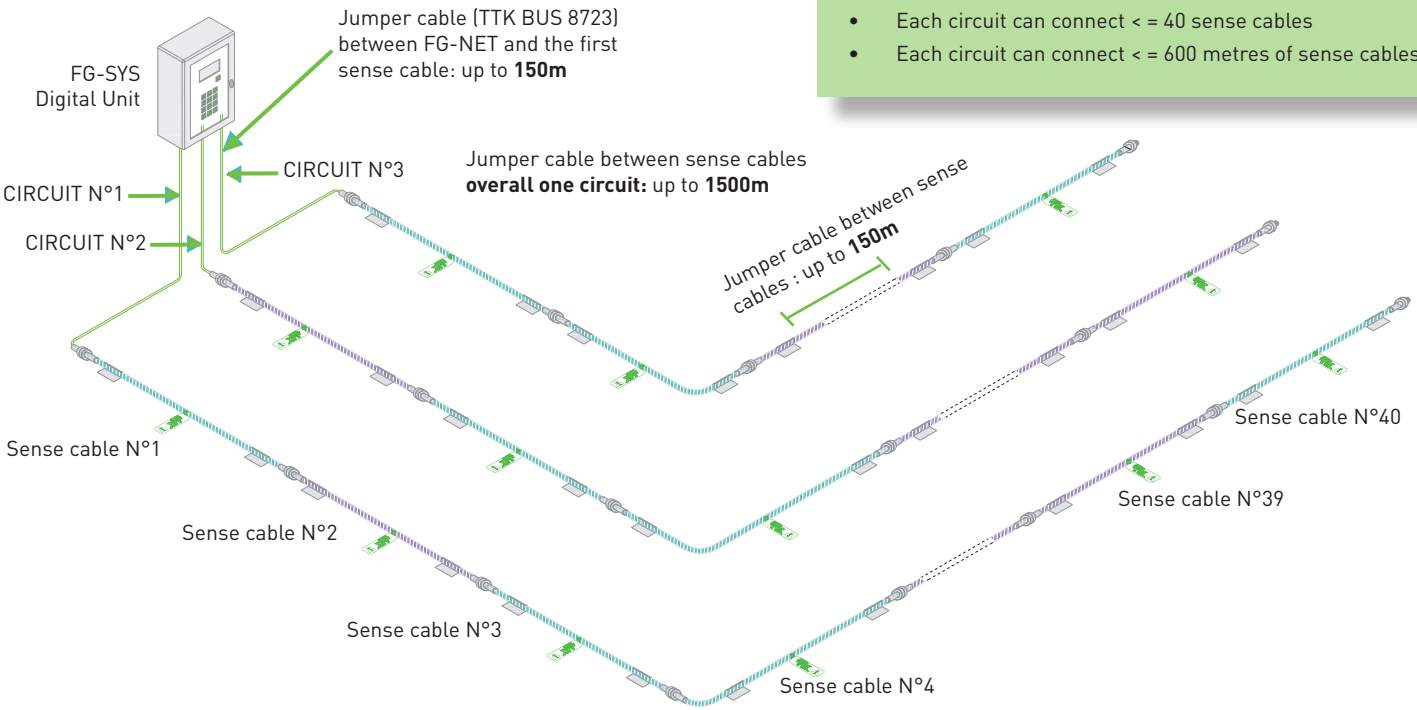
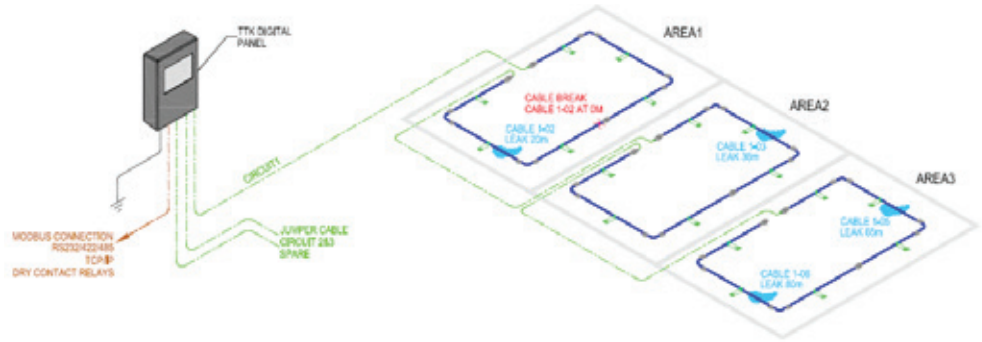


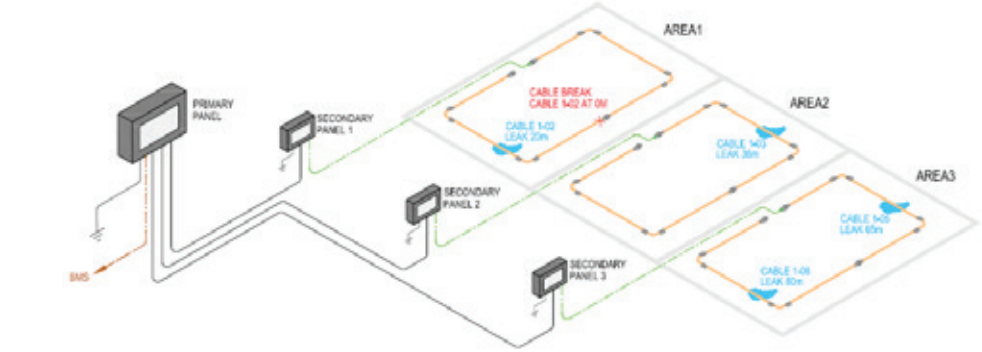
Figure 1.2.2 Basic layout of FG-SYS with 3 circuits

1.2.2.1 Layout Comparison Between TTK & Other System



For TTK Digital System (FG-NET, FG-SYS):

- 1 sole digital panel can monitor all 3 areas, no need of any slave mondule.
- It detects multileaks: 4 leaks (even simultaneous) on 3 areas.
- It detects multileaks + cable break fault: 4 leaks and 1 cable break.



For Other Traditional System:

- 1 master panel + 3 slave mondules are enquired to monitor all 3 areas.
- In case of multileak: only the first leak can be located precisely; others are detected but without precise location.
- In case of multileaks + cable break fault: no leak can be detected after the cable break faults in the same area.

1.2.3 Satellite Device: FG-BBOX

The FG-BBOX is a satellite device (or a ''daughter panel'') of the TTK FG-NET digital unit. It expands FG-NET to manage two additional circuits of sense cables with up to **1200 metres (or 80 lengths)** of additional sense cables.

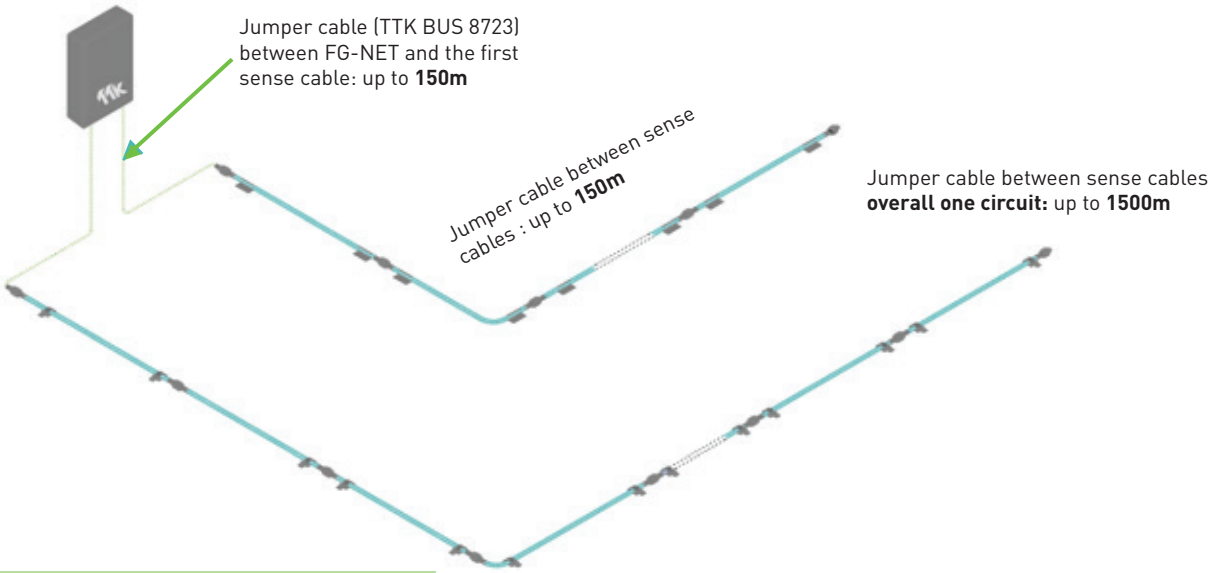
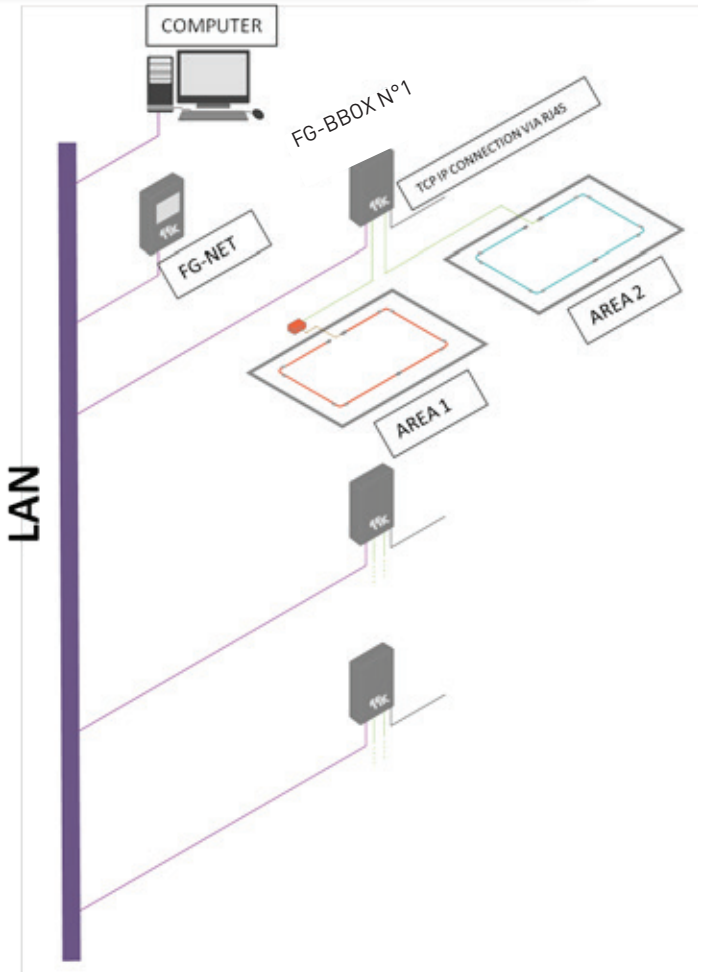


Figure 1.2.3 Layout of FG-BBOX with 2 circuits

- Each circuit can connect < = 40 sense cables
- Each circuit can connect < = 600 metres of sense cables



Figures 1.2.3.1 FG-BBOX connection with FG-NET on Ethernet network

FG-BBOX is monitored by FG-NET via a standard Ethernet network.

- In the event of a fault on the sense cables connected to the FG-BBOX, the relevant relay contact is activated and the LED on the relevant circuit switched to red.
- Each FG-BBOX proceeds TCP/IP connection via RJ45. Each FG-BBOX has four relay contacts: 2 leak relays (1 for each circuit), 1 cable break relay and 1 power failure relay.

Layout Explanation (Figure 1.2.3.1) :

- FG-BBOX N°1 is connected to FG-NET via Ethernet. FG-BBOX N°1 monitors two areas: AREA 1: equipped with oil sense cable using an interface box FG-DOD (ref 1.4.5 on page 15); AREA 2: equipped with water sense cable.
- Up to **16 x FG-BBOX** can be connected to one FG-NET unit without exceeding a total number of **500** digital sense cables per FG-NET.

FG-BBOX-LL digital unit uses the same principal. It has OD BUS 8771 output. It is designed to be connected to hydrocarbon FG-OD range of sense cables / point sensors exclusively, for industry Long Line 'LL' applications.
For more details, ref to «TTK Fuel Leak Detection Airport / Pipeline / Storage Tank Design Guide».

1.2.4 Four Zone Alarm & Locating Unit: FG-ALS4

The FG-ALS4, four zones alarm & locating system unit is designed to be used with analog sense cables: FG-ECS, FG-ACS or FG-ECX, FG-ACX, for water, base or acid leak detection.

In the event of liquid leak or fault on the sense cables in any zone, the FG-ALS4 will respond as follows:

- An audible alarm is triggered and a relay is activated.
- The touch screen of the panel displays the zone, the location of the leak (to the **nearest metre**) and details of the fault (the type of fault leak or cable break).
- Report to the BMS via MODBUS /JBUS protocol.

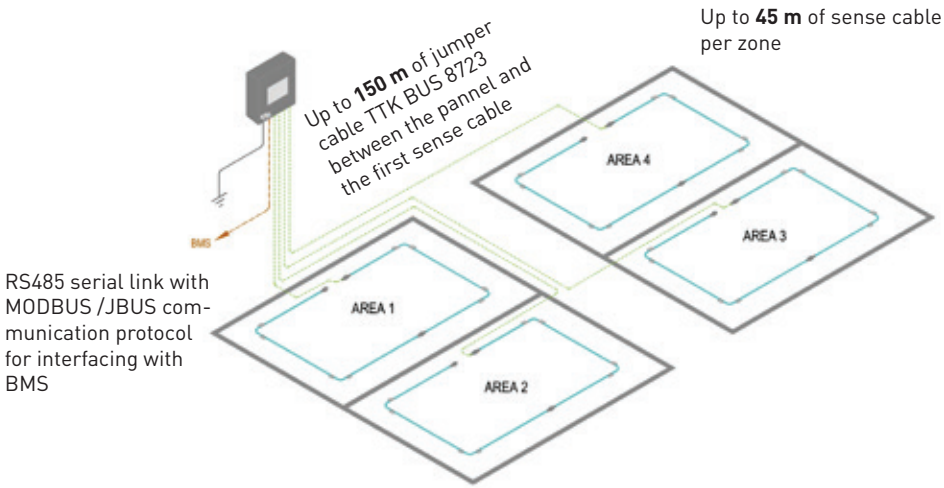


Figure 1.2.4 : Layout of FG-ALS4 with 4 zones

Layout Explanation (Figure 1.2.4) :

- **4** detection zones are available.
- FG-ALS4 can control **up to 45m** of sense cable **per zone**.
- In total, **up to 180m** of sense cable **per unit**.
- In case of one zone has less than 45m, the unused length can not be transferred to another zone.

1.2.5 Four Zone Alarm & Locating Unit For Hydrocarbon: FG-ALS4-OD

The FG-ALS4-OD, four zones alarm & locating system unit for hydrocarbon leak detection is designed to be used exclusively with FG-OD hydrocarbon range of detectors.

In the event of liquid leak or default on the sense cables for each zone, the responses from the FG-ALS4-OD alarm & locating unit:

- An audible alarm is triggered and a relay is activated.
- The touch screen of the panel displays the zone, the location of the leak (**on the cable**) and details of the fault (the type of fault leak or cable break).
- Report to the DCS/SCADA/Safeguarding system via a JBUS/MODBUS protocol.

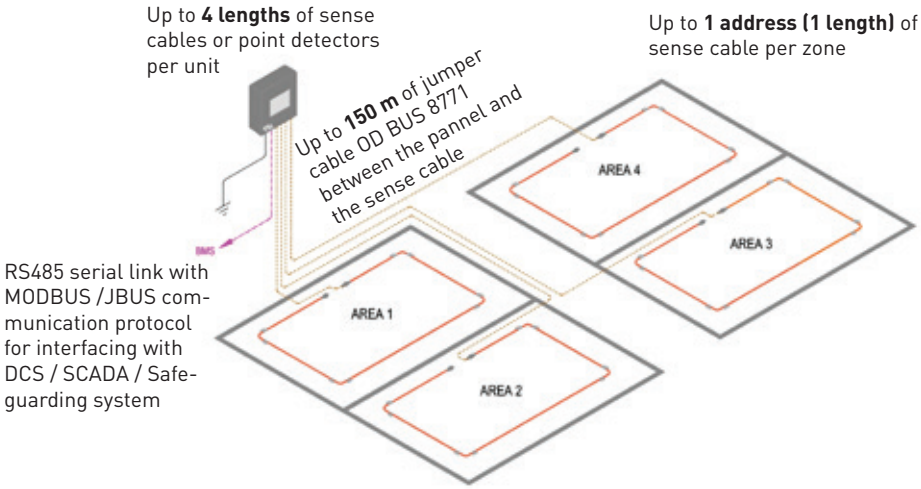


Figure 1.2.5 : Layout of FG-ALS4-OD with 4 zones

Layout Explanation (Figure 1.2.5):

- **4** detection zones are available.
- FG-ALS4-OD can control **up to 1 address** or **1 length** (of 3, 7 or12m) of sense cable or point sensor **per zone**.
- In total, **up to 4 lengths** (or **48m**) of sense cables or point sensors **per unit**.
- Different possibilities of configurations are:
  - 1 cable per zone; or
  - 2 cables in one zone et 0 cable in another ; or
  - all of the 4 cables in one zone.
- Point detector can be connected in the place of sense cables, see 1.3.2 on page 12.

For a system with FG-ALS4 or FG-ALS4-OD unit:

- Between 2 lengths of sense cables: up to **150m** of jumper cables.
- Total length of jumper cables on a unit: up to **300m**.

1.2.6 Alarm Unit: FG-A

The FG-A alarm unit is a non-locating unit. It is designed to be used with analog sense cables as FG-ECS, FG-ECX, FG-ACS and FG-ACX for water and acids leak detection.
Responses on the FG-A alarm unit:

- In the case of a leak, an audible alarm is triggered. The red LED on the front panel is switched on and the leak relay is activated.
- In the case of cable break, an audible alarm is triggered, the yellow LED on the front panel is switched on and the cable break relay is activated.

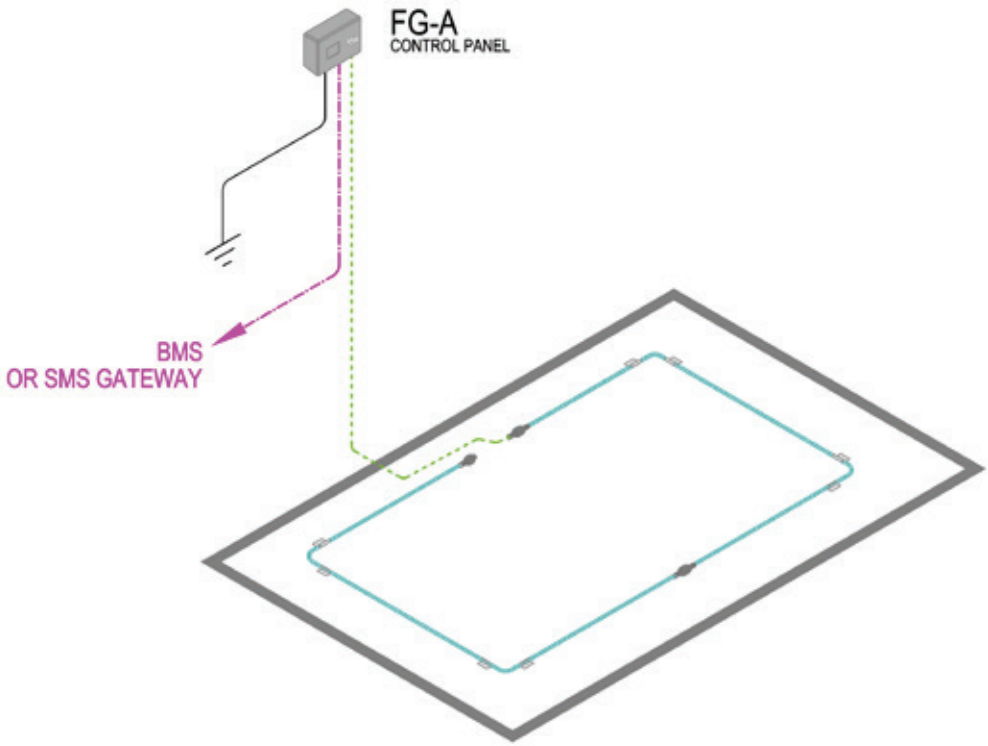


Figure 1.2.6 Layout with FG-A

Layout Explanation (Figure 1.2.6):

- The FG-A unit has 1 circuit.
- It can control up to **30 metres** of sense cables (either one length of FG-ECS / FG-ACS or several lengths of FG-ECX / FG-ACX).

1.3 Point Sensors

In some situations, point sensors (probes) may better adapt the specific environment than sense cables.
Below are 2 Point Sensors, designed to be used with TTK digital units and four zones alarm & locating system units for instant detection of liquid leaks.

1.3.1 Addressable Water Point Sensor: FG-ECP

- The FG-ECP, point sensor for water leak detection, is suitable to be used in environment such as lift pit and drip tray.
- The point sensor is available in two models: sense cable in ''U'' form and ''L'' form to suit different environments.
- It is designed to be used with FG-NET, FG-BBOX and FG-SYS digital units.
- Up to 40 x FG-ECP point sensors per digital unit circuit can be connected.
- FG-ECP point sensor can be mixed connected with FG-EC sense cables in one circuit on a digital unit (see figure 1.3.1.2).

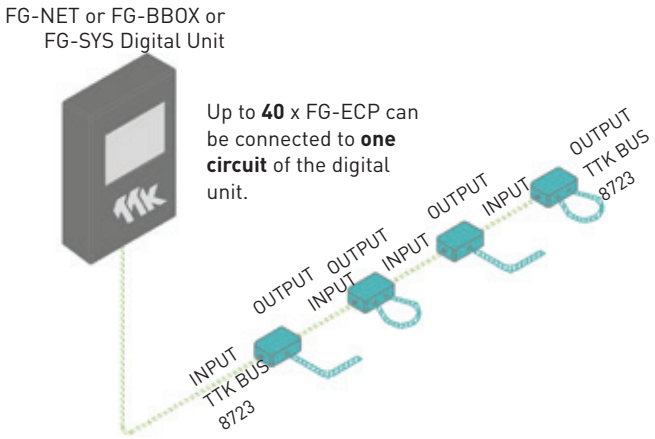


Figure 1.3.1: Layout of FG-ECP with FG-NET

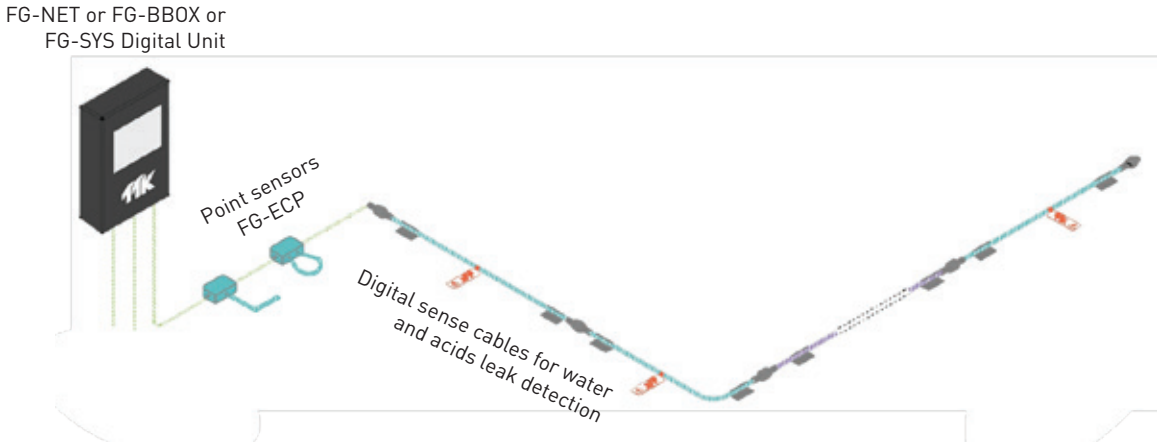


Figure 1.3.1.2: Layout of mixed connection of point sensors FG-ECP and digital sense cables FG-EC on a circuit of FG-NET digital unit

1.3.2 Addressable Hydrocarbon Point Sensor: FG-ODP

- The FG-ODP, point sensor for liquid hydrocarbon and non-conductive solvent leak detection, is suitable to detect hydrocarbon floating on water, for example on tank and pit application.
- It should always be connected on a point sensor diversion box FG-DOP before connecting to a locating unit with OD BUS 8771 output.
- The point sensor is compatible with FG-NET-LL, FG-BBOX-LL or FG-ALS4-OD Locating Unit (with OD BUS 8771 output). It is also compatible with FG-NET and FG-BBOX digital units (with BUS 8723 output) but need to install an extra interfacing box FG-DOD between (more details see 1.4.5 mixed layout with FG-DOD and FG-DOP on page 16)
- Up to 40 x FG-ODP point sensors per FG-NET-LL or FG-BBOX-LL digital unit circuit.
- Up to 4 x FG-ODP point sensors per FG-ALS4-OD locating unit.

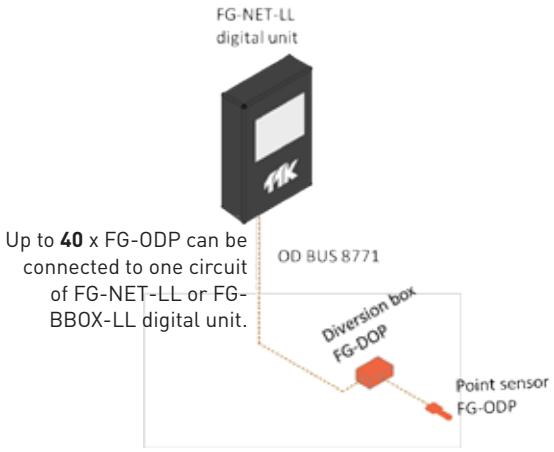


Figure 1.3.2: Layout of point sensor FG-ODP with FG-NET-LL digital unit using FG-DOP box

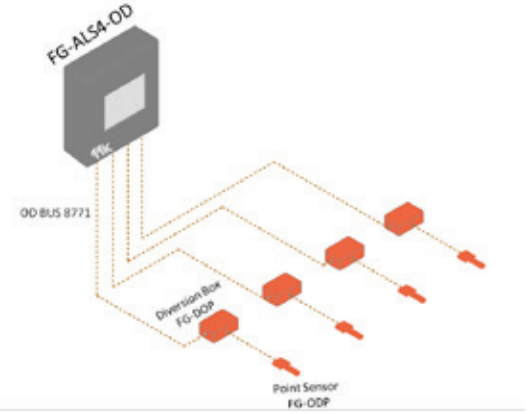


Figure 1.3.2.1: Layout of point sensor FG-ODP on 4 circuits of FG-ALS4-OD unit using FG-DOP

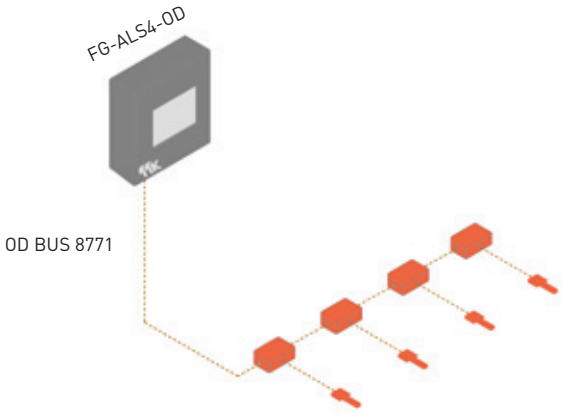


Figure 1.3.2.2: Layout of point sensor FG-ODP on 1 circuit of FG-ALS4-OD unit using FG-DOP

Layout Explanation (Figure 1.3.2.1, 1.3.2.2):

- Up to **4** x FG-ODP can be connected to one FG-ALS4-OD locating unit.
- 2 possibilities to connect up to 4 FG-DOP + FG-ODP on FG-ALS4-OD unit:
  - either 4 point sensors on 4 different zones (as figure 1.3.2.1);
  - or on the same zone (as figure 1.3.2.2).

In order to fit the complex installation, TTK offers different kinds of boxes: such as FG-DTC, FG-DTCS, FG-DCTL and FG-DOD. They have their own characteristics but all of them facilitate the extension of the system in different situation.
Layouts in session 1.4 explain different situation.

1.4.1 Diversion Box: FG-DTC

- The digital diversion box FG-DTC makes it possible to split a detection circuit into two parts, so as to allow the system to cover more horizontal space (figure 1.4.1).

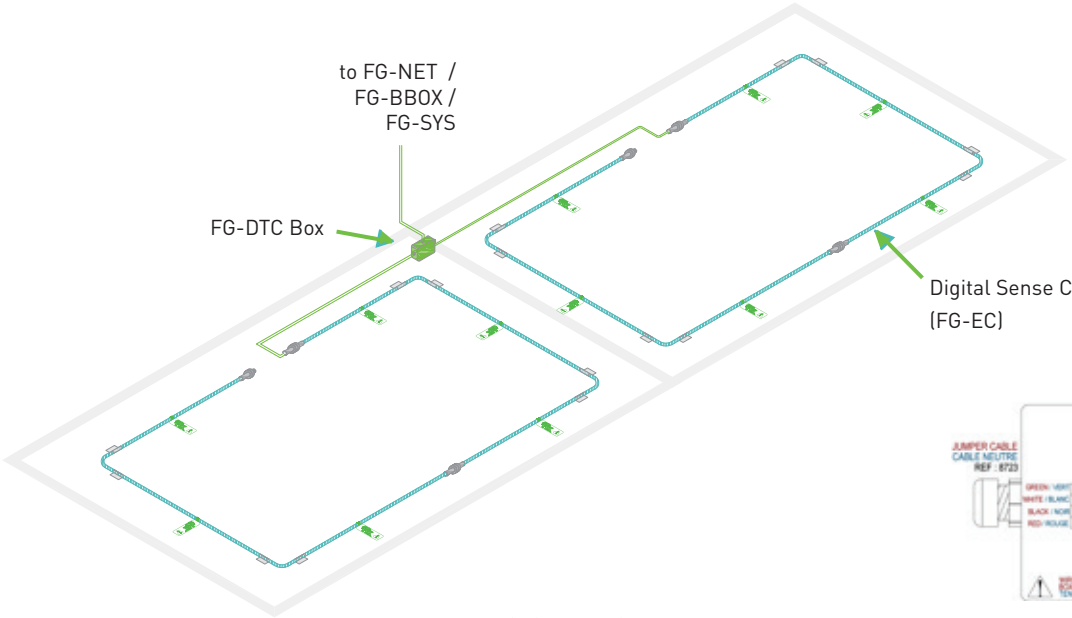


Figure 1.4.1: Layout with diversion box FG-DTC

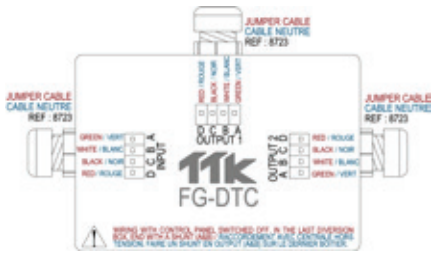


Figure 1.4.1.1: Diversion box FG-DTC cabling diagram

1.4.2 Addressable Box: FG-DTCS

- The addressable sector box FG-DTCS allows connecting digital unit FG-NET with analog sense cables and makes these cables addressable, in the meantime it has a unique advantage to cover vertical space (as illustrated in figure 1.4.2).

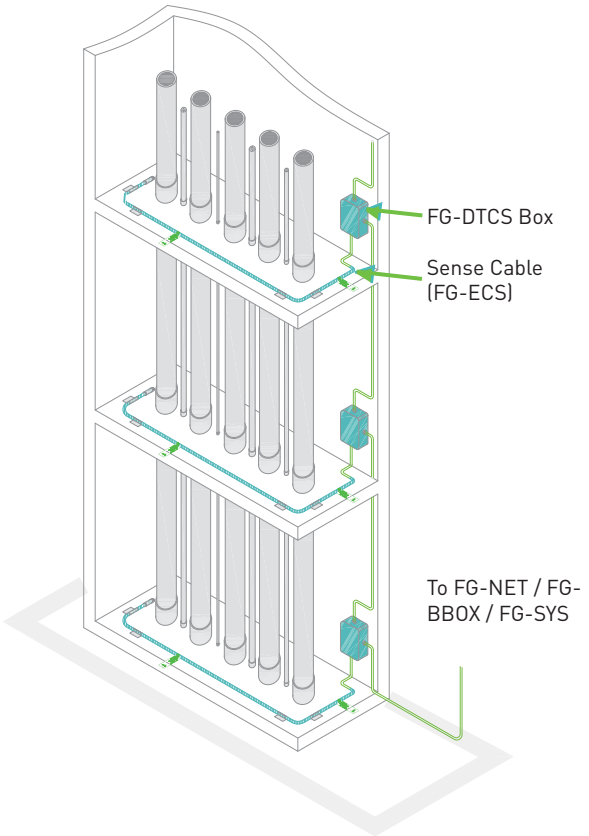


Figure 1.4.2: Layout with addressable box FG-DTCS

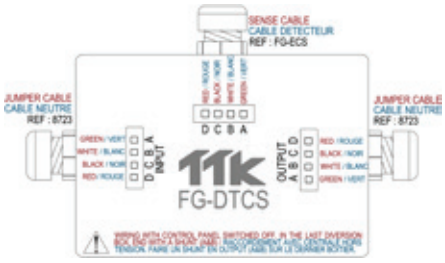


Figure 1.4.2.1: Addressable box FG-DTCS cabling diagram

FG-ECS Sense Cable:

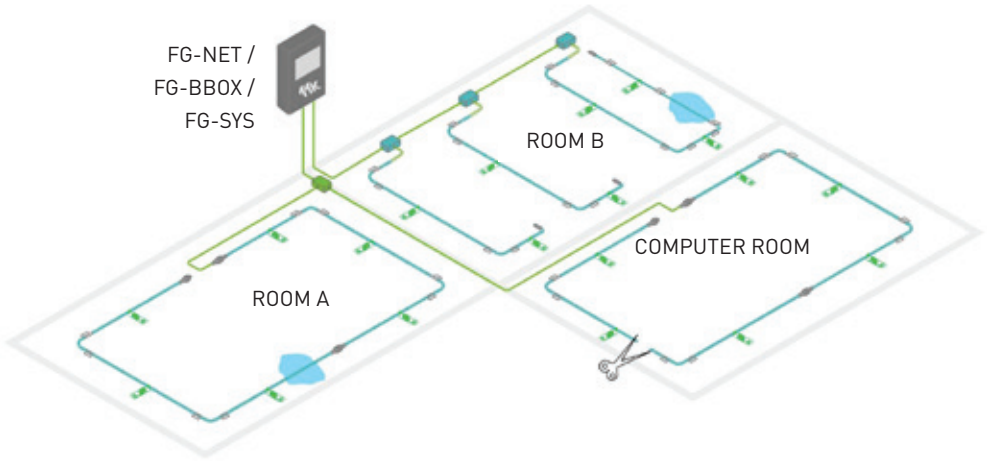
- FG-ECS cable is an analog water sense cable (without micro-chip).
- Each cable includes a jumper cable and an end termination at two tips.
- The standard lengths are 3, 7 and 15m.

Design Tips:

- FG-DTCS box is designed to use with FG-ECS and FG-ACS analog sense cables (above two figures use FG-ECS cable as example).
- FG-DTCS box has advantages when used for similar small to midium size space on different levels (vertical areas) as sector layout.

1.4.3 Mixed Layout With FG-DTC & FG-DTCS Boxes

- In real installation, FG-NET system layout could be complex. A mixed installation of FG-DTC and FG-DTCS boxes could ease installation, it allows extension of the system.



Design Tips:

- Use jumper cable for wall or corridor passage between two sense cables. Maximum jumper cable length for each FG-NET output is 150 metre.
- FG-EC cables can be daisy-chained, this is used for horizontal extension (on wide areas on the same floor).
- FG-ECS cables (without connector) has a termination at end tip of the cable, it is recommanded to use for vertical extension (on different floors).

Figure 1.4.3 : Layout with FG-DTC et FG-DTCS boxes

Layout Explanation (Figure 1.4.3) :

- The system uses one FG-DTC box and three FG-DTCS boxes.
- Both ROOM A and COMPUTER ROOM are protected by four FG-EC sense cables. These cables are connected to the first circuit of the panel via a FG-DTC box.
- ROOM B is protected by three sector sense cables FG-ECS via 3 FG-DTCS boxes.
- In this installation, the panel will trigger 3 alarms:
  - leak alarm in ROOM A with +/-1m leak precision;
  - leak alarm in ROOM B indicating the alarming cable;
  - cablebreak alarm in COMPUTER ROOM +/-1m leak precision (all upstream cables in COMPUTER ROOM still functioning).

1.4.4 'Cut-To-Length' Addressable Box: FG-DCTL

- The FG-DCTL addressable box allows the connection of one analog sense cable (1 to 45m, ''Cut-To-Length'') to the main BUS wire from the digital panel.
- FG-DCTL will create an address on the panel for that sense cable.
- The LED on the front face of the box indicates the box's status in real time.

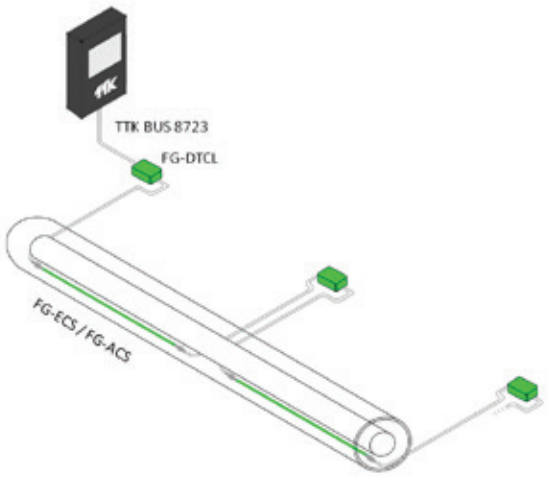


Figure 1.4.4 : Layout with FG-DCTL interface box

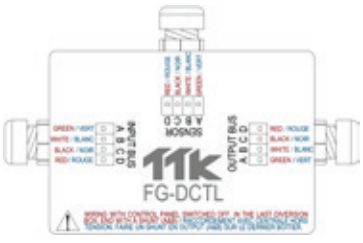


Figure 1.4.4.1: Interface box FG-DCTL cabling diagram

Layout Explanation (Figure 1.4.4):

- FG-DCTL is compatible with FG-NET, FG-BBOX and FG-SYS digital units.
- FG-DCTL is compatible with sense cables as FG-ECS and FG-ACS (length from 1 to 45m).

1.4.5 Interface Box: FG-DOD

- FG-DOD is an OD BUS interface box.
- It is used for FG-OD sense cables installed in combination with a water / acids installation on FG-NET / FG-BBOX digital units.
- It will split a standard BUS into two outputs, the first one being ATEX approved and dedicated to FG-OD sense cables, and the second one being dedicated to water / acids sense cables or to another box (see figure 1.4.5.1).

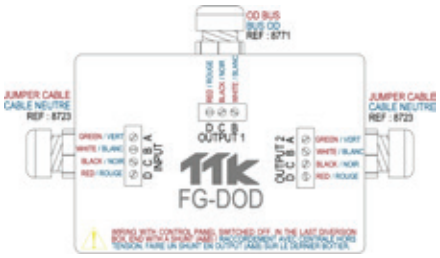


Figure 1.4.5 : Interface box FG-DOD cabling diagram

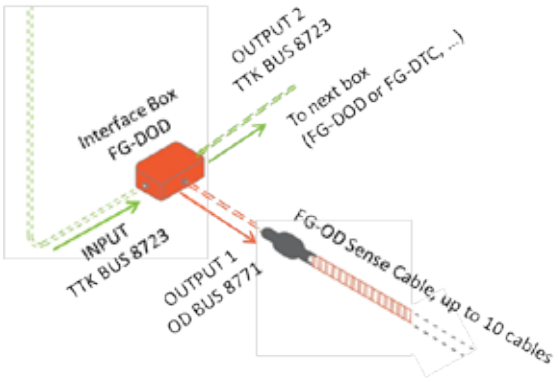


Figure 1.4.5.1: Connection of interface box FG-DOD

Layout Explanation (Figure 1.4.5.1):

- Up to 10 x FG-OD sense cables (on OUTPUT 1) can be connected to one interface box FG-DOD.
- On OUTPUT 2, diversion box or interface box can be connected.

- FG-DOD works as an interface between FG-NET digital unit (with TTK BUS 8723 output) and FG-OD sense cables (with OD BUS 8771 output).

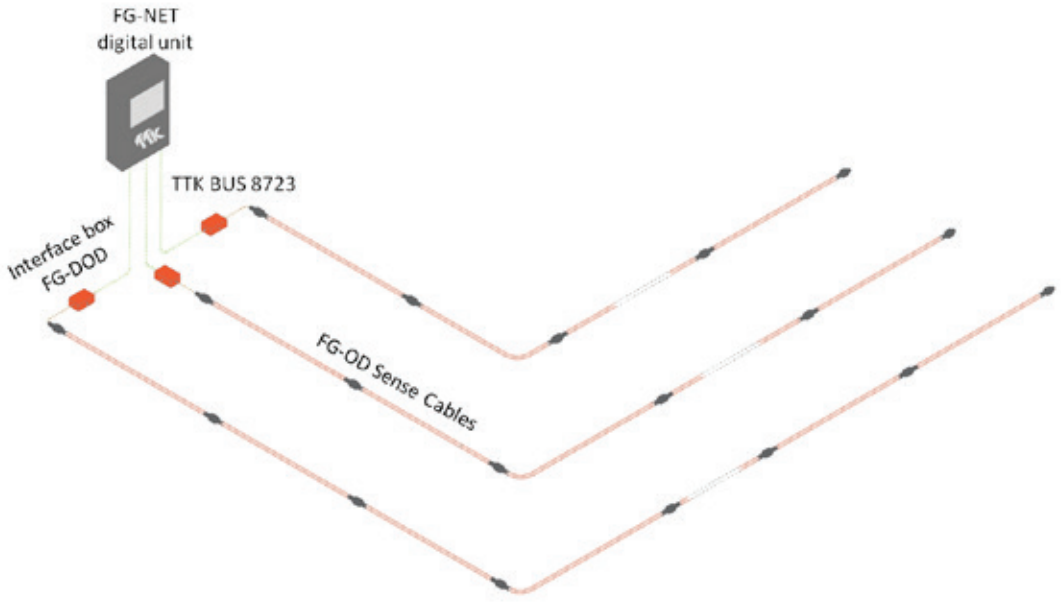


Figure 1.4.5.2: Layout of digital unit FG-NET and sense cable FG-OD using interface boxes FG-DOD

1.4.6 Point Sensor Diversion Box: FG-DOP

- FG-DOP is a point sensor diversion. It is a connection box for integration of the point sensor FG-ODP on an OD BUS 8771.
- More layout examples with FG-ALS4-OD see 1.3.2 on page 12.

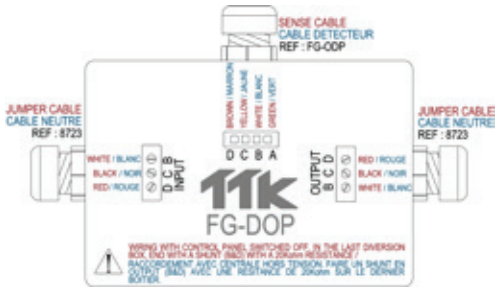


Figure 1.4.6 : Point sensor diversion box FG-DOP cabling diagram

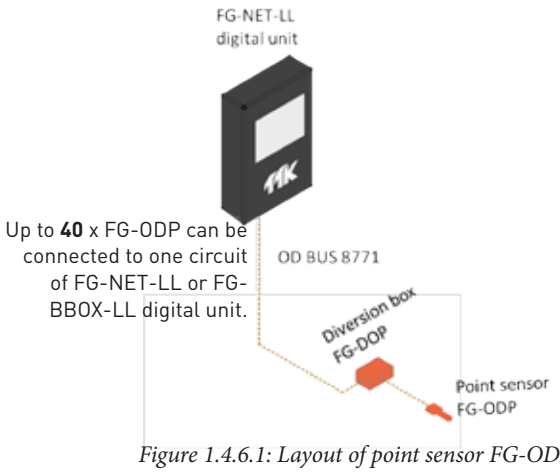


Figure 1.4.6.1: Layout of point sensor FG-ODP on FG-NET-LL digital unit using FG-DOP

1.4.7 Mixed Layout With FG-DOD & FG-DOP Boxes

- A mixed use of boxes FG-DOD and FG-DOP allows the connection of digital units with TTK BUS 8723 (FG-NET, FG-BBOX) outputs to point sensor FG-ODP.

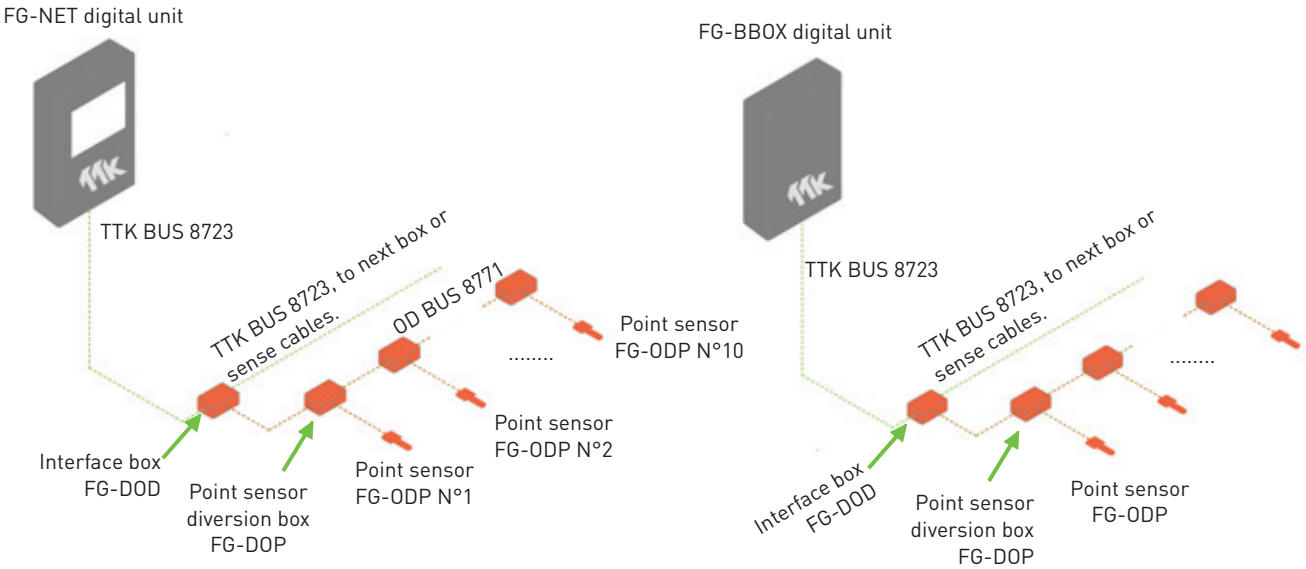


Figure 1.4.7 : Layout of mixed use of FG-DOD and FG-DOP boxes on FG-NET and FG-BBOX units

Layout Explanation (Figure 1.4.7):

- Up to **40** x FG-ODP can be connected to one circuit of FG-NET / FG-BBOX digital unit.
- Up to **10** x diversion box FG-DOP + point sensor FG-ODP can be connected on 1 interface box FG-DOD

1.4.8 Diversion Box: FG-DEx

- FG-DEx is OD BUS Diversion Box. This diversion box makes it possible to split a detection circuit into two parts, so as to allow the system to cover more horizontal space.
- It is similar to FG-DTC's function but designed for OD BUS 8771. and use **only** with end plugs reference FG-TMOX.

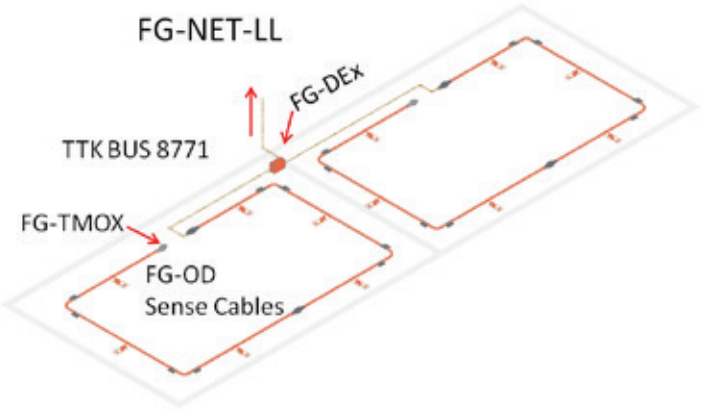


Figure 1.4.8 : Layout of diversion box FG-DEx

Layout Explanation (Figure 1.4.8) :

- FG-DEx box has split the circuit from FG-NET-LL digital unit into two parts.
- Up to **10** x FG-OD sense cables can be connected to one FG-DOD box.

1.5 Horizontal Layout On Three Outputs

FG-SYS / FG-NET Digital Unit has 3 outputs. They can be used for both horizontal and vertical installation for a larger extension. The layout presented below (figure 1.5) is a horizontal layout.

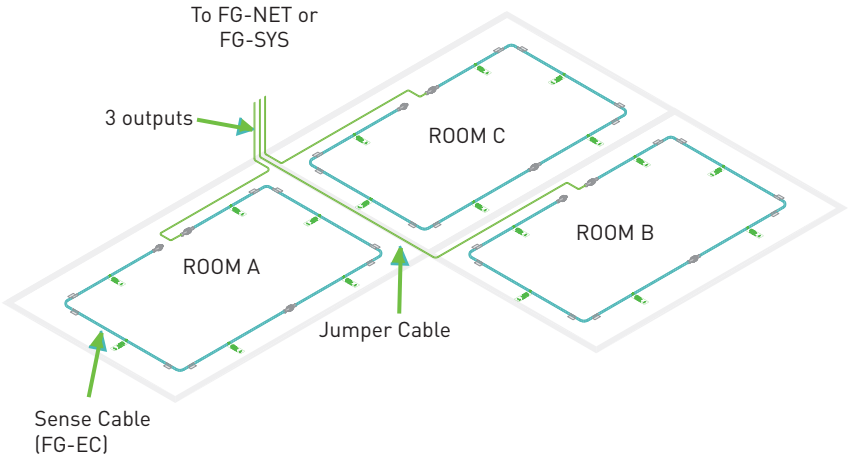


Figure 1.5 Horizontal layout

Layout Explanation (Figure 1.5) :

- The system uses all the three outputs of a FG-SYS / FG-NET unit.
- Each output starts from FG-SYS / FG-NET with jumper cable for wall passage till the zone of protection.
- Output 1 goes to room A;
- Output 2 goes to room B;
- Output 3 goes to room C.
- Each output is independent. Room A, B and C are totally independent.

Installation Tips (Figure 1.5) :

- Hold-down clips with adhesive are recommended every 1.5 metres or where required.
- An end termination is indispensable for the last sensing cable of one circuit.

1.6 Vertical Layout On Three Outputs

For a vertical installation in building environment, FG-SYS / FG-NET three outputs are designed for providing extensions to several floors.

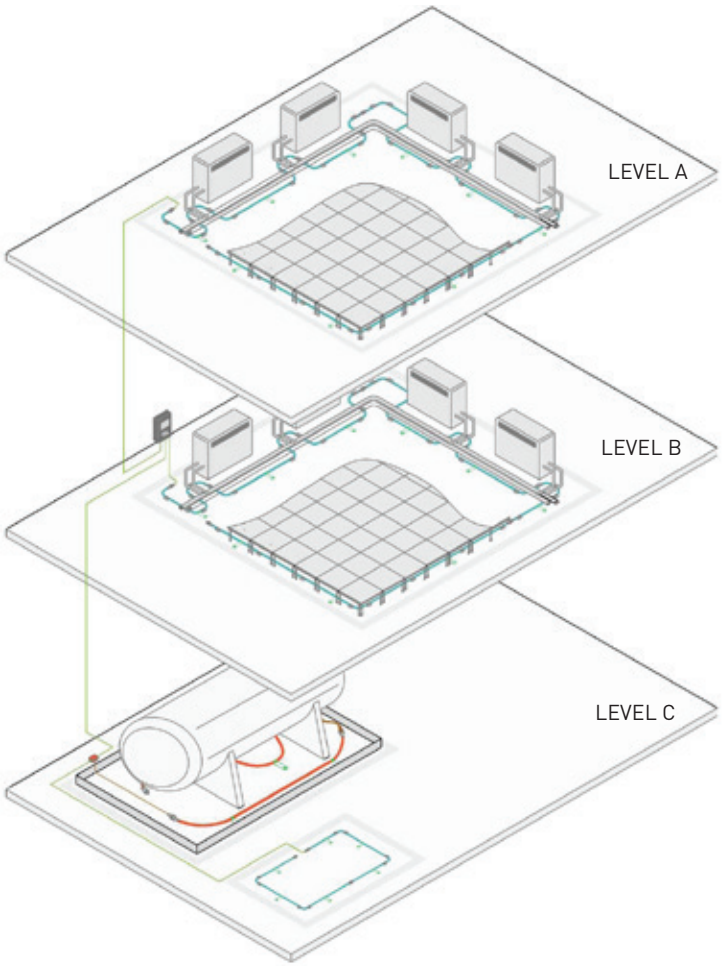


Figure 1.6 Vertical layout

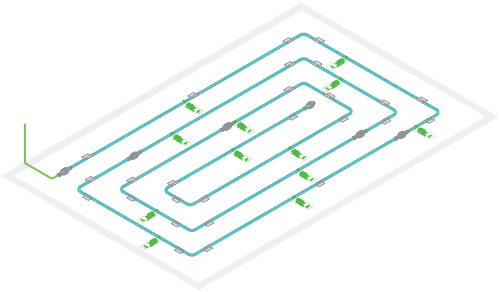
Layout Explanation (Figure 1.6) :

- A single digital panel is enough to manage sense cables installed on these three levels.
- Each output starts from FG-SYS / FG-NET with jumper cable for wall passage till the zone of protection.
- On level C, FG-DOD is used for the connection with FG-OD sense cable.
- Each output is independent. Thus floor A, B and C are totally independently under control, to ensure a best security.

1.7 Three Typical Digital Sense Cable Layouts

In order to fit different installation situation and client's requirements, TTK suggests three typical layouts to protect an area.

Extensive Density Protection

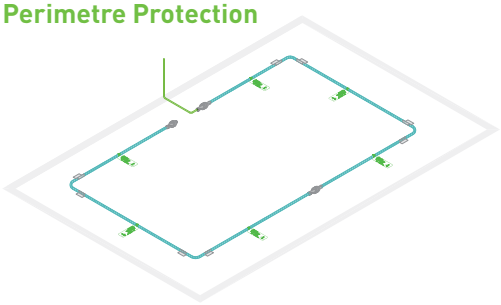


Typical 'very important place' extensive density protection, allowing perimetre and total floor coverage of the room.

Typical application:

Mission critical facilities, data center, hospital, emergency call center, airport control centre, expensive equipments/machines, UPS room, etc.

Perimetre Protection



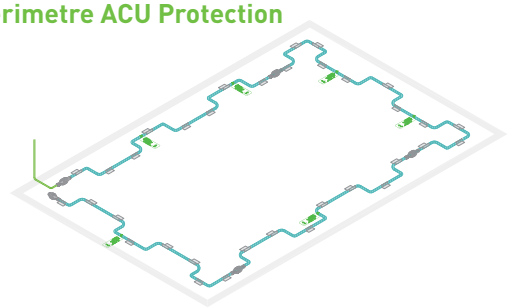
Typical and the most commun design for prevent external liquid leak come inside the protected zone.

Sensing cable typically installed about 1 metre from the walls.

Typical application:

Offices, archives room, kitchen, toilets, technical room, tank room, lift pit, etc.

Perimetre ACU Protection



Typical design for air-conditionners and leak possible objects, prevent leaks extend without acknowledge.

Sensing cable typically installed about 75cm in front of and near the air-outlet of machines.

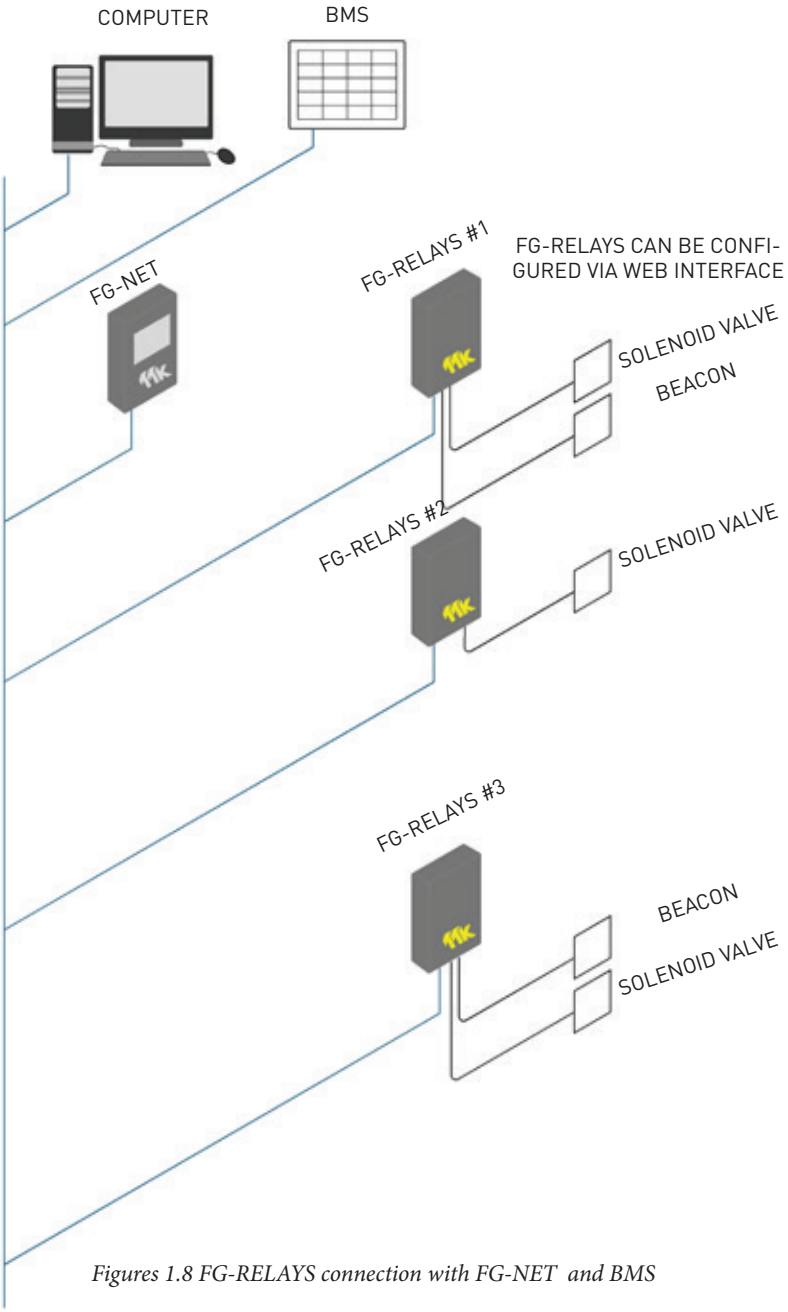
Typical application:

ACU room, comms room, vending areas, etc.

Figures 1.7 Three typical layouts

1.8 External Relays Box: FG-RELAYS

The FG-RELAYS is a digital external relays box. It works as a satellite device of the FG-NET digital unit. It adds a set of 24 configurable external relays to the FG-NET. It allows FG-NET to drive external devices such as solenoid valves, BMS signals, beacons and others, to react in case of leak or system alarms.



Figures 1.8 FG-RELAYS connection with FG-NET and BMS

Layout Explanation (Figure 1.8) :

- FG-RELAYS N°1, N°2,... N°16 are connected to FG-NET via Ethernet. They are presented as FG-RELAYS #1, FG-RELAYS #2 and so on displayed on the FG-NET Digital Unit.
- FG-RELAYS box status can be viewed on the FG-NET digital unit. In case of box disconnected, FG-NET displays an alarm and the general relay is activated.
- The FG-RELAYS is accessible via a web interface for configuration.
- Up to **16 FG-RELAYS** boxes can be managed by one FG-NET allowing for a maximum of 384 (24x16) additional relays.

PART 2 APPLICATIONS

2.1 Data Center, Air-Conditioner Room Applications

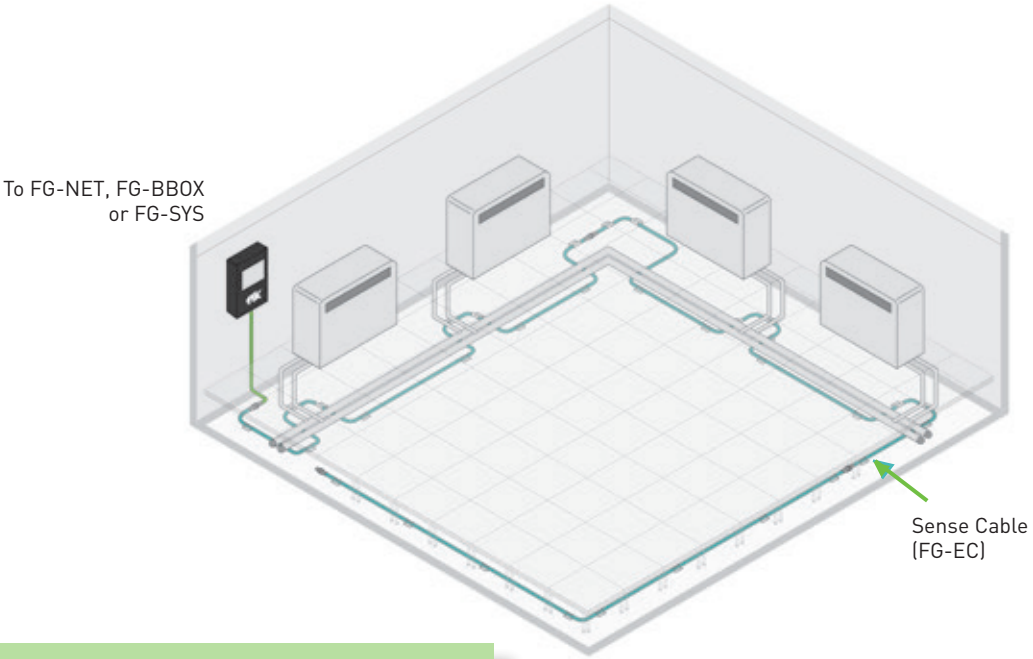


Figure 2.1

Layout Explanation (Figure 2.1) :

- Four Air Conditoner Uints (ACUs) are installed in the perimetre of the room.
- In this case, sense cables (FG-EC) are installed in the perimetre of the room and in front of the (ACUs).
- This installation is to prevent leaks from ACUs and prevent external leaks from entering the room.

Note:

- Suggest to place Sensing Cables 75cm in front of the air outlet of air-conditionning unit.

2.2 Technical Equipments

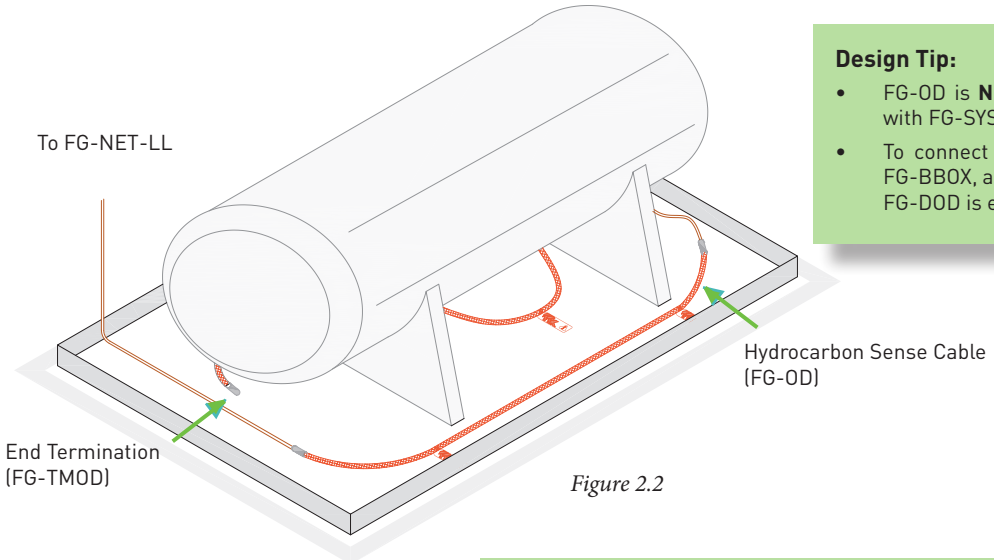


Figure 2.2

Design Tip:

- FG-OD is **NOT** compatible with FG-SYS digital unit.
- To connect to FG-NET or FG-BBOX, an interface box FG-DOD is enquired.

Layout Explanation (Figure 2.2) :

- This figure is a typical installation for fuel tank and generator.
- FG-OD sense cables are installed in the perimetre of the equipment.
- This installation is to prevent leaks from the technical equipment.
- For more information about the application examples of FG-OD, refer to hydrocarbon system Design Guides.

FG-OD Digital Oil Sense Cable:

- FG-OD detects the presence of liquids hydrocarbon and solvents.
- Fast response and re-usable after leak detection.
- Suitable for dangerous zones of explosive atmosphere – Zener Barrier: Ex ia IIB T4 Ga (ATEX "Zone 0").

2.3 Indoor Water Pipe Application

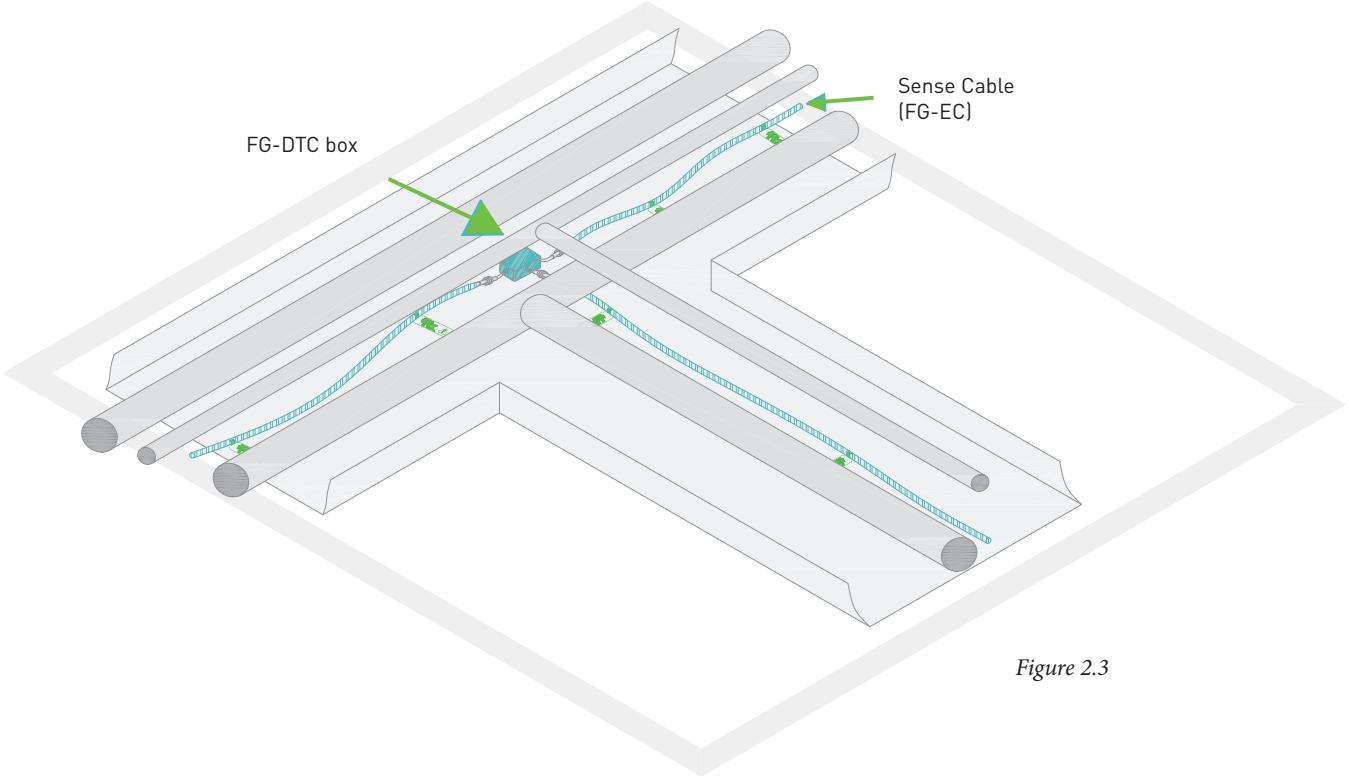


Figure 2.3

Layout Explanation (Figure 2.3) :

- Sense cables (FG-EC) are installed in the drip trays under pipes.
- This installation makes sure an immediate detection for any leak from the pipe.
- Diversion box allows the circuit extends to two parts so as to cover more pipes.

For pipe with insulation (without drip tray), figure 2.3.1 et figure 2.3.2 present two kinds of water sensing cable installation.

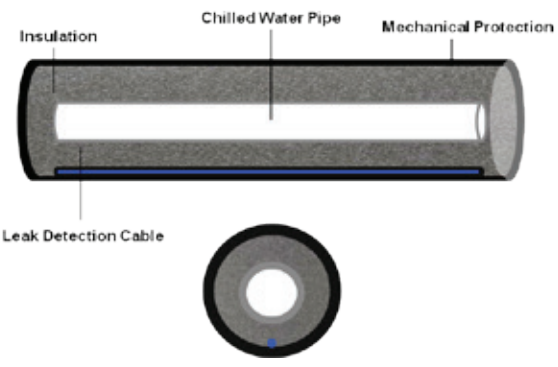


Figure 2.3.1

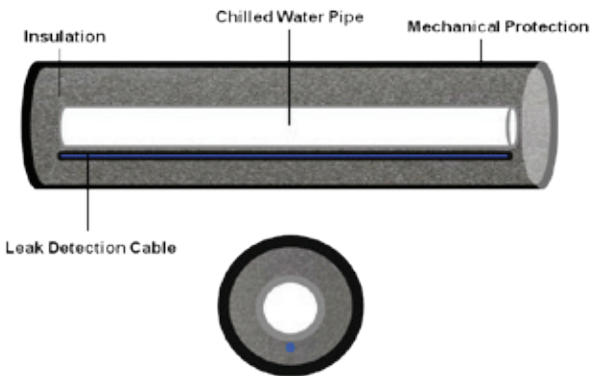


Figure 2.3.2

Layout Explanation (Figure 2.3.1 & Figure 2.3.2) :

- The sense cable is installed in the insulation level, near the mechanical protection (Figure 2.3.1);
- The sense cable is installed in the insulation level, under the water pipe (Figure 2.3.2).
- Both installations assure an immediate detection for any leak from the pipe, the typical application when the pipes are not equipped with the drip tray.

2.4 Application for Several Levels in One Building

FG-SYS / FG-NET locating systems are flexible, from a small area to several big areas, they fit the situation. Both systems have unique advantages in multiple level buildings.

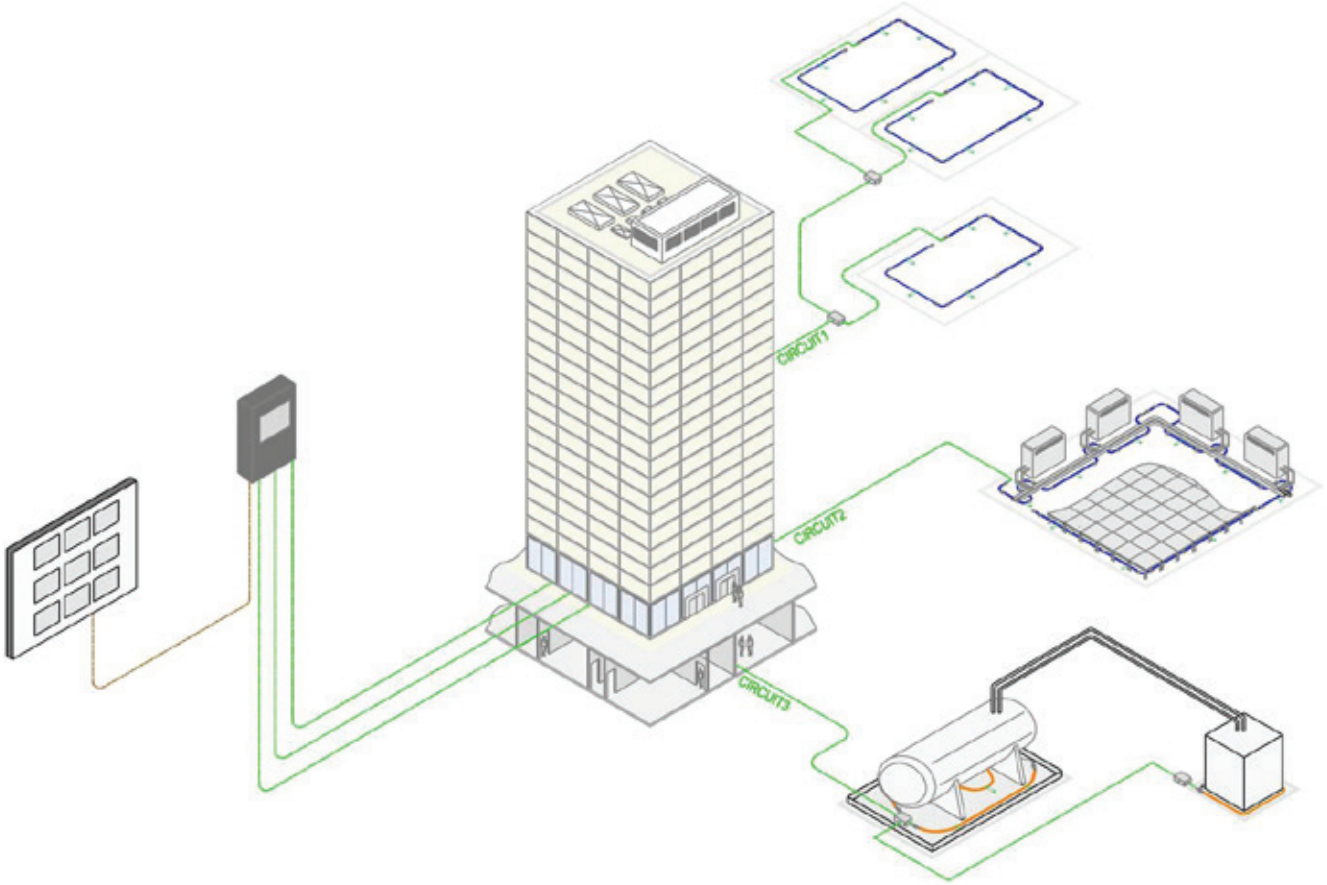


Figure 2.4

Layout explanations (Figure 2.4) :

- The digital unit uses 3 outputs to go to different levels, thus to cover all places that need protection in the whole building.
- Each output has capacity till 600m cables, thus in total 1800m cables can be connected to only 1 digital unit. FG-NET can connect with satellite devices FG-BBOX (up to 1200m of sense cables per device, ref to chapiter 1.7)
- Three possibilities to exploit the information on the digital unit:
  - RJ45 port for connecting network-Protocol TCP / IP;
  - RS232 or RS422/485series links - JBUS / ModBUS protocol;
  - 9 relays: 8 fully configurable relays and one specific relay for power failure.
- The alarm panel is installed in ground floor security office for supervising the whole building.