

DUOX<sup>plus</sup>






**FERMAX**

DUOX PLUS SYSTEM

INSTALLATION AND SYSTEM QUICK GUIDE

en.

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## 1 INTRODUCTION

DUOX PLUS is the first fully digital video door entry system in 2 non-polarized wires along the entire installation, versatile, flexible and scalable; capable of success in any type of project.

Recommended for both new and replacement installations. DUOX PLUS is a highly flexible system that can be installed with many types of cables without the need to install intermediate elements in most cases.

For both audio and video, the DUOX PLUS system is installed in the same way, allowing the user to choose which terminal they prefer in their home, a telephone or a monitor. Additionally, it is the only system in 2-wires that allows **two communication channels in the same block**, meaning two panels calling two different apartments at the same time.

DUOX PLUS can include in the same project:

- Up to 999,999 addresses (apartments).
- Up to 10 general entrance panels + 10 panels per block + 10 sub-block/stair panels.
- Up to 100 blocks and/or stairs all in one system.

**The fact that it is digital allows the simplest and most frequent installations to be carried out without intermediate elements in the main riser, but it also permits to be adapted to all types of topologies and distances using additional accessories**, making it possible to succeed with guarantees from small individual buildings to large residential projects with distances of up to 2km between the panel and the furthest terminal. All in a 2-wires system.

In this guide we will explain **basic installations** (without intermediate elements), their **installation rules** and **limitations** in order to be able to make a quotation and install them in a satisfactory way. In addition, we include examples of basic and extended typical installations that will be shown as a reference.

## 2 THE DUOX PLUS SYSTEM: DEFINITIONS AND CONCEPTS

### 2.1 OUTDOOR PANELS

External devices that are installed at the entrance to our building and that allow us to **call** the apartments, **communicate** with them and **open the door**, among other features. There are a large number of models with different characteristics:

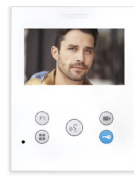


## 2.2 TERMINALS (Audio & Video)

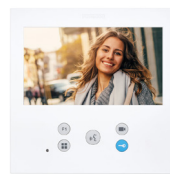
Internal devices installed in our homes that receive calls from the outdoor panels.



Ref. 9445  
Ref. 9446 Wi-Fi



Ref. 9448  
Ref. 9449 Wi-Fi



Ref. 9468  
Ref. 9469 Wi-Fi



Ref. 3444



Ref. 3452

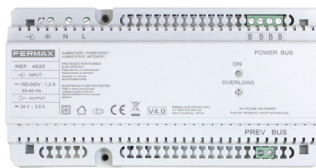


Ref. 3450

## 2.3 POWER SUPPLY

Power supply devices that turns on the video door entry system.

Ref. 4825



Ref. 4840



## 2.4 ADAPTATION

DUOX PLUS is a digital system which only works on 2 wires. For its correct performance it requires adaptation in some points of the installation so that the signal is not reflected and therefore we can obtain the best quality. This adaptation is done with “**ADAPTERS**” which are small elements that we will place in certain points of the installation. Some DUOX PLUS products do also have this adaptation integrated, so in some cases we can select the type of adaptation required in the device itself.

Ref. 3255

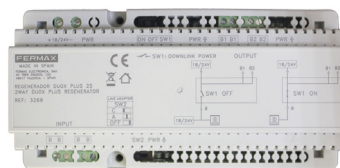


## 2.5 OTHER INSTALLATION ELEMENTS

Optional element that allows to give more functionality and capacity to the system.

### REGENERATORS:

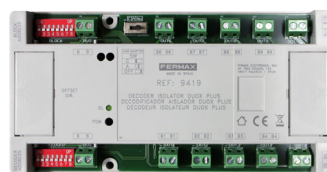
Ref. 3269



Ref. 3268



### DECODER:



Ref. 9419



Ref. 9425

### Additional RELAYS:

Ref. 3233



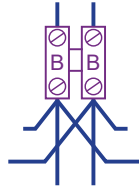
Ref. 3267



\*For more information and details on DUOX products, please consult our catalogue and our website [www.fermax.com](http://www.fermax.com).

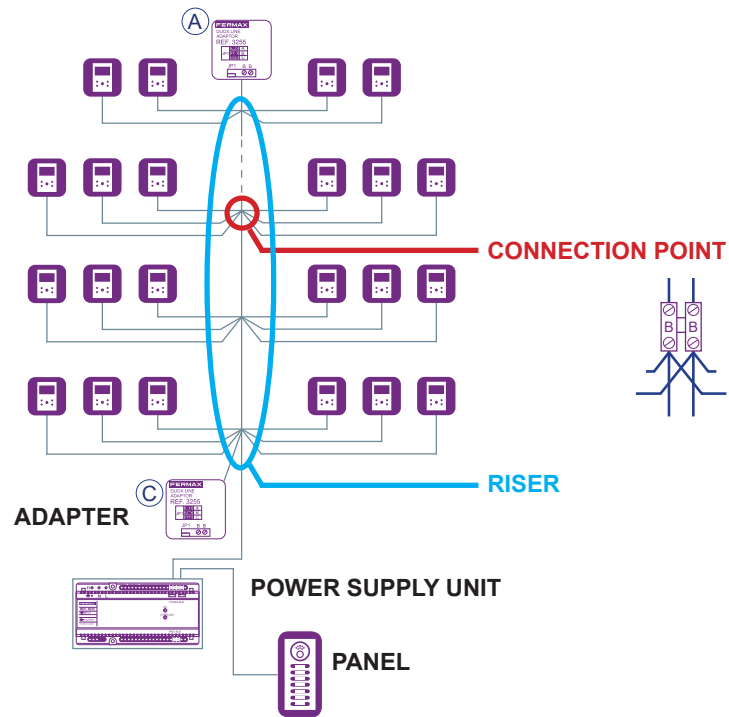
## 2.6 CONNECTION POINT

It is a point where we connect several cables without intermediate elements and it divides the connection into several 'paths'.



## 2.7 RISER

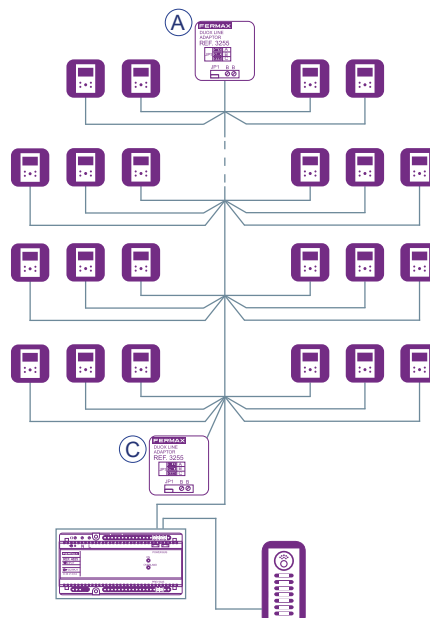
It is the main cable that usually connects several floors or long distances. Our backbone of the system where we will find the CONNECTION POINTS.



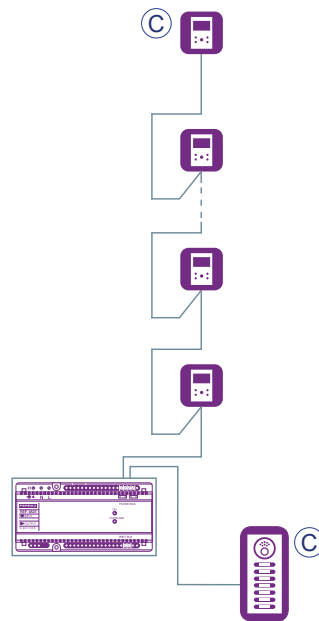
## 2.8 TOPOLOGY

This refers to the way in which we are going to connect our DUOX PLUS installation. There are 3 main types: **DISTRIBUTION**, **CASCADE** and **STAR**.

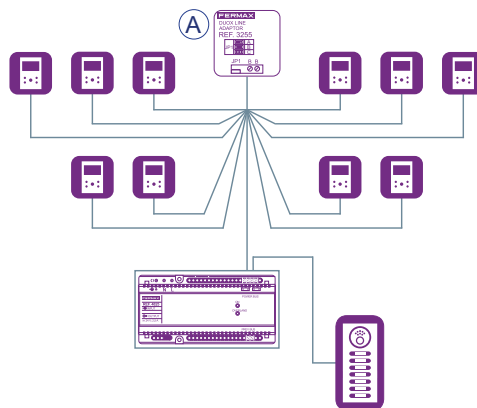
**DISTRIBUTION:** A distribution per floor, with one or more RISER(S) incorporating several CONNECTION POINTS in which we will connect/branch our TERMINALS.



**CASCADE:** A cascade with one or more RISER(S) with NO CONNECTION POINTS, but where the TERMINALS are connected from one to the other directly in series.



**STAR:** This is a topology consisting of ONE CONNECTION POINT (no riser) where MORE THAN 6 TERMINALS and up to a maximum of 10 are connected.



*\*Each of these topologies does have different rules and best practices of installation which will be discussed later in this guide with clear and defined examples.*



## 3 BASIC INSTALLATIONS

**These are installations that do not require intermediate elements.** These installations have some limitations and general concepts to be taken into account.

### 3.1 GENERAL RULES FOR BASIC INSTALLATIONS

For a proper operation of the system **without intermediate elements (basic installations)**, it is recommended to consider the following guidelines and limitations that apply to **audio, video** and **mixed** installations:

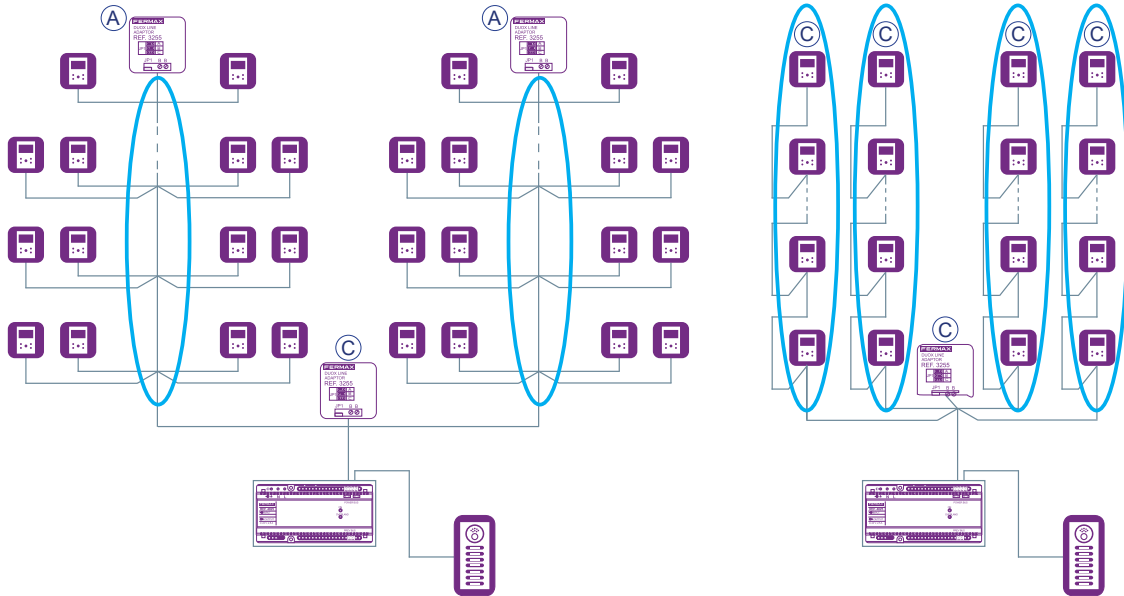
#### 3.1.1 TERMINALS

A basic DUOX PLUS installation consists of a maximum of 30 TERMINALS, either telephones or monitors.

#### 3.1.2 RISERS

A basic installation can be divided into several RISERS.

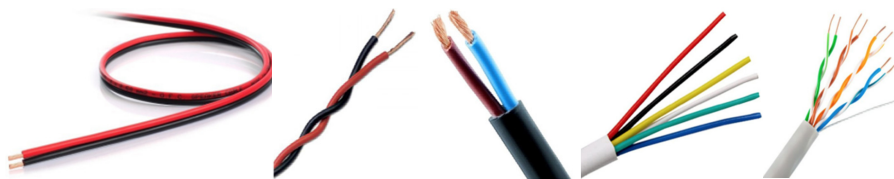
- **DISTRIBUTION** = Up to 2 RISERS maximum.
- **CASCADE** = Up to 4 RISERS maximum.



### 3.1.3 WIRING

DUOX PLUS allows the use of many types of wiring as long as they comply with minimum quality characteristics. For the correct operation of the system, FERMAX recommends:

- Parallel or Twisted cable in different cross-sections (1mm<sup>2</sup>, 0.5mm<sup>2</sup>)
- CAT5 (0.2 mm<sup>2</sup>)



**NOTE:** For other replacement cables (loose wires or telephone cable) please consult our technical department. With these types of cable, additional installation elements such as additional sources or regenerators may be required to ensure correct operation of the system with the highest quality.

#### Important wiring considerations.



We do not recommend at all bad quality cable with high % of aluminium. This may affect to the DUOX PLUS and the quantity of power supplies needed due to voltage drops. We do recommend only **copper cable**.



Use **only 1 BUS within the same cable**. For example, 1 cable with 4 wires should not be used to make 2 BUSES or RISERS (B/B and B/B).

RISER 1  
B/B



RISER 2  
B/B

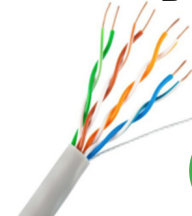


It is highly recommended to keep the **same type of cable and the same cross-section throughout the installation**. In case this is not possible, we may need some additional element installed in the RISER such as decoder or regenerator.



In **CASCADE** installations, it is possible to “join 2 wires” (doubling section) to increase the cross-section, but always maintaining the same cross-section throughout the installation. I.E. If we double the cable, it is recommended to double it in the whole installation.

B B



### 3.1.4 POWER SUPPLY UNIT

A POWER SUPPLY SET is required to power the system according to the following table:

Cable Section	DISTRIBUTION					
	NO WIFI			WIFI		
	VEO	VEO - XS	VEO - XL	VEO	VEO - XS	VEO - XL
1.0 mm <sup>2</sup>	40	40	34	28	28	24
0.5 mm <sup>2</sup>	38	36	30	24	24	22
CAT5	32	22	20	18	18	12

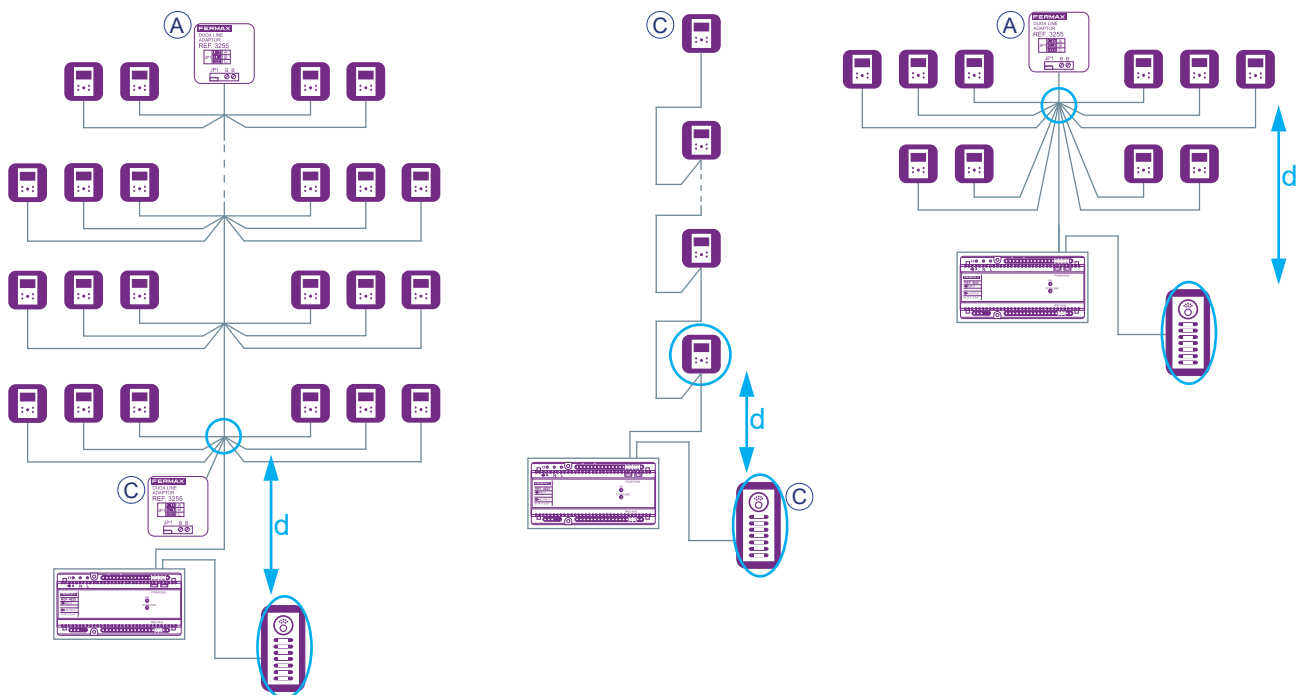
Cable Section	CASCADE					
	NO WIFI			WIFI		
	VEO	VEO - XS	VEO - XL	VEO	VEO - XS	VEO - XL
1.0 mm <sup>2</sup>	40	36	30	26	22	20
0.5 mm <sup>2</sup>	32	28	22	20	18	14
CAT5	16	12	10	12	10	8

\*For telephones, we can consider the same as NO Wi-Fi VEO Monitors

### 3.1.5 MAX CABLE DISTANCES in BASIC INSTALLATIONS.

Distance (d) OUTDOOR PANEL to the first CONNECTION POINT:

The **distance** between the **OUTDOOR PANEL** and the **first CONNECTION POINT** is key for a successful DUOX PLUS installation.



This distance depends on the number of risers regardless the type of cable used.

MAXIMUM DISTANCE OUTDOOR PANEL to 1st CONNECTION POINT				
CASCADE 1 RISER	CASCADE 2-4 RISERS	STAR	DISTRIBUTION 1 RISER	DISTRIBUTION 2 RISERS
55 m	25 m	30 m	55 m	35m

### Distance between CONNECTION POINTS.

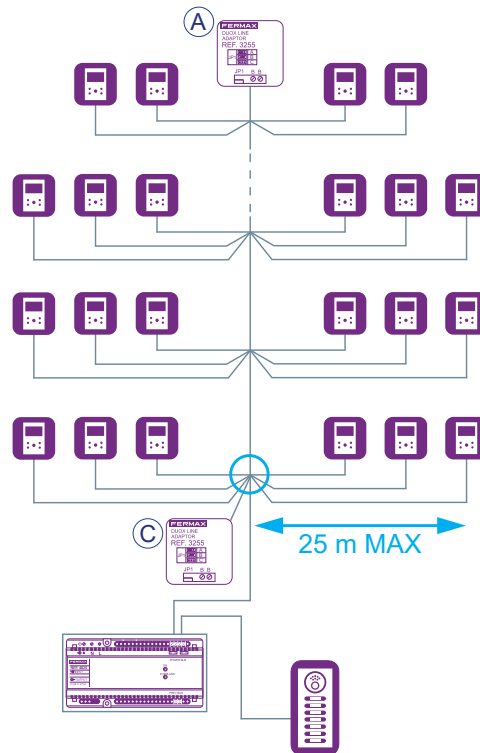
A **minimum distance of 3 meters** between the different **CONNECTION POINTS** is always recommended.



Distance and number of apartment TERMINALS to each CONNECTION POINT.

#### DISTRIBUTION:

In a plant layout topology, a maximum of: **6 TERMINALS per CONNECTION POINT**. The maximum distance from a TERMINAL to the furthest CONNECTION POINT shall not exceed **25m**.

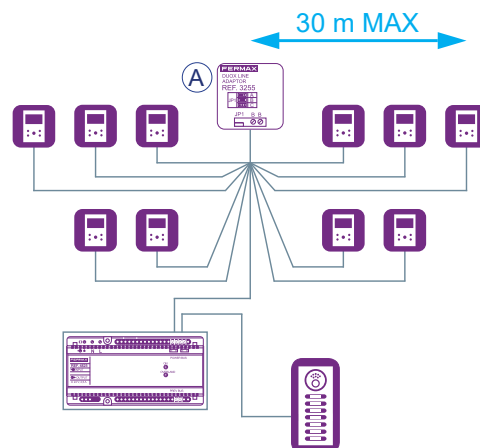


#### CASCADE:

In this case it does not apply, because in a cascade each terminal is the connection point.

#### STAR:

In a star distribution topology, a maximum of: **10 TERMINALS** in the CONNECTION POINT. The maximum distance from any apartment TERMINAL to the furthest CONNECTION POINT shall not exceed **30m**.



### 3.1.6 OUTDOOR PANELS

A basic DUOX PLUS installation is based on **1 OUTDOOR PANEL** connected to the system. In case of more panels are needed, we can add a regenerator **Ref.3269** or **Ref.3268**. The distance from OUTDOOR PANEL to the first CONNECTION POINT must not exceed the distance (d) specified in the previous point (3.1.5).

### 3.1.7 ADAPTATION

Any DUOX PLUS installation always requires adaptation. This is done with line ADAPTERS (**Ref.3255**), small and easy-to-install devices that allows the DUOX PLUS signal to achieve good quality signal transmission.

ADAPTATION requires configuring our line adapters in **mode "C" or mode "A"** (easily selectable) depending on the topology used. A brief explanation of these modes would be:

Mode “C” is a soft adaptation that allows the line to be adapted while absorbing little signal power. It is the most commonly used mode in a bus or CASCADE topology.

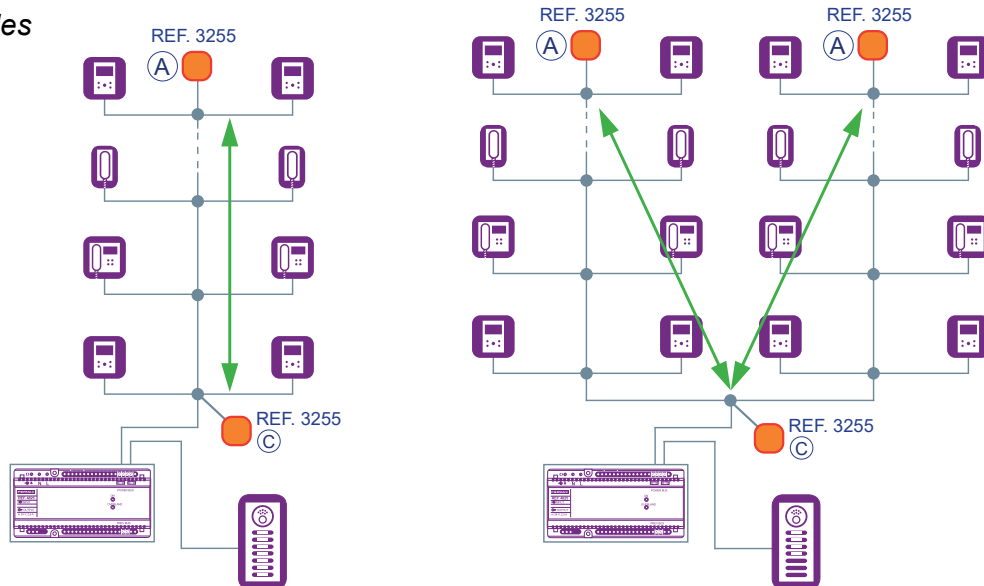
Mode “A” is a higher resistance adaptation, which absorbs more signal power. This is the mode we generally use when there are derivations in the installation to absorb such reflections that can be produced. This is common in DISTRIBUTION and STAR topologies.

**DISTRIBUTION TOPOLOGY:**

**C** at the FIRST POINT OF CONNECTION.

**A** at the LAST POINT OF CONNECTION.

*Examples*



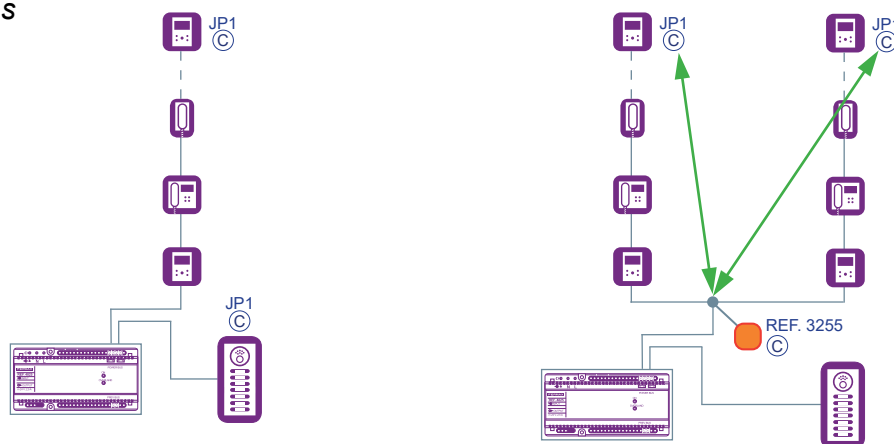
**NOTE:** In basic installations, we will not adapt the OUTDOOR PANEL in this type of DISTRIBUTION topologies.

**CASCADE TOPOLOGY:**

**C** at the FIRST CONNECTION POINT / ELEMENT (Panel or Terminal).

**C** at the LAST CONNECTION POINT / ELEMENT (Panel or Terminal).

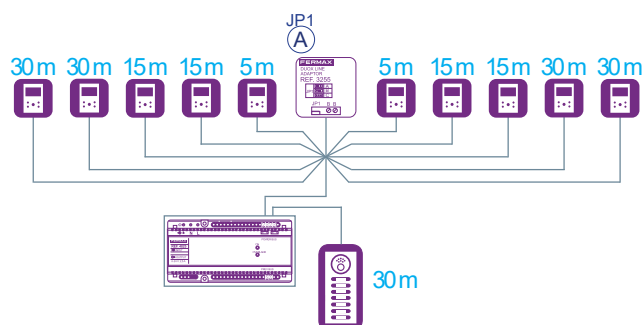
*Examples*



**STAR:**

**A** at the single CONNECTION POINT.

*Examples*

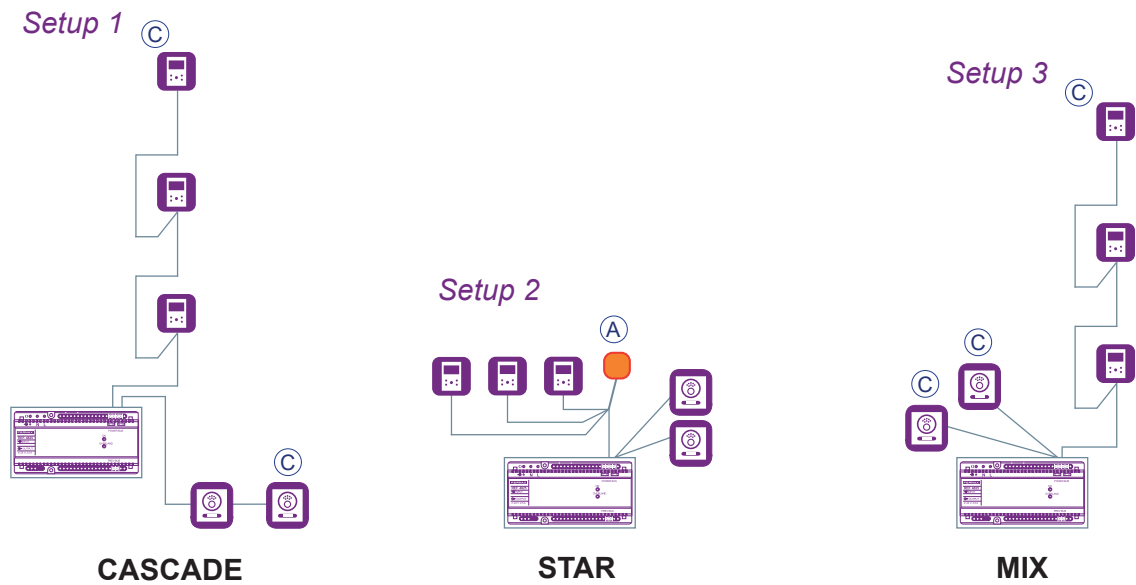


**NOTE:** The elements of the DUOX PLUS system (PANELS, TERMINALS and OTHER ACCESSORIES) do also have integrated line adapters we can use mainly in CASCADE topologies.



**EXTENDED KITS:**

In KITS we can recommend both Star or Cascade topology using up to 2 panels and several monitors (DUOX PLUS Supports up to 3 terminals in the same apartment/kit).



CASCADÉ				
Cable	Max Distance: Monitor - Monitor	Total Distance: Monitor - PSU	Distance: Panel - Panel	Max Distance: Panel - PSU
1.0 mm <sup>2</sup>	50 m	150 m	100 m	200 m
CAT5	30 m	90 m	60 m	120 m

STAR		
Cable	Max Dist: Panel/Monitor - Connection point	Max Distance: Panel/Monitor - PSU
1.0 mm <sup>2</sup>	30 m	100 m
CAT5	30 m	60 m

MIX (monitors CASCADÉ and panels STAR)			
Cable	Max Distance: Monitor - Monitor	Total Distance: Monitor - PSU	Max Distance: Panel - PSU
1.0 mm <sup>2</sup>	50 m	150 m	100 m
CAT5	30 m	90 m	60 m

*\*In Kits, we consider that the connection point is next to the PSU (recommendable).*

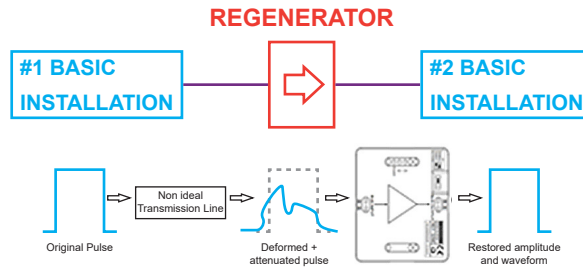
## 4 EXTENDED INSTALLATIONS

We consider **extended installations** those that exceed any of the limitations mentioned above for basic installations. These installations need intermediate elements such as **REGENERATORS** and/or **DECODERS** that will help us to carry out any type of installation that we may find.

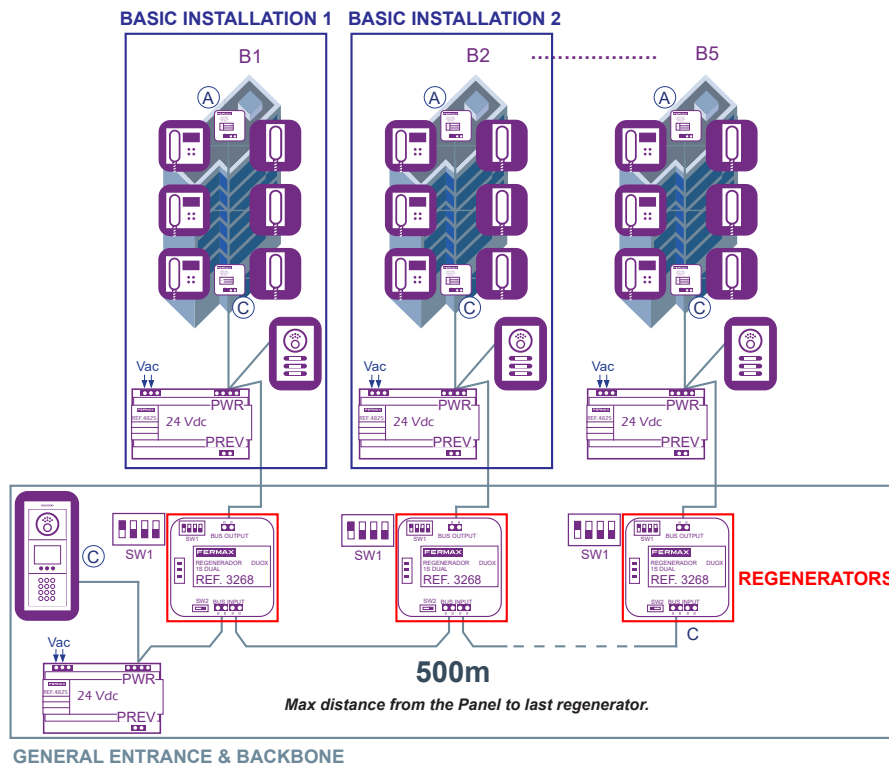
### 4.1 REGENERATORS

They are devices that recycle or regenerate the DUOX PLUS signal when it is weak or deteriorated. The main concept is simple: They allow us to divide a complex installation into several basic installations mentioned in the previous section of this Quick Guide.

At the output of a regenerator we can consider that we have a new **basic installation** in which we can apply the same rules learned before. Basically this device achieves to recover a poor quality signal and replicate it correctly at its output.



A regenerator allows us to “link” basic installations (with the concepts seen above) and it allows us to “extend” the limitations of the system in a very flexible way. In addition, it is important to note that this device **REGENERATES in two-ways from input to output and viceversa**, and also **between outputs** in case of the 2-output regenerator Ref.3269. A very typical case of use of regenerators is an installation of several basic blocks linked to a general entrance:



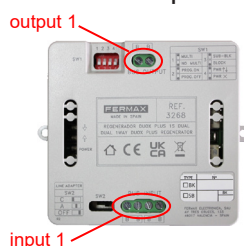
In this case, the regenerators divide each block into small basic installations. At the signal level, they are independent of each other, but they are all connected to a general cable leading to 1 general input board, called “backbone” or general entrance BUS.

## 4.2 TYPES OF REGENERATORS

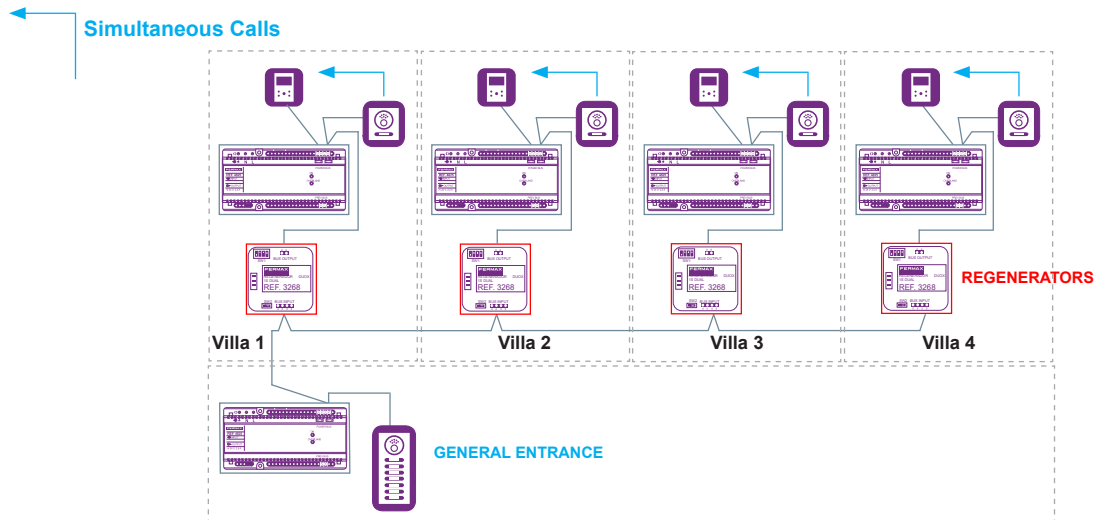
### 4.2.1 ONE OUTPUT / MULTICHANNEL Regenerators Ref.3268

They are regenerators consisting of **one input** and **one output**.

These regenerators are also ideal for installations of several blocks or houses with a general entrance, as they can be configured as “**Standard**” or “**Multichannel**” to separate the **communication channels**. So each block / house can have their own and independent call/conversation at the same time.



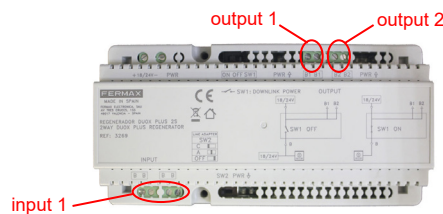
The output of the regenerator can create an independent communication channel. For example, simultaneous calls would be allowed as follows:



Remember that in DUOX PLUS we can have **2 conversation channels** on each block due to the multichannel regenerator.

### 4.2.2 Regenerators with 2 OUTPUTS Ref.3269

They are regenerators with **one input** and **two outputs**.



They incorporate a 24Vdc input to connect a DUOX PLUS Ref.4840 power supply and distribute current between its inputs and outputs.

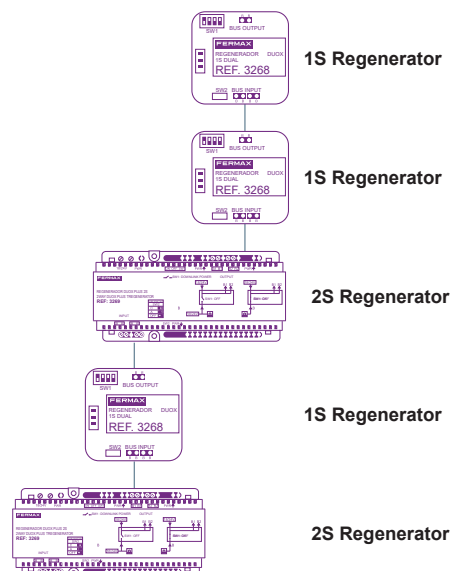
Its 3 points (input and outputs) make it very versatile as it always regenerates from one point to any other. However, unlike the 1-output regenerator Ref.3268, it **does not make the communication channels independent**.

## 4.3 REGENERATORS - Good practices

When it comes to the connection of regenerators, there are a number of key concepts that must be taken into account.

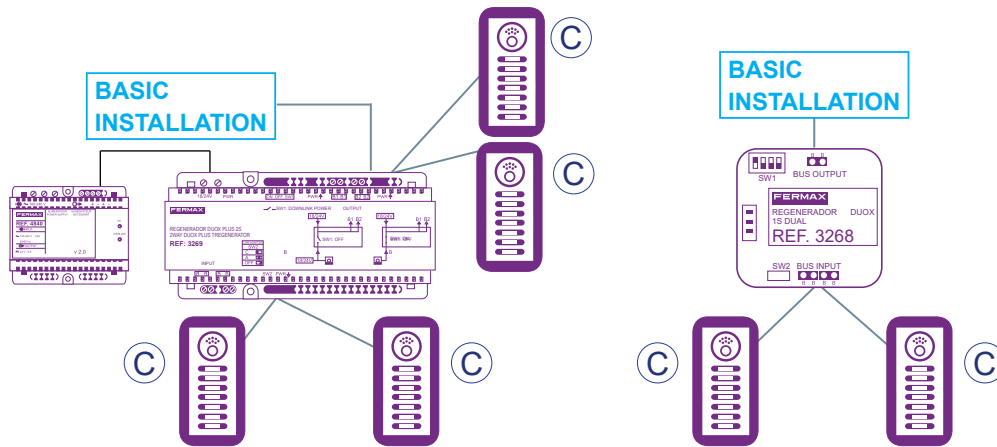
### 4.3.1 Maximum number of regenerators.

**A maximum of 5 regenerators** can be connected **in CASCADE** (input-output-input-output...). These regenerators can be of both types mixed:



### 4.3.2 Maximum number of OUTDOOR PANELS per regeneration point.

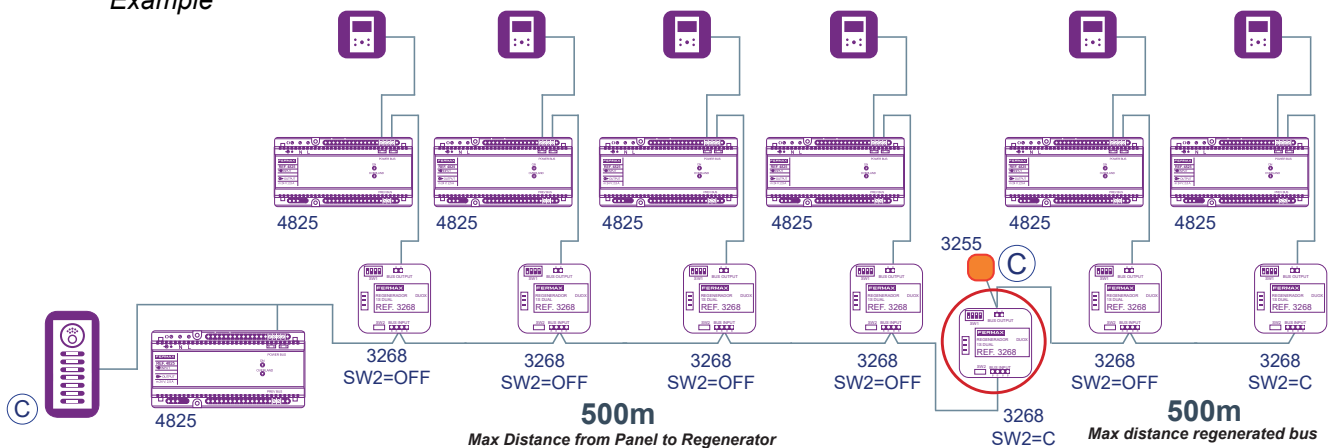
We can connect up to a **maximum of 2 OUTDOOR PANELS** to the input or output of a **REGENERATOR**. In this case, **adaptation as follows: "C"** on each **OUTDOOR PANEL**.



### 4.3.3 Maximum number 1W REGENERATORS Ref.3268 in parallel (BUS).

In case of **standard** configuration (not multichannel) the maximum number of 1W regenerators **Ref.3268** in parallel is **4 units**, afterwards, it is necessary to add a regenerator in the bus as a signal booster.

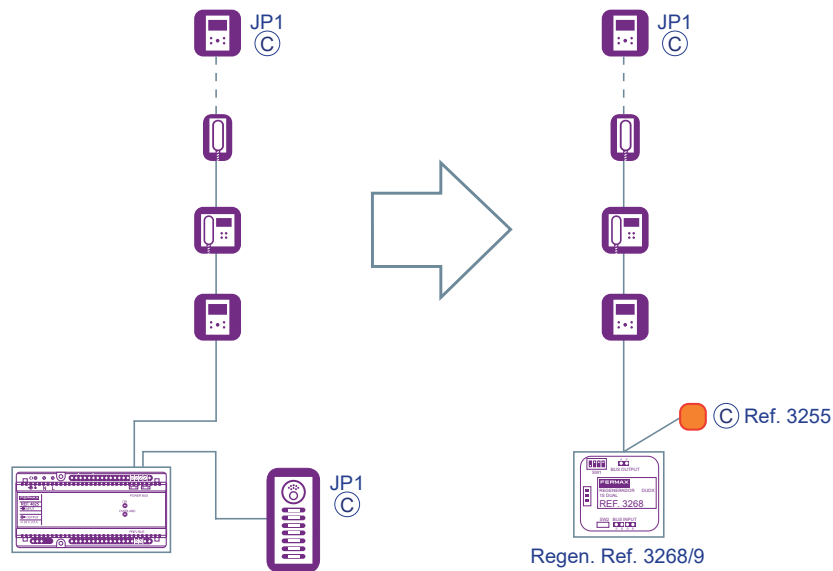
Example



This is necessary only when using 1W Regenerators **Ref.3268** as “Standard”, not “Multichannel”. If the one output regenerators are configured in multichannel mode, you can install as many as you want.

### 4.3.4 Regenerators and CASCADE Topologies.

In the same way, in a “CASCADE” topology, the panel is the first element in which we place our line adapter, Or when we use regenerators, the output of the regenerator is actually the first element in our BUS, so the line adapter must be placed as follows:

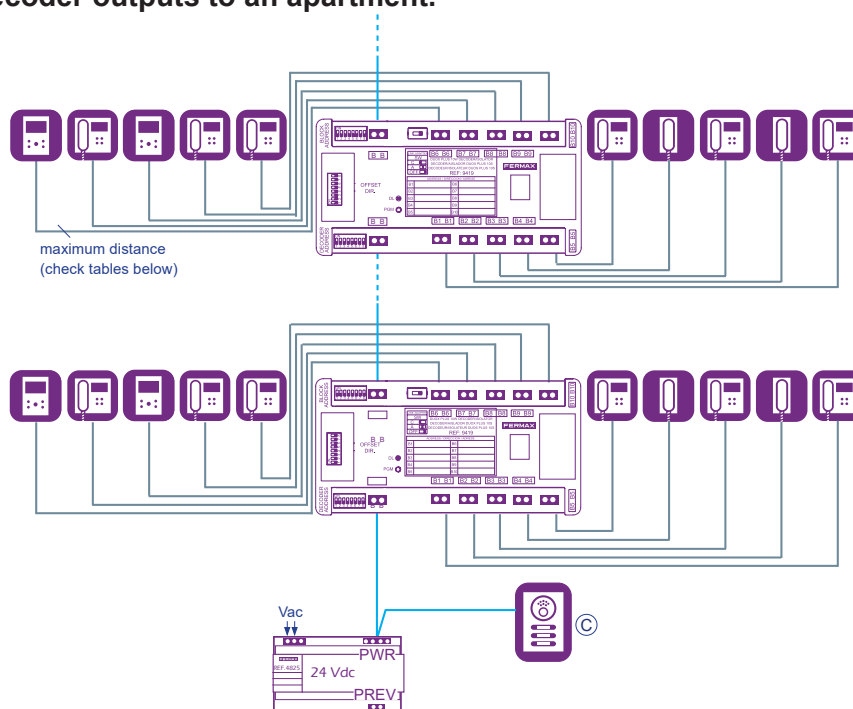


## 4.4 DECODERS

**DECODERS** are intermediate elements that allow us to connect point-to-point terminals with greater flexibility and greater distances without affecting the signal. **They are very useful in the following cases:**

- When we need to install more than 6 terminals per floor in our building.
- When the distance from the terminals to the riser is larger than 25m.
- Or when we do not know this distance at all.
- When cable types of different cross-sections are mixed.
- When all of the cables of the replacement installation go to a single point.

A decoder allows a very simple quotation of the system and the concept is very basic: **We will connect each of the decoder outputs to an apartment.**



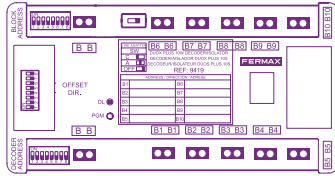
**It is not a mandatory element** in DUOX PLUS, as we can carry out basic installations following the rules mentioned in this guide, but they are very useful when we have no information about the installation or when we want to extend distances from riser connection points to the apartments. Additionally, they give some extra advantages such as:

- **No need to program the terminals:** The decoder can automatically program the terminals connected to it by just pressing its PGM button.
- **Electrical isolation of each apartment:** In case of short circuit the decoder will restart the installation and isolate the output in which the short circuit is located.



## 4.5 TYPES OF DECODER

### 4.5.1 DECODER with 10 outputs Ref.9419



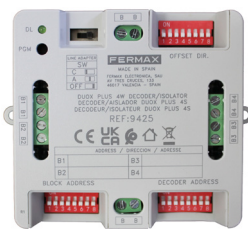
Cable section	Max. dist.
1 mm <sup>2</sup>	100 m.
0,5 mm <sup>2</sup>	50 m.
CAT5	20 m.

Device in which we can connect 10 apartments, one to each output with **up to 3 terminals in each apartment** (3 terminals per output), with maximum distances depending on the cable used. Size DIN10.

*Note: Depending on the terminal and cable distance, an additional power supply may be required to connect 3 terminals. Max. current supported per output = 1.1Amp*

It isolates at signal level and electrically each output allowing a total independence from the terminals installed in the system. *I.E. A disconnection or a short circuit in any output will not affect the rest of the installation.*

### 4.5.2 DECODER with 4 outputs (Ref.9425 \*Not yet available)



Cable section	Max. dist.
1 mm <sup>2</sup>	100 m.
0,5 mm <sup>2</sup>	50 m.
CAT5	20 m.

Same as the previous one, but smaller version. Device in which we can connect **4 apartments**, one to each output with up to **3 terminals in each apartment** (3 terminals per output), with maximum distances depending on the cable used. Size DIN4.

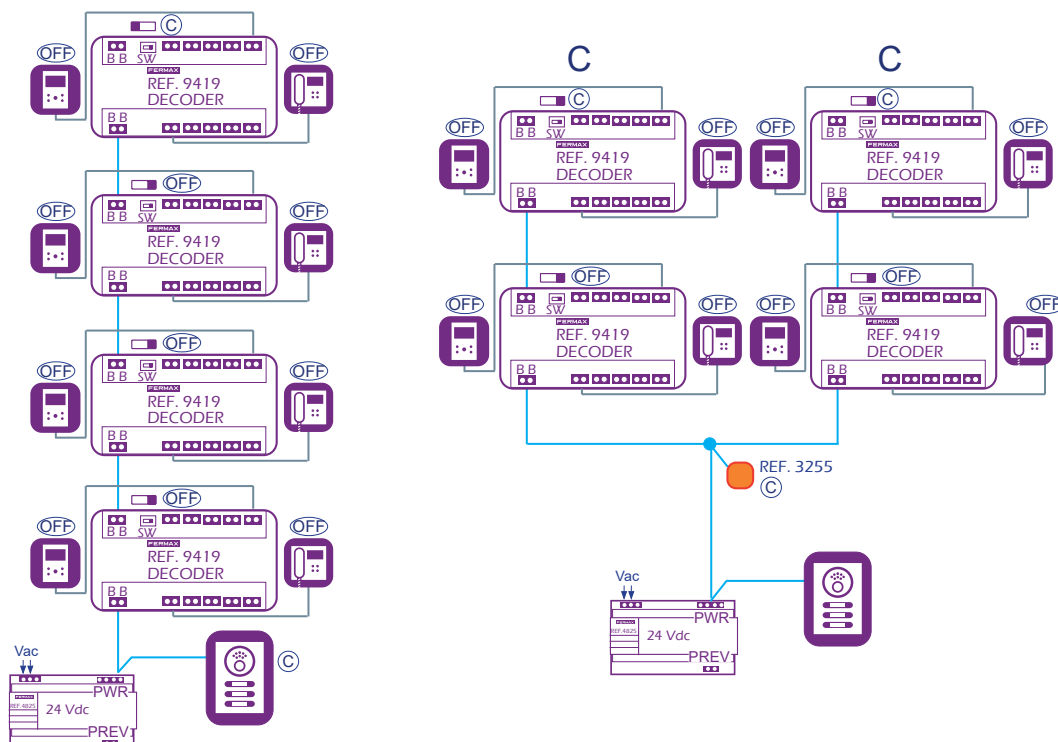
*Note: Depending on the terminal and cable distance, an additional power supply may be required to connect 3 terminals. Max. current supported per output = 1.1Amp*

**It isolates at signal level and electrically each output** allowing a total independence of the housing terminals in the system. *I.E. That is, a disconnection or short circuit at any outlet will not affect the rest of the installation.*

## 4.6 ADAPTATION OF DECODERS and maximum quantity

ADAPTATION using decoders is considered as a **CASCADE** (“C-C”).

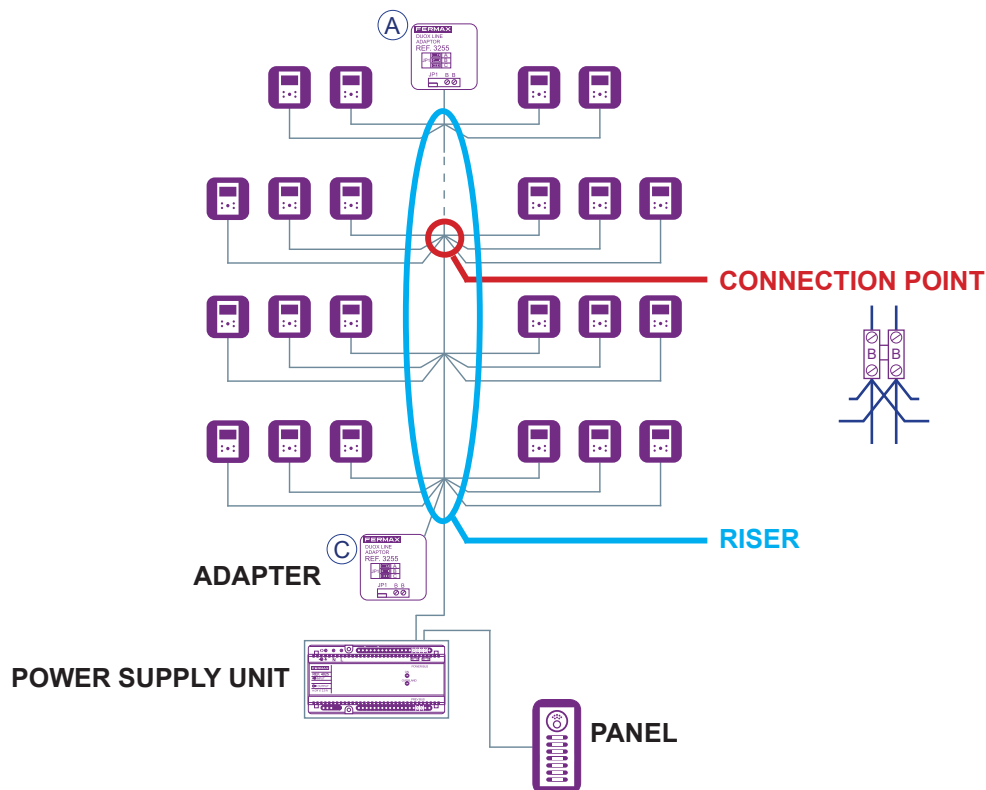
- o A maximum of 4 decoders of 10-outputs without regenerator is recommended.
- o A maximum of 10 decoders of 4-output without regenerator is recommended.





## ANNEX 1 - SUMMARY OF BASIC INSTALLATIONS

(without regenerator and additional elements)



### Capacities:

- 1 OUTDOOR PANELS.
- Up to 30 TERMINALS maximum.

### Wiring and power supply.

- Do not mix cable sections in the same installation.
- Use only one bus within the same cable/hose.
- Recommended parallel, twisted, CAT5 cable.
- See number of terminals per power supply, according to cable used.

### Topologies:

- CASCADE  
Up to 4 RISERS.
- DISTRIBUTION  
Up to 2 RISERS.  
Up to 6 TERMINALS per floor/CONNECTION POINT.
- STAR  
Up to 10 TERMINALS.

### Distances:

- Between TERMINAL and CONNECTION POINT.  
25m maximum.
- Between CONNECTION POINTS.  
3m minimum recommended.
- Between OUTDOOR PANEL and first CONNECTION POINT.  
55m = Distribution with 1 Riser and Cascade with 1 Riser.  
35m = Distribution with 2 Risers.  
30m = Star.  
25m = Cascade with >1 Riser.

\*This compendium is intended to be a basic guide of concepts focusing on key rules for an understanding of the DUOX PLUS system, with its rules, limitations and accessories. For more detailed technical information, please consult the product MANUALS and the DUOX PLUS TECHNICAL PRESENTATION or contact our TECHNICAL DEPARTMENT.



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