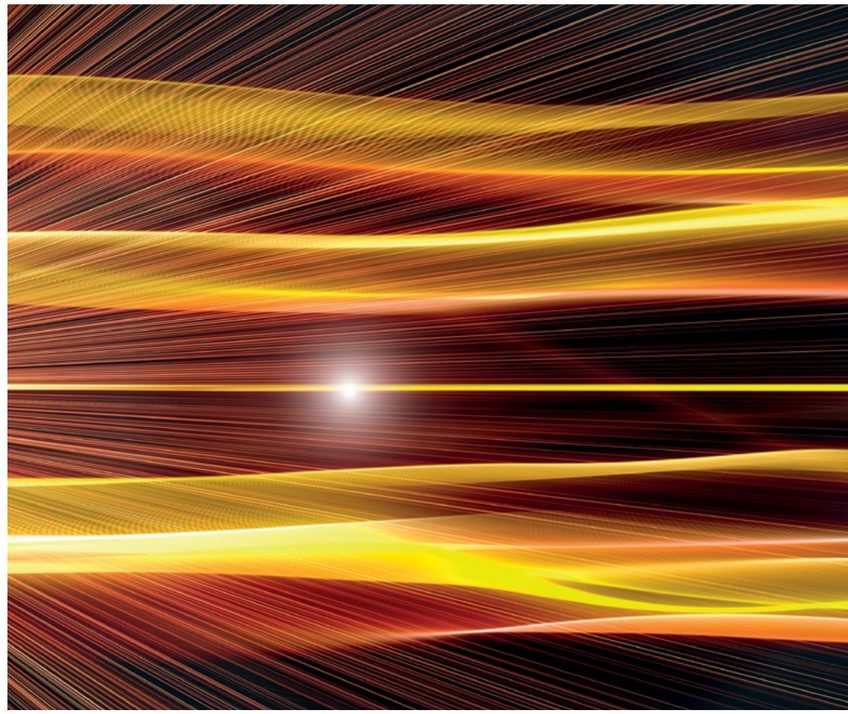

breaking down boundaries

DALI PowerLine Communication

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Innovation ahead

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DALI PowerLine Communication

DALI PowerLine Communication (DALI PLC) is a revolutionary technology that allows for the control of DALI luminaires through mains power lines. Developed to save time and costs during the installation and modification of lighting systems, it also offers increased flexibility of installation, commissioning, and use. This is possible as DALI PLC removes the need to install additional wiring, is fully compatible with any standard DALI driver and controller and size of luminaire, and comes with several methods of implementation suitable for a wide range of requirements.

NON-DISRUPTIVE AND -DESTRUCTIVE INSTALLATION

The main advantage of DALI PLC is that all DALI communication is carried out through the mains, removing the need for installation of new wiring in ceilings and walls, which saves time and up to 30 % on installation costs.

EASY INTEGRATION INTO EXISTING SYSTEMS

As DALI PLC relies only on mains wiring to do its job, it is incredibly easy to integrate into existing systems meaning you can update one area only, or perform a progressive upgrade of a whole building.

SAVE ENERGY

Updating an older lighting system will certainly result in lower energy consumption thanks to the use of more efficient and effective technologies along with energy saving controls like presence and daylight sensing, and dimming.

ULTIMATE FLEXIBILITY DURING INSTALLATION

DALI PLC can be installed using a variety of methods, all of which are suitable for almost any space and can be combined as needed to meet your specific requirements.

CHOOSE THE DEVICES THAT SUIT YOU BEST

As DALI PLC is fully compatible with any standard DALI driver, controller, and luminaire, you can choose whatever DALI devices suit your specific needs best. Controllers in our portfolio include simple DALI Input Units as well as more advanced wireless DALI interfaces such as DeeBridge and BlueBridge.

DIMMING, COLOUR CONTROL, LIGHTING SCENES

DALI PLC lets you do all the things you would normally do with a DALI installation, just without the extra control lines. So whether you want dimming, TunableWhite, or RGB control via direct regulation, lighting scenes, or schedules, DALI PLC makes it easy as well as very cost-effective to add DALI functionality to your new or updated lighting system.

Miracles without the work

RESPECTING OUR HERITAGE

There are many challenges when updating and improving the performance of listed, protected, and heritage buildings. It is often necessary to preserve the layout and original appearance, including walls as well as furniture and lighting equipment, where materials and finishes must be chosen to match those used during the original construction of the building. In addition, when updating lighting systems, it is important to also reduce energy consumption and maintenance, increase usability, and contribute to improved wellbeing. DALI PLC is an ideal solution as it allows for modification and control of lighting systems without the need for installation of additional wiring, and is extremely flexible in terms of device choice thanks to being fully compatible with all DALI controllers and luminaires.

RAPID RECONSTRUCTION FOR LARGE BUILDINGS

The modification of electrical and lighting infrastructures in large buildings can take several weeks. In the case of factories, office buildings, hotels, and hospitals, this can result in significant disturbance to day-to-day operation. To minimise associated issues and losses, it is ideal to use a solution such as DALI PLC as it takes maximum advantage of available infrastructure, and so greatly reduces installation times and disturbance as well as costs. Everyone will be back to work in time at all!

LET THERE BE LIGHT

Lighting is key to success in retail, so it is important to use the most dramatic, flexible, and effective solutions. Nowadays, this often means using DALI to enable the creation of an array of effects throughout the day. However, updating a retail lighting system to use DALI can be costly and time-consuming, which results in reduced revenue. To minimise closure times, it is useful to use DALI PLC, which is highly flexible at installation, promises all the benefits of DALI, and is cost-effective and fast to implement. With DALI PLC for retail, you really can have your cake and eat it.

DON’T FORGET HOME

It is still quite rare to find DALI used in domestic applications. This is partly due to the price of devices, but mainly because modification of the electrical and lighting infrastructure of a house is time-consuming and costly. We are not talking here about new builds where the architect plans the installation of DALI wiring into the construction as part of home automation, but about older buildings that are still in use. In this case, much of the prohibitive work and cost involved in the installation of a new DALI network can be mitigated by the use of DALI PLC. So simple. And it really works!

DALI PLC Bridge

A DALI powered, DIN rail mountable module that connects two or more DALI networks through coupling of DALI communication to mains wiring. It can be used to both send and receive DALI commands through the power lines.

TECHNICAL PARAMETERS

- Input voltage: 230 V AC / 50 Hz (see datasheet for full specification)
- Supports forwards and backwards DALI commands according to IEC 62386-102
- DALI powered (only one DALI Power Supply may be used)
- Three-phase support
- Communication error source detection
- Over-voltage protection
- Dimensions: 90 x 36 x 58 mm
- Housed in a standard 2U DIN box for easy installation in switchboards

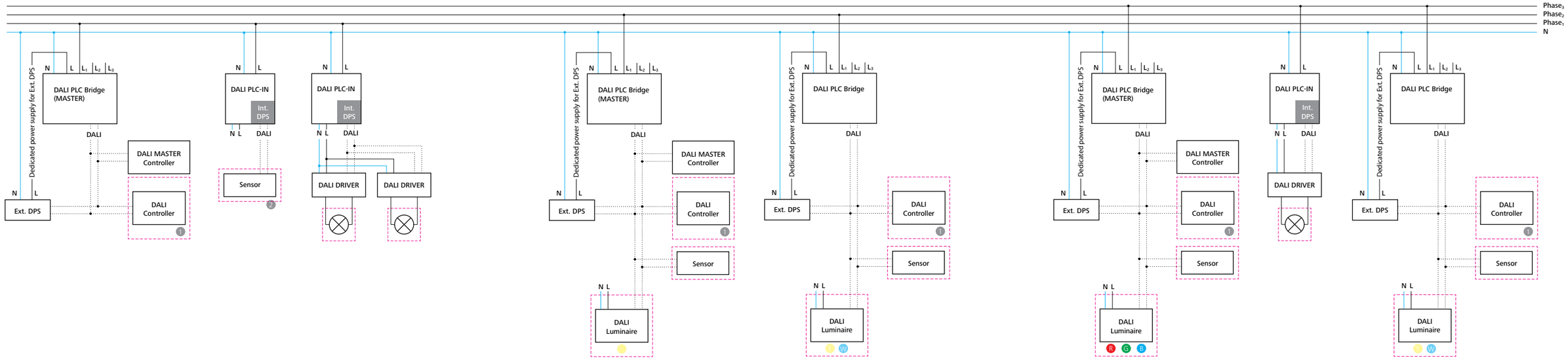
DALI PLC-IN

A small, mains-powered module designed for direct installation within a luminaire to connect it to a DALI PLC network. It can be used to both send and receive DALI commands through the power lines.

TECHNICAL PARAMETERS

- Input voltage: 230 V AC / 50 Hz (see datasheet for full specification)
- Supports forwards and backwards DALI commands according to IEC 62386-102
- Mains powered (no additional DALI Power Supply required)
- Internally powered DALI control output to luminaire – connect up to three DALI drivers
- Must be connected via the mains to at least one DALI PLC Bridge
- Over-voltage protection
- Dimensions: 33 x 50 x 30 mm

The possibilities of DALI PLC



DALI PLC DEVICES

- Each DALI PLC network may contain a maximum of 64 DALI devices. DALI PLC devices are not counted as part of the 64 as they are “invisible” to DALI.
- All DALI PLC devices can have luminaires and/or controllers connected to their DALI side.
- All DALI PLC devices can receive, modulate, and send DALI commands from connected DALI controllers as well as receive and translate commands sent from other DALI PLC devices.
- Ensure that the L1 terminal of each DALI PLC Bridge is always connected to at least one phase. L1 is used to power the dedicated L output for the DALI Power Supply. If L1 is not connected to a phase, the L output will not be powered.

THE “MASTER”

- Each DALI PLC network needs a “master” DALI PLC Bridge to acts as the “brain” of the installation.
- Any DALI PLC Bridge within a network can act as the master. It is possible to select a new master by pressing the reset button on the desired DALI PLC Bridge. This will reset and initiate remapping of the entire DALI and DALI PLC network, which will take several minutes.
- DALI PLC cannot communicate in real time with DALI. To overcome this, the master DALI PLC Bridge periodically requests and stores information about its network status and communicates it to all connected DALI PLC devices. When a DALI controller requests device status updates, it receives the information from the closest DALI PLC device within the time stipulated in the DALI standard.

DALI PLC NETWORK LIMITATIONS

- Like any type of control signal, the DALI PLC signal loses strength as it travels further along the control lines (in this case, power lines). DALI PLC installations are therefore limited to line lengths of 300 m.
- It is possible to connect up to three DALI devices to each DALI PLC-IN at the DALI output, such as three DALI drivers. This is due to the 15 mA current limit of the internal DALI network.
- DALI drivers connected to the L and N outputs of a DALI PLC-IN must not represent a combined load of more than 100 W.

USING THREE PHASE WIRING

- DALI PLC Bridge devices may be connected to multiple phases. DALI PLC-IN devices may only be connected to a single phase.
- It is possible to distribute a DALI PLC network across three phases in the case that luminaires are connected to different phases. Any DALI PLC Bridge can be connected to multiple phases to interconnect them into a single DALI network. Installation methods 1, 2, and 3 can all be distributed across a single phase or multiple phases according to need. (See installation methods 1, 2, and 3 on pages 12–17. Installation method 3 specifically shows a network distributed across three phases.)
- It is also possible to use three phases to create three independent DALI networks with 3 x 64 devices (192 total). The wiring must remain separated and at least one DALI controller used per phase. (See the above diagram and installation method 4 on pages 18–19.)
- Connection of DALI PLC Bridge terminals to phases does not need to follow any particular order. The only limitation is that no more than one phase can be connected to each terminal.

DIAGRAM NOTES

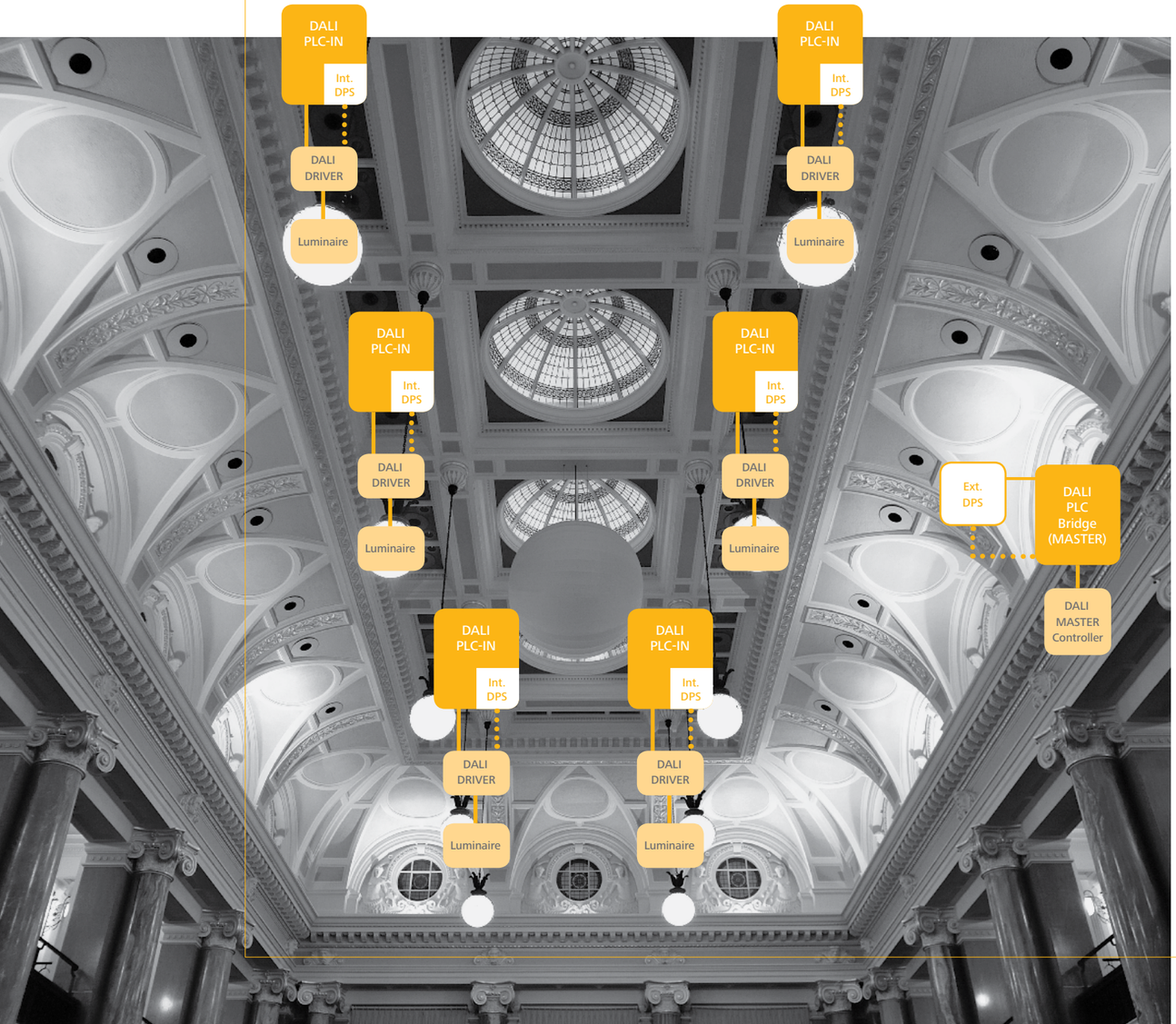
———	Mains wiring L
———	Mains wiring N
.....	DALI bus
▭	DALI device
Ext. DPS	External DALI Power Supply
Int. DPS	Internal DALI Power Supply

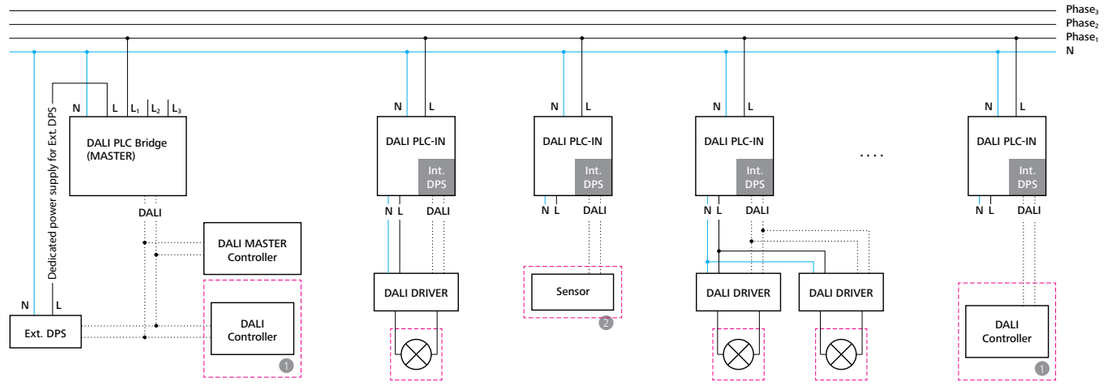
- The number of DALI devices per network (in a pink box) is limited to 64.
- Not all DALI controllers ❶ require a DALI address, e.g., iLumTech’s wireless controllers DeeBridge and BlueBridge.
- As DALI PLC-IN devices have a limited output current, it is only possible to connect sensors ❷ with low current requirements.
- RGB and TW luminaires may or may not require more than one DALI address depending on their DALI type.

Installation method 1

ONE DALI PLC BRIDGE DEVICE CONNECTED TO ONE OR MORE DALI PLC-IN DEVICES

For the simplest DALI PLC networks, you need only one DALI PLC Bridge that acts as the master connected to several DALI PLC-IN devices. DALI PLC-IN devices are ideal for use where there is no possibility to add additional wiring as they are placed directly within luminaires and only need to be connected to the mains. Perfect for use in heritage buildings such as churches and cultural buildings as well as in places where the construction materials make it overly difficult to install new wiring within the walls and ceilings. It is possible to distribute such networks across one, two, or three phases as required.





This schematic shows a single DALI PLC network on one phase.

INSTALLATION

Installation must be performed without voltage applied to the mains.

1. Connect the dedicated output terminal L of the DALI PLC Bridge to the phase input L of its DALI Power Supply (and also N).
2. Connect the DALI terminals of the DALI PLC Bridge to the DALI output of its DALI Power Supply.
3. Connect the DALI bus (with DALI controllers and/or luminaires) to the DALI terminal of the DALI PLC Bridge.
4. Lead the mains wires from the DALI PLC Bridge to one or more DALI PLC-IN devices connected in parallel.
5. If the network includes more than one phase, connect all used phases to the phase connection terminals on the DALI PLC Bridge. For connection guidance, see “Using three phase wiring” on page 11.

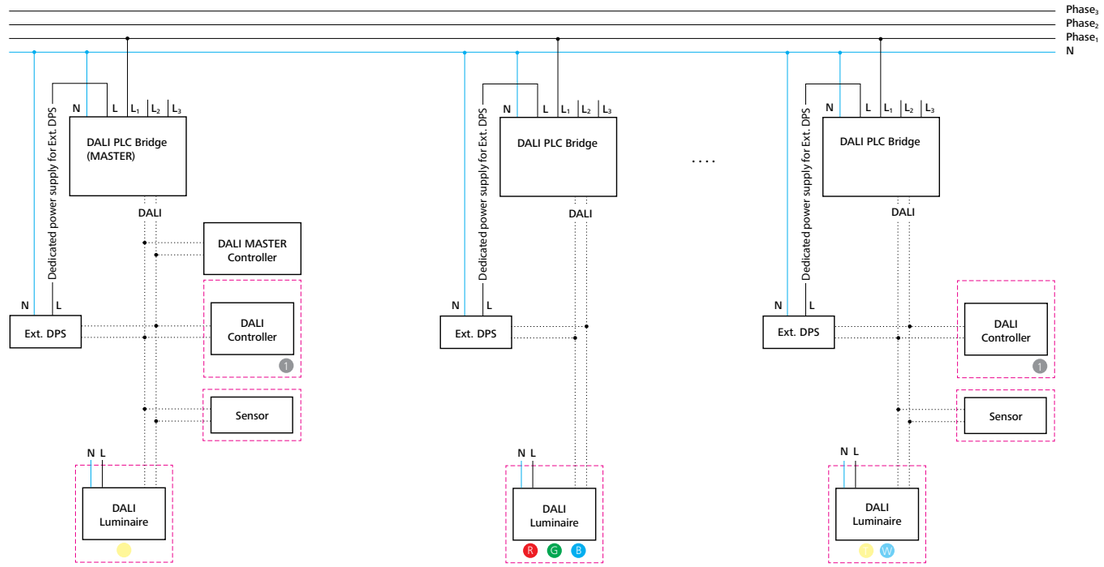
COMMISSIONING

1. Commissioning is performed automatically by the master DALI PLC Bridge device. No other commissioning tools are required.

Installation method 2

COUPLING OF ONE OR MORE DALI PLC BRIDGE DEVICES CONNECTED TO DALI BUSES

In some spaces, it may be viable to install DALI buses in some locations but not throughout the entire space. For such cases, DALI PLC is ideal to couple these various DALI buses via the mains wiring into a single network. Each DALI bus requires its own DALI Power Supply and DALI PLC Bridge device to connect it to the rest of the DALI PLC installation. This installation method is useful for spaces ranging from office buildings and hotels to shops and restaurants. It is possible to distribute such networks across one, two, or three phases as required.



This schematic shows a single DALI PLC network on one phase.

INSTALLATION

Installation must be performed without voltage on the mains power.

1. Connect the dedicated output terminal L of each DALI PLC Bridge to the phase input L of its DALI Power Supply (and also N).
2. Connect the DALI terminals of each DALI PLC Bridge to the DALI output of its DALI Power Supply.
3. Connect each DALI bus (with DALI controllers and/or luminaires) to the DALI terminal of its DALI PLC Bridge.
4. Lead the mains wires between all DALI PLC Bridge devices (Lx, N).
5. If the network includes more than one phase, connect all used phases to the phase connection terminals on the DALI PLC Bridge devices. Any DALI PLC Bridge can be used to interconnect phases. For connection guidance, see “Using three phase wiring” on page 11.

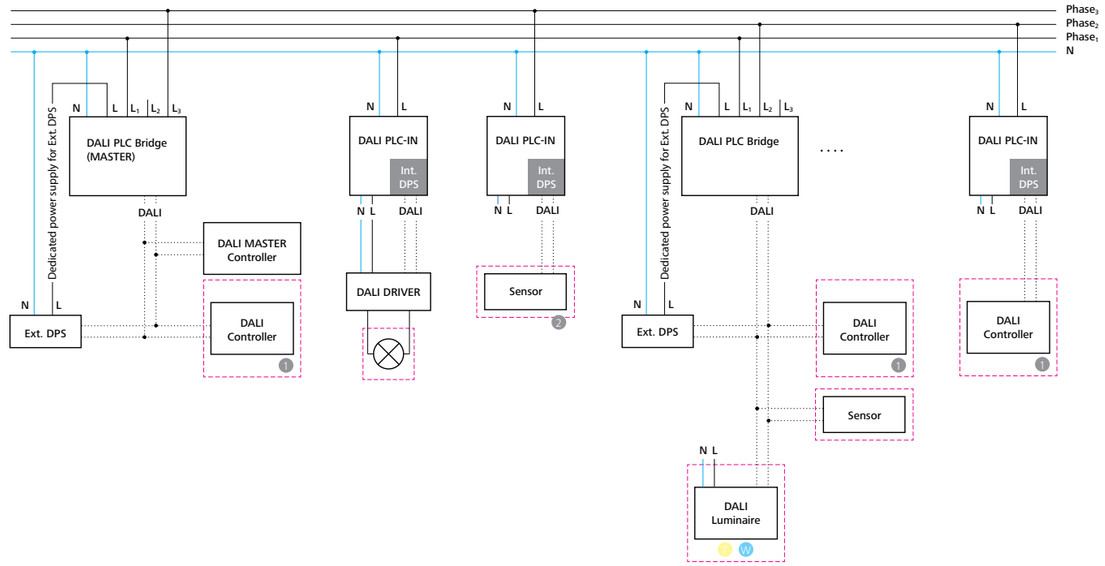
COMMISSIONING

1. Commissioning is performed automatically by the master DALI PLC Bridge device. No other commissioning tools are required.

Installation method 3

ONE OR MORE PLC BRIDGE DEVICES CONNECTED TO DALI BUSES COMBINED WITH ONE OR MORE DALI PLC-IN DEVICES

This installation method is very much the same as the previous except that it also includes DALI PLC-IN devices. Such a combination offers the greatest flexibility for positioning and controlling of luminaires within the network and is perfectly suited to use in office buildings, hotels, and even hospitals, where rooms or offices can be equipped with a DALI bus but the corridor requires lighting than runs off the mains. Of course, the principles of the installation method can be applied to almost any type of space. It is possible to distribute such networks across one, two, or three phases as required.



This schematic shows a single DALI PLC network distributed across three phases.

INSTALLATION

Installation must be performed without voltage on the mains power.

1. Connect the dedicated output terminal L of each DALI PLC Bridge to the phase input L of its DALI Power Supply (and also N).
2. Connect the DALI terminals of each DALI PLC Bridge to the DALI output of its DALI Power Supply.
3. Connect each DALI bus (with DALI controllers and/or luminaires) to the DALI terminal of its DALI PLC Bridge.
4. Lead the mains wires between all DALI PLC Bridge devices and DALI PLC-IN devices connected in parallel (L and N). Each DALI PLC Bridge device can be used with a group of luminaires connected by a DALI bus.
5. If the network includes more than one phase, connect all used phases to the phase connection terminals on the DALI PLC Bridge devices. Any DALI PLC Bridge can be used to interconnect phases. For connection guidance, see “Using three phase wiring” on page 11.

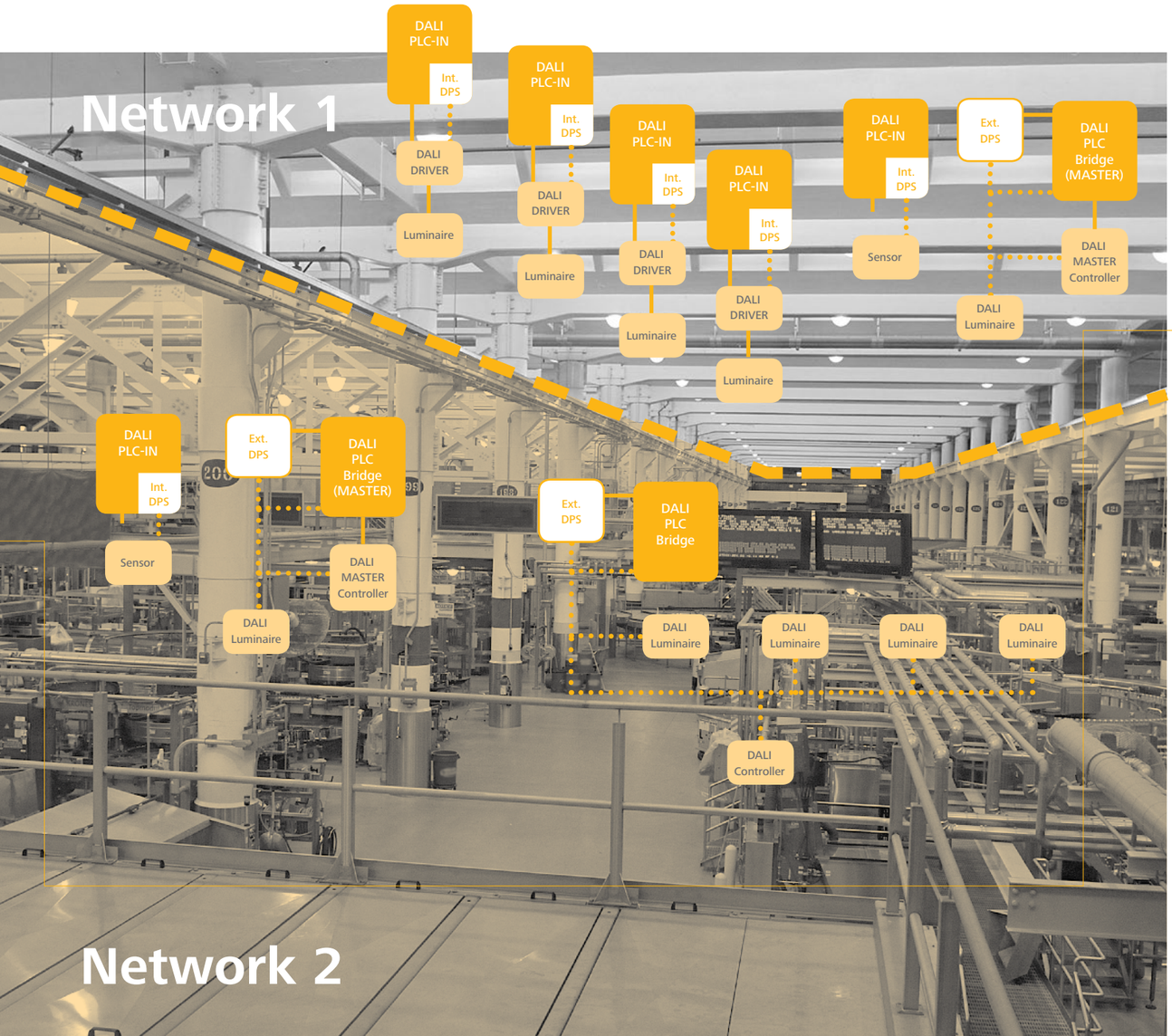
COMMISSIONING

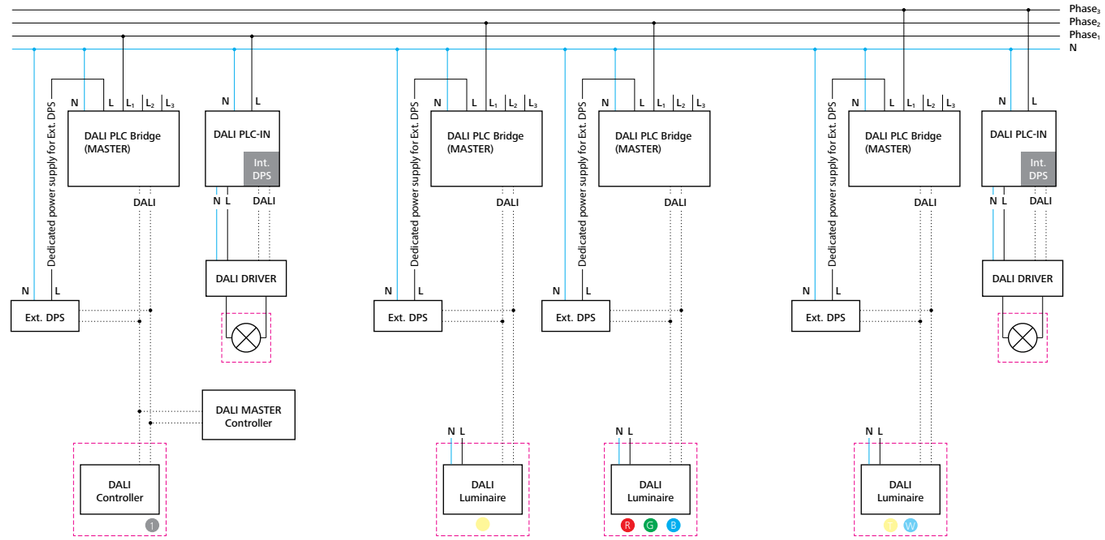
1. Commissioning is performed automatically by the master DALI PLC Bridge device. No other commissioning tools are required.

Installation method 4

USE OF THREE PHASE WIRING WITH THREE MASTER DALI PLC BRIDGE DEVICES TO CREATE THREE SEPARATE DALI NETWORKS

For larger spaces or complexes like office buildings, factories, supermarkets, and warehouses, 64 DALI devices are simply not enough. Such buildings often use three phase wiring, which opens up the possibility to use each phase as a separate DALI PLC network with 64 DALI devices. Each phase must be used independently of the others in order for this to work and so must have its own DALI controllers and master DALI PLC Bridge device.





This schematic shows three independent DALI PLC networks on three phases.

INSTALLATION

Installation must be performed without voltage on the mains power.

1. Connect the dedicated output terminal L of each DALI PLC Bridge to the phase input L of its DALI Power Supply (and also N).
2. Connect the DALI terminals of each DALI PLC Bridge to the DALI output of its DALI Power Supply.
3. Connect each DALI bus (with DALI controllers and/or luminaires) to the DALI terminal of its DALI PLC Bridge.
4. Lead the mains wires between all DALI PLC Bridge devices and DALI PLC-IN devices connected in parallel (L and N). Each DALI PLC Bridge device can be used with a group of luminaires connected by a DALI bus.
5. Repeat this process for all three phases.
6. Note: each phase network must be connected to the L1 terminal of its DALI PLC Bridge devices.

COMMISSIONING

1. Commissioning is performed automatically by the master DALI PLC Bridge device. No other commissioning tools are required.

What is DALI?

DALI is an international standard for professional digital lighting and a worldwide registered trademark, and is considered the most flexible and reliable control system for innovative lighting solutions. It is a worldwide standard, specified by the International Electrotechnical Commission (IEC). The DALI protocol is set out in the technical standard IEC 62386.

DEVICES USED IN A DALI SYSTEM

- Control gear: provides a power control circuit to drive light sources.
- Control device: provides information to other control devices and can send commands to control gears.
  a) Input device: provides some information to the system such as a button press or movement detection.
  b) Application controller: provides commands and works as a decision-makers in a DALI system (sends commands to control gears to modify the light output).
- Bus power supplies: allow for both communication on the bus and supply power to any bus-powered DALI device. At least one bus power supply must be present in a DALI system (can be part of another device or a separate unit).
- Bus wires: connect the DALI terminals of devices in the system.
- Other devices: configuration tools, DALI interfaces, etc.

GENERAL REQUIREMENTS

The standard specifies general requirements for:

- 101: the system,
- 102: control gears,
- 103: control devices (upcoming in the DALI 2 standard).

The DALI standard defines the following devices and describes their particular requirements:

- Device type 1: self-contained emergency lighting (202),
- Device type 2: discharge lamps (203),
- Device type 3: low voltage halogen lamps (204),
- Device type 4: supply voltage controller for incandescent lamps (205),
- Device type 5: conversion from digital signal into DC voltage (206),
- Device type 6: LED modules (207),
- Device type 7: switching function (208),
- Device type 8: colour control (209).

The current DALI standard does not contain definition of control devices, which will be addressed in the upcoming DALI 2 standard in part 103: control devices. It will allow for use of single- and multi-masters, and define input devices, application controllers, timing and addressing modes, and commands to enable and disable application controllers, etc.

TECHNICAL BASICS

Technical boundaries:

- a maximum of 64 devices per subnet (hub/router),
- cabling no longer than 300 m,
- devices can consume no more than 250 mA each.

Cabling benefits:

- standard 2-core cabling (1.5 mm^2),
- polarity free and free wiring topology,
- DALI power and data on the same wires.

Digital benefits:

- robust communication,
- individual (64), group (16), and broadcast (all) control,
- easy to change using software,
- two-way communication (feedback).

Information sourced from www.dali-ag.org