



IntelliPower

Retrofit made easier with power line carrier technology

Technical Overview



Photography: Henri Pham on Unsplash

IntelliPower

IntelliPower lets you deploy intelligent, digitally controllable LED lighting solutions where they were never possible before, both indoors and outdoors.

For retrofits, IntelliPower lets you use the electrical infrastructures already installed in historic buildings, in-ground lighting systems, bridges, and other existing structures, letting you realize all the benefits of a state-of-the-art LED lighting system without having to undertake expensive rewiring, renovation, or excavation work. IntelliPower also lets you deploy intelligent LED lighting solutions on existing building exteriors, bridges, and any other situation where access to data and mains power sources is difficult, or where the power and data sources must be located at a distance from luminaires.

What is IntelliPower?

IntelliPower is a groundbreaking implementation of proven power line carrier (PLC) technology, a system for carrying data on the same conductors used for transmitting electrical power.

PLC technology has been used successfully for years in applications such as home automation, home networking, and remote monitoring and control of meters and other electrical equipment for utilities.



Photography: LITE Ltd.

IntelliPower applies the principles of PLC technology to intelligent LED lighting systems. With IntelliPower, you can install and digitally control intelligent Powercore luminaires from Color Kinetics using existing electrical branches, 2 + ground wiring, and luminaire mounting points, making dynamic LED lighting retrofits possible where rewiring is prohibited, problematic, or too expensive. IntelliPower can also reduce installation expenses for labor, materials, time, and rental equipment, lowering overall initial costs and bringing LED lighting retrofits within budget.



The standard three IntelliPower devices: the Data Enabler IntelliPower, the Data Filter IntelliPower, and the Data Receiver IntelliPower.

Unlike the low- and mid-bandwidth PLC systems used in many home and utility-side applications, IntelliPower enables high-bandwidth DMX and Ethernet data communications over conventional 2 + ground wiring. High-bandwidth IntelliPower communications support the full range of color-changing lighting effects, dynamic light shows, and video — not just simple switching and digital dimming.

IntelliPower and Powercore

IntelliPower allows you to realize all the benefits of intelligent Powercore LED lighting systems where it was never possible before. IntelliPower and patented Powercore technology work together to help you achieve unprecedented results.

Powercore, an advanced power management system patented by Color Kinetics, delivers power input directly to luminaires from line voltage over standard 3 + ground wiring.

Powercore simplifies installation and lowers system costs by eliminating external power supplies, separate data cabling, and special installation methods. Powercore also lowers the cost of installation and maintenance by reducing a system's total parts count, minimizing the size and weight of the power management components required to run a lighting system, and extending luminaire and cable runs.

By allowing you to install intelligent Powercore luminaires using existing 2 + ground wiring and mounting points, IntelliPower lowers installation and total system costs even more. Depending on the details and requirements of the installation, you can use IntelliPower to replace existing conventional lights with dynamic LED luminaires, extend an existing lighting system with runs of intelligent Powercore luminaires, or integrate intelligent lighting with building automation systems. You can use these approaches in any combination in a single installation.

When to Use IntelliPower

Like any advanced solution, IntelliPower is appropriate in many, but not all, circumstances. In some cases, a standard Powercore or low-voltage solution may be more cost-effective than an IntelliPower solution.

For any given lighting project, you must evaluate a number of factors, including the state of existing electrical and physical infrastructures, the cost and complexity of installing new wiring and restrictions due to local electrical or historic preservation codes.

Where initial cost is the determining factor, TCO and ROI comparisons between IntelliPower solutions and alternatives are crucial. To determine whether IntelliPower is the right solution for your lighting project, contact your local Color Kinetics representative or a Signify System Service Center.

Consider using IntelliPower for flexible, cost-effective solutions in the following situations:

- IntelliPower offers the ability to replace static conventional lighting with dynamic LED lighting in buildings and structures where replacing existing 2 + ground wiring is prohibited or too costly — for example, in historic buildings or in-ground exterior lighting systems. Using IntelliPower devices, you can install intelligent LED luminaires with luminaires from Color Kinetics in place of existing conventional luminaires without running any new 3 + ground wiring or additional 2 + ground wiring.
- Even where conduit is already installed, pulling new 3 + ground wiring can be cost-prohibitive. In such cases an IntelliPower solution may be able to reduce overall installation costs to bring a project within budget.
- IntelliPower can lower the cost of enhancing and extending installed lighting systems in existing buildings. For example, IntelliPower may allow you to use a building's existing electrical infrastructure (2 + ground) to deliver combined power and data to an installation of new intelligent LED luminaires (3 + ground) on the building's façade.
- An IntelliPower solution allows you to integrate intelligent LED lighting systems with conventional lighting systems, building automation systems, occupancy sensors, or daylight harvesting systems.

Anatomy of an IntelliPower System

In a typical IntelliPower system, there are three types of IntelliPower devices — the Data Enabler IntelliPower, the Data Receiver IntelliPower, and the Data Filter IntelliPower.

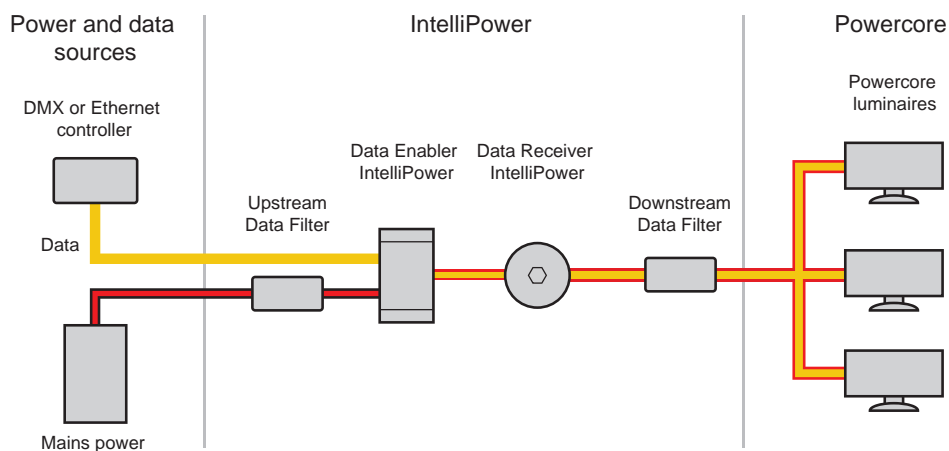
These devices coexist in any existing electrical branch, along with a DMX or Ethernet lighting controller in the system, and intelligent Powercore LED luminaires from Color Kinetics. LED luminaires can be installed in virtually any configuration, up to the limits imposed by the electrical circuit and data signal integrity. Optionally, there may be data filters in the electrical stream to ensure clear data control to the luminaires.

Data Enabler IntelliPower

The Data Enabler IntelliPower accepts standard 2 + ground mains power from an electrical panel and control data from a DMX or Ethernet lighting controller, merges the power and data streams, and outputs the combined power/data stream over standard 2 + ground wiring.

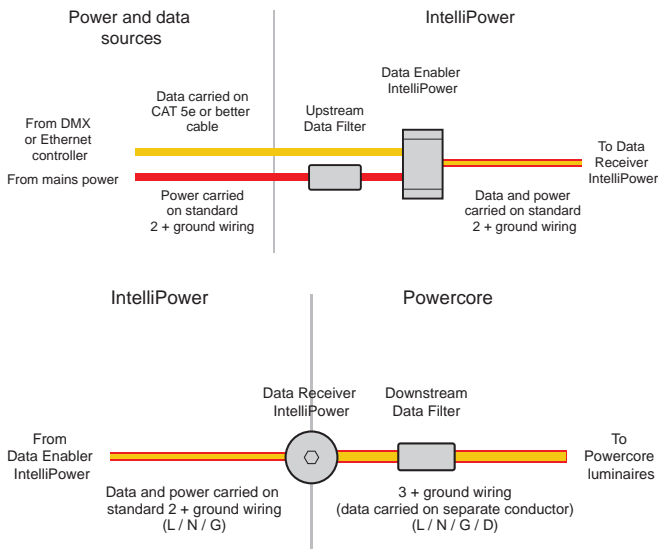
DMX and Ethernet Lighting Controllers

You can use any DMX or Ethernet controller from Color Kinetics with IntelliPower systems, as well as third-party DMX controllers and third-party Ethernet controllers that support KiNET, the Ethernet lighting protocol from Color Kinetics. You connect controllers to the Data Enabler IntelliPower using standard CAT 5e or better cables.



Data Receiver IntelliPower

The Data Receiver IntelliPower accepts the combined 2 + ground power/data stream from a Data Enabler IntelliPower and translates it into a 3 + ground scheme (line, neutral, ground, and data) in order to output it to intelligent Powercore LED luminaires from Color Kinetics.



Data Filter IntelliPower

The Upstream and Downstream Data Filter IntelliPower are specially designed to eliminate noise and interference from the input stream, preserving the integrity of the PLC data at the Data Receiver from electrical disruption (from both directions) before it continues to the luminaire.

Upstream for positioning between the electrical power source and Data Enabler IntelliPower devices.

Downstream for positioning between the Data Receiver IntelliPower devices and the first luminaire on the branch.

Data filters are optional and may or may not be necessary in your installation; the need for them will be determined by a site assessment and analysis.

Intelligent Powercore LED Luminaires

IntelliPower works with all intelligent Powercore LED luminaires from Color Kinetics:

IntelliColor luminaires combine three or more channels of colored LED sources to natively produce millions of colors of light.

IntelliWhite luminaires combine two or more channels of white-light LED sources to produce a range of color temperatures.

IntelliHue luminaires combine multiple channels of colored and white-light LED sources to produce high-quality white light, subtle pastels, and saturated colors, in the same precisely controllable luminaire.

Intelligent Powercore LED luminaires install in a number of different ways, depending on what type of connections they have — for example, detachable pre-configured leader cables, or integrated 4-conductor power/data cables with flying leads. Selected luminaires can be top-mounted directly to Data Receiver IntelliPower devices in situations where you want to reuse existing luminaire mounting points and avoid running 3 + ground wiring entirely.

Site Readiness Assessment

When retrofitting existing buildings and structures, the condition and suitability of the installation site is a critical factor in determining the feasibility of an IntelliPower solution.

The site readiness assessment team will work with you to identify any potential barriers to successful installation and commissioning. Any potential IntelliPower site must undergo an evaluation to determine if it is suitable for the use of IntelliPower technology. As with any professional lighting project, assessing and planning an IntelliPower solution requires the lighting designer or specifier to collaborate with professionals in related areas of responsibility. Depending on the complexity of the solution and the level of integration with other systems, the site readiness assessment team may include architects, structural engineers, electricians or electrical contractors, system integrators, building or plant managers, programmers, light show designers, and others.

The assessment is usually split into a pre-assessment and a site visit. The pre-assessment consists of observations of the existing infrastructure and is performed by the job specifier, client, and electrician familiar with the existing electrical infrastructure. The site visit is performed by a technical expert, who runs tests to measure data transmission quality. The technical expert can also perform the pre-assessment.

The purpose of the pre-assessment is to gather information about the state of the existing wiring, including panel locations, breakers to be used (including corresponding lights), and conduit length (from the IntelliPower Data Enabler to the furthest luminaire location). The information gathered during the pre-assessment, including information about the proposed controller and luminaire types, will be used to determine if the site passes preliminary requirements. If the site passes the requirements, this information will then be used to design a test to measure data transmission quality. If the site is partially or fully disqualified from using IntelliPower, this information can

be used to design alternative proposals.

During the site visit, a technical expert and electrician will set up an IntelliPower network for testing. The test requires the electrician who performed the pre-assessment to be present to splice test equipment into existing wiring on all circuits that will be used. The Data Enablers used in the test should be spliced into the circuit close to where they will be installed (often near the electrical panel). Receivers should be placed at the light location furthest from the panel. After the hardware is set up, the technical expert uses software to measure data transmission quality between IntelliPower devices.

Following the site visit, the data transmission quality data will be analyzed, and decisions will be made regarding the site's suitability for IntelliPower.



Photography: Kafai Liu on Unsplash

Data Enabler IntelliPower Considerations

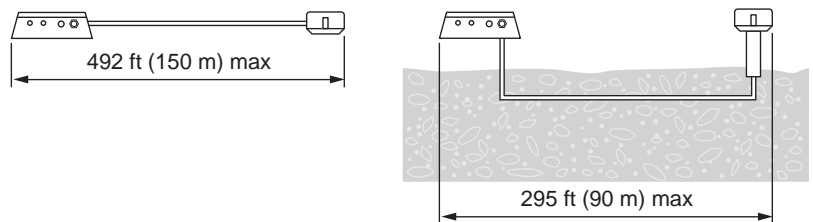
Except in special circumstances, you install one Data Enabler IntelliPower device per electrical branch.

Data Enabler IntelliPower outputs combined power and control data over standard 2 + ground cable. In typical installations, one or more Data Receiver IntelliPower devices are installed on the same electrical branch. Data Enabler IntelliPower devices also offer DMX and Ethernet data outputs, which allow you to connect multiple Data Enabler IntelliPower devices to a single control source using standard CAT 5e or better cable.

Because most intelligent LED luminaires from Color Kinetics accept DMX control data, Data Enabler IntelliPower automatically translates Ethernet data and outputs it in the appropriate data format.

The distance from the electrical panel to the Data Enabler IntelliPower device on a branch has no effect on the performance of the system. However, we recommend that Data Enabler IntelliPower devices are installed near the electrical or breaker panel to create an easy access point and to keep the installation clean. We also recommend that your DMX or Ethernet controller, Ethernet switches, and any required equipment are installed in the same accessible location to simplify programming, system maintenance and modifications, and troubleshooting.

Data Enabler IntelliPower devices can be mounted directly to any flat surface or substrate. Data Enabler IntelliPower devices must be installed in a location that allows air to move freely around the device.



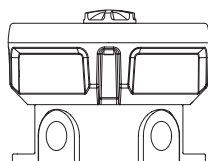
*Measurements are guidelines for system planning and must be verified with a site assessment.

Data Receiver IntelliPower Considerations

Data Receiver IntelliPower devices receive combined power and data from Data Enabler IntelliPower over standard 2 + ground cable, and outputs power and data to intelligent Powercore luminaires over standard 3 + ground cable. You can install as many as 63 Data Receiver IntelliPower devices per electrical branch, up to the limits imposed by data integrity and the capacity of the electrical circuit.

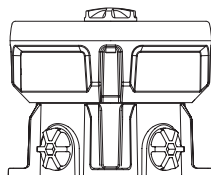
To ensure data integrity, maximum 2 + ground run lengths from a Data Enabler IntelliPower device to the last Data Receiver IntelliPower device on a branch is 150 m (about 492 ft) above ground, and 90 m (about 295 ft) in-ground. Bear in mind that maximum in-ground run lengths can vary depending on the depth and condition of the cable, and other considerations.*

Total wiring volume: approx. 23 cu in
(varies depending on junction box used)



Example standard US 4 in round junction box

Total wiring volume: 27 cu in



Color Kinetics Wiring Compartment

Data Receiver IntelliPower devices install to junction boxes. In North America, you can use standard 4 in round US electrical junction box per luminaire, rated for your application, with 3.5 in center-to-center screw holes. Outside of North America, you can install Data Receiver IntelliPower devices to the outdoor-rated Wiring Compartment from Color Kinetics (included with CE versions of Data Receiver IntelliPower).

Because it has a slightly larger capacity than a standard 4 in round junction box, you can also use the Wiring Compartment in North America for increased wiring volume. In some circumstances, the Wiring Compartment may allow you to make additional connections to each Data Receiver IntelliPower device.

Data Receiver IntelliPower and intelligent Powercore luminaires can be installed in a variety of configurations to support virtually any lighting design plan or system requirement. In general, there are three main approaches to installing Data Receiver IntelliPower devices and attaching intelligent Powercore luminaires to them.

- You can install one Data Receiver IntelliPower device per intelligent Powercore luminaire. This layout is appropriate for situations in which you want to install non-linear LED luminaires to existing mounting points while minimizing the need for new 3 + ground wiring.
- Certain intelligent Powercore luminaires with canopy bases or threaded mounting posts can be top-mounted directly to Data Receiver IntelliPower devices. This approach allows you to eliminate the need to run new 3 + ground wiring altogether, since all connections are made inside the Data Receiver IntelliPower wiring compartment. The table to the left lists the intelligent LED luminaires that can be top-mounted to Data Receiver IntelliPower devices.
- You can install a run of intelligent Powercore luminaires from a Data Receiver IntelliPower. This layout is appropriate for situations in which you want to install linear LED luminaires that interconnect by means of end-to-end connectors or jumper cables, or where you prefer to run new 3 + ground wiring — for instance, if you're installing intelligent LED luminaires in a area of a building that was previously unlit.
- You can use these approaches in any combination to satisfy your specific lighting and system plan requirements. For instance, you can top-mount ColorBurst Powercore Architectural luminaires to a run of 15 Data Receiver IntelliPower devices installed in series, and use every fifth Data Receiver IntelliPower device as the starting point for runs of ColorGraze Powercore or ColorReach Powercore luminaires.

Color Kinetics technology portfolio

We continually explore your challenges, invest in research and development, and make the significant commitment required to develop and perfect breakthrough technologies. The result of decades of work, our unequaled portfolio of

proprietary, quality-enhancing technologies helps you achieve the best possible results. These technologies increase quality by ensuring sustainability, consistency, raising uniformity, providing precision control, and more.



Optibin

Where consistency begins.

Our LED optimization technology begins the color consistency process by grouping (or binning) LEDs by flux as well as center wavelength. This proprietary binning optimization process uses an advanced bin selection formula that exceeds industry standards for chromaticity. The result? Higher uniformity and consistency of hue and color temperature for all our luminaires.



Chromasync

Optimize output & color consistency.

Our advanced output optimization technology controls and boosts output while ensuring color consistency. When enabled, Chromasync ensures excellent color consistency between luminaires, without manually adjusting color points on each luminaire.



IntelliHue

The smart way to deliver white & color light.

Our advanced approach to color mixing produces high-quality white light, subtle pastels, and fully saturated colors in the same precisely controllable luminaire. All with unrivaled color accuracy across the entire range of color temperatures.



OptiField

Uniformity never looked this good.

OptiField's freeform optic creates a breakthrough rectangular beam that covers large surfaces with full, bright, even light. And OptiField can cover more surface area with fewer luminaires — simplifying installation while lowering energy use.



Powercore

Power made simple.

Our patented approach to power output proves that simple is better. As well as faster, more efficient, and accurate. Powercore® controls power output to luminaires directly from line voltage. It merges line voltage with control data and delivers both over a single standard cable—dramatically simplifying installation and lowering total system cost.



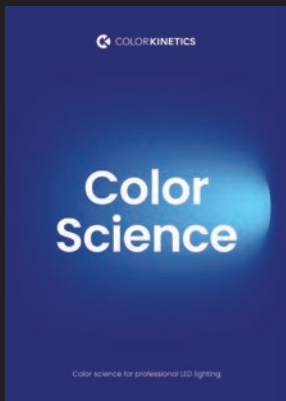
IntelliPower

Retrofit made easier.

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What matters in professional lighting?

Our series of guides explores key topics in professional lighting—Color Science, Light Matters, Quality Matters, Optics Matter, and more. It's part of our commitment to passing on our deep technical knowledge and decades of expertise to help you achieve your vision.



Color Science

Color science serves as an underlying technical foundation for the entire lighting industry. It establishes a consistent way of thinking about light—how it is created, controlled, and delivered in real-world implementations. A core understanding of the science of color is critical to lighting professionals, who must be able to specify the right light—color, technology, luminaire, and more—clearly and accurately.



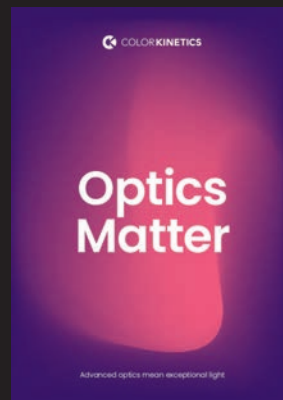
Light Matters

Traditional methods of evaluating light focused on lumen output, which was defined by the output capabilities of a light source, such as an incandescent lamp. The advent of LED lighting changed all that, since lumens were no longer the best measurement of a luminaire's capabilities. We explore some of the new ways lighting can be evaluated in the age of LED.



Quality Matters

What does quality mean to you? The answer depends on what you do within the lighting industry. Quality has different meanings for building and site owners/managers, lighting designers, and installers. We delve into the needs of each of these groups as we take a holistic approach to quality, one that begins and ends with the customer.



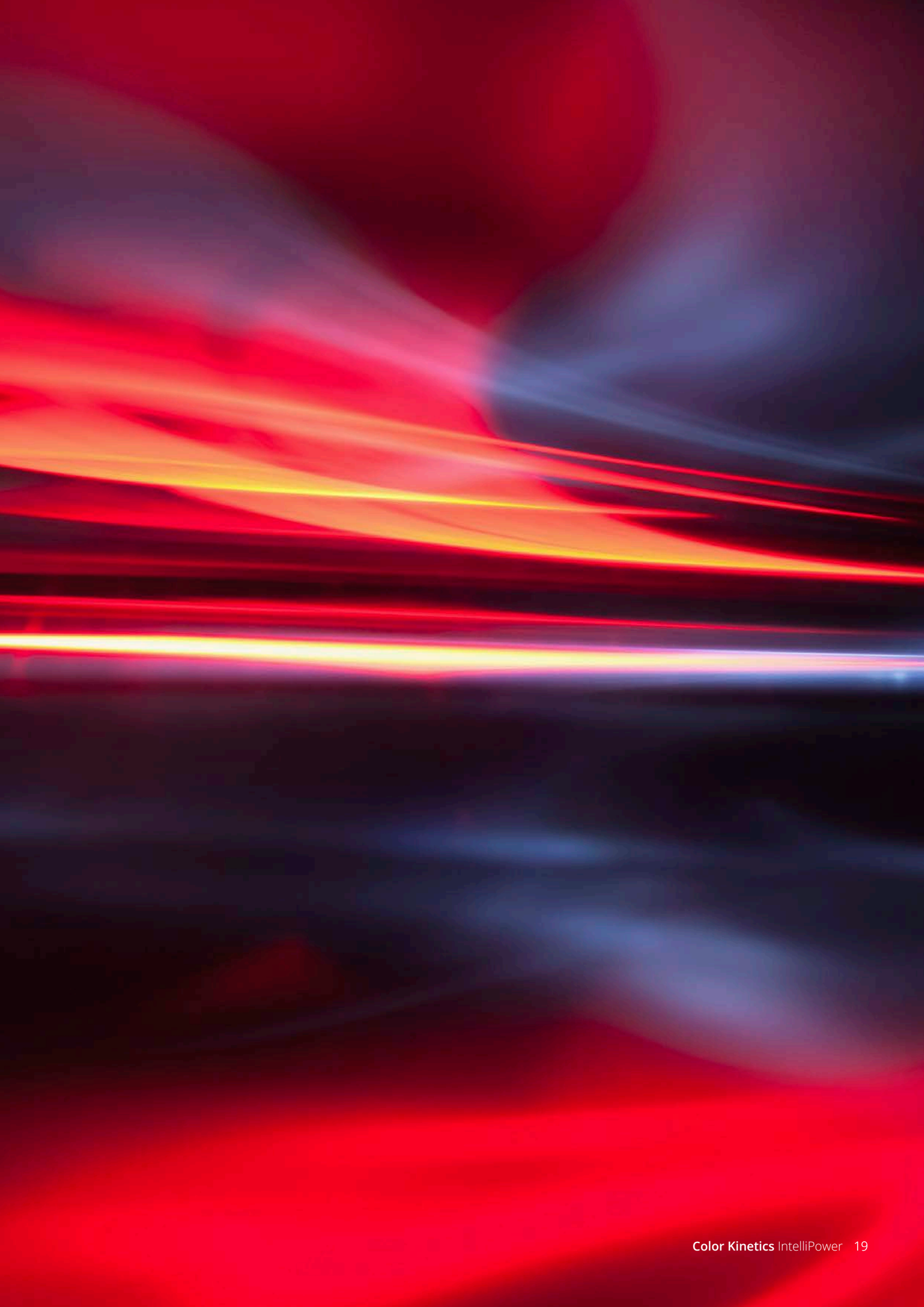
Optics Matter

It's safe to say that few lighting designers, building owners/managers, or other lighting professionals have ever seen the optical system housed inside an LED luminaire. But the optical system, or optics, play a vital, but often hidden role in performance, efficiency, and more. The right optics within a luminaire make a big difference in the final results—for both interior and exterior applications.

Choose the luminaire that meets your needs

IntelliPower is just part of the ongoing effort by Color Kinetics to set new standards for accessibility. These technologies work together to deliver the performance required by innovative and ambitious lighting applications.

To find out more about how to make Color Kinetics IntelliPower part of your next lighting design, visit www.colorkinetics.com



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