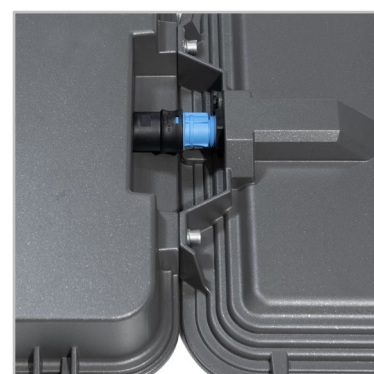


# TFLEX COMBI



## The all-round powerful tunnel lighting solution

TFLEX COMBI is a revolutionary, modular-based lighting solution for enhancing the road tunnel lighting experience.

Part of the TFLEX lighting concept, TFLEX COMBI is the combination of TFLEX MODULE and its driver box, TFLEX DRIVE. This association provides optimised, energy-efficient lighting solutions for all typical tunnel zones from entry to exit.

An advanced, fully integrated system with lighting, cabling and control, it guarantees the lowest energy consumption while respecting the most stringent tunnel lighting requirements and standards.

Integrating the latest digital and optical technology, TFLEX COMBI ensures high visual performance for an improved driving experience.



## Concept

TFLEX COMBI provides a flexible and homogeneous solution that meets the tunnel lighting requirements of various specific zones (threshold, transition, interior and exit).

Made of robust and sustainable materials (aluminium, steel and glass), TFLEX COMBI ensures long-lasting performance in the harshest tunnel environments. With a tool-free philosophy for the opening/closing and smart cabling, TFLEX COMBI facilitates installation and maintenance operations to minimise costs and traffic disruption.

TFLEX COMBI combines the energy efficiency of LED technology with the photometric performance of the latest LensoFlex® platform developed by Schröder. It integrates specific tunnel optics for symmetrical, pro-beam or counter-beam (CBL) lighting distributions to optimise lighting levels on road and wall surfaces while providing high visual comfort.

The TFLEX COMBI lighting modules have been developed to enable constant dimming. Equipped with a double circuit, TFLEX COMBI can either be dimmed completely, partially or even have 50% of its LEDs switched off. This possibility not only maximises energy savings, it also extends the lifetime of the complete installation and reduces the need for disruptive maintenance.

TFLEX COMBI is a complete tunnel solution that includes lighting modules, dedicated driver box (TFLEX DRIVE), smart cabling with quick-on QPD connectors and advanced control systems to improve safety for drivers and to provide major operational benefits for tunnel managers.



The TFLEX COMBI is a complete tunnel lighting solution designed to suit all kinds of tunnel projects.



Tool-free, fire rated cables and connectors reduce the installation time dramatically and improve installation quality and reliability.

## TYPES OF APPLICATION

- TUNNELS & UNDERPASSES

## KEY ADVANTAGES

- Flexibility: modular approach with wide range of lighting distributions
- Compact, lightweight and easy to install
- Two electrical circuits for enhanced dimming possibilities, optimised power factor and longer lifespan
- High quality and robust materials
- Designed for long-lasting performance
- Tool-free access for easy maintenance



TFLEX COMBI's driver box, TFLEX DRIVE, is equipped with the latest control technologies to provide the best solution in tunnel lighting management.



TFLEX COMBI offers various mounting options for ceiling or wall mounting with fixed or tiltable fixations.

TFLEX COMBI | TFLEX COMBI 1



TFLEX COMBI | TFLEX COMBI 2



TFLEX COMBI | TFLEX COMBI 3

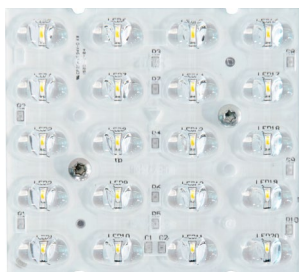




## LensoFlex® 4

LensoFlex® 4 maximises the heritage of the LensoFlex® concept with a very compact yet powerful photometric engine based upon the addition principle of photometric distribution. The number of LEDs in combination with the driving current determines the intensity level of the light distribution. With optimised light distributions and very high efficiency, this fourth generation enables the products to be downsized to meet application requirements with an optimised solution in terms of investment.

LensoFlex® 4 optics can feature backlight control to prevent intrusive lighting, or a glare limiter for high visual comfort.



## Advanced Tunnel System 4 (ATS 4)

The ATS 4 (Advanced Tunnel System 4) is a powerful tunnel lighting control system for precise remote dimming and switching of each individual connected luminaire, based on various tunnel parameter inputs (emergency exits, smoke extraction system, traffic cameras, etc.).

The ATS 4 permanently communicates with the Lumgates, an RS422 closed-loop device connected to the luminaire drivers, to control the light intensity and provide command/reporting features.



## Advanced Tunnel System 4 DALI (ATS 4 DALI)

The Advanced Tunnel System 4 DALI provides the essential functions of the ATS 4 over a DALI network protocol, enabling dimming of luminaire clusters to be controlled collectively.

The ATS 4 DALI is the ideal solution to implement a reliable and powerful tunnel lighting control system with streamlined features and optimised costs.



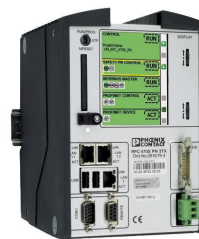
## Sensors and cameras

The ATS 4 can be connected to various sensors and cameras to permanently adjust the lighting levels to indoor and outdoor conditions and avoid any visual adaptation problems.



## Tunnel Control System 4 (TCS 4)

The Tunnel Control System 4 (TCS 4) is a gateway ensuring the connection/control of the multiple ATS 4 controllers as well as the communication with the central management system of the tunnel infrastructure (SCADA) if applicable.

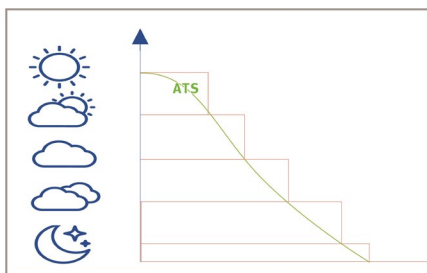




Jointly developed by Schröder and Phoenix Contact, the Advanced Tunnel System 4 (ATS 4) has been designed to control every lighting point or clusters of luminaires to perfectly adapt the lighting level according to conditions in the tunnel, to monitor the power consumption and to report the burning hours or any failure to facilitate maintenance. The system includes a self-commissioning feature and enables scenarios to be adapted remotely at any moment.

## PRECISE AND CONTINUOUS DIMMING

ATS 4 provides 25 different dimming levels to precisely adapt the lighting to the real needs. Without any over-lighting, the energy consumption is limited to what is absolutely necessary to ensure safe and comfortable driving conditions.



## FLEXIBILITY

Flexible redundancy offers security on multi-level applications, not only for the lighting.

## PLUG AND PLAY COMMISSIONING

This control system is easy to install and configure. The tunnel lighting study can be directly imported into the ATS 4 control system. This unique feature, in combination with the auto-addressing of the Lumgates, leads to an extremely short commissioning time once the fixtures have been installed.

The ATS 4 benefits from a complete set of toolless smart cables and connectors, allowing installers to speed up cabling and save valuable time on-site.

## INTERACTION WITH THIRD PARTY SYSTEMS

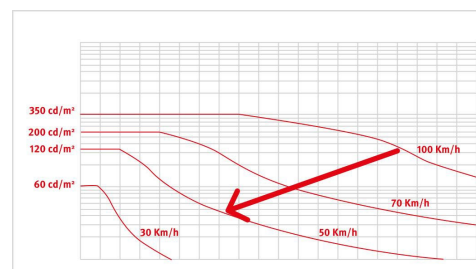
Every command or signal sent to or coming from a tunnel component (emergency exit, smoke extraction system, traffic management system...) can be used to trigger a responsive lighting scenario. All of the tunnel equipment can be controlled through the same bus command.

## MAXIMISED SAFETY

The system enables the easy set-up of emergency and disaster management scenarios.

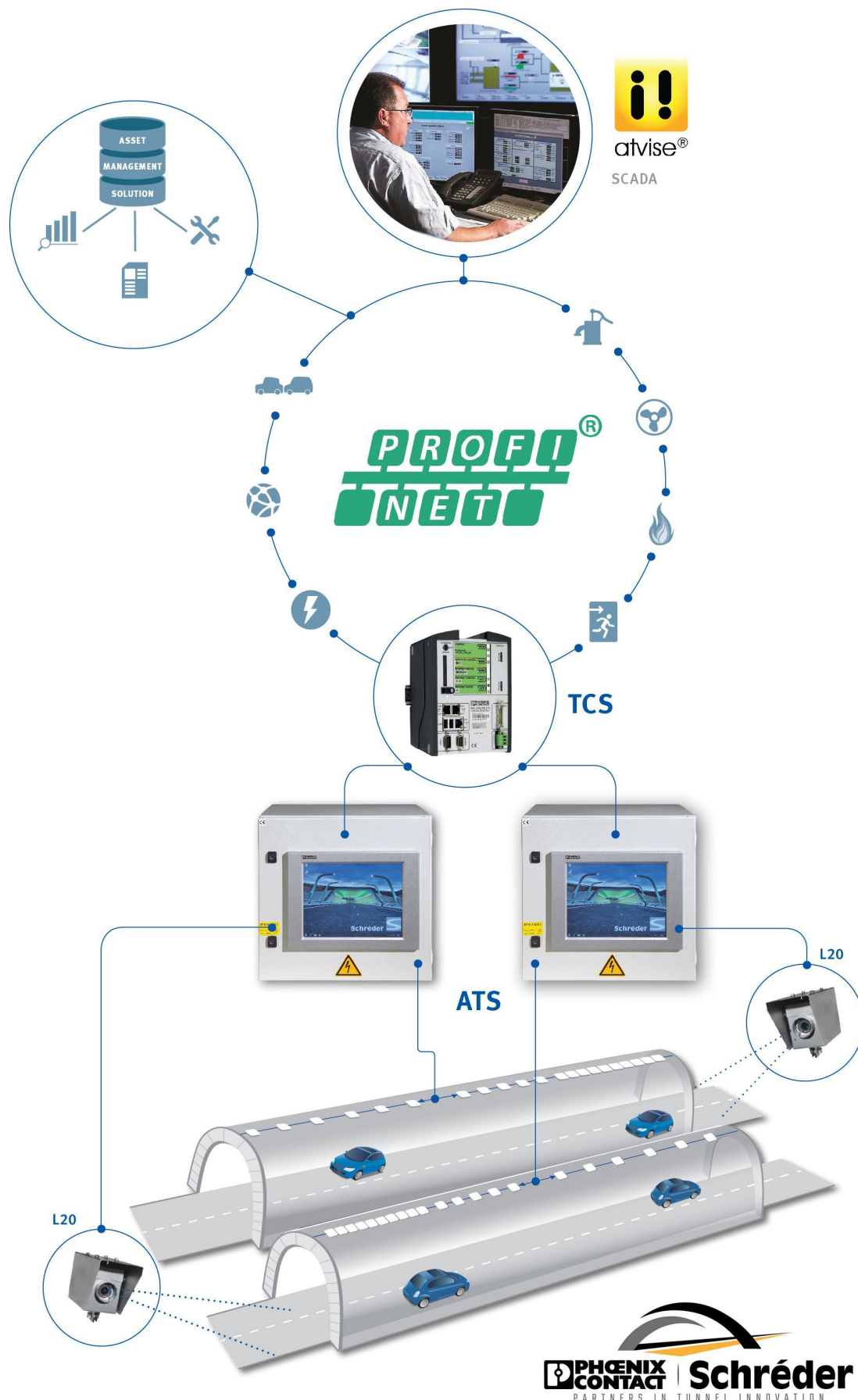
## ADAPTIVE LIGHTING ACCORDING TO SPEED

The ATS 4 can be linked to a traffic monitoring system to obtain data regarding speed or density to adapt the lighting level according to safety standards. This option further reduces energy consumption and increases the lifetime of the installation while ensuring the best driving conditions for motorists.



## ADAPTIVE LIGHTING ACCORDING TO POLLUTION

Based on cleaning cycles, the ATS 4 can take into account the depreciation of the flux due to dirt accumulation to continuously provide the requested lighting level in the tunnel. No more, no less. This feature offers additional energy savings while providing safety and comfort for users.





## GENERAL INFORMATION

Circle Light label	Score ≥90 - The product fully meets circular economy requirements
Driver included	Yes
CE mark	Yes
ENEC certified	Yes
ENEC+ certified	Yes
UL certified	Yes
RCM mark	Yes
UKCA marking	Yes

## HOUSING AND FINISH

Housing	Aluminium
Optic	PMMA
Protector	Tempered glass
Housing finish	<p>Polyester powder coating</p> <p>Standard polyester powder coating (C2-C3 according to the ISO 9223-2012 standard)</p> <p>Optional "seaside" polyester powder coating (C4 according to the ISO 9223-2012 standard)</p> <p>Optional "seafront" polyester powder coating with anodisation (C5-CX according to the ISO 9223-2012 standard)</p>
Standard colour(s)	AKZO grey 900 sanded
Tightness level	IP66/IP69
Impact resistance	IK 09
Vibration test	<p>Compliant with ANSI C 136-31 standard, 3G load</p> <p>Compliant with modified IEC 68-2-6 (0.5G)</p>
Access for maintenance	Tool-less access to gear compartment

· TFLEX COMBI 3 modules with fixed brackets complies with ANSI C 136-31 standard, 3G load

## OPERATING CONDITIONS

Operating temperature range (Ta)	-30°C up to +50°C / -22°F up to 122°F
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· Depending on the luminaire configuration. For more details, please contact us.

## ELECTRICAL INFORMATION

Electrical class	Class 1 US, Class I EU
Nominal voltage	220-240V – 50-60Hz 347-480V – 50-60Hz 277V – 50-60Hz
Surge protection options (kV)	10 20
Electromagnetic compatibility (EMC)	EN 55015 / EN 61000-3-2 / EN 61000-3-3 / EN 61547
Control protocol(s)	1-10V, DALI
Control options	Lumgate, Bi-power, Remote management
Associated control system(s)	Advanced Tunnel System 4 (ATS 4) Advanced Tunnel System 4 DALI (ATS 4 DALI)

## OPTICAL INFORMATION

LED colour temperature	4000K (NW 740)
Colour rendering index (CRI)	>70 (NW 740)

## LIFETIME OF THE LEDS @ TQ 25°C

All configurations	100,000h - L95
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· Lifetime may be different according to the size/configurations. Please consult us.

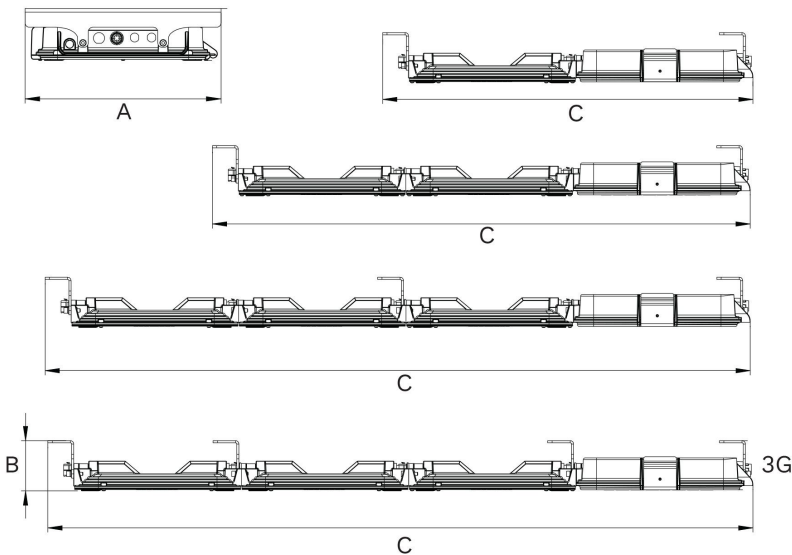


DIMENSIONS AND MOUNTING

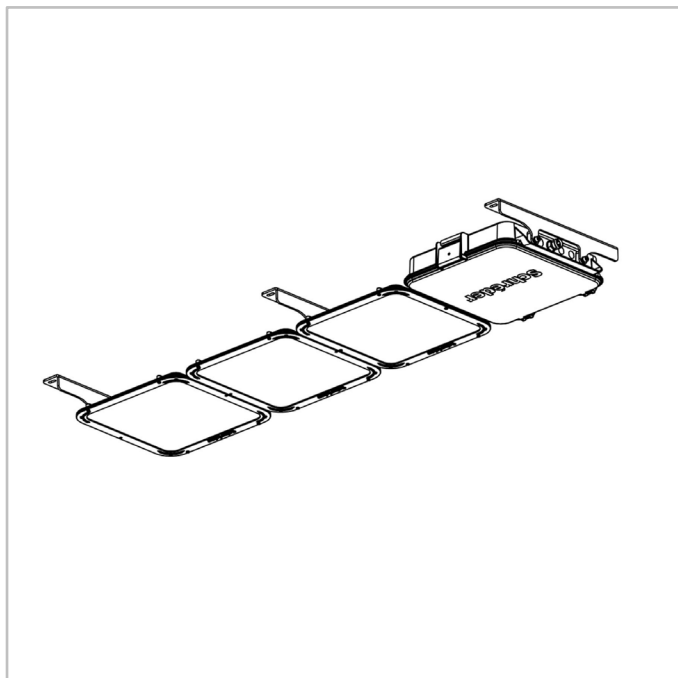
AxBxC (mm   inch)	TFLEX COMBI 1 : 440x117x860   17.3x4.6x33.9 TFLEX COMBI 2 : 440x117x1247   17.3x4.6x49.1 TFLEX COMBI 3 : 440x117x1635   17.3x4.6x64.4
Weight (kg   lbs)	TFLEX COMBI 1 : 16   35.2 TFLEX COMBI 2 : 23   50.6 TFLEX COMBI 3 : 32   70.4
Mounting possibilities	Hook(s) for suspension Surface mounting Wall-mounted

· Size and weight may be different according to the configuration. Please consult us for more information.

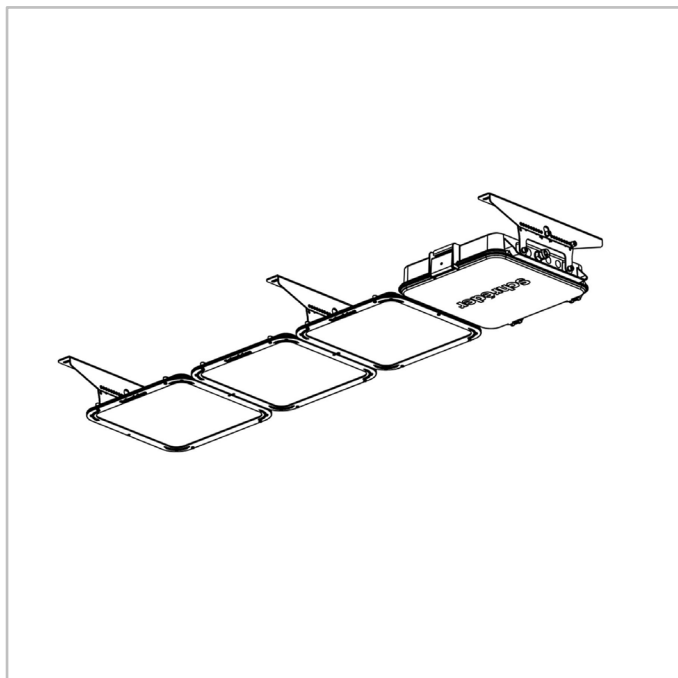
· Various dedicated brackets, swiveling and direct mountings. Please consult the installation sheets.



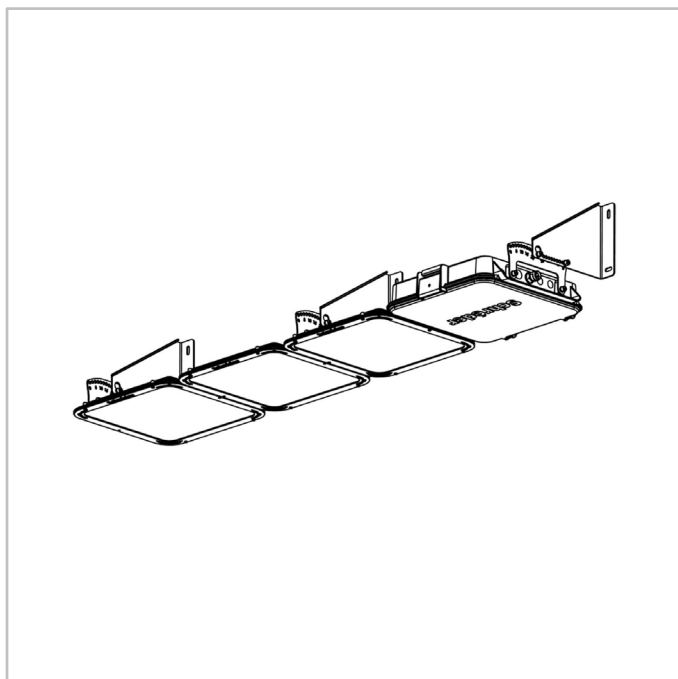
TFLEX COMBI | Fixed brackets - more details in the installation sheet



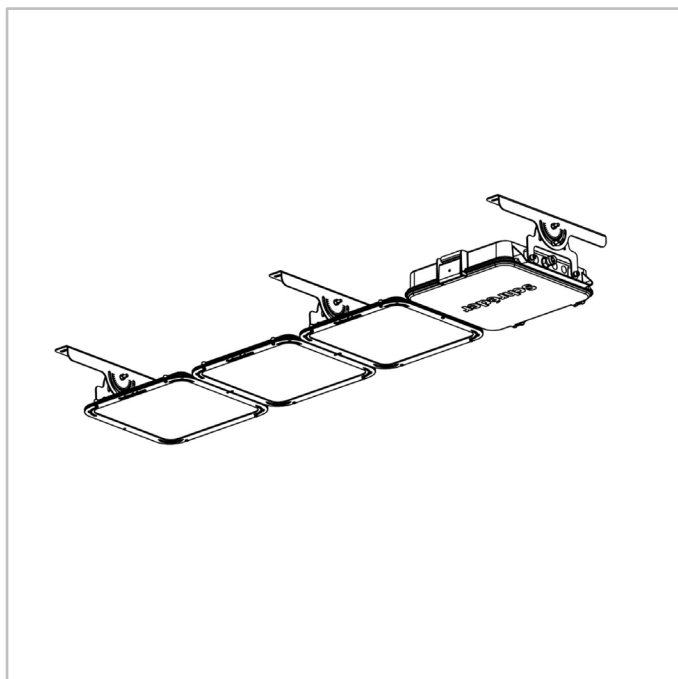
TFLEX COMBI | Pull-out swivelling mounting - more details in the installation sheet



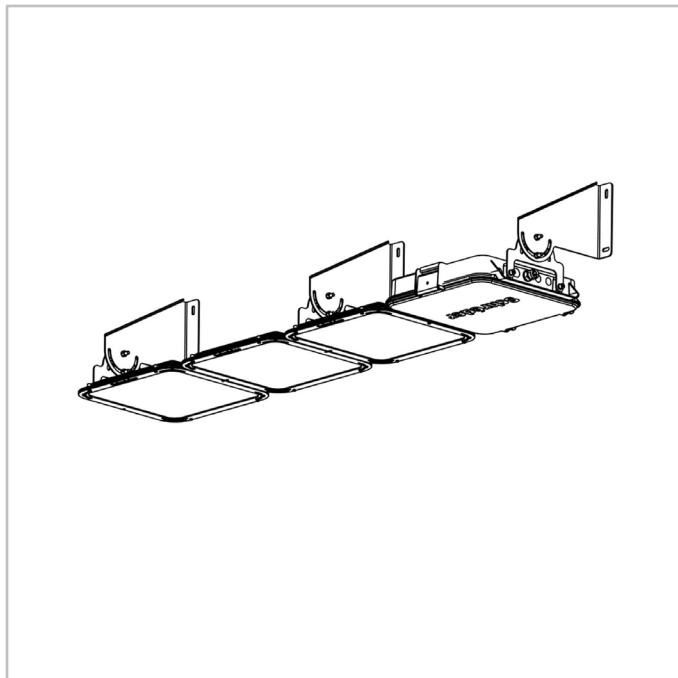
TFLEX COMBI | Pull-out swivelling wall mounting - more details in the installation sheet



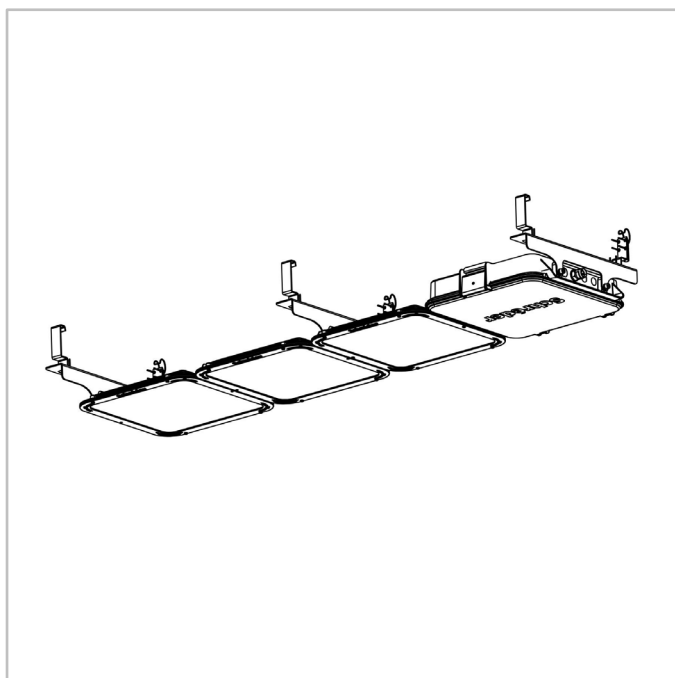
TFLEX COMBI | Adjustable swivelling mounting - more details in the installation sheet



TFLEX COMBI | Adjustable swivelling wall mounting - more details in the installation sheet



TFLEX COMBI | Hook fixation - more details in the installation sheet





Luminaire output flux (lm)		Power consumption (W)		Luminaire efficacy (lm/W)	
Number of LEDs	Min	Max	Min	Max	Up to
80	13000	33700	86	254	173

Tolerance on LED flux is  $\pm 7\%$  and on total luminaire power  $\pm 5\%$



Luminaire output flux (lm)			Power consumption (W)		Luminaire efficacy (lm/W)
Neutral White 740					
Number of LEDs	Min	Max	Min	Max	Up to
120	19600	50600	128	388	174
160	26100	67500	172	508	173

Tolerance on LED flux is  $\pm 7\%$  and on total luminaire power  $\pm 5\%$



Luminaire output flux (lm)			Power consumption (W)		Luminaire efficacy (lm/W)
Neutral White 740					
Number of LEDs	Min	Max	Min	Max	Up to
240	69700	91100	508	624	156

Tolerance on LED flux is  $\pm 7\%$  and on total luminaire power  $\pm 5\%$

