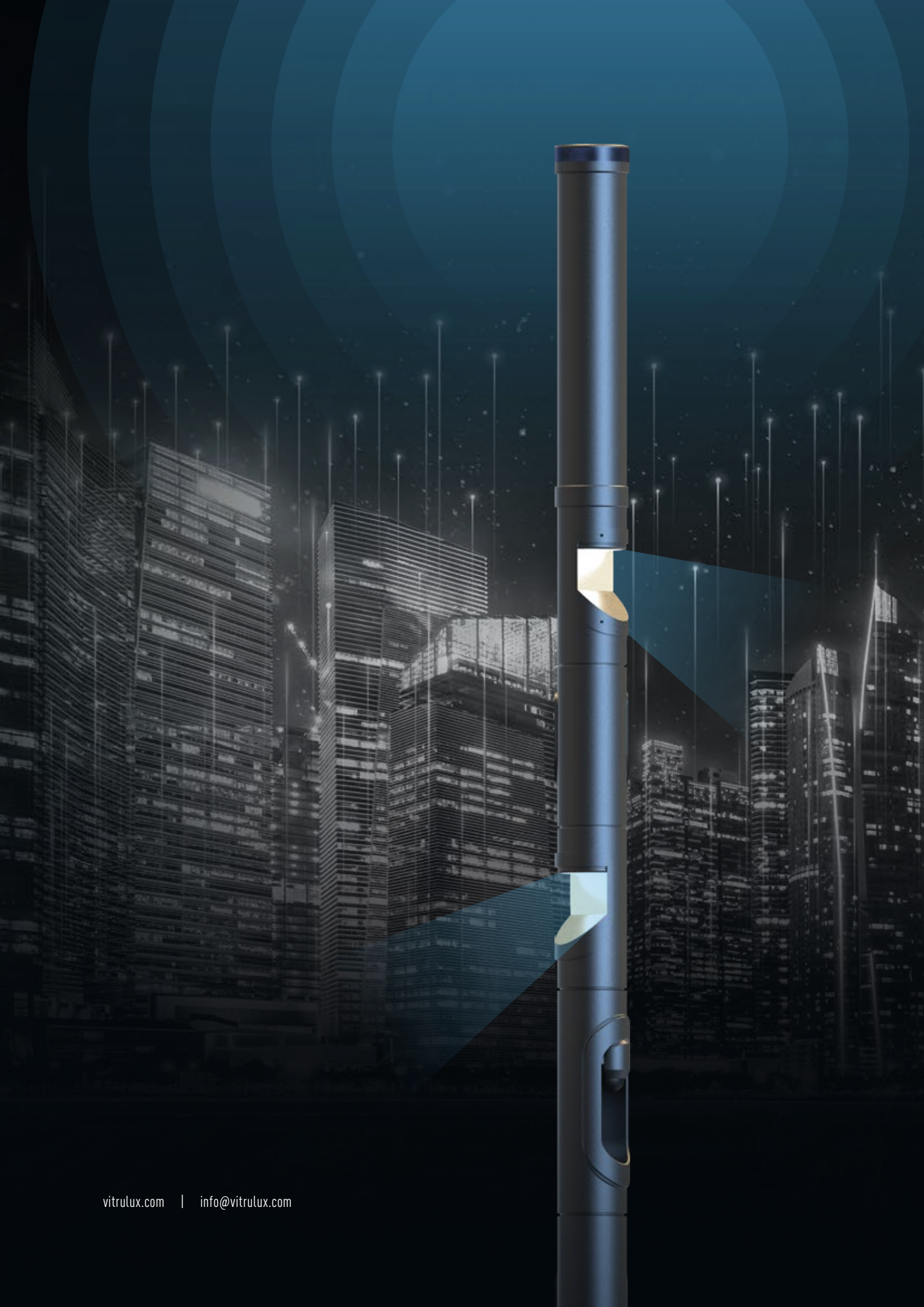


vitrulux.com | info@vitrulux.com

VITRULUX

Intelligent Solutions for Smart Cities

Smart Cluster
Solution overview 2023

VITRULUX

About us

Vitrulux is, first and foremost, a team of the best specialists: planners, engineers, and designers, as well as a powerful production facility with the state-of-the-art equipment, scientific laboratories and a training centre. We use our own patented technologies that ensure the best technical characteristics of our products in the market. We analyse progressive global trends and engineering innovations and offer not only the leading-edge, but also forward-looking solutions. We fully comply with the standards for indoor and outdoor lighting and secure strict control over the technological process at every stage, which allows us to guarantee the quality of our products and their operational reliability.

Company mission

We develop technologies and create projects that define spaces for living. We want to transform habitats into smart cities of the future, where high quality of human life is inseparable from the well-being of the planet. Our goal is to achieve a perfect combination of customer desires, aesthetics and optimal technical solutions in every project. Our concept is the combination of high technology, perfect design and environmental friendliness in everything we do.

Bronislav V. Gorlinsky
the founder of the Company

"Every modern city dweller is surrounded by multiple services that have become common as air. As the new technologies are getting more accessible and affordable, they bring the necessary infrastructure to our streets, back yards, and parks. What will it be like? What changes are coming to our living space, our cities, and our planet in the near future?

We are propelling new ideas, bringing the future closer, integrating the nerve ends of the city organism into its architectural landscape. The service space becomes denser, and at the same time more invisible and human-friendly."

Welcome

The Smart Cluster!

The city that's bright

The care for the environmental policy with reduction of pollution and carbon footprint requires the lighting systems to become intellectual, technologically advanced, and energy efficient.

The city with the established

modern digital infrastructure, designed to meet the existing and future requirements, succinctly fit into the city's architectural shape, operating for the city growth and people's benefit.

The city where it's comfortable to

— move freely;
— communicate and socialize;
— feel safe about your life and health;
— enjoy the atmosphere and the aesthetics of the ambience.

The city that is effectively covered with services


Law & Security enforcement


Civil information & Alarm system

Emergency services call availability


Urban systems monitoring


Video surveillance & Analytics

Internet of Things


Wireless network access


Energy efficiency & Manageability


Environmental monitoring


Attractive & Fittable design


Automated transport & Delivery

Vitrulux Smart Pole / Smart Cluster Technology is the synthesis of ergonomics and modern engineering, with design modularity, flexibility, and variety of technological solutions kept in an elegant form.

What is Smart City

Smart Cluster principles:

- Creating a universal multi-purpose infrastructure with room for growth and modernization;

- Layered design with implementation of BIM technology;

- Unification, modularity and scalability;

- Uniform control & management;

- Unified design concept.

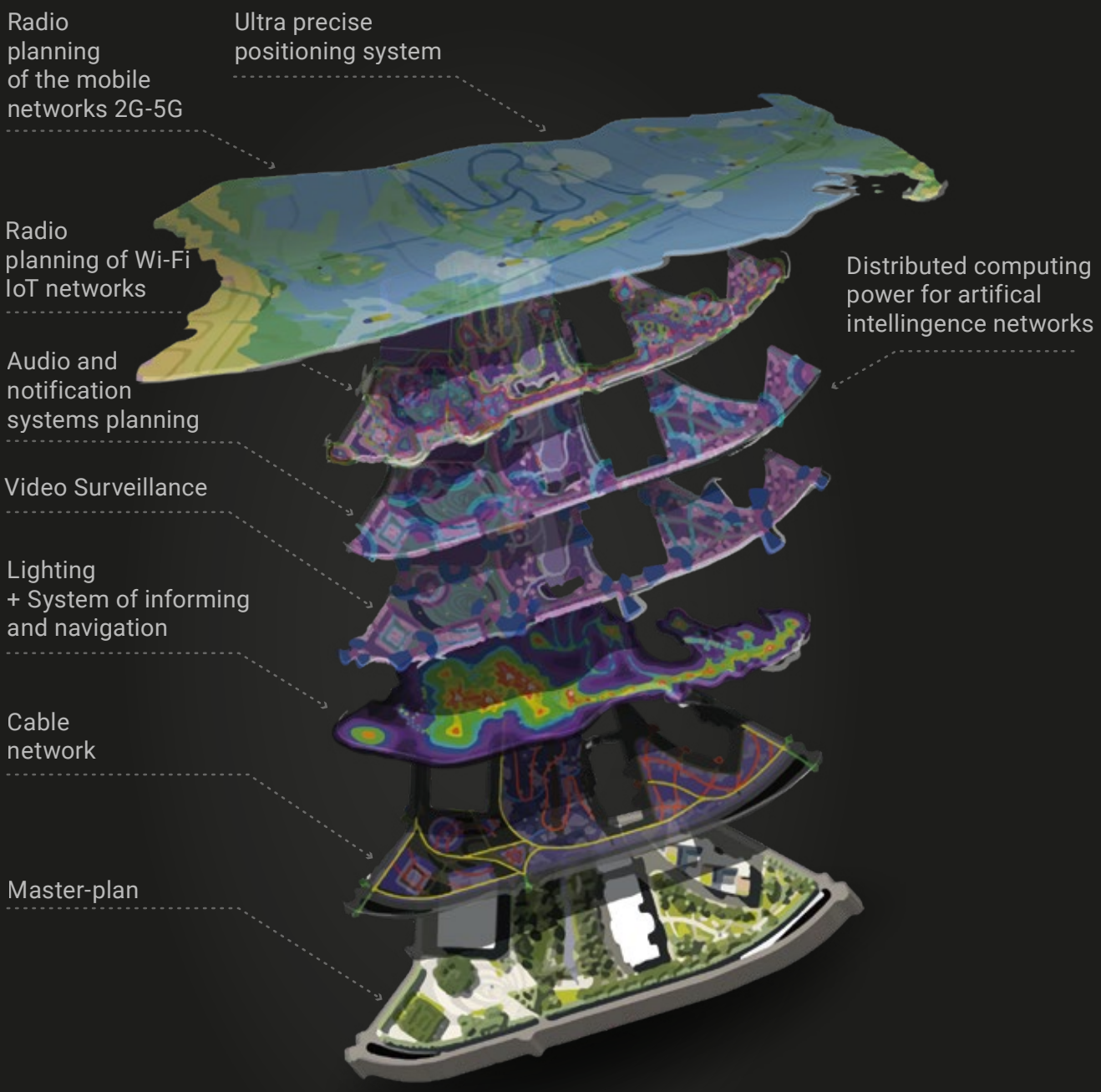
1st Principle

Unified design concept
accepted in the city.

Smart Poles are durable architectural objects which will become members of the “architectural family” of the neighborhood for decades.

2nd Principle

Building a multilevel infrastructure with room for growth and modernization.



Layered design with implementation of BIM technology allow to avoid intersection and duplication of engineering systems, make correct calculation of capacity and bearing capabilities, and plan enough room for development, which is particularly relevant in situations with extensive excavation work and further landscaping of the territory. Reduction of related works during maintenance & modernization is a must. This principle also enables the source data for planning the main power & communication networks.

3nd Principle

Unification and scalability while building multi-level infrastructure.

Major highways

Dense road traffic flows
Plazas, large intersections

Low Smart Poles density;
High load per pole;
Large data flow;
Bright lighting requirement;

Pole height:
up to 15 meters
Number of modules:
starting from 8

Secondary streets

High volume of pedestrian traffic
Abundance of intersections

High concentration of services;
High Smart Pole density;
High dynamics of data flow;

Pole height: 8-9 meters
Number of modules: 4-6

Yards and Parks

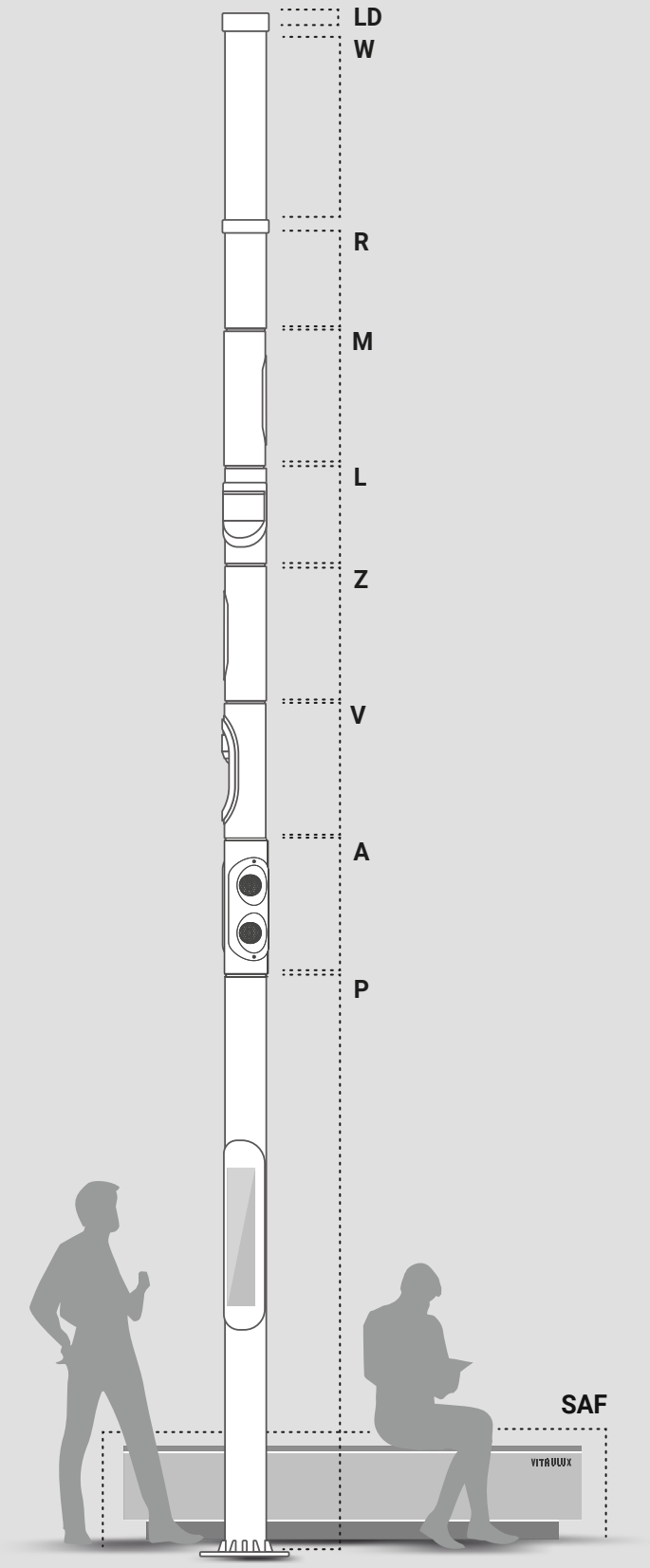
Small territories
Now traffic density

Distributed lighting systems;
Low quantity and density of services;
Mostly static field;

Pole height: up to 6 meters
Number of modules: 2-4

4th Principle

Open architecture.
Modular system structure.



Modular structure principle provides the Smart Pole system with unique flexibility of functionality choice. The possibility of equipment integration from practically any manufacturer allows users to utilize the equipment they are familiar with.

The majority of functional modules have unified placement constructions, which allows interchanging and increasing functionality as needed.

Module parts can be rotated to a desired angle without disassembling the pole.

Smart Light

Positioning Beacon

Managed Lighting

Inteligent lighting

Smart Lite

Positioning Beacon

Wi-Fi or Small Cell

Managed Lighting

Video

Audio

SOS / Info panel

Services wherever they are needed

Smart - family

Smart Pole

Drone port

Positioning Beacon

Wi-Fi

Cellular services

Meteo Module

Highway Lighting

Pedestrian Lighting

Architectural Lighting

Video Surveillance

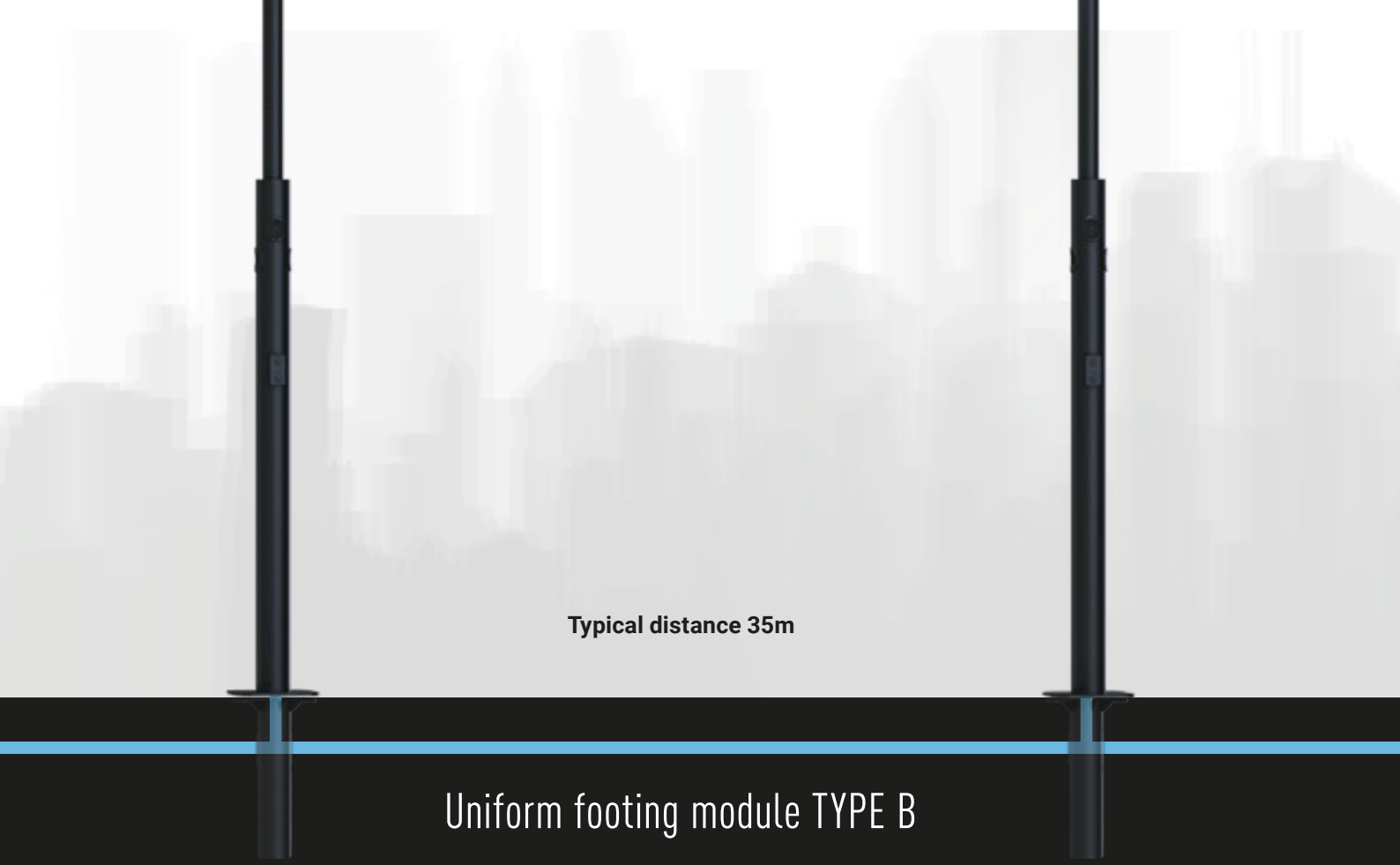
Video Analytics

Audio Playback & Alerting

Auto Charging Station

Bringing the full range of serices.

Uniform footing module TYPE A



Uniform footing module TYPE B

No manholes
Less earthwork
Less landscaping

What's under

-pre-connection boxes
-spiral reserve length storage
-cable entry module
-super-flywheel power storage module

Pre-terminated hybrid cable assemblies

Power
Fiber Optics
Signal Wires

SAF

Small Architectural Forms (SAF) are used for cellular base station placement in situations when integration into the pole is impossible.

SAF design is individually matched with the object. Usually, they are shaped as a bench, flower-bed, or information board.

Benches can be optionally equipped with PWR1/PWR3 gadget chargers.

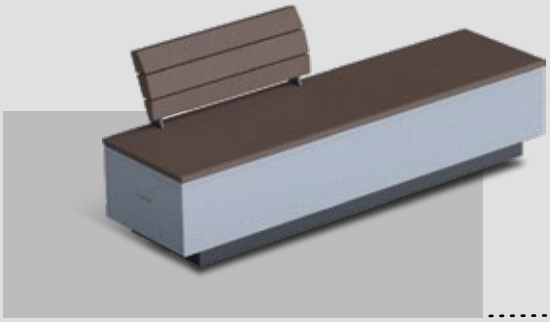
SAF 1

Materials: **concrete**

SAF 2

Materials: **concrete**

SAF 3

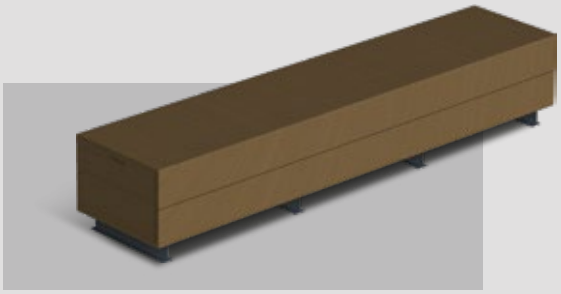


Materials: **concrete | wood | metal**

SAF 4

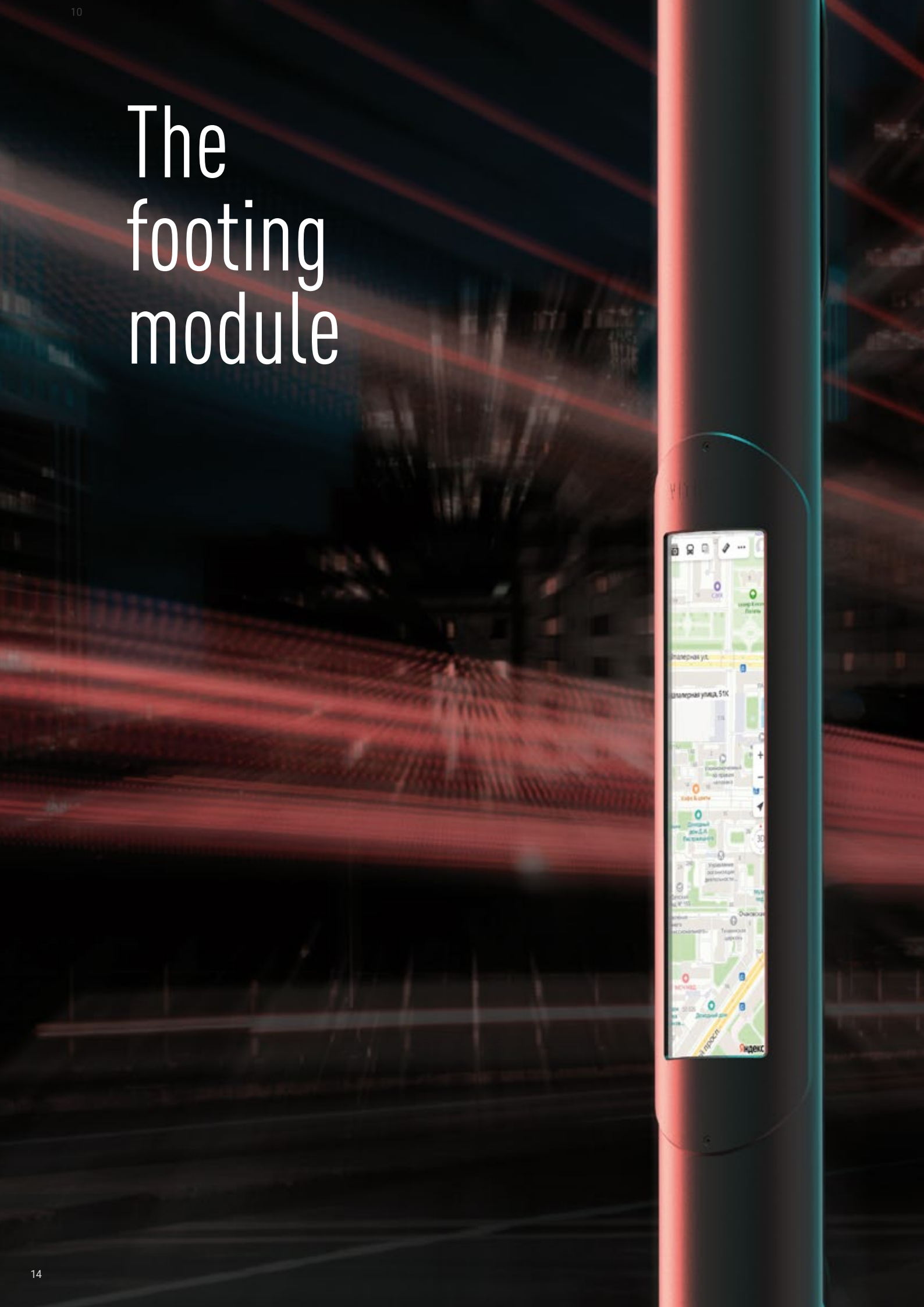
Materials: **concrete | wood | metal**

SAF 5



Materials: **wood | metal**

The footing module



P1

The basic footing, is used for cable line connection and placement of main pole communication equipment. It has three lockable service hatches.

P2

The footing with the **SOS/INFO call panel**.

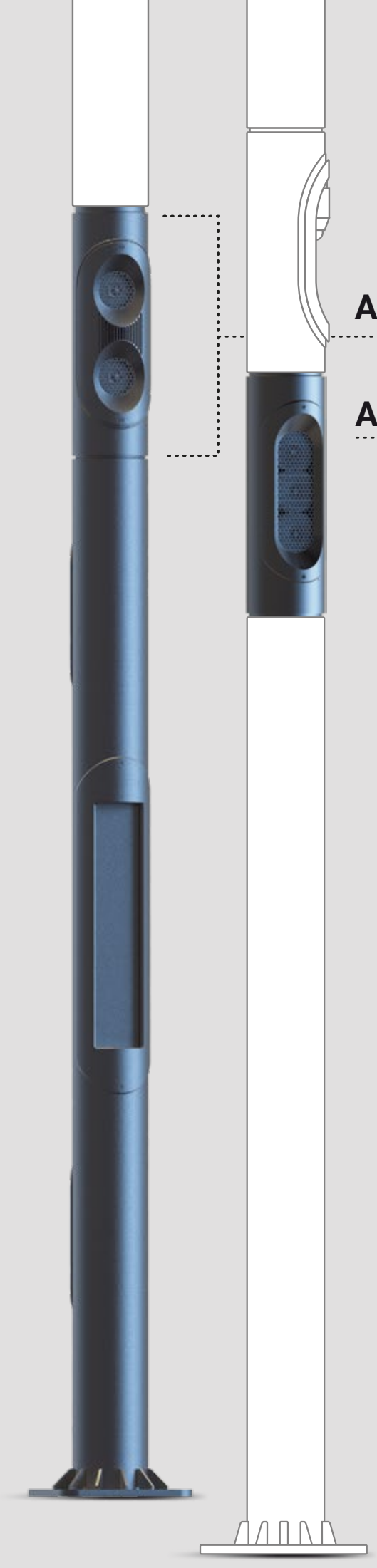
P3

The footing equipped with **the information display with or without a touchscreen function.**

Additional optional modules:

PWR1 - USB charger module
PWR2 - electric car charger module with Type2 outlet, 7/11/22kW
PWR3 - wireless cell phone/tablet charger module.

Acoustic system modules



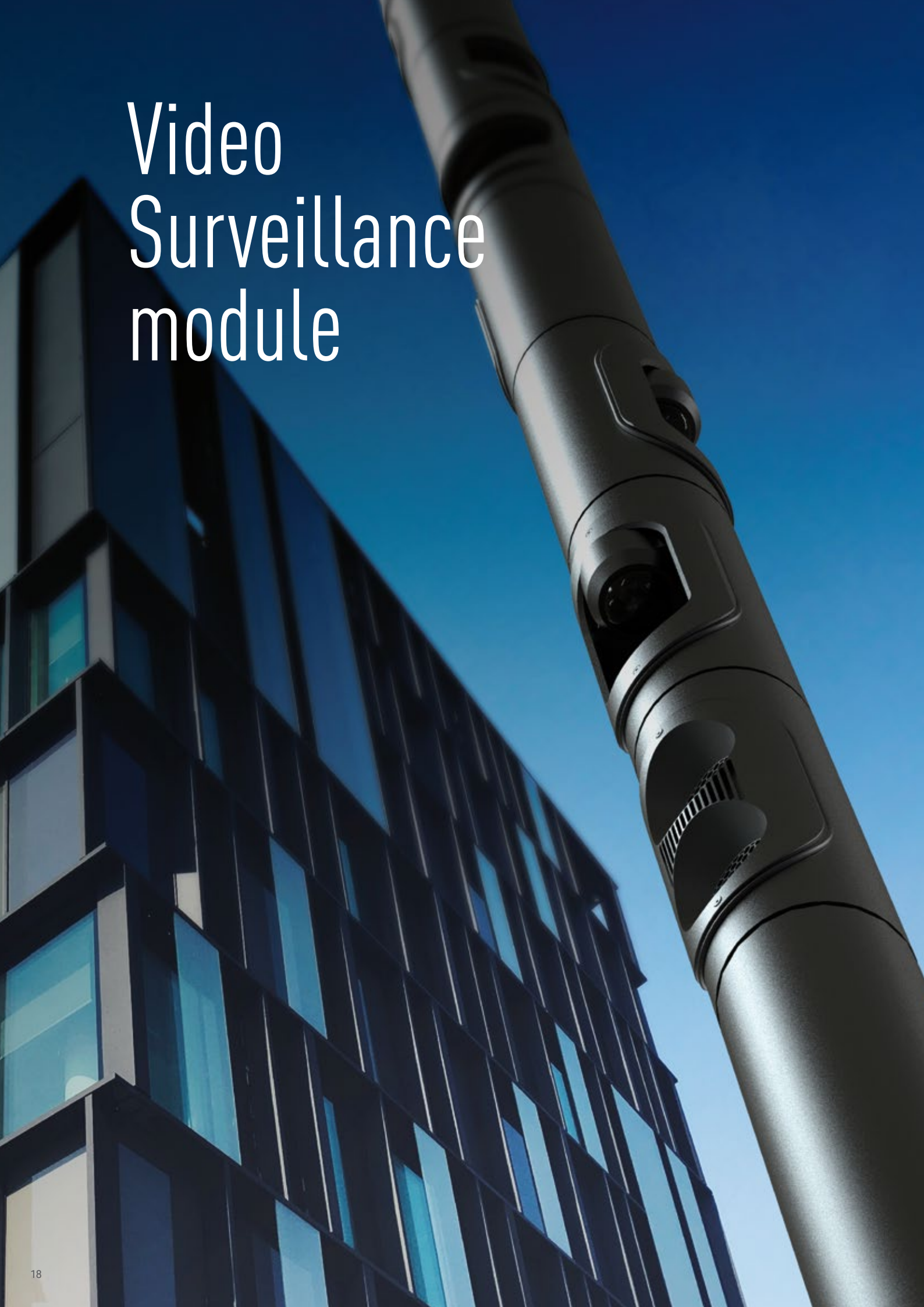
A1 **Rated power 35W**

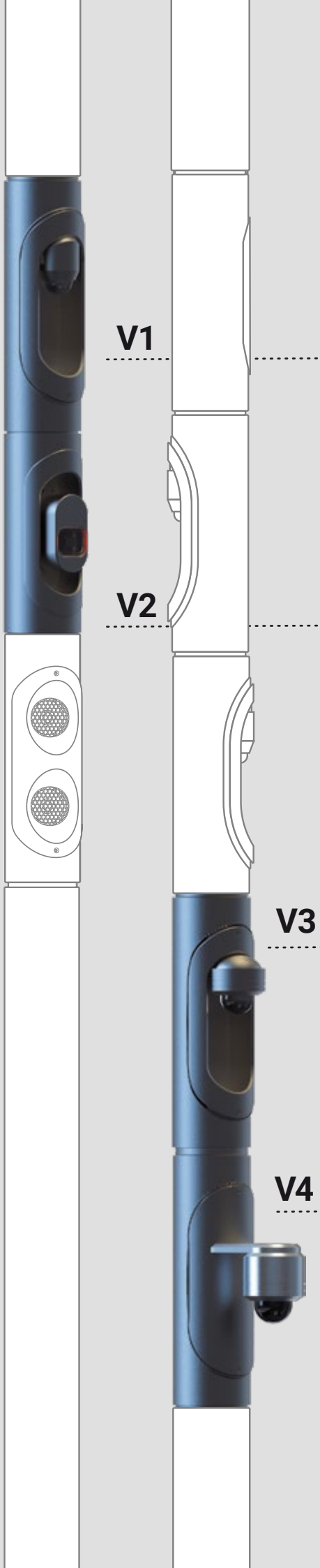
A2 **Rated power 80W**

Speakers	Coaxial speakers with 120W peak output
IP	65
Frequency, Hz	90-22000
Impedance, Ohm	4
Sensitivity, dB	90
Speaker head	Titanium dome

Acoustic modules can be connected with P3 display module or operate separately. Local or online HTTP/RTSP playback is supported. Optional priority interface for public announcement/civil defense systems is available.

Video Surveillance module





V1

Public areas monitoring

Fixed/PTZ dome camera

Image sensor, CMOS	1/2,8''
Effective pixels, Mpix	3,2
Focus distance, mm	2.8-12
IP67	-50..+50°C

V2

Semi-submerged high resolution ready for analytics

Image sensor, CMOS	1/2,8''
Effective pixels, Mpix	5
Focus distance, mm	2.8-12
IP67	-50..+50°C

V3

High speed PTZ dome camera with 180° visible sector

Image sensor, CMOS	1/2,8''
Effective pixels, Mpix	2-5
Focus distance, mm	4.7-141
IP67	-50..+50°C

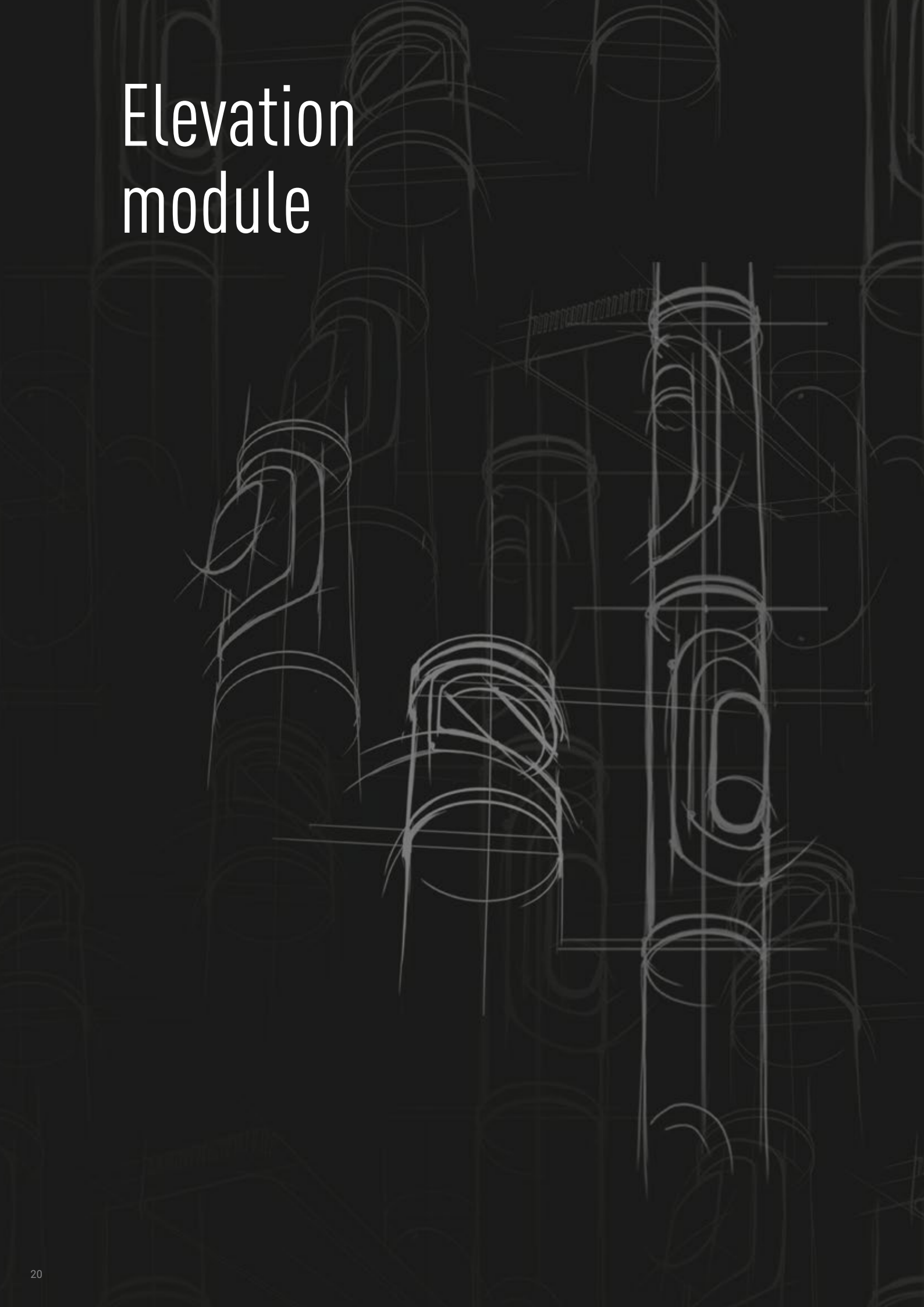
V4

External hanged PTZ speed dome camera

Typical parameters are shown above.

Various camera types can be integrated according to the Customer's technical requirements.

Elevation module



Elevation module

has a standard interface for a functional module covered by a hatch for future functionality development.

Z1 0.7m high

Z2 1.5m high

Z3 3m high

Z4

customer specified

Aluminium plated steel modules of the pole ensure high bearing capacity and strong corrosion protection. Specially selected polymer paint is environment resistant and maintainable.

Functional lighting module

Light beam diagrams

WATT	40-80 W Power
lm	4600-9600 lm Light stream
	120 lm/W Light output
	2700-5000 K Light temperature
CRI INDEX	≥ 85 CRI index
	Any RAL on demand Case color
	Harsh environment resistant
°C	-60°...+50°C outdor temperature range
IPxx CODE	IP 67
IKxx CODE	IK07 Vandal proof code

Lighting modules L

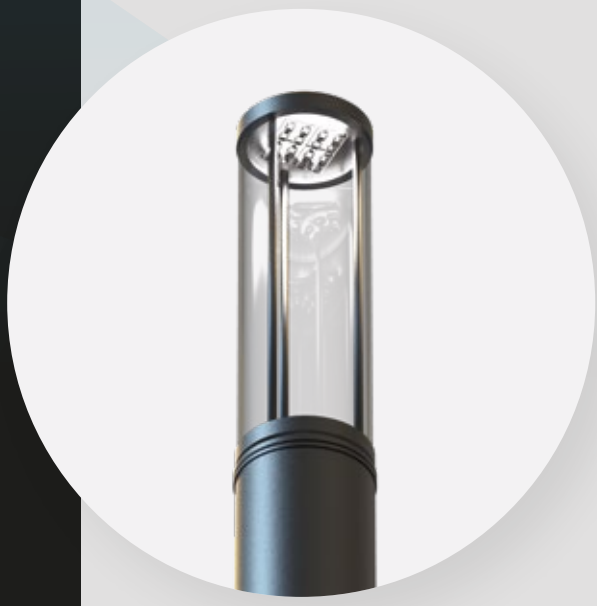
Designed for pedestrian areas lighting

L1

sector 120°

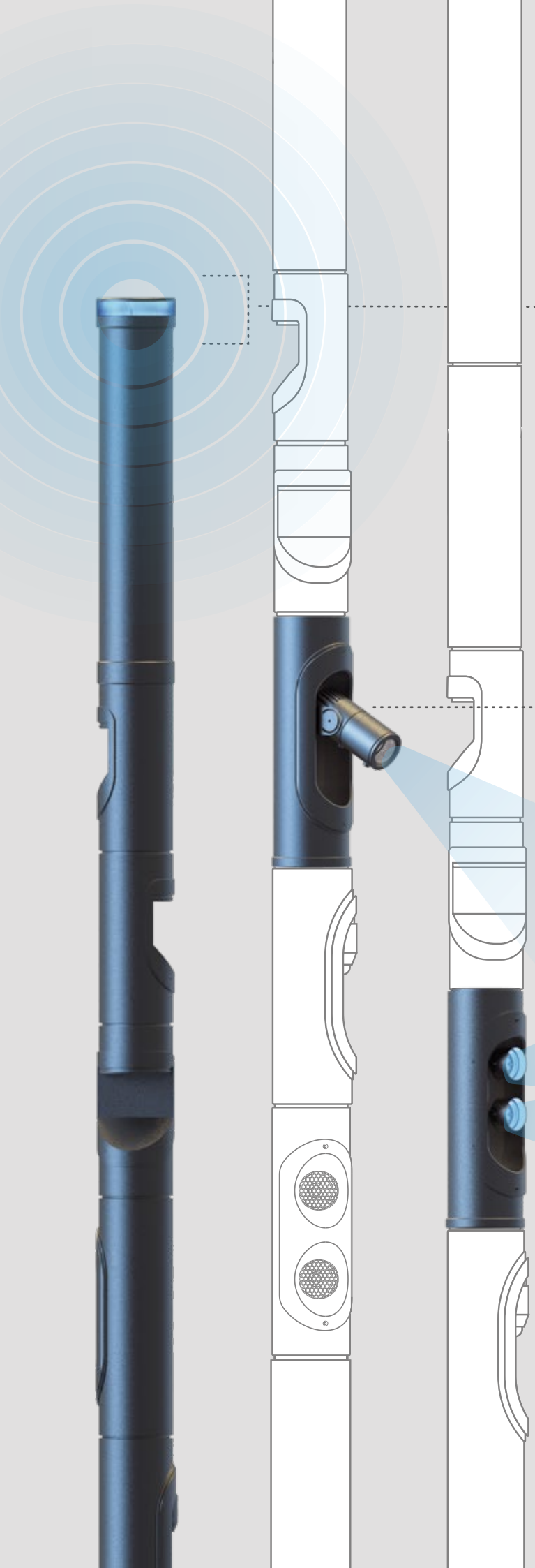
L2

360° Pole top module



Decorative lighting modules

WATT — Up to 10-70 W Power	lm — Up to 1760 lm Light stream
110 lm/W Light output	2700-5000 K Light temperature
CRI INDEX — ≥ 85 CRI index	Any RAL on demand Case color
Harsh environment resistant	°C — -60°...+50°C outdor temperature range
IPXX CODE — IP 67	IKXX CODE — IK07 Vandal proof code



LD3

Decorative element for pole roof marking.

LD2

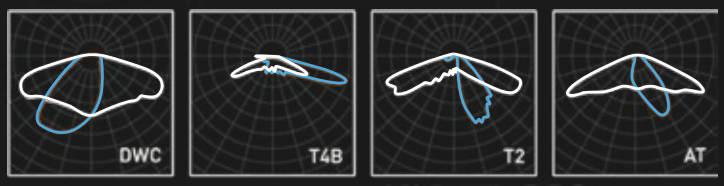
Gobo projector, 60W

LD1

White or RGBW accent lighting / architecture backlight module has two spots of 24/40/60W

Street lighting modules

Light beam diagrams



WATT	100-225 W Power
lm	12000-24000 lm Light stream
	120 lm/W Light output
	2700-5000 K Light temperature
CRI INDEX	≥ 85 CRI index
	Any RAL on demand Case color
	Harsh environment resistant
°C	-60°...+50°C outdor temperature range
IPXX CODE	IP 67
IKXX CODE	IK07 Vandal proof code

LS1

100W

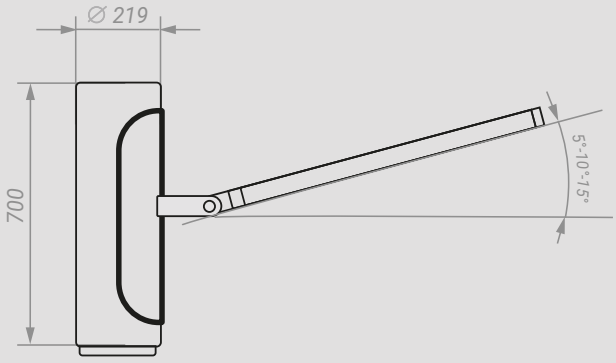
LS2

150W

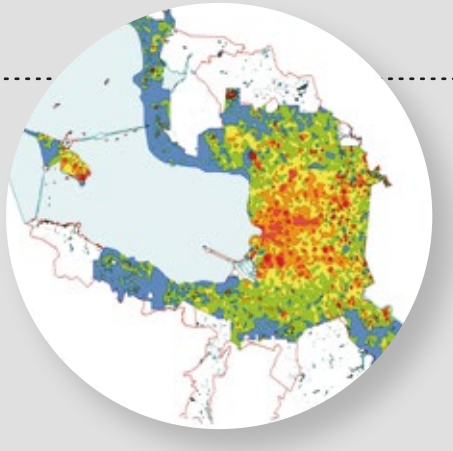
LS3

200W

Tilt angle: 5° / 10° / 15°



Meteo module with CO^2 sensor



Pollution level analysis

Air pressure & CO2 level measurement is the common method to gauge the air quality. Basic CO2 levels, ppm:

1. <400 healthy, normal outside level
2. 500-750 acceptable with some complaints possible
3. 1000-2000 General drowsiness
4. > 2500 Hazardous level

Other pollutant gases on demand. An external full functional meteo station can be installed as requested by Customer.

Cellular antenna module

R1 single-band. In production.

Antenna module is built into the pole and covered with radio transparent enclosure that makes it indistinguishable from the other modules.
It allows to operate 2G/3G/4G/5G/IoT signals within 0.7 - 5.8 GHz, depending on antenna type, from the radio modules integrated into the pole or SAF.
Various macro-and micro-cell antennas are available in the shape of the pole tube.

Type R1D1
1-2-3 **sector**
1.7-2.7 **GHz**
3x65° **X-pol**
10.5-17.5dB **Gain**
2x2 **MIMO**
VET

Type R1D3
Quasi-omni
1710-2690 **MHz**
360° **X-pol**
8 **dB gain**
2x2 **MIMO**
FET

R2 Dual-band. In production.

Type R2D40
1-2-3 **sector**
790-960/1710-2690 **MHz**
3x65 **X-pol**
15/17.5 dB **Gain**
2x2 **MIMO**
FET/RET

R3 active

The active antenna module integrated into the pole. Completed case - Huawei AAU5940

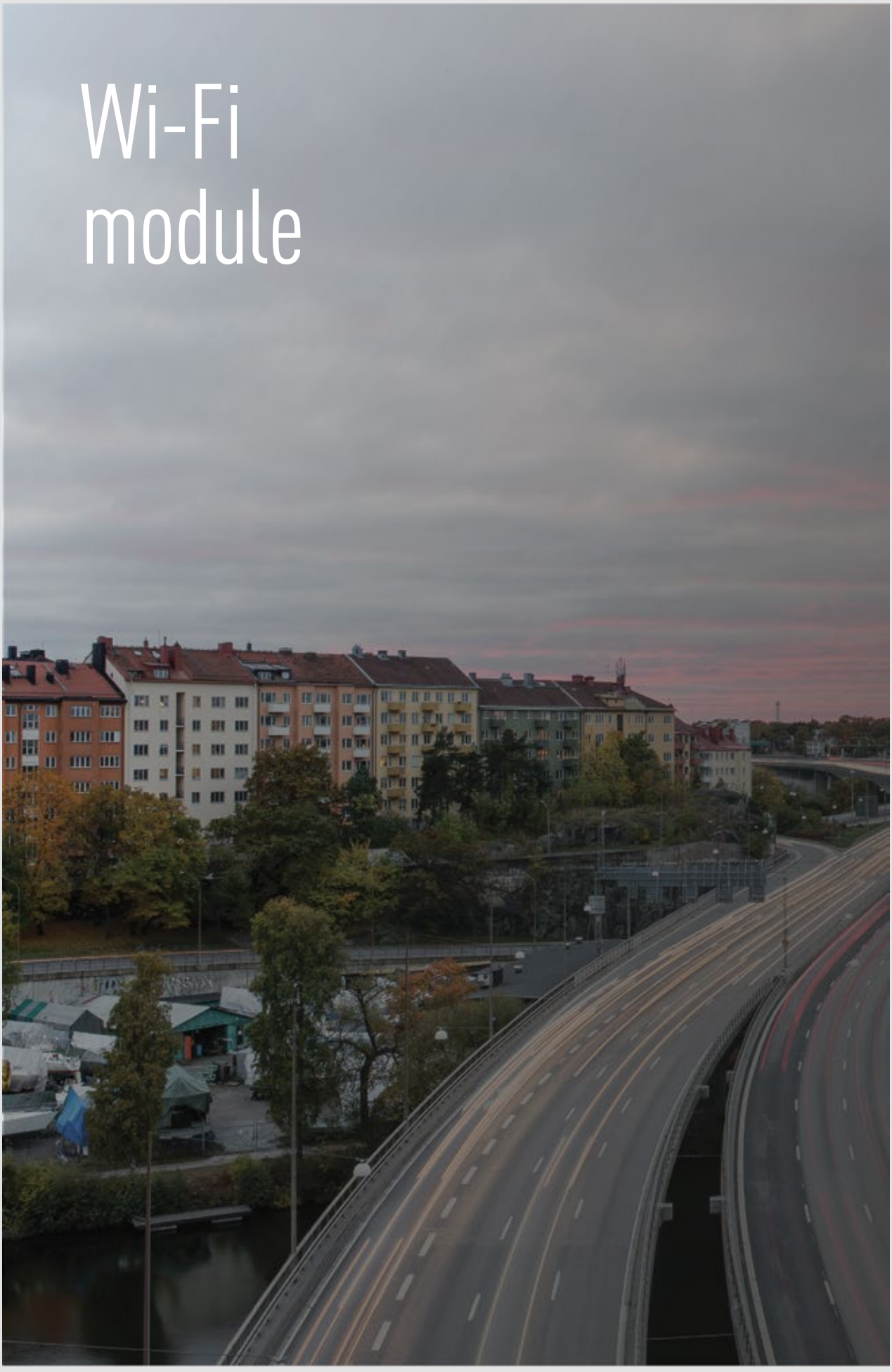
R4

4.9GHz 5G band. Under development.

R5

3.5GHz 5G band. Under testing.

Wi-Fi module



W1

up to 256 users
802.11a/b/n/ac
up to 1.75 Gbit/s throughput

W2

up to 512 users
802.11a/b/n/ac, ac _Wave2
up to 3.46 Gbit/s throughput

W3 (Wi-Fi 6)

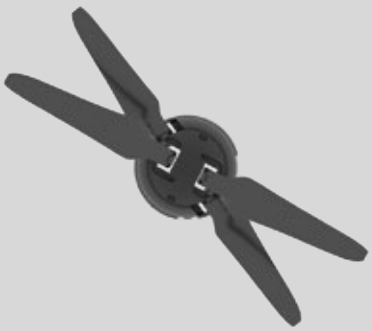
up to 600 users
802.11a/b/g/n/ac/ac wave 2 /ax
MIMO up to 8x8
up to 10.3 Gbit/s throughput

Drone Dock

Drone Dock is a multifunctional module that provides complete security for storing and operating the Novus drone as an integral part of the Smart City.

Fully integrated into smart poles, the Drone Dock is capable of keeping the drone up and running at all times. Via interaction with the smart system, the module receives a signal and automatically releases the drone as soon as it detects the possibility of an accident.

As a state-of-the -art drone base, this module provides year-round charging and makes the drone ready to fulfill missions 24/7.



Smart
Multipurpose
Unique

A compact and powerful axial drone with fully automatic takeoff, navigation and landing capabilities integrated into Smart Cluster is a unique solution by Vitrulux.

Communication, navigation, housing and recharging are performed by the Smart Cluster poles.

Max. takeoff altitude
1000m

Max. speed
8 m/s

Hovering accuracy range
±0.05m (horizontal)

48 MP
camera

Sensing
system

Novus

An unmanned security guard.

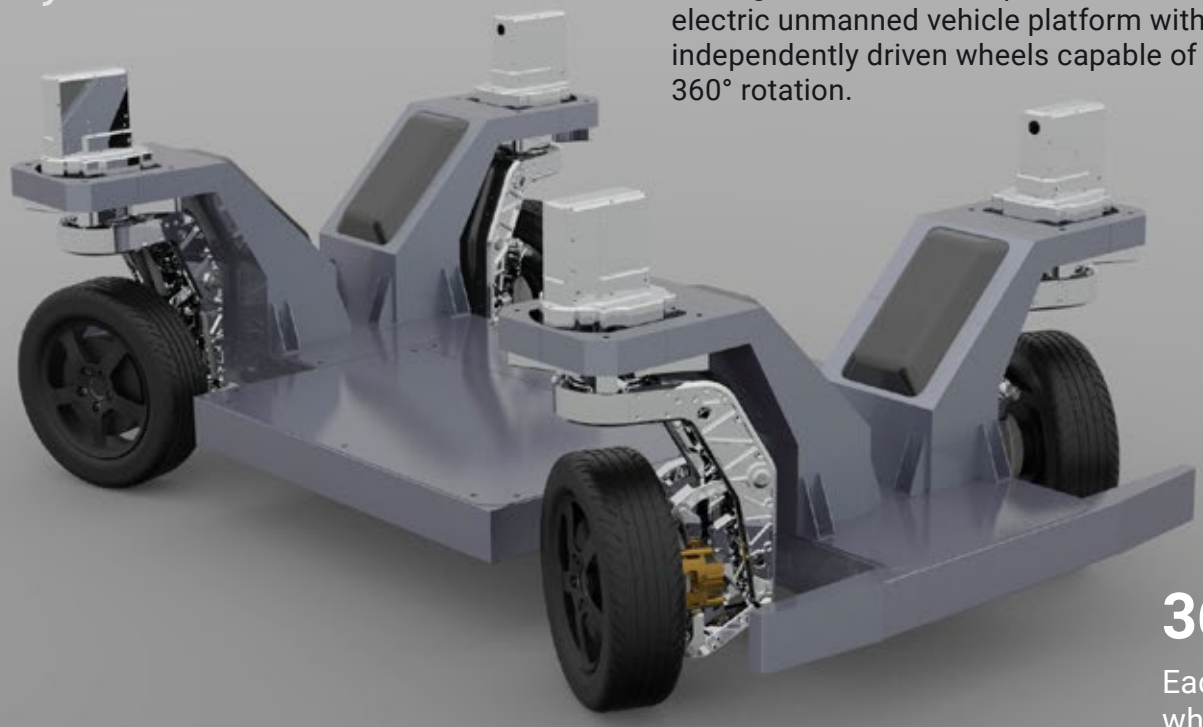
This flying object is equipped with a video camera, microphone, speaker, and compact merchandise holder that enable it to perform innovative functions such as monitoring & filming, remote voice communication, and delivery of rescue tools.

Its primary purpose is routine proactive and preventive security protection.

As part of Smart Cluster, Novus is aimed at preventing accidents predicted by the smart poles. Its minimalistic design, focused particularly on functionality, along with high performance characteristics make Novus a state-of-the-art drone capable of reaching the designated destination within just several minutes.
With a maximum wind speed resistance of 6 m/s and an operating temperature range of -10° to 40° C (14° to 104° F), Novus is truly an all-season aid to rescue services.

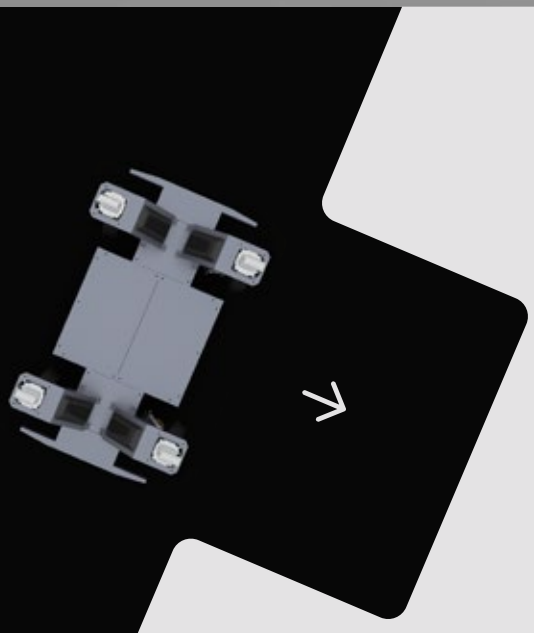
Fully automatic

This unique Smart Cluster invention is literally making the future one step closer – a universal electric unmanned vehicle platform with independently driven wheels capable of full 360° rotation.



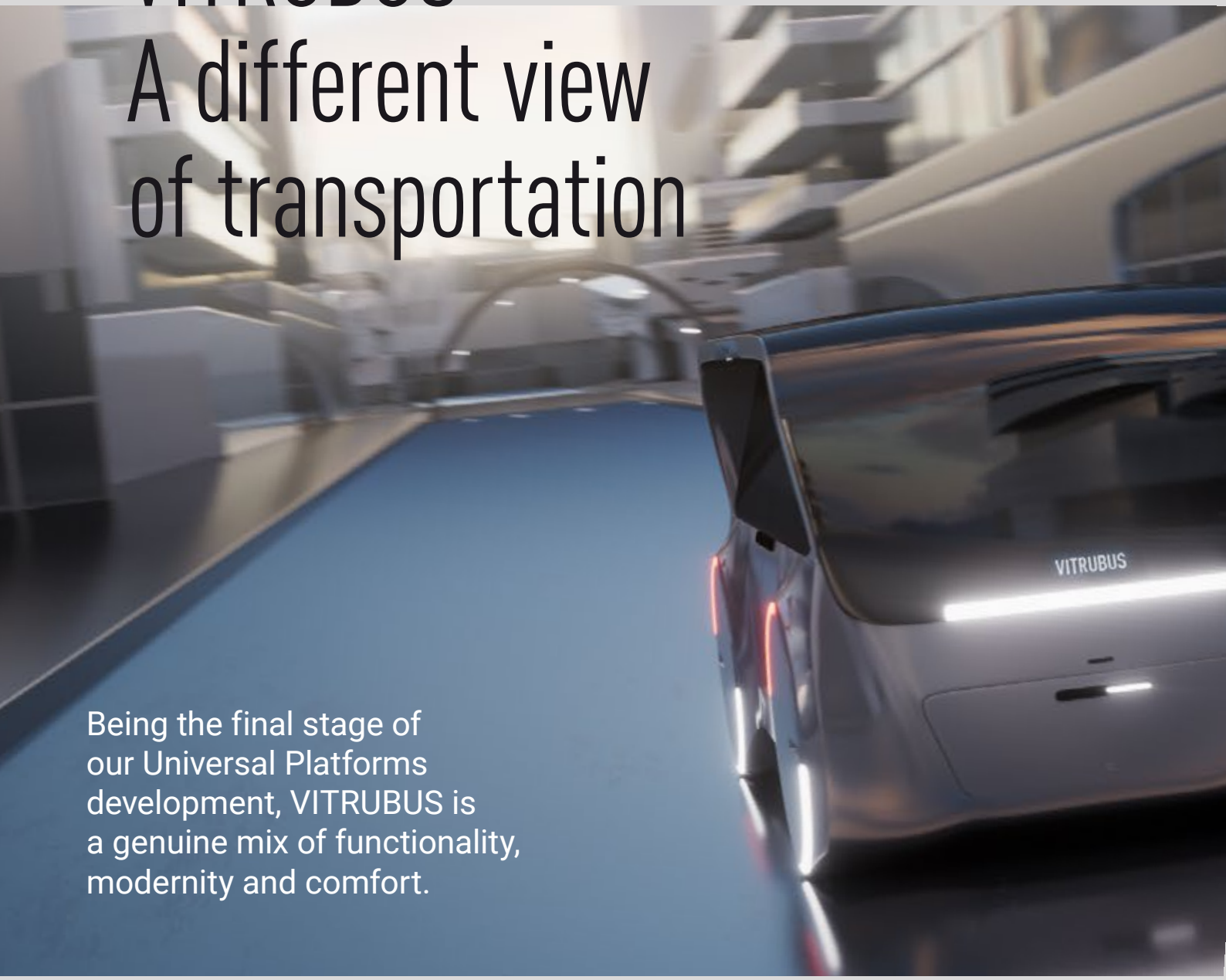
360°
Each wheel's rotation

A uniform transport platform for Smart City



The AWS wheel modules are a key feature of the platform, as this technology takes urban transportation to an entirely new level. Finding a parking spot or turning around on a narrow street is no longer a problem.
Due to its universality, any vehicle body can be installed on the platform – both freight and public purposes are available.

VITRUBUS
A different view of transportation



Being the final stage of our Universal Platforms development, VITRUBUS is a genuine mix of functionality, modernity and comfort.

The versatile modular electric platform driven by AWS wheeled modules, capable of moving in any direction, guided and controlled by Smart Cluster, is the personalized transport of the future.

The Ultra Precise Real-Time Positioning System (UPRTPS) enables zero-emission unmanned vehicles of various purposes – trucks, public transit, or taxi cabs – to move optimally within the city, providing its citizens with freedom of movement and safety.

Physical layer

Higher modules are reachable with unique modular self-supported ladder. There’s no need to use lifting machines to perform maintenance works. Smart accessories create the friendly environment for the workers.

10%

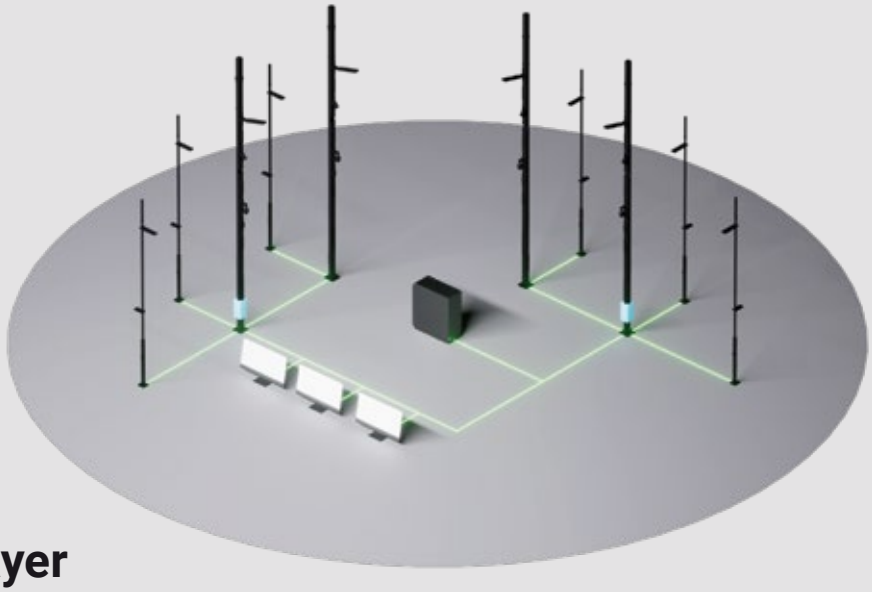
Most of active devices are fit in the footing module and reachable from the ground. A uniform cross-connection module enables to check all life parameters promptly.

90%

Smart maintenance

Network layer

Parameters are constantly monitored via SNMP agents. Most of faults are diagnosed remotely and managed almost automatically. Maintenance and repair templates increase the ratio of cases resolved at 1st line.



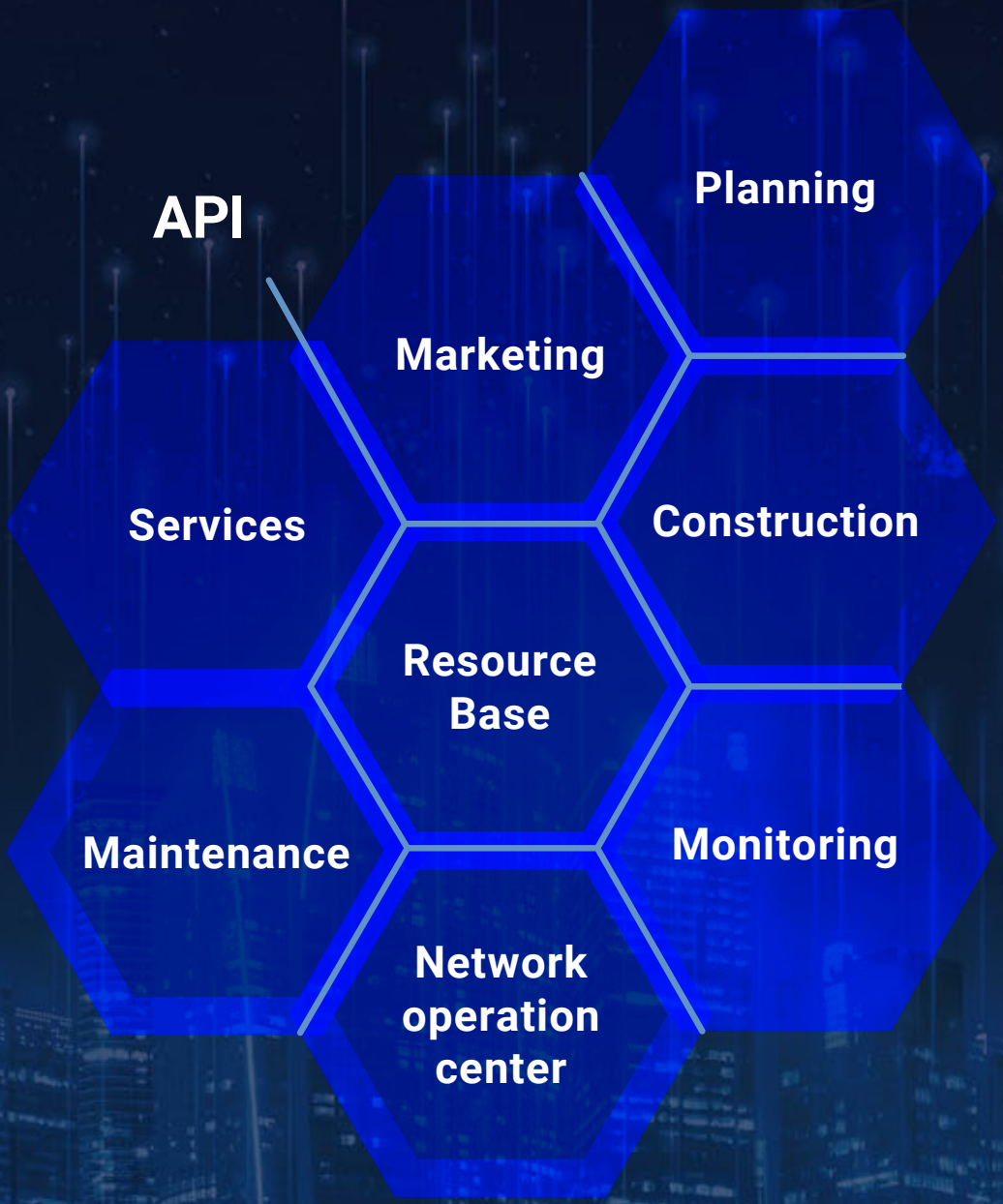
System layer

Total control of resources helps to ensure effective management. The registration and analysis of all cases form the background for the proactive management system with a knowledge database as its foundation.

Engineer in-the-box

The “Engineer in-the-box” system enables the competence to be brought to the right place at the right moment.

Modules are linked with API interfaces that make the system flexible, scalable and maintainable.



Modular software for infrastructure operator

Marketing

CRM-like platform to turn the plans into installations of services.

Planning

Collect&summarize the market information. Plan the investment, construction and sales.

Services

Installation/shutoff management & billing module needed for any telecom operator. Point of income for the whole system.

Construction

An ordinary construction management module to superintend the construction workflow creating the resources for the Cluster.

Resource base

The core module and the digital twin of the system. Chain resources help to outline the complicated structure of the real multi-purpose network and horizontal links between the clusters.

Monitoring

SCADA-like module to keep the cluster under control and proactively manage the maintenance cases.

Maintenance

A module similar to Service Desk to manage installations and maintenance, including personnel and material base management as well.

Network operation center

A powerful set of human-machine interfaces to operate the resource base, create maintenance scenarios, provide the 2nd service line.

The system that grows and transforms in sync with the city

Enter the future today:

- Plan the starting functionality
- Define the initial topology
- Create once
- Add cluster by cluster
- Use, amend and modify for years

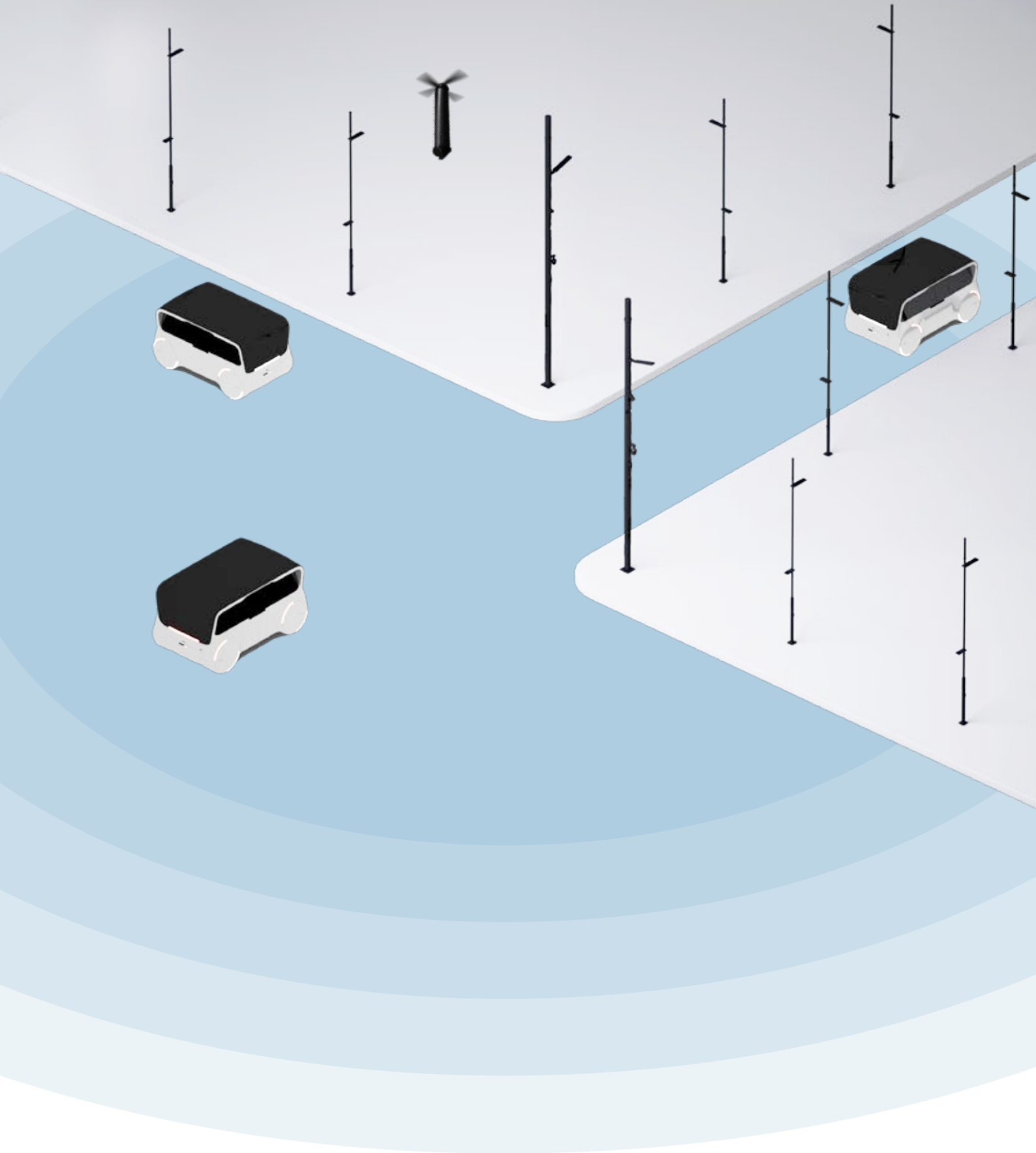
Get the advantages of:

- total connectivity -
  power / fiber / Wi-Fi / IoT / 4G / 5G
- uniform data transport protocol
- virtual separation and isolation of the systems
- uniform management & maintenance system

Cut operating costs:

Focus on tomorrow, you're well-equipped:

- redundant power is distributed and stored for system backup & recharge the vehicles
- modern data / IoT network is at your service
- ultra-precise positioning system is ready to take care for unmanned vehicles & drones.



Smart Cluster Complete Solution

Future is the accessible reality today

MWC
GSMA

Intelligent Solutions for Smart Cities

VITRULUX