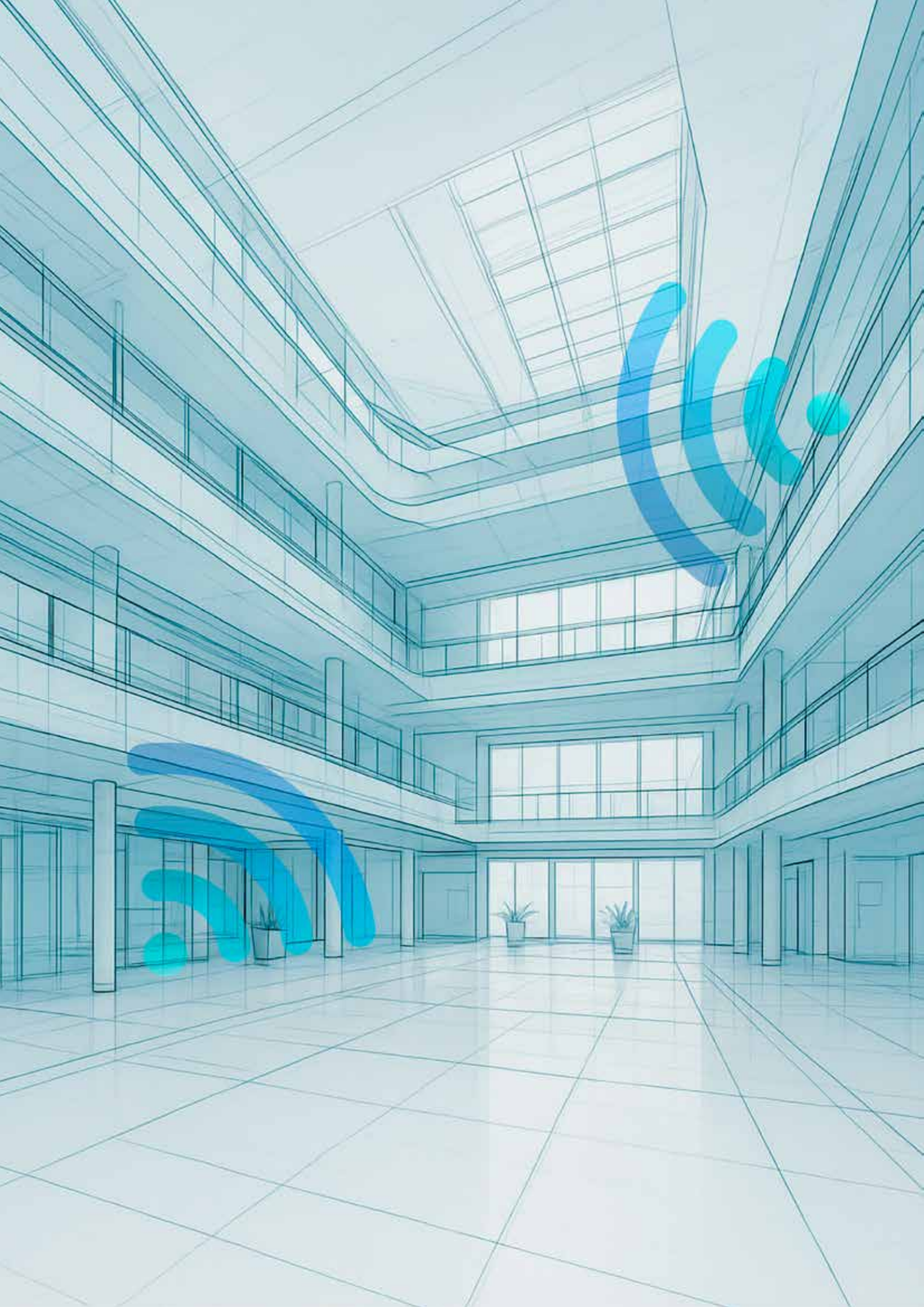
Capetti ELETTRONICA
DAL 1973

PRODUCT CATALOGUE



THE WIRELESS MONITORING
MADE IN ITALY



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WINECAP™ MONITORING SYSTEMS

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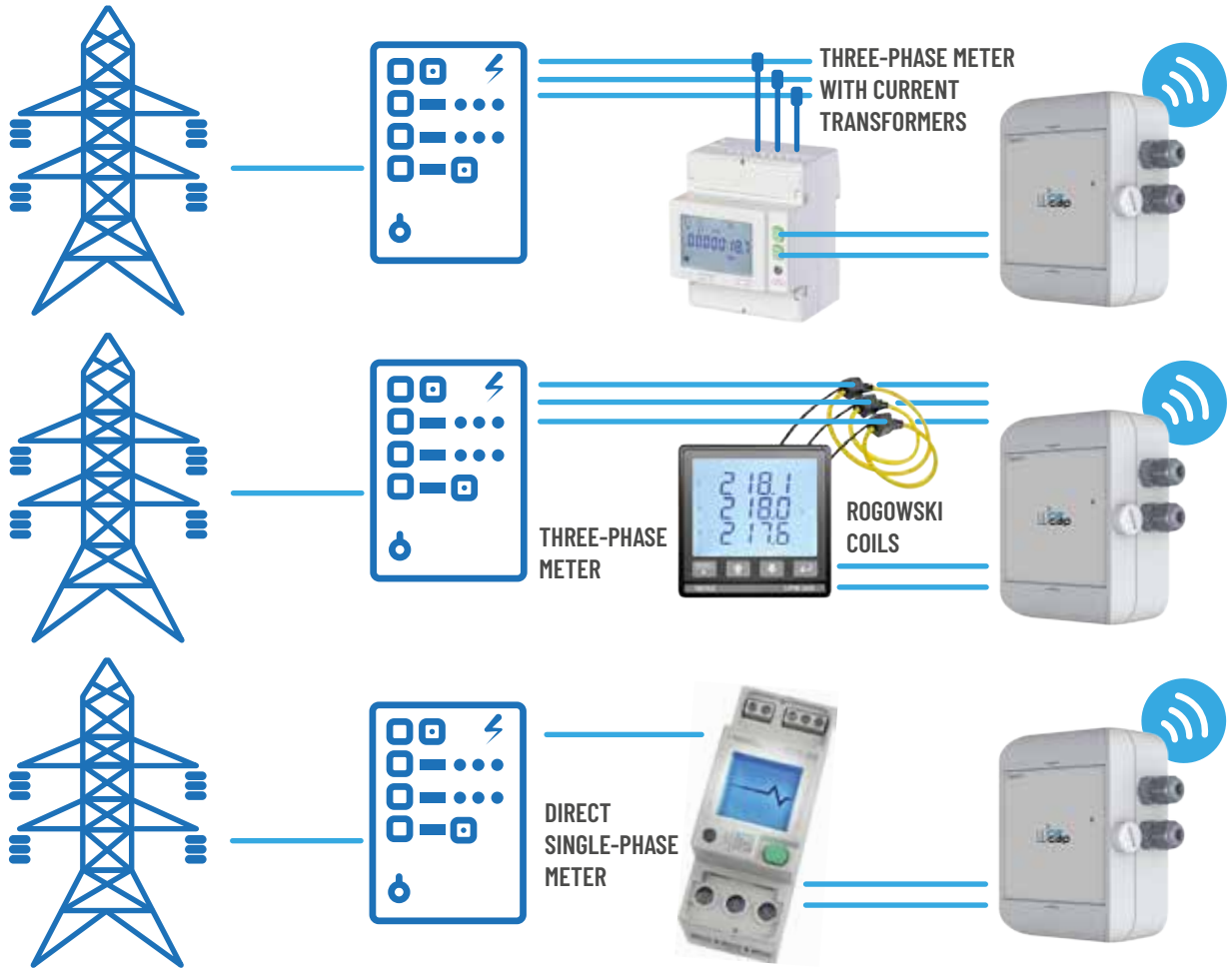
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ENVIRONMENTAL & ENERGY MONITORING

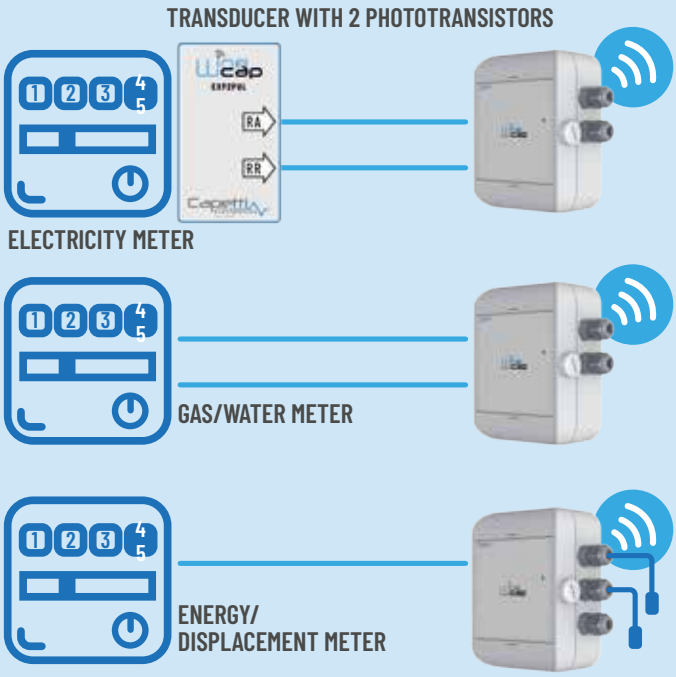
The flexibility and modularity of **Capetti's wireless monitoring** systems make the **WineCap**™ data logger network the best solution for environmental and energy monitoring.
The Capetti solution is one of a kind and offers users numerous exclusive benefits, thanks to the possibility of using **internal or external temperature** sensors, a choice of **indoor or outdoor** solutions, a **variety of quantities** measured and logged, **radio coverage** which can be increased as required via self-powered repeaters, **the two-way** nature of the network, **the interoperability** of the gateways with **Modbus PLCs**, the selection **of alarm thresholds** and **safe**, remote data access via the Service Centre.





Capetti metering systems are ideal for any **wireless energy monitoring application**: direct **single and three-phase metering**, indirect metering via closed/open **current transformers**, and indirect metering using **Rogowski coils**. This approach enables an accurate view of consumption relating to each section considered.

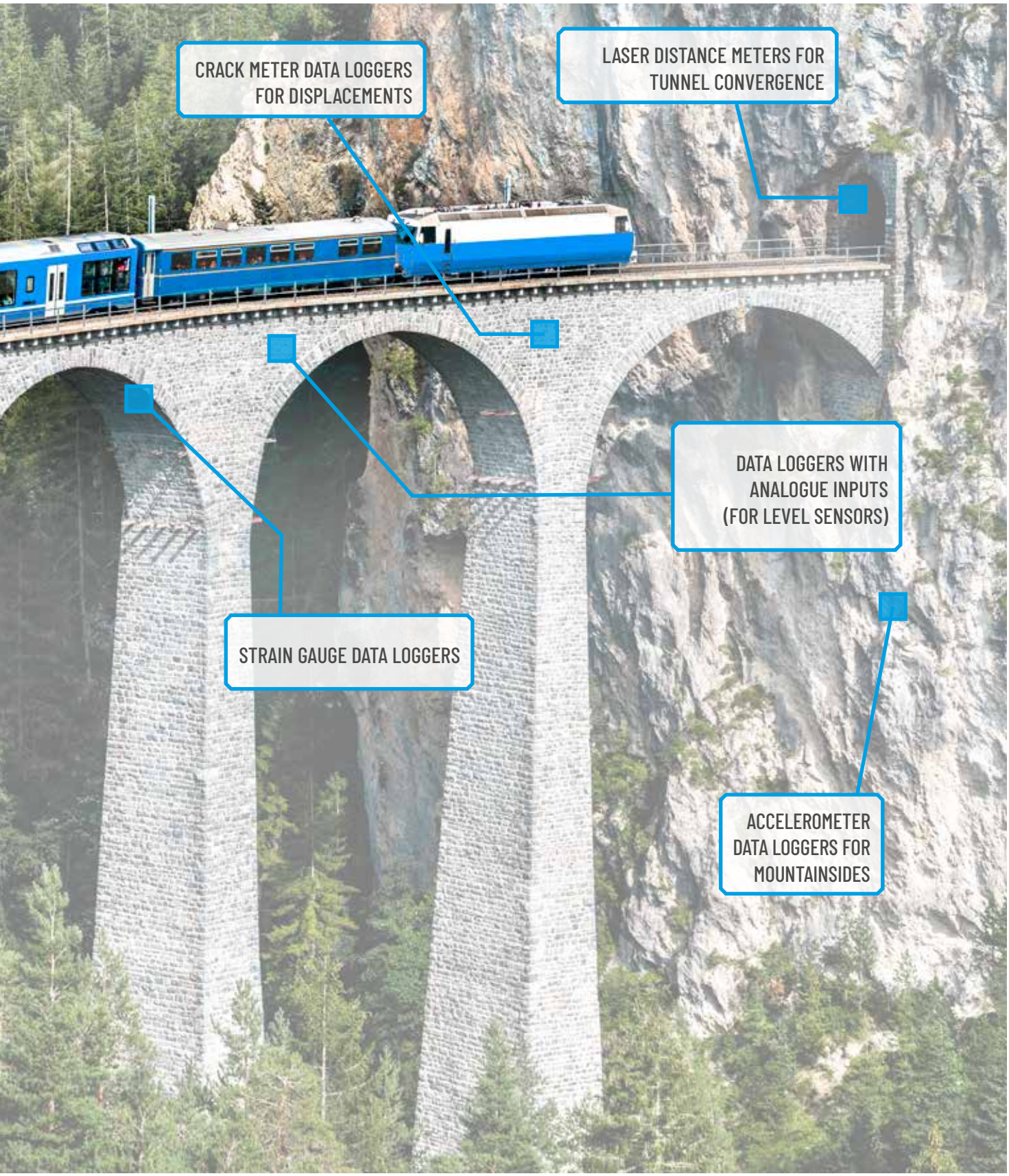
With Capetti's wireless metering data loggers you can read the pulse output from electricity meters (via specific **WineCap**™ transducers with phototransistors), gas meters (downstream of suitable safety barriers), water or energy and displacement meters (with specific inputs for supply/return temperature sensors, to ensure high sensitivity even under minimum flow conditions).



GEOTECHNICAL & STRUCTURAL MONITORING

The flexibility and modularity of the **WineCap**™ system make the Capetti Elettronica wireless solution ideal for **numerous geotechnical and structural monitoring applications.**




CRACK METER DATA LOGGERS FOR DISPLACEMENTS
LASER DISTANCE METERS FOR TUNNEL CONVERGENCE
DATA LOGGERS WITH ANALOGUE INPUTS (FOR LEVEL SENSORS)
STRAIN GAUGE DATA LOGGERS
ACCELEROMETER DATA LOGGERS FOR MOUNTAINSIDES

ACCELERATION AND VIBRATION MONITORING (DYNAMIC SHM)

The **WineCap™ Dynamics transmission system has revolutionised SHM** by introducing the option to dynamically characterise structures and infrastructure through data collection for modal analysis, the advanced synchronisation of wireless data loggers on the same network and the availability of the entire datagram.




PRE-TRIGGER
THRESHOLD SETTING
LOCAL BACKUP ON THE DATA
LOGGER AND THE GATEWAY
RAW DATA
ALWAYS
AVAILABLE
IDEAL FOR
MODAL ANALYSIS
DYNAMICS
Capetti



WINECAP™ MONITORING SYSTEMS

GATEWAYS

Gateways for collecting, storing and exporting data which can **handle up to 50 wireless data loggers** with storage equivalent to **2,500,000 samples.**
All gateways are provided along with the **WineCap™ Manager** configuration software.

	 **MB**	 **ETH**	 **IOT**
Connectivity	Modbus RS485	RS485 Modbus RTU	Modbus RS485
		Ethernet Modbus RTU	4G
Operating conditions	Temperature -20 to +60 °C		
	Humidity 0÷90%		
Degree of protection	IP 30		
Service Centre	-	✓	✓
Power Supply 12-24V.	Excluded		
Dimensions	DIN 2U	DIN 4U	DIN 6U
Codes	**WLRG-MB** **WLRG-MB-B** (boxed, power supply unit included)	**WLRG-ETH** **WLRG-ETH-A** (America 915MHz) **WLRG-ETH-B** (boxed, power supply unit included)	**WLRG-IOT** **WLRG-IOT-A** (America 915MHz) **WLRG-IOT-B** (boxed, power supply unit included) **WLRG-IOT-M1** (2 relay outputs) **WLRG-IOT-M1-B** (2 relay outputs, boxed, power supply unit included) **WLRG-IOT-M5** (transmission to Service Centre every 5 minutes) **WLRG-IOT-M5-B** (transmission to Service Centre every 5 minutes, boxed, power supply unit included) **WLRG-IOT-PPS** (in box with 10 W panel and 12 V - 9 Ah battery, IP68) **WLRG-IOT-PPS-PLUS** (in box with 50 W panel and 12 V - 18 Ah battery, IP68)

GATEWAYS

The most powerful **WineCap**™ gateway yet has arrived - change network configuration via the cloud or web server, without installing software on your PC.



	LX	LX-B	LX-PPS
Connectivity	Multi-radio (LoRa® and Dynamics) and Multi-protocol (Modbus RTU and TCP, MQTT)		
Operating conditions	Temperature -40° to +60°		
Degree of protection	IP 30	IP 67	IP 68
Service Centre	✓	✓	✓
Power Supply 12-24V.	Excluded	Included	Integrated with 10W photovoltaic panel
Dimensions	88x91x33	180x180x60	380x280x130
Codes	**GW25LX**	**GW25LX-B**	**GW25LX-PPS** (boxed with 10 W panel and 12 V - 9 Ah battery) **GW25LX-PPS-PLUS** (version with 50 W panel and 12 V - 18 Ah battery)

Related items	**CAP-5MP-CAM:** full HD camera to capture and send event frames, IP66
	CV10107: Antenna extension 5 m in length



REPEATERS

Radio routers and repeaters **to increase radio range** of the wireless data loggers.

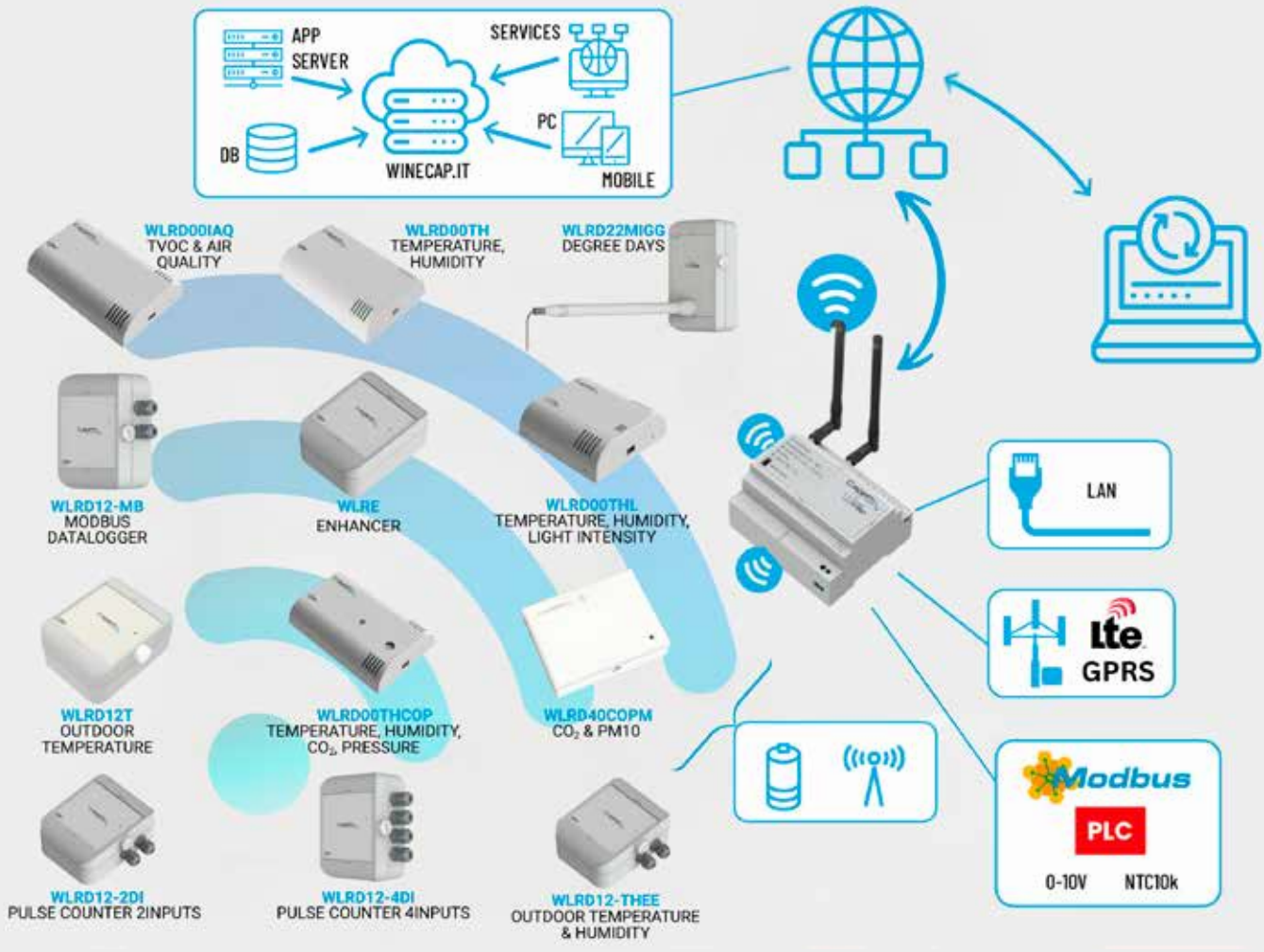
CASE STUDIES:

San Martino, Genoa *p. 31*

Degree of protection	IP65
Operating conditions	Temperature -30 to +60°C
Lifetime	Up to 7 years
Connections	Up to 50 nodes (data loggers with maximum of 15 repeaters in a cascade configuration)
Dimensions (mm)	120x90x50
Battery type	BAT3
Codes	WLRE



SYSTEM ARCHITECTURE



SMART DATA LOGGERS

FOR AIR QUALITY

Smart wireless data loggers for indoors **with integrated sensors** to monitor **air quality**.

CASE STUDIES:

Molinette Hospital, Turin *p. 30*
San Martino, Genoa *p. 31*
Mirdif Hospital, Dubai *p. 33*
Foqus, Naples *p. 35*
Circoscrizione 8, Turin *p. 36*
Cathedral Crypt, Siena *p.42*






	TH	COP	COPM	IAQ
Quantities measured (resolution) [range]	**Temperature** (0,01°) [-10÷60°] **Relative humidity** (0,05%) [0÷100%]	**Temperature** (0,01°) [-10÷60°] **Relative humidity** (0,05%) [0÷100%] **CO_2 concentration** (1ppm) [0÷10.000 ppm]	**Temperature** (0,01°) [-10÷60°] **CO_2 concentration** (1ppm) [0÷5000ppm] **PM2,5** and **PM10** (1µg/m³) [1÷1.000µg/m³]	**Total VOC** (5ppb) [5...10.000ppb] **IAQ index** (0,1) [1...5 UBA scale] **Relative IAQ Index** (10) [0...500 EPA scale]
Degree of protection	IP30			
Lifetime	Up to 12 years	Up to 4 years	Up to 4 years (unlimited with C type USB cable)	Up to 8 years
Dimensions (mm)	120x80x33,5	120x80x33,5	155x120x43	120x80x33,5
Battery type	BAT2	BAT2	2x BAT3	BAT2
Codes	**WLRD00TH**	**WLRD00THCOP**	**WLRD40COPM**	**WLRD00IAQ** **WLRD00THIAQ** (version with temperature, humidity, total VOC and relative IAQ index)

SMART DATA LOGGERS

WITH INTEGRATED TEMPERATURE & HUMIDITY SENSORS

Smart wireless data loggers for outdoors with **integrated sensors** to monitor **temperature and light intensity.**

CASE STUDIES:

Santa Maria alle Scotte, Siena *p. 34*
Ricci Oddi, Piacenza *p. 41*
Cathedral Crypt, Siena *p.42*







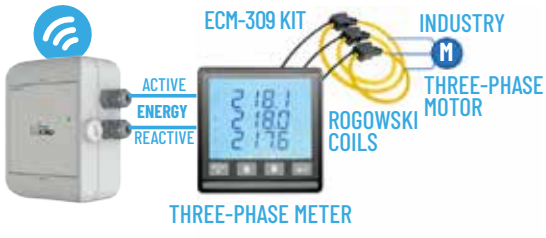
	12T	THL	MiGG
Measured quantities (resolution) [range]	**Temperature outdoor** (0,01°C) [-30÷+60°C]	**Temperature outdoor** (0,01°C) [-30÷+60°C] **Relative humidity** (0,05%) [0÷100%] **Light intensity** (1 Lux) [0÷16kLux]	**Temperature outdoor** (0,01°C) [-30÷+50°C]
Transducer type	NTC10KΩ		PT1000 class A
Degree of protection	IP65	IP30	IP65
Lifetime	Up to 10 years	Up to 5 years	Up to 10 years
Dimensions (mm)	120x90x50	80x80x25	157x90x50
Battery type	BAT2	BAT1	BAT2
Codes	**WLRD12T**	**WLRD00THL** **WLRD00THLP** (version with presence detection)	**WLRD22MiGG** (temperature, average daily temperature, cumulative degree days as per Decree 412, cumulative degree days at the reference temperature selected during installation)
Calibration	**RINTAR:** 3-point recalibration service for degree day data loggers -MiGG		

SMART DATA LOGGERS

FOR METER READINGS

CASE STUDIES:

San Martino, Genoa *p. 31*





	MB	4DI
Measured quantities (resolution) [range]	**With the WLRD12-MB Modbus interface equipped with LoRa®** modbus interface with 4 configurable channels for reading voltage, current, temperature, volume, energy etc.	**Continuous partial or cumulative count on 2 to 4 inputs** (single pulse) [0-65535 pulses]
Degree of protection	IP65	
Lifetime	Up to 10 years	
Dimensions (mm)	120x90x50	
Battery type	BAT2	
Codes	**WLRD12- MB**	**WLRD12-4DI**

With the WLRD12-MB Modbus interface equipped with LoRa® radio module it is possible to read 4 channels containing values for temperature, current, volume, electrical energy, thermal energy, power and much more!



WLRD12-MB

ELECTRICAL OR THERMAL ENERGY METER



Related items	For 4DI	Meters	**EC1-40 MID** (40A single-phase), **EC1-80 MID** (80A single-phase)
			EC3-80 MID (80A direct three-phase), **EC3-6TA MID** (three-phase with transformers)
			ECM-209 KIT (Rogowski kit DIN-standard guide), **ECM-309 KIT** (Rogowski kit screen front)
		Transformers	**TAC40/5, TAC60/5, TAC100/5, TAC200/5, TAC250/5, TAC400/5** (closed with 5 A output)
			TAPRV10/100, TAPRV10/200, TAPRV11/200, TAPRV12/300, TAPRV12/400, TAPRV13/400
			TAPRV1/500 (open with 5 A output)
		Phototransistors	**EXP2PUL** (light pulse transducer for electricity meters)

SMART DATA LOGGERS

FOR EVENTS & STATUS MONITORING

Smart wireless data logger for recording **water/electrical/HVAC events**.

CASE STUDIES:

Silos *p. 40*





	WLRA	T-KK
Measured quantities (resolution) [range]	**Actuation** on 4 relays with contact 250 Vac max – 8 A [1 changeover relay + 3 NO relays]	**Status change on** 2 digital inputs (1 change / 30sec) [open collector]
Degree of protection	IP65	
Lifetime	Up to 5 years	Up to 7 years
Dimensions (mm)	120x90x50	
Battery type	BAT2	
Codes	WLRA00R4	WLRD12T-KK



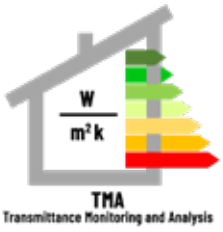
Wireless status/level monitoring kit	**WLRD12T-KK + WLRG-IOT-M1-B** (4G gateway with two relay outputs for activating the alarm and/or flashing light when a status change is recorded on data logger WSD12T-KK) **M1-SOUNDER** (audible alarm/video for gateway M1)



Cloud Service +

THERMAL TRANSMITTANCE MONITORING

With **software included** in the Cloud Service Plus



CASE STUDIES:
Public building, Agnone *p.38*



FLUX

Measured quantities (resolution) [range]	**Heat flow** (0,05 W/m²) [± 35 W/m²]
Degree of protection	IP65
Lifetime	Up to 5 years
Dimensions (mm)	120 x 90 x 50
Battery type	BAT2



TF KIT



INTERNAL SIDE



EXTERNAL SIDE



TMA app on CS PLUS FULL500



MAPPE app on CS PLUS FULL500

Codes	FLUX	**TF KIT** heat flow meter system kit consisting of: - 2 thermometer data loggers (for measuring surface temperature at three contact points on the inside and outside walls of the building to be monitored) - 1 heat flow data logger (measurement of heat flow on the inside wall of the building to be monitored) - 6 x PT1000 transducers and heat flow meter plate
	CS	**CS PLUS FULL** (Service centre map display, TMA - Transmittance Monitoring and Analysis, REA - environmental energy reporting)

SMART DATA LOGGERS

FOR METEOROLOGICAL STATIONS

Smart wireless data loggers **for monitoring temperature, humidity, wind, sun, rain.**

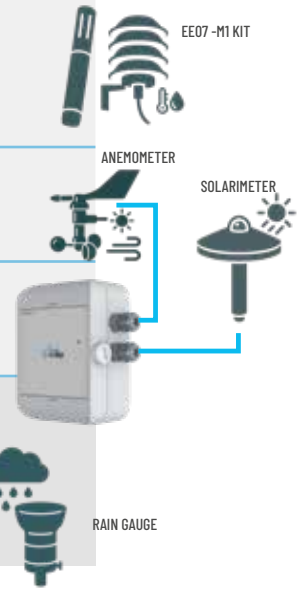
CASE STUDIES:

Défense Arena, Paris *p. 39*
Greek Theatre, Syracuse *p. 43*
Champorcher Valley, Aosta *p. 46*
Lake Spina, Pralormo *p. 47*



	THEE	2DI	LVD
Measured quantities (resolution) [range]	**Temperature outdoor** (0,01°C) [-40°C÷+80°C] **Relative humidity** (0,05%RH) [0÷100%]	**Partial count on 2 inputs** (single pulse) [0-65535 pulse/period]	**Solar radiation** (8W/m2) [0÷2kW/m²] **Wind speed** (0,1m/s) [0,5÷70m/s] **Wind direction** (1°) [0÷360°]
Degree of protection	IP65		
Lifetime	Up to 5 years	Up to 7 years	Up to 5 years
Dimensions (mm)	120x90x50		
Battery type	BAT2		
Codes	WLRD12-THEE	WLRD12-2DI	WLRD12-LVD

Related items	For THEE	**EE07-M1** (outdoor temperature and relative humidity sensor with connection cable, -40 to +80°C, 0 to 100% RH, IP65, conformal coating version) **EE07-M1 KIT** (outdoor temperature and relative humidity sensor with weather protection, flange and connection cable)
	For LVD	**AN6410** (Cup anemometer with 12-metre cable)
		ANS-RSG-B (Thermopile pyranometer to calculate total radiation)
	For 2DI	**PL200** (Rain gauge with 0.2 mm resolution)



SMART DATA LOGGERS

FOR EXTERNAL TRANSDUCER INTEGRATION

Smart wireless data logger **for connection with external transducers a**nd option of powering them.

CASE STUDIES:

Cathedral Crypt, Siena *p.42*
Lake Spina, Pralormo *p.47*



	PS-MB (for transducers with modbus output)	PS-4AI (for transducers with analogue output)
Measured quantities (resolution) [range]	**LoRa® modbus interface** with 4 configurable channels for reading generic quantities	**Values in % of the full scale** (12 bit) [0÷10V, 0÷25mA]
Degree of protection	IP65	
Lifetime	Up to 3 years	
Dimensions (mm)	160x90x50	
Battery type	2X BAT4	
Codes	WLRD22PS-MB	**WLRD22PS-4AI** (4 proportional inputs) **WLRD22PS-4AIM4** (4 proportional inputs and Goretex valve)

Possibility of receiving data loggers already wired to transducers



PIEZOMETERS



SOUND LEVEL METERS



PHOTOVOLTAIC SOLARIMETERS



T, RH AND CO_2 PROBES



ANEMOMETERS



LEVEL SENSORS

Related items	
CAP650AN	(Wire anemometers with range 0...20m/s)
CAP190PZ	(Piezometer with level measurement, Ø 22mm)
CAP130FO	(Sound level meter range 35...130dB, resolution 0.1dB)
CAP10LIV	(Ultrasound level sensor up to 10m)
CAP872CO2	(Transducer for temperature, relative humidity, CO_2 and outdoor atmospheric pressure)
ANS-PPS	(Photovoltaic solarimeter 0-1200W/m²)

SMART DATA LOGGERS
FOR TEMPERATURE MONITORING

Smart wireless data logger for **measuring temperature** via external transducers.

CASE STUDIES:

Careggi, Florence *p. 32*
Historic building, Turin *p. 37*
Greek Theatre, Syracuse *p. 43*
Foundation plate, Cuneo *p. 51*



	TT1K	TT10K
Measured quantities	Transducer input PT1000	NTC transducer input
Degree of protection	IP65	
Lifetime	Up to 5 years	
Dimensions (mm)	120x90x50	
Battery type	BAT2	
Codes	WLRD12-TT1K	WLRD12-TT10K

Possibility of receiving DATA LOGGERS already wired to the transducers

Related items	PT1000 SENSORS	**PT1000-IP68** (for heavy-duty use or embedding in concrete, IP68, -50 to +105°C)
		PT1000FR (in plastic for surface wall temperatures, IP65, -30 to +60°C)
		PT1000CR (for cryogenic use, IP68, -200 to +150°C)
		PT1000CNT (in brass for point-of-contact surface temperatures, IP65, -50 to +105°C)
	NTC SENSORS	**NTC10K** (in brass for point-of-contact surface temperatures, IP65, -50 to +105°C)
		NTC10KSUP (in square plate with fastening holes for precision surface temperatures, IP68, -30 to +100°C)
		NTC10K-IP68 (for heavy-duty use, IP68, -50 to +105°C)
		NTC10KIM (for groundwater, IP68, 0 to +60°C)



SMART DATA LOGGERS
FOR POTENTIOMETERS

Smart wireless data logger for potentiometers with external transducers **to monitor cracks and linear displacements.**

CASE STUDIES:

Archaeological Park, Segesta *p. 44*
San Quirico district, Genoa *p. 49*
Piazza Venezia, Rome *p. 52*
Lyon-Turin railway tunnel *p. 53*
Highway structures *p. 59*
Ipodam, Philippines *p. 60*





	T-DD	4D
Measured quantities (resolution) [range]	**Temperature** (0,01°) [-30÷60°] **Linear deformation** at 2 inputs maximum (6µm) [preset: 0-25mm 0-50mm 0-100mm 0-200mm]	**Temperature** at 1 input maximum (0.01°) [-30 to 60°] **Linear deformation** at 4 inputs maximum (0.01% of full scale) [0-100% of full scale]
Degree of protection	IP65	
Lifetime	Up to 10 years	
Dimensions (mm)	120x90x50	160x90x50
Battery type	BAT2	
Codes	**WLRD12T-DD** (Can be combined with potentiometers with electrical range of 25 50 100 200 mm)	**WLRD22-4D** (Can be combined with potentiometers with any electrical range)

Possibility of receiving DATA LOGGERS already wired to the transducers

Related items	LINEAR TRANSDUCERS	With spring	**PY2-F-025** (0÷25mm) **PY2-F-050** (0÷50mm) **PY2-F-100** (0÷100mm)
		With loop	**PZ12-A-025** (0÷25mm IP65) **PZ12-A-050** (0÷50mm IP65) **PZ12-A-100** (0÷100mm IP65) **PZ12-A-200** (0÷200mm IP65)
	WIRE TRANSDUCER		**GSF** (wire potentiometer with full scale 4,800 mm)
	BRACKETS		**FIX-PY2** (bracket for securing spring-loaded linear transducers to the wall)
			GSF-FLA033 (bracket for securing the wire transducer at 90°)
	TEMPERATURE TRANSDUCER		**NTC10KSUP** (for surface temperatures, IP68, BETA3977, -30 to +100°C)









SMART DATA LOGGERS

FOR STRAIN GAUGES & VIBRATING WIRE SENSORS

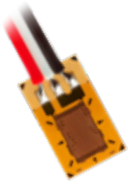
Smart wireless data loggers for connecting to **strain gauges, load cells and vibrating wire blocks.**

CASE STUDIES:

Bilbao, Spain *p. 48*
Villa Italia - Lake Como *p. 50*
Lyon-Turin railway tunnel *p. 53*
Grand Paris Express, Paris *p. 54*
Road bridge, Val Senales *p. 58*
Church of Saints Carlo & Biagio, Rome *p. 45*
Ipodam, Philippines *p. 60*



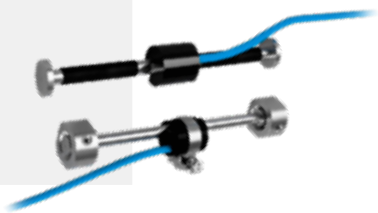




	EX1-EX2	EX6	VW
Measured quantities (resolution) [range]	**Temperature** (0,01°) [-30÷60°] **Deformation** on 3 inputs (2,5μV/V) [0÷4,95 mV/V]	**Temperature** (0,01°) [-30÷60°] **Deformation** on 3 inputs or load cell (1,2 μV/V) [0÷2,48 mV/V]	**Temperature** (0,01°C) [-20÷70°C] **Frequency** on 4 inputs max (0,1Hz) [400÷5.000Hz]
Degree of protection	IP65		
Lifetime	Up to 10 years		Up to 4 years
Dimensions (mm)	120x90x50		160x90x50
Battery type	BAT2		
Codes	**WLRD12T-EX1** (half bridge 120 OHM) **WLRD12T-EX2** (quarter bridge 120 OHM)	**WLRD12T-EX6** (full Wheatstone bridge with full scale 2.48mV/V)	**WLRD12-VW** (up to 4 inputs for vibrating wire blocks)



Related items	For EX6	**CAP120CE** (Electric load cell for tie rods, f.s. 1000 KN) **CAP165CE** (Electric load cell for tie rods, f.s. 1500 KN) **CAP190CE** (Electric load cell for tie rods, f.s. 2000 KN)
	For VW	**CAP155VW** (155 mm vibrating wire embedment strain gauge, range ± 1500 microeps) **CAP165VW** (165 mm vibrating wire weldable strain gauge, range ± 1500 microeps)



SMART DATA LOGGERS

FOR INCLINOMETRIC AND LASER DISTANCE MONITORING

Smart wireless data logger for **dual-axis inclinometers with/without laser distance measurement.**

CASE STUDIES:

San Quirico district, Genoa *p. 49*
Piazza Venezia, Rome *p. 52*
Metro 5, Milan *p. 55*
Asti-Nizza Monferrato railway line *p. 56*
Lagoon bridge, Alghero *p. 57*





	TII	DIST
Measured quantities (resolution) [range]	**Temperature** (0,01 °C) [-30 °C÷+60 °C] **Dual-axis inclination** (0,0002°) [±6,5000°]	**Dual-axis inclination** (0,0002°) [-6,5000°÷+6,5000°] **Temperature** (0,01 °C) [-30 °C÷+60 °C] **Relative distance** (0,1 mm) [±3200 mm] **Absolute distance** (1 mm) [50÷65000 mm]
Degree of protection	IP69	IP67
Lifetime	Up to 5 years	
Dimensions (mm)	131,6x153,8x60	100x100x80
Battery type	BAT3	
Codes	**WLRD59TII**	**WLRD15IIDIST-FX**

Related items	for TII	**FIX-59T** (Kit with fixing plate and screws for dome-shaped data logger applications to be secured) **FIX-MAG-59T** (Magnetic kit for securing dome-shaped data loggers onto metal surfaces, tractive force > 20 kg)
	for DIST	**SCH-DIST** (Screen to protect against direct light) **TARG-L10** (Adhesive target 10x10cm for distances over 40 m)



SMART DATA LOGGERS

FOR ACCELERATION MONITORING

Smart wireless data logger **with integrated triaxial accelerometer for dynamic monitoring.**



	59G	59GT
Measured quantities (resolution) [range]	**Acceleration on 3 axes** (up to 15 µg) [-4g to +4g max] **Temperature** (0,01°) [-40÷+85°]	**Acceleration on 3 axes** (up to 15 µg) [-4g to +4g max] **Inclination on three axes** (0,0002°) [±10°] **Temperature** (0,01°) [-40÷+85°]
Degree of protection	IP69	
Lifetime	Up to 2 years	
Dimensions (mm)	131,6x153,8x60	
Battery type	BAT3	
Sampling frequency	Selectable up to 1 kHz	
Codes	**WDY59G**	**WDY59GT**

Related items	**FIX-59T** (Kit consisting of a mounting plate and screws for "glue-on" applications of dome DATA LOGGERS)
	FIX-MAG-59T (Magnetic kit for fixing dome DATA LOGGERS to metal surfaces, pull force >20 kg)



Wireless capture and transmission of the full accelerogram for events and planned mode

SMART DATA LOGGERS

FOR VIBRATION MONITORING

Smart wireless data logger **with integrated triaxial velocimeter for dynamic monitoring.**



	59V	59VT
Measured quantities (resolution) [range]	**Velocity on three axes** (up to 0.00015 mm/s) [-1000÷+1000 mm/s] **Temperature** (0,01°) [-40÷+85°]	**Velocity on three axes** (up to 0.00015 mm/s) [-1000÷+1000 mm/s] **Inclination on three axes** (0,0002°) [±10°] **Temperature** (0,01°) [-40÷+85°]
Degree of protection	IP69	
Lifetime	Up to 2 years	
Dimensions (mm)	131,6x153,8x60	
Battery type	BAT3	
Sampling frequency	Selectable up to 1 kHz	
Codes	**WDY59V**	**WDY59VT**

Related items	**FIX-59T** (Kit consisting of a mounting plate and screws for "glue-on" applications of dome DATA LOGGERS)
	FIX-MAG-59T (Magnetic kit for fixing dome DATA LOGGERS to metal surfaces, pull force >20 kg)



Wireless capture and transmission of the full vibrogram for events and planned mode



WINECAP™ MONITORING APPLICATIONS

HOSPITALS
MOLINETTE, TURIN







BACKGROUND
With almost 3000 hospital, school and university premises benefiting from its wireless systems, CAPETTI Elettronica is now a major player in energy monitoring for public buildings.

THE SOLUTION
The S. Giovanni Battista Hospital in Turin, commonly known as Le Molinette, is the fourth largest public hospital in Italy. Its 25 wings cover an area of 150,000 sq. m., and they are monitored with hydrothermal **WineCap™** systems. After studying the layout and inspecting the facility, Capetti engineers were able to suggest the ideal position for data loggers.

THE RESULT
Data on temperature, humidity and CO_2 concentration is now used for the temperature regulation systems for the entire hospital complex, and to monitor air quality.

THE WINNING CHOICE
> **TH** (air temperature and humidity)

> **THCOP** (carbon dioxide concentration)

> **ETH** (ethernet gateway)



TH

HOSPITALS
SAN MARTINO, GENOA







BACKGROUND
The San Martino General Hospital in Genoa is one of the largest leading health facilities in Europe covering a total area of more than 340,000 m^2.

THE SOLUTION
The project by the Iren Group and l'Operosa SpA involved the installation of **WineCap™** monitoring systems with LoRa® radio protocol, chosen for their characteristics of long range, reliability and low energy consumption.
The solution has WLRG-IOT gateways strategically distributed in the facility to gather and send data to the monitoring platform, supported by WLRE repeaters that guarantee stable radio coverage, including in the most critical areas. Environmental conditions are monitored by WLRDOOTH data loggers to measure temperature and humidity, whereas consumption is managed using WLRD12-4DI data loggers that are integrated with the existing heat consumption meters on site, and the three-phase meters for measuring active energy consumption provided within the scope of the project.
Furthermore, Capetti Elettronica provided the CS PLUS MAP service, which has proved to be extremely useful for managing systems in such a vast setting, as it makes it possible to intuitively visualise the position of the WineCap™ devices within the detailed hospital layouts.

THE RESULT
Using the Capetti systems enables accurate hydrothermal monitoring, which is essential in highly critical healthcare settings, and energy monitoring, contributing significantly to the organisation of resources at the San Martino Hospital.



WLRE

THE WINNING CHOICE
> **WLRG-IOT** (Gateway)
> **WLRE** (Repeater)
> **TH** (Indoor temperature and relative humidity)
> **4DI** (4 inputs for pulse counts)

HOSPITALS

CAREGGI, FLORENCE



BACKGROUND

Cryogenic liquids, typically liquid nitrogen, are used for sensitive cold chain applications, such as preserving blood, vaccines and organs and freezing biotechnological products. Even some chemical reactions in the fields of medicine and pharmacology require temperature of less than -180°C.

THE SOLUTION

In 2016 Florence's Careggi Hospital needed to implement a temperature monitoring system in various wings at the facility. However the requirement was not just to log the temperature in various rooms with the usual temperature and humidity data loggers, but also to monitor micro-environments in the haematology and genetics departments, and in some medical laboratories. In these rooms the temperature to be monitored could fall well below -20°C, in some cases reaching -200°C.

THE RESULT

Using the **WineCap™** technology it was possible to view all temperature data with the same user account through the CAPETTI Service Centre. Precision platinum resistance thermometers were provided already cabled to the respective data loggers and the data was stored in the cloud.



THE WINNING CHOICE

> **TT1K** (temperature on two channels with external thermoresistances)

> **PT1000CNT** (brass thermoresistance)

> **PT1000CR** (stainless steel thermoresistance)

HOSPITALS

MIRDIF HOSPITAL, DUBAI



BACKGROUND

The **WineCap™** data loggers for measuring temperature and humidity guarantee line-of-sight radio range greater than 5 km and, thanks to CAPETTI's Ultra Low Power technology, long-life batteries enable autonomy of up to 12 years with temperature and humidity samples every 10 minutes. The measurements recorded by the data loggers are stored locally and sent to gateways at scheduled intervals.

THE SOLUTION

In hospitals such as Dubai's Mirdif Hospital, with large windows, the WSN (wireless sensor network) can propagate uniformly along the structure by positioning the gateway antenna on one of the low buildings external to the system. Moreover, battery repeaters make it possible to redirect the signal from increasingly remote data loggers (thanks to intelligent routing that autonomously selects the best route), thereby increasing radio coverage by up to 16 times. As a result, it is even possible to capture data from the sensors when they have to be installed in a very shielded location (typically departments further inside, basement departments such as operating theatres and casualty departments).

THE RESULT

By means of a CONFIRM and ACK mechanism, the application profile guarantees that data is definitely received (true data logging). Data are captured a second time and also stored by the gateway. The **WineCap™** system reliably manages the concentration and transmission of temperature and humidity data relating to the rooms and corridors in the various departments, regularly sending it to the BEMS (Building Energy Management System) via MODBUS protocol.



TH

THE WINNING CHOICE

> **TH** (temperature and relative humidity measurements)

HOSPITALS

SANTA MARIA ALLE SCOTTE, SIENA



BACKGROUND

Buildings with centralised heating systems, such as healthcare facilities, are required to install automatic temperature regulation systems and individual heat metering units in accordance with Presidential Decree no. 74 of 16 April 2013. To enable the proper management and control of systems in relation to external climatic conditions, the calculation of degree days is used, which is an essential parameter for determining ON/OFF periods and heating modulation methods.

THE SOLUTION

The Azienda Ospedaliero-Universitaria Senese, historically known as Ospedale Santa Maria alle Scotte, is one of Tuscany's major healthcare facilities. It has numerous buildings spread over a large area and requires energy consumption to be carefully managed to ensure optimal conditions in each department. In order to support the automatic temperature regulation system in rooms and ensure regulatory compliance, ENGIE chose the WineCap™ data loggers with the LoRa® radio by Capetti Elettronica which specifically calculate degree days, and positioned them in the most exposed areas of the buildings, on the roofs in particular.

THE RESULT

Monitoring the actual external climatic conditions with the **WineCap™** data loggers made it possible to automate the calculation of degree days with precision and continuity, providing reliable data to control the systems. The system supports regulatory compliance, the optimisation of energy efficiency in the facility, and an improvement in ambient comfort for patients and staff.



THE WINNING CHOICE

> **MiGG** (ACCREDIA-certified precision outdoor air temperature)

SCHOOLS
FOQUS, NAPOLI







BACKGROUND
EDUQA, the first school in Italy with an environmental focus, is situated in the Spanish quarter in Naples. This is a high-value project at a social, educational and urban renewal level, and has multi-purpose facilities dedicated to cultural activities.

THE SOLUTION
Mindful of the keywords Innovation, Wellbeing and Sustainability, the Indoor Air Quality project was developed in collaboration with the Spanish quarter foundation (FOQUS) and uses the **WineCap™** system by Capetti Elettronica to monitor air quality parameters, including indoor temperature and relative humidity, and the concentration of carbon dioxide, particulate PM2.5 and PM10.

THE RESULT
The slogan states that "The Essential is Invisible, Such as the Air we Breathe. Let's Learn to Recognise It". This best represents the aim of the project, unique in the Campania region, to ensure that the environment is safe and healthy for pupils and teachers, who received a training session on interpreting the data measured, and making improvements in particular.



THE WINNING CHOICE
> **COPM** (Indoor temperature, concentration of CO_2, particulate PM2.5 and PM10)

> **IAQ** (TVOC - Total Volatile Organic Compounds, Air Quality Index AQI and Relative Air Quality Index AQI)

OFFICES
CIRCOSCRIZIONE 8, TURIN







BACKGROUND

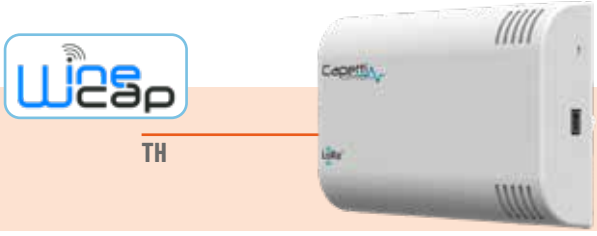
With the EfficienTO project, Turin City Council and the Iren Group embarked on an energy upgrade plan for public buildings, with the aim of improving efficiency, reducing emissions and increasing comfort in public spaces. Some of the areas involved in the initiative include the building at Corso Corsica 55, the location of Circoscrizione 8, which contains the registry office, the public library and the local health authority department.

THE SOLUTION

Capetti Elettronica worked in conjunction with the system integrator AMB Solutions to provide a complete remote-controlled system to manage energy and control heating systems, and AHUs.
Key elements in the technological solution are the **WineCap™** data loggers with LoRa® radio protocol, which measure indoor temperature and humidity in real time. The data is sent to the cloud platform to be analysed in detail. Via the data collection gateway and the modbus protocol, the system communicates with the Distech Controls™ building management system (BMS), which intervenes directly on HVAC systems to ensure the optimal control of ambient conditions.

THE RESULT

Integration between the wireless Capetti Elettronica devices, the PLC and the supervision software in the BMS has made the building more efficient, comfortable and sustainable. Automatically controlling HVAC systems based on environmental data monitored in real time has led to a significant reduction in energy consumption and operating costs.



THE WINNING CHOICE

> **TH** (Indoor temperature and relative humidity)

> **ETH** (Gateway LoRa® radio protocol)

OFFICES
HISTORIC BUILDING, TURIN





BACKGROUND
Calculating heat consumption is crucial for managing corporate and public buildings. Heat energy is often monitored using meters, which can be challenging, require maintenance, and most of all are invasive in terms of installation on pipes in existing systems.

THE SOLUTION
The **WineCap™** solution used by Eurix in a historic building in Turin consists of temperature data loggers with two inputs for external thermistors. Every 10 minutes the sensors installed wirelessly monitor the change in temperature of the heat-transfer fluid that supplies each user. The data captured from the sensors are then sent to the Capetti Elettronica gateways.

THE RESULT
Eurix designed and developed an alternative system for calculating heat consumption, achieving an efficient, cost-effective solution. The use of **WineCap™** temperature sensors, along with machine learning algorithms developed by Eurix, enables the calculation of heat distributed to each individual user in the building. This solution makes it possible to monitor and efficiently manage the most energy-intensive users.

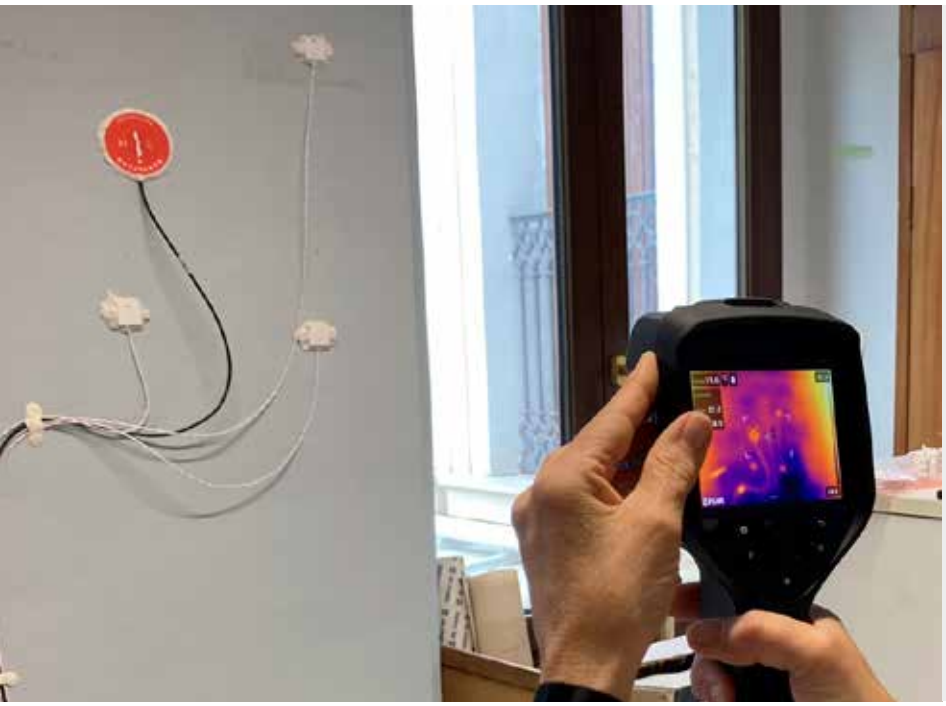


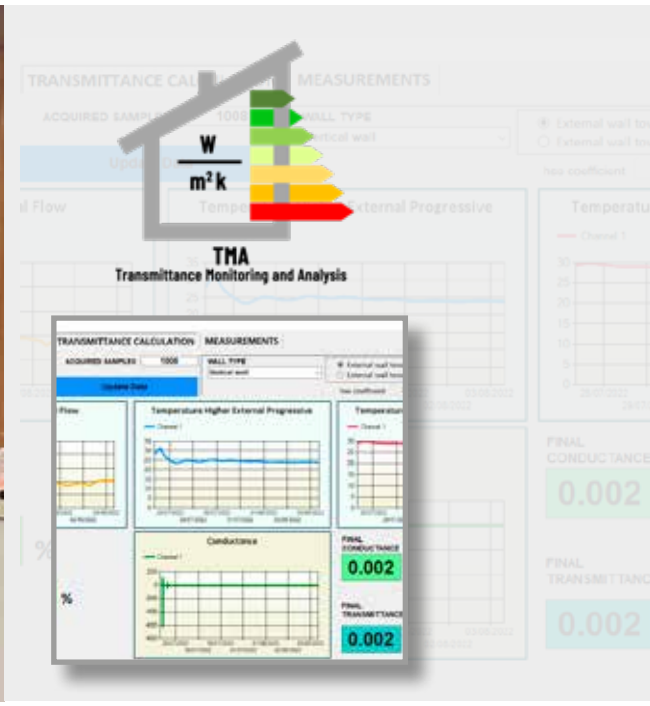
THE WINNING CHOICE
> **TT10K** (temperature data logger on two channels with external thermistors)

> **NTC10K** (external temperature transducer)

OFFICES

PUBLIC BUILDING, AGNONE





BACKGROUND

CAPETTI Elettronica has always been mindful of climate change and the need to reduce polluting emissions, and ever since the company was established it has set the market standard when it comes to electronic instrumentation for capturing physical quantities. **"You only know what you measure"** was a saying by Lord Kelvin and CAPETTI has made it its own, employing this spirit to become a leader in measurements via temperature transducers - wireless data loggers with Pt1000 sensors and integrated NTC delivering high precision, resolution, repeatability and reliability.

THE SOLUTION

CAPETTI Elettronica designed the WSD12-TF wireless system to measure the thermal transmittance of the walls, which enables convenient, non-invasive calculation of the conductance using the heat flow meter method. This system is excellent assistance for building energy certification, as it enables the quick and easy measurement of external and internal surface temperatures, correlating them with heat flow linked to the dispersion of the wall itself.

THE RESULT

All measurements are recorded on the wireless data loggers, sent to the WSN control unit and sent to the cloud where, via the **WineCap™** Service Centre, the user can view graphs, print reports and export data through transmittance monitoring & analysis (TMA) software made available by Capetti with algorithms developed in collaboration with ENEA - nothing could be simpler!

THE WINNING CHOICE

> **TF KIT** (thermoflowmetric kit)

> **CS PLUS FULL** (TMA on Service Center)



TF KIT

SWIMMING POOLS
DÉFENSE ARENA, PARIS





BACKGROUND
An advanced ambient monitoring system was implemented in the prestigious setting of the Défense Arena, one of the main locations for the Paris 2024 Olympic Games. The aim was to guarantee optimal climatic conditions for athletes and spectators, providing a comfortable, controlled environment during the whole event.

THE SOLUTION
With significant focus on Innovation, Efficiency and Precision, the ambient monitoring project was developed using the **WineCap™** data loggers by Capetti Elettronica. The THEE model connected to an IP65 hydrothermal sensor was chosen to measure and record changes in temperature and humidity values, so that ambient parameters could be monitored continuously.

THE RESULT
The monitoring systems implemented at Défense Arena ensured a high level of air quality control, contributing to the success of the Olympic events. Not only can the data gathered be used to make climate control decisions, it can also provide valuable information for similar events in the future. This initiative reflects commitment to sustainability and technological innovation in the management of sports facilities.

THEE



THE WINNING CHOICE
> **THEE** (data loggers with inputs for external temperature sensors)

> **EE07-M1** (external sensor for temperature and relative humidity)

SERVICE STATIONS

SILOS







BACKGROUND

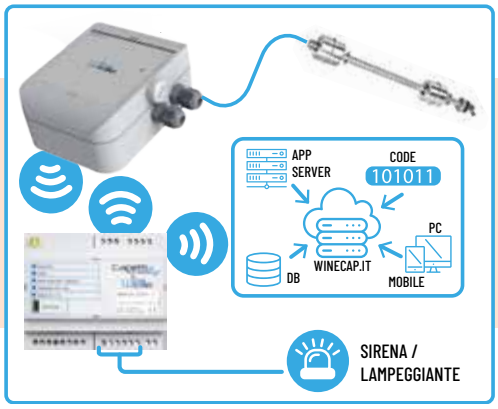
For more than 40 years Autogrill has been a world leader in catering services for travellers, with the slogan Feeling Good on the Move. Established in 1977, this Italian multinational operates in 30 countries, manages approximately 3300 outlets, and boasts a portfolio of over 300 brands owned and licensed.

THE SOLUTION

The distribution of domestic water in the network of service stations is managed by hydraulic pumps and tanks, whose level must be monitored continuously to detect operational issues and potential water leaks. The **WineCap**™ solution enables system status to be monitored remotely by connecting the gateway to the Service Centre, and locally with the installation of an alarm/flashing light installed in the technical room.

THE RESULT

Capetti Elettronica's wireless system adapts perfectly to monitoring requirements on the motorway network and in town outlets, as it promptly detects status and events changes involving water and electricity.



THE WINNING CHOICE

> **T-KK** (Outdoor temperature and 2 NC/NO inputs for status and alert integration)

> **GATEWAY M1** (Gateway for local management of system FAIL status and ALERT thresholds with 2 output relays)

CULTURAL ASSETS
RICCI ODDI, PIACENZA



BACKGROUND
In April 2022 the exhibition entitled Klimt - The Man, the Artist, his World was set up in the Ricci Oddi Modern Art Gallery and the XNL – Piacenza Contemporanea cultural centre. It illustrates one of the most riveting periods in the history of early 20th century art, through the life, creative journey and collaborations of the Father of the Vienna Secession.

THE SOLUTION
Capetti Elettronica had already used its museum monitoring systems in facilities such as the Gran Guardia Palace in Verona, the Palace of Venaria, the Poldi Pezzoli Museum in Milan, Goethe House in Rome, the Casa Romei Museum in Ferrara and the Oriental Art and Egyptian Museums in Turin. Having seen Capetti's extensive experience in this field, the organisers of the exhibition therefore decided to put their trust in the **WineCap™** systems to measure and log environmental data.

THE RESULT
Hydrothermal data loggers were selected to measure the temperature and humidity in the various exhibition rooms, in addition to data loggers with illuminometers for works particularly sensitive to light intensity, such as original drawings by the Austrian artist.

THE WINNING CHOICE
> **THL** (light intensity measure)

> **TH** (temperature and relative humidity measure)



THL

CULTURAL ASSETS
CATHEDRAL CRYPT, SIENA





BACKGROUND

The Cathedral Crypt in Siena is a treasure chest of art and spirituality that was hidden for centuries, and only came to light in 2003 during restoration work. The extraordinary fragility of the 14th century frescoes, and the complex interaction between historic architectural features and the microclimatic conditions, require constant monitoring that is reliable yet non-invasive.

THE SOLUTION

Data loggers capable of monitoring the main microclimatic parameters and air quality were installed to meet the project objectives. The system measures indoor temperature, relative humidity, VOC, CO2, atmospheric particulate (PM2.5, PM10), light intensity, presence detection, and ambient sound level. In particular, noise monitoring was introduced to keep noise levels under control in an underground setting where intense sound waves can cause mechanical micro-stresses in sensitive structures and surfaces over time.

THE RESULT

The monitoring system enables internal conditions in the crypt to be fully controlled and a prompt response if threshold values are exceeded. The information captured supports preventive conservation actions, helping to minimise risk relating to humidity, poor air quality, excessive light or high sound levels.



COPM

THE WINNING CHOICE

> **THIAQ** (Indoor temperature and relative humidity - TVOC)
> **COPM** (Concentration of CO2 - Particulate PM2.5 PM10)
> **THLP** (Light intensity - presence in room)
> **PS-4AI + CAP130FO** (3-channel data logger and sound level meter)

CULTURAL ASSETS
GREEK THEATRE, SYRACUSE

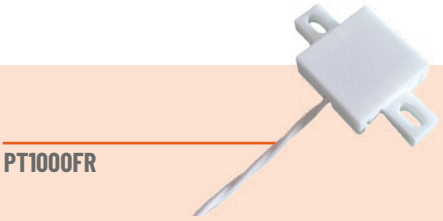





BACKGROUND
The Greek Theatre in Syracuse dates back to the 5th century BC, and has been almost completely dug out of the rock, representing the most significant example of theatrical architecture in the Greek west. As part of the conservation work developed by the Archaeological Park Department, CMR LAB installed a microclimatic monitoring system to support the restoration work on the stone structures, using the WineCap™ wireless technology by Capetti Elettronica.

THE SOLUTION
The monitoring system involves the use of surface temperature sensors placed in contact with the stair risers and treads, arranged in different areas of the theatre to detect the stone possibly overheating. These are accompanied by three anemometers installed at strategic points on-site to measure wind speed and direction, and a weather station to measure air temperature and relative humidity. All of the sensors are connected to **WineCap™** data loggers, which collect the data at regular intervals and send it via wireless transmission to a gateway situated in proximity to the seating area.

THE RESULT
The solution implemented guarantees ongoing, non-invasive environmental monitoring, such that essential information can be captured to protect and enhance the site. This provides a concrete example of how technological innovation can support the conservation of cultural assets.



THE WINNING CHOICE

> **TT1K + PT1000FR** (data logger with 2 inputs for external temperature transducers + surface temperature sensor)

> **LVD + AN6410** (3-channel data logger and anemometer)

CULTURAL ASSETS

ARCHAEOLOGICAL PARK, SEGESTA





BACKGROUND

This spectacular Doric temple was built in the 5th century BC and is situated in the province of Trapani. A structural monitoring system was optimised in agreement with the works management, to log any temple movement or subsidence.

THE SOLUTION

The system installed has pairs of transducers positioned at the height of the architrave on the inside, to monitor movement in the horizontal axis, and additional potentiometers on the inside and outside at the second front column to the east. These sensors are connected to **WineCap™** data loggers, which carry out sampling every 10 minutes, and send the data wirelessly to a control unit located near the temple. All CAPETTI data loggers have internal temperature probes to be able to relate the measurements obtained to environmental conditions.

THE RESULT

The control unit is self-powered via a photovoltaic panel, and the data is logged within it and sent to the online Service Centre, enabling the clear, convenient and continuous monitoring of the archaeological site.

WineCap

4D



THE WINNING CHOICE

> **4D** (displacement measures)

> **T-DD** (cracks extension)

> **BOX-PPS** (photovoltaic power supply)

CULTURAL ASSETS

CHURCH OF SAINTS CARLO & BIAGIO AI CATINARI, ROME









BACKGROUND

The Church of Saints Carlo & Biagio ai Catinari in Rome represents architectural heritage of extraordinary historic and religious value. During structural reinforcement work, the need for a monitoring system transpired that could guarantee reliability, precision and continuity, without compromising the integrity of a setting that is as unique as it is complex.

THE SOLUTION

To meet these requirements Tecnica MP chose the **WineCap™** wireless systems by Capetti Elettronica. Using data loggers connected to strain gauges made it possible to accurately measure tensile forces on chains and suspended metal elements during the delicate consolidation phase and after removing temporary supports. The system was completed with a gateway for remote transmission, such that data gathered is available immediately and conveniently at a distance.

THE RESULT

The integration of the **WineCap™** technology enabled reliable, non-invasive control, supporting targeted project choices while guaranteeing the maximum protection of historic heritage. The result was made possible thanks to synergy between Tecnica MP's expertise and Capetti Elettronica's innovation, which emphasised yet again its mission to have technology supporting the protection of monuments and historic buildings.



EX2

THE WINNING CHOICE

> **EX2** (Smart wireless data logger with outdoor temperature and three inputs for strain gauge bridge transducer)

HYDROGEOLOGY

CHAMPORCHER VALLEY, AOSTA



BACKGROUND

As part of advanced environmental monitoring, gathering rainfall data is essential for climate analysis, water management and the prevention of extreme events. It is often necessary to install measurement stations even in remote areas with no electricity connection or cables.

THE SOLUTION

The rainfall monitoring system was implemented by InGeoLab using the **WineCap™** data loggers by Capetti Elettronica, along with an electric rain gauge. Combining it with a PPS box with a photovoltaic panel enables autonomous operation in any weather conditions and in the absence of electrical power.
Modular configuration enables the wireless monitoring system to be integrated with different climatic monitoring sensors: with the IP65 hydrothermal sensor with weather protection to measure temperature and relative humidity; with the anemometer to measure wind speed and direction; with the solarimeter to measure solar radiation.

THE RESULT

The implementation of the **WineCap™** system ensures that environmental parameters are continually and reliably monitored, providing real-time data for meteorological studies, water resource management and the prevention of hydrogeological risk. The wireless solution is a step forward when it comes to smart monitoring in the environmental sector, with particular focus on sustainability and technological innovation.



2DI

THE WINNING CHOICE

> **2DI** (2-channel data logger)

> **PL200** (rain gauge with pulse output)

> **BOX-PPS** (photovoltaic supply kit)

HYDROGEOLOGY

LAKE SPINA, PRALORMO






BACKGROUND

Lake Spina is an artificial body of water of environmental and practical interest for the purpose of water management, in an area that is exposed to hydrogeological fragility.

THE SOLUTION

The project developed by Geolab involved the installation of an integrated system based on wireless **WineCap™** data loggers by Capetti Elettronica, connected on one side to piezometric sensors arranged in three parallel rows along the embankment and towards the valley to measure the groundwater level, and on the other side to ultrasonic level sensors positioned to monitor the body of water upstream, downstream and discharges through the embankment. The system is complete with a meteorological station that enables the correlation of weather variations (rainfall, wind, temperature and humidity) with the ever-changing piezometric and water levels, providing a predictive and comprehensive picture of lake behaviour. The entire system has been installed without electricity, and is powered autonomously from a photovoltaic unit that ensures operational continuity.

THE RESULT

In an increasingly unstable climatic context, the system installed at Lake Spina offers reliable and operationally consistent monitoring of its water and atmospheric parameters, providing strategic support for anticipating critical issues, protecting the area and strengthening hydrogeological resilience.

THE WINNING CHOICE

WineCap



PS-4AI

> **PS-4AI** (4 proportional inputs for piezometers and level sensors)
> **THEE + EE07-M1 KIT** (data loggers with external sensor for outdoor temperature and relative humidity with weather protection)
> **2DI + PL200** (2-channel data logger and rain gauge)
> **LVD + AN6410** (3-channel data logger and anemometer)

HYDROGEOLOGY

BILBAO, SPAIN







BACKGROUND

As part of the project to upgrade the railway network in the Basque Country, especially along the Bilbao-Abando access corridor and station, a hydrogeological study accompanied by a subsoil monitoring system was planned. Monitoring the aquifer is strategic for site safety, planning actions and safeguarding the surrounding environment.

THE SOLUTION

Wells with a depth of 55 metres were implemented to meet these requirements, and each equipped with strain gauge piezometers to monitor aquifer behaviour in the areas involved in the work. Choosing the **WineCap™** technology by Capetti Elettronica made it possible to meet the requirements in terms of reliability, robustness and continuity over time.
The system used demonstrated effective sensor management, easy configuration directly in the field, and excellent resistance against external agents, which are all essential aspects for satisfactory operation in operational contexts as complex as that of large infrastructure projects.

THE RESULT

The solution represents a concrete application of the **WineCap™** technology in an infrastructure project of considerable importance at a European level, and attests to its effectiveness in highly complex settings and robust performance over time.

WineCap

VW



THE WINNING CHOICE

> **VW** (4-channel data loggers for strain gauge transducers)

EXCAVATIONS

SAN QUIRICO DISTRICT, GENOA









BACKGROUND

The Rio Fulle water upgrade project has recently been completed in the San Quirico district in Genoa, with the implementation of a new channel and reinforced concrete culvert. The work aims to make a flood-risk area safe, and required deep excavations near existing buildings, and utility features to be moved along the central street in San Quirico.

THE SOLUTION

Synthesis chose the wireless **WineCap™** systems by Capetti Elettronica to ensure safety during the most critical worksite phases, installing an automated monitoring system active for the duration of the work. Dual-axis inclinometers were positioned on neighbouring buildings to measure potential deformation or structural failure, in addition to crack meter data loggers with external transducers to measure the formation and development of any cracks, and laser distance meters to check for potential subsidence. The data captured was automatically sent to be available on a web platform, and is always accessible to the relevant operators for the timely management and comprehension of information.

THE RESULT

The solution ensured that the structural conditions of neighbouring buildings were monitored accurately providing reliable, prompt data to prevent risk situations. The convenient installation, device autonomy and remote data access contributed to improving the efficiency and safety of the entire site.

WineCap

T-DD



THE WINNING CHOICE

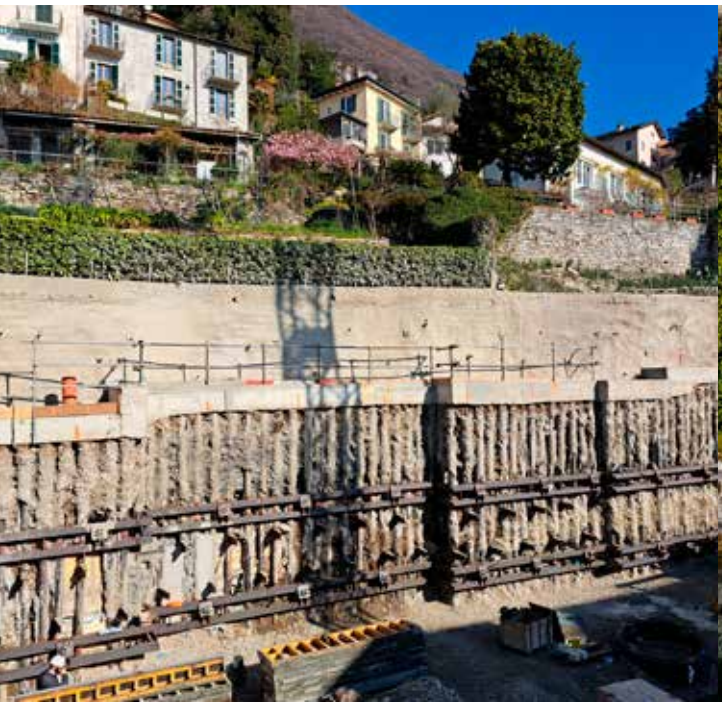
> **TII** (dual-axis inclinometer)

> **DIST-FX** (laser distance meter)

> **T-DD + PZ12-A-025** (data logger + transducer for crack dimensions)

EXCAVATIONS

VILLA ITALIA – LAKE COMO





BACKGROUND

The work was to renovate and extend a historic building in an extremely panoramic position on the shores of Lake Como. The Villa Italia building was built in the first half of the 19th century in the council district of Carate Urio.

THE SOLUTION

Excavations were carried out, with a maximum face of approximately 12 metres, to construct an underground private garage. The load cells were installed on pre-tensioned carbon spring steel tie rods included in the work to support the excavation face, consisting of a retention system of piles and tie rods.

THE RESULT

Thanks to the use of a toroidal load cell and the **WineCap™** monitoring system, it was possible to measure the workload variations undergone by the tie rods and anchoring. This equipment enabled the excavations to be completed safely, by evaluating and monitoring soil forces on the containment structures.



EX6

THE WINNING CHOICE

> **EX6** (strain gauge data logger for load cells)

> **CAP165CE** (electric load cell for tie rods, full scale 1500 KN)

EXCAVATIONS
FOUNDATION PLATE, CUNEO







BACKGROUND

During the cement hydration process the heat generated by the chemical reactions can cause internal stress in concrete, with the risk of cracks due to thermal shrinkage. To prevent this and ensure that the material hardens appropriately, temperature monitoring becomes crucial. In a major industrial expansion project designed to create the foundation plate for a new plant for silos and milling operations, the need to control heat development in the concrete transpired, ensuring compliance with respect to design parameters and existing legislation.

THE SOLUTION

The monitoring system installed by Cismondi involves the use of four **WineCap™** temperature and humidity data loggers positioned at strategic points on the foundation plate, each accompanied by two IP68 platinum resistance thermometers installed at different cast depths. The system is complete with a gateway (MWDG) with a photovoltaic panel unit (BOX-PPS) to enable installation in the absence of electrical power. The data captured is sent to the cloud service where it can be viewed, downloaded or managed remotely, thereby providing effective, timely control of the concrete conditions.

THE RESULT

Monitoring has made it possible to obtain trends for the temperature of the concrete in the casting, setting and hardening phases. The data gathered has helped to prevent shrinkage or cracks, improving the quality of operations and observing design parameters.

THE WINNING CHOICE



> **TT1K** (2 inputs for external temperature transducers)

> **PT1000-IP68** (PT1000 sensor for heavy-duty use)

EXCAVATIONS

PIAZZA VENEZIA, ROME



BACKGROUND

Upgrading urban mobility in the capital with the implementation of the C metro line represents a strategic project for the future of Rome, not to mention a tricky challenge in terms of safeguarding historic heritage. The T3 section in particular crosses areas of considerable archaeological value and valuable monuments, such as San Giovanni, the Colosseum and Piazza Venezia. SOCOTEC chose the wireless WineCap™ monitoring systems by Capetti Elettronica to safeguard the structures and works along the section.

THE SOLUTION

The **WineCap™** system made it possible to accurately identify any changes to layout, deformations and irregular movements in the buildings surrounding the excavation area and the site, which are early indicators of potential structural damage. Installation was quick, discreet and non-invasive, which is also ideal in settings of high archaeological and historic value. This was essential in an area that accommodates true symbols of Rome, such as the Vittoriano monument and Palazzo Venezia, where safeguarding aesthetic and structural integrity is paramount.

THE RESULT

In a setting as unique as that of Rome's historic centre, the wireless technology by Capetti Elettronica guaranteed maximum protection for buildings and monuments without changing aesthetics or designated use, combining the site requirements with the protection of heritage of immeasurable value.



TII

THE WINNING CHOICE

> **TII** (Dual-axis inclinometer)

> **T-DD** (Data loggers with 2 inputs for potentiometer transducers)

TUNNELS & RAILWAYS

LYON-TURIN RAILWAY TUNNEL







BACKGROUND

TELT - Tunnel Euralpin Lyon Turin is the dual-national developer, 50% owned by the French government and 50% by the Italian government through the state railway network, Ferrovie dello Stato Italiane, responsible for implementing and managing the future cross-border Lyon-Turin railway line. The base tunnel is an essential element for the future rail connection, and is located between Susa in Piedmont and Saint-Jean-de-Maurienne in Savoie.

THE SOLUTION

Capetti Elettronica wireless instrumentation was chosen to measure strain and deformations generated by tunnel excavations. The **WineCap™** data loggers capture data coming from multipoint borehole extensometers and load cells positioned at the base of the ribs.

THE RESULT

The customer can continually monitor the development of phenomena caused by the penetration of excavations, accurately measuring what can become significant displacements in the structure, especially in the tunnel section, in addition to loads in the most critical areas.

WineCap

EX6



THE WINNING CHOICE

> **T-DD** (cracks extension and temperature)

> **4D** (displacement measure)

> **EX6** (strain gauge data loggers / for load cells and temperature)

TUNNELS AND RAILWAYS

GRAND PARIS EXPRESS, PARIS



BACKGROUND

The main aim of the Grand Paris Express project is to reinforce the Paris underground network. With approximately 200 km of new interconnecting lines, the extension of two existing lines and the implementation of four completely new lines, this ambitious infrastructure project snaking through the French capital and its urban areas will also involve the creation of 68 new railway stations.

THE SOLUTION

Capetti Elettronica wireless instrumentation was chosen to monitor the impact of excavation works on existing urban structures and on the construction works. Equipment included MEMS dual-axis inclinometers on the buildings within the area of geotechnical interference, single-axis inclinometers on electrolevel tilt meters positioned in stations and on tracks, vibrating wire strain gauges on temporary counter struts in sites and pre-cast segments, or even in the launching structure for the tunnel boring machine (TBM).

THE RESULT

The customer was able to view the relevant measurements continuously thanks to the GSM **WineCap™** gateway, and completed the monitoring with sound level meters to check the noise generated.

THE WINNING CHOICE

> **VW** (4 vibrating wire transducer inputs)

> **PS-4AI** (Noise monitoring with a sound level meter)



TUNNELS AND RAILWAYS

METRO 5, MILAN







BACKGROUND

Milan's M5 subway line winds along approximately 25 km of tunnels and connects the Bignami Parco Nord station to San Siro stadium, providing a public transport service that radically reduces road traffic and optimises the urban environment.

THE SOLUTION

A building with underground levels was to be constructed in an area corresponding to the tunnels. Monitoring potential deformation in tunnels is essential for keeping the subway running. The tunnel was therefore split into cross-sections and five **WineCap**™ inclinometer data loggers installed in each.

THE RESULT

The laser distance meters/inclinometers in the **WineCap**™ monitoring system checked for deformation via essential convergence measurements in tunnel sections.



DIST-FX

THE WINNING CHOICE

> **DIST-FX** (laser distance meter/inclinometer with multi-way bracket kit)

TUNNELS AND RAILWAYS

ASTI-NIZZA MONFERRATO RAILWAY LINE





BACKGROUND

Monferrato Piemontese is an area of Italy that features uplands and valleys, with landscapes that are known especially for various vineyards. The Asti-Nizza Monferrato railway line runs through these landscapes from east to west. The company GD Test was commissioned to monitor the tracks potentially affected by embankment movement as a result of operations to create an underpass using a pipe jacking technique. It was deemed appropriate to set up a particularly versatile system of wireless sensors suited to the morphological context and the absence of an electricity supply line.Furthermore, the technical specifications stipulated by RFI (railway operator) required a monitoring system with readout intervals and thresholds handled as quickly as possible, to guarantee safe train operation.

THE SOLUTION

GD Test put its trust in a **WineCap**™ monitoring system made up of 21 wireless dual-axis inclinometers, battery-powered and installed on the sleepers to monitor longitudinal and transversal levels, skew at 3 and 9 metres, and other crucial parameters of interest to RFI. Data are transmitted by the system thanks to a gateway that can also be powered by photovoltaic panels, and operates with readout intervals of 5 minutes and customer-defined thresholds. Once monitoring commences, the precision and reliability of the data are very useful and enable prompt decisions if displacement exceeds set threshold values.

THE RESULT

Precision and reliability are two essential factors for a successful railway monitoring system. These two parameters have never been neglected in the relationship between Capetti Elettronica and GD Test that spans decades.



TII

THE WINNING CHOICE

> **TII** (IP69 dual-axis inclinometers with zero-point position)

> **GATEWAY M5** (gateway with transmission to Service Centre every 5 minutes)

BRIDGES AND VIADUCTS

LAGOON BRIDGE, ALGHERO



BACKGROUND

The bridge to be monitored is situated in a lagoon area on the Sardinian coast, and is an essential link between a town centre and the surrounding areas. The structure has three stone arches and is next to an ancient Roman feature. Traffic crosses it regularly and it requires routine monitoring and maintenance.

THE SOLUTION

The **WineCap™** system by Capetti Elettronica was chosen with the aim of monitoring for potential structural failure or movement in the piles in the watercourse. Using data loggers for dual-axis inclinometers with laser distance meters combined with reference targets, measurements are continually taken to check for possible displacements on the Y-axis in addition to rotations of the loadbearing structure.

THE RESULT

The use of laser distance meters simplifies and improves structural monitoring, eliminating the need for level gauge sight glasses, which are difficult to install due to their hydraulic and fluid circuits that are inevitably sensitive to temperature over time and need constant maintenance. The **WineCap™** laser distance meters are easy to install and are extremely precise, guaranteeing accurate measurements, maximum reliability and service continuity.

WineCap

DIST



THE WINNING CHOICE

> **DIST-FX** (laser distance meter/inclinometer with multi-way bracket kit)

> **TARG-DIST** (triangular target)

BRIDGES AND VIADUCTS

ROAD BRIDGE, VAL SENALES





BACKGROUND

There were many objectives - measure existing compression on the bridge beams in question, check maximum beam deflection under load, and subsequently monitor the stress conditions continually.

THE SOLUTION

Tensile testing was chosen to measure current residual prestress conditions, however not by taking the usual core sample of concrete, but rather by using a truncated pyramid sample appropriately set up by means of strain gauges connected to CAPETTI **WineCap™** data loggers. The graphs produced during the strain caused/applied when taking the sample and the με value measured after taking the sample enabled a fairly precise evaluation of beam compression. Static strain gauge testing was then carried out, by measuring deformation with three sensors positioned at the centre and edges of the beam, and applying the weight of lorries, first one and then two (load test). Therefore the calculation did not focus on strain in terms of σ, but on deformation in terms of ε (to understand the compression limit for the part under strain with a certain accuracy).

THE RESULT

In order to monitor the condition of the structure over time, values on the three strategic points are now captured regularly, so that the data can be viewed remotely with automatic alerts. The deterioration of a reinforced concrete bridge is never a sudden phenomenon (sagging cables, corrosion etc.). Techniques such as the one described above are long-term solutions that can avoid costly tomographic investigations.



THE WINNING CHOICE

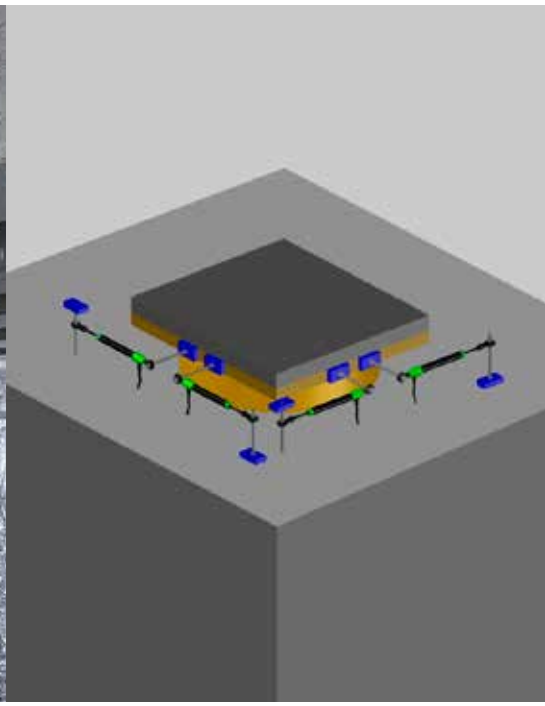
> **EX2** (Datalogger with 3 strain gauge channels and 1 external NTC10K channel)

EX2

BRIDGES AND VIADUCTS

HIGHWAY STRUCTURES





BACKGROUND

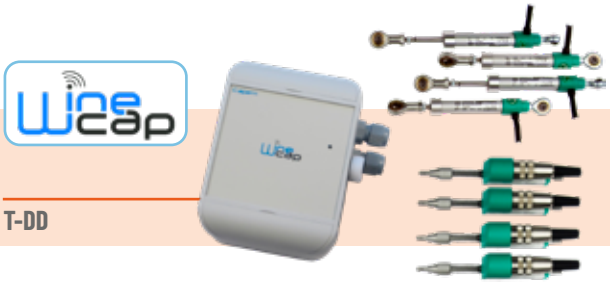
A fundamental aspect in the maintenance of large works is checking the structural integrity of bridges and viaducts. Deciding to carry out effective monitoring is the key to accurately identifying areas to focus on for restoring the overall functionality of infrastructure in good time.

THE SOLUTION

Sacertis Ingegneria designed a system to measure relative bearing-pillar and loadbearing slab-bearing movements, for the purpose of checking for the correct behaviour of the bordering elastomer disc bearings and relevant fittings connected to the structure. More specifically, a pair of linear displacement transducers was installed for each degree of freedom permitted by the bearing (one joined to the pillar and the other to the loadbearing slab), in combination with the **WineCap**™ data loggers.

THE RESULT

Consequently it was possible to measure relative movement and obtain the bearing displacement value.

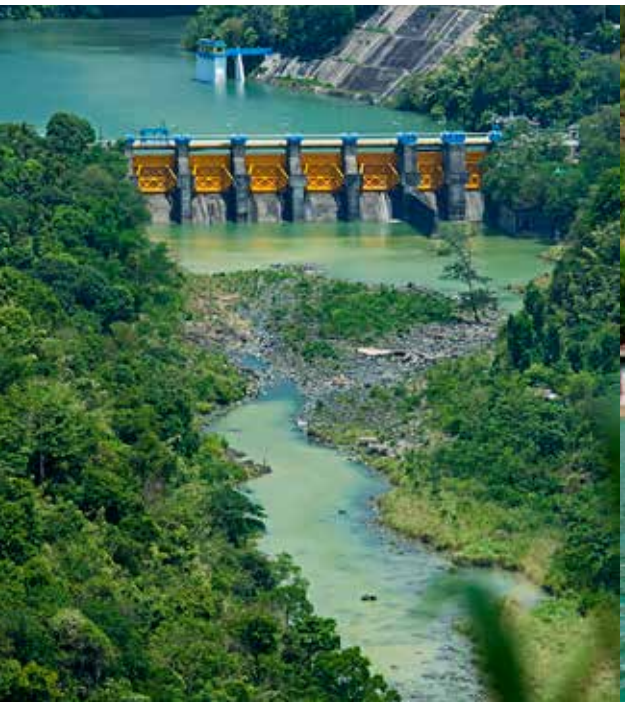


THE WINNING CHOICE

> **T-DD** (measurement of relative movement)

DAMS

IPODAM, PHILIPPINES





BACKGROUND

Ipo Dam is a gravity dam with a concrete water reservoir situated at approximately 7.5 kilometres downstream of the Angat dam within the Angat Watershed Forest Reserve in the Philippines. It was completed in 1984 and has a maximum storage capacity of 7.5 million cubic metres. The spillway level of the dam, which has seven radial gates, is at an altitude of 101 metres. The dam water is diverted to the Novaliches Portal and La Mesa dam.

THE SOLUTION

During the construction of dam protection and containment structures, various structural checks were required to ensure safe working conditions. GD Test put its trust in the **WineCap**™ data loggers, installing a monitoring system that could obtain a comprehensive and detailed real-time picture of the situation in terms of displacements and loads.

THE RESULT

Dams are situated between engineering works which are potentially very dangerous, therefore the need to continually monitor their behaviour is recognised universally and accepted in all countries. In the construction and testing phases, checks are designed to meet immediate safety requirements. During operation, monitoring provides information that is useful for identifying the behaviour of the system in its entirety and at particular critical points, and focusing on their evolution over time.

WineCap

4D



THE WINNING CHOICE

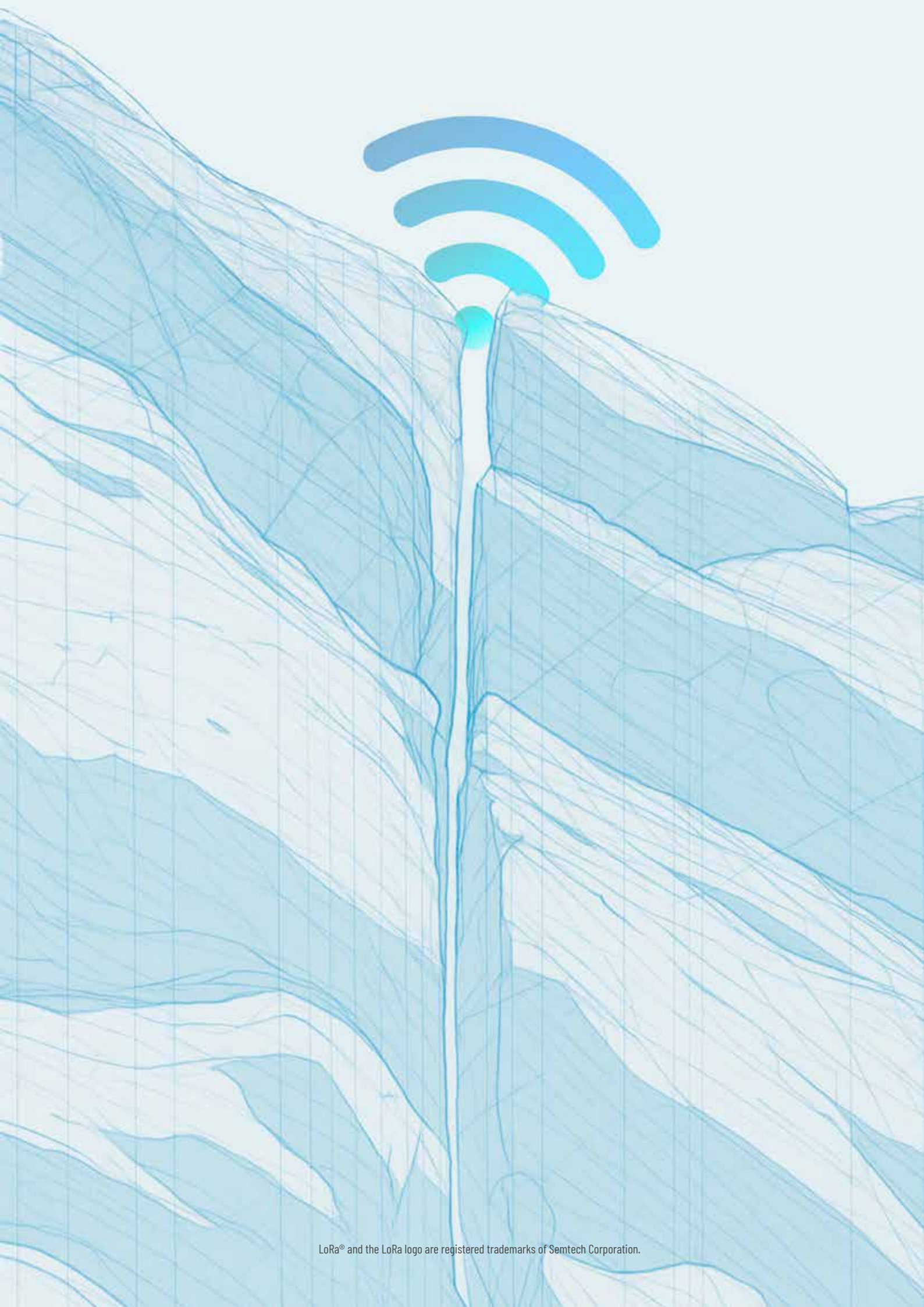
> **T-DD** (size of cracks)

> **4D** (measurement of displacement)

> **EX6** (strain gauge data logger/for load cells)



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