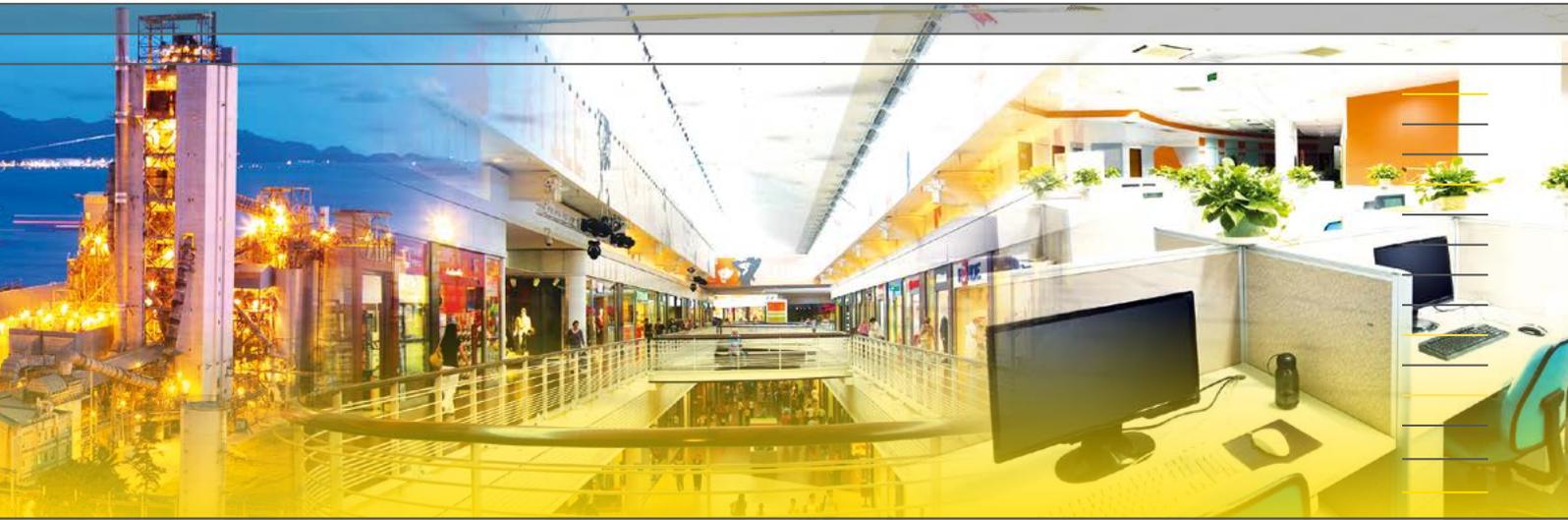


ENERGY AUDITING AND MONITORING IN COMPANIES



Introduction

- To implement Article 8 (4-6) of the EU Energy Efficiency Directive (2012/27/EU), the UK government has set up ESOS (Energy Savings Opportunity Scheme) which requires large companies to carry out energy assessments in order to identify cost-effective saving measures.

This **concerns any company** which:

- employs more than 250 people,
- has an annual turnover in excess of €50 million (£ 38,937,777),
- has an annual balance-sheet total in excess of €43 million (£ 33,486,489),
- is not covered by an Energy Management System certified as complying with the EN ISO 50001 standard

GOAL

By analysing the structures (building, insulation, etc.), users will seek to assess **passive energy efficiency**. Then, using high-performance equipment and smart measurement, test and control systems (variable speed drives or load-shedding devices), it will be possible to optimize operation and, more generally, improve **active energy efficiency**.

REGULATORY FRAMEWORK

By 5th December 2015, the companies concerned must have carried out an audit covering 65 % of their energy bills in order to identify the potential sources of energy savings. The energy audit must be performed in line with the general methodological and quality requirements regarding preparation, execution and reporting, as defined by the **EN 16247-1** standard. This will all be done within the framework of an environmental management system compliant with the **ISO 14001** standard. Subsequently, the audit will have to be repeated every four years, covering 80 % of energy bills.

If improvements are made, new measurements must be performed to assess their impact. Measurement plans will be implemented for this regular monitoring, in compliance with the requirements of the ISO 50001 standard.

AUDITORS

The audit may be performed by an **external service** provider or a person in the company. External service providers are considered competent for this type of audit if they hold a quality label in the areas covered by the energy audit (buildings, industrial processes or transport). In-house staff are considered competent if they have the appropriate skills to fulfil the requirements of the audit methodology (training, experience, etc.).

EN 16247-1 STANDARD

The EN 16247-1 standard defines the general methodological and quality requirements for preparation, execution and reporting of the audit. These methods are defined according to the activity audited:

- for buildings: EN 16247-2:2014
- for industrial processes: EN 16247-3:2014
- for transport: EN 16247-4:2014

In all cases, measurement campaigns are necessary to check the efficiency of the equipment, the periods when it is used and the real condition of the building shells.

REPORT

When the audit is finished, a report must be presented to the company and the UK Environment Agency. It must indicate:

- the scope of the audit performed
- consumption and the type of energy used (electricity, gas, etc.)
- the possibilities for improvement in terms of energy efficiency, as well as the cost of the improvements and the extent of the potential annual energy savings, thus giving an idea of the payback period for these improvements.

PLAN

Do

CHECK

ACT



ELECTRICITY CONSUMPTION

An electricity consumption profile will be established to identify the improvements needed to reduce consumption. This can be done by positioning loggers at different points in the electrical installation. They should be set up:

- At the level of the main meter
- On the feeders of electrical switchboards or low-voltage general switchboards
- At the level of the end-equipment (machines, desktop workstations, heating, etc.)

The quality of the electrical energy is important for limiting overconsumption. The following values are measured:

- Voltage and current
- Active power and energy
- Reactive and distorting power and reactive energy
- Power factor ($\cos \varphi$)

These various values are recorded over different representative periods (one day, one month, etc.), at a sampling rate which depends on the system audited (machinery, desktop computing, etc.). Various measuring instruments can be used to perform these measurements:

- Current, voltage, power and energy loggers
- Multimeter clamps for measurements on three-phase or single-phase systems
- Meters

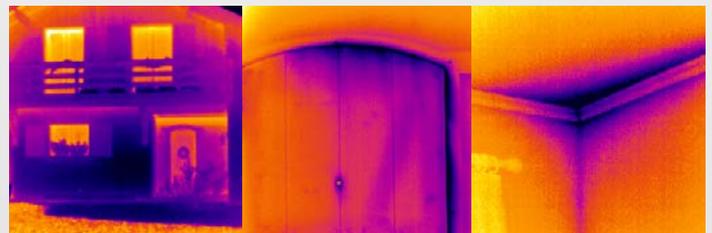
When the audit is finished, a permanent installation must be set up to ensure regular energy monitoring. This monitoring determines the energy consumption (electricity, water, gas, air, etc.) by type of usage. This makes it possible to make targeted improvements and then measure their impact very simply.

The results are then processed by all the departments concerned (maintenance, production, finance, general management) to reduce and allocate the genuine cost of the energy.

THERMOGRAPHY TO ASSESS THE BUILDING'S ENERGY EFFICIENCY

Infrared thermography can be used to reveal heat losses and deduce the useless extra energy consumption which they represent. These losses are a potential source of savings. Thermal cameras are ideal for quickly detecting faults and irregularities such as:

- Insulation faults
- Air infiltration at openings (windows, doors)
- Thermal bridges
- Leaks
- Excessive humidity



It can also be used to detect faults on electrical installations or mechanical equipment. In this way, the auditor can quickly diagnose any points which may cause overconsumption.

For example:

- Electrical problems: faulty contacts, overloads, unbalance, etc.
- Mechanical problems: wear points, adjustment errors, poor lubrication

The energy audit and the measurements

1



Qualistar+ three-phase network and power analysers

Objectives: to record and quantify electrical consumption.

- Monitoring of the energy consumed and the active, reactive, non-active, apparent and distorting power values.
- Harmonics, THD
- Flicker
- Unbalance
- Voltage swells and dips
- Transients
- Frequency
- Inrush current
- Power factor (Cos ϕ)



2



DiaCAM2 and RayCAM thermal cameras

Objective: to optimize energy consumption for heating purposes.

- Measurement of the surface temperature of an object or a partition
- Indoor temperature monitoring
- Detection of insulation faults and thermal bridges
- Detection of equipment malfunctions and overheating of rotating parts



3

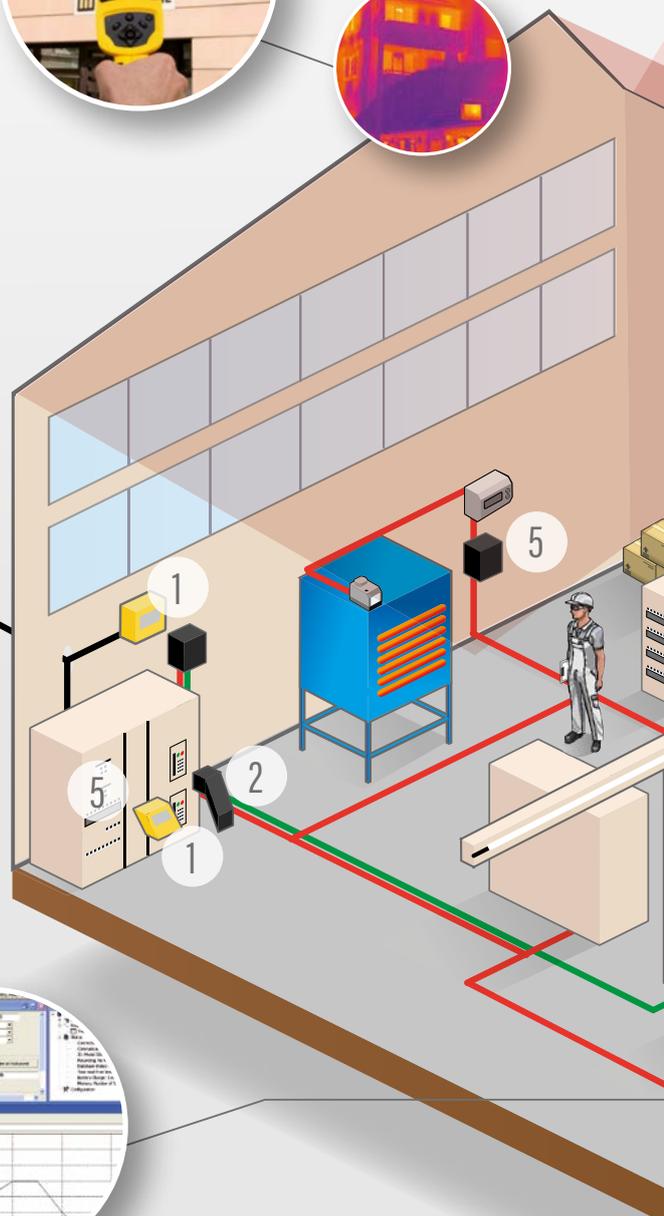
C.A 1227 logger thermo-anemometer

Objective: to modulate the flow rates according to the real needs in order to achieve savings.

- Adapt the air flow-rates to the needs so as to limit consumption and heating costs.
- Improve the energy efficiency of the equipment in order to provide the required flow-rates with minimum consumption
- Measure to check whether the real flow-rates exceed the recommendations.
- Speed from 0.25 m/s to 35.0 m/s (49.0 to 6,890.0 fpm)
- Flow-rate from 0.00 to 2,999 m³/h
- Temperature: -20 °C to +50 °C



Electricity supplier

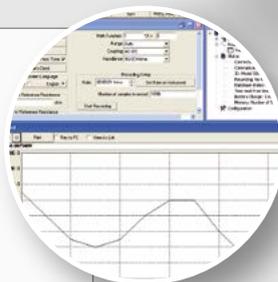


DataView[®]

Software platform for processing and analysing the data.

Users have direct access to:

- real-time display
- processing of the recorded data and alarms
- report generation for energy surveys



5



PEL102 and PEL103 power and energy loggers

Objective: to identify the causes of overconsumption by equipment or overbilling. The energy logger measures the voltage, current, power and energy parameters useful for comprehensive surveys of electrical installations.

- Recording and metering of electrical consumption
- Possibility of installing in a network to provide several metering points simultaneously
- Simple, straightforward installation without cutting off the electricity supply



6



C.A 1110 luxmeters

Objective: to ensure correct sizing of lighting.

- Check whether all the lamps are necessary for comfort
- Reduce power consumption while guaranteeing sufficient lighting (lighting management mode, choice of luminaires, colours of partitions, etc.)
- Measurement of the illuminance of all the light sources (LED, Fluo. etc.) up to 200,000 lux in compliance with Class C of the NFC 42-710 standard

6

7



C.A 1510 Logger

Assessment of performance

- Verification of air-renewal efficiency by measuring the level of CO₂
- Temperature / RH / CO₂ monitoring

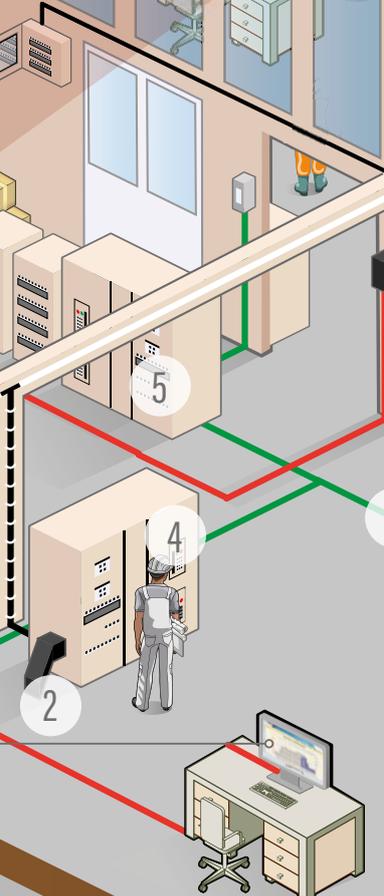
Assessment of comfort

- Air-tight buildings with low ventilation flow-rates are incompatible with good air quality
- Hygrothermal comfort criteria with CO₂ level

7



2



4



F405 multimeter clamps

Objective: active power measurement.

- Simple measurement of voltages and currents on the installation (on electrical switchboards or directly on the equipment)
- Measurement of the THD which contributes to overloading of the electrical power sources

The permanent measuring system

Once you have identified the points requiring improvement, **you can set up a measurement and metering plan.** A permanent measuring system is then necessary to monitor energy **performance** over time.

It can be used to identify the deviations with regard to the reference framework defined by the organization's energy policy after the decisions concerning improvement or monitoring resulting from the survey. According to ISO 50001, **the measuring system must be part of a continuous improvement process.**

ENERDIS proposes a comprehensive solution for energy performance monitoring with its meters, power monitors, pulse concentrators and **E.online** software Energy Information System. This guarantees long-term control and monitoring of the energy data and Energy Performance Indices (EPI). Rational testing of the effectiveness of the energy-saving and optimization operations undertaken is guaranteed by means of clearly comprehensible information: graphs and dashboards present the hourly, daily, monthly and annual data. All the targets highlighted (CO₂, EUR, kWh, M³, etc.) are constantly monitored.

1



Memo 4 - Submeter

Objective: metering, submetering, energy monitoring and rebilling

- Single-phase, direct connection up to 45 A
- Integrated RS485 Modbus communication
- Double-tariff and bidirectional metering

2



ULYS meter

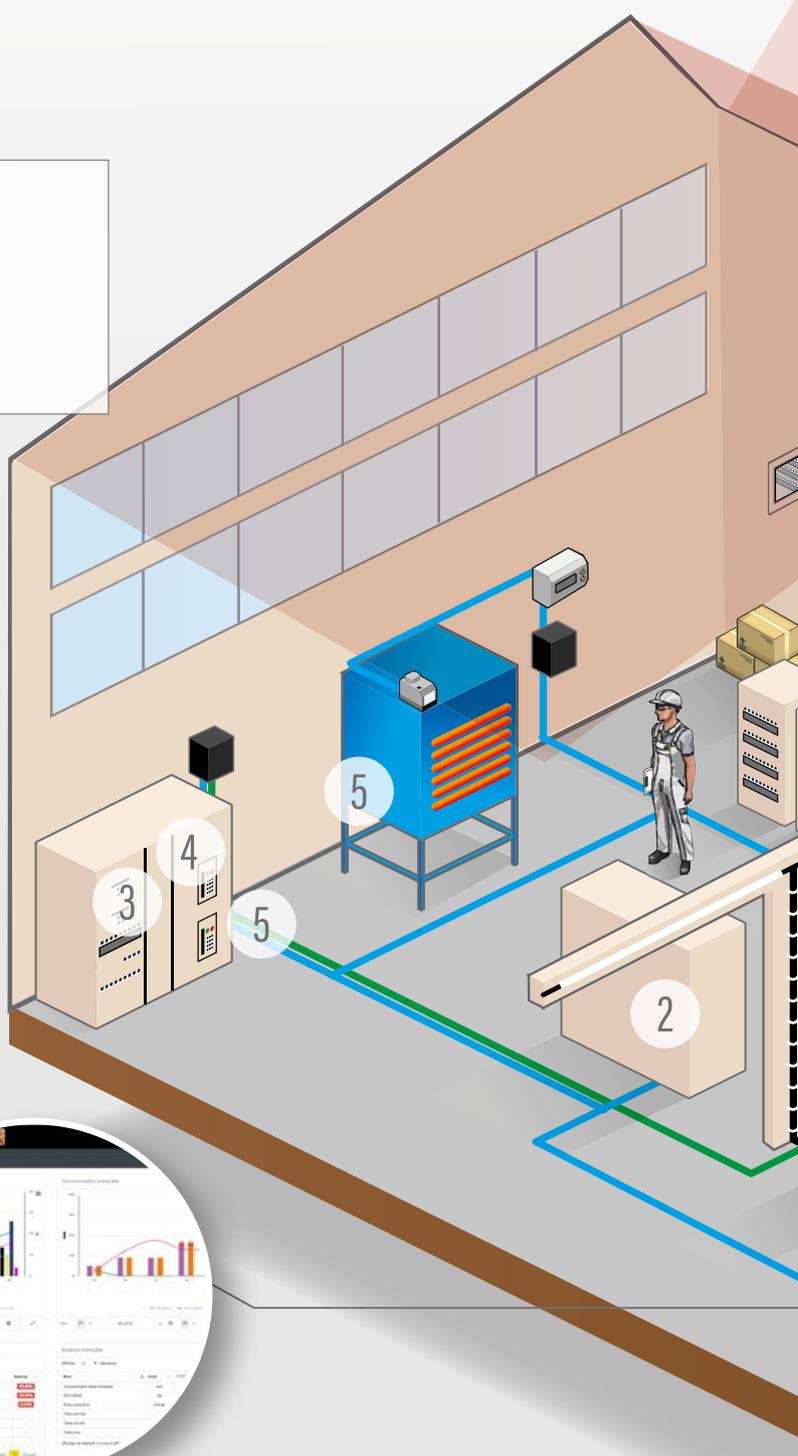
Objective: metering, submetering, energy monitoring and rebilling

- Multiple measurements:
U, V, I, PF, F, P, Q, S, cumulated indices
- Compact: 4 DIN
- Accuracy: Class 1 as per IEC 62053-21
- Direct connection or via CT
- Built-in RS485 Modbus or Ethernet communication
- Single phase up to 80 A with direct connection
- 80 A three-phase or on 1 or 5 A CT

eonline3

Energy performance supervision, analysis and monitoring

- Centralize and consolidate all the energy data
- Allocate and rebill energy costs
- View and map consumption



3



ELOG DATA LOGGER

Objective: to collect and centralize the data in various formats from multi-brand, multi-function equipment (meters, sensors, power monitors, PLCs, etc.)

- Large number of communication ports (2 x RS485, Ethernet, 5 pulse inputs)
- 3-month recording capacity for 100 variables
- *Format des données compatible E.online 3 et autres logiciels spécialisés*
- *Export automatique des fichiers de données csv,xml, vers des serveurs FTP*
- *Pages web embarquées pour la configuration et la supervision*

4



ENERIUM 300

Objective: energy metering and monitoring of electrical networks

- Measurement of all the electrical quantities
- Measurement of harmonics up to the 50th order
- Hour meters: 3 (network presence, load presence, aux. source)
- Time/date-stamped recording of the last 1,024 voltage events
- EN 50160 power quality measurement functions

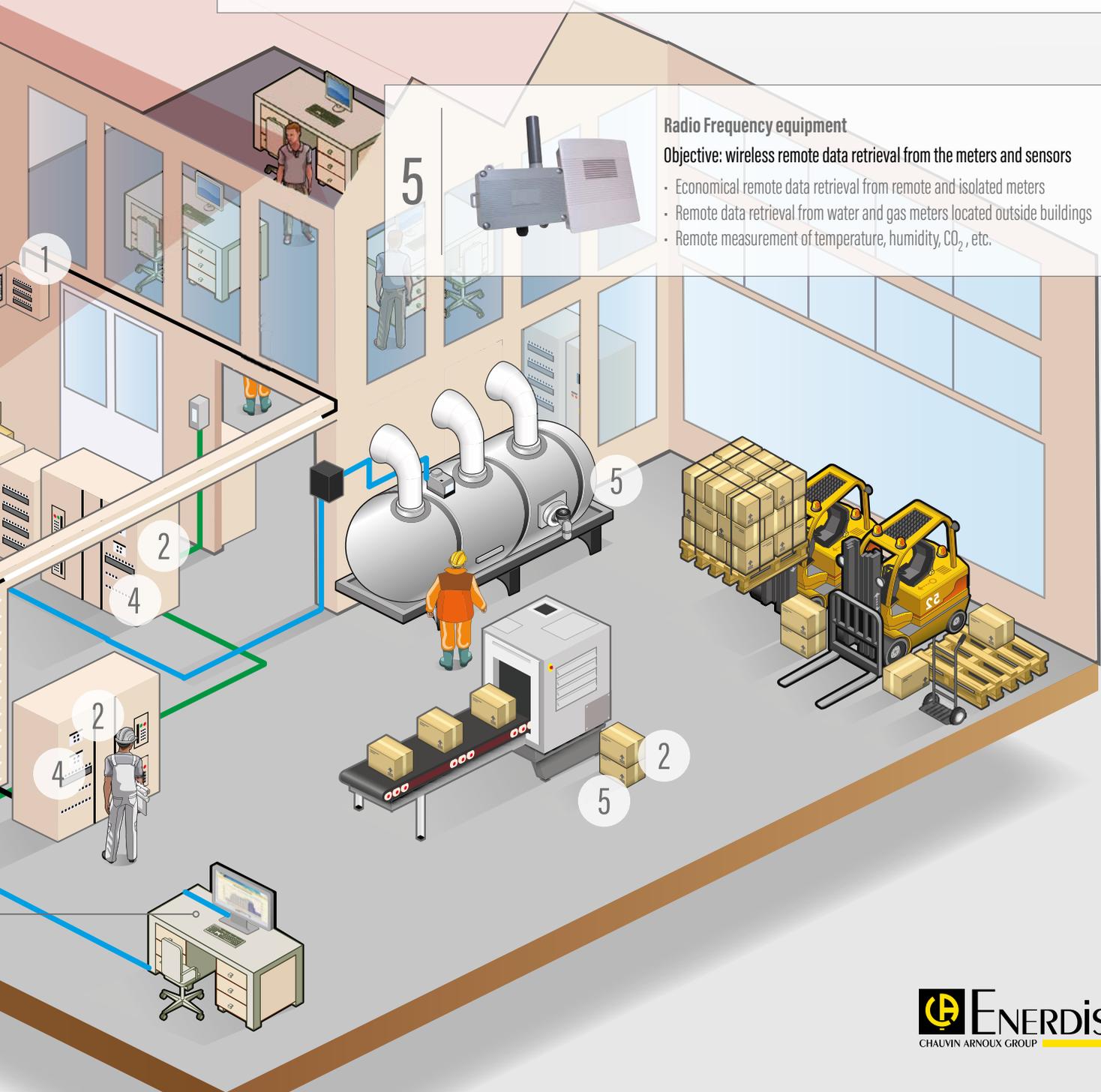
5



Radio Frequency equipment

Objective: wireless remote data retrieval from the meters and sensors

- Economical remote data retrieval from remote and isolated meters
- Remote data retrieval from water and gas meters located outside buildings
- Remote measurement of temperature, humidity, CO₂, etc.





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FRANCE
Chauvin Arnoux
 190, rue Championnet
 75876 PARIS Cedex 18
 Tel: +33 1 44 85 44 38
 Fax: +33 1 46 27 95 59
 export@chauvin-arnoux.fr
 www.chauvin-arnoux.com

UNITED KINGDOM
Chauvin Arnoux Ltd
 Unit 1 Nelson Ct, Flagship Sq, Shaw Cross Business Pk
 Dewsbury, West Yorkshire - WF12 7TH
 Tel: +44 1924 460 494
 Fax: +44 1924 455 328
 info@chauvin-arnoux.co.uk
 www.chauvin-arnoux.com

Middle East
Chauvin Arnoux Middle East
 P.O. BOX 60-154
 1241 2020 JAL EL DIB - LEBANON
 Tel: +961 1 890 425
 Fax: +961 1 890 424
 camie@chauvin-arnoux.com
 www.chauvin-arnoux.com

