



**CAVEL - a European product made in Italy**

## State-of-the-Art Production Process and Quality Control

### Introduction

The Quality structure within Italiana Conduttori Srl is tasked with carrying out a series of checks: on the incoming raw materials, during the production process and on the finished product, in order to maintain the very highest quality standards.

The measurements and tests relating to product quality are performed using the most up-to-date products, calibrated by authorized external laboratories. Company policy has always been geared towards improving quality, investing in new technology and finding new sources for the procurement of raw materials.

Over 70 employees work at the Gropello Cairoli site. Many of them are young and therefore receptive to the various training and refresher courses required.

The CAVEL Laboratory is one of the most well-equipped in this sector in Italy. Four people are employed on a full-time basis: one to carry out statistical tests on the incoming materials and the finished product, another to design cables and resolve any quality issues, a third to compile and update technical documentation, and finally the fourth to ensure the ISO 9001 Quality System is applied correctly within the company.

The Laboratory is also responsible for the regular calibration of the production process testing equipment, while the Production Service - a team consisting of another two people - schedules order progress and verifies process checking. A Technical Service is involved in updating the machinery, as well as servicing and repairing it.

### Production Process, Processing Phases and Quality Checks Flow

#### 1. Copper Wire Drawing



**Description:** red copper wires with a diameter between 0.31 mm and 3.40 mm are drawn.

**Quality control:** before drawing, the Laboratory checks a sample of each virgin wire in line with breaking load, elongation and superficial appearance specifications.

**Process control:** the drawing machines are automated and operate 24 hours a day, 5 days a week; the construction parameters are controlled by a processor; the employee carries out the following checks on the drawing system: purity of the liquid lubricant and efficiency of the annealing furnace, while performing the following checks on the product: diameter, breaking load, elongation, ovalization and surface oxidation of the finished wire.



## 2. Primary Insulation



**Description:** a solid or foam PE dielectric is extruded on the internal wire. In the case of foam dielectrics, inert gas (nitrogen) injection technology is applied. This technique reduces attenuation losses and significantly lengthens the working life of the cable. The extrusion machines can expand the dielectrics by up to 70%, from a size of just a few millimeters up to a few centimeters.

**Quality controls:** on a daily basis, the Laboratory checks that the capacitance values displayed by the line equipment conform to the reference standards. Every batch of thermoplastic material passes an acceptance test before entering the production cycle.

**Process controls:** the diameter and capacitance of the dielectric are monitored constantly. The data is recorded on paper and in magnetic format. Staff check the degree of expansion regularly. All other processing parameters, such as: number of screw turns, line speed, temperature and pressure inside the extruder, and radio frequency heating of the wire are checked using a processor. The unthreading force between the internal wire and the dielectric is also checked. Finally, the centering and ovalization of the dielectric is visually checked under a microscope.

## 3. Braiding



**Description:** cable shielding is formed on the primary insulation. It consists of a braid created using conductive wires, with or without interposed conductive ribbons. The company uses over 200 braiding machines, which offer great flexibility and a high production capacity.

**Quality controls:** the Laboratory checks every batch of capillary wires and foils for: elongation, breaking load and surface oxidation.



**Process controls:** the operators visually check the braiding process, which is aided by various alarm mechanisms in the event of breaks in the spool or wire breakage. The machines are reviewed regularly by the Technical Service.

#### 4. Sheath



**Description:** a sheath in PVC, PE or halogen-free (EVA-based) and/or flame-retardant thermoplastic material is extruded over shielded and unshielded cables.

**Quality controls:** raw material samples are tested to guarantee fault-free processing. Every batch of thermoplastic material is checked for: Shore hardness, resistance to UV and specific weight; every batch of plastic material is tested on the production line before it is deemed suitable for the actual production process.

**Process controls:** the main processing parameters are checked by the processor. This involves constant monitoring of the outer diameter, insulation when live and any indication of faults in the sheath with a spark tester. Line operators check: ovalization, diameter, sheath unthreading force and the text and metrics printed on the sheath.

#### 5. Packaging

**Description:** there are numerous packaging machines which wind various lengths of cable for different package types, such as: shrink-packed bundles or plastic, plywood and wood reels.

**Quality controls:** the instruments used for the quality controls conducted in this department - the final processing phase before storage - are inspected, reviewed and recalibrated by the Laboratory on a regular basis.

**Process controls:** the departmental staff use a spectrum analyzer to check the electrical parameters of the finished product. Tests are completed for: attenuation losses, wire continuity and capacity, plus a spark tester is used to carry out a further check for any faults in the sheath.

**G.M. Lionello Ioris Bronzo. CAVEL**  
 Quality System Manager – Italiana  
 Conduttori Srl

Gropello Cairoli, 11/12/2023

