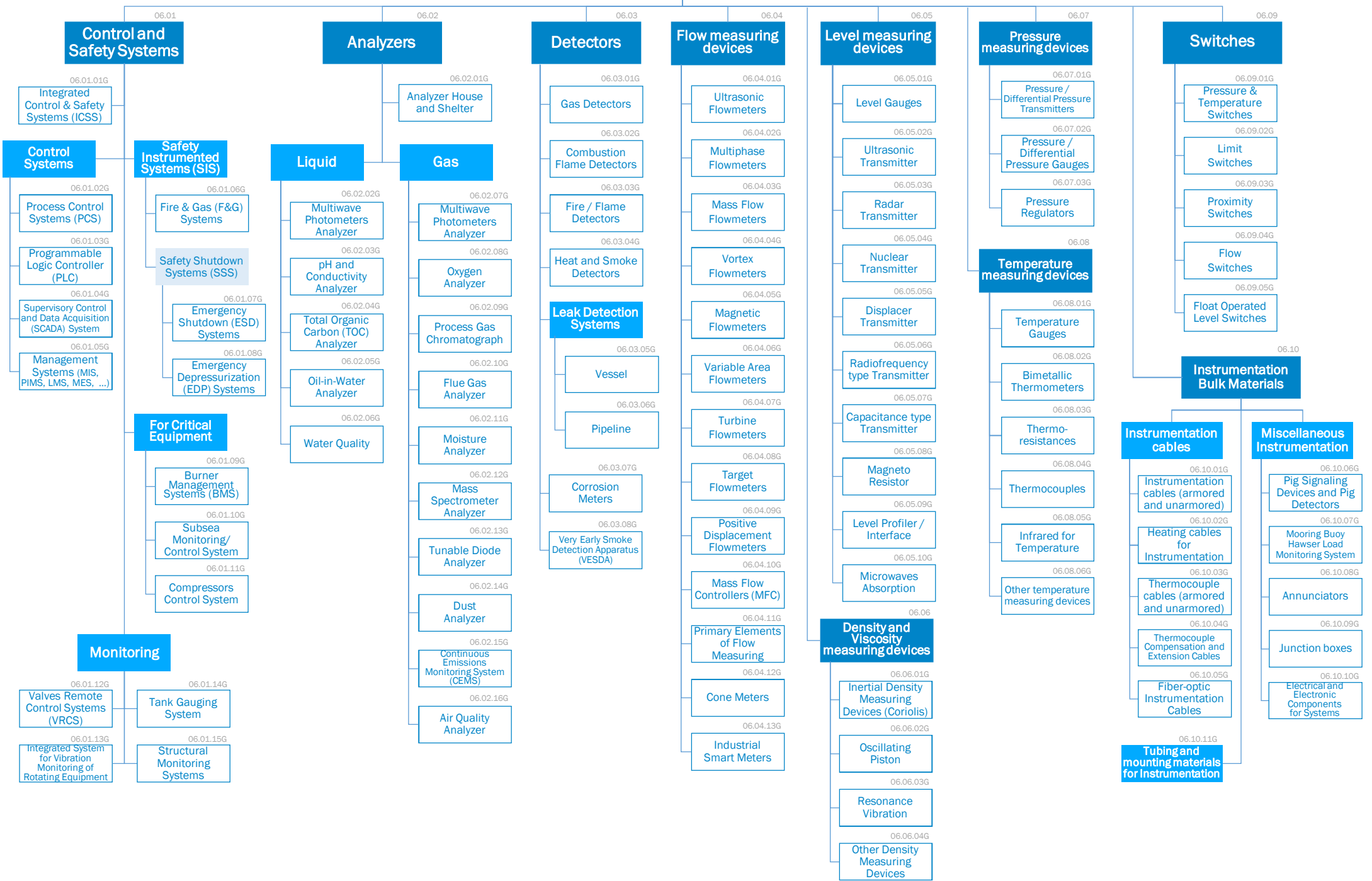


# Control Systems and Instrumentation



# CONTROL SYSTEMS AND INSTRUMENTATION

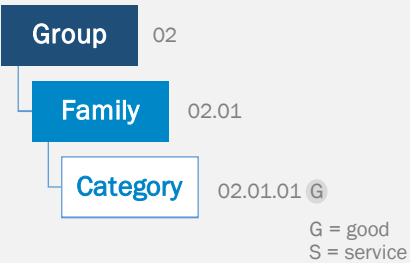
This Group defines the variety of systems and devices used in order to monitor and control a given process.

As a general rule of thumb, “families” of categories define the product and system type (e.g. Flow Measuring Devices, Pressure Measuring Devices, ...), “sub-families” define the function, while the “categories” are described by the operating technology that is used in order to achieve the measurement (e.g. Magnetic Flow Meters, Ultrasonic Flow Meters, ...).

Local Controllers have not been considered since not that frequent anymore in the plant. That applies also, in general, to pneumatic-driven applications.

Sharing a common language in a fragmented and highly diversified part of the value chain is of fundamental importance for all the actors involved.

The Standard Categorization has been designed to drive the Buyer across the value chain and driven by the changes in competition that are present in the market.



## MAIN RATIONALES BEHIND THE STANDARD CATEGORIZATION

### Control Systems

- This Family describe a set of devices that manages, commands, directs or regulates the behaviour of other devices, systems, machines and processes.
- ICSS (Integrated Control and Safety System) identify systems that have control and security functions (SIS, F&G, ..) and are delivered through separated «machines», but integrated at physical as well as programming level.
- Generally speaking, the work Integrated defined a set of systems – or functions – separated but based on the same technology or on technologies with high level of interfaces among themselves, and frequently manufactured by the same vendor.
  - There is a general tendency toward proposing and procuring integrated solution, especially on greenfield projects;
  - On brownfield / revamping projects, higher possibility of systems separately procured.
- Distributed Control Systems (DCS) can be associated to PCS (Process Control System), sometimes referred also as Basic PCS (Process Control System).
- SIS (Safety Integrated System) can be associated to ESD System (that identifies the action of Emergency Shutdown).
- Fire & Gas (F&G), Emergency Shutdown (ESD) and Emergency Depressurization (EDP) are mainly referred as Systems, but – in case of Integrated Control and Safety Systems – they represent “functions”.
- Process Shutdown (PSD) Systems / “Function” is s shutdown of the entire process system and represent a level hierarchy within the Category of “Emergency Shutdown (ESD) Systems”.
- Structural Monitoring Systems included the monitoring of stress conditions, environmental conditions and others.
- For the purpose of this Standard Categorization, a series of Control Systems and Instrumentation have been considered in Packages (Group 03), for example:
  - High Integrity Protection System (HIPPS);
  - Flow Meters Skids;
  - Metering Systems.

### Analyzers

- All the measuring devices listed in this section are used to define the chemical properties of the samples and can be split as per Liquid Analyzer and Gas Analyzer
  - Gas Analyzer are an instrumentation used to measure the concentration of a known gas in given mixture of gases from a process / stream. This includes: Ambient Gas Monitoring, Emissions Monitoring and Process Monitoring
  - Liquid Analyzer are used in order to measure the concentration of a known element in a given liquid
- Multiwave Photometers Analyzers is a broad category that include: “Near Infrared”, “Ultraviolet”, “Fiber Optic” photometers. These photometers operate in the infrared (IR), near infrared (NIR), ultraviolet (UV) and visible (VIS) regions
- Chlorine Analyzer are included in Total Organic Carbon (TOC) Analyzers
- Continuous Emissions Monitoring Systems (CEMS) typically monitor the following emissions: sulfur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide, hydrogen chloride, airborne particulate matter, mercury, volatile organic compounds, and oxygen. CEMS can also measure air flow, flue gas opacity and moisture.

### Detectors

- This family must not be confused with the analyzer one. Detectors detect situations that are outside of the normal operating conditions and set up an alarm. On the other hand, analyzers determine, in real time, the quantity/concentration of a said gas/liquid/particle in a given process.

### Flow measuring devices

- Mass Flowmeters include:
  - Coriolis Flowmeters
  - Thermal Mass Flowmeters
  - Multi-parametric Flowmeters
- Primary Elements of Flow Measuring include:
  - Flange
  - Fitting
  - Pitot tubes
  - Venturi tubes
  - Nozzles
  - Plates
  - Orifices
  - Meter Runs
  - ...
- Ultrasonic Flow Meters include Doppler and Transit Time
- Rotameter is a different name for Variable Area Flowmeter
- Mass Flow Controllers (MFC) combine a mass flow meter, electronics and a valve

### Instrumentation Bulk Materials

- In this Family can be found all the elements that usually don’t have a name in a P&I (Cables, Pipes, ...).
- No distinction for armoured or unarmoured cable has been made
- “Electrical and Electronic Components for Systems” include Timers, Relays, ...