elecsoft

visual factory

Version 7.5

The best solution for SPC control in a manufacturing plant and at machine level.

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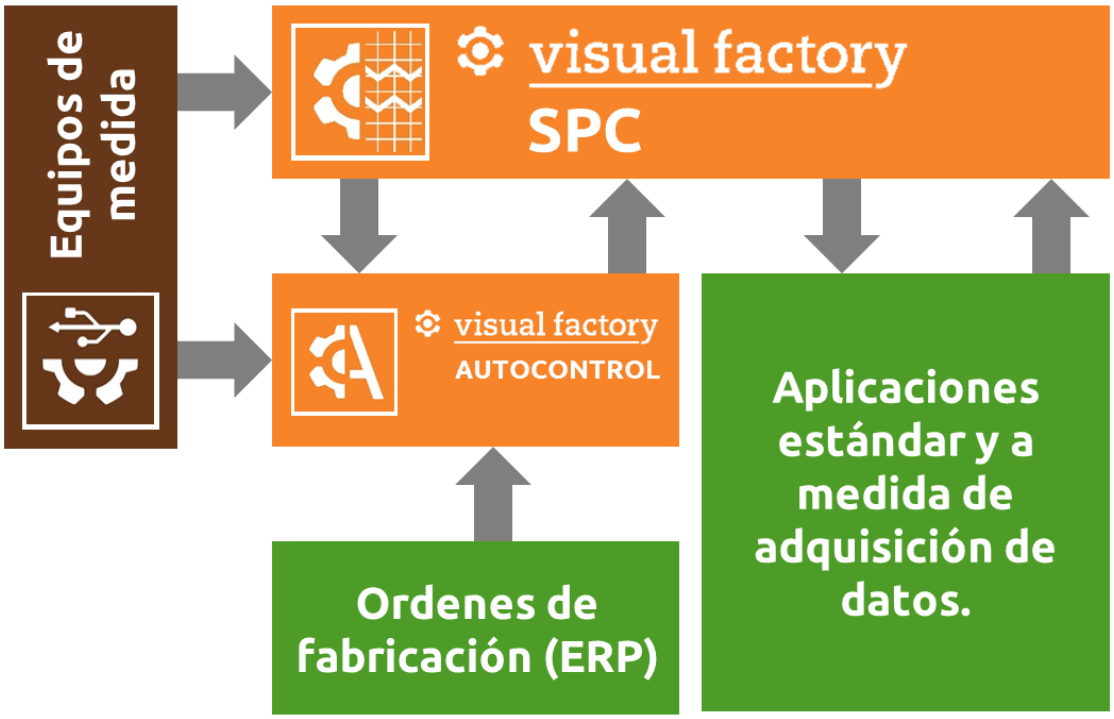
visual factory

Main Features.

- ✓ Visual Factory SPC is a computer application designed to facilitate the recording and analysis in real time of statistical studies of the process and machine capability.
- ✓ The main characteristics of the system are:
- ✓ Complete system for Statistical Process Control (SPC).
- ✓ Process studies by variables and by attributes.
- ✓ Process and machine capability studies.
- ✓ Calculations for Normal and Non-Normal processes (asymmetric distributions).
- ✓ Self-control module for use in production.
- ✓ Direct data input from measuring equipment connected to the computer.
- ✓ Data acquisition from three-dimensional and vision machines.
- ✓ Definition of data entry guidelines.
- ✓ Integration with your company's ERP to obtain information.
- ✓ Analysis of short- and long-term results.
- ✓ Wide variety of views and reports, which can be extended by the user.
- ✓ Real-time search of all the information.
- ✓ Complies with the current IATF 16949:2016 standard.
- ✓ Different options to suit your needs.
- ✓ Easy to configure and use.
- ✓ It is supported by the Technical Support team.

Integration with other systems



One of the main characteristics of the Visual Factory SPC system is its connectivity and integration with other systems present in the industry nowadays. Some of these systems are listed below and will be further explained:

- Visual Factory SPC: It is the central core for our statistical process control solution. It is in charge of the definition of guidelines, data entry and exploitation of results through views and reports that can be defined by the user.

- Visual Factory Autocontrol: Standard application for data acquisition in a workshop environment. The main characteristics of this application are its ease of use and speed when introducing data.

- - Visual Factory AADTV: Standard application for data acquisition from files generated by three-dimensional CMM and vision, or any device generating a text or Excel file that can be interpreted to import data into the Visual Factory SPC database.

- - Measurement equipment: Visual Factory standard applications are designed to acquire data directly from measurement equipment. The ESSerialDll application allows

configuring communication interfaces between the protocols of most device manufacturers and Visual Factory.

- - Link to customer's ERP and/or MES systems to:

  o Obtain information from the POs (Production Orders) to facilitate data entry at the self-monitoring stations.

  o Synchronize control guidelines data. This avoids data entry duplication.

  o Obtain the operating status of the machines to plan data entries.

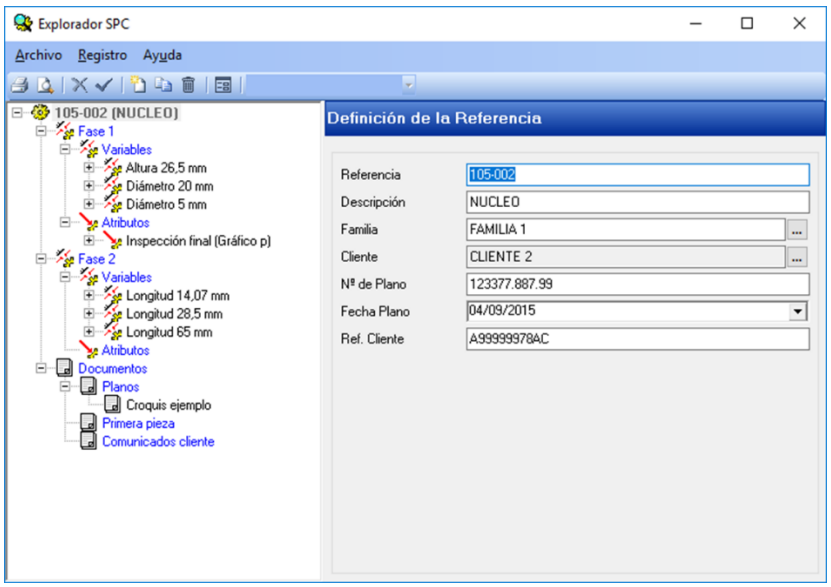
  o Report of information relevant to the measuring position and stored in the ERP and/or MES from Autocontrol.

Note:	These links often require integration projects between the ERP and/or MES manufacturer and our applications.

- - Specific developments in integration and data acquisition. Several examples of these developments will be shown at the end of this document.

Visual Factory SPC

Control guideline



Through Visual Factory SPC's References module, it is possible to define the SPC control pattern for each of the references. By means of this module we will be able to define:

Main reference data

The user will specify the important fields related to the reference: code, description, ...

In addition, the same user can extend the fields that will be used for the general definition of the reference.

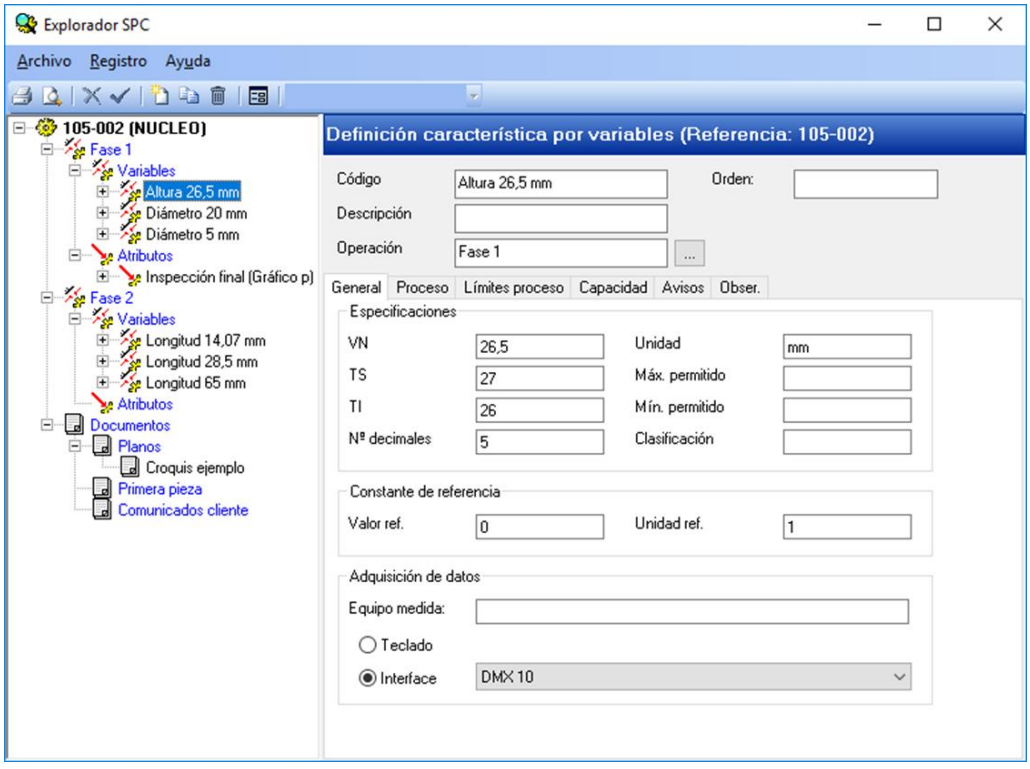
This information usually appears as a header in reports.

SPC Explorer

As seen in the "SPC Explorer" on the left of the screen, the user can divide the SPC control guideline by phases (this is an optional functionality). In each of the phases, the user will indicate the characteristics to be controlled, by variables and by attributes.

There si also a documentation section to incorporate documents associated to the guideline.

Defining characteristics by variables

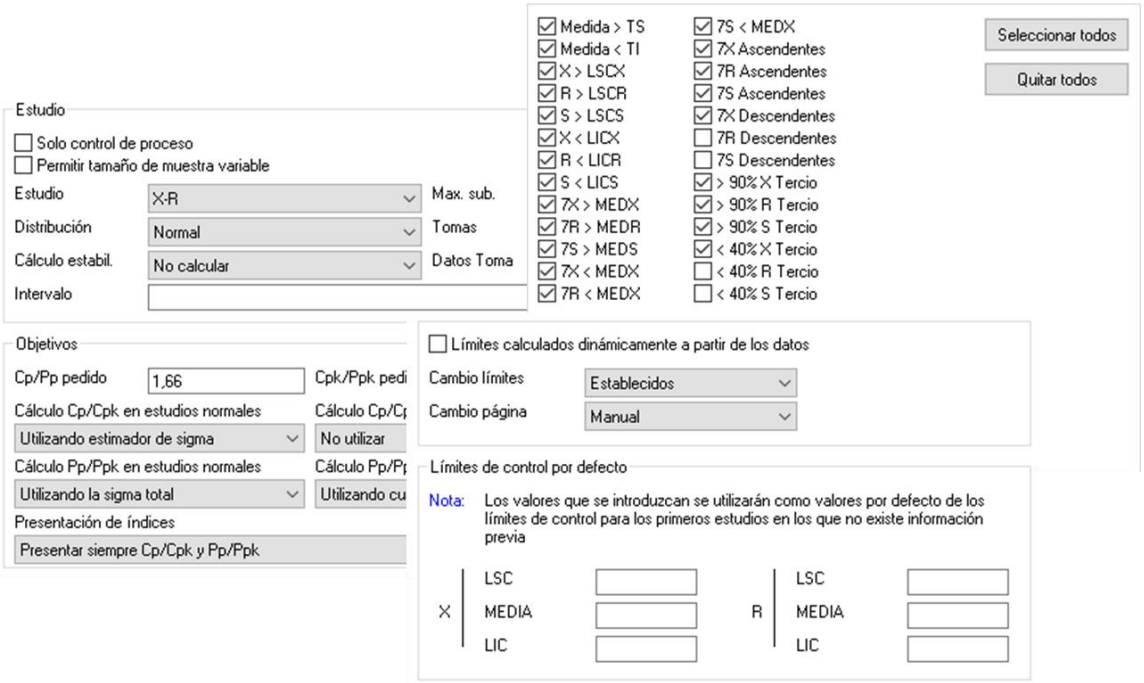


The most relevant aspects of the feature will be indicated.

As you can see on the screen, you can also indicate the measuring equipment with which you will carry out the data entry.

It should be highlighted that you can define characteristics with only one limit.

From this screen you will also indicate the parameters that configure the SPC analysis of the process:



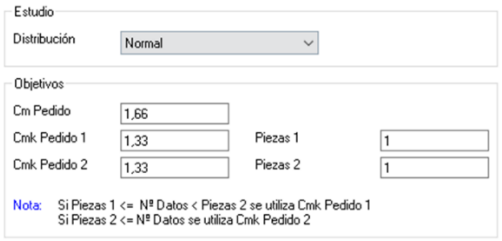
Visual Factory SPC is based on the reference "SPC 2" edited by the AIAG (Automotive Industry Action Group) and the standard IATF 16949:2016.

It should be noted in the definition of studies:

- Possibility of entering a variable number of samples. For example, for a given characteristic we can indicate a sample size of 5, but in a specific sampling we can enter only 3.
- Diversity of statistical graphs: X-R, X-S, Sliding Averages, and individual values.
- Several possible distributions: Normal, 2- and 3-parameter Weibull, 2- and 3-parameter LogNormal, Johnson Transform, Extended Normal. You can choose these distributions or indicate that the application should select the one that best suits the data entered at any given time.

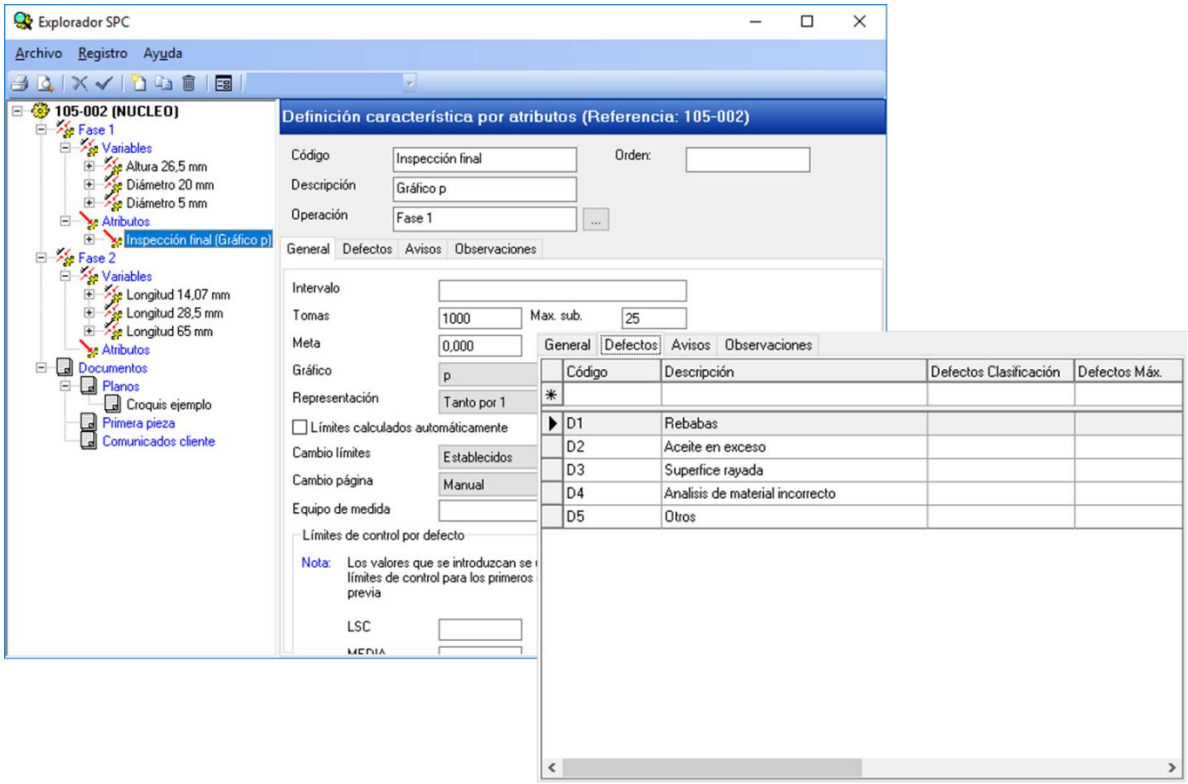
- Possibility of calculating process stability using Anova - F Test and other procedures.
- Automatic calculation of process limits according to various criteria.
- Definition of intervention messages.

From this screen it is also possible to define the parameters for carrying out machine capability studies.



As with the process studies it is possible to select from several possible statistical distributions.

Defining characteristics by attributes



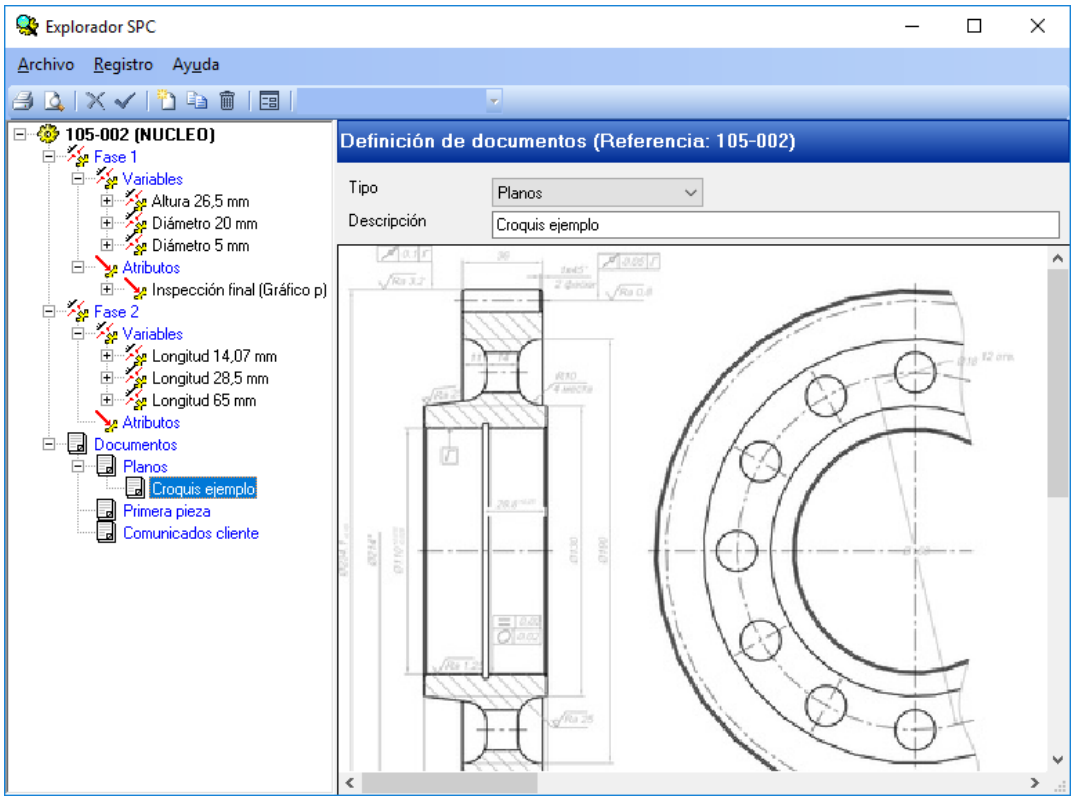
Defining the parameters and defects to be analysed in attribute studies.

As with variables, it is possible to define the parameters that define the statistical study and those that should be highlighted:

- Process graph: p, np, c and u.

- Defects to be checked.
- Automatic calculation of the process limits according to various criteria.
- Definition of intervention warnings.

Guideline Documentation

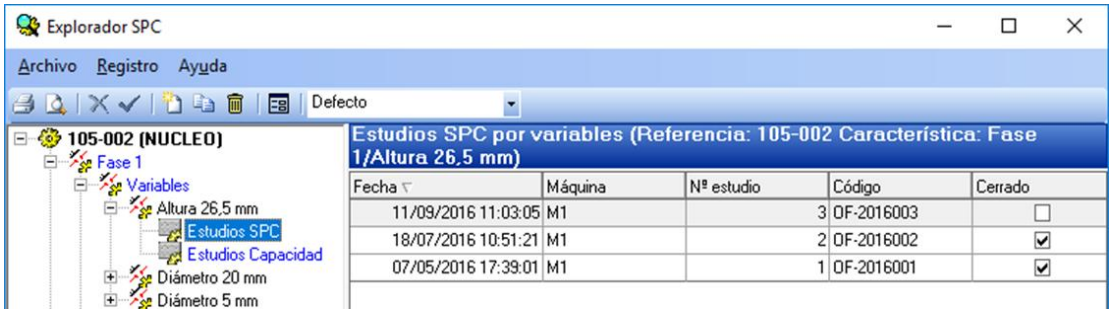


It is possible to attach and/or link images, Word, Excel, PDF documents, ...

Visual Factory allows to define document categories (Blueprints, First piece, ... come by default, but the user is able to customize it) where records with documentation can be added. This documentation will also be visible from the Autocontrol module.

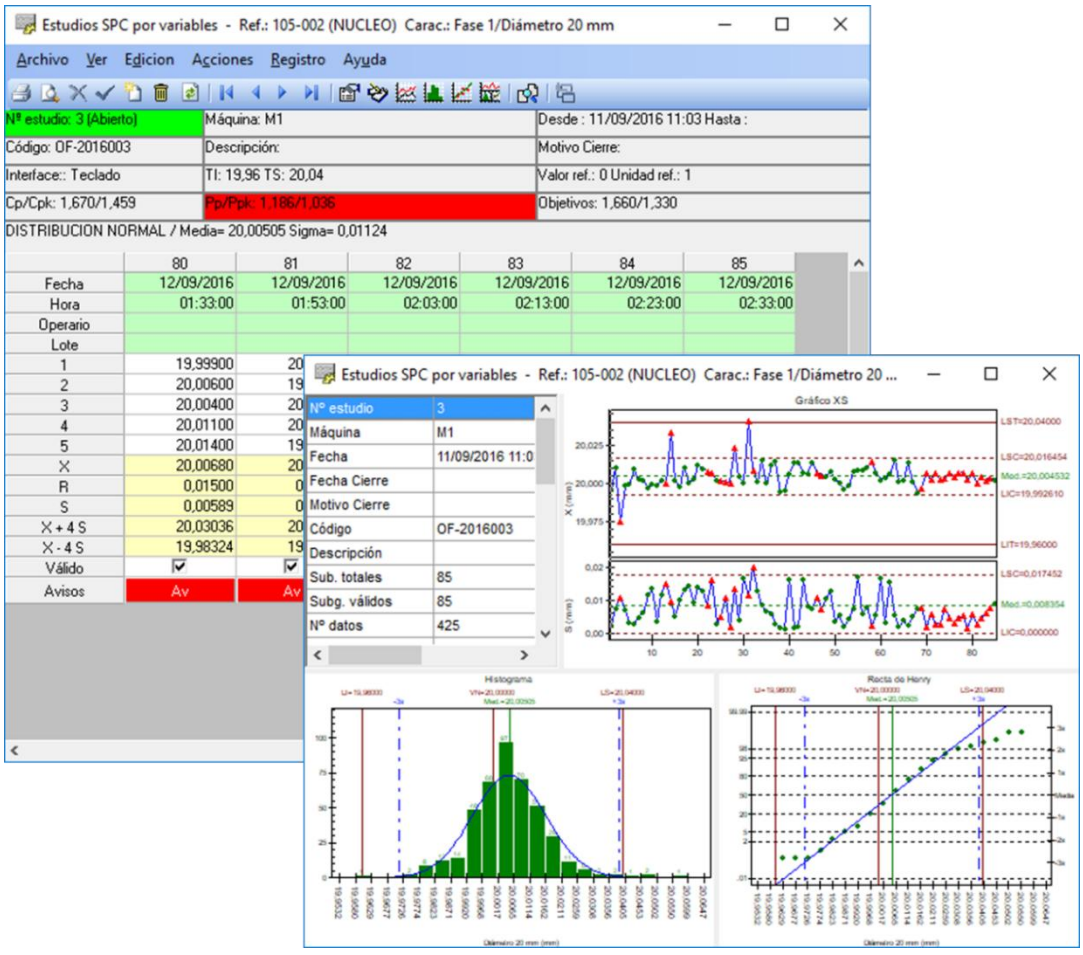
Process studies by variables

For each of the characteristics we can see the history of studies carried out both of process and of capability.



Usually the Production Order is associated with the study code. This makes it easier to follow up later.

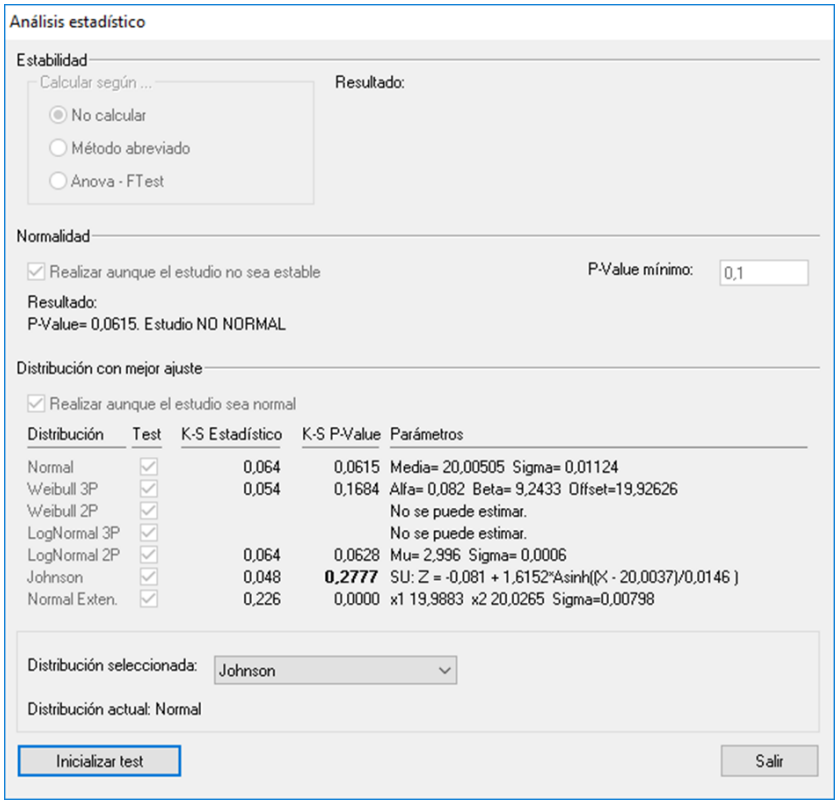
From the application itself it is possible to enter data via keyboard or from measuring equipment.



As we enter data, we can open a second window in which we will see in real time how the graphs are updated.

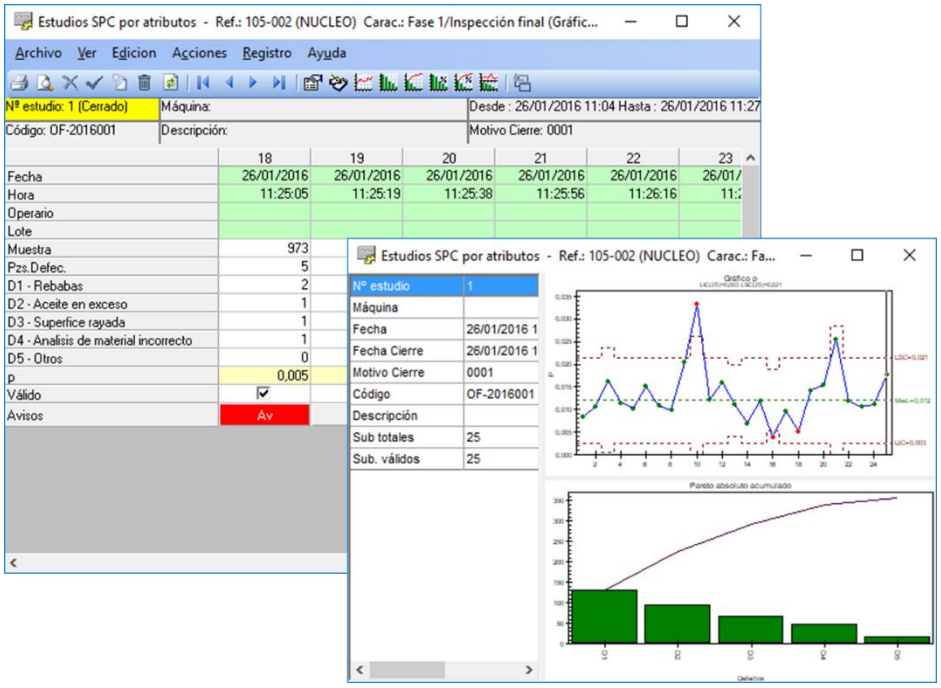
Statistical Analysis

This functionality allows the study of the stability of the process and to establish which of the distributions is more suitable for the data entered.



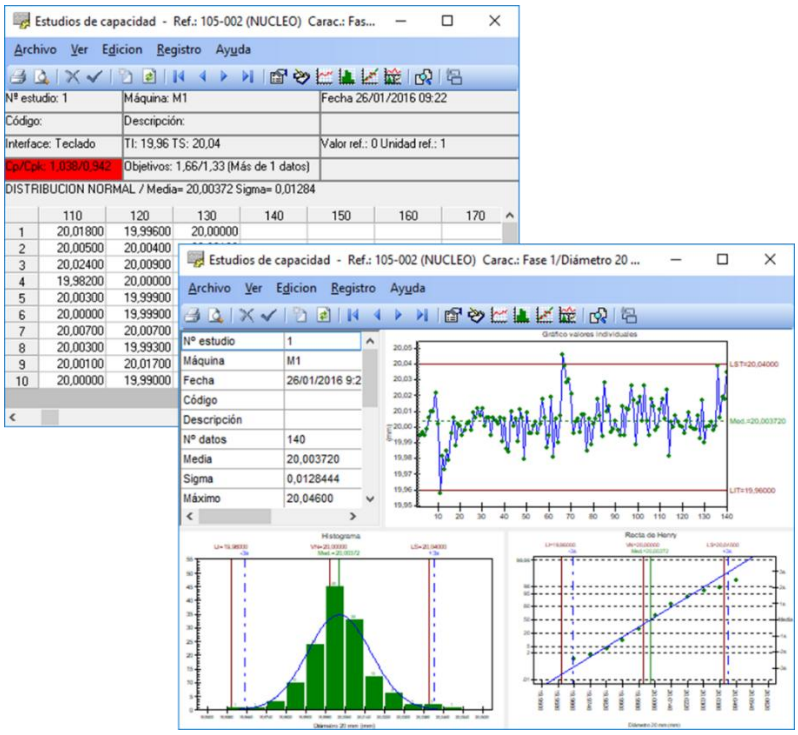
Process studies by attributes

In the same way that the studies are carried out by variables, we can introduce data from studies by attributes and visualize their results in real time.

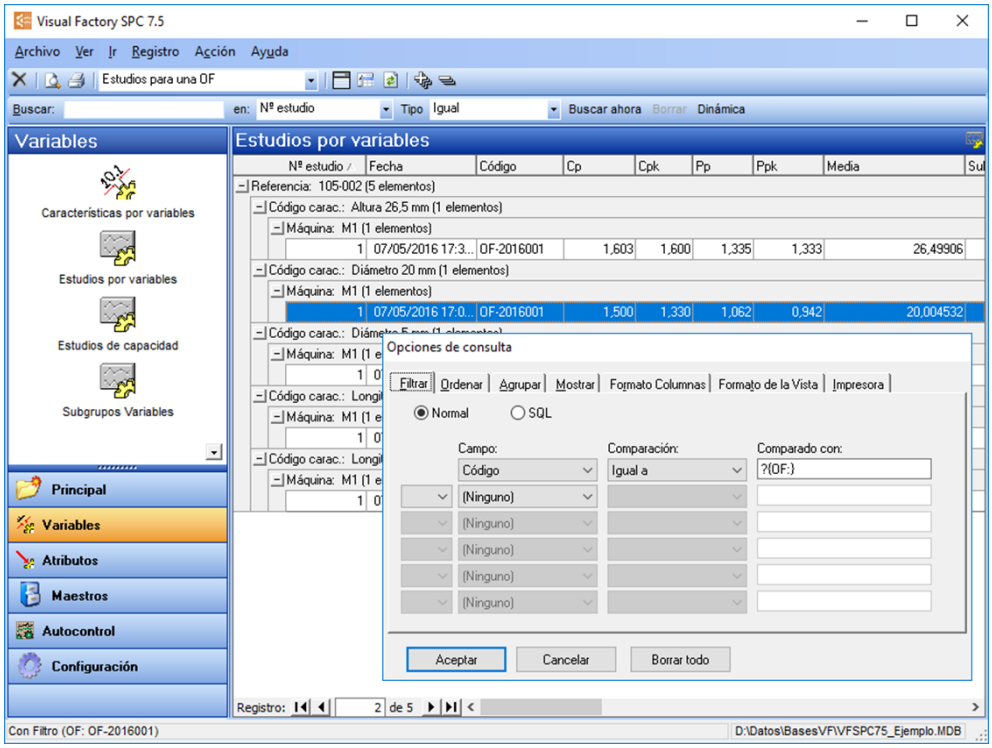


Machine capability studies.

In the same way that process studies are recorded by variables and attributes, we can perform a historical machine capability study.



Using the data - Reports



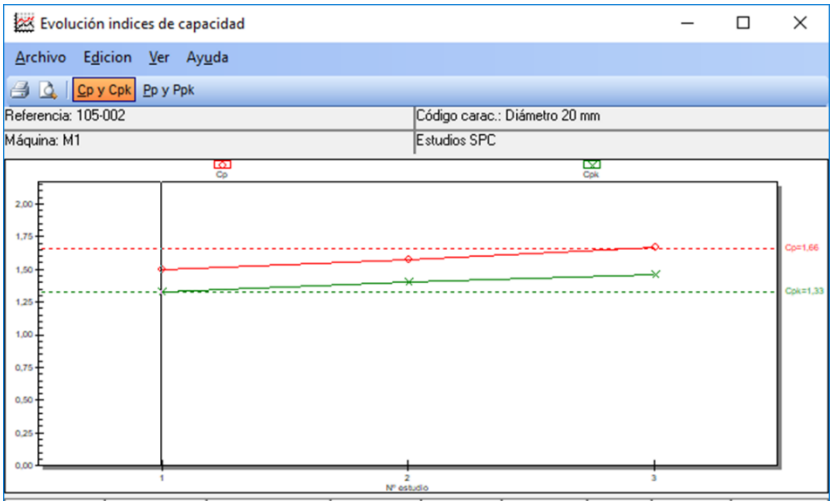
Visual Factory has different modules where we can visualize the information previously introduced according to different criteria.

It is worth mentioning that the user can define views to organize the data according to his/her needs. Applying filters, grouping, ordering, and giving format to the data of each one of the modules. The views can be public for all users or private.

For example, some of the reports that we can obtain:

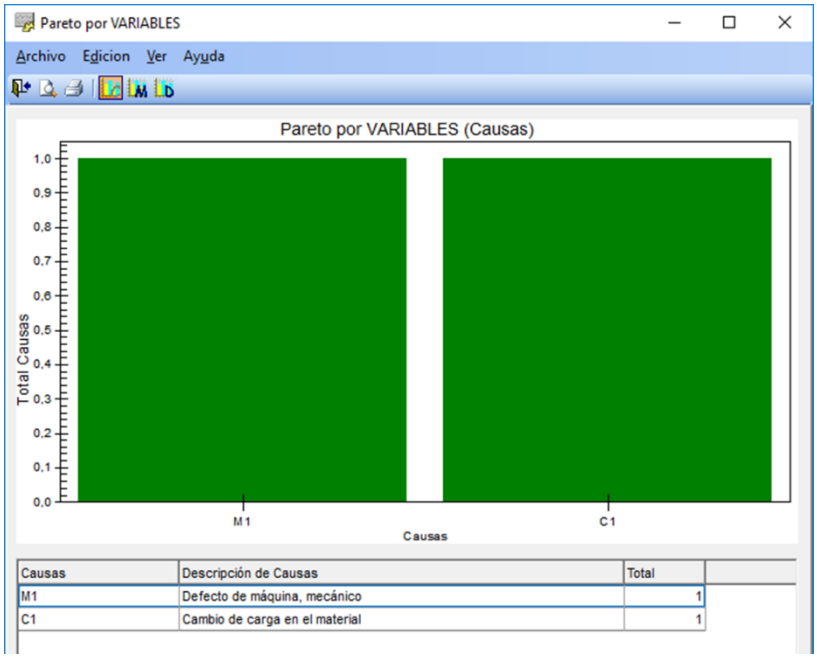
- Listings of the general parameters of the process studies by variables, attributes, and capability.
- Lists of information of data introduced at subgroup level. For example: data entered in the last 15 days, data entered out of tolerance, data entered with warnings and without entered notes.
- Lists between dates, with specific filters for reference, characteristic, for an PO, ...

- Chart of Evolution of Capacity Indexes:



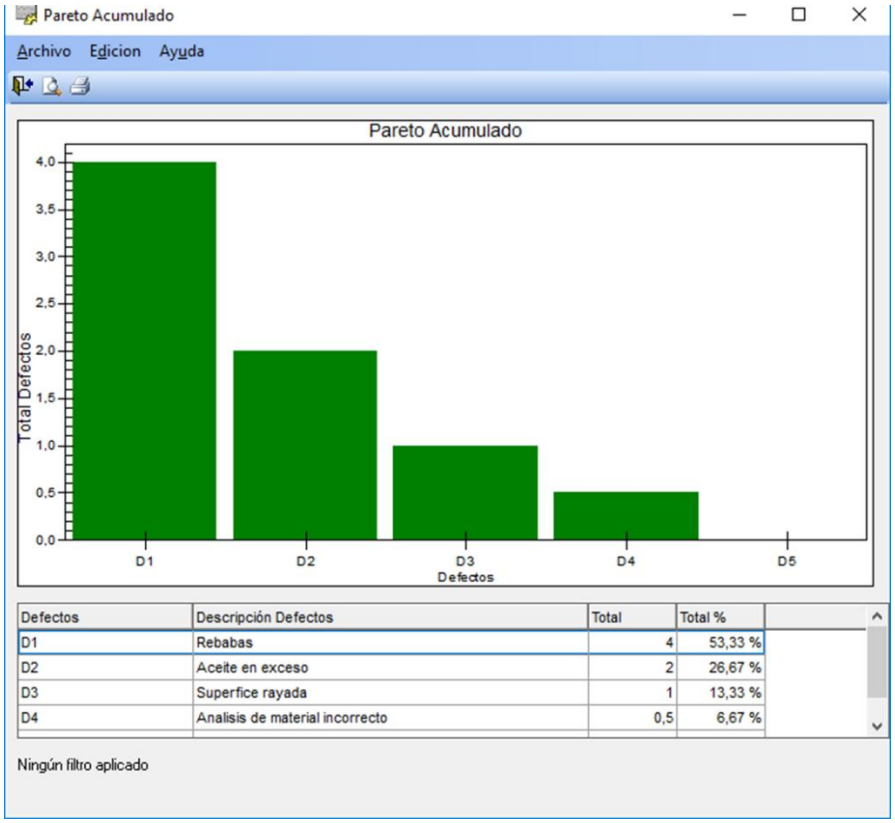
Máquina	Nº estudio	Fecha	Código	Cp	Cpk	Pp	Ppk	Cp/Pp pedido
M1	1	07/05/2016 17:0...	OF-2016001	1,500	1,330	1,062	0,942	1
M1	2	18/07/2016 10:5...	OF-2016002	1,577	1,403	1,077	0,958	1
M1	3	11/09/2016 11:0...	OF-2016003	1,670	1,459	1,186	1,036	1

- Causes, Measures and Decisions Pareto charts entered when notifications occur

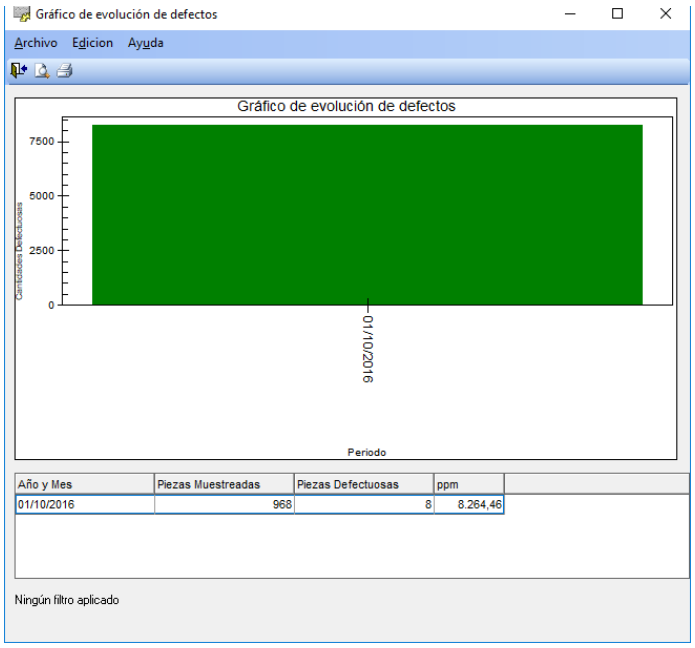


Causas	Descripción de Causas	Total
M1	Defecto de máquina, mecánico	1
C1	Cambio de carga en el material	1

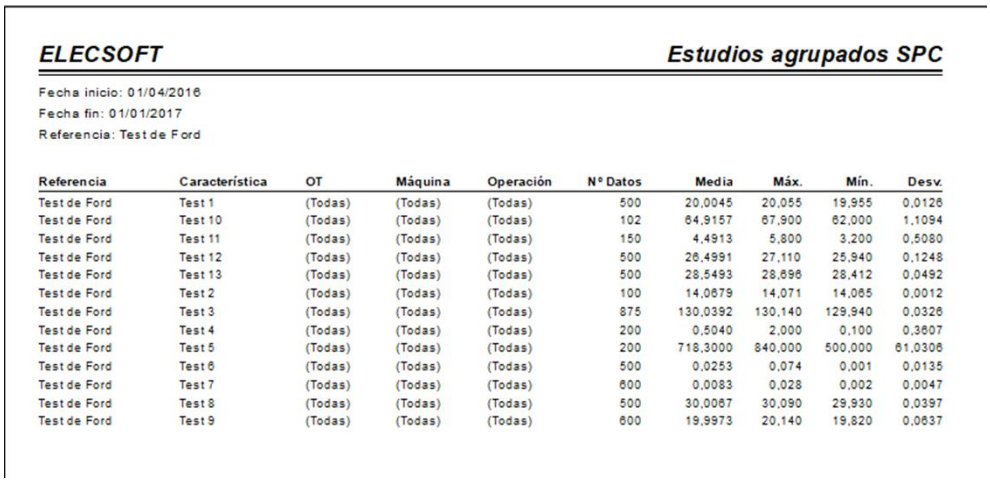
- Cumulative defect Pareto chart (attributes): The user can filter between the two dates, by reference, ...



- Time evolution of defects.



- Studies grouped between dates

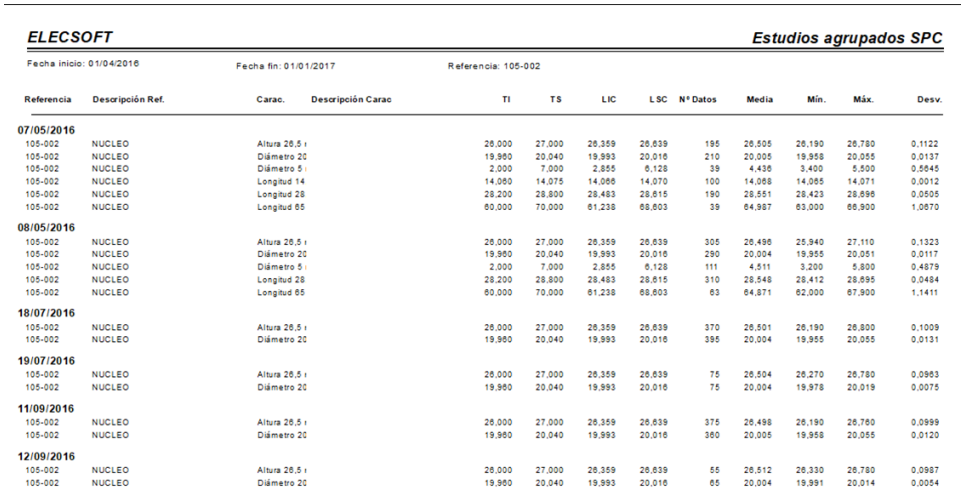


ELECSOFT — **Estudios agrupados SPC**

Fecha inicio: 01/04/2016
Fecha fin: 01/01/2017
Referencia: Test de Ford

Referencia	Característica	OT	Máquina	Operación	Nº Datos	Media	Máx.	Mín.	Desv.
Test de Ford	Test 1	(Todas)	(Todas)	(Todas)	500	20,0045	20,055	19,955	0,0126
Test de Ford	Test 10	(Todas)	(Todas)	(Todas)	102	64,9157	67,900	62,000	1,1094
Test de Ford	Test 11	(Todas)	(Todas)	(Todas)	150	4,4913	5,800	3,200	0,5080
Test de Ford	Test 12	(Todas)	(Todas)	(Todas)	500	26,4991	27,110	25,940	0,1248
Test de Ford	Test 13	(Todas)	(Todas)	(Todas)	500	28,5493	28,696	28,412	0,0492
Test de Ford	Test 2	(Todas)	(Todas)	(Todas)	100	14,0679	14,071	14,065	0,0012
Test de Ford	Test 3	(Todas)	(Todas)	(Todas)	875	130,0392	130,140	129,940	0,0326
Test de Ford	Test 4	(Todas)	(Todas)	(Todas)	200	0,5040	2,000	0,100	0,3607
Test de Ford	Test 5	(Todas)	(Todas)	(Todas)	200	718,3000	840,000	500,000	61,0306
Test de Ford	Test 6	(Todas)	(Todas)	(Todas)	500	0,0253	0,074	0,001	0,0135
Test de Ford	Test 7	(Todas)	(Todas)	(Todas)	600	0,0083	0,028	0,002	0,0047
Test de Ford	Test 8	(Todas)	(Todas)	(Todas)	500	30,0067	30,090	29,930	0,0397
Test de Ford	Test 9	(Todas)	(Todas)	(Todas)	600	19,9973	20,140	19,820	0,0637

- Studies grouped by day

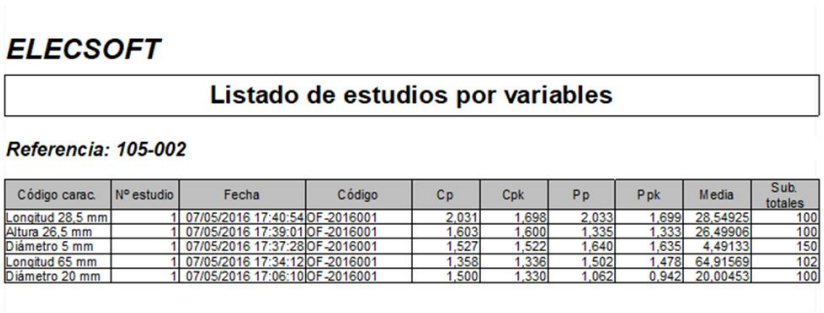


ELECSOFT — **Estudios agrupados SPC**

Fecha inicio: 01/04/2016 Fecha fin: 01/01/2017 Referencia: 105-002

Referencia	Descripción Ref.	Carac.	Descripción Carac	TI	TS	LIC	LSC	Nº Datos	Media	Mín.	Máx.	Desv.
07/05/2016												
105-002	NUCLEO	Altura 26,5		26,000	27,000	26,359	26,639	195	26,505	26,190	26,780	0,1122
105-002	NUCLEO	Diámetro 20		19,960	20,040	19,993	20,016	210	20,005	19,958	20,055	0,0137
105-002	NUCLEO	Diámetro 5		2,000	7,000	2,855	6,128	39	4,436	3,400	5,500	0,5645
105-002	NUCLEO	Longitud 14		14,060	14,075	14,066	14,070	100	14,068	14,065	14,071	0,0012
105-002	NUCLEO	Longitud 28		28,200	28,800	28,483	28,615	190	28,551	28,423	28,696	0,0505
105-002	NUCLEO	Longitud 65		60,000	70,000	61,238	68,603	39	64,987	63,000	66,900	1,0670
08/05/2016												
105-002	NUCLEO	Altura 26,5		26,000	27,000	26,359	26,639	305	26,496	25,940	27,110	0,1323
105-002	NUCLEO	Diámetro 20		19,960	20,040	19,993	20,016	290	20,004	19,955	20,051	0,0117
105-002	NUCLEO	Diámetro 5		2,000	7,000	2,855	6,128	111	4,511	3,200	5,800	0,4879
105-002	NUCLEO	Longitud 28		28,200	28,800	28,483	28,615	310	28,548	28,412	28,695	0,0484
105-002	NUCLEO	Longitud 65		60,000	70,000	61,238	68,603	63	64,871	62,000	67,900	1,1411
18/07/2016												
105-002	NUCLEO	Altura 26,5		26,000	27,000	26,359	26,639	370	26,501	26,190	26,800	0,1009
105-002	NUCLEO	Diámetro 20		19,960	20,040	19,993	20,016	395	20,004	19,955	20,055	0,0131
19/07/2016												
105-002	NUCLEO	Altura 26,5		26,000	27,000	26,359	26,639	75	26,504	26,270	26,780	0,0963
105-002	NUCLEO	Diámetro 20		19,960	20,040	19,993	20,016	75	20,004	19,978	20,019	0,0075
11/09/2016												
105-002	NUCLEO	Altura 26,5		26,000	27,000	26,359	26,639	375	26,498	26,190	26,760	0,0999
105-002	NUCLEO	Diámetro 20		19,960	20,040	19,993	20,016	360	20,005	19,958	20,055	0,0120
12/09/2016												
105-002	NUCLEO	Altura 26,5		26,000	27,000	26,359	26,639	55	26,512	26,330	26,780	0,0987
105-002	NUCLEO	Diámetro 20		19,960	20,040	19,993	20,016	65	20,004	19,991	20,014	0,0054

- Certificates to customer of a PO.



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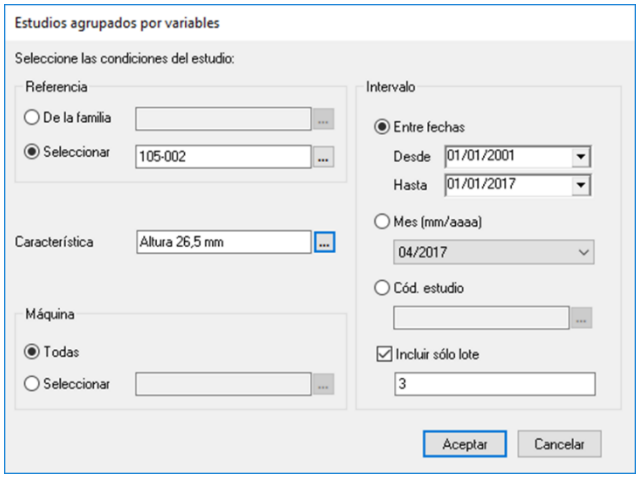
Listado de estudios por variables

Referencia: 105-002

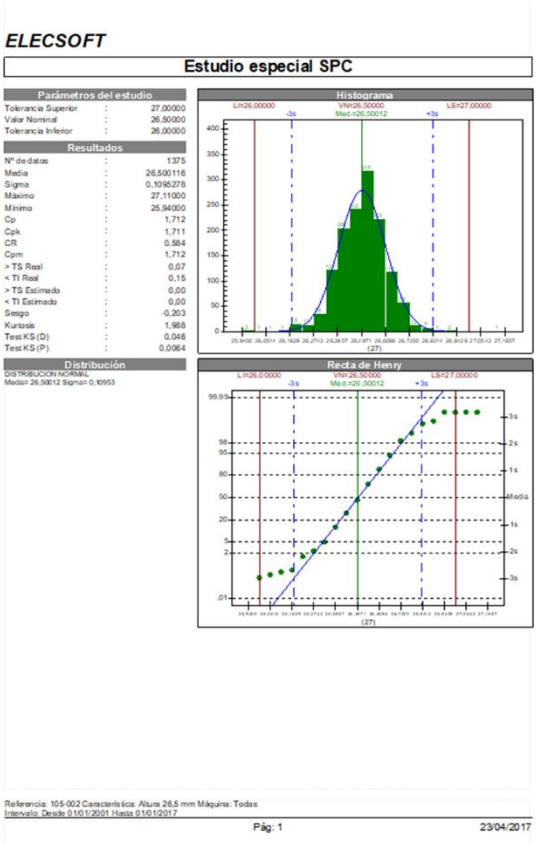
Código carac.	Nº estudio	Fecha	Código	Cp	Cpk	Pp	Ppk	Media	Sub. totales
Longitud 28,5 mm	1	07/05/2016 17:40:54	OF-2016001	2,031	1,698	2,033	1,699	28,54925	100
Altura 26,5 mm	1	07/05/2016 17:39:01	OF-2016001	1,603	1,600	1,335	1,333	26,49906	100
Diámetro 5 mm	1	07/05/2016 17:37:28	OF-2016001	1,527	1,522	1,640	1,635	4,49133	150
Longitud 65 mm	1	07/05/2016 17:34:12	OF-2016001	1,358	1,336	1,502	1,478	64,91569	102
Diámetro 20 mm	1	07/05/2016 17:06:10	OF-2016001	1,500	1,330	1,062	0,942	20,00453	100

Visual Factory provides an integrated report designer that will allow you to adapt the printing formats to the requirements of each company. It also has the possibility of integrating advanced reports made in Crystal Reports and Microsoft Excel.

Grouped Studies



Visual Factory SPC stores the data entered in studies (usually related to PO). Process studies are then performed based on these studies. But it can be interesting to obtain studies under other criteria, for example, between dates, for a month, ...



Other Features

- ✓ User creation. It is possible to use user security integrated into the application itself or to use Windows security and Active Directory.
- ✓ Permissions manager. The application has a powerful permissions manager that will allow the creation of user groups with differentiated access to the different functionalities of the application.
- ✓ Support master for the creation of the control guidelines, studies and recording of incidents.
- ✓ Definition of application literals. It is possible to define the literals that appear on the application screens. Fields can also be added and removed from the device card.

Easy to install and use

- ✓ Standard SPC application easy to install and update: Uses the most up to date InstallShield and Windows Installer technologies
- ✓ Easy to learn and configure: Uses Elecsoft Application Framework technology: user interface based on Microsoft Outlook philosophy, with the possibility of configuring reports and views, as well as performing powerful searches.
- ✓ Compatible with Windows 7, 8, 8.1 and 10 of 32 and 64 bits.
- ✓ Compatible with Office 2000 to 2016 32-bit and Office 2010 to 2016 64-bit
- ✓ Uses MS Access or MS SQL Server 2008 R2 to 2016 databases
- ✓ Supports data migration from other applications
- ✓ User interface available in Spanish and English (check with ELECSOFT for availability of software in other languages).
- ✓ Training courses and advice according to your needs

Standards used

- ✓ ISO 9001:2015. Quality management systems. Requirements.
- ✓ IATF 16949: 2016. Automotive quality management system Standard.
- ✓ SPC 2nd edition elaborated by AIAG (Automotive Industry Action Group)

Visual Factory SPC Editions

Visual Factory SPC SME

Basic edition thought for companies that do not require SPC management directly from the workshop. It has all the calculation and reporting power of the professional edition, but without the Autocontrol options.

Visual Factory SPC Professional

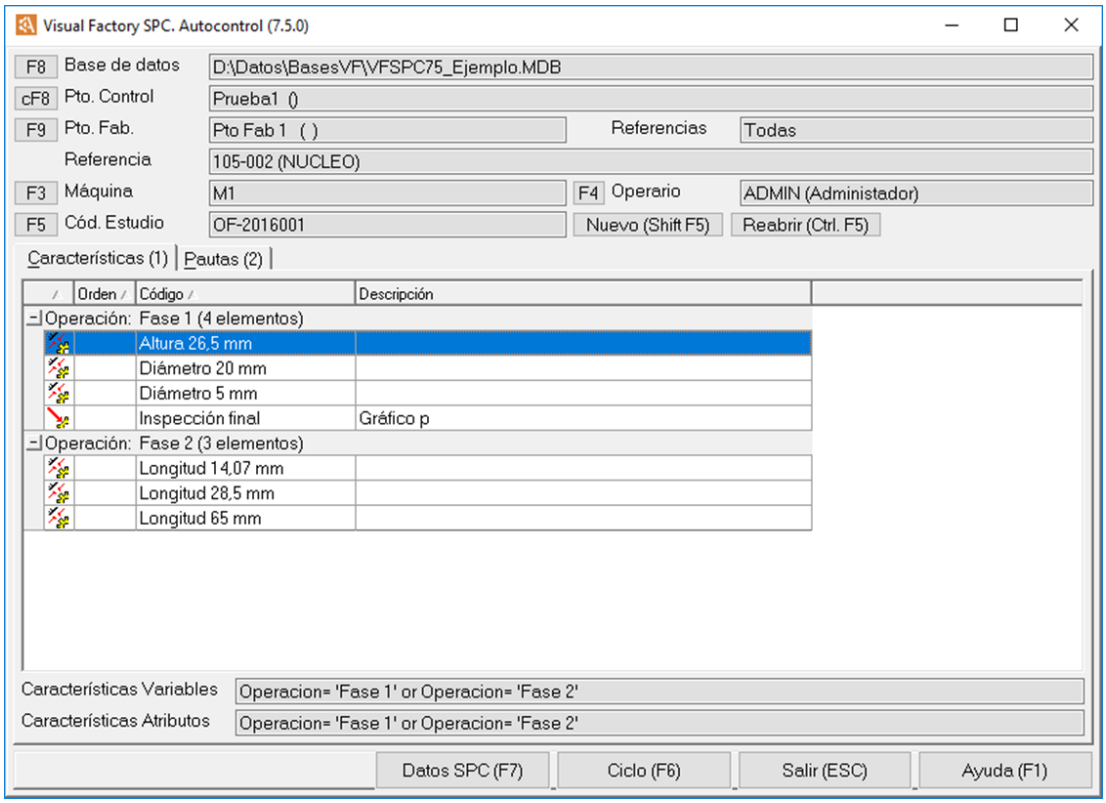
Full edition designed so that data entry and process monitoring is carried out by the operator himself at self-monitoring stations located on the manufacturing lines.

Differences between options

Functionality	SME	Prof.
Definition of references and characteristics	√	√
Studies of process and machine capability.	√	√
Control graphs, histogram and Henry Straight Line	√	√
Normal and Not normal distributions	√	√
Statistical Analysis		√
Reports and labels designer	√	√
Linked and/or attached files	√	√
Displaying of images in the reference setting	√	√
Customization of public and private views to filter, group, sort and format listed records	√	√
Display of public and private views	√	√
Customization of fields and literals	√	√
E-mailing of reports and export to PDF	√	√
Access data base	√	√
Special reports configuration with Crystal Reports and MS Excel		√
Import between databases		√
Export to MS Excel from the views		√
Simultaneous access from several stations		√
MS SQL Server data base		√
Direct reading from measuring devices		√
Evolution chart of the capability indexes		√
Causes, Corrective Measures and Decisions Pareto charts		√
Studies grouped by variables		√
Accumulated pareto of defects over time		√
Time evolution of defects chart		√
Including an **Auto Control** License		√

Visual Factory Autocontrol

Visual Factory Autocontrol is mainly intended to be installed in a workshop environment so that the operator him/herself can easily and intuitively enter the process data.



The most important features of this application are:

- Data entry by keyboard and/or simple and intuitive measuring equipment.
- The application performs a data entry cycle with all the characteristics defined in the control guideline.
- There are two possibilities to select the study:

  1. Introduction of Reference, Machine and PO (study code)

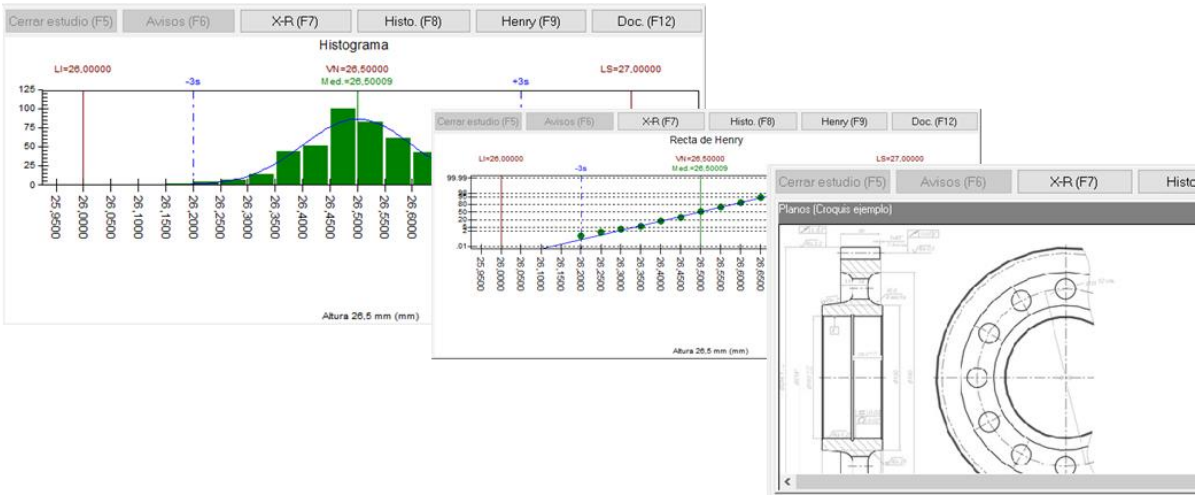
  2. By directly selecting the PO. For this option it is mandatory to interface with the ERP or MES system to obtain the Reference and Machine data through the PO.

- Configuration of control stations (usually associated to computers)

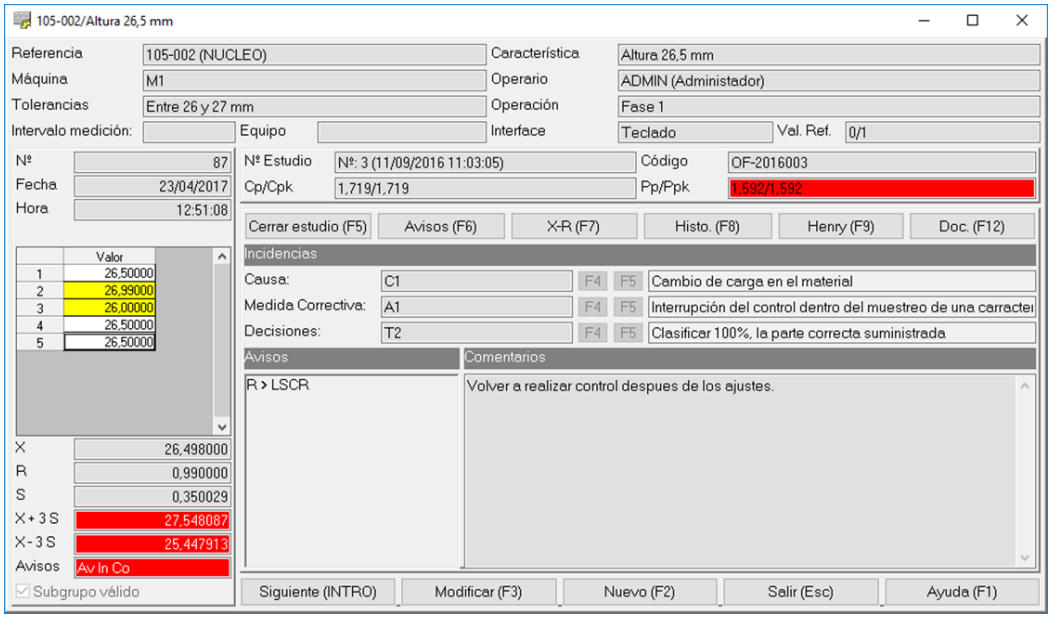
- Configuration of production stations. For each station, you can filter the references and characteristics that can be displayed.

When entering data, it shows:

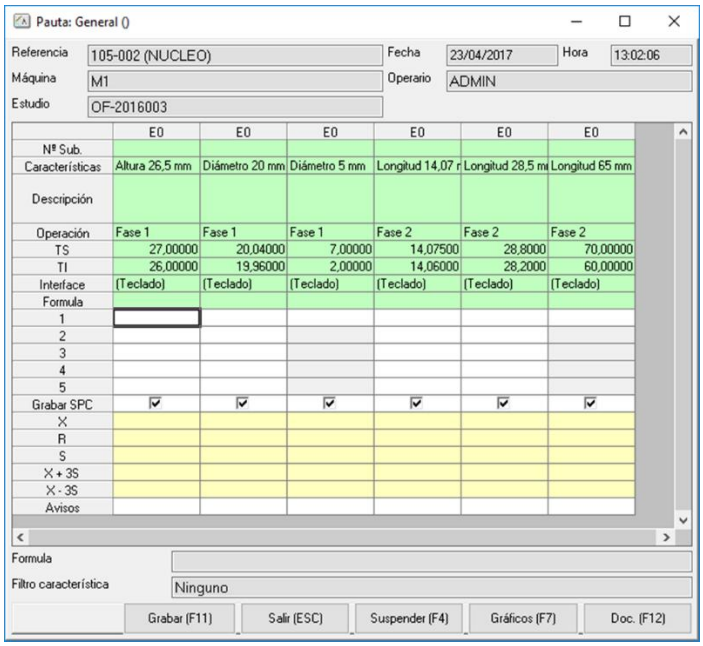
The user can switch between the X-R, Histogram, Henry's Straight Line and Documentation screens:



An important aspect is the possibility of entering Causes, Measures, Decisions, and comments when control notifications occur:



Alternative data entry for variable processes



With this screen we can move from top to bottom and from left to right to enter the data of the different characteristics.

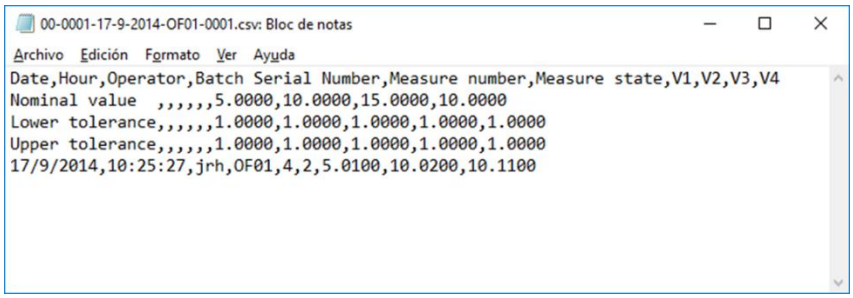
With this option it is also possible to define calculation formulas using one or more entries.

This form of display is also very useful when entering data from multi-dimensional measuring devices.

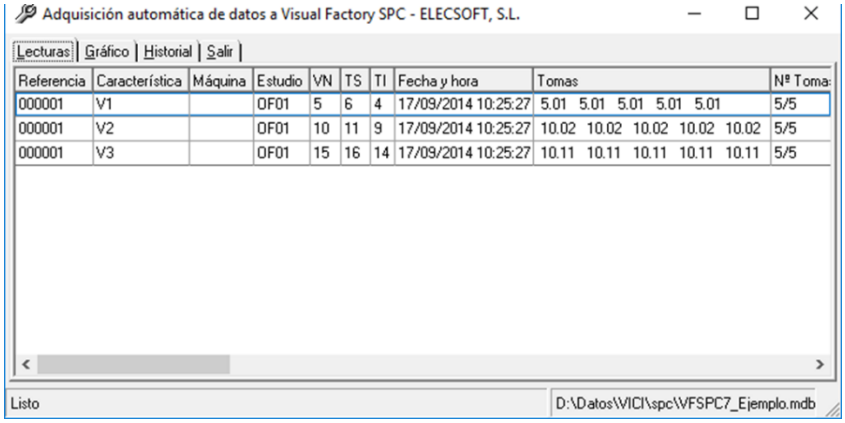
Visual Factory AADTV

Visual Factory AADTV (Adquisición Automática de Datos de Tridimensionales y Visión/ *Automatic Three-dimensional CMM and Vision Data Acquisition*) is a standard application for data acquisition from text or Excel files. These files are usually generated when 3D or Vision machines measure a given part.

Example of one of these files:



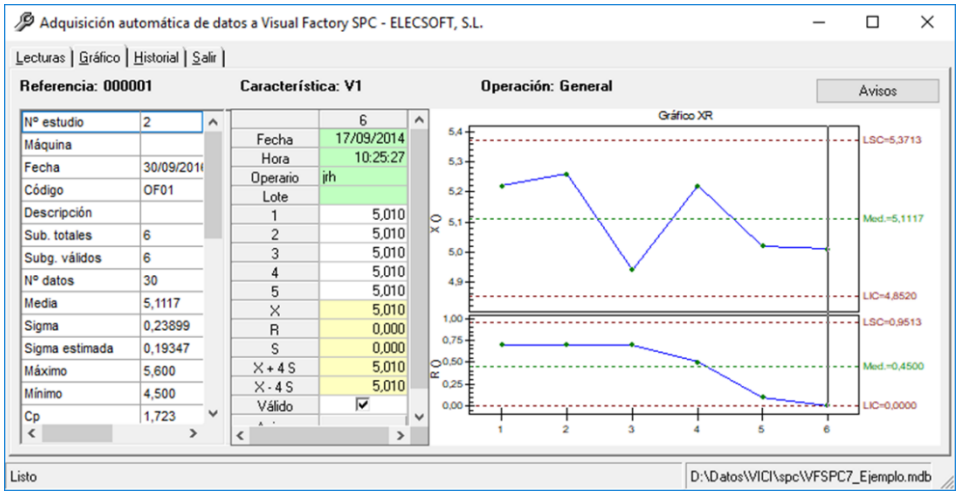
The application stands by while the file is generated from the 3D or vision machine. When it arrives, it interprets it and then uploads it.



When the data indicated in the CPS Control Guideline is collected, it saves the subgroup in the database.

Note: By default, the application requires that references and characteristics be previously defined in SPC, but it can be configured to define them automatically with the information received.

From this same application we can visualize the control chart and the most important process data:



There are different configurations depending on the file to be imported. Currently the application is prepared to read files from VICI, MCV, Tesa and Hommel vision machines. It also supports files from 3D machines with Cosmos, Metrolog, ...

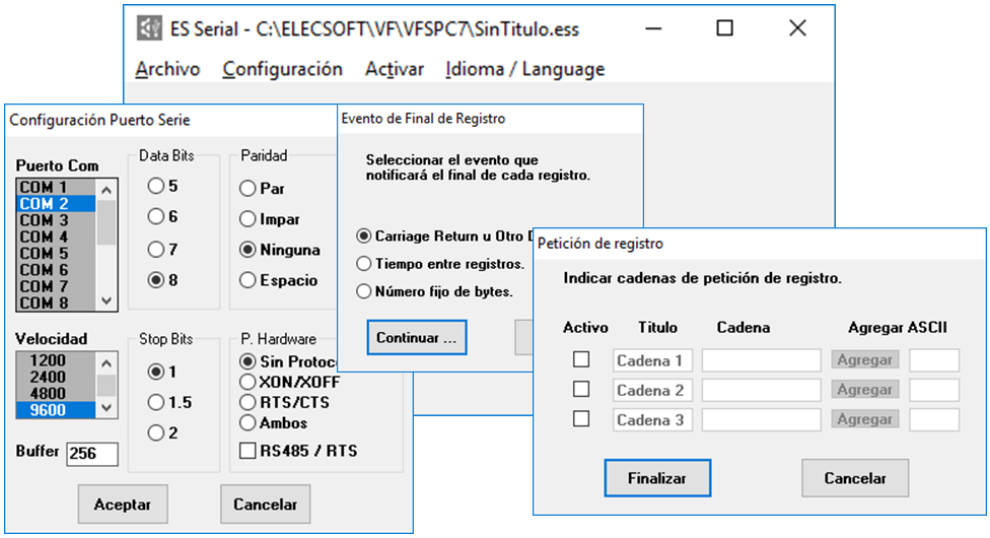
In any case, within the implementation project of the data acquisition application, the adaptation and parameterization to the specific format provided by the client is contemplated.

Measurement Devices

Visual Factory SPC y Visual Factory Autocontrol allow the data entry from different measuring equipment:

- Mitutoyo equipment with digimatic output connected to multiplexers with RS-232 or USB output with VCP (Virtual Comm Port). Also, Mitutoyo equipment with direct connection via USB cable.
- Silvac equipment with cable or Bluetooth connection (via VCP).
- Tesa equipment with wired connection to an RS-232 port or to USB with VCP.
- Sartorius and Metler scales with RS-232 connection.
- Mecmesin outside meters
- In general, any measurement equipment that has an RS-232 or USB output with VCP.

Visual Factory SPC is delivered with the ESSerialDll7 application that allows to configure interface files to connect to different measurement devices.



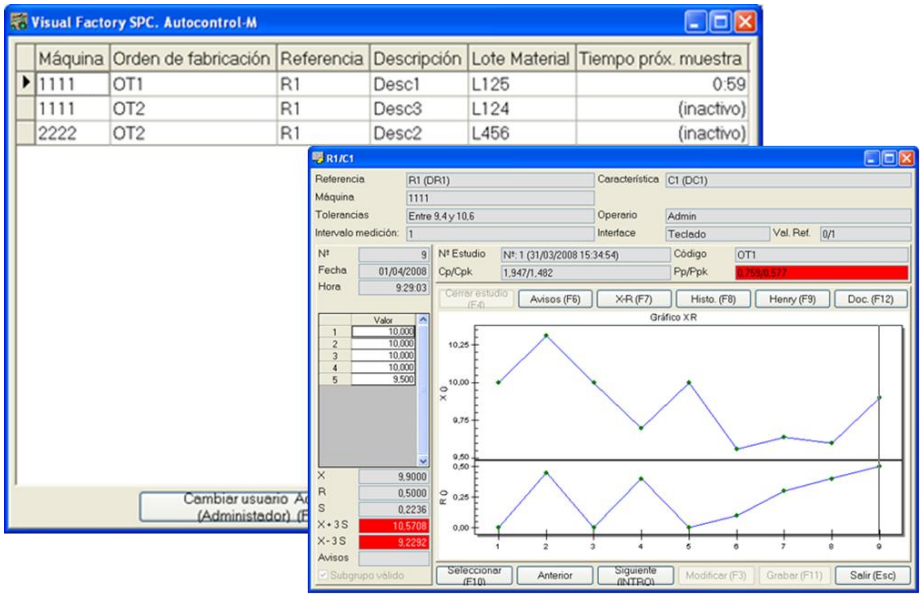
In case it was not possible to design an interface through this tool, ELECSOFT could design a specific interface for that particular equipment.

At a general level, it also manages the use of pedals for data entry from different devices.

Specific software developments

This section shows some of the developments made to meet specific customer demands.

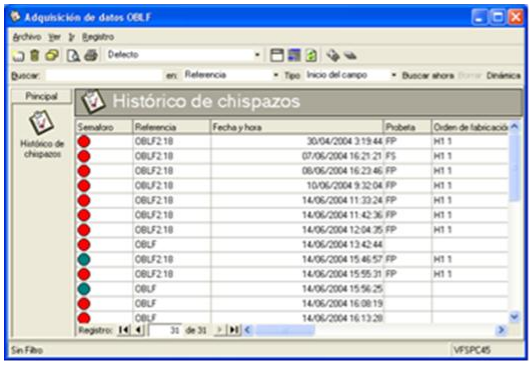
Visual Factory Autocontrol – M

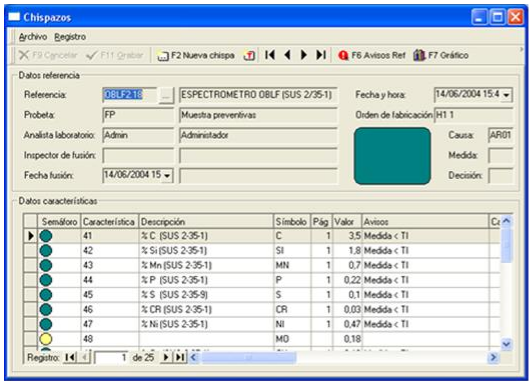


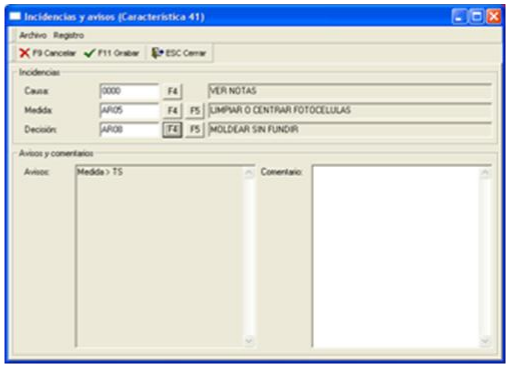
Application similar to the Autocontrol described above, but with the following particularities:

- It directly presents the pending POs at the main screen; the user can only select between one of these POs. For each workstation, it is possible to configure the machines associated with that workstation, so it only shows the POs of those machines.
- The application obtains this information from the MES system.
- Control of the time between captures. To do this, it connects to the MES system to know which machines are active. The time considered is that of the active machine.
- Both the query and the data entry are made by entering the cycle of the defined characteristics.

Visual Factory ADOBLF

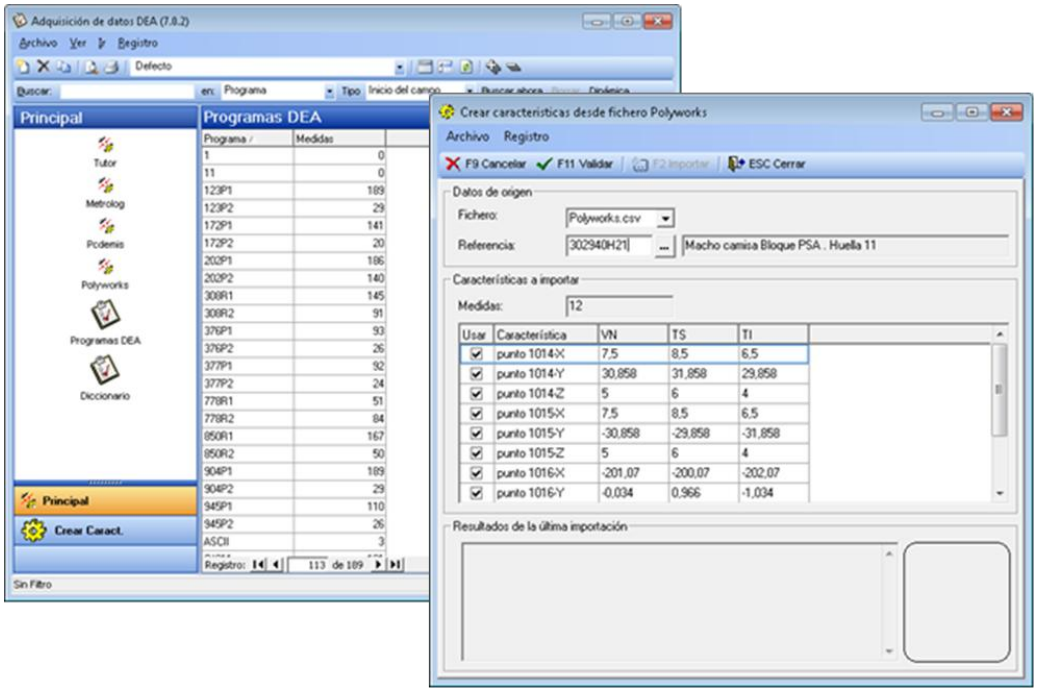






Software designed for data acquisition from spectrometers. It allows to keep a record of each of the chemical elements that constitute the sample. It is possible to configure which of these elements will also be saved in SPC.

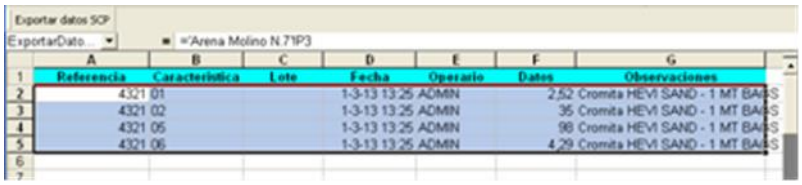
Visual Factory ADDEA



This application allows the import of files from a 3D CMM.

It accepts Tutor, Metrolog, PC Demis and Polyworks formats.

Excel add-in to export data to Visual Factory SPC



This add-in is installed in MS Excel and allows exports to Visual Factory SPC.

This add-in is very useful when the client uses a number of predefined formats in Excel for data entry.

Visual Factory Table Import

This application allows imports from a table shared with the client. The structure of this table is static, and the client must adapt to this structure.

The main aim of this application is to import data generated by the client through other means and place it in the import table. Usually this is data from other systems which is generated automatically or manually.

Each time the application is run, the pending data will be imported. To automate the acquisition, a scheduled Windows task is usually configured to run the application.

Importing the Control Plan from Excel

Different custom applications have been developed to import the data from control guidelines defined in Excel. This way, the definition of Visual Factory SPC references can be completed quickly and easily.