

## Calibration Certificate

**N.: 1/2014**

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COMPANY: PRESYS INSTRUMENTS

INSTRUMENT: Temperature Transmitter

FUNCT.: Boiler steam output temperature

AREA: sector-1

CRITICALITY: A

REG. NUMBER: 0720996

TAG: TT-14001

CALIBRATION PERIOD: 12 Months

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TECHNICAL INFORMATION

INSTRUMENT	DOCUMENTS
MODEL: TY-2090	O.S.: SAP310114-002
MANUFACT.: Presys	PROC.: P11/01

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CALIBRATION AND ADJUSTMENT

**STRATEGY: 1**  
 RANGE INPUT: RTD-Pt-100 0.00 to 100.00 (°C)      RANGE OUTPUT: Current 4.0000 to 20.0000 mA

INITIAL CALIBRATION

Calibration (°C)	Reference (mA)	Corr. Cal. (°C)	Corr Ref. (mA)	Reading 1 (mA)	Average (mA)	Error (mA)	U (mA)	k	Accept. Crit. (mA)
0.00	4.0000	0.00	4.0000	4.0218	4.0218	0.0218	0.0008	2.000	0.1600
25.00	8.0000	25.00	8.0000	8.0232	8.0232	0.0232	0.0008	2.000	0.1600
50.00	12.0000	50.00	12.0000	11.8190	11.8190	-0.1810	0.0010	2.000	0.1600
75.00	16.0000	75.00	16.0000	15.9559	15.9559	-0.0441	0.0011	2.000	0.1600

Tags
Main Reports

Registered Tags

TT-14001

Area: \Area-2

Tag

Tag Name: TT-14001    Cal./Verif.: Calibration    Criticality: A

Instrument: 0720996

Function / Interval   Instrument   Calibration   Strategy   Operation Conditions

Strategy: 1   Instrument Scale: Temperature

Calibration Generation: Presys Calib.

Scale: RTD-Pt-100-°C

Options Presys Calibrators: Sensor P1

Operator: Jack Newton  
31/01/2014 09:48:24

Revisor: Peter Taylor  
31/01/2014 09:49:14

Responsible: John Doe  
31/01/2014 09:49:57

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## ISOPLAN-5 Calibration Software

### Technical Manual

EM0221-12

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## 1. Introduction

ISOPLAN is a software developed to automate the instrument calibration process in conjunction with Presys calibrators. It manages all information supplied by the calibrator being used, analyzes data and generates error graphs and calibration reports. It is ideal for a company that already has or will have a quality program with ISO 9000 standard.

ISOPLAN-5 allows work orders to be specified containing calibration strategies for several instruments (tags). Through its instructions, Presys calibrator defines the correct sequence for calibration of all points and, when necessary, it organizes the data input to be provided by the operator. In the field, Presys calibrators have sufficient autonomy to inform the operator of the measurements (calibrations) that have been made and the deviations found during the calibration process.

## 2. Minimum System and Hardware Requirements

- Windows 7, 8, 8.1 or 10 ( 32 bits or 64 bits)
- Computer with 1GHz processor or higher.
- 2GB of RAM memory.
- Monitor with the resolution set at 1024 x 768 or higher.
- 100 MB of free hard disk space for installation of Isoplan.
- Mouse
- Serial port or USB for communication with calibrators.
- Ethernet or Wifi network for communication with Presys advanced calibrators.

## 3. Installation

ISOPLAN uses the Microsoft .NET platform for application development, which must be installed before ISOPLAN. Installation of the .NET platform is incorporated in the setup program and the steps explained below should be followed only if required. The installation program is in English and details about the use of each screen are explained in this manual.

Run the setup.exe program in the program installation CD. This installation must be executed by an administrator level. Normally, before installing Isoplan, additional components required by the Isoplan development tool are installed.

After the initial programs are installed, installation of ISOPLAN will begin. Click on the Next button when the following screen appears.

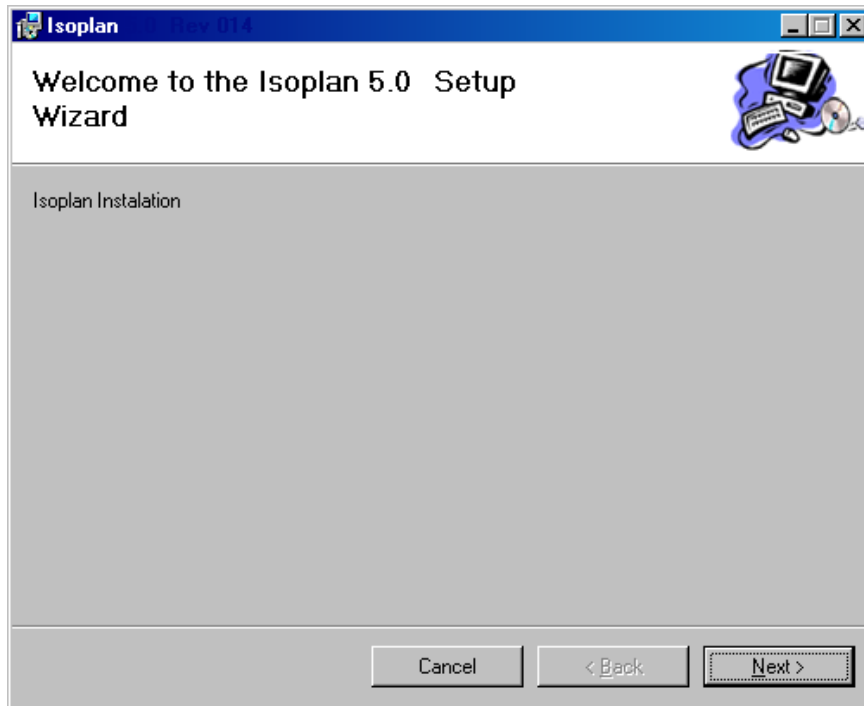


Figure 1 - Screen of ISOPLAN Installation Wizard

On the next screen, the directory for the installation of ISOPLAN is defined. The default directory is "C:\isocs5", but it may be changed. There is also an option with the text "Install ISOPLAN for yourself, or for anyone who uses this computer" to indicate that you wish to install ISOPLAN only in your account (Just Me option) or for any user of the machine (Everyone option). After these options have been configured, simply click on the "Next" button twice to confirm the installation of the program and wait for the installation to complete.

After ISOPLAN is installed, the following screen will appear. Click on the "Close" button to complete the installation

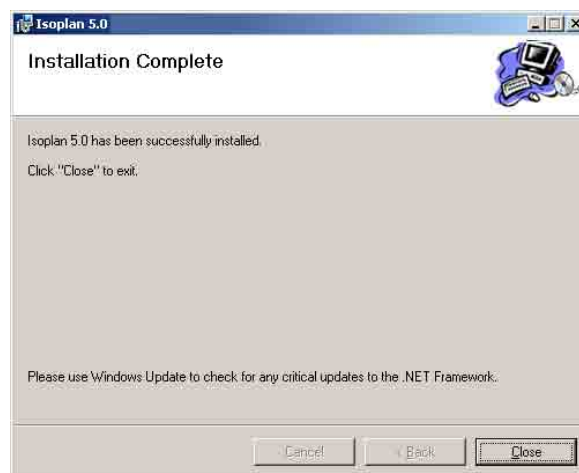


Figure 2 - Screen indicating that installation was successfully completed

After the end of the installation, a new icon will appear to start ISOPLAN. This icon can normally be found by clicking on the main Windows screen on "Start > Programs > Presys Instruments > ISOPLAN".

Isoplan installs only the Access database. In case it is necessary to install the SQL Server or Oracle database, check topic **11 ISOPLAN Maintenance**.

### **3.1. Migration from previous versions Isoplan or other database**

Migration from previous versions of ISOPLAN or migration of Access database to another database (eg. SQL Server) should be realized by sending the ISOPLAN database to Presys. The version of ISOPLAN with Access database does not allow use with different database, as SQL Server.

### **3.2. Removing ISOPLAN**

In case it is necessary to remove ISOPLAN from the machine in which it was installed, simply follow the standard procedure for removing programs in Windows. Go to the control panel, in which there must be an option to add or remove programs and an icon to remove ISOPLAN. You can also remove the Microsoft .NET platform by searching for the option "Microsoft .NET Framework". This Microsoft platform may be used by other applications and is not exclusive of ISOPLAN. Its uninstallation may prevent other programs that use this resource from functioning.

### 3.3. Starting ISOPLAN

In the first time that ISOPLAN is used, the serial number provided with the program installation CD is required.

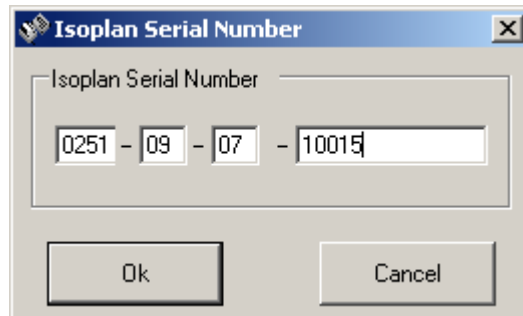


Figure 3 – Serial number of ISOPLAN

Next the login screen is shown.

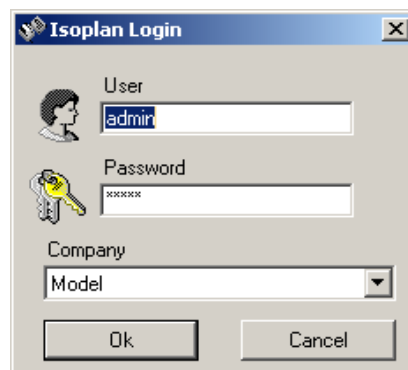


Figure 4 – Login screen ISOPLAN

The standard password for accessing the program is:

**User: admin**  
**Password: admin**

Isoplan allows the registration of multiple companies, but at first an example is used with the name "**Model**".

### 3.3.1. Calibration Overdue Alarm

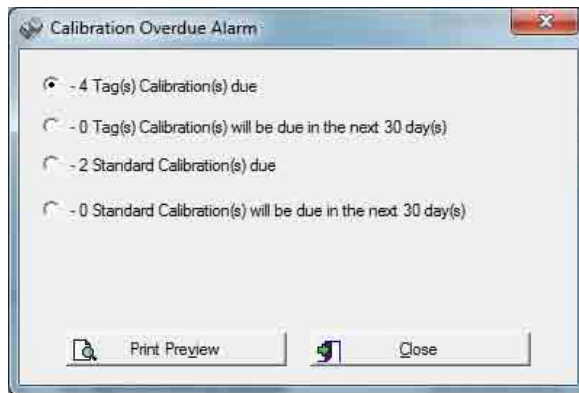


Figure 5 – Calibration Overdue Alarm

The Isoplan presents, upon entering the program, a calibration alarm for tags, loops and standard that will be due in a period, for example, in the next 15 days. The number of days can be changed in the settings screen. Leaving the setting at 0 days the alarm screen is disabled. Click the **Print Preview** button to issue a report of tags or standard due or will be due. It is possible to use the standard options on the screen. Click the **Close** button to access the main program screen.



Figure 6 – ISOPLAN

## 4. Optional Modules for Isoplan

The Isoplan presents modules or optional features that can be requested at the time of purchase of the software or purchased after.

Optional modules are described below:

### 4.1. SQL Server Database (5S)

The default version of Isoplan uses Access database that meets satisfactorily applications with a small number of concurrent users (1 to 3).

SQL Server is a database more robust supporting a larger number of users and less prone to failure being provided by Microsoft, but it requires more knowledge for its installation and maintenance. This type of database is suitable for companies that already use the database in SQL Server systems other than Isoplan. See topic 11.2 Using an SQL Server Database .

### 4.2. Oracle Database (5O)

Oracle is a database similar to SQL Server, previously mentioned, supplied by another manufacturer, Oracle. See topic 11.3 Using an Oracle Database .

### 4.3. DataSheet (DSh)

This module allows registering a datasheet of the characteristics of each instrument registered in Isoplan. This data sheet can be printed by the user Isoplan. This module also allows register operating conditions of each tag and generate a single document with details of the instrument and the tag where the instrument is installed. See topics 5.13.2 Instrument Datasheet and 5.14.6 Operational Conditions.

### 4.4. Data Collector (CDE)

This module enables to export work orders from Isoplan to Excel spreadsheet. This spreadsheet can be completed and sent to other computers or mobile devices (Pockets, Palm's, etc.). These devices can edit the spreadsheet with Excel, for example, and need not have the Isoplan installed. The data in this spreadsheet can be filled by imported to Isoplan. See topic 6.2.6 Download to Excel Worksheets.

#### **4.5. Pressure Safety Valves (PSV)**

The Isoplan allows the generation of a calibration certificate for specific safety valves and Presys also optionally provides a calibrator, DMY 2017 PSV, which presents some features specific to the data collection point of opening and closing of safety valves.

See topics 5.14.4.3 Calibration of safety valves (PSV Module) e 6.2.2 Download to Presys Calibrator DMY-2017 PSV .

#### **4.6. Loops (ML)**

The loop is a combination of two or more instruments connected so that the signal passes from one to the other in order to perform a measurement. This module allows to manage, so independent calibrations of loops in the same way as is done with individual instruments such as certificates create and issue a plan calibrations for the loops. For example, create certificates and issue a calibration plan.

Refer to topic 5.15 Loops.

#### **4.7. Signature Electronic (ASE)**

Enables the use of electronic signature for the certificates of the Isoplan. This signature follows the recommendations of the American Norm 21 CFR - Part 11 for the pharmaceutical industries. This norm recognizes as valid certificates stored in electronic form through the approval of the certificate through a password entered by the user.

Refer to topic 7.7.4 Signature Electronic

#### **4.8. Procedures (PCD)**

This module allows to perform change control procedures for calibration documents (Word, Excel, etc.) with the Isoplan. This module allows only the Isoplan users to make changes to these documents.

Refer to topic 5.11 Procedures

#### **4.9. Audit-Trail (AT)**

This module enables in the Isoplan the Audit-Trail. This module consists of a report with all the changes a user makes within the Isoplan as register a new instrument, delete calibrations, etc.

#### 4.10. Service Provider (PS)

This module is designed for service provider companies wishing to issue certificates using Isoplan. There is a customer base for organizing tags and instruments for a specific customer, the certificate shows the name and address of the customer and you can disable some fields of the certificate as the date of next calibration, for example.

See topics 5.17 Register of Clients and 7.7.3 Correction of the Certificate in Isoplan with Service Provider module .

#### 4.11. FDA Module

For attend the American Norma 21 CFR - Part 11 for the pharmaceutical industries, the modules AT, ASE, DSH and ML must be included in the Isoplan.

#### 4.12. Critical Analysis Module (CA)

This module allows you to generate an approval document in the Isoplan tag register called a critical analysis where one or more users must approve the information defined in the register as acceptance criteria, instrument input range, calibration periodicity, etc. The approval must be performed by up to 4 users through electronic signature where after all the approvals a unique number is generated for the analysis. In addition to the individual approval document for each tag registered in Isoplan, a spreadsheet with a list of all the critical tags registered in Isoplan containing the main information related to the critical analysis such as calibration points, acceptance criteria and calibration periodicity can be generated.

When entering Isoplan the input alarm displays information on the number of critical analyzes pending and the number of tags that the user who is signing in must sign.

#### 4.13. Accredited Services Module










This module facilitates the creation of calibration certificates that are suitable for accreditation with the Brazilian Calibration Network. **Isoplan presents only a few certificate models for services relating to temperature and pressure quantities. Depending on the procedures that the laboratory uses, it may be necessary to adapt the Isoplan accreditation certificate models. This service must be performed upon request to Presys.**

## 5. Register

All information related to the automatic calibration process of an instrument is stored in the ISOPLAN database. The Registration menu in the main screen contains the items necessary for the complete configuration of the device characteristics and the sequence of operations performed by the Presys calibrator.

### 5.1. Toolbar

All registration screens have a toolbar on the upper part with the controls for the creation of new registers (tags, units, areas etc.), deletion of registers or copying and pasting of data. The toolbar commands are as follows:

	Creates a new register (tag, instrument, area etc.).
	Saves the current register, which may be an existing register or a new one.
	Deletes an existing register.
	Cancel the update of a register in case it has not been saved.
	Copies data from a register to the transfer area.
	Pastes data from the transfer area to the current register. It may be a new blank register.
	Lock or unlock edition of a register. Click on this button to activate register edition
	Button to close the screen.
	Opens the Help file.

The **Toolbar** can also be accessed by the right mouse button or through hot keys as shown below:

	Ctrl + n.
	Ctrl + s.
	Ctrl + d.
	Ctrl + z.
	Ctrl + c.
	Ctrl + v.
	Ctrl + e.
	Ctrl + f.
	Ctrl + a.

## 5.2. Copying and pasting registers

The copy and paste operation is similar to that of other programs running in Windows, but it is restricted to one single ISOPLAN screen. The copy and paste option is normally used to create several registers that are almost identical: for example, in case it is necessary to register several repeated instruments, simply click on the copy button to transfer data from the model instrument to the transfer area, click on the new button and then click on the paste button to copy all data from the model instrument to the new blank instrument.

## 5.3. Lock Change Records

The Isoplan screens of register have an icon with a picture of a closed or opened lock. When the lock is closed saving changes is locked. Clicking the lock icon saving the changes is released.

## 5.4. Register of Scales

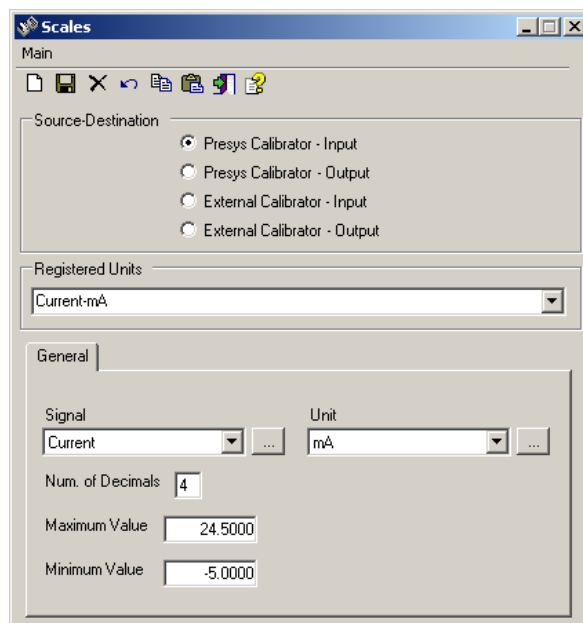


Figure 7 - Dialog box **Scales**

The registers defined for **Units** and **Signal Types** are grouped in order to establish the scales used by the instruments and calibrators in the calibration process. Refer to the **Toolbar** topic to create and delete registers.

### Presys Calibrator - Input

Measurement scales of Presys calibrators (data can not be either altered or deleted).

### Presys Calibrator - Output

Generation scales (source) of Presys calibrators (data can not be either altered or deleted).

### External Calibrator - Input

Measurement scales of other calibrators are also used to define the output signal of the instruments to be calibrated.

#### Signal

Choose one of the registered **Signal Types**. Use the button next to the signal type to edit or created a new type of signal.

### External Calibrator - Output

Generation scales of other calibrators are also used to define the input signal of the instruments to be calibrated.

#### Signal

Choose one of the registered **Signal Types**. Use the button next to the signal type to edit or created a new type of signal.

#### Unit

Choose one of the registered **Units**. Use the button next to the unit to edit or created a new unit.

### Number of Decimal Places

Number of decimal places used in the reports.

### Maximum Value and Minimum Value

Maximum value and minimum value allowed for this scale. These values must be defined according to the instruments and standards available for calibration.

## 5.4.1. Units

The Units dialog box allows the types of engineering units previously registered to be checked and new units to be included. It must be observed that the program classifies units as internal, corresponding to those used in Presys calibrators to indicate their input or output signals. The external units refer to the signals that were read or generated externally (without the participation of Presys calibrator). A list of tag operational conditions can be created for each registered tag. Refer to the **Toolbar** page to create and delete registers.

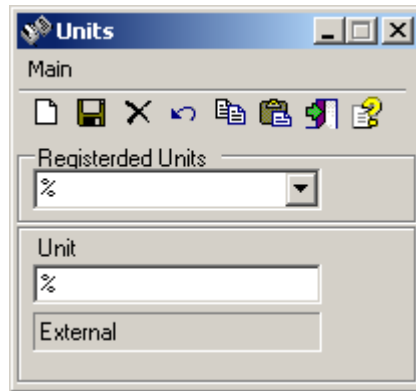


Figure 8 - Dialog box **Units**

### **Registered Units**

List of registered units.

### **Unit**

Text of the registered unit. Only external units can be created or changed.

## **5.4.2. Signals**

The **Signal Type** dialog box presents the registered signal types and allows new signals to be registered. Reference is also made here to signals of internal and external type, such as the signals allowed by a Presys calibrator and by the instrument to be calibrated, respectively, whether they are input or output. Refer to the **Toolbar** page to create and delete registers.

### **Registered Signals**

List of signals already registered in the program.

### **Signal**

Text of the registered signal. Only external signals can be created or changed.

## **5.5. Failures**

The Failure dialog box allows the creation of codes to identify failures that occur or are observed during the calibration process. Registered codes may be input in Presys calibrators by the operator during the execution of a work order, or added to the calibration report when the diagnosis is specified. A list of failures registered in ISOPLAN can be generated and checked through the "**Print Preview**" option in the Report menu. The **Failures and Conditions Found** report presents the failure number, description of the failure or condition, and comment for each register. Refer to the **Toolbar** page to create and delete registers.

### **Registered Failures**

List of failures already registered in the program.

### Failure number

A number defined by the user to identify failure or condition found in calibrations.

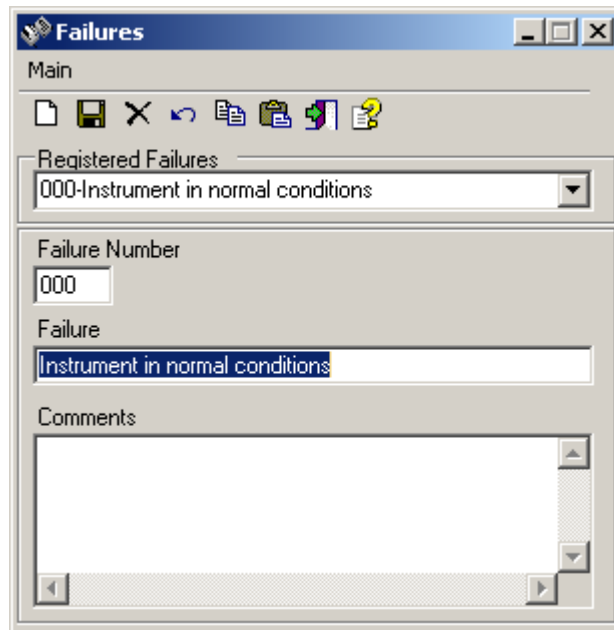


Figure 9 - Dialog box **Failures**

### Failure

Brief description of the failure.

### Comments

Comments with further details explaining the type of failure.

## 5.6. Laboratories

It is used to register external laboratories that can receive the standards or instruments registered in ISOPLAN. Refer to the **Toolbar** to create and delete registers.

### Registered Laboratories

List of registered laboratories.

#### 5.6.1. Laboratory

It presents basic data about the laboratory.

## ISOPLAN Name

Internal name used in ISOPLAN to make it easier to locate a certain laboratory.

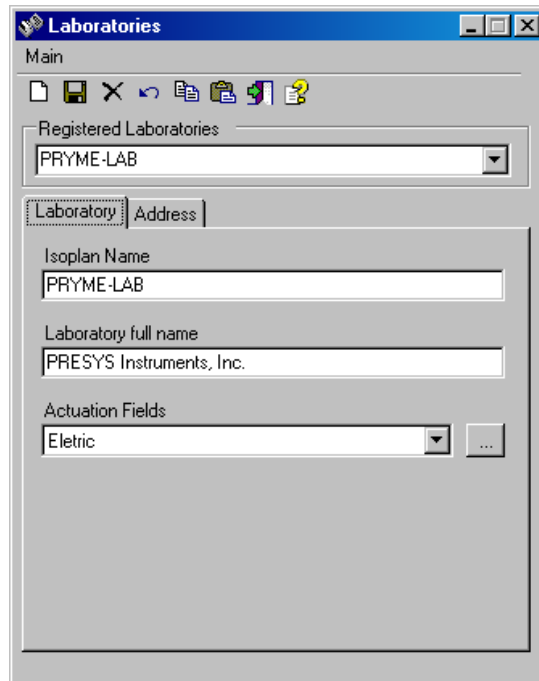


Figure 10 - Dialog box **Laboratories**

### Laboratory full name

Name of the laboratory as it should appear in the reports issued by Isoplan.

### Actuation Fields

Fields in which the laboratory works. Refer to the topic **Actuation Field**

The list of registered laboratories can be printed accessing the menu **Main> Print Preview List of Laboratories**.

## 5.6.2. Address

Data about the location of the Laboratory. These data are optional.

### Address

Address of laboratory including name of the street or avenue where it is located.

### City

City where the laboratory is located.

### State

State where the laboratory is located.

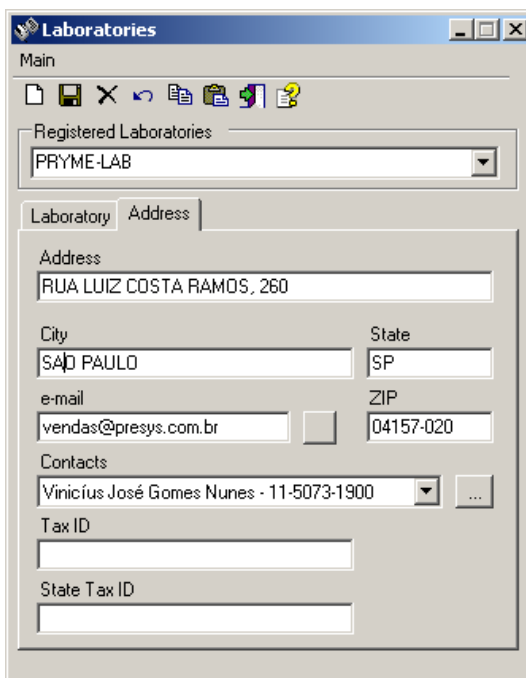


Figure 11 - **Address** tab in dialog box **Laboratories**

### Zip code

Postal code of the address of the laboratory.

### E-mail

Main e-mail of the laboratory. The button next to the e-mail field can be used to open the standard e-mail program configured in Windows.

### Contacts

List of contacts in the laboratory that can be edited by clicking on the button. "...". Refer to the **Contacts** topic.

### Tax ID

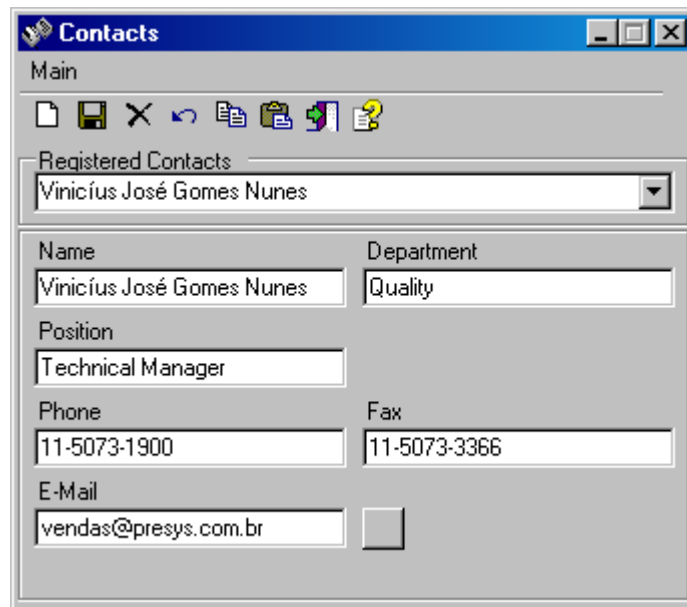
Federal Tax ID number of the laboratory.

### State Tax ID

State tax registration number of the laboratory.

### 5.6.3. Laboratory Contacts

Register with information about the contacts in a certain laboratory. Refer to the **Toolbar** page to create and delete registers.



Name	Department
Vinicius José Gomes Nunes	Quality

Position	Technical Manager
----------	-------------------

Phone	11-5073-1900	Fax	11-5073-3366
-------	--------------	-----	--------------

E-Mail	vendas@presys.com.br	<input type="checkbox"/>
--------	----------------------	--------------------------

Figure 12 - Dialog box **Laboratory Contacts**

#### Registered Contacts

List of registered contacts.

#### Name

Name of the contact person in the laboratory.

#### Department

Department where the person works.

#### Position

Description of position.

#### Phone, Fax, e-mail

Information on how to contact the person. In the e-mail field it is possible to open the standard electronic mail program of Windows.

### 5.6.4. Actuation Fields

Register with the lab's areas of work See the **Toolbar** page for creating and deleting records.

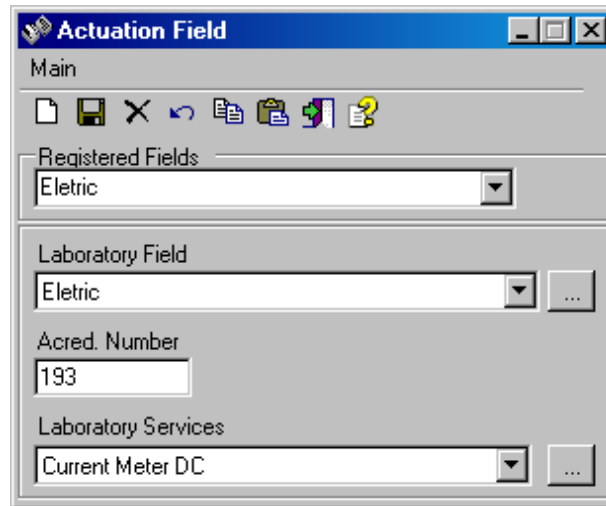



Figure 13 -Dialog box **Fields of Laboratory**

#### Registered Fields

Lists of fields registered for this laboratory.


#### Laboratory Field

Select one of the existing fields or click on the button  to edit or register this list. Refer to the **Laboratory Field** topic.

#### Accreditation Number

Laboratory accreditation number.

#### Laboratory services

Services that can be executed by the laboratory within the selected actuation field. Click on the button  to edit or register this list. Refer to the **Laboratory Services** topic.

### 5.6.4.1. Register of Actuation Field

It registers a list of fields that are available to the several laboratories registered in ISOPLAN. Refer to the **Toolbar** page to create and delete registers.

#### Laboratory Actuation Field

Name of the field of the laboratory.

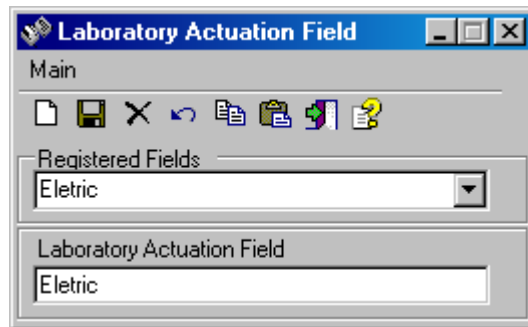


Figure 14 -Dialog box **Laboratory Actuation Field**

### 5.6.4.2. Laboratory Services

The laboratory may provide several types of service in each field. The service is defined through the combination of a certain area and type of service. Refer to the **Toolbar** page to create and delete registers.

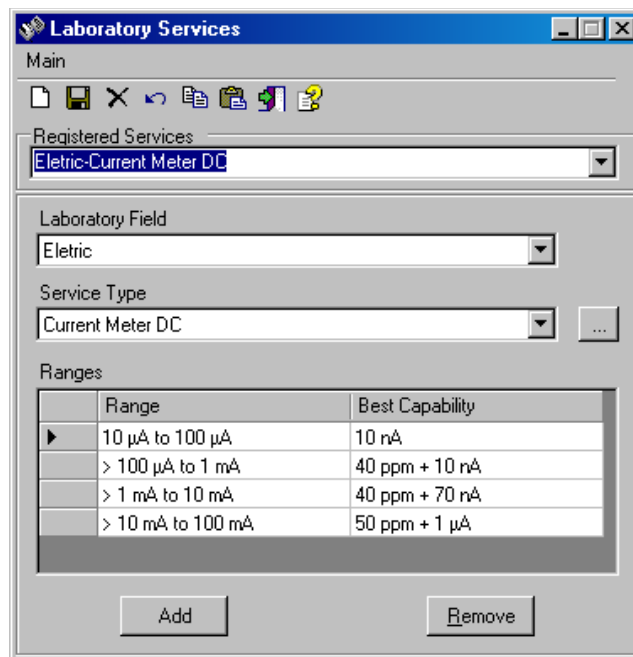


Figure 15 - Dialog box **Laboratory Services**


## Registered services

List of services registered in the software.

## Laboratory Field

Filed in which the service must be registered. The fields available are only those registered for the laboratory. In case a new field is required, return to the **Actuation Filed** screen.

## Service Type

Select one of the registered types of service or create a new type of service by using the button .

## Ranges

Table with the ranges in which the laboratory can work. Click on the **Add** button to create a new range and fill in the fields of the table. **Range** is a text in which the laboratory measurement or generation range (e.g.: 0 to 10V) can be input. In the **Best Capability** field, input the best capability of the laboratory for that range (e.g.: 10ppm + 0.3mV). To remove a range, click on the **Remove** button.

### 5.6.4.3. Types of Service

List of types of service that are available to the several laboratories registered in Isoplan. Refer to the **Toolbar** page to create and delete registers.

## Name of Service

Text with the name of the service executed by the laboratory.

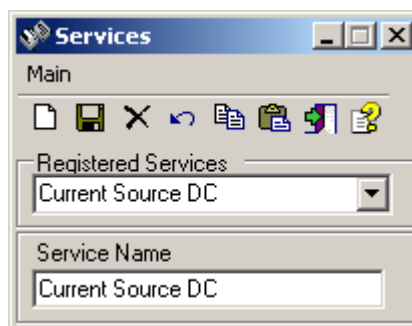


Figure 16 - Dialog box **Services**.

### 5.7. Verifications

ISOPLAN has a simplified control of instruments that do not require calibration. This control is called **verification**. In this mode the instrument report presents only a few items that were checked and no measurement register is made in ISOPLAN. The items to be verified are registered on this screen and later they can be associated to the tag of the instrument to be verified.

#### Registered verifications

List of registered verifications.

#### Verification

Description of the registered verification.

### 5.8. Types of Instrument

Register of the types of instrument employed by the user. Refer to the **Toolbar** to create and delete registers.

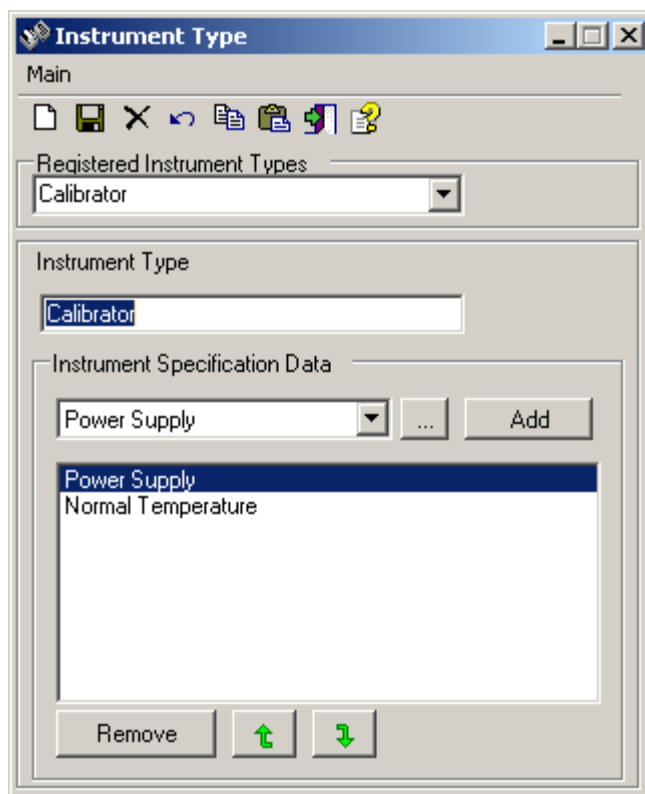


Figure 17 – **Instrument Type** dialog box.


## Registered instrument types

List of types of instrument registered in the software.

## Instrument type

Description of the type of instrument.

## Instrument Specification Data<sup>1</sup>

These data are optional and allow the user to create a datasheet template with several properties of the instrument. To add a new property to the type of instrument, click on the **Add** button. To remove a property, click on the **Remove button**. In case it is necessary to create a new property, click on the button . The order in which the properties appear on the datasheet can be modified by using the buttons with the arrows to move the property upwards or downwards.

### 5.8.1. Properties

The several properties that can be part of the datasheet of an instrument are registered on this screen. Refer to the **Toolbar** page to create and delete registers.

## Instrument properties

List of registered properties.

## Property

Description of the property being registered.

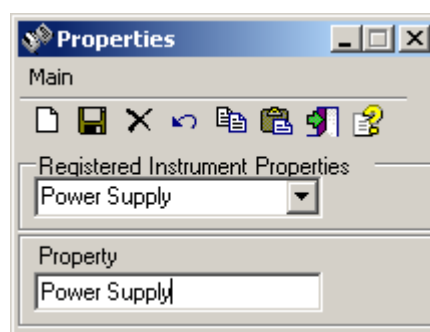


Figure 18 - Dialog box **Properties**.

---

<sup>1</sup> Available only on Isoplan with Datasheet module (DSH)

## 5.9. Operational Conditions<sup>2</sup>

A list of tag operational conditions can be created for each registered tag. Refer to the **Toolbar** page to create and delete registers.

### Registered Tag Types

List of the types of registered tags.

### Operational condition model

Name of a model of tag operation condition.

### Tag Specification Data

These data are optional and allow the user to create a model with a list of the several operational conditions of a tag. To add a new condition, click on the **Add** button. To remove a condition, click on the button **Remove**. In case it is necessary to create a new condition, click on button **...**. The order in which the conditions appear on the datasheet can be modified by using the buttons with the arrows to move the condition upwards or downwards.

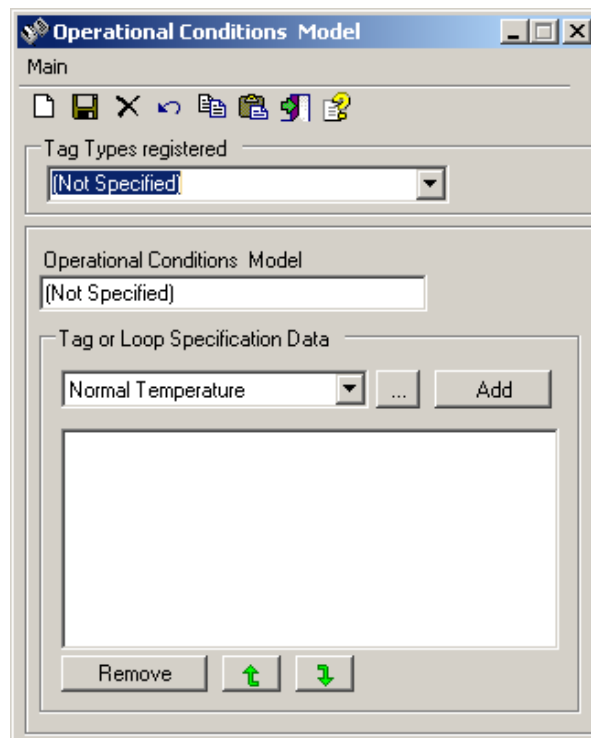


Figure 19 – **Operational Condition Model** dialog box.

<sup>2</sup> Available only on Isoplan with Datasheet module (DSh)

### 5.9.1. Conditions<sup>3</sup>

The several operation conditions that can appear in a tag are registered on this screen.

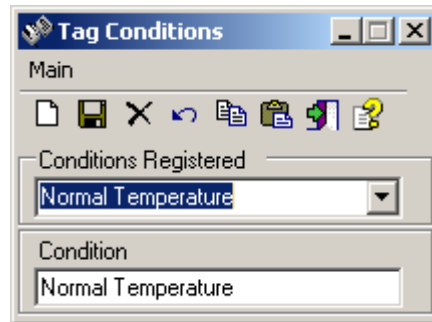


Figure 20 – **Tag Conditions** Model dialog box.

#### Registered Conditions

List of registered operation conditions.

#### Condition

Description of the operation condition being registered.

### 5.10. Areas

It shows the areas or sectors in which the **Tags** registered in Isoplan can be allocated. Refer to the **Toolbar** to create and delete registers.

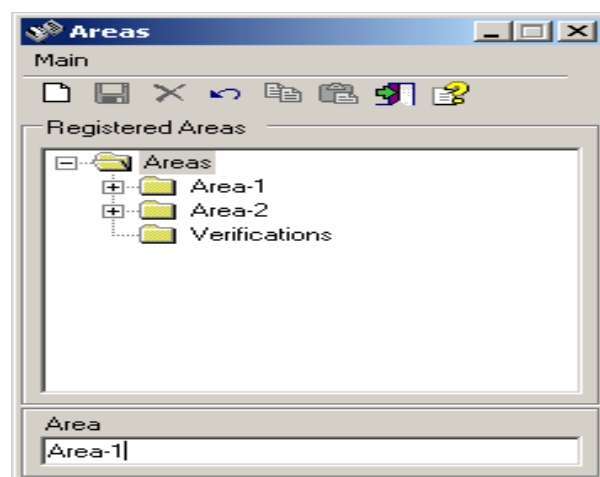


Figure 21 - Dialog box **Areas**.

<sup>3</sup> Available only on Isoplan with Datasheet module (DSh)

**Registered areas**

Tree with registered areas. ISOPLAN has the option of creating areas and sub-areas. To create an area, click on the Areas folder and then on the **New** button. To create a sub-area, select one of the existing areas by clicking on the area folder and then on the **New** button.

**Area**

Name of the area.

Below the area name there are some data with the number of tags registered in Isoplan, total number of tags in the area and sub-area and total number of tags in the area only.

In the lower right corner of the screen, It is possible to view the list of tags and loops that belong to the selected area.

**5.11. Procedures**

Register with calibration procedures adopted by ISOPLAN users.

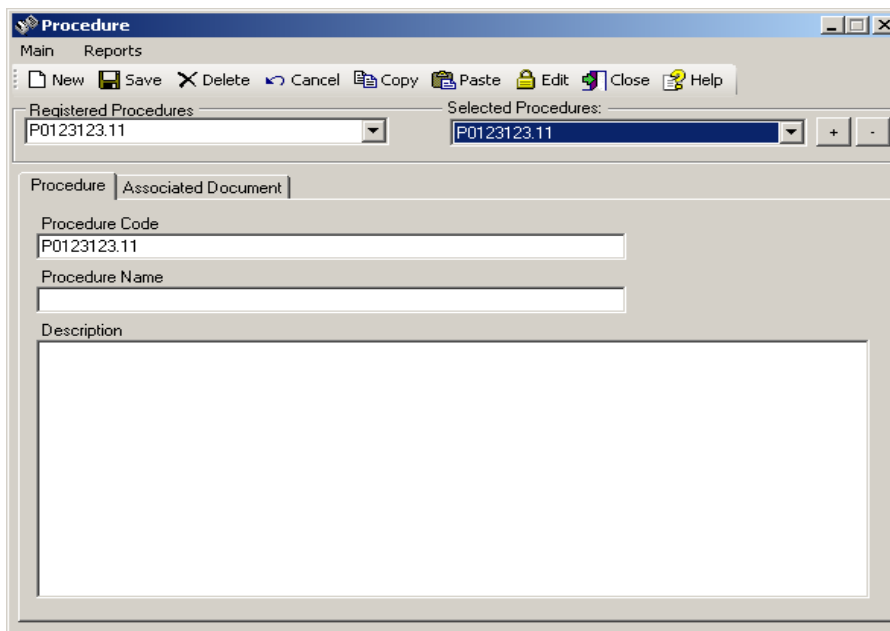


Figure 22 - Dialog box **Procedures**.

**Registered Procedures**

List of registered procedures.

**Procedure Code**

Alphanumeric code of the calibration procedure.

**Procedure Name**

Name to make it easier to identify the procedure.

**Description**

Optional short text to describe the procedure.

**Selected Procedure**

The ISOPLAN allows you to print preview several procedures at once, to select the procedures click **Reports>Select Procedures**, if you want to see the procedures in separate files, also check the option **Separate reports**. In the field **Registered Procedures** select the procedure that you want to print preview, and then click the button **+** to add the procedure to the Selected Procedures list. To print preview the procedures that are in the list, click **Main> Print Preview**.

**5.11.1. Control Documents<sup>4</sup>**

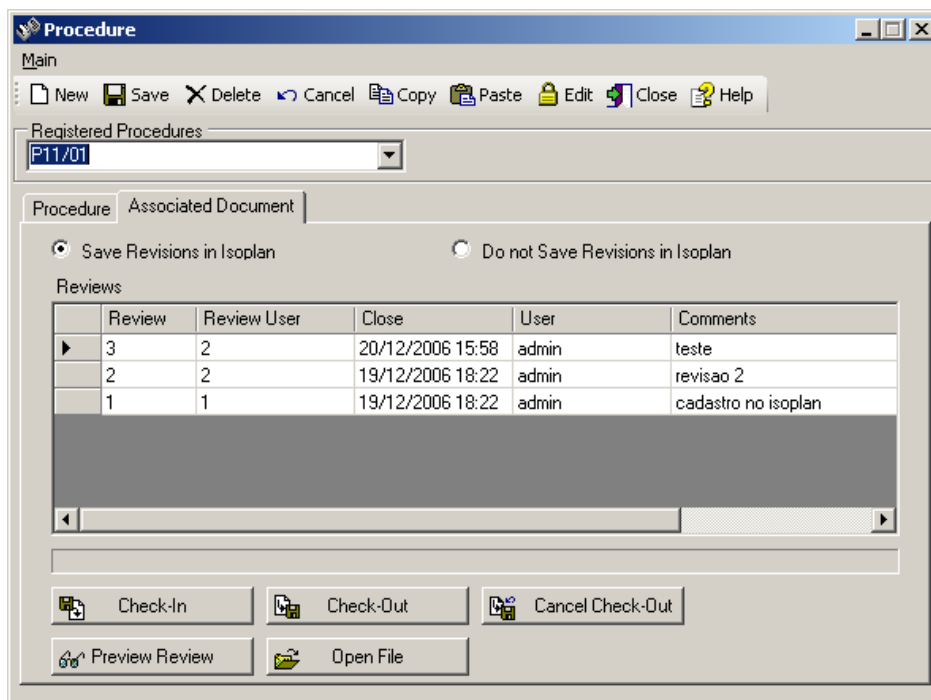


Figure 23 – Associated **Document** tab

The registration of tags allows the operation conditions of the tag to be registered. There are two options for storing documents:

<sup>4</sup> Available in Isoplan with procedure module

### Save Revisions in Isoplan

With this option, documents are stored in a folder controlled by Isoplan. This folder is defined in the Settings Isoplan. The files are encrypted before they are stored in this folder and can only be accessed through Isoplan.

### Do not Save Revisions in Isoplan

With this option, the Isoplan only stores the file path associated with the procedure (Ex: [\\server\lab\p001.doc](#)). The Isoplan has no control over the files which can be changed without the use of Isoplan.

The change control documents are realized by the following commands:

### Check-in

Check-in is used to store a new document or a new revision in Isoplan. By clicking the check-in is requested the document associated with the procedure, for example, a Word document, a justification and a number or code revision of the document. Clicking the OK button the document is stored in Isoplan or just created a link has been chosen the "**Do not Save Revisions in Isoplan**".

### Check Out

The checkout is used to change a document controlled by Isoplan. By clicking the check-out must be chosen a location where you saved the file for changes to be made. Upon completion of the changes should be made to check in, as explained earlier, to store a new revision in Isoplan. It is not possible for two users Isoplan perform a checkout simultaneously. Click on **Cancel** to cancel check out of a document.

### Preview Revisions

The Isoplan allows it to be viewed a specific revision. Click the row of the revision you want to view and click the **Display Review**.

### Opens Archive

Open the document from the last place where the document was saved.

## 5.12. Standards

Register with the standards used to calibrate the **Instruments**.

**Registered Standards**

List of standards registered in the software.

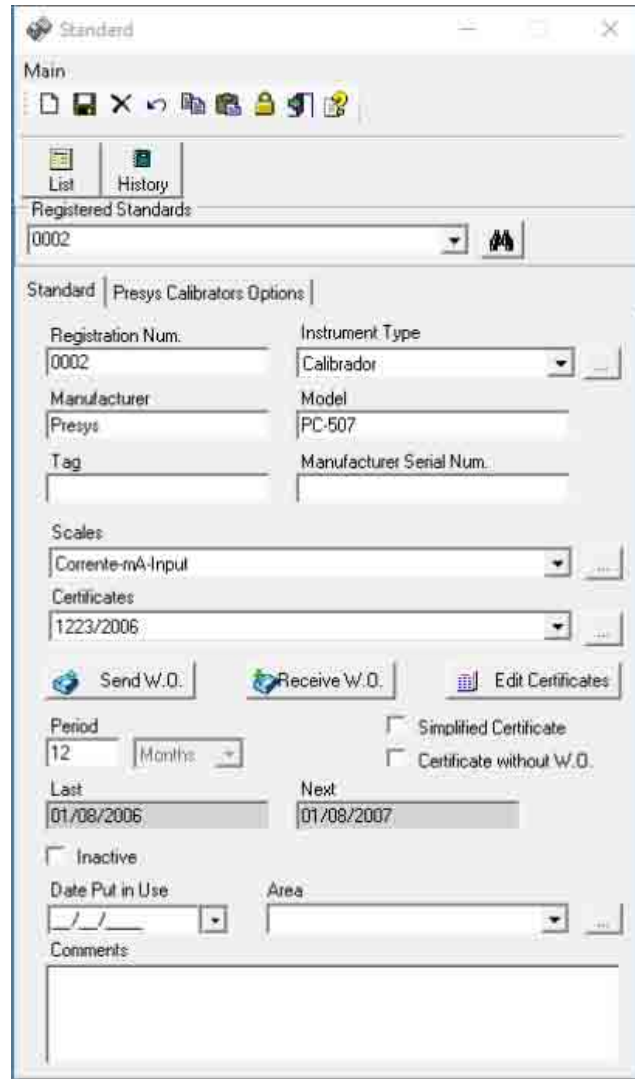


Figure 24 - Dialog box **Standards**.

**5.12.1. Standard**

It presents basic data to register a standard.

**Registration Number**

A number or code that identifies the standard. This number does not have to be the same as the manufacturer's serial number.

**Type of Instrument**

One of the **Types of instrument** previously registered in the program that is suitable for the calibrator being registered.

### **Manufacturer**

Manufacturer of the standard.

### **Model**

Model of the standard.


### **Tag**

Optional field in case a tag needs to be defined for the standard.


### **Serial Number**

Optional field for the manufacturer's serial number.

### **Scales**

Each standard must have one or more measurement signal or generation signal scales. To add or remove scales, click on the button  to access the **standard scales** register. This register must be made after the basic data of the standard register is saved.

### **Certificates**

Register of the standard certificates. To add or remove a certificate, click on the button  or on the **Edit Certificates** button to access the **standard certificates** register. This register must be made after the basic data of the standard register is saved.

### **Send W.O.**

Creates a calibration work order (W.O.) for the standard that will be sent to an external laboratory. Refer to the **work orders of the standard** topic.

### **Receive W.O.**

Inputs data of the standard calibration certificate provided by the laboratory. Refer to the **receive W.O. of the standard topic**.

### **Period**

Defines the frequency of standard calibration in months or days. This field is informational only, the period is set at the time of signing the standard certificate.

**Simplified certificate**

Allows the user to register the standard simplified certificate, no need to fill calibration values, in this case, the standard uncertainty is estimated for the accuracy of the registered range.

**Certificate without W.O.**

Allows registering the standard certificate without generating a work order

**Last**

Date of last standard calibration.

**Next**

Date of next standard calibration. Calibration date can be changed by using the calendar or inputting the date.


**Inactive**

If a standard has a defect so that it can not be repaired, you can click this option to keep the standard registered but inactive where it no longer appears in the list of registered standards and there is no further need to perform calibrations of this standard.

**Date In Use**

Date that the pattern was put in use Only the user with supervisor level can make changes in this field.

**Area**

Area or sector that defines the location of the tag in the plant. Select one of the areas available or use the button  to register a new area.

**Comments**

Free text field to enter comments.

**5.12.2. Presys Calibrator Options**

For ISOPLAN to work in conjunction with Presys calibrators, it is necessary to register the information shown on this screen.

### Pressure Options

These fields are specific to the pressure measurement calibrators. There are two types of pressure calibrators: those that use external sensors (**External Sensor** option); and those that use internal sensors (**Internal Sensor PC-507** option). In case the equipment does not measure pressure, use the **No pressure module** option. Presys equipment can use up to four sensors.

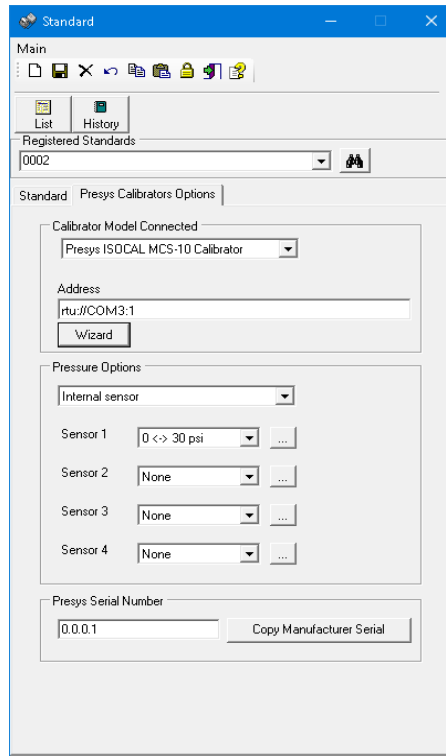



Figure 25 – Presys Calibrator Options tab in the Standard dialog box

### Field Calibrator Model

Choose one of the Presys Calibrator models corresponding to the standard you are registering. The communication address must be entered with the Presys calibrators. Calibrators can use some types of communication protocols that will be described in the next topic.

### Sensors 1 to 4

Presys devices have up to four pressure sensors in which it is possible to choose one of the ranges available. If necessary, a new range can be registered by clicking on the button . Refer to the **Pressure Sensors** register.

### Presys Serial Number

For the program to run correctly, it is necessary to register a serial number provided by Presys.

### 5.12.3. Pressure Sensors

Presys pressure sensors allow up to four sensors to be registered. ISOPLAN presents a list of sensors provided by Presys so that it is not necessary to create new ranges for most cases. If the range is not available, it must be registered so that the calibrator can be used in ISOPLAN.

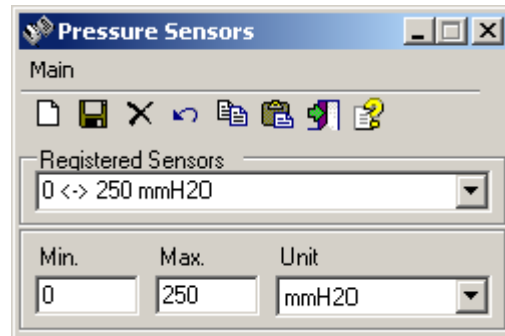


Figure 26 –Dialog box **Pressure Sensors**

#### **Registered Sensors**

List of registered sensors.

#### **Minimum and Maximum**

Minimum and maximum values of the sensor. The minimum value may be negative in sensors that can measure pressures below atmospheric pressure.

#### **Unit**

Use a suitable pressure unit, normally psi or mmH2O.

#### 5.12.4. Communication protocols Calibrators Presys

The communication address configuration uses a format similar to the addresses of Web browsers where each protocol uses a different address format. To facilitate the address registration there is a wizard, click the **Wizard** button next to the address.

On the Wizard screen you can choose one of the protocols used by Presys calibrators.

- **http** - protocol used by the advanced line of Presys calibrators being suitable for installations where the computer running the Isoplan and the calibrators are interconnected in the same wired (ethernet) or wireless (wi-fi) local area network. The address has the following format:

`http://address`

where:

address = ip address or host name of the calibrator in the Windows network.

Example: `http://192.168.1.5`

- **connector** - protocol used by the advanced line of Presys calibrators being suitable for installations where the computer running the Isoplan and the calibrators are not on the same network, for example Isoplan is virtualized in a server on the Internet. Refer to topic 6.5 The address has the following format:

`connector://address/calibrator_serial`

where:

address = ip address or machine name where the Presys connector is installed.

calibrator\_serial = calibrator serial number.

Example: `connector://192.168.50.1/290.08.17`

- **usb** - protocol used by the advanced line of Presys calibrators being suitable for installations where the computer running the Isoplan and the Presys calibrator are connected via a USB cable. The address has the following format:

usb://[drive letter]

where:

drive letter = letter of the drive that appears on the computer when Presys calibrator uses USB cable. This field is optional where in case it is not filled the Isoplan automatically searches for the calibrator.

Example: usb://

- **Modbus Rtu** - protocol used by the Presys calibrators that use serial communication with modbus rtu protocol. The calibrators can be connected in RS-485 network. The machine where the Isoplan and calibrator are connected must be connected via USB/Serial cable. The address has the following format:

rtu://COMX:[ModbusAddress]

where:

COMX = COM port used

ModbusAddress = modbus address. Optional field with default value equal to 1.

Example: rtu://COM3:1

- **Modbus TCP** - In this mode calibrators with serial communication can connect to Isoplan via local network (ethernet or wi-fi) through a Modbus rtu to Modbus TCP adapter. This adapter allows all Presys calibrators share a single network. The address has the following format:

modbustcp://address:[Port]:[SlaveAddress]

where:

address = ip address or host name of the Modbus / TCP adapter for Modbus-Rtu.

Port: TCP port of the adapter, usually 502.

SlaveAddress: modbus address of the calibrator, usually address 1 configured in the calibrator.

Example: modbustcp://192.168.50.2:502: 1

### 5.12.5. Register of Scales

This register presents the several scales that can be used by a calibration standard. It is also possible to register points that must appear in the standard calibration certificate and additional sources of error that can be taken into consideration in the calculation of calibrator uncertainty during calibration of an instrument.

#### Registered Scales

List of registered calibration scales.

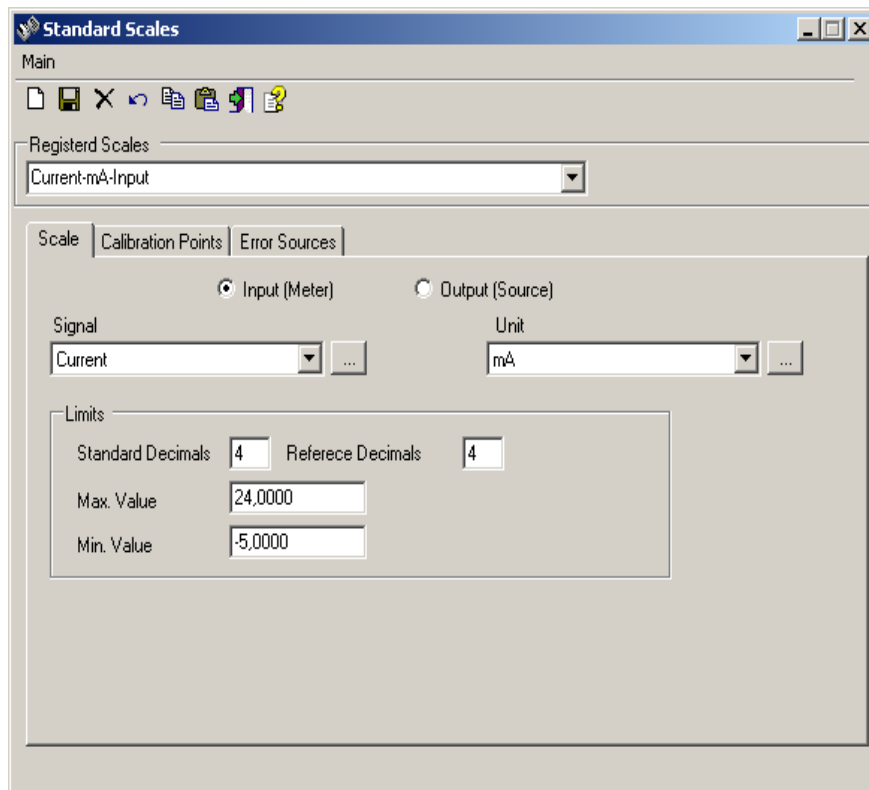


Figure 27 - Dialog box **Standard Scales**

#### 5.12.5.1. Standard Scale

A calibration standard has one or more measurement signal or generation signal scales. In order to register a standard calibration certificate, it is necessary to register these scales in ISOPLAN.

#### Input (Meter) or Output (Source) Mode

A scale can refer to a signal measured by the standard (input) or a signal generated by the standard (output), that is, the standard works as a source.

**Signal**

Type of signal of the standard scale. Refer to the **signal type** register.

**Unit**

Unit of the standard scale. Refer to the **units** register.

**Num. Decimals Standard**

Number of decimals corresponding to the resolution of the standard. The number of decimal places can be changed when data is input in the standard certificate.

**Num. Decimals Reference**

The number of places corresponding to the resolution of the reference standard used by the laboratory. The number of reference decimals can be changed when data is input in the standard certificate.

**Maximum Value and Minimum Value**

Range of values that the standard can generate or measure according to a defined scale.

**History Maximum Error**

Click the "Show Graph" button to generate a graph with the maximum calibration error of a standard scale over time. There are two options to show the limit for the error: **Only Error** - limit based on error and **Error Plus Uncertainty** - limit based on sum of error module plus uncertainty.

**5.12.5.2. Calibration Points**

In this tab the calibration points that must be shown in the calibration certificate are defined. A calibration point is added by clicking on the **Add** button and removed by clicking on the **Remove** button after the calibration point to be removed is selected. The following columns are defined in this table:

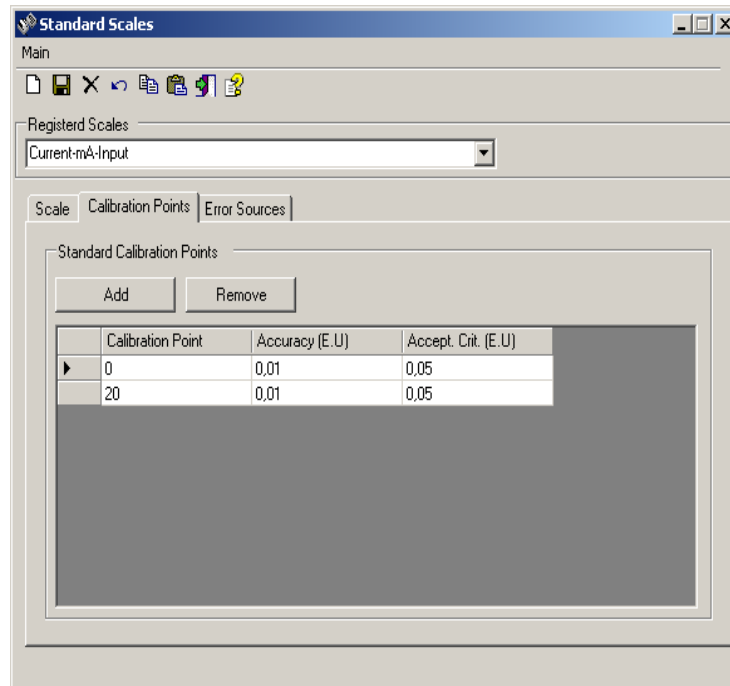


Figure 28 - Calibration Points tab in the dialog box Standard Scales

### Calibration Points

Calibration point that should appear in the certificate. When certificate data is input, the calibration points can be changed, if necessary, according to the points defined by the external laboratory.

### Accuracy (E.U.)

Accuracy in an engineering unit specified in the manual of the manufacturer of the standard. In case the manufacturer provides the accuracy as a percentage, the value must be converted engineering unit (E.U.) before this value is defined in Isoplan.

### Acceptance Criteria (E.U.)

ISOPLAN allows each calibration point to be validated through acceptance criteria. The laboratory must provide, for each calibration point, the error and the uncertainty. The sum of the error module with the uncertainty is compared to the acceptance criteria defined in this column.

### Calculation Assistant

Isoplan works with accuracy values and acceptance criteria in an engineering unit. The fields of the group **Calculation Assistant** are intended to convert instrument specifications as a percentage of full scale, span and read to engineering unit. Choose whether you want to fill in the Accuracy column or Acceptance Criteria, enter the percentage value, choose one of the options (Reading, Span or Full Scale) and **click** in **Calculate** for the Isoplan to perform the calculations.

### 5.12.5.3. Error Sources

Besides the uncertainty value provided by the laboratory, it is possible to add other uncertainty components related to the standard scale that is being registered. These uncertainty components were called sources of error in ISOPLAN. An example of an error source is the effect of variation in ambient temperature on the value measured by the standard. To add a new error source, fill in the name for the error source and click on the **Add** button. To remove an error source, click on the **Remove** button. The uncertainty of an error source is registered by filling in the table present in the group called **Ranges**. First click on the **Add** button and then fill in the table. The uncertainty can be defined to different values according to the value that was measured or generated by the standard. To remove a line from the table, click on the **Remove** button.

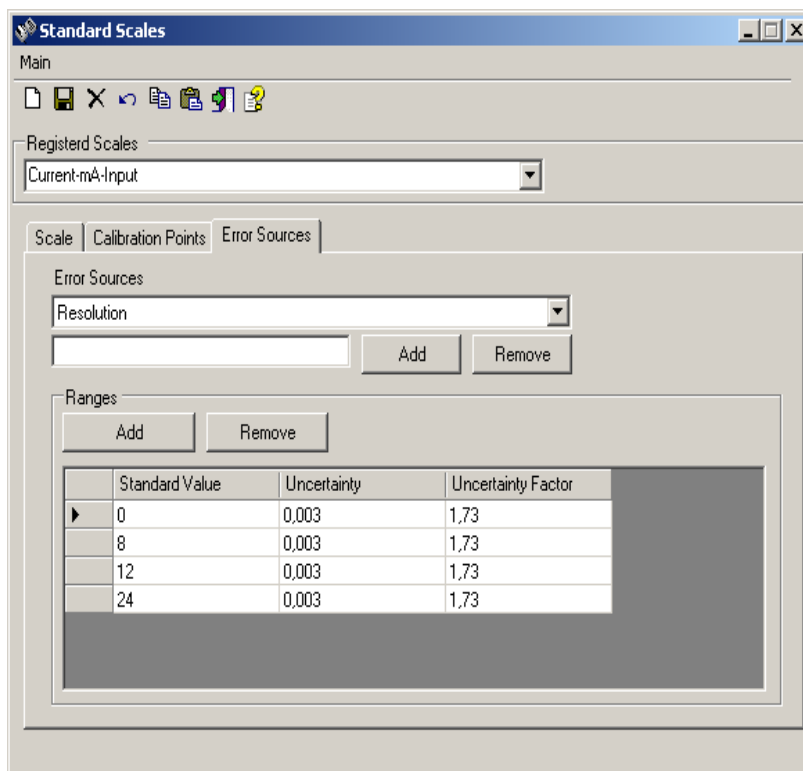


Figure 29 – Tab **Error Sources** in the dialog box **Standard Scales**

#### Standard Value

Value measured or generated by the standard. The uncertainty will be defined for the value typed in this column.

## Uncertainty

Value of the uncertainty due to the error source that is being registered. This value must be in the same unit as that of the registered scale. For example, if the register contains an uncertainty due to temperature variation for a current meter, the uncertainty value must be in mA or another registered current scale. The value of this uncertainty can be provided by the manufacturer or obtained through some other kind of research made by the user.

## Uncertainty Factor

The uncertainty due to a certain error source usually follows a probability distribution (rectangular, triangular, normal etc.). Depending on the type of distribution, it is necessary to input a factor that will be used to obtain the standardized uncertainty which in turn will be used to calculate the uncertainty of the standard. For rectangular distribution, the uncertainty factor is 1.732 (SQRT(3)), for triangular distribution, the uncertainty factor is 2.4495 (SQRT(6)) and for normal distribution, the uncertainty factor is 2.

## Uncertainty Factor Selected When Choosing Standard Scale

This option is used to leave extra uncertainty components selected (resolution, drift, etc.) when a standard calibration scale is selected in the calibration results part.

#### 5.12.5.4. Scale Registering Help for Presys Calibrators

Isoplan allows you to register easily the scales of Presys calibrators. Click on **Main>Scale Registering Help For Presys Calibrators**.

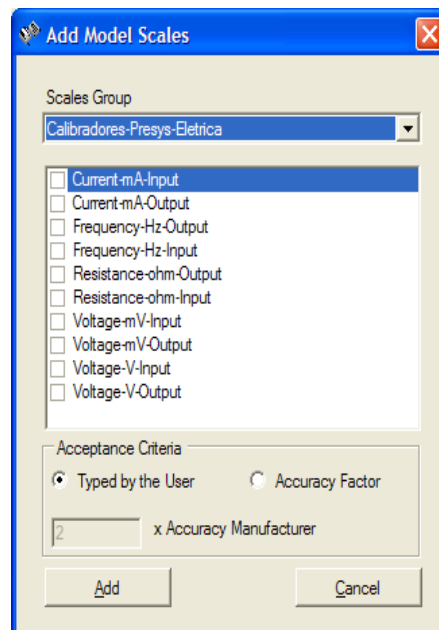


Figure 30 - Scale Registering Help for Presys Calibrators

Choose one of the Scales Group of the list that are classified by magnitudes, select the scales that have a certificate or that you want to certify, and optionally a multiplying factor to calculate the acceptance criteria based on accuracy of the manufacturer and click on **Add** button. Isoplan will register automatically the selected scales using accuracy data of the Presys calibrator specification and the calibration points usually used on certificate generate by Presys Inst. These automatically registered dates can be edited if necessary.

### 5.12.6. W.O. (Work Order) of the Standard

In order to input data of a standard certificate, it is necessary to create a standard W.O. After a W.O. is created, a report with the work order must be generated by clicking on the **Send W.O.** button The fields on this screen are as follows:

#### Registered W.O.

List of registered work orders. The W.O. uses automatic numbering created by Isoplan.


#### ISOPLAN Internal W.O. Number

ISOPLAN creates a sequential number automatically to number the work order. It is not necessary to fill in this field.

#### User W.O. Number

This field is optional and allows a different numbering system to be used for the work order. This number is defined by the user and it can be used, for example, to fill in a W.O. number defined in a procedure of the company or provided by another system.

#### Laboratory

Select one of the registered laboratories or use the button  to register a new laboratory.

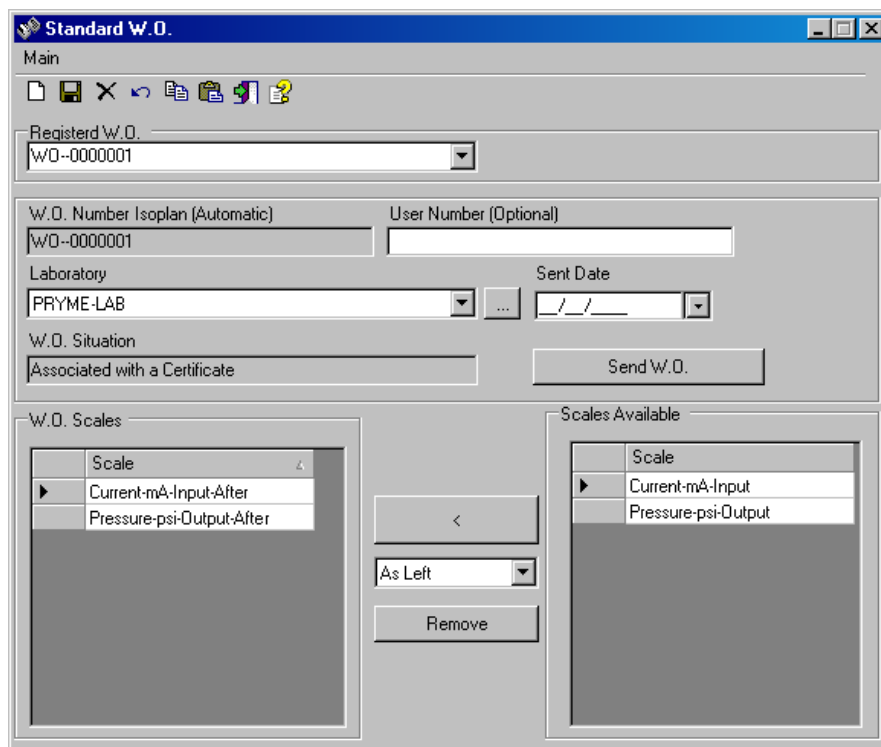


Figure 31 - Dialog box **Standard W.O.**

**Sent Date**

Date when the standard will be sent to the external laboratory.

**W.O. Condition**

Condition of the W.O. The following options are available: **New** - The W.O. was created and is expecting the emission report to be generated. **Sent** - the emission report has been generated **Associated to a Certificate** - the standard has returned from the external laboratory and a certificate has been created.

**W.O. Scales**

Scales of the standard that will be calibrated by the laboratory. It is not necessary to add all standard scales, but only the scales for which the laboratory will provide a certificate.

**Scales Available**

All scales of the standard registered in ISOPLAN. Refer to **Register of Scales**.

**5.12.6.1. Adding and Removing Scales**

A work order is composed of one or more scales to be calibrated by the external laboratory. In order to add a scale, click on the square that is shown on the left-hand corner of the scale name to select it. Choose the **Before Adjustment** option (laboratory must provide a certificate before making any adjustment in the standard) or the **After Adjustment option** (laboratory provides a certificate after adjusting the standard). Click on the "<" button to add a scale to the W.O.. In case it is necessary to remove a scale from the W.O., simply select it by clicking on the square on the left-hand corner of the scale name and click on the **Remove** button. Only the **After Adjustment** option is normally selected because in many cases the laboratory does not provide an instrument calibration certificate before the adjustment.

**5.12.6.2. Send W.O.**

After the W.O. is created and saved, a report with the data of the scales to be calibrated by the external laboratory can be generated by clicking on the **Send W.O.** button.

**5.12.7. Receive Standard W.O.**

This screen starts the receipt of a work order of the standard so that certificate data provided by the laboratory that calibrated the standard can begin to be input.

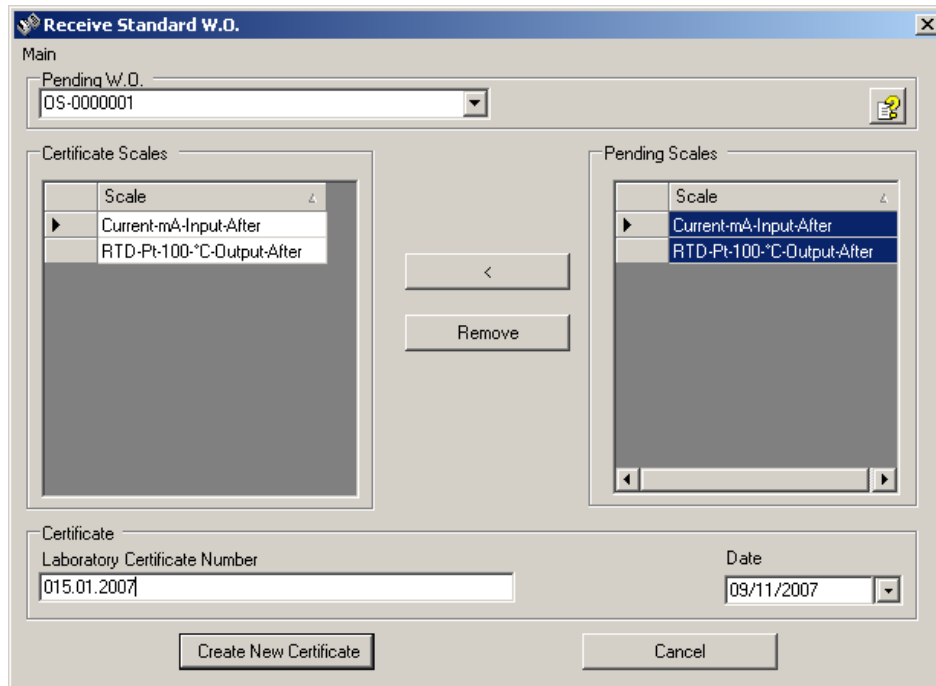


Figure 32 - Dialog box **Receive Standard W.O.**

### Creating a new Certificate of a Standard

1. Select one of the W.O. from the **Pending W.O. list**.
2. Choose from the **Pending Scales list** those scales that were calibrated in the certificate provided by the laboratory. In case the laboratory has provided more than one certificate, only one certificate must be created at a time. Scales are selected by clicking on the square next to the name of the scale. Press the Ctrl key if you want to select more than one scale simultaneously.
3. Click on the "<" button to transfer scales from the **W.O. to the Certificate Scales** list. If an item is added by mistake, select the scale from the list and click on the **Remove** button.
4. Fill in the **Laboratory Certificate Number** and **Certificate Date** fields with the date when the calibration was made.
5. Click on the **Create a New Certificate** button to begin to input certificate data. A new blank certificate will be created with the selected scales. Type in the certificate data as described on the **Standard Certificates** screen.

### 5.12.8. Standard Certificates

Standard certificate data is input on this screen. It is not possible to create a new certificate through this screen. Instead, it is necessary to follow the **send W.O.** and **receive W.O.** procedures. Refer to the **Toolbar** page to check the functions of the buttons. The **new**, **copy** and **paste** buttons are disabled.

## Registered Certificates

List of registered certificates or those expecting data to be input.

### 5.12.8.1. Certificate

The screenshot shows a software window titled "Standards Certificates". At the top, there is a menu bar with options: New, Save, Delete, Cancel, Copy, Paste, Edit, Close, and Help. Below the menu bar is a list box labeled "Registered Certificates" containing the entry "06.11.2007". The main area of the window has four tabs: "Certificate", "Measured Points", "Failures", and "Signature". The "Certificate" tab is selected. It contains several input fields: "Certificate Number" (06.11.2007), "Date" (23/11/2007), "Work Orders" (WO-0000038), "Laboratory" (PRYME-LAB), "Temperature" (25°C), and "Humidity" (54%). At the bottom, there is an "Attached File" section with three buttons: "Add", "Remove", and "Visualize".

Figure 33 - Dialog box **Standards Certificates**

This tab presents basic data about the standard certificate made in an external laboratory.

#### Certificate number

Number of the certificate provided by the laboratory.

#### Date

Certificate date.


#### Work Order

This is a read-only field showing the number of the W.O. associated to the certificate.

**Responsible**

This field is automatically filled in when the user clicks on the **Sign** button. See more details about the signature in the **Standard Certificates** topic.

**Laboratory**

List of available laboratories. Click on the button  in case it is necessary to create a new laboratory.

**Temperature**

Room temperature in the laboratory.

**Humidity**

Relative humidity in the laboratory.

**Attached File**

In this group it can be added and viewed a file in PDF format, usually the standard calibration certificate, click the **Add** button to add a file, the **Remove** button is used to remove the file, and to view the file click the **Visualize** button.

### 5.12.8.2. Failures

The screenshot shows a software window titled "Search Standards" with a "Failures" tab selected. The form contains the following elements:

- Registration No. (text input)
- Instrument Type (dropdown menu)
- Manufacturer (text input)
- Model (text input)
- Tag (text input)
- Manufacturer Serial Number (text input)
- Last (date picker) to (date picker)
- Next (date picker) to (date picker)
- Calibration Due
- Active
- Inactive

Figure 34 - Failures tab in the **Standard Certificates** dialog box.

#### Failures and Conditions Found

On this screen it is possible to add failures or conditions that occurred during calibration of the standard. Click on the **Add** button to define a new failure or condition found during calibration. In case it is necessary to remove one of the failures that have been added, select it and click on the **Remove** button.

#### Comments

Fill in this field with general comments about the calibration of the standard.

### 5.12.8.3. Measured Points

In this tab the calibration points of the standard are typed. They must be copied from the certificate provided by the laboratory. The procedure to input data is as follows:

1. Select one of the scales from the list shown in the **Scales field**.
2. In the **Decimals field**, adjust the number of decimal places of the standard (instrument that was sent to the laboratory) and of the reference (standard used

- by the laboratory).
- Fill in the **Measured Points** table with the values provided by the certificate. The columns in the table are as follows: **Value Indicated** - value indicated by the standard (instrument) that was sent to the laboratory. **Val. Standard Ref.** -value measured by the laboratory reference standard. **Error (E..U.)**-error in engineering unit calculated by the program. **Uncertainty**-uncertainty value provided by the laboratory. **K Factor** - K factor value supplied by the laboratory. **Accept. Crit.** - acceptance criteria in the same engineering unit of the scale. The sum of the error module and uncertainty is compared with this value to determine if the scale diagnosis is approved or reproved. The measured points correspond to the values defined in the **standard scale**. If necessary you can add or remove the calibration points using the **Add** and **Remove** buttons.
  - Click on the **Save** button before changing from one scale to another to save the changes made.

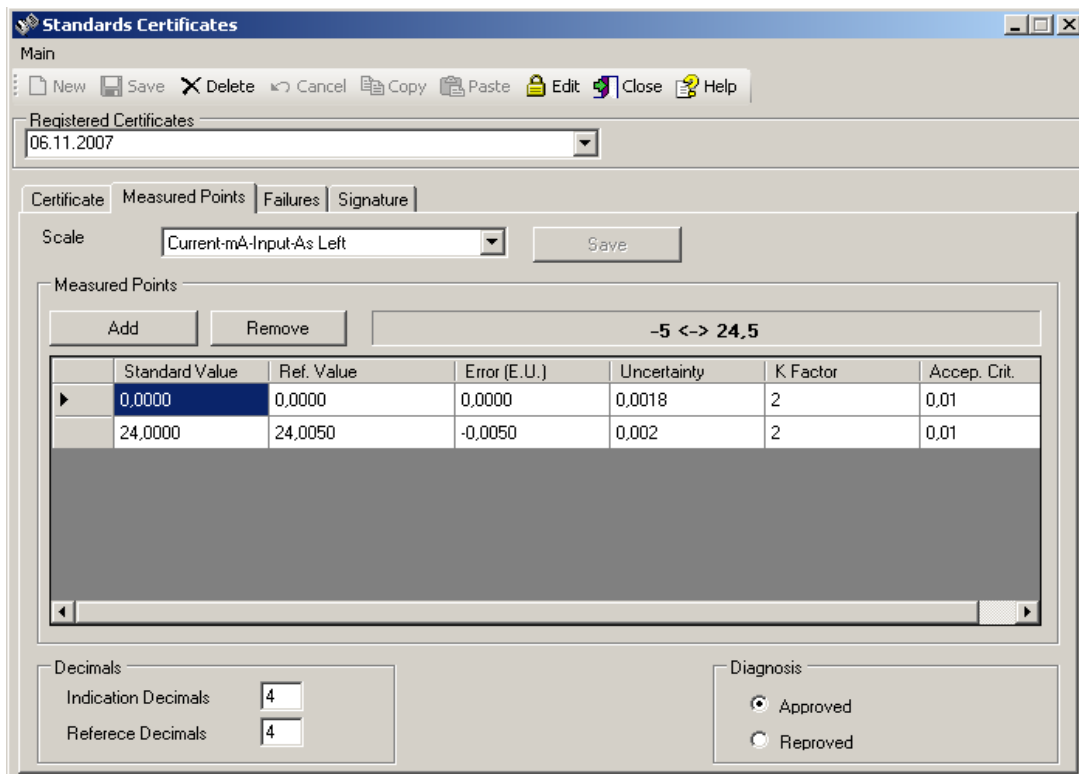


Figure 35 - Tab **Measured Points** of the dialog **Certificates of Standards**

#### 5.12.8.4. Finishing Data Entry (Signature)

The standard can only be used for instrument calibrations after finalization of the standard certificate data entry. This completion is done as follows:

1. View or print the data entered in Isoplan through the report **from** the **Main>Print Preview** menu.
2. After verifying that all the data has been entered correctly, you must define the calibration period or click the **Keep Period**, option and then click the **Sign**. An electronic signature is made by the person responsible for entering the certificate data. This signature is simply a confirmation of the user's password. After signing the certificate, the data can no longer be changed and the certificate is ready to be used for instrument calibrations that use the standard.

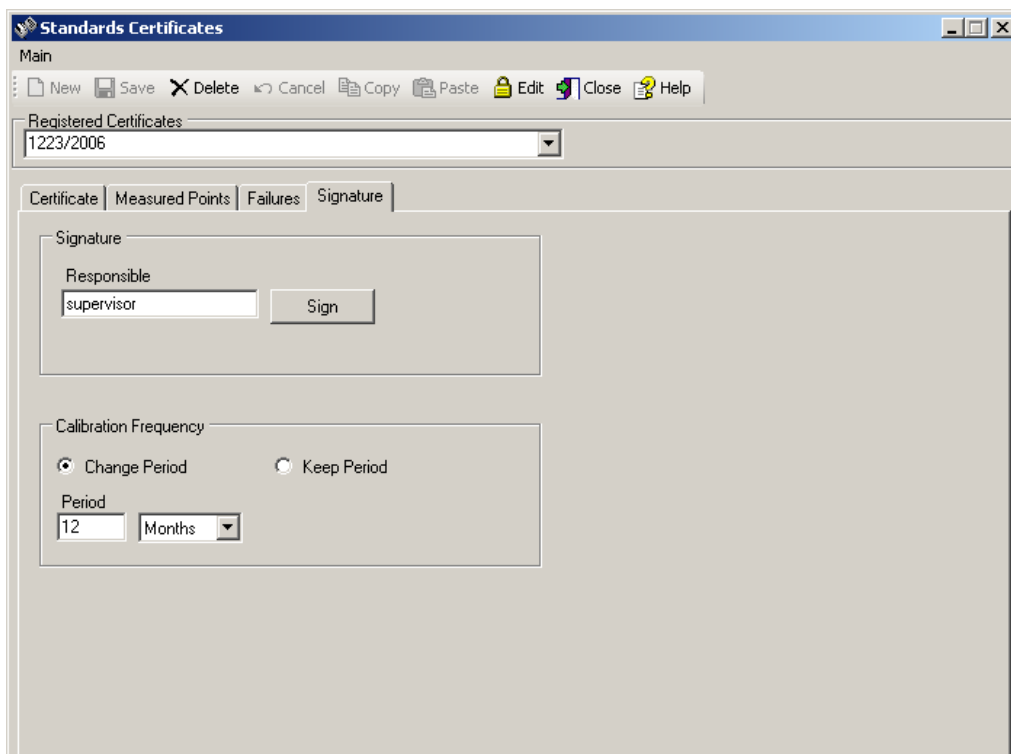


Figure 36 - Tab **Signature** of the dialog **Certificates of Standards**

### 5.12.9. Report Menu

The standard register displays the following reports:

#### List of Standards

Click the **List** button to preview a list of registered standards. Inactive standards do not appear in this list.

#### History

Click the **History** button to view a history of the calibrations of the standard.

### 5.12.10. Instrument Search

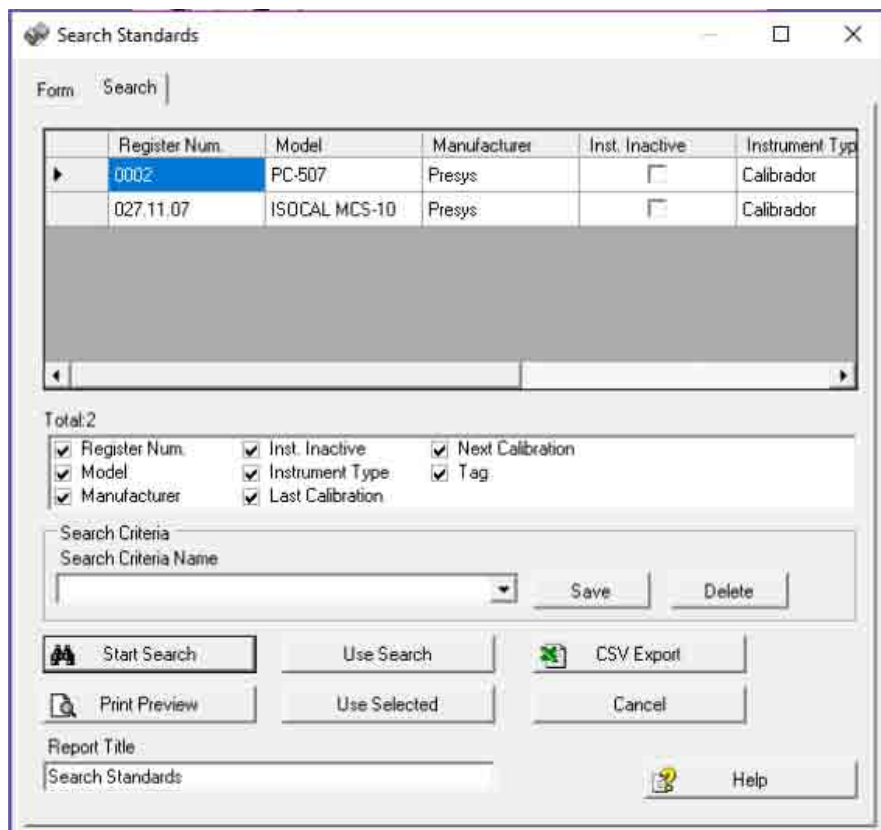



Figure 37 - Tab **Form** of the **Standard Search** dialog box

Through the button  it is possible to search the standards registered in ISOPLAN based on few details about the standard. The search procedure is as follows:

1. Use the **Form** tab to fill some known information about the standard. You can perform a search knowing only a few characters, for example by typing in the Num of Register 02 will return all standards that contain the characters "02". The fields that are irrelevant to the search can be left blank. See below further details about how to fill in the fields.
2. Click on the **Search** tab in the upper part of the screen. Click on the **Start Search** button to search the ISOPLAN register according to the criteria defined in the **Form** tab. The search result is shown in the table in the upper part of the screen. The search result can be printed by clicking on the **Print Preview** button, to check the result of the printing, and then on the printer icon, to send the report to the printer.
3. To work with the only with standards found use the button **Use Search** to transfer the list of found tags to the list of standards present in the registration screen. The **Use Selected** button can be used to display only the selected standards. Use the **Cancel** button if you do not need to work with the list of standards found.

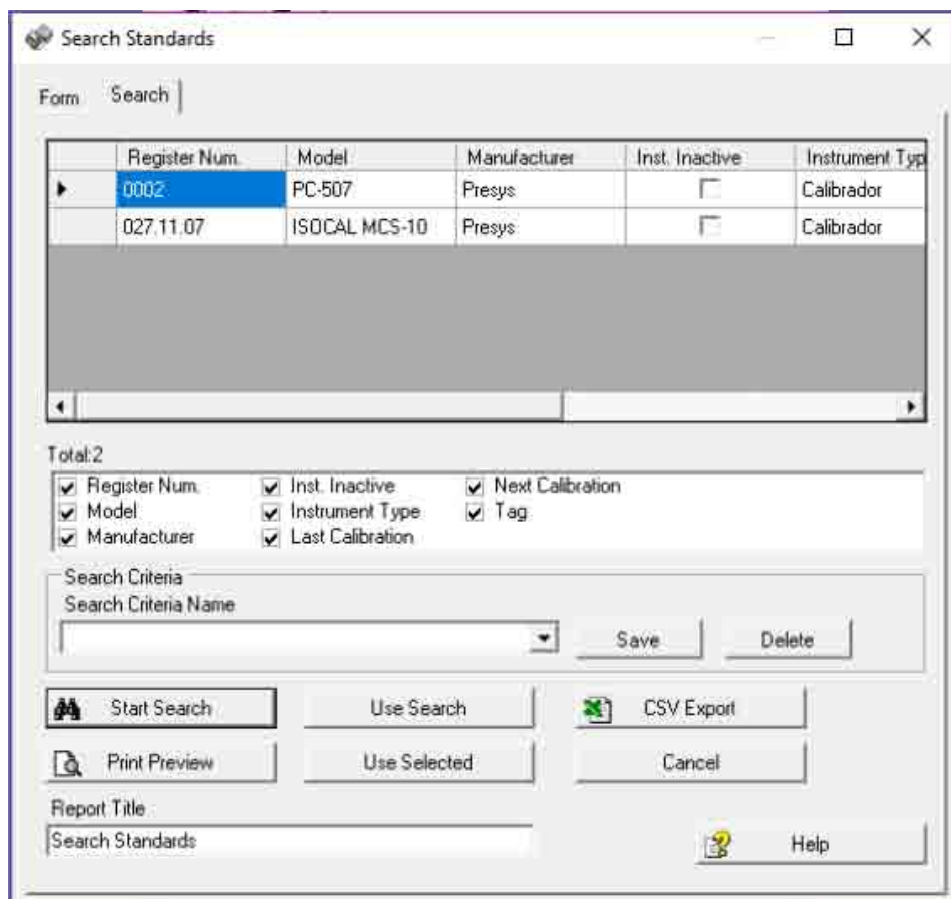


Figure 38 - Tab **Search** of the **Search standard Dialog Box**

**Comments:**

- The **Last** and **Next** fields represent the date of the last and next calibration of the standard respectively. The two fields allow three options: a) fill the date only on the left: in this case will be searched the standards **from** the specified date. b) fill in date only on the right: standards with calibrations will be searched **up to** specified date. c) completion of the two dates: standards will be searched with calibrations that are in the interval between the two dates specified.

### 5.12.10.1. Search Criteria

The group called **Search Criteria** allows you to save search criteria used. To use this feature do the following:

1. To perform a search on Isoplan usually using a filter, for example, tags that begin with the letter "T" ("T").
2. Enter a name for this search criteria, for example, "Temperature Tags" and click **Save**.
3. To use this search criteria in the choice list "Name Search Criteria" the name entered in the previous step and click on "**Start Search**".
4. To remove a saved search criteria click the "**Remove**".

### 5.12.10.2. Exporting Search Results

The **CSV Export** button lets you export the search result in text format separated by semicolons and can be read by other programs such as Excel format in a simple and plain easier to manipulate the data. Reports of Isoplan can be exported to PDF, Excel and Word, but the formatting of these files cannot be well suited to handle the data in other programs, for example, to create a filter in Excel.

### 5.12.11. Importing Certificates from Presys Laboratory

The Presys calibration laboratory offers the user the option of downloading the calibration certificate data from a standard over the internet into a text file that can be imported into Isoplan. The standard, scales, and certificate can be created automatically by Isoplan by importing this file. To import a pattern and / or certificate do the following:

1. \* Save the downloaded file from the Presys Lab site to a folder on your computer.
2. \* On the Standard screen, click the **Main>Import Presys Certificate**.
3. Select the file downloaded from the Presys website and click **Open**.
4. Wait for the message that the standard has been imported.

#### Comments:


- The accuracy and acceptance criteria are not part of the Presys certificate and should be reviewed by the Isoplan user.

- The acceptance criteria used by Isoplan is based on the accuracy of the standard or the sum of the error and uncertainty of the certificate, this value may not be adequate for the needs of the laboratory.
- **This import feature is for the sole purpose of saving typing time. The responsibility to verify that the data is correct according to the laboratory procedures remains with the user who electronically signs the standard calibration data document in Isoplan.**

### 5.13. Instruments

The instruments represent the equipment to be calibrated (indicators, controllers etc.). ISOPLAN allows the registration of an instrument datasheet and of the instrument scales that are used in case it is necessary to employ other error sources besides the standards during calibration. Refer to the **Toolbar** to create and delete registers.

#### Registered instruments

List of registered instruments. Use the button  to perform an **instrument search**.

### 5.13.1. Register of Instruments

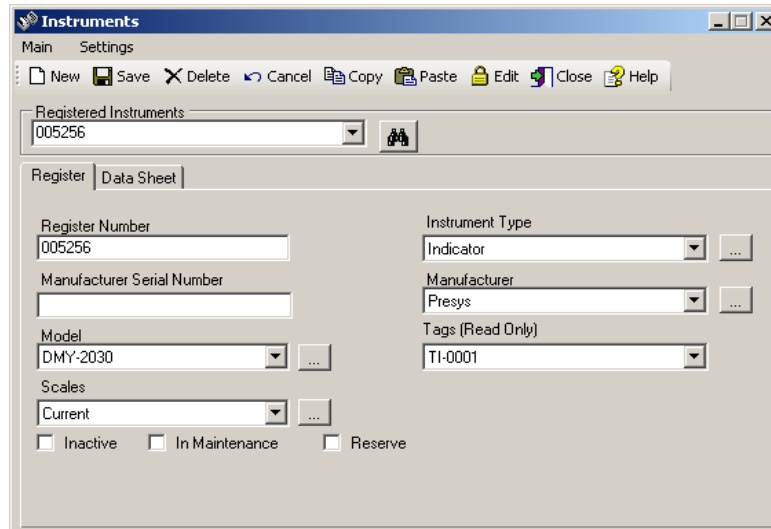


Figure 39 - Register tab in the Instruments dialog box.

This screen presents the main instrument data to be registered in ISOPLAN. The fields on this screen are as follows:

#### Registration Number

Alphanumeric field that identifies the instrument. This field may contain the manufacturer's serial number or an internal number of the company that identifies each instrument.


#### Type of Instrument

One of the **types of instrument** previously registered in the program.


#### Model

List of registered instrument model. Click on the button  to change the list of models of the instrument.

#### Manufacturer

List of registered instrument manufacturers. Click on the button  to change the list of manufacturers of the instrument.

**Scales**

List of registered instrument scales. Click on the button  to change the list of scales of the instrument.

**Inactive**

Select this field to indicate that the instrument is inactive due to a failure that cannot be repaired or due to some other reason.

**Maintenance**

Check to indicate that the instrument is in maintenance. Optional data.

**Reserve**

Check to indicate that it is an instrument of reservation. Optional data.

**Tags (Read Only)**

List of tags associated with this instrument. This list is populated as the tags are registered, you cannot add tags through this screen.

### 5.13.2. Instrument Datasheet<sup>5</sup>

When a type of instrument is selected, ISOPLAN automatically presents a list of properties that can be registered. This list is only shown if the properties have been registered on the **Types of Instruments** screen. The **Value** column is to be filled in by the user.

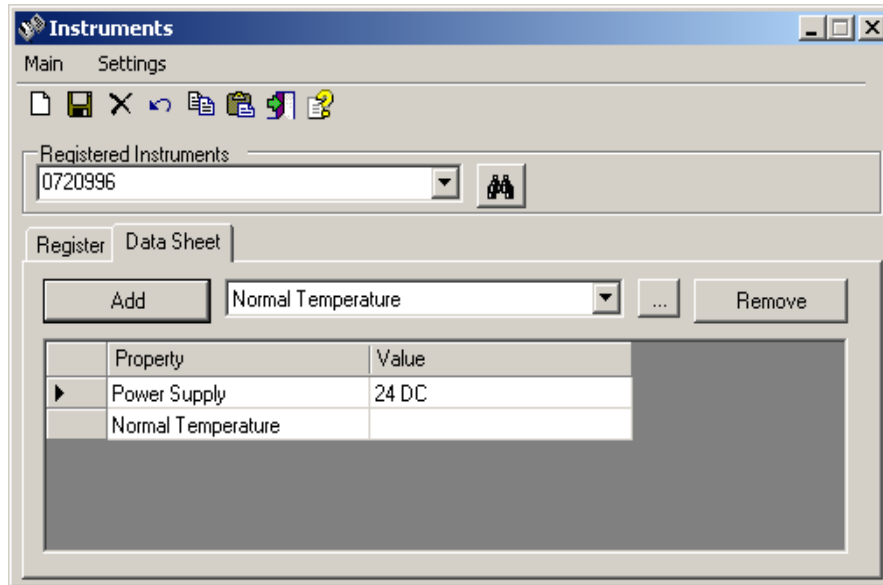


Figure 40 Register tab in the Instrument Data-sheet dialog box

#### 5.13.2.1. Adding and Removing Properties

The register of an instrument datasheet allows properties to be added or removed only from a specific instrument. To add a new property, select it from the list in the center of the screen and click on the **Add** button. To remove an instrument property, click on the square next to the desired property to select it and then click on the button **Remove**. To register, click on the button **...**. It is not necessary to fill in all properties.

<sup>5</sup> Available only on Isoplan with Datasheet module (DSh)

### 5.13.2.2. Datasheet Report

To print a list with the instrument datasheet, click on **Main > Print Preview**. The **Settings > Datasheet** menu has two options: **Show blank values** - prints full datasheet including blank values; and **Do not show blank values** - prints datasheet without blank values.

PRESYS Instrument Data Sheet					
COMPANY: Presys Instrumentos e Sistemas					
R.N.: 0720996	INST. TYPE: Temperature Transmitter				
MODEL: TY-2690					
MANUFACT: Presys					
<table border="1"> <thead> <tr> <th>PROPERTY</th> <th>VALUE</th> </tr> </thead> <tbody> <tr> <td>Power Supply</td> <td>24 DC</td> </tr> </tbody> </table>		PROPERTY	VALUE	Power Supply	24 DC
PROPERTY	VALUE				
Power Supply	24 DC				
10/3/2009 DATE	User Administrator RESPONSIBLE				

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Figure 41 - Instrument Datasheet Report

### 5.13.3. Photo

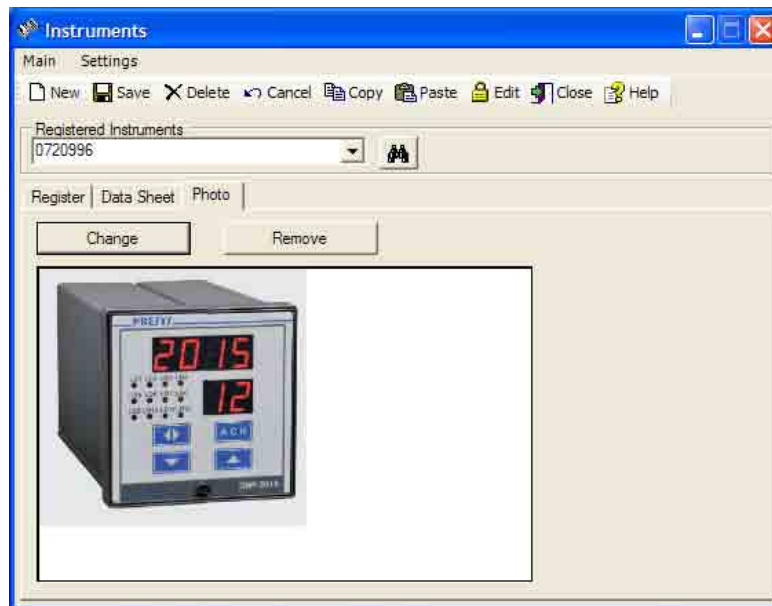


Figure 42 - Photo tab in the Instruments screen

Click on **Change** to add or modify a photo and on **Remove** to remove the photo associated to the instrument. This option need to be activated in the configuration menu.

### 5.13.4. Instrument Search

The **Instrument Search** dialog allows you to search for instruments among those already registered according to the characteristics specified in the tab **Form** for register number, instrument type, model, manufacturer, active or inactive situation and existence of tag associated to this instrument. Instrument registers can also be sorted according to registration number or tag.

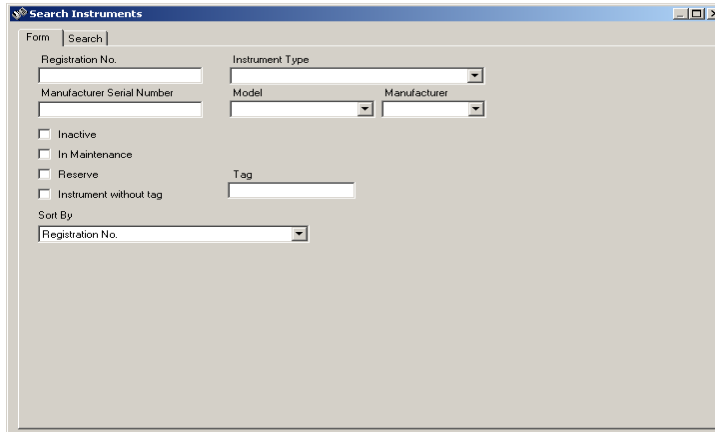


Figure 43 – **Form tab** in the Instrument **Search dialog box**

The fields whose information is irrelevant to the search can be left blank. A search can be made knowing only a few characters. For example, by typing 01 for the registration number, all instruments whose registration number contains 01 will be shown.

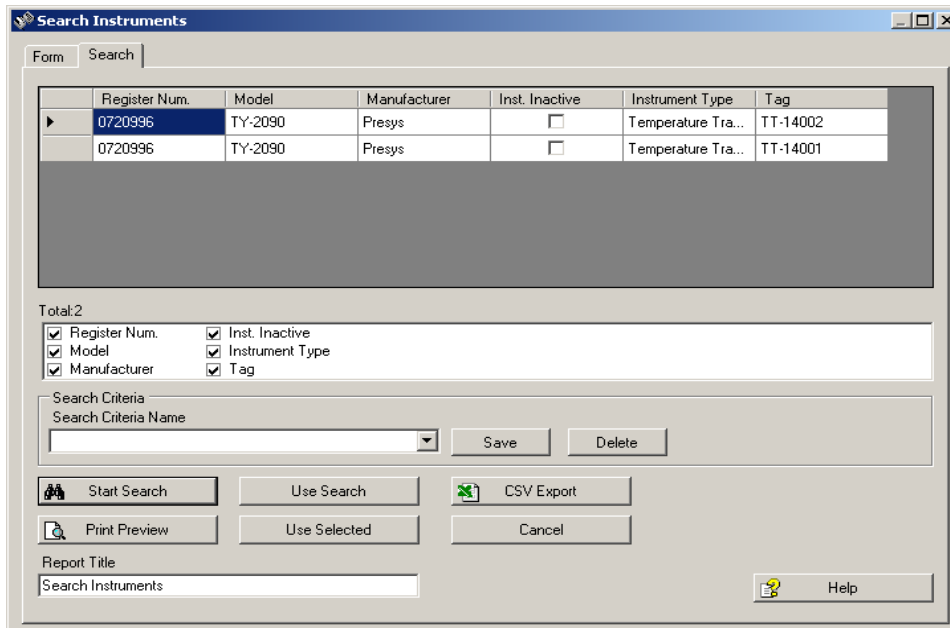


Figure 44 – **Search tab** in the Instrument **Search dialog box**

Click on the **Start Search** button for Isoplan to start the search. The search result will be written in a box in the upper part of the window and it can be printed as a report with a title (edited in the **Report Title** box) and date. Below the search screen there is a list with the columns of the table, unselect any column that has no interest that appears on the screen or in the print preview. The **Print Preview** button allows a report with the search result to be previewed on the screen. The **Use Search** button transfers the instruments of the search to the **Instruments** box in the main dialog box. The **Use Selected** button can be used to display only the selected instruments.

PRESYS Search Instruments					
Registration Num.	Model	Manufacturer	Inactive	Instrument Type	Tag
0720996	TY-2090	Presys	No	Temperature Transmitter	TI-14002
0720996	TY-2090	Presys	No	Temperature Transmitter	TI-14001

10/5/2009	User Administrator
DATE	RESPONSIBLE

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Figure 45 – Report Instrument Datasheet

### 5.13.4.1. Saving a Search Parameters

The search screen instrument provides an option to save the search criteria for use later. Having performed a search using one or more filters, for example, equal to Presys manufacturer, can save this criteria give a **name** for it and clicking **Save**. This name will be saved in the list below the **Search Criteria Name** field. Click the name of the Start button and search for the search to be redone without the need to fill the filters tab **Form**.

### 5.13.4.2. Exporting Search Results

The **CSV Export** button lets you export the search result in text format separated by semicolons and can be read by other programs such as Excel format in a simple and plain easier to manipulate the data. Reports of Isoplan can be exported to PDF, Excel and Word, but the formatting of these files cannot be well suited to handle the data in other programs, for example, to create a filter in Excel.

### 5.13.5. Register of Scales

An instrument can have several scales; for ISOPLAN a scale corresponds to a combination of input and output of the instrument. The scale is used in case it is necessary to register extra uncertainties of type B associated to the instrument (for example, instrument resolution, hysteresis etc.) and the manufacturer's accuracies for a certain instrument scale. It is possible to calibrate the instrument without using the scale register. See the **Toolbar** page for creating and deleting records.

### Registered Scales

List of registered scales.

### 5.13.5.1. Scale

A scale corresponds to a combination of input and output of the instrument. If the instrument has multiple channels, it is not necessary to register a scale for each channel provided that all channels present the same characteristics. For example, in the case of an instrument with 10 reading channels of PT-100 sensor, a single channel can be registered and it will be used later to register **Tags** for all channels of the instrument.

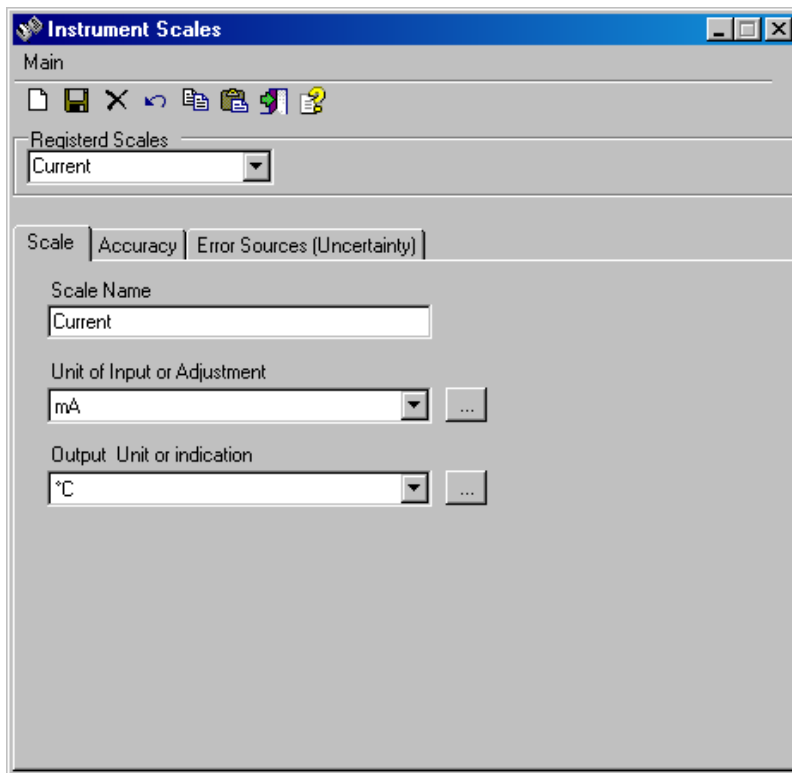


Figure 46 – **Scale** tab in the **Instrument Scales** dialog box

#### Scale Name

A name for the scale (e.g. temperature), if the instrument has a scale to measure temperature. This field is a free text, but it is not possible to register two scales with the same name for the same instrument.

#### Input Unit or Adjustment

Unit used in the instrument input in case it is a meter or transmitter. If the instrument is a source, the unit would be the one with which the source is adjusted.

### Output Unit or Indication

Unit used in the instrument output, for example a transmitter or a source. In the case of an indicator instrument, the indication unit must be used. For example, for an indicator with 4 to 20mA input and 0 to 100% indication, the input unit would be mA and the output unit would be %.

### 5.13.5.2. Accuracy

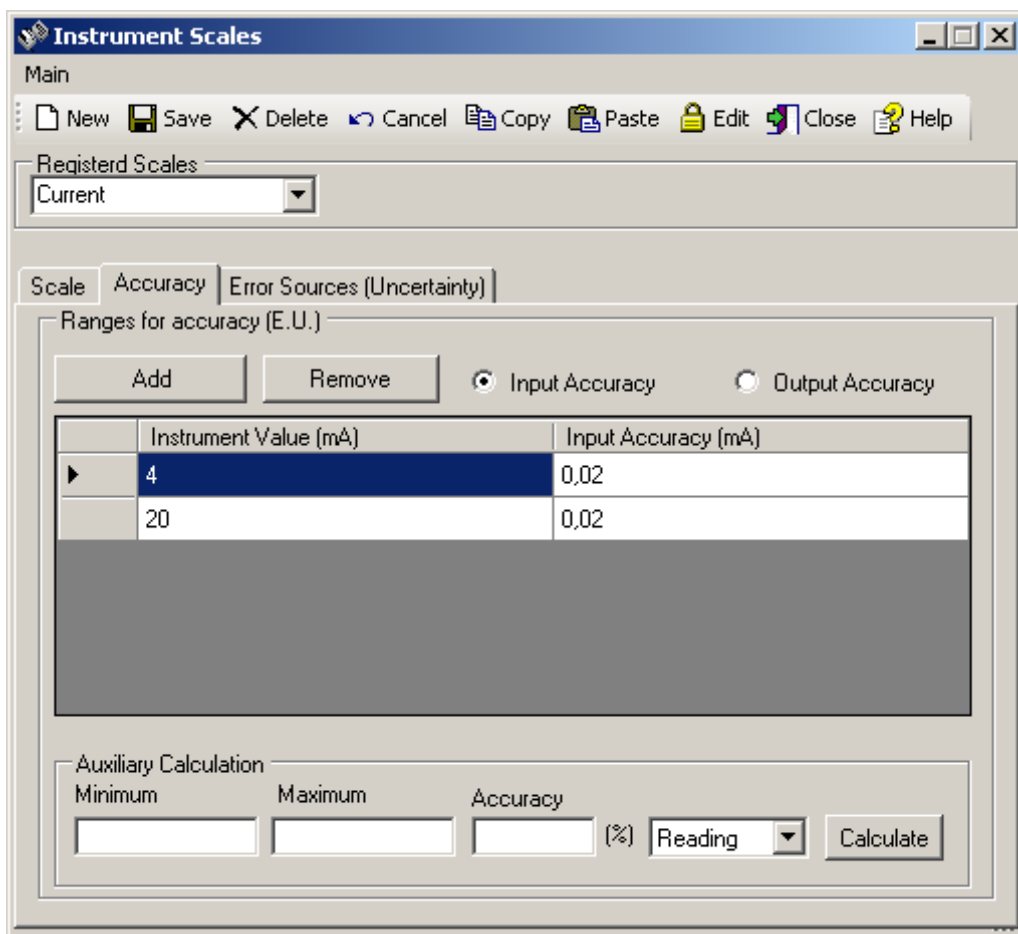


Figure 47 – Accuracy tab in the Instrument Scales dialog box

Table with the manufacturer's accuracy for the scale that is being registered. An instrument can have different accuracies depending on the input value applied to it. In this case, several accuracy values can be registered. The **Instrument Value** field represents a value applied to the instrument input and the **Input Accuracy** field represents the value in engineering unit of the instrument input of the accuracy provided by the manufacturer. Isoplan allows also to register the instrument's output accuracy, simply check the **Output Accuracy** option and fill in the corresponding field in the table. For example, in the case of a temperature transmitter with PT-100 input, unit in °C and 4 to 20mA current output, the input accuracy must be fill in (°C) and the output accuracy must be fill in mA. The **Add** and **Remove** buttons are used to add or remove,

respectively, values defined as accuracy for the instrument. Click on the square beside the instrument value before clicking on the button **Remove**.

The fields of the group **Calculation Assistant** are intended to convert the instrument specifications as a percentage of full scale, span and reading to engineering unit. Enter the minimum and maximum value of the instrument range, enter the value in percentage, choose one of the options (Reading, Span or Full Scale) and click **Calculate** for Isoplan to perform the calculations.

### 5.13.5.3. Error Sources

Besides the uncertainty value due to the calibration standards, it is possible to add other uncertainty components related to the instrument scale that is being calibrated by ISOPLAN. These uncertainty components were called sources of error in ISOPLAN. An example of an error source is the effect of variation in ambient temperature on the value measured by the instrument. To add a new error source, fill in the name for the error source and click on the **Add** button. To remove an error source, click on the **Remove** button.

The uncertainty due to an error source is registered by filling in the table present in the group called **Ranges**. First click on the **Add** button and then fill in the table. The uncertainty can be defined with different values according to the value applied to the instrument input. To remove a line from the table, click on the **Remove** button.

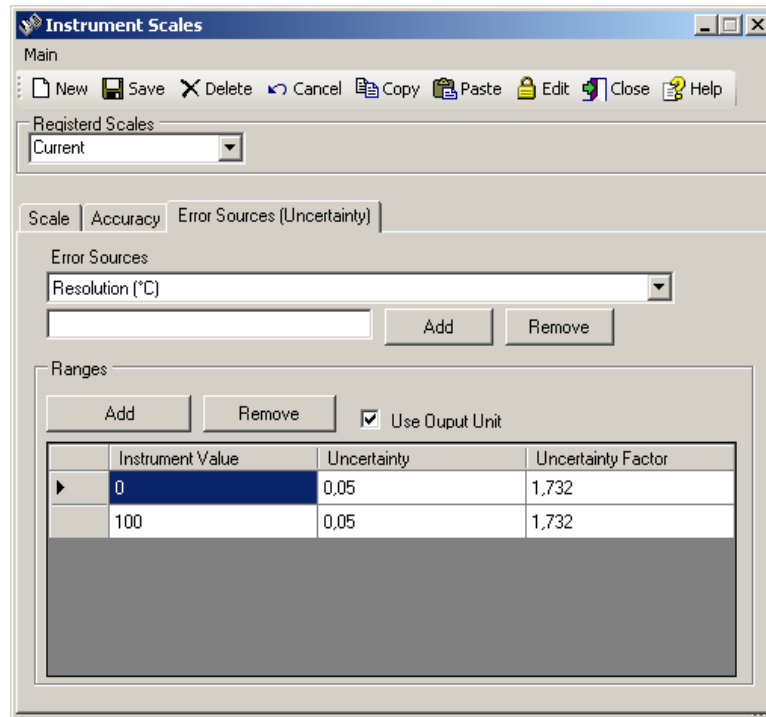


Figure 48 – **Error Sources** tab in the Dialog Box **Instrument Scales**

**Instrument value**

Value applied to the instrument input. If the **Use Output Unit option** is selected, this value must be in the instrument output unit. For example, for a transmitter with PT-100 input, unit in °C and 4 to 20mA output, the unit to be used will be °C if the **Use Output Unit option** is not selected, and mA if it is.

**Uncertainty**

The uncertainty value due to the error source that is being registered corresponds to the instrument value. This value must be in the same unit as that of the **Scale** tab. The value of this uncertainty can be provided by the manufacturer or obtained through some other kind of research made by the user.

**Uncertainty Factor**

The uncertainty due to a certain error source usually follows a probability distribution (rectangular, triangular, normal etc.). Depending on the type of distribution, it is necessary to input a factor that will be used in order to obtain the standardized uncertainty to be employed to calculate the uncertainty of the standard. For rectangular distribution, the uncertainty factor is 1.732 (SQRT(3)), for triangular distribution, the uncertainty factor is 2.4495 (SQRT(6)) and for normal distribution, the uncertainty factor is 2.

### Adds Automatically to Download

This option is for automatically adding an uncertainty component associated with the scale of the instrument, eg resolution. The purpose of this option is to prevent the user from having to choose the extra uncertainty components at each instrument calibration.

### 5.13.6. Register of Models

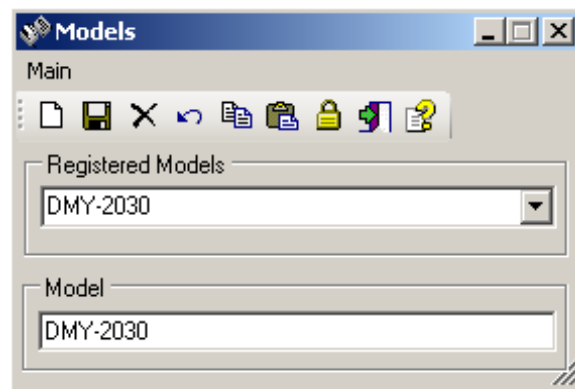


Figure 49 - Dialog box Models

This screen displays the models of registered instruments in ISOPLAN. Refer to the **Toolbar** to create and delete registers.

#### Registered Models

List of registered instrument model.

#### Model

Instrument model. This is a free text field, but it is not possible to register two models with the same name.

### 5.13.7. Register of Manufacturers

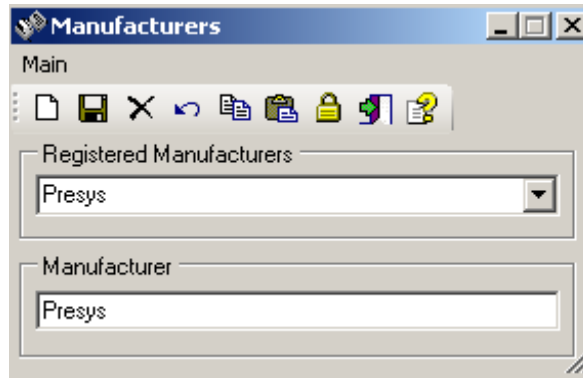


Figure 50 - Dialog box Manufacturers

This screen displays the manufacturers of registered instruments in ISOPLAN. Refer to the **Toolbar** to create and delete registers.

#### Registered Manufacturers

List of registered instrument manufacturers.


#### Manufacturer

Instrument manufacturer. This is a free text field, but it is not possible to register two manufacturers with the same name.


## 5.14. Tags

For ISOPLAN, tags are the points of measurement or indication of the process in which the ISA terminology is generally used to identify each tag. In ISOPLAN each tag must be associated to an instrument - identified by the registration number - , which effectively carries out the measurement. If the process does not change, the tag normally remains the same and through time the associated instrument is changed due to failures, replacement by a newer model etc. The screen presents tag identification fields, which are described below, and several tabs, explained in separate topics, to define the tag calibration strategy. After all tabs have been filled in, the tag can be saved. Refer to the **Toolbar** topic to create and delete registers.


### Registered Tags

List of registered tags. Use the button  to make a tag search.

### Area

Area or sector that defines the location of the tag in the plant. Select one of the areas available or use the button  to register a new area.



### Client<sup>6</sup>

This field define which client the tag is associated. Select one of the clients available or use the button  to register a new client.

### Tag Name

Name that identifies the tag and normally follows ISA terminology, for example, TT-101 for a temperature transmitter.

### Instrument

Instrument associated to the tag and identified by the registration number. Choose one of the instruments available on the list or use the button  to register a new instrument. Use the button  to filter the instruments shown on this list through the **Instrument Search**.

### Cal./Verif.

It indicates if the tag will be used for calibration or only for verification. In the verification mode the measurements are not registered and ISOPLAN fills in the calibration and strategy data automatically. It is necessary to fill in the items to be verified in the **Verifications** tab.

### Inactive

---

<sup>6</sup> Optional Module Service Provider

<sup>10</sup> Critical Analysis Module

To indicate that the tag is inactive. Inactive tags do not appear in calibration plan.

### **Calibrated Only in Loop**


Option used to indicate that the tag is calibrated in loop, when a loop is calibrated, the date of the next calibration of its component will be updated according to the date of the next calibration of the loop, as long as the calibrated only in loop option is checked

The tags calibrated in loop appear in the calibration plan and in the critical analysis list <sup>10</sup> with an indication that they are calibrated in loop

### **External Calibration**

Option used to indicate that the tag is calibrated in an external laboratory

#### **5.14.1.1. Criticality Register**

Criticality of the Tag. Select one of the criticalities available or use the button  to register a new criticality.

### 5.14.2. Function/Interval

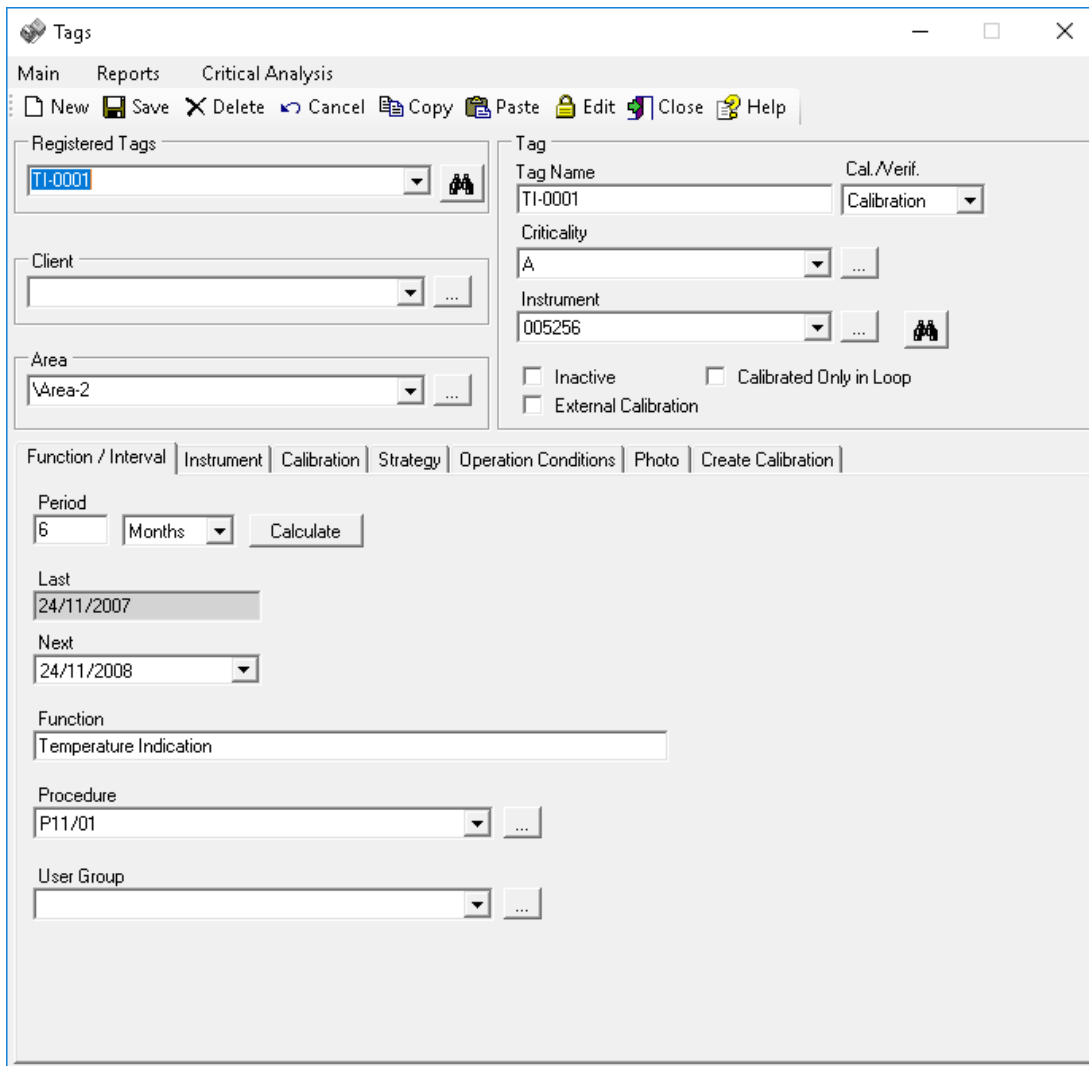


Figure 51 – **Function/Interval** tab in the dialog box **Tags**

Some properties of the tag calibration period and function are defined in this tab. The fields are as follows:

#### Period

It defines the interval between calibrations in days or months, according to the selected option. If the tag has already been calibrated, Isoplan can calculate the date of the next calibration through the **Calculate** button.

#### Per. Min. and Per. Max.

If the automatic adjustment of frequency was selected in the Configurations screen, then these two fields, corresponding to the minimum and maximum periods

between calibrations, must be filled in. The automatic adjustment cannot change the calibration period outside this interval.

**Last**

Date of last tag calibration. This field is only for consultation and shows when the last calibration using ISOPLAN was made.


**Next**

Date of next tag calibration. This date will be used to develop the **calibration plan**.

**Function**

Text describing the function of the tag.

**Procedure**

Code of the procedure used for the calibration. Select one of the procedures available or use the button  to register a new procedure.

**Accredited Service Type <sup>7</sup>**

Choose one of the services such as Digital Pressure Manometer, Analog Manometer, Temperature Meter with Thermocouple Sensor and others to create a certification certificate for Isoplan. The calibration process is the same regardless of whether calibration is accredited or not. In the certificate there is some optional information that the user can add to the certificate as immersion depth.

**5.14.3. Instruments**

This tab is only for consultation and shows instrument information so that it is possible to check if the instrument associated to the tag is correct. The information is the same as that of the **Instruments** register.

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<sup>7</sup> Accredited Services Module

### 5.14.4. Calibration

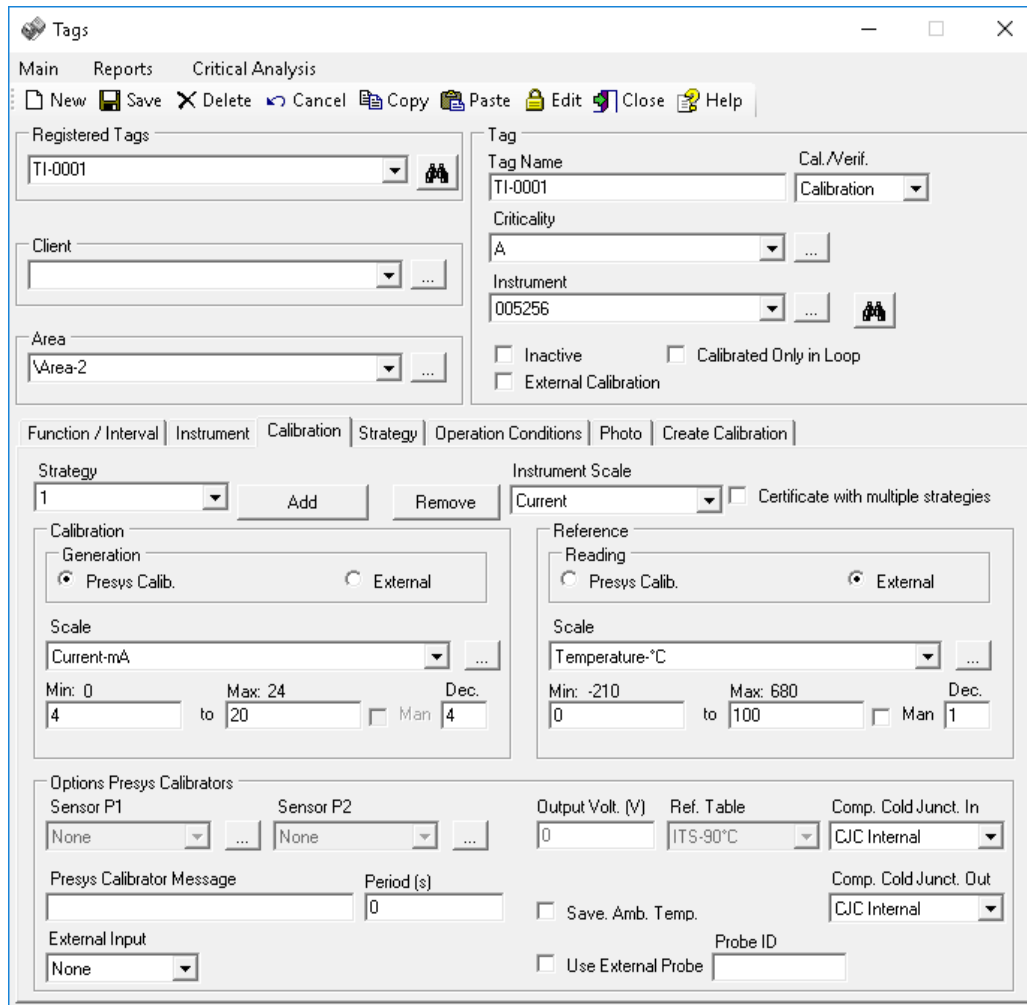


Figure 52 – Calibration tab in the dialog box Tags

In this part of the screen the calibration data that will be sent to Presys calibrators or collected manually begin to be defined. Information about the signal that will be applied to the instrument input and that will be read in the instrument output is presented on this screen. The fields in this tab are as follows:

#### Strategy

The calibration strategy consists of all settings that must be used to calibrate an instrument - for example, signal applied to instrument input, calibration points etc. ISOPLAN allows up to two different strategies, called strategy 1 and strategy 2, and more than one strategy can be used per tag. For example, in the case of a controller that calibrates instrument input and output independently, one strategy can be created for the input and another for the output. A new tag presents at first only one strategy (strategy 1). If you need to create another strategy click the button **Add** and if you need to remove an existing strategy click the **Remove** button. To change strategy simply click on the list of the strategy field. Normally each strategy will present an independent calibration

certificate. Use the Certificate with multiple strategies option so that the same certificate can present more than one calibration strategy or range.

### Instrument scale

If the instrument scale register was used, then the **instrument scale** must be associated to the calibration strategy. Data about **instrument error sources** can be used to calculate the uncertainty in the calibration certificate. The units used in the instrument register and in the calibration strategy must coincide so that ISOPLAN can calculate automatically the effect of these error sources on the uncertainty of the instrument certificate.

### Calibration

In the **Calibration** section, the calibrator output signal (generation), which can also be interpreted as the signal that will be applied to the instrument input, is defined. The **Generation** field has two options:

1. **Calib. Presys** : In this mode the **Scale** list displays only the Presys calibrator scales.
2. **External**: in this mode the **Scale** list shows the external scales according to the **Scales** register. External scales are used when Presys calibrators will not be used to generate a signal.

### Scale

The **Scale** list shows the available scales according to the previous option. Below the list, it is possible to define the minimum and maximum values of the calibration range (signal applied to the instrument input). The **Decimals** field shows the number of decimal places that will appear in the certificate for the calibrator output signal. In the case of a Presys calibrator this number of decimals cannot be changed. If an external scale is being used, the number of decimals can be defined by clicking on the **Man.** option. By default the number of decimals is the same as that defined in the **Scales** register.

### Reference

In the **Reference** group, the calibrator input signal (reading) is defined which can also be interpreted as the output signal of the instrument. This group has configuration analogous to the group of calibration where there is option to use scales of the Presys calibrators or external calibrators and again must be defined a minimum and maximum value that in this case corresponds to the output of the instrument. This reference signal is not always measured, in case of indicators this signal is read by the user and an external scale must be used.

### Presys Calibrator Options

**Save Amb. Temp.:** select this option if the calibrator has a port for RTD probe and you want to use this probe to measure the room temperature.

**Ref. Table:** in the case of thermocouple or thermoresistance reading or generation, choose the temperature scale and unit. Normally the ITS-90 scale is used.

**Output Volt.:** a level of calibrator output voltage must be defined if the calibrator is used to generate frequency.

**Sensors P1 and P2:** see the explanation below about Presys equipment for measuring pressure.

### Presys Calibrator Message

Text shown in the display of Presys calibrators before calibration.

### Stabilization Time

indicates the stabilization time used by Presys calibrators. It is mainly used with Presys thermal baths and this period indicates the time to elapse after the bath reaches the temperature of the calibration point, before measuring the value of the instrument (temperature of a sensor, output signal of a transmitter etc.). When using Presys calibrators that require values to be typed in (indicators, manometers etc.), this period should be zero. It must also be zero if a manual pressure pump is used together with Presys calibrators.

### Comp. Cold Junction Input /Comp. Cold Junction Output

Selects the option of cold joint compensation to measure or simulate thermocouples. The option uses CJC Internal temperature compensation using the internal sensor calibrator and the option CJC Ext. Probe uses an external sensor connected to thermoresistance side entrance for measuring the temperature of the cold junction.

## 5.14.4.1. Using Presys Calibrators to measure Pressure

If a Presys pressure measurement calibrator (PC-507 or other) is used to calibrate an instrument that has a pressure port (manometers, P/I converters etc.), it is necessary to define the scale shown in the **Calibration** group as **Pressure P1 or Pressure P2** and the unit to be used. The **Pressure P1-P2** option is used to measure differential pressure. In addition to setting the correct scale should be set in the **Presys Calibrators Options**, the capsule you want to use for pressure P1 or P2, for example a capsule from 0 to 30 psi. When calibration information is sent to the Presys equipment (**download**), the program will search in the **standard register** which sensor has the desired range. In the case of calibration of instruments that generate pressure, such as an I/P converter, this configuration must be made in the **Reference group**.

## 5.14.4.2. Using Presys Thermal Baths

In the case of Presys thermal baths (T-25N, T-350P etc) it is necessary to define the scale present in the **Calibration** group as **Temp. Probe** , which means that the internal probe of the bath will be used to measure the temperature.

#### 5.14.4.3. Calibration of safety valves (PSV Module)<sup>8</sup>

Calibration of safety valves can be performed on Isoplan in conjunction with Presys DMY2017-PSV calibrator on Isoplan with PSV module. To perform this type of calibration, the tags screen must be configured as follows:

1. In the **Calibration** tab, use the generation scale in the Presys Calib. mode and the **PSV Pressure scale**.
2. Choose the operating range of the valve, eg 0 to 10 kgf/cm<sup>2</sup>
3. In the strategy tab add two calibration points, the first point corresponds to the closing of the valve and the second the aperture, the same value can be used for the two points.

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<sup>8</sup> Available only on Isoplan with safety valve module (PSV)

4. Fill in the value of acceptance criteria, in pressure unit, of the first point corresponding to the closing of the valve and the second point corresponding to the opening of the valve. Isoplan also allows the automatic calculation of the acceptance criteria according to the tolerances of the American Standard ASME I and ASME VIII. See in the Appendix the tolerance table used by Isoplan.
5. To use automatic calculation select one of the standards and click the calculate button. Isoplan shall automatically calculate the tolerances according to the selected standard.

#### **5.14.4.4. Calibration of Block Valves (PSV Module)<sup>9</sup>**

The PSV module allows the calibration of blocking valves which in the Isoplan corresponds to a leak test where the valve must have the outlet closed and a pressure applied to the inlet. Isoplan evaluates the pressure drop to indicate a possible leak by issuing a specific report for this type of test.

Select type of valve, Block Valve.

#### **5.14.4.5. Switch Calibration**

Isoplan has a specific certificate for switches such as pressure switches or thermostats. To perform the switch calibration, make the following settings in the tags screen:

1. Choose a pressure or temperature signal as the calibration (generation) scale depending on the type of switch used.
2. Choose the "Presys Calib." and the Switch SW-SW scale to indicate that the output of the instrument corresponds to a switch, for example a contact.
3. In the calibration strategy, place only two calibration points, where the first point corresponds to the reset of the switch and the second corresponds to the alarm.

Presys calibrators presently do not allow switch calibration through download to field calibrator, and manual download and calibration with contact input must be performed as explained in the manual of calibrator.

The readings of switch certificate correspond to the alarm or reset points of the key.

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<sup>9</sup> Available only on Isoplan with safety valve module (PSV)

#### 5.14.4.6. Digital Output Reading with Presys Calibrators

Advanced Presys calibrators allow to read the digital output of HART and Profibus instruments. To use this feature enable the **External Input** option of the tab **Calibration > Options Presys Calibrator**. The reading range should remain as the External option, even if in this case the output is read by the Presys calibrators. Set the reading with scale according to the instrument's digital output, for example, for temperature indication choose an external scale Temperature ° C. . . The available options are as follows:

##### **HART**

Used for reading instruments with digital output using the HART protocol. The address of the instrument must be set in the **HART Address field**.

##### **PROFIBUS**

Used for reading instruments with digital output using the PROFIBUS PA protocol. The address of the instrument must be set in the **Profibus Address** field and the index of the block containing the digital output can usually be left as zero.

### 5.14.5. Strategy

The fields in this tab are linked to strategy 1 or 2, as explained in the topic about the **Calibration** tab. The fields of the screen are described below.

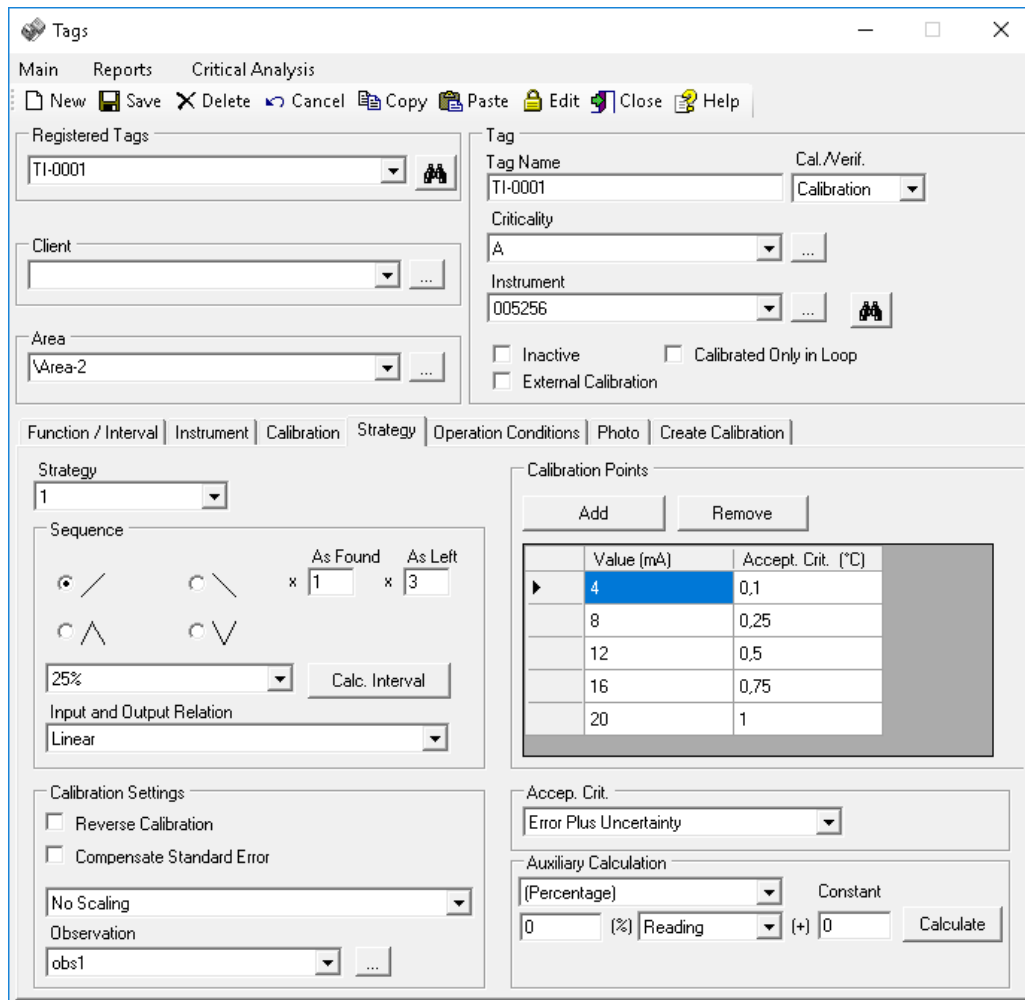


Figure 53 – Strategy tab in the dialog box Tags

#### Sequence

There are four sequence options: 1) **up** ↗ ; 2) **down** ↘ ; 3) **up-down** ^ ; 4) **down-up** v

**As Found and As Left:** Indicates the number of times the as-found or as-left calibration points will be repeated.

**Automatic Calculation of Calibration Points:** The **Calc. Interval** button allows the calibration points to be calculated automatically. Choose one of the options (10, 20 or 25%), click on the **Calc. Interval** button and the calibration points will be shown in the table on the right.

**Input / Output Relation:** The instruments that are normally used have a linear relation between the signal applied to the instrument input and the signal read in the output. There is an alternative to use the Square Root option – normally for flow meters in which the output signal is proportional to the **Square Root** of the input. The option called **Inverse (1/x)** allows you to calibrate conductivity meter where in the certificate must appear as input signal resistance and output signal conductivity, inverse of resistance. The **Pt-100 (IEC) ITS-90** option allows the PT-100 formula of the ITS-90 standard to be used as the input and output ratio.

### Calibration Points

This table shows the calibration points that will be used. As previously explained, ISOPLAN allows the calibration points to be calculated automatically. It is also possible to add and remove calibration points by clicking on the **Add** and **Remove** buttons. To remove a point, select it by clicking on the square on the left-hand side of the table next to the calibration point.

### Acceptance Criteria


In order to validate a calibration certificate, a criteria must be defined to approve or reprove a certificate. This criteria is a numeric value individually defined for each calibration point and is in engineering unit. This value is in the second column of the calibration points table. Isoplan provides two options: **Only error** – in this case, ISOPLAN suggests the certificate should be approved if  $|E| \leq \text{acceptance criteria}$ , where  $|E|$  is the error module **Error plus uncertainty** – ISOPLAN suggests the certificate should be approved if  $|E| + U \leq \text{acceptance criteria}$ , where  $|E|$  is the error module and  $U$  is the uncertainty of the calibration point.

### Automatic Calculation of the Acceptance Criteria Values


If the acceptance criteria is defined as a percentage of reading, span or full scale, ISOPLAN allows the acceptance criteria values of the Calibration Points table, which must be in engineering unit, to be calculated automatically based on the acceptance criteria as a percentage plus a constant in engineering unit. Input the percentage value in the field next to the (%) and the constant value in engineering unit in the field Constant, choose the type of calculation (percentage of reading, span or full scale) and click on the **Calculate** button.

## Calibration Settings

Defines some settings for calibration:

- **Reverse Calibration:** calibration performed in Isoplan is usually done by setting a desired value on the standard that is applied to the input of the instrument and reading a value indicated on the instrument where multiple reads the default value is fixed and the value of the instrument may change. In the case of inverted calibration, eg used in an analog pressure manometer, the value applied to the instrument input is adjusted until the instrument displays a desired value and then the value of the standard is read. In the case of multiple readings the value of the instrument instrument is fixed and the value shown in the standard may vary. In the case of multiple reads the value of the instrument is fixed and the value displayed on the standard may change.
- **Corrects Defaults :** option used to correct values indicated by the calibration standards in the certificate, for example, if a standard displays 10.00, but in the certificate indicates that for this value the laboratory reference is 9.95 so if this option is enabled, the value of 9.95 will be displayed and no longer the value indicated in the standard display.
- **Certificate and readings with scaled values:** When this option is selected, all values read out at the instrument output are scaled to the input unit, for example, on a transmitter with input from 0 to 100°C and output 4 to 20 mA will display all readings, errors and uncertainties in °C unit.
- **Certificate with scaled values:** in this option the values will only be scaled in the calibration certificate.
- \* **Observation:** selects the observation that will be used in the calibration strategy. Click the button  to check the existing observations or register new observations.

### 5.14.5.1. Observation Register

The button  next to the observation field allows you to enter the observations that appear in the calibration certificate below the table of calibration points.

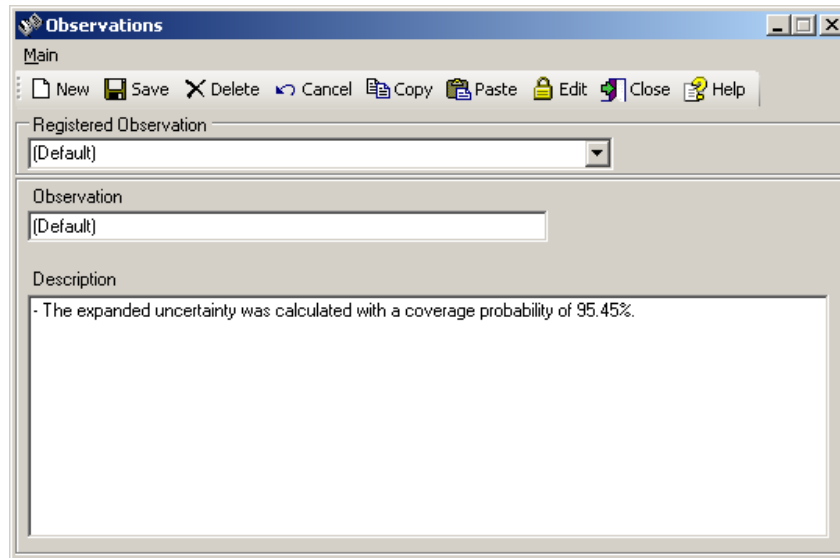


Figure 54 – Observation Register screen

#### Observation

Observation name to facilitate the search of the desired observation.

#### Text of Note

Text that will appear on the certificate, this text can be different for each strategy calibration if desired.

### 5.14.6. Operational Conditions<sup>10</sup>

The registration of tags allows the operation conditions of the tag to be registered. This data is optional and models can be built through the registers of **tag operation conditions**, so that a certain type of tag (transmitter, manometer etc.) will have the conditions ready to be filled in.

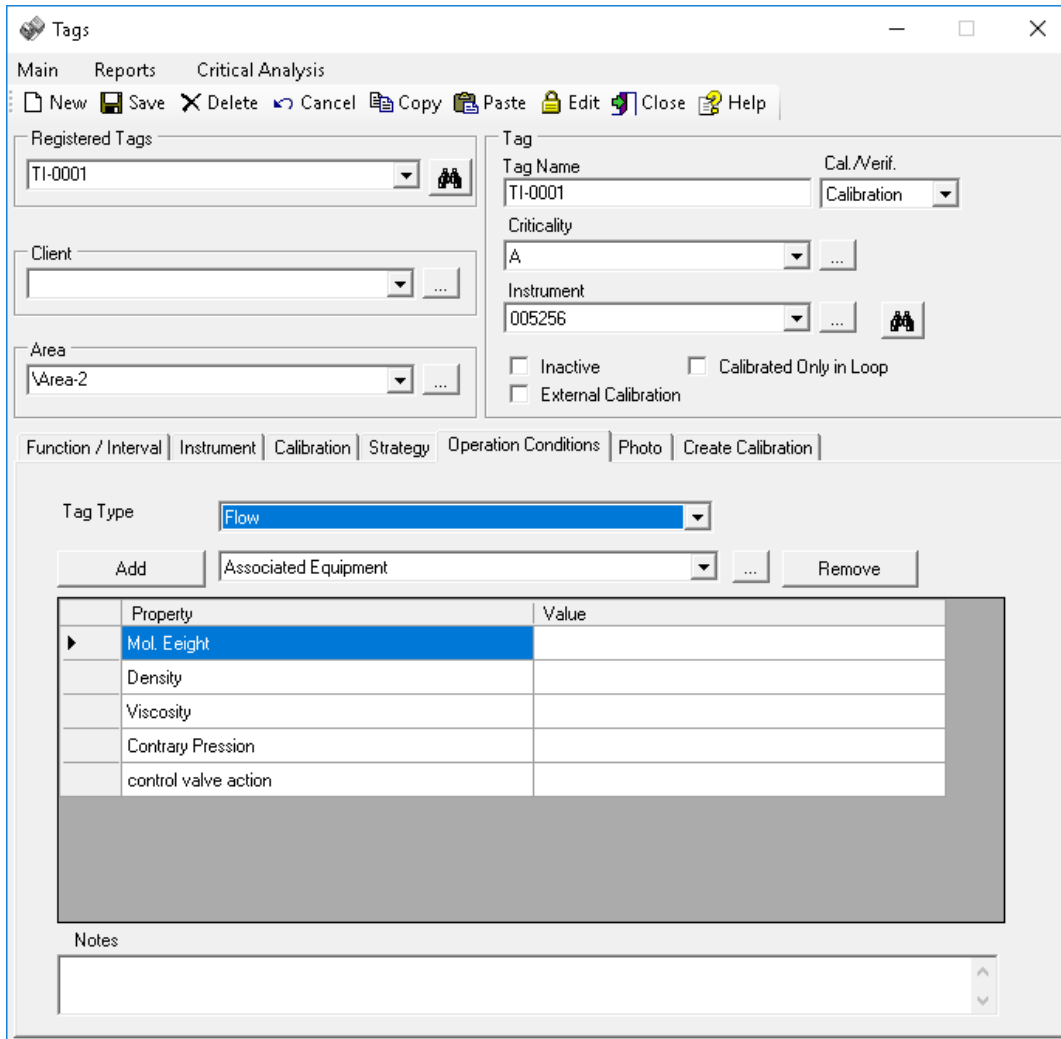



Figure 55 – Operation Conditions tab in the dialog box Tags

<sup>10</sup> Available only on Isoplan with Datasheet module (DSh)

### 5.14.6.1. Preparing an operation condition sheet

1. Choose one of the types of tag from the **Tag Type** list.
2. Fill in the table in the **Value column**. This field is a free text, letters and numbers can be used.
3. In the **Notes** field a brief comment can be added about the tag.

#### Comments:

- If it is necessary to register a specific property for this tag that is not listed in the model, choose one of the properties from the list in the center of the screen and click on the **Add** button. This property will be added only for this tag and will not affect other tags that use the same model. A new property can be created by using the button. 
- Use the **Remove** button to exclude properties from the tag operation conditions. The property will be removed only for this tag and will not affect other tags that use the same template.

### 5.14.6.2. Technical Specification Report

ISOPLAN allows a technical specification report to be generated in the **Reports > Technical Specification** menu. This report combines information from the Instrument Datasheet and the tag operation conditions.

PRESYS		TECHNICAL SPECIFICATION		TAG No.:
		Temperature Transmitter		TT-14001
<b>INSTRUMENT</b>	Reg. Number	0720996		
	Instrument Type	Temperature Transmitter		
	Range	Temperature 0 a 500 (°C)		
	Accuracy	Temperature ± 0.1 (°C)		
	Power Supply	24 DC		
	Normal Temperature			
	Procedure	P11.01		
	Model	TY-2090		
	Manufacturer	Presys		
<b>OPERATIONAL COND.</b>	Tag	TT-14001		
	Area	\Area-1		
	Function	Autoclave Temperature		
	Interval	12 Months		
	Criticality	A		
	Strategy 1 Calibration Scale	RTD-Pt-100 0 <-> 100 °C		
	Strategy 1 Maximum Tolerance	0,16 °C		
	Normal Pressure	5 bar		
	Maximum Pressure	8 bar		
	Normal Temperature	150 °C		
	Maximum Temperature	170 °C		
	Area Classification (NEC)	CLASS 1 DIV. 1 - GROUP C		
	<b>NO - TES</b>			
		10/5/2009	User Administrator	
		DATE	RESPONSIBLE	

Figure 56 - Technical Specification Report

### 5.14.7. Verifications

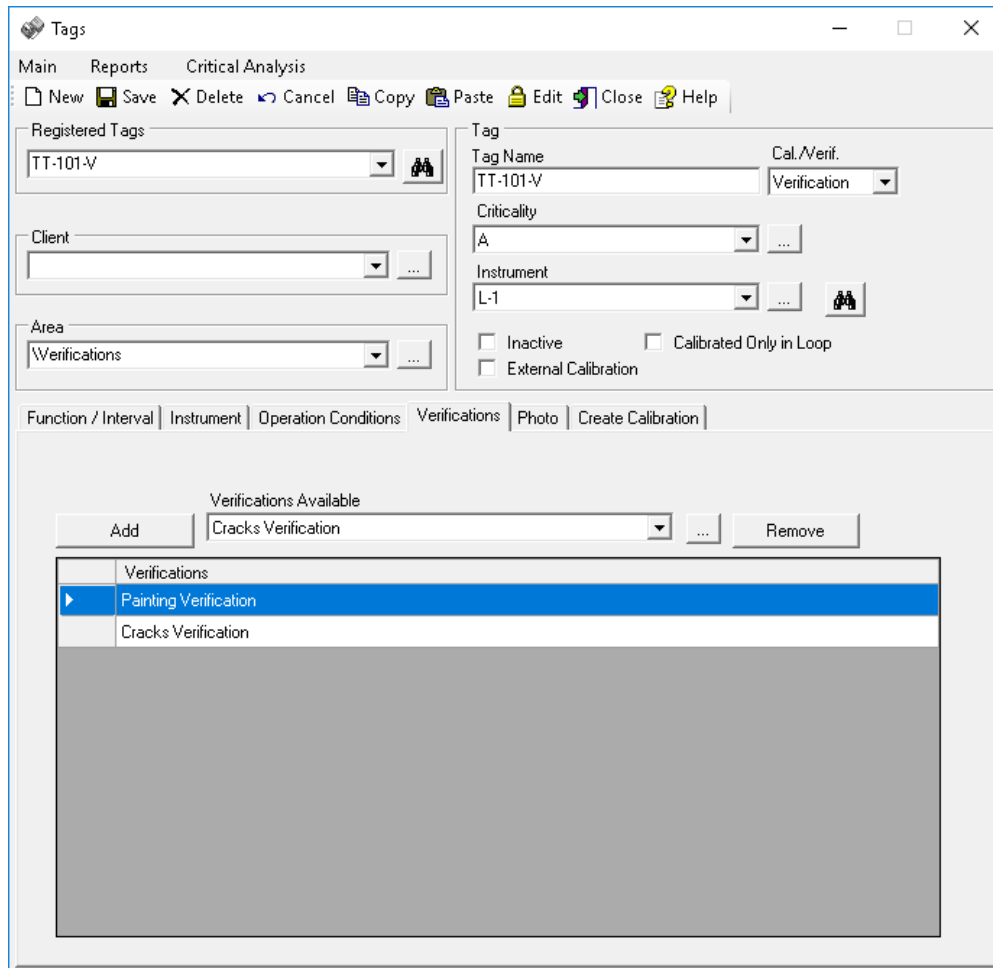



Figure 57 – **Verifications** tab in the dialog box **Tags**

ISOPLAN has a simplified control of instruments that do not require calibration. This control is called **verification**. This tab specifies the items to be checked on the instrument periodically. See **Verifications** register.

Choose one of the items from the list in the center of the screen and click on the **Add** button. This will be one of the items to be verified.

Use the **Remove** button to exclude an item that does not require verification anymore.

Click on the button  in case it is necessary to create a new type of verification that is not available.

### 5.14.8. Create Calibration

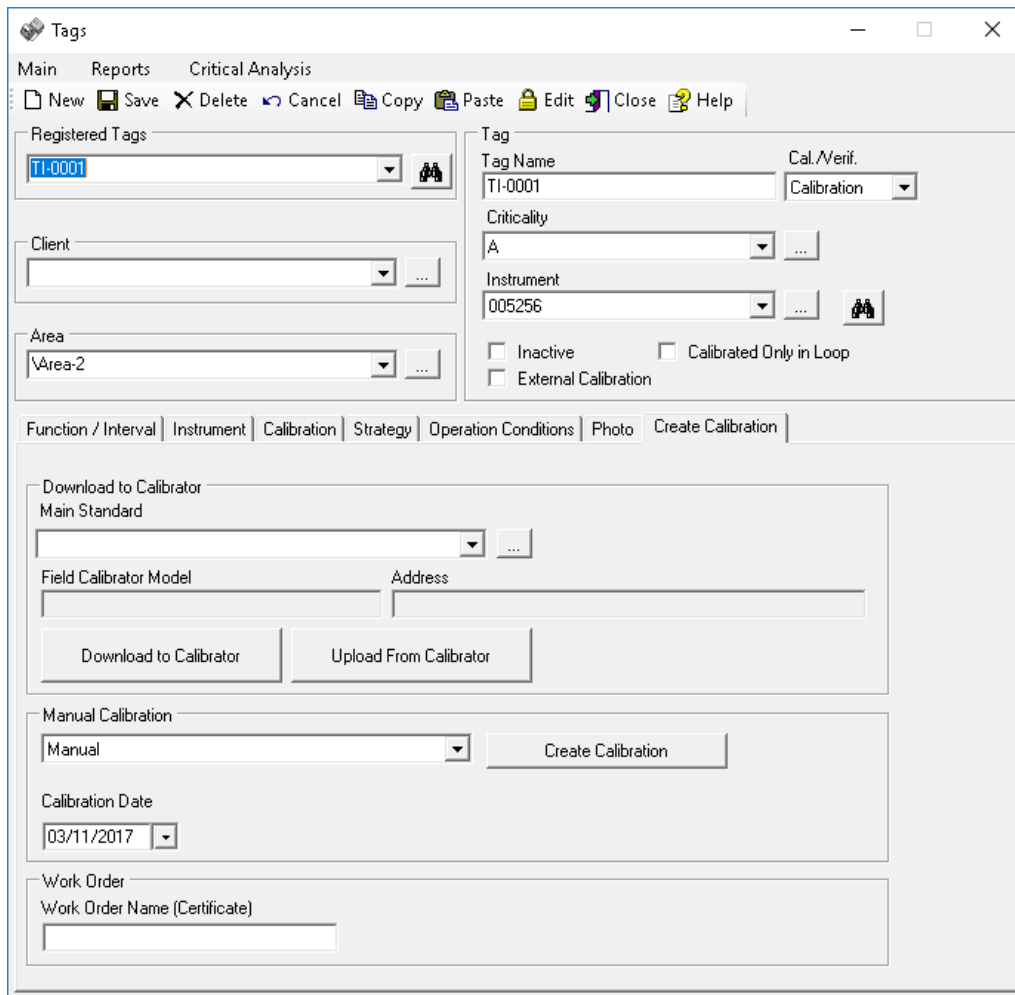


Figure 58 – **Create Calibration** tab in the dialog box **Tags**

The tag registration screen has a link to download and upload to Presys calibrator, you can also do a manual calibration without work order.

### **Download to Calibrator**

To download or upload to Presys calibrator, you must select the standard used, the communications port, and click the Download to Calibrator or Upload From Calibrator button. For more details refer to the manual section 6.2.

### **Manual calibration**

ISOPLAN allows users to create a calibration without the need to generate a work order, to create a calibration select the type of calibration and the calibration date, and click on the Create Calibration button. For more information about the type of manual calibration and external calibration laboratory, see Item 6 of the manual.

The external laboratory calibration without calibration points can be used when is only needed date management with no fill points.

### 5.14.9. Photo Tag

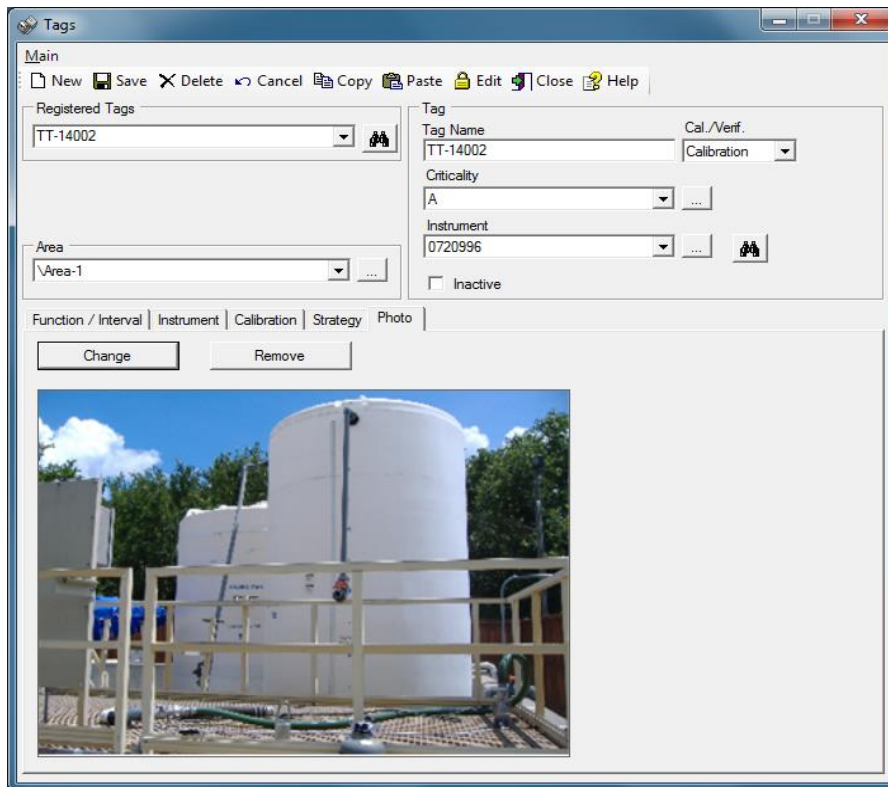


Figure 59 – **Photo** tab in the dialog box **Tags**


Used to add a photo of the location of the tag. Click the **Change** button to add or modify a photo and the **Remove** button to remove a photo associated with the tag.

### 5.14.10. Tag Search

The screenshot shows a 'Search Tags' dialog box with a 'Form' tab selected. The form is organized into several sections:

- Tag Search Section:** Includes a 'Tag' text field, an 'Area' dropdown menu, a 'Search in all sub-areas' checkbox, a 'Tag Type' dropdown, and a 'Criticality' dropdown.
- Date Range Section:** Features 'Last' and 'Next' date pickers, each with a 'to' date picker and a 'DD/MM/YYYY' format indicator.
- Calibration Section:** Contains checkboxes for 'Calibration Due', 'Active', 'Inactive', 'Calibrated Only in Loop', 'External Calibration', and 'Internal Calibration'.
- Client Section:** Includes a 'Client' dropdown and a 'Cal./Verif.' dropdown.
- Analysis Section:** Features a 'Pending Critical Analysis' dropdown and a 'User Group' dropdown.
- Instrument Section:** Includes 'Registration No.' and 'Instrument Type' dropdowns, 'Manufacturer Serial Number', 'Model', and 'Manufacturer' dropdowns, and checkboxes for 'Inactive', 'In Maintenance', and 'Reserve'.
- Sort By Section:** A 'Sort By' dropdown menu currently set to 'Tag'.

Figure 60 – **Form** tab in dialog box **Search Tags**

Through the button  it is possible to search the tags registered in ISOPLAN based on few details about the tag. The search procedure is as follows:

4. Use the **Form** tab to fill in the data that is known about the tag. In the fields that allow texts to be typed in, a search can be made knowing only a few characters. For example, by typing TT for the Tag name, all tags whose tag name contains TT will be shown. The fields that are irrelevant to the search can be left blank. See below further details about how to fill in the fields.
5. Select a sorting criterion in the **Sort By** field at the bottom of the screen.
6. Click on the **Search** tab in the upper part of the screen. Click on the **Start Search** button to search the ISOPLAN register according to the criteria defined in the **Form** tab. The search result is shown in the table in the upper part of the screen. The search result can be printed by clicking on the **Print Preview** button, to check

the result of the printing, and then on the printer icon, to send the report to the printer.

- It is also possible to use the **Use Search** button to transfer the list of tags that were found to the list of tags on the registration screen. The **Use Selected** button can be used to display only the selected tags. Use the **Cancel** button if the list of tags that were found will not be necessary for further procedures.

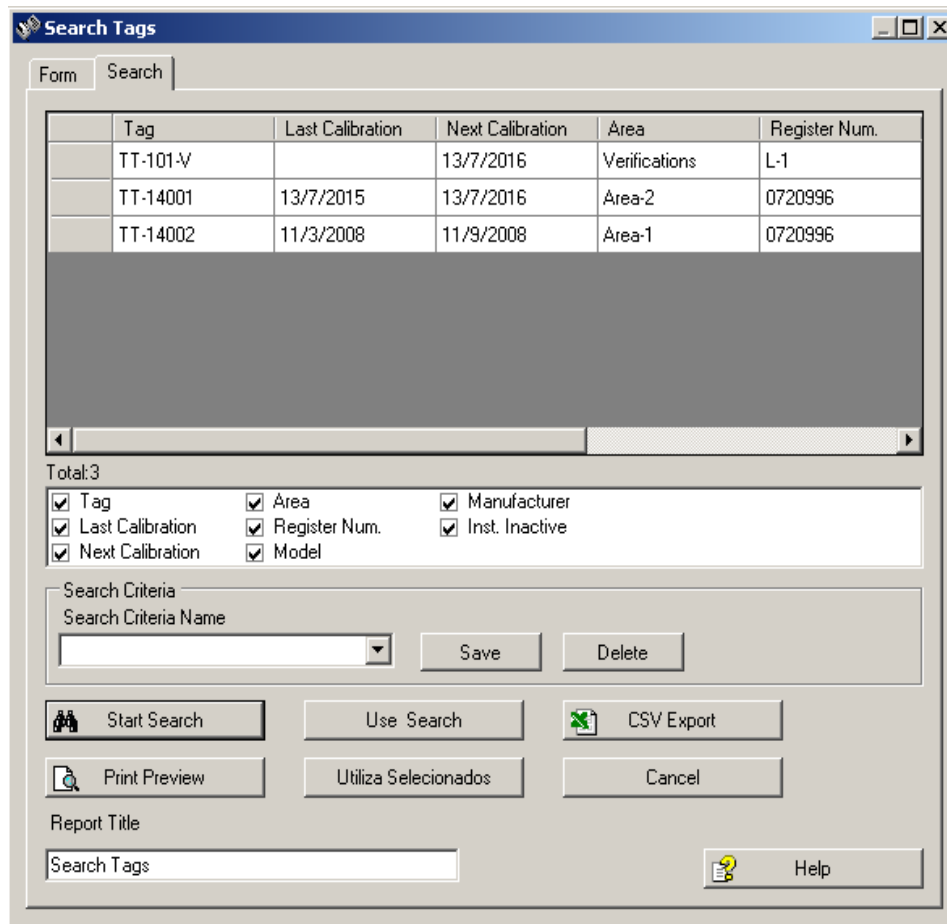


Figure 61 – **Form** tab in dialog box **Search Tags**

**Comments:**

- The **Area** field shows the **Search all sub-areas** option. When this option is selected, the search is made in the selected area and in all sub-areas of the initial area.
- The **Last** and **Next** fields represent the date of the last and next tag calibration, respectively. Both fields allow three options: a) fill in the date on the left only – in this case, calibrations **from** the specified date on will be searched for.. b) fill in the date on the right only – calibrations performed **until** that date will be searched

- for c) fill in both dates – calibrations performed during the time interval between the specified dates will be searched for.
- The Inactive field allows the search of tags associated to inactive instruments.

#### 5.14.10.1. Search Criteria

The group called **Search Criteria** allows you to save search criteria used. To use this feature do the following:

1. To perform a search on Isoplan usually using a filter, for example, tags that begin with the letter "T" ("T").
2. Enter a name for this search criteria, for example, "Temperature Tags" and click **Save**.
3. To use this search criteria in the choice list "Name Search Criteria" the name entered in the previous step and click on "**Start Search**".
4. To remove a saved search criteria click the "**Remove**".

#### 5.14.10.2. Exporting Search Results

The **CSV Export** button lets you export the search result in text format separated by semicolons and can be read by other programs such as Excel format in a simple and plain easier to manipulate the data. Reports of Isoplan can be exported to PDF, Excel and Word, but the formatting of these files cannot be well suited to handle the data in other programs, for example, to create a filter in Excel.

### 5.14.11. Critical Analysis of the Tag<sup>11</sup>

The tag register displays the "User Group" field where it is defined which group of users will be responsible for the approval of the tag.

The critical analysis worksheet is created on the tags screen as follows:

1. Click the menu **Critical Analysis>Critical Analysis Worksheet** from the tags screen.
2. Click the **Save** button to save registered data. The saved data consists of the list of tag register information and the instrument associated with the tag.
3. Click the menu **Main>Print Preview** to verify that the data you have entered is correct. If any data is wrong go back to the tag register, correct the register and, after corrected, click again on the screen of the critical analysis worksheet, click the **Update** button to update the data in the worksheet and save the worksheet again.
4. After checking the registration data, each member of the user group must enter the tag and approve the registration by clicking on the "**Approve**" button. This approval will generate an electronic signature being requested the user's password.
5. All users in the group must approve the worksheet to the worksheet. If a user checks for an error, he can click on the "**Reprove**" button and justify the reason for the disapproval. In this case, the approval process must be started again and all users must re-sign.
6. After approval of all users an approval number is generated and if necessary an approval document can be generated through the menu **Main>Print Preview**.

---

<sup>11</sup> Critical Analysis Module

### 5.14.11.1. Search for Critical Analysis

The tag search screen allows you to find tags with pending critical analysis. The **Pending Critical Analysis** field has the following options:

(Pending): filters tags with pending review.

(No Critical Analysis): tags registered in Isoplan where no critical analysis was registered.

"Login": pending analysis for a specific user.

The **User Group** field allows you to find all the tags of a certain group of users.

### 5.15. Loops<sup>12</sup>

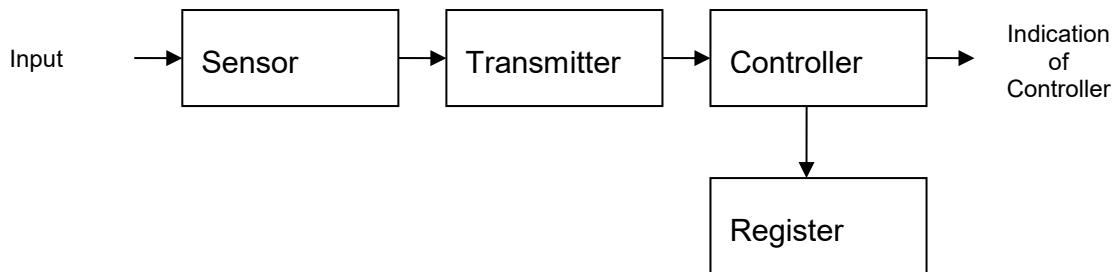


Figure 62 – Diagram of a loop

The loop is a combination of two or more instruments connected so that the signal passes from one to the other in order to perform a measurement. For example, to measure a temperature it is possible to use a thermocouple sensor that is connected to a transmitter that converts the output signal of the thermocouple into an electric current signal of 4 to 20mA, and this current signal is applied in the input of a controller that indicates the temperature in degrees Celsius.

Isoplan has a loop register that is independent from the register of instruments or tags that would be the individual components of the loop. The loop and the tag (individual loop component) are treated equally in Isoplan and the main difference is that the loop screens do not contain instrument data because the loop is associated to several tags or instruments.

All screens to make the calibration (**Work Order**) and generate the certificates (**Calibration Results**) are duplicated with an option for tags and another for loops. This manual presents only the screens related to the tags because the operation of the loop screen is basically the same; the fill-in instructions can be used for both a tag screen and a loop screen.

The registration of a loop is similar to that of a tag. The **Function/Interval, Calibration, Strategy, Operation Conditions** and **Verifications** tabs are filled in the same way as in the registration of tags. The **Components** tab will be explained in the next topic.

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<sup>12</sup> Available only on Isoplan with LOOP module

### 5.15.1. Loop Components

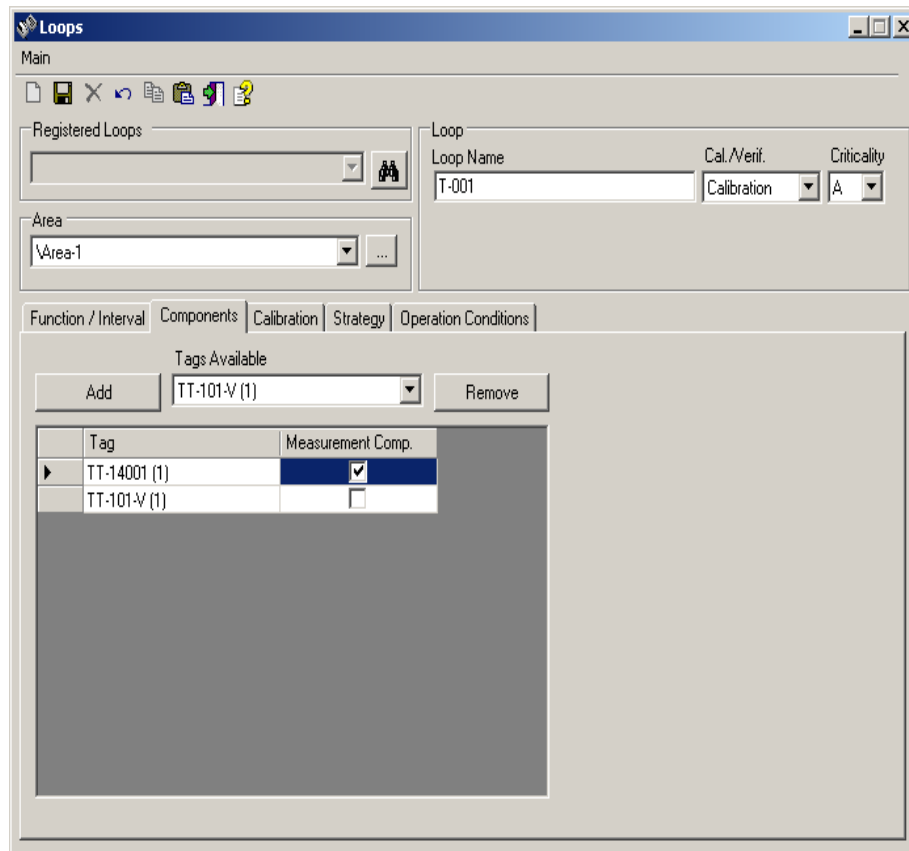


Figure 63 – Components tab in the dialog box Loops

The **Components** tab shows all the tags (previously registered) that form the loop. The **Measurement Comp.** (Measurement Component) is an information field to indicate whether a tag is used to perform a measurement. Usually the tags are used to perform a measurement, but there are cases of only auxiliary tags (instruments) such as a recorder that does not affect the accuracy or uncertainty of the loop.

Isoplan allows the generation of the loop certificate from the certificate of each component of the loop. Isoplan will convert the errors and uncertainties of the certificate of each tag to the same unit of the loop and will combine these uncertainties as described in the appendix, for example, a certificate from a transmitter with output from 4 to 20 mA requires errors and uncertainties to be converted from mA to °C. To perform this conversion it is necessary to fill some tag and loop range data in the **Components** tab table.

The following columns are defined in this table:

**Min. Tag, Max. Tag:** output range of the instrument associated with the tag, for example, 4 to 20 mA

To add a tag to the loop, select one of the existing tags and click on the **Add** button.

To remove a tag from the loop, click on the gray square to the left of the tag name to select it and then click on the **Remove** button.

### 5.15.2. Loop Components

The Isoplan allows a calculation of the accuracy of the loop consisting of performing a calculation to combine the accuracy of each component. The appendix of the manual explains how this calculation is performed. The value of the accuracy of each component corresponds to the value entered in the scale of the instrument. To generate a report with a loop accuracy calculation result click on the menu **Reports > Loop Accuracy> Print Preview** . in the loop register screen.

The calculation of the loop accuracy is independent of the existence of calibrations of the loop tags. In the **Strategy** tab there is a column in the calibration points table that allows you to set the required accuracy for the loop. The required accuracy can be compared to the calculated value and an diagnosis can be issued if the accuracy of the loop is in accordance with the desired value. The diagnosis must be defined by the Isoplan user through the fields of the **Accuracy Diagnosis of the Loop** group.

Isoplan allows you to generate a report with a list of loop components by clicking the **Reports> Loop Register> Print Preview** menu. in the loop register screen.

## 5.16. Companies

Isoplan allows a single data base to store the registration of multiple independent companies. In the login the user must choose the company he or she works for. Supervisor-level users can create new companies.

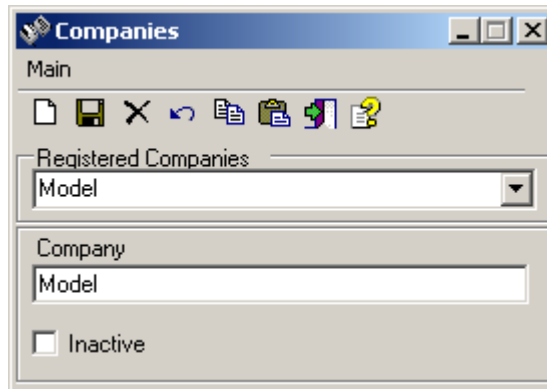


Figure 64 - Dialog box **Companies**

### Company

Text with the company name that is shown only in the login of Isoplan. Refer to the **Configurations** topic to define the company name that is shown in the certificate.

### Inactive

A company cannot be deleted after it has been created. Click on the **Inactive** option if you do not want the company to be shown anymore as an option in the login.

Although there is a single data base, it is not possible to share register data between companies. For example, if the user belongs to more than one company, he or she must be registered in all companies. The same occurs for the other Isoplan screens, such as Areas, Instruments, Standards, Tags etc.

**When a new company is created, a new user is automatically created with login "admin" and password "admin".** Close ISOPLAN and log in again by selecting the new registered company on the login screen. The **Scales, Failures, Types of Instruments** and **Operation Conditions** registers show some data to facilitate the initial registration, but this data can be changed if necessary. The **Areas, Standards, Tags** and **Instruments** registers are empty when a new company is created.

## 5.17. Register of Clients<sup>13</sup>

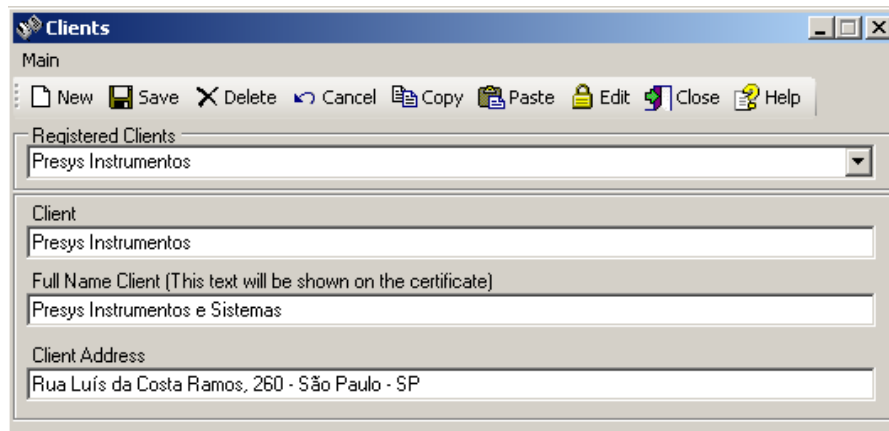


Figure 65 – Clients dialog box

Registration clients screen for Isoplan with service provider module.

**Client:** Client Name of shorthand that appears on the screens of Isoplan.

**Full Name Client:** text with client's name. It should appear in the calibration certificate.

**Client Address:** text with client's address. It should appear in the calibration certificate.

There is no necessary to create several companies, one for each client, one company can be created, for example, with the laboratory name and for all clients equipment in this company which corresponds to the laboratory. In Isoplan there is an option to search tags or calibration of a specified client.

---

<sup>13</sup> Service Provider Module

## 5.18. Configurations

This screen shows the general configuration of ISOPLAN.

### 5.18.1. Company

The tab presents information about the company that is using ISOPLAN.

Figure 66 – **Form tab** in dialog box **Configuration**

#### Company Name

Text with the company name that is shown in the Isoplan reports.

#### Logo of Reports

ISOPLAN allows the company logo displayed in the reports to be changed by the user. In order to change the logo, do as follows:

1. Click on the **Change** button to open a dialog box and insert the picture of the logo. The picture must be in Windows bitmap or PNG format.

2. ISOPLAN shows a preview of how the picture will appear in the certificate. The Width (mm) and Height (mm) options allow the size of the picture to be changed in order to obtain a better printing result, for example by reducing a little the picture height or width to avoid conflict with the margins of the report.

### **Verification**

The texts shown in the verification report (**Approved**, **Reproved** or **N.A.**) can be changed in case a different terminology is required.

### **Tags - Enable Tag Operation Condition**

Enable option tags operating conditions.

### **Tags - Tag Photo**

Enables tag photo register

### **Tags - Area**

The Isoplan allows users edit the word area, the change is made in the calibration certificate, the tags screen and in the area registration screen.

### **Instruments - Instrument Photo**

Enable Instrument Photo

### **Instruments - Register Number**

The Isoplan allows users edit the word Register Number, the change is made in the calibration certificate and in the instruments registration screen.

**Enable Register Auxiliaries Menus**

Unchecking this option allows users to remove some auxiliary menu screens from home screen of Isoplan as scale signals, operating conditions and others that can be accessed through other screens.

**Simplified certificate**

Allows the user to register the standard simplified certificate, no need to fill calibration values, in this case, the standard uncertainty is estimated for the accuracy of the registered range.

**Certificate without W.O.**

Allows registering the standard certificate without generating a work order

**5.18.2. General**

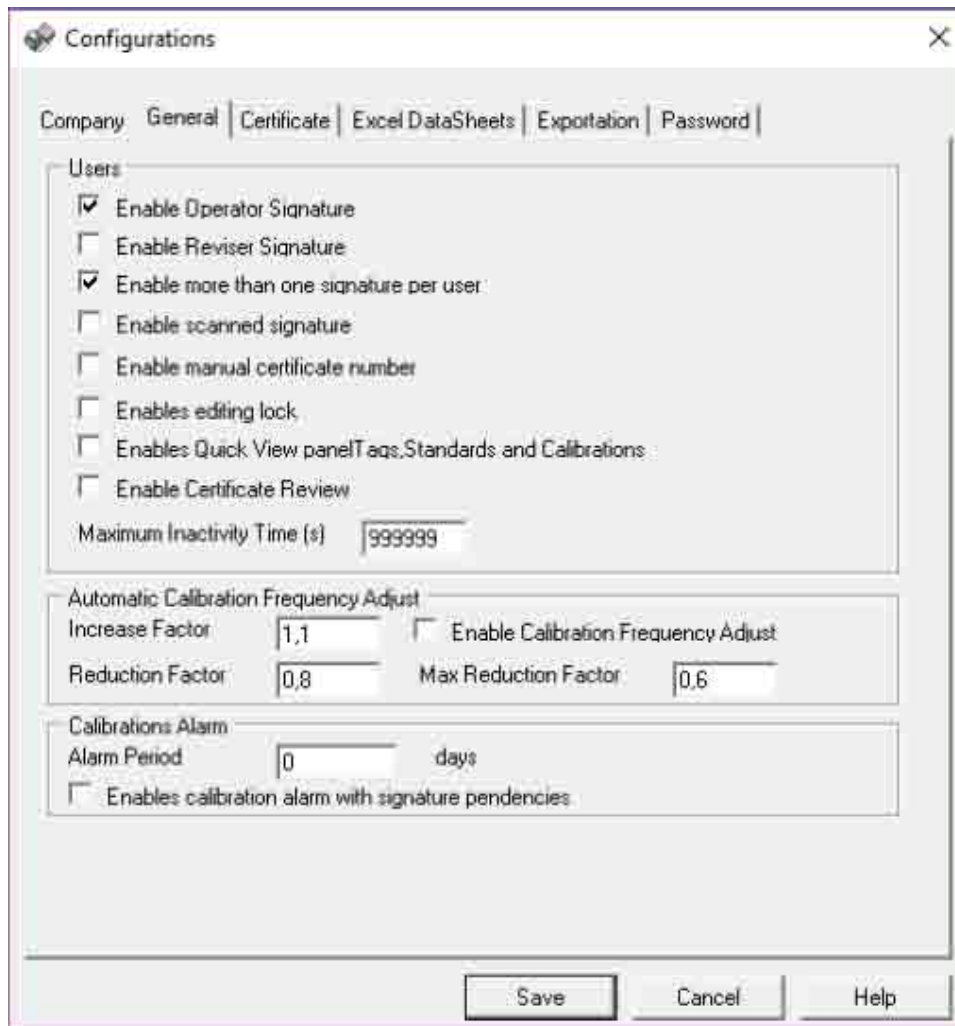


Figure 67 – **Form tab** in dialog box **Configuration**

This screen shows the general configuration of ISOPLAN.

**Enable Operator Signature**

When this option is selected, it indicates the report must bear the signature of the operator.

**Enable Reviewer Signature**

When this option is selected, it indicates the report must bear the signature of the reviewer.

### Enable more than one signature per user

When this option is selected, it indicates the same user can sign the same certificate more than once, for example the same user is the operator and the person in charge of the certificate.

### Enable scanned signature

When this option is selected, it indicates the report will be signed with a digital signature that was registered in **User Registration**.

### Enable manual certificate number

When this option is selected, it indicates that the calibration certificate number will be determined manually by the user.

### Enable editing lock

When this option is checked it indicates that the isoplan registration screens will initially open with the controls locked, i.e. not allowing editing, editing will only be allowed after the user unlocks by clicking on the padlock.

### Maximum Inactivity Time

If the user leaves the software open without clicking on any Windows screen for the time specified in this field, ISOPLAN is automatically closed. If the user is working with other software, the time is not counted as inactive. Inactivity time begins to be counted only if no application is being used. **It is necessary to restart ISOPLAN for the alteration to be effective.**

### Enable Automatic Frequency Adjustment

This option allows ISOPLAN to adjust automatically the frequency of calibration after data has been input on the **Calibration Results** screen. The adjustment algorithm is explained in the manual appendix and is based on the Schumacher table and the factors explained below.

### Increase Factor

This factor is used by ISOPLAN to define the increase in the interval between calibrations. In the example in the figure, if the calibration interval is 30 days then the new interval will be  $1.1 \times 30$ , which corresponds to 33 days.

### Reduction Factor

This factor is used by ISOPLAN to reduce the interval between calibrations. In the example in the figure, if the calibration interval is 30 days then the new interval will be  $0.8 \times 30$ , which corresponds to 24 days.

### Max. Reduction Factor

This factor is used by ISOPLAN to reduce the interval between calibrations when the Schumacher table indicates a maximum reduction in the calibration interval. This value must be lower than that of the **Reduction Factor**.

### Calibration Alarm - Alarm Period

Number of days in the calibration alarm of Isoplan entry. For example a value of 30 indicates that the Isoplan shows the number of calibrations expiring within 30 days. Set it to 0 to disable the alarm.

### Calibration Alarm - Enable calibration alarm with signature pendencies.

Select this option to display an alert showing **how many calibrations are pendency with some kind of signature** when the dialog box of **"Calibration Result"** is opened.

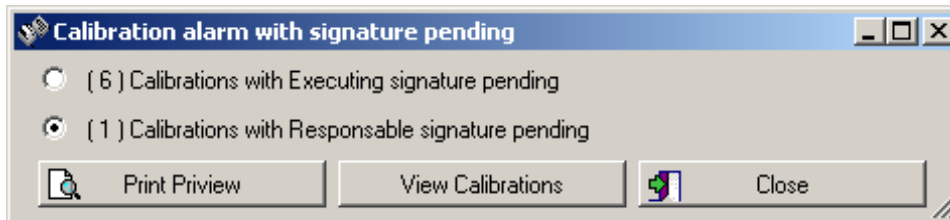


Figure 68 - Calibration Alarm with signature pending dialog box

**Print Preview:** loads a report with a list of all calibrations with selected signature pendencies

**View Calibrations:** view calibrations to the type of signature with selected pendency

**Close:** loads the calibration results dialog box normally

**5.18.3. Service Provider<sup>14</sup>**

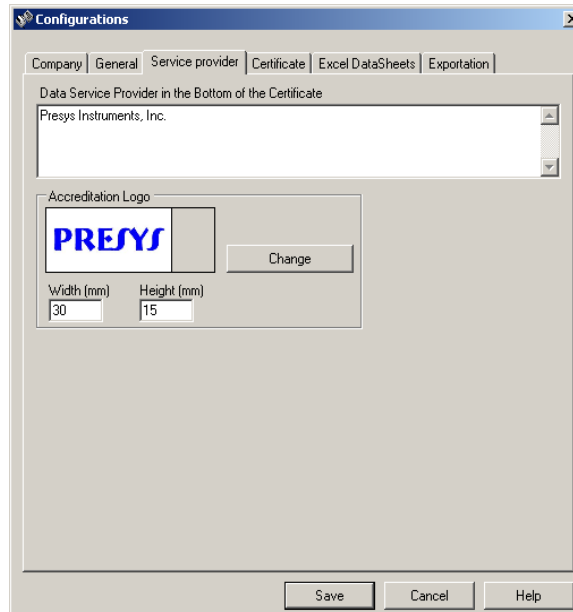


Figure 69 – **Service Provider tab** in the dialog box **Configurations**

**Data Service Provider in the Bottom of the Certificate**

Text with name and address information of the service provider being displayed in the footer of the certificate.

---

<sup>14</sup> Optional Module

### Accreditation Logo

ISOPLAN allows the company logo displayed in the reports to be changed by the user. In order to change the logo, do as follows:

3. Click on the **Change** button to open a dialog box and insert the picture of the logo. The picture must be in Windows bitmap or PNG format.
4. ISOPLAN shows a preview of how the picture will appear in the certificate. The Width (mm) and Height (mm) options allow the size of the picture to be changed in order to obtain a better printing result, for example by reducing a little the picture height or width to avoid conflict with the margins of the report.

### Accreditation Text Header

Free text with up to 4 lines shown in the headings of accredited certificates, for example, accreditation number.

### 5.18.4. Certificate

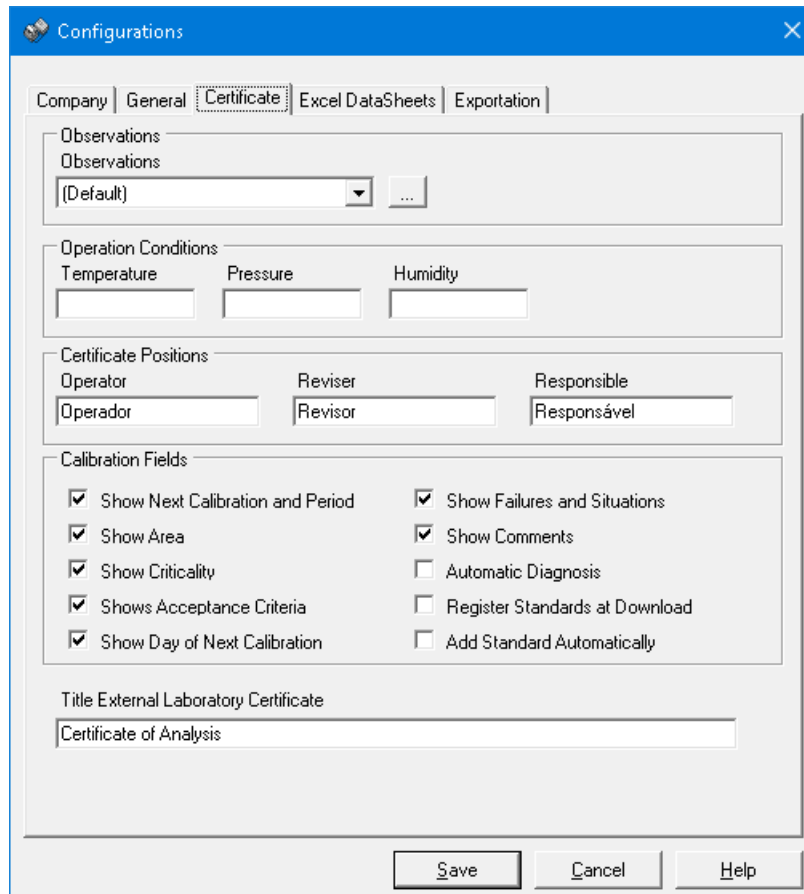


Figure 70 – Form tab **Certificate** in dialog box **Configurations**

#### **Observations**

List of observations that can be used in strategies or a tag calibration ranges. Click the button next to the list to add new types of observations.

#### **Operational Conditions**

Environmental conditions that are filled by default in the certificate. These fields can be changed for each calibration.

#### **Positions in the Certificate**

The position that appears below the full name (operator, reviewer and responsible) can be changed according to user needs.

#### **Calibration Fields**

The fields: next calibration and period, area, criticality, acceptance criticality, failures and situations and comments can be shown marked fields in the settings screen, or removed from the certificate if unchecked the settings screen.

**Automatic Diagnosis**

When this option is enabled, Isoplan gives the diagnosis (approved or reproved) automatically on the calibration certificate comparing the error or the error more uncertainty with the acceptance criteria defined by the user.

**Register Standard at Download**

When this option is enabled, during download, the user has the option to choose the standards used for each tag that belongs to the work order.

**Add Standard Automatically**

This option allows the Isoplan during the download, try to automatically find the used scales and standards. This automatic choice only works if they have been registered the standard certificates with signature. This choice uses only the scale of the main standard selected in the download and Isoplan can not locate calibration scales that involve more than one standard.

**Shows Next Calibration Day**

This option sets Isoplan to display the date format of the next day calibration. To display the next calibration date in month and year format, disable this option.

**Certificate Title**

Title of external laboratory certificate

### 5.18.5. Excel DataSheets<sup>15</sup>

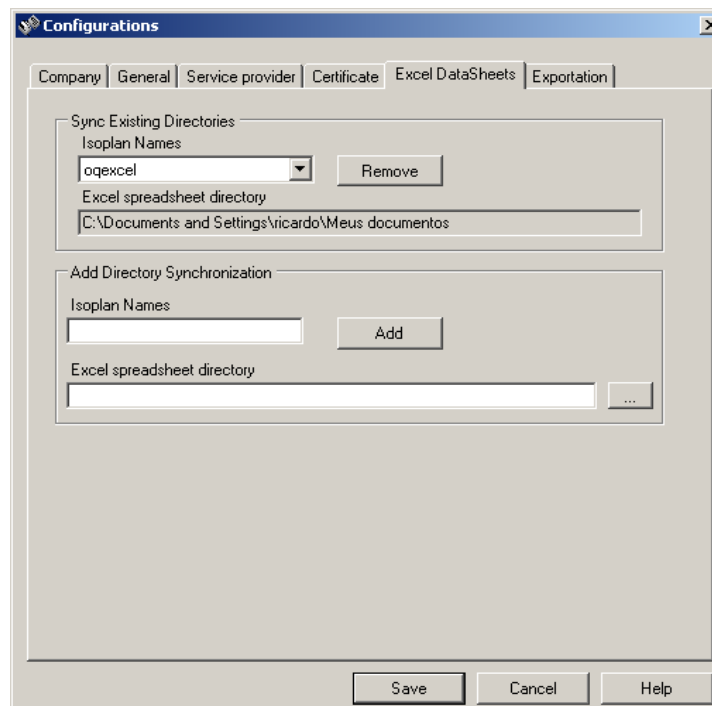


Figure 71 – Form tab **Excel worksheet** in dialog box **Configuration**

#### Sync Existing Directories

Directories where spreadsheets are saved that can be sent to devices mobile. Usually this folder should be the synchronization folder between the computer and the selected mobile.

#### Add Synchronization Directory

Isoplan allows users to create multiple directories where the Excel datasheet are temporarily saved, for example, one for each Palm to be connected with the computer.

To create a new directory must be completed two fields:

**Isoplan Name:** a name to identify within the Isoplan to which device the sheets will be sent. Isoplan automatically creates a new directory with the name you entered.

**Excel Spreadsheet directory:** directory where the spreadsheets are saved. When using in conjunction with a Palm. It must be used the directory defined in synchronization software that came with the equipment.

<sup>15</sup> Optional Module

### 5.18.6. Exportation

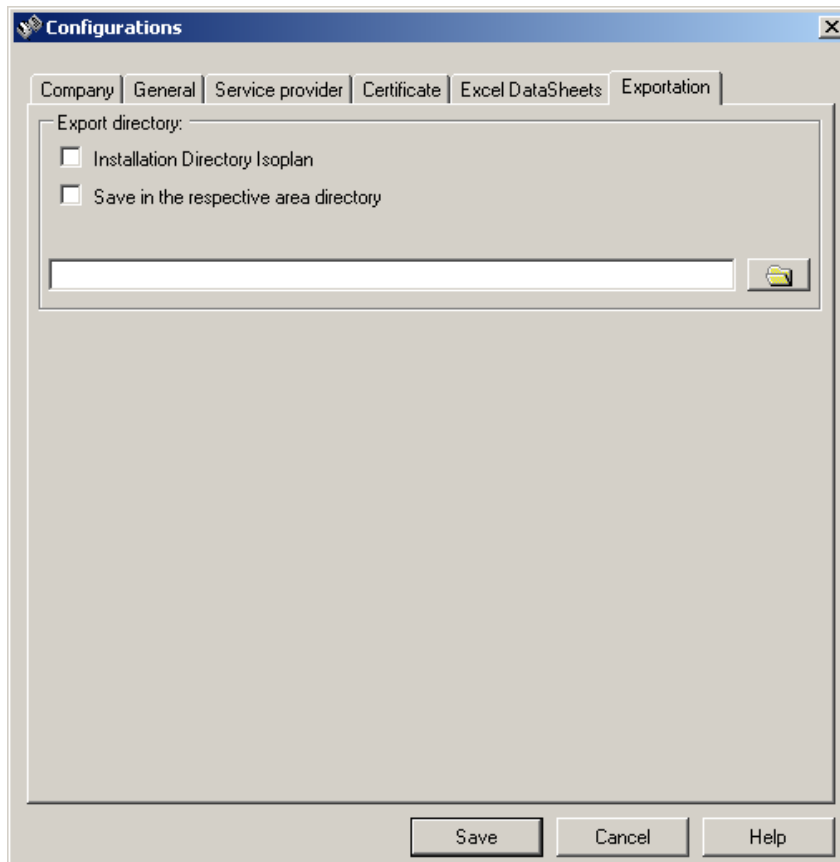


Figure 72 – Form tab **Export** in dialog box **Configuration**

ISOPLAN allows users to set the path where the exported certificate will be saved

#### Installation Directory Isoplan

When this option is checked indicating that the export certificates will be saved in the ISOPLAN installation directory.

#### Save in the respective area directory

When this option is checked it indicates that the exported certificates will be saved in a folder with area name that the tag / loop belongs. ISOPLAN automatically creates the installation directory a folder called **Export**, **Export** folder within the folders will be created with names of areas.

ISOPLAN also lets users save the exported certificates in any other directory, simply leave the options **Installation Directory Isoplan** and **Save in the respective area directory blank** and fill the path manually in the text box.

### 5.18.7. Password

Parameter	Value
Number of uppercase letters	0
Number of lowercase letters	0
Number of numbers	0
Number of special characters	0
Password Min. Size	5
Max. Invalid Attempts	3
Change Password Time (days)	999999

Figure 73 – Form tab **Password** in dialog box **Configuration**

The complexity of the Isoplan access password can be defined by the user according to the following parameters:

#### **Number of Characters**

Minimum number of uppercase characters that must compose the password

#### **Quantity Lowercase Characters**

Minimum number of lowercase characters that must compose the password

#### **Quantity of Numbers**

Minimum number of numeric characters to compose the password

#### **Quantity Special Characters**

Minimum number of special characters that must compose the password

#### **Max. Invalid Attempts**

Number of invalid attempts to log in ISOPLAN using a wrong password. If the user exceeds this limit, access is blocked and the user must be unblocked as described in the **Register of Users** screen.

**Min. Password Size**

Number of characters that must be used in the password.

**Change Password Time (days)**

Time, in days, that the password should be changed. When trying to login into Isoplan with an expired password, it is requested to replace it, which must follow the parameters that were determined in the above configurations. The new password must be different from the last five passwords used by the user

## 5.19. Users

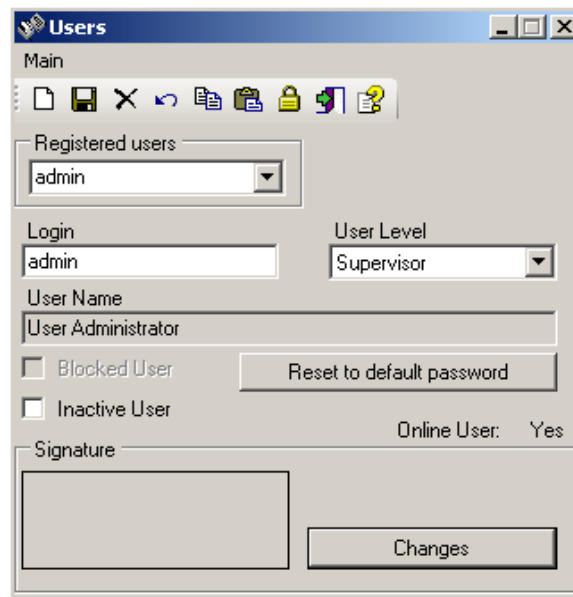


Figure 74 - Dialog box **Users**

Access to ISOPLAN is allowed only to registered users. Below is a description of the fields in the register of users. The permissions of each user level are defined on the **Permissions** screen. When a user is created, the standard password is **1234** and it must be changed in the first login. In case the user forgets the password, click on the **Reset to default password** button to return to the password **1234**.

### Registered users

List of registered users.

### Login

User name or nickname to be used when logging in the program.

### User Level

The program has four user levels: read-only; operator; reviewer; supervisor. The read-only level only gives access to reading in the program. The supervisor level always gives complete access to ISOPLAN. Users' access to certain ISOPLAN screens can be limited through the permission register, which can be accessed in the **Register > Permissions** menu.

### User name

Full name of the user, which will be shown in the certificate.

### Blocked User

This field is selected when the user exceeds the maximum number of invalid attempts with an invalid password to log in the program. This number is adjusted in the **Configurations** screen.

### **Inactive User**

A user should not normally be deleted from ISOPLAN because in general he or she may have signed several certificates. If the user leaves the company or does not need to access ISOPLAN, he or she can be made inactive so that access to the program is blocked even if the password is correct.

### **Signature**

Using the button **Add** it is possible to assign a figure that will be used as the user's signature, will be used only when the **Use digitized signature** option in the configuration register is enabled.

Isoplan allows you to print a list of registered users through the **Main>Print Preview** menu.

Isoplan allows visualize if there are other users connected to the same database, simply select the user and observe the indication **Online User**.

## 5.20. Permissions

It allows access to ISOPLAN screens to be defined depending on user level. The list on this screen (**Registered permissions**) shows the name of ISOPLAN screens and cannot be changed. The types of permission are as follows:

1. **No Access:** user does not have access to the screen and a warning is shown indicating that access is blocked.
2. **Read:** user can access the screen but may only read it.
3. **Operation:** user has full access, allowing changes to be made.

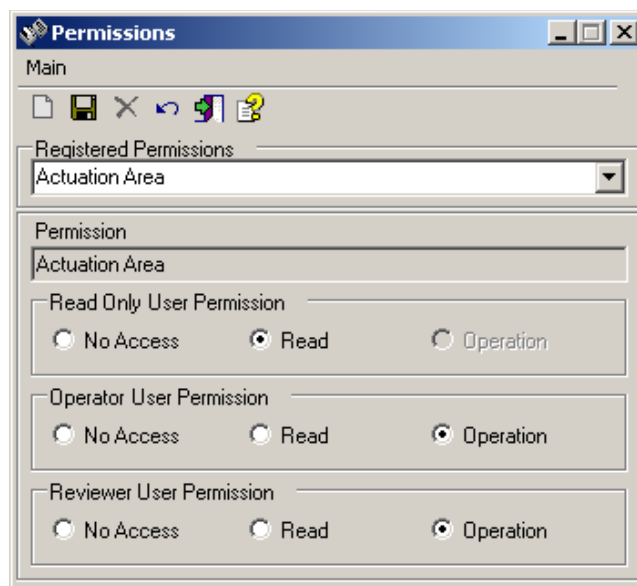



Figure 75 - Dialog box **Permissions**

ISOPLAN allows access to be controlled only by user level – there is no option to limit access of a specific user to certain screens. ISOPLAN allows the user permissions to be configured as **Read-only**, **Operator** and **Reviewer** level. A user's level is defined when he or she is registered. In order to define the permission of a certain screen, do as follows:

1. Choose the screen whose permissions will be adjusted, e.g. **Standards**, on the Registered **Permissions list**.
2. Choose the level of permission (**No Access**, **Read** or **Operation**) for each user level (Read-only, Operator and Reviewer).
3. Click on the button  to save the data.

Isoplan allows printing the list of permissions registered through the menu **Main > Print Preview**.

**Comments:**

- The screens for registering users and permissions are configured by default with blocked access. Enabling access to these screens is not recommended.
- The **Supervisor** user level always has complete access to the program. It is not possible to define permissions for the supervisor user.

## 5.21. User Group <sup>16</sup>

The use of the critical analysis module requires the creation of a group of users to approve the instrument register. Multiple user groups can be created that can approve one or more Isoplan tags. The user group can be created through the menu **Register> User Group**.

The fields on this screen are as follows:

**Group Name:** user defined text identifying the name of the groups.

**User 1 ... User 4:** List of users who are part of the group corresponding to one of the users registered in Isoplan. If the group has less than 4 users, leave the unused users blank.

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<sup>16</sup> Critical Analysis Module

## 5.22. Audit Trail 17

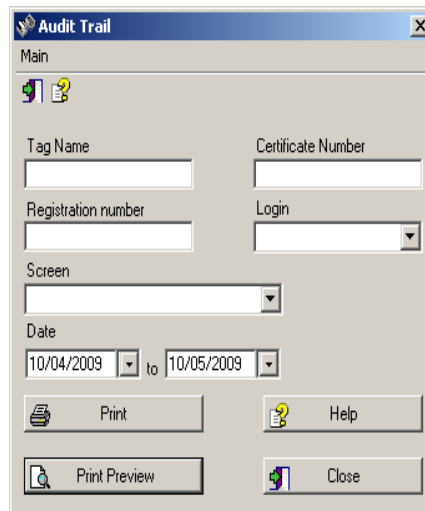


Figure 76 – Dialog box **Audit Trail**

All operations of creation, edition and deletion of registers in ISOPLAN are recorded in a log file (**audit trail**), which allows everything done in ISOPLAN to be checked.

The function of the Audit Trail screen is to search the log files for information of interest to the user, e.g. all modifications within a certain interval, modifications to a certain screen etc.

The use of this screen is similar to that of the search screens in ISOPLAN: fill in the fields of interest to track modifications (e.g. **Tag**, **Registration Number** etc.) and click on the **Print Preview** button.

The **Screen** field filters the search for the changes made to a certain ISOPLAN screen, for example **tag** screen, **instrument** screen etc.

## 5.23. User Password

At any moment the user can change his or her password through the **Register > User Password menu**. In order to do that, the user must type in the current password and then the new password twice. The user must define a password that is different from the current one and respect the limitation of password size defined in the **Configurations** screen.

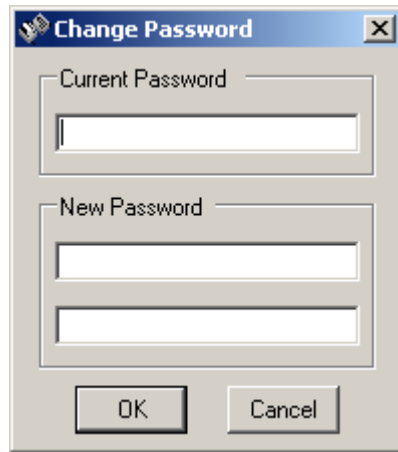


Figure 77 – Dialog box **User Password**

### 5.24. Login/Logoff

Isoplan allows **user switching** without restarting the software, just do **Logoff** and **Login**.

To make the logoff, click on "**Register**">"**Log Off**".

To make login, click on "**Register**">"**Log in**". Select the company that user is registered and fill in the fields "User" and "Password"

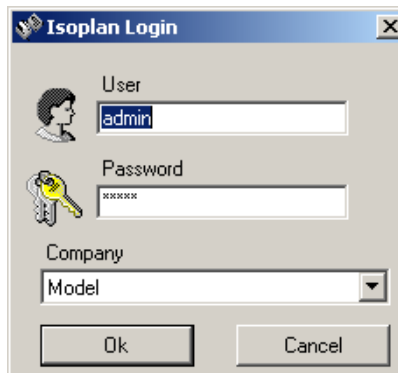


Figure 78 – Dialog box **Isoplan Login**

### 5.25. Quick View Panel

The quick display panel is used for **view Tags, Loops, Overdue Standards and Calibrations with pending signatures.**

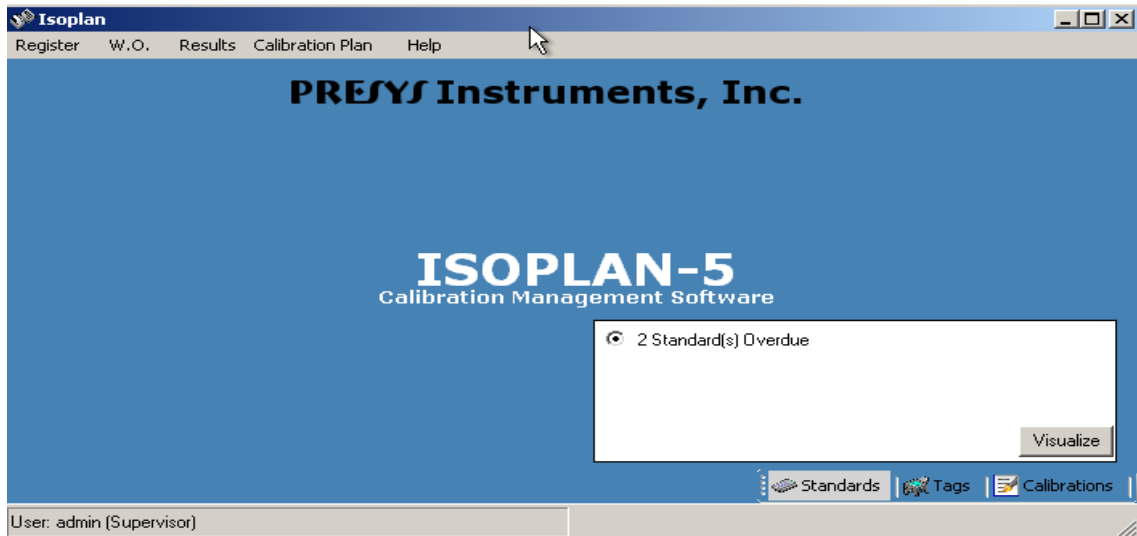


Figure 79 – Quick View Panel dialog box

To Enable Quick View Panel click on menu **Register>Configurations**, select **General** tab, click on **Enable Quick View Panel Tags, Standards and Calibrations** and click on **Save**.

### Using Quick View Panel

Put the mouse pointer over the lower right **corner of Isoplan screen**, to display the options panel.



Figure 80 – Quick View Panel

### Standards

It shows standards that are **overdue**, select the standard option and click view.

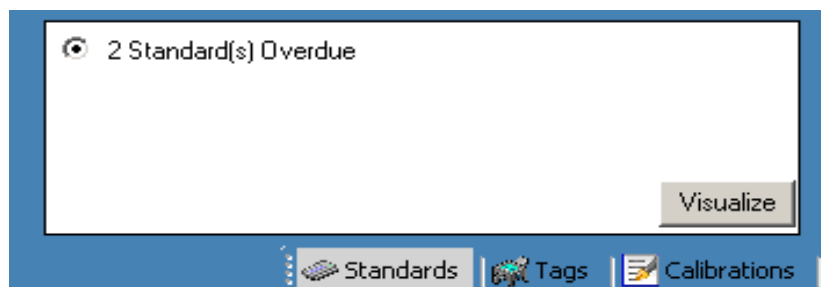


Figure 81 –Quick View Panel - Standards

### Tags

It shows tags and loops that are overdue, select the tags option and click view.

## Calibrations

It shows calibrations with pending signatures, select the desired option and click view.

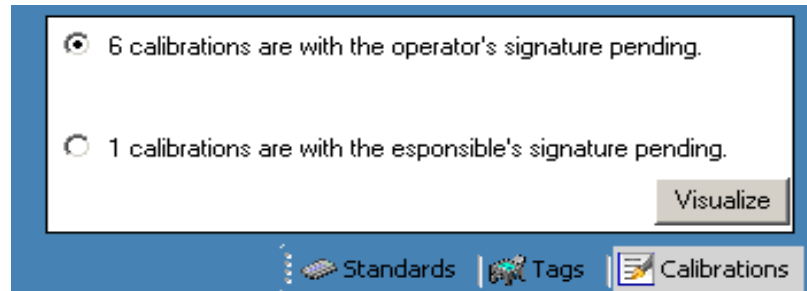


Figure 82 – Quick View Panel - Calibrations with dependencies signatures

## 6. Work Orders W.O.

Calibration data is input in ISOPLAN by means of a work order (W.O.), which consists of a set of tags to be calibrated. This work order can be executed in the following ways:

1. By using one of Presys calibrators, the W.O. is downloaded from the computer to the calibrator and the data stored in the calibrator is uploaded to the computer.
2. By sending the W.O. data directly to the printer or to the computer screen, without necessarily using one of Presys calibrators (Manual Download). The data obtained in the calibration can also be input through the computer keyboard (Manual Upload).
3. By sending the W.O. data directly to the printer or to the computer screen, as in the previous way, but also sending the W.O. to an external laboratory that will be responsible for the calibration, adjustment and issuing of the instrument certificate. Only some of the data from the certificate provided by the external laboratory will be input in ISOPLAN.
4. Create Excel spreadsheets with calibration data so that this data can be entered on other computers or mobile devices capable of editing Excel spreadsheets.

### 6.1. Creating a W.O.

In order to execute a work order, it is first necessary to create a W.O. and to choose the tags that will be part of it. After it has been created, the W.O. can be sent to one of Presys calibrators or it can be executed manually. This screen has edition buttons similar to those of the register screens. Refer to the **Toolbar** topic to create and delete registers, which in this case correspond to a W.O..

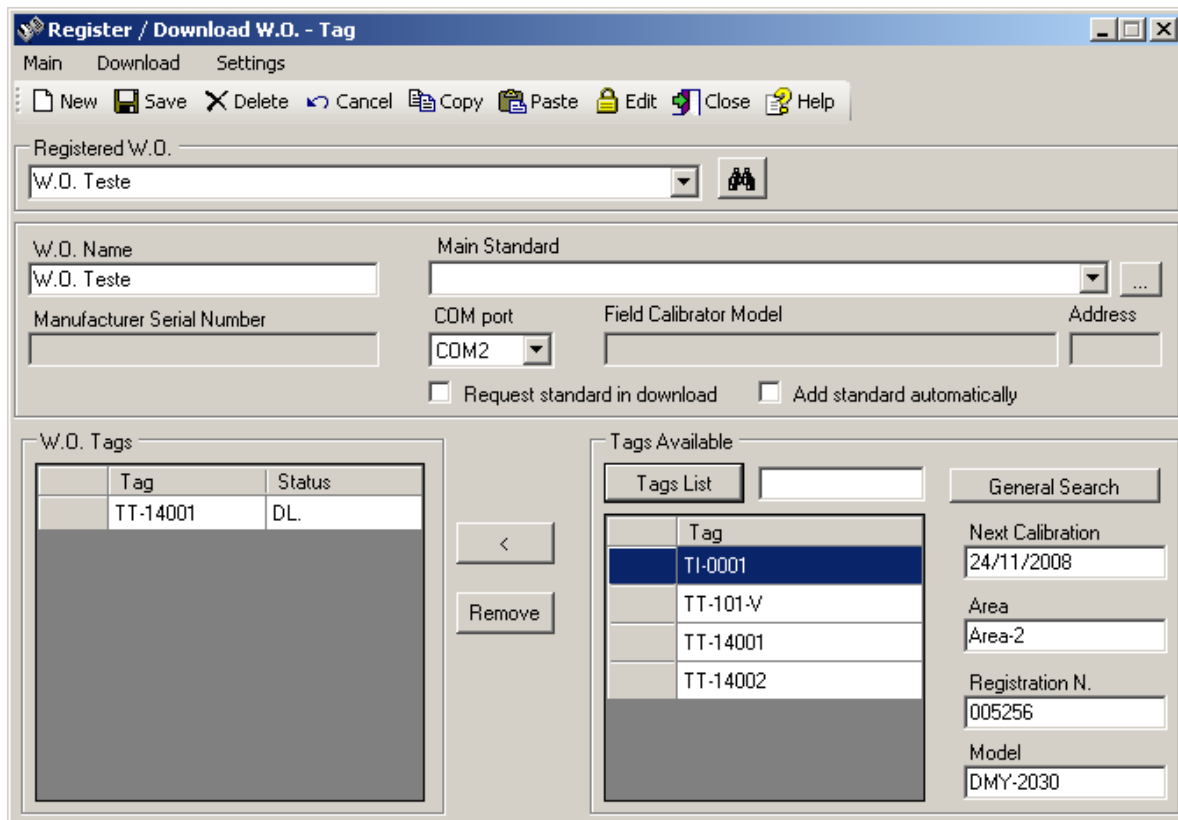


Figure 83 – Register/Download W.O. dialog box

### 6.1.1. Choosing Tags for the W.O.

The creation of a W.O. requires first that tags that will be part of the W.O. be located in the register. There are two options:


1. **Search by Tag name:** click on the **Tags List** button. This option will list all registered tags, the filter can be done through the text box next to the tag name typing some characters that compose it.
2. **General Tag Search:** a more advanced search can be made by using the same search screen of the tag register. Click on the **General Search** button and follow the same instructions of the **Tag Search** register screen. Click on the **Use Search** button and the located tags will be displayed in **Tags Available**.

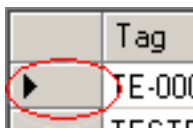
**Note:**


- In the **Tags Available** section, when a certain tag is clicked on, information about the tag is shown (Next Calibration, Registration Number, Instrument Model and Area).

### 6.1.2. Creating or Editing a W.O.

After the **Available Tags** table indicates which tags must be calibrated, the W.O. creation can be initiated, according to the following procedure:

1. Press the New button  to start a new W.O.
2. Fill in the area **W.O. name** with a text for the W.O. name. Each W.O. registered in ISOPLAN must have a name.
3. Select the main standard to be used and the serial port of the microcomputer, **COM port** (The COM port that has "<->" in the name are the ports that are available).



4. Click the square next to the table tag **Available Tags** to select it and click the "<" button to transfer the tag to table **W.O. Tags**. The tags in this table will be sent to the calibrator or will be manually calibrated. If necessary, one of the tags can be removed by selecting the tag on the **W.O. Tags** table and pressing the **Remove** button.
5. Press the Save button  to save the W.O created.

Next to the list tags, there is a column where the calibration status of each tag in the examined W.O. is indicated. Each tag added to a W.O. receives the classification **NW**, indicating it is a new tag. The **DL** status is presented by tags which have been transferred to a Presys calibrator through **download** operation and by tags used with **manual download** operation. **UP** corresponds to: tags whose calibration information has been **uploaded** from a Presys calibrator; tags created through **manual upload**; or tags where **false download** operation was used. **MA** is shown next to tags without calibration, whose W.Os have been closed manually. The tags corresponding to the calibrations deleted in the **Calibration Results** dialog box are indicated by **DEL**.

It is possible to issue a work order report or verify its layout by selecting "**Print Preview**" or "**Print**" from the **Report** menu. Each tag of the work order is followed by the description of the instrument function, the calibration identification (1 or 2), serial number, area, status and amount of time spent in the calibration (in hours).

Isoplan allows users to sort the list of work order by name or by date through the menu **Settings>Order by name** or **Order by date**.

### 6.1.3. Choice of Standards Used in Calibration

The Isoplan presents two options that allows the choice of standards used during the download.

The option "**Request Standards in Download**" makes Isoplan ask the standards used for each tag of the WO during the download.

Click the option Add "**Add Standards Automatically**" to Isoplan to try find the scales used by standard. This option works when it is been used Presys calibrators, certified standards have been registered and signed in Isoplan and it was used a single scale of Presys calibrator to generate or read a signal. Obs.: It is not possible to make download of inactive tags

## 6.2. W.O. Download

The act of sending calibration information to Presys equipment is called **Download**. In case a Presys calibrator is not used and the data is collected manually, the **Manual Download** must be used. There are several types of Downloads, as shown below:

Obs.: It is not possible to make download of inactive tags.

### 6.2.1. Download to Presys Calibrator

In order to transfer one of the work orders from the "W.O." list to the Presys calibrator. Select the W.O. so that its name in the "Registered W.O.s" list is indicated. In the "Download" menu, start the work order transfer by choosing the "Download Field Calibrator" command.

It is not necessary to carry out all the calibrations of all the tags of the same W.O. loaded to the Presys calibrator. However, after the calibration results have been transferred to the computer through **Upload**, it is not allowed to carry out a new download of the previously calibrated tags. In order to execute the remaining calibrations, it is possible to carry out a download of the same W.O. again. In this case, ISOPLAN will transfer the tags without calibration only (**NW** or **DL** status).

When there is a tag registered in more than one W.O., it is possible to download the tag only if there is no other W.O. with the same tag with a hanging calibration, that is, with **DL** status. Otherwise, Isoplan shows an error message, along with the name of the W.O. that contains the tag already loaded, and it is necessary to wait for its upload or, if necessary, the W.O. can be closed manually with the **Close W.O.** command in **Main** menu (the **NW** or **DL** status of each tag becomes **MA**).

### 6.2.2. Download to Presys Calibrator DMY-2017 PSV <sup>18</sup>

To send a work order to the DMY-2017-PSV calibrator, follow the steps:

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<sup>18</sup> Available only on Isoplan with safety valve module (PSV).

1. Add the tag on the OS, it is only allowed a single tag.
2. Select as calibrator model "Presys DMY-2017 Calibrator Online"
3. Save and click on **Download> Download Field Calibrator** menu.
4. It must be shown an operating screen to make the valve calibration with 2017 as explained in the next section.

### 6.2.2.1. Calibrator operation DMY -2017 PSV by Isoplan

The calibration of the DMY-2017 is made in the online mode, the calibrator should be connected to the computer during the calibration, it is not possible to perform the calibration autonomously and transfer the data stored in calibrator to Isoplan as in other calibrators Presys like Isocal, PC-507, etc.

Before starting calibration is necessary to adjust the Calibrator group settings:


- **Channel:** choose which channel will be used 1 or 2.
- Enter the **C1** field value, in psi, pressure capsule used at channel 1.
- **C1 Time:** maximum time in seconds for channel 1, after detection of the valve opening peak pressure, for the calibrator to find the minimum pressure point corresponding to valve closure. This value may be a few seconds, for example, 10 (s).
- **RTU communication type:** used when communication between the Isoplan and PSV station is made by serial communication. The modbus address is usually 1, but can be changed..
- **TCP communication type:** used when communication between the Isoplan and PSV station is made by Modbus/TCP communication. The modbus address can be set, usually 1, the IP address and port of the TCP protocol, usually 502.

The operation of the Isoplan 2017 is made as follows:

1. Select whether it will perform preliminary calibration of the valve (**As Found**) or final calibration (**As Left**).
2. Choose which repetition or test will run, it is usually recorded one test in the preliminary calibration and 3 tests in the final calibration. The same test can be repeated several times, but only the last had been saved in Isoplan.

3. Once the safety valve is connected to the compressor click the **Start** button. If the connection with calibrator is running it should be shown on the screen the pressure value indicated by Presys calibrator and a graph with pressure versus time.
4. Increase pressure on the valve and wait until its opening
5. After the peak pressure calibrator is detected waits for the set time and measures the minimum corresponding to valve closure. In the bottom of the screen are shown the opening points and closing of the valve detected by Presys calibrator.
6. Click the **Save** button to save the test and perform the other tests repeating the previous steps again. If the **next point for Question option** is enabled the Isoplan open a message box asking if you want to start the next test.
7. After you performed all tests and have clicked **Save**, the screen can be closed and return to Isoplan to transfer the calibration data for the Isoplan database. The data is saved in a temporary file while it is not transferred to the Isoplan, but if you made a new download for the same tag of this valve, all calibration values will be lost.

### 6.2.2.2. Pressure graph

The graph has some simple "zoom" features. Click and drag to zoom a particular region of the graph. Click the button  that appears on the scroll bar below the graph to undo the zoom.

Click on a point of the graph to display a cursor, there are two fields below the graph showing the pressure value and the time point selected by the cursor. **Span** field corresponds to the time interval in minutes shown by the chart when the test is initiated.

### 6.2.2.3. DMY -2017 Calibrator Operation with Block Valve

The operation of the calibration screen is performed as follows:

1. Adjust the communication configuration in the same way as explained in the previous topic.
2. Set a time for recording the pressure value, the stabilization time of the tag screen is used.
3. Choose either As Found or As Left.
4. Type a text as a test description, for example, "Direction" A "Open".
5. Click **Start** to start the test.
6. Click **End** if you want to end the test before the specified time.

7. You can hit the position of the chart annotations by dragging with the mouse.
8. After you performed all tests and have clicked **Save**, the screen can be closed and return to Isoplan to transfer the calibration data for the Isoplan database. The data is saved in a temporary file while it is not transferred to the Isoplan, but if you made a new download for the same tag of this valve, all calibration values will be lost.

### 6.2.3.W.O. Manual Download

The manual download is normally used in calibrations where there is no participation of a Presys calibrator. This download consists of a report that must be filled in manually by the operator in charge of the calibration.

The manual download is initiated by clicking on **Manual Download** on the "**Download**" menu. Then, the reports are seen on the screen.

The report for each tag in the W.O. consists of a header filled with information about the instrument corresponding to the tag, calibration and adjustment tables with the calibration and reference values specified for the calibration sequence, and the remaining fields for reading values ("as found" and "as left") blank so that they can be filled later.

The update of the tag status and the restrictions about pending tags mentioned in the previous section also apply to manual download.

It is important to highlight that the manual download does not depend on the calibrator chosen during the creation of the W.O. It is not necessary to have ISOCAL or any other Presys calibrator to perform the manual download.

### 6.2.4.Manual Download External Laboratory

This option has the same characteristics of a manual download and must be used when the instrument is sent to an external laboratory or when the calibration is carried out by a third party, who issues a previously prepared calibration certificate. In this case, a blank report is issued showing the calibration points, and this information must be part of the certificate issued by the external laboratory, which basically consists of the value measured by the instrument, the uncertainty and the K factor for each calibration point.

### 6.2.5.Download Loop Calculated<sup>19</sup>

The creation of the calculated loop certificate is done through the menu command **Download>Download Manual Loop Calculated** similarly it would be done to calibrate a loop through field measurements, but in this case Isoplan uses the certificate of each loop tag to creation of the loop certificate. After the download is completed, this screen can be closed and click the menu **Results>Calibrations Result>Loops** to issue the loop calculated certificate.

### 6.2.6.Download to Excel Worksheets<sup>20</sup>

Isoplan allows users to do calibration using Excel spreadsheet to be sent to other PCs, Palms and other devices that work with spreadsheet Excel 2000 or higher. This feature is only available with Isoplan with Excel datasheet module.

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<sup>19</sup> Optional Module Loops (ML)

<sup>20</sup> Optional Module Data Collector (CDE)

### 6.2.6.1. Excel Settings

Before starting the download of Excel datasheet verify if Excel 2000 or higher is installed on the machine and set the directories where the datasheet are saved through the menu "**Register>Configurations>Excel DataSheets.**"

Isoplan allows users to create multiple directories where the Excel datasheet are temporarily saved, for example, one for each Palm to be connected with the computer.

To create a new directory must be completed two fields:

**Isoplan Name:** a name to identify within the Isoplan to which device the sheets will be sent.

**Excel Spreadsheet directory:** directory where the spreadsheets are saved. When using in conjunction with a mobile device it is recommended to use a directory synchronization software that came with the device.

### 6.2.6.2. Create Excel Spreadsheet

An WO must be created in Isoplan the same way as was done in previous versions of the software.

After creating WO click on **Download>Manual Download Excel** menu to create spreadsheet with the data that should be collected during calibration.

Before the creation of spreadsheet, Isoplan asks for a confirmation with the directory where the spreadsheet will be sent. These directories are created in the configuration screen as explained in the previous section.

After sending datasheet, Isoplan opens the directory where the sheets were created.

### 6.2.6.3. Fill Spreadsheet

They must be completed in the spreadsheet fields where the cells are colored background. No checking of data is made in the spreadsheet, only during the transfer of the sheet to the Isoplan. The data entered are the same present in Isoplan screen.

### 6.2.7. False Download

This kind of download aims to document any tag that should be calibrated on a certain date but, for some reason, such as the impossibility to stop the process, the instrument which occupies the position of the corresponding tag has not been authorized for calibration.

False download is initiated by clicking on **False Download** and it works the same way as the two other types of download. But, in this case, no report is issued and no instruction is sent to the Presys calibrator. In this operation, all the data about the tags of the work order are made available for the preparation of calibration reports (**Results** menu), and the tables concerning the calibration values are not filled in.

### 6.2.8. W.O. in Isoplan with Service Provider Module<sup>21</sup>

The name of the work Order (WO) will be shown in the calibration certificate. After downloading the WO it can not be erased or altered.

### 6.2.9. Work Order Search

The work order has a search option when clicking the button with binoculars icon. There is an option to filter by the name of the OS, tag name and status of the OS (pending or closed). It is possible to search knowing only a few characters that makes up the name tag or OS

### 6.2.10. Report and Closing of a W.O.

ISOPLAN allows the printing of a report with the list of tags that are part of the W.O. on the **Main > Print Preview** menu. There is also the option of sending the report directly to the printer using the **Main > Print menu**

The execution of a W.O. using ISOPLAN starts when calibration data is sent to the Presys calibrator (download) or when a blank report, which must be filled in with data, is issued (manual download), as well as when calibration information is collected in the field or in a laboratory and when the calibration data is entered into ISOPLAN via serial communication (upload) or typing (manual upload).

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<sup>21</sup> Optional Module Service Provider (PS)

PRESYS Work Order					
COMPANY: Presys Instruments, Inc.					
W.O.:					
TAG	TAL	FUNCTION	REL. N.	STATUS	TIME
TT-14801	1	Automatic Inspection	0720906	NW	
					TOTAL HOURS:
11/05/2009 DATE			User Administrator RESPONSIBLE		

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Figure 84 –Work Order Report

After the download, a W.O. tag cannot be used in new work orders until the upload has been performed. If for any reason the tag upload cannot be performed and it is important to keep the W.O., a procedure called closing of the W.O. must be carried out. The closing of the W.O. is carried out through the **Main > Close W.O.** menu, showing ISOPLAN that this work order has been closed by the operator and no more tag calibration data uploads will be performed.

### 6.3. Upload from Field Calibrator

After the instrument calibrations have been performed by the Presys calibrator following the instructions on the work order, the results can be transferred to the computer. Connect the calibrator to the network and click on the **Upload > Upload** menu.

The Upload presents two options:

**All Tags Calibrator:** uploads all present tags in Presys calibrator.

**Only Tag Selected:** upload only the selected tag from the calibrator, with 2017 this option can be used when you want to end an incomplete calibration, for example, it was only done the preliminary calibration and you like to end the final calibration, in this case the operation screen calibration of 2017 appears again. Isoplan does not allow the transfer of calibration data for the Isoplan database partially, if is transferred only the data of the preliminary calibration will not be possible later transfer the data of the final calibration having to run a new work order.

**Tasks created in the Calibrator:** Isoplan allows you to upload data from a task that was created manually using an advanced Presys calibrator. This functionality basically aims to transfer the calibration values. The tag or instrument must be registered in Isoplan before uploading from calibrator. The calibrator must be connected and networked with Isoplan so that the tasks created in the calibrator appear on the Upload screen. The upload should be done as follows:

- Select the the option Tasks Created in Calibrator.
- Click Search to locate the tasks created in the calibrator.
- Select a tag and click the Upload>Upload menu. The tag list displays the tag name and instrument number.

Isoplan allows users to order the uploads list by name or by date through the menu **Settings>Order by name** or **Order by date OS**.

During the upload, in case the registration number of the instrument on the calibrator has not been entered (serial number), a screen called **Confirm Changes Upload** will appear. In this moment, the registration number on the list **Registration Number** must be selected, and then it is necessary to click on **OK** to resume the upload.

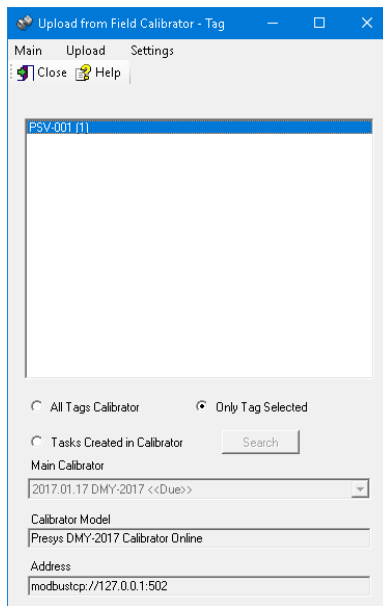


Figure 85 – Dialog box **Upload from Field Calibrator**

After the upload is finished, the tags that were in the calibrator are removed from the **Pending Tags** list. In order to view the calibration data, it is necessary to go to the **Calibration Results** screen on the main screen menu of ISOPLAN **Results > Calibration Results**. If a tag cannot be found, use the option **Tags General Search** on the Results screen.

## 6.4. Manual Upload

The filling in of calibration data is initiated through a dialog box called Manual Upload (it is opened by using the W.O. menu on ISOPLAN main window), where all the tags with available manual download are shown. Choose one of the tags and select the option **Upload**, so that the window **Manual Upload Data Entry** appears.

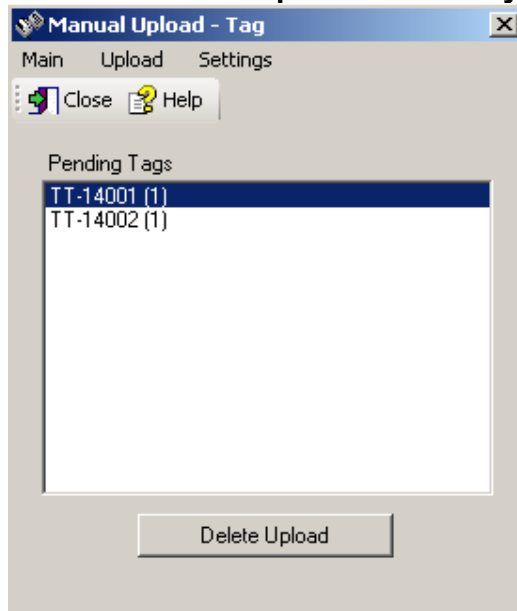


Figure 86 – Dialog box **Manual Upload**

Isoplan allows users to order the uploads list by name or by date through the menu **Settings>Order by name** or **Order by date OS**.

You can delete the tags of **Pending Tags** list through the **Delete Upload button**.

### 6.4.1. Manual Upload Input

The data collected during calibration must be entered on this screen. Choose the option **As Found** to enter the initial calibration data and **As Left** to enter the final calibration. Then, fill in the table fields and click on **Save** to save the calibration data.

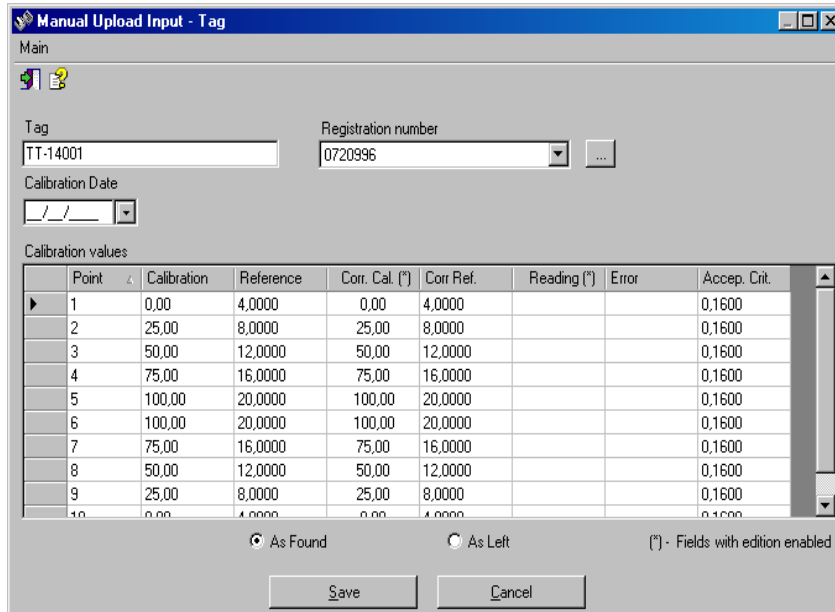


Figure 87 – Dialog box **Data Entry Manual Upload**

After saving, the tag is removed from the **Pending Tags** list. In order to view the calibration data, it is necessary to go to the **Calibration Results** screen on the main screen menu of ISOPLAN **Results > Calibration Results**. If a tag can not be found, use the option **Tags General Search** on the **Results** screen.

The fields on this screen are as follows:

**Tag**

Instrument tag identification.

**Registration Number**

Instrument registration number.

**Calibration Date**

Date when the calibration was completed.

**Calibration Values**

On this table, the values concerning **Corrected Calibration** and **Reading** are entered, where:

- **Point:** calibration point number.
- **Calibration:** calibration point (instrument input).
- **Reference:** reference point (instrument output).
- **Corrected Calibration:** corrected calibration value; value applied to the instrument input. This value is normally the same as the calibration value, but in

some cases, such as pressure measurement, it is not possible to adjust the instrument input (calibration) to the desired value, so it is necessary to enter the calibration value effectively used in the instrument input, which is referred to as **Corrected Calibration** in ISOPLAN.

- **Reading**: instrument output value; it can be an indication read by the operator or a signal measured by a standard, in the case of transmitters or sources.
- **Error**: value calculated by ISOPLAN with the error in engineering unit.
- **Acceptance Criteria**: acceptance criteria in engineering unit.

### 6.4.2. Manual Upload External Laboratory

The tags that have been sent for calibration in an external laboratory and are waiting for the certificate input appear on this screen. Choose one of the tags and select the option **Upload**, so that the window **Manual Upload External Lab. appears. External**.

### 6.4.3. Manual Upload Input External Calibration

The calibration data provided by the external laboratory certificate must be completed on this screen. Choose the option **As Found** to enter the initial calibration data and **As Leftt** to enter the final calibration. Then, fill in the table fields and click on **Save** to save the calibration data.

After saving, the tag is removed from the **Pending Tags** list. In order to view the calibration data, it is necessary to go to the **Calibration Results** screen on the main screen menu of ISOPLAN **Results > Calibration Results**. If a tag can not be found, use the option **Tags General Search** on the **Results** screen.

The fields on the screen are the following:

#### Tag

Instrument tag identification.

#### Registration Number

Instrument registration number.

#### Calibration Date

Date when the calibration was completed.

#### Calibration Values

On this table, the values concerning **Calibration** and **Reading** are entered, where:

- **Point**: calibration point number.
- **Calibration**: calibration point (instrument input). ISOPLAN brings the desired calibration points that have been defined in the **tags** registration in the **strategy** part. This value can be altered in case the laboratory has defined a different

calibration point.

- **Reference:** reference point (instrument output).
- **Reading:** instrument output value; it can be an indication read by the operator or a signal measured by a standard, in the case of transmitters or sources. This value is generally an average value provided on the calibration certificate.
- **Uncertainty:** uncertainty value declared on the certificate.
- **K Factor:** K factor associated with uncertainty.
- **Acceptance Criteria:** acceptance criteria in engineering unit.

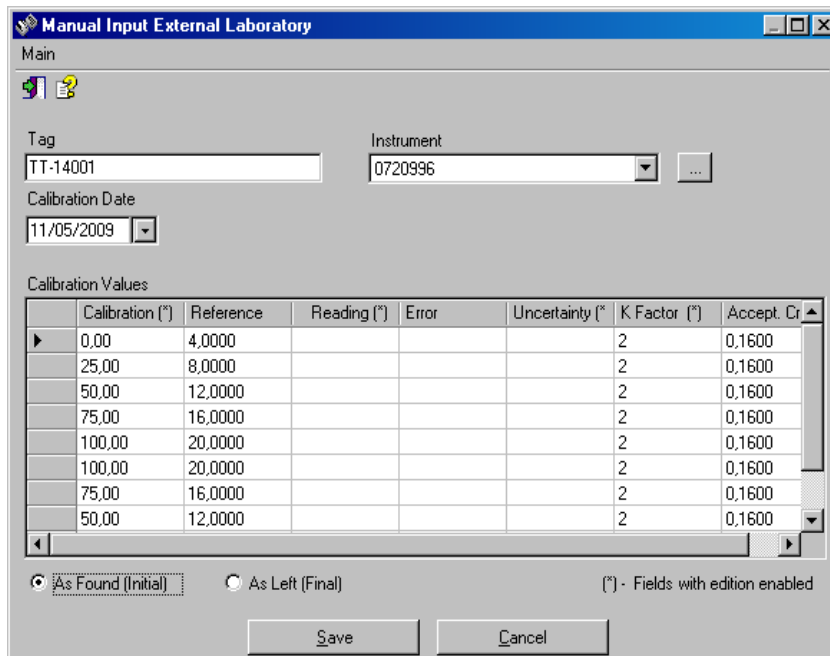


Figure 88 - Manual Input External Laboratory dialog box

## 6.5. Isoplan Connector

Isoplan presents an application called Isoplan Connector that facilitates the communication of Isoplan with Presys calibrators through ethernet connection in corporate environments where Isoplan is virtualized, does not have access to USB port or direct access to the network where the calibrator is installed. In this mode both Isoplan and calibrators must have access to a common server defined by the company's IT department.

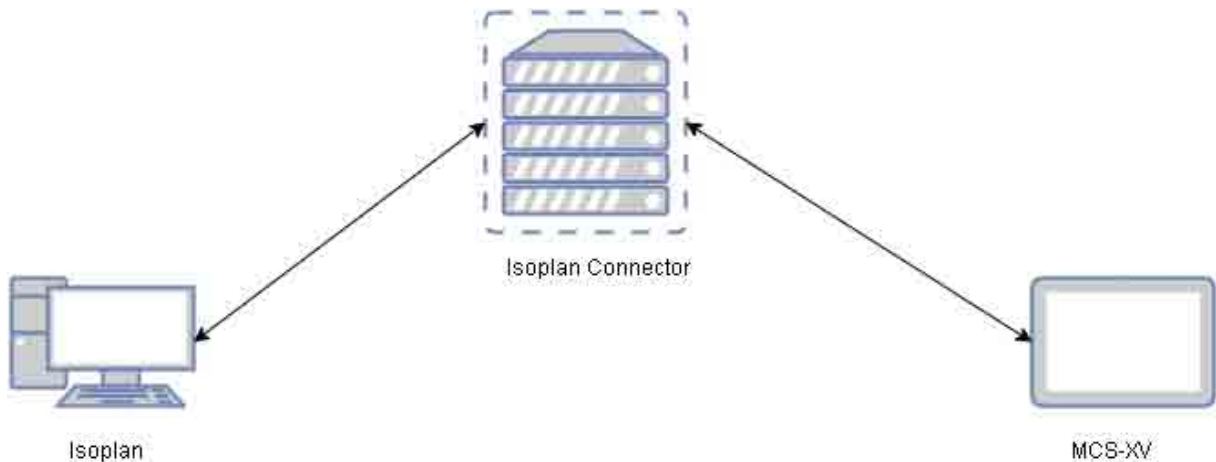


Figure 89 – Isoplan connector

The communication between the Isoplan and the calibrators is no longer direct and works as follows:

- 1) During Download Isoplan sends all calibration information to the connector that stores this data as a Presys Calibrator task on the server where the connector is installed. The Calibrator does not need to be turned on at this time.
- 2) Turn on the calibrator and follow the next steps inside the calibrator.
- 3) + Choose the Tasks> Explore Tasks> Remote Server option
- 4) Tap Search to list the tasks sent by Isoplan and stored in the connector. Note that Isoplan does not have to be open at this time.
- 5) Tap Load to transfer the tasks to the Calibrator to run.
- 6) Perform tasks normally on the calibrator
- 7) After the task has been executed, go back to the Remote Server option.
- 8) Tap the Performed tab and tap SEARCH.
- 9) Tap Send to send the tasks that are performed to the connector. The task is not sent directly to the Isoplan database

- 10) Return to Isoplan and upload the pending calibrations in the same way as other calibrations sent to the calibrators are uploaded. Note that the calibrator does not need to be turned on at this time.

## 6.5.1. Connector Installation

Installing the connector requires that the software be installed on a company server and adjust some settings on Isoplan and the calibrator.

### 6.5.1.1. Server Installation

The installation of the connector on the server should be done as follows:

- 1) Install Isoplan on a company server. This server can be any machine that is connected continuously.
- 2) Search in the Windows Start menu for the connector shortcut in Presys Instruments> Isoplan 5.0> Presys Calibrators Connector
- 3) Run the connector by clicking on the shortcut.
- 4) On the Windows Service tab click Install to install the connector as a Windows service.
- 5) Adjust the connector network information:

Address: machine name or connector ip address

Port: TCP / IP port that will be used by the connector

**NOTE: The address and port cannot be used by another program and both the calibrator and Isoplan should not have restriction to connect to this address. The Isoplan and the calibrator may be in different locations and networks, but both need to have access to this server where the connector was installed.**

- 6) Click Save to save the settings.
- 7) Click Start to start the connector service. The connector is a Windows service that works regardless of whether a user is logged on to the machine. You should normally set the service to start automatically.
- 8) Click Test to verify that the service is working.

### 6.5.1.2. Calibrator Configuration

The following settings must be performed on the Calibrator:

- 1) + Choose the Tasks> Explore Tasks> Remote Server option

2) Touch the CONFIGURATION tab.

3) Enter the following as the remote address:

http://<address>/ITasksCalibrator

Where: <address> is the address where the connector is running.

4) Tap the tab WAITING and press SEARCH to verify that the calibrator is able to access the connector.

## 7. Results

### 7.1. Calibration Results

This screen is used to view the calibration data performed through upload and the issuing of calibration certificates. Before printing the certificate, it is necessary to enter some complementary information about calibration on the several tabs of this screen, as described in the topics below:

### 7.2. Tags

The Tags tab shows a list of calibrated tags. Initially, the list shows the tags that have been calibrated over the last working week. The Tags list can be modified through the **Filter** available on the screen. To filter choose one of the options, then click the **Update** button, the options are:

**Calibrations with latest upload:** lists all calibrations carried out in the last 15 days;

**Pending operator:** list all calibrations that are awaiting signature of the operator;

**Pending reviser:** list all calibrations that are awaiting signature of the reviser;

**Pending responsible:** list all calibrations that are awaiting signature of the responsible;

**All:** list all calibrations.

Isoplan allows you to perform an instant search of tags that are on the list, simply enter the tag name or part, in the **Filter text box**.

For a more detailed search see the menu **Main>General Tags Research**.

This list is also used to delete calibrations, see the **Erasing Calibrations topic**.

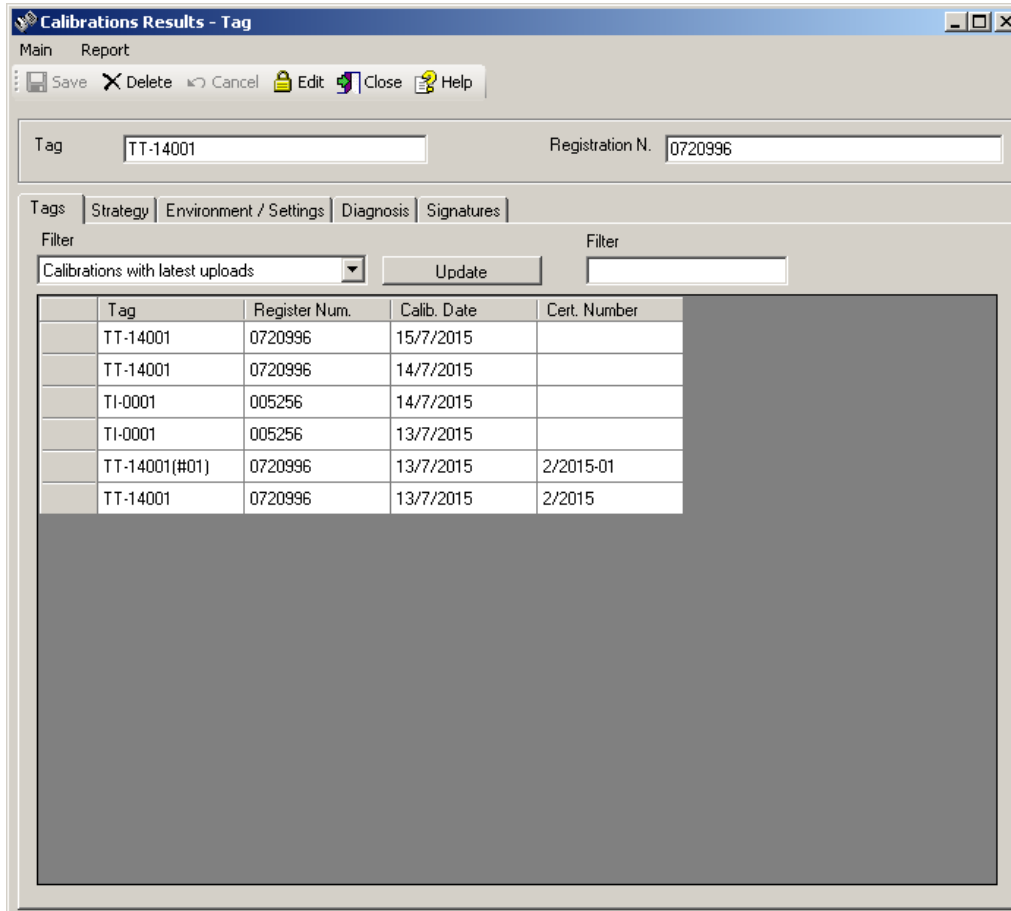


Figure 90 – Tags tab on the Calibrations Results dialog box

### 7.3. Strategy

Isoplan allows a single certificate with more than one range or calibration strategy. If it have been configured more than one strategy in the tag register, it can select the desired strategy in the **strategy** list.

#### 7.3.1. Calibration Values

This table shows the calibration values and it can display different columns. It depends if the calibration is carried out by ISOPLAN or if the instrument is sent to an external laboratory.

### 7.3.1.1. Table for calibrations carried out by ISOPLAN

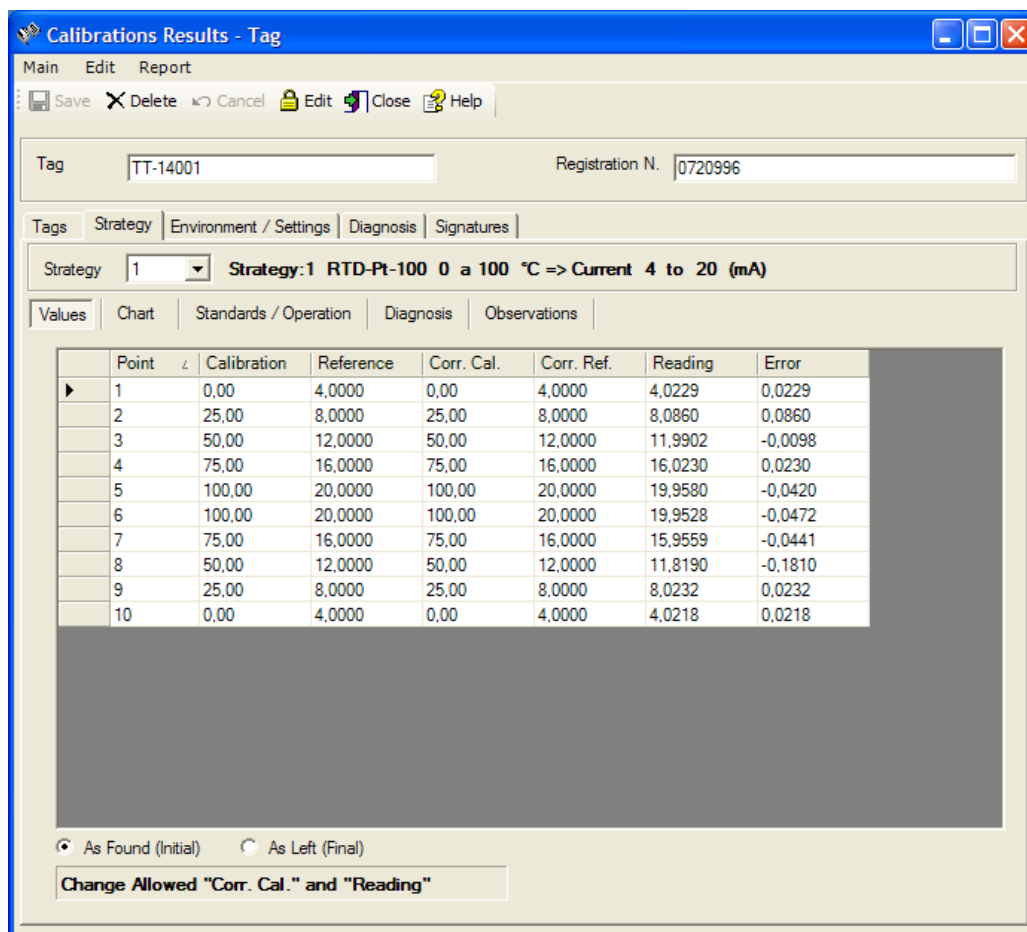


Figure 91 – Values tab on the Calibrations Results dialog box

- **Point:** calibration point number.
- **Calibration:** calibration point (instrument input).
- **Reference:** reference point (instrument output).
- **Corrected Calibration:** corrected calibration value; value applied to the instrument input. This value is normally the same as the calibration value, but in some cases, such as pressure measurement, it is not possible to adjust the instrument input (calibration) to the desired value, so it is necessary to enter the calibration value effectively used in the instrument input, which is referred to as **Corrected Calibration** in ISOPLAN.
- **Ref. \* Corr. :** reference point (instrument output) when the corrected calibration value in the instrument input is applied.
- **Reading:** instrument output value; it can be an indication read by the operator or a signal measured by a standard, in the case of transmitters or sources.

- **Error:** value calculated by ISOPLAN with the error in engineering unit.
- **Acceptance Criteria:** acceptance criteria in engineering unit.

### 7.3.1.2. Table for Calibrations carried out in External Laboratory

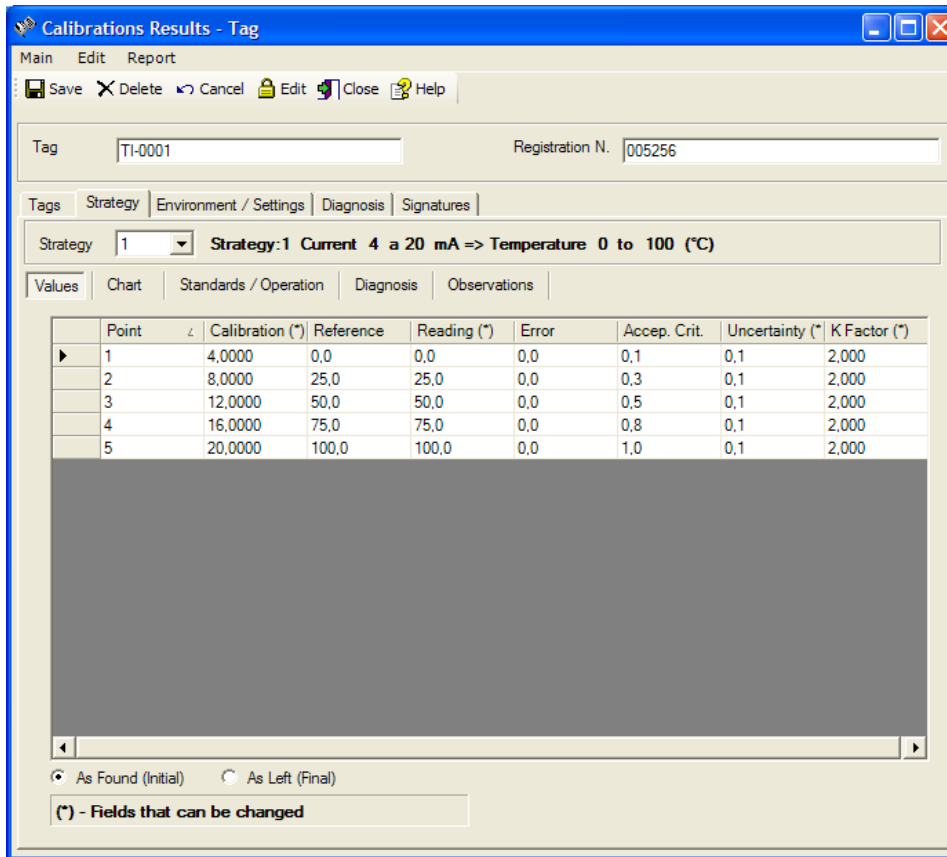


Figure 92 – External lab. **Values** tab on the Calibrations Results dialog box  
**Calibration Results**

- **Point:** calibration point number.
- **Calibration:** calibration point (instrument input). ISOPLAN brings the desired calibration points that have been defined in **the tags registration in the strategy part**. This value can be altered in case the laboratory has defined a different calibration point.
- **Reference:** reference point (instrument output).
- **Reading:** instrument output value; it can be an indication read by the operator or a signal measured by a standard, in the case of transmitters or sources. This value is generally an average value provided on the calibration certificate.
- **Uncertainty:** uncertainty value declared on the certificate.

- **K Factor:** K factor associated with uncertainty.
- **Acceptance Criteria:** acceptance criteria in engineering unit.

### 7.3.2. Error Chart

This tab shows an error chart in relation to the calibration point. The error of the measured values is expressed in engineering unit. The results achieved during readings with up, down or up/down sequences for as found and as left calibrations can be drawn on the same chart by the selection of the items of the "Sequence Type" field.

Click on **Chart** to open a separate screen for the charts, allowing them to be printed.

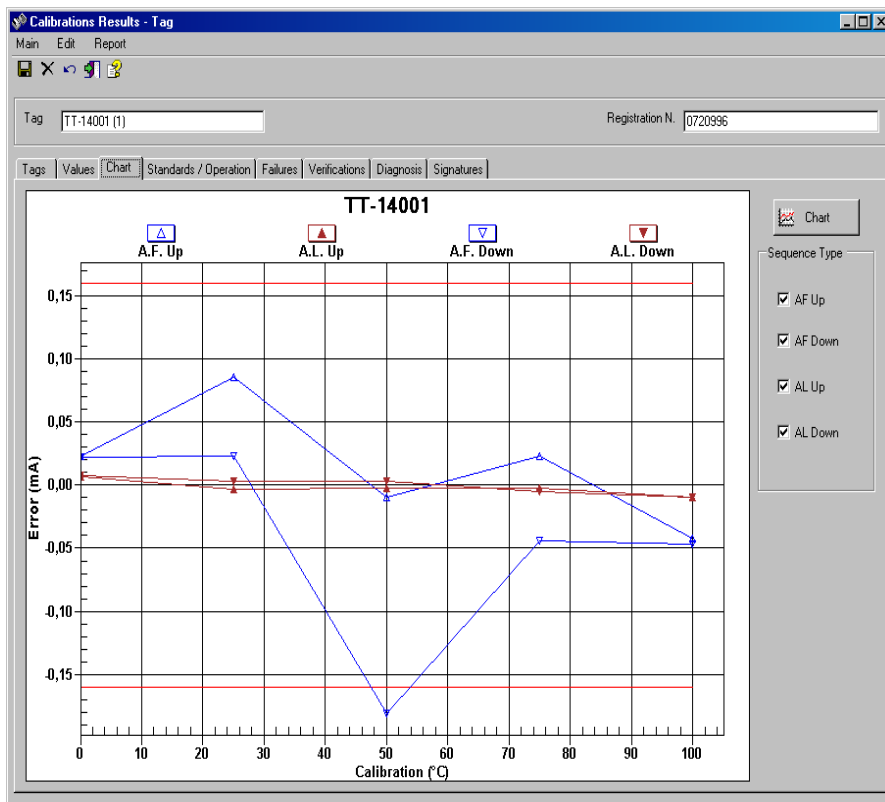


Figure 93 – **Chart** tab on the **Calibrations Results** dialog box **Operation Conditions and Standards**


### 7.3.3. Standards

This tab presents data on calibration conditions, external laboratory data, sources of error, uncertainties due to the standards used and the instrument being calibrated. Below the description of the items on this screen.


#### 7.3.3.1. Error Sources

Error Sources Uncertainties due to the used standards and to the instrument being calibrated. This option must not be used when the instrument is sent to an external laboratory.

### Used Standards

List with the standards used during calibration. Click on the button  to edit the list of used standards. See section **Used Standards** to obtain more details about choosing standards.

### Instrument Uncertainty Sources

ISOPLAN allows uncertainties related to the instrument to be taken into account, such as uncertainty due to the instrument resolution, effect of the room temperature variations etc. Click on the button  to edit the list of used error sources. See section **Instrument Uncertainty Sources**.

### Number of Uncertainty Decimals

ISOPLAN usually brings the same number of decimals used in the reference (instrument output) to show uncertainty. There is an option to show the uncertainty with a larger or smaller number of decimal places by choosing one of the values from this list for the number of places the option "**2 Significant**" to show the uncertainty with two significant figures.

## 7.3.3.2. Used Standards

This screen is used to register the standards applied during the calibration of an instrument according to the procedure stated below. It is only possible to use a standard that has a certificate registered in ISOPLAN, as explained in **standards registration**.

1. First, click on the "**Instrument Input Uncertainties**" field if you would like to add standards that have been used to generate the instrument input signal, or click on "**Instrument Output Uncertainties**" if you would like to add standards that have been used to measure an instrument output signal (normally used with transmitters).
2. Click on the **Add** button of the **Uncertainty Standards** tab to access the screen showing the available standards. Isoplan has the option of trying to automatically find the standard used, click the **Yes** button to accept this option or **No** to manually select the standard.
3. Choose one of the available standards from the **Error Source** field, which must correspond to the standard used during calibration.
4. In the **Scale** field, choose which standard scale has been used.

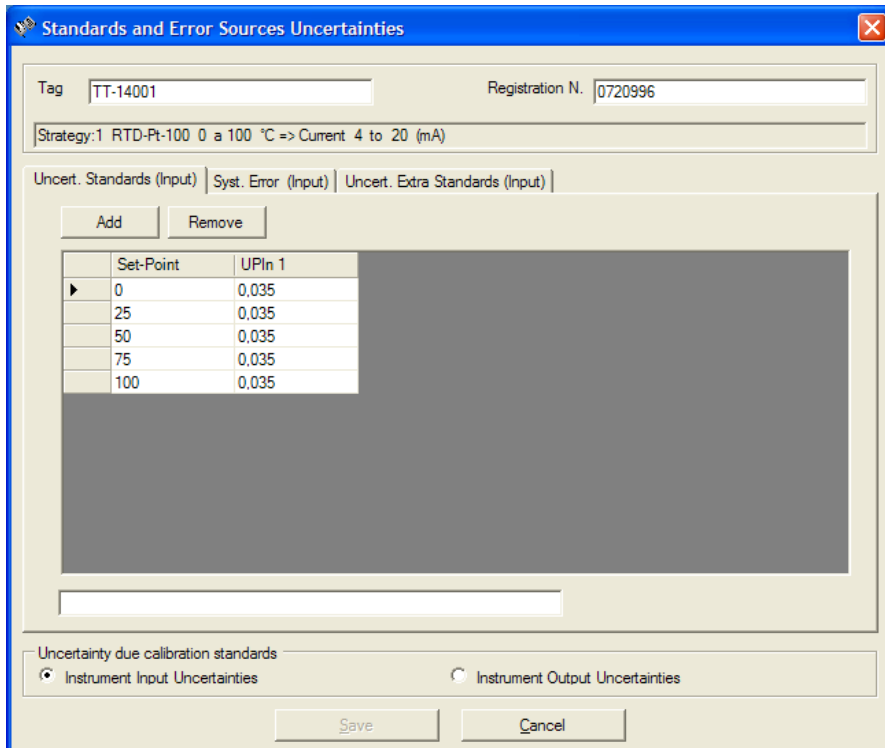


Figure 94 - Tab **Uncertainty Standards** of the dialog box **Uncertainty of Standards and Error Sources**

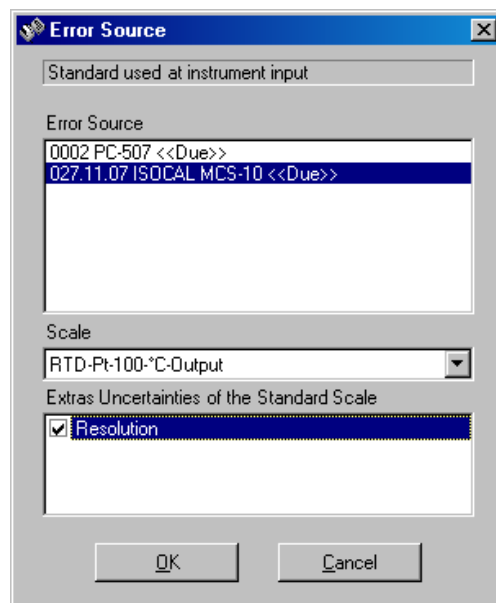


Figure 95 - Adding an **Error Source** dialog box

5. Optionally, choose an extra type of uncertainty, besides the standard, that is likely to be taken into account for the preparation of the calibration certificate. These extra uncertainties only appear if they are created in the **Standard Scales Registration**.
6. Click on **OK** to confirm the standard addition.

- The table on the **Standard Uncertainties** tab must show a new column with the uncertainties due to the standard. The column is called Upln1, which means this is the first standard uncertainty associated with the instrument input. The **Syst. Error** tab represents the standard systematic error, as described in the manual appendix, and it is only used if the option **Correct Standards** on the **Diagnosis** tab is chosen.
- Repeat steps 2 to 7 for any other standard scale that has been used in the instrument input.
- If there is the need to add standards associated with the instrument output, it is necessary to start from step 1 again, choosing the corresponding option.

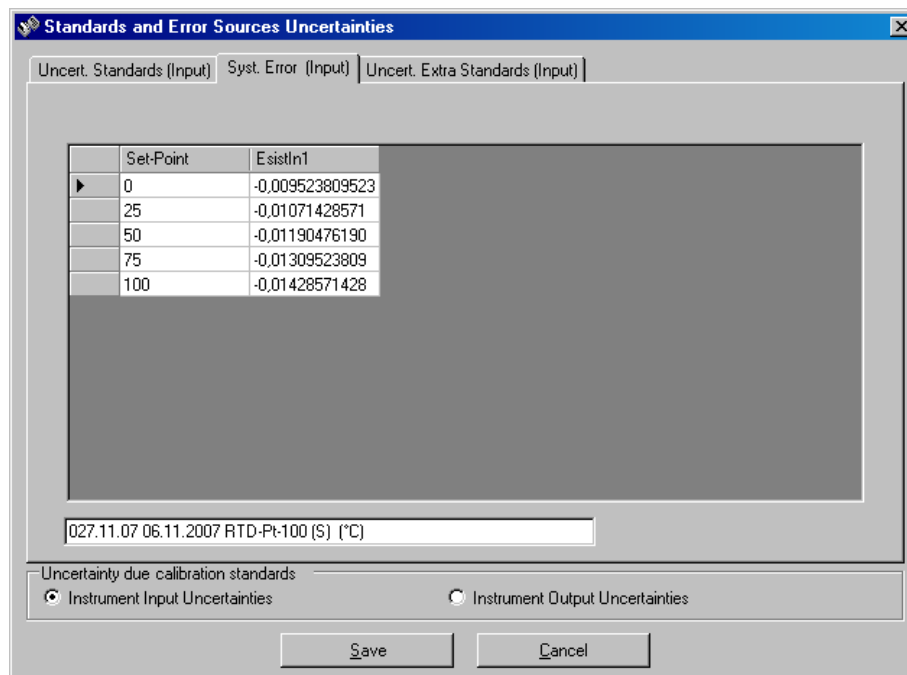


Figure 96 - Tab **System Error** of dialog box **Uncertainty of Standards and Error Sources**

The tab **Syst. Error** displays the systematic error of the standard as supplied in the standard register for the measured point. A systematic error of the standard was considered to be the value indicated by the standard minus the reference value of the laboratory that provided the certificate of the standard.

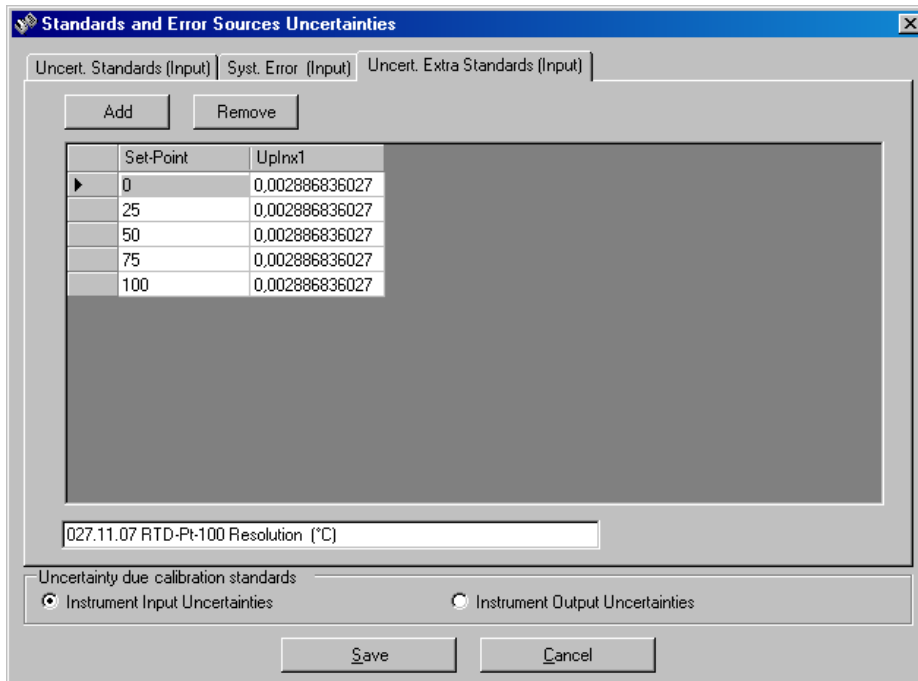


Figure 97 - Tab **Standards Extra Uncert** of the dialog box **Uncertainty of Standards and Error Sources**

The tab **standards Extra Uncert.** shows values for other uncertainties that were chosen in step 5 explained above.

**Comments:**

- The values shown on the screen correspond to the interpolated data concerning used errors and uncertainties, obtained from the standard calibration certificate.
- ISOPLAN can display a warning saying it was not possible to calculate the uncertainty data. This usually occurs in cases where ISOPLAN is not capable of converting the unit from the standard certificate to the unit used in the instrument calibration. ISOPLAN only allows the conversion of pressure unit. It is recommended to register scales that do not have the same pressure as the unit that will be used by the instruments.

### 7.3.3.3. Instrument Uncertainty Sources

ISOPLAN allows extra uncertainties regarding the instrument to be taken into account, such as uncertainty due to the instrument resolution, effect of the environmental temperature variation etc. In order to add uncertainties related to the instrument, follow the procedure described below.

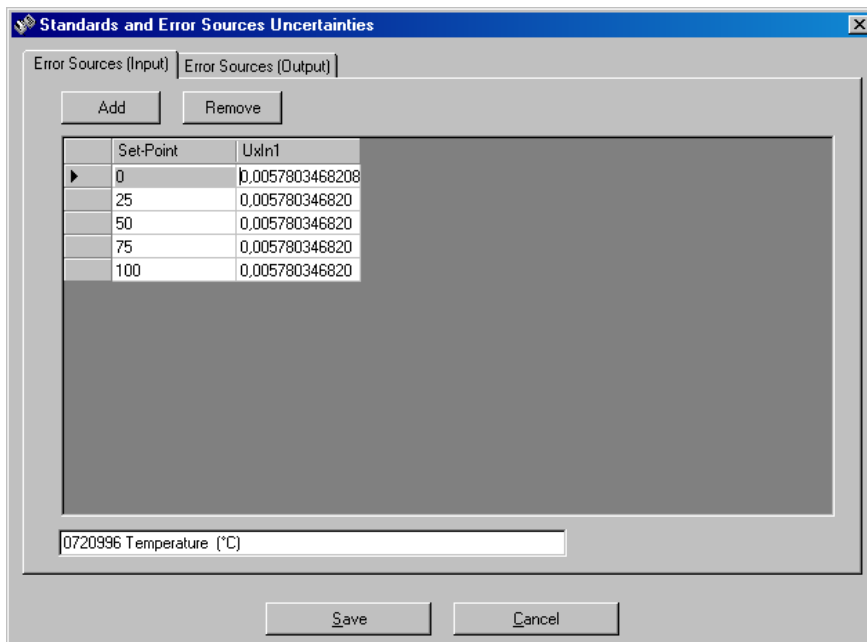


Figure 98 - Tab **Error Sources** of the dialog box **Uncertainty of Standards and Error Sources**

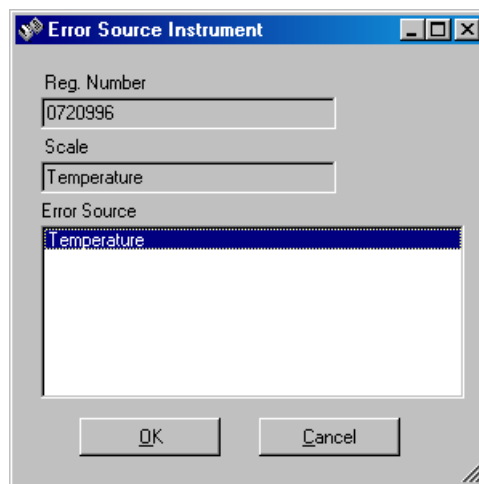


Figure 99 - **Error Source dialog box**

1. Choose the **Error Source (Input)** tab if you want to register an error source associated with the instrument input, or choose the **Error Source (Output)** tab if you want to register an error source associated with the instrument output.
2. Click on the **Add** button to access the screen with the registered instrument error sources.
3. Choose one available **Error Source**. This list will only appear if an error source registration was made on the **Instrument Scales** screen, and if this scale was associated in a correct way on the **Calibration tab of the Tags** Registration.
4. Click on **OK** to confirm the addition of the error source.
5. The table on the **Error Source (Input)** tab must display a new column with the uncertainties due to the instrument. The column is called UxIn1, which means this is an extra uncertainty from the first error source associated with the calibration.
6. Repeat steps 2 to 5 for any other instrument error source that you may want to add.
7. If it is necessary to add error sources to the instrument output, one must start from step 1 again, choosing the corresponding option.

**Comments:**

- The values shown on the screen correspond to the interpolated data concerning uncertainties that have been registered on the **Instrument Scales screen**.
- ISOPLAN can display a warning saying it was not possible to calculate the uncertainty data. This usually occurs in cases where Isoplan-5 is not capable of converting the unit from the instrument scale registration to the unit used in the instrument calibration.

### 7.3.4. Scale Diagnosis

This tab provides information about the calibration diagnosis, maximum error found and some calibration settings. This diagnosis is specific to a single calibration strategy or range. There is also a general diagnosis for cases where there is more than one strategy for the tag.

#### Initial Diagnosis and Final Diagnosis

In ISOPLAN, the diagnosis is defined by the user, who can specify if the instrument was **approved** or **reproved** by clicking on one of the options on the screen. The equipment is usually reprovod if the error, or the absolute value of the error plus the uncertainty, is smaller than the acceptance criteria. If desired, the user can approve an instrument that presents an error larger than the acceptance criteria. In this case, it is recommended to justify the approval in the comments part of the **Failures** tab.

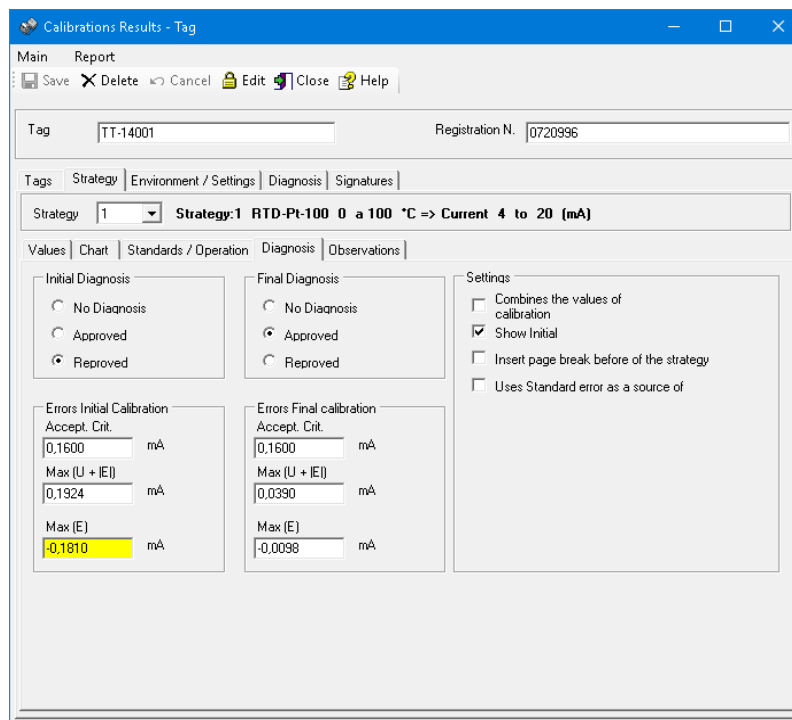


Figure 100 – **Diagnosis** tab on the Calibrations Results dialog box

## Calibration Errors

This field brings information about the initial and final calibration, where:

**Max (E):** biggest error found during calibration.

**Max (|E|+ U):** biggest sum value of the error module and uncertainty.

**Acceptance Criteria:** acceptance criteria defined by the user. The acceptance criteria are shown for the biggest error found.

## Configurations

Defines some settings for calibration:

- **Reverse calibration:** the calibration at ISOPLAN is usually performed by adjusting a desired value to the standard, which is applied to the instrument input, and by reading a value indicated on the instrument. In case of multiple readings, the standard value is fixed and the instrument value can vary. For the reverse calibration, which is used for the analogical manometers, for example, the value applied to the instrument input is adjusted until the instrument indication shows a desired value, and then the standard value is read. In case of multiple readings, the instrument value is fixed and the standard value can vary. When it comes to reverse calibration, the report transforms the field Reading into Reference, indicating that the standard reference value is what varies.
- **Group by the Calibration Values:** Isoplan normally separates both ascending and descending reading points to check for some type of hysteresis, if you are not interested in this separation click on this option where Isoplan groups all points of the same calibration value, for example, if you have made a calibration ranging from 0 to 100 and 100 to 0 once, if you click this option, the certificate will consider that there were 2 readings for each calibration point.
- **Corrects Standards:** option used to correct values indicated by the calibration standards by the certificate, for example, if a standard shows on the display 10.00, but on the certificate indicates that for this value the laboratory reference is 9.95 so if this option is enabled, the value of 9.95 will be displayed and not the value indicated in the standard display.
- **Acceptance Criteria Type:** concerning the option **Only Error**, ISOPLAN suggests the approval of the certificate if  $|E| \leq \text{acceptance criteria}$ , where  $|E|$  refers to the absolute value of the error. Choosing **Error plus uncertainty** – ISOPLAN suggests the certificate should be approved if  $|E| + U \leq \text{acceptance criteria}$ , where  $|E|$  is the error module and  $U$  is the uncertainty of the calibration point.
- **Display As Found:** if disabled the as found calibration is no longer displayed even if it was done.

- **Inserts page break before strategy:** inserts a page break before the strategy to improve the formatting of the certificate.
- **Uses Error of Standard as Uncertainty Source:** allows you to use the maximum error of the standard as a source of uncertainty. This feature can be used when the pattern correction option has not been chosen.

### 7.3.5. Observations

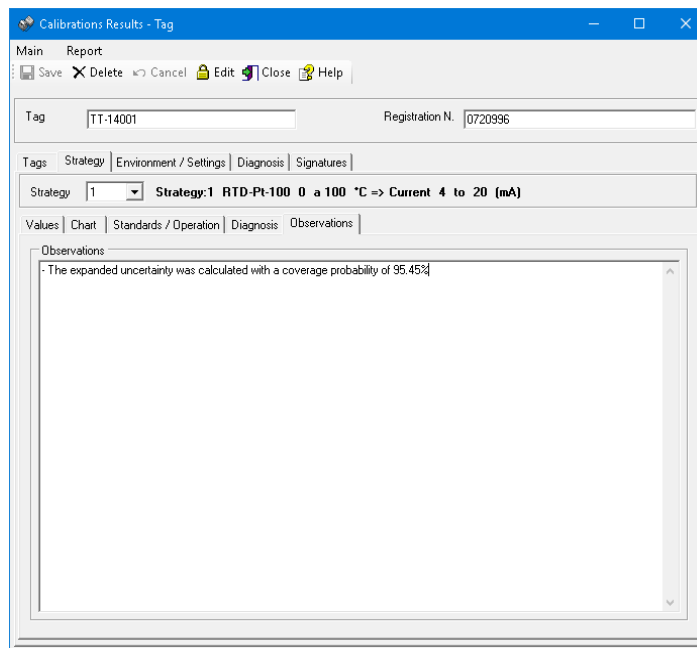


Figure 101 – **Diagnosis** tab on the Calibrations Results dialog box

The **Notes** tab allows the user to enter all the remarks pertaining to the certificate. This field is populated with a default text that can be set in the **Configuration** option of the menu **Register** of Isoplan. Only supervisor level user can change this text.

### 7.3.6. Accreditation <sup>22</sup>

The fields in this tab may vary according to the service chosen.

**Uncertainty due to zero point hysteresis:** Check the option "**Enable zero point hysteresis**" to add an uncertainty component due to zero point hysteresis. You must enter the zero point read at the beginning and end of the calibration.

The temperature services have the following fields:

**Shows Electrical Signal on the Certificate:** this option, when marked, is used to show the corresponding value of the electrical signal (ohm or mV) generated by the sensor together with the temperature points. These values must be entered in the **Values** tab.

**Electrical Signal Unit:** sensor's electrical signal unit (mV for thermocouples and ohm for thermoresistors).

**Number of Wires:** number of thermoresistance wires.

**Shaft Length:** This option, when checked, is used to show the depth value at which the sensor was calibrated along with the temperature points. These data must be entered on the **Values** tab.

**Immersion Unit:** Immersion unit used as mm.

**Shaft Length:** Text with length of sensor shaft.

**Shaft diameter:** text with sensor rod diameter.

In the part of adding standards used there is a option called "**Calibration Points Used**" where you can specify in which calibration points the standard was used. Normally all points are marked, uncheck if the standard has not been used at all calibration points.

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<sup>22</sup> Accredited Services Module

## 7.4. Environment/Settings

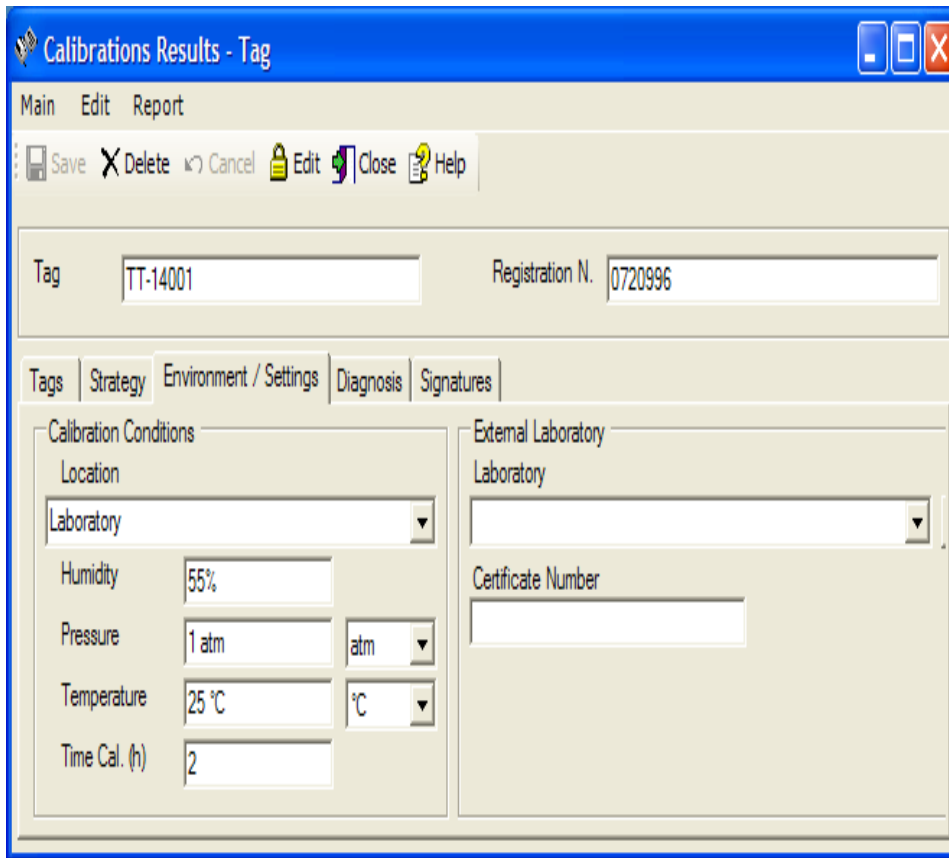


Figure 102 - Tab **Standards/Operation** of the dialog box **Calibration Results**

### Local

Text to define where the instrument was calibrated. Isoplan shows a list with the last registered locals.

### Humidity, Pressure and Temperature

Fields that define the conditions of the environment during calibration.

### time Cal. (h)


Calibration time in hours. This value is used to generate calibration time statistics, see topic **Area Statistic**.

The calibration conditions can be filled with a default value of temperature, pressure and humidity if it has been filled in the **Configurations** option of Isoplan.

### 7.4.1.External Laboratory

Data used for instruments calibrated in an external laboratory.

### Laboratory

Select one of the registered laboratories or use the button  to register a new laboratory.

### Certificate number

Number of the certificate provided by the laboratory.

### Attached File

In this group it can be added and viewed a file in PDF format, usually the standard calibration certificate, click the **Add** button to add a file, the **Remove** button is used to remove the file, and to view the file click the **Visualize** button.

## 7.4.2. Service Provider<sup>23</sup>

### Client

In the case of the Isoplan service provider there is possibility to choose the client that appears in the certificate of the Instrument.

### Show Accreditation Logo

Option to display a laboratory accreditation logo on the certificate.

## 7.5. General Diagnosis

### Initial Diagnosis and Final Diagnosis

These configurations are similar to the strategy diagnosis shown previously, but would be for the certificate as a whole, the strategy diagnosis is individual by range, this would be a final diagnosis of the instrument, where the user, for example, could approve a presented instrument some scale that presents a nonconforming diagnosis.

### Maintenance

Indicates whether the maintenance type was **preventative** or **corrective**.

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<sup>23</sup> Optional Module Service Provider

Defects and situations detected during calibration can be added through the tab **Defects**. The addition of a defect is done as follows:

1. Click the button **Add**.
2. Choose one of the defects from the list or click on the **Edit** button to create a new defect and click the **Ok** button to add the defect. The **Cancel** button is used to cancel the addition of the defect.
3. If necessary remove a defect choose the defect to be removed and click on the **Remove** button.

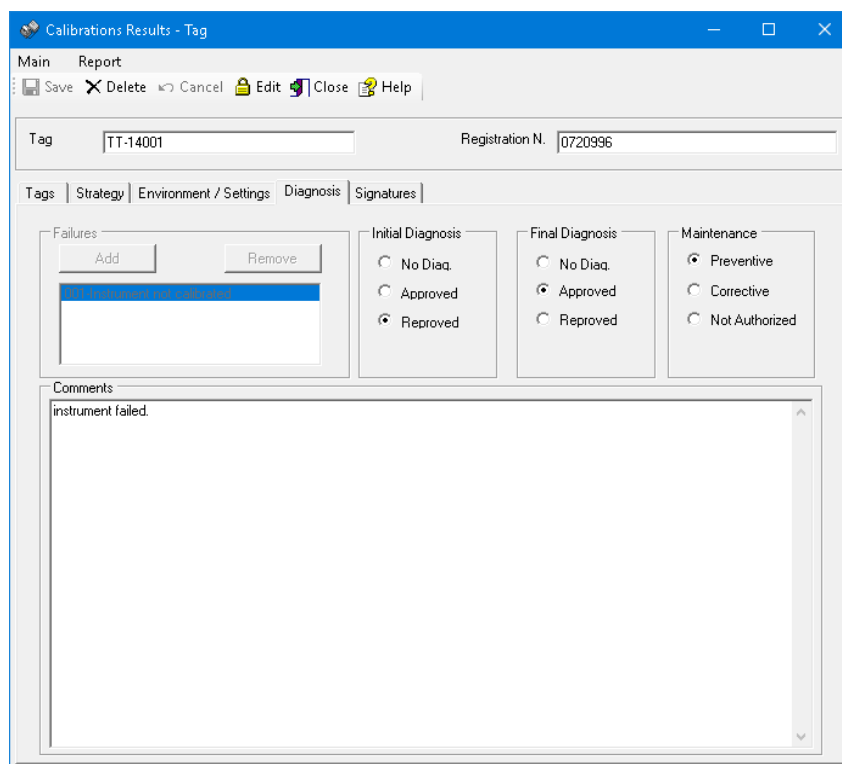


Figure 103 – Tab **Diagnosis** on the Calibrations Results dialog box

The list of defects can be changed through the **Registration>Defects** menu of the Isoplan main screen.

This guide also allows you to add a short text with general comments on calibration through the **Comments** field.

## 7.6. Verifications

When the tag is selected for verification only, see **Tag** register, is presented a table with verifications that were performed

### Verifications Executed

In this table it is defined whether the verifications was **Approved** , **Reproved** or if the **verification does not apply** (N.A.) to this tag. The choice is made through a list in the **Result** column.

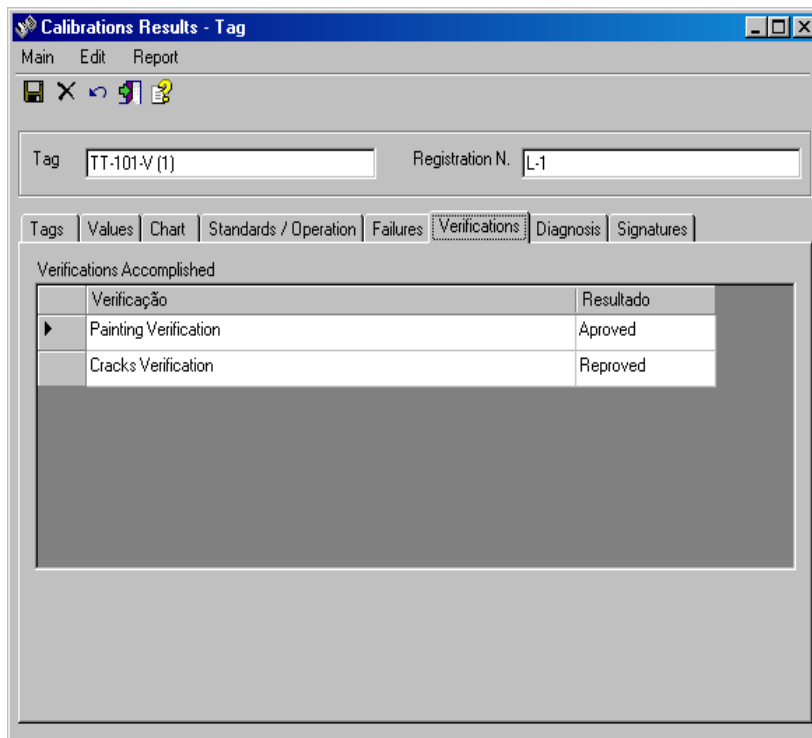


Figure 104 - Tab **Verifications** of the dialog box **Calibration Results**

## 7.7. Signature


### 7.7.1. Manual Signature

In Isoplan without electronic signature, the user only chooses which user is the operator and the responsible, and it is necessary to manually sign the printed certificates.

To finalize the calibration and issue the certificate it is necessary to terminate the calibration by clicking the button "**Ends Calibration**". Isoplan now generates a unique number for the certificate. After terminating the calibration it is only for reading, if you want to change the certificate you need to click the "**Corrects**" button and justify the correction.

The certificate number can also be set manually by the user, to enable check **Enable manual certificate number** option in the tab **General** of the configuration register.

### 7.7.2. Isoplan Manual Signature Service Provider<sup>24</sup>

The client field allows the name and address of the client to be defined in the report header. Click the button  to edit or add a new client.

Termination of the calibration on the Isoplan with the service provider module is performed by clicking on the "**Ends Calibration**" button where the user must confirm that he really wants to terminate the calibration data entry. Once the end of the calibration is confirmed, no further changes to the certificate will be allowed, it will be necessary to create a revision of the certificate if changes are necessary. The certificate number will be unique even if one or more companies have been registered in Isoplan.

In addition to asking the user if he or she wants to finish the calibration, there is an option called "**Overlap a Certificate done**" if you want the certificate to replace an existing certificate that is likely has an error.

### 7.7.3. Correction of the Certificate in Isoplan with Service Provider module<sup>25</sup>

After the calibration is finished, the certificate can not be changed, if a correction is necessary, there are two options:

1. You must create a new work order, do the download and upload procedures and when you finish the certificate leave the option **Overlap a Certificate done** checked selecting the certificate number of the calibration to be corrected. This mode should be used if there are major

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<sup>24</sup> Service Provider Module

<sup>25</sup> Service Provider Module

changes to the certificate, eg adding new calibration points, changing the output type from mA to ° C, etc.

2. Click the button "**Correct**" of the Tab **Signatures** in the **Calibrations Results** screen.

In the case of correction by the **Results** form a justification is requested and a copy of the certificate will be created where the number is changed, for example from 2/2009, to 2/2009-01 indicating that it is the the first revision of the certificate. The tag name on the screen also changes where it is added (# 01) in the tag name, in the certificate this text does not appear. The revision tag must be located in the tab **Tags** of the **Results**.

The corrected certificate displays a text referring to the original certificate being corrected.

### 7.7.4. Signature Electronic<sup>26</sup>

The name of the operator, reviewer, and responsible user only appears on the certificate after the electronic signatures have been made, which in Isoplan consists in validating the user by his/her password.

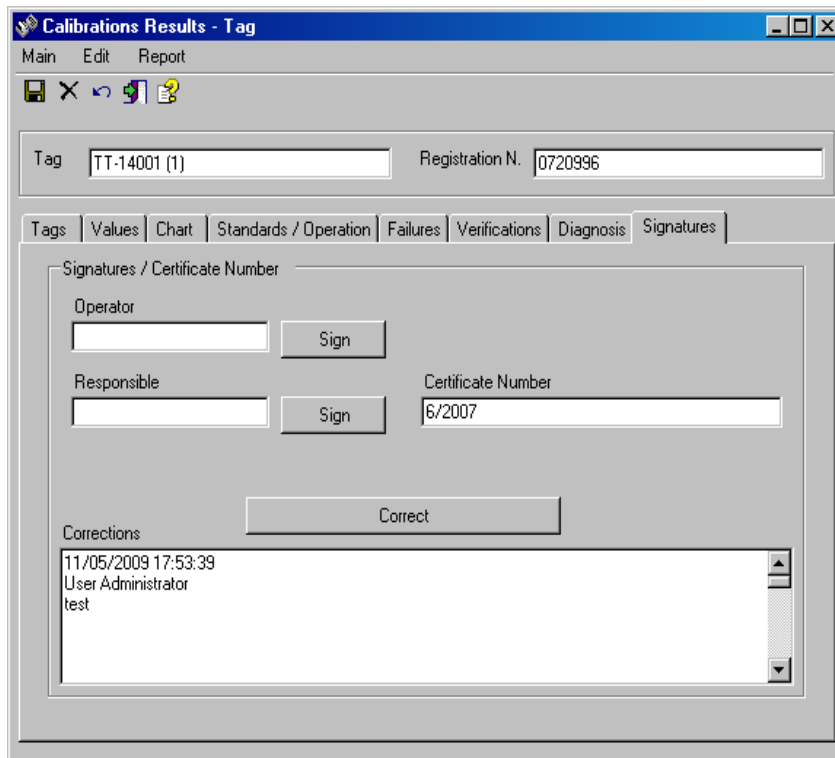


Figure 105 - Tab **Signatures** of dialog **Calibration Results**

<sup>26</sup> Available only on Isoplan with Electronic Signature module (ASE)

The certificate is signed as follows:

1. Enter the **Signatures** tab and choose whether you want to sign the certificate as a operator, reviewer, or responsible.
2. Click the button **Sign** next to the **Operator** field, type the password and if it is correct the user login appears on the screen. After the signature, the user's full name appears on the certificate.
3. Depending on the settings and the company's procedures, two different users must access ISOPLAN and repeat steps 1 and 2, one signing as **Reviser** and the other one as **Responsible**. After the **Responsible** signature, a certificate number is created automatically, and it is not allowed to change the certificate anymore. In case it is necessary to modify a previously signed certificate, see the instructions in the Correcting a **Signed Certificate** section.

**Note:**

- There are some options on the **Registration > Settings** menu that allow the adjustment of some signature settings, such as enabling the same user to enter more than one signature.
- Isoplan allows the user to use a scanned signature that will appear in the certificate, so the **Enabled Scanned signature** option of the general configuration register tab must be enabled and the user must add a signature in the Users register.

#### 7.7.4.1. Correcting a Signed Certificate

After the Operator signature is entered, ISOPLAN prevents any change on the **Calibration Results** screen from being made. If the reviser or responsible has found any error, it is possible to start a certificate correction. The correction is made by clicking on the **Correct** button on the **Diagnosis** tab, where a reason for the correction must be stated. The justification appears on the **Corrections** field.


### 7.8. Calibration Reports

ISOPLAN brings the following types of reports:

- **Standard**: report commonly used, which contains three calibration points, the uncertainty and the error.
- **General**: report that shows the read values and It is recommended for equipment where a single repetition is performed.
- **Brief**: reports that presents only a reading average, the error and the uncertainty.
- **Accreditation** : specific reports for accredited services performed on Isoplan.
- **Uncertainty sheet** : report showing in more detail the uncertainty components used in the Isoplan calculations.

After all the tabs on the **Calibration Results** screen are complete, you can generate the calibration certificate or directly export in PDF format.

To generate certificate:

1. Click on the **Report** menu on the **Calibration Results** screen and choose one of the certificate models.
2. Click on the **Show Error Chart** option in case you want the error chart to appear on the certificate.
3. Click on the **Main > Print Preview** menu on the **Calibration Results** screen to view how the printed certificate will look like.
4. On the preview screen, click on the printer icon. It is possible to export the report into a PDF, Excel or Word file by using the icon .

<b>PRESYS</b>		<b>Calibration Certificate</b>		N.: 6/2007							
				Page LI							
COMPANY: Presys Instruments, Inc.			REG. NUMBER: 0720996								
INSTRUMENT: Temperature Transmitter			TAG: TT-14001								
FUNCT.: Autoclave Temperature			CALIBRATION PERIOD: 12 Months								
AREA: Area-1											
TECHNICAL INFORMATION											
INSTRUMENT	OPERATION CONDITIONS	DOCUMENTS									
MODEL: TY-2090 IN: RTD-Pt-100 FCT: Current MANUFACT.: Presys	RANGE INPUT: 0 to 100 (°C) RANGE OUTPUT: 4 to 20 (mA) Criticality: A	PROC: P11/01									
CALIBRATION AND ADJUSTMENT											
INITIAL CALIBRATION											
Calibration (°C)	Reference (mA)	Corr. Cal. (°C)	Corr Ref. (mA)	Reading 1 (mA)	Average (mA)	Error (mA)	U (mA)	k	Accep. Crt. (mA)		
0,00	4,0000	0,00	4,0000	4,0229	4,0229	0,0229	0,0114	2,000	0,1600		
25,00	8,0000	25,00	8,0000	8,0860	8,0860	0,0860	0,0114	2,000	0,1600		
50,00	12,0000	50,00	12,0000	11,9902	11,9902	-0,0098	0,0114	2,000	0,1600		
75,00	16,0000	75,00	16,0000	16,0230	16,0230	0,0230	0,0114	2,000	0,1600		
100,00	20,0000	100,00	20,0000	19,9580	19,9580	-0,0420	0,0114	2,000	0,1600		
100,00	20,0000	100,00	20,0000	19,9528	19,9528	-0,0472	0,0114	2,000	0,1600		
75,00	16,0000	75,00	16,0000	15,9559	15,9559	-0,0441	0,0114	2,000	0,1600		
50,00	12,0000	50,00	12,0000	11,8190	11,8190	-0,1810	0,0114	2,000	0,1600		
25,00	8,0000	25,00	8,0000	8,0232	8,0232	0,0232	0,0114	2,000	0,1600		
0,00	4,0000	0,00	4,0000	4,0218	4,0218	0,0218	0,0114	2,000	0,1600		
FINAL CALIBRATION											
Calibration (°C)	Reference (mA)	Corr. Cal. (°C)	Corr Ref. (mA)	Reading 1 (mA)	Reading 2 (mA)	Reading 3 (mA)	Average (mA)	Error (mA)	U (mA)	k	Accep. Crt. (mA)
0,00	4,0000	0,00	4,0000	4,0074	4,0073	4,0063	4,0070	0,0070	0,0114	2,000	0,1600
25,00	8,0000	25,00	8,0000	8,0068	7,9912	7,9910	7,9963	-0,0037	0,0178	2,299	0,1600
50,00	12,0000	50,00	12,0000	12,0041	11,9982	11,9919	11,9981	-0,0019	0,0141	2,106	0,1600
75,00	16,0000	75,00	16,0000	16,0035	15,9810	16,0077	15,9974	-0,0026	0,0281	2,798	0,1600
100,00	20,0000	100,00	20,0000	19,9833	19,9956	19,9916	19,9902	-0,0098	0,0143	2,114	0,1600
100,00	20,0000	100,00	20,0000	19,9858	19,9940	19,9925	19,9908	-0,0092	0,0127	2,038	0,1600
75,00	16,0000	75,00	16,0000	15,9911	15,9896	16,0039	15,9949	-0,0051	0,0161	2,208	0,1600
50,00	12,0000	50,00	12,0000	11,9837	12,0157	12,0111	12,0035	0,0035	0,0355	3,087	0,1600
25,00	8,0000	25,00	8,0000	8,0087	7,9877	8,0128	8,0031	0,0031	0,0261	2,713	0,1600
0,00	4,0000	0,00	4,0000	4,0110	4,0061	4,0056	4,0076	0,0076	0,0119	2,000	0,1600
COMMENTS:											
a) The expanded uncertainty was calculated for a confidence level of 95.45%											
CALIBRATION CONDITIONS											
LOCATION: Laboratory		PRESS: 1 atm		TEMPERATURE: 25 °C							
HUMIDITY: 55%											
USED STANDARDS											
Model: ISOCAL MCS-10 S.N.: 027.11.07 Cert. N.: 06.11.2007 Next Calib.: 23/11/2008 Scale: RTD-Pt-100 (°C) U: (0)											
Model: ISOCAL MCS-10 S.N.: 027.11.07 Cert. N.: 06.11.2007 Next Calib.: 23/11/2008 Scale: Current (mA) U: (1)											
MAINTENANCE TYPE AND FAILURE CODE											
Preventive											
001-Instrument not calibrated											
DIAG.			DATES								
INITIAL DIAG.: Reproved			FINAL DIAG.: Approved								
			CALIBRATION: 26/11/2007								
			NEXT: 26/11/2008								
COMMENTS											
Instrument failed.											
Operator User Administrator 12/05/2009 10:38:58			Responsible User Administrator 12/05/2009 10:39:17								

Figure106 – Calibration Certificate sample

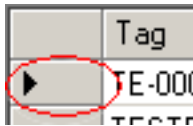
To export directly to PDF click the menu **Main>Export to PDF** of the screen **Calibration Results**.

Isoplan allows you to print several certificates directly at once, so select the calibrations you want to print in the calibration list and then click the menu **Main> Print Selected Calibrations**.

## 7.9. Erasing Calibrations

In order to erase calibrations performed through ISOPLAN, follow the steps below:

1. Access the **Calibration Results** screen and click on the **Tags** tab.
2. Check if the calibration you would like to erase is on the list. In case it is not, try a search, as described in the **General Tags Search** section.



3. Select the desired tag by clicking on the square next to the tag column, as shown in the figure above. Multiple tags can be selected by pressing the Ctrl key while clicking on the tag.
4. Click on the button **Erase** and confirm.

## 7.10. Label Printing

Isoplan displays the label printing option through the menu **Main>Print Label Preview**. Clicking on this option Isoplan shows a screen where the following fields are shown:

**Label:** fields specifying the characteristics of the label used by Isoplan. If necessary, contact Presys to use another label type.

**Line and Column:** A form of labels for inkjet or laser printers usually have several labels on one page. This field indicates in which position (row and column) that the label is on the page.

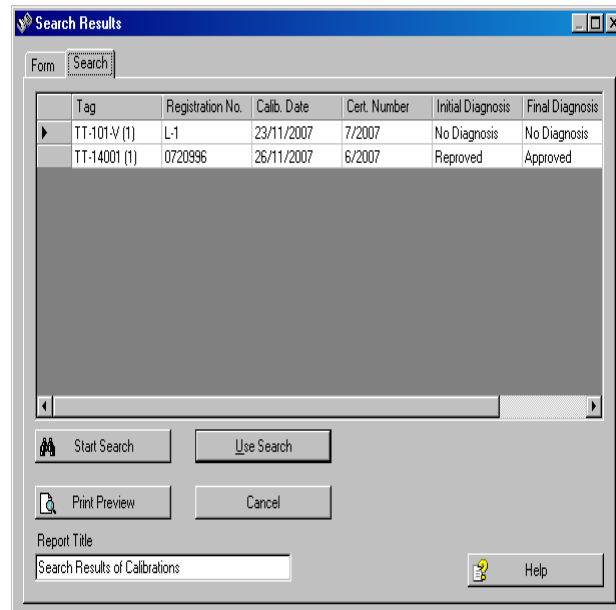
## 7.11. General Tags Search

Use the **Main > General Tags Search** menu to find the calibrations performed through ISOPLAN. The search procedure is as follows:

1. Use the **Form** tab to fill in the data that is known about the tag. On the fields that allow typing, it is possible to use wildcards (%) in case you know the information to fill in only part of the fields. For example, when entering TT% into the tag field, all the calibration tags starting with "TT" will be shown. The fields that are irrelevant to the search can be left blank. See below further details about how to fill in the fields.
2. Select a sorting criterion in the **Sort By** field at the bottom of the screen.
3. Click on the **Search** tab in the upper part of the screen. Then, click on the **Start Search** button to search through ISOPLAN, following the criterion set on the **Form** tab. The search result is shown in the table in the upper part of the screen. The search result can be printed by clicking on the **Print Preview** button, to check the result of the printing, and then on the printer icon, to send the report to the printer.
4. To work only with calibrations found use the **Use Search** button to transfer the list of calibrations found to the list of tags in the **Calibration Results** screen. Use the **Cancel** button if the list of tags that were found will not be necessary for further procedures.

The screenshot shows the 'Search Results' dialog box with the 'Form' tab selected. The 'Tag' field contains 'TT%'. The 'Area' and 'Criticality' fields are dropdown menus. The 'Search in all sub-areas' checkbox is unchecked. The 'Calibration' section includes 'Initial Diganosis' (Approved, Reproved, No Diag), 'Final Diganosis' (Approved, Reproved, No Diag), 'Maintenance' (Preventive, Correct, Not Authorized), 'Used Standard' (dropdown), 'Interval' (date range dropdowns), and 'Missing Signature' (checkbox). The 'Instrument' section includes 'Registration No.', 'Instrument Type' (dropdown), 'Model', 'Manufacturer', and an 'Inactive' checkbox. The 'Sort By' dropdown menu is set to 'Tag'.

Figure 107 - Tab **Form** of dialog **Search Results**



The screenshot shows a software window titled "Search Results". At the top, there is a "Form" tab and a "Search" button. Below this is a table with the following data:

Tag	Registration No.	Calb. Date	Cert. Number	Initial Diagnosis	Final Diagnosis
TT-101-V (1)	L-1	23/11/2007	7/2007	No Diagnosis	No Diagnosis
TT-14001 (1)	0720996	26/11/2007	6/2007	Reproved	Approved

Below the table, there are several buttons: "Start Search", "Use Search", "Print Preview", and "Cancel". At the bottom, there is a "Report Title" field containing the text "Search Results of Calibrations" and a "Help" button.

Figure 108 - Tab **Search** of dialog **Search Results**

The following are comments on some form fields:

- **Area:** field shows the **Search all sub-areas** option. When this option is selected, the search is made in the selected area and in all sub-areas of the initial area.
- **Diagnosis:** returns calibrations where any of the marked options are true, for example, by checking the **No Diagnosis** option and **Reproved**, returns all the calibrations that are without diagnosis or reproved.
- **Maintenance:** it works the same way as the Diagnosis field, where calibrations are displayed when any of the options marked are true.
- **Interval:** shows two dates that limit the search to the desired time interval. Both fields allow three options: a) fill in the date on the left only – in this case, calibrations **from** the specified date on will be searched for b) fill in the date on the right only – calibrations performed **until** that date will be searched for c) fill in both dates – calibrations performed during the time interval between the specified dates will be searched for.
- **Signatures:** choose one of the users as a operator or responsible for filtering calibrations of a particular user. Choose the (pending) option if you want to choose the calibrations where the signature of a certain level of user is pending.
- **Certificate number:** search for certificate number.

## 7.12. Instruments History

The information registered in the ISOPLAN database can be used to issue reports that indicate the situation verified during the several performed calibrations for each instrument registration number.

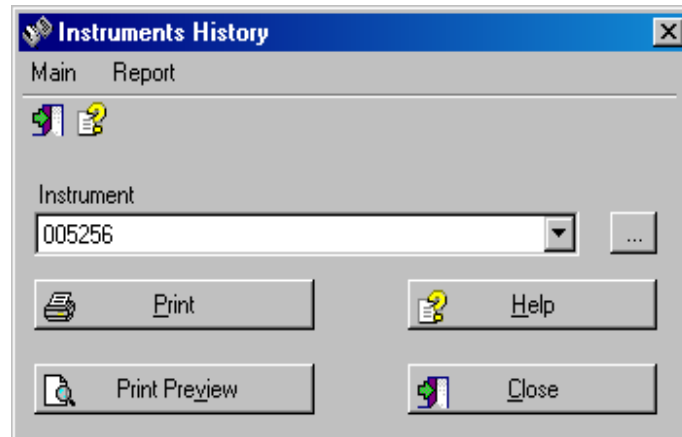


Figure 109 –Instruments **History** dialog box

The organization of the **Calibrations History – Instrument** report is selected on the **Report** menu, according to the "**General**" and "**Brief**" options. The general report displays technical information about the instrument and lists, in chronological order, the type of maintenance carried out (preventive, corrective or not authorized), the verified failures (through their codes and descriptions exactly as specified on the **Failures** dialog box) and the tag corresponding to the instrument in each of the calibrations. In the summarized report, the failure codes are presented (without descriptions) in the format of a table where only the verified errors are marked with an "x" for each calibration.

The instrument choice for the report depends on the registration number selected on the box of the **Registration Number** list. For the box to show only some of the registered instruments, open the **Instrument General Search** dialog box by clicking on the "..." button. After the search, the "**Registration Number**" box is filled in with the instruments registration numbers filtered during the search. Use the "**Print Preview**" and "**Print**" buttons to check the report and print it.

PRESYS		Tag History		Page 1/1
COMPANY: Presys Instruments, Inc.				
INSTRUMENT: Indicator				
FUNCT: Temperature Indication			TAG: TI-0001	
AREA: Area-1			CALIBRATION PERIOD: 6 Months	
TECHNICAL INFORMATION				
INSTRUMENT	OPERATION CONDITIONS	DOCUMENTS		
MODEL: DMY-2030 IN: Current OUT: Temperature MANUFACT: Presys	RANGE INPUT: 0 to 20 (mA) RANGE OUTPUT: 0 to 100 (°C) Criticality: A	PROC.: P1101		
MAINTENANCE TYPE AND FAILURE CODE				
DATE	Maintenance	990	004	REGISTRATION
24/11/2006	Preventive	X		005236
23/11/2007				005236
24/11/2007	Preventive		X	005236
12/05/2009 DATE		User Administrator Operator		

Figure 110 – Instrument History report

## 7.13. History Tag

The information registered on ISOPLAN database can be used to generate reports that indicate the situations verified during the several calibrations performed for each tag, besides charts that indicate the evolution of the errors found in the instrument calibrations that belonged to the same tag.

The organization of the **Calibrations History – Tag** report is selected on the **Report** menu, according to the **"General"** and **"Brief"** options. The general report displays technical information about the last instrument associated with the tag and lists, in chronological order, the type of maintenance carried out (preventive, corrective or not authorized), the verified failures (through their codes and descriptions exactly as specified on the **Failures** dialog box) and the registration number corresponding to the instrument in each of the calibrations. In the summarized report, the failure codes are presented (without descriptions) in the format of a table where only the verified errors are marked with an "x" for each calibration.

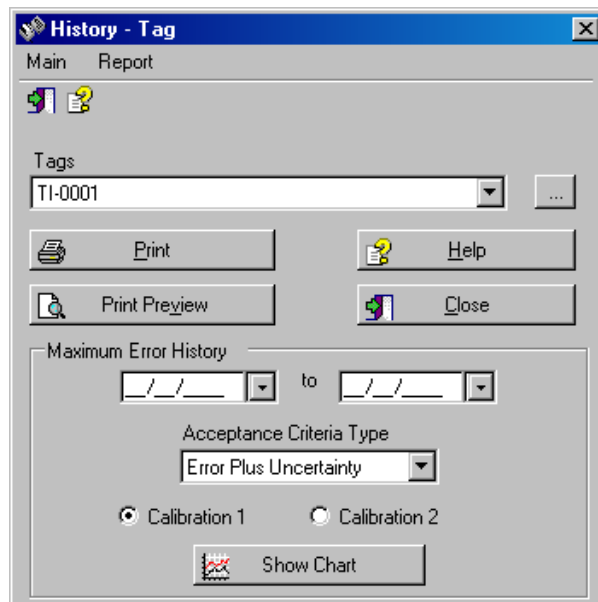


Figure 111 – History - Tag dialog box

The tag choice for the report depends on the name selected of the **"Tag"** list. Open the **Tags General Search** dialog box by clicking on the **"Search ..."** button to show only some of the registered tags. After the search, the **"Tag"** list box is filled in with the chosen tags, according to the possible tag names, areas, calibration dates, serial number, kind and model of instrument. Use the **"Print Preview"** and **"Print"** buttons to check the report and print it.

PRESYS Tag History												
COMPANY: Presys Instruments, Inc. Page 1.1												
INSTRUMENT: Indicator TAG: TI-0001												
FUNCTION: Temperature Indication		CALIBRATION PERIOD: 6 Months										
AREA: Area 1												
TECHNICAL INFORMATION												
INSTRUMENT	OPERATION CONDITIONS	DOCUMENTS										
MODEL: DMV-2030	RANGE INPUT: 0 to 20 (mA)	PROC: P11/01										
PS: Current	RANGE OUTPUT: 0 to 100 (°C)											
OUT: Temperature	Criticality: A											
MANUFACT.: Presys												
MAINTENANCE TYPE AND FAILURE CODE												
DATE	Maintenance	001	002	003	004	005	006	007	008	009	010	REGISTRATION
24/11/2006	Preventive	X										005256
23/11/2007												005256
24/11/2007	Preventive		X									005256
12/05/2009			User Administrator									
DATE:			Operator									

Figure 112 – Tags History report

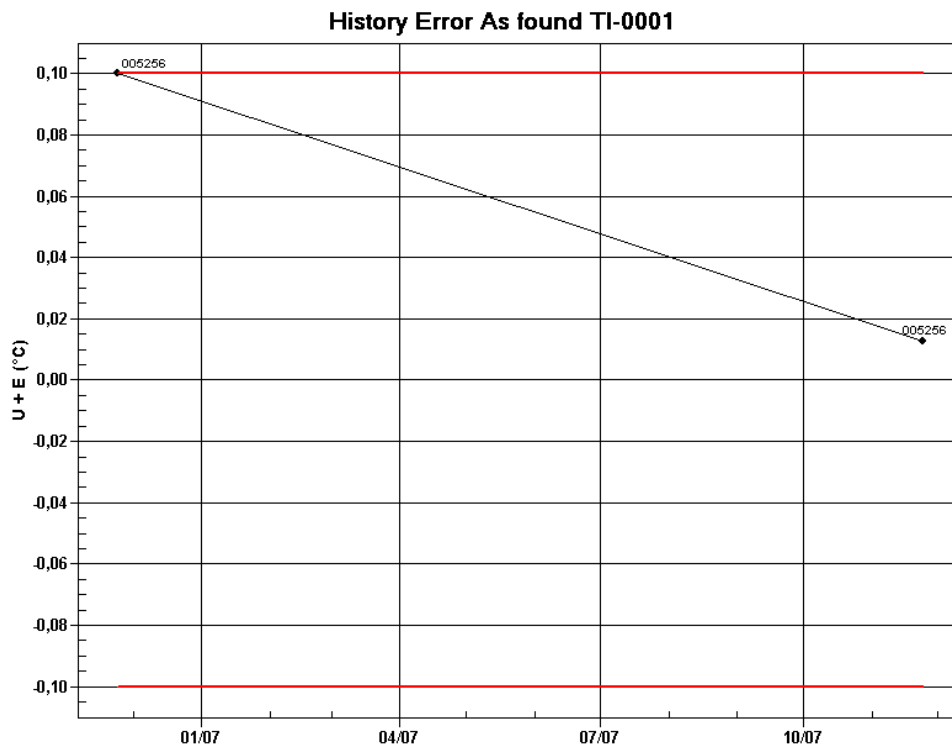


Figure 113 - Max error history graph

The error chart has its specifications provided on the "**Maximum Error History**" field. Select the type of error to be examined on the box of the "Acceptance Criteria Type" list (**Error** or **Error plus Uncertainty**) and indicate the period in which the calibrations must be included. To specify an unlimited period, leave the initial or final date fields unfilled, or both fields. Press the "**Show Chart**" button to open the chart screen. In order to print, use the **Print** command on the **File** menu.

## 7.14. Area Statistics

This dialog box allows the creation of a report displaying calibration statistics and a chart with the calibration distribution along the year, as described in the following section.

### 7.14.1. Creating an Area Statistics Report

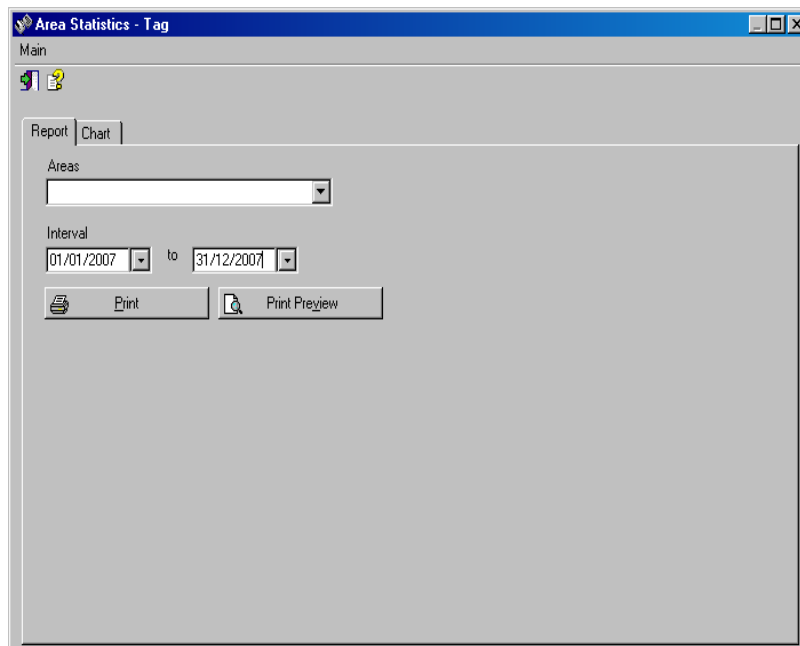


Figure 114 - Tab **Report** of dialog **Statistics by Area**

PRESYS Calibration Statistics - Tags			
COMPANY: Presys Instruments, Inc.			
PERIOD: 01/01/2007 to 31/12/2007			
AREA	Cal. N.	Time (h)	
Area-1	<i>Not Defined</i>	1	0,00
	<i>Preventive</i>	2	4,00
	<b>Area Total:</b>	<b>3</b>	<b>4,00</b>
Verifications	<i>Not Defined</i>	1	0,00
	<b>Area Total:</b>	<b>1</b>	<b>0,00</b>
	<b>GRAND TOTAL:</b>	<b>4</b>	<b>4,00</b>
12/05/2009 DATE		User Administrator RESPONSIBLE	

Page 1.1

Figure 115 -Report of the calibration statistics

1. Choose one of the areas or leave the **Area** field unfilled to obtain a report about all the areas.
2. Define an interval between the dates on the **Interval** field.
3. Click on the **Print Preview** button to see the report on the screen or use the **Print** button to send the report directly to the printer.

## 7.14.2. Creating a Calibration Distribution Chart

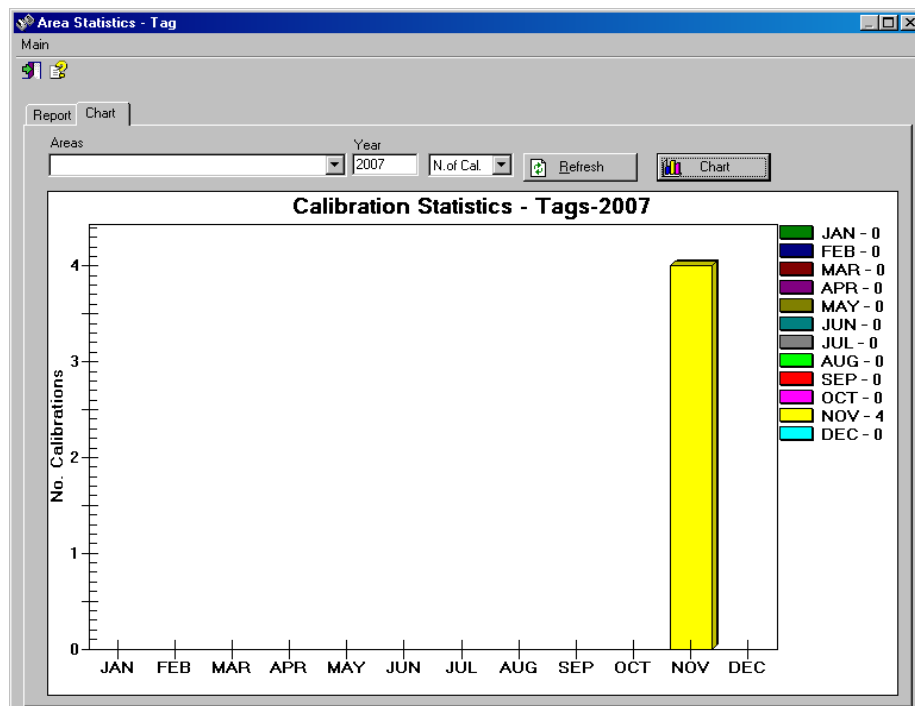


Figure 116 - **Chart** tab on the Area Statistics dialog box

1. Click on the **Chart** tab on the screen.
2. Choose one of the areas or leave the **Area** field unfilled to obtain a report about all the areas.
3. Enter the year corresponding to the chart on the Year field.
4. Choose the type of chart: **N. Cal.** to show the number of calibrations per month; or **N. Hours** to show the number of hours spent with the calibration service per month.
5. Click on the **Refresh** button to view the chart and use the Chart button to highlight a chart. If necessary, the chart can be printed by clicking on the **File > Print** menu of the open window.

### 7.15. Calibration Plan

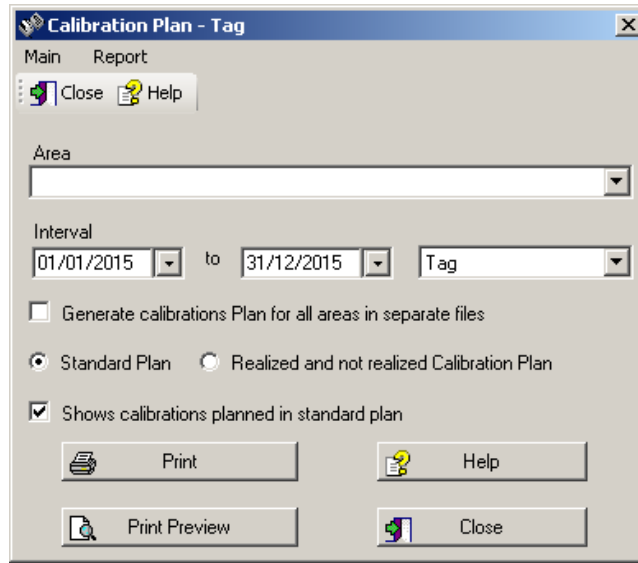


Figure 117 - Dialog Box **Calibration Plan**

#### 7.15.1. Standard Pan

The Calibration Plan dialog box allows the issuing of a report informing all the tags (grouped by month) of a certain area, whose next calibrations will be carried out in a certain period. In order to view the calibrations of all the company areas, leave the "Area" list box unfilled. Select the **Standard Plan** option. The report can be viewed and printed by pressing the "Print Preview" and "Print" buttons.

PRESYS		Calibration Plan - Tags				Page	14
COMPANY Presys Instruments, Inc.							
Area: \Area-2		Month: 05/2009					
Tag	Function	Last Calibration	Next Calibration	Reg Num.	Model		
T1-0001	Temperature Indication	24/11/2007	24/05/2009	005250	DMV-2030		
Area: \Area-2		Month: 11/2009					
Tag	Function	Last Calibration	Next Calibration	Reg Num.	Model		
TT-14001	Anticlave Temperature	26/11/2007	26/11/2009	0120996	TY-2000		
T1-0001	Temperature Indication	24/11/2007	24/11/2009	005250	DMV-2030		
12/05/2009		User Administrator					
Date		Operator		Responsible			

Figure 118 –Calibration Plan Report

#### 7.15.2. Realized and not Realized Calibration Plan

This report is used when selected the **"Realized and not Realized Calibration Plan"**. In this mode Isoplan submit a report with the following information relating to a certain specified period:

**Performed:** list of calibrations performed in the period and planned to be executed in the chosen period.

**PAD - Performed after the deadline:** list of calibrations planned to be made in the period, but were executed late.

**UDE- Unrealized(deadline expired):** calibrations planned for the period but until the report print time were not made.

**UTE: Unrealized (to expire):** calibrations to be performed in the future, appears only if period covers future dates.

In the final report is presented a bar graph with the number of calibrations for each list and sum of all calibrations scheduled for the interval.

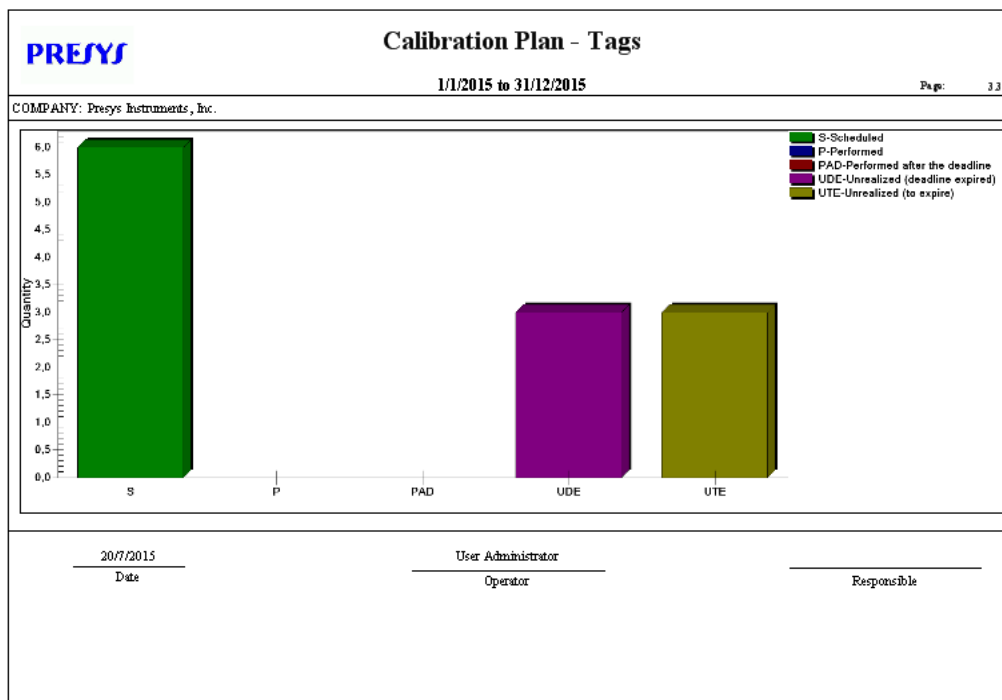



Figure 119 –Calibration Plan Report - Realized and not Realized

### 7.15.3. Generate calibration plan for all areas in separate file

Isoplan allows users you to print or to print preview calibrations plan from all areas at once. You can also select the areas that will be printed following the steps below:

- Check the **Generate calibrations plan for all areas in separate files option**;
- In the **Report** menu select the **Select Areas option**;
- In the list of Areas choose the area you want to print or print preview, then click the button  and add the area to the list of Selected Areas;
- Repeat the above step for the number of sectors that you want;
- Click the **Print** or **Print Preview button**.

#### 7.15.4. Show calibrations planned in standard plan

This option must be checked to generate a calibration plan with all calibrations planned in the selected interval.

Example: If an instrument is calibrated annually and the selected interval is five years, the report showed all calibrations to be made during these five years.

If **Show calibrations planned in the standard** plan is not checked the calibration plan report only shows the next calibration.

## 7.16. Critical Analysis List <sup>27</sup>

Isoplan allows you to generate a list of tags to get an overview of the tags critical levels of the entire factory or any specific area.

The list can be generated through the menu **Results> Critical Analysis List**.

Click the **Generate List** button to generate an Excel spreadsheet with the critical level of the tags and some additional information of the register.

The list can be filtered by part of the tag name, area and instrument type.

## 8. Isoplan Explorer

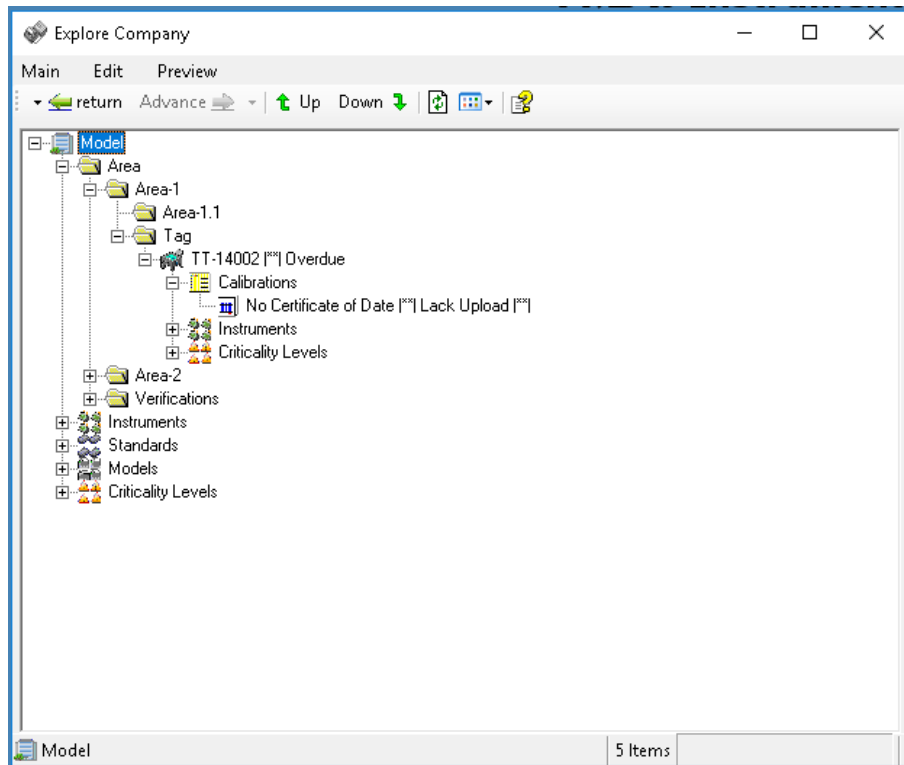


Figure 120 - Dialog Box **Isoplan Explorer**

The **Isoplan Explorer** dialog box allows user to consult, quickly, all the company information, for example: areas, tags, loops, calibration, certificate, etc.

### 8.1. Menus and Status Bar

With the click of the right mouse button you can access the menu, each item has its own menu, status bar and in some cases their own nomenclature, as follows:

#### 8.1.1. Company

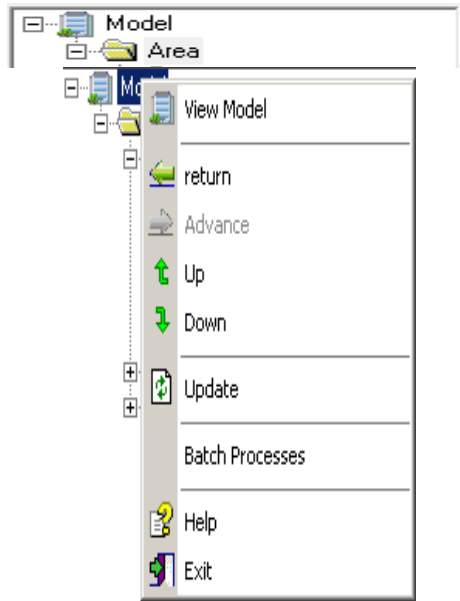


Figure 121 Companies Menu

**Menu**

**View Model:** opens the **Register of Companies** dialog box, in the example, the company name is Model;

**Exit:** Close Isoplan Explorer dialog box

**Status Bar**



Figure 122 –Company status bar

Displays the Company **name**, in the example, the company name is Model

**8.1.2. Areas**

**Menu**

**Areas:** opens the Register of **areas** dialog box.

**8.1.3. Tags**

**Nomenclature**

1. **Name** Tag register;
2. **Inactive:** Tag is inactive
3. **Due:** Tag is due

## Menu

**View Tags:** Loads the **tag registration** dialog box;

**Technical Specification:** Loads a **report with the technical specifications** of the Tag;

## Status Bar



Figure 123 –Tags status bar

1. **Name** of Tag Register
2. Tag **active**;
3. Tag **inactive**;
4. Tag **not due** with the next calibration date;
5. Tag **Overdue**, with the date it would be the next calibration.

## 8.1.4. Loops

### Menu

**View Loop:** Loads the **loop register** dialog box;

**View Loop Register:** Loads a **report** with the report of the **selected loop**;

**View Accuracy Loop:** Loads a **report** with the **accuracy of the selected loop**.

## 8.1.5. Calibrations

### Nomenclature

1. **Calibration date**;
2. **Number of calibration certificate**;
3. **Due:** Tag is due
4. **No calibration date:** No calibration date
5. **No Certificate number:** There is no calibration code;
6. **Miss upload:** Calibration with pending upload.

### Menu

**View Calibration:** Loads calibrations results dialog box;

**View Certificate:** Loads calibration certificate report

**Export to PDF:** Export Report to PDF

**Upload:** Loads upload dialog box

**Status Bar**



Figure 124 –Calibrations status bar

1. **Date** and **Certificate number** of the calibration (Nomenclature received only in the window);
2. Certificate with **signature pending**;
3. Tag waiting for **upload**.

**Report Menu**

As the Calibration Result, you can determine the type of report  
 This menu is only available when selecting a calibration

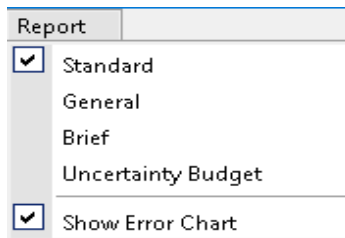


Figure 125 - Reports Menu

**Standard:** Loads a **report of the standard type**;

**General:** Loads a **report of the general type**;

**Brief:** Loads a **report of the brief type**.

NOTE: When no option is selected the report is created according to the standard options of the calibration results screen.

**8.1.6. Instruments**

**Nomenclature format separated by "-" (dash)**

Register Number;

Model;

Manufacturer;

**Menu**

**View Instrument:** Loads Register o **Instruments dialog** box

**Print Preview:** View **Instruments data**

**Status Bar**

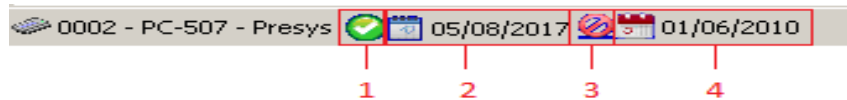


Figure 126 – Instruments status bar

1. Instrument **active**;
2. Instrument **inactive**;
3. Instrument **in maintenance**;
4. Instrument **is spare**

**8.1.7. Standards**

**Nomenclature format separated by "-" (dash)**

Register Number;

Model;

Manufacturer;

**Menu**

**View Standards:** Loads standards **dialog box**

**View List of Standards:** View **report** with standards data

**View Standards:** Loads standards **dialog box**

**View Standard History:** Displays the **calibration history** of the selected standard;

**Status Bar**

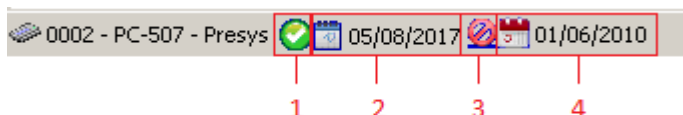


Figure 127 – Instruments status bar

1. Standard **Active**;
2. Standard **not due** with the next calibration date;

3. Standard **Inactive**;
4. Standard **due** with due date

### 8.1.8. Manufacturers

#### Menu

**View Manufacturers:** Loads the dialog box **Manufacturers**;

**View Manufacturer:** Loads the dialog box of **manufacturer register** ;

**Exit:** Close Isoplan Explorer dialog box

### 8.1.9. Models

#### Menu

**View Models:** Loads **Models** dialog box

**View Model:** Loads the dialog box of **models register** , already with the selected model;

### 8.1.10. Clients

#### Menu

**View Clients:** Loads **clients dialog box**;

**View Clients:** Loads **clients dialog box**;

### 8.1.11. Criticality Levels

#### Menu

**View Criticality Levels:** Loads **criticality levels dialog box**

## 8.2. Controls

The **Isoplan Explorer** dialog box has several controls for easy handling.

### 8.2.1. Main Menu bar

Menu bar with buttons for back, forward, up, down, block tree view, update, list, search field, the search button, search settings, views settings and help screen



Figure 128 – Standard status bar

1. **Return: Back** to the last selected item;
2. **Advance: Advances** an item
3. **Up:** Go **up** an item
4. **Down:** Go **down** an item.
5. **Block View Tree: Blocks the exchange of the tree view item** (only available in the tree view + list);
6. **Update List: Updates** all items;
7. **Search Field: Search items** text (Only available in the Preview List and tree view + list);
8. **Search Button:** Execute a **search**
9. **Search Settings:** Sets the **search options** (Only available in the Preview List and tree + list view);

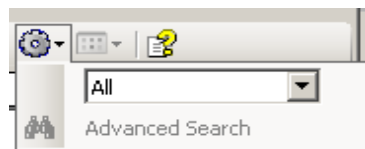


Figure 129 - Setting Search menu

**Search criteria:** Search only the specific **type of item**;



Figure 130 – Search Types

**Advanced Search:** Enabled only when the **type of search is (Tags, Loops, calibrations Tags, calibrations loops and instruments).**

Note. When the Advanced Search is used, the tree view is automatically locked and can only be used again when clicked the lock icon (icon 5 from the main menu bar)

**10. Display Mode:** Sets the **display of items**;

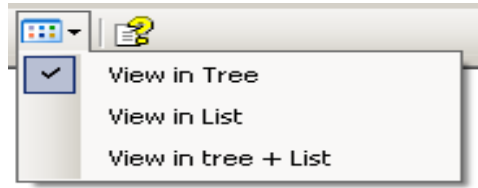


Figure 131 - Display Types

**Tree View:** View in root;

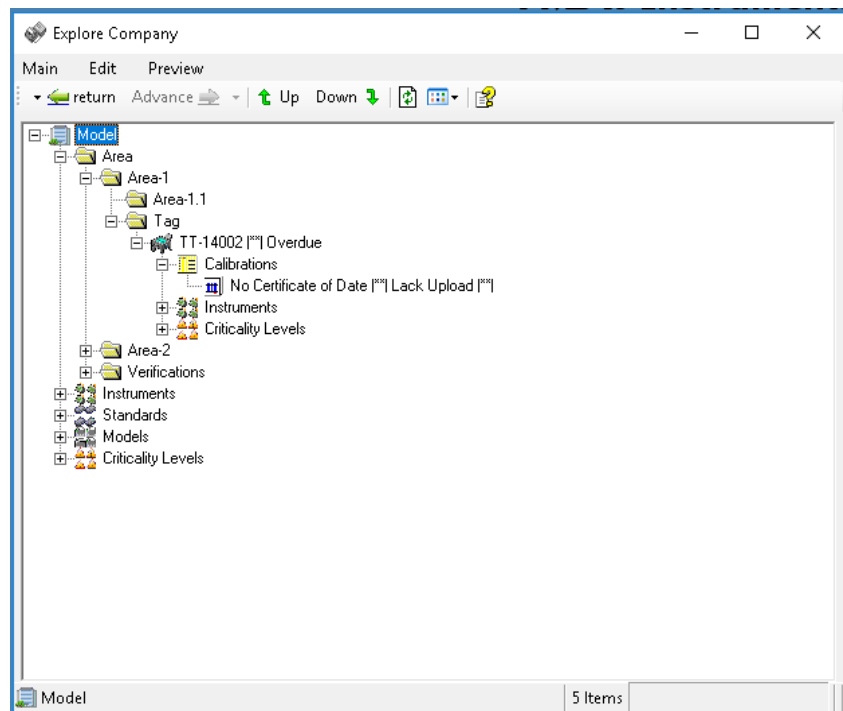


Figure 132 –Tree View

**List View:** View Icons;

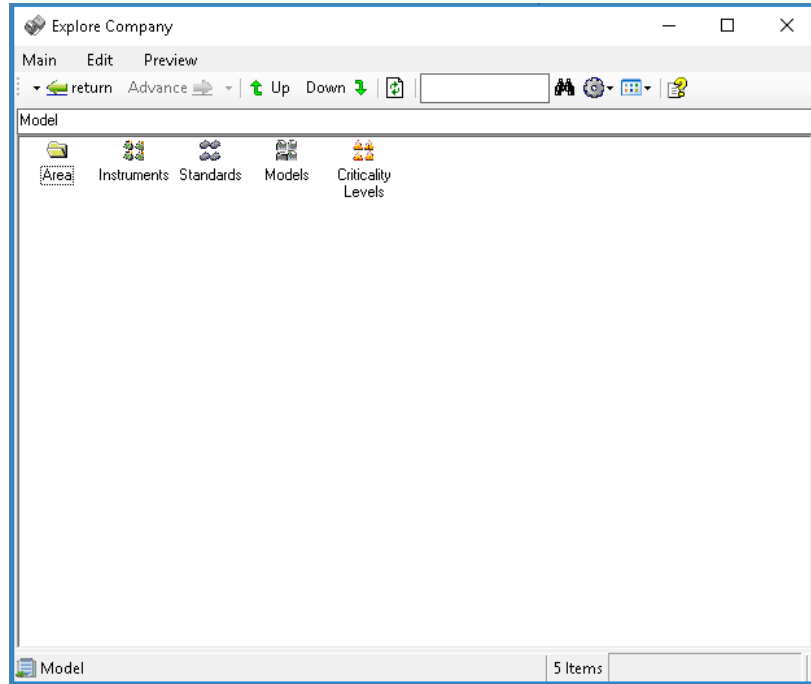


Figure 133 - List View

**View Tree and List:** View in **Tree** along with the view in **list**.

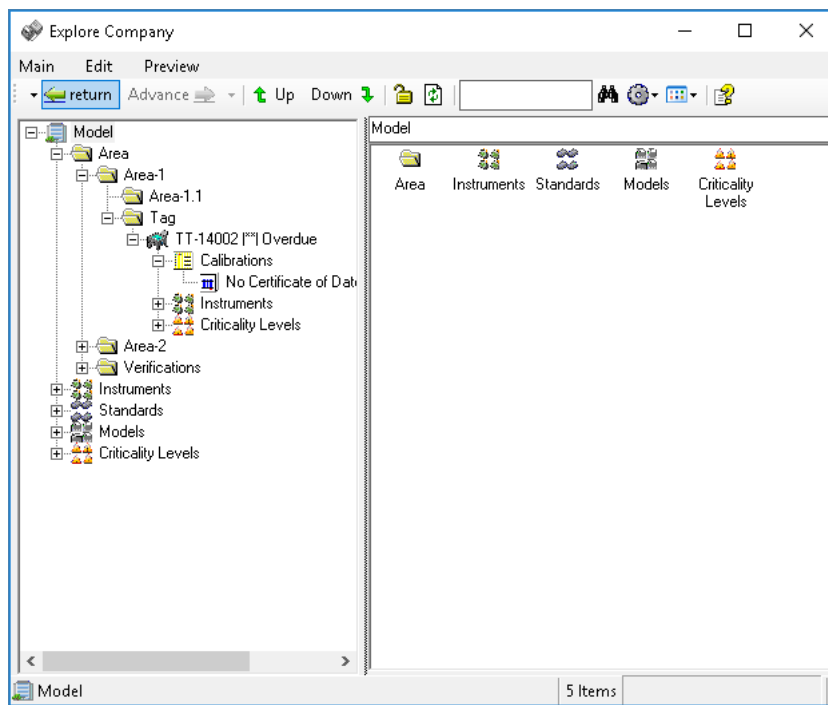


Figure 134 - Tree + List View

**11. Help button:** Loads the dialog help.

### 8.2.2. Report Menu

Sets which items are **displayed**.

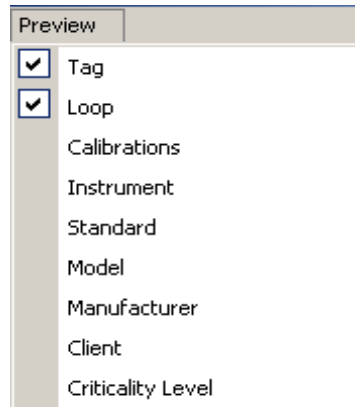


Figure 135 - View Menu

### 8.2.3. Toolbar

Item Local



Figure 136 –Toolbar

By double-clicking on the item name, it is selected and displayed.  
This bar only appears in List view and Tree view plus List

### 8.2.4. Main Menu bar

Bar with **list count** and **progress bar**.



Figure 137 - Main Status Bar

**Progress bar;**  
Internal Items count or **items selected**.

### 8.3. Move Tags/Loops

To change the area of tag / loop, just select the tag / loop and move to a new area (If the area is the same, the tag / loop will not be modified).

Select the **Tag (s) / loop (s)** you want to change the area.

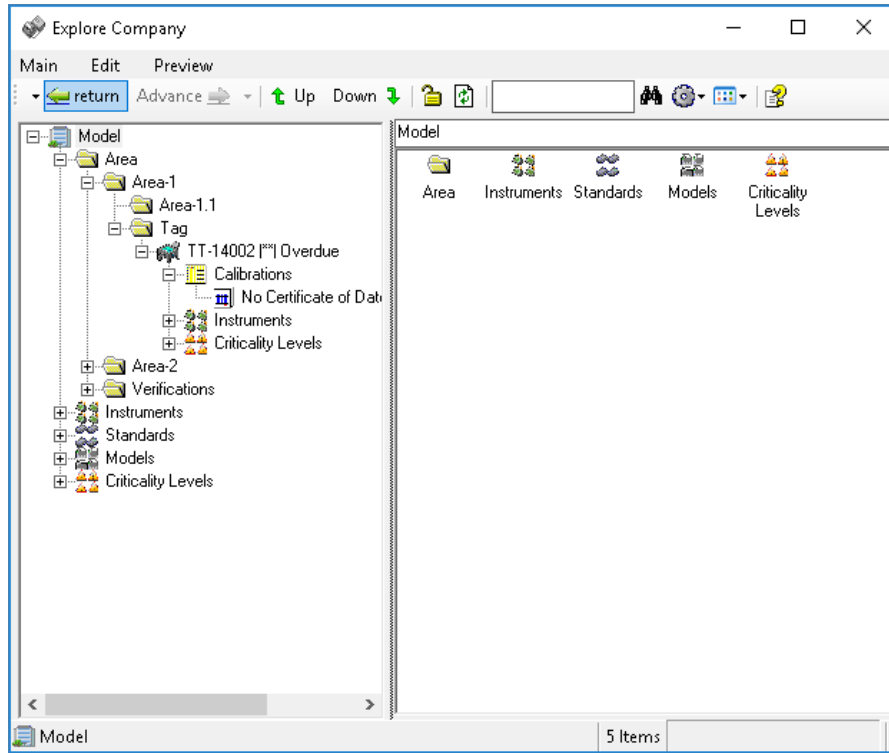


Figure 138 – Tags Selected for moving

Click and hold with the left mouse button, and then move to a new area and release the left mouse button.

Click Yes in the change confirmation message.

Wait for the screen load, the screen will be reloaded and will open the area to the moved tags.

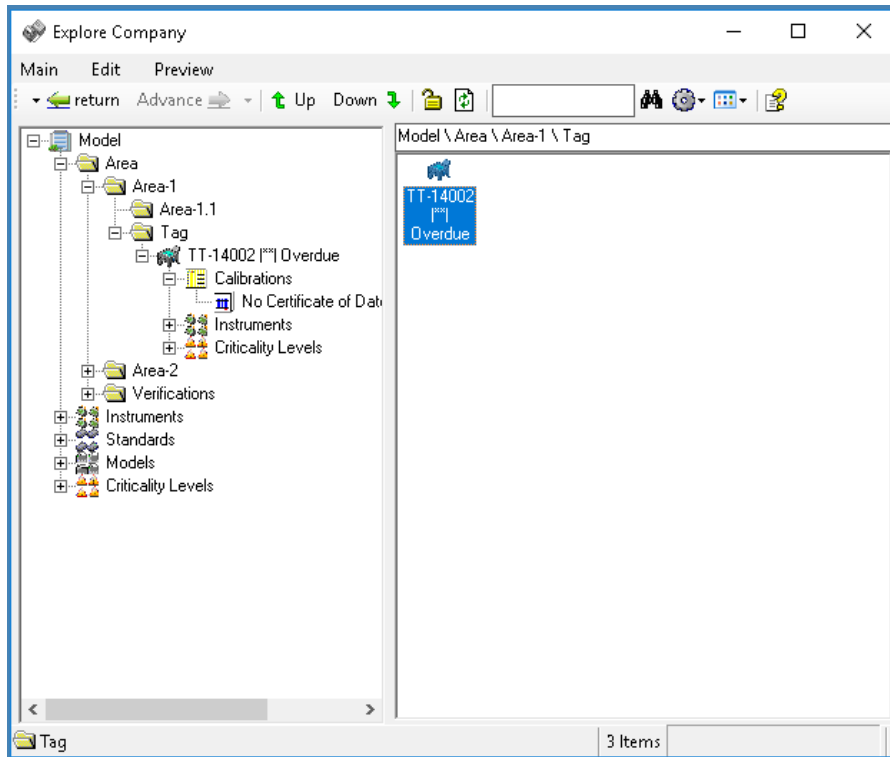


Figure 139 - Tags in the New Area

The move action can also be performed with loops and tags simultaneously, and can be used to tag folder and loop to move all the tags / loop of their areas.

Another option is to click the **"Edit"** menu and then the menu **"Batch Processes"**.



Figure 140 - Move of Tags/Loops

Hold and move the area you want to move the tags / loops to the field of "New Location" or select the area and click the button next to the field of "New Location"

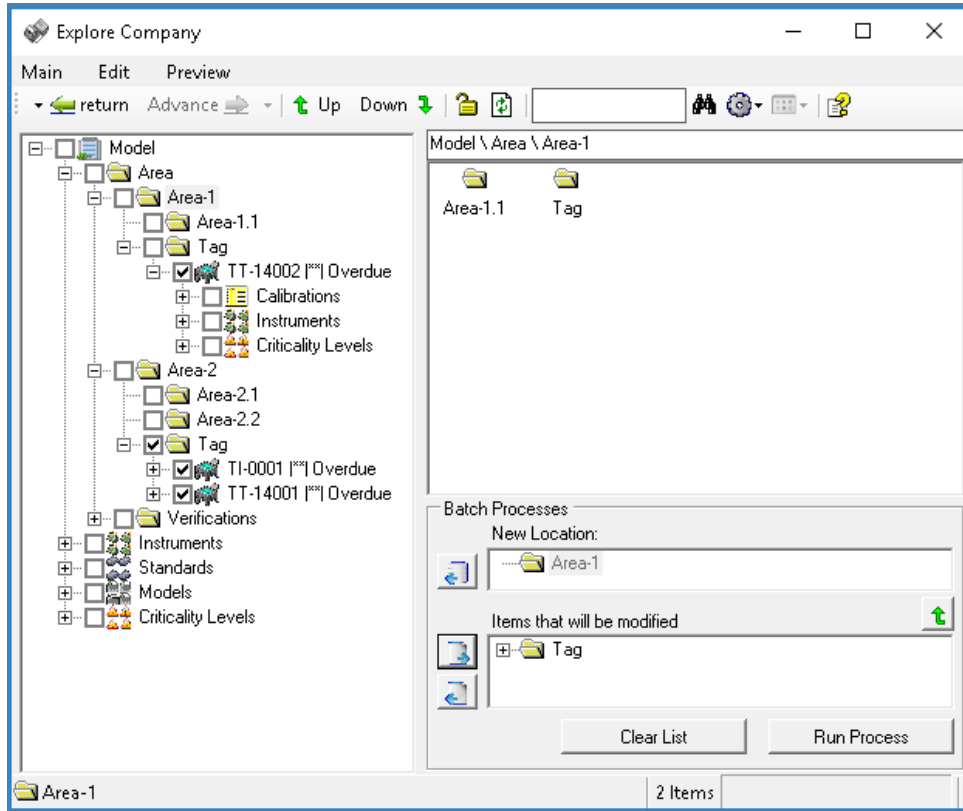


Figure 141 - Area that received the Tags/Loop

Hold and drag the Tags that will be moved to the new area in the field "Items that will be modified" or select the Tags/Loops and click the button next to the field "Items that will be modified".

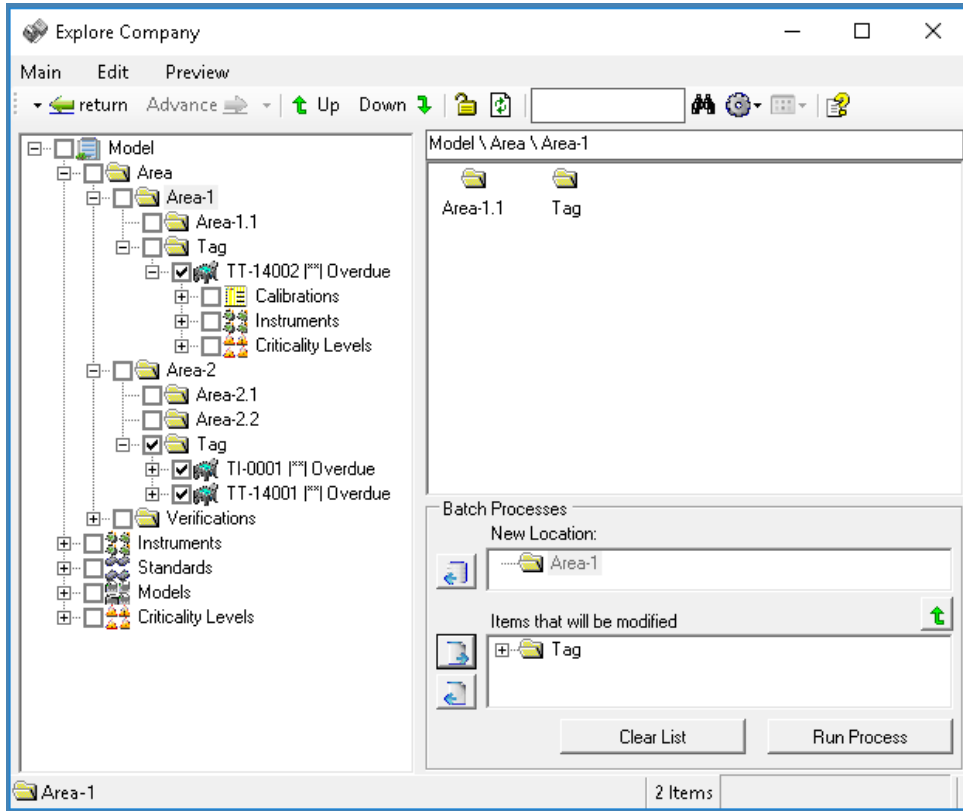


Figure 142 - Tags that will be moved from the area

Click on **Run Process**.

Click **Yes** and wait for the tags/loops to be moved.

At the end of the process a message will be displayed, questioning the display of the changes.

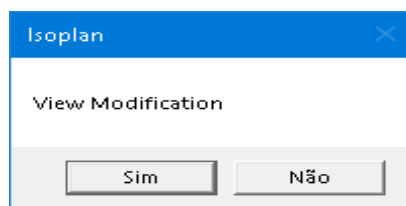


Figure 143 - Move Confirmation View

Click **Yes** to view the changes

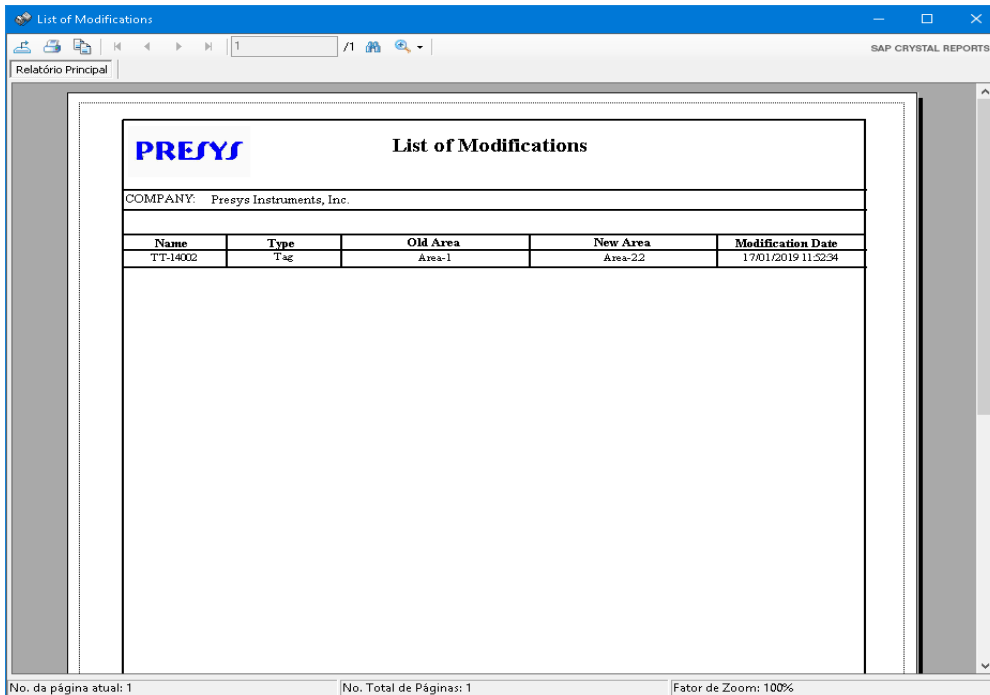


Figure 144 - Moving Report

Note: The tags / loops that have not been modified for any problems will be shown in "Red."

**Buttons:**



Figure 145 -Move Buttons Tags/Loops

1. Remove the selected item;
2. Add the selected item;
3. Clean all items from the Items list that will be modified;
4. Execute the moving process of Tags / selected loops;
5. Previews the list of "Items that will be modified."

**8.4. Hot Keys**

The **Isoplan Explorer** dialog box also features a set of hot keys that facilitate its use, below there is a complete list of valid shortcuts.

Ctrl + e	Use the search tool
Ctrl + f	Use advanced search tool
Ctrl + w	Close the Isoplan Explorer dialog box

Ctrl + p	Load Batch processes menu
Ctrl + z	Back to last selected item
Ctrl + y	Next to last selected item
Ctrl + Page Up	View an item above
<b>Ctrl + Page Down</b>	View an item below
Ctrl + Home	Select company
Ctrl + t	Tree View
Ctrl + l	List View
Ctrl + v	Tree View and List View
Ctrl + a	Help
F5	Updates all items
Alt + l	Disables the Moving in the tree

## 9. Unit Conversion

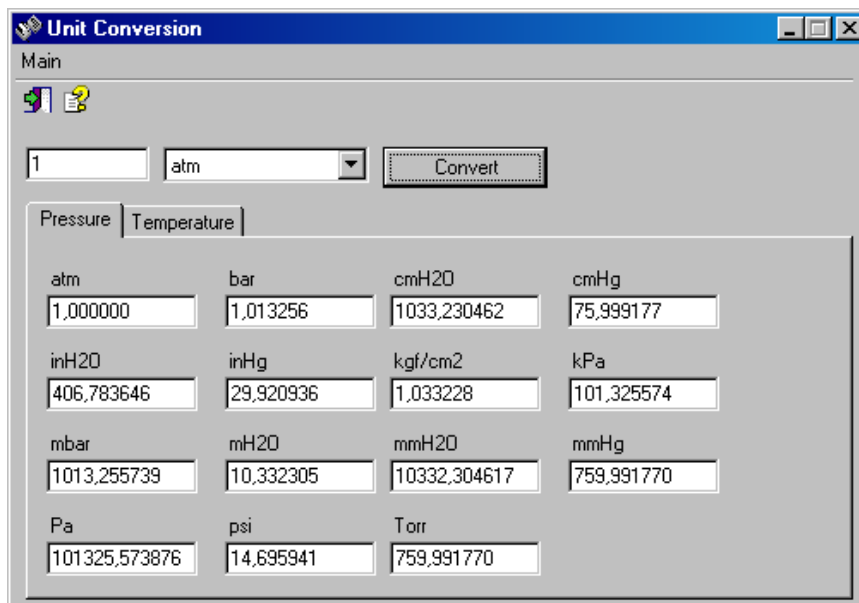


Figure 146 – Unit Conversion dialog box

The **Unit Conversion** dialog box allows the user to convert temperature or pressure value given in a certain unit to values in many other units (psi, atm, kgf/cm<sup>2</sup>, in H<sub>2</sub>O, m H<sub>2</sub>O, cm H<sub>2</sub>O, mm H<sub>2</sub>O, in Hg, cm Hg, mm Hg, bar, mbar, kPa and torr for pressure; degrees Celsius and Fahrenheit for temperature)

Choose one of the available units from the **"Unit"** list box and enter a value into the **"Value"** box. Then press the **"Convert"** button in order to see the corresponding values in other units.

## 10. Using Presys Calibrators

This section provides an overview of the use of Presys calibrators. However, calibrations of the instrument types described in this text must be performed with the appropriate calibrators.

Communication between a Presys calibrator and the computer is accomplished by means of the RS-232 Interface of the Presys calibrators or RS-485 Interface (except for ISOCAL MCS-10) connected to the computer COM 1, 2, 3 or 4 serial port and to the corresponding input on the side panel of the calibrator. Connect the communication cable to the Presys calibrator so that polarity identification of the cable (white mark) coincides with that on the calibrator. The message exchange is enabled only by selecting the **COM** function on the main menu of the calibrator. In this situation, the Presys calibrator is able to receive a work order. This initial procedure corresponds to the next two figures:

1. Choose the **COM** option on the main menu and press ENTER:

```

IN      OUT      EXEC
CONF    CAL    > COM

```

Note: For calibrations using pressure input in ISOCAL with PMY Pressure Module or in PC-507, make sure to set the pressure indication (manometric or vacuum) to zero before entering **COM** function, according to the procedure described in the technical manuals of the calibrators.

2. Then, the functions on the **COM** menu are shown:

```

> TAG      EXEC      VERIF

```

Choose one of the work orders from the "**W.O.**" list of ISOPLAN (make sure the calibrator model associated to the W.O. is the one connected to the computer) and start its transfer with the **Download** command. Remember that the **False Download** command on the **Download** menu does not transfer any calibration instructions to the calibrator. See section 6.2.1 on **W.O. Registration/Download**.

The **TAG** option displays the work order tags in the calibrator. Select the tag related to the calibration to be performed and press ENTER. In order to enter in **EXEC** or **VERIF** options, the "**None**" tag must not be selected. Otherwise, the message "**Choose a tag first**" will be shown.

Connect the calibrator input and/or output terminals to the instrument corresponding to the tag above and choose the **EXEC** option to calibrate it. Inform the calibration type ("*as found*" or "*as left*"), the operator's name and the device serial number, as shown below:

```

> AS_FOUND
  AS_LEFT

Operator's Name
-----
Serial Number
-----

```

Choose each character (number or letter) as the operator's name and serial number with the  $\uparrow$  and  $\downarrow$  arrow keys, and move to the adjacent places with the  $\rightarrow$  and  $\leftarrow$  arrow keys. Numbers can be entered directly by pressing the keys corresponding to the numbers you want. Confirm each written word by pressing ENTER. Be sure to inform the correct instrument serial number – ISOPLAN checks the serial number associated with the tag during the *upload* operation.

Wait a few seconds while the calibrator configures its input and output automatically. Before starting the calibration, the display shows, if it exists, the message written on the **Strategy** tab on the **Tags** dialog box in ISOPLAN (section 5.14).

In general, instruments can be grouped in 3 basic types, namely:

1. Indicator Type
2. Source Type
3. Converter Type

Each one of these types defines a distinct way of calibration, which can be implemented by the ISOPLAN/Presys calibrator. See their descriptions below:

## Indicator Type

For this instrument type, the calibrator only generates the signal and reading is carried out externally ("Presys Calib." for "**Output**" and external "**Reading**" in **Calibration (1) or (2) on Tags**). That is, the calibrator generates signals automatically in the sequence determined by the calibration strategy and the reading is accomplished by the operator, and its value is entered into the calibrator when it is asked.

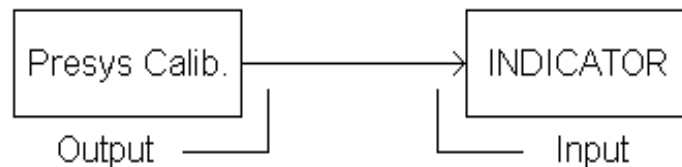


Figure 147 - Calibration of an indicator type instrument

See the example below:

1. One of the calibration points is displayed:

**Set = 50.000mV**

2. And its output is automatically generated:

**OUT = 50.000mV**

3. After a certain time (specified as **Settle Time** in **Strategy (1) or (2) on Tags**), the value read in the display of the instrument being calibrated is asked:

**Input Value:**  
**+00.000#**

Note: If a zero value is attributed to **Settle Time**, you must press ENTER after the signal is stable so that the calibrator asks for the reading value.

4. The reading value carried out externally must be entered by the operator:

**Input Value:**  
**+50.008#**

5. When pressing ENTER, the value is stored in the calibrator memory and its error is calculated:

**Writing to RAM**  
**Error: 0.02%**

6. The calibrator goes, after that, to the next calibration point:

**Set = 37.500 mV**

At the end of the calibration, the "**Calibration End**" message appears.

## Source Type

For calibrations of source type instruments, the Presys calibrator only performs the reading, i.e., the instrument to be calibrated generates the signals (external "**Output**" and "Presys Calib." for "**Reading**" in **Calibration (1) or (2) on Tags**). The calibrator previously informs the signal to be generated by the instrument according to the sequence determined by the calibration strategy (**Strategy (1) or (2) on Tags**) and, for each calibration point, the reading is accomplished automatically by the Presys calibrator.

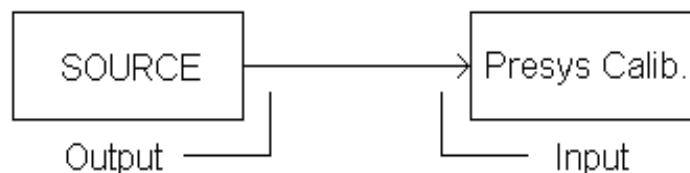


Figure 148 - Calibration of a source type instrument

See the example below:

1. The calibrator asks for the first output signal to be generated:

**Next setpoint:**  
**Out = 0.0000#**

2. Make the external source (instrument) to generate the set-point you want and, by pressing ENTER, the signal is automatically read:

**IN = 0.0060mA**

3. After a certain time (specified as **Settle Time** in **Strategy (1)** or **(2)**) the value of the reading is stored in the calibrator memory and its error is calculated:

**Writing to RAM**  
**Error: 0.03%**

Note: If a zero value is attributed to **Settle Time**, you must press ENTER after the signal is stable so that the calibrator stores the reading.

4. The message above is shown during a short period of time and the calibrator asks again for the next output signal to be generated corresponding to the next calibration point:

**Next setpoint:**  
**Out = 4.0000#**

At the end of the calibration process, the "**Calibration End**" message appears.

## Converter Type

In the case of a converter type instrument, the Presys calibrator can carry out a completely automatic calibration since the work order configures the calibrator to generate the output signal corresponding to the calibration point and to read its input simultaneously ("Presys Calib." for "**Output**" and "**Reading**" in **Calibration (1)** or **(2)**).

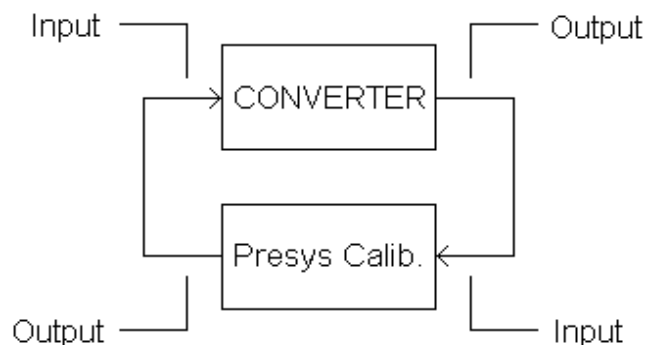


Figure 149 - Calibration of a converter type instrument

After informing the calibration type ("*as found*" or "*as left*"), the operator's name and the device serial number, the calibrator configures its input and output automatically and displays the message written on the **Strategy** tab on the **Tags** dialog box of ISOPLAN. You must then press ENTER to start calibration.

Below, an example of calibration sequence:

1. The output for one of its calibration points is displayed and it is followed by its reading:

**IN = 50.010mV**  
**OUT = 50.000mV**

2. After a certain time (specified as **Settle Time** in **Strategy (1)** or **(2)**) the value of the last reading is stored in the calibrator memory and its error is calculated:

**Writing to RAM**  
**Error: 0.02%**

Note: If a zero value is attributed to **Settle Time**, you must press ENTER after the signal is stable so that the calibrator stores the reading.

3. The message above is displayed for a short period of time and the next calibration point is shown.

The "**Calibration End**" message indicates the end of the calibration process.

Besides the three types of calibration described above, there is also the possibility of using the Presys calibrator only for storing data of calibrations in which signals are generated externally and the reading is carried out by the operator; or of performing calibrations of temperature sensors or instruments with pressure input, in which temperature or pressure, although being generated by means of an external source, can be directly read by the Presys calibrator. These calibrations are classified as:

1. Calibration with External Signal Generation and External Reading
2. Calibration of Temperature Sensors
3. Calibration of Instruments with Pressure Input

See their descriptions below:

### Calibration with External Signal Generation and External Reading

In this case, the Presys calibrator is not used directly in the calibration. The calibrator indicates the signal to be generated according to the sequence determined in **Strategy (1)** or **(2)** on **Tags**, and the operator must select this signal on the external source and then read the value indicated on the instrument being calibrated, which must be entered into the calibrator when asked. Specify, on the **Tag** dialog box of ISOPLAN, External for "**Output**" ("**Calibration**" field) and "**Reading**" ("**Reference**" field).

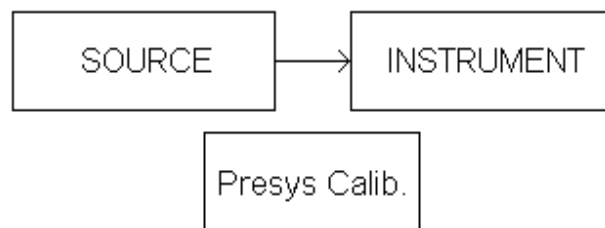


Figure 150 - Calibration of Instrument with External Signal Generation and External Reading

See the example below:

1. The calibrator asks for the first signal to be generated:

**Next setpoint:  
Out = 10.0000#**

2. Make the external source generate the set-point and press ENTER.

3. After a certain time (specified as **Settle Time** in **Strategy (1)** or **(2)** on **Tags**), the value read on the display of the instrument being calibrated is asked:

**Input Value:  
+00.0000#**

Note: If a zero value is attributed to **Settle Time**, you must press ENTER after the signal is stable so that the calibrator asks for the reading value.

4. The reading value carried out externally must be entered by the operator:

**Input Value:  
+10.0020#**

5. When ENTER is pressed, the value is stored in the calibrator memory and its error is calculated:

**Writing to RAM  
Error: 0.02%**

6. The message above is shown during a short period of time and the calibrator asks again for the next output signal to be generated corresponding to the next calibration point:

**Next setpoint:  
Out = 20.0000#**

At the end of the calibration, the "**Calibration End**" message appears.

## Calibration of a Temperature Sensor with ISOCAL

In this calibration type, it is necessary to use a calibration bath which generates temperature to the sensor. The operator must set the temperature asked by the calibrator (according to the sequence determined by the calibration strategy), and its value is read by ISOCAL with the temperature probe. On the **Calibration** tab on the **Tag** dialog box, specify "Presys Calib." for "**Output**" and "Temp. Probe" for "**Signal**" ("**Calibration**" field), and External or "Presys Calib." for "**Reading**" ("**Reference**" field), if the verification of the sensor is carried out externally or by ISOCAL, respectively.

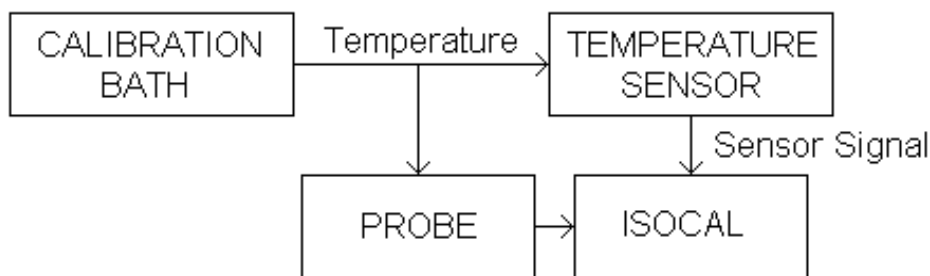


Figure 151 – Temperature sensor calibration

See the example below:

1. The calibrator asks for the first signal to be generated:

**Next setpoint:**  
**Out = 100.00#**

2. Set the external source to generate the set-point asked. By pressing ENTER, the signal is automatically read:

**IN = 100.20°C**  
**PROB = 100.01°C**

3. After a certain time (specified as **Settle Time** in **Strategy (1) or (2) on Tags**) the value of reading is stored in the calibrator memory and its error is calculated:

**Writing to RAM**  
**Error: 0.19%**

Note: If a zero value is attributed to **Settle Time**, you must press ENTER after the signal is stable so that the calibrator stores the value.

4. The message above is shown during a short period of time and the calibrator asks again for the next output signal to be generated corresponding to the next calibration point:

**Next setpoint:  
Out = 200.00#**

At the end of the calibration process, the "**Calibration End**" message appears.

## Temperature Sensor Calibration with Presys Dry Block Calibrator

A calibration with Presys dry block calibrator is simpler to carry out than the one in the previous case, and it may also be performed automatically, without any intervention from the operator during the calibration, except when using temperature indicators, such as glass thermometers. In this case, the operator must enter the reading values. This is possible because the dry block temperature control, the probe for block temperature measurement and the Presys calibrator are all integrated in a single instrument.

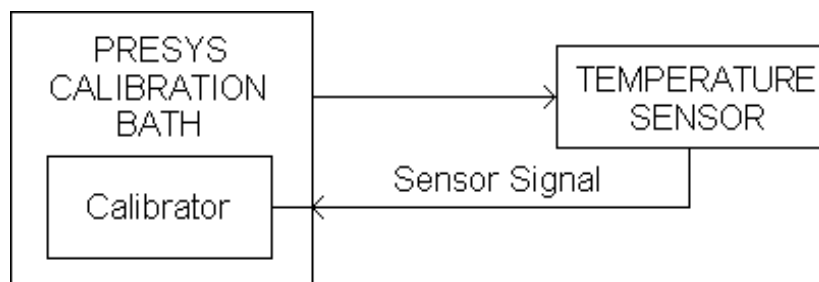


Figure 152 - Temperature sensor calibration with Presys dry block calibrator

The configuration of the **Calibration** tab on the **Tag** dialog box is made the same way as explained for the previous case, that is, "Presys Calib." for "**Output**" and "Temp. Probe" for "**Signal**" ("**Calibration**" field), and External or "Presys Calib." for "**Reading**" ("**Reference**" field), in case the verification of the sensor is carried out externally or by the Presys dry block calibrator, respectively.

The example below presents a RTD calibration performed automatically:

1. The display shows the first calibration point used as the set-point of the dry block temperature control. Then, it shows the temperature values of the sensor being calibrated and of the dry block probe:

**IN = 50.01 °C  
PROB = 50.00 °C**

2. After the dry block temperature stabilizes, the calibrator waits a certain time (specified as **Settle Time** in **Strategy (1)** or **(2)**) before the value of reading is stored in the calibrator memory and its error is calculated:

**Writing to RAM**

**Error: 0.02%**

Note: If a zero value is attributed to **Settle Time**, you must press ENTER after the signal is stable so that the calibrator stores the reading.

3. The message above is displayed for a short period of time and the next calibration point is shown.

The "**Calibration End**" message indicates the end of the calibration process.

### Calibration of Instruments with Pressure Input

For this calibration, an external pressure source is necessary. The operator must apply the pressure indicated by the calibrator (according to the sequence determined by the calibration strategy), and its value is read by ISOCAL with UC504 PMY pressure module or by a PC-507. On the **Calibration** tab of the **Tag** dialog box, specify "Presys Calib." for "**Output**" and Pressure P1, Pressure P2 or Pressure P1-P2 for "**Signal**" ("**Calibration**" field), and External or "Presys Calib." for "**Reading**" ("**Reference**" field), in case the verification of the instrument output signal is carried out externally or by the Presys calibrator, respectively. For connections among pressure source, calibrated instrument and ISOCAL, see sections 3.2 to 3.5 from **UC504 PMY Pressure Module** technical manual. A PC-507 does not require a pressure module, so it is only necessary to make the connections with the pressure source and the instrument to be calibrated.

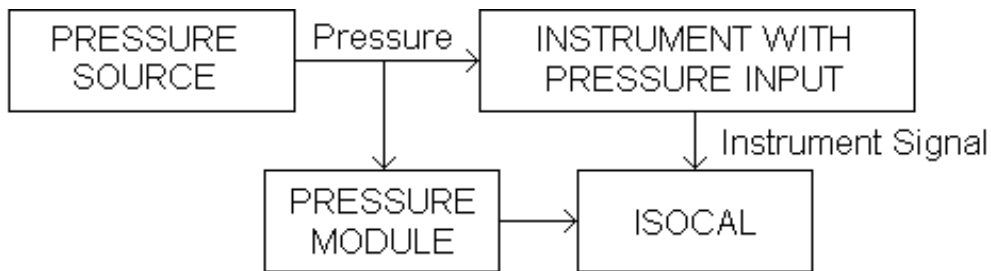


Figure 153 - -Calibration of Instrument with Pressure Input

See the example below:

1. The Presys calibrator asks for the first signal to be generated:

**Next setpoint:  
Out = 0.0000#**

2. Make the pressure source generate the set-point you want and, by pressing ENTER, the signal is automatically read:

**IN = 0.0100mA**  
**Out = -0.0001atm**

3. After a certain time (specified as **Settle Time** in **Strategy (1) or (2) on Tags**) the value of reading is stored in the calibrator memory and its error is calculated:

**Writing to RAM**  
**Error: 0.05%**

Note: If a zero value is attributed to **Settle Time**, you must press ENTER after the signal is stable so that the calibrator stores the value.

4. The message above is shown during a short period of time and the calibrator asks again for the next output signal to be generated corresponding to the next calibration point:

**Next setpoint:**  
**Out = 0.3000#**

At the end of the calibration process, the "**Calibration End**" message appears.

If there are points with errors higher than the error tolerance in any one of the calibration types above, the number of failures is displayed along with the "**Calibration End**" message and, when ENTER is pressed, the "**Failure Code**" (only for *as found* calibration) is asked. Then, the Presys calibrator indicates the input and/or output normally. The C/CE key brings the display back to the main menu.

The calibration points and their readings, the errors and number of failures can be verified in the **VERIF** option for each calibration type ("*as found*" or "*as left*"). If a not calibrated tag is chosen, the "**No calibration performed**" message will be shown. See what to do in this case:

1. Choose the **VERIF** option and press ENTER:

**TAG EXEC > VERIF**

2. Choose the calibration type and press ENTER:

**> AS\_FOUND**  
**AS\_LEFT**

3. The number of failures in the calibration is informed:

**Calib. perform.  
0 points fail**

4. Pressing ENTER causes the error of the first point and the **OK** or **FAIL** remark to be displayed:

**Point 001 (OK)  
Error: 0.00%**

5. Pressing the → or ← arrow keys causes the read and generated signals for the calibration of the first point to be displayed (in this example the number of decimals of the output signal is that used by the Presys calibrator, and that of the input is the one specified for the mV scale on **Scales**):

**IN = 50.004  
Out = 50.000**

It is necessary to press the ← or → arrow keys in order to see the calibration point again, as well as its error. The ↑ and ↓ arrow keys display information about the other calibration points. To quit the **VERIF** option, use the C/CE key.

In order to accomplish the transfer of calibration data to the computer, make sure the **COM** function is selected on the main menu of the calibrator, and activate *upload* in ISOPLAN according to the description in section 6.3 for **Upload from Field Calibrator**.

## 11. ISOPLAN Maintenance

This program was created to perform some access configurations, back up of the database used by ISOPLAN, as well as carry out some tests to check how ISOPLAN was installed.

The program starts when you click on the **ISOPLAN Maintenance** icon, which is located in the ISOPLAN group of programs.

### 11.1. Using Access Database

Access is a very simple database, which does not require much knowledge for maintenance, and it is generally adequate to be used along with ISOPLAN in places where there are few users working with the instruments maintenance. Initially, ISOPLAN is installed to work with an Access database, located in the set up directory of the program.

#### 11.1.1. Access Database Network Installation

A copy of Access database is included in ISOPLAN, but it will only work on the computer where the program was installed. In order to set up Access database in a network server, do the following:

1. Open the **ISOPLAN Maintenance** program and click on the **Database** tab.
2. Choose **Access** from the **Database Type** list.
3. The **Database Main File** field shows where the model database, that comes along with the program, is installed, e.g. "c:\isocs\data\db50.mdb".
4. Click on the "**Open Directory**" button to have access to the directory where the Access database is installed.
5. Copy all the files and directories from this folder to a network location where the Access database must be, for example \\SERVER\ISOPLAN [HYPERLINK: file:///\\SERVER\ISOPLAN], where "SERVER" is the server's name and ISOPLAN is the name of the directory where the database will be. ISOPLAN users must be allowed to read and write on this folder.
6. Change the path of the **Database Main File** field, usually called db50.mdb, to the new location, e.g. "\\SERVER\ISOPLAN\db50.mdb".
7. Click on the **Save** button to save the new configurations.

8. See the **Auto-Check** topic in case you want to do an initial test before using ISOPLAN. Close the **ISOPLAN Maintenance** program and try to log on ISOPLAN.
9. If ISOPLAN is installed on several computers, open the **ISOPLAN Maintenance** program on every computer and configure the **Database Main File** field, in order to direct all the computers to the same file.

### 11.1.2. Access Database Backup

In order to make a database backup, follow these steps:

1. Open the ISOPLAN Maintenance program, click on the **Database** tab and check if **Access** is selected as the **Database Type**.
2. Click on the **Backup** button.
3. Choose a directory and a name to save the backup file, compacted file (zip format) and click on the **Save** button.

#### Comments:

- Isoplans that bring the Audit-Trail module create monthly files of Access database that can take up considerable space. There is an option called **Include Audit-Trail Files to Backup** that does not include these files in the backup when disabled. This option must only be chosen in case of support for the sending of the database to Presys, in order to reduce the size of the backup file.
- There is an option called **Send Backup by E-mail** that, when marked, opens the standard e-mail program automatically and attaches the backup file, so you just have to enter the e-mail address, write a message and click on Send.

### 11.1.3. Restoring Access Database Backup

In order to restore an Access Database backup, follow these steps:

1. Open the ISOPLAN Maintenance program, click on the **Database** tab and check if **Access** is selected as the **Database Type**.
2. Click on the **Restore Backup** button.
3. Find where the zip backup file is located and click on the **Open** button.
4. A confirmation of the database location will be required, and if the information is correct, click on **Yes**. **If there is an ISOPLAN database in the directory, it will be lost.**

### 11.1.4. Repairing an Access Database

The repair of the database file must be done in case the user does not manage to run ISOPLAN, many error messages are shown or the program stops running during its normal operation.

It is important to perform a backup of the DB50.MDB file (or any other database used) before beginning the database repair operation.

To repair the database, do the following:

1. Open the ISOPLAN Maintenance program, click on the **Database** tab and check if **Access** is selected as the **Database Type**.
2. Close ISOPLAN if it is open.
3. Click on the **Repair** button and confirm the operation execution. A dialog box indicating the directory where ISOPLAN was installed will be shown.
4. Select the database file and click on OK.
5. Wait until the end of the database repair process.

In case the repair was not successful, the database must be restored from a previous backup of the database file.

## 11.2. Using an SQL Server Database 28

SQL Server is a more robust database, allowing a larger number of users, and it is less subjected to failures. However, it demands more knowledge for maintenance and set up, so it is recommended for companies that already use SQL Server for other corporate systems. Microsoft offers a free version of SQL Server with a limit to the database maximum size, but it is adequate to ISOPLAN. Initially, ISOPLAN comes with an Access database, therefore a configuration must be made to allow its use with SQL Server database.

### 11.2.1. Installing the Database on the SQL Server

This set up demands certain knowledge of the use and management of the tools that come along with SQL Server Database; thus the following items are just a general guidance on how to set up the server using the Enterprise Manager, which is included in the SQL 2000.

1. Locate the MSSQL folder on the Set up CD, where backup (bak) files of the ISOPLAN database for SQL Server can be found. The file used must be compatible with SQL version that is installed in the company, for example, for SQL 2000, use the file db50SQL2000.bak.
2. Open the Enterprise Manager program, select the Server where the ISOPLAN database will be located and click on the **Action > All Tasks > Restore Database menu**.
3. Fill in the **Restore as database** field with the ISOPLAN database name, such as "isoplan", click on the **From device** option and click on the **Select Devices** button to locate the ISOPLAN backup file. The ISOPLAN file usually stays in the same server where SQL server is. It is possible to use the standard options on the screen. Click on **OK** and check if the ISOPLAN database was installed.
4. Register a new user on the SQL (check the Enterprise Manager manual), for example, "isoplan", choose a password and grant the user a permission from the ISOPLAN database owner "db\_owner". It is only necessary to create a single user for the ISOPLAN, regardless of the amount of people who will use it. There is a separate users' registration inside ISOPLAN.
5. Open the **ISOPLAN Maintenance** program and click on the **Database** tab.
6. Choose **SQL Server** as the **Database Type**.
7. Fill in the **Server** fields (server address as well as the instance used, if this is the case, e.g. "192.168.33.18\SQLEXPRESS"), Database (database name defined on step 3), **User** (ISOPLAN user name on the SQL Server) and **Password** (ISOPLAN user password on the SQL Server)
8. Use **Standard Security** if authentication through SQL Server is being used and **Integrated Security** if the access to SQL Server is limited by the Windows user login. In this case, the **User** and **Password** fields are not used. See further explanation on the SQL Server manual.
9. Click on the **Test Connection** button to check if the connection was successfully made.
10. Click on the **Save** button to save the configurations.
11. Close the ISOPLAN Maintenance program and try to access ISOPLAN by using the standard account (user name "admin" and password "admin").
12. Repeat steps 5 to 11 on all the computers where ISOPLAN has been installed.

### 11.2.2. SQL Server Database Backup

ISOPLAN offers a basic backup routine of an SQL Server Database. This resource is often unnecessary, since more advanced backup tools from the SQL Server can be used, or any other procedure followed by the company. To perform a backup through ISOPLAN, do the following:

1. Open the ISOPLAN Maintenance program, click on the **Database** tab and check if **SQL Server** is selected as the **Database Type**.
2. Fill in the **Backup File** field with the file name and directory where the backup file will be saved. **This directory is located on the SQL server, not on the computer running the ISOPLAN Maintenance Program.** If you use a name without directory, for example, "isoplan.bak", the SQL Server will store the file on the standard backup directory, which is also located on the server.
3. Click on the Make Backup button to start the backup.

### 11.2.3. Restoring SQL Server Database Backup

A database backup on ISOPLAN is normally restored using the program that comes along with the SQL Server, therefore the use of ISOPLAN is not necessary. The log in used by ISOPLAN on the SQL server must show the permission for a database creation (Database Creators) in order to carry out this procedure.

1. Open the ISOPLAN Maintenance program, click on the Database tab and check if SQL Server is selected as the Database Type.
2. Fill in the Backup File field with the backup file name (.bak). If you use a directory name, e.g. C:\isoplan\isoplan.bak, this file will be searched for on drive C: of the server where SQL Server is installed, not on the computer running the ISOPLAN Maintenance Program.
3. Click on the Restore Backup button to finish the process.

**Note:**

- When a backup copy is restored, all the information from the ISOPLAN database on the SQL Server is erased.

## 11.3. Using an Oracle Database 29

Oracle, as well as SQL Server, is a more robust database, allowing a larger number of users, and it is less subjected to failures. However, it demands more knowledge for maintenance and set up, so it is recommended for companies that already use Oracle for other corporate systems. There is a free version of Oracle with a limit to the database maximum size, but it is adequate to ISOPLAN. Initially, ISOPLAN comes with an Access database, therefore a configuration must be made to allow its use with Oracle 10g database or higher.

### 11.3.1. Installing an Oracle Database

This set up demands certain knowledge of the use and management of tools that come along with Oracle Database. The following items are just a general guidance on how to set up the server using the "Data Pump" tool. It is necessary to have one of the following softwares installed on the same computer where ISOPLAN is: "Oracle Database 10g Client" or "Oracle Instant Client 10.2.0.4", provided by Oracle. These softwares are not included on the ISOPLAN setup CD, but can be downloaded from Oracle website.

1. Locate the Oracle folder on the Set up CD, where the backup (.dmp) file of the ISOPLAN database for Oracle can be found in the "Data Pump" format.
2. Run a impdp command line utility, which is used to import the isoplan.dmp file to the Oracle server. The scheme on the file is called "isoplan". Below, an example of a command line to be used.

```
impdp SYSTEM/admin SCHEMAS=isoplan DIRECTORY=isoplandir DUMPFILE = ISOPLAN.DMP  
REMAP_SCHEMA = isoplan:isoplan_data TABLE_EXISTS_ACTION = replace LOGFILE=isoplanimport.log
```

These are the descriptions of some parameters. See Oracle documentation:

SYSTEM/admin: login and password of the System account in Oracle.

isoplandir: directory in Oracle where the file isoplan.dmp is located. It can be created by using the SQL command from Oracle "CREATE OR REPLACE DIRECTORY", or an existing file can be used.

REMAP\_SCHEMA=isoplan: isoplan\_data: used when necessary to change the ISOPLAN user name. In the example, it was altered from "isoplan" to "isoplan\_data".

3. After importing the database scheme, the user must have be left with "connect" and "resource", according to Oracle documentation. Choose a password for the ISOPLAN user (scheme) on Oracle.
4. Open the **ISOPLAN Maintenance** program and click on the **Database** tab.
5. Choose from the **Database Type** as **Oracle**.

6. Fill in the **Server** field (server address, e.g. "192.168.33.18"), **Port** (TCP/IP port used, generally 1521), Instance (Instance name on Oracle server, for example, XE), **User** (ISOPLAN user name on Oracle) and **Password** (ISOPLAN user password on Oracle).
7. Click on the **Test Connection** button to check if the connection was successfully made.
8. Click on the **Save** button to save the configurations.
9. Close the ISOPLAN Maintenance program and try to access ISOPLAN by using the standard account (user name "admin" and password "admin").
10. Repeat steps 5 to 9 on all the computers where ISOPLAN has been installed.

### 11.3.2. Oracle Database Backup

ISOPLAN does not have commands to make an Oracle database backup. There is only one backup option, intended for support, in case it is necessary to send a copy of the database to Presys without making contact with the Oracle administrator. When clicking on the "Support Backup" button, a zip file name is requested, where all the data concerning the database internal tables will be stored. This zip file can be sent to Presys by e-mail, in case it is necessary to perform some tests with the same data from Oracle at Presys.

### 11.4. ISOPLAN Auto-Check

The ISOPLAN Maintenance program brings a routine to check the environment where the program is installed, such as database connection and serial communication. This auto-check procedure has the main purpose to help the product set up support. The auto-check routine is carried out as follows:

1. Open the ISOPLAN Maintenance program and click on the **Auto-Check** tab.
2. In case you want to test the serial communication with the Presys calibrators, connect the calibrator to the computer serial port, leaving the calibrator display on the COM menu. Then, select the model according to the calibrator being used, choose the COM port and mark the **Test Communication** option.
3. Click on the **Start** button to generate an Auto-Check report.

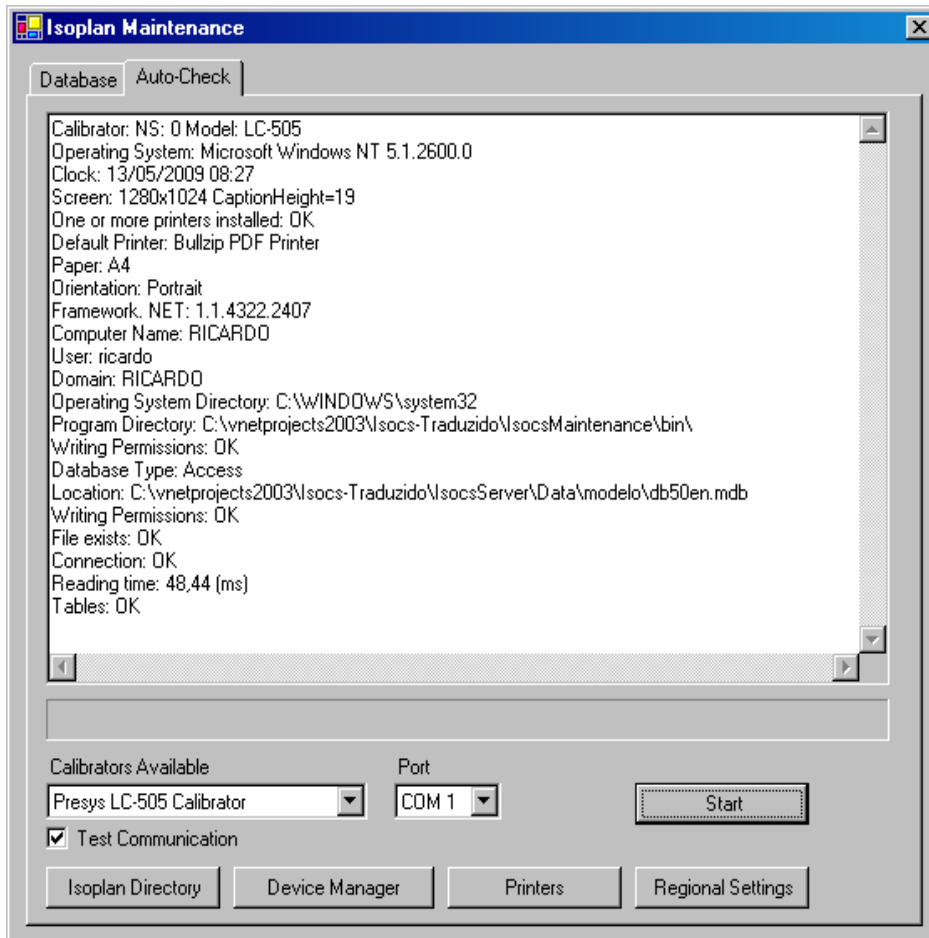


Figure 154 – **Auto-Check** tab on the ISOPLAN Maintenance dialog box

**Comments:**

- If the communication is working, the calibrator serial number and model must appear on the first line of the report.
- The other information displayed is about the operational system, database connection and directories permissions intended to help the program support.
- The buttons at the bottom of the tab represent the shortcuts to the operational system options. **ISOPLAN Directory**: opens the directory where ISOPLAN is installed. **Device Manager**: opens the device manager and checks if the computer has a COM port installed. **Printers**: shows the installed printers. **Regional Settings**: opens the **Regional Settings** screen from Windows.

**11.5. Reset User**

The Isoplan Maintenance software allows **to return the default user settings as password, inactive status and locked status** using the **"Reset User"** option.

Open Isoplan Maintenance software and then click the **"Reset User"** button.

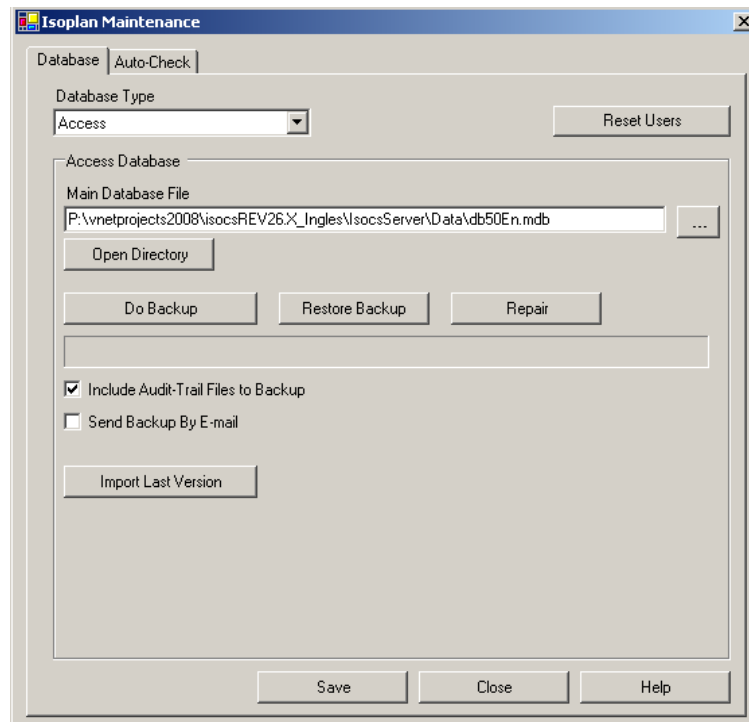


Figure 155 - **Reset Users** of dialog box **Isoplan Maintenance**

Select the **type of database where the company is registered**.

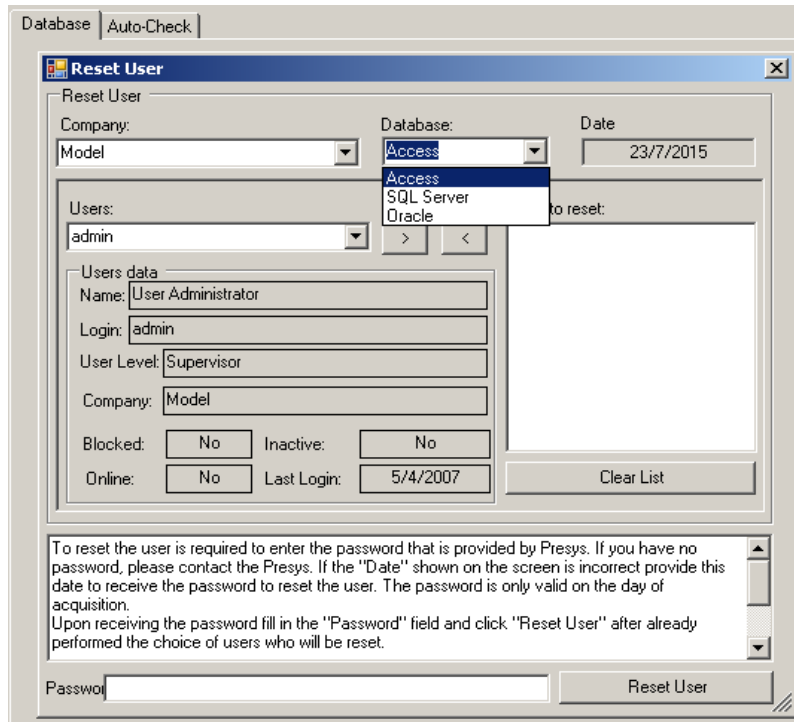


Figure 156 - Selecting Database Type in the "Reset User" dialog box

Select the users you want to reset the password and click the ">" to add user the list and reset the password.

**Note: When the user is selected, the data it will be shown in the "User Data"**

Enter the **password provided by Presys** in the "Password" field, then click "Reset Password"

**"To reset the user is required to enter the password that is provided by Presys. If you have no password, please contact the Presys. If the "Date" shown on the screen is incorrect provide this date to receive the password to reset the user. The password is only valid on the day of acquisition. Upon receiving the password fill in the "Password" field and click "Reset User" after already performed the choice of users who will be reset. Select the type of database being used, the company where users meet and finally users who will be reset to the default settings The configuration of the users will return to default settings when resetting users. The user will be unlocked, On, and the password will be reset to 1234"**

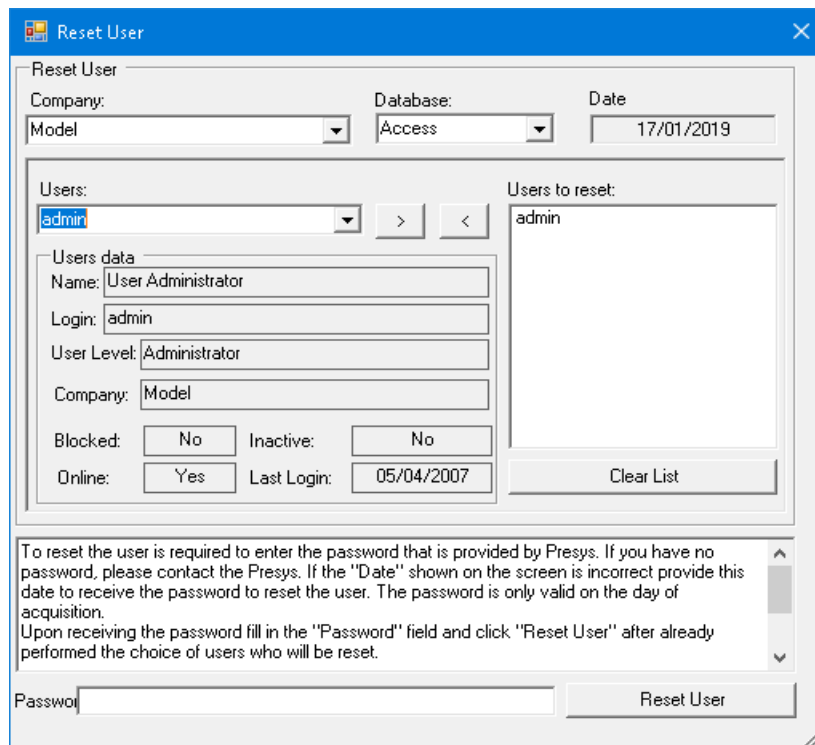


Figure 157 - Resetting User in the "Reset User" dialog box

## Appendix 1 - Uncertainty Calculation

The uncertainty of measurement is based on the statistical analysis obtained during calibration (Type A Uncertainty) and by other means that are not based on the measurements (Type B Uncertainty). On the following pages, definitions and formulas used in the general uncertainty of measurement calculation are shown. The calculations refer to a single calibration point, therefore they must be repeated for each point defined in the tag calibration strategy.

### Type A Standard Uncertainty

$$U_1 = \frac{S_i}{\sqrt{n}} \text{ (Eq. 1)}$$

where:  $S_i$  = Standard Deviation  
 $n$  = number of measurements (in general, three measurements)  
 $U_1$  = type A standard uncertainty.

$$S_i = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} \text{ (Eq. 2)}$$

where:  $x_i$  = value of each reading for a certain calibration point  
 $\bar{x}$  = average reading value

### Type B Standard Uncertainty

Uncertainties evaluated by means other than statistical analysis of a series of measurements. Type B uncertainties used in ISOPLAN are described below:

## Calibrator Standard and Instrument Error Source Uncertainty

$$U_2 = \frac{U_x}{F_x} \text{ (instrument extra uncertainty) (Eq. 3)}$$

$$U_2 = \frac{U_{pextra}}{F_{pextra}} \text{ (standard extra uncertainty) (Eq. 4)}$$

where:

$U_x$  = instrument extra uncertainty registered on the instrument scale section.  
 $F_x$  = factor associated with instrument extra uncertainty

$U_{pextra}$  = extra standard uncertainty registered on the standard scales section.  
 $F_{pextra}$  = factor associated with standard extra uncertainty

These uncertainties are optional and only used if the user has registered them in ISOPLAN, and if they have been added during calibration. These uncertainties can be used to add other error sources that must be taken into account during calibration, such as effect of environmental temperature, weather variation since the last certificate etc.

## Uncertainty No Correction of Standards

Optional uncertainty that can be added during the uncertainty calculation when the standard correction option is not used.

$$U_2 = \frac{E \max}{\sqrt{3}} \text{ (uncertainty of non-correction of the standard) (Eq. 5)}$$

where:

$E_{max}$  = maximum error of the certificate of the standard for the selected scale.

## Calibrator Standard Inherited Uncertainty

This factor is composed of the standard uncertainties used to calibrate the instrument. The standards used are defined during the **Upload**, where the standard and the used scales are chosen.

The calibrator uncertainty ( $U_3$ ) is composed of the calibrator uncertainties used for the reading of a signal ( $U_e$ ) and of the calibrator uncertainties used to generate a signal ( $U_s$ ):

$$U_3 = \sqrt{\sum_i (U_{e(i)})^2 + \sum_i (U_{s(i)})^2} \text{ ( Eq. 6)}$$

where:

$U_e(i)$  = calibrator uncertainty of each reading standard used.

$U_s(i)$  = calibrator uncertainty of each generating standard used.

$U_3$  = total calibrator uncertainty.

**Reading Calibrator Uncertainty**

$$U_e = \frac{U_{cert}}{K} \text{ (Eq. 7)}$$

where: Ucert = uncertainty declared on the certificate.  
 K = constant K declared on the certificate.

On the certificate, the worst uncertainty between two existing points concerning the calibration point is used. This method can be easily understood with an example. Suppose we must calibrate an instrument that has current output, like a temperature transmitter, for example. Observe the figure:

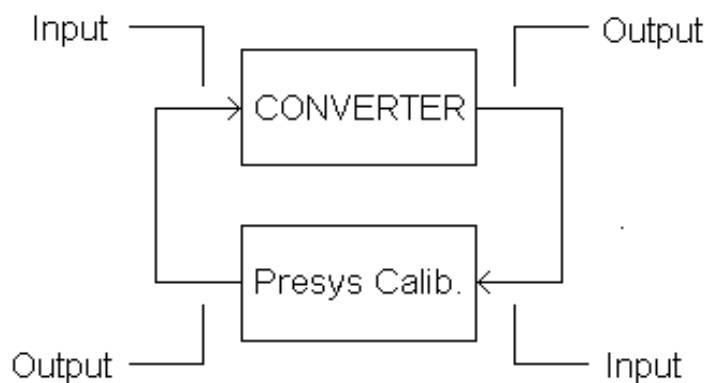


Figure 158 - Calibration of a converter type instrument

In this example, the reading is the calibrator current input. Suppose you want to calibrate the instrument to a point where the output is 4mA, therefore we must know the standard uncertainty for a reading close to 4mA. From the standard calibration certificate, we have the following data:

p1 = 3mA Ucert1 = 0.001mA K1 = 2  
 p2 = 6mA Ucert2 = 0.002mA K2 = 2

where: p1, p2 = calibrated points on the standard certificate.  
 Ucert1,Ucert2 = uncertainties declared on the certificate for points p1 and p2.  
 K1,K2 = "K" coverage factors declared on the certificate for points p1 and p2.

Therefore, points 3 and 6mA are available for input, so calibrator uncertainty for 4mA is estimated the following way:

$$Up_1 = \frac{Ucert1}{K1} = \frac{0,001}{2} = 0,0005(mA)$$

$$Up_2 = \frac{Ucert2}{K2} = \frac{0,002}{2} = 0,001(mA)$$

$$Ue = Max(Up_1, Up_2) = 0,001(mA)$$

In case there is more than one reading calibrator, it is necessary to find the uncertainty for each calibrator, and then apply the value found to the formula (Eq. 5).

### Generation Calibrator Standard Uncertainty

$$Us' = \frac{Ucert}{K} \text{ (Eq. 8)}$$

where: Ucert = uncertainty declared on the certificate.  
 K = constant K declared on the certificate.

In this case, it is also necessary to find the standard uncertainty value, as described in the previous example.

The calculations made by ISOPLAN (uncertainties, errors etc.) and the tag acceptance criteria are related to the instrument output, therefore the generation calibrator standard uncertainty must be propagated from the instrument input to output. This is possible with the use of propagation of uncertainty formulas. For linear instruments, the propagation of uncertainty from the instrument input to output happens as follows:

$$Us = \frac{(S \max - S \min)}{(E \max - E \min)} \cdot Us' \text{ (Eq. 9)}$$

where: Smax = instrument output maximum value (value configured on tags registration on the reference field).  
 Smin = instrument output minimum value (value configured on tags registration on the reference field).  
 Emax = instrument input maximum value (value configured on tags registration on the calibration field).  
 Emin = instrument input minimum value (value configured on tags registration on the calibration field).  
 Us' = standard uncertainty value of the input standard obtained from the formula (7).

The value given in (8) must be used to calculate the total standard uncertainty

Still about the previous example, suppose the temperature transmitter has a Pt-100 as input, ranging from 0 to 100°C, and the output between 4 and 20mA, and we are calibrating the point corresponding to 0°C. As standard calibrator, we use an instrument that simulates a Pt-100, where the **standard** uncertainty obtained from the certificate for 0°C, already interpolated, is 0.025°C.

Applying (8)

$$U_s = \frac{(20 - 4)}{(100 - 0)} \cdot 0,025 = 0,004(mA)$$

Calculating  $U_s$  and  $U_e$ , it is possible to calculate the total calibrator inherited uncertainty using the equation (5), that is:

$$U_3 = \sqrt{0,0006667^2 + 0,004^2} = 0,00406(mA)$$

In simpler cases, for example, an indicator instrument type such as thermometers or manometers, we only have the generation standard uncertainty, therefore,  $U_e = 0$ , only  $U_s$  are left, where most of the cases  $U_s = U_s'$ , because the range of calibration and reference values are equal.

### Combined Uncertainty

Combined uncertainty of a measurement, when this measurement is obtained through values from several other quantities, is equal to the positive square root of a sum of terms.

$$U_c = \sqrt{U_1^2 + U_2^2 + U_3^2} \text{ (Eq. 10)}$$

where:  $U_c$  = combined standard uncertainty

$U_1$  = Type A uncertainty

$U_2$  = Type B uncertainty related to the instrument and calibrator extra uncertainties

$U_3$  = Type B uncertainty related to the calibrator standards used

### Effective Degrees of Freedom

When many uncertainties are combined, it is necessary to know the number of effective degrees of freedom that must be taken into account during calibration, for the calculation of the uncertainty of measurement. It is obtained through the use of the Welch-Satterthwaite formula:

$$v_{eff} = \frac{Uc^4}{\sum_{i=1}^N \frac{u_i^4}{v_i}} \quad (\text{Eq. 11})$$

where:  $v_{eff}$  = effective degrees of freedom

$Uc$  = combined standard uncertainty

$U_i$  = standard uncertainty value of each component used to calculate the combined uncertainty. Normally we only have the uncertainty  $U_1$  that has degrees of freedom equal to  $n-1$ , the other uncertainties usually have infinite degrees of freedom. Isoplan finds the degrees of freedom of the standard using the  $k$  factor typed if it is greater than two through the  $t$ -student table with a probability of 95.45%. For example, if the certificate of the standard has a  $k$  factor equal to 2.11 the number of degrees of freedom will be 25.

### Uncertainty of Measurement

Quantity defining an interval around the result of a measurement, from which a large P fraction of the probability distribution is expected to be achieved, and P is the coverage probability or confidence level. This is the value shown on ISOPLAN reports and used to define if the diagnosis is approved or not.

$$U = K \cdot U_c \text{ (Eq. 12)}$$

where: K = coverage factor  
 $U_c$  = combined uncertainty defined in (9).

The K coverage factor is obtained on the Student's t distribution (t), for a certain confidence level and certain degrees of freedom defined in (10). If  $\nu_{eff}$  is not a whole number, K is calculated by the means of a linear interpolation from the immediate numbers (anterior and posterior ones) existing on the table.

$$K = t_p(\nu_{eff}) \text{ (Eq. 13)}$$

Example: A given trust level is equal to 95.45% ( $P = 95.45\%$ ) and a number of effective degrees of freedom,  $\nu_{eff}$  calculated in (10) is equal to 3.85. Find K.

In this case, the value immediately before is 3 and the value immediately after is 4, therefore we have the following values for K:

$$\nu_{eff} = 3 \Rightarrow K = 3,31$$

$$\nu_{eff} = 4 \Rightarrow K = 2,87$$

In a linear interpolation of the two points above, we have:

$$K = \left( \frac{3,31 - 2,87}{3 - 4} \right) \cdot (3,85 - 3) + 3,31 = 2,936$$

## Appendix 2 - Instrument Calculation with Square Root Function

Instruments like flow meters (square root function) use the following formula to calculate the reference value.

### In Root Function

$$R(C) = \sqrt{\frac{(C - C_{\min})}{(C_{\max} - C_{\min})}} \cdot (R_{\max} - R_{\min}) + R_{\min} \quad (\text{Eq. 14})$$

where:

R = reference value

C = calibration point

$C_{\min}$  = minimum calibration value configured on tags screen.

$C_{\max}$  = maximum calibration value configured on tags screen.

$R_{\min}$  = minimum reference value configured on tags screen.

$R_{\max}$  = maximum reference value configured on tags screen.

### Appendix 2.1 - Propagation of Uncertainties

The propagation of standard uncertainty used in the instrument input to the output, as in the case of flow meters, is calculated using the following formula:

$$U_s(C) = \frac{R(C + U_c) - R(C - U_c)}{2}$$

where:

C = calibration point specified in the strategy.

$U_s(C)$  = generation calibrator standard uncertainty referring to the tags screen calibration.

$R(C)$  = flow meter formula mentioned in the previous topic.

$U_c(C)$  = calibrator standard uncertainty obtained from the calibration certificate.

In the previous formula, it is possible to see that  $U_s(C)$  is numerically evaluated when we calculate if the  $U_s$  variation is due to a calibration point variation of  $+U_c(C)$  and  $-U_c(C)$ .

## Appendix 2.2 - Propagation of Errors

The propagation of the systematic standard error used in the instrument input to the output, in the case of flow meters, is found using the following formula:

$$E_s(C) = R(C) - R(C - E_s')$$

where:

C = calibration point specified in the strategy.

Es'(C) = generation standard systematic error in the referring calibration unit of the tags screen.

R(C) = flow meter formula mentioned in the previous topic.

Es(C) = systematic error propagated from instrument input to output, i.e., in the reference unit of the tags screen.

## Appendix 3 - Automatic Calibration Frequency Setting

ISOPLAN uses previous calibration diagnosis to define if the calibration period must be increased or reduced. This increase or reduction is based on Schumacher Table as well as on the factors defined on the configuration screen.

Previous Calibrations	Current Calibration	
	F	C
CCC	D	E
FCC	D	P
CF	M	P
FC	M	P
FF	M	P

Schumacher Table

The information on the screen is the following:

**Previous Calibrations:** diagnosis of the two or three previous calibrations

**Current Calibration:** diagnosis of the last calibration.

**C:** calibration diagnosis was approved or is compliant.

**F:** calibration diagnosis was reprovved or is not compliant (out of tolerance).

**D:** calibration interval must be reduced according to the **Reduction Factor** shown on the **Configurations** screen.

**M:** calibration interval must be reduced according to the Maximum **Reduction Factor** shown on the **Configurations** screen.

**E:** calibration interval must be increased or extended according to the **Increase Factor** shown on the **Configurations** screen.

On the tags screen, the maximum and minimum limits for a calibration interval are shown, preventing calibrations from happening between very short or very long intervals.

ISOPLAN uses the following algorithm:

- 1) After the calibration data is entered, ISOPLAN checks if the diagnosis concerning the previous calibrations fit one of the cases on Schumacher table, for example, CCC (three calibrations with approved diagnosis), FF (two calibrations with reproved diagnosis etc.). If none of the cases occurs, the calibration interval is kept the same.
- 2) If one of the cases on the table occurs, according to the diagnosis of the current calibration, ISOPLAN will calculate the calibration interval following the suggestion from Schumacher Table and the factors on the configuration screen.

E (extend):  $T_{novo} = T \cdot fa$

D (reduce):  $T_{novo} = T \cdot fd$

M (maximum reduction):  $T_{novo} = T \cdot fm$

P (remain):  $T_{novo} = T$

where:

$T_{novo}$  = New calibration interval suggested by ISOPLAN in months or days.

$T$  = Current calibration interval in months or days.

$fa$  = Calibration interval increase factor, which must be a number higher than 1.

$fd$  = Calibration interval reduction factor, which must be a number lower than 1.

$fm$  = Calibration interval maximum reduction factor, which must be a number lower than  $fd$ .

- 3) ISOPLAN checks if the new suggested interval is between the minimum and maximum limits specified by the user. If the interval goes beyond the maximum limit, ISOPLAN adopts the maximum value suggested by the user as the new interval. In case of reduction, ISOPLAN also suggests the minimum limit, if the calculations present a value lower than the minimum limit suggested by the user.
- 4) The user is requested to confirm if s/he really wants to change the calibration interval. In case the user confirms the change, the calibration interval is altered.

### Appendix 4 - Characteristics of Analog Manometers

The loop is a combination of two or more instruments connected so that the signal passes from one to the other in order to perform a measurement. The metrological evaluation of the loop can be done in two ways. The first consists of the loop calibration performed in Isoplan through the normal loop download and upload procedure, where the loop as a whole is treated as an instrument by injecting a standard signal at the beginning of the loop and reading the output or indication of the last instrument of the loop. In this mode all the instruments must be interconnected and functioning in order to carry out the calibration. The second way is to use the calibration parameters of each tag of the loop (uncertainties and errors) and to use the uncertainty propagation method to estimate the error and uncertainty of the loop.

The following figure shows the loop diagram

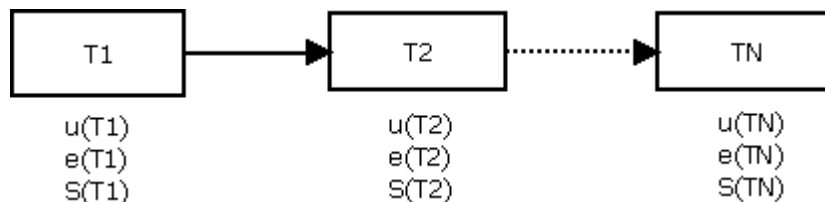


Figure 159 - Loop composed of several tags

In the previous figure T1 through Tn are the various tags that make up a loop. A signal is present at the input of the loop, passes through several instruments until it reaches the output of the last equipment, which in many cases is an indicator showing the signal of the loop (temperature, flow, pressure and etc.).

In order to perform the loop uncertainty calculations manually, the following data must be obtained:

SP(M): point of calibration of the loop that is desired to do the calculations.

AmplitudeInput (M): input amplitude in the loop or operating range of the loop.

AmplitudeOutput(M): amplitude of output in the loop or range of operation of the loop.

AmplitudeInput (TN): input amplitude of each tag of the loop.

AmplitudeOutput(TN): output amplitude of each tag of the loop.

SPOUT (TN): value in the output of each of each tag of the loop.

u (TN): standard uncertainty consisting of the expanded uncertainty divided by k factor. Value obtained in the tag certificate.

e(TN): systematic error, difference between the value indicated or read on the instrument and the reference value shown on the certificate. Obtained by tag certificate.

vEff(TN): effective degrees of freedom of tag N. Obtained by tag certificate.

**Loop Sensitivity**

The sensitivity of the tag is a constant, which when multiplied by the value of variation of the input produces the value of variation of the output of the tag. The sensitivity for linear instruments can be calculated by dividing the amplitude of the instrument output by the input amplitude, for example, in a transmitter with input from 0 to 100°C and output 4 to 20 mA we have as sensitivity the value of  $(20-4)/(100-0)=0.16$  mA /°C.

The sensitivity of the loop can be calculated by the following equation:

$$S(M) = S(T1).S(T2). \dots S(TN) \quad (\text{Eq. 15})$$

where:

S(M): loop sensitivity

S(TN): sensitivity of each tag of the loop. For linear instruments it is given by

$$S(TN) = \text{AmplitudeOutput(TN)} / \text{AmplitudeInput (TN)}$$

where:

AmplitudeInput(TN): amplitude of variation of the instrument input.

AmplitudeOutput(TN): amplitude of variation of the instrument output corresponding to the variation of input amplitude mentioned above.

**Relative Tag Error**

To facilitate the combination of errors and uncertainties the calculations will be made in relative terms, in the case of Isoplan in relation to the operating range of the loop. In this way the calculations become simpler since it is not necessary to deal with different units or quantities of each tag of the loop.

$$Er(TN) = E(TN) / \text{Amplitude}(TN)$$

where:

$Er(TN)$ : relative error of tag N

$S(TN)$ : sensitivity of each tag of the loop.

For example, in a tag that has an uncertainty of 1°C in the certificate and the operating range in the loop is from 0 to 100° C (amplitude), then the relative error will be  $1/100 = 0.1$ .

### Relative Loop Error

It can be shown that the relative equivalent error of the loop is calculated by the following equation:

$$Er(M) = Er(T1) + Er(T2) \dots Er(TN) \quad (\text{Eq. 16})$$

where:

$Er(M)$ : relative error of the loop corresponding to the error of the loop in engineering unit divided by the output span of the loop.

$Er(TN)$ : relative tag error that corresponds to the tag error in engineering unit divided by the output span of the tag.

The relative error of the loop corresponds to the simple sum of the relative errors of each tag of the loop.

### Loop Error in Engineering Unit

The previous equation shows the error of the loop in relation to the output amplitude of the loop, to calculate the error in engineering unit, simply multiply the relative error by the output amplitude of the loop.

$$E(M) = Er(M) * \text{AmplitudeOutput}(M) \quad (\text{Eq.17})$$

where:

$E(M)$ : loop error in engineering unit.

$\text{AmplitudeOutput}(M)$ : amplitude of output in the loop or range of operation of the loop.

This value is shown in the Isoplan certificate.

### Loop Relative standard Uncertainty

It can be shown that the relative equivalent standard uncertainty of n uncorrelated interconnected tags can be estimated by:

$$ur(M)^2 = ur(T1)^2 + ur(T2)^2 + \dots + ur(TN)^2 \quad (\text{Eq. 18})$$

where:

ur(M): relative standard loop uncertainty that corresponds to the standard loop uncertainty in engineering unit divided by the output span of the loop.

ur(TN): relative standard uncertainty of the tag that corresponds to the standard uncertainty of the tag in engineering unit divided by the output span of the tag.

The standard uncertainty of each tag corresponds to the uncertainty shown in the Isoplan certificate divided by the k factor.

$$ur(TN) = (U(TN) / K(TN)) / \text{Span}(TN)$$

### Effective Degrees of Freedom of the Loop

Using the Welch-Sartewaite equation, the effective degree of freedom of the loop can be determined

$$\frac{ur(M)^4}{v(M)} = \frac{ur(T1)^4}{v(T1)} + \frac{ur(T2)^4}{v(T2)} + \dots + \frac{ur(TN)^4}{v(TN)} \quad (\text{Eq. 19})$$

where:

ur(M): relative standard uncertainty of the loop obtained in (Eq. 18)

ur (TN): relative standard uncertainty of the tag N obtained through the tag certificate.

v (TN): effective degrees of freedom that can be obtained from the calibration certificate of the tag.

In this equation the only unknown is v(M) which gives the effective degrees of freedom of the loop.

### Expanded Relative Uncertainty of the loop

After the number of degrees of freedom of the loop is found is used the t-Student table to find the coverage factor (K) in the same way that is explained in the appendix of calculation of uncertainty of the tag.

$$Ur(M) = K * ur(M)$$

ur(M): relative standardized uncertainty of loop calculated in the previous topic. .

K: coverage factor that must be obtained by interpolating the t-Student table to a confidence level of 95.45% as explained in the appendix to calculate the uncertainty of the tag.

### Expanded Loop Uncertainty

The previous equation shows the uncertainty of the loop in relation to the output amplitude of the loop, in order to calculate the uncertainty in engineering unit, it is sufficient to multiply the relative uncertainty by the output amplitude of the loop.

$$U(M) = U_r(M) * \text{AmplitudeOutput}(M) \text{ (Eq. 20)}$$

where:

$U(M)$ : expanded uncertainty of the loop in engineering unit.

$\text{AmplitudeOutput}(M)$ : amplitude of output in the loop or range of operation of the loop.

This value is shown in the Isoplan certificate.

## Appendix 5 - ASME Calibration Tolerance

Below is the tolerance table that Isoplan uses to automatically calculate the acceptance criteria for safety valves.

<b>ASME I Aperture</b>	
Pressure	Tolerance
Up to 70 psi	2 psi
From 70 to 300 psi	3 %
From 300 to 1000 psi	10 psi
Above 1000 psi	1%
<b>ASME VIII Opening</b>	
Up to 70 psi	2 psi
Above 70 psi	3%

<b>ASME I Differential Relief</b>	
Pressure	Tolerance
Any Pressure	4% or 4psi (whichever is greater)
<b>ASME VIII Differential Relief</b>	
Any Pressure (Gases)	10%
Any Pressure (Liquids)	25%

## Appendix 6 - Characteristics of Analog Manometers

In the certificate of analog manometers some characteristics of the instrument are calculated.

### Maximum Repeatability

$$R = 100 * \text{MAX}(E) / \text{Range}$$

$$E = \text{ABS}(\text{MaxMes} - \text{MinMes}) \text{ (for the same up or down calibration point)}$$

Where:

R = Maximum Repeatability

MaxMes = maximum value measured for a calibration point.

MinMes = measured minimum value for a calibration point.

E = difference between the highest value and the lowest measured value of the same up or down calibration point.

Range = Instrument range

NOTE: Calibration points are separated between ascending and descending calibration points.

### Maximum Fiducial Error

$$EF = 100 * \text{MAX}(E) / \text{Range}$$

$$E = \text{ABS}(V_i - V_p)$$

Where:

EF = Maximum Fiducial Error

E = difference between the value indicated by the instrument ( $V_i$ ) and the value indicated by the standard ( $V_p$ ) for each calibration point.

Range = Instrument range

**Maximum Hysteresis**

$$H = 100 * \text{MAX} (Eh) / \text{Range}$$

$$Eh = \text{ABS} (VMc - VMd)$$

Where:

H = Hysteresis

Eh = difference between the measured value of a calibration point for each increasing and decreasing cycle

VMc - measured value of an increasing calibration point

VMd - measured value of a decreasing calibration point

Range = Instrument range

