3. Operation of the application

- General description of the program
- How to use the bookmarks
- Import/Export
- Importing tasks from Ergo/IBV Tool
- How to use the search function
- Wizard to select modules
- ISO analysis mode
- Adding photographs
- How to handle the video
- How to handle the reports
- Questionnaire manager
- Integration with Smart OSH

GENERAL DESCRIPTION OF THE PROGRAM

Ergo/IBV is a Windows application to assess work-related ergonomic risks. An opening image is displayed (Figure 1) which automatically disappears when the program is ready to be run.

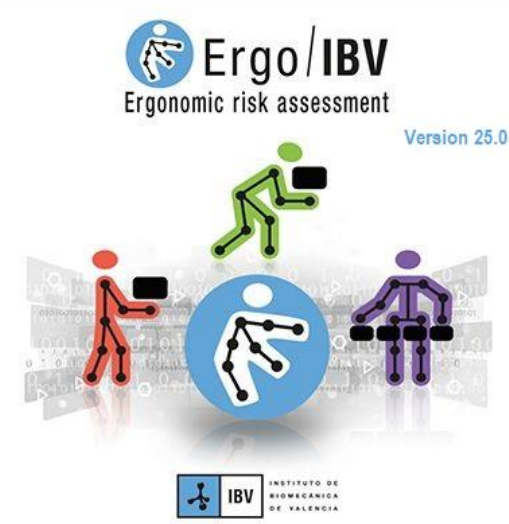


Figure 1. Ergo/IBV opening image

The main window of the application shows the icon and the name of the software. There are several areas below the menu bar (Figure 2). The toolbar buttons and the bookmarks drop-down menu are displayed in the upper of the screen, the functions of which are described later. Below the elements previously described, there is a website with relevant information and links.

The rest of the window can change its display mode: **web view** (Figure 2), **assessment view** (Figure 3), where the evaluator can perform the task analysis, and **design view** (Figure 4), where you can examine workstation designs.

Figure 2. Home web view

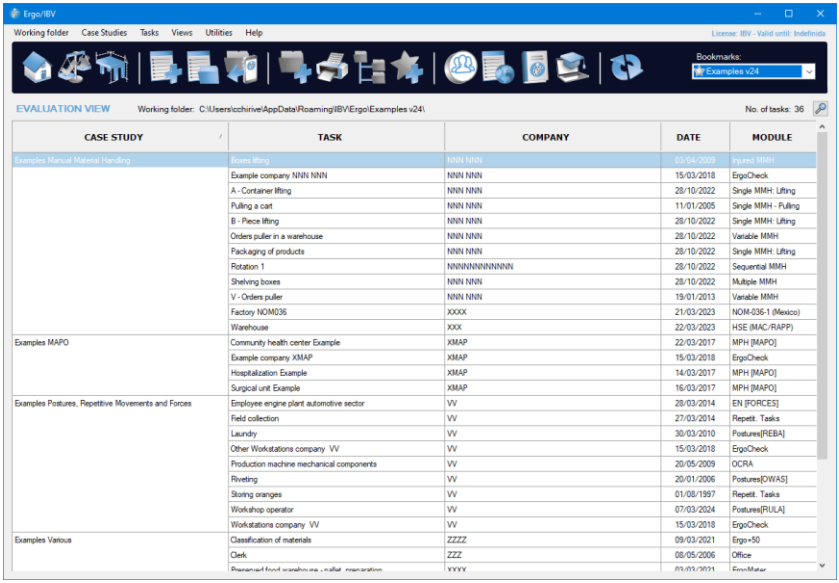


Figure 3. Assessment view

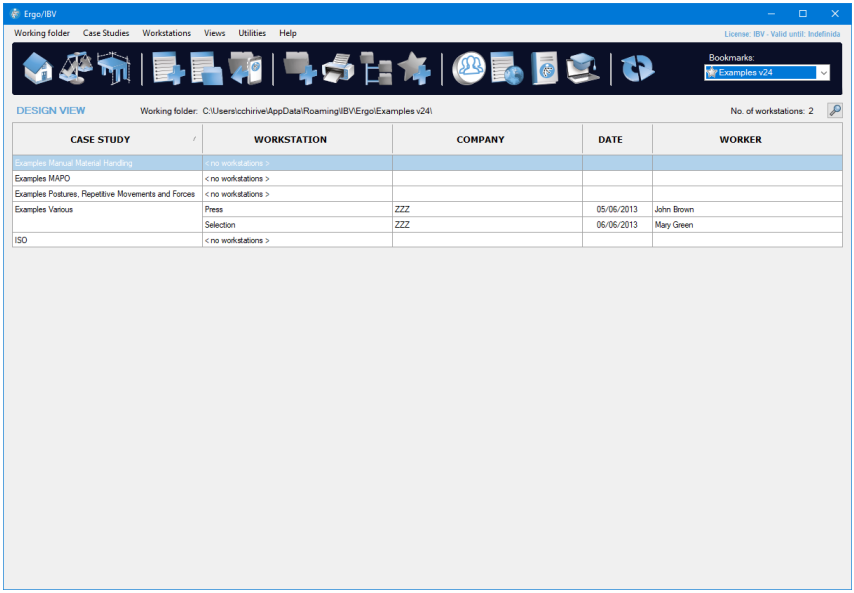


Figure 4. Design view

The following concepts are handled when using the application:

- ***Task:*** it is an analysis performed using any of the risk assessment *modules* available in the application, which correlates with a file that is saved in the desired *case study* and *working folder*. Each file contains one single task. The names of these tasks are managed by Ergo/IBV and are identified by a prefix based on the task name and the ***.ergo*** extension.
- ***Workstation***: it is a study performed using the *anthropometric design of the workstation module* available in the application, which correlates with a file that is saved in the desired *case study* and *working folder*. Each file contains one single workstation. The names of these files are managed by Ergo/IBV, which identifies them with a prefix based on the task name and the ***.ergo*** extension.

  Important: The names of the files (corresponding to tasks or workstations) should not be changed from Window Explorer because the application will modify each name again when necessary. You should also avoid copying, pasting and deleting the files directly from Windows Explorer; these actions should be carried out from Ergo/IBV.
- ***Case study***: it is a group of tasks and/or workstations which correlates with a Windows folder located in a *working folder*.

- ***Working folder***: it is the directory where the user works at a given time. In this folder, the user creates case studies and works with tasks or workstations (create, copy, delete, import tasks, etc.). Its content is shown as a list of case studies made up of tasks or workstations. It is possible to change the working folders at any time, from the menu or from the toolbar.

ASSESSMENT VIEW. It shows the list of case studies and tasks in a *working folder* (Figure 3); the header includes the following information:

- **Working folder**: it shows the directory where the user is working, which includes the case studies of the list.
- **Number of tasks**: it shows how many tasks there are on the list.

Each row of the list identifies the following fields (which allows you to reorder the list at any time by clicking the relevant title):

- **Case study**: name of the group of tasks.
- **Task**: name that the evaluator assigned to the task.
- **Company**: name of the company or work center where the task is developed.
- **Date** of the task analysis.
- **Module**: name (full or abbreviated) of the risk assessment module used for the analysis.

DESIGN VIEW. The design view shows the list of workstations in a *working folder* (Figure 4), headed by the following information:

- **Working folder**: it shows the directory where the user is working, which includes the case studies of the list.
- **Number of workstations**: it shows how many workstations there are on the list.

Each row of the list identifies the following fields (which allows you to reorder the list at any time by clicking the relevant title):

- **Case study**: name of the group of workstations.
- **Workstation**: name that the evaluator assigned to the workstation.
- **Company**: name of the company or work center to which the workstation belongs.

- **Date** of the workstation study.
- **Worker**: name (full or abbreviated) or identification code of the worker to whom the workstation under study is to be adapted.

This view may require authentication if data protection is enabled [see chapter *"Annex 4: Data Protection"*].

MENUS. The menu bar at the top of the window allows you to perform different functions and to obtain information. The menus include the following commands:

Working folder

- *Change working folder*: it opens a dialog where you can select a different working folder.
- *Browse working folder*: it opens Windows file browser in the working folder.
- *Add bookmark*: it allows you to quickly create a bookmark (shortcut) for the current folder.
- *Manage bookmarks*: it opens a window where you can manage the bookmarks of the folders, as it will be later explained [see section "How to use bookmarks"].

Case studies

- *New*: it allows you to create a new case study.
- *Delete*: it permanently deletes the case study selected together with all the tasks and/or workstations that it contains.
- *Change name*: it allows you to change the name of the case study selected.
- *Modify*: it allows you to see or change the data of the case study selected.
- *Report*: it generates a report of the case study selected.

Tasks

This menu is only activated in the *Assessment* view.

- *New:* it creates a new task to be analyzed with one of the assessment *modules* available.
- *Open*: it shows the task selected in order to be viewed or to change its data. It can also be opened by double-clicking the corresponding row of the task list.

- *Delete*: it permanently deletes the selected tasks from the list. When this command is performed from the *Recently used* or *Last search* lists [see "Bookmarks drop drown" in this chapter] only the task reference is deleted from the list, not the file associated to the task.
- *Copy*: it allows you create a copy of the selected task, identifying it as a *copy*.
- *Move*: it allows you to change the location of the tasks selected (they are saved in the destination folder and are automatically deleted from the source folder).
- *Search*: it opens a window to find tasks saved in any directory by using different search filters [see "How to use search function" in this chapter].
- *Import*: it allows you to bring tasks into the case study selected; they can be files from both the current version of the software and previous versions [see "*Import/Export"* in this chapter].
- *Export*: it allows you to save the tasks selected on the current list to another location that must be specified [see "*Import/Export"* in this chapter].

Workstations

This menu is only active in the *Design* view.

- *New*: it creates a workstation with the module of *anthropometric design of the workstation*.
- *Open*: it shows the selected workstation in order to view it or to change its data. It can also be opened by double-clicking the corresponding row in the list of workstations.
- *Delete*: it permanently deletes the workstations selected from the list. When this command is performed from the *Recently used* or *Last search* lists [see "*Bookmarks drop-down*" in this chapter], only the workstation reference is deleted from the list, not the file associated to the workstation.
- *Copy*: it allows you create a copy of the selected workstation, identifying it as a *copy*.
- *Move*: it allows you to change the location of the selected workstations (they are saved in the destination folder and are automatically deleted from the source folder).
- *Search*: it opens a window to find workstations saved in any directory by using different search filters [see "How to use the search function" in this chapter].

- *Import*: it allows you to bring workstations into the selected case study [see "*Import/Export"* in this chapter].
- *Export*: it allows you to save the workstations selected from the current list in a different folder which you must specify [see "*Import/Export"* in this chapter].

Views

- *Home*: it opens Ergo/IBV home page.
- *Assessment*: it activates the Assessment view, which shows the list of tasks in the *working folder.*
- *Design*: it activates the Design view, which shows the list of workstations in the *working folder.*

Utilities

- *Client's area*: it opens the web portal developed by the IBV, where occupational health professionals can keep up with the latest developments in the field, obtain relevant documents or exchange views and opinions with other users of the application.
- Questionnaire manager: it opens an optional tool that allows the user to collect risk assessment questionnaires through the web to automatically incorporate their data into the Ergo/IBV application. Currently, this tool is only enabled for the questionnaires associated with the *Ergo+50* module of Ergo/IBV [see *"Questionnaire manager",* in this chapter].
- *Configure* (Figure 5): it shows a configuration window where you can load the image of the company logo (which will be included in all the reports generated by the program); enable and disable the ISO operating mode [see *"ISO* analysis mode*"* in this chapter].

Figure 5. Configuration window (Utilities menu)

- *Change password:* it allows you to change the password of the user identified in the Ergo/IBV session. This command is only visible if the data protection is enabled [see chapter *"Annex 4: Data Protection"*]
- *License*: it opens a window that shows the data of the license for use.
- *Select printer*: it sets the default printer and specifies the printing conditions.

Help

- *Manual*: it gives online access to all the chapters and annexes that make up this user manual, in PDF format. It also allows access to data sheets to collect the task information required to apply the risk assessment modules. They can be useful when a computer is not available at the time of analyzing the task at the workstation.
- *About* (Figure 6): it provides information on the current version of the program, including the organizations that have worked with the IBV in the development of the application *modules*. It also gives access to the Ergo/IBV license agreement.

Figure 6. About (Help menu)

TOOLBAR. The buttons on the toolbar of the main window are associated with the menu commands already mentioned. Some of these buttons change depending on whether you activate the assessment or the design view.

Open home page. It shows Ergo/IBV home page.

New Task/Workstation. This button creates a task or workstation.

Open Task/Workstation. It shows the task or workstation selected from the list.

Import Tasks from Ergo/IBV Tool. It allows you to create the tasks registered in the mobile application.

New case study. It creates an empty case study in which tasks/workstations can be included.

Report of the case study. It generates a report with the relation tasks/workstations of the case study selected.

Open assessment view. It shows the task list of the last working folder used.

Open design view. It shows the workstation list of the last working folder used.

Change working folder. This button allows you to select a different working folder.

Add bookmark. It allows you to quickly create a bookmark (shortcut) for the current work folder.

Open client area. It allows you to access a portal web for Ergo/IBV clients.

Open questionnaire manager. It allows you to access the questionnaire manager web tool.

Open User *Manual*. It gives online access to all the chapters and annexes that make up this user manual, in PDF format. It also allows access to data sheets to collect the task information required to apply the risk assessment modules. They can be useful when a computer is not available at the time of analyzing the task at the workstation.

Open Training course. It gives online access to Ergo/IBV course.

Refresh contents. If there was no internet connection when starting, Ergo/IBV checks the connection again. If a web view is active, the current page is reloaded. If the Assessment or Design view is active, then the program will force the update of the list with the contents of the working folder.

FUNCTIONALITY AVAILABLE IN THE LISTS. There are a number of functions that can be performed on the list of tasks or workstations:

List search. When the list being displayed is very extensive, you can perform a text search (Figure 7) that is activated with the small magnifying glass in the upper right corner of the window.

The search can be used both in the Assessment and the Design View; in the Assessment View it searches in the *Task* and *Company* fields, whereas in the Design View the search is performed in the *Workstation, Company* and *Worker* fields.

When pressing the "*Search in current list*" button, the "*Find*" box is displayed, in which you must enter the text to be searched for (taking into account accent marks and spelling). Use the "*Search next*" and "*Search previous"'* buttons to scroll through the list.

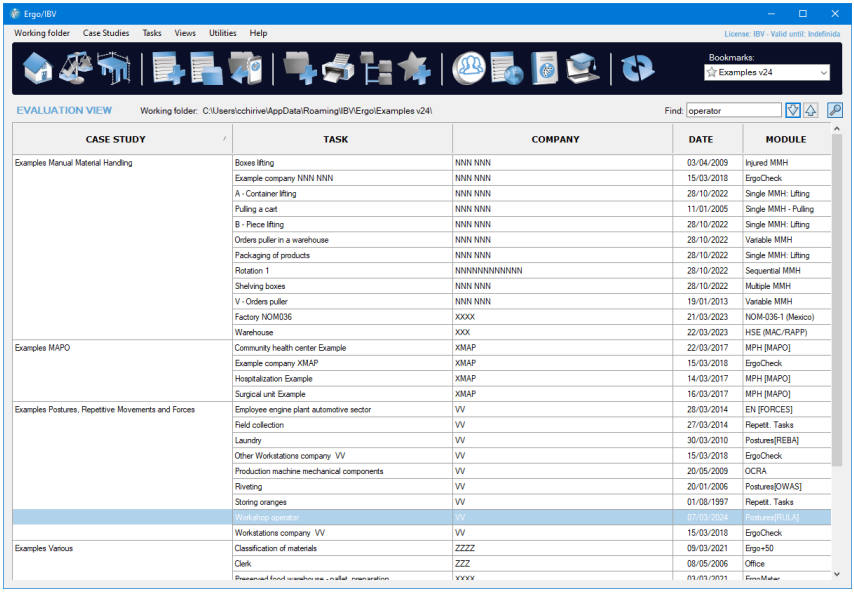
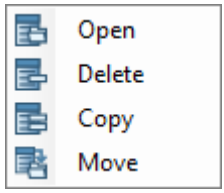


Figure 7. Searching for text in the list

Contextual menu. When you right-click on the list, a context menu appears with the following options:



- *Open*: it shows the task or workstation selected from the list.
- *Delete*: it permanently deletes the selected tasks or workstations from the list.
- *Copy*: it creates a copy of the selected task or workstation.
- *Move*: it allows you to change the location of the tasks or workstations selected.

Drag and Drop. It is also possible to move or copy tasks and workstations by clicking with the left mouse button on an item in the list, dragging and dropping it in another area of the list. If when you release the mouse button the *"Ctrl"* key on the keyboard is pressed, a copy of the dragged element will be made, if it is not pressed, this element will be moved from one case study to another.

HOW TO USE THE BOOKMARKS

A bookmark is a shortcut that facilitates the selection of a *working folder*; its use is optional, and you can create as many bookmarks as desired.

Bookmarks are managed in a specific window which is described below, but some operations can also be performed quickly:

- Creating a bookmark for the current working folder from the "*Working folder* | *Add bookmark*" menu, as previously mentioned.
- Selecting an existing bookmark to change the working folder from the bookmarks drop-down menu that will be described later.

Bookmark management. There is a window to manage the bookmarks of the folders (Figure 8), which is accessed from the "*Working folder* | *Manage bookmarks*" menu. This window allows you to select a bookmark in order to change the associated working folder, as well as to create, delete and modify bookmarks.

This window shows the existing bookmarks in tabular form, where each row displays the following information:

- **Alias.** The alias is by default the name of the associated folder, but it can be changed at any time.
- **Favorite**. Check the box if you want to highlight the bookmark as favorite when it is displayed in the drop-down.
- **Location**. It shows the directory containing the associated folder.
- **Date of creation**. It shows when the bookmark was created.
- **Last access**. It shows when the associated folder was last accessed.

The buttons on this window perform the following functions:

- **Delete**. This command deletes the selected bookmark, asking for previous confirmation.
- **New**. This button creates a bookmark for the folder that you specify.
- **Ok**. It accepts all the actions performed in the table and activates the folder of the selected row as working folder.
- **Cancel**. This cancels the changes to the table and cancels the row selection.

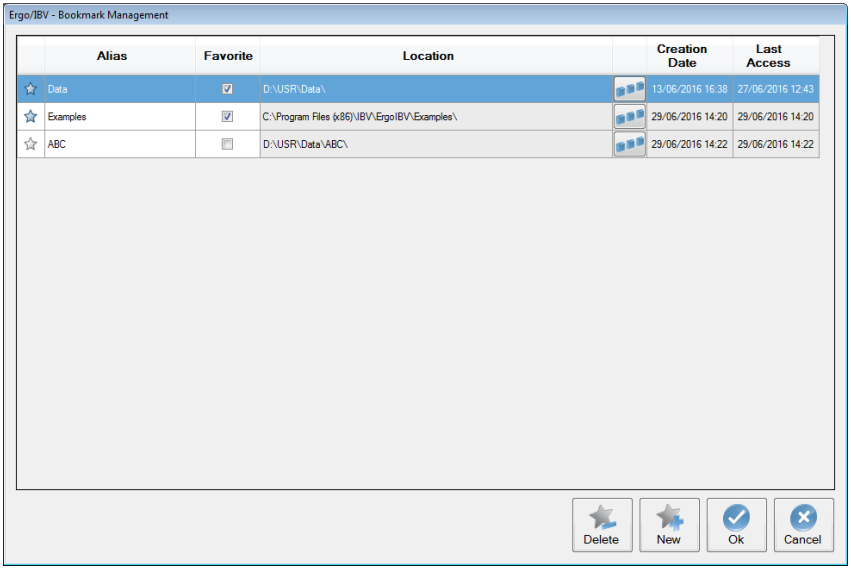


Figure 8. Window for managing bookmarks

Bookmarks drop-down menu. A dropdown in the top left of the main window allows you to change quickly to another working folder that has a bookmark (Figure 9). The drop-down menu contains the folders that have recently been used, identified by their *Alias* and preceded by a star (highlighted in blue, if it is a *Favorite*).

Other shortcuts are also included at the end of the drop-down menu. One of them replicates the functionality of the "Working folder | Add Bookmark" menu, which allows to quickly create a new bookmark for the current working folder (**<Add bookmark>).** The other shortcuts provide special lists that do not correspond with the contents of a single working folder; these lists show tasks if the *Assessment* view is active and workstations if the *Design* view is active:

Design:

- **<Recently used>** (Figure 10) shows the tasks or workstations recently opened by the user, identifying the access date (instead of the analysis date).
- **<Last search>** includes the tasks or workstations found when the search by directory was last used [see section "*How to use the search function*"].

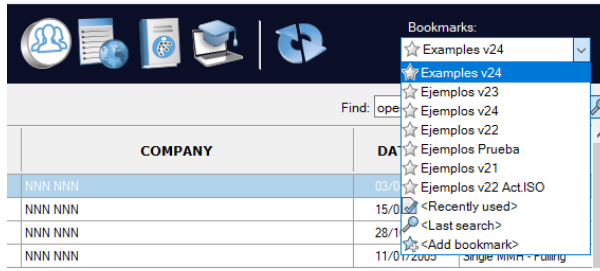


Figure 9. Bookmarks drop-down

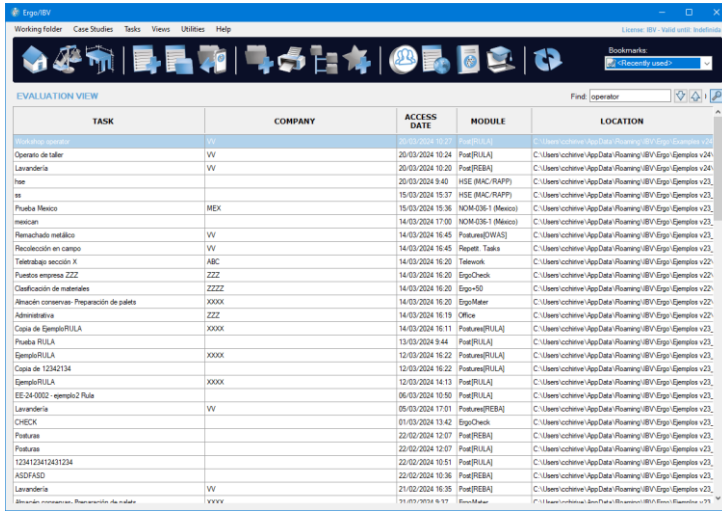


Figure 10. List of the tasks recently used

IMPORT/EXPORT

The Import or Export functions can be used to exchange tasks or workstations among working folders or different users. To import or export task, activate the *Assessment View*, whereas to import or export workstations you must activate the *Design View*.

An option is also available to import tasks created in the mobile application **Ergo/IBV Tool**. This import is explained in more detail in the next section of this chapter.

Export. You can export tasks or workstations from any list in two ways ("*Tasks*| *Export"* or "Workstations | *Export"*):

- Select a single task/workstation from the list, press "*Export"'* and choose the location and name of the file where this task/workstation will be saved.
- Select several tasks/workstations from the list at the same time, press "*Export"* and choose only the location where the tasks/workstations will be saved.

Import. There are also to ways to import tasks or workstations to the active working folder ("*Tasks"* | *"Import"* or "Workstations | *Import"* menu):

- If you want to import only one task/workstation, press "*Import* | *Task"* or "*Import* | *Workstation"* and select the desired file.
- If you want to import several tasks/workstations contained in a folder, press the option "*Import* | *Working folder"* and choose the location of the source folder. This function will not go into the subdirectories of the source folder.

The tasks saved in old formats (prior to version 10) must be first imported to the current version of the application in order to be able to work with them. To do this, there are two options in the *"Tasks* | *Import* | *Version 9 and earlier"* menu, only with the *Assessment View* active.

- **File.erg**. This option allows you to import the tasks from a single old file (with **.erg** extension). All the tasks contained in that file will be imported to the active working folder.
- **Bulk import**. You can import all the **.erg** files from the selected folder. In this case, this function will go into the subdirectories of the source folder. The subdirectory structure of the source folder will be reproduced in the directory of the active working folder, and an additional folder for each **.erg** file that is imported (where the tasks contained in that file will be located) will also be created.

The tasks and workstations that have been imported are shown on the <R*ecently used*> list, which can be useful after a *Bulk import* (to check which tasks have been imported and where they have been located).

IMPORTING TASKS FROM ERGO/IBV TOOL

The **Ergo/IBV Tool** application is available on Google Play for Android operative system. This application allows the safety expert to obtain at the workstation the necessary data to perform the assessment of the ergonomic risks. The mobile application allows you to create tasks, collect data on the chosen analysis module and get media information (photos, videos, audios, notes and sketches) in order to facilitate further analysis of each task.

The *Ergo/IBV Tool Import tasks* command allows you to create the tasks registered in the mobile application. This command is on the toolbar, in the *Tasks*|*Import* menu option and in the *New Task* window.

This option opens a window (Figure 11) which shows a list of tasks that are available to be imported. This list is generated by scanning the directory where the tasks from the mobile were downloaded and shows the task name, company, date of creation and module.

You must check on the list all the tasks to be imported and then press the *OK* button. If the module that should be used with a task to be imported has not been specified on the mobile application, or if there are several alternative modules, you will have to select one from the relevant drop-down menu in the *Module* column.

Before importing, the tasks must have downloaded from the mobile device to the computer. If there is no location selected for the downloaded tasks, you must choose a location. To make this task easier, Ergo/IBV includes the following commands:

This button allows you to select the location where the tasks have been downloaded on the computer.

This command refreshes the contents of the task list available in the selected location.

Pressing this button opens a window that guides the user when downloading tasks form the mobile device to the computer.

This command opens Windows file browser in the selected download location, which will show a folder for each task downloaded. Each folder contains the data and media files created for the task.

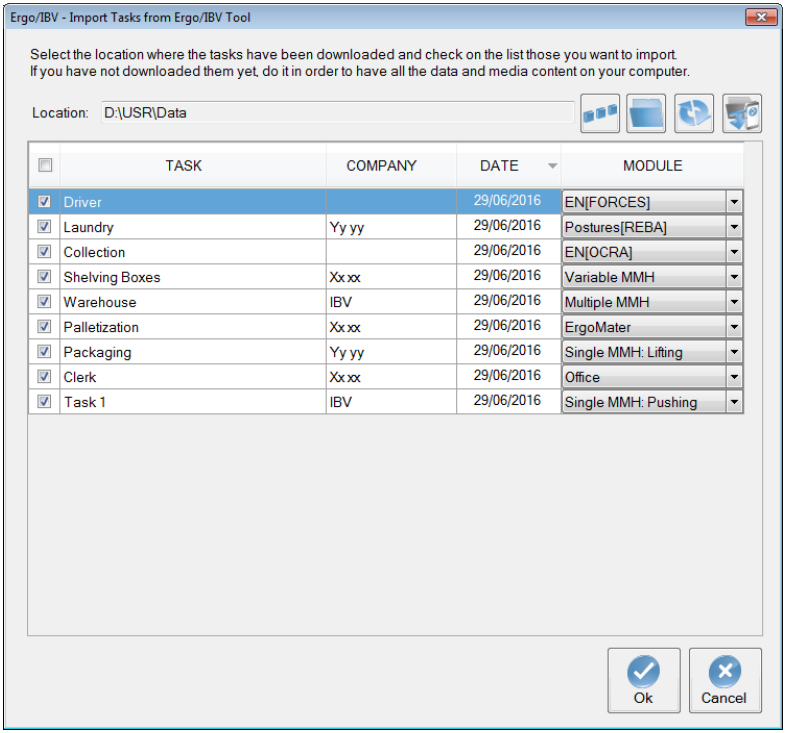


Figure 11. Importing tasks from Ergo/IBV Tool

The *Tasks Download from Ergo/IBV Tool* button shows a window (Figure 12) that guides the user when downloading tasks to the computer.

Ergo/IBV tries to detect the mobile devices connected via a USB port. If more than one is detected, then the relevant one should be selected from the *Detected Devices* drop-down menu.

When a device is detected and selected with the Ergo/IBV Tool application installed, a list of the folders of the tasks detected in that device will be shown. When pressing the download button, all the tasks with all the media files will be copied to the selected location. If the *Delete from the device on download completion* box is activated, Ergo/IBV will delete all the files from the mobile device once they are copied. It is advisable to delete them in order to free the resources of the mobile device.

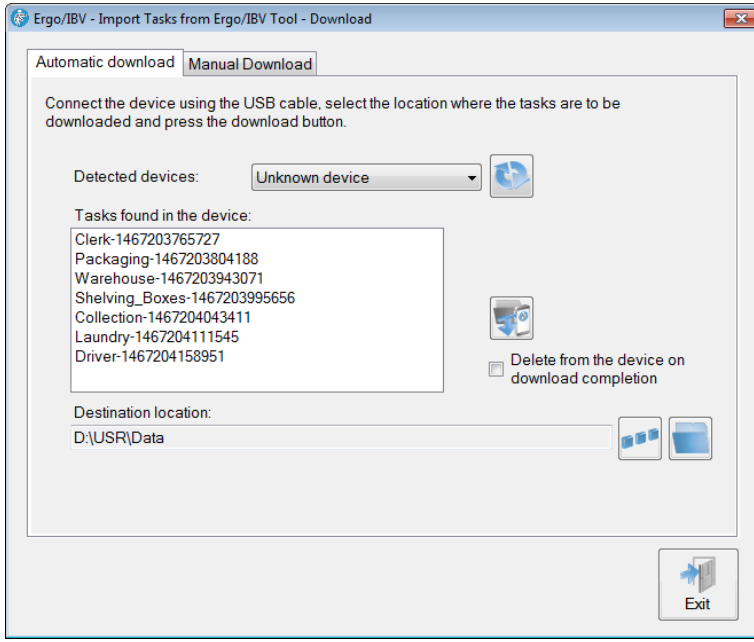


Figure 12. Downloading tasks from Ergo/IBV Tool

The download window shows the following buttons:

This button refreshes the detected devices.

This command allows you to select the computer location where you want to download the tasks from the mobile device.

Pressing this button opens Windows file explorer in the selected download location.

This button starts downloading the tasks from the mobile device to the computer.

If Ergo/IBV does not detect the mobile device, the Manual Download tab offers instructions on how to manually download the tasks.

HOW TO USE THE SEARCH FUNCTION

The program includes the "*Search*" window to find tasks or workstations saved in any directory (Figure 13). You can search for tasks by activating the *Assessment View* and accessing the *Search* command in the *Tasks* menu. If you want to search for workstations, activate the *Design View* and access the *Search* button in the *Workstations* menu. This window can also be accessed from the toolbar ("*Search tasks/workstations*" button).

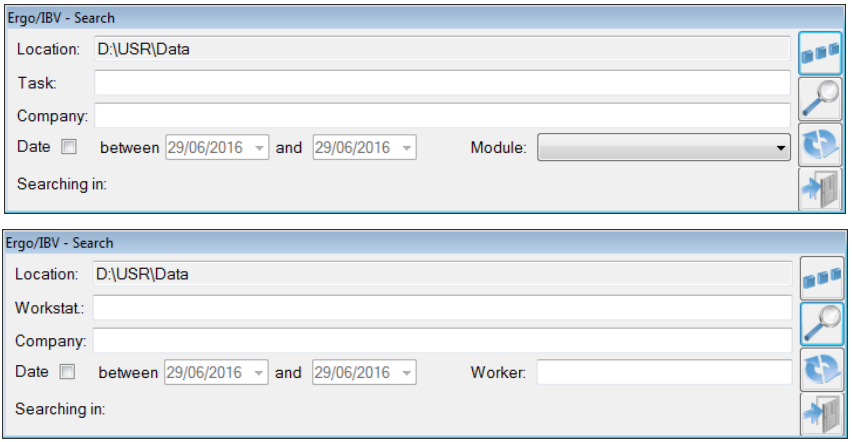


Figure 13. Windows of the task search and the workstation search functions

Select the **Location** where you want to perform the search by pressing the "*Select search location"* button. The directory will be remembered in future searches during the work session.

Task search filters. The following filters can be used when performing a task search, either individually or combined:

- **Task**. Enter the name (full or partial) assigned to the task.
- **Company**. Enter the name (full or partial) of the company or work center where the task is carried out.
- **Date**. Click the cell to enable the boxes in which the analysis date range is specified.
- **Module**. Select from the drop-down menu the risk assessment module used for the analysis.

Workstation search filters. The following filters can be used to perform a workstation search:

- **Workstation**. Enter the name (full or partial) assigned to the workstation.
- **Company**. Enter the name (full or partial) of the company or work center where the workstation is located.
- **Date**. Click the cell to enable the boxes in which the analysis date range is specified.
- **Worker**. Enter the name (full or partial) of the worker to whom the workstation under study is being adapted.

Press the "*Start search*" button to begin. During the search, the view of the button changes from a magnifying glass to a "*Cancel*" icon, which allows you to stop the search at any time.

The "*Empty search filters*" button deletes all the specified search filters so that you can enter new ones.

The "*Exit*" button closes the search window and takes you back to the main window of the program.

Search results (Figure 14). The results that meet the specified filters are shown as a new list of tasks or workstations, and are identified in the bookmarks drop-down as <*Last search*>. Each row of results shows the following data:

- **Task** or **Workstation**
- **Company** where the task is performed or the workstation is located.
- **Date** of the analysis.
- **Module** used for the analysis or **Worker** for whom the adaptation of the workstation is being studied.
- **Location** of the folder where the task or the workstation is.

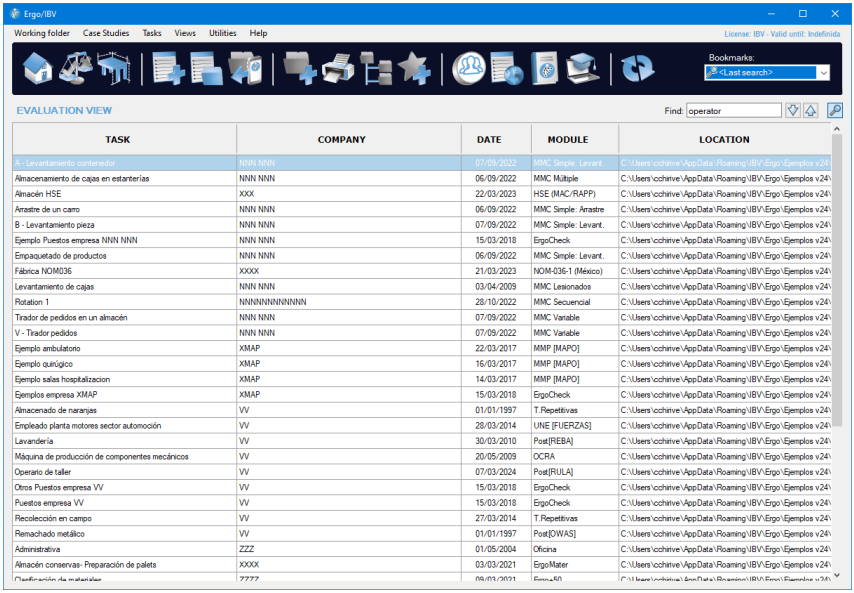


Figure 14. Results of the task search

WIZARD TO SELECT MODULES

The *wizard to select modules* is an Ergo/IBV utility that helps the user during the task assessment by facilitating the selection of the most appropriate modules to be applied. This utility helps you choose the most suitable module(s) to assess the risk of the task you want to analyze. It is an optional utility that is available in the *Assessment* view.

Access. The wizard is accessed from the Ergo/IBV module selection screen (“*Task* | *New Task”* menu) (Figure 15).

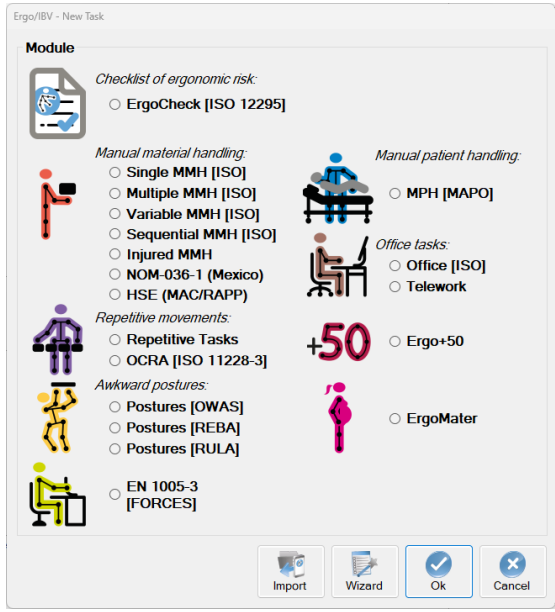


Figure 15. Access to the wizard to select modules

Operation. Access the *New Task* screen and press the *Wizard* button in order to access the utility screen (Figure 16), where a checklist is displayed on which the user must specify the analysis conditions. Check only the applicable box(es).

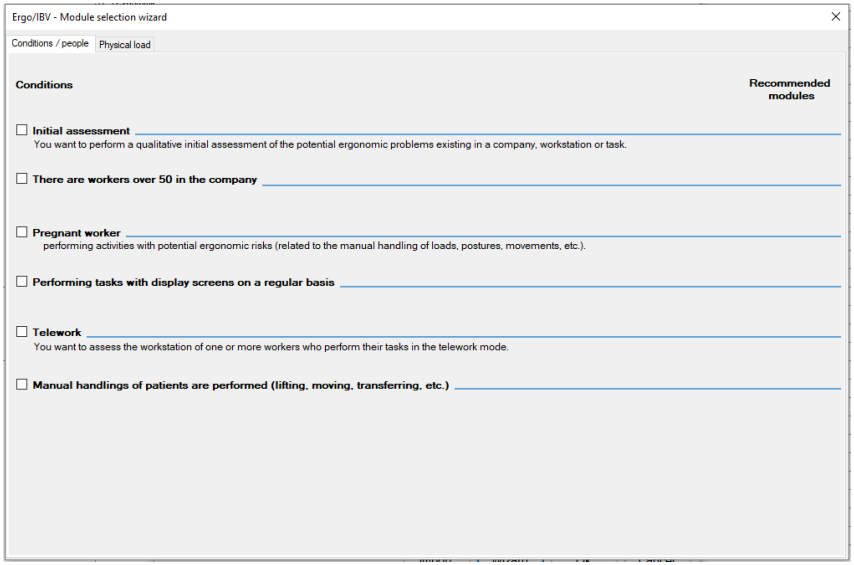


Figure 16. Wizard main screen

The task information that is going to help define the most suitable module(s) is provided below:

The wizard is divided into two blocks: **Conditions/people** and **Physical load**. It is important to review the questions asked in both blocks in order to get a proper estimation of the most relevant assessment methods.

Conditions / people

Initial assessment. The user wants to perform a qualitative initial assessment of the potential ergonomic risks that exist in a company, workstation or task.

There are workers over 50 years old in the company.

Pregnant worker performing activities that pose potential ergonomic risks (associated with load manual handling, posture, movements, etc.).

Performing tasks with display screens on a regular basis

Telework. You want to assess the workstation of one ore more workers who perform their tasks in the telework mode.

Manual handlings of patients are performed (lifting, moving, transferring, etc.)

Physical Load

Manual load lifting > 3 kg

- You want to perform a simple risk assessment of activities involving lifting/lowering of loads, carrying of loads and/or team manual handling.
- The person who performs the lifting task has returned to work after suffering a lower back injury (such as musculoskeletal overexertion, strains or non-specific LBP).
- Different load lifting tasks are performed in a particular sequence or rotation throughout the working day.
- Liftings are the same; their conditions do not change significantly during the task (for example, the loads weigh the same, they are lifted always in the same way, from and to the same places, etc.).
- Load liftings are different; there are significant changes in some conditions (weight, load position in the origin and destination point, etc.).
- The handling conditions of the lifting task vary greatly (for example, when preparing orders in a warehouse, where many objects with different weights are lifted, at very different heights and/or depths, with or without trunk rotation, etc.).
- > 3 kg load lifting and carrying tasks are combined.

Manual load pushing or pulling

- You want to perform a simple risk assessment of activities involving pushing and/or pulling of loads with auxiliary equipment.
- Load pulling and pushing is always the same; the conditions do not change significantly during the task.
- Load pushing/pulling tasks are different; there are significant changes in some conditions (initial or sustained force, distance traveled, grip height, etc.).
- Pushing is combined with pulling.

Repetitive movements of the upper limbs in tasks with clearly defined work cycles

- You want to get the specific risk to the neck-shoulder area and the hand-wrist area, separately.
- You want to get the overall risk for the upper limbs, and know the influence of the distribution of the working hours (exact sequence of events and their duration in minutes).

Poor posture of different body areas

- You want to analyze working postures sampled with a certain regular time interval.
- You want to analyze working postures selected because they are thought to be the most frequent and/or arduous:
    - Postural loading affects the whole body
    - Postural loading mainly affects the upper limbs

Force application

- You want to perform a simple risk assessment of activities involving pushing and/or pulling of loads without the use of auxiliary equipment.
- You want to assess the risk of activities involving the application of forces for operating/using controls/pedals, as well as pushing/pulling objects without wheels, guides or rollers, both in a standing and a sitting position.

From the previous information, the program automatically shows which assessment modules should be applied. Figure 17 shows that the evaluator should apply the *Multiple MMH* module to assess lifting and load carrying tasks, and the UNE EN 1005-5 [OCRA] module to assess the repetitive movements of the upper limb.

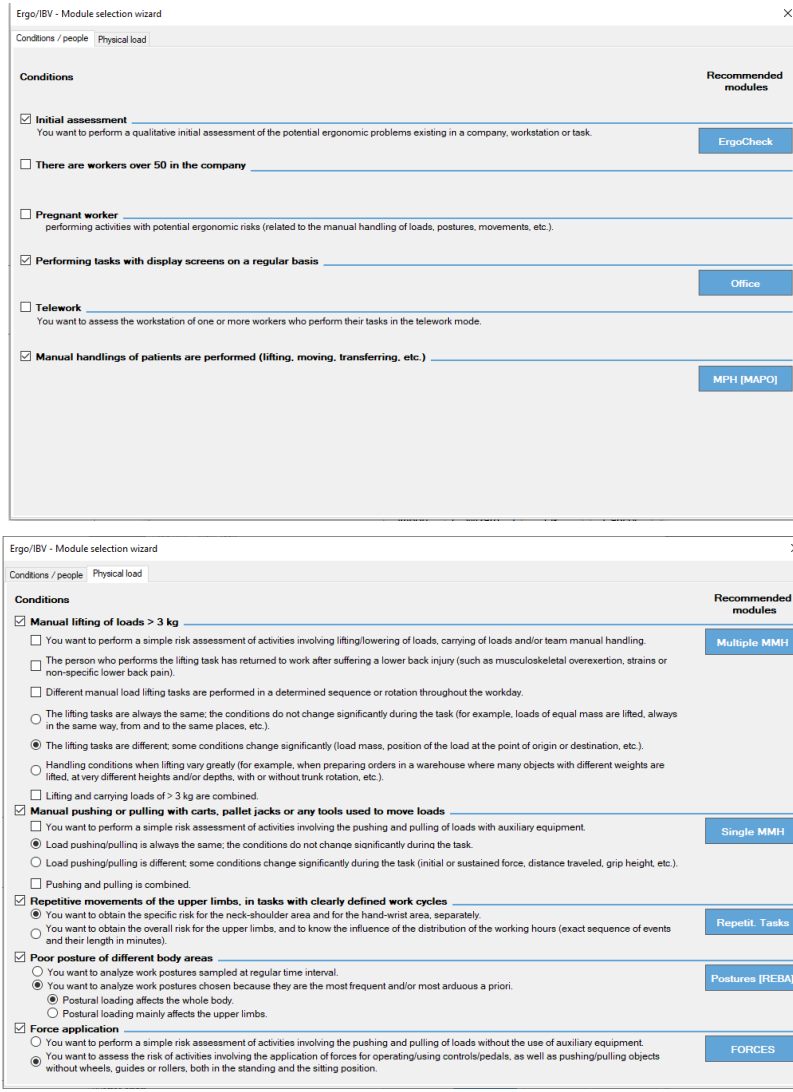


Figure 17. Wizard screens showing the selected modules

Conditions. It is possible to use more than one module to analyze the same task, because not all assessment procedures are mutually exclusive.

There are, however, a number of conditions that are indeed exclusive, that is, selecting some conditions of the analysis disables the selection of others. For example, if the user specifies that the worker is pregnant, none of the assessment modules concerning physical load will be recommended (*Manual load handling, Repetitive movements* and *Poor posture*), and the user will be sent to the *ErgoMater assessment module*.

ISO ANALYSIS MODE

Ergo/IBV allows you to assess workstations following the technical criteria set out in the ISO 11228 series of standards for the analysis of manual load handling tasks and repetitive tasks.

The analysis of office tasks considers the criteria set out in the ISO standards, 9241, 8995 and 7730 series.

The program includes the criteria set out in the following standards:

- ISO 11228-1 (2021). *Ergonomics-Manual handling. Part 1: Lifting, lowering and carrying*. International Organization for Standardization (ISO).
- ISO 11228-2 (2007). *Ergonomics-Manual handling. Part 2: Pushing and Pulling*. International Organization for Standardization (ISO).
- ISO 11228-3 (2007). *Ergonomics-Manual handling. Part 3: Handling of low loads at high frequency*. International Organization for Standardization (ISO).
- ISO 9241-303 (2011) Ergonomics of human-system interaction -- Part 303: Requirements for electronic visual displays.
- ISO 9241-4 (1998) Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 4: Keyboard requirements.
- ISO 9241-400 (2007) Ergonomics of human--system interaction -- Part 400: Principles and requirements for physical input devices.
- ISO 9241-5 (1998) Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 5: Workstation layout and postural requirements.
- ISO 9241-6 (1999) Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 6: Guidance on the work environment.
- ISO 9241-9 (2000) Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 9: Requirements for non-keyboard input devices.
- ISO 8995 (2012) Lighting of work places -- Part 1: Indoor.

- ISO 7730 (2005) Ergonomics of the thermal environment -- Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria.

To activate the ISO assessment mode you must access the Configuration window (Utilities menu | Configure). The user should activate the *ISO Mode* by clicking the activation box (Figure 18).

Figure 18. ISO Mode activation

Once this mode is activated, the user will **ONLY** be able to open the files that have been created in the *ISO mode*, as the program warns.

The *ISO Mode* involves the use of the criteria established in the ISO 11228, 9241, 8995 and 7730 series, which directly affect the following assessment modules (Figure 19):

- Single MMH (lifting and carrying), Multiple MMH, Variable MMH, and Sequential MMH: ISO 11228-1
- Pushing and pulling: ISO 11228-2

- OCRA: ISO 11228-3
- Office: 9241 series, ISO 8995 and ISO 7730

Figure 19. ISO assessment modules

The main features and aspects to be considered in the analysis when a user activates the *ISO Mode* are summarized below.

ISO 11228-1. Lifting and carrying

Single, multiple, variable, and sequential lifting

If the ISO mode is configured, it should be taken into account that the ISO standard does **not** consider the additional task multiplier.

In the ISO mode, this risk multiplier is crossed out (Figure 20). The evaluator must bear in mind that, if this multiplier exists in the workstation being analyzed, it will not be considered, which will affect the Risk Index of the task, as well as the **redesign screens** of such tasks.

In regard to the **various factors included in the equation** (population, duration, frequency, horizontal position, vertical position, displacement, angle of asymmetry, and grip type), both the values and their calculation method are those referred to in the Ergo methodology (see *chapter* 5).

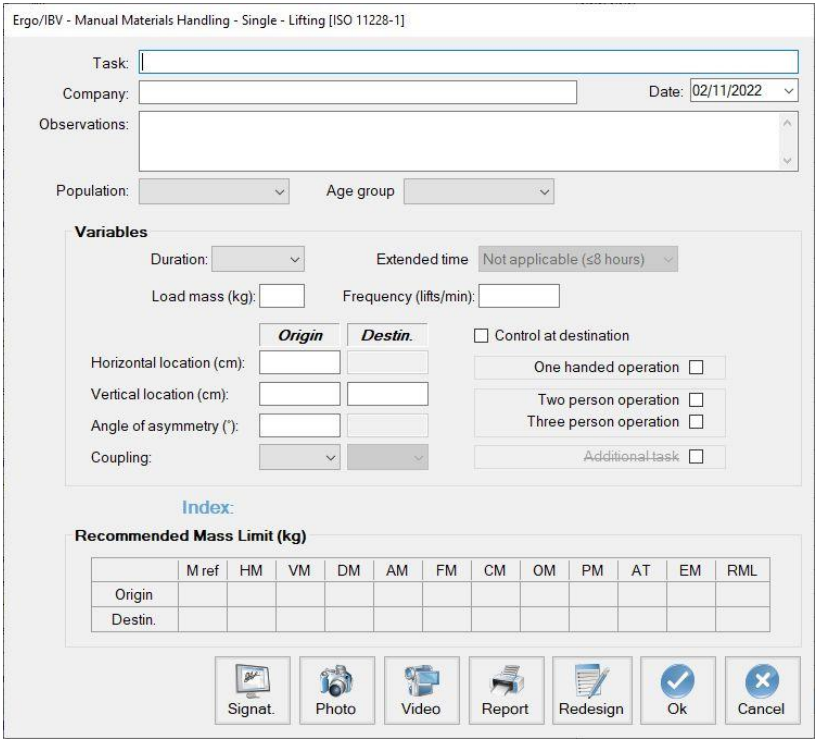


Figure 20. Variables not considered in the ISO standard (crossed out)

There is only *variation in:*

- *The grip type factor*, for which the ISO standard considers a value of 1.00 when the grip is regular and the height is greater than or equal to 75 cm (0.95 in ERGO).
- The two or three-person operation multiplier, which takes a value of 0.85 in the ISO standard, whereas in Ergo it is 0.66
- For multiple MMH lifting tasks (ISO does not include multiple MMH lifting and carrying tasks), variable MMH, and sequential MMH the ISO analysis mode follows the same criteria considered for the Ergo mode (see the corresponding sections in chapters 5, 6 and 7).

Regarding the risk index of the task, the ISO standard considers 5 risk levels for load lifting tasks.

The values, exposure levels, and actions are summarized in the table below:

Risk index	Risk level	Recommended action
IL≤1	Very low	None in general for the healthy working population.
1<IL≤1.5	Low	In particular pay attention to low frequency/high load conditions and to extreme or static postures. Include all factors in redesigning tasks or workstations and consider efforts to lower the LI values < 1,0.
1.5<IL≤2.0	Moderate	Redesign tasks and workplaces according to priorities to reduce the LI, followed by analysis of results to confirm effectiveness.
2.0<IL≤3.0	High	Changes to the task to reduce the LI are a high priority.
IL>3.0	Very high	Changes to the task to reduce the LI are needed immediately.

The report provided by the program consists of the same sections (identification, variables and calculations) as the Ergo methodology. The report header shows that the lifting has been analyzed according to the ISO 11228-1 criteria.

In the "variables" section of the report, the additional task variable does not appear (it is not considered in the ISO methodology); evidently, the risk index of the task considers the 5 levels established by ISO (very low, low, moderate, high, and very high).

By extension, when assessing a **multiple task** made up of several single lifts using the ISO Mode, such multiple task will not allow the Additional Task multiplier to be selected (it is not considered in the ISO standard). The same applies to the analysis of variable and sequential manual materials handling.

Carrying

The ISO 11228-1 (2021) update includes the analysis of load carrying as single tasks, which was not previously considered.

In this case, ISO considers carrying as manually (without mechanical assistance) moving an object which is held with either one or two hands or on the shoulders or neck (except for backpacks) by walking one meter or more.

The ISO standard does **not** consider carryings as multiple tasks, therefore, their analysis will always be considered a single task, as mentioned above.

This section shows how to analyze a *load carrying* task. The analysis starts by choosing the Single MMH *(ISO)* module in the *New Task* window, and then selecting *Carrying (ISO 11228-1)* as the type of task to analyze (Figure 19).

In this way, the main *load carrying* window is accessed (Figure 21) where, in addition to the **identification** data of the case (name of the task, company, date of the analysis, and observations), the following **variables** must be entered:

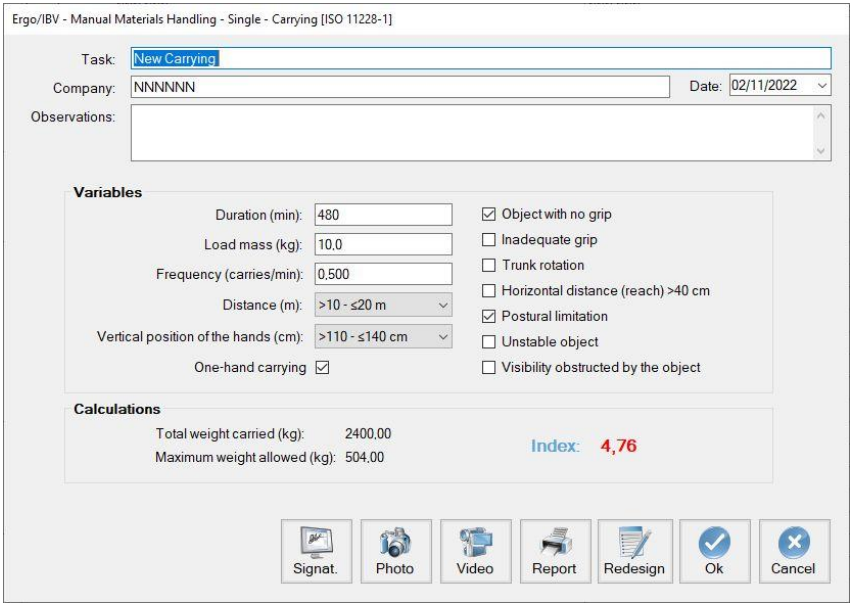


Figure 21. ISO Single MMH – Carrying (ISO 11228-1). Main window

- **Duration**. Specify the duration of the carrying task in minutes (the maximum allowed is 480 minutes, corresponding to an 8-hour workday).
- **Mass.** Specify, in kilograms, the mass carried by the worker.
- **Frequency**. Specify the number of carryings per minute performed by the worker.

- **Distance traveled (meters)**. Select (drop-down menu) the distance to be traveled with the load. The minimum distance for it to be considered load carrying is one meter. Manual carrying distances greater than 20 meters are not acceptable.
- **Vertical position of the hands**. Select (drop-down menu) the vertical position (cm) in which the hands remain while carrying loads. Values below 40 cm or above 140 cm are considered unacceptable.
- **One-handed carrying**. Specify if the load carrying is performed with one hand. In such a case, the allowed cumulative mass limits are reduced by 40%.
- **Conditions of the task**. Select if any of the following situations occur during the load carrying:
    - Object with no grip
    - Inadequate grip
    - Trunk rotation
    - Horizontal distance (reach)>40 cm
    - Postural limitation
    - Unstable object
    - Visibility obstructed by the object

Once these variables have been entered, the program **calculates**:

- **Total carried mass**. Mass, in kilograms, that is carried during the duration of the task.
- **Maximum allowed mass**. Mass, in kilograms, that is allowed under the conditions in which the carrying is actually performed.

With these values, the Risk Index of the task is automatically obtained and shown in the same window as the previous values.

- **Index**. Risk level associated with the load carrying task.

    Carrying RI: Carried mass/Maximum allowed mass

    - Carried mass< maximum allowed. Acceptable risk
    - Carried mass > maximum allowed. Unacceptable risk

Based on this *Index*, two levels of risk are considered:

- *Acceptable risk* (Index ≤1).
- *Unacceptable risk* (Index >1).

Report

Pressing the *Report* button in the carrying main window provides the *report* of the task, which contains the identification data, the variables entered by the evaluator, the calculations made by the program and, finally, the risk of the task together with its interpretation.

Redesign

Pressing the *Redesign* button in the carrying main window opens a window in which the task being analyzed can be redesigned (Figure 22) by modifying the variables in order to obtain a lower risk *Index*.

The features and use of this window are similar to the interactive redesign of load lifting (chapter 5).

The redesign is performed by modifying the carrying variables to obtain a lower *Index*, thus reducing the risk of injury to the worker. The process is guided by the program through a series of recommendations.

The redesign is **interactive** so that the new risk *Index* is automatically calculated as the evaluator modifies any variable by directly entering the new value in the corresponding box, or by using the button to the right of each variable to increase or decrease its value. Categorical variables can be changed by checking or unchecking the box to the left.

Disable variables. Sometimes, certain carrying variables may be conditioned by real limitations of the task that do not allow them to be modified. If such limitations exist, the relevant variables can be disabled so that they are not considered by the program when recommending changes in the redesign. To do this, the 'X' mark must be removed from the button next to the variable.

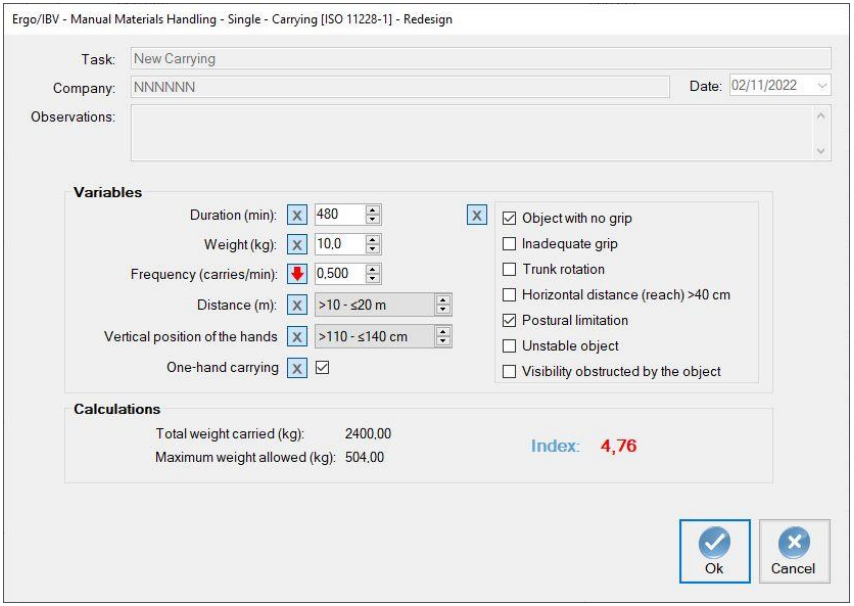


Figure 22. ISO Single MMH – Carrying (ISO 11228-1). Interactive redesign

ISO 11228-2. Pushing and pulling

With regard to the assessment of single and multiple pushing/pulling tasks, the criteria considered in the ISO standards and the Ergo methodology have points in common.

In multiple lifting tasks that involve pushing/pulling, the additional task factor cannot be considered since this factor is not included in the ISO standard.

The main difference is based on the results interpretation, as the ISO standard compares the forces measured with those established in the tables and also sets a color code:

> *If the forces measured, initial or sustained, are greater than the recommended forces, the risk level is RED.*
>
> *Otherwise, the risk level is GREEN.*

Although the ISO standard does not establish any risk index, the following values are obtained so as to help the analyst:

- *Acceptable* risk (Index ≤1)
- *Unacceptable* risk (Index >1)

The report provided by the program consists of the same sections (identification, variables and calculations) as the Ergo methodology, except the additional task factor (in the case of multiple tasks). The report header shows that the pushing/pulling has been analyzed according to the ISO 11228-1 criteria.

ISO 11228-3. OCRA

The assessment procedure set out in the ISO 11228-3 standard has similarities with the procedure included in ERGO, specifically with "Method 2 - Detailed risk assessment" of UNE EN 1005-5 (2007) concerning the assessment of risk due to high-frequency repetitive handling. In turn, this standard is based on the OCRA method (*Occupational Repetitive Actions*) originally developed by the EPM research center in Milán [Colombini, Occhipinti y Grieco, 2002].

With regard to the operating mode and use of the program, since both methodologies are similar, it is advisable to read the manual of the OCRA Multitask module.

However, there are some differences between the Ergo and the ISO operating mode which are important to point out:

1. The nomenclatures used by ISO 11228-3 and the ERGO method differ in some multipliers of the equation. The equivalence table of nomenclatures between the Ergo and the ISO methodology (ISO 11228-3) is shown below.

ERGO	**ISO**
CF	K_f
D_j	t_j
$Fo_{M}j$	F_{Mj}
$Po_{M}j$	P_{Mj}
Ad_{Mj}	A_{Mj}
Du_{M}	t_{M}

2. The method to calculate the OCRA index differs in both procedures. The ERGO mode incorporates the criteria of the UNE EN 1005-5 (2007) standard, as well as the procedure set out in the article "Ocra method: a new procedure for analyzing multiple repetitive tasks [E. Occhipinti, D. Colombini, 2009] *Research Unit Ergonomics of Posture and Movement (EPM), Foundation Don Gnocchi Onlus Milan –Italy",* presented at the 17th IEA Conference of the International Ergonomics Association on August 9 - 14, 2009 Beijing, China, to

calculate the OCRA index in multiple repetitive tasks. In the OCRA method used in the ISO standard, the criterion to calculate the OCRA index is the one set out in the UNE EN 1005-5 (2007) standard. The **calculation of the OCRA index used in the ISO 11228-3 standard** is shown below.

In the main window (Figure 23) for each upper limb, both right and left:

- **ATA – Number of actual technical actions, total**. It is the total number of actual technical actions during the working hours, that is, those that are really performed by the worker including all the repetitive subtasks analyzed. It is obtained by the following equation:

$$ATA = \sum_{j=1}^{n} F_j \times D_j$$

where:

n	Number of repetitive subtasks performed during the working hours
j	Generic repetitive subtask
F_j	Frequency (technical actions/min) of subtask j
D_j	Duration (minutes) of subtask j

- **RTA – Number of reference technical actions, total**. It is the total number of reference technical actions during the working hours, that is, those recommended taking into account the conditions under which they are performed. For all the repetitive subtasks analyzed, it is obtained by the following equation:

$$RTA = \sum_{j=1}^{n} \left[CF \times D_j \times \left(Fo_{Mj} \times Po_{Mj} \times Re_{Mj} \times Ad_{Mj}\right)\right] \times \left(Du_M \times Rc_M\right)$$

where:

n	Number of repetitive subtasks performed during the working hours
j	Generic repetitive subtask
CF	Constant of frequency = 30
D_j	Duration (minutes) of subtask j
Fo_{Mj}, Po_{Mj}, Re_{Mj}, Ad_{Mj}	Force, posture, repetitiveness, and additional multipliers for subtask j
Du_M	Duration multiplier
RcM	Recovery multiplier

- **OCRA index**. It is a representative value of the risk level of musculoskeletal disorders in the upper limb. It is calculated as the ratio of the two previous values [ATA/RTA]. The risk grows as the index increases, with three levels and their associated color codes, which are interpreted as follows:

≤ 2,2	*No risk* (green). Acceptable condition.
2,3 – 3,5	*Very low risk* (yellow). Improvements are recommended.
> 3,5	*Risk* (red). Not acceptable. It is necessary to redesign the subtask and/or the workstation.

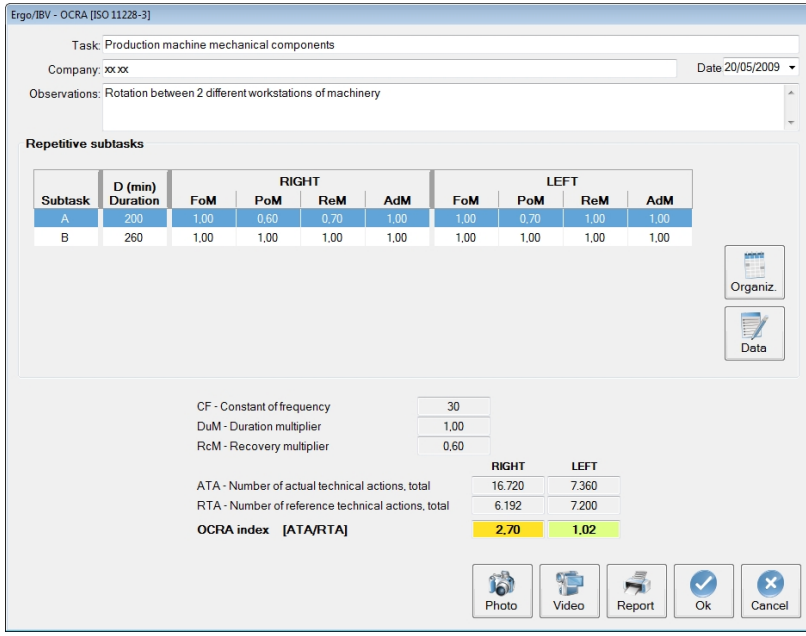


Figure 23. OCRA [ISO 11228-3] – Main window

In addition to these results, other values are displayed in the main window (Figure 23). Each row of a repetitive subtask includes the name, duration, and the force, posture, repetitiveness and additional multipliers obtained for each side. The constant of frequency (which always takes the value 30) and the calculated duration and recovery multipliers are shown below.

ISO 9241 series, ISO 8995 and ISO 7730. OFFICE

If the ISO mode is configured, this module does not consider some of the criteria from the European and Spanish legislation. These criteria will be shown disabled (crossed out), Figure 24.

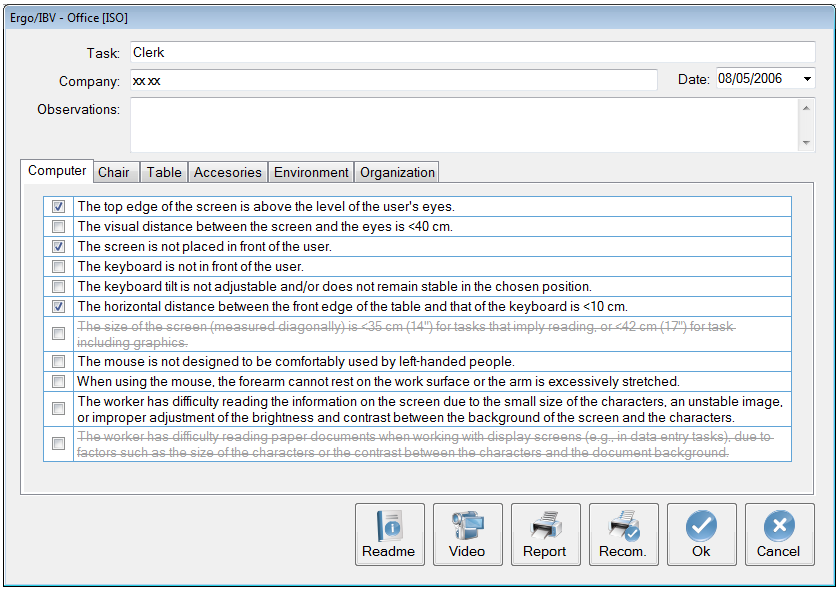


Figure 24. Variables not considered by the ISO standards in office tasks (crossed out)

The evaluator should note that if any of the criteria that appear crossed out are present in the workstation under analysis, it will not be considered and, therefore, the recommendations for improvement cannot be obtained. The criteria not covered by the ISO standards are as follows:

- **Computer**:
    - The screen size (measured diagonally) is <35 cm (14") for reading tasks, or <42 cm (17") for tasks including graphics.
    - The worker has difficulty reading documents (in paper) when working with display screens (for instance, in data entry tasks), due to factors such as the size of the characters or the contrast between the characters.

- **Chair**
    - Some accessible parts of the chair may have rough edges, protrusions or coatings which might cause injuries to the user.
    - The chair in not stable and may fall over when leaning on the edge of the seat, the back, or one of the armrests.
- **Table**
    - There are drawers or cross planks below the central part of the board.
    - In the space that surrounds the table where the chair of the worker is the minimum free surface is <2 m^2, or the distance between the frontal edge of the table and the closest obstacle behind the worker is <115 cm.
- The worker has not been informed about the risks involved in the job and the preventive measures associated with them.

The report provided by the program consists of the same sections as the Ergo methodology. The report header shows that the task has been analyzed according to the ISO criteria.

ADDING PHOTOGRAPHS

All the risk analysis tasks allow you to include a photograph that will be stored along with the data of the task and which will appear in its report.

By pressing the *Photo* button in the main screen of all the modules, you access the photograph window (Figure 25), which allows you to manage the photograph of the task.

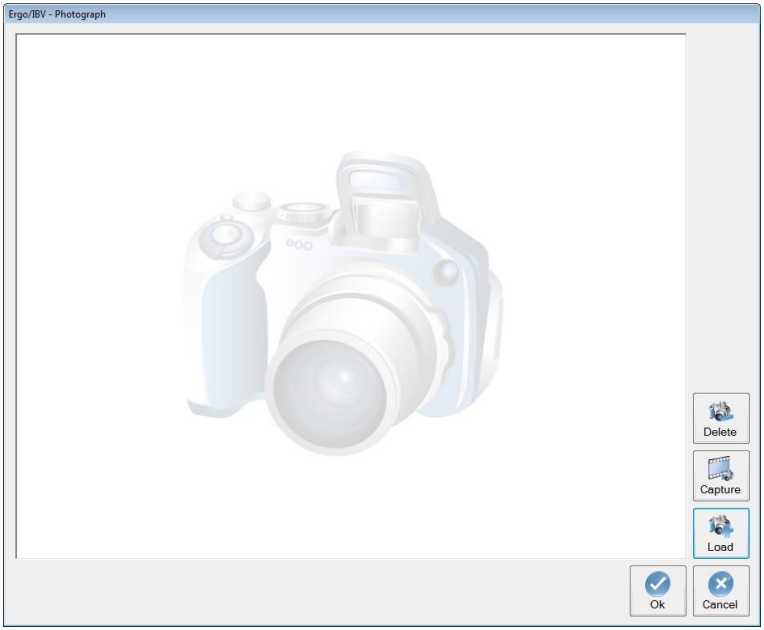


Figure 25. Photograph management window

The function of the various buttons in the photograph window is as follows:

The *Load* button selects a picture to attach it to the task.

The *Capture* button takes a screenshot of the current frame of the video player.

The *Delete* button removes the photograph of the task.

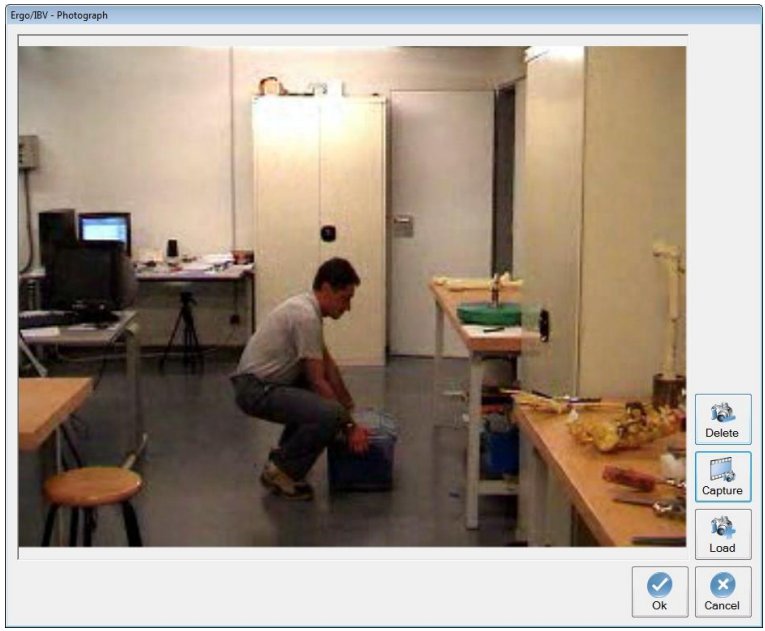


Figure 26. Photograph of the task

ADD SIGNATURE

In all the tasks of risk analysis, the user can include a scanned signature and the name of the evaluator, which will be stored together with the task data and displayed in the task report.

The *Signature* button available on the main screen of all the modules allows the user to access a window (Figure 27) to manage the signature of the task.

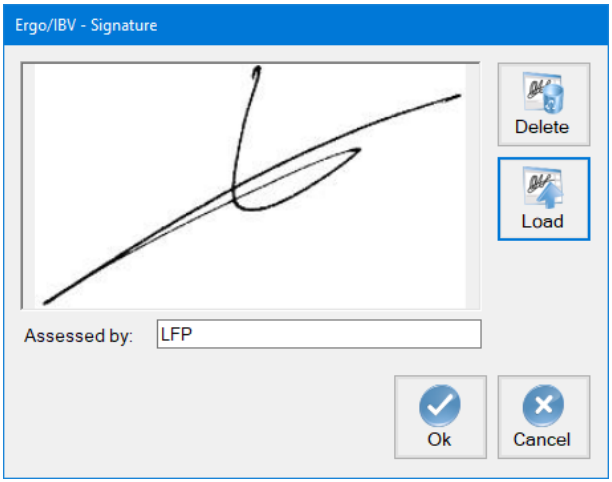


Figure 27. Window to manage the signature

The signature window includes several buttons with the following functions:

The *Upload* button allows the user to select a scanned signature and attach it to the task.

With the *Delete* button, the scanned signature can be removed from the task.

HOW TO USE THE VIDEO

The Ergo/IBV program allows you to view the worker task that has been recorded on video. This is a considerable advantage as it avoids the need to use an additional monitor for this function. The video player is accessible from all the application modules. The basic instructions for its operation are described below.

Video player. Pressing the "Video" button from any task opens the Video Player window (Figure 28), which is resizable and can be located anywhere on the screen.

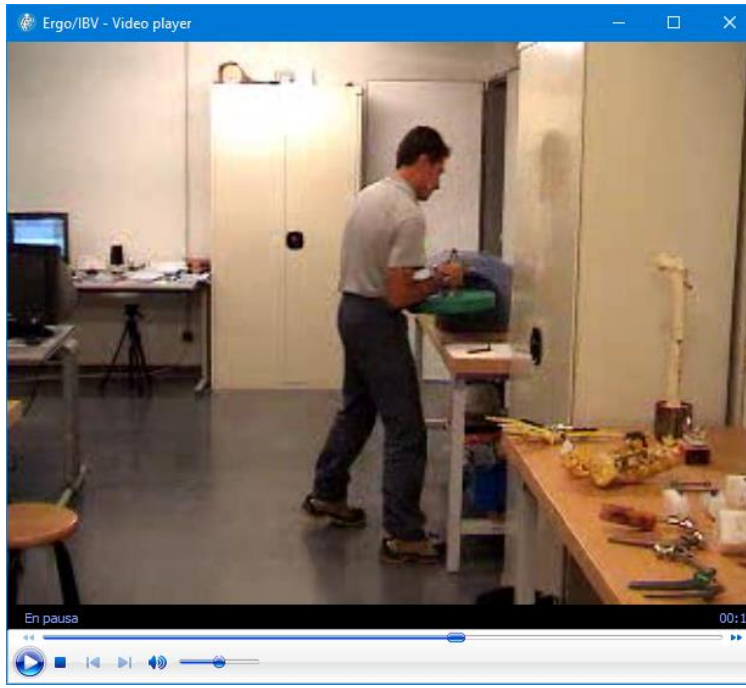


Figure 28. Video player

HOW TO USE THE REPORTS

The program generates different types of reports, according to the module applied, the contents of which will be detailed in the relevant chapters of this manual. Their common features are explained below.

Report window. The window where the reports are displayed includes the following (Figure 29):

- Button to print the report.
- Drop-down menu to select the zoom.
- Buttons to move through the pages (first, previous, next and last).

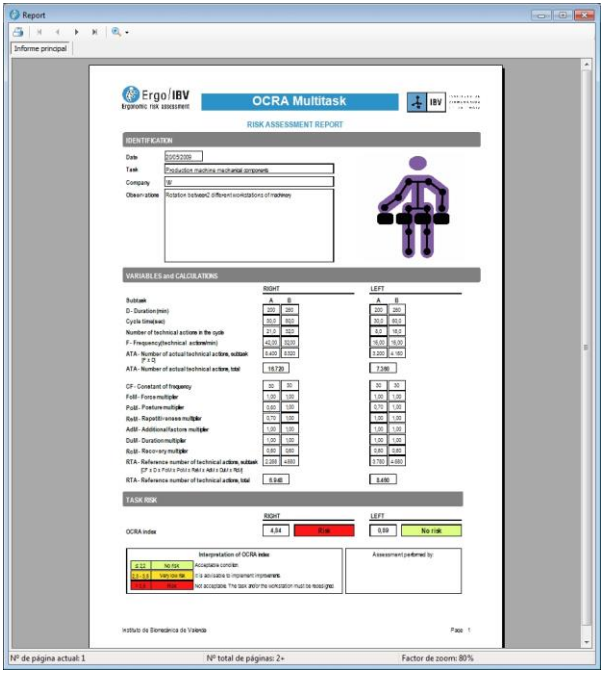


Figure 29. Report display window

Company logo. The top right corner of the pages of any report can include the logo of the company that purchased the application. This logo is loaded as follows:

- Press the button

in the *Configuration* window of the *Utilities* menu.
- Select the logo from the window opened for this purpose. The format of the selected image must be JPG.

Evaluator identification. All the *task reports* generated by the application have a space for evaluators to enter their name and signature. This box is usually located on the first page, except in certain types of report where it is located at the end.

Task image. In the header of each report, the software includes by default the image associated with the module used for the analysis, together with the identification data of the case. If a photograph was added to the task, the default image will be replaced by the photograph. It is also possible to replace the module image with a recorded image of the real task without having to add it to the task. To do this, the *Video Player* window must be open. The program will load the image that is being displayed when the **report** button is pressed and, therefore, the evaluator must find and freeze the desired image before launching the report from any task.

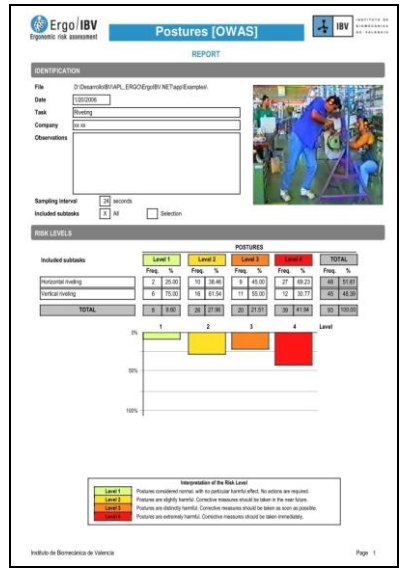
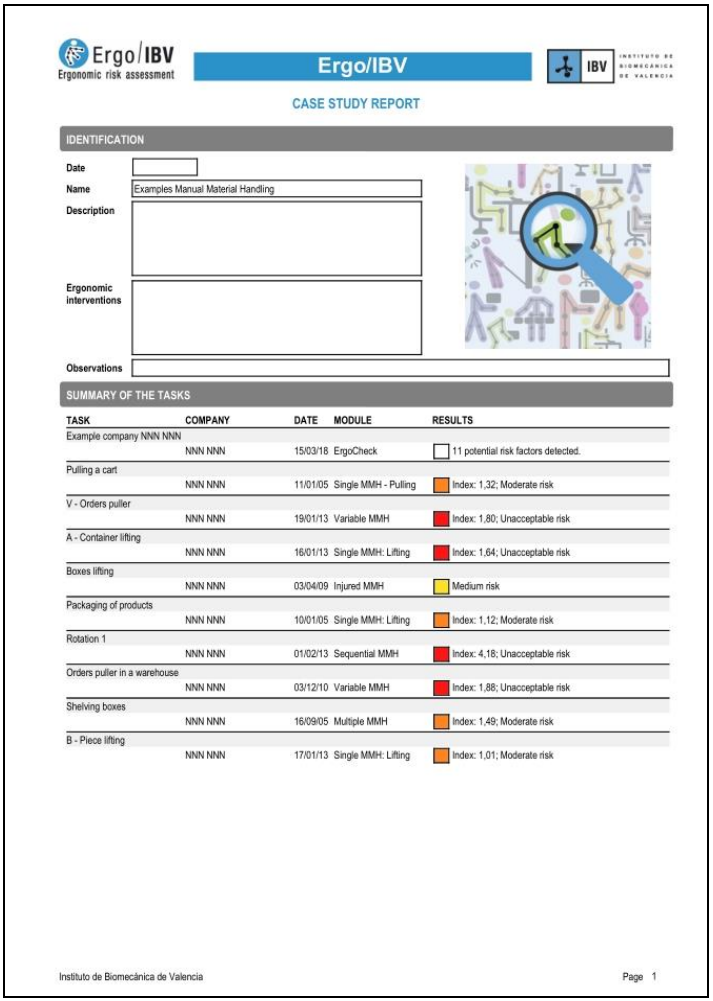


Figure 30. Report including the task image

Report of the case study. Ergo/IBV can also generate a report that includes all the tasks or workplaces that belong to the same case study.

This study also provides a list with the name of the task analyzed or the workstation designed, the company to which it belongs, completion date, module used, and a summary of the results obtained.



Ergo/IBV
Ergonomic risk assessment

Ergo/IBV

IBV INSTITUTO DE BIOMECÁNICA DE VALENCIA

CASE STUDY REPORT

IDENTIFICATION

Date

Name: Examples Manual Material Handling

Description

Ergonomic interventions

Observations

SUMMARY OF THE TASKS

TASK	COMPANY	DATE	MODULE	RESULTS
Example company NNN NNN				
	NNN NNN	15/03/18	ErgoCheck	11 potential risk factors detected.
Pulling a cart				
	NNN NNN	11/01/05	Single MMH - Pulling	Index: 1,32; Moderate risk
V - Orders puller				
	NNN NNN	19/01/13	Variable MMH	Index: 1,80; Unacceptable risk
A - Container lifting				
	NNN NNN	16/01/13	Single MMH: Lifting	Index: 1,64; Unacceptable risk
Boxes lifting				
	NNN NNN	03/04/09	Injured MMH	Medium risk
Packaging of products				
	NNN NNN	10/01/05	Single MMH: Lifting	Index: 1,12; Moderate risk
Rotation 1				
	NNN NNN	01/02/13	Sequential MMH	Index: 4,18; Unacceptable risk
Orders puller in a warehouse				
	NNN NNN	03/12/10	Variable MMH	Index: 1,88; Unacceptable risk
Shelving boxes				
	NNN NNN	16/09/05	Multiple MMH	Index: 1,49; Moderate risk
B - Piece lifting				
	NNN NNN	17/01/13	Single MMH: Lifting	Index: 1,01; Moderate risk

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Figure 31. Report of the case study. Example 1

Ergo/IBV
Ergonomic risk assessment

Ergo/IBV

IBV INSTITUTO DE BIOMECÁNICA DE VALENCIA

CASE STUDY REPORT

IDENTIFICATION

Date

Name Examples Postures, Repetitive Movements and Forces

Description

Ergonomic interventions

Observations

SUMMARY OF THE TASKS

TASK	COMPANY	DATE	MODULE	RESULTS
Other Workstations company	VV			
	VV	15/03/18	ErgoCheck	14 potential risk factors detected.
Workstations company	VV			
	VV	15/03/18	ErgoCheck	17 potential risk factors detected.
Employee engine plant automotive sector				
	VV	28/03/14	EN [FORCES]	Subtask Actuating lever: Index: 0,82; Risk unacceptable Subtask Pushing boxes: Index: 2,30; Risk unacceptable Subtask Driving machine: Index: 0,39; Risk acceptable Subtask Pushing actuator: Index: 0,56; Risk moderate
Laundry				
	VV	30/03/10	Postures[REBA]	Subtask Sorting clothes: - Posture 1: REBA: 9; Risk High - Posture 2: REBA: 3; Risk Low - Posture 3: REBA: 3; Risk Low Subtask Washing machine: - Posture 1: REBA: 5; Risk Medium - Posture 2: REBA: 7; Risk Medium Subtask Ironed: - Posture 1: REBA: 3; Risk Low - Posture 2: REBA: 5; Risk Medium - Posture 3: REBA: 10; Risk High
Field collection				
	VV	27/03/14	Repetit. Tasks	ST Neck Risk: IV MT Neck Risk: IV LT Neck Risk: IV

Figure 32. Report of the case study. Example 2

QUESTIONNAIRE MANAGER

If the evaluator wishes, the *questionnaire manager* can be used. It is an optional tool that makes it possible to collect risk assessment questionnaires through the web to automatically incorporate their data into the Ergo/IBV application. It is a useful alternative to conventional paper forms to collect and enter the data manually in the program.

At present, this tool is only enabled for the questionnaires associated with the *Ergo+50* and *Telework* modules, which must be filled out by the workers themselves, and whose specific content is explained in detail in the corresponding chapter of this manual.

The evaluator accesses the tool using the menu '*Utilities* | *questionnaire manager*', whose main purposes are:

- To create *studies* to collect the opinion of a group of workers to whom the questionnaire is sent (such group is defined by their email addresses). At the beginning of the study, each worker will receive an email with the link to the questionnaire, so that they can answer it through the web.
- To specify particular opening and closing dates for each study. It is also possible to make changes in this regard such as closing the study manually at any time, extending its closing date or bringing it forward automatically after receiving a certain percentage of questionnaires answered. The questionnaires can only be answered while the study is open.
- To perform a statistical follow-up of the answers received.
- To send a reminder message at any time to those workers who have not answered the questionnaire.
- To download the results of each study in a file in **xml** format, which will be subsequently *imported* from the risk assessment module to analyze the data.

It is important to note that the Ergo+50 module does not allow the evaluator to relate the answers received with the emails of the workers to whom the questionnaire was sent, so that the anonymity and confidentiality required to apply this module are fully guaranteed, as indicated later when describing how the module works.

INTEGRATION WITH SMART OSH

If Smart OSH software is available, Ergo/IBV can be easily configured to work in an integrated way with it. The integrated operation will allow the tasks analysed with Ergo/IBV to be stored and downloaded from Smart OSH, thus making Ergo/IBV results and reports accessible in Smart OSH.

To activate the integration with Smart OSH, access the *Configuration* window (*Utilities*|*Configure* menu). In this window, check the *Integrated with Smart OSH* box in the *Operating mode* section (Figure 33).

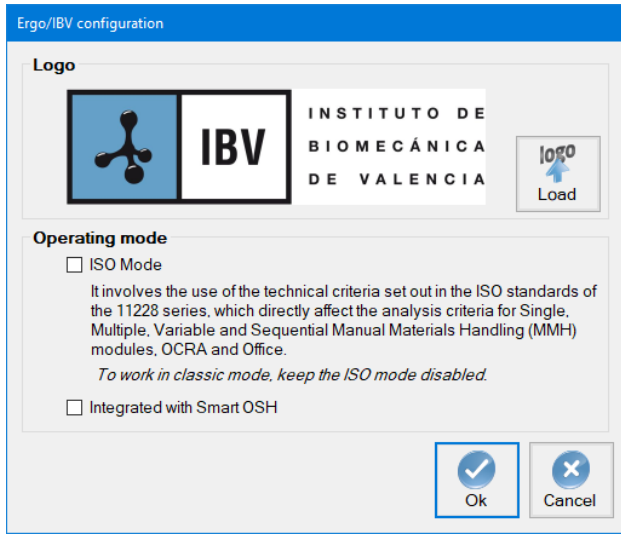

Figure 33. Activating Smart OSH integration

When the Smart OSH integration is activated, a window for entering the Smart OSH user credentials will be displayed (Figure 34). This authentication will be stored in memory for the duration of the Ergo/IBV run. Once the Smart OSH authentication has been performed, it will be possible to store and download tasks and workstations in Smart OSH.

Figure 34. Smart OSH user authentication

To download a task stored in Smart OSH, from the assessment view, click on "New Task" (or *Tasks*|*New* menu), and in the module selection window (Figure 35) click on the "Download" button located on the left side at the bottom of the screen.

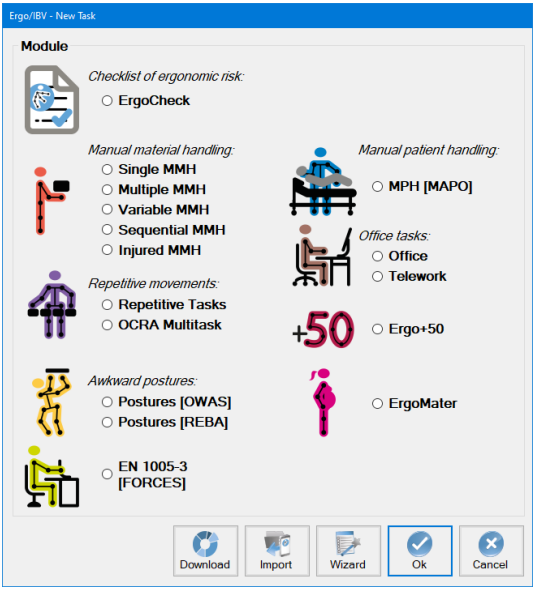

Figure 35. Smart OSH task download

Ergo/IBV will request the Smart OSH code corresponding to the ergonomic study to be downloaded (Figure 36). Once a valid code has been entered, the task will be downloaded and opened.

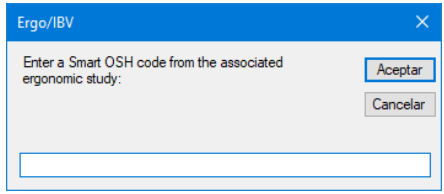

Figure 36. Entering the Smart OSH code

It can also be downloaded using the menu option *Tasks* | *Import* | *Smart OSH Tasks*. Or from the Design view with the menu option *Workstations* | *Import* | *Smart OSH Workstation.*

With the integration mode activated, and successfully authenticated in Smart OSH, when the "OK" button is clicked in the data window of any Ergo/IBV module, the corresponding task or job will be stored in Smart OSH. PDF reports and module results interpretable by the Smart OSH software will also be stored.