13. MODULE
OCRA Checklist

- Introduction
- Data
- Report
- Annex

INTRODUCTION

Scope of application. The module *OCRA Checklist* allows you to analyse repetitive tasks of the upper limbs with clearly defined work cycles. The OCRA Checklist is a simplified tool (based on the OCRA index) for measuring the risk of biomechanical overload of the upper limbs, which can be used both in the initial stage of estimating risk levels in a certain industrial setting (i.e., mapping), or later for managing the risk.

Contents.

The methodology is based on the definition of repetitive tasks, understood as those that are carried out in work cycles (regardless of their length), where the same movements and technical actions are repeated continuously.

OCRA Checklist is organized into six main groups of risk factors, for which information must be gathered during the analysis:

- Duration of repetitive tasks: total number of hours during the working day (shift) in which the worker is exposed to this type of activity.
- Recovery periods: organization of tasks during the working day and consideration of breaks or rest periods included within the work cycle.
- Frequency of movements: number of repeated technical actions performed during the task.
- Force exerted: level of muscular effort required to perform the task.
- Awkward postures and stereotyped movements: body positions or gestures that increase joint stress.
- Additional factors: conditions that aggravate the risk, such as exposure to vibrations, low temperatures, repeated impacts or high-precision work.

Each of these factors is translated into pre-assigned numerical values. By combining them using specific formulas, the OCRA Checklist Index is obtained.

The OCRA Checklist Index allows to classify risk into different levels: from green (acceptable risk) to purple (high risk). This provides a clear and objective view

of occupational exposure, facilitating the identification of jobs that require preventive intervention.

Source. This module is based on the **revised version** of the OCRA Checklist method in its **high precision calculation mode**, as specified in the following references:

- Colombini, D., Occhipinti, E., & Álvarez-Casado, E. (2013). The revised OCRA Checklist method. Editorial Factors Humans: Barcelona, Spain.
- Colombini, D., & Occhipinti, E. (2016). Risk analysis and management of repetitive actions: a guide for applying the OCRA system (occupational repetitive actions). CRC Press.

DATA

The analysis is started by selecting the module *OCRA Checklist* in the *New Task* window (Figure 1).

This opens the main window of the module (Figure 2), where the information is entered.

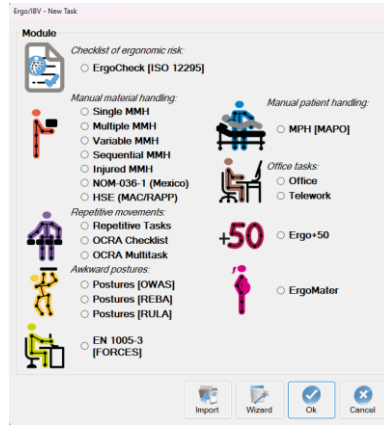

Figure 1: Access to module OCRA Checklist

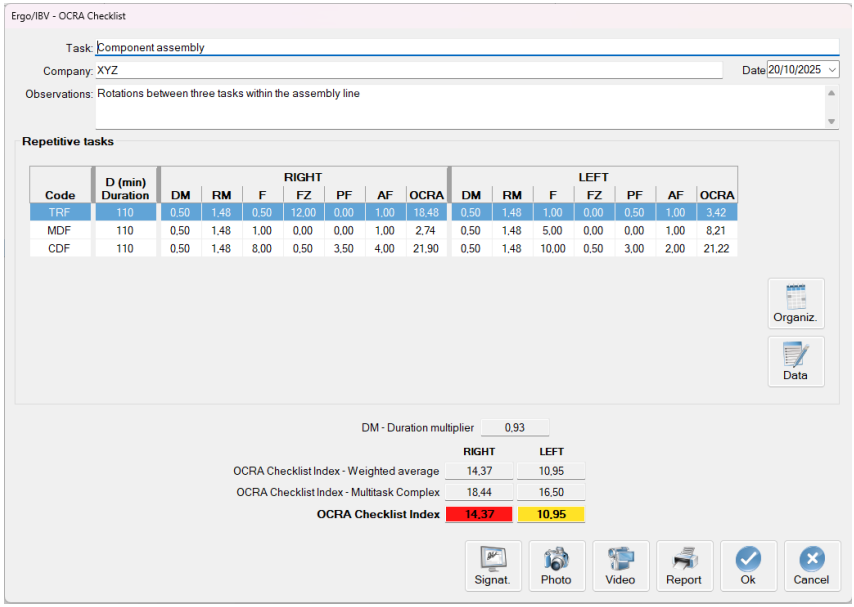

Figure 2: OCRA Checklist – Main window

Identification. The data that identify the case are registered in the header of the main window: name of the task[1] and company, date of analysis and relevant observations.

Repetitive tasks. The first step is to define the organization of the work, which may include one or more repetitive task, by pressing the *Organiz.* button and accessing the corresponding window. The repetitive tasks that have been defined will be displayed as a table at the top of the main window. The second step is to give detailed information on each repetitive task by selecting the corresponding row and pressing the *Data* button in the main window.

Note: Depending on the number of repetitive tasks, their duration, and the organization of the work, there are three modes of operation for OCRA Checklist.:

- **Monotask**: when a single repetitive task is performed during the shift. In this case, the OCRA Checklist Index formula is applied = MD x RM x (F + FZ + FP + AF), where each element corresponds to a multiplier or risk factor (duration, recovery, frequency, force, posture and additional factors).
- **Multitask**: when during the shift the worker rotates between multiple repetitive tasks. In this case, the exposure index is calculated using the Multitask Exposure Index, which considers two possibilities:
  - **Exposure index with short rotations**: task rotation takes place in a period of less than 90 consecutive minutes for each task performed. In this case, the arithmetic mean of the indexes for each task is calculated, weighted by the time spent on each one (Weighted average OCRA Checklist Index).
  - **Exposure index with long rotations**: task rotation takes place within a period of more than 90 consecutive minutes for each task performed. In this case, a formula based on the task generating the highest overload as minimum is applied (Multitask complex OCRA Checklist Index).

Based on the information entered in the *Organiz.* button (number of repetitive tasks and distribution throughout the shift), the software identifies the functioning mode and provides the corresponding final result.

The content and how to enter the information in the different windows is described below.

[1] In the context of this module, the 'Task' field is equivalent to 'Workplace' or 'Workstation'.

Organization

Pressing the *Organiz.* button in the main window opens the *Organization* window (Figure 3), which includes the following:

- **Repetitive tasks**. Identify all the repetitive tasks performed by a worker in a shift or workday. Press the *New* button to enter the name of the task (maximum 3 characters) and a brief description of it in the appropriate boxes. The 'Recovery in the cycle' box allows you to indicate whether there are periods within the cycle during which the muscle groups are completely at rest[2].

  The *Delete* button lets you eliminate the selected task and all the associated data (previously asking for confirmation). The *Copy* button allows you to create a copy of a task with all the data defined in the original task (see *Task data* in the next section). This can be very useful when there are similar tasks the data of which are complex to enter. In addition, the button *Import* allows you to reuse tasks defined in other OCRA tasks.

- **Distribution of the working hours**. Specify the exact frequency of the events during the shift (and their duration in minutes), by selecting the relevant options from the drop-down menu:

  - Task. The names of all the repetitive tasks previously defined are shown in order to select the applicable one.
  - Non-repetitive work. It includes non-repetitive work which cannot be regarded as a recovery period of the upper limbs (because it involves physical load); for example, supplying, preparing, cleaning, carrying, etc.
  - Recovery. It includes the breaks, pauses and non-repetitive work that can be regarded as recovery of the upper limbs; for example, visual control, etc[3].
  - Lunch. It is the break to have lunch (or dinner in the case of night shifts). There are two options to choose from:

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[2] 'Recovery in the cycle' refers to periods within the cycle during which the muscle groups are completely at rest (such as visual control or waiting time). To be considered significant, these periods must last at least 10 consecutive seconds within the cycle and be repeated every cycle, with a 5:1 ratio of work time to recovery time.

[3] For a period to be effectively considered a 'Recovery', it must have a duration of at least 8 minutes. If it lasts less than this, it will be considered 'non-repetitive work'.

- Lunch break included in shift. Lunch break included within the working hours (and therefore paid).[4]
- Lunch break NOT inc. in shift. This refers to rest periods or lunch breaks that are not included in the working hours (for example, in the case of split shifts).

The *New* button creates each row of events, and the *Delete* button eliminates the selected event. The *Up/Down* buttons allow you to change the position of the selected row in the list of events.

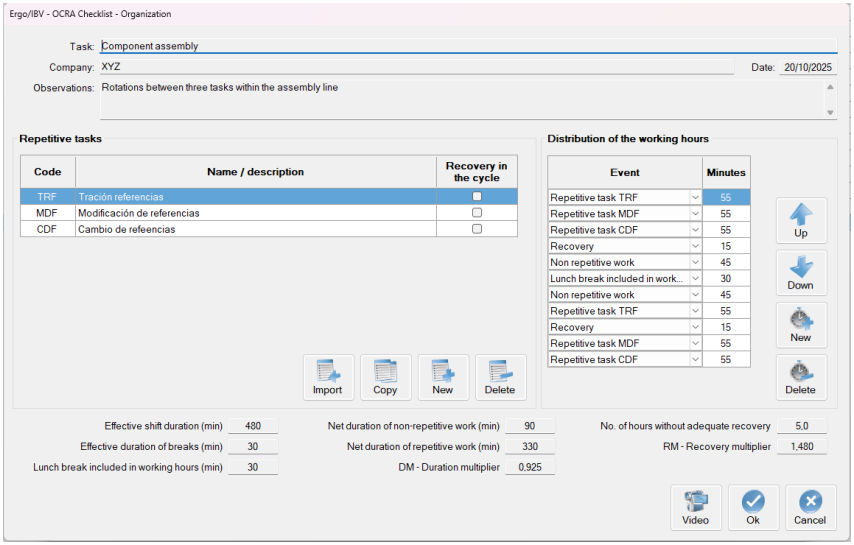


Figure 3: OCRA Checklist – Organization

From this information, the program automatically calculates and displays the following data at the bottom of this window:

[4] To be considered a lunch break, the break must last at least 30 minutes. If it lasts less than 30 minutes, it will be considered as an ordinary recovery period during the shift. This affects the calculation of hours without adequate recovery.

- **Effective shift duration (min)**. Sum of all events during the workday, except for 'Lunch not included': Repetitive task(s) + non-repetitive work + Recovery + Lunch included.
- **Effective duration of breaks (min)**. Sum of all breaks considered as recovery included in the working day[2].
- **Lunch break included in working hours (min)**. Sum of all periods of 'Lunch included'.
- **Net duration of non-repetitive work (min)**. Sum of all periods of 'non-repetitive work' performed during the working day.
- **Net duration of repetitive work (min)**. Total of all periods of repetitive tasks performed during the working day.
- **DM - Duration multiplier**. It depends on the preceding data (Net duration of repetitive work) and is obtained using a table of values.
- **No of hours without adequate recovery**. Depending on the distribution of the working day, it is determined how many hours do not have an "adequate recovery" period, considering adequate when for each hour of repetitive task there are ≥ 8 consecutive minutes of recovery or there is a 5:1 ratio between repetitive work time and recovery time. The hour before lunch, if any, and the hour before the end of the working day are not counted (both hours are considered to have adequate recovery).[5]
- **RM - Recovery multiplier**. It depends on the preceding data (number of hours without adequate recovery) and it is obtained using a table of values[6].

[5] The number of hours without adequate recovery time can be determined with a precision of 0.5 hours. To do so, the following criteria should be applied to both the work period following the lunch break and the work period at the start of the shift:

- Work periods with a duration of less than 20 minutes are counted as periods with adequate recovery time.
- Work periods with a duration of greater than or equal to 20 minutes and less than or equal to 40 minutes are counted as 0.5 hours without adequate recovery time.
- Work periods with a duration of greater than 40 minutes but less than 80 minutes are counted as 1 hour without adequate recovery time.

[6] Except in the case where 'Recovery in the cycle' has been checked for **all** the repetitive tasks, in which case it is assumed that there are 0 hours without adequate recovery = Recovery Multiplier (RM) = 1.

Task data

The *Task data* window (Figure 4) is accessed by selecting the row of the repetitive task and clicking the *Data* button in the main window (Figure 2), which is headed by the name of the task, its description and the following variables:

- **D - Duration**. Task duration (in minutes) automatically calculated from the events defined in the organization.
- **NTC – Net total cycle time (sec)**. Enter the duration (in seconds) of a work cycle that is representative of the task[7].

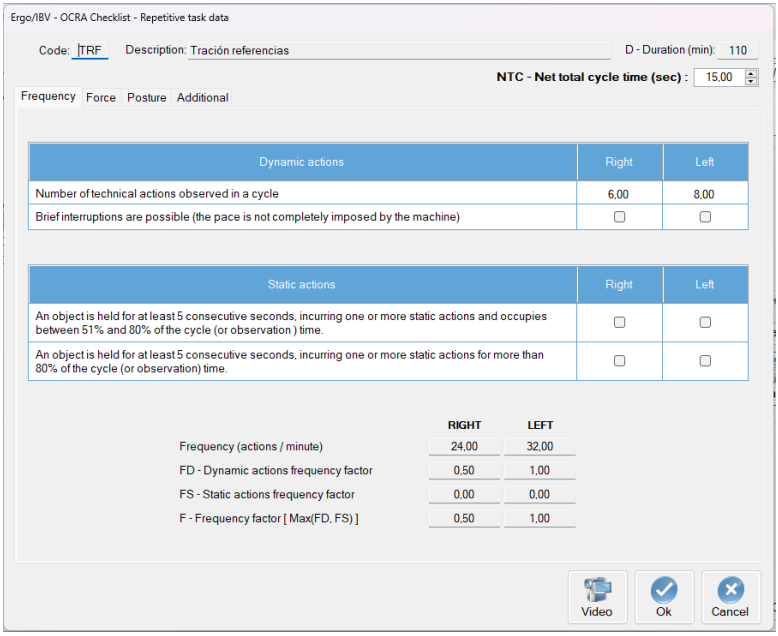


Figure 4: OCRA Checklist – Task data – Technical actions

[7]Net Total Cycle Time (NTC) is calculated by dividing the Net Duration of Repetitive Work in seconds by the number of cycles performed during the shift. Depending on the process, 'cycles' may be equivalent to the count of parts/units or the count of packages, boxes or assemblies that group several units together.
Alternatively, the NTC can be obtained by observing a representative period of work and directly entering the cycle duration in seconds.

The next step is to analyze the contents of the work cycle, identifying and counting its technical actions, and connecting them to different risk factors. This information is entered in the different tabs of this window, as detailed below.

Frequency

The technical actions performed by the worker must be identified in a **work cycle** representative of the repetitive task, taking into account the following concepts:

> *Work cycle*: sequence of the technical actions that are always repeated in the same way.
>
> *Technical actions*: elementary manual actions involving musculoskeletal activity of the upper limbs and which are necessary to complete the operations within the work cycle, such as reaching, grabbing, holding, turning, pushing, cutting, placing, etc.

The technical action may be dynamic (characterised by movement) or static (characterised by holding a single posture, such as when a worker must hold an object in his hand). Different methods are used to calculate the scores for dynamic and static technical actions. The higher value should be used for the calculation of the final score, as it will reflect the predominant requirement (dynamic or static).

Therefore, the data to be entered is as follows, distinguishing between the right and left sides:

Dynamic actions. The following data are recorded (Figure 4):

- **Number of technical actions observed in a cycle**. Count the number of actions performed in a cycle (including the number of times the same technical actions are repeated within the cycle).[8].
- **Brief interruptions are possible (the pace is not completely imposed by the machine)**. Select this option if the cycle allows for brief interruptions.

[8] It is possible to enter decimal values. For example, if a technical action is performed every 4 cycles, it would have a value of 0.25. If, in addition, 6 technical actions are performed in the cycle, the value to be entered would be 6+0.25 = 6.25.

Static actions. Indicate whether one or more of the following situations exist within the cycle (Figure 4):

- **An object is held for at least 5 consecutive seconds, incurring one or more static actions and occupies between 51% and 80% of the cycle (or observation) time**.
- **An object is held for at least 5 consecutive seconds, incurring one or more static actions for more than 80% of the cycle (or observation) time**.

Based on the previous data, the program calculates and displays the following data for each upper limb:

- **Frequency (actions / minute)**. This is the frequency of technical actions for the task (expressed as the number of technical actions per minute). It is obtained from the number of technical actions entered and the cycle time (NTC).
- **FD - Dynamic actions frequency factor –** It is calculated based on frequency (actions/minute) and the possibility of brief interruptions. It is obtained using a table of values.
- **FS - Static actions frequency factor**. It is established in accordance with the indications regarding the existence of Static Actions.
- **F - Factor Frecuencia**. The maximum value between FD and FS.

Force

Specify the force exerted with each upper limb, right and left, during the cycle.

To do this, identify the situations in which force is applied during the cycle, classify them according to three levels, and count how long they last (in seconds).

For each level, manually enter the number of seconds during the cycle that a certain force is applied (Figure 5).

The three levels considered are:

- WORK ACTIVITY REQUIRES **MODERATE** FORCE (Score 3-4 on Borg scale) FOR: Pulling or pushing levers, Pushing buttons, Closing or opening, Pressing or manipulating components, Using tools, Manipulating components to lift objects.
- WORK ACTIVITY REQUIRES **INTENSE** FORCE (Score 5-6-7 on Borg scale) FOR: Pulling or pushing levers, Pushing buttons, Closing or opening,

Pressing or manipulating components, Using tools, Manipulating components to lift objects.

- WORK ACTIVITY REQUIRES **MAXIMAL** FORCE (Score 8-9-10 on Borg scale) FOR: Pulling or pushing levers, Pushing buttons, Closing or opening, Pressing or manipulating components, Using tools, Manipulating components to lift objects.

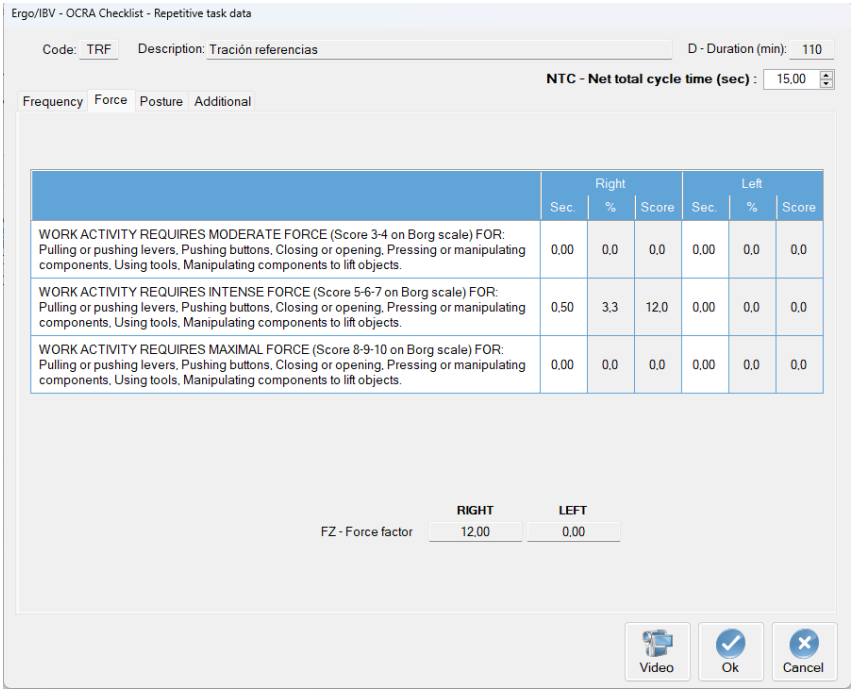


Figure 5: OCRA Checklist – Task data – Force

Based on the seconds entered for each level, the software calculates the percentage (**%**) of time during which force is being applied. A table of values is used to obtain the Force Score (**Score**) for each level.

Based on this data, the programme calculates and displays the **FZ – Force Factor** for each upper limb, which is the sum of the force scores for each level.

Posture

Specify the existence of **awkward postures and movements** of each upper limb, right and left, during the cycle must be specified (Figure 6).

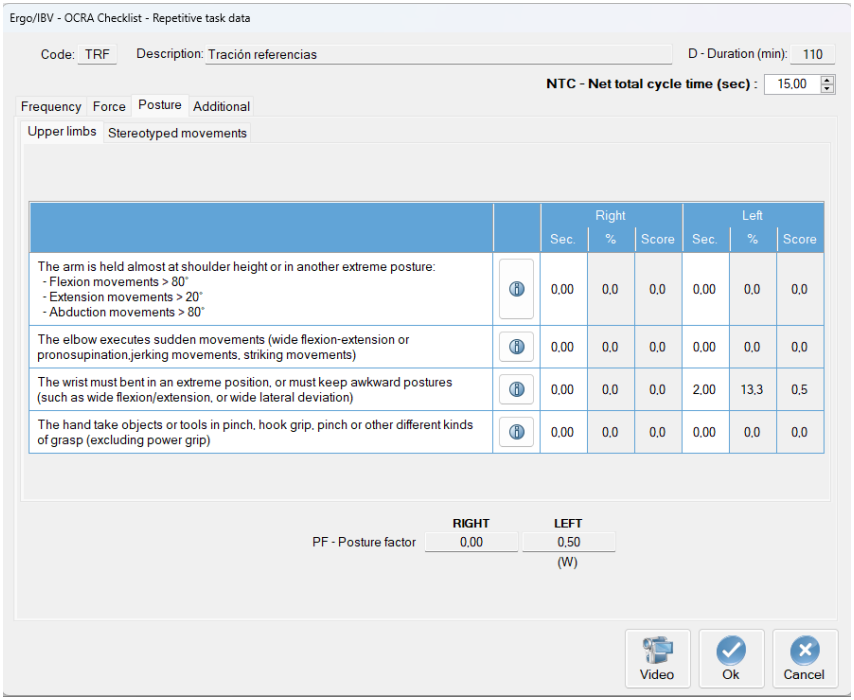


Figure 6: OCRA Checklist – Task data – Posture – Upper limbs

The data to be entered in this section, which will determine the **Posture Factor (PF)**, are divided into two sections: **Upper Limbs** and **Stereotyped Movements**.

Upper Limbs

Specify the existence of awkward postures in each upper limb, right and left, during the cycle. To do this, identify the situations in which awkward postures occur during the cycle and count how long they last (in seconds).

In each of the awkward posture situations, manually enter the number of seconds in which the indicated posture is held during the cycle (Figure 6). The options are as follows:

- The **arm** is held almost at shoulder height or in another extreme posture:
  - Flexion movements > 80°
  - Extension movements > 20°
  - Abduction movements > 80°
- The **elbow** executes sudden movements (wide flexion-extension or pronosupination, jerking movements, striking movements):
  - Flexion or extension > 60°
  - Pronation > 60°
  - Supination > 60°
- The **wrist** must bend in an extreme position, or must keep awkward postures (such as wide flexion/extension, or wide lateral deviation).
  - Flexion or extension > 45°
  - Radial deviation > 15°
  - Ulnar deviation > 20°
- The **hand** takes objects or tools in pinch, hook grip, pinch or other different kinds of grasp (excluding power grip).

By pressing the button  for each option, it is possible to obtain information and a diagram that helps to identifying situations involving awkward postures (Figure 7).

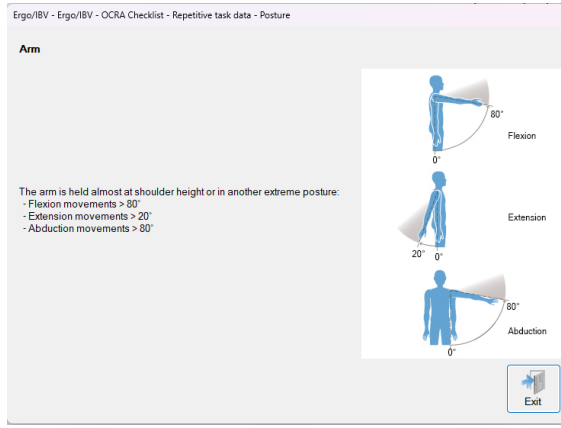


Figure 7: OCRA Checklist – Task data – Posture – Guide for assessing the arm

Based on the seconds entered for each situation, the software calculates the percentage (**%**) of time during which awkward postures are being performed during the cycle. A table of values is used to obtain the **Force Score** (**Score**) for each situation (Figure 6).

Stereotyped movements

Detect whether there is stereotypical movements or static postures and whether the same type of work gestures are performed (regardless of whether they are awkward or not). Indicate whether one or more of the following situations exist within the cycle (Figure 8):

- Presence of identical shoulder and/or elbow and/or wrist and/or hand movements, repeated for more than half the time (or the cycle time is between 8 and 15 seconds in which technical actions, even different ones, of the upper limbs prevail).
- Presence of identical shoulder and/or elbow, and/or wrist, and/or hand movements, repeated almost all the time (or the cycle time is less than 8 seconds in which technical actions, even different ones, of the upper limbs prevail).

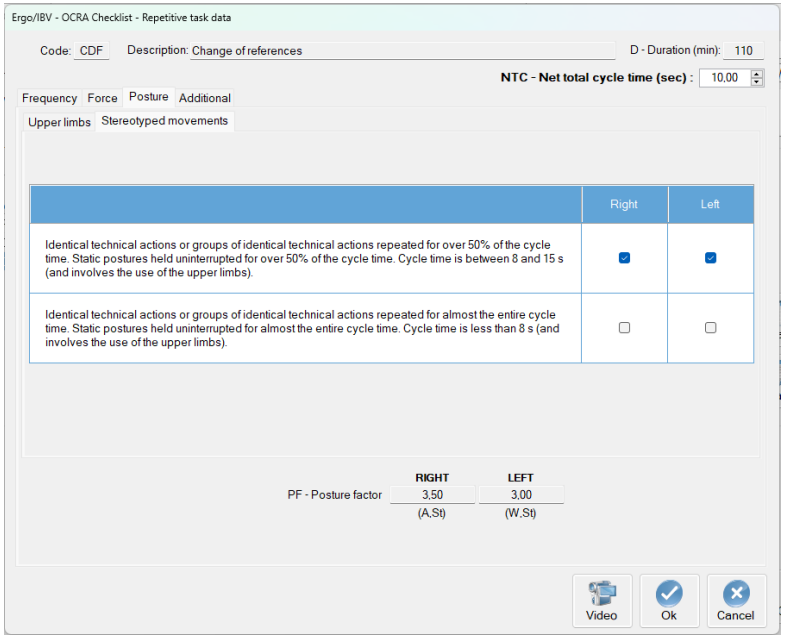


Figure 8: OCRA Checklist – Task data – Posture – Stereotyped movements

From this data, the software calculates and displays below for each upper limb the **PF – Posture Factor** (Figures 6 and 8), which is obtained by adding the maximum value of the Upper Limb scores to the Stereotyped Movements score. To facilitate redesign, the acronyms of the factors responsible for this value are identified in parentheses (**A**: arm, **E**: elbow, **W**: wrist, **H**: hand, and **St**: Stereotyped Movements).

Additional factors

Finally, specify for each upper limb (both right and left) if certain **additional factors** are present during the task by checking the applicable box (Figure 9); this refers to other risk factors for which there is evidence of causal relationship or worsening of work-related musculoskeletal disorders in the upper limbs.

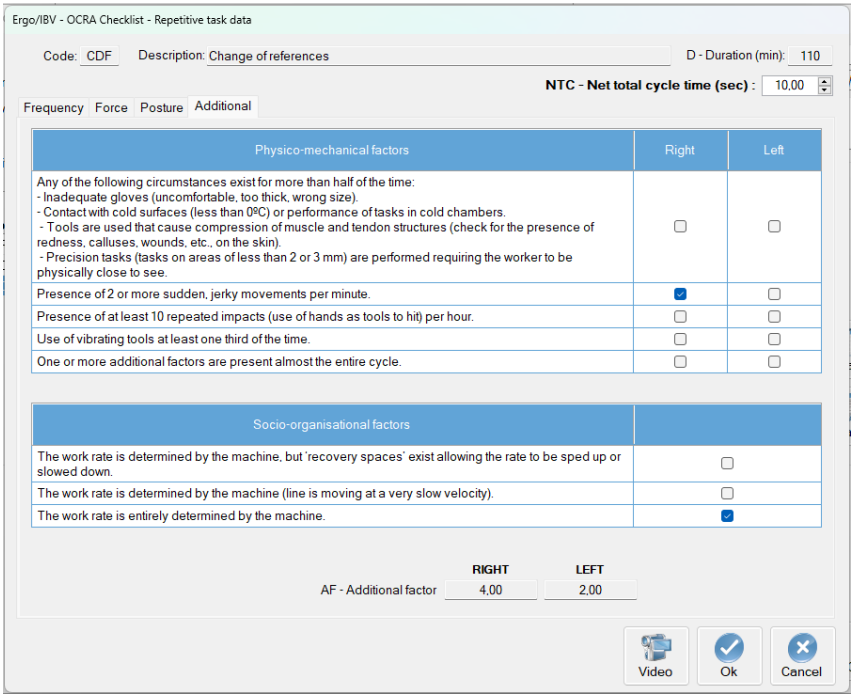


Figure 9: OCRA Checklist – Task data – Additional

Additional factors are divided into two groups:

Physico-mechanical factors

Indicate for each upper limb (right and left) whether one or more of the following situations are present during the cycle:

- Any of the following circumstances exist for more than half of the time:
    - Inadequate gloves (uncomfortable, too thick, wrong size)
    - Contact with cold surfaces (less than 0ºC) or performance of tasks in cold chambers
    - Tools are used that cause compression of muscle and tendon structures (check for the presence of redness, calluses, wounds, etc., on the skin).
- Precision tasks (tasks on areas of less than 2 or 3 mm) are performed requiring the worker to be physically close to see.
- Presence of 2 or more sudden, jerky movements per minute.
- Presence of at least 10 repeated impacts (use of hands as tools to hit) per hour.
- Use of vibrating tools at least one third of the time.
- One or more additional factors are present almost the entire cycle.

Socio-organisational factors

Indicate, in general terms, whether any of the following situations apply (it is possible to select more than one, but only the worst one will be considered):

- The work rate is determined by the machine, but 'recovery spaces' exist allowing the rate to be sped up or slowed down.
- The work rate is determined by the machine (line is moving at a very slow velocity).
- The work rate is entirely determined by the machine.

From these data, the **AF – Additional Factor** is automatically calculated and displayed below for each side. This is obtained by adding the maximum score for each of the two groups.

OCRA Checklist index calculation

From the previous information, the following data are shown in the main window (Figure 2) for each upper limb, both right and left:

- **Table with data and factors for each task**. The following data is shown for each repetitive task analyzed (distinguishing between right and left sides):
    - **Code** - Task identification code.
    - **D (min)** – Duration of the task in minutes during the working day.
    - **DM** – Duration Multiplier, calculated using the actual duration of the task.
    - **RM** – Recovery Multiplier, calculated according to the organization of the working day, therefore it is the same for all tasks analyzed.
    - **F** – Frequency Factor of the task.
    - **FZ** – Force Factor of the task.
    - **PF** – Posture Factor of the task.
    - **AF** – Additional Factor of the task.
    - **OCRA** – OCRA Checklist Index for the task, calculated using the total DM.

- **DM – Duration Multiplier** – Value of the total duration multiplier (considering the cumulative duration of all repetitive tasks during the working day).

- **OCRA Checklist Index**. The following options are available:
    - OCRA Checklist Index – Weighted average. Index calculated for short rotations (<90 minutes). Only appears in multitask analysis situations. Informative value.
    - OCRA Checklist Index – Multitask complex. Index calculated for long rotations (<90 minutes). Only appears in multitask analysis situations. Informative value.
    - **OCRA Checklist Index.**
        - In the case of multitask analysis, this value will correspond to the Average or Complex Index value,

depending on the rotation pattern specified in the Workday Distribution.

- In the case of monotask analysis, the index will correspond to the direct application of the following formula:

OCRA Checklist Index = MD x RM x (F + FZ + FP + AF)

Where:

- DM - Duration Multiplier
- RM - Recovery Multiplier
- F - Frequency Factor of the task.
- FZ - Force Factor of the task.
- PF - Posture Factor of the task.
- AF - Additional Factor of the task.

For all cases, the interpretation of the Index is as follows (Figure 10):

< 7,60	Acceptable risk
7,60 - 11,00	Very low risk
11,01 - 14,00	Medium-low risk
14,01 - 22,50	Medium risk
>22,50	High risk

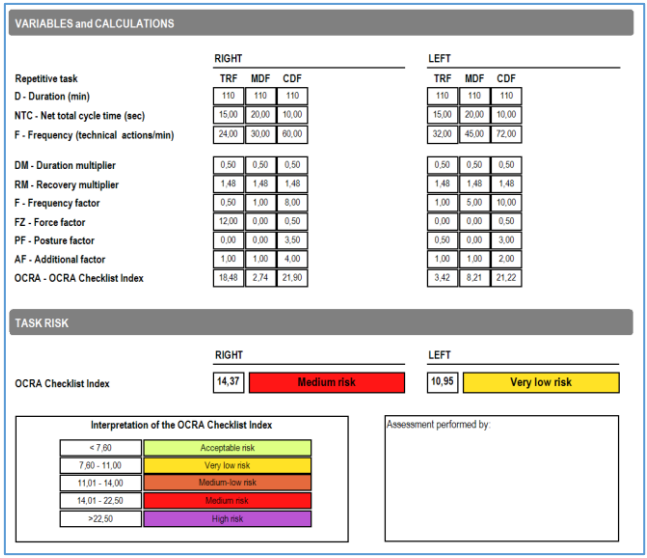
Figure 10: Color code and risk level depending on the OCRA Checklist Index

The Annex to this manual provides details of the calculations used to obtain the OCRA Checklist Index for the different situations.

REPORT

Pressing the *Report* button in the main window of this module (Figure 2) opens a document that includes the following sections:

- **Identification**. It includes the general data that identify the case (date, task, company, observations) and an image of the task (if a photograph was added).
- **Variables and calculations** (Figure 11). It summarizes in tabular form the most relevant data of the assessment of each upper limb. The information about each task is sorted by columns.
- **Task risk** (Figure 11). It offers the OCRA Checklist index for each side with the corresponding colour code and its interpretation.
- **Organization** (Figure 12). It shows the details of the organization of the work, including the definition of repetitive tasks, distribution of the working hours, and data related to the duration and recovery multipliers.
- **Task data**. Finally, for each task analyzed all the data recorded are detailed (Figures 13 and 14):
    - General data: Code, Name, Duration, NTC, Recovery available.
    - Frequency: Data for calculating the Frequency Factor.
    - Strength: Data for calculating the Force Factor.
    - Posture: Data for calculating the Posture Factor.
    - Additional Factor: Data for calculating the Additional Factor.



VARIABLES and CALCULATIONS

	RIGHT			LEFT		
Repetitive task	TRF	MDF	CDF	TRF	MDF	CDF
D - Duration (min)	110	110	110	110	110	110
NTC - Net total cycle time (sec)	15,00	20,00	10,00	15,00	20,00	10,00
F - Frequency (technical actions/min)	24,00	30,00	60,00	32,00	45,00	72,00
DM - Duration multiplier	0,50	0,50	0,50	0,50	0,50	0,50
RM - Recovery multiplier	1,48	1,48	1,48	1,48	1,48	1,48
F - Frequency factor	0,50	1,00	8,00	1,00	5,00	10,00
FZ - Force factor	12,00	0,00	0,50	0,00	0,00	0,50
PF - Posture factor	0,00	0,00	3,50	0,50	0,00	3,00
AF - Additional factor	1,00	1,00	4,00	1,00	1,00	2,00
OCRA - OCRA Checklist Index	18,48	2,74	21,90	3,42	8,21	21,22

TASK RISK

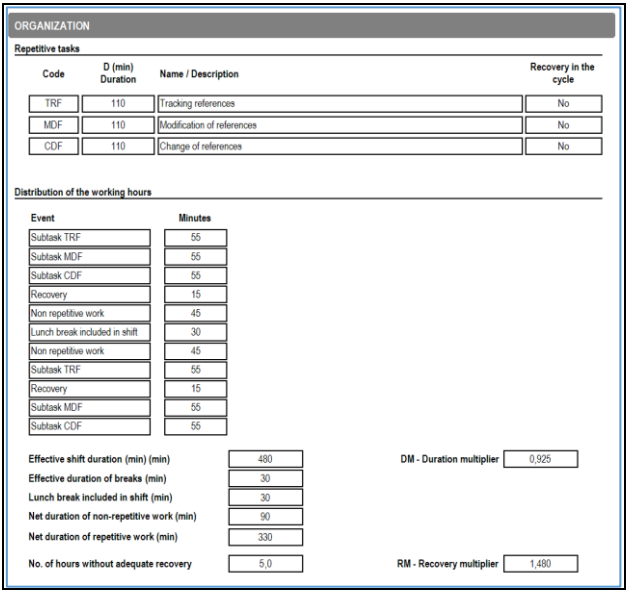
	RIGHT		LEFT	
OCRA Checklist Index	14,37	Medium risk	10,95	Very low risk

Interpretation of the OCRA Checklist Index

< 7,80	Acceptable risk
7,80 - 11,00	Very low risk
11,01 - 14,00	Medium-low risk
14,01 - 22,50	Medium risk
>22,50	High risk

Assessment performed by:

Figure 11: OCRA Checklist – Report (variables, calculations and risk)



ORGANIZATION

Repetitive tasks

Code	D (min) Duration	Name / Description	Recovery in the cycle
TRF	110	Tracking references	No
MDF	110	Modification of references	No
CDF	110	Change of references	No

Distribution of the working hours

Event	Minutes
Subtask TRF	55
Subtask MDF	55
Subtask CDF	55
Recovery	15
Non repetitive work	45
Lunch break included in shift	30
Non repetitive work	45
Subtask TRF	55
Recovery	15
Subtask MDF	55
Subtask CDF	55

Effective shift duration (min) (min)	480	DM - Duration multiplier	0,925
Effective duration of breaks (min)	30		
Lunch break included in shift (min)	30		
Net duration of non-repetitive work (min)	90		
Net duration of repetitive work (min)	330		
No. of hours without adequate recovery	5,0	RM - Recovery multiplier	1,480

Figure 12: OCRA Checklist – Report (organization)

TASK DATA

Code	TRF	**Name / Description**	Tracking references
D - Duration (min)	110		
NTC - Net total cycle time (sec)	15,00	**Recovery in the cycle**	No

Frequency

Dynamic actions	RIGHT	LEFT
Number of technical actions observed in a cycle	6,00	8,00
Brief interruptions are posible (it is posible to modulate the pace)		
Static actions		
An object is held for at least 5 consecutive seconds, incurring one or more static actions and occupies between 51% and 80% of the cycle (or observation) time.		
An object is held for at least 5 consecutive seconds, incurring one or more static actions for more than 80% of the cycle (or observation) time.		
FD - Dynamic actions frequency factor	0,50	1,00
FS - Static actions frequency factor	0,00	0,00
FREQUENCY FACTOR (F)	**0,50**	**1,00**

Force

	RIGHT			LEFT		
	Seconds	%	Score	Seconds	%	Score
Moderate Force	0,00	0,0	0,0	0,00	0,0	0,0
Intense Force	0,50	3,3	12,0	0,00	0,0	0,0
Maximal Force	0,00	0,0	0,0	0,00	0,0	0,0
FORCE FACTOR (FZ)			12,00			0,00

Posture

	RIGHT			LEFT		
	Seconds	%	Score	Seconds	%	Score
Arm	0,00	0,0	0,0	0,00	0,0	0,0
Elbow	0,00	0,0	0,0	0,00	0,0	0,0
Wrist	0,00	0,0	0,0	2,00	13,3	0,5
Hand	0,00	0,0	0,0	0,00	0,0	0,0
Stereotyped movements for more than half of the time						
Stereotyped movements almost all the time						
PF - POSTURE FACTOR			0,00			0,50
						(W)

Figure 13: OCRA Checklist – Report (task data)

Additional factors

Physico-mechanical factors	RIGHT	LEFT
Any of the following circumstances exist for more than half of the time: inadequate gloves, contact with cold surfaces, tools that cause compression, precision tasks.		
Presence of 2 or more sudden, jerky movements per minute.		
Presence of at least 10 repeated impacts (use of hands as tools to hit) per hour.		
Use of vibrating tools at least one third of the time.		
One or more additional factors are present almost the entire cycle.		
Socio-organisational factors		
The work rate is determined by the machine, but 'recovery spaces' exist allowing the rate to be sped up or slowed down.	X	
The work rate is determined by the machine (line is moving at a very slow velocity).		
The work rate is entirely determined by the machine.		
ADDITIONAL FACTOR (AF)	1,00	1,00

Figure 14: OCRA Checklist – Report (task data, cont.)

ANNEX – CALCULATIONS FOR OBTAINING THE OCRA CHECKLIST INDEX

Monotask

When a single repetitive task is performed during the shift. In this case, the OCRA Checklist Index formula is applied:

OCRA Checklist Index = MD x RM x (F + FZ + FP + AF)

Where:

- DM - Duration Multiplier
- RM - Recovery Multiplier
- F - Frequency Factor of the task.
- FZ - Force Factor of the task.
- PF - Posture Factor of the task.
- AF - Additional Factor of the task.

Multitask

When during the shift the worker rotates between multiple repetitive tasks. In this case, the exposure index is calculated using the Multitask Exposure Index, which considers two possibilities:

Exposure index with short rotations: **Weighted average OCRA Checklist Index**

When task rotation takes place in a period of less than 90 consecutive minutes for each task performed. In this case, the arithmetic mean of the indexes for each task is calculated, weighted by the time spent on each oneC.

Weighted average OCRA Checklist Index = (PuntA * %PA) + (PuntB * %PB) + …

Where:

- Punt A: The value of the real exposure index[9] for task A.
- %PA: Percentage of the duration of the shift spent performing task A.
- Punt B: The value of the real exposure index for task B.
- %PB: Percentage of the duration of the shift spent performing task B.

Exposure index with long rotations: **Multitask complex OCRA Checklist Index**

When task rotation takes place within a period of more than 90 consecutive minutes for each task performed. In this case, a formula based on the task generating the highest overload as minimum is applied (Multitask complex OCRA Checklist Index).

To calculate the Multitask Complex OCRA Checklist Index, the following calculation model is proposed:

- Step 1: Calculate the real exposure index (REI) for each of the tasks, considering the value of the duration multiplier equivalent to the total duration of the task (total exposure time) within the work shift. The recovery multiplier factor is the same for all tasks.
- Step 2: Order the tasks from highest to lowest REI value. The task with the highest REI value will be called Task 1, its REI OCRA1 and its duration Dum1.
- Step 3: Apply the following formula to calculate the Index:

$$\text{Multitask Complex OCRA Checklist Index} = OCRA_{1(Dum1)} + (\Delta ocra_1 \times K)$$

Where:

- $OCRA1_{(Dum1)}$: The highest calculated REI value considering the total duration of the task within the shift.
- $\Delta OCRA1$: The highest calculated REI value considering the total duration of the repetitive work within the shift (sum of the duration of each of the tasks) less $OCRA1_{(Dum1)}$.

[9] The Real Exposure Index for each task is calculated by applying the OCRA Checklist Index formula, using the DM value for the entire working day.

- $\Delta ocra1 = OCRA1_{(Dum1)} - OCRA1_{(Dumj)}$

- K

$$K = \frac{\sum_{i=1}^{i=N} OCRA_{imax} \times FT_i}{OCRA_{1max}}$$

  - i,…N: Repetitive work tasks
  - $OCRA_{imax}$: The REI of task i calculated taking into consideration the total duration of the repetitive work within the shift.
  - FTi: Fraction of the duration of task i (value between 0 and 1) with regard to the total duration of the repetitive work.
  - $OCRA_{1max}$: Fraction of the duration of task i (value between 0 and 1) with regard to the total duration of the repetitive work.