

17. MODULE

Postures [RULA]

- Introduction
- Data
- Report
- Redesign



INTRODUCTION

Scope of application. The module titled Postures [RULA] allows you to assess the ergonomic risk of working postures, with special emphasis on the upper limb, but considering information on the level of load on different parts of the body.

Contents. The postures to be analyzed for each subtask performed by the worker are selected; generally, the most frequent and/or most arduous working postures are initially chosen. Each analyzed posture requires encoding the position of the different body segments of *group A* (arms, forearms and wrists) and *group B* (trunk, neck and legs), as well as the force/load and muscle activity engaged in that posture. This allows you to obtain a final *RULA score* of a particular posture, which implies a certain *action level* in order to reduce the risk.

Source. The module is based on the RULA (*Rapid Upper Limb Assessment*) method of postural analysis, developed in 1993 by McAtamney and Corlett of the Institute for Occupational Ergonomics (University of Nottingham), with the aim of assessing the exposure of workers to risk factors that cause a high postural load and can lead to upper limb disorders.

DATA

The analysis is started by selecting the *Postures [RULA]* module in the *New task* window (Figure 1).

This opens the main window of the module (Figure 2), which shows the following:

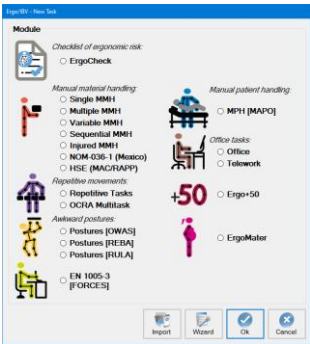


Figure 1: Access to the Postures [RULA] module

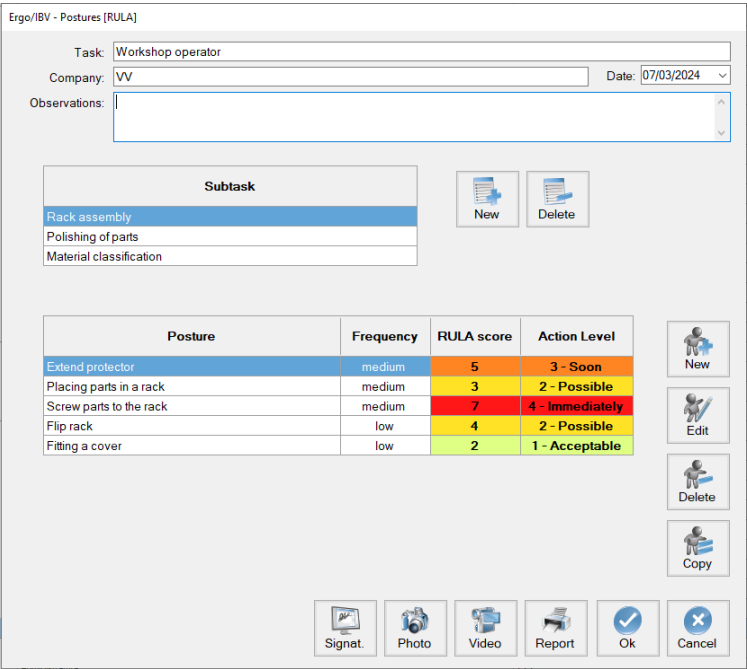


Figure 2: Postures [RULA] – Main window

- **Identification.** The name of the task and company, analysis date and the observations of the evaluator are recorded.
- **Subtasks.** Each subtask is defined, the postures of which are to be analyzed. The name of each subtask is introduced by pressing the *New* button. The *Delete* button allows you to delete the subtask selected from the list and all the associated postures (asking for confirmation first). The name of a subtask can be changed by directly writing in the corresponding cell.
- **Postures.** The table below summarizes the information about the postures included in the subtask that has been previously selected.

Postures are managed with the buttons on the right side, the functions of which are as follows:

- *New*: it accesses the *Posture data* window to create a new posture in the selected subtask.
- *Edit*: it accesses the *Posture data* window to edit the information of the selected posture.
- *Delete*: it deletes the selected posture (asking for confirmation first).
- *Copy*: it copies the selected posture and all the associated data (it may be useful when similar postures that differ in very few data are recorded or when the risk of the posture is reduced by redesigning, as shown later). By pressing this button, the copied posture is added and the same name as the original is assigned by default (indicating that it is a copy). Then you must select this copy, edit the relevant changes and save them by pressing the *OK* button.

How to introduce the information associated with each posture is described below.

Posture data

The *Posture data* window is automatically headed by the name of the *subtask*, which includes the posture. The header of this window also records the following (Figure 3):

- **Posture.** A name must be assigned to the posture.
- **Frequency.** The frequency of the posture during the workday must be identified: *low* (occasionally), *medium* (often, but it is not the usual posture) or *high* (normal working posture). This is a purely subjective estimate of the evaluator which can be useful when prioritizing the actions required to reduce the risk of the posture.
- **Observations (posture).** The clarifications on the posture that are considered to be important should be specified.
- **Video reference.** If the task was recorded, the location of the posture in the video should be identified.

Ergo/IBV - Postures [RULA] - Posture data

Subtask: Rack assembly Posture: Extend protector Frequency: ☐ low ☒ moderate ☐ high

Observations: (posture) Video reference: 10:15:00

A - Arms, Forearms, Wrists B - Trunk, Neck, Legs Results

ARM RIGHT LEFT

Extension > 20° Ext 20°-Flex 20° Flexion 20-45° Flexion 45-90° Flexion > 90°

☐ Arm abduction ☐ Shoulder raised ☐ Arm weight is supported

FOREARM **WRIST** **WRIST TWIST**

Flexion < 60° Flexion 60-100° Flexion > 100° Neutral pos. 0° Flex/Ext 0-15° Flex/Ext > 15° Mid-range of twist Near end of range of twist

☐ Crosses midline of body ☐ Lateral deviation

MUSCLE USE **FORCE / LOAD**

☐ Posture is mainly static (held for longer than 1 minute)
☒ Repetitive action (repeated > 4 times a minute)

☐ None ☐ Occasional < 2 kg ☒ Occasional 2-10 kg
☐ Static or repetitive 2-10 kg ☐ Occasional > 10 kg
☐ Static or repetitive > 10 kg ☐ Explosive

Video Ok Cancel

Figure 3: Postures [RULA] – Posture data (group A – arms, forearms, wrists)

The posture encoding is done in different tabs of this window, as explained below.

A – Arms, Forearms, Wrists (Figure 4). The position of the body segments of group A is encoded with the help of diagrams. You can analyze the **right** side, the **left** side, or both, by entering the data in the corresponding tab(s); (if both sides are analyzed, the program will only use the most arduous one to calculate the final risk).

- **Arm.** Select one of the buttons to specify the arm position:
 - Extension > 20°
 - Extension 20° to flexion 20°
 - Flexion 20-45°
 - Flexion 45-90°
 - Flexion > 90°

Check the applicable box(es) if there is also:

- Arm abduction (lateral movement away from the body)
- Shoulder raised
- Arm supported (It includes the arm supported on a surface)

- **Forearm.** Select one of the buttons to specify the forearm position:
 - Flexion < 60°
 - Flexion 60-100°
 - Flexion > 100°

Check the applicable box if there is also:

- Forearm separation (which includes if the lower arm is working across the midline of the body or out to the side)

- **Wrist.** Select one of the buttons to specify the wrist position:
 - Neutral position
 - Flexion/Extension 0-15°
 - Flexion/Extension > 15°

Check the applicable box(es) if there is also:

- Lateral deviation (which includes radial or ulnar deviation)

- **Wrist twist.** Select one of the buttons to specify the wrist twist position:
 - Wrist is in mid-range of twist
 - Wrist is at or near the end of range of twist

For the coded posture of Group A, Muscle Use and Force/Load of the upper limb should also be indicated:

- **Muscle use.** Assess the muscle activity of the Upper Limbs, specifying whether the following conditions occur (none, one or both):
 - **Static posture.** Mark only if the position of any segment of the upper limb is maintained without movement for >1 minute.
 - **Repetitive action.** Mark only if the movement of any upper limb segment is repeated >4 times per minute.
- **Force / Load.** In the analysed posture, assess the force or load of the Upper Limbs, by choosing only one of the options:
 - **None** (no resistance).
 - **Occasional <2 kg.** The load or force is 2 kg or less and held intermittently
 - **Occasional 2-10 kg.** The load or force is 2-10 kg and held intermittently.
 - **Static or repetitive 2-10 kg.** Tasks that require maintaining a force or load between 2 and 10 kg for more than 1 minute (static) or that are repeated more than 4 times per minute.
 - **Occasional >10 kg.** The load or force is more than 10 kg and held intermittently
 - **Static or repetitive >10 kg.** Tasks that require maintaining a force or load greater than 10 kg for more than 1 minute (static) or that are repeated more than 4 times per minute.
 - **Explosive.** Load or force of any magnitude experienced with rapid build-up or a jolting action.

Ergo/IBV - Postures [RULA] - Posture data

Subtask: Rack assembly Posture: Extend protector Frequency: ☐ low ☒ moderate ☐ high

Observations: (posture) Video reference: 10:15:00

A - Arms, Forearms, Wrists B - Trunk, Neck, Legs Results

NECK

Extension Flexion 0-10° Flexion 10-20° Flexion > 20°

☐ Rotation ☐ Lateral tilt

TRUNK

Sitting, hip-trunk angle > 90° Flex. up to 20° Flexion 20-60° Flexion > 60°

☐ Rotation ☐ Lateral tilt

LEGS

Seated, legs feet well supported

Standing, weight evenly distributed

Standing, weight unevenly distrib.

MUSCLE USE

☐ Posture is mainly static (held for longer than 1 minute)

☐ Repetitive action (repeated > 4 times a minute)

FORCE / LOAD

☒ None ☐ Occasional < 2 kg ☐ Occasional 2-10 kg

☐ Static or repetitive 2-10 kg ☐ Occasional > 10 kg

☐ Static or repetitive > 10 kg ☐ Explosive

Video Ok Cancel

Figure 4: Postures [RULA] – Posture data (group B – Neck, Trunk, Legs)

A – Trunk, Neck, Legs (Figure 4). The position of the body segments of group B is registered with the help of diagrams.

- **Neck.** Select one of the buttons to specify the neck position:
 - Extension
 - Flexion 0-10°
 - Flexion 10°-20°
 - Flexion > 20°

Check the applicable box(es) if there is also:

- **Rotation** (which includes to the right or to the left)
- **Lateral tilt** (which includes to the right or to the left)
- **Trunk.** Select one of the buttons in order to specify the trunk position:

- Sitting and well supported with a hip-trunk angle of 90° or more
- Flexion 0° - 20°
- Flexion 20-60°
- Flexion > 60°

Check the applicable box(es) if there is also:

- **Rotation** (which includes to the right or to the left)
- **Lateral tilt** (which includes to the right or to the left)

- **Legs.** Select one of the buttons to specify the legs position:
 - **Sitting**, legs and feet well supported.
 - **Standing**, weight evenly distributed.
 - **Unilateral support or unstable posture** (includes standing with one unsupported or slightly supported leg).

For the coded posture of Group B, Muscle Use and Force/Load of the neck, trunk and legs areas should also be indicated:

- **Muscle use.** Assess the muscle activity of the neck, trunk and legs areas, specifying whether the following conditions occur (none, one or both):
 - **Static posture.** Mark only if the position of any segment of the neck, trunk or legs areas is maintained without movement for >1 minute.
 - **Repetitive action.** Mark only if the movement of the neck, trunk or legs areas is repeated >4 times per minute.
- **Force / Load.** In the analysed posture, assess the force or load of the neck, trunk and legs areas, by choosing only one of the options:
 - **None** (no resistance).
 - **Occasional <2 kg.** The load or force is 2 kg or less and held intermittently
 - **Occasional 2-10 kg.** The load or force is 2-10 kg and held intermittently.
 - **Static or repetitive 2-10 kg.** Tasks that require maintaining a force or load between 2 and 10 kg for more than 1 minute (static) or that are repeated more than 4 times per minute.
 - **Occasional >10 kg.** The load or force is more than 10 kg and held intermittently

- **Static or repetitive >10 kg.** Tasks that require maintaining a force or load greater than 10 kg for more than 1 minute (static) or that are repeated more than 4 times per minute.
- **Explosive.** Load or force of any magnitude experienced with rapid build-up or a jolting action.

Results (Figure 5). Once the posture is encoded, the last tab shows the assessment results. To do this, the program assigns a series of intermediate scores to the encoding items and finally obtains the **RULA score** that represents the action level of the posture.

Ergo/IBV - Postures [RULA] - Posture data

Subtask: Rack assembly Posture: Extend protector Frequency: ☐ low ☒ moderate ☐ high

Observations: (posture) Video reference: 10:15:00

A - Arms, Forearms, Wrists B - Trunk, Neck, Legs **Results**

Group A

ARM

6 2 6 2

FOREARM

3 2 3 2

WRIST

4 2 4 2

WRIST TWIST

2 1 2 1

Right Left

Table A

5 3

FORCE / LOAD

3 1

MUSCLE USE

1 1

=

Score C

13 5

Group B

NECK

6 2

TRUNK

6 3

LEGS

2 1

Table B

9 4

FORCE / LOAD

3 0

MUSCLE USE

1 0

=

Score D

13 4

RULA score

7 5

Action Level

3 - Soon

Action Level Interpretation

Investigation and changes are required soon

Video Ok Cancel

Figure 5: Postures [RULA] – Results

The procedure that is applied is explained below:

- The individual scores for each segment of group A and group B are obtained using several tables of values.
- Then the combined score of group A, using Table A (if both sides were assessed, the most difficult one is used while the other side is displayed dimmed in the corresponding cells), and the combined score of group B using Table B are obtained.
- The *Muscle use* and *force/load* score is added to the resultant value of Table A in order to obtain score C.
- The *Muscle use* and *force/load* score is added to the resultant value of Table B in order to obtain score D.
- Scores C and D are combined using Table C in order to obtain the final RULA score.

In each score cell, in addition to the current value, the *maximum possible value* for that cell is displayed in a small box. This data helps the potential redesign, as seen later.

Depending on the **RULA score** a particular **action level** is considered that indicates the urgency of the ergonomic intervention (need to take action in order to reduce the risk), as shown in the following table.

RULA score	Action Level	Action Level Interpretation
1-2	1 - Acceptable	Posture is acceptable if it is not maintained or repeated for long periods.
3-4	2 - Possible	Further investigation is needed and changes may be required.
5-6	3 - Soon	Investigation and changes are required soon
7	4 - Immediate	Investigation and changes are required immediately

Both the *RULA score* and the *action level* have associated color codes for easy interpretation. Once they are calculated, these results are also shown in the main window of the module, together with the name and frequency of the posture (Figure 2).

REPORT

Pressing the *Report* button at the bottom of the main window opens another window where you can select the postures to be detailed in the optional part of the report (Figure 6). Although all the analyzed postures can be included, they can also be selected according to their action level.

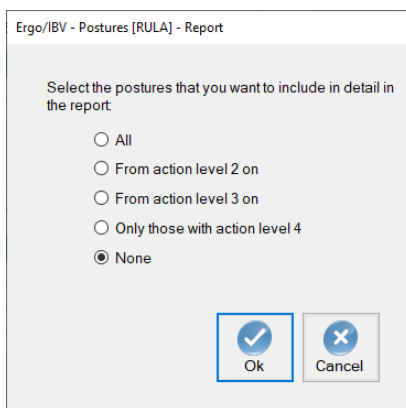


Figure 6: Postures [RULA] – Report (selection of the postures to be detailed)

When the report is configured, you can access the requested report by pressing the *Accept* button, which includes the following:

- **Identification.** It includes general information on the case (date of analysis, name of the task, company and observations of the evaluator). If a photograph was added to the task, it will also appear in this section.
- **Posture risk** (Figure 7). This section is always shown and summarizes the results for all the analyzed postures, grouped according to the subtask to which they belong. Each posture shows its name, estimated frequency and the results obtained for the *RULA score* and the *action level*, with their color codes. At the end of this section, the interpretation table of the *RULA score* is included.

POSTURE RISK

Subtask	Posture	Frequency	RULA score	Action Level
Rack assembly				
	Extend protector	medium	5	3 - Soon
	Placing parts in a rack	medium	3	2 - Possible
	Screw parts to the rack	medium	7	4 - Immediately
	Flip rack	low	4	2 - Possible
	Fitting a cover	low	2	1 - Acceptable
Polishing of parts				
	Adjusting parts on the table	medium	3	2 - Possible
	Polishing exterior	high	3	2 - Possible
	Polishing interior	high	5	3 - Soon
Material classification				
	Taking parts from the trolley	high	3	2 - Possible
	Place on top shelf	medium	5	3 - Soon
	Place on medium shelf	medium	3	2 - Possible
	Place on lower shelf	medium	3	2 - Possible

RULA score interpretation

RULA score	Action Level	Action Level Interpretation
1-2	1 - Acceptable	Posture is acceptable if it is not maintained or repeated for long periods
3-4	2 - Possible	Further investigation is needed and changes may be required
5-6	3 - Soon	Investigation and changes are required soon
7	4 - Immediately	Investigation and changes are required immediately

Assessment performed by:

Figure 7: Postures [RULA] – Report (posture risk)

Posture detail (Figure 8). As already indicated, this section of the report is optional and will depend on the postures previously requested. Each posture is headed by its identification, that is, the subtask where it is included, the posture name, its frequency, observations and the video reference where it is located. The assessment results are then shown, which include all the items recorded in the encoding of the posture, the intermediate scores associated, and the final *RULA score* (including the maximum possible value of each cell) as well as the *action level* for that posture.

POSTURE DETAIL			
Subtask	Rack assembly	Posture	Extend protector
		Frequency	medium
Observations (posture)	----		Video reference
			10:15:00

Group A

	Right	Left																								
ARM																										
Flexion 20-45°	2	2																								
Abduction	6	6																								
Shoulder raised	-	-																								
Arm weight is supported	-	-																								
FOREARM																										
Flexion < 60°	2	2																								
Crosses midline of body	3	3																								
WRIST																										
Flexion/Extension 0-15°	2	2																								
Lateral deviation	4	4																								
WRIST TWIST																										
Wrist is in mid-range of twist	1	1																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 35%; text-align: center;">Table A</td> <td style="width: 35%; text-align: center;">3</td> </tr> <tr> <td>FORCE / LOAD</td> <td></td> <td style="text-align: center;">+</td> </tr> <tr> <td>Occasional 2-10 kg (the load or force is 2-10 kg and held intermittently)</td> <td style="text-align: center;">1</td> <td></td> </tr> <tr> <td>MUSCLE USE</td> <td></td> <td style="text-align: center;">+</td> </tr> <tr> <td>Static (sustained > 1 min)</td> <td style="text-align: center;">-</td> <td></td> </tr> <tr> <td>Repeated (>4 times/min)</td> <td style="text-align: center;">X</td> <td style="text-align: center;">1</td> </tr> <tr> <td></td> <td style="text-align: center;">=</td> <td></td> </tr> <tr> <td>Score C</td> <td></td> <td style="text-align: center;">5</td> </tr> </table>				Table A	3	FORCE / LOAD		+	Occasional 2-10 kg (the load or force is 2-10 kg and held intermittently)	1		MUSCLE USE		+	Static (sustained > 1 min)	-		Repeated (>4 times/min)	X	1		=		Score C		5
	Table A	3																								
FORCE / LOAD		+																								
Occasional 2-10 kg (the load or force is 2-10 kg and held intermittently)	1																									
MUSCLE USE		+																								
Static (sustained > 1 min)	-																									
Repeated (>4 times/min)	X	1																								
	=																									
Score C		5																								

Group B

	Right	Left																								
NECK																										
Flexion 10-20°	2	2																								
Rotation	-	-																								
Lateral tilt	-	-																								
TRUNK																										
Flexion 20-60°	3	3																								
Rotation	-	-																								
Lateral tilt	-	-																								
LEGS																										
Standing with the body weight evenly distributed over both feet, with room for changes of position	2	1																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 35%; text-align: center;">Table B</td> <td style="width: 35%; text-align: center;">4</td> </tr> <tr> <td>FORCE / LOAD</td> <td></td> <td style="text-align: center;">+</td> </tr> <tr> <td>No resistance</td> <td style="text-align: center;">0</td> <td></td> </tr> <tr> <td>MUSCLE USE</td> <td></td> <td style="text-align: center;">+</td> </tr> <tr> <td>Static (sustained > 1 min)</td> <td style="text-align: center;">-</td> <td></td> </tr> <tr> <td>Repeated (>4 times/min)</td> <td style="text-align: center;">-</td> <td style="text-align: center;">1</td> </tr> <tr> <td></td> <td style="text-align: center;">=</td> <td></td> </tr> <tr> <td>Score D</td> <td></td> <td style="text-align: center;">4</td> </tr> </table>				Table B	4	FORCE / LOAD		+	No resistance	0		MUSCLE USE		+	Static (sustained > 1 min)	-		Repeated (>4 times/min)	-	1		=		Score D		4
	Table B	4																								
FORCE / LOAD		+																								
No resistance	0																									
MUSCLE USE		+																								
Static (sustained > 1 min)	-																									
Repeated (>4 times/min)	-	1																								
	=																									
Score D		4																								

RULA score	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <div style="background-color: #cccccc; width: 10px; height: 10px; margin: 0 auto;"></div> <div style="font-size: 24px; font-weight: bold; margin: 0 auto;">5</div> </div>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Action Level</td> <td style="width: 70%; text-align: center; background-color: #ffcc00;">3 - Soon</td> </tr> <tr> <td>Action Level Interpretation</td> <td style="text-align: center;">Investigation and changes are required soon</td> </tr> </table>	Action Level	3 - Soon	Action Level Interpretation	Investigation and changes are required soon
Action Level	3 - Soon					
Action Level Interpretation	Investigation and changes are required soon					

Figure 8: Postures [RULA] – Report (detail of the posture)

REDESIGN

The evaluator can use the results window to see how the different scores change as the encoding variables are modified. This can be helpful when redesigning the task or workstation to reduce the risk of a particular posture.

In order to avoid losing the data of the original posture, it is advisable to backup the posture, rename it as a redesign, edit the relevant changes and save it.

In general, we will try to reduce those scores that are closest to its *maximum possible value*.