Assessment of repetitive tasks of the upper limbs (the ART tool)

Guidance for employers

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The assessment of repetitive tasks (ART) tool is designed to help you risk assess tasks that require repetitive moving of the upper limbs (arms and hands). It helps you to assess some of the common risk factors in repetitive work that contribute to the development of upper limb disorders (ULDs).

ART is aimed at those responsible for designing, assessing, managing and inspecting repetitive work. It can help identify those tasks that involve significant risks and where to focus risk-reduction measures. It will be useful to employers, safety representatives, health and safety practitioners, consultants and ergonomists.

Further information on ART, including online training on how to use the tool, can be found at www.hse.gov.uk/msd/uld/art.

Assessment guide

Repetitive tasks are made up of a sequence of upper limb actions, of fairly short duration, which are repeated over and over again, and are almost always the same (eg stitching a piece of cloth, manufacturing one part, packaging one item).

- ART is most suited for tasks that:
  - involve actions of the upper limbs;
  - repeat every few minutes, or even more frequently; and
  - occur for at least 1–2 hours per day or shift.
- The tasks are typically found in assembly, production, processing, packaging, packing and sorting work, as well as work involving the regular use of hand tools.
- **ART is not intended for display screen equipment (DSE) assessments.**

ART is made up of three sections:

- **The assessment guide** – this provides detailed information about how to use the tool, the risk factors and the assessment criteria. Read it carefully before using the tool.

- **The flow chart** – this provides an overview of the assessment process. It also guides experienced users through the tool fairly quickly.

- **The task description form and score sheet** – this provides a place to record information about the task as well as the findings of the assessment.

Before completing ART

- Spend some time observing the task to ensure that what you are seeing is representative of normal practices.
- It is important to consult workers and safety representatives during the assessment process.
- Where several people do the same task, make sure you consult more than one worker about the demands of the task.
- It may help to video record the task so you can view it again, away from the work area.

Completing the task description form

- Describe the repetitive task to be assessed.
- You may find the timeline helpful to mark the times when the repetitive task is performed and when any breaks or pauses occur. Consider the timing of:
  - meal breaks;
  - other official breaks;
  - other pauses (eg during pauses in production); and
  - any non-repetitive tasks (eg visual inspection task).

Making the assessment

- Decide whether to make an assessment of the left arm and the right arm, or just the arm that is predominantly involved in the task. If there is any doubt, consider both the left and the right arm.

- Ensure you read the assessment guide before you begin your assessment. You may be familiar with the manual handling assessment charts (MAC) tool. Although the format of ART looks similar, there are some subtle differences in the way the tool is used.

- The assessment is split into four stages:
  - Stage A: Frequency and repetition of movements;
  - Stage B: Force;
  - Stage C: Awkward postures;
  - Stage D: Additional factors.

- For each stage, follow the flow chart and/or assessment guide to determine the level of risk for each risk factor. The levels of risk are classified in the table below.

G = GREEN Low level of risk
A = AMBER Medium level of risk – Examine task closely
R = RED High level of risk – Prompt action needed

- Circle the colour band and the corresponding numerical score on the flow chart or assessment guide. It is possible to use intermediate scores if the factor you are assessing falls between two categories.

- Complete the score sheet, following the instructions on page 10. This will determine the task score and exposure score.

Taking action

The purpose of using ART is to identify significant risks and then reduce the level of risk in the task.

- The task scores and exposure scores help prioritise those tasks that need most urgent attention and help check the effectiveness of any improvements. The colours assigned to the risk factors will help identify where to focus risk-reduction measures.

- Where tasks require attention, first look for 'higher order' solutions where it is reasonably practicable to eliminate the hazard, for example, through redesign of the work, substitution or replacement of tools or components, or automation of the task. Where these measures are not practicable, identify how tasks might be improved to avoid or reduce those factors that score red. Then consider how to reduce the amber scores. If scores for individual risk factors cannot be improved, then the lowest order in the hierarchy of controls is to minimise the risk by designing suitable systems of work (eg task rotation schedules), using PPE, if appropriate, and providing training.

- Preventative measures can be simple and cost-effective (eg making changes to the working height or placement of work items can allow better arm postures).

- Consult the people who are doing the repetitive work when exploring and introducing risk-reduction measures. Employees can be especially good at devising effective and practical improvement measures.

- You cannot prevent all ULDs. Suitable systems for early reporting of symptoms, proper treatment, rehabilitation and return to work are essential components for managing risks and any episodes of ULDs.

Frequency and repetition

A1 Arm movements

Observe the movement of the arm and select the category that is most appropriate. It is possible to select intermediate scores. Assess both the left (L) and right (R) arm.

		L	R
Arm movements are	Infrequent (eg some intermittent movement)	0	0
	Frequent (eg regular movement with some pauses)	3	3
	Very frequent (eg almost continuous movement)	6	6

A2 Repetition

This refers to movement of the arm and hand, but not the fingers. Observe the movement of the arm and hand and count the number of times the same or a similar pattern of motion is repeated over a set period of time (eg 1 minute). Assess both the left (L) and right (R) arm.

		L	R
Similar motion pattern of the arm and hand is repeated	10 times per minute or less	0	0
	11–20 times per minute	3	3
	More than 20 times per minute	6	6

Force

B Force

Use the grid below to determine the level of force exerted with the hand and the amount of time that the force is exerted. It is possible to select intermediate scores on the grid if appropriate. If more than one type of force is exerted, select the highest score obtained with the grid.

There are two methods to determine the level of hand force:

- Ask the person doing the work if there are any actions that require muscle effort of the arm, hand or fingers. If such actions are identified, ask the worker to describe the level of force involved in each action (eg light force, moderate force, strong force, or very strong force).
- Otherwise, use the written descriptions below to determine the level of force exerted with the hand.

Light force	**There is no indication of any particular effort**
Moderate force	**Force needs to be exerted. For example:** ■ **Pinching or gripping objects with some effort** ■ **Moving levers or pushing buttons with some effort** ■ **Manipulating lids or components with some effort** ■ **Pushing or forcing items together with some effort** ■ **Using tools with some effort**
Strong force	**Force is obviously high, strong or heavy**
Very strong force	**Force is near to the maximum level that the worker can apply**

Worker's description of the level of force exerted with the hand

	Light	Moderate	Strong	Very strong
Infrequent	G0	A1	R6	Changes required*
Part of the time (15–30%)	G0	A2	R9	Changes required*
About half the time (40–60%)	G0	A4	R12	Changes required*
Almost all the time (80% or more)	G0	R8	Changes required*	Changes required*

* Changes to the task are required due to unacceptable levels of force.

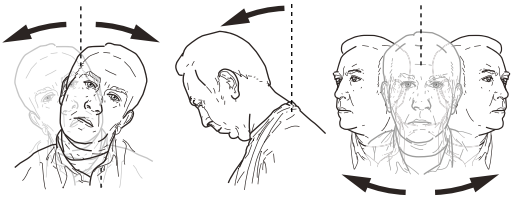
Awkward postures

Determine the amount of time that the worker spends in the postures described below. This includes the time spent moving to a bent or twisted position repetitively and the time spent holding a bent or twisted position.

C1 Head/neck posture

The neck is considered to be bent or twisted if an obvious angle between the neck and back can be observed as a result of performing the task.

The head or neck is:

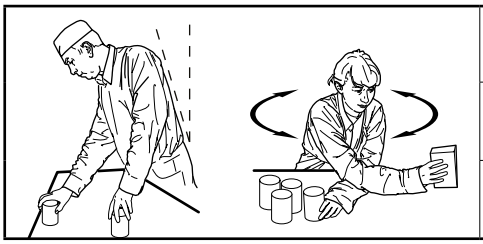


In an almost neutral posture	0
Bent or twisted part of the time (eg 15–30%)	1
Bent or twisted more than half of the time (more than 50%)	2

C2 Back posture

The back posture is considered awkward if more than 20° of twisting or bending is observed.

The back is:

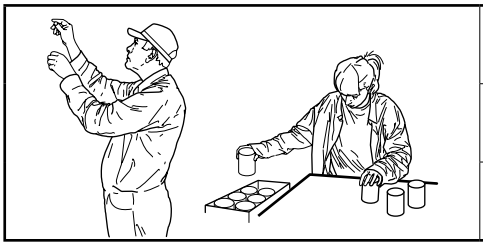


In an almost neutral posture	0
Bent forward, sideways or twisted part of the time	1
Bent forward, sideways or twisted for more than half of the time	2

C3 Arm posture

The arm is considered to adopt an awkward posture if the elbow is raised to around chest height and the arm is unsupported (eg not resting on a workbench).

The elbow is:

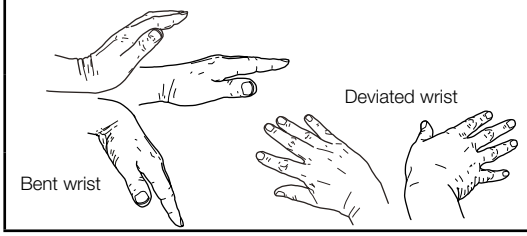


	L	R
Kept close to the body or supported	0	0
Raised away from the body part of the time	2	2
Raised away from the body more than half of the time	4	4

C4 Wrist posture

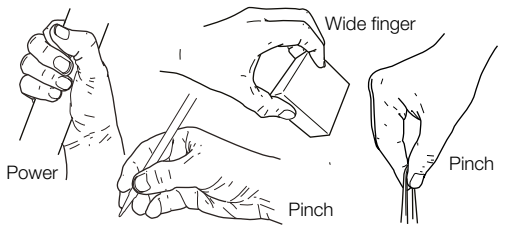
The wrist is considered to be bent or deviated if an obvious wrist angle can be observed.

The wrist is:

		L	R
	Almost straight/in a neutral position	0	0
	Bent or deviated part of the time	1	1
	Bent or deviated more than half of the time	2	2

C5 Hand/finger grip

The hands or fingers hold objects in a:

		L	R
	Power grip or do not grip awkwardly	0	0
	Pinch or wide finger grip for part of the time	1	1
	Pinch or wide finger grip for more than half of the time	2	2

Additional factors

D1 Breaks

Determine the maximum amount of time that individuals perform the repetitive task without a break. Breaks are significant changes or pauses (eg of at least 5–10 minutes) in arm or hand activity. They include structured breaks such as meal breaks. They also include time spent performing other tasks that do not involve similar repetitive arm movements (eg a visual inspection task).

The worker performs the task continuously, without a break, for:

Less than one hour, or there are frequent short breaks (eg of at least 10 seconds) every few minutes over the whole work period	**0**
1 hour to less than 2 hours	**2**
2 hours to less than 3 hours	**4**
3 hours to less than 4 hours	**6**
4 hours or more	**8**

D2 Work pace

Speak to the workers about any difficulties they might have keeping up with the work. Select the most appropriate category. If the score is amber or red, ask for more information about this aspect of the work.

Not difficult to keep up with the work	**0**
Sometimes difficult to keep up with the work	**1**
Often difficult to keep up with the work	**2**

D3 Other factors

Identify any other factors that are present in the task. For example:

- gloves affect gripping and make the handling task more difficult;
- a tool (eg hammer, pick) is used to strike two or more times a minute;
- the hand is used as a tool (eg hammer) and struck ten or more times per hour;
- the tools, workpiece or workstation cause compression of the skin;
- the tools or workpiece cause discomfort or cramping of the hand or fingers;
- the hand/arm is exposed to vibration;
- the task requires fine precise movements of the hand or fingers;
- operators are exposed to cold or draughts or grip cold tools; and
- lighting levels are inadequate.

Select the most appropriate category. Assess both the left (L) and right (R) arm.

	L	R
No factors present	0	0
One factor is present	1	1
Two or more factors are present	2	2

D4 Duration

Determine the amount of time that a worker performs the repetitive task in a typical day or shift (excluding breaks). Select the most appropriate category.

Duration of task by a worker	Duration multiplier
Less than 2 hours	X 0.5
2 hours to less than 4 hours	X 0.75
4 hours to 8 hours	X 1
More than 8 hours	X 1.5

D5 Psychosocial factors

Psychosocial factors are not given a score. However, they should be considered, through discussion with workers, and, if present in the workplace, recorded on the score sheet. They include things such as:

- little control over how the work is done;
- incentives to skip breaks or finish early;
- monotonous work;
- high levels of attention and concentration;
- frequent tight deadlines;
- lack of support from supervisors or co-workers;
- excessive work demands; and
- insufficient training to do the job successfully.

Completing the score sheet

Enter the colour band and numerical score for each risk factor on the score sheet. There is also a place on the score sheet to record other important findings of the assessment.

If you assess both arms, several factors only need to be assessed once. These are head/neck posture, back posture, breaks, and work pace. However, these scores should be entered into the columns for both the left arm and right arm.

Follow the instructions below to calculate the task score and exposure score.

Calculating the task score

To calculate the task score, add together the scores on the score sheet.

Task score = A1 + A2 + B + C1 + C2 + C3 + C4 + C5 + D1 + D2 + D3

If you assess both arms, the scores for the left arm and right arm should be kept separate and not combined.

Calculating the exposure score

It is possible to adjust the task score to reflect the total duration that the task is performed by a worker. Multiply the task score by the appropriate duration multiplier (D4) to calculate the exposure score.

Task score		**X** Duration multiplier		**=** Exposure score	

The task scores and exposure scores help prioritise those tasks that need most urgent attention and help check the effectiveness of any improvements.

The colours assigned to the risk factors will help identify where to focus risk-reduction measures.

A system for interpreting the exposure score is proposed in the table below.

Exposure score	Proposed exposure level	
0–11	Low	Consider individual circumstances
12–21	Medium	Further investigation required
22 or more	High	Further investigation required urgently

Even if the exposure score is low, take into account the requirements of certain individuals and groups where appropriate (eg new and expectant mothers, workers that are new, returning to work, or having difficulties with repetitive work). Individual adjustments to the work may still be needed to help accommodate these people.

Dealing with task rotation

The method described on page 10 to calculate the exposure score applies where a worker performs the same repetitive task throughout the day or shift. However, it is recognised that workers may actually carry out several different repetitive tasks as part of their job.

If workers rotate to other repetitive tasks in their job, you should assess all their tasks involving repetitive movements of the upper limbs and consider their overall exposure.

One method is to use ART to make an assessment of each repetitive task in the rotation. Then compare the risk factor colours and scores across the different tasks. If you find that workers rotate to tasks with similar red scores or high task scores, the task rotation may not provide enough variation or recovery in the work. In this case, examine the task rotation system further. It is important to speak to workers about whether the rotation provides sufficient recovery or improves their work in other ways.

An electronic workbook is also available to calculate the overall score of a job involving several repetitive tasks. This job exposure score helps prioritise jobs involving more than one repetitive task. The workbook, along with further information on how to complete the score sheet, can be found at www.hse.gov.uk/msd/uld/art.

Further information

Further information on ART, including online training on how to use the tool, additional score sheets and task description forms can be found at www.hse.gov.uk/msd/uld/art.

HSE publications

Upper limb disorders in the workplace HSG60 (Second edition) HSE Books 2002 ISBN 978 0 7176 1978 8 www.hse.gov.uk/pubns/books/hsg60.htm

Seating at work HSG57 (Third edition) HSE Books 1998 ISBN 978 0 7176 1231 4 www.hse.gov.uk/pubns/books/hsg57.htm

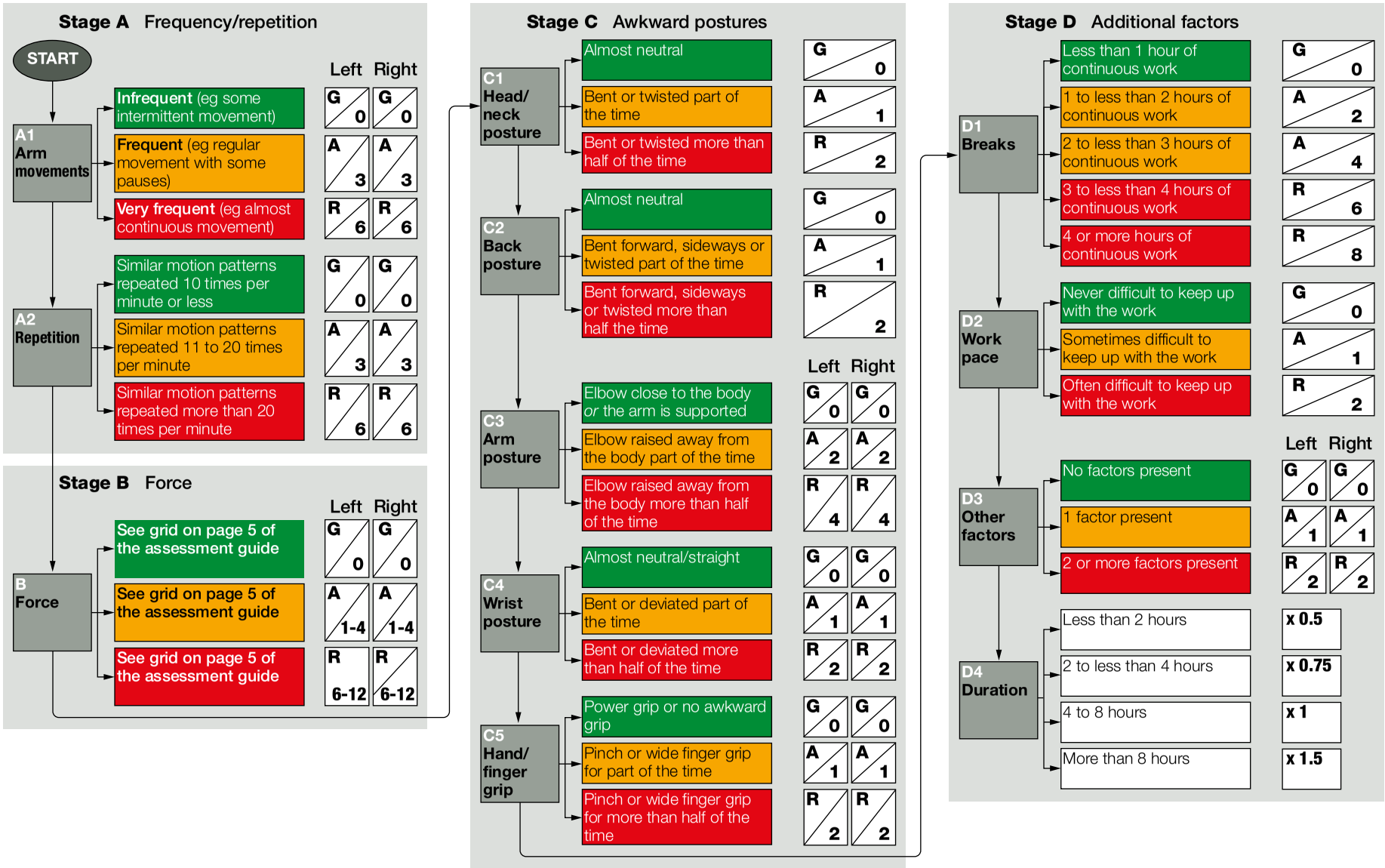
Manual handling assessment charts (the MAC tool) Leaflet INDG383(rev2) HSE Books 2014 www.hse.gov.uk/pubns/indg383.htm

Hand-arm vibration. The Control of Vibration at Work Regulations 2005. Guidance on Regulations L140 HSE Books 2005 ISBN 978 0 7176 6125 1 www.hse.gov.uk/pubns/books/l140.htm

Manual handling at work: A brief guide Leaflet INDG143(rev3) HSE Books 2012 www.hse.gov.uk/pubns/indg143.htm

Managing upper limb disorders in the workplace: A brief guide Leaflet INDG171(rev2) HSE Books 2013 www.hse.gov.uk/pubns/indg171.htm

Flow chart


Stage A Frequency/repetition
START
A1 Arm movements
Infrequent (eg some intermittent movement)
Frequent (eg regular movement with some pauses)
Very frequent (eg almost continuous movement)
A2 Repetition
Similar motion patterns repeated 10 times per minute or less
Similar motion patterns repeated 11 to 20 times per minute
Similar motion patterns repeated more than 20 times per minute
Left Right
G 0 G 0
A 3 A 3
R 6 R 6
G 0 G 0
A 3 A 3
R 6 R 6
Stage B Force
B Force
See grid on page 5 of the assessment guide
See grid on page 5 of the assessment guide
See grid on page 5 of the assessment guide
Left Right
G 0 G 0
A 1-4 A 1-4
R 6-12 R 6-12
Stage C Awkward postures
C1 Head/ neck posture
Almost neutral
Bent or twisted part of the time
Bent or twisted more than half of the time
G 0
A 1
R 2
C2 Back posture
Almost neutral
Bent forward, sideways or twisted part of the time
Bent forward, sideways or twisted more than half the time
G 0
A 1
R 2
Left Right
C3 Arm posture
Elbow close to the body or the arm is supported
Elbow raised away from the body part of the time
Elbow raised away from the body more than half of the time
G 0 G 0
A 2 A 2
R 4 R 4
C4 Wrist posture
Almost neutral/straight
Bent or deviated part of the time
Bent or deviated more than half of the time
G 0 G 0
A 1 A 1
R 2 R 2
C5 Hand/ finger grip
Power grip or no awkward grip
Pinch or wide finger grip for part of the time
Pinch or wide finger grip for more than half of the time
G 0 G 0
A 1 A 1
R 2 R 2
Stage D Additional factors
D1 Breaks
Less than 1 hour of continuous work
1 to less than 2 hours of continuous work
2 to less than 3 hours of continuous work
3 to less than 4 hours of continuous work
4 or more hours of continuous work
G 0
A 2
A 4
R 6
R 8
D2 Work pace
Never difficult to keep up with the work
Sometimes difficult to keep up with the work
Often difficult to keep up with the work
G 0
A 1
R 2
Left Right
D3 Other factors
No factors present
1 factor present
2 or more factors present
G 0 G 0
A 1 A 1
R 2 R 2
D4 Duration
Less than 2 hours
2 to less than 4 hours
4 to 8 hours
More than 8 hours
x 0.5
x 0.75
x 1
x 1.5
Stage A Frequency score
A1 + A2
Stage B Force score
B
Stage C Posture score
C1 + C2 + C3 + C4 + C5
Stage D Additional factors
D1 + D2 + D3
Task score
Duration
D4
Exposure score
Left hand
Right hand

Task description form

Assessor name:		**Date:**	
Company name:		**Location:**	
Name of task:			
Task description:			

What is the weight of any items handled?	

If items weigh more than 8 kg and the task involves manual handling consider using the MAC

Which side of the body is primarily involved?	**Left**		**right**		**both**	

What hand tools are used?	
Production rate (if available)	units per shift, hour or minute (circle as appropriate)
How often is the task repeated?	every seconds

Draw the breaks in the shift

First hour →

How long does a worker perform the task?	**…without a break**	hours
	…in a typical day or shift (excluding breaks)	hours
How often does an individual perform the task? (eg daily, weekly, etc)		
How often is the task carried out within the organisation? (eg daily, etc)		
Do workers rotate to other tasks? **If so, what tasks?**		

You can download further copies of these forms at www.hse.gov.uk/msd/uld/art

Score sheet

Enter the colour band and numerical score for each risk factor in the table below. Follow the instructions on page 10 to determine the task score and exposure score.

Risk factors	**Left arm**		**Right arm**	
	Colour	Score	Colour	Score
A1 Arm movements				
A2 Repetition				
B Force				
C1 Head/neck posture				
C2 Back posture				
C3 Arm posture				
C4 Wrist posture				
C5 Hand/finger grip				
D1 Breaks				
D2 Work pace				
D3 Other factors				
Task score				
D4 Duration multiplier		**X**		**X**
Exposure score				
D5 Psychosocial factors				

Are there other indications that the task is high risk?

☐ The task or similar tasks have a history of ULDs (eg company accident book, RIDDOR reports, medically diagnosed cases of upper limb disorders).

☐ There are signs workers find the task difficult (eg wearing arm supports or bandages, reporting discomfort, aches or pains). Ask the workers if they have any of these symptoms.

☐ Other indications? If so, describe:

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This document is available at www.hse.gov.uk/pubns/indg438.htm.