

Turn - T

Code	Force/Weight (daN/kg)	Time in TMU for Angular Degrees Turned										
		30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
T-S	Small: ≤1	2.8	3.5	4.1	4.8	5.4	6.1	6.8	7.4	8.1	8.7	9.4
T-M	Medium: >1 up to ≤5	4.4	5.5	6.5	7.5	8.5	9.6	10.6	11.6	12.7	13.7	14.8
T-L	Large: >5 up to ≤16	8.4	10.5	12.3	14.4	16.2	18.3	20.4	22.2	24.3	26.1	28.2

Body, Leg and Foot Motions

Code	TMU	Motion Length	Description
FM FMP	8.5 19.1	up to 10 cm	Foot Motion pivoted at ankle with heavy pressure
LM-	7.1 0.5	up to 15 cm each additional cm	Leg Motion hinged at knee or hip in any direction
SS-C1 SS-C2	17.0 0.2 34.1 0.4	less than 30 cm 30 cm each additional cm 30 cm each additional cm	Side Step lateral motion of the body Use Reach or Move . Case I: complete when leading leg contacts floor. Case II: lagging leg must contact floor before next motion can be made.
TBC 1 TBC 2	18.6 37.2		Turn Body 45 to 90 degrees Case I: complete when leading leg contacts floor. Case II: lagging leg must contact floor before next motion can be made.
B, S, KOK AB, AS, AKOK	29.0 31.9		Bend, Stoop or Kneel on One Knee Arise from Bend, Stoop, Kneel on One Knee
KBK AKBK	69.4 76.7		Kneel on Both Knees Arise from Kneel on Both Knees
SIT STD	34.7 43.4		Sit Stand from sitting position
W - P W - PO	15.0 17.0	per pace per pace	Walk Walk obstructed and/or with load > 23 kg

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MTM-1®
Data Card
(SI - metric system)



Do not attempt to use this chart or apply Methods-Time Measurement in any way unless you understand the proper application of the data. This statement is included as a word of caution to prevent difficulties resulting from misapplication of the data.

The time values in this data card are equivalent to a performance of 100 % LMS	Time Units			
	TMU	seconds	minute	hour
	1	0.036	0.0006	0.00001
	27.8	1		
	1,666.7		1	
100,000			1	

Simultaneous Motions

		Disengage D		Position P			Grasp G			Move M			Reach R				
		2	1E 1D	1NS 2SS 2NS	1SS 2S	1S	4	1B 1C	1A 2 5	C	B	A Bm	C D	B	A E		
		D	E	D	E	D	E	O	W	O	W	O	W	O	W	O	W
Reach R	A, E																
	B																
	C, D																
Move M	A, Bm																
	B																
	C																
Grasp G	1A, 2, 5																
	1B, 1C																
	4																
Position P	1S																
	1SS, 2S																
Disengage D	1E, 1D																
	2																

Motions not included in above table:
T Turn: normally easy with all motions except when Turn is controlled or with Disengage
AP Apply Pressure: each case must be analyzed
P3 Position: always difficult
D3 Disengage: normally difficult
RL Release: always easy
D Disengage: any class may be difficult if care must be exercised to avoid injury or damage to object

Code	TMU	Description
ET	15.2 × T/D maximum 20.0 TMU	Eye Travel T: distance between points from and to which the eye travels D: perpendicular distance from the eye to the line of travel T
EF	7.3	Eye Focus

Reach - R

Motion Length in cm	TMU							Case Description	
	R-A	R-B	R-C R-D	R-E	mR-A R-Am	mR-B R-Bm	m(B)		
2 or less	2.0	2.0	2.0	2.0	1.6	1.6	0.4	A Reach to object in fixed location, or to object in other hand or on which other hand rests.	
4	3.4	3.4	5.1	3.2	3.0	2.4	1.0		
6	4.5	4.5	6.5	4.4	3.9	3.1	1.4		
8	5.5	5.5	7.5	5.5	4.6	3.7	1.8		
10	6.1	6.3	8.4	6.8	4.9	4.3	2.0		
12	6.4	7.4	9.1	7.3	5.2	4.8	2.6		
14	6.8	8.2	9.7	7.8	5.5	5.4	2.8		
16	7.1	8.8	10.3	8.2	5.8	5.9	2.9		
18	7.5	9.4	10.8	8.7	6.1	6.5	2.9		
20	7.8	10.0	11.4	9.2	6.5	7.1	2.9		
22	8.1	10.5	11.9	9.7	6.8	7.7	2.8	B Reach to single object in location which may vary slightly from cycle to cycle.	
24	8.5	11.1	12.5	10.2	7.1	8.2	2.9		
26	8.8	11.7	13.0	10.7	7.4	8.8	2.9		
28	9.2	12.2	13.6	11.2	7.7	9.4	2.8		
30	9.5	12.8	14.1	11.7	8.0	9.9	2.9		
35	10.4	14.2	15.5	12.9	8.8	11.4	2.8		
40	11.3	15.6	16.8	14.1	9.6	12.8	2.8		
45	12.1	17.0	18.2	15.3	10.4	14.2	2.8		
50	13.0	18.4	19.6	16.5	11.2	15.7	2.7		
55	13.9	19.8	20.9	17.8	12.0	17.1	2.7		
60	14.7	21.2	22.3	19.0	12.8	18.5	2.7	C Reach to object jumbled with other objects in a group so that search and select occur.	
65	15.6	22.6	23.6	20.2	13.5	19.9	2.7		
70	16.5	24.1	25.0	21.4	14.3	21.4	2.7		
75	17.3	25.5	26.4	22.6	15.1	22.8	2.7		
80	18.2	26.9	27.7	23.9	15.9	24.2	2.7		
2 or less	2.0	2.0	2.0	2.0	1.6	1.6	0.4		D Reach to very small object or where accurate grasp is required.
4	3.4	3.4	5.1	3.2	3.0	2.4	1.0		
6	4.5	4.5	6.5	4.4	3.9	3.1	1.4		
8	5.5	5.5	7.5	5.5	4.6	3.7	1.8		
10	6.1	6.3	8.4	6.8	4.9	4.3	2.0		
12	6.4	7.4	9.1	7.3	5.2	4.8	2.6		
14	6.8	8.2	9.7	7.8	5.5	5.4	2.8		
16	7.1	8.8	10.3	8.2	5.8	5.9	2.9		
18	7.5	9.4	10.8	8.7	6.1	6.5	2.9		
20	7.8	10.0	11.4	9.2	6.5	7.1	2.9		
22	8.1	10.5	11.9	9.7	6.8	7.7	2.8	E Reach to indefinite location to get hand in position for body balance or next motion or out of way.	
24	8.5	11.1	12.5	10.2	7.1	8.2	2.9		
26	8.8	11.7	13.0	10.7	7.4	8.8	2.9		
28	9.2	12.2	13.6	11.2	7.7	9.4	2.8		
30	9.5	12.8	14.1	11.7	8.0	9.9	2.9		
35	10.4	14.2	15.5	12.9	8.8	11.4	2.8		
40	11.3	15.6	16.8	14.1	9.6	12.8	2.8		
45	12.1	17.0	18.2	15.3	10.4	14.2	2.8		
50	13.0	18.4	19.6	16.5	11.2	15.7	2.7		
55	13.9	19.8	20.9	17.8	12.0	17.1	2.7		

Grasp - G

Code	TMU	Case Description
G1A	2.0	Pick-up Grasp: any size object by itself, easily grasped.
G1B	3.5	Pick-up Grasp: object very small or lying close against a flat surface
G1C1	7.3	$\varnothing > 12$ up to ≤ 25 mm
G1C2	8.7	$\varnothing \geq 6$ up to ≤ 12 mm
G1C3	10.8	$\varnothing < 6$ mm
G2	5.6	Regrasp: change grasp without relinquishing control.
G3	5.6	Transfer Grasp: control transferred from one hand to the other.
G4A	7.3	$> 25 \times 25 \times 25$ mm
G4B	9.1	$\geq 6 \times 6 \times 3$ up to $\leq 25 \times 25 \times 25$ mm
G4C	12.9	$< 6 \times 6 \times 3$ mm
G5	0.0	Contact Grasp (sliding or hook grasp).

Release - RL

Code	TMU	Case Description	Code	TMU	Case Description
RL1	2.0	Normal release performed by opening fingers as independent motion	RL2	0.0	Contact release

Move - M

Motion Length in cm	TMU					with Force/Weight			Case Description
	M-A	M-B	M-C	mM-B M-Bm	m(B)	in daN/kg up to	Static Const. SC in TMU	Dynamic Factor	
2 or less	2.0	2.0	2.0	1.7	0.3	1	0.0	1.00	A Move object to other hand or against stop.
4	3.1	4.0	4.5	2.8	1.2	2	1.6	1.04	
6	4.1	5.0	5.8	3.1	1.9	4	2.8	1.07	
8	5.1	5.9	6.9	3.7	2.2	6	4.3	1.12	
10	6.0	6.8	7.9	4.3	2.5	8	5.8	1.17	
12	6.9	7.7	8.8	4.9	2.8	10	7.3	1.22	
14	7.7	8.5	9.8	5.4	3.1	12	8.8	1.27	
16	8.3	9.2	10.5	6.0	3.2	14	10.4	1.32	
18	9.0	9.8	11.1	6.5	3.3	16	11.9	1.36	
20	9.6	10.5	11.7	7.1	3.4	18	13.4	1.41	
22	10.2	11.2	12.4	7.6	3.6	20	14.9	1.46	B Move object to approximate or indefinite location, Total Clearance > 25 mm
24	10.8	11.8	13.0	8.2	3.6	22	16.4	1.51	
26	11.5	12.3	13.7	8.7	3.6	24	18.0	1.56	
28	12.1	12.8	14.4	9.3	3.5	26	19.6	1.61	
30	12.7	13.3	15.1	9.8	3.5	28	21.2	1.66	
35	14.3	14.5	16.8	11.2	3.3	30	22.8	1.71	
40	15.8	15.6	18.5	12.6	3.0	32	24.4	1.76	
45	17.4	16.8	20.1	14.0	2.8	34	26.0	1.81	
50	19.0	18.0	21.8	15.4	2.6	36	27.6	1.86	
55	20.5	19.2	23.5	16.8	2.4	38	29.2	1.91	
60	22.1	20.4	25.2	18.2	2.2	40	30.8	1.96	C Move object to exact location, Total Clearance > 12 up to ≤ 25 mm
65	23.6	21.6	26.9	19.5	2.1	42	32.4	2.01	
70	25.2	22.8	28.6	20.9	1.9	44	34.0	2.06	
75	26.7	24.0	30.3	22.3	1.7	46	35.6	2.11	
80	28.3	25.2	32.0	23.7	1.5	48	37.2	2.16	

Position - P

Code	Fit	Class of Fit		Symmetry	Handling	
		Insertion	Tolerance		E	D
P1	Loose	No pressure required	$> \pm 1.5$ up to $\leq \pm 6.0$ mm	S	5.6	11.2
				SS	9.1	14.7
				NS	10.4	16.0
P2	Close	Light pressure required	$> \pm 0.4$ up to $\leq \pm 1.5$ mm	S	16.2	21.8
				SS	19.7	25.3
				NS	21.0	26.6
P3	Tight	Heavy pressure required	> 0 up to $\leq \pm 0.4$ mm	S	43.0	48.6
				SS	46.5	52.1
				NS	47.8	53.4

Apply Pressure - AP

Code	TMU	Case Description	Components	Code	TMU	Description
APA	10.6	Without Regrasp	AF+DM+RLF	AF	3.4	Apply Force
APB	16.2	With Regrasp	G2+APA	DM	4.2	Dwell Minimum
				RLF	3.0	Release Force

Disengage - D

Code	Fit	Case Description	E	D
D1	Loose	Very slight effort, blends with subsequent move up to approx. 2.5 cm	4.0	5.7
D2	Close	Normal effort, slight recoil up to approx. 12 cm	7.5	11.8
D3	Tight	Considerable effort, hand recoils markedly up to approx. 30 cm	22.9	34.7