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	8.5	up to 10 cm	**Foot Motion** pivoted at ankle
FMP	19.1		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
		less than 30 cm	**Side Step** lateral motion of the body Use **Reach** or **Move.**
SS-C1	17.0 0.2	30 cm each additional cm	Case I: complete when leading leg contacts floor.
SS-C2	34.1 0.4	30 cm each additional cm	Case II: lagging leg must contact floor before next motion can be made.
TBC 1	18.6		**Turn Body** 45 to 90 degrees Case I: complete when leading leg contacts floor.
TBC 2	37.2		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	D	E	O	W	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																									
	1NS, 2SS,2NS																									
Disengage **D**	1E, 1D																									
	2																									

■ = Easy to perform simultaneously.
■ = Can be performed simultaneously with practice
■ = Difficult to perform simultaneously even after long practice. Allow both times.

W: within the area of normal vision
O: outside the area of normal vision
E: easy to handle
D: difficult to handle

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

Eye Travel and Eye Focus

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 R-A	R-B	R-C R-D	R-E	mR-A R-Am	mR-B R-Bm	m(B)	Case Description
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	**B** Reach to single object in location which may vary slightly from cycle to cycle.
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	**C** Reach to object jumbled with other objects in a group so that search and select occur.
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	**D** Reach to very small object or where accurate grasp is required.
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	**E** Reach to indefinite location to get hand in position for body balance or next motion or out of way.
60	14.7	21.2	22.3	19.0	12.8	18.5	2.7	
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	

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	∅ > 12 up to ≤25 mm	**Pick-up Grasp:** interference with Grasp on bottom and one side of nearly cylindrical object.
G1C2	8.7	∅ ≥ 6 up to ≤ 12 mm	
G1C3	10.8	∅ < 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	> 25×25×25 mm	**Select Grasp**: object jumbled with other objects so that search and select occur.
G4B	9.1	≥ 6×6×3 up to ≤ 25×25×25 mm	
G4C	12.9	< 6×6×3 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 M-A	M-B	M-C	mM-B M-Bm	m(B)	with Force/Weight in daN/kg up to	Static Const. SC in TMU	Dynamic Factor	Case Description
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				
6	4.1	5.0	5.8	3.1	1.9	2	1.6	1.04	
8	5.1	5.9	6.9	3.7	2.2				
10	6.0	6.8	7.9	4.3	2.5	4	2.8	1.07	
12	6.9	7.7	8.8	4.9	2.8				
14	7.7	8.5	9.8	5.4	3.1	6	4.3	1.12	
16	8.3	9.2	10.5	6.0	3.2				
18	9.0	9.8	11.1	6.5	3.3	8	5.8	1.17	**B** Move object to approximate or indefinite location, Total Clearance > 25 mm
20	9.6	10.5	11.7	7.1	3.4				
22	10.2	11.2	12.4	7.6	3.6	10	7.3	1.22	
24	10.8	11.8	13.0	8.2	3.6				
26	11.5	12.3	13.7	8.7	3.6	12	8.8	1.27	
28	12.1	12.8	14.4	9.3	3.5				
30	12.7	13.3	15.1	9.8	3.5	14	10.4	1.32	
35	14.3	14.5	16.8	11.2	3.3				
40	15.8	15.6	18.5	12.6	3.0	16	11.9	1.36	**C** Move object to exact location, Total Clearance > 12 up to ≤ 25 mm
45	17.4	16.8	20.1	14.0	2.8				
50	19.0	18.0	21.8	15.4	2.6	18	13.4	1.41	
55	20.5	19.2	23.5	16.8	2.4				
60	22.1	20.4	25.2	18.2	2.2	20	14.9	1.46	
65	23.6	21.6	26.9	19.5	2.1				
70	25.2	22.8	28.6	20.9	1.9	22	16.4	1.51	
75	26.7	24.0	30.3	22.3	1.7				
80	28.3	25.2	32.0	23.7	1.5				

Position - P

Code	Class of Fit: Fit	Insertion	Tolerance	Symmetry	Handling E	Handling D
P1	Loose	No pressure required	> ± 1.5 up to ≤ ± 6.0 mm	S	5.6	11.2
				SS	9.1	14.7
				NS	10.4	16.0
P2	Close	Light pressure required	> ±0.4 up to ≤ ± 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 ≤ ± 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
APA	10.6	Without Regrasp	AF+DM+RLF
APB	16.2	With Regrasp	G2+APA

Code	TMU	Description
AF	3.4	Apply Force
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