Tabelle 5.22:

Calculation of the maximum recommended Power Fempf

| Fempf | = | Fmax (PP) | \* | P1 | \* | P2 | \* | T1 | \* | T2 | \* | T3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

This applies to:

| Abbreviations | Descriptions |
| --- | --- |
| Fmax | Maximum static action force of the whole body - or Finger-Hand-Systems |
| PP | Force-Percentile value(P15 for planning analysis; P50 for Ist-Analysis) |
| P1 | Dependent on the direction of the force. Influence of age. |
| P2 | Gender Influence(1,0 = Man; 0,5 = Wife or Man and Wife) |
| T1 | Frequency of the force application  |
| T2 | Biomechanical - Factor(muscular strain, asymmetric posture, a-/ ambidexterous force applied) |
| T3 | Physiology-Factor(frequency of the power exercises in unfavorable postures, Strength exercises within long-running unfavorable stance phase) |

 The maximum force value for the whole body -and Finger-Hand-Force are given in the table 5.23 and 5.4. They are a part of table 5.17 till 5.20. (See also appendix D and E).

Table 5.23:

Maximum force value of the whole body – Systems for Planning and 1st analysis

**Assembling-Specific Force Atlas**

F max All value in Newton [N]

 Whole body forces, ambidextrous, Men

(Correcting factor for women value 0,5)

The specified values are the results of the force vectors of 5 N rounded.

P15: 15. Men the force percentage (for Planning analysis)

P50: 50. Male Force percentage (for Ist-Analysis)

Upright

P15 P50

Bent

P15 P50

Over Head

P15 P50

+A 380 515 +A 320 485 +A 360 455

-A 405 530 -A 305 405 -A 410 520

+B 260 340 +B 315 420 +B 245 330

-B 380 505 -B 440 645 -B 395 525

+C 205 315 +C 225 335 +C 160 235

-C 170 280 -C 140 230 -C 150 235

stays - Upright h = 1 500 mm

Bent

h = 1 100 mm

Overhead

h = 1 700 mm

Table 5.24:

Maximum force value of the Finger-Hand-Systems for Planning- and Ist-Analysis

| Assembly Specific Force Atlas  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fmax | Finger-Hand-Force Men(Correction factor for women: 0,5) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Force gradient | Ø 40 mm |  |  |  | Clearance 15 mm |  | Clearance15 mm |  | Cross Width e 65 mm |  |  |  |  |  | Cross Width e 51 mm |  |
| Posture | Sit en | Stand | Sit en | Stand | Sit en | Stand | Sit en | Stand | Sit en | Stand | Sit en | Stand | Sit en | Stand | Sit en | Stand |
| 15. Percentile | 255 | 230 | 100 | 125 | 80 |  | 70 |  | 245 |  | 175 | 335 | 65 |  | 85 |  |
| 50. Percentile | 365 | 340 | 145 | 170 | 105 |  | 90 |  | 340 |  | 260 | 450 | 85 |  | 115 |  |

For Planning Analysis the 15. Force percentile of the table 5.23 and 5.24 should be used; for the 1st Analysis. The 50 percentile, possibly taking into account the gender and the “training unit”. We can find note on the age influence (Factor P1) in table 5.15 (Page 188). The activity related parameter (T1 till T3) we can find

 in table 5.10 till 5.12 and 5.25. The frequency as well as the biomechanical and

 physiological correction factors are taken into consideration in the activity related parameters.

For the planning analysis the frequency according to EN 1005-3 is taken into account. For the first analysis the traditional German methods (Siemens and derivatives according to Burandt und Schultetus as well as VDI, REFA and Bullinger) are taken into account. For the assembly specific Force Atlas the Schultetus method is selected[18], which distinguishes between the two difficult and one-sided dynamic force exercises. And the more dynamic frequency influence take into account the method defined by Siemens and Burandt (and Bullinger) (see also section 5.15). Also according to EN 1005-3, the force applied and the exertion duration should be abandoned in > 3 seconds, as he describes here in Table 5.24 a static rather than a dynamic force exercise. Table 5.25 gives an overview taking into account the frequency of force exercises in the different methods.

Table 5.25:

Taking into account the frequency of the force exercise in the method according to EN 1005-3 and Schultetus

| Frequency per Minute | 0 | 0,5 | 0,67 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Frequency per 8h |  | 240 | 322 | 480 | 960 | 1440 | 1920 | 2400 | 2880 | 3360 | 3840 | 4320 | 4800 | 5280 | 5760 |  |
| T1 according to Schultetus (Finger‐Hand‐Force) | 0,80 | 0,75 | 0,74 | 0,72 | 0,67 | 0,66 | 0,63 | 0,61 | 0,58 | 0,57 | 0,55 | 0,54 | 0,52 | 0,51 | 0,50 |  |
| T1 according to Schultetus (Whole body force) | 0,80 | 0,68 | 0,67 | 0,64 | 0,59 | 0,54 | 0,50 | 0,45 | 0,41 | 0,37 | 0,34 | 0,30 | 0,27 | 0,24 | 0,21 |  |
| T1 according to EN 1005‐3; t\*) ≤ 3 sec | 0,80 | 0,64 |  |  | 0,40 |  |  |  |  |  |  |  |  |  |  |  |

\*) t = Tension durarion of the force exercise

A description of the “Biomechanical factors”, in which the influence of asymmetry, one hand versus ambidextrous force exercise and inner muscular tension is taken into view, we can find in the section 5.2.1 (Page 182 ff.). The same applies for the “ Physiological factor” in which the usual force exercise is carried out in which unfavorable postures for the body are adopted and the force actions is done in phases which are long-drawn- out and are unfavorable to the body.

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