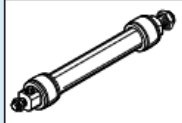
# Muscle and Force Compliation

| Function | Version | I.D. [mm] | Nominal length [mm] | Lifting force [N] |
|---|---|---|---|---|
| Single-acting, pulling | Fluidic Muscle with press-fitted connection | | | |
| |  | 5 | 30 ... 1000 | 0 ... 140 |
| | | 10 | 40 ... 9000 | 0 ... 630 |
| | | 20 | 60 ... 9000 | 0 ... 1500 |
| | | 40 | 120 ... 9000 | 0 ... 6000 |

| I.D. [mm] | Max. permissible pretensioning | Max. permissible contraction | Operating pressure [bar] | → Page/Internet |
|---|---|---|---|---|
| Fluidic Muscle with press-fitted connections | | | | |
| 5 | 1% of nominal length | 20% of nominal length | 0 ... 6 | 11 |
| 10 | 3% of nominal length | 25% of nominal length | 0 ... 8 | |
| 20 | 4% of nominal length | 25% of nominal length | 0 ... 6 | |
| 40 | 5% of nominal length | 25% of nominal length | 0 ... 6 | |

*Figure 1: Festo Air Muscle Specifications*

*Table 1: Body Segments by Weight*

| Segment | Sex | Age | Weight (grams) |
|---|---|---|---|
| **Right Upper Arm** | F | 20 | 1525.6 |
| **Right Upper Arm** | M | 40 | 2560.1 |
| **Right Upper Arm** | M | 68 | 1420.7 |
| **Left Upper Arm** | M | 30 | 1484.5 |
| **Left Upper Arm** | M | 30 | 1411.3 |
| **Left Upper Arm** | M | 68 | 1239.1 |
| **Right Forearm** | F | 20 | 725.6 |
| **Right Forearm** | M | 40 | 1389.7 |
| **Right Forearm** | M | 30 | 821.0 |
| **Right Forearm** | M | 68 | 767.2 |
| **Left Forearm** | M | 68 | 765.3 |
| **Left Forearm** | M | 30 | 770.1 |
| **Right Hand** | M | 68 | 447.1 |
| **Right Hand** | M | 40 | 525.1 |
| **Right Hand** | F | 20 | 316.8 |
| **Right Hand** | M | 30 | 393.2 |
| **Left Hand** | M | 68 | 443.9 |
| **Left Hand** | M | 30 | 374.0 |

| Variable | Equation/Constant |
|---|---|
| **Torque ($\tau$)** | $F * r * \sin\theta$ |
| **Lifting force (F)** | $F = \frac{f * r1}{r2}$ |

| | |
|---|---|
| | where f is the input force, r1 is the radius of the wheel, and r2 is the length of the arm |

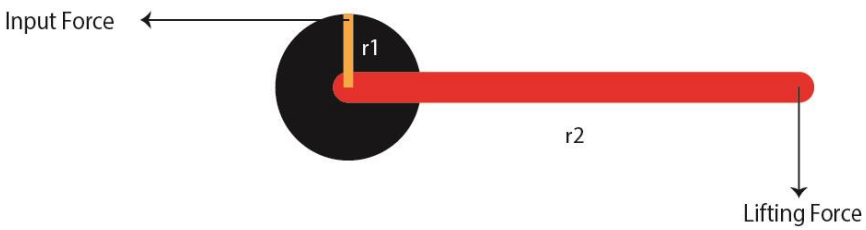



*Figure 2: Force Diagram*