

# Forging Program

## BILLETS

(product used for further hot forming)

- Round:  $\varnothing$  90-1000 mm
- Square: sq. 90-900 mm
- Length: 2000-10000 mm

## FORGED BARS

(acc.to DIN 7527/6 standard)

- Round:  $\varnothing$  90-1050 mm
- Square bars: 80-950 mm
- Flat bars: from 90x60 mm to 1800x500 mm or 1200x700 mm or 1500x600 mm
- Length: 2000 - 10 000 mm
- Max. diameter and weight:**
- Structural steel:  $\varnothing$  1050 mm
- Tool steel:  $\varnothing$  950 mm
- Stainless steel:  $\varnothing$  850 mm
- Max. forging weight: 29 500 kg
- Max. weight of ESR forging: 24 000 kg

### TOLERANCES AND ADDITIONS - DIN 7527/BL.6

| FINISH SIZE<br>b |       | TOOL STEEL             |                                     |                             |                                     | STRUCTIAL STEEL        |                                     |                             |                                     | ALLOYED AND UNALLOYED STEEL |                                     |                             |                                     |
|------------------|-------|------------------------|-------------------------------------|-----------------------------|-------------------------------------|------------------------|-------------------------------------|-----------------------------|-------------------------------------|-----------------------------|-------------------------------------|-----------------------------|-------------------------------------|
|                  |       | Lenght up to 3500 mm   |                                     | Lenght over 3500 to 6000 mm |                                     | Lenght up to 3500 mm   |                                     | Lenght over 3500 to 6000 mm |                                     | Lenght up to 3500 mm        |                                     | Lenght over 3500 to 6000 mm |                                     |
|                  |       | Section                | Lenght                              | Section                     | Lenght                              | Section                | Lenght                              | Section                     | Lenght                              | Section                     | Lenght                              | Section                     | Lenght                              |
| OVER             | UP TO | Additional tolerance Z | Additional tolerance Z <sub>1</sub> | Additional tolerance Z      | Additional tolerance Z <sub>1</sub> | Additional tolerance Z | Additional tolerance Z <sub>1</sub> | Additional tolerance Z      | Additional tolerance Z <sub>1</sub> | Additional tolerance Z      | Additional tolerance Z <sub>1</sub> | Additional tolerance Z      | Additional tolerance Z <sub>1</sub> |
| 16               | 25    | 2,6 ±0,6               | 9 <sup>+10</sup> / <sub>-7</sub>    | / /                         | / /                                 | / /                    | / /                                 | / /                         | / /                                 | / /                         | / /                                 | / /                         | / /                                 |
| 25               | 40    | 3 ±0,7                 | 9 <sup>+10</sup> / <sub>-8</sub>    | / /                         | / /                                 | 5 ±0,9                 | 11 <sup>+10</sup> / <sub>-8</sub>   | 8 ±2,6                      | 16 <sup>+10</sup> / <sub>-8</sub>   | / /                         | / /                                 | / /                         | / /                                 |
| 40               | 63    | 4 ±0,9                 | 10 <sup>+11</sup> / <sub>-8</sub>   | 6 ±1,4                      | 14 <sup>+11</sup> / <sub>-9</sub>   | 6 ±1,1                 | 12 <sup>+11</sup> / <sub>-8</sub>   | 9 ±2,9                      | 17 <sup>+11</sup> / <sub>-8</sub>   | 9 ±2,8                      | 13 <sup>+13</sup> / <sub>-9</sub>   | / /                         | / /                                 |
| 63               | 80    | 5 ±1,1                 | 11 <sup>+12</sup> / <sub>-9</sub>   | 7 ±1,6                      | 15 <sup>+12</sup> / <sub>-10</sub>  | 7 ±1,4                 | 14 <sup>+12</sup> / <sub>-9</sub>   | 11 ±3,3                     | 18 <sup>+12</sup> / <sub>-9</sub>   | 11 ±3,1                     | 15 <sup>+14</sup> / <sub>-9</sub>   | 14 ±4                       | 20 <sup>+18</sup> / <sub>-12</sub>  |
| 80               | 100   | 6 ±1,3                 | 12 <sup>+13</sup> / <sub>-9</sub>   | 8 ±1,9                      | 16 <sup>+13</sup> / <sub>-10</sub>  | 8 ±1,7                 | 15 <sup>+13</sup> / <sub>-9</sub>   | 12 ±3,6                     | 20 <sup>+13</sup> / <sub>-9</sub>   | 12 ±3,4                     | 16 <sup>+16</sup> / <sub>-10</sub>  | 15 ±4,4                     | 21 <sup>+20</sup> / <sub>-12</sub>  |
| 100              | 125   | 7 ±1,5                 | 14 <sup>+14</sup> / <sub>-11</sub>  | 10 ±2,1                     | 17 <sup>+14</sup> / <sub>-10</sub>  | 10 ±2                  | 16 <sup>+14</sup> / <sub>-11</sub>  | 13 ±4                       | 21 <sup>+14</sup> / <sub>-11</sub>  | 14 ±3,8                     | 17 <sup>+17</sup> / <sub>-10</sub>  | 17 ±4,8                     | 22 <sup>+21</sup> / <sub>-13</sub>  |
| 125              | 160   | 9 ±1,8                 | 15 <sup>+14</sup> / <sub>-11</sub>  | 12 ±2,5                     | 19 <sup>+15</sup> / <sub>-12</sub>  | 12 ±2,3                | 18 <sup>+14</sup> / <sub>-11</sub>  | 15 ±4,6                     | 22 <sup>+14</sup> / <sub>-11</sub>  | 16 ±4,2                     | 19 <sup>+18</sup> / <sub>-11</sub>  | 19 ±5,4                     | 24 <sup>+22</sup> / <sub>-14</sub>  |
| 160              | 200   | 11 ±2,2                | 17 <sup>+14</sup> / <sub>-14</sub>  | 14 ±2,9                     | 21 <sup>+16</sup> / <sub>-14</sub>  | 14 ±2,8                | 20 <sup>+14</sup> / <sub>-14</sub>  | 18 ±5,2                     | 25 <sup>+14</sup> / <sub>-14</sub>  | 18 ±4,9                     | 22 <sup>+20</sup> / <sub>-13</sub>  | 21 ±6,3                     | 26 <sup>+22</sup> / <sub>-15</sub>  |
| 200              | 250   | 13 ±2,6                | 20 <sup>+16</sup> / <sub>-16</sub>  | 17 ±3,5                     | 23 <sup>+17</sup> / <sub>-17</sub>  | 17 ±3,4                | 23 <sup>+16</sup> / <sub>-16</sub>  | 21 ±6                       | 27 <sup>+16</sup> / <sub>-16</sub>  | 21 ±5,6                     | 24 <sup>+22</sup> / <sub>-14</sub>  | 24 ±7,2                     | 29 <sup>+26</sup> / <sub>-17</sub>  |
| 250              | 315   | 16 ±3,2                | 23 <sup>+18</sup> / <sub>-18</sub>  | 21 ±4,2                     | 26 <sup>+19</sup> / <sub>-19</sub>  | 21 ±4,2                | 26 <sup>+18</sup> / <sub>-18</sub>  | 24 ±7                       | 30 <sup>+18</sup> / <sub>-18</sub>  | 25 ±6,5                     | 28 <sup>+26</sup> / <sub>-15</sub>  | 28 ±8,4                     | 32 <sup>+29</sup> / <sub>-19</sub>  |
| 315              | 400   | 19 ±4                  | 27 <sup>+21</sup> / <sub>-21</sub>  | 26 ±5                       | 30 <sup>+22</sup> / <sub>-22</sub>  | 26 ±5,1                | 30 <sup>+21</sup> / <sub>-21</sub>  | 29 ±8,4                     | 35 <sup>+21</sup> / <sub>-21</sub>  | 30 ±7,7                     | 32 <sup>+28</sup> / <sub>-18</sub>  | 33 ±10                      | 36 <sup>+33</sup> / <sub>-22</sub>  |
| 400              | 500   | 24 ±4,9                | 32 <sup>+25</sup> / <sub>-25</sub>  | 32 ±6,2                     | 35 <sup>+26</sup> / <sub>-26</sub>  | 32 ±6,3                | 36 <sup>+25</sup> / <sub>-25</sub>  | 35 ±10                      | 40 <sup>+25</sup> / <sub>-25</sub>  | 36 ±9,2                     | 38 <sup>+33</sup> / <sub>-22</sub>  | 40 ±11,9                    | 42 <sup>+38</sup> / <sub>-25</sub>  |
| 500              | 630   | 30 ±6                  | 38 <sup>+29</sup> / <sub>-29</sub>  | 39 ±7,5                     | 41 <sup>+31</sup> / <sub>-31</sub>  | 39 ±7,8                | 42 <sup>+29</sup> / <sub>-29</sub>  | 42 ±12                      | 47 <sup>+29</sup> / <sub>-29</sub>  | 44 ±11                      | 45 <sup>+39</sup> / <sub>-25</sub>  | 48 ±14,3                    | 49 <sup>+46</sup> / <sub>-29</sub>  |
| 630              | 800   | 37 ±7,4                | 47 <sup>+35</sup> / <sub>-35</sub>  | 49 ±9,4                     | 49 <sup>+36</sup> / <sub>-36</sub>  | 49 ±9,8                | 52 <sup>+35</sup> / <sub>-53</sub>  | 52 ±14,9                    | 55 <sup>+35</sup> / <sub>-53</sub>  | 54 ±13,5                    | 55 <sup>+45</sup> / <sub>-30</sub>  | 58 ±17,4                    | 58 <sup>+51</sup> / <sub>-34</sub>  |
| 800              | 1000  | 46 ±9,3                | 57 <sup>+42</sup> / <sub>-42</sub>  | 61 ±11,6                    | 53 <sup>+44</sup> / <sub>-44</sub>  | 61 ±12,1               | 63 <sup>+42</sup> / <sub>-42</sub>  | 64 ±18,1                    | 66 <sup>+42</sup> / <sub>-42</sub>  | 66 ±16,2                    | 67 <sup>+55</sup> / <sub>-36</sub>  | 71 ±21,3                    | 69 <sup>+61</sup> / <sub>-40</sub>  |

## Forging Program – FORGED BARS – GROUPS OF STEEL GRADES

### GROUP 1: Unalloyed and alloyed structural steels:

- Round: max.  $\varnothing$  1050 mm
- Square: max. sq. 950 mm
- Flat: max. 1800 x 500 mm, 1500 x 600 mm, 1200 x 700 mm (max. ratio width : thickness is 11 : 1)  
Larger dimensions, as agreed with customer.

### GROUP 2: Low-alloyed tool steels:

- Round: max.  $\varnothing$  950 mm
- Square: max. sq. 850 mm
- Flat: max. 1600 x 550 mm, 1200 x 700 mm (max. ratio width : thickness is 11 : 1)  
Larger dimensions, as agreed with customer.

### GROUP 3: High-alloyed cold work tool steels:

- Round: max.  $\varnothing$  650 mm
- Square: max. sq. 550 mm
- Flat: max. 1000 x 300 mm, 800 x 400 mm, 1150 x 250 mm (max. ratio width : thickness is 8 : 1)

### GROUP 4: High-alloyed hot work tool steels:

- Round: max.  $\varnothing$  950 mm
- Square: max. sq. 850 mm
- Flat: max. 1600 x 450 mm, 1200 x 600 mm (max. ratio width : thickness is 10 : 1)

### GROUP 5: High-speed steels:

- Round: max.  $\varnothing$  270 mm
- Square: max. sq. 240 mm
- Flat: max. 300 x 250 mm (max. ratio width : thickness is 4 : 1)

### GROUP 6: Special steels:

- Round: max.  $\varnothing$  800 mm
- Square: max. sq. 750 mm
- Flat: max. 1500 x 400 mm, 1200 x 500 mm, 1000 x 550 mm (max. ratio width : thickness is 8 : 1)  
Larger dimensions, as agreed with customer.

### FORGINGS

- Max. dia.:  $\varnothing$  1050 mm
- Max. length: 10 000 mm
- Max. weight of a forging: 27 000 kg
  - Conventional: 29 500 kg
  - ESR: 24 000 kg
  - Machined: 12 000 kg

### DISCS

- Max. external dia.:  $\varnothing$  2500 mm
- Max. borehole dia.:  $\varnothing$  1800 mm
- Max. weight: 28 000 kg

### BUSHES

- Max. external dia.:  $\varnothing$  950 mm
- Max. borehole dia.:  $\varnothing$  700 mm
- Min. external dia.:  $\varnothing$  200 mm
- Max. length: 1900 mm
- Borehole diameter has to be at least 100 mm smaller than diameter of the final product borehole.
- Addition per length is 150 mm.
- Tolerance per length is 40–50 mm.

### MACHINING

- Peeled:  $\varnothing$  85-205 mm
- Turned :  $\varnothing$  206-1150 mm, length: 10 m, weight: 30 000 kg
- Milled : max. width: 1200 mm  
max. thickness: 1040 mm  
length: 6 m  
weight: 10 000 kg
- Forgings can also be subjected to rough machining.