# CLAIMS

1. A steel for cold working consisting of in weight % (wt.%):

| | |
|---|---|
| C | 2.2 - 2.4 |
| Si | 0.1 - 0.55 |
| Mn | 0.2 – 0.8 |
| Cr | 4.1 – 5.1 |
| Mo | 3.1 – 4.5 |
| V | 7.2 – 8.5 |
| optionally one or more of | |
| N | 0.02 – 0.15 |
| P | ≤ 0.05 |
| S | ≤ 0.5 |
| Cu | ≤ 3 |
| Co | ≤ 5 |
| Ni | ≤ 3 |
| W | ≤ 2 |
| Nb | ≤ 2 |
| Al | ≤ 0.1 |
| Ti | ≤ 0.1 |
| Zr | ≤ 0.1 |
| Ta | ≤ 0.1 |
| B | ≤ 0.6 |
| Be | ≤ 0.2 |
| Bi | ≤ 0.2 |
| Se | ≤ 0.3 |
| Ca | 0.0003 – 0.009 |
| O | 0.003 - 0.01 |
| Mg | ≤ 0.01 |
| REM | ≤ 0.2 |

balance Fe apart from impurities.

2. A steel according to claim 1 fulfilling at least one of the following requirements:

| | |
|---|---|
| C | 2.25 - 2.35 |
| Si | 0.2 - 0.5 |
| Mn | 0.2 – 0.6 |
| Cr | 4.5 – 5.0 |
| Mo | 3.5 – 3.7 |
| V | 7.7 – 8.3 |
| N | 0.02 – 0.08 |
| P | ≤ 0.03 |
| S | ≤ 0.03 |
| Cu | 0.02 - 2 |
| Co | ≤ 1 |
| Ni | ≤ 1 |
| W | ≤ 0.3 |
| Nb | ≤ 0.5 |
| Al | ≤ 0.06 |
| Ti | ≤ 0.01 |
| Zr | ≤ 0.01 |
| Ta | ≤ 0.01 |
| B | ≤ 0.01 |
| Be | ≤ 0.02 |
| Se | ≤ 0.03 |
| Mg | ≤ 0.001 |

3. A steel according to claim 1 or 2 fulfilling at least one of the following requirements:

| | |
|---|---|
| C | 2.26 - 2.34 |
| Si | 0.22 - 0.52 |
| Mn | 0.22 – 0.52 |
| Cr | 4.58 – 4.98 |
| Mo | 3.51 – 3.69 |

| | |
|---|---|
| V | 7.75 – 8.25 |
| Cu | ≤ 0.5 |
| Ni | ≤ 0.3 |

4. A steel according to claim 1, comprising:

| | |
|---|---|
| C | 2.2 - 2.4 |
| Si | 0.1 - 0.55 |
| Mn | 0.2 – 0.8 |
| Cr | 4.1 – 5.1 |
| Mo | 3.1 – 4.5 |
| V | 7.2 – 8.5 |
| N | 0.02 – 0.08 |

balance Fe apart from impurities.

5. A steel according to any of the preceding claims fulfilling at least one of the following requirements:

| | |
|---|---|
| C | 2.26 - 2.34 |
| Si | 0.22 - 0.52 |
| Mn | 0.22 – 0.52 |
| Cr | 4.58 – 4.98 |
| Mo | 3.51 – 3.69 |
| V | 7.75 – 8.25 |
| N | 0.03 - 0.06 |

6. A steel according to any of the preceding claims fulfilling all of the following requirements:

| | |
|---|---|
| C | 2.26 - 2.34 |
| Si | 0.22 - 0.52 |
| Mn | 0.22 – 0.52 |
| Cr | 4.58 – 4.98 |
| Mo | 3.51 – 3.69 |

| | |
|---|---|
| V | 7.75 – 8.25 |

7. A steel according to any of the preceding claims, wherein the content of Mo and V are adjusted to fulfil the requirement:

| | |
|---|---|
| Mo/V | 0.4 – 0.5. |

8. A steel according to any of the preceding claims having an unnotched impact toughness in the LT direction at 25 °C of 30 - 80 J at a hardness of 60 HRC in the hardened and tempered condition.

9. A steel according to any of the preceding claims having a compression yield strength of at least 2400 MPa at 60 HRC.

10. A steel according to claim 7, wherein the content of Mo and V are adjusted to fulfil the requirement:

| | |
|---|---|
| Mo/V | 0.42 – 0.48. |

11. A steel according to claim 8 having an unnotched impact toughness in the LT direction at 25 °C of 35-55 J, at a hardness of 60 HRC in the hardened and tempered condition.

## CLAIMS

1. A powder metallurgy produced tool steel for cold working consisting of in weight % (wt.%):

| | |
|---|---|
| C | 2.2 - 2.4 |
| Si | 0.1 - 0.55 |
| Mn | 0.2 – 0.8 |
| Cr | 4.1 – 5.1 |
| Mo | 3.1 – 4.5 |
| V | 7.2 – 8.5 |
| optionally one or more of | |
| N | 0.02 – 0.15 |
| P | ≤ 0.05 |
| S | ≤ 0.5 |
| Cu | ≤ 3 |
| Co | ≤ 5 |
| Ni | ≤ 3 |
| W | ≤ 2 |
| Nb | ≤ 2 |
| Al | ≤ 0.1 |
| Ti | ≤ 0.1 |
| Zr | ≤ 0.1 |
| Ta | ≤ 0.1 |
| B | ≤ 0.6 |
| Be | ≤ 0.2 |
| Bi | ≤ 0.2 |
| Se | ≤ 0.3 |
| Ca | 0.0003 – 0.009 |
| O | 0.003 – 0.01 |
| Mg | ≤ 0.01 |
| REM | ≤ 0.2 |

balance Fe apart from impurities.

2. A steel according to claim 1 fulfilling at least one of the following requirements:

| | |
|---|---|
| C | 2.25 - 2.35 |
| Si | 0.2 - 0.5 |
| Mn | 0.2 – 0.6 |
| Cr | 4.5 – 5.0 |
| Mo | 3.5 – 3.7 |
| V | 7.7 – 8.3 |
| N | 0.02 – 0.08 |
| P | ≤ 0.03 |
| S | ≤ 0.03 |
| Cu | 0.02 - 2 |
| Co | ≤ 1 |
| Ni | ≤ 1 |
| W | ≤ 0.3 |
| Nb | ≤ 0.5 |
| Al | ≤ 0.06 |
| Ti | ≤ 0.01 |
| Zr | ≤ 0.01 |
| Ta | ≤ 0.01 |
| B | ≤ 0.01 |
| Be | ≤ 0.02 |
| Se | ≤ 0.03 |
| Mg | ≤ 0.001 |

3. A steel according to claim 1 or 2 fulfilling at least one of the following requirements:

| | |
|---|---|
| C | 2.26 - 2.34 |
| Si | 0.22 - 0.52 |
| Mn | 0.22 – 0.52 |
| Cr | 4.58 – 4.98 |

| | |
|---|---|
| Mo | 3.51 – 3.69 |
| V | 7.75 – 8.25 |
| Cu | ≤ 0.5 |
| Ni | ≤ 0.3 |

4. A steel according to claim 1, comprising:

| | |
|---|---|
| C | 2.2 - 2.4 |
| Si | 0.1 - 0.55 |
| Mn | 0.2 – 0.8 |
| Cr | 4.1 – 5.1 |
| Mo | 3.1 – 4.5 |
| V | 7.2 – 8.5 |
| N | 0.02 – 0.08 |

balance Fe apart from impurities.

5. A steel according to any of the preceding claims fulfilling at least one of the following requirements:

| | |
|---|---|
| C | 2.26 - 2.34 |
| Si | 0.22 - 0.52 |
| Mn | 0.22 – 0.52 |
| Cr | 4.58 – 4.98 |
| Mo | 3.51 – 3.69 |
| V | 7.75 – 8.25 |
| N | 0.03 - 0.06 |

6. A steel according to any of the preceding claims fulfilling all of the following requirements:

| | |
|---|---|
| C | 2.26 - 2.34 |
| Si | 0.22 - 0.52 |
| Mn | 0.22 – 0.52 |
| Cr | 4.58 – 4.98 |

| | |
|---|---|
| Mo | 3.51 – 3.69 |
| V | 7.75 – 8.25 |

7. A steel according to any of the preceding claims, wherein the content of Mo and V are adjusted to fulfil the requirement:

| | |
|---|---|
| Mo/V | 0.4 – 0.5. |

8. A steel according to any of the preceding claims having an unnotched impact toughness in the LT direction at 25 °C of 30 - 80 J at a hardness of 60 HRC in the hardened and tempered condition.

9. A steel according to any of the preceding claims having a compression yield strength of at least 2400 MPa at 60 HRC.

10. A steel according to claim 7, wherein the content of Mo and V are adjusted to fulfil the requirement:

| | |
|---|---|
| Mo/V | 0.42 – 0.48. |

11. A steel according to claim 8 having an unnotched impact toughness in the LT direction at 25 °C of 35-55 J, at a hardness of 60 HRC in the hardened and tempered condition.