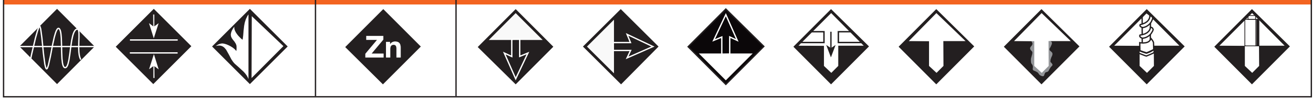
# DYNABOLT

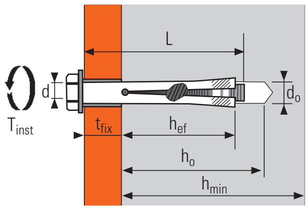
## Zinc Coated Steel



### Sleeve Type Expansion Anchor

| Performance | Material | Installation |
|---|---|---|



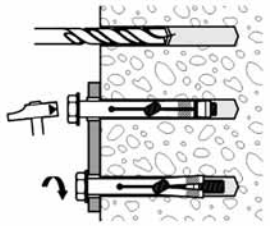




Pre-assembled anchor

MATERIAL

Bolt class 6.8

INSTALLATION



## Technical Data

| DYNABOLT HEX NUT | Minimum anchor depth: Min anchor depth (mm) $h_{ef,min}$ | Max thick of fixture (mm) $t_{fix}$ | Min drill depth (mm) $h_o$ | Min thick of base material (mm) $h_{min}$ | Maximum anchor depth: Max anchor depth (mm) $h_{ef,max}$ | Max thick of fixture (mm) $t_{fix}$ | Min drill depth (mm) $h_o$ | Min thick of base material (mm) $h_{min}$ | Ø Thread (mm) d | Ø Drill bit (mm) $d_o$ | Total anchor length (mm) L | Max tighten torque (Nm) $T_{inst}$ | Ramset power tool code | Drill bit type-size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DP06040 | 25 | 10 | 45 | 55 | - | - | - | - | M4.5 | 6 | 40 | 7 | DD527 | R3 PLUS-6 |
| DP06060 | | 30 | | | - | - | - | - | | | 60 | | | |
| DP08040 | 26 | 8 | 45 | 55 | 30 | 5 | 50 | 65 | M6 | 8 | 40 | 9 | DD527 | R3 PLUS-8 |
| DP08065 | - | - | - | - | | 30 | | | | | 65 | | | |
| DP08090 | - | - | - | - | | 55 | | | | | 90 | | | |
| DP10040 | 28 | 7 | 50 | 65 | - | - | - | - | M8 | 10 | 40 | 20 | DD527 | R3 PLUS-10 |
| DP10050 | - | - | - | - | 34 | 10 | 50 | 65 | | | 50 | | | |
| DP10075 | - | - | - | - | 34 | 35 | 65 | 80 | | | 75 | | | |
| DP10100 | - | - | - | - | | 60 | | | | | 100 | | | |
| DP10125 | - | - | - | - | | 85 | | | | | 125 | | | |
| DP12060 | 35 | 12 | 65 | 80 | - | - | - | - | M10 | 12 | 60 | 40 | DD527 | R3 PLUS-12 |
| DP12070 | - | - | - | - | 44 | 20 | 65 | 95 | | | 70 | | | |
| DP12100 | - | - | - | - | | 50 | | | | | 100 | | | |
| DP12125 | - | - | - | - | | 75 | | | | | 125 | | | |
| DP16065 | 39 | 12 | 65 | 95 | 46 | 14 | 70 | 100 | M12 | 16 | 65 | 70 | DD543 | R3 PLUS-16 |
| DP16110 | - | - | - | - | | 49 | | | | | 110 | | | |
| DP16140 | - | - | - | - | | 83 | | | | | 140 | | | |
| DP20080 | 50 | 20 | 70 | 100 | - | - | - | - | M16 | 20 | 80 | 150 | DD543 | R3 PLUS-20 |
| DP20115 | | 52 | | | - | - | - | - | | | 115 | | | |
| DP20160 | | 96 | | | - | - | - | - | | | 160 | | | |

## Anchor Mechanical Properties

| THREADED PART | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| $f_{uk}$ (N/mm²) Min. tensile strength | 600 | 600 | 600 | 600 | 600 | 600 |
| $f_{yk}$ (N/mm²) Yield strength | 480 | 480 | 480 | 480 | 480 | 480 |
| $W_{el}$ (mm³) Elastic section modulus | 5.4 | 12.7 | 31.2 | 62.3 | 109.2 | 277.5 |
| $M^0_{Rk,s}$ (Nm) Characteristic bending moment | 3.8 | 9.2 | 22.5 | 44.8 | 72.0 | 166.0 |
| **M** (Nm) Recommended bending moment | 1.9 | 4.5 | 11.2 | 22.4 | 36.0 | 83.0 |



## Ultimate Loads ($N_{Ru,m}$, $V_{Ru,m}$) / Characteristic Loads ($N_{Rk}$, $V_{Rk}$) in kN

**TENSILE** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| **Minimum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | 25 | 26 | 28 | 35 | 39 | 50 |
| $N_{Ru,m}$ (kN) | 4.7 | 6.7 | 8.9 | 13.4 | 15.6 | 22.7 |
| $N_{Rk}$ (kN) | 3.5 | 5.1 | 6.7 | 10.1 | 11.8 | 17.1 |
| **Maximum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | - | 30 | 34 | 44 | 46 | - |
| $N_{Ru,m}$ (kN) | - | 8.4 | 11.9 | 18.9 | 20.0 | - |
| $N_{Rk}$ (kN) | - | 6.3 | 8.9 | 14.2 | 15.1 | - |

**SHEAR** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| $V_{Ru,m}$ (kN) | 3.5 | 8.0 | 14.5 | 23.0 | 33.4 | 62.0 |
| $V_{Rk}$ (kN) | 2.9 | 6.7 | 12.1 | 19.1 | 27.8 | 51.7 |

## Design Loads ($N_{Rd}$, $V_{Rd}$) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}}{\gamma_{Mc,N}}$$

$$V_{Rd} = \frac{V_{Rk}}{\gamma_{Ms,V}}$$

**TENSILE** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| **Minimum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | 25 | 26 | 28 | 35 | 39 | 50 |
| $N_{Rd}$ (kN) | 1.7 | 2.4 | 3.2 | 4.8 | 5.6 | 8.1 |
| **Maximum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | - | 30 | 34 | 44 | 46 | - |
| $N_{Rd}$ (kN) | - | 3.0 | 4.2 | 6.8 | 7.2 | - |

$\gamma_{Mc,N} = 2.1$

**SHEAR** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| $V_{Rd}$ (kN) | 1.8 | 4.2 | 7.6 | 12.0 | 17.4 | 32.3 |

$\gamma_{Ms,V} = 1.6$

## Recommended Loads ($N_{rec}$, $V_{rec}$) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}}{\gamma_{Mc,N} \cdot \gamma_F}$$

$$V_{rec} = \frac{V_{Rk}}{\gamma_{Ms,V} \cdot \gamma_F}$$

**TENSILE** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| **Minimum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | 25 | 26 | 28 | 35 | 39 | 50 |
| $N_{rec}$ (kN) | 1.2 | 1.7 | 2.3 | 3.4 | 4.0 | 5.8 |
| **Maximum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | - | 30 | 34 | 44 | 46 | - |
| $N_{rec}$ (kN) | - | 2.1 | 3.0 | 4.8 | 5.1 | - |

$\gamma_F = 1.4$

$\gamma_{Mc,N} = 2.1$

**SHEAR** @ Concrete strength 30 N/mm²

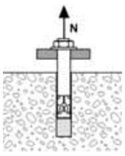
| Anchor size | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| $V_{rec}$ (kN) | 1.3 | 3.0 | 5.4 | 8.5 | 12.4 | 23.1 |

$\gamma_F = 1.4$

$\gamma_{Ms,V} = 1.6$

## CC-Method

### TENSILE in kN

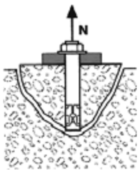



Pull-out resistance
Concrete strength 30 N/mm²

$N_{Rd,p} = N^0_{Rd,p} \cdot f_B \cdot f_T$

| $N^0_{Rd,p}$ Design pull-out resistance | | | | | | |
|---|---|---|---|---|---|---|
| **Anchor size** | **M4.5** | **M6** | **M8** | **M10** | **M12** | **M16** |
| **Minimum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | 25 | 26 | 28 | 35 | 39 | 50 |
| $N^0_{Rd,p}$ (kN) | 1.7 | 2.4 | 3.2 | 4.8 | 5.6 | 8.1 |
| **Maximum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | - | 30 | 34 | 44 | 46 | - |
| $N^0_{Rd,p}$ (kN) | - | 3.0 | 4.3 | 6.7 | 7.2 | - |

$\gamma_{Mc,N} = 2.1$

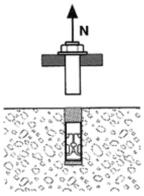



Concrete cone resistance
Concrete strength 30 N/mm²

$N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_T \cdot \Psi_s \cdot \Psi_{c,N}$

| $N^0_{Rd,c}$ Design cone resistance | | | | | | |
|---|---|---|---|---|---|---|
| **Anchor size** | **M4.5** | **M6** | **M8** | **M10** | **M12** | **M16** |
| **Minimum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | 25 | 26 | 28 | 35 | 39 | 50 |
| $N^0_{Rd,c}$ (kN) | 3.3 | 3.5 | 4.0 | 5.5 | 6.4 | 9.4 |
| **Maximum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | - | 30 | 34 | 44 | 46 | - |
| $N^0_{Rd,c}$ (kN) | - | 4.3 | 5.3 | 7.7 | 8.3 | - |

$\gamma_{Mc,N} = 2.1$

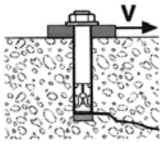



Steel resistance

| $N_{Rd,s}$ Steel design tensile resistance | | | | | | |
|---|---|---|---|---|---|---|
| **Anchor size** | **M4.5** | **M6** | **M8** | **M10** | **M12** | **M16** |
| $N_{Rd,s}$ (kN) | 2.7 | 6.3 | 11.5 | 18.1 | 26.4 | - |

$\gamma_{Ms,N} = 2.0$

### SHEAR in kN

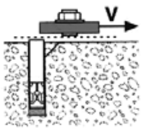



Concrete edge resistance
Concrete strength 30 N/mm²

$V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_{\beta,V} \cdot \Psi_{s\text{-}c,V}$

| $V^0_{Rd,c}$ Design concrete edge resistance at a minimum edge distance ($c_{min}$) | | | | | | |
|---|---|---|---|---|---|---|
| **Anchor size** | **M4.5** | **M6** | **M8** | **M10** | **M12** | **M16** |
| **Minimum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | 25 | 26 | 28 | 35 | 39 | 50 |
| $c_{min}$ | 45 | 45 | 50 | 60 | 70 | 110 |
| $s_{min}$ | 85 | 85 | 100 | 115 | 170 | 220 |
| $V^0_{Rd,c}$ (kN) | 2.3 | 2.5 | 3.2 | 4.6 | 6.5 | 14.3 |
| **Maximum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | - | 30 | 34 | 44 | 46 | - |
| $c_{min}$ | - | 50 | 60 | 75 | 100 | - |
| $s_{min}$ | - | 95 | 120 | 145 | 200 | - |
| $V^0_{Rd,c}$ (kN) | - | 3.0 | 4.3 | 6.7 | 11.4 | - |

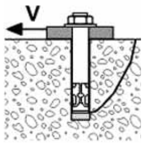
$\gamma_{Mc,V} = 1.5$




Steel resistance

| $V_{Rd,s}$ Steel resistance shear resistance | | | | | | |
|---|---|---|---|---|---|---|
| **Anchor size** | **M4.5** | **M6** | **M8** | **M10** | **M12** | **M16** |
| $V_{Rd,s}$ (kN) | 1.6 | 3.8 | 6.9 | 10.9 | 15.8 | - |

$\gamma_{Ms,V} = 1.6$




Concrete pry-out failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_B \cdot \Psi_s \cdot \Psi_{c,N}$

| $V^0_{Rd,cp}$ Design pry-out resistance | | | | | | |
|---|---|---|---|---|---|---|
| **Anchor size** | **M4.5** | **M6** | **M8** | **M10** | **M12** | **M16** |
| **Minimum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | 25 | 26 | 28 | 35 | 39 | 50 |
| $V^0_{Rd,cp}$ (kN) | 4.6 | 5.0 | 5.5 | 7.7 | 9.0 | 13.1 |
| **Maximum anchorage depth** | | | | | | |
| $h_{ef}$ (mm) | - | 30 | 34 | 44 | 46 | - |
| $V^0_{Rd,cp}$ (kN) | - | 6.1 | 7.4 | 10.8 | 11.6 | - |

$\gamma_{Mc,V} = 1.5$

$N_{Rd} = \min(N_{Rd,p}\,;\,N_{Rd,c}\,;\,N_{Rd,s})$

$\beta N = N_{Sd} / N_{Rd} \le 1$

$V_{Rd} = \min(V_{Rd,c}\,;\,V_{Rd,s}\,;\,V_{Rd,cp})$

$\beta V = V_{Sd} / V_{Rd} \le 1$

$\beta N + \beta V \le 1.2$

### $f_B$ INFLUENCE OF CONCRETE

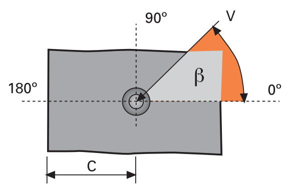
| Concrete Grade | $f_B$ | Concrete Grade | $f_B$ |
|---|---|---|---|
| C16/20 | 0.81 | C35/45 | 1.21 |
| C20/25 | 0.90 | C40/50 | 1.28 |
| C25/30 | 1.00 | C45/55 | 1.34 |
| C30/37 | 1.10 | C50/60 | 1.40 |

### $f_T$ INFLUENCE OF EMBEDMENT DEPTH

$f_T = \left(\frac{h_{act}}{h_{ef,min}}\right)^{1.5}$ where: $h_{ef,min} \le h_{act} \le h_{ef,max}$

### $f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

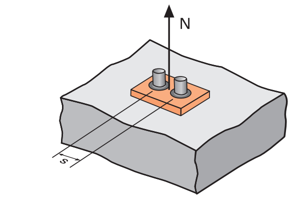
| Angle β [°] | $f_{\beta,V}$ |
|---|---|
| 0~50 | 1.0 |
| 60 | 1.1 |
| 70 | 1.2 |
| 80 | 1.5 |
| 90~180 | 2.0 |




MECHANICAL ANCHORS

## CC-Method

### $\Psi_s$ INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD




$\Psi_s = 0.5 + \frac{s}{6h_{ef}}$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 3h_{ef}$

$\Psi_s$ must be used for each spacing influenced the anchors group

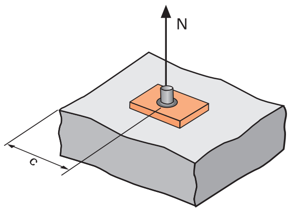
Spacing, s — Reduction Factor $\Psi_s$ — Minimum anchorage depth

| Spacing, s | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| 40 | 0.77 | 0.76 | | | | |
| 45 | 0.80 | 0.79 | 0.77 | | | |
| 50 | 0.83 | 0.82 | 0.80 | | | |
| 55 | 0.87 | 0.85 | 0.83 | 0.76 | | |
| 60 | 0.90 | 0.88 | 0.86 | 0.79 | 0.76 | |
| 75 | 1.00 | 0.98 | 0.95 | 0.86 | 0.82 | |
| 80 | | 1.00 | 0.98 | 0.88 | 0.84 | 0.77 |
| 100 | | | 1.00 | 0.98 | 0.93 | 0.83 |
| 105 | | | | 1.00 | 0.95 | 0.85 |
| 120 | | | | | 1.00 | 0.90 |
| 150 | | | | | | 1.00 |

Spacing, s — Reduction Factor $\Psi_s$ — Maximum anchorage depth

| Spacing, s | M6 | M8 | M10 | M12 |
|---|---|---|---|---|
| 50 | 0.78 | | | |
| 55 | 0.81 | 0.77 | | |
| 70 | 0.89 | 0.84 | 0.77 | |
| 75 | 0.92 | 0.87 | 0.78 | 0.77 |
| 90 | 1.00 | 0.94 | 0.84 | 0.83 |
| 100 | | 0.99 | 0.88 | 0.86 |
| 105 | | 1.00 | 0.90 | 0.88 |
| 130 | | | 0.99 | 0.97 |
| 135 | | | 1.00 | 0.99 |
| 140 | | | | 1.00 |

### $\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD




$\Psi_{c,N} = 0.275 + 0.725 \cdot \frac{c}{h_{ef}}$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = 1.5 \cdot h_{ef}$

$\Psi_s$ must be used for each distance influenced the anchors group

Edge, c — Reduction Factor $\Psi_{c,N}$ — Minimum anchorage depth

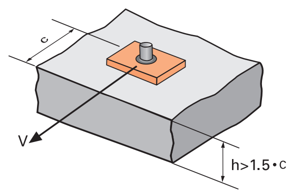
| Edge, c | M4.5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|
| 45 | 1.00 | 1.00 | | | | |
| 50 | | | 1.00 | | | |
| 60 | | | | 1.00 | | |
| 70 | | | | | 1.00 | |
| 110 | | | | | | 1.00 |

$\Psi_{c,N,min}$ = 1.0, no reduction is permitted

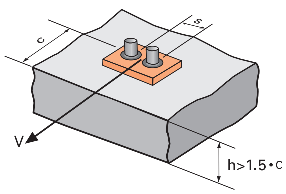
Edge, c — Reduction Factor $\Psi_{c,N}$ — Maximum anchorage depth

| Edge, c | M6 | M8 | M10 | M12 |
|---|---|---|---|---|
| 20 | 0.75 | | | |
| 25 | 0.87 | 0.80 | | |
| 30 | 1.00 | 0.91 | 0.76 | 0.74 |
| 35 | | 1.00 | 0.85 | 0.82 |
| 40 | | | 0.93 | 0.90 |
| 45 | | | 1.00 | 0.98 |
| 50 | | | | 1.00 |

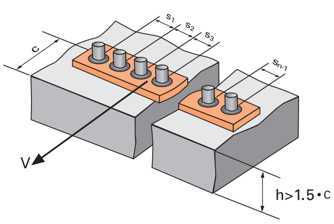
### $\Psi_{s\text{-}c,V}$ INFLUENCED OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD




$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$




$\Psi_{s\text{-}c,V} = \frac{3c + s}{6c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$




FOR SINGLE ANCHOR FASTENING — Reduction Factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

| $\frac{c}{c_{min}}$ | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\Psi_{s\text{-}c,V}$ | 1.00 | 1.31 | 1.66 | 2.02 | 2.41 | 2.83 | 3.26 | 3.72 | 4.19 | 4.69 | 5.20 | 5.72 |

FOR 2 ANCHORS FASTENING — Reduction Factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

| $\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$ | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 0.67 | 0.84 | 1.03 | 1.22 | 1.43 | 1.65 | 1.88 | 2.12 | 2.36 | 2.62 | 2.89 | 3.16 |
| 1.5 | 0.75 | 0.93 | 1.12 | 1.33 | 1.54 | 1.77 | 2.00 | 2.25 | 2.50 | 2.76 | 3.03 | 3.31 |
| 2.0 | 0.83 | 1.02 | 1.22 | 1.43 | 1.65 | 1.89 | 2.12 | 2.38 | 2.63 | 2.90 | 3.18 | 3.46 |
| 2.5 | 0.92 | 1.11 | 1.32 | 1.54 | 1.77 | 2.00 | 2.25 | 2.50 | 2.77 | 3.04 | 3.32 | 3.61 |
| 3.0 | 1.00 | 1.20 | 1.42 | 1.64 | 1.88 | 2.12 | 2.37 | 2.63 | 2.90 | 3.18 | 3.46 | 3.76 |
| 3.5 | | 1.30 | 1.52 | 1.75 | 1.99 | 2.24 | 2.50 | 2.76 | 3.04 | 3.32 | 3.61 | 3.91 |
| 4.0 | | | 1.62 | 1.86 | 2.10 | 2.36 | 2.62 | 2.89 | 3.17 | 3.46 | 3.75 | 4.05 |
| 4.5 | | | | 1.96 | 2.21 | 2.47 | 2.74 | 3.02 | 3.31 | 3.60 | 3.90 | 4.20 |
| 5.0 | | | | | 2.33 | 2.59 | 2.87 | 3.15 | 3.44 | 3.74 | 4.04 | 4.35 |
| 5.5 | | | | | | 2.71 | 2.99 | 3.28 | 3.57 | 3.88 | 4.19 | 4.50 |
| 6.0 | | | | | | 2.83 | 3.11 | 3.41 | 3.71 | 4.02 | 4.33 | 4.65 |

FOR OTHER CASE OF FASTENINGS

$$\Psi_{s\text{-}c,V} = \frac{3c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3nc_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

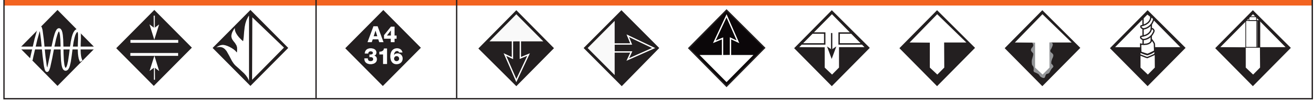
# DYNABOLT

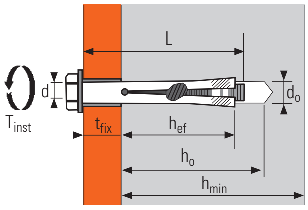
## Stainless Steel (A4)



### Sleeve Type Expansion Anchor

| Performance Related | Material | Installation Related |
|---|---|---|



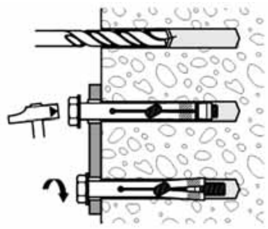




Pre-assembled anchor

MATERIAL

Bolt class A4-316

INSTALLATION



## Technical Data

| DYNABOLT HEX NUT | Max anchor depth (mm) | Max thick of fixture (mm) | Max drill depth (mm) | Min thick of base material (mm) | Ø Thread (mm) | Ø Drill bit (mm) | Total anchor length (mm) | Max tighten torque (Nm) | Ramset power tool code | Drill bit type-size |
|---|---|---|---|---|---|---|---|---|---|---|
| | $h_{ef}$ | $t_{fix}$ | $h_o$ | $h_{min}$ | d | $d_o$ | L | $T_{inst}$ | | |
| DP06040SS | 25 | 8 | 35 | 50 | M4.5 | 6 | 40 | 10 | DD527 | R3 PLUS-6 |
| DP06060SS | | 27 | | | | | 60 | | | |
| DP08040SS | 26 | 8 | 45 | 55 | M6 | 8 | 40 | 20 | DD527 | R3 PLUS-8 |
| DP08065SS | 30 | 30 | | | | | 65 | | | |
| DP10050SS | 34 | 8 | 50 | 65 | M8 | 10 | 50 | 40 | DD527 | R3 PLUS-10 |
| DP10075SS | | 35 | | | | | 75 | | | |
| DP10100SS | | 62 | | | | | 100 | | | |
| DP12060SS | 35 | 3 | 65 | 95 | M10 | 12 | 60 | 70 | DD527 | R3 PLUS-12 |
| DP12070SS | | 18 | | | | | 70 | | | |
| DP12100SS | 44 | 46 | | | | | 100 | | | |
| DP12125SS | | 74 | | | | | 125 | | | |

## Anchor Mechanical Properties

| THREADED PART | M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $f_{uk}$ (N/mm²) Min. tensile strength | 600 | 600 | 600 | 600 |
| $f_{yk}$ (N/mm²) Yield strength | 480 | 480 | 480 | 480 |
| $W_{el}$ (mm³) Elastic section modulus | 5.4 | 12.7 | 31.2 | 62.3 |
| $M^0_{Rk,s}$ (Nm) Characteristic bending moment | 3.8 | 9.15 | 22.5 | 44.8 |
| M (Nm) Recommended bending moment | 1.9 | 4.5 | 11.2 | 22.4 |

# DYNABOLT

## Stainless Steel (A4)



### Ultimate Loads ($N_{Ru,m}$, $V_{Ru,m}$) / Characteristic Loads ($N_{Rk}$, $V_{Rk}$) in kN

**TENSILE** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $h_{ef}$ (mm) | 25 | 30 | 34 | 35 |
| $N_{Ru,m}$ (kN) | 4.7 | 6.7 | 9.5 | 10.8 |
| $N_{Rk}$ (kN) | 3.5 | 5.1 | 7.2 | 8.0 |

**SHEAR** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $V_{Ru,m}$ (kN) | 3.5 | 8.0 | 14.5 | 23.0 |
| $V_{Rk}$ (kN) | 2.9 | 6.7 | 12.1 | 19.1 |

### Design Loads ($N_{Rd}$, $V_{Rd}$) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}}{\gamma_{Mc,N}}$$

$$V_{Rd} = \frac{V_{Rk}}{\gamma_{Ms,V}}$$

**TENSILE** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $h_{ef}$ (mm) | 25 | 30 | 34 | 35 |
| $N_{Rd}$ (kN) | 1.7 | 2.4 | 3.4 | 3.8 |

$\gamma_{Mc,N} = 2.1$

**SHEAR** @ Concrete strength 30 N/mm²

| Anchor size | M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $V_{Rd}$ (kN) | 1.8 | 4.2 | 7.8 | 12.0 |

$\gamma_{Ms,V} = 1.6$

### Recommended Loads ($N_{rec}$, $V_{rec}$) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}}{\gamma_{Mc,N} \cdot \gamma_F}$$

$$V_{rec} = \frac{V_{Rk}}{\gamma_{Ms,V} \cdot \gamma_F}$$

**TENSILE** @ Concrete strength 30 N/mm²

| Anchor size | M8 | M10 | M12 | M16 |
|---|---|---|---|---|
| $h_{ef}$ (mm) | 25 | 30 | 34 | 35 |
| $N_{rec}$ (kN) | 1.2 | 1.7 | 2.4 | 2.7 |

$\gamma_F = 1.4$
$\gamma_{Mc,N} = 2.1$

**SHEAR** @ Concrete strength 30 N/mm²

| Anchor size | M8 | M10 | M12 | M16 |
|---|---|---|---|---|
| $V_{rec}$ (kN) | 1.3 | 3.0 | 5.4 | 8.5 |

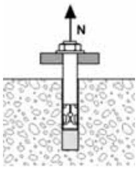
$\gamma_F = 1.4$
$\gamma_{Ms,V} = 1.6$

# DYNABOLT
## Stainless Steel (A4)



## CC-Method

### TENSILE in kN

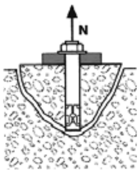



Pull-out resistance
Concrete strength 30 N/mm²

$N_{Rd,p} = N^0_{Rd,p} \cdot f_B$

| $N^0_{Rd,p}$ Anchor size | Design pull-out resistance M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $h_{ef}$ (mm) | 25 | 30 | 34 | 35 |
| $N^0_{Rd,p}$ (kN) | 1.7 | 2.4 | 3.4 | 3.9 |

$\gamma_{Mc,N} = 2.1$

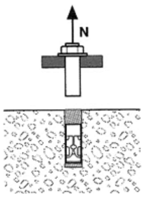



Concrete cone resistance
Concrete strength 30 N/mm²

$N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot \Psi_s \cdot \Psi_{c,N}$

| $N^0_{Rd,c}$ Anchor size | Design cone resistance M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $h_{ef}$ (mm) | 25 | 30 | 34 | 35 |
| $N^0_{Rd,c}$ (kN) | 3.3 | 4.3 | 5.3 | 5.5 |

$\gamma_{Mc,N} = 2.1$

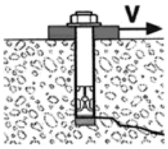



Steel resistance

| $N_{Rd,s}$ Anchor size | Steel design tensile resistance M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $N_{Rd,s}$ (kN) | 3.1 | 7.0 | 12.8 | 20.3 |

$\gamma_{Ms,N} = 2.0$

### SHEAR in kN

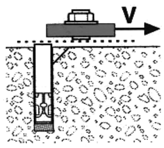



Concrete edge resistance
Concrete strength 30 N/mm²

$V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_{\beta,V} \cdot \Psi_{s\text{-}c,V}$

| $V^0_{Rd,c}$ — Design concrete edge resistance at a minimum edge distance ($c_{min}$) Anchor size | M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| **Minimum anchorage depth** | | | | |
| $h_{ef}$ (mm) | 25 | 26 | 28 | 35 |
| $c_{min}$ | 45 | 45 | 50 | 60 |
| $s_{min}$ | 85 | 85 | 100 | 115 |
| $V^0_{Rd,c}$ (kN) | 2.3 | 2.5 | 3.2 | 4.6 |

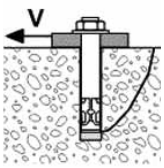
$\gamma_{Mc,V} = 1.5$




Steel resistance

| $V_{Rd,s}$ Anchor size | Steel design shear resistance M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| $V_{Rd,s}$ (kN) | 1.6 | 3.8 | 6.9 | 10.9 |

$\gamma_{Ms,V} = 1.6$




Concrete pry-out failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_B \cdot \Psi_s \cdot \Psi_{c,N}$

| $V^0_{Rd,cp}$ Anchor size | Design pry-out resistance M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| **Minimum anchorage depth** | | | | |
| $h_{ef}$ (mm) | 25 | 30 | 34 | 35 |
| $V^0_{Rd,cp}$ (kN) | 4.6 | 6.1 | 7.4 | 7.7 |

$\gamma_{Mc,V} = 1.5$

$N_{Rd} = \min(N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$
$\beta N = N_{Sd} / N_{Rd} \le 1$

$V_{Rd} = \min(V_{Rd,c} ; V_{Rd,s} ; V_{Rd,cp})$
$\beta V = V_{Sd} / V_{Rd} \le 1$

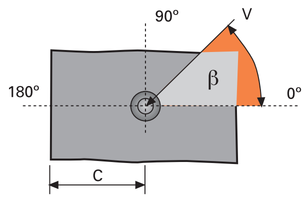
$\beta N + \beta V \le 1.2$

### $f_B$ INFLUENCE OF CONCRETE

| Concrete Grade | $f_B$ | Concrete Grade | $f_B$ |
|---|---|---|---|
| C16/20 | 0.81 | C35/45 | 1.21 |
| C20/25 | 0.90 | C40/50 | 1.28 |
| C25/30 | 1.00 | C45/55 | 1.34 |
| C30/37 | 1.10 | C50/60 | 1.40 |

### $f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

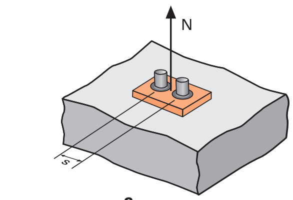
| Angle β [°] | $f_{\beta,V}$ |
|---|---|
| 0~50 | 1.0 |
| 60 | 1.1 |
| 70 | 1.2 |
| 80 | 1.5 |
| 90~180 | 2.0 |





## CC-Method

### $\Psi_s$ INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD




$\Psi_s = 0.5 + \frac{s}{6h_{ef}}$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 3h_{ef}$

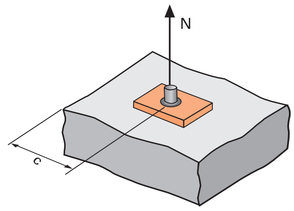
$\Psi_s$ must be used for each spacing influenced the anchors group

Spacing, s — Reduction Factor $\Psi_s$

Minimum anchorage depth

| | M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| 40 | 0.77 | | | |
| 45 | 0.80 | | | |
| 50 | 0.83 | 0.78 | | |
| 55 | 0.87 | 0.81 | 0.77 | 0.76 |
| 60 | 0.90 | 0.83 | 0.79 | 0.79 |
| 75 | 1.00 | 0.92 | 0.87 | 0.86 |
| 80 | | 0.94 | 0.89 | 0.88 |
| 90 | | 1.00 | 0.94 | 0.93 |
| 100 | | | 0.99 | 0.98 |
| 105 | | | 1.01 | 1.00 |

### $\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD




$\Psi_{c,N} = 0.275 + 0.725 \cdot \frac{c}{h_{ef}}$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = 1.5 \cdot h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group

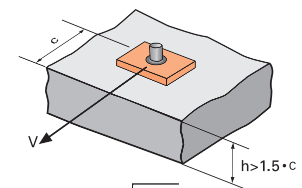
Edge, c — Reduction Factor $\Psi_s$

Minimum anchorage depth

| | M4.5 | M6 | M8 | M10 |
|---|---|---|---|---|
| 45 | 1.00 | 1.00 | | |
| 50 | | | 1.00 | |
| 60 | | | | 1.00 |

$\Psi_{c,N,min}$ = 1.0, no reduction is permitted

### $\Psi_{s\text{-}c,V}$ INFLUENCED OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

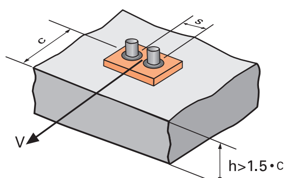



$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$

FOR SINGLE ANCHOR FASTENING — Reduction Factor $\Psi_{s\text{-}c,V}$

Non-cracked concrete

| $\frac{c}{c_{min}}$ | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\Psi_{s\text{-}c,V}$ | 1.00 | 1.31 | 1.66 | 2.02 | 2.41 | 2.83 | 3.26 | 3.72 | 4.19 | 4.69 | 5.20 | 5.72 |

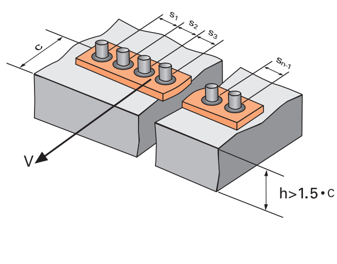



$\Psi_{s\text{-}c,V} = \frac{3c + s}{6c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$

FOR 2 ANCHORS FASTENING — Reduction Factor $\Psi_{s\text{-}c,V}$

Non-cracked concrete

| $\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$ | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 0.67 | 0.84 | 1.03 | 1.22 | 1.43 | 1.65 | 1.88 | 2.12 | 2.36 | 2.62 | 2.89 | 3.16 |
| 1.5 | 0.75 | 0.93 | 1.12 | 1.33 | 1.54 | 1.77 | 2.00 | 2.25 | 2.50 | 2.76 | 3.03 | 3.31 |
| 2.0 | 0.83 | 1.02 | 1.22 | 1.43 | 1.65 | 1.89 | 2.12 | 2.38 | 2.63 | 2.90 | 3.18 | 3.46 |
| 2.5 | 0.92 | 1.11 | 1.32 | 1.54 | 1.77 | 2.00 | 2.25 | 2.50 | 2.77 | 3.04 | 3.32 | 3.61 |
| 3.0 | 1.00 | 1.20 | 1.42 | 1.64 | 1.88 | 2.12 | 2.37 | 2.63 | 2.90 | 3.18 | 3.46 | 3.76 |
| 3.5 | | 1.30 | 1.52 | 1.75 | 1.99 | 2.24 | 2.50 | 2.76 | 3.04 | 3.32 | 3.61 | 3.91 |
| 4.0 | | | 1.62 | 1.86 | 2.10 | 2.36 | 2.62 | 2.89 | 3.17 | 3.46 | 3.75 | 4.05 |
| 4.5 | | | | 1.96 | 2.21 | 2.47 | 2.74 | 3.02 | 3.31 | 3.60 | 3.90 | 4.20 |
| 5.0 | | | | | 2.33 | 2.59 | 2.87 | 3.15 | 3.44 | 3.74 | 4.04 | 4.35 |
| 5.5 | | | | | | 2.71 | 2.99 | 3.28 | 3.57 | 3.88 | 4.19 | 4.50 |
| 6.0 | | | | | | 2.83 | 3.11 | 3.41 | 3.71 | 4.02 | 4.33 | 4.65 |




FOR OTHER CASE OF FASTENINGS

$\Psi_{s\text{-}c,V} = \frac{3c + s_1 + s_2 + s_3 + ..... + s_{n-1}}{3nc_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$

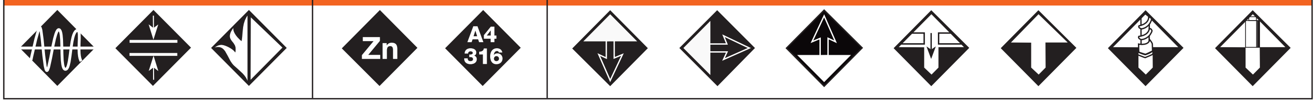
# DYNABOLT

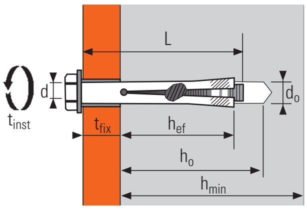
## Brick and Block Anchoring



### Sleeve Type Expansion Anchor

| Performance Related | Material | Installation Related |
|---|---|---|

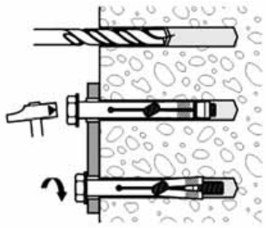



Pre-assembled anchor

MATERIAL
Bolt class 6.8

INSTALLATION



## Technical Data

| DYNABOLT HEX NUT | Anchor depth (mm) | Max thick of fixture (mm) | Drill depth (mm) | Ø Drill bit (mm) | Ø Thread (mm) | Max tighten torque (Nm) | Ramset power tool code | Drill bit type-size |
|---|---|---|---|---|---|---|---|---|
| | $h_{ef,min}$ | $t_{fix}$ | $h_o$ | $d_o$ | d | $T_{inst}$ | | |
| **DP08065** | 30 | 25 | 45 | 8 | M6 | 10 | DD527 | R3 PLUS-8 |
| **DP10050** | 34 | - | 50 | 10 | M8 | 15 | DD527 | R3 PLUS-10 |
| **DP10075** | | 30 | | | | | | |
| **DP12060** | 44 | 12 | 65 | 12 | M10 | 15 | DD527 | R3 PLUS-12 |
| **DP12070** | | 22 | | | | | | |

**3 HOLE BRICK / 10 HOLE BRICK / CONCRETE BLOCK**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **DP08065** | - | 10 | 45 | 8 | M6 | 10 | DD527 | R3 PLUS-8 |
| **DP10050** | - | - | 50 | 10 | M8 | 15 | DD527 | R3 PLUS-10 |
| **DP10075** | - | 30 | | | | | | |
| **DP12060** | - | 12 | 65 | 12 | M10 | 15 | DD527 | R3 PLUS-12 |
| **DP12070** | - | 22 | | | | | | |

## Anchor Mechanical Properties

| THREADED PART | M6 | M8 | M10 |
|---|---|---|---|
| $f_{uk}$ (N/mm2) Min. tensile strength | 600 | 600 | 600 |
| $f_{yk}$ (N/mm2) Yield strength | 480 | 480 | 480 |
| $W_{el}$ (mm3) Elastic section modulus | 12.7 | 31.2 | 62.3 |
| $M^0_{Rk,s}$ (Nm) Characteristic bending moment | 9.2 | 22.5 | 44.8 |
| **M** (Nm) Recommended bending moment | 4.5 | 11.2 | 22.4 |

MECHANICAL ANCHORS

# DYNABOLT

## Brick and Block Anchoring



### Recommended Loads ($N_{rec}$, $V_{rec}$) for Solid Clay Brick in kN

**TENSILE**

| Anchor size | M6 | M8 | M10 |
|---|---|---|---|
| $h_{ef}$ (mm) | 35 | 40 | 40 |
| $N_{rec}$ (kN) | 3.1 | 4.6 | 4.6 |

**SHEAR**

| Anchor size | M6 | M8 | M10 |
|---|---|---|---|
| $h_{ef}$ (mm) | 35 | 40 | 40 |
| $V_{rec}$ (kN) | 3.9 | 4.4 | 4.4 |

### Recommended Loads ($N_{rec}$, $V_{rec}$) for 3 Hole in kN

**TENSILE**

| Anchor size | M6 | M8 | M10 |
|---|---|---|---|
| $h_{ef}$ (mm) | 35 | 40 | 40 |
| $N_{rec}$ (kN) | 3.9 | 4.1 | 4.1 |

**SHEAR**

| Anchor size | M6 | M8 | M10 |
|---|---|---|---|
| $h_{ef}$ (mm) | 35 | 40 | 40 |
| $V_{rec}$ (kN) | 2.9 | 3.4 | 3.8 |

### Recommended Loads ($N_{rec}$, $V_{rec}$) for 10 Hole in kN

**TENSILE**

| Anchor size | M6 | M8 | M10 |
|---|---|---|---|
| $h_{ef}$ (mm) | 35 | 40 | 40 |
| $N_{rec}$ (kN) | 0.8 | 0.9 | 0.9 |

**SHEAR**

| Anchor size | M6 | M8 | M10 |
|---|---|---|---|
| $h_{ef}$ (mm) | 35 | 40 | 40 |
| $V_{rec}$ (kN) | 2.0 | 2.3 | 3.1 |

### Recommended Loads ($N_{rec}$, $V_{rec}$) for Concrete Block in kN

**TENSILE**

| Anchor size | M6 | M8 | M10 |
|---|---|---|---|
| $h_{ef}$ (mm) | 35 | 40 | 40 |
| $N_{rec}$ (kN) | 1.0 | 1.0 | 1.0 |

**SHEAR**

| Anchor size | M6 | M8 | M10 |
|---|---|---|---|
| $h_{ef}$ (mm) | 35 | 40 | 40 |
| $V_{rec}$ (kN) | 1.4 | 1.6 | 2.1 |

Refer to "Brick and Block Anchoring" for minimum spacings and edge distance