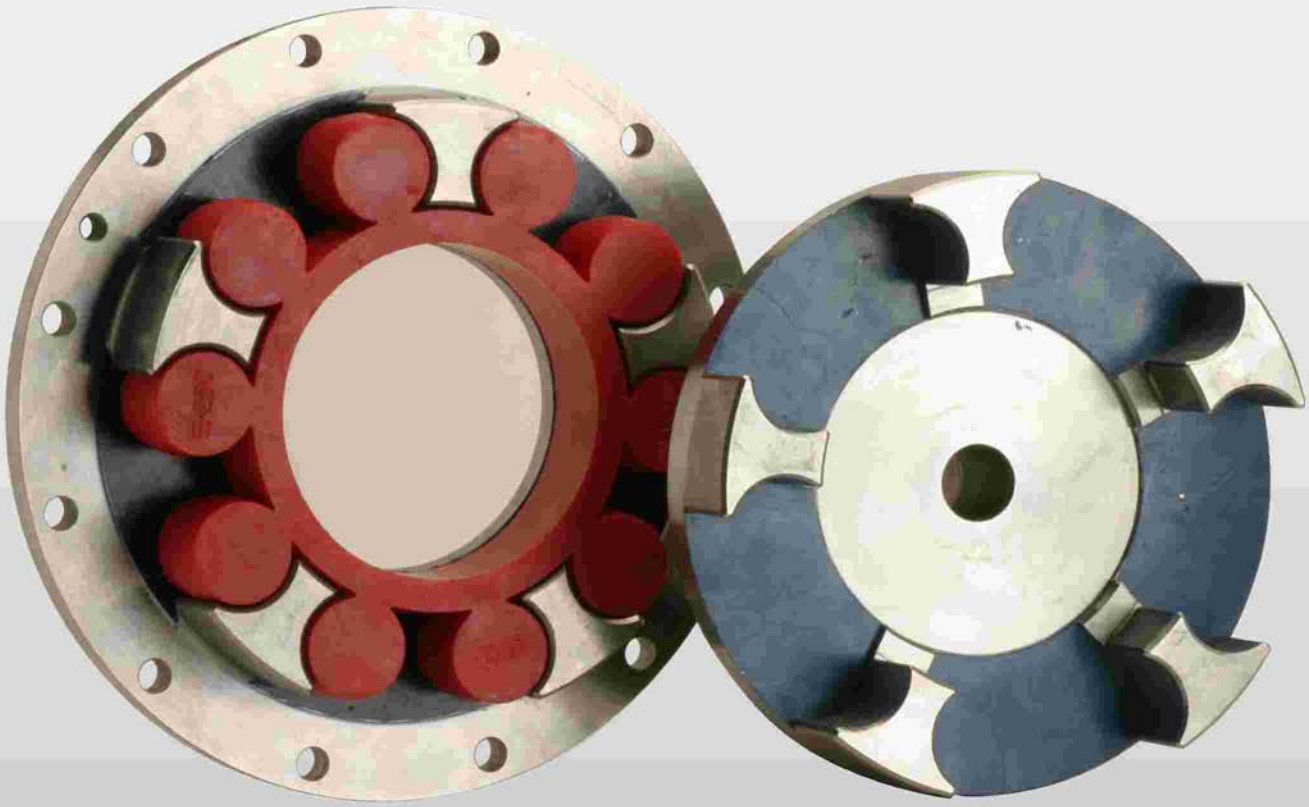
Voith Turbo

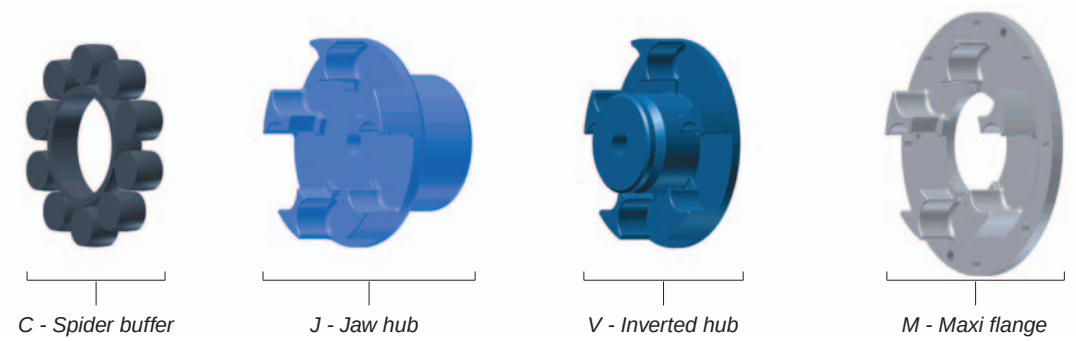
VOITH

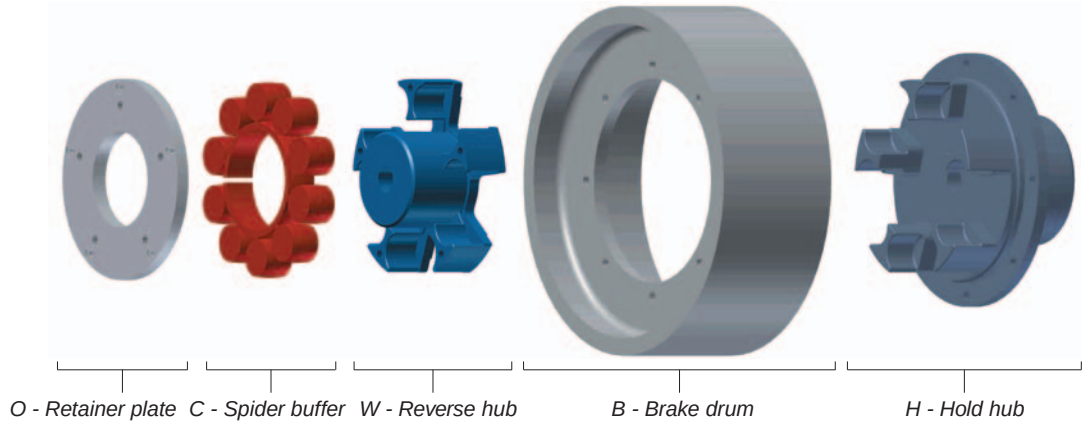
# Voith Spider Torque Coupling



# Flexible and failsafe spider coupling

**Modular design can change spider in -situ when w hub is used by remaining D plate only.**




*Overview of ST Coupling components.*

## Product description

The Voith Spider Torque (ST) coupling transfers torque and accepts misalignment between connected drive shafts. The coupling uses a flexible spider, which compensates for axial, radial, angular offsets as well as torsional movement.

A spider-type design is used for the buffer element of the Voith ST coupling. It consists of solid elastomeric cylinders joined by an internal ring. The cylinders are compressed between the jaws of the ST coupling. Depending on the direction of the drive, only half the cylinders in the coupling are compressed.

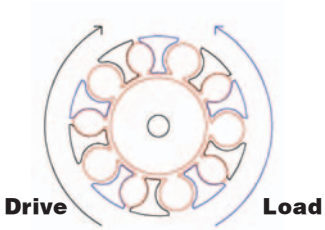



**Illustration of Spider cylinder compression.**

The compression principle suits the elastomeric materials and long service life is achieved. The better the alignment of the coupling, the less the abrasive stresses. The large-volume buffers permit demanding conditions to be integrated.

The softer compounds absorb more vibration, with lower torque transmission capacity. The harder compounds increase the torque capacity without increasing the coupling size, with lower vibration absorption.

## Key benefits

- Torsional flexibility.
- Alignment compensation.
- Vibration absorption.
- Failsafe arrangement.
- Modular assembly.
- Different materials to suit needs.
- Long service life.
- Axial blind assembly.
- Application versatility.

## Typical applications

- Cranes.
- Winches.
- Escalator.
- Centrifugal pumps.
- Fans and compressors.
- Hammer mills.
- Bucket elevators.
- Scraper conveyors.
- Power generators.
- Rotary mills.
- Turbine mills.
- Fluid couplings.
- Crushers.
- Reciprocating pumps.
- Axial float applications.
- Steel mill roller tables.
- Heavy reverse drives.
- Limited float available.

## Coupling selection procedure

**Step 1:** Calculate nominal torque Tn(Nm) using absorbed power Pa(kW)
[when not available use motor power.] The installed motor power (kW) is preferred in cases where the coupling must hold the stall torque.

$$Tn(Nm) = \frac{Pa(kW) \times 9\,550}{\text{Shaft speed (rpm)}}$$

**Step 2:** Multiply the answer by the service factor (SF) from Table 2.

$$Tr(Nm) = Tn \times SF(Nm)$$

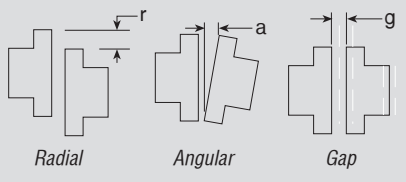
Note: Tr(Nm) must be smaller than Tp(Nm)[Peak torque of coupling].

**Step 3:** Using this answer, check coupling torque (Tp) in Table 1 and select the correct buffer material from Table 3.

**Step 4:** Check the maximum speed (rpm), inertia, mass, bore sizes and keys.

## Alignment tolerance

*[See table 1 below]*




Note: Dimension g is Cg in the coupling dimensions table on page 3. The value given below is the tolerance applicable to the gap.

## Table 1 - Speed, torque ratings and alignment values

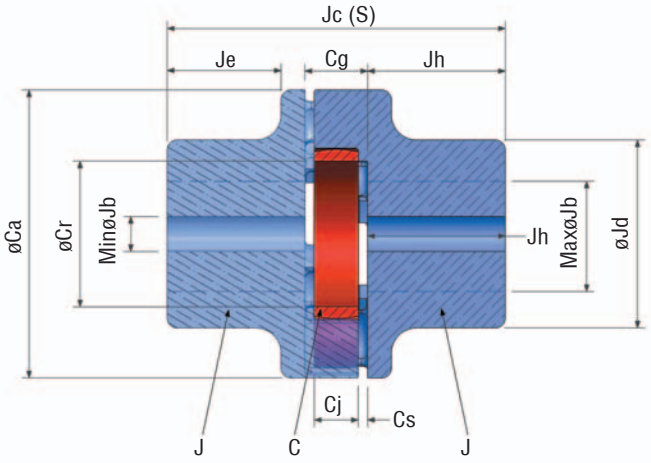
| Coupling Type & Size # | Speed Max Rpm | Perbunan Black | | Vulkollan Red | | Vulkollan Blue | | Alignment tolerance | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Torque Nom (Nm) | Torque Max (Nm) | Torque Nom (Nm) | Torque Max (Nm) | Torque Nom (Nm) | Torque Max (Nm) | r Radial (mm) | a Angular (mm) | g Gap (mm) |
| **ST 50** | 15 000 | 7 | 19 | 12 | 32 | 18 | 47 | 0.05 | 0.17 | ±0.6 |
| **ST 70** | 11 000 | 27 | 80 | 42 | 121 | 63 | 182 | 0.08 | 0.24 | ±0.8 |
| **ST 85** | 9 000 | 37 | 112 | 58 | 174 | 87 | 262 | 0.08 | 0.30 | ±1.0 |
| **ST 100** | 7 250 | 65 | 183 | 102 | 270 | 153 | 405 | 0.08 | 0.32 | ±1.3 |
| **ST 125** | 6 000 | 117 | 350 | 250 | 750 | 370 | 1 110 | 0.10 | 0.32 | ±1.5 |
| **ST 145** | 5 250 | 200 | 600 | 400 | 1 200 | 600 | 1 800 | 0.10 | 0.38 | ±1.5 |
| **ST 170** | 4 500 | 310 | 930 | 630 | 1 890 | 950 | 2 850 | 0.10 | 0.40 | ±1.8 |
| **ST 200** | 3 750 | 540 | 1 620 | 1 100 | 3 300 | 1 650 | 4 950 | 0.15 | 0.42 | ±2.0 |
| **ST 230** | 3 250 | 830 | 2 490 | 1 720 | 5 160 | 2 580 | 7 740 | 0.15 | 0.44 | ±2.5 |
| **ST 260** | 3 000 | 1 300 | 3 900 | 2 650 | 7 950 | 3 980 | 11 940 | 0.15 | 0.48 | ±2.5 |
| **ST 300** | 2 500 | 1 920 | 5 760 | 3 900 | 11 700 | 5 850 | 17 550 | 0.18 | 0.52 | ±2.5 |
| **ST 360** | 2 150 | 3 170 | 9 500 | 6 460 | 19 400 | 9 700 | 29 100 | 0.18 | 0.63 | ±2.5 |
| **ST 400** | 1 900 | 4 360 | 13 080 | 8 900 | 26 700 | 13 350 | 40 050 | 0.18 | 0.70 | ±2.5 |

## Table 2 - Service factors

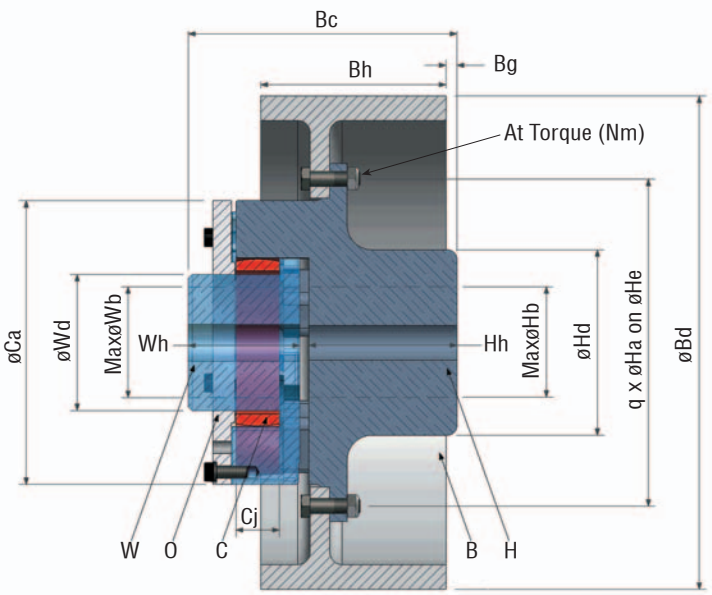
| Duty Class | Driven Machine - example types | Driver - prime mover | | | |
|---|---|---|---|---|---|
| | | Electric Motors + Turbines | Internal combustion engines | | |
| | | | 1 Cyl. | 2+3 Cyl. | 4 Cyl. + more |
| **Light Duty** | Centrifugal Pumps, Fans & Belt conveyors. | 1.5 | 3.0 | 2.5 | 2.0 |
| **Medium Duty** | Hammer mills, Bucket elevator, scraper conveyor. | 2.0 | 3.5 | 3.0 | 2.5 |
| **Heavy Duty** | Crushers, cranes, hoists, calendars, grissleys. | 2.5 | 4.0 | 3.5 | 3.0 |
| **Extra Heavy Duty** | Reciprocating pumps, compressors - 3 cyl or less | 3.0 | 4.5 | 4.0 | 3.5 |
| **Ultra Heavy Duty** | Steel mill roller tables, heavy reversing drives | >5.0 | 6.5 | 6.0 | 5.5 |

## Table 3 - Spider torque coupling material

| Material Used | Natural Rubber Black | Perbunan Black | Vulkollan Green | Vulkollan Red | Vulkollan Blue |
|---|---|---|---|---|---|
| **Shore hardness** | 70a-75a | 80a - 85a | 80a - 85a | 93a - 95a | 60d - 62d |
| **Colour** | Black | Black | Green | Red | Blue |
| **Part code** | ST (size) C70nr | ST (size) C80nt | ST (size) C80vg | ST (size) C93vr | ST (size) C60vb |
| **Permissible temperature** | | | | | |
| **Continuous range** | -30° to 80°C | -30° to 80°C | -35° to 80°C | -35° to 80°C | -35° to 80°C |
| **Intermittent range** | -50° to 100°C | -65° to 120°C | -40° to 100°C | -40° to 100°C | -40° to 100°C |
| **Fatigue capacity** | Very good | Good | Excellent | Excellent | Excellent |
| **Abrasion resistance** | Good | Good | Excellent | Excellent | Excellent |
| **Torsional rigidity** | Soft | Medium | Medium | High | Very High |
| **Product availability** | On request | Ex-stock | On request | Ex-stock | On request |
| **Resistance to:** | | | | | |
| **Petrol** | Nil | Good | Very good | Very good | Very good |
| **Benzole** | Nil | Low | Good | Good | Good |
| **Oil & grease** | Low | Good | Very good | Very good | Very good |
| **Acids** | Good | Very good | Nil | Nil | Nil |
| **Alkalines** | Good | Very Good | Nil | Nil | Nil |
| **Hot water** | Good | Good | Low | Low | Low |
| **Normal weather** | Good | Good | Very Good | Very Good | Very Good |
| **Tropical climates** | Good | Good | Satisfactory | Satisfactory | Satisfactory |




*Assembly JCJ - Standard*




*Assembly WBH - Accessible spider and brake drum*

## Coupling Dimensions

Hubs and brake-drums supplied in steel or SG iron. Buffers supplied in material selected from table 3 on page 2.

| Coupling size | ST 50 | ST 70 | ST 85 | ST 100 | ST 125 | ST 145 | ST 170 | ST 200 | ST 230 | ST 260 | ST 300 | ST 360 | ST 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| øJb max | 25 | 32 | 40 | 42 | 55 | 65 | 80 | 90 | 100 | 120 | 130 | 140 | 165 |
| øCa | 50 | 70 | 85 | 105 | 126 | 145 | 170 | 200 | 230 | 260 | 300 | 360 | 400 |
| Jc | 75 | 100 | 110 | 125 | 145 | 164 | 190 | 245 | 270 | 285 | 330 | 417 | 440 |
| Cg | 16 | 23 | 24 | 27 | 33 | 39 | 41 | 48 | 50 | 60 | 69 | 73 | 73 |
| Je | 23.5 | 31.5 | 35 | 37.5 | 44 | 47.5 | 60.5 | 82.5 | 91 | 88.5 | 107.5 | 140 | 147.5 |
| øJd/Hd | 41 | 50 | 60 | 65 | 85 | 95 | 120 | 135 | 150 | 180 | 200 | 210 | 250 |
| øWd | - | - | - | 38 | 48 | 60 | 82 | 95 | 105 | 130 | 150 | 210 | 230 |
| øWb max | - | - | - | 25 | 38 | 45 | 60 | 70 | 76 | 95 | 110 | 150 | 165 |
| Jh/Hh | 29.5 | 38.5 | 43 | 49 | 56 | 60.5 | 74.5 | 98.5 | 110 | 112.5 | 131.5 | 172 | 183.5 |
| Wh | - | - | - | 50 | 57 | 65 | 75 | 85 | 90 | 110 | 130 | 175 | 180 |
| Bh | - | - | - | 55 | 80 | 100 | 120 | 120 | 150 | 200 | 240 | 240 | 270 |
| *øBd | - | - | - | 160 | 200 | 250 | 315 | 315 | 400 | 500 | 630 | 630 | 710 |
| øHo | - | - | - | M8 | M8 | M12 | M12 | M14 | M14 | M18 | M18 | M22 | M22 |
| Cj | 14 | 20.5 | 21 | 23.5 | 29 | 34.5 | 35.5 | 41.5 | 42.5 | 52.5 | 58.5 | 64 | 64 |
| øCr | 19 | 26 | 34 | 42 | 52 | 64 | 90 | 100 | 115 | 140 | 162 | 215 | 250 |
| Cs | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5.5 | 6.5 | 7.5 | 7.5 | 8.5 | 9 | 9 |

## Technical details: JCJ

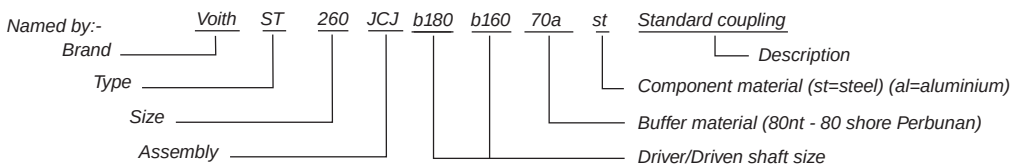
| Coupling size | ST 50 | ST 70 | ST 85 | ST 100 | ST 125 | ST 145 | ST 170 | ST 200 | ST 230 | ST 260 | ST 300 | ST 360 | ST 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mass (kg) | 0.66 | 1.55 | 2.5 | 4.3 | 6.2 | 8.6 | 14 | 25.7 | 41 | 59 | 87 | 139.5 | 174 |
| Inertia (kgm$^2$) | .00014 | .00075 | .0017 | .0040 | .0101 | .0195 | .046 | .0921 | .1865 | .3967 | .7343 | 1.534 | 2.600 |

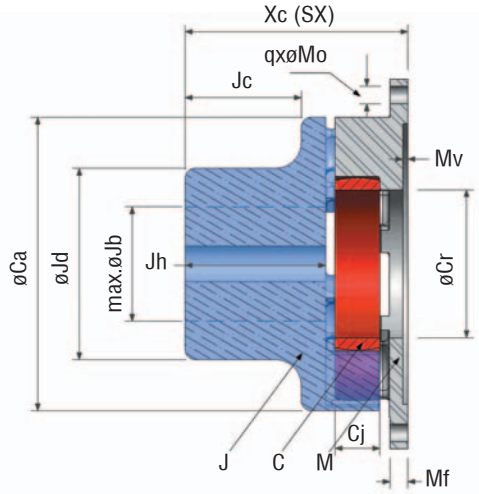
## Technical details: WBH

| Coupling size | ST 50 | ST 70 | ST 85 | ST 100 | ST 125 | ST 145 | ST 170 | ST 200 | ST 230 | ST 260 | ST 300 | ST 360 | ST 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| At Torque (Nm) | - | - | - | 25 | 25 | 86 | 86 | 210 | 210 | 410 | 410 | 710 | 710 |
| Mass (kg) | - | - | - | 9.3 | 12.55 | 15.6 | 28.1 | 45.5 | 76.8 | 125.5 | 216.2 | 268.6 | 342.9 |
| Inertia (kgm$^2$) | - | - | - | .0435 | .0503 | .0597 | .1658 | .4593 | 1.297 | 3.588 | 10.73 | 11.56 | 21.04 |

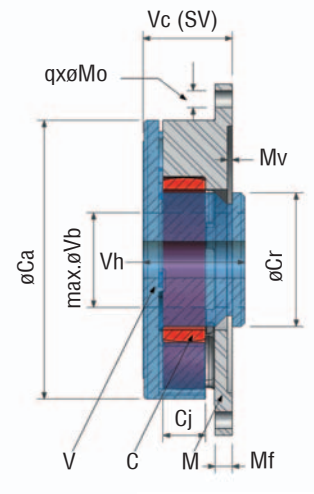
**Drum diameter can vary to your requirements. Certified drawing on request. Material codes: sm=steel, dc=SG iron, al=aluminium, gc= cast iron*

## When ordering please specify

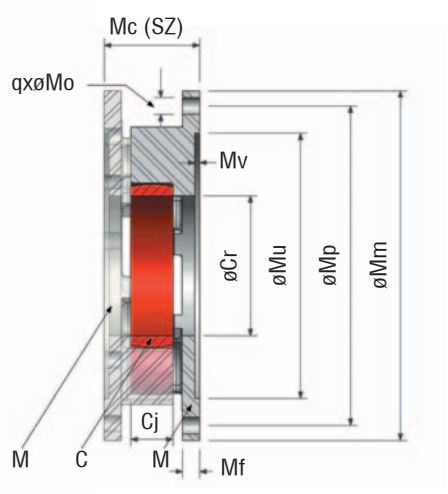





*Assembly JCM - External hub flange*




*Assembly VCM - Inverted hub flange*




*Assembly MCM - Flange to flange*

## Coupling Dimensions

Hubs supplied in steel or SG iron. Flanges supplied in aluminium or steel. Buffers in material selected from table 3 on page 2.

| Coupling size | ST 100 | ST 125 | ST 145 | ST 170 | ST 200 | ST 230 | ST 260 | ST 300 | ST 360 | ST 360 | ST 400 | ST 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voith 'ENK' size | | | -206 | | -274+ 366 | 422 | -487 | 562 | -650 | 750 | -866 | 1000 |
| øCa | 105 | 126 | 145 | 170 | 200 | 230 | 260 | 300 | 360 | 360 | 400 | 400 |
| Cj | 20 | 25 | 30 | 30 | 35 | 35 | 45 | 50 | 55 | 55 | 55 | 55 |
| øCr | 42 | 52 | 64 | 90 | 100 | 115 | 140 | 162 | 215 | 215 | 250 | 250 |
| Xc | 84.5 | 97 | 110.5 | 128 | 158.5 | 173 | 190 | 221 | 276 | 276 | 287.5 | 287.5 |
| Vc | 42 | 47 | 56.5 | 61.5 | 67 | 72 | 87.5 | 102.5 | 127.5 | 127.5 | 127.5 | 127.5 |
| Mc | 46 | 51 | 61 | 66 | 70 | 74 | 92.5 | 109.5 | 132.5 | 132.5 | 132.5 | 132.5 |
| axial | ±1.3 | ±1.5 | ±1.5 | ±1.8 | ±2.0 | ±2.0 | ±2.5 | ±2.5 | ±2.5 | ±2.5 | ±2.5 | ±2.5 |
| øJd | 65 | 85 | 95 | 120 | 135 | 150 | 180 | 200 | 210 | 210 | 250 | 250 |
| Jh | 49 | 56 | 60.5 | 74.5 | 98.5 | 110 | 112.5 | 131.5 | 172 | 172 | 183.5 | 183.5 |
| Je | 37.5 | 40 | 47.5 | 60.5 | 82.5 | 91 | 88.5 | 107.5 | 140 | 140 | 148.5 | 147.5 |
| max. øJb | 42 | 55 | 65 | 80 | 90 | 100 | 120 | 130 | 140 | 140 | 165 | 165 |
| øVd | 38 | 48 | 60 | 82 | 95 | 102 | 130 | 147 | 210 | 210 | 230 | 230 |
| Vh | 50 | 57 | 65 | 75 | 85 | 90 | 110 | 130 | 175 | 175 | 180 | 180 |
| max. øVb | 25 | 30 | 38 | 55 | 60 | 65 | 80 | 95 | 140 | 140 | 145 | 145 |
| øMm | 145 | 170 | 194 | 220 | 252 | 290 | 335 | 385 | 455 | 514 | 595 | 690 |
| øMp | 128 | 148 | 172 | 195 | 228 | 265 | 310 | 360 | 420 | 480 | 555 | 650 |
| øMu | 100 | 130 | 150 | 170 | 195 | 220 | 265 | 315 | 360 | 420 | 485 | 580 |
| Mv | 2 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 6 | 6 |
| Mf | 10 | 10 | 12 | 14 | 14 | 14 | 18 | 24 | 28 | 30 | 30 | 30 |
| q x øMo | 6x9.5 | 6x9.5 | 6x9.5 | 6x14 | 8x14 | 8x14 | 12x14 | 16x14 | 16x18 | 20x18 | 12x22 | 16x22 |
| Demount holes | 2xM8 | 2xM8 | 2xM8 | 2xM12 | 2xM12 | 2xM12 | 2xM12 | 2xM12 | 2xM16 | 2xM16 | 2xM20 | 2xM20 |

## Technical details

| Coupling size | ST 100 | ST 125 | ST 145 | ST 170 | ST 200 | ST 230 | ST 260 | ST 300 | ST 360 | ST 360 | ST 400 | ST 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JCM Mass (kg) | 2.64 | 4.61 | 5.69 | 9.7 | 14.6 | 23 | 33.2 | 50.3 | 80 | 83.7 | 85 | 94.3 |
| JCM Inertia (kgm$^2$) | 0.0034 | 0.0077 | 0.015 | 0.033 | 0.06 | 0.122 | 0.26 | 0.0511 | 1.083 | 1.301 | 1.972 | 2.83 |
| VCM Mass (kg) | 1.67 | 2.64 | 4.17 | 6.9 | 10.2 | 12.9 | 22.1 | 36 | 85.7 | 89.4 | 101 | 110.4 |
| VCM Inertia (kgm$^2$) | 0.0028 | 0.0063 | 0.012 | 0.026 | 0.05 | 0.0845 | 0.181 | 0.3975 | 1.17 | 1.388 | 2.185 | 2.908 |
| MCM Mass (kg) | 0.88 | 1.22 | 1.78 | 2.4 | 3.38 | 4.32 | 7 | 13 | 23 | 30.4 | 38 | 56.6 |
| MCM Inertia (kgm$^2$) | 0.0026 | 0.0054 | 0.01 | 0.019 | 0.04 | 0.06 | 0.136 | 0.3122 | 0.683 | 1.1176 | 1.944 | 3.661 |

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