PHILIPPGROUP

# PHILIPP Spherical head anchor


VB3-T-033-en - 09/17

## for tubes and shafts

## Installation and Application Instruction

## Transport and mounting systems for prefabricated building

### Technical department

Our staff will be pleased to support your planning phase with suggestions for the installation and use of our transport and mounting systems for precast concrete construction.

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Customized to your particular needs.

### Practical tests on site

We ensure that our concepts are tailored precisely to your requirements.

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The latest design software, animated videos and CAD libraries can always be found under www.philipp-gruppe.de.

### Engineering contact

Phone: +49 (0) 6021 / 40 27-318
Fax: +49 (0) 6021 / 40 27-340
E-mail: technik@philipp-gruppe.de

### Sales contact

Phone: +49 (0) 6021 / 40 27-300
Fax: +49 (0) 6021 / 40 27-340
E-mail: vertrieb@philipp-gruppe.de

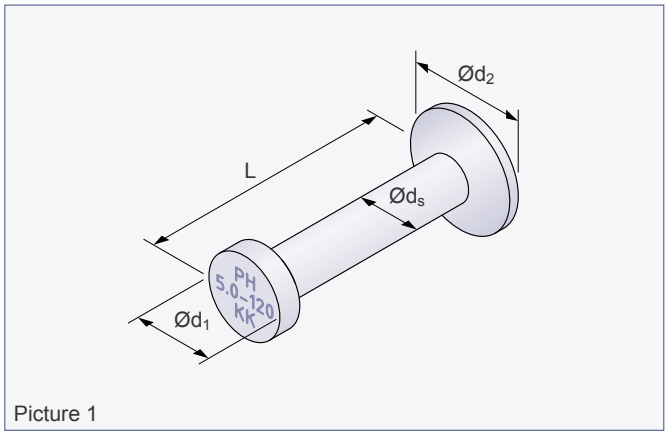



## Content

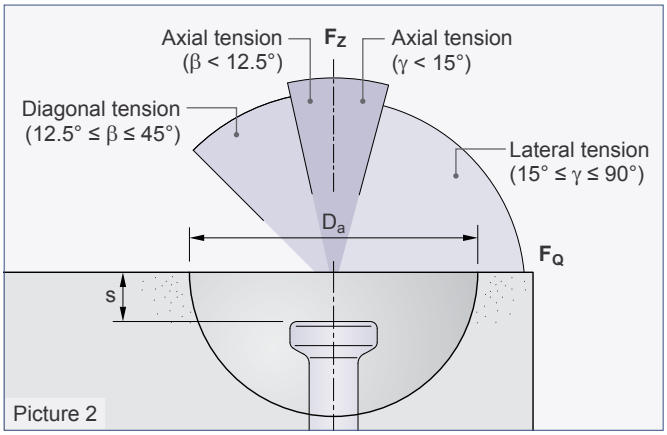





## System description



Picture 1



Picture 2

The Spherical head anchor is part of the PHILIPP Transport anchor system and complies with the VDI/BV-BS Guideline "Lifting inserts and lifting insert systems for precast concrete elements" (VDI/BV-BS 6205).
The use of Spherical head anchors requires the compliance with this Installation Instruction as well as the General Installation Instruction. The Installation Instruction for the belonging lifting device must be followed also. The anchor may only be used in combination with the mentioned PHILIPP lifting devices.
Spherical head anchors are designed for the transport of precast concrete units only. Multiple use within the transport chain (from production to installation of the unit) means no repeated usage. This Installation Instruction does not specify a repeated usage (e.g. ballasts for cranes) or a permanent fixation.

In order to distinguish the different sizes of Spherical head anchors a marking with load class and length is given on the head of the anchor. Picture 1 and table 1 show the dimensions and load classes of the Spherical head transport anchors.

**Table 1: Load classes and dimensions**

| Ref.-No. | Type | Dimensions [mm] | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|
| | | L | $Ød_s$ | $Ød_1$ | $Ød_2$ | s | $D_a$ | [kg/100 pcs.] |
| 81-050-075 | KK 5.0 | 75 | 20 | 36 | 50 | 15 | 94 | 33.0 |
| 81-050-085 | | 85 | 20 | 36 | 50 | 15 | 94 | 34.0 |
| 81-050-095 | | 95 | 20 | 36 | 50 | 15 | 94 | 38.0 |
| 81-050-110 | | 110 | 20 | 36 | 50 | 15 | 94 | 42.0 |
| 81-050-120 | | 120 | 20 | 36 | 50 | 15 | 94 | 44.0 |
| 81-075-085 | KK 7.5 | 85 | 24 | 46 | 60 | 15 | 118 | 62.0 |
| 81-075-095 | | 95 | 24 | 46 | 60 | 15 | 118 | 64.0 |
| 81-075-100 | | 100 | 24 | 46 | 60 | 15 | 118 | 67.0 |
| 81-075-120 | | 120 | 24 | 46 | 60 | 15 | 118 | 71.0 |
| 81-075-140 | | 140 | 24 | 46 | 60 | 15 | 118 | 78.0 |
| 81-075-165 | | 165 | 24 | 46 | 60 | 15 | 118 | 89.0 |
| 81-100-115 | KK 10.0 | 115 | 28 | 46 | 70 | 15 | 118 | 91.0 |
| 81-100-120 | | 120 | 28 | 46 | 70 | 15 | 118 | 93.0 |
| 81-100-135 | | 135 | 28 | 46 | 70 | 15 | 118 | 100.0 |
| 81-100-150 | | 150 | 28 | 46 | 70 | 15 | 118 | 107.0 |
| 81-100-170 | | 170 | 28 | 46 | 70 | 15 | 118 | 119.0 |
| 81-100-200 | | 200 | 28 | 46 | 70 | 15 | 118 | 131.0 |
| 81-100-250 | | 250 | 28 | 46 | 70 | 15 | 118 | 155.0 |
| 81-150-140 | KK 15.0 | 140 | 34 | 69 | 85 | 15 | 160 | 187.0 |
| 81-150-165 | | 165 | 34 | 69 | 85 | 15 | 160 | 201.0 |
| 81-150-200 | | 200 | 34 | 69 | 85 | 15 | 160 | 228.0 |
| 81-150-300 | | 300 | 34 | 69 | 85 | 15 | 160 | 299.0 |
| 81-200-165 | KK 20.0 | 165 | 39 | 69 | 98 | 15 | 160 | 259.0 |
| 81-200-200 | | 200 | 39 | 69 | 98 | 15 | 160 | 280.0 |
| 81-200-250 | | 250 | 39 | 69 | 98 | 15 | 160 | 322.0 |
| 81-200-340 | | 340 | 39 | 69 | 98 | 15 | 160 | 402.0 |

To determine the correct type please refer also to our General Installation Instruction.

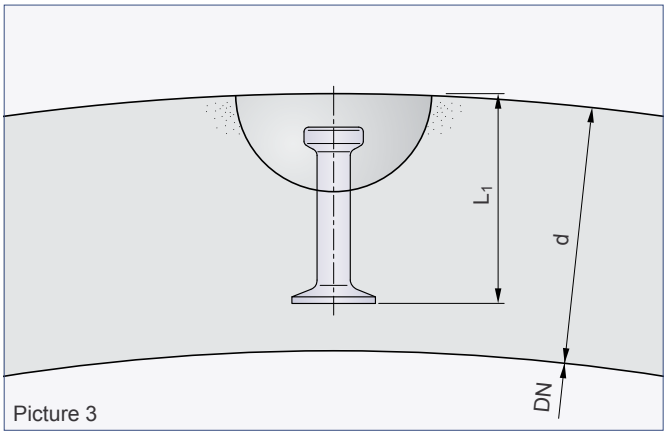
## Bearing capacities

### Materials

Spherical head anchors consist of a conforming to standards round steel bar with a forged head at both ends. The anchor can be supplied also in electro-galvanised, hot-dip galvanised and stainless steel material.

### Application

According to this instruction Spherical head anchors can be used to lift tubes and shafts. Table 2 shows the bearing capacities of the Spherical head anchors in tubes and shafts.



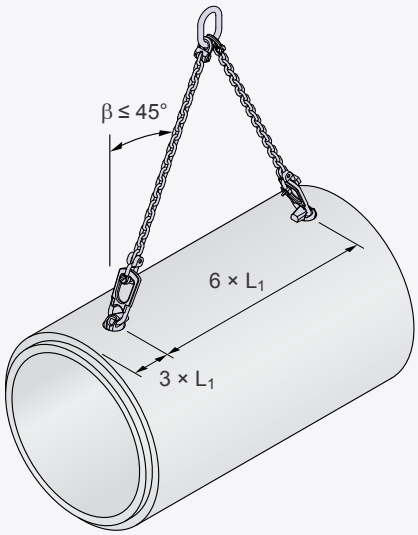
Picture 3

**Table 2: Permissible loads in tubes and shafts for axial tension, diagonal tension and lateral tension**

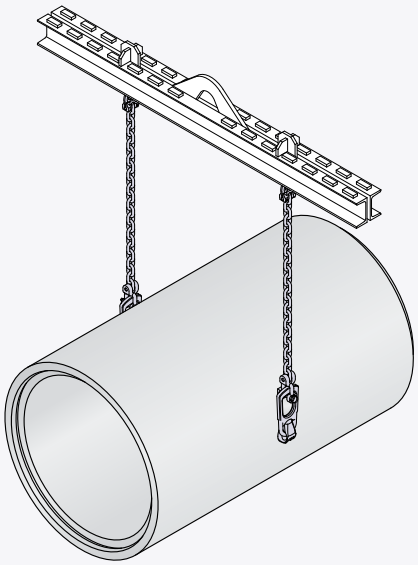
| Ref.-No. | Nominal diameter tube DN [mm] | Minimum tube wall thickness d [mm] | perm.F if $f_{cc}$ **35 N/mm²** Axial tension perm. $F_Z$ 0°- 12.5° [kN] | Diagonal tension perm. $F_Z$ 12.5°- 45° [kN] | Lateral tension perm. $F_Q$ 15°- 90° [kN] | if $f_{cc}$ **45 N/mm²** Axial tension perm. $F_Z$ 0°- 12.5° [kN] | Diagonal tension perm. $F_Z$ 12.5°- 45° [kN] | Lateral tension perm. $F_Q$ 15°- 90° [kN] | if $f_{cc}$ **55 N/mm²** Axial tension perm. $F_Z$ 0°- 12.5° [kN] | Diagonal tension perm. $F_Z$ 12.5°- 45° [kN] | Lateral tension perm. $F_Q$ 15°- 90° [kN] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 81-050-075 | ≥ 500 | 115 | 26.8 | 21.4 | 40.5 | 30.4 | 24.3 | 45.9 | 33.6 | 26.9 | 50.0 |
| 81-050-085 | | 125 | 31.5 | 25.2 | 47.7 | 35.8 | 28.6 | 50.0 | 39.5 | 31.6 | 50.0 |
| 81-050-095 | | 135 | 36.5 | 29.2 | 50.0 | 41.4 | 33.1 | 50.0 | 45.8 | 36.6 | 50.0 |
| 81-050-110 | | 150 | 44.5 | 35.6 | 50.0 | 50.0 | 40.4 | 50.0 | 50.0 | 40.8 | 50.0 |
| 81-050-120 | | 160 | 50.0 | 40.1 | 50.0 | 50.0 | 40.8 | 50.0 | 50.0 | 40.8 | 50.0 |
| 81-075-085 | ≥ 1200 | 125 | 31.3 | 25.0 | 47.3 | 35.5 | 28.4 | 53.6 | 39.2 | 31.4 | 59.3 |
| 81-075-095 | | 135 | 36.3 | 29.0 | 54.8 | 41.1 | 32.9 | 62.2 | 45.5 | 36.4 | 68.7 |
| 81-075-100 | | 140 | 38.9 | 31.1 | 58.7 | 44.1 | 35.3 | 66.6 | 48.7 | 39.0 | 73.6 |
| 81-075-120 | | 160 | 49.8 | 39.8 | 75.0 | 56.4 | 45.2 | 75.0 | 62.4 | 49.9 | 75.0 |
| 81-075-140 | | 180 | 61.6 | 49.2 | 75.0 | 69.8 | 55.8 | 75.0 | 75.0 | 59.2 | 75.0 |
| 81-075-165 | | 205 | 75.0 | 59.2 | 75.0 | 75.0 | 59.2 | 75.0 | 75.0 | 59.2 | 75.0 |
| 81-100-115 | ≥ 1400 | 155 | 46.7 | 37.4 | 70.6 | 52.9 | 42.4 | 80.0 | 58.5 | 46.8 | 88.4 |
| 81-100-120 | | 160 | 49.5 | 39.6 | 74.8 | 56.1 | 44.9 | 84.8 | 62.0 | 49.6 | 93.8 |
| 81-100-135 | | 175 | 58.2 | 46.6 | 88.0 | 66.0 | 52.8 | 99.8 | 73.0 | 58.4 | 100.0 |
| 81-100-150 | | 190 | 67.4 | 54.0 | 100.0 | 76.5 | 61.2 | 100.0 | 84.5 | 67.6 | 100.0 |
| 81-100-170 | | 210 | 80.4 | 64.3 | 100.0 | 91.2 | 71.3 | 100.0 | 100.0 | 71.3 | 100.0 |
| 81-100-200 | | 240 | 100.0 | 71.3 | 100.0 | 100.0 | 71.3 | 100.0 | 100.0 | 71.3 | 100.0 |
| 81-100-250 | | 290 | 100.0 | 71.3 | 100.0 | 100.0 | 71.3 | 100.0 | 100.0 | 71.3 | 100.0 |
| 81-150-140 | ≥ 1400 | 180 | 60.9 | 48.8 | 92.1 | 69.1 | 55.3 | 104.4 | 76.4 | 61.1 | 115.5 |
| 81-150-165 | | 205 | 76.8 | 61.4 | 116.0 | 87.0 | 69.6 | 131.5 | 96.2 | 77.0 | 145.4 |
| 81-150-200 | | 240 | 100.8 | 80.7 | 150.0 | 114.3 | 91.5 | 150.0 | 126.4 | 101.1 | 150.0 |
| 81-150-300 | | 340 | 150.0 | 122.5 | 150.0 | 150.0 | 122.5 | 150.0 | 150.0 | 122.5 | 150.0 |
| 81-200-165 | ≥ 1400 | 205 | 76.4 | 61.1 | 115.5 | 86.7 | 69.3 | 130.9 | 95.8 | 76.6 | 144.8 |
| 81-200-200 | | 240 | 100.5 | 80.4 | 151.8 | 113.9 | 91.1 | 172.1 | 125.9 | 100.7 | 190.3 |
| 81-200-250 | | 290 | 138.4 | 110.7 | 200.0 | 156.9 | 125.5 | 200.0 | 173.5 | 138.8 | 200.0 |
| 81-200-340 | | 380 | 200.0 | 140.0 | 200.0 | 200.0 | 140.0 | 200.0 | 200.0 | 140.0 | 200.0 |

The weight of 1.0 t corresponds to 10.0 kN.

## Application




Picture 4



Picture 5

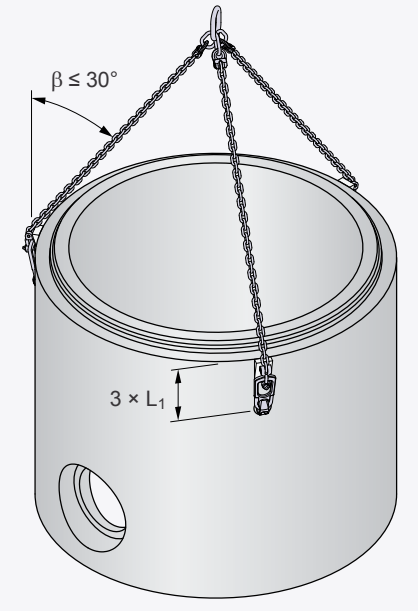
### Centre and edge distances, thicknesses of the tubes

The position and installation of Spherical head anchors in precast concrete units require minimum element dimensions and centre distances for a safe load transfer. Table 2 shows the minimum thickness d of a unit to cover the load directions axial and diagonal tension (β = 0° up to 45°) and lateral tension.

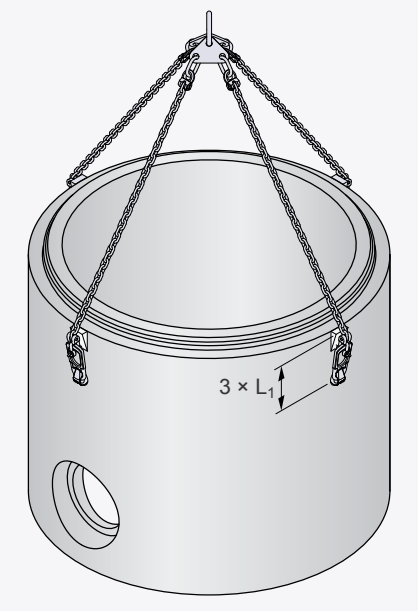
The minimum edge distance of the Spherical head transport anchor $a_r$ is min. 3 × $L_1$ ($L_1$ = L + s) and the minimum distance between each Spherical head transport anchor $a_a$ is min. 6 × $L_1$.

### Spherical head transport anchors in shafts

Shafts and manholes are transported with three or four Spherical head anchors depending on the weight of the shaft. Here, the anchors are installed laterally in the wall (Picture 6). When using four load bearing anchors a balancer (compensation rig) must be used (Picture 7). To prevent damages to the upper concrete edge an inclination angle of β ≤ 30° must not be exceeded (Picture 6). We recommend to protect the edge from spalling. The permissible lateral forces according to table 2 are valid. For the edge and centre distances the values specified in the previous chapter are applied accordingly.




Picture 6




Picture 7

## Reinforcement

### Reinforcement

For the usage of Spherical head anchors a structural reinforcement of the concrete element is required.
At the first time of lifting the concrete must have a minimum strength of $f_{cc}$ **35 N/mm²**. Should it be necessary to cut single bars for the installation of Spherical head anchors these have to be replaced by bars of the same diameter, strength and enough lap length according to EC 2. The user is personally responsible for further transmission of load into the concrete unit.

### Concrete

Concrete strengths $f_{cc}$ given in table 2 are based on concrete cube strengths at the time of first lifting.

### Corrosion

If the concrete elements with installed Spherical head anchors are stored outside for a longer time (contact with rain or humidity causes moisture insight the recesses) corrosion may reduce the bearing capacity of the Spherical head anchor. Therefore the anchor may fail under load. In addition, marks on the concrete surface caused by corrosion may appear.

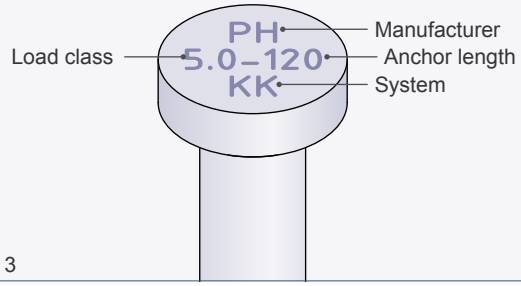
Manipulation and welding on Spherical head transport anchors are not permitted.

### Marking

In order to distinguish the different sizes of Spherical head anchors a marking with load class and length is given on the head of the anchor.

- Marking on anchor head
  - Manufacturer (PH)
  - Load class (e.g. 2.0)
  - Anchor length (e.g. 120)
  - System (KK)
- Marking on anchor foot
  - CE marking ①
  - Material (e.g. A4 for stainless steel SS316)

① The EC Declaration of Conformity (DoC) of the Spherical head anchor is available on request or can be downloaded from our website www.philipp-gruppe.de.




Picture 3

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Sustainable solutions

PHILIPP GROUP


**PHILIPP GmbH**
Lilienthalstrasse 7-9
D-63741 Aschaffenburg
Phone: +49 (0) 6021/40 27-0
Fax: +49 (0) 6021/40 27-440
info@philipp-gruppe.de

**PHILIPP GmbH**
Roßlauer Strasse 70
D-06869 Coswig/Anhalt
Phone: +49 (0) 34903/6 94-0
Fax: +49 (0) 34903/6 94-20
info@philipp-gruppe.de

**PHILIPP GmbH**
Sperberweg 37
D-41468 Neuss
Phone: +49 (0) 2131/59 18-0
Fax: +49 (0) 2131/59 18-10
info@philipp-gruppe.de

**PHILIPP Vertriebs GmbH**
Leogangerstraße 21
A-5760 Saalfelden / Salzburg
Phone + 43 (0) 6582 / 7 04 01
Fax + 43 (0) 6582 / 7 04 01 20
info@philipp-gruppe.at


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**For more information visit our website: www.philipp-group.de**