

EYE ANCHOR

SPHERICAL LIFTING SYSTEM



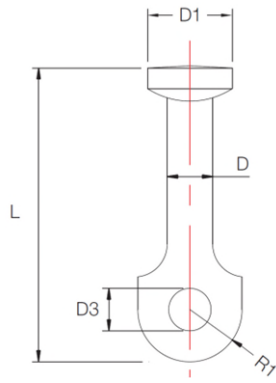
Mise à jour du 11/12/2024

Presentation

- The eye anchor is part of the Artéon product line. They are destined to lifting precast elements on the manufacturing plant and on construction site.
- All of our eye anchors are CE certified.
- In addition, our products are inspected to verify their compliance and thereby ensure their safety before placing them on the market.
- The anchors are made of S355J0 or equivalent raw steel.
- They are available in raw, electrogalvanized, HDG and on request in stainless steel.

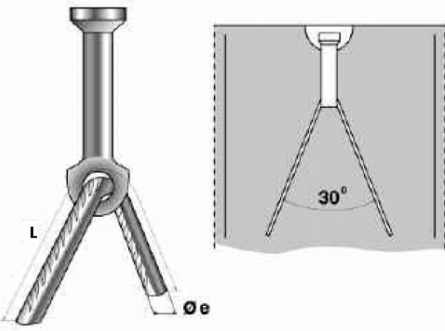
Admissible working loads and dimensions

The admissible working loads for a maximum sling angle of 45° to the anchor's in terms of steel capacity are given in the table below.

Admissible load	1.3 T	2.5 T	5 T	10 T	20 T	32 T	
D mm	10	14	20	28	38	50	
D1 mm	18	25	36	46	69	88	
D3 mm	10	13	20	25	38	47	
R1 mm	11	16	21,5	27,5	41,5	50	
L normal mm	65	90	120	180	250	300	
L short mm			90	115			

Anchor's Rebars

- B500 rebar (steel reinforcement bars for concrete with a yield limit of 500 MPa)
- To be chosen in accordance with the type of anchor and concrete strength during the first lifting from the table below:

	Admissible load	1.3 T	2.5 T	5 T	10 T	20 T	32 T
	Diameter e (mm)	8	10	16	20	32	40
	Concrete at 10 MPa	700	1100	1600	2000	3000	3800
	Concrete at 20 MPa	600	700	1100	1400	2000	2700
	Concrete at 30 MPa	450	600	900	1100	1700	2100
The total length L (mm) to install depending on the concrete strength.							

Determination of applied loads on anchorages

To determine the applied loads on anchorages, the following parameters must be considered:

- Weight of precast element
- Bonding to the formwork
- Lifting equipment introducing a dynamic coefficient
- Sling Angle
- Number and position of lifting points (number of effective lifting point).

1. Weight of precast element

The weight to be used in the calculations is the true weight of the part plus the weight of the items that will be lifted with it (formwork, pre-assembled components, etc.).

2. Bonding to the formwork

The bonding force q_{adh} acts when the part is stripped; it depends on the type of formwork used and is indicated in table below:

- The area to be used in the calculations is the area of concrete still in contact with the mould at the time of stripping . - With imprinted concrete surfaces, the adherence will be greater than indicated by the table and must be calculated separately. - In some particular cases, the adherence to be counted may be zero: prestressed parts, parts poured in lost forms, etc ...	Type of formwork	q_{adh}
	Oiled plastic or steel formwork	1 kN/m ²
	Oiled varnished wood formwork	2 kN/m ²
	Rough wood formwork	3 kN/m ²

3. Dynamic forces

During the lifting and shifting of the precast parts, the anchorages are subjected to dynamic forces. These forces depend on the type of lifting equipment used; a dynamic coefficient, defined in the table below, is used to allow for them:

<i>Lifting equipment</i>	<i>dynamic coefficient (ψ_{dyn})</i>
Crane, fixed or on rails, speed < 1m/s	1.15
Crane, fixed or on rails, speed > 1m/s	1.30
Travelling crane, speed < 1m/s	1.15
Travelling crane, speed > 1m/s	1.60
Lifting and shifting on level ground	2
Lifting and shifting on uneven ground	4

In other cases, the dynamic coefficient will be determined by a qualified individual.

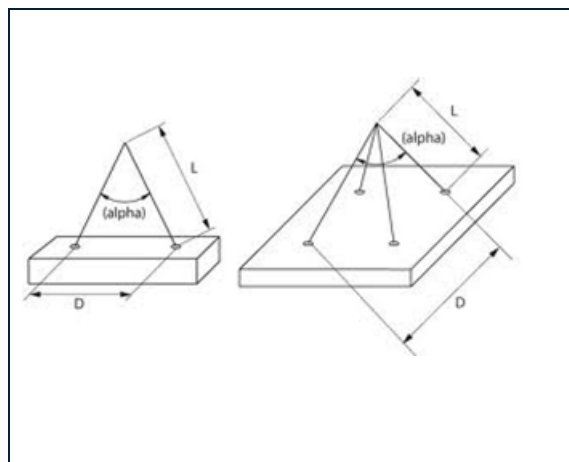
4. Sling angle

- If the slings are not vertical during the lifting, the force in the anchorages is weighted by the slinging coefficient from the table opposite.
- This coefficient depends on angle α , the angle at the apex of two diametrically opposed slings
- With D = distance between the two diametrically opposed anchorages.

<i>Angle α</i>	<i>Sling Length L</i>	<i>Slinging Coefficient (ψ_e)</i>
0°	-	1
30°	2 D	1.04
45°	1.3 D	1.08
60°	D	1.16
90°	0.7 D	1.42

5. Number of effective lifting points

- In a static system, the distribution of the loads in the slings depends on the positions of the anchorage points and on the tension in the slings; this is because, if the points are not perfectly symmetrical or if the slings are not all of the same length, some will not be taut. For this reason, when four-strand slings are used, only two effective lifting points are counted in the sizing.
- All of the lifting points placed are included in the calculation when a system that can distribute the loads over all of the anchorages is used (balancing lifting beam, slings with pulleys, etc.)



6. Determination of the forces applied to the anchorages

$$E_d = \frac{(G + q_{adh} \cdot A_f) \cdot \psi_{dyn} \cdot \psi_e}{N_{eff}}$$

With:

- G : weight of the part (kN)
- Q_{adh} : adherence (kN/m²)
- A_f : casting area (m²)
- ψ_{dyn} : dynamic coefficient
- ψ_e : slinging coefficient
- N_{eff} : number of effective points

7. Conclusion

- The working load limit of the anchorage chosen must be greater than E_d .
- It is sometimes necessary to calculate the forces applied to the anchorages in different stages of production in order to identify the worst case and choose the anchorages accordingly (handling in plant, lifting on site, tilting, etc.).
- The strength of the concrete at the time of the different lifting steps (in plant and on site) must be taken into account when choosing the size and type of anchorage.
- A qualified individual must choose the anchorage and check its pull-out strength in concrete.

8. Choice of rebars for foot and eye anchors

- The rebar is chosen according to the "Rebar" table on page 1.

Conditions ensuring correct and safe use of the anchors

1. Safety factors

- The safety factor on the anchors is 3 with respect to failure of the steel. The static test coefficient is 1.5 without deformation of the part. The recommended safety factor on the anchorage with respect to the pull-out strength of the concrete is at least 2.5.
- Anchors that have been used more than 10 times must not be loaded to more than 0.6 times their working load limit.
- The working load limit of an anchor is marked on its head.

2. Precautions to be taken when placing anchors

- Never weld the anchors.
- Always use the hemispherical formers provided for this purpose.
- The anchors must be slightly shy of the surface of the concrete (recessed in the former).

3. Strength of the eye anchors

- An eye anchor makes use of the adherence of its rebar.
- The longer the rebar, the stronger the anchorage.
- Comply carefully with the diameters recommended in our documentation.

Note: for narrow panels, always prefer an eye (or foot and eye) anchor.

4. Precautions to be taken during lifting

- At the time of lifting, refer to our directions for use of the rings, which state the conditions ensuring correct and safe use.
- The strength of the concrete and the lifting system (sling angles) assumed in the sizing of the anchors must be strictly applied.

The information provided in this document is for guidance only and reflects our current knowledge. We shall not be responsible or liable for any improper or inappropriate use of our products.

Given the wide range of possible uses, our recommendations do not exempt users from carrying out their own tests. Our laboratory and technical department will be happy to provide you with any information you may require.

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