

## Standardized Storage Silos

### Standardized Storage Silos

Zeppelin Silo- und Apparatechnik GmbH is the world's leading manufacturer of silos. As a result of our comprehensive experience in the handling of bulk solids and the production of silos, we are able to supply an extensive range of standardized silos in addition to individual products made to customers' specification. The range of standard silos for the storage of bulk solids is augmented by a series of gravity-type blending silos. These permit the blending and homogenizing of bulk solids during the product discharge stage.

In addition, we are able to supply all the accessories needed to ensure the dependable, maintenance-free operation of the silo installation.

### Standard Silo Range:

#### Static Configuration

Pure standard silos are designed to be used with a wide spectrum of bulk solids and are able to meet most operating requirements without design modifications. The design loads on which the structural strength of the silos is based are determined in accordance with DIN1055, part 6. A prerequisite for compliance with this standard is that the bulk solids should be of a granular or powdery consistency and, in any case, be of a free-flowing nature with a minimal tendency to coagulate. The product must be discharged by way of a central outlet only, without developing asymmetric flow patterns. Specifically, our static stress calculations are based on the following assumptions relating to the bulk solids.

- Design pressure = +45/-5 mbar
- Specific gravity of bulk goods  $\gamma = 6,0 \text{ kN/m}^3$   
or  
 $10 \text{ kN/m}^3$
- Horizontal load factor  $\lambda = 0,5 - 0,7$
- Wall friction coefficient  $\mu = 0,3 - 0,4$
- Discharging load factor  $e_{\eta} = 1,2$
- Bulk material coefficient  $\beta_G = 0,4$
- Base loading factor  $c_b = 1,5$

On the basis of these assumed loads, around 80 % of all bulk solids can be provided for. In cases involving bulk solids having properties at variance with the data given above, or which do not flow freely or have a tendency to eccentric discharge, even if only at times, we require specific information to be supplied. We manufacture standard silos even for these products, but in such cases it is necessary to draw up a separate stress analysis, taking account of the variations in product data.

This applies equally to silos which will be subjected to external loadings in excess of the figures given below. Variations in external loadings occur primarily in coastal areas or on exposed sites. The ability of silos to withstand earth tremors depends on the ratio of the height of the silo to its diameter. In general, silos are designed to withstand intensity 7 on the MSK scale or for use in earthquake zone 2, as specified in DIN 4149. In cases involving other earthquake zones, we should be notified before the order is placed, so that we can verify the resistance capacity of the silo in the stress analysis. We are always willing to quote you individually for our standard silos.

In case where heavier-gauge walls are required by comparison with our standard silos, because of variations in the bulk solids properties or more severe external loadings, we will identify the supplementary charges in your quotation.



Accepted loadings for standard silo design: + 45/-5 mbar

- Wind pressure load up to 8 m above ground level:	$q = 0,5 \text{ kN/m}^2$
- Wind pressure load up to 8 m to 20 m above ground level:	$q = 0,8 \text{ kN/m}^2$
- Wind pressure load up to 8 m above ground level:	$q = 1,1 \text{ kN/m}^2$
- Load on roof (snow and live loads): $d \leq 4200 \text{ mm}$	$q = 1,0 \text{ kN/m}^2$
$d > 4200 \text{ mm}$	$q = 0,75 \text{ kN/m}^2$
- Concentrated load on silo roof:	$P = 1,0 \text{ kN}$
- Area loading for connecting frames including snow load:	$q = 1,5 \text{ kN/m}^2$
- max. mounting height for silos with short skirt:	8m above ground level
with long skirt:	at ground level

## Standardized Storage Silos

### Determining the Flow Characteristics of Bulk Solids

Data on the flow characteristics of the bulk solids concerned are of the utmost importance for the configuration of the silo and, in turn, the trouble-free discharge of the product. If the flow behaviour of the bulk material is not specifically known, we recommend that shear tests be carried out in accordance with the FEM 2.381 guideline. These tests do not only permit the parameters to be determined which are necessary for the silo to be designed in accordance with the strength requirements laid down in DIN 1055, part 6, but also help in the selection and dimensioning of a suitable method of product discharge, so that the latter process can be guaranteed to take place without any problems.

### Installation

We will, if required, carry out the entire silo installation or will provide the services of supervisors or skilled installers. By this means, the installation will be carried out rapidly and cost-effectively.

### Quality Assurance

The exceptionally high quality standards (proved by our certification according to DIN ISO 9001/EN 29001) to which our products are made, is assured by our highly trained workforce and our modern manufacturing processes. In addition, our standard silos are subject to continuous, self-regulated inspections during manufacture and undergo further acceptance testing before delivery. As a result, we guarantee that our customers receive silos made to consistently high quality standard. Needless to say, we are also able to provide further proof of quality if required, such as ultrasonic and x-ray tests on welded seams, together with leak tests, dye penetration tests, etc.

### Let's talk about it!

The present technical data sheets are a summary of the current ZEPPELIN product program. They intend to help the customer in his planning processes. With this manual you take part in the continuous upgrading of the ZEPPELIN program. The ZEPPELIN advice center will automatically supply you with information about newly developed or improved products. Thus you are always up to date about the latest developments in "Silo Technology".

You can use the attached fax form to send us your quotation.

For further questions please do not hesitate to contact our experts personally. They are easily available at the ZEPPELIN advice center in Friedrichshafen and they will be happy to help you in a friendly and competent way.

### ZEPPELIN Silo- und Apparatechnik GmbH

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D-88045 Friedrichshafen

Phone: ++ 49 75 41 2 02 02

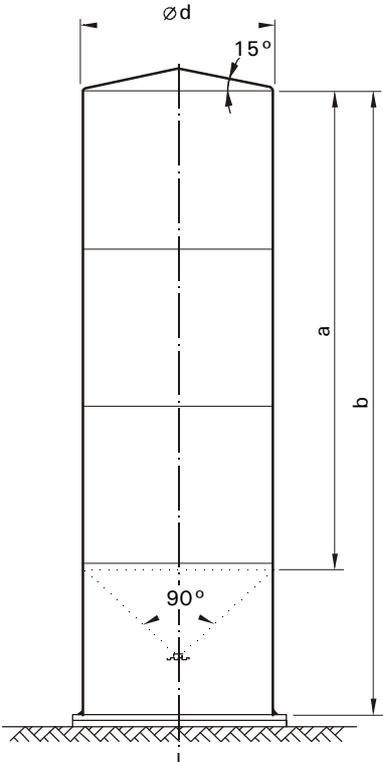
Telefax: ++ 49 75 41 2 02 4 91

e-mail: [zentral.fn@zeppelin.de](mailto:zentral.fn@zeppelin.de)

Internet: [zeppelin.com](http://zeppelin.com)

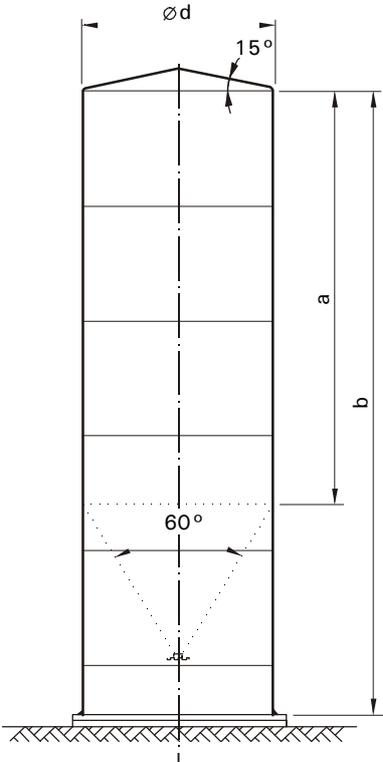
## Storage silos

Material: EN AW-5754 (AlMg3)  
 Silo configuration: Roof slope 15°, hopper with 90° angle of discharge  
 Standard accessories: 1 Set of lifting lugs  
 All dimensions in mm

Silo type NL (with long skirt)	Silo dimensions	Price code	Price code
<p>Silo with long skirt and base ring for full support.</p>  <p>If you cannot foresee a silo of a standard diameter due to building constraints or other reasons, please consult us. In such cases, we are able to supply suitable products.</p>	<p><b>d= 2400</b></p> <p>26 m<sup>3</sup> a = 5500 b = 7500            37 m<sup>3</sup> a = 8000 b = 10000            48 m<sup>3</sup> a = 10500 b = 12500            60 m<sup>3</sup> a = 13000 b = 15000            70 m<sup>3</sup> a = 15500 b = 17500</p> <p><b>d= 3000</b></p> <p>40 m<sup>3</sup> a = 5100 b = 7500            55 m<sup>3</sup> a = 7600 b = 10000            65 m<sup>3</sup> a = 8850 b = 11250            75 m<sup>3</sup> a = 10100 b = 12500            83 m<sup>3</sup> a = 11350 b = 13750            90 m<sup>3</sup> a = 12600 b = 15000            100 m<sup>3</sup> a = 13850 b = 16250            110 m<sup>3</sup> a = 15100 b = 17500            125 m<sup>3</sup> a = 17600 b = 20000</p> <p><b>d= 3500</b></p> <p>53 m<sup>3</sup> a = 4900 b = 7500            65 m<sup>3</sup> a = 6150 b = 8750            77 m<sup>3</sup> a = 7400 b = 10000            100 m<sup>3</sup> a = 9900 b = 12500            125 m<sup>3</sup> a = 12400 b = 15000            150 m<sup>3</sup> a = 14900 b = 17500            173 m<sup>3</sup> a = 17400 b = 20000            197 m<sup>3</sup> a = 19900 b = 22500            221 m<sup>3</sup> a = 22400 b = 25000            245 m<sup>3</sup> a = 24900 b = 27500</p> <p><b>d= 4200</b></p> <p>105 m<sup>3</sup> a = 6900 b = 10000            140 m<sup>3</sup> a = 9400 b = 12500            174 m<sup>3</sup> a = 11900 b = 15000            208 m<sup>3</sup> a = 14400 b = 17500            243 m<sup>3</sup> a = 16900 b = 20000            278 m<sup>3</sup> a = 19400 b = 22500            312 m<sup>3</sup> a = 21900 b = 25000</p>	<p><b>Type NL-24-9-6</b>            Bulk density            6 kN/m<sup>3</sup></p> <p>NL2496 026            NL2496 037            NL2496 048            NL2496 060            NL2496 070</p> <p><b>Type NL-30-9-6</b>            Bulk density            6 kN/m<sup>3</sup></p> <p>NL3096 040            NL3096 055            NL3096 065            NL3096 075            NL3096 083            NL3096 090            NL3096 100            NL3096 110            NL3096 125</p> <p><b>Type NL-35-9-6</b>            Bulk density            6 kN/m<sup>3</sup></p> <p>NL3596 053            NL3596 065            NL3596 077            NL3596 100            NL3596 125            NL3596 150            NL3596 173            NL3596 197            NL3596 221            NL3596 245</p> <p><b>Type NL-42-9-6</b>            Bulk density            6 kN/m<sup>3</sup></p> <p>NL4296 105            NL4296 140            NL4296 174            NL4296 208            NL4296 243            NL4296 278            NL4296 312</p>	<p><b>Type NL-24-9-1</b>            Schüttgew.            10 kN/m<sup>3</sup></p> <p>NL2491 026            NL2491 037            NL2491 048            NL2491 060            NL2491 070</p> <p><b>Type NL-30-9-1</b>            Bulk density            10 kN/m<sup>3</sup></p> <p>NL3091 040            NL3091 055            NL3091 065            NL3091 075            NL3091 083            NL3091 090            NL3091 100            NL3091 110            NL3091 125</p>

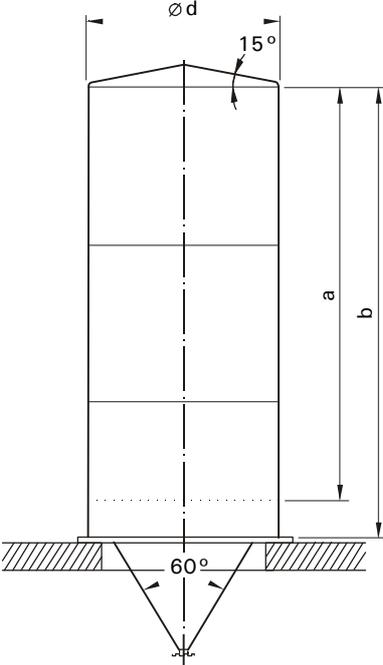
## Storage silos

Material: EN AW-5754 (AlMg3)  
 Silo configuration: Roof slope 15°, hopper with 60° angle of discharge  
 Standard accessories: 1 Set of lifting lugs  
 All dimensions in mm

Silo Type NL (with long skirt)	Silo dimensions	Price code	Price code
<p>Silo with long skirt and base ring for full support.</p>  <p>If you cannot foresee a silo of a standard diameter due to building constraints or other reasons, please consult us. In such cases, we are able to supply suitable products.</p>	<p><b>d= 2400</b></p> <p>25 m<sup>3</sup> a = 4800 b = 7500            36 m<sup>3</sup> a = 7300 b = 10000            47 m<sup>3</sup> a = 9800 b = 12500            58 m<sup>3</sup> a = 12300 b = 15000            70 m<sup>3</sup> a = 14800 b = 17500</p>	<p><b>Type NL-24-6-6</b>  <b>Bulk density</b>  <b>6 kN/m<sup>3</sup></b></p> <p>NL2466 025            NL2466 036            NL2466 047            NL2466 058            NL2466 070</p>	<p><b>Type NL-24-6-1</b>  <b>Bulk density</b>  <b>10 kN/m<sup>3</sup></b></p> <p>NL2461 025            NL2461 036            NL2461 047            NL2461 058            NL2461 070</p>
	<p><b>d= 3000</b></p> <p>35 m<sup>3</sup> a = 4200 b = 7500            45 m<sup>3</sup> a = 5450 b = 8750            55 m<sup>3</sup> a = 6700 b = 10000            70 m<sup>3</sup> a = 9200 b = 12500            80 m<sup>3</sup> a = 10450 b = 13750            90 m<sup>3</sup> a = 11700 b = 15000            105 m<sup>3</sup> a = 14200 b = 17500            125 m<sup>3</sup> a = 16700 b = 20000            140 m<sup>3</sup> a = 19200 b = 22500            150 m<sup>3</sup> a = 20450 b = 23750</p>	<p><b>Type NL-30-6-6</b>  <b>Bulk density</b>  <b>6 kN/m<sup>3</sup></b></p> <p>NL3066 035            NL3066 045            NL3066 055            NL3066 070            NL3066 080            NL3066 090            NL3066 105            NL3066 125            NL3066 140            NL3066 150</p>	<p><b>Type NL-30-6-1</b>  <b>Bulk density</b>  <b>10 kN/m<sup>3</sup></b></p> <p>NL3061 035            NL3061 045            NL3061 055            NL3061 070            NL3061 080            NL3061 090            NL3061 105            NL3061 125            NL3061 140            NL3061 150</p>
	<p><b>d= 3500</b></p> <p>45 m<sup>3</sup> a = 3750 b = 7500            58 m<sup>3</sup> a = 5000 b = 8750            70 m<sup>3</sup> a = 6250 b = 10000            94 m<sup>3</sup> a = 8750 b = 12500            118 m<sup>3</sup> a = 11250 b = 15000            142 m<sup>3</sup> a = 13750 b = 17500            154 m<sup>3</sup> a = 15000 b = 18750            166 m<sup>3</sup> a = 16250 b = 20000            190 m<sup>3</sup> a = 18750 b = 22500            200 m<sup>3</sup> a = 20000 b = 23750            212 m<sup>3</sup> a = 21250 b = 25000            236 m<sup>3</sup> a = 23750 b = 27500</p>	<p><b>Type NL-35-6-6</b>  <b>Bulk density</b>  <b>6 kN/m<sup>3</sup></b></p> <p>NL3566 045            NL3566 058            NL3566 070            NL3566 094            NL3566 118            NL3566 142            NL3566 154            NL3566 166            NL3566 190            NL3566 200            NL3566 212            NL3566 236</p>	<p><b>Type NL-35-6-1</b>  <b>Bulk density</b>  <b>10 kN/m<sup>3</sup></b></p> <p>NL3561 045            NL3561 058            NL3561 070            NL3561 094            NL3561 118            NL3561 142            NL3561 154            NL3561 166            NL3561 190            NL3561 200            NL3561 212            NL3561 236</p>
	<p><b>d= 4200</b></p> <p>93 m<sup>3</sup> a = 5500 b = 10000            127 m<sup>3</sup> a = 8000 b = 12500            162 m<sup>3</sup> a = 10500 b = 15000            196 m<sup>3</sup> a = 13000 b = 17500            231 m<sup>3</sup> a = 15500 b = 20000            266 m<sup>3</sup> a = 18000 b = 22500            300 m<sup>3</sup> a = 20500 b = 25000</p>	<p><b>Type NL-42-6-6</b>  <b>Bulk density</b>  <b>6 kN/m<sup>3</sup></b></p> <p>NL4266 093            NL4266 127            NL4266 162            NL4266 196            NL4266 231            NL4266 266            NL4266 300</p>	<p><b>Type NL-42-6-1</b>  <b>Bulk density</b>  <b>10 kN/m<sup>3</sup></b></p> <p>NL4261 093            NL4261 127            NL4261 162            NL4261 196            NL4261 231            NL4261 266            NL4261 300</p>

## Storage silos

Material: EN AW-5754 (AlMg3)  
 Silo configuration: Roof slope 15°, hopper with 60° angle of discharge  
 Standard accessories: 1 set of lifting lugs  
 All dimensions in mm

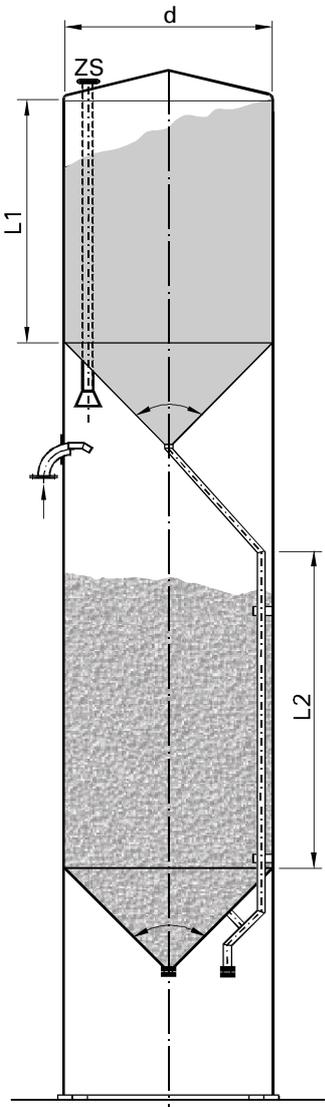
Silo Type NK (with short skirt)	Silo dimensions	Price code	Price code
<p>Silo with short skirt and base ring for full support.</p>  <p>If you cannot foresee a silo of a standard diameter due to building constraints or other reasons, please consult us. In such cases, we are able to supply suitable products.</p>	<p><b>d= 2400</b></p> <p>23 m<sup>3</sup> a = 4500 b = 5000            29 m<sup>3</sup> a = 5750 b = 6250            34 m<sup>3</sup> a = 7000 b = 7500            46 m<sup>3</sup> a = 9500 b = 10000            57 m<sup>3</sup> a = 12000 b = 12500            68 m<sup>3</sup> a = 14500 b = 15000</p>	<p><b>Type NK-24-6-6</b>  <b>Bulk density</b>  <b>6 kN/m<sup>3</sup></b></p> <p>NK2466 023            NK2466 029            NK2466 034            NK2466 046            NK2466 057            NK2466 068</p>	<p><b>Type NK-24-6-1</b>  <b>Bulk density</b>  <b>10 kN/m<sup>3</sup></b></p> <p>NK2461 023            NK2461 029            NK2461 034            NK2461 046            NK2461 057            NK2461 068</p>
	<p><b>d= 3000</b></p> <p>38 m<sup>3</sup> a = 4500 b = 5000            55 m<sup>3</sup> a = 7000 b = 7500            64 m<sup>3</sup> a = 8250 b = 8750            72 m<sup>3</sup> a = 9500 b = 10000            82 m<sup>3</sup> a = 10750 b = 11250            90 m<sup>3</sup> a = 12000 b = 12500            100 m<sup>3</sup> a = 13250 b = 13750            125 m<sup>3</sup> a = 17000 b = 17500</p>	<p><b>Type NK-30-6-6</b>  <b>Bulk density</b>  <b>6 kN/m<sup>3</sup></b></p> <p>NK3066 038            NK3066 055            NK3066 064            NK3066 072            NK3066 082            NK3066 090            NK3066 100            NK3066 125</p>	<p><b>Type NK-30-6-1</b>  <b>Bulk density</b>  <b>10 kN/m<sup>3</sup></b></p> <p>NK3061 038            NK3061 055            NK3061 064            NK3061 072            NK3061 082            NK3061 090            NK3061 100            NK3061 125</p>
	<p><b>d= 3500</b></p> <p>76 m<sup>3</sup> a = 7000 b = 7500            100 m<sup>3</sup> a = 9500 b = 10000            124 m<sup>3</sup> a = 12000 b = 12500            148 m<sup>3</sup> a = 14500 b = 15000            172 m<sup>3</sup> a = 17000 b = 17500            196 m<sup>3</sup> a = 19500 b = 20000            220 m<sup>3</sup> a = 22000 b = 22500            244 m<sup>3</sup> a = 24500 b = 25000</p>	<p><b>Type NK-35-6-6</b>  <b>Bulk density</b>  <b>6 kN/m<sup>3</sup></b></p> <p>NK3566 076            NK3566 100            NK3566 124            NK3566 148            NK3566 172            NK3566 196            NK3566 220            NK3566 244</p>	<p><b>Type NK-35-6-1</b>  <b>Bulk density</b>  <b>10 kN/m<sup>3</sup></b></p> <p>NK3561 076            NK3561 100            NK3561 124            NK3561 148            NK3561 172            NK3561 196            NK3561 220            NK3561 244</p>
	<p><b>d= 4200</b></p> <p>148 m<sup>3</sup> a = 9500 b = 10000            182 m<sup>3</sup> a = 12000 b = 12500            217 m<sup>3</sup> a = 14500 b = 15000            252 m<sup>3</sup> a = 17000 b = 17500            286 m<sup>3</sup> a = 19500 b = 20000            321 m<sup>3</sup> a = 22000 b = 22500            355 m<sup>3</sup> a = 24500 b = 25000</p>	<p><b>Type NK-42-6-6</b>  <b>Bulk density</b>  <b>6 kN/m<sup>3</sup></b></p> <p>NK4266 148            NK4266 182            NK4266 217            NK4266 252            NK4266 286            NK4266 321            NK4266 355</p>	<p><b>Type NK-42-6-1</b>  <b>Bulk density</b>  <b>10 kN/m<sup>3</sup></b></p> <p>NK4261 148            NK4261 182            NK4261 217            NK4261 252            NK4261 286            NK4261 321            NK4261 355</p>

## Storage silos

Material:  
Silo configuration:  
Standard accessories:

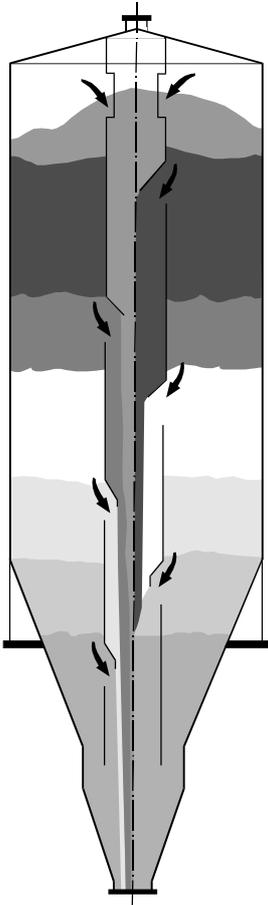
EN AW-5754 (AlMg3)  
Roof slope 15°, hopper with opening angle 60°/90°  
1 set of crane lugs  
All dimensions in mm

## Multi-chamber silos

	Designation	Price code
	<p><b>Additional discharge funnel with 90° opening angle</b></p> <p>Conical bottom for d = 2400 for bulk density 6 kN/m<sup>3</sup>            Conical bottom for d = 3000 for bulk density 6 kN/m<sup>3</sup>            Conical bottom for d = 3500 for bulk density 6 kN/m<sup>3</sup>            Conical bottom for d = 4200 for bulk density 6 kN/m<sup>3</sup></p> <p>Conical bottom for d = 2400 for bulk density 10 kN/m<sup>3</sup>            Conical bottom for d = 3000 for bulk density 10 kN/m<sup>3</sup>            Conical bottom for d = 3500 for bulk density 10 kN/m<sup>3</sup>            Conical bottom for d = 4200 for bulk density 10 kN/m<sup>3</sup></p> <p><b>Additional discharge funnel with 60° opening angle</b></p> <p>Conical bottom for d = 2400 for bulk density 6 kN/m<sup>3</sup>            Conical bottom for d = 3000 for bulk density 6 kN/m<sup>3</sup>            Conical bottom for d = 3500 for bulk density 6 kN/m<sup>3</sup>            Conical bottom for d = 4200 for bulk density 6 kN/m<sup>3</sup></p> <p>Conical bottom for d = 2400 for bulk density 10 kN/m<sup>3</sup>            Conical bottom for d = 3000 for bulk density 10 kN/m<sup>3</sup>            Conical bottom for d = 3500 for bulk density 10 kN/m<sup>3</sup>            Conical bottom for d = 4200 for bulk density 10 kN/m<sup>3</sup></p> <p><b>Extension for discharge pipe, depending on installation height of additional conical bottom</b>  <b>Basic price for discharge pipe DN 150</b>  <b>Basic price for discharge pipe DN 200</b>  <b>Extra charge for pipe elongation L2 per meter</b></p> <p><b>Protective pipe DN 100 for Silot, flange at the top DN 100, connecting gauge PN 10 with opening in hopper and centering cone at base.</b>  <b>Basic price for protective pipe ZS</b>  <b>Extra charge for pipe elongation L1 per meter</b></p>	<p><b>ZK2496</b>  <b>ZK3096</b>  <b>ZK3596</b>  <b>ZK4296</b></p> <p><b>ZK2491</b>  <b>ZK3091</b>  <b>ZK3591</b>  <b>ZK4291</b></p> <p><b>ZK2466</b>  <b>ZK3066</b>  <b>ZK3566</b>  <b>ZK4266</b></p> <p><b>ZK2461</b>  <b>ZK3061</b>  <b>ZK3561</b>  <b>ZK4261</b></p> <p><b>ZL15</b>  <b>ZL20</b>  <b>ZL1502</b></p> <p><b>ZS10</b></p> <p><b>ZS1000</b>  <b>ZL1001</b></p>

## Blending Silos

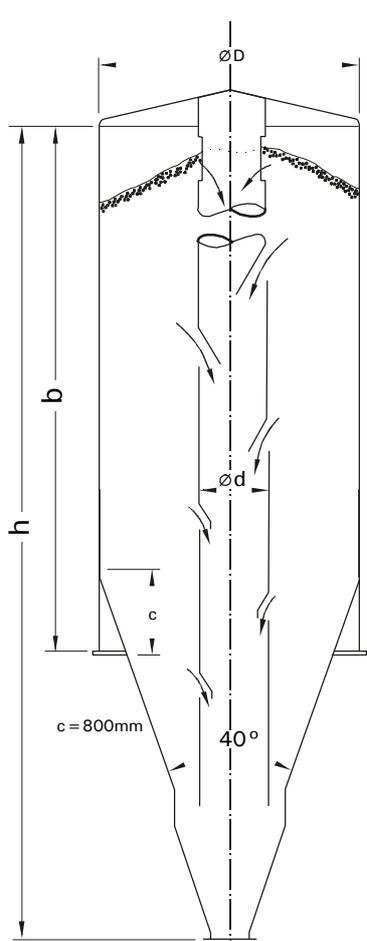
### Centro-Blender

	Product description
	<p><b>Centro-Blender</b></p> <p>continuous and batch-wise blending and homogenizing of bulk solids</p> <p><b>Utilization</b></p> <p>for solids having easy to poor flowability (plastic powders, recycling materials, pellets, flowable elastomers)</p> <p><b>Components</b></p> <p>vertical central blending pipe with intake openings at different levels</p> <p>cylindrical blending chamber</p> <p><b>System description</b></p> <p>Via the intake openings solids are simultaneously withdrawn from a multitude of layers from the annular space at different layers and led into the central blending pipe. The number and size of the intake openings are determined under consideration of the blender geometry and flow properties of the bulk solids.</p> <p><b>Advantages</b></p> <p>The Zeppelin Centro Blender offers the following advantages:</p> <ul style="list-style-type: none"> <li>no negative influence on the blending process</li> <li>consequent design for mass flow</li> <li>easy cleaning in case of change to a different product</li> <li>easy integration in the production process as the blender can be used for continuous and batch-wise blending</li> <li>high blending efficiency due to simultaneous withdrawal of solids from different layers</li> <li>for many applications of homogenization a single pass is sufficient, especially when the blender content is composed of a high number of individual batches</li> </ul>

# Blending Silos

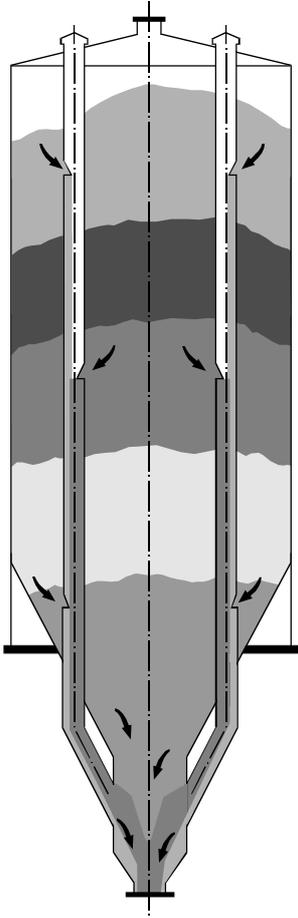
Material: EN AW-5754 (AlMg3)  
 Silo configuration: Roof slope 15°, hopper with 40° angle of discharge  
 Standard accessories: 1 set of lifting lugs  
 All dimensions in mm

## Centro-Blender

	Silo dimensions	Price code
 <p>If you cannot foresee a silo of a standard diameter due to building constraints or other reasons, please consult us. In such cases, we are able to supply suitable products.</p>	<p><b>d = 1600</b></p> <p>7 m<sup>3</sup> d = 400 b = 3750 h = 5400            10 m<sup>3</sup> d = 400 b = 5000 h = 6650</p>	<p><b>Type CB-16-4-8</b>  <b>Bulk density 8 kN/m<sup>3</sup></b></p> <p>CB1648 007            CB1648 010</p>
	<p><b>d = 2000</b></p> <p>15 m<sup>3</sup> d = 600 b = 5000 h = 8000            20 m<sup>3</sup> d = 600 b = 6250 h = 9250            24 m<sup>3</sup> d = 600 b = 7500 h = 10750</p>	<p><b>Type CB-20-4-8</b>  <b>Bulk density 8 kN/m<sup>3</sup></b></p> <p>CB2048 015            CB2048 020            CB2048 024</p>
	<p><b>d = 2200</b></p> <p>25 m<sup>3</sup> d = 600 b = 6250 h = 9500            28 m<sup>3</sup> d = 600 b = 7500 h = 10750</p>	<p><b>Type CB-22-4-8</b>  <b>Bulk density 8 kN/m<sup>3</sup></b></p> <p>CB2248 025            CB2248 028</p>
	<p><b>d = 2400</b></p> <p>30 m<sup>3</sup> d = 600 b = 6250 h = 9800            40 m<sup>3</sup> d = 600 b = 8750 h = 12300            50 m<sup>3</sup> d = 600 b = 11250 h = 14800</p>	<p><b>Type CB-24-4-8</b>  <b>Bulk density 8 kN/m<sup>3</sup></b></p> <p>CB2448 030            CB2448 040            CB2448 050</p>
	<p><b>d = 2800</b></p> <p>65 m<sup>3</sup> d = 600 b = 10000 h = 14100</p>	<p><b>Type CB-28-4-8</b>  <b>Bulk density 8 kN/m<sup>3</sup></b></p> <p>CB2848 065</p>
	<p><b>d = 3000</b></p> <p>75 m<sup>3</sup> d = 600 b = 10000 h = 14000            85 m<sup>3</sup> d = 600 b = 11250 h = 15250            100 m<sup>3</sup> d = 600 b = 13750 h = 17750            110 m<sup>3</sup> d = 600 b = 15000 h = 19000</p>	<p><b>Type CB-30-4-8</b>  <b>Bulk density 8 kN/m<sup>3</sup></b></p> <p>CB3048 075            CB3048 085            CB3048 100            CB3048 110</p>
	<p><b>d = 3500</b></p> <p>105 m<sup>3</sup> d = 800 b = 10000 h = 15050            130 m<sup>3</sup> d = 800 b = 12500 h = 17550</p>	<p><b>Type CB-35-4-8</b>  <b>Bulk density 8 kN/m<sup>3</sup></b></p> <p>CB3548 105            CB3548 130</p>
	<p>The standard dimensions are based on the configuration for PVC dryblend and bulk solids with comparable flow characteristics. For other bulk solids, we configure Centro-Blend blending silos in accordance with the verified product flow characteristics.</p>	

## Blending Silos

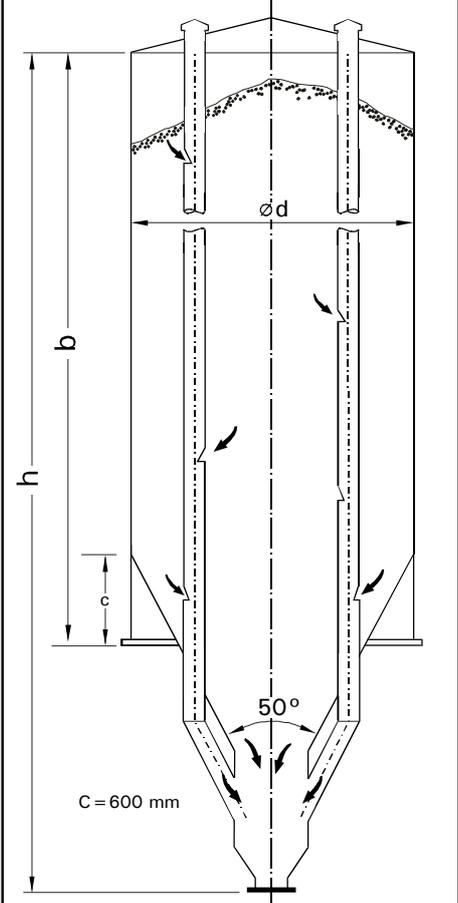
### Multi-Pipe (Gravity Blender)

	Product description
	<p><b>Multi-Pipe Gravity Blender</b></p> <p>For free flowing, dry and cohesionless bulk solids with particle sizes above approx. 0.5 mm, especially pellets.</p> <p><b>Design</b></p> <p>With extruded three-compartment pipes made from aluminium respectively stainless steel.</p> <p>Each individual chamber of the blending pipe has several intake openings.</p> <p><b>Description</b></p> <p>Via the intake openings of the blending pipes the bulk solids will flow from different zones in the silo into the central hopper outlet, resulting in different residence times which are used for blending.</p> <p>With continuous operation solids are fed constantly or in regular intervals into the blender while the respective quantity is withdrawn via the blending pipes and the hopper outlet. Thus, the filling level remains almost constant.</p> <p>With discontinuous operation the blender is filled successively with different batches. After filling the material within the blender is recirculated or discharged directly. As during discharge the filling level is reduced constantly, solids are withdrawn successively via intake openings at different heights of the individual blending pipe compartments.</p> <p>Only at the start of the homogenization process a quantity of approx. 15% of the blender content has to be recirculated as mainly bulk solids with the same composition can be found in the discharge cone, the blending chamber and in the lower area of the blending pipes.</p> <p><b>Advantages</b></p> <p>Zeppelin Multi-Pipe Gravity Blenders are applicable for different filling levels up to approx. 25%. Design of the hopper for mass flow guarantees good homogenization results.</p> <p>Zeppelin Multi-Pipe Gravity Blenders can be used either continuously or for batch-wise blending.</p> <p>For many applications the homogenizing effect of one single pass is satisfactory due to the high number of discharge points. Thus, the recirculation via an external pneumatic conveying system will, therefore, only be necessary for a very high degree of homogeneity or extremely wide fluctuations of product quality.</p>

# Blending Silos

Material: EN AW 5754 (AlMg3)  
 Silo configuration: Roof slope 15°, hopper with 50° angle of discharge  
 Standard accessories: 6 nozzles with blind flanges in the roof for blending pipes  
 1 set of lifting lugs  
 All dimensions in mm

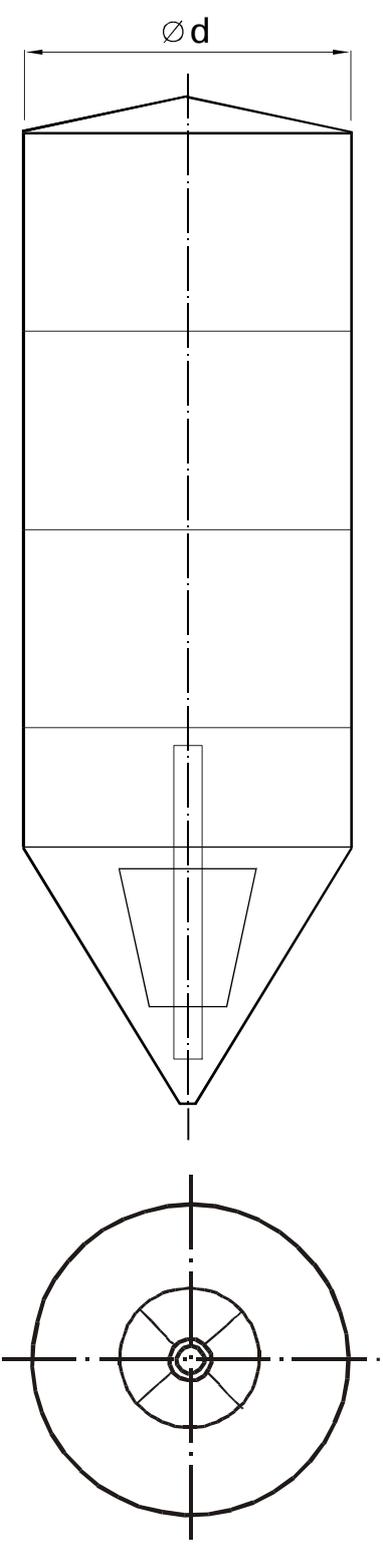
## Multi-Pipe (Gravity Blender)

Silo Type MP (with short skirt)	Silo dimensions	Price code
 <p data-bbox="129 1825 587 1951">If you cannot foresee a silo of a standard diameter due to building constraints or other reasons, please consult us. In such cases, we are able to supply suitable products.</p>	<p data-bbox="608 461 740 488"><b>d = 2000</b></p> <p data-bbox="628 517 1118 544">18 m<sup>3</sup>      b = 6250      h = 9000</p>	<p data-bbox="1209 427 1501 490"><b>Bulk density 6 kN/m<sup>3</sup></b> <b>Type MP-20-5-6</b></p> <p data-bbox="1273 517 1449 544">MP2056 018</p>
	<p data-bbox="608 577 740 604"><b>d = 2200</b></p> <p data-bbox="628 633 1118 660">25 m<sup>3</sup>      b = 7500      h = 10250</p>	<p data-bbox="1257 577 1469 604"><b>Type MP-22-5-6</b></p> <p data-bbox="1273 633 1449 660">MP2256 025</p>
	<p data-bbox="608 689 740 716"><b>d = 2400</b></p> <p data-bbox="628 745 1118 772">30 m<sup>3</sup>      b = 7500      h = 10500</p> <p data-bbox="628 779 1118 806">45 m<sup>3</sup>      b = 10000      h = 13000</p>	<p data-bbox="1257 689 1469 716"><b>Type MP-24-5-6</b></p> <p data-bbox="1273 745 1449 772">MP2456 030</p> <p data-bbox="1273 779 1449 806">MP2456 045</p>
	<p data-bbox="608 840 740 866"><b>d = 2800</b></p> <p data-bbox="628 896 1118 922">50 m<sup>3</sup>      b = 8750      h = 12150</p>	<p data-bbox="1257 840 1469 866"><b>Type MP-28-5-6</b></p> <p data-bbox="1273 896 1449 922">MP2856 050</p>
	<p data-bbox="608 956 740 983"><b>d = 3000</b></p> <p data-bbox="628 1012 1118 1039">70 m<sup>3</sup>      b = 10000      h = 13600</p> <p data-bbox="628 1046 1118 1072">100 m<sup>3</sup>      b = 13750      h = 17350</p>	<p data-bbox="1257 956 1469 983"><b>Type MP-30-5-6</b></p> <p data-bbox="1273 1012 1449 1039">MP3056 070</p> <p data-bbox="1273 1046 1449 1072">MP3056 100</p>
	<p data-bbox="608 1106 740 1133"><b>d = 3500</b></p> <p data-bbox="628 1162 1118 1189">100 m<sup>3</sup>      b = 10000      h = 14150</p> <p data-bbox="628 1196 1118 1223">125 m<sup>3</sup>      b = 12500      h = 16650</p> <p data-bbox="628 1229 1118 1256">150 m<sup>3</sup>      b = 15000      h = 19150</p>	<p data-bbox="1257 1106 1469 1133"><b>Type MP-35-5-6</b></p> <p data-bbox="1273 1162 1449 1189">MP3556 100</p> <p data-bbox="1273 1196 1449 1223">MP3556 125</p> <p data-bbox="1273 1229 1449 1256">MP3556 150</p>
	<p data-bbox="608 1290 740 1317"><b>d = 4000</b></p> <p data-bbox="628 1346 1118 1373">160 m<sup>3</sup>      b = 12500      h = 17200</p> <p data-bbox="628 1379 1118 1406">180 m<sup>3</sup>      b = 13750      h = 18450</p> <p data-bbox="628 1413 1118 1440">200 m<sup>3</sup>      b = 15000      h = 19700</p>	<p data-bbox="1257 1290 1469 1317"><b>Type MP-40-5-6</b></p> <p data-bbox="1273 1346 1449 1373">MP4056 160</p> <p data-bbox="1273 1379 1449 1406">MP4056 180</p> <p data-bbox="1273 1413 1449 1440">MP4056 200</p>
	<p data-bbox="608 1473 740 1500"><b>d = 4200</b></p> <p data-bbox="628 1529 1118 1556">200 m<sup>3</sup>      b = 13750      h = 18650</p> <p data-bbox="628 1563 1118 1590">250 m<sup>3</sup>      b = 17500      h = 22400</p>	<p data-bbox="1257 1473 1469 1500"><b>Type MP-42-5-6</b></p> <p data-bbox="1273 1529 1449 1556">MP4256 200</p> <p data-bbox="1273 1563 1449 1590">MP4256 250</p>
	<p data-bbox="608 1624 740 1650"><b>d = 4500</b></p> <p data-bbox="628 1680 1118 1706">250 m<sup>3</sup>      b = 15000      h = 20250</p> <p data-bbox="628 1713 1118 1740">300 m<sup>3</sup>      b = 18750      h = 24000</p>	<p data-bbox="1257 1624 1469 1650"><b>Type MP-45-5-6</b></p> <p data-bbox="1273 1680 1449 1706">MP4556 250</p> <p data-bbox="1273 1713 1449 1740">MP4556 300</p>
	<p data-bbox="608 1774 740 1800"><b>d = 5000</b></p> <p data-bbox="628 1830 1118 1856">360 m<sup>3</sup>      b = 17500      h = 23250</p> <p data-bbox="628 1863 1118 1890">400 m<sup>3</sup>      b = 20000      h = 25750</p>	<p data-bbox="1257 1774 1469 1800"><b>Type MP-50-5-6</b></p> <p data-bbox="1273 1830 1449 1856">MP5056 360</p> <p data-bbox="1273 1863 1449 1890">MP5056 400</p>
	<p data-bbox="608 1924 740 1951"><b>d = 6000</b></p> <p data-bbox="628 1980 1118 2007">525 m<sup>3</sup>      b = 17500      h = 24350</p> <p data-bbox="628 2013 1118 2040">600 m<sup>3</sup>      b = 20000      h = 26850</p>	<p data-bbox="1257 1924 1469 1951"><b>Type MP-60-5-6</b></p> <p data-bbox="1273 1980 1449 2007">MP6056 525</p> <p data-bbox="1273 2013 1449 2040">MP6056 600</p>

## Blending Silos

### Multi-Flow Blender

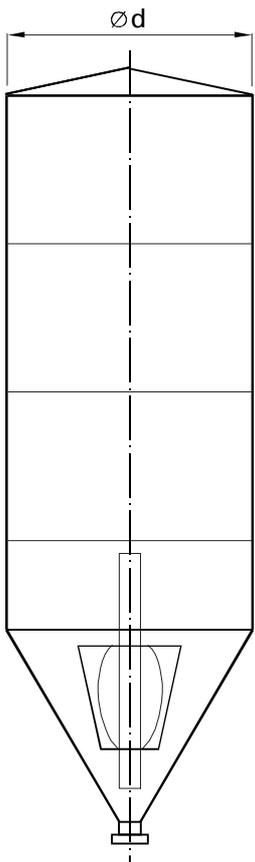
Page 1 of 2

	Product description
	<p><b>For homogenizing batches or production-related variations of pellets and powders. Easy to retrofit to existing storage silos.</b></p> <p><b>Description</b></p> <p>The blending effect of the ZEPPELIN Multi-Flow Blender is achieved by the installation of a blending hopper resulting in different flow velocities and, thus, in different residence times of the bulk solids. Multi-Flow Blending Silos are most advantageous if the ratio of their height to the diameter is less than 2,5.</p> <p><b>Design</b></p> <p>Multi-Flow Blending Hoppers can be welded into silos during fabrication. Optionally existing silos can be retrofitted with the hopper. For retrofitting the hopper can be subsequently welded or flange-mounted to the silo.</p> <p>The Multi-Flow Blending Hopper is designed for mass flow ensuring an optimum blending result and complete discharge of the silo.</p> <p>For support of the hopper plane vertical ribs are used which facilitates cleaning of the silo.</p> <p><b>Operation</b></p> <p>The Multi-Flow Blender is suitable for continuous operation as well as for discontinuous, batch-wise operation. The blending process can optionally be improved by external recirculation.</p> <p>In most cases for homogenization of batches one single pass is sufficient. If the ratio of the silo height to the silo diameter is very small and if only a few batches shall be homogenized recirculation should be foreseen.</p> <p><b>Advantages</b></p> <p>The ZEPPELIN Multi-Flow Blending Hopper offers you the following advantages:</p> <ul style="list-style-type: none"> <li>Easy and quick method to retrofit existing silos</li> <li>Good blending results due to a wide residence time distribution and due to mass flow</li> <li>Easy cleaning due to no additional internal installations in the blending hopper</li> <li>Favorable solution for blending of bulk solids</li> </ul>

# Blending silos

Material: EN AW 5754 (AlMg3) or stainless steel  
 Bolting for flanges: stainless material  
 Configuration: 50/60°-mass flow hopper  
 Blending cone with central pipe  
 Vertical support ribs  
 All dimensions in mm

## Multi-Flow Blender

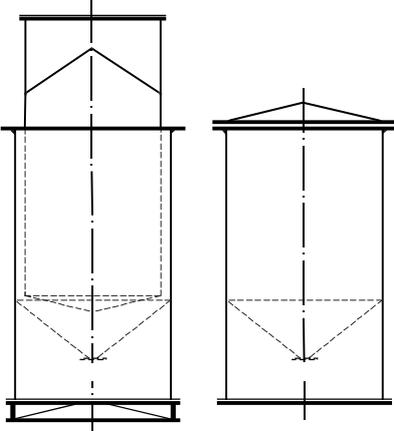
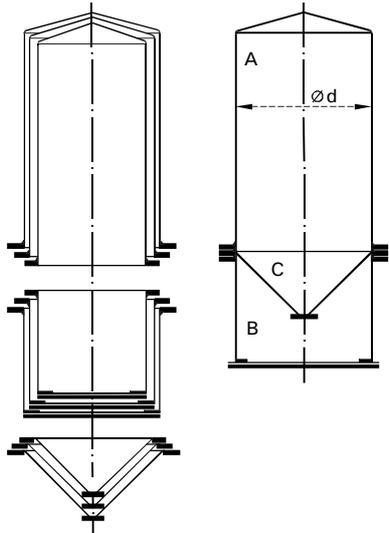
Silo type MF	Blending hopper dimensions	Price code
 <p data-bbox="135 1769 518 1892">If you cannot foresee a silo of a standard diameter due to building constraints or other reasons, please consult us. In such cases, we are able to supply suitable products.</p>	<p data-bbox="603 459 1082 526"><u>Hoppers for welding to the silo during fabrication</u></p> <p data-bbox="603 555 734 683"> <b>d = 2400</b>  <b>d = 3000</b>  <b>d = 3500</b>  <b>d = 4200</b> </p> <p data-bbox="603 750 1066 784"><u>Hopper for flanging to the silo flange</u></p> <p data-bbox="603 813 734 940"> <b>d = 2400</b>  <b>d = 3000</b>  <b>d = 3500</b>  <b>d = 4200</b> </p> <p data-bbox="603 1008 1093 1075"><u>Hopper for retrofitting existing silos by welding (without flange connection)</u></p> <p data-bbox="603 1104 734 1232"> <b>d = 2400</b>  <b>d = 3000</b>  <b>d = 3500</b>  <b>d = 4200</b> </p> <p data-bbox="603 1854 1173 1960">Standard dimensions are based on the design for free flowing bulk solids with a density of the bulk solids up to 6 kN/m<sup>3</sup>, a wall friction angle ≥ 20 ° and a design temperature of 60° C.</p>	<p data-bbox="1295 555 1423 683"> <b>MFE2400</b>  <b>MFE3000</b>  <b>MFE3500</b>  <b>MFE4200</b> </p> <p data-bbox="1295 813 1423 940"> <b>MFF2400</b>  <b>MFF3000</b>  <b>MFF3500</b>  <b>MFF4200</b> </p> <p data-bbox="1295 1104 1423 1232"> <b>MFS2400</b>  <b>MFS3000</b>  <b>MFS3500</b>  <b>MFS4200</b> </p>

## Storage silos

Material: EN AW-5754 (AlMg3)  
 Silo configuration: Roof slope 15°, hopper with 60°/90° angle of discharge  
 Standard accessories: 1 set of lifting lugs  
 All dimensions in mm

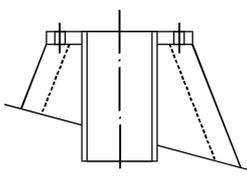
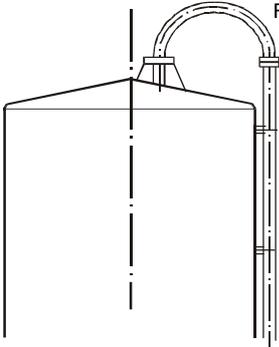
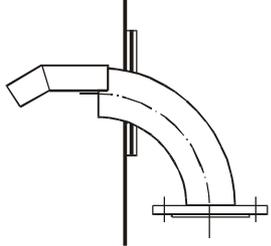
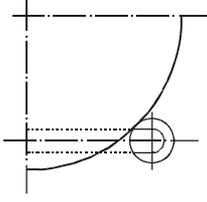
### Emboxable version

(efficient method for transportation)

	Product description
<p data-bbox="177 651 531 678">Two silos in emboxable version</p>  <p data-bbox="156 1249 549 1276">Several silos in emboxable version</p> 	<p data-bbox="587 416 711 443"><b>Utilization</b></p> <p data-bbox="587 450 1267 477">For several (at least two) silos of equal or similar size.</p> <p data-bbox="587 512 828 539"><b>System description</b></p> <p data-bbox="587 546 1469 703">ZEPPELIN emboxable silos are manufactured with minor differences in diameter (difference 50-100 mm) and are equipped with a flange connection at the transition between the cylinder and the hopper respectively roof. This method allows to embox the cylinders, hoppers, and skirts of a silo group into each other for transportation.</p> <p data-bbox="587 710 1490 801">In case of increased requirements for dust density and gas density we recommend a density welding at the flange connection after installation on site.</p> <p data-bbox="587 837 735 864"><b>Accessories</b></p> <p data-bbox="587 871 1481 1028">Accessories which protrude more than 25 or 50 mm from the silo wall and which shall be fitted to the silo cylinder are delivered in screwed execution for installation on site. This method can only be realized thanks to the exact manufacture of ZEPPELIN emboxable silos in vertical position.</p> <p data-bbox="587 1064 724 1090"><b>Calculation</b></p> <p data-bbox="587 1097 1493 1225">The silo size is stipulated based on the minimum volume of the smallest silo or on the average volume of the silo group. The number of ZEPPELIN emboxable silos per transport package depends on the max. permissible package weights.</p> <p data-bbox="587 1261 708 1288"><b>Transport</b></p> <p data-bbox="587 1294 1489 1518">For transport of the packages are put on wooden saddles or wooden supports depending on the requirements. For overseas transport the open front surface at the cylinder is sealed with wooden covers. The accessories are stowed inside the packages during transport. For transport the hopper cones will be fixed to the flange of the cylindrical silo shell or stowed in the dead space inside the skirt (depending on the length and weight of the packages).</p> <p data-bbox="587 1554 708 1581"><b>Assembly</b></p> <p data-bbox="587 1588 1485 1744">On site the emboxable silo parts (skirts respectively hoppers with short skirts and silo cylinders) are deboxed. The skirts are lifted onto the foundation base rings. The flange connections are bolted together. For the silo erection normally one crane is required. An additional fork-lift truck will be required to dismount the components of a package.</p> <p data-bbox="587 1780 735 1807"><b>Advantages</b></p> <p data-bbox="587 1814 1493 2036">Considerable reduction of the total volume required for transportation over far distances respectively overseas (e.g. for the transport of two emboxable silos approx. 45% of the normally required shipping volume can be saved, for the transport of six silos approx. 80% can be saved) whereas the optical quality of the silos is not deteriorated. Quick and easy erection of the silos (the erection will take approx. 4 h per silo if it is carried out by 3 skilled workers).</p>

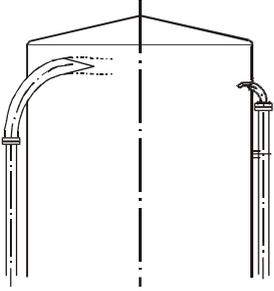
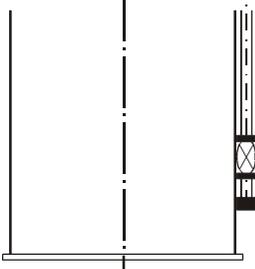
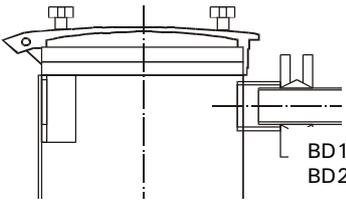
**Silo accessories**

**Silo filling**

	Designation	Price code
 <p>L3 L4 L5</p>	<p><b>Filling via silo roof</b></p> <p><b>Filling nozzle</b> made from aluminium, PN 10 for mounting to the silo roof, with reinforcing ribs</p> <p><b>DN 80</b> (for filling pipe elbow FB1)  <b>DN 100</b> (for filling pipe elbow FB2 and FBS1)  <b>DN 125</b> (for filling pipe elbow FBS2)</p>	<p>L3 L4 L5</p>
 <p>FB1, FB2 FBS1, FBS2</p> <p>R8 R10</p>	<p><b>Filling pipe with top elbow</b> made from stainless steel 1.4541, elbow 180°, R = 600 or 1000 mm, flanges PN 10 with gasket and bolts, connection to filling pipe by loose flange</p> <p><b>DN 80</b> loose flange at connection to the filling nozzle  <b>DN 100</b> loose flange at connection to the filling nozzle</p> <p><b>DN 80</b> fixed flange at connection to the filling nozzle  <b>DN 100</b> fixed flange at connection to the filling nozzle</p>	<p>FB1 FB2 FBS1 FBS2</p>
 <p>L15 L16</p>	<p><b>Filling nozzles mounted laterally to silo shell</b></p> <p><b>Filling nozzle</b> made from stainless steel 1.4541, PN 10 elbow 90°, R 5 d, with internal deflector plate, radial mounting to silo shell</p> <p><b>DN 80</b>  <b>DN 100</b></p>	<p>L15 L16</p>
 <p>L31 L32 L33 L34</p>	<p><b>Filling nozzle</b> made from aluminium tangentially mounting to silo shell, with elbow 90°, R = 1000 mm, flange joint PN 10 and deflector plate</p> <p><b>DN 80</b>  <b>DN 100</b></p> <p><b>Filling nozzle</b> made from stainless steel 1.4541, PN 10 tangential mounting to silo shell, elbow 90°, R = 1000 mm, with deflector plate</p> <p><b>DN 80</b>  <b>DN 100</b></p>	<p>L31 L32 L33 L34</p>

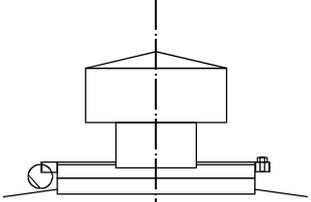
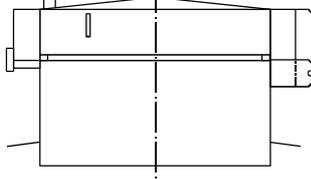
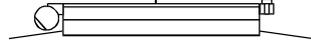
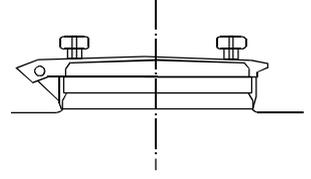
**Silo accessories**

**Silo filling**

	Designation	
<p>L31 L32 L33 L34</p>  <p>L15 L16</p> <p>R8 R10</p>	<p><b>Filling pipe</b> made from aluminium, with connecting flange PN 10 at top, with vehicle coupling or flange joint at the bottom, inclusive of pipe brackets and U-bracket screws</p> <p><b>DN 80</b> <b>DN 100</b></p> <p><b>Limit switch</b> for the vehicle coupling</p>	<p><b>R8</b> <b>R10</b></p> <p><b>RE</b></p>
 <p>R8 R10</p> <p>QV8 QV10</p>	<p><b>Squeezing valve</b> with electric-pneumactical controls comprising: pressure reducing valve with pressure gauge 3/2-port-solenoid valve (non-charged open circuit) Power supply unit 24 V DC Quick-action ventilating valve Sound absorber</p> <p><b>DN 80</b> <b>DN 100</b></p>	<p><b>QV8</b> <b>QV10</b></p>
 <p>BD1 BD2</p>	<p><b>Filling dome</b> made from aluminium with horizontally positioned connecting flange PN 10 and aluminium deflector. Complete with roof inspection hole DN 500</p> <p><b>DN 80</b> <b>DN 100</b></p>	<p><b>BD1</b> <b>BD2</b></p>

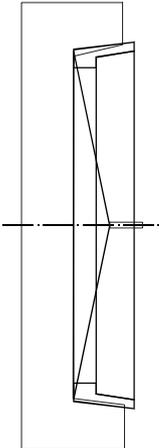
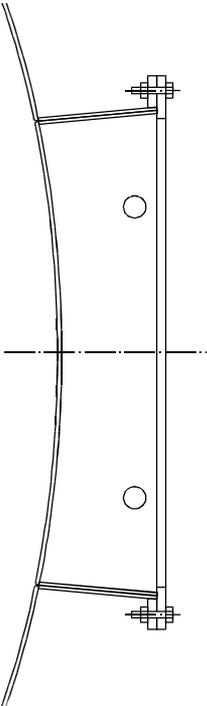
**Silo accessories**

**Roof inspection holes and roof manholes**

	Designation	
 <p>ME5</p>	<p>Roof inspection hole* Combined with weld mounted vent nozzle DN 200</p> <p><b>DN 500</b></p>	<p><b>ME5</b></p>
 <p>ME6</p>	<p>Roof inspection hole* Combined with swivel-type ventilation hood (open cross-section 0,10 m<sup>2</sup>) and integrated safety grid</p> <p><b>DN 600</b></p>	<p><b>ME6</b></p>
 <p>M5</p>	<p>Roof inspection hole* with integrated safety grid</p> <p><b>DN 500</b> <b>DN 600</b></p>	<p><b>M5</b> <b>M6</b></p>
 <p>M6 M8</p>	<p>Roof manhole with srew-mounted cover and integrated safety grid</p> <p><b>DN 600</b> <b>DN 800</b></p>	<p><b>M6</b> <b>M8</b></p>
	<p>Padlock for ME and M.</p> <p><b>VS10</b></p> <p><small>* Permitted in the Federal Republic of Germany only as an access opening for assembly oprations but not as a manhole for operational access according to the German accident prevention regulations UVV/VBG 112.</small></p>	<p><b>VS10</b></p>

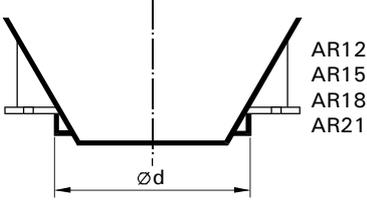
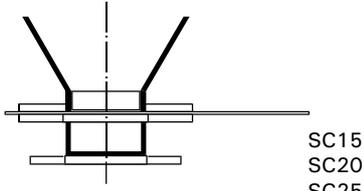
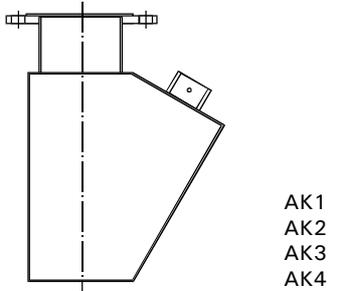
**Silo accessories**

**Shell access openings and manholes**

	Designation	
 <p data-bbox="443 562 499 611">M7 M7A</p>	<p data-bbox="571 488 922 584">Access opening* with cover opening inwards <b>DN 600</b></p> <p data-bbox="571 618 1201 745">Access opening* with cover opening inwards and deflector plate to prevent deposits of product on the manhole <b>DN 600</b></p>	<p data-bbox="1377 555 1425 582"><b>M7</b></p> <p data-bbox="1366 719 1433 745"><b>M7A</b></p>
 <p data-bbox="464 1211 520 1261">MV5 MV6</p>	<p data-bbox="571 1010 1233 1171">Access opening* with deflector to avoid product deposits. The deflec- tor is bolted to the manhole cover, so that the man- hole can be completely removed when the silo is empty.</p> <p data-bbox="683 1171 786 1234"><b>DN 500</b> <b>DN 600</b></p> <p data-bbox="571 1899 1249 1973">* Permitted in Germany only as an access opening for assembly op- erations but not as a manhole for operational access complying with German accident prevention regulations UVV/VBG 112.</p>	<p data-bbox="1366 1171 1433 1234"><b>MV5</b> <b>MV6</b></p>

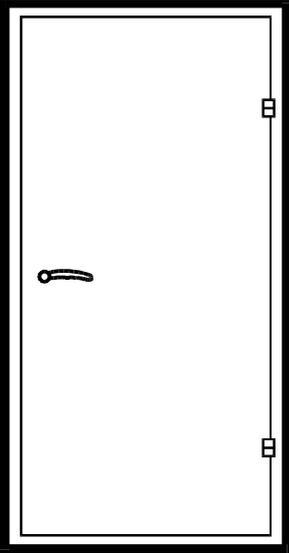
## Silo accessories

### Product discharge fittings

	Designation	Price code
	<p><b>Suspension mount</b></p> <p>Suspension mount for vibrating bottom sleeves</p> <p><b>d ≤ 1250 mm</b>  <b>d ≤ 1500 mm</b>  <b>d ≤ 1800 mm</b>  <b>d ≤ 2100 mm</b></p>	<p><b>AR12</b>  <b>AR15</b>  <b>AR18</b>  <b>AR21</b></p>
	<p><b>Emergency slide valves</b></p> <p>Emergency slide valve for pellets. Aluminium frame with CrNi steel slide plate for manual operation, welded to conical bottom, inclusive of connecting flange at the bottom.</p> <p><b>DN 150</b>  <b>DN 200</b>  <b>DN 250</b></p>	<p><b>SC15</b>  <b>SC20</b>  <b>SC25</b></p>
	<p><b>Vacuum extraction box</b></p> <p>Vacuum extraction box for pellets made from aluminium; with connecting flange DN 150, 1 opening DN 80 and clamping flanges optionally</p> <p>d = 60/70/80 for vacuum pipe connection.</p> <p><b>1 clamping flange</b>  <b>2 clamping flanges</b>  <b>3 clamping flanges</b>  <b>4 clamping flanges</b></p>	<p><b>AK1</b>  <b>AK2</b>  <b>AK3</b>  <b>AK4</b></p>

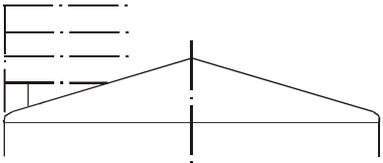
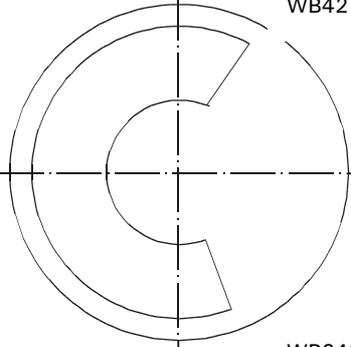
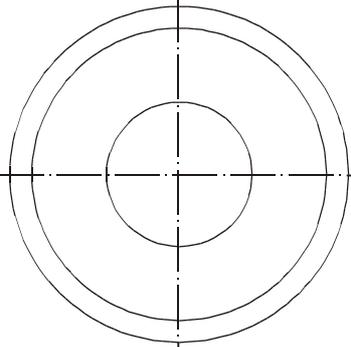
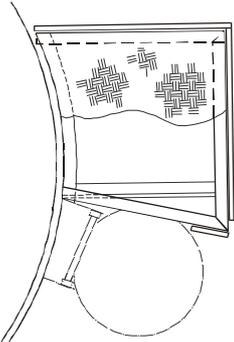
**Silo accessories**

**Skirt doors and openings**

	Designation	Price code
 <p style="text-align: right; margin-right: 20px;">T1 T3 T4</p>	<p><b>Doors</b></p> <p>Door, lockable, with door knob and reinforcement of skirt in the vicinity of door opening, door optionally with stop at right or left hand side.</p> <p style="text-align: center;">850 x 1400 mm 850 x 1800 mm 500 x 800 mm</p> <p><b>Large openings in the silo skirt</b></p> <p>Opening in silo skirt with reinforcement of the silo shell.</p> <p style="text-align: center;">850 x 1400 mm 850 x 1800 mm 500 x 800 mm</p> <p><b>Openings in the silo skirt</b></p> <p style="text-align: center;">up to 100 x 100 mm up to 250 x 250 mm up to 500 x 500 mm</p>	<p style="text-align: center;">T1 T3 T4</p> <p style="text-align: center;">AU1 AU3 AU4</p> <p style="text-align: center;">DU10 DU25 DU50</p>

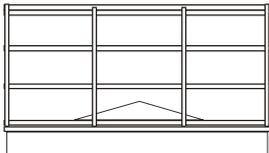
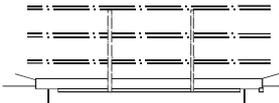
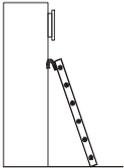
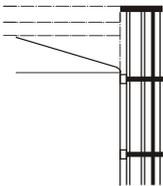
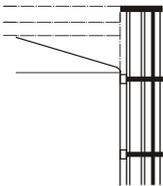
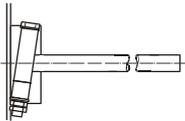
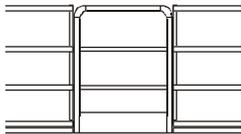
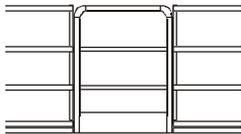
**Silo accessories**

**Maintenance platforms**

	Designation	Price code
 <p>WB24.. WB30.. WB35.. WB42..</p>  <p>WB2418 WB3018 WB3518 WB4218</p>  <p>WB2436 WB3036 WB3536 WB4236</p>  <p>MP1</p>	<p><b>Maintenance platforms</b></p> <p>Even/plain maintenance platforms according to DIN 31003, made from checkered aluminium plate, suitable for silo roofs with 15° slope. Platform width: 600 mm.</p> <p>Maintenance platforms at 180°  <b>for silo diameter 2400 mm</b>  <b>for silo diameter 3000 mm</b>  <b>for silo diameter 3500 mm</b>  <b>for silo diameter 4200 mm</b></p> <p>Maintenance platforms at 360°  <b>for silo diameter 2400 mm</b>  <b>for silo diameter 3000 mm</b>  <b>for silo diameter 3500 mm</b>  <b>for silo diameter 4200 mm</b></p> <p><b>Manhole platform</b></p> <p>Manhole platform, made from checkered aluminium plate, with 1200 mm high railing, to be mounted laterally to the silo shell, size 1000 x 850 mm</p> <p><b>Anti-slip coating</b></p> <p>For additional safety on a roof with slope angle 15° a anti-slip coating can be rolled out. This coating provides the slippery roof with a rough structure.</p>	<p><b>WB2418</b> <b>WB3018</b> <b>WB3518</b> <b>WB4218</b></p> <p><b>WB2436</b> <b>WB3036</b> <b>WB3536</b> <b>WB4236</b></p> <p><b>MP1</b></p> <p><b>ASD</b></p>

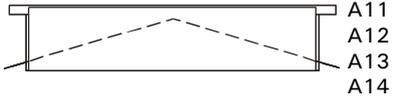
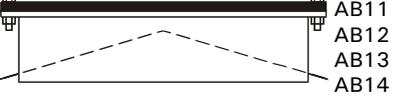
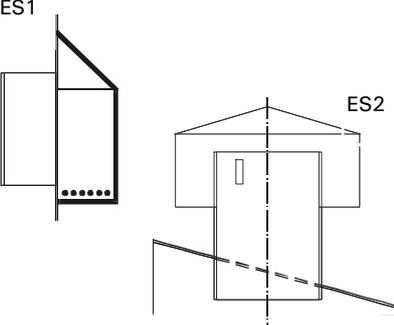
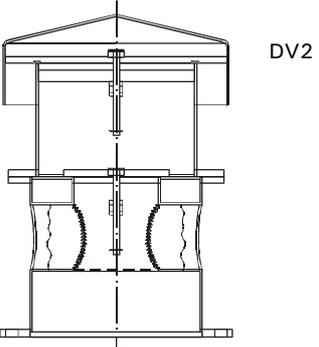
## Silo accessories

### Access elements

	Designation	
 <p>G24 G30 G35 G42</p>	<p><b>Roof railings</b></p> <p>Roof railings 1200 mm high (in combination with maintenance platforms WB 1350 mm high), with hand rail and one knee rail and one foot rail inclusive of fastening elements for mounting to silo roof.</p> <p>for silo diameter 2400 mm for silo diameter 3000 mm for silo diameter 3500 mm for silo diameter 4200 mm</p>	<p>G24 G30 G35 G42</p>
 <p>B6-B35</p>	<p><b>Connecting walkways</b></p> <p>Connecting walkway made from checkered aluminium plate, with railings 1200 mm high, 820 mm wide.</p> <p>for distance between silos up to 600 mm for distance between silos up to 900 mm for distance between silos up to 1200 mm for distance between silos up to 1500 mm for distance between silos up to 2000 mm for distance between silos up to 2500 mm for distance between silos up to 3000 mm for distance between silos up to 3500 mm</p>	<p>B6 B9 B12 B15 B20 B25 B30 B35</p>
 <p>UK25 UK30 UK35</p>	<p><b>Ladders and rest platform</b></p> <p>Ladder without safety cage, with attachment bracket on silo</p> <p>length 2500 mm length 3000 mm length 3500 mm</p>	<p>UK25 UK30 UK35</p>
 <p>U</p>	<p>Short ladder with safety cage, inclusive of fastening clips to silo.</p>	<p>U</p>
 <p>RP</p>	<p>Rest platform for ladders (prescribed for a ladder height of more than 10 m, according to DIN 24532 and German accident prevention regulations UVV)</p>	<p>RP</p>
 <p>UR</p>	<p>Attachment brackets for short ladder necessary for further silos (1 pair)</p>	<p>UE</p>
 <p>UR</p>	<p><b>Safety elements</b></p> <p>Safety hoop as safeguard against falling at top of ladder.</p>	<p>UR</p>
 <p>UT</p>	<p>Safety gate as safeguard against falling at top of ladder.</p>	<p>UT</p>
	<p>Access barrier for ladder U with padlock.</p>	<p>US</p>

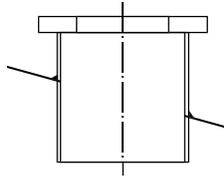
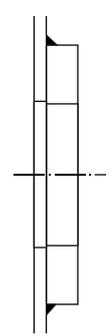
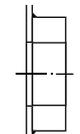
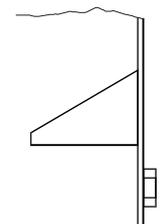
## Silo accessories

### Filter and vent nozzles, pressure relief valves

	Designation	Price code
	<b>Filter nozzles</b> Round filter nozzles, with flange, without gasket and screws, mounted on silo roof <b>internal diameter 500 - 849 mm</b> <b>internal diameter 850 - 1200 mm</b>	<b>A11</b> <b>A12</b>
	Square filter nozzles, with flange, without gasket and screws, mounted on silo roof <b>internal width 500 - 849 mm</b> <b>internal width 850 - 1200 mm</b>	<b>A13</b> <b>A14</b>
	<b>Blind flanges for filter nozzles</b> Blind flange for round filter nozzle with gasket and screws <b>for internal diameter 500 - 849 mm</b> <b>for internal diameter 850 - 1200 mm</b>	<b>AB11</b> <b>AB12</b>
	Blind flange for square filter nozzle with gasket and screws <b>for internal width 500 - 849 mm</b> <b>for internal width 850 - 1200 mm</b>	<b>AB13</b> <b>AB14</b>
	<b>Vent nozzle</b> Vent nozzle with rain collar, mounted to silo roof <b>DN 200 (Open cross-section 0.02 m<sup>2</sup>)</b>	<b>ES1</b>
	Vent nozzle with rain collar, mounted to silo shell <b>200 x 160 mm (Open cross-section 0.02 m<sup>2</sup>)</b>	<b>ES2</b>
	<b>Pressure relief valve</b> Pressure relief valve designed for +45/-5 mbar ± 10% made from aluminium, with rain collar and connecting flange DN 250 PN 10. The valve is not gas-tight. For more detailed information, see leaflet No. DV 2 Appropriate nozzle: C8	<b>DV2</b>          <b>C8</b>

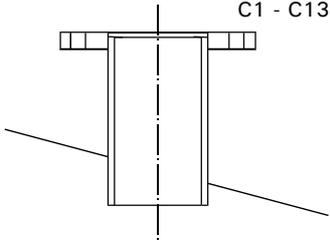
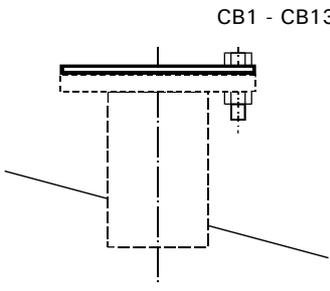
## Silo accessories

### Nozzles for level indicators

		Designation	
		<u>Nozzles for level indicators</u>	
		<b>Flange nozzles</b>	
		Flange nozzles according to DIN 2501, PN 10, without gaskets and bolts	
		<b>DN 100</b>	<b>C4</b>
	D2	<b>150 x 150 mm / internal diameter d = 100 mm with 4 threaded holes d = 18 on hole circle d = 170</b>	<b>D2</b>
	D3	<b>d= 120/70 mm, with 4 threaded holes M 6 on hole circle d= 90</b>	<b>D3</b>
	D4	<b>d= 150/70 mm, with 4 threaded holes M 6 on hole circle d= 90</b>	<b>D4</b>
	DB2	<b>Block flanges</b>	
	DB3	<b>150 x 150 mm / d= 120, with 4 threaded holes M 16 on hole circle d= 170</b>	<b>DB2</b>
	DB4	<b>d= 120/70 mm, with 4 threaded holes M 6 on hole circle d= 90</b>	<b>DB3</b>
		<b>d= 120/70 mm with 4 threaded holes M 8 on hole circle d= 90</b>	<b>DB4</b>
	GM 1/2	<b>Threaded sleeve with plastic screw plug</b>	
	GM1	R 1/2"	<b>GM 1/2</b>
	GM1 1/2	R 1"	<b>GM1</b>
	GM2	R 1 1/2"	<b>GM1 1/2</b>
GM2 1/2	R 2"	<b>GM2</b>	
	R 2 1/2"	<b>GM2 1/2</b>	
		<b>Protective hood</b>	
	SD	Protective hood for level indicators mounted to the silo shell and the cone.	<b>SD</b>

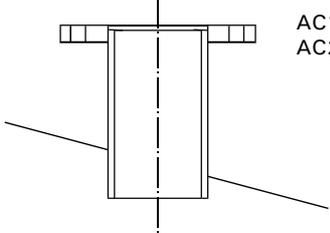
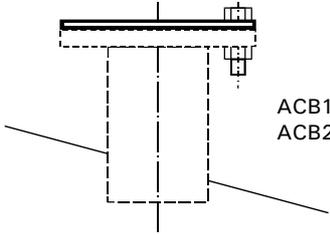
## Silo accessories

### Nozzles

	Designation	
	<p><b>Flange nozzles</b></p> <p>Flange nozzles made from aluminium with connecting dimensions according to DIN 2501, PN 10, without gasket and bolts</p> <p>           DN 50            DN 65            DN 80            DN 100            DN 125            DN 150            DN 200            DN 250            DN 300            DN 350            DN 400            DN 450            DN 500         </p>	<p>C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13</p>
		<p><b>Blind flanges</b></p> <p>Blind flanges made from aluminium for nozzles Type C with gasket and bolts</p> <p>           DN 50            DN 65            DN 80            DN 100            DN 125            DN 150            DN 200            DN 250            DN 300            DN 350            DN 400            DN 450            DN 500         </p>
	<p>Special types on request.</p>	

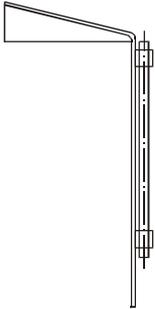
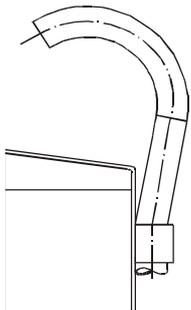
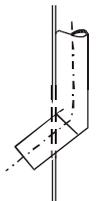
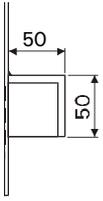
## Silo accessories

### Nozzles

	Designation	
 <p>AC1" - AC20"</p>	<p><b>Flange nozzles</b></p> <p>Flange nozzles made from aluminium with connecting dimensions according to ANSI B 16.5 150 lbs/sq.inch, without gaskets and bolts</p> <p>1" 1 1/2" 2" 3" 4" 5" 6" 8" 10" 12" 14" 16" 18" 20"</p>	<p>AC1 AC1½ AC2 AC3 AC4 AC5 AC6 AC8 AC10 AC12 AC14 AC16 AC18 AC20</p>
 <p>ACB1" - ACB20"</p>	<p><b>Blind flange</b></p> <p>Blind flanges made from aluminium for nozzle type AC with gaskets and bolts.</p> <p>1" 1 1/2" 2" 3" 4" 5" 6" 8" 10" 12" 14" 16" 18" 20"</p>	<p>ACB1 ACB1½ ACB2 ACB3 ACB4 ACB5 ACB6 ACB8 ACB10 ACB12 ACB14 ACB16 ACB18 ACB20</p>
	<p>Special types on request.</p>	

**Silo accessories**

**Protective cable conduit/Rain collar**

	Designation	
 <p>KS1 KS2 KS3 KS4</p>	<p><b>Protective cable conduit</b></p> <p>Protective cable conduit, complete with brackets, welded vertically to the silo shell, open at top and bottom, not led into the silo skirt</p> <p>internal diameter = 29 mm internal diameter = 50 mm internal diameter = 80 mm internal diameter = 100 mm</p>	<p>KS1 KS2 KS3 KS4</p>
 <p>KB1 KB2 KB3 KB4</p>	<p>Elbow fitting, upper end-section for cable conduit</p> <p>internal diameter = 29 mm internal diameter = 50 mm internal diameter = 80 mm internal diameter = 100 mm</p>	<p>KB1 KB2 KB3 KB4</p>
 <p>KD1 KD2 KD3 KD4</p>	<p>Lead-in aperture for introduction of cable conduit into silo skirt</p> <p>internal diameter = 29 mm internal diameter = 50 mm internal diameter = 80 mm internal diameter = 100 mm</p>	<p>KD1 KD2 KD3 KD4</p>
 <p>RK24 RK30 RK35 RK42</p>	<p><b>Rain collar</b></p> <p>Rain collar for insertion under roof flashing</p> <p>for silo diameter = 2400 mm for silo diameter = 3000 mm for silo diameter = 3500 mm for silo diameter = 4200 mm</p>	<p>RK24 RK30 RK35 RK42</p>

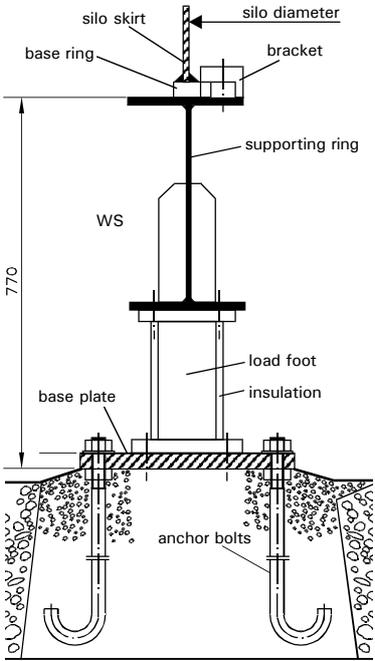
**Silo accessories****Filling level control system**

Page 1 of 2

	Designation
	<p data-bbox="604 421 1262 450"><b>ZEPPELIN Filling level control system ZEP-CONTROL</b></p> <p data-bbox="604 517 746 546"><b>Application</b></p> <p data-bbox="604 584 1417 645">For continuous measurement of the weighing of silos and vessels – Exactly defined display of silo content at any time</p> <p data-bbox="604 683 692 712"><b>Design</b></p> <p data-bbox="604 750 1501 810">The filling level control system consists of a supporting ring made from steel and load cells with integrated intelligent sensors.</p> <p data-bbox="604 848 1469 972">Evaluation unit for data visualization PC (supplied by customer) runs under digital user surface Microsoft® MS Windows TM. Alternatively a digital display unit with graphics display is available.</p> <p data-bbox="604 1010 1501 1200"><b>Anchoring:</b> The system shall be bolted with the supporting ring and the base plate to the concrete foundation. The base plate shall be bolted or welded to the steel frame. The supporting ring shall be connected to the silo skirt with the help of clamping brackets.</p> <p data-bbox="604 1238 1497 1361"><b>Functioning of the system</b> The sensors measure the load feet's length which varies depending on the current silo weight. The measurement result is transferred as a digital signal to the evaluation unit by means of a bus system.</p> <p data-bbox="604 1400 756 1429"><b>Advantages</b></p> <p data-bbox="604 1467 1390 1496">Continuous measurement – even during the silo filling process</p> <p data-bbox="604 1534 1406 1594">Measurement results are stored as electronic data when the PC visualization is used</p> <p data-bbox="604 1632 1481 1720">Quantity of the material used can be balanced exactly – even if there are varying bulk solids characteristics, humidity, dust formation and crosswinds of up to 80 km/h.</p> <p data-bbox="604 1758 1449 1818">Retrofitting is possible – as well as integration in existing complete installations</p> <p data-bbox="604 1856 1369 1886">Supporting ring and silo are statically adjusted to each other.</p>

**Silo accessories**

**Filling level control system**

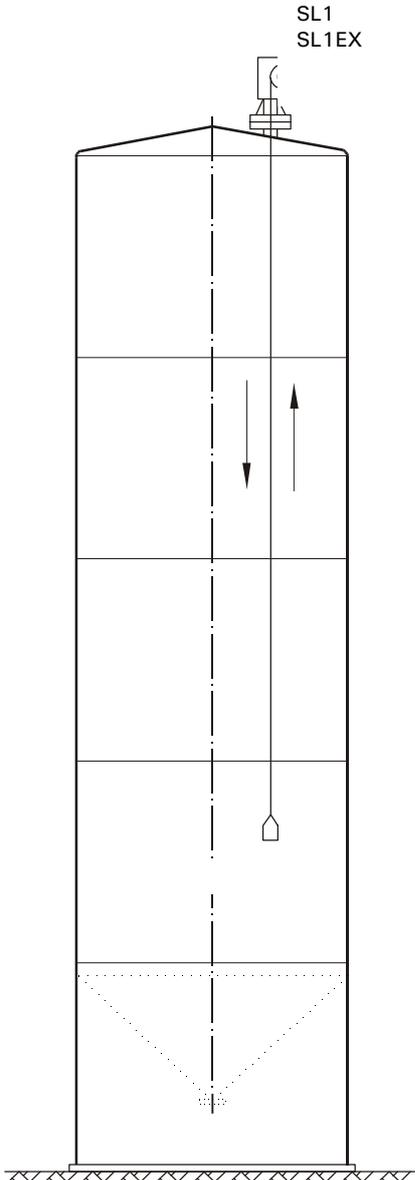
	Designation	Price code																																																		
	<p><b>Filling level control system</b></p> <p>ZEPPELIN filling level control system for continuous measurement of the contents of silos (also suitable for retrofitting). Consists of: supporting ring with load feet, sensors and anchor bolts*.</p> <p>* The number of anchor bolts is determined individually by the result of static analysis for the individual loads.</p> <p>System accuracy: <math>\pm 1\%</math> of max. system weight (G)  Supporting ring: St 37, primed  Load feet: St 37 insulated  Accuracy of load cell: <math>\pm 0.25\%</math> in relation to the scale's end value</p> <p><b>Filling level control system with evaluation on digital display</b>  Filling level indication on digital display.  Digital display unit (per silo)  or  <b>Filling level control system with software for data visualization</b>  Filling level indication on customer's PC with digital user interface Microsoft® Windows.  Bus coupling (per silo)  Software (per group of silos max. 20 units)</p> <table border="0" data-bbox="598 1310 1292 1747"> <thead> <tr> <th colspan="3"></th> <th style="text-align: right;">No. of anchor bolts</th> <th></th> </tr> </thead> <tbody> <tr> <td>D = 2400</td> <td>G = 60 t</td> <td>n = 3</td> <td style="text-align: right;">8</td> <td><b>WS24/ 60</b></td> </tr> <tr> <td>D = 2400</td> <td>G = 80 t</td> <td>n = 4</td> <td style="text-align: right;">12</td> <td><b>WS24/ 80</b></td> </tr> <tr> <td>D = 3000</td> <td>G = 80 t</td> <td>n = 4</td> <td style="text-align: right;">16</td> <td><b>WS30/ 80</b></td> </tr> <tr> <td>D = 3000</td> <td>G = 100 t</td> <td>n = 6</td> <td style="text-align: right;">24</td> <td><b>WS30/100</b></td> </tr> <tr> <td>D = 3000</td> <td>G = 150 t</td> <td>n = 8</td> <td style="text-align: right;">32</td> <td><b>WS30/150</b></td> </tr> <tr> <td>D = 3500</td> <td>G = 120 t</td> <td>n = 6</td> <td style="text-align: right;">24</td> <td><b>WS35/120</b></td> </tr> <tr> <td>D = 3500</td> <td>G = 250 t</td> <td>n = 8</td> <td style="text-align: right;">32</td> <td><b>WS35/250</b></td> </tr> <tr> <td>D = 4200</td> <td>G = 150 t</td> <td>n = 8</td> <td style="text-align: right;">24</td> <td><b>WS42/150</b></td> </tr> <tr> <td>D = 4200</td> <td>G = 250 t</td> <td>n = 8</td> <td style="text-align: right;">32</td> <td><b>WS42/250</b></td> </tr> </tbody> </table> <p>G = max. system weight, D = silo diameter,  n = number of load feet</p> <p>Supporting ring with load feet as above, ring hot-galvanized.</p> <p><b>Access element</b>  4-rung ladder on inside and outside of silo, for access to silo skirt.</p>				No. of anchor bolts		D = 2400	G = 60 t	n = 3	8	<b>WS24/ 60</b>	D = 2400	G = 80 t	n = 4	12	<b>WS24/ 80</b>	D = 3000	G = 80 t	n = 4	16	<b>WS30/ 80</b>	D = 3000	G = 100 t	n = 6	24	<b>WS30/100</b>	D = 3000	G = 150 t	n = 8	32	<b>WS30/150</b>	D = 3500	G = 120 t	n = 6	24	<b>WS35/120</b>	D = 3500	G = 250 t	n = 8	32	<b>WS35/250</b>	D = 4200	G = 150 t	n = 8	24	<b>WS42/150</b>	D = 4200	G = 250 t	n = 8	32	<b>WS42/250</b>	<p></p> <p><b>DAG</b></p> <p><b>PCBK FCS</b></p> <p><b>WS..1/...</b></p> <p><b>WZ9002</b></p>
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**Silo accessories****Switch cabinet**

	<b>Designation</b>	<b>Price code</b>
	<p>Switch cabinet with filling level indication, inclusive of equipment for triggering of ultrasonic level measurement or Silot. Level indicator, filling pipe limit switch Inclusive of equipment for triggering of alarm and warning light. One reset button per silo. Display scaled in %, m<sup>3</sup> or t.</p> <p>Switch cabinet for 1 silo Switch cabinet for 2 silos Switch cabinet for 3 silos Switch cabinet for 4 silos Switch cabinet for 5 silos Switch cabinet for 6 silos</p> <p><b>Warning devices</b></p> <p>Acoustic warning device by alarm (without reset button)</p> <p>Visual warning device by rotating light or flashing alarm light.</p>	<p><b>SS1001</b> <b>SS1002</b> <b>SS1003</b> <b>SS1004</b> <b>SS1005</b> <b>SS1006</b></p> <p><b>WZ90011</b></p> <p><b>WZ90012</b></p>

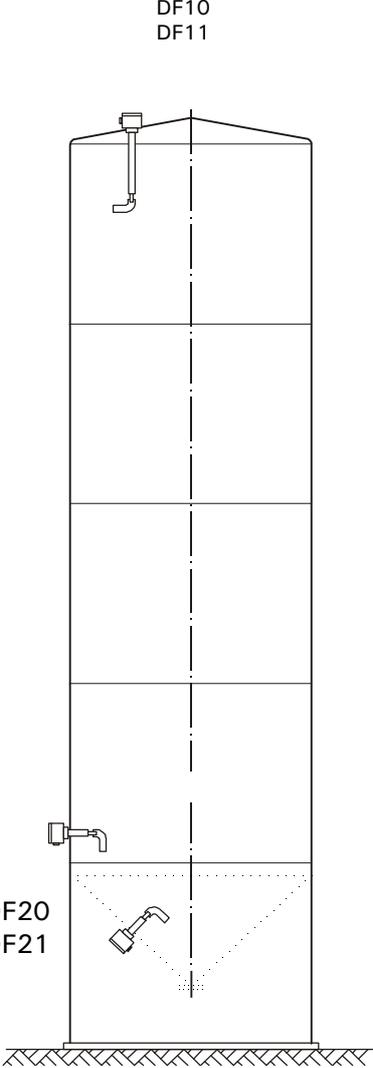
**Filling level control equipment**

**Silot**

	Designation	Price code
	<p><b>Silot (electromechanical plumbline gauge)</b></p> <p><b>Fields of application</b></p> <p>For virtually continuous indication of the silo contents with granular and heavily dusting bulk solids.</p> <p><b>Functional description</b></p> <p>A manually operated starting impulse lowers the measuring cable with the contact weight by means of a cable winch. When the weight touches the product, the weight is pulled up again. During this upward movement counting impulses are released after every 10 cm of collected cable length.</p> <p><b>Product description</b></p> <p>Basic housing and flange made from die-cast aluminium.          Flange connection DN 100, PN 16          Measuring cable made from stainless steel          Cable protection tube made from aluminium, length 500 mm          Weather protection hood made from plastics          Contact weight made from PVC          Measuring range max. 30 m, adjusted according to silo filling height          Start impulse to be activated manually          Integrated heating          Operating temperature -20 °C bis +50 °C          With gasket and bolts (only in conjunction with the purchase of a silo)</p> <p><b>Electro technical data</b></p> <p>Mains voltage 230 V AC, 50 Hz          Protection class IP65          Cables not included in the scope of supply.          Counting impulses are released as analogous signals (0/4 - 20 mA).</p> <p><b>Silot in standard design</b>  <b>Silot with permission for dust explosion classes 10 and 11</b></p> <p>Appropriate nozzle: C4</p>	<p><b>SL1</b> <b>SL1EX</b></p> <p><b>C4</b></p>

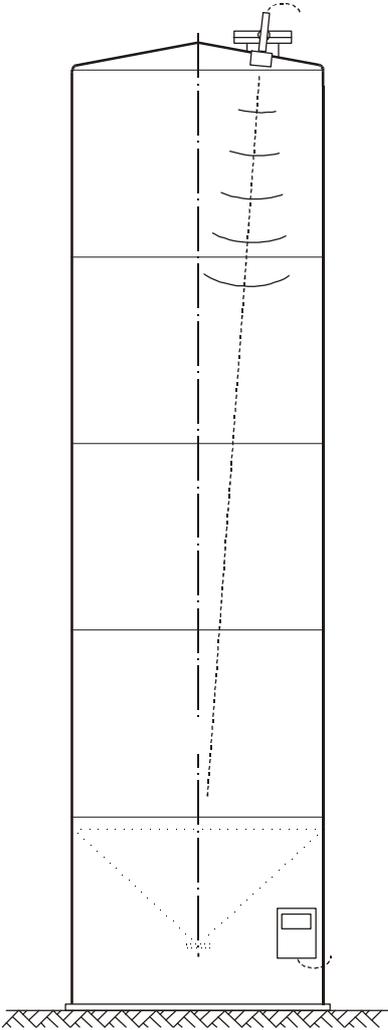
## Filling level control equipment

### Filling level measuring equipment

	Designation	Price code
 <p>DF10 DF11</p> <p>DF20 DF21</p>	<p><b>Rotary paddle type limit switch indicating full level</b></p> <p>Rotary paddle type limit switch to be mounted on the silo roof. Housing made from die-cast aluminium, paddle and measuring blade and blade shaft made from stainless steel, protective tube made from aluminium.</p> <p>Shaft length 800 - 1200 mm Connecting thread R 1½", acc. to DIN 228 With protective hood Signal exit potential-free Operating temperature -20 °C to +50 °C Protection class IP65, mains voltage <b>230 V AC, 50 Hz</b> <b>24 V DC</b></p>	<p><b>DF10</b> <b>DF11</b></p>
	<p>Rotary paddle type limit switch indicating full level With permission for dust explosion class 10/11, mains voltage <b>230 V AC</b> <b>24 V DC</b></p>	<p><b>DF10Ex</b> <b>DF11Ex</b></p>
	<p><b>Rotary paddle type limit switch indicating intermediate level or empty status</b></p> <p>Rotary paddle type limit switch to be mounted in the silo shell or cone. Housing made from die-cast aluminium, paddle and measuring blade and blade shaft made from stainless steel, protective tube made from aluminium.</p> <p>Shaft length 250 mm Connecting thread R 1½", acc. to DIN 228 With protective hood Signal exit potential-free Operating temperature -20 °C to +50 °C Protection class IP65, mains voltage <b>230 V AC, 50 Hz</b> <b>24 V DC</b></p>	<p><b>DF20</b> <b>DF21</b></p>
	<p>Rotary paddle type limit switch indicating intermediate level or empty status with permission for dust explosion class 10, mains voltage <b>230 V AC</b> <b>24 V DC</b></p> <p>Appropriate threaded nozzle: 1½"</p>	<p><b>DF20Ex</b> <b>DF21Ex</b></p> <p><b>GM1½</b></p>

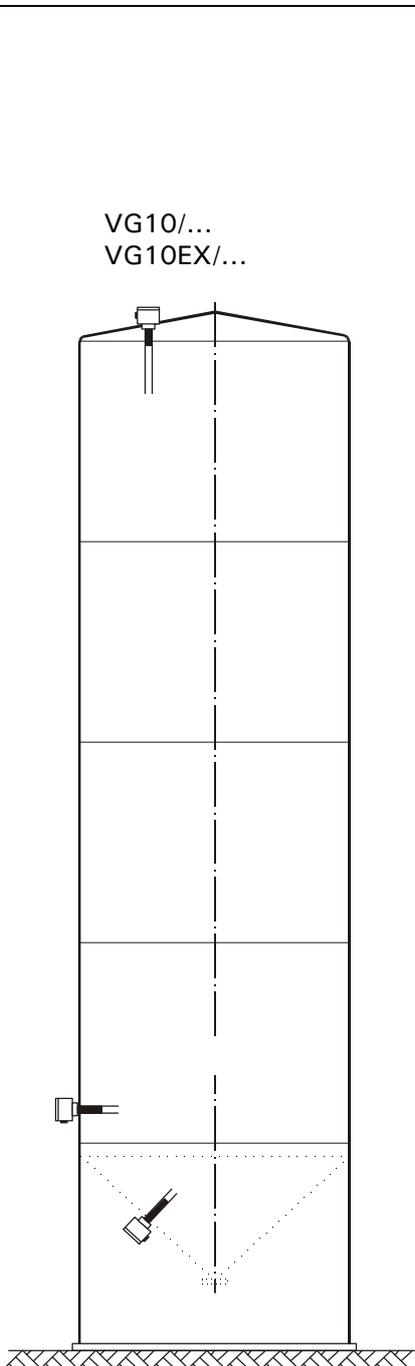
## Filling level measuring equipment

### Ultrasonic level measurement

	Designation	Price code
<p data-bbox="502 600 595 725">US10 US15 US10S US15S</p> 	<p data-bbox="625 434 976 465"><b>Ultrasonic measuring device</b></p> <p data-bbox="625 501 874 533"><b>Fields of application</b></p> <p data-bbox="625 568 1209 658">To be used in touch-free and continuous filling level measuring systems for granular and only lightly dust-producing bulk solids.</p> <p data-bbox="625 694 900 725"><b>Functional description</b></p> <p data-bbox="625 761 1212 949">A sensor emits ultrasonic waves. When the waves hit on the bulk solid, part of them is reflected and picked up again by the sensor. The evaluation device transfers the measuring results into an analogous (0/4 - 20 mA) output signal.</p> <p data-bbox="625 985 868 1016"><b>Product description</b></p> <p data-bbox="625 1052 1177 1218">The sensor is separated from the evaluation device. The evaluation device possesses an integrated control and display panel. The sensor is situated on a swiveling support, flange DN150, adjustably mounted.</p> <p data-bbox="625 1276 836 1308"><b>Measuring range</b></p> <p data-bbox="625 1344 1203 1411">Beginning at 1m from sensor (block distance), ranging to a silo filling height of up to 15 m.</p> <p data-bbox="625 1469 893 1500"><b>Electro-technical data</b></p> <p data-bbox="625 1536 1193 1832">Connecting cable between sensor and evaluation device 2 wires The scope of supply comprises 20 and/or 25 m length of cable Distance between the sound transformer and the evaluation device max. 300 m. Exit signal 0/4 – 20 mA for continuous filling level measurement Relay exit for intermediate level indication</p> <p data-bbox="625 1832 810 1863">Mains voltage:</p> <p data-bbox="702 1863 909 1993">16 - 42 V AC 16 - 60 V DC 90 - 250 V AC 120 - 250 V DC</p> <p data-bbox="625 2029 1177 2060">Appropriate nozzle for ultrasonic sensor: C6</p>	<p data-bbox="1327 1863 1420 1993">US10 US15 US10S US15S</p> <p data-bbox="1327 2029 1369 2060">C6</p>

## Filling level measuring equipment

### Limit level measuring device

	Designation	Price code
 <p>VG10/... VG10EX/...</p> <p>VG20/235 VG20EX/235</p>	<p><b>Vibration limit switch as level indicator indicating full level</b></p> <p><b>Vibration limit switch (System of protection IP 65)</b> Housing made from die-cast aluminium Extension arm made of stainless steel Connection thread R 1 1/2", cone-shaped according to DIN 2999 With protective hood Operation temperature -20 °C to +50 °C Overcharge protection because of full level indication in case of power failure or line break Mains voltage 19 - 253 V AC / 19 - 60 V DC Protection class IP65 Signal output potential-free For mounting on silo roof Length of extension arm 800 mm 1000 mm 1200 mm</p> <p><b>Vibration limit switch with permission for StEX-zone 10 and 11</b> 800 mm 1000 mm 1200 mm</p> <p><b>Vibration limit switch indication empty status or intermediate level</b> Housing made from die-cast aluminium Extension arm made of stainless steel Connection thread R 1 1/2", cone-shaped according to DIN 2999 With protective hood Operation temperature -20 °C to +50 °C Overcharge protection because of full level indication in case of power failure or line break Mains voltage 19 - 253 V AC / 19 - 60 V DC Protection class IP65 Signal output potential-free For mounting in silo skirt or silo cone. Length of extension arm 235 mm</p> <p><b>Vibration limit switch with admission for dust explosion classes 10 and 11</b> 235 mm</p> <p>Appropriate threaded sleeve: R 1 1/2"</p>	<p>VG10/80 VG10/100 VG10/120</p> <p>VG10EX/80 VG10EX/100 VG10EX/120</p> <p>VG20/235</p> <p>VG20EX/235</p> <p>GM1 1/2</p>

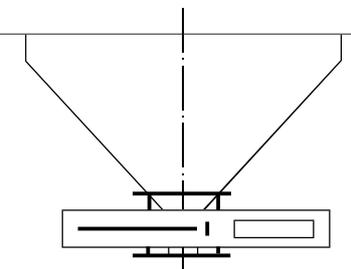






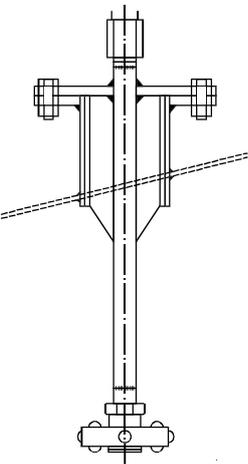
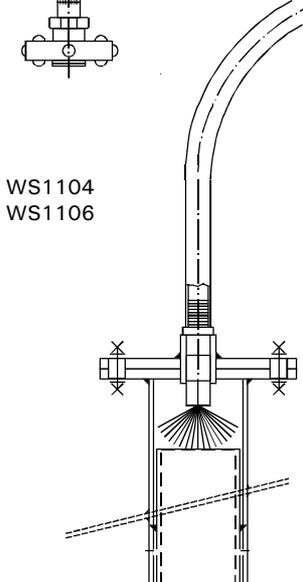
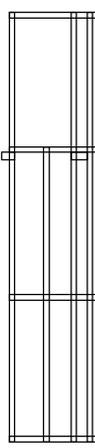
**Discharge control/stopping units**

**Slide valve**

	Designation	Price code
<p style="text-align: center;">AS15-30 C</p> 	<p><b>Pneumatically controlled slide valve for bulk solids</b></p> <p>Complete with terminal box, solenoid valve and limit switches wired on a terminal strip. There are 3 entries and 2 connections for the supply line available.</p> <p>2 limit switches (ON/OFF), output voltage 24 V DC, mark Pepperl &amp; Fuchs, Type NBB5-18GM50E2</p> <p>Solenoid valve G ¼", 24 V DC, mark Herion</p> <p>Valve connector with blow-out diode</p> <p>With quick-action ventilating valve G 3/8"</p> <p>Air consumption 3 - 8 bar compressed air, oilfree and dry</p> <p>Time required for closing &lt; 1 sec.</p> <p>Slide valve, pneumatically activated, Rated size</p> <p style="text-align: center;"> <b>DN 150</b>  <b>DN 200</b>  <b>DN 250</b>  <b>DN 300</b> </p>	<p style="text-align: center;"> <b>AS15C</b>  <b>AS20C</b>  <b>AS25C</b>  <b>AS30C</b> </p>

**Special silo accessories**

**Washing systems**

	Designation	
 <p>WS1003 WS1005</p>  <p>WS1104 WS1106</p>  <p>EK</p>	<p><b>Silo washing systems</b></p> <p>Silo washing system, comprising washing nozzle with welded cleaning head and 3/4" connecting nipple.</p> <p>Washing nozzle with cleaning head for a connected pressure of 3 - 5 bar, an  <b>effective range of up to 3000 mm diameter and a water consumption of 70 - 90 l/min</b></p> <p><b>effective range of up to 5000 mm diameter and a water consumption of 200-250 l/min</b></p> <p><b>Blending silo washing systems</b></p> <p>Blending silo washing system, comprising washing nozzle with screw-mounted cleaning heads and ring pipe a connecting nozzle DN80 or DN100 on silo roof for a connected pressure of 3 - 5 bar, adequate for  <b>Blending silo diameters of up to 4200 mm and a water consumption of approx. 400 - 650 l/min</b></p> <p><b>Blending silo diameters of up to 6000 mm and a water consumption of approx. 600 - 750 l/min</b></p> <p>Blending silo washing system as supplement to WS11, comprising 6 cleaning nozzles with screw-mounted washing nozzles connected to the ring pipe WS11. Blending silo washing system with a water consumption of 180 - 220 l/min and a connected pressure of 3 - 5 bar.</p> <p>Access cage for manhole M8 facilitates cleaning of interior of silo with a hose. Access depth approx. 2.2 m.</p>	<p><b>WS1003</b></p> <p><b>WS1005</b></p> <p><b>WS1104</b></p> <p><b>WS1106</b></p> <p><b>WS20</b></p> <p><b>EK</b></p>

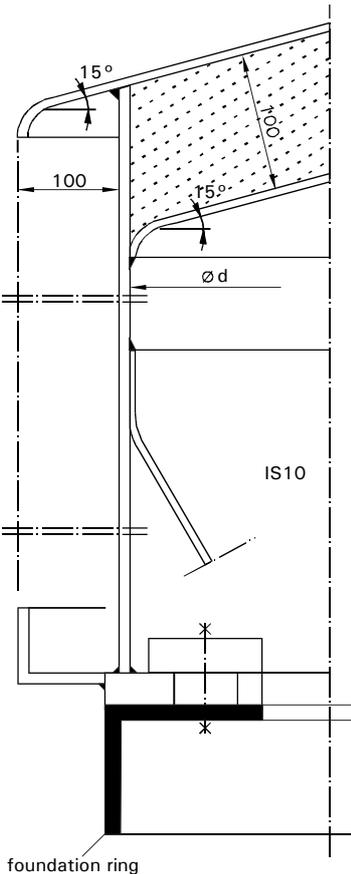
## Silo accessories

### Anchoring

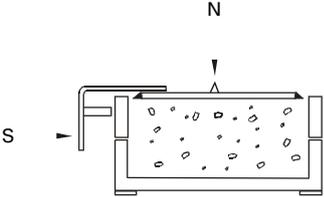
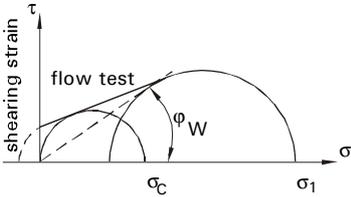
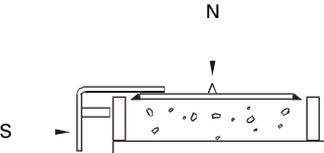
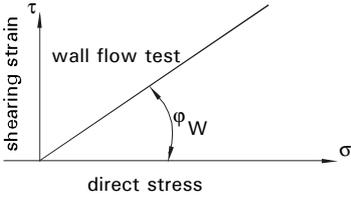
	Designation	Price code	
	<p><b>Silo mounting to a concrete foundation</b></p> <p>Foundation base ring made from St 37 with pre-installed anchor bolts, pressure plates, nuts and washers. The base ring is delivered in advance in two parts for casting with concrete. The ring elements are delivered unpainted. We recommend to paint all exposed surfaces after installation.</p>		
	No. of Anchors		
	d = 2400	F24 25 - 48 m <sup>3</sup> 12 F24 70 m <sup>3</sup> 24	F2412 F2424
	d = 3000	F30 35 - 75 m <sup>3</sup> 12 F30 80 - 110 m <sup>3</sup> 24 F30 125 m <sup>3</sup> 32 F30 140 / 150 m <sup>3</sup> 48	F3012 F3024 F3032 F3048
	d = 3500	F35 45 - 100 m <sup>3</sup> 12 F35 110 - 150 m <sup>3</sup> 12 F35 154 - 173 m <sup>3</sup> 12 F35 190 - 197 m <sup>3</sup> 12 F35 214 - 221 m <sup>3</sup> 12 F35 238 - 245 m <sup>3</sup> 12	F3512 F3524 F3532 F3540 F3552 F3568
	d = 4200	F42 93 - 140 m <sup>3</sup> 12 F42 162 - 208 m <sup>3</sup> 24 F42 231 - 243 m <sup>3</sup> 32 F42 266 - 312 m <sup>3</sup> 48	F4212 F4224 F4232 F4248
		Foundation base ring as above but with hot-galvanized ring, anchors and pressure plates.	FZxxxx
		<p><b>Silo mounting on steel frame</b></p> <p>Template for drilling holes in silo base ring and steel, sub-frame, delivered in two parts with screw fasteners, made from St 37.</p> <p>for silo diameter 2400 mm for silo diameter 3000 mm for silo diameter 3500 mm for silo diameter 4200 mm</p>	SB24 SB30 SB35 SB42
		<p><b>Anchor rack steel construction</b> <b>Shear connector tight anchoring</b> <b>Earthing boss</b></p>	M24x100 VA24 EL

**Silo accessories**

**Silo insulation**

	Designation	
 <p>15°</p> <p>100</p> <p>15°</p> <p>Ød</p> <p>IS10</p> <p>foundation ring</p>	<p><b>Silo insulation</b></p> <p>Silo pre-configured for insulating jacket to be mounted on site, comprising accessible, double-skin silo roof, insulated with 100 mm mineral wool, roof overhang and, supporting ring flange to fasten the insulation mats and cladding panels when silo is assembled.</p> <p><b>for silo diameter 2400 mm</b>  <b>for silo diameter 3000 mm</b>  <b>for silo diameter 3500 mm</b>  <b>for silo diameter 4200 mm</b></p> <p>Silo shell insulated with mineral mats 100 mm thick and with 1 mm aluminium sheet.          Price per m<sup>2</sup></p> <p>Insulation for silo accessories on request.</p>	<p><b>IS1024</b>  <b>IS1030</b>  <b>IS1035</b>  <b>IS1042</b></p> <p><b>S1100</b></p>

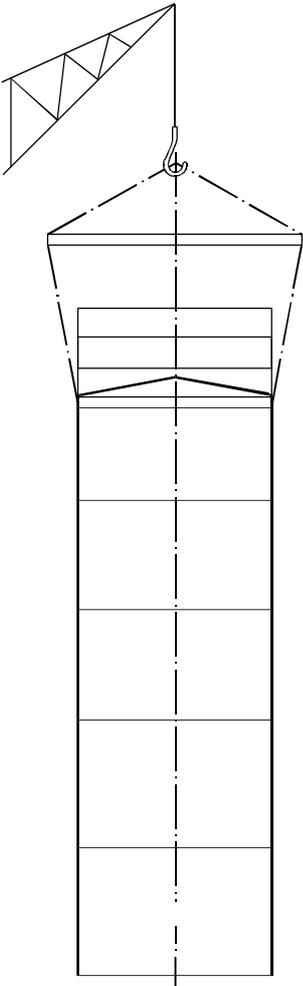
**Determination of Bulk solids characteristics**

	Designation	Price code
	<p><b>Determination of bulk solids characteristics</b></p> <p>Standard series of trials to determine the flow characteristics of bulk solids.</p> <p>The trials provide for the measurement of</p> <ul style="list-style-type: none"> <li>- 3 flow tests for different densities of bulk solids</li> <li>- 1 wall flow test to determine the wall friction.</li> </ul> <p>The evaluated test results are incorporated in a final report, together with the configuration data for the silo required.</p>	<p><b>SV01</b></p>
	<p><b>Tests for consolidation over time</b></p> <p>The storage of bulk solids under compaction pressure, which occurs between withdrawals, can effect flowability through time consolidation over a period of time, particularly in the case of adherent bulk solids.</p> <p>The tests provide for the determination of consolidation over time for four storage periods up to max. 120 h, including the evaluation of the results for the silo configuration (in conjunction with SV01)</p>	<p><b>SV02</b></p>
	<p><b>Configuration data for the silo static calculation</b></p> <p>Determination of the different bulk solids data according to DIN 1055, part 6, from shear tests and bulk solids comparisons.</p>	<p><b>SV03</b></p>
	<p><b>Shortened series of tests to determine the configuration of a bulk flow silo for free-flowing bulk solids, comprising:</b></p> <ul style="list-style-type: none"> <li>- 1 flow test</li> <li>- 1 wall flow test</li> <li>- Configuration for a bulk flow silo.</li> </ul>	<p><b>SV04</b></p>
	<p><b>Determination of additional wall flow test for alternative silo wall materials.</b></p> <p>Trials at higher temperatures, particularly for the determination of consolidation over time, can be carried out but involve high costs and should only be performed with consideration for the results obtained from trials at room temperature.</p> <p>The specified prices are subject to the provision that the test are carried out with non-toxic, non-hygroscopic bulk solids, under ambient conditions. For the trials, a representative sample, consisting of at least 5 liters of the bulk material concerned, must be made available (the costs of return carriage and/or disposal of the test material to be borne by the customer).</p> <p>Product samples must be accompanied by a completed safety specification, complying with DIN 52900.</p>	<p><b>SV05</b></p>

**Quality certificates****Documentation**

	<b>Designation</b>	
	<b>Quality certificates</b>	
	Quality certificates for butt-welded seams on silos <b>X-ray testing</b> <b>Nekal air test with suction bell</b>	<b>QN01</b> <b>QN02</b>
	Quality certificates for fillet-welded seams on silos <b>Dye-penetration test</b>	<b>QK</b>
	<b>Documentation</b>	
	Preparation of individual documents for the client, which are not ZEPPELIN standard: <b>Welding plan</b> <b>Welding process tests</b> <b>Welders' certificates</b> <b>Test schedule</b> <b>Test sequence schedule</b>	<b>DO1</b> <b>DO2</b> <b>DO3</b> <b>DO4</b> <b>DO5</b>
	Revision of Zeppelin standard drawings according to customer's specifications.	<b>DZ1</b>
	<b>Static calculations</b>	
	Static calculation of a standard silo.	<b>ST1</b>

**Silo Assembly**

	Designation	Price code
	<p><b>Assembly</b></p> <p>We will carry out the complete assembly of silos or provide the services of supervisors or skilled assemblers on request. As a rule, the assembly operation breaks down into the following stages:</p> <ol style="list-style-type: none"> <li>1. Offloading of the silo and accessories from the wagon or transport vehicle with a mobile crane.</li> <li>2. Transfer from the offloading siding to the construction site with a crane or low-loader.</li> <li>3. Screw-mounting of the ladder and filling pipe to the appropriate silo.</li> <li>4. Levelling up the foundation base rings.</li> <li>5. Setting the silos upright and placing them on their base rings</li> <li>6. Screw-assembling the silos, positioning and mounting the railings and connecting walkways.</li> </ol> <p>If only a small number of silos are involved, it is advisable for the crane and vehicles to be provided by the customer, since he will be familiar with local conditions. We will, however, provide all the advice at our disposal. Experiences crane operating companies are usually able to provide suitable equipment when notified of the operation concerned. Alternatively, they can consult Zeppelin for advice.</p> <p>Given efficient organization, and provided the silos are erected on foundation base rings and need only be transported over reasonably short, convenient distances, two assemblers can erect up to six silos on one day and complete the assembly on the second day (32-40 working hours). If the customer can supply fitters from his staff (who must not suffer from vertigo) it should be sufficient if we supply a supervisor to direct the customer's personnel (one to two people).</p> <p>We calculate the costs of assembly as follows:</p> <ul style="list-style-type: none"> <li>- Travel and standard working time, at home or abroad <ul style="list-style-type: none"> <li>Supervisor</li> <li>Skilled assembler</li> </ul> </li> <li>Overtime supplements 25 %, 50 % or 100% of the above rates, in accordance with the tariffs agreed by the Suedwuerttemberg Hohenzollern Metal Industries.</li> <li>- Travel allowance in accordance with the applicable tariff agreement. In the case of outward or return travel by personnel at an intermediate time of day, the travel allowance is reduced in accordance with the recognized regulations.</li> </ul>	

Date: \_\_\_\_\_ Project: \_\_\_\_\_

Company's Name: \_\_\_\_\_

Please return to:  
**ZEPPELIN Silo- und  
 Apparatechnik GmbH**  
 Leutholdstraße 108  
 D-88045 Friedrichshafen

P.O.Box/Street: \_\_\_\_\_

Postal code, Town: \_\_\_\_\_

Your ZEPPELIN specialist: \_\_\_\_\_

Correspondent: \_\_\_\_\_

Department/Building: \_\_\_\_\_

eMail: \_\_\_\_\_

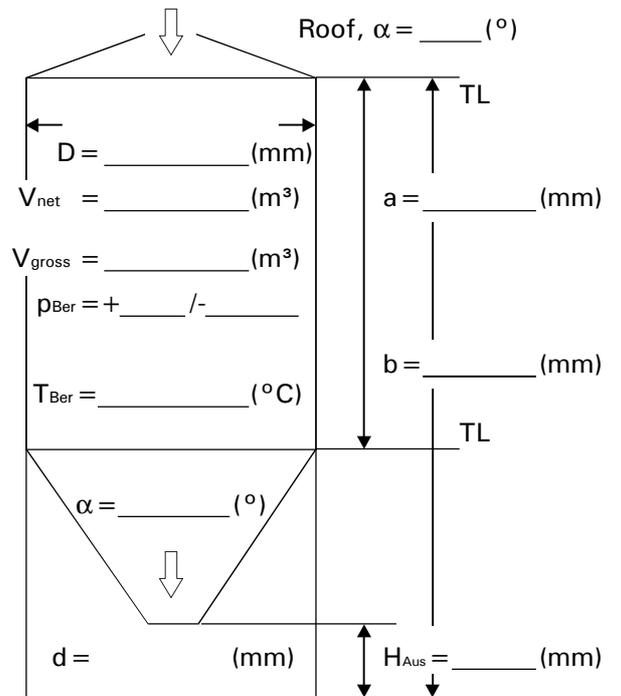
Phone.: ++49-75 41 / 20 2 - ...  
 Telefax: ++49-75 41 / 20 2 - 4 91

Telephone: \_\_\_\_\_ / \_\_\_\_\_ Telefax: \_\_\_\_\_

**Notes:**

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max. \_\_\_\_\_ (m³/h) / DN: \_\_\_\_\_



Requested time of delivery: \_\_\_\_\_

Type of silo: \_\_\_\_\_ Material: \_\_\_\_\_

No. of silos: \_\_\_\_ Distance between silo centers: \_\_\_\_ (mm)

- Pressure Proof Silo     Embosable Silo
- Blending Silo     Multi-Chamber Silo

Site location: \_\_\_\_\_

- Construction on steel frame, Height above ground: \_\_\_\_\_ (mm)
- with foundation ring     with weighing system     with filter

Product discharge facility: \_\_\_\_\_

max. \_\_\_\_\_ (m³/h) / DN: \_\_\_\_\_

**Bulk solids data:**

Product designation: \_\_\_\_\_

Medium grain size  $d_{50}$ : \_\_\_\_\_ (µm)  
 Bulk density: \_\_\_\_\_ (g/l)

- Discharge facility required     Danger of dust explosion

Loads assumed according to standard ?

**Enclosures (if necessary):**

- Sketch of silo     Sketch of assembly     Safety data sheet     Product data sheet

## Terms and Conditions of Sale, Supply and Delivery of Zeppelin Silo- und Apparatechnik GmbH - Leutholdstraße 108 - D-88045 Friedrichshafen

### 1. Extent and Scope of Supply

Extent and scope of supply shall be subject to mutual agreement in writing. In the absence of such agreement, the seller's acknowledgement of order shall apply. Verbal agreements shall have no effect unless confirmed in writing. Specifications, drawings, illustrations, particulars of weight and dimensions and other data submitted with the quotation are approximate only, unless specifically identified and confirmed as binding. The seller will retain property and copyright in all proposals and estimates, drawings, specifications and other documents and data, and the purchaser will not disclose them to any third party. Drawings, specifications and other documentation submitted with proposals or furnished for quotation purposes shall be returned to seller on request and/or if quotation or proposal does not result in a contract or purchase order.

### 2. Prices

Unless otherwise agreed, prices will be for delivery ex works, unpacked and unloaded; and in the event of orders for processing and treatment of materials, prices shall apply subject for free issue materials, suitable for the intended purposes, being delivered carriage paid into the seller's works in satisfactory conditions.

### 3. Packing and Loading

Unless otherwise agreed, packing and loading will be charged as an extra, at cost. Where cases and crates are returned complete and undamaged free to seller's premises, two thirds of the amount charged to the purchaser will be credited to his account. Advance deductions for returned packing will not be permitted. Open sided crates and lattice-boxes are exempt from this refund and will not be taken back.

### 4. Shipment and Dispatch

Unless otherwise agreed, goods will be dispatched and shipped for account and risk of the purchaser, and the seller does not accept any responsibility for arranging lowest-cost transport and carriage. No claims will be permitted for loss, damage to, or other deterioration of goods in transit.

### 5. Delivery Dates and Delivery Delays

The term of delivery shall commence on the date all order documents are available to the seller, all deposits and/or advance payments are made by the purchaser, and all technical details are agreed and confirmed. Delivery schedules, dates or periods are **approximate** only.

Late delivery shall not entitle the purchaser to claim indemnification for loss of interest, nor to claim penalties for default, non-performance, etc. The seller shall be entitled to an appropriate adjustment of delivery period where delays are caused by unforeseeable incidents in his works or in that of his supplier(s), or by incidents or occurrences beyond his reasonable control. Such incidents and occurrences include, but are not limited to, force majeure, war, acts of government, commandeering or confiscation, strike, riot, epidemics, works accidents, labor or materials shortages, transport delays, an essential part, component or assembly becoming or proving to be unserviceable or useless, quota systems being imposed, and in general all other actions, incidents or occurrences that cause a reduction in or discontinuance of production. In the event of any such incident or occurrence, the seller shall in addition have the right, at this option, to withdraw from the contract. In all these cases the purchaser shall **not** be entitled to claim damages for delayed delivery or for non-performance.

### No penalties are agreed in the contract.

Items or goods ordered on call-off will be invoiced upon their completion, regardless of shipping or call-off date. Such items or goods will be stored on the seller's premises over and above the agreed period as an exception only, and invariably at the purchaser's risk.

### 6. Complaints and Liability

For defects, including absence of contractually agreed or stipulated features, characteristics and/or properties, the seller shall, to the exclusion of any further claims, be liable to the extent only, that he shall, at his option, repair or replace ex works and free of charge any of the goods or parts thereof that are found to be or have become defective within a period of 6 months from date of delivery, such defects without any doubt being attributable to any action or inaction on the part of the seller during the period before property and risk in the goods have passed to the purchaser, and such defects in particular rendering unfit, causing to be unserviceable, or greatly limiting the use of any such goods or part thereof due to faulty design, structural defects, improper materials, bad workmanship. This liability does not extend to normal wear and tear nor damage or defects due to improper or unworthmanlike handling or servicing, excessive use, unsuitable works facilities, etc. The liability period for structures, edifices, buildings, shall be 2 years. For repairs or replacements within the frame of this liability commitment, the seller will supply, free of charge, the required material(s), spares or replacement parts ex works, and he will, if deemed necessary by him, provide skilled labor for the installation of such material(s), spares or replacement parts, free of charge. For the rest, the conditions of clause 7 will apply also in the event of provision of labor and man-power by the seller. All further claims for defects or deficiencies in the supplied goods (conversion, reduction, and indemnification) shall be excluded to the extent as this is legally admitted. This shall apply in particular to any claims for loss of profit, for reimbursement of direct or indirect costs arising from acceptance, handling, trading or the use of defective goods or parts thereof by the purchaser, and to any other consequential damages. The seller shall not be held liable for shortcomings due to faulty design, incorrect performance, bad workmanship, or to other defects and deficiencies in documentation or parts made available to him by the purchaser or by thirds, provided however that the seller has not violated any obligation possibly incumbent on him to check, examine or verify. Such parts as are made obsolete by replacement shall become the property of the seller.

### 7. Installation and Erection of Equipment on Site

In the event that the seller provides any manpower for the installation and erection on site, the following shall apply: Preparations must be perfected to such an extent that all the seller's personnel will be able to commence operations directly upon arrival on site, and will be able to continue working without undue interruptions, discountenances, downtime, delays of any kind, and also repeated travels, when not caused by any fault, negligence, oversight of, or otherwise ascribable to the seller, shall be for the account of and will be charged to the purchaser. Unskilled labor and general help shall be provided by the purchaser, at his cost, and he will also be responsible for construction work as well as for erecting, or have erected by others, the necessary scaffolding and work platforms, and the purchaser shall further be responsible for provision of the required commodities and auxiliaries such as water, oxygen, etc. The purchaser shall, to the best of his knowledge, attest or certify as correct the erection crew's weekly work sheets. The purchaser shall also provide a certificate confirming termination of erection operations. Erection work will be charged for at daily rates which shall be agreed or contractually settled on placement of order: the same applies to possible overtime and work on Sundays and public holidays. Travelling hours and down-time are considered working hours and will be invoiced accordingly. Fares, and the transport of personal effects and luggage, equipment and tools, shall be borne by the purchaser. Accommodation and provisions will also be charged to the purchaser at rates that shall be agreed and settled in advance.

### 8. Termination and Cancellation

In the event that, after having formally acknowledged the purchase order, the seller receives information questioning the purchaser's solvency in regard to providing coverage for the order amount, and in particular, if facts in support of these doubts emerge, such facts being, for example, suspension of payments, legal injunctions, a receiver being appointed, liquidation of business, or if the purchaser mortgages, assigns or transfers title and ownership of goods, or outstanding debts, or if he does not pay invoices even after having been warned, then the seller shall have the right at his option, to request security or collateral or prepayment for existing orders, or to insist on payment in cash even if some other form of payment was agreed or if he already has accepted the purchaser's draft in settlement: or to cancel or terminate the purchase order or supply contract forthwith, without prejudice to any other rights hereunder, in particular the right to claim damages for non-fulfillment or non-performance.

### 9. Reservation of Title

The seller retains title and ownership in all goods until such a time as goods are paid for in full and all other claims the seller may have against the purchaser have been met and settled (extended title or lien in goods). During this time the purchaser shall not have the right to dispose of goods in any manner outside the normal course of business, including, but not limited to, mortgaging or transferring title as security or collateral. The purchaser shall be under obligation to notify the seller, without delay, of any attempt by third parties to obtain title to the goods, or of any other measures by third parties impairing or encroaching upon the seller's rights or ownership. In urgent cases, such notification shall be done by telephone, telex, telefax or telegram.

If the purchaser has disposed of the goods in the regular course of business, reservation of title to the goods shall be replaced by the claim the purchaser has against the third party. This claim the purchaser herewith cedes or assigns to the seller, and the seller herewith accepts such cession or assignment (extended title or lien in goods). The purchaser agrees to reserve title in goods until such goods have been paid for in full by any third party (passed-on lien in goods).

If the purchaser has treated, processed, combined, mingled or installed the goods in other goods the purchaser herewith cedes or assigns all his claims to title, joint ownership, surrender, payment, with respect to the newly made, processed, or fabricated items, parts, products, or goods, to the seller, and seller herewith accepts this cession or assignment. The seller agrees that upon request of the purchaser he will release any security or collateral as far as their value surpasses the purchaser's total claim by more than 20 per cent.

### 10. Terms of Payment

Unless otherwise agreed, payment for delivered goods will become due within 30 days from delivery, at the point of payment by the seller. For late payments, interest on arrears will be charged to the amount of four per cent (4 %) over and above the minimum lending rate of the Landeszentralbank. Withholding payments, non-return of drawings or other documents or items which are the seller's property and also the setting off, or balancing of any claims the purchaser may have against any title or claims of the seller will not be recognized, nor any deductions from the agreed purchase price. Drafts and checks will be accepted subject to funds being available on their presentation. Any extras or fees arising therefrom are for the account of the purchaser.

### 11. Place of Settlement and Court of Law

The settling-place, or point of payment, for all liabilities stemming from this purchase order will be, for both parties, the place of residence, or domicile, of the seller and the jurisdiction will be the seat of the court of law, responsible for the seller's domicile.

**12. The above terms and conditions apply** without further notice also to future orders. Any contradictory terms or conditions of the purchaser will be deemed null and void. Should one or several of the above terms and conditions be or become ineffective, this will not affect the effectiveness of all other terms and conditions.

**13. Offers, proposals and quotations are, in principle, without engagement and subject to goods being unsold.**

## Sales Conditions for Silos made from Aluminium and Stainless steel

### Silo Capacities

The specified silo capacities are calculated from the combined volume of the cylinder and discharge hopper in accordance with the drawings in the catalogue, rounded up or down. Claims will not be accepted in respect of divergent volumes. If required, the discharge hopper attachment in the silo shell can be raised or lowered.

### Static Configuration

Standard ZEPPELIN silos are configured in accordance with the load and bulk solids data given on page 2 of this catalogue. To prevent the base carcass or silo shell from becoming distorted, at least 80 % of the surface of the supporting rings must rest on the substructure (foundation, steel frame, roof of building, etc). Guidelines on the design, calculation and construction of steel frames should be obtained from ZEPPELIN (Notice G).

You have to inform us before placing the order about deviating earthquake-, wind- or snow loads or other additional loads. Eventual additional costs which result from changes in load will be charged to you.

### Static Stress Analyses

If a static stress analysis is required, this will be supplied upon receipt of the purchase order for the silo/s. Verification by an expert, if required, should be commissioned by the construction contractor at his expense. If, as an exception, a static stress analysis is required before the order is placed, we charge a nominal fee which is credited when the order is received (Pricecode ST01).

### Materials

The conical roof, silo shell, discharge hopper and silo skirt are made of AlMg3, accessories of AlMg3 or AlMgSi. Bolts and other fastening components are made from stainless steel. Foundation base rings and anchor bolts made from steel are supplied unpainted. We absolutely recommend the use of galvanized foundation rings. If they are not galvanized you will have to paint them. We would like to paint out that ZEPPELIN does not accept responsibility in case of non-galvanized foundation rings.

### Surfaces

The surfaces stay untreated. We will not accept any liability for damage to surfaces in transit or during assembly. Silos are washed internally after completion. Depending on requirements, we recommend to clean silos and pipelines before use. Possible discolouration of single shells of Aluminium silos are due to production on the part of the Aluminium producer. It does not impair the function and is no defect.

### Weld seams (only Aluminium silos)

Seams are welded airtight by the MIG and TIG processes. For reasons of process technology and strength, weld seams remain untreated. Possible weld spatter or other irregularities are removed. The treatment of the weld seams with stainless steel silos is made as per specifications.

### Manufacturing Tolerances

Manufacturing tolerances are assessed in accordance with Procedure Instruction 20 VA 04 007.

### Packaging

Packaging for transport on land will be invoiced according to expenses.

### Storage

Silos for which firm delivery dates have been stipulated or which should be delivered on call are usually stored on our premises if the consignee will have no possibility to keep the silo on site up to their installation. Intermediate storage will be free of charge for the first 3 weeks - calculated from the delivery or call date agreed upon. From the 4<sup>th</sup> week we would have to charge you with a storage fee of DM 85,00 per week and silo.

### Transportation

In case that the maximum admissible dimensions for transportation of silos by road or truck are exceeded, we will prepare sketches for loading of the material. Furthermore, we will apply for the required special transport permissions.

We cannot accept any liability for unpunctual availability of the rail wagons, for an extended duration of the transport, rest times of the cranes on site and similar consequences resulting from delayed transportation.

In case that the goods will not be collected by you directly after readiness for shipment, the goods shall automatically become our property - subject to receipt of payment - and a contract for keeping the goods will be automatically concluded so that the goods are kept on our premises at your risk. Following readiness for shipment ZEPPELIN will only be liable for damages caused intentionally or by an act of culpable negligence.

### Dates of Delivery

Delivery dates will have to be agreed upon. We keep an ample material storage contingency thus being in a position to take on short-term dates in individual cases - subject to free shop capacities. The agreed delivery date will be guaranteed under the condition that the customer supplies technical clarification and drawings approval as scheduled. If we receive technical clarification after permission was supplied this may result in changes of delivery date and price terms.

### Delivery

For delivery of the silos free access to site shall be guaranteed for the transport means if the assembly will be carried out by ZEPPELIN, the following pre-conditions shall be fulfilled:

- Availability of sufficient space to position the large crane vehicle
- One small and one large crane vehicle shall be supplied by the customer, depending on the size of the silo
- One traverse shall be supplied by customer
- At least two helpers and the tools required shall be supplied free of charge for ZEPPELIN

In winter the silos might get dirty during transportation due to weather conditions. In order to avoid any possible visual effects caused by salt of grits we recommend to clean the silos and accessories immediately upon their arrival with a steam cleaner. On order, cleaning could be effected by the truck driver against a fee of DM 210,00 per silo, the steam cleaner should be available on site free of charge for us. We cannot accept any liability for visual disturbances which are due to weather conditions.

### Price Terms

Prices are based on the price list which is valid on the date of quotation. Our prices are net, ex works, loaded, exclusive of packing costs, duty unpaid, local V.A.T. unpaid.

### Reservation for Price Modification

The prices are calculated on the basis of the material prices and wages which are applicable at start of printing. For the case that the material prices and wages will change or the design will be modified, we reserve the right to change our prices. If the manufacturing drawings for the silo will be subject to modification while the order is carried out, we reserve the right, to adapt the prices accordingly.

### Payment

- 1/3 on receipt of order confirmation
- 1/3 on delivery/shipment readiness
- 1/3 30 days after delivery/shipment readiness

### Guarantee

We guarantee the use of fault-free materials, efficient manufacturing processes and the dimensional conformity and durability of our silos and accessories for a period of 12 months after entry into service or a maximum of 18 months after delivery or notification of readiness for shipment. The purchaser is responsible for the selection and arrangement of accessories. Please note, that some types of PET pellets lead to development of noise (sounding like a horn) during discharge from silos. This cannot be considered as a fault and we, therefore, cannot accept any liability for subsequent costs.

### Silos in Operation

Please note that we cannot accept any responsibility for any damages to the silos due to asymmetric flow of bulk solids or arching. We cannot accept any liability for any defects at silos which could result from the asymmetric flow of bulk solids or for arching. Furthermore, please note the bulk solids' characteristics which are indicated in our order confirmation. The operator of the plant shall be responsible for the observation.

### Testing

The silos are tested according to ZEPPELIN standard with regard to dimensional and geometrical accuracy.

### Documentation

We will provide you with the following documents:

- Silo drawings
- Static calculation ready for approval
- Foundation load data
- Documentation for accessories if applicable

### Alterations

We reserve the right to introduce technical changes in the interest of product improvement.

Furthermore, please note the enclosed General Terms and Conditions of Sale, Supply and Delivery.