

## GENERAL INFORMATION

Vessels with or without agitators are used as a condenser, collectors, for mixing and for numerous other applications. NORMAG offers a corresponding large variety in solutions to the user for nearly all application scenarios existing in practice for this. Here, the application includes the installation in smaller and bigger systems, also in combination with other materials, like steel enamel, as well as the combination with covers, agitators, drives and heating devices for the construction of the most different apparatuses.

On account of the transparency as well as the special geometry and material properties of the vessels made of borosilicate glass 3.3, the application offers advantages in all areas of the chemical-pharmaceutical and adjoining industries, from the laboratory to the process area. Borosilicate glass 3.3 meets the often prevailing high requirements as approved and proven material for the construction of pressure vessels.

The vessels can be connected through the standardized pipe ends and nozzles in all construction sizes with the connected components in a highly resilient and secure manner. Detailed information on connections is in chapter 3 "Connections". All the fundamental information on vessels made of borosilicate glass 3.3 is included in chapter 10 "technical information".



The standardized construction sizes data are on the following pages. On request we are pleased to offer special solutions according to additional customer requirements, e.g. Material adaptation. In the option overview at the end, different product features can already be customized when ordering.

We are happy to answer your questions about components and special solutions.

## CYLINDRICAL VESSELS

Cylindrical vessels are a universally applicable solution at a reasonable price for many applications. The range extends from simple condensers to isolated and tempered reaction vessels with graduation and low-dead space bottom outlet valve.

Cylindrical vessels are usually complemented by glass covers, however, corrosion -resistant coated flat lids are also available.

All cylindrical vessels can be delivered with a graduation. When ordering vessels with graduation, please supplement the option "-GR" with indicating the graduation steps for the item number. The information is two-digit, for example-GR25 for a graduation in 2,5-l steps or-GR50 for a graduation in 5-l steps.

Cylindrical vessels usually have a round bottom. Optionally, the bottom can also be designed in torispherical head form, which has advantages concerning construction height, residual mixing volume and Scale-up. The item number is to be complemented in this case with the option-O4. 3 wall vessels always have a torispherical head form.

### **Cylindrical vessels with dead space free seat and bottom drain valve**

All NORMAG cylindrical vessels can be planned with an integrated dead space free seat and nozzles, with which the bottom drain valve type VOB is to be used in combination. Validations of customers, especially in the pharmaceutical field, have pointed out the clearly increased idle properties of the cylindrical vessels and the cleanability especially of the floor drain system by riboflavin tests in comparison to existing systems.

There are bottom drain valves in manual or pneumatic design, alternatively with integrated temperature measurement, in conductive design and with flexible operating extensions for safe and ergonomic operation. You will find detailed information for the different designs of the bottom drain valves in the catalogue chapter 4.

Here, the bottom nozzles in the vessel can be designed in DN 40 or DN 50. The flange type is as a standard PF. That's why the flange system abbreviation"-P" is cancelled with simple cylindrical vessels from nominal width 200 onwards.

When ordering vessels with bottom drainage nozzles, the abbreviation VOB40 or VOB50 is to be put in the item number instead of the nominal width of the bottom nozzles "DN1".

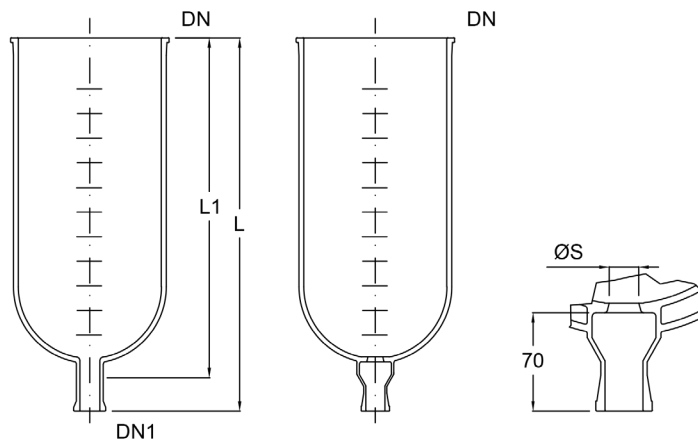
### **Cylindrical vessels as a customized solution**

Besides the outlined standard variations, numerous variations specific for process and specific for customers are also possible. Examples are:

- Horizontal cylindrical vessels, e.g. for the minimization of the construction height
- Cylindrical vessels with bigger drainage or side nozzles e.g., suitable for insert heaters of type HIG or HIS (chapter 6)
- Cylindrical vessels, especially for the small amounts, which are delivered in combination with the NORMAG needle valve for fine dosages up to drop-wise dosage.

For technical clarification and inquiries about special solutions as well as for a specific quotation, please contact our specialists.

CYLINDRICAL VESSELS



Cylindrical vessel AV...-P

**Description:**

Cylindrical vessel, PF system:

Cylindrical vessel, PF, with seat for bottom drain valve type VOB40:

Cylindrical vessel, PF, with seat for bottom drain valve type VOB50:

Cylindrical vessel, PF system, with graduation

Cylindrical vessel, PF system, with torispherical head:

Cylindrical vessel, PF, without bottom nozzle:

Cylindrical vessel, PF, length according former design:

Cylindrical vessel, PF, with non-conductive coating:

Cylindrical vessel, PF, with conductive coating:

**Order no**

AV V/DN/DN1-P

AV V/DN/VOB40

AV V/DN/VOB50

AV V/DN/DN1-P-GR...

AV V/DN/DN1-P-O4

AV V/DN/000-P

AV V/DN/DN1-P-O10

AV V/DN/DN1-P-C1

AV V/DN/DN1-P-C3

**Example**

AV 050/300/025-P

AV 050/300/VOB40

AV 050/300/VOB50

AV 050/300/025-P-GR50

AV 050/300/025-P-O4

AV 005/150/000-P

AV 010/200/025-P-O10

AV 050/300/025-P-C1

AV 050/300/025-P-C3

V Volume [l]	DN	DN1	L [mm]	L1 [mm]	Optionally graduated [l]	Item no. standard	Item no. with seat for VOB**
5	150	25	450*	390	0,25	AV 005/150/025-P	AV 005/150/VOB40-P
5	200	25	350	290	0,5	AV 005/200/025-P	AV 005/200/VOB40
10	200	25	525*	465	0,5	AV 010/200/025-P	AV 010/200/VOB40
20	300	25	500	440	2	AV 020/300/025-P	AV 020/300/VOB40
30	300	25	650	585	2	AV 030/300/025-P	AV 030/300/VOB40
50	300	25	900	835	2	AV 050/300/025-P	AV 050/300/VOB40
50	400	25	650*	585	2	AV 050/400/025-P	AV 050/400/VOB40
100	400	50	1000	940	5	AV 100/400/050-P	AV 100/400/VOB50
100	450	50	900	835	5	AV 100/450/050-P	AV 100/450/VOB50
100	600	50	650	575	5	AV 100/600/050-P	AV 100/600/VOB50
150	450	50	1225	1160	5	AV 150/450/050-P	AV 150/450/VOB50
150	600	50	850	780	5	AV 150/600/050-P	AV 150/600/VOB50
200	450	50	1550	1485	5	AV 200/450/050-P	AV 200/450/VOB50
200	600	50	1025	955	5	AV 200/600/050-P	AV 200/600/VOB50
300	600	50	1375	1305	5	AV 300/600/050-P	AV 300/600/VOB50
400	600	50	1725*	1655	5	AV 400/600/050-P	AV 400/600/VOB50

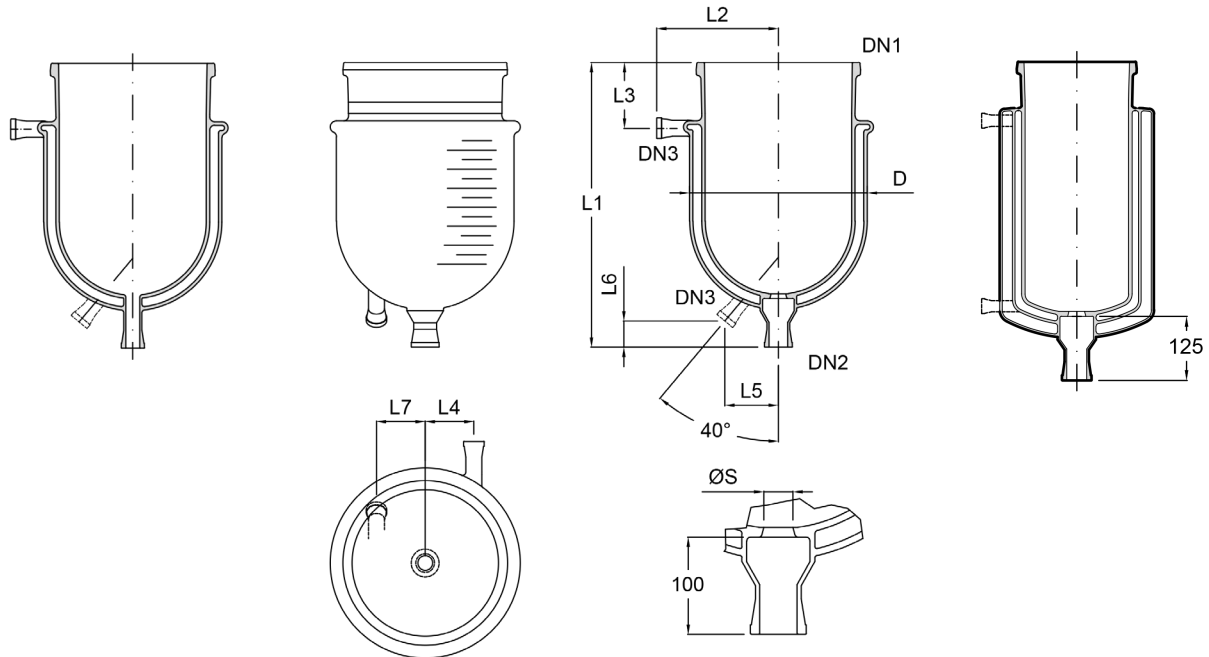
\* Different lengths to previous standard lengths

\*\* Free seat cross section 30 mm for VOB40 and 42 mm for VOB50

JACKETED CYLINDRICAL VESSELS

Cylindrical vessels can be designed with tempering jacket. With full-melted tempering jacket in cylindrical vessels, the allowed temperature difference decreases between jacket and internal space. For corresponding application cases, please contact our experts.

Especially for very low-temperature applications, there is the option to design the cylindrical vessels as a 3-wall vessel, type AVT. An ice formation is avoided by the evacuated external insulating jacket.



Cylindrical vessel with tempering jacket AVJ...-P

Cylindrical vessel with tempering jacket AVJ.../VOB...-P

3-wall-vessel AVT.../VOB...-P

Description:

- Jacketed cylindrical vessel, PF system:
- Jacketed cylindrical vessel, PF, with graduation:
- Jacketed cylindrical vessel, PF, with seat for VOB:
- Jacketed cylindrical vessel, PF, torispherical bottom:
- Jacketed cylindrical vessel, length according former design:
- 3-wall-vessel, PF, torispherical bottom:

Item no.

Example

- AVJ V/DN1/DN2-P AVJ 050/300/025-P
- AVJ V/DN1/DN2-P-GR.. AVJ 050/300/025-P-GR50
- AVJ V/DN1/VOB...-P AVJ 050/300/VOB40-P
- AVJ V/DN1/DN2-P-O4 AVJ 050/300/025-P-O4
- AVJ V/DN1/DN2-P-O10 AVJ 010/200/025-P-O10
- AVT V/DN1/VOB...-P AVT 050/300/VOB40-P

V	DN1	DN2	DN3	D	L	L2	L3	L4	L5	L6	L7	Item no.	Item no.
[l]					[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	standard	with seat for VOB**
5	150	15	15	200	565*	165	100	90	40	50	50	AVJ 005/150/025-P	AVJ 005/150/VOB40-P
5	200	25	25	250	425	200	80	100	30	75	75	AVJ 005/200/025-P	AVJ 005/200/VOB40-P
10	200	25	25	250	580	200	80	100	30	75	75	AVJ 010/200/025-P	AVJ 010/200/VOB40-P
20	300	25	25	365	585*	250	105	110	54	100	100	AVJ 020/300/025-P	AVJ 020/300/VOB40-P
30	300	25	25	365	720*	250	105	110	54	100	100	AVJ 030/300/025-P	AVJ 030/300/VOB40-P
30	400	25	25	465	600	300	145	140	59	150	75	AVJ 030/400/025-P	AVJ 030/400/VOB40-P
50	300	25	25	365	1000*	250	105	110	54	100	100	AVJ 050/300/025-P	AVJ 050/300/VOB40-P
50	400	50	25	465	750*	300	145	140	59	150	75	AVJ 050/400/050-P	AVJ 050/400/VOB50-P
100	400	50	25	465	1140*	300	145	140	59	150	75	AVJ 100/400/050-P	AVJ 100/400/VOB50-P

\* Different lengths to previous standard lengths

\*\* Free seat cross section 30 mm for VOB40 and 42 mm for VOB50

## SPHERICAL VESSELS

NORMAG spherical vessels can be used, for example, as inflow and reservoir vessels, agitator and reaction vessel or also in circulation evaporators.

Spherical vessels are usually complemented by glass covers, however, corrosion-resistant coated flat lids are also available.

With spherical vessels, the upper nozzle is specified production-conditioned by default as the nominal width named in the table. However, on request, this can also be changed.

All spherical vessels can be delivered with a graduation on request. When ordering vessels with graduation, please supplement the option "-GR" with indicating the graduation steps for the item number. The information is two-digit, for example-GR25 for a graduation in 2,5-l steps or-GR50 for a graduation in 5-l steps.

### **Spherical vessels with dead space free seat and bottom drain valve**

All NORMAG spherical vessels can be planned with an integrated dead space free seat and nozzles, with which the bottom drain valve type VOB is to be used in combination. Validations of customers, especially in the pharmaceutical field, have pointed out the clearly increased idle properties of the cylindrical vessels and the cleanability especially of the floor drain system by riboflavin tests in comparison to existing systems.

There are bottom drain valves in manual or pneumatic design, alternatively with integrated temperature measurement, in conductive design and with flexible operating extensions for safe and ergonomic operation. You will find detailed information for the different designs of the bottom drain valves in the catalogue chapter 4.

Here, the bottom nozzles in the vessel can be designed in DN 40 or DN 50. The flange type is as a standard PF. That's why the flange system abbreviation"-P" is cancelled with simple cylindrical vessels from nominal width 200 onwards.

When ordering vessels with bottom drainage nozzles, the abbreviation VOB40 or VOB50 is to be put in the item number instead of the nominal width of the bottom nozzles "DN1".

### **Spherical vessels as a customised solution**

Besides the outlined standard variations, numerous variations specific for process and specific for customers are also possible. Examples are:

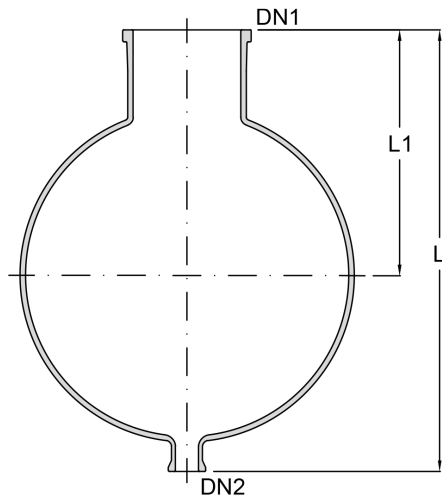
- Spherical vessels with bigger drainage or side nozzles, e.g., suitable for insert heaters of type HIG or HIS (chapter 6)
- Spherical vessels, especially for the small amounts, which are delivered in combination with the NORMAG needle valve for fine dosages up to drop-wise dosage.

An overview of possible nozzle positions and vessel dimensions can be found in the following table in "SPHERICAL VESSELS, WITH SIDE NOZZLES, OPTIONS FOR CUSTOMIZED VERSIONS".

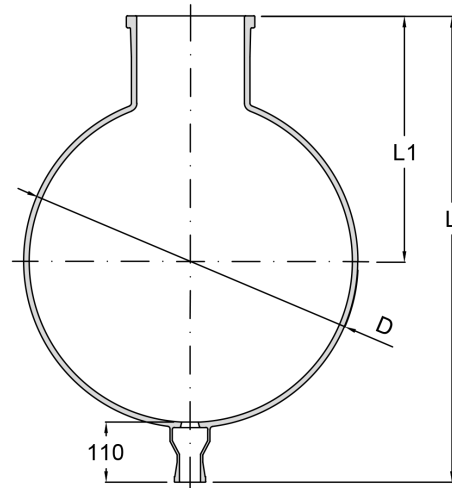
For technical clarification and inquiries about special solutions as well as for a specific quotation, please contact our specialists.

SPHERICAL VESSELS, WITHOUT SIDE NOZZLES

In the design with seat for a dead space-poor bottom drain valve of the type VOB, the nozzle is long enough by default to be able to use a heating mantle.



Spherical vessel without side nozzle  
AF...-P



Spherical vessel, with seat for VOB  
AF.../VOB...-P

**Description:**

Spherical vessel, PF system:

Spherical vessel, PF, with seat for bottom drain valve Type VOB40: AF V/VOB40-P

Spherical vessel, with seat for bottom drain valve Type VOB50: AF V/VOB50

Spherical vessel, PF system, with graduation

Spherical vessel, PF, without bottom nozzle:

Spherical vessel, PF, with non-conductive coating:

Spherical vessel, PF, with conductive coating:

**Item no.**

AF V/DN2-P

AF V/VOB40-P

AF V/VOB50

AF V/DN2-P-GR...

AF V/000-P

AF V/DN2-P-C1

AF V/DN2-P-C3

**Example**

AF 050/025-P

AF 020/VOB40-P

AF 200/VOB50

AF 050/025-P-GR50

AF 050/000-P

AF 050/025-P-C1

AF 050/025-P-C3

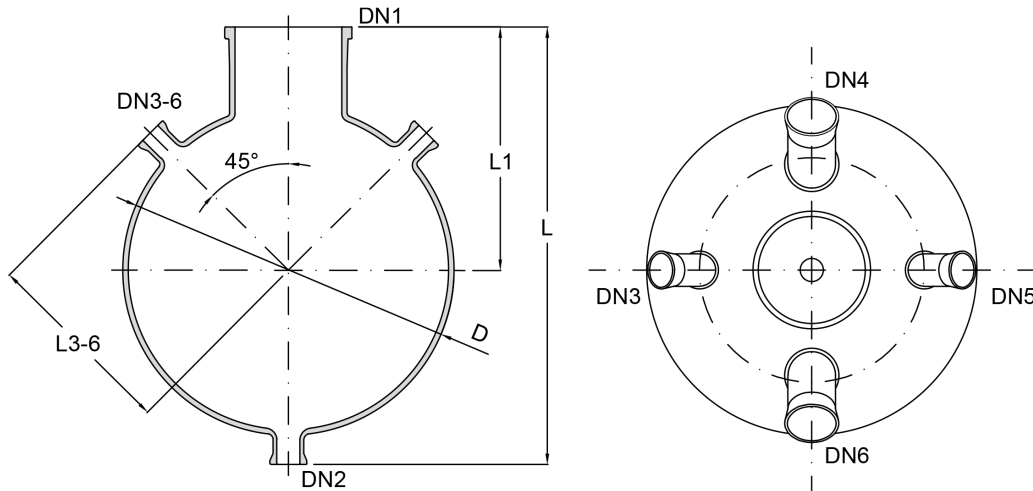
V	D	DN1	DN2	L	L1	Item no.	L	Item no.
Volume	[mm]			[mm]	[mm]	Standard	[mm]	with seat for VOB
[l]								
2	166	50	15	275	145	<b>AF 002/015-P</b>	-	-
5	223	80	15	375	215	<b>AF 005/015-P</b>	-	-
10	279	100	25	450*	250	<b>AF 010/025-P</b>	490	<b>AF 010/VOB40-P</b>
20	350	100	25	550*	300	<b>AF 020/025-P</b>	575	<b>AF 020/VOB40-P</b>
50	490	200	25	700*	395	<b>AF 050/025-P</b>	740	<b>AF 050/VOB40</b>
100	610	200	50	825	430	<b>AF 100/050-P</b>	835	<b>AF 100/VOB50</b>
200	750	300	50	1.000	545	<b>AF 200/050-P</b>	1.020	<b>AF 200/VOB50</b>

\* Different lengths to previous standard lengths

**SPHERICAL VESSELS, WITH SIDE NOZZLES**

Spherical vessels with side nozzles will be designed as a standard design with two or four 45 ° inclined side nozzles. Typical nozzles standards can be thereby covered for handhole cover, vapor / exhaust / vacuum lines, measuring technology and feed dosing.

This design is also available with a seat for a dead-space free bottom outlet valve. The total length in this case can be found on the previous page.



Spherical vessel with side nozzle AF...-P-S.

**Description:**

- Spherical vessel, with two 45° nozzles, PF system:
- Spherical vessel, with four 45° nozzles, PF system:
- Spherical vessel, PF, with seat for bottom outlet valve type VOB:
- Spherical vessel, PF, with graduation

**Item no.**

**Example**

- AF V/DN2-P-S1      AF 050/025-P-S1
- AF V/DN2-P-S3      AF 050/025-P-S3
- AF V/VOB...-P-S.      AF 050/VOB40-P-S3
- AF V/DN2-P-S.-GR...      AF 050/025-P-GR50-S3

V Volume [l]	D [mm]	DN1	DN2	DN3 DN5	DN4	DN6	L [mm]	L1 [mm]	L3/L5 [mm]	L4 [mm]	L6 [mm]	Item no.
2	166	50	15	25	-	-	275	145	145	-	-	AF 002/015-P-S1
2	166	50	15	25	40	40	275	145	140	145	145	AF 002/015-P-S3
5	223	80	15	25	-	-	375	215	170	-	-	AF 005/015-P-S1
5	223	80	15	25	40	40	375	215	170	175	175	AF 005/015-P-S3
10	279	100	25	25	-	-	450*	250	200	-	-	AF 010/025-P-S1
10	279	100	25	25	80	80	450*	250	200	225	225	AF 010/025-P-S3
20	350	100	25	25	-	-	550*	300	235	-	-	AF 020/025-P-S1
20	350	100	25	25	80	80	550*	300	235	260	260	AF 020/025-P-S3
50	490	200	25	25	-	-	700*	395	305	-	-	AF 050/025-P-S1
50	490	200	25	25	80	80	700*	395	305	330	330	AF 050/025-P-S3
100	610	200	50	50	-	-	825	430	370	-	-	AF 100/050-P-S1
100	610	200	50	50	100	100	825	430	370	415	415	AF 100/050-P-S3
200	750	300	50	50	-	-	1000	545	450	-	-	AF 200/050-P-S1
200	750	300	50	50	100	150	1000	545	450	485	500	AF 200/050-P-S3

\* Different lengths to previous standard lengths



**SPHERICAL VESSELS, WITH SIDE NOZZLES, OPTIONS FOR CUSTOMIZED VERSIONS**

Deviating or complementary nozzles design is often necessary for spherical vessels with side nozzles. The possibilities for the adaptation are varied. Please, describe or outline to us your specific demands, we are glad to check the feasibility and to offer the accordingly specific vessel.

As a guideline for the specific design possibilities, the following key points apply:

- Main nozzles DN according to above standard table for "spherical with side nozzles" should also be used as a preferential design for customised design, in case of need, an adaptation can be checked into
- Design with and without bottom nozzles DN2 in different nominal widths according to the following table
- Number of side nozzles is possible according to enclosed table for a typical nominal width mix. Of these, deviations must be checked in individual cases, e.g. when exclusively using small nozzles, the number of the possible side nozzles can be increased.
- Angled nozzles DN according to above standard table for "spherical with side nozzles" should also be used as a preferential design with 45° for customised designs, in case of need, an adjustment between 10 ° (for example for baffles or measuring technology) and 90 ° is possible.
- An oblique to approximately tangential nozzle arrangement is possible
- A jacketed spherical vessel design is possible in principle, however, the standard case is the use of cylinder vessels for jacketed versions



Example spherical vessel, with side nozzles, customer-specific design AF...-P-X...

V Volume [l]	D [mm]	DN2	side nozzles [DN]	L <sub>side nozzles</sub> [mm]	side nozzles [typ. quantity] <sup>1)</sup>	Item no.
2	166	15-50	15 - 40	125 – 150	0 – 4	AF 002/...-P-X...
5	223	15-100	15 - 50	150 – 200	0 – 4	AF 005/...-P-X...
10	279	15-150	15 - 100	200 – 250	0 – 4	AF 010/...-P-X...
20	350	15-150	15 - 100	250 – 275	0 – 6	AF 020/...-P-X...
50	490	25-200	15 - 150	325 – 375	0 – 6	AF 050/...-P-X...
100	610	25-200	25 - 150	375 – 450	0 – 8	AF 100/...-P-X...
200	750	25-300	25 - 200	425 – 500	0 – 8	AF 200/...-P-X...

1) Number of side nozzles is possible according to enclosed table for a typical nominal width mix. Of these, deviations must be checked in individual cases, e.g. when exclusively using small nozzles, the number of the possible pitch circle nozzles can be increased.



## VESSEL COVERS AND VESSEL LIDS

Vessel covers and vessel lids serve as conclusion of a cylindrical or spherical vessel and offer possibilities by means of various nozzles, for example, for connecting agitators, pipelines, fittings, inlet pipes and measuring instruments.

Vessel covers made of borosilicate glass have as a standard a torispherical design which is above all compact, geometrically more alike to bigger containers of other materials and thus advantageous for a Scale-up and allow vertical nozzle arrangements more easily. Glass covers are very often used in combination with vessels made of stainless steel, enamel or other materials, in particular to be able to see the inside of the vessel / agitator tank.

As standard covers - per nominal width - a cover with 3 nozzles, typically for reservoir vessels and collective vessels, and with 5 or 7 nozzles, typically for agitator tank, are planned.

Because the number, nominal width and arrangement of the nozzles depend mostly very individually on the process engineering requirements, on request, we also supply vessel covers and lids with other nozzle and connection variants than those specified in the following table.

Possibilities for this can be found below under "Vessel covers, customer-specific design".

For technical clarification and inquiries, please contact our specialists.

**VESSEL COVERS, STANDARD**

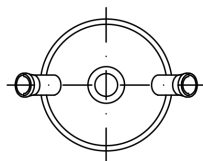
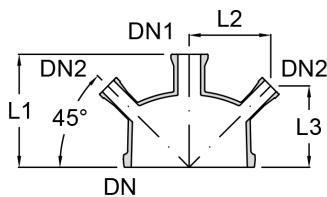
The following covers are standard types, depending on the nominal width:

- a cover with 3 nozzles, typically for receivers and storage vessels, Type AL ...-S1 or AL ...-S2
- a cover with 7 or 5 nozzles, typically for reactors, Type AL ...-S3.

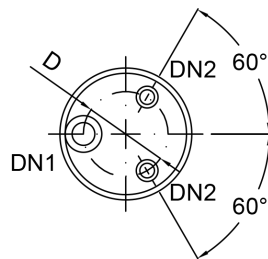
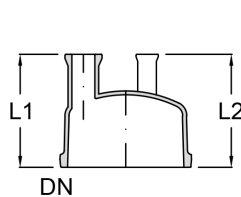
The dimensions and arrangement of the nozzles of the standard covers can be taken from the following drawings and tables.

Possible deviations from the standard are given on page 7.12

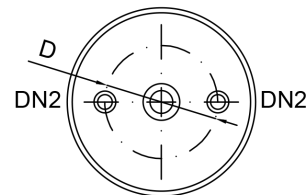
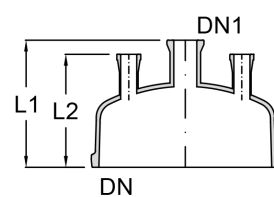
**COVERS FOR RESERVOIRS AND COLLECTION VESSELS**



vessel cover AL...-P  
DN 100-300, type A



vessel cover AL...-P  
DN 150, type B



vessel cover AL...-P  
DN 200-600, type B

**Description:**

vessel cover, PF-System:

vessel cover, PF-System, non-conductive coated:

Vessel cover, PF-System, conductive coated:

**Item no.**

AL [Number of nozzles]-P-S

AL [Number of nozzles]-P-S.-C1

AL [Number of nozzles]-P-S.-C3

**Example**

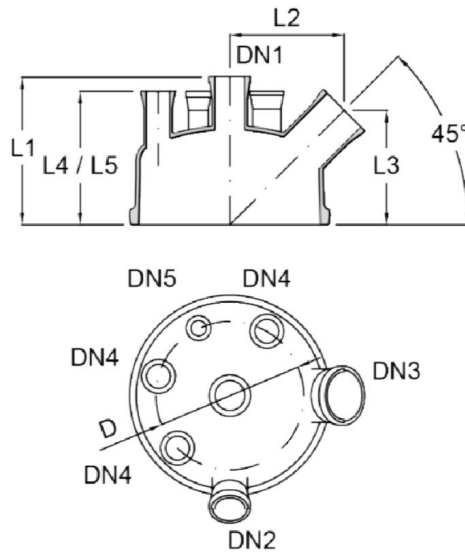
AL 300/3-P-S2

AL 300/3-P-S2-C1

AL 300/3-P-S2-C3

DN	Typ	DN1	DN2	d	L1	L2	L3	Number of nozzles	Item no.
					[mm]	[mm]	[mm]		
100	A	50	15	-	150	90	115	3	<a href="#">AL 100/3-P-S1</a>
150	A	50	25	-	200	125	145	3	<a href="#">AL 150/3-P-S1</a>
150	B	40	25	110	200	200	-	3	<a href="#">AL 150/3-P-S2</a>
200	A	50	25	-	200	147	147	3	<a href="#">AL 200/3-P-S1</a>
200	B	40	25	150	200	175	-	3	<a href="#">AL 200/3-P-S2</a>
300	A	50	25	-	225	187	187	3	<a href="#">AL 300/3-P-S1</a>
300	B	40	25	250	250	200	-	3	<a href="#">AL 300/3-P-S2</a>
400	B	40	25	300	300	275	-	3	<a href="#">AL 400/3-P-S2</a>
450	B	50	40	350	325	275	-	3	<a href="#">AL 450/3-P-S2</a>
600	B	50	40	400	375	300	-	3	<a href="#">AL 600/3-P-S2</a>

COVERS FOR REACTORS



vessel cover AL...-P  
DN 200-600, type C

**Description:**

Vessel cover, PF-System:

Vessel cover, PF-System, non-conductive coated:

Vessel cover, PF-System, conductive coated:

**Item no.**

AL [Number of nozzles]-P-S

AL [Number of nozzles]-P-S.-C1

AL [Number of nozzles]-P-S.-C3

**Example**

AL 300/7-P-S3

AL 300/7-P-S3-C1

AL 300/7-P-S3-C3

DN	Typ	DN1	DN2	DN3	DN4	DN5	d	L1	L2	L3	L4	L5	Number of nozzles	Item no.
								[mm]	[mm]	[mm]	[mm]	[mm]		
200	C	40	50	50	25	-	150	200	154	154	175	-	5	<a href="#">AL 200/5-P-S3</a>
300	C	80	80	80	40	25	250	250	187	187	225	200	7	<a href="#">AL 300/7-P-S3</a>
400	C	80	100	80	40	25	300	300	238	238	275	275	7	<a href="#">AL 400/7-P-S3</a>
450	C	80	100	80	40	25	350	325	247	247	275	275	7	<a href="#">AL 450/7-P-S3</a>
600	C	80	150	100	40	25	400	375	346	266	300	300	7	<a href="#">AL 600/7-P-S3</a>

**VESSEL COVERS, OPTIONS FOR CUSTOMIZED VERSIONS**

Deviating or complementary nozzles design is often necessary for covers. The possibilities for the adaptation are varied. Please, describe or outline to us your specific demands, we are glad to check the feasibility and to offer the according cover.

As a guideline for the specific design possibilities, the following key points apply:

- Design with and without central nozzles in different nominal widths according to the following table
- Central nozzles should be designed centrally, an eccentric adjustment can be checked into if necessary.
- Number of pitch circle nozzles is possible according to enclosed table for a typical nominal width mix. Of these, deviations must be checked in individual cases, e.g. when exclusively using small nozzles, the number of the possible pitch circle nozzles can be increased.
- There are different pitch circle diameters feasible
- Vertical and angled nozzles, preferably in 10 ° or 45 °, are possible. In extreme cases, angles up to 90 ° are possible for flat cover design for e.g., cases of very low available construction heights.
- An oblique to approximately tangential nozzle arrangement is possible
- A jacketed cover design is possible.



Example cover, customer specific design AL...-P-X...

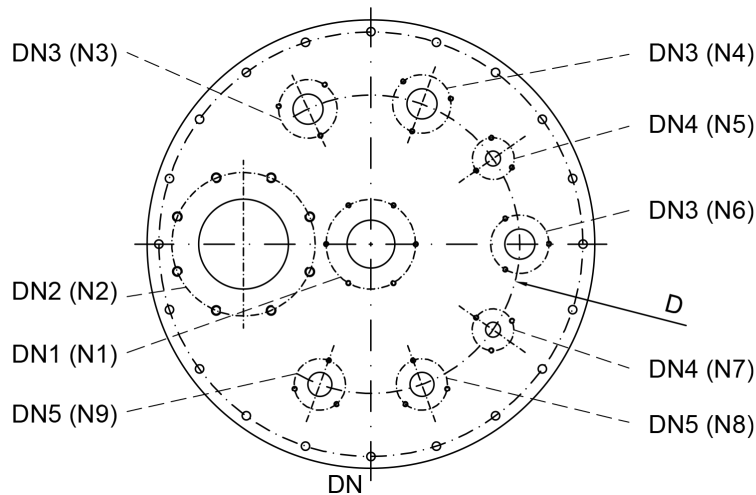
Nominal width [DN]	d <sub>pitch circle</sub> [mm]	side nozzles [Nominal width]	L <sub>side nozzle</sub> [mm]	side nozzles [typ. quantity] <sup>1)</sup>	Item no.
100	70	15 - 50	150 – 175	0 – 4	<a href="#">AL 100/...-P-X...</a>
150	70 - 120	15 - 50	175 – 200	0 – 4	<a href="#">AL 150/...-P-X...</a>
200	70 - 175	15 - 80	175 – 225	0 – 4	<a href="#">AL 200/...-P-X...</a>
300	70 - 290	15 - 100	200 – 225	0 – 6	<a href="#">AL 300/...-P-X...</a>
400	70 – 375	15 - 150	250 – 300	0 – 6	<a href="#">AL 400/...-P-X...</a>
450	70 - 400	25 - 150	275 – 325	0 – 8	<a href="#">AL 450/...-P-X...</a>
600	70 - 525	25 - 200	300 – 400	0 – 8	<a href="#">AL 600/...-P-X...</a>

1) Number of side nozzles is possible according to enclosed table for a typical nominal width mix. Of these, deviations must be checked in individual cases, e.g. when exclusively using small nozzles, the number of the possible pitch circle nozzles can be increased.

**FLAT LIDS**

Flat lids represent a short construction and therefore space-saving solution and can be an economical alternative for glass covers with large nominal widths. Flat lids of the type ALP are made of stainless steel and in contact with the product and coated with ECTFE as standard. Alternatively, these flat lids may be without or with other coating as well as made of other materials such as Hastelloy C22 or enamel.

The possibilities for the adaptation are varied. Please, describe or outline to us your specific demands, we are glad to check the feasibility and to offer the according lid.



Flat lid ALP...-P-X...

**Description:**

- Flat lid, ECTFE-coated, PF system:
- Flat lid, ECTFE-coated, conductive, PF system:
- Flat lid, stainless steel:
- Flat lid, Hastelloy C22:
- Flat lid, PFA-coated:
- Flat lid, enamelled:

**Item no.**

- ALP DN/[Number of nozzles]-P-X...
- ALP DN/[Number of nozzles]-P-M2-X...
- ALP DN/[Number of nozzles]-P-O6-X...
- ALP DN/[Number of nozzles]-P-O7-X...
- ALP DN/[Number of nozzles]-P-O8-X...
- ALP DN/[Number of nozzles]-P-O9-X...

**Example**

- ALP 450/7-P-X...
- ALP 450/7-P-M2-X...
- ALP 450/7-P-O6-X...
- ALP 450/7-P-O7-X...
- ALP 450/7-P-O8-X...
- ALP 450/7-P-O9-X...

**INLET PIPES**

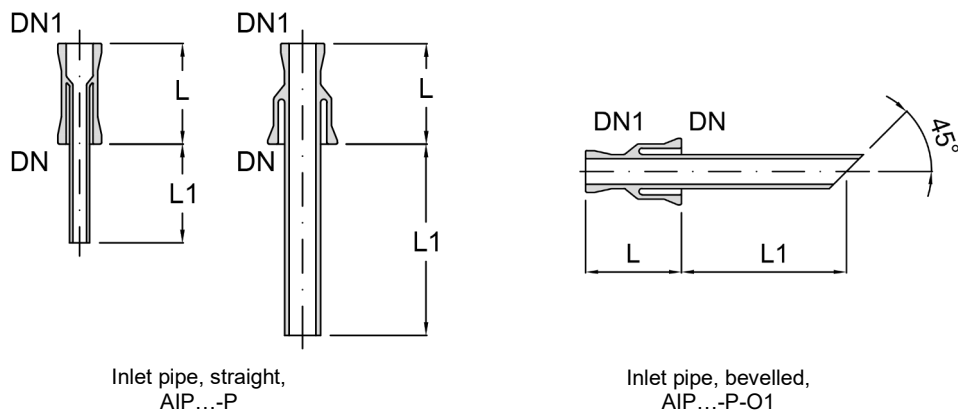
Inlet pipes are used predominantly in order to guide liquids in a defined manner into a vessel or apparatus, but can also be used, for example, for gassing or as baffles.

**INLET PIPES, STRAIGHT**

Straight inlet pipes are used for vertical or horizontal nozzles.

Inlet pipes bevelled at the head (option-O1) have the advantage to better guide the dripping off liquid, the construction lengths are identical.

For special design, such as for example lengths or angles deviating from the catalogue standard, other geometries, closed inlet pipes with boreholes or inlet pipes with melted glass frits, please contact our specialist department.



**Description:**

Inlet pipe straight, PF system:

Inlet pipe straight, non-conductive coated:

Inlet pipe straight, conductive coated:

**Item no.**

AIP DN/DN1/L1-P

AIP DN/DN1/L1-P-C1

AIP DN/DN1/L1-P-C3

**Example**

AIP 040/025/0100-P

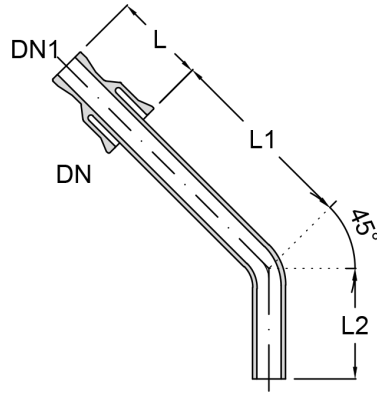
AIP 040/025/0100-P-C1

AIP 040/025/0100-P-C3

DN	DN1	L [mm]	L1 [mm]	Item no. straight	Item no. bevelled
15	15	75	100	<a href="#">AIP 015/015/0100-P</a>	<a href="#">AIP 015/015/0100-P-O1</a>
25	15	100	100	<a href="#">AIP 025/015/0100-P</a>	<a href="#">AIP 025/015/0100-P-O1</a>
25	25	100	100	<a href="#">AIP 025/025/0100-P</a>	<a href="#">AIP 025/025/0100-P-O1</a>
40	25	100	100	<a href="#">AIP 040/025/0100-P</a>	<a href="#">AIP 040/025/0100-P-O1</a>
40	25	100	300	<a href="#">AIP 040/025/0300-P</a>	<a href="#">AIP 040/025/0300-P-O1</a>
40	25	100	650	<a href="#">AIP 040/025/0650-P</a>	<a href="#">AIP 040/025/0650-P-O1</a>
50	25	100	100	<a href="#">AIP 050/025/0100-P</a>	<a href="#">AIP 050/025/0100-P-O1</a>
50	25	100	300	<a href="#">AIP 050/025/0300-P</a>	<a href="#">AIP 050/025/0300-P-O1</a>
50	25	100	650	<a href="#">AIP 050/025/0650-P</a>	<a href="#">AIP 050/025/0650-P-O1</a>

**INLET PIPES, ANGLED 45 °**

Besides straight inlet pipes for vertical or horizontal nozzles, angled inlet pipes can be delivered for 45 ° nozzles on covers or spherical vessels.



Inlet pipe, angled  
AIP 45/...-P

**Description:**

Inlet pipe angled 45°, PF system:

Inlet pipe angled 45°, non-conductive coated:

Inlet pipe angled 45°, conductive coated:

**Item no.**

AIP 45/DN/DN1/L2-P

AIP 45/DN/DN1/L2-P-C1

AIP 45/DN/DN1/L2-P-C3

**Example**

AIP 45/040/025/0165-P

AIP 45/040/025/0165-P-C1

AIP 45/040/025/0165-P-C3

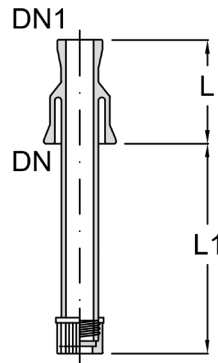
DN	DN1	L [mm]	L1 [mm]	L2 [mm]	Item no.
25	15	100	115	150	<a href="#">AIP 45/025/015/0150-P</a>
40	25	100	135	165	<a href="#">AIP 45/040/025/0165-P</a>
50	25	100	150	150	<a href="#">AIP 45/050/025/0150-P</a>
80	50	125	200	265	<a href="#">AIP 45/080/050/0265-P</a>



**INLET PIPES FOR GASSING**

These inlet pipes have a porous sintered glass sheet made of borosilicate glass 3.3 at the outlet, through which the gas stream is passed into the vessel finely distributed. The pore size can be selected between the sizes 00 and 5. For this, the item number is supplemented by the corresponding pore size with the option abbreviation PS.

The sintered glass pane is connected to the inlet pipe via a GL thread and a PTFE screw cap with bore. Hence, a replacement to change the pore size, for example, or to insert a defined punched PTFE pane, is easily possible.



Inlet pipe for gassing  
AIPG...-P-PS.

**Description:**

Inlet pipe for gassing, pore size 0, PF system:

**Item no.**

AIPG DN/L-P-PS0

**Example**

AIPG 025/0150-P-PS0

Inlet pipe for gassing, pore size 2, PF system:

AIPG DN/L-P-PS2

AIPG 025/0150-P-PS2

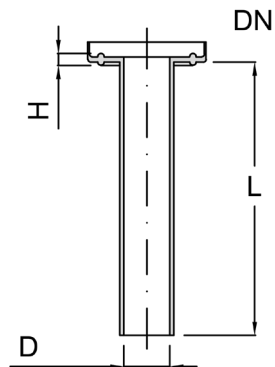
DN	L [mm]	L1 [mm]	D1 [mm]	D2 [mm]	Item no.
25	100	650	23	11	<b>AIPG 025/0650-P-PS.</b>
40	100	650	32,5	15	<b>AIPG 040/0650-P-PS.</b>
50	100	650	41,5	20	<b>AIPG 050/0650-P-PS.</b>

**INLET PIPES MADE OF PTFE**

Inlet pipes made from PTFE offer the advantage of lower installation height and possibilities for subsequent replacement with a simple intermediate flange seal, which often plays a role especially in pilot plants. The free cross section is slightly reduced compared with the nozzle nominal width.

Optionally, a beveled version or with side holes are possible.

On request, corresponding inlet pipes can also be delivered made of other materials or with a smaller diameter for drop dosing.



Einleitrohr, PTFE  
AIPP...-P

**Description:**

Inlet pipe made of PTFE, PF system:

Inlet pipe made of PTFE, conductive, with earthing lug, PF system:

**Item no.**

AIPP DN/L-P

AIPP DN/L-P-M2

**Example**

AIPP 025/0100-P

AIPP 025/0100-P-M2

DN	L [mm]	D [mm]	H [mm]	Item no.
15	100	10	4,5	<a href="#">AIPP 015/0100-P</a>
15	250	10	4,5	<a href="#">AIPP 015/0250-P</a>
25	100	17	4,5	<a href="#">AIPP 025/0100-P</a>
25	250	17	4,5	<a href="#">AIPP 025/0250-P</a>
40	100	33	5	<a href="#">AIPP 040/0100-P</a>
40	250	33	5	<a href="#">AIPP 040/0250-P</a>
50	100	42	5	<a href="#">AIPP 050/0100-P</a>
50	250	42	5	<a href="#">AIPP 050/0250-P</a>
80	100	72	6	<a href="#">AIPP 080/0100-P</a>
80	250	72	6	<a href="#">AIPP 080/0250-P</a>
100	100	92	6,5	<a href="#">AIPP 100/0100-P</a>
100	250	92	6,5	<a href="#">AIPP 100/0250-P</a>
150	100	140	7	<a href="#">AIPP 150/0100-P</a>
150	250	140	7	<a href="#">AIPP 150/0250-P</a>

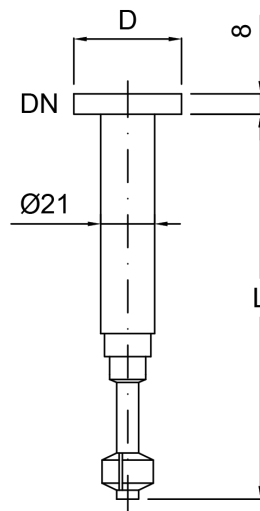
**INLET PIPES WITH SPRAY NOZZLE**

Inlet pipes with spray nozzle of type AISB are possible supplements for vessels or apparatus where CIP cleaning is required. The spray angle is 360°. In the presence of further installations (for example stirrer, inlet pipes, measurements), the installation of a second spray nozzle may be appropriate in order to avoid a spray shadow. The inlet pipe with spray nozzle is designed completely from PTFE, optionally also in conductive version with grounding connection.

The minimum pressure is 0.5 barg to max. 3 barg, the effective cleaning diameter at 0.5 barg is about 500 mm or about 1,000 mm at 3 barg.

The installation length L can be customised to your requirements.

For connection of the inlet pipes with spray nozzle to a glass flange, use two standard seals, type CGR ...-P, and a connection with 10 mm longer screws, type CP ... -P-L0010, according to chapter 3 (e.g. 2 x CGR025-P und 1 x CP025-P-L0010).



Inlet pipe with spray nozzle, PTFE  
AISB...-P

**Description:**

Inlet pipe with spray nozzle, PTFE, PF system:

Inlet pipe with spray nozzle, PTFE conductive with earthing lug, PF system

Inlet pipe with spray nozzle, differing installation length, PTFE, PF system:

**Item no.**

AISB DN/L

AISB DN/L-M2

AISB DN/L

**Example**

AISB 025/0150

AISB 025/0150-M2

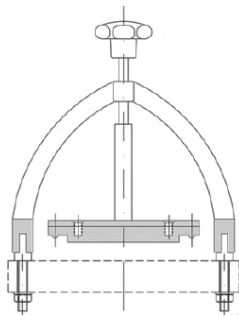
AISB 025/0320

DN	L [mm]	D [mm]	minimum pressure [barg]	Flow rate at 2 bar (water) [l/min]	spray angle	Item no.
25	150	42	0,5	4,0	360°	<a href="#">AISB 025/0150</a>
40	150	61	0,5	4,0	360°	<a href="#">AISB 040/0150</a>
50	150	76	0,5	4,0	360°	<a href="#">AISB 050/0150</a>

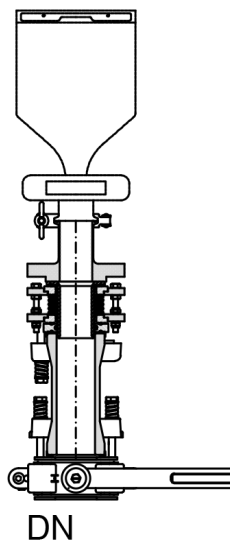
**SOLIDS DOSING, BATCH**

In addition to the possibility of a hand hole with hinged lid, see Chapter 3 Type "CQLC", there is also the option of manually metering ready-made quantities of solids for solids dosage. This can be done with a cover nozzle as large as possible, as standard with a connection flap as well as a connection system with connecting piece for inerting / drying, rinsing and cleaning nozzle with hand hole cover. The dosage itself takes place via commercially available systems with "gun", type SH, or "box", type SE, with prefabricated bags (standard PP, non-conductive, 1 - 10 l selectable) with the possibility for

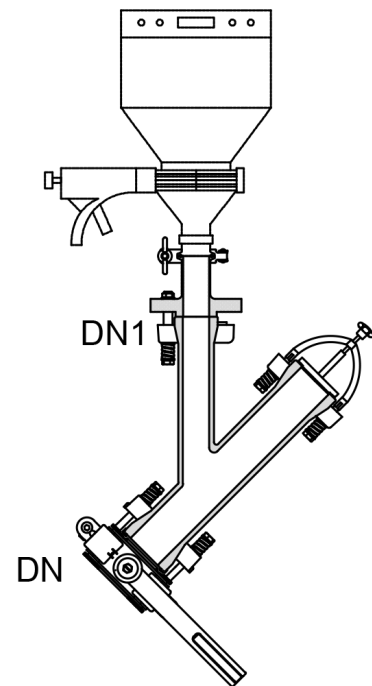
- High-Containment Dosage
- Avoiding cross-contamination by using disposable bags
- Dust-free product transfer (class 5 cleanroom according to ISO EN 14644-1)
- Possibility of sampling in bags by non-intrusive sampling from agitator tank



Handhole cover CQLC, see chapter 3



Solids dosage system with solids bag, box system ASDB...-P-SE



Solids dosage system with solids bag, gun system ASDB...-P-SH

**Description:**

Solids dosage, PF system:

Solids dosage, conductive, PF system:

Solids dosage, FDA conform, PF system:

**Item no.**

ASDB DN -P-S.

ASDB DN -P-S.-M2

ASDB DN -P-S.-Z1

**Example**

ASDB 080-P-S.

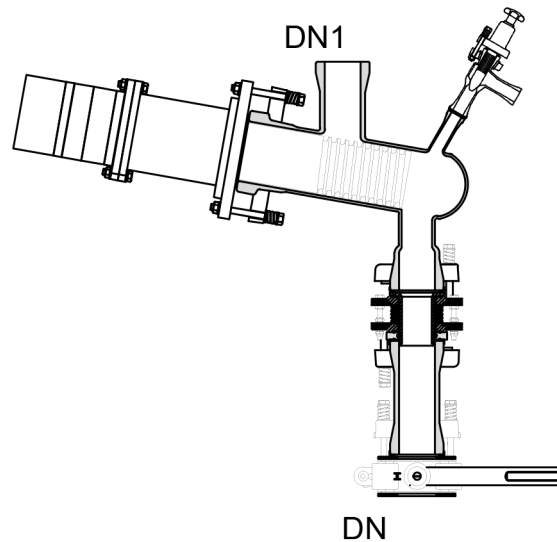
ASDB 080-P-S.-M2

ASDB 080-P-S.-Z1

DN	L [mm]	L1 [mm]	bag [l]	Item no. Typ „box“	Item no. Typ „gun“
80	1.000	300	2	<b>ASDB 080-P-SE</b>	<b>ASDB 080-P-SH</b>
100	1.050	300	5	<b>ASDB 100-P-SE</b>	<b>ASDB 100-P-SH</b>
150	1.100	300	10	<b>ASDB 150-P-SE</b>	<b>ASDB 150-P-SH</b>

**SOLIDS DOSING, CONTINUOUS**

For corrosion-resistant solids dosing, in addition to the possibility of adding as a batch, there is also the option of continuously metering solid material with type ASDC. For this purpose, a vessel or pre-assembled dosing system analogous to the ASDB type is connected to the DN1 nozzle. The solid matter is conveyed continuously via a PTFE screw with an adjustable conveying speed to the discharge nozzle DN, through which the solid matter falls into the vessel space. The supply to the vessel can be shut off via a manual flap. In addition, an inerting / drying or rinsing process is possible via the valve and the nozzle DN2.



Solids dosage system with solids bag  
ASDC...-P

**Description:**

- Solids dosage, PF system:
- Solids dosage, conductive, PF system:
- Solids dosage, FDA-konform, PF system:
- Solids dosage, FDA-konform, ATEX, PF system <sup>1)</sup>:

**Item no.**

- ASDC DN -P
- ASDC DN -P-M2
- ASDC DN -P-Z1
- ASDC DN -P-O5

**Example**

- ASDC 080-P
- ASDC 080-P-M2
- ASDC 080-P-Z1
- ASDC 080-P-O5

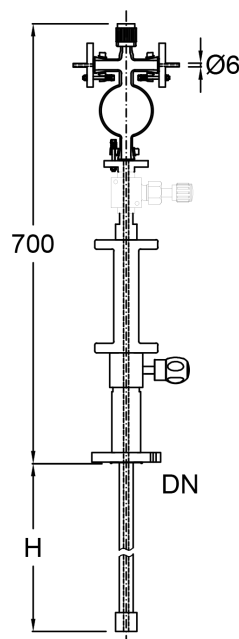
DN	DN1	DN2	L [mm]	L1 [mm]	bag [l]	Dosage [ml/min]	Item no.
80	80	25	550	100	2 - 20	20 - 50	<b>ASDC 080-P</b>
100	100	25	600	100	5 - 50	50 - 200	<b>ASDC 100-P</b>
150	150	25	650	100	10 - 50	50 - 200	<b>ASDC 150-P</b>

1) as standard for EX-Zone 2/2, IIB, T3. Deviations are possible on request.

**SAMPLING SYSTEM**

For sampling, it is possible to take a sample by means of the system type VSS via a vertical nozzle of the vessel cover. This is done via a completely PTFE product-contacting height-adjustable sampling tube with a small inner diameter, which is manually immersed in the liquid for sampling only and is fixed at the desired position with a manual locking option. Via a nozzle N3, the liquid is sucked into the spherical sampling vessel by means of a vacuum, "Type VSS ...-SV", or a pump, "Type VSS ...-SP", and shut off against return flow with the valve underneath. The sample may then be taken as standard via a syringe through a membrane at nozzle N4. Then the shut-off valve is opened again and the remaining sample liquid is pushed back after the sample has been raised above the liquid level in the vessel, for example with nitrogen (nozzle N2). In principle, a rinsing process, for example with the solvent used on the product side, is also possible via this nozzle.

In addition to the two listed suction versions, it is possible to select the vessel cover diameter and the sample tube length.



Sampling system VSS ...-SV

**Description:**

Sampling system, PF system:

Sampling system, system „vacuum“, PF system:

Sampling system, conductive, PF system:

Sampling system, FDA conform, PF system:

**Item no.**

VSS DN/H -P-S...

VSS DN/H -P-SV

VSS DN/H -P-S...-M2

VSS DN/H -P-S...-Z1

**Example**

VSS 080/0800-P-S...

VSS 080/0800-P-SV

VSS 080/0800-P-S...-M2

VSS 080/0800-P-S...-Z1

DN	H	tube, inside	sample volume	Item no. type „vacuum“	Item no. type „pump“
	[mm]	[mm]	[l]		
40	800	4	1	<b>VSS 040/0800-P-SV</b>	<b>VSS 040/0800-P-SP</b>
50	800	4	1	<b>VSS 050/0800-P-SV</b>	<b>VSS 050/0800-P-SP</b>
80	800	4	1	<b>VSS 080/0800-P-SV</b>	<b>VSS 080/0800-P-SP</b>

**AGITATORS RW**

Type RW agitators are supplied for NORMAG RU type stirrers

- in powered form, differentiated according to laboratory and process scale and differentiated according to magnetic drive format or manual form (hand mixer)
- with different adapter flanges with corresponding connecting flange shapes and diameters
- with different shaft sealing systems and possibly associated monitoring and locking systems
- with different product-contacting materials
- with different drive types and outputs (electric, pneumatic, optional others)
- with optional standardized additional requirements such as ATEX, specific certificates, motor requirements and measurement engineering
- with optional special requirements.

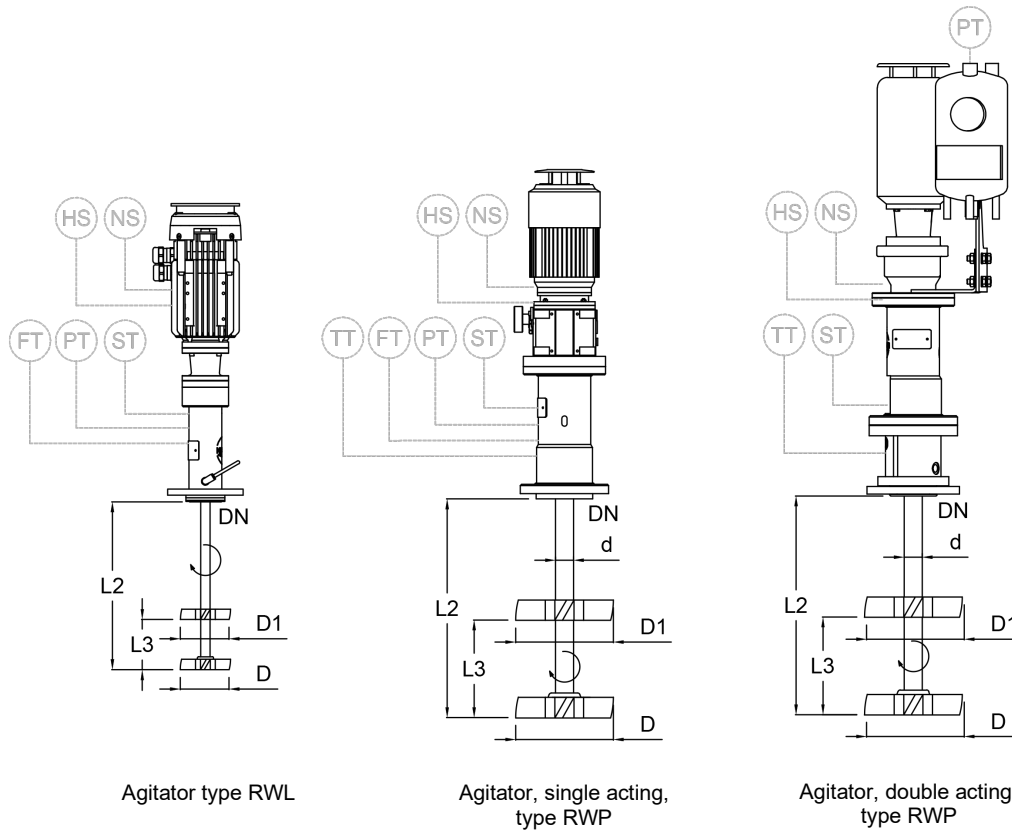
The agitators, in conjunction with the RU stirrer, perform the various mixing tasks such as suspending, homogenizing, dispersing or dissolving fluid mixtures. This can be done for vessels with or without heat input, continuous or discontinuous operation and various vessel types (length, shape, residual stirring volume, eccentric cover assembly, inlet and outlet nozzles, etc.) and accessories (baffles, inlet pipes, measurement engineering).

The standard operating conditions for all subsequent agitators are based on the following data:

- permissible pressure and temperature range -1 / + 0.5 (optionally 6) barg and -50 / + 200 ° C, possibly restrictive conditions due to guidelines such as ATEX 2014/34 / EU
- Ambient conditions 5/40 ° C, 50% air humidity
- Motor 230/400 V, 50 Hz, 3 Ph, IP 54 (for Type AM & AF)  
in the case of ATEX requirement, design as standard with "increased safety"
- maximum torque from 2.5 Nm (for 0.25 kW) to 7 Nm (for 1.1 kW), the corresponding maximum viscosity can be determined based on this in conjunction with the stirrer.
- torque up to 0 (70) - 700 rpm, Possibly restrictive conditions due to guidelines such as ATEX 2014/34 / EU, magnetic stirrer drives (up to 300 rpm) and stirrer shape / diameter
- Standard construction height, not angled, amounts to
  - RWP (ca. 650 mm)
  - RWL (ca. 550 mm with standard motor and approx. 400 mm for laboratory motor type AML)
  - RWM (ca. 630 mm)
  - RWH (ca. 280 mm for d=20 mm),  
RWH (ca. 450 mm for d=45 mm),

Deviations from the stated standard operating conditions are possible and can be specified with the identifier RW ... / -X ... as a special version for the stirrer / agitator and are gladly checked for feasibility by our specialist department.





For agitators RW following specifications and options are possible:

Description:	Item no.	Example
Agitator RW	RWP d0/NW-G...-A...(-Options) RWL d0/NW-G...-A...(-Options) RWH d0/NW-G... (-Options)	RWP 35/K80 -G1-AM037 RWL 20/P40-GT1/1-AM025-EX12B3-Z1 RWH 20/P40-GH1
with RW...	Agitator types	
	- Agitator process scale, with electric drive	RWP -
	- agitator laboratory scale, with electric drive	RWL -
	- Agitator, with magnetic drive	RWM -
	- Hand stirrer	RWH -
d0/NW	d0 indicates the diameter of the stirrer, while NW indicates the possible nominal width with Flange type (K for KF flange (version TK 6 x 150 mm) and P for PF flange connection) for the respective type of agitator:	
	- d <sub>0</sub> =20 mm diameter of laboratory agitator	Type RWL 20/K40, 20/K50, 20/P25, 20/P40, 20/P50
	of magnetic agitator	type RWM 16/G40
	of hand mixer	Type RWH 18/P40
	- d <sub>0</sub> =35 mm diameter of agitator	Type RWP 35/K80, 35/K100, 35/K150 35/P80, 35/P100, 35/P150
	- d <sub>0</sub> =45 mm diameter of agitator	Type RWP 35/K80, 45/K100, 45/K150 45/P80, 45/P100, 45/P150
	of hand mixer	Type RWH 45/K40

G...	Shaft sealing systems with the following options:		
	- single-acting mech. seal, PTFE/ceramic <sup>1)0)</sup>	for RWL, RWP	G1
	additional temperature monitoring <sup>1)0)</sup>	for RWL, RWP	G1...-MT
	- single-acting GLRD, graphite/SiC/FFKM <sup>1)0)</sup>	for RWP	G2
	additional temperature monitoring <sup>1)0)</sup>	for RWL, RWP	G2...-MT
	- lip seal, type INTERSEAL, PTFE/SiC/FFKM <sup>3)7)</sup>	for RWL, RWP	G3
	- double-acting GLRD, liquid lubricated, PTFE/SiC/FFKM <sup>2)4)</sup>	for RWP	G4
	- Magnetic coupling, SS/graphite/PTFE <sup>5)</sup>	for RWL, RWP	G5
	- Hand mixer, laboratory, PTFE/FFKM/SiC <sup>6)</sup>	for RWH	GH1
	- Hand mixer, Process, PTFE/FFKM/SS <sup>6)</sup>	for RWH	GH2

Spare parts for the shaft sealing systems are available on request.

Explanations:

0) for ATEX application with zone 0 inside mandatory in version GT1 with T-probe measurement

1) for embodiments

- gas pressure superimposed	G../1
- Inert flow superimposed	G../2
- cooling flange	G../3
- cooling flange & gas pressure superimposed	G../4
- cooling flange & Inert flow superimposed	G../5

2) For the sliding ring seal types G3 and G4, the following additional lengths result:

- RWP...G3 (tog. 113 mm)
- RWL...G3 (tog. 32 mm)
- RWL...G4 (tog. 110 mm)

3) for embodiments

- Pressure monitoring	G../D1
- Pressure monitoring and superimposing	G../D2

4) with thermosiphon, 3l (inspection glass, PI, supply valve) and connecting lines, draining and brackets, optionally with temperature sensor (ATEX application), oil pump, level measurement / contact and cooler

5) with plain bearings / ball bearings made of graphite and stainless steel, optionally with cooler for applications at higher temperatures

6) Laboratory and process control, each with FFKM O-ring seal

A..	Drive A, differentiated by types and subsequently output		
	Information in 0.01 kW increments for above Standard conditions of the motor		
	- electric, manual <sup>1)2)</sup>	AM	AM025
	electric, manual Laboratory <sup>1)2)</sup>	AL	AL009
	electric, frequency converter <sup>1)2)</sup>	AF	AF037
	electric, manual, angle drive <sup>1)2)</sup>	AMW	AMW025
	electric, frequency converter, flexible extension <sup>1)2)</sup>	AMF	AFW037
	electric, manual, flexible extension <sup>1)2)</sup> AMF	AMF025	
	electric, frequency converter, flexible extension <sup>1)2)</sup>	AFF	AFF037
	- pneumatic <sup>3)</sup>	AP	AP009
	pneumatic, angle drive <sup>3)</sup>	APW	APW009

Explanations:

- 1) for stainless steel motor type option -O01  
 1) for stainless steel motor type and cleanroom option -O02  
 2) for ATEX application, recognizable by the selected option "EX ..." the aforementioned  
 Standard conditions have to be observed. The following standard options still have to be considered:  
 for flameproof enclosure -O03  
 for flameproof enclosure and temperature class T4 -O03  
 3) for pneumatic drives, volume is up to 80 dB, required pre-pressure 6 barg, dry.  
 The consumptions are to be coordinated with our specialist department on order.

## O.. Optional additions

ATEX design	...-EX	...-EX12B3
- 3. Position: EX zone in the product room	0, 1 or 2	
- 4. Position: EX-Zone in surroundings	1 or 2	
- 5. Position: ignition class	IIA, IIB or IIC	
- 6. Position: Temperature class	T1, T2, T3 or T4	

## Measurements

- rotational speed measurement, local, via graduation	/ (Standard for AM & AMW)
- rotational speed measurement, via Initiator	...-MS
- Torque via Motor	...-MD
- Viscosity via Motor	...-MV
- Temperature measurement	...-MT
- Pressure measurement	...-MP

## Z. Certificates for stirrers

- FDA certificate	...-Z1
- TA Luft certificate 1)	...-Z2
- Surface roughness certificate ( $R_a \leq 0.8 \mu\text{m}$ ) 2)	...-Z3
- Several certificates, e.g. FDA and "TA Luft" Certificate	...-Z12

Explanations:

- 1) TA Luft certificate only possible in combination with agitators of the types  
 G1-1, GT1-1, G3-2, G4 and G5 (marked types  
 in the field of agitators ...). The certificate refers to the compliance  
 with the TA Luft, status 09/2016  
 2) Surface roughness certificates are only offered for metallic materials (type M3, M4 and M5)

## X... special requirements, for example

- Provision by customers
- Required residual stirrer volume,
- Special materials
- ...
- ...

## STIRRERS RU

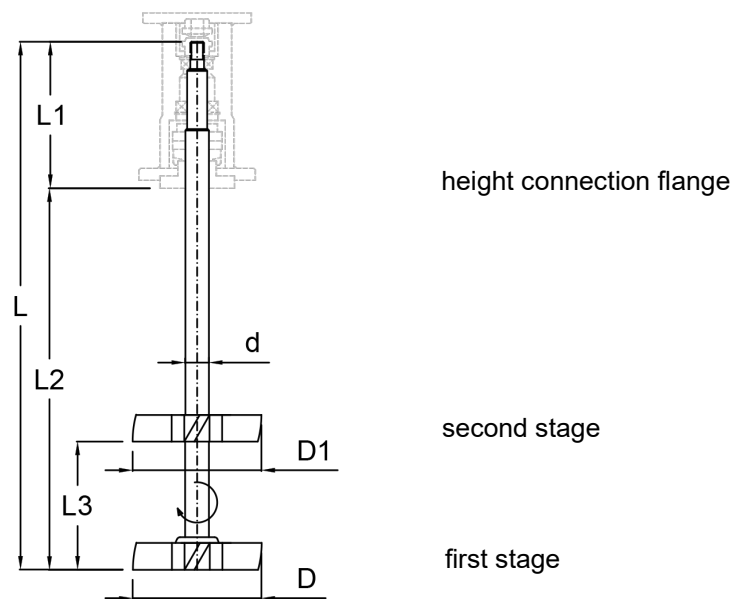
Type RU stirrers are supplied for NORMAG RW type agitators in

- different materials
- with different stirrer head types and quantity
- in different lengths

The stirrers, in conjunction with the agitator, perform the various mixing tasks such as suspending, homogenizing, dispersing or dissolving fluid mixtures. This can be considered in the overall context with or without heat input, continuous or discontinuous and the vessel type (length, shape, residual stirring volume, eccentric cover assembly, inlet and outlet nozzles, etc.) and accessories (baffles, inlet pipes, measurement engineering).

The standard operating conditions for all subsequent stirrers are based on this data. Deviations from the stated standard operating conditions are possible and can be specified under XXXX as a special version for the stirrer / agitator and are gladly checked for feasibility by our specialist department.

- permissible pressure and temperature range  $-1 / + 0.5$  (6) barg and  $-50 / + 200$  ° C, possibly restrictive conditions due to guidelines such as ATEX 2014/34/EU, without temperature shock
- maximum torque / viscosity is limited by motor, not by stirrer
- Torque up to 700 rpm, Possibly restrictive conditions due to guidelines such as ATEX 2014/34/EU and stirrer shape / diameter



principal sketch stirrer  
RU...

The following specifications and options are available for mixers RU:

Description:	Item no.	Example	
Stirrer Type RU, 1-stage	RU Ed0/L...-Hn..d1(E)-M..	RU E20-L395-H1AN135-M11-Z1	
2-stage	RU Ed0/L...-Hn..d1(E)/..d2-M...-Z.	RU E20-L520-H2IPE135/150IP200-M11-Z1	
with RU	Stirrer	-	
Ed0	Type of sliding ring seal of the NORMAG agitator RW		
	- E	single-acting mechanical seal	
	- D	double-acting mechanical seal	
	- V	Lip seal (multiple seal)	
	- M	magnetic coupling	
	- H	hand mixer	
	and also possible diameter d0 of the agitator shaft, suitable for agitator type NR		
	- 20 mm diameter for laboratory agitator	Type RWL	E20, V20
	- 16 mm diameter for magnetic agitator	type RWM	M16
	- 20 mm diameter for hand mixer	Type RWH	H20
	- 35 mm diameter for agitator	Type RWP	E35, D35, V35
	- 45 mm diameter for agitator	Type RWP	E45, D45, V45
	- 45 mm diameter for hand mixer	Type RWH	H45
L...	Total length l of the stirrer in mm (10 mm Grid, tolerance +/-5 mm)	L395	
	The length from the main flange L2 results after deduction of the length L1 from the total length:		
	- E20 (-172 mm), V20 (-196 mm), M16 (-193 mm) , H20 (-220 mm)		
	- E35 (-215 mm), D35 (-325 mm), L35 (-328 mm)		
	- E45 (-215 mm), D45 (-325 mm)		
	The following maximum lengths are to be assumed for the individual stirrers:		
	- E20/V20/M16 (1.000 mm, except AN), H20 (1.400 mm)		
	- E35/D35/V35 (1.200 mm, except AN)		
	- E45/D45 (1.500 mm, except AN), H45 (1.500 mm)		
	Variations are possible depending on the rotational speed, Stirrer head diameter and ATEX requirements		
Hn..(E)	Stirrer head H, distinguished by	H	H1AN135
	2. Position: n = number of stirrer heads / stages	1 or 2	
	Distinction between fixed (HN ...) or exchangeable stirrer head (HN ... E), each with		
	3.&4. Position: Stirrer head types		
	- Anchor <sup>2)</sup>	AN	-
	- Impeller	IP	IPE
	- Turbine	TB	TBE
	- Beam with smoothing or roughening function	BA	-
	- Propeller, downflow <sup>1)</sup>	PD	PDE
	- Propeller, upflow <sup>1)</sup>	PU	PUE
	- Pitched blade, downflow <sup>1)</sup>	SD	SDE
	- Pitched blade, upflow <sup>1)</sup>	SU	SUE
	1) for clockwise rotation of the agitator		
	2) only for reduced rotational speeds up to 300 rpm and generally without exchangeable head		

	5.-7. Position: Stirrer head diameter d1	H...d1
	(8.-10. Position: Optional for second stage stirrer head type, with Stirrer head diameter d2 and distance L3 to lower stirrer	H...d1/L2...d2
M..	Product contacting materials of stirrer M (XY) with	
	- X as agitator shaft material and	
	- Y as stirrer head material	
	1 = PTFE white (not conductive) <sup>1)</sup>	...-M11
	2 = PTFE black (conductive) <sup>1)</sup>	...-M22
	3 = stainless steel 1.4571 <sup>2)</sup>	...-M33
	4 = Hastelloy C22 <sup>2)</sup>	...-M44
	5 = Zirconium <sup>2)</sup>	...-M55
	6 = enamel <sup>2)3)</sup>	...-M66
	7 = borosilicate glass 3.3	...-M77
	... = customer-specific alternative material	

For stirrers with replaceable head FFKM is used as the standard sealing material of the stirrer head

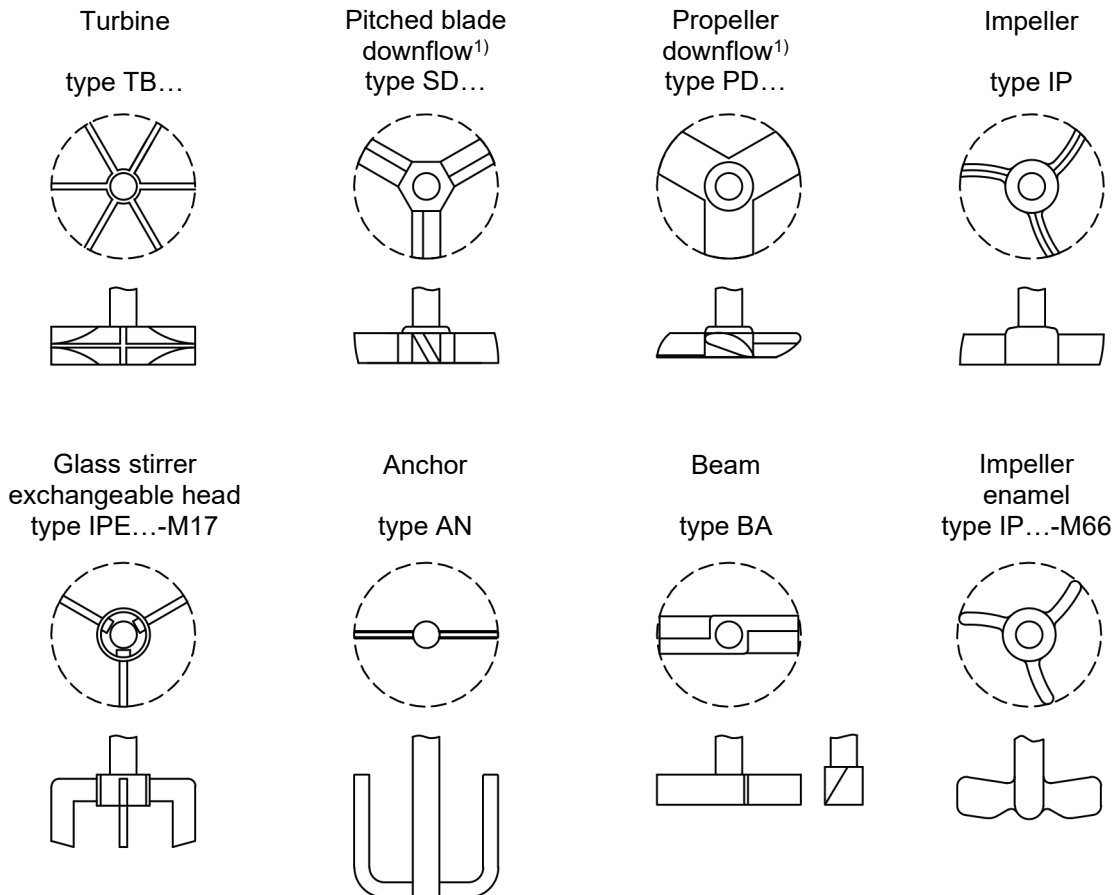
Explanations:

- 1) PTFE sheathed agitator shaft, PTFE stirrer head with steel core,  
sealing and one piece connected with agitator shaft, Steels continuously welded to shaft
- 2) stirrer head one piece connected with agitator shaft, Steels continuously welded to shaft
- 3) In enamel in design Impeller and anchor possible

Z.	Certificates for stirrers	
	- FDA certificate	...-Z1
	- Surface roughness -certificate ( $R_a \leq 0.8 \mu\text{m}$ ) <sup>1)</sup>	...-Z3
	- Material certificate 2.2	...-Z4
	- Several certificates, e.g. FDA and Material certificate	...-Z14

Explanations:

- 1) Surface roughness- certificates are only offered for metallic materials (type M3, M4 and M5)



1) for clockwise rotation of the stirrer

figure 1: stirrer types RU

In addition to the stirrers with the specified options, spare parts and replacement heads are available individually for the stirrers with exchangeable heads. Examples are:

**SPARE PARTS:**

Exchangeable head, O rings, FFKM:

**Item no.**

RU ...-SP01

**Example**

RU 35-SP01 (-Z1)

Exchangeable head, clamping lid, PTFE:

RU ...-SP02

RU 35-SP02 (-Z1)

Exchangeable head, type Impeller:

RU ...-SP03-IPE...

RU 35-SP03-IPE175-M1 (-Z1)

Exchangeable head, type Propeller downflow:

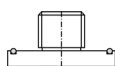
RU ...-SP03-PDE...

RU 18-SP03-PDE120-M2 (-Z1)

Exchangeable head, type Propeller upflow:

RU ...-SP03-PUE...

RU 45-SP03-PUE120-M3 (-Z1)



Spare parts, exchangeable head

- O ring, FFKM
- clamping lid, PTFE

RU 20-SP01  
RU 20-SP02

RU 35-SP01  
RU 35-SP02



Examples Spare-/exchange heads

- Impeller, PTFE
- Propeller, PTFE

RU 35-SP03-IPE  
RU 35-SP03-PUE

Stirrer heads, exchangeable, with spare parts and exchange heads  
RU...E und RU ...E-SP..



## OPTIONS VESSELS & AGITATORS

The following options can be chosen in addition to the standard components. Each option chosen must be entered at the end of the item number. Several options can be chosen, and as far as possible, they are presented in alphabetical order. In the following table you will find examples of item numbering, which include additional options.

Description:	Item no.	Example
Cylindrical vessel, PF system:	AV V/DN/DN1-P	AV 050/300/025-P
Cylindrical vessel, PF, with seat for bottom drain valve type VOB40:	AV V/DN/VOB40	AV 050/300/VOB40
Cylindrical vessel, PF, with seat for bottom drain valve type VOB50:	AV V/DN/VOB50	AV 050/300/VOB50
Cylindrical vessel, PF system, with graduation	AV V/DN/DN1-P-GR...	AV 050/300/025-P-GR50
Cylindrical vessel, PF system, with torispherical head:	AV V/DN/DN1-P-O4	AV 050/300/025-P-O4
Cylindrical vessel, PF, without bottom nozzle:	AV V/DN/000-P	AV 050/300/000-P
Cylindrical vessel, PF, length according former design:	AV V/DN/DN1-P-O10	AV 010/200/025-P-O10
Cylindrical vessel, PF, with non-conductive coating:	AV V/DN/DN1-P-C1	AV 050/300/025-P-C1
Cylindrical vessel, PF, with conductive coating:	AV V/DN/DN1-P-C3	AV 050/300/025-P-C3

You can choose from the following options:

### OPTION C – COATING / GLASS TYPE

The standard components used are those made of borosilicate glass 3.3 without coating. The following alternative options are possible:

- C1 = coating, non-conductive
- C2 = coating, non-conductive, for higher temperatures and chemical resistance
- C3 = coating, conductive
- C4 = amber glass
- C5 = quartz glass

### OPTION F – FLANGE TYPE

The standard components used are made of borosilicate glass 3.3 with the flange type F4 (PF system).

The following flange connectors for glass structural components are also generally available:

- F1 = KF flanges, type KF../1
- F2 = KF flanges, type KF../2
- F3 = KF flanges, type KF../3
- F4 = PF flanges, type PF
- F5 = Tube connection 16 mm
- F6 = Tube connection 26 mm
- F7 = GL-thread GL 18
- F8 = GL-thread GL 25
- F9 = NS 29/32
- F10 = NS 45/40

All other combinations of the flange types F1 to F4 can be selected as options, we will be happy to check whether the other types of flange can be used with your desired structural component.

**OPTION GR – GRADUATED**

Cylindrical and spherical vessels made of glass can be provided with an externally baked in graduation. The graduation consists of smaller graduations in a certain volume distance and larger graduations with numerical values for main volume intervals (for example graduations per liter with larger graduations with numerical value every 5 liters.)

**Example:**

GR05 = graduation marks every 0.5 liters

GR20 = graduation marks every 2.0 liters

GR50 = graduation marks every 5.0 liters

**OPTION M – MATERIAL / PTFE-DESIGN**

The standard design is in white PTFE, non-conductive and with no material certificate.

M1 = PTFE conductive

M2 = PTFE conductive with earthing

**OPTION O – SPECIAL OPTIONS**

The following special options are offered for certain structural components.

O1 = inlet pipe 45 ° bevelled

O4 = cylindrical vessel with torispherical head instead of round bottom

O5 = Solids dosage, continuous in ATEX-design EX-Zone 2/2, IIB, T3

**OPTION SP – SPARE PARTS**

The replacement parts are described for each individual component.

**OPTION Z – CERTIFICATES**

Standard deliveries do not come with certificates.

The following certificates can optionally be delivered with your order.

Z1 = FDA material certificate<sup>1)</sup>

Z2 = material certificate 2.2

Z3 = Certificate for Technical Guidelines on Air Quality Control (TA-Luft)

1) FDA material certificates can be delivered for product-side structural components containing PTFE.