

General Material Installation

MATERIAL HANDLING SYSTEM

PB INNOVATION

PB INNOVATION ENGINEERING CO.,LTD | 18/155 SOI.RAMINTRA 65, THARANG, BANGKHEN, BANGKOK 10230 , MOBILE 084 111 8798
INFO@PB-INNOVATIONS.COM / WWW.PB-INNOVATIONS.COM

Stainless steel pipes:

- Make a request!
- Smoothed inner seam
- Deburred ends
- Supplied in commercial lengths of 6 m
- Material: Stainless steel 1.4301 / X5CrNi18-10 / 304

Aluminium pipes:

- Ends cleanly deburred
- Supplied in trade length of 6 m.

Glass pipes:

- Borrosilicate glass 3.3
- With copper strip
- Ends fire-polished



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 SURFACE FINISH:
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DEBUR AND
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 EDGES

	NAME	SIGNATURE	DATE:
DRAWN	NARAWIT		
CHK'D	AMPHORN		REVISION:
APP'VD	PRATHIN		
MFG	PHADUNGSAK		
Q.A	AMPHORN		MATERIAL:

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WEIGHT: NON

FOR:

TITLE:

DWG NO.

A4

SCAL: -

SHEET 1 OF 1

Pipe holding clamp:

- Made of galvanized steel



U-Clamp

- Made of galvanized steel



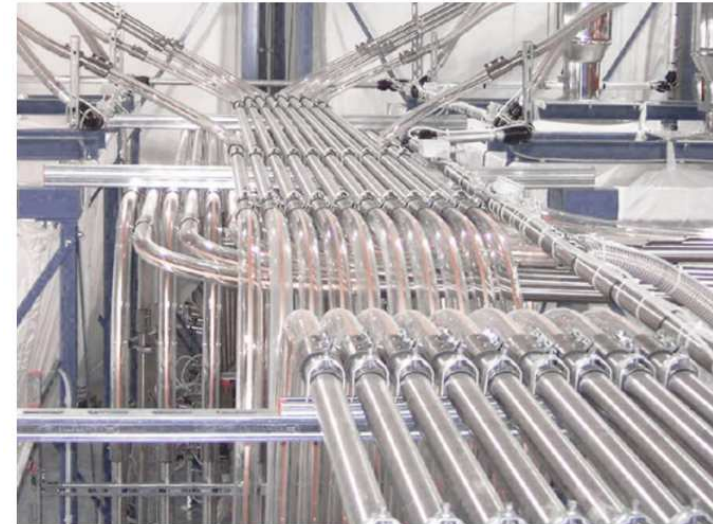
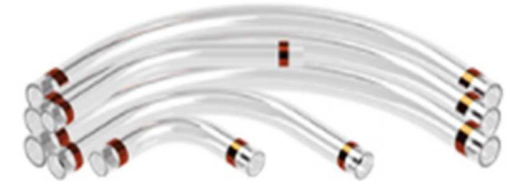
Bends (Stainless Steel)

- Crease-free bends
- Deburred ends
- Radius 75 upto 1000
- Piping DN54 upto 84



Bends (Glass)

- Borosilicate glass 3.3
- ends-fire-polished
- with copper strip
- DN47 upto 80



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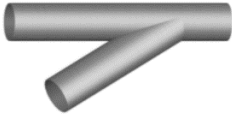

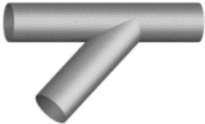
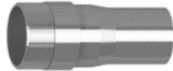



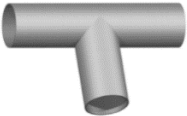
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A	Piping fittings (Stainless Steel) – Branch 30°		Reducers – DN38 upto DN108		A
B	Piping fittings (Stainless Steel) – Branch 45°		Threaded pipes 1.5” – 4”		B
C	Piping fittings (Stainless Steel) – Branch 60°		Piping fittings (Stainless Steel) L pieces		C
D	Piping fittings (Stainless Steel) – Y-Piece 60°		Piping fittings (Stainless Steel) – T-Piece		

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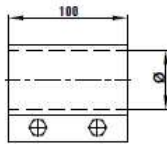
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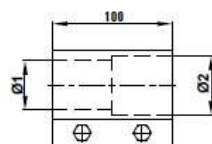
DWG NO. A4

Pipe coupling

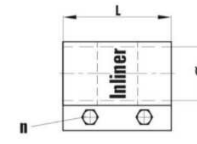
- Light version
- Length = 100 mm, 2 screws
- Sleeve (NBR black, Natural rubber seal white, Silocone red)
- Temperature NBR balck – 80°C
- Temperature Natural rubber seal, white – 110°C
- Temperature Silicone RED – 250°C
- Stainless Steel Sleeve
- Available size DN38 upto DN102 mm.



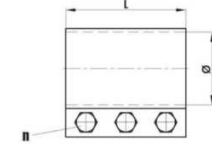
Model: RV.10



Model: RV.11



Model: RV.12



Model: RV.16

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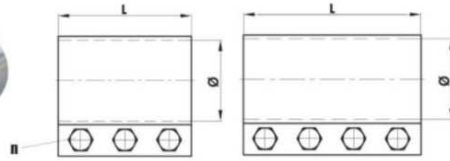
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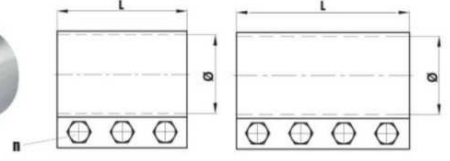
SHEET 1 OF 1

Pipe coupling

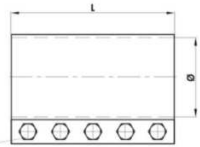
- Medium and Heavy Duty
- Length = 100 mm, 2 screws
- Sleeve (NBR black, Natural rubber seal white, Silocone red)
- Temperature NBR balck – 80C°
- Temperature Natural rubber seal, white – 110C°
- Temperature Silicone RED – 250C°
- Stainless Steel / Galvanized Sleeve
- Available size DN48 upto DN219 mm.



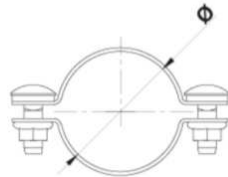
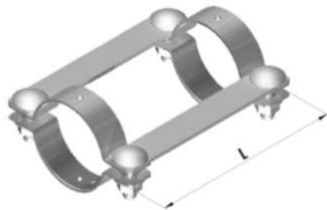
Model: HL



Model: H



Model: HX



Tension relief



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DWG. NO.

A4

SCAL: -

SHEET 1 OF 1

This transparent hose is used as a flexible line for materials or vacuum.
 It is very smooth on the inside and ensures a gentle flow of the bulk material.
 The PUR variant lends itself to the conveying of abrasive bulk materials (plastics and food).
 The cast-in galvanised steel spiral ensures high vacuum resistance and the transmission of electrostatic energy.



Hose "SCH.01.PVC"

- Transparent suction hose for **low abrasive granules**
- Made of thermoplastic soft PVC; smooth inside; fully cast-in steel spiral (earthing wire)
- Bending radius: approx. 3 x inner diameter
- Vacuum resistance: -0.8 bar (rel)
- Temperature range: -15 / +60 °C; (peak +80 °C)
- Available size: ID38 upto ID 76 mm.

SCH.01

Hose "SCH.01.PVC.PUR"

- Abrasion-resistant, transparent suction and pressure hose for **highly abrasive granules and powders (plastics and food)**
- Polyester-PUR hose 0.6 mm thick; smooth inside; outer sheath made of thermoplastic soft PVC; fully cast-in steel spiral (earthing wire)
- Bending radius: approx. 3 x inner diameter
- Vacuum resistance: -0.8 bar (rel)
- Temperature range: -15 / +60 °C (peak +80 °C)
- Available size: ID40 upto ID 60 mm.

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This abrasion-resistant and antistatic hose is mainly used as a flexible material line. It is made entirely of polyurethane (PUR). The version with 1.45 mm usable wall thickness has a small minimum bending radius, which makes it very flexible. In the variant with a usable wall thickness of 2.0 mm, the minimum bending radius is larger. It is ideally suited for the conveyance of heavily abrasive bulk materials. The cast-in copper-coloured steel spiral ensures high vacuum resistance and conducts the electrostatic energy.



SCH.02

Hose "SCH.02 - 1.4 mm"

- Abrasion-resistant suction hose for **abrasive granules**
- Wall made of pure polyester-polyurethane (PUR), usable wall thickness 1.45 mm; incorporated steel spiral (earthing wire)
- Antistatic and flame retardant
- Approved according to TRGS 727 and ATEX 2014/34 EU
- Bending radius: approx. 2 x inner diameter
- Vacuum resistance inside dia. < 80 mm: -0.6 bar (rel)
- Vacuum resistance inside dia. > 80 mm: -0.2 bar (rel)
- Temperature range: -40 / +90 °C; (peak +125 °C)
- Available size: ID32 upto ID150 mm

Hose "SCH.02 - 2.0 mm"

- Abrasion-resistant suction hose for **heavily abrasive granules**
- Wall made of pure polyester-polyurethane (PUR), usable wall thickness 2.0 mm; incorporated steel spiral (earthing wire)
- Antistatic and flame retardant
- Approved according to TRGS 727 and ATEX 2014/34 EU
- Bending radius: approx. 2.5 x inner diameter
- Vacuum resistance: -0.8 bar (rel)
- Temperature range: -40 / +90 °C; (peak +125 °C)
- Available size: ID40 upto ID90 mm.

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DWG. NO.	A4

This PVC hose is used as a flexible line for materials or vacuum. It is very smooth on the inside. Its large minimum bending radius ensures that the bulk material flows through gently. The variant with a PUR inner coating is thus suitable for the conveyance of highly abrasive bulk materials. The circumferential hard plastic spiral ensures high vacuum resistance, while the circumferentially cast copper string conducts the electrostatic energy.



Hose "SCH.03.PVC"

SCH.03

- Ivory-coloured suction hose for **low abrasive granules**
- Made of transparent PVC with embedded hard ivory-coloured PVC spiral; smooth inside; outside with encapsulated copper string (earthing wire)
- Bending radius: approx. 4 x inner diameter
- Vacuum resistance: -0.7 bar (rel)
- Temperature range: -15 / +60 °C; (peak +80 °C)
- Available size: ID40 upto ID90 mm.

Hose "SCH.03.PVC.PUR"

- Abrasion-resistant ivory-coloured suction hose for **highly abrasive granules and powders** (plastics and food)
- Polyester-PUR hose 0.6 mm thick; Smooth inside; Outer sheath made of transparent PVC with embedded hard ivory-coloured PVC spiral; Smooth inside; Outside with encapsulated copper string (earthing wire)
- Bending radius: approx. 4 x inner diameter
- Vacuum resistance: -0.7 bar (rel)
- Temperature range: -15 / +60 °C; (peak +80 °C)
- Available size: ID40 upto ID90 mm.

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SCAL: -	SHEET 1 OF 1

TWIST couplings

Benefits

- One-hand operation (1/8 turn when opening)
- Low effort required
- Without internal offset
- Product-carrying parts made of stainless steel
- Can be retrofitted on existing coupling tables
- Durable construction for rough operating environments



Pipe connection

- Made of aluminium
- Seal inserted in the ring groove

Cap with chain

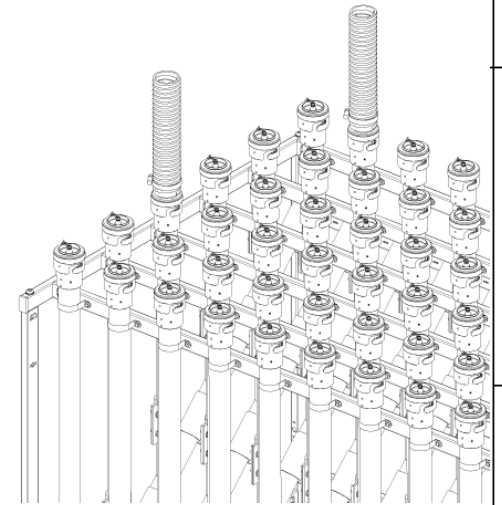
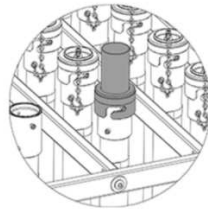
- Plastic cap (black)
- Chain made of galvanized steel

Hose connection

- Plastic closure (black)
- Pipe made of stainless steel

Plug

- Made of stainless steel
- Chain made of galvanized steel



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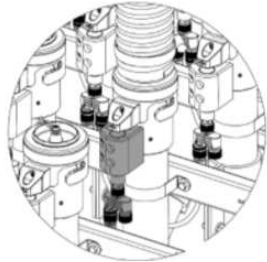
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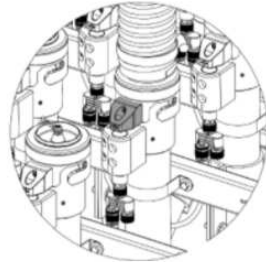
1 RFID sensor with holder

- Plastic holder (black)
- Stainless steel / plastic sensor
- With T-branch module and 0.6 m cable



2 RFID tag with holder

- Plastic holder (black)
- Plastic tag (black)



3 RFID interface "Profinet"

- SIEMENS CPU with Profinet interface
- Access via S7 put/get functions
- Equipment optionally for 72, 144 or 216 sensors
- including cable
- Power supply: 230 V (50 Hz)
- L x W x H: 600 x 400 x 250
- with connection between the RFID interface and the coupling table



4 "RFID" protective cover

- Made of stainless steel
- For 2 rows
- For coupling tables type B4 - B6 or M4 - M6



5 TWIST coded "RFID"

Benefits

- Easy to retrofit with RFID sensor
- Exact positioning of RFID sensor head and RFID tag
- Quick and easy assembly
- Space-saving arrangement in coupling tables
- Good value for money



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Camlock couplings



Camlock male part "for pipe"

→ With seal



Camlock plugs

→ With fastening chain



Camlock cap

→ With seal
→ With fastening chain



Camlock female part "for pipe"

→ With seal



Storz coupling with pipe

→ With cap and fastening chain
→ Pipe made of stainless steel (l = 500 mm)



Camlock female part "for hose"

→ With seal
→ Product-carrying parts made of stainless steel



Storz coupling with pipe

→ With cap and fastening chain
→ Pipe made of stainless steel (l = 500 mm)
→ Limit switch (10 m cable)



Camlock male part "for hose"

→ With seal



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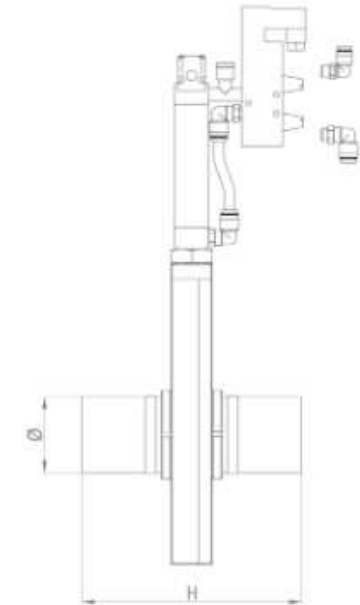
SLIDE VALVE AS.10

Our AS.10 slide valve is used in suction conveyor systems for plastic granules (\varnothing 3–6 mm) to shut off material and vacuum lines. This also applies to abrasive plastic granules with glass fibre content. It closes and opens pipelines reliably and over the full cross-section even during conveyance. Several slide valves can be controlled with a single magnetic valve.

Slide valve AS.10

- Stainless steel pipe connection
- Valve housing made of aluminium
- Slide plate made of PET
- Bulk material temperature -5 / + 80 °C
- Ambient temperature -5 / + 50 °C
- Compressed air supply 6 bar, oil-free and dry

“Open/close” function



Dimensions

	\varnothing	P	B	L	H
AS.10.040.024V.PC	40	1/8"	74	310	170
AS.10.045.024V.PC	45	1/8"	84	360	172
AS.10.050.024V.PC	50	1/8"	84	360	172
AS.10.060.024V.PC	60.3	1/8"	94	400	172
AS.10.065.024V.PC	65	1/8"	104	476	224
AS.10.070.024V.PC	70	1/8"	114	491	224
AS.10.076.024V.PC	76.1	1/8"	114	491	224
AS.10.080.024V.PC	80	1/8"	118	491	224
AS.10.084.024V.PC	84	1/8"	128	590	227
AS.10.089.024V.PC	88.9	1/8"	128	590	227
AS.10.100.024V.PC	100	1/8"	142	678	251

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SLIDE VALVE WITH BYPASSAS.20

The AS.20 slide valve is used in suction conveyor systems for plastic granules to lock and simultaneously empty material lines. This also applies to abrasive plastic granules with glass fibre content. It closes and opens pipelines reliably and over the full cross-section even during conveyance. Several slide valves can be controlled with a single magnetic valve.

“Open/close” function

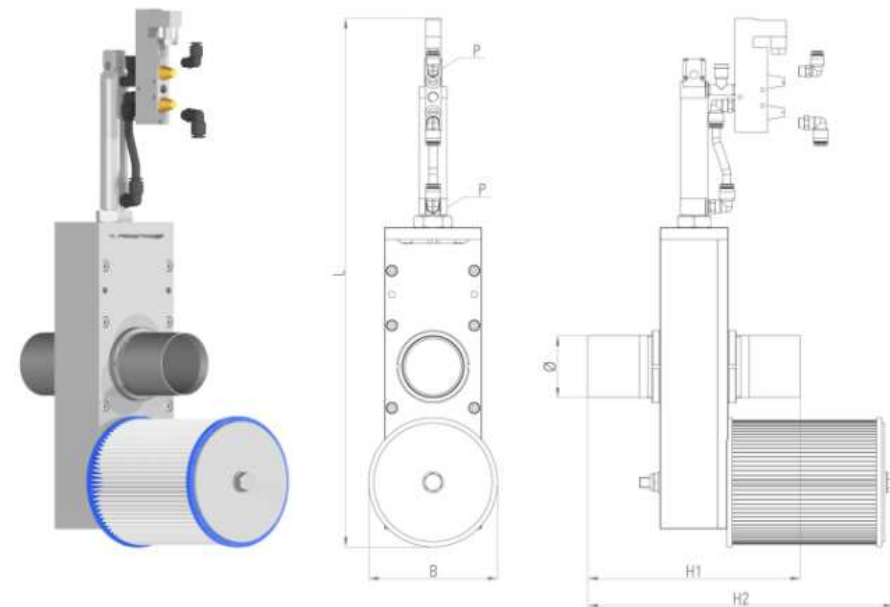


Slide valve with bypass AS.20.F

- Stainless steel pipe connection
- Valve housing made of aluminium
- Slide plate made of PET or stainless steel in the passage
- Filter made of polyester fleece
- Bulk material temperature -5 / + 80 °C
- Ambient temperature -5 / + 50 °C
- Compressed air supply 6 bar, oil-free and dry
- Power supply 24 V DC
- A pneumatic connection piece (6 and 8 mm) is included

Dimensions

	∅	P	B	L	H1	H2
AS.20.040.F	40	1/8"	125	428	192	229
AS.20.045.F	45	1/8"	125	458	196	233
AS.20.050.F	50	1/8"	125	458	196	233
AS.20.060.F	60.3	1/8"	125	473	206	297
AS.20.076.F	76.1	1/8"	150	570	256	322



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MFG	PHADUNGSAK	MATERIAL:
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CLEANING VALVELSV

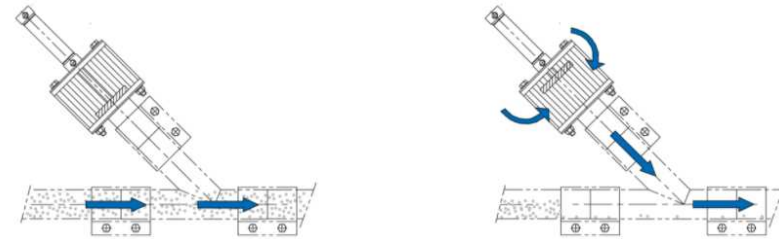
The LSV cleaning valve is used in suction conveyor systems. When open, filtered ambient air flows into the material line, the material flow is interrupted and the subsequent material line is sucked empty. Several cleaning valves can be controlled with a single magnetic valve.

Cleaning valve LSV.10

Cleaning valve normally open

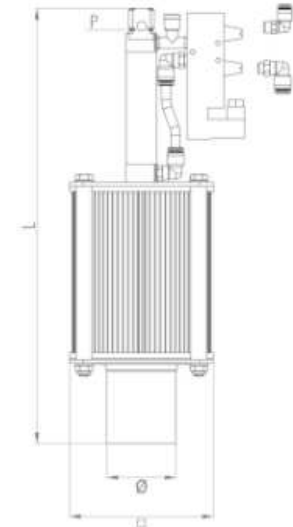
- Pipe connection made of aluminium
- Suction filter made of polyester fleece
- Bulk material temperature -5 / + 80 °C
- Ambient temperature -5 / + 50 °C
- Compressed air supply 6 bar, oil-free and dry
- Power supply 24 V DC
- A pneumatic connection piece (6 and 8 mm) is included.

“Open/close” function



Dimensions

	Ø	P	□	L
LSV.10.040.024V.PO.BO	40	1/8"	125 x 125	330
LSV.10.045.024V.PO.BO	45	1/8"	125 x 125	330
LSV.10.050.024V.PO.BO	50	1/8"	125 x 125	330
LSV.10.060.024V.PO.BO	60	1/8"	125 x 125	379
LSV.10.065.024V.PO.BO	65	1/8"	151 x 151	450
LSV.10.070.024V.PO.BO	70	1/8"	151 x 151	450
LSV.10.076.024V.PO.BO	76	1/8"	151 x 151	450



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Q.A	AMPHORN		MATERIAL:	DWG. NO.

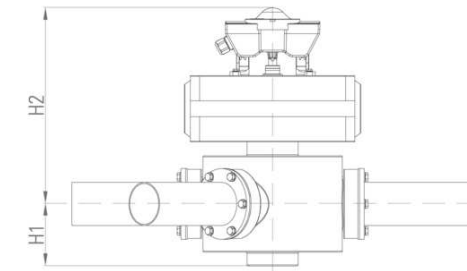
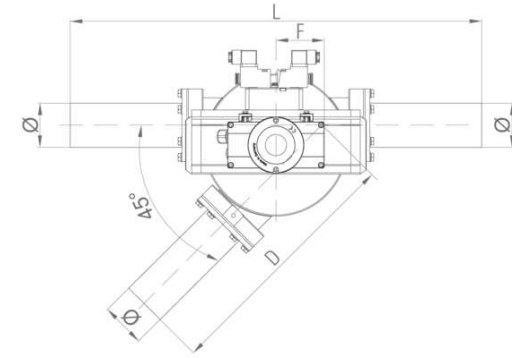
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Rotary switch (pressure conveying)

- Housing and cover made of cast aluminium
- Including conveyor pipe sections made of stainless steel
- Silicone seal
- Pneumatically driven
- 5/2-way magnetic valve, 24 V DC
- End position control with two proximity switches
- Bulk material temperature max. 80 °C
- Ambient temperature -10 to + 40°C
- Working pressure range max. 1.0 bar

Dimensions

	Ø	L	F	D	H1	H2
W.02.076	76.1	706	82	435	115	346
W.02.108	108	746	92	465	125	356
W.02.125	129	756	97	475	142	374



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SHEET 1 OF 1

Blower unit:

The blower unit supplies the necessary conveying air for emptying silo vehicles or SeaBulk containers. Switching between these operating modes takes place using a “silo truck / sea bulk” switch. For emptying SeaBulk containers, we also offer a mobile rotary valve station.

Functions:

- Filling pressure monitoring (max. 0.8 bar); warning messages when exceeded
- Automatic shutdown in critical pressure range
- Key switch (system on/off); emergency stop (emergency shutdown of the system)
- Start/stop push-button combination (switching the blower on and off)
- Horn / flashing light combination (warning signal when pressure is exceeded)
- Option: Control of a mobile rotary valve station for emptying SeaBulk containers

Installation conditions:

- The system is only suitable for indoor installation in ventilated rooms.
- The max. distance between the blower unit and the filling point is 20 m.
- The max. length of the filling pipe at the silo is 30 m (of which 20 m vertical).

Blower unit included control (option: cooler + dryer)

- Blower unit with soundproof hood for generation of conveying air;
- suction filter, pressure gauge, non-return valve, manometer
- Dry air generator at the suction point of the blower
- Air cooler at the blower outlet
- Switch cabinet with PLC control and frequency converter
- as well as a separate control unit for installation directly at the filling point
- Power supply: 400 V (50 Hz)
- Rated current: 93.2 A
- Maximum pre-fuse: 150 A



	Output		Output
G.D.TRUCK.SEABULK.10	48 kW	G.D.TRUCK.SEABULK.20	49 kW



G.D.TRUCK.SEABULK.30	57 kW
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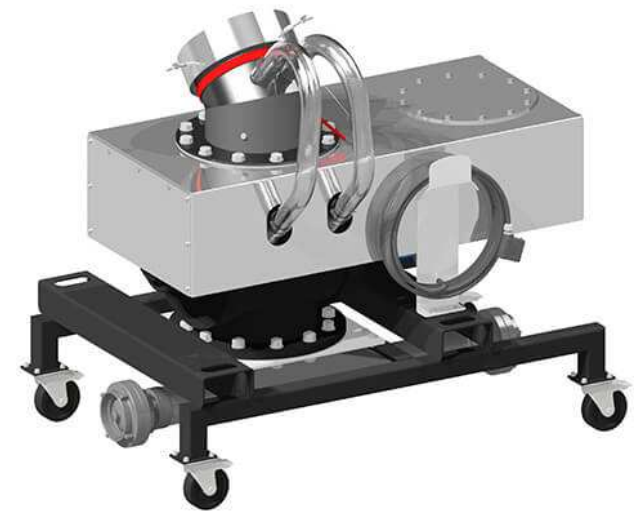
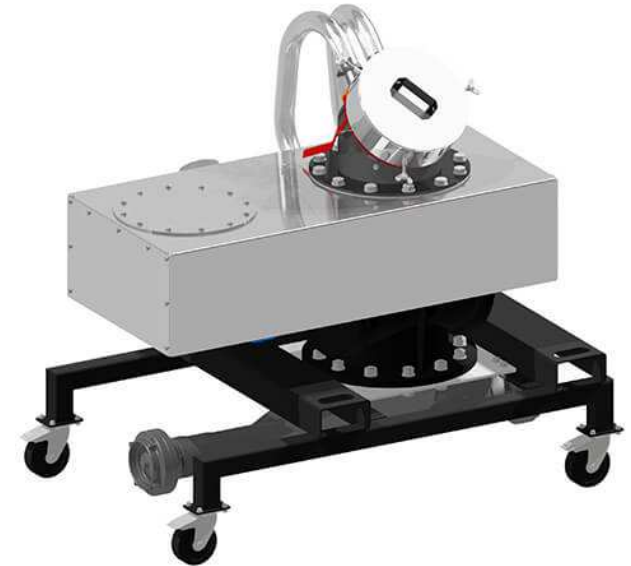
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Rotary valve station

- Frame with runners for forklift transport
- Weather-proof housing with inspection opening
- Rotary valve with drive (frequency converter) and leakage air connection
- Bulk material deflector at the inlet of the rotary valve
- Inlet pipe for connecting the Seabulk outlet (with sealing cap)
- Pipe adapter with connections for air and material hose (Storz A coupling with cap)
- Connection for leakage air return (Storz B coupling with cap)
- Connector (Harting) for signal and power
- Power supply: 400 V (50 Hz)



	≈ to/h (0.6 to/m ³)	Output
ZRS.SEABULK.250.AL.01	12	1.1 kW
ZRS.SEABULK.300.AL.01	20	1.5 kW

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Mobile positive conveying unit ≈ 3–6 t/h

This mobile positive conveying unit is used for the manual emptying of granules from 25 kg bags and for filling silos. With a slight modification, this mobile positive conveying unit can also be used with regrind. Big bags can also be emptied with the optional steel stacking frame (RAL9005). The components are all housed on a steel frame that can be transported by forklift.



Mobile positive conveying unit ≈ 8–9 t/h

This mobile positive conveying unit is used for the manual emptying of granules or regrind from big bags and for filling silos. The big bag frame can be removed so that 25 kg sacks can be emptied whenever needed. The components are all housed on a steel frame that can be transported by forklift.



“Storz-A” silo filling hose

- Abrasion-resistant conveying hose for filling the silo
- Temperature range -20°C / +80°C
- With Storz A coupling and blind cover on both sides

Dimensions

	Length
SCH.09.SILOSCHLAUCH.102.05	5 m
SCH.09.SILOSCHLAUCH.102.10	10 m



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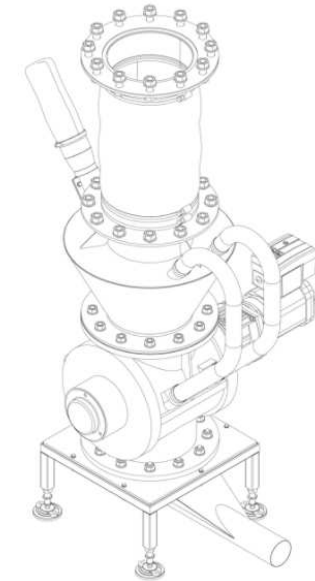
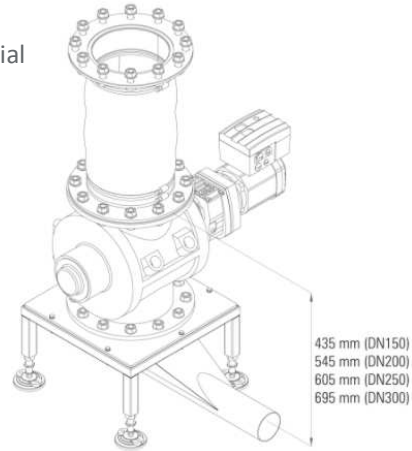
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Rotary valve "ZRS.01"

INSTALLATION EXAMPLES

- Housing made of cast aluminium (hard anodized inside)
- Cell wheel made of stainless steel
- Gear motor RAL9005 (jet black)
- Power connection 400 V (50 Hz)
- **Manual control of the discharge rate** via frequency converter
- **Bulk material deflector at inlet** to prevent damage to the bulk material



Dimensions

	Connection size	H	L1	L2	B	Motor power	Discharge rate
ZRS.01.150.01.FU.AL	DN150 LKR 240; 8 x M20	280	741	526	285	0.55 kW	≈ 0.9-2.9 m ³ /h
ZRS.01.200.01.FU.AL	DN200 LKR 295; 8 x M20	390	887	625	343	1.10 kW	≈ 5.8-12.0 m ³ /h
ZRS.01.250.01.FU.AL	DN250 LKR 350; 12 x M20	450	925	638	411	1.10 kW	≈ 10.5-21.7 m ³ /h
ZRS.01.300.01.FU.AL	DN300 LKR 400; 12 x M20	540	1094	750	482	1.50 kW	≈ 19.8-41.1 m ³ /h

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Flexible transition

- Flexible antistatic fabric hose
- Hose length ≈ 500 mm



Dimensions

	Typ	Connection above	connection below
ZRS.00.FLEX.01.150.150	01	Flange DN150	Flange DN150
ZRS.00.FLEX.01.200.200	01	Flange DN200	Flange DN200
ZRS.00.FLEX.01.250.200	01	Flange DN250	Flange DN200
ZRS.00.FLEX.01.250.250	01	Flange DN250	Flange DN250
ZRS.00.FLEX.01.300.300	01	Flange DN300	Flange DN300
ZRS.00.FLEX.02.250.200	02	Pipe Ø250	Flange DN200
ZRS.00.FLEX.02.250.250	02	Pipe Ø250	Flange DN250
ZRS.00.FLEX.03.230.200	03	Hose Ø230	Flange DN200
ZRS.00.FLEX.03.285.250	03	Hose Ø285	Flange DN250
ZRS.00.FLEX.03.350.300	03	Hose Ø350	Flange DN300

Leakage air collector

- Made of stainless steel
- With hose filter



Dimensions

	Volume	Connection	Height
ZRS.04.LLUFT.250.040.CR	40 l	DN250	465
ZRS.04.LLUFT.250.100.CR	100 l	DN250	715
ZRS.04.LLUFT.300.050.CR	50 l	DN300	465
ZRS.04.LLUFT.300.110.CR	110 l	DN300	685

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Single-span channels: Tables for MQ-21D channel

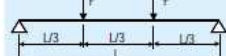
F1 at f = L/200, F2 at f = L/300, F at σ_{perm} . incl. dead weight of channel

Single-span channel with uniaxial deflection Uniformly distributed load



Span width (cm)	F (kNm)	F (kN)	f (mm) $\leq \sigma_{perm}$	F1 (kN)	f (mm) $\leq \sigma_{perm}$	F2 (kN)	f (mm) $\leq \sigma_{perm}$
25	12.00	3.00	<0.1	-	-	-	-
50	6.00	3.00	0.5	-	-	-	-
75	4.00	3.00	1.6	-	-	-	-
100	3.00	3.00	3.8	-	-	2.65	3.3
125	2.30	2.88	7.1	2.53	6.3	1.68	4.2
150	1.59	2.39	10.2	1.74	7.5	1.15	5.0
175	1.16	2.03	13.9	1.26	8.8	0.82	5.8
200	0.88	1.76	18.1	0.95	10.0	0.61	6.7
225	0.69	1.55	23.0	0.73	11.3	0.46	7.5
250	0.55	1.38	28.3	0.57	12.5	0.36	8.3
275	0.45	1.24	34.3	0.45	13.8	0.27	9.2
300	0.38	1.13	40.8	0.36	15.0	0.21	10.0
325	0.32	1.03	47.9	0.29	16.3	0.16	10.8
350	0.27	0.94	55.5	0.23	17.5	0.12	11.7
375	0.23	0.86	63.8	0.18	18.8	0.08	12.5
400	0.20	0.79	72.6	0.13	20.0	0.05	13.3
425	0.17	0.73	81.9	0.10	21.3	0.02	14.2
450	0.15	0.68	91.8	0.07	22.5	-	-
475	-	-	-	-	-	-	-
500	-	-	-	-	-	-	-
525	-	-	-	-	-	-	-
550	-	-	-	-	-	-	-
575	-	-	-	-	-	-	-
600	-	-	-	-	-	-	-

Single-span channel with uniaxial deflection Two concentrated loads



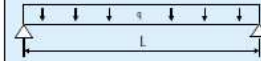
Span width (cm)	F (kNm)	F (kN)	f (mm) $\leq \sigma_{perm}$	F1 (kN)	f (mm) $\leq \sigma_{perm}$	F2 (kN)	f (mm) $\leq \sigma_{perm}$
25	1.50	<0.1	-	-	-	-	-
50	1.50	0.6	-	-	-	-	-
75	1.50	2.2	-	-	-	-	-
100	1.35	4.6	-	-	-	0.97	3.3
125	1.08	7.2	0.93	6.3	0.62	4.2	4.2
150	0.89	10.4	0.64	7.5	0.42	5.0	5.0
175	0.76	14.2	0.46	8.8	0.30	5.8	5.8
200	0.66	18.5	0.35	10.0	0.22	6.7	6.7
225	0.58	23.4	0.27	11.3	0.17	7.5	7.5
250	0.52	28.9	0.21	12.5	0.13	8.3	8.3
275	0.47	35.0	0.17	13.8	0.10	9.2	9.2
300	0.42	41.6	0.13	15.0	0.08	10.0	10.0
325	0.38	48.9	0.10	16.3	0.06	10.8	10.8
350	0.35	56.7	0.08	17.5	0.04	11.7	11.7
375	0.32	65.0	0.06	18.8	0.03	12.5	12.5
400	0.30	74.0	0.05	20.0	0.02	13.3	13.3
425	0.28	83.5	0.04	21.3	-	-	-
450	0.25	93.5	0.02	22.5	-	-	-
475	-	-	-	-	-	-	-
500	-	-	-	-	-	-	-
525	-	-	-	-	-	-	-
550	-	-	-	-	-	-	-
575	-	-	-	-	-	-	-
600	-	-	-	-	-	-	-

MQ system



Loading condition 1:

Single-span channel with uniformly distributed load over span width L



$$M_{max} = \frac{q * L^2}{8} = \sigma_{perm} * W$$

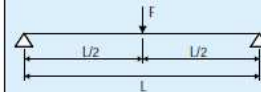
$$q = \frac{8 * \sigma_{perm} * W}{L^2 \leq}$$

$$f_{max} = \frac{5}{384} * \frac{q * L^4}{E * I}$$

$$q = \frac{384 * E * I * f_{max}}{5 * L^4}$$

Loading condition 2:

Single-span channel with single load at mid-span L/2



$$M_{max} = \frac{F * L}{4} = \sigma_{perm} * W$$

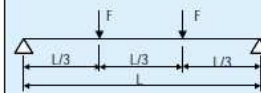
$$F = \frac{4 * \sigma_{perm} * W}{L}$$

$$f_{max} = \frac{1}{48} * \frac{F * L^3}{E * I}$$

$$F = 48 * \frac{E * I * f_{max}}{L^3}$$

Loading condition 3:

Single-span channel with two single loads each at L/3



$$M_{max} = \frac{F * L}{3} = \sigma_{perm} * W$$

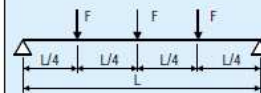
$$F = \frac{3 * \sigma_{perm} * W}{L}$$

$$f_{max} = \frac{23}{648} * \frac{F * L^3}{E * I}$$

$$F = \frac{648 * E * I * f_{max}}{23 * L^3}$$

Loading condition 4:

Single-span channel with three single loads each at L/4



$$M_{max} = \frac{F * L}{2} = \sigma_{perm} * W$$

$$F = \frac{2 * \sigma_{perm} * W}{L}$$

$$f_{max} = 0.04948 * \frac{F * L^3}{E * I}$$

$$F = \frac{1}{0.04948} * \frac{E * I * f_{max}}{L^3}$$

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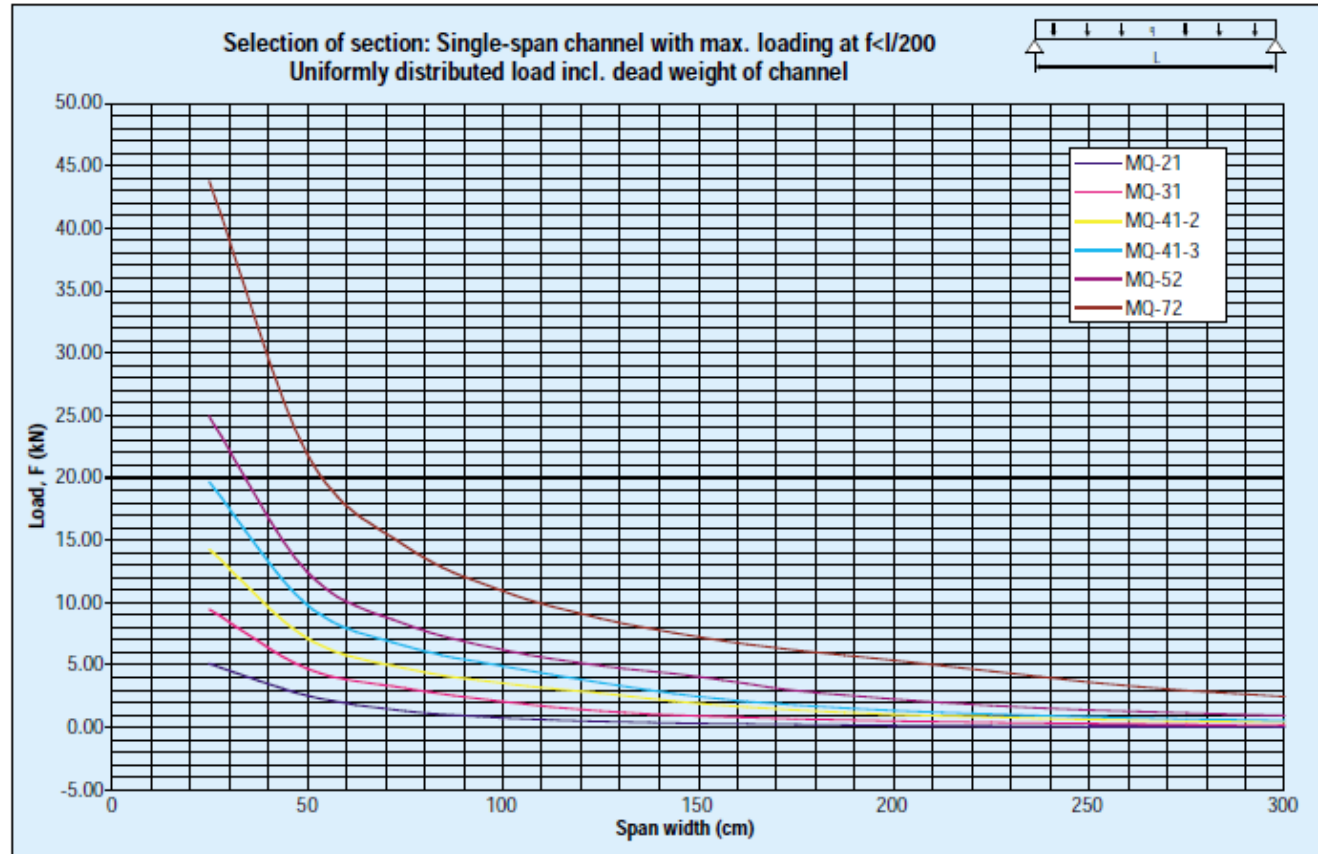
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Single-span channels: Selection of channel section



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