DOCUMENTATION SHEET

Rubber Bellows

Selection table bellows with hose clamps

SELECTION TABLE
BELLOWS WITH HOSE CLAMPS

General

Our rubber bellows are made from various elastomers and provide the flexible element in pipework that is indispensable in todays technically advanced plant and machinery installations. By using the best quality proven rubber compounds and a construction based on many years of experience, our rubber bellows are produced to a high quality standard to guarantee maximum safety and performance.

The rubber bellows provide:

- Compensation of thermal or mechanical movement of pipework in axial, lateral or angular directions.
- Absorption and isolation of vibration combined with damping of pipework borne sound transmission.
- Reduction of pressure pulses in pipework.
- Compensation for pipework misalignment on flexible mounted installations.

Our rubber bellows are available in standard constructions, type **3K**, **3K2** and **4K**, each available in different rubber qualities, so that the correct rubber bellows can be selected for every kind of medium and temperature.

Identification marking	Inner lining Material and resistance	Outside cover Material and resistance
Yellow ring	**NBR** (Reinforced with textile cord) For fresh-, cold-, or seawater. Temp. range: -15°C + 90°C.	**NBR**
Red HP	**EPDM** (Reinforced with aramide cord) Hot-water constructions for heating installations with safe usage temperatures of 120°C.	**EPDM** Especially resistant for outside weather conditions as well as ageing.
Blue ring	**EPDM** (Reinforced with aramide cord) For drinking water, food and alcoholic beverages, also with fat containing foods such as oil.	**EPDM** Especially resistant for outside weather conditions, as well as oil age, ozone resisting.

TABLE

As an addition to the flanged bellow range our 3K and 3K2 rubber bellows have been designed especially to provide small, low weight rubber bellows which are both very flexible and simple to install.

The 3K ranges accommodate misalignment, axial and lateral pipe work movements and dramatically reduce the transmission of noise, vibration and shock.
High tensile strength texture cord plies combined with proven synthetic rubber mixes guarantee maximum reliability and an extended working life.

The burst pressure safety factor is 5 times the working pressure of 4 Bar.
The minimum work pressure is 70 kPa (abs) and can be lowered by fitting a vacuum support ring. Average installed insulation is about 25 dB, a figure which is further improved by compressed installation. The maximum working pressures are guaranteed by using the recommended power clamps in galvanized or stainless steel.

Rubber Design
vibration and noise control

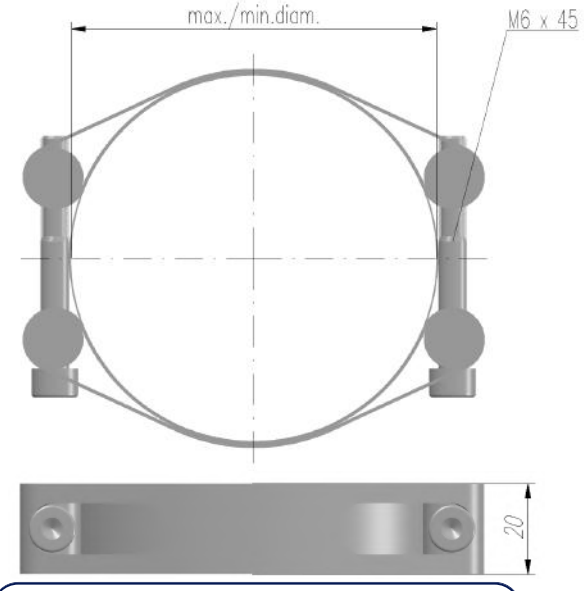
DOCUMENTATION SHEET

Rubber Bellows
Hose clamps

HOSE CLAMPS

	MILD STEEL 12.03 CR.3 GALVANISED	
	Minimum diameter Ø	Maximum diameter Ø
KSK030D000	30	40
KSK040D000	40	50
KSK045D000	45	55
KSK050D000	50	60
KSK055D000	55	65
KSK060D000	60	70
KSK065D000	65	75
KSK070D000	70	80
KSK075D000	75	85
KSK080D000	80	90
KSK085D000	85	95
KSK090D000	90	100
KSK095D000	95	105
KSK100D000	100	110
KSK105D000	105	115
KSK110D000	110	120
KSK115D000	115	125
KSK120D000	120	130
KSK125D000	125	135
KSK130D000	130	140
KSK135D000	135	145
KSK140D000	140	150
KSK145D000	145	155
KSK150D000	150	160
KSK155D000	155	165
KSK160D000	160	170
KSK165D000	165	175
KSK170D000	170	180

TABLE

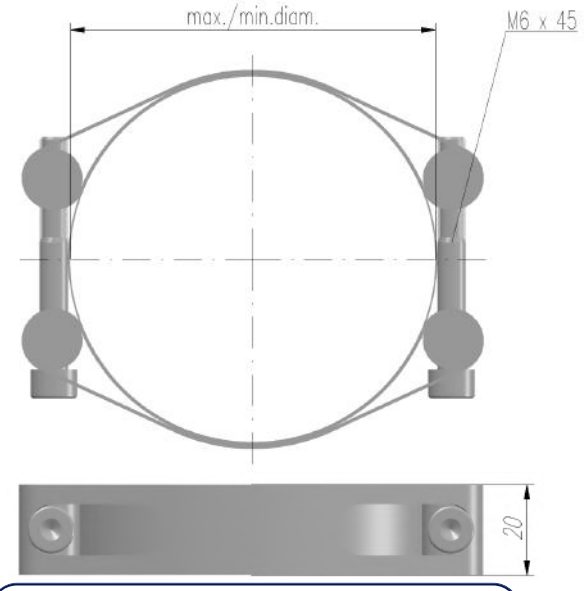


DIMENSIONS

HOSE CLAMPS

	STAINLESS STEEL 316	
	Minimum diameter Ø	Maximum diameter Ø
KSK030D030	30	40
KSK040D030	40	50
KSK045D030	45	55
KSK050D030	50	60
KSK055D030	55	65
KSK060D030	60	70
KSK065D030	65	75
KSK070D030	70	80
KSK075D030	75	85
KSK080D030	80	90
KSK085D030	85	95
KSK090D030	90	100
KSK095D030	95	105
KSK100D030	100	110
KSK105D030	105	115
KSK110D030	110	120
KSK115D030	115	125
KSK120D030	120	130
KSK125D030	125	135
KSK130D030	130	140
KSK135D030	135	145
KSK140D030	140	150
KSK145D030	145	155
KSK150D030	150	160
KSK155D030	155	165
KSK160D030	160	170
KSK165D030	165	175
KSK170D030	170	180

TABLE



DIMENSIONS

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Rubber Design
vibration and noise control

DOCUMENTATION SHEET

Rubber Bellows
Vacuum support ring

VACUUM SUPPORT RING

General

Vacuum support rings allow for higher vacuum in the bellows according to the table.

The stainless steel ring (AISI 316Ti) can be installed before delivery but also afterwards for rubber bellows with flanges at nominal bores up to 300 mm.

Larger sizes as well as nylon vacuum support rings need to be installed at the factory.

Note: Using vacuum support rings will limit the movement range by 50% in all directions.

		316 TI (WST nr 1.4571)	
	A	Without vacuum support ring kPa (abs)	With vacuum support ring kPa (abs)
KRV040R	40	20	0
KRV050R	50	20	0
KRV065R	65	20	0
KRV080R	80	30	0
KRV100R	100	40	10
KRV125R	125	60	20
KRV150R	150	60	20
KRV200R	200	70	20
KRV250R	250	70	20
KVR300R	300	80	20

TABLE

DIMENSIONS

Rubber Design
vibration and noise control

DOCUMENTATION SHEET

Rubber Bellows

Type Flame guard

FLAME GUARD

General

Flame guards protect the rubber bellows for overheating from the outside.

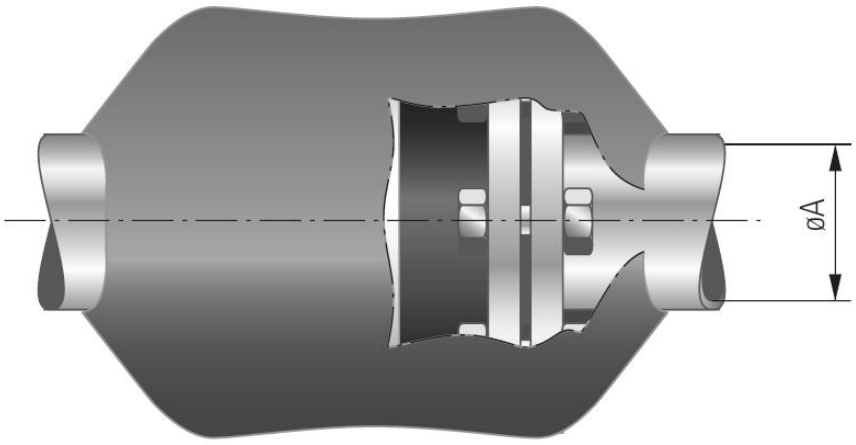
These covers are made of various layers of fabric materials consisting of high temperature glass fiber and are resistant against oil, chemicals and ageing.

Flame tests have proven a rubber bellows to withstand 800°C heat and flames for 30 minutes.

The covers can be installed easily after installation of the rubber bellows and can be removed the same way and will not interfere with the function of the rubber bellows.

	Class F30
	A [mm]
VB025A11	25
VB032A11	32
VB040A11	40
VB050A11	50
VB065A11	65
VB080A11	80
VB100A11	100
VB125A11	125
VB150A11	150
VB200A11	200
VB250A11	250
VB300A11	300

TABLE



DIMENSIONS

DOCUMENTATION SHEET

Rubber Bellows
Chemical resistance

CHEMICAL RESISTANCE

PART 1, A-K

Rating code A Excellent B Good C Conditional X Inappropriate Please ask Chemicals in system	Innerliner of expansion joint									
	ECO Epichloridine	NR Natural	CR Cloroprene	NBR Nitrile	EPDM EPDM	CSM Hypalon	IIR Butyl	SBR SBR	FKM Viton	PTFE Teflon
Acetaldehyde D	-	X	X	X	B	C	B	X	A	A
Acetic acid 5%	B	B	A	B	A	A	A	B	A	A
Acetic acid 10%	B	B	B	B	A	B	A	B	A	A
Acetic acid 20%	B	B	B	B	A	B	B	B	B	A
Acetic acid 30%	B	B	B	B	A	B	B	B	B	A
Acetic acid 50%	B	B	C	C	A	B	B	C	C	A
Acetic acid 99,5% glacials	X	B	X	C	B	C	B	C	X	A
Acetic acid. Amhydride	X	C	C	X	A	C	A	C	X	A
Aceton	X	B	C	X	A	C	A	C	X	A
Acetylene	-	B	B	A	A	B	B	C	X	A
Ammonia gas, cold	-	A	A	A	A	A	A	C	X	A
Ammonia gas, hot	-	X	B	X	B	B	A	C	X	A
Ammonia, liquid	-	B	A	B	A	B	A	B	X	A
Ammonium hydroxid	B	B	B	C	A	A	A	B	B	A
Amyl acetate	X	C	X	X	A	C	A	X	X	A
Aniline	X	X	X	X	B	X	B	X	B	A
Aniline dyes	-	B	B	C	B	B	B	B	B	A
Animal fats	A	X	B	A	B	B	B	X	A	A
Argon	-	X	X	C	A	X	B	X	A	A
Arsenic acid	-	B	B	B	A	A	A	B	A	A
Beer	A	A	A	A	A	A	A	A	A	A
Benzene (Benzol)	X	X	X	X	X	X	X	X	A	A
Black liquer	-	X	C	A	X	C	X	X	A	A
Brandy	-	A	A	A	A	A	A	A	A	A
Bromine liquid	-	X	X	X	X	X	X	X	A	A
Butane	A	X	A	A	X	B	X	X	A	A
Butanol (butyl alcohol)	-	A	A	A	A	A	A	A	A	A
Butyl acetat	X	X	X	X	B	C	X	X	X	A
Calcium hypochlorite	B	C	X	C	A	A	B	X	A	A
Caustic potash	-	B	B	C	B	A	A	B	C	A
Caustic soda	-	A	B	C	A	B	A	B	B	A
Chlorine gas, dry 40°C	B	X	X	X	C	C	X	X	A	A
Chlorine gas, wet 40°C	B	X	X	X	C	C	X	X	C	A
Chlorine solution, 0.1 gr/l	-	-	-	A	A	A	-	-	A	A
Chlorine solution, 0.1-1gr/l	-	-	-	A	A	A	-	-	A	A
Chlorine solution, 1-10g/l 40°C	-	-	-	B	B	B	-	-	-	-
Chlorine solution, >10gr/l 40°C	-	-	-	C	C	C	-	-	-	-

CHEMICAL RESISTANCE

PART 1, A-K

Rating code A Excellent B Good C Conditional X Inappropriate Please ask	Innerliner of expansion joint									
	ECO	NR	CR	NBR	EPDM	CSM	IIR	SBR	FKM	PTFE
Chemicals in system	Epichloridine	Natural	Cloroprene	Nitrile	EPDM	Hypalon	Butyl	SBR	Viton	Teflon
Chlorosulphonic acid	-	X	X	X	X	X	X	X	C	A
Chromic acid	-	X	X	X	C	B	C	X	A	A
Detergent	A	B	B	A	A	A	A	B	A	A
Diesel oil	A	X	C	A	X	C	X	X	A	A
Ethane	-	X	B	A	X	B	X	X	A	A
Ethanol	B	A	A	A	A	A	A	A	B	A
Ether, Ethyl ether	B	X	X	C	X	X	C	X	X	A
Ethyl acetat	-	X	X	X	B	X	B	X	X	A
Ethyl chloride	B	B	X	B	A	C	A	B	A	A
Ethyl glycol (Cellosolve)	-	X	X	C	B	C	B	X	C	A
Ethylene chloride	-	X	X	X	C	X	C	X	B	A
Ethylene glycol	A	A	A	A	A	A	A	A	A	A
Ferrous salts, non oxidizing	-	A	A	A	A	A	A	A	A	A
Formaldehyde, formalin 40°C	B	B	B	B	A	A	A	B	A	A
Formic acid 40°C	B	B	B	X	A	B	A	A	X	A
Fuel oil	A	X	C	Z	X	C	X	X	A	A
Furan (Furfuran)	-	X	X	X	X	X	X	X	C	A
Furfural (Furfurol)	X	X	X	X	B	C	B	X	X	A
Glucose	A	A	A	A	A	A	A	A	A	A
Glycerine, glycerol	A	A	A	A	A	A	A	A	A	A
Green liquor, white liquor	A	A	A	A	A	A	A	A	A	A
Hydraulic oil	A	X	B	A	X	B	X	X	A	A
Hydrobromic acid, max 40°C	-	-	-	C	A	A	B	-	B	A
Hydrochloric acid, 37%	B	-	-	X	A	A	-	-	-	A
Hydrochloric acid, 37% 70°C	C	X	X	X	X	C	X	X	X	A
Hydrochloric acid, diluted	-	-	-	C	A	A	B	-	A	A
Hydrofluoric acid, 50% 40°C	-	C	C	X	B	B	B	C	A	A
Hydrofluosilicic acid 40°C	-	A	B	B		A	A	B	A	A
Hydrogen	-	B	A	A	A	A	A	B	A	A
Hydrogen peroxid, 3% 40°C	-	B	B	B	A	A	A	B	A	A
Hydrogen peroxid, 30% 20°C	-	C	C	C	B	A	B	C	A	A
Hydrogen peroxid, 90% 20°C	-	C	C	C	-	-	-	-	B	A
Hydrogen sulphide, dry 20°C	-	A	A	A	A	A	A	A	X	A
Hydrogen sulphide, wet 20°C	B	X	A	C	A	A	A	X	X	A
Hydrogen sulphide, wet 40°C	B	X	C	X	B	C	B	X	X	A

DOCUMENTATION SHEET

Rubber Bellow
Chemical resistance

CHEMICAL RESISTANCE

PART 2, L-Z

Rating code A Excellent B Good C Conditional X Inappropriate Please ask Chemicals in system	Innerliner of expansion joint									
	ECO Epichloridine	NR Natural	CR Cloroprene	NBR Nitrile	EPDM EPDM	CSM Hypalon	IIR Butyl	SBR SBR	FKM Viton	PTFE Teflon
Lactic acid	-	B	A	A	A	A	B	B	A	A
Linseed oil	A	X	B	A	B	B	A	X	A	A
Liquid manure	-	-	-	A	A	A	-	-	-	A
LP-gas	A	X	B	A	X	X	X	X	A	A
Lubricating oil	A	X	C	A	X	X	X	X	A	A
Methanol, methyl alcohol	B	A	A	B	A	A	A	A	X	A
Methyl chloride	-	X	X	X	C	X	C	X	A	A
Methyl ethyl ketone MEK	X	X	X	X	A	X	B	X	X	B
Methyl isobutyl ketone	X	X	X	X	B	X	C	X	X	A
Methyl isopropyl ketone	-	X	X	X	C	X	C	X	X	A
Methylene chloride	-	X	X	X	X	X	X	X	B	A
Milk	-	A	A	A	A	A	A	A	A	A
Netural gas	A	C	A	A	X	A	X	C	A	A
Nitric acid 20% 40°C	X	X	C	X	A	A	A	X	A	A
Nitric acid 20% 50°C	X	X	X	X	B	A	B	X	A	A
Nitric acid 40% 50°C	X	X	X	X	C	A	C	X	A	A
Nitric acid 50% 50°C	X	X	X	X	X	B	X	X	A	A
Nitric acid 60% 20°C	X	X	X	X	X	C	X	X	A	A
Nitric acid 70% 20°C	X	X	X	X	X	C	X	X	A	A
Nitric acid fuming	X	X	X	X	X	X	X	X	C	A
Nitrobenzene	X	X	X	X	B	X	B	X	B	A
Nitrogen	A	A	A	A	A	A	A	A	A	A
Nitrous gasses	-	X	X	X	C	X	X	X	X	B
Oleic acid	A	X	C	A	X	C	X	X	A	A
Olive oil	A	X	C	A	C	C	C	X	A	A
Oxalic acid	-	C	C	C	A	B	A	B	B	A
Oxygen	B	C	B	C	A	B	A	X	A	A
Ozone	A	X	C	X	B	B	C	X	A	A
Palmitic acid	B	B	B	A	B	C	B	B	A	A
Paraffin, kerosene	-	X	C	A	X	C	X	X	A	A
Perchloroethylene	B	X	X	C	X	X	X	X	A	A
Petrol, 100 octan	C	X	X	C	X	X	X	X	A	A
Petrol, 65 octan	B	X	X	B	X	C	X	X	A	A
Petroleum ether	B	X	B	B	X	X	X	X	A	A
Petroleum oils, high aromatic	B	X	X	B	X	X	X	X	A	A
Petroleum oils, low aromatic	A	X	C	A	X	B	X	X	A	A
Phenol	-	X	X	X	C	C	B	X	A	A
Phosphoric acid 45% 40°C	-	C	B	C	A	B	B	C	A	A

Rubber Design
vibration and noise control

CHEMICAL RESISTANCE

PART 2, L-Z

Rating code
A Excellent
B Good
C Conditional
X Inappropriate
Please ask

Innerliner of expansion joint

Chemicals in system	ECO Epichloridine	NR Natural	CR Cloroprene	NBR Nitrile	EPDM EPDM	CSM Hypalon	IIR Butyl	SBR SBR	FKM Viton	PTFE Teflon
Phosphoric acid 85% 40°C	-	C	C	X	B	B	B	C	A	A
Plating sol. w/o chromium.	-	X	X	X	A	C	C	X	A	A
Propan, LP-gas	A	X	C	A	X	C	X	X	A	A
Propanol, propyl alcohol	A	A	A	A	A	A	A	A	A	A
Rapeseed oil	A	X	X	X	A	C	A	X	A	A
Rosin oil	-	X	C	A	X	C	X	X	A	A
Salicylic acid	-	A	C	B	A	A	A	B	A	A
Salt solutions, non oxidizing	-	A	A	A	A	A	A	A	A	A
Sewage water	-	B	B	A	B	A	B	B	A	A
Silicofluoric acid 40°C	-	B	B	B	B	A	B	B	A	A
Sodium hypochlorite <10gr/l	B	C	B	C	A	A	B	C	A	A
Sodium hypochlorite >10gr/l	B	X	X	X	B	B	C	X	A	A
Styrene 40°C	-	X	X	X	X	X	X	X	B	A
Sugar solutions	-	A	A	A	A	A	A	A	A	A
Sulphur chloride 40°C	-	X	X	X	X	C	X	X	A	A
Sulphur, molten	-	X	X	X	B	B	C	X	A	A
Sulphur dioxide, dry gas 40°C	-	C	X	X	A	X	B	C	A	A
Sulphur trioxide, dry gas	-	X	X	X	B	X	C	X	A	A
Sulphuric acid <60%	B	C	C	X	B	B	B	X	A	A
Sulphuric acid 60% 50°C	X	C	X	X	B	B	B	X	A	A
Sulphuric acid 75% 50°C	X	X	X	X	B	B	B	X	A	A
Sulphuric acid 80% 50°C	X	X	X	X	C	B	C	X	A	A
Sulphuric acid 96% 50°C	X	X	X	X	C	C	X	X	A	A
Sulphuric acid, fuming, Oleum	X	X	X	X	X	X	X	X	B	A
Sulpurous acid 40°C	-	C	C	C	A	A	B	C	A	A
Tar 40°C	B	X	C	B	X	C	X	X	A	A
Toluene, toluol	X	X	X	C	X	X	X	X	A	A
Transformer oil, chl. hydrocar.	-	X	X	X	X	X	X	X	A	A
Transformer oil, mineral based	-	X	B	A	X	C	X	X	A	A
Trichloroethylene 40°C	-	X	X	X	X	X	X	X	A	A
Turpentine, terpene	A	X	X	A	X	X	X	X	A	A
Vegetable oils	A	X	C	A	X	B	X	X	A	A
Water, destilled	A	A	C	A	A	A	A	A	A	A
Water, fresh	A	A	B	A	A	A	A	A	A	A
Water, fresh, destilles 100°C	-	C	C	B	A	B	B	C	A	A
Water, salt	-	A	A	A	A	A	A	A	A	A
Whiskey, Wine	-	A	A	A	A	A	A	A	A	A
Xylene, xylol	X	X	X	X	X	X	X	X	A	A

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Rubber Design
vibration and noise control

DOCUMENTATION SHEET

Rubber Bellows

Selection table bellows with flanges

SELECTION TABLE
BELLOWS WITH FLANGES

General

Our rubber bellows are made from various elastomers and provide the flexible element in pipework that is indispensable in todays technically advanced plant and machinery installations. By using the best quality proven rubber compounds and a construction based on many years of experience, our rubber bellows are produced to a high quality standard to guarantee maximum safety and performance.

The rubber bellows provide:

- Compensation of thermal or mechanical movement of pipework in axial, lateral or angular directions.
- Absorption and isolation of vibration combined with damping of pipework borne sound transmission.
- Reduction of pressure pulses in pipework.
- Flexible joint faces which provide built-in sealing within the bellows construction.
- Compensation for pipework misalignment on flexible mounted installations.

Our rubber bellows are available in standard constructions, type **1A**, **1B**, **1C** and **1S**, each available in different rubber qualities, so that the correct rubber bellow can be selected for every kind of medium and temperature. Next to that the high pressure bellows are available on request.

Identification marking	Inner lining Material and resistance	Outside cover Material and resistance
Yellow ring	**ECO or NBR** **(Reinforced with textile cord)** For fresh-, cold-, or seawater, all known fuels and petrol-benzolmixtures 50:50. Temp. range water: +70°C. Temp. range oil: -15°C + 90°C.	**ECO or CR** Especially resistant for outside weather conditions, as well as oil, age, ozone and flame resisting.
Yellow GS	**NBR - Nitrile** **(Reinforced with steel cord)** For fresh-, cold-, or seawater, all known fuels and petrol-benzolmixtures 50:50 and flame resistant without protection cover. Temp.range water: 40°C + 70°C. Temp. range oil: -15°C + 90°C.	**(C R) -Chloroprene** Especially resistant for outside weather conditions, as well as oil, age, ozone and flame resisting.
Yellow HO	**NBR** **(Reinforced with textile cord)** For fresh-, cold-, or seawater, all known fuels and petrol-benzolmixtures 50:50. Temp. range water: +70°C. Temp. range oil: >110°C.	**(C R) -Chloroprene** Especially resistant for outside weather conditions, as well as oil, age, ozone and flame resisting.
Red ring	**EPDM** **(Reinforced with textile cord)** Hot-water constructions for heating installations with safe usage temperatures of 90°C.	**EPDM** Especially resistant for outside weather conditions as well as ageing.
Red HP	**EPDM** **(Reinforced with aramide cord)** Hot-water constructions for heating installations with safe usage temperatures of 130°C.	**EPDM** Especially resistant for outside weather conditions as well as ageing.
Green ring	**CSM** **(Reinforced with textile cord)** Acid resistant rubber which can be used for most acids. However specify the substance and the operating temperature.	**(C R) -Chloroprene** Especially resistant for outside weather conditions, as well as oil, age, ozone and flame resisting.
White ring	**NBR** **(Reinforced with textile cord)** For drinking water, food and alcoholic beverages, also with fat containing foods such as oil.	**(C R) -Chloroprene** Especially resistant for outside weather conditions, as well as oil age, ozone and flame resisting.

TABLE

Rubber Design
vibration and noise control

SELECTION TABLE
BELLOWS WITH FLANGES

Rubber bellows with flanges have a special flow-assisting convoluted shape of the bellows which minimize detrimental turbulence of the medium and pressure loss.
High tensile strength texture cord plies combined with proven synthetic rubber mixes guarantee maximum reliability and an extended working life.
The rubber bellows are produced with a vulcanized steel ring to guarantee a perfect sealing of the profiled sealing rings in the special chamber of the swivel flanges.

The maximum working pressure is 16 Bar (10 Bar*) with a test pressure of 25 Bar and even a burst pressure of over 60 Bar (30 Bar*).
(*for bellows larger than NB 150)

Average installed insulation is about 25 dB, a figure which is further improved by compressed installation. The standard flange range is made of carbon steel S235JR, drilled according to DIN PN10/16 and electrolytic galvanized.

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DOCUMENTATION SHEET

Rubber Bellows
Type Approvals

TYPE APPROVALS

Type	Type approval		
1A Yellow	X	X	X
1A Hot oil			X
1A Double Yellow	X		
1A Red	X	X	X
1A Double Red	X	X	X
1A White	X	X	X
1A Green	X	X	X
1B Yellow			X
1B Red			X
1S Yellow	X	X	
1S Red	X	X	
3K Yellow		X	
3K Red		X	

TABLE

Remark

Other classification type approvals available on request.

Rubber Design
vibration and noise control

DOCUMENTATION SHEET

Rubber Bellows

Pressure Units Conversion Table

PRESSURE UNITS CONVERSION TABLE

Unit	bar	mbar	Pa	kPa	MPa	psi	kgf/cm2	mm Hg (Torr)	mm wk
1 bar	1	1000	100.000	100	0,1	14,5038	1,0972	750,062	10197,16
1 mbar	0,001	1	100	0,1	0,0001	0,0145	$1,01972\ 10^{-3}$	0,7501	10,1972
1 Pa	0,00001	0,01	1	0,001	0,000001	0,000145	$1,01972\ 10^{-5}$	0,0075	0,10197
1 kPa	0,01	10	1000	1	0,001	0,145	0,010197	7,5006	101,972
1 MPa	10	10.000	1.000.000	1000	1	145,038	10,1972	7500,62	101972
1 psi	0,06895	68,95	6895,06	6,895	$6,895\ 10^{-3}$	1	0,07031	51,717	703,01
1 kgf/cm²	0,981	980,7	98066,5	98,0665	0,9807	14,2233	1	735,56	10.000
1 mm Hg (1 Torr)	0,00133	1,333	133,3	0,13332	$0,1333\ 10^{-3}$	0,01934	0,001359	1	13,5951
1 mm wk	0,000098	0,098	9,807	0,009807	$9,807\ 10^{-6}$	0,00142	0,0001	0,07356	1

TABLE

1N = 0,102 kg 1Pa = 1/N/m² 1KPa = 1 KN/m² 1MPa = 1MN/m^2

Rubber Design
vibration and noise control

DOCUMENTATION SHEET

Rubber Bellows
Installation instruction

INSTALLATION INSTRUCTION

Precautions prior to installation

- Install the rubber bellows at a visible and easy accessible position for inspection and replacement.

- The bellows diameter should match with the size of the pipe inside/outside diameter and in case of rubber bellows with clamps only very small differences are acceptable to secure a good sealing.

- Check all data of the bellows like type of fluid, temperature and pressure, compared with the system where it will be used for, before starting installation.

- For a safe operation it is important to use correct counter flanges. The sealing face of the flange needs to be machined smooth and must cover the rubber sealing face for at least 60% of the rubber bellows. We recommend to use welding neck flanges as those assure a proper sealing of the bellows.

- In case of an enlarged inner diameter of the flange loose rings of at least 4 mm need to be applied to secure a correct sealing.

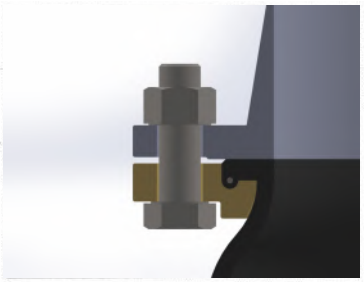
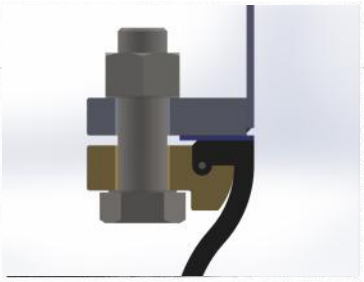


Fig. 2 Flange provided with smooth sealing surface.



Right

Fig. 4 Flange provided with flat sealing gasket to protect the rubber surface.

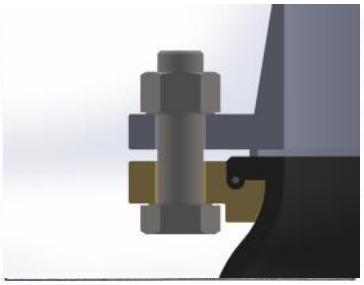
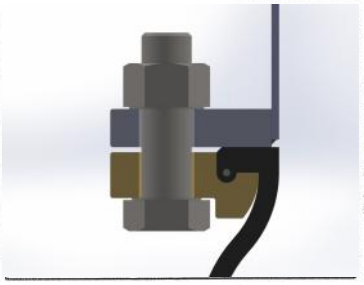


Fig. 3 Do not use flange with tongue or groove which will damage the rubber.



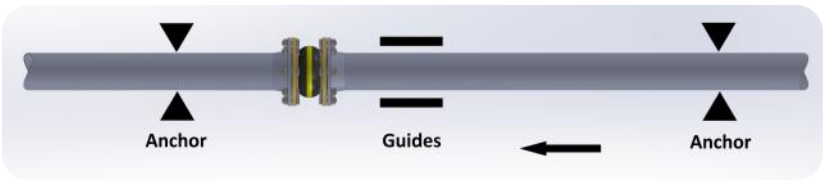
Wrong

Fig. 5 Sharp edge pipe ends will damage the rubber face.

- In case there will be vacuum in the system the use of a vacuum ring is recommended and can be installed in the bellows easily before installation if it is not included already.

- Rubber bellows produce reaction forces as a result of the pressure in the pipe work and these forces can be absorbed by using adequate fixed points.

- Use bellows with extension limiters if there are no fixed points.



- Rubber bellows acts as a piston by the forces arising from the internal pressure. To prevent the pipes from damage they are to be properly anchored in order to take care of these reactions forces (Fr). The reaction force of the bellows can be calculated by the formula as follows.

Fr = A x P x 0,01

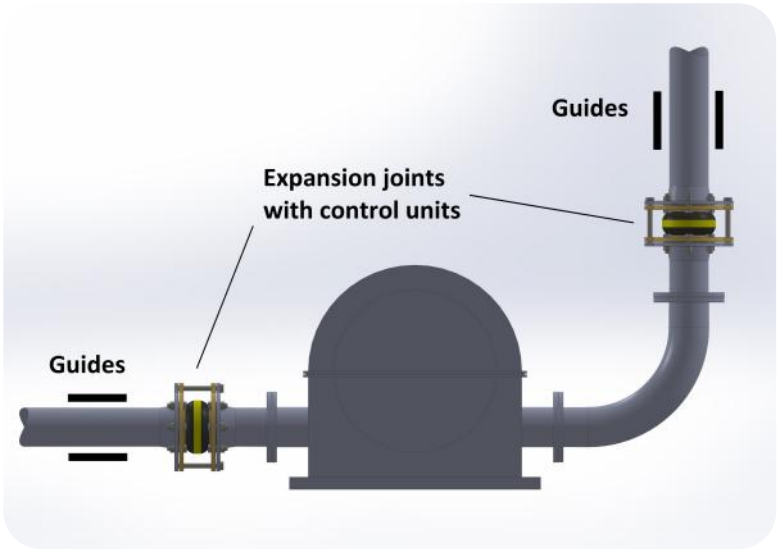
Fr = reaction force in kN

A = effective cross sectional area in cm2 – see relevant table of bellows

P= (actual pressure in Bar or kp/cm2) x 0.01

- The distance from the bellow to the first fixed point or pipe guide should not be larger than 4x pipe diameter (L1)
- The distance between pipe guides and fixed points in horizontal pipe work should not be bigger than 14x pipe diameter (L2)
- The distance between pipe guides and fixed points in vertical pipe work should not be bigger than 20x pipe diameter (L3)

- Use bellows with extension limiters if there are no fixed points.



INSTALLATION INSTRUCTION

Installation

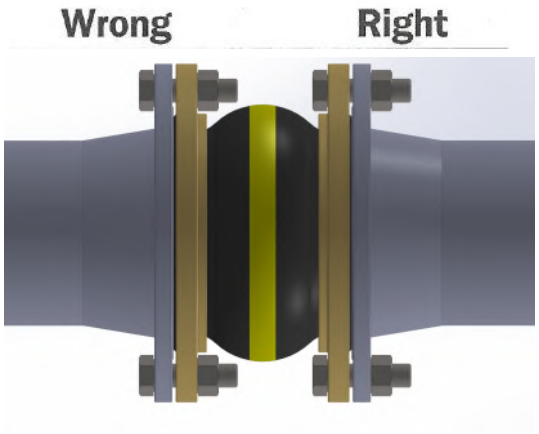
- During installation the rubber bellows might be compressed or stretched slightly to eliminate misalignments of the system however the allowable maximum values of the movements will change accordingly.

- If the rubber bellows needs to be stretched to install, please pay attention to the collar of the sealing ring of the bellows being kept in position and will not tear out of the groove of the flange.

- Load the rubber bellows to compression necessary for installation between the flanges to the allowable maximum according to the tables（values depend on type of bellows）

- If possible install the bellows in such a way that the production date is visible in order to make a better review for replacement.

- It is recommended to insert the bolts from the rubber bellows side of the flanges however if this is not possible the loose threaded end must not interfere with the maximum movements of the bellows.



- Do not use sharp tools which may damage the rubber.

- Install the bolts crosswise.

- Apply the torque crosswise（3 steps）by tightening the bolts by hand.

- Fasten all bolts crosswise with 50 Nm.

- Final torque to be applied crosswise according to the table.

Nominal Bore	Bolt torque PN10 flange in Nm.
NB 32 - NB 80	40 - 60
NB 100 - NB 200	60 - 80
NB 250 - NB 300	80 - 100

- If no torque wrench is available fasten the bolts with common sense and keep anyway distance between the connecting flanges of at least one (1) mm.

Precautions after installation

- In case of works the rubber bellows needs to be protected against heat, flames and sparks and in the event of these works protection of the bellows has to be made.

- Permanent radiation heat needs to be avoided or use a flame protection guard.

- Do not exceed maximum permissible temperature according to the tables to secure long life time of the product.

- If a test pressure will be applied on the system the maximum value is the maximum working pressure x 1,5.

- Do not paint the surface of the rubber and keep the part clean in order to allow adequate inspections.

- Bellows do not need maintenance however are subject to wear and need to be inspected every year at leakage, cracks and other deviations.

General

- Combined movements
If the installation length of the bellows is longer then it natural lenth the allowable lateral movements are limited.

Installation length	130 mm	140 mm	150 mm
Lateral permisselbe	20 mm	10 mm	5 mm

- Temperature versus movements and pressures
The values shown in the documentation are based on a temperature of max. 50°C. Exceeding this temperature will give a reduction of the max. movements and/or pressures according to the table.

Temperature	Reduction
50°C - 70°C	25%
70°C - 100°C	40%

- Calculed lifetime at various temperatures.

Working temperature	Intermittent use max. 300 hrs/year	Continuous use
0° - 30°C	12 years	6,0 years
30° - 50°C	9 years	4,5 years
50° - 70°C	7 years	3,5 years
70° - 90°C	5 years	2,5 years
90° - 100°C	2 years	1,2 years