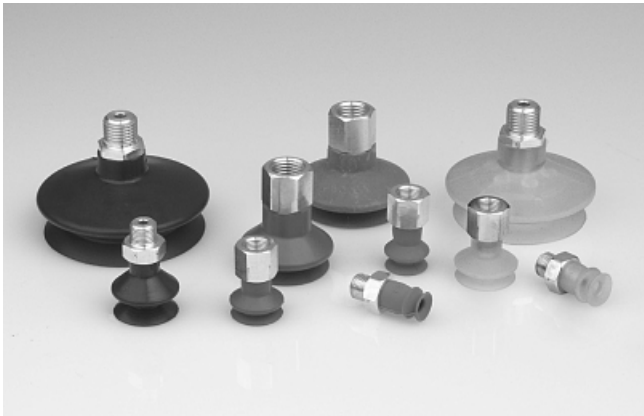


Bellows suction pads (round)

Bellows suction pads FSGA (1.5 folds)



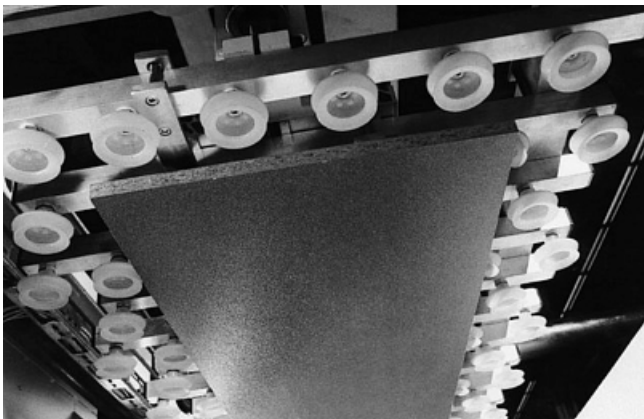
Bellows suction pads FSGA

Our highlights...

- Wide range of diameters and materials
- Soft, tapered sealing lip
- Optimized shape with 1.5 folds
- Very stiff top fold
- Supports on the bottom

Your advantages...

- > For a wide range of different workpieces
- > Very good adaptation to curved or uneven workpiece surfaces
- > High suction force and optimum damping effect during placement on workpieces
- > Good resistance to horizontal forces at high acceleration values
- > No permanent deformation of thin-walled workpieces



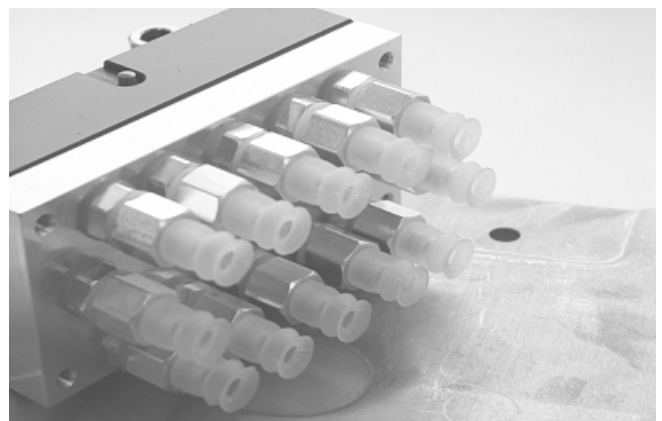
Handling of coated wooden sheets with suction pads FSGA

Applications

- Handling of extremely sensitive workpieces (optimum damping effect due to folds, inner support prevents pulling-in of workpiece)
- Handling of workpieces with uneven surfaces, such as pipes (corrugations permit optimal adaptation to concave and convex surfaces)
- Specially designed folds permit use in systems with very short cycle times
- Available in many different materials (see material overview)



Handling of electronic components with suction pads FSGA



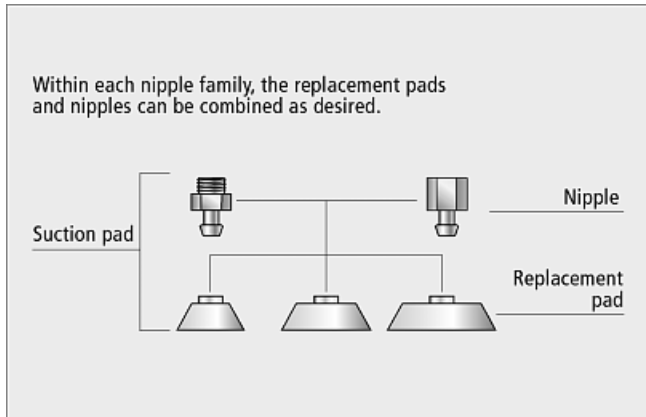
Bellows suction pads FSGA mounted to form a vacuum carpet

Bellows suction pads (round)

Bellows suction pads FSGA (1.5 folds)



Vacuum suction pads
2



Modular suction-pad system

Construction

- Robust and hard-wearing suction pad FSGA with single sealing lip, consisting of suction pad FGA with 1.5 folds and connection nipple
- All nipples plugged in
- Suction pads are delivered unassembled



Suitability for branch-specific applications

Designation code Bellows suction pads FSGA (1.5 folds)

Short designation	Diameter in mm	Material and shore hardness	Connection thread
Example: FSGA	25	SI-55	G1/8-IG
FSGA...with connection nipple FGA...without connection nipple	11 to 78	NBR-55-2 SI-55 HT 1-60 NK-45	M5-AG to G1/4-IG/AG (AG = male; IG = female)

Bellows suction pads (round)

Bellows suction pads FSGA (1.5 folds)



Ordering data Bellows suction pads FSGA (1.5 folds)

Type	Suction pad material * / hardness in Shore A			
	High temp material HT1 60±5ShA	Natural Rubber NK 45±5ShA	Perbunan NBR 55±5ShA	Silicone SI 55±5ShA
FSGA 11 G1/8-AG	10.01.06.01226	10.01.06.00408	10.01.06.00075	10.01.06.00085
FSGA 11 G1/8-IG	10.01.06.01232	10.01.06.00407	10.01.06.00061	10.01.06.00068
FSGA 11 M5-AG	10.01.06.01227	10.01.06.00406	10.01.06.00076	10.01.06.00086
FSGA 14 G1/8-AG	10.01.06.00932	10.01.06.00387	10.01.06.00381	10.01.06.00384
FSGA 14 G1/8-IG	10.01.06.00948	10.01.06.00386	10.01.06.00380	10.01.06.00383
FSGA 14 M5-AG	10.01.06.00933	10.01.06.00385	10.01.06.00379	10.01.06.00382
FSGA 16 G1/8-AG	10.01.06.01228	10.01.06.00411	10.01.06.00077	10.01.06.00087
FSGA 16 G1/8-IG	10.01.06.01233	10.01.06.00410	10.01.06.00062	10.01.06.00069
FSGA 16 M5-AG	10.01.06.01229	10.01.06.00409	10.01.06.00078	10.01.06.00088
FSGA 20 G1/8-AG	10.01.06.00936	10.01.06.00396	10.01.06.00390	10.01.06.00393
FSGA 20 G1/8-IG	10.01.06.00952	10.01.06.00395	10.01.06.00389	10.01.06.00392
FSGA 20 M5-AG	10.01.06.00937	10.01.06.00394	10.01.06.00388	10.01.06.00391
FSGA 22 G1/8-AG	10.01.06.01230	10.01.06.00414	10.01.06.00079	10.01.06.00089
FSGA 22 G1/8-IG	10.01.06.01234	10.01.06.00413	10.01.06.00063	10.01.06.00070
FSGA 22 M5-AG	10.01.06.01231	10.01.06.00412	10.01.06.00080	10.01.06.00090
FSGA 25 G1/8-AG	10.01.06.00940	10.01.06.00405	10.01.06.00399	10.01.06.00402
FSGA 25 G1/8-IG	10.01.06.00956	10.01.06.00404	10.01.06.00398	10.01.06.00401
FSGA 33 G1/4-AG	10.01.06.00941	10.01.06.00330	10.01.06.00081	10.01.06.00091
FSGA 33 G1/4-IG	10.01.06.00957	10.01.06.00415	10.01.06.00064	10.01.06.00071
FSGA 43 G1/4-AG	10.01.06.00942	10.01.06.00418	10.01.06.00082	10.01.06.00092
FSGA 43 G1/4-IG	10.01.06.00958	10.01.06.00417	10.01.06.00065	10.01.06.00072
FSGA 53 G1/4-AG	10.01.06.00943	10.01.06.00326	10.01.06.00083	10.01.06.00093
FSGA 53 G1/4-IG	10.01.06.00977	10.01.06.00419	10.01.06.00066	10.01.06.00073
FSGA 63 G1/4-AG	-	10.01.06.00687	10.01.06.00685	10.01.06.00686
FSGA 63 G1/4-IG	-	10.01.06.00693	10.01.06.00691	10.01.06.00692
FSGA 78 G1/4-AG	-	10.01.06.00340	10.01.06.00084	10.01.06.00094
FSGA 78 G1/4-IG	-	10.01.06.00421	10.01.06.00067	10.01.06.00074

*See Section 2, "Basic Principles of Suction-Pad Materials" for further details of materials

Ordering data spare parts suction pads

Type	Dimensions in mm			
	High temp material HT1 60±5ShA	Natural Rubber NK 45±5ShA	Perbunan NBR 55±5ShA	Silicone SI 55±5ShA
FGA 11	10.01.06.01247	10.01.06.00423	10.01.06.00095	10.01.06.00098
FGA 14	10.01.06.00868	10.01.06.00372	10.01.06.00370	10.01.06.00371
FGA 16	10.01.06.01248	10.01.06.00424	10.01.06.00096	10.01.06.00099
FGA 20	10.01.06.00870	10.01.06.00375	10.01.06.00373	10.01.06.00374
FGA 22	10.01.06.01249	10.01.06.00425	10.01.06.00097	10.01.06.00100
FGA 25	10.01.06.00872	10.01.06.00378	10.01.06.00376	10.01.06.00377
FGA 33	10.01.06.00873	10.01.06.00426	10.01.06.00130	10.01.06.00126
FGA 43	10.01.06.00874	10.01.06.00427	10.01.06.00131	10.01.06.00127
FGA 53	10.01.06.00875	10.01.06.00428	10.01.06.00132	10.01.06.00128
FGA 63	-	10.01.06.00690	10.01.06.00688	10.01.06.00689
FGA 78	-	10.01.06.00429	10.01.06.00133	10.01.06.00129

*See Section 2, "Basic Principles of Suction-Pad Materials" for further details of materials

Bellows suction pads (round)

Bellows suction pads FSGA (1.5 folds)



Ordering data spare parts suction pad nipples

Type	Suction-pad nipples [AG]		Suction-pad nipples [IG]	
FSGA 11 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 11 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 14 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 14 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 16 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 16 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 20 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 20 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 22 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 22 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 25 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 33 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSGA 43 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSGA 53 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSGA 63 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSGA 78 G1/4	SA-NIP N019 G1/4-AG	10.01.06.01959	SA-NIP N019 G1/4-IG	10.01.06.01960

Technical data Bellows suction pads FSGA (1.5 folds)

Type	Suction force [N]*	Pull-off force [N]**	Volume [cm ³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]	Nipple family
FSGA 11	0,95	3,8	0,225	10	4	N 016
FSGA 14	1,20	5,0	0,420	13	4	N 016
FSGA 16	2,30	6,7	0,750	20	4	N 016
FSGA 20	4,70	10,7	1,150	30	4	N 016
FSGA 22	5,70	15,2	1,400	25	4	N 016
FSGA 25	5,30	17,3	3,150	20	4	N 016
FSGA 33	13,60	39,6	4,750	40	6	N 018
FSGA 43	22,80	64,5	9,250	60	6	N 018
FSGA 53	51,30	95,0	26,250	75	6	N 018
FSGA 63	85,00	135,0	39,000	75	6	N 018
FSGA 78	137,40	218,0	76,000	70	6	N 019

*The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor

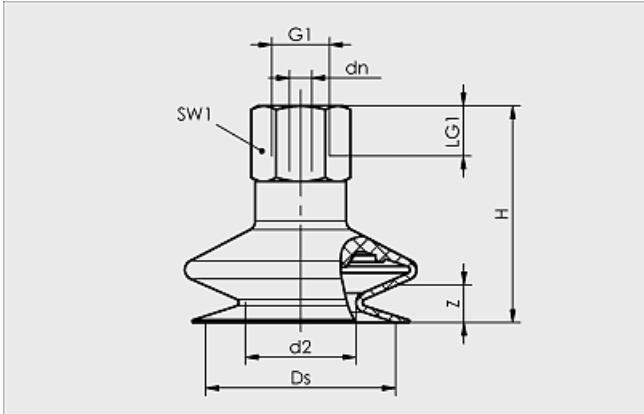
**The pull-off force of the versions made of natural rubber is reduced by about 40%

Bellows suction pads (round)

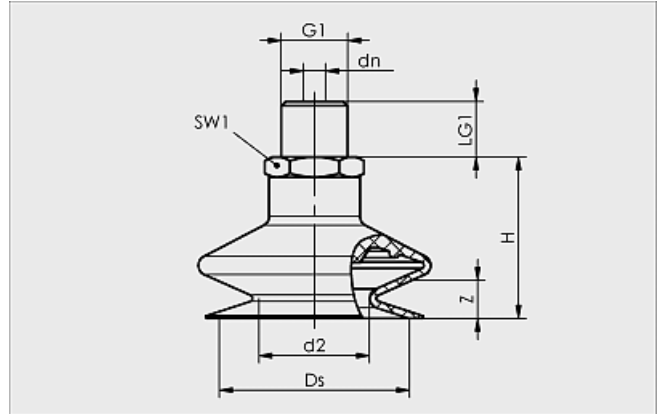
Bellows suction pads FSGA (1.5 folds)



Design data Bellows suction pads FSGA (1.5 folds)



FSGA 11 to 78 IG



FSGA 11 to 78 AG

Type	Dimensions in mm*							
	d2	dn	Ds	G1	H	LG1	SW1	Z (Stroke)
FSGA 11 G1/8-AG	5,1	3,5	10,4	G1/8"-M	22,0	7,5	14	4
FSGA 11 G1/8-IG	5,1	3,5	10,4	G1/8"-F	28,0	8,5	14	4
FSGA 11 M5-AG	5,1	2,5	10,4	M5-M	21,0	5,0	7	4
FSGA 14 G1/8-AG	5,0	3,5	12,8	G1/8"-M	22,0	7,5	14	5
FSGA 14 G1/8-IG	5,0	3,5	12,8	G1/8"-F	28,0	8,5	14	5
FSGA 14 M5-AG	5,0	2,5	12,8	M5-M	21,0	4,5	7	5
FSGA 16 G1/8-AG	8,4	3,5	15,6	G1/8"-M	25,0	7,5	14	7
FSGA 16 G1/8-IG	8,4	3,5	15,6	G1/8"-F	31,0	8,5	14	7
FSGA 16 M5-AG	8,4	2,5	15,6	M5-M	24,0	5,0	7	7
FSGA 20 G1/8-AG	11,0	3,5	18,1	G1/8"-M	21,5	7,5	14	5
FSGA 20 G1/8-IG	11,0	3,5	18,1	G1/8"-F	27,5	8,5	14	5
FSGA 20 M5-AG	11,0	2,5	18,1	M5-M	20,5	4,5	7	5
FSGA 22 G1/8-AG	11,1	3,5	20,0	G1/8"-M	25,0	7,5	14	6
FSGA 22 G1/8-IG	11,1	3,5	20,0	G1/8"-F	31,0	8,5	14	6
FSGA 22 M5-AG	11,1	2,5	20,0	M5-M	24,0	5,0	7	6
FSGA 25 G1/8-AG	9,9	3,5	22,5	G1/8"-M	29,0	7,5	14	9
FSGA 25 G1/8-IG	9,9	3,5	22,5	G1/8"-F	35,0	8,5	14	9
FSGA 33 G1/4-AG	17,0	4,4	30,0	G1/4"-M	31,0	11,0	17	9
FSGA 33 G1/4-IG	17,0	4,4	30,0	G1/4"-F	42,0	12,0	17	9
FSGA 43 G1/4-AG	21,9	4,4	38,0	G1/4"-M	32,0	11,0	17	10
FSGA 43 G1/4-IG	21,9	4,4	38,0	G1/4"-F	43,0	12,0	17	10
FSGA 53 G1/4-AG	33,0	4,4	50,0	G1/4"-M	38,0	11,0	17	12
FSGA 53 G1/4-IG	33,0	4,4	50,0	G1/4"-F	49,0	12,0	17	12
FSGA 63 G1/4-AG	44,5	4,4	60,0	G1/4"-M	39,0	11,0	17	14
FSGA 63 G1/4-IG	44,5	4,4	60,0	G1/4"-F	51,0	12,0	17	14
FSGA 78 G1/4-AG	54,0	8,0	74,0	G1/4"-M	53,0	11,0	21	14
FSGA 78 G1/4-IG	54,0	8,0	74,0	G1/4"-F	62,0	12,0	21	14

*Acceptable dimensional tolerances for rubber parts concerning to M3 - DIN 7715

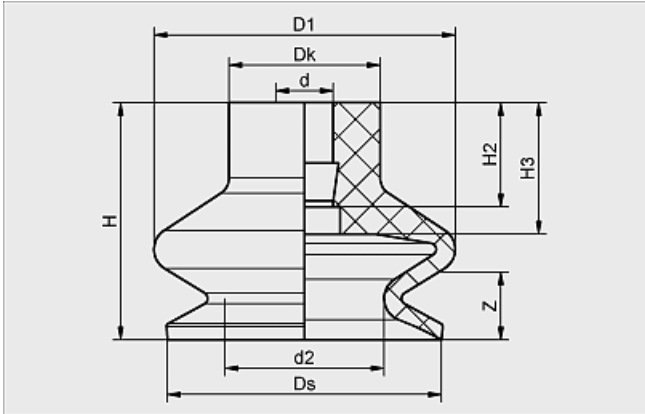
Bellows suction pads (round)

Bellows suction pads FSGA (1.5 folds)

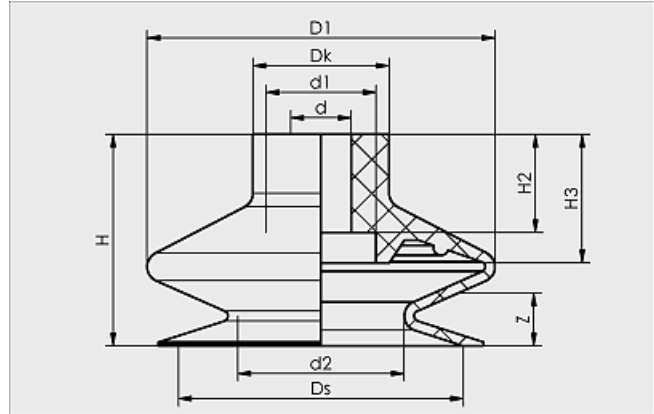


Vacuum suction pads
2

Design data Bellows suction pads FGA (1.5 folds)



FGA 11 to 25



FGA 33 to 78

Type	Dimensions in mm*									
	d	d1	d2	D1	Dk	Ds	H	H2	H3	Z (Stroke)
FGA 11	4,5	-	5,1	12,0	10	10,4	16,0	6,9	9,3	4
FGA 14	4,5	-	5,0	13,7	10	12,8	15,5	6,9	8,5	5
FGA 16	4,5	-	8,4	17,0	10	15,6	19,2	6,9	9,3	7
FGA 20	4,5	-	11,0	19,9	10	18,1	15,2	6,9	8,7	5
FGA 22	3,8	-	11,1	24,2	10	20,0	19,0	6,9	9,1	6
FGA 25	4,5	-	9,9	25,0	10	22,5	23,0	6,9	8,9	9
FGA 33	8,0	16,0	17,0	36,0	18	30,0	27,0	13,0	14,0	9
FGA 43	8,0	14,5	21,9	45,9	18	38,0	27,6	13,0	17,1	10
FGA 53	8,0	14,5	33,0	58,6	18	50,0	34,0	13,0	19,0	12
FGA 63	8,0	14,5	44,5	67,0	18	60,0	34,0	13,0	18,8	14
FGA 78	11,8	21,8	54,0	83,0	25	74,0	47,0	19,7	31,4	14

*Acceptable dimensional tolerances for rubber parts concerning to M3 - DIN 7715