Belman

TYPE 40

TYPE 40
RUBBER EXPANSION JOINT



DN 40 to DN 5000
Type 40 is a highly elastic Rubber Expansion Joint with a corrugation that achieves very low inherent resistance. It is characterised by the ability to absorb very large movements in all directions. The corrugation shape, the number of corrugations, the overall length and the material thickness can be matched to your requirements. Furthermore, a wide variety of rubber qualities are available so that a suitable rubber compound can be selected for every application (see material descriptions on the following page). Type 40 is mainly used in large industrial plants and power stations, where it absorbs movements in the pipework, compensates for structural displacements and settlements and dampens vibrations.

Bellow design
Corrugated Rubber Bellow with reinforcement and shaped solid rubber flanges, self-sealing (no additional seals required). Suitable for backing flanges with support shoulder.

Flange version
Both sides with backing flange made of hot-dip steel galvanized, drilled according to DIN PN 10 (standard). Other materials and dimensions are possible.

Pressure resistance
Design according to customer specification, max. 100 bar operating pressure.

Vacuum resistance
Only vacuum-proof with vacuum support ring. Vulcanised support rings possible.

Accessories
- Tie rods
- Vacuum supporting rings
- Guide sleeves
- PTFE lining
- Potential equalisation
- Flame-resistant protective covers
- Dust and splash protection covers
- Earth cover / sun protection cover

Further information is available on request.



Movement absorption
Very large axial, lateral and angular movement absorption possible. Different corrugation geometries and Bellow designs (single and multi-corrugated) available.

Approvals/conformity
CE, drinking water conform, FDA and EG 1935/2004 conform (detailed overview is available on request).

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SPECIFICATIONS & APPLICATION

BELLOW		BELLOW DESIGN			PERMISSIBLE OPERATING DATA									
Colour code	Colour marking	Core (inner)	Rein-forcement	Cover (outer)	Max. temperature °C	°C	bar	°C	bar	°C	bar	°C	bar	°C	bar
Red		EPDM	Polyamide	EPDM	100										
Blue		EPDM TW	Polyamide	EPDM	100										
White-red		EPDM beige	Polyamide	EPDM	100										
Green		CSM	Polyamide	CSM	100										
Yellow		NBR	Polyamide	NBR	100										
White		NBR beige	Polyamide	NBR	100										
Grey		CR	Polyamide	CR	90										
Red-blue-red		EPDM	Aramid	EPDM	100	Expansion Joints will designed according to your operating parameters.									
Blue-blue-blue		EPDM TW	Aramid	EPDM	100										
White-blue-red		EPDM beige	Aramid	EPDM	100										
Orange-blue-orange		EPDM HT	Aramid	EPDM HT	125										
Green-blue-green		CSM	Aramid	CSM	100										
Yellow-blue-yellow		NBR	Aramid	NBR	100										
White-blue-white		NBR beige	Aramid	NBR	100										
Grey-blue-grey		CR	Aramid	CR	90										
Lilac-blue-lilac		FPM	Aramid	FPM	180										
-	-	Silicone	Aramid	Silicone	180										
-	-	Silicone	Glas fabric	Silicone	200										

APPLICATION

Type 40 red (EPDM)
For water, sea water, cooling water with glycol or other chemical additives for treating water, saline solutions, weak acids and weak alkaline solutions.
Unsuitable for aliphatic, aromatic and chlorinated hydrocarbons, oil or oily media.

Type 40 blue (EPDM TW)
Like Type 40 red, but approved for drinking water.

Type 40 white-red (EPDM beige)
Like Type 40 red, but with light-coloured internal rubber in food-grade (FDA and EG 1935/2004 conform).
Not approved for drinking water.

Type 40 green (CSM)
For chemicals, aggressive, chemical wastewater and compressor air containing oil.

Type 40 yellow (NBR)
For oils, fats, gases, diesel fuels, kerosene and crude oil. Not suitable for aromatic and chlorinated hydrocarbons, esters and ketones.

Type 40 white (NBR beige)
Like Type 40 yellow, but with light-coloured internal rubber in food-grade (FDA and EG 1935/2004 conform).
Not approved for drinking water!

Continued on the next page ➡

TYPE 40

APPLICATION

(Continued)

Type 40 grey (CR)
For water, waste water, swimming pool water, salt water, cooling water with anti-corrosive products containing oil, oil mixtures and compressed air containing oil.

Type 40
red-blue-red (EPDM/Aramid)
Like Type 40 red, but with aramid fabric.

Type 40
blue-blue-blue AF (EPDM TW/ Aramid)
Like Type 40 blue, but with aramid fabric.

Type 40
white-blue-red (EPDM beige/ Aramid)
Like Type 40 white-red, but with aramid fabric.

Type 40
orange-blue-orange (EPDM HT/ Aramid)
Like Type 40 red, but with aramid fabric for temperatures up to +125°C.

Type 40
green-blue-green (CSM/Aramid)
Like Type 40 green, but with aramid fabric.

Type 40
yellow-blue-yellow (NBR/Aramid)
Like Type 40 yellow, but with aramid fabric.

Type 40
white-blue-white (NBR beige/ Aramid)
Like Type 40 white-grey, but with aramid fabric.

Type 40
grey-blue-grey (CR/Aramid)
Like Type 40 grey, but with aramid fabric.

Typ 40
lilac-blue-lilac (FPM/Aramid)
For flue gas desulphurisation systems and bio-diesel. High chemical resistance to benzene, xylene, toluene, aromatic, chlorinated hydrocarbons, mineral acids and fuels with an aromatic content of more than 50%. Temperatures of up to +180°C.

Type 40 Silicone
(Silicone/Glas fabric or aramid)
Suitable for hot air, acetic acid.
Satisfactory resistance to aliphatic engine and gear oils.
Also available in foodstuff quality.
Excellent resistance to ageing, UV, ozone and weather.
Very good radiation resistance.
Not for use with steam above 120°C.
No resistance to fuels.

Important information:
For aggressive media, please have the material resistance checked by our engineers.

The Bellows must not be painted or insulated at media temperatures >50°C.

Please also note the installation instructions and the tolerances according to the FSA manual (which is available on request)

TYPE 40

VACUUM RESISTANCE & FLANGE VERSIONS

VACUUM RESISTANCE

Type 40 is a Rubber Expansion Joint that is only vacuum-resistant to a small degree, so a suitable vacuum supporting ring should be used on underpressure.

Standard material: 1.4571

An alternative design with a vulcanised vacuum supporting ring is also available.

Please note that greater stiffness rates must be taken into account and that the axial and lateral movement will be reduced.

Further information on vacuum supporting spirals/rings is available on request.

SUPPORING RING VERSIONS



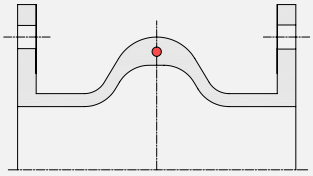
Supporting ring with baffle
DN 150 - DN 350



Expansion Joint with supporting ring



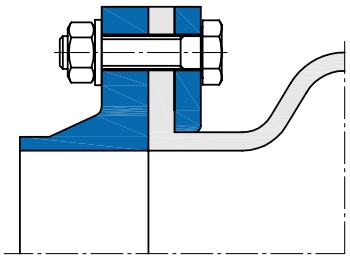
Supporting ring with lock/double lock
DN 200 - DN 450 /
DN 500 - DN 5000



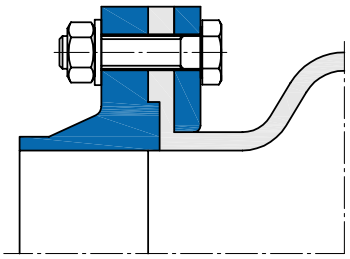
Vulcanised supporing ring (example)
Please take the limited movement into account.

FLANGE VERSIONS

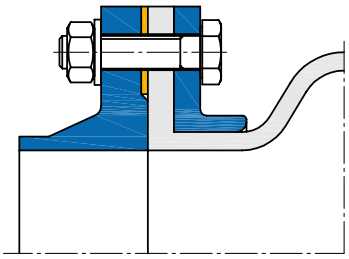
Type 40 is produced with solid rubber flanges. To ensure a tight connection to the pipeline/assembly, the counter flange should be flat without a raised face. If this is not possible, the Expansion Joint flange can be produced with a negative recess (see version 2) for example to accommodate the raised face of the counter flange and ensure a flat connection. Alternatively, spacer rings can be used.



Version 1
Standard version



Version 2
With recess compensation



Version 3
With recess spacer ring

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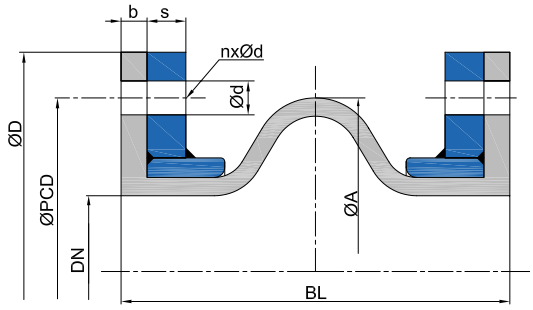
DESIGN A
WITHOUT TIE RODS



DESIGN A - WITHOUT TIE RODS

Can be used to absorb movements in all directions (for combined movements, refer to the movement diagram, which is available on request), for vibration and noise damping.

The Expansion Joint's reaction force must be absorbed through appropriate pipeline guidance (see the installation instructions, which is available on request).





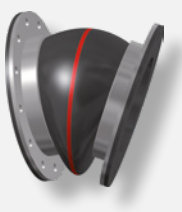
axial -



axial +



lateral +/-



angular +/-

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TYPE 40

DIMENSIONS FOR **DESIGN A**

(Example values - may vary depending on specification)

DN*1	LENGTH	BELLOW			FLANGE PN 10*4					MOVEMENT ABSORPTION*5				WEIGHT
										AX		LA	AN	
	BL*2 mm	ØA mm	b mm	WF*3 mm²	ØD mm	ØPCD mm	Ød mm	n	s mm	+ mm	- mm	+/- mm	+/- ∠°	kg
200	**250**	280	10	53066	340	295	22	8	20	20	40	26	11.3	19.0
250	**250**	330	10	75439	395	350	22	12	20	20	40	26	9.1	22.5
300	**250**	384	10	104009	445	400	22	12	20	20	40	28	7.6	25.0
350	**250**	432	10	133249	505	460	22	16	20	20	44	27	6.5	31.5
400	**250**	484	10	169007	565	515	26	16	20	20	44	27	5.7	39.5
450	**250**	532	10	197823	615	565	26	20	28	20	44	27	5.1	51.0
500	**250**	585	10	241800	670	620	26	20	28	20	44	27	4.6	57.5
600	**250**	685	10	336785	780	725	30	20	28	20	44	27	3.8	72.5
700	**250**	786	10	448656	895	840	30	24	28	20	44	26	3.3	88.5
800	**300**	917	13	617614	1015	950	33	24	28	31	53	34	4.4	115.0
900	**300**	1017	13	764723	1115	1050	33	28	28	31	53	33	3.9	128.0
1000	**300**	1117	13	927532	1230	1160	36	28	28	31	53	33	3.5	146.0
1100	**300**	1217	13	1106041	1345	1270	36	32	28	31	53	33	3.2	168.0
1200	**300**	1317	13	1300250	1455	1380	39	32	28	41	43	32	3.9	196.0
1300	**300**	1417	13	1510159	1565	1485	42	32	28	31	53	32	2.7	219.0

Continued on the next page ➡

*1: Smaller and larger nominal diameters possible after technical inspection.

*2: Overall length range 150 mm to 500 mm. For larger overall lengths the feasibility must be checked.
For smaller overall lengths, please also refer to types 49, 50 and 55.

*3: The effective area (WF), the rubber flange thickness (b) and the outer diameter of the corrugation (ØA) may vary depending on the design.

*4: Other standards/dimensions possible.

*5: Movement absorption can be increased by changing the corrugation and overall length.

- Maximum size DN 5000.
- Table values correspond to a Bellows design with 6 bar operating pressure at 60°C.

Important information
Please note the appropriate fix point constructions and plain bearings in your piping system, as well as the tolerances as per the FSA Handbook (which is available on request)!

For more information please refer to the installation instruction, which is available on request.

TYPE 40

DIMENSIONS FOR **DESIGN A**

(Example values - may vary depending on specification)

DN*1	LENGTH	BELLOW			FLANGE PN 10*4					MOVEMENT ABSORPTION*5				WEIGHT
										AX		LA	AN	
	BL*2 mm	ØA mm	b mm	WF*3 mm²	ØD mm	ØPCD mm	Ød mm	n	s mm	+ mm	- mm	+/- mm	+/- ∠°	kg
Continued...														
1400	**300**	1517	13	1735768	1675	1590	42	36	28	31	53	31	2.5	241.0
1500	**300**	1617	13	1977077	1795	1705	48	36	28	31	53	31	2.4	261.0
1600	**300**	1717	13	2234086	1915	1820	48	40	28	31	53	31	2.2	291.0
1700	**300**	1817	13	2478817	2015	1920	48	44	33	31	53	30	2.1	380.0
1800	**300**	1917	13	2765656	2115	2020	48	44	33	31	53	30	2.0	401.0
1900	**300**	2017	13	3068195	2220	2125	48	48	33	31	53	29	1.9	428.0
2000	**300**	2117	13	3386434	2325	2230	48	48	33	31	53	29	1.8	455.0
2100	**350**	2255	15	3851387	2440	2335	56	48	33	43	69	38	2.3	505.0
2200	**350**	2355	15	4206992	2550	2440	56	52	33	43	69	37	2.2	539.0
2400	**350**	2555	15	4965302	2760	2650	56	56	33	43	69	36	2.1	600.0
2500	**350**	2655	15	5368007	2860	2750	56	56	33	43	69	36	2.0	624.0
2600	**350**	2755	15	5786412	2960	2850	56	60	33	43	69	35	1.9	646.0
2800	**350**	2955	15	6670322	3180	3070	56	64	33	43	69	34	1.8	726.0
3000	**350**	3155	15	7617032	3405	3290	62	68	33	43	69	33	1.6	807.0

*1: Smaller and larger nominal diameters possible after technical inspection.

*2: Overall length range 150 mm to 500 mm. For larger overall lengths the feasibility must be checked.
For smaller overall lengths, please also refer to our types 49, 50 and 55.

*3: The effective area (WF), the rubber flange thickness (b) and the outer diameter of the corrugation (ØA) may vary depending on the design.

*4: Other standards/dimensions possible.

*5: Movement absorption can be increased by changing the corrugation and overall length.

- Maximum size DN 5000.
- Table values correspond to a Bellows design with 6 bar operating pressure at 60°C.

Important information
Please note the appropriate fix point constructions and plain bearings in your piping system, as well as the tolerances as per the FSA Handbook (which is available on request)!

For more information please refer to the installation instruction, which is available on request.

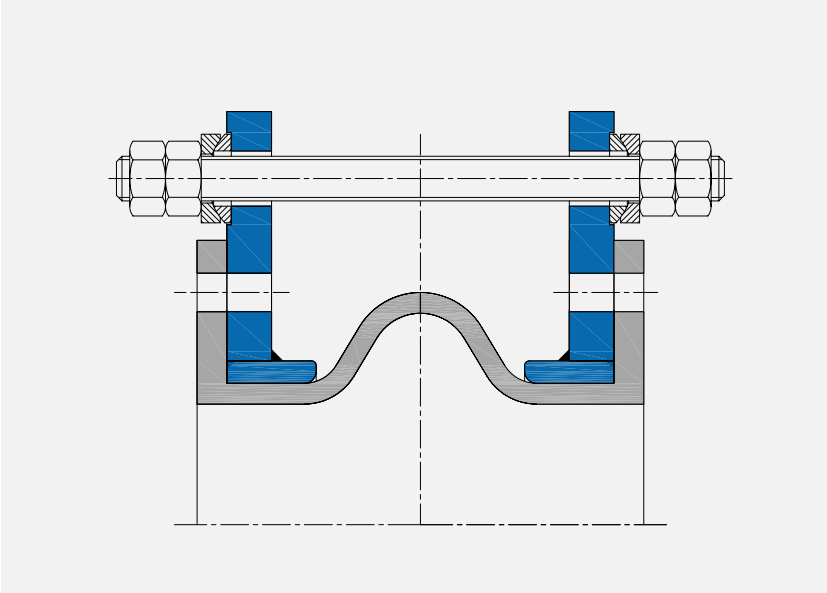
TYPE
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OTHER DESIGNS
DESIGN E & DESIGN M

Design E
- with tie rods
For absorbing the Expansion Joint's reaction force in the direction of expansion while also absorbing great lateral movement.

The use of PTFE-coated spherical washers and conical sockets reduces the frictional force considerably during lateral movement. Can be used for vibration insulation and absorbing lateral movement.

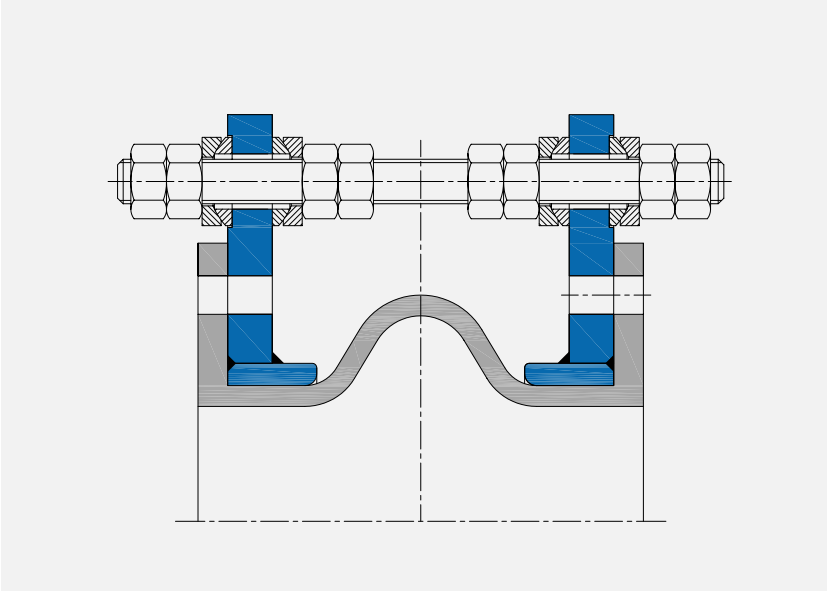
Note: The number of tie rods is calculated corresponding to the available design data.



Design M
- with tie rods/thrust limiters
For absorbing the Expansion Joint's reaction force in the direction of expansion while also absorbing high lateral movement and preventing the Bellow from strong compression.

The use of PTFE-coated spherical washers and conical sockets reduces the frictional force considerably during lateral movement. Can be used for vibration insulation and absorbing lateral movement.

Note: The number of tie rods is calculated corresponding to the available design data.

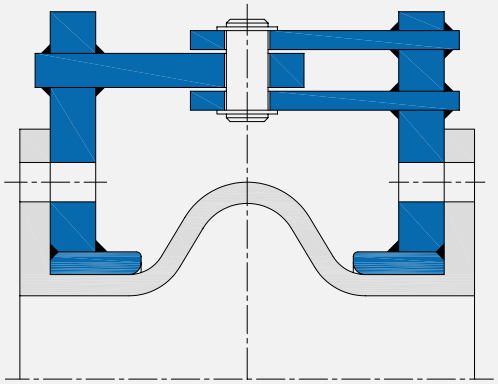


TYPE 40

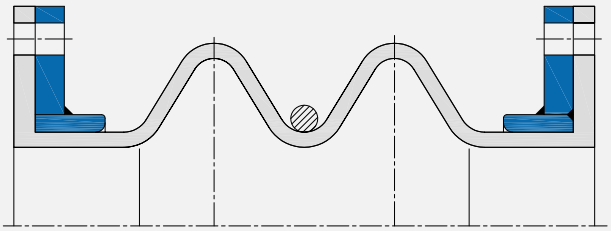
OTHER DESIGNS
DESIGN F & MULTI CORRUGATED BELLOW

Design F
- with hinge
For absorbing angular movement in a single plane while simultaneously guiding the pipework. The hinge absorb the reaction forces so that the fix point only needs to absorb the adjusting movement.

Usually two hinge Expansion Joints are fitted with an intermediate pipe to achieve a high level of lateral movement (see the example in the technical appendix, which is available on request).



Multi-corrugated bellow designs
Different corrugation geometries and Bellow forms (single and multi-corrugated) are available, in order to absorb high axial, lateral and angular movement.



Example - double corrugation,
Design A - without tie rods

Important information
Please note the appropriate fix point constructions and plain bearings in your piping system!

Information on this can be found in the installation instructions, which is available on request.

Regarding the bracing, please refer to the technical information, which is available on request.

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TYPE 40

AXIAL STIFFNESS RATES* (SINGLE-CORRUGATION)

DN	LENGTH BL mm	STIFFNESS RATES (AVERAGES VALUE FROM FULL WAY) 0 bar N/mm	1 bar N/mm	1,5 bar N/mm	2,5 bar N/mm	3 bar N/mm	4 bar N/mm	5 bar N/mm	6 bar N/mm	10 bar N/mm	16 bar N/mm
200	**200**	45	79	83	90	108	144	180	216	360	576
250	**200**	51	88	95	107	127	166	206	246	405	645
300	**200**	56	98	105	118	139	180	225	269	454	727
350	**200**	66	117	124	138	164	216	266	317	541	866
400	**250**	40	70	75	83	99	131	161	190	322	513
450	**250**	48	85	91	102	119	152	193	235	389	626
500	**250**	55	99	105	118	135	171	218	265	457	743
600	**250**	68	119	125	136	163	218	272	326	544	870
700	**250**	70	121	130	147	174	228	283	338	557	886
750	**250**	72	126	134	151	178	232	289	346	583	935
800	**250**	73	129	137	153	182	239	295	350	599	958
850	**250**	80	141	149	166	198	262	321	380	644	1026
900	**300**	95	169	180	202	235	300	383	466	770	1239
1000	**300**	136	245	260	291	335	422	539	656	1129	1836
1050	**350**	132	251	264	290	352	475	592	710	1171	1867
1100	**350**	173	328	345	380	461	622	775	929	1534	2445
1200	**350**	188	360	381	422	511	688	845	1002	1677	2666
1300	**350**	204	386	405	443	546	751	924	1096	1827	2902
1400	**350**	220	415	436	477	588	809	995	1180	1967	3126
1500	**350**	236	455	484	542	652	871	1083	1295	2120	3368
1600	**350**	310	597	626	685	836	1138	1403	1668	2821	4504
1700	**350**	374	721	754	818	1018	1416	1726	2036	3438	5459
1800	**350**	452	873	912	990	1231	1714	2089	2464	4160	6606
2000	**350**	690	1339	1408	1546	1868	2512	3171	3830	6314	10115
2100	**350**	791	1523	1609	1780	2134	2841	3636	4431	7288	11735
2200	**350**	910	1747	1841	2029	2475	3367	4168	4969	8099	12831
2400	**350**	1050	1995	2118	2363	2846	3812	4751	5691	9450	15089
2500	**400**	1210	2142	2275	2541	3013	3957	4882	5808	9922	15887
2600	**400**	1290	2270	2408	2683	3199	4231	5179	6128	10385	16538
2800	**400**	1420	2528	2693	3025	3512	4487	5723	6958	11502	18517

*Example values, depending on Bellows structure

Warning: Deviations (+/-25%) in the stiffness rates may occur due to use of different materials and manufacturing processes.

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TYPE 40

LATERAL STIFFNESS RATES*
(SINGLE-CORRUGATION)

DN	LENGTH BL mm	STIFFNESS RATES (AVERAGES VALUE FROM FULL WAY) 0 bar N/mm	1 bar N/mm	1,5 bar N/mm	2,5 bar N/mm	3 bar N/mm	4 bar N/mm	5 bar N/mm	6 bar N/mm	10 bar N/mm	16 bar N/mm
200	**200**	200	330	342	366	387	428	484	540	616	804
250	**200**	220	370	382	407	430	475	540	605	686	898
300	**200**	250	425	440	470	495	545	620	695	783	1020
350	**200**	280	482	497	529	556	610	696	781	882	1154
400	**250**	180	315	326	347	365	400	456	513	576	752
450	**250**	190	338	349	371	387	420	478	536	604	789
500	**250**	200	330	342	366	387	428	484	540	616	804
600	**250**	235	388	402	430	454	503	569	635	724	945
700	**250**	310	521	538	574	606	670	761	853	967	1265
750	**250**	310	527	546	583	614	676	769	862	970	1265
800	**250**	340	585	604	643	675	741	845	949	1071	1401
850	**250**	340	595	615	656	689	755	862	969	1088	1421
900	**300**	360	641	661	702	733	796	905	1015	1145	1494
1000	**300**	380	673	698	749	818	956	1020	1083	1216	1539
1050	**350**	390	605	628	675	746	889	971	1053	1201	1513
1100	**350**	395	612	636	683	756	901	984	1067	1217	1533
1200	**350**	440	724	744	783	864	1025	1111	1197	1390	1756
1300	**350**	460	724	763	842	923	1086	1180	1274	1463	1840
1400	**350**	480	724	775	878	963	1133	1231	1330	1526	1920
1500	**350**	530	885	924	1002	1088	1261	1370	1479	1707	2152
1600	**350**	645	1109	1152	1238	1342	1548	1683	1819	2090	2632
1700	**350**	710	1299	1330	1392	1508	1740	1885	2031	2308	2876
1800	**350**	445	814	834	872	945	1090	1181	1273	1446	1802
2000	**350**	890	1682	1727	1816	1952	2225	2394	2563	2919	3613
2100	**350**	886	1692	1745	1852	2002	2304	2450	2596	2835	3367
2200	**350**	1050	2016	2086	2226	2464	2940	3045	3150	3465	3990
2400	**350**	1360	2638	2802	3128	3400	3944	4114	4284	4529	5114
2500	**400**	1680	2856	2957	3158	3326	3662	4166	4670	5258	6854
2600	**400**	2035	3500	3616	3846	4043	4436	5057	5678	6410	8384
2800	**400**	2760	4830	4996	5327	5594	6127	6997	7866	8832	11537

*Example values, depending on Bellows structure

Warning: Deviations (+/-25%) in the stiffness rates may occur due to use of different materials and manufacturing processes.

Belman

TYPE 40

ANGULAR STIFFNESS TORQUE* **(SINGLE-CORRUGATION)**

DN	LENGTH BL mm	STIFFNESS TORQUE (AVERAGES VALUE FROM FULL WAY) 0 bar Nm/°	1 bar Nm/°	1,5 bar Nm/°	2,5 bar Nm/°	3 bar Nm/°	4 bar Nm/°	5 bar Nm/°	6 bar Nm/°	10 bar Nm/°	16 bar Nm/°
200	**200**	6	10	11	12	14	18	23	28	46	74
250	**200**	10	16	18	20	24	31	38	46	76	120
300	**200**	15	25	27	30	36	47	58	70	117	188
350	**200**	22	39	42	47	55	73	90	107	183	293
400	**250**	17	30	32	36	43	57	69	82	139	221
450	**250**	26	45	48	54	63	81	103	125	207	333
500	**250**	36	64	68	76	88	110	141	172	296	481
600	**250**	62	108	113	123	148	198	247	296	494	790
700	**250**	85	147	157	179	211	276	343	410	675	1074
750	**250**	99	174	186	209	246	320	399	478	805	1290
800	**250**	118	209	222	248	294	386	476	567	968	1550
850	**250**	145	255	270	301	359	475	582	688	1166	1857
900	**300**	191	341	363	408	473	605	771	938	1551	2496
1000	**300**	334	601	639	715	822	1036	1323	1610	2773	4510
1050	**350**	355	675	710	781	947	1279	1595	1911	3154	5029
1100	**350**	508	965	1016	1117	1354	1828	2281	2733	4510	7192
1200	**350**	654	1248	1320	1464	1771	2386	2932	3477	5817	9249
1300	**350**	825	1559	1636	1790	2205	3036	3733	4430	7383	11730
1400	**350**	1024	1935	2030	2221	2737	3767	4632	5497	9162	14557
1500	**350**	1252	2416	2571	2880	3464	4633	5759	6886	11269	17905
1600	**350**	1866	3592	3769	4124	5032	6849	8444	10040	16981	27114
1700	**350**	2528	4880	5099	5537	6885	9582	11681	13779	23260	36938
1800	**350**	3417	6594	6890	7483	9305	12950	15785	18621	31434	49919
2000	**350**	6395	12406	13046	14325	17309	23277	29385	35492	58513	93749
2100	**350**	8062	15520	16394	18141	21742	28944	37047	45150	74256	119567
2200	**350**	10150	19488	20537	22635	27608	37556	46488	55420	90336	143117
2400	**350**	13875	26363	27982	31219	37602	50367	62786	75204	124878	199388
2500	**400**	17315	30648	32553	36362	43116	56622	69868	83114	141987	227352
2600	**400**	19930	35077	37203	41455	49427	65371	80019	94668	160437	255504
2800	**400**	25360	45141	48100	54017	62724	80138	102202	124265	205418	330698

*Example values, depending on Bellows structure

Warning: Deviations (+/-25%) in the stiffness torque may occur due to use of different materials and manufacturing processes.