

RATO S / RATO S+

SERVICE LIFE OF HIGHLY FLEXIBLE COUPLINGS

THEORETICAL EXPECTED LIFETIME

VULKAN couplings are produced and tested under the most stringent quality controls. As a result, apart from a high level of functional safety across several hours of operation, they even offer the user a long service life of several years. The expected service life of the flexible elements is depending on the individual operating or storage conditions. Even with optimal operating or storing condition, the elastomer of the coupling ages and wears out. This results in changes in the dynamic characteristic and functional performance of the coupling over the lifetime.

Impermissible or excessively high element stresses caused by the connected machinery reduces the expected service life. The alignment of the connected parts has also an influence on the total lifetime. Hence, we recommend that you regularly inspect the elements at least twice a year. The inspection procedure should include the operating hours, the visual shape, permanent set, cracks and other signs of damage and wear. This inspection can be completed on-site by the crew referring to the data on the attached tables or by a VULKAN Technician. Additionally, we recommend to check the alignment between the connected machinery, especially with elastic mounted systems in regular terms.

Normal ageing of natural rubber causes a certain hardening and changing of dynamic properties. After 10 years, the stiffness and damping of highly flexible rubber couplings has changed significantly.

In case of changes in dynamic properties of the rubber elements we recommend, to replace them in order to ensure the function and the dynamic behavior of the drive line.

In case of impermissible cracks, the flexible elements have to be replaced. Permissible lengths and depths of cracks, permissible permanent set and the theoretical expected lifetime may be selected from the tables enclosed. For cracks in the bonding zone between rubber and metal parts the same values in the tables are valid.

VULKAN Service is also pleased to provide support in the inspection and assessment of couplings that have been installed.



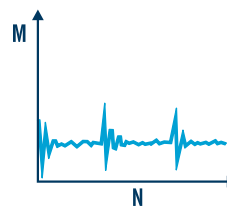
Coupling	Natural Rubber		Silicon	
RATO S	50,000 h	10 years	-	-
RATO S+	50,000 h	10 years	-	-



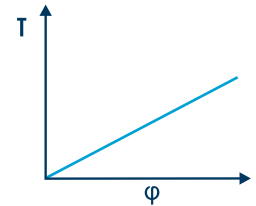
10 years service life



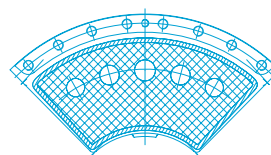
50,000 operation hours



Dynamic characteristic



Static twist angle



Tearing

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Checking the permissible permanent set of a RATO S / RATO S+ segment takes place by obtaining **S** at the outer diameter of the rubber element. Therefore, see (Figure 1 and Figure 2). In case the maximum value is reached, the flexible element has to be replaced.

Figure 1

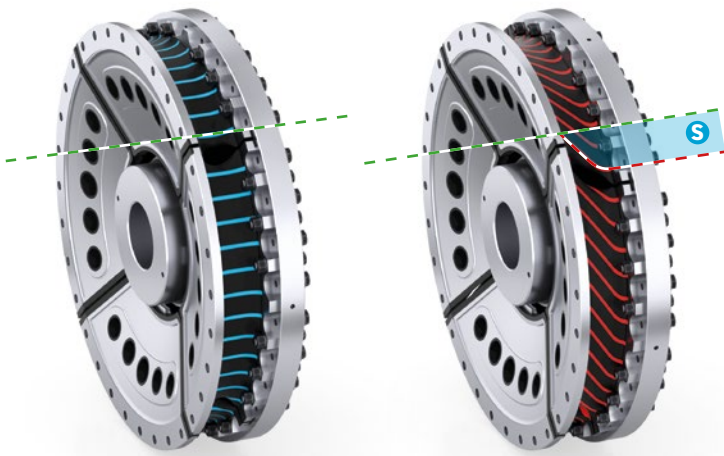
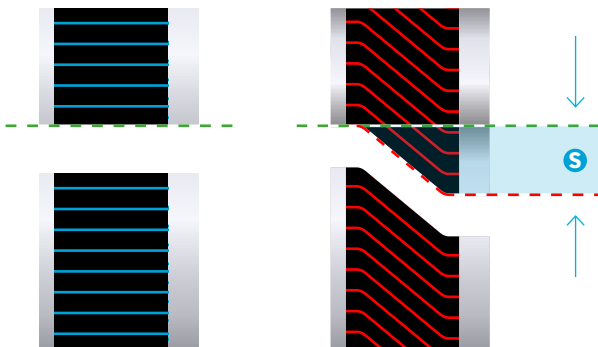


Figure 2



PERMISSIBLE PERMANENT SET RATO S

Size	S [mm]	Size	S [mm]
G 0310	50	G 3610	52
G 0510	60	G 3710	55
G 0810	72	G 3810	85
G 1210	17	G 3910	56
G 1310	19	G 4010	55
G 1410	20	G 4310	58
G 1510	21	G 4410	57
G 1610	23	G 4510	101
G 1710	25	G 4610	30
G 1810	53	G 4710	77
G 1910	26	G 4810	73
G 2010	58	G 4910	31
G 2110	29	G 5010	76
G 2210	62	G 5110	78
G 2310	30	G 5310	121
G 2410	68	G 5410	32
G 2510	33	G 5510	84
G 2610	72	G 5610	83
G 2710	33	G 5720	90
G 2810	78	G 5810	74
G 2910	36	G 6010	38
G 3010	40	G 6210	91
G 3110	41	G 6310	91
G 3210	44	G 6510	42
G 3310	42	G 6810	108
G 3410	45	G 7010	45
G 3510	46	G 7310	113

PERMISSIBLE PERMANENT SET RATO S+

Size	S [mm]	Size	S [mm]
G 4J10	73	G 5G10	83
G 5B10	78		

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As a result of the deformation, aging and load of the flexible element during normal operation, cracks may get formed that are permissible in our natural rubber elements up to a certain limit (Figure 3 and Figure 4). Depending on size, visual shape, age and location of cracks a rework by grinding and coating could be recommended in order to extend the total lifetime. Surface cracks in the flexible element of a RATO S / RATO S+ coupling are permissible, if these cracks occur on all sides of the entire rubber surface up to a depth as mentioned (Figure 3, depth X). With defined cracks predominantly in the outer rubber surface, the segment faces and segment corners the maximum allowed length and depth is mentioned in the table (Figure 4, depth Y, Z). If the permissible influenced area as a combination of the mentioned cracks is exceeded, it is recommended to replace the flexible element as soon as possible.

Figure 3

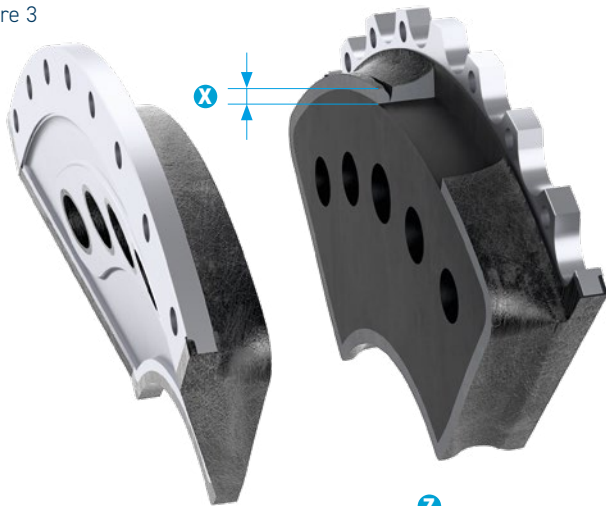
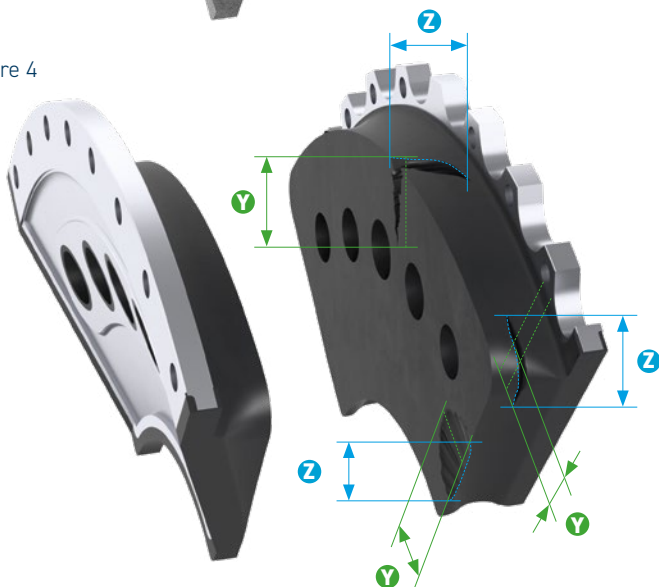


Figure 4



PERMISSIBLE DEPTHS OF CRACKS RATO S

Size	X [mm]	Y [mm]	Z [mm]	Size	X [mm]	Y [mm]	Z [mm]
G 0310	9	16	42	G 3610	14	23	62
G 0510	11	19	49	G 3710	14	23	62
G 0810	13	22	57	G 3810	15	25	67
G 1210	4	7	19	G 3910	15	25	66
G 1310	5	8	21	G 4010	15	25	66
G 1410	5	9	23	G 4310	16	27	72
G 1510	5	9	25	G 4410	16	27	72
G 1610	6	10	27	G 4510	17	29	78
G 1710	6	11	29	G 4610	17	29	78
G 1810	7	12	31	G 4710	17	29	78
G 1910	7	12	31	G 4810	17	29	78
G 2010	7	13	33	G 4910	19	32	84
G 2110	7	13	33	G 5010	19	32	84
G 2210	8	14	36	G 5110	19	32	84
G 2310	8	14	36	G 5310	20	34	91
G 2410	9	15	39	G 5410	20	34	90
G 2510	9	15	39	G 5510	20	34	90
G 2610	9	16	42	G 5610	20	34	90
G 2710	9	16	42	G 5720	21	36	96
G 2810	10	17	45	G 5810	22	37	98
G 2910	10	17	45	G 6010	22	37	98
G 3010	11	19	49	G 6210	23	39	104
G 3110	11	19	49	G 6310	23	39	104
G 3210	12	20	53	G 6510	24	40	106
G 3310	12	20	53	G 6810	25	42	112
G 3410	13	22	57	G 7010	25	43	114
G 3510	13	22	57	G 7310	28	48	126

PERMISSIBLE DEPTHS OF CRACKS RATO S+

Size	X [mm]	Y [mm]	Z [mm]	Size	X [mm]	Y [mm]	Z [mm]
G 4J10	17	29	78	G 5G10	20	34	90
G 5B10	19	32	84				

RATO S / RATO S+

SEGMENT INSPECTION SHEET

Vessel:

Date:

Location:

Running Hours:

Engine:

Power:

Speed:

Coupling:

Size:

Comm-Nr.:

Permanent set:

Engine < > Gearbox < > Shaft Generator

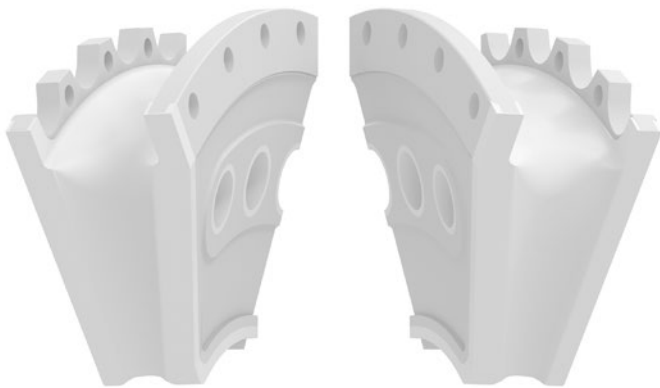
Row 1

Row 2

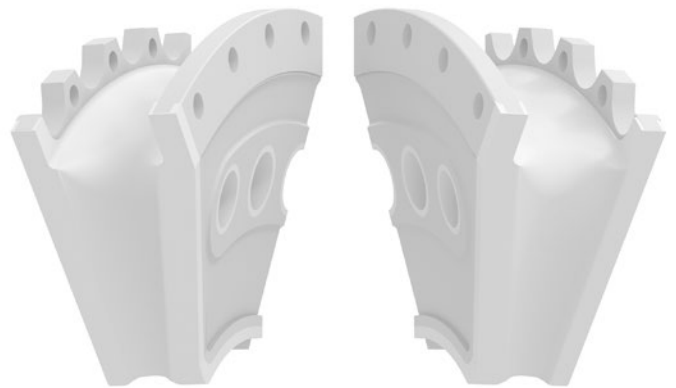
Row 3

Row 4

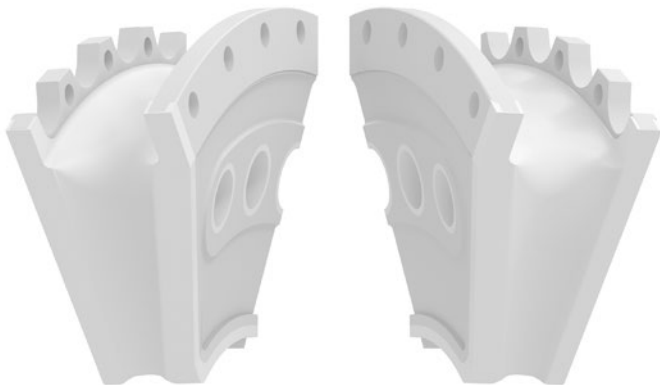
Segment no:



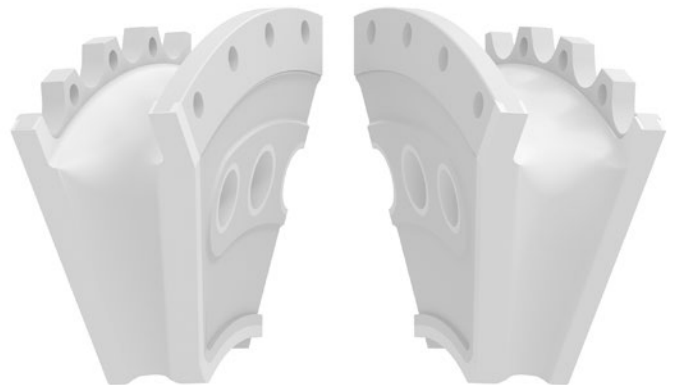
Segment no:



Segment no:



Segment no:



Please make a sketch of the cracks on the shown segments. Use one sheet for one row. Mark the cracks with "length / depth" if possible.