GMT RUBBER-METAL-TECHNIC LTD

Your Partner For Anti-Vibration and Shock Control Solutions For Railway Vehicle Applications







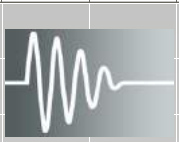


GMT RUBBER-METAL-TECHNIC LTD Tel: (+44)(0)1943 870670 Fax: (+44)(0)1943 870631 E-mail: sales@gmtrubber.com www.gmtrubber.com

Contents

GMT manufactures many thousands of rubber to metal bonded components and anti-vibration mounts for the railway industry.

Not all of these product types are contained in this catalogue — therefore, if you are unable to find the required product, please contact our sales/support team who will be pleased to assist.



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The Company

Since the company was established in 1968, the corporate identity of GMT in the field of vibration isolation and rubber to metal bonding has been developing through exposure in numerous industrial sectors including rail, construction, aerospace, marine, automotive and defence.

Having achieved growth year on year since its foundation, the GMT group now has a turnover of more than 80 million Euros, employing more than 600 people worldwide within the rubber to metal bonded products division alone.

By maintaining our clear and distinct vision for the future, GMT intends to secure its place as the leader in the industry by ensuring we meet the needs of our customers.

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GMT in the Railway Vehicle Industry

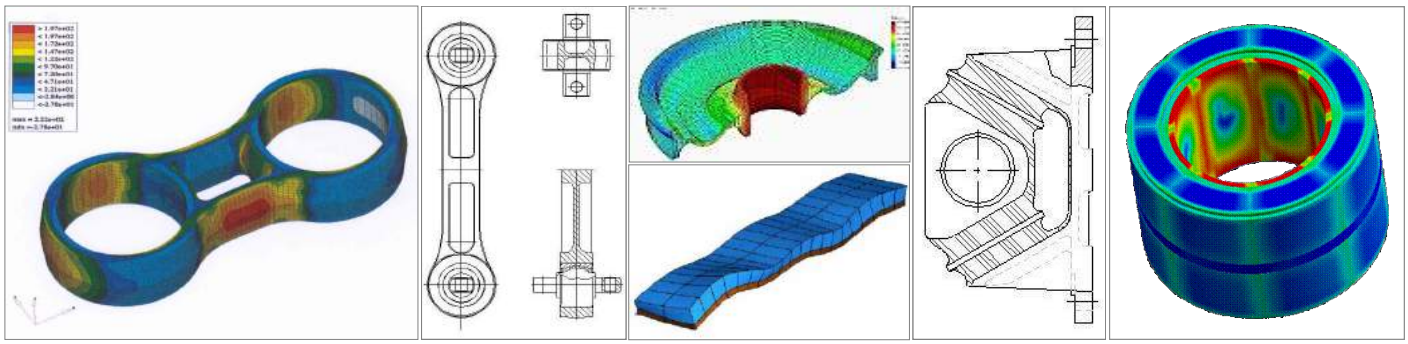
INTRODUCTION

In the last twenty years the railway vehicle industry was characterised by numerous projects, significant acquisitions, rapid growth and considerable reorganisation. Development and calculation of components and systems has tended toward being transferred to partners and suppliers. As a result of this trend, it has become essential that tier 2 and tier 3 suppliers have the respective capabilities in terms of modules (e.g FEM calculation, damage calculation, etc.) as well as the appropriate internal equipment/capacity (i.e multi-axial test facilities, creep test equipment, climate chambers, etc.).

GMT has demonstrated its abilities as a recognised development partner for companies in the railway vehicle industry and has further established itself by class leading innovation and investment activities. Specifically, GMT has invested in processes, calculation programmes and test facilities in order to be able to realise each specification, supply tender documentation and meet stipulated customer requirements. This helps to ensure that GMT establishes the most appropriate and professional solution possible.

Today GMT is one of the leading companies in the railway vehicle sector owing to its reliability, capacity and product range. GMT's quality awareness has led to an appreciation and acceptance of GMT in terms of participation during the development process as well as in fitting vehicles and bogies in final manufacture.

In the following pages you will find an extract of the GMT product range for the railway vehicle sector as well as some customer references and projects in which GMT participated during the past 25 years. We are very proud of the aforementioned and we aim to make sure that our partnership with companies within the railway vehicle sector can be maintained and expanded.



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GMT in the Railway Vehicle Industry Cont'd

PRODUCT RANGE EXAMPLES:

- Primary springs (axle/conical/rolling rubber springs)
- Primary suspension systems
- Secondary spring systems inclusive of air spring bellow and additional spring
- Steering rods
- Torque supports
- Primary/secondary spring washers
- Lateral/longitudinal stop buffers
- Pivot bearings
- Spherical bearings and bushes
- Rolling supports
- Wheel set guide elements
- Resilient wheels
- Motor and gearbox mounts

Primary Suspension

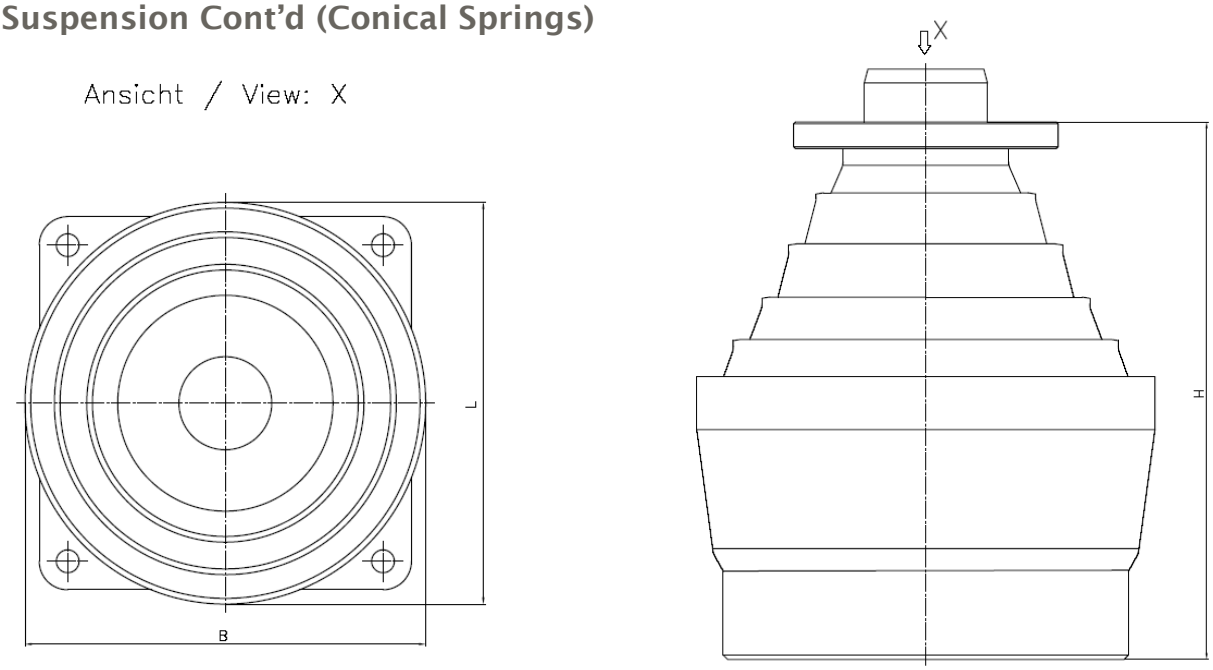
CONICAL SUSPENSION SPRINGS

GMT offer a large range of conical primary suspension mounts which can be used in various applications including body manufacturing for the bedding and suspension of the engine in the chassis frame.

They allow for considerable spring excursion and have a progressive stiffness characteristic curve. Horizontal stiffness's can be altered through the inclusion of elements with slots and buffers can be incorporated into designs to absorb additional shock loads

Example of use

Primary Suspension Cont'd (Conical Springs)

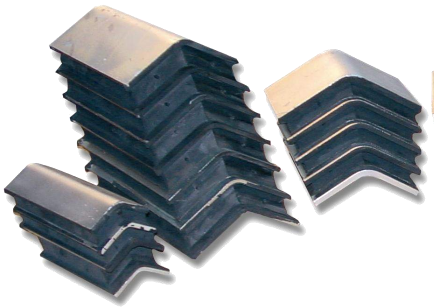


Part No.	Dimensions upon delivery			Vertical load vehicle			Spring length under tare load	Spring travel f1	Spring travel f2	Tangential stiffness
	B	L	H	tare	loaded	max.	new condition before settling	tare-max	tare-loaded	tare
	mm	mm	mm	daN	mm	daN	mm	mm	mm	N/mm
MTG2325	146	146	124	450	800	1050	87,5 1)	11,5	7	490
MTG2326	146	146	124	540	920	1300	87,5 1)	10	6	620
MTG2327	150	150	126	1150	2520	3280	73,5 1)	14	10,5	1100
MTG2328	157	157	140	1200	2480	3220	128 2)	12	9	1100
MTG2329	170	170	176	1310	2520	3280	164 1)	13,3	9,4	1070
MTG2330	173	173	173	1250	2257	3000	157 1)	16,5	11	850
MTG2331	178	178	164	1730	2420	3050	146 1)	15	9	720
MTG2332	178	178	166	1266	2197	3140	146 1)	26	16	490
MTG2333	180	180	167	1390	1950	2450	146 1)	20	11,4	445
MTG2334	180	180	169	500	850	1105	156 1)	17,2	9,7	376
MTG2335	196	196	176	1570	2670	3430	152 1)	25	16,5	620
MTG2336	196	196	189	1400	2070	2830	165 1)	23,5	12,5	520
MTG2337	200	200	233	1400	2500	3250	210 2)	21,5	14	710
MTG2338	220	155	203	1125	2300	3050	183,5 2)	22,5	16	627
MTG2339	230	230	291	2250	4100	5500	254 1)	30,5	21,8	660
MTG2340	240	240	231 *	1700	2600	3400	187 2)	20	12	690
MTG2341	250	250	235	2000	3000	4000	212 2)	24	12	800
MTG2342	257	257	288	2600	4000	5600	250 1)	30	16	800
MTG2343	260	260	304	2400	3100	4400	250 1)	30	12	510
MTG2344	260	260	249	2000	3200	4530	216 3)	33	20	600
MTG2345	264	264	268	2280	2650	4000	213 2)	27	7,4	515
MTG2346	265	265	251	1896	3311	4304	228 1)	27	17	833
MTG2347	265	265	249	1573	2985	3680	228 1)	25	17	820
MTG2348	270	270	284	4500	6230	7470	232 2)	18	12,4	1100
MTG2349	270	270	284	2500	3900	4675	240 2)	25	17,5	700
MTG2350	290	290	292	2600	3500	4550	250 2)	27	13	610

Comment
1) forward axial spring characteristic curve
2) backward axial spring characteristic curve
3) force-averaged axial spring characteristic curve from forward and backward motion
*=washer 3mm

Primary Suspension Cont'd (Axle Springs)

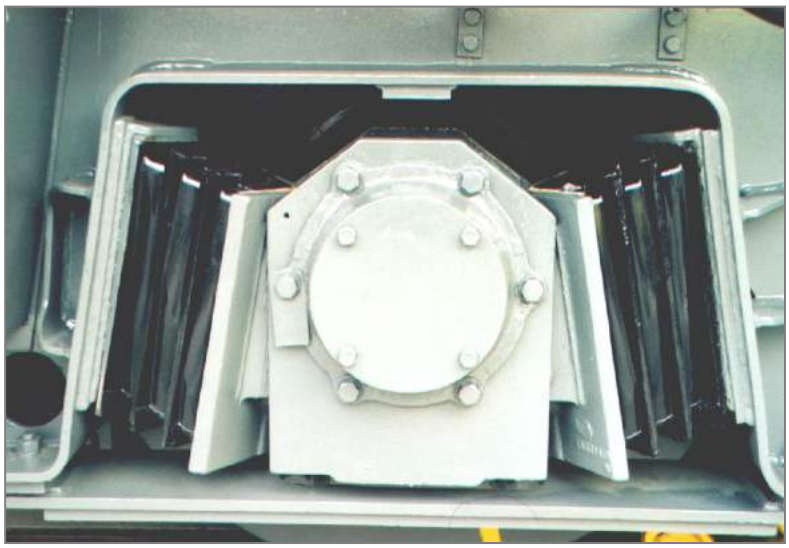
AXLE SPRINGS



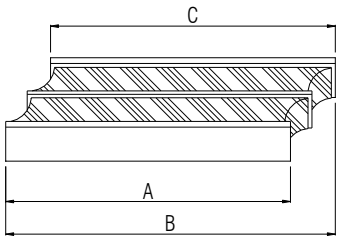
GMT offer a large range of chevron axle springs which are multi-purpose vibration reducing elements. Due to their simple installation and long life span, chevron springs are ideal for use in all types of rail vehicles.

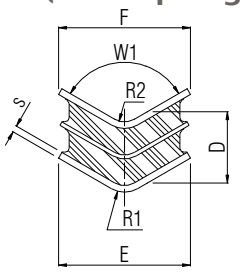
By selecting the angles and the number of intermediate spring links in conjunction with the relative angles of the chevron springs to each other, three different spring stiffness's can be produced. Furthermore, the degree of stiffness can also be varied by altering geometric dimensions of the individual layers and the rubber hardness.

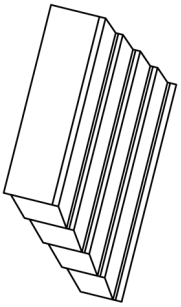
Example of use

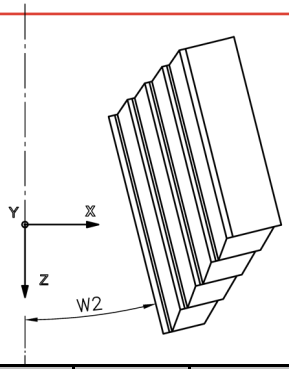


Primary Suspension Cont'd (Axle Springs)









Part No.	W1 / °	D / mm	F / mm	E / mm	C / mm	A / mm	B / mm	R1 / mm	R2 / mm	s / mm	W2 / °
AS2298	120	49,5	62,5	62,5	125	125	152	8	5	3	-
AS2292	90	57,4	84	110,3	165	152	179.3	14,5	9,5	5	20
AS2297	120	60	146	186,5	177	152	197	28	22	6	-
AS1854	120	60	146	185,5	177	152	197	28	22	6	22
AS1510	120	54	100	100	186	186	205	20	15	5	12
AS2294	120	125,4	148	193	208,8	176	208.8	25	19	6	12
AS1888	120	90	147.5	193	177.5	139.5	209	19	24	6	-
AS1589	120	90	147,5	193	178	140	209	25	19	6	-
AS1519	120	77	80	80	182	152	214	10	15	5	-
AS2305	90	84	84	110,3	203	190	217.3	14,5	9,5	5	20
AS2313	120	114	146	201	127	178	218	32	24	5	-
AS2299	120	94	120	120	213	200	235	22	16	6	15
AS1517	120	179	184	270	292	203	241	32	26	8	22
AS2310	120	72	100	100	186	186	247	20	15	5	5
AS2317	120	114	141	196	216	165	247	16	11	5	-
AS1511	120	54	100	100	216	216	250	20	15	5	-
AS2308	120	94,5	120	120	220	200	251	22	16	6	8
AS2311	120	94,5	120	120	220	200	252.5	22	16	6	8
AS2319	120	94,5	120	136	208	200	258	22	16	6	12
AS2314	120	109,8	139,3	201,5	240	195	260	16	11	5	-
AS1512	120	94,5	120	120	213	200	263	22	16	6	-
AS2301	120	91,5	120	120	213	200	263	20	16	4	11
AS2306	107	116	157	233	215	165	263	31	25	7	-
AS2318	120	95	120	136	213	200	263	22	16	6	12
AS2309	120	107,4	130	130	232	217	273	22	16	6	8
AS1346	120	115	137	176	194	248	286	25	20	5	11
AS1365	120	67	125	125	248	248	294	14	20	6	10
AS2324	120	90,6	135	135	266	260	302	22	16	12	7,5
AS1514	120	93	145	145	250	246	307	22	16	6	10
AS2303	120	93	145	145	250	246	307	22	17	6	-
AS2304	120	93	145	145	250	246	307	22	17	6	12
AS2307	120	93	145	145	246	246	307	22	16	6	10
AS2293	106	149	150	251	282	177	311	31	25	6	11
AS2300	120	121	160	160	255	255	315	23	20	6	-
AS1513	120	94,5	125	120	248	248	329	22	16	6	-
AS2316	120	161,7	159	159	255	255	335	23	20	6	-
AS2322	106	151,5	151,7	252,4	273	203	337	31	25	6	12
AS2296	120	57,5	100	100	310	310	340	20	14	6	-
AS1965	106	133	167	252	308	216	340	32	26	8	22
AS2323	120	193	160	160	268	234	363	25,4	19,4	6	10
AS1518	120	193	160	260	267	235	363	25.4	25.4	4.5	-
AS1516	120	150	193	230	303	258	365	57	15	9	10
AS2312	120	150	218	218	295	295	370	29	21	6	10
AS2315	120	146	220	218	295	295	370	29	21	6	10
AS2320	120	146	220	218	295	295	370	29	21	6	10
AS2321	120	139	160	160	300	340	374	24	16	8	10
AS2251	120	111,5	170	235	344	300	377	45	16	9	14
AS2302	120	158,5	250	250	356	356	419	20	18	8	10
AS2295	120	139	178	220	325	330	420	28	20	8	14

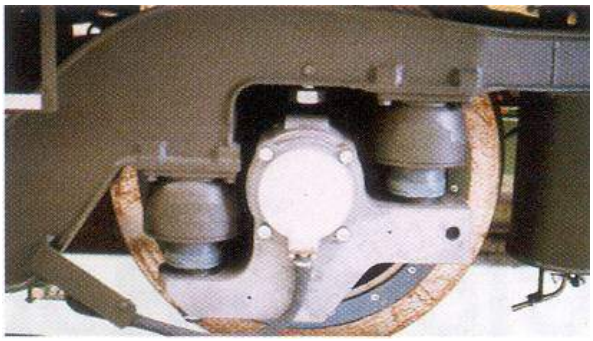
Primary Suspension Cont'd (Rolling Rubber Springs)

ROLLING RUBBER SPRINGS

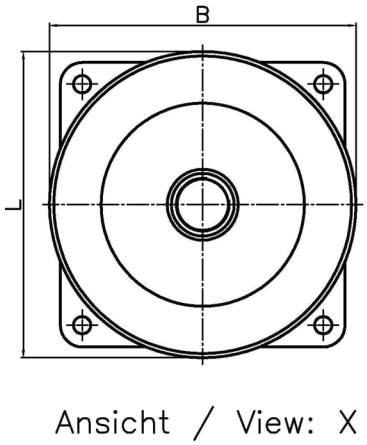
GMT offer a large range of rolling rubber mounts which are vibration dampening elements consisting of a rubber ring, a tapered insert and a metal housing. The metal parts and the rubber ring are not bonded together by vulcanisation.

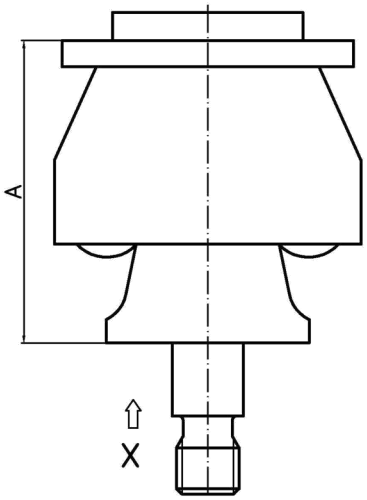
Roller springs are used for dampening vibrations in rail vehicles. The characteristics of roller springs can be varied as required within their permissible capacity. Load capacities range from 20 to 80kN with suspension travel ranging from 60 to 120mm.

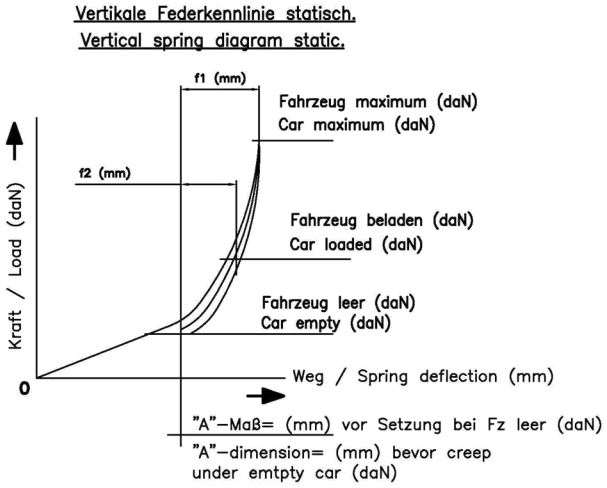
Example of use



Primary Suspension Cont'd (Rolling Rubber Springs)







Part No.	Dimensions upon delivery			Vertical load vehicle			Spring length under tare load [A]	Spring travel f1	Spring travel f2
	B	L	A	tare	loaded	max.	new condition before settling	tare-max	tare-loaded
	mm	mm	mm	daN	daN	daN	mm Tol: ±3mm	mm Tol: ±3mm	mm
RS2351	190	190	220	1530	1794	2300	155	17	8
RS2352	200	200	191	1545	2365	3365	148	18	8
RS2353	200	184	187	1025	1537	2000	147	18	13
RS2354	200	184	194	407	1032	1350	175	18	15
RS2355	200	184	166	407	1032	1350	147	18	15
RS2356	210	210	205*	1224	2245	2500	219	22	20
RS2357	210	210	219*	1304	2177	2720	205	26	16
RS2358	220	220	235*	2027	3322	4318	222	31	22
RS2359	220	220	233*	1898	3090	3862	218	28	20
RS2360	220	220	233*	1579	2968	3709	218	36	28
RS2361	220	220	245*	1740	2387	3103	225	24	15
RS2362	220	220	244*	1838	2625	3413	239	21	13
RS2363	225	225	266*	2884	4000	4512	236	19	12
RS2364	225	225	278*	3300	3700	4810	248	14	5
RS2365	225	225	320*	900	3750	4875	291	60	50
RS2366	229	229	312*	2300	4330	5918	275	25	17
RS2367	245	245	265	2200	2700	3500	182	20	10
RS2368	300	265	405	2700	4500	6300	318	48	34
RS2369	300	265	409	2125	3250	4225	345	31	20
RS2370	304	363	162	1865	3540	4071	107	37	30
RS2371	360	300	246	1849	3290	5266	189	42	22
RS2372	360	480	293	3065	3815	5781	223	48	8
RS2373	360	303	249	2150	4305	6780	191	40	28
RS2374	453	460	299	3536	6283	7226	210	46	35
RS2375	453	460	300	3400	7300	11800	200	62	46
RS2376	453	460	250	3948	5808	6679	194	47	35
RS2377	616	460	277	2650	4950	7000	213	57	35

* = prestressed

Primary Suspension Cont'd (Rolling Rubber Springs)

Part No.	Dimensions upon delivery			Vertical load vehicle			Spring length under tare load [A]	Spring travel f1	Spring travel f2
	B	L	A	tare	loaded	max.	new condition before settling	tare-max	tare-loaded
	mm	mm	mm	daN	daN	daN	mm Tol: ±3mm	mm Tol: ±3mm	mm
RS2431	199	199	272*	1397	2333	3033	240	24	15
RS2432	199	199	266*	828	1342	1745	240	24	15
RS2433	199	199	265*	1260	1900	2470	240	24	15
RS2434	199	199	265*	800	1150	1500	240	24	15
RS2435	200	184	200	1060	1523	1980	162	15	10
RS2436	220	220	272*	1043	1809	3516	252	47	28
RS2437	220	220	245*	1138	1733	2253	224	33	22
RS2438	220	220	245*	1484	2088	2715	224	30	20
RS2439	220	220	254	1625	2875	3740	203	27	19
RS2440	225	225	309*	3375	4250	5525	264	15	8
RS2441	225	225	309*	3125	3625	4713	269	13	5
RS2442	225	225	322*	2400	3900	5460	269	33	20
RS2443	225	225	347*	1500	3050	4270	293	47	36
RS2444	225	225	287*	2750	3500	4550	255	22	12
RS2445	225	225	286*	1758	2512	3266	274	32	20
RS2446	280	280	237*	2200	4000	7000	218	41	25
RS2447	300	265	340*	2450	3150	4095	330	28	10
RS2448	300	265	411	3200	4565	5935	320	32	18
RS2449	300	265	416	3065	4375	5690	327	33	18
RS2450	300	265	390	2500	3750	4875	323	33	20
RS2451	300	265	410	2275	3500	4725	340	36	21
RS2452	300	265	350*	5250	5750	7475	306	9	3
RS2453	300	265	407	2980	4370	6555	309	32	16
RS2454	300	265	405	3750	4080	6120	303	20	5
RS2455	300	265	406	2980	4905	6555	309	32	24
RS2456	304	363	176	1865	3540	4071	107	42	34
RS2457	360	300	248	1634	3394	3903	190	40	32
RS2458	360	480	290	4660	6497	7471	326	35	22
RS2459	368	368	421*	4130	7000	9000	365	45	30
RS2460	380	300	350	3740	5592	6430	342	30	26
RS2461	453	460	297	3470	5328	6127	194	38	28
RS2462	453	460	300	3303	5604	6445	204	40	28

* = prestressed

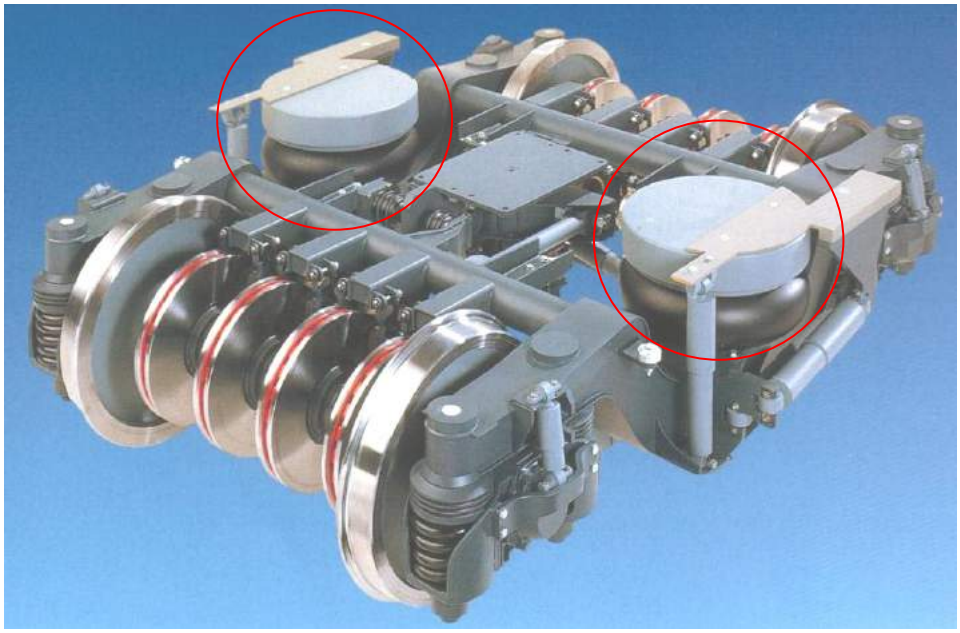
Secondary Suspension (Air Spring)

AIR SPRINGS

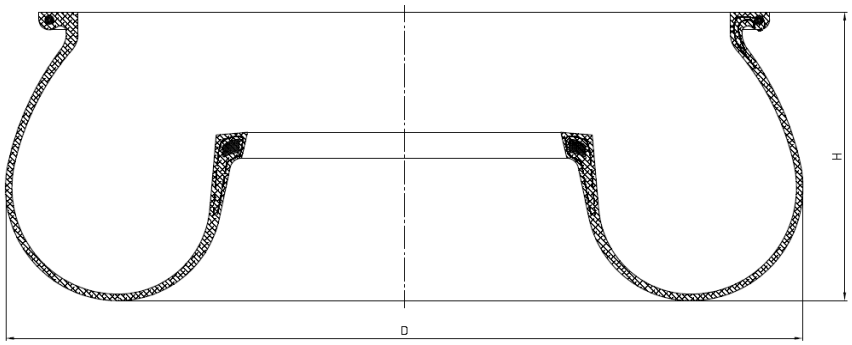
GMT offer a large range of air springs and can manufacture air springs to meet customers individual requirements. As an approved supplier to numerous major OEM's, GMT has gained a reputation in the industry for providing high quality products which is imperative for the railway industry.

GMT Air Springs provide high torsional, horizontal and conical displacements giving a low frequency ride characteristic for various conditions.

Air Springs can be supplied complete with additional secondary rubber springs, which provide suspension in case of air supply defect or leakage



Secondary Suspension Cont'd (Air SpringS)



Part No.	D	H	Carrying capacity		Axial stiffness		Radial stiffness	
BAG2378	474	166	40 kN (2bar)	80 kN (6bar)	116 N/mm (2bar)	378 N/mm (6bar)	74 N/mm (2bar)	83 N/mm (6bar)
BAG2379	480	130	41 kN (2bar)	81 kN (6bar)	145 N/mm (2bar)	286 N/mm (6bar)	90 N/mm (2bar)	42 N/mm (6bar)
BAG2380	492	144	37 kN (2 bar)	88kN (6 bar)	397 N/mm (2 bar)	804 N/mm (6 bar)	44 N/mm 2 (bar)	41 N/mm (6bar)
BAG2381	494	143	34 kN (2bar)	81 kN (6bar)	240 N/mm (@50kN)	355 N/mm (@80kN)	90N/mm (@50kN)	100 N/mm (@80kN)
BAG2382	658	245	35 kN (2bar)	132kN (6 bar)	160 N/mm (2bar)	418 N/mm (6 bar)	85 N/mm (2 bar)	120 N/mm (6bar)
BAG2383	682	240	-	-	317 N/mm (2bar)	516 N/mm (6bar)	132 N/mm (2bar)	245 N/mm (6bar)
BAG2384	694	246	38 kN (2bar)	137kN (6bar)	351 N/mm (2bar)	580 N/mm (6bar)	127 N/mm (2bar)	164 N/mm (6bar)
BAG2385	700	240	37 kN (2bar)	140 kN (6bar)	436 N/mm (2bar)	891 N/mm (6bar)	150 N/mm (2bar)	260 N/mm (6bar)
BAG2386	358	240						
BAG2387	498	133						
BAG2247	502	175						
BAG2388	543	181						
BAG2389	578	190						
BAG2390	584.5	138						
BAG2391	590	146						
BAG2392	598	142						
BAG2393	600	175						
BAG2394	600	175						
BAG2395	612	192						
BAG2396	630	192						
BAG2397	660	185						
BAG2398	685	190						
BAG2399	692	190						
BAG2400	698	192						
BAG2401	698	192						
BAG2256	725	270						
BAG2402	750	225						
BAG2403	800	190						
BAG2404	836	180						

measured values can be provided on request

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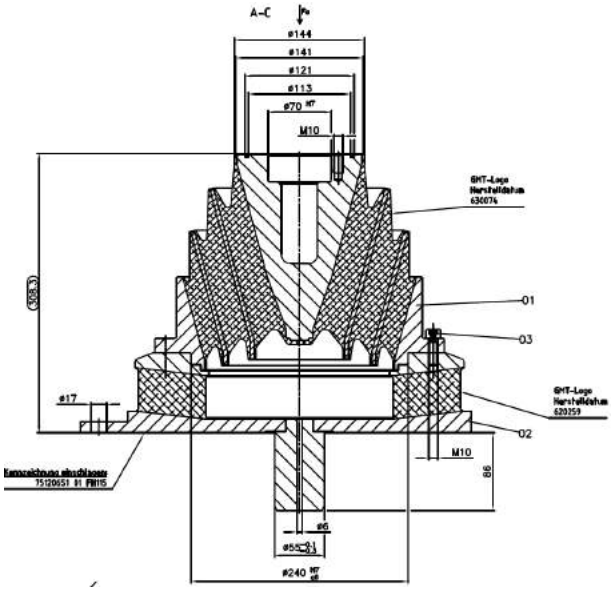
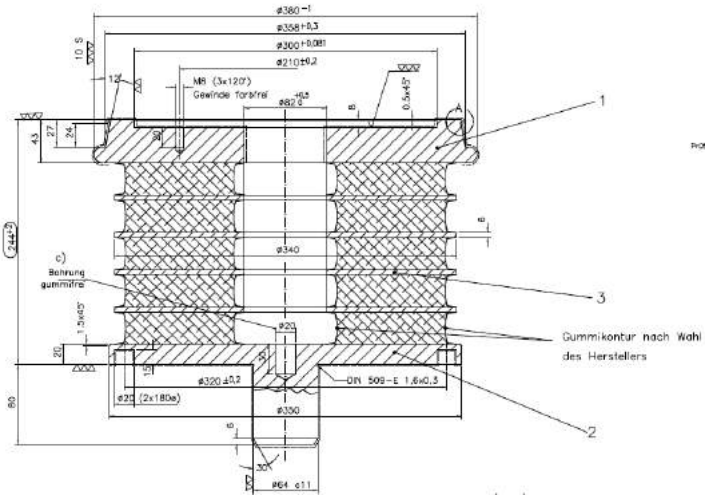
Secondary Suspension Cont'd (Additional Spring)

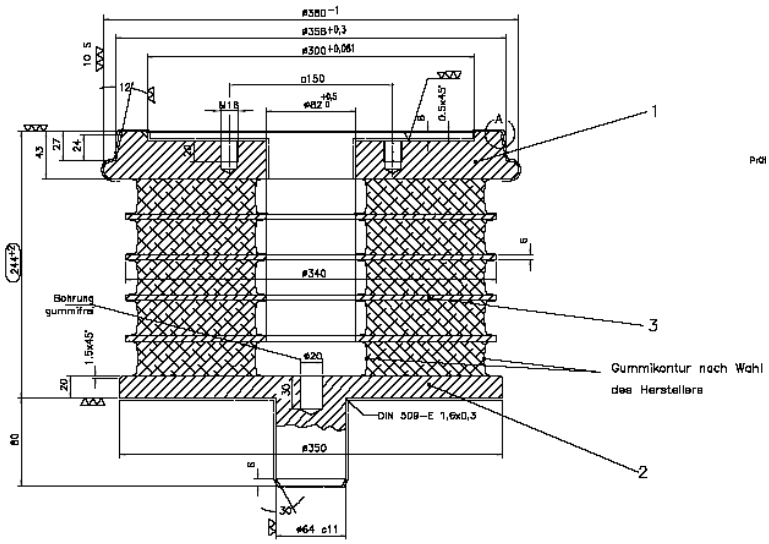
ADDITIONAL SPRINGS

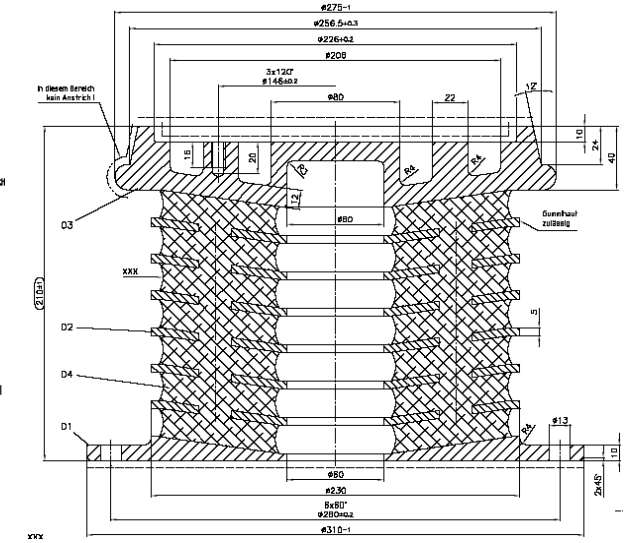
In case of defect of the air supply or leakage of the air spring the function is taken over by additional spring mechanisms. Horizontal deflections in this case are taken over by sliding plates on which the air spring plate sinks down. Vertical suspension as well as partially transverse suspension is taken over by rubber springs acting as an additional spring.

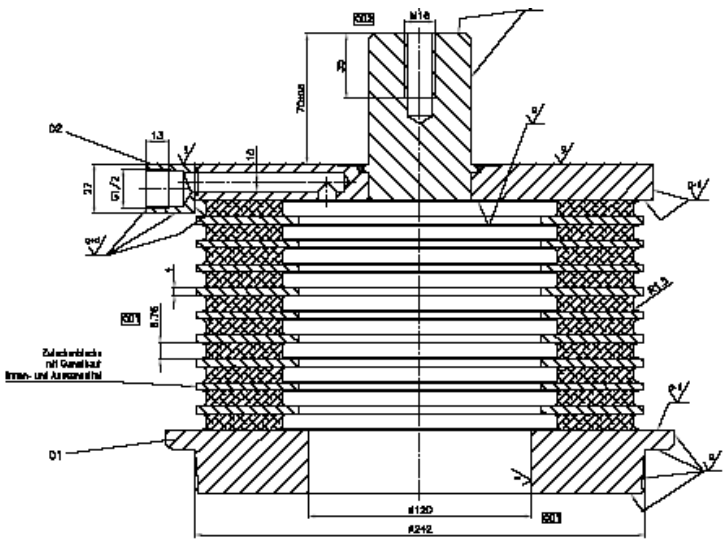
Secondary Suspension Cont'd (Additional Spring)

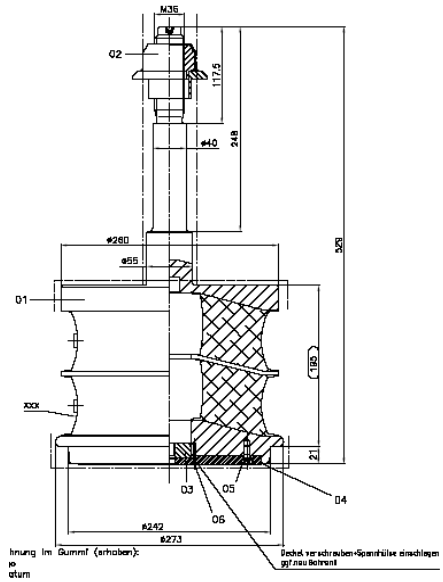




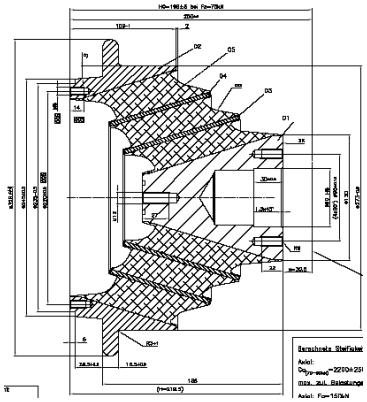


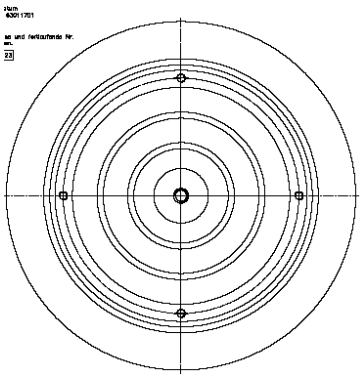


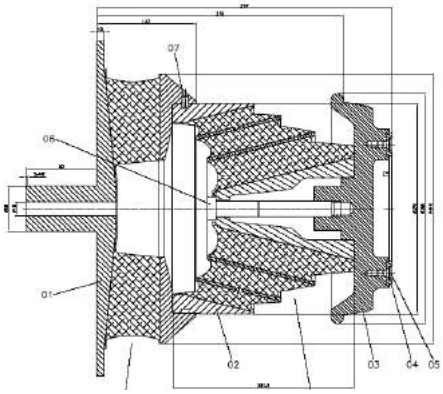


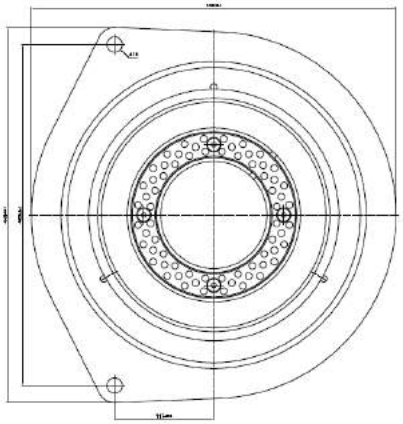


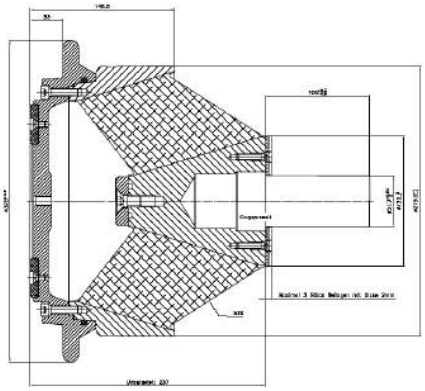
Secondary Suspension Cont'd (Additional Spring)

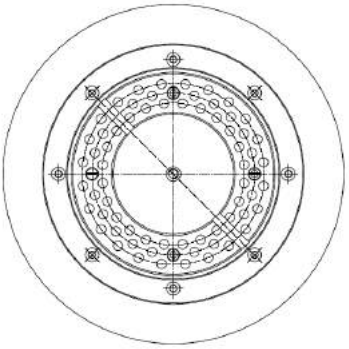


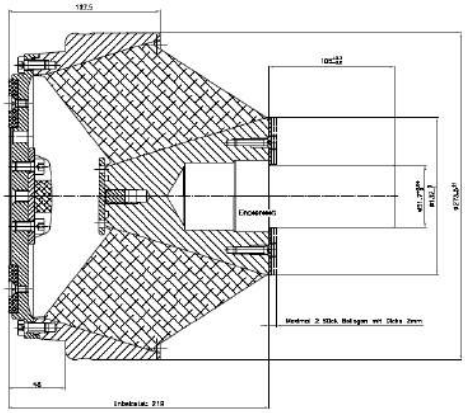


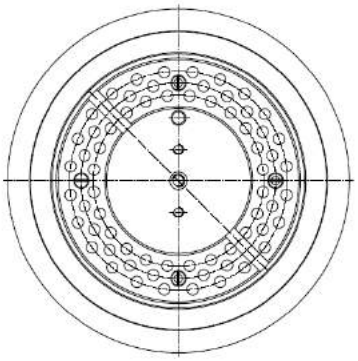












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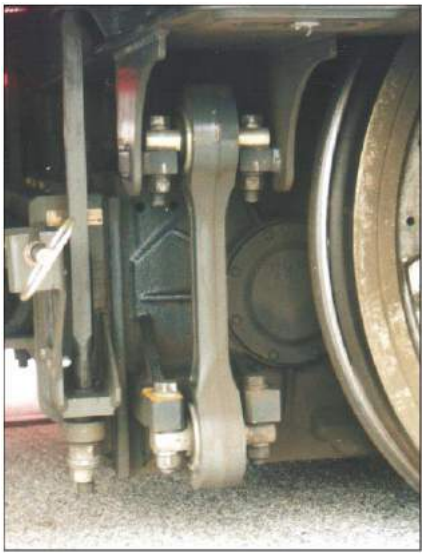
Control Links

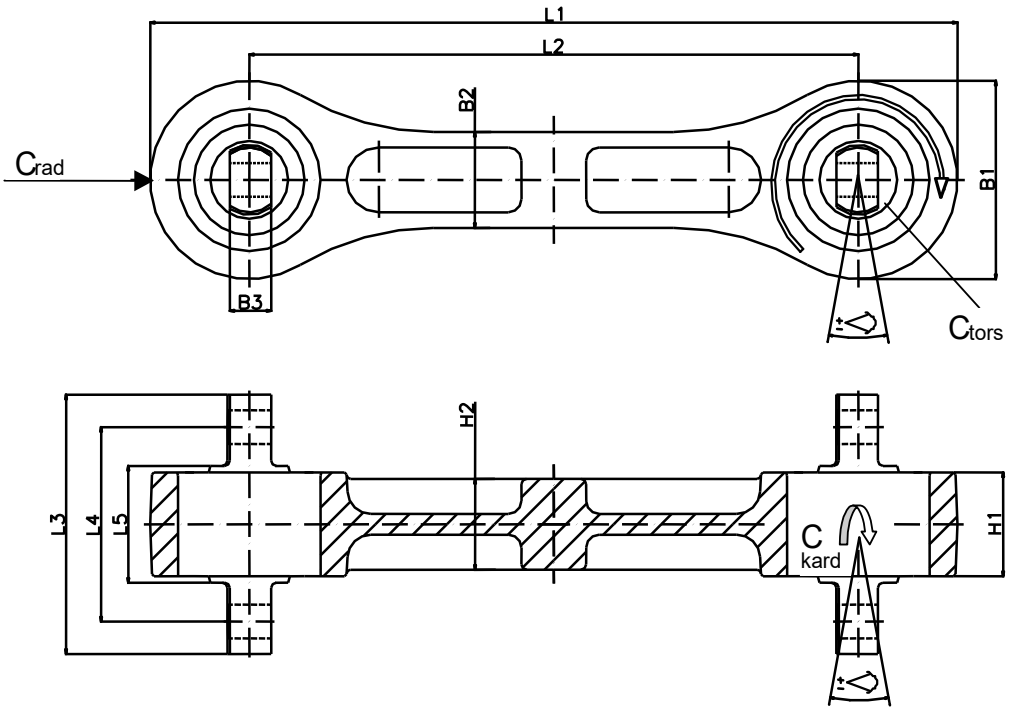
CONTROL LINKS

GMT Control Links provide axle location and resistance to braking and traction forces. Control links can be supplied in various lengths and configurations complete with Spherical Bearings or Bushes to suit loading requirements.

Example of use



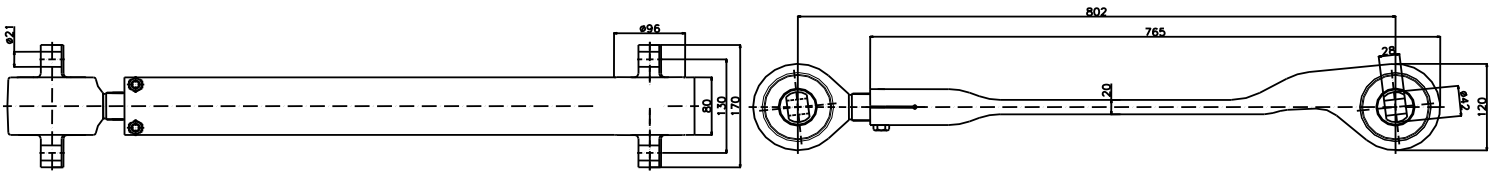
Control Links Cont'd



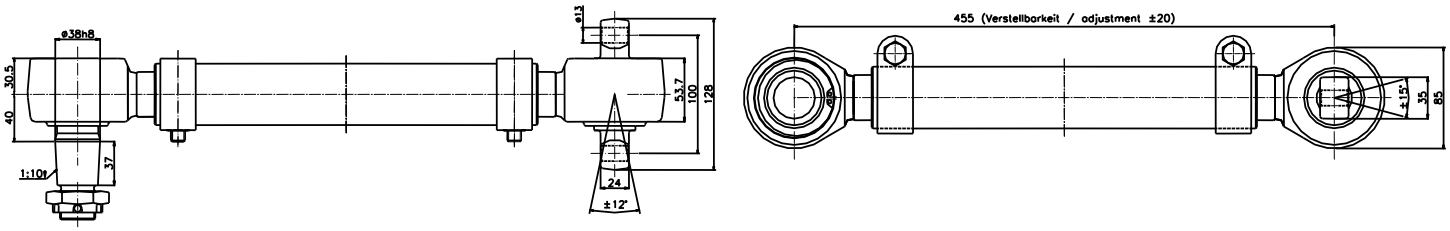
Part No.	Dimensions of deflection		Hardness of Rods	Stiffnesses		
	L2	L4		Crad.	Ctors.	Ccard.
	[mm]		ShA	[kN/mm]	[Nm/°]	[Nm/°]
TA2405	171	90	75	90	-	-
TA2406	320	120	60	35	45	36
TA2407	380	130	60	12,5	-	33
TA2408	450	170	71	12	-	-
TA2409	450	170	73	13	50	28
TA2410	450	170	75	13	60	40
TA2411	450	170	75	13	60	40
TA2412	470	150	72	42,5	134	87,2
TA2413	475	130	45	47	120	86
TA2414	475	130	60	50	-	34
TA2415	500	150	65	80	-	-
TA2416	500	130	57	47	120	86
TA2417	528.5	155	58	35	45	36
TA2418	590	190	60	83	-	-
TA2419	625	165	63	35	300	270
TA2420	700	165	72	16	152	88
TA2421	740	158	71	115	1160	720
TA2422	740	158	70	180	-	-
TA2423	740	158	71	180	-	-
TA2424	1240	165	72	16	152	88

Hardnesses/stiffnesses are taken from latest versions. They can be varied.

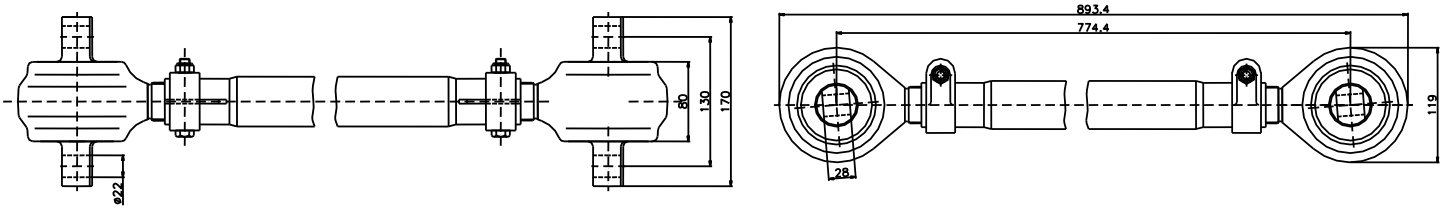
Control Links Cont'd (Special Design)



		Stiffnesses			Permissible loads		
Part No.	Hardness ShA	Crad. [kN/mm]	Ctors. [Nm/°]	Ccard. [Nm/°]	Frad. [kN]	tors. angle [°]	tors. angle [°]
TA2425	65	10	80	220	50	3	5

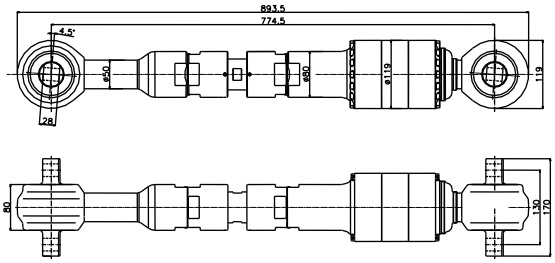


		Stiffnesses			Permissible loads		
Part No.	Hardness ShA	Crad. [kN/mm]	Ctors. [Nm/°]	Ccard. [Nm/°]	Frad. [kN]	tors. angle [°]	tors. angle [°]
TA2426	80	13	/	/	20	25	/

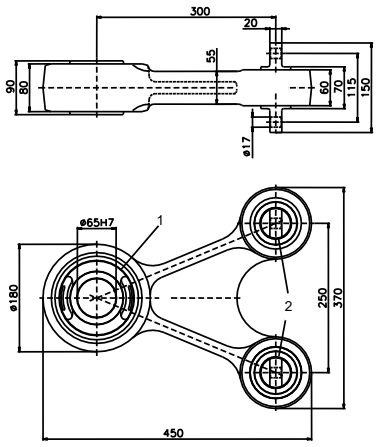


		Stiffnesses			Permissible loads		
Part No.	Hardness ShA	Crad. [kN/mm]	Ctors. [Nm/°]	Ccard. [Nm/°]	Frad. [kN]	tors. angle [°]	tors. angle [°]
TA2427	70	105	/	/	80	/	/

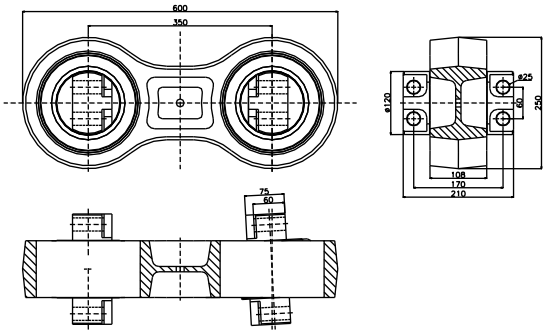
Control Links Cont'd (Special Design)



Part No.	Hardness ShA	Stiffnesses Crad. [kN/mm]	Ctors. [Nm/°]	Ccard. [Nm/°]	Permissible loads Frad. [kN]	tors. angle [°]	tors. angle [°]
TA2428	72	55	210	390	70	3	5



Part No.	1. Bush Hardness ShA	Stiffness Cxrad [kN/mm]	Cyrad [kN/mm]	Ctors [Nm/°]	Ccard [Nm/°]	Permissible loads Fxrad [kN]	Fyrad [kN]	tors [°]	conical [°]	2. Spherical Bearing Hardness ShA	Stiffness Crad [kN/mm]	Ctors [Nm/°]	Ccard [Nm/°]	Permissible loads Frad [kN]	tors [°]	conical [°]
TA2429	75	7,5	30	100	42	45	42	/	3	72	65	64	42	50	/	5



Part No.	Hardness ShA	Stiffnesses Crad. [kN/mm]	Ctors. [Nm/°]	Ccard. [Nm/°]	Permissible loads Frad. [kN]	tors. angle [°]	conical. angle [°]
TA2430	71	214	/	730	150	/	5

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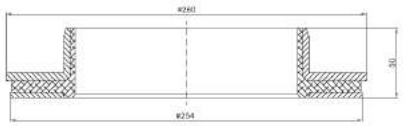
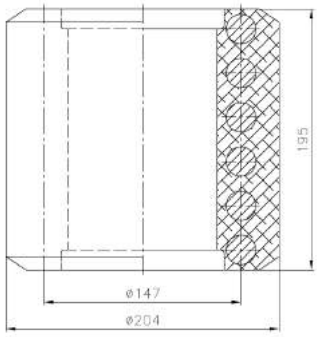
Additional Products for the Railway Industry

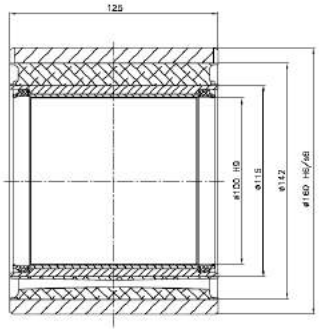
Beside product categories afore mentioned there are further numerous elements and systems used in bogie/chassis in order to reduce vibration. Below are some examples of additional products:

PRIMARY/SECONDARY SPRING WASHERS

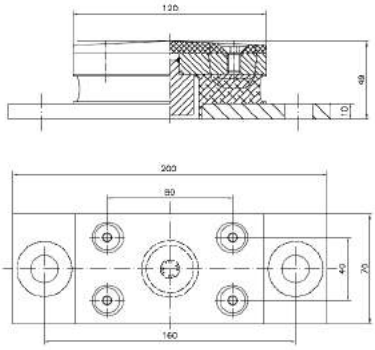


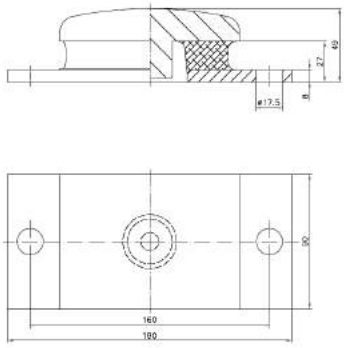
PIVOT BEARINGS



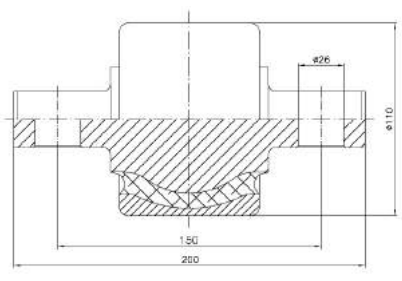


LATERAL/LONGITUDINAL STOP BUFFERS

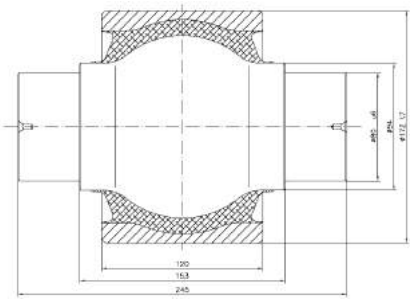




SPHERICAL BEARINGS



641002



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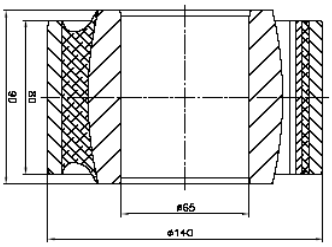
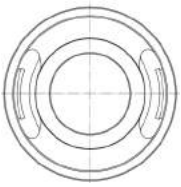
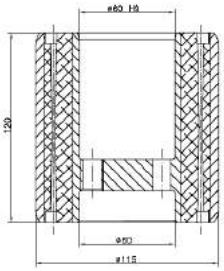
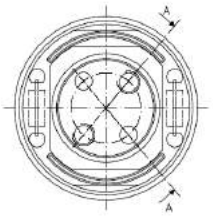
Additional Products for the Railway Industry Cont'd

BUSHES

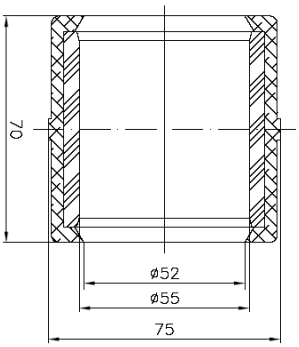


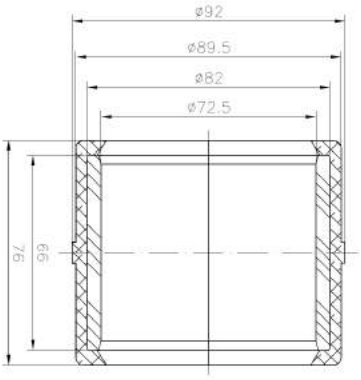




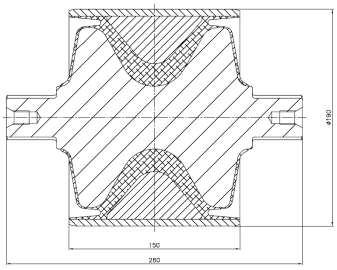


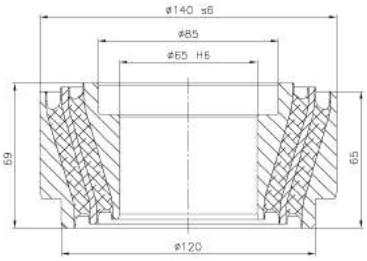
ROLLING SUPPORTS

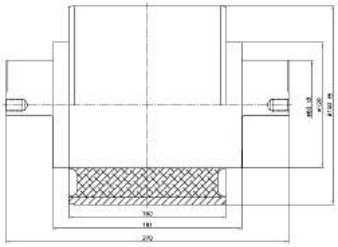




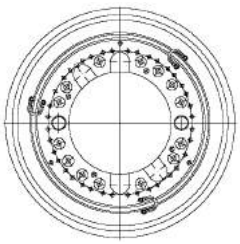
WHEELSET GUIDE ELEMENTS



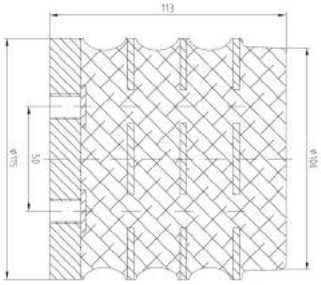


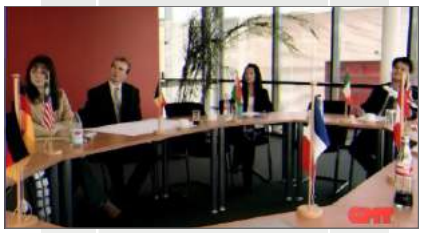


RESILIENT WHEELS



BUFFERS





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