

The BMW Motorcycle — Telescopic Forks

Documentation for the BMW Service Training School

BMW Motorrad GmbH + Co.
Service Promotion



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The telescopic front forks have a guide or mounting tube which turns freely but without play on two taper roller bearings in the steering head of the motorcycle frame. The guide tube is connected to the two hard chromium plated fixed fork tubes by a steel upper bridge and a forged aluminium lower bridge.

Aluminium slider tubes move up and down over the fixed fork tubes, and have a threaded union in the base to which the damper tube is connected.

The load is borne by progressive-rate coil springs resting at the bottom on the damper piston and at the top against fixed upper spring mounts.

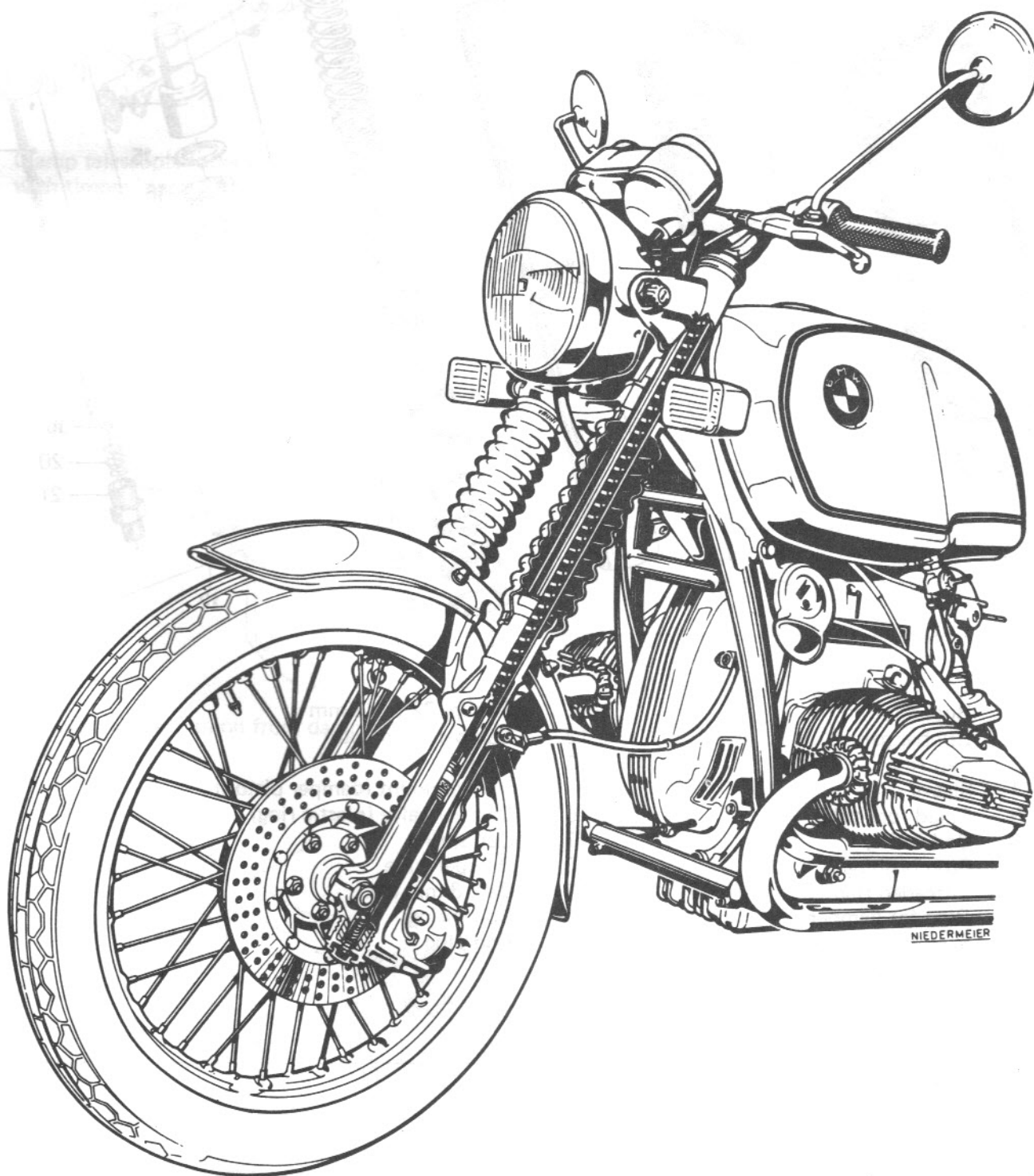
Depending on the use to which the motorcycle is put, the operating conditions and the weight of accessories or fairings mounted on it, the spring and damper rates can be chosen for optimum ride and handling.

The telescopic forks have a steering lock angle of 42 degrees to left and right (only 35 degrees on the R 100 RS).

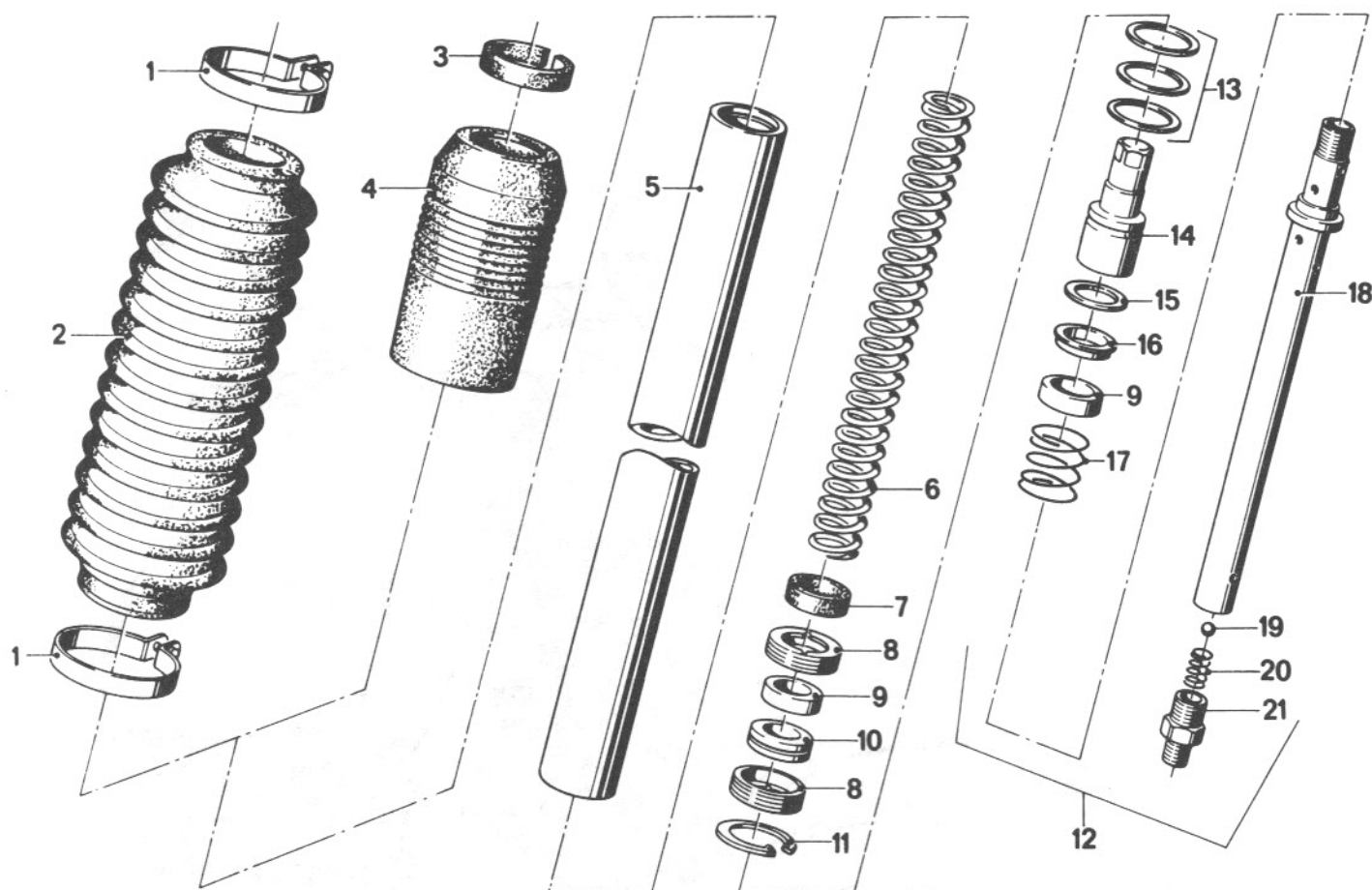
Instructions for removal from motorcycle

- Remove the front wheel.
- Remove the mudguard.
- Disconnect the earth (ground) lead.
- Detach the cockpit or full fairing (depending on model).
- Detach the handlebar grips and handlebars.
- Detach the headlight.
- Detach the upper fork bridge.
- Remove the swing brake caliper (leaving the pipe connected).
- Unscrew and remove the slotted nut.
- Pull out the forks and remove from the motorcycle frame.

1.0 Telescopic forks — R 50/5 - R 100 RS
(up to 1980 model)



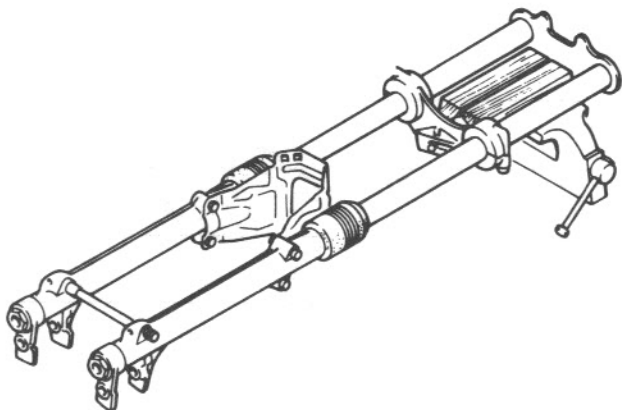
1.1 Springs and dampers for telescopic forks — R 50/5 - R 100 RS
(up to 1980 model)



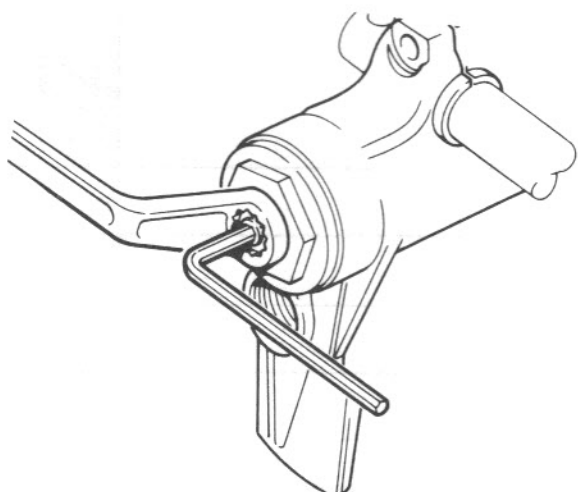
- 1 Hose clip
- 2 Rubber gaiter
- 3 Felt ring
- 4 Sleeve
- 5 Fixed fork tube
- 6 Coil spring
- 7 Stop bushing
- 8 Threaded ring
- 9 Ring for damper
- 10 Ring for increased damping (tension phase)

- 11 Circlip, 32 x 1.2 mm
- 12 Damper, complete
- 13 Shim
- 14 Spring mount (damper piston)
- 15 Damper valve (plastic ring)
- 17 Coil spring
- 18 Damper tube
- 19 Ball, 8 mm dia.
- 20 Coil spring
- 21 End plug

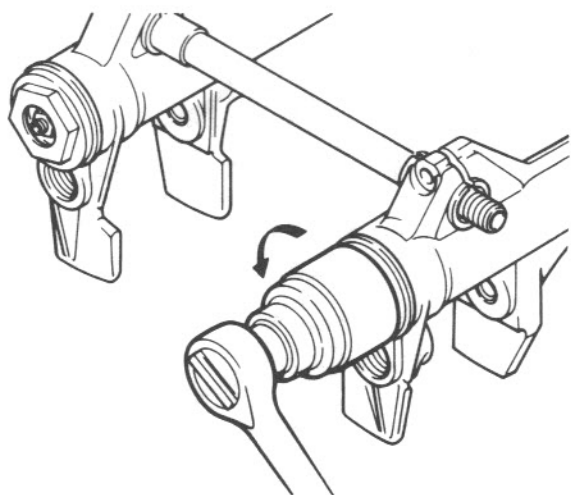
1.2 Telescopic forks – stripping down



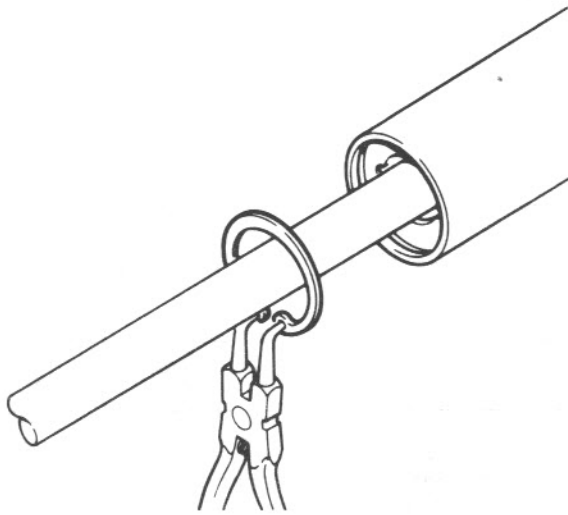
Clamp telescopic forks into vice with timber block 31 4 600.



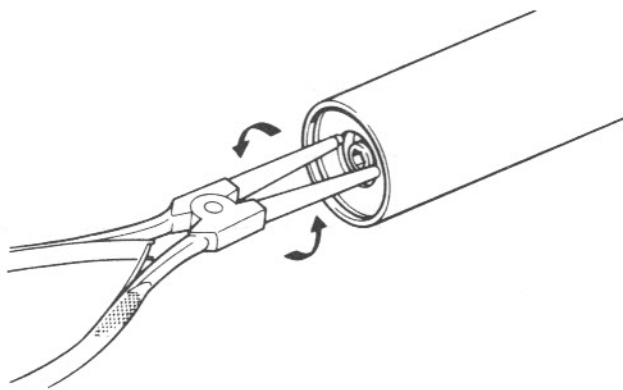
Remove threaded union from damper tube.



Take off bottom threaded union and pull off slider tube.

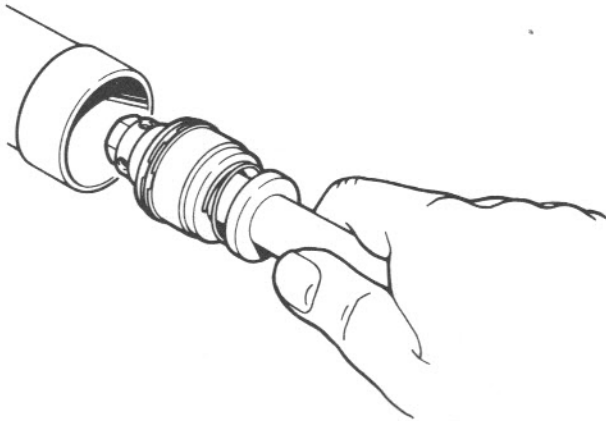


Remove circlip.



Remove threaded rings and damper jet.
Pull out damper tube.

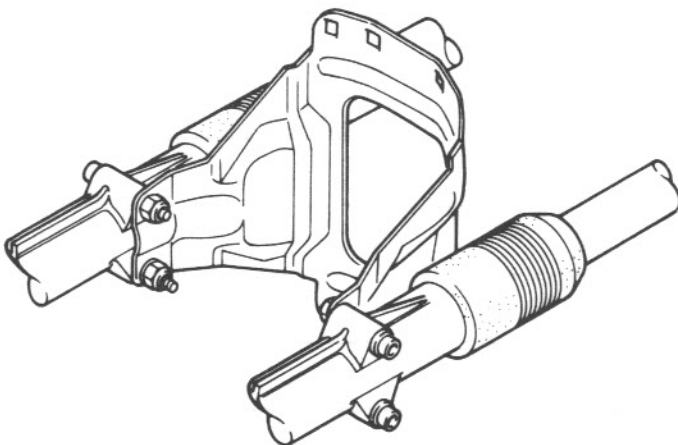
1.3 Telescopic forks — assembly



When installing the damper, use assembly bushing 31 4 700.



Drive in slider tube sealing ring with special tool 31 4 650.

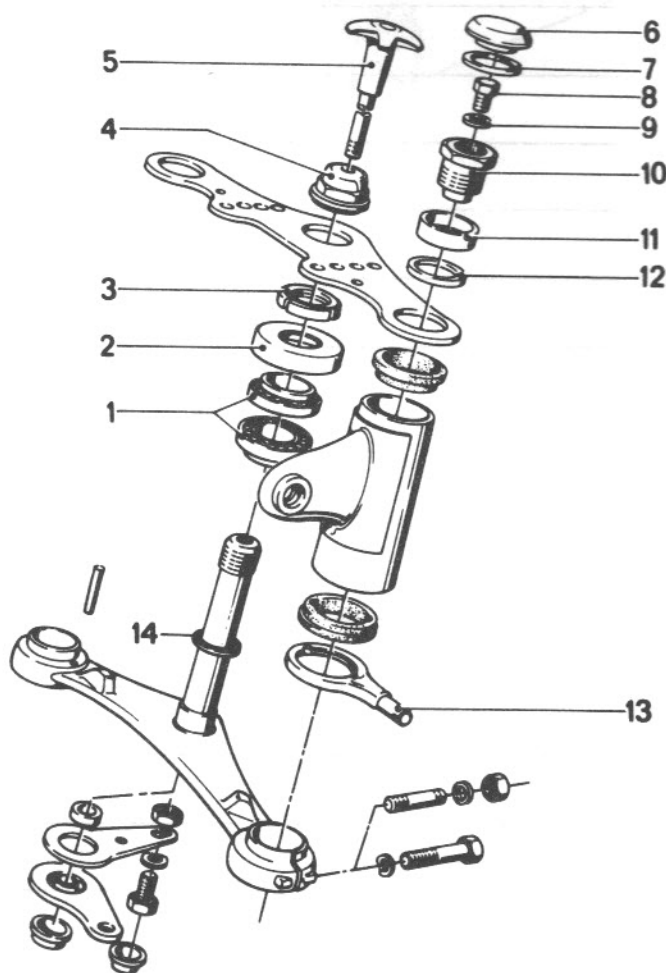


Install the shaped sheet-metal hoop with the quick-release axle in position, to prevent trapped stresses.

1.4 Springs and dampers for telescopic forks

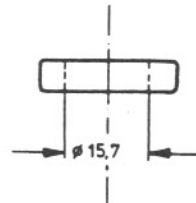
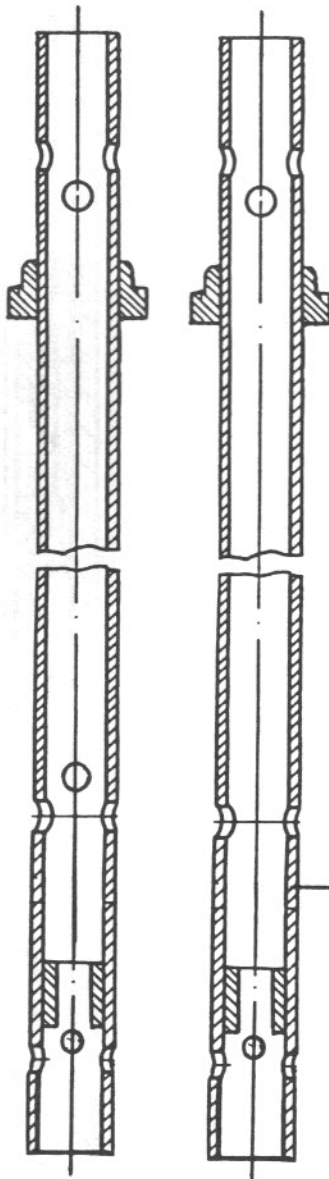


By installing uprated fork springs, by inserting shims at the upper spring mounts and by using smaller damper jets, the suspension and damping can be made stiffer to suit individual operating requirements.

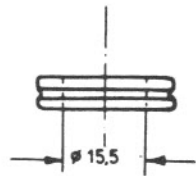


Steering head and upper spring mounts

Heavy duty (HD) damper tube and damper jet



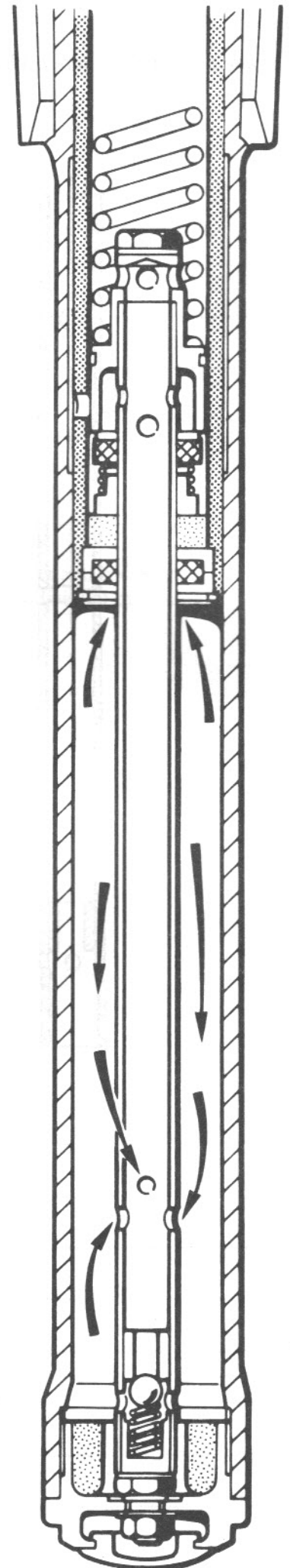
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31 421 232 045

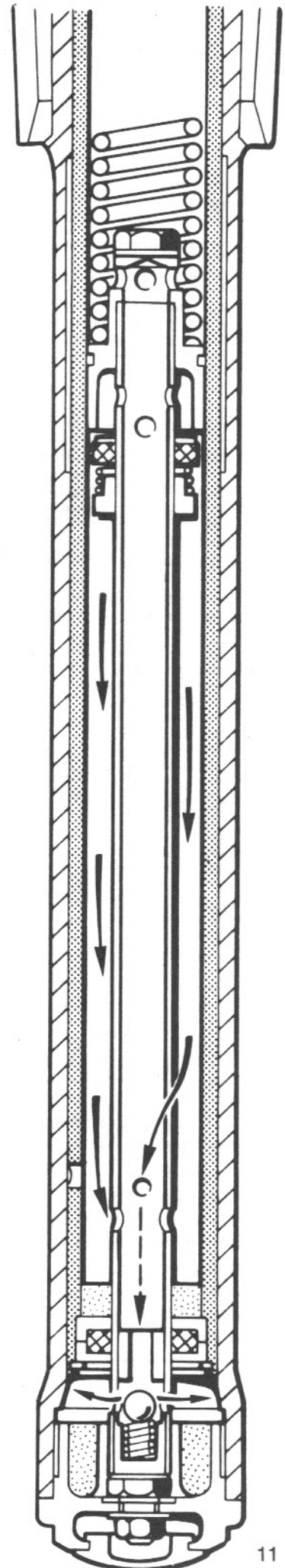
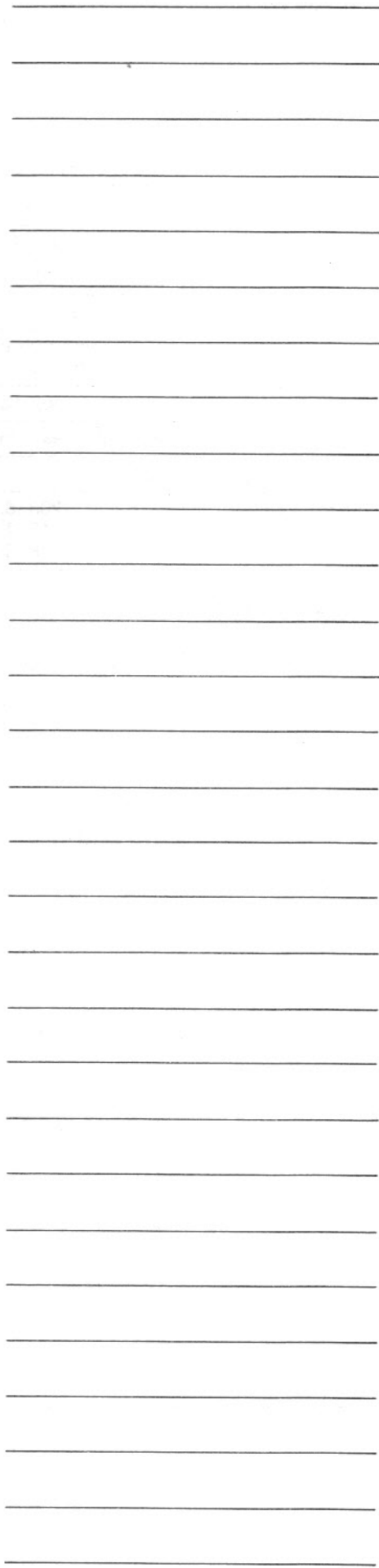
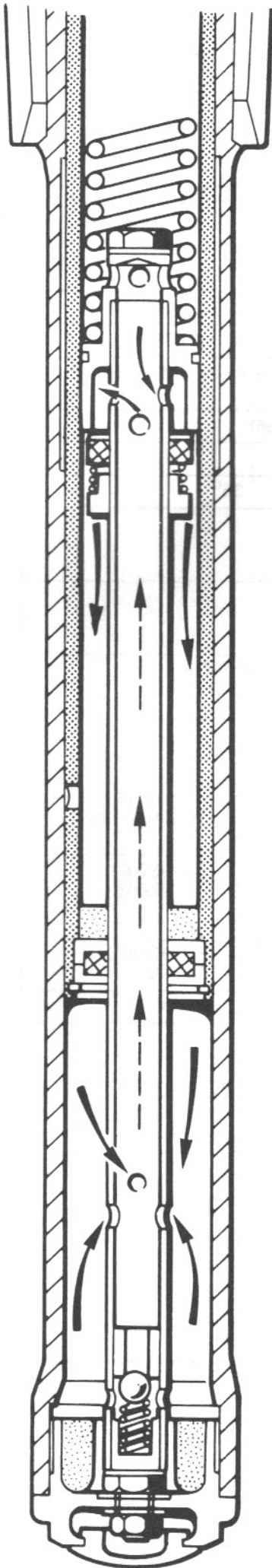


Part number
31 421 234 506

Part number 31 421 234 474

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1.6 Technical data — R 50/5 - R 100 RS (up to 1980 model)

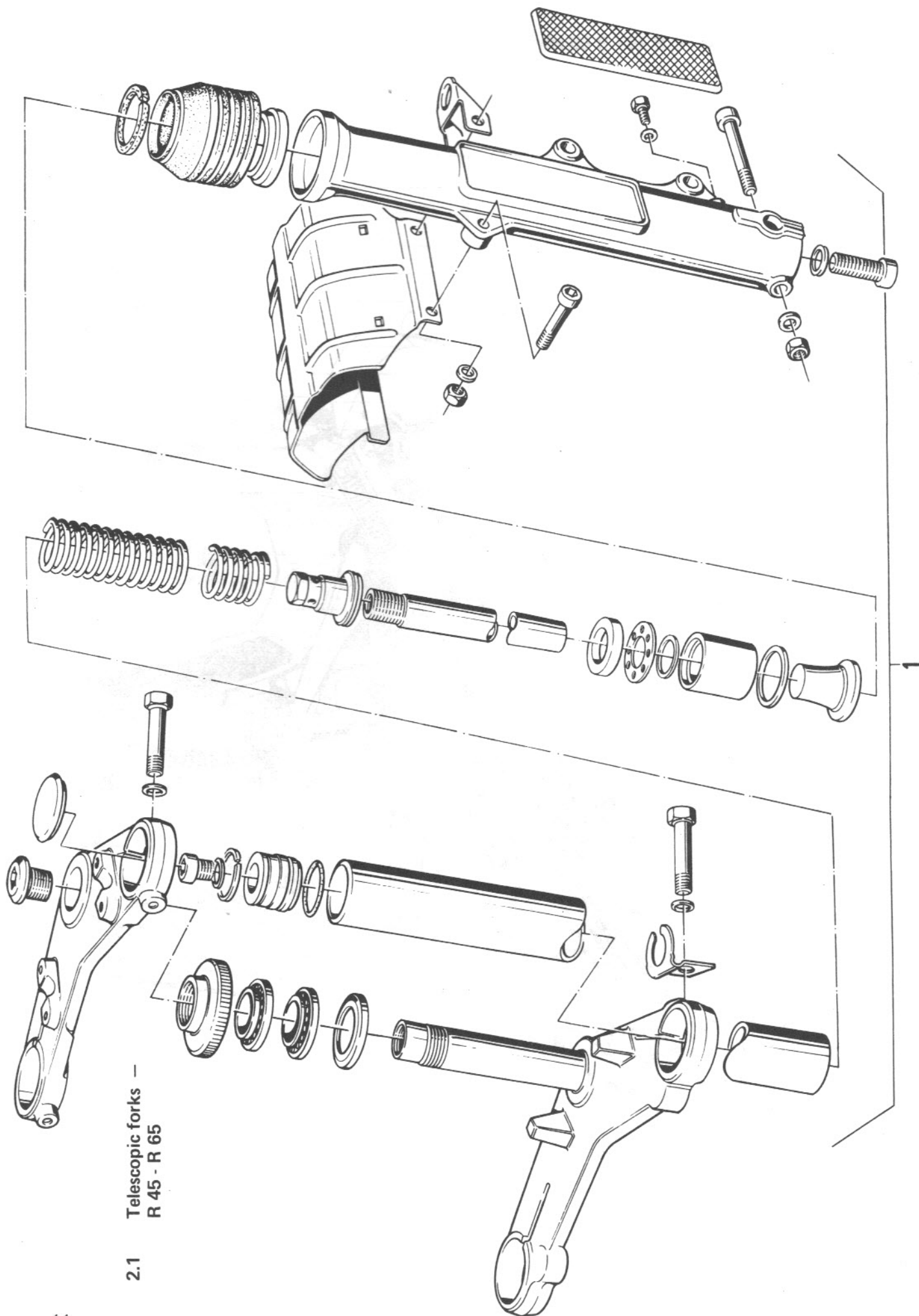
Type	R 50/5 - R 100 S	R 100 RS/R 100 RT
External diameter of piston on damper tube mm (in)	27.7 ± 0.1 (1.091 ± 0.004)	
Internal diameter of fixed fork tube mm (in)	28 ± 0.15 (1.102 ± 0.006)	
Piston clearance in fixed fork tube mm (in)	0.05 ... 0.55 (0.002 ... 0.022)	
Relaxed length of coil spring mm (in)	567 (22.32)	543 (21.38)
Bearing lubrication	Brand-name multipurpose grease with drip point 180°C (356°F)	
Front wheel caster mm (in)	app. 93 (3.66)	
Steering lock angle (handlebars)	app. 40° to each side	
Lock angle of telescopic forks	42°	35°
Front suspension travel (load 75 kg/165 lb) mm (in)	208 (8.19)	
- upwards (compression) mm (in)	110 (4.33)	
- downwards (tension) mm (in)	98 (3.86)	
Installed length test (measure from upper edge of support tube to machined face on lower fork guide) mm (in)	159 (6.26)	
Fixed fork tubes	hard chromium plated	
Fork slider tubes	cast light alloy	
Lower fork bridge	forged light alloy	
Oil content per fork leg l (Imp. pint, US quart)	0.28 (0.5, 0.3)	
Oil grade (damper oil)	Shell 4001, Shell Aero Fluid 4, Castrol DB Hydraulic Fluid, Castrol Shock Absorber 1-3, Aral P 3441, Aral 1010, Mobil Aero HFA	
External diameter of hard chromium plated telescopic fork fixed tube mm (in)	36 - 0.050 - 0.075	(1.417 - 0.002) - 0.003)
Max. permissible runout of fixed fork tubes mm (in)	0.1 (0.004)	
Internal diameter of fork slider tubes mm (in)	36 +0.025 0	(1.417 +0.001) 0
Clearance between fork slider and fixed tubes mm (in)	0.24 (0.009)	

Tightening torques Nm (lb.ft)

Base threaded union in slider tube	80 ... 85	(59 ... 63)
Nut, M 8 x 1 mm (connection between damper base threaded union and slider tube)	23 ... 26	(17 ... 19)
Axle clamp bolt	15 + 2	(11 + 1.5)
Upper hoop plate	23	(17)
Telescopic fork centering nut	120 ... 130	(88 ... 96)
Clamp screw at clamp ring	10 ... 12	(7.4 ... 8.8)
Upper spring mount	120	(88)
Clamp bolts at lower fork bridge	33 ... 35	(24 ... 26)
End plugs at bottom of damper tube and piston (spring mount)	25 ... 27	(18.5 ... 20)

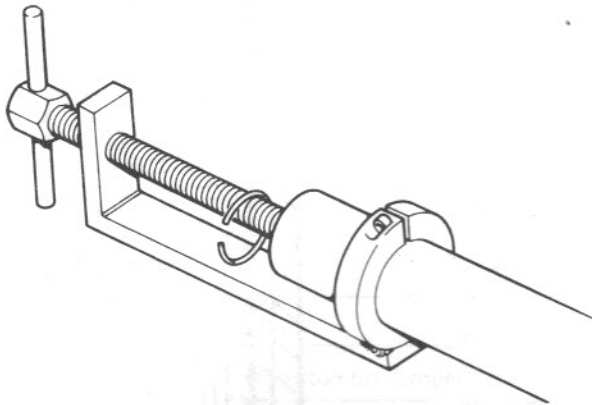
2.0 Telescopic forks — R 45 / R 65 LS



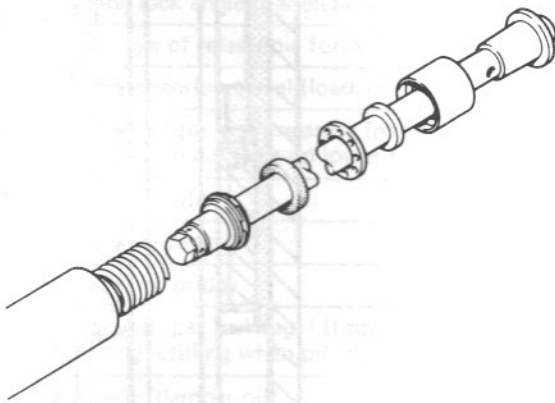


2.1 Telescopic forks -
R 45 - R 65

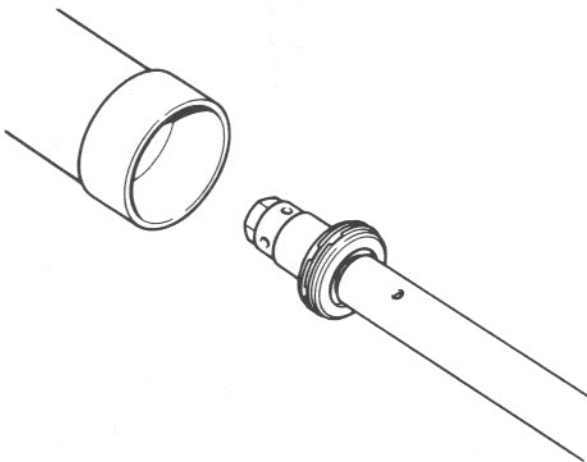
2.2 Telescopic forks — stripping down and assembly



Remove the upper spring mount with clamp 31 4 690.

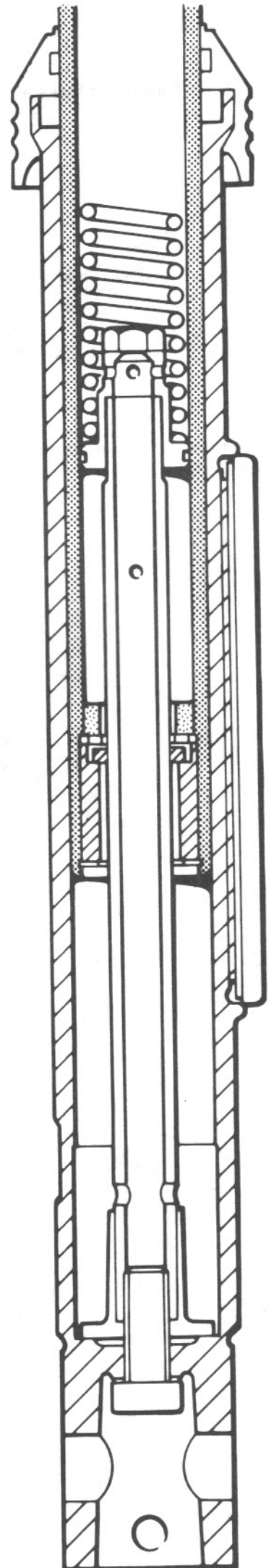


Damper components.



Install damper with bushing 31 4 720.

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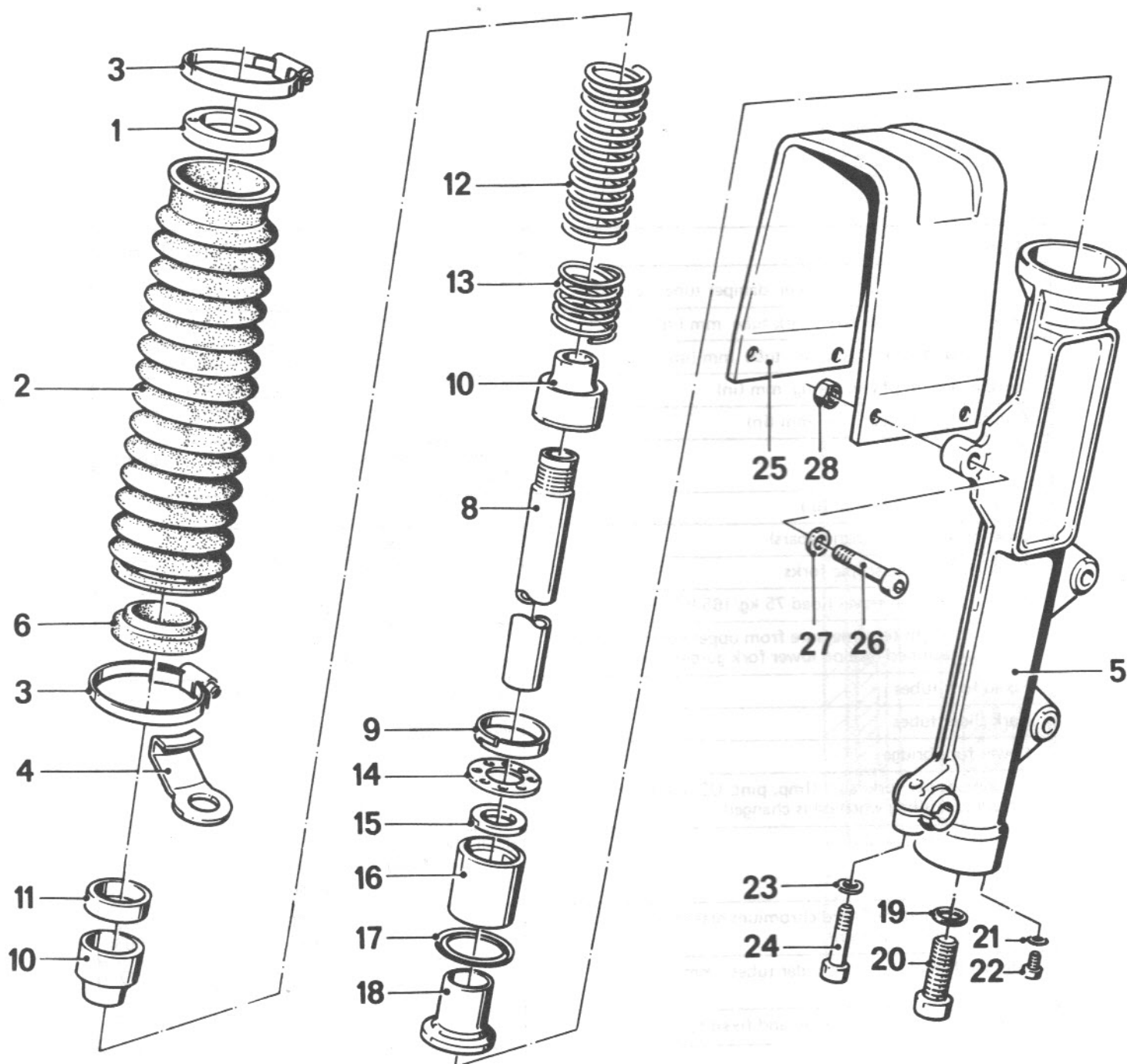
2.4 Technical data – R 45 / R 65

Model	R 45 (20 kW)/R 45 (26 kW)/R 65/R 65 LS			
External diameter of piston on damper tube mm (in)	27.7 ± 0.17 (1.091 ± 0.007)			
Internal diameter of fixed fork tube mm (in)	28 ± 0.15 (1.102 ± 0.006)			
Piston clearance in fixed fork tube mm (in)	0.15 ... 0.62 (0.006 ... 0.024)			
Relaxed length of coil spring mm (in)	490 + 12 (19.29 + 0.47)			
Coil spring wire diameter mm (in)	4.25 (0.167)			
Bearing lubrication	Brand-name multipurpose grease with drip point 180°C (356°F)			
Front wheel caster mm (in)	app. 96 (3.78)			
Steering lock angle (handlebars)	app. 42° to each side			
Lock angle of telescopic forks	42°			
Front suspension travel (load 75 kg/165 lb) mm (in)	175 (6.89)			
Installed-length test (measure from upper edge of support tube to machined face on lower fork guide) mm (in)	189.5 (7.46)			
Fixed fork tubes	Seamless drawn steel tube, hard chromium plated			
Fork slider tubes	Cast light alloy			
Lower fork bridge	Forged light alloy			
Oil content per fork leg l (Imp. pint, US quart) including refilling when oil is changed	0.190 (0.33, 0.2)			
Oil grade (damper oil)	Shell 4001, Shell Aero Fluid 4, Castrol DB Hydraulic Fluid, Castrol Shock Absorber 1-318, Aral P 3441, Aral 1010, Mobil Aero HFA			
External diameter of hard chromium plated telescopic fork fixed tube mm (in)	36	- 0.050 - 0.075	(1.417	- 0.002) - 0.003)
Internal diameter of fork slider tubes mm (in)	36	+ 0.025 0	(1.417	+ 0.001) 0
Clearance between fork slider and fixed tubes mm (in)	0.05 ... 0.1 (0.002 ... 0.004)			

Tightening torques Nm (lb.ft)

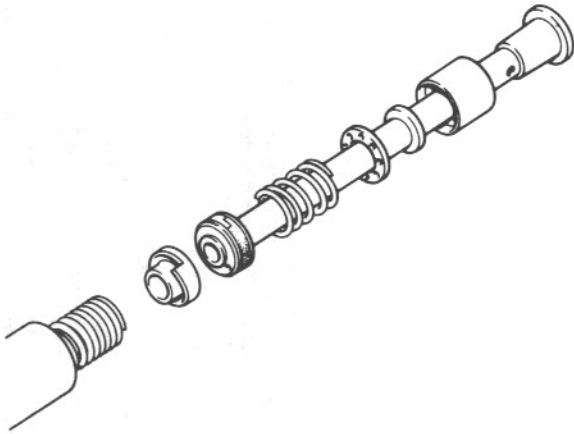
Screw end plug	75 ... 80	(55 ... 59)
Clamp bolts at lower fork bridge	35 ... 40	(26 ... 29)
Retaining screw (damper with slider tube)	35 ± 5	(26 ± 3.7)
Axle clamp bolt	15 + 2	(11 + 1.5)
Hoop plate to slider tube	20 ... 25	(15 ... 18)

3.0 Telescopic forks — R 80 G/S - R 100 RS (from 1981 model)

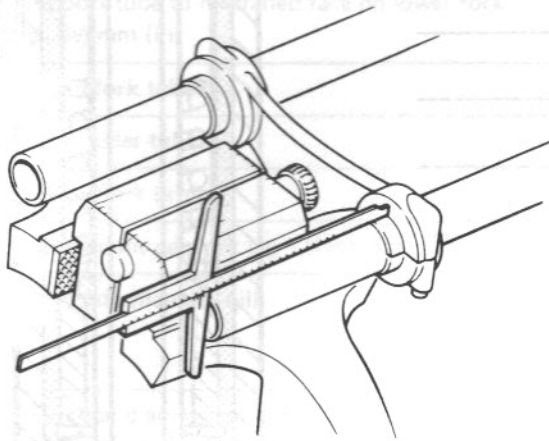


Springs and dampers

- 5 Slider tube
- 8 Damper tube
- 9 Sealing ring for piston 16
- 10 Spring mount
- 11 Spacer
- 12 Coil spring
- 13 Auxiliary spring
- 14 Packing disc
- 15 Damping disc
- 16 Damper piston
- 17 Circlip



Damper components

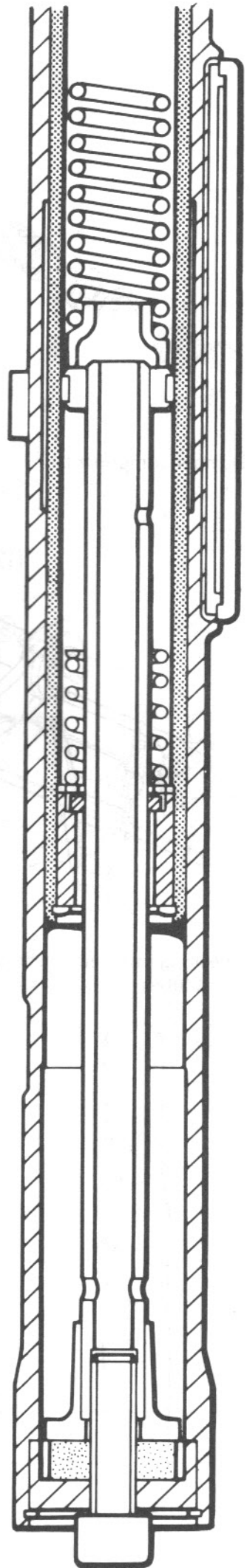


Checking installed length of fixed tubes



Slider tube
sealing ring —
drive in with
special tool
31 4 650

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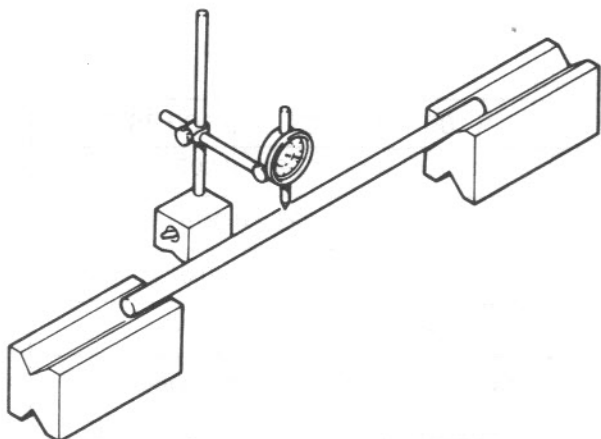
3.2 Technical data — R 80 G/S - R 100 RS (from 1981 model)

Type	R 80 G/S	R 100—R 100CS	R 100 RS/RT
External diameter of piston on damper tube mm (in)	27.7 - 0.17 (1.091 - 0.007)		
Internal diameter of fixed fork tube mm (in)	28 ± 0.15 (1.102 ± 0.006)		
Piston clearance in fixed fork tube mm (in)	0.15 ... 0.62 (0.006 ... 0.024)		
Relaxed length of coil spring mm (in)	539 +12 (21.22 +0.47)		
Bearing lubrication	Brand-name multipurpose grease with drip point 180°C (356°F)		
Front wheel caster mm (in)	114 (4.49)	95 (3.74)	
Front fork steering lock angle	47°	42°	35°
Suspension travel mm (in)	200 (7.87)		
Installed-length test (measure from upper edge of support tube to machined face on lower fork guide) mm (in)	161 (6.34)		
Fixed fork tubes	Seamless drawn steel tube, hard chromium plated		
Fork slider tubes	Cast light alloy		
Lower fork bridge	Forged light alloy		
Oil content per fork leg l (Imp. pint, US quart)	0.220 + 0.010 (0.039 + 0.02, 0.23 + 0.01)		
Oil grade (damper oil)	Shell 4001, Shell Aero Fluid 4, Mobil Aero HFA, Castrol DB Hydraulic Fluid, Castrol Shock Absorber 1-318, Aral P 3441, Aral 1010		
External diameter of hard chromium plated telescopic fork fixed tube mm (in)	36 - 0.050 (1.417 - 0.002) - 0.075 (1.417 - 0.003)		
Max. permissible runout of fixed fork tubes mm (in)	0.1 (0.004)		
Internal diameter of fork slider tubes mm (in)	36 + 0.025 (1.417 + 0.001) 0 0		
Clearance between slider and fixed tubes mm (in)	0.24 (0.009)		

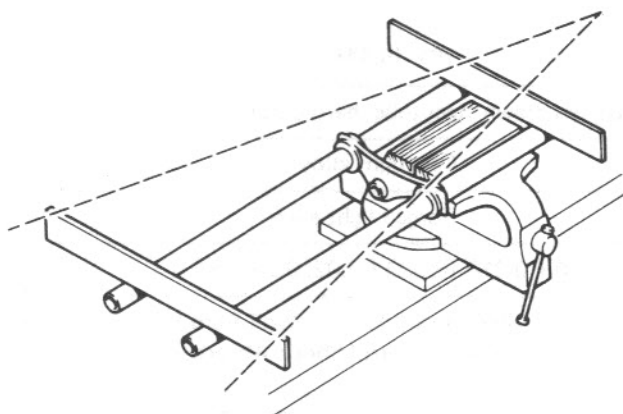
Tightening torques Nm (lb.ft)

Cap nut	120 + 10	(88 + 7.4)
Slotted nut	zero play	
Fork bridge clamp bolts	40 + 5	(29 + 3.7)
Upper spring mounts	120 + 10	(88 + 7.4)
Machine screw in spring mount	9 + 1	(6.6 + 0.7)
Retaining screw (damper with slider tube)	35 ± 5	(26 ± 3.7)
Axle clamp bolt	15 + 2	(11 + 1.5)
Oil drain plug	8 + 2	(5.9 + 1.5)
All other bolts and nuts are to be tightened according to the customary values quoted by the manufacturers of threaded connections, or as stated in the latest BMW Standard sheet 60002.0.		

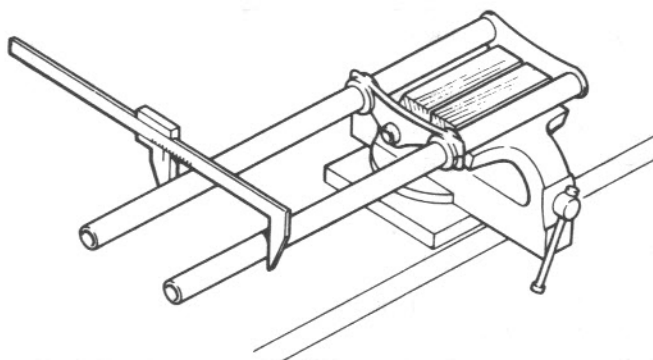
4.0 Accident repairs



Checking fixed tube for runout



Checking for distortion at lower
fork bridge with straightedges
31 4 620



Checking that fixed tubes are
parallel

5.0 Special tools for work on telescopic forks

Order No.	Designation
31 4 600	Clamping jaws for fork tubes
31 4 620	Straightedges for checking that fixed fork tubes are parallel
31 4 650	Drift for sliding tube sleeve
31 4 690	Clamp for spring mount on R 45 – R 65 LS
31 4 700	Assembly bushing to protect damper piston rings on R 50/5 – R 100 RS (1980)
31 4 720	Assembly bushing to protect damper piston rings on R 45 – R 65 and for all models from 1981 on
31 4 750	Measuring wrench to check friction values at steering head
31 4 800	Collar ring to increase support face when pulling out steering head bearings
31 4 820	Spacer for pulling steering head bearings in conjunction with spindle from frame testing gauge
31 4 850	Hexagon ring wrench for tightening centering nut on upper fork bridge