

Chapter 11 Table of Contents

Brake Types & Compatibility

Rim & Hub Brakes	11-2
Brakes Using the Rim Surface	11-2
Brakes Applying Torque to the Hub	11-3
Brake Levers	11-3
Caliper to Lever Compatibility	11-4–11-5

Brake Lever Adjustment

Flat Bar & Drop Bar Levers	11-6
----------------------------	------

Rim Brake Design & Adjustment

Brake Bosses	11-7
Brake Pad Positioning	11-8–11-9
Selecting a Brake to Fit	11-10
Sidepull	11-10
Dual Pivot	11-10
Linear Pull	11-11
Cantilever	11-11
U-Brake	11-12
Centerpull	11-12
Roller-Cam	11-12
Hydraulic Rim Brake (Magura)	11-12

Hydraulic Disc Brakes

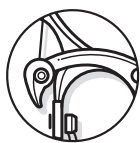
Operation & Terms	11-13
Troubleshooting Hydraulic Disc Brakes	11-14–11-15

Disc Brake Design & Standards

Shimano Centerlock Standards	11-16
Post Mount & Other Standards	11-16
IS Frame & Fork Standards	11-17

Disc Brake Brands

Avid Tools, Torque Specs & Fluid	11-18–11-19
Avid Adapters	11-19–11-21
Formula Tools, Torque Specs, Fluid & Grease	11-22–11-23
Formula Adapters	11-24–11-25
Grimeca Tools, Torque Specs, Fluid & Grease	11-26
Grimeca Braking Systems in the USA	11-26–11-27
Hayes—Tools, Fluid & Grease, Torque Specs	11-28–11-29
Hayes Adapters	11-30–11-31
Hayes Adapters to Fit Older Forks & Frames	11-32–11-33
Hope Hydraulic—Tools, Torque Specs & Fluid	11-34–11-35
Hope Standard Brake Fitting & Adapters	11-36–11-37
Magura Hydraulic—Tools, Torque & Fluid	11-38–11-39
Magura Hydraulic Rim Brakes—Tools, Torque & Fluid	11-39
Magura Adapters	11-40–11-42
Shimano Tools, Fluid, Torque Specs	11-43–11-44
Shimano Brake Pad Lineup	11-45
Shimano Adapters	11-46–11-47



Brake Types & Compatibility

RIM & HUB BRAKES

The main types of brakes used on bicycles are those using the rim surface and those applying torque to the hub.

BRAKES USING THE RIM SURFACE

Sidepull now mostly found on BMX bicycles, though formerly found on many road bicycles. These are supplied in many sizes to fit various frame, rim and tire combinations.

Dual pivot as used on most modern road bikes. There are two usual sizes; short reach, for racing bikes with small tire cross-sections and tight frame clearances; long or medium reach, for slightly wider tires and/or fender clearance.

Centerpull was popular during the 1970s for mid-priced road bikes and generally with fender clearance.

U-brakes as used on many BMX bicycles and formerly on some MTBs; a good choice for tight locations such as on the chainstays. U-brakes are like centerpulls, except that the pivots are brazed or welded to the frame or fork; these bosses are *not* in the same location as for cantilever or linear pull brakes.

Roller-cam was briefly popular in the early 80s, and generally similar to U-brakes, but using a cam instead of a straddle yoke and link cable to move the brake arms.

Cantilever as used on cyclocross bicycles and many older MTBs and tandems. By varying the straddle cable (or link wire) length, extra clearance can be gained for fenders. *If cantilever brakes are used with knobby tires and if the lever cable fails, the transverse cable can snag on the tire if safety devices are not used. Also, the brake shoes rotate closer to the spokes as*

they wear and may dive under the rim if not readjusted or replaced. Linear pull brakes avoid these problems and fit the same frame-mounted brake bosses.

Linear pull (e.g. Shimano V-brakes): Like cantilever brakes except that the brake arms extend upward above the tire and are pulled together by a single cable. Short reach for BMX and road bikes (75 mm to 85 mm arms), medium reach (~100 mm) for MTBs and long reach (~110 mm) for MTB or trekking bikes with fenders. *Note: the high mechanical advantage of linear pull brakes requires special, low mechanical advantage brake levers. Even so, these brakes are very powerful. People who are new to them need to be warned to use a light touch on the front brake lever (see section about levers, below).*

GENERAL NOTES

Choose a size which places the brake shoe posts near the center of the slot so adjustment can be made easily as the pad wears and so the pad does not contact the tire sidewall. Rims and tires may overheat in long descents on heavily laden bicycles (especially tandems). A separately controlled high-capacity disc or drum brake is needed for such use.

The mechanical advantage of centerpull, cantilever and U-brakes can be adjusted by changing the length of the straddle (transverse) cable. Many older brakes had an anchor bolt at one end of the straddle cable allowing it to be adjusted at will. For brakes with cast fittings at each end, Shimano formerly made, and Problem Solvers still makes, an “oversize” straddle cable hanger which acts on the brake in much the same way as a shorter straddle cable, making the brake response less mushy.

(continued)

Brake Types & Compatibility *(continued)*

BRAKES APPLYING TORQUE TO THE HUB

Mechanical disc, cable-actuated, used on many budget MTBs.

Hydraulic disc, actuated by means of hydraulic fluid or mineral oil, used on some MTBs.

Drum cable-actuated, frequently used on tandems. Smaller drum brakes are also preferred on some utility bicycles for their weatherproof qualities.

Coaster used only on the rear wheel and actuated by backpedaling.

Band cable-actuated, common in Japan on cheaper models; operates by contracting a band around the outside of a brake drum. *Note: because the band tends to tighten itself as the bicycle moves forward, a band brake can only be used safely on the rear wheel.*

Roller Cable-operated; cylindrical rollers are wedged between an internal, ramped actuator and the hub shell. Used on some Shimano Nexus models. Roller brakes may be actuated by backpedaling (in which case they are a variety of coaster brake) or by a cable.

BRAKE LEVERS

There are two basic categories of brake levers.

Drop bar levers are mounted on the bend of drop-style handlebars; available for standard routing (exposed cable), aero routing (along the handlebar), and reverse routing (along the handlebar from the bottom of the lever, for special aero handlebars). These levers are tightened by a band which may be stamped with a size marking. Choose a band diameter which matches the bar.

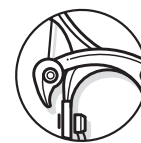
Flat bar levers MTB, BMX, and tourist levers are designed for straight bar sections. The cable is usually routed from the lever body, in the opposite direction from the lever, although some levers have the pivot at the outer end and route the cable differently. Clamping may be by means of a band as with road levers, or by a clamp integrated with the lever body. As always, match bar and lever diameter.

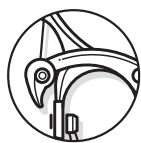
Brake reach and variations Some drop bar brake levers are designed for smaller hands and thus have less travel. Reducing the mechanical advantage still allows the normal amount of cable travel, but with reduced power—partially offset because people with smaller hands tend to weigh less. Some lever designs have reach adjusters to move the initial position of the lever in relation to the handlebar. Some brake systems for MTBs, on which greater pad-to-rim distance is desirable, provide increased mechanical advantage as the brake lever advances.

Dual-cable brake levers Some brake levers are designed for a special double cable or for two cables. Because the front and rear brake are used differently under different riding conditions, it is usually better to actuate each brake with a separate cable, even on a tandem which has a drum or disc brake in addition to rim brakes. Levers operating double or dual cables should go to different brakes working on the same wheel.

Dual levers with one cable Extension levers used on older road bicycles to allow brake operation from the tops of drop bars do not work very efficiently; a newer design using an entirely separate lever at the top of the handlebar designed so that the brake can be actuated either by the standard or top mounted lever—both sharing a continuous cable routing—is effective.

(continued)





Brake Types & Compatibility *(continued)*

CALIPER TO LEVER COMPATIBILITY

The leverage (mechanical advantage) of the brake and lever must be matched so as to avoid bottoming out the lever or creating too much “grab,” so braking is predictable, smooth and safe. Try to use levers specifically designed for the particular brakes. When mixing and combining, ask these critical questions and check braking while having a short safe ride in a controlled area.

- 1** Does the lever bottom out against the handlebar? Does it feel mushy?
- 2** Is there enough braking power? Too much?
- 3** Are the levers easy enough to reach?
- 4** Is there sufficient pad-to-rim clearance?

General guidelines for compatibility are as follows:

Flat bar lever, traditional type Sidepull, dual pivot, centerpull, cantilever, roller-cam, band, front drum and U-brakes work well with the same levers, though brake “feel” will show differences. The sidepull brake has a mechanical advantage of about 1:1 and the cantilever brake, 2:1, so more force at the levers is required to stop a sidepull-equipped bike.

Flat bar lever, linear pull type Linear pull and mechanical disc are both high leverage designs, and need a lever with a low mechanical advantage. This type of lever would provide weak braking with other types of brakes and must not be used with them.

Flat bar lever, linear pull adjustable ratio type, or adjustable ratio type (universal) If the adjustment range is wide enough, this kind of lever can work with any cable-operated brakes when set up correctly.

Flat bar lever, hydraulic type It is best not to mix brands as these brakesets are designed as systems. Mixing models within the brand should only be done after checking with a technical service representative or manufacturer’s chart.

Drop bar lever, traditional, aero or dual-control (Shimano STI) type: Sidepull, dual pivot, centerpull, cantilever, roller, band, front drum and U-brakes work well with these levers, though brake “feel” will show differences. Cantilevers can feel mushy, though levers optimized for dual-pivot brakes can give a more pleasant feel. Drop bar levers which work OK with cantilever brakes include the Dia-Compe 287. The Avid Shorty cantilever works reasonably well with Shimano STI levers. **Linear pull and disc type brakes** *must not be used with any available drop bar lever we know about, as of this printing, with the sole exception of a specific Avid disc caliper designed (and clearly marked) to work with drop bar levers.*

Factors that affect fit of cantilever, linear pull, roller-cam, and U-brake (brake boss pivots on the frame) are as follows:

1 Distance between brake bosses Nominal width is approximately 80–82 mm but some brakes work better with wider or narrower spacing. Some types of brake shoes can be adjusted in/out using supplied washers (nut/bolt type) or by sliding the post in/out (post type) to account for narrow/wide rims.

2 Parallelism Use a vernier caliper to verify that brake bosses are parallel.

3 Rim diameter and dropout to brake boss distance Observing whether you can get the pads to line up is the most practical advice, as this varies by brake type and somewhat by brand.

(continued)

Brake Types & Compatibility *(continued)*

CALIPER TO LEVER COMPATIBILITY *(continued)*

4 Rim width Compensation can be made by moving the pads in/out to account for rim width. Usually there are a number of washers (for bolt-type pads) or the pad can be slid on its post (for post-type pads).

5 Axle slot position relative to brake boss

If the wheel is installed in a different position each time on the horizontal rear dropouts, brake pad position may be affected, especially on BMX bicycles with low seatstays. For this reason, many dropouts have “stops” so the pads won’t need constant readjustment every time the wheel is reinstalled.

6 Width of tire Sometimes a wide tire necessitates a lower-profile shoe or longer straddle cable length for clearance.

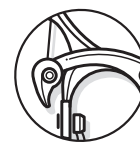
7 Spring to brake boss compatibility Some brakes cannot achieve sufficient spring tension on older brake bosses which have only a single hole for the end of the spring.

8 Brake boss pivot stud length and diameter

Some studs may be too long, making the brake arm too loose. Fix by filing the stud down. If the stud is too short, the brake will bind. The washer on the mounting bolt may have been deformed, usually from overtightening. Either replace the washer or flip it over. An overtightened bolt may deform the mounting stud, causing it to flare out and bind. Either file it down and use a longer mounting bolt, or replace the brake with one which has a separate internal pivot sleeve.

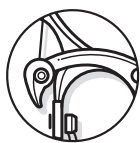
Inexpensive brake arms typically have a loose fit, and accordingly, some pivot studs are as much as .01" (.25mm) oversize. High-quality arms are likely to bind or not even mount on these due to a tighter fit. It is sometimes necessary to use a machinist’s reamer to increase the inside diameter of the arm bushing, or to use a little sandpaper and filing to reduce the pivot diameter or remove high spots.

Note Some pivot studs are only swaged onto the brake boss. Consider brazing or welding these to avoid possible failure.



MATCH LEVERAGE OF BRAKE AND LEVER

To ensure that braking is predictable, smooth and safe, the leverage (mechanical advantage) of the brake and lever must be matched so as to avoid bottoming out the lever or creating too much “grab.”



Brake Lever Adjustment

Brake levers are supplied in a wide variety of designs and shapes, the two most common being for drop bars and flat, or riser, bars. Proper function is determined both by the ergonomics between the lever and hand, and the lever to brake caliper mechanical advantage.

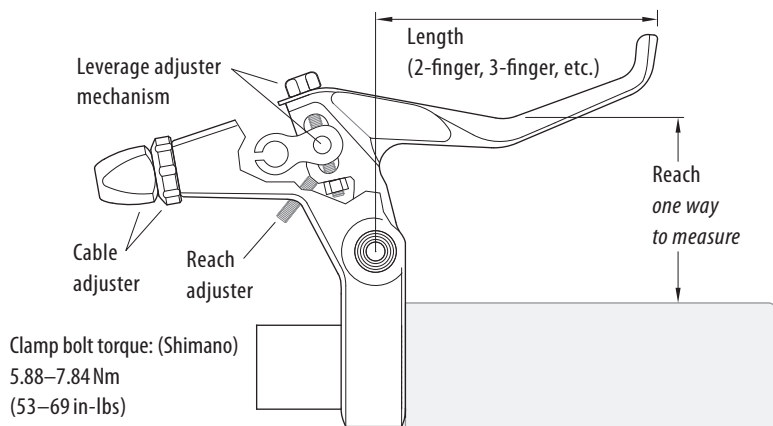
Choose a lever which fits the hand comfortably, which can be reached easily during braking, and

which gives sufficient braking power. For younger children, the selection of brake levers is particularly critical, due to low finger strength and small hand size. Coaster brakes may be preferable or required due to this limitation—but even for older children, finding the right-sized lever can be a worthwhile challenge.

FLAT BAR & DROP BAR LEVERS

Flat bar lever

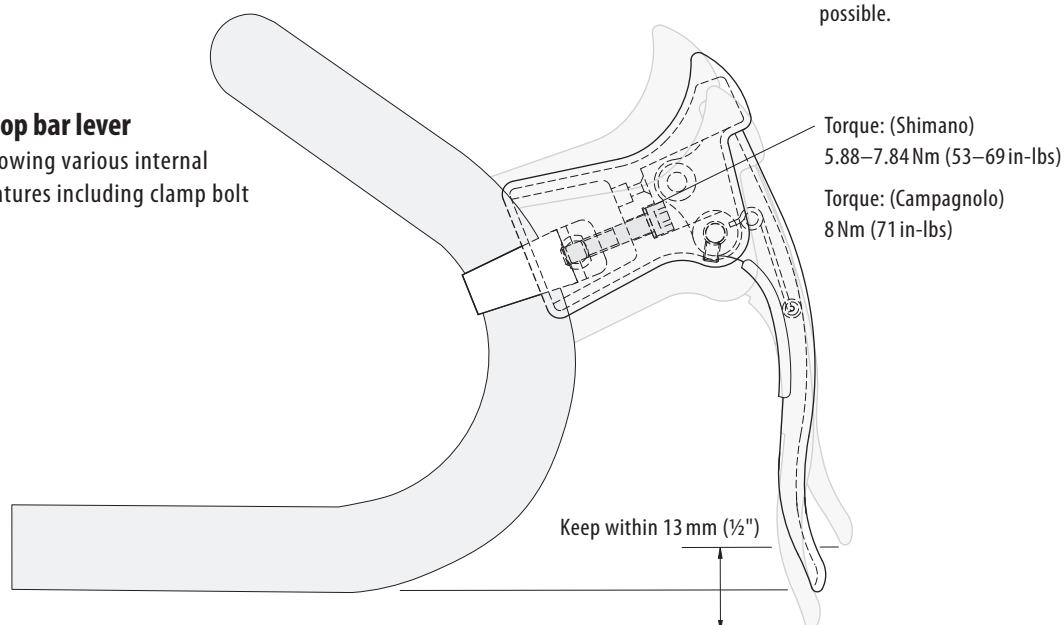
Partial cutaway view of an MTB lever such as the Avid Speed Dial



- Reach adjuster: sets initial lever arm distance from the bar.
- Cable adjuster: to adjust slack in the cable system.
- Leverage adjuster: the illustration shows an adjustable cable-end fitting. Most levers have **no** leverage adjustment, while some have a 2- or 3-position fitting. Refer to the section on compatibility of brakes and brake levers in this chapter and/or similar supplier information when in doubt, as the leverage needs to be optimized as closely as possible.

Drop bar lever

Showing various internal features including clamp bolt



Warning

There is a huge variation in the listed torque between brands. Use the manufacturer's assembly instructions to avoid poor assembly or injury.

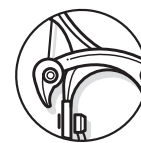
Rim Brake Design & Adjustment

BRAKE BOSSES

Most linear pull, cantilever and U-brakes need to use brake bosses with the dimensions shown here. Braking performance will suffer when there is a poor fit.

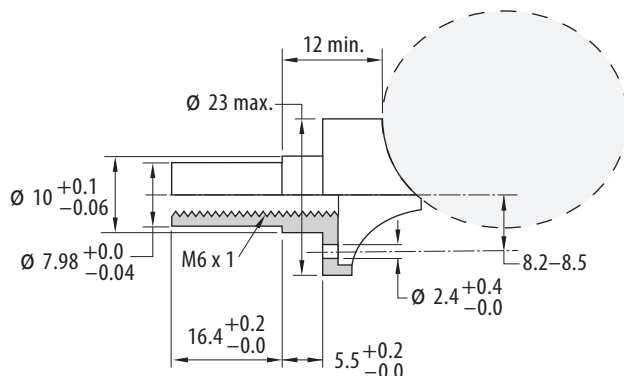
Most brakes accept some variation in boss spacing and rim width. Typical boss spacing is

80~82 mm, but it may be anywhere from 77 to 85 mm to suit narrower or wider rims. These extremes limit a bike's rim choices and often require pad respacing.

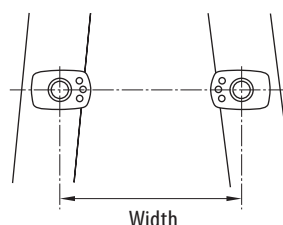


Frame mounted brake boss considerations

Boss diameters and lengths



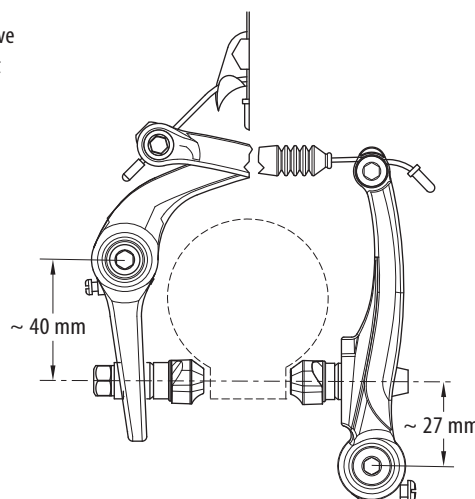
Width between bosses



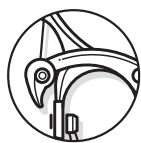
Boss height relative to the rim

Dimensions shown are representative and allow for brake pad adjustment either up or down.

For U-brakes and roller-cam brakes (*left side of drawing*), the brake bosses are above the rim.



For linear pull and cantilever brakes (*right side of drawing*), the brake bosses are below the rim.



Rim Brake Design & Adjustment *(continued)*

BRAKE PAD POSITIONING

Rim-mounted brakes allow fine tuning of pad/rim position as shown in illustrations to the right and on page 11-9.

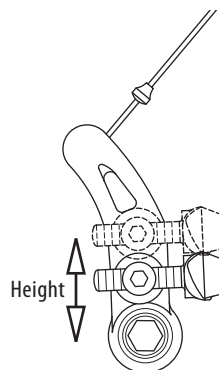
- 1 Height** vertical position
- 2 In/out** horizontal position
- 3 Rim sidewall face angle**
- 4 Parallelism to rim top**
- 5 Toe-in angle**
- 6 Long/short end positioning** for even pad wear and force application

The illustrations show a post-type pad assembly and arm on a cantilever brake, but basic positioning principles are applicable to threaded stud-type pad assemblies as well and to any type of rim brake. Tightening torque depends on type of brake shoe assembly, not type of brake. Post assemblies need more tightening torque than threaded-stud types.

Pad replacement notes Pads are often asymmetric, curved to match the rim profile, or may have an angled side facing the rim. Care must be taken regarding individual pad orientation, particularly when pads are interchanged or replaced.

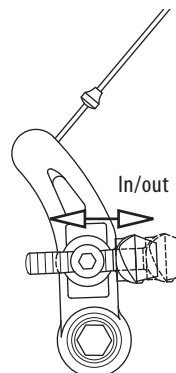
Warning for models with brake-pad holders

The brake pad can come out of the brake pad holder if the open end of the holder faces forward. Orient the assemblies with the closed end facing forward.



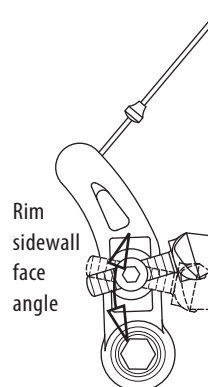
1 Height: vertical position

- For brakes which pivot from below (cantilever, linear pull) set pad ~1 mm from the rim top to avoid “diving” under the rim as the pad wears.
- For brakes which pivot from above using 2 pivot points (centerpull, U-brake, roller-cam) set pad ~2 mm from the top to prevent pad from contacting tire as it wears.
- For brakes which pivot from above using one pivot point (sidepull), set pad ~1 mm from rim face top to compensate for downward creep as the pad wears. For dual pivot sidepull brakes, set pads between 1–2 mm from rim face top edge.



2 In/out horizontal position

- Post-type pad: slide post in/out to account for rim width, frame pivot width and link cable width.
- Pad with threaded stud: rear-range thin and thick washers to adjust pad in/out to account for rim width, frame pivot width and arm width.



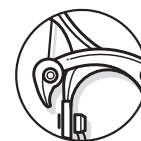
3 Rim sidewall face angle

- Align pad surface parallel to rim braking surface. Rims with noticeably angled sidewalls may require special angled shoes, (e.g. sidepull brakes with threaded pad assemblies).

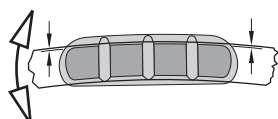
(continued)

Rim Brake Design & Adjustment *(continued)*

BRAKE PAD POSITIONING *(continued)*



Rotation angle



4

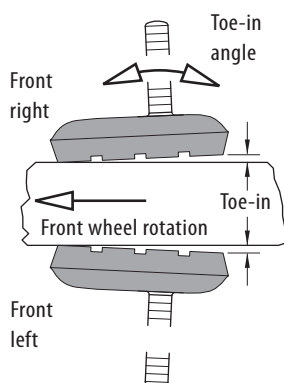
Parallelism to rim top

- Rotate pad in relation to the rim braking surface to equalize height at its front and rear. *Exception:* If a front sidepull, centerpull or dual pivot brake mount is flexible, lower the front end of the brake shoes enough that they do not rise up and contact the tire in use. Check by trying to roll the bike forward with the brake applied.

5

Toe-in angle and measurement

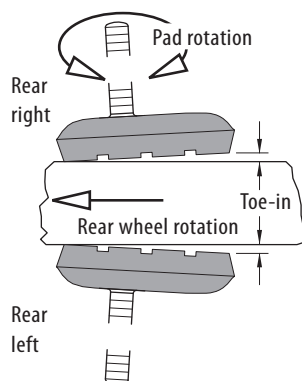
- Sidepull, dual pivot, centerpull ~0.5–1.0 mm.
- Cantilever, linear pull, U-brake, etc. with longer brake shoes: ~1.0–1.5 mm.



6

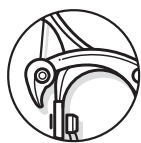
Long/short end of pad (for even pad wear and force application)

- The forward motion of the rim tends to flex the brake mechanism and rotate the rear of the pad into the rim. It is generally preferred to orient the long side of the pad facing forward. However, (illustration 6) pad orientation often depends on available space, so flipping the long/short ends for the rear brake is quite common to clear the seatstays. Curved brake pads must be switched left for right to change the direction of the long ends while simultaneously keeping the curves aligned to the rim. Substituting shorter brake pads is another valid solution.



WARNING FOR MODELS WITH BRAKE-PAD HOLDERS

The brake pads can come out of the brake-pad holder if the open end of the holder is open on the side that faces forward. Orient the pad assemblies with the closed side facing forward.



Rim Brake Design & Adjustment *(continued)*

SELECTING A BRAKE TO FIT

Brake reach adjustment range must allow pads to line up to the rim, with some slack for readjustment as pads wear.

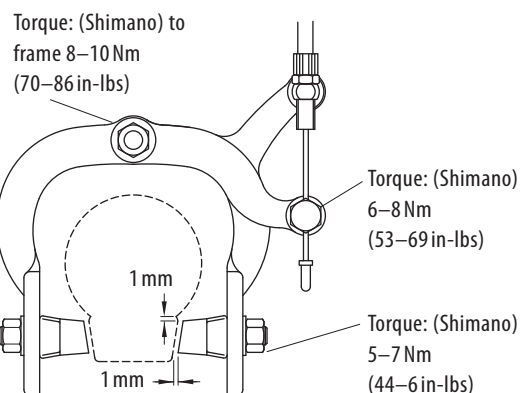
Check clearance over tire. For off-road bicycles, clearance should be greater than 25 mm to clear any debris that could become lodged

and lock the wheel. For road bicycles, 10 mm is considered sufficient. Fenders, racks, etc., require additional clearance.

Check that the brake doesn't interfere with any parts (frame, fork, racks, panniers, etc.).

SIDE PULL

Sidepull (traditional)

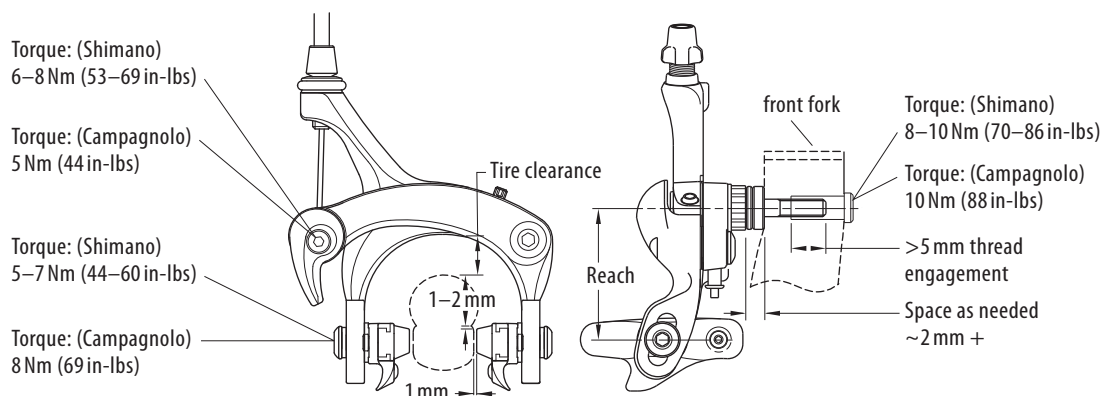


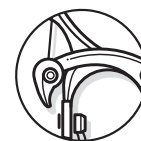
Warning

There is a huge variation in the listed torque between brands. Use the manufacturer's assembly instructions to avoid poor assembly or injury.

DUAL PIVOT

Dual pivot

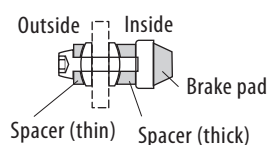




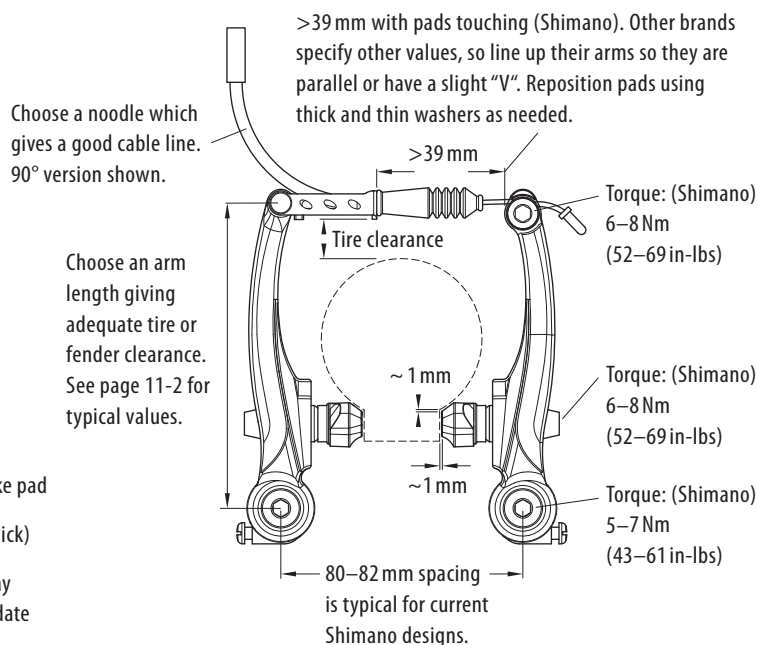
Rim Brake Design & Adjustment *(continued)*

LINEAR PULL

Threaded-stud pad assembly detail

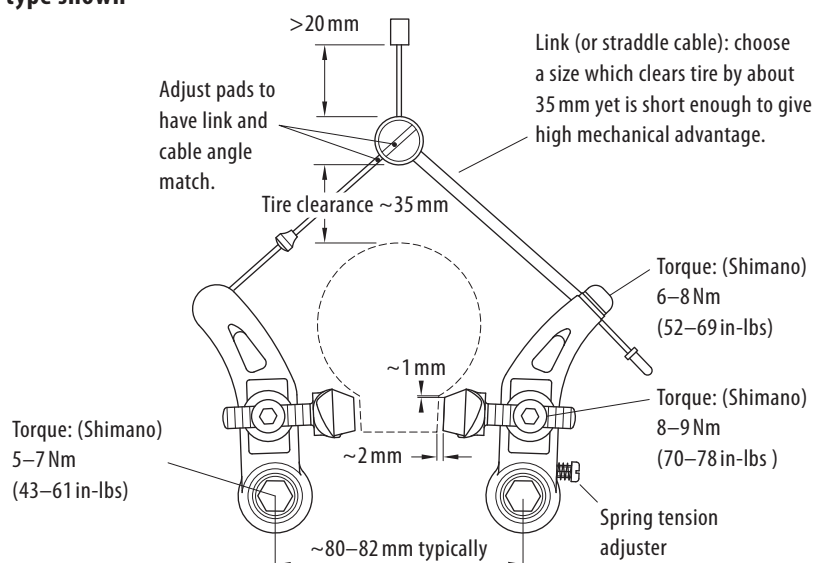


Thick and thin spacers may be switched to accommodate different rim widths.

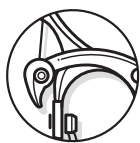


CANTILEVER

Low-profile type shown

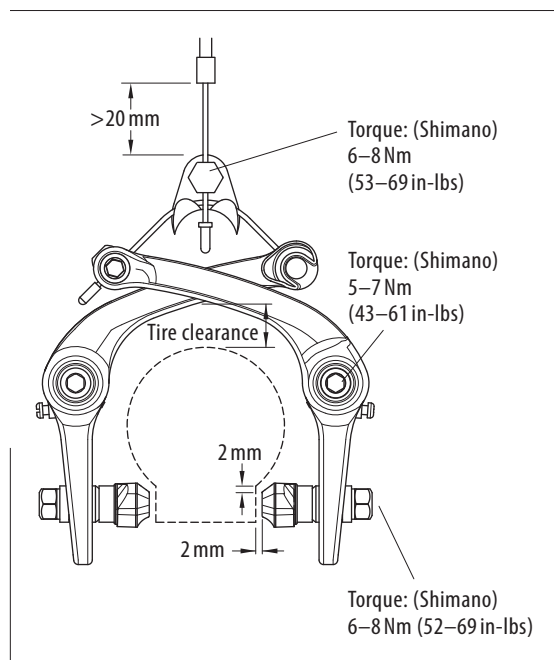


(continued)

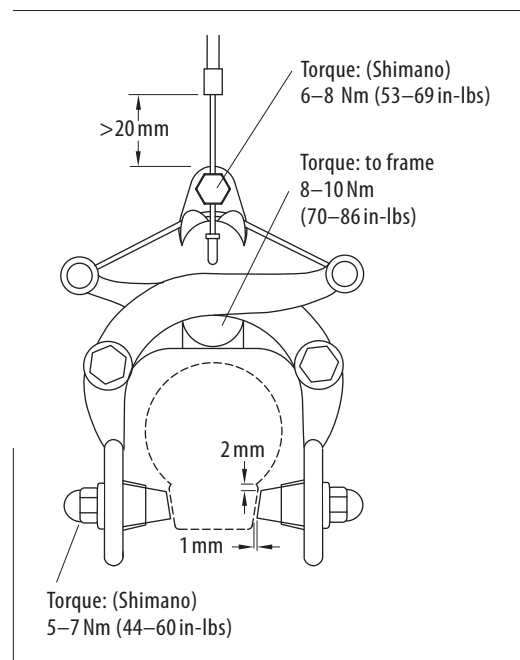


Rim Brake Design & Adjustment *(continued)*

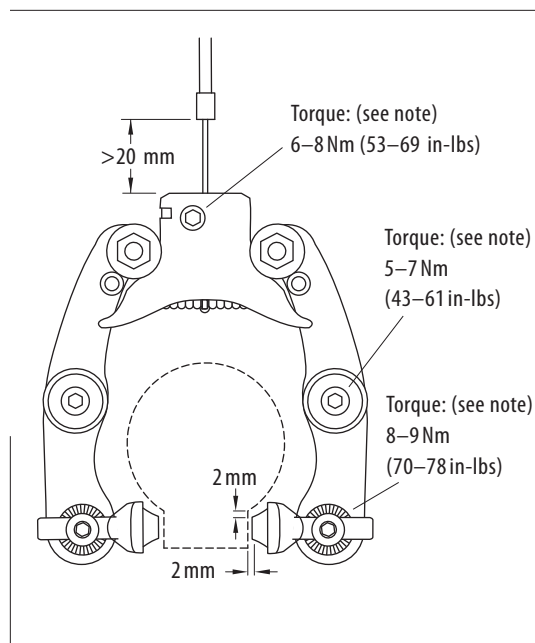
U-BRAKE



CENTERPULL



ROLLER-CAM



Note

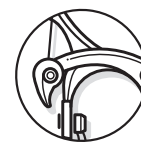
Torque values are based on the most equivalent Shimano bolt assembly designs. Shimano never manufactured roller-cam brakes. Suntour and other companies did. Take this into account when tightening and work with heightened sensitivity—as with any brake for which manufacturer's torque is not known. See notes in Appendix pages 15-16 and 15-17 for more information on torque issues.

Warning

There is a huge variation in the listed torque between brands. Use the manufacturer's assembly instructions to avoid poor assembly or injury.

HYDRAULIC RIM BRAKE (Magura)

Information on this type of rim brake is grouped with Magura hydraulic disc brakes, due to close similarities in fluid, torque and tool requirements. *Please refer to page 11-39, Magura Rim Type Hydraulic—Tools, Torque & Fluid.*



Hydraulic Disc Brakes

OPERATION & TERMS

In a hydraulic disc brake, actuation of the hand lever depresses the piston in a master cylinder, forcing hydraulic fluid against the slave pistons of the caliper. These squeeze the brake pads against the disc. There are two main kinds of hydraulic disc brake systems.

Full hydraulic The master cylinder is mounted on the brake lever and a hose transfers the fluid to the caliper.

Semi-hydraulic The master cylinder is mounted on the caliper itself. The brake lever is linked to the caliper by wire cable as in a conventional cable-operated brake.

COMPONENTS

A hydraulic disc braking system is composed of these main elements:

Master cylinder This acts as a ram pushing fluid through the system.

Reservoir This contains a reserve of hydraulic fluid. A “top-up” is occasionally needed to restore the level of the fluid in the master cylinder to compensate for wear of the brake pads. Under the cap of the master cylinder is a seal which moves up and down in response to changes in demand for fluid.

This seal must resist air and humidity. The reservoir may be combined with the master cylinder or may be a separate component.

Hydraulic hose Used on full hydraulic systems, this serves to transfer fluid between master and slave cylinders. It must resist swelling, rupture, leakage and normal wear and tear.

Caliper This houses the slave cylinders and pads and is attached to the frame or fork. It

is termed “fixed” or “floating” depending on whether one or both pads move. If only one pad moves, the caliper deflects on a bracket to bring the other pad to the rotor surface.

Disc (also known as rotor) This rotates with the wheel and is typically perforated for self-cleaning, heat dissipation, water removal and weight saving. Stainless steel is preferred due to its anti-rust properties. Discs may be available in different diameters depending on the application. Adapter plates match the caliper assembly to the rotor (disc) size.

Fluid Serves to transfer force from master to slave cylinder(s). Mineral oil or DOT 3, 4, 5 or 5.1, are the popular (though not mutually compatible) choices. Desirable fluid properties:

1 As braking generates heat, the fluid must absorb heat with a low coefficient of expansion, avoiding backpressure which would result in inadvertent braking and drag when the brake lever is released.

2 Must be non-hygroscopic (not absorb water), which could boil and pressurize the system, applying the brakes when not wanted.

3 Must last in service for extended intervals.

Slave pistons These are part of the caliper assembly and press the pads against the disc. Their movement is minute compared to that of the master cylinder piston, so pads must be positioned very close to the disc so they will contact the rotor when the lever is squeezed.

Pads The pad compound must provide a high coefficient of friction and wear slowly while at the same time not causing rapid disc erosion.

(continued)



Hydraulic Disc Brakes (continued)

OPERATION AND TERMS (continued)

Closed system In this system, springs inside the caliper pull the pistons away from the disc, totally eliminating drag. Lever free play is adjusted by means of a thumbwheel on top of the master cylinder. A closed system is preferred for cross-country or short downhill racing where elimination of drag is most important.

Open system The lever position does not change relative to the bars—however hard or long the descent. A metal diaphragm inside the

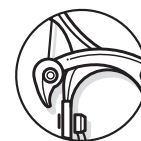
reservoir self-adjusts as the pads wear and also allows for expansion of the fluid, even at the highest temperatures. These features allow the brakes to be used for either downhill or cross-country riding.

Break-in period New brakes require a break-in period to score the disc surfaces and achieve full braking power. Ride conservatively while the parts settle in. Use this time to adjust to the brakes’ response.

TROUBLESHOOTING HYDRAULIC DISC BRAKES

Problem	Possible cause	Corrective action
The lever produces no effect when moved towards the handlebar	Incorrect bleeding	Repeat bleeding.
	Leak in the system	Check for leaks, replace parts as needed.
	Pad position set too wide	Ensure that the pads are correctly adjusted relative to the disc surface.
	Bad cartridge	Replace cartridge and re-bleed.
	Pad position needs to be reset.	Sometimes if brakes are new or have had maintenance done, the lever will require pumping several times to reset the pad position.
Spongy feel when pulling the lever, reduced power	Air in the system	Bleed the system. If the problem persists, there may be a leak.
Reduced braking power	New pads not “broken in”	Break in the pads (generally through 20–50 uses to scour the disc surfaces).
	Oil/lubricants on rotor and/or pads	Clean the rotor with warm dishwater or alcohol. Replace contaminated brake pads.
	Air in the system	Bleed the brake.
	Leak in the system	Check for leaks, replace parts as needed.
	Wrong hydraulic fluid	Seals and perhaps other parts may be damaged. In the worst case, the entire system will have to be replaced.

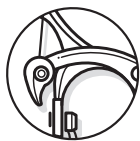
(continued)



Hydraulic Disc Brakes *(continued)*

TROUBLESHOOTING HYDRAULIC DISC BRAKES *(continued)*

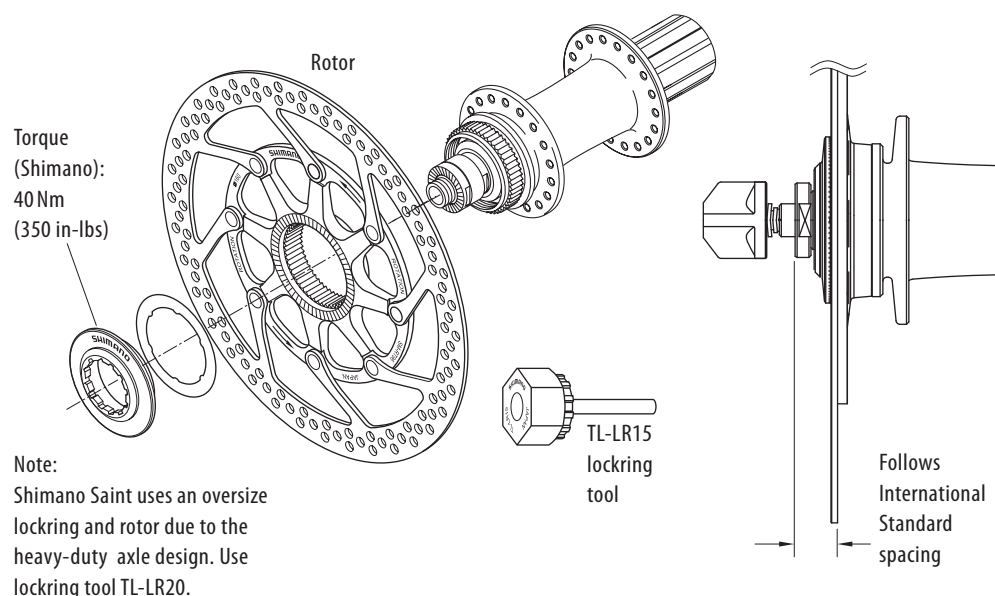
Problem	Possible cause	Corrective action
The lever does not snap back to its return position when released.	The lever pivot is binding.	The lever pivot needs lubricating. If lubrication does not cure the problem, then disassemble the lever pivot and clean the bushing, ensuring that it moves freely. Also make sure that the lever pivot screw is not overtightened.
The disc rubs against the pads	The caliper is not properly centered on the disc.	Center caliper.
	Inadequate clearance (piston pushed out)	Change piston's initial "off" position.
	Bent disc	Replace disc.
Fluid leaks	Leak in the fitting	Replace sealing o-ring. Tighten the hose nut.
	Leak in the hose	Replace the hose.
	Caliper bleed screw loose	Tighten the caliper bleed screw.
Squealing brake	Badly aligned frame	Align brake caliper.
	Paint on fitting eyelets	Remove any paint and check for an even contact surface without burrs.
	Wheel QR skewer insufficiently tightened	Increase tightening of QR.
	Insufficiently tightened wheel spokes	Check for an evenly high-tensioned wheel.
Contaminated brake pads	Carelessness or leak	Brake pads must be changed, check for leaks.
Contaminated rotor	Carelessness or leak	Clean rotor with dishwater or alcohol, check for leaks.
Rattling noise and rough deceleration	Brake pads worn to bare metal	Change brake pads.



Disc Brake Design & Standards

SHIMANO CENTERLOCK STANDARDS

Centerlock attachment system as used on XTR (2003–04), Saint, Deore XT and others in 2004



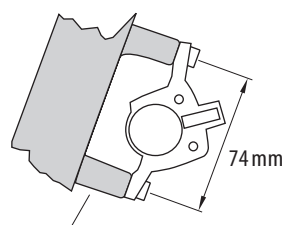
POST MOUNT & OTHER STANDARDS

74 mm (called the Post Mount, or PM, standard) is quite popular. Many manufacturers make their brakes to fit both the 74 mm PM and 51 mm IS (International Standard) mounts through the use of an adapter or by direct attachment.

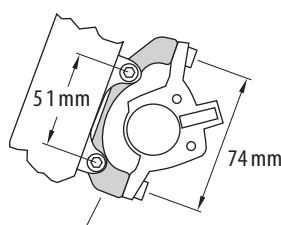
Older bicycles may be found with 22 mm, 69 mm, and other former standards originated by Hayes, Manitou, etc.

There is a huge (and changing) number of adapters to fit various combinations of brand, rotor size and various frames and forks.

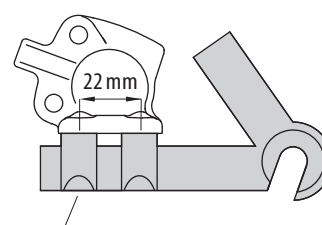
Subsequent pages include tables or drawings showing various adapters.



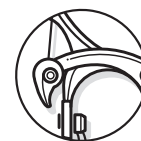
Manitou fork with compatible 74 mm PM (post mount) caliper. No adapter needed, direct mount.



Adapter converting PM compatible caliper (74 mm spacing) to IS (51 mm) design fork.



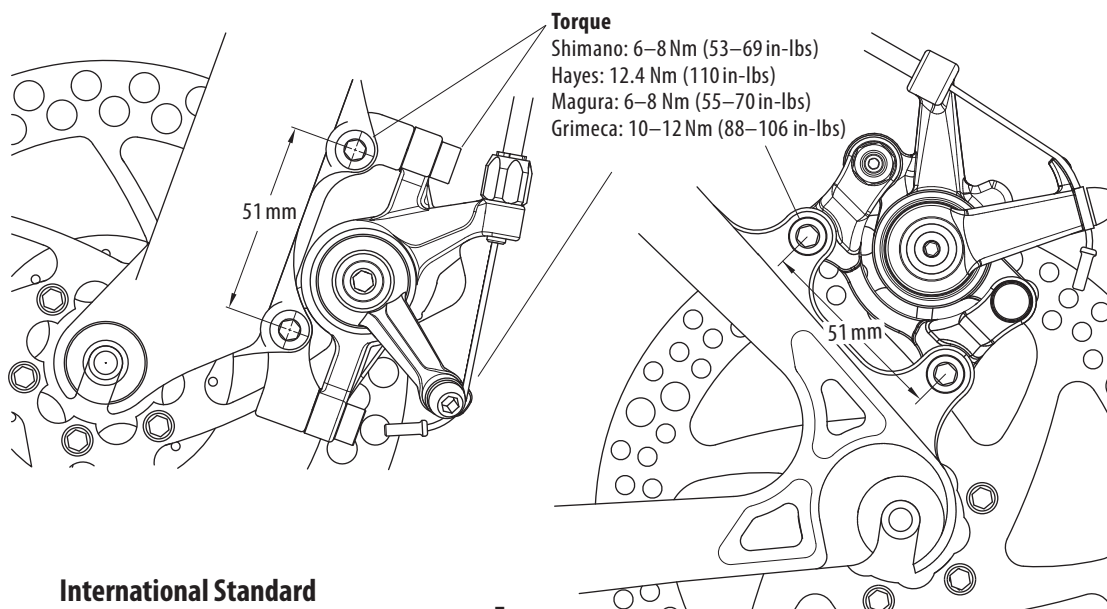
Hayes; 22 mm direct mount (obsolete, mainly replaced by IS).



Disc Brake Design & Standards *(continued)*

IS FRAME & FORK STANDARDS

Disc brakes (mechanical calipers shown)



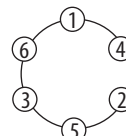
Torque
 Shimano: 6–8 Nm (53–69 in-lbs)
 Hayes: 12.4 Nm (110 in-lbs)
 Magura: 6–8 Nm (55–70 in-lbs)
 Grimeca: 10–12 Nm (88–106 in-lbs)

International Standard for mounting

- 51 mm for frame and fork mounting spacing.
- 44 mm BCD (bolt circle diameter) for attaching rotor to hub, 6-bolt pattern.
- Bolts must be low, ~2.7 mm height over the disc rotor, to avoid contact with fork, frame, etc. Torx model T25 may be useful in this regard.

Torque
 Shimano: 2–4 Nm (18–35 in-lbs)
 Hayes: 6 Nm (55 in-lbs)
 Magura: 4 Nm (35 in-lbs)
 Grimeca: 5–7 Nm (44–62 in-lbs)
 Hope: 8 Nm (71 in-lbs) for M6 bolts,
 4 Nm (35 in-lbs) for M5 bolts

Typical bolt torquing sequence to avoid deforming rotor.



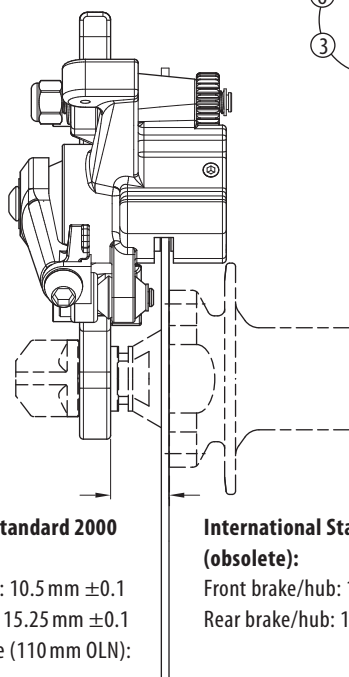
Warning

There is a huge variation in the listed torque between brands. Use the manufacturer's assembly instructions to avoid poor assembly or injury.



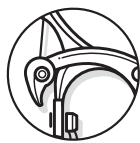
Important!

When installing virtually *any* cable-actuated disc brake, it is crucial that there be no more than 20 mm ($\frac{3}{4}$ ") of excess cable beyond the cable anchor bolt. A longer cable could potentially get caught in the rotor and be pulled into the caliper, causing wheel lockup. Also, avoid using an open cable run (between cable housing stops) along a fork blade. Flexing of the fork during braking could pull on the cable and lock the brake.



International Standard 2000 (current):
 Front brake/hub: 10.5 mm ± 0.1
 Rear brake/hub: 15.25 mm ± 0.1
 Ft thru-axle type (110 mm OLN): 15.25 mm ± 0.1

International Standard 1999 (obsolete):
 Front brake/hub: 13 mm
 Rear brake/hub: 16 mm



Disc Brakes—Avid

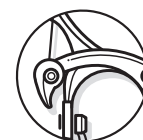
AVID TOOLS, TORQUE SPECS & FLUID

TOOLS FOR INSTALLATION & MAINTENANCE

	Mechanical, MTB & road	Hydraulic, Juicy Seven
2 mm hex key	—	Yes
2.5 mm hex key	Yes	—
4 mm hex key	—	Yes
5 mm hex key	Yes	Yes
10 mm box/open wrench	—	Yes
Cable cutters	Yes	—
Torx T25 key wrench	Yes	Yes
Torque wrench 2.8–10 Nm / 25–90 in-lbs range	Yes	Yes

TORQUE SPECS

	Mechanical, MTB & road	Hydraulic, Juicy Seven
Brake lever (bolt to bar)	Varies by model:	2.8–3.4 Nm / 25–30 in-lbs
Avid FR1 disc-specific lever	3.5–5 Nm / 30–40 in-lbs	—
Avid Speed Dial lever 5/7/Ti	5–7 Nm / 40–60 in-lbs	—
Avid Speed Dial Ultimate lever	3.3–4.2 Nm / 28–36 in-lbs	—
Hydraulic line to lever	—	5.5–6.2 Nm / 50–55 in-lbs
Banjo bolt, hydraulic line to caliper	—	5.5–6.2 Nm / 50–55 in-lbs
Lever screw in bleed plug (T-10 Torx)	—	Snug, no torque established
Bleed screw on caliper (T-10 Torx)	—	Snug, no torque established
Caliper attachment to frame/fork	9–10 Nm / 80–90 in-lbs	9–10 Nm / 80–90 in-lbs
CPS (alignment) bolts	8–10 Nm / 70–90 in-lbs	8–10 Nm / 70–90 in-lbs
Brake pad bolts	Uses “spreader clip” retainer	Uses “spreader clip” retainer
Disc rotor to hub bolts	6.2 Nm / 55 in-lbs	6.2 Nm / 55 in-lbs
Bolt attaching cable to caliper	5–7 Nm / 40–60 in-lbs	—



Disc Brakes—Avid *(continued)*

AVID TOOLS, TORQUE SPECS & FLUID *(continued)*

HYDRAULIC FLUID

	Mechanical, MTB & road	Hydraulic, Juicy Seven
Avid Hi-Performance DOT fluid or DOT 4 or 5.1*	—	Yes

* Not 5.0, which will cause problems if mixed.

AVID ADAPTERS

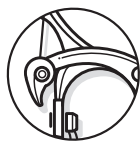
Mounting type	Rotor Ø in mm recent / older	Brake caliper	Avid PN recent / older*	Compatibility
Fork†				
IS	Ø 160/165	Standard mechanical, Juicy 7 hydraulic	04-763029 / 02-630192	Ø 165 was a 2001 spec, Ø 160 a 2002 and later spec
	Ø 185	Standard mechanical, Juicy 7 hydraulic	04-721029 / 02-731029	Only compatible with 2002 and later mechanical disc brake cali- pers, not with 2001 caliper
	Ø 203	Standard mechanical, Juicy 7 hydraulic	04-731028 / 02-731028	Only compatible with 2002 and later mechanical disc brake cali- pers, not with 2001 caliper
	Ø 160	Juicy 7 hydraulic	04-761025	Only Juicy 7
RockShox Boxxer	Ø 203	Standard mechanical, Juicy 7 hydraulic	04-735026	Special for Boxxer only
Marzocchi QR20 type	Ø 203	Standard mechanical, Juicy 7 hydraulic	04-736023	Special for Marzocchi 20 mm thru-axle only
PM Manitou	Ø 160/165‡	Standard mechanical, Juicy 7 hydraulic	Direct attachment	Ø 165 was a 2001 spec, Ø 160 a 2002+ spec. Not interchangeable.
	Ø 185	Standard mechanical, Juicy 7 hydraulic	04-723023 / 03-723023	Only compatible with 2002 and later mechanical disc brake calipers, not with 2001 caliper
	Ø 203 mm	Standard mechanical, Juicy 7 hydraulic	04-733022 / 03-733022	Only compatible with 2002 and later mechanical disc brake calipers, not with 2001 caliper

* Recent PNs are shown in **Bold** type. For the Juicy 7, in particular, use the most recent adapters to achieve the best fit.

† All front adapters are for standard 100 mm OLN hubs. Avid has no adapters for QR20 or QR20 Plus thru-axle hubs which have 110 mm OLN and thus require different spacing.

‡ The difference in rotor diameter is accommodated in the design of the caliper body. A 165 mm rotor will rub in the back of a 2002 and later caliper body, and a 160 mm rotor will not engage fully with a 2001 caliper.

(continued)



Disc Brakes—Avid (continued)

AVID ADAPTERS (continued)

Mounting type	Rotor Ø in mm recent / older	Brake caliper	Avid PN recent / older*	Compatibility
Frame				
IS	Ø 140	Standard mechanical	04-763029 / 03-630192 [§]	2002 and later model mechanical disc brake caliper only
	Ø 160/165[‡]	Standard mechanical, Juicy 7 hydraulic	04-764026 / 02-630186	Some pre-2001 frames require a rotor smaller than Ø 160 mm. Check to ensure proper clearance. Ø 160 and Ø 165 are not inter- changeable.
	Ø 185	Standard mechanical, Juicy 7 hydraulic	04-722026 / 02-722026	Check to ensure proper clearance for an oversized rotor.
	Ø 203	Standard mechanical, Juicy 7 hydraulic	04-732025 / 02-732025	Check to ensure proper clearance for an oversized rotor.
	Ø 160	Juicy 7 hydraulic	04-762022	Only for Juicy 7

* Recent PNs are shown in **Bold** type. For the Juicy 7, in particular, use the most recent adapters to achieve the best fit.

[‡] The difference in rotor diameter is accommodated in the design of the caliper body. A 165 mm rotor will rub in the back of a 2002 and later caliper body, and a 160 mm rotor will not engage fully with a 2001 caliper.

[§] Uses 165/160 front IS bracket on the rear tabs to mount 140 mm rotor.

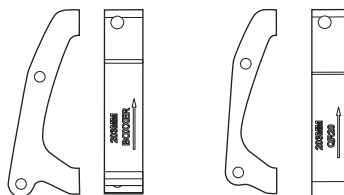
Disc Brakes—Avid *(continued)*

AVID ADAPTERS *(continued)*

Examples of Avid adapters*

Front, special forks

CPS mounting brackets for Type N
BBDB mechanical caliper or Juicy 7



04-735026

Boxxer

04-736023

Marzocchi QR 20

Front, IS fork

CPS mounting bracket for Type N
BBDB mechanical caliper or Juicy 7



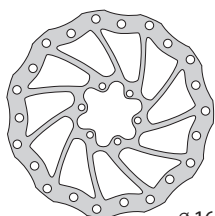
04-763029

Rear, IS frame

CPS mounting bracket for Type N
BBDB mechanical caliper or Juicy 7



04-764026



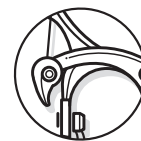
Ø 165*/160

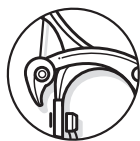
Note regarding rotor diameters

Avid adapters are available for rotor diameters 160 / 165 mm, 185 mm and 203 mm.
For rotor diameter 160 / 165 mm, special considerations apply:

The difference in rotor diameter is accompanied by caliper body changes. A 165 mm rotor will rub inside the back of a 2002–04 type N caliper body, and a 160 mm rotor won't engage fully with a 2001 type F caliper.

* Refer to the table on pages 11-19 and 11-20 for information on the full range of Avid adapters. Not all types are illustrated.





Disc Brakes—Formula

FORMULA TOOLS, TORQUE SPECS, FLUID & GREASE

TOOLS FOR INSTALLATION & MAINTENANCE

	Activa, MD1 mechanical	B4 hydraulic	4-Racing hydraulic	Evoluzione hydraulic
2 mm hex key	—	Yes	Yes	Yes
2.5 mm hex key	Yes	Yes	Yes	Yes
3 mm hex key	Yes	Yes	Yes	Yes
4 mm hex key	Yes	Yes	Yes	Yes
5 mm hex key	Yes	Yes	Yes	Yes
8 mm box/open wrench	Yes	Yes	Yes	Yes
10 mm box/open wrench	—	—	—	Yes
17 mm box/open wrench	Yes	—	—	—
Hydraulic tube cutter	—	Yes	—	—
Cable cutter	Yes	—	—	—
Flat-blade screwdriver	Yes	Yes	Yes	Yes
Small Phillips screwdriver	—	—	—	Yes
Pliers	—	—	—	Yes
Torx T25 key wrench	Yes	Yes	Yes	Yes
Torx T15 key wrench	—	Yes	Yes	—
Torx T10 key wrench	—	Yes	Yes	—
FD40007-20 master cylinder pack fixing tool	—	—	—	Yes
Master cylinder substitution tool FD40026-20	—	Yes	Yes	—

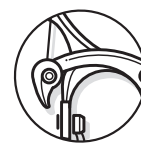
The B4 and 4 Racing use the same pads.

The Evoluzione brakes are available in three models: Evoluzione 98, Evoluzione 99 and Evoluzione 9.5. The master piston of the Evoluzione 9.5 has a diameter of 9.5 mm, and other two have an 11 mm piston. The 98's lever has the tube outlet parallel to the handlebar rather than inclined towards the front.

The 4-Racing brakes are available in versions XC, FR, and DH. The disc diameters are different, and the XC model uses the B4 brake lever.

The B4 brakes are available in 3 models: Sport, Pro, Team and SL. The colors, materials and diameters of the pistons and calipers differ, but the mechanisms are the same.

The pads of the Activa braking system are compatible with the MD-1 calipers if the Activa disc is used.



Disc Brakes—Formula *(continued)*

FORMULA TOOLS, TORQUE SPECS, FLUID & GREASE *(continued)*

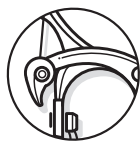
TORQUE SPECS

	Activa, MD1 mechanical	B4 hydraulic	4-Racing hydraulic	Evoluzione hydraulic
Brake lever bolt to bar	Formula does not supply brake lever	2.5 Nm / 22 in-lbs	2.5 Nm / 22 in-lbs	6 Nm / 53 in-lbs
Hydraulic line to lever	—	8 Nm / 70 in-lbs	12 Nm / 105 in-lbs	9 Nm / 79 in-lbs
Hydraulic line to caliper	—	9 Nm / 79 in-lbs	9 Nm / 79 in-lbs	12 Nm / 105 in-lbs
Fluid reservoir cover bolts	—	1 Nm / 9 in-lbs	1 Nm / 9 in-lbs	1 Nm / 9 in-lbs
Bleed screw on caliper	—	2 Nm / 17 in-lbs	2 Nm / 17 in-lbs	5.7 Nm / 51 in-lbs
Caliper attachment to frame/fork	9 Nm / 79 in-lbs	9 Nm / 79 in-lbs	9 Nm / 79 in-lbs	9 Nm / 79 in-lbs
Brake pad bolts	*	5.75 Nm / 51 in-lbs	5.75 Nm / 51 in-lbs	Snap ring
Assemble caliper body	*	5.75 Nm / 51 in-lbs	5.75 Nm / 51 in-lbs	5.75 Nm / 51 in-lbs
Disc rotor to hub bolts	5.7 Nm / 50 in-lbs	5.75 Nm / 51 in-lbs	5.75 Nm / 51 in-lbs	5.75 Nm / 51 in-lbs
Bolt attaching cable to caliper	2.9Nm / 26 in-lbs	—	—	—

* No information


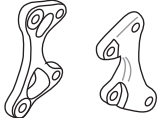
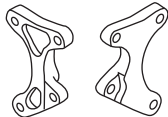
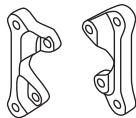
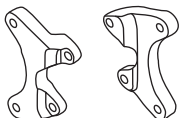
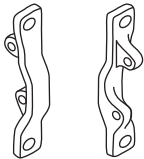
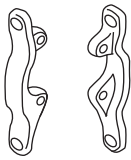
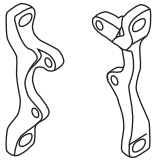
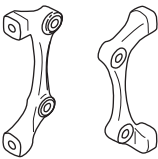
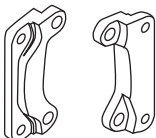
HYDRAULIC FLUID & GREASE

	Activa, MD1 mechanical	B4 hydraulic	4-Racing hydraulic	Evoluzione hydraulic
DOT 4 or Shell Donax UB hydraulic brake fluid preferred. DOT 3 also OK	—	Yes	Yes	Yes
Use silicone grease for EPDM seals	—	Yes	Yes	Yes



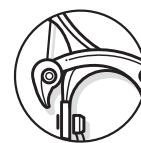
Disc Brakes—Formula *(continued)*

FORMULA ADAPTERS

MODEL	ADAPTERS			
	Adapter type	Rotor Ø 160 mm	Rotor Ø 185 mm	Rotor Ø 205 mm
Fork				
4 Racing, Extreme	IS	FD40037-10 	FD40026-10 	FD40036-10* 
	RockShox Boxxer		FD40029-10 	FD40043-10 
	Marzocchi Mr T			FD40052-10 
	PM (Manitou)		FD40028-10 	FD40044-10 
B4	IS fork with PM caliper		FD51029-00 	
B4, Evoluzione	IS		FD51027-00† 	

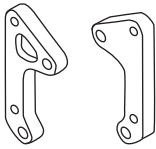
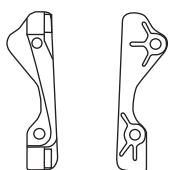
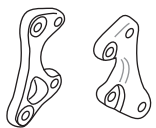
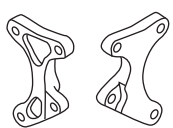
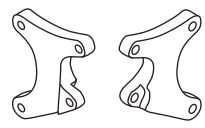
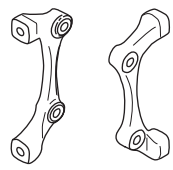
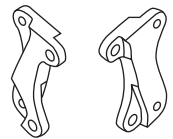
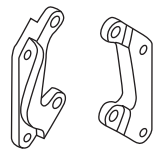
* Converts Ø 185 rotor-equipped brakes, using new rotor and additional adapter.

† Converts Ø 160 rotor-equipped brakes, using new rotor and additional adapter.



Disc Brakes—Formula *(continued)*

FORMULA ADAPTERS *(continued)*

MODEL	ADAPTERS			
	Adapter type	Rotor Ø 160 mm	Rotor Ø 185 mm	Rotor Ø 205 mm
Fork				
	Boxxer		FD51007-00 	
B4, Evoluzione	PM		FD51019-00 	
Frame				
4 Racing, Extreme	IS	FD40027-10 	FD40036-10† 	FD40051-10† 
B4	IS using PM caliper	FD51028-00 		
B4, Evoluzione	IS	FD51014-00‡ 	FD51015-00‡ 	

† Converts Ø 160 rotor-equipped brakes, using new rotor and additional adapter.

‡ Converts Ø 140 rotor-equipped brakes, using new rotor and additional adapter.



Disc Brakes—Grimeca

GRIMECA TOOLS, TORQUE SPECS, FLUID & GREASE

Grimeca does not supply a tool list, but states that common bike shop tools are appropriate when used correctly.

Grimeca does not generally list torque values, stating that tightening to specified torque is not standard shop practice. In such cases, refer to

the Hope brake torque values, which are based on bolt thread size (M4 and M5), as these may apply; and/or use your best judgment and experience as a guide. The available torque specs are listed below.

TORQUE SPECS

	System 6 / 6.1 mechanical	System 4 / 5 / 5.1 hydromechanical	System 1 / 1.1 / 15 / 15.1 hydraulic
Caliper attachment to frame/fork	10–12 Nm / 88–106 in-lbs	10–12 Nm / 88–106 in-lbs	10–12 Nm / 88–106 in-lbs
Disc rotor to hub bolts	5–7 Nm / 44–62 in-lbs	5–7 Nm / 44–62 in-lbs	5–7 Nm / 44–62 in-lbs

HYDRAULIC FLUID & GREASE

	System 6 / 6.1 mechanical	System 4 / 5 / 5.1 hydromechanical	System 1 / 1.1 / 15 / 15.1 hydraulic
DOT 3 or 4 hydraulic brake fluid	–	Yes	Yes
Use silicone grease for seals	–	Yes	Yes

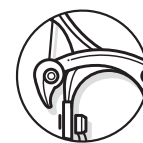
GRIMECA BRAKING SYSTEMS IN THE USA

Grimeca stresses direct mounting and a large diversity of brake models to fit different disc sizes, rather than few models and many adapters. Grimeca has only a few specialized adapters, as for example, to fit IS standard to PM on Manitou forks. Models sold in the USA are the 7, 8, 12, 17.

There are some differences between the two charts on page 11-27. As of this writing, Grimeca

is trying some sizes (for example, 203mm), and also, discrepancies between normal and special production may exist. Due to this evolving situation, it is prudent to check with a parts distributor when planning to change rotor size.

(continued)



Only some Grimeca combinations are offered through BTI in the USA. Model 17 does not require adapters for a 203 mm disc, and can function only with large rotors.

Disc Brakes—Grimeca *(continued)*

GRIMECA BRAKING SYSTEMS IN THE USA *(continued)*

MODEL	ROTOR DIAMETER				
	Ø 160 mm	Ø 160 mm	Ø 180 mm	Ø 200 mm*	Ø 203 mm
7F, 7R	Yes	—	—	—	—
8F, 8R	—	Yes	Yes [†]	No [‡]	No [‡]
12F, 12R	—	Yes	Yes [†]	Yes	Yes
17F, 17R	—	—	—	Yes	Yes
BTI rotor PN	GM-820160	GM-820161	GM-820180	GM-820200	GM-820203
Notes	Mechanical rotor uses a different steel alloy	—	Using PM adapter GM-860100	Using adapter GM-830008	Using adapter GM-830009/GC-2020/CM-1623

* 200 mm has been replaced by 203 mm.

[†] For front (F) only.

[‡] Although System 8 will work with large rotors, this combination is not recommended by Grimeca.

Manitou PM fork adapter for 185 mm rotor; GM-860100 (for System 7). BTI does not sell the rotor.

IS adapter to use 185 mm rotor; GC-2018 (System 8/12). BTI does not sell the rotor.

GRIMECA STANDARD ROTOR & CALIPER COMBINATIONS

Rotor Ø	Grimeca rotor part number	Braking systems according to rotor size and model F = front brake, R = rear brake
Ø 140 mm	6 121 105245	1R, 2R, 2.1R, 2.2R, 4R, 5R, 5.1R, 7R, 9R, 13R, 14R, 15R, 16R
	6 121 108083	
Ø 160 mm	6 121 105177	1F, 1.1R, 2F, 2.1F, 2.2F, 4F, 5F, 5.1F, 7F, 7.1R, 9F, 9.1R, 13F, 14F, 14.1R, 15F, 15.1, 16F, 16.1R
	6 121 106541	
	6 121 105581	8F, 8R, 12F, 12R, 19F, 20F
	6 121 107649	
	6 121 109010	
Ø 165 mm	6 121 109706	6F, 6.1R, 7.2F, 9.2R, 10F, 11R, 14.2F, 16.2F
	6 121 108940	
Ø 180 mm	6 122 107633	1.1F, 7.1F, 9.1F, 14.1F, 15.1F, 16.1F
	6 121 107635	8F*, 12F*, 17R
Ø 185 mm	6 122 107753	1F [†] , 4F [†] , 6.1F, 7F [†] , 8F [†] , 9.2F, 11F, 13F [†] , 14F [†] , 15F [†] , 16F [†]
Ø 200 mm	6 122 109611	12F [‡] , 17F, 18F

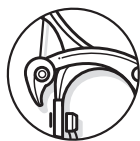
* 20 mm larger than normal, by using rear caliper on the front fork.

[†] 25 mm larger than the usual 160 mm when using Manitou 74 mm size post-mount adapter. 160 mm diameter not possible with this mount. Usable on brake models 1, 4, 7, 8, 13, 14, 15, 16.

[‡] 40 mm larger than otherwise by using specific adapter PN# 6 122 109611; only for brake model 12 (front fork mount).

Note

Where several rotors of the same size are offered, the difference is in the steel alloy of the disc.



Disc Brakes—Hayes

HAYES—TOOLS, FLUID & GREASE, TORQUE SPECS

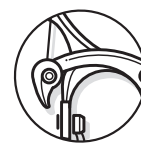
TOOLS FOR INSTALLATION & MAINTENANCE

	HMX-1 XC, HMX-1 HD, MX-1, MX-2 mechanical	HFX MAG PLUS, HFX 9 XC, HFX MAG HD, HFX 9 HD hydraulic
2 mm hex key	—	Yes
4 mm hex key	Yes	Yes
5 mm hex key	Yes	Yes
6 mm box/open wrench	—	Yes
8 mm box/open wrench	—	Yes
10 mm box/open wrench	—	Yes
13 mm box/open wrench	—	Yes
Scissors or cable cutter	—	Yes
Cable cutter	Yes	—
Flat-blade screwdriver	—	Yes
Small Phillips screwdriver	—	Yes
Hammer	—	Yes
Drift punch	—	Yes
Torque wrench	Yes	Yes
Torx T25 key wrench	Yes	Yes

HYDRAULIC FLUID & GREASE

	HMX-1 XC, HMX-1 HD, MX-1, MX-2 mechanical	HFX MAG PLUS, HFX 9 XC, HFX MAG HD, HFX 9 HD hydraulic
DOT 3 or DOT 4 hydraulic brake fluid—DOT 4 has higher boiling point	—	Yes
Moisten sealing surfaces with DOT 3 or 4 during reassembly	—	Yes

Clean the disc and pads with isopropyl alcohol only. Throw away contaminated pads.



Disc Brakes—Hayes *(continued)*

HAYES—TOOLS, FLUID & GREASE, TORQUE SPECS *(continued)*

TORQUE SPECS

	HMX-1 XC, HMX-1 HD, MX-1, MX-2 mechanical	HFX MAG PLUS, HFX 9 XC, HFX MAG HD, HFX 9 HD hydraulic
Brake lever (bolt to bar)	Hayes does not supply lever	1.7–2.25 Nm / 15–20 in-lbs
Hydraulic line to lever	—	4.5 Nm / 40 in-lbs plus one full rotation*
Handlebar master cylinder clamp screw	—	1.7–2.25 Nm / 15–20 in-lbs†
Master cylinder jam nut	—	5.6 Nm / 50 in-lbs
Hydraulic line to G2 caliper (2003+)	—	6.2 Nm / 55 in-lbs
Hydraulic line to G1 caliper (before 2003)	—	4.5 Nm / 40 in-lbs plus one full rotation*
Banjo bolt, hydraulic line to caliper	—	6.2 Nm / 55 in-lbs
Fluid reservoir cover bolts	—	0.57 Nm / 5 in-lbs
Bleed screw (on caliper)	—	0.23 Nm / 2 in-lbs (Torque to seal. Do not overtorque.) Teflon tape or thread sealant.
Caliper mount bolts to frame/fork	12.43 Nm / 110 in-lbs.	12.43 Nm / 110 in-lbs
Caliper bridge bolts	12.43 Nm / 110 in-lbs	12.43 Nm / 110 in-lbs
Brake pad bolts	Spring retained, or magnetic‡	None, spring-retained
Disc rotor to hub bolts	6.2 Nm / 55 in-lbs in a star pattern sequence.	6.2 Nm / 55 in-lbs in a star pattern sequence
Bolt attaching cable to caliper	6.7 Nm / 60 in-lbs	—

* HFX 9: 6.78 Nm / 60 in-lbs

† HFX 9: 3.38–3.94 Nm / 30–35 in-lbs

‡ Depending on model: HMX-1 uses spring-clip attachment, MX2 uses magnetic attachment.









Disc Brakes—Hayes (continued)

HAYES ADAPTERS

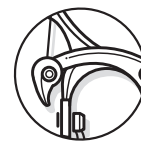
Recent caliper models all use a 74 mm spacing, allowing direct mount on the PM system (Manitou) without need for any bracket. With adapters, these calipers can be used with the IS system.

Pictured are the most common recent adapters. Older Hayes have had a variety of mountings and adapters. Older adapter models are described on pages 11-32 to 11-33.

ADAPTERS

Adapter type	Rotor Ø 160 mm	Rotor Ø 203 mm
Fork		
IS	<p> Hub needed Std QR 100 mm OLN Aftermarket kit 98-15068 OEM 98-14917 </p> 	<p> Hub needed Ø 20 mm w/110 mm OLN Aftermarket kit 98-15068 OEM 98-14917 </p>   <p> Side view wider and offset for 110 mm OLN hub </p>
Boxxer		<p> Hub needed Ø 20 mm w/110 mm OLN Aftermarket kit 98-15069 OEM 98-14922 </p>   <p> Side view wider and offset for 110 mm OLN hub </p>
Psylo / Jr. T		<p> Hub needed Ø 20 mm (narrow) or Std QR,100 mm OLN Aftermarket kit 98-15069 OEM 98-14922 </p> 

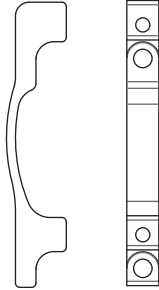

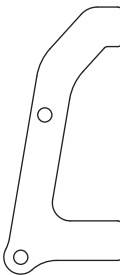
(continued)



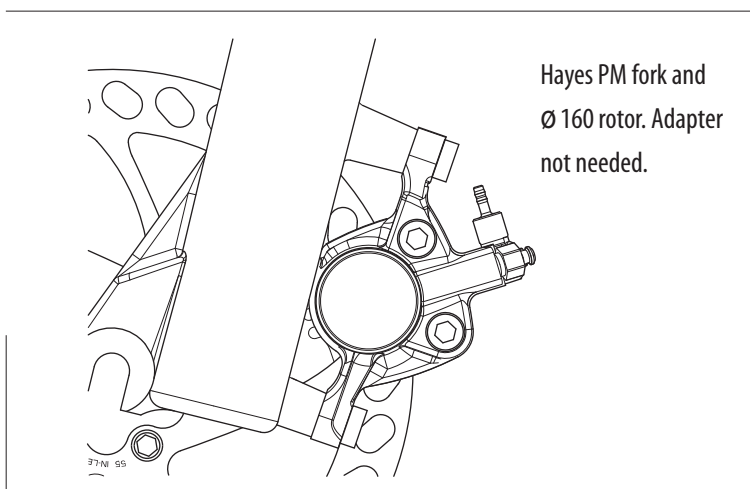
Disc Brakes—Hayes *(continued)*

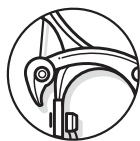
HAYES ADAPTERS *(continued)*

ADAPTERS

Adapter type	Rotor Ø 160 mm	Rotor Ø 203 mm
Fork		
PM	Hub needed Std QR 100 mm OLN	Hub needed Ø 20 mm or Std QR, 100 mm OLN
	Aftermarket kit 98-15072 OEM 98-15012	Aftermarket kit 98-15072 OEM 98-15012
	No adapter needed*	
Frame		
IS	Hub needed Std QR, 135 mm OLN	Hub needed Std QR, 135 mm OLN
	Aftermarket kit 98-15073 OEM 98-14924	Aftermarket kit 98-15074 OEM 98-15033
		

* See illustration, right bottom.





Adapter availability

RS and MN type are no longer made, and most adapters for these calipers are no longer available.

UN is the current Hayes type and name for Manitou PM standard; UN adapters are available.

Disc Brakes—Hayes *(continued)*

HAYES ADAPTERS TO FIT OLDER FORKS & FRAMES

MODEL					ADAPTERS	
Manufacturer	Fork model, frame design*	Rotor Ø in mm	Caliper†	Hub	Aftermarket part number	OEM part number
Forks						
Manitou	Recent Manitou	Ø 160	UN	Std	Direct mount, no adapter needed	
	Ø 160 to Ø 203 PM conversion	Ø 203	UN	Std/20 mm	98-15072	98-15012
	98 X Vert Ti / 98-99 thru-axle	Ø 203	UN	20 mm	98-15126	98-14918
	98 X Vert Ti / 98-99 thru-axle	Ø 203	MN	20 mm	98-14588	98-14564
Marzocchi	99 GT QR20	Ø 160	MN	20 mm QR special	98-15070	98-14891
	Marz 99 QR20	Ø 160	UN	QR special	98-14925	98-14925
	97 Bomber / Alloy (1998-99)	Ø 203	MN	Std	98-14590	98-14568
	98 Bomber	Ø 203	RS	Std	98-14591	98-14572
	99 Mr. T	Ø 203	MN	20 mm	98-14599	98-14598
	Jr. T	Ø 203	UN	20 mm	98-15604	98-15603
Most suppliers and models since 1999/2000	IS fork w/std axle	Ø 160	UN	Std	98-15068	98-14917
	IS fork w/20 mm axle	Ø 160	UN	20 mm	98-15282	98-15206
	IS fork w/20 mm axle	Ø 203	UN	20 mm	98-15069	98-14922
RockShox	98 Judy SL	Ø 160	RS	Std	98-14538	98-14422
	98 Boxxer	Ø 203	MN	20 mm	98-14589	98-14567
	Boxxer	Ø 203	UN	20 mm	98-15071	98-14920
	Psylo	Ø 203	UN	20 mm	98-15604	98-15603
RST	98 RST High 5	Ø 160	RS	Special	N/A	98-14825
	98 Mozo XXL	Ø 203	RS	20 mm	98-14837	98-14827
	99 Sigma	Ø 203	MN	20 mm	98-14599	98-14598

* The Hayes website has a listing by model and supplier of forks made from 1998 to the present.

† Caliper bolt mount standards: Hayes has had several (see below).

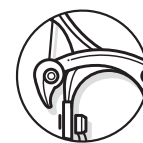
RS = 71 mm caliper spacing (bolt hole to bolt hole). Not currently made.

MN = 69 mm caliper spacing (bolt hole to bolt hole). Not currently made.

UN = 74 mm caliper spacing (bolt hole to bolt hole). Referred to as PM or Manitou standard by the industry.

‡ The rotor which can be used depends on where the framebuilder placed the bosses.

(continued)



Disc Brakes—Hayes *(continued)*

HAYES ADAPTERS TO FIT OLDER FORKS & FRAMES *(continued)*

MODEL					ADAPTERS	
Manufacturer	Fork model, frame design*	Rotor Ø in mm	Caliper†	Hub	Aftermarket part number	OEM part number
White Brothers	98 UP150	Ø 203	RS	20 mm	98-14594	98-14566
Frames						
Various	Rear IS std to Hayes	Ø 160	22 mm	Rear	98-15281	98-15043
	IS rear	Ø 160	UN	Rear	98-15073	98-14924
	IS rear	Ø 203	UN	Rear	98-15074	98-15033
	Rear Hayes 69 mm standard	Ø 160	MN	Rear	98-14866	98-14577
	Rear Hayes 22 mm standard	Ø 160 or Ø 203‡	22 mm	Std	Direct mount, no adapter needed	

* The Hayes website has a listing by model and supplier of forks made from 1998 to the present.

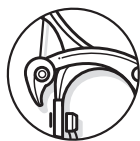
† Caliper bolt mount standards: Hayes has had several (see below).

RS = 71 mm caliper spacing (bolt hole to bolt hole). Not currently made.

MN = 69 mm caliper spacing (bolt hole to bolt hole). Not currently made.

UN = 74 mm caliper spacing (bolt hole to bolt hole). Referred to as PM or Manitou standard by the industry.

‡ The rotor which can be used depends on where the framebuilder placed the bosses.



Disc Brakes—Hope

HOPE HYDRAULIC—TOOLS, TORQUE SPECS & FLUID

TOOLS FOR INSTALLATION & MAINTENANCE

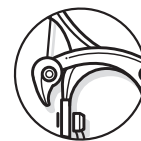
Open type: Open 2, Mini*, DH4,
Enduro 4†, M4

Closed type: XC4, Closed 2

2 mm hex key	Yes	Yes
2.5 mm hex key	Yes	Yes
3 mm hex key	Yes	Yes
4 mm hex key	Yes	Yes
5 mm hex key	Yes	Yes
6 mm hex key	Yes	Yes
8 mm box/open wrench	Yes	Yes
10 mm box/open wrench	Yes	Yes
Hose cutter	Yes	Yes
Razor knife	Yes	Yes
Flat-blade screwdriver	Yes	Yes
Standard pliers	Yes	Yes
Circlip pliers	Yes	Yes
Long needle-nose pliers	Yes	Yes
Torque wrench	Yes	Yes
Hope spot tool	Yes	Yes
Hope pressure bleeder	Yes	Yes
Hope hub service tools	Yes	Yes
Hope multi-tool	Yes	Yes
Set of picks (i.e. dental)	Yes	Yes

* Mini replaced Open2 in 2001.

† Enduro 4 replaced DH4 in 2001.



Disc Brakes—Hope *(continued)*

HOPE HYDRAULIC—TOOLS, TORQUE SPECS & FLUID *(continued)*

TORQUE SPECS

	Open type: Open 2, Mini*, DH4, Enduro 4†, M4	Closed type: XC4, Closed 2
Hose connector	8 Nm / 71 in-lbs	8 Nm / 71 in-lbs
M6 bolts	8 Nm / 71 in-lbs	8 Nm / 71 in-lbs
M5 bolts	4 Nm / 35 in-lbs	4 Nm / 35 in-lbs
Pistons (Closed 2 and XC4 only)	—	2 Nm / 18 in-lbs

* Mini replaced Open2 in 2001

† Enduro 4 replaced DH4 in 2001

Note: Torque specification not available for very small bolts. Avoid overtightening.

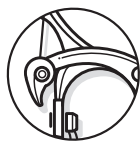
HYDRAULIC FLUID

	Open type: Open 2, Mini*, DH4, Enduro 4†, M4	Closed type: XC4, Closed 2
DOT 4‡ hydraulic brake fluid	Yes	Yes

* Mini replaced Open2 in 2001.

† Enduro 4 replaced DH4 in 2001.

‡ In the USA, brakes use DOT 4. DOT 4 can be mixed with DOT 5.1 without any bad effect. Avoid DOT 5.0 fluid, as it is silicone-based and will ruin the seals.

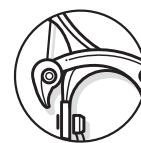


Disc Brakes—Hope *(continued)*

HOPE STANDARD BRAKE FITTING & ADAPTERS

MODEL		ADAPTERS				
Model	Version	Adapter type	Rotor Ø 145 mm	Rotor Ø 165 mm	Rotor Ø 185 mm	Rotor Ø 205 mm
Fork						
C2	5	IS	—	Not required	—	—
	3	IS	—	—	Not required	—
M4	5	IS	—	Not required	—	—
	3	IS	—	—	Not required	—
	8	IS	—	—	—	Not required
Mini	5	IS	—	Not required	—	—
	3	IS	—	—	Not required	—
	8	IS	—	—	—	Not required
M4	5	PM	—	—	HBSM20H	—
	3	PM	—	—	—	HBSM20H
C2	9:74	PM	—	Not required	—	—
	5	PM	—	—	HBSM20H	—
	3	PM	—	—	—	HBSM20H
Mini	9:74	PM	—	Not required	—	—
	5	PM	—	—	HBSM20H	—
	3	PM	—	—	—	HBSM20H
C2	6	Boxxer	—	—	Not required	—
M4	6	Boxxer	—	—	—	Not required
Mini	6	Boxxer	—	—	—	Not required
M4 Mini	12	Marzocchi Super Monster T, Monster T, Monster T2	—	—	—	Not required
C2	5	Manitou Dorado	—	—	—	Manitou IS Mount
M4	5	Manitou Dorado	—	—	—	Manitou IS Mount
Mini	5	Manitou Dorado	—	—	—	Manitou IS Mount

(continued)



Disc Brakes—Hope *(continued)*

HOPE STANDARD BRAKE FITTING & ADAPTERS *(continued)*

MODEL		ADAPTERS				
Model	Version	Adapter type	Rotor Ø 145 mm	Rotor Ø 165 mm	Rotor Ø 185 mm	Rotor Ø 205 mm
Frame						
M4	5	IS	Not required	—	—	—
	3	IS	—	Not required	—	—
	8	IS	—	—	Not required	—
C2	5	IS	Not required	—	—	—
	3	IS	—	Not required	—	—
Mini	8	IS	Not required	—	—	—
	5	IS	—	Not required	—	—
	3	IS	—	—	Not required	—
C2	1	Hayes chainstay	—	HBRM165H	—	—
Calipers as IS		Hayes seatstay	—	HBRMHIS*	—	—

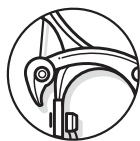
* The rotor which can be used depends on where the framebuilder placed the bosses.

Alternative adapters

Two adapters are available to allow installation of larger rotors:

HBIS40 allows a 40 mm larger rotor on a standard caliper (51 mm IS type).

HBIS20 allows a 20 mm larger rotor on a standard caliper (51 mm IS type).



Disc Brakes—Magura

MAGURA HYDRAULIC—TOOLS, TORQUE & FLUID

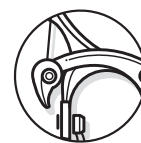
TOOLS FOR INSTALLATION & MAINTENANCE

	Gustav	Marta / Marta SL	Louise / Louise FR	Clara	Julie
2 mm hex key wrench	Yes	Yes	Yes	Yes	Yes
2.5 mm hex key wrench	—	Yes	Yes	—	—
3 mm hex key wrench	Yes	Yes	Yes	Yes	Yes
5 mm hex key wrench	Yes	Yes	Yes	Yes	Yes
8 mm box/open wrench	Yes	Yes	Yes	Yes	Yes
Sharp knife	Yes	Yes	Yes	Yes	Yes
Flat blade screw driver	Yes	Yes	Yes	Yes	Yes
Torx T25 key wrench	Yes	Yes	Yes	Yes	Yes
Torx T7 key wrench	Yes	Yes	Yes	Yes	Yes
Transport mounting device (to keep brake pads spread)	Yes	Yes	Yes	Yes	Yes

TORQUE SPECS

	Gustav	Marta / Marta SL	Louise / Louise FR	Clara	Julie
Brake lever (bolt to bar)	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs
Hydraulic line to lever	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs
Hydraulic line to caliper	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	4 Nm / 34 in-lbs
Banjo bolt, hydrau- lic line to caliper	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs
Fluid reservoir cover bolts	0.6 Nm / 5 in-lbs	0.6 Nm / 5 in-lbs	0.6 Nm / 5 in-lbs	0.6 Nm / 5 in-lbs	0.6 Nm / 5 in-lbs
Bleed screw (on caliper)	6 Nm / 51 in-lbs	2.5 Nm / 22 in-lbs	2.5 Nm / 22 in-lbs	2.5 Nm / 22 in-lbs	2.5 Nm / 22 in-lbs
Caliper attachment to frame/fork	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs	6 Nm / 51 in-lbs
Brake pad bolts	1 Nm / 9 in-lbs	1 Nm / 9 in-lbs	No, uses cotter pin	No, uses cotter pin	No, uses cotter pin

(continued)



Disc Brakes—Magura *(continued)*

MAGURA HYDRAULIC—TOOLS, TORQUE & FLUID *(continued)*

TORQUE SPECS

	Gustav	Marta / Marta SL	Louise / Louise FR	Clara	Julie
Disc rotor to hub bolts	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs	4 Nm / 34 in-lbs
Securing bolt for caliper holder	3Nm / 26 in-lbs	No	No	No	No

HYDRAULIC FLUID

Magura Royal Blood (low viscosity mineral oil)

MAGURA HYDRAULIC RIM BRAKES—TOOLS, TORQUE & FLUID

TOOLS FOR INSTALLATION & MAINTENANCE

HS 11, HS 33

2 mm hex key	Yes
3 mm hex key	Yes
5 mm hex key	Yes
8 mm box/open wrench	Yes
Sharp knife	Yes

Note

We have grouped this rim brake type with the Magura hydraulic disc brakes due to close similarities in torque, tools and fluid values and requirements; and for the reader's convenience of having all Magura hydraulic models together.

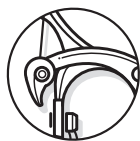
TORQUE SPECS

HS 11, HS 33

Brake lever	4 Nm / 34 in-lbs
Vent bolt (on lever)	4 Nm / 34 in-lbs
Upper bolts	4 Nm / 34 in-lbs
Center bolt	6 Nm / 51 in-lbs
Hourglass bolt	4.5 Nm / 39 in-lbs
Brake booster bolts	4 Nm / 34 in-lbs
Olive fastener (hydraulic line)	4 Nm / 34 in-lbs

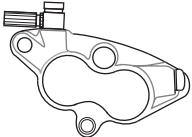
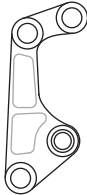
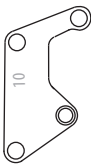

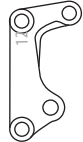

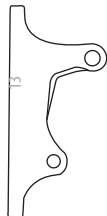

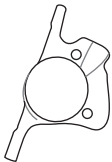

HYDRAULIC FLUID

Magura Royal Blood (low viscosity mineral oil)

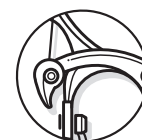


Disc Brakes—Magura *(continued)*

MAGURA ADAPTERS

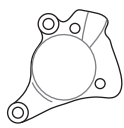
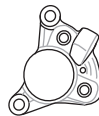
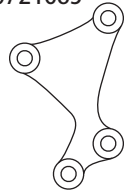
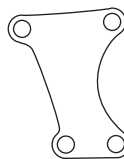



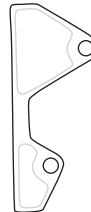



MODEL	ADAPTERS			
	Type	Rotor Ø 160 mm	Rotor Ø 180 mm	Rotor Ø 190 mm Rotor Ø 210 mm
Fork / front brake				
Gustav M  <i>The Gustav M caliper is manufactured in IS only. The many adapters adapt it to PM standard or to the many available Magura rotor sizes in IS specification.</i>	IS		0721210 	0721395 
	Boxxer		0721212 	0721644 
	PM		0721379 	0721645 
	Marzocchi Monster			0721604 
Julie 	IS		0721694 	
	PM	No adapter needed		

(continued)



Disc Brakes—Magura *(continued)*

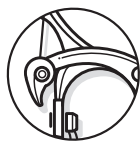
MAGURA ADAPTERS *(continued)*

MODEL	ADAPTERS				
	Type	Rotor Ø 160 mm	Rotor Ø 180 mm	Rotor Ø 190 mm	Rotor Ø 210 mm
Fork / front brake					
Julie 	IS	No adapter needed			
Louise, Louise FR* 	IS	No adapter needed	0721683 	0721454 	
	Boxxer		0721608 	0721609 	
	PM		0721643 	0721606 	
Louise† 	IS	0721694 			
Marta SL† 	PM	No adapter needed			
	IS	No adapter needed	Not sold with Ø 180 rotor, but convertible using the same adapters as for the Louise/Louise FR "short arm."		

* Louise/Louise FR "short arm" shape generally used for fork.

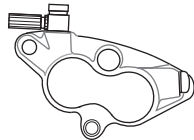

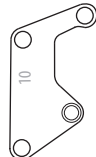


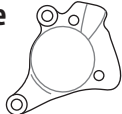
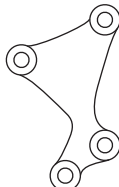

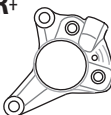
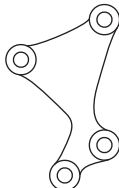
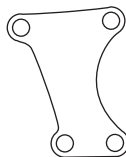
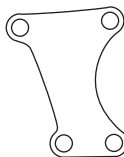



† "Direct mount" shape generally used for PM Manitou forks.

(continued)



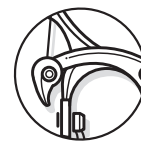
Disc Brakes—Magura *(continued)*

MAGURA ADAPTERS *(continued)*

MODEL		ADAPTERS				
	Type	Rotor Ø 160 mm	Rotor Ø 180 mm	Rotor Ø 190 mm	Rotor Ø 210 mm	
Frame / rear brake						
Gustav M 	IS	0721211 	0721395 			
Julie 	IS	0721695 				
	PM	No adapter needed				
Julie 	IS	No adapter needed	0721683 			
Marta SL 						
Louise, Louise FR† 	IS	No adapter needed	0721683 	0721454 	0721454 	
Louise† 	IS	0721695 				
Marta SL† 						

† "Direct mount" shape generally used for PM Manitou forks.

‡ Louise/Louise FR "long arm" shape generally used for frame.



Disc Brakes—Shimano

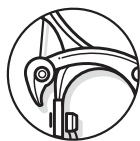
SHIMANO TOOLS, FLUID, TORQUE SPECS

TOOLS FOR INSTALLATION & MAINTENANCE

	Mechanical models	XTR (M965) hydraulic	XT (M755) hydraulic	Deore (M555) Nexave (C901) hydraulic	Deore (M525) hydraulic
3 mm hex key	—	Yes	Yes	Yes	Yes
4 mm hex key	—	Yes	—	—	—
5 mm hex key	Yes	Yes	Yes	Yes	Yes
6 mm socket	—	—	—	Yes	—
7 mm socket wrench	—	Yes	—	—	—
8 mm socket wrench	—	—	Yes	—	Yes
8 mm open/closed wrench	—	—	—	—	Yes
10 mm open/closed wrench	—	—	Yes	—	—
Cable cutter	Yes	—	—	—	—
Needle-nose pliers	—	—	—	—	Yes
Flat-blade screwdriver	Yes	Yes	Yes	Yes	Yes
#1 Phillips screwdriver	—	Yes	Yes	Yes	Yes
#2 Phillips screwdriver	—	Yes	Yes	Yes	Yes
Disc locknut tool	—	TL-LR15	—	—	—
Torque wrench	Yes	Yes	Yes	Yes	Yes
Torx T25 key wrench	Yes	—	Yes	Yes	Yes

HYDRAULIC FLUID

	Mechanical models	XTR (M965) hydraulic	XT (M755) hydraulic	Deore (M555) Nexave (C901) hydraulic	Deore (M525) hydraulic
Shimano mineral oil	—	Yes	Yes	Yes	Yes



Disc Brakes—Shimano *(continued)*

SHIMANO TOOLS, FLUID, TORQUE SPECS *(continued)*

TORQUE SPECS

	Mechanical models	XTR (M965) hydraulic	XT (M755) hydraulic	Deore (M555) Nexave (C901) hydraulic	Deore (M525) hydraulic
Brake lever (attachment to handlebar)	6–8 Nm / 53–69 in-lbs	6–8 Nm / 53–69 in-lbs	6–8 Nm / 53–69 in-lbs	6–8 Nm / 53–69 in-lbs	6–8 Nm / 53–69 in-lbs
Brake lever to hydraulic line, regular or banjo	—	5–7 Nm / 44–60 in-lbs	5–7 Nm / 44–60 in-lbs	5–7 Nm / 44–60 in-lbs	5–7 Nm / 44–60 in-lbs
Hydraulic line to caliper, regular or banjo	—	5–7 Nm / 44–60 in-lbs	5–7 Nm / 44–60 in-lbs	5–7 Nm / 44–60 in-lbs	5–7 Nm / 44–60 in-lbs
Fluid reservoir cover bolts	—	0.3–0.5 Nm / 2.7–4.4 in-lbs	0.3–0.5 Nm / 2.7–4.4 in-lbs	0.3–0.5 Nm / 2.7–4.4 in-lbs	0.3–0.5 Nm / 2.7–4.4 in-lbs
Bleed screw	—	4–6 Nm / 35–53 in-lbs	4–6 Nm / 35–53 in-lbs	4–6 Nm / 35–53 in-lbs	4–6 Nm / 35–53 in-lbs
Caliper mount bolts to frame/fork	6–8 Nm / 53–69 in-lbs	6–8 Nm / 53–69 in-lbs	6–8 Nm / 53–69 in-lbs	6–8 Nm / 53–69 in-lbs	6–8 Nm / 53–69 in-lbs
Brake pad bolts	*	2–4 Nm / 18–35 in-lbs	2–4 Nm / 18–35 in-lbs	2–4 Nm / 18–35 in-lbs	2–4 Nm / 18–35 in-lbs
Brake pad adjustment screw	6–8 Nm / 53–69 in-lbs	—	—	—	—
Disc rotor to hub bolts	2–4 Nm / 18–35 in-lbs	—	2–4 Nm / 18–35 in-lbs	2–4 Nm / 18–35 in-lbs	2–4 Nm / 18–35 in-lbs
Disc rotor to hub (XTR type, SM-RT96)	—	40 Nm / 350 in-lbs	—	—	—
Bolt attaching cable to caliper	6–8 Nm / 53–69 in-lbs	—	—	—	—

* No information.



SHIMANO BRAKE PAD LINEUP

Model	Type	M01*	M02†	M03*	M04†	M05†	M06*	M07†	M07-5	M08‡	C01§
		Sintered metal	Resin	Sintered metal	Resin	Resin	Sintered metal	Resin	Resin	Resin	Sintered metal
BR-M965	Hydraulic						Option	Standard			
BR-M800	Hydraulic						Standard		Option		
BR-M765	Hydraulic						Option		Standard		
BR-M755	Hydraulic			Standard	Option						
BR-M555	Hydraulic	Standard	Option								
BR-M525	Hydraulic									Standard	
BR-M515	Mechanical					Standard					
BR-M475	Mechanical									Standard	
BR-C901	Hydraulic										Standard
BR-C601	Mechanical					Standard					
BR-C501	Mechanical									Standard	

* M01/M03/M06: Longer pad life, good for anti-fade, good consistency either dry/wet. May cause noise while braking.

† M02/M04/M05/M07: Same performance as metal pad. Shorter pad life than metal.

‡ Do not use M08 brake pads with the BR M515/BR-M515-LA brake system: the brake arm and caliper will touch before the pad wear indicator is activated, leading to a gradual reduction in braking performance.

§ C01: Metal pad, good for trekking use.



Disc Brakes—Shimano

(continued)

SHIMANO ADAPTERS

MODEL	ADAPTERS / FORK					ADAPTERS / FRAME
	Rotor \varnothing in mm	IS fork	QR20 Plus type (Marzocchi) fork	Boxxer (RockShox) fork	PM type (Manitou) fork	IS frame
BR-M966	\varnothing 160	SM-MA-F160P/S	SM-MA-F160P/Z	—	Direct mount	SM-MA-R160P/S
	\varnothing 203	SM-MA-F203P/S	SM-MA-F203P/Z	SM-MA-F203P/B	SM-MA-F203P/P	SM-MA-R203P/S
BR-M965	\varnothing 160	Direct mount	—	—	—	Direct mount
BR-M965	\varnothing 203	SM-MA-F203S/S	SM-MA-F203S/Z	SM-MA-F203S/B	SM-MA-F203S/P	SM-MA-R203S/S
BR-M800	\varnothing 160	SM-MA-F160P/S	SM-MA-F160P/Z	—	Direct mount	SM-MA-R160P/S
BR-M800	\varnothing 203	SM-MA-F203P/S	SM-MA-F203P/Z	SM-MA-F203P/B	SM-MA-F203P/P	SM-MA-R203P/S
BR-M765	\varnothing 160	SM-MA-F160P/S	SM-MA-F160P/Z	—	Direct mount	SM-MA-R160P/S
BR-M765	\varnothing 203	SM-MA-F203P/S	SM-MA-F203P/Z	SM-MA-F203P/B	SM-MA-F203P/P	SM-MA-R203P/S
BR-M755	\varnothing 160	Direct mount	—	—	—	Direct mount
	\varnothing 170	—	—	—	SM-MA-F170S/P	—
	\varnothing 203	SM-MA-F203S/S	SM-MA-F203S/Z	SM-MA-F203S/B	SM-MA-F203S/P	SM-MA-R203S/S
BR-M555-M	\varnothing 160	—	SM-MA-F160P/Z	—	Direct mount	—
BR-M555-M	\varnothing 203	SM-MA-F203P/S	SM-MA-F203P/Z	SM-MA-F203P/B	SM-MA-F203P/P	SM-MA-R203P/S
BR-M555	\varnothing 160	Direct mount	—	—	—	Direct mount
BR-M555	\varnothing 203	SM-MA-F203S/S	SM-MA-F203S/Z	SM-MA-F203S/B	—	SM-MA-R203S/S

(continued)



Disc Brakes—Shimano *(continued)*

MODEL	ADAPTERS / FORK					ADAPTERS / FRAME
	Rotor Ø in mm	IS fork	QR20 Plus type (Marzocchi) fork	Boxxer (RockShox) fork	PM type (Manitou) fork	IS frame
BR-M525	Ø 160	SM-MA-F160P/S	SM-MA-F160P/Z	—	Direct mount	SM-MA-R160P/S
BR-M525	Ø 203	—	—	—	—	—
BR-M515-M	Ø 160	SM-MA-F160P/S	SM-MA-F160P/Z	—	Direct mount	SM-MA-R160P/S
BR-M515-M	Ø 203	—	—	—	—	—
BR-M515	Ø 160	M515 adapter (F)	—	—	—	M515 adapter (R)
BR-M515	Ø 203	—	—	—	—	—
BR-M475	Ø 160	SM-MA-F160P/S	SM-MA-F160P/Z	—	Direct mount	M475 adapter (R)
BR-M475	Ø 203	—	—	—	—	—



Notes