Comfort and Ergonomics

Logitech MX Revolution Mouse

People are spending more time at their PCs than ever before. Hand and arm movements are repeated hundreds, perhaps thousands of times over the course of a day as people write and edit documents, scan spreadsheets, search the Web, create playlists, browse photos, send e-mail and instant messages, and play games. A recent Logitech study revealed that in an average eight hour day, people have six applications open on their computers at any one time and the active window switches or new windows open every 50 seconds. The average user will also spin the mouse's scroll wheel 26 feet in a given day.

The right mouse can make an enormous difference in comfort. Advanced navigation features can economize the amount of finger and hand movement needed to get to the proper point in a document or Web page. And the slightest differences in shape, texture, support and hand positioning can make a dramatic difference over time. Touch a mouse once and you may not notice these differences; hold it for eight hours a day, seven days a week, 365 days a year and you certainly will.

Because having a comfortable mouse has never been more important, the Logitech® MX™ Revolution cordless laser mouse enhances people's comfort and reduces the amount of movement, effort and strain needed to navigate on the PC. It features dramatic contours, subtle curves, breakthrough navigation technology, and a design rooted in ergonomic principles.

Sizing the mouse for range of hands

Before Logitech designed the MX Revolution mouse, members of the product development team worked closely with ergonomics experts to study and understand the complexity of the human hand. Part of that process included identifying hand and finger dimensions of the target customer: the adult male. The most complete study of its kind, "Hand Anthropometry of U.S. Army Personnel" (U.S. Army, 1991) chronicles a range of male hand dimensions that Logitech used to define the shape and size of its new mice.

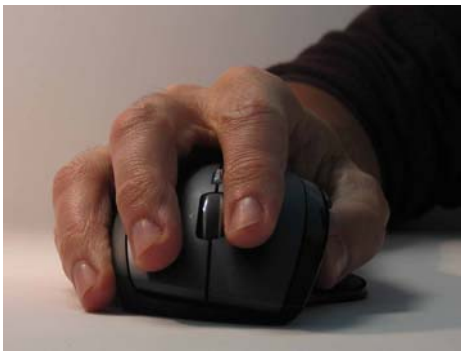
The arc length of the MX Revolution (shown above) – the distance from where the base of the typical index finger (second digit) and third finger rest to edge of the mouse keyplate – is 82 mm. According to a study of male U.S. Army personnel, the 90th percentile index finger length is approximately 81.6 mm. Also factoring in that the pad of the fingertip is approximately 8-10 mm from the fingertip, the MX Revolution provides more than enough length to support even very long fingers.

Factoring in measurements was step one. But because of the complexity of the human hand and its 27 bones, Logitech's engineers and designers knew that simply relying on a study about hand sizes wasn't enough. The company put models in the hands of a wide variety of computer users, ensuring that the vast majority of hand sizes would be able to use the mice comfortably.

A relaxed, natural hand position

Most computer mice are flat on the top, and to use them, the forearm and hand are twisted so that the palm faces down, parallel to the tabletop surface. In what is referred to as a pronated position, this flat hand angle is unnatural and requires effort to maintain – which isn't noticeable in the short term, but over a long period of time can lead to discomfort.

The MX Revolution mouse was sculpted with a shape that slopes from a user's right to left – allowing the hand to take a more handshake-like position. These slopes enable the mice to deliver more natural, comfortable hand positions that result in less strain.



When a hand rests on the MX Revolution (shown above), it angles slightly toward a handshake position – a more comfortable, relaxed position. Below, the fingers and wrist are more level on a typical mouse, a position that requires more effort to maintain.

Minimizing Wrist Extension, Finger Flex

To use a mouse comfortably – especially over a long period of time – it's important to minimize the amount of wrist extension and finger flexing. Logitech designed the MX Revolution mouse with a low profile (at its peak, the MX Revolution mouse is 42.9 mm tall), which helps keep the angle of wrist extension of most hands under 15 degrees.

To ensure that users can reach and engage the mouse controls without excessively flexing their finger joints, Logitech carefully places the controls according to hand position. For example, when the index finger is on the scroll wheel, the thumb should naturally come to rest on or near the controls located on the side of the mouse. In the case of the MX Revolution, these controls include the thumb wheel (used for zooming in and out of photos or navigating through open windows) and Forward and Back buttons. Logitech positions mouse controls so that most hands can engage those controls with the knuckle joint flexed no more than 45 degrees.

With a height of only **40.9 mm** tall (at its peak), the VX Revolution mouse minimizes the wrist extension of users.

Dramatic thumb scoop

Logitech sculpted the MX Revolution mouse with a dramatic scoop that supports the thumb and eases the stress on the thermor muscle (the large pad-like muscle just below the thumb). Most mice require the extra effort needed to hold the thumb against the side of the mouse. A 26 mm ledge offers support under the thumb so that it can grip the mouse in a relatively relaxed state. The thumb scoop also makes it easier to grab and move the mouse.

The MX Revolution mouse's dramatic thumb scoop provides support for the thumb. It also features a rubber grip pad and a sharp edge at the top that make it easier to pick up and move the mouse.

Small scroll gap

Logitech's MX Revolution mouse has an extremely narrow gap (22.5 mm) between the wheel and the left and right keyplates. As often as people use the scroll wheel, this smaller gap reduces the distance a finger must travel to engage the wheel – which over a long period of time can result in a significant reduction in exertion. The smaller gap also allows Logitech to deliver larger keyplates, making it easier to hold the mouse and engage the buttons from a wider range of positions.

Overhanging, lipless keyplates for large hands

The Logitech MX Revolution mouse accounts for very large hands with a design safeguard. By eliminating the lip edges from the keyplates on the mice, long fingers that overhang the keyplates can still push and activate the keys. Other mice that have lips around the front of the keyplates prevent overhanging fingers from being able to click the buttons.

Neither the VX Revolution nor MX Revolution (above) mice have lip edges in front of the keyplates. Someone with long fingers that hang over the keyplates can still press down and engage the buttons.

Defining optimal button tension

The amount of force required to press a mouse button and trigger an action can make the difference between a good user experience and a frustrating one. Too much actuation force in a button requires extra exertion, and too little can result in accidental action that makes navigating on the computer more cumbersome and unnatural. Logitech carefully evaluated the position and purpose of each button before determining the appropriate tension.

Frequently used buttons such as the main left and right keys on the mouse have the lowest amount of actuation force so that over time people don't exert as much effort to trigger the buttons. The thumb wheel on the MX Revolution mouse is a good example of a button that requires a higher force – in addition to rotating forward and back, the wheel is also a button that can be pressed down (by default, a click of this wheel will return the view of an active window to 100 percent). The actuation tension of this button is 320 grams, three times the amount of most buttons.

MX Revolution	
Button	**Force range**
Right key	80g (+/-35)
Left key	80g (+/-35)
One-Touch Search	100g (+/-40)
Thumb middle	220g (+/-80)
Forward key	90g (+/-40)
Backward key	90g (+/-40)
Tilt right (wheel)	100g (+/-50)
Tilt left (wheel)	100g (+/-50)
Middle button (wheel)	320g (+/80)

Ultra-smooth glide

The mice include low-resistance Polytetrafluoroethylene (PTFE) feet that allow the mice to glide across a surface with less resistance than with typical mice. The reduced resistance means that the amount of energy required for each movement of the mouse is decreased. When someone moves the mouse thousands of times a day, this added glide can add up to a lot of saved exertion. And with less resistance, it's also easier to navigate to a precise point on screen – mice with traditional feet tend to stick periodically and skip on-screen, requiring a corrective motion to navigate to the intended place.