

6. Why invest in ergonomics?

The status and value of ergonomics in a company can be determined by answering the following questions:

Does the organization have problems with:	yes	no
– increasing manufacturing costs		
– increasing costs for maintenance and repair		
– decreasing product quality		
– susceptibility to production breakdowns		
– keeping to deadlines		
– customer satisfaction		
Does the organization want to:		
– improve safety at work		
– reduce illness-related absence (e.g. for back problems)		
– motivate		
– improve the well-being of employees		
Is the organization planning to:		
– restructure the workplaces		
– install new facilities		
– introduce new manufacturing sequences and equipment		

If several of the questions were answered with "yes", there is probably a need for ergonomic improvements in the organization, and the next steps are as follows:

- Using the questionnaire in chapter 10, pinpoint the weaknesses of the workplace and analyze them.
- Formulate goals.
- Decide what action to take.
- Calculate the investment required and compare.

What are the benefits of ergonomics?

1. Well-being in the work place

If all aspects of the workplace, including the nature of the work, its organization, the environment and the space available, are in accordance with the abilities of the individual, then the conditions for maximum work satisfaction have been met.

2 Less illness-related absences

Where workplaces have been ergonomically designed there are less accidents and bodily complaints, so there are less days lost.

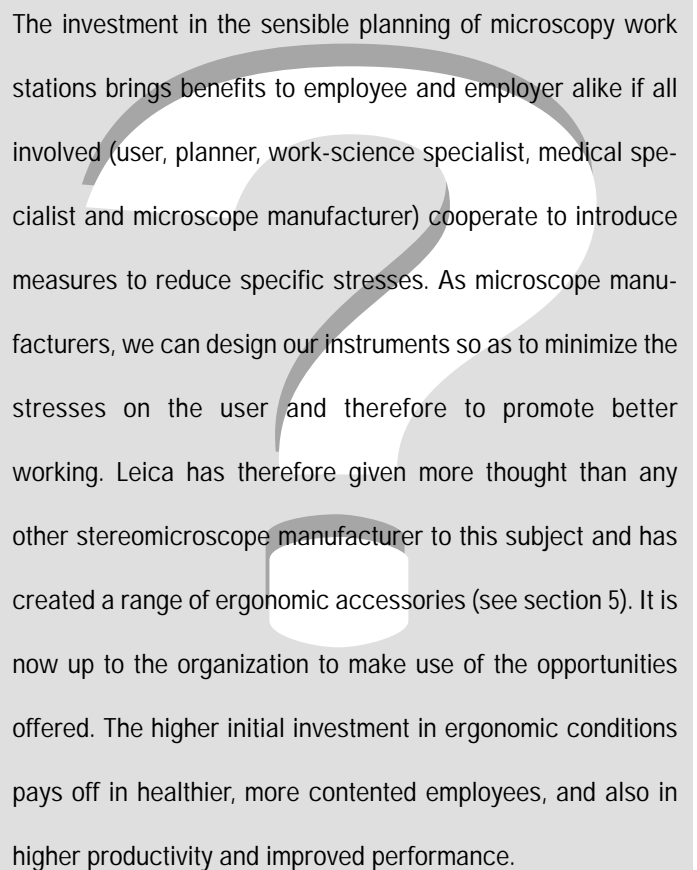
3 Higher productivity

A human-engineered workplace is the basis for increased motivation and performance by its user.

4 Better business results

The holistic inspection of the workplace and the optimum implementation of ergonomic expertise lead to better business results.

Why invest in the Leica ergonomics program?



The investment in the sensible planning of microscopy work stations brings benefits to employee and employer alike if all involved (user, planner, work-science specialist, medical specialist and microscope manufacturer) cooperate to introduce measures to reduce specific stresses. As microscope manufacturers, we can design our instruments so as to minimize the stresses on the user and therefore to promote better working. Leica has therefore given more thought than any other stereomicroscope manufacturer to this subject and has created a range of ergonomic accessories (see section 5). It is now up to the organization to make use of the opportunities offered. The higher initial investment in ergonomic conditions pays off in healthier, more contented employees, and also in higher productivity and improved performance.

The Leica ergonomics program – employee and employer both gain

The Leica ergonomics program

- ✓ prevents a forced posture, tiredness, reduced performance and bodily discomfort.
- ✓ offers better, healthier viewing conditions through the options of adapting the eyepoint individually and of changing the posture at any time.
- ✓ reduces static exertion during precision work, because the arms and hands can be supported.
- ✓ improves visual work, because the high-quality optical system does not subject the eyes to the strain of accommodation.
- ✓ enables the user to concentrate and work for long periods at a time.

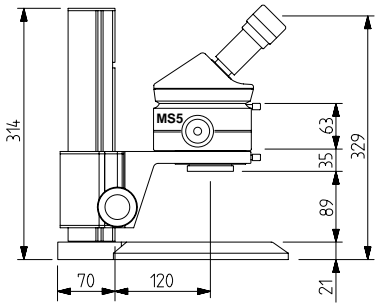
The advantages for the company:

- ✓ Higher productivity
- ✓ Better quality
- ✓ Lower costs
- ✓ Less absenteeism
- ✓ Greater safety
- ✓ More reliable
- ✓ Competitiveness
- ✓ Better business results.

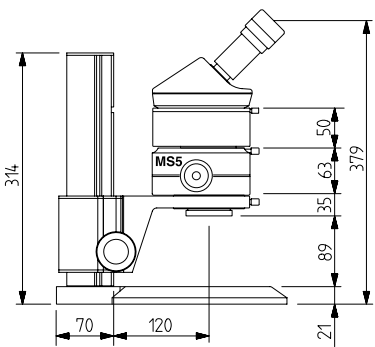
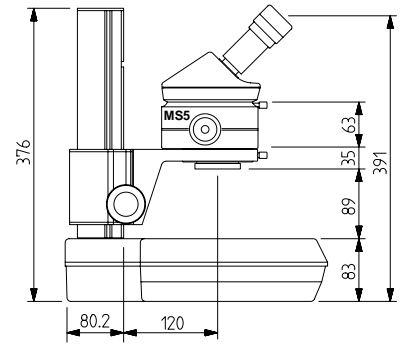
7. Dimensions with Leica ergonomics modules

Leica MS5 with incident-light stand

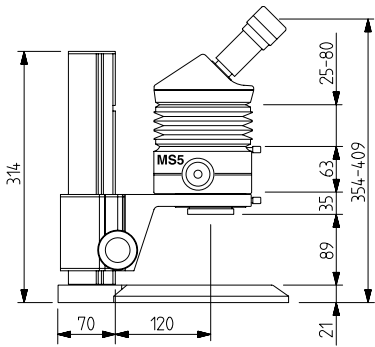
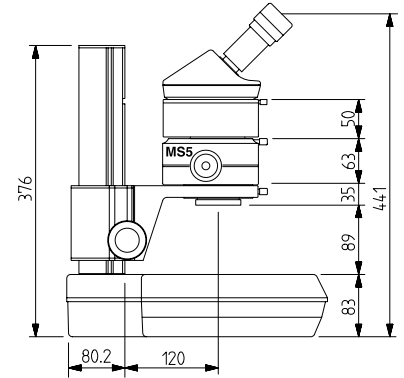
Leica MS5 with transmitted-light stand



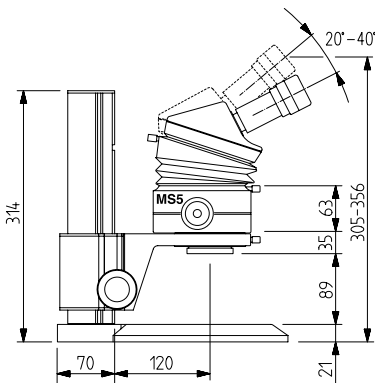
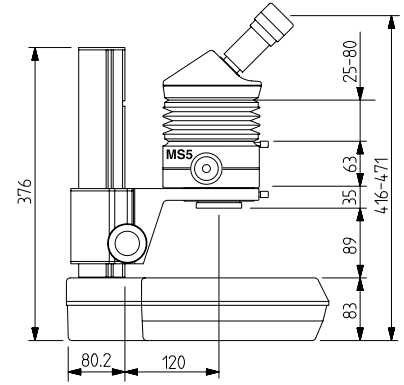
Binocular tube with 45° viewing angle



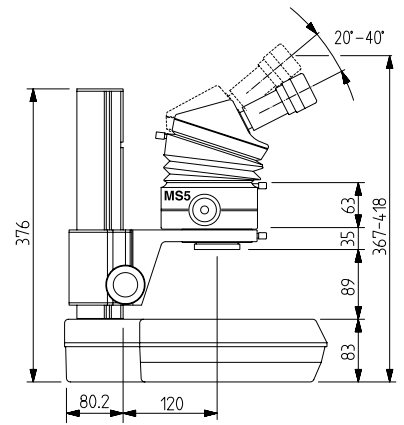
ErgoModule™ 50mm and binocular tube with 45° viewing angle



ErgoModule™ 25 - 80mm and binocular tube with 45° viewing angle

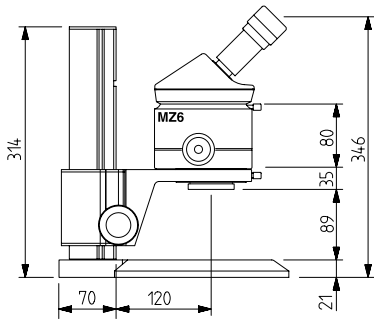


ErgoWedge™ 5° - 25° and binocular tube with 45° viewing angle

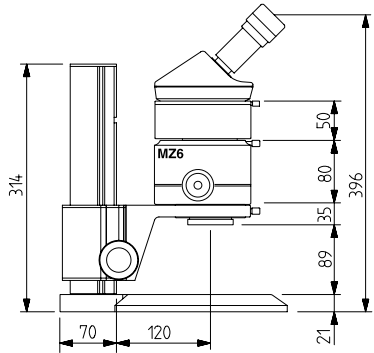
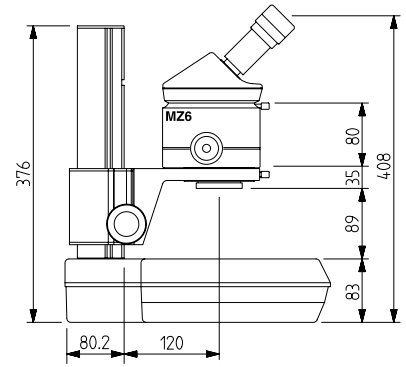


Leica MZ6 with incident-light stand

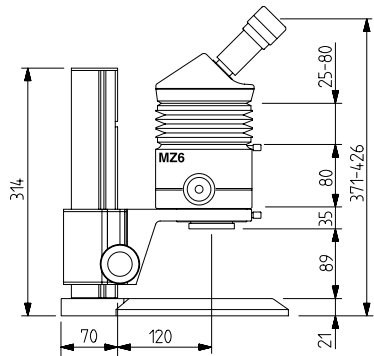
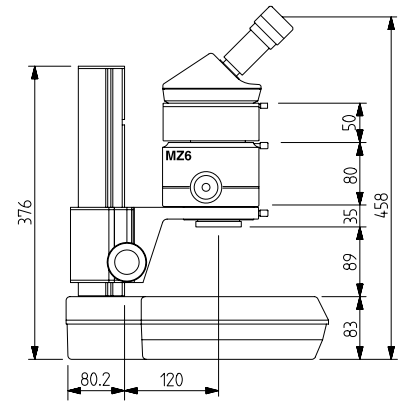
Leica MZ6 with transmitted-light stand



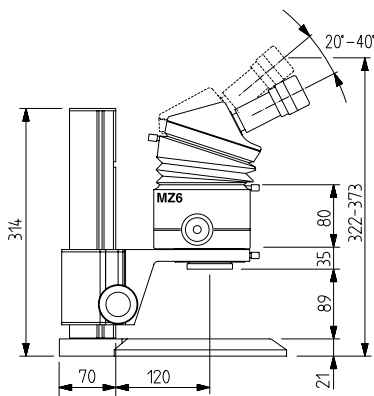
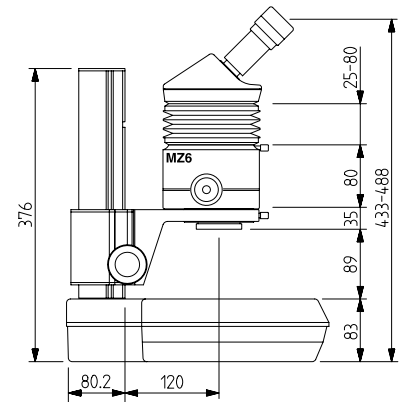
Binocular tube with 45° viewing angle



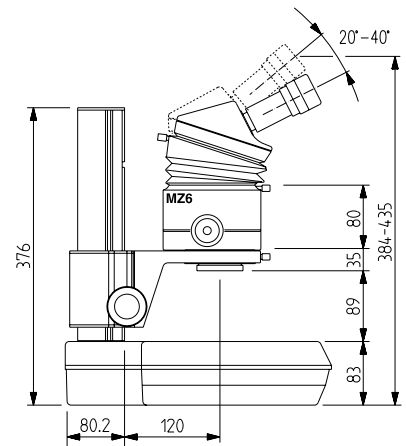
ErgoModule™ 50mm and binocular tube with 45° viewing angle



ErgoModule™ 25 - 80mm and binocular tube with 45° viewing angle

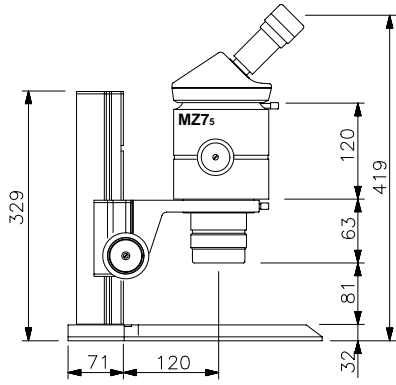


ErgoWedge™ 5° - 25° and binocular tube with 45° viewing angle

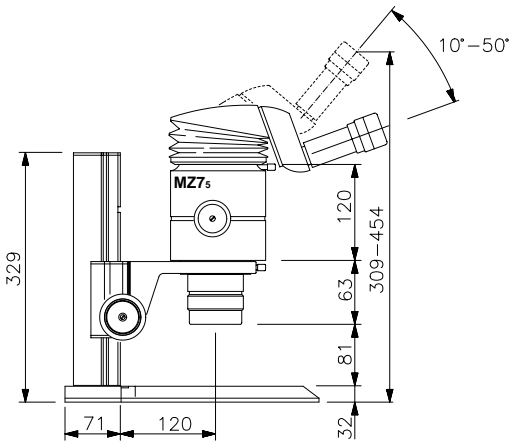
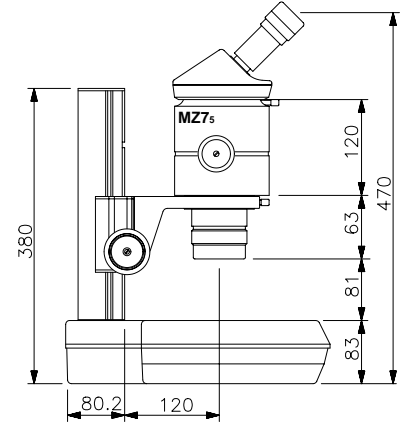


Leica MZ7_s with incident-light stand

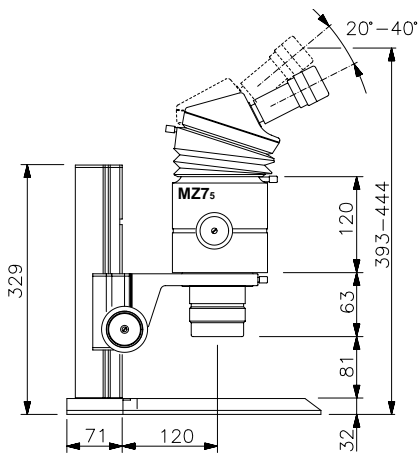
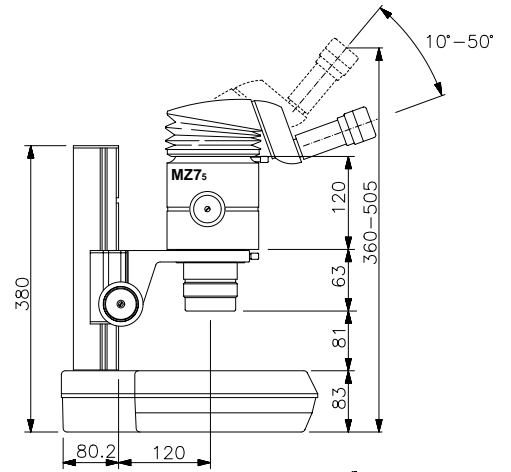
Leica MZ7_s with transmitted-light stand



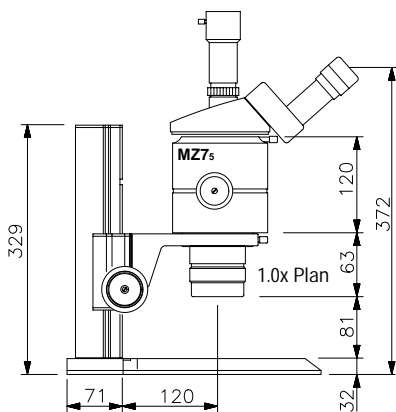
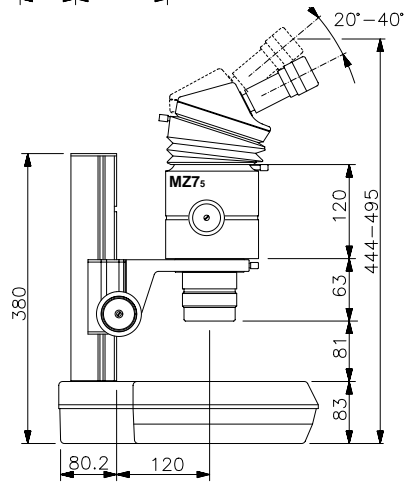
Binocular tube with 45° viewing angle



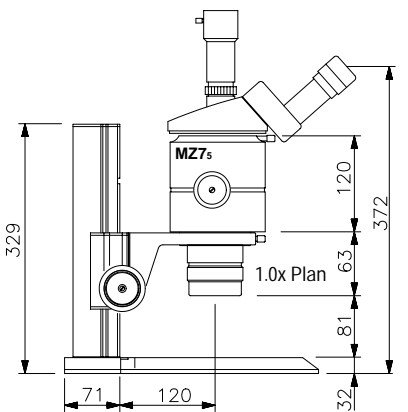
ErgoTube™ 10° - 50°



ErgoWedge™ 5° - 25° and binocular tube with 45° viewing angle

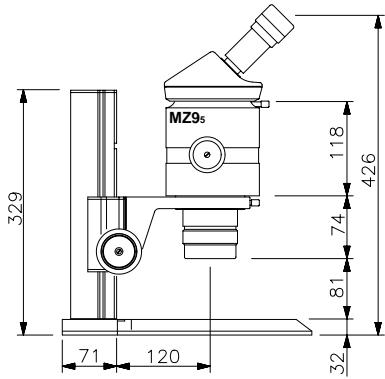


Trinocular photo- / video tube

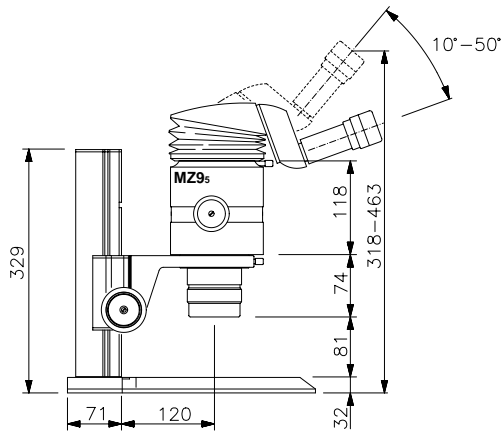
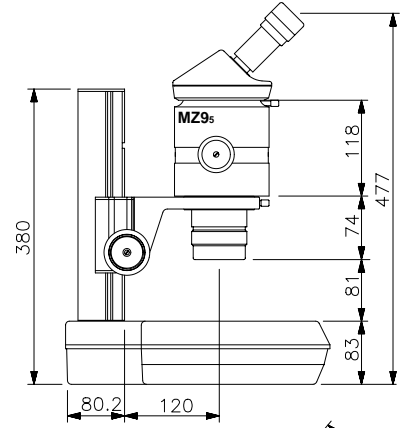


Leica MZ9₅ with incident-light stand

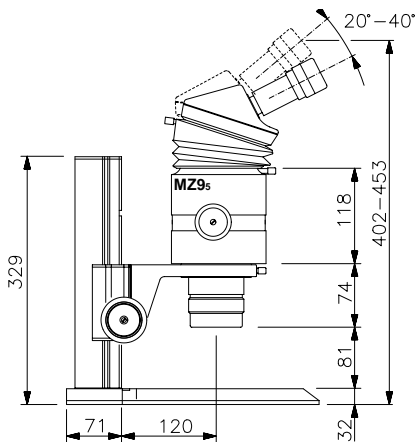
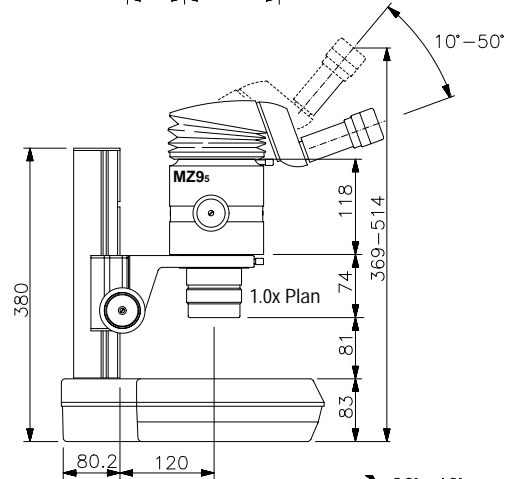
Leica MZ9₅ with transmitted-light stand



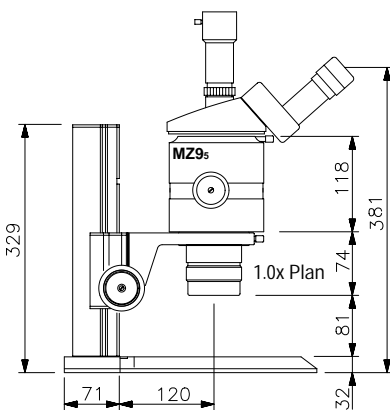
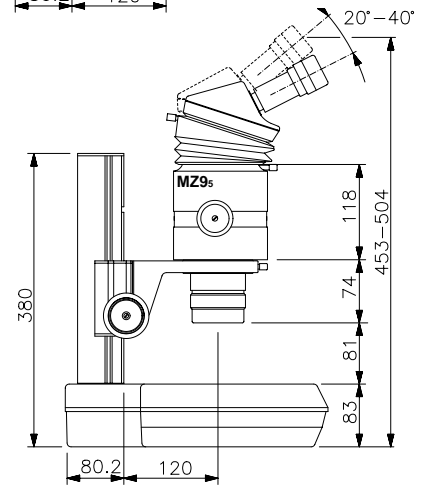
Binocular tube with 45° viewing angle



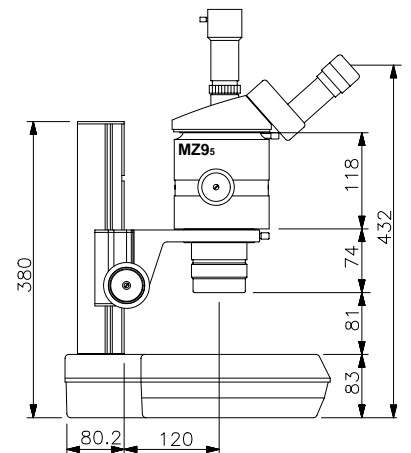
ErgoTube™ 10° - 50°



ErgoWedge™ 5° - 25° and binocular tube with 45° viewing angle

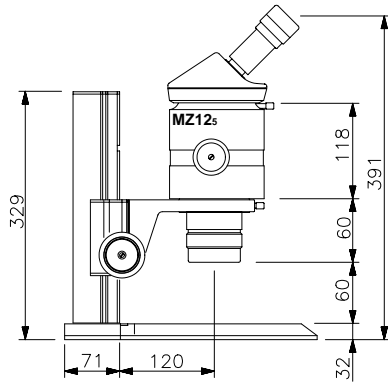


Trinocular photo- / video tube

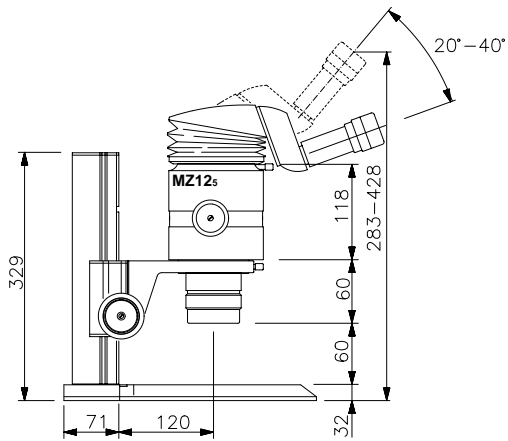
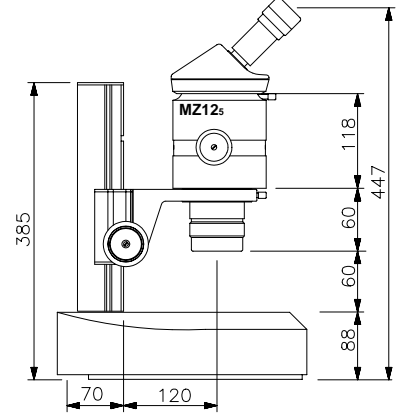


Leica MZ12₅ with incident-light stand

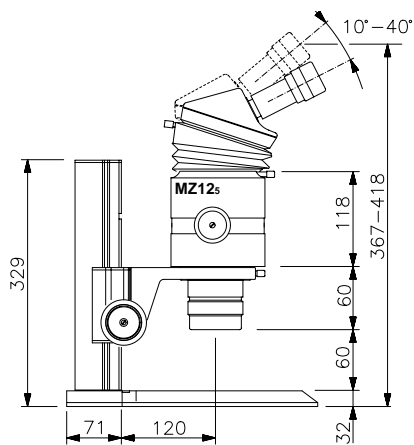
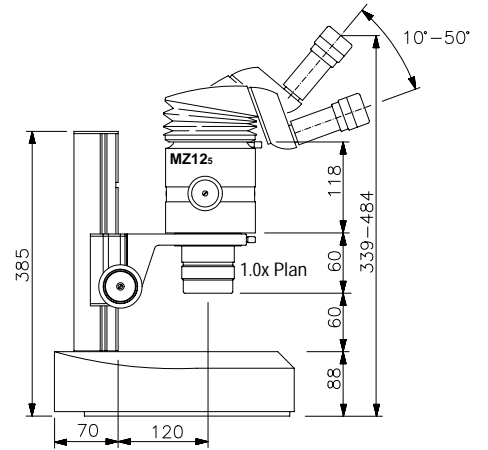
Leica MZ12₅ with transmitted-light stand
HL



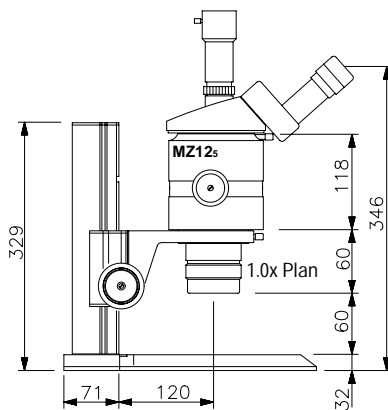
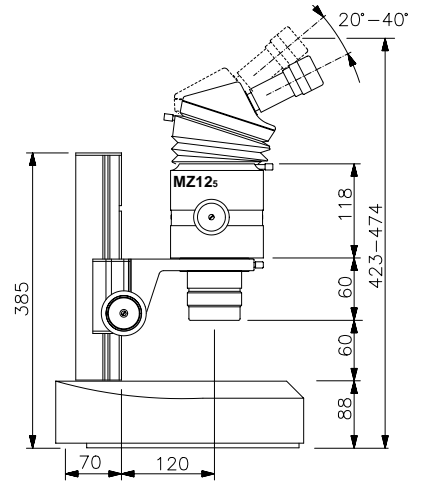
Binocular tube with 45° viewing angle



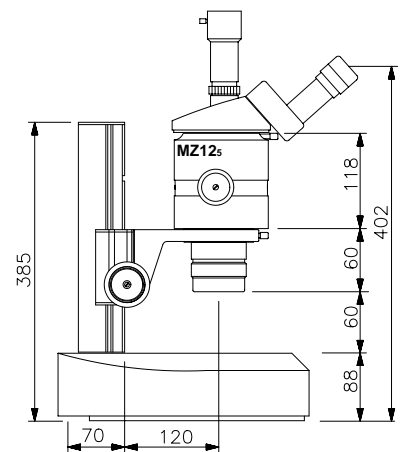
ErgoTube™ 10° - 50°



ErgoWedge™ 5° - 25° and binocular tube with 45° viewing angle

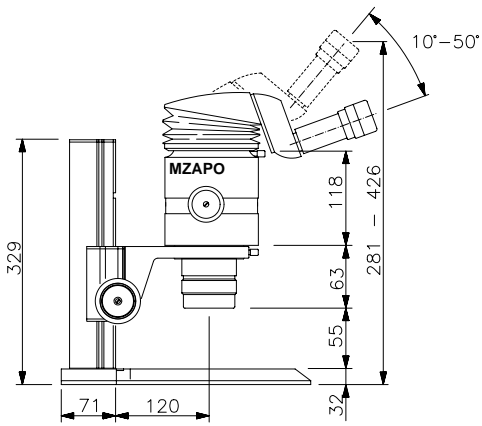


Trinocular photo- / video tube

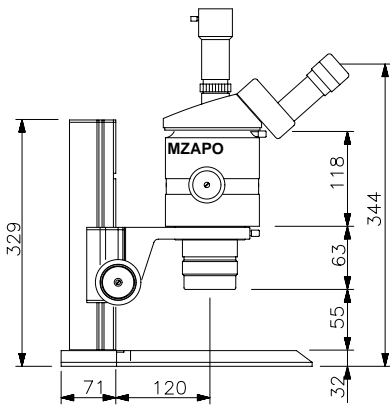
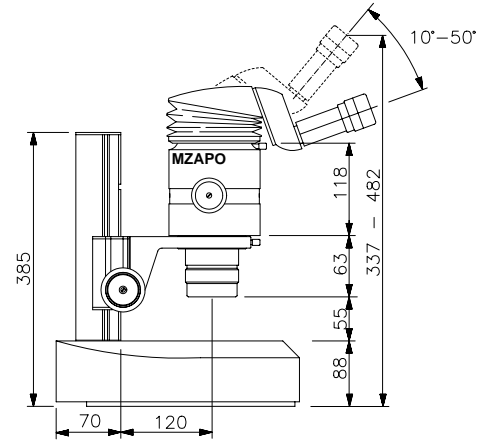


Leica MZAPO with incident-light stand

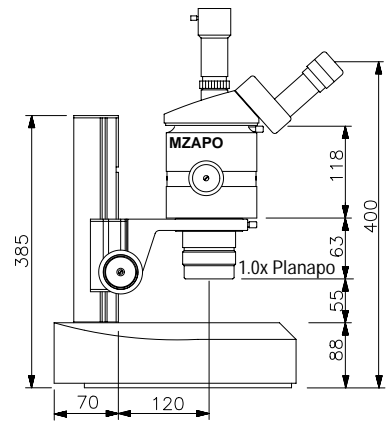
Leica MZAPO with transmitted-light stand HL



ErgoTube™ 10° - 50°



Trinocular photo- / video tube



8. Want to know more about ergonomics?

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- ACM Transactions on Computer-Human Interactions (TOCHI)
- Applied Ergonomics (Journal)
- COMPLEXITY INTERNATIONAL - an Electronic Journal of Complex Systems Research
- CSERIAC GATEWAY newsletter
- Ecological Psychology
- Ergonomics
- Ergonomics Abstracts
- Ergonomics Journal
- Ergonomic News
- Ergonomics that Work
- ErgoTalk
- ErgoWeb
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- IEA Ergonomics International
- IEEE Transactions on Systems, Man, and Cybernetics
- IIE Solutions (Magazine)
- Industrial Hygiene News
- Industrial Safety & Hygiene News
- interactions (ACM)
- International Encyclopedia of Ergonomics and Human Factors, Taylor & Francis, Ltd.
- International Journal of Cognitive Ergonomics (Journal)
- International Journal of Human-Computer Studies
- International Journal of Industrial Ergonomics
- International Journal of Man-Machine Studies
- Journal of Occupational and Environmental Medicine (Magazine)
- Modern Job Safety & Health (Looseleaf)
- Newsletter for IIE Ergonomics and work measurement society.
- Occupational Ergonomics (Journal)
- Occupational Hazards
- Occupational Health & Safety
- Occupational Health & Safety News (Newsletter)
- OH&S Canada
- Psycology (ftp-Archive)
- Safety and Health
- Scandinavian Journal of Work, Environment & Health
- Science
- SIGCHI Bulletin
- Society for Work Science News (Newsletter)
- The International Journal of Occupational Safety and Ergonomics, Central Institute for Labour Protection Warszawa
- Thesis - science and technology
- Workplace Ergonomics

<http://ergoweb.com/Pub/ewhome.shtml>

<http://www.ergonomics.com.au/index.html#Contents>

<http://www.ergonomics.com.au/ergolinks.htm>

<http://www.osha.gov/index.htm>

ergoweb

Ergonomics Australia On-Line

Includes very many links to ErgoInfos

OSHA Occupational Safety & Health Administration

9. Agencies

Listed according to country

World wide

- World Health Organization (WHO)

USA

- ADA (Americans with Disabilities Act) Document Center
- Bureau of Labor Statistics
- Crew System Ergonomics Information Analysis Center (CSERIAC)
- Department of Health & Human Services (DHHS)
- Environmental Protection Agency (EPA)
- The Federal Aviation Administration (FAA)
 - FAA Office of Chief Scientific and Technical Advisor for Human Factors
 - FAA Technical Center Human Factors Laboratory (HFL)
 - FAA/OAM Aviation Maintenance & Inspection
- NASA
 - NASA-Ames Research Center, Human Factors Activities
 - NASA Langley Research Center, Human Engineering Methods Research Laboratory
 - NASA Technical Reports Server
- National Institutes of Health (NIH)
- National Institute for Occupational Safety and Health (NIOSH)
- OSHA Web (U. S. Department of Labor's Occupational Safety and Health Administration)
- U. S. Department of Energy's Environment, Safety and Health (ES&H) Technical Information Services
- ATSDR Toxic Substance Registry

Europe

- European Space Agency (ESA)
 - ESA Microgravity Database
 - ESA Publications

Germany

- Forschungsgesellschaft für angewandte Naturwissenschaften e.V. (FGAN)
 - Forschungsinstitut für Antropotechnik (FAT)

Finland

- Finnish Institute of Occupational Health
- National Research and Development Centre for Welfare and Health (STAKES)

Sweden

- Swedish National Institute for Working Life (NIWL) (ex Swedish National Institute of Occupational Health)

Japan

- Advanced Telecommunications Research Laboratories (ATR), Kyoto, Japan)
- Agency of Industrial Science and Technology (MITI), National Institute of Bioscience and Human-Technology, Ergonomics and Human-Technology

Canada

- Canadian Centre for Occupational Health and Safety
- Defence and Civil Institute of Environmental Medicine (Canada), Human Factors Division

Associations

- International Ergonomics Association (IEA, Sweden)
- International Ergonomics Association (IEA, USA)
- International Society for Ecological Psychology (ISEP)
- European Association for Cognitive Ergonomics
- The Ergonomics Society (United Kingdom)
- The Ergonomics Society of Australia
- Human Factors and Ergonomics Society
 - The Human Factors and Ergonomics Society at SUNY Buffalo (UB)
 - New England Chapter of the Human Factors and Ergonomics Society
 - Cognitive Engineering and Decision Making Technical Group (CEDM-TG)
 - HFES Special Interest Group on Virtual Environments
- ACM
 - ACM Special Interest Group on Computer-Human Interaction (SIGCHI)
- American Industrial Hygiene Association (AIHA)
- Optical Society of America (OSA)
- Society of Photo-Optical Instrumentation Engineers (SPIE)
- IEEE
 - IEEE's Systems, Man, and Cybernetics Society
- Society for Information Display (SID)
- Gesellschaft für Arbeitswissenschaft (GfA)
- Gesellschaft für Informatik (GI)
 - Fachausschuß 2.3 Ergonomie in der Informatik
 - Fachgruppe (FG) 2.3.1 Software-Ergonomie
- REFA-Verband
- Verband Deutscher Elektrotechniker e.V. (VDE)
- Verein Deutscher Ingenieure (VDI)
- Deutsche Gesellschaft für Psychophysiologie und ihre Anwendung e.V. (DGPA)
- Deutsche Forschungsgemeinschaft (DFG)
- Österreichische Arbeitsgemeinschaft für Ergonomie (ÖAE)

10. Questionnaire about the ergonomic arrangement of the workplace

Part 1: Personal data

This questionnaire is intended for use by persons responsible for planning workplaces to ensure maximum efficiency. It will help as a check list to ensure that no important aspects are neglected.

The questionnaire is based on material in the following two documents, with modifications:

- *Untersuchung der Belastung bei Lupen- und Mikroskopierarbeiten.* Conrady P., Krueger H., Zülch J. et al (this document contains a detailed questionnaire)
- *Physiologische Arbeitsgestaltung.* Etienne Grandjean.

Sex

Age

Are you right-handed / left-handed?

Do you wear spectacles?

Do you wear spectacles when using the microscope?

Do you smoke?

Part 2: Organization of work

Tasks

1. Job (assembly, inspection, analysis, other)
2. Main activity:
3. Subsidiary activity:
4. Do you use a microscope / stereomicroscope ?
5. Were you trained to use the above instrument before you started to use it ?
6. Working posture (sitting, standing, bent)
7. Does the work involve a high level of dexterity, attention and perception ?
8. Does the way that the work is organized (shift work, continuous work for long periods, work at fixed times) cause stress?

Physical exertion

9. Is the work heavy ?
10. Do you have to lift heavy objects ?
11. Is the weight of the objects reasonable ?
12. Do you use stress-minimizing postures when lifting and carrying objects ?
13. Do you have to repeatedly introduce the object beneath the microscope ?
14. Does the object remain stationary while it is being observed ?
15. Is intensive static exertion involved ?
16. Are stressful holding operations involved ?
17. Can the holding of objects be made easier with handrests ?
18. Can objects be held in mechanical devices ?
19. Is intensive dynamic exertion involved ?
20. Is the work less than continuous ?
21. Is the work carried out effectively ?

Working time, breaks in work

22. How long have you been working at this workstation ?
23. For how many hours each day on average do you work at the microscope ?
24. Do you often have to look down the microscope continuously for more than one or two hours ?
25. Do you have to look into the microscope for a short time but at regular intervals ?
26. How often do you have to leave your workplace (to deal with something else or to find out about something) ?
(e.g. 3-5 times an hour / 1-2 times a day)
27. Do you often have a break to relax ?
28. Are there enough / not enough compulsory work breaks to enable you to relax ?
29. Are the work breaks of appropriate length and at appropriate times ?
30. Would it be useful to have additional work breaks ?
31. Would flexitime be an advantage ?
32. Is the lunch break long enough ?

Monotony

33. Is your work at the microscope nearly always the same ? Would you call it monotonous ?
34. Do you generally stay in one posture while working at the microscope ?
35. Does the repetitive work force you to adopt an uncomfortable posture ?
36. How long at a time do you spend on each item ?
37. Would new working techniques (e.g. job rotation or the addition of other duties) reduce the monotony ?
38. Does the arrangement and organization of the workplace allow social contact ?

Shift work

39. Are there day shifts and night shifts ?
40. Does the existing shift system permit night-shift work for short periods ?
41. How often during the year are there free days during the normal working week (Monday - Friday) ?
42. Are acceptable conditions available for sleep during the day ?

Requirements for precision work

43. Is the precision work carried out with visual inspection ?
44. Does the precision work require a long period of training ?
45. Are all requirements met for easily acquiring an automatic routine ?
46. Are the directions and sequences of the movements required all natural ?

Part 3: Questions about physical complaints

Movement problems

Have you suffered from any of the following problems during the last few weeks ?

Where do these problems occur (left / middle / right) ?

1. Neck : Stiffness or pain
2. Shoulder : Stiffness or pain
3. Back : Stiffness or pain
4. Small of the back : Stiffness or pain
5. Arms : Tiredness, pain, numbness, tingling, cramp
6. Hands, hand joints, fingers : Tiredness, pain, numbness, cramp, trembling
7. Legs or feet : Pain or numbness
8. Difficulty in holding a light object such as a telephone receiver high up for long periods, or in combing your hair

Problems with the eyes

Have you suffered from any of the following eye problems during the last few weeks ?

9. Tired, heavy eyes
10. Itching, stabbing, burning, weeping, pain
11. The sensation of sand grains in the eye
12. Red eyes
13. Bright light is painful
14. A swimming sensation in front of the eyes
15. Flickering in front of the eyes
16. Blurred vision when you change from close-range vision to long-range vision ?
17. Can you see better if you close one eye ?
18. Headaches

If you have had any of the 18 problems listed above :

19. How often ?
 - on more than two days a week
 - several times a month
 - rarely
20. Does the problem occur at night ?
21. For how long have you been suffering from the problem ?
22. Have you seen a doctor about it ?
23. What did the doctor diagnose ?
24. Do you think that the problem has anything to do with your work ?
25. Did you have difficulties when you started this sort of work ? What sort of problems ?
26. Are you taking medicines ? Which ones, and why ?
 - daily or almost daily
 - occasionally
 - rarely or never

Part 4: Assessment of the microscope

Optical properties

1. Can the magnification be set easily ?
2. Can the focus be set easily ?
3. Does the image shake ?
4. Can you see the entire field of view sharply ?
5. When you first look into the microscope, do you see a double image ?
6. Does the image become blurred while you are looking at it ?
7. Does the image look distorted ?
8. Do you see colour fringes in the image ?
9. If you wear spectacles, does the spectacle frame disturb you when you are working ?

Microscope illumination

10. Is the image too bright / correct / too dark ?
11. Can the brightness be easily adjusted ?
12. Do you adjust the brightness to your requirements before you start work ?
13. Are you disturbed by stray light ?

Ergonomics of the microscope

14. The microscope is too high up / at the right height / too low down
15. The microscope is too far away / at the right distance / too near
16. The viewing height is too far up / correct / too low down
17. The viewing angle is too steep / correct / too flat
18. Do the positions of the controls enable you to retain a natural posture ?
19. Are the functions of the controls in accordance with the operations required ?
20. Is force required to use the controls ?
21. In relation to the height of the table, the drive knobs are too high / at the right height / too low
22. The focusing knobs are too far away / at the right distance / too near
23. Is there enough room in which to move ?
24. Can you keep your head in a natural posture while you are inspecting the work visually or while you are taking readings ?
25. Do you have to move to an unnatural posture in order to operate the pedals ?

Displays

26. Is the information on any display unit used well set out and appropriate to the task ?
27. Are digits, words, symbols and scale divisions of a size appropriate to their distance away ?
28. Does the position of the elements in the display enable them to be inspected easily and accurately ?
29. Is magnification needed to examine the display ?
30. Is there a logical relationship between display unit and controls in terms of both position and information ?
31. Can all acoustic signals be perceived without difficulty ?
32. Have you received a user manual and read it ?
33. Is the user manual easily understandable, technically correct and complete ?

5. Assessment of the workplace

The geometry of the workplace

1. The working table is too high up / at the right height / too low down
2. The working area on the table is enough / not enough
3. Have you adjusted the height of the table to your requirements ? yes / no / the table is not adjustable
4. Do you have enough room under the table for your legs and feet ? yes / no
5. Is the chair comfortable ? yes / no. Does it cause physical problems ?
6. When you first sit down at your workplace, do you adjust the height of your chair ? yes / sometimes / no / the chair is not adjustable
7. Does the backrest of your chair support the whole of your back ? yes / no
8. Can you sit comfortably and relaxed on your chair ? yes / no
9. Do you need a footrest ? yes / no

Environment

10. Do noises distract you from your work ?
11. Do the activities of other people distract you from your work ?
12. Is your attention distracted by other activities at the same workplace ?
13. Do vibrations distract you from your work ?

Room climate

13. Are you disturbed by the room climate or by the lighting ?
14. Is the room temperature comfortable ?
15. In the room in summer, it is generally too warm / just right / too cold
16. In the room in winter, it is generally too warm / just right / too cold
17. Are the radiators positioned correctly ?
18. Are there draughts ?
19. Is the air stale / too dry ? Is the relative humidity correct ?
20. Is the air circulation good enough ?
21. Are there smells ?
22. Do people often smoke in the room ?
23. Does tobacco smoke disturb you ?
24. Does the room climate cause you
 - sore eyes ?
 - rheumatism ?
 - tiredness ?
 - susceptibility to illness ?
 - sensitivity to atmospheric changes ?
 - circulation disorders ?
 - a stuffed-up nose ?
 - colds ?
 - other
 - no problems

Lighting conditions in the room

25. Is the room brightness adequate during the day ?
26. Is the artificial lighting bright enough ?
27. Are there large differences in brightness where you mostly need to look ?
28. Do you have to change your attention from bright objects to dark ones from time to time ?
29. Is there stray reflected light in the workplace ?
30. Is the room illumination arranged properly ?
31. Is the artificial lighting uniform (e.g. no tube flicker) ?

Colours

32. Does the colour scheme at your workplace produce unfavourable contrasts in brightness ?
33. Are eye-catching colours used sensibly ?
34. Does the colour scheme in the room produce a restful and friendly atmosphere ?

Heat

35. Is the heat tolerable ?
36. Is the clothing suitable ?
37. Do you get enough to drink ?
38. Can you suggest ways of reducing the heat ?

Protection against noise

39. Does the noise distract your attention or interfere with your thinking ?
40. Does the noise make conversation difficult ?
41. Is the noise level high enough to damage the ears ?
42. Can you suggest ways of reducing the noise?

Health protection

43. Are there pollutants in the air ?
44. Can the spread of pollutants be prevented at source ?
45. Would it help to fit an air extractor ?
46. Do you come into contact with pollutants which could cause skin eczema ?
47. Could the technical installations cause accidents ?
48. Does the work process involve an accident hazard ?
49. Could accidents be caused by third parties ?
50. Is there a risk of fire or explosion ?

11. Current publicity material

- Brochure
For made-to-measure productivity. The ergonomic program for Leica stereomicroscopes. M1-215-2en
- Ergonomics: The science which makes working life more pleasant M3-215-1en
- Poster
Productivity is a question of position. Relaxation exercises during work breaks M5-106-1en
- Advertisement
The Leica ergonomics program for better working conditions. BU-SM 21-98
- Press release SM/PR 11/97
- ErgoHandbook M3-215-4de
(available from your Leica agency against cover charge of SFr 5.-)

Telefax

Subject Leica ergonomics program

I should like to take advantage of the Leica ergonomics modules.

I am ordering the following ergonomics modules:

Nr. 10 446 123	ErgoWedge™ 5°–25°	_____ units
Nr. 10 446 171	ErgoModule™ 30mm to 120mm	_____ units
Nr. 10 446 170	ErgoModule™ 50mm	_____ units
Nr. 10 346 910	ErgoWedge™ ±15°	_____ units
Nr. 10 445 822	ErgoTube™ 10°–50°	_____ units
Nr. 10 446 253	ErgoTube™ 45°	_____ units
Nr. _____	_____	_____ units

I should like to re-equip my stereomicroscope. Model: Leica (WILD) M _____
Please call me. The best time is: _____ am/pm

Institute/company _____

Name/first name _____

Street/no. _____

Postcode/City _____

Telephone _____

Fax _____

E-mail _____

Application _____

Date _____

Signature _____

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