WILD
HEERBRUGG

Wild M5 Matr.81891 di Cesare Brizio

Centraggio della testa del microscopio

La tacca di centraggio sul fianco della testa del microscopio dovrebbe coincidere perfettamente con il segno di riferimento che appare sulla base del microscopio. Al riguardo, all'arrivo del microscopio si sono osservati due problemi:

- con la tacca in perfetta coincidenza, il centraggio è imperfetto (la testa risulta leggermente ruotata in senso orario, e quindi diviene difficile ottenere la stereoscopia, sovrapponendo i campi visivi dei due obiettivi);
- se si serra eccessivamente la vite di ritenzione, data la forma della tacca e del piolo che la ingaggia, la testata è forzata a ruotare al di là del segno di riferimento.

Dopo l'intervento del Dr. Sini, che ha leggermente ruotato in senso orario le viti di ritenzione del fondo della testa del microscopio, e ha ricentrato i prismi dopo la pulitura, la testa allineata con il segno di riferimento, e serrata senza inutili esagerazioni, garantisce un centraggio perfetto.

Regolazione Distanza Interpupillare

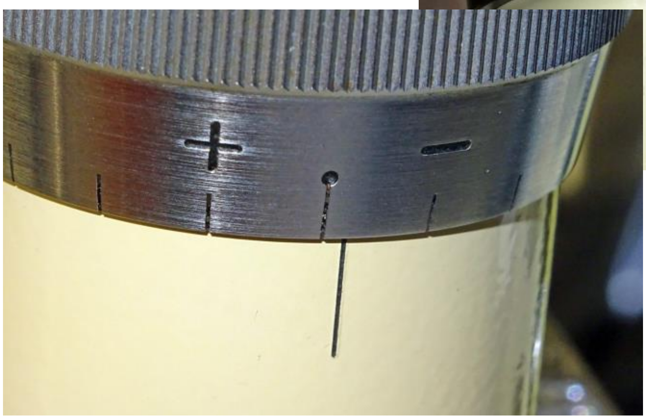
Il microscopio è stato ricevuto con un problema meccanico relativo all'indicatore della distanza interpupillare: se gli obiettivi venivanno distanziati oltre la tacca dei 60 millimetri poi si percepiva una forte resistenza al momento di riportarli a una distanza inferiore. Per riavvicinarli, era necessario svitare le due vitine della protezione trasparente dell'indicatore (o addirittura svitare le tre viti della copertura della testa del microscopio) e riposizionare su una posizione più stretta gli oculari, esercitando una leggera pressione sul settore circolare metallico con i valori, che appare leggermente incastrato. Ciò dipendeva dalla rottura e deformazione della molla di centraggio del settore circolare.

Dopo l'intervento del Dr. Sini, gli oculari percorrono fluidamente il loro intero arco di distanziamento, e l'indicatore di distanziamento restituisce valori coerenti ed esatti. Anche il dettaglio tecnico di questi interventi è descritto nella scheda tecnica del Dr. Sini.

Regolazione degli oculari

Era chiaro dalle immagini fotografiche che gli originali oculari sono stati sostituiti con quelli, molto più performanti, del Wild M10 entrato in commercio negli Anni Novanta, ultimo microscopio a marchio Wild prima della "incorporation" in Leica – ovvero con oculari Wild 445111 10X/21B – il Wild M10 è apocromatico in tutto l'apparato ottico, il Wild M5 in versione standard è semplicemente acromatico. Gli oculari funzionavano egregiamente, ma il microscopio aveva smesso di essere parfocale.

Dopo l'intervento del Dr. Sini, che ha contrassegnato con un punto di colore a tempera bianco le nuove posizioni del segno di riferimento degli oculari, essi si trovano normalmente come visibile in fotografia, e garantiscono la parfocalità a tutti e quattro gli ingrandimenti disponibili. Il sistema di correzione diottrica tramite allungamento del tubo sinistro, per il settaggio a me confacente è avvitato a fondo, poi ruotato in senso antiorario fino al segno del centraggio, o circa tre millimetri prima.



Pulizia prismi della testa del microscopio

Esaminati in trasparenza a oculari rimossi, i prismi sottostanti gli oculari apparivano velati. Era addirittura possibile osservare una piccolissima area coperta da una muffa.

Dopo l'intervento del Dr. Sini, che ha realizzato alcuni fori con punte da 1.25mm di diametro sulle staffe di sostegno dei prismi prima di smontarli, consentendo con ciò un loro rapido riallineamento dopo la pulizia, e che ha realizzato la scheda tecnica di cui alle pagine seguenti, i prismi sono perfettamente allineati e privi di qualsiasi traccia di muffa. Il dettaglio del procedimento di spinatura è illustrato alla scheda tecnica del Dr. Sini, alle pagine seguenti.

Interventi svolti su lente inferiore

Appena ricevuto il microscopio, nell'esaminare la faccia inferiore dell'obiettivo, notavo molta polvere all'interno di tale lente. La ghiera ad anello esterna è rimuovibile per il montaggio di accessori quali lenti addizionali e supporti per l'illuminazione, e poteva essere svitata senza alcuno sforzo. Notavo altresì che l'anello filettato di ritenzione della lente era evidentemente stato svitato in passato, come testimoniavano le condizioni delle due tacche di ingaggio. Con cautela e senza alcuna difficoltà, riuscivo a svitare l'anello di ritenzione, e pulire entrambe le facce della lente esterna con panno ottico in microfibra, poi a riposizionarla così come l'avevo trovata e a avvitare nuovamente fino a fine corsa l'anello di ritenzione e l'anello filettato esterno. sebbene apparentemente allineato, il microscopio presentava un tremendo astigmatismo, quasi impercettibile a 6x e 12x, ma insopportabile a 25x e soprattutto a 50x.

Dopo l'intervento del Dr. Sini, che si rendeva conto che avevo ricevuto il microscopio con la lente inferiore ribaltata, e la rimontava girata nel senso corretto, l'astigmatismo spariva, e il microscopio passava lo "star test" a tutti gli ingrandimenti. Questo è dimostrato dall'allegata scheda tecnica.

Distanza di lavoro

Con riferimento alla superficie inferiore della ghiera porta-accessori, la distanza tra essa e il piano di lavoro del tavolino è tra i 91 e i 92 mm.

Scheda tecnica n° 157

Il tubo del microscopio Stereoscopico WILD mod. M5

Matr.81891

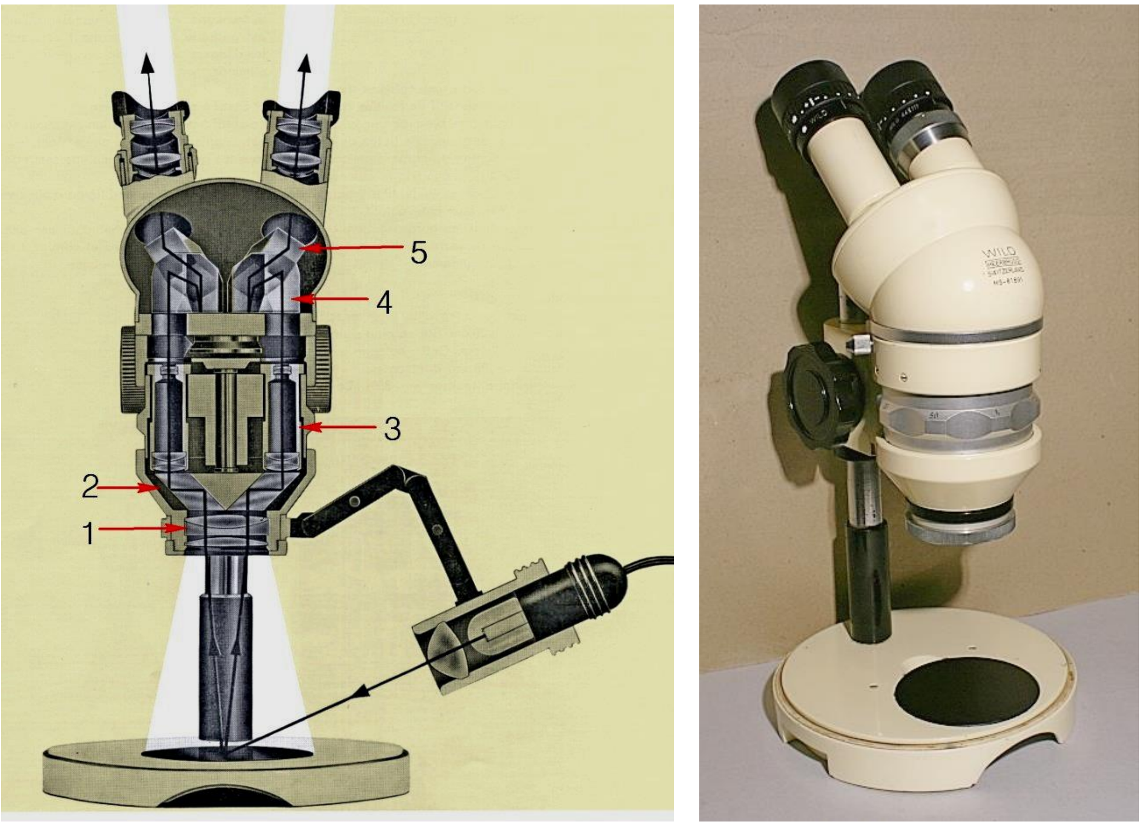


Fig. 35a – Color crema, peso notevole, ricchissimo corredo di accessori. Questo è l'equipaggiamento di base.

Un classico, il modello "de luxe" nella serie degli stereoscopici della casa Wild negli anni '60 del secolo scorso, con schema CMO, ma con qualche preziosismo.

Già nella figura precedente, oltre ai componenti classici del sistema CMO (obbiettivo (1), sistemi afocali "galileiani" per il cambiamento dell'ingrandimento (3), prismi di Schmidt per il raddrizzamento dell'immagine e l'inclinazione dell'asse ottico di 45° (4)), si vede una coppia di prismi a doppia riflessione totale che aumentano la distanza fra i due canali (2) ed un'analoga coppia di prismi dello stesso tipo per allargare la distanza fra i due oculari (5).

Questo esemplare viene ricoverato poiché, in poche parole, "si vede male", specialmente ai forti ingrandimenti.

Fig. 35b – Un'occhiata con lo star test non lascia dubbi: con un residuo di coma ed astigmatismo come questo, nessuno strumento ottico può essere utilizzabile.

Come prima osservazione, si constata che il difetto (la coda delle centriche) è orientato in maniera speculare nei due canali: effetto ovvio se il difetto non è limitato ad uno dei canali, dato che l'inclinazione del raggio principale dei due canali, nello spazio fra obbiettivo ed oggetto, è la stessa rispetto al piano mediano dello strumento.

Quindi, la causa non può che risiedere in un organo che interessa entrambi i canali. E l'unico organo in comune è l'obbiettivo CMO.

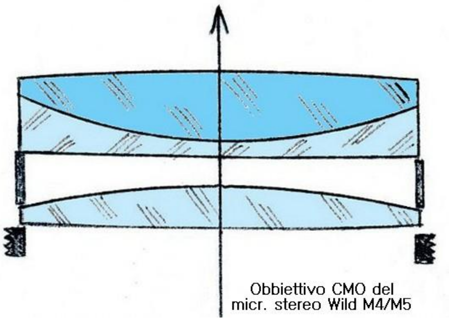


Fig. 35c – Come si vede da questo schema, l'obbiettivo del modello M5, come pure del fratello minore M4, è costituito da un doppietto superiore e da una biconvessa asimmetrica inferiore.

Dubbio: che qualcuno abbia smontato l'obbiettivo per pulirlo ed abbia rimontato qualche lente alla rovescia?

Avendo sotto mano lo schema ottico, non c'è che smontare quel sistema e verificare la situazione.

Il dubbio è verificato: la lente inferiore era montata alla rovescia. La raddrizziamo?

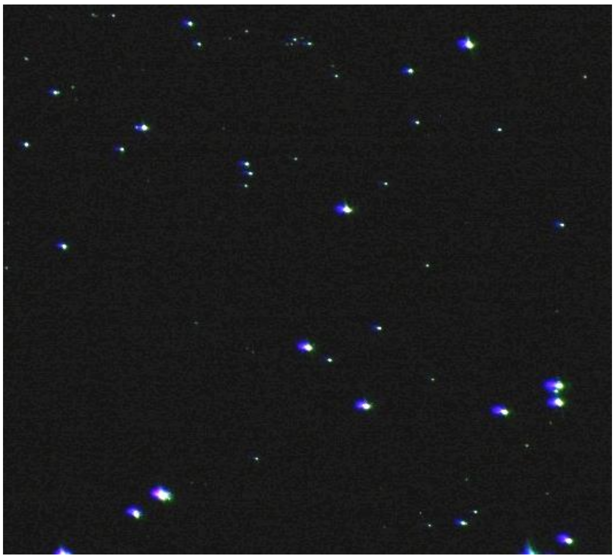


Fig. 35d – Controllare subito il risultato con lo star test: la situazione è tornata normale.

Un occhio attento noterà che, nella figura a lato, le centriche mostrano una leggerissima coda diretta a sinistra. Questo è fisiologico: nel sistema CMO i due obbiettivi sono costituiti da due porzioni periferiche della stessa lente. Dunque, questi "obbiettivi parziali" lavorano "fuori asse".

In queste condizioni, un residuo di aberrazioni extra-assiali (coma, astigmatismo, cromatica laterale) si può ridurre solo con aumento della complessità (e del costo) del CMO. Un piccolo residuo è normale.

Ciò fatto, basterebbe pulire e rimontare l'obbiettivo. Ma uno sguardo dentro il tubo binoculare mostra un certo appannamento dei prismi.

La pulizia dei prismi è opportuna, e risulta possibile su alcune delle loro facce, ma non su tutte. Occorre smontare il tubo.

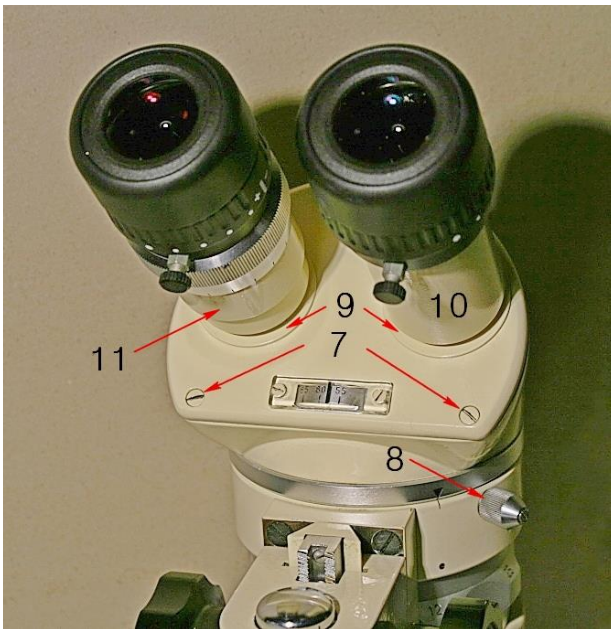


Fig. 35e – Il tubo binoculare è fissato da una punta spinta a vite dalla manopolina 8. Quella punta fissa il tubo al corpo dello strumento incastrandosi in una delle due tacche (13, figura seguente) presenti nella coda di rondine (14) fissata da tre viti alla base del tubo.

Allentata la manopolina 8, si può sfilare il tubo (leggera rotazione in senso anti-orario).

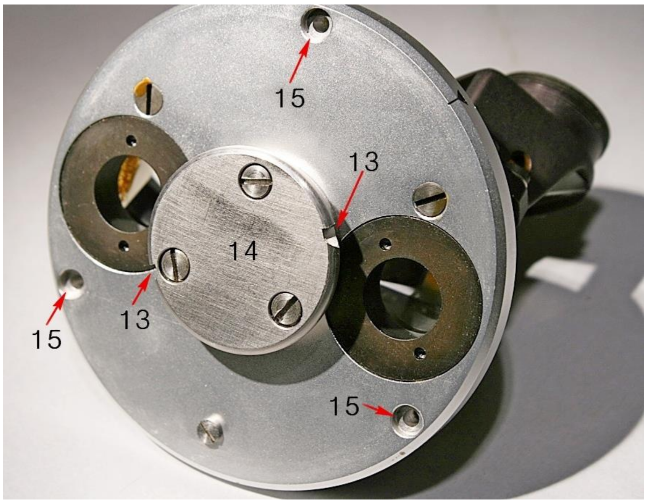
Per togliere il coperchio del tubo occorre prima di tutto svitare le due boccole porta-oculare (10 ed 11) e sfilare dall'estremo inferiore di esse i due anelli 9, destinati ad impedire la penetrazione della polvere all'interno del tubo.

Poi, occorre togliere le tre viti 7 (nella foto è invisibile la terza, nascosta dalla boccola 10).

Tolto il coperchio, appare la situazione della fig. 35g.

Fig. 35f – Le due tacche 13 sono simmetricamente disposte ai bordi della coda di rondine 14. Il loro profilo è asimmetrico e facilita il corretto posizionamento del tubo se lo infila nella sua sede con una leggera rotazione in senso orario.

Nei fori 15 alloggiano tre viti a testa cilindrica, togliendo le quali si può togliere il guscio esterno del tubo (17 nella figura seguente).



Dopo aver tolto il coperchio (le tre viti 7 della penultima figura) si scopre il sistema dei prismi.

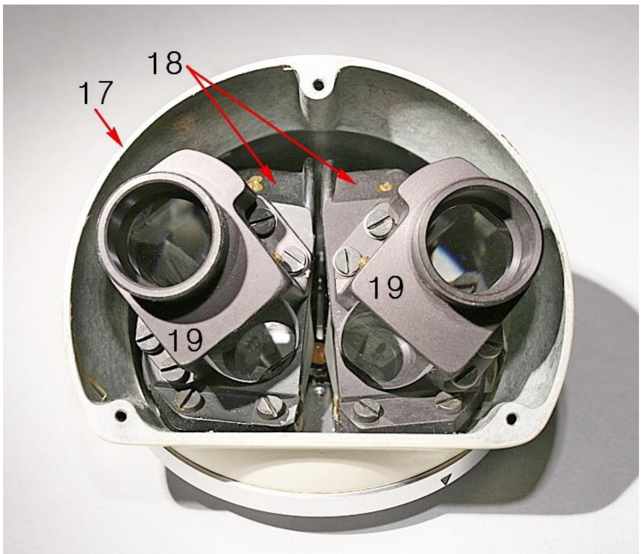


Fig. 35g – Tolto il coperchio, all'interno del guscio 17, si vedono i due supporti dei prismi di Schmidt (18) ed i due supporti dei prismi di spostamento dell'asse (19).

I supporti 18 sono fissati, tramite una piastra d'appoggio (28, fig 35ℓ a pag. 1336), alla base del tubo, da 2 + 2 viti (18' e 18" nella figura seguente) e su di essi sono fissati i supporti 19 da altre2 + 2 viti (19' e 19" nella figura seguente).

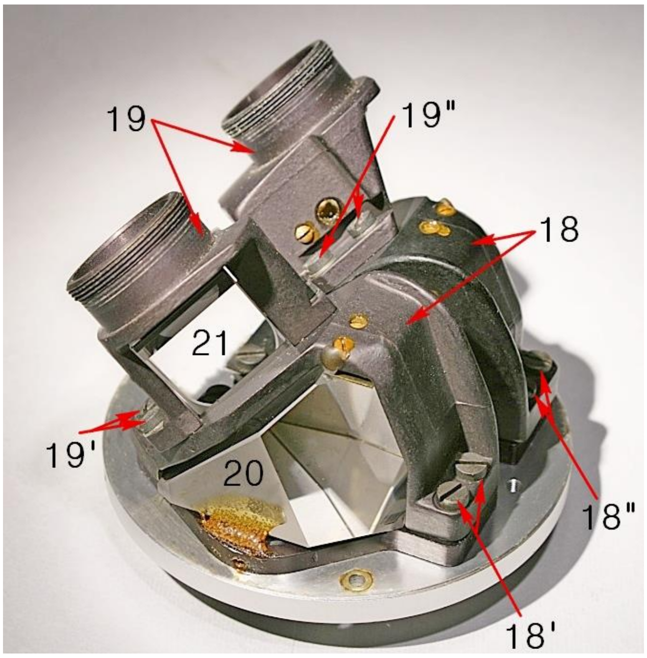


Fig. 35h (a destra) – Dopo aver smontato le tre viti 15 della fig. 35f (pag. 1328) ed il guscio 17, si accede liberamente al gruppo dei prismi, con i supporti 18 e 19 già visti.

A questo punto, sono accessibili solo alcune facce dei prismi di Schmidt (20) e dei prismi di spostamento dell'asse (21).

Sono visibili alcune delle viti che tengono fermi i supporti18 (18' e 18") ed i supporti 19 (19' e 19").

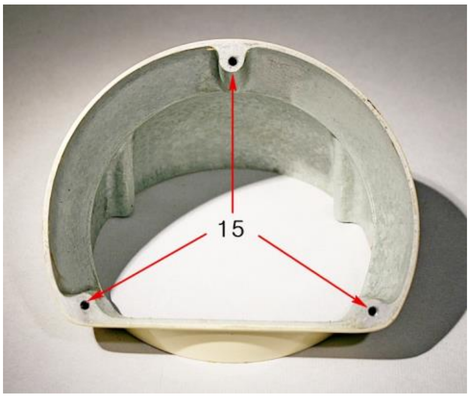


Fig. 35i (sopra) – Questo è il guscio 17, staccato dalla base del tubo.

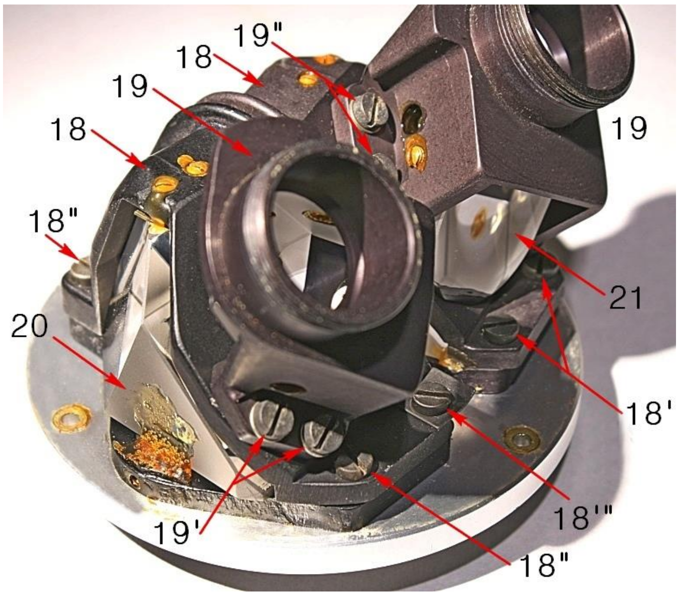
Fig. 35j (a destra) – Visto dall’altro lato, il sistema dei prismi mostra altri dettagli.

Risulta chiaro anche qui che non tutte le facce dei prismi sono accessibili in questa situazione.

Va notata la piastrina quadrata che si trova sotto la testa della vite 18’”. Essa serve da appoggio per la punta 24 visibile nella figura seguente.

Nella fig. 35e a pag. 1328 si sarà notata, nella parte bassa del coperchio del tubo, una finestrella trasparente che lascia vedere una scala girevole la quale indica il valore della distanza pupillare.

Tale scala si sposta quando le boccole porta-oculare vengono allontanate od avvicinate fra loro e la piastrina 18’” spinge sulla punta 24 della figura seguente.



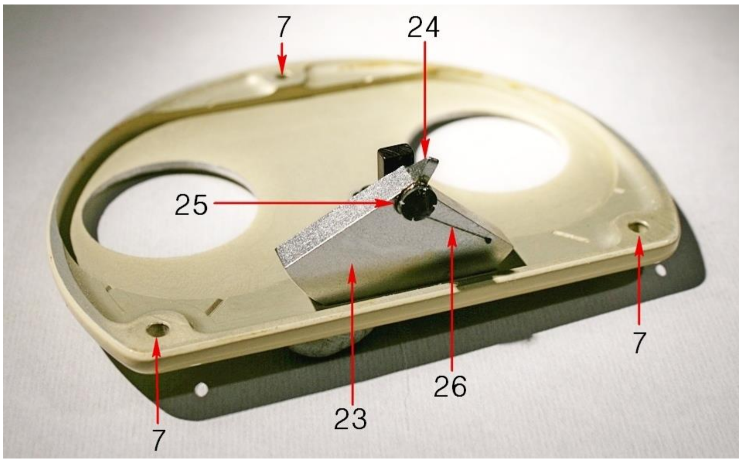


Fig. 35k (a sinistra) – Sul rovescio del coperchio del tubo si vede il settore circolare 23, capace di ruotare attorno al perno 25 e spinto a ruotare in senso orario dalla molla 26.

La punta 24, che sporge dal centro del settore 23, in condizioni di lavoro, è spinta dal piastrino 18’” della figura precedente.

Bene. Occorre quindi smontare qualcuno dei supporti dei prismi per poter pulire tutte le loro superfici.

Prima di smontare un pezzo meccanico per un intervento qualunque, sapendo di doverlo rimontare, è buona regola “spinarlo”, vale a dire praticare due fori attraverso il pezzo stesso ed il relativo piano di appoggio: al momento del rimontaggio, due “spine” cilindriche, dello stesso diametro dei fori, consentiranno di riportare il pezzo nella posizione originale prima di serrare le viti di fissaggio.

Nel caso nostro sono occorsi 2 + 2 fori (da 1,25 mm) nei due supporti 18 ed altrettanti nei supporti 19.

Ma … c’è qualcosa che non si può spinare: il vetro.

Fig. 35ℓ (a destra) – Sul lato destro, è stato staccato il supporto 19 dal 18.

A sinistra, sono stati smontati i supporti 18 e 19, e sotto di essi appare una piastra d’appoggio (28), che non è necessario smontare. Su di essa, appaiono due superfici di riferimento, su cui appoggia la faccia inferiore del prisma di Schmidt sinistro.

Sono visibili quattro dei fori per spine già praticati (29). Non è stato necessario smontare il supporto 18 destro.

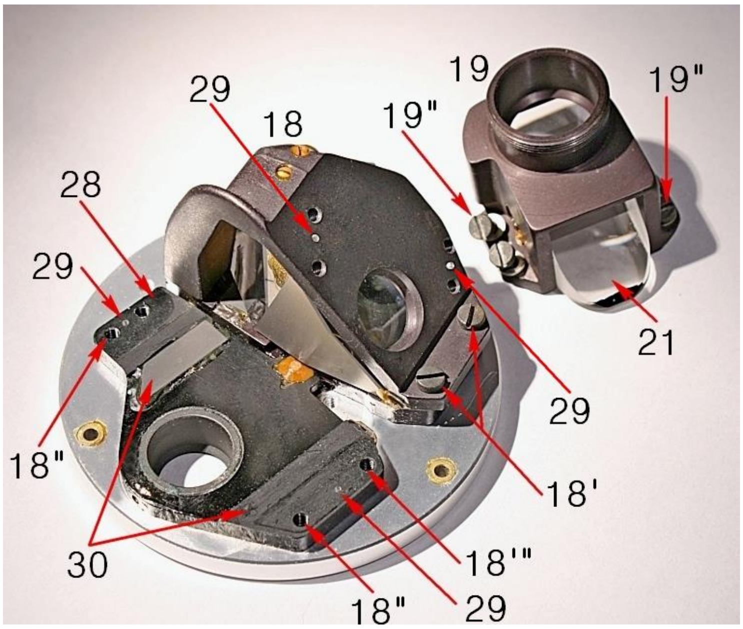
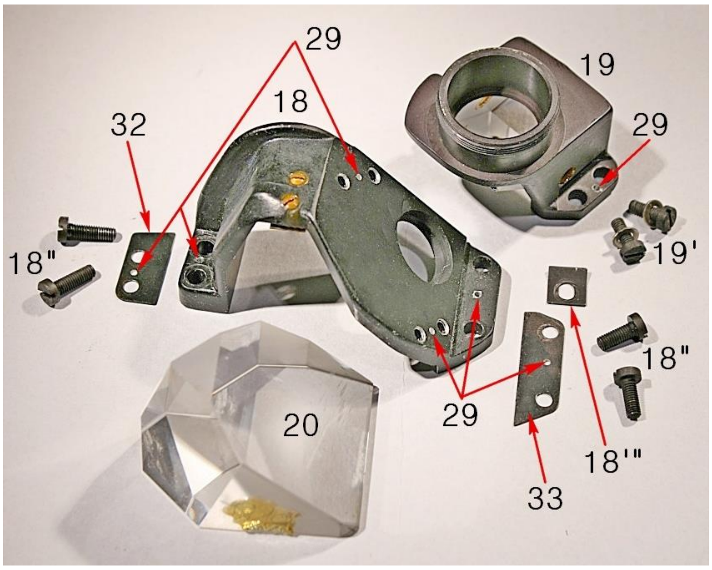


Fig. 35m – Ecco il supporto del prisma di Schmidt sinistro. Si notino le due piastrine 32 e 33 che determinano lo spazio esatto riservato al prisma fra il supporto 18 e la piastra di base 28 della figura precedente.

Abbiamo già visto la funzione della piastrina quadrata 18’”.



Ora sono accessibili tutte le facce di tutti i prismi, senza smontare nessun altro pezzo.

Ma qui nasce un problemino.

Abbiamo spinato tutti i supporti dei prismi (18 e 19).

Però, dopo aver pulito i prismi, al momento di rimontare tutto il sistema e controllare la centratura reci-proca (parcentratura) fra i due oculari, ci si accorgerà che la centratura è cattiva.

Spiegazione semplice.

Dopo aver rimontato e fissato con le viti 18”, 19’ e 19” tutti i supporti, il prisma di Schmidt ha come solo riferimento le superfici 30 (fig. 35ℓ). In alto, il supporto 18 lo spinge su di esse. Però, lateralmente, il prisma è libero di spostarsi e ruotare leggermente attorno ad un asse verticale.

Per questo, prima di serrare le viti 18”, bisognerà spostare con piccoli colpetti il prisma fino ad un risultato accettabile. Per piccoli ritocchi finali, si potranno tenere lente le viti 18” e spostare per approssimazioni successive il supporto 18.

Occorrerà un po’ di pazienza, ma ci si riesce.

Il paziente è dimesso.

Wild M5 Stereo-microscope

Instructions for use

WILD HEERBRUGG SWITZERLAND

Introduction

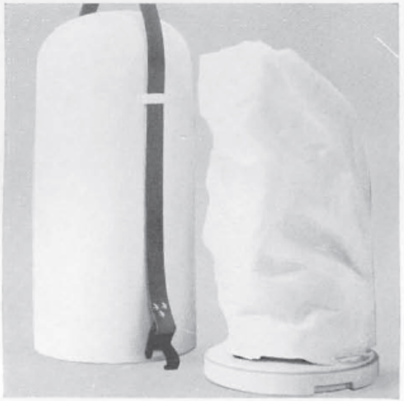
Contents

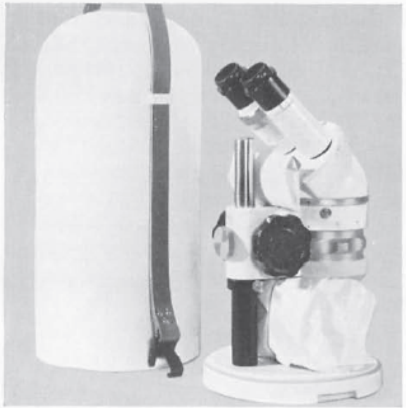
The M5 stereomicroscope is a highly efficient precision instrument which will give the best possible results, providing the user is fully conversant with the correct method of using the instrument and its accessories. We therefore suggest that these instructions are carefully read through before working with the equipment for the first time. The M5 stereomicroscope is covered by our guarantee:

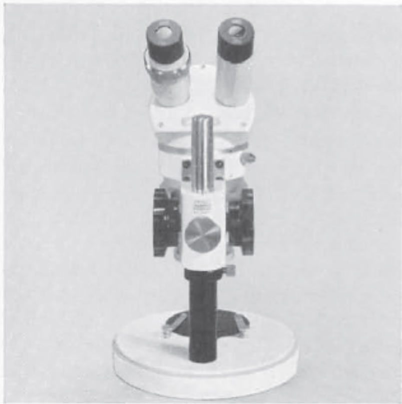
We guarantee the quality of each of our instruments. Our guarantee covers all faults in materials and manufacture. It does not, however, cover damage resulting from careless or improper handling.

Our local representatives, as well as our specialists in Heerbrugg, will be pleased to assist you in any problems concerning microscopy. We wish you every success in your work with the M5 stereomicroscope.

The numbers quoted in the text refer to the illustration on page 20, which can be folded out for easy reference.







I. Unpacking the instrument

After removing the outer packing the instrument in its metal hood should be placed on the bench. The two patented locking clips, linking the hood to the base of the microscope, are then released by pulling sideways and the hood is lifted clear of the instrument. The additional paper packing is removed and the accessories, which are separately wrapped, are unpacked.

Above: Fig. 1 M5 stereomicroscope with metal hood lifted off

Centre: Fig. 2 With the outer packing removed

Below: Fig. 3 M5 stereomicroscope ready for setting up after removal of the paper padding

II. Instructions for use

a) Setting up the basic equipment for incident illumination

Remove the dustcaps (1) from the eyepieces (2), which will be found already in the tubes, and turn the milled diopter ring (3) on the left eyetube, so that the middle of the scale is opposite the mark on the eyetube. Place the object on the metal stage plate (20).
Turn the magnification changer (17) to the highest position (i.e. so that the number 50 is opposite the black spot).

Loosen the clamping screw (8) and, holding the body of the instrument (18) with one hand, slide the microscope up and down the column of the stand (5) until the object is visible when looking into the eyepieces. Then re-tighten the locking screw (8) to secure the instrument in position.

Release the safety ring (10) by loosening its screw (11) and slide it up the column until it comes into contact with the drive housing (7). Re-tighten the screw (11).

Release the clamping screw (8) and swing the microscope so that it lies centrally above the plate in the foot; it is correctly positioned when the index mark on the top of the drive housing is in line with the black line (6) on the column. Re-tighten the clamping screw (8). Bring the object into focus by turning the focusing knobs (9).

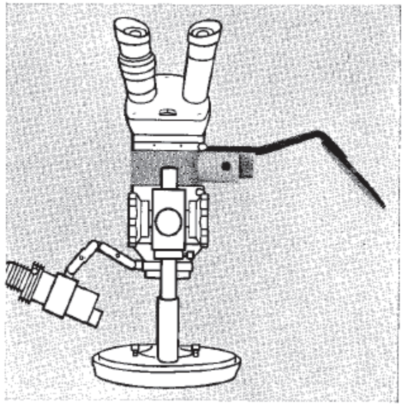
Move the eyetubes (13) apart to suit the interpupillary distance of the observer. The scale (4) gives the distance in mm between the centre of the eyetubes and, once the observer's interpupillary distance is known, facilitates rapid tube adjustment.

Fit the eyecups onto the eyepieces, so that distracting sidelight is cut out.
To obtain other magnifications turn the magnification changer (17) and adjust the focus slightly with the focusing knobs (9) if necessary.

If the observer's vision is weaker in one eye then the other it can be compensated by turning the diopter ring (3) on the left tube. First bring the preparation into focus using only the right eye (looking into the right eyetube). Then close the right eye and focus the preparation through the left eyetube solely by turning the diopter ring.

If all these instructions have been carefully carried out a good three-dimensional image of the object will be produced. Where this seems difficult to obtain it is almost certainly because either the distance between the eyetubes is incorrect or because the observer's eyes are not relaxed, i.e. are not focused at infinity. (Most people require a little practice before they can see the correct 3D effect using a stereomicroscope; however, it is sometimes not possible for observers with bad eyesight to obtain a perfect stereoscopic

Fig. 4 M5 stereomicroscope with drawing tube in position



picture.) Because the eyepieces have a relatively high exit pupil it is possible to use the microscope whilst wearing spectacles.

Possible errors in elevation within the image can be corrected by gently turning the binocular tube in its dove-tail mount. This error cannot occur if the tube has been locked in its correct position.

If the focusing movement is too stiff or too slack it may be altered by holding one knob still and turning the other in a clockwise or anticlockwise direction until the required tension is obtained.

b) Fixing and changing tubes

1. Binocular inclined tube
2. Phototube A
3. Phototube B with hinged prism
4. Stereo-phototube
5. Drawing tube

All the above-mentioned tubes have a dove-tail ring base which facilitates orientation. The tubes are attached to the top of the objective housing and are locked in position by a clamping screw (16).

1. It is essential that the optical axis of each eyepiece is in precise alignment with the appropriate intermediate objective. This position is only obtainable when the binocular tube is correctly orientated so that the triangular mark on the mounting ring of the tube is opposite the vertical line on the body of the instrument (15). If the binocular tube is to be used in the reversed position it may be rotated through 180° and lined up with a similar mark on the opposite side of the body. Once the tube has been correctly orientated it must be locked in position with the clamping screw (16).

The distance between the eyetubes can be varied between 55 and 77 mm and can be read off from a scale. The distance between the tubes must correspond exactly to the interpupillary distance of the observer if a perfect three-dimensional image is to be obtained.

If one of the observer's eyes is weaker than the other it can be corrected by the use of the diopter ring on the left eyetube, as described on page 4. Observers with normal eyesight should turn the diopter ring until the index mark is opposite the black spot between + and — on the scale.

The eyepieces should slide easily into the eyetubes. If necessary the T-slits at the top of the eyetubes can be slightly adjusted.

2. to 4. If phototubes are to be used please refer to the instructions in section II. h).

5. The body of the M5 drawing tube fits between the objective housing and the binocular tube. It can be used on either the right or left hand side of the microscope (the mirror pointing to right or left respectively). The drawing tube has a magnification factor of 1·25 ×, which must be taken into account when calculating overall magnification of the microscope. Two index marks on the body of the drawing tube are used for precise orientation in the same way as already described for the binocular tube.

The next step is to focus the microscope with the black shutter knob (on the side arm of the drawing tube) pushed in. In this position the light path from the mirror is blocked. When the object is in focus the shutter knob is pulled out and the knurled ring on the side arm is turned to bring the drawing paper into focus. The drawing paper should lie below the mirror. Best results are obtained when the object and the drawing paper are equally illuminated, and to achieve this it may be necessary to reduce the intensity of the microscope lamp, or alternatively to use a secondary source, such as a bench lamp, to illuminate the drawing paper.

Specimens for comparison, timers and similar objects may also be placed under the drawing mirror so that they can be observed simultaneously with the specimen. The image of these objects, or of the drawing paper, naturally only lies in one light path, but by binocular observation both the paper and the object on the microscope stage can be seen at the same time.

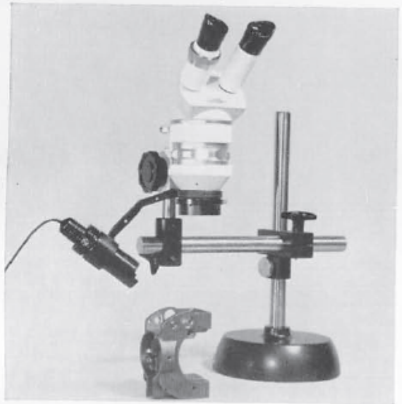


Fig. 5 M5 stereomicroscope with 0·5 × additional objective on swinging arm stand

c) Stands and their uses

1. Normal stand
2. Swinging arm stand
3. Table clamp stand

1. The normal stand of the M5 has a 20 cm (8 in.) high column, 20 mm (¾ in.) in diameter, fixed securely to a circular baseplate. This column supports the drive housing and allows the height of the instrument to be varied to accommodate large objects. To alter the height the clamping screw (8) is loosened, followed by the safety ring (10). The drive housing can then be slid up and down the column, or swung from side to side to cover any particular area of the object. The lower part of the column is covered by a metal sleeve (12), which will prevent damage to the objective should the drive housing slip down the column when both screws (8 and 11) are released.

The long black line engraved on the rear of the column is used for centring the instrument over the stage: the instrument is correctly centred when the index mark on the top of the drive housing is in line with that on the column.

The base socket is used for the attachment of various stages and metal or glass stage plates.

2. The swinging arm stand consists of a heavy cast base bearing a strong vertical column, to which a horizontal arm is clamped. The arm can be rotated horizontally through 360° and its height can be varied by sliding it up and down the vertical column. A short rod for the attachment of the M5 is clamped on the horizontal arm and is used in the same way as the column of the normal stand: it can be rotated through 360° in a vertical plane. A safety ring similar to (10) ensures that the horizontal arm remains at its original height setting. The swinging arm stand allows the microscope to be fixed in virtually any position and greatly facilitates the examination of large, irregular objects.

3. The remarks contained in the foregoing paragraph also apply to the table clamp stand, which differs from the swinging arm stand only in having a table clamp instead of a cast base. It can be clamped to table tops between 25 and 50 mm (1–2 in.) thick. In certain circumstances it is more convenient to use this stand than those described under 1 and 2 above.

d) Magnification changer and additional objectives

The magnification changer lies between the main built-in objective and the binocular tube and is a horizontal drum, the outer portion of which takes the form of a knurled ring (17). By turning this ring in a clockwise direction one can rapidly range through four different magnifications, increasing in power and indicated by the index numbers 6, 12, 25 and 50 (when 10 × eyepieces are used without an intermediate tube or additional objective, these numbers represent total magnifications of 6 ×, 12 ×, 25 × and 50 ×). A stop prevents the ring being turned past the 50 position. The working distance for all positions of the magnification changer is 96 mm (approx. 3¾ in.).

Additional objectives with factors of 0·3 ×; 0·5 ×; 1·5 × and 2·0 × are available and fit over the knurled ring (19), which lies below the main objective. They are secured by a clamping screw, which should lie on the right of the observer when correctly fitted. The objective mount is joined to its clamping ring by a spindle which enables it to be swung out of the light path when not required. Complete data concerning the magnifications and working distances obtainable with various optical combinations are given in the tables on page 18.

e) Stages

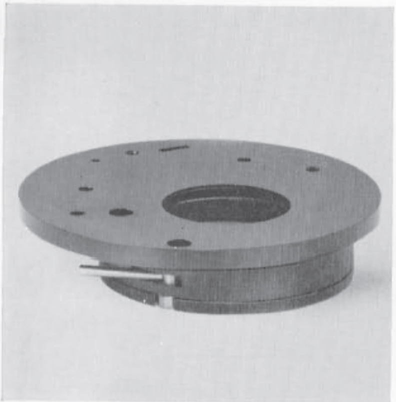
The socket in the base of the normal stand is used for the attachment of various stages:

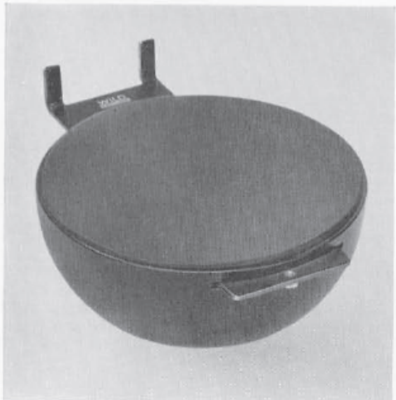
1. Metal plate, white on one side, black on the other
2. Glass plates, clear or frosted
3. Sliding stage with eccentric clamp
4. Stage carrier with eccentric clamp, for mechanical stage K or attachable mechanical stage C (both of these stages are also used on our M20 research microscope)
5. Cup stage

1. & 2. The glass and metal plates are simply placed in the base socket and rest on a shoulder in the rim. They can be held in place by the stage clips.

3. The sliding stage is fitted into the socket by an eccentric clamp and is used with a glass or metal stage plate (according to whether incident or transmitted light is employed). A grease covered friction plate allows the stage to be pushed in any direction, so that the object can be examined over a wide area, or movement of small objects can be followed.

4. The stage carrier is also locked in the base socket by an eccentric clamp. It is bored to accept the attachable mechanical stage C, which is fitted with scales and verniers and allows movement of the object through 25 × 50 mm. The standard mechanical stage K of





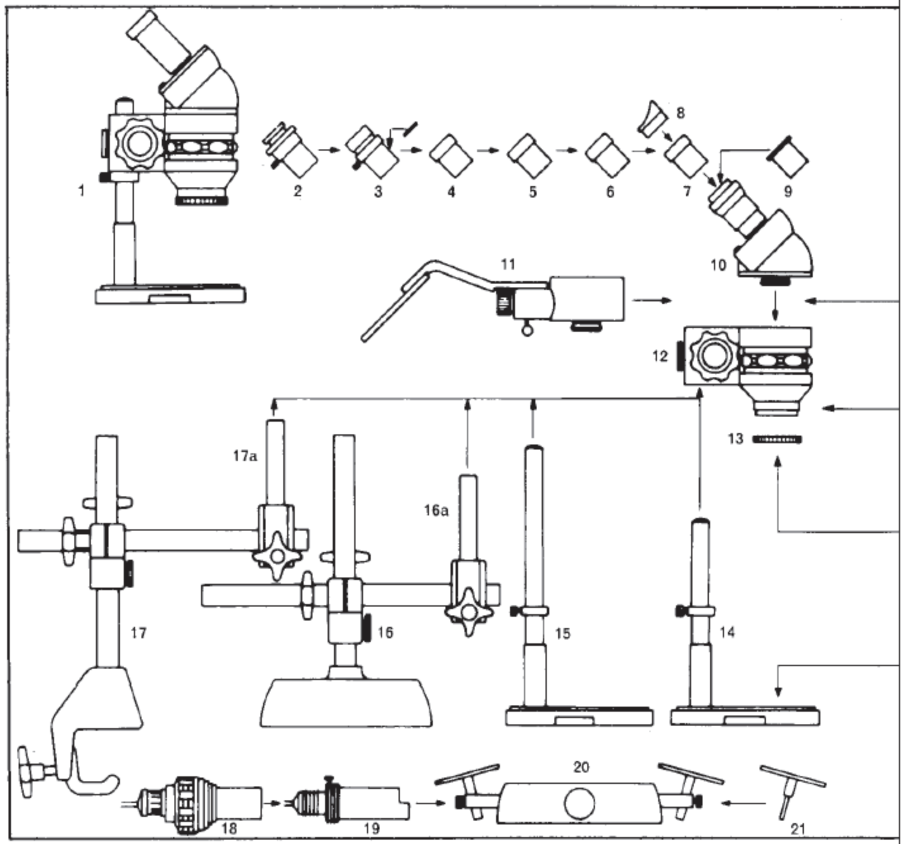
the M20 research microscope can also be fitted to the stage carrier. The K stage measures 135 × 150 mm and is fitted with coaxial controls giving movement through 50 × 75 mm. The special column M5c must be used to obtain the full movement of the K stage.

5. The cup stage simply rests in the base socket of the M5 and can be rotated or inclined in any direction. A pull-out holder allows petri dishes of various sizes to be accommodated. The top of the cup stage is rubber-covered so that pins can be stuck into it when the stage is being used for the examination of insects, dissections and similar subjects.

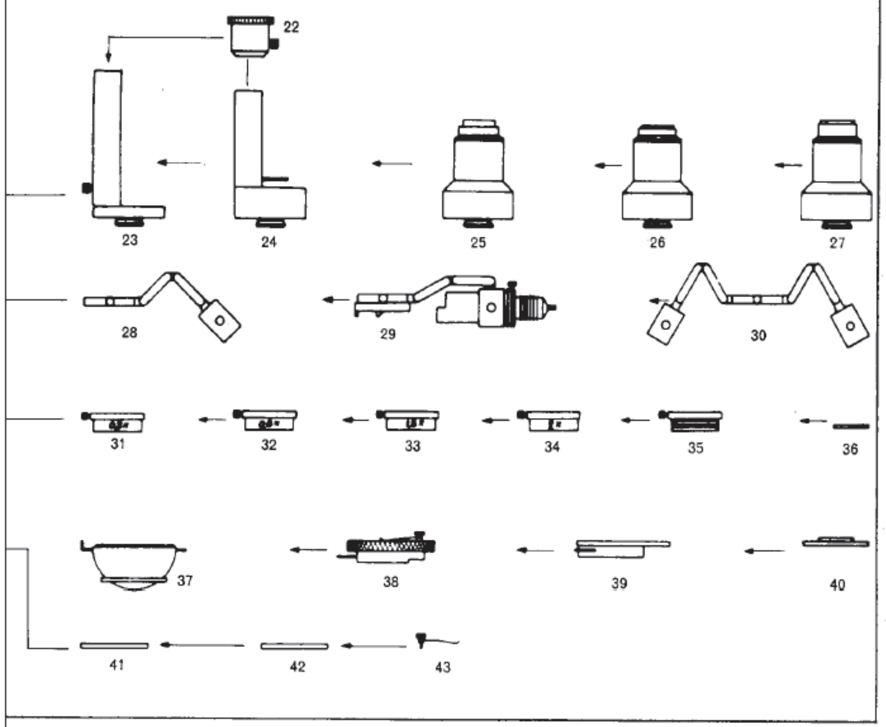
Above: Fig. 6 Sliding stage with metal stage plate, stage clips and eccentric clamp

Centre: Fig. 7 Stage carrier for mechanical stage K and attachable mechanical stage C, with eccentric clamp

Below: Fig. 8 Cup stage with petri dish holder



		Code No.
1	M5 standard outfit	
2	Goniometer eyepiece	1123
3	Measuring eyepiece	1120
4	Eyepiece 20 ×	1102
5	Eyepiece 15 ×	1101
6	Eyepiece 10 ×	1100
7	Eyepiece 8 ×	1103
8	Eyecup	1025
9	Adapter ring for normal eyepieces	1136
10	Binocular tube	1000
11	Drawing tube	1220
12	Housing containing magnification changer and main objective	-
13	Knurled ring	-
14	Normal stand	1150
15	Stand with 30 cm (12 in.) column	1350
16	Swinging arm stand with	
16a	Microscope column 1168	1165
17	Table clamp stand with	
17a	Microscope column 1168	1166
18	Mains lamp	1051
19	Low voltage lamp	1052
20	Base for transmitted light with two handrests	1185
21	Handrests only (pair)	1176
22	Camera clamping ring	1201



No.		Code No.
23	Phototube A	1200
24	Phototube B	1202
25	Stereo-phototube for Alpa-Reflex	1210
26	Stereo-phototube for Exakta	1211
27	Stereo-phototube for Edixa	1212
28	Lamp bracket	1050
29	Prism for vertical illumination (with 1050 + 1052)	1063
30	Double lamp bracket	1053
31	Additional objective 0·3 ×	1108
32	Additional objective 0·5 ×	1107
33	Additional objective 1·5 ×	1105
34	Additional objective 2·0 ×	1106
35	Analyser mount	1189
36	Polariser, 33 mm ∅	8160
37	Cup stage	1160
38	Sliding stage	1161
39	Stage carrier (for K and C stages)	1162
40	Polariser for transmitted light	1085
41	Metal stage plate	1152
42	Glass stage plate	1153/1154
43	Stage clip	1151

WILD HEERBRUGG

f) Illumination

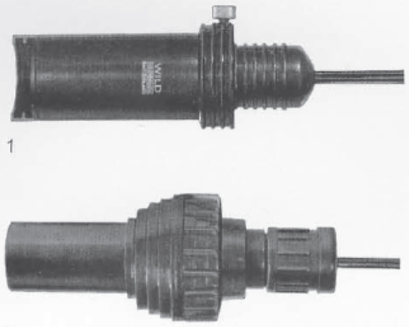
1. Incident light
2. Transmitted light

1. Both the mains lamp and the low voltage lamp are fixed to the M5 by an adjustable attachment bracket. To attach the bracket the chromium-plated ring (19) is unscrewed, the bracket is pushed up on to the flange and locked into position with the clamping screw. The chromed ring (19) is then screwed back into position, after which the clamping screw is loosened so that the lamp can be swung around the axis of the microscope. The lamp selected is then pushed home into the lamp holder and fixed with a clamping screw. The articulated arm of the attachment bracket allows the lamp to be fixed to give illumination from any direction. If the arm is too stiff, or too slack, the tension of the joints can be altered using a small tommy-bar. If the lamp filament is not exactly centred it can be corrected by turning the lamp socket. The low voltage lamp is fitted with a collector lens. The brightness and area of the light falling on the stage can be varied by altering the distance between the collector and the bulb. A screw locking the bulb socket allows the bulb in its socket to be rotated or moved in or out as desired. The light intensity of the low voltage lamp can also be varied by the regulating transformer. (N.B. the life of the bulb is reduced if it is used for long periods at more than 6V.)

Should the object require illumination from two directions a double lamp bracket is available and is fitted as described above.

The low voltage lamp can be used for vertical incident illumination in conjunction with a special prism (fig. 10) which is clamped onto the chromium-plated ring (19) below the lamp bracket. The lamp is arranged to project a concentrated beam on to the prism, which is then slid backwards and forwards until the appropriate area of the specimen is illuminated. This arrangement is especially recommended when a shadow-free image is required.

2. The special base for transmitted light is illustrated in fig. 11. The normal stand is placed on top of the transmitted light base and secured from below by a screw. The object is placed on the frosted glass insert (in the base socket of the normal stand) and can be held in position with the stage clips if necessary. Either the mains or the low voltage lamp can be inserted into the hole in the rear of the transmitted light base, which contains a lever-controlled inclinable mirror for directing the light onto the preparation. Both handrests are vertically and laterally adjustable. If daylight illumination is to be used for work with transmitted light the mirror should be turned to face the front of



1

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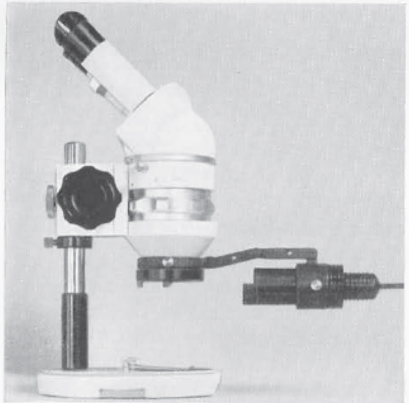
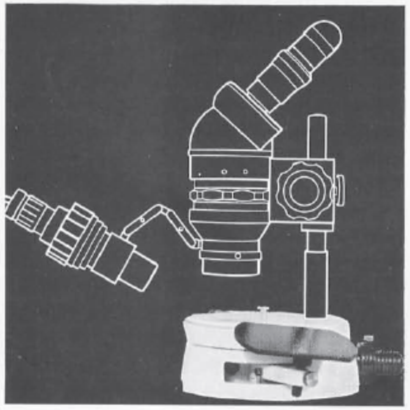




the microscope and the frosted glass insert should be replaced by clear glass.
The mains lamp is switched on and off by rotating the collar round the bulb socket; the low voltage lamp is operated via the transformer.
In certain applications a combined transmitted/incident illumination is benefical.

Above: Fig. 9 1. Low voltage lamp; 2. Mains lamp

Centre: Fig. 10 M5 stereomicroscope with prism for vertical illumination and low voltage lamp in bracket

Below: Fig. 11 Base for transmitted light with handrests and low voltage lamp in position

g) Polarised light

1. Incident light
2. Transmitted light

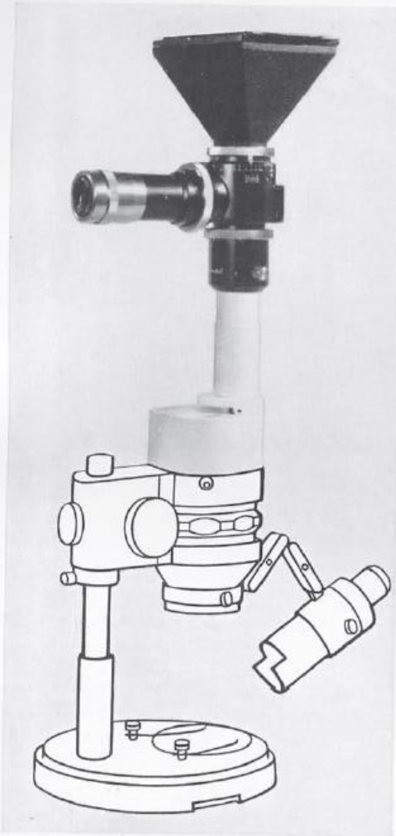
1. For simple observations in polarised incident light an analysing filter is supplied in swivel mount, which is attached by a clamping screw to the chromium-plated ring (19). The analyser can be swung out of the light path when not required. The 33 mm ∅ polarising filter is supplied without a mount, and lies in the filter holder of the low voltage lamp. It is advisable to insert a heat-absorbing filter behind the polariser.
2. In work with transmitted polarised light the analyser is used in exactly the same way as described in paragraph g)1. above. The polariser, however, is supplied fixed to a glass insert, which must be placed in the base socket with the polarising filter facing downwards. The vibration directions of the polariser and analyser are indicated by two small marks engraved on the filters.
For more advanced work in polarised light a special version of the M5 (M5 Pol) is available.

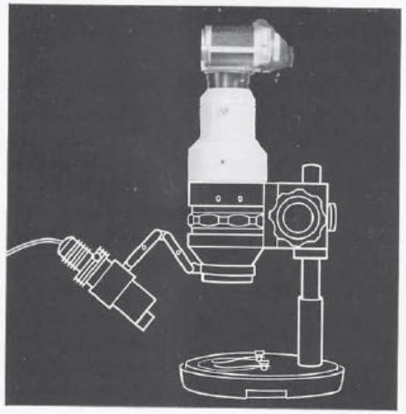
h) Stereo-photomicrography

1. Phototube A
2. Phototube B
3. Stereo-phototube

Phototubes A and B can both be used for taking single photographs, as well as for stereo-pairs, whereas the stereo-phototube can only be used for 35 mm stereo-pairs.

1. & 2. In stereo-photomicrography the normal binocular tube is replaced by the appropriate phototube, which is fixed to the instrument by a clamping screw in the same way. It is important, however, to ensure that the screw passes into the appropriate slit in the dove-tail ring of the tube (alignment is simplified by an orientation mark on the tube itself). The camera clamping ring is fixed over the top of the tube, an eyepiece placed in the tube and the camera body placed on top of the eyepiece. When the camera lies in the correct position on top of the eyepiece the clamping ring is tightened. The focusing telescope, which forms part of the camera, must then be adjusted to bring the built-in format-indicating graticule into focus. The image is focused by looking into the focusing telescope and turning the focusing knob of the microscope: when the image is in focus in the telescope it is also focused in the plane of the film or plate and the photograph can be taken. Complete working instructions for





Above: Fig. 12 Phototube B with camera MKaI for normal and stereo-photomicrography

Below: Fig. 13 Stereo-phototube with Alpa-Reflex camera body for stereo-photomicrography

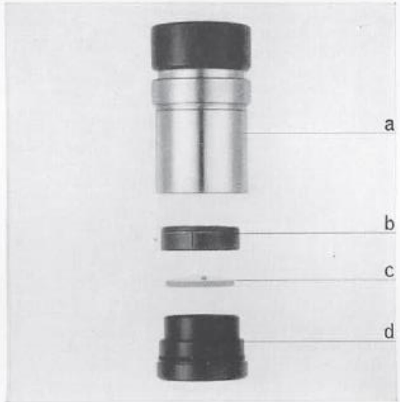
the camera are given in our publication M2 601e.

When taking stereo-pairs using phototube A the two exposures are made separately. The tube is first aligned over one light path, then unclamped, rotated through 180° and clamped over the other light path for the second picture to be taken. The screw at the base of the tube should be released and the tube and camera rotated together until the focusing telescope is pointing towards the observer. Care should be taken that the position of the camera relative to the tube is not altered during this operation, otherwise difficulty may be experienced in subsequent alignment of the photographs to make a true stereo-pair. The tube screw should be retightened before the second exposure is made.

If the phototube B is used it is not necessary to rotate the tube between exposures since a lever-operated built-in prism serves the same function. The first photograph is taken with the lever on the right, the second with the lever on the left.

After processing both photos are mounted side by side to make a stereo-pair. This should be done in such a way that the photo taken in the right hand light path is on the right. The distance between identical points in the photographs should be around 62 to 65 mm. The stereo-pair should be examined with a stereo-viewer.

Fig. 14 Measuring eyepiece 10x
a) focusing mount
b) spring ring
c) graticule
d) graticule holder



3. The stereo-phototube is used for stereo-photography of moving objects, in conjunction with a 35 mm single lens reflex camera, used **without** the camera objective. The camera is fixed to the phototube with an appropriate adapter and the complete assembly is then attached to the microscope body in place of the binocular tube. The image is focused through the camera view-finder. Both pictures are taken simultaneously and the images lie side by side on the negative. Using this set-up the exposure times are normally quite short, even at high magnifications. However, for quick-moving subjects it may be preferable to use our electronic flash equipment (see leaflet M1 305e and working instructions M2 305e). These pictures are best seen as diapositives (i.e. 2 × 2 in. slides or transparencies) using a hand-held stereo-viewer. It is important that the viewer has **parallel** and not divergent light paths from the slides to the eye.

i) Microscopic measurements

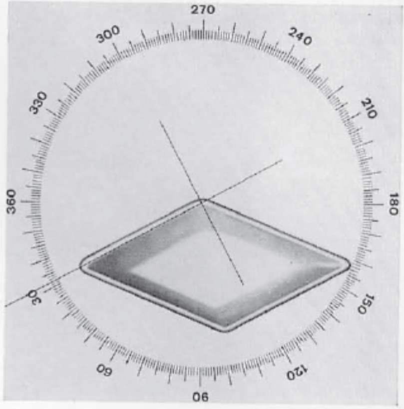
1. Measuring eyepiece 10 × with crosshairs or scale 12:120
2. Measuring eyepiece 20 × with scale 5:100
3. Goniometer eyepiece 10 × with 360° scale
4. Stage micrometer
5. Grid graticule, 100 × 1 mm² or 400 × 0·25 mm²

In making measurements with the M5 stereo-microscope a measuring eyepiece is placed in one eyetube only, the other containing a normal eyepiece of the same power. Measuring eyepieces have a focusing eyelens which is turned to bring the graticule into focus.

To change or insert a graticule the lower, black lacquered portion of the measuring eyepiece is unscrewed, the spring collar is lifted off and the graticule plate removed and changed. When inserting a graticule it is important to check that it is clean and that the scale is the right way round and upright; this is best seen by using a hand lens. When the graticule plate is in position the spring collar is replaced and the complete lower portion of the eyepiece is screwed back into position.

The next step is to focus on the preparation: the scale of the eyepiece graticule and the preparation should be visible simultaneously. In this way the measuring eyepiece can be used for relative measurements of structures

Fig. 15 Measurement of interfacial angles of a crystal with the goniometer eyepiece.



within the preparation, but if distances are required to be known in mm or µ, then the eyepiece scale must first be calibrated against an object (stage) micrometer. This is carried out in the following way:

The object micrometer, which can be of glass or metal (or may even be an ordinary ruler) must have a sclae of known dimensions. It is placed on the stage and its scale is sharply focused. The image of object micrometer and the eyepiece graticule lie in the same plane when no parallax can be seen between the two scales (this can be checked by moving the head slightly from side to side).

The object micrometer is then orientated so that its scale is parallel to, and at one point coincident with that of the eyepiece graticule.

It is then noted how many eyepiece intervals (b) correspond to how many object micrometer intervals (a). Then the absolute value of the eyepiece scale can be calculated from the formula $\frac{b}{a} \times E$, where E = the value of the interval between each graduation of the object micrometer.

Example:

The magnification changer is set at 50 and the 10× measuring eyepiece is employed.

It is found that

20 intervals on the object micrometer = b represent 100 intervals on the eyepiece graticule = a

$E = 0{\cdot}1$ mm (100 µ)

$\frac{b}{a} \cdot E = \frac{20}{100} \cdot 0{\cdot}1 = 0{\cdot}02$ mm or 20 µ

Thus, at this magnification, one interval on the eyepiece graticule represents 0·02 mm or 20 µ. Naturally each change of magnification will give a different value for the eyepiece micrometer graduations, which must be re-calculated in the same way, using an object micrometer.

The M5 drawing tube can also be used for measuring purposes. No measuring eyepiece is required; instead squared paper is placed below the mirror and is calibrated against the object micrometer. This method is particularly useful for area measurements.

For angular measurements the 10× goniometer eyepiece is employed. This eyepiece incorporates a 360° scale and a rotatable pointer. The axis of the pointer (marked by a small crossline) is arranged at the apex of the angle to be measured. The pointer is aligned with one arm of the angle (e.g. one side of a crystal) and the angle read off from the scale. The pointer is then turned until it lies along the other arm of the angle and the difference between the scale readings gives the value of the angle measured. The goniometer scale can be read directly to 1°.

III. Magnification tables

Without additional objective — Working distance 96 mm (3¾ in.)

Eyepiece 8x *	**	Eyepiece 10x *	**	Eyepiece 15x *	**	Eyepiece 20x *	**
4,8×	38	6×	35	9×	28	12×	22
9,6×	19	12×	17	18×	14	24×	11
20×	9	25×	8,4	37,5×	7	50×	5
40×	4,5	50×	4,2	75×	3,5	100×	2,6

With additional objective 1,5× — Working distance 48 mm (2 in.)

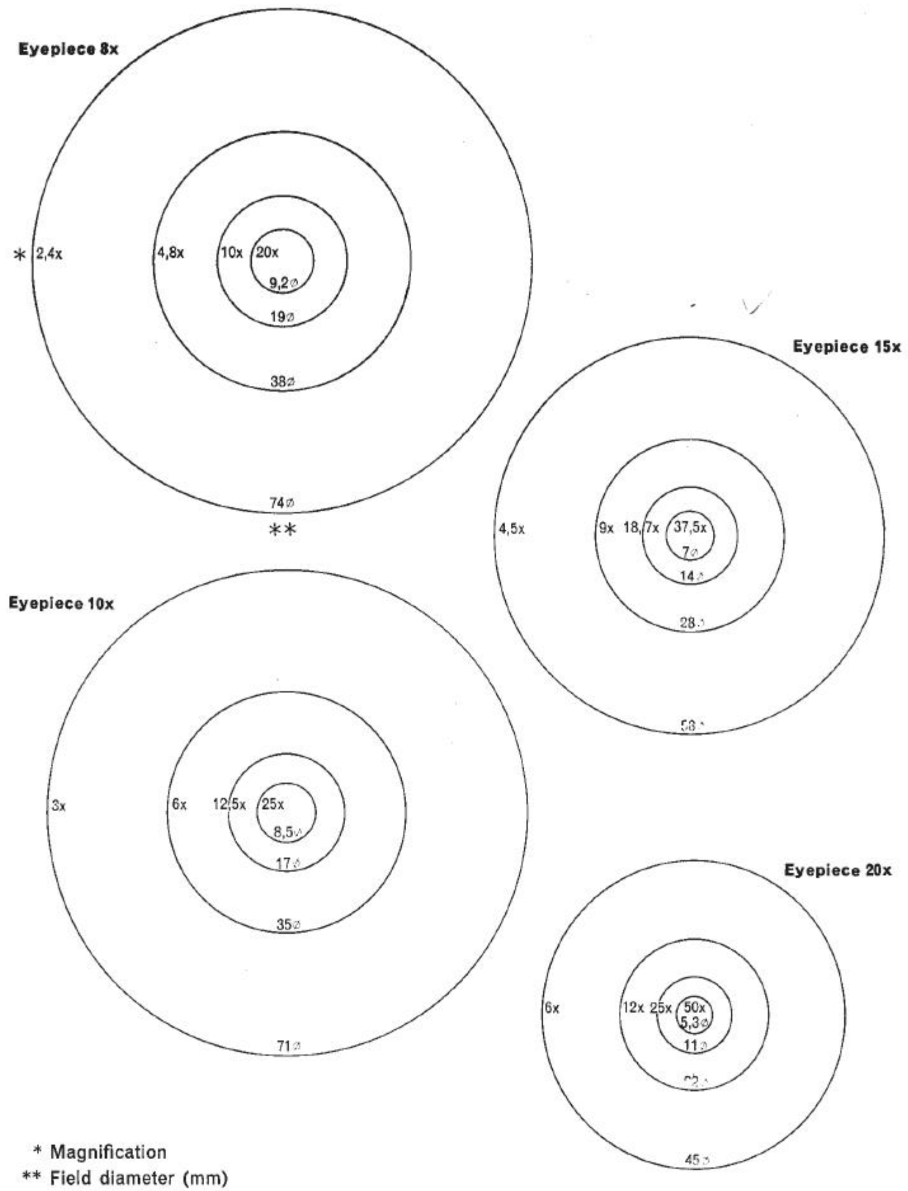
Eyepiece 8x *	**	Eyepiece 10x *	**	Eyepiece 15x *	**	Eyepiece 20x *	**
7,2×	25	9×	23	13,5×	19	18×	14,5
14,4×	12	18×	11,5	27×	9,3	36×	7
30×	6	37,5×	5,5	56×	4,5	75×	3,5
60×	3	75×	2,8	112,5×	2,2	150×	1,7

With additional objective 2,0× — Working distance 33 mm (1¼ in.)

Eyepiece 8x *	**	Eyepiece 10x *	**	Eyepiece 15x *	**	Eyepiece 20x *	**
9,6×	18	12×	17	18×	14	24×	11
19×	9	24×	8,5	36×	7	48×	5,3
40×	4,5	50×	4,2	75×	3,5	100×	2,6
80×	2,2	100×	2	150×	1,7	200×	1,3

* Magnification
** Field diameter (mm)

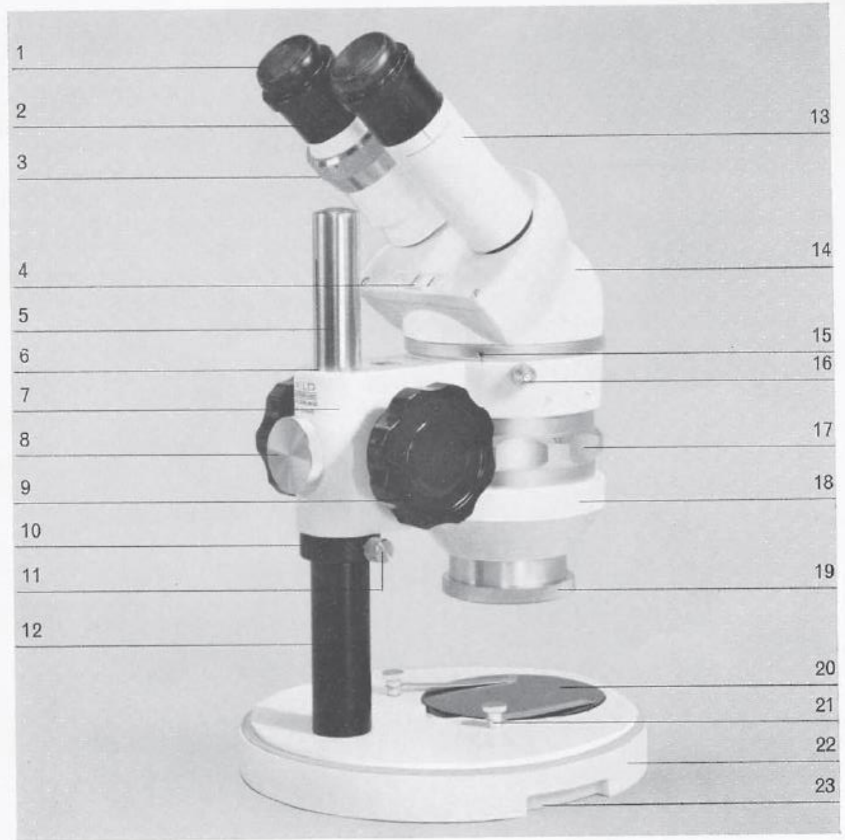
With additional objective 0,5 × ———— Working distance 165 mm (6½ in.)



* Magnification
** Field diameter (mm)

19

1 Dustcap
2 Eyepiece
3 Diopter ring
4 Interpupillary distance scale
5 Column
6 Index mark
7 Drive housing
8 Clamping screw for 7
9 Focusing knob
10 Safety ring
11 Clamping screw for 10
12 Sleeve
13 Eyetube
14 Binocular tube
15 Orientating mark for tube
16 Tube clamping screw
17 Magnification changer
18 Microscope body
19 Knurled ring
20 Metal stage plate
21 Stage clip
22 Base
23 Slot for hood clamp



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IV. Care of the instrument

If it is to be maintained in good working order optical equipment must always be handled carefully and, above all, protected from dust and dirt. When the microscope is not in use it should always be covered with either a plastic dust cover or the metal carrying hood. The outer surfaces of the optical components may be cleaned with a soft, well washed linen rag or a special optical cleaning cloth, and finished by brushing lightly with a soft, grease-free, brush. Hard, resistant deposits may be removed with a soft cloth moistened with xylol. The xylol should be wiped off the lens surface with another cloth before it dries. The user should **never** dismantle the optical components – this could cause the lenses to come out of adjustment, with a corresponding deterioration of the image.

The metal parts of the stand should be cleaned from time to time by wiping with a clean rag or a piece of chamois leather. The moving parts of the instrument, such as the rack and pinion focusing mechanism and magnification changer, should **never** be oiled: oiling may cause them to jam completely. A special lubricating grease is used for the mechanical parts of the M5 and is only available from the manufacturers.

Should the instrument break down or give unsatisfactory results due to faulty handling it must be repaired by a skilled mechanic or, preferably, by the makers.

V. Packing

If the M5 stereomicroscope is to be moved it should be carefully packed to withstand rough handling during transit. The dust caps should be pushed onto the eyepieces and the body of the microscope lowered to the bottom of the column and clamped securely in position. The gap between the objective and the base should be packed with paper. The eyetubes should be wrapped in tissue paper: the binocular tube should be securely clamped to the body. The metal hood may then be carefully lowered over the instrument and fixed to the base by its two clamps.

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