

Virtual Build

I thought it might be both interesting and illuminating to carry out a virtual build of a 160mm tube system microscope from one of the big 4 based on the best or at least the more reasonable actual prices* items sold for on eBay.

Since many of the outrageous prices for microscopes and parts advertised on eBay are placed by unscrupulous† sellers hoping to take advantage of newbies by capitalising on their recognition of an established name in microscopy - I thought it high time that those contemplating such a venture have a clearer idea of what is involved and how much a build of this nature is likely to cost if one avoids the worst excesses on eBay.

I have chosen a Zeiss Standard WL as the virtual stand for two reasons. Firstly, it is the top stand of the Zeiss Standard 160mm system line (I have omitted the Photomicroscope, Ultraphot and Universal stands which also use the 160mm tube length due to their substantial size and weight), and secondly because it is the instrument that I actually have, and so I am familiar with all the bits and pieces that conform it as well as what constitutes a reasonable price (in as much as there is such a thing as a reasonable price in the amateur microscope market of one of the big 4).

The Standard WL differs from the other standards in several ways, firstly in the focus block, which has a fine focus range of 2mm and a $2\mu\text{m}$ adjustment (as opposed to the full range fine focus and $5\mu\text{m}$ adjustment of the other standards), secondly in the use of quick release stage and condenser carriers and thirdly in having a wider and longer base.

It shares the removable nosepiece/turret of the Standard 18.

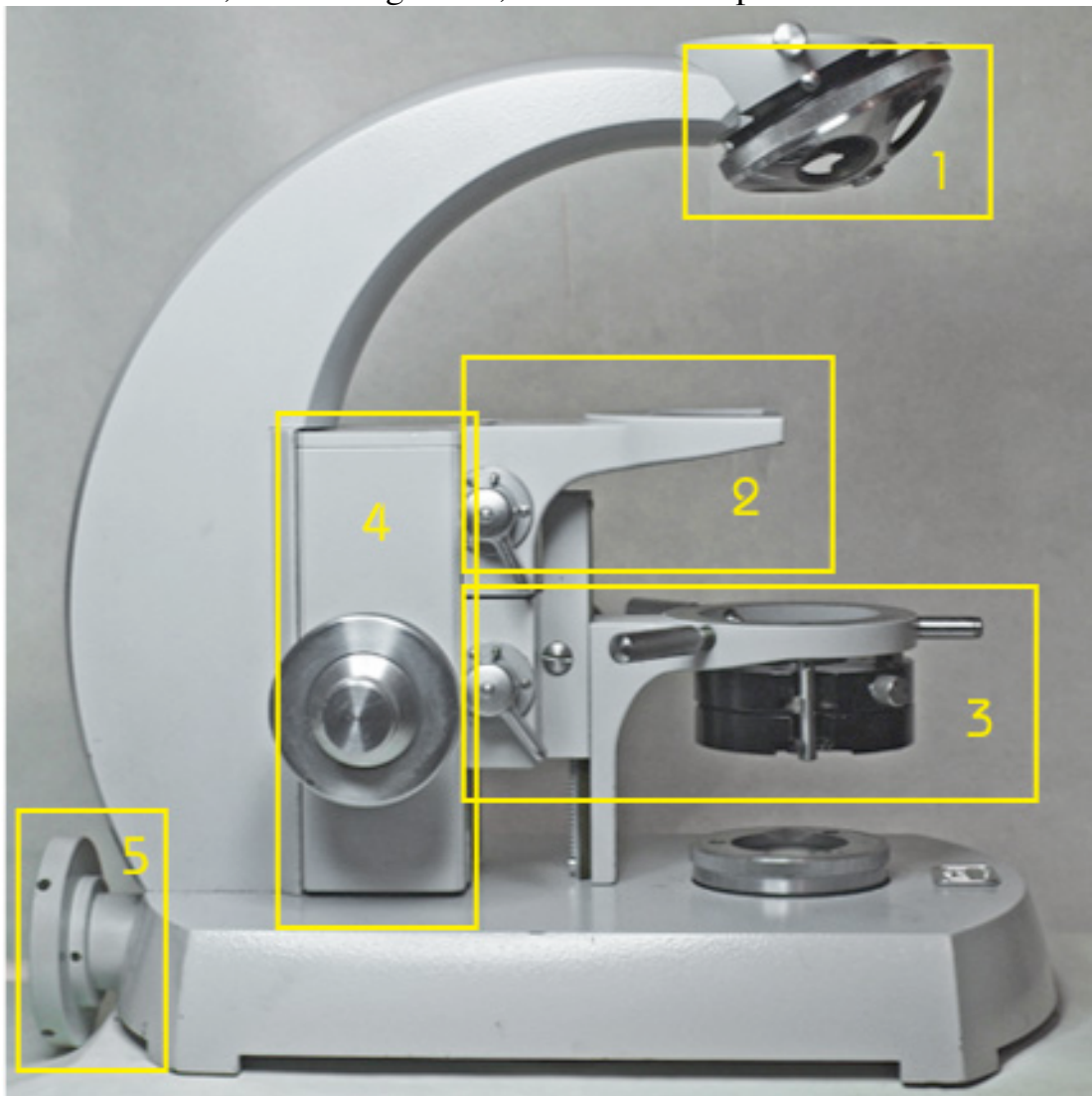
*the prices items actually sell for on eBay (as opposed to what sellers would like you to pay) can be found by pressing the *Advanced* feature to the right of the blue search button, adding the search terms, ticking *Sold listings* under the *Search including* heading and lastly pressing the blue search button. The prices items have sold for appear in green.

† the term *unscrupulous* and worse is richly deserved by those who not only attempt to charge grossly inflated prices but also omit mentioning known problems with equipment by either claiming ignorance of the field or by the use of a minimal description while hiding behind such phrases as *sold as is*.

The use of a removable nosepiece along with the quick release stage and condenser carriers make the WL a pleasure to work with. Cleaning up after using an oil objective is about as painless as it is ever likely to be, as removing both the nosepiece and condenser to allow unrestricted access to them takes just seconds. Similarly, being able to remove the carriers makes it much easier to make many adjustments as it unclutters the work area. The stand itself can be further disassembled by the removal of the 4 bolts that hold the arm on the base and further yet by the removal of the 6 bolts that hold the coarse and fine focus to the arm. In fact the WL is designed to be completely disassembled in minutes.

The basic stand:

1. removable nosepiece, 2. quick release stage carrier, 3. quick release condenser carrier, 4. focusing block, 5. external lamp house collection tube.



Even though the Zeiss Standard WL as a top of the range modular stand is capable of hosting a large array of illumination methods, this exercise is not an attempt to convince anyone who decides to attempt a similar build to necessarily equip their instrument with every conceivable adaptation. Both the budget and the present needs of each individual microscopist should set the extent of the build.

The idea is to arrive at a working instrument that is a pleasure to use and which is capable of growing with us at each step of the way.

Pricing the build

All the virtual items used in this build were sold during the previous 60 days on eBay, that is the time period that sold items remain visible in the sold item section. A little more patience and better prices yet are potentially available.

Patience is the key to better prices, that and avoiding sellers that skimp on images, descriptions, claim large discounts and use *sold as is* as a matter of course.

A little research in the sold items section will give one a fair idea of what the average price is. Ask the seller questions, ask for more or better images. The more you ask the better the chance of a successful transaction.

Best offers are also a good way to obtain a better price. One should not offer too little however, that is as bad as sellers asking too much. One can do worse than be guided by the average price and a sense of fairness when making offers.

The condition of an item should be clearly stated - if an item is not as described, as in it has a flaw that renders its use or the price paid void, then it should be returned or the money refunded. Do not be afraid of giving negative feedback if the seller has deliberately glossed over flaws.

Many unscrupulous sellers use the *artificial discount technique* to entice unwary buyers. The seller starts by offering an item at much more than it is actually worth, any sales made during this period to the unwary/impatient is considered a bonus. The seller then reduces the vastly inflated price to a slightly less outrageous one while claiming a large discount has been made.

Do not obsess on fantastic bargains - if something is too good to be true it generally is. Con men would have a much harder time if most people were not permanently on the lookout for a bargain or out to double their money.

The Stand

I will start the virtual purchase with a pretty basic bare stand, the one sold on eBay consisting solely of the base, field diaphragm housing, 6v 15w collector tube, arm, focus block and nosepiece.



[Carl Zeiss Standard WL 89 Microscope Stand, Excellent Condition!](#)

\$149.99

1 bid

Sep-09 07:03

From United States

[View similar active items](#)

Missing and needed to get the microscope up and running are:

microscope head eyepieces objectives condenser carrier stage carrier	condenser stage collection tube (46 70 50) 12v 60w lamp house power supply
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The first step is to complete the basic stand with the addition of the missing condenser carrier and stage carrier and the replacement of the 6v 15w collection tube (46 70 50) with the much more versatile (46 70 40) that will allow us to connect either the 12v 60w external tungsten lamp house or the 12v 100w external halogen lamp house.



[Zeiss Microscope Quick Release Condenser Carrier Mount Excellent !](#)

\$49.00

Best offer accepted

Jul-07 13:26

From United States

[View similar active items](#)

 Top-rated seller



[Zeiss Microscope Quick Release Stage Carrier Mount Excellent !](#)

\$39.00

Best offer accepted

Jul-03 14:42

From United States

[View similar active items](#)

 Top-rated seller

Prices of the quick release carriers (best offer accepted) were probably in the \$25/\$35 range. There was no connector tube of type (46 70 40) sold during this period, however it is not unreasonable to assume that one could be obtained for about \$20/\$25 dollars.

The next step is to obtain a head. There are several different types of Zeiss head which can be used, though ideally, if one plans on taking photographs and most of us do, then a trinocular head is our goal.

Fortunately for the purposes of this build, one was sold at a very reasonable price during this time period by a responsible and reputable seller. A pair of 12.5x eyepieces complements this head nicely.



Carl Zeiss Microscope Trinocular Observation Head Excellent !

\$191.38

18 bids

Jul-13 12:42

From United States

[View similar active items](#)

Top-rated seller



Carl Zeiss Eyepiece Pair- Kpl-W (Widefield) 12.5x

\$34.95

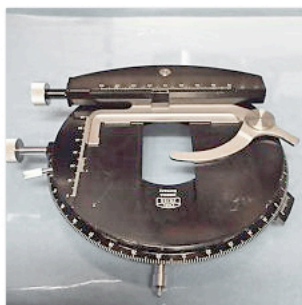
1 bid

Sep-18 16:41

From United States

[View similar active items](#)

We now need to locate a stage, ... again we were lucky.



Zeiss Microscope Rotating Stage W/360° Vernier Excellent Condition

Rare Rotational Markings For Pol Applications

\$160.00

Buy It Now

Jun-29 10:02

From United States

[View similar active items](#)

A rotating stage is very useful if one is not able to rotate one's camera as it allows one to take either landscape or portrait images as needed. It is also very useful when using both oblique illumination and DIC as varying the angle of the subject can improve its visualization.

There are various types of Zeiss condenser that could be used on this stand, as there were several sold during this period, I shall show a selection.

The first one shown is, along with the 0.9, the most basic model of the Zeiss Flip -Top condensers that will work on the WL - brightfield only.

The second one, an Achromat Aplanic 1.4 NA is perhaps the most interesting, as apart from the default brightfield it has phase 1, 2 and 3 and a darkfield stop that when oiled allows one to achieve darkfield with higher magnification objectives.

The third condenser, a Phako IV'Z7 Aplanic 0.63 NA has brightfield (the default illumination of all these condensers) but lacks phase 1 and the extra darkfield stop. It has phase 2 and 3 and of course adds DIC.

Phase 1 basically allows the use of the 10x objective, but as phase 2 starts at 16x, the lack of ph1 is not overly critical.



ZEISS 1.3 FLIP-TOP CONDENSER Nice!

\$45.95

Buy It Now

[View similar active items](#)

Sep-12 11:59

From United States

Top-rated seller



Zeiss Microscope Phase-Contrast Turret Condenser, exc. condition.

\$99.00

1 bid

[View similar active items](#)

Sep-05 18:54

From United States

Top-rated seller



Zeiss Microscope 465273 Inko Phase Turret Condenser w/ apl 0.63 Top Lens

\$401.80

Was: \$574.00

Best offer accepted

30% off

[View similar active items](#)

Jul-29 12:40

From United States

Top-rated seller

To complete the illumination we need a lamp house and a power supply.



Carl Zeiss 12V 60W Illuminator for WL, Standard, IM/ICM and Universal Microscope

\$49.99

1 bid

Aug-21 07:00

From United States

[View similar active items](#)



Zeiss #910224 Heavy Duty Microscope Power Supply for 100W illuminators.

\$65.00

Buy It Now

Aug-29 17:53

From United States

[View similar active items](#)

Top-rated seller

That just leaves the objectives. In this case the best plan (as our aim is to get up and running) is to go with phase, as phase objectives work well in brightfield and hence oblique and darkfield, as the slight theoretical image loss is in practice barely perceptible.



Zeiss Plan 6.3/0.16 rms Thread 6.3X Microscope Objective Lens 160mm

\$59.00

Buy It Now

+\$9.00 shipping

Aug-03 08:07

From United States

[View similar active items](#)

Top-rated seller



Zeiss Microscope Objective Ph2 Planachromat 16x Excellent !

\$79.00

Buy It Now

+\$12.95 shipping

Aug-24 16:49

From United States

[View similar active items](#)

Top-rated seller



Zeiss Ph2 Neofluar 25/0.60 160/0.17 25x Phase Contrast Microscope Objective

\$96.00

Best offer accepted

Jul-20 13:49

From United States

[View similar active items](#)

Top-rated seller



Zeiss Ph2 Plan 40/0.60 160/1.1-1.5 40x Microscope Objective 46 07 16

\$59.95

Best offer accepted
Shipping not specified

[View similar active items](#)

Sep-02 11:35

From United States

Top-rated seller



Carl Zeiss Microscope Objective Ph3 Neofluar 63x variable coverglass Nice !

\$89.00

15 bids
+\$19.95 shipping

[View similar active items](#)

Jul-13 13:36

From United States

Top-rated seller

The Sums

The stand	\$ 150
Stage carrier	\$ 30
Condenser carrier	\$ 35
Connecter tube	\$ 25
Trinocular head	\$ 192
12.5x eyepieces	\$ 35
Rotating stage	\$ 160
Phase contrast/DIC condenser	\$ 402
12v 60w Lamp House	\$ 50
12v 100w Power Supply	\$ 65
6.3x/0.16 objective	\$ 59
16x/0.35 ph2	\$ 79
25x/0.60 ph2	\$ 96
40x/0.60 ph2	\$ 45
63x/0.90 ph3	\$ 98
Total:	\$1521

The prices paid for this virtual build will of course vary for anyone attempting such a build in reality. Just the postage for so many individual items will come to a not insubstantial sum. It is hard to say by how much or in which direction - whether it would come to more or less - as there are a couple of good bargains in this virtual exercise and though patience is a virtue it is sometimes hard to put into practice.

There were also choices made that might not have been made by the reader, such as the choice of condenser for example.

I did consider the possibility of choosing the darkfield condenser with 3 phase ports and recommending that more time be spent in searching for a DIC condenser with a higher NA.

There was no attempt to include more parts for the DIC system, this was partly because there were no additional parts sold during this time and partly because there are 4 DIC systems available for the Zeiss WL‡. Which of these would turn out to be more practical or economical by the time one has all the parts or as many of them as possible is hard to say.

The price paid so far for this microscope compares very favourably with many of the generic budget Chinese microscopes that go for over a thousand dollars for the darkfield and phase versions.

Yet we are not really comparing prices here as one can only really do that when comparing like with like and the WL is as unlike any generic budget Chinese microscope as one is likely to get.

For at the end of the day, due to the simplicity and beauty of its modular design as well as its excellent build quality, the Standard WL is not only a pleasure to use, but is also eminently expandable, such that it will be able to keep up with our interest as it grows and develops.

It will in all likelihood outlive you, and with care, will probably give the next generation a run for their money.

‡ <http://www.microbehunter.com/microscopy-forum/viewtopic.php?f=15&t=1543>

Forbes Pettigrew
Venezuela
mapologo AT gmail DOT com

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