

INFINIPROBE™ TS-160 INSTRUCTIONS FOR USE

You are about to experience a radically new approach to Photo and Cine imaging. It has a Variable Iris, but no f/stops and it focuses internally without any changes to its outer dimensions. It ranges magnification from 0 to as much as 16x. Almost any camera up to and including those with 35mm sensors can be used with it. It may be a "counter-intuitive" experience even to *experienced* photographers. It is the InfiniProbe TS-160 from Infinity Photo-Optical Company.

Now, a single lens can be used for imaging from MICRO and MACRO to table-top advertising, motion pictures, and wherever incredible depth of field is demanded.

QUICK-START CHECKLIST: (For Macro and Micro HM)

- 1) Mount the TS-160/camera on any suitable support—from a tripod to a boom stand—and use a suitable form of illumination.
- 2) Move the TS-160 up or down, closer or farther from an object to select a magnification.
- 3) Turn the Focusing Ring to focus on the object.
- 4) Close-down the Variable Iris until you see the *first* "jump" in contrast.
- 5) *Without moving the TS-160*, turn the Focusing Ring to focus *slightly* above and below your originally-chosen plane.
- 6) If you see blurring equal on both sides of focus, STOP and re-focus to the originally-chosen plane. If blurring is not *quite* equal on both sides of focus, *slightly* close-down a bit more until it is.

Once you see blurring equal on both sides of focus, you will have set the *best possible image* from the TS-160.

The TS-160 series consists of three unique, patented internally-focusable microscope bodies which are capable of use for macro, micro and special effects with imaging capabilities beyond any other known optical devices. One Standard and two ROBUSTO TS-160s can be equipped for the artistic and the scientific, from industrial imaging of an assembly or process to the processes of cinematography; from making movies to still portraiture; from capturing the veins on a leaf to documenting vascular surgery. This list could go on and on. Yet in every usage, the quality of the imagery is either world-class, totally unparalleled--or both.

The TS-160's imaging potentials stem from what can be termed its unique, patented Nelsonian® optical configuration. Although constructed with a long front tube facilitating the "immersive experience" when used closely, these lenses should not be confused with endoscopes or borescopes which have a similar probe-like appearance. The TS-160—unlike endo-/borescopes—is *not* a front lens with optical relays progressively transferring the same characteristics as that lens to the camera in order to provide immersive characteristics. Instead, the TS-160 Nelsonian design is a complete microscope devoid of typical relays. The TS-160 is a complete harmony of optical construction and imaging correction. This permits it to do both the unexpected and unique by means of Double Focus (more later) which makes it possible to custom tailor the image from the artistic to the scientific, from strict detail to the creatively ethereal.

Another feature of the TS-160's micro tech is its use of *Nelson Point* correction. The 19th Century English microscopist E M Nelson observed that in microscopes only *one* aperture was best for obtaining the highest quality image. This happens when a sudden jump in contrast happens abruptly as the iris is closed. The TS-160's Iris—(again) unlike other lenses—is not incorporated for use to control light, but primarily to set for the Nelson Point. Although this contrast "jump" happens within a zone established by the object and lighting, a general setting is depicted by a white dot on the Iris housing's engraving where an approximate Nelson Point occurs.

With proper use, your TS-160 will provide years of imaging that individually would require several lenses to do--if at all.

The TS-160 Nelsonian Optical System. The TS-160 consists of a Main Body which contains an internally-focusable optical system, activated by a Focusing Ring which turns 360-degrees. Inside is a provision for 25mm diameter filters (for example, polarizers or fluorescence types). At its rear is at least one T24mm tube which allows access to accessories when it is temporarily removed or exchanged with a mount for use on a stereo microscope stand. A Clamp and optional Mounting Bar are available so that the TS-160 can be mounted on tripods or fixtures via 1/4-20 or two "outboard" M4 taps. A Variable Iris allows contrast and aberrational control.

The InfiniProbe TS-160's optical configuration may be best described as being a continuously-focusable microscope. This means you can focus on any suitable object at a distance and move in to see it become a single frame at great magnification. Instead of being limited to a single working distance, you can choose whatever standoff you wish. You will never lose sight of your object as you focus closer and closer. As you focus, detail (resolution) increases and depth of field gets shallower. If you need more depth of field, just back up to get what you need. The depth of field and magnification are then balanced for best results.

A NOTE ON NELSONIAN SYSTEMS

Another feature of the Nelsonian system is that tremendous depth of field is imparted *without stopping down the aperture responsible for resolution*. Here, using the TS-160 gives the at first *impression* that this is happening. *Not at all*. The resolution provided by the TS-160 would be *impossible* were the system stopped-down. This is why a typical macro lens at f/22 can not hold two objects 34 inches apart in focus whereas the TS-160 can to spare.

So how is it that the image is somewhat darker than other lenses, requiring higher ISO usage? The answer is that the Nelsonian system is a projection system. In other words—a *microscope*. Just as in a cinema, the greater the projection, the less bright the image. In order to fill full format, *both* T30/T24 tubes require a 54mm projection. At its resolving power equal to fill full format, the light throughput is virtually *identical* to that of a laboratory microscope filling the same sized sensor. This is due to the Inverse Square Law. So, for every doubling of projection, *One-quarter* the brightness results. This means that if a Super35 format sensor is used, the T24 tube can be *removed* for less projection that fills that field.

Today, sensors are readily usable at ISO ratings that are essentially noise-free and in the future, almost all will be. This is what has made the application of Nelsonian principles practical. The imagery provided by the TS-160 may at first seem to "defy physics." But it is just the opposite: By carefully taking advantage of modern technological trends, the TS-160 is solidly *based* on physics.

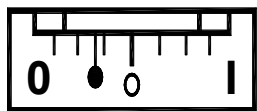
USE WITH MACRO OBJECTIVE

The Macro Objective screws on to the Iris assembly's front instead of the TS-160's other tubular objectives. When attached it focuses the TS-160 from infinity down to 32mm, from 0 to 4x. It's image on a camera is erect—as usual.

The Macro's quality is monitored by the Iris. Generally, the best results are obtained when the Iris is set to the white dot engraved on it. This is what will be explained as being the Nelson Point with the other objectives (see below) and so all attachable lenses on the TS-160 are calculated for best imagery at that setting. However, the Macro will provide reasonably good results more or less open because it operates on somewhat different principles from its tubular stablemates.

USE WITH THE MICRO HM OBJECTIVE

There is only *one* Iris position (with slight tolerances) to which the Micro HM and SFX Lenses (see below) must be set. Using it more closed or more open will not provide optimum results. This iris position sets the Focuser for highest performance. Optically, the Iris is not used for any other real purpose with the Micro HM Objective. The sharpest images will result from adherence to this setting.



Note: This is the most ideal Iris setting for the HM Objective.

ACTIVE AND PASSIVE FOCUSING.

The various objectives for the TS-160—aside from the Macro—can be focused in two ways: **active** and **passive**. This is yet another uniqueness of Nelsonian optics.

Active focus *converges* on objects. Passive occurs where the focus is set to infinity and *not* at any other setting. The active method should *primarily* be used with the Micro HM objective. The focus ring is turned to acquire a clear image of a selected object. This provides the finest images from 3 meters to 18mm.

PASSIVE FOCUS WITH SFX LENSES.

The SFX objectives are *Special Effects* lenses for Cine and Photo uses which are optically corrected to be focused to infinity *and not focused again*. Doing so keeps EVERYTHING IN FOCUS from infinity to mere centimeters (inches) from the lens itself. The following are the ranges in focus for each of the SFX objectives:

Characteristics of the SFX Lenses

SFX-1 (100mm) - Infinity to 20 inches

SFX-2 (50mm) - Infinity to 6 inches

SFX-3 (33mm) - Infinity to 2 inches.

The SFX series may be thought of as the "Set and Forget" lenses. This allows them to produce three significant special effects:

All in all, the SFX Lenses offer special effects no other lenses can.

Deep Focus - As already noted, keeping nearly everything in focus. [This technique was pioneered by, for example, Gregg Toland in Citizen Kane. But, what took him days to do, is now possible from the SFX lenses in minutes. It is now possible to utilize this story-telling technique in productions ECONOMICALLY].

Forced Perspective - Since all is in focus, models and other close objects appear larger than they are. [An example of this is the scene shot by DP Dean Cundey in Jurassic Park where a basket of "dinosaur eggs" is in focus at the same time the actors are. This is a powerful story-telling method made simple by the SFX Lenses on the TS-160].

Soft Focus - "SFX" *also* means "Soft if Focused." That is, if SFX Lenses are *actively* focused their *departure* from their ideal correction for infinity focus causes them to produce softer imagery. By also opening the Iris past its optimum setting (The Nelson Point), various degrees of softness can be introduced.

All in all, the SFX Lenses offer special effects no other lenses can.

TS-160 (All Models)

SFX-1 LENS DATA in Active Focus Mode (Soft Focus)

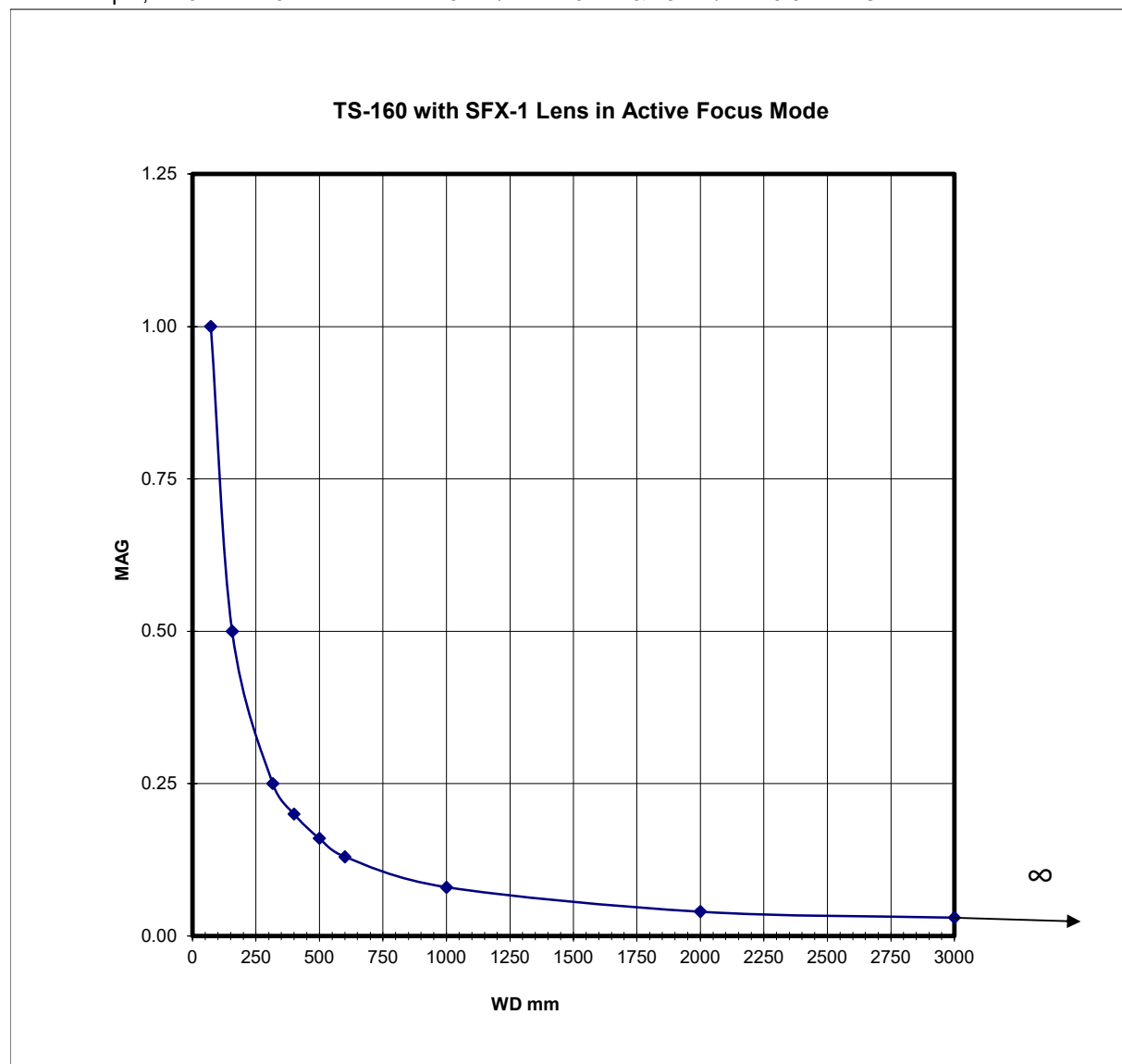
Note: These data do not apply for passive focus mode.

WD mm	72	156	316	400	500	600	1000	2000	3000
Mag	1.00	0.50	0.25	0.20	0.16	0.13	0.08	0.04	0.03
FOV mm	36	72	144	180	225	277	450	900	1200

FOV based on 35mm format (36mm horizontally).

For formats other than 35mm: Divide magnification into the sensor's horizontal dimension.

For example, 17.3mm x 13mm Sensor: $17.3\text{mm}/4x = 4.3\text{mm}$ & $13\text{mm}/4x = 3.3\text{mm}$ FOV.



TS-160 (All Models)

SFX-2 LENS DATA in Active Focus Mode (Soft Focus)

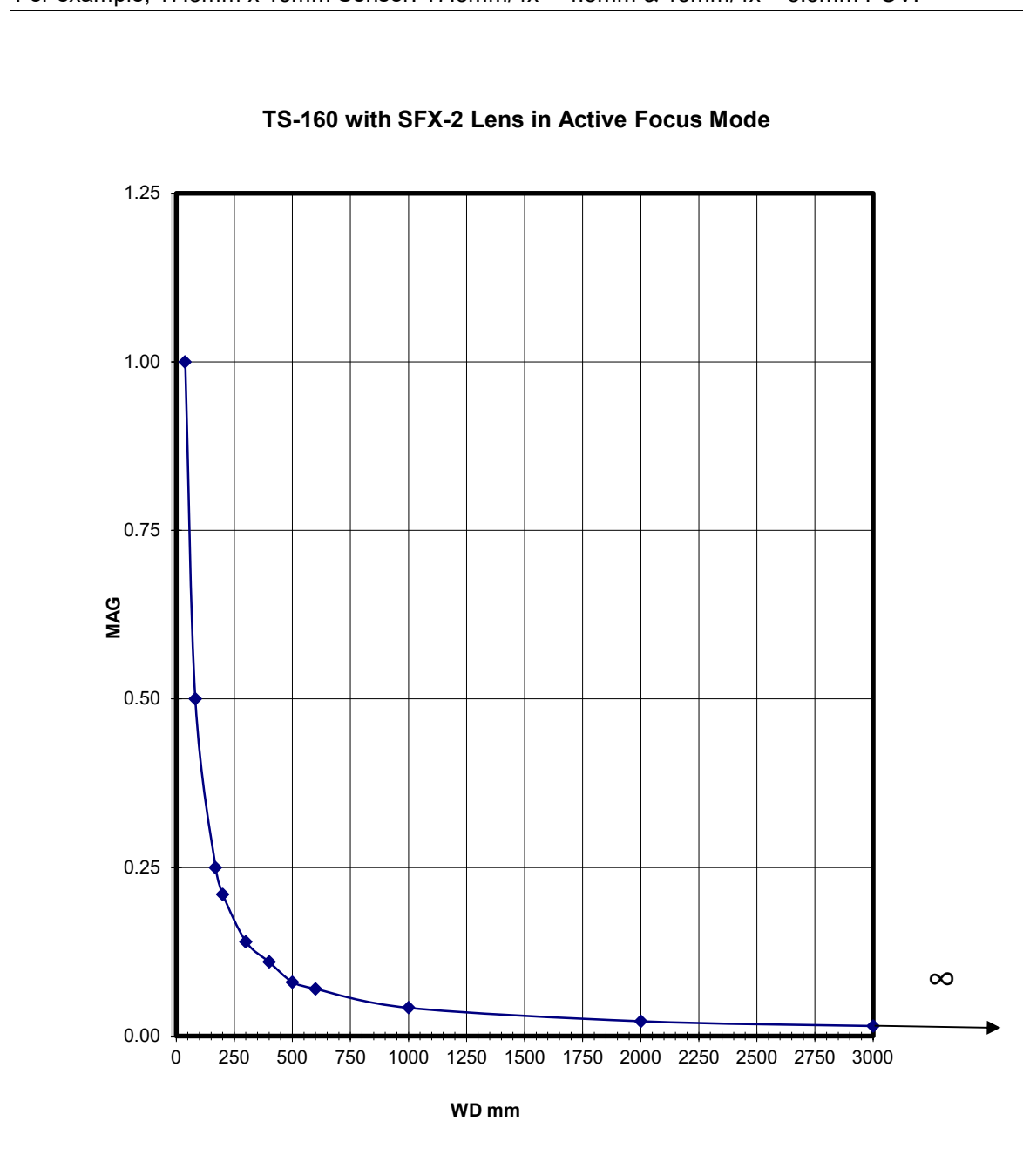
Note: These data do not apply for passive focus mode.

WD mm	38	82	169	200	300	400	500	600	1000	2000	3000
Mag	1.00	0.50	0.25	0.21	0.14	0.11	0.08	0.07	0.042	0.022	0.015
FOV mm	36	72	144	171	257	327	450	514	857	1636	2400

FOV based on 35mm format (36mm horizontally).

For formats other than 35mm: Divide magnification into the sensor's horizontal dimension.

For example, 17.3mm x 13mm Sensor: 17.3mm/4x = 4.3mm & 13mm/4x = 3.3mm FOV.



TS-160 (All Models)

SFX-3 LENS DATA in Active Focus Mode (Soft Focus)

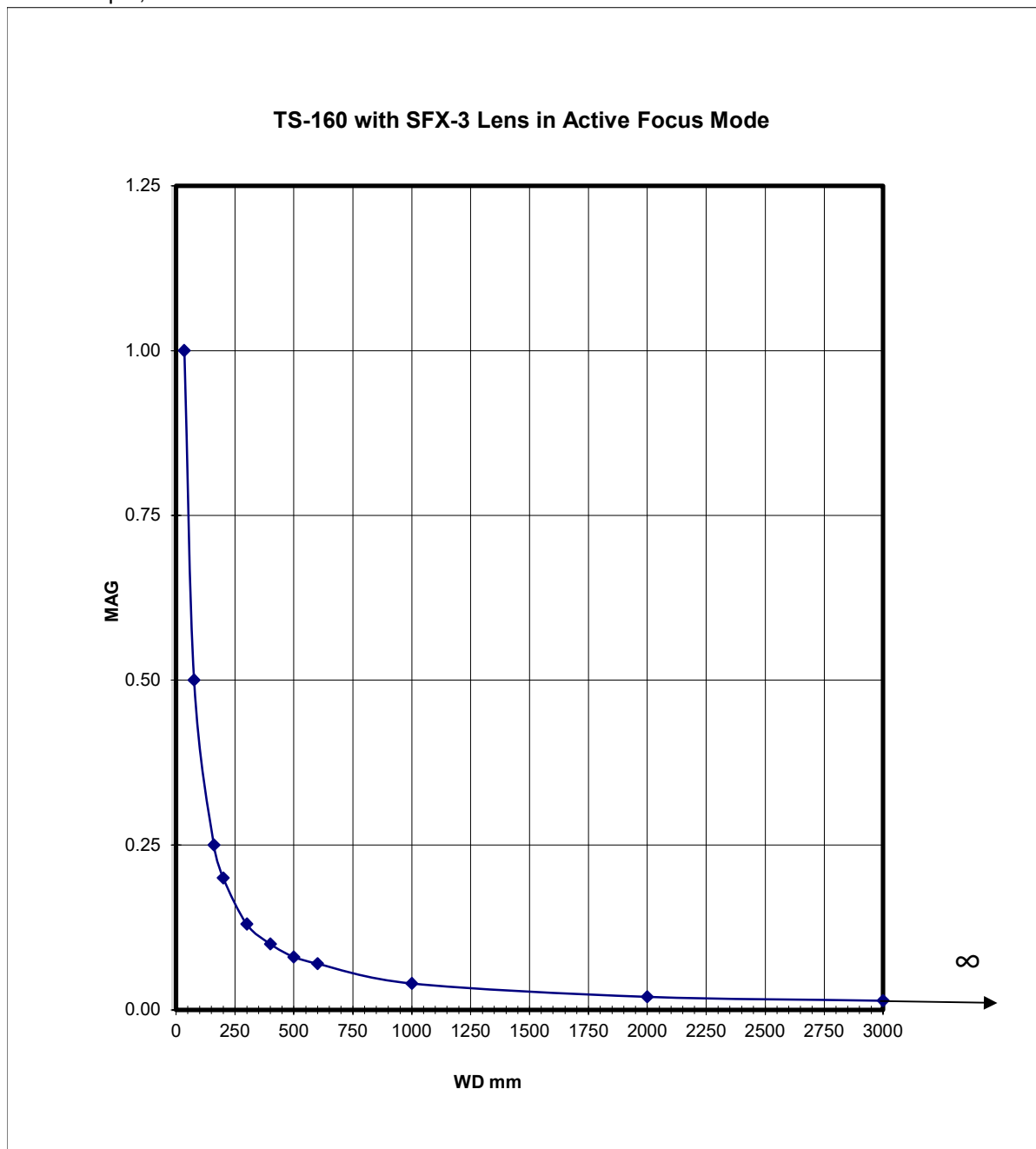
Note: These data do not apply for passive focus mode.

WD mm	35	76	160	200	300	400	500	600	1000	2000	3000
Mag	1.00	0.50	0.25	0.20	0.13	0.10	0.08	0.07	0.040	0.020	0.014
FOV mm	36	72	144	180	277	360	450	514	900	1818	2609

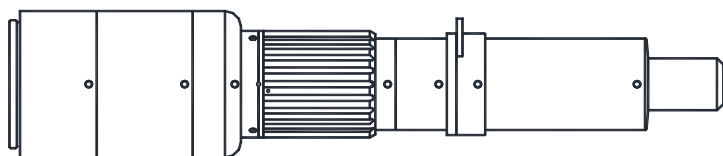
FOV based on 35mm format (36mm horizontally).

For formats other than 35mm: Divide magnification into the sensor's horizontal dimension.

For example, 17.3mm x 13mm Sensor: 17.3mm/4x = 4.3mm & 13mm/4x = 3.3mm FOV.

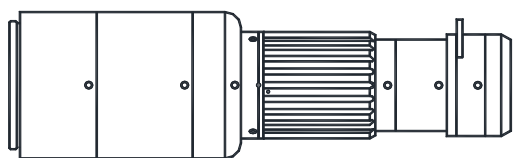


InfiniProbe TS-160 Standard



LENGTH: 220mm [8.66"] MICRO HM

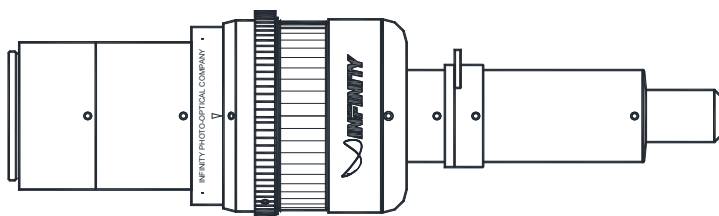
WEIGHT: 332g [11.7 oz.]



LENGTH: 153.5mm [6.04"] MACRO

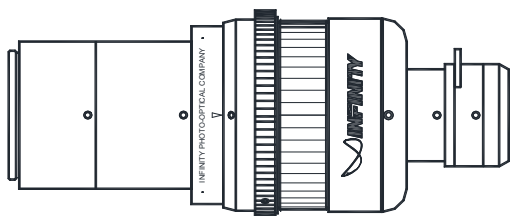
WEIGHT: 298g [10.5 oz.]

InfiniProbe TS-160 ROBUSTO



LENGTH: 220mm [8.66"] MICRO HM

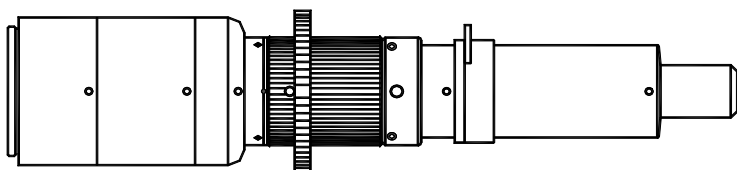
WEIGHT: 678g [23.9 oz.]



LENGTH: 153.5mm [6.04"] MACRO

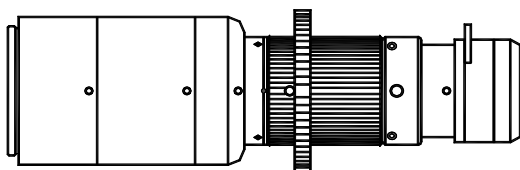
WEIGHT: 644g [22.7 oz.]

InfiniProbe TS-160 ROBUSTO-Lite



LENGTH: 220mm [8.66"] MICRO HM

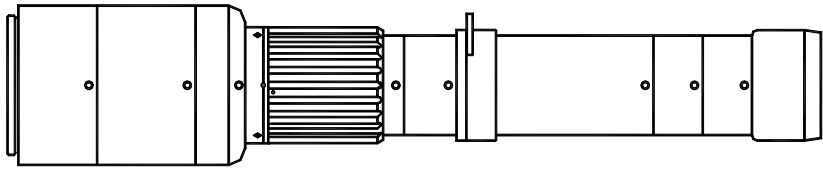
WEIGHT: 404g [14.3 oz.]



LENGTH: 153.5mm [6.04"] MACRO

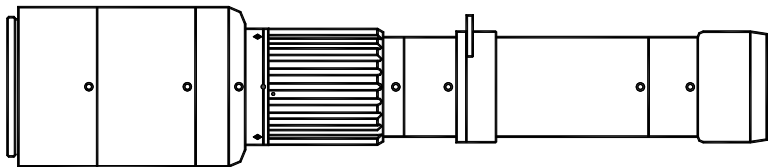
WEIGHT: 370g [13.1 oz.]

InfiniProbe TS-160 Standard



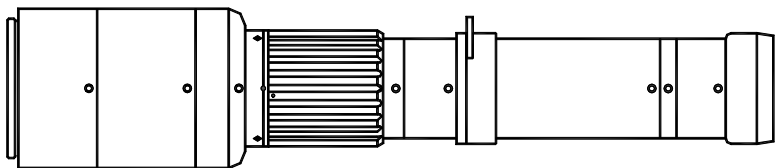
LENGTH: 244.5mm [9.63"] SFX-1

WEIGHT: 386g [13.6oz.]



LENGTH: 228mm [8.98"] SFX-2

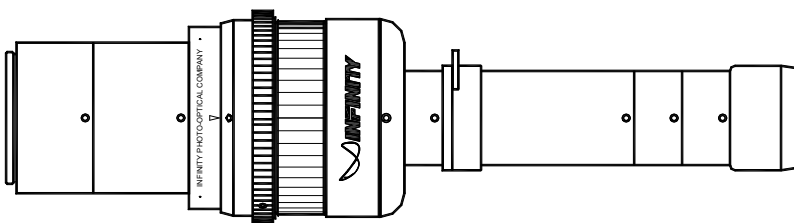
WEIGHT: 374g [13.2oz.]



LENGTH: 230mm [9.01"] SFX-3

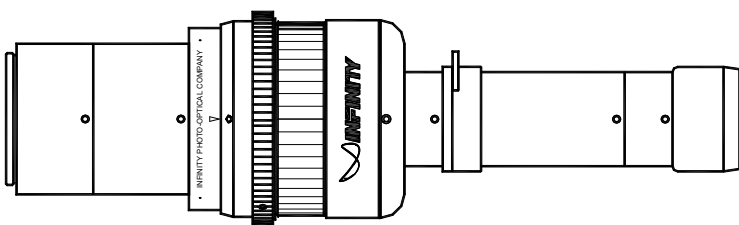
WEIGHT: 364g [12.8oz.]

InfiniProbe TS-160 ROBUSTO



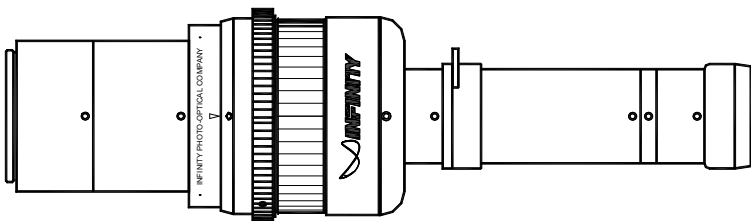
LENGTH: 244.5mm [9.63"] SFX-1

WEIGHT: 731g [25.8oz.]



LENGTH: 226.5mm [8.92"] SFX-2

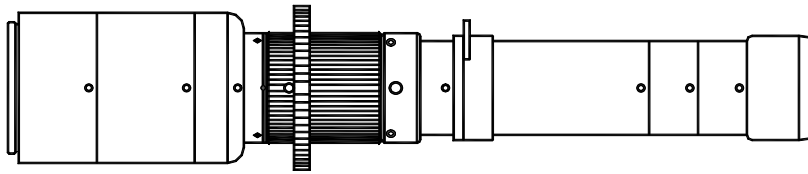
WEIGHT: 720g [25.4oz.]



LENGTH: 230mm [9.01"] SFX-3

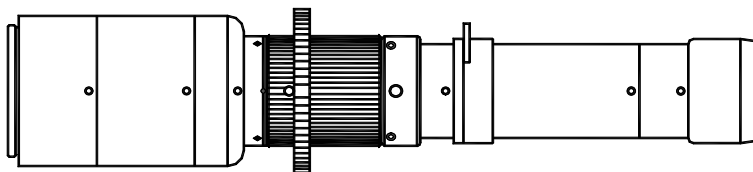
WEIGHT: 710g [25oz.]

InfiniProbe TS-160 ROBUSTO-Lite



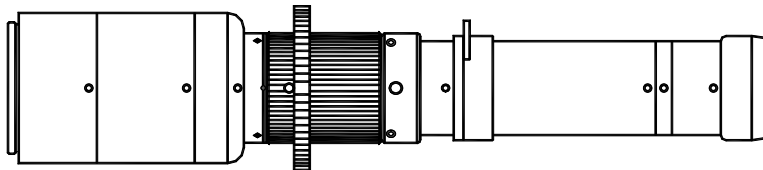
LENGTH: 244.5mm [9.63"] SFX-1

WEIGHT: 458g [16.2oz.]



LENGTH: 226.5mm [8.92"] SFX-2

WEIGHT: 447g [15.8oz.]



LENGTH: 230mm [9.01"] SFX-3

WEIGHT: 437g [15.4oz.]

Illumination. The TS-160 provides the best results when the light is intense and highly-directed. For modeling and fixed illumination, fiber optic or LED sources are recommended. Nevertheless, the best way to capture high-resolution images is by using flash.

Mounting Options. The TS-160 can be mounted on standard tripods or jigs by means of an optional Large Clamp with 1/4-20 and two "outboard" M4 taps. Alternatively, it can be mounted on many brands of stereo microscope stands by optional adapters. Infinity makes a line of such adapters that are all 24mm long. The T24 tube can be removed and the selected Stereo Stand Adapter screwed on in place. Unlike many such adapters, Infinity's all become integral to the TS-160 itself.

Filter Holder. Removing all the T-tubes allows access to the Filter Holder Receptacle. Most 25mm diameter filters can be positioned there and locked in place by a Retaining Ring. M27 filters can also be attached. In this way, the TS-160 can be equipped with polarizing, color, neutral density or fluorescence filters.

InfiniLight™ Adapter Tubes. Presently there are two InfiniLight Tubes with front flanges to fit Canon and Nikon flash units onto the TS-160 Main Body. The InfiniLight combines with the TS-160 to make a very compact yet efficacious macro system with self-contained flash illumination.

The InfiniLight consists of a flanged T tube part that is 12mm thick another 12mm T tube attached to it, thereby making it possible to exchange the supplied T24 Tube so that the InfiniLight becomes integral to the TS-160. This also permits custom spacings (we will advise) for use with various cameras whose otherwise obstructive designs (e.g., those with thick built-in handles) to be utilized on the TS-160.

C-mount Camera Use. The TS-160 lends its unique capabilities to high quality microscope cameras made by the major manufacturers. Most cameras used on laboratory-type microscopes are C-mount and usually have 2/3-in. or slightly larger sensors. These cameras often are supplied with useful software. Although the TS-160 is primarily designed to take advantage of formats as large as 35mm as provided by high-quality DSLRs, it can be used productively with microscope-type cameras as well. Please refer to the Infinity Photo-Optical website, www.infinity-usa.com for further details.

Care and Cleaning. Your InfiniProbe TS-160 should be treated as the fine instrument that it is. Care should be taken to keep dust and dirt off the external lens surfaces. The unit can be cleaned (metal parts only) with a cloth moistened with alcohol. The external optical surfaces should be cleaned only when necessary, and then, only by a soft cotton swab moistened by an approved optical glass cleaner. If you have further questions, please contact Infinity Photo-Optical Company or your authorized dealer.

Warranty. Details of the Warranty are contained on the Warranty Page (attached).