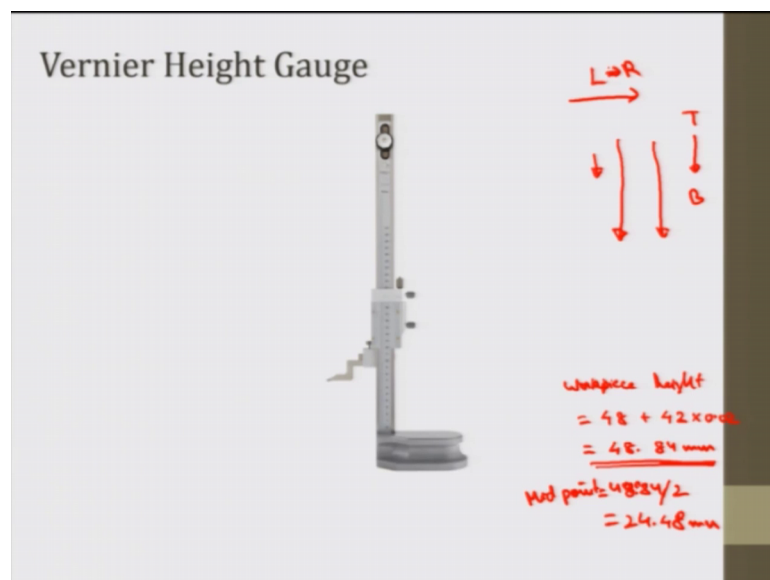


Engineering Metrology
Prof. J. Ramkumar
Department of Mechanical Engineering & Design Programme
Indian Institute of Technology, Kanpur
Dr. Amandeep Singh Oberoi
Department of Industrial and Production Engineering
National Institute of Technology, Jalandhar

Lecture - 15
Laboratory demonstration: Vernier height gauge

Good morning welcome back to the course on Engineering Metrology and we are in the Laboratory demonstration section here. So, we have discussed various instruments before like vernier caliper micro meter.

(Refer Slide Time: 00:25)



Now, we have Vernier Height Gauge here. Vernier height gauge is another vernier instrument which is used to measure the height.

(Refer Slide Time: 00:35)



So, you can see that this vernier height gauge is here. So, this is the vernier height gauge which is having various components, which are very similar to the vernier caliper all about the difference is that we do not have calipers here, but measuring scribe we call it scriber, we call it stylus. So, this is only one jaw that is movable.

So, because this is not a jaw it is a scribe. So, the moving part of this instrument is known as slider. Slider can be moved up and down like this, when we lose this screws it can moved up and down. When we look at the full view, we can see that a big scale is there vertical scale that is known as main scale. This is the main scale it has also a calibrations on both of its sides and in the calibrations are in inches and in mm in both scales the calibrations are there.

And on the both sides of the main scale we have guiding face. We can see this stainless steel or hardened steel that that two guiding face which is of stainless steel kind of color. So, these two guiding face are there on which the slider is moving up and down the guiding face is are also grounded very well. So, as there is no play in moving of the grinder. So, you know this is a mechanical instrument in which as I discussed before that with small tiny particles of dust or chips we can have such an errors in it. So, the instrumental errors might rise with life with aging or with use or may be the environmental conditions those are dirty.

So, there is a major role of this scriber here, if you look at this scriber at the tip of this scriber is sharpened here is sharpened because this is also used for marking and it is very important that the vernier caliper the base of the scriber. Ok I will loosen this scriber here I will take off this scriber so it can be removed. So, we will like to show you the bottom surface of this scriber. So, which is the surface, which is grounded properly. So, whenever the scriber has to be sharpened it has to be sharpened from the top taper surface it has to be sharpened from this surface.

Because the grounded surface this is the one the surface of the bottom of this scriber is the one based on which the calibration is done. So, that is never grinded and the surface is made up of chrome steel sometimes see this is the measuring face, this face is the surface of the bottom is known as the measuring face. So, other components of the pro extension we have fixing device on which we are trying to fix this stylus, I will keep on using word stylus or scriber interchangeably. So, it is fixed on the fixing device on the fixing device we have this nut and there may be some packing sometime if it is required.

So, these are the major components of our vernier height gauge. This vernier height gauge is of make miththulu and it has maximum calibration of 300 mm you can see. So, the calibration is mm maximum, but the height is even higher the height is even higher to show as to adjust the slider over it. The important part the vernier height gauge is the base of the height gauge if you see the bottom surface of the base. This bottom surface of the base has to be flat now this is one of the important parts of the vernier height gauge that determines the accuracy of the increment.

Based on this only the accuracy the measurements of the precision the measurement would come. So, we can see that we have just put we have just put the when we have height gauge on the table at first. So, I liked to show you that this is actually a wooden table. So, the table is not grounded very well. So, we need to use a surface plate what if we use this table if you see I will use a feeler gauge and try to see that do we have any gap between the table surface and the bottom surface of the vernier height gauge? Let us try.

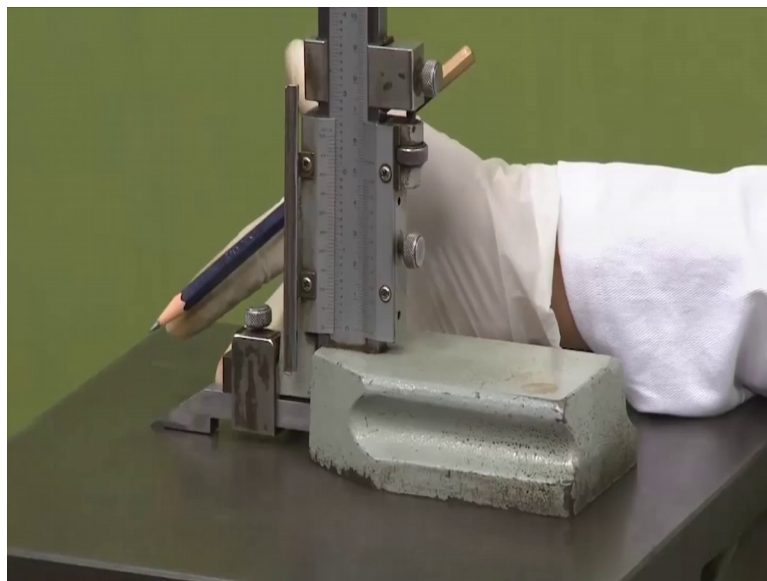
So, this is the most thick feeler gauge which is of the order of 80 by 100 it is 0.8. So, this is a thin as you can see that, you can see that it can be inserted here. So, there is a small bump or some small trough here. So, this surface is not grounded that how the thing is that, we have to move this height gauge like we have to swipe this

height gauge on the, this ground surface to make some markings. So, it is not recommended to use any surface like that. So, the basic instrument the basic tool in metrology lab such a spread has to be there to use vernier height gauge.

Now, I will put my vernier height gauge on the surface plate when a height gauge is now kept on the surface plate. Now let us try to do the same exercise let us try to insert the most fine feeler gauge which is also order 5 by 100. That is 0.05 mm thickness. So, is it inserting? No. So in any side from either of this sides which is not getting inserted so; that means, it is quite sensitive it is quite flat with the surface plate.

Now, we will follow the first guide line cleaning of the instruments actually, we have cleaned the surface plate before. So, we will clean the bottom surface of our instrument using acetone or may be cloth. So, I will just swipe quickly this cloth over the surface plate as well. So, as to avoid any dust particles the cleaning part is almost done.

(Refer Slide Time: 08:13)



Actually we have cleaned the vernier height gauge before ok. You can see because of the weight it is falling down because its nuts where lose.

Now so, be since it is fallen down will see the zero error. So, is there any zero error? When the bottom of the scribe touches the ground the zero line of the vernier caliper should coincide with the zero line of the main scale. So, is there any zero error? No. Zero is coinciding with zero. So, this is a good news with we do not have to work with errors

here at least instrumental errors. So, we can do any kind of calculations using this. Now let us before actually doing measurement I like to give some more information on a height gauge it is a vernier height gauge is a graduatory scale or bar is held in a vertical position by finally, grounded and left base. A precision ground surface plate is mandatory as I said.

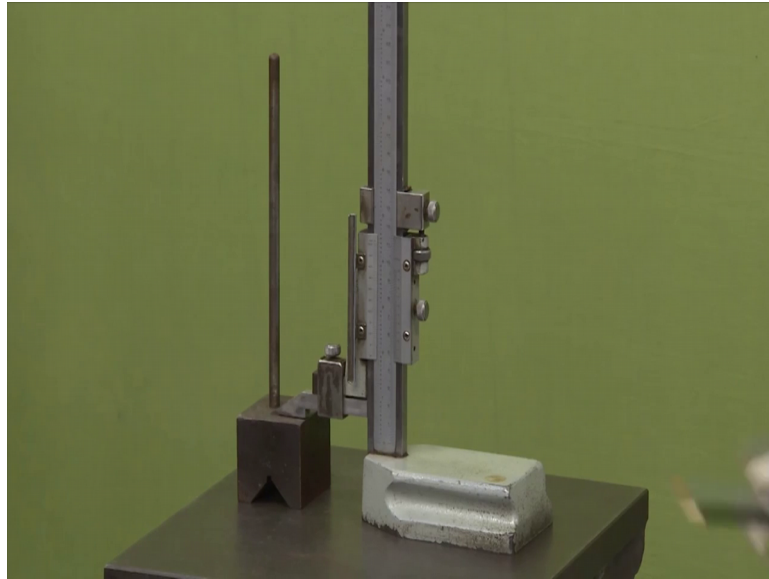
So, the feature of the jaw to my measure is held between the base and the measuring jaw measuring jaw or you call it measuring jaw stylus. The stylus is mounted on a slider that moves up and down and it can be tightened using nut the there is a fine adjustment nut as well and fine adjustment clamp here. So, the clamping screws both are like the vernier caliper will first tighten the clamp. The first tighten the fine adjustment clamp this clamp, then using the fine adjustment screw we can move it we can make fine adjustment here then after getting the desired height we can clamp a main screw and conveniently note down the reading after that.

So, unlike in the depth gauge the main scale in the height gauge is stationary while the slider moves ups and down and the least count of this instrument is 0.02 mm it is also mentioned over there. Vernier height gauge is available in various sizes ranging from 150 to 500 mm for precision tool loom application. Some models have quick adjustment screw release on the movable jaw, that makes it possible to that we move to any point within the approximate range. So, this is helpful.

Vernier height gauge is find applications in inspection department as well inspection department are the one where the measurements are taken after the production manufactured. So, modern variance of height gauges are may be optical electronic digital and are becoming they are becoming increasing popular. So, as I said if there is a digital vernier caliper we need not to just zero and in this case, this is the mechanical one we always have towards just this zero and work with the zero error if it occurs.

So, let us try to find height of some component here.

(Refer Slide Time: 11:39)



I will call it work piece ok. So, this is one component, so what is the height of this component? What I will do? I will place this stylus on this component on this component ok. Now I will see I will lock the fine adjustment slider first then a till the fine adjustment part of the slider then the main screw of the slider after the fine adjustment accurate is just kept over there we need not to over just if it is kept properly then we lock this one.

Now, we can note down the reading here reading is very similar to the vernier caliper, because we have the similar kind of vernier and the main scales here. So, you can see that the height of this component is let me see which is the coinciding point. So, 48 plus something, it is 48 mm plus something what is that something we can see which line is coinciding.

Student: (Refer Time: 13:22).

42nd line is coinciding. So, the height of our work piece is 42 into 0.02 is equal to 48.84mm and. So, this is just one application ok. We can find height of any work piece that is within the range of our instrument ok. What if we need to find the midpoint of this ok, one thing is this height is actually 48.84 we can adjust it to 48. 84 by 2 midpoint this is equal to 24.48 mm.

This is another way what we can do we can just low down the height of the scribe here to somewhere to high height whatever we like. So, what we can do we can lower down the height of the slider here to make the make the scriber to make a mark on the work piece. So, we can make a mark here. So, the rule to make a mark is we have to make we have to keep the height gauge at some angle you know if I do at 90 degree the mark would not be that very precise this is not a right way left right left right this is not a good way.

Also making it right it is not a good way marking like this intermediate marking is also not recommended. The best way to make a mark is to make it at a make like a tilt it at some angle like tilt it at some angle. So, as this corner one of the corner touches the work piece and to mark it in one go like this. This is the best way and like this is human body it is the rule of economics whenever we need to whenever we draw the lines it is from upside down.

Whenever we draw a line it is like this, like the best way to draw the line is this the stroke has to be upside down and from left to right from top to bottom. So, it is important that whenever we mark so, because we are holding the instrument it is better, because our hand would like to come in the equilibrium position in the relax position and the relax position of the hand is like this marking something like this is not recommended it is better to bring the hand in the back order position like, if I have to mark it should be like this.

So, this is the rule of economics that whenever you mark like I said top to bottom or from left to right my hand my right hand is trying to come into the equilibrium position equilibrium or you say relax position the relax position of hand is this. So, when I start from the left it will try to come to the relax position from left to right.

So, if your right handed person and try to mark straight lines from right to left or from bottom to top, you will see that it will be a little difficult because we are habitual or our body is habitual not habitual, it is actually the rule m its rule of lecture only that everything would be likely to come into the equilibrium position or the relax position. So, it is better that as we are holding the height gauge we have we it is better if we pull it here ok. So, this is the way to mark. So, we have marked it once, now I can turn it upside down and make another mark.

(Refer Slide Time: 17:25)



You can see these two lines; the middle line between these two can be the midpoint. So, this is the way to mark another use of vernier height gauge is if we need to mark properly like we can use clear head of the combination set or trasciar to mark the lines very parallel to these here.

This can be always done with height gauge. If I have marked a line here, I can even mark the lines here.

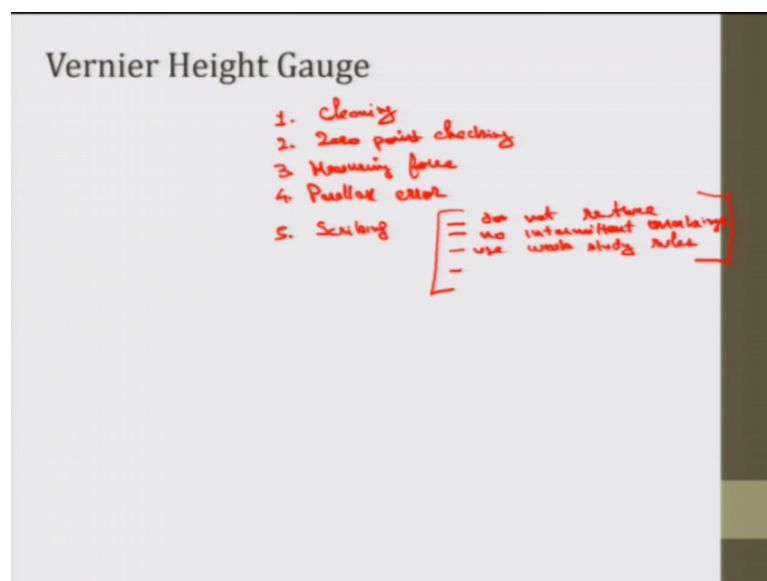
(Refer Slide Time: 18:09)



On that side what for marking we have used a ink; however, there are there is a ink available in the market for a metal marking, but we have just used this marker to mark it to produce this red color. So, as the marking is clear. So, we can mark the parallel lines here. Now we have got this line around all the four surfaces and if you have do any machining it is marked here.

So, metrology is all about marking measuring all those things. So, this is the use of vernier height gauge. So, there are certain guide lines and as in other instruments.

(Refer Slide Time: 19:13)



The first thing is cleaning as I said we need to clean the components properly before we start working. Thoroughly cleaning the height gauge, surface plate, work piece to be measured, we need to apply a some good quality oil to slide way of the main beam some times.

And number two is zero point checking. Zero point checking like we need to make sure that the height gauge reads zero when a scriber measuring face touches the surface plate while under the normal light measuring force ok. Now before using the height gauge we need to wipe of the anticorrosive oil from the bottom surface of the base and the scriber mount it is important here.

Now, their certain an errors that could be made number three is measuring force ok the if the measuring force is not proper, it would not give a very good results. So, when taking

measurements we need to be careful to exert to actually not exert the excessive force to exert the appropriate force on the work piece with a scribes. Now special case is needed when the feeding of scriber using the fine feed screw. So, for instance if the height gauge is open in this height and if I try to place it here this is not a good practice. So, this is not a good practice. So, it would it would try to deteriorate this scriber as well and also the force that is exerting is not proper.

So, it is important to loosen it properly place it gently and tighten this and if now I keep on tightening this fine adjustment screw it will exert some extra force. So, that is also not recommended. When we have just kept it here, now just kept it here let us see after tightening is after tightening this clamp let us see that it is any adjustment any light force no very tightly just very loosely it is then we will tighten this.

So as this can be removed easily here ok. So, the force is also important measuring force next precaution ok. I can put certain that the general precautions like parallax error then scribing is important here in scribing, scribing in scribing when scribing the lines clamps the slider firmly and slide the slider in one direction as I said do not retrace I have I just give a demonstration on these do not retrace no intermittent lines intermittent markings use work study rules like I said we need to top to bottom left to right ok. So, scribing is important.

Otherwise it might bring some errors ok. So, this was all of about the vernier height gauge. So, next we will meet in the next part of the laboratory demonstration only I will pick in other instrument and explain that. So, as if now I will just take a small pause then we will move in a next lecture.

Thank you.