

## **MEASURING AND MAINTAINING DRUM PRESSURE AND DRUM PRESSURE DIFFERENTIAL FOR HUMMEL FLOOR SANDER**

**The following literature was created solely as a means for suggesting tips and procedures aimed at getting the very optimum performance out of your HUMMEL Belt Sanding machine. This is not official literature from the manufacturer. We caution you to use this material reasonably and intelligently. Follow all safety guidelines. The author, manufacturer, distributor or any other purveyor of this literature assumes no liability of any kind from the use or misuse of this material.**

One of the very most over-looked performance aspects of any belt sanding machine such as the HUMMEL is its Drum Pressure, and perhaps more importantly, a phenomenon we have arrived upon calling "Drum Pressure Differential". Drum Pressure and Drum Pressure Differential play such a vital role in the quality of the finished wood floor's topography, that their importance cannot be understated. HUMMEL machines that come in for service with complaints of leaving "waves" on the floor are found to have neglected or under-maintained suspension systems at a rate very close to 100% of the time. (In other words, it would probably be less accurate to say 99% than to say 100%). Being the sole North American Agent for Eugen Lagler GmbH, and having seen every aspect of the entire service spectrum many times over, it couldn't be more apparent that a thorough regimen of inspection and service to the HUMMEL's suspension system should be a part of every maintenance program. The following procedural outline details a very simple means for both analyzing vital suspension performance as well as how to restore that performance back to its peak. Also contained are recommendations of time intervals for which to inspect and/or service the suspension. To supplement any HUMMEL maintenance program with these following procedures that are both simple and modest in terms of time-consumption, you are nearly assured to witness drastic improvements in your machine's overall performance.

**Before undertaking any of the following maintenance/service procedures, be sure to read and follow all safety precautions written in the HUMMEL Owner's Manual. Always disconnect machine from power source prior to and during service, and only plug it in for testing and sanding. Always wear adequate eye protection during ALL of the following procedures.**

### **CHECKING THE WHEELS**

It wouldn't make any sense to inspect a HUMMEL's suspension and all its related aspects without taking a look at the wheels. The effects of overly dirty or deformed wheels on a floor's final topography are not difficult to visualize.

- 1.) Carefully roll machine over *forward* into what we call the "somersault position", where the curve of the dust chute is touching the ground. (Older HUMMEL models that have the smaller swithbox and separate capacitor tubes do not rest well in this position. Instead of letting curve of chute all the way down to floor, let it down onto

- an elevated surface such as a chair such that the switchbox does NOT rest on the floor).
- 2.) Using a *sharp* floor scraper, carefully scrape clean all wheel surfaces by holding blade to surface and rotating wheel to cut/skim residues such as wood filler from the wheels. Keep working it until the surface is clean. We DO NOT recommend the use of any solvents for cleaning wheels.
  - 3.) Check all 3 wheels for roundness by anchoring up a straight-edge soundly such that an even gap of 1/16" -- 1/8" is present between straight edge and wheel surface. Slowly roll the wheel while observing the gap. There should be no appreciable change in the gap as the wheel is rotated. If there is, then the offending wheel(s) or tire(s) should be renewed.

***We recommend cleaning the wheels on your HUMMEL any time as deemed necessary, and checking the wheels for roundness once every 6 months or better. Always remember to get machine off its wheels as well as drum during storage and/or transport.***

Note: All newer HUMMEL machines (approximately 2003 and newer) come equipped with the convenient single center bolt "quick-change" wheels. This is so that an older set can be on hand and quickly changed out for the rougher, messier jobs that may have a higher likelihood of compromising newer, more pristine wheels. Any older HUMMEL can be converted over to utilize "Quick-change" wheels.

### **MEASURING DRUM PRESSURE AND DRUM PRESSURE DIFFERENTIAL**

In order to effectively measure Drum Pressure (DP) and Drum Pressure Differential (DPD), a **scale and platform** must first be constructed. A small amount of time and material invested here is sure to prove invaluable to your HUMMEL's long-term performance. To build a Scale and Platform:

- 1.) Obtain just about any bathroom-type, analog (non-digital) scale preferably with a hard surface, (not carpeted) and set it on a hard, level floor.
- 2.) Using a piece of plywood approximately 36" X 18" and at least 3/4" thick and some various blocks of wood cut to a length equal to the plywood's width, build a platform up to the level of the scale. It is important to achieve a platform height as close to the height of the scale's weighing surface as possible. Run a straight edge from the scale's weighing surface to the platform surface to check for good continuity. Be sure to install plenty of support blocks beneath the platform to prevent any bowing of the platform that may otherwise occur when a HUMMEL is placed upon it.
- 3.) Before fastening the support material to the plywood platform face, place HUMMEL upon platform, and with scale butted up against the platform's end, roll machine forward into such a position that the drum can be lowered onto the scale's weighing surface. Lower drum down onto weighing surface all the way and observe the position of the Operator's Lever in its resting place. It should be more or less in the same position as it would while machine is resting on the flat floor. If lever falls too low, then platform is too *high* relative to scale and *must be lowered*. If lever comes to

rest at a position *higher* than what it does on a flat floor, then the platform is too *low* relative to scale and *must be raised*.

- 4.) Once you are satisfied that scale and platform are of equal heights sufficient to accurately weight your HUMMEL's DP, securely fasten all support material to plywood face with screws or nails. (Be sure no screw or nail heads are sticking up to interfere with rolling the machine on the platform).

Now you are ready to measure DP and DPD. Before doing so, it is important to have a basic understanding of how the HUMMEL's suspension operates and to know what you are looking for when conducting these tests on the scale.

As the HUMMEL's drum is raised and lowered to the floor during normal sanding operations, it is actually the entire machine that is tilting forward (drum down) and backward (drum up). Of chief importance is the fact that a total of 5 *hinge-points* are at work in the machine's suspension during this raising and lowering of the drum to its sanding surface. They are:

- 1.) LH lateral wheel axle at region where it "rolls" inside of axle bore of Main Housing.
- 2.) RH lateral wheel axle at region where it "rolls" inside of axle bore of Main Housing.
- 3.) Operator's Lever at region where bushing rolls outside of Handle Shaft.
- 4.) Operator's Lever at region where Upper Rod pivots inside linkage point aperture.
- 5.) Lower Rod at region where its end is fastened with a Pivot Pin to Suspension Yoke.

In order for the HUMMEL to effectively apply the *adequate* and *consistent* drum pressure vital for achieving a superior topography in the finished floor, it is imperative that these hinge-points are clean, properly lubricated and ultimately working freely together. In the absence of these conditions within the suspension, a HUMMEL can't be expected to sand as aggressively as it should, will tend to make the operator's right hand and arm tire quickly, and will be apt to leave surface irregularities such as "waves" in the finished floor surface.

Being equipped with a scale and platform as described above, you now have the means to effectively measure out and put a number to how much resistance (or friction) is contained within the moving parts of your HUMMEL's suspension. This is what we call **Drum Pressure Differential (DPD)**.

Prior to measuring DPD, it is important to know just what all this entails, primarily that it requires 2 separate readings from the scale. The first is what we call the *Low Reading*, and the second is what we call the *High Reading*. The Low Reading is then subtracted from the High Reading in which the remaining difference shall be the assigned value for DPD. To make these needed measurements for determining DPD, do the following:

- 1.) Prior to any weighing procedures relating to your HUMMEL's drum pressure, be sure the machine is at least reasonably clean and *entirely* assembled, (not partially torn down for other repair or maintenance procedures). Be sure that the Suspension Tensioner Lever is in the *lowest position (Grob)* of the notchplate.
- 2.) Place HUMMEL upon platform, and with scale butted up against the platform's end, roll machine forward into such a position that the drum can be lowered on to the scale's weighing surface.
- 3.) *Very carefully and very slowly* lower the drum downward onto the scale's weighing surface. Make believe there is a bug between your HUMMEL's drum and the weighing surface of the scale, and your objective is to rest your drum on that bug's back without harming the bug. Watch the scale climb ever-so slowly as you gradually continue to allow more weight to be passed from the lever in your hand to the drum on the scale. Continue in this manner until the scale stops rising, as there should be no surge in the scale's reading at the moment your hand is removed from the lever. Make note of the scale's reading at this point. This is your **LOW READING**.
- 4.) While Drum is resting upon the scale from step #3, push downward on the Operator's Lever with your thumb to artificially elevate the reading on the scale. Bring it up to 90 lbs. or so, and then with the same degree of gradualness exercised in step #3, slowly and carefully relax your thumb and allow the scale to settle back downward. Continue this process until the scale comes to its own rest, and again, there should be no surge in the scale's reading as your hand is taken away from the Operator's Lever. Make note of where the reading finally comes to rest. This is your **HIGH READING**.
- 5.) Subtract your Low Reading from your High Reading. This is your **DPD**.
- 6.) Take the average between the Low and High Readings (add the two together and divide by 2). This is your **DP**.

**Ideal DPD for optimal suspension performance should be 4-6 lbs, and never above 8 lbs.**

**Ideal DP for optimal suspension performance should be 65 lbs. plus or minus 1 lb.**

(For example, a Low Reading of 62 lbs. and a High Reading of 68 lbs. would have a DPD of 6 lbs., and a DP of 65 lbs. This would be ideal.)

**If DPD is above 8 lbs., the suspension should be serviced (see next section entitled Servicing Suspension).**

**If DPD is below 8 lbs., but DP is off, adjustments should be made to Drum Pressure (see section entitled Adjusting Drum Pressure).**

**If DPD is above 8 lbs. and DP is off, SERVICE SUSPENSION FIRST! It is a waste of time to attempt to make adjustments to DP when DPD is outside the acceptable range.**

*We recommend measuring your HUMMEL's DPD and DP once every 6 months or so, or any time symptoms consistent with suspension problems (as stated above) exist.*

## **SERVICING SUSPENSION**

*For the following procedures to your HUMMEL's suspension system, we strongly recommend carrying them out exactly as written and done exactly the same for all involved components, regardless of whether they are new replacements or existing parts.*

### **Operator's Lever/Upper Rod/Lower Rod**

*This part of the service addresses 2 of the 5 aforementioned Hinge Points: **The Operator's Lever at region where bushing rolls outside of Handle Shaft and Operator's Lever at region where Upper Rod pivots inside linkage point aperture.***

Prior to this procedure, inspect these linkage components for excessive wear or damage. There should be a small amount of play in the Operator's Lever with respect to where it rides upon the Handle Shaft, but certainly not anything a reasonable mind would call excessive. Both Upper and Lower Rods should be straight and *never* be rubbing against any parts of the machine body or dust chute. Remember, it is always money well spent to replace parts that are damaged or excessively worn to the extent of hindering your machine's performance.

- 1.) Remove Operator's Lever from Handle Shaft. On the newer HUMMEL models that have the bullet-shaped handles, unscrew RH handle, disconnect fastener (either a cotter pin or a Fixing Cap) that fastens Upper Rod to Operator's Lever, and with a pair of snap ring pliers, remove outer snap ring that holds Operator's Lever in place. Remove Precision Washer and slide Operator's Lever off Handle Shaft. For the older HUMMEL models with the flanged handles, disconnect Upper Rod from Operator's Lever, unscrew LH handle, remove grub screw that secures Handle Shaft at its center and slide Handle Shaft/Operator's Lever assembly free from its mounting bracketry. Remove inner snap ring, and along with Precision Washer, slide Operator's Lever off Handle Shaft.
- 2.) Using 80 grit sandpaper in a twisting motion, sand the region of the Handle Shaft where the bushing of the Operator's Lever rides. (80 grit, we have conclusively found, produces far better results for these procedures than any other grit.) Even if there is no corrosion evident on the shaft, sand thoroughly around it until it shines an "80 Grit Luster".
- 3.) Whether or not you decide to replace the Operator's Lever, roll up a piece of 80 grit sandpaper slightly smaller than the diameter of its bushing, and with a twisting motion, scuff out interior of bushing. Do this only until this inner surface is uniformly scuffed. (The reasoning behind scuffing these two corresponding surfaces is to alleviate friction within hinge point by reducing surface areas in contact with each other.)

- 4.) Roll up the 80 grit sandpaper even tighter, and with a twisting motion, scuff out any debris or burrs within the aperture of the Operator's Lever where the "Nub" of the Upper Rod is carried when assembled.
- 5.) Inspect "Nub" region of Upper Rod for excessive wear in the form of deep notches cut into it. Replace if necessary. With a twisting motion, scuff "Nub" region of Upper Rod until it shines an "80 Grit luster".
- 6.) Coat the interior of the bushing (Operator's Lever) with a modest bit of chassis grease (contained in the HUMMEL Grease Gun, part # P228). **DO NOT use petroleum distillates in aerosol form as they may cause harm to bushing material.** Reassemble Handle Shaft, Upper Rod and Operator's Lever in reverse of disassembly. (TIP: For refastening Fixing Cap-type fastener to Upper Rod, lower Operator's Lever into "Down" position and place a large, flat-bladed screwdriver between Upper Rod at region of "Nub" and Dust Chute of machine. With Fixing cap held into position at end of "Nub", place a 13 mm socket over Fixing Cap and tap into place with a small hammer.)

*We recommend servicing Operator's Lever once every 6 months or so, or any time symptoms consistent with suspension problems (as stated above) exist.*

### **Lateral Wheels**

- 1.) Carefully roll machine over *forward* into what we call the "somersault position", where the curve of the dust chute is touching the ground. (Older HUMMEL models that have the smaller switchbox and separate capacitor tubes do not rest well in this position. Instead of letting curve of chute all the way down to floor, let it down onto an elevated surface such as a chair such that the switchbox does NOT rest on the floor).
- 2.) Using a 13 mm wrench (supplied in your HUMMEL Tool Kit), loosen the bolts (1 for RH Lateral Wheel, 1 for LH Lateral Wheel) that secure Suspension Yoke Clamps to Lateral Wheel Axles.
- 3.) Using the appropriate allen key supplied in your HUMMEL Tool Kit (6 mm for older models with socket head-type bolt, 4 mm on newer models with grub-type allen bolt), remove set screw for RH Lateral Wheel (located at same Suspension Yoke Clamp).
- 4.) Remove both Lateral Wheels by sliding them outward. (You may need to use a pry-bar and blocks of wood of appropriate thickness to lever them free. Be careful not to bend arm-region of wheel unit – let pry-bar grab arm at its closest proximity to axle. Also, be careful about using a pry-bar against the cast aluminum body of your machine, as you could break the casting with enough force. Use some penetrating oil to help this removal process if needed).
- 5.) Make sure that the axle shafts of both Lateral Wheels are clean of any oil, grease or debris. Using 80 grit sandpaper with a twisting motion, sand around the axle shafts of both Lateral wheels at regions where they ride (and roll) inside axle bores of Main Housing until they shine an "80 Grit Luster".
- 6.) Depending upon the age of your machine, the axle bores that house the Lateral Wheels will either be equipped with epoxy-type bushing sleeves (newer models), or no bushings at all (older models). In addition, models without bushing sleeves are

- equipped with grease fittings at each axle bore, whereas those with the bushing sleeves are not. If your HUMMEL is equipped with the bushings, inspect for breakage, replace with part # P1110 if necessary. For either type of axle bore, clean them free of any grease, oil or debris.
- 7.) Roll up a piece of 80 grit sandpaper slightly smaller than the diameter of the axle bore (with or without bushing), and with a twisting motion, scuff out interiors of both axle bores. Do this only until these inner surfaces are uniformly scuffed.
  - 8.) For the LH axle bore, (*adjustable side*) rub a very small amount of chassis grease into the bore's interior (with or without bushing). It is very important not to get any excess grease into this LH bore prior to installing wheel. (If equipped with a grease fitting, give a couple of pumps with grease gun to flush it out. Wipe away dirty grease injected into empty axle bore from grease fitting and then rub in a very small amount of clean grease. If grease fitting is clogged, replace with part # P071).
  - 9.) Using chassis grease, liberally coat axle of LH Lateral Wheel (no pilot hole) all the way around, but only from wheel arm to half way along axle's length. (Since the LH Lateral Wheel is adjustable and has no pilot screw, it is especially important to apply grease in this manner. The intent is to keep the lubricant restricted to the regions where the axle rolls inside the axle bore, and *not* in the region that accepts the clamp from the Suspension Yoke. Careful attention to this will greatly reduce any future likelihood of the LH Lateral Wheel coming out of adjustment due to slippage within the clamp.)
  - 10.) Install LH Lateral Wheel into axle bore and clamp of Suspension Yoke. Tighten clamp just tight enough to hold in any position, yet is moveable by hand.
  - 11.) Repeat steps 8, 9 and 10 for the RH Lateral Wheel. (Since this side is held in a fixed position with a pilot screw, the likelihood of slippage within the clamp is minimal if assembled properly. No need to be as critical about lubricant here.)
  - 12.) Using a 2" X 2" X 4" block of wood, prop up the rear end of the suspension yoke. (This allows you a better view of pilot hole on RH Lateral Wheel, as well as a sturdier foundation to carry out the remainder of work to be done under here.)
  - 13.) Shine a flashlight into pilot hole and position wheel such that threaded pilot hole of clamp and pilot hole of axle line up perfectly. Install and tighten pilot screw. Tighten clamp bolt.
  - 14.) Using Setting Tool (P233) from your HUMMEL Tool Kit, adjust LH Lateral Wheel to match height of RH wheel as described in HUMMEL Owner's Manual. Tighten bolt tight to secure LH wheel. (Note: Any time adjustments are made to Lateral Wheels, always "Touch Test" to ensure machine is cutting level before sanding. (See section entitled, "Touch Testing for Levelness" for further explanation).
  - 15.) Remove wood block and inspect Pivot Pin that connects Lower Rod to Suspension Yoke for smooth, non-binding movement. The presence of a problem at this particular hinge-point is extremely rare. Dissassemble, sand, lube, and reassemble as deemed necessary.

After successfully completing all the above cleaning, scuffing and lubricating procedures to your HUMMEL's hinge-points, you should witness a vast improvement in your machine's DPD. Keep in mind that as you slowly lower the Operator's Lever, it should

be smooth and continuous, not choppy or in any way segmented. Repeat any of the above procedures if needed.

If you are confident you've carried out all these procedures effectively and your DPD is still a little too high and your DP is too low, proceed to the next section entitled "Adjusting Drum Pressure". In nearly all cases, too low of a DP will tend to keep DPD elevated, so it just might be that getting your machine's DP up to where it is supposed to be is all that's remaining to bring your DPD down to the acceptable range.

*We recommend servicing the Lateral Wheels any time your readings on the scale suggest doing so, or any time symptoms consistent with suspension problems (as stated above) exist. The service described above typically lasts for 18-24 months before it is needed again.*

## **ADJUSTING DRUM PRESSURE**

Each HUMMEL is equipped with a Tensioning Lever and Notchplate to enable its operator to make adjustments to drum pressure depending upon the task at hand. For more information on this, consult your HUMMEL Owner's Manual or Sanding of Wooden Floors Manual, both published by Lagler GmbH and both available from your local Lagler distributor. Aside from these "operator intended" adjustments, there is an overall, governing drum pressure set by the manufacturer intended to best cover an average of the broad spectrum of sanding tasks expected over a machine's lifetime. Occasionally, some adjustments may be warranted to correct a low DP, but in most cases, correcting problems with DPD bring about the most noteworthy results for improved suspension-related performance.

There are two points for adjustment for either increasing or decreasing DP:

- 1.) *Tensioning Spring at rear of Suspension Yoke*
- 2.) *Height of Rear Wheel Caster*

*Before making any adjustments to these points, be advised it is much better to achieve desired effect on DP by making smaller adjustments to **BOTH** points rather than to try to accomplish it all with only one adjustment.*

To make adjustments to either point, carefully roll machine over *forward* into what we call the "somersault position", where the curve of the dust chute is touching the ground. (Older HUMMEL models that have the smaller switchbox and separate capacitor tubes do not rest well in this position. Instead of letting curve of chute all the way down to floor, let it down onto an elevated surface such as a chair such that the switchbox does NOT rest on the floor).

## **TENSIONING SPRING**



Note how Tensioning Spring is fastened to welded bracket at rear of Suspension Yoke by way of a threaded stud and 2 nuts. There should be one nut on each side of the welded bracket threaded onto the stud that passes through bracket. The two nuts carry out two separate functions for which we give them different names: The **Locking Nut**, which is the one most easily accessed, and the **Positioning Nut**, which is positioned less conveniently.

- 1.) Using a 2" X 2" X 4" block of wood, prop up the rear end of the suspension yoke. (This allows easier wrenching access to Locking Nut).
- 2.) Using a 13 mm wrench (open or box end, NOT a socket) and a flat-bladed screwdriver inserted into slot at exposed end of threaded stud, loosen Locking Nut.
- 3.) Remove wood block. To *decrease* DP, turn Positioning Nut clockwise, which will run it *toward* the spring along threaded stud. The result will be *more* tension imparted to Tensioning Spring and an overall decrease in DP. To *increase* DP, turn Positioning Nut counter-clockwise, which will run it *away from* the spring along the threaded stud. The result will be less tension imparted to the spring and an overall increase in DP. Always remember, *tightening* the Tension Spring *reduces* DP, while *slackening* the Tension Spring *increases* DP. It holds exactly the same effect as moving the Tensioning Lever into the different positions of the Notchplate.
- 4.) Reprop Suspension Yoke with wood block. Hold Screwdriver into slot of threaded stud and tighten up Locking Nut with wrench. Do not let threaded stud twist during tightening. The result will be torque imparted to Tensioning Spring, which can create a difficulty for the Tensioning Lever to remain seated in its chosen Notchplate position when drum is up. Remove wood block.

Note: Most HUMMEL machines are set up with about 5 threads left exposed atop Locking Nut. Try to avoid being too far on either side of this parameter.

### REAR WHEEL CASTER HEIGHT

- 1.) Using a 6mm allen key (supplied in your HUMMEL Tool Kit), loosen Holding Screw that secures Rear Wheel Caster into its position. Remove Rear Wheel Caster.
- 2.) Note there should be about 4 spacer washers (part # P386) on milled shoulder of caster shaft. To *decrease* DP, *remove* one or more spacer washers. To *increase* DP, *add* one or more spacer washers. DO NOT attempt to adjust position of Rear Wheel Caster by relying solely upon Holding Screw to hold it in place – it will not hold, the rear of machine will eventually lower and a loss of DP shall result.

Note: All too often, people get just a bit over-excited about the prospect of making their machine "more aggressive". Adjustments to DP can make your machine more aggressive, but we urge you not to get ridiculous about it. Try to stay as close as you can to the factory-set adjustments for DP. Bear in mind that aggression is a trade-off: What you may gain from an elevated level of aggression early in the job is most probably lost later in the job where finesse becomes more of a factor. This is not to mention a higher usage rate of sandpaper, more wear and tear on your machine, as well as greater fatigue to the operator in the time the sander is in use. In most cases, a machine set up to be "more

aggressive" results in nothing other than "turning more wood into dust" on the job at hand. If you encounter some rough jobs that require an unusual amount of heavy cutting, consider opting for HUMMEL's "Red Drum" (P1120). Coupled with a reasonable increase to DP, this feature makes your HUMMEL an ideal tool for cutting the really tough stuff.

### **TOUCH TESTING FOR LEVELNESS**

Any time there has been an adjustment made to the HUMMEL's Lateral Wheels, it should be "Touch Tested" prior to sanding. As precise as you may have been in measuring the relative heights of these wheels, the real judge is what it does while sanding.

- 1.) Ready the machine for sanding as described in your HUMMEL Owner's Manual, having it set up with a sandpaper belt of 80 grit or higher.
- 2.) With your machine atop a wood surface you are confident is flat, start up machine.
- 3.) Hold the machine still and gently lower Operator's Lever till you "touch" the flat sanding surface for about 1 second, then lift it back up. (Do this several times in different areas to ensure consistency in reading).
- 4.) Observe the marks or "Footprints" made by machine. The look you are seeking to achieve is a symmetrical, elongated football-shaped mark. If the "Footprint" is triangular in shape, the pointed end represents the side of the machine that is cutting too light and the cut end represents the side that is cutting too heavy. For example, if you observe a triangular footprint that points to your left as you stand behind your machine, it means that the Lateral Wheels are set such that that machine leans to the right. To correct this condition, the adjustable Lateral Wheel must be adjusted to stand the machine's RH side up taller. This would entail a slight rotation of its axle within the Yoke Clamp in the direction that pulls wheel *away* from top of wheel well. Conversely, the direct opposite holds true in the case that the triangular footprint points to your right. Take your time to keep testing and adjusting little by little. In most cases, it only takes 1 or 2 adjustments before it is right where you want it, and to put your machine on its most efficient path to the finished product on the jobsite is well worth the effort.