

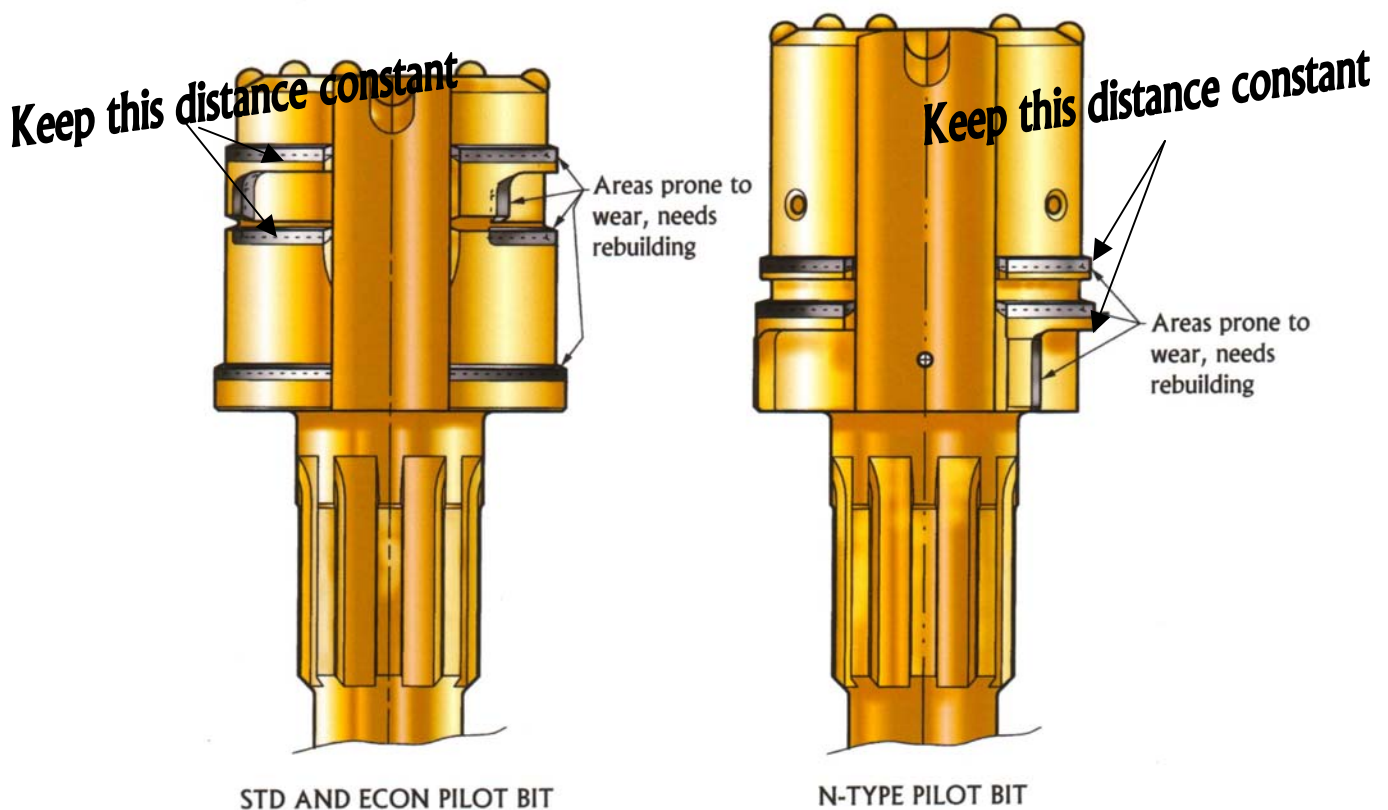
## Maintenance of the pilot bits

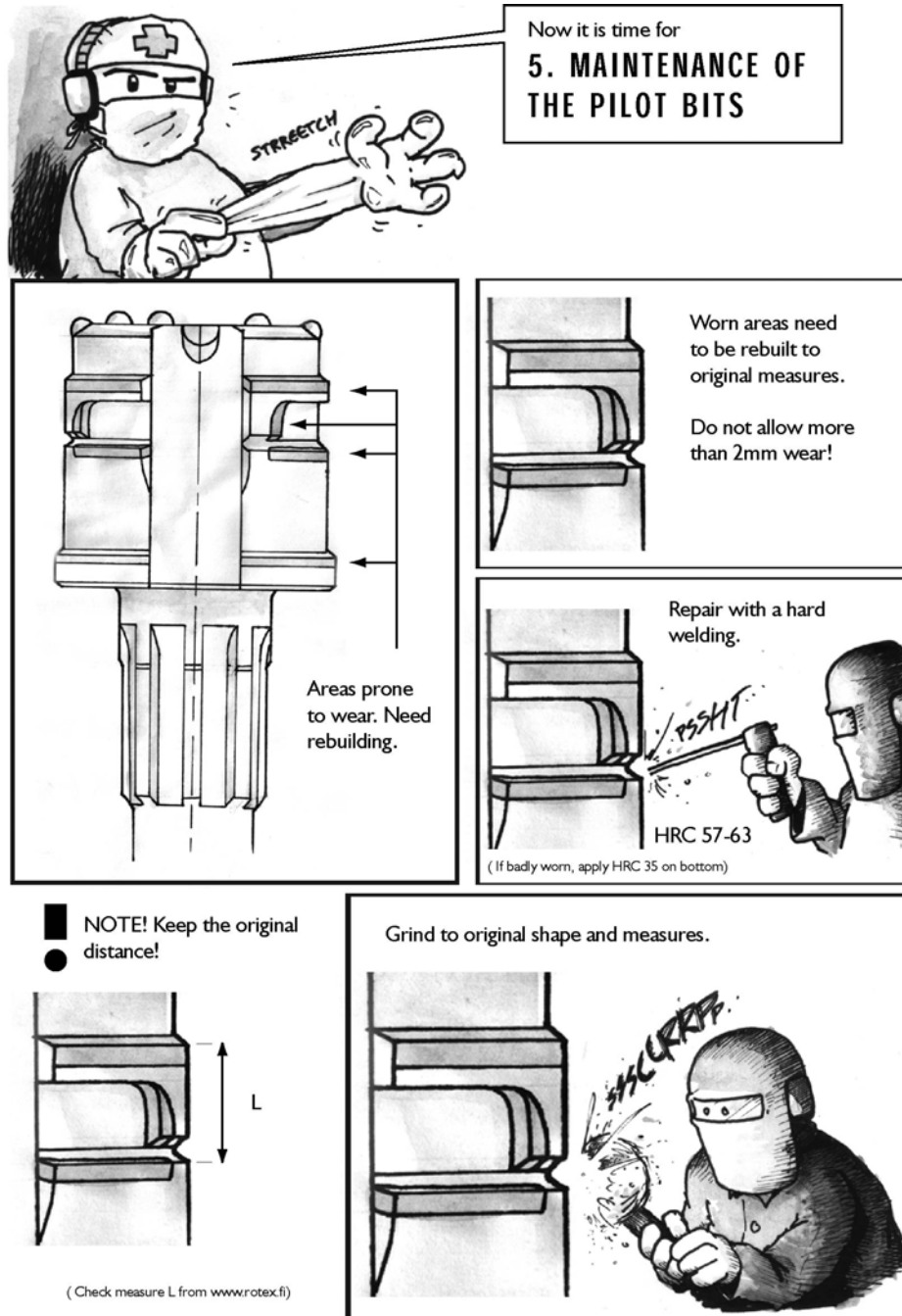
### 1. Impact shoulders

The impact, feed and torque stresses generated during drilling cause gradually wear to the shoulders of the pilot bit and the ring bit. This wear is usually the limiting factor of the lifetime of the pilot. In order to guarantee trouble free operation and locking/unlocking of the bayonet coupling, the shoulders of the pilot bit have to be rebuilt when the wear in the axis direction has reached 2-3 mm. The following figures show the areas where rebuilding is needed.

Manual metal-arc welding (arc welding) is recommended for rebuilding. Normal yield electrodes should be used. The electrodes should meet the specification E 6-55 (DIN 8556) or similar, where the hardness after welding is 50-60 HRC. Welding should be carried out using electrodes with a diameter of 2.5 mm; at 60-120 A. See more specified instructions for preheating and welding in the electrodes manual. During welding the pilot bit temperature must not exceed 200-220°.

After welding the surfaces must be ground to original levels.





**Apply hard weld on the worn surface**

- If less than 3-4 mm wear, apply HRC58-60 on the case hardened surface
- If over 4 mm wear, apply first thin layer of HRC28-38 mid layer, grind it and add hard layer of HRC58-60 on top
- Grind to original measures, keep the original shoulder distances
- Electrodes should equivalent to Esab OK 83.28 (mid layer) and Esab OK 83.50 (hard surface) or harder.
- Slow cooling!

### Wear and maintenance problems:



If the 3-4 mm thick case hardened surface wears off the overall wear will be very rapid. The maintenance should take place early enough to avoid situations like in this picture on left. A thick mid layer of HRC28-35 is required before hard welding can be applied as the final surface.



If the hard weld is applied on the softer body material (when the case hardening has all worn off) it will chip out and take sometimes more body material along.



Drill bit impact shoulders have been filled only in locking groove. The main impact shoulders in the front of the bit were not filled at all, due to which they did not even touch the reamer's shoulders. Drilling continued by using locking groove as the only impact shoulder. High point load in groove caused finally crack in the pilot bit. Longitudinal cracks seldom break the bit, though, this pilot bit was properly repaired and about 400 more meters drilled.

## Maintenance process:



Preheat the body with care, thoroughly but not to exceed 100-120 ° C



Hard welding in process at site. Do not let the body temperature exceed 200-220 °C.



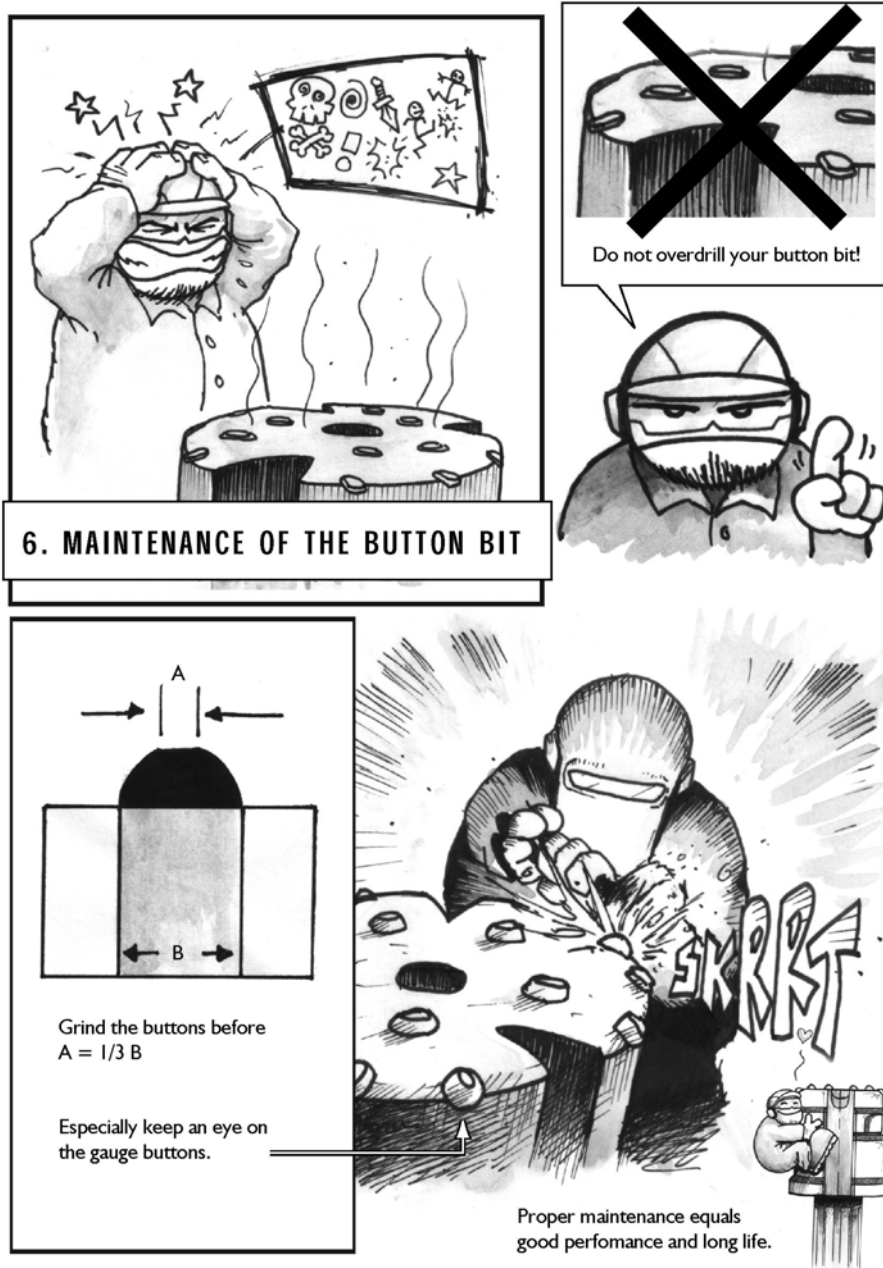
Welded bit, before grinding it back to original measures.



Special templates are available for each pilot size for shoulder distance check.

## 2. Tungsten carbide buttons

The wear of the tungsten carbide inserts depends on ground, silica content of the rock/stones and the drilling parameters. Flattened buttons have to be grinded before the flat part is about 4 mm wide (= 1/3 of the button diameter). If the grinding is not done the buttons are subject to breaking. Grinding done early enough guarantees proper penetration rate and prevents the spoiling of the bit far too early.



### Excess button wear problems:



Insufficient impact energy has caused excessive wear in gauge buttons. This is a result of too low compressor pressure / too small compressor size in hard highly silicate rock.



Over drilled drill bit. Badly worn gauge buttons should have been grinded much earlier, when flat part was less than 1/3 of the button diameter, now it is too late. If the buttons are not grinded in time the flat surfaces will not penetrate into the rock but generate heat, which will damage the buttons, and they will break. Grinding too late wont help the situation.

### 3.Bit life can be extended with proper care and use:

#### Drill with sufficient feed and rotation torque

- Avoid impacts when the bit is not against firm ground.
- Sharpen the buttons in due time, sharp evenly
- Fill impact shoulders, check the distances and that the main impact shoulder carries the reamer- Use enough air with high enough pressure to ensure DTH hammer's proper operation and add water and / or foam in sticky clay. Make sure bailing velocity is sufficient.