

TYT Torch Analysis

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Scope

This report is a summary of findings regarding the TYT Torch produced in Turkey. This torch has been spotted as a “bargain brand” BR-22 and has potential safety hazards and intellectual property infringements which prove problematic for our customers and business respectively.

Hypothesis

We believe there are numerous aspects about this design that were simply copied without any validation and could prove dangerous to customers. In addition, these “copied” ideas are the property of Broco and may allow us to take legal action against this competitor.

Course of Action

1. Disassemble torch systematically
2. Document any potential safety concerns
 - a. Combustible materials
 - b. Potential sources of failure
 - c. Etc.
3. Document of obvious similarities in design
4. Research and test material flammability

Safety Concerns

Serviceability

In order to run my analysis on the torch, I needed to open it up and look inside. After removing the bolts, I discovered there was an immense amount of silicon adhesive holding the whole inside together. After spending a substantial amount of time prying at the seams and using heat to soften the glue, I finally broke the casing open to find everything inside coated with a thick layer of it. Customers will find it difficult to change out or service any internal parts of this torch and will most likely not be able to return it to its original state once open which could prove dangerous if attempted.



For example, when I was separating the casing, the silicon joined to the rubber shielding on the power line and tore it, exposing the bare wire within.



Damaged Flash Arrestor

My first attempt to remove the flash arrestor was rather tiresome. It would not budge, and the material began to chip off while I was engaging the screwdriver. It was not until I applied heat and got the case open that it was easily removable. This could mean poor material selection or that the engineers could have neglected the grade altogether.

Once it was removed, there were visible defects. The main shaft was bent as if it were compressed or hit by something prior to being installed. This means a severe lack of quality inspection in the production of the torches which are put on the market.



Hose Material

The gas line has a hose to connect the valve to the torch head, similar to our design, however, this material is purposed for hydraulic systems and is rated for a max heat of 212 deg F. I have requested the MSDS for these hoses from the manufacturer and will check to see for sure whether combustibility is a concern. (See results at end)

SEL SuperStream 1K hose (P/N HWB1N-K31S)

<https://www.eaton.com/EN/sel/Selcontent/#>



In addition to material concerns, there was a perforation in the outer protective layer for the hose caused by drilling out the hole for the screw which held the casing together. If this operation were to affect the hose itself, it could cause a rupture in the oxygen line.



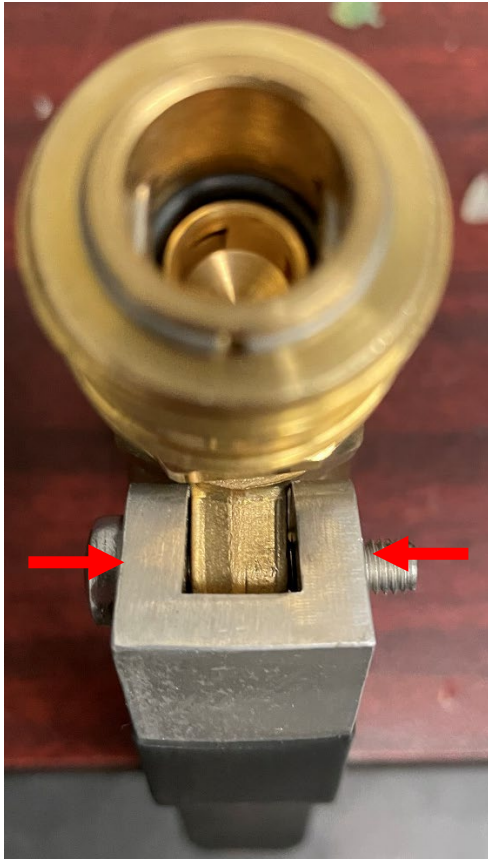
Wire Shielding

Unlike our BR-22, the power line lacks shielding within the torch handle. This could allow the power to cause a voltage between the diver's hand and the wire and produce a shocking sensation.



Aluminum Trigger

The trigger is made from cheap aluminum and is not sized correctly. It was made far too large for the mount they designed which means it is more likely to bend out of shape causing failure in the future.



Intellectual Property Infringement

These two torches are very similar in many ways. Below is an image depicting both torches next to one another. The casing, flash arrestor, head, and overall assembly concept are the most alike (the collet nut thread is similar enough to make the parts interchangeable). See detailed comparisons below. Looking into design patents filed by Broco for this design will allow us to take legal action against this other torch and lay claim to any profit they may have stolen.



Additional areas for inspection

Foam Bushing

There is a foam ring between the body and the collet nut. This may be for insulation purposes but could potentially be made from a combustible material.



Rubber Washer

Like the BR-22, there is a black rubber washer which sits under the collet that provides a sealed surface for the rod to rest against. This will also require a combustion test or further research to determine material safety.



Materials Testing

Potential combustible materials (foam bushing, rubber washer, hose) were exposed directly to an open flame to observe their reactions. While the Foam ring and hose remained engulfed for a short period afterwards, ultimately, they self-extinguished after a few seconds.

The foam ring and rubber washer do not raise any concerns as they will most likely become extinguished by the water in their immediate surroundings. The hose however, burned for long enough to be concerning (15 seconds). If a flame or spark were to make its way into the O₂ line, the hose could erode enough to cause a leak or catch flame.



Ash post-burn