



brewology

THE APPLIED SCIENCE OF BREWING

Brewology Cask Washers

Technical information

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Tornado TC62 Cask Washer

(62 Firkins per hour using the standard Brewology recipe)



How does it work?

The washing process is fully automated and simply requires a cask which has had its shive and keystone removed to be placed on the wash station (no drain or pre-rinse is required).

Washing can only commence when the process systems are at the required recipe set points, temperatures, pressure, levels etc. If the system is not ready to wash, the screen will indicate to the operator the reason why washing has not started. When a cask is present on a wash station, the safety switch will be set on and allow washing. If an operator moves the cask during washing, the machine will stop the process.

The washing process begins as follows:

- **Drain open** - Liquor and solids drain out from the cask through a coarse mesh screen and emerges from the drain outlet on the side of the machine (this should be located over, or piped to a suitable drain).
- **Pre-wash to Drain** - Approximately 6 to 7 litres of pre-wash (recovered liquor) will be pulsed into the cask at 6 bar+ via a free spinning rotating wash nozzle. The spent liquor draining from the cask will continue to go to drain.

- **Pre-wash to Recovery Tank** - The internal pneumatic drain shuttle will now move to divert liquor draining from the cask to the recover/pre-wash tank via a tank top filter tray. The pump will now circulate pre-wash liquor from the tank through a pump suction filter with a 100-micron Stainless Steel mesh filter. This prevents debris from damaging/blocking the pump and washer nozzle.
- **Detergent to Detergent** - Hot detergent will now circulate from the heated detergent tank via a mesh tray and pump suction filter. The internal drain shuttle moves to return spent liquor from the cask to the detergent tank.
 - Recipe-driven detergent tank heating and temperature control (typically 60 to 70°C)
 - Heat Recovery from Pre-Wash Tank
 - Optional detergent dosing
 - Optional detergent strength monitoring
- **Final Rinse & Sanitisation** - 80°C minimum, 85 to 89°C under normal operation
 - Tuned to use 6 to 7 litres per Firkin wash
 - Spent liquor returns to Pre-wash/Recovery Tank
 - Excess heat used to heat detergent tank
- **Cycle complete** - lamp flashes and drain to drain opens

Why you need a Tornado Cask Washer

- Quick and effective
 - 62 Firkins per hr from 6 to 7 litres of clean water
 - Pulse washing via a special cutting blade rotating nozzle
 - Powerful pre-wash at up to 7 bar gauge pressure
 - Hot detergent wash at pressure up to 7 bar gauge pressure
 - Hot Final Rinse for Sanitisation and effective detergent removal
- Compact small footprint for high performance
- Remove the shive/keystone load and wash
 - No need to drain
 - No need to pre-rinse
- Cost effective to operate
- Guaranteed wash and sanitise to recipe parameters
- Adjustable recipes for deep clean
- Can support Keg washing
- Time clock to automatically warm up ready for production
- Remote diagnostics and customer support

Tornado Modular Cask Washer TCM90-S

(90 Firkins per hr on the Brewology wash recipe)

This is a triple station cask washer, with two inbuilt base tanks, nominal 300 litre each.

The washing process is fully automated and simply requires a cask which has had its shive and keystone removed to be placed on the wash station (no drain or pre-rinse is required).

Washing can only commence when the process systems are at the required recipe set points, temperatures, pressure, levels etc. If the system is not ready to wash, the screen will indicate to the operator the reason why washing has not started. When a cask is present on a wash station, the safety switch will be set on and allow washing. If an operator moves the cask during washing, the machine will stop the process.

This modular Cask Washer is different from the TC62 twin station machine as each wash station operates as a separate cask washer fed from common services.

Each liquor supply, hot water, pre-wash and detergent wash uses a dedicated pump with variable speed controls which enables the pump to run at the optimum pressure and flow rate.

When the washer is warming up or or idle, the pumps will run at sufficient speed to circulate the liquor to ensure the system remains hot and ready for use. When washing, the pump speed will increase to deliver 6 bar gauge pressure during washing on the pre-wash and detergent wash, the hot wash works at slightly lower pressure 3 bar gauge pressure.

When the operator presses the start button, washing will commence on a wash station with a cask present and detected. If the operator moves the cask during washing, it will immediately stop the washing process on the appropriate wash head.

Tornado Modular Cask Washer TCM150-S

(150 Firkins per hr on the Brewology wash recipe)

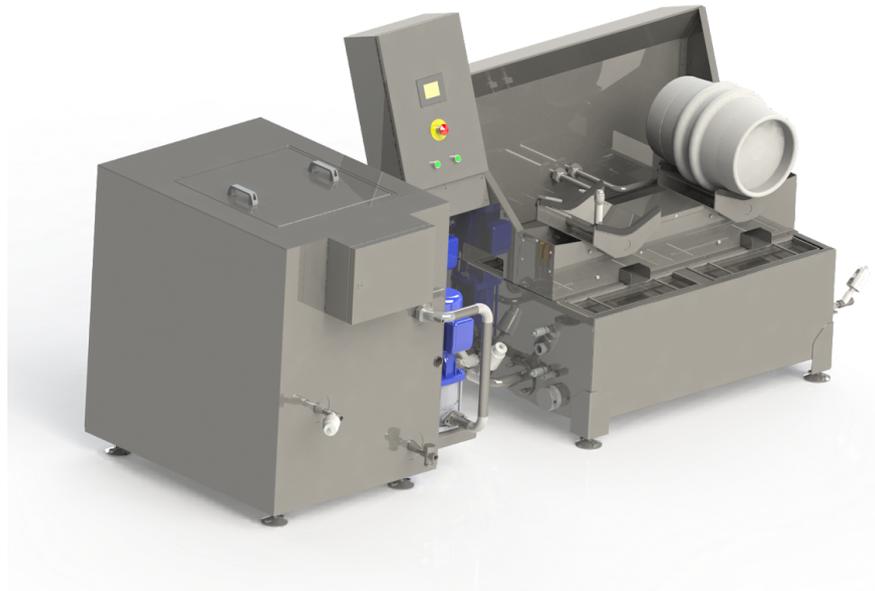
This is a five station cask washer, with two in-built base tanks, nominal 500 litre each with a steam heating coil and temperature controls in the detergent tank. The Cask Washer is constructed from a triple station master station cask washer with an add-on twin station extension. This can be supplied factory fitted or purchased as a bolt on add-on at a later date.

As individual separate wash stations, the operator simply starts at one end and works his way along the washer unloading, loading and starting each separate wash station. This spreads out the operator effort required and provides a sustainable production system.

One operator can easily service up to 6 wash stations as individual units whilst 2 or 3 units is normally considered the max for a batch load and wash machine.

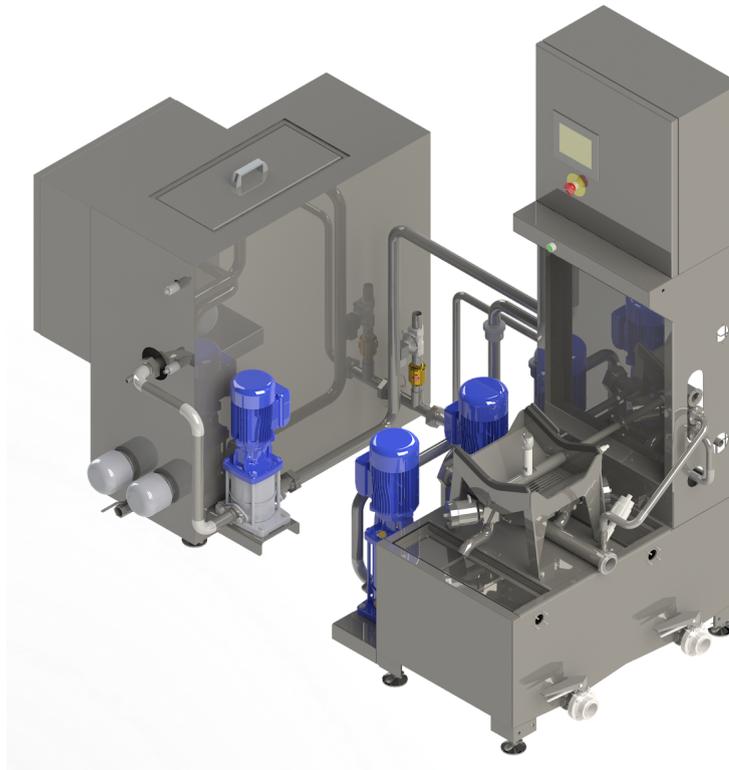
At 150 Firkins per hour this matches the needs of a ECM 120 Cask Racker/Filler. The specification and detail are the same as for the TCM90-S above.

General Information Tornado TC62 Cask Washer & HWT 500-S



The new washer was designed to be efficient and effective whilst being easily maintained and operated. Its primary function was to De-Ullage, clean and sanitise the cask to ensure there was nothing to spoil your quality crafted ales.

The most popular cask washer is the TC62 twin station unit. This module can de-ullage, wash and sanitise 62 Firkins per hour (110 seconds for 2 Firkins) with time for off-load and reload. Recently we have also introduced the new Tornado Modular Cask Washer, which starts with a single station unit which can have additional modules added at any time. This new range goes from TCM32 to TCM180.



Tornado Modular Cask Washer TCM32-E with a 250L-E Hot Water Generator

De-Ullage (Old product removal)

Most cask washers aren't able to effectively cope with ullage (old beer), and require either draining and/or rinsing prior to cask washing. This is time-consuming and expensive. On a Tornado Cask Washer, you don't have to worry about this. The washer "drains to drain" and "pre-washes to drain" to remove the ullage and other debris once removing the shive and keystone.

If it's essential or desirable to collect the Ullage separately from detergent contaminated wastewater, then the new Modular Tornado can have these facilities added as an option.

Pre-Wash

We recover the very hot sanitisation water to a pre-wash tank. Some of the heat is transferred to the detergent tank to maintain its high temperature. The rest is used to pre-wash the new cold cask and commence its journey to hot, final sanitisation. The actual pre-wash process is split into two stages, with the initial stage being "pre-wash to drain" and the second stage "pre-wash recirc". The water used in stage one is balanced to the amount of final rinse to minimise water usage, yet still maintain adequate pre-washing and debris removal.

Pulsed Washing

A key feature of a Tornado Cask Washer is its timed power pulsed washing system. If you were to blast powerful wash water into a cask, it would quickly fill the up and engulf the rotating

wash nozzle. By timed pulsed washing, the cask can drain between power pulses to provide an effective clean. On large walk beam Cask Washers, you have a drain period as the cask moves forward. However, on a Single Station Cask Washer, you don't have this option. Effective cleaning needs the high power flow, at 5 to 6 bar pressure, which scavenges the debris from the internal cask wall. We have optimised the power pulse and wash nozzle to remove fruit fly larvae. We achieve the best results in the industry with our system, however, we cannot guarantee removal of a bad infestation which may require an acid detergent presoak and a second wash in some cases.

Rotating Wash Nozzle

The Brewology rotating wash nozzle has taken over 30 years to develop. In this time we've produced a nozzle which is robust, can scour the cask with a water cutting blade and yet has a realistic flow rate. The nozzle is optimised for 5 to 6 bar water pressure, which won't atomise the water. It's worth noting that the nozzle is a precision device machined to very close tolerances, and should be considered a consumable part due to its wear. It should, however, last for over 12 months with normal use, and can be monitored by simply observing the pressure during washing via the Tornado HMI (Touch Screen).

On other cask washers, the nozzles used are based upon tank/vessel cleaning CIP nozzles which use low-pressure fluids to wet and soak the internal vessel walls.

Hot Detergent Wash

The main wash on our Tornado Cask Washer is based upon hot detergent normally at around 60 to 70°C. This is directly heated by either electric immersion heater (6Kw) or a steam coil. The temperature is accurately controlled via a transducer connected to the PLC/HMI. You have the ability to set the temperature and its alarms via the recipe, as well as monitoring the temperature either on screen or remotely. We also recover heat from the spent final rinse liquor which is recovered to the adjacent pre-wash tank. We can add options to our system to automatically dose in additional detergent and use a conductivity probe to monitor the detergent strength. Automatic dosing is a low-cost addition which replaces manual dosing, but without conductivity monitoring (which is an expensive addition), there is always some uncertainty with simple auto dosing. The very simple solution is to add detergent each time you refill the detergent tank (2 litres is typical for a new tank).

Final Hot Sanitisation Rinse

Over the last 30 years, the process of hot water final rinse sanitisation has been developed to replace steam cask sanitisation. In keging, steam sterilisation is an essential feature for long shelf life and because a keg is a sealed pressurized vessel, it can be steam sterilised at 3 bar.

A cask, however, is an open unpressurized vessel when washed, and injecting pressurized steam is extremely wasteful of energy. Also, most brewery steam supplies are not suitable for injecting into a cask or keg without substantial preparation i.e. separation/strainers and culinary filtration.

The Brewology Tornado Cask Washer uses hot final rinse water to sanitise the cask. The process is designed to raise the cask's internal surface up to above 80°C by injecting hot clean water at a temperature of between 85 to 89°C. From our vast experience of cask cleaning, we

believe this to be the best practical and most economical means of ensuring that the next beer to be packaged in a Tornado cask will not spoil its product.

Tornado Master Controls

The Brewology control panel on a Tornado cask washer is a variation of a standard Brewology Master Control Module. It contains a PLC HMI (Colour Touch Screen / Human Machine Interface) a mains power distribution system, a DC power supply and distribution system, a network interface, machine I/O and the very important external communications port (Internet connection). The Tornado Controller also has the motor control gear for combined Pre-wash / Detergent pump. The powerful PLC/HMI has spare capacity to control a Hot water generator Keg module utilising the Tornado cask washers as the Kegging Det Set. Automated CIP set and general Brewery and Cold Room automation and instrumentation.

Safety & Operation

The Brewology Tornado TC62 cask washer is a twin station machine which washes two casks simultaneously you can also wash single casks if required. A cask sensor detect each cask and will only wash on the station where a cask is detected. If no casks are detected the machine will not operate. The Tornado modular range TCM 32/62/90/120/150/180 cask washers have sensors and a station start button and will only wash when the sensor is activated by a cask.

The Cask Washer will only operate when its processes match the recipe set points and a cask is present. The operator then simply presses the start button and leaves the Tornado Cask Washer to go through its recipe driven times, temperatures and pressures to ensure the cask is de-ullaged, clean and sanitised. The operator will only get the OK to remove the cask when its critical parameters have been satisfied.

Hot Water Tank / Hot Water Generator

The Brewology Tornado cask washer is recommended for a final hot water sanitisation rinse. The temperature required is much higher than traditional commercial hot water systems and thus needs a specialist industrial hot water generator. The Brewology Hot Water Generator is specially designed to deliver hot water at 85 to 89°C to meet the needs of Cask Washing and Keg Washing. The tank can heat up via electric immersion elements, 18 or 36 kW, gas via an immersion tube, LPG, natural gas burner, or steam coil in the tanks.

The HWG will be complete with the HW pump and controls which will be networked to the Tornado Master Controller on the cask washer.

We normally supply this HWG with a standard connection kit. This includes the flow and return lines, all pre-made and factory tested. However, the standard connection kit is based on our standard range of Tornado Cask Washer/HWG layouts. If you require a different layout, you can inform us of the revised layout and we can quote you for a pre-made bespoke connection kit, or you can get the connections made locally. A process flow sheet will be provided to assist you.

Cask Washing Services

The Brewology Tornado Cask Washers and Hot Water Generators can deliver higher performance compared to our competitors but to achieve this it necessary to supply our systems with adequate services. We are happy to advise, assist and work with you, your consultant or contractor.

Electric Supply

The Tornado Master Controller requires a three phase 415v 50hz TP&E supply, normally via a 32 amp plug and socket (size is dependant on the method of heating)

The Hot Water Generator requires a three phase 415v 50hz TP&E supply, normally via a 16/32/63 amp plug and socket (size is dependant on the method of heating)

For a steam heated tank A 16 AMP p&s will be OK.

Clean Cold Water

This connects via a 1 inch solenoid and non return valve to our hot water tank. If you connect this via a hose this should be a least ¾ inch with about 1 bar pressure.

Compressed Air/Machine Control Air

At 6 bar gauge pressure, clean, dry, industrial quality compressed air, with minimal oil carryover, connected normally via a 10mm push fit connection. The air set (filter regulator, pressure gauge, isolator is included).

Steam

At 0.5 to 3.0 bar gauge pressure, trapped and filtered to remove all rust and debris.

Drainage

This machine should be sited on a wet floor with adequate drainage,

Brewology has optional modules available to process the services locally and can also supply suitable steam generators and air compressors specially selected to meet the needs of Cask Packaging & Kegging.

The New Brewology Modular Cask Washer



Tornado TCM90

Brewology has extended its successful range of Tornado Cask Washers with a Modular Cask Washer. The range starts with a Single Station Basic Module, which is extendable by adding further second stations at any time. For larger breweries, the TCM90 Station Washer is the better option, with add-ons to produce 4, 5 or 6 station cask washers with the capability of producing cleaned casks internally from 90 Firkins/hr to 180 Firkins/hr.

Unlike other fixed station Cask Washers, where a batch of casks are loaded and washed simultaneously, the Tornado Modular range is a group of independently fixed station Cask Washers which you load and start each module independently. This arrangement provides significant benefits when you have three or more washing stations, as the operator can service the washer at a much more leisurely and less critical pace.

One advantage of the Modular Cask Washer, is that if the operator is late reloading a wash station, it will only affect that station, as opposed to all stations. In practice, a traditionally fixed station cask washer unloaded and loaded by an enthusiastic operator may achieve the quoted performance rate for a few wash cycles, but this rate will soon tail off. On a modular cask washer, even with more stations, the operator will be able to achieve a much greater sustainable output.

The washing process on a modern Brewology cask washer has been optimised to work within a 2 minute cycle (120 seconds), 112 second washing, 8 second for off loading and reloading each module.

The wash cycle is also optimised to utilise the minimum amount of clean hot water at 85 to 90°C to rinse the detergent and pasteurise/sanitise the casks internal surface, making it safe for the next batch of quality cask ale. A typical Firkin cask wash is balanced to utilise just 6 to 7 litres of new clean hot water per internal clean.

Traditional wall beam cask washers use up to 100 L per firkin wash, and modern fixed station small cask washer can use over 20 L per wash.

The tradition of steaming a cask with often live unfiltered steam is both ineffective and very expensive and unfiltered steam often introduces rust from the pipework into a clean cask. In the days of dark brown beers, milds, porters, and stouts this may have been acceptable, but you don't want rust stains spoiling your crafted IPA or cask lager.

By reducing the amount of new clean water per cask, this also reduces the energy required to clean each cask internally and also ensures the Tornado Cask Washer discharges the minimal amount of wastewater/effluent. The intake and final discharge (wastewater) are balanced.

Ullage Collection Option

The Tornado Modular Cask Washer, like its kegging relation, has the added option to sort strong/organic effluent without detergent from general wastewater, which will contain traces of detergent.

Many breweries separate strong effluents such as waste yeast and cask bottoms from the general mixed wastewater. This allows them to utilise strong chemical free effluent as a fertilizer and spread it on the land.

This option is accomplished via a 4th drain valve at each station which feeds into a second 2 inch drain line.

Modular Construction

The new Tornado Modular Cask Wash is constructed using common tanks, with dedicated pumps for Pre-wash, Detergent wash, and Final Hot Rinse/Sanitisation. The wash stations are modular units with a modular supply valve manifold and a modular cask cradle and combined drain manifold.

Cask washing is an essential process in a cask brewery and it's essential to minimise downtime, yet reduce service and maintenance costs. The Brewology Tornado Modular Cask Washer has three separately pumped supply services from three tanks. This simplification improves reliability - with tray strainers and a 100-micron pump suction filter, there is little chance of cask debris from blocking a pump. We only use quality Stainless Steel multistage pumps which can, if necessary, be service exchanged via Brewology along with other key plant items.

The modular valve blocks used on the new both the Modular Tornado Cask Washer and

Module Keg Washer/Filler are common and the supply identical services such as recovered rinse water, detergent, and hot rinse water. The Keg machines have additional services such as processing air, CO₂, and steam to blow back liquids from the sealed pressure vessel (kegs). This makes it practical to utilise the twin tanks mounted below a Modular cask washer. The hot final rinse water, which is needed for both cask final rinse and keg final rinse, can also be common to both cask and keg packaging.

On the new Modular Cask Washer, the three individual service pumps for Pre-wash, Detergent, and Hot Water are all controlled via a variable speed, digitally controlled pump, which is programmed to deliver the correct flow and pressure on demand to whatever device it's supporting. Thus pre-wash, detergent or hot water final rinse can be supplied to a rotating wash nozzle on the cask washer, the wash head on a keg washer, and it can even deliver CIP liquor to a fixed product line or tank spray ball to provide fully automated general CIP.

Using the Cask Washer as a General CIP Set

The latest Brewology Tornado Cask washer Modular (TCM) can also be further utilised as a general plant CIP set for cleaning other beer processing machines, and services such as pipework and tanks. To fully automate the process, you need additional add-ons to operate the cask washer as a general CIP set. But these add-ons, such as automated detergent dosing and monitoring also improve both cask washing and keg washing and allow for cleaning the tanks, and supplying and processing product such as FVs, CTs, DPVs MTs and BBT. As an automated general CIP set, the TCM can also clean the cask filler, keg filler, bottle or can filler, and can even be programmed to clean and monitor overnight, as well as providing automated text alerts should a process fail.