



CCBA 2019 Spring Conference  
San Diego, California  
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# D SYSTEM KEG VALVE

Design, Function, Maintenance and Safety

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Sales Manager, North America  
*Packaging Division*



# *The Challenge:*

*How can keg line Packaging Managers, Maintenance Engineers, Production Managers and Operators, QA and QC Managers, Warehouse and Cellar Workers all work together to achieve the ultimate goal...*

## Customer Satisfaction?

Knowledge of Best Practices is key

Proactive maintenance is critical

Training and adherence to SOPs is essential

Participation of every team member is  
necessary

# Spears Around the World



- \* **A-System** = Alumasc
- \* **G-System** = Grundy
- \* **S-System** = Sankey
- \* **D-System** = Draft System

- \* **U-System** = Universal Equipment Company
- \* **M-System** = Micro Matic
- \* **L-System** = Soft Drink (Limonade)

# Three Keg Neck Styles

- Two-eared Drop-in Neck
- 14 tpi Threaded Neck
- SOS/Euro Style Neck



# Two Varieties of D System Valve

## Ball Beer Valve



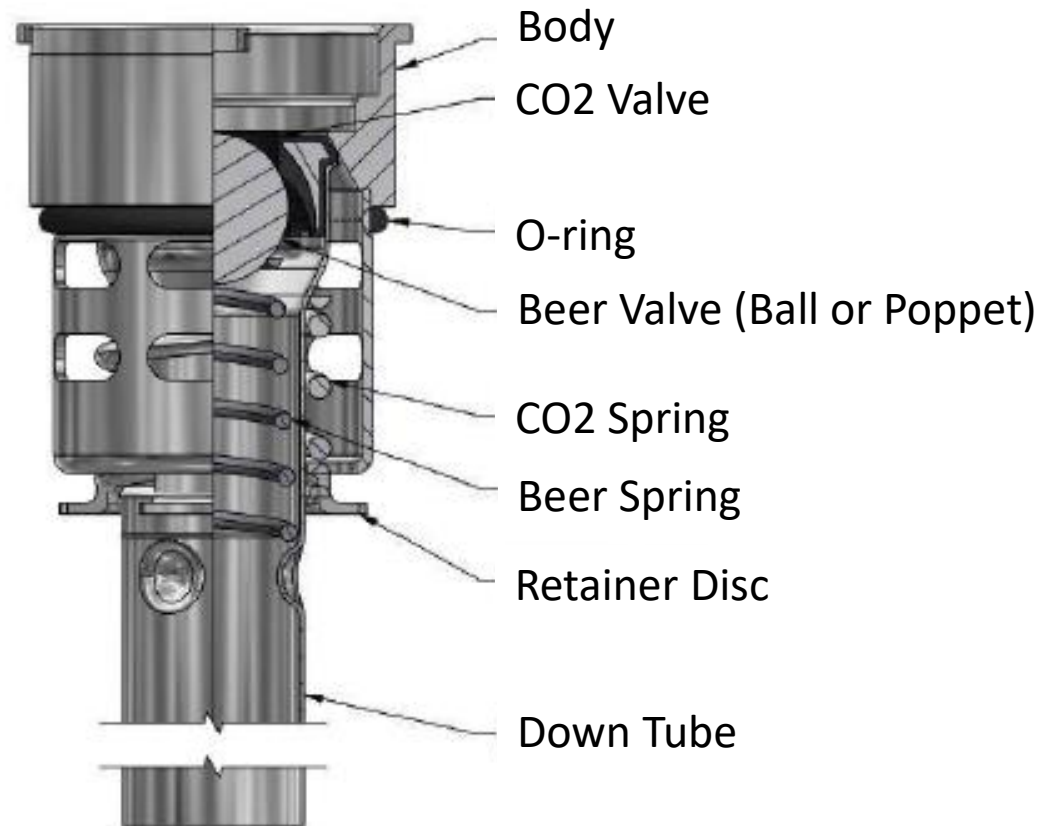
## Poppet Beer Valve



\*Note that almost all internal components are unique to their valve type. Ball style beer valves are the most common. Poppets can be most easily recognized by the flat spot on the top of the “button”

# Identification of Parts

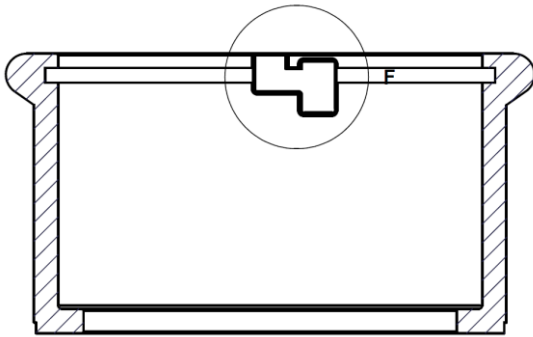
Full assembly: keg “spear”





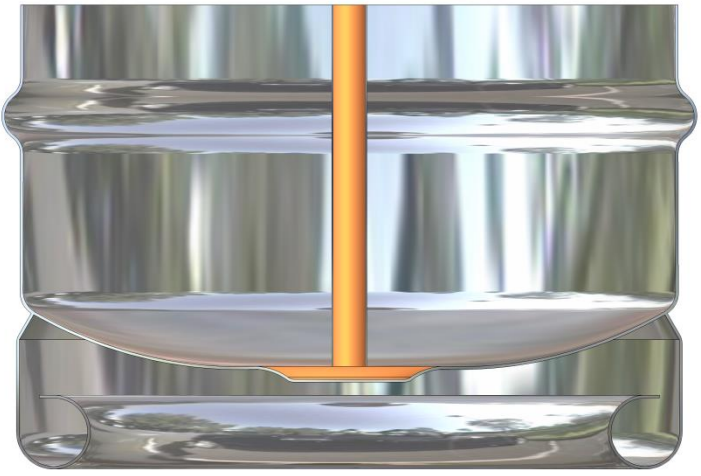
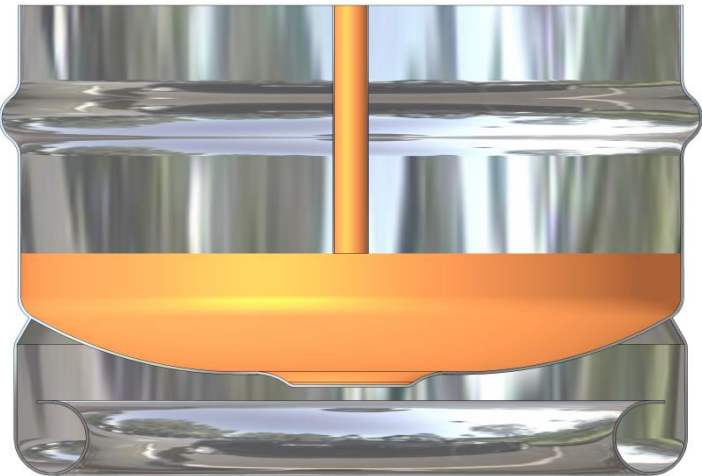
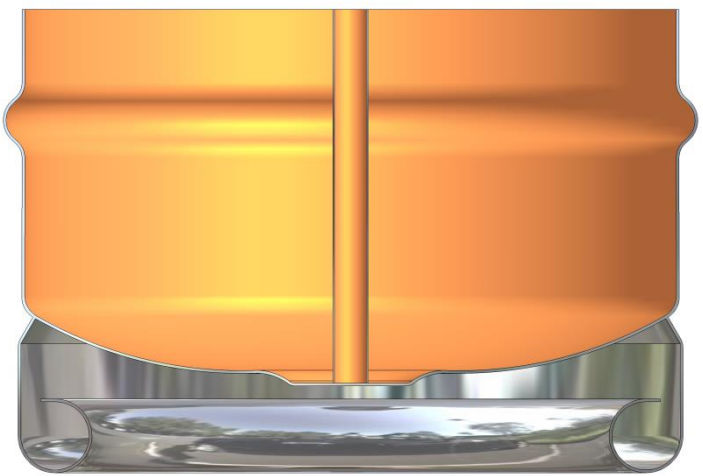
# D System Spear Safety Features

- Drop-in spears: Squared “ears” on body fit in the Z-slots in keg neck
- Drop-in spears: Double Circlip, safe until tampered-with or reused
- Threaded spears: Safety Clip
- Pressure Relief Safety Feature: both poppet-type and certain ball-type for untapped kegs



# Spear Length, Critical to Function

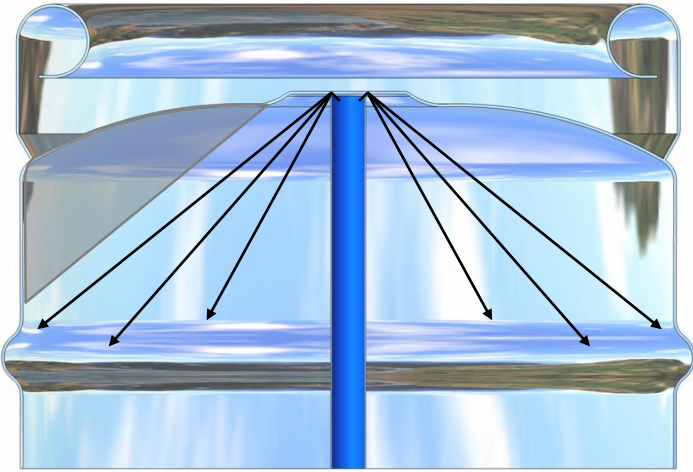
## Filling and Dispensing



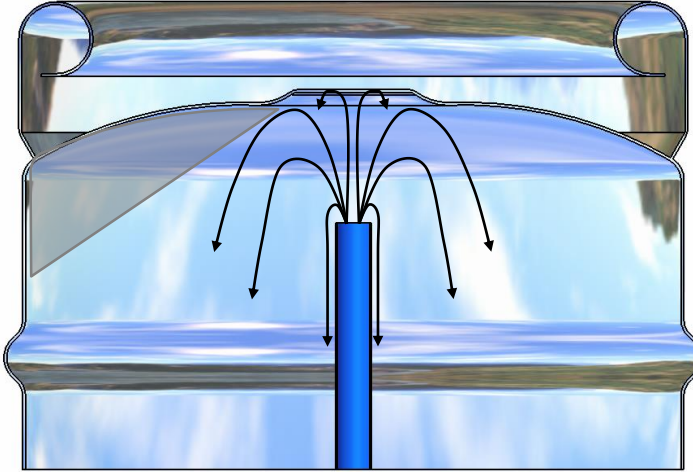


# Spear Length, Critical to Function

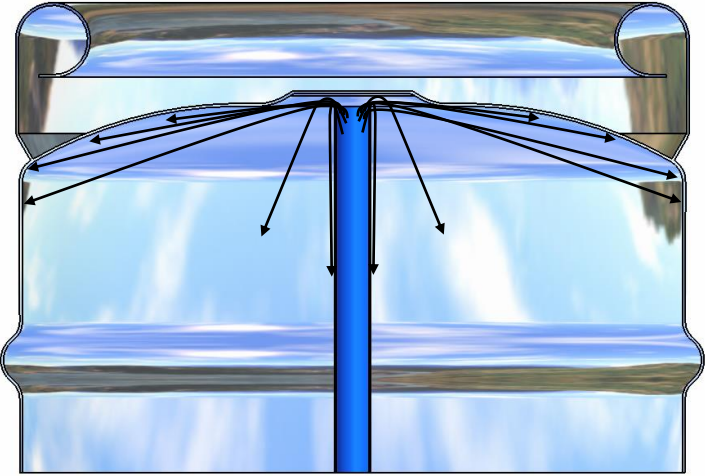
## Cleaning



too long

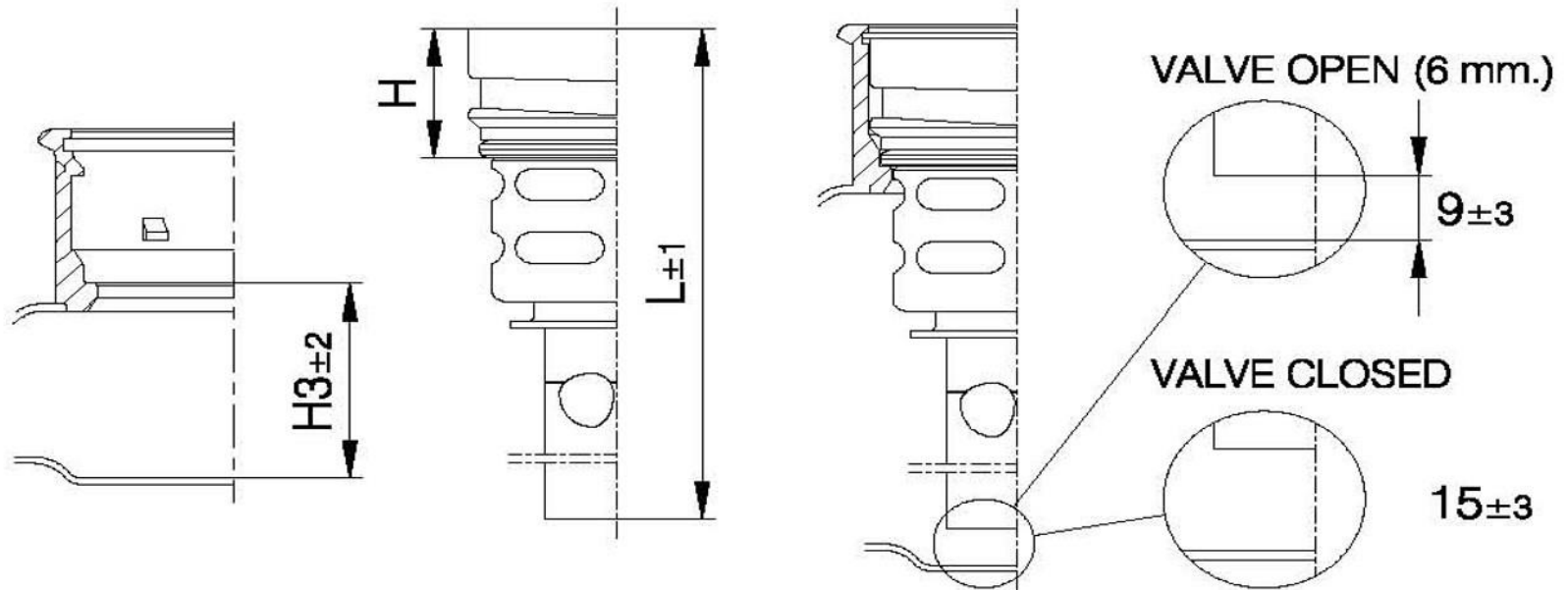


too short



# Determining Correct Spear Length

- Drop-in, SOS Type Necks:  $H3 + 12\text{mm} = L$
- 14tpi Threaded Necks:  $H3 + 15\text{mm} = L$



# How Do Valves Fail?

- Beer Leaker
- CO2 Leaker
- Foamer
- Delamination of CO2 Valve
- Neck Leak



# Causes for Valve Failure:

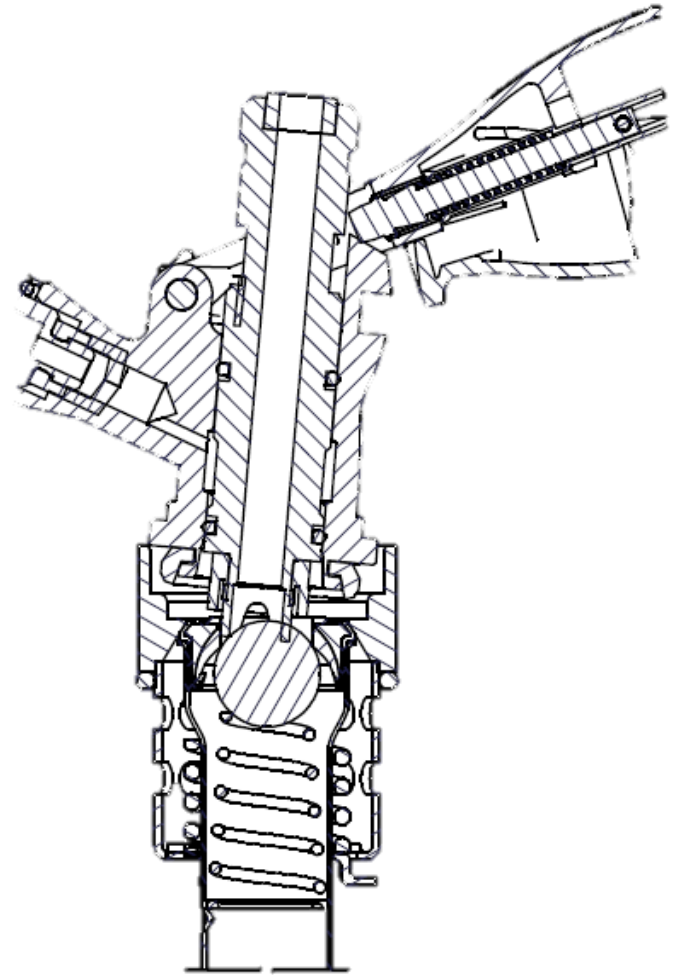
*Damage due to abuse!*

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- Keg Coupler (aka Tavern Head)
- Washer/Filling Line Interface
- Steam Temperature, Chemical Solution Strength or UV Light Exposure
- Overfilling

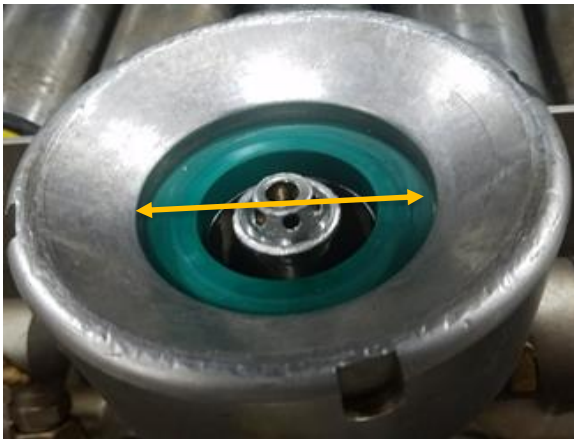
# Keg Coupler Damage

- Damaged - Probes with burrs
- Careless operator - Forced on, wrong position



# Washer/Filler Interface

- Damaged probe
- Keg neck “bent”
- Keg neck poorly centered
- Foreign object



Check diameter of  
Centering Cones.  
Replace at >64.4mm





# Washer/Filler Interface, cont'd

- Poor design of probe

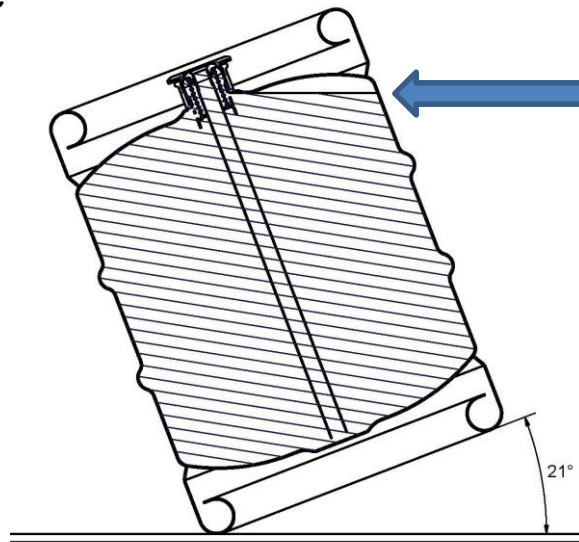


# Steam, Chemical Solution, UV Light

- Micro Matic Recommendations
  - Follow Product Warranty guidelines!
  - Avoid prolonged exposure to sunlight (UV)
- Micro Matic Product Warranty
  - Function, 2 years; Rubber parts, 2 years; Metal parts, 5 years
  - Following guidelines:
    1. **Steam:**
      - a. Maximum temperature 135°C (275°F),
      - b. Maximum exposure, 2 minutes
    2. **Caustic/alkali and/or Phosphoric, Citric, Nitric/Phos blend acids:**
      - a. Maximum solution strength =/ $<3\%$  solution
      - b. Maximum temperature 80°C (176°F)
      - c. Maximum exposure, 10 minutes

# Over-filling

- Thermal Expansion of Liquid = hydraulic pressure  
*Leave head space! Your kegs are designed to hold full specified volume of beer plus head space.*
- **Best method:** fill by metered volume or by weight
- **Second best method:** fill upright to overflow through coupler with keg propped on an angle



**Fill to here!**

(the angle will need to be calculated for different kegs to get the correct volume fill)

*Head space:*

20L = .4L

30L = .6L

50L = .8L

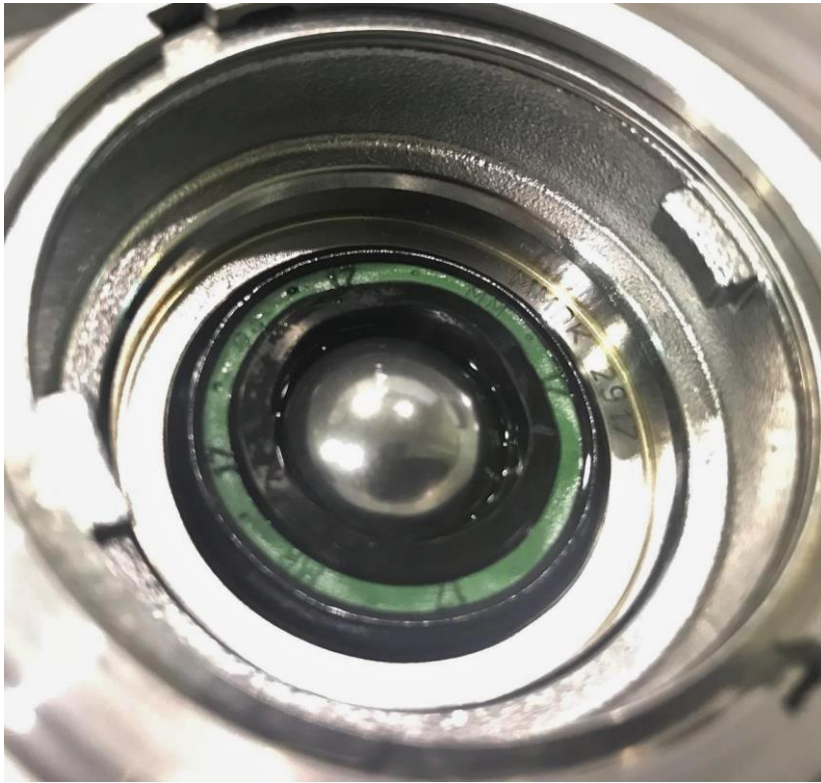
½ bbl = 1.0L

1.5% x 2,000 bbls = 30bbl  
(60 kegs of beer)

- **Worst method:** fill upright, flat on the floor (valve end up) to overflow from coupler resulting in keg that is 100% filled with beer – over-filled

# Damage to Valves

Over-pressurization, likely from freezing or thermal expansion caused by temperature changes and a lack of proper headspace in the keg



# Damage to Valves

Over-pressurization, due to over-filling and extreme pressure of hydraulic force





# Damage to Valves

Early stage and late stages, delamination of CO<sub>2</sub> Valve





# Damage to Valves

Impact damage to CO<sub>2</sub> Valve. Likely beer leaker and foamer.



UV Damage, cracking of rubber due to exposure to sunlight



***And no circlip installed!!! Critical hazard***

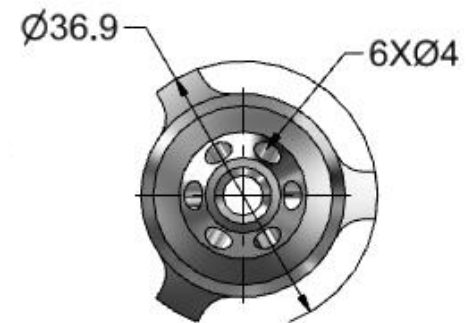
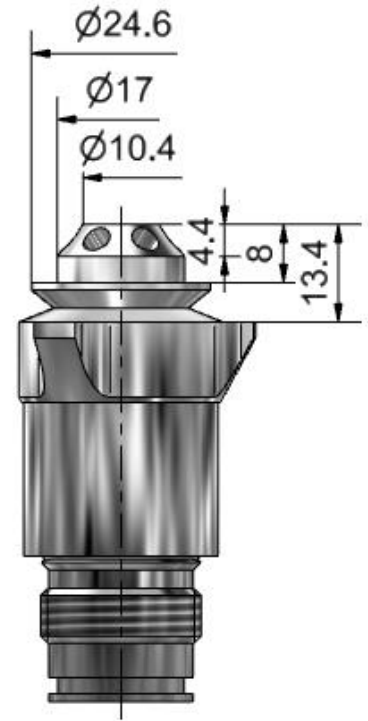
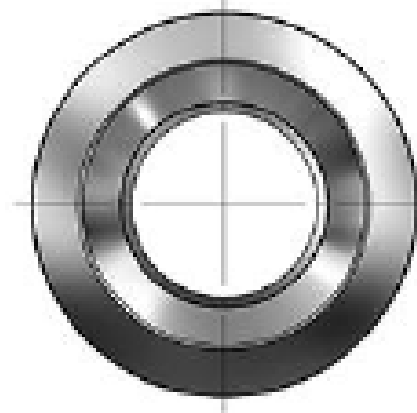
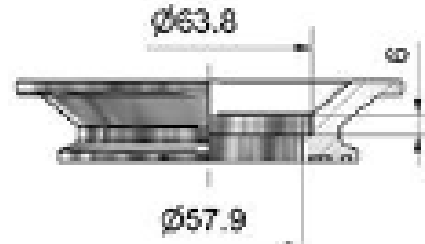
# How to Avoid Valve Damage

## 1. Well-designed and maintained keg washer probes



### Centering Cone

Diameter new 63.8 mm  $\pm 0.1$   
Replace when  $> 64.2$  mm



D-System

# How to Avoid Valve Damage, cont'd

## 2. Maintain Your Keg Valves

- Pull spears for inspection on a regular basis
- **Rebuild spears after about 7-8 years of service, possibly sooner if your valves are abused!**
- Replace both rubber parts and both springs  
(~\$6.20 for parts, 3-5 minutes of your time)
- **ALWAYS use a new double circlip (never reuse these)**
- ALWAYS use proper tools and technique and OEM parts
- **Work safely! Work on ONE KEG AT A TIME! No shortcuts!**
- Send spears out for 3<sup>rd</sup> party refurbishment, MM Certified Valve Refurbisher (or) rebuild in-house
- **Let us help you**

# How to Avoid Valve Damage, cont'd

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## 3. Inspect Kegs Returned to the Brewery

- Check for bent necks, foreign objects, damaged CO2 valves (foamer kegs)

## 4. Repair Every “Bad” Keg

- What does “bad” mean? Sensory problem, flat beer, foamer, beer leaker, neck leaker, bent neck, leaking weld, crushed chime, freeze damage, etc
- Kegs returned as “bad” should be quarantined, sorted and logged, rebuild every one!

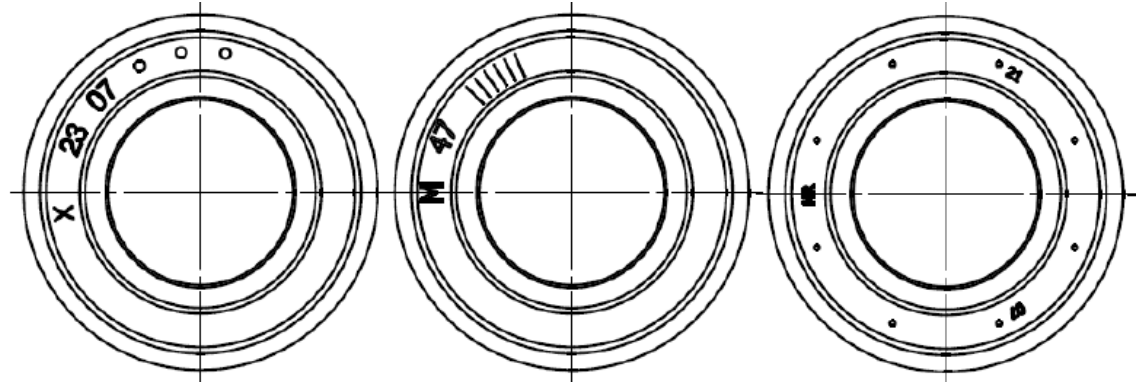
## 5. Follow MM Product Warranty Guidelines

## 6. Don't Overfill

# Age Determination of Keg CO2 Valves

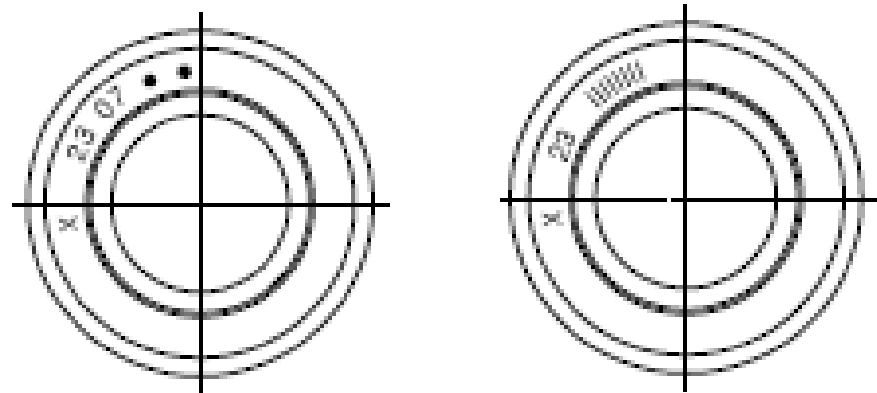
*(non-color-coded)*

- MM Ball-style



(first hash mark = 2002)

- MM Poppet-style



(first hash mark = 1993)

# Age Determination of MM Keg Valves



(color-coded)

2017

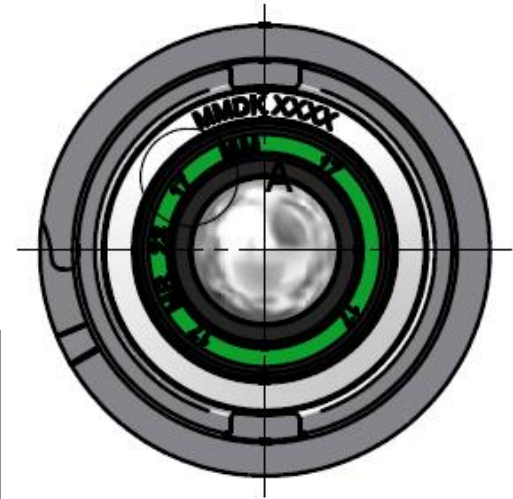
RAL: 6032

2018

RAL: 8001

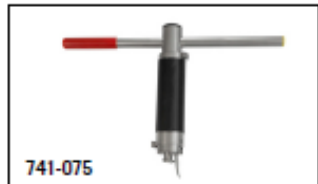
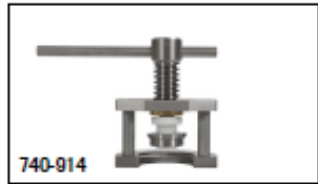
2019

RAL: 1016





# Use Proper Tools – Safely!



# Best Practices - Safety

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- Establish and maintain strict SOPs for personnel and conduct formal in-house certification-level training
- No one works on kegs who isn't fully trained
- Always double-check that keg is depressurized, yourself and handle every keg as if it is under pressure
- Work on one keg at a time – start to finish
- Use the correct tools and parts matching original manufacturer
- **Never reuse circlips**, train everyone to identify damaged, tampered-with, missing circlips
- Follow tool/valve manufacturers' guidelines

# Best Practices - QA / QC

*In addition to standard QC sampling methods and practice:*

- Quarantine and log every “bad” keg – look for trends; what does “bad” mean? Search for the source of the problem
- Inspect every keg coming back into your brewery
- Repair every “bad” keg - 5 minutes, <\$10 parts
- Pull and inspect spears regularly
- Check keg washer performance and condition regularly
- Proactive, routine refurbishment of keg valves
- Check fill levels regularly

# What is the end result?

*A multi-level program of  
QC / QA and Safety Assurance  
to achieve the ultimate goal:*

**Customer Satisfaction**

*for your Draft Packaged Beer*

Thank you for your interest and attention!

*For additional information, please contact me:*

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