

safe and reliable



KÜHME Hydrogen ready Solutions



- **Hydrogen – Gamechanger for a Carbon-Free Economy** **3**
- **H₂ Color Knowledge** **4**
- **The future is now: H₂ - ready Solutions from Bochum** **5**
- **KÜHME H₂ - ready Valve Equipment** **7**
- **H₂ Fields of Application served by KÜHME** **13**
- **Case Studies | References in H₂** **14**

FIND OUT MORE

The interactive MORE Button will lead you to content related additional, more detailed information.

You are Welcome. Just try and find out.



Hydrogen – Gamechanger for a Carbon-Free Economy

As the most common chemical element in the universe associated with a potential immeasurable availability as secondary energy carrier, the potential of hydrogen as an energy source is undisputable and has been recognized far earlier than today. In consequence hydrogen is for example an essential component of liquid rocket fuels.

Aiming for a carbon neutral economy, hydrogen has been assigned the leading strategic role based on recent decisions taken on governmental level as well as by the energy and producing industry in many states around the globe. Hence it is for sure that hydrogen as a renewable fuel in civil and industrial energy will become most significant in view to the production as well as utilization green energy strategy.

Besides setting up distribution network infrastructure the linked challenges will be to adapt equipment and technology to large scale plant design, which requires know-how and expertise but does not prerequisite rocket technology.



Green Hydrogen

Produced solely from renewable sources, like:

- Pyrogasification or electrolysis of water with electricity from wind, solar or biomass
- Biogas steam reforming

Turquoise Hydrogen

Produced by means of thermal cracking of methane (methane pyrolysis) in which solid carbon is created instead of CO₂. The heat supply of the high-temperature reactor must be based on renewable energy sources and the permanent binding of the carbon must be ensured to maintain CO₂-neutrality.

Blue Hydrogen

Produced from conventional energy sources, either:

- Fossil sources with CO₂ capture and storage (CCS)
- Water electrolysis by means of nuclear power

Grey hydrogen

Produced from fossil sources, usually from natural gas steam reforming to H₂ and CO₂



The future is now: H₂ - ready Solutions from Bochum

Due to its low molecular mass hydrogen is a challenging medium. Within hydrogen applications suitable valve technology has to consider in particular high-performance sealing systems and material resistance. KÜHME is familiar with the relevant engineering since the 1970s, in which high-cycle switching valve series for PSA plants have been established.



KÜHME - pioneers in hydrogen applications since 1973

Nowadays - no question of color, whether green/turquoise, blue or grey - KÜHME Solutions provide uncompromising safety for hydrogen applications in its production processes as well as its consumption sided utilization in energy generation.





No matter whether the single plate gate valve in gas distribution grid, the quick closing shut-off valve in firing system or the complex tailored mixing skid, all KÜHME solutions made in Bochum warrant for maximum degrees of reliability and safety for the individual hydrogen application.

**Where essential safety is not negotiable
- KÜHME your first choice!**



Based on these principles KÜHME as a know-how carrier as well accompanies the development of new or special applications with tailored key technology. In addition to a strong cooperation partner, we are already now able to offer a broad hydrogen ready and proven product portfolio for multiple application fields.



KÜHME Single Plate Gate Valves



ELI-SIL / DELI-SIL



50 (2") to 400 (16")

Up to 100 bar g

-10...+70°C

Manual Remote



DELI-GAL / DELI-SAL



50 (2") to 300 (12")

Up to 100 bar g

-10...+70°C

Manual Remote



available not available

Available size range DN/(ND)

Pressure range ($P_{operating}$)

Temperature range ($T_{operating}$)

Type of actuation

Absolute gas tightness

Type approval (DVGW)

MORE



safe and reliable

KÜHME Quick-Closing Safety Shut-off Valves



KVF

KVII/F

KVII/HF



15 (½") to 50 (2")

65 (2½") to 300 (12")

65 (2½") to 300 (12")

Up to 50 bar g

Up to 12 bar g

Up to 16 bar g

+200°C

+180°C

+180°C

<1 second

<1 second

<1 second



■ available □ not available

Available size range DN/(ND)

Pressure range ($P_{operating}$)

Temperature range ($T_{operating}$)

Closing time (*standard*)

Type approval (*PED, EN 161 & EN 16678*)

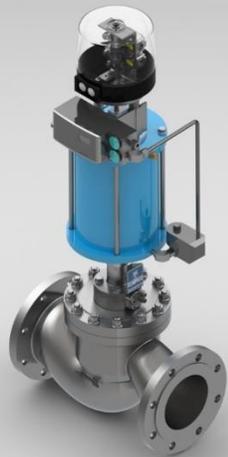
Zero leakage (*EN 12266-1 class A*)

MORE



safe and reliable

Hybrid Valve



15 (1/2") to 300 (12")

Up to 50 bar g

+180°C

Safety shut-off Control



PSA Control Valve



15 (1/2") to 350 (14")

Up to 50 bar g

+200°C

High cycle on/off Control



The Unique Combination

Safety Shut-Off Valve
+
Control Valve
=
KÜHME Hybrid Valve

available not available

Available size range DN/(ND)

Pressure range ($P_{operating}$)

Temperature range ($T_{operating}$)

Functions integrated

Type approval (*PED, EN 161 & EN 16678*)

Zero leakage (*EN 12266-1 class A*)

MORE



KÜHME ESD Valves for GT Application

KVH

KVH-HT

KVH-GT



50 (2") to 300 (12")

80 (3") to 300 (12")

50 (2") to 300 (12")

Up to 50 bar g

Up to 50 bar g

Up to 70 bar g

+180°C

+225°C

+260°C

<1 second

<1 second

0,15 seconds



available not available

Available size range DN/(ND)

Pressure range ($P_{operating}$)

Temperature range ($T_{operating}$)

Closing time (*standard*)

Type approval (*PED, EN 161 & EN 16678*)

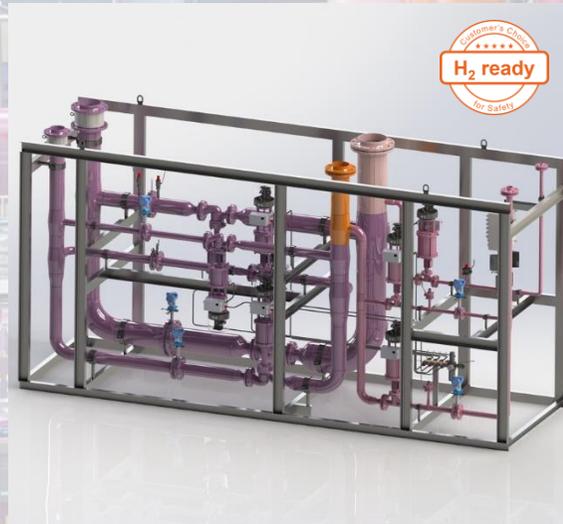
Zero leakage (*EN 12266-1 class A*)

MORE



H₂ Gas Burner Skid

H₂ Mixing Skid



15 (1/2") to 300 (12") *(and above)*

15 (1/2") to 300 (12") *(and above)*

available not available

Size spectrum DN/(ND)

Ready to connect System

Customized & tailored design

KÜHME valve technology

Valve functions incorporated

Standard conformity *(PED, EU-Rules)*

- Safety shut-off
- Control

- (Safety) Shut-off
- Control



■ First class internal and external tightness

- Ready to connect systems

■ Heavy duty design for highest number of operating cycles

- Tailored system solutions from one hand - engineered and made in Bochum

■ High safety level through zero leakage

■ Diffusion and embrittlement safe design

■ High-performance valves with a extended service life

- Compact system design, fully pre-tested and certified

■ Proven Valve Equipment for hydrogen application since 1973

H₂
ready

Large or small scale: H₂ Applications served by KÜHME



Industrial Firing



H₂ Storage



Gas Engines



Gas Grid



H₂ Production



Gas Turbines



Steel and Glass



PSA Units



Compressors



Project: Brazil

| | |
|-------------|---|
| Application | Industrial firing / Steel / Residue gas (97,4% H ₂) |
| Equipment | Automatic Safety Shut-off Valves |
| Size(s) | ND 4" / 1" |
| Quantity | 3 nos. |
| Features | KÜHME Safety Shut-off & Vent Valves |



Project: Sweden

| | |
|-------------|---|
| Application | Self acting overpressure protection (@ 335 bar) |
| Equipment | Emergency Shutdown Valve (ESDV) |
| Size(s) | DN 25 |
| Quantity | 2 nos. |
| Features | Tailored KÜHME high pressure ESDV |



Project: The Netherlands

| | |
|-------------|--|
| Application | Naphta Cracker / Hydrogen production |
| Equipment | High-cycling On/Off and Control Valves |
| Size(s) | DN 25 / 40 / 50 |
| Quantity | 20 nos. |
| Features | KÜHME PSA On/Off and Control Valves |



Project: Ivory Coast

| | |
|-------------|--|
| Application | PSA (Pressure Swing Adsorption) Plant |
| Equipment | High-cycling On/Off and Control Valves |
| Size(s) | ND 2" / 3" / 4" / 6" / 14" |
| Quantity | 59 nos. |
| Features | KÜHME PSA On/Off and Control Valves |



Project: India

| | |
|-------------|--|
| Application | Firing (100% H ₂) / Chemical plant |
| Equipment | Automatic Safety Shut-off Valves |
| Size(s) | ND 3" / ½" |
| Quantity | 1 nos. |
| Features | KÜHME DBB Valve Combination |



Project: Germany

| | |
|-------------|---|
| Application | Hydrogen Flare (@ up to 180 bar) / Refinery |
| Equipment | Angle seat Quick Opening Valves |
| Size(s) | DN 350 |
| Quantity | 2 nos. |
| Features | Tailored KÜHME Valve Upgrading |



Project: Korea

| | |
|-------------|----------------------------------|
| Application | Strip processing / Rapid cooling |
| Equipment | Hydrogen / Nitrogen Mixing Skid |
| Size(s) | DN 250 / 125 / 50 |
| Quantity | 1 nos. |
| Features | KÜHME Hybrid Valves |



Project: P. R. China

| | |
|-------------|----------------------------------|
| Application | Strip processing / Rapid cooling |
| Equipment | Hydrogen / Nitrogen Mixing Skid |
| Size(s) | DN 100 / 80 / 25 |
| Quantity | 1 nos. |
| Features | KÜHME Hybrid Valves |



Project: United States

| | |
|-------------|----------------------------------|
| Application | Strip processing / Rapid cooling |
| Equipment | Hydrogen / Nitrogen Mixing Skid |
| Size(s) | ND 4" / 3" / 3/4" |
| Quantity | 4 nos. |
| Features | KÜHME Hybrid Valves |



Project: United States

| | |
|-------------|----------------------------------|
| Application | Strip processing / Rapid cooling |
| Equipment | Hydrogen Main Supply Skid |
| Size(s) | ND 1 1/2" |
| Quantity | 1 nos. |
| Features | KÜHME Safety Shut-off Valves |



Project: Germany

| | |
|-------------|--|
| Application | Flat glass production / prot. atmosphere |
| Equipment | Double Hydrogen / Nitrogen Mixing Skid |
| Size(s) | DN 150 / 50 |
| Quantity | 1 nos. |
| Features | KÜHME Hybrid & Safety Shut-off Valves |



Project: Mexico

| | |
|-------------|--|
| Application | Flat glass production / prot. atmosphere |
| Equipment | Hydrogen / Nitrogen Mixing Skid |
| Size(s) | ND 4" / 1" |
| Quantity | 1 nos. |
| Features | KÜHME Hybrid Valves |





PLEASE JOIN US:



KÜHME Armaturen GmbH

Am Vorort 14
44894 Bochum
Germany

Phone: +49 234 29802 - 0

Fax: +49 234 29802 – 10

E-Mail: info@kuehme.de

Web: www.kuehme.de