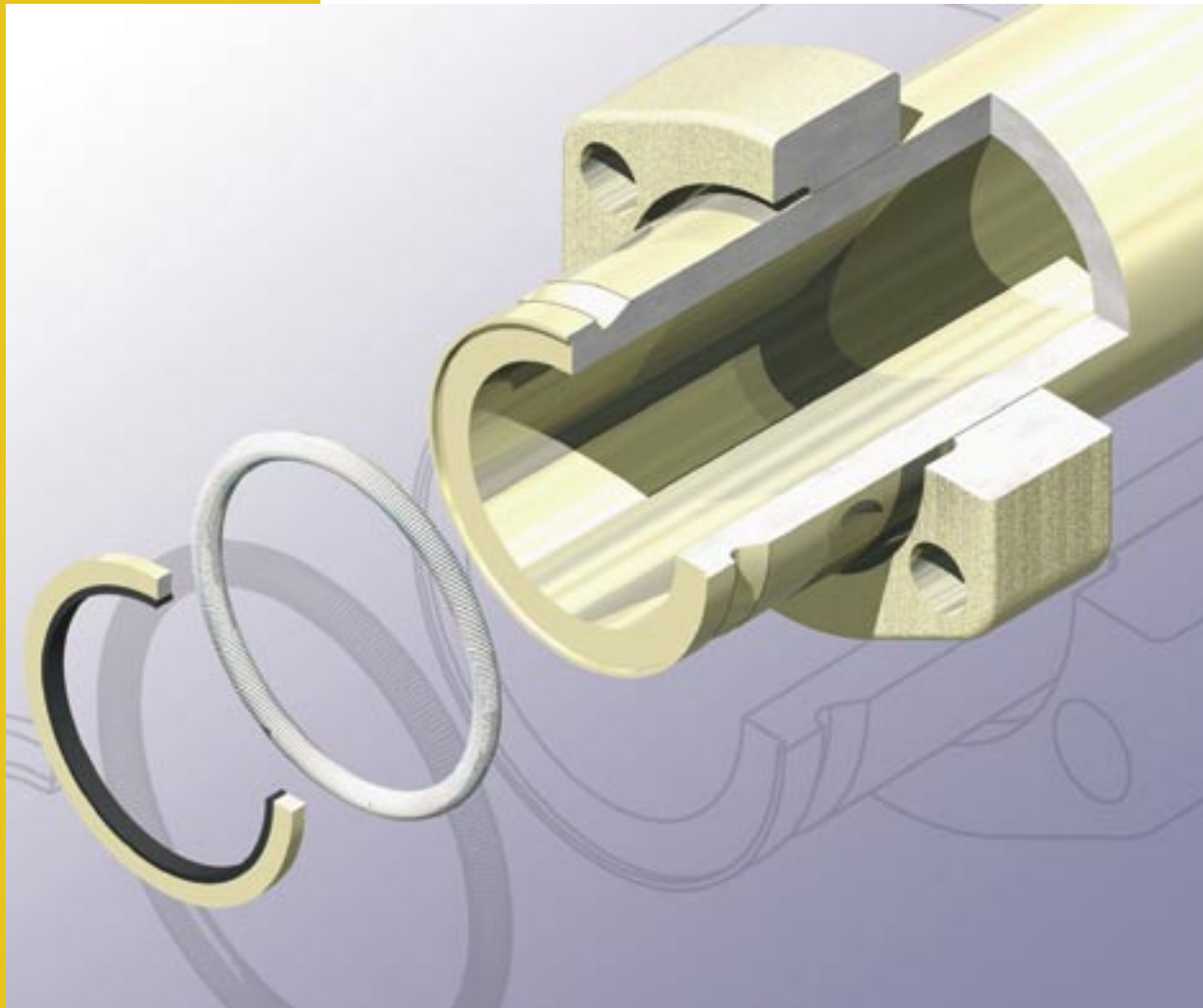


# **GS RETAIN RING FLANGE SYSTEM**

**–Piping without Welding**



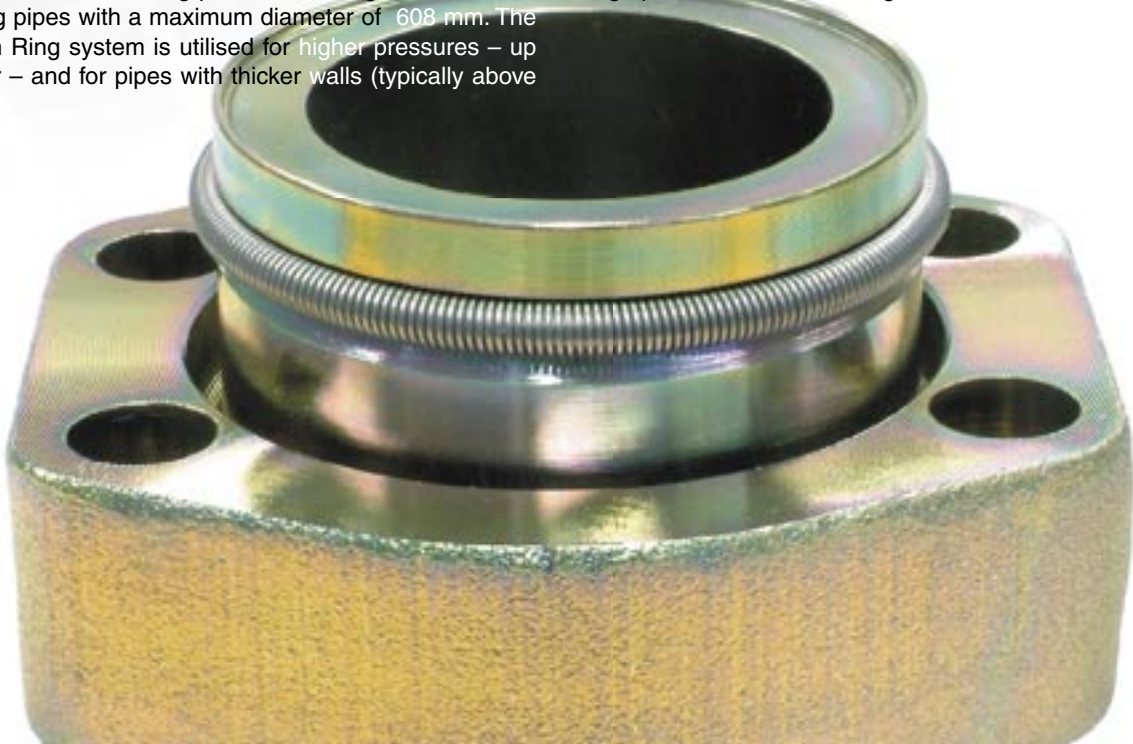
# High Quality, Clean and Cost-Efficient High Pressure Piping Systems

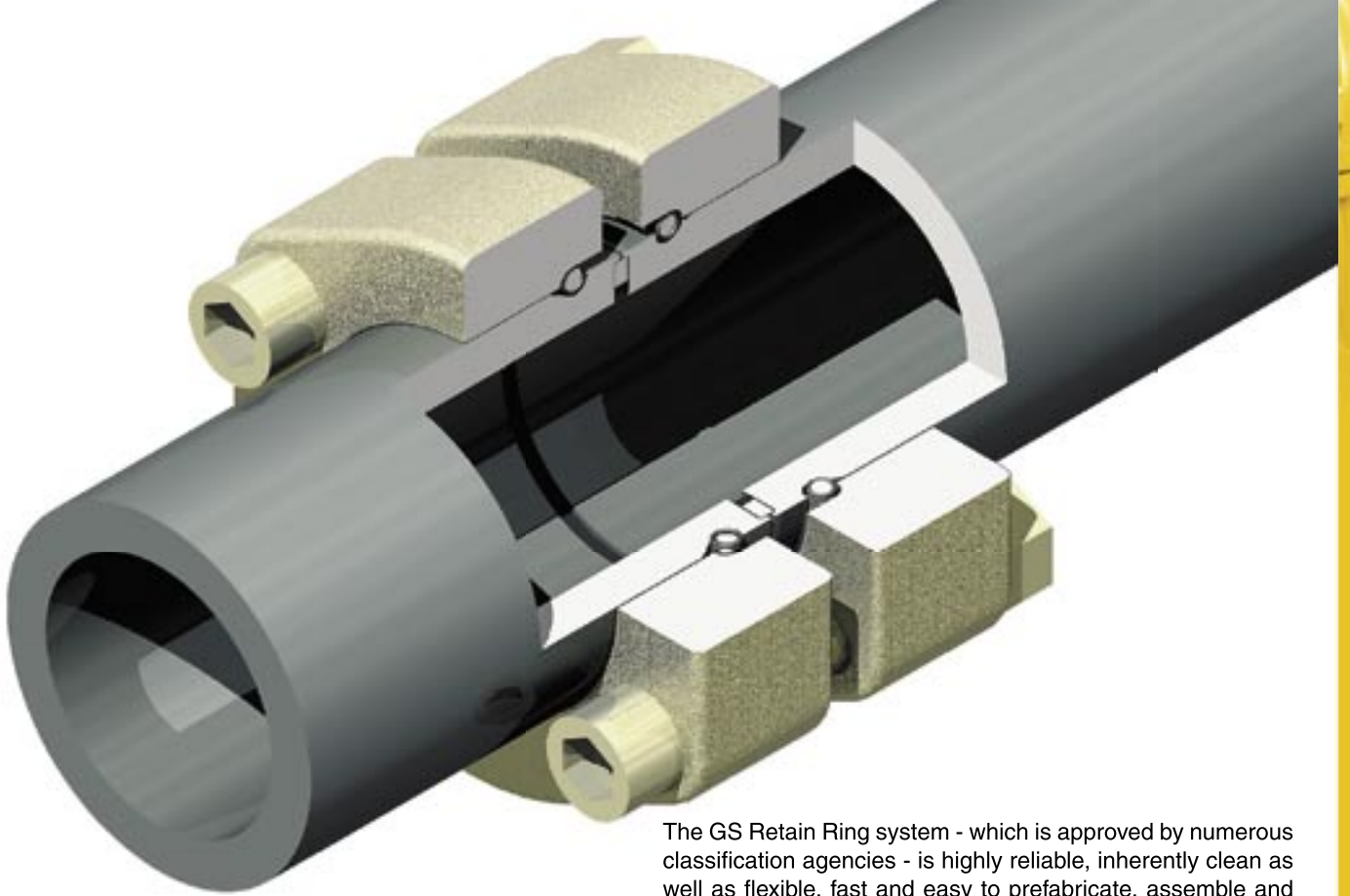
*GS-Hydro is the world's leading supplier of non-welded piping technology - "Piping without Welding". GS-Hydro's innovative retain ring pipe connecting systems allow piping systems with working pressures up to 690 bar and pipes with diameters between 39 and 350 mm to be assembled without welding. The GS Retain Ring system provides a fast and easy method to connect pipes with the highest possible quality and reliability, completely leak-free, with high levels of joint integrity in the most cost efficient manner.*



GS-Hydro's in-house developed technology includes three individual systems - the GS 37° and GS 90° flare flange systems and the GS retain ring system. The GS 37° flare flange system provides a reliable high-pressure (up to 350 bar) joint for pipes with a diameter as large as 90 mm, whereas the 90° flare flange system is utilised in low pressure piping systems with working pressures as high as 16 bar for connecting pipes with a maximum diameter of 608 mm. The GS Retain Ring system is utilised for higher pressures – up to 690 bar – and for pipes with thicker walls (typically above 7.5 mm).

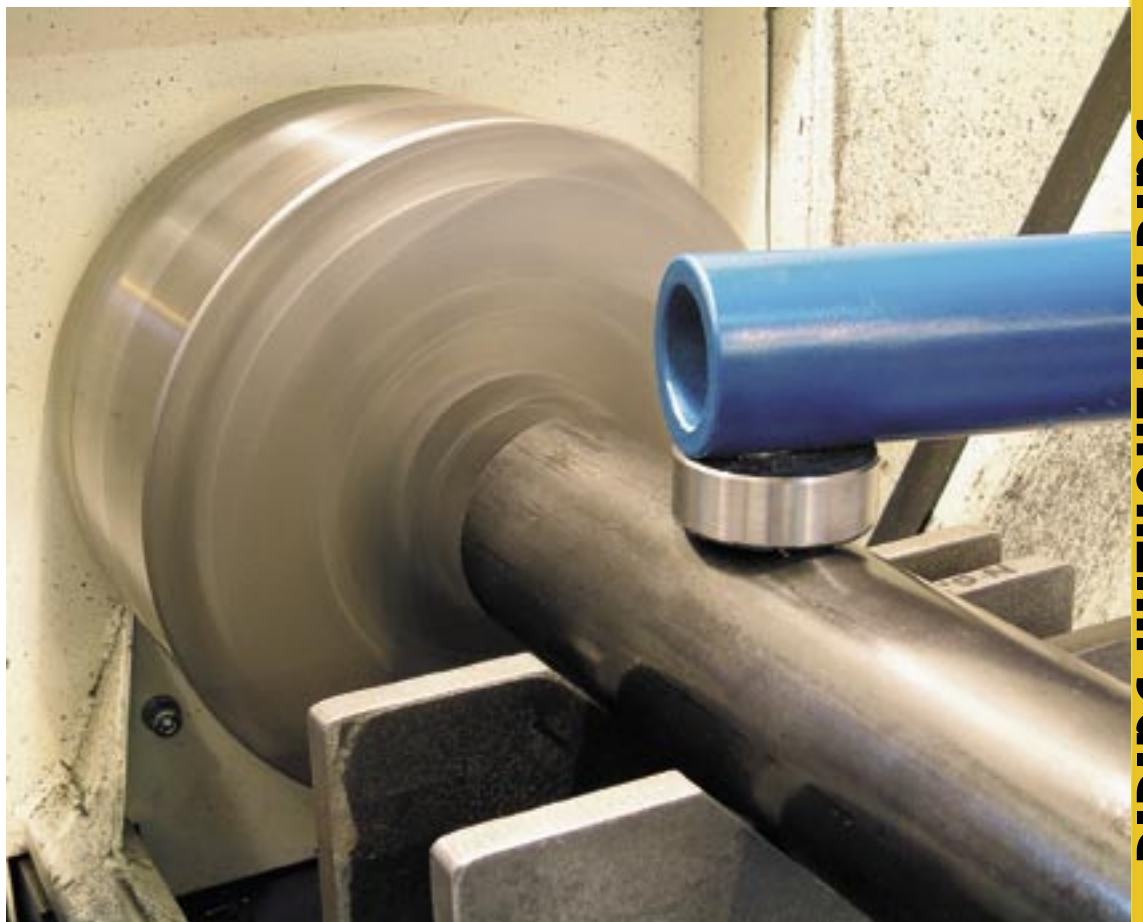
The GS Retain Ring system is used in a broad range of high pressure piping applications in a wide variety of industries ranging from marine and off shore to metals & mining, pulp & paper, aerospace and defence, as well as wood & forestry industries. The retain ring system is suitable for hydraulic, lubrication, hydrocarbon, high pressure air, mud cement and high pressure water cleaning lines.





The GS Retain Ring system - which is approved by numerous classification agencies - is highly reliable, inherently clean as well as flexible, fast and easy to prefabricate, assemble and install. The GS Retain Ring system is also suitable for a wide range of materials ranging from mild steel to copper-nickel, super-duplex and aluminium/brass. The GS Retain Ring system is an overall more cost efficient method to construct high pressure piping systems than welding.

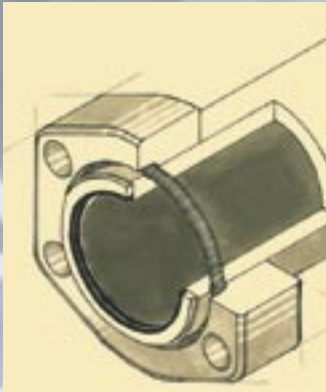
GS-Hydro's capabilities cover the full range of products and services from complete piping systems - engineered, prefabricated, installed and commissioned - to customised, prefabricated piping modules and separate piping components. GS-Hydro also delivers the machines needed for the prefabrication and preparation of the retain ring piping system.



*Grooving machine in action*

# Reliable Technology for Demanding Conditions

The GS Retain Ring system is used for piping with a maximum allowable working pressure up to 350-400 bar. In special applications, the retain ring system can be used with working pressures as high as 690 bar. Extensive testing programs have shown the suitability of the retain ring jointing method for high pressure piping systems in a wide range of different materials ranging from mild and stainless steel to duplex and titanium and all other quality pipe materials with an elongation above 20%. The GS Retain Ring system is approved by numerous classification companies around the world.



## GS Retain Ring System (technical data):

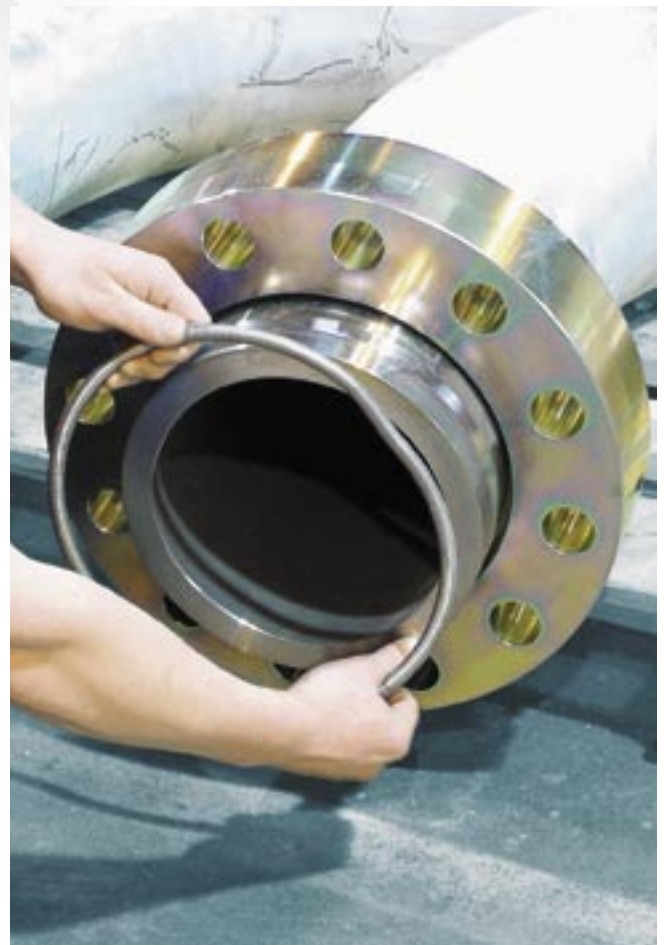
	SAE 3000	SAE 6000	ISO 6164
pressure, bar	210 – 350	420	210 - 690
size, pipe	26x6 - 97x12	26x6 - 66x8.5	60.3x11.04 - 355.6x41.4
size, flange	1/2" - 3"	1/2" - 2"	2" - 12"
material, pipe	mild steel, galvanised steel, copper-nickel, aluminium/brass duplex, super duplex, titanium, 4130 (elongation above 20%)		
material, flange	electric zinc coated carbon steel, hot dip galvanized carbon steel, stainless steel or titanium		
material, seal	viton, NBR		
material, retain ring	stainless steel		



**The Retain ring flange system is approved by the following classification companies:**

- DnV** Det Norske Veritas
- LRS** Lloyd's Register of Shipping
- GL** Germanischer Lloyd
- ABS** American Bureau of Shipping
- BV** Bureau Veritas
- RINA** Registro Italiano Navale Group
- MRS** Russian Maritime Register of Shipping
- NKK** Nippon Kaiji Kyokai
- CCS** China Classification Society

The retain ring system is approved to be used off-shore by NORSOK (piping spec.'s IS70, IS80, GS70 and JS80).



The GS Retain Ring system provides a compact, high-pressure joint, in which the flanges are held to the pipe by a 'retain ring', a stainless steel ring/spring that sits in a machined groove on the pipe-end. The GS retain ring system has been subject to rigorous vibration testing, burst and impulse testing as well as fire testing.

GS-Hydro's retain ring system is fast to fabricate as well as completely clean. When preparing a retain ring connection a groove is made on the pipe and the pipe end itself is machined. The flanges are placed onto the pipe and the retain rings are installed into the groove. A seal is placed in-between the pipe ends, and the flanges are then tightened together.

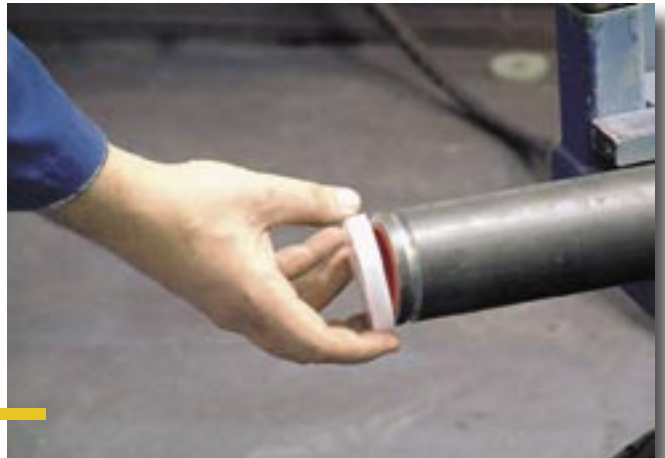


*The retain ring- and seal grooves are machined with a special grooving machine.*

*The prefabricated piping modules are then washed with 110°-130°C steam (to which a chemical cleaning agent has been added).*



*Piping modules are protected with oil in order to prevent corrosion during transportation and storing.*



*Prior to shipping the pipe end is carefully plugged.*



*The prefabricated piping modules and components are carefully packed.*

*GS-Hydro's containerised workshop enables the fabrication of modules also on-site.*



The assembly and installation is also fast, efficient and completely clean resulting in significant savings in time, cleaning, inspection and testing.



*The cover is removed from the pipe end,*



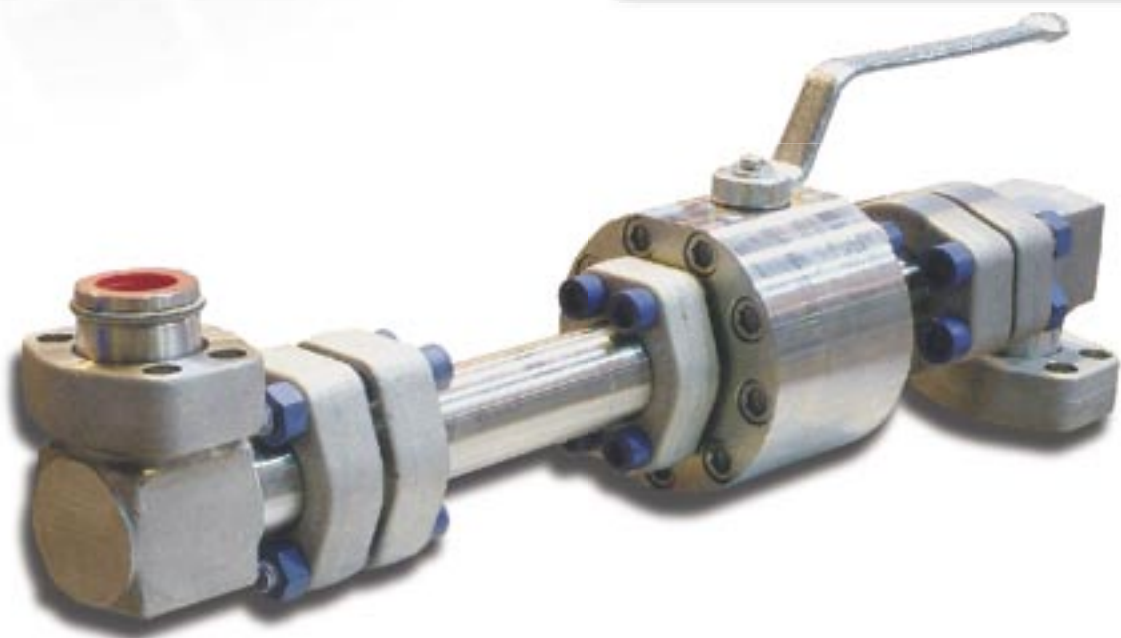
*...the pipe end is cleaned with a cloth...*



*The dowty seal is greased before installation.*



*The bolts are tightened to complete the installation.*



# ...with major time and cost savings

*GS-Hydro's retain ring system provides a higher quality solution with major time and cost savings compared to conventional welded piping systems to a wide range of customers within industries ranging from marine, off shore and aerospace & defence to pulp & paper and metals & mining industries.*



*Miki-City – world's largest shaking table*



Within the **Marine Industry** the GS Retain Ring system is used extensively for hydraulic and other piping systems, where the reliability and inherent cleanliness, fast installation times and flexible engineering bring major time and cost benefits.

The GS Retain Ring system is utilised within the **Offshore Industry** for hydraulic, mud, cement, high pressure water and other high pressure piping systems. High quality, quick assembly, and no "hot work" allow for safe and cost effective installation compared to conventional welding on oil drilling platforms.

The GS Retain Ring system is utilised by a wide variety of industries including for instance **Metals & Mining, Automotive, Aerospace & Defence, Pulp and Wood & Forestry** for its flexibility, precision and reliability. **Testing facilities**, including the world's largest earth simulator, rely on the GS Retain Ring system for the hydraulic piping systems due to its inherent cleanliness and fast and flexible installation.

## GS Retain Ring system 'Piping without Welding'- technology

- simple, reliable, flexible and safe
- suitable for all materials
- proven, leak-free technology
- highest level of cleanliness, intrinsically clean
- fast, easy and flexible to install
- easy and fast to use for repairs => no hot-work
- small space requirement
- approved by numerous classification companies
- lower total piping system cost