

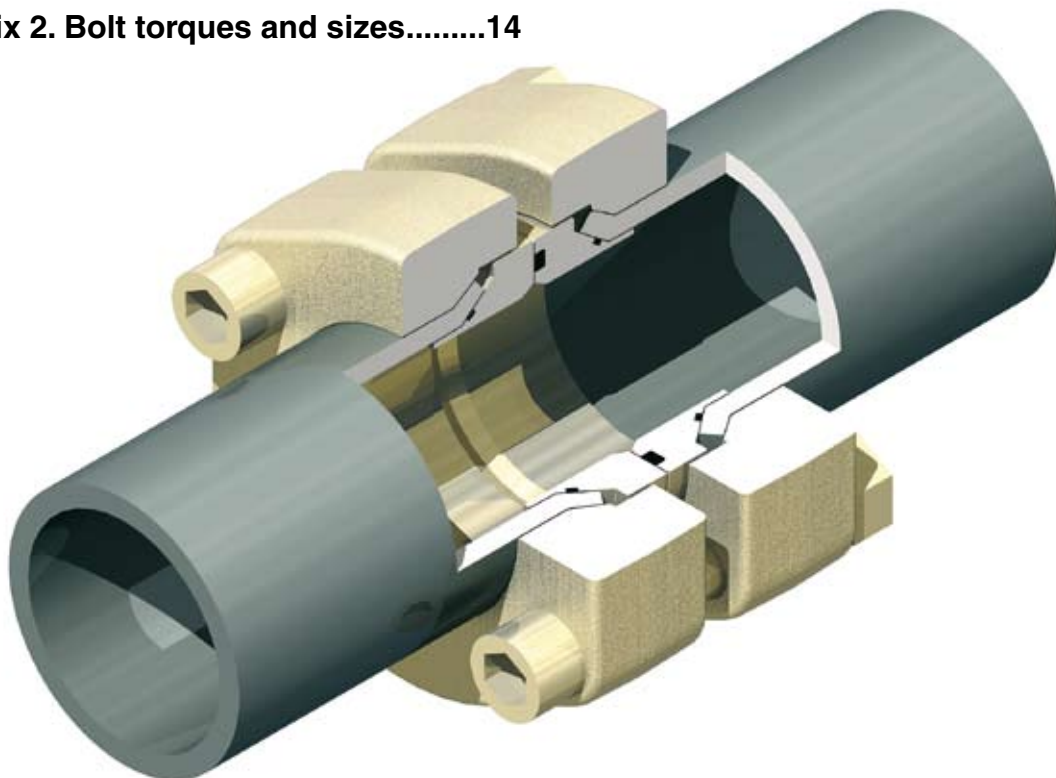
GS 37° Flare Flange System

Flaring and Installation Instructions



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Introduction

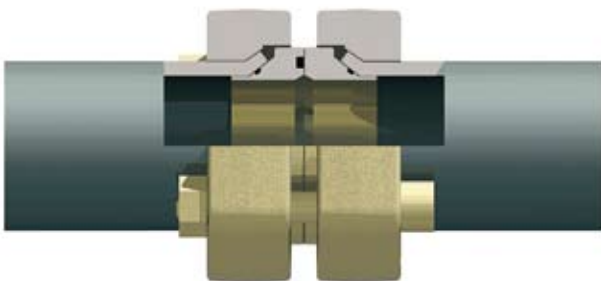
These are GS-Hydro's guidelines for the manufacture and assembly of the GS-Hydro 37° flare flange system. In the case of special applications (special sealing arrangements, non-conductive connections, special materials etc) please contact GS-Hydro for further instructions.

In order to achieve the integrity required in any piping system it is imperative that operators are fully trained and conversant with the tools and machines to be used. GS-Hydro can provide training and instruction as well as installation supervision if required.

Refer to the relevant health and safety instructions for protective measures.



Protect yourself always by using required personal protective equipments.



The GS 37° flare system is used for piping with pressure within range 50–420 bar. Extensive test programs – including rigorous vibration testing – have proven the suitability of the GS 37° flare flange system for a wide range of different materials and applications. GS-Hydro solutions are approved by many Classification companies for a wide range of materials and applications.

	SAE 50	SAE 3000	SAE 6000	ISO 6164 / DIN
pressure, bar	< 50	210 – 350	420	350-400
size, pipe	50x3 – 273x6	16x2 – 90x5	16x2 – 60x5	50x5 – 72x7
size, flange	1 1/2" – 10"	1/2" – 3"	1/2" – 2"	1 1/2" – 2 1/2"
material, pipe	mild steel, galvanised steel, copper-nickel, aluminium/brass duplex, super duplex, titanium, tungum (elongation above 20%)			
material, flange	electric zined carbon steel, hot dip galvanized carbon steel, stainless steel or titanium			
material, seal	Viton, NBR			

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GS-37° Connection Technology

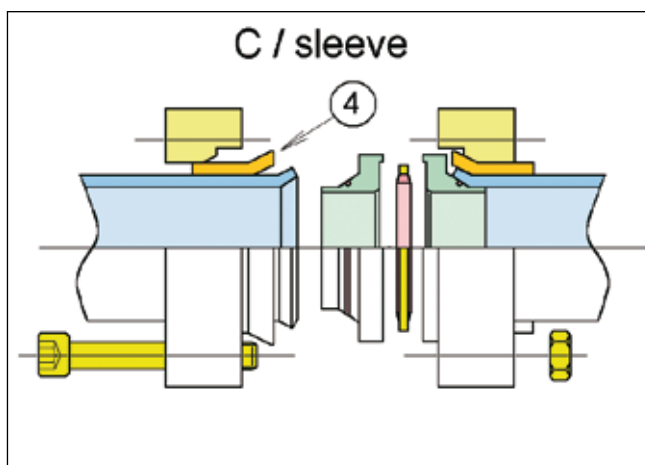
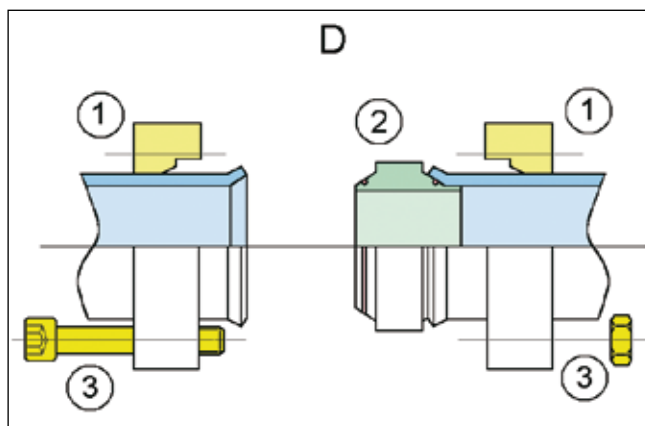
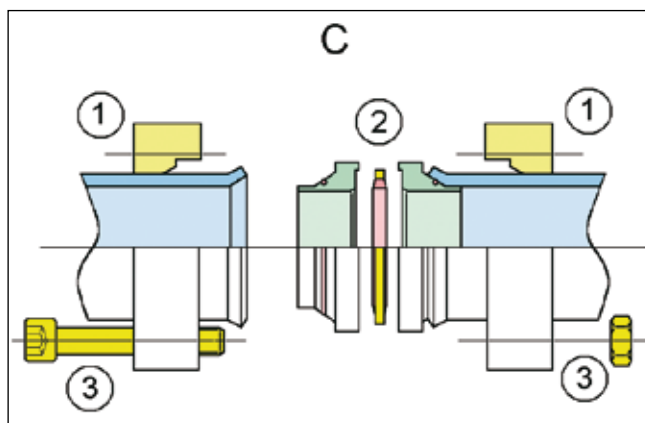
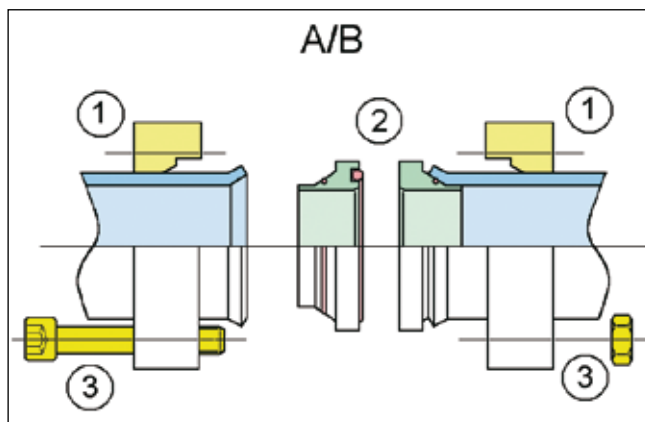
The GS 37° flare flange system provides a variety of different ways to pipe connections.

Type A/B utilises O-rings on all sealing surfaces.

Type C, with bonded seal, is a safe method of connection particularly in field conditions as inserts are identical.

Type D is an optional connection method when assembling long straight lines.

Type C added with extra sleeve, provides possibility to have flange and tube with different nominal sizes (i.e. 38 x 4 tube can be used with 1" SAE flange).



Selection of the pipe

GS-Hydro recommends the use of cold drawn pipes & tubes due to the inherent quality, (precision dimensions and shape) and cleanliness, (no scale) characteristics. As a comparison, hot rolled tubes will always have scale both inside and outside due to the manufacturing process and may not be exactly round.

GS Hydro's cold forming process ensures there will not be any scale inside the tube after the manufacturing.

Original GS-Hydro high-pressure piping can be recognised from the marking **GS-PIPING** along the tube length.

GS-Hydro maintains a large stock of carbon and stainless steel pipes & tubes to be utilised in hydraulic and other piping systems:

	Carbon Steel	
Material Specification	DIN 1630	-
Manufacturing Tolerances	DIN 2391-1	EN 10305-4
Technical Terms of Delivery	DIN 2391-2/C	EN 10305-4
	Stainless Steel (mm)	Stainless Steel (sch)
Material Specification	ASTM A269/A213 (A.W.)	ASTM A312
Manufacturing Tolerances	ASTM A269	ASTM A530

All precision steel pipes are supplied with trace numbers.



Always keep the tubes stored indoors away from rain and moisture. Make sure all the tubes are protected with plastic plugs in the ends.

Cutting off the pipe

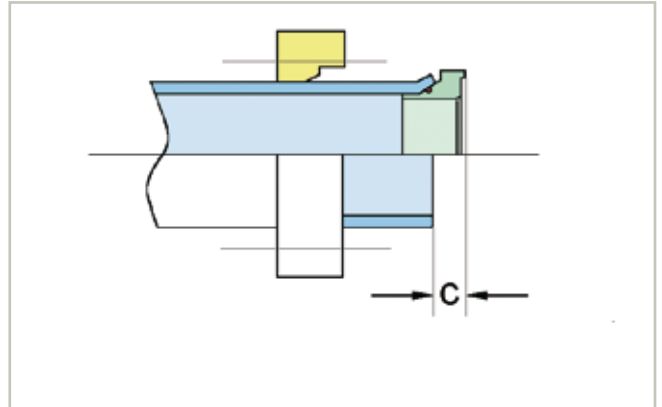
When cutting a tube for GS 37° flare flange piping, the measurement C must be considered. This dimension "C" is the adjustment to the length of the tube to compensate for the dimension of the insert cone. Cut tubes squarely by using cold saw. Do not use roller cutter or grinder.

The measurement C is shown for the different flange types in Appendix 1, page 13.

After cutting the tube, make sure to put a plastic plug in the tube you do not use.

After cutting, the pipe is de-burred inside and outside; then wiped clean by cloth in order to remove any metal particles.

Especially with small size pipes (below 60 mm) it is recommended also to shoot foam projectiles by means of compressed air through pipes – use Jet Clean, Compri Tube Clean or respective method.



Cleaning operations before flaring



Inspect the flange type before placing it on to the tube (remember to use the sleeve if required). The original GS-flange has a **GS-PIPING** text, marking of flange type and a charge number for traceability.



Clean the flaring cone and dies before fitting to the flaring machine. Ensure also the correct size cone and dies are selected for the tube size.

Tools must be kept clean and lubricated.



Tools must be checked regularly.

Worn-out tools must be replaced.

Damaged, worn, or dirty tools will affect the sealing efficiency.

Clamping the pipe



Place the pipe between the dies and push it against the stopper. Check that the pipe is positioned horizontally and aligned with the flaring machine. Use pipe supports with long and heavy pipes.

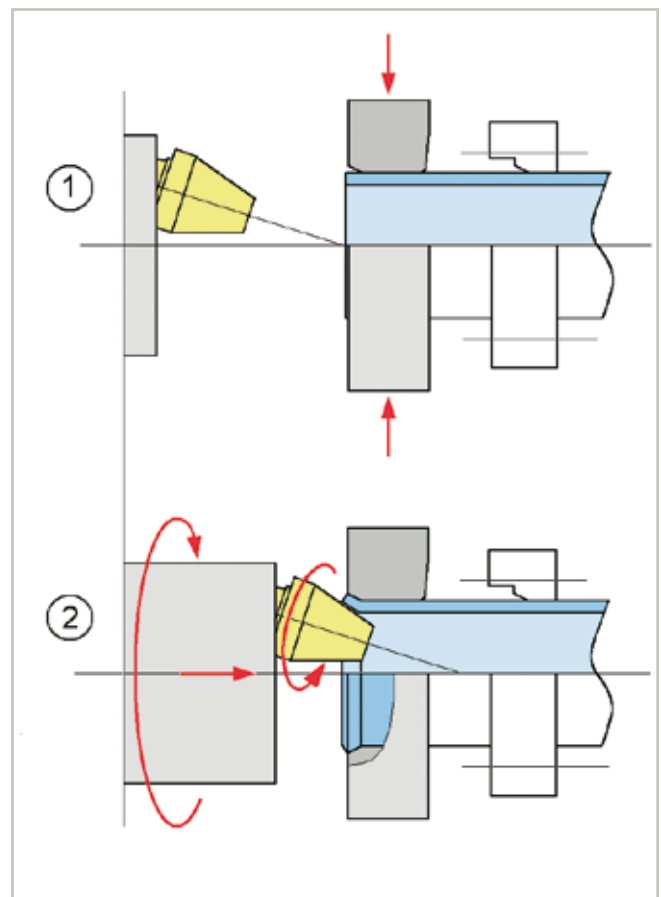
Flaring operations

Use only GS-Hydro flaring machine and genuine flaring cones and clamping dies.

It is recommended to carry out a test flare to find the exact setting of the stopper, the right pressure of the clamping jaws and the flaring pressure as well as the right time setting for the work cycle.

Before beginning the flaring operation check that the surface of the flaring cone has been thoroughly oiled or treated with Gleitmo 830 (Fuchs Lubritech) lubricating paste for cold forming.

After the flaring machine has been set up, the pipe to be flared is pushed into its jaws against the stopper and the jaws are locked (1). Then the pipe is flared (2).



Note that the flange is being placed onto pipe before flaring operation.

When the flare has been formed completely, it should be rolled another 3 to 5 more turns, before the cone is retracted.

For detailed information refer to the relevant operating instructions of machine utilized.

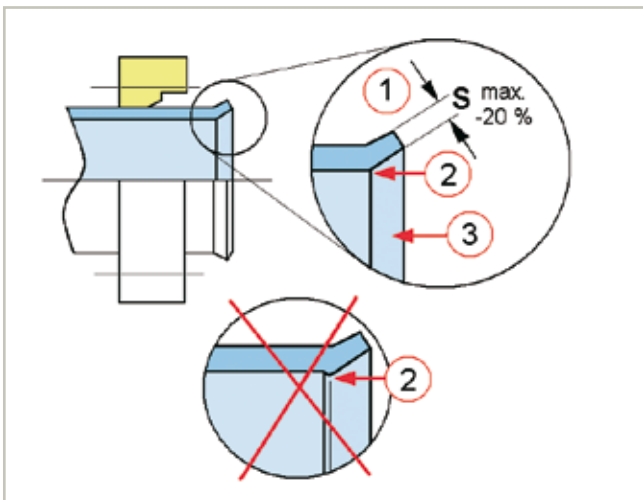
Never reach into tool area while machine is working.



Checking of the flaring



The flared pipe is cleaned with a cloth before visually checking quality.



The thinning of the flared part of the tube “S” may not exceed 20% of wall thickness (1).

If the tube has been over-flared a lip will appear which will stop the fitting of the insert cone past (2).

At the same time the quality of the inner flared surface (3) should be checked. It should be **perfectly smooth, clean and glassy**.



Verify the outside dimension of the flaring (Appendix 1, page 13) and check that the flare is concentric with the pipe.



After the flare is checked and cleaned the pipe end is covered with a plug or with a tape.

Assembling of parts

Inspect components prior to assembly:

- use non-abrasive soft cloth to ensure all components are free from grease, dirt or any contaminants
- verify that all components are of correct material and size

Lubricate the O-ring with system fluid or equivalent lubricant. Place O-ring carefully into its groove.

Examine all sealing surfaces to detect possible mechanical damages and rust.

Fit the insert cone into tube flare. If needed, tap gently with plastic or hide mallet.

Lubricate the bonded seal (dowty seal) with Gleitmo 805 -paste or equivalent.



Connecting the joint

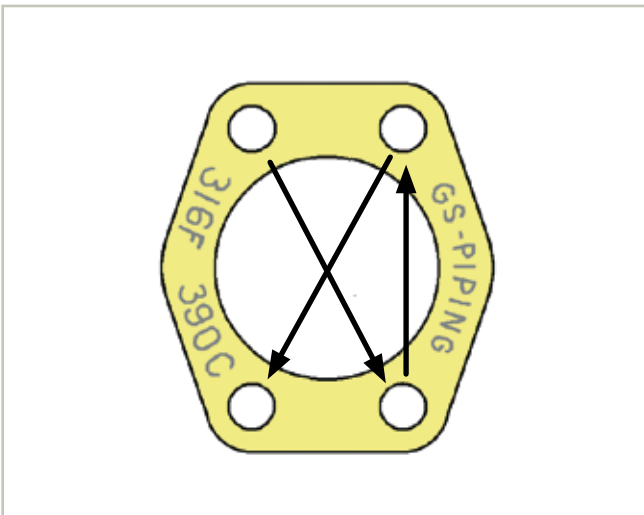


Verify that you are using right type and size of bolts (Appendix 2, page 14).

Tighten bolts in diagonal sequence in small increments to appropriate torque level. See illustrated example.

Bolt torques for 37° flare flanges are shown in Appendix 2, page 14.

Bolt torque values are based on friction factor $\mu=0,15$ (slightly greased bolts). Effective greasing can reduce the friction factor 30-50 %.



1. Tighten lightly with a wrench.
2. Tighten crosswise with 30% of the recommended torque.
3. Tighten crosswise with 70% of the recommended torque.
4. Tighten crosswise with 100% of the recommended torque.



Do not tighten further after step 4.



It is recommended to use calibrated bolt torque wrench in all cases.



Remember! The given tightening torques are working values when the system is in operation.

This means that the torques must be checked either after the pressure test and/or a week after the start-up.

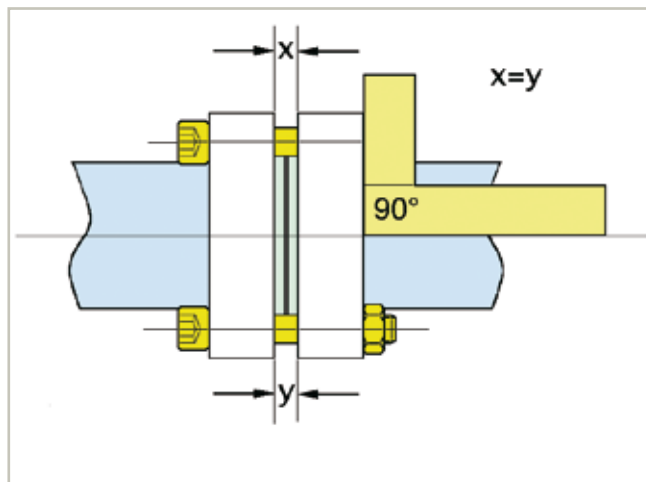
During installation

After tightening ensure that flanges are at 90 degrees to the pipe and that the gap between flanges is equal ($x=y$).

Verify also that the bolts protrude 1–2 threads from the nut.



Alignment must be within 2°–3°. This must be controlled before tightening of bolts.



Reassembly

If the connection has to be opened, mark the insert cone and the pipe to ensure the sealing surfaces are easily re-aligned. Check the condition of seals and change them if required.

Always ensure you are using original spare parts, supplied by GS-Hydro.

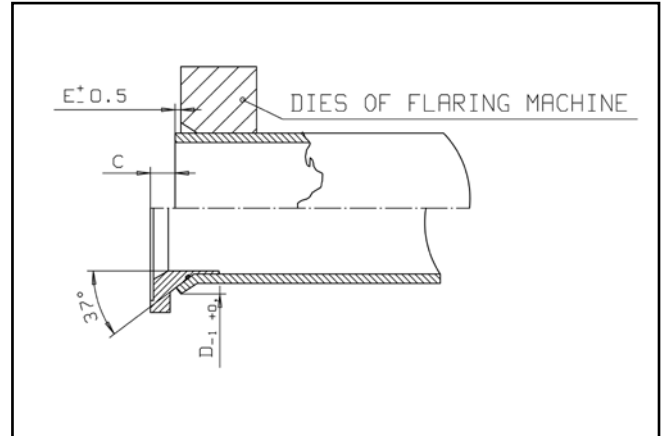


The reassembly must always be carried out without increasing the tightening torque values!



Appendix 1. Flared 37° joint

Size	Pipe Size	Part No	D	E	C
1 1/2"	50x3	124/50X3FA	58	1.0	12
2"	60x3	132/60X3FA	68	1.5	12
2 1/2"	75x3	140/75X3FA	83	1.5	13
3"	90x3.5	148/90X3.5FA	100	1.5	11
3 1/2"	100x4	156/100X4FA	110.8	1.5	18
4"	115x4	164/115X4FA	124.5	1.5	15
5"	140x4.5	180/140X4.5FA	150	1.5	16
6"	165x5	196/165X5FA	181	1.5	14
8"	220x6	228/220X6FA	236	1.5	18
10"	273x6	260/273X6FA			18



Size	Pipe Size	Part No	D	E	C
1/2"	16x2.0	308/16X2.0FC	20	0	10
1/2"	18x2.0	308/18X2.0FC	22	0	11
1/2"	20x2.0	308/20X2.0FC	24	0	9
1/2"	25x2.5	308/25X2.5FC	29	0	9
1/2"	25x3.0	308/25X3.0FC	29	0	9
3/4"	20x2.0	312/20X2.0FC	24	0	12
3/4"	20x2.5	312/20X2.5FC	24	0	12
3/4"	25x2.5	312/25X2.5FC	29	0	9
3/4"	25x3.0	312/25X3.0FC	29	0	10
3/4"	30x3.0	312/30X3.0FC	36	0.5	9
1"	25x2.5	316/25X2.5FC	29	0	9
1"	25x3.0	316/25X3.0FC	29	0	9
1"	30x3.0	316/30X3.0FC	36	0.5	7
1"	30x4.0	316/30X4.0FC	36	0.5	7
1"	38x4.0	316/38X4.0FC	43.5	0.5	10
1 1/4"	30x3.0	320/30X3.0FC	36	0.5	10
1 1/4"	30x4.0	320/30X4.0FC	36.5	0.5	10
1 1/4"	38x4.0	320/38X4.0FC	43.5	0.5	9
1 1/4"	38x5.0	320/38X5.0FC	43.5	0.5	9
1 1/4"	42x4.0	320/42X4.0FC	48	0.5	11
1 1/2"	30x3.0	324/30X3.0FC	36.5	0.5	14
1 1/2"	38x4.0	324/38X4.0FC	43.5	0.5	13
1 1/2"	42x4.0	324/42X4.0FC	48	0.5	13
1 1/2"	50x5.0	324/50X5.0FC	58	1.0	11
2"	50x5.0	332/50X5.0FC	58	1.0	11
2"	60x5.0	332/60X5.0FC	68	1.5	11
2"	60x6.0	332/60X6.0FC	68	1.5	11
2 1/2"	60x5.0	340/60X5.0FC	68	1.5	12
2 1/2"	72x7.0	340/72X7.0FC		1.5	12
2 1/2"	75x5.0	340/75X5.0FC	83	1.5	13
3"	75x5.0	348/75X5.0FC	83	1.5	16
3"	90x5.0	348/90X5.0FC	100	1.5	14

Size	Pipe Size	Part No	D	E	C
1/2"	16x2.0	608/16X2.0FC	20	0	10
1/2"	18x2.0	608/18X2.0FC	22	0	11
1/2"	20x2.0	608/20X2.0FC	24	0	9
1/2"	25x2.5	608/25X2.5FC	29	0	9
1/2"	25x3.0	608/25X3.0FC	29	0	9
3/4"	20x2.0	612/20X2.0FC	24	0	12
3/4"	20x2.5	612/20X2.5FC	24	0	12
3/4"	25x2.5	612/25X2.5FC	29	0	9
3/4"	25x3.0	612/25X3.0FC	29	0	10
3/4"	30x3.0	612/30X3.0FC	36	0.5	9
3/4"	30x4.0	612/30X4.0FC	36	0.5	9
1"	25x2.5	616/25X2.5FC	29	0	9
1"	25x3.0	616/25X3.0FC	29	0	9
1"	30x3.0	616/30X3.0FC	36	0.5	7
1"	30x4.0	616/30X4.0FC	36	0.5	8
1"	38x4.0	616/38X4.0FC	43.5	0.5	10
1 1/4"	30x3.0	620/30X3.0FC	36	0.5	10
1 1/4"	30x4.0	620/30X4.0FC	36	0.5	10
1 1/4"	38x4.0	620/38X4.0FC	43.5	0.5	9
1 1/4"	38x5.0	620/38X5.0FC	43.5	0.5	9
1 1/4"	42x4.0	620/42X4.0FC	48	0.5	11
1 1/2"	30x3.0	624/30X3.0FC	36	0.5	14
1 1/2"	38x4.0	624/38X4.0FC	43.5	0.5	13
1 1/2"	38x5.0	624/38X5.0FC	43.5	0.5	13
1 1/2"	42x4.0	624/42X4.0FC	48	0.5	13
1 1/2"	50x5.0	624/50X5.0FC	58	1.5	11
2"	50x5.0	632/50X5.0FC	58	1.5	11
2"	60x5.0	632/60X5.0FC	68	1.5	11
2"	60x6.0	632/60X6.0FC	68	1.5	11

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Appendix 2. Bolt Torques

SAE 50 bar			Bolt DIN 912, 8.8	
Size	Flange Type	Bolt Torque	Flange to flange	Flange to block
1 1/2"	124F	50 Nm	M12x70	x40
2"	132F	50 Nm	M12x70	x40
2 1/2"	140F	50 Nm	M12x70	x40
3"	148F	60 Nm	M16x80	x50
3 1/2"	156F	70 Nm	M16x90	x50
4"	164F	85 Nm	M16x90	x50
5"	180F	125 Nm	M16x90	x50
6"	196F	110 Nm	M16x110	x60
8"	228F	200 Nm	M20x120	x70
10"	260F	290 Nm	M20x140	x80

SAE 3000 psi			Bolt DIN 912, 8.8	
Size	Flange Type	Bolt Torque	Flange to flange	Flange to block
1/2"	308F	20 Nm	M8x60	x35
3/4"	312F	28 Nm	M10x60	x35
1"	316F	37 Nm	M10x60	x35
1 1/4"	320F	48 Nm	M10x70	x35
1 1/2"	324F	62 Nm	M12x80	x45
2"	332F	73 Nm	M12x80	x50
2 1/2"	340F	107 Nm	M12x110	x60
3"	348F	186 Nm	M16x130	x80

SCH Serie SAE 3000 psi			Bolt DIN 912, 8.8	
Size	Flange Type	Bolt Torque	Flange to flange	Flange to block
1/2"	308/21.3F	20 Nm	M8x60	x35
3/4"	312/26.7F	28 Nm	M10x60	x35
1"	316/33.4F	37 Nm	M10x60	x35
1 1/4"	320/42.2F	48 Nm	M10x70	x35
1 1/2"	324/48.3F	62 Nm	M12x80	x45
2"	332/60.3F	73 Nm	M12x80	x50
2 1/2"	340/73F	107 Nm	M12x110	x60
3"	348/88.9F	186 Nm	M16x130	x80

SAE 6000 psi			Bolt DIN 912, 8.8	
Size	Flange Type	Bolt Torque	Flange to flange	Flange to block
1/2"	608F	20 Nm	M8x60	x35
3/4"	612F	34 Nm	M10x70	x40
1"	616F	56 Nm	M12x70	x45
1 1/4"	620F	85 Nm	M14x90	x50
1 1/2"	624F	158 Nm	M16x100	x60
2"	632F	250 Nm	M20x110	x70

SCH Serie SAE 6000 psi			Bolt DIN 912, 8.8	
Size	Flange Type	Bolt Torque	Flange to flange	Flange to block
1/2"	608/21.3F	20 Nm	M8x60	x35
3/4"	612/26.7F	34 Nm	M10x70	x40
1"	616/33.4F	56 Nm	M12x70	x45
1 1/4"	620/42.2F	85 Nm	M14x90	x50
1 1/2"	624/48.3F	158 Nm	M16x100	x60
2"	632/60.3F	250 Nm	M20x110	x70

DIN 350–400 bar			Bolt DIN 912, 8.8	
Size	Flange Type	Bolt Torque	Flange to flange	Flange to block
1 1/2"	424F	158 Nm	M16x90	x50
2"	432F	200 Nm	M16x90	x50
2 1/2"	440F	275 Nm	M20x120	x70

SCH Serie DIN 350–400 bar			Bolt DIN 912, 8.8	
Size	Flange Type	Bolt Torque	Flange to flange	Flange to block
1 1/2"	424/48.3F	158 Nm	M16x90	x50
2"	432/60.3F	200 Nm	M16x90	x50
2 1/2"	440/73F	275 Nm	M20x120	x70

Notes

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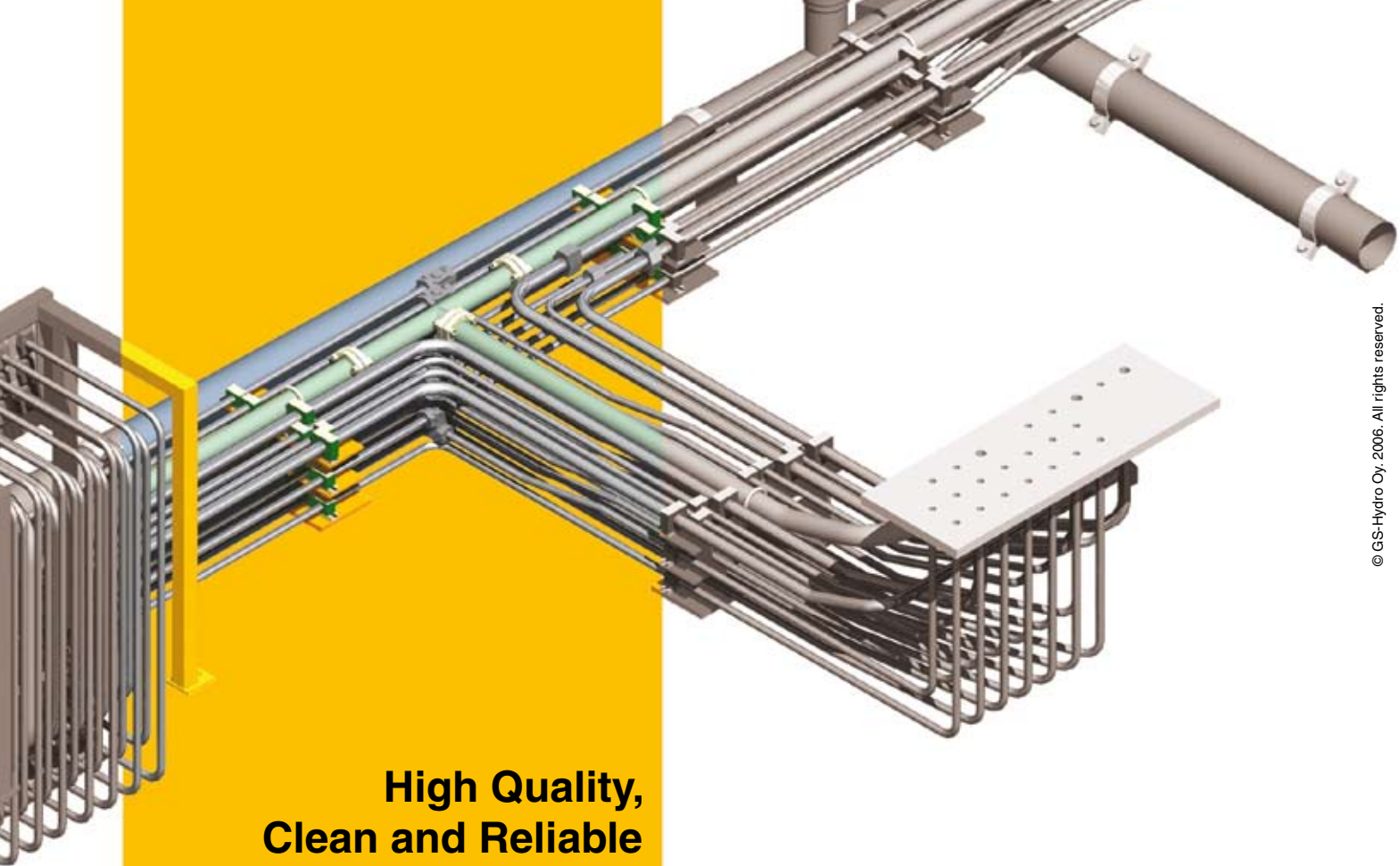
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High Quality, Clean and Reliable Piping without Welding

The innovative GS Piping System is used primarily in hydraulic applications, but it is also ideal for both low and high pressure applications with high demands on quality, reliability and cleanliness. In addition to being inherently clean, the GS Piping System is easy, fast and flexible to install.

Taking complete responsibility for the piping system allows GS-Hydro to optimise every phase of the delivery, thus ensuring a high quality, cost-efficient, on-time delivery of the entire piping system.



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