

GS-FLANGE SYSTEM

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The GS-Piping System consists of three flange systems which allow piping systems with working pressures from 10 to 690 bar and pipe diameters between 16 and 600 mm to be assembled without welding. The Retain Ring and 37° Flare Flange systems are used for high pressure connections and the 90° Flare Flange connection for low pressure applications.



GS-flange connections

Retain Ring System

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 carbon and stainless steel to duplex and titanium and all other quality pipe materials with an elongation above 20%.



	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	carbon steel, galvanised steel, duplex, super duplex, titanium (materials having elongation above 20%)		
material, flange	electric zinc coated carbon steel, hot dip galvanized carbon steel, stainless steel or titanium		
material, seal	NBR, FPM (Viton®)		
material, retain ring	stainless steel		

37° Flare Flange System

The 37° flare flange system is used for piping with a maximum allowable working pressure of 420 bar. The 37° flare flange jointing method is suitable for high pressure piping systems in a wide range of different materials ranging from mild steel to tungum.



	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 – 73x7
size, flange	1 1/2" – 10"	1/2" – 3"	1/2" – 2"	1 1/2" – 2 1/2"
material, pipe	carbon steel, galvanised steel, copper-nickel, aluminium/brass duplex, super duplex, titanium, tungum (materials having elongation above 20%)			
material, flange	electric zinc coated carbon steel, hot dip galvanized carbon steel, stainless steel			
material, seal	NBR, FPM (Viton®)			

90° Flare Flange System

The 90° flare flange system is used for class III piping with a maximum allowable working pressure of 16 bar. The 90° flare flange jointing method is suitable for low pressure piping systems in a wide range of different materials ranging from carbon steel to super duplex.



	SAE	ANSI/JIS/BS/DIN
pressure [bar]	10 – 40	10 – 40
size, pipe	16x1.5 – 220x6	21.3x2.1 – 608x12.5
size, flange	1/2" – 8"	1/2" – 24"
material, pipe	carbon steel, galvanised steel, copper-nickel, aluminium/brass duplex, super duplex, titanium, tungum (materials having elongation above 20%)	
material, flange	electric zinc coated carbon steel, hot dip galvanized carbon steel, stainless steel or titanium	
material, seal	based on media inside pipe (example Klinger® SIL C-4430)	

Type Approvals, Pressure classes

Type Approvals

GS-Hydro flange systems are type approved by the following classification companies:

Institute		37° Flaring 50–420 bar	Retain Ring 210–420 bar	Retain Ring 690 bar	90° Flaring
DNV	Det Norske Veritas Classification	x	x	x	x
LR	Lloyds Register MEA	x	x		x
GL	Germanischer Lloyd	x	x		x
ABS	American Bureau of Shipping	x	x		x
BV	Bureau Veritas	x	x		x
RINA	Registro Italiano Navale	x	x		x
MRS	Russian Maritime Register of Shipping	x	x		x
NKK	Nippon Kaiji Kyokai	x	x		x
CCS	China Classification Society	x	x		x

GS-pressure classes

GS-Hydro's flange systems are divided into pressure classes. The pressure class is selected based on the working pressure of the piping system. Each pressure class contains then all the GS-components needed for the piping system with that specific working pressure.

- **10–40 bar** 90° flare flanges, collars and sealings
- **SAE 50 bar** SAE-dimensioned low pressure piping components for 37° flaring and retain ring connection
- **SAE 3000 psi** Components for metric pipes and connection components for schedule series pipes according to SAE-standard J518C code 61
- **SAE 6000 psi** Components for metric pipes and connection components for schedule series pipes according to SAE-standard J518C code 62
- **DIN 350–400 bar** Components for metric pipes and connection components for schedule series pipes according to DIN-standard
- **SAE 10000 psi** Components for schedule series pipes drilled to SAE-standard J518C code 62



GS-code key

Part No

Flange Code	Face Type	Pressure	Size
1	SAE J518	50 bar	1 1/2" – 5"
1/2	round	50 bar	6" – 8"
3	SAE J518	3000 psi	1/2" – 3"
6	SAE J518	6000 psi	1/2" – 3"

Pipe Size

38X4
Pipe O.D. x wall thickness [mm]

316/38X4FC*

*) 316/38X4FC includes:
 316F 1 pc
 16/38X4FC 1 pc
 1629 1 pc
 OR30X1.0 1 pc

GS-size code

08	12	16	20	24	32	40
1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"
48	56	60	64	80	96	28
3"	3 1/2"	3 3/4"	4"	5"	6"	8"

Insert Cone Code

Insert Cone Code	Sealing Surface
FA	O-ring groove
FB	Flat face
FC	Bonded seal groove
FD	Straight coupling

Part No

Flange Code	Face Type	Pressure	Size
1	SAE J518	50 bar	1 1/2" – 5"
1/2	round	50 bar	6" – 8"
3	SAE J518	3000 psi	1/2" – 3"
4	square	400 bar	2" – 3 1/2"
6	SAE J518	6000 psi	1/2" – 2"
8	round	350 bar	3 3/4" – 12"

432019*

*) 432019 includes:
 432 2 pcs
 32019 1 pc
 32 2 pcs
 3219 2 pc

GS-size code

08	12	16	20	24	32	40
1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"
48	56	60	64	80	96	160
3"	4"	4 1/2"	5"	6"	8"	10"

Designation

001 Flange for welding	041 Hose assembly (straight/straight)
002 Flange for welding	042 Hose assembly (90°/90°)
003 Flange for welding	043 Hose assembly (45°/45°)
004 Flange for welding	045 Hose assembly (straight/90°)
005 Flange for welding	046 Hose assembly (90°/45°)
006 Flange for welding	047 Hose assembly (45°/straight)
007 Flange for welding	082 Flange for welding
008 Flange for welding	083 Flange for welding
009 Flange for welding	084 Flange for welding
010 Flange for welding	085 Flange for welding
011 Flange for welding	086 Flange for welding
013 Female thread flange (BSP)	099 Adaptor
014 Male thread flange (BSP)	113 Female thread flange (NPT)
015 Elbow flange	114 Male thread flange (NPT)
016 Tee flange	115 Elbow block
018 Flange bend	116 Tee block
019 Bulkhead flange	125 Blind flange
020 Hose insert, straight	129 Ball valve flange
021 Hose insert, 90°	135 Non-return valve
022 Hose insert, 45°	150 Tailstock
024 Vibra bulkhead flange	214 Male thread flange (UNF)
025 Flange plug	901 Compensator
035 Tee between (BSP 1/4")	902 Compensator
036 Tee between (BSP 1/2")	918 U-loop for low pressure
037 Tee between (BSP 3/4")	920 U-loop for high pressure

Material possibilities

GS-flange connections can be accomplished by several different material alternatives. The following tables demonstrates 4 different complete assemblies, out of which the best combination can be chosen out depending on the application.

Flare flange connections

	Part Code	Component Code	Material
Standard assembly	320/38X4FC	320F Flange	electric zinc coated carbon steel
		20/38X4FC Insert Cone	electric zinc coated carbon steel
		20/38F Sleeve	electric zinc coated carbon steel
		2030 Bonded Seal	electric zinc coated carbon steel/NBR
		OR30X1.0 O-ring	NBR, Shore 90 A
Stainless Steel	320/38X4FCSS	320FSS Flange	AISI 316
		20/38X4FCSS Insert Cone	AISI 316
		20/38FSS Sleeve	AISI 316
		2030SS Bonded Seal	AISI 316/NBR*
		OR30X1.0 O-ring	NBR, Shore 90 A
Stainless Steel +electric zinc coated carbon steel flanges	320/38X4FCSS/ZN	320F Flange	electric zinc coated carbon steel
		20/38X4FCSS Insert Cone	AISI 316
		20/38FSS Sleeve	AISI 316
		2030SS Bonded Seal	AISI 316/NBR*
		OR30X1.0 O-ring	NBR, Shore 90 A
Stainless Steel +hot dip galv. carbon steel flanges	320/38X4FCSS/HDG	320FHDG Flange	hot dip galvanized carbon steel
		20/38X4FCSS Insert Cone	AISI 316
		20/38FSS Sleeve	AISI 316
		2030SS Bonded Seal	AISI 316/NBR*
		OR30X1.0 O-ring	NBR, Shore 90 A

Retain ring flange connections

	Part Code	Component Code	Material
Standard assembly	320019	320 Flange	electric zinc coated carbon steel
		20019 Bulkhead	electric zinc coated carbon steel
		20 Retain ring	AISI 302
		2030 Bonded Seal	electric zinc coated carbon steel/NBR
Stainless Steel	320019SS	320SS Flange	AISI 316
		20019SS Bulkhead	AISI 316
		20 Retain ring	AISI 302
		2030SS Bonded Seal	AISI 316/NBR*
Stainless Steel +electric zinc coated carbon steel flanges	320019SS/ZN	320 Flange	electric zinc coated carbon steel
		20019SS Bulkhead	AISI 316
		20 Retain ring	AISI 302
		2030SS Bonded Seal	AISI 316/NBR*
Stainless Steel +hot dip galv. carbon steel flanges	320019SS/HDG	320HDG Flange	hot dip galvanized carbon steel
		20019SS Bulkhead	AISI 316
		20 Retain ring	AISI 302
		2030SS Bonded Seal	AISI 316/NBR*

*) In stainless steel bonded seals there is also possibility to have FPM (Viton) as rubber material.

Zinc electrodeposited coating (ZN) according to EN 12329 – Fe//Zn 12/A/T2.

- Zinc layer thickness minimum 12 micrometer
- Clear chromate passivation – Chrome 6-free
- Additional sealing treatment by organic sealant

Hot dip galvanization (HDG) according to EN ISO 1461.

- With smaller (drum process) hot dip galvanized components the zinc thickness of layer is min. 45 micrometer.
- With bigger (rack process) hot dip galvanized components the zinc thickness of layer is min. 70 micrometer.

Assembly and installation



These are GS-Hydro's guidelines for the manufacture and assembly of the GS-Hydro 37° flare flange system, retain ring system and 90° flare flange system. The detailed installation instructions are available from GS-Hydro upon request. Also 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. Especially important is to use trained GS-personnel and right type of machinery when carrying out grooving operations.

GS-Hydro can provide training and instruction as well as installation supervision if required.

When using bolt torque tables – following things should be carefully noted:

- GS-Hydro provides bolt torques for two alternative greases:
 - Gleitmo 805
 - Molykote G rapid plus
- There are different bolt torque columns for zinc electroplated bolts and hot dip galvanized bolts.

Always make sure that right bolt torque values are selected.

The GS-Hydro flange connecting system is enormously flexible – even flared and retain ring components fit together. This feature together with numerous other benefits of non-welded connection technology makes the whole system fast and easy to install – making it simply unique.



Assembly and installation, GS-37° Flare Flange System

GS-37° flare flange system

The following presents the general principles of the assembly and installation of the GS-37° flare flange system and are thus not to be construed as detailed and complete instruction.

Note! The detailed assembly and installation instructions are available from GS-Hydro upon request.

In the flaring process the end of the tube is clamped into an in-house developed flaring machine where a conical rotating tool flares the pipe end into a dye. The flange is installed onto the pipe prior to flaring. The assembly is done by placing a flaring cone on both the flared pipe ends with a seal in-between. The flanges are then tightened together to complete the connection.



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



Inspect the flange type before placing it on to the pipe (remember to use the sleeve if required). The original GS-flange has a GS-PIPING text, marking of flange type and a follow-up number.



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



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.



Lubricate the O-ring with Gleitmo 750 or equivalent lubricant. Place O-ring carefully into its groove. Examine all sealing surfaces to detect possible rust or mechanical damages.

Assembly and installation, GS-37° Flare Flange System



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



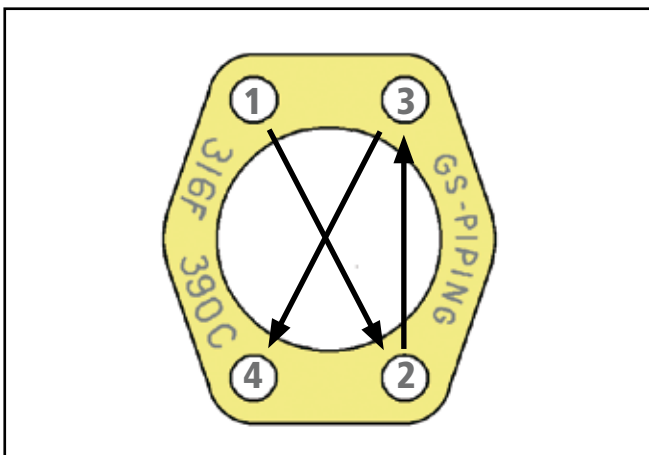
Lubricate the bonded seal with Gleitmo 805 -paste or equivalent. Control that pipe ends fit together and are aligned for sealing.



Lubricate bolt threads amply according to illustration. If tightened on bolt, lubricate bolt head compression face. If tightened on nut, lubricate nut on flange side.



The greased bolts (and nut) are tightened to the given torque to complete the installation.



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

1. Tightening of the bolts should start immediately after greasing of threads
2. Tighten lightly with a wrench.
3. Tighten crosswise with 30% of the recommended torque.
4. Tighten crosswise with 70% of the recommended torque.
5. Tighten crosswise with 100% of the recommended torque. Repeat this step until all bolts stand still with full torque applied. Minimum 2 full cycles.

Assembly and installation, GS-37° Flare Flange System

Bolt Torques for Gleitmo 805 -grease

Metric connections

SAE 50 bar		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1 1/2"	124F	M12x70	x40	36 Nm	43 Nm
2"	132F	M12x70	x40	36 Nm	43 Nm
2 1/2"	140F	M12x70	x40	36 Nm	43 Nm
3"	148F	M16x80	x50	50 Nm	60 Nm
3 1/2"	156F	M16x90	x50	50 Nm	60 Nm
4"	164F	M16x90	x50	63 Nm	76 Nm
5"	180F	M16x90	x50	92 Nm	76 Nm
6"	196F	M16x110	x60	81 Nm	97 Nm
8"	228F	M20x120	x70	118 Nm	142 Nm
10"	260F	M20x140	x80	166 Nm	199 Nm

SAE 3000 psi		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1/2"	308F	M8x60	x35	22 Nm	27 Nm
3/4"	312F	M10x60	x35	24 Nm	29 Nm
1"	316F	M10x60	x35	31 Nm	37 Nm
1 1/4"	320F	M10x70	x35	40 Nm	48 Nm
1 1/2"	324F	M12x80	x45	45 Nm	54 Nm
2"	332F	M12x80	x50	53 Nm	64 Nm
2 1/2"	340F	M12x110	x60	69 Nm	83 Nm
3"	348F	M16x130	x80	137 Nm	165 Nm

SAE 6000 psi		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1/2"	608F	M8x60	x35	22 Nm	27 Nm
3/4"	612F	M10x70	x40	28 Nm	34 Nm
1"	616F	M12x70	x45	41 Nm	50 Nm
1 1/4"	620F	M14x90	x50	69 Nm	83 Nm
1 1/2"	624F	M16x100	x60	116 Nm	140 Nm
2"	632F	M20x110	x70	145 Nm	174 Nm
2 1/2"	640F	M24x130	x90	240 Nm	288 Nm
3"	648F	M30x130	x100	415 Nm	492 Nm

DIN 350–400 bar		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1 1/2"	424F	M16x90	x50	88 Nm	98 Nm
2"	432F	M16x110	x60	113 Nm	127 Nm
2 1/2"	440F	M20x120	x70	158 Nm	190 Nm

ANSI 36.19 connections

SAE 3000 psi		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1/2"	308F/21.3	M8x60	x35	22 Nm	27 Nm
3/4"	312F/26.7	M10x60	x35	24 Nm	29 Nm
1"	316F/33.4	M10x60	x35	31 Nm	37 Nm
1 1/4"	320F/42.2	M10x70	x35	40 Nm	48 Nm
1 1/2"	324F/48.3	M12x80	x45	45 Nm	54 Nm
2"	332F/60.3	M12x80	x50	53 Nm	64 Nm
2 1/2"	340F	M12x110	x60	69 Nm	83 Nm
3"	348F/88.9	M16x130	x80	137 Nm	165 Nm

SAE 6000 psi		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1/2"	608F/21.3	M8x60	x35	22 Nm	27 Nm
3/4"	612F/26.7	M10x70	x40	28 Nm	34 Nm
1"	616F/33.4	M12x70	x45	41 Nm	50 Nm
1 1/4"	620F/42.2	M14x90	x50	69 Nm	83 Nm
1 1/2"	624F/48.3	M16x100	x60	119 Nm	140 Nm
2"	632F/60.3	M20x110	x70	145 Nm	174 Nm
2 1/2"	640F	M24x130	x90	240 Nm	288 Nm
3"	648F/88.9	M30x130	x100	415 Nm	492 Nm

DIN 350–400 bar		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1 1/2"	424F/48.3	M16x90	x50	88 Nm	98 Nm
2"	432F/60.3	M16x110	x60	113 Nm	127 Nm
2 1/2"	440F	M20x120	x70	158 Nm	190 Nm

ELZ = Zinc electroplated coating
 HDG = Hot dip galvanised coating
 Torque values are with a tolerance of 0...5%.
 (Note! The torque values of 340-flanges shall not be exceeded).

Assembly and installation, GS-37° Flare Flange System

Bolt Torques for Molycote G rapide plus -grease

Metric connections

SAE 50 bar		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1 1/2"	124F	M12x70	x40	33 Nm	36 Nm	50 Nm
2"	132F	M12x70	x40	33 Nm	36 Nm	50 Nm
2 1/2"	140F	M12x70	x40	33 Nm	36 Nm	50 Nm
3"	148F	M16x80	x50	45 Nm	50 Nm	60 Nm
3 1/2"	156F	M16x90	x50	45 Nm	50 Nm	70 Nm
4"	164F	M16x90	x50	57 Nm	63 Nm	85 Nm
5"	180F	M16x90	x50	83 Nm	92 Nm	125 Nm
6"	196F	M16x110	x60	73 Nm	81 Nm	110 Nm
8"	228F	M20x120	x70	107 Nm	113 Nm	200 Nm
10"	260F	M20x140	x80	150 Nm	166 Nm	238 Nm

SAE 3000 psi		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1/2"	308F	M8x60	x35	20 Nm	22 Nm	20 Nm
3/4"	312F	M10x60	x35	22 Nm	24 Nm	28 Nm
1"	316F	M10x60	x35	28 Nm	31 Nm	37 Nm
1 1/4"	320F	M10x70	x35	36 Nm	40 Nm	48 Nm
1 1/2"	324F	M12x80	x45	41 Nm	45 Nm	62 Nm
2"	332F	M12x80	x50	48 Nm	53 Nm	73 Nm
2 1/2"	340F	M12x110	x60	63 Nm	69 Nm	107 Nm
3"	348F	M16x130	x80	124 Nm	137 Nm	187 Nm

SAE 6000 psi		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1/2"	608F	M8x60	x35	20 Nm	22 Nm	20 Nm
3/4"	612F	M10x70	x40	26 Nm	28 Nm	34 Nm
1"	616F	M12x70	x45	37 Nm	41 Nm	56 Nm
1 1/4"	620F	M14x90	x50	63 Nm	69 Nm	85 Nm
1 1/2"	624F	M16x100	x60	105 Nm	116 Nm	158 Nm
2"	632F	M20x110	x70	131 Nm	145 Nm	205 Nm
2 1/2"	640F	M24x130	x90	216 Nm	305 Nm	305 Nm
3"	648F	M30x130	x100	376 Nm	415 Nm	544 Nm

DIN 350–400 bar		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1 1/2"	424F	M16x90	x50	80 Nm	88 Nm	120 Nm
2"	432F	M16x110	x60	104 Nm	113 Nm	155 Nm
2 1/2"	440F	M20x120	x70	143 Nm	158 Nm	226 Nm

ANSI 36.19 connections

SAE 3000 psi		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1/2"	308F/21.3	M8x60	x35	20 Nm	22 Nm	20 Nm
3/4"	312F/26.7	M10x60	x35	22 Nm	24 Nm	28 Nm
1"	316F/33.4	M10x60	x35	28 Nm	31 Nm	37 Nm
1 1/4"	320F/42.2	M10x70	x35	36 Nm	40 Nm	48 Nm
1 1/2"	324F/48.3	M12x80	x45	41 Nm	45 Nm	62 Nm
2"	332F/60.3	M12x80	x50	48 Nm	53 Nm	73 Nm
2 1/2"	340F	M12x110	x60	63 Nm	69 Nm	107 Nm
3"	348F/88.9	M16x130	x80	124 Nm	137 Nm	187 Nm

SAE 6000 psi		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1/2"	608F/21.3	M8x60	x35	20 Nm	22 Nm	20 Nm
3/4"	612F/26.7	M10x70	x40	26 Nm	28 Nm	34 Nm
1"	616F/33.4	M12x70	x45	37 Nm	41 Nm	56 Nm
1 1/4"	620F/42.2	M14x90	x50	63 Nm	69 Nm	85 Nm
1 1/2"	624F/48.3	M16x100	x60	108 Nm	119 Nm	158 Nm
2"	632F/60.3	M20x110	x70	131 Nm	145 Nm	205 Nm
2 1/2"	640F	M24x130	x90	216 Nm	305 Nm	305 Nm
3"	648F/88.9	M30x130	x100	376 Nm	415 Nm	544 Nm

DIN 350–400 bar		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1 1/2"	424F/48.3	M16x90	x50	80 Nm	88 Nm	120 Nm
2"	432F/60.3	M16x110	x60	104 Nm	113 Nm	155 Nm
2 1/2"	440F	M20x120	x70	143 Nm	158 Nm	226 Nm

ELZ = Zinc electroplated coating
 HDG = Hot dip galvanised coating
 SS = Stainless steel

Torque values are with a tolerance of 0..5%.
 (Note! The torque values of 340-flanges shall not be exceeded).

Assembly and installation, GS-Retain Ring Flange System

GS-Retain Ring Flange System

The following presents the general principles of the assembly and installation of the GS retain ring system and are thus not to be construed as detailed and complete instruction.

Note! The detailed assembly and installation instructions are available from GS-Hydro upon request.

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 prefabricated piping modules are then washed with 110°C–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 cover is removed from pipe end and the pipe is cleaned with a doth.



Install the flanges with the retain ring groove facing towards the end of the pipe. The original GS-flange has a GS-PIPING -text, marking of flange type and a charge number for traceability.

Assembly and installation, GS-Retain Ring Flange System



Install the retain ring onto the pipe.



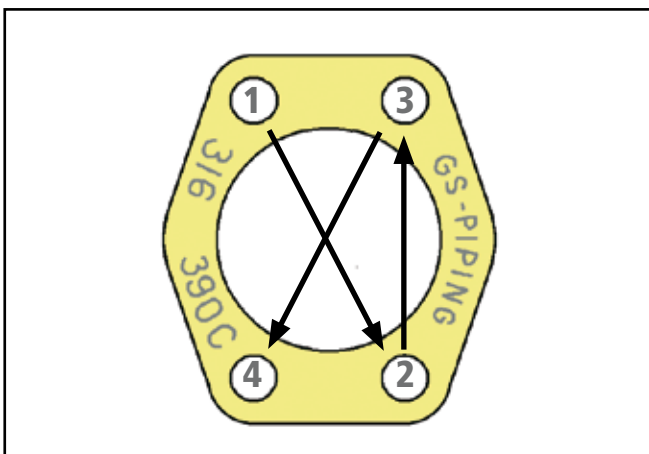
Lubricate the bonded seal with Gleitmo 805 -paste or equivalent. Control that pipe ends fit together and are aligned for sealing.



Lubricate bolt threads amply according to illustration. If tightened on bolt, lubricate bolt head compression face. If tightened on nut, lubricate nut on flange side.



The greased bolts (and nut) are tightened to the given torque to complete the installation.



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

1. Tightening of the bolts should start immediately after greasing of threads
2. Tighten lightly with a wrench.
3. Tighten crosswise with 30% of the recommended torque.
4. Tighten crosswise with 70% of the recommended torque.
5. Tighten crosswise with 100% of the recommended torque. Repeat this step until all bolts stand still with full torque applied. Minimum 2 full cycles.

Assembly and installation, GS-Retain Ring Flange System

Bolt Torques for Gleitmo 805 -grease

Metric connections

SAE 50 bar		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1 1/2"	124	M12x70	x40	36 Nm	43 Nm
2"	132	M12x70	x40	36 Nm	43 Nm
2 1/2"	140	M12x70	x40	36 Nm	43 Nm
3"	148	M16x80	x50	50 Nm	60 Nm
3 1/2"	156	M16x90	x50	50 Nm	60 Nm
4"	164	M16x90	x50	63 Nm	76 Nm
5"	180	M16x90	x50	92 Nm	76 Nm
6"	196	M16x110	x60	81 Nm	97 Nm
8"	228	M20x120	x70	118 Nm	142 Nm
10"	260	M20x140	x80	166 Nm	199 Nm

SAE 3000 psi		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1/2"	308	M8x60	x35	22 Nm	27 Nm
3/4"	312	M10x60	x35	23 Nm	28 Nm
1"	316	M10x60	x35	31 Nm	37 Nm
1 1/4"	320	M10x70	x35	40 Nm	48 Nm
1 1/2"	324	M12x80	x45	45 Nm	54 Nm
2"	332	M12x80	x50	53 Nm	64 Nm
2 1/2"	340	M12x110	x60	69 Nm	83 Nm
3"	348	M16x130	x80	137 Nm	165 Nm

SAE 6000 psi		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1/2"	608	M8x60	x35	22 Nm	27 Nm
3/4"	612	M10x70	x40	28 Nm	30 Nm
1"	616	M12x70	x45	41 Nm	49 Nm
1 1/4"	620	M14x90	x50	59 Nm	70,8 Nm
1 1/2"	624	M16x100	x60	95 Nm	106 Nm
2"	632	M20x110	x70	114 Nm	137 Nm
2 1/2"	640	M24x130	x90	227 Nm	272 Nm
3"	648	M30x130	x100	359 Nm	426 Nm

DIN 350–400 bar		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
2"	432	M16x110	x60	95 Nm	107 Nm
2 1/2"	440	M20x120	x70	158 Nm	190 Nm
3"	448	M24x140	x80	311 Nm	373 Nm
4"	456	M30x160	x100	511 Nm	614 Nm
4 1/2"	860	M20x140	x80	183 Nm	220 Nm
5"	864	M24x160	x100	362 Nm	435 Nm
6"	880	M30x220	x130	590 Nm	644 Nm
8"	896	M36x220	x130	1247 Nm	1360 Nm
10"	8160	M36x280	x180	977 Nm	1066 Nm

ANSI 36.19 connections

SAE 3000 psi		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1/2"	308/21.3	M8x60	x35	22 Nm	27 Nm
3/4"	312/26.7	M10x60	x35	23 Nm	30 Nm
1"	316/33.4	M10x60	x35	31 Nm	37 Nm
1 1/4"	320/42.2	M10x70	x35	40 Nm	48 Nm
1 1/2"	324/48.3	M12x80	x45	45 Nm	54 Nm
2"	332/60.3	M12x80	x50	53 Nm	64 Nm
2 1/2"	340/73.0	M12x110	x60	69 Nm	83 Nm
3"	348/88.9	M16x130	x80	137 Nm	165 Nm

SAE 6000 psi		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1/2"	608/21.3	M8x60	x35	22 Nm	27 Nm
3/4"	612/26.7	M10x70	x40	25 Nm	30 Nm
1"	616/33.4	M12x70	x45	41 Nm	49 Nm
1 1/4"	620/42.2	M14x90	x50	59 Nm	70,8 Nm
1 1/2"	624/48.3	M16x100	x60	88 Nm	106 Nm
2"	632/60.3	M20x110	x70	114 Nm	137 Nm
2 1/2"	640/73	M24x130	x90	169 Nm	203 Nm
3"	648/88.9	M30x130	x100	311 Nm	370 Nm

DIN 350–400 bar		Bolt DIN 912, 8.8		Bolt Torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
2"	432/60.3	M16x110	x60	95 Nm	107 Nm
2 1/2"	440/73.0	M20x120	x70	140 Nm	168 Nm
3"	448/88.9	M24x140	x80	287 Nm	345 Nm
4"	456/114.3	M30x160	x100	511 Nm	614 Nm
5"	864/141.3	M24x160	x100	340 Nm	408 Nm
5"	864/139.7	M24x160	x100	340 Nm	408 Nm
6"	880/168.3	M30x220	x130	590 Nm	644 Nm
8"	888/219.1	M30x220	x130	886 Nm	966 Nm
10"	8160	M36x300	x180	977 Nm	1066 Nm
12"	8192/323.9	M36x320	x180	1280 Nm	1396 Nm
14"	8224/355.6	M39x360	x220	1249 Nm	1362 Nm

ELZ = Zinc electroplated coating
 HDG = Hot dip galvanised coating
 Torque values are with a tolerance of 0...5%.
 (Note! The torque values of 340-flanges shall not be exceeded).

Assembly and installation, GS-Retain Ring Flange System

Bolt Torques for Molycote G rapide plus -grease

Metric connections

SAE 50 bar		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1 1/2"	124	M12x70	x40	33 Nm	36 Nm	50 Nm
2"	132	M12x70	x40	33 Nm	36 Nm	50 Nm
2 1/2"	140	M12x70	x40	33 Nm	36 Nm	50 Nm
3"	148	M16x80	x50	45 Nm	50 Nm	58 Nm
3 1/2"	156	M16x90	x50	45 Nm	50 Nm	68 Nm
4"	164	M16x90	x50	57 Nm	63 Nm	72 Nm
5"	180	M16x90	x50	83 Nm	92 Nm	106 Nm
6"	196	M16x110	x60	73 Nm	81 Nm	94 Nm
8"	228	M20x120	x70	107 Nm	118 Nm	136 Nm
10"	260	M20x140	x80	150 Nm	166 Nm	238 Nm

SAE 3000 psi		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1/2"	308	M8x60	x35	20 Nm	22 Nm	20 Nm
3/4"	312	M10x60	x35	21 Nm	23 Nm	28 Nm
1"	316	M10x60	x35	28 Nm	31 Nm	38 Nm
1 1/4"	320	M10x70	x35	36 Nm	40 Nm	49 Nm
1 1/2"	324	M12x80	x45	41 Nm	45 Nm	61 Nm
2"	332	M12x80	x50	48 Nm	53 Nm	72 Nm
2 1/2"	340	M12x110	x60	63 Nm	69 Nm	87 Nm
3"	348	M16x130	x80	124 Nm	137 Nm	158 Nm

SAE 6000 psi		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1/2"	608	M8x60	x35	20 Nm	22 Nm	20 Nm
3/4"	612	M10x70	x40	26 Nm	28 Nm	35 Nm
1"	616	M12x70	x45	37 Nm	41 Nm	55 Nm
1 1/4"	620	M14x90	x50	54 Nm	59 Nm	84 Nm
1 1/2"	624	M16x100	x60	86 Nm	95 Nm	111 Nm
2"	632	M20x110	x70	103 Nm	114 Nm	160 Nm
2 1/2"	640	M24x130	x90	204 Nm	288 Nm	288 Nm
3"	648	M30x130	x100	326 Nm	359 Nm	471 Nm

DIN 350-400 bar		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
2"	432	M16x110	x60	87 Nm	95 Nm	130 Nm
2 1/2"	440	M20x120	x70	143 Nm	158 Nm	226 Nm
3"	448	M24x140	x80	280 Nm	311 Nm	392 Nm
4"	456	M30x160	x100	460 Nm	511 Nm	667 Nm
4 1/2"	860	M20x140	x80	165 Nm	183 Nm	194 Nm
5"	864	M24x160	x100	326 Nm	362 Nm	431 Nm
6"	880	M30x220	x130	536 Nm	536 Nm	700 Nm
8"	896	M36x220	x130	1133 Nm	1133 Nm	1577 Nm
10"	8160	M36x280	x180	888 Nm	888 Nm	1162 Nm

ANSI 36.19 connections

SAE 3000 psi		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1/2"	308/21.3	M8x60	x35	22 Nm	17 Nm	20 Nm
3/4"	312/26.7	M10x60	x35	25 Nm	25 Nm	30 Nm
1"	316/33.4	M10x60	x35	31 Nm	31 Nm	38 Nm
1 1/4"	320/42.2	M10x70	x35	40 Nm	40 Nm	49 Nm
1 1/2"	324/48.3	M12x80	x45	45 Nm	49 Nm	61 Nm
2"	332/60.3	M12x80	x50	53 Nm	57 Nm	72 Nm
2 1/2"	340/73.0	M12x110	x60	69 Nm	84 Nm	87 Nm
3"	348/88.9	M16x130	x80	137 Nm	115 Nm	158 Nm

SAE 6000 psi		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
1/2"	608/21.3	M8x60	x35	22 Nm	17 Nm	20 Nm
3/4"	612/26.7	M10x70	x40	25 Nm	25 Nm	30 Nm
1"	616/33.4	M12x70	x45	41 Nm	44 Nm	55 Nm
1 1/4"	620/42.2	M14x90	x50	59 Nm	59 Nm	84 Nm
1 1/2"	624/48.3	M16x100	x60	88 Nm	74 Nm	102 Nm
2"	632/60.3	M20x110	x70	114 Nm	112 Nm	160 Nm
2 1/2"	640/73	M24x130	x90	152 Nm	215 Nm	215 Nm
3"	648/88.9	M30x130	x100	282 Nm	311 Nm	409 Nm

DIN 350-400 bar		Bolt DIN 912, 8.8		Bolt Torque		
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts	SS-bolts
2"	432/60.3	M16x110	x60	87 Nm	95 Nm	130 Nm
2 1/2"	440/73.0	M20x120	x70	126 Nm	140 Nm	197 Nm
3"	448/88.9	M24x140	x80	259 Nm	287 Nm	362 Nm
4"	456/114.3	M30x160	x100	460 Nm	511 Nm	667 Nm
5"	864/141.3	M24x160	x100	306 Nm	340 Nm	405 Nm
5"	864/139.7	M24x160	x100	306 Nm	340 Nm	405 Nm
6"	880/168.3	M30x220	x130	536 Nm	536 Nm	700 Nm
8"	888/219.1	M30x220	x130	805 Nm	805 Nm	1117 Nm
10"	8160	M36x300	x180	888 Nm	888 Nm	1162 Nm
12"	8192/323.9	M36x320	x180	1163 Nm	1163 Nm	1613 Nm
14"	8224/355.6	M39x360	x220	1135 Nm	1135 Nm	1704 Nm

ELZ = Zinc electroplated coating
 HDG = Hot dip galvanised coating
 SS = Stainless steel
 Torque values are with a tolerance of 0...5%.
 (Note! The torque values of 340-flanges shall not be exceeded).

Assembly and installation, GS-90° Flare Flange System

GS-90° flare flange system

The following presents the general principles of the assembly and installation of the GS 90° flare flange system and are thus not to be construed as detailed and complete instruction.

Note! The detailed assembly and installation instructions are available from GS-Hydro upon request.

In the flaring process the end of the tube is clamped into an in-house developed flaring machine where a conical rotating tool flares the pipe end into a dye. The flange is installed onto the pipe prior to flaring. The assembly is done by placing a flaring cone on both the flared pipe ends with a seal in-between. The flanges are then tightened together to complete the connection.



The pipe is first deburred inside and out.



The flaring cone and dye is cleaned before beginning the flaring.



The flange is placed on the pipe end with chamfer facin outwards.



The pipe end is inserted into the dies with the correct flaring dimensions.



The cone and inside the pipe is lubricated.

Assembly and installation, GS-90° Flare Flange System



The pipe is flared in two stages, first 37° and then 90°.



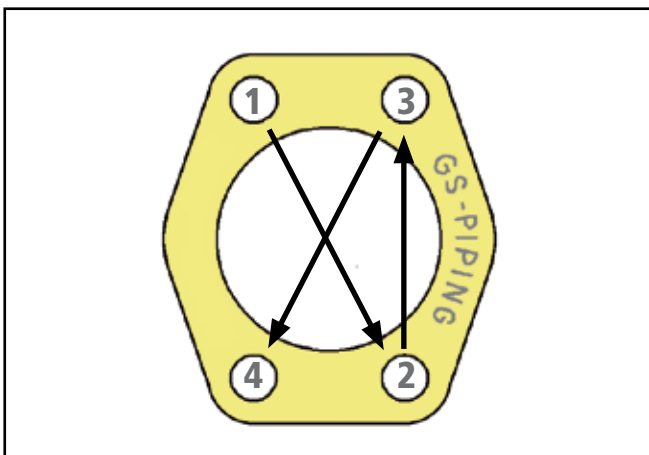
Lubricate bolt threads amply according to illustration. If tightened on bolt, lubricate bolt head compression face. If tightened on nut, lubricate nut on flange side.



The bolts are used to center the seal.



The greased bolts (and nut) are tightened to the given torque to complete the installation.



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

1. Tightening of the bolts should start immediately after greasing of threads
2. Tighten lightly with a wrench.
3. Tighten crosswise with 30% of the recommended torque.
4. Tighten crosswise with 70% of the recommended torque.
5. Tighten crosswise with 100% of the recommended torque. Repeat this step until all bolts stand still with full torque applied. Minimum 2 full cycles.

Correct bolt torques for GS-90° connections will be found from GS-Hydro's official Assembly and Installation Instructions.