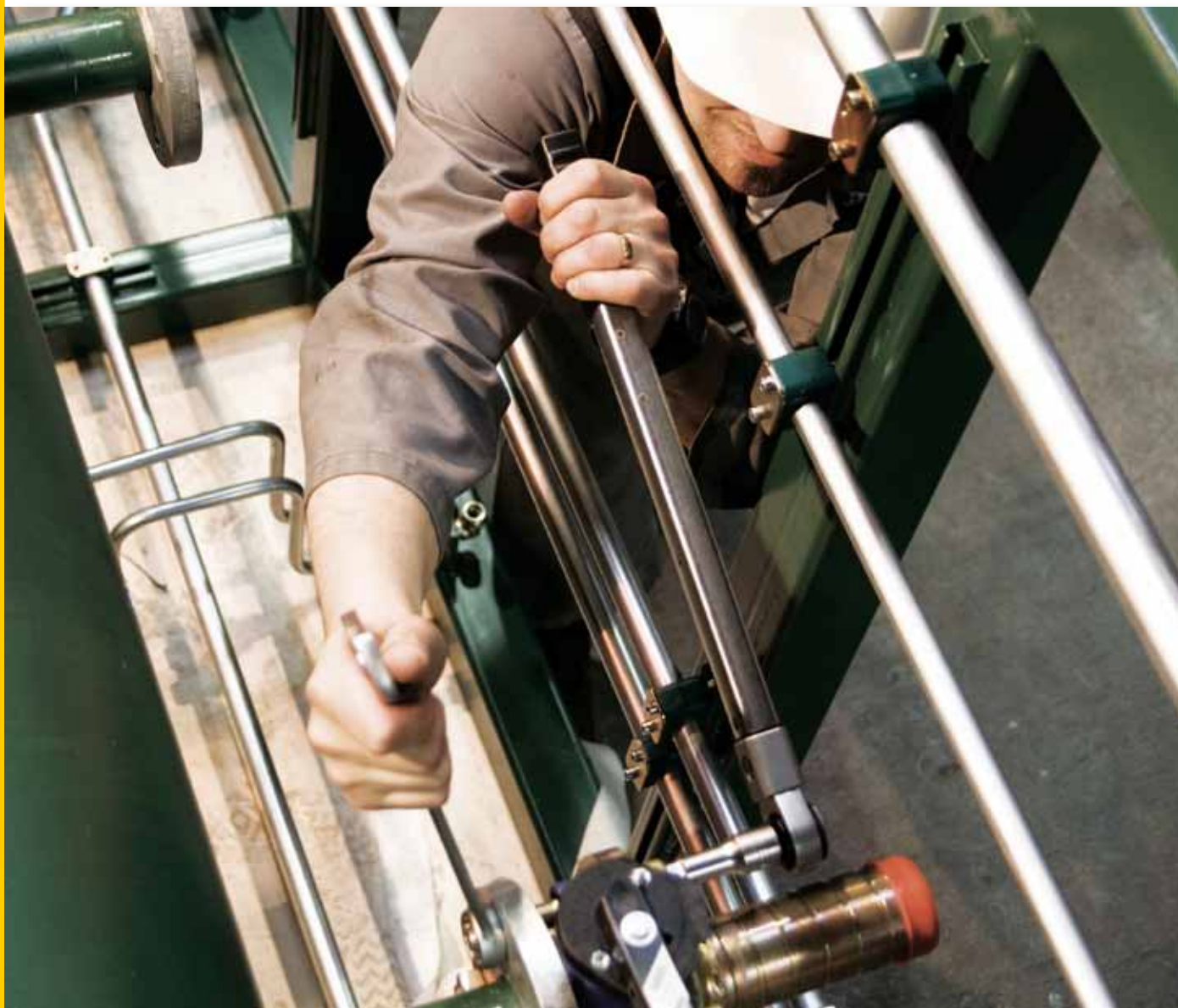


FLARING AND INSTALLATION INSTRUCTIONS

GS-90° FLARE FLANGE SYSTEM

REVISION JANUARY 2015

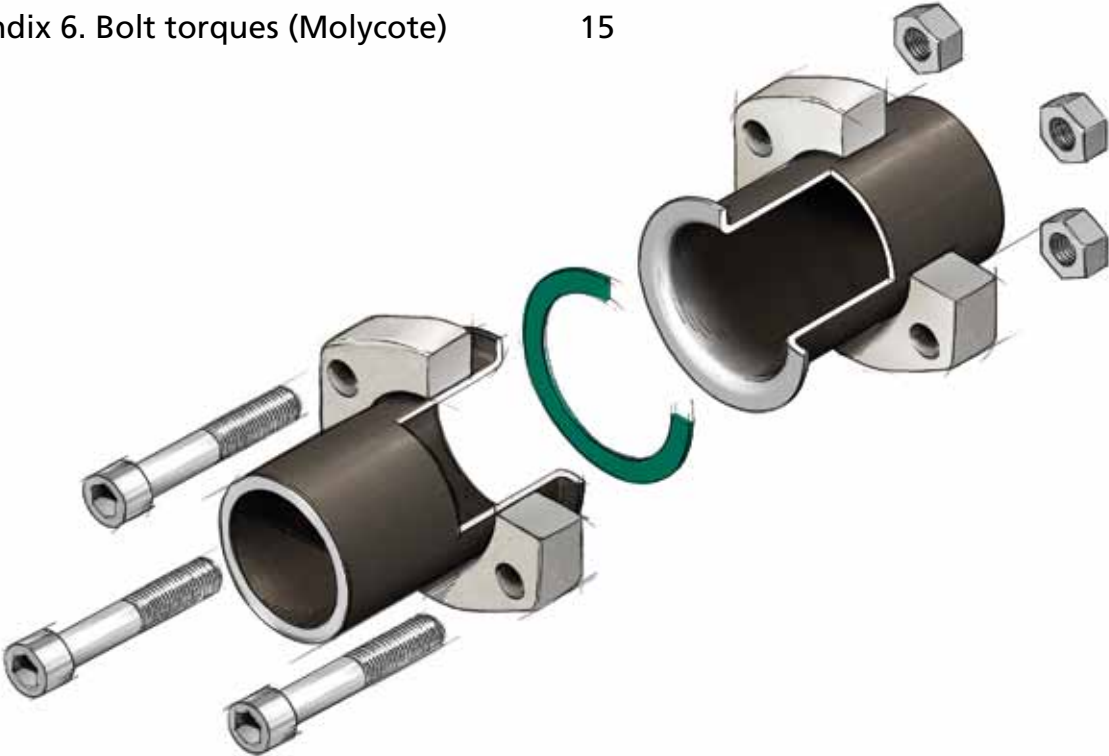


GS-90°


GS-Hydro

Table of contents

Introduction	3
Selection of the pipe	4
Cutting of the pipe	5
Cleaning operations before flaring	6
Clamping the pipe	6
Flaring operations	7
Checking the flaring	8
Assembling of parts	9
Connecting the joint	10
Reassembly	11
Appendix 1 and 2. Flared joint DIN 90°	12
Appendix 3 and 4. Flared joint SAE 90°	13
Appendix 5. Bolt torques (Gleitmo 805)	14
Appendix 6. Bolt torques (Molycote)	15



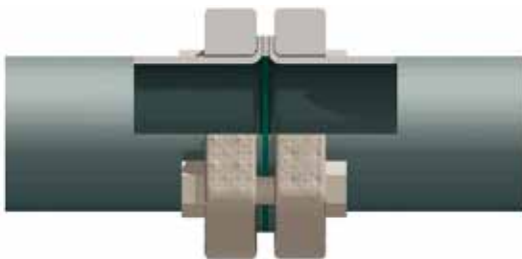
Introduction

These are GS-Hydro's guidelines for the manufacture and assembly of the GS-Hydro 90° 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 the required personal protective equipments.



The GS 90° flare system is used for class III piping systems with operating pressures of up to 40 bar. Extensive test programs – including rigorous vibration testing – have proven the suitability of the GS 90° 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.

GS-90° Flare Flange System (technical data):

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

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 cold drawn 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 fitted with plastic plugs in the ends.



Cutting off the pipe



Cut tubes squarely by using cold saw. Do not use roller cutter or grinder.

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 also recommended to shoot foam projectiles by means of compressed air through the pipes – use Jet Clean, Compri Tube Clean or a respective method.

Cleaning operations before flaring

Place the GS 90° flare flange on the pipe end with the chamfer facing outwards.

Inspect the flange type before placing it on to the tube. 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 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.

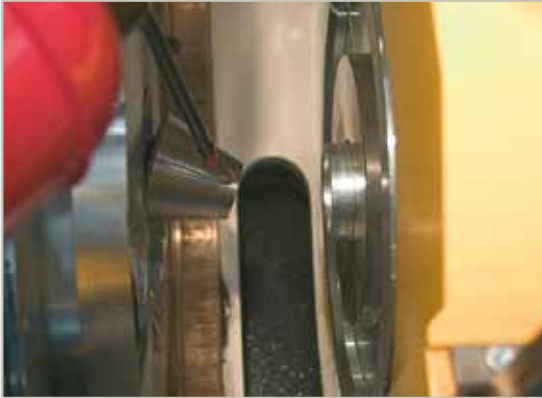
Damaged, worn, or dirty tools will affect the sealing efficiency.

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).

GS-90° flaring is done in two steps – at first with 37° cone...



... and then with 90° cone.



Ensure that the flange is placed on the pipe before beginning flaring operation.



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

Checking the flaring

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



Verify the outside dimension of the flaring (Appendix 1-4, pages 11-14) and check that flare is concentric with the pipe.



Check the wall thickness of the flared part. The thickness should be approx. 80% of the nominal thickness of the pipe.



Ensure that the flare is at 90° angle to the pipe.

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
- use non-abrasive soft cloth to clean all components from grease and dirt
- verify that all components are of correct material and size



Verify that you are using the right type and size of bolt. Always use calibrated torque tools.

For bolt dimensions exceeding M20 we recommend use of hydraulic torque tool.

Please note that there are two values shown for each bolt type, one for **Gleitmo 805** (Appendix 5, page 14) and one for **MOLYKOTE G-Rapid Plus** (Appendix 6, page 15). Torque tables are only valid for these two lubrication agents.



Inspect the bolts and nuts to ensure no damage.

Lubricate bolt threads amply according to illustration.

Spread evenly with a brush.

Tightening must be done from the bolt side. If in special case nut is tightened, then the bolt torque values must be engreased with 10%.



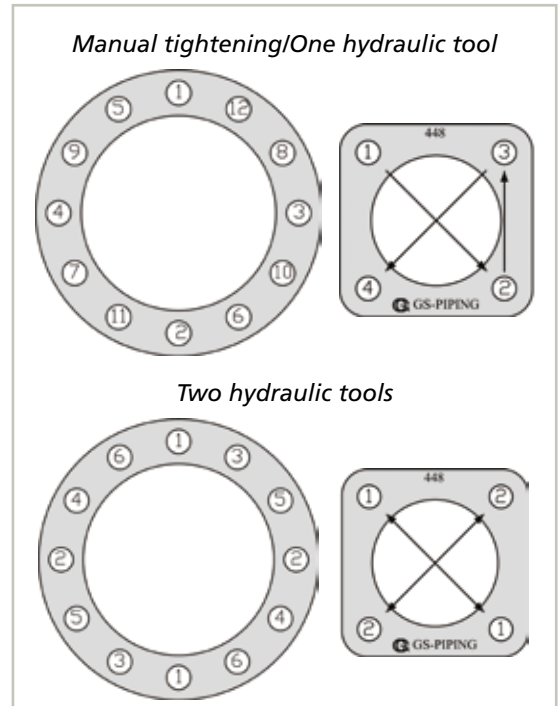
Control that pipe ends fit together and are aligned for sealing.

Insert the bolts and gasket which will centralize on bolts.

Control that the bolts run free through bolt holes, and that the flanges are parallel before starting tightening sequence.

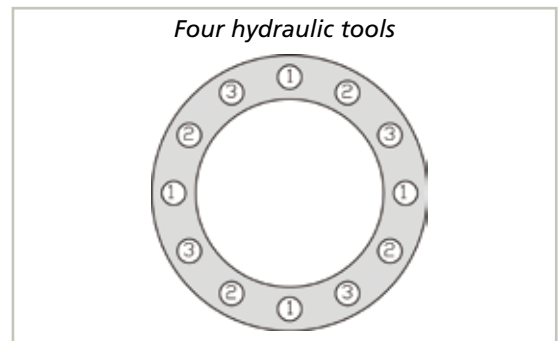
Tighten bolts in diagonal sequence in small increments to appropriate torque level. See illustrated example.


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.



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 50% of the recommended torque.
 4. Tighten crosswise with 100% of the recommended torque.
- Repeat this step until all bolts stand still with full torque applied. Minimum 2 full cycles.





We recommend that all bolt torques are checked immediately after pressure test – at least 10% of connections must be verified. We also recommend that after 1 - 2 weeks of system operation, bolt torques of all connections are verified.



During installation

After each tightening sequence ensure that flanges are at 90 degrees to the pipe and that the gap between flanges is equal to $(x=y) \pm 1$ mm.

Also, verify that the bolts protrude 1–2 threads from the nut.

Reassembly

Ensure that all pressure is bled out from the system.



DO NOT take for granted that there is no pressure in the system, all connections must be disassembled with great caution. Please check that all relevant HSE regulations are followed.

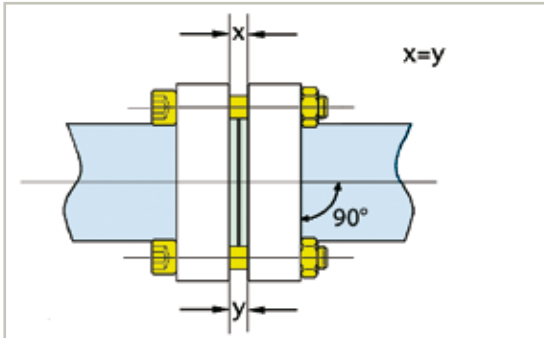
Loosen bolts a quarter of a turn in a crosswise pattern similar to assembly. Repeat until all pretension of bolts is released. Continue disassembly until the flange can be moved. Ensure that no pressure is left in the system. Take out the bolts and carefully take the connection apart.

Check all sealing surfaces and ensure no damages. Seal all parts that are not to be reassembled immediately. If temporary storage is required, make sure parts are protected from environmental influences.

We recommend that all soft seals are replaced before reassembly.

If the time in operation have been short, and no damage can be seen on the seals, they might be used again.

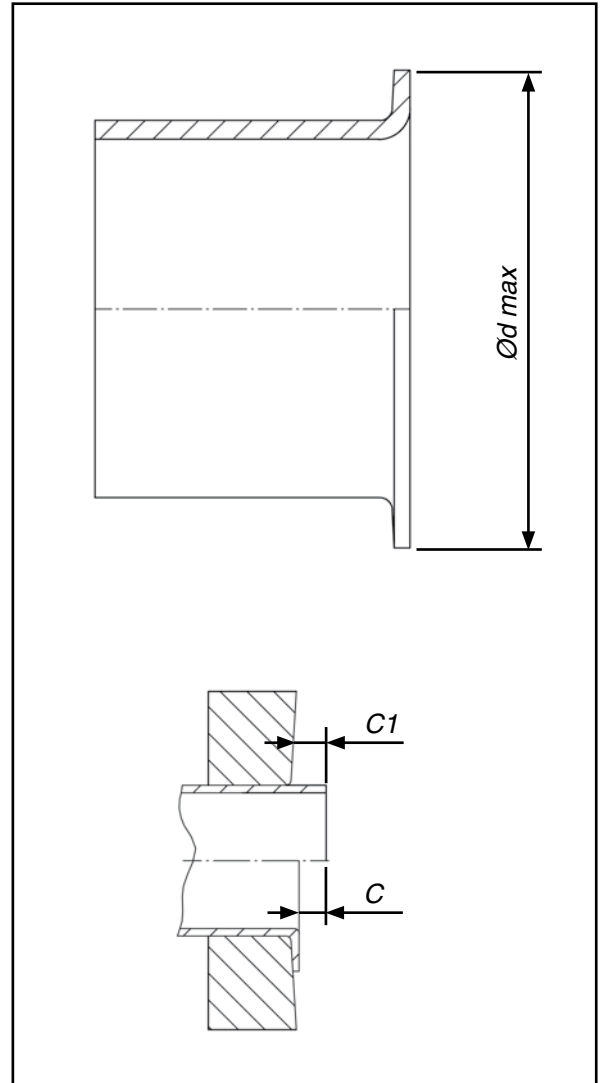
When the connection is to be assembled again please follow procedure for connecting the joint step by step. Use the correct bolt torque from the tables.



Appendix 1.

Flared joint DIN 90°/St37.4

Size	PN	Pipe O.D.	C	C1	d max
DN40	10-40	48.3	13	14	73
DN50	10-40	60.3	18	22	92
DN65	10-40	76.1	17	20	105
DN80	10-40	88.9	23	27	127
DN100	10-16	114.3	24	28	158
DN100	25-40	114.3	26	31	162
DN125	10-25	139.7	25	32	188
DN150	10-16	168.3	23	27	212
DN150	25	168.3	26	31	218
DN200	10-16	219.1	23	29	268
DN200	25	219.1	32	36	278
DN250	10-16	273.0	24	27	320
DN300	10	323.9	25	28	370
DN300	16	323.9	29	31	378
DN350	10	355.6	43	41	430
DN350	16	355.6	47	46	438
DN400	10	406.4	45	44	482
DN400	16	406.4	49	48	490



Appendix 2.

Flared joint DIN 90°/AISI 316

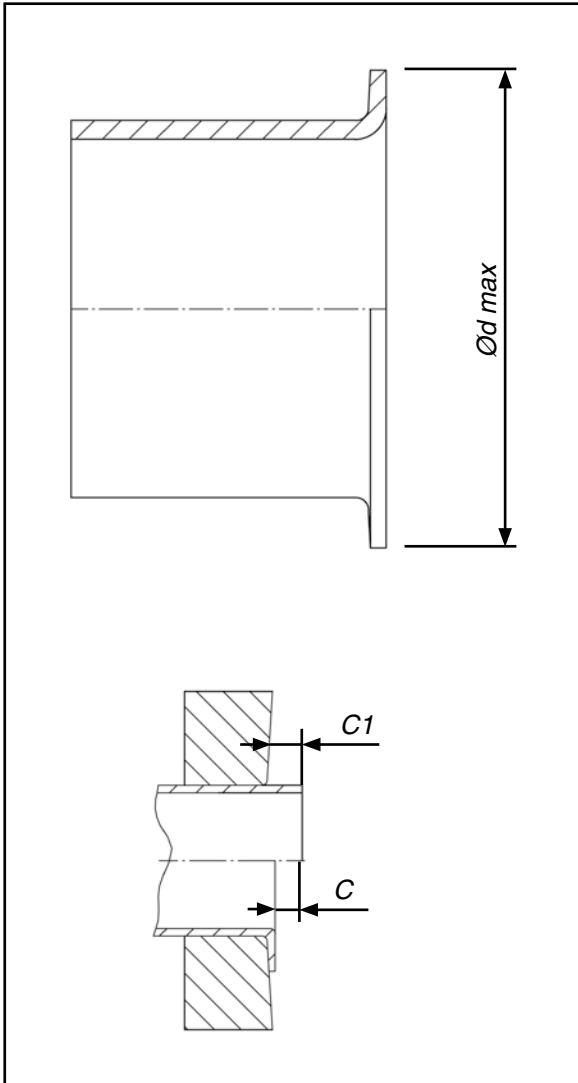
Size	PN	Pipe O.D.	C	C1	d max
DN40	10-40	48.3	9	9	65
DN50	10-40	60.3	10	10	80
DN65	10-40	76.1	12	12	100
DN80	10-40	88.9	16	15	120
DN100	10-40	114.3	15	14	143
DN125	10-25	139.7	16	15	170
DN150	10-25	168.3	16	15	200
DN200	10-25	219.1	21	19	260
DN250	10-16	273.0	24	22	320
DN300	10-16	323.9	24	22	370
DN350	10-16	355.6	26	24	407
DN400	10-16	406.4	27	25	459

Appendix 3. Flared joint SAE 90°/St37.4

Type	Pipe O.D.	C	C1	d max
24N	48.3/50	8	9	65.3
32N	60.3/60	8	10	76
40N	76.1/75	8	9	90
48N	88.9/90	8	10	107
56N	101.6/100	11	13	123
64N	114.3/115	10	12	135
80N	139.7/140	11	12	161
96N	168.3/165	12	15.5	191
28N	219.1/220	17	20	254

Appendix 4. Flared joint SAE 90°/AISI 316

Type	Pipe O.D.	C	C1	d max
16NSS	30.0	7.5	9	45
24NSS	48.3	8	9	65.3
32NSS	60.3	8	10	76
40NSS	76.1	8	9	90
48NSS	88.9	8	10	107
56NSS	101.6	11	13	123
64NSS	114.3	10	12	135
80NSS	139.7	11	12	161
96NSS	168.3	12	15.5	191
28NSS	219.1	17	20	254



Appendix 5. Bolt Torques for Gleitmo 805 -grease

SAE 10–40 bar		Bolt DIN 931, 8.8		Bolt torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1 1/2"	124N	M12x70	x40	43 Nm	52 Nm
2"	132N	M12x70	x40	43 Nm	52 Nm
2 1/2"	140N	M12x70	x40	44 Nm	54 Nm
3"	148N	M16x80	x50	67 Nm	92 Nm
3 1/2"	156N	M16x90	x50	87 Nm	120 Nm
4"	164N	M16x90	x50	94 Nm	129 Nm
5"	180N	M16x110	x60	118 Nm	161 Nm
6"	196N	M16x110	x60	101 Nm	138 Nm
8"	228N	M20x120	x70	118 Nm	162 Nm

DIN 2576 10–40 bar		Bolt DIN 931, 8.8		Bolt torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1 1/4"	GSEN-PN10/40-DN32/38	M16x60	x40	27 Nm	37 Nm
	GSEN-PN10/40-DN32/42.4				
1 1/2"	GSEN-PN10/40-DN40/44.5	M16x60	x40	27 Nm	37 Nm
	GSEN-PN10/40-DN40/48.3				
2"	GSEN-PN10/40-DN50/60.3	M16x70	x45	34 Nm	46 Nm
	GSEN-PN10/40-DN50/57				
2 1/2"	GSEN-PN10/16-DN65/73	M16x70	x45		
	GSEN-PN10/16-DN65/76.1				
	GSEN-PN25/40-DN65/73			47 Nm	64 Nm
	GSEN-PN25/40-DN65/76.1				
3"	GSEN-PN10/16-DN80/88.9	M16x80	x45	30 Nm	42 Nm
	GSEN-PN25/40-DN80/88.9				
4"	GSEN-PN10/16-DN100/108	M16x70	x45	27 Nm	37 Nm
	GSEN-PN10/16-DN100/114.3				
	GSEN-PN25/40-DN100/114.3	M20x90	x55	45 Nm	47 Nm
5"	GSEN-PN10/16-DN125/133	M16x80	x45	27 Nm	37 Nm
	GSEN-PN10/16-DN125/139.7				
	GSEN-PN25/40-DN125/139.7	M24x100	x65	74 Nm	71 Nm
6"	GSEN-PN10/16-DN150/159	M20x80	x55	64 Nm	67 Nm
	GSEN-PN10/16-DN150/168.3				
	GSEN-PN25/40-DN150/168.3	M24x100	x65	88 Nm	84 Nm
8"	GSEN-PN10-DN200/219.1	M20x90	x60	77 Nm	80 Nm
	GSEN-PN16-DN200/219.1			58 Nm	62 Nm
	GSEN-PN25-DN200/219.1	M24x110	x70	95 Nm	90 Nm
10"	GSEN-PN10-DN250/273	M20x90	x60	66 Nm	68 Nm
	GSEN-PN16-DN250/273	M24x100	x70	97 Nm	98 Nm
12"	GSEN-PN10-DN300/323.9	M20x90	x60	81 Nm	84 Nm
	GSEN-PN16-DN300/323.9	M24x110	x70	121 Nm	115 Nm
14"	GSEN-PN10-DN350/355.6	M20x100	x65	121 Nm	125 Nm
	GSEN-PN16-DN350/355.6	M24x120	x75	127 Nm	121 Nm
16"	GSEN-PN10-DN400/406.4	M24x110	x70	124 Nm	118 Nm
	GSEN-PN16-DN400/406.4	M27x130	x80	170 Nm	161 Nm

ELZ = Zinc electroplated coating

HDG = Hot dip galvanised coating

Torque values are with a tolerance of 0...5%

Appendix 6. Bolt Torques for MOLYKOTE G-Rapid Plus -grease

SAE 10–40 bar		Bolt DIN 931, 8.8		Bolt torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1 1/2"	124N	M12x70	x40	35 Nm	39 Nm
2"	132N	M12x70	x40	35 Nm	39 Nm
2 1/2"	140N	M12x70	x40	36 Nm	40 Nm
3"	148N	M16x80	x50	59 Nm	62 Nm
3 1/2"	156N	M16x90	x50	77 Nm	80 Nm
4"	164N	M16x90	x50	83 Nm	87 Nm
5"	180N	M16x110	x60	103 Nm	108 Nm
6"	196N	M16x110	x60	89 Nm	93 Nm
8"	228N	M20x120	x70	104 Nm	109 Nm

DIN 2576 10–40 bar		Bolt DIN 931, 8.8		Bolt torque	
Size	Flange Type	Flange to flange	Flange to block	ELZ-bolts	HDG-bolts
1 1/4"	GSEN-PN10/40-DN32/38	M16x60	x40	24 Nm	25 Nm
	GSEN-PN10/40-DN32/42.4				
1 1/2"	GSEN-PN10/40-DN40/44.5	M16x60	x40	24 Nm	25 Nm
	GSEN-PN10/40-DN40/48.3				
2"	GSEN-PN10/40-DN50/60.3	M16x70	x45	29 Nm	31 Nm
	GSEN-PN10/40-DN50/57				
2 1/2"	GSEN-PN10/16-DN65/73	M16x70	x45		
	GSEN-PN10/16-DN65/76.1				
	GSEN-PN25/40-DN65/73			41 Nm	43 Nm
	GSEN-PN25/40-DN65/76.1				
3"	GSEN-PN10/16-DN80/88.9	M16x80	x45	27 Nm	28 Nm
	GSEN-PN25/40-DN80/88.9				
4"	GSEN-PN10/16-DN100/108	M16x70	x45	24 Nm	25 Nm
	GSEN-PN10/16-DN100/114.3				
	GSEN-PN25/40-DN100/114.3	M20x90	x55	39 Nm	40 Nm
5"	GSEN-PN10/16-DN125/133	M16x80	x45	24 Nm	25 Nm
	GSEN-PN10/16-DN125/139.7				
	GSEN-PN25/40-DN125/139.7	M24x100	x65	62 Nm	64 Nm
6"	GSEN-PN10/16-DN150/159	M20x80	x55	56 Nm	57 Nm
	GSEN-PN10/16-DN150/168.3				
	GSEN-PN25/40-DN150/168.3	M24x100	x65	74 Nm	63 Nm
8"	GSEN-PN10-DN200/219.1	M20x90	x60	67 Nm	69 Nm
	GSEN-PN16-DN200/219.1			51 Nm	52 Nm
	GSEN-PN25-DN200/219.1	M24x110	x70	80 Nm	81 Nm
10"	GSEN-PN10-DN250/273	M20x90	x60	57 Nm	59 Nm
	GSEN-PN16-DN250/273	M24x100	x70	81 Nm	83 Nm
12"	GSEN-PN10-DN300/323.9	M20x90	x60	71 Nm	72 Nm
	GSEN-PN16-DN300/323.9	M24x110	x70	102 Nm	104 Nm
14"	GSEN-PN10-DN350/355.6	M20x100	x65	88 Nm	108 Nm
	GSEN-PN16-DN350/355.6	M24x120	x75	107 Nm	109 Nm
16"	GSEN-PN10-DN400/406.4	M24x110	x70	104 Nm	106 Nm
	GSEN-PN16-DN400/406.4	M27x130	x80	142 Nm	145 Nm

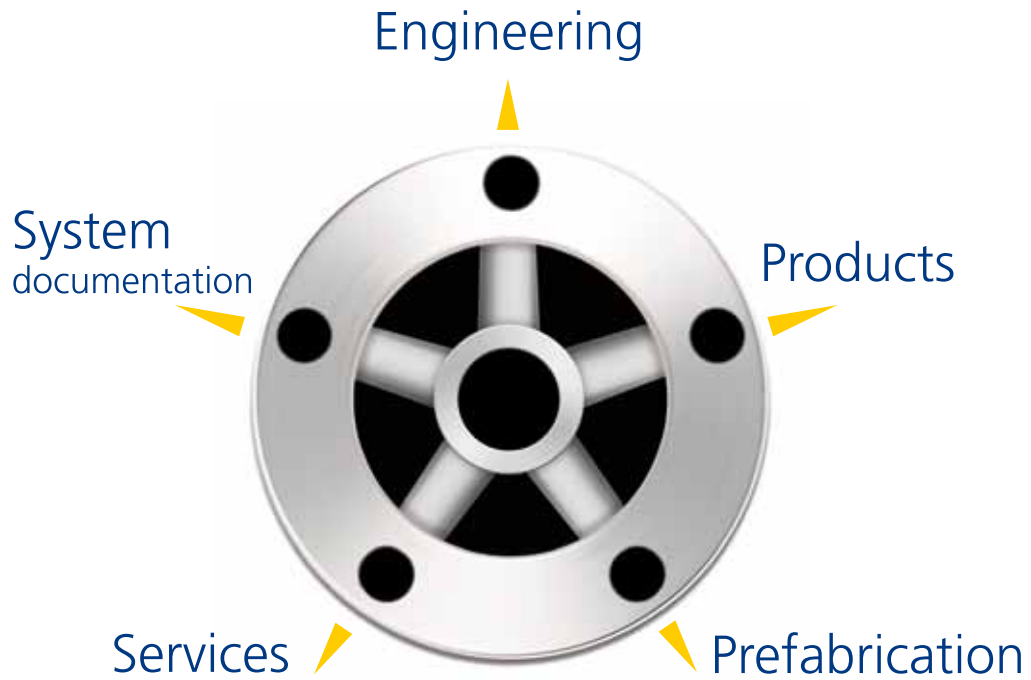
ELZ = Zinc electroplated coating

HDG = Hot dip galvanised coating

Torque values are with a tolerance of 0...5%

GS-Hydro is the original provider of non-welded piping solutions with numerous benefits for a wide variety of demanding applications. The company operates globally in more than twenty-five countries through own companies and partners. GS-Hydro supplies complete piping systems with engineering, products, prefabrication, services and documentation.

GS-Hydro system offering



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