GF Piping Systems

COOL-FIT 4.0

Installation Instructions

Deep Refrigeration Applications
Flow ≥ –33°C

Deep Refrigeration Applications (Flow ≥ –33°C)

Supplement to Planning Fundamentals

1 General Guidelines and Boundary Conditions

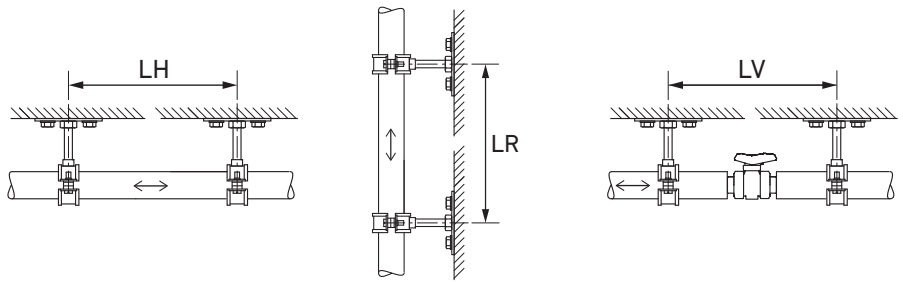
The installation guidelines are recommendations on the basis of the outlined assumptions and boundaries. For deviating situations like more complex routings, less available space for an L-Bend, different load cases, static evidences, please contact GF Advanced Engineering. At any time, the planning fundamentals have to be taken into account and the instructions have to be followed for a correct and long lasting function of the system.

Boundary conditions	
System and pipe class	COOL-FIT 4.0
Flow temperature	-33 to +47°C
Ambient temperature	-5 to +45°C
Installation temperature	-5 to +40°C
Medium type	Organic salt solution (reduction factor PE100: F=1.0; ABS: F=1.25)
Operation time	25 years for flow temp. ≤47°C; reduced for flow temp. >47°C

2 Maximal Permissible Operating Pressure

	[°C]	-50	-40	-30	-20	-10	0	10	20	30	40	50	60
COOL-FIT 4.0 pipe and fitting, SDR11, PE100, C=1.6	[bar]	15.07	15.07	15.07	15.07	15.07	15.07	15.07	12.69	10.81	9.30	8.08	7.08
COOL-FIT 4.0 pipe and fitting, SDR17, PE100, C=1.6	[bar]	9.42	9.42	9.42	9.42	9.42	9.42	9.42	7.93	6.76	5.82	5.05	4.43
Ball valve, ABS, PN10	[bar]		8.00	8.00	8.00	8.00	8.00	8.00	8.00	6.40	4.80	3.20	1.60
Butterfly valve, ABS, PN10	[bar]			8.00	8.00	8.00	8.00	8.00	8.00	6.40	4.80	3.20	1.60

3 Maximum Support Distances



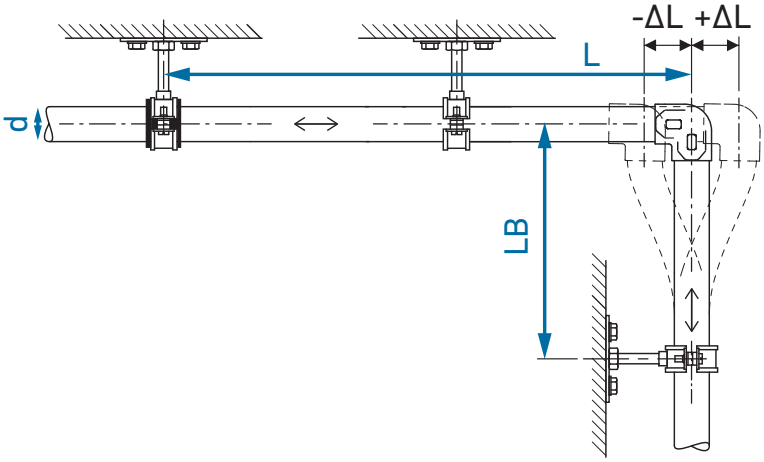
	Horizontal LH max. [m]	Riser LR max. (1.3 x LA) [m]	Valve LV max. (0.5 x LA) [m]	Pipe weight with media ρ=1025 kg/m3 [kg/m]
d32/90	1.8	2.3	0.9	2.1
d40/110	2.0	2.6	1.0	3.1
d50/110	2.0	2.6	1.0	3.9
d63/125	2.0	2.6	1.0	5.6
d75/140	2.1	2.7	1.1	7.5
d90/160	2.2	2.9	1.1	10.1
d110/180	2.3	3.0	1.2	14.2
d140/225	2.5	3.3	1.3	22.7
d160/250	2.6	3.4	1.3	29.5
d225/315	2.9	3.8	1.5	55.2
d250/355	3.3	4.3	1.7 (metal valve*)	67
d280/400	3.5	4.6	1.8 (metal valve*)	84
d315/450	3.7	4.8	1.9 (metal valve*)	105
d355/500	3.9	5.1	2.0 (metal valve*)	133
d400/560	4.1	5.3	2.1 (metal valve*)	168
d450/630	4.3	5.6	2.2 (metal valve*)	212

* Support metal valves direct

4 Flexible Sections

4.1 Flexible Sections (L-Bend or LB)

Temperature Range	
Flow temperature	-33 to +47°C
Ambient temperature	-5 to +45°C
Installation temperature	-5 to +40°C



① Pipe length L	② d (mm)
	③ LB [m]
-ΔL [mm] ④	④ +ΔL [mm]

① choose pipe length L
② choose dimension d
③ determine minimal clamping distance of the flexible section LB.
④ consider space for pipe movement due to contraction –ΔL and expansion +ΔL

Table for L-Bend, pipe contraction and expansion - COOL-FIT 4.0 pipe

Pipe length L	d32	d40	d50	d63	d75	d90	d110	d140	d160	d225	d250	d280	d315	d355	d400	d450
0.5 m	0.5 -3 1	0.5 -3 1	0.5 -4 1	0.6 -4 1	0.6 -4 1	0.7 -4 1	0.7 -4 1	0.8 -4 1	0.8 -4 1	1.0 -4 1	1.0 -4 1	1.1 -4 1	1.2 -4 1	1.2 -4 1	1.3 -4 1	1.4 -4 1
1.0 m	0.6 -7 1	0.7 -7 1	0.7 -7 1	0.8 -8 1	0.9 -8 1	0.9 -8 1	1.0 -8 1	1.1 -8 1	1.2 -8 1	1.4 -9 1	1.5 -9 1	1.5 -9 1	1.6 -9 1	1.7 -9 1	1.8 -9 1	1.9 -9 1
1.5 m	0.8 -10 2	0.9 -10 2	0.9 -11 2	1.0 -11 2	1.0 -12 2	1.1 -12 2	1.2 -12 2	1.4 -12 2	1.5 -13 2	1.7 -13 2	1.8 -13 2	1.9 -13 2	2.0 -13 2	2.1 -13 2	2.2 -13 2	2.4 -13 2
2.0 m	0.9 -13 3	1.0 -14 3	1.0 -15 3	1.1 -15 3	1.2 -15 3	1.3 -16 3	1.4 -16 3	1.6 -17 3	1.7 -17 3	1.9 -18 2	2.1 -18 3	2.2 -18 3	2.3 -18 3	2.4 -18 3	2.6 -18 3	2.8 -18 3
2.5 m	1.0 -17 3	1.1 -17 3	1.2 -18 3	1.3 -19 3	1.4 -19 3	1.5 -20 3	1.6 -21 3	1.8 -21 3	1.9 -21 3	2.2 -22 3	2.3 -22 3	2.4 -22 3	2.6 -22 3	2.7 -22 3	2.9 -22 3	3.1 -22 3
3.0 m	1.1 -20 4	1.2 -20 4	1.3 -22 4	1.4 -23 4	1.5 -23 4	1.6 -24 4	1.7 -25 4	1.9 -25 4	2.1 -25 4	2.4 -26 4	2.5 -26 4	2.7 -26 4	2.8 -26 4	3.0 -26 4	3.2 -27 4	3.4 -27 4
3.5 m	1.2 -24 5	1.3 -24 5	1.4 -25 5	1.5 -26 4	1.6 -27 4	1.7 -28 5	1.9 -29 5	2.1 -29 4	2.2 -29 5	2.6 -31 4	2.7 -31 5	2.9 -31 4	3.1 -31 5	3.2 -31 4	3.4 -31 4	3.6 -31 5
4.0 m	1.3 -27 5	1.4 -27 5	1.5 -29 5	1.6 -30 5	1.7 -31 5	1.9 -32 5	2.0 -33 5	2.2 -33 5	2.4 -34 5	2.7 -35 5	2.9 -35 5	3.1 -35 5	3.3 -35 5	3.5 -35 5	3.7 -35 5	3.9 -36 5
4.5 m	1.4 -30 6	1.5 -30 6	1.6 -33 6	1.7 -34 6	1.8 -35 6	2.0 -36 6	2.1 -37 6	2.4 -37 6	2.5 -38 6	2.9 -39 6	3.1 -40 6	3.3 -39 6	3.5 -40 6	3.7 -40 6	3.9 -40 6	4.1 -40 6
5.0 m	1.4 -34 7	1.6 -34 7	1.6 -36 6	1.8 -38 6	1.9 -39 6	2.1 -40 6	2.2 -41 6	2.5 -41 6	2.7 -42 6	3.1 -44 6	3.3 -44 6	3.4 -44 6	3.7 -44 6	3.9 -44 6	4.1 -44 6	4.4 -45 7
6.0 m	1.6 -40 8	1.7 -41 8	1.8 -44 8	2.0 -45 8	2.1 -46 8	2.3 -47 8	2.4 -49 8	2.7 -50 8	2.9 -50 8	3.3 -53 7	3.6 -53 8	3.8 -53 8	4.0 -53 8	4.2 -53 8	4.5 -53 8	4.8 -53 8
7.0 m	1.7 -47 9	1.9 -47 9	1.9 -51 9	2.1 -53 9	2.3 -54 9	2.4 -55 9	2.6 -57 9	3.0 -58 9	3.2 -59 9	3.6 -61 9	3.8 -62 9	4.1 -61 9	4.3 -62 9	4.6 -62 9	4.8 -62 9	5.2 -62 9
8.0 m	1.8 -54 11	2.0 -54 11	2.1 -58 10	2.3 -60 10	2.4 -62 10	2.6 -63 10	2.8 -66 10	3.2 -66 10	3.4 -67 10	3.9 -70 10	4.1 -71 10	4.4 -70 10	4.6 -70 10	4.9 -71 10	5.2 -71 10	5.5 -71 10
9.0 m	1.9 -61 12	2.1 -61 12	2.2 -65 12	2.4 -68 12	2.6 -70 12	2.8 -71 12	3.0 -74 12	3.4 -74 12	3.6 -76 12	4.1 -79 11	4.4 -79 12	4.6 -79 12	4.9 -79 12	5.2 -79 12	5.5 -80 12	5.8 -80 12
10 m	2.0 -67 13	2.2 -68 13	2.3 -73 13	2.5 -76 13	2.7 -77 13	2.9 -79 13	3.2 -82 13	3.5 -83 13	3.8 -84 13	4.3 -88 12	4.6 -88 13	4.9 -88 13	5.2 -88 13	5.5 -88 13	5.8 -88 13	6.2 -89 13
15 m	2.5 -101 20	2.7 -102 20	2.8 -109 19	3.1 -113 19	3.3 -116 19	3.6 -119 19	3.9 -123 19	4.3 -124 19	4.6 -126 19	5.3 -132 19	5.6 -132 19	6.0 -131 19	6.3 -132 19	6.7 -132 19	7.1 -133 19	7.5 -134 20
20 m	2.9 -134 26	3.2 -135 27	3.3 -146 26	3.6 -151 26	3.8 -155 26	4.1 -158 26	4.5 -164 26	5.0 -165 26	5.3 -168 26	6.1 -175 25	6.5 -176 26	6.9 -175 26	7.3 -176 26	7.7 -177 26	8.2 -177 26	8.7 -178 26
25 m	3.2 -168 33	3.5 -169 34	3.7 -182 32	4.0 -189 32	4.3 -193 32	4.6 -198 32	5.0 -205 32	5.6 -207 32	6.0 -210 32	6.8 -219 31	7.3 -220 32	7.7 -219 32	8.2 -220 32	8.6 -221 32	9.2 -221 32	9.7 -223 33
30 m	3.5 -202 40	3.9 -203 40	4.0 -218 39	4.4 -227 38	4.7 -232 38	5.1 -237 39	5.5 -246 39	6.1 -248 38	6.5 -252 39	7.5 -263 37	8.0 -264 39	8.4 -263 38	9.0 -264 39	9.5 -265 38	10.0 -265 38	10.7 -267 39
40 m	4.0 -269 53	4.5 -271 54	4.7 -291 52	5.1 -302 51	5.4 -309 51	5.9 -316 52	6.3 -328 51	7.1 -330 51	7.5 -336 51	8.6 -351 50	9.2 -353 52	9.7 -351 51	10.3 -352 52	10.9 -353 51	11.6 -354 51	12.3 -357 52
50 m	4.5 -336 66	5.0 -339 67	5.2 -364 65	5.6 -378 64	6.0 -386 64	6.5 -396 65	7.1 -410 64	7.9 -413 64	8.4 -420 64	9.7 -439 62	10.3 -441 65	10.9 -438 64	11.6 -440 65	12.2 -442 64	12.9 -442 64	13.8 -446 65

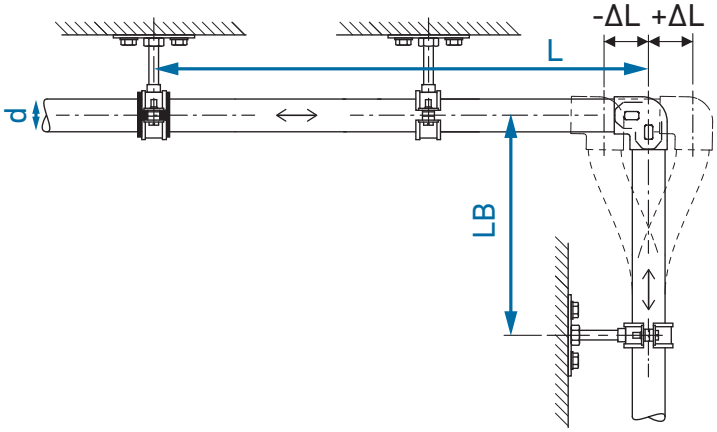
Request GF support for values in dark grey fields and complex routings.

L-bends not required for pipe length smaller 0.5m.

4.2 Flexible Sections (L-Bend or LB) – Reduced Temperature Range (Lowered Requirements)

Choose the pipe length L and dimension d and determine the minimal clamping distance of the flexible section LB. Consider space for pipe movement due to contraction –ΔL and expansion +ΔL.

Reduced Temperature Range	
Flow temperature	-33 to +47°C
Ambient temperature	+5 to +45°C
Installation temperature	-5 to +35°C



① Pipe length L	② d (mm)
	③ LB [m]
	-ΔL [mm] ④ ④ +ΔL [mm]

① choose pipe length L
② choose dimension d
③ determine minimal clamping distance of the flexible section LB.
④ consider space for pipe movement due to contraction –ΔL and expansion +ΔL

Table for L-Bend, pipe contraction and expansion - COOL-FIT 4.0 pipe

Pipe length L	d32	d40	d50	d63	d75	d90	d110	d140	d160	d225	d250	d280	d315	d355	d400	d450
0.5 m	0.4 -3 1	0.4 -3 1	0.5 -3 1	0.5 -3 1	0.6 -3 1	0.6 -3 1	0.7 -4 1	0.7 -4 1	0.8 -4 1	0.9 -4 1	1.0 -4 1	1.0 -4 1	1.1 -4 1	1.2 -4 1	1.2 -4 1	1.3 -4 1
1.0 m	0.6 -5 2	0.6 -5 2	0.7 -6 2	0.7 -6 2	0.8 -6 2	0.9 -7 2	0.9 -7 2	1.0 -7 2	1.1 -7 2	1.3 -8 2	1.4 -8 2	1.4 -8 2	1.5 -8 2	1.6 -8 2	1.7 -8 2	1.8 -8 2
1.5 m	0.7 -8 3	0.8 -8 3	0.8 -9 3	0.9 -9 3	1.0 -10 3	1.0 -10 3	1.1 -11 3	1.3 -11 3	1.4 -11 3	1.6 -12 3	1.7 -12 3	1.8 -12 3	1.9 -12 3	2.0 -12 3	2.1 -12 3	2.3 -12 3
2.0 m	0.8 -11 4	0.9 -11 4	0.9 -12 4	1.0 -13 4	1.1 -13 4	1.2 -13 4	1.3 -14 4	1.5 -14 4	1.6 -15 4	1.8 -15 4	1.9 -16 4	2.0 -16 4	2.2 -16 4	2.3 -16 4	2.4 -16 4	2.6 -16 4
2.5 m	0.9 -13 5	1.0 -13 5	1.1 -15 5	1.2 -16 5	1.2 -16 5	1.3 -17 5	1.5 -18 5	1.6 -18 5	1.8 -18 5	2.0 -19 5	2.2 -20 5	2.3 -19 5	2.4 -20 5	2.6 -20 5	2.7 -20 5	2.9 -20 5
3.0 m	1.0 -16 6	1.1 -16 6	1.2 -18 6	1.3 -19 6	1.4 -19 6	1.5 -20 6	1.6 -21 6	1.8 -21 6	1.9 -22 6	2.2 -23 6	2.4 -24 6	2.5 -23 6	2.7 -23 6	2.8 -24 6	3.0 -24 6	3.2 -24 6
3.5 m	1.1 -18 7	1.2 -19 7	1.2 -21 7	1.4 -22 7	1.5 -23 7	1.6 -24 7	1.7 -25 7	2.0 -25 7	2.1 -26 7	2.4 -27 7	2.6 -27 7	2.7 -27 7	2.9 -27 7	3.0 -27 7	3.2 -28 7	3.4 -28 7
4.0 m	1.1 -21 8	1.3 -21 8	1.3 -24 8	1.5 -25 8	1.6 -26 8	1.7 -27 8	1.9 -28 8	2.1 -29 8	2.2 -29 8	2.6 -31 8	2.7 -31 8	2.9 -31 8	3.1 -31 8	3.3 -31 8	3.5 -31 8	3.7 -32 8
4.5 m	1.2 -24 9	1.3 -24 9	1.4 -27 9	1.5 -28 9	1.7 -29 9	1.8 -30 9	2.0 -32 9	2.2 -32 9	2.4 -33 9	2.7 -35 9	2.9 -35 9	3.1 -35 9	3.3 -35 9	3.5 -35 9	3.7 -35 9	3.9 -36 9
5.0 m	1.3 -26 10	1.4 -27 10	1.5 -30 10	1.6 -31 10	1.8 -32 10	1.9 -34 10	2.1 -35 10	2.3 -36 10	2.5 -37 10	2.9 -39 10	3.1 -39 10	3.2 -39 10	3.4 -39 10	3.6 -39 10	3.9 -39 10	4.1 -40 10
6.0 m	1.4 -32 12	1.5 -32 12	1.6 -36 12	1.8 -38 12	1.9 -39 12	2.1 -40 12	2.3 -43 12	2.6 -43 12	2.7 -44 12	3.1 -46 12	3.4 -47 12	3.6 -47 12	3.8 -47 12	4.0 -47 12	4.2 -47 12	4.5 -48 12
7.0 m	1.5 -37 14	1.7 -38 14	1.8 -42 14	1.9 -44 14	2.1 -45 14	2.3 -47 14	2.5 -50 14	2.8 -50 14	2.9 -51 14	3.4 -54 14	3.6 -55 14	3.8 -54 14	4.1 -55 14	4.3 -55 14	4.6 -55 14	4.9 -56 14
8.0 m	1.6 -42 16	1.8 -43 16	1.9 -48 16	2.1 -50 16	2.2 -52 16	2.4 -54 16	2.6 -57 16	3.0 -57 16	3.1 -59 16	3.6 -62 16	3.9 -63 16	4.1 -62 16	4.4 -63 16	4.6 -63 16	4.9 -63 16	5.2 -64 16
9.0 m	1.7 -47 18	1.9 -48 18	2.0 -54 18	2.2 -56 18	2.4 -58 18	2.6 -61 18	2.8 -64 18	3.1 -64 18	3.3 -66 18	3.9 -70 18	4.1 -71 18	4.3 -70 18	4.6 -70 18	4.9 -71 18	5.2 -71 18	5.5 -72 18
10 m	1.8 -53 19	2.0 -54 20	2.1 -59 20	2.3 -63 20	2.5 -65 20	2.7 -67 20	2.9 -71 20	3.3 -72 20	3.5 -73 20	4.1 -77 20	4.3 -78 20	4.6 -78 20	4.9 -78 20	5.2 -78 20	5.5 -79 20	5.8 -80 20
15 m	2.2 -79 29	2.4 -80 29	2.6 -89 29	2.8 -94 29	3.0 -97 29	3.3 -101 30	3.6 -106 30	4.0 -107 30	4.3 -110 30	5.0 -116 30	5.3 -118 30	5.6 -117 30	6.0 -117 30	6.3 -118 30	6.7 -118 30	7.1 -120 30
20 m	2.5 -105 39	2.8 -107 39	3.0 -119 39	3.3 -125 39	3.5 -130 39	3.8 -135 39	4.2 -142 40	4.7 -143 40	5.0 -146 40	5.7 -155 40	6.1 -157 40	6.5 -155 40	6.9 -156 40	7.3 -157 40	7.7 -157 40	8.2 -159 40
25 m	2.8 -132 49	3.2 -134 49	3.3 -149 49	3.6 -157 49	3.9 -162 49	4.3 -168 49	4.6 -177 50	5.2 -179 50	5.6 -183 50	6.4 -193 50	6.9 -196 50	7.2 -194 50	7.7 -196 50	8.1 -196 50	8.6 -197 50	9.2 -199 51
30 m	3.1 -158 58	3.5 -161 59	3.6 -178 59	4.0 -188 59	4.3 -195 59	4.7 -202 59	5.1 -213 59	5.7 -215 59	6.1 -220 60	7.0 -232 59	7.5 -235 60	7.9 -233 60	8.4 -235 60	8.9 -235 60	9.5 -236 60	10.1 -239 61
40 m	3.6 -211 78	4.0 -214 78	4.2 -238 78	4.6 -251 78	5.0 -259 78	5.4 -269 79	5.9 -284 79	6.6 -286 79	7.0 -293 80	8.1 -309 79	8.7 -313 80	9.2 -311 80	9.8 -313 80	10.3 -314 80	10.9 -315 80	11.7 -319 81
50 m	4.0 -263 97	4.5 -268 98	4.7 -297 98	5.1 -314 98	5.5 -324 98	6.0 -337 99	6.6 -355 99	7.4 -358 99	7.9 -366 99	9.1 -387 99	9.7 -392 100	10.2 -388 100	10.9 -391 101	11.5 -392 100	12.2 -393 100	13.0 -398 101

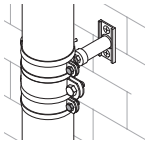
Request GF support for values in dark grey fields and complex routings.

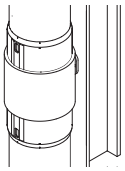
L-bends not required for pipe length smaller 0.5m.

5 Riser Installation Example

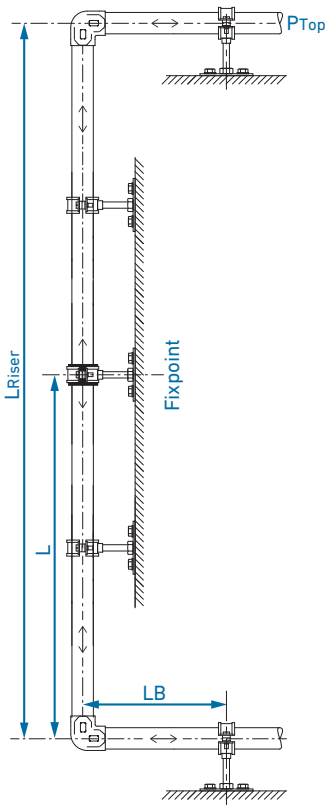
Following table shows an example of the achievable riser lengts under assumptions:

Boundary conditions	
System and pipe class	COOL-FIT 4.0 SDR11
Flow temperature	-33 to +47°C
Ambient temperature	-5 to +45°C
Installation temperature	-5 to +40°C
Fixed point position	Middle of the riser pipe
Pressure on top level	3 bar (PTop)
Support distance vertical	Equal to horizontal (stability increase for very long riser pipe length)





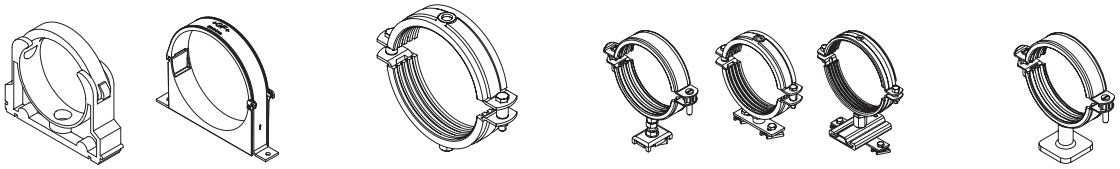
	Pipe support distance reduced for long riser		Fixed point		Fixed point for increased forces	
	Horizontal [m]	Vertical [m]	Max. riser length (LRiser) [m]	Fixed point force [kN]	Max. riser length (LRiser) [m]	Fixed point force [kN]
d32/90	1.8	1.8	43	0.9		
d40/110	2.0	2.0	54	1.7		
d50/110	2.0	2.0	44	1.7		
d63/125	2.0	2.0	49	2.7		
d75/140	2.1	2.1	52	3.8		
d90/160	2.2	2.2	54	5.4		
d110/180	2.3	2.3	54	7.5		
d140/225	2.5	2.5	45	10	55	12
d160/250	2.6	2.6	35	10	55	16
d225/315	2.9	2.9	17	10	54	29
d250/355	3.3	3.3	14	10	54	35
d280/400	3.5	3.5			41	35
d315/450	3.7	3.7			32	35
d355/500	3.9	3.9			24	35
d400/560	4.1	4.1			18	35
d450/630	4.3	4.3			14	35



⚠ Following sections are recommended to be proofed by GF Specialized Services before installation:

- Riser pipe dimension >d160
- Riser pipe with multiple dimensions
- Installation differ from normal installation with fixed point in the middle

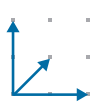
6 Sliding Clamps



	Klip-It	Stress Less	Sikla sliding clamp		Sikla sliding clamp with screws and threaded plates for connection to Sikla rail system		Sikla sliding clamp with welding plate	
	Code GF	Code GF	Typ	Code Sikla	Typ	Code Sikla	Typ	Code Sikla
d32/90	173061013	155484507	Ratio S-K 90	155993	GLH-CC 90	802867	GLH-ASP 90	802866
d40/110	173061014	155484508	Ratio S-K 110	156000	GLH-CC 110	802869	GLH-ASP 110	802868
d50/110	173061014	155484508	Ratio S-K 110	156000	GLH-CC 110	802869	GLH-ASP 110	802868
d63/125	173061015	155484518	Stabil D-3G-K 125	802130	GLH-CC 125	802871	GLH-ASP 125	802870
d75/140	173061016	155484519	Stabil D-3G-K 140	802131	GLH-CC 140	802873	GLH-ASP 140	802872
d90/160	173061017	155484509	Stabil D-3G-K 160	802132	GLH-CC 160	802875	GLH-ASP 160	802874
d110/180			Stabil D-3G-K Top 180	802897	GLH-CC 180	802877	GLH-ASP 180	802876
d140/225		155484511	Stabil D-3G mE 219-225	107468	GLH-CC 225	802881	GLH-ASP 225	802880
d160/250		155484512	Stabil D-3G mE 244-250	107477	GLH-CC 250	802883	GLH-ASP 250	802882
d225/315		155484511	Stabil D-3G mE 307-318	189974	GLH-CC 315	802887	GLH-ASP 315	802886
d250/355			LC-HV 90Da 365 HCP m.E.	802905				
d280/400			LC-HV 90Da 407 HCP m.E.	802906				
d315/450			LC-HV 90Da 457 HCP m.E.	802907				
d355/500			LD-HV 90Da 508 HCP m.E.	802908				
d400/560			LD-HV 90Da 574 HCP m.E.	802909				
d450/630			LD-HV 90Da 641 HCP m.E.	802910				
Comment	Klip-It ≥D110 must be mounted upright		≥D225 sliding function via sliding plate					

Clamps are just recommendations and individual clarification is recommended

7 Notes/Isometric Grid



Local support around the world

Visit our webpage to get in touch with your local specialist:
www.gfps.com/our-locations

MA_00136 2024579
COOL-FIT simplified -33 (10.22)

8201 Schaffhausen/Switzerland