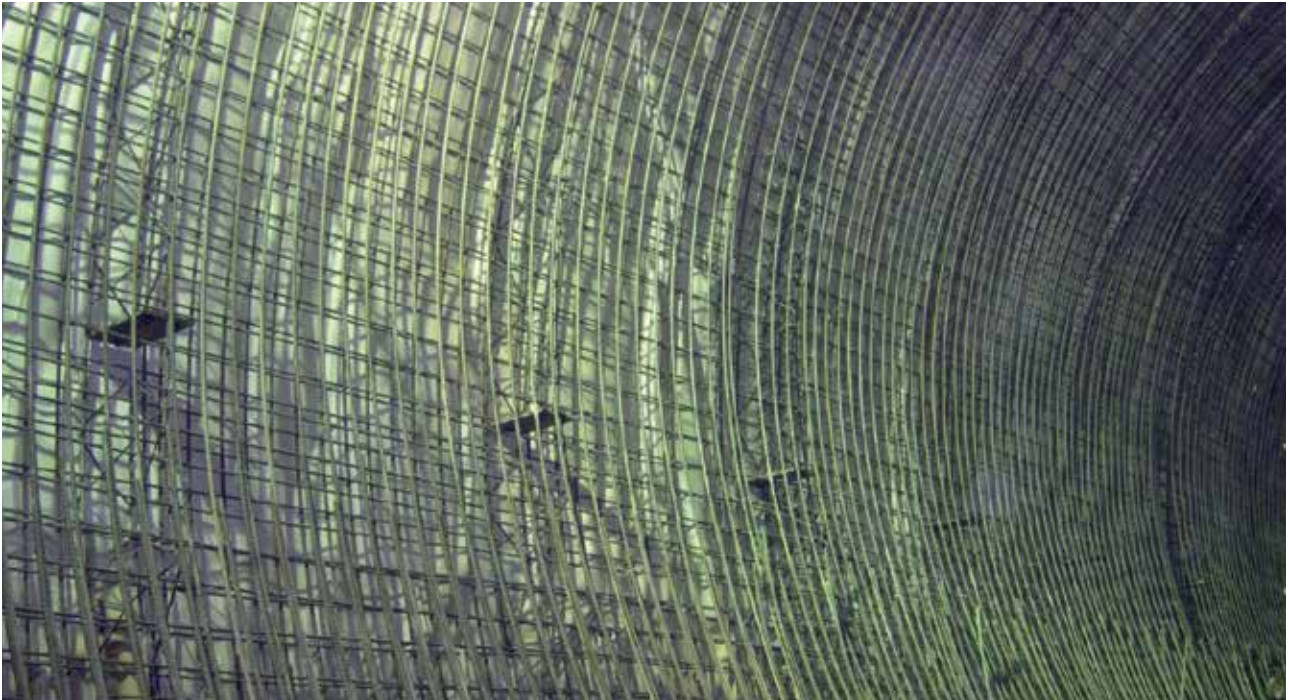


DYWIDAG Steel Support Solutions



Quality assurance

DYWIDAG ensures complete QA traceability and high standards of service for all items in our Steel Support Solutions portfolio.

Testing procedures



Lattice Girders Testing



TH-Profile

DYWIDAG Lattice Girders

Main standards/Approvals

- ASTM A615/A615M Gr.75
- BS B4449 B500B or equivalent
- ASTM A615/A615M Gr.60
- BS B4449 B400B or equivalent
- EN 10025-2 S235 or JIS G3101 SS400
- EN 10025-2 S235 or JIS G3101 SS400
- Standard grade 8.8(EN ISO 898-1) or ASTM A325
- ASTM A194
- Raw material made from ASTM A519-03 5140/EN 10083-1 41Cr4
- AWS A5.28 ER80S-G
- Conform to deformations requirements of ASTM A615/A615M-08
- Final product has deformations exceeding requirements of ASTM A 615.

Fabrication

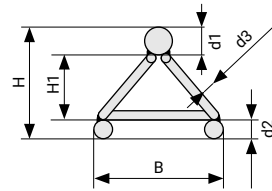
DYWIDAG Lattice Girders are fabricated by 3 or 4 main round bars and connected by different designed connectors. Connectors were majorly divided into three design patterns : Spider, Butterfly and Cage. The main components include : main bars, secondary bars, connectors, connection, base plates, bolts and nuts.

Material standards for main components

Components	Material	Standards
Main & Secondary Bars	Smooth reinforced steel	ASTM A615/A615M Gr.75 BS B4449 B500B or equivalent
Connectors (spider)	Smooth reinforced steel	ASTM A615/A615M Gr.60 BS B4449 B400B or equivalent
Link Bars	Round steel bar	EN 10025-2 S235 or JIS G3101 SS400
Connection and base plates	Standard or elephant foot	EN 10025-2 S235 or JIS G3101 SS400
Screw Bolt	Steel	Standard grade 8.8 (EN ISO 898-1) or ASTM A325
Screw Nut	Steel	ASTM A194
Welding: AWS A5.28 ER80S-G		

Specifications for Three-bar design

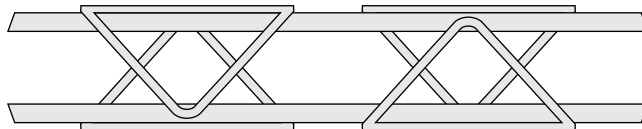
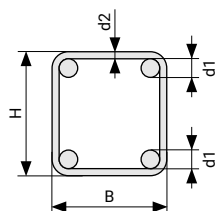
Spider design



Symbols	H1	H	B	d1	d2	d3	A1	A7	A	Jx	Wx	Weight
Designation	mm	mm	mm	mm	mm	mm	cm ²	cm ²	cm ²	cm ³	cm ³	kg/m
95-20-25	50	95	100	25	20	10	4.91	3.14	11.19	148	28	10.2
100-20-30	50	100	100	30	20	10	7.07	3.14	13.35	193	38	11.9
106-20-36	50	106	100	36	20	10	10.18	3.14	16.46	246	47	14.3
105-25-30	50	105	100	30	25	10	7.07	4.91	16.89	255	47	14.7
111-25-36	50	111	100	36	25	10	10.18	4.91	20.00	336	58	17.1
116-30-36	50	116	100	36	30	10	10.18	7.07	24.32	424	64	20.5
115-20-25	70	115	140	25	20	10	4.91	3.14	11.19	239	37	10.4
120-20-30	70	120	140	30	20	10	7.07	3.14	13.35	306	51	12.1
126-20-36	70	126	140	36	20	10	10.18	3.14	16.46	383	54	14.5
125-25-30	70	125	140	30	25	10	7.07	4.91	16.89	398	56	14.9
131-25-36	70	131	140	36	25	10	10.18	4.91	20.00	517	77	17.3
136-30-36	70	136	140	36	30	10	10.18	7.07	24.32	644	83	20.7
140-20-25	95	140	180	25	20	10	4.91	3.14	11.19	384	49	10.8
145-20-30	95	145	180	30	20	10	7.07	3.14	13.35	485	66	12.5
151-20-36	95	151	180	36	20	10	10.18	3.14	16.46	598	69	14.9
150-25-30	95	150	180	30	25	10	7.07	4.91	16.89	625	72	15.3
156-25-36	95	156	180	36	25	10	10.18	4.91	20.00	799	100	17.7
161-30-36	95	161	180	36	30	10	10.18	7.07	24.32	986	107	21.1
160-20-25	115	160	220	25	20	12	4.91	3.14	11.19	525	58	11.0
165-20-30	115	165	220	30	20	12	7.07	3.14	13.35	658	78	12.7
171-20-36	115	171	220	36	20	12	10.18	3.14	16.46	804	82	15.1
170-25-30	115	170	220	30	25	12	7.07	4.91	16.89	842	86	15.5
176-25-36	115	176	220	36	25	12	10.18	4.91	20.00	1070	120	17.9
181-30-36	115	181	220	36	30	12	10.18	7.07	24.32	1312	126	21.3
175-20-25	130	175	220	25	20	12	4.91	3.14	11.19	644	66	11.2
180-20-30	130	180	220	30	20	12	7.07	3.14	13.35	805	87	12.9
186-20-36	130	186	220	36	20	12	10.18	3.14	16.46	980	91	15.3
185-25-30	130	185	220	30	25	12	7.07	4.91	16.89	1027	96	15.7
191-25-36	130	191	220	36	25	12	10.18	4.91	20.00	1299	134	18.1
196-30-36	130	196	220	36	30	12	10.18	7.07	24.32	1589	141	21.5

Specifications for Four-bar design

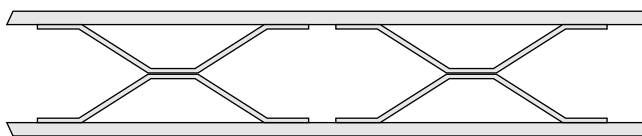
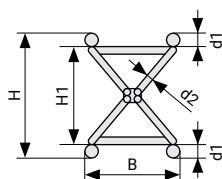
Cage design



Type	Designation	H	B	d1	d2	A
	H-d1-4bars	mm	mm	mm	mm	cm ²
G150	150-25-48	180	140	25	10	19.64
G200	220-32-48	220	180	32	12	32.17

Type	Weight per unit length incl. Main & Connection bars	Height of section	Ultimate load of Main bars	Ultimate bearing moment
	W (kg/m)	H (mm)	Pu (t)	Mp (t-m)
G150	≥ 18.0	140-180	≥ 100.35	≥ 6.15
180-25-48	19.17	180	104.17	7.03
G200	≥ 30.0	180-220	≥ 158.83	≥ 13.13
220-32-48	30.13	220	170.58	13.99

Butterfly design



Symbols	H1	H	B	d1	d3	A	Wx	Wy	Weight
Designation	mm	mm	mm	mm	mm	cm ²	cm ³	cm ³	kg/m
G100-20	50	140	100	20	10	12.57	65	41	12.7
G100-25	50	150	100	25	10	19.63	103	56	14.3
G100-30	50	160	100	30	10	28.27	151	72	19.4
G100-36	50	172	100	36	10	40.72	222	88	26.7
G140-20	75	190	140	20	10	12.57	96	65	18.1
G140-25	75	200	140	25	10	19.63	151	94	18.5
G140-30	75	210	140	30	10	28.27	219	124	25.3
G140-36	75	222	140	36	10	40.72	319	161	35.1
G190-20	95	230	180	20	10	12.57	121	90	13.9
G190-25	95	240	180	25	10	19.63	190	132	19.3
G190-30	95	250	180	30	10	28.27	275	178	26.1
G190-36	95	262	180	36	10	40.72	399	237	35.9
G230-20	115	270	220	20	10	12.57	146	114	14.3
G230-25	115	280	220	25	10	19.63	228	170	19.7
G230-30	115	290	220	30	10	28.27	330	233	26.5
G230-36	115	302	220	36	10	40.72	479	316	36.3
G260-20	130	300	220	20	10	12.57	164	114	14.7
G260-25	130	310	220	25	10	19.63	258	170	20.1
186-20-36	130	320	220	30	10	28.27	372	233	26.9
196-30-36	130	332	220	36	10	40.72	539	316	36.7

DYWIDAG TH-Profiles

Main standards/Approvals

- DIN 21544 for the Material
- DIN 21530 for the Dimensions, Static values, Testings.

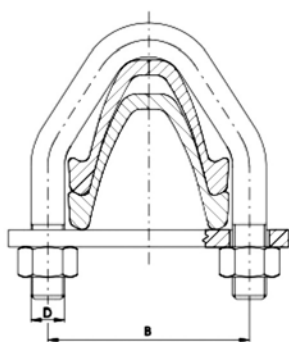
Fabrication

In cases where the overburden is high, a rigid steel support is not suitable : we then have to utilize the principle of "yielding" profiles. DYWIDAG TH-Profiles are the yielding profiles which are fabricated as per DIN 21530.

When the tunnel excavation is over-profiled, the space between the excavated surface and TH-Profiles is filled up with a compressible material which acts as first layer of defense in case of deformation experienced by the tunnel.

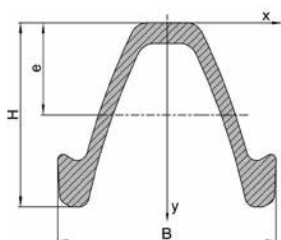
If the tunnel deformation crosses certain pre-designed limit, then the TH-Profiles will resist deformations to limits as per design and, when those limits are reached, the TH-Profiles will start yielding by deforming at the overlapping joints and distributing the loads on the entire ring and in process shortening the circumference of TH-Profile arch.

Materials



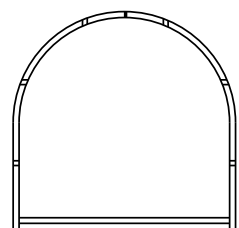
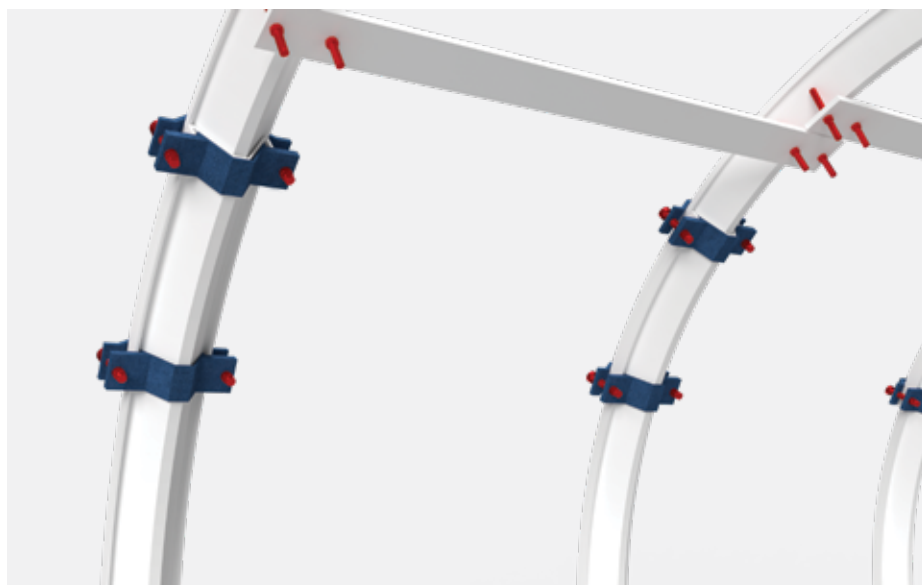
- Mine support steel 31Mn4 according to DIN 21544
- Cold-bent to the corresponding geometry design
- Single overlapping segments are usually connected by two locks
- Alternative DYWIDAG TH-Profile locks are available on request
- Additional parts such as straight beams, forepoling sheets, and steel lagging can also be fabricated on request
- DYWIDAG TH-Profile Systems are available in 2 types : AR (As Rolled) and QT (Quenched and Tempered)

Technical standards

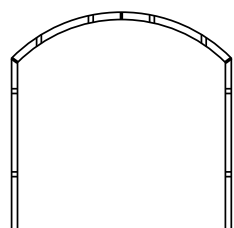


Characteristic Value/Type	Symbol	Unit	TH-21	TH-25	TH-29	TH-36	TH-44
Nominal Weight	m	Kg/m	21	25	29	36	43,7
Profile Height	H	mm	108	118	124	138	147,8
Profile Width	B	mm	124	135	151	171	172
Neutral Axis	e	mm	52	58	58	69	TBC
Section Modulus	W_x	cm ³	61	80	94	136	165

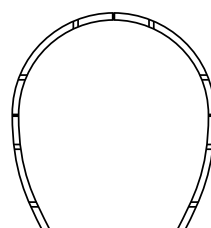
Support types



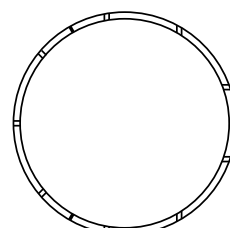
Horseshoe with optional invert strut design (2 pcs)



Modified horseshoe design (4 pcs)



Horseshoe design (4 pcs)



360° Circular design (3 pcs)



Contact your local office for technical specifications

Europe
DYWIDAG Systems Int. GmbH
 Neuhofweg 5
 Unterschleissheim 85716
 +49-89-30 90 50-100
 info@dywidag.com

Americas
DYWIDAG Systems Int. USA Inc.
 320 Marmon Drive
 Bolingbrook IL 60440
 +1-630-739 1100
 sales.us@dywidag.com

Australia
DYWIDAG Systems Int. Pty. Ltd.
 24 Groves Road
 Bennetts Green, NSW 2290
 +61 (2) 4081 5500
 sales.au@dywidag.com

Middle East
DYWIDAG-Systems Int. Saudi Arabia LLC
 Salah Ad Din Al Ayyubi Rd, Ad Dubbat
 Riyadh 12623, KSA
 +966-11-4553123
 sales.sa@dywidag.com

Asia Regional HQ
DYWIDAG Asia Co. Ltd.
 2F-1 No. 15, Lane 48
 Xing Shan Road, Taipei 114,
 Taiwan, R.O.C.
 +886 2 2748 1076
 sales.tw@dywidag.com

DYWIDAG Trading (Shanghai) Co., Ltd.
 Room 704, Tower A Far East
 International Plaza - 319 Xian Xia
 Road, Chang Ning District, Shanghai
 200051, R.P. China
 +86 21 6235 0186
 sales.cn@dywidag.com

DYWIDAG Systems Int. Far East Ltd.
 Room 2103, 21/F, Office Plus @
 Wan Chai, No 303 Hennessy Road,
 Wanchai, Hong Kong
 +852 2833 1913
 sales.hk@dywidag.com

Korea
DYWIDAG Systems Korea Co. Ltd.
 5th Floor, Spring Morning B/D
 8, Mabang-ro, Seocho-gu
 Yangjae 2(i) dong Seoul 06778
 +82-2-34 72 01-41
 sales.kr@dywidag.com

India
DYWIDAG-Bridgecon India Pvt. Ltd.
 265, Okhla Industrial Estate
 Phase III, New Delhi-110020, India
 +91-11-41052207
 sales.in@dywidag.com