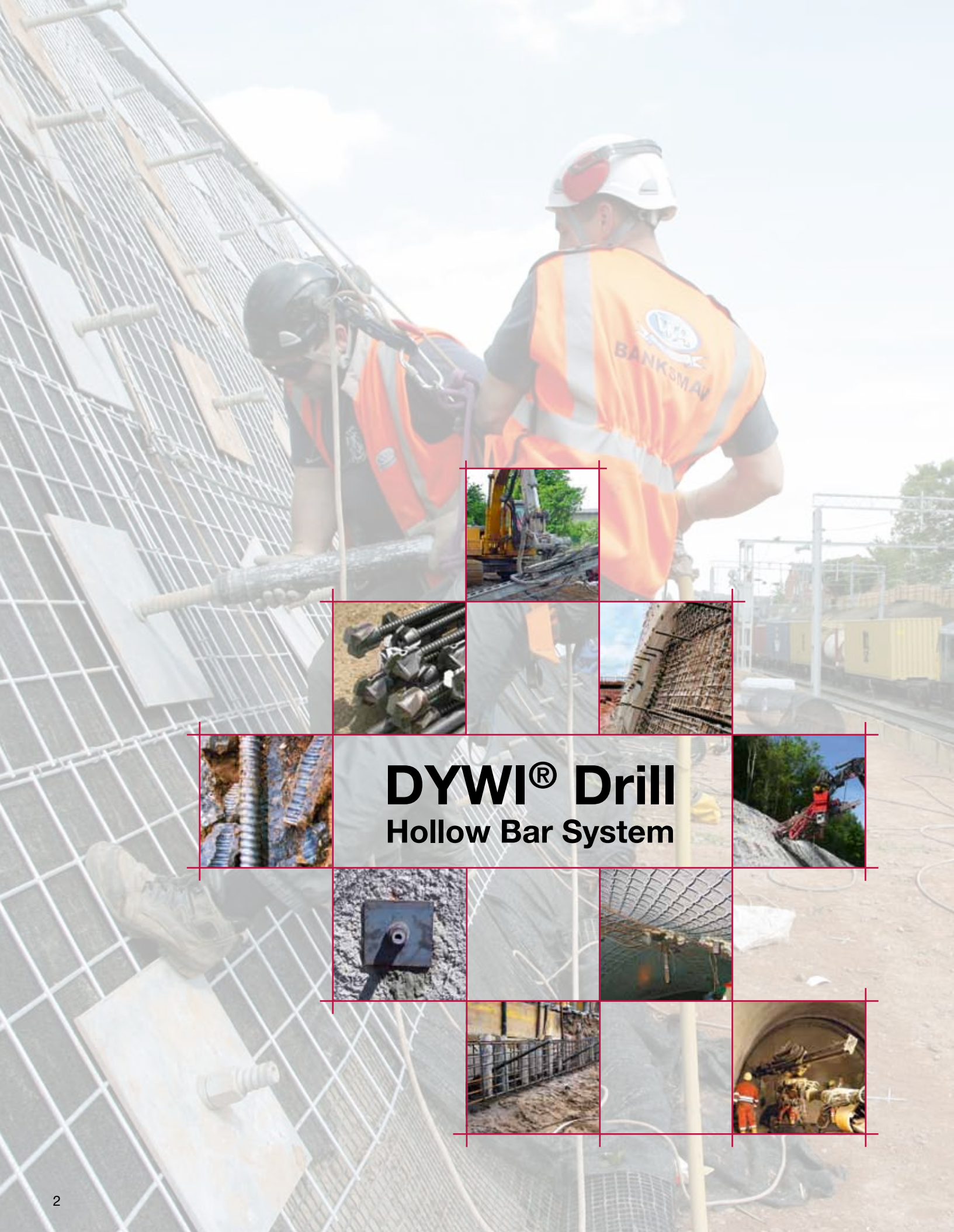
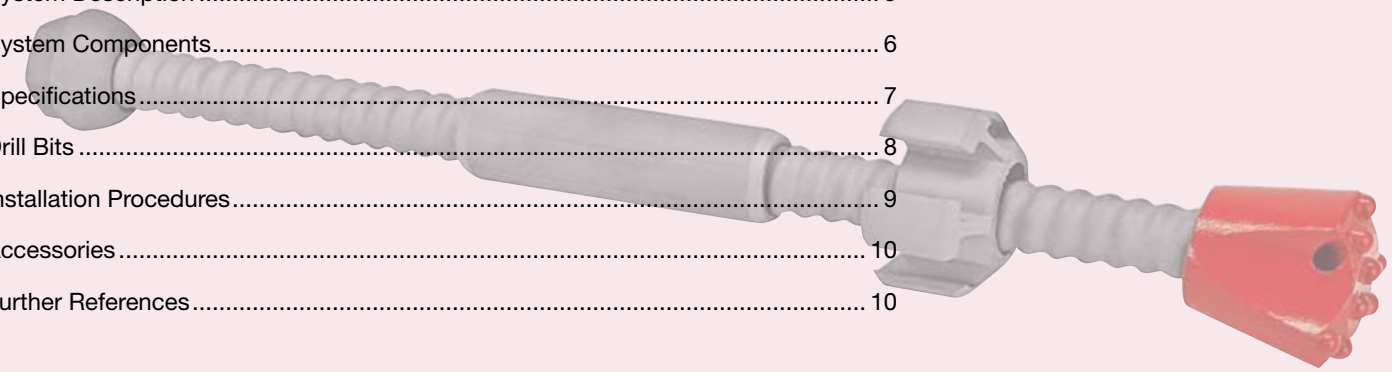
DYWIDAG-SYSTEMS INTERNATIONAL

DYWI® Drill Hollow Bar System



DYWI® Drill
Hollow Bar System

Contents



Introduction

The DYWI® Drill Hollow Bar System is a self-drilling ground control solution used in Civil Engineering and Underground Construction. It features a wide range of applications such as soil nails, micro-piles, rock bolts, or ground anchors.

Installations in weak ground and under unstable borehole conditions represent no difficulty and are ideal for the application of the DYWI® Drill Hollow Bar System.

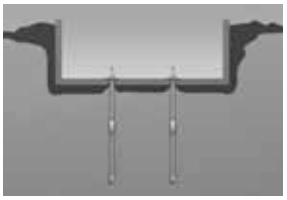
Additionally, the DYWI® Drill Hollow Bar System may be used as a forepoling element for pre-support or als a lance for injection works.

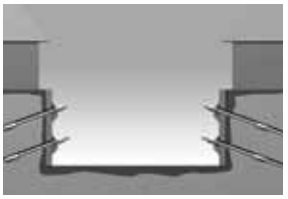
DYWIDAG-Systems International has a long-term experience in the development, manufacturing, and distribution of the DYWI® Drill Hollow Bar System.

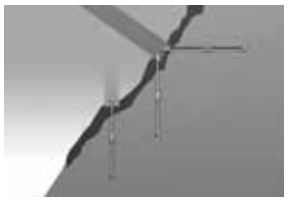
Fields of Application

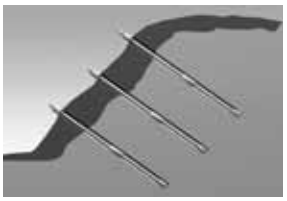
Civil Engineering

- Pile foundation
- Buoyancy control
- Slope and embankment stabilization
- Reinforcement of excavation pits and retaining walls
- Foundation of pylons and wind mills
- Anchorage of avalanche protection structures and noise barriers
- Injection works



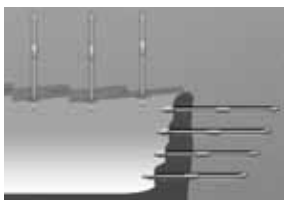


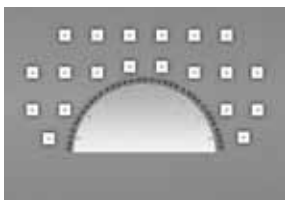


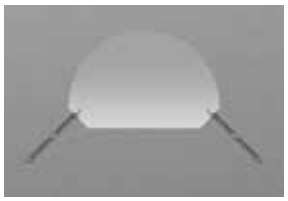


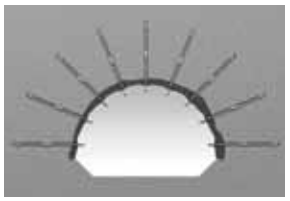
Underground Mining and Tunneling

- Stabilization of tunnel portals, trenches, and cut-and-cover areas
- Forepoling
- Face stabilization
- Radial rock bolting
- Foot piles
- Roof and rib bolting
- Injection works









Main Advantages

- Fast and safe self-drilling installation
- Easy and similar operating principle using standard personnel and on-site drilling machinery
- Drilling, installation, and optional grouting in a single operational step
- Proven installation process under difficult ground conditions
- Trouble-free application under unstable borehole conditions
- Sound and efficient alternative compared to time-consuming cased drilling installation methods and products
- Minimization of ground disturbance
- Adjustment of the drill bit design and diameter to different and varying ground conditions possible
- Minor space requirements for installation
- Functional adjustment of required lengths using couplings
- Broad range of hollow bar load capacity classes allows basic dimensioning and adaptation of design
- Robust system and high-strength thread designed for the demands of the construction industry

System Description

- Self-Drilling ground control solution
- Used as anchor, rock bolt, soil nail, micropile, spile, or injection lance
- Preferably used under unstable borehole conditions
- Self-Drilling installation without casing using a lost drill bit
- Installation with standard rotary or rotary-percussive rock drilling equipment
- Hollow bar with continuous left-hand cold-rolled outside thread utilized as drill rod during installation
- Easy extension of hollow bars using couplings
- Grouting may either be performed while drilling with a rotary injection adapter or after the drilling operation
- Thread profile allows an ideal bond between the hollow bar and the grouting medium
- Assembly and fixation of the head construction: plate and nut

System Components

- **Nut**
  - Convex seat or domed version
  - Different designs and dimensions available
- **Coupling**
  - Continuous inside thread with middle stop
  - Controlled drilling energy transmission
  - Full load bearing capacity
- **Drill Bit**
  - One drill bit per installed unit
  - Different diameters and designs
  - Hardened and carbide insert versions

Example: assembly system components rock bolt

- **Plate**
  - Flat or domed
  - Plate design adjusted to system demands
  - Various angle compensation systems and special plate designs available
- **Hollow Bar**
  - Used as hollow drill rod during installation
  - Suitable for simultaneous or subsequent grouting
  - Tension or compression member with continuous left-hand outside thread

Specifications

- Special lengths and dimensions available upon request
- Galvanized or combi-coated system components available upon request
- DSI product approvals also include notes for temporary or permanent system applications

Technical Data Series R32

No.	Characteristic Value / Type[1)]	Symbol	Unit	R32-210	R32-250	R32-280	R32-320	R32-360	R32-400
1	Nominal external diameter	$Ø_{e.nom}$	[mm]			32			
2	Actual external diameter	$Ø_e$	[mm]			31.1			
3	Average internal diameter [2)]	$Ø_i$	[mm]	21.0	20.0	18.5	16.5	15.0	12.5
4	Nominal cross-sectional area [3)]	S_0	[mm²]	340	370	410	470	510	560
5	Nominal weight [4)]	m	[kg/m]	2.65	2.90	3.20	3.70	4.00	4.40
6	Yield load [5)]	$F_{p0.2.nom}$	[kN]	160	190	220	250	280	330
7	Ultimate load [5)]	$F_{m.nom}$	[kN]	210	250	280	320	360	400
8	Yield strength [6)]	$R_{p0.2}$	[N/mm²]	470	510	540	530	550	590
9	Ultimate strength [6)]	R_m	[N/mm²]	620	680	680	680	710	710
10	$R_m / R_{p0.2}$ [7)]	---	[1]			≥ 1.15			
11	Ultimate load strain [7)]	A_{gt}	[%]			≥ 5.0			
12	Thread standard	---	[---]			ISO 10208			
13	Standard bar length [8)]	L	[m]			2/3/4/6			
14	Article No. [9)]	---	[---]			30100YY10X0			

Technical Data Series R38 and R51

No.	Characteristic Value / Type [1)]	Symbol	Unit	R38-420	R38-500	R38-550	R51-550	R51-660	R51-800
1	Nominal external diameter	$Ø_{e.nom}$	[mm]		38			51	
2	Actual external diameter	$Ø_e$	[mm]		37.8			49.8	
3	Average internal diameter [2)]	$Ø_i$	[mm]	21.5	19.0	17.0	34.5	33.0	29.0
4	Nominal cross-sectional area [3)]	S_0	[mm²]	660	750	800	890	970	1150
5	Nominal weight [4)]	m	[kg/m]	5.15	5.85	6.25	6.95	7.65	9.00
6	Yield load [5)]	$F_{p0.2.nom}$	[kN]	350	400	450	450	540	640
7	Ultimate load [5)]	$F_{m.nom}$	[kN]	420	500	550	550	660	800
8	Yield strength [6)]	$R_{p0.2}$	[N/mm²]	530	530	560	510	560	560
9	Ultimate strength [6)]	R_m	[N/mm²]	640	670	690	620	680	700
10	$R_m / R_{p0.2}$ [7)]	---	[1]			≥ 1.15			
11	Ultimate load strain [7)]	A_{gt}	[%]			≥ 5.0			
12	Thread standard	---	[---]		ISO 10208			ISO 1820	
13	Standard bar length [8)]	L	[m]			2/3/4/6			
14	Article No. [9)]	---	[---]		30200YY10X0			30300YY10X0	

Technical Data Series T76

No.	Characteristic Value /Type[1)]	Symbol	Unit	T76-1200	T76-1600	T76-1900
1	Nominal external diameter	$Ø_{e.nom}$	[mm]		76	
2	Actual external diameter	$Ø_e$	[mm]		74.6	
3	Nominal cross-sectional area [3)]	S_0	[mm²]	2000	2700	3200
4	Nominal weight [4)]	m	[kg/m]	16	20	24
5	Yield load [5)]	$F_{p0.2.nom}$	[kN]	1000	1200	1500
6	Ultimate load [5)]	$F_{m.nom}$	[kN]	1200	1600	1900
7	Yield strength [6)]	$R_{p0.2}$	[N/mm²]	500	450	470
8	Ultimate strength [6)]	R_m	[N/mm²]	600	600	600
9	$R_m / R_{p0.2}$ [7)]	---	[1]		> 1.15	
10	Ultimate load strain [7)]	A_{gt}	[%]		> 5.0	
11	Thread standard	---	[---]		DSI T76	
12	Standard bar length [8)]	L	[m]		2/3/4	
13	Article No. [9)]	---	[---]		3040YYY10X0	

1) Status: 2012-06, note: all values are subject to change
2) Calculated from the actual external diameter, the average thread height, and the nominal cross-sectional area, rounded
3) Calculated from the nominal weight: $S_0 = 10^6 \times m / 7850$ [kg/m³] ; **4)** Deviation: -3 / +9 [%] ; **5)** Characteristic 5%-fractile value
6) Calculated from the characteristic load value and nominal weight, rounded ; **7)** Characteristic 10%-fractile value
8) Off-size bar lengths are available upon request / modulus of elasticity: 205 000 [N/mm²] ; **9)** "YYY" ... Ultimate Load/10 [kN]; "X" ... hollow bar length [m].

Drill Bits

Characteristics

- Successful installation performance dependent on selection of the drill bit
- Large drill bit portfolio for different ground conditions
- Optimized in regards to installation parameters such as cutting ability and drilling rates
- Adjusted to the requirements in Civil Engineering as well as Underground Mining and Tunneling
- Further information regarding drill bit design and selection are included in a separate DSI leaflet on drill bits for the DYWI® Drill Hollow Bar System

Article No.	Description	Article Code	Design	Thread	Diameter Ø [mm] 1)											
(„XXX“ … Diameter Ø [mm])					51	76	90	100	110	115	120	130	150	175	200	300
301080111XXX	Cross drill bit, hardened	CB-Thread-D-HD		R32	X	X										
302080111XXX				R38		X	X			X						
303080111XXX				R51		X	X	X		X		X	X			
304080111XXX				T76						X		X	X		X	
301080121XXX	Cross drill bit, with carbide inserts	CB-Thread-D-HM		R32	X	X										
302080121XXX				R38		X	X			X						
303080121XXX				R51			X	X		X						
304080121XXX				T76						X		X			X	
301080211XXX	Button drill bit, hardened	BB-Thread-D-HD		R32	X	X										
302080211XXX				R38		X	X	X		X						
303080211XXX				R51		X		X		X						
304080211XXX				T76							X	X				
301080221XXX	Button drill bit, with carbide inserts	BB-Thread-D-HM		R32	X	X										
302080221XXX				R38		X	X	X		X						
303080221XXX				R51		X		X		X						
304080221XXX				T76							X	X				
301080411XXX	Arc-shaped drill bit, hardened	AR-Thread-D-HD		R32	X	X	X			X						
302080411XXX				R38		X	X			X						
303080411XXX				R51			X			X						
301080511XXX	Arc-shaped drill bit, with carbide inserts	AR-Thread-D-HM		R32	X	X										
302080421XXX				R38												
303080421XXX				R51												
301080811XXX	Arc-shaped button drill bit, hardened	AB-Thread-D-HD		R32		X	X									
302080511XXX				R38		X	X			X						
303080511XXX				R51		X	X			X						
304080511XXX				T76						X		X				
301080521XXX	Arc-shaped button drill bit, with carbide inserts	AB-Thread-D-HM		R32		X	X									
302080521XXX				R38		X	X			X						
303080521XXX				R51		X	X			X						
304080521XXX				T76						X		X				
301080611XXX	Two-stage R-flush drill bit (retro-flush), hardened	TSB-Thread-D-R		R32												
302080611XXX				R38												
303080611XXX				R51												
304080611XXX				T76							X	X	X	X	X	X
301080613XXX	Two-stage RS-flush drill bit (retro-flush and side flush), hardened	TSB-Thread-D-RS		R32		X		X	X			X				
302080613XXX				R38		X		X	X			X	X			
303080613XXX				R51					X			X	X			
304080613XXX				T76												

1) X-marked fields indicate standard drill bit types, other dimensions available upon request.

Installation Procedures

Self-drilling installation may be accomplished either manually or semi-automated, depending on the available drilling machinery.

Simultaneous drilling and grouting

- Assembly of the DYWI® Drill Hollow Bar System and connection to the rotary injection adapter

- Rotary self-drilling installation and simultaneous grouting

- Optional extension using couplings

- De-coupling from the rotary injection adapter

Self-drilling installation and subsequent grouting

- Assembly of the DYWI® Drill Hollow Bar System and connection to the rock drill

- Rotary percussive self-drilling installation without casing: single-use drill bit and hollow bar drill steel, water or air-water mixture flushing

- Optional extension using couplings

- De-coupling from the drilling machinery, subsequent grouting using a post-grouting adapter

- Assembly of anchorage or head construction (plate and nut), depending on the application

Technical Features

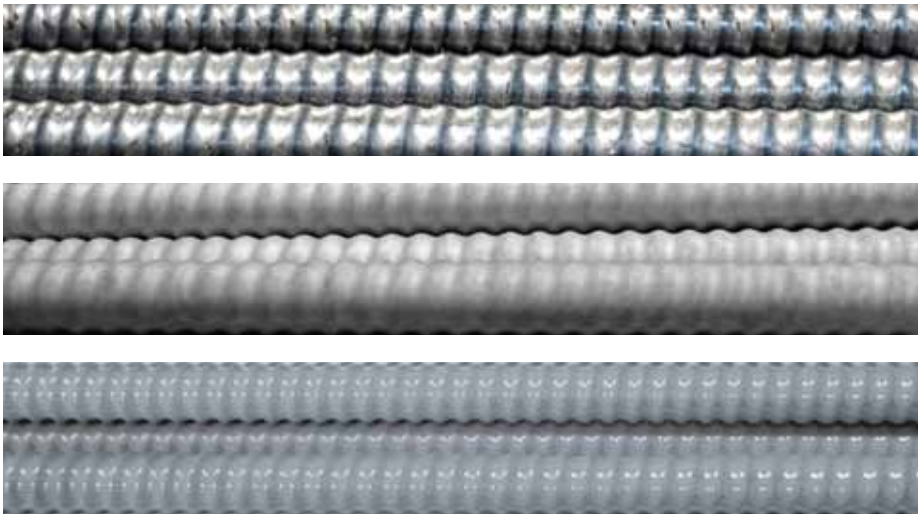
- Immediate grouting ensures ideal mixing with loose gravel or soil
- Permeation of the grout into the surrounding ground
- Improved and uniform distribution of the grouting medium over the entire installation length

Accessories

- Centralizers
- Sleeves for free length systems
- Rock drilling equipment: shank adapters, couplings, and coupling adapters
- Drill bit adapters
- Rotary injection adapters and accessories
- Grouting adapters
- DSI cement grout
- Mortar-Mixing pumps
- Flow-Pressure meters
- Stressing, pre-loading, or pull testing equipment

Corrosion Protection

- Design principle sacrificial corrosion protection: consideration of loss in cross-section over the design life, depending on the corrosion potential
- Improved corrosion protection of the DYWI® Drill Hollow Bar System: galvanized or duplex coated versions available upon request
- Hollow bar galvanizing according to EN 1461
- Hollow bar duplex coating according to EN 15773 and EN 13438 available upon request
- Further information on permanent system applications and corrosion rate classifications are included in DSI's product approvals



Further References

- DSI leaflet on drill bits for the DYWI® Drill Hollow Bar System
- EN 14490: Execution of special geotechnical works - Soil nailing
- EN 14199: Execution of special geotechnical works - Micropiles
- EN 1461: Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods
- EN 15773: Industrial application of powder organic coatings to hot dip galvanized or sherardized steel articles [duplex systems] - Specifications, recommendations and guidelines
- EN 13438 Paints and varnishes - Powder organic coatings for galvanized or sherardised steel products for construction purposes
- Approval for application as soil nail for temporary and semi-permanent application by the Austrian Federal Ministry of Transport, Innovation and Technology, Vienna, GZ: BMVIT-327.120/0010-IV/ST2/2012
- European Technical Approval (ETA) as rock and soil nail for temporary and permanent application, currently in preparation (ETA application: GZ OIB-240-007/09)
- Designs and dimensions of system components and primary material specifications are included in DSI's system brochures and approvals.

DYWI® Drill

Hollow Bar System

DSI Austria
DYWIDAG-Systems International GmbH
Alfred-Wagner-Strasse 1
4061 Pasching/Linz, Austria
Phone +43-7229-610 49 0
Fax +43-7229-610 49 80
E-mail alwag@dywidag-systems.at
www.alwag.com

ARGENTINA
AUSTRALIA
AUSTRIA
BELGIUM
BOSNIA AND HERZEGOVINA
BRAZIL
CANADA
CHILE
CHINA
COLOMBIA
COSTA RICA
CROATIA
CZECH REPUBLIC
DENMARK
EGYPT
ESTONIA
FINLAND
FRANCE
GERMANY
GREECE
GUATEMALA
HONDURAS
HONG KONG
INDONESIA
ITALY
JAPAN
KOREA
LEBANON
LUXEMBOURG
MALAYSIA
MEXICO
NETHERLANDS
NORWAY
OMAN
PANAMA
PARAGUAY
PERU
POLAND
PORTUGAL
QATAR
RUSSIA
SAUDI ARABIA
SINGAPORE
SOUTH AFRICA
SPAIN
SWEDEN
SWITZERLAND
TAIWAN
THAILAND
TURKEY
UNITED ARAB EMIRATES
UNITED KINGDOM
URUGUAY
USA
VENEZUELA

Please note:
This brochure serves basic information purposes only. Technical data and information provided herein shall be considered non-binding and may be subject to change without notice. We do not assume any liability for losses or damages attributed to the use of this technical data and any improper use of our products. Should you require further information on particular products, please do not hesitate to contact us.

www.dywidag-systems.com

04390-1/07.12-web he