Installation Manual

for

ANZEX Undercut Anchor System

MIYANAGA CO., LTD

ANZEX 714-00E / 617-00E

Table of Contents

1. The Undercut Anchor System

1.1. Overview

To ensure the reliability of an installed anchor, a secure installation is of vital importance, in addition to the anchoring performance of the anchor itself. From this perspective, the Miyanaga ANZEX Undercut Anchor System is an integrated system composed of an ANZEX bolt and its specialized installation tools (Figure 1-1).

It is a post-installed anchor system. After drilling a normal straight hole (hereafter “primary hole”), a specialized expanding tool (undercutter) is used to expand the bottom of the primary hole in conical shape (an expansion).
The expander sleeve of the ANZEX bolt is expanded to fix mechanically to the concrete (mechanical interlock).

Further, by using the specialized installation tools, the security of installation can be visually confirmed, improving the reliability of the installed anchor.

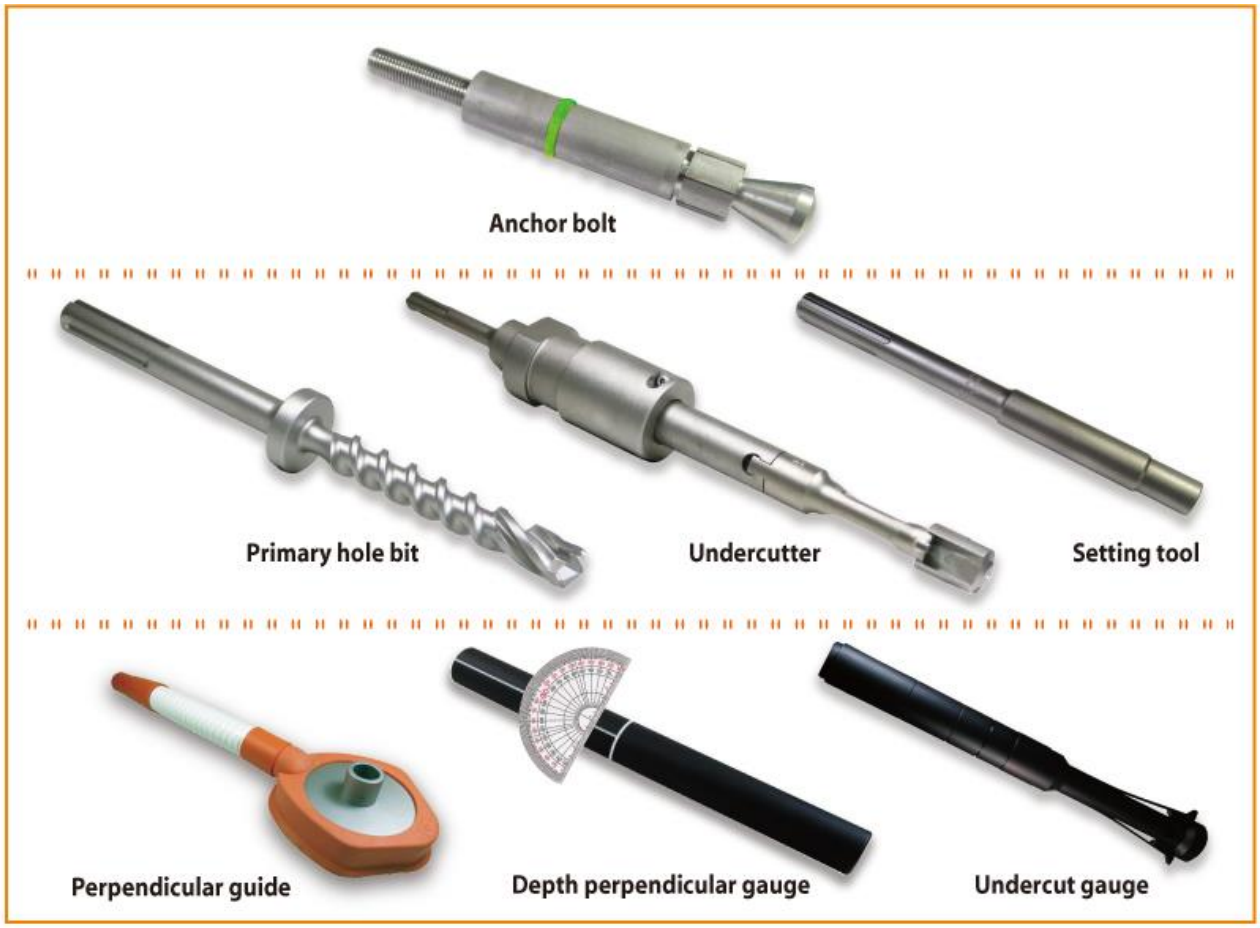


Figure 1-1　ANZEX Undercut Anchor System

1.2. Features

- The bolt is fixed mechanically to the undercut hole, causing the load on the bolt to be transferred to the concrete reliably by bearing force, not by friction or adhesion.
- Excellent anchoring performance in tension zones and cracked concrete. (It performs comparably to cast-in-place anchor bolts with heads.)
- The anchor is expanded into the undercut substrate in the primary hole, adding no stress to the base material. This allows for closer anchor spacing and edge distances compared to other metal expansion anchors.
- The undercutting of the primary hole (to expand the hole) can be completed quickly using the specialized undercutter.
- By using the undercut gauge, the worker can visually confirm the completion of the expansion.
- The cutter blade of the undercutter can be easily replaced.
- The primary hole bit, undercutter, and the anchor bolt are designed as total system so that each step of the installation can be visually confirmed, preventing situations such as insufficient embedded depth or incomplete expansion and allowing for reliable installation.

1.3. Principles of Anchoring

The tensile load which is loaded on the ANZEX bolt is transferred to the base concrete by the bearing force on the conical surface in the concrete through the expanded sleeve of bolt. (Figure 1-2).The area of the conical surface of the expanded hole is designed to be large enough to withstand the bearing force, so that designs for the anchor can be "*steel failure*".

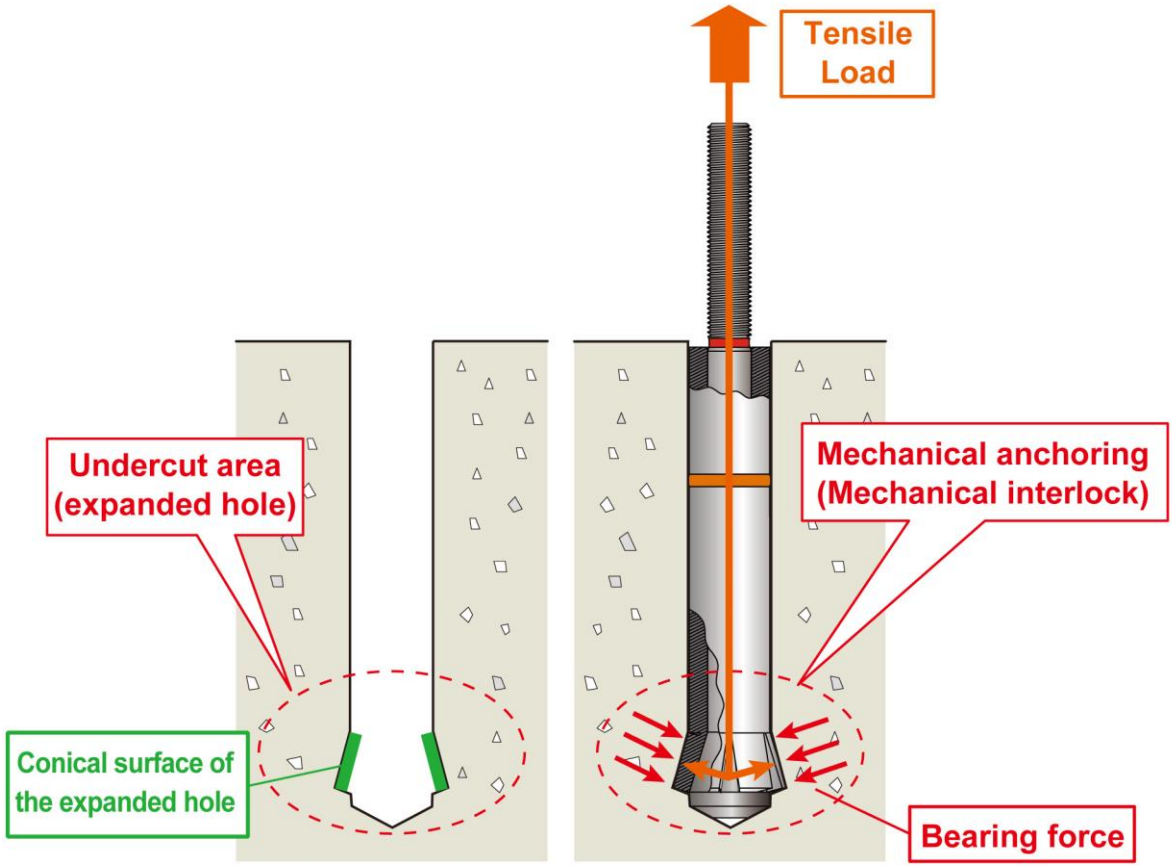


Figure 1-2 Principles of Anchoring of an ANZEX Bolt

There are three series of ANZEX bolts (Pre-setting and Through-fastening) , as required by various applications: AZ46 (normal steel bolt), AZ88 (high-strength steel bolt), and AZA4 (stainless steel bolt). Male threads of diameter M12 to M24 are standard. Other specifications of different bolt sizes or female threads can be specially designed, if required. An ANZEX bolt is composed of a conical bolt, an expander sleeve, a washer, a pair of nuts, a resin ring and a thread protection PE net.

The primary hole is drilled with a carbide tipped drill bit equipped with depth guide stopper, ensuring the designated diameter and depth of hole. The undercut portion is drilled (expanded) using the specialized undercut drill bit (undercutter). With the primary hole as a guide, it is drilled in the designated position, angle, and diameter.

1.4. ANZEX Bolt Components and Material Composition

The ANZEX bolt is composed of (1) a conical bolt, (2) an expander sleeve, (3) a washer, (4) a pair of nuts (locking), (5) a resin ring and (6) a thread protection PE net.

(Figure 1-3 Component Parts of an ANZEX Bolt)

The specifications of each component part differ for each of the three series, classified according to the strength of the bolt.

- Material specification
  - AZ46 series(Pre-setting/Through-fastening): Table 1.4-1
  - AZ88 series(Pre-setting/Through-fastening): Table 1.4-2
  - AZA4 series(Pre-setting/Through-fastening): Table 1.4-3

The specifications (design and installation data) of each anchor bolts are described.

- Specifications / Design and Installation data
  - AZ46 series(Pre-setting) : 1.5.1
  - AZ88 series(Pre-setting) : 1.5.2
  - AZA4 series(Pre-setting) : 1.5.3
  - AZ46(Through-fastening) : 1.6.1
  - AZ88(Through-fastening) : 1.6.2
  - AZA4(Though-fastening) : 1.6.3

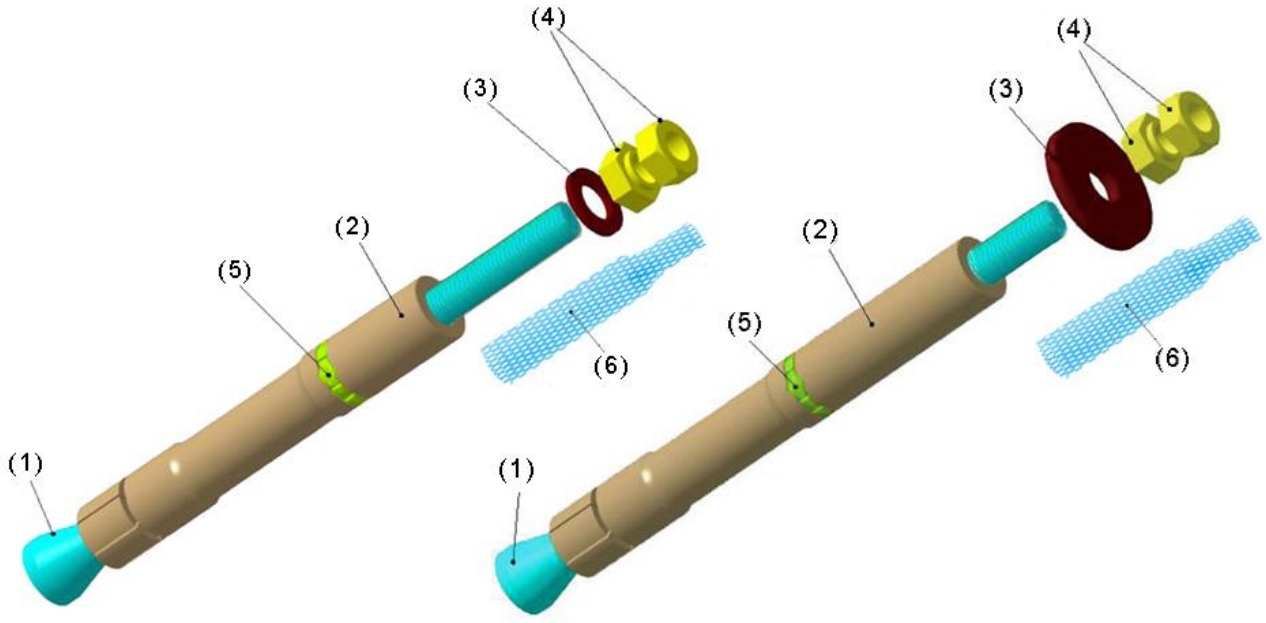


Figure 1-3 Component Parts of an ANZEX Bolt

Table 1.4-1. AZ46 Series Material Specifications (Pre-setting / Through-fastening)

No.	Component	Specifications
(1)	Conical bolt	Strength Classification 4.6 (JIS B 1051) Tensile strength: 400N/mm^2 or greater Yield strength ($_s\sigma_y$): 240N/mm^2 or greater SS400 (JIS G 3101) or equivalent material Hot-dip galvanized (HDZ35)
(2)	Expander sleeve	SAE4103 S-C(SAE J 404) Hot-dip galvanized (HDZ35)
(3)	Washer	JIS B 1256　Standard　200HV Hot-dip galvanized (HDZ35)
(4)	Nut	Hardlock Nut by HARDLOCK Industry Co.,Ltd. Product name: HLN-R Class4 HDZ
(5)	Resin-ring	Polypropylene
(6)	Thread protection PE net	LDPE(Low Density Poly Ethylene)

Table 1.4-2. AZ88 Series Material Specifications (Pre-setting / Through-fastening)

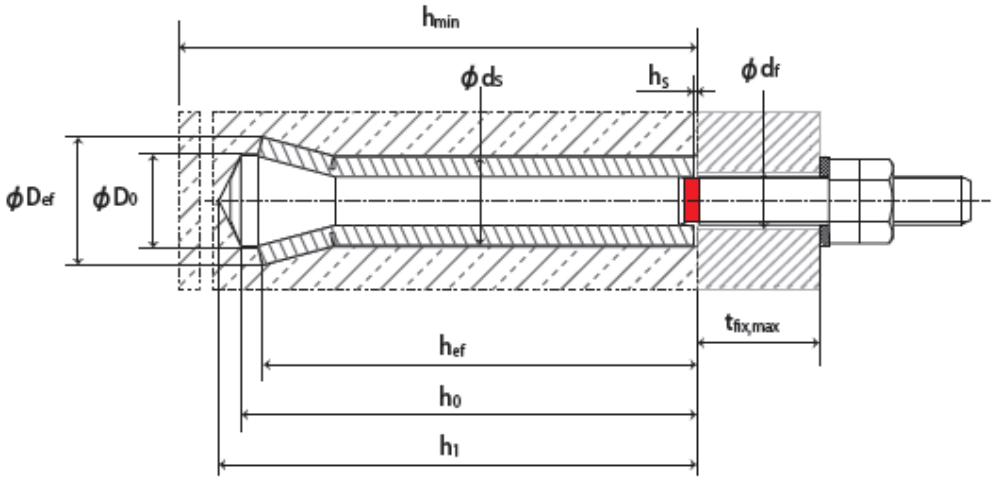
No.	Component	Specifications
(1)	Conical bolt	Strength Classification 8.8 (JIS B 1051) Stress at 0.2% permanent strain M12, M16: 640N/mm^2 or greater M20, M24: 660N/mm^2 or greater Tensile strength M12, M16: 800N/mm^2 or greater M20, M24: 830N/mm^2 or greater SCM435 (JIS G 4053) thermally refined or equivalent material Electroplated (Ep-Fe/Zn 5/CM2 (trivalent))
(2)	Expander sleeve	SAE4130 S-C (SAE J 404) Electroplated (Ep-Fe/Zn 5/CM2 (trivalent))
(3)	Washer	JIS B 1256　Standard　300HV Electroplated (Ep—Fe/Zn 5/CM2 (trivalent))
(4)	Nut	Hardlock Nut by HARDLOCK Industry Co.,Ltd. Product name: HLN-R Class8 (trivalent)
(5)	Resin-ring	Polypropylene
(6)	Thread protection PE net	LDPE(Low Density Poly Ethylene)

Table 1.4-3. AZA4 Series Material Specifications (Pre-setting / Through-fastening)

No.	Component	Specifications
(1)	Conical bolt	Steel Grade Classification A4 JIS Strength Classification 50(JIS B 1054-1) Stress at 0.2% permanent strain: 210N/mm^2 or greater Tensile strength: 500N/mm^2 or greater SUS316 (JIS G 4303)
(2)	Expander sleeve	SUS316TKA S-C (JIS G 3446) or equivalent material
(3)	Washer	JIS B 1256　Standard SUS304 A200
(4)	Nut	Hardlock Nut by HARDLOCK Industry Co.,Ltd. Product name: HLN-R A2-50 (SUS304)
(5)	Resin-ring	Polypropylene
(6)	Thread protection PE net	LDPE(Low Density Poly Ethylene)

1.5. ANZEX Bolt (Pre-setting) Specifications (Design and Installation Data)

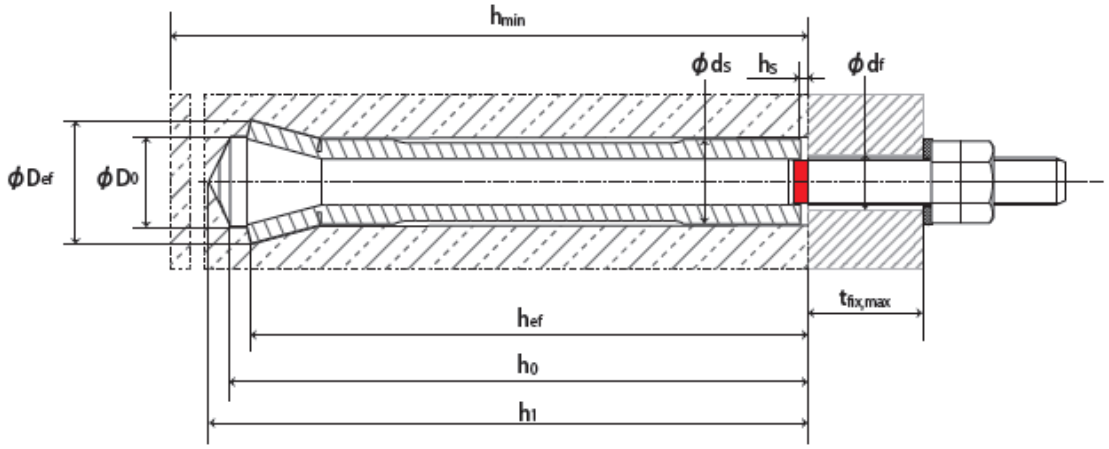
1.5.1 AZ46 Series (Pre-setting)



Thread size(pitch)			M12	M16	M20	M24
Part Number			AZM12 P46H225	AZM16 P46H305	AZM20 P46H360	AZM24 P46H440
Drill hole diameter	D_0	[mm]	22.5	30.5	36.0	44.0
Sleeve diameter	d_s	[mm]	22.0	29.5	35.0	42.0
Drilled hole depth	h_0	[mm]	96	131	162	195
Deepest drilled hole depth	h_1	[mm]	100.8	137.5	170.1	204.5
Expanded diameter	D_{ef}	[mm]	31.5	42.3	49.3	59.2
Effective anchorage depth	h_{ef}	[mm]	90	123	153	184
Effective sectional area of thread	A_s	[mm^2]	84.3	157	245	353
Minimum thickness of concrete member	h_{min}	[mm]	150	200	245	353
Depth of sleeve surface	h_s	[mm]	2 ≤	2 ≤	3 ≤	3 ≤
Diameter of clearance hole in fixture	d_f	[mm]	14	18	22	26
Maximum thickness of fixture	$t_{fix,max}$	[mm]	25	30	40	50
Applying torque	Convex nut	[Nm]	80	200	385	665
	Concave nut	[Nm]	54–78	140–200	240–400	320–600
Minimum tensile load		[kN]	33.7	62.8	98.0	141.2

Coating specification: Hot-dip galvanized HDZ35

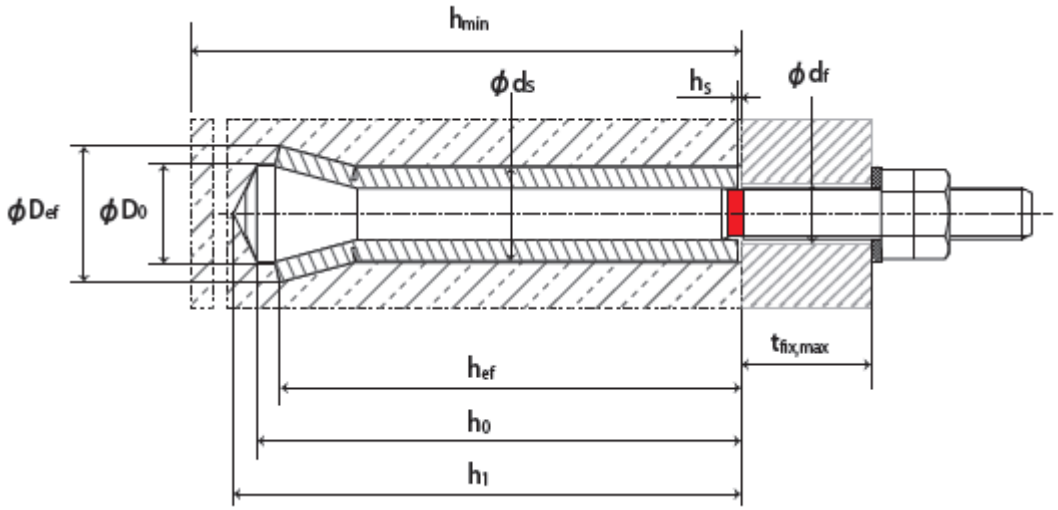
1.5.2 AZ88 Series (Pre-setting)



Thread size			M12	M16	M20	M24
Part Number			AZM12 P88E225	AZM16 P88E305	AZM20 P88E360	AZM24 P88E440
Drill hole diameter	D_0	[mm]	22.5	30.5	36.0	44.0
Sleeve diameter	d_s	[mm]	22.0	29.5	35.0	42.0
Drilled hole depth	h_0	[mm]	141	198	249	296
Deepest drilled hole depth	h_1	[mm]	145.8	204.5	257.1	305.5
Expanded diameter	D_{ef}	[mm]	31.5	42.3	49.3	59.2
Effective anchorage depth	h_{ef}	[mm]	135	190	240	285
Effective sectional area of thread	A_s	[mm^2]	84.3	157	245	353
Minimum thickness of concrete member	h_{min}	[mm]	210	290	360	430
Depth of sleeve surface	h_s	[mm]	2 ≤	2 ≤	3 ≤	3 ≤
Diameter of clearance hole in fixture	d_f	[mm]	14	18	22	26
Maximum thickness of fixture	$t_{fix,max}$	[mm]	30	40	50	60
Applying torque	Convex nut	[Nm]	70	170	330	570
	Concave nut	[Nm]	27–39	70–100	120–200	160–300
Minimum tensile load		[kN]	67.4	125.6	203.4	293.0

Coating specification: Electroplated and chromate conversion coating (trivalent chromium) Ep-Fe/Zn 5/CM2 (trivalent)

1.5.3 AZA4 Series (Pre-setting)

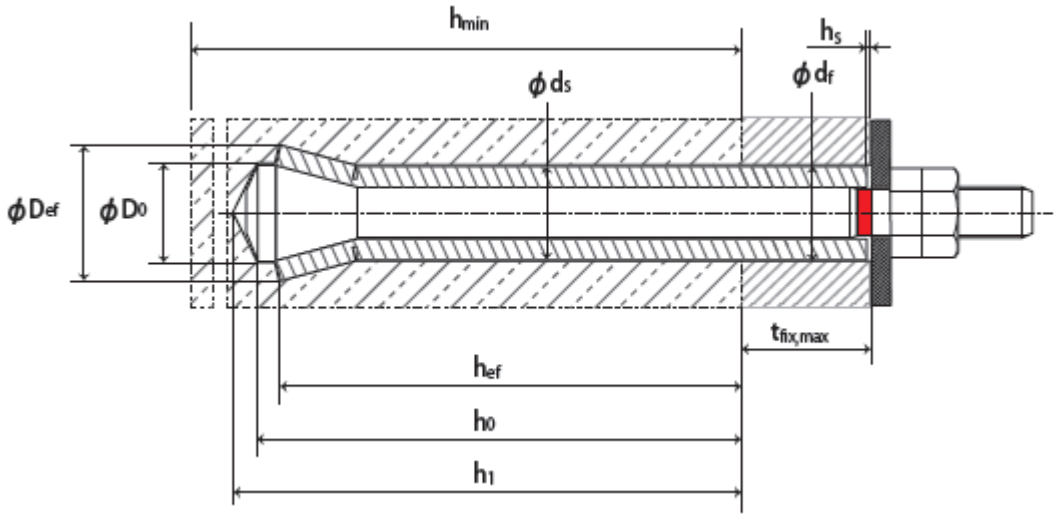


Thread size			M12	M16	M20	M24
Part Number			AZM12 PA4N225	AZM16 PA4N305	AZM20 PA4N360	AZM24 PA4N440
Drill hole diameter	D_0	[mm]	22.5	30.5	36.0	44.0
Sleeve diameter	d_s	[mm]	22.0	29.5	35.0	42.0
Drilled hole depth	h_0	[mm]	109	148	185	221
Deepest drilled hole depth	h_1	[mm]	113.8	154.5	193.1	230.5
Expanded diameter	D_{ef}	[mm]	31.5	42.3	49.3	59.2
Effective anchorage depth	h_{ef}	[mm]	103	140	176	210
Effective sectional area of thread	A_s	[mm^2]	84.3	157	245	353
Minimum thickness of concrete member	h_{min}	[mm]	170	230	290	350
Depth of sleeve surface	h_s	[mm]	2 ≤	2 ≤	3 ≤	3 ≤
Diameter of clearance hole in the fixture	d_f	[mm]	14	18	22	26
Maximum thickness of fixture	$t_{fix,max}$	[mm]	30	40	50	60
Applying torque	Convex nut	[Nm]	22	55	110	185
	Concave nut	[Nm]	27–39	70–100	120–200	160–300
Minimum tensile load		[kN]	42.2	78.5	122.5	176.5

No coating

1.6. ANZEX Bolt (Through-fastening) Specification (Design and Installation Data)

1.6.1 AZ46 Series (Through-fastening)

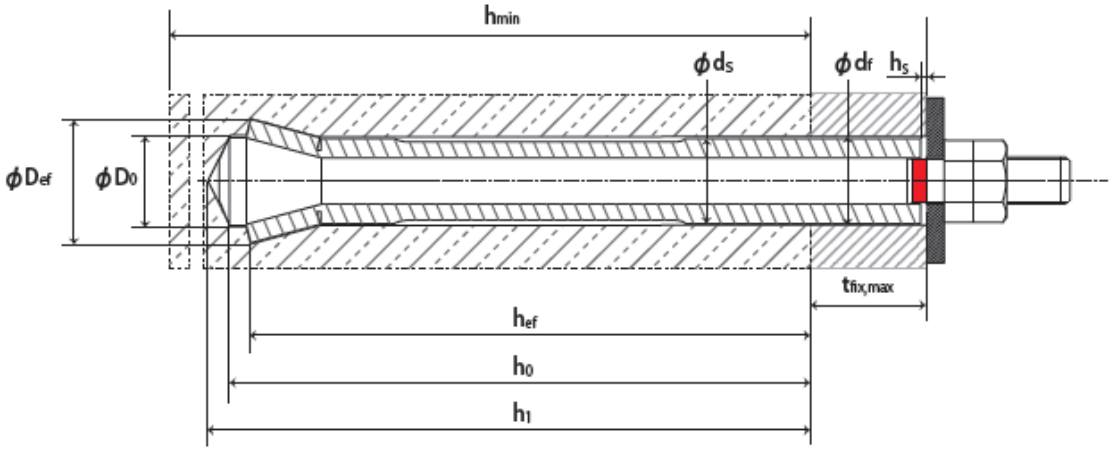


Thread size(pitch)			M12	M16	M20	M24
Part Number			AZM12 T46H225	AZM16 T46H305	AZM20 T46H360	AZM24 T46H440
Drill hole diameter	D_0	[mm]	22.5	30.5	36.0	44.0
Sleeve diameter	d_s	[mm]	22.0	29.5	35.0	42.0
Drilled hole depth	h_0	[mm]	96	131	162	195
Deepest drilled hole depth	h_1	[mm]	100.8	137.5	170.1	204.5
Expanded diameter	D_{ef}	[mm]	31.5	42.3	49.3	59.2
Effective anchorage depth	h_{ef}	[mm]	90	123	153	184
Effective sectional area of thread	A_s	[mm^2]	84.3	157	245	353
Minimum thickness of concrete member	h_{min}	[mm]	150 + α	200+ α	245+ α	353+ α
Depth of sleeve surface	h_s	[mm]	2 ≤	2 ≤	3 ≤	3 ≤
Diameter of clearance hole in fixture	d_f	[mm]	23	32	39	47
Maximum thickness of fixture	$t_{fix,max}$	[mm]	25	30	40	50
Applying torque	Convex nut	[Nm]	80	200	385	665
	Concave nut	[Nm]	54–78	140–200	240–400	320–600
Minimum tensile load		[kN]	33.7	62.8	98.0	141.2

Coating specification: Hot-dip galvanized HDZ35 * α = $t_{fix,max}$ - (thickness of fixture)

fixture)

1.6.2 AZ88 Series (Through-fastening)

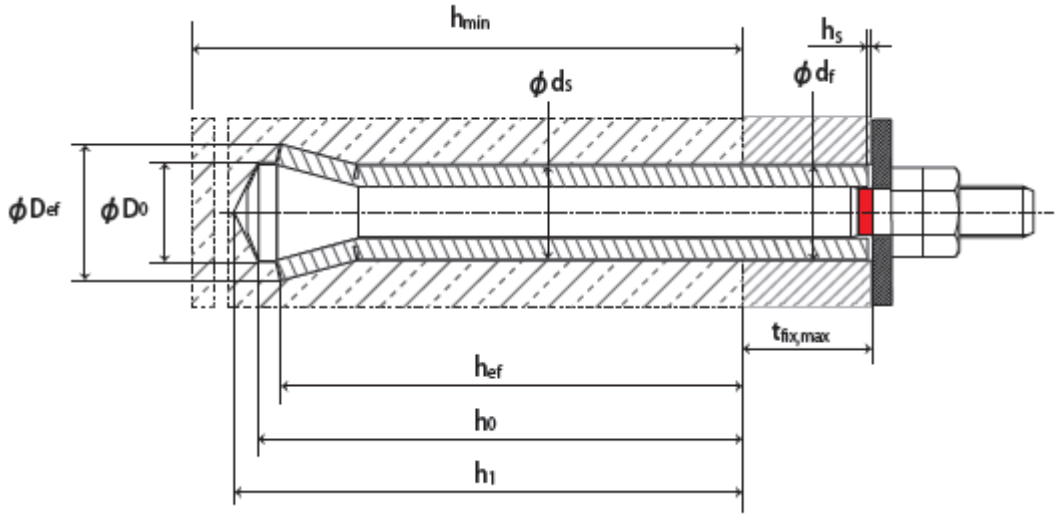


Thread size			M12	M16	M20	M24
Part Number			AZM12 T88E225	AZM16 T88E305	AZM20 T88E360	AZM24 T88E440
Drill hole diameter	D_0	[mm]	22.5	30.5	36.0	44.0
Sleeve diameter	d_s	[mm]	22.0	29.5	35.0	42.0
Drilled hole depth	h_0	[mm]	141	198	249	296
Deepest drilled hole depth	h_1	[mm]	145.8	204.5	257.1	305.5
Expanded diameter	D_{ef}	[mm]	31.5	42.3	49.3	59.2
Effective anchorage depth	h_{ef}	[mm]	135	190	240	285
Effective sectional area of thread	A_s	[mm^2]	84.3	157	245	353
Minimum thickness of concrete member	h_{min}	[mm]	210 + α	290 + α	360 + α	430 + α
Depth of sleeve surface	h_s	[mm]	2 ≤	2 ≤	3 ≤	3 ≤
Diameter of clearance hole in fixture	d_f	[mm]	23	32	39	47
Maximum thickness of fixture	$t_{fix,max}$	[mm]	30	40	50	60
Applying torque	Convex nut	[Nm]	70	170	330	570
	Concave nut	[Nm]	27–39	70–100	120–200	160–300
Minimum tensile load		[kN]	67.4	125.6	203.4	293.0

Coating specification: Electroplated and chromate conversion coating (trivalent chromium) Ep-Fe/Zn 5/CM2 (trivalent)

* $\alpha = t_{fix,max}$ - (thickness of fixture)

1.6.3 AZA4 Series (Through-fastening)



Thread size			M12	M16	M20	M24
Part Number			AZM12 TA4N225	AZM16 TA4N305	AZM20 TA4N360	AZM24 TA4N440
Drill hole diameter	D_0	[mm]	22.5	30.5	36.0	44.0
Sleeve diameter	d_s	[mm]	22.0	29.5	35.0	42.0
Drilled hole depth	h_0	[mm]	109	148	185	221
Deepest drilled hole depth	h_1	[mm]	113.8	154.5	193.1	230.5
Expanded diameter	D_{ef}	[mm]	31.5	42.3	49.3	59.2
Effective anchorage depth	h_{ef}	[mm]	103	140	176	210
Effective sectional area of thread	A_s	[mm^2]	84.3	157	245	353
Minimum thickness of concrete member	h_{min}	[mm]	170 + α	230 + α	290 + α	350 + α
Depth of sleeve surface	h_s	[mm]	2 ≤	2 ≤	3 ≤	3 ≤
Diameter of clearance hole in the fixture	d_f	[mm]	23	32	39	47
Maximum thickness of fixture	$t_{fix,max}$	[mm]	30	40	50	60
Applying torque	Convex nut	[Nm]	22	55	110	185
	Concave nut	[Nm]	27–39	70–100	120–200	160–300
Minimum tensile load		[kN]	42.2	78.5	122.5	176.5

No coating

* $\alpha = t_{fix,max}$ - (thickness of fixture)

2　Anchor Bolt Installation

2.1 Installation Tools

2.1.1　Overview of Installation Tools

By using specialized tools and following the procedure, the ANZEX Undercut Anchor System allows for secure installation of anchor bolts. Additionally, by using the gauge with some processes, the worker “himself” can visually confirm that each process is properly completed. The specialized tools are as follows:

- **Primary hole bit with depth-guide stopper**

  Drills near-perfect round holes with proper depth.

  ・Primary hole bit for Pre-setting anchor with using Perpendicular guide

  ・Primary hole bit for Pre-setting anchor (w/o Perpendicular guide)

  ・Primary hole bit for Through-fastening anchor with using Perpendicular guide

  ・Primary hole bit for Through-fastening anchor (w/o Perpendicular guide)

- **Undercutter**

  Expand the primary hole at the proper position, of the proper angle, and of the proper expansion width.

- **Setting tool**

  ・Setting tool (Hand-operated)

  ・Mechanical setting tool for electric drills.

- **Depth perpendicular gauge and undercut gauge**

  ・Depth perpendicular gauge : for confirming the depth and perpendicularity of the primary hole

  ・Undercut gauge : for confirming proper undercutting.

	Pre-setting anchor		Through-fastening anchor	
	using with Perpendicular guide	without Perpendicular guide	using with Perpendicular guide	without Perpendicular guide
Primary hole bit	○	○	○	○
Depth perpendicular gauge	○	○	○	○
Undercutter	●(common tool)			
Undercut gauge	●(common tool)			
Setting tool	●(common tool)			

2.1.2　Primary hole bit with depth guide stopper.

2.1.2.1　Primary hole bit using with Perpendicular guide

Two types of primary hole bits with depth guide stopper, one is using with Perpendicular guide for perpendicular drilling, another is not using Perpendicular guide.

Please use the proper combination of Primary hole bit and Perpendicular guide due to different overall length.

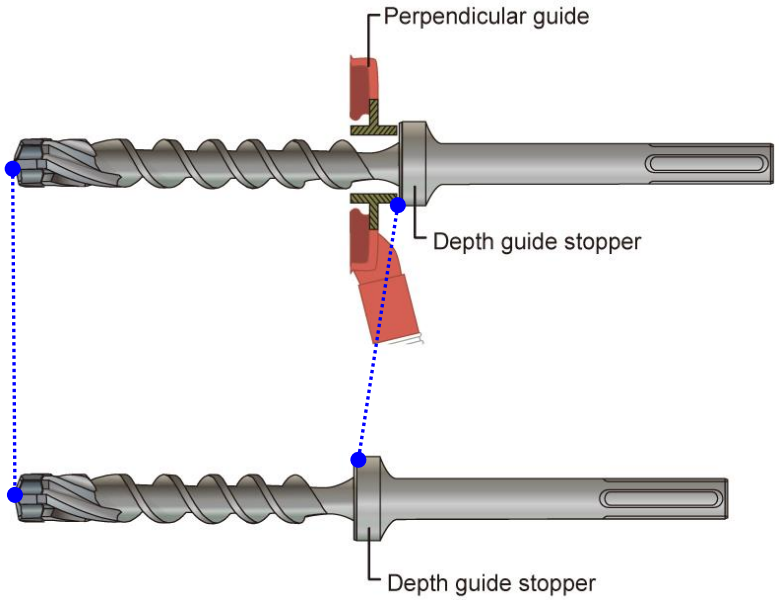


Figure 2-1　Primary hole bit with depth guide stopper

2.1.3　The Undercut Tool (Undercutter)

2.1.3.1　The Components of the Undercutter

The undercutter is composed of multiple parts, as shown in Figure 2-2.

The worn cutter blade can be easily changed to new one.

*Refer to: Appendix1.2 “How to change a cutter blade”.

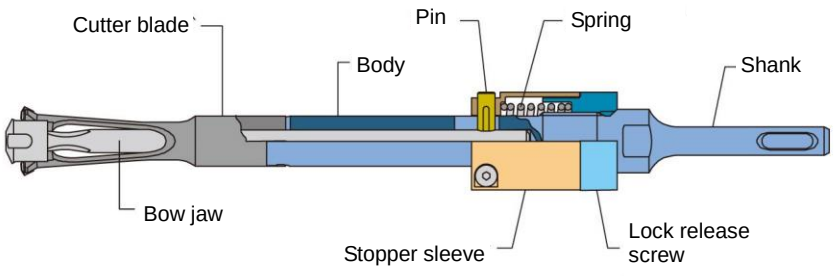


Figure 2-2 Undercutter components

2.2 Installation Procedure of anchor (Pre-setting and Through-fastening)

The ANZEX bolt can be installed reliably in accordance with proper procedures below.

(1) Preparation

Check that the anchor bolt and the corresponding installation tools are on hand.
(Refer to : Appendix 1.3 “Corresponding Tools for Each Anchor”.)

(2) Attaching the dust-collecting pad with a perpendicular guide

Attach the perpendicular guide with the dust-collecting pad to the marked point.
Check the vacuum cleaner works well without problems and a dust-collecting pad with perpendicular guide sticks on the concrete surface.

(3) Drilling the primary hole

Use a dedicated primary hole bit and drill until its depth-guide stopper touches the perpendicular guide or the concrete surface.
The worker can visually confirm the completion of drilling. It minimizes the variation of drilling depth depending on workers.

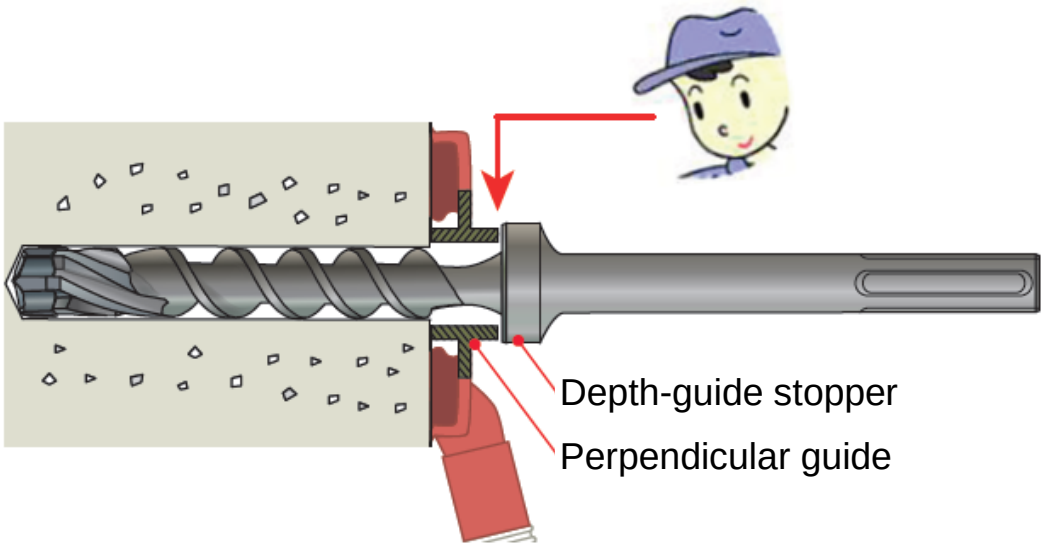


Figure 2-3 The depth-guide stopper in contact with the perpendicular guide (Pre-setting type)

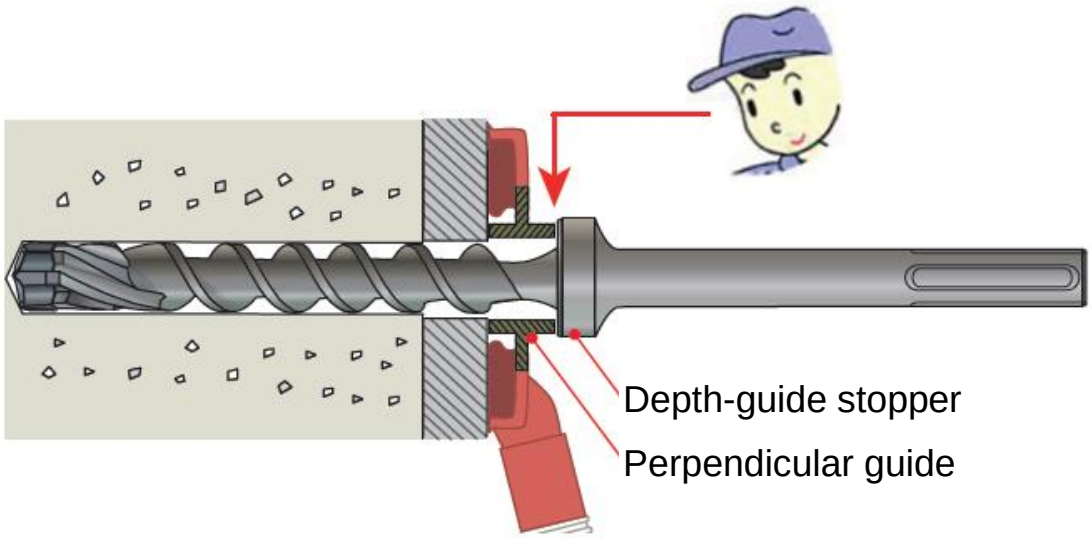


Figure 2-4 The depth-guide stopper in contact with the perpendicular guide (Through-fastening type)

(4) Cleaning the primary hole

Thoroughly remove chips from inside the hole using the vacuum cleaner or blower.
The remaining chips may cause defective installation.

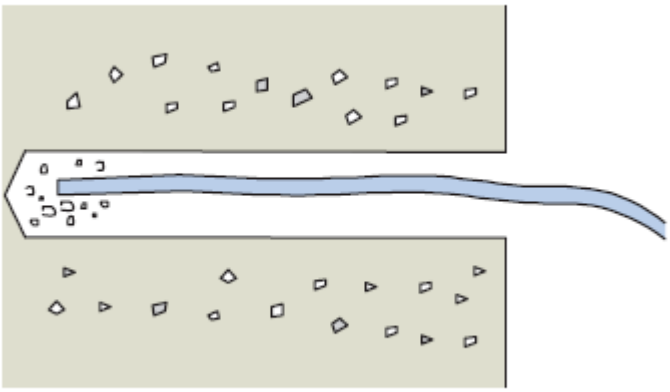


Figure 2-5 Cleaning the primary hole

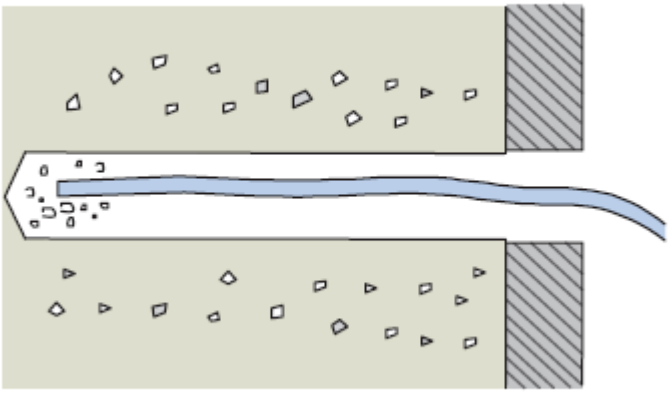


Figure 2-6 Cleaning the primary hole (Through-fastening type)

(5) Confirming depth and perpendicularity

Using the depth perpendicular gauge, confirm that the hole is within 5 degrees of 90 degrees.

At the same time, the depth can be confirmed to be as prescribed.

If a defect is found, return to the preceding steps and clean the primary hole.

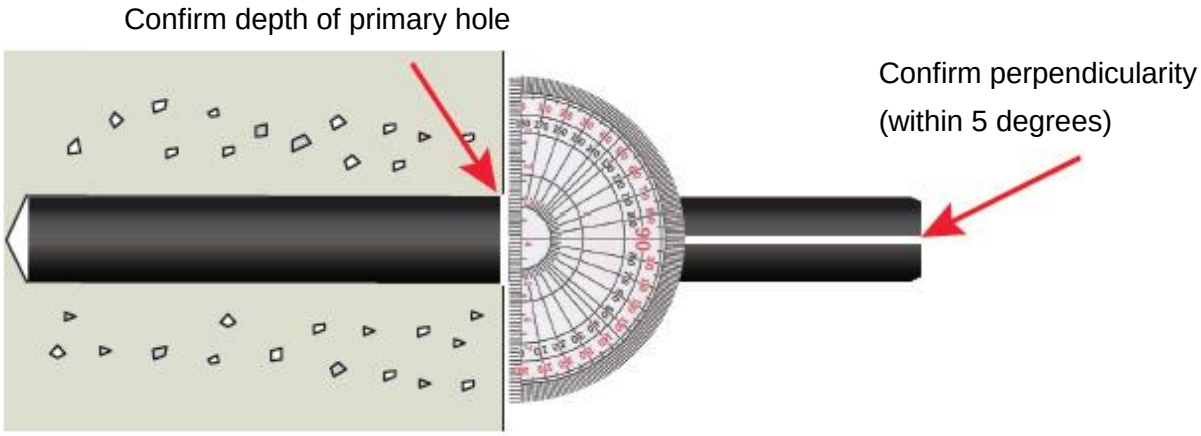


Figure 2-7 Confirming depth and perpendicularity of primary hole (Pre-setting type)

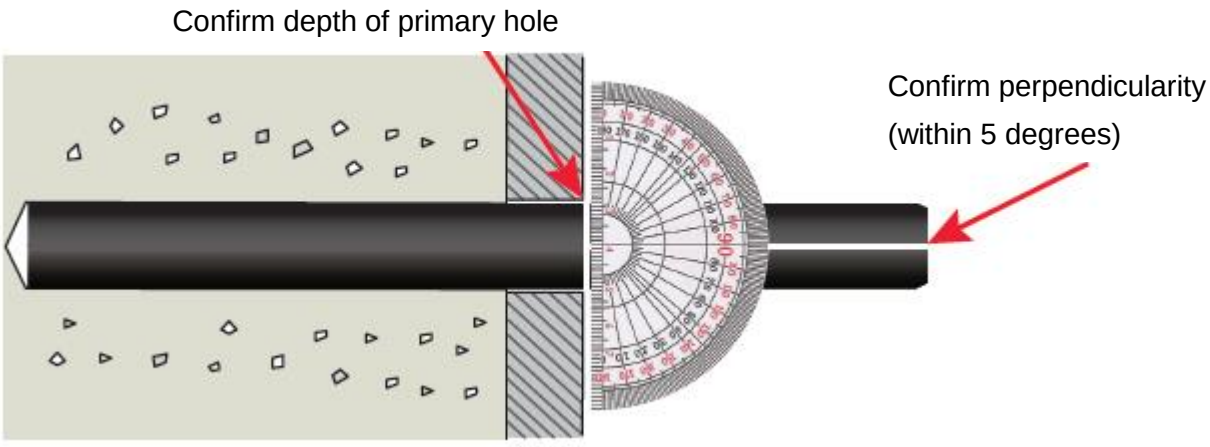


Figure 2-8 Confirming depth and perpendicularity of primary hole (Through-fastening type)

(6) Undercutting

Use the undercutter to expand the primary hole.

(6)-1 Preparation

Before use, clean around the cutter blade and the bow jaw with a brush.

Then, hold and press the bow jaw against the ground, and confirm that the cutter blade opens and closes smoothly.

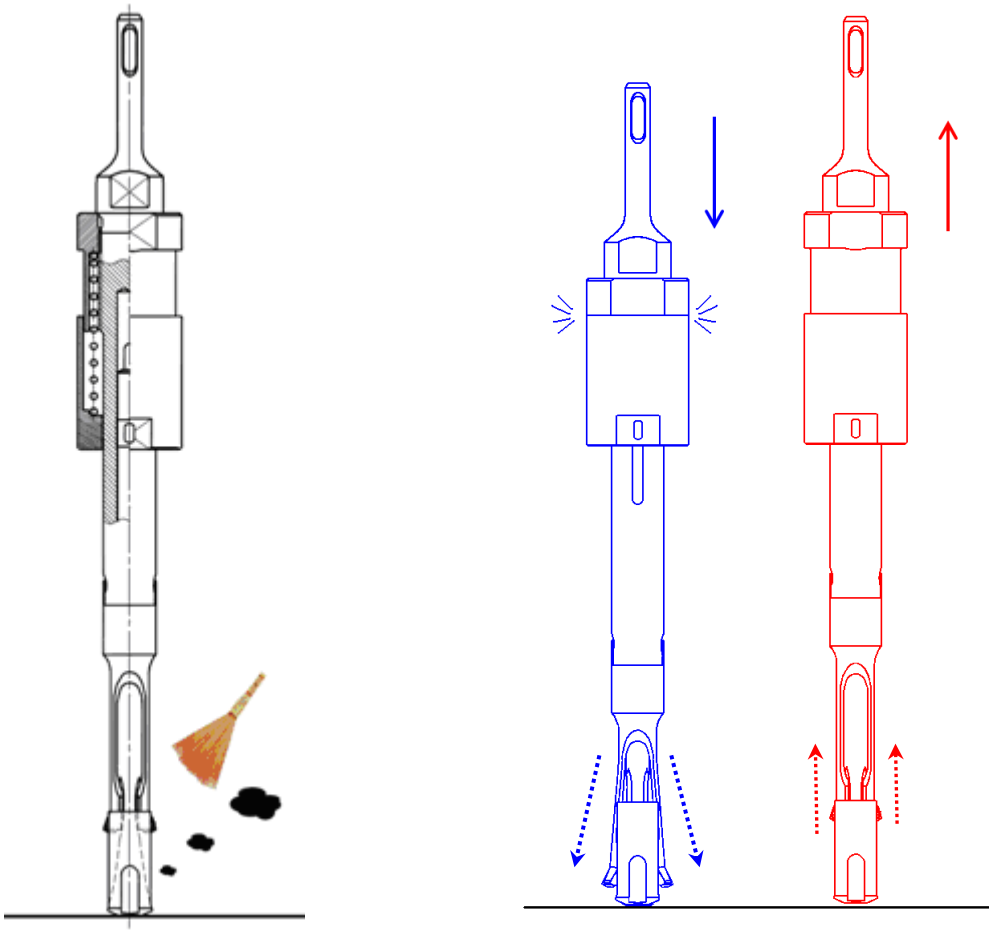


Figure 2-9 Preparation before using the undercutter

(6)-2　Undercutting the primary hole

Hold the tip of the bow jaw against the bottom of the primary hole. Turn on the hammer drill and press.

It is prone to getting stuck at the start of undercutting, so drill at a slow feed speed, then increase the load once the undercutting process has become stabilized.

The procedure is completed when the gap between the lock release screw and the stopper sleeve has closed.

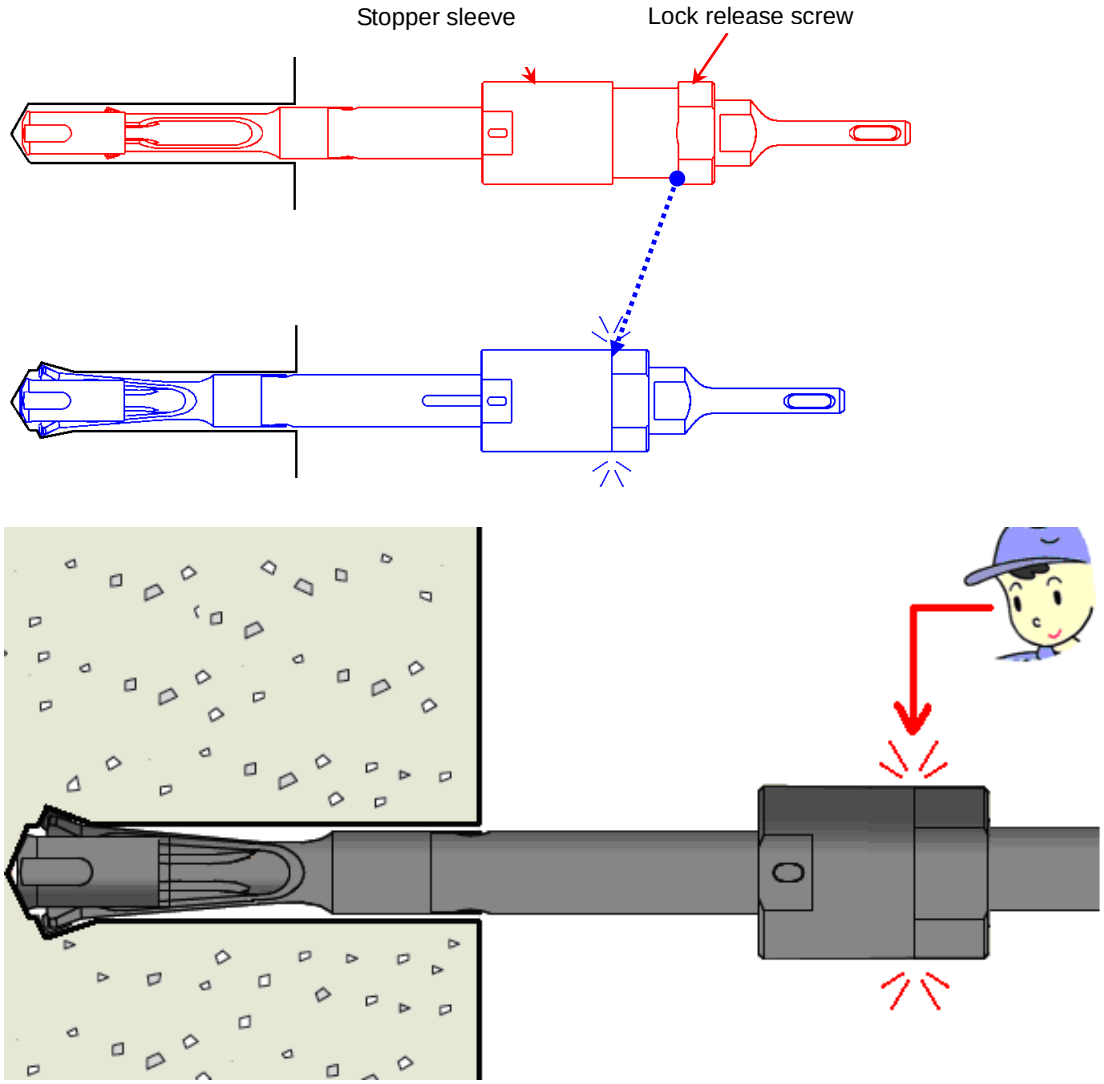


Figure 2-10 Completion of the Undercutting procedure

** Appendix 1.2 : How to change to a new cutter blade (when the cutter blade is worn out)

(7) Removing the undercutter

When the undercutter is pulled from the undercut hole, the expanded cutter blade is closed and the undercutter can be removed from the undercut hole.

If the cutter blade is not closed, turn the undercutter slightly or press it against the bottom of the hole with the hammer drill to close the cutter blade.

** Appendix 1.1: Troubleshooting : sticking　(If undercutter is stuck)

(8) Cleaning the undercut hole

Thoroughly remove chips from inside the hole using the vacuum cleaner or blowers. Particularly the part of undercut should be cleaned for proper installation of anchor bolt. Chips that remain may cause defective installation.

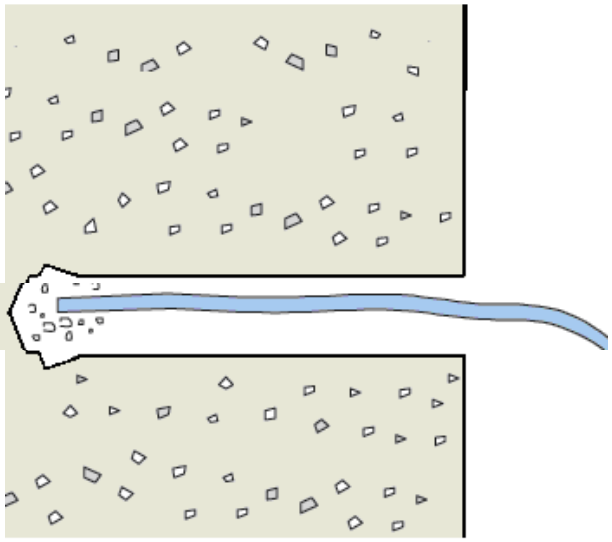


Figure 2-11　Cleaning the undercut hole

(9) Confirming the undercutting

Insert the undercut gauge into the undercut hole. If there is no gap, the undercutting has been properly completed.

If undercutting is not properly completed, return to the preceding step and clean the undercut hole.

** Note :It is not necessary to rotate the undercut gauge to confirm the undercutting.

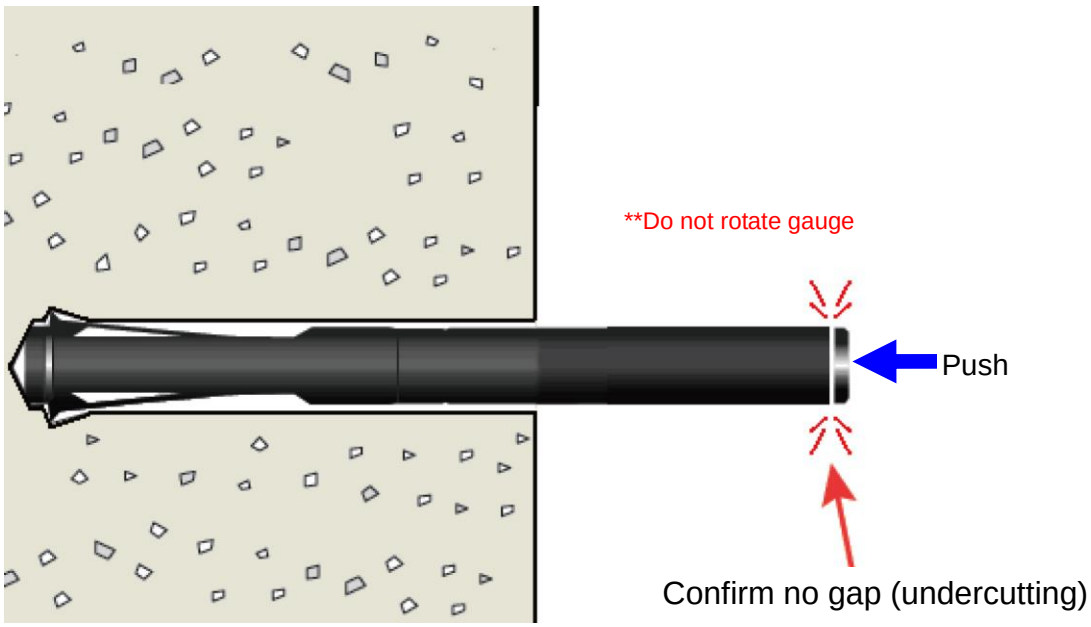


Figure 2-12 Confirming the undercutting

(10) Setting the anchor

Attach the setting tool to the electric drill (if using the mechanical setting tool), and insert the anchor bolt covered with a thread protection PE net not to damage the thread part. Insert the anchor bolt that is attached to setting tool, into the undercut hole and add hammering to open the expanding portion of the expander sleeve. When the red line of conical bolt can be confirmed, the anchor bolt is installed properly. Also the completion of the procedure is evident by the change in the sound and reactive force of the hammering.

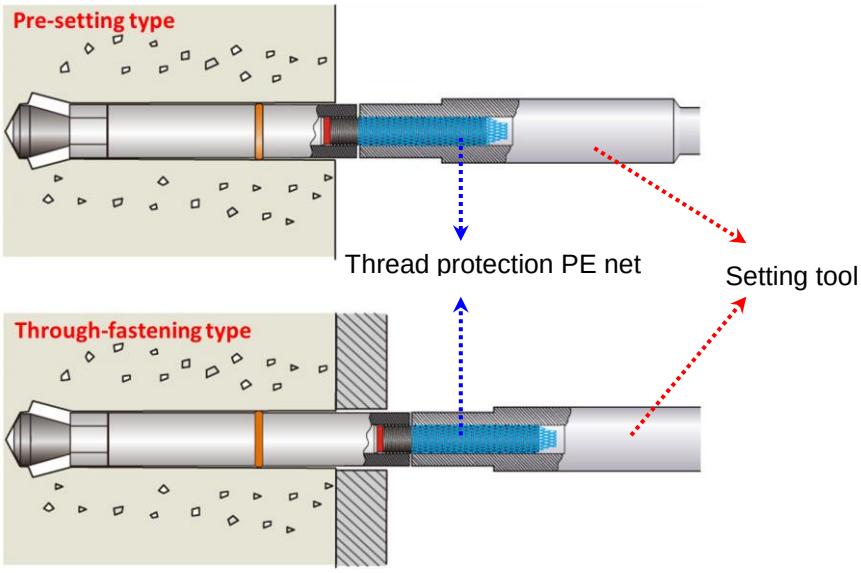


Figure 2-13 Anchor inserted

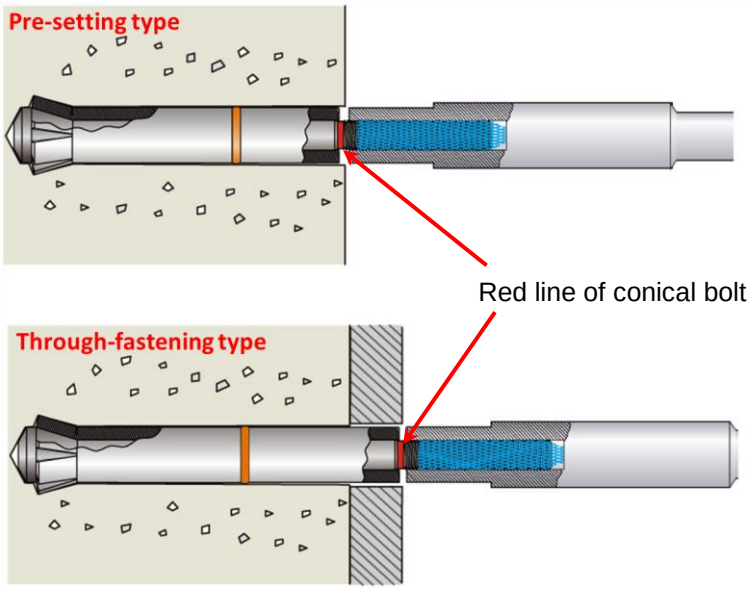


Figure 2-14　Anchor setting completed

The setting is completed when the expander sleeve has been completely set inside the hole, the red line marked on the conical bolt is visible, and it is visibly confirmed that the top surface of the expander sleeve is lower than the surface of the concrete by distance h_s.

** Note :

h_s / Refer to : “1.5 ANZEX Bolt(Pre-setting) Specification”

“1.6 ANZEX Bolt(Through-fastening) Specification”

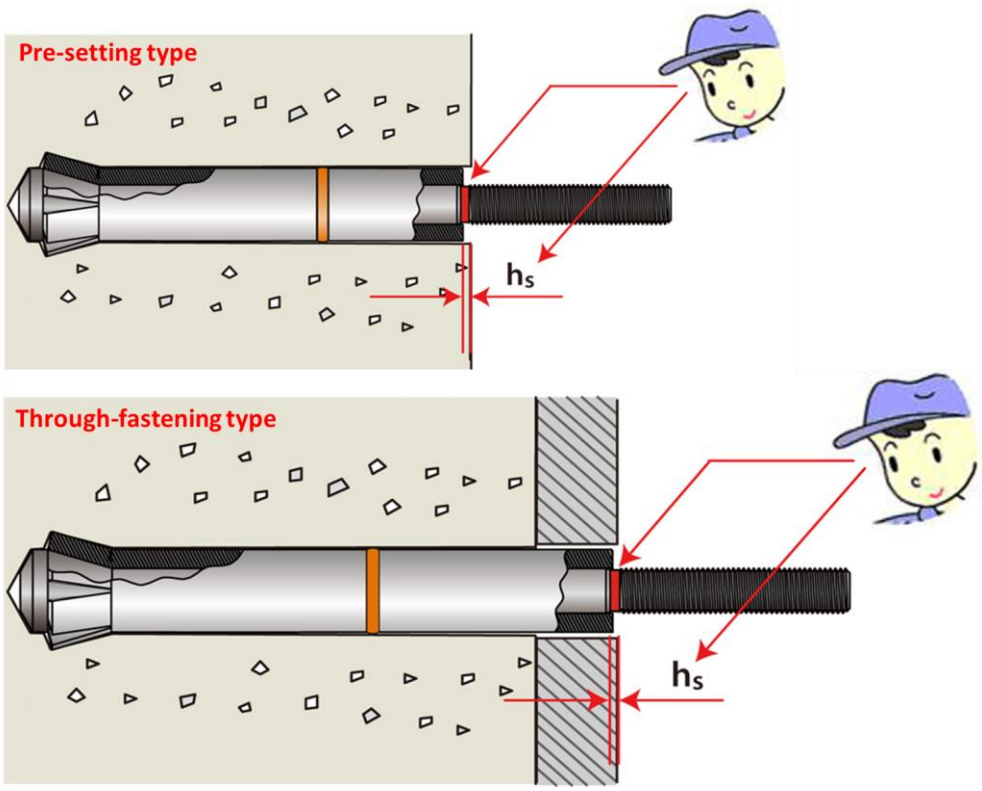


Figure 2-15 Confirmation after setting the anchor: red line and depth of sleeve surface

(11) Fixing (tightening the nuts)

A pair of nuts (Hardlock nut) is used. Tighten the convex nut then the concave nut, each to its specified torque, to complete installation

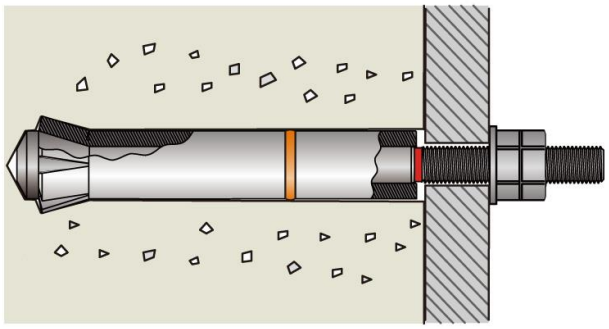


Figure 2-16　Fixing completed (Pre-setting type)

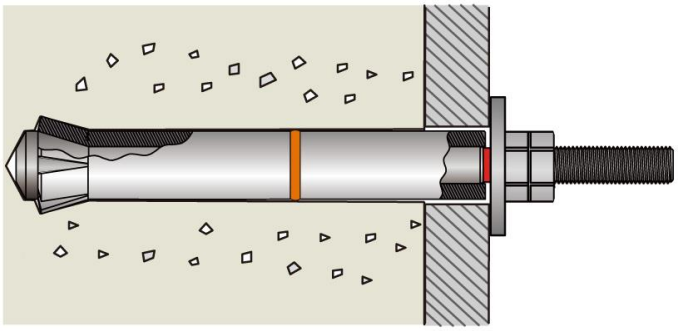


Figure 2-17　Fixing completed (Through-fastening type)

2.3 Installation Check Sheet

The anchor bolt is installed correctly by strictly following the installation procedures in section 2.2(P.18/ Installation procedure). However, from the point of view of long-term management, creating and keeping a check sheet are recommended.

An example of sample check sheet for ANZEX bolt Pre-setting type (AZM16P88E305) and ANZEX bolt Through-fastening type (AMZ16T88E305) are provided on the following pages.
(Contact us if required.)

Example 1 (Pre-setting type)

**Items written in red are variable value depending on Anchor bolt part No.

*** Check Sheet *** ANZEX Anchor Installation

Installation Date		Installed by	
Anchor bolt part No.	AZM16P88E305	Measured by	
Concrete Strength	[N/mm^2]	Recorded by	

Step (1): Drilling the primary hole *Rotary Hammer Drill to be used (Model No):

Item	Measuring device	Standard value	Measurement							
Cleaning the primary hole (vacuum)	Vacuum cleaner	Visual check	□	□	□	□	□	□	□	□
Depth of drilled hole H_0	Depth perpendicular gauge	198-202 [mm]	□	□	□	□	□	□	□	□
Perpendicularity (x)	Depth perpendicular gauge	Within 5 deg.								
Perpendicularity (y)	Depth perpendicular gauge	Within 5 deg.								

Step (4): Undercutting *Rotary Hammer Drill to be used (Mode No) :

Item	Measuring device	Standard value	Measurement							
Cleaning the undercut hole	Vacuum cleaner	Visual check	□	□	□	□	□	□	□	□
Confirming the undercutting	Undercut gauge	Visual check	□	□	□	□	□	□	□	□

Step (7): Setting the anchor Electric tool to be used:

Item	Measuring device	Standard value	Measurement / Measured value							
Confirming set complete	Setting mark (red line)	Visual check	□	□	□	□	□	□	□	□
Sleeve position h_S	Depth gauge	2 mm or more								

Step (8): Fixing (tightening the nuts)

Item		Measuring device	Standard value	Measured value							
Applying torque	Convex nut	Torque wrench	170 [Nm]								
	Concave nut	Torque wrench	70-100 [Nm]								

Supervisor Signature/Date

Example 2 (Through-fastening type)

**Items written in red are variable value depending on Anchor bolt part No.

*** Check Sheet ***　ANZEX Anchor Installation

Installation Date		Installed by	
Anchor bolt part No.	AZM16T88E305	Measured by	
Concrete Strength	[N/mm^2]	Recorded by	

Step (1): Drilling the primary hole　*Rotary Hammer Drill to be used (Model No):

Item	Measuring device	Standard value	Measurement							
Cleaning the primary hole (vacuum)	Vacuum cleaner	Visual check	□	□	□	□	□	□	□	□
Depth of drilled hole H_0	Depth perpendicular gauge	238-243 [mm]	□	□	□	□	□	□	□	□
Perpendicularity (x)	Depth perpendicular gauge	Within 5 deg.								
Perpendicularity (y)	Depth perpendicular gauge	Within 5 deg.								

Step (4): Undercutting　*Rotary Hammer Drill to be used (Mode No) :

Item	Measuring device	Standard value	Measurement							
Cleaning the undercut hole	Vacuum cleaner	Visual check	□	□	□	□	□	□	□	□
Confirming the undercutting	Undercut gauge	Visual check	□	□	□	□	□	□	□	□

Step (7): Setting the anchor　Electric tool to be used:

Item	Measuring device	Standard value	Measurement / Measured value							
Confirming set complete	Setting mark (red line)	Visual check	□	□	□	□	□	□	□	□
Sleeve position h_S	Depth gauge	2 mm or more								

Step (8): Fixing (tightening the nuts)

Item		Measuring device	Standard value	Measured value							
Applying torque	Convex nut	Torque wrench	170 [Nm]								
	Concave nut	Torque wrench	70-100 [Nm]								

Supervisor Signature/Date

<<　Appendix　>>

Installation Manual

for

ANZEX Undercut Anchor System

MIYANAGA CO., LTD

1.1. Troubleshooting : Jam (When the undercutter is stuck)

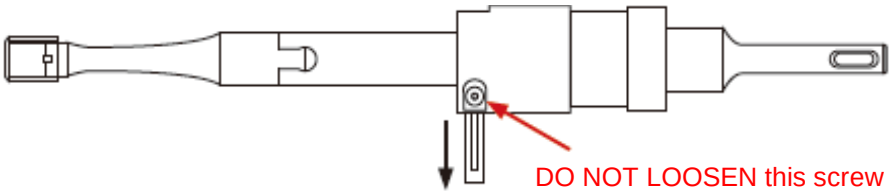
When the cutter blade is stuck while undercutting and it cannot be pulled out from the hole, use wrenches as shown in Figure AP-1 to force the cutter blade closed and remove the undercutter from the hole. After removal, retighten the loosened screw and continue undercutting..

Figure AP-1 Using wrenches (spanners)

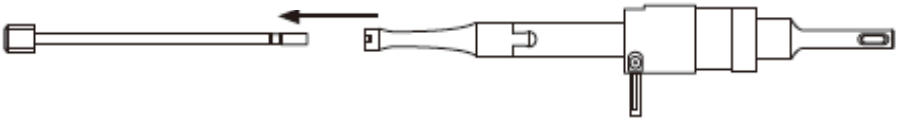
1.2. How to change the cutter blade

The cutter blade can be changed by following the procedure below.

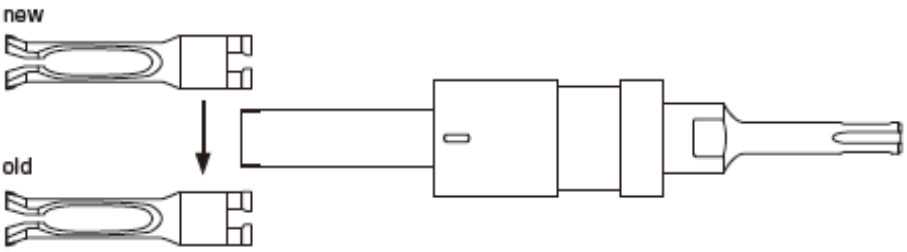
1. Press the pin on the undercutter using a screwdriver.



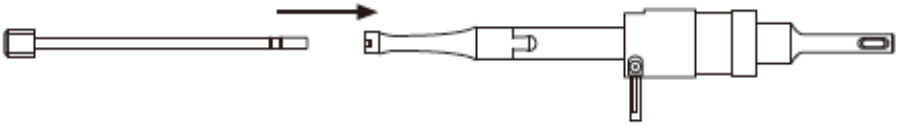
2. Pull out the bow jaw.



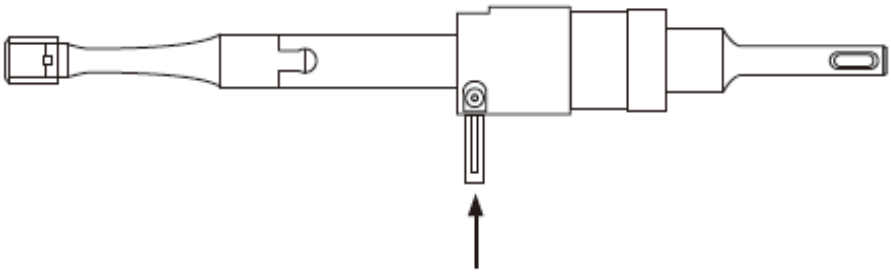
3. Change the blade.



4. Insert the bow jaw.



5. Align the pin and pinhole and reinsert.



1.3. Corresponding Tools for Each Anchor (AZ46 / AZ88 / AZA4)

1.3.1 Part Numbers of Tools

1.3.1.1 AZ46 (Pre-setting / Through-fastening)

						M12	M16	M20	M24
				Thread size(pitch)		M12	M16	M20	M24
				Anchor bolt (Pre-setting type)		AZM12P46H225	AZM16P46H305	AZM20P46H360	AZM24P46H440
				Anchor bolt (Through-fastening type)		AZM12T46H225	AZM16T46H305	AZM20T46H360	AZM24T46H440
Primary hole drilling (Pre-setting)	**Perpendicular guide**	**Using**	**Perpendicular guide**			PG225	PG305V	PG360V	PG440V
			Primary hole bit (pre-setting)		SDS-max	PHG225101MAX	PHG305138MAX	PHG360171MAX	PHG440205MAX
					Hexagonal	PHG225101HEX	PHG305138HEX		
		Not using	**Primary hole bit** (pre-setting)		SDS-max	PH225101MAX	PH305138MAX	PH360171MAX	PH440205MAX
					Hexagonal	PH225101HEX	PH305138HEX		
	Depth perpendicular gauge(pre-setting)					VG46225	VG46305	VG46360	VG46440
Primary hole drilling (Through-fastening)	**Perpendicular guide**	**Using**	**Perpendicular guide**			PG225	PG305V	PG360V	PG440V
			Primary hole bit (through-fastening)		SDS-max	PHG225126MAX	PHG305168MAX	PHG360211MAX	PHG440255MAX
					Hexagonal	PHG225126HEX	PHG305168HEX		
		Not using	**Primary hole bit** (through-fastening)		SDS-max	PH225126MAX	PH305168MAX	PH360211MAX	PH440255MAX
					Hexagonal	PH225126HEX	PH305168HEX		
	Depth perpendicular gauge(through-fastening)					VG46225T	VG46305T	VG46360T	VG46225T
Undercutting	**Undercutter**			Shank type	SDS-plus	UC225SDS			
					SDS-max		UC305MAX	UC360MAX	UC440MAX
					Hexagonal		UC305HEX		
			cutter blade			BL225	BL305	BL360	BL440
	Undercut gauge					GE225	GE305	GE360	GE440
Setting tool	**Mechanical setting tool for electric drills**			Shank	SDS-max	STMAXM12	STMAXM16	STMAXM20	STMAXM24
					Hexagonal	STHEXM12	STHEXM16	STHEXM20	STHEXM24
	Setting tool (Hand-operated)					STM12	STM16	STM20	STM24

1.3.1.2 AZ88 (Pre-setting / Through-fastening)

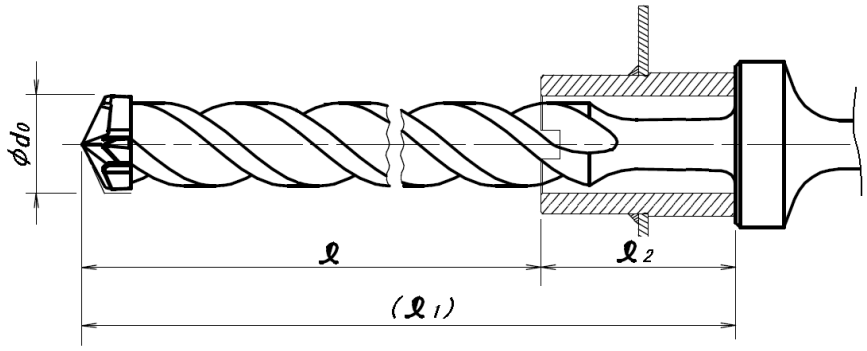
				Thread size(pitch)		M12	M16	M20	M24
				Anchor bolt (Pre-setting type)		AZM12P88E225	AZM16P88E305	AZM20P88E360	AZM24P88E440
				Anchor bolt (Through-fastening type)		AZM12T88E225	AZM16T88E305	AZM20T88E360	AZM24T88E440
Primary hole drilling (Pre-setting)	Perpendicular guide	Using		Perpendicular guide		PG225	PG305V	PG360V	PG440V
				Primary hole bit (pre-setting)	SDS-max	PHG225146MAX	PHG305205MAX	PHG360258MAX	PHG440306MAX
					Hexagonal	PHG225146HEX	PHG305205HEX		
		Not using		Primary hole bit (pre-setting)	SDS-max	PH225146MAX	PH305205MAX	PH360258MAX	PH440306MAX
					Hexagonal	PH225146HEX	PH305205HEX		
				Depth perpendicular gauge(pre-setting)		VG88225	VG88305	VG88360	VG88440
Primary hole drilling (Through-fastening)	Perpendicular guide	Using		Perpendicular guide		PG225	PG305V	PG360V	PG440V
				Primary hole bit (through-fastening)	SDS-max	PHG225176MAX	PHG305245MAX	PHG360308MAX	PHG440366MAX
					Hexagonal	PHG225176HEX	PHG305245HEX		
		Not using		Primary hole bit (through-fastening)	SDS-max	PH225176MAX	PH305245MAX	PH360308MAX	PH440366MAX
					Hexagonal	PH225176HEX	PH305245HEX		
				Depth perpendicular gauge(through-fastening)		VG88225T	VG88305T	VG88360T	VG88225T
Undercutting	Undercutter		Shank type		SDS-plus	UC225SDS			
					SDS-max		UC305MAX	UC360MAX	UC440MAX
					Hexagonal		UC305HEX		
				cutter blade		BL225	BL305	BL360	BL440
	Undercut gauge					GE225	GE305	GE360	GE440
Setting tool	Mechanical setting tool for electric drills		Shank		SDS-max	STMAXM12	STMAXM16	STMAXM20	STMAXM24
					Hexagonal	STHEXM12	STHEXM16	STHEXM20	STHEXM24
	Setting tool (Hand-operated)					STM12	STM16	STM20	STM24

1.3.1.3 AZA4 (Pre-setting / Through-fastening)

					Thread size(pitch)	M12	M16	M20	M24
					Anchor bolt (Pre-setting type)	AZM12PA4N225	AZM16PA4N305	AZM20PA4N360	AZM24PA4N440
					Anchor bolt (Through-fastening type)	AZM12TA4N225	AZM16TA4N305	AZM20TAA4N360	AZM24TA4N440
Primary hole drilling (Pre-setting)	Perpendicular guide	Using			Perpendicular guide	PG225	PG305V	PG360V	PG440V
			Primary hole bit (pre-setting)	SDS-max		PHG225114MAX	PHG305155MAX	PHG360194MAX	PHG440231MAX
				Hexagonal		PHG225114HEX	PHG305155HEX		
		Not using	Primary hole bit (pre-setting)	SDS-max		PH225114MAX	PH305155MAX	PH360194MAX	PH440231MAX
				Hexagonal		PH225114HEX	PH305155HEX		
	Depth perpendicular gauge(pre-setting)					VGA4225	VGA4305	VGA4360	VGA4440
Primary hole drilling (Through-fastening)	Perpendicular guide	Using			Perpendicular guide	PG225	PG305V	PG360V	PG440V
			Primary hole bit (through-fastening)	SDS-max		PHG225144MAX	PHG305195MAX	PHG360244MAX	PHG440291MAX
				Hexagonal		PHG225144HEX	PHG305195HEX		
		Not using	Primary hole bit (through-fastening)	SDS-max		PH225144MAX	PH305195MAX	PH360244MAX	PH4402916MAX
				Hexagonal		PH225144HEX	PH305195HEX		
	Depth perpendicular gauge(through-fastening)					VGA4225T	VGA4305T	VGA4360T	VGA4225T
Undercutting	Undercutter		Shank type	SDS-plus		UC225SDS			
				SDS-max			UC305MAX	UC360MAX	UC440MAX
				Hexagonal			UC305HEX		
			cutter blade			BL225	BL305	BL360	BL440
	Undercut gauge					GE225	GE305	GE360	GE440
Setting tool	Mechanical setting tool for electric drills		Shank	SDS-max		STMAXM12	STMAXM16	STMAXM20	STMAXM24
				Hexagonal		STHEXM12	STHEXM16	STHEXM20	STHEXM24
	Setting tool (Hand-operated)					STM12	STM16	STM20	STM24

1.3.2. Dimensions of Primary Hole Bit

1.3.2.1 Dimensions of Primary Hole Bit for Pre-setting type (When Using Perpendicular Guide)

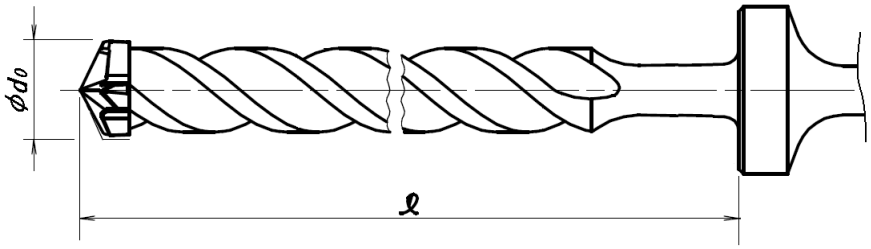


("G" is added to the Part No. of the corresponding primary hole bit, and the body is lengthened by ℓ_2.)

Anchor bolt Part No.	Primary hole bit Part No.	Shank type	Max. drilling depth ℓ_2 [mm]	Tool length ℓ_2 [mm]	Nominal diameter Φd_0 [mm]
AZM12P46H225	PHG225101MAX	SDS-max	101	50	22.5
	PHG225101HEX	Hexagonal			
AZM16P46H305	PHG305138MAX	SDS-max	138	60	30.5
	PHG305138HEX	Hexagonal			
AZM20P46H360	PHG360171MAX	SDS-max	171	60	36.0
AZM24P46H440	PHG440205MAX	SDS-max	205	70	44.0
AZM12P88E225	PHG225146MAX	SDS-max	146	50	22.5
	PHG225146HEX	Hexagonal			
AZM16P88E305	PHG305205MAX	SDS-max	205	60	30.5
	PHG305205HEX	Hexagonal			
AZM20P88E360	PHG360258MAX	SDS-max	258	60	36.0
AZM24P88E440	PHG440306MAX	SDS-max	306	70	44.0
AZM12PA4N225	PHG225114MAX	SDS-max	114	50	22.5
	PHG225114HEX	Hexagonal			
AZM16PA4N305	PHG305155MAX	SDS-max	155	60	30.5
	PHG305155HEX	Hexagonal			
AZM20PA4N360	PHG360194MAX	SDS-max	194	60	36.0
AZM24PA4N440	PHG440231MAX	SDS-max	231	70	44.0

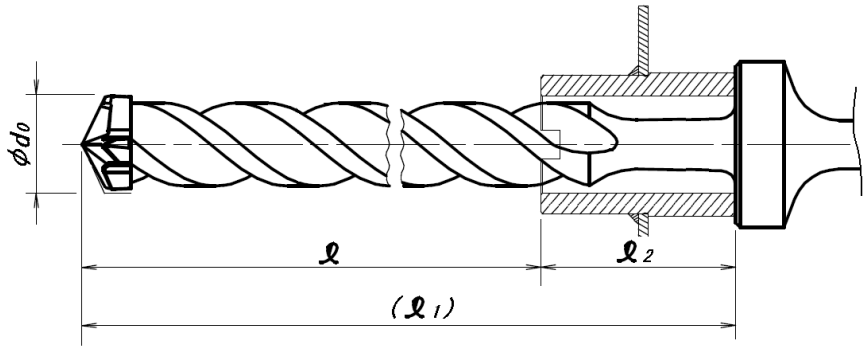
1.3.2.2 Dimensions of Primary Hole bit for Pre-setting type

(When Not Using Perpendicular Guide)



Anchor bolt Part No.	Primary hole bitl Part No.	Shank type	Max. drilling depth ℓ [mm]	Nominal diameter Φd0 [mm]
AZM12P46H225	PH225101MAX	SDS-max	101	22.5
	PH225101HEX	Hexagonal		
AZM16P46H305	PH305138MAX	SDS-max	138	30.5
	PH305138HEX	Hexagonal		
AZM20P46H360	PH360171MAX	SDS-max	171	36.0
AZM24P46H440	PH440205MAX	SDS-max	205	44.0
AZM12P88E225	PH225146MAX	SDS-max	146	22.5
	PH225146HEX	Hexagonal		
AZM16P88E305	PH305205MAX	SDS-max	205	30.5
	PH305205HEX	Hexagonal		
AZM20P88E360	PH360258MAX	SDS-max	258	36.0
AZM24P88E440	PH440306MAX	SDS-max	306	44.0
AZM12PA4N225	PH225114MAX	SDS-max	114	22.5
	PH225114HEX	Hexagonal		
AZM16PA4N305	PH305155MAX	SDS-max	155	30.5
	PH305155HEX	Hexagonal		
AZM20PA4N360	PH360194MAX	SDS-max	194	36.0
AZM24PA4N440	PH440231MAX	SDS-max	231	44.0

1.3.2.3　Dimensions of Primary Hole Bit for Through-fastening type (When Using Perpendicular Guide)

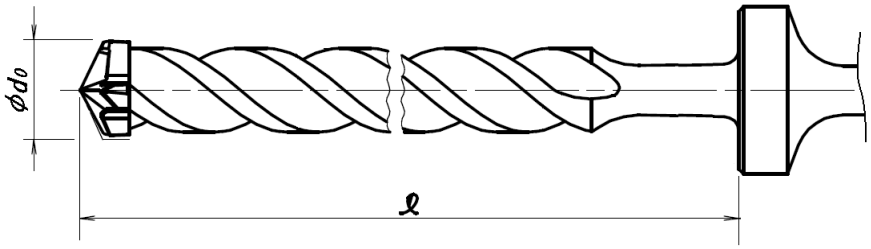


("G" is added to the Part No. of the corresponding primary hole bit, and the body is lengthened by ℓ_2.)

Anchor bolt Part No.	Primary hole bit Part No.	Shank type	Max. drilling depth ℓ_2 [mm]	Tool length ℓ_2 [mm]	Nominal diameter Φd_0 [mm]
AZM12T46H225	PHG225126MAX	SDS-max	126	50	22.5
	PHG225126HEX	Hexagonal			
AZM16T46H305	PHG305168MAX	SDS-max	168	60	30.5
	PHG305168HEX	Hexagonal			
AZM20T46H360	PHG3601211MAX	SDS-max	211	60	36.0
AZM24T46H440	PHG440255MAX	SDS-max	255	70	44.0
AZM12T88E225	PHG225176MAX	SDS-max	176	50	22.5
	PHG225176HEX	Hexagonal			
AZM16T88E305	PHG305245MAX	SDS-max	245	60	30.5
	PHG305245HEX	Hexagonal			
AZM20T88E360	PHG360308MAX	SDS-max	308	60	36.0
AZM24T88E440	PHG440366MAX	SDS-max	366	70	44.0
AZM12TA4N225	PHG225144MAX	SDS-max	144	50	22.5
	PHG225144HEX	Hexagonal			
AZM16TA4N305	PHG305195MAX	SDS-max	195	60	30.5
	PHG305195HEX	Hexagonal			
AZM20TA4N360	PHG360244MAX	SDS-max	244	60	36.0
AZM24TA4N440	PHG440291MAX	SDS-max	291	70	44.0

1.3.2.4 Dimensions of Primary Hole Bit for Through-fastening type

(When Not Using Perpendicular Guide)



Anchor bolt Part No.	Primary hole bitl Part No.	Shank type	Max. drilling depth ℓ [mm]	Nominal diameter Φd0 [mm]
AZM12T46H225	PH225126MAX	SDS-max	126	22.5
	PH225126HEX	Hexagonal		
AZM16T46H305	PH305168MAX	SDS-max	168	30.5
	PH305168HEX	Hexagonal		
AZM20T46H360	PH3601211MAX	SDS-max	211	36.0
AZM24T46H440	PH440255MAX	SDS-max	255	44.0
AZM12T88E225	PH225176MAX	SDS-max	176	22.5
	PH225176HEX	Hexagonal		
AZM16T88E305	PH305245MAX	SDS-max	245	30.5
	PH305245HEX	Hexagonal		
AZM20T88E360	PH360308MAX	SDS-max	308	36.0
AZM24T88E440	PH440366MAX	SDS-max	366	44.0
AZM12TA4N225	PH225144MAX	SDS-max	144	22.5
	PH225144HEX	Hexagonal		
AZM16TA4N305	PH305195MAX	SDS-max	195	30.5
	PH305195HEX	Hexagonal		
AZM20TA4N360	PH360244MAX	SDS-max	244	36.0
AZM24TA4N440	PH440291MAX	SDS-max	291	44.0