

PROCESS MANUAL

	Page
Hole Preparation	2
HuckMAX™	3
Huck-Clinch®	8
NAS1919/1921	13
MS90353/90354	19
MS21140/21141	19
Ti-Matic®	24
Blind Head Shapes	29
Removal	33
Trouble Shooting	37



RECOMMENDATIONS for HOLE PREPARATION

- Drill sizes should be chosen to generate holes within the diameter ranges shown for the specific blind rivets or blind bolts.
- If holes are drilled near the low limit, especially if sealant is used, pins sometimes break low and installations are incomplete. An easy remedy is to drill or ream the holes slightly larger (within the diameter limits). This provides a little extra space for sealant trapped in the hole.

Suggestions for good hole preparation practice:

Clean round holes within tolerance and with minimal burrs are fundamental for good joint durability. Below are a few suggestions which should help to achieve good installations:

- Clamping of the structure with temporary devices is very helpful in avoiding sheet separation, burrs/chips between the sheets and hole misalignment.
- Drills should be sharp. Optimized drill point geometry has surprising benefits for hole quality, productivity and minimizing operator fatigue.
- Drill speeds are critical to achieve hole quality and productivity, while minimizing operator fatigue.
 - Aluminum structure 4,000 to 6,000 RPM are recommended.
 - For stainless or titanium 300 to 1,000 RPM are recommended.
 - For Composite structure, carbide drills and c'sink cutters are recommended.
- Lubrication of drills is very helpful in reducing drill wear, burrs and effort. Each shop has its favorite drill lube.
- Excessive "push" on the drill motor (dull drill) can create sheet separation, burrs and chips between the sheets and should be avoided.
- Hole normality is important. Angularity beyond 2° should be avoided.
- Countersink concentricity is critical. Generally countersinks are normal to the structural surface. Angularity problems are caused by hole angularity beyond the 2° limit. Undersize countersink pilots are the most common cause of eccentricity problems and resulting cosmetics issues.
- A fillet relief radius at the base of the countersink is required for proper rivet head seating. Typically, .020/.030" radius relief is sufficient.
- A fillet relief radius under protruding head blind rivets and/or bolts helps to avoid head seating problems due to fillet interference.
- Edge relief at the blind side may cause malfunction and should be avoided.
- "Straightening-out" misaligned holes with a drill or reamer can cause "figure 8" holes and in turn may hinder blind side bulb formation.

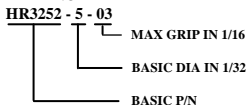
Suggestions for good installation practice:

- The installation tool should be properly aligned and firmly pushed against the structure. This helps to avoid premature breaking of pintails and minor sheet gapping due to misalignment and presence of sealant.
- The trigger must be depressed until pin break indicates completion of the installation cycle.
- Worn and dirty installation tools can cause bad installations. Of particular importance are gripping jaws. Worn and dirty jaws may cause stripping of pull grooves and pin fracture in the pull groove area.

HuckMAX™ HR32XX & HR35XX FAMILIES

HuckMAX P/N	Product Description
HR3212	NOM-100°Flush-Alu/Steel
HR3213	NOM-Protruding-Alu/Steel
HR3222	NOM-100°Flush-Alu/Cres
HR3223	NOM-Protruding-Alu/Cres
HR3242	O/S-100°Flush-Alu/Steel
HR3243	O/S-Protruding-Alu/Steel
HR3252	O/S-100°Flush-Alu/Cres
HR3253	O/S-Protruding-Alu/Cres
HR3522	NOM-100°Flush-Monel/Cres
HR3523	NOM-Protruding-Monel/Cres
HR3552	O/S-100°Flush-Monel/Cres
HR3553	O/S-Protruding-Monel/Cres

PART NUMBER KEY



HOLE SIZES

Rivet Dia	Hole Dia	Recomm Drill
-4 NOM	.129/.132	#30; 3,3mm
-4 O/S	.143/.146	#27; 3,7mm
-5 NOM	.160/.164	#20; 4,1mm
-5 O/S	.176/.180	#16; 4,5mm
-6 NOM	.192/.196	#10; 4,9mm
-6 O/S	.205/.209	#5; 5,25mm

FASTENER IDENTIFICATION

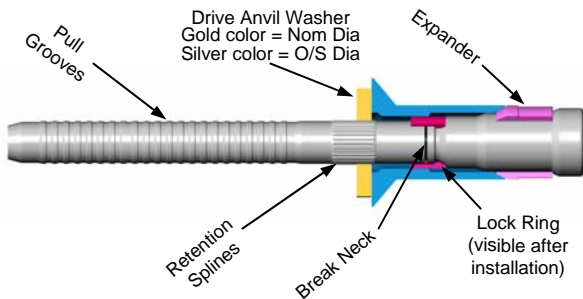
Rivets carry the following identification head markings:

- The special "X" as manufacturer's identification symbol.
- Material code letter.
 - No letter = Aluminum sleeve with alloy steel pin.
 - "+" = Aluminum sleeve with Cres pins
 - "M" = Monel sleeve with Cres pins
- Grip identification number.
 - Grip range = nominal grip +0/-0.063".
 - Example: -4 grip ranges .250" to .187"



Illustration of head markings on HR3252-5-04

ANATOMY of HuckMAX™





Flush Head --- Nominal & O/S Dia



Grip #	Grip Range		
	-4 dia	-5 dia	-6 dia
-2	.045 Δ / .125	.063/.125	.073/.125
-3	.126/.187	.126/.187	.126/.187
-4	.188/.250	.188/.250	.188/.250

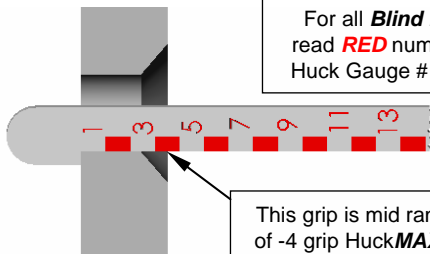
Δ Min grip is 0.062 for HR3212, HR3222, and HR3522

Protruding Head --- Nominal & O/S Dia



Grip #	Grip Range		
	-4 dia	-5 dia	-6 dia
-1	.025/.062	.031/.062	.037/.062
-2	.063/.125	.063/.125	.063/.125
-3	.126/.187	.126/.187	.126/.187
-4	.188/.250	.188/.250	.188/.250

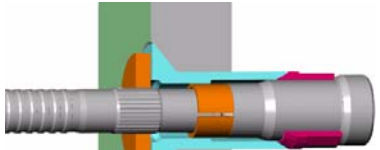
GRIP GAUGE READING



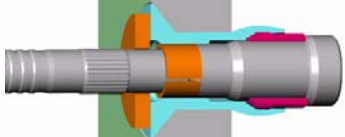
For all **Blind Rivets** read **RED** numbers on Huck Gauge # 105093

This grip is mid range of -4 grip HuckMAX™

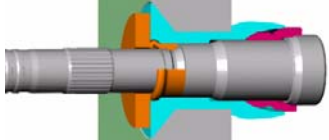
- 1) Rivet inserted into clearance hole, tool is engaged.



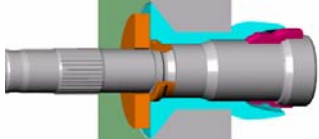
- 2) Expander enters sleeve, upset starts to form.



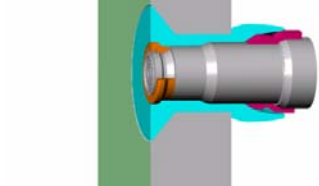
- 3) Upset continues to form, lock starts to form.



- 4) Upset complete, lock completely formed.



- 5) Pin breaks flush, lock visible, installation complete.

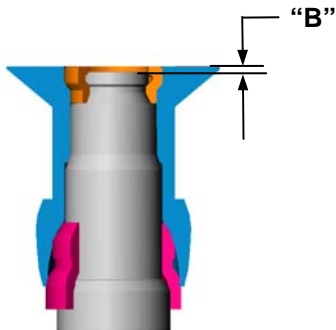
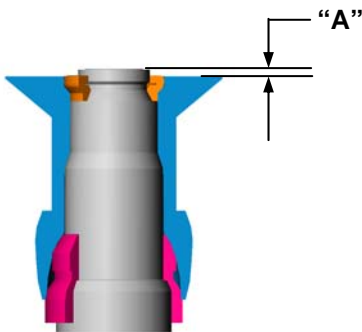


INSPECTION of INSTALLED

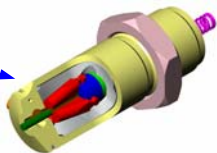
HuckMAX™

The position of the spindle break and the lock collar position provide important information about the quality of the installation. Spindle flushness limits are shown in the table below.

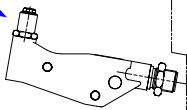
Rivet Dia	"A" Dim Pin above Head	"B" Dim Pin below Head	Lock Collar Position
-4	+0.010	-0.015	Due to the installation principle, collars are flush with the top of the head
-5	+0.010	-0.020	
-6	+0.010	-0.020	



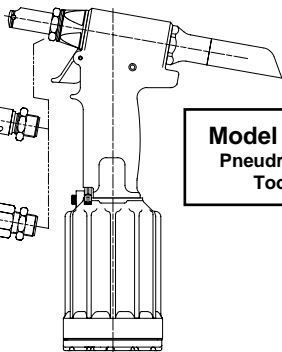
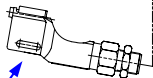
All new 4-Jaw HD
99-3442
Straight HD Std Nose



99-1334
90° Angle Nose



99-1336
Off-Set HD Nose



Model 2013
Pneudraulic
Tool

Huck Model 2013 is an all new installation tool, formulated for **HuckMAX™** and **Huck-Clinch®** blind rivets, with specific emphasis on ergonomic shape, light weight and durability. One tool and one nose can install all sizes, shapes and materials of HuckMAX™ and Huck-Clinch® rivets. The following nose attachments are designed to fit directly on this new tool:

Straight HD Std	99-3442	Heavy Duty
Straight-HD Long	99-3443	Heavy Duty
Off-Set Single Jaw	99-1333	Light Duty
Off-Set 2 Jaw HD	99-1336	Heavy Duty
90° Angle Nose	99-1334	Light Duty

However, the HuckMAX™ system is user friendly and can also be installed with a variety of existing Huck tools or some Cherry and Allfast tools.

Important note: *In the interest of long tool life, Off-Set and 90° Angle tools should only be used when access limitations require them. Durability of straight tools is a multiple of that of limited access tools.*

Huck-Clinch® HC32XX & HC62XX FAMILIES

Huck-Clinch P/N	Product Description
HC3212	NOM-100°Flush-Alu/Steel
HC3213	NOM-Protruding-Alu/Steel
HC3214	NOM-100°Shear-Alu/Steel
HC6222	NOM-100°Flush-Alu/Cres
HC6223	NOM-Protruding-Alu/Cres
HC6224	NOM-100°Shear-Alu/Cres
HC3242	O/S-100°Flush-Alu/Steel
HC3243	O/S-Protruding-Alu/Steel
HC3245	O/S-Unisink-Alu/Steel
HC6252	O/S-100°Flush-Alu/Cres
HC6253	O/S-Protruding-Alu/Cres

PART NUMBER KEY

HC3252 - 5 - 03

MAX GRIP IN 1/16

BASIC DIA IN 1/32

BASIC P/N

HOLE SIZES

Rivet Dia	Hole Dia	Recomm Drill
-4 NOM	.129/.132	#30; 3,3mm
-4 O/S	.143/.146	#27; 3,7mm
-5 NOM	.160/.164	#20; 4,1mm
-5 O/S	.176/.180	#16; 4,5mm
-6 NOM	.192/.196	#10; 4,9mm
-6 O/S	.205/.209	#5; 5,25mm

FASTENER IDENTIFICATION

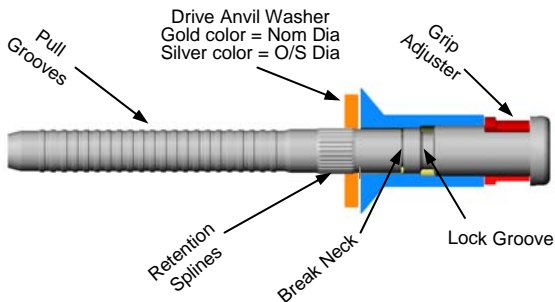
Huck-Clinch® rivets carry the following identification head markings:

- The special "X" as manufacturer's identification symbol.
- Material code symbol.
 - No marking = Aluminum sleeve with alloy steel pins
 - "+" = Aluminum sleeve with Cres pins
- Grip identification number.
 - Grip range = nominal grip +0/-0.063".
 - Example: -4 grip ranges .250" to .187"



Illustration of head markings on HC3252-5-04

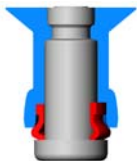
ANATOMY of Huck-Clinch®



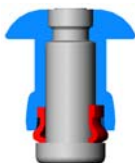
Huck-Clinch® -- GRIP LENGTH SELECTION



Flush Head --- Nominal & O/S Dia

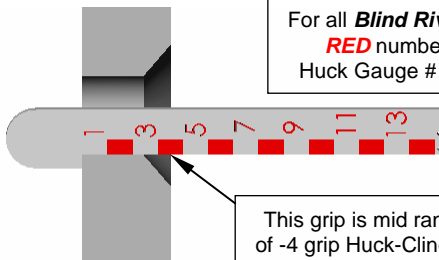


Grip #	Grip Range		
	-4 dia	-5 dia	-6 dia
-2 Nom	.063/.125	.065/.125	.080/.125
-2 O/S	.063/.125	.063/.125	.073/.125
-3	.126/.187	.126/.187	.126/.187
-4	.188/.250	.188/.250	.188/.250
-5	.251/.312	.251/.312	.251/.312



Grip #	Grip Range		
	-4 dia	-5 dia	-6 dia
-1	.025/.062	.031/.062	.037/.062
-2	.063/.125	.063/.125	.063/.125
-3	.126/.187	.126/.187	.126/.187
-4	.188/.250	.188/.250	.188/.250

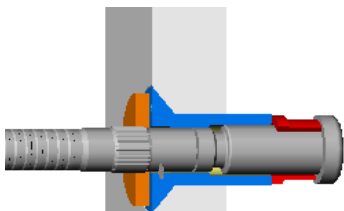
GRIP GAUGE READING



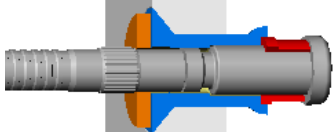
For all **Blind Rivets** read **RED** numbers on Huck Gauge # 105093

This grip is mid range of -4 grip Huck-Clinch®

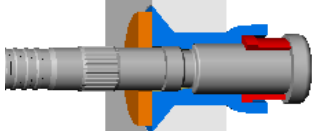
1) Rivet inserted into clearance hole, tool is engaged.



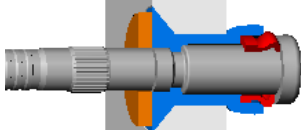
2) Grip adjuster enters sleeve, upset starts to form.



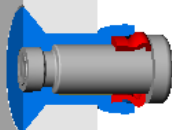
3) Upset continues to form, shoulder of the pin swages material from the sleeve wall and lock starts to form.



4) Upset complete, lock is filled.



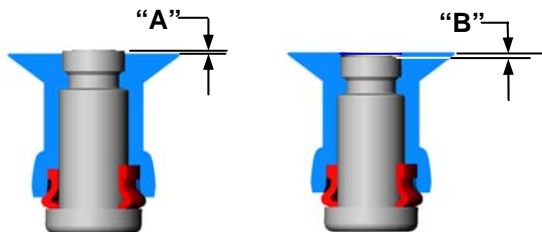
5) Pin breaks flush, installation complete.



INSPECTION of INSTALLED --Huck-Clinch®

The position of the spindle break and the lock collar position provide important information about the quality of the installation. Spindle flushness limits are shown in the table below.

Rivet Dia	"A" Dimension Pin above Head	"B" Dimension Pin below Head	Internal "Solid Circle" Lock
-4	+ .010	- .015	No Lock Ring is visible at the rivet head. Spindle Flushness indicates Proper Lock Formation
-5	+ .010	- .020	
-6	+ .010	- .020	



HEAD SHAVING

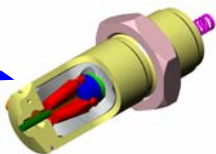
The head of flush tension Huck-Clinch® blind rivets can be shaved for cosmetic or aerodynamic improvement if:

- 1) Spindle flushness meets the limits of table above prior to shaving.
and
- 2) The recommended shave limits of table below are not exceeded.

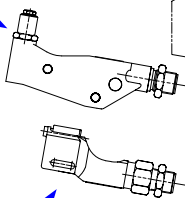
Shaving of shear head Huck-Clinch® blind rivets (e.g. HC3214, HC6224) is not recommended.

Rivet Diameter	Max Recommended Head Shave
-4	0.006"
-5	0.008"
-6	0.010"

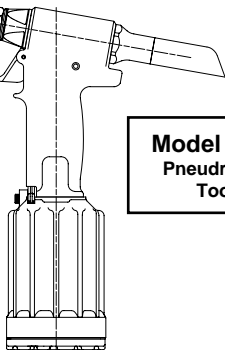
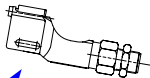
All new 4-Jaw HD
99-3442
 Straight HD Std Nose



99-1334
 90° Angle Nose



99-1336
 Off-Set HD Nose



Model 2013
 Pneudraulic
 Tool

Huck Model 2013 is an all new installation tool, formulated for **HuckMAX™** and **Huck-Clinch®** blind rivets, with specific emphasis on ergonomic shape, light weight and durability. One tool and one nose can install all sizes, shapes and materials of HuckMAX™ and Huck-Clinch® rivets. The following nose attachments are designed to fit directly on this new tool:

Straight HD Std	99-3442	Heavy Duty
Straight-HD Long	99-3443	Heavy Duty
Off-Set Single Jaw	99-1333	Light Duty
Off-Set 2 Jaw HD	99-1336	Heavy Duty
90° Angle Nose	99-1334	Light Duty

However, the Huck-Clinch® system is user friendly and can also be installed with a variety of existing Huck tools or some Cherry and Allfast tools.

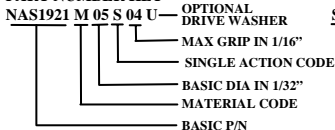
Important note: *In the interest of long tool life, Off-Set and 90° Angle tools should only be used when access limitations require them. Durability of straight tools is a multiple of that of limited access tools.*

NAS P/N	Huck P/N	Product Description
NAS1919B()S()	SMLSP-B()-()	NOM - Protruding - Alu
NAS1919M()S()	SMLSP-M()-()	NOM - Protruding - Monel
NAS1919C()S()	SMLSP-EU()-()	NOM - Protruding - Cres
NAS1921B()S()	SMLS100-B()-()	NOM - 100° Flush - Alu
NAS1921M()S()	SMLS100-M()-()	NOM - 100° Flush - Monel
NAS1921C()S()	SMLS100-EU()-()	NOM - 100° Flush - Cres
None	OSMLSP-B()-()	O/S - Protruding - Alu
None	OSMLSP-M()-()	O/S - Protruding - Monel
None	OSMLSP-EU()-()	O/S - Protruding - Cres
None	OSMLS100-B()-()	O/S - 100° Flush - Alu
None	OSMLS100-M()-()	O/S - 100° Flush - Monel
None	OSMLS100-EU()-()	O/S - 100° Flush - Cres

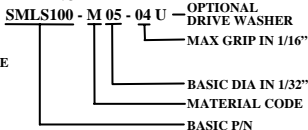
RECOMMENDED HOLE SIZES

Rivet Dia	Hole Dia	Recommended Drill	Recommended Reamer
-4 NOM	.129/.132	#30; 3.3mm	
-5 NOM	.160/.164	#20; 4.1mm	
-6 NOM	.192/.196	#10; 4.9mm	
-8 NOM	.256/.261	"F"; 6.5mm	
-4 O/S	.143/.146	Oversize Fasteners are intended for repair only	.144; 3.7mm
-5 O/S	.176/.180		.177; 4.5mm
-6 O/S	.205/.209		.206; 5.25mm
-8 O/S	.271/.275		.272; 6.9mm

PART NUMBER KEY



PART NUMBER KEY



FASTENER IDENTIFICATION

Rivets carry the following identification head markings:

- The special "X" as manufacturer's identification symbol.
 - Material code letter:
 - No letter = Aluminum sleeve with aluminum pins
 - "M" = Monel sleeve with Cres pins
 - "C" = Cres sleeve with Cres pins
 - Grip identification number.
 - Grip range = nominal grip +0/-0.063".
- Example: -4 grip ranges .250" to .187"

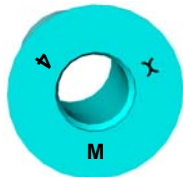
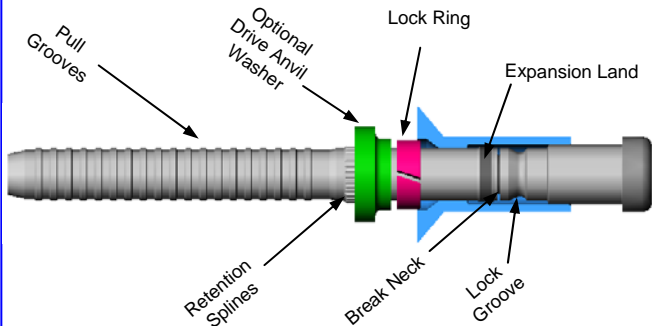


Illustration of head markings on NAS1921M05S04

ANATOMY of NAS1921 Blind Rivet



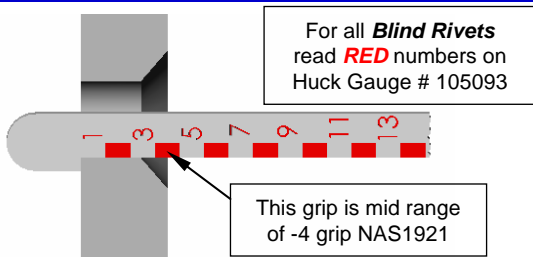
NAS1919/1921-- GRIP LENGTH SELECTION

Grip #	Grip Range -- Flush Head NAS1921B, M & C			
	-04 dia	-05 dia	-06 dia	-08 dia
-01	.057/.078	.075/.100	n/a	n/a
-02	.078/.125	.080/.125	.100/.125	n/a
-03	.126/.187	.126/.187	.126/.187	.126/.187
-04	.188/.250	.188/.250	.188/.250	.188/.250

Grip #	Grip Range -- Protruding Head NAS1919B, M & C			
	-04 dia	-05 dia	-06 dia	-08 dia
-00	.020/.035	.025/.045	.037/.062	n/a
-01	.025/.062	.031/.062	.037/.062	n/a
-02	.063/.125	.063/.125	.063/.125	.063/.125
-03	.126/.187	.126/.187	.126/.187	.126/.187
-04	.188/.250	.188/.250	.188/.250	.188/.250

Longer grip lengths follow this incremental pattern

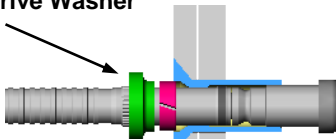
GRIP GAUGE READING



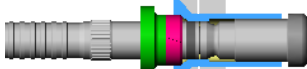
NAS1921 ----- INSTALLATION SEQUENCE

**Shown with optional Drive Washer
(Code "U")**

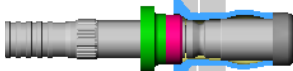
1) Rivet inserted into clearance hole, tool is engaged.



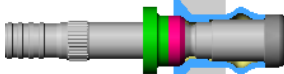
2) Expansion land on the pin moves through and expands the sleeve to fill the hole.



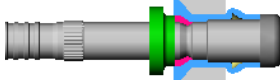
3) Hole fill complete, upset starts to form.



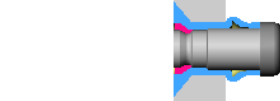
4) Upset continues to form and sheet gaps are closed.



5) Upset is complete, lock ring is forced into the lock cavity.



6) Pin breaks flush, installation is complete.

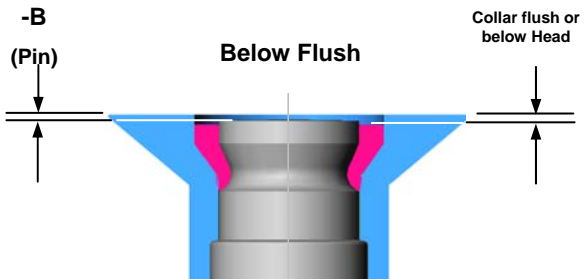
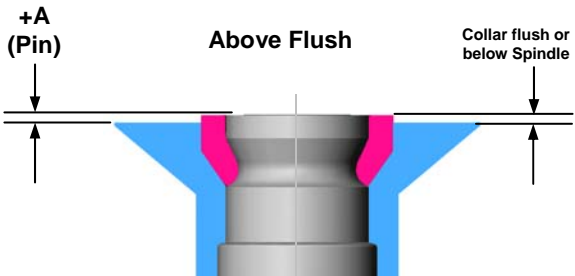


Note: For fasteners with the optional Drive Washer, Blunt installation noses are recommended.

FLUSHNESS of NAS1919/1921 Rivets

The position of the spindle break and the lock collar position provide important information about the quality of the installation. Spindle and collar flushness limits are shown in the table below.

Nom Dia	Pin Position "A" Above	Pin Position "B" Below	Pin Position "A" Above	Pin Position "B" Below
	Single Action M & C Flush Head Rivets		All Other Rivets	
-04	+0.010	-.005	+0.018	-.008
-05	+0.010	-.005	+0.022	-.010
-06	+0.010	-.005	+0.025	-.012
-08	+0.015	-.005	+0.032	-.016



NAS1919/1921 -- INSTALLATION TOOLING

Nose attachments on this page apply to traditional NAS1919/1921 rivets without integral Drive Washers!

Model 2012 Guns			
Rivet dia	Short	Standard	Long
-04	99-2724	99-2725	99-2726
-05	99-2730	99-2731	99-2732
-06	99-2736	99-2737	99-2738

Models 202, 244 and 2025 Guns			
Rivet dia	Short	Standard	Long
-04	99-2724	99-2725	99-2726
-05	99-2730	99-2731	99-2732
-06	99-2736	99-2737	99-2738
-08	99-2742	99-2743	99-2744

Models 245, 246 and 247 Guns			
Rivet dia	Short	Standard	Long
-08	99-2745	99-2746	99-2747

Hand Tool "HK-150-456" may be used for small volume field repair work for installation of -4, -5 & -6 diameter rivets. This tool comes equipped with individual diameter inserts.

NAS1919/1921-- OFF-SET TOOLING

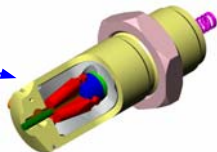
Hydraulic Power Tool Model 206-375		
Rivet dia	1 $\frac{1}{4}$ " Off-Set	1 $\frac{7}{8}$ " Off-Set
-04	99-1715	99-1715-1
-05	99-1716	99-1716-1
-06	99-1717	99-1717-1
-08	99-1718	99-1718-1

Offset tooling can be used on pneudraulic tools shown above with special adapters.

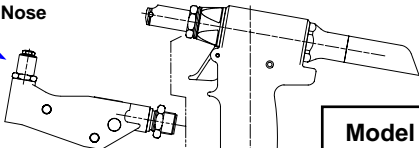
NAS1919/1921U-- INSTALLATION TOOLING

Nose attachments on this page apply to NAS1919/1921U rivets with integral Drive Washers ONLY!

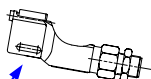
All new 4-Jaw HD
99-3458-202
Straight HD Std Nose



99-3467
90° Angle Nose



99-3466
Off-Set Nose



Model 2012
Pneudraulic
Tool

Huck Model 2012 is an all new installation tool, formulated for **NAS1919/1921** blind rivets, with specific emphasis on ergonomic shape, light weight and durability. One tool and one nose can install sizes -4, -5 & -6 dia "U" code rivets. The following nose attachments are designed to fit directly on this new tool:

Straight HD Std	99-3458-202	Heavy Duty
Straight-HD Long	99-3459-202	Heavy Duty
Off-Set 2 Jaw	99-3466	Std Duty
90° Angle Nose	99-3467	Std Duty

Important note: *In the interest of long tool life, Off-Set and 90° Angle tools should only be used when access limitations require them. Durability of straight tools is a multiple of that of limited access tools.*

MS Blind Bolt Families

MS P/N	Huck P/N	Product Description
MS90353U	UB100-T	NOM - 100° Flush - Steel
None	OUB100-T	O/S - 100° Flush - Steel
MS90354U	UBP-T	NOM - Protruding - Steel
None	OUBP-T	O/S - Protruding - Steel
MS21140U	UB100-EU	NOM - 100° Flush - A286
None	OUB100-EU	O/S - 100° Flush - A286
MS21141U	UBP-EU	NOM - Protruding - A286
None	OUBP-EU	O/S - Protruding - A286

PART NUMBER KEY

MS21140U 06 03 W — “W” INDICATES DRIVE WASHER
 NOM GRIP IN 1/16”
 BASIC DIA IN 1/32”
 BASIC MS P/N “UNIMATIC”
 FLUSH HEAD

PART NUMBER KEY

UB100 -EU 06 -03 W — “W” INDICATES DRIVE WASHER
 NOM GRIP IN 1/16”
 BASIC DIA IN 1/32”
 MATERIAL CODE
 BASIC HUCK P/N “UNIMATIC”
 FLUSH HEAD

HOLE SIZES & Recommended DRILL DIAS

Dias	Hole Dia	Recommended Drill	Recommended Reamer
-5	.164/.167	#19; 4.2mm	
-6	.199/.202	#8; 5.1mm	
-8	.260/.263	"G"; 6.6mm	
-10	.312/.315	5/16; 7.95mm	
-12	.374/.377	3/8; 9.5mm	
-14	.437/.441	7/16; 11.1mm	
-16	.500/.504	1/2; 12.7mm	
-5 O/S	.180/.183	Oversize Fasteners are intended for repair only	.181; 4.6mm
-6 O/S	.215/.218		.216; 5.5mm
-8 O/S	.276/.279		.277; 7.04mm
-10 O/S	.328/.331		.329; 8.35mm
-12 O/S	.390/.393		.391; 9.93mm
-14 O/S	.453/.457		.454; 11.53mm

MS Blind Bolts

FASTENER IDENTIFICATION

MS Blind Bolts carry the following identification head markings:

- The special "X" as manufacturer's identification symbol.
- Material code letter.
 - No letter = Alloy Steel parts
 - "C" = Cres parts
- Grip identification number.
 - Grip range = nominal grip $\pm .031$ "

Example: -4 grip ranges from .219" to .281"

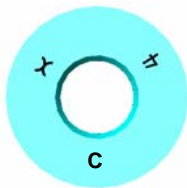
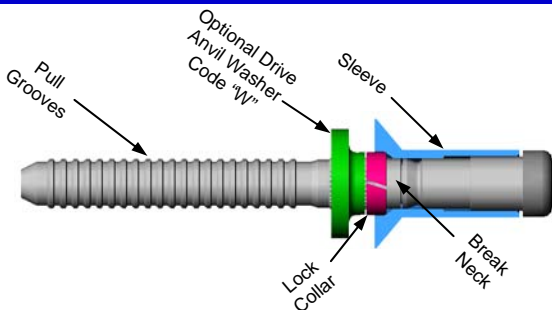


Illustration of head markings on MS21140U0604

ANATOMY of MS Blind Bolt



Standard "Unimatic" Blind bolt without Drive Washer.

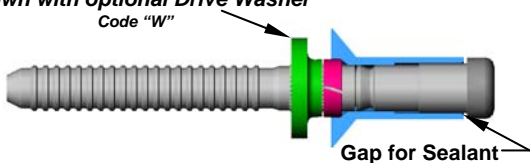
Green dye indicates single action installation tooling for -05 and -06 diameters



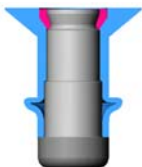
MS Blind Bolts

GRIP LENGTH SELECTION

Shown with optional Drive Washer
Code "W"

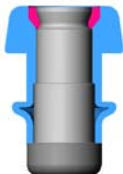


Flush Head



Grip #	Grip Range				
	-5; -6 dia	-8 dia	-10; -12 dia	-14 dia	-16 dia
-2	.094/.157	n/a	n/a	n/a	n/a
-3	.156/.220	n/a	n/a	n/a	n/a
-4	.219/.282	.219/.282	.219/.282	n/a	n/a
-5	.281/.345	.281/.345	.281/.345	.281/.345	n/a
-6	.344/.407	.344/.407	.344/.407	.344/.407	.344/.407

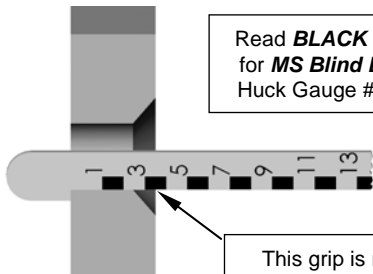
Protruding Head



Grip #	Grip Range		
	-5 dia	-6 thru -12 dia	-14 & -16 dia
-1	.031/.095	n/a	n/a
-2	.094/.157	.094/.157	n/a
-3	.156/.220	.156/.220	.156/.220
-4	.219/.282	.219/.282	.219/.282

Longer grip lengths follow this incremental pattern

GRIP GAUGE READING

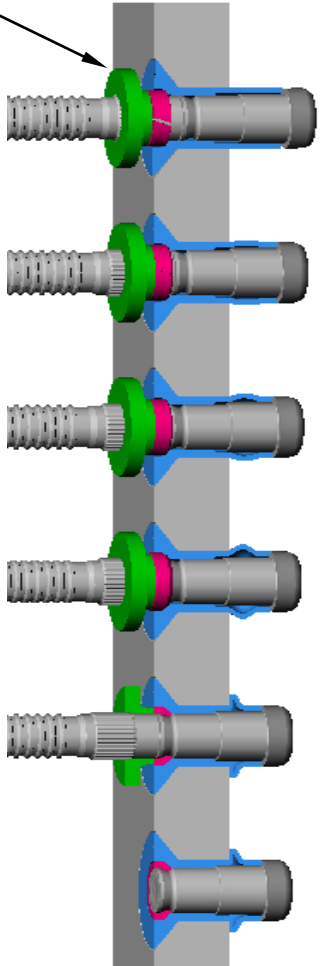


Read **BLACK** numbers for **MS Blind Bolts** on Huck Gauge # 105093

This grip is mid range of -4 grip for **MS Blind Bolts**

**Shown with optional Drive Washer
(Code "W")**

- 1) MS Blind Bolt inserted into clearance hole, tool is engaged.
- 2) Pin moves to contact end of sleeve. Upset starts to form.
- 3) Upset continues to form.
- 4) Upset continues to form, lock collar begins to enter the lock cavity.
- 5) Upset complete, lock fully engaged.
- 6) Pin breaks flush, installation is complete.

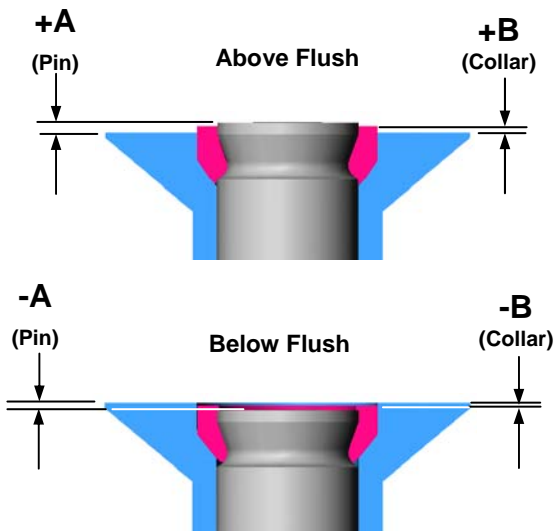


Note: For fasteners with the optional Drive Washer, Blunt installation noses are recommended.

INSPECTION of INSTALLED *MS Bolts*

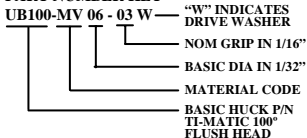
The position of the spindle break and the lock collar position provide important information about the quality of the installation. Spindle and collar flushness limits are shown in the table below.

Nom Dia	MS90353/354		MS21140/141	
	Pin Position "A"	Collar Position "B"	Pin Position "A"	Collar Position "B"
-05	+0.020/-0.000	±0.017	±0.10	+0.000/-0.017
-06	+0.024/-0.000	±0.022	±0.10	+0.000/-0.022
-08	+0.030/-0.000	±0.029	±0.15	+0.000/-0.029
-10	+0.038/-0.000	±0.037	+0.020/-0.015	+0.000/-0.037
-12	+0.046/-0.000	±0.045	+0.025/-0.020	+0.000/-0.045
-14	+0.054/-0.000	±0.050	n/a	n/a
-16	+0.062/-0.000	±0.056	n/a	n/a



Ti-Matic P/N	Product Description
UB100-MV	NOM - 100°Flush - Ti/Ti
UB130-MV	NOM - 130°Flush - Ti/Ti
UBP-MV	NOM - Protruding - Ti/Ti
UB100-EV	NOM - 100°Flush - Cres/Ti
UB130-EV	NOM - 130°Flush - Cres/Ti
UBP-EV	NOM - Protruding - Cres/Ti

PART NUMBER KEY



HOLE SIZES & Recommended DRILL DIAs

Nom Dia	Hole Dia	Recomm Drill
-4	.129/.132	#30; 3.3mm
-5	.164/.167	#19; 4.2mm
-6	.199/.202	#8; 5.1mm
-8	.260/.263	"G"; 6.6mm
-10	.312/.315	5/16; 7.95mm

FASTENER IDENTIFICATION & SELECTION

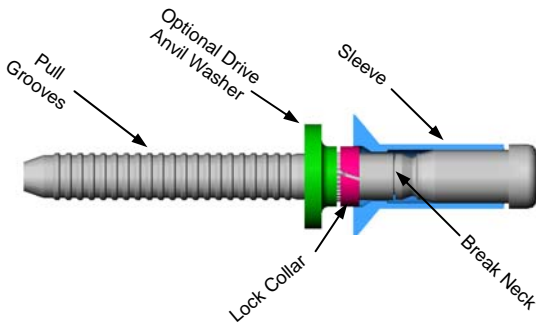
Ti-Matics® carry the following identification head markings:

- The special “X” as manufacturer’s identification symbol.
 - Material code letter.
 - “MV” = All titanium
 - “EV” = Cres sleeve with titanium pin
 - Grip identification number.
 - Grip range = nominal grip \pm .031”
- Example: -4 grip ranges .219” to .281”



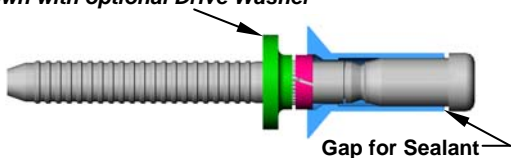
Illustration of head markings on UB100-MV06-04

ANATOMY of Ti-Matic®



Ti-Matic® GRIP LENGTH SELECTION

Shown with optional Drive Washer



Flush Head



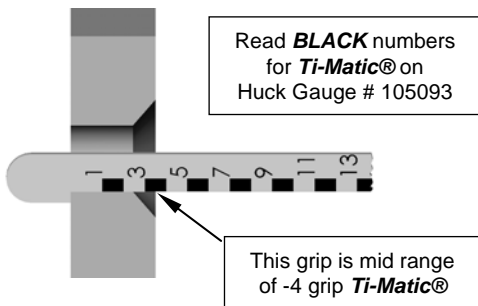
Grip #	Grip Range				
	-4 dia	-5 dia	-6 dia	-8 dia	-10 dia
-2	.094/.157	.094/.157	.094/.157	n/a	n/a
-3	.156/.220	.156/.220	.156/.220	.156/.220	n/a
-4	.219/.282	.219/.282	.219/.282	.219/.282	.219/.282
-5	.281/.345	.281/.345	.281/.345	.281/.345	.281/.345

Protruding Head



Grip #	Grip Range				
	-4 dia	-5 dia	-6 dia	-8 dia	-10 dia
-1	.031/.095	.031/.095	.031/.095	n/a	n/a
-2	.094/.157	.094/.157	.094/.157	.094/.157	.094/.157
-3	.156/.220	.156/.220	.156/.220	.156/.220	.156/.220
-4	.219/.282	.219/.282	.219/.282	.219/.282	.219/.282

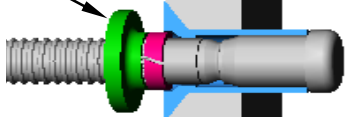
GRIP GAUGE READING



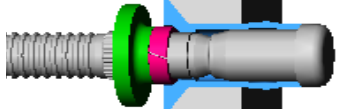
Ti-Matic® INSTALLATION SEQUENCE

**Shown with optional Drive Washer
(Code "W")**

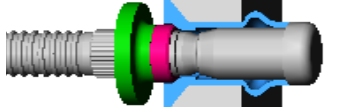
- 1) Ti-Matic® fastener inserted into clearance hole, tool is engaged.



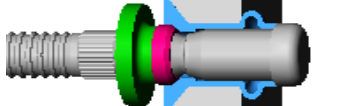
- 2) Pin moves to contact end of sleeve. Upset starts to form.



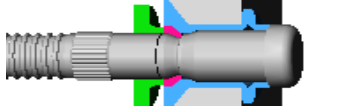
- 3) Upset continues to form.



- 4) Upset continues to form, lock collar begins to enter the lock cavity.



- 5) Upset complete, lock fully engaged.



- 6) Pin breaks flush, installation is complete.

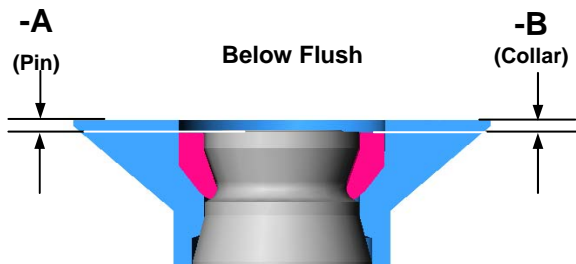
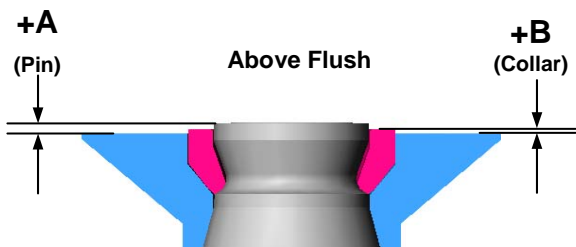


Note: For fasteners with the optional Drive Washer, Blunt installation noses are recommended.

INSPECTION of INSTALLED *Ti-Matics*®

The position of the spindle break and the lock collar position provide important information about the quality of the installation. Spindle and collar flushness limits are shown in the table below.

Nom Dia	Pin Position "A"	Collar Position "B"
-4	$\pm .010$	$\pm .010$
-5	$\pm .010$	+ .010 / - .017
-6	$\pm .010$	+ .010 / - .022
-8	$\pm .015$	+ .015 / - .029
-10	+ .020 / - .015	+ .020 / - .037



INSTALLATION TOOLING

All MS and Ti-Matic® Blind Bolts

Models 202, 244 & 2025 Guns

Models 202, 244 & 2025 are new ergonomic lightweight tools

Note:
Models 202 & 244 will not pull -8 diameter

Note:
Model 245 will not pull -12 diameter

Bolt dia	Short	Standard	Long
-04	99-2724	99-2725	99-2726
-05	99-2700	99-2701	99-2702
-06	99-2706	99-2707	99-2708
-08	99-2712	99-2713	99-2714

Models 245 & 246 Guns

Note:
Blunt Cherry tools will not install Huck Blind Bolts. Exception: All Blind Bolts with Drive Washers are installed with Blunt tools.

Bolt dia	Short	Standard	Long
-08	99-2715	99-2716	99-2717
-10	99-2718	99-2719	99-2720
-12	99-2721	99-2722	99-2723

Models 5901 & A5901 Guns

Note:
Models 5901 & A5901 are hydraulic tools, which require a hydraulic power source

Bolt dia	Standard
-12	H99-599
-14	H99-738
-16	H99-678

Note: The tools shown above are recommended as most current and best suitable to install blind bolts. Some older tools, may also be used, but are not recommended for new purchase. For additional hydraulic tools, contact AFS at 1 800 431 3091

MS & Ti-Matic®

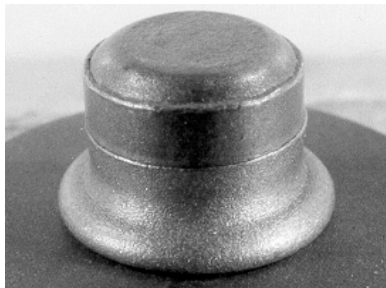
OFFSET TOOLING

Hydraulic Power Tool Model 206-375

Rivet dia	1 $\frac{1}{4}$ " Offset	1 $\frac{7}{8}$ " Offset
-04	99-1715	99-1715-1
-05	99-1712	99-1712-1
-06	99-1713	99-1712-1
-08	99-1714	99-1714-1

INTERPRETATION of BLIND HEAD SHAPES

Applies to NAS1900 Blind Rivets and MS Blind Bolts



Perfect Bulb



**Partial Tulip;
OK if foot print covers 50%
or more of the structure.**

INTERPRETATION of BLIND HEAD SHAPES

Applies to NAS1900 Blind Rivets and MS Blind Bolts



Full Tulip;
foot print covers less than 50% of
the structure.
Fastener cannot develop full joint
properties and should be replaced.



Bulb "Off Sheet";
foot print does not contact the
structure.
Fastener cannot develop joint
properties and should be replaced.

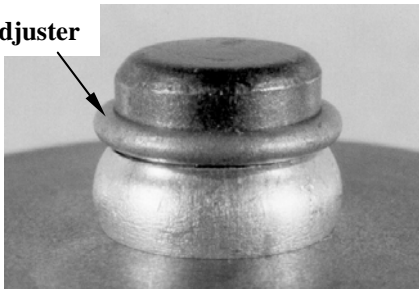
INTERPRETATION of BLIND HEAD SHAPES

Bulb Expander



HuckMAX™
View of Blind Head of properly installed fastener.

Grip Adjuster

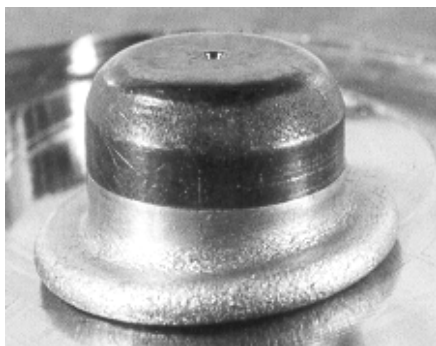
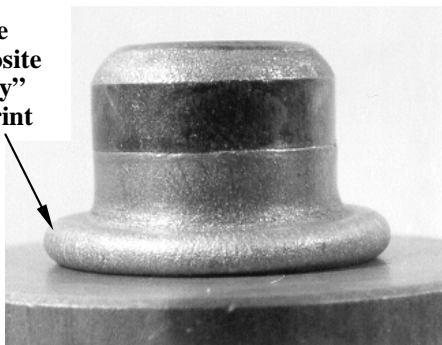


Huck-Clinch®
View of Blind Head of properly installed fastener.

Note: For Min Grip, grip adjuster component does not bulge.

INTERPRETATION of BLIND HEAD SHAPES

**Large
“Composite
friendly”
Foot Print**



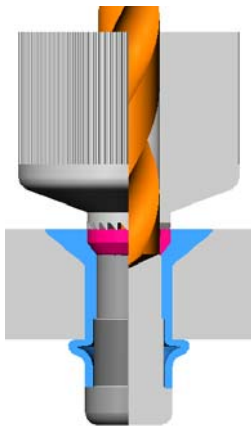
**Ti-Matic® Bulb
View of Blind Head of
properly installed fastener
on flat and 7° sloped surface.**

BLIND FASTENER REMOVAL

Removal of installed fasteners is accomplished with drills, punches and skill. For some types of fasteners, special Removal Kits are available from AFS, which ease the task of removal. Principal steps are as follows:

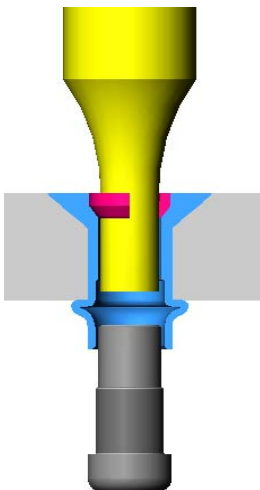
Step 1:

Drill out the pin to the depth of the lock pocket. A drill guide bushing is helpful for drill alignment.



Step 2:

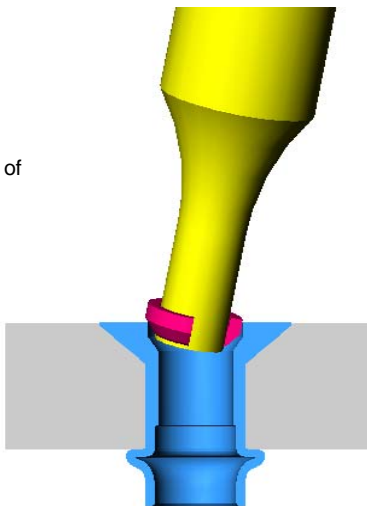
Punch out the remaining portion of the pin.



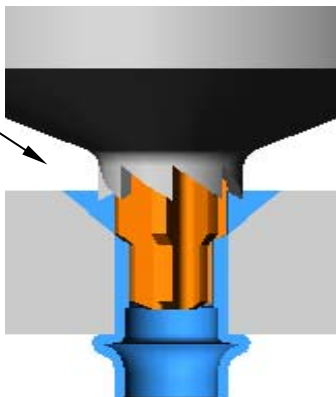
Note: a list of available Removal Kits is shown on page 36.

BLIND FASTENER REMOVAL cont'd

Step 3:
Pry out remnants of
the lock ring

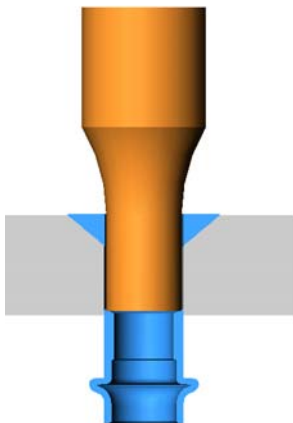


Step 4:
Ream out sleeve to
near base of head.
Take care not to
damage the hole in
the structure.

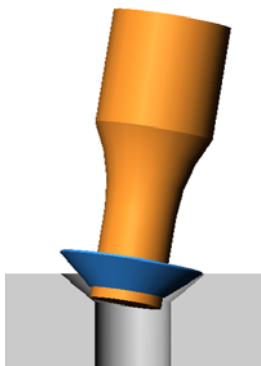


BLIND FASTENER REMOVAL cont'd

Step 5:
Punch out
remnants
of sleeve



Step 6:
Pry out
remnants
of sleeve head



BLIND FASTENER REMOVAL KITS

Ms Blind Bolts and Ti-Matics®

Dia	Kit #
-5	105-50
-6	105-60
-8	105-80
-10	105-100
-12	105-120

All Blind Rivets

Dia	Kit #
-4	105-24
-5	105-25
-6	105-26
-8	105-28



TROUBLE SHOOTING SUGGESTIONS-- ALL HUCK BLIND FASTENERS

PROBLEM	POSSIBLE CAUSE	REMEDY
Spindle breaks high	Oversize hole	Check hole dia and drilling technique Remove & replace with oversize rivet
	Rivet grip too long	Remove and replace with proper grip rivet
	Installation tool	Defective or wrong tool/nose piece
	Defective rivet	Inspect rivets and test function in a test hole
Spindle breaks low	Undersize hole	Remove rivet, ream hole to size and install a new rivet Note: When working with wet sealant, allow for a little extra hole clearance to provide space for the sealant
	Rivet grip too short	Remove and replace with proper grip rivet
	Misaligned holes	Review hole preparation and assembly technique
	Tool cocked	Align installation tool with axis of rivet
	Installation tool	Defective or wrong tool/nose piece
	Defective rivet	Inspect rivets and test function in a test hole
	Build-up of debris in jaws	Disassemble and clean jaws; replace jaws if worn
	Tool worn	Replace anvil in tool nose
	Defective or wrong tool/nose	Replace tool with correct tool in good condition
	Hole cocked	Hole should be normal to surface within 2°
Head not seated	Tool cocked	Align installation tool with axis of rivet
	Eccentric countersink	Good fit between hole and c'sink pilot
	No fillet relief at base of c'sk	Provide relief radius at base of c'sink
	Undersize hole	Increase hole size and reduce amount of sealant applied
Bulb off-sheet	Rivet grip too long for the job	Remove and replace with proper size rivet

The purpose of this manual is to provide general guidelines regarding the use of Alcoa Fastening Systems blind fasteners. In the event of conflict between this manual and the user's company policies, the user should refer to his/her own company's policies.

**For Fastener and Installation Tooling Info,
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