



ALLIED MACHINE & ENGINEERING

Holemaking Solutions for Today's Manufacturing



Drilling



Reaming



Burnishing



Threading



Wohlhaupter®

► **BORING**

Combi-Line Rough and Finish Boring Tools



Specials



WOHLHAUPTER®

The background of the page is a solid red color. Overlaid on this is a complex geometric pattern. It features several concentric circles that are centered towards the left side of the page. Intersecting these circles is a grid of thin, light-red lines. Some of these lines are straight, while others are curved, following the circular pattern. The overall effect is a technical or architectural drawing style.

SECTION

B10-C

Combi-Line Rough and Finish Boring

Wohlhaupter® Rough and Finish Boring

Combi-Line

► Diameter Range: 0.965" - 7.913" (24.50 mm - 201.00 mm)



One tool. Two operations.

The Wohlhaupter Combi-Line combines both rough and finish boring into one operation. The front insert holder is the roughing cutting edge while the shorter holder finishes the hole, saving you time and money.

Your safety and the safety of others is very important. This catalog contains important safety messages. Always read and follow all safety precautions.



This triangle is a safety hazard symbol. It alerts you to potential safety hazards that can cause tool failure and serious injury.

When you see this symbol in the catalog, look for a related safety message that may be near this triangle or referred to in the nearby text.

There are safety signal words also used in the catalog. Safety messages follow these words.

WARNING

WARNING (shown above) means that failure to follow the precautions in this message could result in tool failure and serious injury.

NOTICE means that failure to follow the precautions in this message could result in damage to the tool or machine but not result in personal injury.

NOTE and **IMPORTANT** are also used. These are important that you read and follow but are not safety-related.

Visit www.alliedmachine.com for the most up-to-date information and procedures.

Applicable Industries



Aerospace



Agriculture



Automotive



Firearms



General
Machining



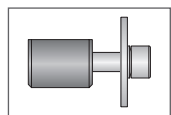
Oil & Gas



Renewable
Energy

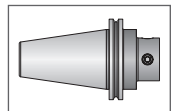
Reference Icons

The following icons will appear throughout the catalog to help you navigate between products.



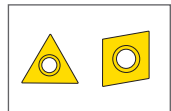
Clamping Elements

For use with insert holders and boring heads



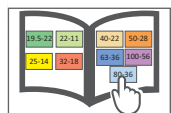
Shanks

A variety of shanks for different machines



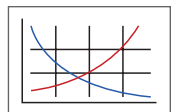
Inserts

For use with insert holder boring heads and boring bars using indexable inserts



MVS Connection Color Guide

Detailed instructions and information regarding the MVS connection(s)



Recommended Cutting Data

Speed and feed recommendations for optimum and safe boring



Coolant-Through Option

Indicates that the product is coolant through

Combined Rough and Finish Boring Table of Contents

Combi-Line Introduction

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Series	Diameter Range	
	Imperial (inch)	Metric (mm)
Combi-Line 404 (401)	0.965 - 7.913	24.50 - 201.00

Combi-Line Product Overview

Combi-Line ROUGH & FINISH BORING

Two operations. One Tool.

Decrease cycle time and tool changes with the Wohlhaupter Combi-Line. The Combi-Line combines rough and finish boring into one tool with height displaced insert holders.

Reduce your **cycle time** with the Combi-Line.

- Diameter range: 0.965" - 7.913" (24.50 mm - 201.00 mm)
- Reduce cycle and tool changing time
- Available in semi-standard same level or height displaced insert holders
- Coolant through
- 0.0001" (0.002 mm) vernier adjustment on finishing insert holder
- Max spindle speed: 5,000 SFM



IMPORTANT: Max spindle speed refers to maximum possible speed for an individual boring head and is not a recommended parameter. Refer to page B10-M: 12 for recommended application-specific parameters. Factory technical assistance is available for your specific applications through our Application Engineering department.
ext: 7611 | email: appeng@alliedmachine.com

Cycle time is crucial. Why not choose the best process?

Application: Ductile Cast Iron

Finish Diameter: 1.968" (50 mm) (+/- 0.0005" [0.013 mm])

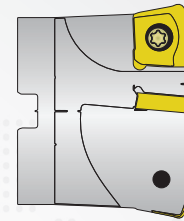
Pre-Hole Diameter: 1.771" (45 mm)

Boring Depth: 8.228" (209 mm)

Hole Finish: 32 Ra



Measure	1st Process Option	
	Step 1 Rough 49mm Competitor 1.5" High Feed Milling Tool	Step 2 Finish 50mm Wohlhaupter 320 Boring Head
Speed	1000 SFM (2500 RPM)	600 SFM (1165 PRM)
Feed Rate	0.020 IPT (153 IPM)	0.004 IPR (0.466 IPM)
Total Passes	77	1
Cycle Time (per hole)	1.93 min	1.77 min
Tool Change Time	15 sec	
Cycle Time (per part)	3 min 54 sec	



1.5" High Feed Milling Tool



Wohlhaupter 320 Boring Head

Measure	2nd Process Option	
	Step 1 Rough 49mm Wohlhaupter Twin Cutter @49mm Ø	Step 2 Finish 50mm Wohlhaupter 320 Boring Head
Speed	500 SFM (990 RPM)	600 SFM (1165 PRM)
Feed Rate	0.012 IPR (11.88 IPM)	0.004 IPR (0.466 IPM)
Total Passes	1	1
Cycle Time (per hole)	.69 min	1.77 min
Tool Change Time	15 sec	
Cycle Time (per part)	2 min 46 sec	



Wohlhaupter Twin Cutter



Wohlhaupter 320 Boring Head

OUR **SOLUTION**

Combi-Line Rough and Finish Boring

Measure	3rd Process Option Finish 50mm Wohlhaupter Combi-Line
Speed	600 SFM (1165 RPM)
Feed Rate	0.004 IPR (0.466 IPM)
Total Passes	1
Cycle Time (per hole)	1.77 min
Tool Change Time	0
Cycle Time (per part)	1 min 46 sec

- Combi-Line assembly:
 (1) *Insert holders* (x2): 402021
 (2) *Serrated tool body*: 404006
 (3) *Shank*: 353014

Boring inserts
 ► *Item No. 297653WHC19*



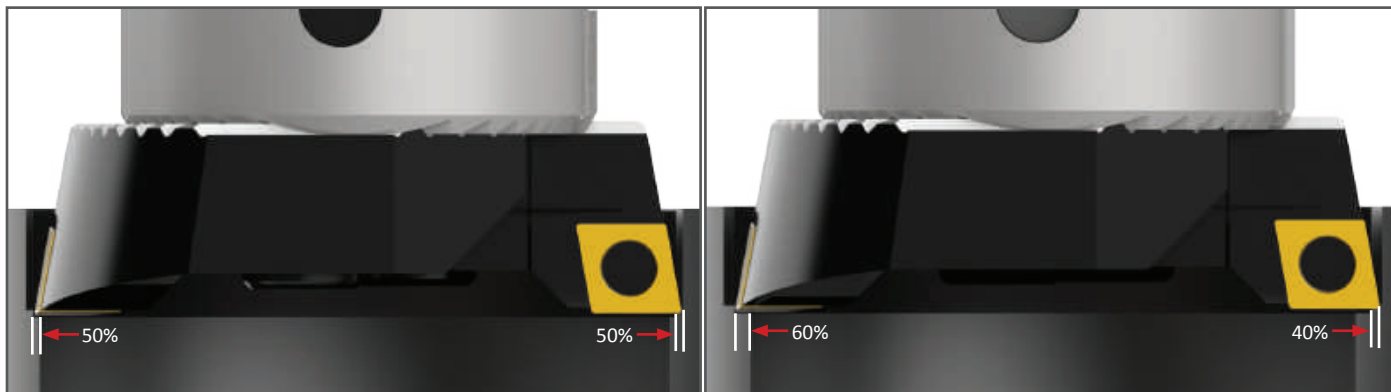
*60 seconds of
total cycle time saved*



1 tool vs. 2 tools saves you time and money

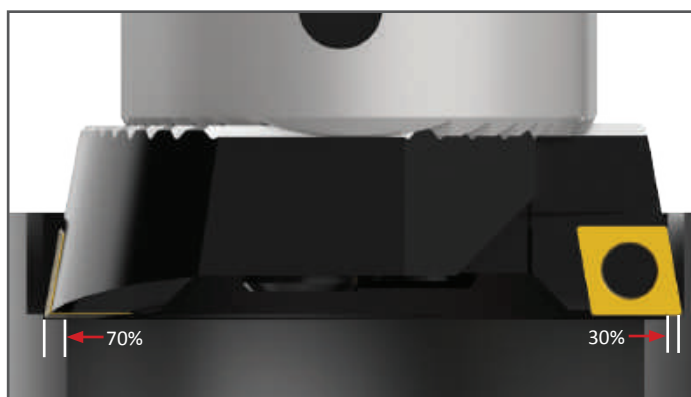
Material Removal Percentages | Tool Usage | Same-Level Cutting

Material Removal Percentages



Material removal up to 0.157" (4.00 mm) on diameter: **50% roughing 50% finishing**

Material removal up to 0.157" - 0.276" (4.00 mm - 7.00 mm) on diameter: **60% roughing 40% finishing**



Material removal up to 0.276" - 0.394" (7.00 mm - 10.00 mm) on diameter: **70% roughing 30% finishing**

- For tools with a length-to-diameter ratio greater than 4:1, the existing hole diameter should be no more than 0.157" (4.00 mm) smaller than the finish diameter. The 50% roughing and 50% finishing rule should be applied.
- When boring with severe interruptions, the existing hole diameter should be no more than 0.157" (4.00 mm) smaller than the finish diameter. The 50% roughing and 50% finishing rule should be applied.

IMPORTANT: Consult application engineering for technical support when using Combi-Line tools in holes with interruptions.
ext: 7611 | email: appeng@alliedmachine.com

Tool Usage

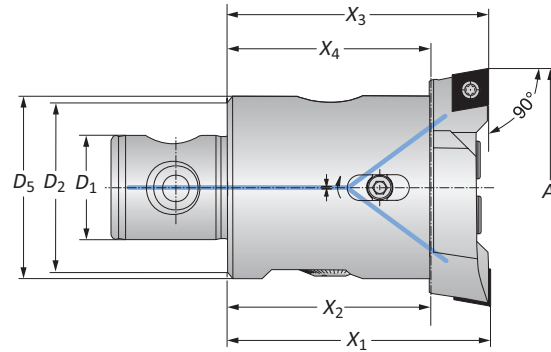
- For most applications, the same inserts should be used in both the roughing and finishing insert holders.
- To insure proper chip breaking, the finishing insert holder DOC must be at least 0.020" (0.50 mm)
- Up to a 4:1 length-to-diameter ratio, standard insert holders with a height displacement of up to 0.012" (0.30 mm) can be used.
- Inserts with wiper geometry are recommended only for special Combi-Line applications.

Same-Level Cutting (0.003" (0.08 mm) Height Displacement)

- With length-to-diameter ratios greater than 4:1, same-level insert holders are recommended to reduce the risk of vibration.
- Same-level cutting inserts will create a 0.003" (0.08 mm) step between the roughing and finishing sides.
- Boring blind holes may require the use of same-level insert holders. (If a true 90° flat bottom is required, a secondary operation to clean up the bottom step may be needed.)
- Combi-Line should be applied as a single-effective cutting tool even when same-level insert holders are used.

Boring Heads and Insert Holders

Diameter Range: 0.965" - 7.913" (24.50 mm - 201.00 mm)



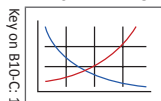
COMBI LINE

Connection	Boring Range	Boring Head							Part No.	
$D_2 D_1$	A	X_1	X_3	X_2	X_4	D_5	Weight	Insert Form	(x2)* Insert Holder**	Boring Head
22 - 11	0.965 - 1.161	1.811	1.801	1.339	1.329	—	0.220 (lbs)	101	402029	404003
25 - 14	1.142 - 1.457	2.205	2.195	1.614	1.604	1.024	0.440 (lbs)	101	402009	404004
25 - 14	1.142 - 1.457	2.205	2.195	1.614	1.604	1.024	0.440 (lbs)	103	402011	404004
25 - 14	1.417 - 1.732	2.205	2.195	1.614	1.604	1.181	0.661 (lbs)	101	402017	404005
25 - 14	1.417 - 1.732	2.205	2.195	1.614	1.604	1.181	0.661 (lbs)	103	402019	404005
32 - 18	1.693 - 2.126	2.598	2.587	1.890	1.878	1.339	0.881 (lbs)	103	402021	404006
40 - 22	2.087 - 2.598	2.953	2.941	2.165	2.154	—	1.543 (lbs)	103	402005	404007
50 - 28	2.559 - 3.268	2.953	2.941	2.165	2.154	—	2.425 (lbs)	103	402013	404008
63 - 36	3.228 - 4.055	3.543	3.531	2.756	2.744	—	4.850 (lbs)	103	402001	404009
80 - 36	4.016 - 5.000	3.543	3.531	2.598	2.587	3.346	6.613 (lbs)	103	402025	404010
80 - 36	5.000 - 5.984	3.543	3.531	2.598	2.587	3.346	6.834 (lbs)	103	402026	404010
80 - 36	5.945 - 6.929	3.543	3.531	2.598	2.587	5.276	8.377 (lbs)	103	402025	404011
80 - 36	6.929 - 7.913	3.543	3.531	2.598	2.587	5.276	8.598 (lbs)	103	402026	404011
22 - 11	24.50 - 29.50	46.00	45.75	34.00	33.75	—	0.10 (kg)	101	402029	401003
25 - 14	29.00 - 37.00	56.00	55.75	41.00	40.75	26.00	0.20 (kg)	101	402009	401004
25 - 14	29.00 - 37.00	56.00	55.75	41.00	40.75	26.00	0.20 (kg)	103	402011	401004
25 - 14	36.00 - 44.00	56.00	55.75	41.00	40.75	30.00	0.30 (kg)	101	402017	401005
25 - 14	36.00 - 44.00	56.00	55.75	41.00	40.75	30.00	0.30 (kg)	103	402019	401005
32 - 18	43.00 - 54.00	66.00	65.70	48.00	47.70	34.00	0.40 (kg)	103	402021	401006
40 - 22	53.00 - 66.00	75.00	74.70	55.00	54.70	—	0.70 (kg)	103	402005	401007
50 - 28	65.00 - 83.00	75.00	74.70	55.00	54.70	—	1.10 (kg)	103	402013	401008
63 - 36	82.00 - 103.00	90.00	89.70	70.00	69.70	—	2.20 (kg)	103	402001	401009
80 - 36	102.00 - 127.00	90.00	89.70	66.00	65.70	85.00	3.00 (kg)	103	402025	401010
80 - 36	127.00 - 152.00	90.00	89.70	66.00	65.70	85.00	3.10 (kg)	103	402026	401010
80 - 36	151.00 - 176.00	90.00	89.70	66.00	65.70	134.00	3.80 (kg)	103	402025	401011
80 - 36	176.00 - 201.00	90.00	89.70	66.00	65.70	134.00	3.90 (kg)	103	402026	401011

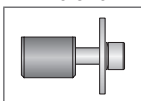
*(2) insert holders are required

**Insert holders sold individually

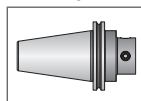
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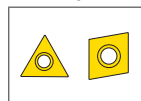
B10-C: 6



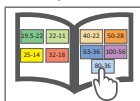
B10-F



B10-H



B10: vi-vii



ⓘ = Imperial (in)
Ⓜ = Metric (mm)

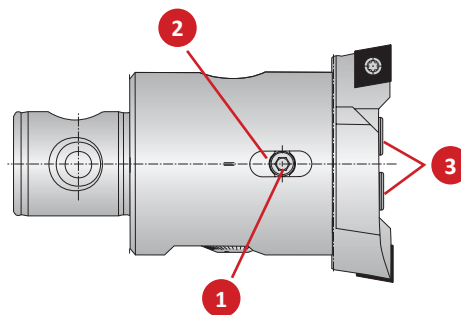
Inserts sold separately

IMPORTANT: Max spindle speed refers to maximum possible speed for an individual boring head and is not a recommended parameter. Refer to page B10-M: 12 for recommended application-specific parameters. Factory technical assistance is available for your specific applications through our Application Engineering department.

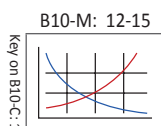
ext: 7611 | email: appeng@alliedmachine.com

Accessories

Screws | Clamping Elements



Boring Head Part No.		Part No.				
		1 Clamp Screw	Service Key	2 Clamping Piece	3 Cap Screw	Service Key
i	404003	401223	s2.5 / A	–	401323	s3 / B
	404004	401224	s2.5 / B	401204	401324	s4 / B
	404005	401225	s2.5 / B	401205	401324	s4 / B
	404006	401226	s3 / B	401206	401324	s4 / B
	404007	401227	s3 / B	401207	401327	s5 / B
	404008	115288	s4 / B	401208	401329	s6 / B
	404009	215501	s4 / B	401209	401329	s6 / B
	404010	401230	s4 / B	401210	019183	s8 / C
	404011	401230	s4 / B	401210	019183	s8 / C
m	401003	401223	s2.5 / A	–	401323	s3 / B
	401004	401224	s2.5 / B	401204	401324	s4 / B
	401005	401225	s2.5 / B	401205	401324	s4 / B
	401006	401226	s3 / B	401206	401324	s4 / B
	401007	401227	s3 / B	401207	401327	s5 / B
	401008	115288	s4 / B	401208	401329	s6 / B
	401009	215501	s4 / B	401209	401329	s6 / B
	401010	401230	s4 / B	401210	019183	s8 / C
	401011	401230	s4 / B	401210	019183	s8 / C



i = Imperial (in)
 m = Metric (mm)

Guaranteed Test / Demo Application Form

Distributor PO #

The following must be filled out completely before your test will be considered

IMPORTANT: For processing, send Purchase Order to your Allied Field Sales Engineer (FSE). Please clearly mark the paperwork as "Test Order."

Distributor Information

Company Name: _____
Contact: _____
Account Number: _____
Phone: _____
Email: _____

End User Information

Company Name: _____
Contact: _____
Industry: _____
Phone: _____
Email: _____

Current Process List all tooling, coatings, substrates, speeds and feeds, tool life, and any problems you are experiencing

Test Objective List what would make this a successful test (i.e. penetration rate, finish, tool life, hole size, etc.)

Application Information

Hole Diameter: _____ in/mm Tolerance: _____ Material: _____
(4150 / A36 / Cast Iron / etc.)
Preexisting Diameter: _____ in/mm Depth of Cut: _____ in/mm Hardness: _____
(BHN / Rc)
Required Finish: _____ RMS State: _____
(Casting / Hot rolled / Forging)

Machine Information

Machine Type: _____ Builder: _____ Model #: _____
(Lathe / Screw machine / Machine center / etc.) (Haas, Mori Seiki, etc.)
Shank Required: _____ Power: _____ HP/KW
(CAT50 / Morse taper, etc.)
Rigidity: Orientation: Tool Rotating: Thrust: _____ lbs/N
☐ Excellent ☐ Vertical ☐ Yes
☐ Good ☐ Horizontal ☐ No
☐ Poor

Coolant Information

Coolant Delivery: _____ Coolant Pressure: _____ PSI / bar
(Through tool / Flood)
Coolant Type: _____ Coolant Volume: _____ GPM / LPM
(Air mist, oil, synthetic, water soluble, etc.)

Requested Tooling

QTY	Item Number

QTY	Item Number



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Warranty Information



Allied Machine & Engineering ("Allied Machine") warrants to original equipment manufacturers, distributors, industrial and commercial users of its products for one year from the original date of sale that each new product manufactured or supplied by Allied Machine shall be free from defects in material and workmanship.

Allied Machine's sole and exclusive obligation under this warranty is limited to, at its option, without additional charge, replacing or repairing this product or issuing a credit. For this warranty to be applied, the product must be returned freight prepaid to the plant designated by an Allied Machine representative and which, upon inspection, is determined by Allied Machine to be defective in material and workmanship.

Complete information as to operating conditions, machine, setup, and the application of cutting fluid should accompany any product returned for inspection. This warranty shall not apply to any Allied Machine products which have been subjected to misuse, abuse, improper operating conditions, improper machine setup or improper application of cutting fluid or which have been repaired or altered if such repair or alteration, in the judgement of Allied Machine, would adversely affect the performance of the product.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Allied Machine shall have no liability or responsibility for any claim, whether in contract, tort or otherwise, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery or use of any product sold hereunder, in excess of the cost of replacement or repair as provided herein.

Allied Machine shall not be liable in contract or in tort (including, without limitation, negligence, strict liability or otherwise) for economic losses of any kind or for any special, incidental, indirect, consequential, punitive or exemplary damages arising in any way out of the performance of, or failure to perform this agreement.

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