

A Handbook On Tool Room Grinding

including the sharpening of high-speed steel, nonferrous cast alloy and cemented carbide tools

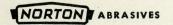


Making better products... to make your products better

NORTON COMPANY, Worcester 6, Mass.

© 1947, 1956 and 1957 by Norton Company

*Trade Mark Reg. U. S. Pat. Off.





Introduction

Successful sharpening of cutting tools depends mostly upon the use of the correct grinding wheel, tool set-up and method of grinding for each kind of tool. This handbook has been prepared to guide the tool room operator or the apprentice in the proper selection and use of grinding wheels, and to familiarize him with the principles and methods of grinding various types of tools and cutters—carbide as well as high-speed steel and cast alloy types.

For a complete treatise on grinding wheel markings and selection, the reader is referred to a separate handbook, "Abrasives and Grinding Wheels," Form 1508, which may be obtained by writing to the Norton Company.

Acknowledgment is made to the several tool and grinding machine manufacturers who generously assisted in the preparation of this book with photographs, drawings or tables.

ALUNDUM and CRYSTOLON are registered trade marks of Norton Company for aluminum oxide and silicon carbide respectively.

	Table of Contents	
Chapter	TOOR VI AND P SAME OF REAL PROPERTY OF SECTION	Page
I	Wheels for Tool Room Grinding	
	The Abrasives	1
	The Bonds	3
	Grinding Wheel Specifications	5
	Grain Size (Grit)	5
	Grade (Hardness or Strength of Bonding)	6
	Structure (Grain Spacing)	6
	Norton Method of Marking Grinding Wheels	8
	Standard Types of Grinding Wheels	9
	Grinding Wheel Speeds	12
	Truing and Dressing the Grinding Wheel	12
	Diamond Wheels	14
	Bond Types	15
	Standard Grit Sizes	17
	Standard Grades	18
	Diamond Concentration	19
	When to Use "100" Concentration	20
	When to Use "75" Concentration	21
	When to Use "50" Concentration	21
	When to Use "25" Concentration	22
	Depth of Diamond	22
II	Sharpening High-Speed Steel and Cast Alloy	
	Multi-Tooth Cutters	
	Grinding Wheels Recommended	27
	Direction of Wheel Rotation	28
	Relief Angle	29

NORTON ABRASIVES

[iv]

Width of Land	Page 30
Producing the Relief Angle	30
	32
Setting the Tooth Rest, Using a Straight Wheel Setting the Tooth Rest, Using a Cup Wheel	33
Typical Set-Ups for Sharpening Cutters	34
Plain (Spiral) Milling Cutters	34
Staggered Tooth Milling Cutters	37
Side Milling Cutters	38
Face Milling Cutters	38
End Mills	40
Angle Cutters	43
Formed Cutters	43
Fellows Gear Shaper Cutters	44
Hobs	46
Metal Cutting Saws	47
Chucking Reamers	49
Hand Reamers	51
Taper Reamers	52
III Sharpening Carbide Multi-Tooth Cutters	
Steps in Resharpening a Dulled Face Mill	64
Steps in Sharpening a Multiple Fly-Cutter	
Type of Face Mill	68
Advantages of Diamond Wheels for Cutter	
Grinding	71
Reamers	72
IV Sharpening Single-Point Tools (Cemented	
Carbide)	
Grinding Rules	76
Procedure in Grinding Typical Tools	79
Ordinary Dull Tools	80



Chapter		Page
	Chipped or Broken Tools	82
	Rough Grinding	84
	Finish Grinding	86
	Grinding the Chip Breaker	89
	Honing the Cutting Edge	91
	Milled and Brazed Tools	92
	Ejector Type Tools	93
	Grinding Procedure	94
	Chip Breakers	95
V	Grinding the Chip Breaker on Carbide Tools	
	Types of Ground Chip Breakers	98
	Recommended Width of Chip Breaker (w)	99
	Wheels for Chip Breaker Grinding	100
	Grinding Procedure	101
	Truing and Dressing the Diamond Wheel	102
VI	Hand Honing of Carbide Tools	
	Diamond Vitrified Hand Hones	105
VII	Sharpening Single-Point Tools (High-Speed Steel and Cast Alloy)	
	High-Speed Steel Tools	107
	Cast Alloy Tools	108
	Tool Shapes	110
VIII	Sharpening Miscellaneous High-Speed Steel Tools	
	Drills	112
	Taps	116
	Broaches	119
	Thread Chasers	122
	Insert Type Chasers	122
	Milled Type Chasers	124

NORTON ABRASIVES

[vi]

Chapter									Page
	Hobbed Type Chasers	·B	70	ber	100	10			125
	Collapsing Tap Chasers								128
	Tangential Chasers	f. at	9.0	e la					128
	Circular Chasers								135
	Dies				no.E				139
	Surface Grinding								139
	Cylindrical Grinding	T. e	q y		itos				140
	Internal Grinding	NIS.		150					140
	Offhand Grinding								140
IX	Miscellaneous Tool Room	G	rine	lin	σ				
20	Operations				-				
	Cylindrical Grinding								144
	Surface Grinding		1.1				d.		147
	Internal Grinding			7.	. H				150
						i			151
X	Miscellaneous Carbide Ga							9	
	Cylindrical Grinding			6	P				154
	Surface Grinding	ies		Y. I	a O	naid			156
	Internal Grinding	olo	Sim	133	1087	mp	Sho		157
	Cutting Off and Grooving		Y W	65	Total .	5 15	918		158
	Flat Form Tools	Told			18				160
	Circular Form Cutters			No.			3,11		162
					42	log	7.		163
	Masonry Drills								164
									166
	Centerless Grinding World	k R	est	Bla	des				168
XI	Miscellaneous Abrasive							1	
241	Room		·uu	000	,0		. 00	•	
	"Lightning" (Electro Coa	ted) N	leta	alite	CI	oth		170
100	Abrasive Specialties								171
	India Oilstones								171

NORTON ABRASIVES

Chapter		rage
XII	Norton Grinding Machines for the Tool Room	
	Universal Tool and Cutter Grinders	175
	10", 12", 14" and 18" Universal Grinders 6" x 18" and 8" x 24" Type S-3 Hydraulic	176
	Surface Grinders	181
	4", 6" and 10" Type CTU Cylindrical Grinders	183
XIII	Tables of Useful Information	
	Summary of Grinding Wheel Recommenda-	
	tions	184
	Standard Types of Diamond Wheels	192
	Available and Standard Grades of Norton	
	Diamond Wheels	195
	Analysis of Typical Norton Diamond Wheel	
	Specification	197
	Norbide Abrasive for Carbide Lapping	199
	Relief Tables for High-Speed Steel Cutters	200
	Thread Chaser Grinds Recommended by	
	Manufacturers 202 to	212
	Table of Grinding Wheel Speeds	213
metall	Comparative Brinell, Rockwell and Scleroscope	
	Hardness Table	214
	Metric and Decimal Equivalents of Common	
	Fractions	216
	Classification and Nominal Composition of	
	Principal Types of Tool Steels	217
	Instructions for the Safe Use of Grinding	
	Wheels	220