



since 1914

THE WORLD OF

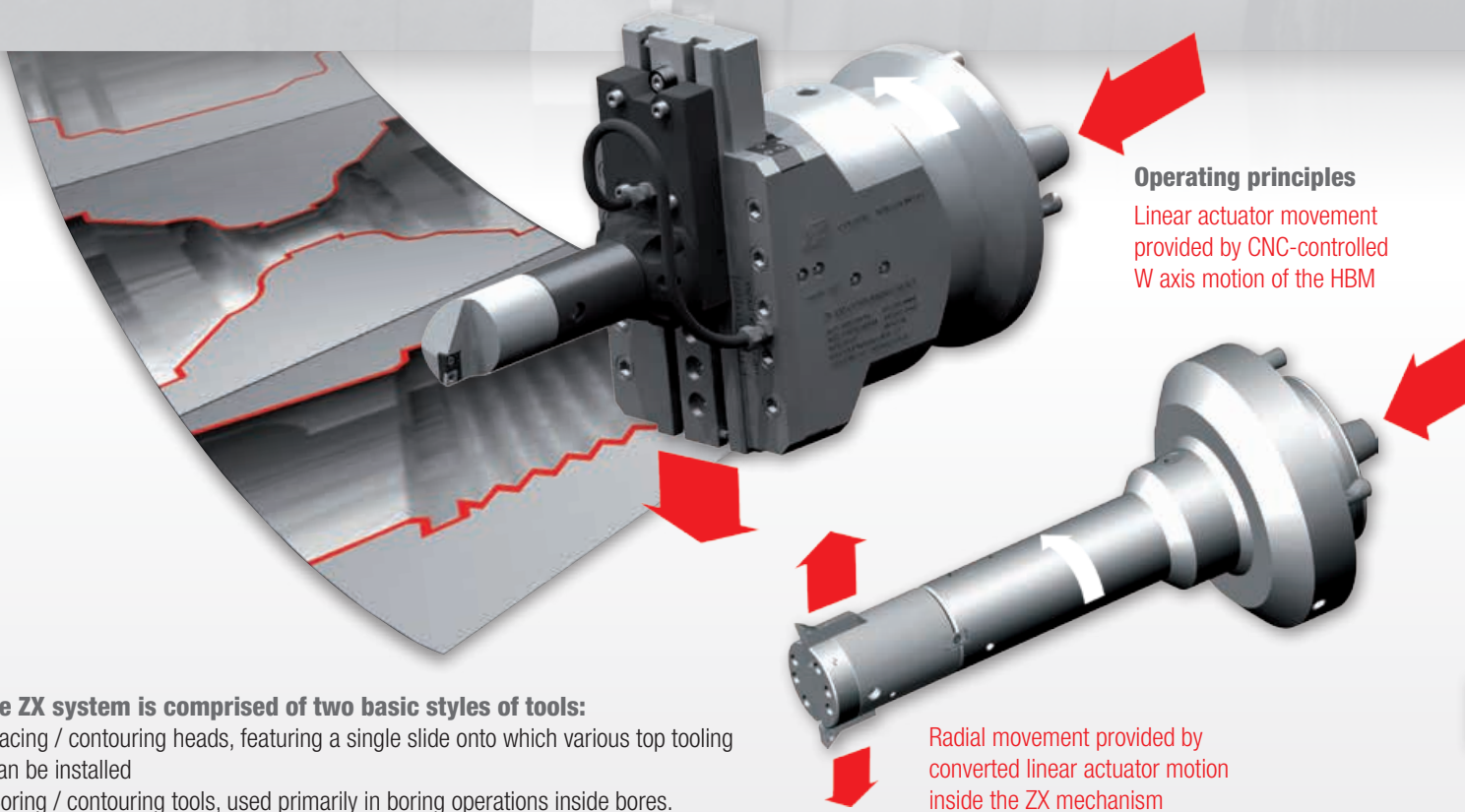


**NO HORIZONTAL BORING MILL IS "COMPLETE"**

**WITHOUT THE ZX-TOOLING-SYSTEM**

## OPERATING PRINCIPLES & APPLICATIONS

ZX-Tools perform accurate **lathe-type operations** on traditional and RAM type horizontal boring mills



**The ZX system is comprised of two basic styles of tools:**

- Facing / contouring heads, featuring a single slide onto which various top tooling can be installed
- Boring / contouring tools, used primarily in boring operations inside bores.

### MECHANICAL ACTUATION

**NO NEED OF ADDITIONAL ELECTRONIC INTERFACE, EXPENSIVE SOFT- OR HARDWARE TO PROVIDE RADIAL TOOL SLIDE MOTION**

By programming simultaneous movement of two CNC axes (typically "W" and "Z") complex turning geometries can be machined on a horizontal boring mill.

### Application samples:

Oil valves and blowout preventers, gearboxes, pump housings, compressors, engine housings, aerospace components (such as landing gear), large castings, and heavy equipment components.

ZX Tool Application: **External Operation**

ZX Tool Application: **Internal Operations**



O/D Grooving



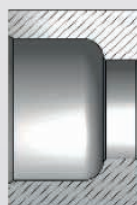
O/D Radii



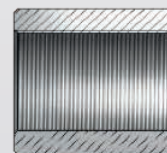
O/D Threading



O/D Turning and Facing



Back Counter Bore and Chamfering



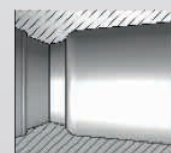
Threading



Grooving



Bottle Bore



Tapers and Radii

# MACHINE TOOL REQUIREMENTS

Manual and automatic **loading of ZX-Tools**

## Machine Tool Spindle Requirements

Location of **automatic hydraulic clamping** & pick up device utilised by Rotary Couplings

Location to bolt on Cam Lock Bonnets on the rotating milling sleeve **manually**

Connection to ZX-Tool actuator

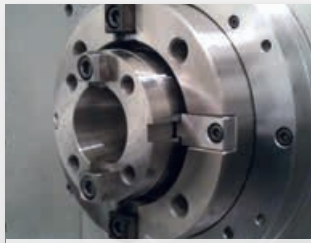
Rotating CNC-controlled **boring spindle** (live spindle) provides **linear moving motion** to the ZX-mechanism where it is converted into radial stroke.

**For all ZX-Tools the live spindle is essential.**

Linear moving horizontal boring mill column or RAM. (In some cases the machine table moves parallel to the spindle)

**Easy programming:**  
Internal ZX mechanism with 2:1 Ratio

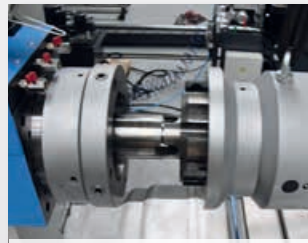
## TYPICAL **MANUAL** LOADING PROCEDURE OF ZX-EQUIPMENT ONTO A HORIZONTAL BORING MILL



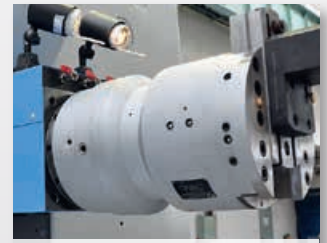
HBM - spindle nose



1. Install Cam Lock Bonnet



2. Load Contouring head



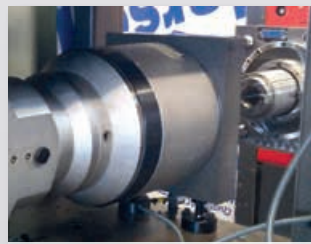
3. Engage and secure Cam Locks

A horizontal boring mill with a **programmable and linear movable inner spindle** that rotates in unison with the outer spindle or milling sleeve is required to use the ZX-Tooling adapted by the **manually attached standard Cam Lock Bonnet**. The Bonnet is directly bolted to the rotating milling sleeve and may remain on the sleeve even if the ZX-Tooling is removed.

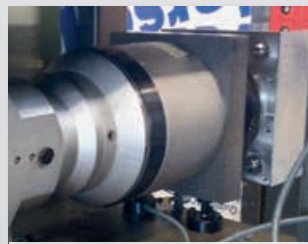
## TYPICAL **AUTOMATIC** LOADING PROCEDURE OF ZX-EQUIPMENT ON A RAM TYPE BORING MILL FEATURING A TOOL PICK UP STATION



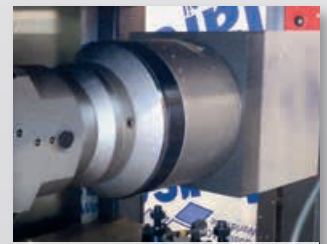
RAM - Spindle nose



1. Engage boring spindle



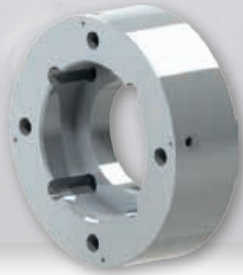
2. Engage hydraulic pull studs



3. Locked & ready for machining

A RAM-type milling machine with a rotating **programmable and linear movable inner spindle** surrounded by **hydraulic clamping devices** for automatic Head mounting on the RAM-face is required to use a ZX-Tool with already attached **Rotary Coupling** or a **Contouring Head with integrated Rotary Coupling**. The complete assembly of the ZX-Tooling and Rotary Coupler or ZX Contouring Head with integrated Rotary Coupler can be picked up from a tool stacker and operated **full automatically**.



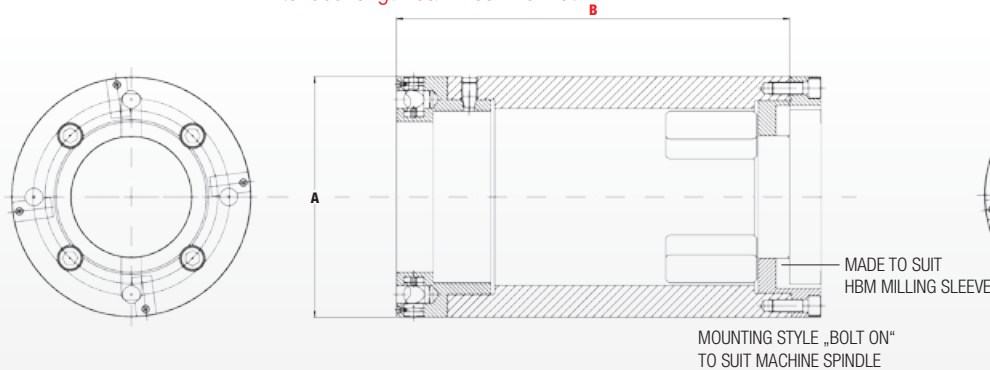


## ZX-CAM-LOCK BONNETS

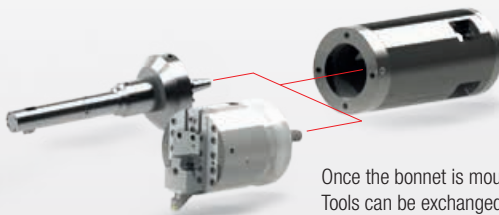
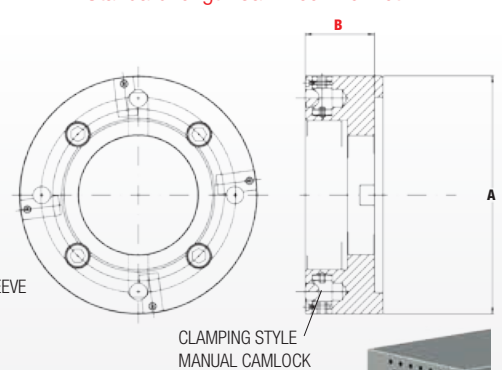
**MANUAL ADAPTOR:** Attach ZX-Tooling manually to a typical horizontal boring mill (HBM)

The ZX system features a quick-release mounting device called a Cam-Lock Bonnet. The Cam-Lock Bonnet is precisely machined to fit the specific horizontal boring mill on which it will be installed.

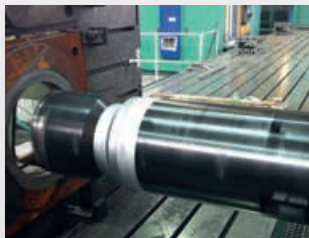
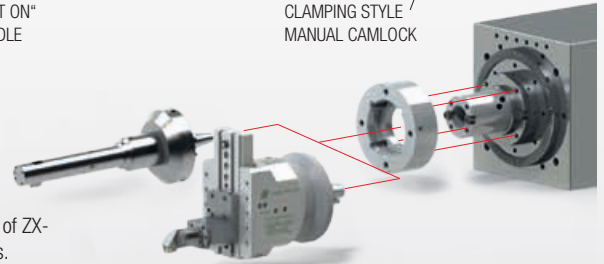
Extended length Cam Lock Bonnet



Standard length Cam Lock Bonnet



Once the bonnet is mounted to the machine different types of ZX-Tools can be exchanged very quick utilizing the 4 cam locks.



Ext. Bonnet 750 w. ZX-300



Ext. Bonnet 250 w. ZX-200



Ext. Bonnet 500 w. MBT-125



Cam Lock: Locked by a 90° turn

### SPINDLE ADAPTORS / BONNETS MANUAL CLAMPING OF ZX-TOOLS

TECHNICAL DATA	UNITS	Standard Bonnet	Bon. Ext. 250	Bon. Ext. 500	Bon. Ext. 750
'A'	mm	ø 305	ø 305	ø 305	ø 305
'B'	mm	90	250	500	750
Maximum speed	RPM	800	500	300	200
Weight	KG	50	75	120	164

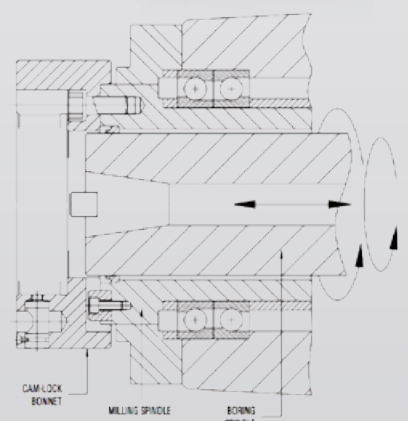
Maximum speed may vary with the size of the ZX Tool mounted on the extended bonnet and the load on the spindle bearings.  
Maximum speed is for bonnet only on the spindle, see page 6 for ZX Contouring Heads maximum speeds.

The bonnet bolts to the outer spindle of the machine, and features four cam-locking pins to retain the ZX tool on the bonnet.

A simple 90-degree rotation of the cam-locking mechanism is all that is required to securely retain the head. A generous engagement surface between the bonnet and head provides maximum support and rigidity. When the head is installed, it literally functions as part of the machine.

**Options that may be ordered with a cam-lock bonnet include:**

- Chip cover plates with wiper seals to keep the mounting surfaces clean
- Proximity switch plates to actuate automatic software switches on machines that are so equipped.

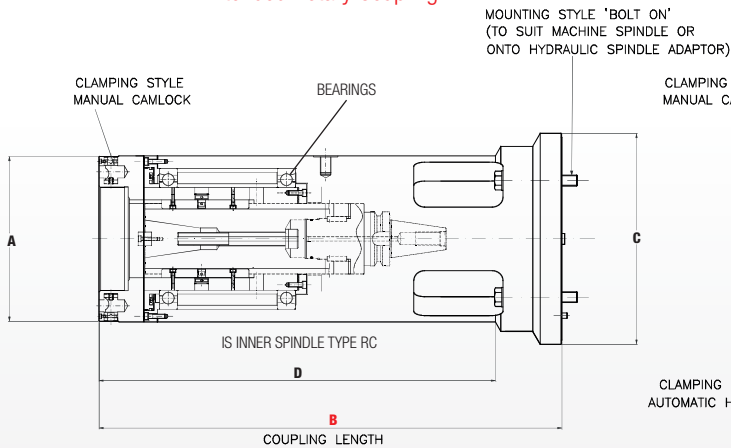


# ZX-ROTARY COUPLINGS

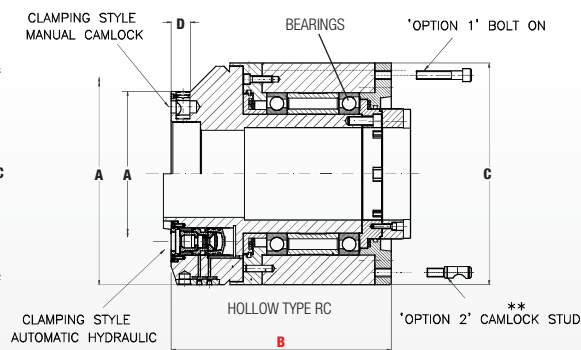
**AUTOMATIC ADAPTOR:** Enable RAM type HBMs to pick up and attach ZX-Tool & Rotary Coupling Assemblies automatically.



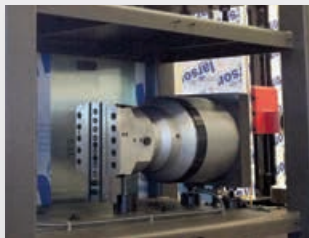
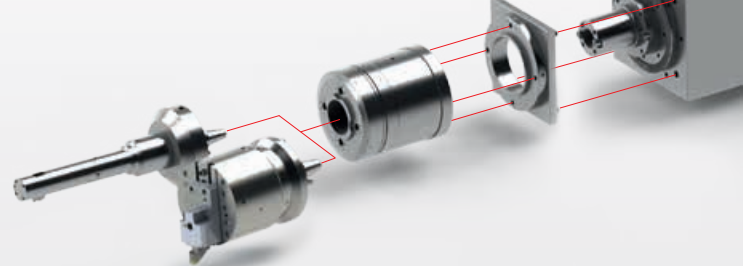
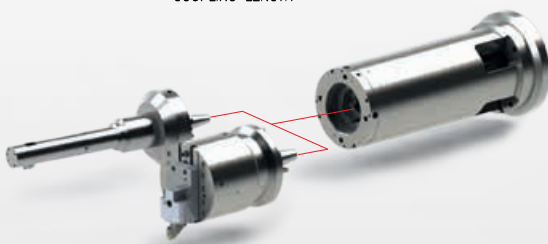
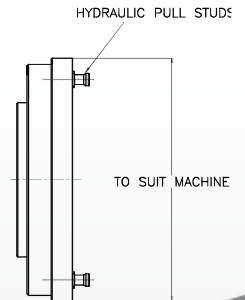
## Extended Rotary Coupling



## Standard Rotary Coupling



## Spindle Adaptor Plate



RC 410-AB-400-C with ZX-420



Special RC application



RC 410-AB-400



RC 410-AC-407-H Autom.

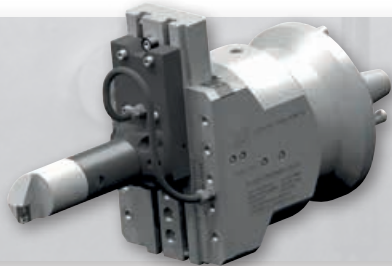
## ROTARY COUPLINGS AUTOMATIC CLAMPING OF ZX-TOOLS

TECHNICAL DATA	UNITS	RC 410-AB-400-C	RC 410-AC-600-C	RC 390-AB-350-C-IS	RC 390-AB-856-C-IS	RC 390-AB 1156-C-IS	RC 410-AC-407-H
RC LENGTH TYPE		STANDARD	EXTENDED	STANDARD	EXTENDED	EXTENDED	STANDARD
INTERNAL TYPE		HOLLOW	HOLLOW	INNER SPINDLE	INNER SPINDLE	INNER SPINDLE	HOLLOW
ADAPTER PLATE MOUNTING		CAMLOCK OR BOLTS	CAMLOCK OR BOLTS	CAMLOCK OR BOLTS	CAMLOCK OR BOLTS	CAMLOCK OR BOLTS	CAMLOCK OR BOLTS
ZX-TOOL MOUNTING		CAM LOCK MANUAL	CAM LOCK MANUAL	CAM LOCK MANUAL	CAM LOCK MANUAL	CAM LOCK MANUAL	HYDRAULIC AUTOM.
'A'	mm	ø 305	ø 305	ø 305	ø 305	ø 305	ø 305
'B'	mm	400	600	350	856	1156	407
'C'	mm	ø 410	ø 410	ø 390	ø 390	ø 390	ø 410
'D'	mm	36	36	40	733	1033	-
Maximum speed*	RPM	800	500	800	150	150	800
Weight	KG	273	310	282	230	268	305

\* Maximum speed may vary with the size of the ZX Tool mounted on the extended bonnet and the load on the spindle bearings.

\*\* Option 2, Camlock Interface might be required if the bolt on style is not possible with a hirth coupling

Utilising the Cam Lock system all standard ZX-Tools can be attached manually to the standard Rotary Coupling. A special hydraulic clamping version is available. Depending on the spindle adaptor plate the Rotary Coupler can utilise the Cam Lock System or bolts to connect. The Spindle Adaptor Plate to be supplied by the machine tool builder.



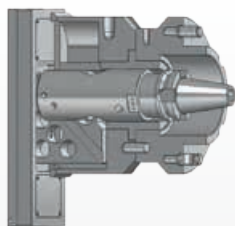
## ZX-CONTOURING HEADS

A complete size range of ZX Contouring Heads featuring Cam Lock Studs for **manual connection** to Cam Lock Bonnets or Rotary Couplings.

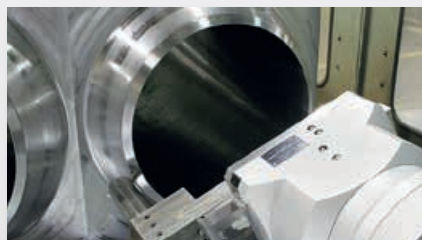
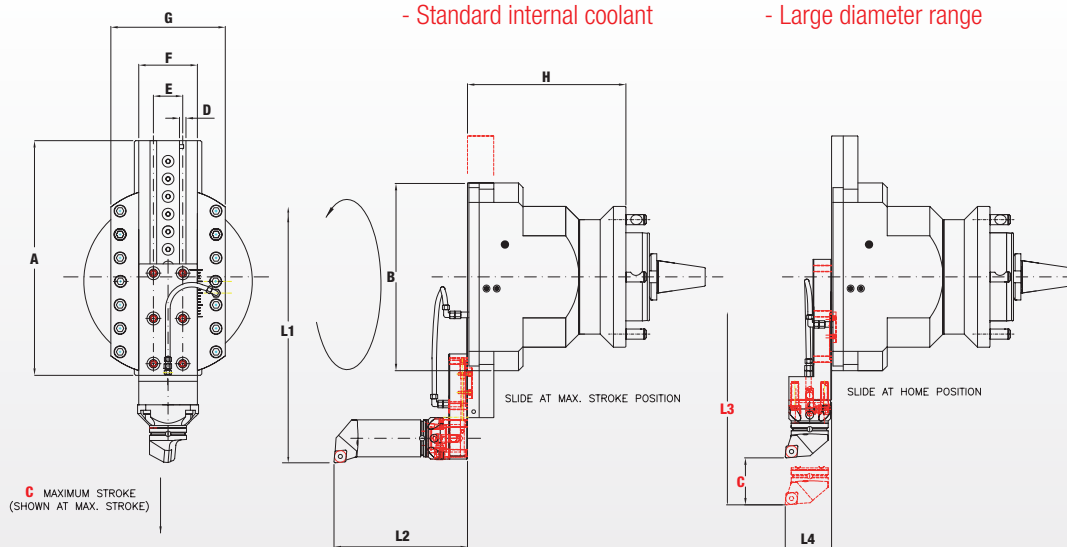
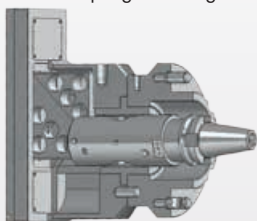
ZX Contouring heads offer the greatest versatility of all ZX tools. These heads have a single tool slide onto which top tooling is mounted into qualified locating holes. This provides repeatable set-ups. With appropriate top tooling, these heads can perform lathe-type operations on horizontal boring mills.

ZX Contouring heads featuring following benefits that increase your productivity:

- High material removal rates
- Extremely rigid and durable design
- Standard internal coolant
- High quality for long working life
- Backlash-free operation
- Large diameter range



Internal ZX mechanism with 2:1 Ratio for easy programming.



ZX 420-TC w. Tool Slide Adaptor



ZX 900-TC w. Tool Slide Adaptor



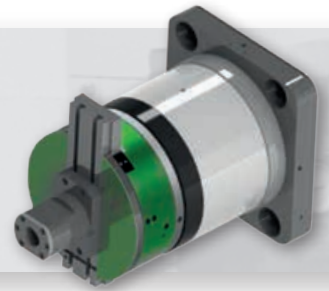
ZX 420-TC w. Tool Slide Adaptor

TECHNICAL DATA	UNITS	ZX 200-TC	ZX 300-TC	ZX420-TC	ZX500-TC	ZX700-TC	ZX900-TC
'A'	mm	200	300	420	500	700	900
'B'	mm	200	300	305	400	500	700
'C' radial traverse	mm	38	75	102	102	127	127
'D'	mm	14,29 x 1	14,29 x 2	14,29 x 2	14,29 x 2	14,29 x 2	14,29 x 2
'E'	mm	Centre	63,5	63,5	63,5	63,5	63,5
'F'	mm	70	127	127	127	127	127
'G'	mm	200	248	248	248	250	250
'H'	mm	307	343	343	343	370	370
L1	mm	ø 381	ø 650	ø 770	ø 850	1120	1500
L2	mm	210	270	310	310	310	310
L3	mm	ø 500	ø 800	ø 980	ø 1060	ø 1330	ø 1700
KM/Capto Adaptors							
L4	mm	65	102	102	102	102	102
Maximum speed	RPM	800	500	350	300	250	150
Stroke ratio		2 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1
Feed	mm/Rev	0,4	0,4	0,4	0,4	0,4	0,4
Max. Torque	da Nm	100	800	800	800	1000	1000
Weight	Kg	107	168	175	205	170	200
Repeatability accuracy	mm	0,003	0,003	0,003	0,003	0,003	0,003
Backlash	mm	0-0,025	0-0,025	0-0,025	0-0,025	0-0,025	0-0,025
Boring accuracy		H7	H7	H7	H7	H7	H7
Max. chip removal on 080M46 steel							
Facing	D.O.C./mm	3	4	4	6	6	6
Boring	D.O.C./mm	3	4	4	6	6	6
Rapid traverse	M/min	0,4	0,4	0,4	0,4	0,5	0,5
Roughness	Ra	1,6	1,6	1,6	1,6	1,6	1,6



# ZX-RC CONTOURING HEADS

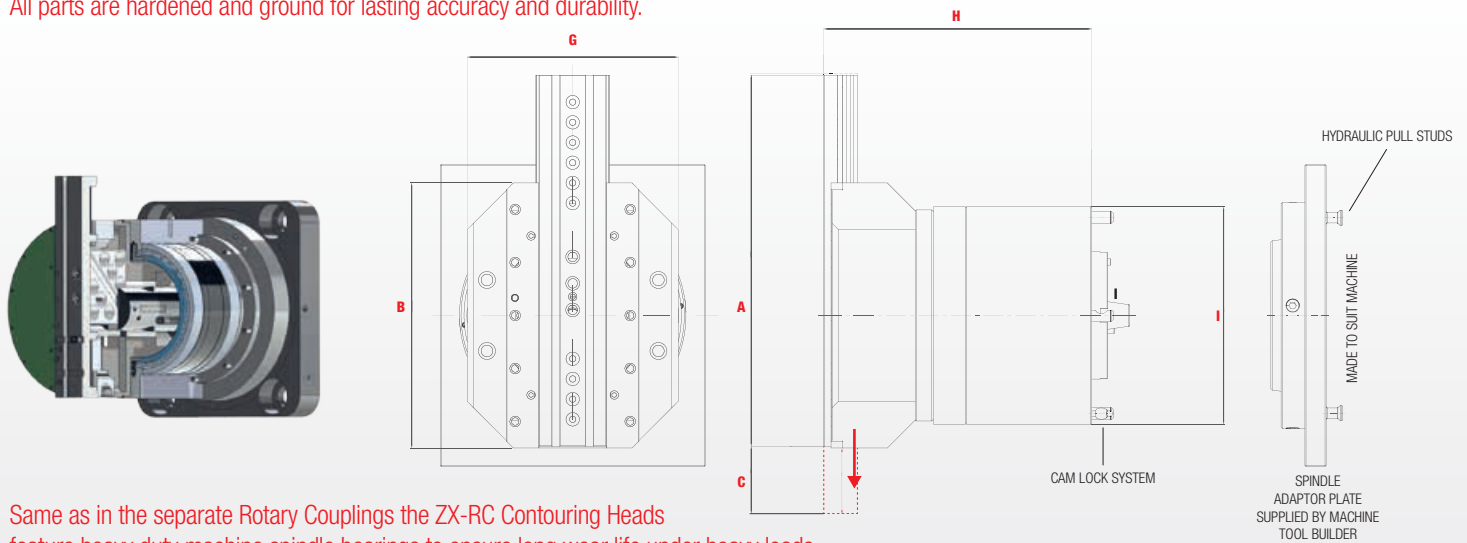
The new ZX Contouring Head range featuring an **integrated Rotary Coupling** for **automatic pick up and clamping** to RAM type HBM machine spindles.



The **ZX-RC Contouring Head** is a compact all in one solution for RAM type milling machines featuring a live spindle. These kind of Heads can be stored in the tool stacker or in the **pick up station** used for milling head auto exchange.

Regardless of ZX Contouring Head type, the proven **mechanical ZX actuation mechanism** converts linear live spindle motion into radial cutter movement. This sturdy design is based on the "sliding inclined wedge" principle for **backlash-free operation**; no gears or bell cranks are used.

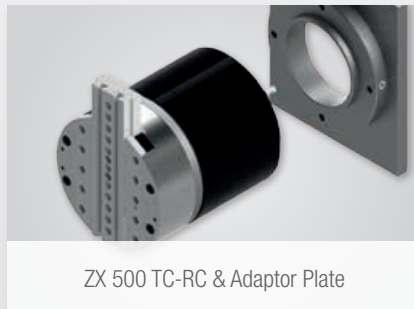
All parts are hardened and ground for lasting accuracy and durability.



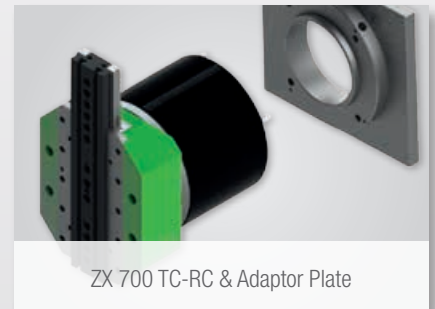
Same as in the separate Rotary Couplings the ZX-RC Contouring Heads feature heavy duty machine spindle bearings to ensure long wear life under heavy loads.



ZX 300 TC-RC & Adaptor Plate



ZX 500 TC-RC & Adaptor Plate



ZX 700 TC-RC & Adaptor Plate

The ZX-RC Contouring Heads are connected to the spindle adaptor plate with Cam Locks.

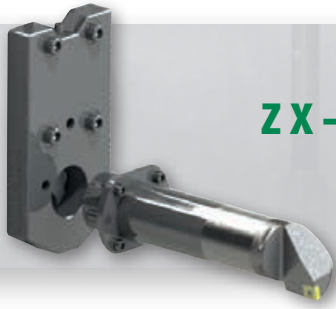
The Spindle adapter plate is build to suit the square RAM face and is supplied by the machine tool builder.

A special version of the ZX-RC Contouring Head for hydraulic full automatic top tool change is available.

TECHNICAL DATA	UNITS	ZX300 TC-RC	ZX500 TC-RC	ZX700 TC-RC
Auto Tool clamp	mm	-	available	available
'A'	mm	300	508	700
'B'	mm	300	400	500
'C' radial traverse	mm	75	102	127
'G'	mm	ø 300	ø 408	398
'H'	mm	472	472	505,5
'I'	mm	ø 410	ø 410	ø 410
Maximum speed	RPM	500	300	250
Stroke ratio		1 to 1	1 to 1	1 to 1
Feed	mm/Rev	0,4	0,4	0,4
Max. Torque	da Nm	800	800	1000
Weight*	Kg	376	410	422
Repeatability accuracy	mm	0,003	0,003	0,003
Backlash	mm	0-0,025	0-0,025	0-0,025
Boring accuracy		H7	H7	H7
Max. chip removal on Q80M46 steel				
Facing	D.O.C./mm	4	6	6
Boring	D.O.C./mm	4	6	6
Rapid traverse	M/min	0,4	0,4	0,5
Roughness	Ra	1,6	1,6	1,6

\* All weights without spindle adapter plate.

All Contouring Heads with feature through coolant facility.



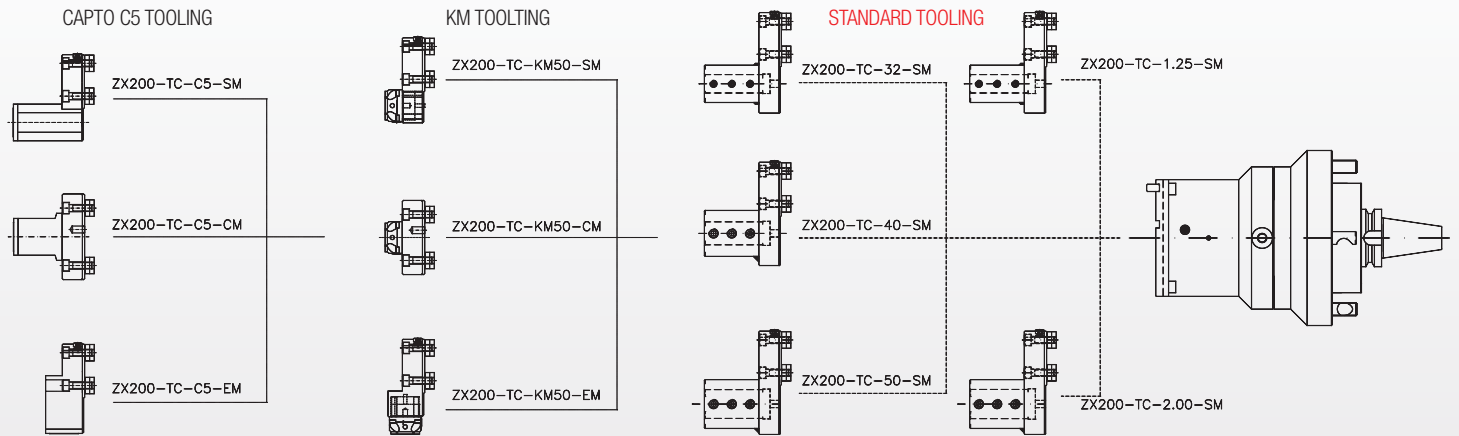
## ZX-INDUSTRY STANDARD TOP TOOLING

Contouring heads, featuring a single slide onto which **various top tooling can be installed**

Modular **top tooling components are available** to meet the machining requirements of most components. Tool slide adapters are also offered to allow the **use of commercially available tooling** systems such as **Capto®** and others.

External turning, grooving, taper boring, radius forming, chamfering, recessing and threading can all be finished in one set-up without removing the component from the machining table.

### ZX-200-TC CONTOURING HEAD TOP TOOLING SAMPLE:



Special tool slide adapter



Side mount Capto C6



End mount Capto C6



Tool slide extension plate



Central Mount 'KM'



End Mount 'KM'



Side Mount 'KM'



Central Mount  
Open Ended Square Shank



Side Mount  
Cylindrical Shank



Central Mount  
Cylindrical Shank

ZX-Tool	Capto			KM tooling			Cylindrical 32 mm	Cylindrical 40 mmKM50	Cylindrical 50 mm	Cylindrical 60 mm	Square 25 mm
	C5	C6	C8	KM50	KM63	KM80					
ZX200-TC	•			•			•	•	•		
ZX300-TC		•	•		•	•			•	•	
ZX420-TC		•	•		•	•			•		•
ZX500-TC		•	•		•	•			•	•	•
ZX700-TC		•	•		•	•			•	•	•
ZX900-TC		•	•		•	•			•	•	•

Many other different types of top tooling are available on demand, such as **tool slide extension plates** to extend the diameter range of your Contouring Head.



# SPECIAL ZX-TOOLS

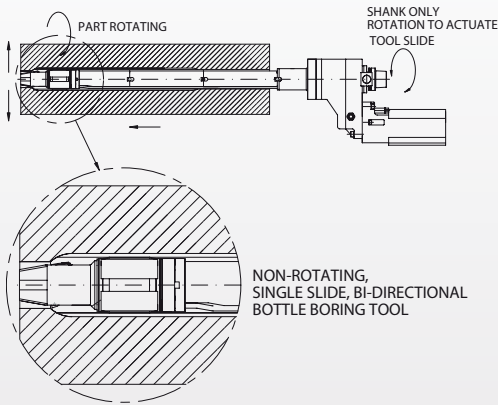
The advantage of the ZX-principle can be utilised on  
**many other different types of machine**



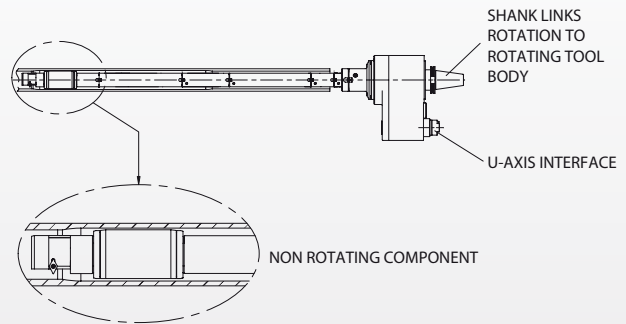
ZX tooling is generally used by the metal cutting industries who utilize Horizontal Boring Machines where components are too large to be machines on a lathe. The ZX Boring Tools can also be adapted to Deep Hole Drilling machines, Mill/Turn machines and Horizontal and Vertical machining centres, to produce internal extended reach cavities, seat pockets and bottle shaped contours including roughing and finishing operations in one set-up.

## SPECIAL APPLICATION SAMPLES

ZX Bottle Boring Tool with attached special non rotating drive unit



ZX Bottle Boring Tool with attached special rotating drive unit and U-Axis interface



Bottle boring tool on a lathe



MBT Tool on a vertical lathe



ZX-Tool on milling/turning machine

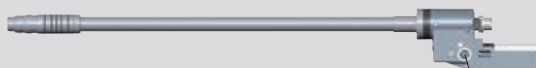


ZX-Tool on Deep hole drilling m.



**Special ZX Contouring Head** featuring an integrated Drive Unit for U-Axis interface and spider clamping for use on multi tasking machine.

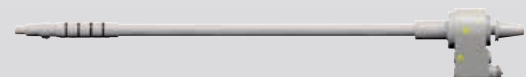
MBT-Bottle Boring Tool mounted to **special non-rotating drive unit** featuring a dove tail clamping system. Spindle rotation is converted inside the drive unit into linear motion to actuate the ZX-mechanism inside the tool.



MBT Bottle Boring Tool mounted to a **special rotating drive unit** featuring a dove tail clamping system. The spindle rotation provides the tool rotation. A separate U-Axis on the machine provides rotation which is converted inside the drive unit into linear motion to actuate the ZX-mechanism inside the tool.

U-AXIS INTERFACE

ZX Contouring Head with integrated drive unit featuring an interface for U-Axis connection next to the machine spindle which provides the rotation that is converted inside the drive unit into linear motion to actuate the ZX-mechanism inside the Contouring Head.



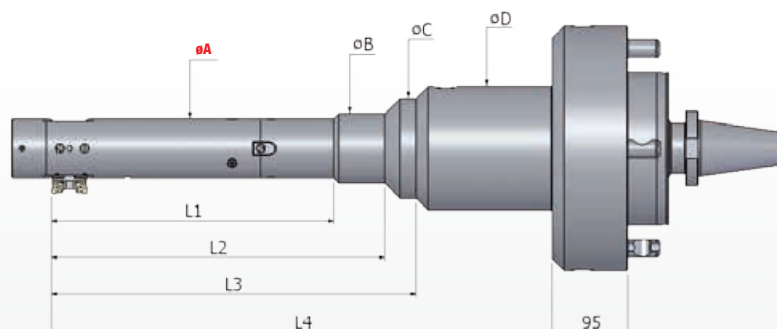
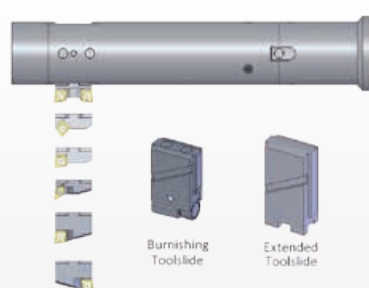
**MBT Bottle Boring Tool** with attached drive unit featuring an interface for U-Axis connection next to the machine spindle which provides the rotation that is converted inside the drive unit into linear motion to actuate the ZX-mechanism inside the MBT Tool.



## ZX-MODULAR BORING TOOLS

The ZX MBT Tools are dedicated to machine **any kind of contours inside bores** and are available with **single or twin tool slides** to achieve balanced cutting forces for high feeds and high material removal rates.

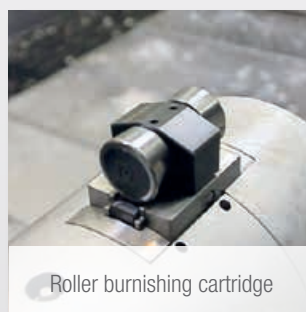
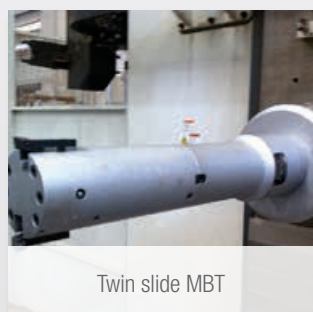
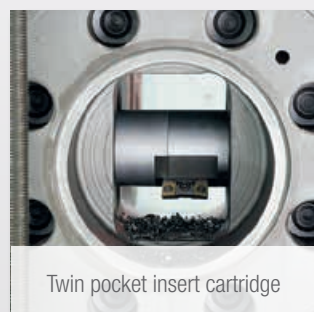
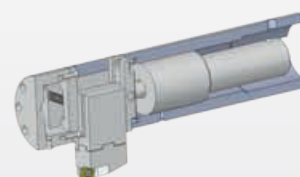
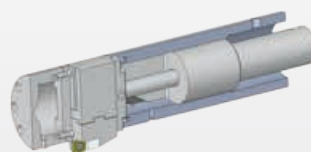
ZX Modular Boring Tools (MBT) offer versatility and economy when machining bores, counter-bores, tapers, threads, and complex contours inside components, over a wide range of diameters. These tools offer the highest cutting speeds and material removal rates available. **The MBT series is available in single-slide (MBT-S) and twin-slide (MBT-T) versions.**



All MBT tools feature 2:1 actuation ratio for easy programming.

### Insert Cartridges and Toolslides

- **Broad size range:** Each tool has a long tool slide stroke that is supplemented by using different cartridges and toolslides to cover an ever wider diameter range. No need to change the toolslide(s) or remove the head from the machine
- **Other special cartridge designs available on request:** e.g. Burnishing Slide

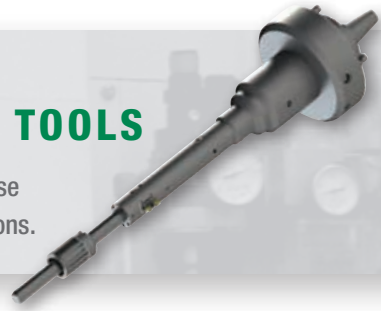


TECHNICAL DATA	UNITS	MBT50	MBT75	MBT100	MBT125
'A'	mm	50	75	100	125
'B'	mm	N/A	86	N/A	N/A
'C'	mm	N/A	125	125	N/A
'D'	mm	155	155	155	155
Through type End Cap Radial Stroke	mm	23	32	45	54
Bottoming End Cap Radial Stroke	mm	12	22	23	30
Total Range of tool with Slide and Cartridge change	mm	50-118	75-194	100-230	125-272
L1 max.	mm	305	350	454	524
L2 max.	mm	N/A	414	486	N/A
L3 max.	mm	N/A	454	N/A	N/A
L4 max.	mm	521,3	622	622	692
L5 max.	mm	557	658	684	725
Maximum speed	RPM	800	800	800	800
Stroke ratio		2 to 1	2 to 1	2 to 1	2 to 1
Repeatability accuracy	mm	0,003	0,003	0,003	0,003
Backlash	mm	0-0,025	0-0,025	0-0,025	0-0,025
Boring accuracy		H7	H7	H7	H7
<b>Max. chip removal on 080M46 steel</b>					
Facing	D.O.C./mm	3	3	3	3
Boring	D.O.C./mm	3	6	7	7
Rapid traverse	M/min	100	100	100	100
Roughness	Ra	0,8	0,8	0,8	0,8

Special MBT Tools are also available in larger and smaller diameter sizes or equipped with special tool slides operating in bi-directional ways (for roughing and finishing without need to change the cartridge).

# ZX-BOTTLE BORING & VALVE SEAT POCKET TOOLS

Specially adapted ZX Modular Boring Tools feature **piloted cutter support** for use in machining seat pocket areas in oil valves and other extended reach applications.



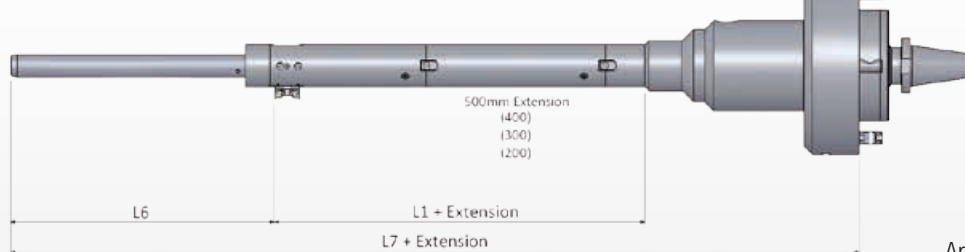
Extended and supported long-reaching ZX Modular Boring Tools called ZX Bottle Boring or Valve Seat Pocket Tools are dedicated to machine cavities or different geometries inside deep bores. **ZX Bottle Boring Tools feature a rotating, O-Ring, or spring loaded pilot located behind the tool slide.**

**Valve Seat Pocket Tools feature** an end cap mounted **pilot shaft** which feeds inside a **collet pilot**, mounted inside the bore for **accurate support** during machining operation.



Bottle Boring Tool with O-Ring Pilot

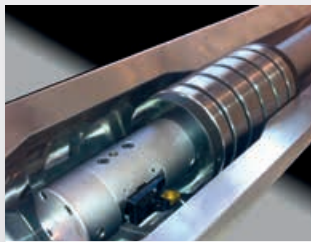
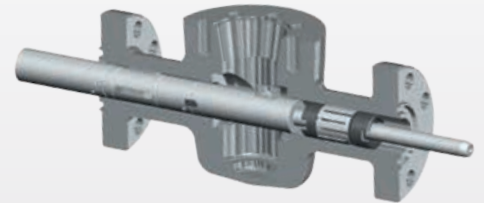
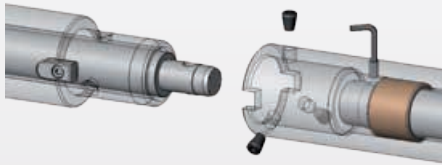
Valve Seat Pocket Tool  
w. Collet Pilot  
and Pilot Shaft



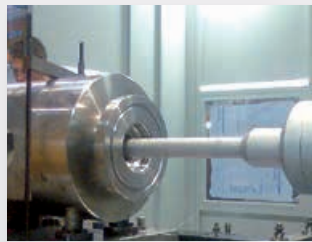
Application: valve body

## Extension Coupling

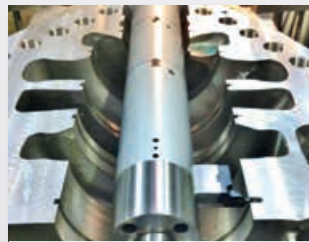
**Modular design and construction:** Makes adjustment of length and configuration fast and easy, greatly enhancing the versatility of the tool. Some sizes can be converted for extended-reach applications with piloted support.



Bottle boring tool inside cavity



Application: valve body



Recessing inside pump housing



Machining seat pocket

COLLET SIZE (øF)		COLLET SIZE (øF)		MBT75		MBT100-S		MBT125-S	
2.060"	52.32mm	2.050"-2.130"	52.07-54.10 mm						
2.560"	65.02mm	2.550"-2.630"	64.77-66.80 mm						
3.000"	76.20mm			2.990"-3.070"	75.95-77.98mm				
4.060"	103.12mm			4.050"-3.070"	102.87-106.43mm	4.050"-4.190"	102.87-106.43mm		
5.125"	130.18mm			5.110"-5.250"	129.79-133.35mm	5.110"-5.250"	129.79-133.35mm	5.110"-5.250"	129.79-133.35mm
6.375"	161.93mm					6.360"-6.500"	161.54-165.10mm	6.360"-6.500"	161.54-165.10mm
7.060"	179.32mm							7.050"-7.130"	179.07-181.10mm
TOOLSLIDE SLIDE RADIUS		CARTRIDGE CUT RADIUS							
		16.5mm	21.0mm	23.0mm	35.5mm	23.0mm	35.5mm	27.0mm	44.0mm
8.5mm		50.0-96.0mm	59.0-105.0mm						
15.0mm		63.0-109.0mm	72.0-118.0mm						
14.5mm									
27.0mm				75.0-139.0mm	100.0-164.0mm				
39.5mm				100.0-164.0mm	125.0-189.0mm	100.0-190.0mm	125.0-215.0mm		
56.5mm				125.0-189.0mm	150.0-214.0mm	125.0-215.0mm	150.0-240.0mm		
35.5mm						159.0-249.0mm	184.0-274.0mm	125.0-233.0mm	159.0-267.0mm
52.5mm								159.0-267.0mm	
62.0mm								178.0-286.0mm	212.0-320.0mm
L6		325mm		448mm		608mm		325mm	
L7		846mm		1070mm		1263mm		846mm	





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OIL & GAS



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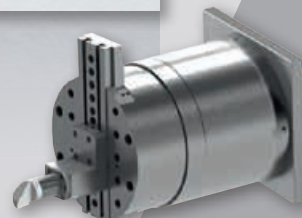
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POWER GENERATION



MARINE



**FOR  
ADDITIONAL  
INFORMATION**

**Cogsdill-Nuneaton Ltd.**

St George's Way  
Bermuda Industrial Estate  
Nuneaton, Warwickshire  
CV10 7QT, UK  
Tel. +44(0)2476383792  
Fax +44(0)2476344433  
Email [sales@cogsdill.co.uk](mailto:sales@cogsdill.co.uk)  
Web [www.zx-tools.com](http://www.zx-tools.com)

**Cogsdill Tool Products, INC.**

P.O. Box 7007  
Camden, SC USA 29021-7007  
Ph. (803) 438-4000  
Fax (803) 438-5263  
Email [cogsdill@cogsdill.com](mailto:cogsdill@cogsdill.com)  
Web [www.cogsdill.com](http://www.cogsdill.com)

**Cogsdill Austria GmbH**

Tel. +43 (0)7665 602 4040  
Email [office@cogsdill.at](mailto:office@cogsdill.at)  
Web [www.cogsdill.at](http://www.cogsdill.at)



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