

## System 3R – Tooling

# Powder Compacting Technology



# Becoming better every day – since 1802

## GF Machining Solutions

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+ We are System 3R.  
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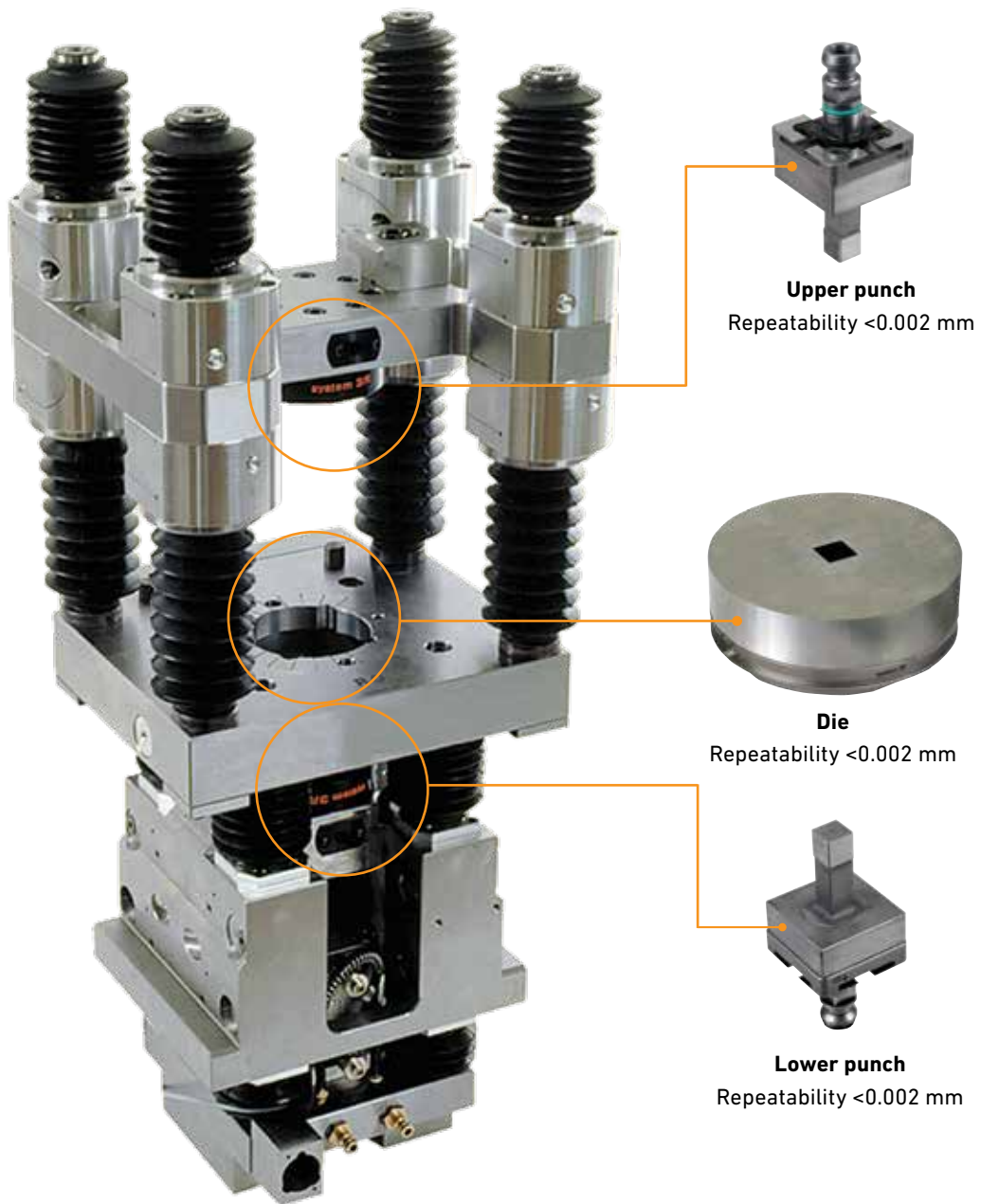
# System 3R Tooling



## Productivity in effect

- + Simple, quick set-up
- + High accuracy
- + Low scrap rate
- + Maximal machine utilization
- + Increased productivity

# System 3R applied in PM



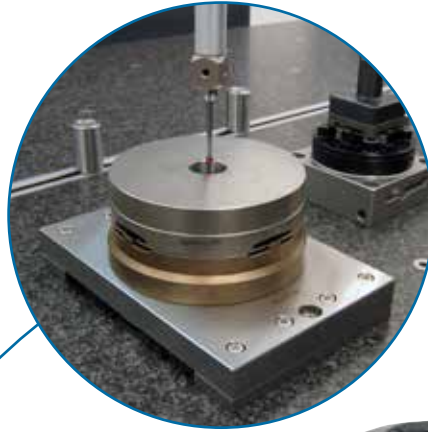
# System 3R applied in the Toolshop

## Use System 3R tooling when producing punches and dies

Gives an increased productivity in the Tool shop by a reduction of the set-up times, improved accuracy & quality and reduced number of rejections.

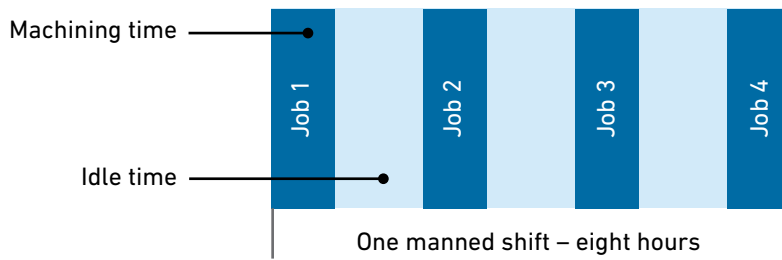
## Use System 3R tooling also for Powder Compacting

Reduces the set-up times in the press and gives an improved accuracy & quality and less repairs.

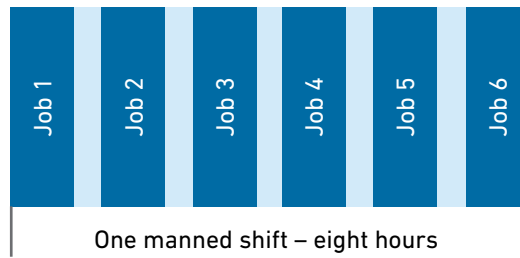


Fitting the machines with the same reference system means that electrodes and workpieces can be moved between the machines without subsequent alignment and checking – **One Minute Set-up.**

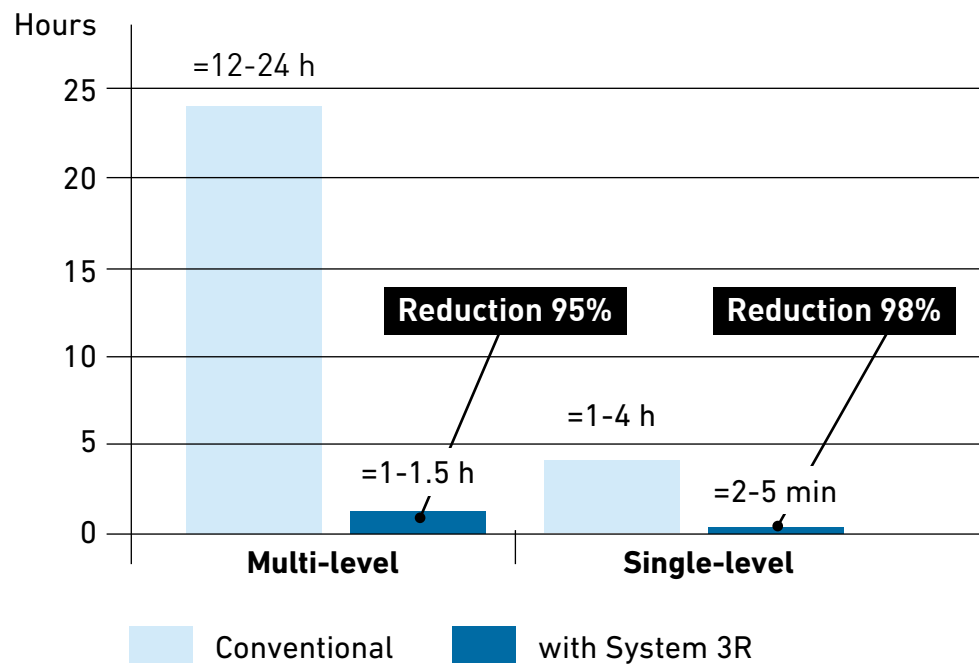
### Conventional setting-up



### Pallet system



### One Minute Set-up Set-up time: change & alignment



#### A reference system minimises setup times

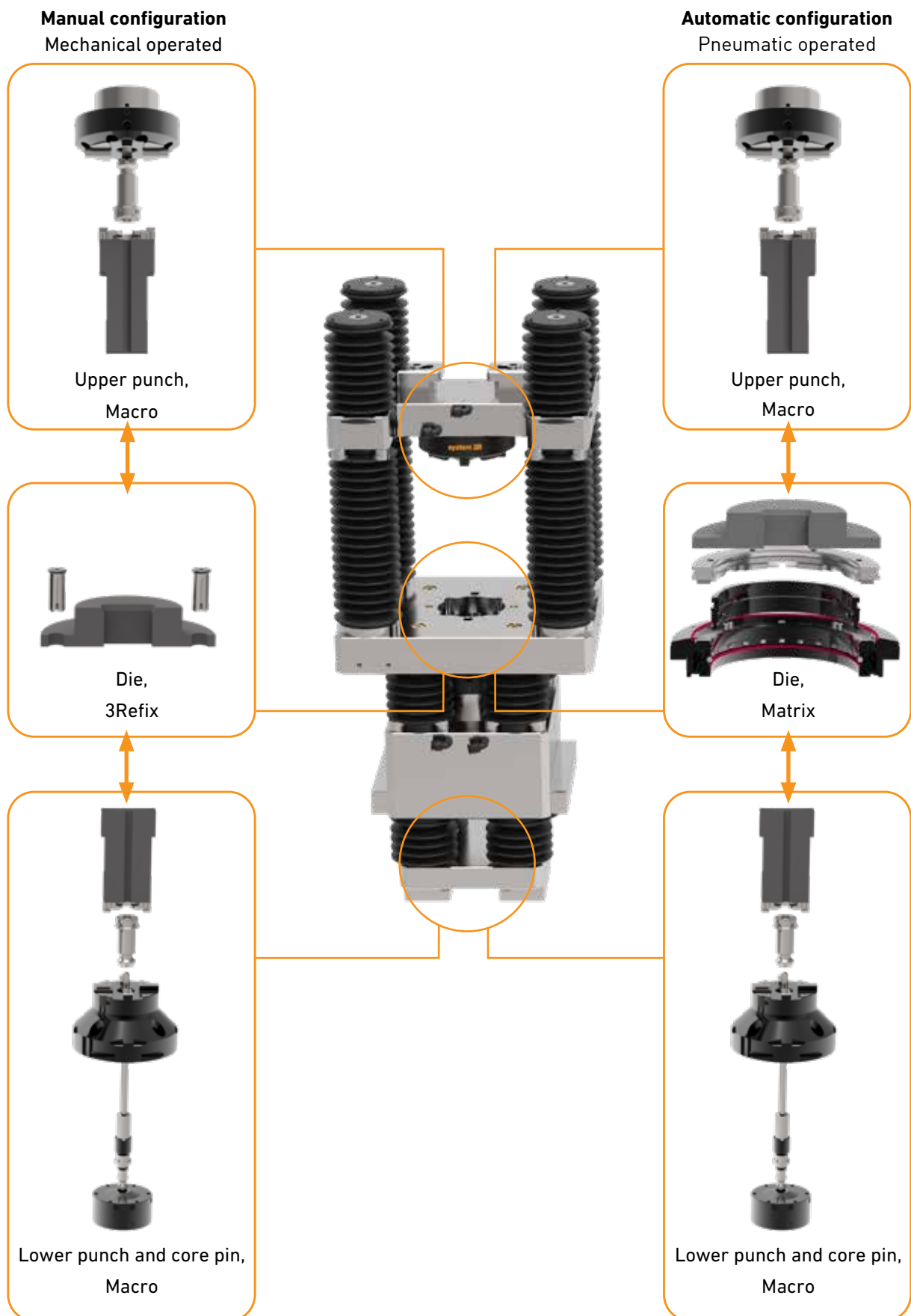
Every minute that can be converted from internal to external setting time increases the spindle time of the machine and with it the productivity of the business.

#### Big earnings are within your reach

The machine generates revenue when its spindle is turning – and only then. Work smarter, not harder.

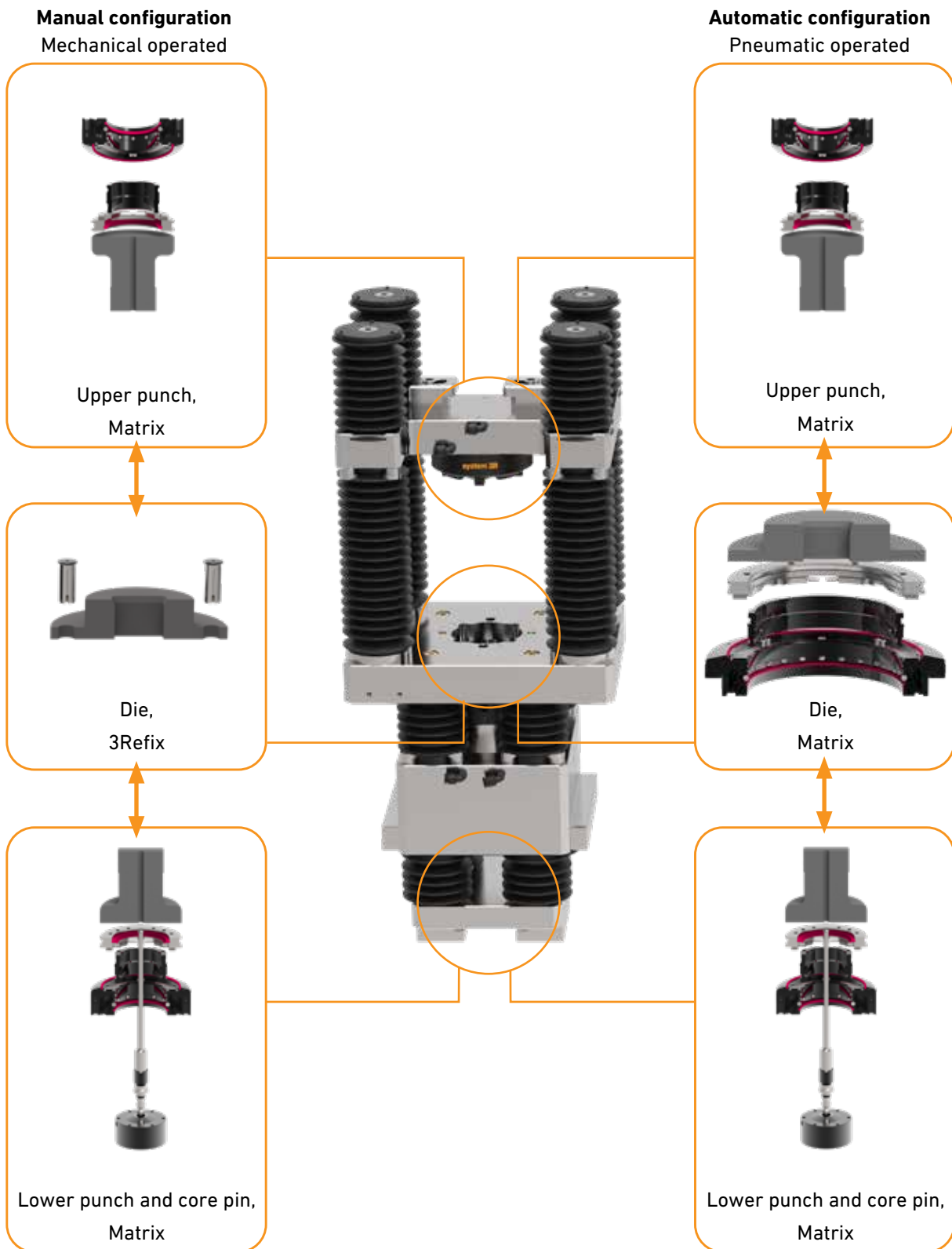
# Examples of configurations

## Single levels



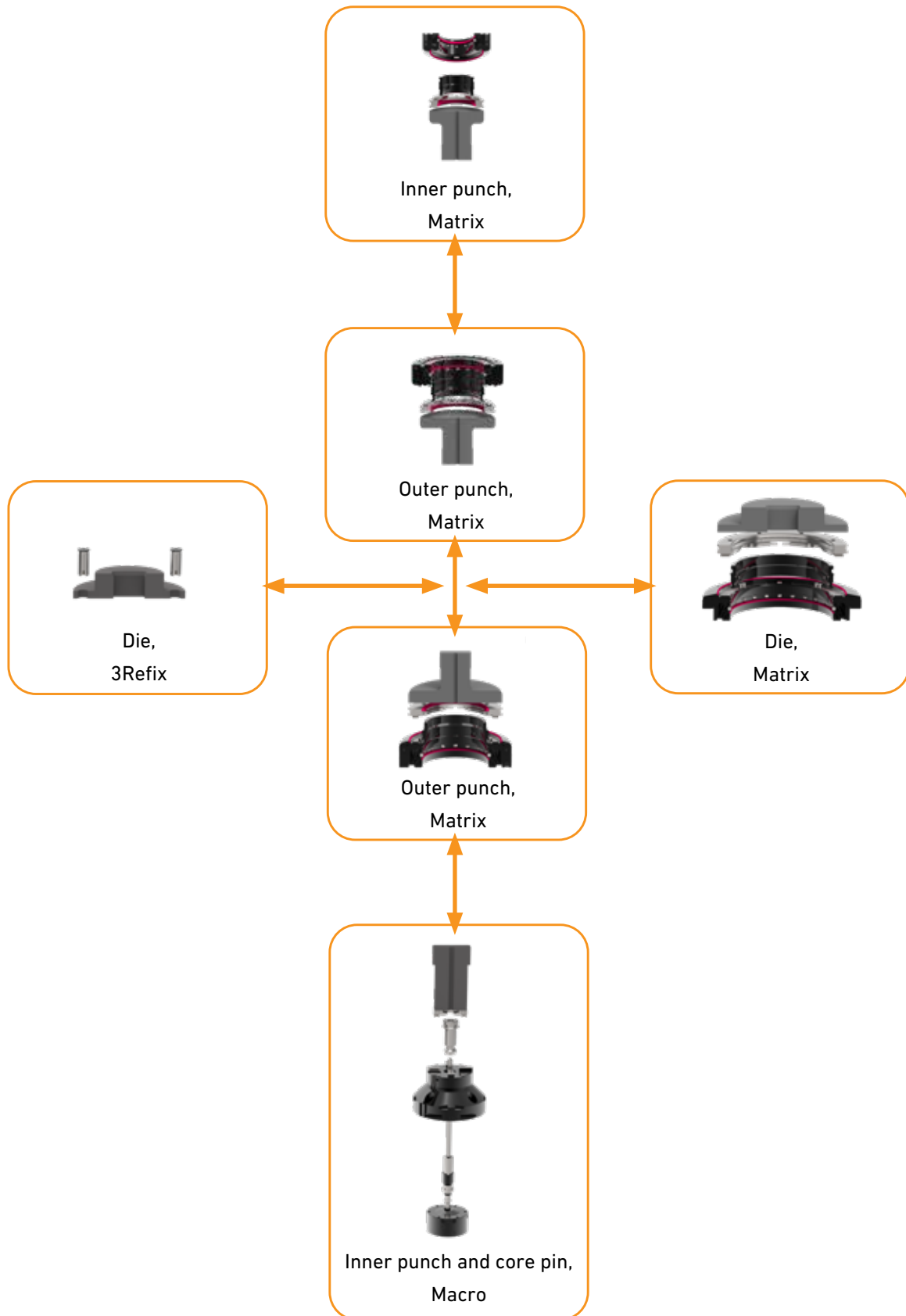


## Single levels



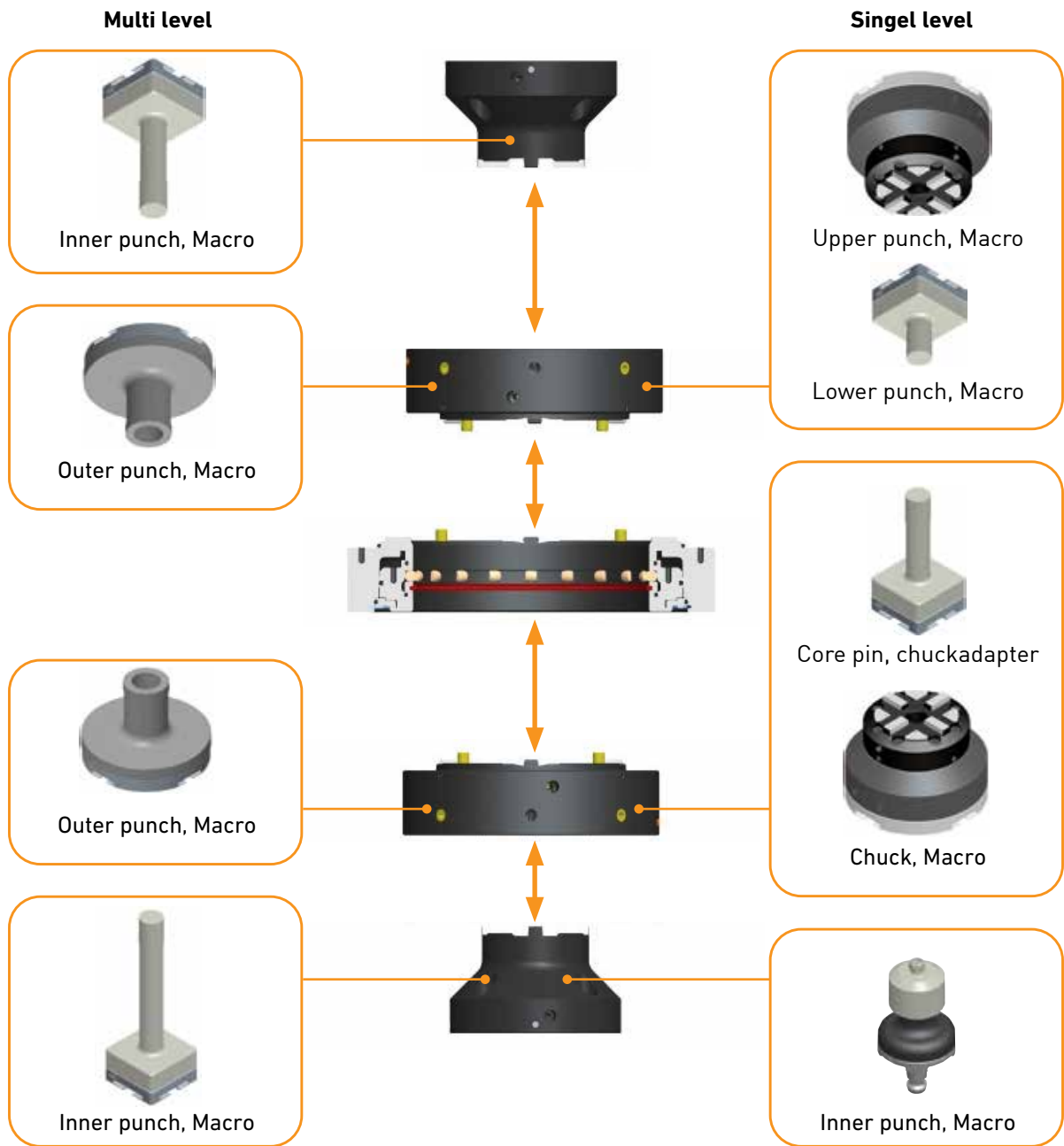
# Examples of configurations

## Multi level



# Maintain flexibility in Press

## Convert Multi to single level



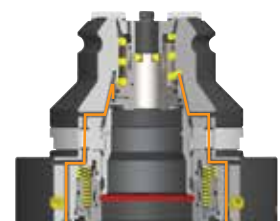
2. Load chuck adapter for single punch

1. Load chuck adapter for shorter core rod.



Connectors for Pneumatic chuck, Matrix 142

Chuck adaptor connectors



Unclamp

Turbo/Airblast cleaning

# Tooling – Top down choice by size

## Chucks

### 3Refix PM mandrels, 3R-901-10PM-TX, Ø10 mm

- + Recommended tightening torque 4 Nm.
- + Weight 0.02 kg.

### 3R-901-20PM-TX, Ø20 mm

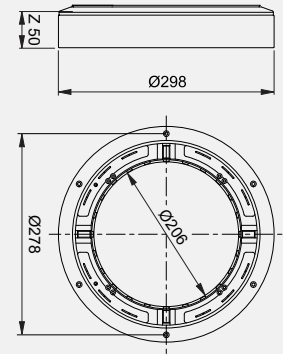
- + Recommended tightening torque 10 Nm.
- + Weight 0.1 kg.



### Pneumatic chuck, Matrix 260, 3R-690.1-260

Chuck for permanent mounting into a PM press.

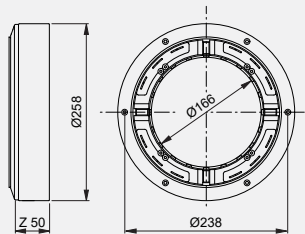
- + Built in height 50 mm
- + Max pressure 200 ton.
- + Required drawbar 3R-695.2-260
- + Hardened references
- + Weight 13 kg.



### Pneumatic chuck, Matrix 220, 3R-690.1-220

Chuck for permanent mounting into a PM press.

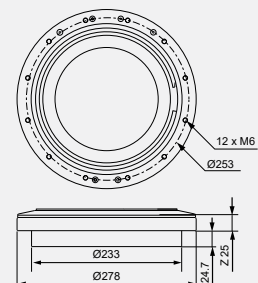
- + Built in height 50 mm
- + Max pressure 150 ton.
- + Required drawbar 3R-695.2-220
- + Weight 11 kg.



### Pneumatic chuck, built in, Matrix 220, 3R-SP28340

Chuck for permanent mounting into a PM press.

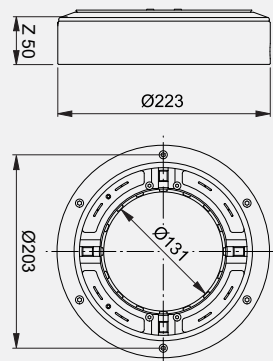
- + Built in height 25 mm
- + Max pressure 150 ton.
- + Required drawbar 3R-695.2-220
- + Weight 10.6 kg.



### Pneumatic chuck, Matrix 185, 3R-690.1-185

Chuck for permanent mounting into a PM press.

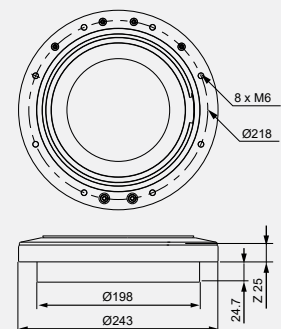
- + Built in height 50 mm
- + Max pressure 100 ton.
- + Required drawbar 3R-695.2-185
- + Weight 9 kg.



### Pneumatic chuck, built in, Matrix 185, 3R-SP28268

Chuck for permanent mounting into a PM press.

- + Built in height 25 mm
- + Max pressure 100 ton.
- + Required drawbar 3R-695.2-185
- + Weight 10.6 kg.



## Chucks

### Pneumatic chuck, Matrix 142, 3R-690.1-142HD

Chuck for permanent mounting into a PM press.

- + Air sensor separated from Turbo.
- + Built in height 50 mm
- + Max pressure 50 ton
- + Required drawbar 3R-695.2-142
- + Weight 7 kg.



### Pneumatic chuck, Matrix 142, 3R-690.1-142

Chuck for permanent mounting into a PM press.

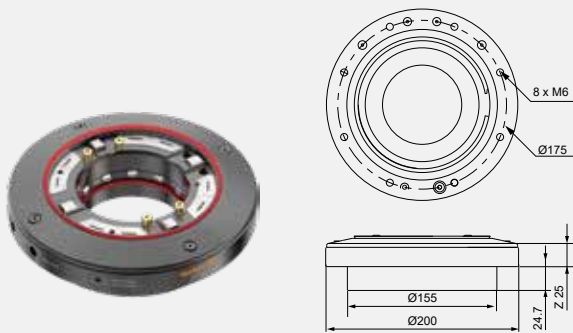
- + Built in height 50 mm
- + Max pressure 50 ton.
- + Required drawbar 3R-695.2-142
- + Weight 7 kg.



### Pneumatic chuck, Built in, Matrix 142, 3R-SP28395

Chuck for permanent mounting into a PM press.

- + Built in height 17.5 mm
- + Max pressure 50 ton.
- + Required drawbar 3R-695.2-142
- + Weight 2.7 kg.



### Pneumatic chuck, Matrix 110, 3R-690.1-110HD

Chuck for permanent mounting into a PM press.

- + Air sensor separated from Turbo.
- + Built in height 35 mm
- + Max pressure 25 ton
- + Required drawbar 3R-695.2-110
- + Weight 2.5 kg.



### Pneumatic chuck, Matrix 110, 3R-690.1-110

Chuck for permanent mounting into a PM press.

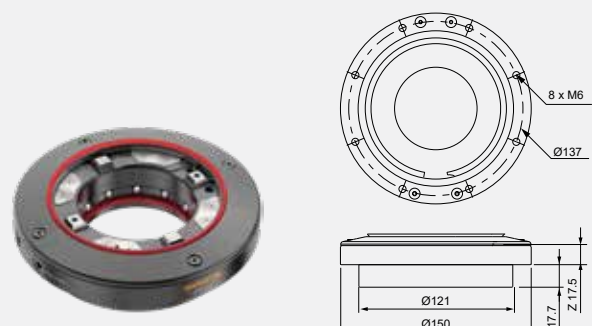
- + Built in height 35 mm
- + Max pressure 25 ton.
- + Required drawbar 3R-695.2-110
- + Weight 2.5 kg.



### Pneumatic chuck, Built in, Matrix 110, 3R-SP28219

Chuck for permanent mounting into a PM press.

- + Built in height 25 mm
- + Max pressure 25 ton.
- + Required drawbar 3R-695.2-110
- + Weight 2.5 kg.

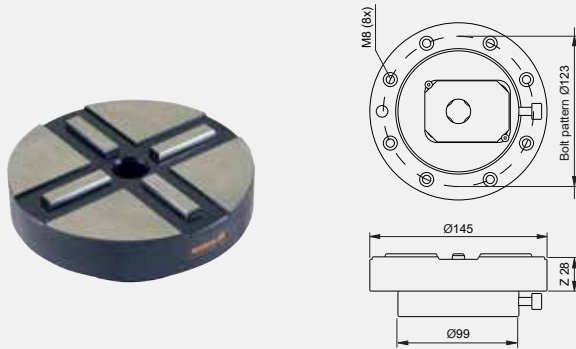


# Tooling – Top down choice by size

## Chucks

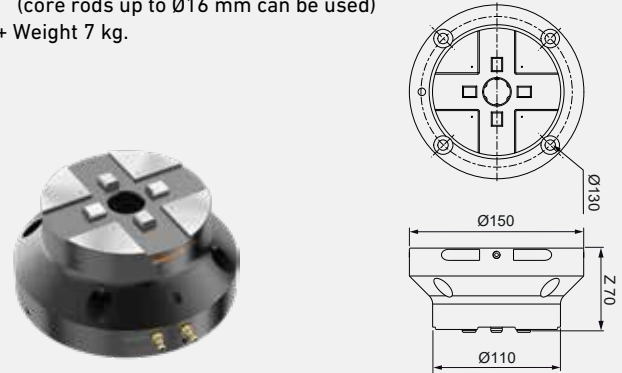
### Manual chuck, MacroMagnum, 3R-680.27-150

- + Built in height 28 mm
- + Max pressure 150 ton.
- + Required drawbar 3R-605.11
- + Weight 4.7 kg.



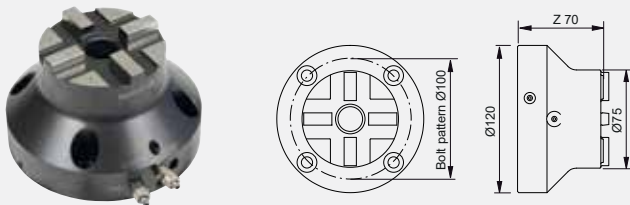
### Pneumatic chuck, Macro PM, 90803.60

- + Built in height 70 mm
- + Max pressure 100 ton.
- + Required drawbar 90840.55 (core rods up to Ø16 mm can be used)
- + Weight 7 kg.



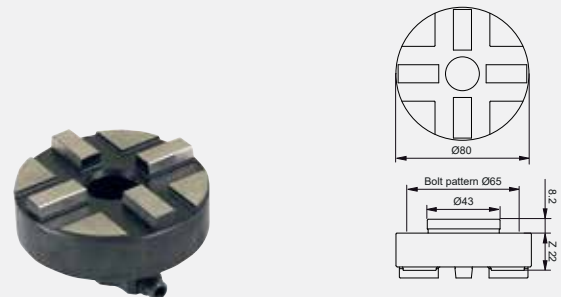
### Pneumatic chuck, Macro PM, 3R-600.17-60

- + Air sensor separated from Turbo.
- + Built in height 70 mm
- + Max pressure 64 ton
- + Required drawbar 3R-605.11
- + Weight 3.5 kg.



### Manual chuck (built-in) Ø80, Macro PM, 3R-600.27-60

- + Built in height 22 mm
- + Max pressure 64 ton
- + Required drawbar 3R-605.11
- + Torque 6 Nm
- + Weight 1 kg.

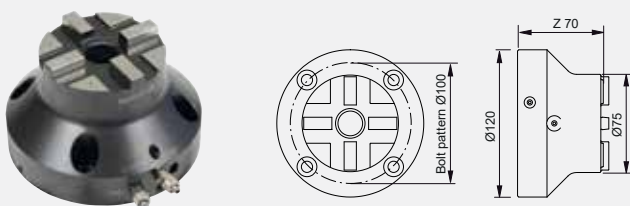


### Pneumatic chuck, Macro PM, 3R-600.17-30

- + Air sensor separated from Turbo.
- + Built in height 70 mm
- + Max pressure 32 ton
- + Required drawbar 3R-605.11
- + Weight 3.5 kg

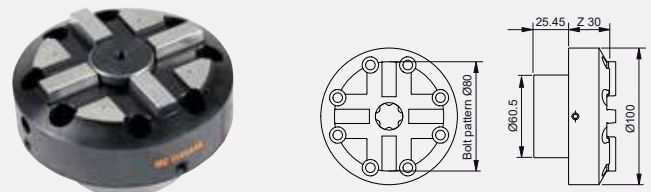
### Pneumatic chuck, Macro PM, 90803.50

- + Built in height 70 mm
- + Max pressure 64 ton.
- + Required drawbar 90840.55 (core rods up to Ø16 mm can be used).



### Built in chuck, Pneumatic, Macro PM, 3R-600.17-32

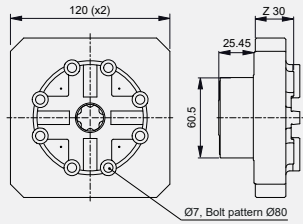
- + Built in height 30 mm
- + Max pressure 32 ton.
- + Required drawbar 3R-605.11
- + Weight 2 kg.



## Chucks

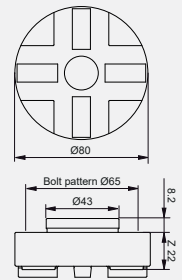
### Built in chuck, Pneumatic, Macro PM, 3R-600.17-34

- + Built in height 30 mm
- + Max pressure 32 ton.
- + Required drawbar 3R-605.11
- + Weight 2.9 kg.



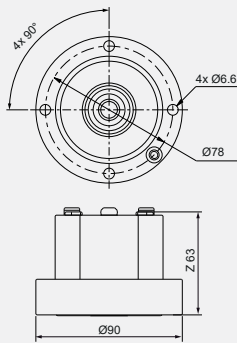
### Manual chuck (built-in) Ø80, Macro PM, 3R-600.27-30

- + Built in height 22 mm
- + Maximal pressure 32 ton.
- + Required drawbar 3R-605.11
- + Torque 6 Nm.
- + Weight 1 kg.



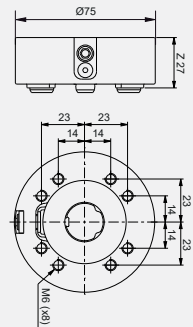
### Pneumatic chuck, Macro PM, 3R-600.17-16

- + Built in height 63 mm
- + Max pressure 16 ton
- + Required drawbar 3R-605.11
- + Weight 1.6 kg,



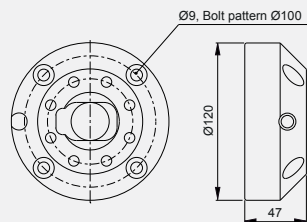
### Manual chuck, Macro, D-20173

- + Built in height 27 mm
- + Max pressure 16 ton.
- + Required drawbar 90958
- + Weight 1 kg.



### Distance block, Macro PM, 3R-A34249

- For manual Macro chuck, i.e. 3R-600.27-XX.
- + Built in height 47 mm.
  - + Weight 2.8 kg.

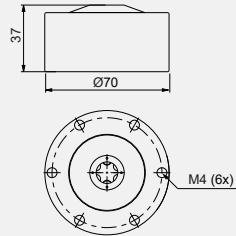


# Tooling

## Pallets and accessories

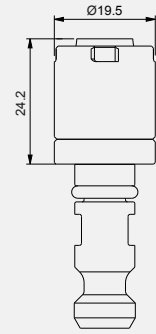
### Pneumatic Core rod chuck, D-20175

For holder D-20175.10  
+ Built in height 37 mm.



### Holder, D-20175.10

Pallet for core rods (Ø10 mm).



### Drawbar, Macro, 90840.55

Requires chuck 90803.50.  
+ Through hole Ø16 mm  
+ Weight 0.2 kg.



### Drawbar, Macro, 3R-605.11

+ Through hole Ø10.2 mm  
+ Weight 0.2 kg.



### Drawbar, Macro, 90958

+ Through hole Ø10.2 mm  
+ Weight 0.1 kg.



Note: With automation, the gripper has to grip on the pallet or change drawbar with gripper interface (i.e. 3R-605.1).

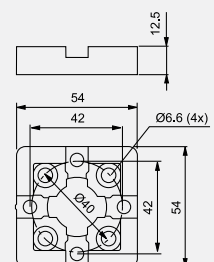
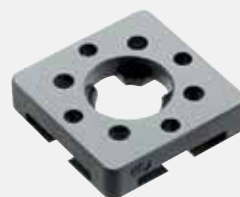
### Locking ring key, 3R-605-GE

To lift the locking ring of the drawbars.  
+ Supplied in sets of 2.



### Pallet 54 mm, Macro, 3R-651.7E-P

+ Max press force: 16 ton.  
+ Supplied in set of 8 pcs  
+ Rust resistant material  
+ Size 54 x 54 x 12.5 mm  
+ Weight 0.2 kg/pc.

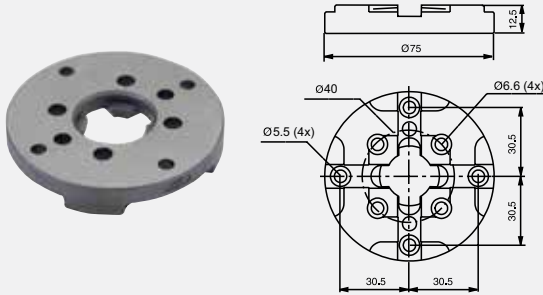




# Pallets

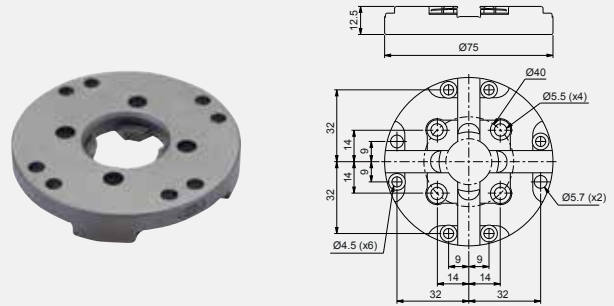
## Pallet Ø75 mm, Macro, 3R-651.75E-P

- + Max press force: 32 ton.
- + Supplied in set of 10 pcs
- + Rust resistant material
- + Size Ø75 x 12.5 mm
- + Weight 0.3 kg/pc.



## Pallet Ø75 mm, Macro, 3R-651.75-50E

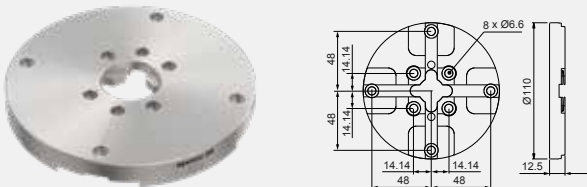
- + Max press force: 64 ton.
- + Supplied in sets of 10 pcs.
- + Rust resistant material
- + Size Ø75 x 12.5 mm
- + Weight 0.3 kg/pc.



## Pallet Ø110 mm, Macro, 90506.06

Hardened pallet with clearance holes for fixing screws.

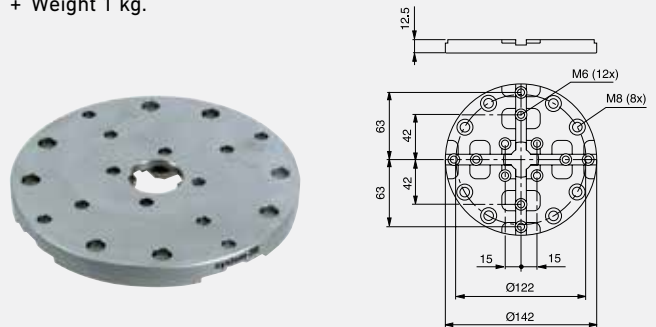
- + Max press force: 100 ton.
- + Rust resistant material
- + Size Ø110 x 12.5 mm
- + Weight 0.7 kg.



## Pallet Ø142 mm, MacroMagnum, 3R-681.71

Hardened pallet with clearance holes for fixing screws.

- + Max press force: 150 ton.
- + Rust resistant material
- + Size Ø142 x 12.5 mm
- + Weight 1 kg.



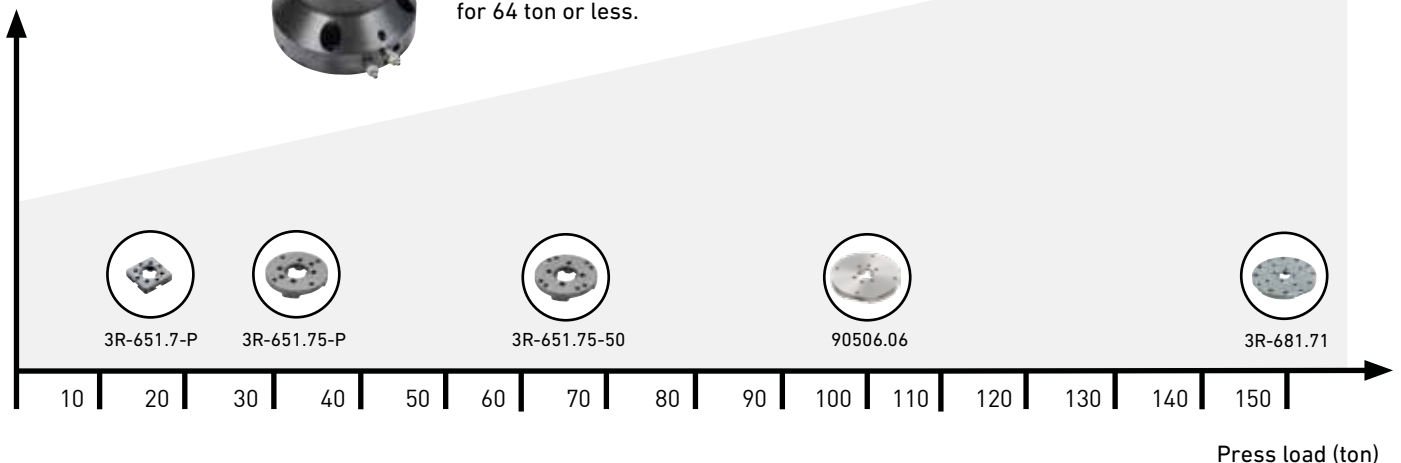
## Choice of chuck, sets permissible max press load for punches

Price on consumables pallets



Example: MacroPM chuck, 3R-600.17-60

Max. Press force: 64 ton.  
Alternate between pallets for 64 ton or less.

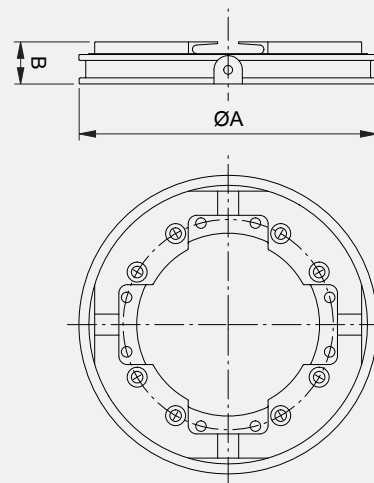


## Pallets and accessories

### Pallets, Matrix

- + Rust resistant material
- + Adapted for automatic changing.

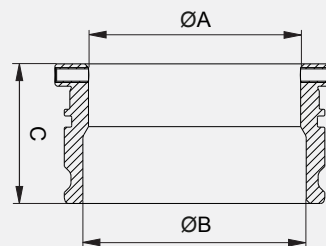
Note: Not self carrying, requires extra support.



Art. No	A (mm)	B (mm)	Press load (ton)	Drawbar	Weight (kg)
3R-691.1-110	110	20	25	3R-695.2-110	0.5
3R-691.1-142	142	20	50	3R-695.2-142	1.2
3R-691.1-185	185	20	100	3R-695.2-185	1.7
3R-691.1-220	220	25	150	3R-695.2-220	2.6
3R-691.1-260	260	25	200	3R-695.2-260	3.2

### Drawbars, Matrix

Note: In automation the gripper has to grip on the pallet and not on the drawbar.



Art. No	A (mm)	B (mm)	C (mm)	Weight (kg)
3R-695.2-110	57	60	38	0.3
3R-695.2-142	67	76	45.5	0.5
3R-695.2-185	112	119	45.5	0.8
3R-695.2-220	147	149	45.5	1.3
3R-695.2-260	187	189	45.5	1.5

### Torque wrench, 4 Nm, 3R-614-04

Intended for Ø10 mm 3Refix mandrels.

- + 4 Nm.

### Torque wrench, 6 Nm, 3R-614-06

Intended for Macro manual chucks.

- + 6 Nm.



### Torque wrench, 10 Nm, 3R-914-10

Intended for Ø20 mm 3Refix mandrels.

- + 10 Nm.



### Air unit, 90125.25-05

Includes status indicators.

- + Weight 1 kg.

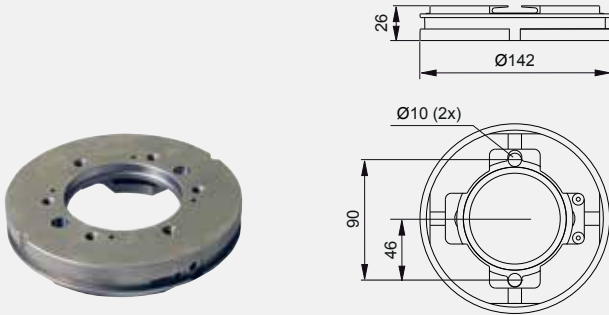


## Pallets and accessories

### Adapterpallet Matrix 142-3Refix Ø10, 3R-SP29388

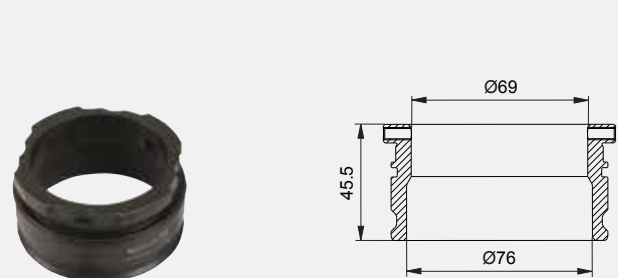
Adapterpallet Matrix 142 to 3Refix (44/46) for dies.

- + Required drawbar 3R-SP29403
- + Weight 1.6 kg.



### Matrix 142-3Refix Drawbar, 3R-SP29403

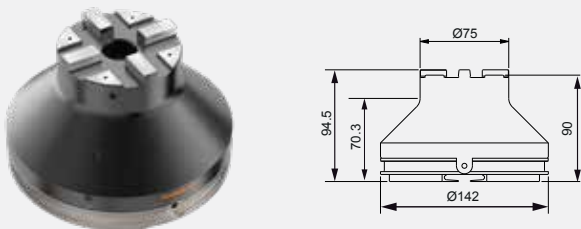
Special Matrix 142 drawbar for adapterpallet 3R-SP29388.



### Chuck adapter, Matrix 142-Macro, 3R-SP33230

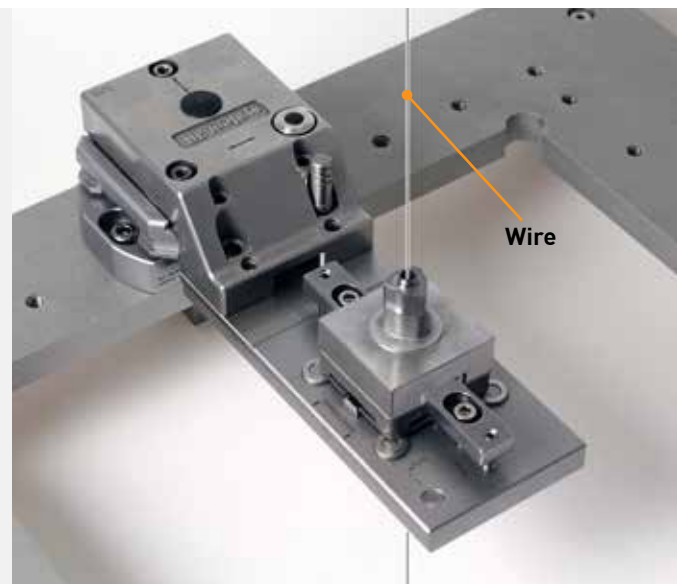
From Matrix 142 into Macro system. Chuck adapter with built-in Macro chuck.

- + Built in height 90 mm
- + Hardened references
- + Maximal pressure 50 ton.
- + Required drawbar 3R-605.11
- + Weight 7 kg.



### Fixture for punch on Macro, 90238

Fixture for punch on Macro, in order to wire-cut a through hole within Ø20 mm.



## Accessories

### Force gauge press Ø72 mm, 3R-SSP122

Intended for checking clamping force of Matrix chucks and for those Macro chucks found in compacting machines (due to cramped and limited space inside machine). In order to check Matrix chucks, see additional converter kits 3R-SSP115-Matrix XXX enabling checking.



### Force gauge regular, 3R-SSP115-BASE

Intended for checking clamping force of Matrix chucks and for those Macro chucks found in non-compacting machines. In order to check Matrix chucks, see additional converter kits 3R-SSP115 Matrix xxx enabling checking.

#### Converter kit, 3R-SSP115 Matrix 110

Added kit to enable checking Matrix 110 chucks.

#### Converter kit, 3R-SSP115 Matrix 142

Added kit to enable checking Matrix142 chucks.

#### Converter kit, 3R-SSP115 Matrix 185

Added kit to enable checking Matrix185 chucks.



### Index blocker-pin, 3R-SP29196

To disable indexing feature on Matrix 110 chucks.

+ Delivered 1 pc.



### Index blocker-pin, 3R-SP29533E

To disable indexing feature on Matrix 142 and 185 chucks.

+ Delivered 2 pcs.



## Accessories

### **Index blocker-pin, 3R-SP29559E**

To disable indexing feature on Matrix 220 and 260 chucks.  
+ Delivered 4 pcs.



### **Handle, Matrix 110, 3R-692.7-110**

Handle to circumvent pallet for easier lift off chuck.  
Comes by different sizes.



### **Handle Matrix 142, 3R-692.7-142**

Handle to circumvent pallet for easier lift off chuck.  
Comes by different sizes.



### **Handle, Matrix 185, 3R-692.7-185**

Handle to circumvent pallet for easier lift off chuck.  
Comes by different sizes.



### **Handle Matrix 220, 3R-692.7-220**

Handle to circumvent pallet for easier lift off chuck.  
Comes by different sizes.



### **Lifting device, 3R-692.8-142**

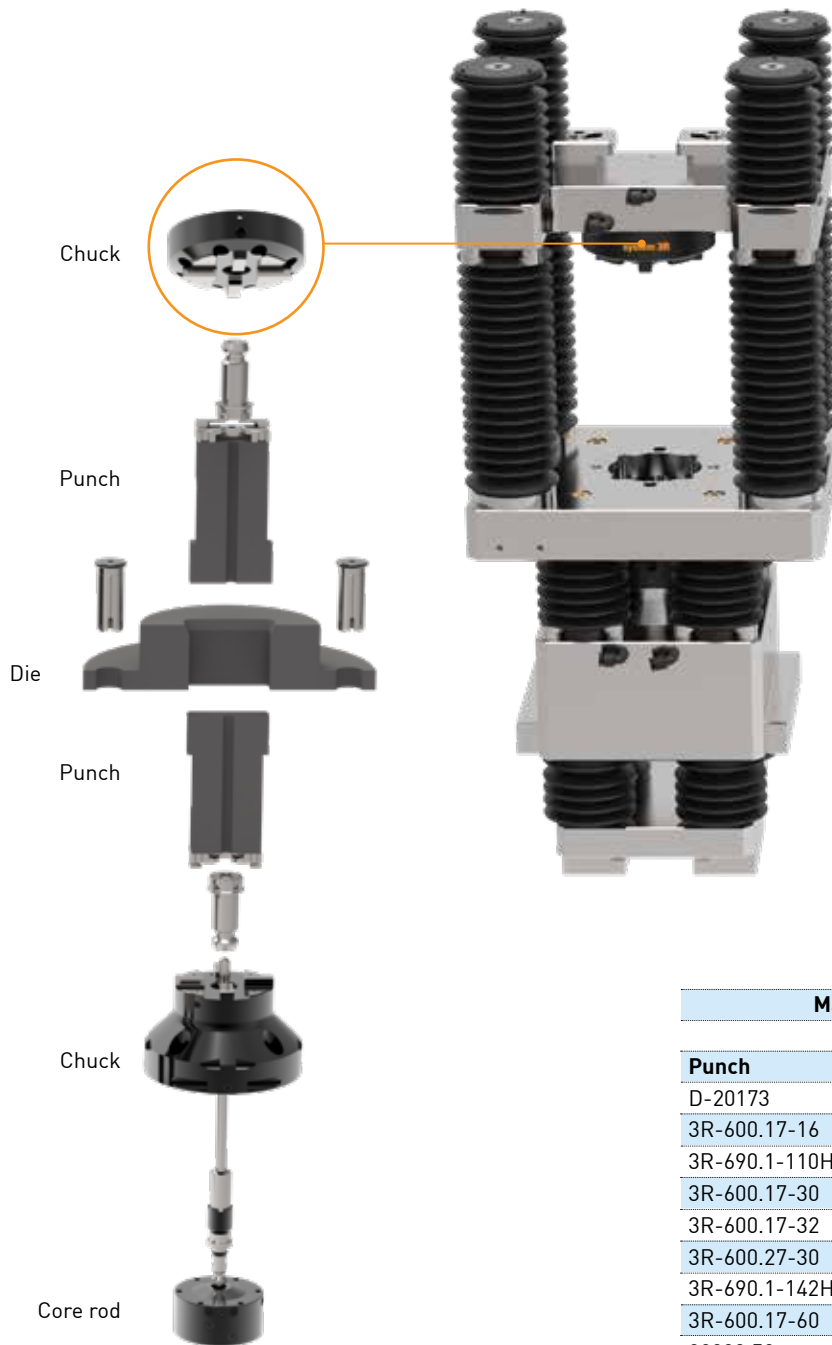
In combination with 3R-692.7-110 and 3R-692.7-142 to enable lift by crane.

### **Lifting device, 3R-692.8-220**

In combination with 3R-692.7-185 and 3R-692.7-220 to enable lift by crane.



# How to make a configuration



						<b>Die</b>									
		<b>Manual or Pneumatic</b>		M	M	P	P	P	P	P	P	P	P	P	P
		<b>Build On or Build In</b>		I	I	O	O	I	O	I	O	I	O	I	I
		<b>Punch</b>													
	D-20173	16	10	M	O	■	-	■	■	■	-	-	-	-	-
	3R-600.17-16	16	10	P	O	■	-	■	■	■	-	-	-	-	-
	3R-690.1-110HD	25	55	P	I	■	-	-	-	-	■	■	-	-	-
	3R-600.17-30	32	10	P	O	■	-	■	■	■	-	-	-	-	-
	3R-600.17-32	32	10	P	I	■	-	■	■	■	-	-	-	-	-
	3R-600.27-30	32	10	M	O	■	-	■	■	■	-	-	-	-	-
	3R-690.1-142HD	50	67	P	O	■	-	-	-	-	-	-	-	■	■
	3R-600.17-60	64	10	P	O	■	-	■	■	■	-	-	-	-	-
	90803.50	40	16	P	O	■	-	■	■	■	-	-	-	-	-
	3R-600.17-62	64	10	P	I	■	-	■	■	■	-	-	-	-	-
	3R-600.27-60	64	10	M	O	■	-	■	■	■	-	-	-	-	-
	90803.60	100	16	P	O	■	-	-	-	-	■	■	-	-	-
	3R-690.1-185	100	110	P	O	-	■	-	-	-	-	-	-	-	-
	3R-690.1-220	150	145	P	O	-	■	-	-	-	-	-	-	-	-
	3R-680.27-150	150	10	M	I	-	■	-	-	-	-	-	-	■	■
	Force (Ton)														
	Core rod (Ø mm)														
	Manual or Pneumatic														
	Build On or Build In														

## Accessories

### Punch alignment system, D-20158-BASE

This fixture enables adjustment of punches within metal powder compacting by Macro system. The fixture is a stand-alone unit. It is possible to replace the indicators with electrical sensors. Free access from underneath, to access fixation-screws for the pallets.

- + Linear probes, 3 pcs
- + Measuring accuracy for the probes
  - deviation: 0.2  $\mu\text{m}$
  - repetition error: 0.05  $\mu\text{m}$
  - applied pneumatic pressure: 1.1-1.5 bar

Accessory kits for (supplied separately):

- Macro 54
- Macro 75
- Matrix 110
- Matrix 142



### Alignment tool & control Z-distance, Macro PM, 90909

Alignment and control tool for the Macro + 3Refix system in PM. Alignment is rough but helps reduce assembly time before final verification and alignment with verification tools. Also to be used to check parallelism between punch levels versus die-plate-level.

- + Dimensions:  $\varnothing 115 \times 75$  mm
- + cc. 3Refix  $\varnothing 10$  mm: 46+44 mm
- + Weight: 2.1 kg.



### Die unit for Z-distance, Matrix 142, D-20198-DZxx

Requires computer etc by D-20189-BASE.

To be used in combination with punch unit D-20198-Zxx.

Punch unit for Z-distance, Macro, D-20198-Zxx

To be used in combination with die unit D-20198-DZxx.



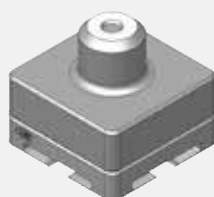
### Tool for Z-distance, Macro, D-20198-ZXX

Tool to establish Z-distance in combination with either 3Refix or Matrix 142 pallet. This unit requires additional tool.

It is possible to apply electrical or mechanical indicators while measuring top surface.

Note: Linear probe is not included.

- + Built in height 50 mm
- + Requires drawbar 3R-605.11 or similar.



## Aligning equipment for all chucks in the press – Verifying tool, HP



Software makes it easy to read and follow the steps.  
Formal document is possible to print and/or store after alignment.

### Verification set – High Performance

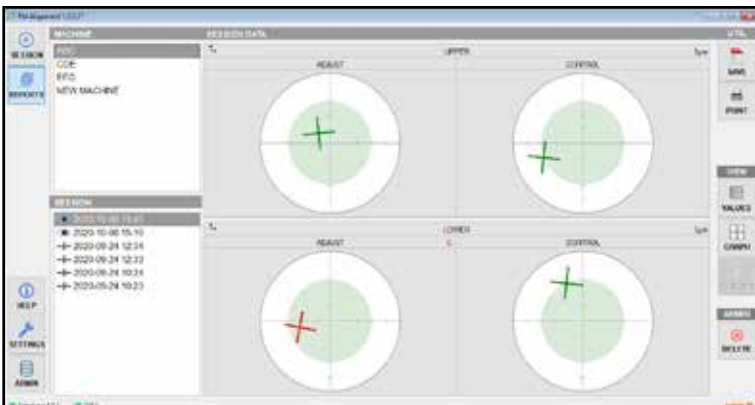
A set of probes with limited pressure point to measure location thus establish deviation by less than  $0.1 \mu\text{m}$  within a second. Handheld computer allows operator to bring it inside the machine for better monitoring of exact location while checking alignment. After each chuck for punch has been aligned, values may be printed or stored. Sets for punches and die to be applied, are sold separately and made available by various tooling interfaces.

### Contents:

Computer set for PM alignment, D-20189-BASE

- + Lap-top
- + Software
- + Signal converter
- + Pneumatic control unit
- + Pneumatically operated probes (3x)

Custom made and suitable tools are ordered separately. This goes for the die and punch(es) and includes required accessories.



PRESS ALIGNMENT PROTOCOL				Type		Measure date and time				
Machine	TST-001	ADJUST SESSION		2020-10-08 14:01:24	Operator					
Die serial no	1100	Die future pos	Y0	Die revision	1					
Punch serial no	1056	Punch revision			1					
Comment										
MEASURED VALUES										
CHUCK	POS	X	Y	C	R	A	B	LVL	H	dH
UPPER	ADJ	3.5	2.8	4.0	4.5	...	...	65	65.0	...
UPPER	CTRL	-1.3	1.2	2.0	1.8	2.0	6.0	145	145.0	80.0
LOWER	ADJ	-3.5	-5.2	-3.1	6.3	...	...	65	65.0	...
LOWER	CTRL	-1.0	-2.7	0.4	2.9	-5.0	-5.1	115	115.0	50.0
MEASURED POSITIONS										
UPPER				LOWER						
ADJUST	UPPER	CONTROL		ADJUST	LOWER	CONTROL				
ACCEPTED DEVIATIONS				UNITS						
X,Y	C	R	A,B	X,Y	C	R	A,B			
±5.5	±10.1	+7.0	±7.0	$\mu\text{m}$	$\mu\text{m}/100\text{mm}$	$\mu\text{m}$	$\mu\text{m}/100\text{mm}$			
PAGE 1/1										



# Other Tooling – MacroNano and MatrixNano\*

- + Extremely high accuracy.
- + High-precision machines are linked together in the production chain, without detracting from the extreme accuracy.
- + Feedback to the machine for supplementary machining after inspection is possible. This feedback is only meaningful if the pallet system is at least as accurate as the measuring machine.

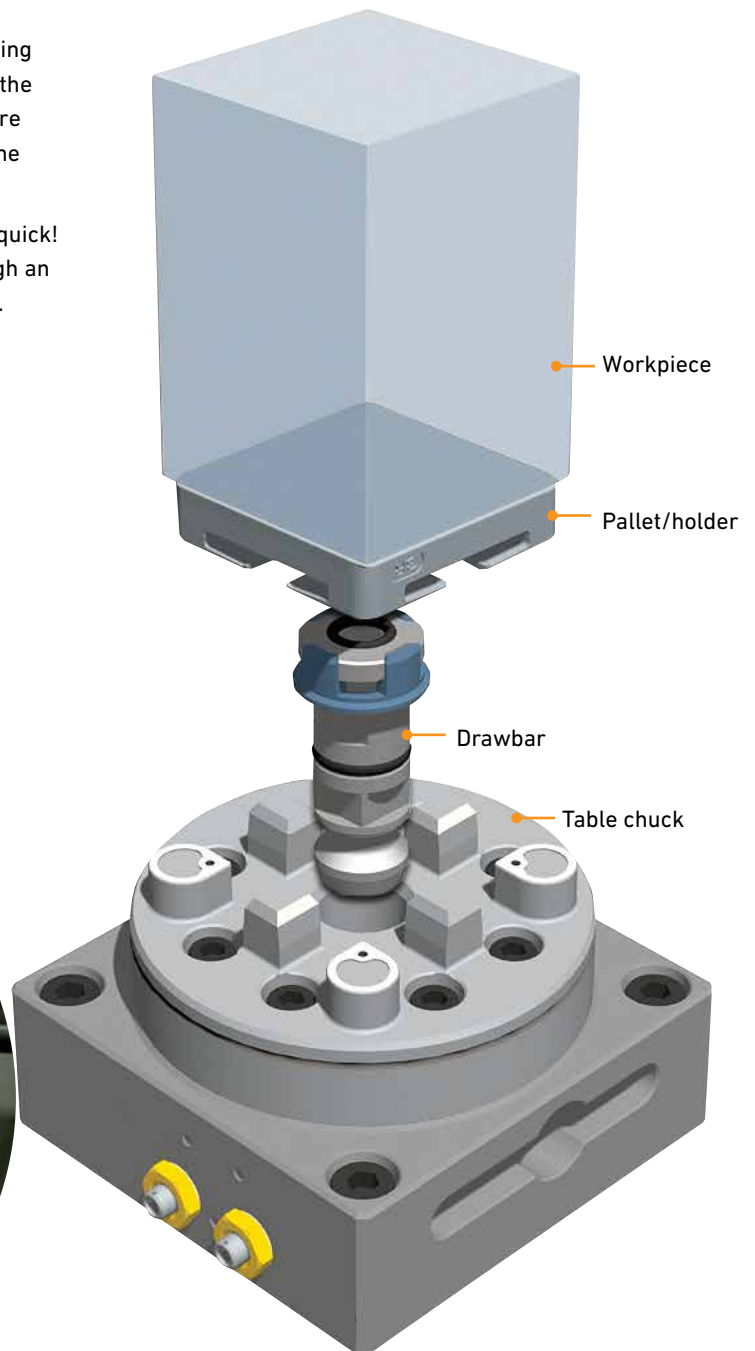
\* Matrix 110 and Matrix 142

## Workholding for Nano Precision

Nano-precision machining requires nano-precision referencing of workpieces and tools- a real challenge even with state of the art solutions available in the market. This becomes even more challenging when the references need to be established in the shortest possible time.

Nano system is best described in two words as precise and quick! The Nano clamping system links the production chain through an ultra-precision coupling both for workpiece and tool holding.

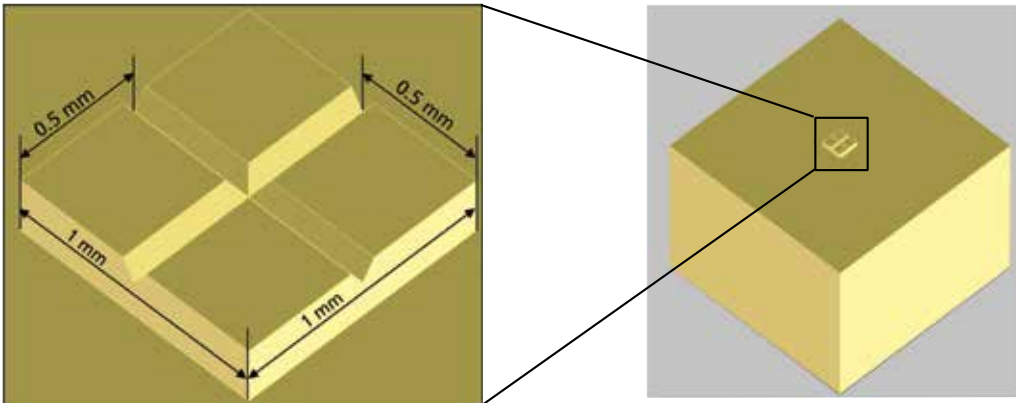
- + Repetition accuracy – within 0.001 mm
- + Fixed index positions 4x90°
- + Required air pressure, pneumatic chuck – 6±1 bar



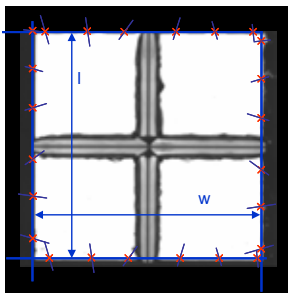
# MacroNano

## Application example: Microstructuring with Diamond Machining

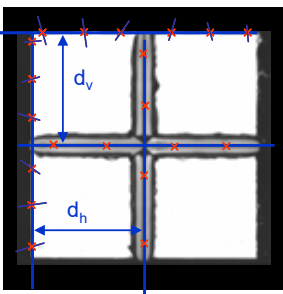
Micro features produced with nano precision



This micro structure is produced by Diamond Flycutting operations on two different machines, each equipped with a MacroNano chuck. The square in the middle of the workpiece (right picture) is produced by plane milling on 1st machine, making use of indexing feature of the MacroNano system. The pallet carrying the workpiece is then transferred to the chuck on 2nd machine to produce the micro-grooves, once again using the indexing feature. The zero reference was determined only once on the 1st machine and then carried through the whole process chain using both the indexing precision and the system precision of the MacroNano system; overall structure deviation is less than 0.5 micron.



Measurement of the cube dimensions

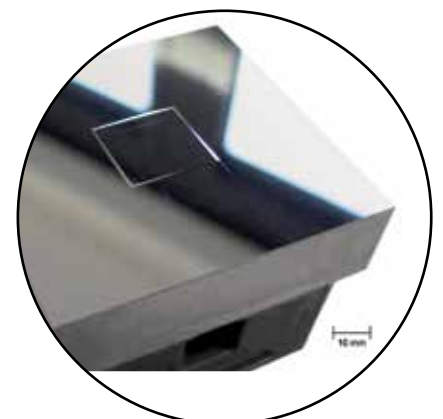
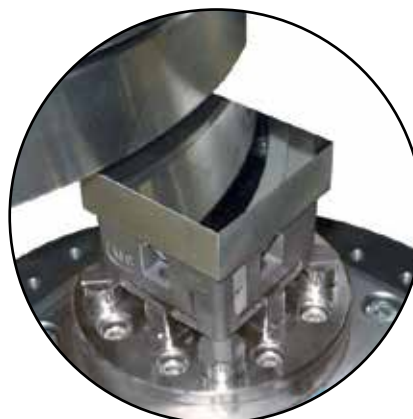


Measurement of groove positions

	Width (mm)	Length (mm)	Vertical dist. (mm)	Horizontal dist. (mm)
$W_1$	0.9996	$l_1$ 0.9999	$d_{v1}$ 0.4988	$d_{h1}$ 0.5013
$W_2$	0.9996	$l_2$ 0.9999	$d_{v2}$ 0.4993	$d_{h2}$ 0.4995
$W_3$	0.9996	$l_3$ 0.9999	$d_{v3}$ 0.4996	$d_{h3}$ 0.5001
$W_4$	0.9997	$l_4$ 0.9999	$d_{v4}$ 0.4991	$d_{h4}$ 0.4995
$W_5$	0.9996	$l_5$ 0.9998	$d_{v5}$ 0.5010	$d_{h5}$ 0.5001
$W_6$	0.9996	$l_6$ 0.9998	$d_{v6}$ 0.5007	$d_{h6}$ 0.5002
$W_7$	0.9997	$l_7$ 0.9999	$d_{v7}$ 0.4996	$d_{h7}$ 0.5012
$W_8$	0.9996	$l_8$ 0.9999	$d_{v8}$ 0.4992	$d_{h8}$ 0.5009
$W_9$	0.9997	$l_9$ 0.9999	$d_{v9}$ 0.4996	$d_{h9}$ 0.5009
$W_{10}$	0.9996	$l_{10}$ 0.9998	$d_{v10}$ 0.4998	$d_{h10}$ 0.5008
<b>W</b>	<b>0.9996</b>	<b>l</b> <b>0.9999</b>	<b><math>d_v</math></b> <b>0.4997</b>	<b><math>d_h</math></b> <b>0.5004</b>

Mean values

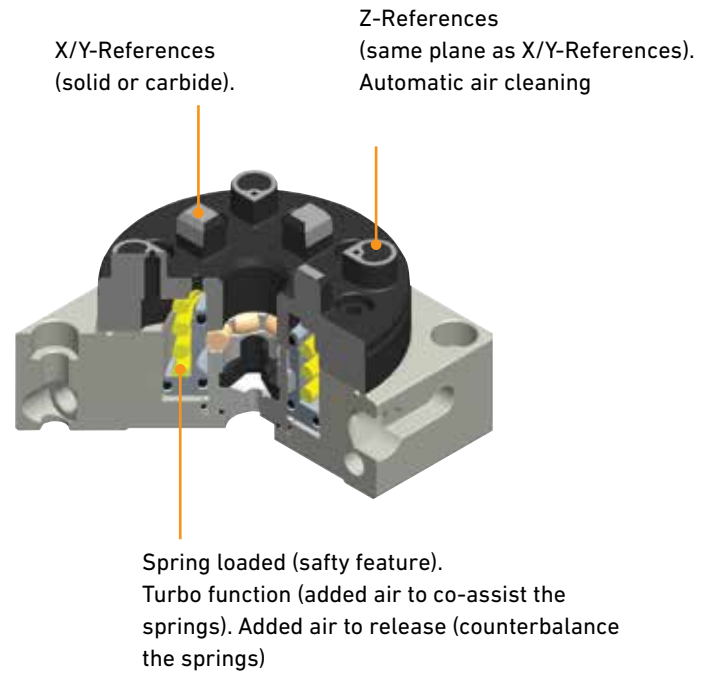
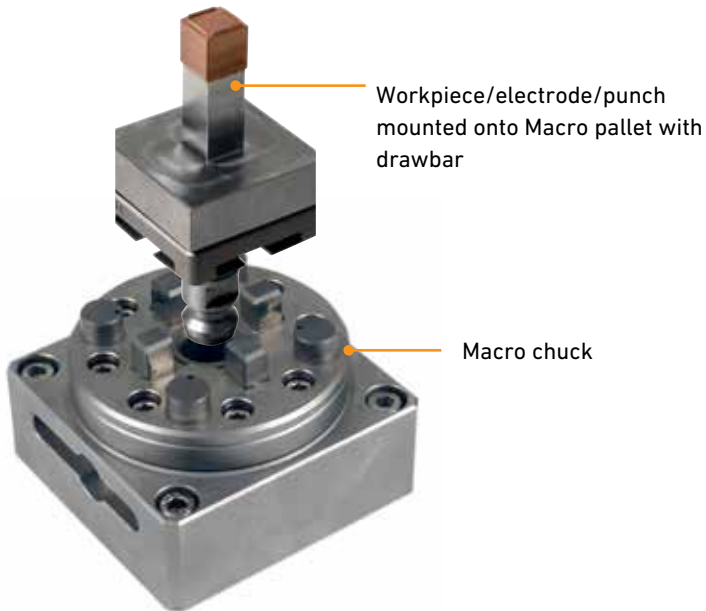
Overall structure deviation < 0.5  $\mu$ m



# Tooling Technology

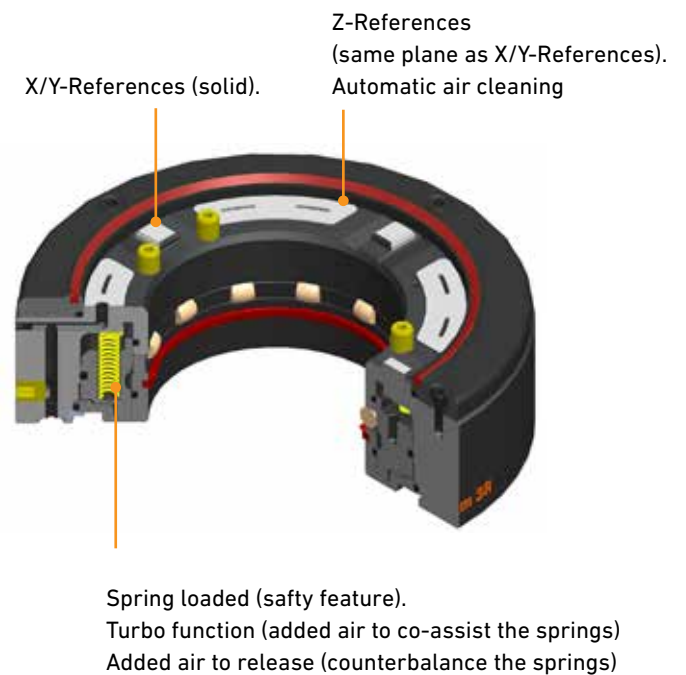
## The Macro system for punches

Choice of reference element is determined by required pressing force.



Note: Recommended air pressure, pneumatic chuck  $6 \pm 1$  bar.

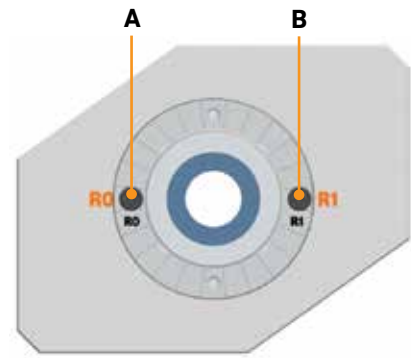
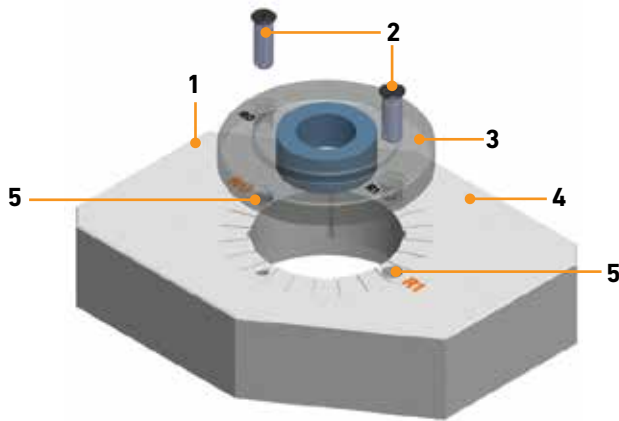
## The Matrix system for dies and punches



Note: For the entire product range see [www.system3r.com](http://www.system3r.com)

## 3Refix for dies

3Refix is a cost effective solution. The 3Refix expanding mandrels (2 pcs) determines the position. First 3Refix mandrel is to determine X/Y-position and the second to determine the angle.



### Description

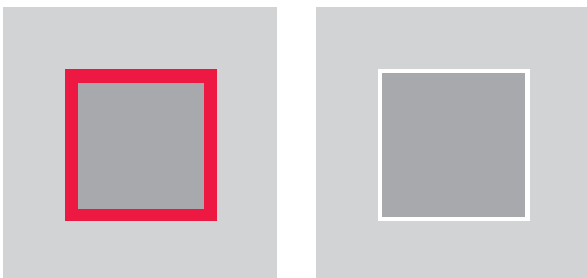
- 1 Z-reference surface
- 2 3Refix mandrels
- 3 Customer made die
- 4 Die plate (table)
- 5 Die plate only requires two holes for 3Refix mandrels

### Procedure (always)

- A Tighten R0 (primary)
- B Tighten R1 (secondary)

### Positioning accuracy

Improved positional accuracy.  
Closer tolerances for finer grains.

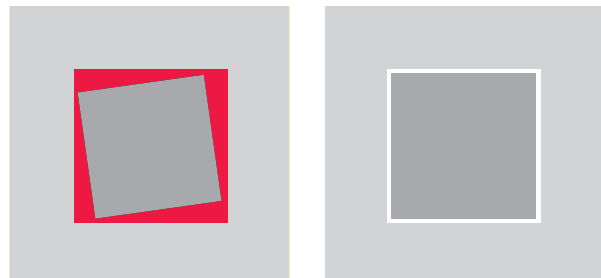


Conventional setting-up

Setting-up with System 3R

### Angular accuracy

Smaller angular deviations  
Less wear and damage to punch and die.

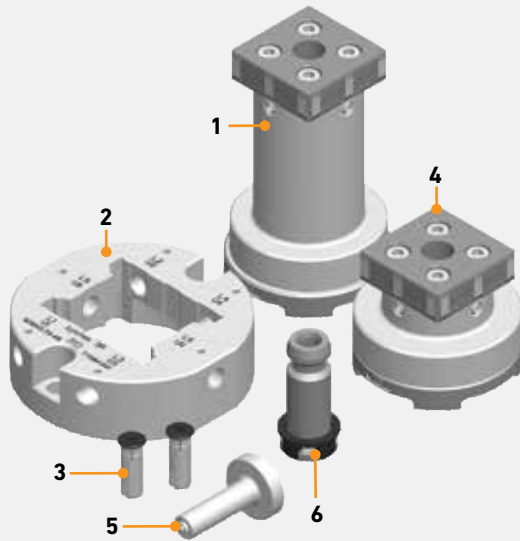


Conventional setting-up

Setting-up with System 3R

# Tooling Technology

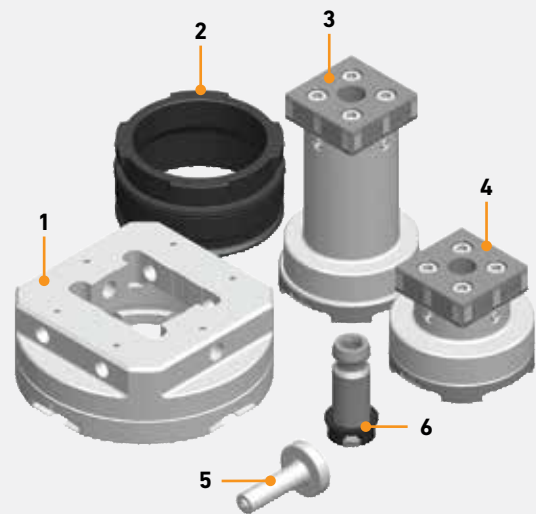
## For Single-level press, 3Refix



- 1 Lower punch (Macro)
- 2 Die pallet to hold dial indicators
- 3 3Refix Ø10 mm
- 4 Upper punch (Macro)
- 5 Pre-set tool
- 6 Drawbar (Macro)

Note: Dial indicators are optional.

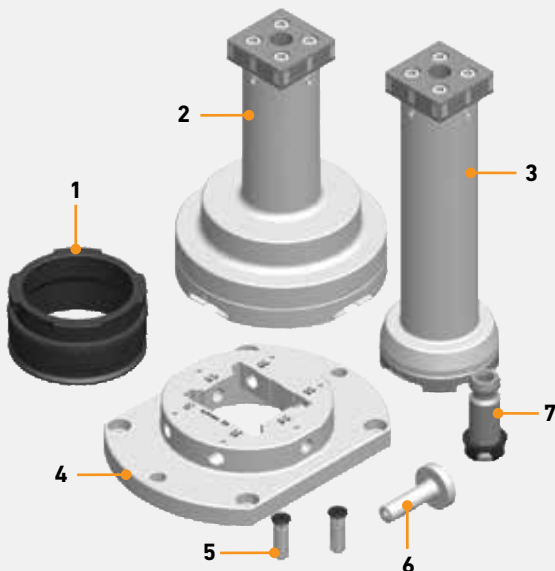
## For Single-level press, Matrix 142



- 1 Die pallet to hold dial indicators (Matrix 142)
- 2 Drawbar (Matrix 142)
- 3 Lower punch (Macro)
- 4 Upper punch (Macro)
- 5 Pre-set tool
- 6 Drawbar (Macro)

Note: Dial indicators are optional.

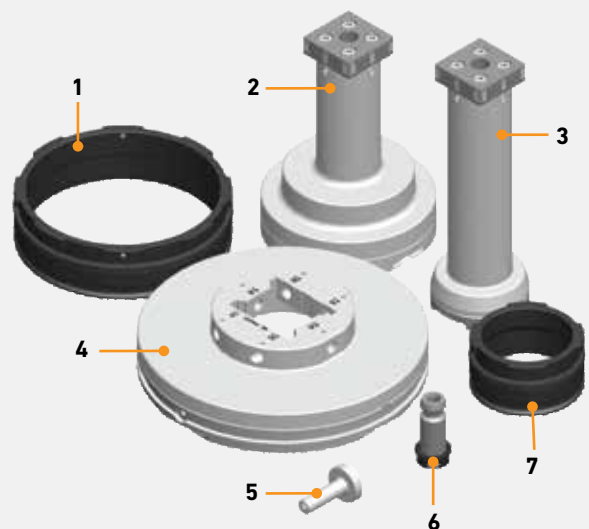
## For Multi-level press, 3Refix



- 1 Drawbar (Matrix 142)
- 2 Outer punch (Matrix 142)
- 3 Inner punch (Macro)
- 4 Die pallet to hold dial indicators
- 5 3Refix Ø10 mm
- 6 Pre-set tool
- 7 Drawbar (Macro)

Note: Dial indicators are optional.

## For Multi-level press, Matrix220



- 1 Drawbar (Matrix 220)
- 2 Outer punch (Matrix 142)
- 3 Inner punch (Macro)
- 4 Die pallet to hold dial indicators (Matrix 220)
- 5 Pre-set tool
- 6 Drawbar (Macro)
- 7 Drawbar (Matrix 142)

Note: Dial indicators are optional.

# VDP (Vibration-Damped Palletisation)

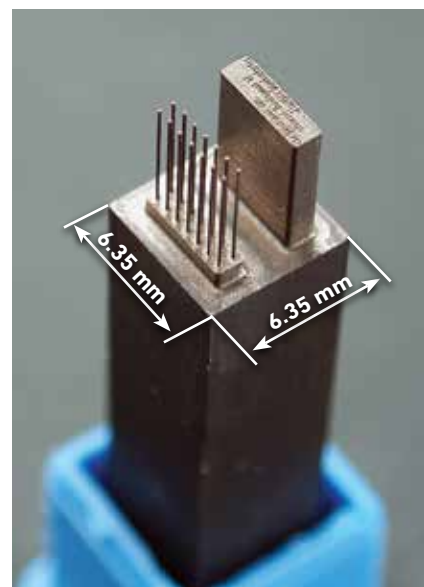
- + improve your surface finish.
- + reduces cutting forces by up to 25%. Lower cutting forces gives lower power consumption and less tool wear.
- + lengthens tool life tool wear by up to 30%, giving lower tool costs.
- + lengthens the life of the machine spindle. Less vibration in the machine spindle extends the life of the spindle by at least 30%.
- + gives shorter lead times. VDP allows machining with higher cutting data – better utilisation of the existing machine capacity. A 30% capacity increase is within your reach.

With conventional chucks, vibrations of the workpiece caused by the dynamic forces due to the action and rotation of the cutting tool. Restrictions therefore have to be imposed on the rotation speed and feed rate of the cutting tool, to prevent instability and to achieve the necessary surface quality.

## Advantages of a damped chuck

After intensive research into the dynamics of chuck systems, machine tool maker System 3R has developed and patented a chuck with vibration-damped palletisation (VDP). By reducing the vibrations of the workpiece and a considerable proportion of the vibrations of the cutting tool, the VDP technology improves the dynamics of the entire metal cutting process. This means that machine tools can be operated at higher speeds with greater accuracy and at the same time with less wear. Workpieces can usually be produced in a single operation within strict dimensional tolerances and with a surface quality in the micrometer range – a millionth of a metre.

- + Better surface finish reduces the need for finishing.
- + Higher material removal rate improves productivity.
- + Less tool wear extends the life of the cutting tools.
- + Less vibration in the machine spindle.
- + Better dimensional accuracy gives fewer rejects.
- + Greater scope for machining difficult materials and complex shapes.
- + Shorter lead times thanks to a higher material removal rate.
- + Lower noise level during machining.



### Example Micro Milling:

VDP advantages: The electrode Aspect Ratio (L/ Ø) was doubled with VDP.

Dimensions: Ø 0.134 mm, length 4.8 mm

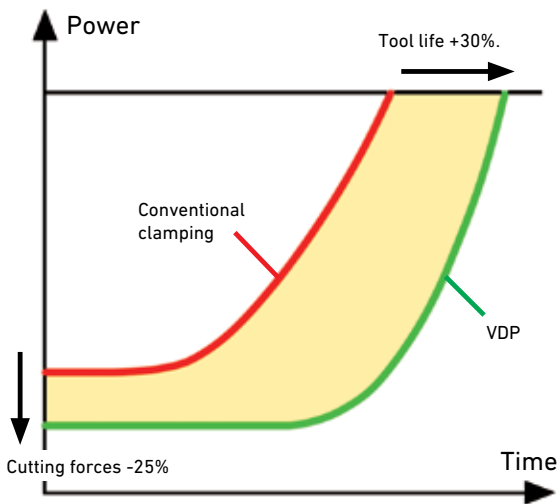
# Increase your capacity with > +30%



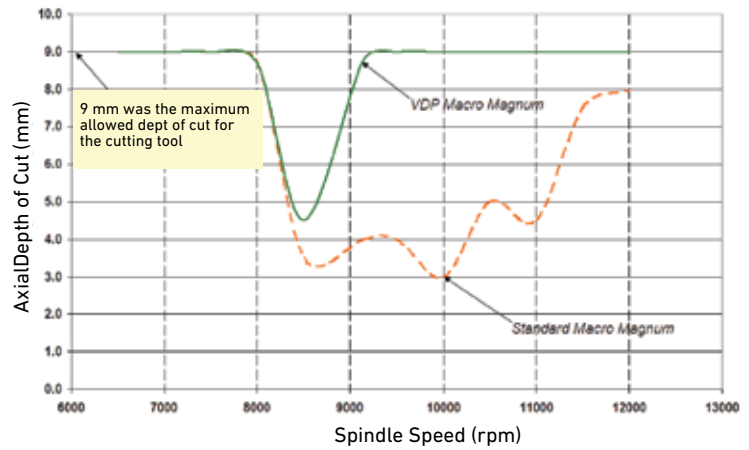
**WITH**



**WITHOUT**



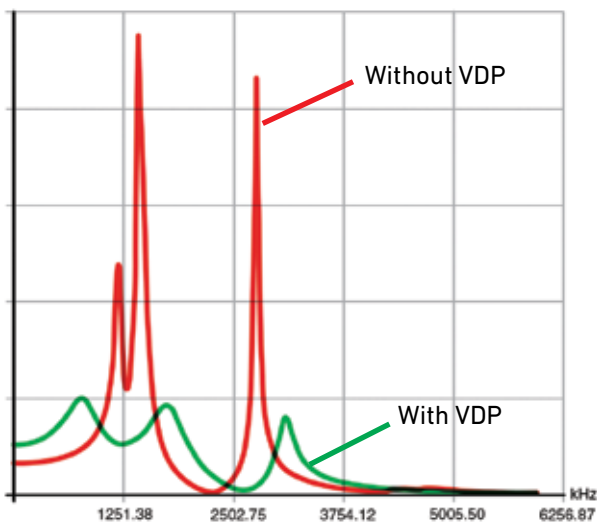
Less tool wear extends the life of the tools = increased revenue.



### Process Stability Analysis (Swiss machine tool manufacturer)

Cutting Speed (RPM)	Axial Depth of Cut (mm)		Increase in removal rate due to VDP (%)
	Magnum Std	Magnum VDP	
8500	3.5	4.5	28.6
9000	4.0	9.0*	125
10000	3.0	9.0*	200

Depth of cut is limited by the cutting tool used for the tests and not by the VDP.



The diagram shows the effect on the oscillation amplitude when machining with the workpiece clamped conventionally and in a damped chuck.

# Automation

## Utilise every hour of the day and night!

An automatic production cell can generate revenue round the clock, seven days a week. Why be satisfied with 40 productive machine-hours a week when the same machine can achieve over 100 additional hours a week? Use every hour of the day and night for production!

WorkPal 1, WorkPartner 1+ and Transformer 6-axis robot - three "aces" which boost your productivity and sharpen your competitiveness.

And not least – they bring faster payback on the investments you made.



WorkPal 1

– modest demands, major benefits



WorkPartner 1+

– can serve two machines



Automation – with 6-axis industrial robot

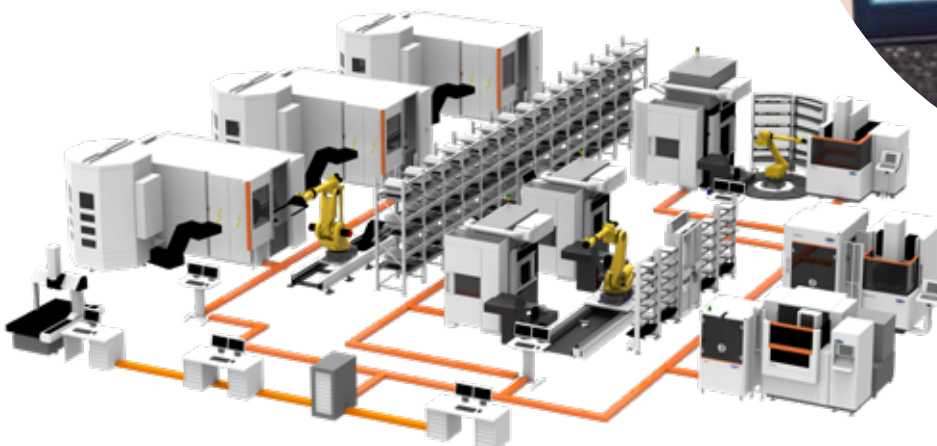
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# WSM – WorkShopManager

## User-friendly Cell Management Software

Master workshop complexity and manage all control processes with our software. For manually controlled and automated processes.

- + Simplify the preparation of jobs
- + Easily execute the jobs in manual or automated machines
- + Monitor the process, change priorities and get utilization statistics
- + ID chip management to ensure highest process security.





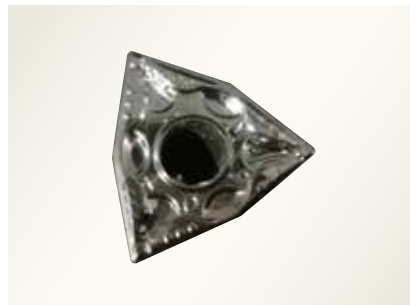
# Productivity in effect

- + Simple, quick set-up
- + High accuracy
- + Low scrap rate
- + Maximal machine utilization
- + Increased productivity



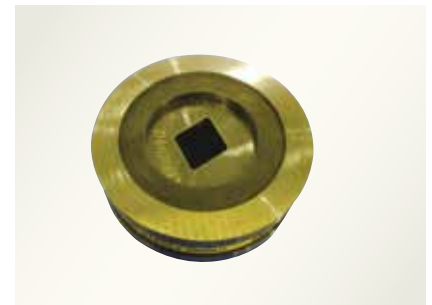
## Punch Electrode

Materials: Tungsten copper carbide  
Accuracy:  $\pm 2 \mu\text{m}$   
Surface quality: Ra 0.06  $\mu\text{m}$



## Punch of carbide inserts

Materials: Cemented Carbide  
Accuracy:  $\pm 2 \mu\text{m}$   
Surface quality: Ra 0.2  $\mu\text{m}$



## Die of carbide inserts

Materials: Cemented Carbide  
Accuracy:  $\pm 2 \mu\text{m}$   
Surface quality: Ra 0.1  $\mu\text{m}$



Powder Compacting Technology  
– Produced details

## About GF Machining Solutions

# Multi-technology solutions provider

Our commitment to you and your specific applications is proven by the value-adding intelligence, productivity and quality delivered by our multi-technology solutions. Your success is our chief motivator. That's why we are continuously advancing our legendary technical expertise. Wherever you are, whatever your market segment and whatever the size of your operation, we have the complete solutions and the customer-centric commitment to accelerate your success—today.

### EDM (Electrical Discharge Machining)



#### Wire-cutting EDM

GF Machining Solutions' wire-cutting EDM is fast, precise and increasingly energy efficient. From ultraprecise machining of miniaturized components down to 0.02 mm to powerful solutions for demanding high-speed machining with respect to surface accuracy, our wire EDM solutions position you for success.

#### Die-sinking EDM

GF Machining Solutions is revolutionizing die-sinking EDM with features like iGAP technology to dramatically boost machining speed and reduce electrode wear. All of our die-sinking systems offer fast removal and deliver mirror finishes of Ra 0.1 µm (4 µin).

#### Hole-drilling EDM

GF Machining Solutions' robust hole-drilling EDM solutions enable you to drill holes in electrically conductive materials at a very high speed—and, with a five-axis configuration, at any angle on a workpiece with an inclined surface.

### Tooling and Automation



#### Tooling

Our customers experience complete autonomy while maintaining extreme accuracy, thanks to our highly accurate System 3R reference systems for holding and positioning electrodes and work pieces. All types of machines can easily be linked, which reduces set-up times and enables a seamless transfer of workpieces between different operations.

#### Automation

Together with System 3R, we also provide scalable and cost-effective Automation solutions for simple, single machine cells or complex, multi-process cells, tailored to your needs.

### Milling



#### Milling

Precision tool and mold manufacturers enjoy a competitive edge with our Mikron MILL S solutions' fast and precise machining. The Mikron MILL P machines achieve above-average productivity thanks to their high performance and Automation. Customers seeking fastest return on investment benefit from the affordable efficiency of our MILL E solutions.

#### High Performance Airfoil Machining

Our Liechti turnkey solutions enable the highly dynamic manufacturing of precision airfoils. Thanks to the unique performance and our expertise in airfoil machining, you increase productivity by producing at the lowest cost per part.

#### Spindles

As part of GF Machining Solutions, Step-Tec is engaged in the very first stage of each machining center development project. Compact design combined with excellent thermal and geometric repeatability ensure the perfect integration of this core component into the machine tool.

### Software



#### Digitalization solutions

To drive its digital transformation, GF Machining Solutions acquired symmedia GmbH, a company specialized in software for machine connectivity. Together, we offer a complete range of Industry 4.0 solutions across all industries. The future requires the agility to adapt quickly to continual digital processes. Our intelligent manufacturing offers embedded expertise, optimized production processes, and workshop Automation: solutions for smart and connected machines.

### Advanced manufacturing



#### Laser texturing

Aesthetic and functional texturing is easy and infinitely repeatable with our digitized Laser technology. Even complex 3D geometries, including precision parts, are textured, engraved, microstructured, marked and labeled.

#### Laser micromachining

GF Machining Solutions offers the industry's most complete line of Laser micromachining platforms optimized for small, high-precision features to meet the increasing need for smaller, smarter parts to support today's leading-edge products.

#### Laser Additive Manufacturing (AM)

GF Machining Solutions and 3D Systems, a leading global provider of additive manufacturing solutions and the pioneer of 3D printing, have partnered to introduce new metal 3D printing solutions that enable manufacturers to produce complex metal parts more efficiently.

### Customer Services



#### Worldwide for you

Ensuring the best performance throughout the lifetime of our customers' equipment is the goal of our three levels of support. Operations Support offers the complete range of original wear parts and certified consumables. Machine Support includes spare parts, technical support, and a range of preventive services to maximize machine uptime. Business Support offers customer-specific business solutions.



## Switzerland

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Biel/Bienne  
Losone  
Geneva  
Flawil  
Langnau

[www.gfms.com](http://www.gfms.com)  
[www.gfms.com/ch](http://www.gfms.com/ch)

## Europe

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Germany, Schorndorf  
[www.gfms.com/de](http://www.gfms.com/de)

United Kingdom, Coventry  
[www.gfms.com/uk](http://www.gfms.com/uk)

Italy, Agrate Brianza - MI  
[www.gfms.com/it](http://www.gfms.com/it)

Spain, Sant Boi de Llobregat  
Barcelona  
[www.gfms.com/es](http://www.gfms.com/es)

France, Palaiseau  
[www.gfms.com/fr](http://www.gfms.com/fr)

Poland, Raszyn / Warsaw  
[www.gfms.com/pl](http://www.gfms.com/pl)

Czech Republic, Brno  
[www.gfms.com/cz](http://www.gfms.com/cz)

Sweden, Vällingby  
[www.gfms.com/system3r](http://www.gfms.com/system3r)

Turkey, Istanbul  
[www.gfms.com/tr](http://www.gfms.com/tr)

## Americas

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USA  
Lincolnshire, IL  
Chicago, IL  
Holliston, MA  
Huntersville, NC  
Irvine, CA  
Woodridge, IL  
[www.gfms.com/us](http://www.gfms.com/us)

Canada, Mississauga ON  
[www.gfms.com/us](http://www.gfms.com/us)

Mexico, Monterrey NL  
[www.gfms.com/us](http://www.gfms.com/us)

Brazil, São Paulo  
[www.gfms.com/br](http://www.gfms.com/br)

## Asia

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China  
Beijing, Shanghai,  
Chengdu, Dongguan,  
Hong Kong, Changzhou  
[www.gfms.com/cn](http://www.gfms.com/cn)

India, Bangalore  
[www.gfms.com/sg](http://www.gfms.com/sg)

Japan  
Tokyo, Yokohama  
[www.gfms.com/jp](http://www.gfms.com/jp)

Korea, Seoul  
[www.gfms.com/kr](http://www.gfms.com/kr)

Malaysia, Petaling Jaya  
[www.gfms.com/sg](http://www.gfms.com/sg)

Singapore, Singapore  
[www.gfms.com/sg](http://www.gfms.com/sg)

Taiwan  
Taipei, Taichung  
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