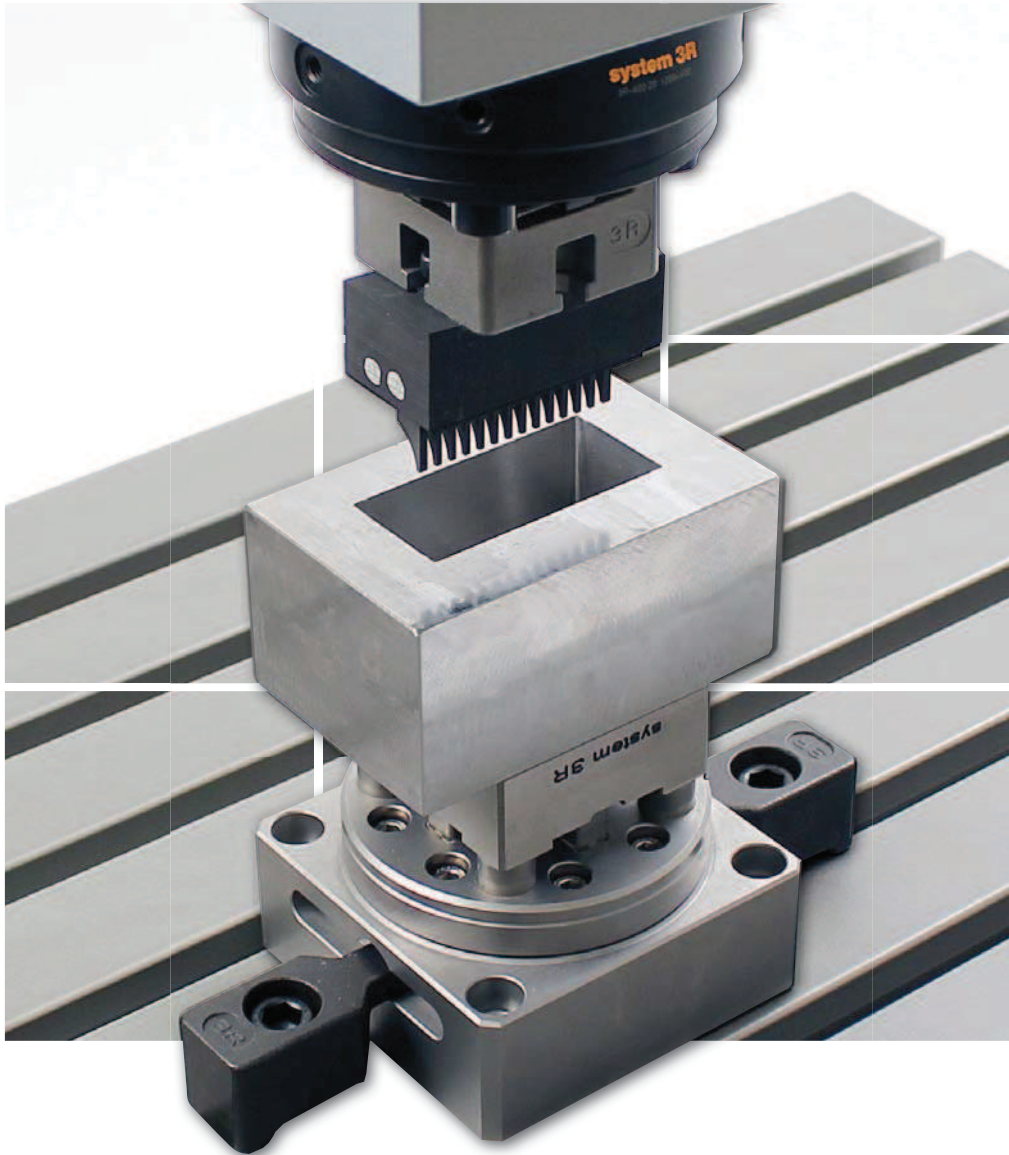# Reference systems for electrode manufacturing & EDMing

Conventional setting-up

Machining time

| Job 1 | Job 2 | Job 3 | Job 4 |

Idle time

One manned shift – eight hours

Pallet system

| Job 1 | Job 2 | Job 3 | Job 4 | Job 5 | Job 6 |

One manned shift – eight hours
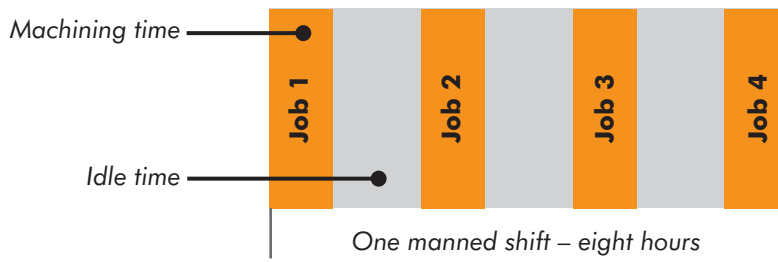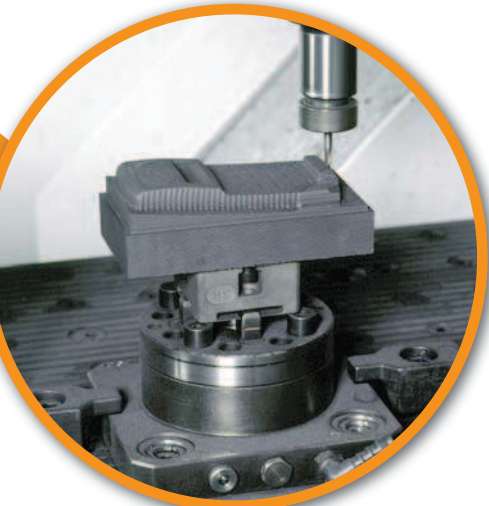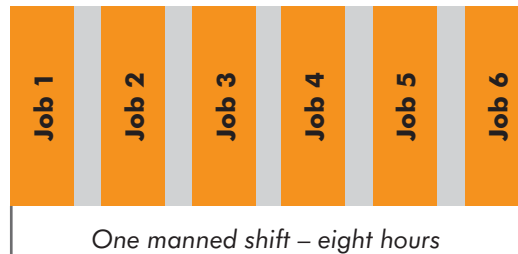
Higher productivity, calculation example:

	Conventional setting-up	Pallet system
Working time per day	8	8
Setting-up time per day (hours)	-4	-0.5
Spindle time per day	=4	=7.5
Working days per week	x5	x5
Spindle time per week	= 20	=37.5

Faster payback, calculation example:

	Conventional setting-up	Pallet system
Hourly invoicing (€)	50	50
Spindle time / week (hours)	x20	x37.5
Revenue / week (€)	=1 000	=1 875
Capital cost of machine (€)	150 000	150 000
Capital cost pallet system (€)	0	+10 000
Total capital outlay (€)	=150 000	=160 000
Paybacktime (weeks)	150	85

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.
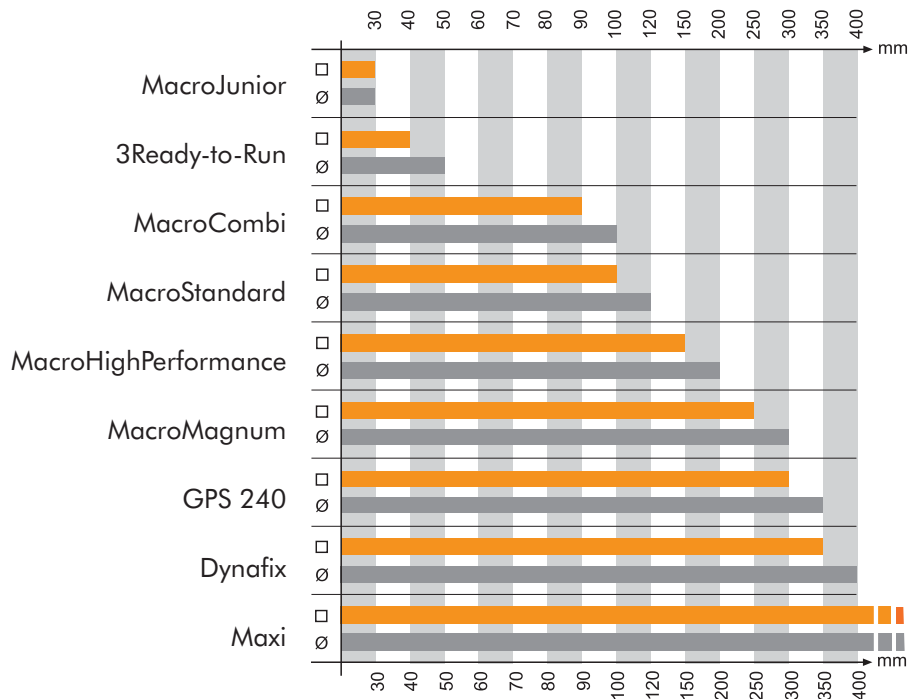
From small to large

The engineering industry is complex. Every company is unique in terms of type of production, machinery, capacity etc.

To satisfy all these different requirements, System 3R has developed reference systems of exceptional flexibility.
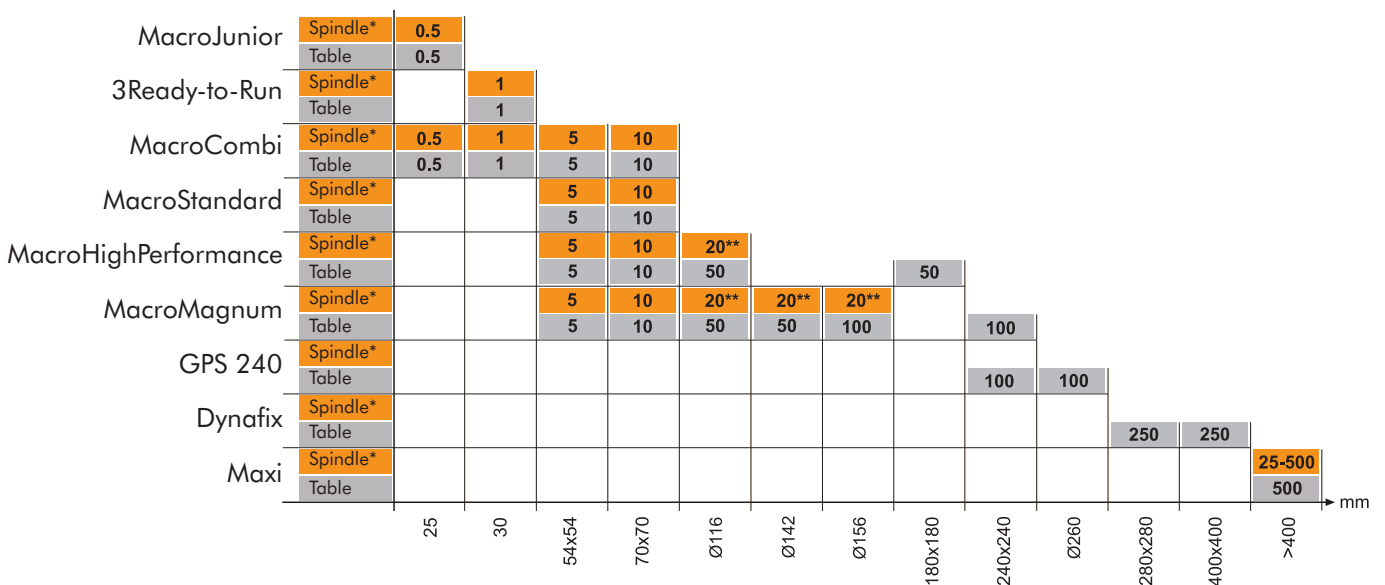
For every size of pallet there is a "recommended" maximum workpiece size. However, this should only be regarded as a guide, since the size of the workpiece relative to the pallet depends above all on the material and the type of machining.

Maximum size of workpiece or electrode, square or round / mm

	□ / ø	30	40	50	60	70	80	90	100	120	150	200	250	300	350	400
MacroJunior	□	30														
	ø	30														
3Ready-to-Run	□		40													
	ø			50												
MacroCombi	□							90								
	ø								100							
MacroStandard	□								100							
	ø									120						
MacroHighPerformance	□										150					
	ø											200				
MacroMagnum	□												250			
	ø													300		
GPS 240	□													300		
	ø														350	
Dynafix	□														350	
	ø															400
Maxi	□															>400
	ø															>400

Maximum weight of workpiece or electrode, spindle chuck or table chuck / kg

		25	30	54x54	70x70	Ø116	Ø142	Ø156	180x180	240x240	Ø260	280x280	400x400	>400
MacroJunior	Spindle*	0.5												
	Table	0.5												
3Ready-to-Run	Spindle*		1											
	Table		1											
MacroCombi	Spindle*	0.5	1	5	10									
	Table	0.5	1	5	10									
MacroStandard	Spindle*			5	10									
	Table			5	10									
MacroHighPerformance	Spindle*			5	10	20**								
	Table			5	10	50			50					
MacroMagnum	Spindle*			5	10	20**	20**	20**						
	Table			5	10	50	50	100		100				
GPS 240	Spindle*													
	Table									100	100			
Dynafix	Spindle*													
	Table											250	250	
Maxi	Spindle*													25-500
	Table													500

* Die-sinking EDM spindle   ** With automatic changing

MacroNano

… 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.

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.

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

- Repetition accuracy – within 0,001 mm
- Locking force – 6000 N
- Fixed index positions 4x90°
- Required air pressure, pneumatic chuck – 6±1 bar
- Recommended max workpiece weight – 50 kg.

Workpiece/ electrode

Pallet/holder

Drawbar

Table chuck

50
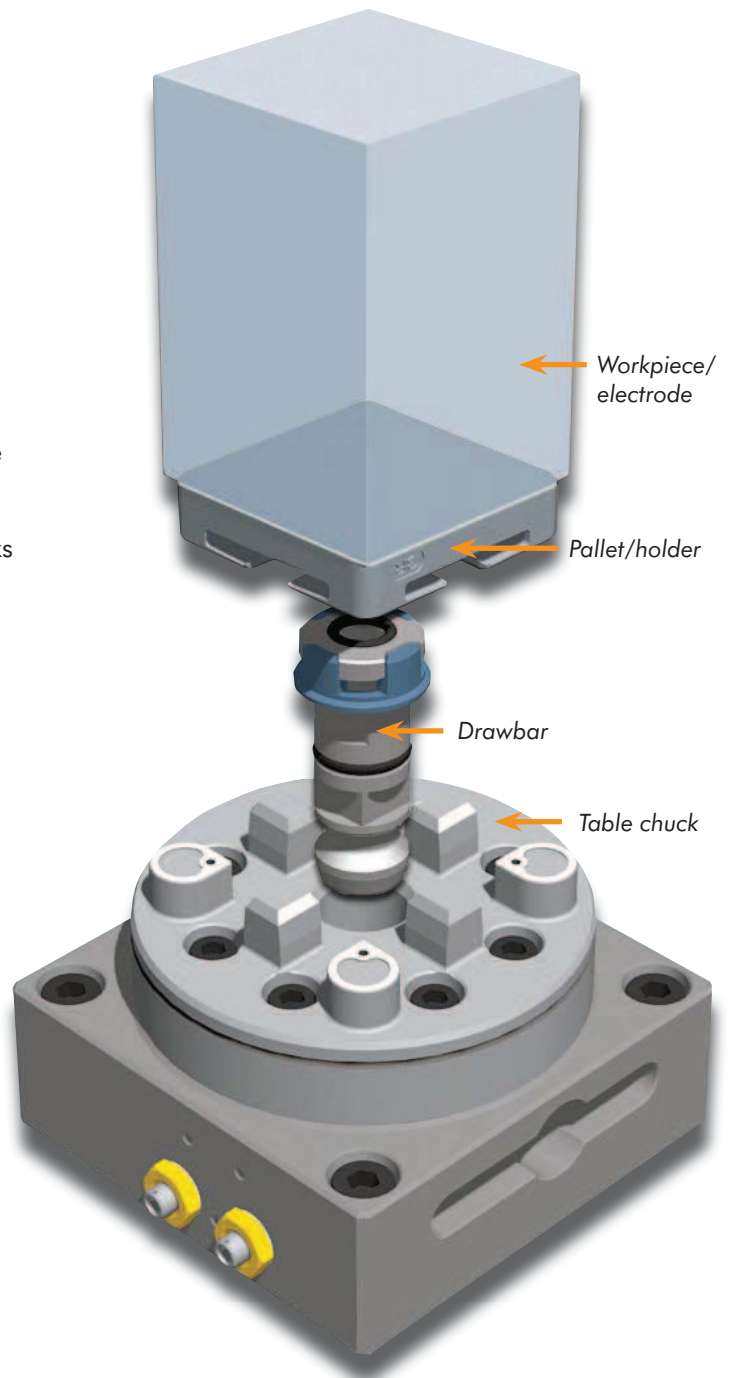
MacroNano

Application example: Microstructuring with Diamond Machining

Micro features produced with nano precision
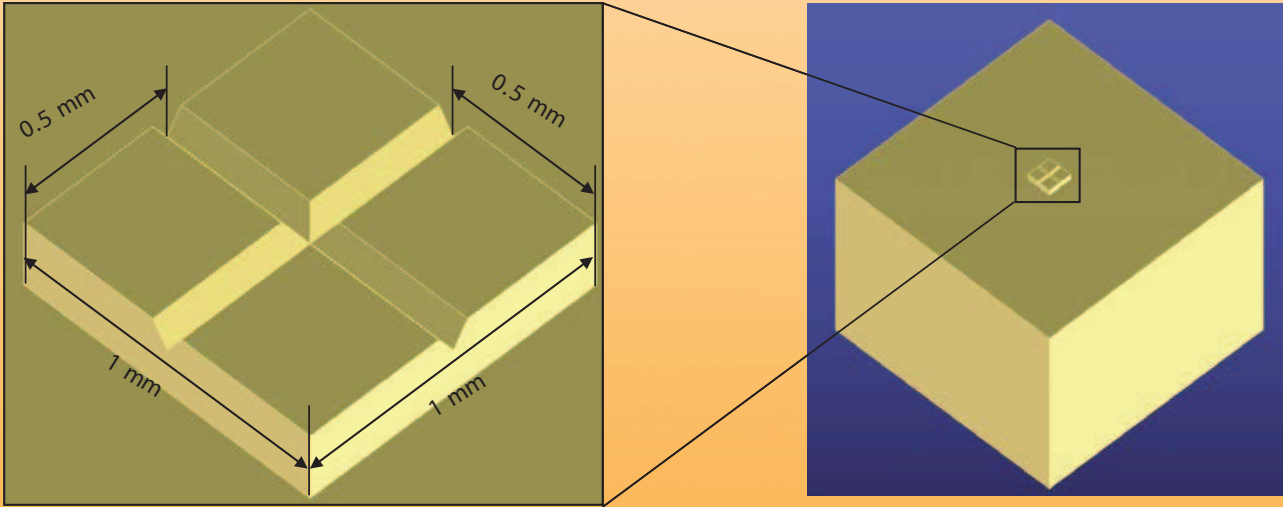
This micro structure is produced by Diamond Flycutting operations on two different machines, each equipped with a MacroNano chuck. The square in the middle of the workpiece (right picture) is produced by plane milling on 1st machine, making use of indexing feature of the MacroNano system. The pallet 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.
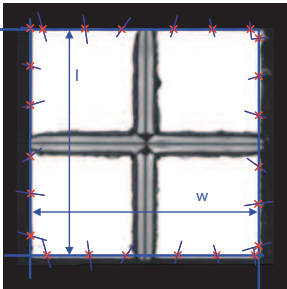
Measurement of the cube dimensions
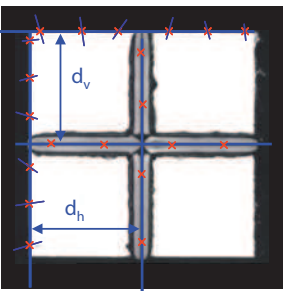
Measurement of groove positions

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
W	**0,9996**	**l**	**0,9999**	**d_v**	**0,4997**	**d_h**	**0,5004**

Mean values

Overall structure deviation < 0,5 μm
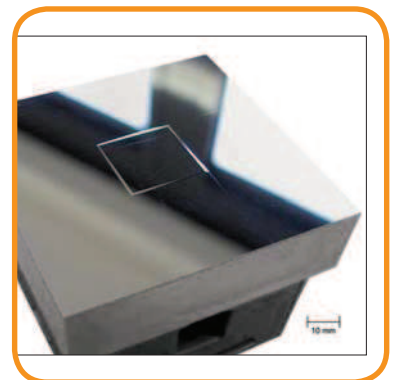
MacroNano – Chucks, Pallets & Accessories

3R-651.7E-N   3R-651.75E-N   3R-651E-N   3R-601.1E-N   3R-606-N   3R-606.1-N

3R-605.1

3R-600.10-3N   3R-600.84-3N   3R-600.86-3N   3R-610.46-3N
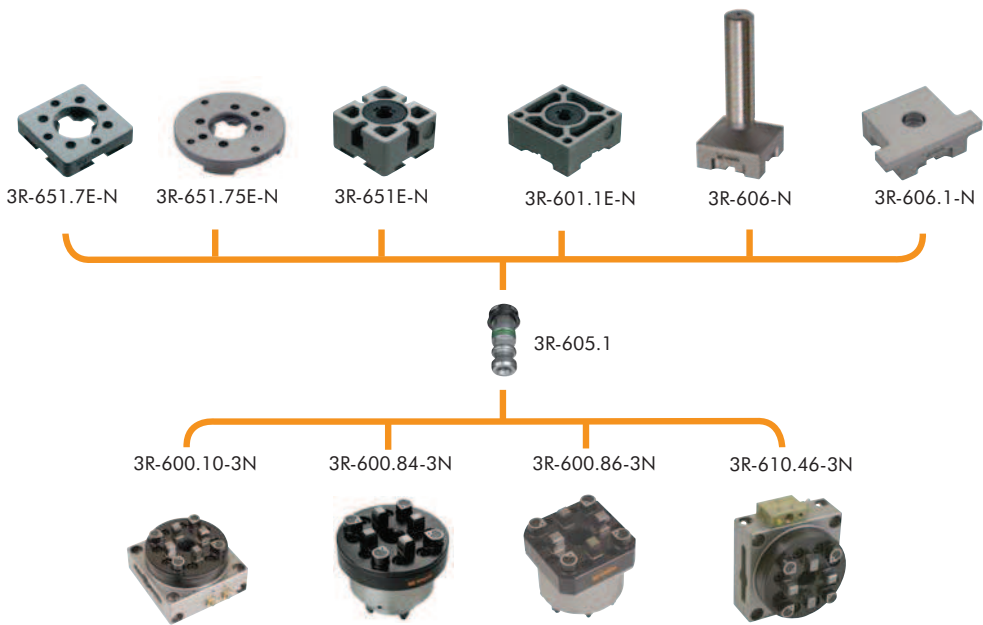
Pneumatic table chuck, MacroNano
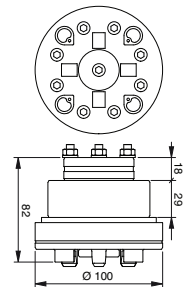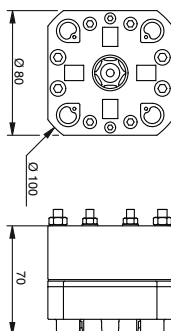## 3R-600.10-3N

Chuck for mounting on the machine table.
- Fixed index positions 4x90°
- Required air pressure, pneumatic chuck – 6±1 bar
- References of cemented carbide
- Required drawbar 3R-605.1
- Air-blast cleaning of Z-references
- Turbo locking
- Weight 4.4 kg.

70

110 (x2)
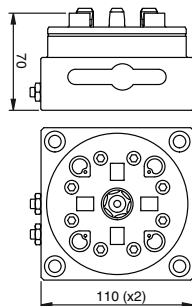
Pneumatic chuck, MacroNano
3R-600.84-3N

Chuck for building-in, for example in a fixture, dividing head or B-axis.
- Fixed index positions 4x90°
- Required air pressure, pneumatic chuck – 6±1 bar
- References of cemented carbide
- Required drawbar 3R-605.1
- Air-blast cleaning of Z-references
- Turbo locking
- Weight 1.8 kg.

18
29
82
Ø 100

Pneumatic chuck, MacroNano
3R-600.86-3N

Chuck for builing-in, for example in a fixture.
- Fixed index positions 4x90°
- Required air pressure, pneumatic chuck – 6±1 bar
- References of cemented carbide
- Required drawbar 3R-605.1
- Air-blast cleaning of Z-references
- Turbo locking
- Weight 1.8 kg.

Ø 80
Ø 100
70

Pneumatic table chuck, MacroNano
3R-610.46-3N

Chuck for mounting on the machine table with integral air unit. For horisontal and vertical use.
- Fixed index positions 4x90°
- Required air pressure, pneumatic chuck – 6±1 bar
- References of cemented carbide
- Required drawbar 3R-605.1
- Air-blast cleaning of Z-references
- Turbo locking
- Weight 4.4 kg.

70

110 (x2)
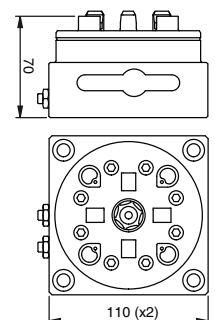
MacroNano – Pallets & Accessories

Pallet 54x54 mm, MacroNano
3R-651.7E-N

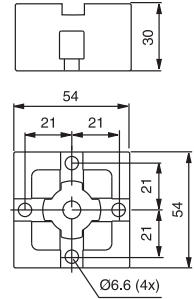Hardened and precision-cast, with clearance holes for four fixing screws.
- Fixed index positions 4x90°
- Adapted for automatic changing
- Parallel-ground top and bottom face
- Rust resistant
- Supplied in sets of 8 pcs.
- Weight per set 1.2 kg.
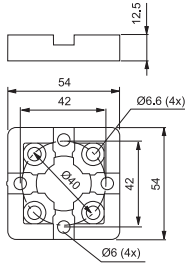
Pallet 54x54 mm, MacroNano
3R-651E-N

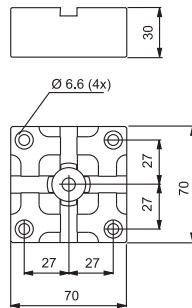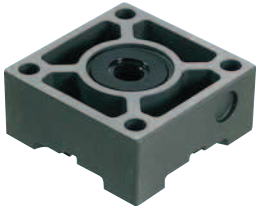Hardened with clearance holes for four fixing screws.
- Fixed index positions 4x90°
- Adapted for automatic changing
- Ready for code carrier
- Rust resistant
- Supplied in sets of 8 pcs.
- Weight per set 3.4 kg.

Pallet 70x70 mm, MacroNano
3R-601.1E-N

Hardened with clearance holes for four fixing screws.
- Fixed index positions 4x90°
- Adapted for automatic changing
- Ready for code carrier
- Rust resistant
- Supplied in sets of 5 pcs.
- Weight per set 3.6 kg.

Pallet dia. 75 mm, MacroNano
3R-651.75E-N

Hardened and milled with clearance holes for eight fixing screws.
- Fixed index positions 4x90°
- Parallel-ground top and bottom faces
- Adapted for automatic changing
- Rust resistant
- Supplied in sets of 10 pcs.
- Weight per set 2.7 kg.
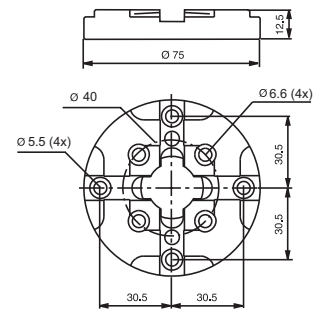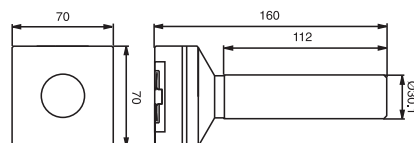
Drawbar
3R-605.1E

- Ø20x57.1 mm with flushing holes Ø7 mm.
- Supplied in sets of 10 pcs.

Check mandrel, MacroNano
3R-606-N

Check mandrel with ground C-reference for setting Macro chucks.
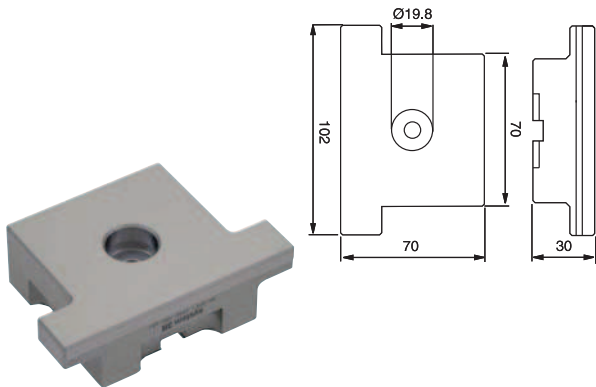- Measuring length 110 mm.
- Weight 2.3 kg.

MacroNano – Accessories

Check ruler, MacroNano
3R-606.1-N

For setting angular positions and for centring Macro chucks.
- Measuring length 100 mm.
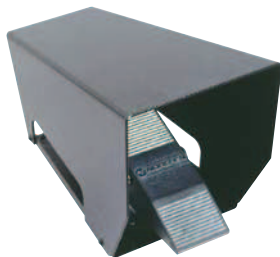- Weight 1.4 kg.

Locking ring key
3R-605-GE

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

Air unit
3R-611.2

Foot operation of pneumatic chucks.

Air unit
3R-611.4

Unit for operation of pneumatic chucks. Two functions, opened/closed.

Code carriers
3R-863.01-10

With pre-programmed unique identity, designed for use on pallets.
- Supplied in sets of 10