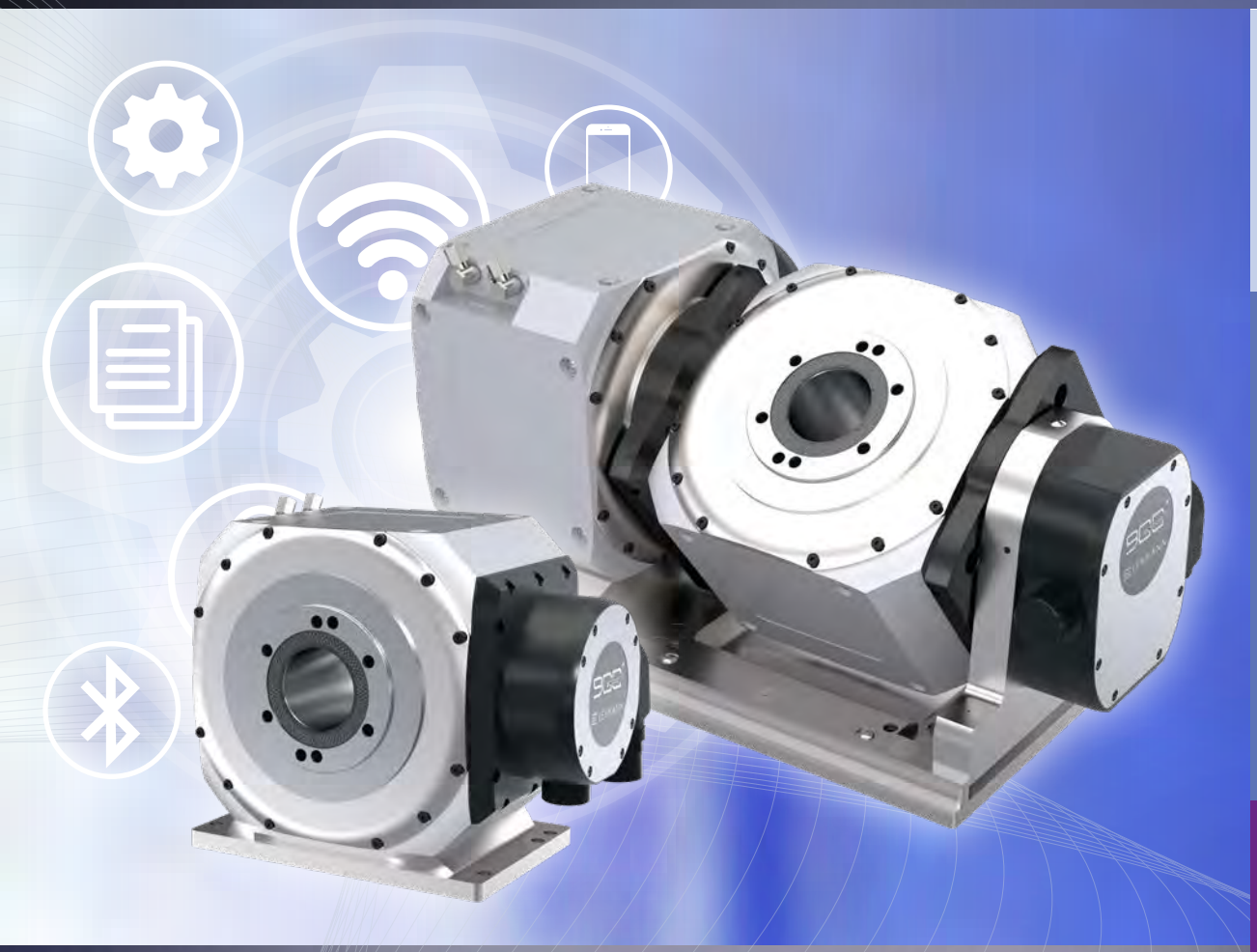
900

Direct drive for real high-speed applications



DD
Series
Direct
Drive

2024

Main catalog

6/2024 | EN

Applications for millturn, power skiving, high-performance grinding, 5-axis simultaneous machining

LEHMANN®

Swiss precision technology

Since 1974

pL LEHMANN s a medium-sized business that has specialized in rotary tables for over 40 years:

1960 Founding – Contract manufacturing
1973 Conversion into a stock corporation
1974 Introduction of numerically controlled rotary tables (HUST)
1980 Construction of new factory building
1986 Development of the 400 series
1988 2nd generation joins management
1997 Construction of new assembly building
2000 Development of the 800 series (DD up to 10,000 rpm)
2002 2nd generation assumes management responsibility
2003 Development of the 700 series (DD up to 800 rpm)
2008 Addition of office building
2010 Development of the 500 series
2011 Start of internationalization / lean production
2013 Development of the high-speed version of the 500 series
2016 Expansion of factory building
2019 Introduction of AM-LOCK and the 900 DD series
2021 New MQ series for measurement technology
2022 New P-Line for simple positioning tasks

Today, pL LEHMANN is still an owner-managed family-owned company present in over 20 countries (see back page of this catalog or visit www.lehmann-rotary-tables.com).

The company is committed to typical Swiss values
- Product quality
- Superior technology
- Innovation and flexibility
- Long-term, sound business policies

For more, see www.lehmann-rotary-tables.com.

* Sales and service partners trained and equipped by pL (VAR – value added resellers or VAP - value added partners)

Additional pL products

Machine tools

Main catalog – Series 500

P-Line

Measurement technology

Q-Line: EA-Q08

Q-Line: MA-Q08

Automation

ROTOMATION

Additives

AM-LOCK

«Whoever wishes to invest in tomorrow's way of production must consider the needs and opportunities available today.»

CNC rotary tables for economic production: pL LEHMANN offers tailor-made and efficient and solutions for practically every sector – plus 10 years of experience in direct drives


Automobile & Mobility

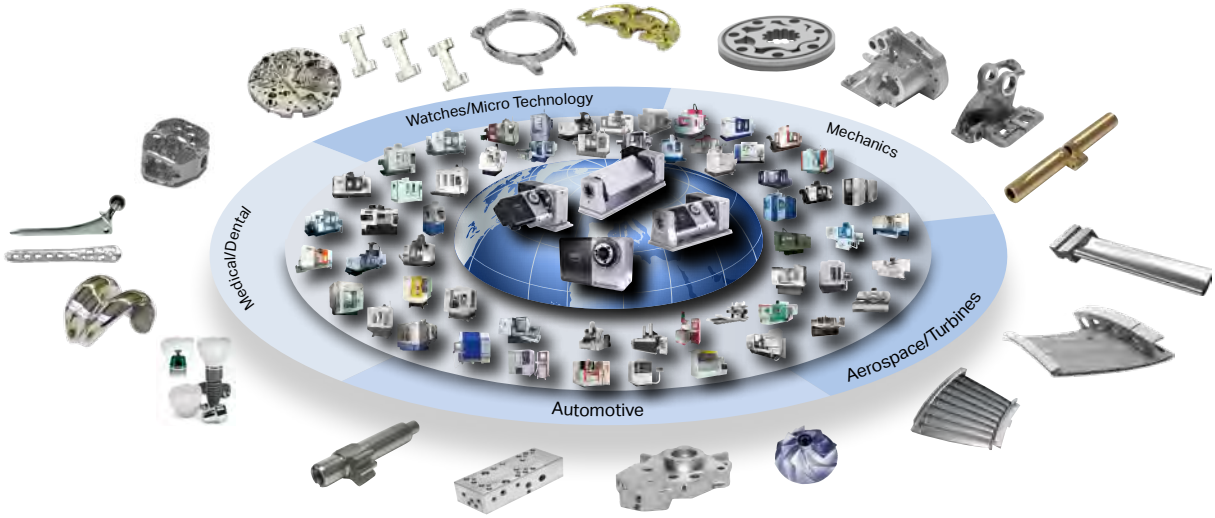

Medical & dental


Micromechanical parts & watches


Aircraft & turbines


Machinery & tools


Components & systems



pL rotary tables in use: on over **200** different machine brands and over **1,000** different machine models.

pL expertise for DD: integrations realized for the most commonly used CNC controllers from **Fanuc, Siemens, Heidenhain and Mitsubishi.**

up to max. 3'300 rpm

High-speed DD

Integrated electronics for plug & play

Quick installed

Monitoring for operation & service

Connectivity

EA-Series

Not yet available; inquire at the factory

T1-Series

DD/DD

DD/PGD

Adaptability

Multifunctional spindle system

Precision

At the workpiece up to 2 µm / 100 mm

High duty time

By default for ED40%, 10 min

High value retention: adjustable at any time, benefits of geared and direct drive can be combined

EA-91x

TAP9

TAP9v

Highest level of flexibility

unique

- Rotary table is available quickly and can be converted at any time
- If needs change, the investment is not lost
- Pay in installments: First the machine, later the rotary table – can be retrofitted at any time (suitable CNC controller required)

Standard machine in stock, available at short notice, equipped with matching rotary table

Diversity of products

unique

- Wide range of applications for each size
- Lower storage costs, also in service (spare parts)
- Increased sales and service productivity

TAP5

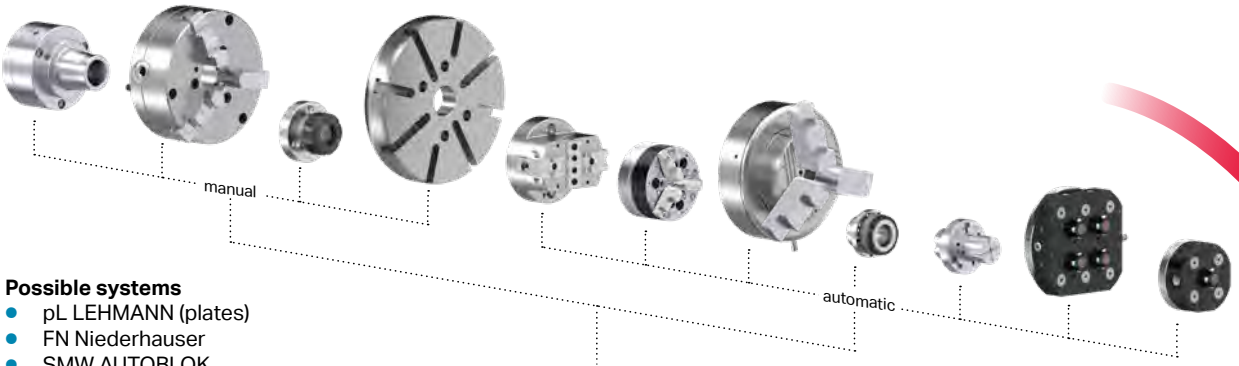
With gear unit rotary table as swiveling / tilting axis

TAP5v

With gear unit rotary table as swiveling / tilting axis

From manual clamping tools for single item production through to fully automated systems

Plates, force clamp and jaw chucks, collet chucks



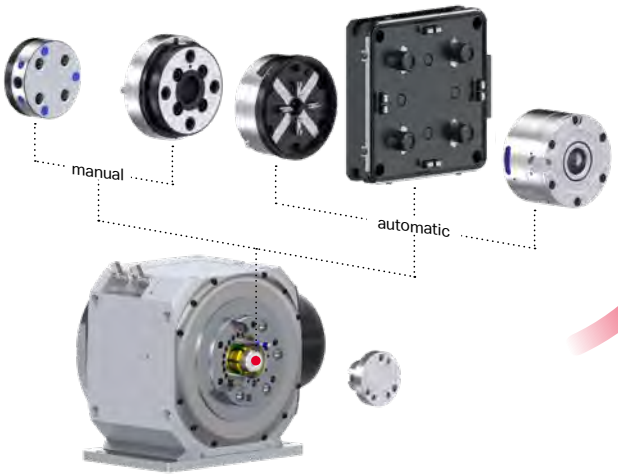
Possible systems
- pL LEHMANN (plates)
- FN Niederhauser
- SMW AUTOBLOK
- SwissChuck
- Hainbuch
- Erowa
- TG Colin
- YERLY
- ...

Automatable: with rotary unions and collet chuck / release cylinder

Centric clamping unit

Possible systems
- SCHUNK
- LANG
- Gressel
- Piranha Clamp
- EVARD
- TRIAG
- ...

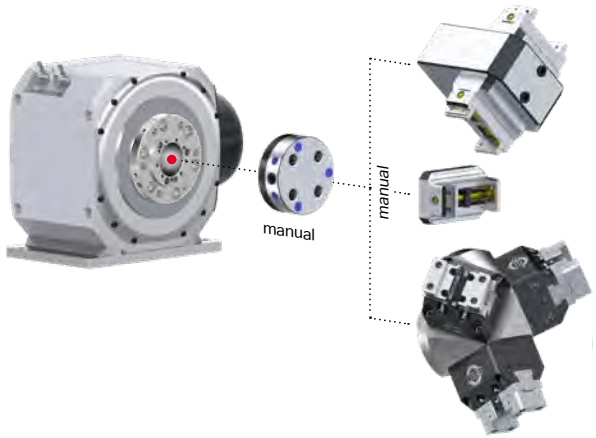
Zero point clamping systems



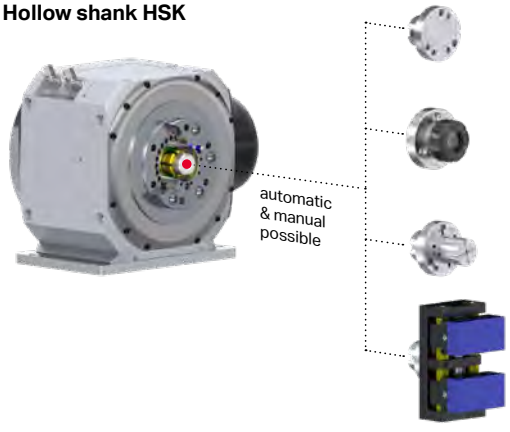
Possible systems
- pL LEHMANN (ripas & CAPTO)
- Erowa
- System 3R
- Parotec
- Roemheld
- AMF
- SCHUNK
- LANG
- GRESSEL
- ...

Centric clamping unit for workpiece handling, mounted zero point clamping system for quick vise replacement

Combination possibilities



Hollow shank HSK



Extremely wide assortment for workpiece clamping. Standardized interface in front and rear: Maximum universality

Tap or medium interface

Overview & Facts
System & smartBox
Rotary tables
KAB, WDF, CNC, WMS
AGG, DDF, RST, LOZ
Service & Technology
Tooling

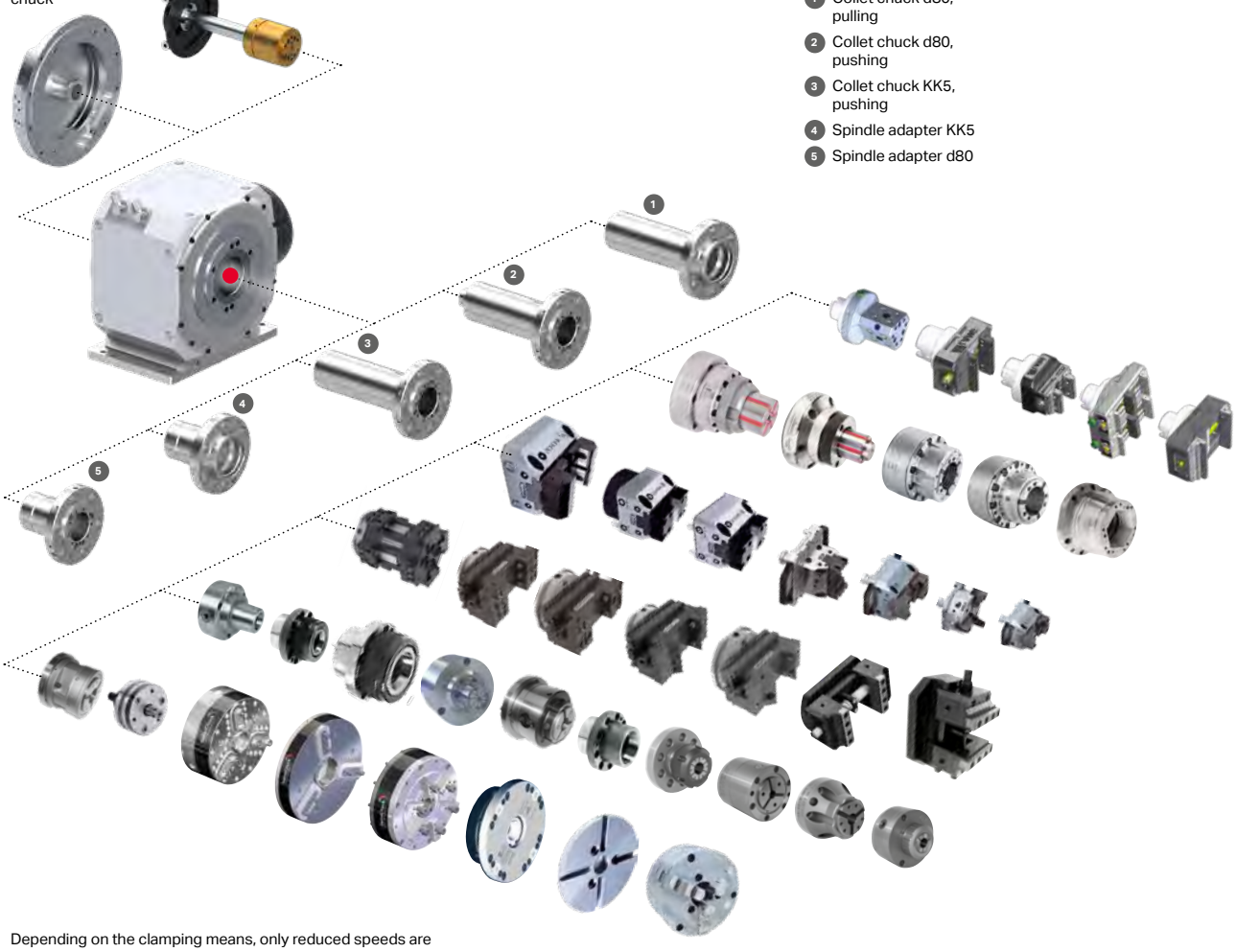
Release cylinder for collet chuck

DDF 4-passage

See all options from **p. 72**

Collet chuck or spindle adapter may be required

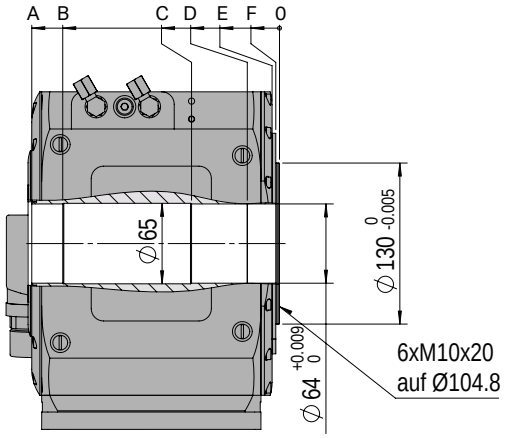
1. Collet chuck d80, pulling
2. Collet chuck d80, pushing
3. Collet chuck KK5, pushing
4. Spindle adapter KK5
5. Spindle adapter d80

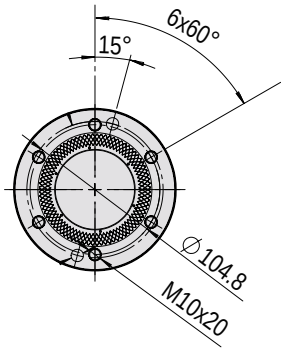


Depending on the clamping means, only reduced speeds are allowed for safety reasons. Please check with manufacturer.

All spindle connection dimensions front and back for building your fixture. Applies to all variants, EA or T-type rotary table alike

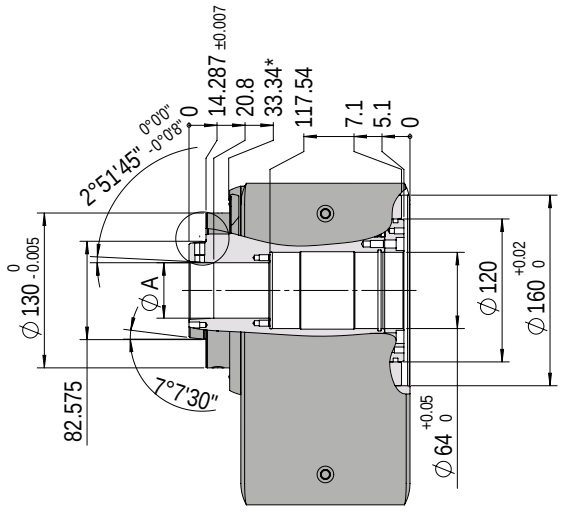
Module size
913 / 915 / 918 ø64/ø130

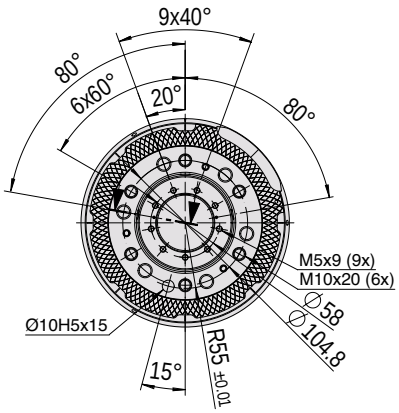




	A	B	C	D	E	F
913	200	175	71	26	6	3
915	200	175	71	26	6	3
918	250	225	71	26	6	3

Module size
520 HSK-A63/KK5





Dimension A	**Standard:** Ø46.55 +0.009/0	**SPI.520-d64:** Ø64

Innovative CUBE-design based on 10 years of experience with DD technology: fully sealed, super-fast, safe, versatile and service-friendly – for Industry 4.0

available with FANUC angular position measuring system – 100% FANUC DDR-compatible!

Prepared for water cooling

- For high speeds and/or long duty cycles (for more information see **p. 34**)

Transport and attachment holes

- Bolt holes for transport
- may be used for fixtures, tool monitoring, measuring probes

Angular position measuring system & temperature monitoring fully integrated

- RENISHAW measuring systems for MITSUBISHI
- FANUC measuring system, 100% compatible with FANUC DDR
- HEIDENHAIN measuring system with EnDat protocol

Universal spindle nose

- Large mounting Ø 130 mm (outside)
- Large through-bore Ø 64 mm

Innovative sealing system

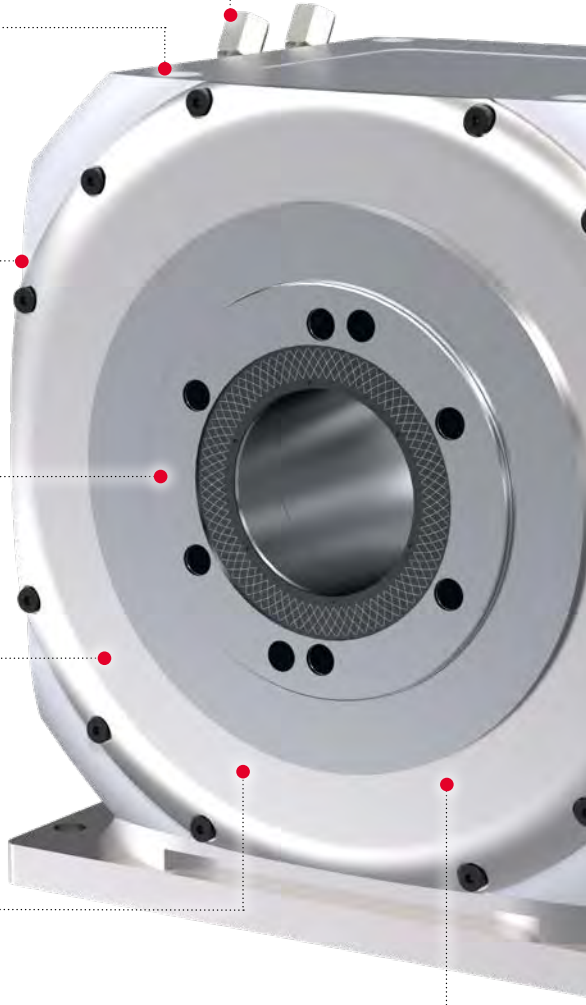
- 100% leaktight in accordance with IP67
- Front and rear labyrinth backed by lip seal with minimal friction loss
- Very high efficiency and minimal heat generation

Spindle bearing

- High-quality, preloaded spindle bearing at front and support bearing at rear
- Designed for very high rpm values
- Lifetime-lubricated

Spindle clamping with fail-safe function

- energyless clamping
- large clamping diameter
- just 5 bar of air pressure required
- Unique: emergency braking without damage in case of power failure



Productivity and availability increase, downtime and maintenance costs decrease

Rugged cast housing

Mobile base plate

- Steel
- 3 sides accessible for mounting at all times
- Cable outlet direction selectable (also at a later date)

pl-smartBox – for real Industry 4.0

Helps to increase productivity and availability, lower downtime and maintenance costs and permits quick troubleshooting and preventive maintenance.

Sensors for ...

- Speed
- Internal pressure
- Temperature
- Humidity
- Shock / impact
- Limit value exceeded with real-time stamp

Components

- Microprocessor
- 3D accelerometer – shock sensor

Monitoring

- Duty cycle limit – overload protection, prevents motor damage

Compatibility

- 100% backwards-compatible with blackBOX (starting at Edition 2)

Prepared for interfaces

- WLAN
- Web server with Ethernet and RJ45 port – display state/error on CNC

Never search for documents again – everything at hand at all times No Internet connection necessary!

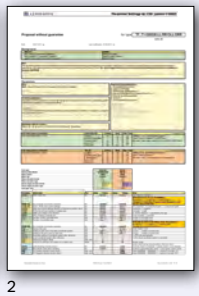
The everyday life of a commissioning technician

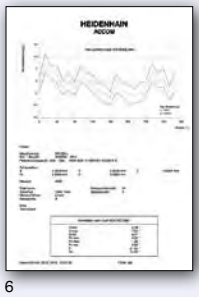
The information needed is missing: electrical schematics, drive data, parameter lists, commissioning instructions ... Commissioning must be interrupted, the search for data begins: paper? Internet? Passwords?. Time is passing. The deadline is approaching. The urgency of the situation means do the best possible with existing knowledge.

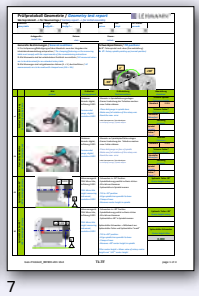
Result: It rotates, but functions only halfway, pL specifications cannot be met (rotational speed, cycle time, accuracy...)

pL finding: Investigations have shown that 70% of optimization cases can be attributed to poor or incorrect commissioning.


1


2


6


7

smart doc on the USB stick

- A mini USB stick is plugged into a USB slot (in the swiveling/tilting axis on T-type rotary tables)
- The following files have been saved on this USB stick:
  1 ADAT drive setup data for each system
  2 Appropriate parameter list for the provided CNC control system
  3 General operating manual / user's manual in German and English
  4 General commissioning manual in German and English with all diagrams
  5 If necessary, machine-specific commissioning manual in German and English (e.g. for Fanuc)
  6 Indexing accuracy report(s) to VDI/DGQ 3441
  7 Geometry report
  8 Main catalog
  9 If necessary, special drawings from the customer
- The files are also available online in the pL-ERP (for Helpliner) as well as in the «full documentation» on the pL website (accessible to all pL representatives)
- All files at the current revision level – version check not needed, risk of errors minimized

Product documentation saved securely: The USB stick remains on the product

Your benefit

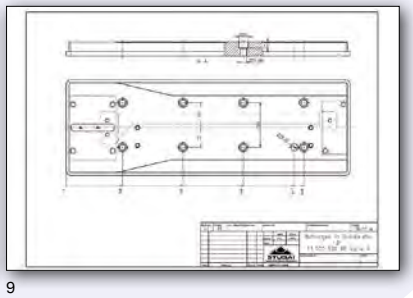
- Download no longer necessary – extra work eliminated
- Password no longer necessary – waiting for registration eliminated
- Internet no longer necessary – problems with poor of no network connection eliminated
- No lost documents, no missing USB stick – stick is always inserted, «loaded» and safety protected under the USB slot cover
- Everything needed is immediately available (appropriate for each rotary table) – tedious searching eliminated
- Emergency solution by technician no longer necessary – existing, often wrong (because out-of-date) data are no longer used

3

4

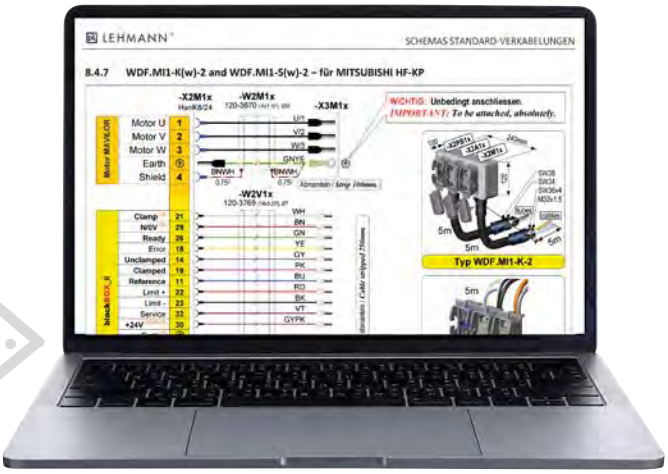
5

8



9

If the USB stick is lost, everything is still available on the website.



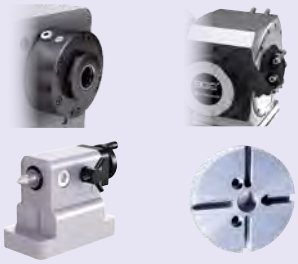
ROTOLUTION – customer-specific turn-key solutions «ontop», largely with proven standard elements, from CAD to commissioning.

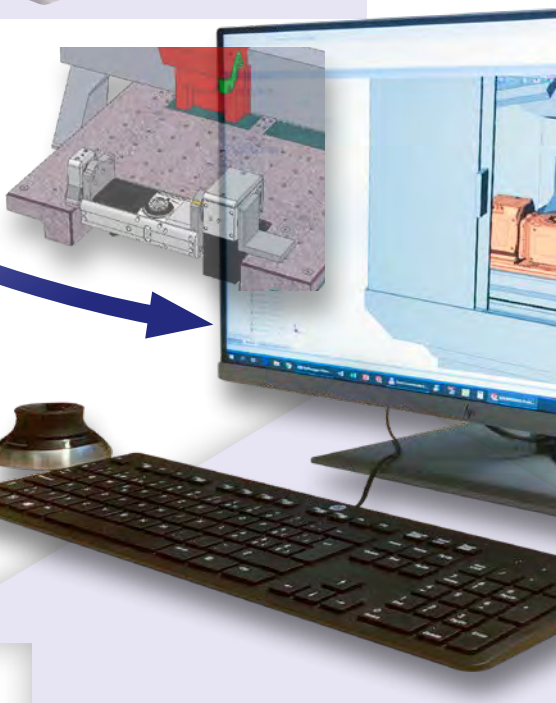
ROTOMATION – The ideal expansion with standardized automation. Economical. Professional. Simple.

Standard

Rotary tables see **pp. 22–27**

Accessories see **pp. 35–37, 72–81**

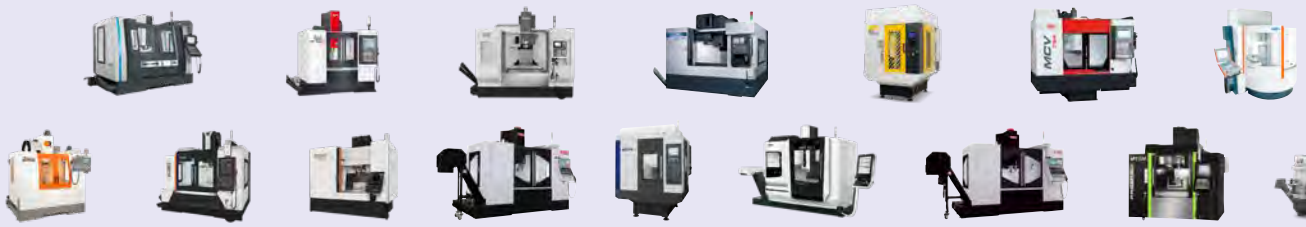




Customer

Problem situation
«help me» –
don't know, have no time,
no experience!

Vertical machining centers and grinding machines (a Selection Guide is available for all of these machines at our website)



*Examples

5th AXIS · GRESSEL · HWR · PAROTEC · ROHM driven by technology · ITG COLIN · amf · HAINBUCH · LANG TECHNIK · PIRANHA CLAMP · SCHUNK · TRIAG INTERNATIONAL · EROWA · hemo · MicroLoc · ripas · SwissChuck · YERLY · EVARD PRECISION S.A. · HOFER technics · NIEDERHAUSER · ROEMHELD · system 3R

ROTOLUTION

CAD & adaptation
- Installation check
- Adjustment to standard parts
- Special parts

CAD & clamping means
- Workpiece clamping
- Standard/special

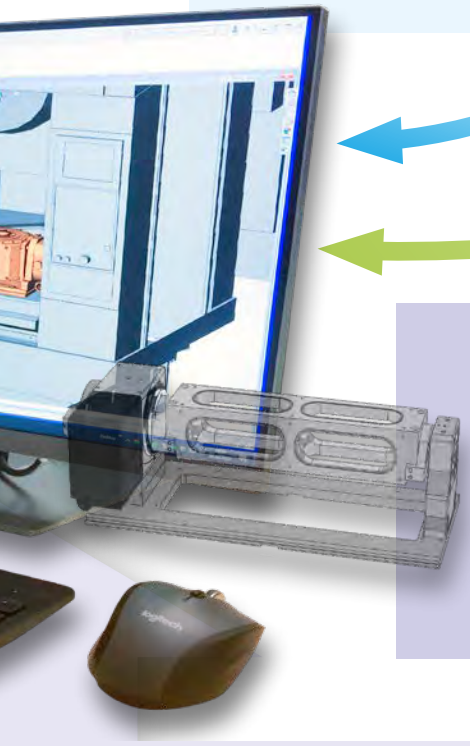
see **p. 82–111**

*Examples

ROTOMATION

CAD & automation
- Workpiece handling
- Partnerships (GU with partners)

see **p. 112–113**



Project management and execution, direct if needed

Plug-&-work package

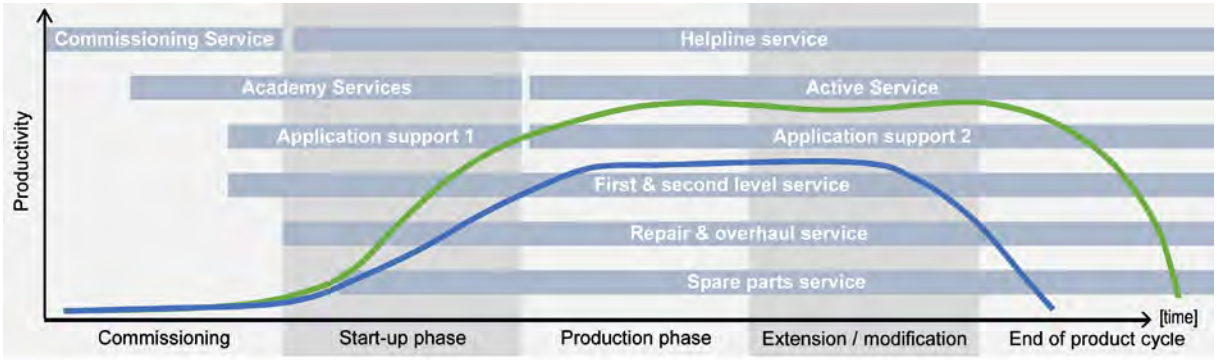
Problem solution «on top» – Standard and ROTOLUTION from a single source, ROTOMATION and machine in partnership

Customer

Present in over 30 countries: from sales consultation to the final service

Increase productivity – Extend lifecycle

Comprehensive and professional services throughout the product life cycle – maximum availability with consistent quality and high productivity.



Productivity with LifeCycle service products from pL LEHMANN
Productivity without service support

A look in our production: High manufacturing depth provides for flexibility and quality

With workpiece pool for unmanned production

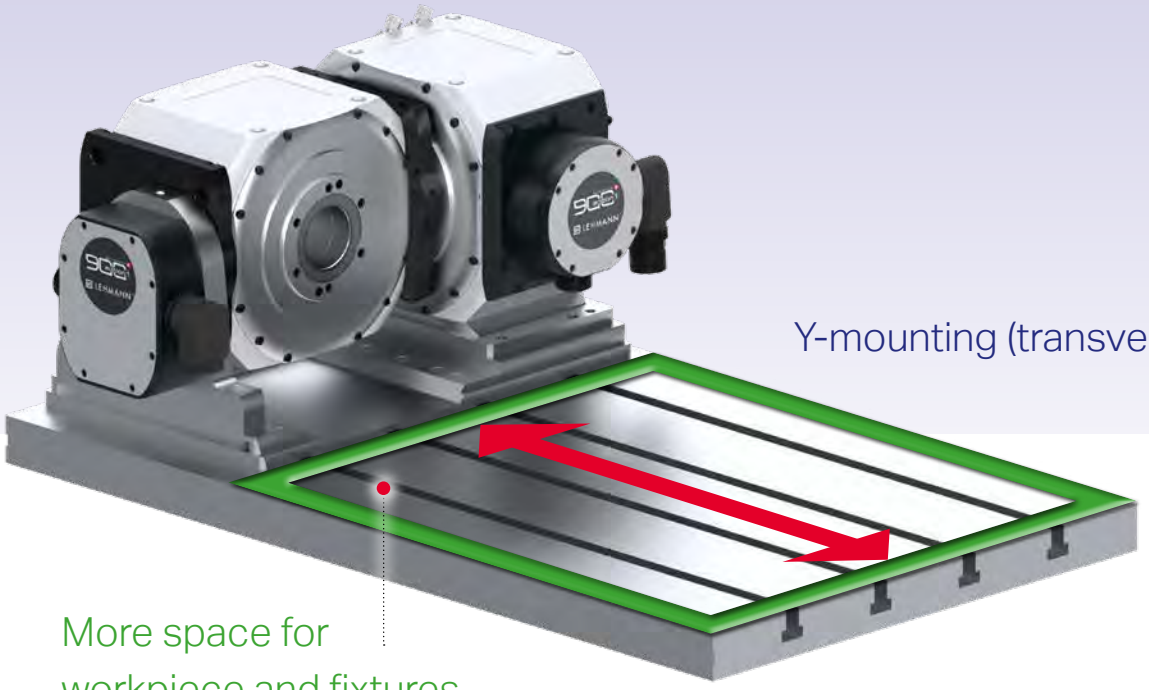
High precision circular and flat grinding

Material flow

Assembly area with Kanban System

Rational equipping of spare parts packages

Interested? Contact us or visit our website at www.lehmann-rotary-tables.com



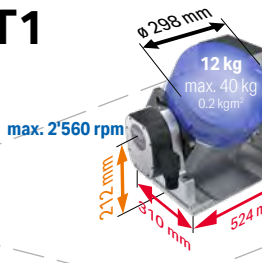
Y-mounting (transverse)

More space for
workpiece and fixtures

T1

T1

T1



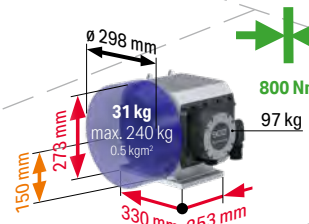
max. 3'2

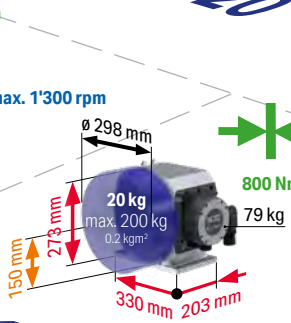
915520

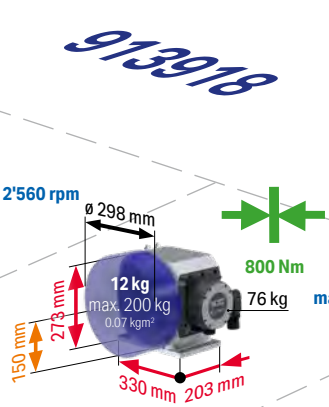
913520

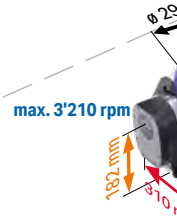
913918

913915









918

915

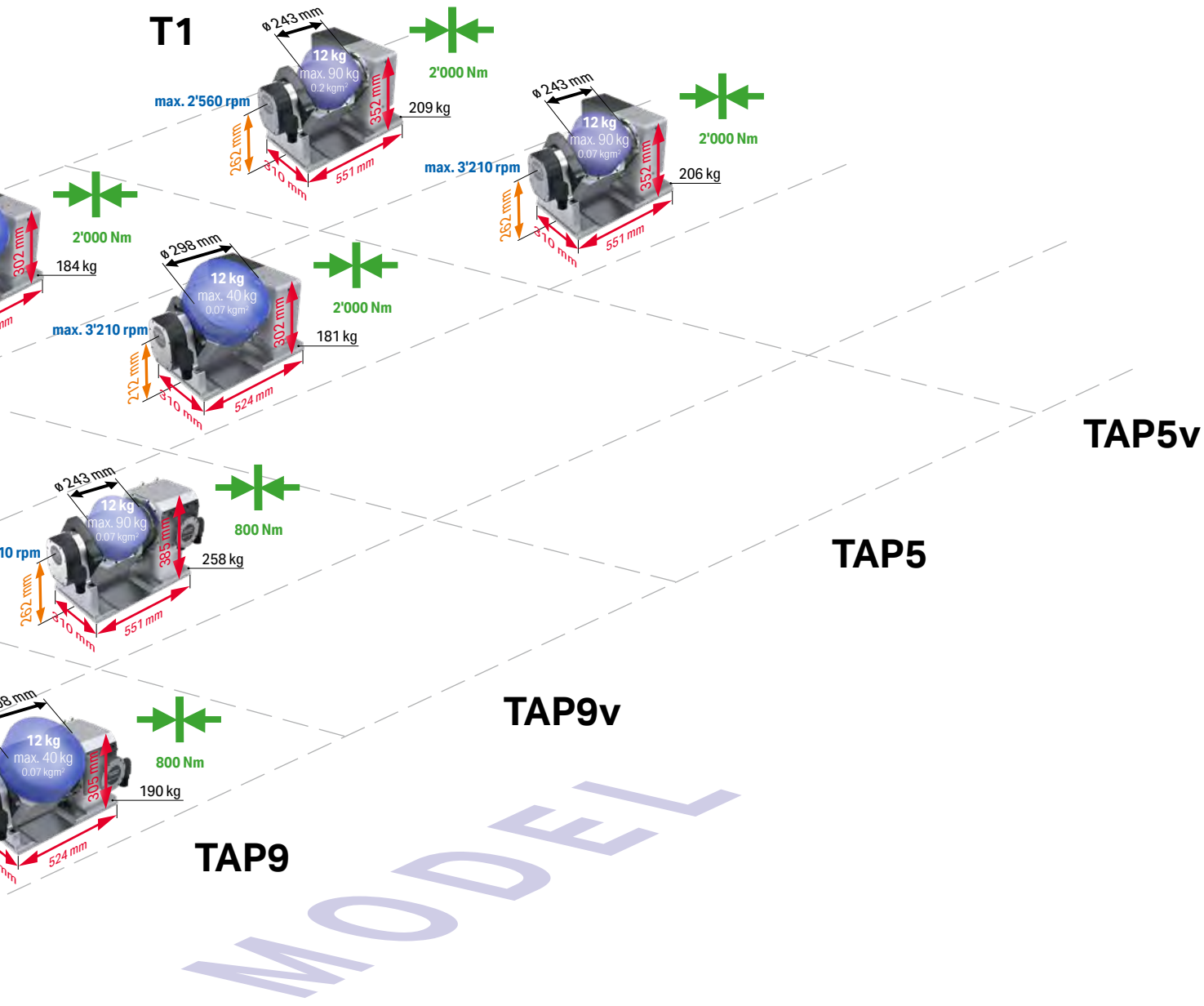
913

SIZE

EA

Highlights

- For millturn applications (e.g. watch cases from bar stock)
- DD up to 3300 rpm available
- Very compact
- For Siemens, Mitsubishi, HEIDENHAIN and Fanuc (if Fanuc measuring system: 100% Fanuc DDT-compatible)



Weight data represent the standard load; higher weights possible, but require modification of rotational speed, acceleration and jerk limitation.

EA	single-axis, single-spindle CNC rotary table
TAP	two-axis rotary table, with supporting bearing
TAPv	Two-axis rotary table, with support bearing, low-profile version (vario)

Feed max.: without flux weakening

EA-913 DD, EA-915 DD and EA-918 DD

EA-913 and EA-915
(identical)

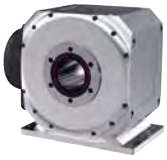
EA-918

General technical data

				EA-913	EA-915	EA-918
Weight			kg	76	79	97
Spindle through-bore			mm	64		
Clamping torque at max. 5 bar air pressure			Nm	max. 800		
Spindle load (max. permissible)	without support		kg	100		120
	with support			200		240
Axial force (max. permissible)			kN	10		
Pull-out torque	clamped		Nm	1,000		1,200
	unclamped			400		500
Moment of inertia	Standard load		kgm²	0.07	0.2	0.5
	J max			0.7*	2*	5*
Positioning accuracy +/- (unloaded)	Fanuc		± arc sec	8		
	Heidenhain			12		
	Siemens 1-head			20		
	Siemens 2-head			5		
	Mitsubishi			20		
Repeat accuracy +/- (unloaded)			± arc sec	1		
Cycle time with standard load (without clamping)	90°		sec	0.19	0.24	0.24
	180°			0.24	0.3	0.3

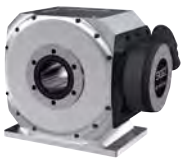
* Speed reduction required

Outgoing cable unit variants



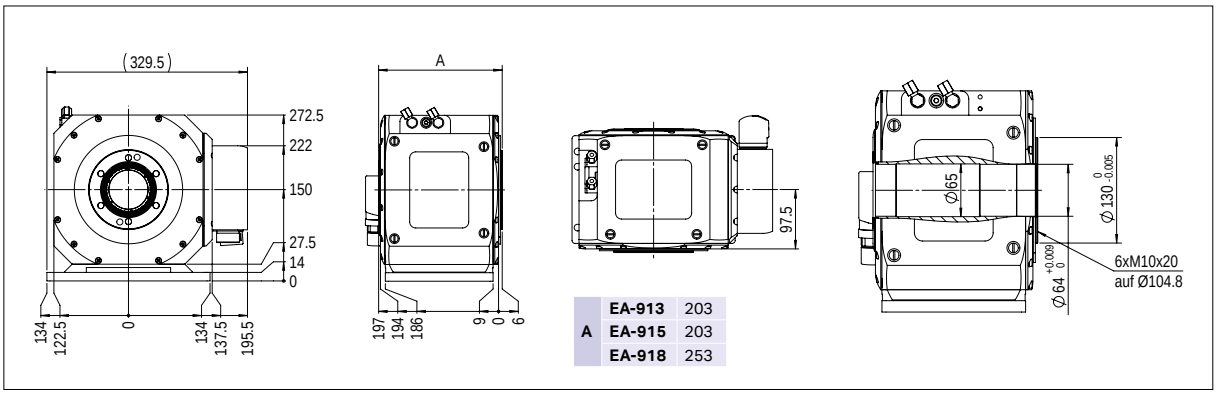
Outgoing cable unit left

Outgoing cable unit top



Outgoing cable right

Can be easily converted by the customer at any time.



A	EA-913	203
	EA-915	203
	EA-918	253

LEHMANN®

Features

- Angular position measuring system +/- 5 arc sec.
- Fail-safe clamping
- Leaktight IP 67
- High-speed up to max. 3300 rpm

Operating parameter reference values

The 900 series rotary tables are the ideal solution for workpiece sizes of up to approx. 100 mm dia. × 100 mm long and when turning operations account for 30% of the overall machining process.

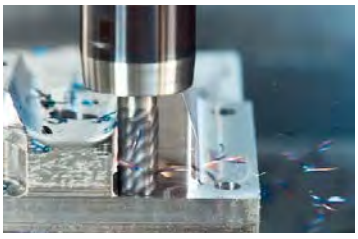
Motor data also applies to dividing/indexing axis on T-type rotary tables **p. 24–27**

Calculated, theoretical values; subject to change.

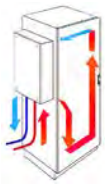
Wet-machining

Splash-water cooling – no cooling unit required
(immersed in coolant, cooling emulsion max. 30 °C)

Dry machining



Water cooling – cooling unit required [4]
(required if splash water cooling is not sufficient)



Cooling unit not included in supply (see **p. 34**)

	Rotary table type	Motor	peak current [3]	max speed [5]	peak torque	intermittent torque	continous torque	standstill torque	max speed [5] with flux weakening [2]
					ED5%	ED40%	ED100%		
			[Arms]	[min⁻¹]	[Nm]				[min⁻¹]
200V [6] standard speed	Type 913 [1]	MOT.HW-A (MOT.ET-A)	57 (70)	2200 (2170)	73 (67)	46 (38)	32 (26)	25 (20)	(3030)
	Type 915	MOT.HW-B (MOT.ET-B)	57 (67)	1300 (1300)	123 (117)	80 (70)	55 (48)	44 (37)	(2070)
	Type 918	MOT.HW-C (MOT.ET-C)	57 (63)	600 (651)	240 (234)	181 (147)	125 (101)	124 (77)	(1120)
400V [7] standard speed	Type 913 [1]	MOT.HW-A (MOT.ET-A)	57 (70)	4200 (3210)	73 (67)	46 (38)	32 (26)	25 (20)	(3210)
	Type 915	MOT.HW-B (MOT.ET-B)	57 (67)	2600 (2560)	123 (117)	80 (70)	55 (48)	44 (37)	(2770)
	Type 918	MOT.HW-C (MOT.ET-C)	57 (63)	1200 (1300)	240 (234)	181 (147)	125 (101)	124 (77)	(1850)

[1] not available as swivelling/tilting axis for T1-91x915 TAP9
[2] not included in the pL delivery. Currently no data available for hardware.
[3] The servo booster must provide at least this peak current to achieve the values stated in the table
[4] Recommended for use with a cooling unit (see **p. 34**):
– approx. 1'600 W rated cooling capacity and at least 1'300 W actual cooling capacity
– Coolant: water-like, non-corrosive
[5] Applies to moment of inertia of 1/2 the standard load. Maximum speed means max. idle speed. These speeds can never be used productively because torque 0 is available here. For Fanuc, a max. of 3000 rpm is possible.
[6] min. 300 VDC intermediate circuit voltage
[7] min. 600 VDC intermediate circuit voltage. If low intermediate voltages are reached (e.g. 400 VAC, uncontrolled 565 VDC), the max. speed must be reduced.

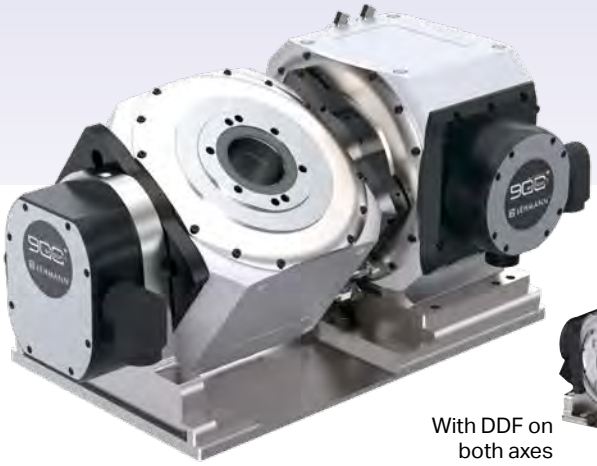
For performance diagrams, see **p. 50**

Item no.

EA–915–F1

- Measuring system see p. 32
- Type
- Rotary table model

T1-913915 TAP9 and T1-915915 TAP9



With DDF on both axes

Workpiece with internal toothing

Both axes with direct drive

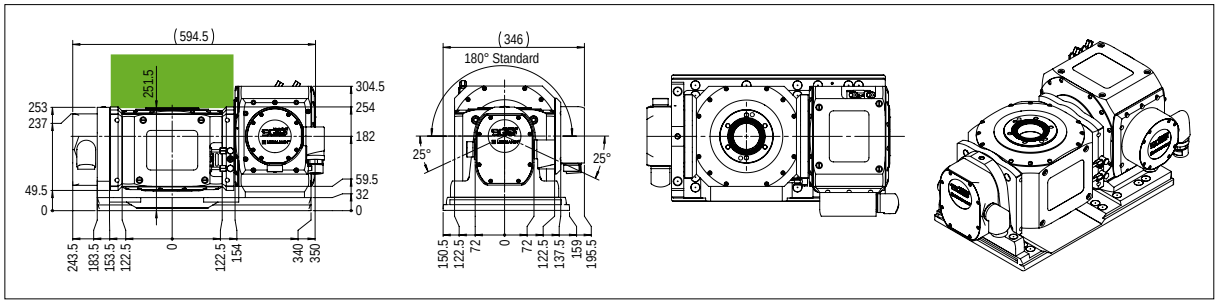
- good accessibility
- ideal for power skiving, 5Ax-simultaneous machining, millturn

General technical data

Drive data: see **p. 23**

			T1-913915 TAP9	T1-915915 TAP9	T1-913918 TAP9v	T1-915918 TAP9v
Weight (aluminum base plate)		kg	190 (166)		258	
Spindle through-bore		mm	64			
Clamping torque at max. 5 bar air pressure	4th axis	Nm	max. 800			
	5th axis	Nm				
Spindle load (max. permissible)		kg	40		90	
Axial force (max. permissible)		kN	20			
Pull-out torque	clamped	Nm	1'000			
	unclamped		400			
Moment of inertia	Standard load	kgm²	0.07	0.2	0.07	0.2
	J max		0.7*	2*	0.7*	2*
Positioning accuracy +/- (unloaded, -90 to +90°)	4th axis Fanuc	± arc sec	8			
	5th axis Fanuc		8			
	4th axis Siemens 1-head		20			
	5th axis Siemens 1-head		22			
	4th axis Siemens 2-head		5			
	5th axis Siemens 2-head		5			
	4th axis Mitsubishi		20			
	5th axis Mitsubishi		22			
Repeat accuracy +/- (unloaded)	4th axis	± arc sec	1			
	5th axis					
Cycle time with standard load (without clamping)	4th axis 90°	sec	0.19	0.24	0.19	0.24
	5th axis 90°		0.48		0.46	
	4th axis 180°		0.24	0.3	0.24	0.3
	5th axis 180°		0.65		0.61	

* Speed reduction required



LEHMANN®

T1-913918 TAP9v and T1-915918 TAP9v

Shorter machine travel for simultaneous machining

- Accelerated machining
- Higher accuracy at the workpiece
- ideal for impeller machining

Available combinations

	Dividing/indexing axis motor*	Swivelling/tilting axis motor*	
T1-913915 TAP9	MOT.ET-A	MOT.ET-B	
T1-915915 TAP9	MOT.ET-B	MOT.ET-B	on request
T1-913918 TAP9v	MOT.ET-A	MOT.ET-C	
T1-915918 TAP9v	MOT.ET-B	MOT.ET-C	on request

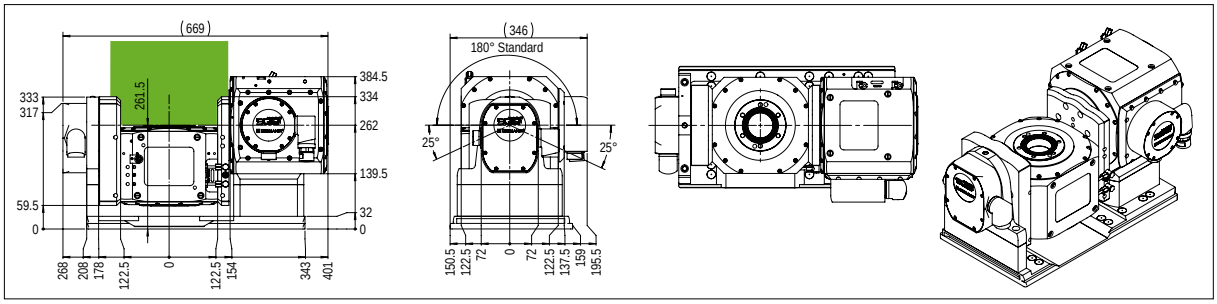
* Motor data: see **p. 23**

Item no.

T1–913918 TAPv-F1

- Measuring system see p. 32
- Low-profile version (vario)
- Support bearing version
- Swivelling/tilting axis size
- Dividing/indexing axis size
- Rotary table model

Impellers



T1-913520 TAP5 and T1-915520 TAP5

Motor mounted on right

Indexing axis DD Swiveling/tilting axis with PGD

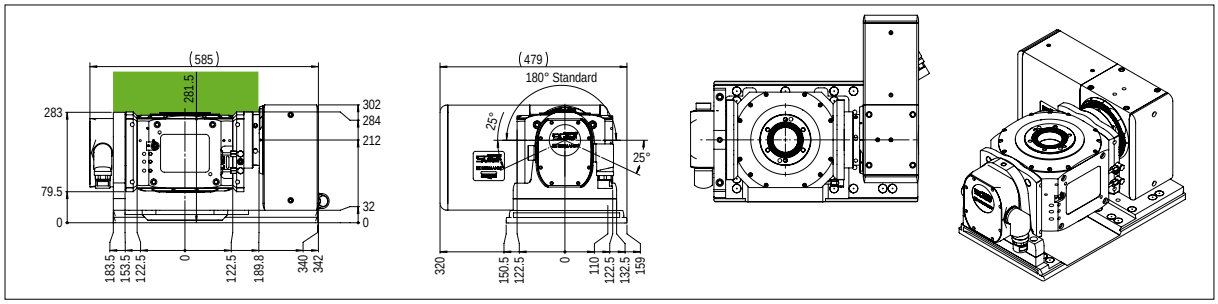
- extremely resilient swiveling/tilting axis for high loads
- good accessibility
- high weights easier to control

General technical data

For drive data of dividing/indexing axis (rotation) see **p. 23**, for swivelling/tilting axis see **p. 27**

			T1-913520 TAP5	T1-915520 TAP5	T1-913520 TAP5v	T1-915520 TAP5v
Weight (aluminum base plate)		kg	181/184 (155)		206/209	
Spindle through-bore		mm	64			
Clamping torque at max. 5 bar air pressure	4th axis	Nm	max. 800			
	5th axis	Nm	2,000			
Spindle load (max. permissible)		kg	40		90	
Axial force (max. permissible)		kN	20			
Pull-out torque	clamped	Nm	1,000			
	unclamped		400			
Moment of inertia	Standard load	kgm^2	0.07	0.2	0.07	0.2
	J max		0.7*	2*	0.7*	2*
Feed torque max ***	5th axis	Nm	440			
Limited torques due to eccentric loads ****		Nm	110			
Positioning accuracy +/- (unloaded, -90 to +90°)	4th axis Fanuc	± arc sec	8			
	4th axis Siemens 1-head		20			
	4th axis Siemens 2-head		5			
	4th axis Mitsubishi		20			
	5th axis – all motors		28 / 10**	28 / 31**	63 / 53**	63 / 40**
Repeat accuracy +/- (unloaded)	4th axis	arc sec	±1			
	5th axis		±2			
Cycle time with standard load (without clamping)	4th axis 90°	sec	0.19	0.24	0.19	0.24
	5th axis 90°		0.48	0.48	0.46	0.46
	4th axis 180°		0.24	0.3	0.24	0.3
	5th axis 180°		0.65		0.61	

* Speed reduction required ** with standard load *** Limited gear unit pitch diameter, at 1 rpm **** For calculation of the torque, see **p. 47**
5th axis optional with WMS, see **p. 32**



LEHMANN®

T1-913520 TAP5v and T1-915520 TAP5v

Eccentric version for shorter travel

For swivelling/tilting axis

Labyrinth seal (cutaway view)

Recommended for:
- Grinding operations
- High coolant pressures
- Extremely fine abrasive particles

Note: Simultaneous machining with the swiveling/tilting axis must be avoided because of eccentricity.

Available combinations

	Dividing/indexing axis motor*	Swivelling/tilting axis motor
T1-913520 TAP5	MOT.ET-A	See table below
T1-915520 TAP5	MOT.ET-B	
T1-913520 TAP5v	MOT.ET-A	
T1-915520 TAP5v	MOT.ET-B	

* Motor data: see **p. 23**

Drive data
Tilting/swivelling axis 520

(based on standard load cube)

		Motors	Feed* [Nm]	Speed [rpm]	Cycle time*** [sec] 90°	180°
MAVILOR / MOVINOR **	TAP5	LN-098	400	30	0.61	1.11
	TAP5v			25	0.73	1.33
FANUC	TAP5	α4 (HV)is	315	28	0.68	1.22
	TAP5v			25	0.76	1.36
MITSUBISHI 200V	TAP5	HG105	320	28	0.65	1.19
	TAP5v			25	0.73	1.33
MITSUBISHI 400V	TAP5	HG-H105	320	28	0.65	1.19
	TAP5v			25	0.73	1.33
SIEMENS	TAP5	1FK2205	400	30	0.62	1.12
	TAP5v			28	0.69	1.23
	TAP5	1FK7042	315	30	0.62	1.12
	TAP5v			25	0.73	1.33

* at 1 rpm ** for Siemens / Heidenhain *** without clamping

Important information

- The limit values as set out in the corresponding parameter list take precedence over the data and information provided in the main catalog (due to motor, drive enhancement and the respective machine CNC)
- Motor-independent data are optimum values at operating temperature
- Further details are available at www.lehmann-rotary-tables.com, under Download / Commissioning

Options

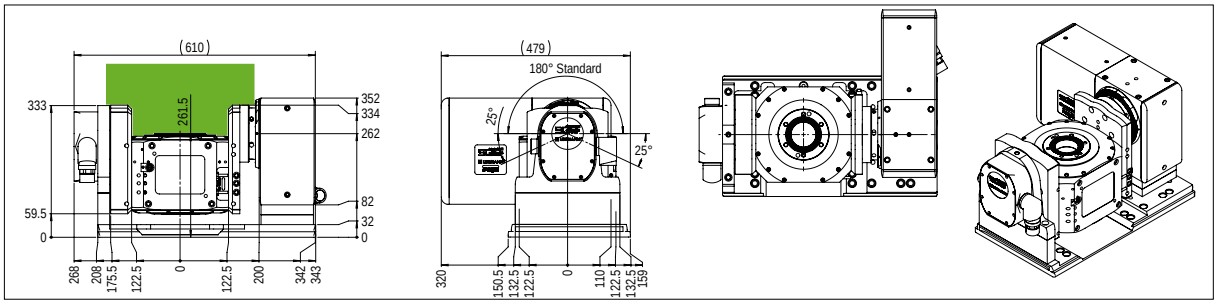
Item no.	Description
GET.5xx-GEN	Increased gear precision *
SPI.5xx-Lab	Spindle seal with labyrinth, integrated sealing air pressure control

* incl. increased radial and axial run-out 0.003 mm

Item no.

T1–913520 TAPv-F1

- Motor
- Low-profile version (vario)
- Support bearing version
- Swivelling/tilting axis size
- Dividing/indexing axis size
- Rotary table model



Practical options for special cases.
Please contact us if you have further needs.

Raised center height on T-type rotary tables

For all combinations of possible spindle accessories.

	Item No.	Increase	SPZ	DDF	SPI.91x-Ada
TAP9		without	•	•	
TAP9	**SPH.TAP9-40**	40mm	•	•	•

SPZ = Collet chucks with release cylinder, DDF = rotary union

End cap for third-party systems

Item No.	Designation	Required center height increase
SPI.91x-Ada	End cap for attachment of external rotary union / clamping cylinder	SPH.TAP9-40

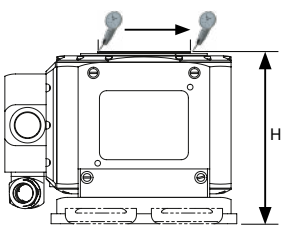
Vertical clamping

	Item No.	DDF	SPZ	Height [mm]	Weight [kg]
EA-913	**GPL.91xver-242***	•	•	242	10.6
EA-915	**GPL.91xver-242***	•	•	242	10.6
EA-918	on request				

* only 1 accessory possible (e.g. DDF), cannot be combined (e.g. ~~DDF+SPZ~~)
SPZ = for clamping cylinder; for more, please refer to **p. 77**
DDF = for rotary union; for more, please refer to **p. 35**

Add-on housing for vertical clamping.
Shown with rotary union.

Add-on housing for vertical clamping.
Shown with direct measuring system compact.



0.01/100 mm (with height increase: 0.005/100 mm)
H = ±0.1

Maximum possible standardization simplifies startup and service

Cabling

Cable set, complete, as follows:

- incl. HARTING connector, incl. wall bushing
- only 1 connector per axis
- bifunctional wall bushings for cab wall as well as for cabinet
- mounted and tested at factory, plug&play

Order items

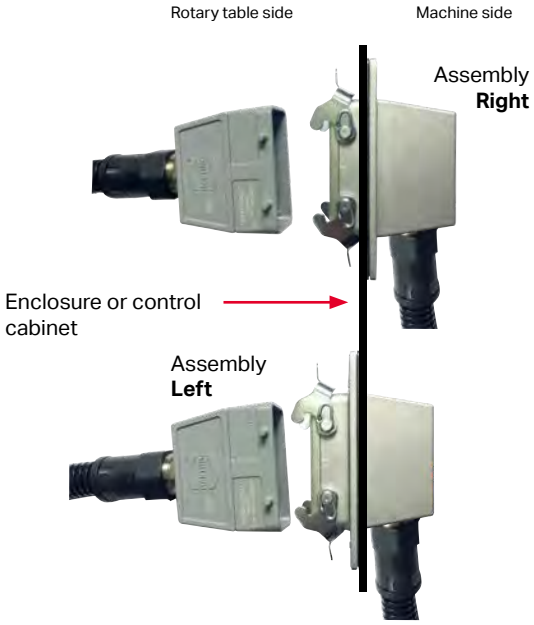
Item no.	Designation	Dimensions
KAB.F9-4.0-M4g	Fanuc DD, fully cabled	4 m, straight HARTING connector
KAB.H9-4.0-M4g	Siemens and Heidenhain DD, fully cabled	4 m, straight HARTING connector
KAB.MI9-4.0-M4g	Mitsubishi DD, fully cabled	4 m, straight HARTING connector
KAB.H9-6.0vss-M4g	Heidenhain 1Vss DD, fully cabled	6 m, straight HARTING connector

Item no.	Designation	Dimensions
WDF.F9-M4	Wall bushing	per axis for Fanuc
WDF.SH9-M4	Wall bushing	per axis for Siemens
WDF.MI9-M4	Wall bushing	per axis for Mitsubishi
WDF.HH9-M4	Wall bushing	per axis for Heidenhain
WDF.F9-FAc	Wall bushing	for Fanuc Robodrill, 4th axis
WDF.F9-FAc2	Wall bushing	for Fanuc Robodrill, 5th axis

Item no.	Designation	Weight [kg]
WDF.lo	Air/oil	0.09
WDF.h	Hydraulics (2 fluted)	
WDF.M4-9xx	Mating connector, without cabling	

Standard items included in delivery

Always supplied as standard (except Fanuc Robodrill)



FANUC Robodrill

Automatic parameter setting by program (included in delivery)

Item no.	Designation	Dimensions
KAB.F9-5.0-FAc	Fanuc DD, fully cabled	Robodrill

Supplied with FANUC interface, compatible with FANUC DDR

Machine preparation

- 80A servo required
- Additional CNC options may be needed, for instance, for rotating function, radius compensation, constant cutting speed, pole detection, 5-axis function for simultaneous operation
- PLC must be prepared and adapted accordingly

Quality at pL LEHMANN «The right processes automatically yield the desired results»

Elasticity of tilting axes TAP5** (guideline values for pitch error)

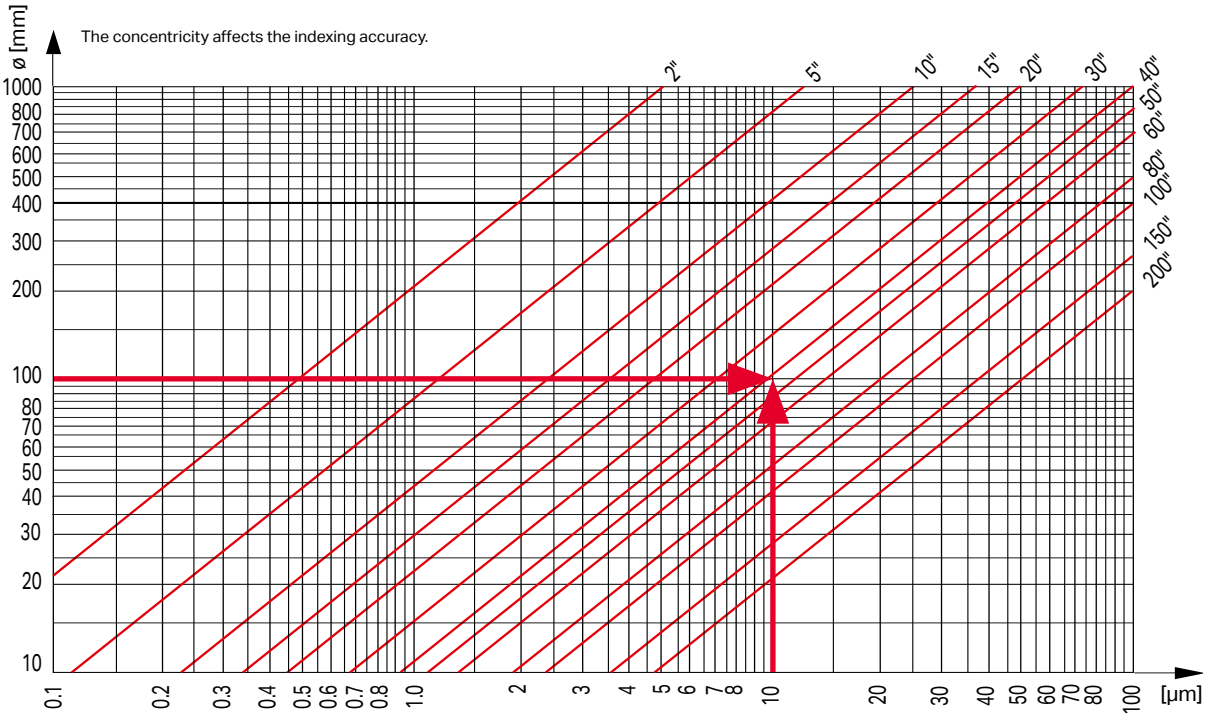
	Unloaded	Standard load sls $_{cube}$*
0° to 90° [arcsec]		
T1-913520 TAP5	-19	+1
T1-915520 TAP5	-19	+22
T1-913520 TAP5v	-55	-45
T1-915520 TAP5v	-55	-32

* see **p. 46**
** Tilting axes with direct drive do not have a pitch error

Explanation: The pitch error corrects the positioning error resulting from elasticity caused by the eccentric load of the rotary axis on the tilting axis.

Recommendation: In order to achieve the best possible accuracies, we always recommend compensating for the gear backlash and the pitch error (5th axis) with the CNC control unit and/or by using a direct measuring system (option, **p. 32**). A tilting range of 180° results in other compensation values; please contact the factory if necessary.

Angular seconds and radian compared



Example: Workpiece-ø 100 mm, concentricity error 0.01mm = additional error on workpiece up to approx. 41"

Concentricity error µ

For the highest indexing accuracy: Fully encapsulated, leak-proof, protected against impact, adjusted with high precision

Measuring method used to determine the gear unit's accuracy to VDI/DGQ 3441 or ISO 230-2

- Measured at operating temperature of the unit after 5 warm-up cycles
- 5 measuring cycles
- 24 measuring points (15° increments)
- Acceleration 500°/s²
- All measured values apply in unloaded condition at room temperature approx. 22 °C
- The values WITHOUT load apply

Attention: Due to the influence of environmental factors during the measurement (temperature, vibration, etc.), the recorded measurement error may exceed the catalog limit value by up to 10%.

Attachment variants of the direct measuring system

Applicable depending on the selected direct measuring system (see **p. 33**)

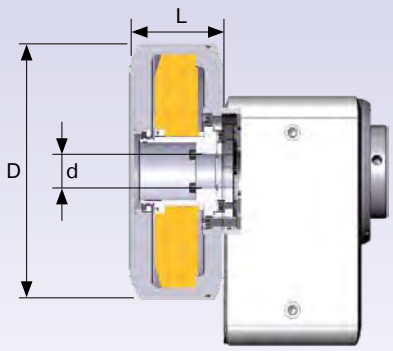
WMS.520-Vor2

WMS.520-Vor7

WMScompact
(WMS.520-VorCX)

Example WMS with DDF
* see **p. 35**

«What you measure is what you get» – how to produce more accurately with 3+2 than with many 5-axis machining centers



	L	D	d
		[mm]	
WMS.520-VorCX	35.9	165	46
WMS.520-VorCH	34.5	180	50
WMS.520-Vor2	91.6		
WMS.520-Vor7	87		46

Direct measuring system required for series 900

	Preparation	Measuring system
Fanuc	WMS.91x-VorFA	WMS.91x-FA
Mitsubishi	WMS.91x-VorMI	WMS.91x-MI
Heidenhain / Siemens	WMS.91x-VorHH	WMS.91x-HH
		WMS.91x-HH+ (increased accuracy)
		WMS.91x-HHvss

Alternative to direct measuring system

for tilting axis with TAP5(v) only

Optional increased mechanical gear accuracy	
GET.5xx-GEN	For data, see respective rotary table on **p. 20–27**

Option: Additional cable for retrofitting direct measuring system
KAB.WMS-14.0-o

Cable run in flexible tubing, 14 m long, without connector

Size and accuracy: wide range for different controls and interfaces

Fully automated measuring system for indexing accuracy measurement

WMS.TXM-75.1T

- T = tilting axis, only with incremental measuring system
- without = only 1 measuring head available, .1 = 1 measuring head, .2 = 2 measuring heads
- M = Incremental, A = Absolute
- X = REX
- T = Tonic / 1Vss, V = Vionic / TTL, S = Siemens, F = Fanuc, M = Mitsubishi

Selecting the direct measuring system

	Encoder kit Item no.	Preparation Item no.	Incremental	Absolute	1Vss	TTL	EnDat02	Siemens driveCliq	Fanuc	Mitsubishi	System	Indexing accuracy normal	Indexing accuracy comp.*	Type	Read head	
Rotary table	**WMS.xXM-75T**	**WMS.520-VorCX**	x		x						**Renishaw** Line count 11840, or 20 µm pitch	± 10"	± 3"	REX	1	5
	WMS.xXM-75.1T	**WMS.520-VorCX**	x			x						± 10"	± 3"	REX	1	5
	WMS.xXM-75.2T	**WMS.520-VorCX**	x			x						± 2.5"	± 1"	REX	2	5
	WMS.xXA-75	**WMS.520-VorCX**		x					x	x	**Renishaw** Line count 11840, or 20 µm pitch	± 10"	± 3"	REX	1	5
	WMS.xXA-75.1	**WMS.520-VorCX**		x				x				± 10"	± 3"	REX	1	5
	WMS.xXA-75.2	**WMS.520-VorCX**		x				x				± 2.5"	± 1"	REX	2	5
	WMS.RU97A	**WMS.520-Vor2**		x				x				± 2.5"		RU97A	built-in	3
	WMS.RU77F	**WMS.520-Vor2**		x					x		**Magnescale**	± 2.5"		RU77	built-in	4
	WMS.RU77M	**WMS.520-Vor2**		x						x		± 2.5"		RU77	built-in	4
	WMS.91x-HH	**WMS.520-VorCH**		x			x					± 12"		ECA 4410	1	5
	WMS.91x-HH+	**WMS.520-VorCH**		x			x					± 8"		ECA 4410	1	5
	WMS.285	**WMS.520-Vor2**		x	x							± 5"		RON 285	built-in	1
	WMS.287	**WMS.520-Vor2**		x	x							± 2.5"		RON 287	built-in	1
	WMS.2381	**WMS.520-Vor2**		x			x					± 4"		RCN 2381	built-in	1
	WMS.2581	**WMS.520-Vor2**		x			x					± 2"		RCN 2581	built-in	1
	WMS.275T	**WMS.520-Vor2**	x			x					**Heidenhain**	± 5"		RON 275	built-in	1
	WMS.8391F **	**WMS.520-Vor7**		x					x			± 2"		RCN 8391F	built-in	2
	WMS.8391M **	**WMS.520-Vor7**		x						x		± 2"		RCN 8391M	built-in	2
	WMS.8381 **	**WMS.520-Vor7**		x			x					± 2"		RCN 8381	built-in	2
	WMS.8591F **	**WMS.520-Vor7**		x					x			± 1"		RCN 8591F	built-in	2
	WMS.8591M **	**WMS.520-Vor7**		x						x		± 1"		RCN 8591M	built-in	2
	WMS.8581 **	**WMS.520-Vor7**		x			x					± 1"		RCN 8581	built-in	2

* Sine error compensated for individually by customer**

** not available for 507/508

HEIDENHAIN

1

Heidenhain RxN 2xxx
Passage: ø20

2

Heidenhain RxN 8xxx
Passage: ø60

Magnescale

3

Magnescale RU 97

4

Magnescale RU 77

RENISHAW

5

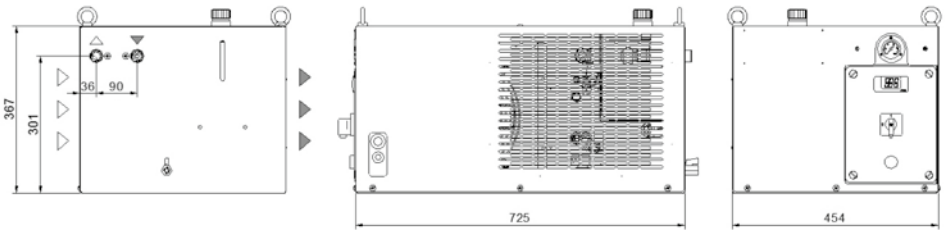
Renishaw

Recommended cooling units (e.g. for high-speed dry machining)
Temperature module for machines with SIEMENS, Mitsubishi and Heidenhain CNC

OLAER cooling unit

Recommended rotary table model as shown here, with rotary union on both axes and «handshake»; see **p. 35**

Cooling lines 6 m*



Order items

Item no.	Designation
AGG.OL-CW12*	OLAER Minichiller CW12, net cooling capacity approx. 1'300 W, incl. cooling lines and connection to rotary table

* Installation by customer or on request by pL LEHMANN (e.g. in the course of commissioning)

Temperature protection module (for Siemens, Mitsubishi and Heidenhain)

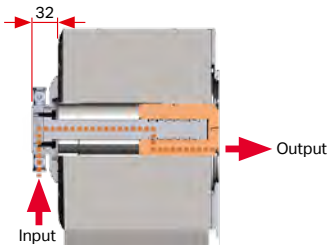
Item no.	Designation
MOT.Temp	IMTHP module incl. connecting stranded wire 24V

If a rotary table with wall bushing (WDF) is ordered, a thermal protection module is always included

Rotary union

- up to 250 bar at max. 80 rpm (air and oil) or up to 6 bar at max. 1500 min (only air)
- low-maintenance, compact
- simple, suitable for retrofitting

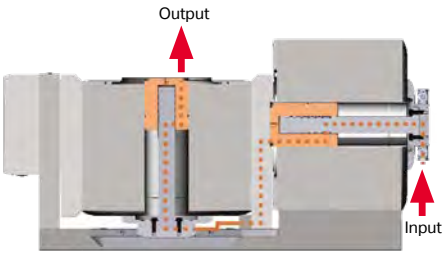
Rotary union for EA rotary tables



Rotary union, 4- or 6-fluted

DDF 4-fluted

Rotary union for T-type rotary tables



TAP9: with rotary union, 4-fluted

Permissible operating parameters

up to 250 bar at max. 80 rpm (air and oil) or up to 6 bar at max. 1500 min (only air)

Pressure-speed data for rotary union

Avoid high and longer lasting speeds under pressure if possible (greatly reduces seal life).
For safety reasons, we also recommend «pressureless clamping»

DDF.91x-04-d80

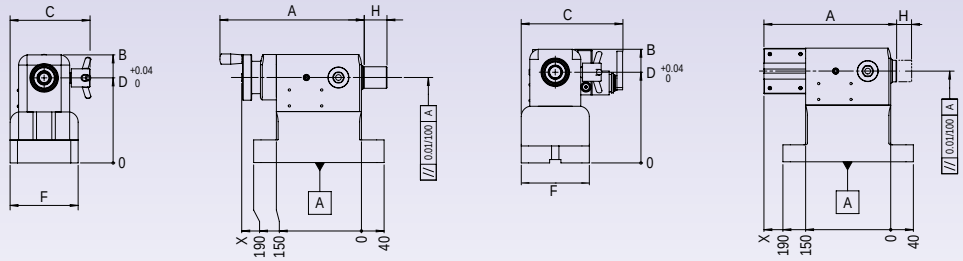
DDF.91x-0x

DDF.91x-04-d80

DDF.91x-04-KK5

Order items

Item no.	Designation
DDF.91x-04	Rotary union, 4-fluted, 6 bar, oil/air, for EA and indexing axis, high-speed
DDF.91x-04-d80	Rotary union, 4-fluted, 6 bar, incl. spindle adapter Ø80, high-speed
DDF.91x-04-KK5	Rotary union, 4-fluted, 6 bar, incl. spindle adapter KK5, high-speed
DDF.91x-06	Rotary union, 6-fluted, 250 bar, oil/air, for EA
DDF.91x-06-KK5	Rotary union, 6-fluted, 250 bar, incl. spindle adapter KK5
DDF.91x-06-TAP9	Rotary union, 6-fluted, 250 bar, oil/air, for swiveling/tilting axis (4 media channels)
DDF.918-06-TAP9v	Rotary union, 6-fluted, 250 bar, oil/air, for swiveling/tilting axis (4 media channels)
DDF.520-06-TAP5	Rotary union, 6-fluted, 250 bar, oil/air, for swiveling/tilting axis (4 media channels)
DDF.520-06CH-TAP5	Rotary union, 6-fluted, 250 bar, oil/air, for tilting axis (4 media channels) WMS compact Heidenhain
DDF.EA-91x-AGG	Loose accessories, 2-passage for cooling unit
DDF.TxP9-DDF	Piping (handshake), 4-6-fluted, for rotary union
DDF.TxP9-SPZ	Piping (handshake), max. 4-fluted, for release cylinder
DDF.TxP9-AGG-2	Piping (handshake) TAP9, 2-passage, for cooling unit
DDF.TxP5-AGG	Piping (handshake) TAP5, 2-passage, for cooling unit



measured without load, quill extended halfway

Standard design for all types = right-handed version (as shown)

		Item no.	Designation	A [mm]	B [mm]	C [mm]	F [mm]	H [mm]	Manual	pneumatic [2]	Weight [kg]	✗	✓
Center height D [mm]	110	**RST.COM-110m** [3]	COMPACT tailstock	222	128	130	100	30	•		11		•
		RST.LIG-110m	LIGHT tailstock	255	150	142	120	40	•		20		•
		RST.LIG-110p-2 [1]	LIGHT tailstock	225		184		40		•	20		•
	150	**RST.COM-150m** [3]	COMPACT tailstock	222	168	130	100	30	•		16		•
		RST.LIG-150m	LIGHT tailstock	255	190	142	120	40	•		25		•
		RST.LIG-150p-2 [1]	LIGHT tailstock	238		184		40		•	25		•
	180	**RST.LIG-180m**	LIGHT tailstock	255	220	142	120	40	•		30		•
		RST.LIG-180p-2 [1]	LIGHT tailstock	238		184		40		•	30		•
	220	**RST.LIG-220m**	LIGHT tailstock	255	260	142	120	40	•		35		•
		RST.LIG-220p-2 [1]	LIGHT tailstock	238		184		40		•	35		•
	235	**RST.LIG-235m**	LIGHT tailstock	255	275	142	120	40	•				•
	280	**RST.LIG-280m**	LIGHT tailstock	255	310	142	120	40	•		42		•
		RST.LIG-280p-2 [1]	LIGHT tailstock	238		184		40		•	42		•
Tailstock Option / Accessories		**RST.L-m**	Left-hand version, manual								0.00		•
		RST.L-p	Left-hand version, pneumatic								0.00	•	
		RST.R-pmh	pneumatic, with manual lever valve								0.09	•	
		RST.L-pmh	Left-hand version, pneumatic, with manual lever								0.09	•	
		RST.Hub-p	Stroke monitoring for tailstock (pneumatic), free cable ends 5 m of which 4.5 m in flexible tubing; stroke 5 mm shorter								0.73	•	
		RST.SPI-MK2s	Fixed center, hardened steel					MK2					•
		RST.SPI-MK3s	Fixed center, hardened steel					MK3			0.37		•
		RST.SPI-MK2hm	Fixed center, HM use					MK2					•
		RST.SPI-MK3hm	Fixed center, HM use					MK3			0.37		•

All LIGHT tailstocks: Parallelism of quill axis to alignment groove adjustable thanks to **zentriX** system (see operating manual)

[1] Delivered as standard without manual lever valve. Can be ordered as option.
[2] Impact force approx. 660...2,000 N at 2...6 bar air pressure
[3] Delivered with center height +/-0.01 mm

Morse taper size (DIN 228)
– COMPACT = MK 2
– LIGHT = MK 3

✗ CANNOT be retrofitted
✓ can be retrofitted

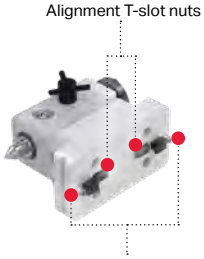
Suitable alignment elements

Item no.	Designation	Slot width	Weight [kg]
AUR.zX-12	**zentriX** alignment pin, 1 pair	12g6	0.10
AUR.zX-14		14g6	0.10
AUR.zX-16		16g6	0.11
AUR.zX-18		18g6	0.12
AUR.St-12	Alignment T-slot nuts, 1 pair	12g6	0.07
AUR.St-14		14g6	0.07
AUR.St-16		16g6	0.07
AUR.St-18		18g6	0.07

Is included in corresponding LOZ.RST. See **p. 39**

Possible alignment elements

Alignment T-slot nuts



zentriX alignment pins

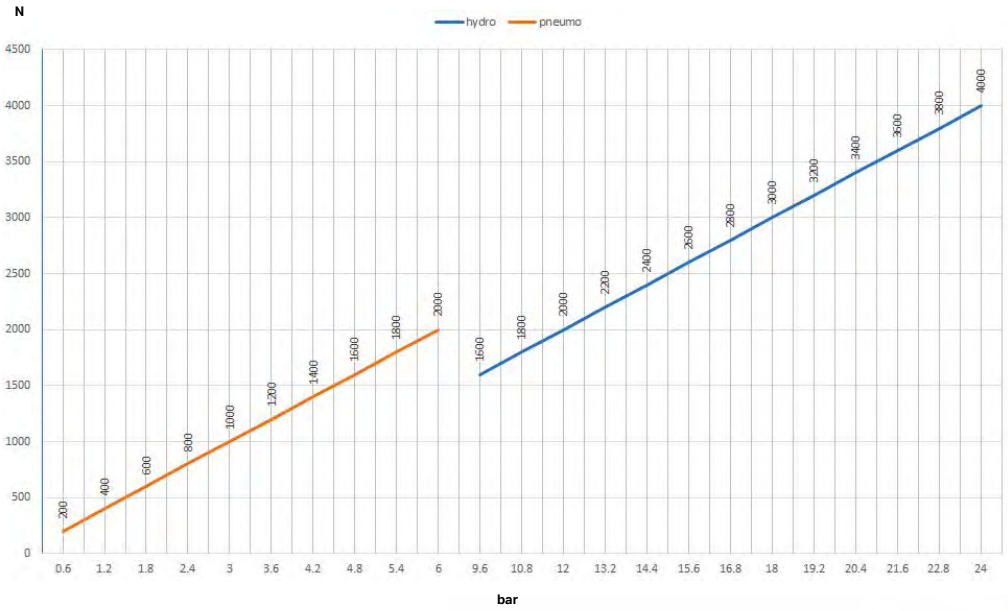
Revolving centers see **p. 111**

Manual version (right-hand)

Pneumatic version (right-hand)

Pneumatic version (right-hand) with manual lever valve (option)

Pressure-force diagram

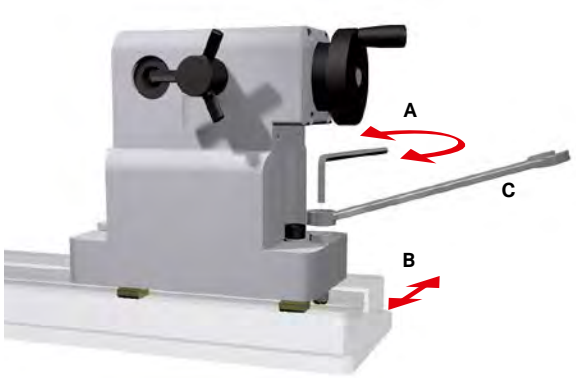


Left-hand model.

Tailstock modules

Align and secure correctly on the machine table: **lineFIX** and **zentriX**

zentriX alignment system (example: tailstock on longFLEX)



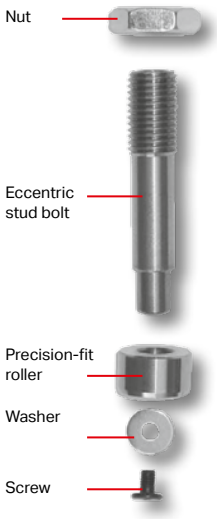
Item no.	Designation	Slot width	Weight [kg]
AUR.zX-12	**zentriX** alignment pin, 1 pair	12g6	0.10
AUR.zX-14		14g6	0.10
AUR.zX-16		16g6	0.11
AUR.zX-18		18g6	0.12

Rotating the Allen wrench **(A)** pushes the tailstock against the base plate **(B)** by means of an eccentric screw. Once the desired position is reached, the eccentric screws is secured with a hexagon nut **(C)**. Finished. For additional information, please refer to the installation and commissioning instructions at: www.lehmann-rotary-tables.com

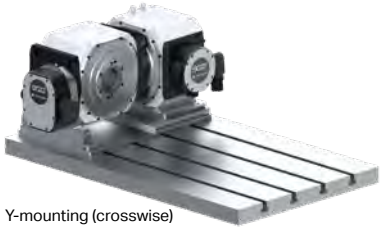
available for ...

All longFLEX versions

All tailstocks



lineFIX alignment system for T-type rotary tables (not for TIP)



Y-mounting (crosswise)

As a standard feature, every T-type rotary table has one **lineFIX** pin (for a slot width of 14 or 18 mm). Every base plate has a hole pattern that matches a T-slot spacing of 100 mm and 125 mm. After being set up initially with the **lineFIX** pin, the rotary table undergoes final adjustment and is then secured in position using these holes.

Principle of operation

retracted, not used

Alignment element in slot 1 (e.g. 14 mm)

Alignment element in slot 2 (e.g. 18 mm)

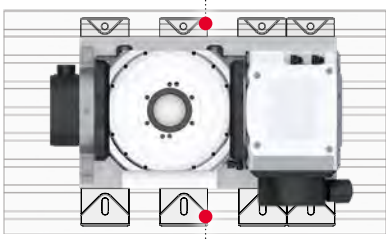
Item no.	Designation	Slot width	Weight [kg]
AUR.iX-12-16	Option (2 pieces)	12/16	
AUR.iX-14-18	Standard (2 pieces)	14/18	0.03
LOZ.Bride-L	Long clamps, for 63/125 grid pattern*		0.93

* When installed properly as described in the operating manual, the hold-down force per clamping claw (short or long) is 20 kN.

Version with clamping claws

If no hole pattern matches the slots, the rotary table can be secured by means of clamping claws.

Short clamping claws (standard scope of delivery)



Long claw clamp (item no.: **LOZ.Bride-L**): for making adjustments when mounting in intermediate positions.

Everything included

LOZ.FAN-EA9

Item no.	For machine	For product	Maintenance unit	Clamps, steel plugs	Gear oil, clamps, steel plugs	Fastening material on machine table (screws, T-slot nuts)	Alignment slot nut (1 pair)
LOZ.91x-EA	neutral	EA-91x	x	x		x	
LOZ.91x-TAP5	neutral	T1-91x520 TAP5(v)	x		x	x	
LOZ.91x-TAP9	neutral	T1-91x91x TAP9(v)	x	x		x	
LOZ.DMG-TAP9	DMG Mori DMP Series	T1-91x91x TAP9(v)		x		x	
LOZ.FAN-EA9	Fanuc Robodrill	EA-91x		x		x	
LOZ.FAN-TAP5	Fanuc Robodrill	T1-91x91x TAP5(v)	x		x	x	
LOZ.FAN-TAP9	Fanuc Robodrill	T1-91x91x TAP9(v)		x		x	
LOZ.LEA-TAP9	Leadwell V series	T1-91x91x TAP9(v)	x	x		x	
LOZ.Nute14-TAP9	Fanuc Robodrill, Brother	TAP9, 14 mm				x	
LOZ.Nute18-TAP9	DMG Mori, Akira, Doosan,..	TAP9, 18 mm				x	
LOZ.RST-14*		LIGHT tailstock, 14 mm				x	
LOZ.RST-14St**		LIGHT tailstock, 14 mm				x	x
LOZ.RST-18*		LIGHT tailstock, 18 mm				x	
LOZ.RST-18St**		LIGHT tailstock, 18 mm				x	x

* with zentriX alignment system (instead of alignment slot nut) and with a fixed center MK3
** with fixed center MK3

Maintenance unit

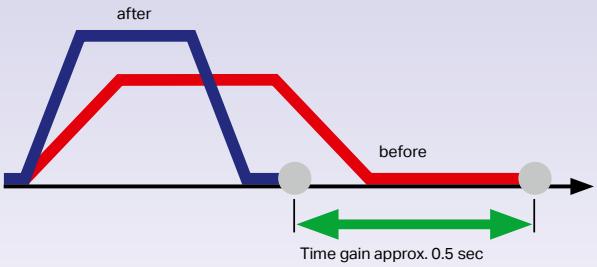
Clamps, steel plugs

Gear oil, clamps, steel plugs

Fastening material on machine table (screws, T-slot nuts)

Alignment slot nut (1 pair)

We support you from A to Z, whether you have problems or when it's a matter of optimization



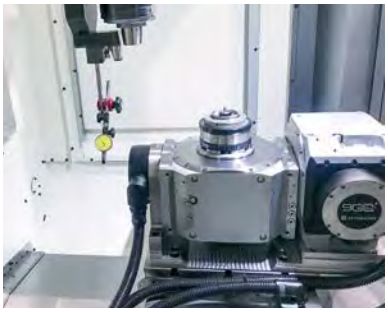
Optimization of the cycle time (CMS **position**)

Commissioning Service

Commissioning of new machines with controls from Siemens, Fanuc, Mitsubishi, Mazak. In addition to **basic commissioning** (see **p. 43**), we optimize for positioning and simultaneous operation through our application support on request.

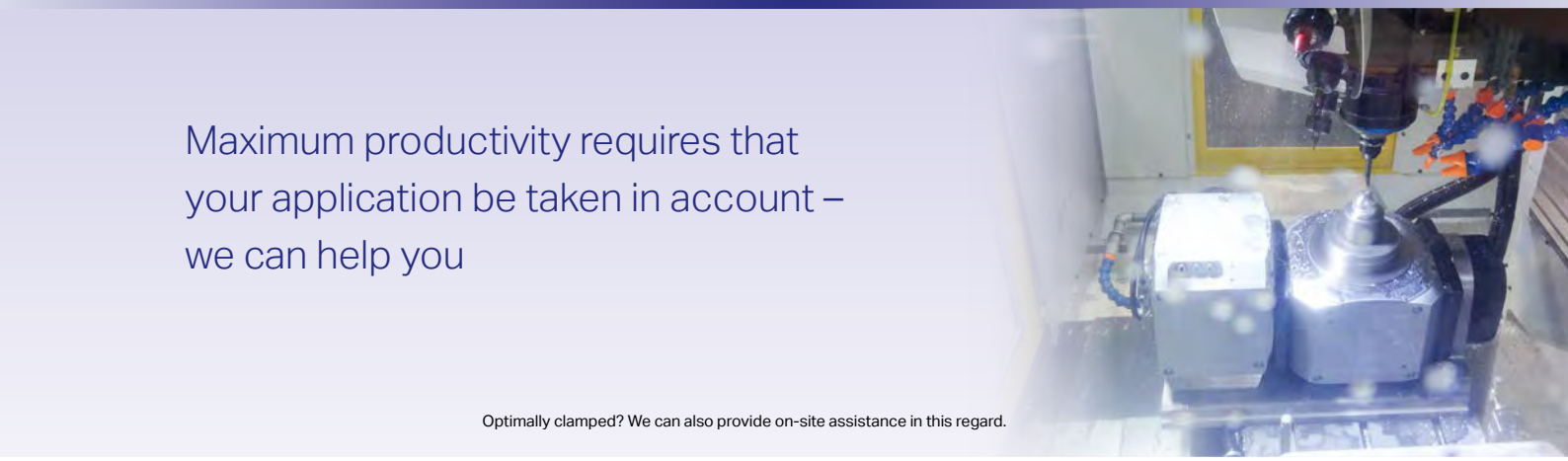
Goal
Improved application, optimal adjustment of rotary table and machine, higher productivity

For item no., see **p. 44**



LEHMANN®

Maximum productivity requires that your application be taken in account – we can help you



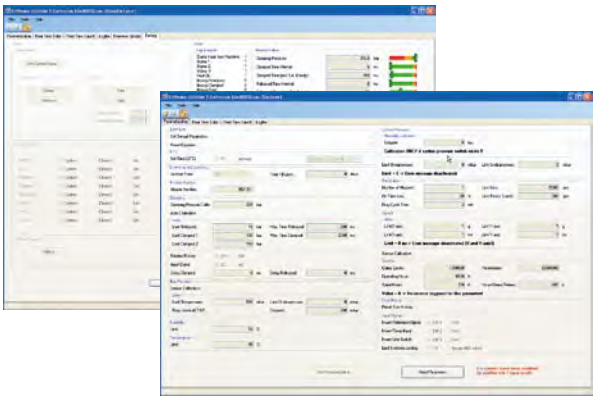
Optimally clamped? We can also provide on-site assistance in this regard.

Helpline Service

Telephone service from 7:30 a.m. – 12:00 noon and 2:00 p.m. – 5:00 p.m. as well as 24-h/5 telephone emergency service for all pL service centers

- Technical assistance
- Diagnostic support
- Organizing factory and field service
- Taking spare part orders

Goal
To help quickly, competently and unbureaucratically

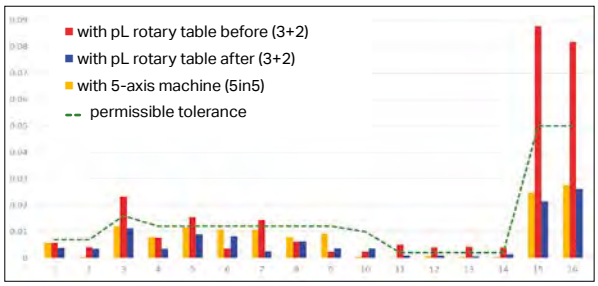


Application Support

Experience has shown: A considerable improvement in time needed per piece and workpiece accuracy are almost always possible.

- Adjustments for spindle operation
- Reliable clamping control.
- General support for lathing/milling operation with BR900
- Safeguarding the equipment against overheating
- Support with PLC adjustments
- Clamping the workpiece correctly, optimizing machining processes
- Improving workpiece accuracy (alignment, 0-point...)
- Fine-tuning of drives and CNC parameterization

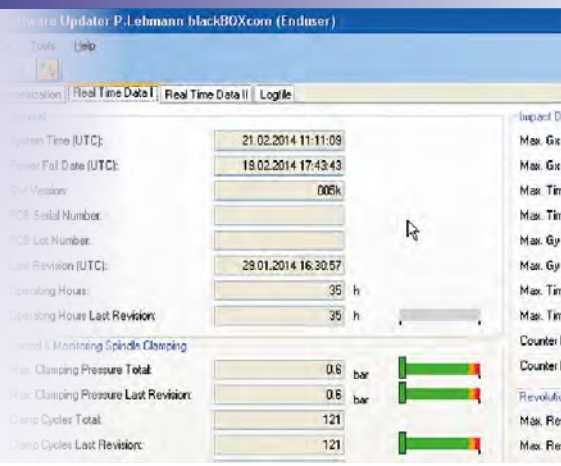
Goal
To extract the maximum, improve efficiency, lower workpiece costs, increase workpiece accuracy



Errors at the measuring points before and after APS **precision** for 3-D machining.

For item no., see **p. 44**

We also support you after the purchase to ensure high availability of your equipment



Active Service[1)]

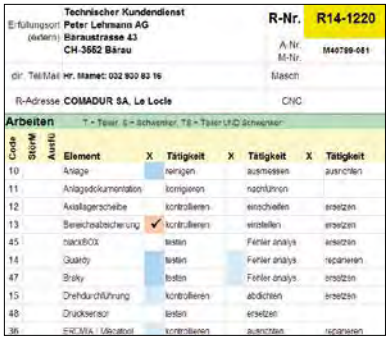
[1)] an excerpt from our Active Services; please contact us for additional options

Easy Check
- Visual inspection
- Hose check
- Read and evaluate blackBOX data
- Status report with recommendation

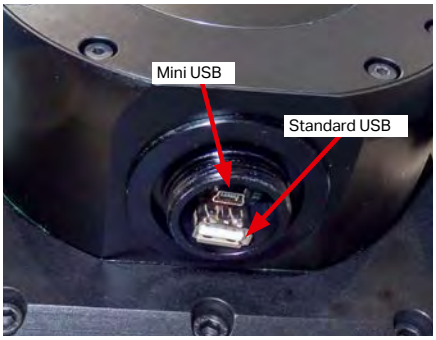
Facts
- Without maintenance contract
- We schedule the region on our own
- Then notify the intended customers of the pending visit
- Customers can decide yes or no

Benefits
- Prevention helps to minimize expensive downtime
- Travel costs are prorated
- The customer does not need to think about it
- No contract, you are free to decide annually
- Based on the worldwide practical experience of pL

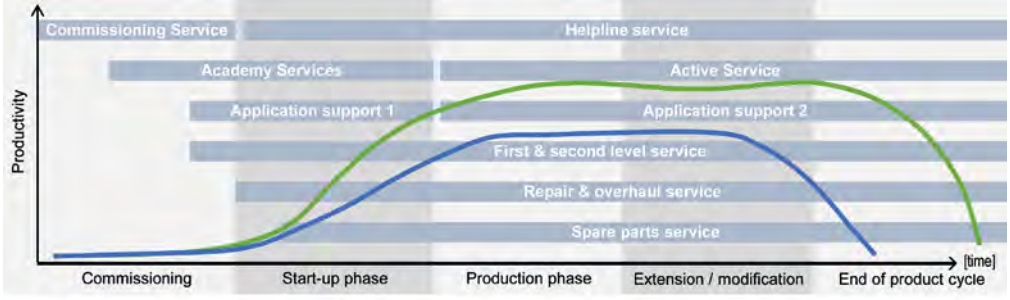
Goal
Prevent downtime, eliminate stress and costs, extend the service life → Prevention instead of reaction



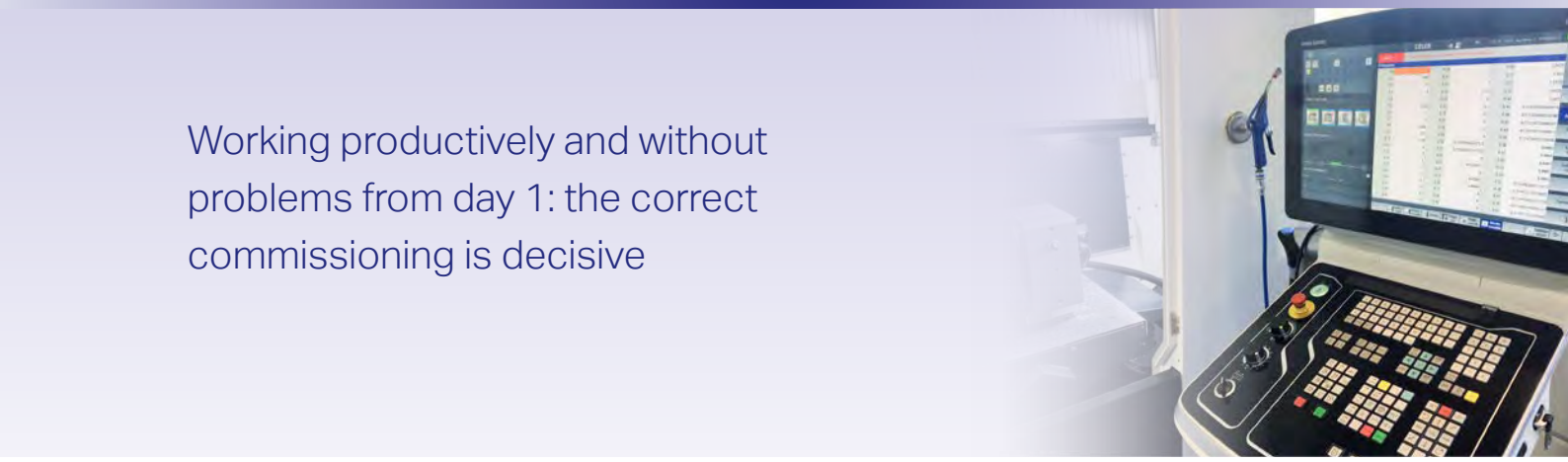
Status report with recommendation



LifeCycle Services: Increased productivity over the life of your machine ...



Working productively and without problems from day 1: the correct commissioning is decisive



Investigations have shown that 70% of problem situations during the warranty period can be prevented through careful and professional commissioning. At the same time, it was obvious that productivity could be increased significantly through use of application service. Make use of our services!

Basic commissioning

Goal
Rotary cable connected and parameterized, ready for production

Activities
- Mechanical assembly of the rotary table on the machine table
- Alignment of the rotary axes with respect to the main axes of the machine
- Kinematics setting/check
- Electrical connection of the rotary table on the machine
- Basic parameterization using pL parameter lists, at least with usual values, but possibly to customer requirements
- Brief customer training

Prerequisite
- Machine must be prepared appropriately (servo, control cabinet cabling, connectors, PLC, CNC with readily available 4th and/or 5th axis/axes; or can be ordered from pL LEHMANN (depending on machine; PLC not possible)
- During commissioning, a qualified technician from the machine supplier may be need to be present (parameter adjustments, possibly adjustment of the PLC etc.); organized and paid by customer, contact us with the request.

Commissioning of servopack

Goal
Connection of the rotary table and adjustment to customer requirements if possible, incl. integration of the Servopack retrofit kit

Activities
- ServoPack installation with cabling in control cabinet up to enclosure wall
- Mechanical assembly of the rotary table on the machine table
- Alignment of the rotary axes with respect to the main axes of the machine
- Kinematics setting/check
- Electrical connection of the rotary table on the machine
- Basic parameterization using pL parameter lists, at least with usual values, but possibly to customer requirements
- Brief customer training

Prerequisite
- Machine must be prepared appropriately (CNC has readily available 4th and/or 5th axis, PLC is prepared)
- During commissioning, a qualified technician from the machine supplier may be need to be present (parameter adjustments, possibly adjustment of the PLC etc.); organized and paid by customer, contact us with the request.

Application support

Goal
Rotary table settings optimized for customer application (time optimization and/or accuracy improvement)

Activities
- Calculation based on rotary table and workpiece (what is possible)
- Check of the geometry, and correct as much as possible
- Check whether the clamping control functions correctly and is not active before the intended position is actually reached
- Check of dividing/indexing errors (0–90° relatively simple; possibly with portable measuring instrument)
- Check of clamping/load placement (no overly eccentric loads, improper clamping), and of the machining sequence and the control response (smooth control)
- Optimization for specific workpiece, incl. clamping device and machining strategy (may require considerably more effort for simultaneous machining; invoiced separately)
- Kinematics setting/check
- PLC adjustments (where possible) for spindle operation, secure clamping, workpiece clamping)
- Expenses such as travel time, travel costs, hotel and meals are calculated on the basis of actual cost

Prerequisite
- Programming system must be prepared appropriately (e.g. for simultaneous operation)

	Item no.	Data	Description
EA-type rotary tables	**INB.1AX9-APS**	max. 20 h, 1-axes	Application support
	INB.1AX9-CMS	basic, max. 15 h, 1-axes	Commissioning of integrated axes
	INB.1AX9-SP	max. 20 h, 1 axes	Commissioning of servopack
T-type rotary tables	**INB.2AX9-APS**	max. 30 h, 2-axes	Application support
	INB.2AX9-CMS	basic, max. 25 h, 2-axes	Commissioning of integrated axes
	INB.2AX9-SP	max. 30 h, 2 axes	Commissioning of servopack
with pL CNC	**INB.MF**	max. 15 h on-site	Commissioning of M-function

Test machining

Preparation
- Checking feasibility
- Determining tool and machining data with tool supplier where applicable
- Creating schedule

Implementation – at the factory with the customer present
- Explaining solution of the application
- Machining and inspecting workpieces
- Measuring equipment provided by the customer – or customer takes workpieces along for the measurement

High geometric accuracies as standard, combined with a high level of rigidity and stability
And for the most demanding requirements: 1/2 tolerance as an option

( ) values = increased accuracy. Item no.. GEO.5xx-GEN

The tolerances given below apply under the following conditions:

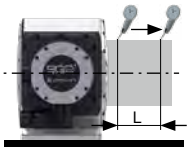
1. The rotary table is mounted as specified in the commissioning instructions
2. The measurement is carried out on a calibrated granite plate (all machine errors are excluded)
3. The rotary table is not subjected to any outside thermal influences (sun, fans, heaters...)
4. Prior to the measurement, the rotary table and the measuring and test equipment have been in the same environment for at least 24 h
5. All measured values are determined for an unloaded rotary table

Geometry of EA rotary tables

Perpendicularity
Spindle surface to support surface

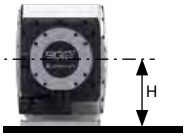
0.01/100 mm (0.005/100 mm)

Parallelism
Spindle axis with support surface



0.01/100 mm (0.005/100 mm)

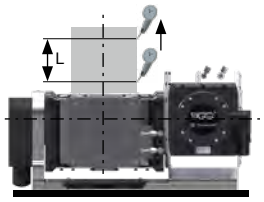
Center height



0...0.04 mm

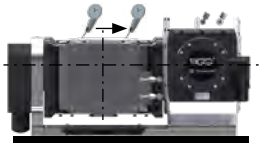
Geometry of T1 rotary tables

Perpendicularity
Dividing/indexing axis to swivelling/tilting axis



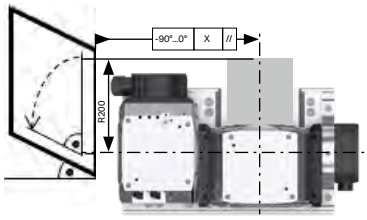
0.01/100 mm (0.005/100 mm)

Parallelism
Spindle surface to support surface



0.01/100 mm (0.005/100 mm)

Tilt drift
Change in the angle between the dividing/ indexing axis and swivelling/tilting axis during the tilting movement from -90° to 0°



0.01/R150 mm (0.005/R150 mm; applies only to T1)

For all rotary tables

Radial and axial run--out for all rotary table versions

- measured at spindle nose
- Axial concentricity on largest diameter
- Radial concentricity of inner bore as well as centering ø

0.006 mm (0.003 mm)

Basics of the drive data

All drive data of pL-LEHMANN rotary tables have been designed for the following standard spindle loads in accordance with DIN/VDE 0530 as follows:

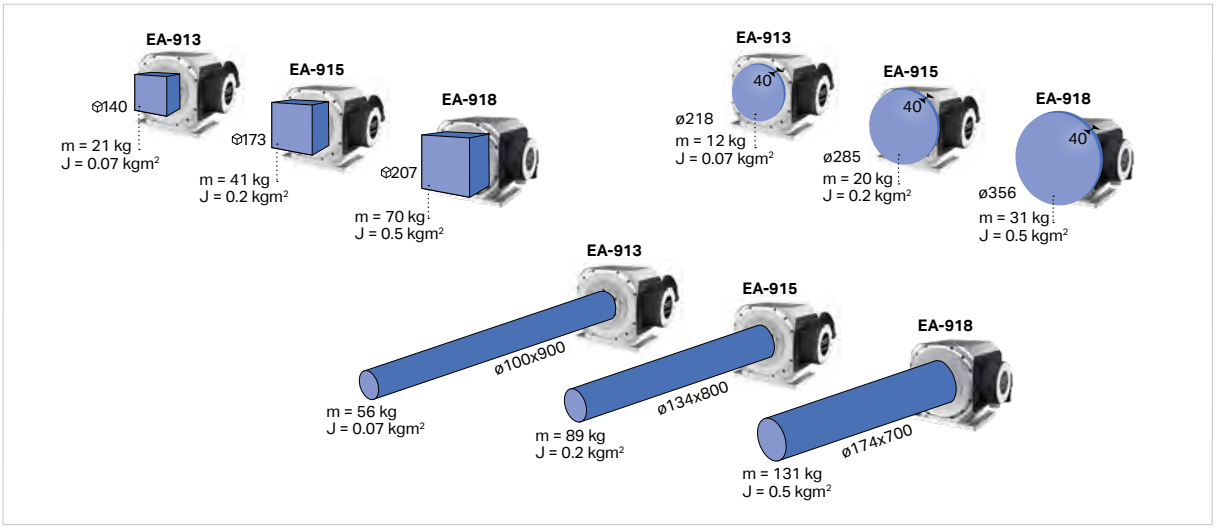
- For intermittent service S3 ED 40%
- Cycle duration 10 minutes

Different conditions require the drive data to be adjusted (acceleration, jerk limitation, speed).

Reference values for duty cycle (ED)

- For normal rotary table work such as milling / boring (mainly positioning) approx. 20%.
- For milling / boring in intensive mixed operation (positioning / feed machining): approx. ED 40%
- For profile and depth grinding approx. ED 60% / simultaneous machining, 5-axis
- For engraving and operations in spindle mode approx. ED 80–100%.
- Mixed operation with turning and simultaneous machining, power skiving approx. duty cycle of 40–60%

EA-type rotary table



T1-type rotary tables (TAP)

Calculating loads, forces and moments of inertia, avoiding risks and damage

It is not only the weight which counts; shape and position are also often decisive factors

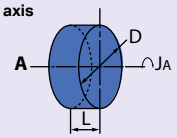
We are here to help

Request a proposal and we will gladly prepare you an offer for your individual calculation up to and with a specific list of parameters. Contact your closest pL LEHMANN representative. We are here to help.

Calculation of the load on the dividing/indexing axis

(using Steiner's theorem)

Center of gravity in rotary axis

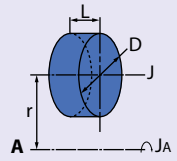


D: Outside diameter of the round bar [m]
L: Length of the round bar [m]
p: Density [kg/m³]
m: Mass of the round bar [kg]
J_A: Moment of inertia [kgm²]

$$m = \frac{D^2 \cdot \pi}{4} \cdot L \cdot p$$

$$J_A = \frac{m \cdot D^2}{8}$$

Center of gravity outside rotary axis



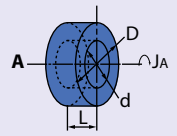
D: Outside diameter of the round bar [m]
L: Length of the round bar [m]
r: Turning radius [m]
p: Density [kg/m³]
m: Mass of the round bar [kg]
J_A: Moment of inertia of the round bar at center A [kgm²]
J: Moment of inertia [kgm²]

$$m = \frac{D^2 \cdot \pi}{4} \cdot L \cdot p$$

$$J = \frac{m \cdot D^2}{8}$$

$$J_A = J + m \cdot r^2$$

Center of gravity in rotary axis

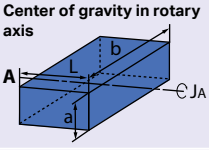


D: Outside diameter of the cylinder [m]
d: Bore diameter of the cylinder [m]
L: Length of the round bar [m]
p: Density [kg/m³]
m: Mass of the cylinder [kg]
J_A: Moment of inertia [kgm²]

$$m = \left(\frac{D^2 \cdot \pi}{4} \cdot L \cdot p\right) - \left(\frac{d^2 \cdot \pi}{4} \cdot L \cdot p\right)$$

$$J_A = \frac{1}{8} m (D^2 + d^2)$$

Center of gravity in rotary axis

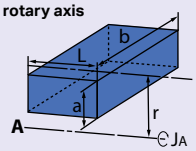


a: Side length [m]
b: Side length [m]
L: Side length [m]
p: Density [kg/m³]
J_A: Moment of inertia [kgm²]

$$m = a \cdot b \cdot L \cdot p$$

$$J_A = \frac{1}{12} m (a^2 + b^2)$$

Center of gravity outside rotary axis



a: Side length [m]
b: Side length [m]
L: Side length [m]
p: Density [kg/m³]
r: Turning radius [m]
J_A: Moment of inertia [kgm²]

$$m = a \cdot b \cdot L \cdot p$$

$$J_A = \frac{1}{12} m (a^2 + b^2 + 12r^2)$$

Key

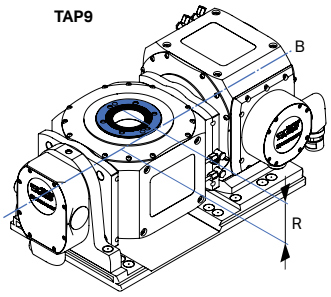
A = Dividing/indexing axis
B = Swivelling/tilting axis
R = Radius between swivelling/tilting axis and spindle nose of dividing/indexing axis [m]
Rs = Center distance [m]
m = Mass [kg]
M = Torque calculated from m x g x Rs [Nm]
Me = Torque acting on the swivelling/tilting axis caused by the dead weight of the dividing/indexing axis [Nm]
g = Acceleration due to gravity 9.81 [m/s²]

Densities of different materials x dynamic speed (p)

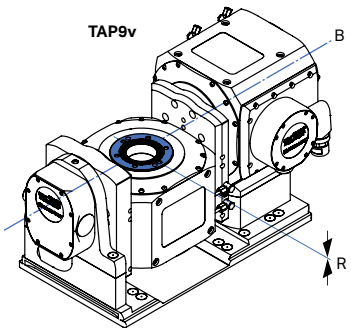
Steel	7.85 x 10^3 kg/m³
Cast iron	7.85 x 10^3 kg/m³
Aluminum	2.7 x 10^3 kg/m³
Copper	8.94 x 10^3 kg/m³
Brass	8.5 x 10^3 kg/m³

Calculation of the load on the swivelling/tilting axis

TAP9



TAP9v



Distance R

Rotary table	R [mm]	Limited torques [Nm]
T1-91x915 TAP9	69.5	36
T1-91x918 TAP9v	0	77
T1-91x520 TAP5	69.5	100
T1-91x520 TAP5v	0	100

Calculation of the torque in the tilting direction (without intrinsic torque of the dividing/indexing axis):

Rs = R + L/2
M = m x Rs x g

Calculation of the total torque in the tilting direction (with intrinsic torque of the dividing/indexing axis):

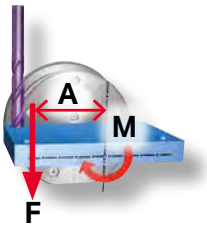
M tot = M + Me (Me represents the gear unit loading without load)

Reference values for configuring and selecting the correct rotary table

F = Feed force, **A** = Distance [m] from rotary table axis to feed force **(F)** during machining, **M** = Resulting torque (FxA)
Resulting torque M = F x A → must not exceed the max. clamping torque [Nm] or max. feed torque [Nm] of the rotary table!

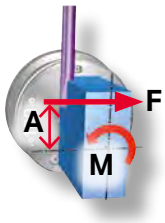
V = Rough machining, WP = indexable inserts, VHM = Solid hard metal

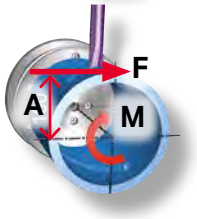
Drilling



Tool type	Wz ø [mm]	Cutting speed [m/min]	Feed F [mm]	Feed force **F** [N] CK45	X5CrNi18-10	AlMg4.5Mn0.7
Twist drill VHM	5	220	0.12	920		
		120	0.10		1120	
		350	0.15			315
Twist drill VHM	10	220	0.27	1'450		
		120	0.18		1'900	
		350	0.2			650
Twist drill VHM	17	220	0.35	2'850		
		120	0.25		3'980	
		350	0.3			1'250
WP drill	38	140	0.09	4'350		
		100	0.08		6'550	
		180	0.16			2'800

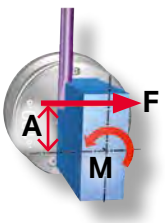
End milling and slot milling





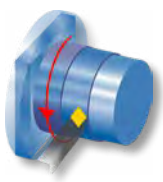
Tool type	Wz ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Cutting width [mm]	Feed force **F** [N] CK45	X5CrNi18-10	AlMg4.5Mn0.7
End milling cutter V	8	180	0.09 x 4	4	8	840		
		70	0.06 x 4	4	8		410	
		570	0.15 x 4	4	8			360
End milling cutter V	12	180	0.11 x 4	6	12	1'100		
		70	0.07 x 4	6	12		700	
		570	0.17 x 4	6	12			550
End milling cutter V	20	180	0.095 x 4	10	20	1'550		
		70	0.08 x 4	10	20		1'400	
		570	0.17 x 4	10	20			950

Hobbing



Tool type	Wz ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Cutting width [mm]	Feed force **F** [N] CK45	X5CrNi18-10	AlMg4.5Mn0.7
End milling cutter V	8	200	0.09 x 4	8	4	510		
		77	0.06 x 4	8	4		420	
		627	0.15 x 4	8	4			360
End milling cutter V	12	200	0.11 x 4	12	6	1'050		
		77	0.07 x 4	12	6		700	
		627	0.17 x 4	12	6			550
End milling cutter V	20	200	0.15 x 4	20	10	2'700		
		77	0.08 x 4	20	10		1'350	
		627	0.17 x 4	20	10			950

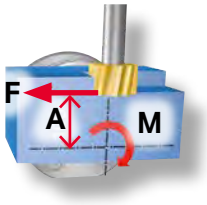
Turning



Tool type	Turning ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Cutting force [N] CK45	X5CrNi18-10	AlMg4.5Mn0.7
Corner lathe tool WP	40	250	0.3	2	541		
		140	0.25	2		286	
		500	0.4	3			65.6

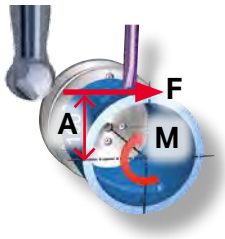
Factory information from well-known tool manufacturers (applies to new tool cutting edges)

Corner milling (slab milling or plane milling)



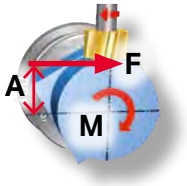
Tool type	Wz ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Cutting width [mm]	Feed force **F** [N]		
						CK45	X5CrNi18-10	AlMg4.5Mn0.7
Angular milling cutter WP	40	160	0.12 x 6	2	40	1'750		
		160	0.12 x 6	2.5	25	1'250		
		85	0.12 x 6	2	40		1'550	
		85	0.12 x 6	2.5	25		1'150	
		500	0.15 x 6	3	40			1'250
Angular milling cutter WP	80	210	0.15 x 10	3.5	80	4'900		
		240	0.15 x 10	7	40	4'900		
		160	0.08 x 10	3.5	80		3'450	
		176	0.08 x 10	7	40		3'450	
		450	0.2 x 10	3.5	80			3'100
		495	0.2 x 10	7	40			3'100

Ball end milling



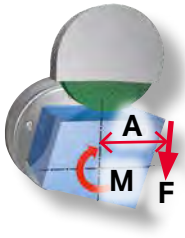
Tool type	Wz ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Cutting width [mm]	Feed force **F** [N]		
						CK45	X5CrNi18-10	AlMg4.5Mn0.7
Ball end milling cutter	6	220	0.1 x 2	1.0	1.0	60		
		100	0.08 x 2	0.8	0.8		35	
		530	0.15 x 2	2.0	2.0			50
Ball end milling cutter	12	220	0.14 x 2	1.3	1.3	100		
		100	0.11 x 2	1.0	1.0		65	
		530	0.16 x 2	3.0	3.0			85

Mill turning



Tool type	Wz ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Cutting width [mm]	Feed force **F** [N]		
						CK45	X5CrNi18-10	AlMg4.5Mn0.7
Angular milling cutter	40	130	0.12 x 6	5	1mm / 360°	435		
		85	0.12 x 6	5	1mm / 360°		390	
		500	0.12 x 6	5	1mm / 360°			193

Grinding



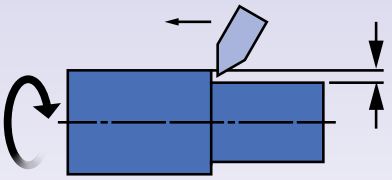
Tool type	Grinding capacity [kW]	Feed force **F** [N]		
		CK45	X5CrNi18-10	AlMg4.5Mn0.7
Ceramic grinding wheel	40	2200		
	75	4130		
CBN grinding wheel				

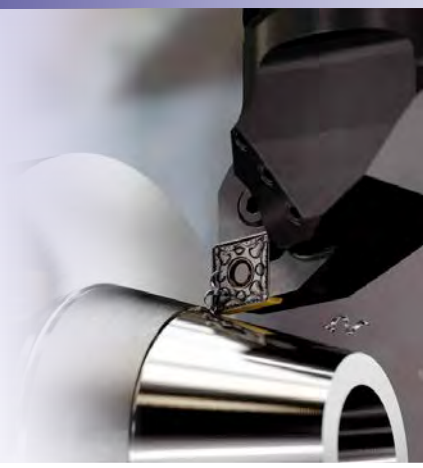
Diagrams of turning depth of cut for different materials as a function of workpiece diameter

Diagram will be added at a later date.

Diagram will be added at a later date.

Turning depth of cut as a function of workpiece diameter

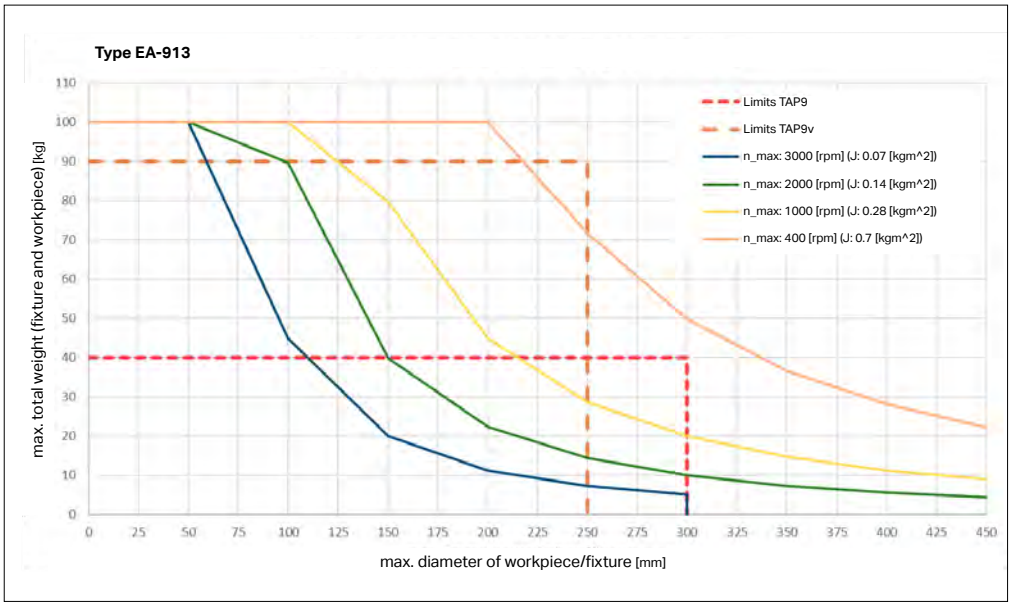


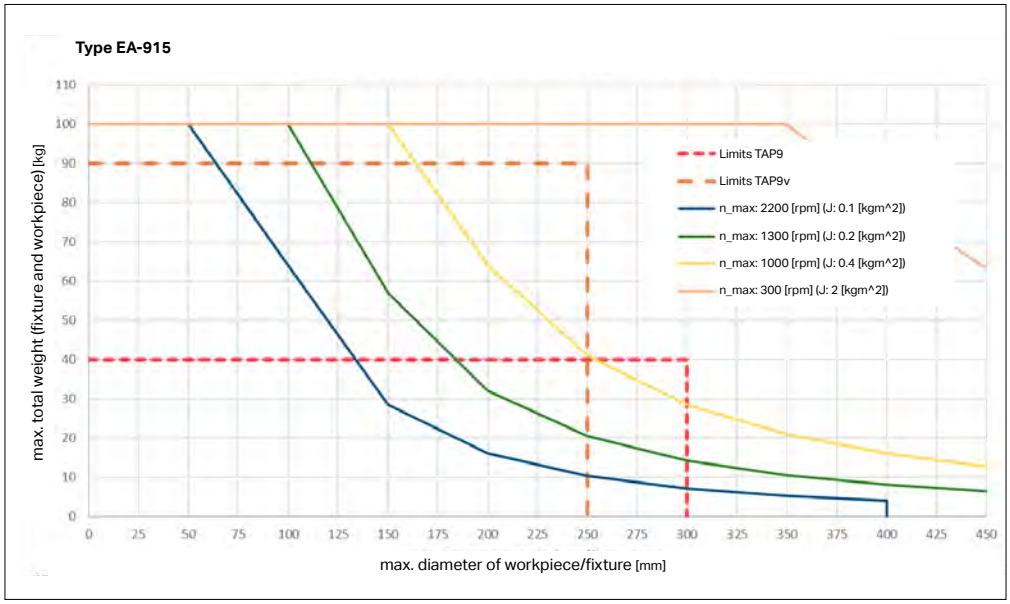


Type EA-918

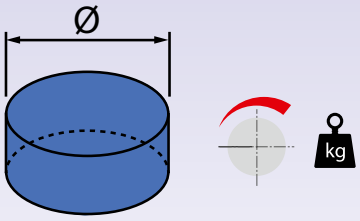
Diagram will be added at a later date.

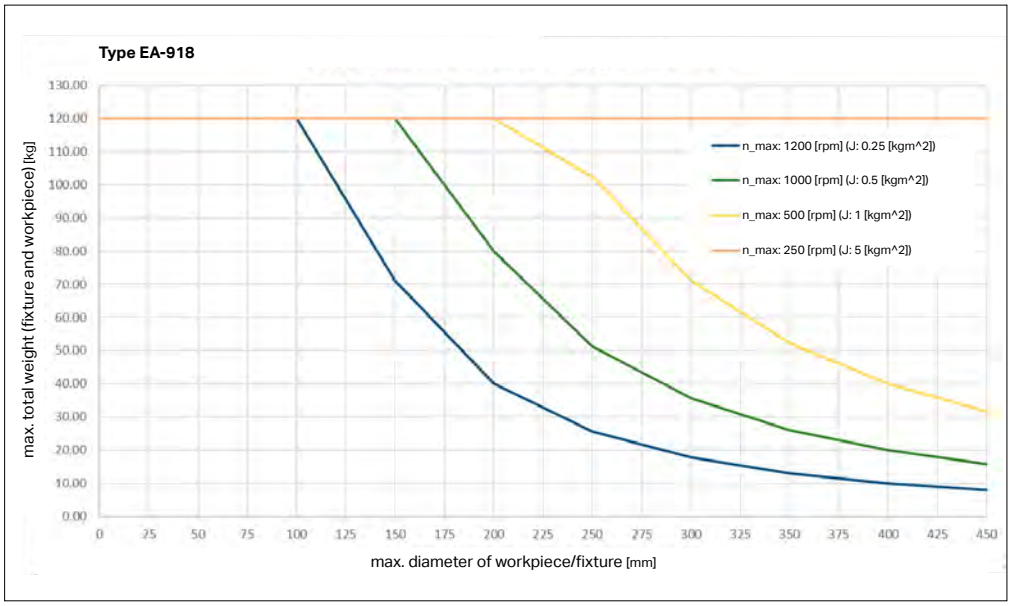
Speed limits in relation to weight and diameter





Spindle speed as a function of spindle load

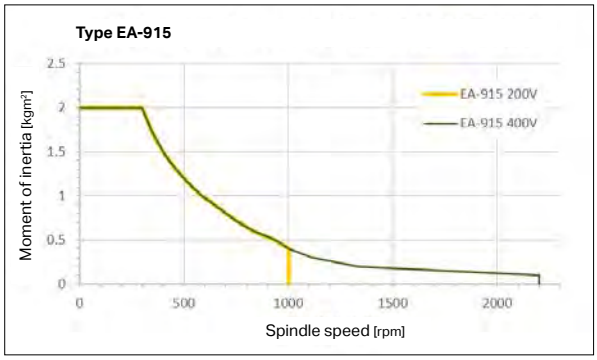


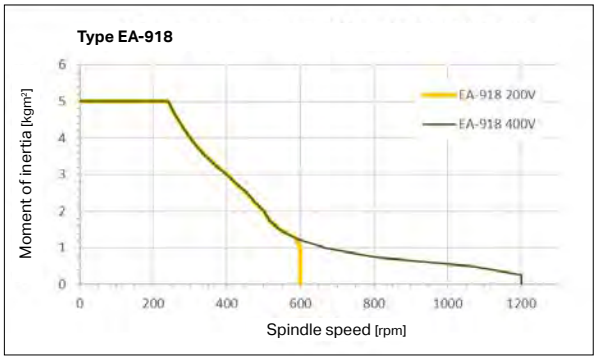


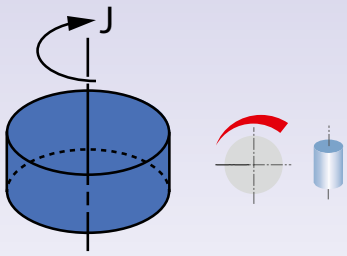
The permissible moment of inertia is dependent on speed, the CNC controller and the type of rotary table.

Balance workpieces, including clamping devices, at higher speeds! For more information, please refer to **p. 65**.

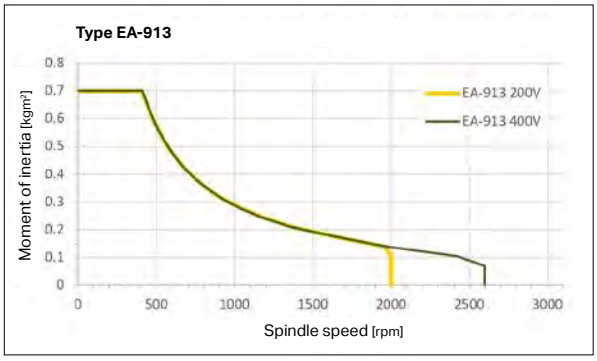
For Fanuc CNC (80A servo controller)

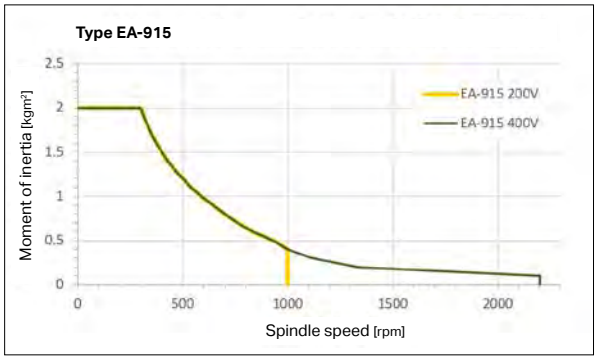


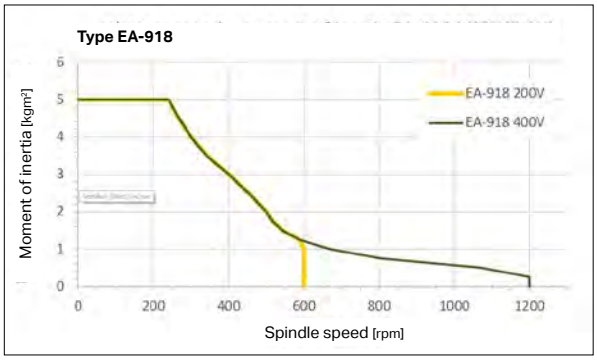




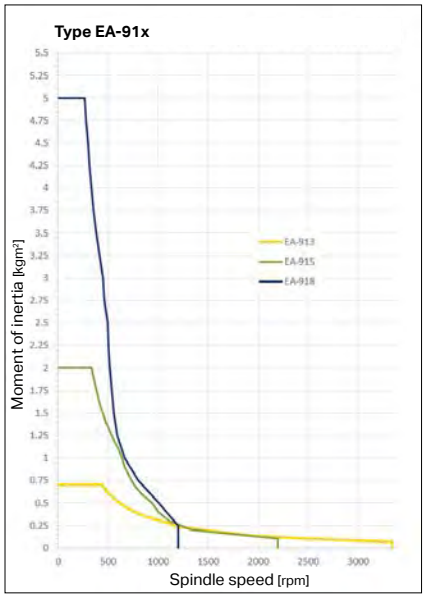
For Mitsubishi CNC



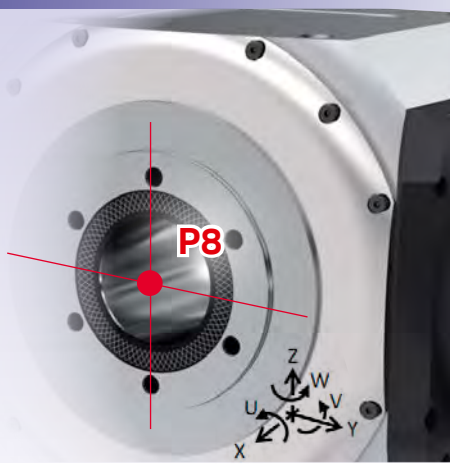




For Siemens and Heidenhain CNC



Material elasticities and their effect on workpiece accuracy: Understand them correctly and know how to respond in real-world practice



P8 with EA-type rotary tables

Background

Every material has a certain elasticity. Depending on the orientation and load, these affect the accuracy of machining in different ways. The figures and data shown here provide information on the values to be expected.

Optimization options

If the static stiffness is insufficient, the following may help:

- Error compensation in the axis direction affected
- Use of lighter clamping means
- Changing the machining strategy

Static mechanical analysis

Using FEM analyses, the compliance in P8 (see figure at right) was calculated in the respective configuration for all T-type rotary tables listed below. The deflections in the X- and Y-directions are usually negligible. The table below shows the deflection in the Z-direction. Depending on the workpiece weight, this information can be used to determine the approximate displacement.

Compliance of EA-type rotary tables in P8 in Z-direction (approximate values)

µm/kg	Rotary table fastened by means of bolting	Rotary table fastened by means of clamping claws
EA-91x	-0.010	-0.008

Compliance of T1-type rotary tables in P8 in Z-direction (approximate values)

µm/kg	0°		90°	
	TAP9	TAP9v	TAP9	TAP9v
T1-91x915	-0.017		-0.021	
T1-91x918		-0.018		-0.015

TAP9

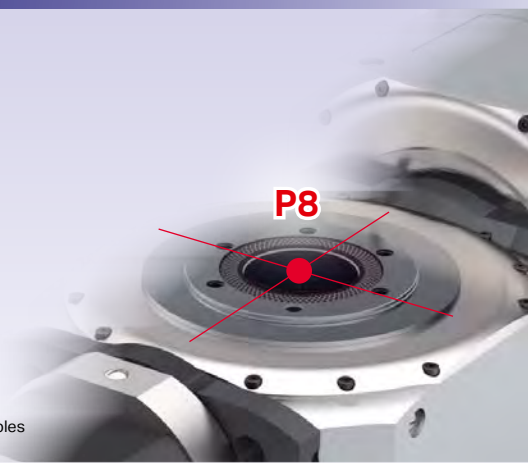
TAP9v

µm/kg	0°		90°	
	TAP5	TAP5v	TAP5	TAP5v
T1-91x520	-0.022	-0.025	-0.035	-0.018

TAP5

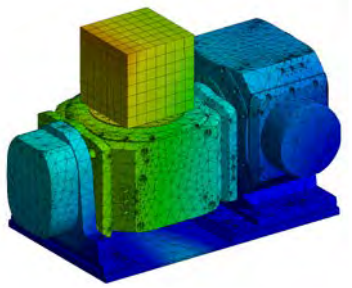
TAP5v

Results of static-mechanical FEM analysis

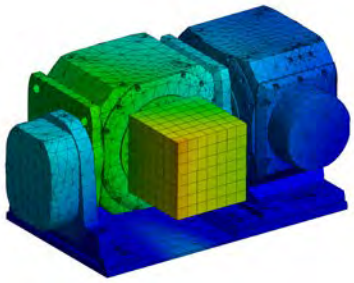


P8 with T-type rotary tables

TAP9

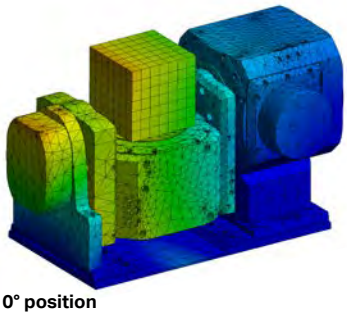


0° position

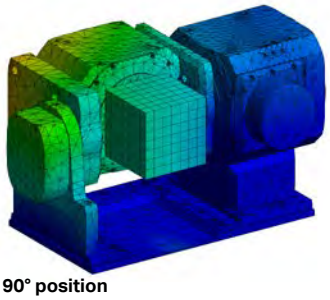


90° position

TAP9v

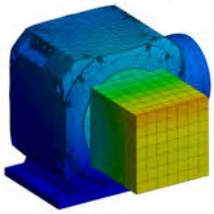


0° position

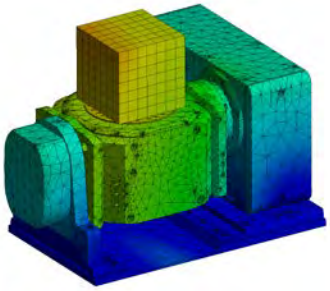


90° position

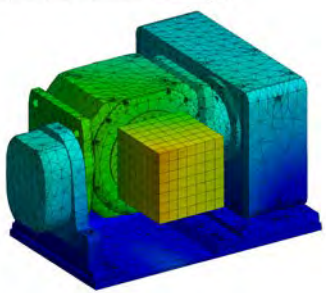
EA



TAP5

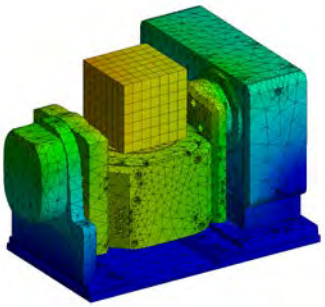


0° position

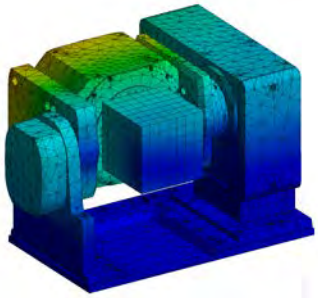


90° position

TAP5v



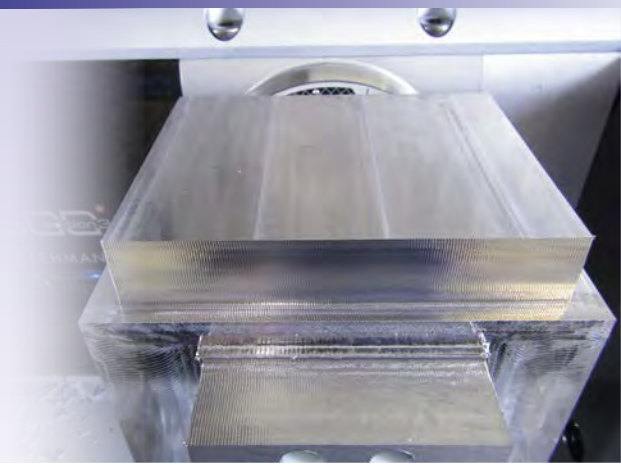
0° position



90° position

Condition: Rotary table is mounted in the specified manner and both axes are clamped with 6 bar compressed air.

Optimizing vibration, tool wear, surface quality and machining capacity



The illustrations below always show mode 1

Dynamic analysis

The eigenfrequencies were determined using FEM modal analyses. The compliance frequency response curves at the right show the result of the harmonic analysis. The first 9 vibration modes and eigenfrequencies of all rotary tables listed below were determined. Experience has shown the mode 1 and mode 2 are the most important in actual practice. These values can be found in the table below.

Optimization options

If the frequency of the machining process starts to increase, change the following:

- Tool speed
- Number of teeth on tool
- Machining strategy
- Workpiece orientation

Important notice: Shape, weight and the way the workpieces are assembled as well as the clamping devices used can significantly affect eigenfrequency.

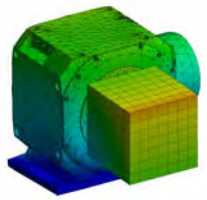
Condition: Rotary table is mounted in the specified manner and both axes are clamped with 5 bar compressed air.

Example of machining frequency calculation

Angular milling cutter ø40 mm, number of teeth 4, speed 1'900 rpm = $\frac{4 \times 1'900}{60}$ = 127 Hz

Eigenfrequency of EA-type and M-type rotary tables, mode 1 and 2 (approximate values)

Hz	Rotary table fastened by means of bolting		Rotary table fastened by means of clamping claws	
	without standard load	with standard load	without standard load	with standard load
Mode 1	443	346	305	263
Mode 2	727	473	498	379



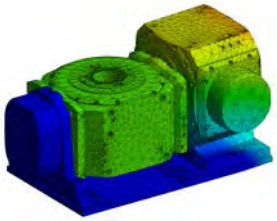
Every object has several natural frequencies (so-called eigenfrequencies) that depend on the object's shape, mass and material. If the machining frequency matches an eigenfrequency, e.g. that of a rotary table, the result is chattering or whistling noises. A vertical machining center has its first eigenfrequency in the range of about 100 Hz. It is important that the machining frequency does not match the eigenfrequency.

The illustrations below always show mode 1

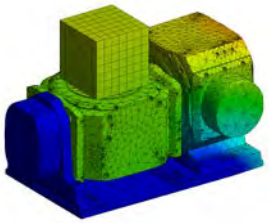
Eigenfrequency of TAP9-type rotary tables, mode 1 and 2 (approximate values)

Hz	without load				with load			
	TAP9		TAP9v		TAP9		TAP9v	
	0°	90°	0°	90°	0°	90°	0°	90°
Mode 1	231	237	168	172	210	217	159	162
Mode 2	347	347	196	196	325	340	196	196

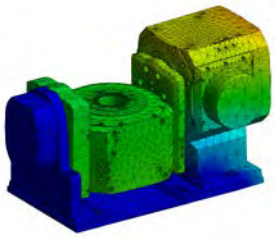
0° position



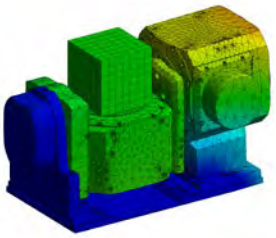
TAP9 without standard load
in accordance with **p. 24**



TAP9 with standard load
in accordance with **p. 24**



TAP9v without standard load
in accordance with **p. 25**

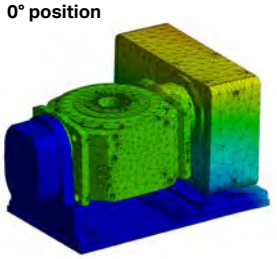


TAP9v with standard load
in accordance with **p. 25**

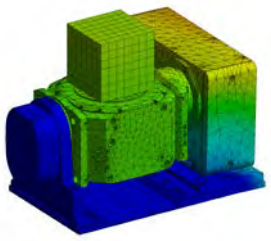
Eigenfrequency of TAP5-type rotary tables, mode 1 and 2 (approximate values)

Hz	without load				with load			
	TAP5		TAP5v		TAP5		TAP5v	
	0°	90°	0°	90°	0°	90°	0°	90°
Mode 1	172	179	136	146	156	164	127	135
Mode 2	239	239	189	189	220	224	189	189

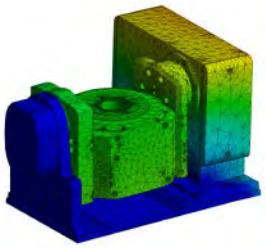
0° position



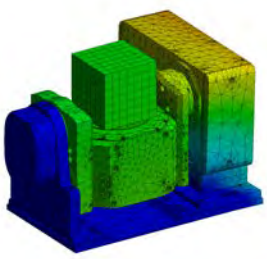
TAP5 without standard load in
accordance with **p. 26**



TAP5 with standard load
in accordance with **p. 26**



TAP5v without standard load
in accordance with **p. 27**

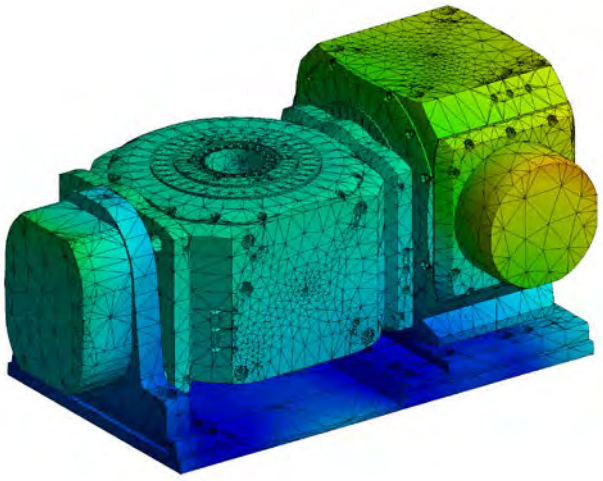


TAP5v with standard load
in accordance with **p. 27**

Thermal deformation from the process and operation

Basics

Heat is generated by friction and electrical losses. The more intense and the longer a motion lasts, the more the temperature rises. Depending on the particular heat sources (motor, gear unit, seals, etc.,) the effects on dimensions differ greatly. At point P8 (see figure to the right), the relevant differences for the workpiece have been determined and are presented in the adjacent tables. The determination was made experimentally and with the aid of simulations.



Thermally induced deformation in stationary state from the FEM simulation of the T1 91x915 TAP9, positioning application with ED 20%, without cooling lubricant and without cooling unit, deformation shown with 80x increase.

Approximate values for estimating the deformations

Approximate values for estimating the thermally induced deformations are listed in the tables on the following pages. All values apply to L-versions; on the R-version, it must be kept in mind that the signs for the directions of rotation are reversed.

Influencing factors

The thermally induced deformations occur in response to external (coolant, ambient air, etc.) and internal (gear unit, bearings, motor, etc.) thermal factors. The following factors require particular attention:

- Operating mode of the table (duty cycle, performance, etc.)
- Idle time between the work cycles
- Optional cooling plate (on request) for removing internal heat from the gear unit, bearings, etc.
- Machine table (thickness, size, material) and how the rotary table is mounted on it

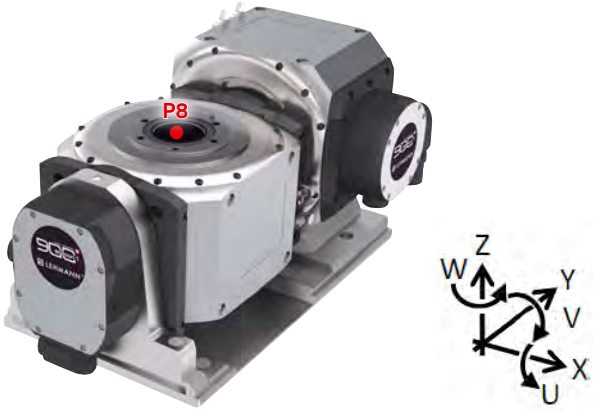
Example of reading the tables

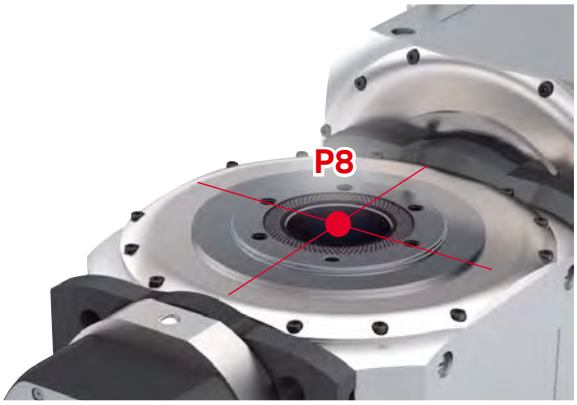
For dry simultaneous machining with the T1-913915 TAP9, the table provides a displacement in V-direction at point P8 of 0 µm after 60 s after a cold start. This remains for the time being. After approx. 1 hour, a displacement of -1 µm occurs, increasing to -5 µm after 10 hours. Explanation of behavior: The temperature increases during longer use, causing the displacement.

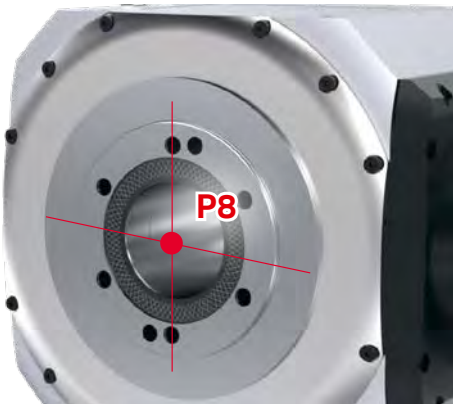
The best cooling is not a substitute for the briefest possible workpiece clamping ...

Measuring point P8

The displacements and rotations are evaluated at point P8, at the center of the spindle surface.

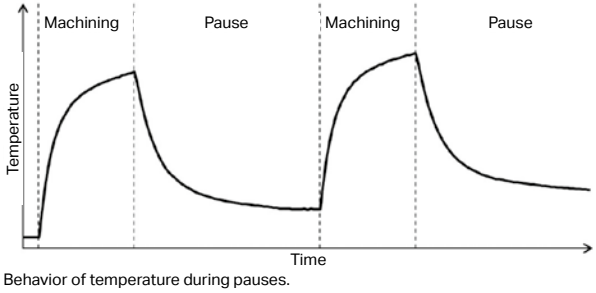






Important for precision machining

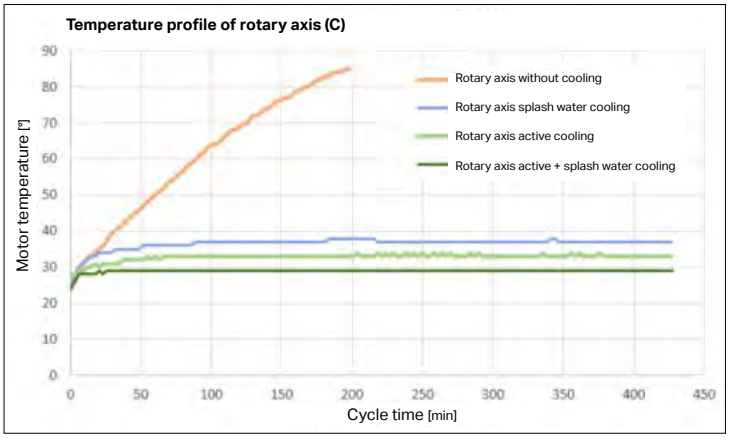
Maximum precision is achieved through use of coolant (KSS). Constant and uniform wetting of the rotary table is recommended. Interruptions in the use of coolant can result in accuracy fluctuations. The most effective heat removal is achieved with water-based coolants that are kept at a constant temperature and distributed uniformly. In addition, pauses and interruptions in machining between individual cycles should be avoided. Relevant cooling and thus deformations can occur even from pauses of one minute.

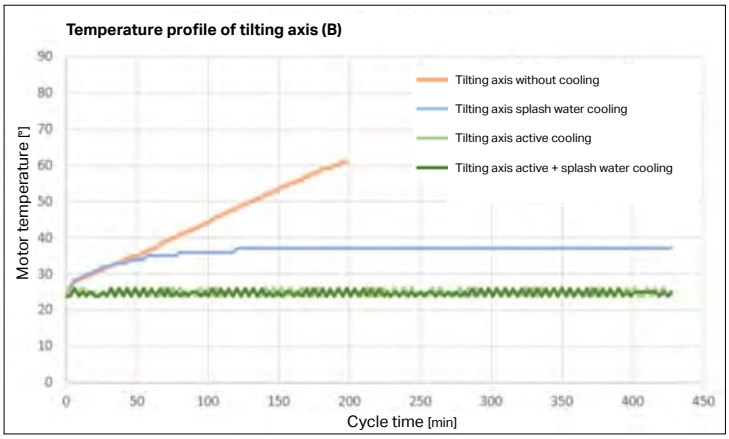


Behavior of temperature during pauses.

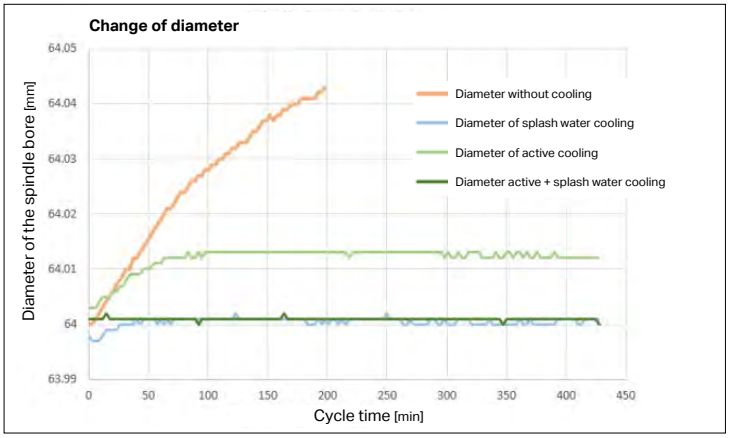
Thermal behavior with the different cooling types

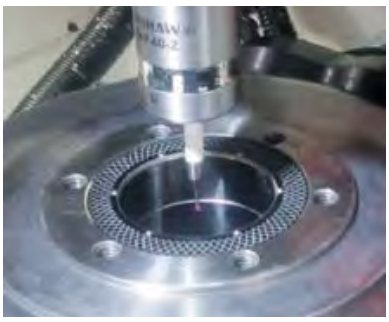
Motor temperatures



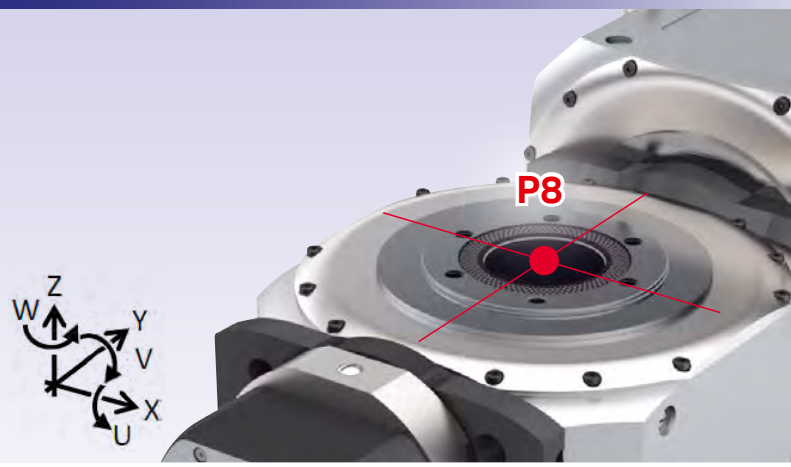


Spindle diameter ø64

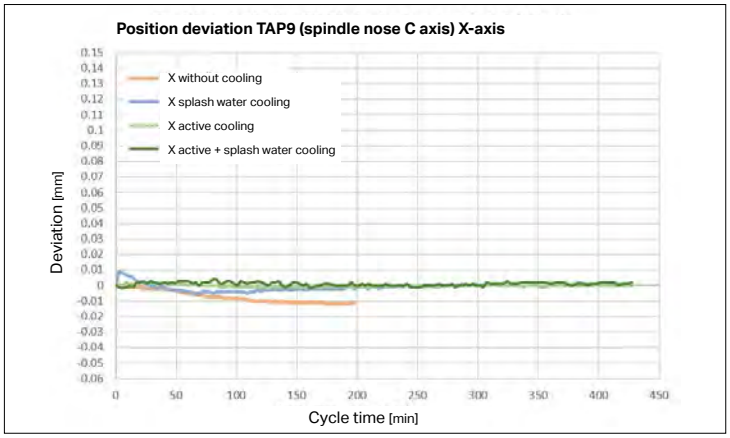


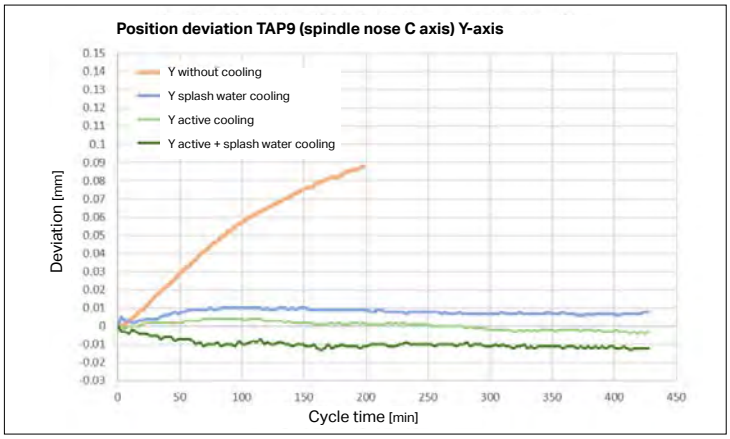


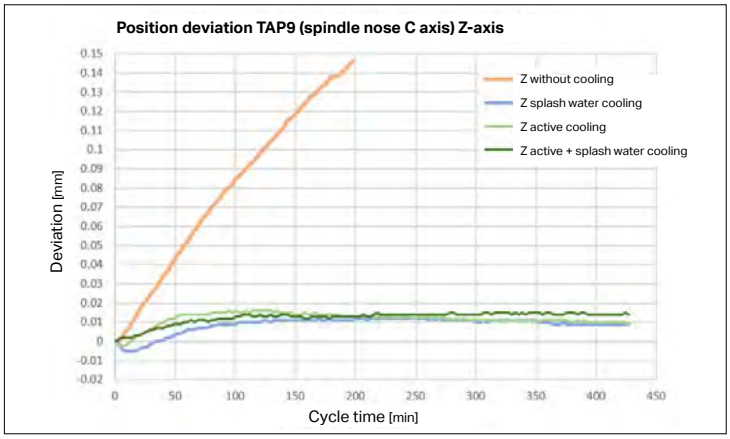
Determination of change in inner diameter by means of measuring probe



Results deviation P8







Information regarding questions about cycle time, PLC, commissioning and application (spec. simultaneous operation)

Cycle time calculation

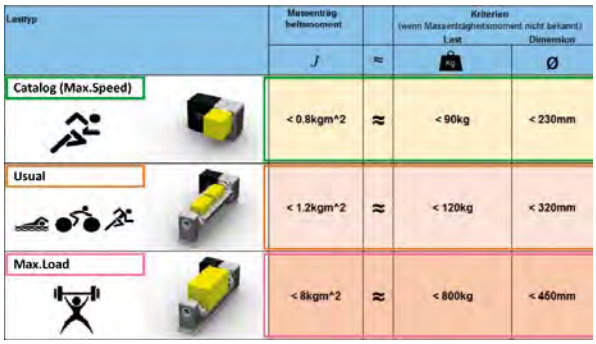
pL has specific calculation tools at its disposal. Where necessary, we can provide assistance when calculating the piece part time. Based on your information, we will prepare a detailed cycle time calculation. See the table to the right for reference values for the clapping cycle.

	unclamp	clamp *
EA-913	90 ms	100 ms
EA-915	90 ms	100 ms
EA-918	90 ms	100 ms
EA-520	120 ms	150 ms

* can be eliminated with PLC optimization

PLC models

Spindle clamping is a pL LEHMANN exclusive and has great potential for savings. At www.lehmann-rotary-tables.com, you can find appropriate PLC templates.



* Tool for determining the permissible limit values for each rotary table; please contact us.

Parameter lists*

A variety of parameter lists for various machines and three typical applications for each are available (Download).

Automatic parameter setting via CNC program. For example, available for FANUC ROBODRILL.

Pull-out torque

Permissible loads based on the rotary table mounting concerned:

Reference values	Unit		EA-913/915	EA-918	Remarks
max. permissible depending on bearing	Nm	clamped	1,000	1,200	Pull-out load, spindle
		unclamped	400	500	
EA with claw clamp	Nm		1,000		with max. tensile load on claw clamp, no notable lifting of the housing [1]
EA with base plate*	Nm		1,000	1,200	Securely bolted from below[2]; base plate is at least twice as wide as housing in the axis direction* and is bolted to machine table in optimal manner
*Base plate width	mm		268		Thickness: min. 40 mm (steel)

All data measured at face of spindle, across rotational axis

Bolt torque as specified in operating manual:

[1] Lifting point on housing

[2] Individual base plate securely bolted to housing from below through all 4 holes

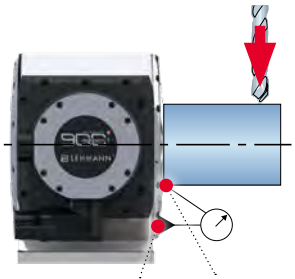
Correct tightening is a prerequisite for the best possible utilization of the permissible load.

Stiffness

Expected response (elasticity) to corresponding load:

Reference values	Unit	913	915	918	520	Remarks
Torsion, gear unit	Nm/°	–	–	–	5,400	in conjunction with feed torque
Spindle, axial*	kN/mm	700	700	700	2,400	in conjunction with axial force
Spindle, deflection*	kNm/mm	32	32	37	52	in conjunction with pull-out torque

*All data measured at face of spindle[1], relative to rotary table housing[2]; spindle clamping active (inactive: axially approx. –20%, deflection approx. –50%)



[2] Measurement stand support surface

[1] Measuring point

Important technical information and explanations for the safe operation of your rotary table

1 Maximum speeds

Maximum speeds are permissible only with standard moment of inertia, otherwise the time to standstill if the emergency OFF is tripped will be too long. In this case, the axis will spin without control or the clamping will break the rotating spindle.

2 Balancing

To ensure fault-free and safe operation, it is essential that workpieces and their clamping devices do not exceed the maximum vibration values. The maximum vibration value at 2000 rpm is <0.5 mm/s by default.
The maximum permissible vibration value is 4.5 mm/s (recommended upper limit is 1.8 mm/s). By request, rotary tables including fixtures and workpieces can be checked and balanced at the factory or on site.
At pL LEHMANN, a vibration measurement is performed on all rotary tables with speeds >1,000 rpm.

3 Rotary table temperature

The motor temperature must not exceed 80 °C. Otherwise the rotary table's internal electronics may suffer permanent damage. Temperature monitoring via the control system is required. If 80 °C are to be exceeded during operation, active cooling for the rotary table is recommended. See **p. 34**

4 Safety information

Machining can be performed at high speeds, so corresponding safety measures must be taken and observed!

All commonly applicable standards concerning the safety of machinery (in this case for lathes) must be observed at all times!
In particular, the following points must be observed:

- It must be prevented that the spindle starts moving when the work area door is open (reliably limited, reduced speed, accordingly).
- Ensure that in the case of an energy failure (air, hydraulics, power) no hazardous situation can occur (safe breaking of axes, workpiece remains clamped without energy, etc.).
- Ensure that safety-relevant parameters (speed with door open, etc.) cannot be manipulated by the user (password, key switch, etc.).
- Guards (housings) must be adjusted to meet the increased demands of turning operations.

Requirements for safety cabs for spindle operation

(according to ISO 23125:2015)

max. perm. Ø	max. perm. speed	Sheet metal	Polycarbonate**
< Ø 130	3'500 rpm *	2 mm	6 mm
< Ø 260	2,700 rpm	2.5 mm	6 mm
< Ø 500	1'400 rpm	2.5 mm	8 mm

* higher speeds at smaller Ø upon request
** Caution, subject to aging, consider reduction factors

The following rule of thumb may be applied: As long as workpieces and speeds are smaller or equal to the largest possible tool at the milling spindle, the requirements for guards are met.
Caution: When using rotary tables of type EA or T (with horizontal axis), the workpiece may spin off upwards – preventive measures are required for all machines without top cover or with bellows only.

Operating parameter reference values

The 900 series rotary tables are the ideal solution for workpiece sizes of up to approx. 100 mm dia. × 100 mm long and when turning and/or grinding operations account for 30% of the overall machining process.

Definition of the terms used in this catalog

5 Drive data

The term «drive data» always refers to rotational speed, acceleration as well as jerk limitation.

6 **Gear** (for swiveling/tilting axis TAP5(v))

Gear unit loading ($M_{gear\ max.}$) **[Nm]**
...refers to the maximum permissible mechanical torque at a spindle rotational speed of 1rpm.

She torque (M_{feed}) **[Nm]**
...refers to the available torque at a rotational speed of 1 rpm, corresponding to the maximum permissible gear load. Depending on the motor used and/or duty cycle, however, it can be correspondingly lower.

Eccentric spindle load ($sl_{eccentric}$) [Nm]
The eccentric load catalog* corresponds

- to 0 Nm (standard load always centric) for EA and M rotary tables as well as dividing/indexing axes of T-type rotary tables
- to the maximum torque for T-type rotary tables, which affects the swivelling/tilting axis in the form of the intrinsic load of the dividing/indexing axis as well as that of the cubic standard load. Please refer to the respective parameter list, catalog values.

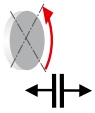
For T-type rotary tables, the eccentric load usual* is identical to the gear load with sls. For an EA rotary table, this torque is equal to the value resulting from the maximum eccentric load when using a rotoFIX Alu with a standard load. Please refer to the respective parameter list, usual values.
The eccentric load max load* corresponds to the maximum mechanical torque which can still be transmitted without any damage using the gear unit at a minimum rotational speed of approx. 10 rpm. Please refer to the respective parameter list, max load values.
* For definitions, please refer to «Geometry / Integration» **p. 69**

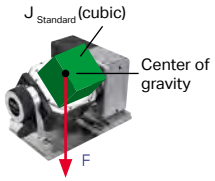
Center of gravity shift without and with load. The greater the red center of gravity, the greater is the gear unit loading in the swivelling/tilting axis. The blue arrow shows the direction in which the center of gravity moves from «without load» to «with load».

pL standard spindle load (sls = $sl_{standard}$) pp. 46/47 **[kg]**
...refers to the pL spindle load defined as standard, derived from practice, covering approximately 90% of all applications. All drive data and parameter lists are designed for the cubic pL standard load. All masses moving within this volume (workpiece including device) and clamped coaxially to the rotary axis can be moved using the standard drive data. Eccentrically arranged standard pL spindle loads may require a reduction of the drive data.

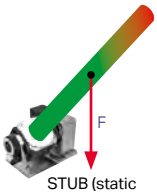
Standard moment of inertia ($J_{standard}$) pp. 46/47 **[kgm2]**
...refers to the resulting moment of inertia due to the defined pL standard load and its shape, if the load is clamped coaxially to the rotary axis. With the 500 series, the J ratio between load and motor is usually 1:1 or less (e.g. 0.5:1). With the 900 series direct drive, the ratio is max. 18:1.

Max. perm. moment of inertia (J_{max}) **[kgm2]**
...corresponds to 10x the standard moment of inertia ($J_{standard}$) In most applications, this moment of inertia is not exceeded even with large workpieces. It should also be noted that the J ratio of 10:1 is NOT exceeded with any 500 series motorized model. With the 900 series direct drive, the ratio is max. 180:1. Higher J ratios can of course be shifted, but this does require the necessary adjustments (upon request).



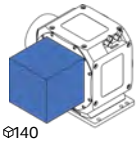


STUB (static torque of unequal burden) [Nm]

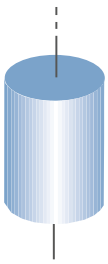


STUB (static torque of unequal burden) [Nm]

EA-913



⌀140
m = 21 kg
J = 0.07 kgm²



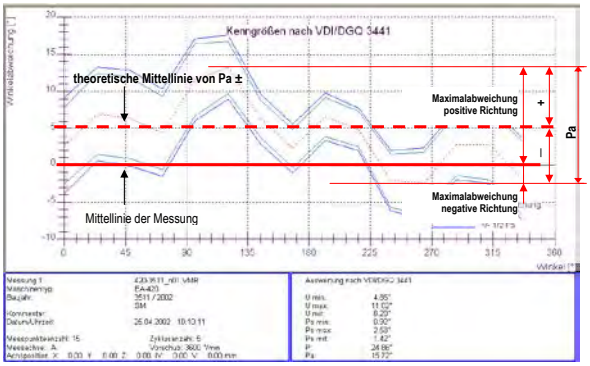
Function explanations, limit values and conditions minimize your risks

7 Rotary table accuracy

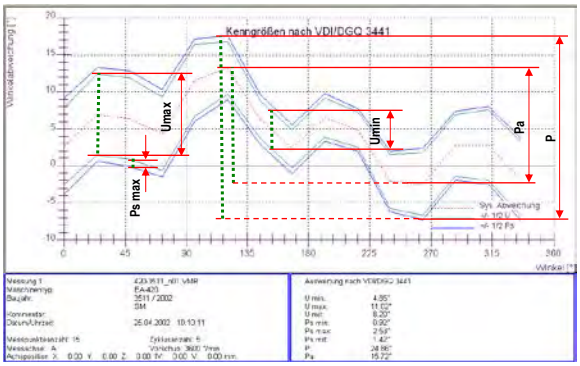
All accuracy data apply to an unloaded rotary table

Measuring process

- 5 Warm-up cycles
- 5 Measuring cycles
- 24 Measuring points (15°)
- Acceleration 500°/s²
- Heidenhain MRP8080 measuring equipment
- Unloaded rotary table as individual module – room temperature approx. 22 °C



Explanation of indexing accuracy Pa ±:



Explanation of various parameters according to VDI/DGQ 3441:

Indexing accuracy (Pa ±) [arc sec]

...refers to the sum of maximum positive and negative deviations between the ACTUAL position and the TARGET position of all angular positions over 360° measured in a direction of rotation, stated as ± value. This is equal to the position deviation Pa according to VDI/DGQ 3441, but accumulated (example: TG ± 15" corresponds to Pa 30") and:

- without consideration of the reversal error into account
- without consideration of the radial and axial run-out error of the spindle

Repeat accuracy (Ps with) [arc sec]

..refers to the maximum deviation within the results of the repeatedly measured angular positions, approached from the same side.
This corresponds to the position variation Ps max according to VDI/DGQ 3441, i.e.:

- without consideration of the reversal error into account

Positioning accuracy (P) [arc sec]

...refers to the maximum deviation between the TARGET position and the ACTUAL position when the direction of rotation changes.
This corresponds to the positioning uncertainty P according to VDI/DGQ, i.e.:

- without consideration of the radial and axial run-out error of the spindle.

Reversal backlash (U gear) [arc sec]

...refers to the maximum mechanical backlash when the direction of rotation changes within a specific number of repeatedly measured angular positions.

- This does not correspond to a measurement parameter according to VDI/DGQ 3441
- The elasticity of all parts connected in the drive train is NOT taken into account

Reversal error (U average*) [arc sec]

...refers to the average reversal error, including elasticity, backlash and/or overshoot of all parts connected in the drive train when the direction of rotation changes within a specific number of repeatedly measured angular positions.
This corresponds to the reversal error U average according to VDI/DGQ 3441. The average value is calculated on the basis of all measured values.

* For compensation and definition of backlash, please refer to «Geometry / Integration, 6.4»

Definition of the terms used in this catalog

8 Speed

Duty cycle (ED) **[%]**

…refers to the duration of the movement per unit of time according to the DIN/VDE 0530 Standard. The axis is designed for an operation of ED 40% at a cycle duration of 10 min. To protect the axis from overload, max. 10 minutes of continuous operation are permitted at the following speeds: 913: 1,600 rpm, 915: 1,100 rpm, 918: 800 rpm. If these values are exceeded, the signal 'Axis released' is reset, causing the spindle to stop. Please contact us if longer continuous cycles at speeds higher than those above are required.

DIN / VDE 0530 S3, ED 40%

Rotational spindle speed (n_{spi}) **[rpm]**

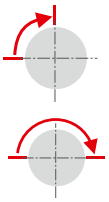
…always refers to the maximum possible rotational speed of the spindle

- while complying with the duty cycle ED
- with the corresponding motor
- with the pL standard spindle load (cubic)

Cycle time 90° / 180° ($t_{90°}$ / $t_{180°}$) **[sec]**

…refers to the time required for the entire dividing / indexing operation for a 90°/180° movement

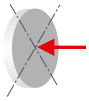
- Dividing/indexing operation STANDARD pL = unclamping and clamping monitored using a pressure sensor.
- Dividing/indexing operation OPTIMIZED = as standard, but the clamped signal is queried only prior to the feed movement. This operation requires adjustment of the respective machine PLC and is not included in the pL scope of delivery.



9 Spindle bearing

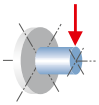
Axial force (F_{axial}) **[N]**

..refers to the maximum permissible axial load on the spindle. It includes the workpiece, devices, machining forces and other forces resulting from the rotational and tilting movement.



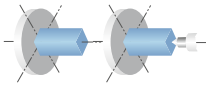
Pull-out torque (M_{tilt}) **[Nm]**

..refers to the maximum permissible tiling load on the spindle, measured from the spindle face. It includes the workpiece, devices, machining forces and torques resulting from the rotational and tilting movement.



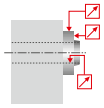
Transport load (sl_{max}) **[kg]**

…refers to the total, maximum permissible load which is installed starting from the spindle nose and performs a rotational movement together with the spindle (device and workpiece). This load does not correspond to the pL standard spindle load.



Radial and axial run-out ($ro_{con/ax}$) **[mm]**

…refers to the maximum deviation occurring in the axial (axial run--out) or radial (radial run--out) direction when measured over 360°. Measured in each case on the maximum possible diameter of the spindle nose.

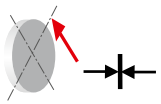


10 Clamping

Clamping torque (M_{clamp}) **[Nm]**

…refers to the maximum permissible torque load on the spindle nose during active clamping (5 bar air pressure). The pL clamping is extremely rigid. Depending on the load, there is also a setting behavior in addition to a usual elasticity. We distinguish between three phases when progressing from zero load to maximum load. The setting behavior results in an irreversible torsion after unloading as follows:

- Phase 1 «normal» (approx. 1/3 to 1/2 of the permissible clamping torque) up to approx. 0.0015 mm*
- Phase 2 «increased» (approx. 2/3 of the permissible clamping torque) up to approx. 0.002 - 0.004 mm*
- Phase 3 «maximum» (up to 100% of the permissible clamping torque) up to approx. 0.008 mm*



In practice, in order to be prepared for adverse factors such as vibration, dulled tools, etc., a maximum of 50% or the spindle clamping torque should be applied during the calculation phase of the application

* For unilateral load, in relation to the spindle outside Ø of the respective rotary table. The indexing and repeat accuracy is not impaired by another positioning.

Function explanations, limit values and conditions minimize your risks

11 Leaktightness (acc. to EN 60529)

...refers to the leaktightness in terms of protection against accidental contact, protection against the ingress of foreign matter and protection against the ingress of water:

IP 65: Protection against accidental contact, no ingress of dust, protection against the ingress of water jets
IP 66: Same protection as IP 65, but protection against the ingress of powerful water jets
IP 67 (standard at pL): Same protection as IP 66, but protection against the ingress of water from temporary immersion
IP 68 (optional at pL): Same protection as IP 67, but protection against the ingress of water from permanent immersion

12 Geometry and integration

All accuracy data apply to an unloaded rotary table

Tilting drift (sd $_{200}$)
...refers to the deviation of the perpendicularity between the dividing/indexing axis and the swivelling/tilting axis over a specific tilting range. pL always measures three points: -90° (horizontal), -45° and 0° (vertical), always related to the position of the dividing/indexing axis and on a radius starting from the center of the swivelling/tilting axis of 200 mm.

3D precision

Offset values (offset)
...refer to the deviation from any theoretical NOMINAL values in order to ensure easier alignment of the rotary table on the machine and faster commissioning.

offset 1: [mm]
0.013

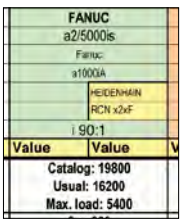
Pitch error (pe)
...refers to the effective NOMINAL-ACTUAL deviation over a specific rotation angle ("pitch error") for axis error compensation on the CNC machine. For rotary tables with gear unit, this occurs typically with the movement of eccentrically arranged loads such as clamping yokes, swivelling/tilting axes etc.

pitch-error: [°]
0.005

Backlash (bl)
...refers to the mechanical and electronic reversal error* (gear unit, angular position measuring system, positioning control...) for the loose backlash compensation on the CNC machine.

* For definition see «Rotary table accuracy» **p. 67**

Parameter lists
To minimize commissioning time and make maximum use of the pL rotary table, you can find parameter lists for various controls at www.lehmann-rotary-tables.com. In the case of load-relevant parameters, we distinguish between...



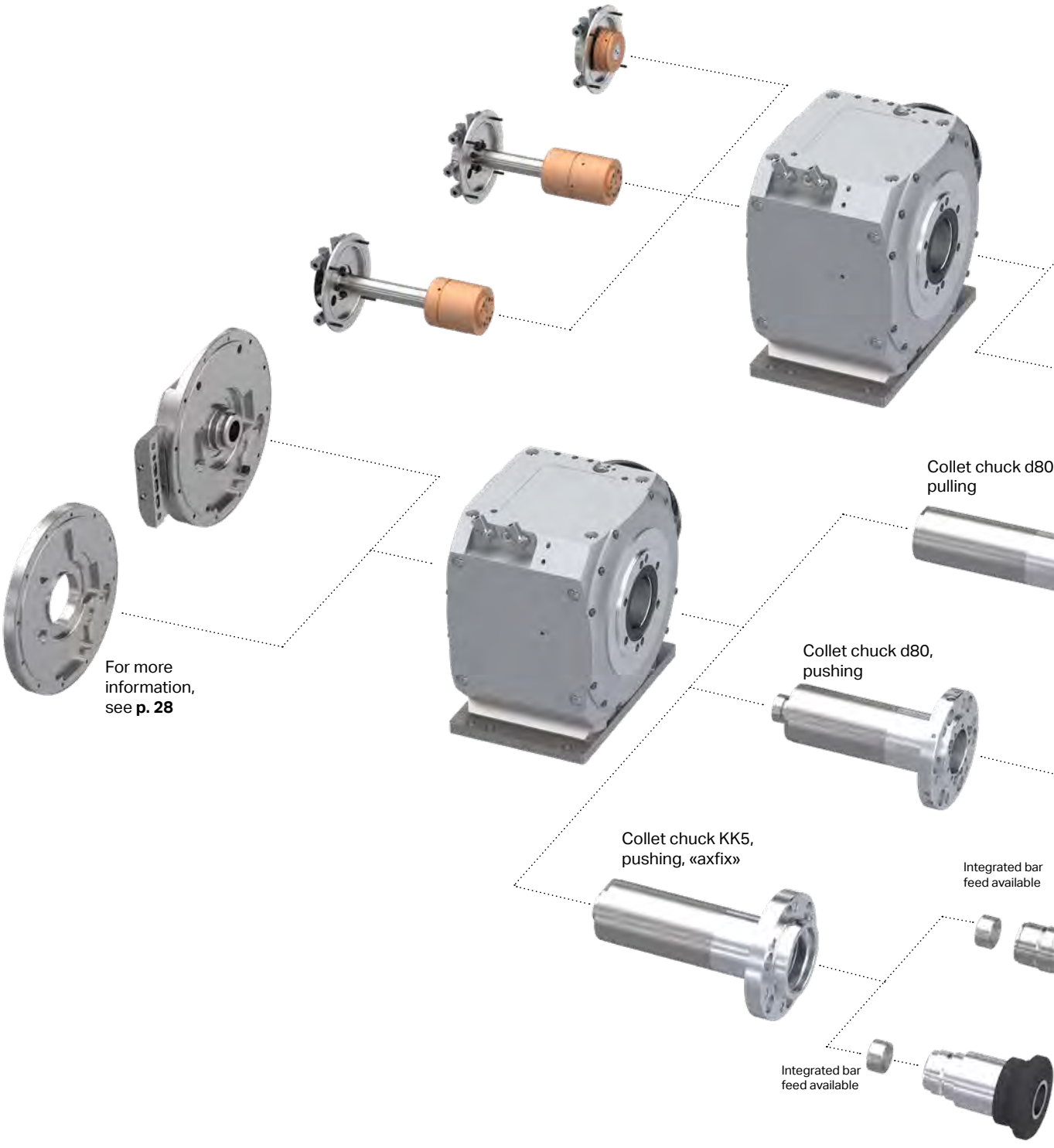
usual
...refers to the practice-oriented drive values for pL standard spindle loads, which should usually be set (pL recommendation) in order to still provide certain reserves to integrate deviations occurring in practice and to allow an easier control comparison. Normally, no warm-up is required here.

catalog
...refers to the maximum achievable catalog drive values for pL standard spindle loads, for which more demanding requirements are imposed both on the commissioning engineer and on the material in order to achieve these values. Depending on the respective application, they must be reduced (empirically). A warm-up cycle is frequently recommended here.

max load
...refers to the maximum achievable drive values for J max. and eccentric loading.

Workpiece clamping systems

To ensure production reliability: powerless workpiece clamping, keeping the workpiece in place even in the event of pressure loss



For more information, see **p. 28**

HAINBUCH 65
up to ø 60 mm

Spindle adapter
KK5

All third-party clamping devices with DDF interface and KK5 mount

Spindle adapter
d80

ripas / HSK
manual

+ third-party clamping devices
with ripas interface

All third-party clamping devices
with DDF interface and d80 mount

HSK clamping
kit, automatic

SCHAUBLIN collet chuck,
automatic

all third-party clamping devices
with tie-rod actuation

HSK manual clamping kit
with pushrod

OTTET collet adapter,
manual

+ third-party clamping
devices with ripas interface

HSK adapter
(universal fit)

OTTET collet adapter
automatic

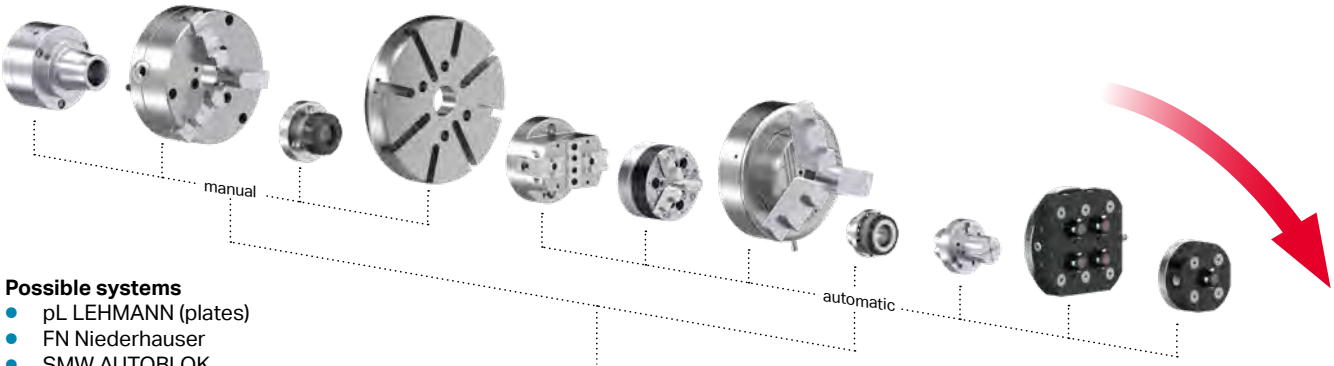
HAINBUCH tongs
TopPlus 26, 40, 52

Hollow shank taper tool chuck

F35

From manual clamping tools for single item production through to fully automated systems

Plates, force clamp and jaw chucks, collet chucks



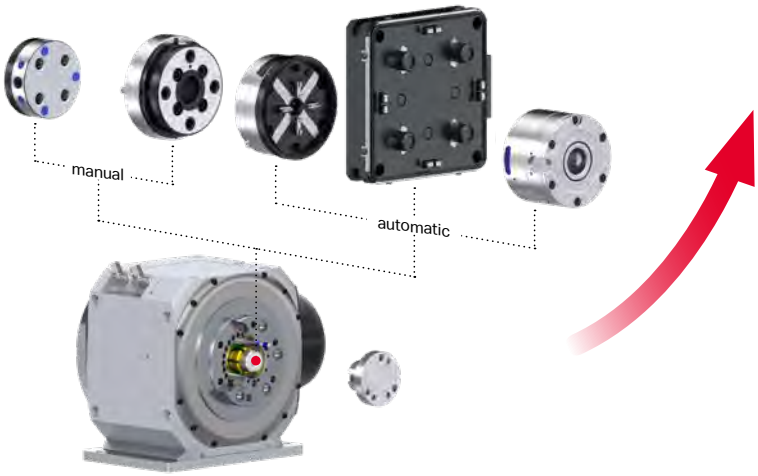
Possible systems
- pL LEHMANN (plates)
- FN Niederhauser
- SMW AUTOBLOK
- SwissChuck
- Hainbuch
- Erowa
- TG Colin
- YERLY
- ...

Automatable: with rotary unions and collet chuck / release cylinder

Centric clamping unit

Possible systems
- SCHUNK
- LANG
- Gressel
- Piranha Clamp
- EVARD
- TRIAG
- ...

Zero point clamping systems

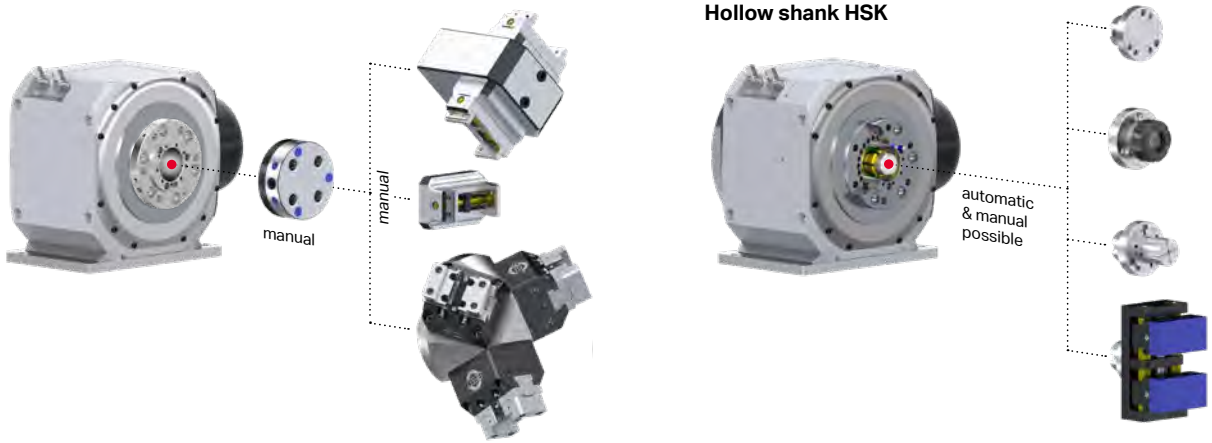


Possible systems
- pL LEHMANN (ripas & CAPTO)
- Erowa
- System 3R
- Parotec
- Roemheld
- AMF
- SCHUNK
- LANG
- GRESSEL
- ...

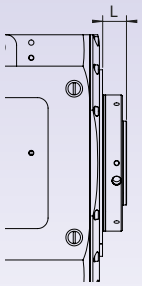
Centric clamping unit for workpiece handling, mounted zero point clamping system for quick vise replacement

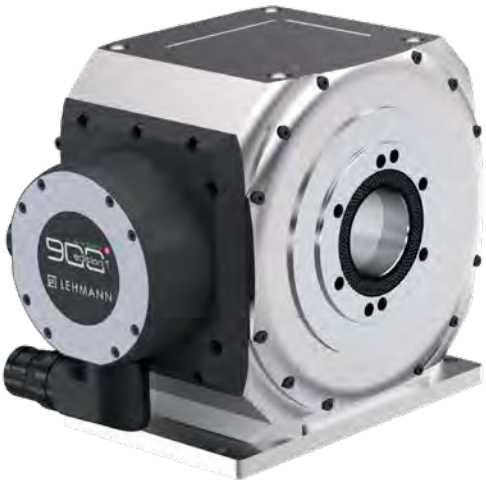
Combination possibilities

Hollow shank HSK

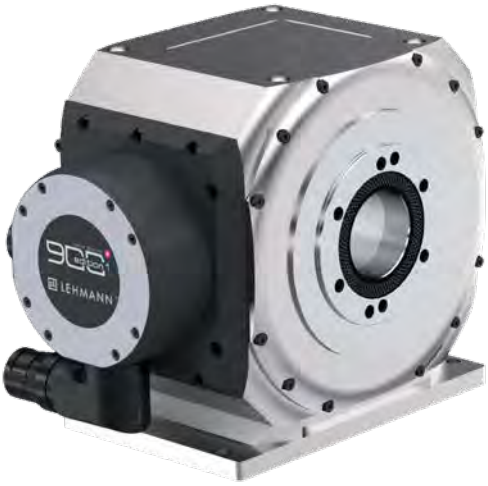


A multitude of accessories adaptable thanks to standardized interface





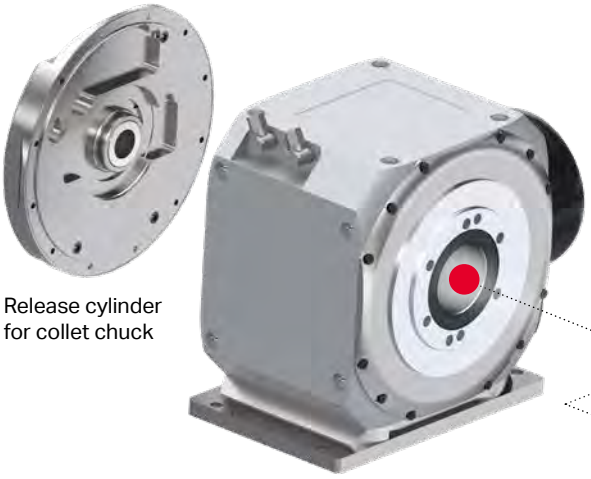
SPI.91x-d80



SPI.91x-KK5

Item no.	Designation	Dimensions	L from spindle [mm]
SPI.91x-d80	Spindle adapter	Outer diameter 80 mm	20
SPI.91x-KK5	Spindle adapter bigBore with KK5		32.3

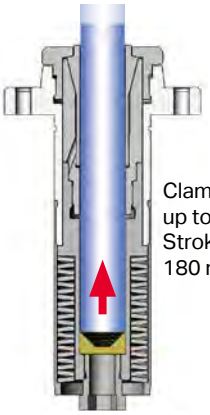
Clamped even without power or pressure: The safe solution for workpiece clamping when operating at high speeds



Release cylinder for collet chuck

Collect chuck needed sometimes

up to Ø 28



Clamping length up to 190 mm Stroke up to 180 mm

up to Ø 60

Clamping length up to approx. 280 mm

Control box for presence check (SPZ.Awk)

Bar feed. For more information, see **p. 84 & p. 89**

Item No.	Designation	Dimension	can be retrofitted
SPZ.91x-s3-d80	Collet chuck d80, incl. release cylinder	pushing, F: 2 kN (6 bar), stroke: 3.0 mm	
SPZ.91x-s9-d80	Collet chuck d80, incl. release cylinder	pushing, F: 2 kN (6 bar), stroke: 9.0 mm	
SPZ.91x-s3-KK5	Collet chuck KK5, incl. release cylinder	pushing, F: 10.5kN (6 bar), stroke: 3.0 mm. effective passage increased	
SPZ.91x-s3-d125	Collet chuck d125, incl. release cylinder	pushing, F: 10.5kN (6 bar), stroke: 3.0 mm. effective passage increased	
SPZ.91x-z3-d80	Collet chuck d80, incl. release cylinder	pulling, F: 10kN (6 bar), stroke: 3.0 mm, M24x1.5	
SPZ.91x-z9-d80	Collet chuck d80, incl. release cylinder	pulling, F: 10kN (6 bar), stroke: 9.0mm, M24x1.5	
SPZ.91x-Stange	Bar feed ø28, stroke 180 mm	fits SPZ.91x-s3d30	•

collet chucks for EA-918 require option SPZ.918-ada
Clamping force depending on clamping device (angle, transmission ratio, etc.)
F=draw-in force

Options for all sizes

SPZ.Awk-Vor	Preparation for presence check only possible for automatic clamping (only with adapter from pL)
SPZ.Awk	Control box for presence check

cannot be combined with bar feed

HSK clamping with precise angular positioning = compact palletizing system manually and automatically

newChuck: ideal table chuck for machining of the 5th or 6th side, for example, with integrated ripas

The main advantages of ripas

- Very space-saving, as integrated completely in the spindle
- Easy to retrofit
- Very torsionally rigid
- High precision
- Standard interface proven in thousands of applications
- When required, standard adapter can also be used (no rough positioning possible)

The principle

The basis is the standardized HSK clamping with conventional clamping sets. However, the carrier cams are precisely ground and can deflect axially. The counterpart (HSK adapter) has a precise groove as well as a positioning bore for the guide pin.

Manual ripas clamping

Clamping cylinder (separate order item)

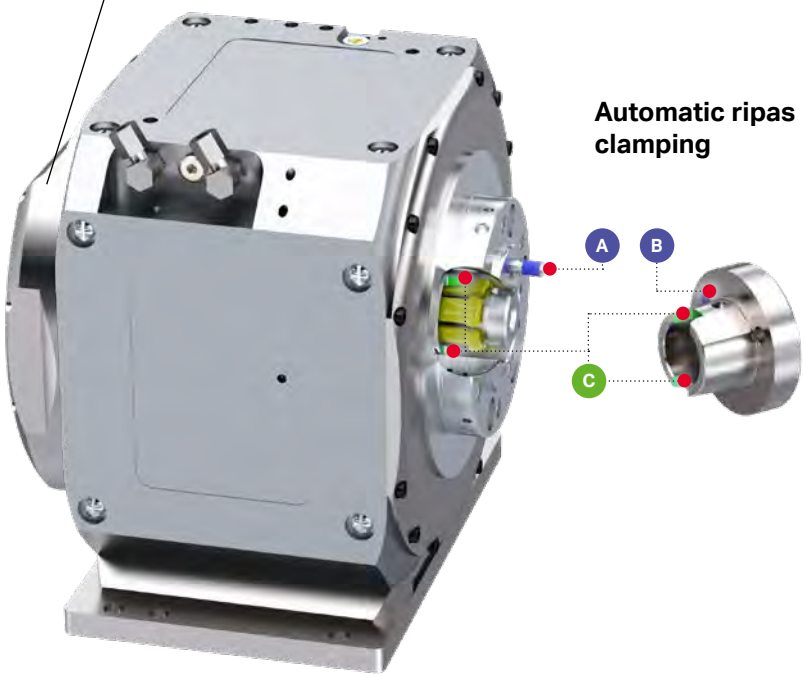
The function

ripas has 3 functions:

A Anti-twist protection
B Rough positioning
C Precision positioning

Process

During changes (manually or automatic), the guide pin A ensures proper orientation while providing rough positioning at the same time B.
Shortly before the face is reached, the inner precision cams perform the precision positioning C.

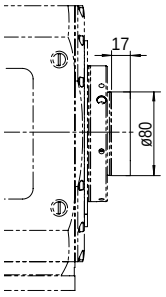


Automatic ripas clamping

Flexible, precise, compact and can be automated – the ripas / zero point clamping system from pL LEHMANN

Item no.	Designation	Weight [kg]	Manual (MAPAL)	Pneumatic	Required clamping cylinder
RIP.91x-63m	ripas clamping, manual, A63		●		
RIP.91x-63p	ripas clamping, pneumatic, A63			●	SPZ.91x-z9-d80
RIP.91x-63m-OT	ripas clamping adapter for collet chuck, A63, manual (Ottet)		●		
RIP.63ada	ripas adapter, A63				RIP.91x-63m or RIP.91x-63p
RIP.63-KD-1	Alignment pin, A63				

HSK = Hollow shank taper to DIN 69063-1 (spindle) or DIN 69893 (adapters)



Above dimensions apply with ripas adapter inserted. Without adapter, the clamping kit protrudes approx. 10.5 mm.

Technical data for ripas / HSK

	Unit	HSK-A63 manual		HSK-A63 automatic	
		Standard	ripasGrip (option)	Standard	ripasGrip (option)
Tensile force	kN	–		10 [1]	
Resulting insertion force on adapter, max.	kN	30 at 20 Nm [2]		30	
Perm. pull-out torque (before losing face contact)	kN	approx. 600		approx. 600	
Transport load	kg	approx. 60		approx. 60	
Perm. torque [3] (slip [4] max. ± 0.003°) **A**	Nm	–	approx. +50%	approx. 150	approx. 300
Perm. torque [3] (slip [4] max. ± 0.01°) **B**	Nm	–	approx. +50%	approx. 250	approx. 450
Repeat accuracy, XYZ	mm	< 0.005		< 0.005	
Repeat accuracy, angular	± arc sec	8		4	

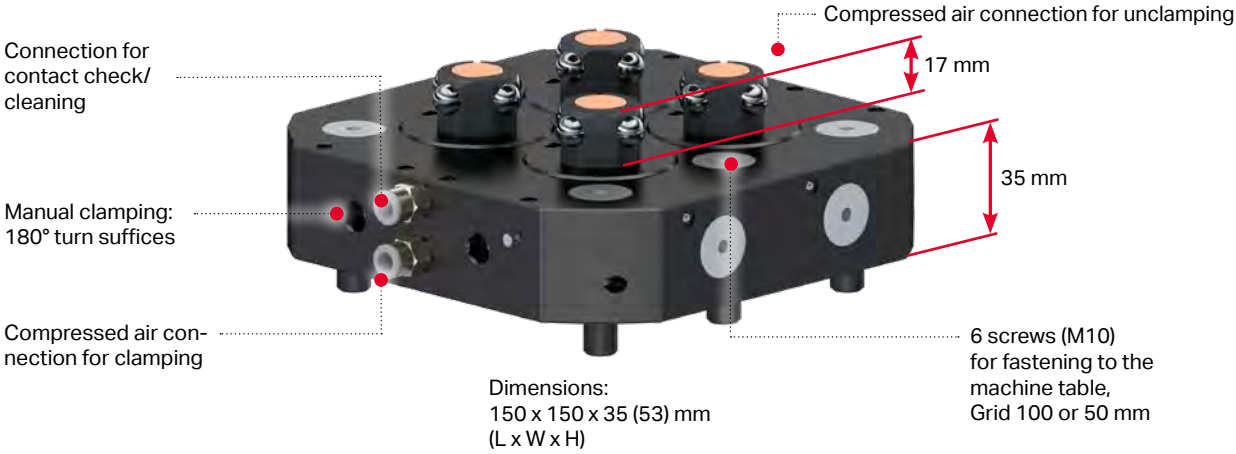
[1] with SPZ.91x-z9-d80
[2] Radial screw
[3] Values apply under static conditions, without any vibrations, with no load, dry, free of grease, clean
[4] returns to original position after unclamping/clamping

Tooling for individual finish machining / finishing

Jumbo pallet (300 x 300 mm) on centric AM-LOCK chuck QUATTRO for light machining

Jumbo pallet (300 x 300 mm) on 4x AM-LOCK-QUATTRO chucks for higher machining forces

QUATTRO chuck



Dimensions:
150 x 150 x 35 (53) mm
(L x W x H)

UNO chuck

Dimensions:
100 x 100 mm
35 mm high

6 benefits (applies to QUATTRO and UNO)

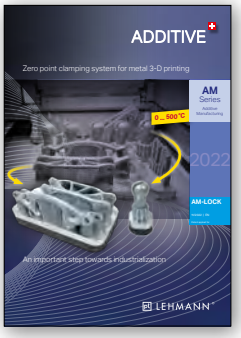
- Only 35 mm high
- Manual and pneumatic in one
- Easy to clean
- With pulse voltage
- Easy mounting
- Minimal maintenance

Technical data

		UNO	QUATTRO
Repeat accuracy X/Y/Z		approx. ± 0.005 mm	
Retention force, clamped	Manual	approx. 6 kN	approx. 24 kN
	pneumatic at 6 bar	approx. 10 kN	approx. 40 kN

Item no.

Item no.	Designation	Dimensions	Weight [kg]	Max. speed [rpm]
AML.SPF-U	UNO chuck	Ø50x34 mm, 1 pin	1.18	
AML.SPF-Q-2	QUATTRO chuck	150x150x34 mm, 4 pins	4.70	

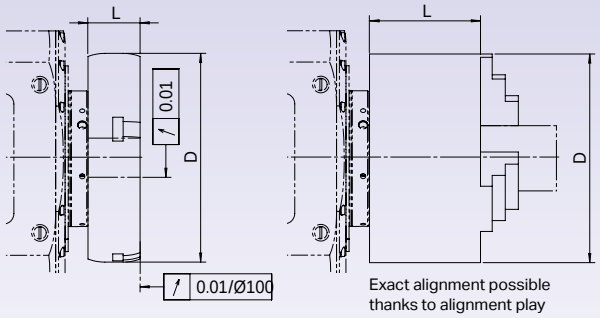


for more information, see AM-LOCK brochure

Clamped quickly and easily

Quickly converted for small series and express work

Further information about jaw chucks at: www.niederhauser.ch
Request installation and operating instructions directly from manufacturer



Exact alignment possible thanks to alignment play (approx. 0.1 mm).

Faceplates (axial discs)

	Item no.	Designation	Diameter D [mm]	Thickness [mm]	Passage [mm]	L from spindle [mm]	Weight [kg]	max. speed [rpm]	Moment of inertia J [kgm²]
91x	**TPL.91x-250**	Faceplate, 8 T-slots 14 mm	250	45	45	42.1	17	*	0.14
	TPL.5xx-GEN	Increased accuracy = ½ tolerance values							
	TPL.mon	Faceplate assembled and measured							

* = TPL without assembly permits full speed, assembly to be performed by client

Scroll chucks, steel (manual)

incl. matching adapter flange, 1 set each of hard boring and turning jaws as well as clamping wrench and fastening screw

	Item no.	Designation	Diameter D [mm]	Thickness [mm]	Passage [mm]	L from spindle adapter [mm]	Weight [kg]	max. speed [rpm]	Moment of inertia J [kgm²]	Required spindle adapter	Niederhauser item no.
d80	**BFU.510-125ps**	Scroll chuck	125		35	74	7	5'500	0.01	SPI.91x-d80	510-125ps
	BFU.510-160ps	Scroll chuck	160		42	82	13	4'600	0.04	SPI.91x-d80	510-160ps
	BFU.510-200ps	Scroll chuck	200		44	92	22	4'000	0.07	SPI.91x-d80	510-200ps
	BFU.5xx-GEN	Increased accuracy = ½ tolerance values									

- Limited clamping force
- Limited range of jaws (no claw and segment jaws)
- Cheaper than wedge bar chuck

Wedge bar chuck SMW type HG-F (manual, modular helical gear jaw system)

incl. matching adapter flange, 1 set of hard, reversible ground stepped jaws in the chuck as well as clamping wrench and fastening screw

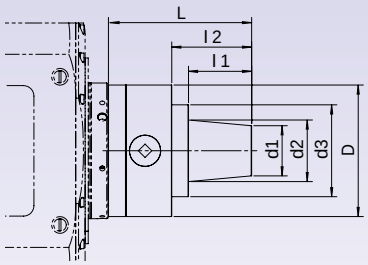
	Item no.	Designation	Diameter D [mm]	Thickness [mm]	Passage [mm]	L from spindle adapter [mm]	Weight [kg]	max. speed [rpm]	Moment of inertia J [kgm²]	Required spindle adapter	Niederhauser item no.
d80	**BFU.510-160ks**	Wedge bar chuck	160		42	81	11	5'500	0.04	SPI.91x-d80	510-160ks
	BFU.510-200ks	Wedge bar chuck	200		42	102.5	22	4'800	0.11	SPI.91x-d80	510-200ks
	BFU.5xx-GEN	Increased accuracy = ½ tolerance values									

- Higher clamping force
- Faster conversions (with quick jaw change system)
- More jaw accessories
- More expensive than scroll chuck

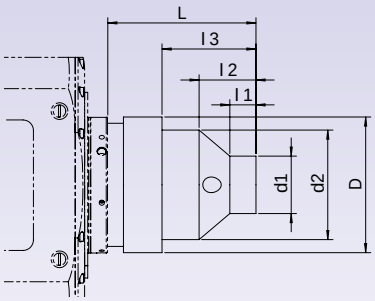
NIEDERHAUSER
SPANNTECHNIK UND SYSTEME

Manual flange-mounted chuck supplied loose, power-operated, set up and aligned by pL LEHMANN (if ordered together with a rotary table)

Further information: www.niederhauser.ch
Request installation and operating instructions directly from manufacturer



Mounting chuck, manual
Radial run-out with collet approx. 15µ (Schaublin)



Mounting chuck, automatic Type B axfix

	pL LEHMANN Item no.	Designation	System	axfix	Manual	Power-actuated	L [mm]	l 1 [mm]	l 2 [mm]	l 3 [mm]	D [mm]	d1 [mm]	d2 [mm]	d3 [mm]	Weight [kg]	max. speed [rpm]	For required options see **p. 76/77**	Niederhauser item no. incl. adapter flange
d80	**ZSP.510-B32Aka**	Mounting chuck	B32	●		●	135	25	54.5	90	130	55	105				SPZ.91x-z3-d80	510-B32KA
KK5	**ZSP.520-B32Am**	Mounting chuck	B32		●		149	59	75	–	130	53	62	88			SPI.91x-KK5	520-B32
	ZSP.520-B45Am	Mounting chuck	B45		●		180	76	–	–	160	65	96	–			SPI.91x-KK5	520-B45

Clamping capacity and passage

System	Clamping capacity [mm]	Collet passage [mm]
B32	0.3...32	28
B45	1...45	36

Mounting chuck


B32, manual


B32, automatic


B45, manual

Collet holder B32

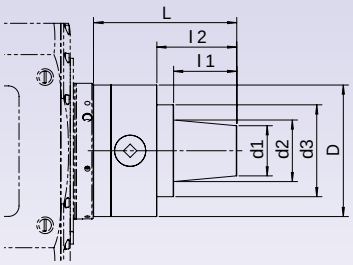
ki-mech gmbh


with pointed B32 collet

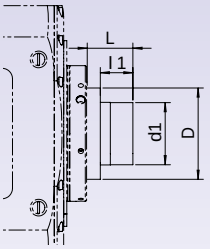

with standard B32 collet

NIEDERHAUSER
SPANNTECHNIK UND SYSTEME

Manual flange-mounted chuck supplied loose, power-operated, set up and aligned by pL LEHMANN (if ordered together with a rotary table)



Mounting chuck, manual



Collet adapter, installed by pL LEHMANN (if ordered together with a rotary table)

Further information: www.niederhauser.ch
Request installation and operating instructions directly from manufacturer

	pL LEHMANN Item no.	Designation	System	Manual	Power-actuated	L [mm]	L1 [mm]	L2 [mm]	D [mm]	d1 [mm]	d2 [mm]	d3 [mm]	Weight [kg]	max. speed [rpm]	For required options see **p. 76/77**	Niederhauser item no. incl. adapter flange
KK5	**ZSP.520-W20Am**	Mounting chuck	W20	●		127	36	53	130	40	54	88			SPI.91x-KK5	520-W20
KK5	**ZSP.520-W25Am**	Mounting chuck	W25	●		151	60	76	130	48	59	88			SPI.91x-KK5	520-W25
KK5	**ZSP.520-W31Am**	Mounting chuck	W31.75	●		138	48	64	130	53	62	88			SPI.91x-KK5	520-W31.75
d80	**ZSP.91x-W20k**	with HSK application	W20		●	39	15		130	47.5					SPZ.91x-z3-d80	
d80	**ZSP.91x-W25k**	with HSK application	W25		●	39	15		130	47.5					SPZ.91x-z3-d80	
d80	**ZSP.91x-W31k**	with HSK application	W31.75		●	39	15		130	47.5					SPZ.91x-z3-d80	

Collet adapters (Type W) pL LEHMANN®


W20


W25


W31.75 (5C)

Collet holder W25



with standard W25 collet

- Rugged and slim design for better accessibility
- Radial run-out < 0.005 mm

ki-mech gmbh

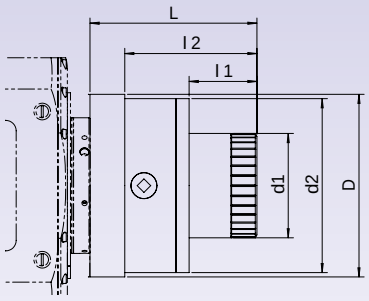
Further information: www.ki-mech.ch
Request installation and operating instructions directly from manufacturer

Clamping capacity and (effective) passage

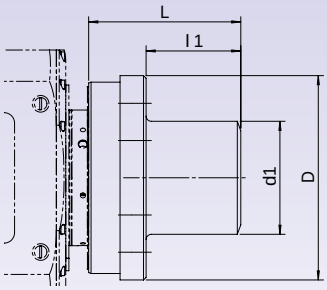
System	Clamping capacity [mm]	Collet passage [mm]	Standard effective passage [mm]
W20	0.3...23	14.5	14
W25	0.3...29	21	17
W31.75 (5C)	0.5...31	27	17

NIEDERHAUSER
SPANNTECHNIK UND SYSTEME

Manual flange-mounted chuck supplied loose, power-operated, set up and aligned by pL LEHMANN (if ordered together with a rotary table)



Mounting chuck, manual Type F



Mounting chuck, hydraulic Type F

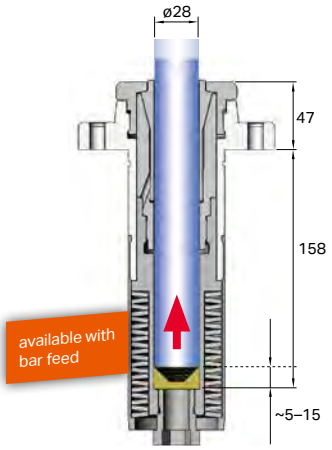
Further information: www.niederhauser.ch
Request installation and operating instructions directly from manufacturer

Collet clamping Type F

Achievable accuracy with collet 30–40µ

	pL LEHMANN Item no.	Designation	Manual	Pneumatic	Hydraulic	System	Clamping capacity [mm]	L [mm]	l 1 [mm]	D [mm]	d 1 [mm]	Weight [kg]	max. speed [rpm]	For required options see **p. 76/77**	Niederhauser item no. incl. adapter flange
d80	**ZSP.510-F35Am**	Mounting chuck	●			F35	1...30	129	40	160	90			SPI.91x-d80	510-F35
d80	**ZSP.510-F35Ak**	Mount. chuck, power-actuated			●	F35	1...30	1144	73.4	112	85			SPZ.91x-z9-d80	510-F35K
KK5	**ZSP.520-F48Am**	Mounting chuck	●			F48	1...42	145	40	160	90			SPI.91x-KK5	520-F48
	ZSP.91x-F35k*	Collet adapter, power-actuated		●		F35	1...30	9		80				SPZ.91x-s9d30	

* available with bar feed, see **p. 77**



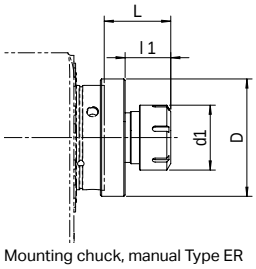
Schaublin F35
Clamping system


Manual

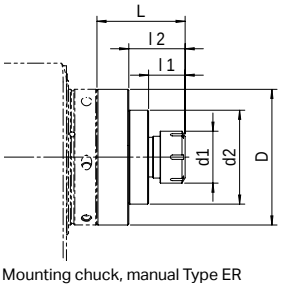

automatic

Collect clamping Type ER

	pL LEHMANN Item no.	Designation	Manual	System	Clamping capacity [mm]	L [mm]	l 1 [mm]	l 2 [mm]	D [mm]	d1 [mm]	d2 [mm]	Weight [kg]	max. speed [rpm]	For required options see **p. 76/77**	Niederhauser item no., incl. adapter flange
KK5	**ZSP.520-E25Am**	Mounting chuck	●	ER-25	0.5...17	80	30	50	130	42	90				520-ER25
KK5	**ZSP.520-E32Am**	Mounting chuck	●	ER-32	1...22	88	38	50	130	50	90			SPI.91x-KK5	520-ER32
KK5	**ZSP.520-E40Am**	Mounting chuck	●	ER-40	2...30	90	40	50	130	63	90				520-ER40



Mounting chuck, manual Type ER



Mounting chuck, manual Type ER


Manual

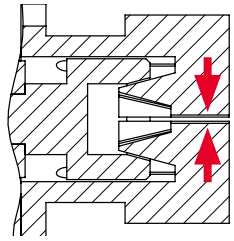
Clamping tools installed and aligned by pL LEHMANN
(if ordered together with a rotary table)

OTTET collet clamping

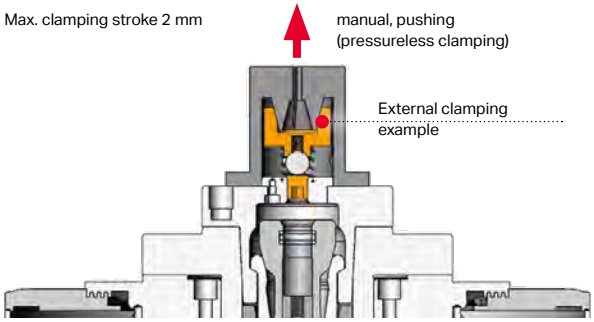
pL LEHMANN Item no.	Designation	Max. speed [rpm]	Required palletizing system ripas and clamping cylinder*
ZSP.91x-OTk	With HSK adapter, power-actuated		RIP.91x-63m-OT and SPZ.91x-s3-d80 required
ZSP.91x-OTm	With HSK adapter, manual		RIP.91x-63p and SPZ.91x-z9-d80 required

* see **p. 78/79**

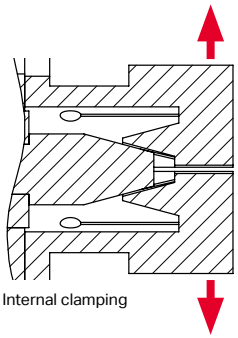
The collet chuck with clamping piston inside is suitable for internal and external clamping, pneumatically actuated.



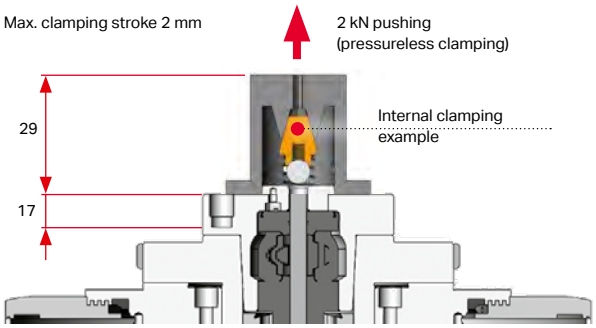
External clamping



ripas automatic (or manual), OTTET manual



Internal clamping



ripas manual (automatic not possible), OTTET automatic

HAINBUCH
SPANNENDE TECHNIK

The clamping device serves as the starting point on the Lehmann CNC rotary table and can be be set up easily for your workpieces through use of a wide variety of clamping elements and adapters. Regardless of whether the clamping requires a round or profiled contour, whether unmachined or finish-machined parts are involved, whether soft or hard machining, or external or internal clamping – the HAINBUCH System offers a multitude of clamping options – without major expense or effort for setup.

Clamping means installed and aligned by pL LEHMANN
(if ordered together with a rotary table)

Further information: www. hainbuch.com
Request installation and operating instructions directly from manufacturer

Advantages of Axzug
- More accurate
- More stable
- Cheaper
- Smaller

Advantages of Axfix
- Fewer clamping marks
- No loss of clamping length
- Defined axial positioning (e.g., for work with counter spindle)
- Hainbuch system not possible

Rotating clamping means

TOPlus Chuck

TOPlus mini Chuck

SPANNTOP Chuck

SPANNTOP mini Chuck

TOROK hand chuck (only Axzug available)

Stationary clamping means

MANOK plus manual vise

HYDROK hydraulic vise

Clamping element

Clamping head – external clamping

- All-round clamping
- 3 different versions: for tubular material, fine machining or boring out yourself
- Multitude of profile clamping options
- Coolant-resistant rubber-metal connection, keeps swarf out of the clamping means
- Clamping capacity SE ø 3 – 65 mm
  Clamping capacity RD ø 3 – 65 mm

Clamping adapters

MANDO Adapt mandrel – Internal clamping

- Fast conversion from external to internal clamping without alignment thanks to CENTREX interface
- Radial run-out < 0.005 mm between chuck taper and mandrel taper
- Clamping capacity ø 8 – 100 mm

Jaw module size 145 or 215 – jaw clamping (2 jaws also available)

- axfixe 3-jaw clamping
- Can be used in rotating (moving) and stationary applications
- Convert from chuck head to mandrel or jaw clamping in less than 2 minutes
- Jaw stroke with size 65: 2.2 mm

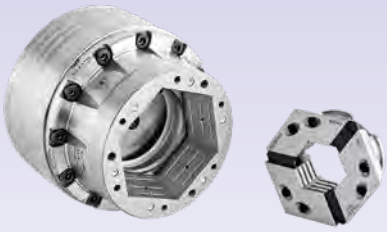
Face driver adaptation

Morse taper adapter

- Enormous flexibility
- Self-centering of adapter in the chuck ≤ 0.003 mm
- Extremely fast conversion without disassembling the chuck [1 min.]

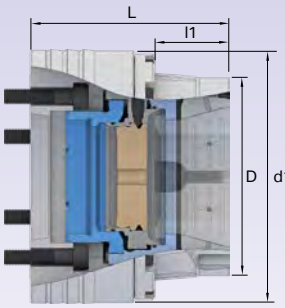
Magnet module

- End face axial clamping via neodymium magnet
- High axial run-out changeover accuracy
- High retention force of 140 N/cm²
- Assembly in 30 sec. without aligning
- Low maintenance, since resistant to contamination
- 1 size Ø200 available

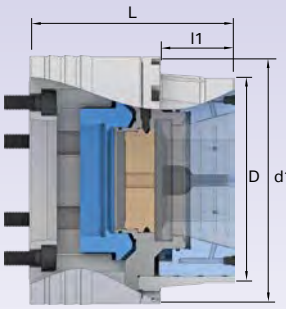


Clamping tools installed and aligned by pL LEHMANN
(if ordered together with a rotary table)

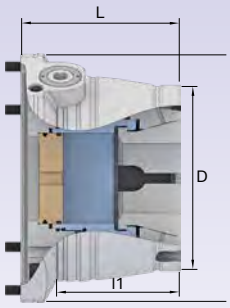
Further information: www. hainbuch.com
Request installation and operating instructions directly from manufacturer



TOPlus mini Axzug
SPANNTOP mini Axzug



TOPlus mini Axfix
SPANNTOP mini Axfix



TOROK SE Axzug
TOROK RD Axzug

HAINBUCH chucks TOPlus mini | TOROK SE

	pL LEHMANN Item no.	Designation	Manual	Hydraulic	Size	Clamping capacity [mm]	L [mm]	l 1 [mm]	D [mm]	d 1 [mm]	Weight [kg]	Max. speed [rpm]	Required accessories	Compatible with modular system	HAINBUCH item no. incl. adapter flange
d80	**HAI.510-tp-axz**	TOPlus mini Axzug		●	52	3...52	103.5	42	119 f7	150	10.9	7000	SPZ.91x-s9-d80	●	10001282
d80	**HAI.510-tp-axf**	TOPlus mini Axfix		●	52	3...52	104.5	44	119 f7	150	10.6	7000	SPZ.91x-s9-d80	●	10001286
d80	**HAI.510-tp-to**	TOROK SE Axzug	●		52	3...52	137	92	125 f7	174	14.6	7000	SPI.91x-d80	●	10001300

TOPlus mini

TOPlus mini

- 25 % higher retention force than SPANNTOP
- Outstanding rigidity thanks to large contact surface of the clamping segments
- Insensitive to dirt thanks to clamping head geometry
- Lower centrifugal force losses compared to jaw chucks
- Optimal lubrication thanks to lubrication grooves in the clamping element holder
- Workpiece stabilized through axial pulling against workpiece stop
- Radial run-out < 0.015 mm
- Minimal interference contour and easy changing of the clamping heads

HAINBUCH chucks SPANNTOP mini | TOROK RD

	pL LEHMANN Item no.	Designation	Manual	Hydraulic	Size	Clamping capacity [mm]	L [mm]	l 1 [mm]	D [mm]	d 1 [mm]	Weight [kg]	max. speed [rpm]	Required accessories	Compatible with modular system	HAINBUCH Item no. incl. adapter flange
d80	**HAI.510-st-axz**	SPANNTOP mini Axzug		●	52	3...52	103.5	45	90 f7	150	9.0	7000	SPZ.91x-s9-d80	●	10001290
d80	**HAI.510-st-axf**	SPANNTOP mini Axfix		●	52	3...52	104.5	44	98 f7	150	9.2	7000	SPZ.91x-s9-d80	●	10001294
d80	**HAI.510-st-to**	TOROK RD Axzug	●		52	3...52	137	92	125 f7	174	14.7	7000	SPI.91x-d80	●	10001297

SPANNTOP mini

Adapter flange required in order
to use Hainbuch system.

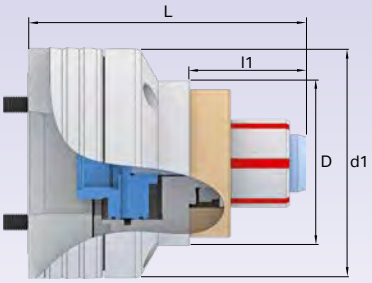
SPANNTOP mini

- Classical benefits of all HAINBUCH power chucks, e.g. high retention force, all-around clamping with high accuracy and exceptional ease of setup
- Lower centrifugal force losses compared to jaw chucks
- Workpiece stabilized through axial pulling against workpiece stop
- Radial run-out < 0.01 mm
- Minimal interference contour and easy changing of the clamping heads

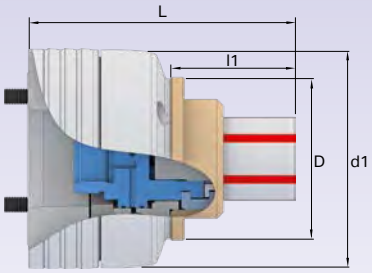
HAINBUCH
SPANNENDE TECHNIK

Clamping tools installed and aligned by pL LEHMANN
(if ordered together with a rotary table)

Further information: www. hainbuch.com
Request installation and operating instructions directly from manufacturer



MANDO T211 Axzug



MANDO T212 Axzug
MANDO T812 Axfix

HAINBUCH clamping mandrels MANDO

	pL LEHMANN Item no.	Designation	Hydraulic	Size	Clamping capacity [mm]	L [mm]	l 1 [mm]	D [mm]	d 1 [mm]	Weight [kg]	max. speed [rpm]	Required clamping cylinder	HAINBUCH Item no. incl. adapter flange
d80	**HAI.510-ma-axz1**	MANDO T212 Axzug	●	s	16...21	112.5	47.5	70	141	7.50	7000	SPZ.91x-s9-d80	10001310
	HAI.510-ma-axf1	MANDO T812 Axfix	●	s	16...21	117.5	49.5	70	141	7.80	7000	SPZ.91x-s9-d80	10001318
	HAI.510-ma-axz2	MANDO T211 Axzug	●	0	20...28	115.5	40.0	75	141	7.20	7000	SPZ.91x-s9-d80	10001303
	HAI.510-ma-axz3	MANDO T212 Axzug	●	0	20...28	123.5	58.5	90	141	8.00	7000	SPZ.91x-s9-d80	10001311
	HAI.510-ma-axf2	MANDO T812 Axfix	●	0	20...28	129.5	60.5	90	141	8.40	7000	SPZ.91x-s9-d80	10001319


MANDO T211

For components with Ø20–200 mm through holes (due to tension bolts)


MANDO T212
MANDO T812

For components with blind holes from Ø8–200 mm

MANDO

- Typical HAINBUCH features such as ease of setup, parallel clamping, optimal force transmission, high rigidity and retention force as well as low wear
- Workpiece stabilized through axial pulling against workpiece stop
- Radial run-out < 0.01 mm, version T812 < 0.025 mm (with +0.003 mm adaptation)
- Large adaptation range through use of vulcanized clamping elements
- Prepared for air system check at workpiece stop

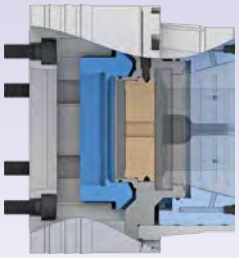

SPANNTOP mini Axzug size 52 on TAP5


MANDO T211 size 0 on TAP9


TOROK SE size 52 on TAP9


TOPlus mini Axfix size 52 on EA-915

HAINBUCH
SPANNENDE TECHNIK

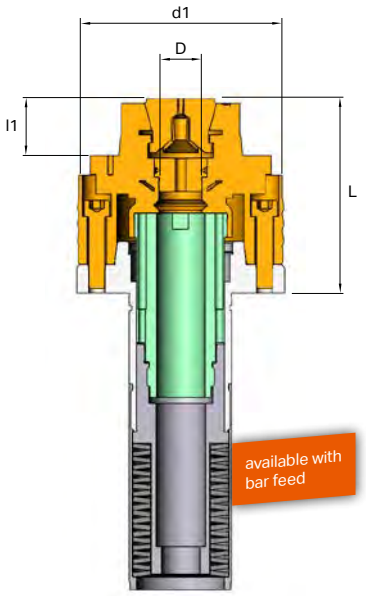


TOPlus mini Axfix
SPANNTOP mini Axfix

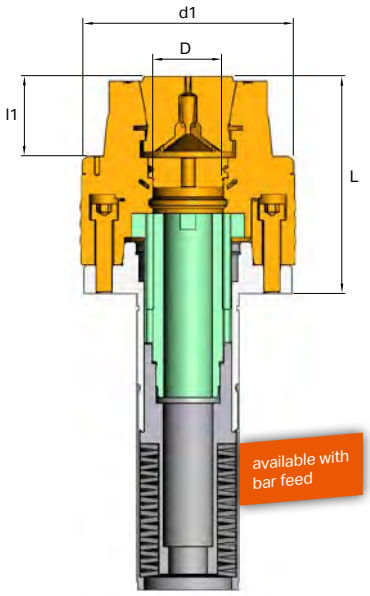
HAINBUCH chuck TopPlus

pL LEHMANN Item no.	Designation	Pneumatic	Size	Clamping capacity [mm]	L [mm]	l 1 [mm]	D [mm]	d 1 [mm]	Weight [kg]	max. speed [rpm]	Required option	HAINBUCH Item no. incl. adapter flange
HAI.91x-tp26-axf**	TopPlus mini size 26	●	26	4...26	125	33	27	128	6.90	10,000	SPZ.91x-s9d30	10018251
HAI.91x-tp40-axf**	TopPlus mini size 40	●	40	4...40	136	47	44	135	9.10	7,000	SPZ.91x-s9d30	10018252
HAI.91x-tp52-axf**	TopPlus mini size 52	●	52	4...52	140	44	53	150	15.60	7,000	SPZ.91x-s9d30	10018708
HAI.91x-tp65-axf*	TopPlus size 65	●	65	4...65	120		61	275			DDF.91x-04-HAI	

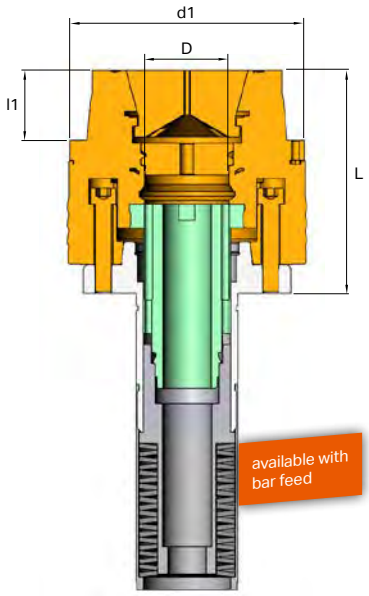
* on request
** available with bar feed, see **p. 77**



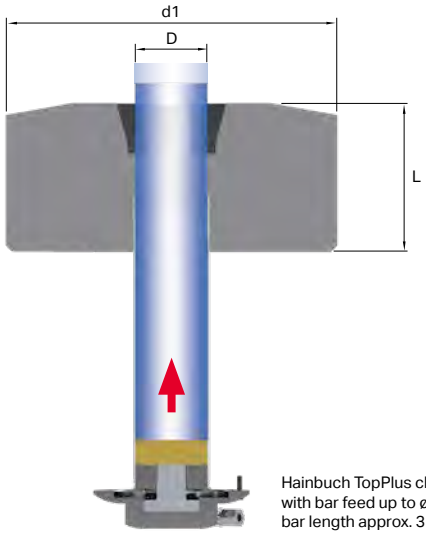
Hainbuch chuck
TopPlus mini size 26



Hainbuch chuck
TopPlus mini size 40



Hainbuch chuck
TopPlus mini size 52



Hainbuch TopPlus chuck, size 65,
with bar feed up to ø60,
bar length approx. 350 mm

Hainbuch catalog product
pL collet adapter
pL collet chuck

Clamping devices assembled by pL LEHMANN, final adjustment by customer (if ordered together with a rotary table)

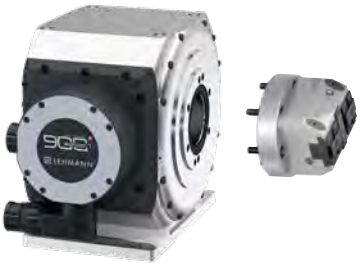
Further information at: www.schunk.com
Request installation and operating instructions directly from manufacturer

Adapter flanges

	pL LEHMANN Item no.		Fits power clamping blocks	L from spindle adapter [mm]	Weight [kg]	SCHUNK Item No.
d80	**SCH.5xx-Ada64**	1	TANDEM3 64	15	0.7	1504986
	SCH.5xx-Ada100	2	TANDEM3 100	20	2.4	1504987
	SCH.5xx-Ada140	4	TANDEM3 140	20	3.9	1536156
	SCH.510-Ada160	3	TANDEM3 160	15	4.8	1504112

ROTA-S plus 2.0 adapter flanges

	pL LEHMANN Item no.	matching the manual chuck	L from spindle [mm]	Weight [kg]	SCHUNK Item No.
d80	**SCH.510-ROTA160**	ROTA-S plus 160	20	4.5	1546433



KSPZ plus 250 on EA-91x

SCHUNK clamping unit on SCHUNK VERO-S **(p. 92)**

Clamping devices assembled by pL LEHMANN, final adjustment by customer (if ordered together with a rotary table)

Further information at: www.schunk.com
Request installation and operating instructions directly from manufacturer

Power clamping blocks

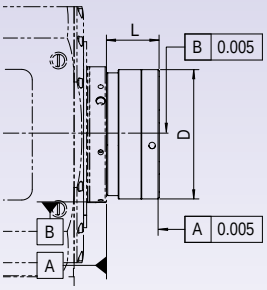
pL LEHMANN Item no.	Designation	Size [mm]	L from spindle (with adapter flange, without jaws) [mm]	Hydraulic	Pneumatic	Centered	Fixed jaw	Jaw stroke [mm]	Clamping force [kN] *	Max. pressure (bar)	Max. range with standard jaws ** [mm]	Weight (with adapter flange) [kg]	Max. speed ***[rpm]	Required adapter flange	Additionally required pL LEHMANN rotary union ***	SCHUNK catalog reference
SCH.KRH100	KRH3 100-Z	100 x 100	94.2	●		●		2	18	60	–	6.9	100	2	DDF.91x-04-d80	1518364
SCH.KRH100LH	KRH3-LH 100-Z	100 x 100	94.2	●		●		6	16	120	–	7.0	100	2	DDF.91x-04-d80	1518368
SCH.KRH160	KRH3 160-Z	160 x 160	102.2	●		●		3	45	60	–	19.2	100	3	DDF.91x-04-d80	1518382
SCH.KRH160LH	KRH3-LH 160-Z	160 x 160	102.2	●		●		8	40	120	–	19.2	100	3	DDF.91x-04-d80	1518386
SCH.KRP100	KRP3 100-Z	100 x 100	89.2		●	●		2	18	9	–	6.4	100	2	DDF.91x-04-d80	1475575
SCH.KRP100LH	KRP3-LH 100-Z	100 x 100	89.2		●	●		6	8	9	–	6.4	100	2	DDF.91x-04-d80	1475586
SCH.KRP160	KRP3 160-Z	160 x 160	97.2		●	●		3	45	9	–	15.8	100	3	DDF.91x-04-d80	1499466
SCH.KRP160LH	KRP3-LH 160-Z	160 x 160	97.2		●	●		8	20	9	–	15.8	100	3	DDF.91x-04-d80	1499475
SCH.KSP64	KSP3 64-Z	64 x 64	65.7		●	●		2	4.5	9	40	1.9	100	1	DDF.91x-04-d80	1409255
SCH.KSP64F	KSP3-F 64-Z	64 x 64	65.7		●		●	4	4.5	9	40	1.9	100	1	DDF.91x-04-d80	1409335
SCH.KSP100	KSP3 100-Z	100 x 100	89.2		●	●		2	18	9	70	6.2	100	2	DDF.91x-04-d80	1409263
SCH.KSP100LH	KSP3-LH 100-Z	100 x 100	89.2		●	●		6	8	9	70	6.2	100	2	DDF.91x-04-d80	1409301
SCH.KSP100F	KSP3-F 100-Z	100 x 100	89.2		●		●	4	18	9	70	6.2	100	2	DDF.91x-04-d80	1409343
SCH.KSP140	KSP3 140-Z	140 x 140	92.7		●	●		3	30	9	90	11	100	4	DDF.91x-04-d80	1409268
SCH.KSP140LH	KSP3-LH 140-Z	140 x 140	92.7		●	●		7	15	9	90	11.1	100	4	DDF.91x-04-d80	1409308
SCH.KSP140F	KSP3-F 140-Z	140 x 140	92.7		●		●	6	30	9	90	11.1	100	4	DDF.91x-04-d80	1409347
SCH.KSP160	KSP3 160-Z	160 x 160	97.2		●	●		3	45	9	120	15.80	100	3	DDF.91x-04-d80	1409272
SCH.KSP160LH	KSP3-LH 160-Z	160 x 160	97.2		●	●		8	20	9	120	16.00	100	3	DDF.91x-04-d80	1409312
SCH.KSP160F	KSP3-F 160-Z	160 x 160	97.2		●		●	6	45	9	120	15.80	100	3	DDF.91x-04-d80	1409351
SCH.KSH100	KSH3 100-Z	100 x 100	94.2	●		●		2	18	60	70	7	100	2	DDF.91x-04-d80	1463173
SCH.KSH100LH	KSH3-LH 100-Z	100 x 100	94.2	●		●		6	16	120	70	7	100	2	DDF.91x-04-d80	1463180
SCH.KSH100F	KSH3-F 100-Z	100 x 100	94.2	●			●	4	18	60	70	7	100	2	DDF.91x-04-d80	1463178
SCH.KSH140	KSH3 140-Z	140 x 140	97.7	●		●		3	30	60	90	13	100	4	DDF.91x-04-d80	1463182
SCH.KSH140LH	KSH3-LH 140-Z	140 x 140	97.7	●		●		7	30	120	90	13	100	4	DDF.91x-04-d80	1463185
SCH.KSH140F	KSH3-F 140-Z	140 x 140	97.7	●			●	6	30	60	90	13	100	4	DDF.91x-04-d80	1463188
SCH.KSH160	KSH3 160-Z	160 x 160	102.2	●		●		3	45	60	120	18.8	100	3	DDF.91x-04-d80	1463202
SCH.KSH160LH	KSH3-LH 160-Z	160 x 160	102.2	●		●		8	20	120	120	19	100	3	DDF.91x-04-d80	1463224
SCH.KSH160F	KSH3-F 160-Z	160 x 160	102.2	●			●	6	45	60	120	18.8	100	3	DDF.91x-04-d80	1463207

* at max. pressure and / or max. torque
** with standard jaws KTR 64 / 100 / 160 / 250 (machining must be carried out by the customer)
*** see **p. 35**, matching spindle adapter (**p. 76**) included in order item
**** only indexing allowed

LH version = long stroke
F version = 1 fixed jaw

Clamping device assembled by pL LEHMANN, final adjustment by customer (if ordered together with a rotary table)

Further information: www.schunk.com
Request installation and operating instructions directly from manufacturer



NSE3 138-P with two media transfers

Adapter flange

	pL LEHMANN Item no.		Compatible with zero-point clamping systems	L from spindle adapter [mm]	Weight [kg]	SCHUNK Item no.
d80	**SCH.5xx-Ada90**	1	NSE mini 90	15	1	1505504
d80	**SCH.5xx-Ada138**	2	NSE3 138	35.7	3.7	1505506
d80	**SCH.5xx-Ada138P**	3	NSE3 138 P	35.7	3.7	1505507

Important technical data

	Unit	NSE3 138	NSE +176
Pneumatic system	[mm]	Yes	Yes
Repeat accuracy	[mm]	< 0.005	< 0.005
Actuating pressure	[bar]	6	6
Draw-in force	[kN]	28	40
Retention force M16	[kN]	75	75

Zero point clamping systems

pL LEHMANN Item no.	Designation non-rusting	Pneumatic 6 bar	Turbo function	non-rusting	D [mm]	L from spindle adapter (with adapter flange) [mm]	Draw-in force [kN]	Incr. draw-in force with turbo function [kN]	Max. retention force [kN]	Weight (with adapter flange) [kg]	Max. speed ** [rpm]	Open	Anti-twist protection	Required adapter flange	Required rotary union*	SCHUNK catalog reference
SCH.90ix	VERO-S NSE mini 90-V1	●	●	●	ø90	35	0.5	1.5	25	1.8	100	●	●	1	DDF.91x-04-d80	0435105
SCH.138ix	VERO-S NSE3 138-V1	●	●	●	ø138	69.5	8	28	75	8.20	100	●	●	2	DDF.91x-04-d80	1313723
SCH.138ix-P	VERO-S NSE3 138-V1-P	●	●	●	ø138	69.5	8	28	75	6.7	100	●	●	3	DDF.91x-04-d80	1359500

*** see **p. 35**, matching spindle adapter (**p. 76**) included in order item
** only indexing allowed
P = with media passage

Increased accuracy = ½ tolerance values; Item no. NPS.5xx-GEN

NSE plus 90-V1

Empty chuck

Centric clamping unit KSA plus 100

NSE3 138-V1-P

Version -P has 2x media passage

Empty chuck

Diaphragm chuck

Centric clamping unit KSC 125

ROTA-S plus 2.0

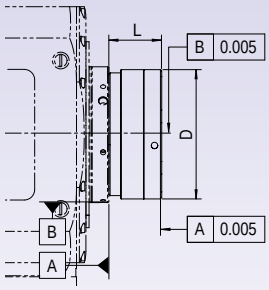
NSE plus 176-V1

Empty chuck

HWR

Clamping devices assembled by pL LEHMANN, final adjustment by customer (if ordered together with a rotary table)

Further information at: www.hwr.de
Request installation and operating instructions directly from manufacturer



HWR zero-point clamping system

pL LEHMANN Item no.	Designation	Manual	Dimensions D x L [mm]	Weight [kg]	Max. speed [rpm]	Required pL LEHMANN accessories	suitable for HWR 5-axis vises*
HWR.5xx-SP52m	SOLIDPoint® 52 incl. adapter plate	•	116x37	3.4	400	SPI.91x-d80	691065-46, 691105-46, 691145, 683085-46, 683120-46, 683085-77, 683120-77, 683160-77
HWR.520-SP52m		•	116x43*	3.6	400		
HWR.5xx-SP52 +96m	SOLIDPoint® 96/52 incl. adapter plate	•	196x37	7.6	400	SPI.91x-d80	691065-46, 691105-46, 691145, 683085-46, 683120-46, 683085-77, 683120-77, 683160-77 683155-77, 683155-125
HWR.520-SP52 +96m		•	196x43*	7.6	400		
HWR.5xx-SP96m	SOLIDPoint® 96 incl. adapter plate	•	196x43	7.6	400	SPI.91x-d80	683155-77, 683155-125
HWR.520-SP96m		•	196x43*	7.6	400		

* Length dimensioned from screw-on surface behind taper

Vises suitable for the HWR zero-point clamping system

pL LEHMANN Item no.	Designation	Clamping capacity [mm]	Weight [kg]	Max. speed [rpm]	HWR Item No.	Base body required
HWR.SG46-S65	SOLIDGrip 46, length 77 mm, jaw width 46 mm	0 – 65	1.7	400	691065-46	pL LEHMANN Item No. **HWR.5xx-SP52m / HWR.520-SP52m**
HWR.SG46-S105	SOLIDGrip 46, length 117 mm, jaw width 46 mm	0 - 105	2.5	400	691105-46	
HWR.SG46-S145	SOLIDGrip 46, length 157 mm, jaw width 46 mm	0 - 145	3.2	400	691145-46	
HWR.SG77-S85	SOLIDGrip 77, length 102 mm, jaw width 77 mm	0 – 85	2.3	400	683085-77	
HWR.SG77-S120	SOLIDGrip 77, length 130 mm, jaw width 77 mm	0 – 120	2.9	400	683120-77	
HWR.SG77-S160	SOLIDGrip 77, length 170 mm, jaw width 77 mm	0 – 160	3.5	400	683160-77	
HWR.SG125-S155-125	SOLIDGrip 125, length 160 mm, jaw width 125 mm	0 – 155	8.4	400	683155-125	pL LEHMANN Item No. **HWR.5xx-SP96m / HWR.520-SP96m**

Clamping tools installed and aligned by pL LEHMANN
(if ordered together with a rotary table)

Further information at: www.gressel.ch
Request installation and operating instructions directly from manufacturer

GRESSEL gredoc pallet system

	pL LEHMANN Item No.	Designation	Manual	D1 [mm]	D2 [mm]	L1 [mm]	L2 [mm]	Weight [kg]	Max. speed [rpm]	Required spindle adapter	GRESSEL Item no. incl. adapter flange
d80	**GRE.510-GRU***	gredoc round	•	ø135	148	30	–	3		SPI.91x-d80	NGS.010.016.01

Technical data	Unit	Dimensions
Mechanical system		Yes
Repeatability	(mm)	< 0.01
Clamping force	(kN)	20
Height tolerance	(mm)	± 0.005

Clamping devices for above GRESSEL gredoc pallet system

pL LEHMANN Item No.	Designation	Manual	D [mm]	L from spindle [mm]	Pallet sizes [mm]	Weight [kg]	Max. speed* [rpm]	GRESSEL catalog reference	Base body required
GRE.C280-grip	C2.0 80 L-130 with reversible jaw grip	•	157 x 80 x 78	128		4	100	CNM.080.001.01	GRE.5xx-GRU*
GRE.C2125-grip	C2.0 125 L-160 with reversible jaw grip	•	208 x 125 x 83	133		8.7	100	CNM.125.001.01	
GRE.NGZ-p	Pyramid 3-way 30° for C3 L-80	•	ø190 x 54 / 30°		ø190	2.6	100	NGZ.010.135.11	
GRE.C3	C3 L-80 without system jaws	•	70 x 80 x 42			0.9	100	CGM.070.002.01	GRE.DOC-x
GRE.SWB-grip	SWB grip 3mm width 45 (1 piece)	•	45 x 22 x 22			0.1	100	CGA.070.001.01	
GRE.AB	Mounting pin, incl. fastening screw	•	ø40			0.1	100	NGA.000.001.01	

All items must be ordered separately! (Ex. assembly for pL LEHMANN EA-507: NGS.010.015.01 + CGM.080.001.01 + NGA.000.001.01)
* only indexing allowed

C2.0 125

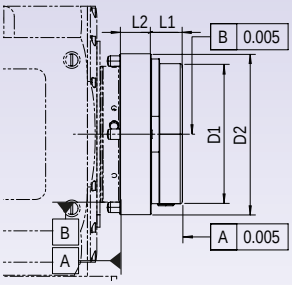
C3

SWB grip 3 mm

Pyramid 3-way 30° with C3 L-80 grip

EA application

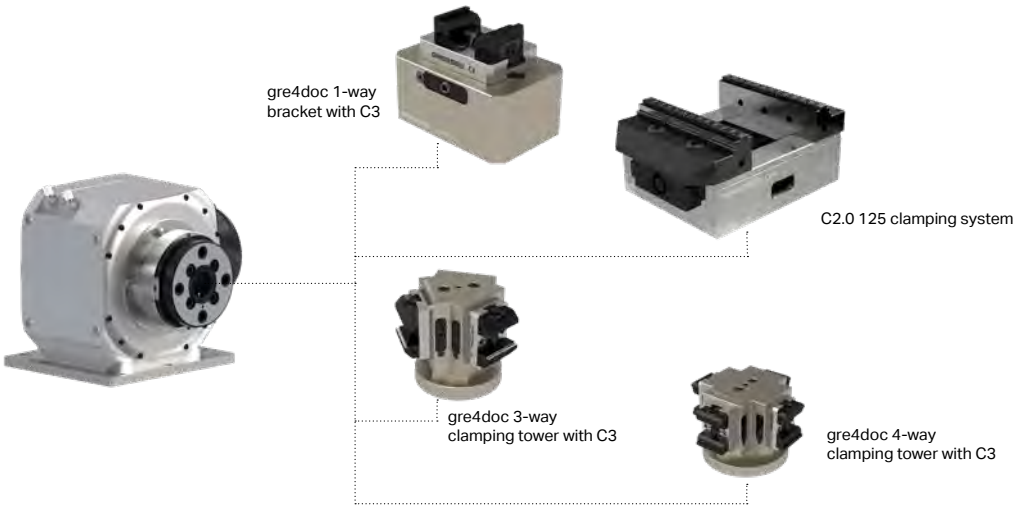
GRESSEL



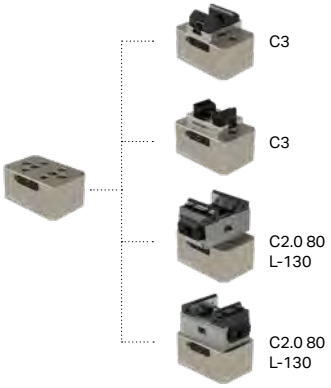
Clamping tools installed and aligned by pL LEHMANN
(if ordered together with a rotary table)

Further information at: www.gressel.ch
Request installation and operating instructions directly from manufacturer

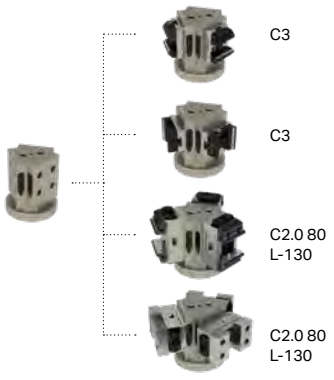
gredoc + gre4doc modular zero-point clamping system



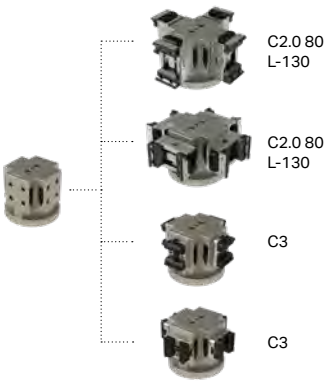
gre4doc 1-way bracket



gre4doc 3-way clamping tower



gre4doc 4-way clamping tower



Clamping towers

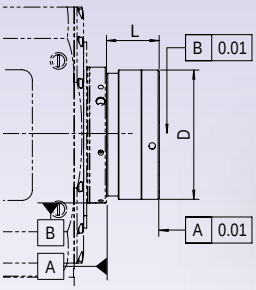
pL LEHMANN Item No.	Designation	Manual	D [mm]	L from spindle [mm]	Pallet sizes [mm]	Weight [kg]	Max. speed* [rpm]	GRESSEL catalog reference	Base body required
GRE.DOC-1	gre4doc 1-way bracket	●	150 x 100 x 70		ø148	2.9	100	NGS.040.000.01	
GRE.DOC-3	gre4doc 3-way pyramid	●	ø148 x 171		ø148	6.3	100	NGS.040.200.01	GRE.5xx-GRU*
GRE.DOC-4	gre4doc 4-way pyramid	●	ø197 x 171		ø148	11.9	100	NGS.040.210.01	

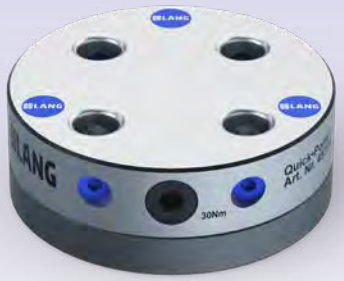
* only indexing allowed

LANG TECHNIK
einfach. zukunft. greifen.

Clamping devices assembled by pL LEHMANN, final adjustment by customer (if ordered together with a rotary table)

Further information at: www.lang-technik.de
Request installation and operating instructions directly from manufacturer

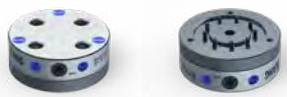




LANG zero-point clamping system

pL LEHMANN Item no.	Designation	Manual	Power-actuated	Dimensions D x L [mm]	Weight [kg]	Max. speed [rpm]	Required pL LEHMANN accessories	suitable for LANG 5-axis vises*
LAN.5xx-QP52m	Quick·Point® 52, incl. adapter flange	●		Ø 116 x 43	3.60	400	SPI.91x-d80	48085-46 / 48085-77 / 48120-46 / 48120-77 / 48160-77
LAN.5xx-QP52k			●		on request		SPZ.91x-S9	
LAN.5xx-QP52 +96m	Quick·Point® 52/96, incl. adapter flange	●		Ø 196 x 37	on request		SPI.91x-d80	48085-46 / 48085-77 / 48120-46 / 48120-77 / 48160-77 / 48155-77 / 48155-125
LAN.5xx-QP96m	Quick·Point® 96, incl. adapter flange	●			7.60		SPI.91x-d80	48155-77 / 48155-125
LAN.5xx-QP96m-D**		●		Ø 196 x 27	on request	400	SPI.91x-d80	
LAN.5xx-QP96k			●	Ø 196 x 37		on request	SPZ.91x-S9	
LAN.520-QP96m		●		Ø 196 x 41.5	7.50	400		48155-77 / 48155-125

* The maximum length of the vise base body depends on the rotary axis type. Longer vise variants may be possible. Please inquire.
** with through hole Ø 46.55 mm


LAN.5xx-QP52m

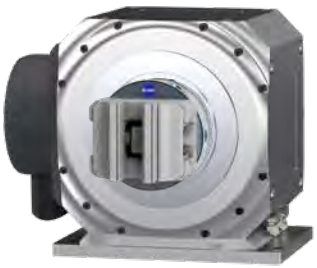

LAN.5xx-QP96m


LAN.520-QP96m


LAN.5xx-QP52 +96m


LAN.5xx-QP96m-D

Vises suitable for the LANG zero-point clamping system

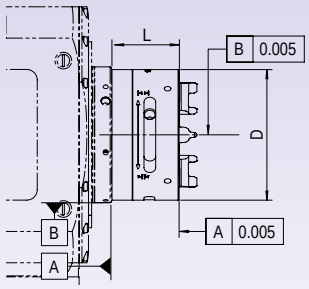


Example of application
Makro·Grip® 77 with Quick·Point® 52, on pL LEHMANN EA-915

pL LEHMANN Item no.	Designation	Clamping capacity [mm]	Weight [kg]	Max. speed [rpm]	LANG Item No.	Base body required
LAN.MG46-S85	Makro·Grip® 46, length 102 mm Jaw width 46 mm	0 – 85			48085-46	
LAN.MG46-S120	Makro·Grip® 46, length 130 mm Jaw width 46 mm	0 – 120			48120-46	
LAN.MG77-S85	Makro·Grip® 77, length 102 mm Jaw width 77 mm	0 – 85	2.30	400	48085-77	pL LEHMANN Item No. **LAN.5xx-QP52x**
LAN.MG77-S120	Makro·Grip® 77, length 130 mm Jaw width 77 mm	0 – 120	2.90	400	48120-77	
LAN.MG77-S160	Makro·Grip® 77, length 170 mm Jaw width 77 mm	0 – 160	3.50	400	48160-77	
LAN.MG77-S155	Makro·Grip® 77, length 160 mm Jaw width 77 mm	0 – 155			48155-77	pL LEHMANN Item No. **LAN.5xx-QP96x**
LAN.MG125-S155	Makro·Grip® 125, length 160 mm Jaw width 125 mm	0 – 155	8.40	400	48155-125	

All LANG vises can also be attached to other zero-point clamping systems (Erowa, Schunk, 3R, etc.) after being adjusted slightly. For further information, please contact your local LANG Technik representative.

EROWA®



Clamping devices installed and aligned by pL LEHMANN
(if ordered together with a rotary table)

Further information at: www.erowa.com
Request installation and operating instructions directly from manufacturer

ProductionChuck 210 Combi ER-032388

	pL LEHMANN Item No.	Designation (incl. flange)	Manual	Pneumatic	D [mm]	L from spindle adapter [mm]	Pallet sizes [mm]	Workpiece weight (perm.) [kg]	Weight [kg]	Max. speed [rpm]	Opening	Clean Z-support	Rotary union	Chuck weight, (incl. adapter flange) [kg]	EROWA catalog reference	EROWA Item no., incl. adapter flange
dB0	**ERO.5xx-CTSix**	CTS Chuck Dual Rotation (Inox)		●	ø112	45.3	ø60	4		8,000			1)	4.3	ER-050316	on request
dB0	**ERO.5xx-FTSix**	FTS Chuck (Inox)		●	ø74	46.5	ø72	4	1.50	4,000	●	●	1)	1.5	ER-057335	ER-073469
dB0	**ERO.5xx-QCix**	QuickChuck 100 P (Inox)	●		ø100	50	□50/ø148	35	2.60	3,000				2.6	ER-036345	ER-073351
dB0	**ERO.5xx-ITS100ix**	ITS Chuck 100 P (Inox)		●	ø100	50	□50/ø148	35	2.50	5,000	●	●	1)	2.5	ER-043123	ER-073433
dB0	**ERO.5xx-MTS**	MTS IntegralChuck S-P/A		●	ø130	60	ø148	50	4.00	4,500	●	●	1)	4	ER-036802	ER-073457
KK5	**ERO.520-PC**	PowerChuck P		●	ø150	75	□50/ø148	50	8.70	5,000	●	●	2)	8.7	ER-115254	ER-073460
KK5	**ERO.520-P210**	ProductionChuck 210		●	ø81/ø210	98	ø210	120	16.60	4,500	●	●	2)	16.6	ER-032964	ER-073461
KK5	**ERO.520-P210c**	Product.Chuck 210 Combi		●	ø210	98	□50/ø210	120	18.00	4,500	●	●	2)	18	ER-032388	ER-073462

Increased accuracy = ½ tolerance values; Item no. NPS.5xx-GEN

Additionally required rotary union (see **p. 35**):
1) = DDF.91x-04-d80, 2) = DDF.91x-04-KK5

for all automatic chucks		
ERO.HSV	Manual control valve	supplied loose with all necessary cables and hoses, ready to connect
ERO.ASV-2	Automatic control valve	supplied loose, for installation in the control cabinet, with all necessary cables/hoses

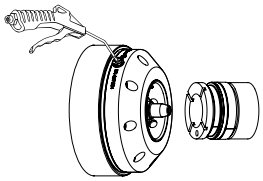
When standard pallets with open holes are used, water, metal chips etc. can get into the pallet chuck, air lines and control valve. To prevent this, seal kits are available from the respective chuck manufacturers.

The speed values are theoretical, application-specific maximum values. The user is responsible for the optimum radial run-out of the pallets (incl. clamping device and workpiece) as well as sufficient workpiece fastening.

FTS Chuck (Inox)
ER-057335

ITS Chuck 100 P (Inox)
ER-043123

CTS Chuck Rotation (Inox)
ER-057324



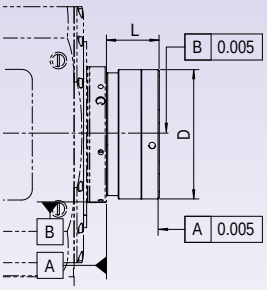
MTS IntegralChuck S-P/A
ER-131210

PowerChuck P
ER-115254

Manual control valve
(option)

Automatic control unit
with monitoring (option)

system 3R



Clamping devices installed and aligned by pL LEHMANN
(if ordered together with a rotary table)

Further information at: www.system3r.com
Request installation and operating instructions directly from manufacturer

S3R.5xx = Item number for combined chuck for types 507 and 510

	pL LEHMANN Item No.	Designation (incl. flange)	Pneumatic	D [mm]	L from spindle adapter [mm]	Pallet sizes [mm]	Number of media transfers	Workpiece weight (perm.) [kg]	Weight [kg]	Max. speed [rpm]	Permitted pull-out torque [Nm]	Opening	Clean Z-support	Clean cams	incr. clamping force/venting	Rotary union	SYSTEM 3R Catalog reference	SYSTEM 3R item no. incl. adapter flange
91x	**S3R.5xx-G70C**	3R GPS 70 COCN	●	ø99	76	ø70	–	10	3.65	5,450		●	●				X663070	X697640
d80	**S3R.5xx-G70**	3R GPS 70	●	ø99	56	ø70	–	10	2.70	5,450		●	●			1)	C188720	X663000
	S3R.5xx-G70C	3R GPS 70 COCN	●	ø99	76	ø70	–	10	3.65	5,450		●	●				X663070	X697640
	S3R.510-G120	3R GPS 120	●	ø118	56	ø120	–	20	3.60	5,450		●	●			1)	C188770	X663010
	S3R.510-G120-P	3R GPS 120	●	ø118	64	ø120	4	20	3.95	5,450		●	●				C190120	X663080
	S3R.510-MGC*	3R Magnum Chuck	●	ø162	46	ø156, w/index pin	–	100	6.70	5,450		●	●		●	1)	3R-SP26712	90940.02
	S3R.510-MGC-P*	3R Magnum Chuck		ø162	48	ø156, w/index pin	2		6.10	5,450		●	●				90948	X697650
	S3R.510-MCC	3R Macro Chuck	●	ø100	49	54x54, 70x70	–	10	2.60	5,450		●	●		●	1)	3R-600.14-30	90940.01
KK5	**S3R.520-G120**	3R GPS 120	●	ø118	70	ø120	–	20	5.00	5,450		●	●			2)	C188770	X663020
	S3R.520-G120-P	3R GPS 120	●	ø118	71	ø120	4	20	5.00	5,450		●	●				C190120	X663090
	S3R.520-G240	3R GPS 240	●	240x240	84	240x240	–	150	20.70	3,000		●	●	●	●	2)	C219200	X663030
	S3R.520-G240-P	3R GPS 240	●	240x240	84	240x240	2	150	20.70	3,000		●	●				X633700	X697600
	S3R.520-G240ix	3R GPS 240, rust-resistant	●	240x240	84	240x240	–	150	21.00	3,000		●	●	●	●	2)	X607620	X663040
	S3R.520-G240ix-P	3R GPS 240, rust-resistant	●	240x240	84	240x240	2	150	21.00	3,000		●	●				X691630	X697610
	S3R.520-MGC*	3R Magnum Chuck	●	ø162	60	ø156, w/index pin	–	100	7.70	5,450		●	●		●	2)	3R-SP26712	90940.12
	S3R.520-MGC-P*	3R Magnum Chuck	●	ø162	60	ø156, w/index pin	2	100	7.20	5,450		●	●				90948	X697660
	S3R.520-MCC	3R Macro Chuck	●	ø100	63	54x54, 70x70	–	10	3.50	5,450		●	●		●	2)	3R-600.14-30	90940.11
	S3R.520-DYN	3R Dynafix	●	277x277	83		–	250				●	●				3R-770-5	90940.30
	S3R.520-DYN-P	3R Dynafix	●	277x277	83		2	250	30			●	●				3R-770-5A	X697670
Ref. Palette	**S3R.RP-GPS240**	Reference pallet GPS 240															C846600	
	S3R.RP-GPS70120	Reference pallet GPS 70															C846360	
	S3R.RP-Macro	Reference pallet Macro															36-606.1	
	S3R.RP-Magnum	Reference pallet Magnum															3R-686.1-HD	

Additionally required rotary union (see **p. 35**):
1) = DDF.91x-04-d80, 2) = DDF.91x-04-KK5

* For Magnum pallets only.
Macro pallets may not be clamped

When standard pallets with open holes are used, water, metal chips etc. can get into the pallet chuck, air lines and control valve. To prevent this, seal kits are available from the respective chuck manufacturers.

Increased accuracy = ½ tolerance values; Item no. NPS.5xx-GEN

- Repeatability 2 µ
- Angular position accuracy 0.005 mm

GPS 70/120/240
- Cast aluminum design at very good price-performance ratio
- Compact in overall height
- No clamping spigots
- Complete coverage for sink erosion and milling applications
- Ideal for automation
- High-precision repeatability

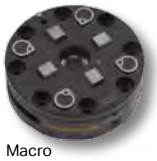
Macro
- High stability and precision
- Especially for milling applications

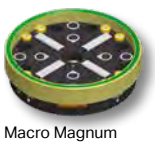
Macro Magnum
- Solid construction
- High stability and precision
- Complete tightness
- Especially for milling applications in the high-precision range

Dynafix
- High holding and clamping forces
- Extremely precise steel ground 0-point supports
- Mainly milling and sink erosion applications


GPS 70


GPS 120


Macro

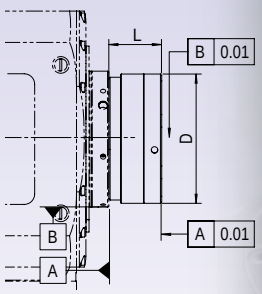

Macro Magnum


GPS 240


Dynafix

pL LEHMANN®

PAROTEC
spanntechnik · robotik · engineering



Clamping tools assembled by pL LEHMANN, final adjustment by customer (if ordered together with a rotary table)

Further information: www.parotec.ch
Request installation and operating instructions directly from manufacturer

	pL LEHMANN Item No.	Designation	Manual	Pneumatic	D [mm]	L from spindle adapter [mm] (up to Z-support)*	Pallet sizes [mm]	Number of media transfers	Max. workpiece weight [kg]	Weight [kg]	Max. speed [rpm]	Open system [bar]	Clean Z-support	With re-tightening	Required accessories*	PAROTEC Item no., Incl. adapter flange
d80	**PAR.510-PG162p**	POWER GRIP 160, 1x		●	Ø162	69	□158/ Ø148	0	250	9.5	6,000	6	●	●	DDF.91x-04-d80	XT2160162010
	PAR.510-PG162mp	POWER GRIP 160, 1x (LPA)	●		Ø162	69	□158/ Ø148	0	250	9.5	6,000	6		●	SPI.91x-d80	XT2160162011
	PAR.510-PG162p-P	POWER GRIP 160, 1x		●	Ø162	69	□158/ Ø148	3	250	9.6	6,000	6	●	●	DDF.91x-04-d80	XT2160162013
	PAR.510-PY162p	POLY GRIP, 1x		●	Ø162	69/76.5	Ø70-Ø148	0	50			6	●	●	DDF.91x-04-d80	XT9911420710
	PAR.510-PY162mp	POLY GRIP, 1x (LPA)	●		Ø162	69/76.5	Ø70-Ø148	0	50			6		●	SPI.91x-d80	XT9911420711

* see **p. 35**, matching spindle adapter (**p. 76**) included in order item

LPA = air gun connection

Technical data	Unit	POWER GRIP	POLY GRIP
Repeatability	mm	±0.002	±0.002
Clamping force without retightening PNEU	kN	17	7
Clamping force with retightening PNEU	kN	28	12
Clamping force without retightening HYDR	kN	35	
Clamping force with retightening HYDR	kN	45	
Permissible pull-out torque without retightening PNEU 6 bar	Nm	429	160 / 210*
Permissible pull-out torque without retightening HYDR 30 bar	Nm	890	

* 2 possible Z-supports. More details on request.

POWER GRIP 160, 1x on EA-91x

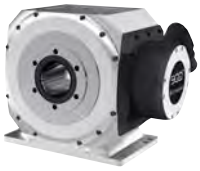
EVARD PRECISION S.A.

Clamping tools assembled by pL LEHMANN, final adjustment by customer (if ordered together with a rotary table)

Further information: www.evard-precision.ch
Request installation and operating instructions directly from manufacturer

Centering vice – Type CM

	pL LEHMANN Item no.	Designation	Manual	Pneumatic	Size [mm]	Clamping capacity [mm]	Weight [kg]	Required accessories	Evard Catalog Reference	Evard Item no. incl. adapter flange
d80	**EVA.5xx-2020**	CM centering vise	●		20	25	0.22	SPI.91x-d80	2020	2020507
	EVA.5xx-2021	CM stainless steel centering vise	●		20	25	0.22	SPI.91x-d80	2021	2021507
	EVA.5xx-3000	CM centering vise	●		30	56	0.66	SPI.91x-d80	3000	3000507
	EVA.5xx-7050	Azimuth centric clamping unit		●	50	50	1.20	SPI.91x-d80	7050	7050507
	EVA.5xx-3001	CM stainless steel centering vise	●		30	56	0.66	SPI.91x-d80	3001	3001507
	EVA.5xx-5000	CM centering vise	●		50	89	2.30	SPI.91x-d80	5000	5000510
	EVA.5xx-7070	Azimuth centric clamping unit		●	70	70	4.00	SPI.91x-d80	7070	7070510
	EVA.5xx-8000	CM centering vise	●		80	137	6.45	SPI.91x-d80	8000	8000510



Combine the EA-91x rotary table with the CM 20 centering vice and split the µ's.

Jaws

	pL LEHMANN Item no.	Designation	Size [mm]	Weight [kg]	Evard Item no.
CM 50	**EVA.500053**	Standard jaw	50	Included in the weight of the vice	500053
	EVA.500051	Stepped jaw	50	Included in the weight of the vice	500051
	EVA.500052	Claw jaw	50	Included in the weight of the vice	500052
	EVA.500055	Special claw jaw	50	Included in the weight of the vice	500055
CM 80	**EVA.800053**	Standard jaw	80	Included in the weight of the vice	800053
	EVA.800051	Stepped jaw	80	Included in the weight of the vice	800051
	EVA.800052	Claw jaw	80	Included in the weight of the vice	800052
	EVA.800055	Special claw jaw	80	Included in the weight of the vice	800055
CM 105	**EVA.105053**	Standard jaw	105	Included in the weight of the vice	105053
	EVA.105051	Stepped jaw	105	Included in the weight of the vice	105051
	EVA.105052	Claw jaw	105	Included in the weight of the vice	105052
	EVA.105055	Special claw jaw	105	Included in the weight of the vice	105055

Ultra-compact self-centering vice – only 50 mm above spindle

Clamping tools assembled by pL LEHMANN, final adjustment by customer
(if ordered together with a rotary table)

Manufacturer for adaptation to pL rotary table: www.ivo-oesterle.de
Manufacturer for all other add-on elements: www.triag-int.ch

ZSP 140

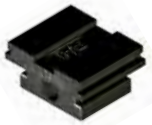
ZSP 180

ripas ❶

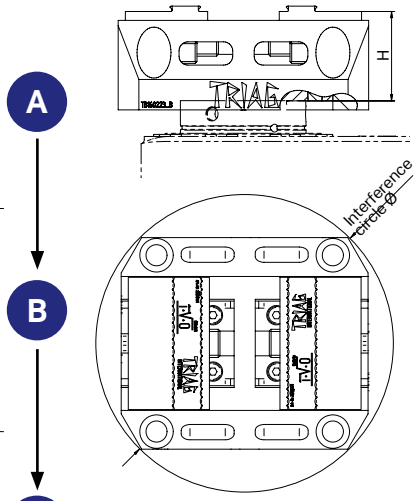
Flange 510 ❷

Slide set 1
Direct stamping jaws
(3 mm), width 75 mm

Slide set 2
Direct stamping jaws
(3 mm), width 76 mm



Slide set 3
powerCLAMP, interface



TpL set

A Centric clamping unit

pL LEHMANN Item No.	Designation	L from flange [mm]	Interference circle Ø [mm]	Weight, approx. (without adapter flange) [kg]	Max. speed [rpm]	Required adapter flange	TRIAG item no.
TRI.ZSP-140	ZSP 140 (140 x 120 x 50)	32.5	184	3	400	❶ / ❷	ZSX140L50-PL
TRI.ZSP-180	ZSP 180 (180 x 120 x 50)		216	4.2			ZSX180L50-PL

B Hollow shank taper adapter and flange

	pL LEHMANN Item no.		Compatible with centric clamping units	L from spindle [mm]	Weight [kg]	Required*	TRIAG item no.
HSK	**RIP.63ada**	❶	ZSP 140 / ZSP 180	12.5	0.9	RIP.91x-63 m	FLZSX-HSK63-PL
d80	**TRI.510**	❷		15	1.2	SPI.91x-d80	FLZSX-510-PL

* see **p. 76/79**

C Suitable jaw set

	pL LEHMANN Item No.	Designation	Weight [kg]	TRIAG item no.
ZSP 140/180	**TRI.ZB5X**	Slide set 1 direct stamping jaws (3 mm), width 75 mm	1	ZB5XPRG
	TRI.ZB5U	Slide set 2 direct stamping jaws (3 mm), width 76 mm	2	ZB5UPRG
	TRI.ZBM	Slide set 3 powerCLAMP, interface	1.8	ZBM

TRIAG
INTERNATIONAL

Clamping devices assembled by pL LEHMANN, final adjustment
by customer (if ordered together with a rotary table)

Further information at: www.triag-int.ch
Request installation and operating instructions directly from manufacturer

Pneumatic centric clamping unit

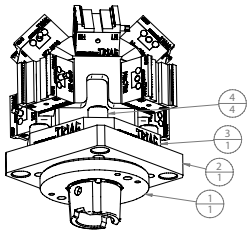
	pL LEHMANN Item No.	Designation	Size [mm]	L from spindle (with adapter flange, without jaws) [mm]	Pneumatic	Jaw stroke [mm]	Clamping force [kN] *	Max. pressure [bar]	Max. range with standard jaws ** [mm]	Weight (with adapter flange) [kg]	Max. speed *** [rpm]	Additionally required pL LEHMANN rotary union **	TRIAG Item no.
d80	**TRI.5xx-ZSP150**	Centric clamping unit	150 x 150	105	•	6	24	12	124.5	13.5	400	DDF.91x-04-d80	ZSP150L100-510/520-PL

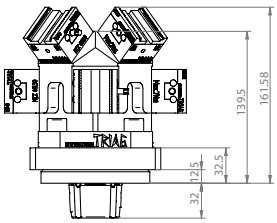
* at max. pressure and / or max. torque
** see **p. 35**
*** only indexing allowed

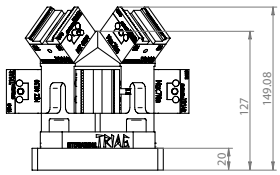
5-axis centric clamping block

	pL LEHMANN Item No.	Designation	Size [mm]	L from spindle (with adapter flange and clamp, without jaws) [mm]	Manual	Weight (with adapter flange) [kg]	Max. speed* [rpm]	Additionally required pL LEHMANN accessories **	TRIAG Item no.
HSK	**TRI.5xx-CENHSK**	5-axis centric clamping block	120 x 120	162	•	7.7	0	RIP.91x-63x	FLZSX-HSK63-PL UB5AXMCZ40-45-4 ZF230540
QuickPoint	**TRI.5xx-CENQP**			149		7	0	LAN.5xx-QP96x	UB5AXMCZ40-45-4 ZF230540

* only indexing allowed
** see **p. 79**







LEHMANN®

There are even more possibilities ...

Further information on the following clamping systems on request

ITG COLIN

YERLY

SwissChuck Precision Workholding

HOFER technics

swiss hemo SPANNTECHNIK | ENGINEERING | MEDIZINTECHNIK

PIRANHA CLAMP

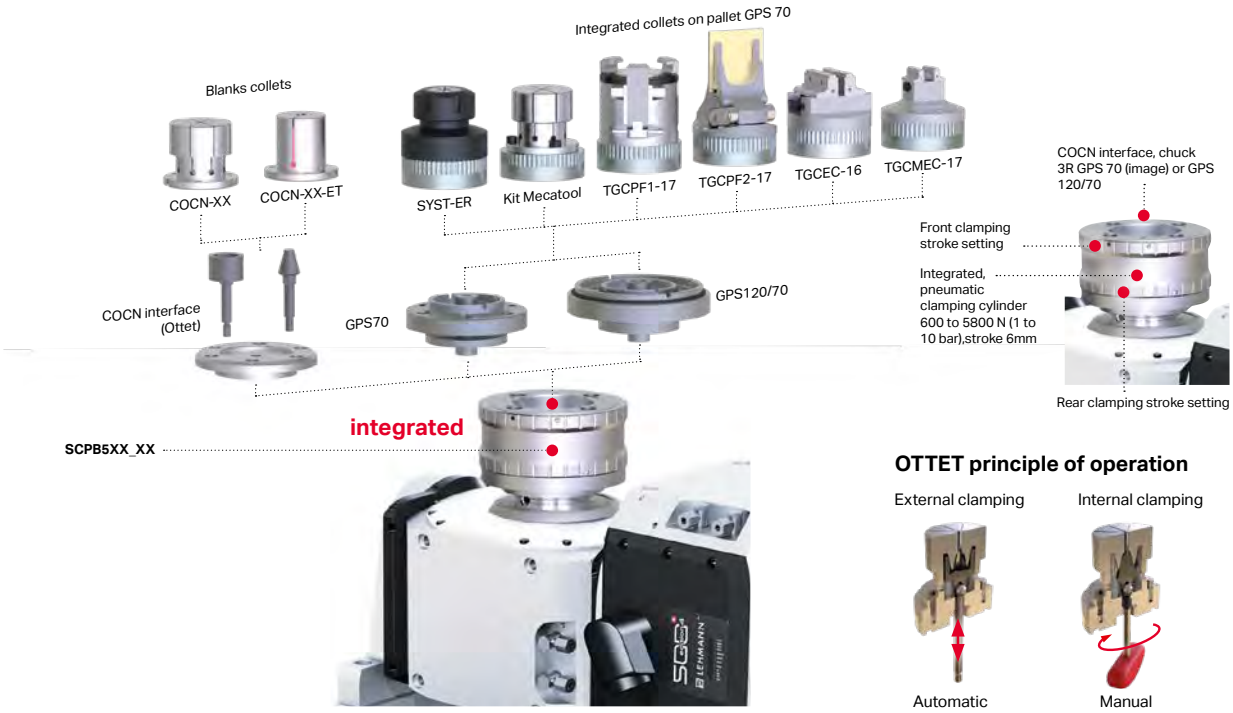
ROEMHELD HILMA ▪ STARK

amf

Further information at: www.tgcolin.ch

Further information at: www.yerly.net

TG Colin



OTTET principle of operation

YERLY

- e.g. for raw part handling, manual or automatic pallet change
- Highly customized pallet chucks according to your needs

SwissChuck
Precision Workholding

Further information at: www.SwissChuck.com

HOFER technics

Further information at: www.hofer-maschinentechnik.ch

SwissChuck

Precision power chucks (cylinder-actuated)

Precision diaphragm chuck (pneumatically actuated)

- Sealed and oil filled
- High-precision
- Precision interface for fast changeovers

HOFER

EA-915 with TITAN 100 zero-point clamping system

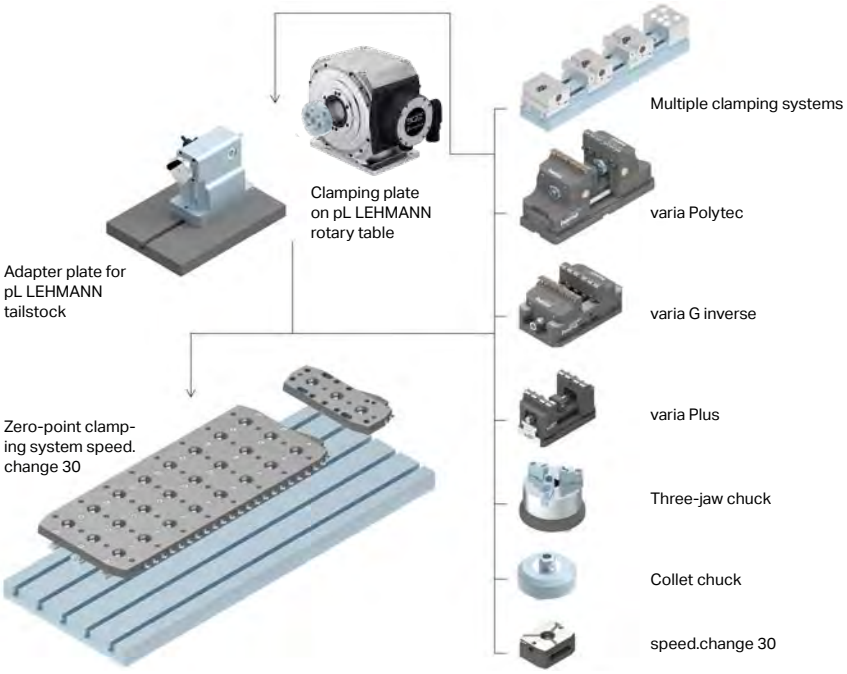
TITAN 100 zero-point clamping system

REX-M centric clamping unit

Further information at: www.hemo.ch

Further information at: www.piranha-clamp.ch

hemo



PiranhaClamp

Zero-point clamping plates

EA-915 with NSP

Ripas

PV 75 Ripas

Snapper 170 Ripas

Snapper 300 Ripas

Gepard 170 Ripas

Gepard 300 Ripas

ROEMHELD
HILMA ▪ STARK

Further information at: www.stark-inc.com

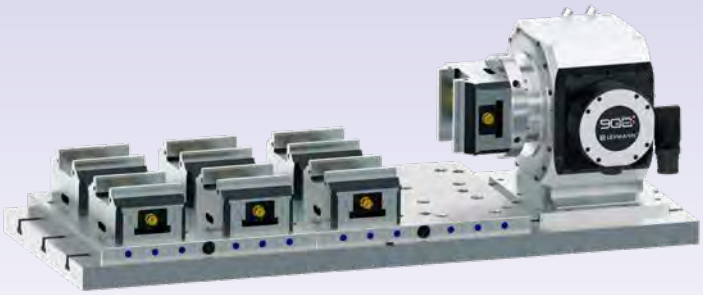
Further information at: www.amf.de

STARK

915

AMF

AMF zero-point clamping system



HWR

pL LEHMANN item No.	Description	Manual	Dimensions L x W x H [mm]	Weight [kg]	Spacing	Positioning accuracy [mm]	Retention force 4 pins [kN]	Number of clamping nests	HWR Item No.
HWR.SP52+96m-1	SOLIDPoint® 96/52: zero-point clamping plate	●	192 x 192 x 27	7.2	96 / 52	0.005	60	1	660005 + 662101 + 662111
HWR.SP96m-1	SOLIDPoint® 96: zero-point clamping plate	●	192 x 192 x 27	7.2	96	0.005	60	1	660205 + 662101 + 662111
HWR.SP96m-2	SOLIDPoint® 96: multiple zero-point clamping plate	●	384 x 192 x 27	15	96	0.005	60	2	660025 + 677102 + 677112
HWR.SP52+96m-2	SOLIDPoint® 96/52: multiple zero-point clamping plate	●	384 x 192 x 27	15	52 / 96	0.005	60	2	660225 + 677102 + 677112
HWR.SP96m-4	SOLIDPoint® 96: multiple zero-point clamping plate	●	384 x 384 x 27	28	96	0.005	60	4	660045 + 677104 + 677114

HWR.SP96m-2

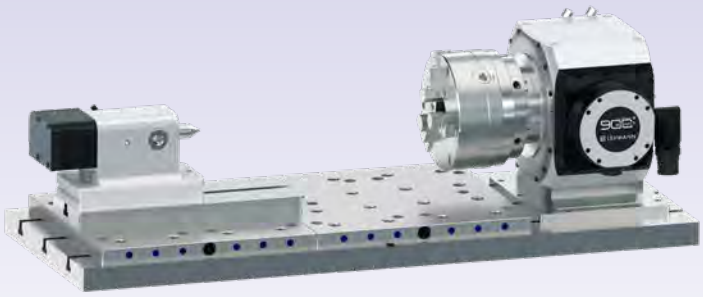
HWR.SP96m-4

LANG

pL LEHMANN item No.	Description	Manual	Dimensions L x W x H [mm]	Weight [kg]	Spacing	Repeatability [mm]	Retention force 4 pins [kN]	Number of clamping nests	LANG Item No.
LAN.QP96m-1	QuickPoint® 96: zero-point clamping plate	●	192 x 192 x 27	7.76	96	0.005	6	1	45710
LAN.QP52+96m-1	QuickPoint® 96/52: zero-point clamping plate	●	192 x 192 x 27	7.45	52 / 96	0.005	6	1	45748
LAN.QP96m-2	QuickPoint® 96: multiple zero-point clamping plate	●	384 x 192 x 27	16.48	96	0.005	6	2	45720
LAN.QP96m-4	QuickPoint® 96: multiple zero-point clamping plate	●	384 x 384 x 27	31.48	96	0.005	6	4	45740

LAN.QP96m-4

LAN.QP96m-1



GRESSEL

pL LEHMANN item No.	Description	Manual	Dimensions L x W x H [mm]	Weight [kg]	Spacing	Positioning accuracy [mm]	Retention force 4 pins [kN]	Number of clamping nests	GRESSEL Item No.
GRE.GEC-2	2-way angular	●	400 x 130 x 30	11	200	< 0.01	2 x 20	2	NGS.020.022.01
GRE.GEC-3	3-way angular	●	600 x 130 x 30	18	100	< 0.01	3 x 20	3	NGS.020.023.01

GRE.GEC-2

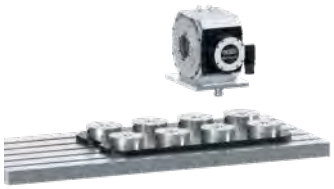
GRE.GEC-3

Preparations for base plate at rotary table, counterbearing and tailstock

Rotary table and counterbearing

For adaptation of the rotary table and the counterbearing, a base plate with corresponding adaptation to the zero-point clamping system is required. The design is project-specific and is offered as an engineering service.

	Item No. Base plate	Item No. Adaptation	Item No. Engineering	Increase of center height
EA-507 (508)	**GPL.507-150**	**SPEZ.GPL-m**	**SPEZ.ENG-k**	40mm
EA-510 (511)	**GPL.510-180**			30mm
EA-520 (521)	**GPL.520-220**			40mm
EA-530	**GPL.530-280**			60mm
GLA.TOP1	**GPL.TOP1-150**			40mm
GLA.TOP2	**GPL.TOP2-180**			30mm



Tailstock

For adaptation of the tailstock, the standard base plate can be adapted to the zero-point clamping system.
If this is not possible due to the positioning on the zero-point clamping plate (e.g. break-through of the holes), an adaptation base plate is required.

	Item No. Adaptation base plate	Item No. Adaptation	Item No. Engineering
RST.LIG-xxxx	**without**	**SPEZ.GPL-m**	**SPEZ.ENG-k**
	GPL.RST-30		

driven by technology

Installed by pL LEHMANN
(if ordered together with a rotary table)

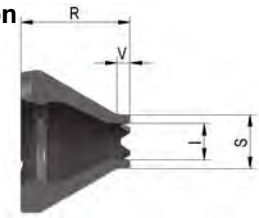
Further information: www.roehm.biz
Request installation and operating instructions directly from manufacturer

Face driver, play-free version with hydraulic compensation for clockwise and counterclockwise rotation

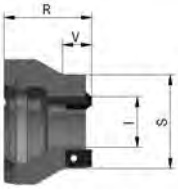
	pL LEHMANN Item no.	Designation	Overhang [mm]	Max. workpiece weight [kg]	Max. axial load [kN]	Weight [kg]	Max. speed [rpm]	Required spindle adapter	RÖHM Item no., incl. adapter flange
d80	**RÖH.510-SM**	Face driver	65	100	20			SPI.91x-d80	1340450

Accessories: Driver plates / play-free / clockwise and counterclockwise rotation

	pL LEHMANN Item no.	Designation	S Clamping circle Ø	Associated center Ø	R Overhang [mm]	l [mm]	V [mm]	Weight [kg]	RÖHM Item no.
directly geared	**RÖH.MS-DV08**	Driver plate	8	4	38	4.5	4		1341603
	RÖH.MS-DV10	Driver plate	10	4	38	4.5	4		1341604
	RÖH.MS-DV12	Driver plate	12	6	36	7	4		1341605
	RÖH.MS-DV16	Driver plate	16	10	33	11	4		1341606
	RÖH.MS-DV20	Driver plate	20	12	30	13	4		1341607
	RÖH.MS-DV25	Driver plate	25	16	30	17	8		1341608
	RÖH.MS-DV32	Driver plate	32	16	30	22	10		1341609
3x select. HM plates 6 x 3.2	**RÖH.MS-HM20**	Driver plate	20	6	30	7	8		1341624
	RÖH.MS-HM25	Driver plate	25	10	30	11	8		1341625
	RÖH.MS-HM32	Driver plate	32	16	30	17.5	10		1341626
	RÖH.MS-HM40	Driver plate	40	16	30	27	16		1341627
	RÖH.MS-HM50	Driver plate	50	16	30	36			1341635
	RÖH.MS-HM63	Driver plate	63	16	30	49			1341636
	RÖH.MS-HM80	Driver plate	80	16	30	66			1341637



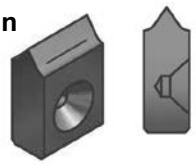
Driver plate, directly geared
1209000



Driver plate
3x select. HM plates 6 x 3.2
1209007

Accessories: Metal carbide driver plates, clockwise and counterclockwise rotation

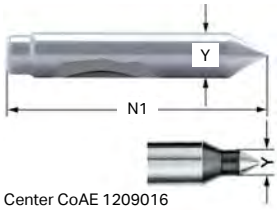
pL LEHMANN Item no.	Designation	Clamping circle Ø	Size	Weight [kg]	RÖHM Item no.
RÖH.HMP-20	Metal carbide plate	20–32	6 x 3.2		88970
RÖH.HMP-40	Metal carbide plate	40–80	9.5 x 3.2		87931



Metal carbide driver plates 088970

Accessories: Center

pL LEHMANN Item no.	Designation	Clamping circle Ø	Y Center Ø	N1 [mm]	Weight [kg]	RÖHM Item no.
RÖH.ZS-08	Center	8–10	4	90		1341941
RÖH.ZS-12	Center	12	6	90		1341942
RÖH.ZS-16	Center	16	10	90		1341943
RÖH.ZS-20	Center	20	12	90		1341944
RÖH.ZS-25	Center	25–80	16	90		1341945



Center CoAE 1209016

driven by technology

Supplied loose by pL LEHMANN

Further information: www.roehm.biz
Request installation and operating instructions directly from manufacturer

Revolving centers

	pL LEHMANN Item no.	Designation	Mount MK	Max. run-out deviation [mm]	Max. workpiece weight [kg]	Max. radial load [daN]	Max. speed [rpm]	D Moving-tip Ø [mm]	B Housing Ø [mm]	A [mm]	G [mm]	K [mm]	Weight [kg]	RÖHM Item no.
Tailstock options / accessories	**RÖH.ZS-DAMK3**	with pressure display and length compensation; spring-loaded tip - spring travel max. 1.6 mm at axial clamping force of 550 daN; body hardened and ground – tip angle 60°	3	0.01	400	200	4000	25	64	105	23.8	31		60798
	RÖH.ZS-SAMK2	Standard version; body hardened and ground; tip angle 60°	2	0.005	200	100	7000	20	43	65	17.8	24		43115
	RÖH.ZS-SAMK3		3	0.005	400	200	6300	22	48.5	70.5	23.8	27		42315
	RÖH.ZS-GDMK2	with small housing diameter, body hardened and ground; tip angle 60°	2	0.005	200	100	7000	15	32	62	17.8	19.5		5336
	RÖH.ZS-GDMK3		3	0.005	400	200	7000	15	34	62	23.8	19.5		5429

Mikö 60798

Mikö 43115 / 42315

Mikö 5336 / 5429

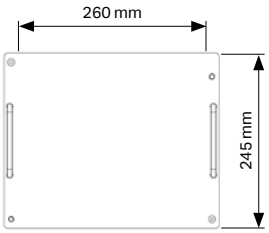
ROTOMATION *transferBox*

- Plug & play indoor automation
- For unmanned 6-side machining with integrated part changer
- Workpiece storage with quick-change system
- Installed/uninstalled on machine within minutes (with zero-point clamping)

Blow off finished workpiece

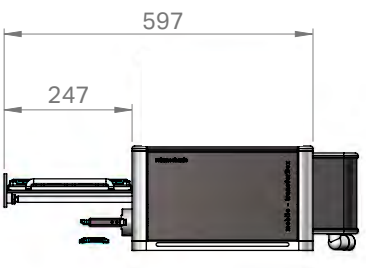
TOP

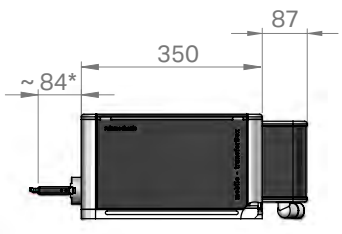
Vertical rod holder



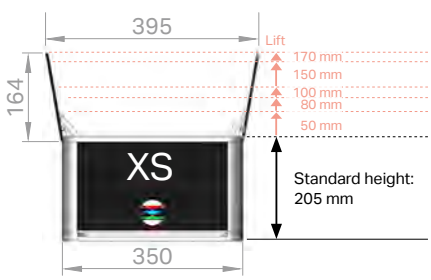
TOP workpiece carrier
Useful depth with standard height*: 94 mm
* Height increase, see below

Part reverser for rear side machining





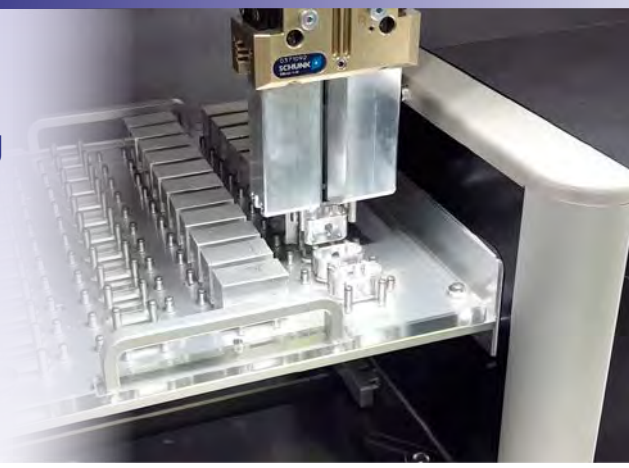
* Example



LEHMANN®

Ideal for existing and new vertical machining centers. Turn nighttime into production time

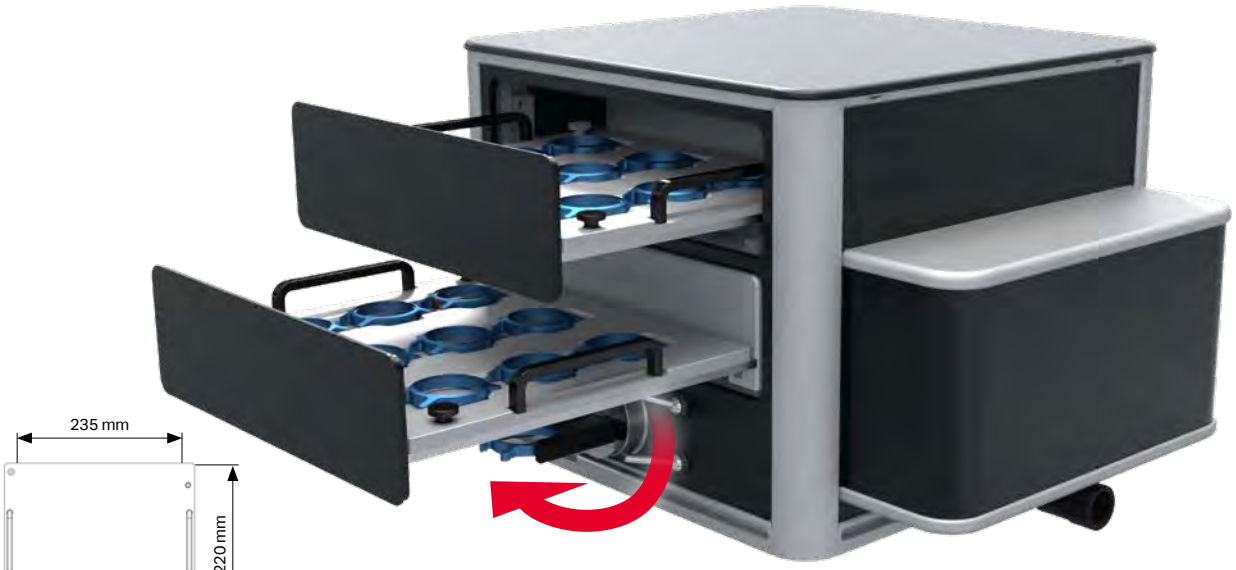
«From real-world applications –
for real-world applications»



Deposit finished workpiece

SLIDE

(here, SLIDE-2)



Workpiece carrier SLIDE
Usable height: max. 49 mm

Part reverser for rear side machining

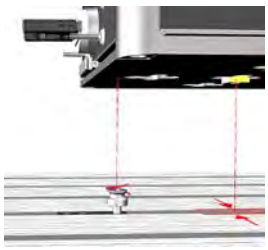
After just a few minutes ... produce!

Position box and plug it in

Load work-pieces

Start program

Zero-point positioning



Interesting expansion

4th axis, one spindle

4th/5th axis

LEHMANN®

ROTARY SOLUTIONS › MACHINE TOOLS & METROLOGY

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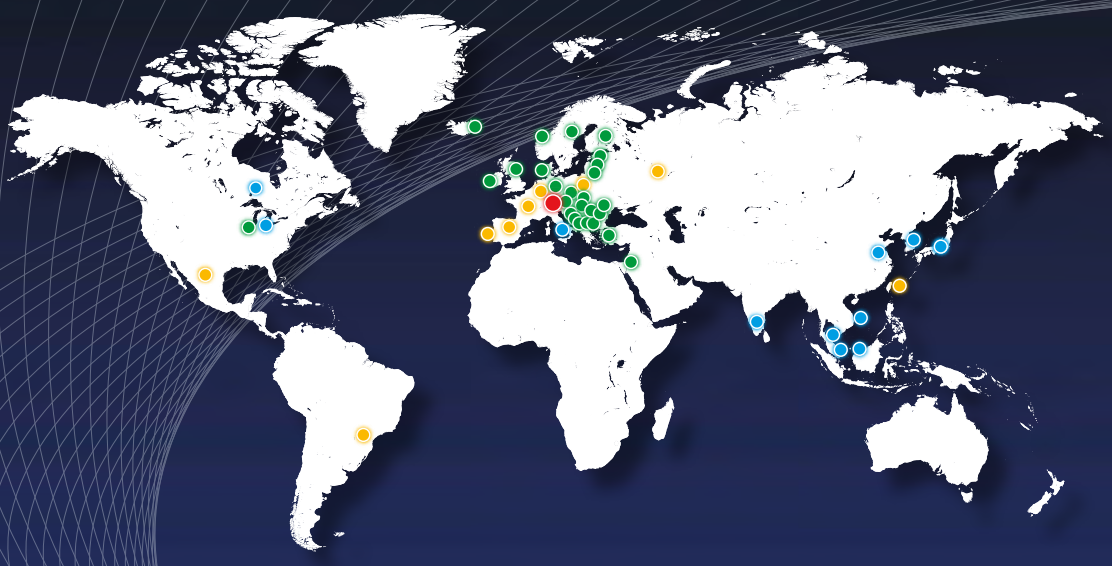

● Headquarters ● direct sales ● pL SOLUTIONS® partner ● value added reseller & partner

More information (address, telephone number...) at www.lehmann-rotary-tables.com

Subject to change / Edition: 6/2024