

900⁺

The new series with direct drive

DD
Series

Direct
Drive

2021

**Main
catalog**

6.2021 | EN
Patent pending

For millturn and grinding applications or
for 5-axis simultaneous machining

Swiss precision technology

Since 1974

Today, pL LEHMANN is still a family-owned and managed company in the hands the second generation and present in over 20 countries (see the back of this catalog).

The company is committed to typical Swiss values: ...

- Depth of manufacturing – over 90% developed and manufactured in-house
- Product quality – reliable, durable, safe
- High-tech – Industry 4.0-compatible, ready to be automated
- Innovation – in tune with the times, adaptable, trendsetting
- Sustainability – long-term approach to business, environmentally conscious
- Basic values – honest, correct, fair

... and specialized in rotary tables for over 40 years:

- 1960 Founding – Contract manufacturing
- 1973 Conversion into a stock corporation
- 1974 Introduction of the first numerically controlled rotary tables (HUST)
- 1980 Construction of new factory building
- 1986 Development of the 400 series
- 1988 2nd generation joins the company's management
- 1997 Construction of new assembly building
- 2000 Development of the 800 series (direct drive up to 10'000 rpm)
- 2002 2nd generation assumes management responsibility
- 2003 Development of the 700 series (direct drive 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
- 2017 Introduction of the 600 series and the start of AM-LOCK development
- 2019 Introduction of the 900 DD series up to 5'450 rpm and market launch of AM-LOCK, as well as the development and introduction of the AM-SHAFT construction shaft concept



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

Other pL products

CNC Rotary Tables classic



Main catalog - Series 500

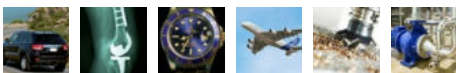




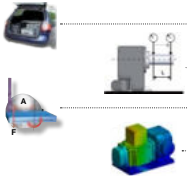

Zero-point clamping system for 3-D printing



AM-LOCK

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

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

	Applications	4	Overview & Facts
	Overview and facts	5	
	Spindle system and accessories	6	
	Spindle connection dimensions	7	
	New design – Innovative technology	8	System & iBox
	smart doc	10	
	Overview of DD-Series	12	Rotary tables
	EA-91x DD	14	
	T1-91x915 TAP9	16	
	T1-91x520 TAP5	18	
	Cables and connectors	20	KAB, CNC, WMS
	CNC control system FANUC 35iB	21	
	Angular-position measuring system, accuracy	22	
	OLAER cooling unit	24	AGG, DDF, RST, LOZ
	Rotary union	25	
	Tailstocks	26	
	Small parts	27	
	Commissioning, training	28	Service & Technology
	Geometry accuracies, spindle loads	33	
	Machining forces	36	
	Behavior of the rotary table, tech. explanations	38	
	Content of workpiece clamping systems	53	Workpiece clamping system
	ROTOMATION & ROTOLUTION	88	
	About pL LEHMANN	94	

The entire catalog is subject to technical changes without notice

CNC rotary tables for economical manufacturing:
pL LEHMANN offers tailor-made and efficient and solutions for almost any industry – **and 10 years of experience in direct drives**



Automobile & Mobility



Medical & dental



Micromechanical parts & watches



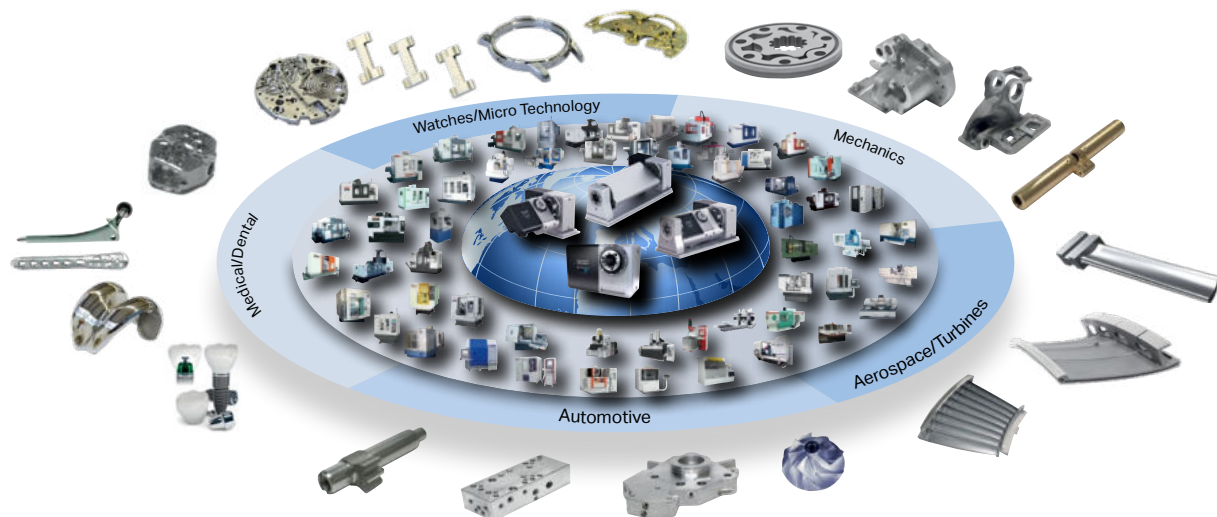
Aircraft & turbines



Machinery & tools



Components & systems



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

pL competence: Integration in **all known** CNC control systems (Fanuc, Siemens, Heidenhain, Haas, Winmax, Mitsubishi, Brother, Mazatrol ...), for new machines as well as for retrofits

up to 5'450 rpm

High-speed DD

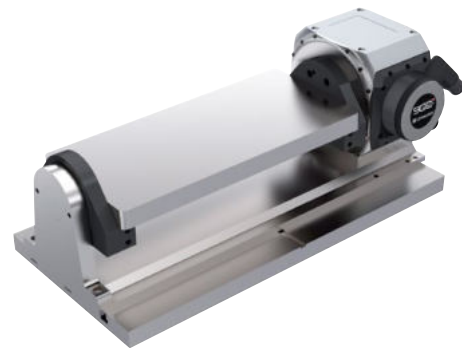
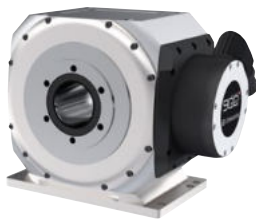
Extended travel in
Z- and X-direction

More space

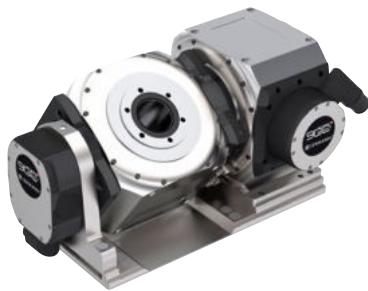


Connectivity

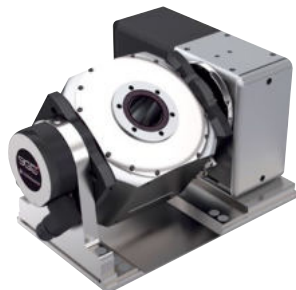
EA-Series



T1-Series



DD/DD



DD/PGD



Adaptability

Multifunctional
spindle system

Precision

At the workpiece
up to 2 μ m / 100 mm

High duty time

By default for ED40%,
10 min

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



Tap or medium interface

Overview & Facts

System & iBox

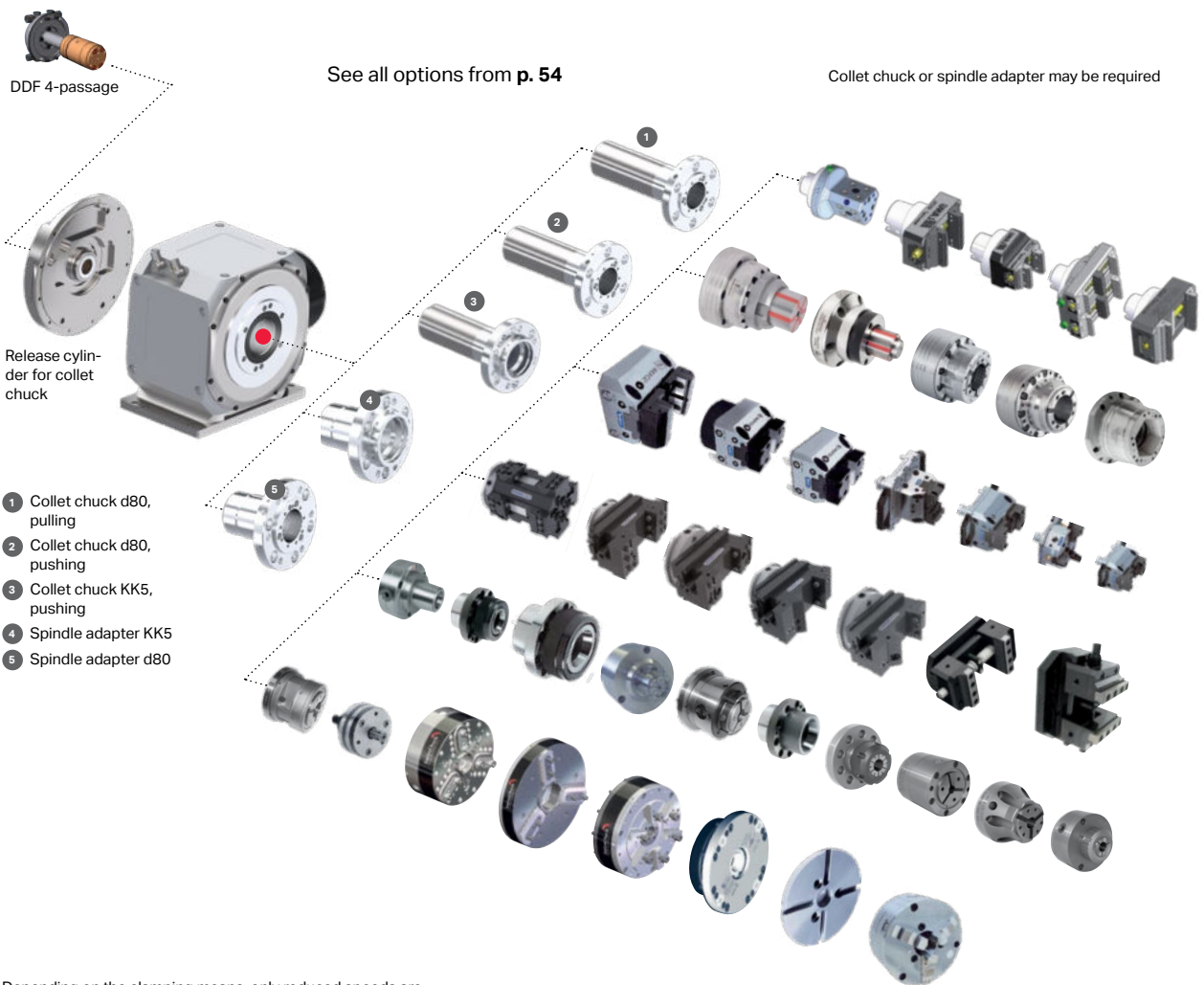
Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



DDF 4-passage

See all options from p. 54

Collet chuck or spindle adapter may be required

Release cylinder for collet chuck

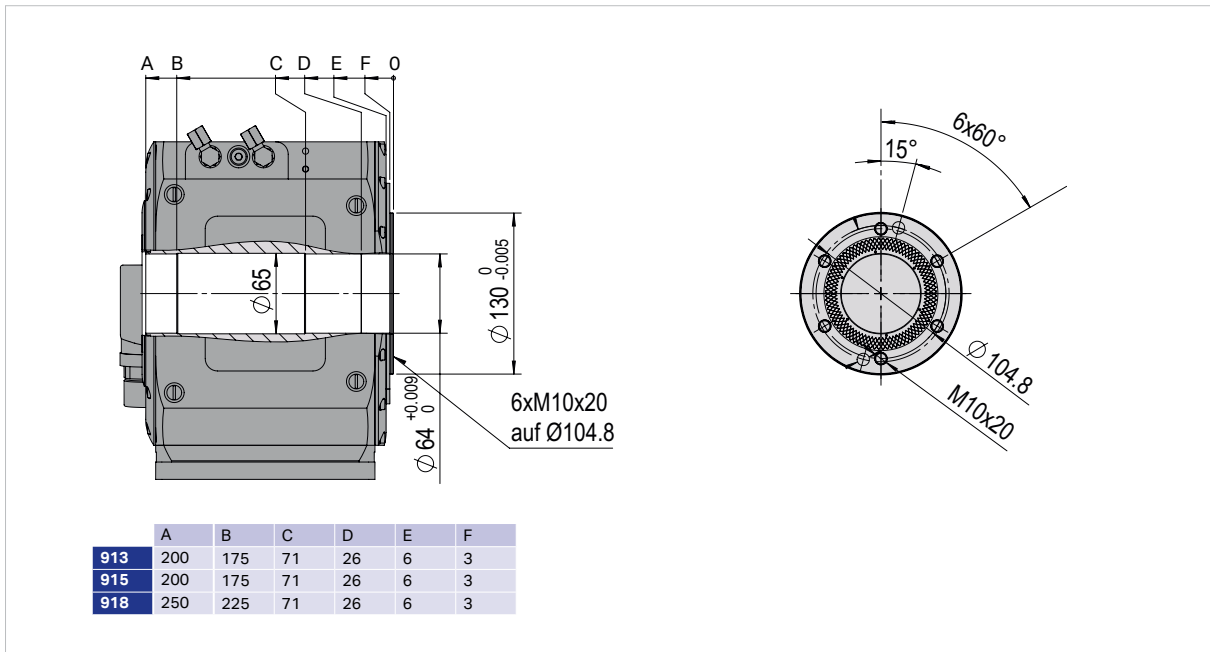
- 1 Collet chuck d80, pulling
- 2 Collet chuck d80, pushing
- 3 Collet chuck KK5, pushing
- 4 Spindle adapter KK5
- 5 Spindle adapter d80

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

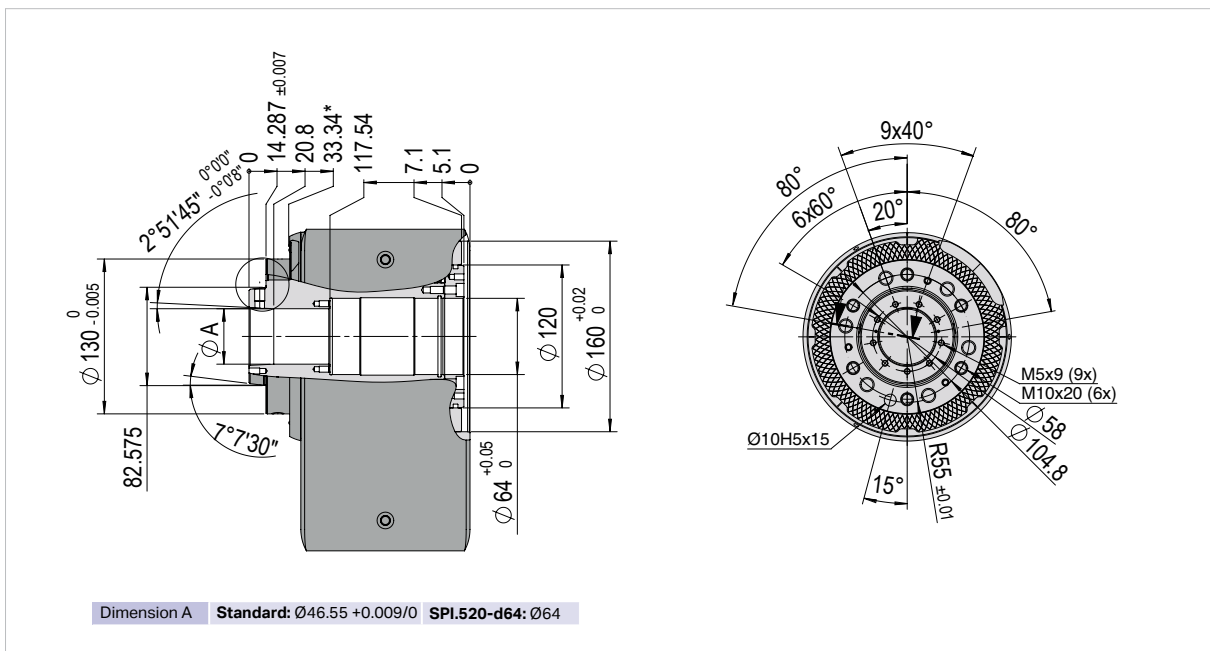


All spindle connection dimensions front and back for building your fixture. Applies to all variants, EA or T-type rotary table alike

Module size
913 / 915 / 918 $\varnothing 64/\varnothing 130$



Module size
520 HSK-A63/KK5



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

NEW

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

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 angular position measuring system for SIEMENS, MITSUBISHI, YASKAWA and BISS
- FANUC measuring system, 100% compatible with FANUC DDR

Prepared for water cooling

- For high speeds and/or long duty cycles (for more information see p. 24)

Universal spindle nose

- Large mounting \varnothing 130 mm (outside)
- Large through-bore \varnothing 64 mm

Innovative sealing system

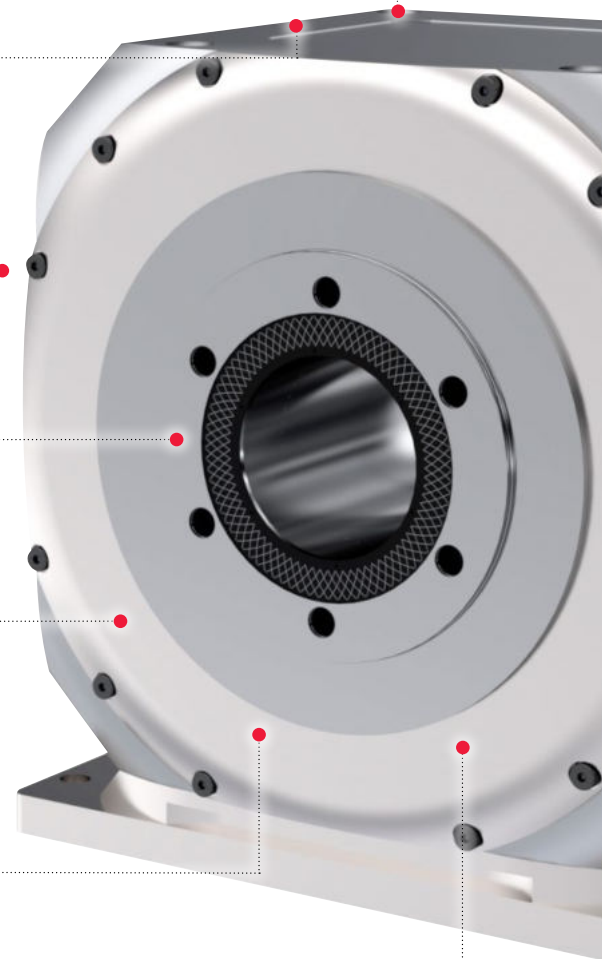
- 100% leaktight in accordance with IP67
- Front and rear labyrinth backed by lip seal with minimal friction loss
- Very high efficiency and minimal heat generation

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

- on large diameter
- energyless clamping
- large clamping diameter
- only 5 – 6 bar air pressure required
- Unique: emergency braking without damage in case of power failure



Productivity and availability increase,
downtime and maintenance costs decrease



Bluetooth®, Ethernet,
web server

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-iBox – 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

- Fast microprocessor
- 3D acceleration sensor – shock sensor

Monitoring

- Duty cycle limit – overload protection, prevents motor damage

Interfaces

- Bluetooth – set parameters and read out data via smartphone and app
- Web server with Ethernet and RJ45 port – display state/error on CNC
- Input for current sensor

Prepared for options

- External WLAN or GSM module
- External, enhanced vibration sensor with additional DSP
- E-mail notification, e.g. of error messages

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

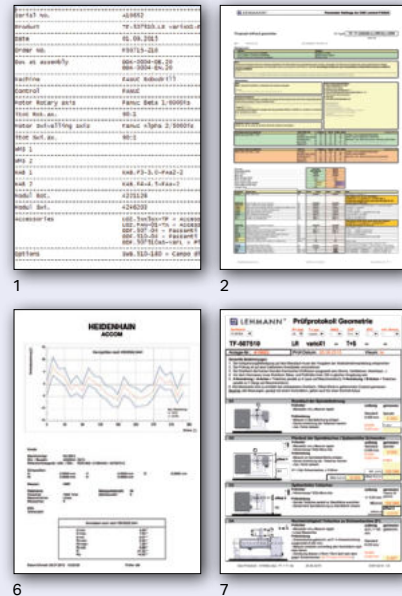
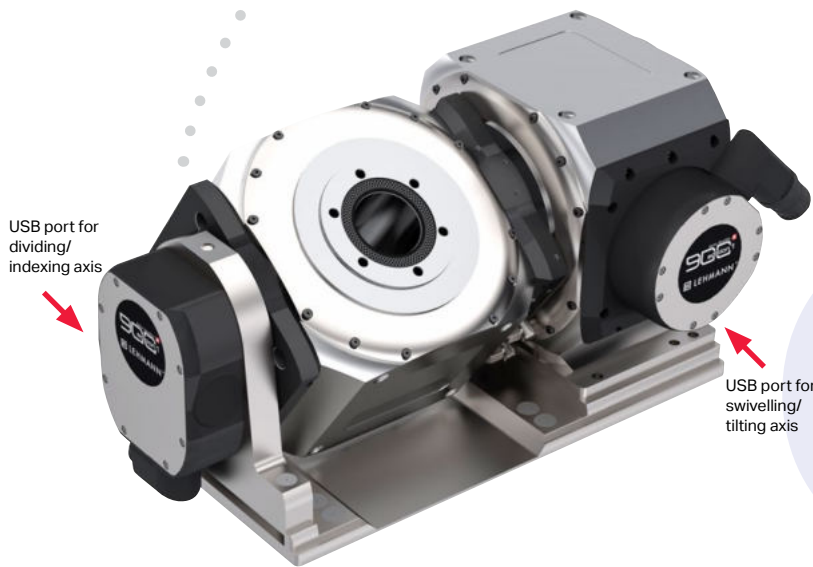
Never search for documents again –
everything at hand at all times
No Internet connection necessary!

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.



smart doc on the USB stick

- A mini USB stick is plugged into a USB slot (in the swivelling/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 If necessary, special drawings from the customer
- The files are also available online in the pL-ERP (for Helipliner) 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 or 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



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



Overview & Facts

System & iBox

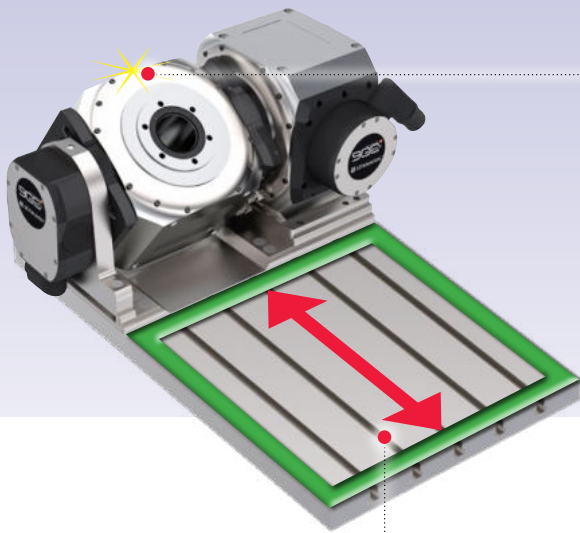
Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

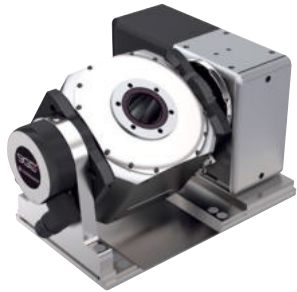
Workpiece clamping system



Very good accessibility, even with short tools

Y-mounting (transverse)

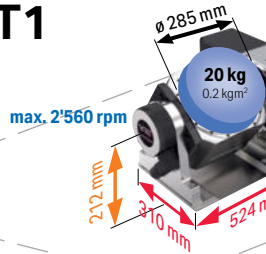
More space for workpiece and fixtures



T1

T1

T1



max. 2'560 rpm

max. 3'000 rpm

max. 3'210 rpm



max. 3'210 rpm

max. 3'210 rpm

915520

913520

913918

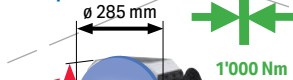
913915



1'000 Nm

97 kg

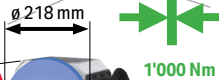
max. 1'300 rpm



1'000 Nm

79 kg

max. 2'560 rpm



1'000 Nm

76 kg

max. 3'210 rpm

918

915

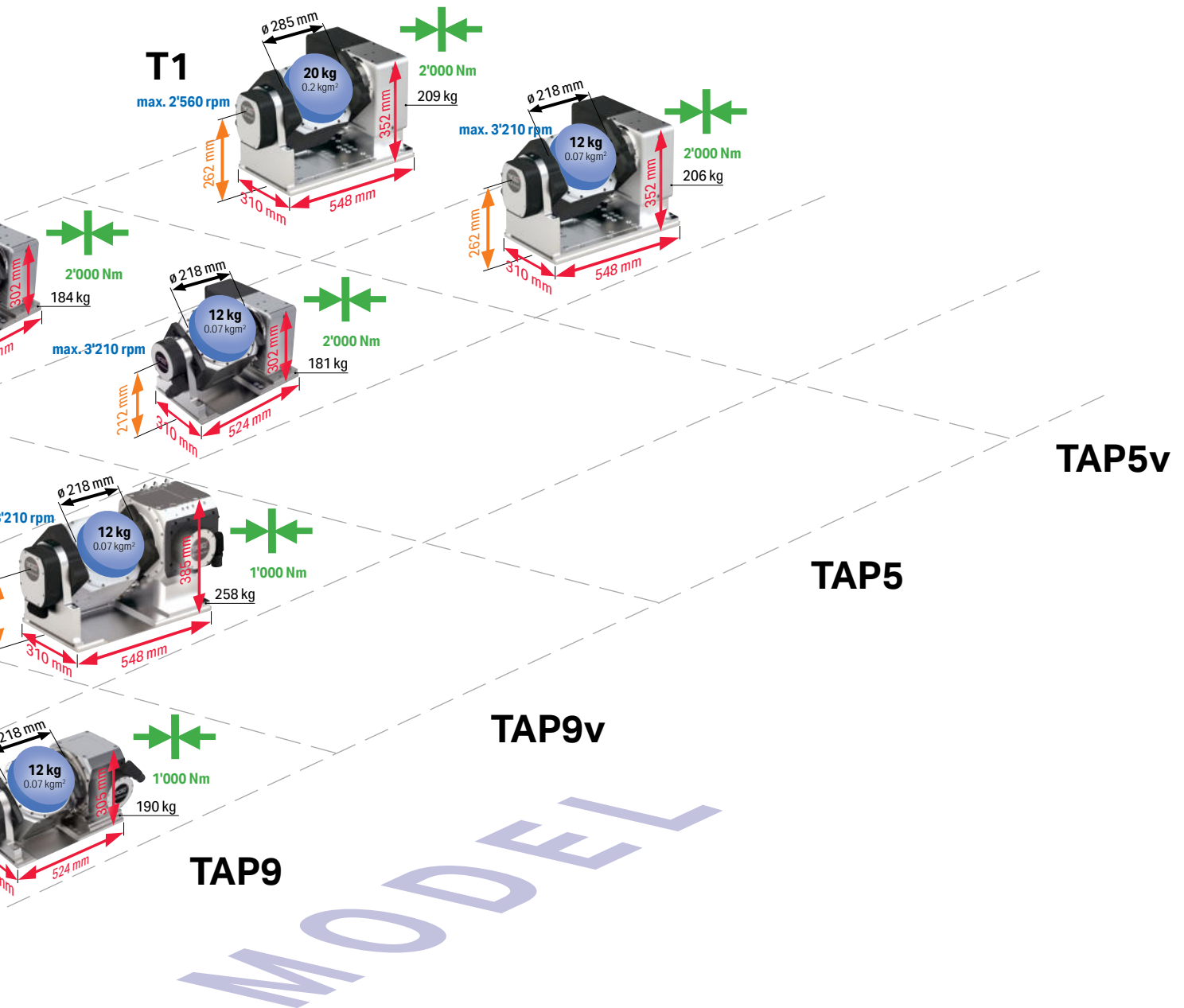
913

EA

SIZE

Highlights

- For millturn applications (e.g. watch cases from bar stock)
- Modular concept in **Cube design**
- DD up to 5'450 rpm (without flux weakening function: max. 3'210 possible)
- Very compact
- For Siemens, Mitsubishi and Fanuc with Fanuc measuring system, 100% Fanuc DDT-compatible (other upon request)



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

Overview & Facts

System & iBox

Rotary tables

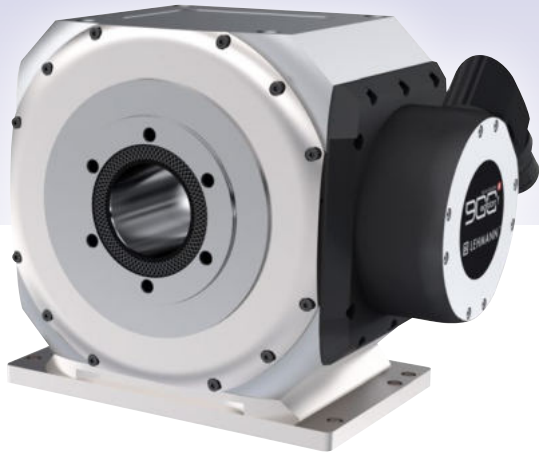
KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

EA-913 DD / EA-915 DD



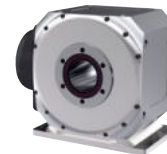
Clamping bridge system upon request

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	20		
Pull-out torque	clamped	Nm	1,000		1,200
	unclamped		400		500
Moment of inertia	Standard load	kgm ²	0.07	0.2	0.5
	J max		0.7	2	5
Positioning accuracy +/- (unloaded)	Fanuc	arc sec	4		
	Siemens 1-head		11 (6°)		
	Siemens 2-head		3 (2°)		
Repeat accuracy +/- (unloaded)	Mitsubishi	arc sec	11 (6°)		
			1		
Cycle time with standard load (without clamping)	90°	sec	0.19	0.24	0.24
	180°		0.24	0.3	0.3

* Option: WMS.91x-GEN

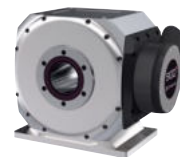
Outgoing cable unit variants



Outgoing cable unit left

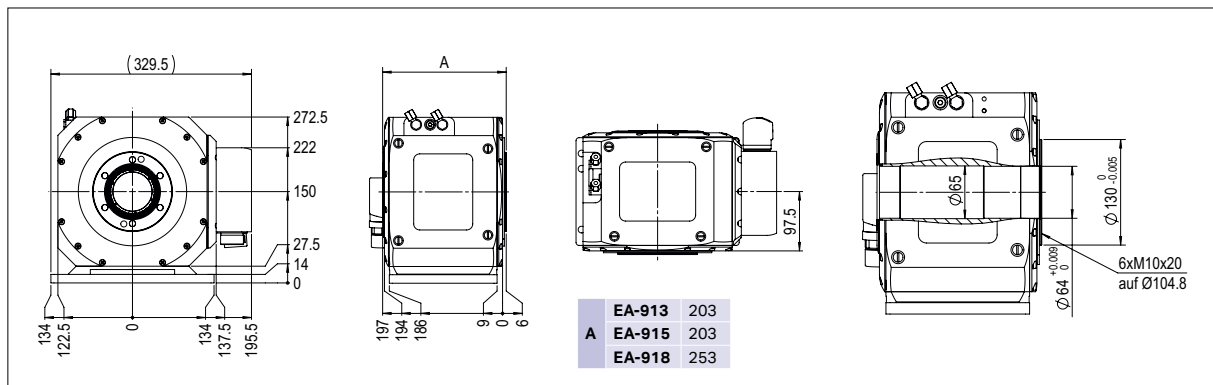


Outgoing cable unit top



Outgoing cable unit right

Can be easily converted by the customer at any time.



Overview & Facts
System & iBox
Rotary tables
KAB, CNC, WMS
AGG, DDF, RST, LOZ
Service & Technology
Workpiece clamping system

Features

- Angular position measuring system ± 3 arc sec.
- Fail-safe clamping
- Leaktight IP 67
- Workpiece clamping system can be retrofitted with clamping cartridges



Motor data also applies to dividing/indexing axis on T-type rotary tables **p. 16–19**

Calculated, theoretical values; subject to change.

Wet-machining

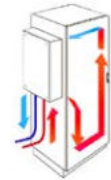


Splash-water cooling – no cooling unit required
(immersed in coolant, cooling emulsion max. 30 °C)

Dry machining



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



Cooling unit not included in supply
(see p. 24)

	Rotary table type	Motor	Peak current ³⁾ [A]	Max speed ⁶⁾ without flux weakening	Max speed ⁶⁾ with flux weakening ²⁾	Peak torque ED5%	Intermittent torque ED40%	Continuous torque ED100%	Standstill torque			
				[rpm]						[Nm]		
200 V	Standard speed	Type 913 ¹⁾	MOT.ET-A	70	2170	3030	67	38	26	20		
		Type 915	MOT.ET-B	67	1300	2070	117	70	48	37		
		Type 918	MOT.ET-C	63	651	1120	234	147	101	77		
	High speed	Type 916 ⁵⁾		50	888	4350	120	90	65	51		
400 V	Standard speed	Type 913 ¹⁾	MOT.ET-A	70	3210	3210	67	38	26	20		
		Type 915	MOT.ET-B	67	2560	2770	117	70	48	37		
		Type 918	MOT.ET-C	63	1300	1850	234	147	101	77		
	High speed	Type 916 ⁵⁾		50	1780	5450	120	90	65	51		

¹⁾ not available as swivelling/tilting axis for T1-91x915 TAP9

²⁾ On Fanuc, a special servo and an additional module are needed for operation «with flux weakening» (does not have space in Robodrill cabinet); check with Fanuc

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. 24):

– approx. 1'600 W rated cooling capacity and at least 1'300 W actual cooling capacity
– Coolant: water-like, non-corrosive

⁵⁾ Not yet available; upon request

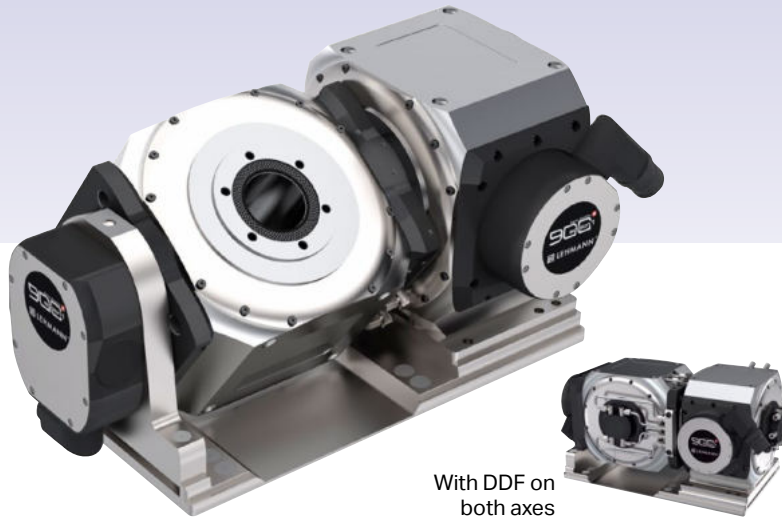
⁶⁾ Applies to moment of inertia of standard load

Item no.

EA-915-F1

Measuring system see p. 22
Type
Rotary table model

T1-913915 TAP9 / T1-915915 TAP9



With DDF on both axes

Both axes with direct drive

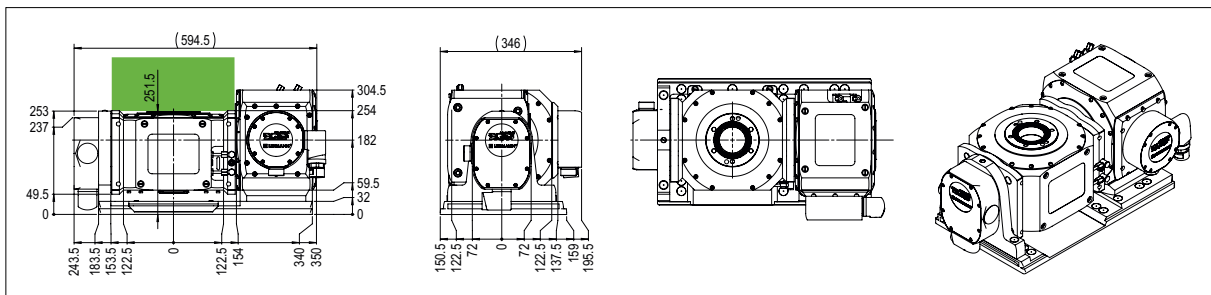
- Perm. spindle load up to 90 kg
- Maximum workpiece Ø 308 mm

General technical data

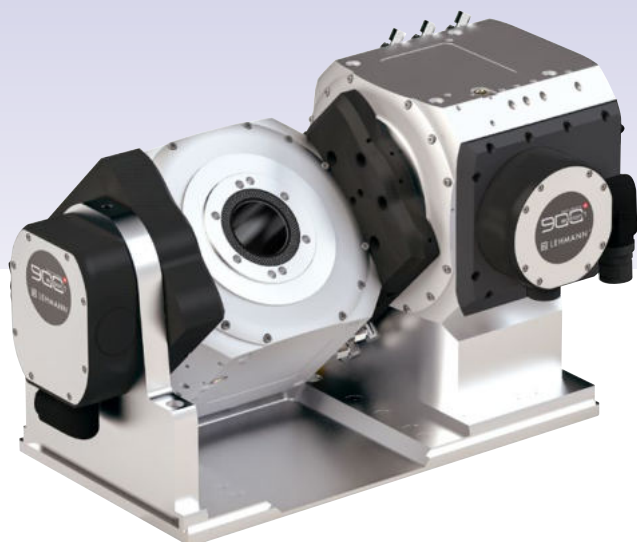
Drive data: see page 15

		T1-913915 TAP9		T1-913918 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	Nm	400		
Moment of inertia	Standard load	kgm ²	0.07		
	J max	kgm ²	0.7		
Positioning accuracy +/- (unloaded, -90 to +90°)	4th axis Fanuc	± arc sec	4		
	5th axis Fanuc		4		
	4th axis Siemens 1-head		11 (6°)		
	5th axis Siemens 1-head		13 (9°)		
	4th axis Siemens 2-head		3 (2°)		
	5th axis Siemens 2-head		3 (2°)		
	4th axis Mitsubishi		11 (6°)		
5th axis Mitsubishi	13 (9°)				
Repeat accuracy +/- (unloaded)	4th axis	± arc sec	1		
	5th axis		1		
Cycle time with standard load (without clamping)	4th axis	sec	0.19		0.46
	5th axis		0.48		
	4th axis		0.24		
	5th axis		0.65	0.61	

* Option: WMS.91x-GEN



T1-913918 TAP9v / T1-915918 TAP9v



Shorter machine travel for simultaneous machining

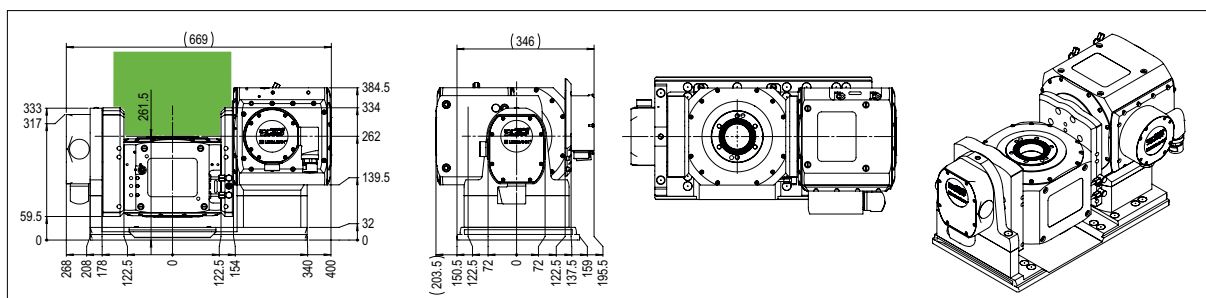
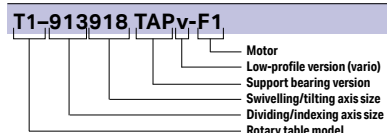
- Accelerated machining
- Higher accuracy at the workpiece

Available combinations

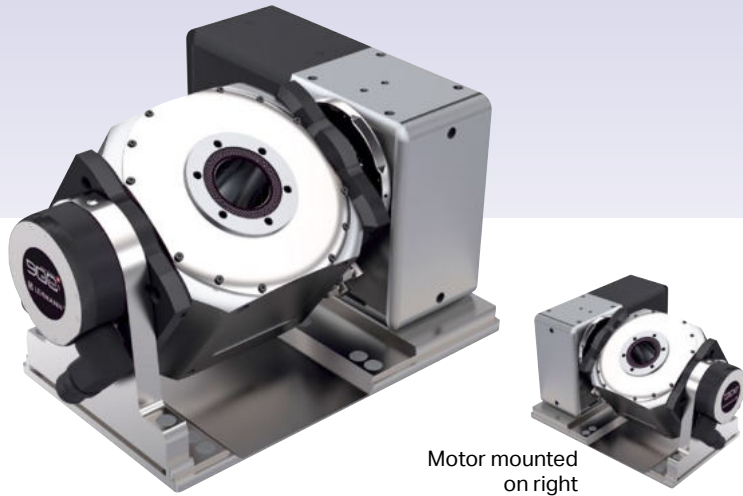
	Dividing/indexing axis motor*	Swivelling/tilting axis motor*	
T1-913915 TAP9	MOT.ET-A	MOT.ET-B	
T1-915915 TAP9	MOT.ET-B	MOT.ET-B	on request
T1-913918 TAP9v	MOT.ET-A	MOT.ET-C	
T1-915918 TAP9v	MOT.ET-B	MOT.ET-C	on request

* Motor data: see p. 15

Item no.



T1-913520 TAP5 / T1-915520 TAP5



Motor mounted on right

Dividing/indexing axis with direct drive

Swivelling/tilting axis with rugged gear unit

- Perm. spindle load up to 90 kg
- Maximum workpiece Ø 400 mm

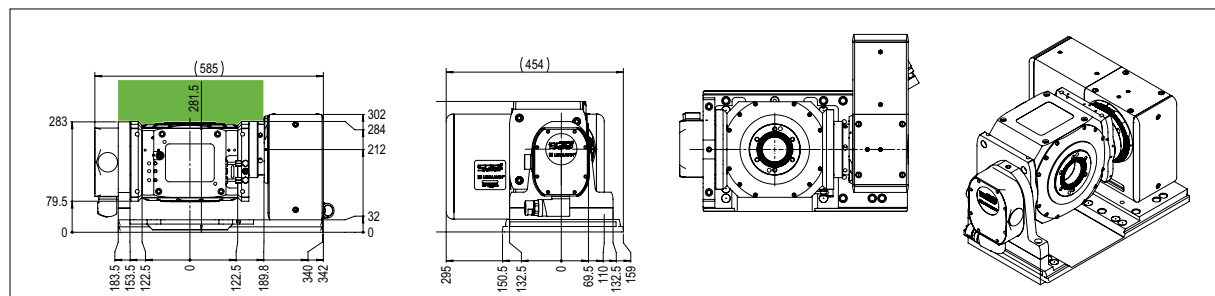
General technical data

For drive data of dividing/indexing axis (rotation) see p. 15, for swivelling/tilting axis see p. 19

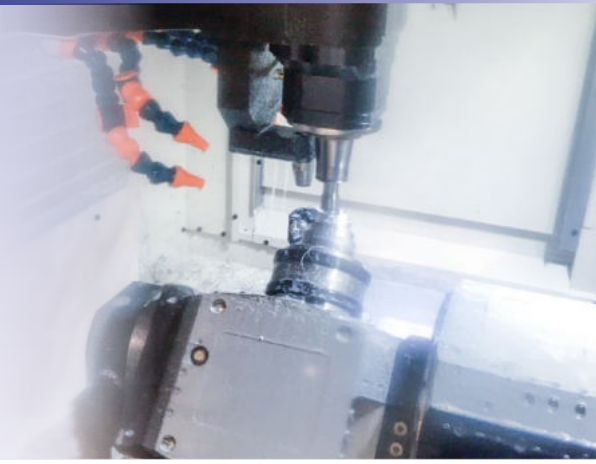
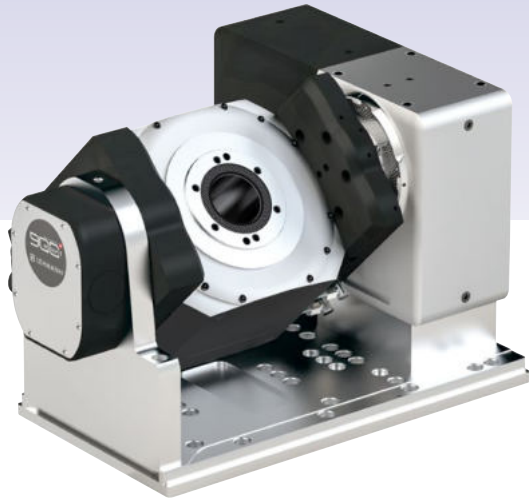
		T1-913520 TAP5	T1-915520 TAP5	T1-913520 TAP5v	T1-915520 TAP5v
Weight (aluminum base plate)		181/184 (155)		206/209	
Spindle through-bore		64			
Clamping torque at max. 5 bar air pressure	4th axis	max. 800			
	5th axis	2,000			
Spindle load (max. permissible)		40		90	
Axial force (max. permissible)		20			
Pull-out torque	clamped	1,000			
	unclamped	400			
Moment of inertia	Standard load	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	4			
	5th axis Fanuc	28 / 10**	28 / 31**	63 / 53**	63 / 40**
	4th axis Siemens 1-head	11 (6°)			
	5th axis Siemens/Mavilor	28 / 10**	28 / 31**	63 / 53**	63 / 40**
	4th axis Siemens 2-head	3 (2°)			
	5th axis Siemens/Mavilor	28 / 10**	28 / 31**	63 / 53**	63 / 40**
	4th axis Mitsubishi	11 (6°)			
5th axis Mitsubishi	28 / 10**	28 / 31**	63 / 53**	63 / 40**	
Repeat accuracy +/- (unloaded)	4th axis	±1			
	5th axis	±2			
Cycle time with standard load (without clamping)	4th axis 90°	0.19	0.24	0.19	0.24
	5th axis	0.48	0.48	0.46	0.46
	4th axis 180°	0.24	0.3	0.24	0.3
	5th axis	0.65		0.61	

5th axis optional with WMS: see p. 22

* Option: WMS.91x-GEN ** with standard load



T1-913520 TAP5v / 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 swivelling/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. 15

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	440	30	0.61
	TAP5v			25	0.73
FANUC	TAP5	α4 (HV)is	355	28	0.68
	TAP5v			25	0.76
MITSUBISHI 200V	TAP5	HG105	440	28	0.65
	TAP5v			25	0.73
MITSUBISHI 400V	TAP5	HG-H105	440	28	0.65
	TAP5v			25	0.73
SIEMENS	TAP5	1FK7042	435	30	0.62
	TAP5v			25	0.73

* at 1 rpm

** for Siemens / Heidenhain

*** without clamping

Important information

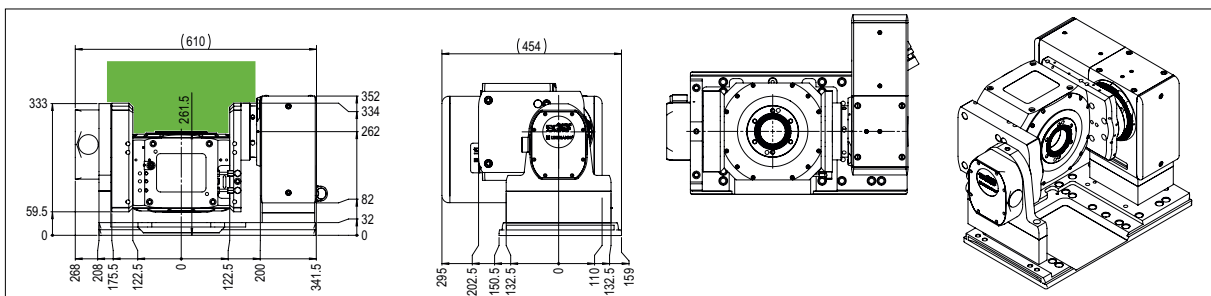
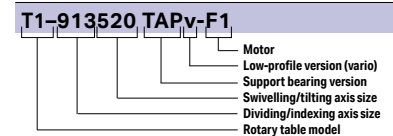
- The limit values as set out in the corresponding parameter list take precedence over the data and information provided in the main catalog (due to motor, drive enhancement and the respective machine CNC)
- Motor-independent data are optimum values at operating temperature
- Further details are available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

Options

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

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

Item no.



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

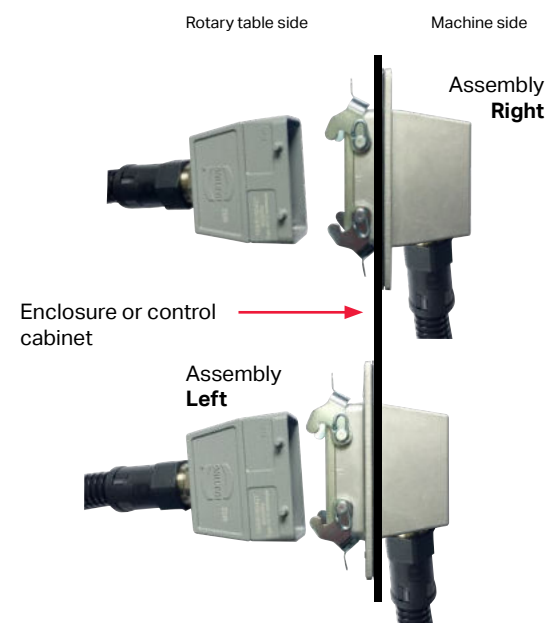
Order items

Item no.	Designation	Dimensions
KAB.F9-4.0-FNC	Fanuc DD, fully cabled	4 m, to FANUC CNC
KAB.F9-4.0-M4g	Fanuc DD, fully cabled	4 m, straight HARTING connector
KAB.S9-4.0-M4g	Siemens DD, fully cabled	4 m, straight HARTING connector
KAB.MI9-4.0-M4g	Mitsubishi DD, fully cabled	4 m, straight HARTING connector

Item no.	Designation	Dimensions
WDF.F9-M4	Wall bushing	per axis for Fanuc
WDF.S9-M4	Wall bushing	per axis for Siemens
WDF.MI9-M4	Wall bushing	per axis for Mitsubishi

Standard items included in delivery

Always supplied as standard (except Fanuc Robodrive)



FANUC Robodrive

Automatic parameter setting by program (included in delivery)

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



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

Extensive scope of functions of a full-scale FANUC CNC with the familiar original user interface



Separate cabinet with mobile multi-functional manual operating device which can be used for both this CNC system as well as for machines equipped with FANUC CNC.

Order items

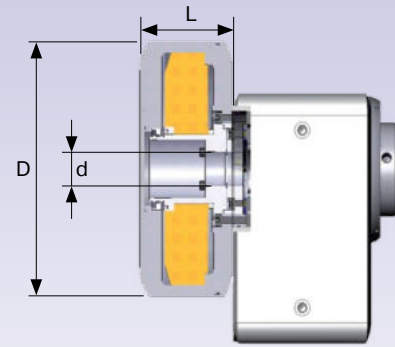
Item no.	Designation	Dimensions / remarks
CNC.1AX-FA-DD	CNC Fanuc 35iB DD, 1-axis (200V)	
CNC.2AX-FA-DD	CNC Fanuc 35iB DD, 2-axis (200V)	
CNC.MFK	M-function cable	Only in conjunction with CNC.1AX-FA-DD or CNC.2AX-FA-DD
CNC.HaKab-10m	Mobile-phone cable	10 m
CNC.BAT	Backup battery option	Only in conjunction with CNC.1AX-FA-DD or CNC.2AX-FA-DD
CNC.Trafo	Transformer	for Fanuc-CNC (400 V to 200 V)
CNC.TRE	Option: Indexing calculator	

Technical data

Features	Specifications	Remarks
1. Programmable angle	0.001 ... 9999.999°	freely programmable
2. Sub-programs	Yes	can be nested in 4 ways
3/ Total storage capacity	4000 characters (bytes)	Optional 128 kBytes
4. Number of programs, incl. macros	63	Optional 400
5. Program storage buffering	via battery	
6. Programming options	Absolute, incremental	can be combined in any way you wish
7. Reference point approach	Yes	optional absolute
8. Reference point shift	Yes	via parameters
9. Manual feed	creep, rapid traverse, gradual	
10. Feed programming	Yes	
11. Repeat function	programmable loop	
12. Software range limit switch	Yes	adjustable via parameters
13. Hardware range limit switch	Yes	
14. Spindle clamping	automatic	can be switched on / off
15. Monitoring of spindle clamping	Yes	
16. «Rotary table in position» output	Yes	
17. External «Manual/Automatic» input	Yes	
18. «Ready for operation / fault detection» output	Yes	
19. External «Enable turning» input	Yes	
20. Free M-function outputs	5x	e.g. to activate an automatic tailstock
21. «External cycle start» input	Yes	
22. «External cycle stop» input	Yes	
23. «External EMERGENCY STOP» input	Yes	1-channel
24. OK button	single stage	
25. Fault message system on manual control pendant	Clear text	
26. Motor output	AC servomotor	1 or 2 axes
27. Motor measuring system input	FANUC serial	
28. Power supply	200...240 VAC 50/60 Hz	3-phase
29. Interface	USB slot, PC card	Ethernet (option)
30. Minimum required signals from the machine	acknowledgeable M-function EMERGENCY STOP connection	if connection to machine CNC required
31. External single block position specification	via RS232 option	not provided
32. Program skips	by using GoTo command	must be done with block numbers (Nxxxx)
33. Continuous turning	Yes	e.g. for grinding work
34. Sub-programs	Yes	can be nested in 4 ways
35. External «EMERGENCY STOP» output	Yes, from manual operating device	1-channel

Overview & Facts
System & iBox
Rotary tables
KAB, CNC, WMIS
AGG, DDF, RST, LOZ
Service & Technology
Workpiece clamping system

For the highest indexing accuracy
Fully encapsulated, leak-proof,
protected against impact, adjusted in a
highly precise manner



Angular position measuring system required for series 900

	Preparation	Measuring system
Fanuc	WMS.91x-VorFA	WMS.91x-FA
Siemens	WMS.91x-VorSI.1	WMS.91x-SI.1, 1 x reading head
Siemens	WMS.91x-VorSI.2	WMS.91x-SI.2, 2 x reading head
Mitsubishi	WMS.91x-VorMI	WMS.91x-MI

Optional angular position measuring system for series 500 (TAP5 and TAP5v)

Add-on parts, assembly and measurement

	Item no.	d	D	L	Weight [kg]	520
Preparation	WMS.520-Vor2	15	130	92	2.82	1 3 4
	WMS.520-Vor7	46	220	87	6.41	2

Angular position measuring system (encoders)

The angular position measuring system option always includes radial and axial run-out of the spindle of 0.003 mm

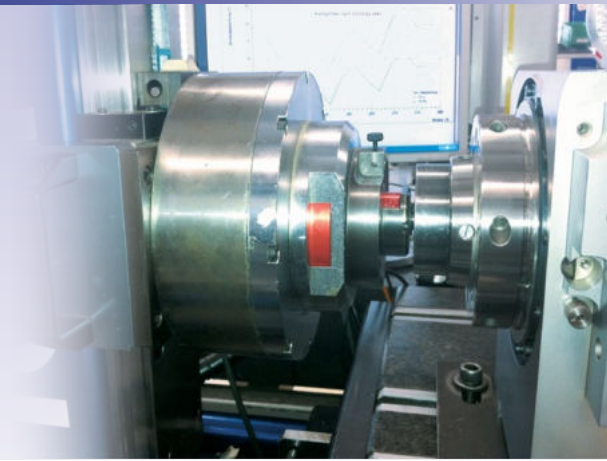
	Item no.	Designation	System accuracy [arc sec]	Weight [kg]	Remarks	
Heidenhain	WMS.2580	RCN 2580, Endat/1Vss (replaces RCN 228)	± 2.5	1.03		1
	WMS.275	RON 275, 5VTTL	± 5	0.88	Haas/Hurco	1
	WMS.8390F	RCN 8390F, Fanuc	± 2	2.73	ø 60 mm	2
	WMS.8390M	RCN 8390M, Mitsubishi	± 2		ø 60 mm	2
	WMS.8380	RCN 8380, Endat/1Vss	± 2	2.73	ø 60 mm	2
	WMS.8590F	RCN 8590F, Fanuc	± 1	2.73	ø 60 mm	2
	WMS.8590M	RCN 8590M, Mitsubishi	± 1		ø 60 mm	2
Magnescale	WMS.8580	RCN 8580, Endat/1Vss	± 1	2.73	ø 60 mm	2
	WMS.RU97A	RU97A, Siemens driveCliq (only for Solution Line)	± 2.5			3
	WMS.RU77F	RU77, Fanuc	± 2.5			4
	WMS.RU77M	RU77, Mitsubishi	± 2.5			4



Alternative to angular position measuring system

Item no.	Designation
GET.520-GEN	Optional increased mechanical gear accuracy

Measuring and recording the angular accuracy, important application information



Fully automated measuring system for indexing accuracy measurement

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°-steps)
- Acceleration 500°/s²
- All measured values apply in the unloaded condition at an ambient temperature of approx. 22°C
- The values WITHOUT load apply

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

Elasticity of swivelling/tilting axes TAP5**

(reference values for pitch error)

	Unloaded	Standard load s/s _{cube} *
0°...90° [arc sec]		
T1-913520 TAP5	-19	+1
T1-915520 TAP5	-19	+22
T1-913520 TAP5v	-55	-45
T1-915520 TAP5v	-55	-32

* see p. 34

** Swivelling/tilting axes with direct drive do not have a pitch error

Explanation: The pitch error corrects the positioning error resulting from elasticity and caused by the eccentric load of the dividing/indexing axis on the swivelling/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 angular position measuring system (option, p. 22). A tilting range of 180° results in other compensation values; please contact the factory if necessary.

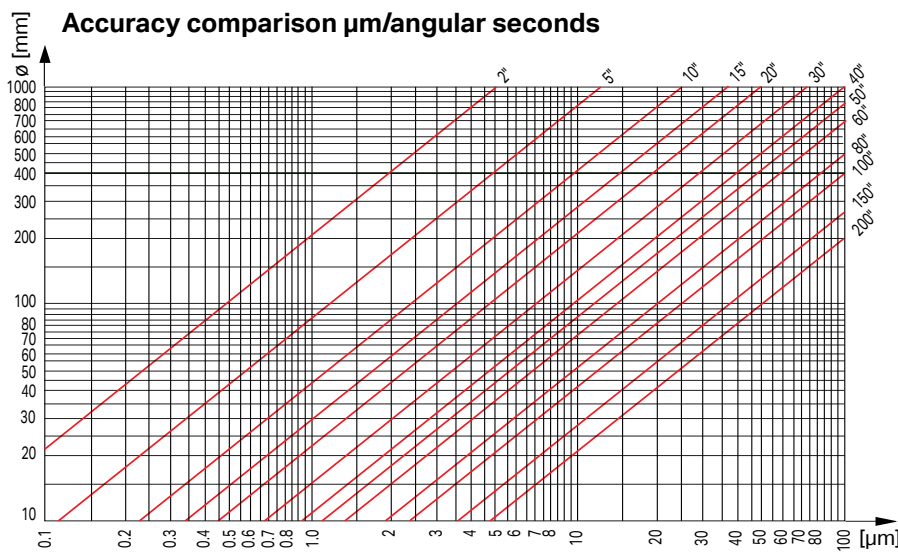
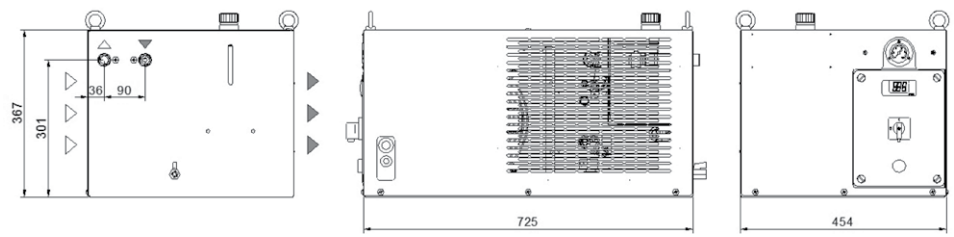
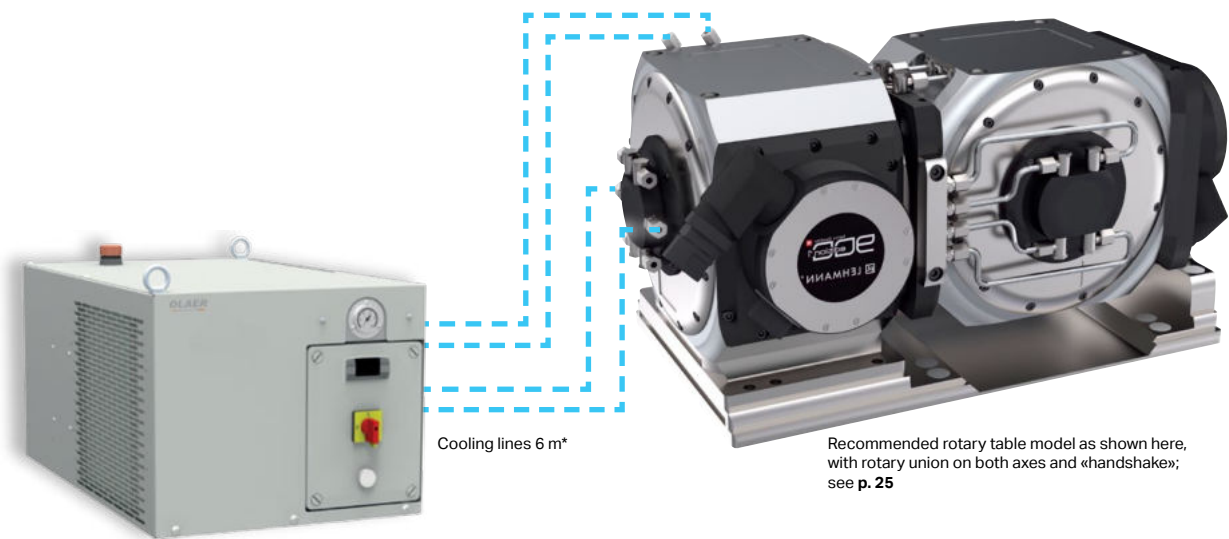


Diagram for determining the relationship between angular seconds and μm on the basis of diameter

Recommended cooling units (e.g. for dry-machining at high speeds) and temperature module for machines with SIEMENS and Mitsubishi-CNC

OLAER cooling unit



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 and Mitsubishi)

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



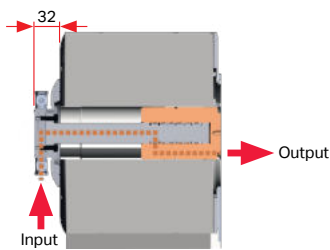
Rotary union

- Up to 250 bar or 500 rpm
- Low maintenance, compact
- Simple, suitable for retrofitting



Rotary union for EA rotary tables

Up to 250 bar or 500 rpm

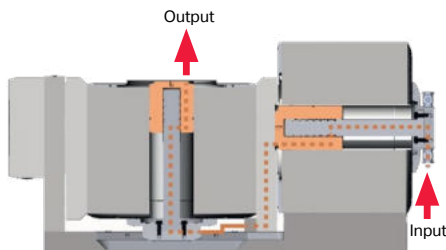


Rotary union, 4- or 6-passage

DDF 4-passage (WITHOUT motor cooling)



Rotary union for T-type rotary tables

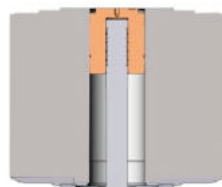


TAP9: with rotary union, 4-passage (partial axis or 6-passage swivelling/tilting axis; 2 passages reserved dividing-axis motor cooling).

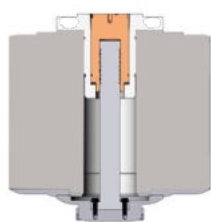
DDF 4-passage (WITH motor cooling)



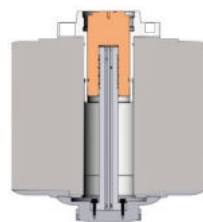
DDF.91x-04-d80



DDF.91x-0x



DDF.91x-04-d80



DDF.91x-04-KK5

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»

Order items

Item no.	Designation
DDF.91x-04	Rotary union, 4-passage, oil/air, for dividing/indexing axis
DDF.91x-04-hs	Rotary union, 4-passage, oil/air, for dividing/indexing axis, Highspeed
DDF.91x-04-d80	Rotary union, 4-passage, incl. spindle adapter Ø80
DDF.91x-04-KK5	Rotary union, 4-passage incl. spindle adapter KK5
DDF.91x-06	Rotary union, 6-passage, oil/air, for dividing/indexing axis
DDF.91x-06-TAP9	Rotary union, 6-passage, oil/air, for swivelling/tilting axis (2 cooling passages)
DDF.918-06-TAP9v	Rotary union, 6-passage, oil/air, for swivelling/tilting axis (2 cooling passages)
DDF.520-06-TAP5	Rotary union, 6-passage, oil/air, for swivelling/tilting axis (2 cooling passages)
DDF.TxP9-AGG	Piping (handshake), 2-passage, for cooling unit
DDF.TxP9-DDF	Piping (handshake), max. 4-passage, for rotary union
DDF.TxP9-SPZ	Piping (handshake), max. 4-passage, for release cylinder

Overview & Facts

System & iBox

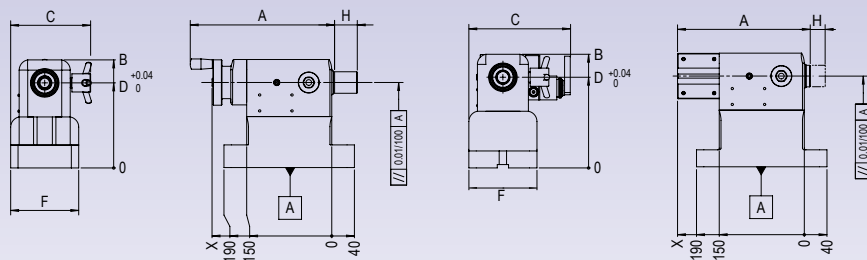
Rotary tables

KAB, CNC, WMIS

AGG, DDF, RST, LOZ

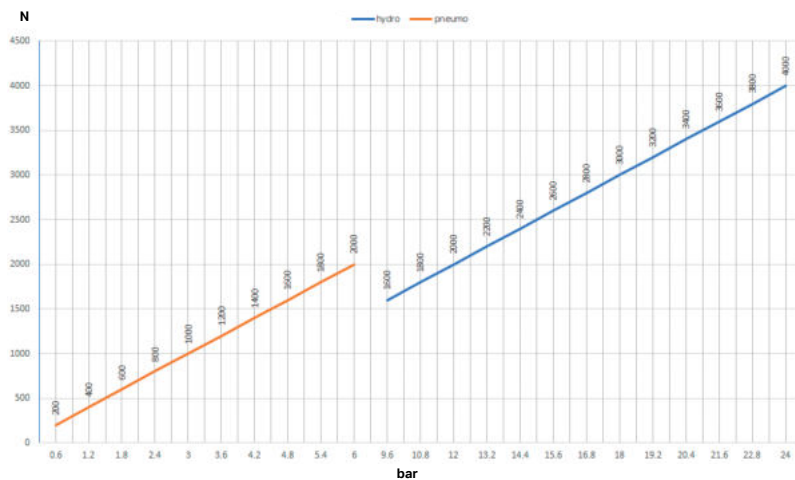
Service & Technology

Workpiece clamping system



measured without load, quill extended halfway

Pressure-force diagram



Suitable alignment elements

Item no.	Designation	Slot width
AUR.zX-12	zentrIX alignment pin, 1 pair	12g6
AUR.zX-14		14g6
AUR.zX-16		16g6
AUR.zX-18		18g6



Manual version (right-hand)

Pneumatic version (right-hand)

Hydraulic version (right-hand)

Standard design for all types = (as shown at very top)

CANNOT be retrofitted
 can be retrofitted

Center height D [mm]	Item no.	Designation	A [mm]	B [mm]	C [mm]	F [mm]	H [mm]	Manual	Pneumatic ²⁾	Hydraulic ³⁾	Weight [kg]			
110	RST.COM-110m ⁴⁾	COMPACT tailstock	222	128	130	100	30	•			11		•	
	RST.LIG-110m	LIGHT tailstock	255		142		40	•			20		•	
	RST.LIG-110p ¹⁾	LIGHT tailstock	225	150	184	120	40		•		20		•	
	RST.LIG-110h ¹⁾	LIGHT tailstock	229		168		40			•	24		•	
	RST.COM-150m ⁴⁾	COMPACT tailstock	222	168	130	100	30	•			16		•	
	RST.LIG-150m	LIGHT tailstock	255		142		40	•			25		•	
	RST.LIG-150p ¹⁾	LIGHT tailstock	238	190	184	120	40		•		25		•	
	RST.LIG-150h ¹⁾	LIGHT tailstock	238		168		40			•	29		•	
	RST.LIG-180m	LIGHT tailstock	255		142		40	•			30		•	
150	RST.LIG-180p ¹⁾	LIGHT tailstock	238	220	184	120	40		•		30		•	
	RST.LIG-180h ¹⁾	LIGHT tailstock	238		168		40			•	34		•	
	RST.LIG-220m	LIGHT tailstock	255		142		40	•			35		•	
	RST.LIG-220p ¹⁾	LIGHT tailstock	238	260	184	120	40		•		35		•	
	RST.LIG-220h ¹⁾	LIGHT tailstock	238		168		40			•	40		•	
	RST.LIG-280m	LIGHT tailstock	255		142		40	•			42		•	
	RST.LIG-280p ¹⁾	LIGHT tailstock	238	310	184	120	40		•		42		•	
	RST.LIG-280h ¹⁾	LIGHT tailstock	238		168		40			•	47		•	
	Tailstock Option / Accessories	RST.L-m	Left-hand version, manual											•
RST.L-p		Left-hand version, pneumatic											•	
RST.R-poh		Pneumatic, without manual lever valve											•	
RST.L-poh		Left-hand version, pneumatic, without manual lever											•	
RST.L-h		Left-hand version, hydraulic											•	
RST.R-hoh		Hydraulic without manual lever valve											•	
RST.L-hoh		Left-hand version, hydraulic, without manual lever valve											•	
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												•
RST.Hub-h		Stroke monitoring for tailstock (hydraulic), free cable ends 5 m of which 4.5 m in flexible tubing; stroke 5 mm shorter												•
RST.SPI-MK2s		Fixed center, hardened steel						MK2						•
RST.SPI-MK3s		Fixed center, hardened steel						MK3						•
RST.SPI-MK2hm		Fixed center, HM use						MK2						•
RST.SPI-MK3hm		Fixed center, HM use						MK3						•

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

¹⁾ Delivered as standard with manual lever valve. Connection plate for external hydraulic supply is a special model, please contact factory.

²⁾ Impact force approx. 660...2'000 N at 2...6 bar air pressure

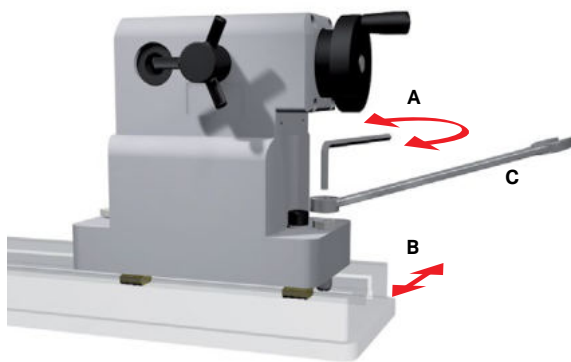
³⁾ Impact force approx. 3'800 N at max. 24 bar oil pressure

⁴⁾ Delivered with center height +/-0.01 mm

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

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

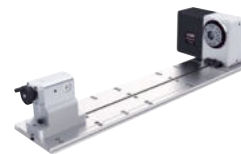
zentriX alignment system (example: tailstock on longFLEX)



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 screw 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

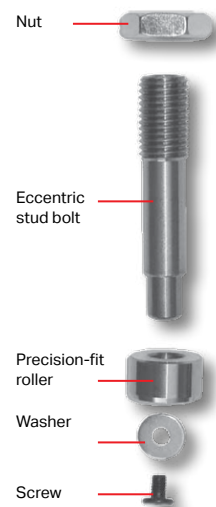
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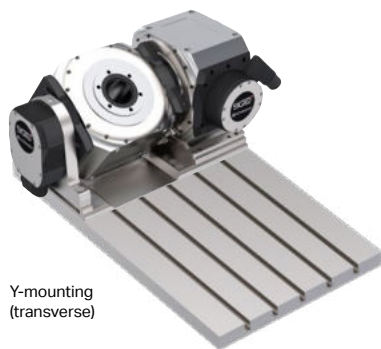
All longFLEX versions



All tailstocks



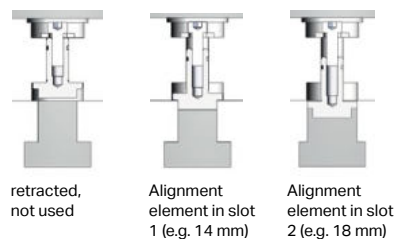
lineFIX alignment system for T-type rotary tables (not for TIP)



Y-mounting (transverse)

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



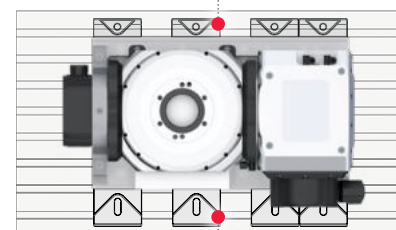
Item no.	Designation	Slot width	Weight [kg]
AUR.iX-12-16	Option (2 pieces)	12/16	
AUR.iX-14-18	Standard (2 pieces)	14/18	0.03
LOZ.Bride-L	Long clamps, for 63/125 grid pattern*		0.93

* 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)

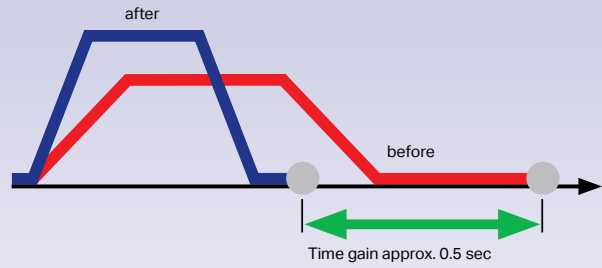


Long clamping jaws (item no.: LOZ.Bride-L): for making adjustments when mounting in intermediate positions.

Small parts

			Maintenance unit	Clamps, steel plugs	Gear oil, clamps, steel plugs	Fastening material on machine table (screws, T-slot nuts)
LOZ.91x-EA		EA-91x	x	x		
LOZ.91x-TAP9		T1-91x91x TAP9(v)	x	x		
LOZ.91x-TAP5		T1-91x520 TAP5(v)	x		x	
LOZ.FAN-TAP9	Fanuc Robodrill	T1-91x91x TAP9(v)				x

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)

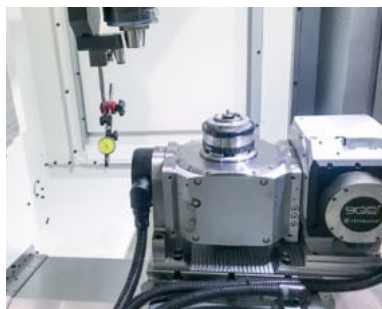
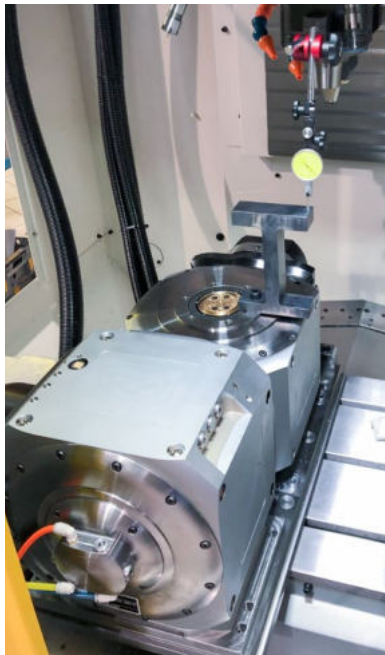
Commissioning Service

Commissioning of new machines with controls from Siemens, Fanuc, Mitsubishi, Mazak. In addition to **basic commissioning** (see p. 31), 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. 32



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.

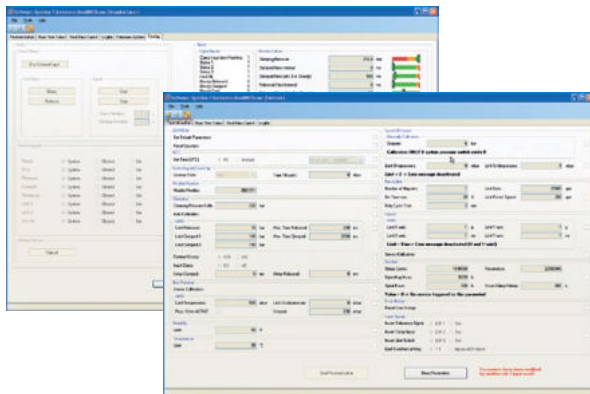
Helpline Service

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



blackBOXcom



Application Support

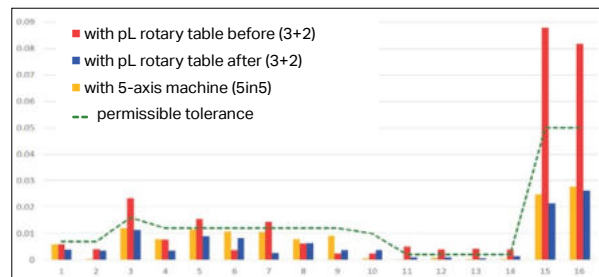
Experience has shown: A considerable improvement in time needed per piece and workpiece accuracy are almost always possible.

- 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

For item no., see p. 32



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

Overview & Facts

System & iBox

Rotary tables

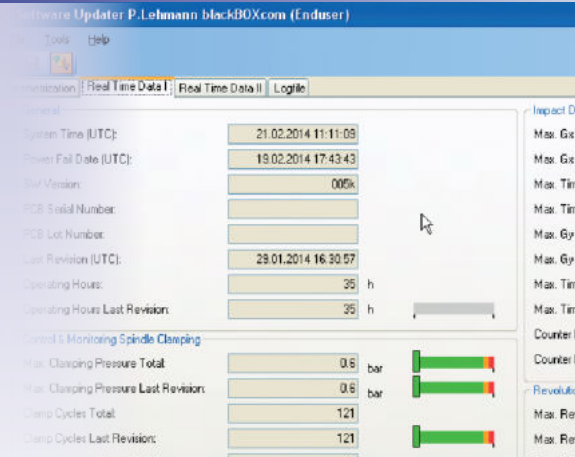
KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

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



Active Service¹⁾

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

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

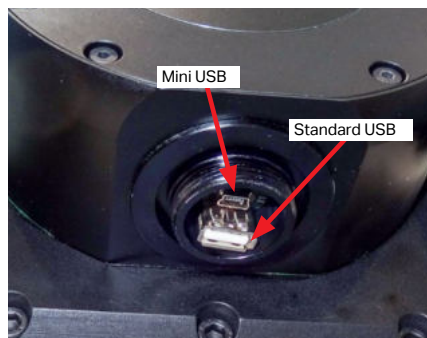
Facts

- 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

Goal

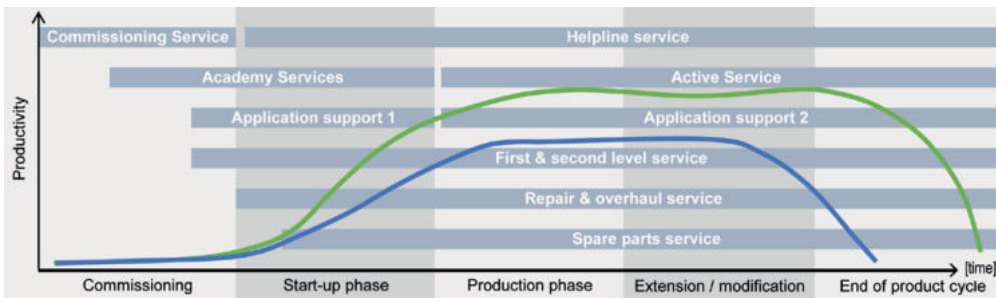
Prevent downtime, eliminate stress and costs, extend the service life → Prevention instead of reaction

Technischer Kundendienst		R-Nr.	R14-1220				
Erfüllungsort: Peter Lehmann AG (extern) Bäraustrasse 43 CH-2662 Bärau		A-Nr.	M40789-001				
dir: Teil/Nr. Nr. Momet: 022 930 83 16		M-Nr.					
R-Adresse: COMADUR SA, Le Locle		Masch.	CNC				
Arbeiten T = Teiler; S = Schwenker; TS = Teiler UND Schwenker							
Code	Element	X	Tätigkeit	X	Tätigkeit	X	Tätigkeit
10	Anlage		reinigen		ausmessen		ausrichten
11	Anlage dokumentieren		kompilieren		nachführen		
12	Anlaufschleife		kontrollieren		einrichten		ersetzen
13	Bereichsbesicherung		kontrollieren		einstellen		ersetzen
45	blackBOX		testen		Fehler analys.		ersetzen
14	Guardy		testen		Fehler analys.		reparieren
47	Braky		testen		Fehler analys.		ersetzen
15	Drehdurchführung		kontrollieren		abdichten		ersetzen
48	Drucksensor		testen		ersetzen		
36	EROWA / Macalot		kontrollieren		ausrichten		reparieren



Status report with recommendation

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



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

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.



Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



Commissioning of M-function

Goal

FANUC 35i linked to machine's CNC via M-function

Activities

- Cabling from the FANUC 35i to the interface on the machine's CNC
- Function test and brief training of the operator
- Linking of EMERGENCY STOP, if possible

Prerequisite

- Machine and CNC must be prepared appropriately (readily available M-function)

Note

Please note that we offer training for the operation of the Fanuc 35iB controller in our Academy.

Application support

Goal

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

Activities

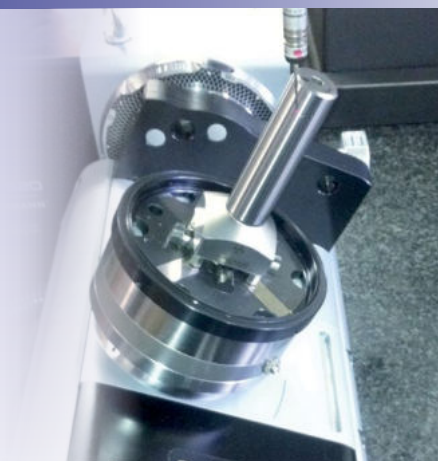
- Calculation based on rotary table and workpiece (what is possible)
- Check of the geometry, and correct as much as possible
- Check whether the clamping control functions correctly and is not active before the intended position is actually reached
- Check of dividing/indexing errors (0–90° relatively 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)
- Adjustment of gear backlash and pitch error
- Optimization for specific workpiece, incl. clamping device and machining strategy (may require considerably more effort for simultaneous machining; invoiced separately)
- Kinematics setting/check
- 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.1AX-APS	max. 15 h, 1-axes	Application support
	INB.1AX-CMS	basic, max. 10 h, 1-axes	Commissioning of integrated axes
T-type rotary tables	INB.1AX-SP	max. 15 h, 1 axes	Commissioning of servopack
	INB.2AX-APS	max. 20 h, 2-axes	Application support
with pL-CNC	INB.2AX-CMS	basic, max. 15 h, 2-axes	Commissioning of integrated axes
	INB.2AX-SP	max. 20 h, 2 axes	Commissioning of servopack
	INB.MF	max. 15 h on-site	Commissioning of M-function

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

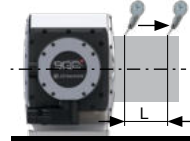


Perpendicularity
 Spindle surface to support surface



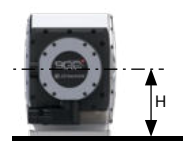
0.01/100 mm (0.005/100 mm)

Parallelism
 Spindle axis with support surface



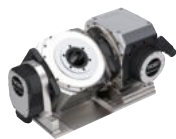
0.01/100 mm (0.005/100 mm)

Center height

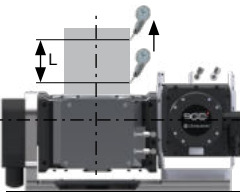


0...0.04 mm

Geometry of T1 rotary tables

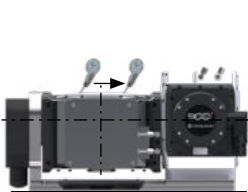


Perpendicularity
 Dividing/indexing axis to swivelling/tilting axis



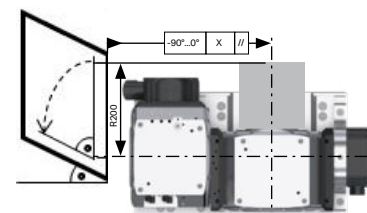
0.01/100 mm (0.005/100 mm)

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 \varnothing



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:

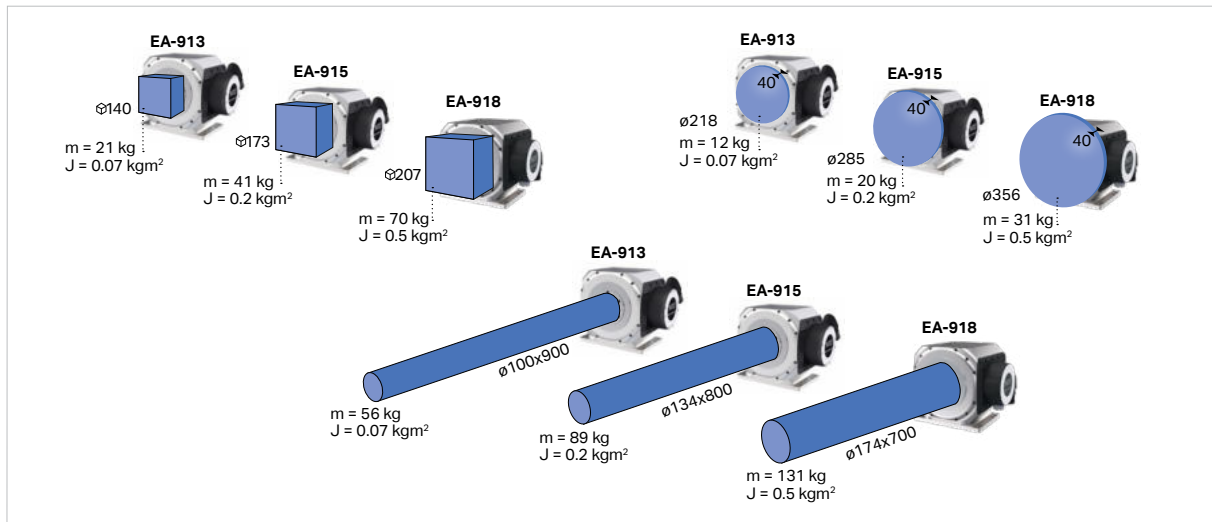
- For intermittent service S3 ED 40%
- Cycle duration 10 minutes

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%.

EA-type rotary table



T1-type rotary tables (TAP)



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



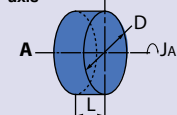
It is not only the weight which counts; shape and position are also often decisive factors

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

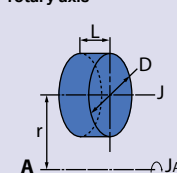


D: Outside diameter of the round bar [m]
L: Length of the round bar [m]
p: Density [kg/m³]
m: Mass of the round bar [kg]
J_A: Moment of inertia [kgm²]

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

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

Center of gravity outside rotary axis



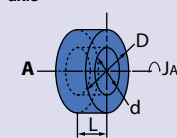
D: Outside diameter of the round bar [m]
L: Length of the round bar [m]
r: Turning radius [m]
p: Density [kg/m³]
m: Mass of the round bar [kg]
J_A: Moment of inertia of the round bar at center A [kgm²]
J: Moment of inertia [kgm²]

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

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

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

Center of gravity in rotary axis

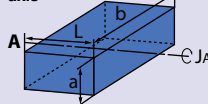


D: Outside diameter of the cylinder [m]
d: Bore diameter of the cylinder [m]
L: Length of the round bar [m]
p: Density [kg/m³]
m: Mass of the cylinder [kg]
J_A: Moment of inertia [kgm²]

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

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

Center of gravity in rotary axis

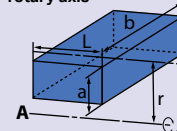


a: Side length [m]
b: Side length [m]
L: Side length [m]
p: Density [kg/m³]
J_A: Moment of inertia [kgm²]

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

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

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]

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

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

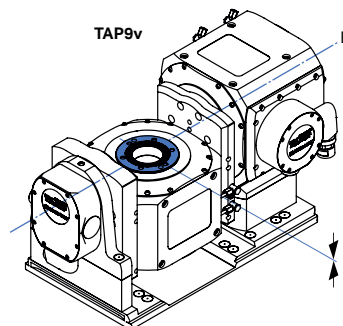
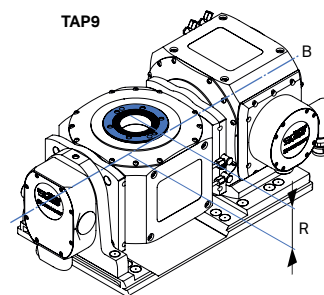
Key

- 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/m ³
Cast iron	7.85 x 10 ³ kg/m ³
Aluminum	2.7 x 10 ³ kg/m ³
Copper	8.94 x 10 ³ kg/m ³
Brass	8.5 x 10 ³ kg/m ³

Calculation of the load on the swivelling/tilting axis



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):

$$Rs = R + L/2$$

$$M = m \times Rs \times g$$

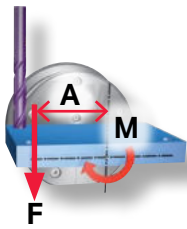
Calculation of the total torque in the tilting direction (with intrinsic torque of the dividing/indexing axis):

$$M_{tot} = M + Me \quad (Me \text{ represents the gear unit loading without load})$$

Reference values for configuring and selecting the correct rotary table

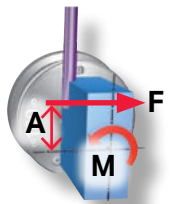
F = Feed force, A = Distance [m] from rotary table axis to feed force (F) during machining, M = Resulting torque (FxA)
Resulting torque M = F x A → must not exceed the max. clamping torque [Nm] or max. feed torque [Nm] of the rotary table!

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



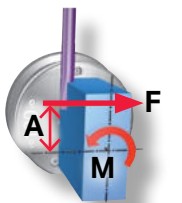
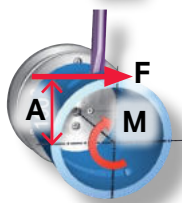
Drilling

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

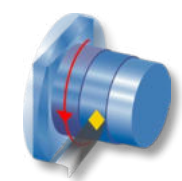


Hobbing

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

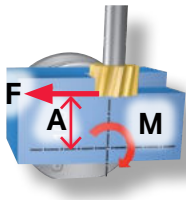
Turning

Tool type	Turning ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Feed force F [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



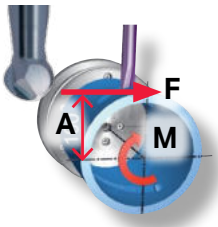
Factory information from well-known tool manufacturers
(applies to new tool cutting edges)

Corner milling (slab milling or plane milling)



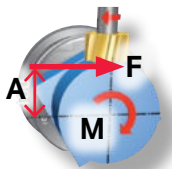
Tool type	Wz ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Cutting width [mm]	Feed force F [N]		
						CK45	X5CrNi18-10	AlMg4.5Mn0.7
Angular milling cutter WP	40	160	0.12 x 6	2	40	1'750		
		160	0.12 x 6	2.5	25	1'250		
		85	0.12 x 6	2	40		1'550	
		85	0.12 x 6	2.5	25		1'150	
		500	0.15 x 6	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



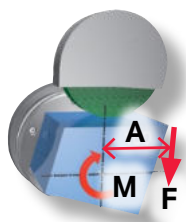
Tool type	Wz ø [mm]	Cutting speed [m/min]	Feed F [mm]	Depth of cut [mm]	Cutting width [mm]	Feed force F [N]		
						CK45	X5CrNi18-10	AlMg4.5Mn0.7
Ball end milling cutter	6	220	0.1 x 2	1.0	1.0	60		
		100	0.08 x 2	0.8	0.8		35	
		530	0.15 x 2	2.0	2.0			50
Ball end milling cutter	12	220	0.14 x 2	1.3	1.3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

Overview & Facts

System & iBox

Rotary tables

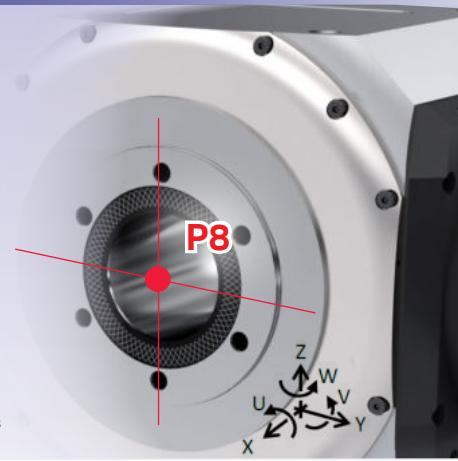
KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

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:

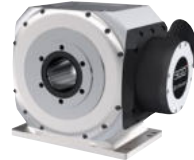
- Error compensation in the axis direction affected
- Use of lighter clamping means
- Changing the machining strategy

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.

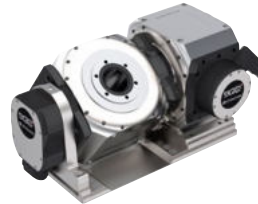
Compliance of EA-type rotary tables in P8 in Z-direction (approximate values)

$\mu\text{m}/\text{kg}$	Rotary table fastened by means of bolting	Rotary table fastened by means of clamping claws
EA-91x	-0.010	-0.008

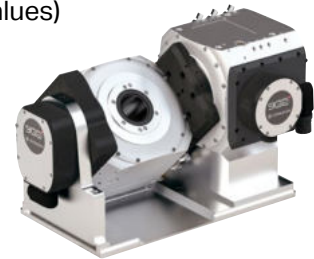


Compliance of T1-type rotary tables in P8 in Z-direction (approximate values)

$\mu\text{m}/\text{kg}$	0°		90°	
	TAP9	TAP9v	TAP9	TAP9v
T1-91x915	-0.017		-0.021	
T1-91x918		-0.018		-0.015

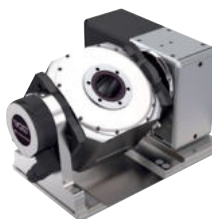


TAP9

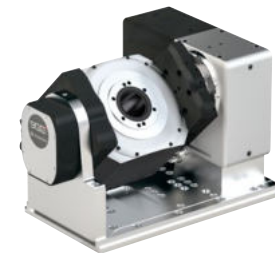


TAP9v

$\mu\text{m}/\text{kg}$	0°		90°	
	TAP5	TAP5v	TAP5	TAP5v
T1-91x520	-0.022	-0.025	-0.035	-0.018

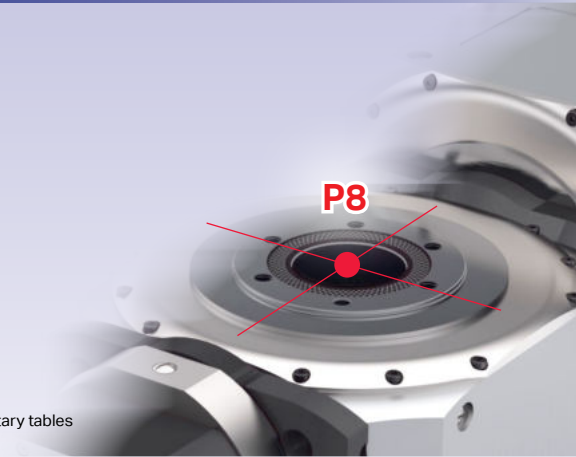


TAP5



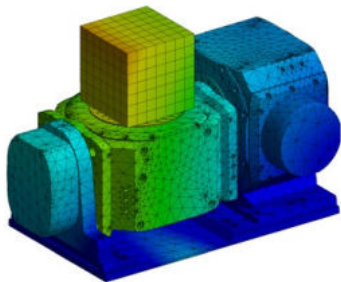
TAP5v

Results of static-mechanical FEM analysis

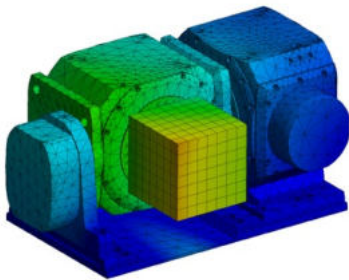


P8 with T-type rotary tables

TAP9

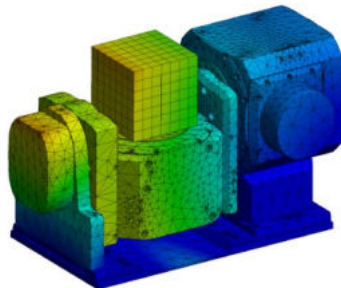


0° position

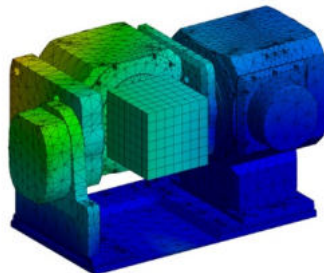


90° position

TAP9v

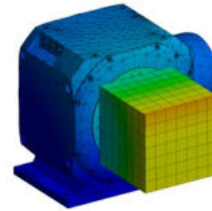


0° position

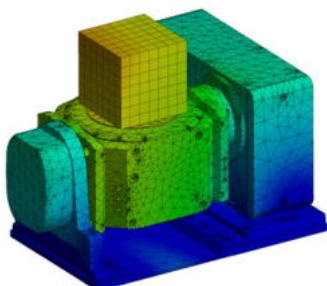


90° position

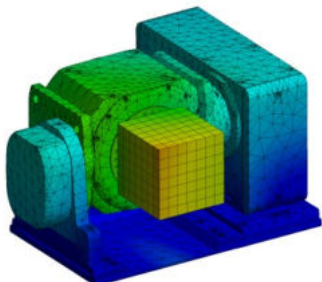
EA



TAP5

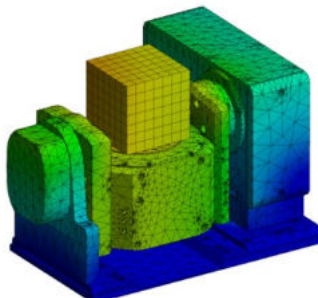


0° position

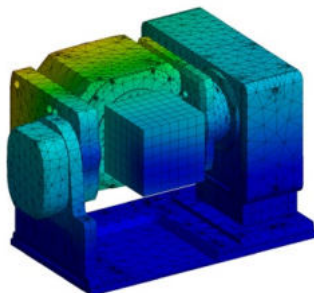


90° position

TAP5v



0° position



90° position



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

Overview & Facts

System & iBox

Rotary tables

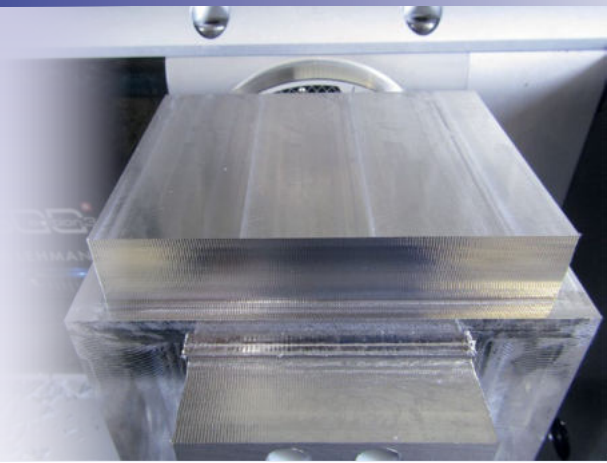
KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

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.

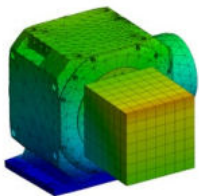
Condition: Rotary table is mounted in the specified manner and both axes are clamped with 5 bar compressed air.

Example of machining frequency calculation

Angular milling cutter $\varnothing 40$ 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



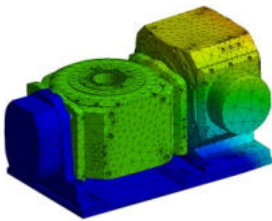
Every object has several natural frequencies (so-called eigenfrequencies) that depend on the object's shape, mass and material. If the machining frequency matches an eigenfrequency, e.g. that of a rotary table, the result is chattering or whistling noises. A vertical machining center has its first eigenfrequency 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

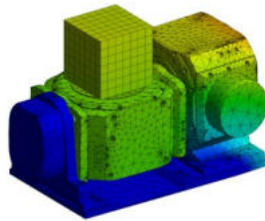
Eigenfrequency of TAP9-type rotary tables, mode 1 and 2 (approximate values)

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

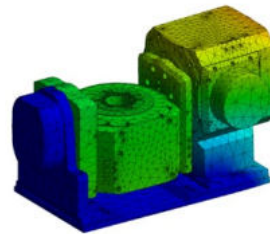
0° position



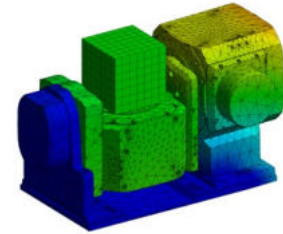
TAP9 without standard load in accordance with p. 16



TAP9 with standard load in accordance with p. 16



TAP9v without standard load in accordance with p. 17

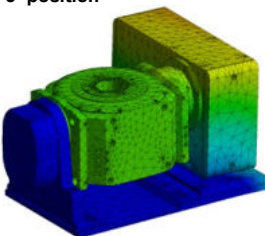


TAP9v with standard load in accordance with p. 17

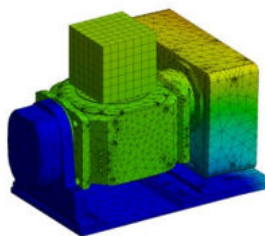
Eigenfrequency of TAP5-type rotary tables, mode 1 and 2 (approximate values)

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

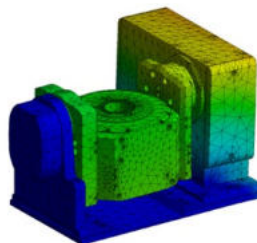
0° position



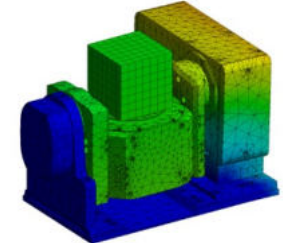
TAP5 without standard load in accordance with p. 18



TAP5 with standard load in accordance with p. 18



TAP5v without standard load in accordance with p. 19



TAP5v with standard load in accordance with p. 19

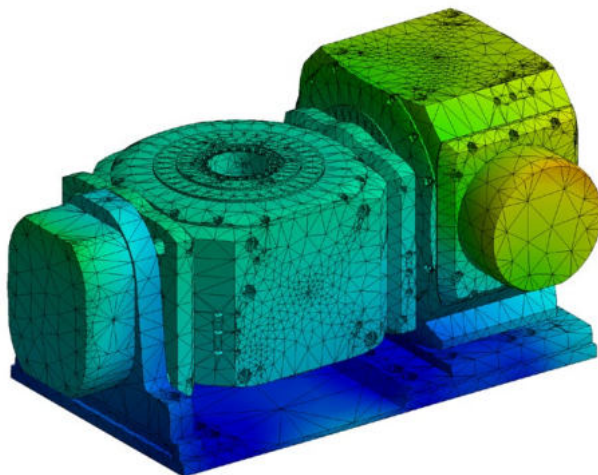
Thermal deformation from the process and operation

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.

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.



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.

Influencing factors

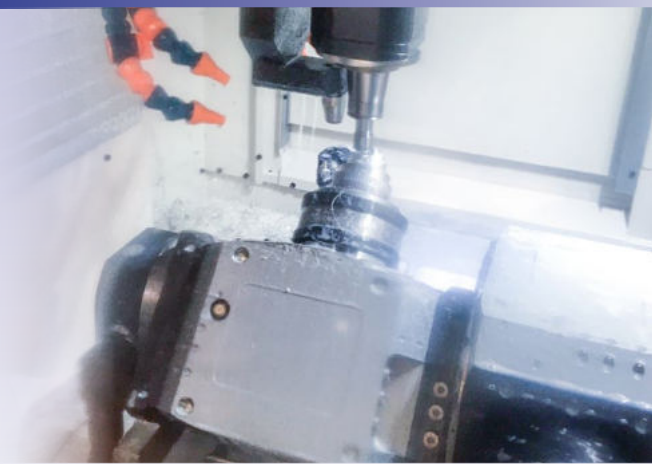
The thermally induced deformations occur in response to external (coolant, ambient air, etc.) and internal (gear unit, bearings, motor, etc.) thermal factors. The following factors require particular attention:

- 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

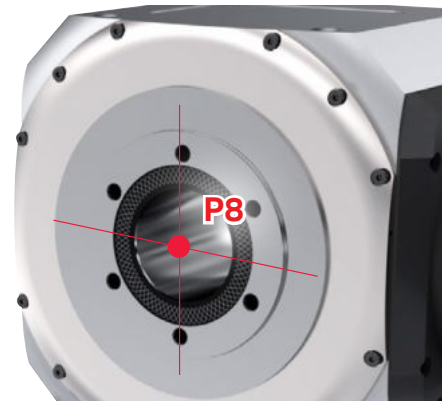
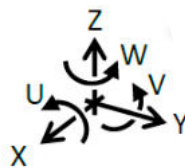
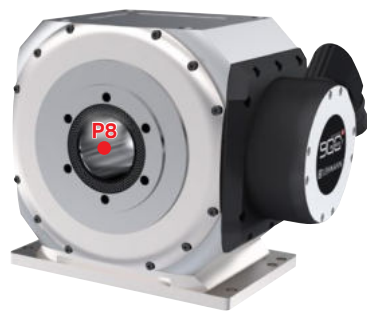
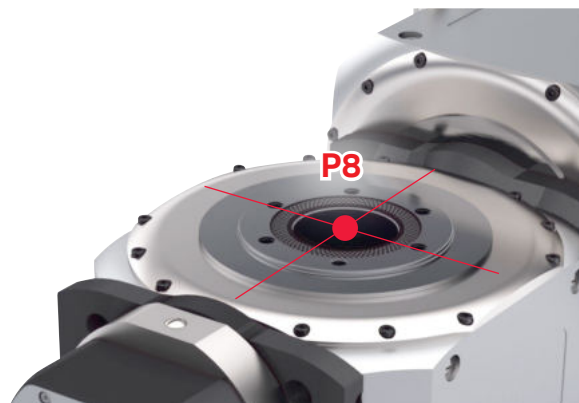
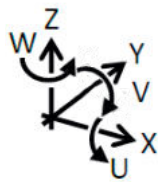
For dry simultaneous machining with the T1-913915 TAP9, the table provides a displacement in V-direction at point P8 of 0 μm after 60 s after a cold start. This remains for the time being. After approx. 1 hour, a displacement of -1 μm occurs, increasing to -5 μm after 10 hours. Explanation of behavior: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

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



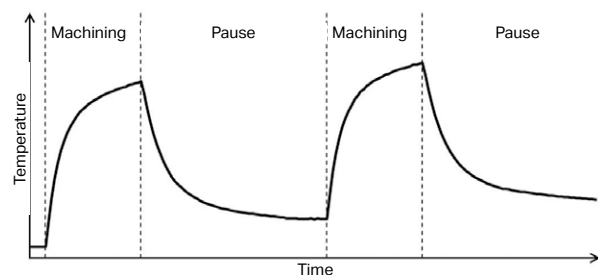
Measuring point P8

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.

Overview & Facts

System & iBox

Rotary tables

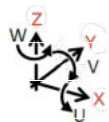
KAB, CNC, WMIS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

The following values in both tables apply with the rotary table mounted and resting over its entire surface on a solid machine table (steel/cast metal).

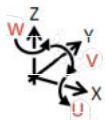


		µm															
		X-displacement					Y-displacement					Z-displacement					
		1	1.5	3	60	600	1	1.5	3	60	600	1	1.5	3	60	600	
		[min]															
Without cooling	Positioning mode (spindle clamping active)	EA-91x DD	0	0	0	2	5	0	0	0	0	0	0	0	0	3	9
		T1-91x915 TAP9	0	0	0	0	0	0	0	0	-1	-5	0	0	0	2	8
		T1-91x915 TAP9v	0	0	0	0	0	0	0	0	-1	-5	0	0	0	2	6
		T1-91x520 TAP5	16	19	20	6	3	-2	-3	-5	-34	-59	3	4	7	34	65
	Simultaneous machining	T1-91x520 TAP5v	0	0	0	0	0	-2	-3	-5	-34	-59	3	4	7	33	63
		EA-91x DD	0	0	0	3	9	0	0	0	0	0	0	0	0	4	15
		T1-91x915 TAP9	0	0	0	0	0	0	0	0	-2	-8	0	0	0	3	11
		T1-91x915 TAP9v	0	0	0	0	0	0	0	0	-2	-8	0	0	0	3	8
	Turning	T1-91x520 TAP5	16	19	20	6	3	-2	-3	-5	-35	-65	3	4	7	35	69
		T1-91x520 TAP5v	0	0	0	0	0	-2	-3	-5	-35	-65	3	4	7	34	65
		EA-91x DD	0	1	3	41	80	0	0	0	0	-2	2	3	6	70	155
		T1-91x915 TAP9	0	0	0	0	0	-1	-1	-3	-54	-101	1	2	5	49	94
With splash-water cooling	Positioning mode (spindle clamping active)	T1-91x915 TAP9v	0	0	0	0	0	-1	-1	-3	-54	-101	1	2	5	30	56
		T1-91x520 TAP5	16	19	20	6	3	-4	-6	-11	-101	-205	3	5	10	73	140
		T1-91x520 TAP5v	0	0	0	0	0	-4	-6	-11	-101	-205	3	5	9	54	103
		EA-91x DD	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Simultaneous machining	T1-91x915 TAP9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9v	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x520 TAP5	19	21	19	17	17	-3	-5	-6	-9	-10	4	7	9	11	11
		T1-91x520 TAP5v	0	0	0	0	0	-3	-5	-6	-9	-10	4	7	9	11	11
	Turning	EA-91x DD	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
		T1-91x915 TAP9	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
		T1-91x915 TAP9v	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
		T1-91x520 TAP5	19	21	19	17	17	-3	-5	-6	-9	-10	4	7	9	11	11
With active water cooling	Positioning mode (spindle clamping active)	T1-91x520 TAP5v	0	0	0	0	0	-5	-8	-11	-26	-27	4	7	9	11	11
		EA-91x DD	0	0	0	2	2	0	0	0	-2	-2	2	3	5	18	18
		T1-91x915 TAP9	0	0	0	0	0	-1	-1	-2	-8	-8	1	1	3	8	8
		T1-91x915 TAP9v	0	0	0	0	0	-1	-1	-2	-8	-8	1	1	3	6	6
	Simultaneous machining	T1-91x520 TAP5	19	21	19	17	17	-5	-8	-11	-26	-27	4	7	9	13	13
		T1-91x520 TAP5v	0	0	0	0	0	-5	-8	-11	-26	-27	4	7	9	11	11
		EA-91x DD	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
		T1-91x915 TAP9	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Turning	T1-91x915 TAP9v	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
		T1-91x520 TAP5	16	18	20	7	6	-2	-3	-4	-24	-29	3	4	7	22	27
		T1-91x520 TAP5v	0	0	0	0	0	-2	-3	-4	-24	-29	3	4	7	22	27
		EA-91x DD	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Turning	T1-91x915 TAP9	0	0	0	-1	-1	-1	-1	-3	-24	-24	1	2	5	38	44	
	T1-91x915 TAP9v	0	0	0	-1	-1	-1	-1	-3	-24	-24	1	2	5	30	35	
	T1-91x520 TAP5	16	18	20	7	6	-4	-6	-10	-89	-152	3	5	10	56	79	
	T1-91x520 TAP5v	0	0	0	-1	-1	-4	-6	-10	-89	-152	3	5	9	48	70	

The values for turning have been determined with the flux weakening of the dividing/indexing axis active. Without flux weakening, less thermal load and therefore less displacement and rotation may be expected.

Duty cycle
 Positioning mode: 20%
 Simultaneous machining: 60%
 Turning: 80%

Overview & Facts
 System & iBox
 Rotary tables
 KAB, CNC, WMS
 AGG, DDF, RST, LOZ
 Service & Technology
 Workpiece clamping system



			arcsec														
			U-Rot					V-Rot					W-Rot				
			1	1.5	3	60	600	1	1.5	3	60	600	1	1.5	3	60	600
Without cooling	Positioning mode (spindle clamping active)	EA-91x DD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9v	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
		T1-91x520 TAP5	-1	-2	-3	8	13	89	102	109	44	36	0	0	0	0	0
		T1-91x520 TAP5v	-1	-2	-3	8	13	89	102	109	44	36	0	0	0	0	0
	Simultaneous machining	EA-91x DD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9v	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0
		T1-91x520 TAP5	-1	-2	-3	8	13	89	102	109	44	36	0	0	0	0	0
		T1-91x520 TAP5v	-1	-2	-3	8	13	89	102	109	44	36	0	0	0	0	0
	Turning	EA-91x DD	0	0	1	1	0	-2	-2	-4	-8	-7	0	0	0	0	2
		T1-91x915 TAP9	0	0	0	-4	3	0	0	0	-1	0	0	0	0	0	0
T1-91x915 TAP9v		0	0	0	-4	3	0	0	0	-1	0	0	0	0	0	0	
T1-91x520 TAP5		-1	-2	-3	8	13	89	102	109	44	36	0	0	0	0	0	
T1-91x520 TAP5v		-1	-2	-3	8	13	89	102	109	44	36	0	0	0	0	0	
With splash-water cooling	Positioning mode (spindle clamping active)	EA-91x DD	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
		T1-91x915 TAP9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9v	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x520 TAP5	-2	-3	-3	-3	-3	102	110	100	91	88	0	0	0	0	0
		T1-91x520 TAP5v	-2	-3	-3	-3	-3	102	110	100	91	88	0	0	0	0	0
	Simultaneous machining	EA-91x DD	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0
		T1-91x915 TAP9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9v	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x520 TAP5	-2	-3	-3	-3	-3	102	110	100	91	88	0	0	0	0	0
		T1-91x520 TAP5v	-2	-3	-3	-3	-3	102	110	100	91	88	0	0	0	0	0
	Turning	EA-91x DD	0	0	1	4	4	-2	-3	-5	-10	-10	0	0	0	-2	-2
		T1-91x915 TAP9	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	0
T1-91x915 TAP9v		0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	0	
T1-91x520 TAP5		-2	-3	-3	-3	-3	102	110	100	91	88	0	0	0	0	0	
T1-91x520 TAP5v		-2	-3	-3	-3	-3	102	110	100	91	88	0	0	0	0	0	
With active water cooling	Positioning mode (spindle clamping active)	EA-91x DD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9v	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	0
		T1-91x520 TAP5	-2	-2	-3	3	2	87	99	106	45	41	0	0	0	0	0
		T1-91x520 TAP5v	-2	-2	-3	3	2	87	99	106	45	41	0	0	0	0	0
	Simultaneous machining	EA-91x DD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	0
		T1-91x915 TAP9v	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	0
		T1-91x520 TAP5	-2	-2	-3	3	2	87	99	106	45	41	0	0	0	0	0
		T1-91x520 TAP5v	-2	-2	-3	3	2	87	99	106	45	41	0	0	0	0	0
	Turning	EA-91x DD	0	0	1	-2	-5	-2	-2	-4	-17	-23	0	0	0	2	5
		T1-91x915 TAP9	0	0	0	-2	-4	0	0	0	0	0	0	0	0	0	0
T1-91x915 TAP9v		0	0	0	-2	-4	0	0	0	0	0	0	0	0	0	0	
T1-91x520 TAP5		-2	-2	-3	3	2	87	99	106	45	41	0	0	0	0	0	
T1-91x520 TAP5v		-2	-2	-3	3	2	87	99	106	45	41	0	0	0	0	0	

The values for turning have been determined with the flux weakening of the dividing/indexing axis active. Without flux weakening, less thermal load and therefore less displacement and rotation may be expected.

Duty cycle
 Positioning mode: 20%
 Simultaneous machining: 60%
 Turning: 80%

Overview & Facts
 System & iBox
 Rotary tables
 KAB, CNC, WMIS
 AGG, DDF, RST, LOZ
 Service & Technology
 Workpiece clamping system

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.

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.

Lasttyp	Masse-trag-beitragmoment	Kriterien (wenn Masse-trag-beitragmoment nicht bekannt)	
		Last	Dimension
Catalog (Max.Speed)	$< 0.8\text{kgm}^2$	$< 90\text{kg}$	$< 230\text{mm}$
Usual	$< 1.2\text{kgm}^2$	$< 120\text{kg}$	$< 320\text{mm}$
Max.Load	$< 8\text{kgm}^2$	$< 800\text{kg}$	$< 450\text{mm}$

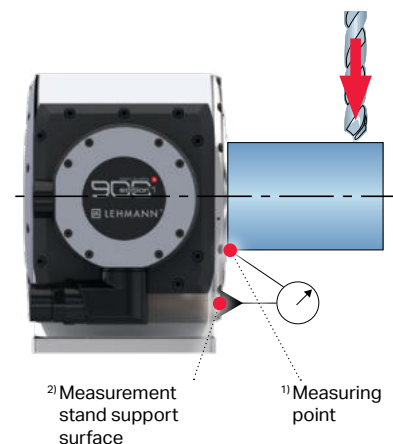
* Tool for determining the permissible limit values for each rotary table; please contact us.

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 spindle¹⁾, relative to rotary table housing²⁾; spindle clamping active (inactive: axially approx. -20%, deflection approx. -50%)



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.

3 Rotary table temperature

The motor temperature must not exceed 90 °C. Otherwise the rotary table's internal electronics may suffer permanent damage. Temperature monitoring via the control system is required. If 90 °C are to be exceeded during operation, active cooling for the rotary table is recommended. See **p. 24**

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.

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 unit

Gear unit loading ($M_{\text{gear max}}$) [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.

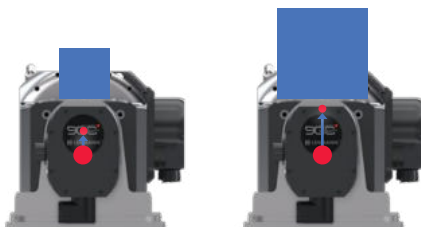
Eccentric spindle load ($sl_{\text{eccentric}}$) [Nm]
The eccentric load catalog* corresponds

- 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. 51

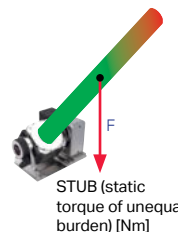
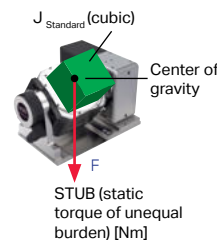


Center of gravity shift without and with load. The greater the red center of gravity, the greater is the gear unit loading in the swivelling/tilting axis. The blue arrow shows the direction in which the center of gravity moves from «without load» to «with load».

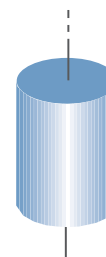
pL standard spindle load ($sls = sl_{\text{standard}}$) pp. 34/35 [kg]
...refers to the pL spindle load defined as standard, derived from practice, covering approximately 90% of all applications. All drive data and parameter lists are designed for the cubic pL standard load. All masses moving within 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}) p. 34/35 [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. The usual J ratio between load and motor is generally 1:1 or less (e.g. 0.5:1).

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 motorized model. Large J values can be moved, of course, but required appropriate adjustments (on request).



EA-913



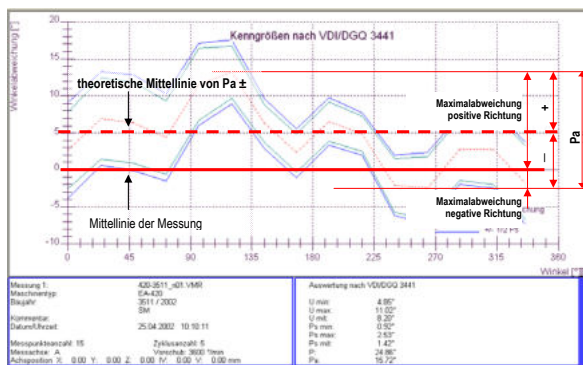
Function explanations, limit values and conditions minimize your risks

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 ROD 800 measuring and test equipment with K15 coupling
- Unloaded rotary table as individual module – room temperature approx. 22 °C



Explanation of indexing accuracy Pa ±:

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]

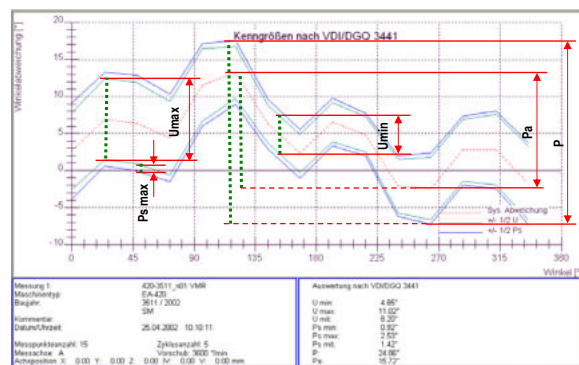
...refers to the maximum deviation within the results of the repeatedly measured angular positions, approached from the same side. This corresponds to the position variation Ps max according to VDI/DGQ 3441, i.e.:

- 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.



Explanation of various parameters according to VDI/DGQ 3441:

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, it is not permissible to operate the unit for more than 10 min without interruption and at speeds above 500 rpm. If these values are exceeded, signal 'Axis released' is reset, causing the spindle to stop. If longer continuous cycles at speeds above 500 rpm are required, contact us.

**DIN / VDE
0530
S3, ED 40%**

Rotational spindle speed (n_{sp})

[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)

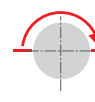
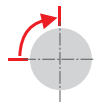


Cycle time 90° / 180° ($t_{90^\circ} / t_{180^\circ}$)

[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.

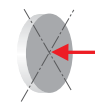


9 Spindle bearing

Axial force (F_{axial})

[N]

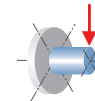
...refers to the maximum permissible axial load on the spindle. It includes the workpiece, devices, machining forces and other forces resulting from the rotational and tilting movement.



Pull-out torque (M_{tit})

[Nm]

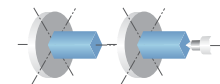
...refers to the maximum permissible tilting load on the spindle, measured from the spindle face. It includes the workpiece, devices, machining forces and torques resulting from the rotational and tilting movement.



Transport load (sl_{max})

[kg]

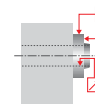
...refers to the total, maximum permissible load which is installed starting from the spindle nose and performs a rotational movement together with the spindle (device and workpiece). This load does not correspond to the pL standard spindle load.



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.



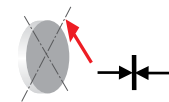
10 Clamping

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 \varnothing 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 (sd₂₀₀)

...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.

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.

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.

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. 49

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.

3D precision

offset 1: [mm]
0.013

pitch-error: [°]
0.005

FANUC		
a2/5000is		
Fanuc		
#1000A		
HEDENHAN		
RCN x2F		
i 90:1		
Value	Value	V
Catalog: 19800		
Usual: 16200		
Max. load: 5400		

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



Workpiece clamping system
Service & Technology
AGG, DDF, RST, LOZ
KAB, CNC, WMS
Rotary tables
System & iBox
Overview & Facts

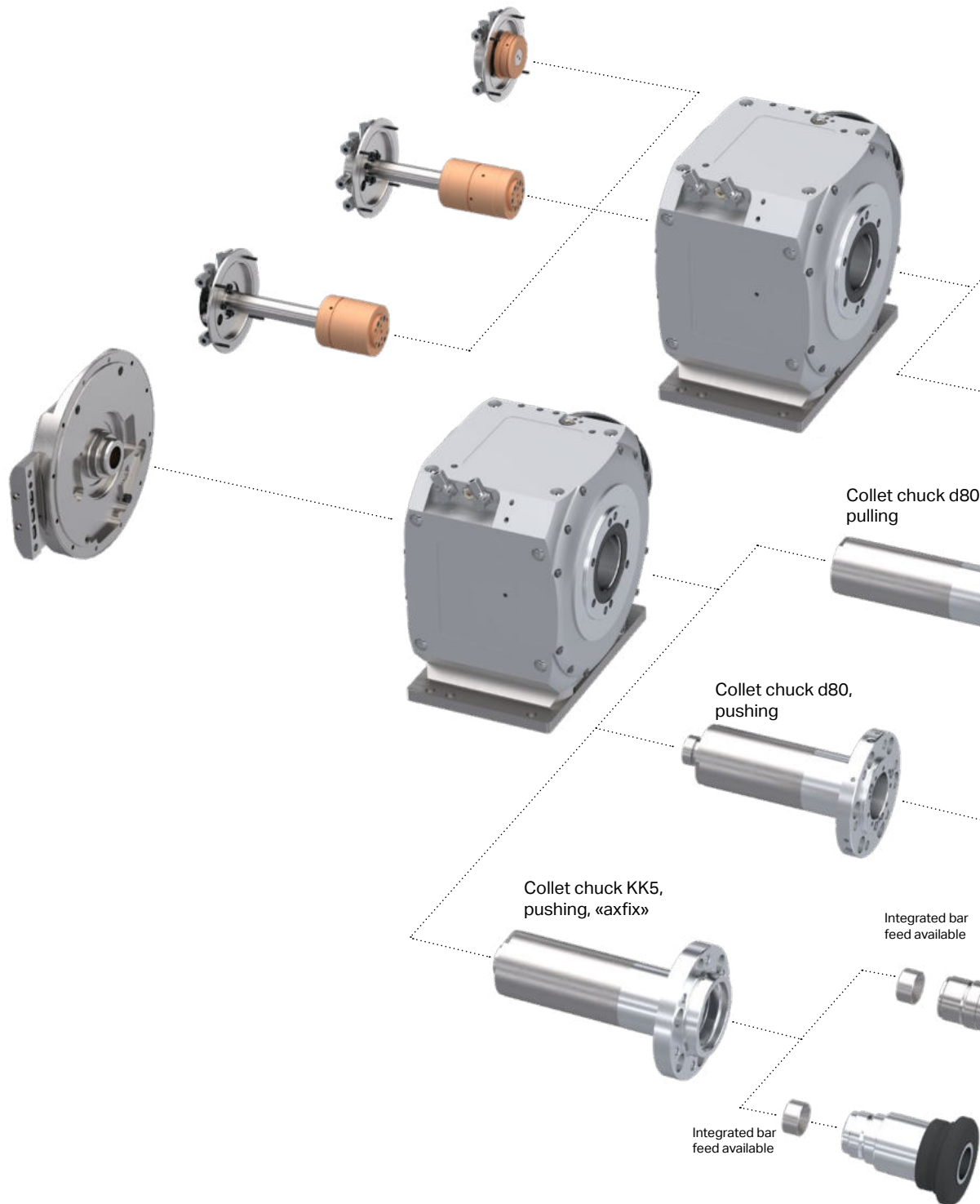
Workpiece clamping systems

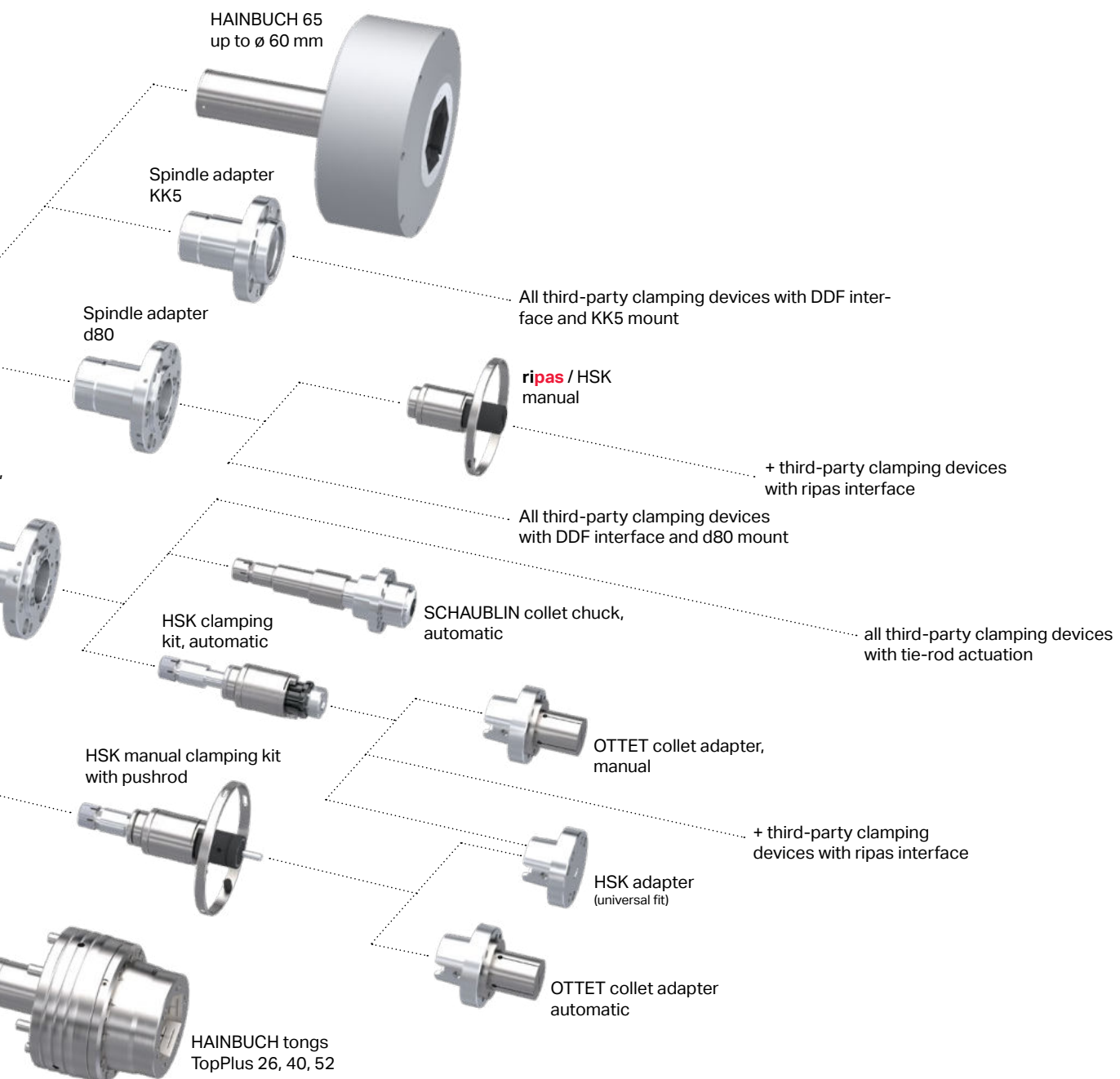
	Collet chuck system	54
	Spindle adapter	56
	Collet chucks, release cylinder	57
	ripas palletizing system	58
	HSK / ripas clamping systems, morse taper inserts	59
	AM-LOCK	60
	Faceplates (axial discs), 3-jaw chuck	61
	SCHUNK TANDEM power clamping blocks	62
	SCHUNK VERO-S zero-point clamping system	63
	GRESSEL gredoc / clamping devices	64
	LANG zero-point clamping system	65
	EROWA palletizing systems	66
	System 3R palletizing systems	67
	PAROTEC palletizing systems	68
	STARK palletizing systems	69
	AMF palletizing systems / YERLY precision clamping systems	70
	Evard centering vice	71
	SCHAUBLIN collet clamping, type B	72
	SCHAUBLIN collet clamping, type W	73
	SCHAUBLIN collet clamping, type F and ER	74
	OTTET collet clamping	75
	RÖHM face driver	76
	RÖHM revolving centers	77
	PiranhaClamp	78
	TRIAG	79
	TGColin / clamping system	80
	F-Tool palletizing systems	81
	HAINBUCH	82
	Vischer & Bolli	86
	reinmechanic – vacuum - mobile	88

Overview & Facts
System & iBox
Rotary tables
KAB, CNC, WMS
AGG, DDF, RST, LOZ
Service & Technology
Workpiece clamping system

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

Overview & Facts
System & iBox
Rotary tables
KAB, CNC, WMS
AGG, DDF, RST, LOZ
Service & Technology
Workpiece clamping system





Overview & Facts

System & iBox

Rotary tables

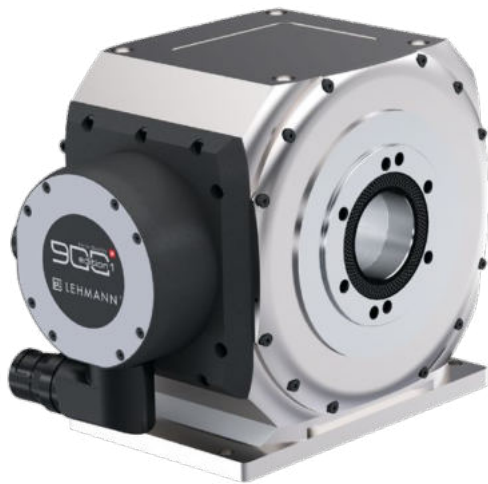
KAB, CNC, WMS

AGG, DDF, RST, LOZ

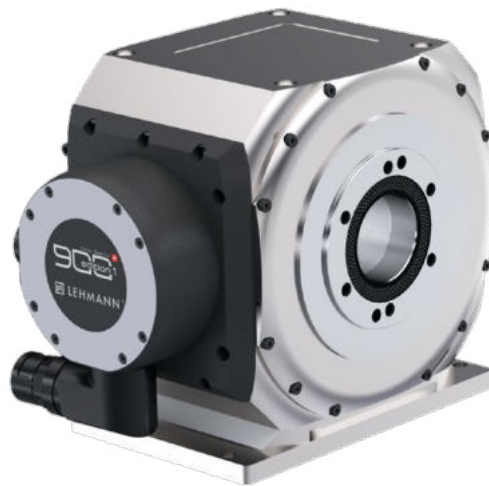
Service & Technology

Workpiece clamping system

A multitude of accessories adaptable thanks to standardized interface



SPI.91x-d80



SPI.91x-KK5

Item no.	Designation	Dimensions
SPI.91x-d80	Spindle adapter	Outer diameter 80 mm
SPI.91x-KK5	Spindle adapter bigBore with KK5	

Workpiece clamping system

Service & Technology

AGG, DDF, RST, LOZ

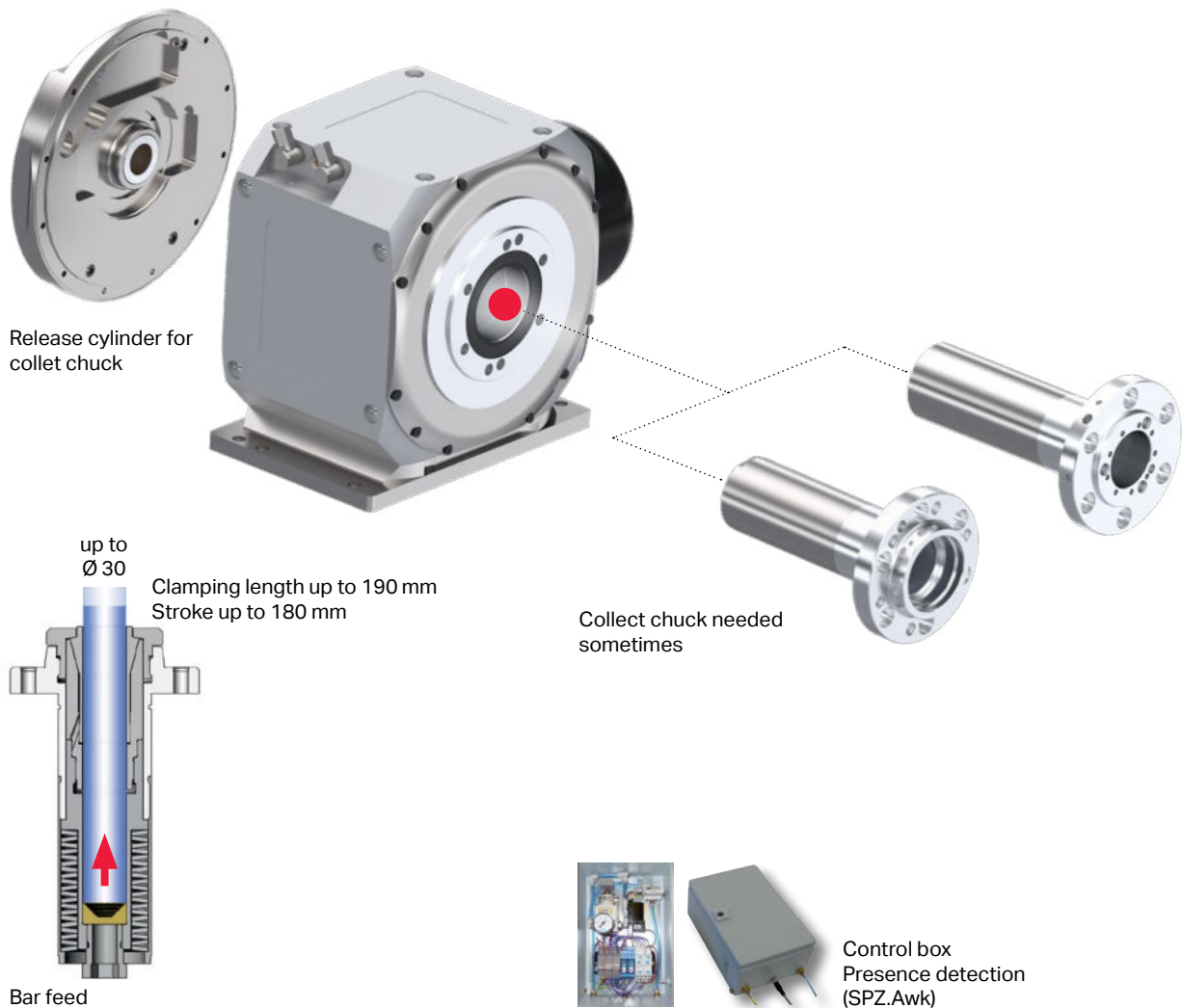
KAB, CNC, WMS

Rotary tables

System & iBox

Overview & Facts

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



Item no.	Designation	Dimensions	can be retrofitted
SPZ.91x-s3	Collet chuck d80 incl. release cylinder	pushing, stroke: 3.0 mm	
SPZ.91x-s9	Collet chuck d80 incl. release cylinder	pushing, stroke: 9.0 mm	
SPZ.91x-s9d30	Collet chuck KK5 incl. release cylinder	pushing, stroke: 9.0 mm, effective passage increased Ø 30 mm	
SPZ.91x-z3	Collet chuck d80 incl. release cylinder	pulling, stroke: 3.0 mm, M24x1.5	
SPZ.91x-z9	Collet chuck d80, incl. release cylinder	pulling, stroke: 9.0 mm, M24x1.5	
SPZ.91x-Stange	Bar feed ø30, stroke 140 mm	fits SPZ.91x-s9d30	•
SPZ.91x-Stange28	Bar feed ø28, stroke 180 mm	fits SPZ.91x-s9d30	•

collet chucks for EA-918 require option SPZ.918-ada

Options for all sizes

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

cannot be combined with bar feed

Overview &
Facts

System &
iBox

Rotary tables

KAB, CNC, WMIS

AGG, DDF,
RST, LOZ

Service &
Technology

Workpiece
clamping system

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.

The function

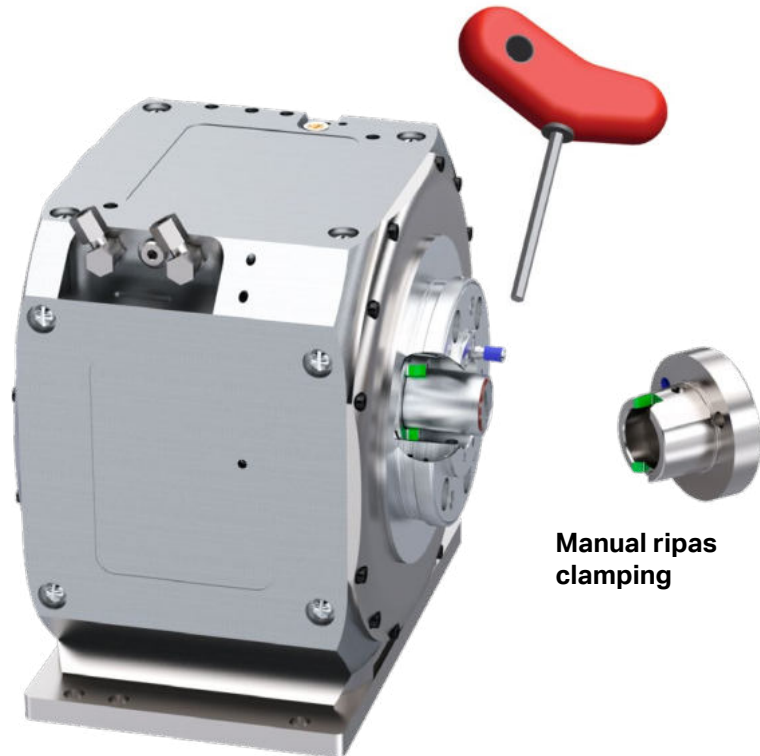
ripas has 3 functions:

- **A** Anti-twist protection
- **B** Rough positioning
- **C** Precision positioning

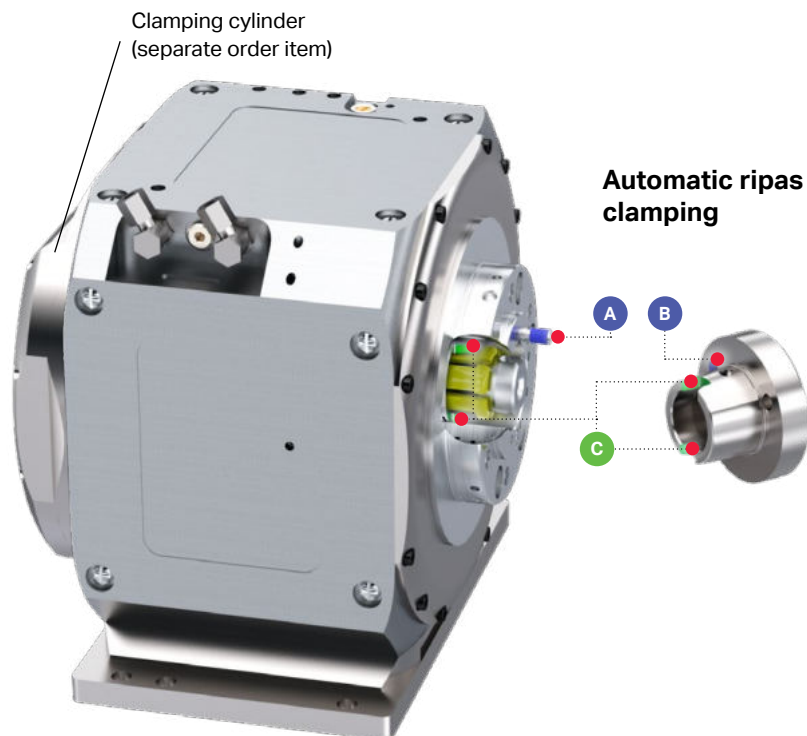
Process

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**.



Manual ripas clamping

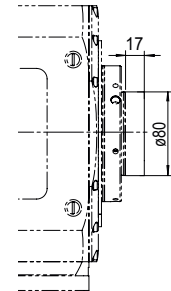


Automatic ripas clamping

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
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)
Perm. tension, max.	kN		-	10 at 50 bar 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

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

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 (see p. 57)

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

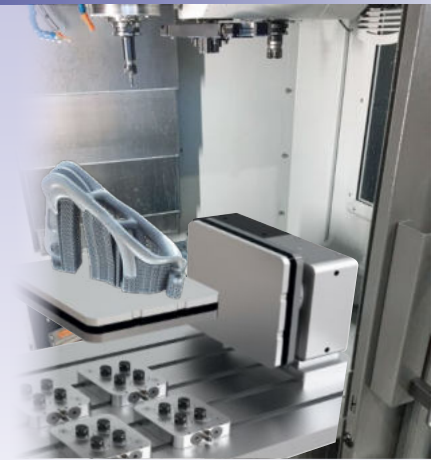
Tooling for individual finish machining / finishing



Jumbo pallet 30x30 on centered chuck for easy machining



Jumbo pallet 30x30 on 4 chucks - clamped



QUATTRO chuck

Connection for location check/cleaning

Manual clamping: 180° turn suffices

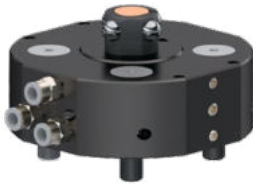
Compressed air connection for clamping (continuous pressure or pulsed). Mechanically locked in the event of pressure drop (safety).



Dimensions: 150 x 150 x 34 mm (L x W x H)

6 bolts (M10) for fastening to the machine table, 100 or 50 mm pattern

UNO chuck



UNO chuck Ø 100 with 4 fastening holes (M8) in a 50 mm spacing

6 benefits (applies to QUATTRO and UNO)

- only 34 mm high
- manual and pneumatic in one
- easy to clean
- pressureless clamping
- easy mounting
- maintenance-free

Technical data

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

all values tentative data

Item no.

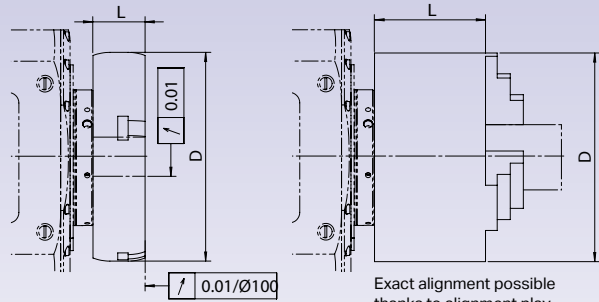
Item no.	Designation	Dimensions	Weight [kg]	max. speed [rpm]
AML.SPF-U	UNO chuck	Ø50x34 mm, 1 pin	2	on request
AML.SPF-Q	QUATTRO chuck	150x150x34 mm, 4 pins	5	



for more information, see AM-LOCK brochure

Clamped quickly and easily

Quickly converted for small series and express work



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 [kgm ²]
91x TPL.91x-250	Faceplate, 8 T-slots 14 mm	250	45	45	42.1	17	*	0.14
TPL.91x-300**	Faceplate, 8 T-slots 14 mm	300	50	45	47.1	27	*	0.31
TPL.91x-350**	Faceplate, 8 T-slots 14 mm	350	50	45	47.1	37	*	0.58
TPL.5xx-GEN	Increased accuracy = ½ tolerance values							
TPL.mon	Faceplate assembled and measured							

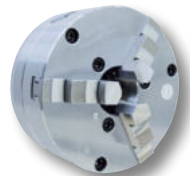
* = TPL without assembly permits full speed, assembly to be performed by client
 ** Increased center height required



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 [mm]	Weight [kg]	max. speed [rpm]	Moment of inertia J [kgm ²]	Moment of inertia J [kgm ²]
91x BFU.91x-160ps	Scroll chuck	160		42	85	13		0.04	520-160ps
BFU.91x-200ps	Scroll chuck	200		55	95	23		0.12	520-200ps
BFU.91x-250ps	Scroll chuck	250		76	106	39		0.31	520-250ps
BFU.5xx-GEN	Increased accuracy = ½ tolerance values								



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

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 [mm]	Weight [kg]	max. speed [rpm]	Moment of inertia J [kgm ²]	Moment of inertia J [kgm ²]
91x BFU.91x-160ks	Wedge bar chuck	160		46	70	11		0.04	520-160ks
BFU.91x-200ks	Wedge bar chuck	210		60	92	22		0.11	520-200ks
BFU.91x-250ks	Wedge bar chuck	260		81	110	38		0.30	520-250ks
BFU.5xx-GEN	Increased accuracy = ½ tolerance values								



Further information:
www.smw-autoblok.de and www.niederhauser.ch
 Request installation and operating instructions directly from manufacturer

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



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

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

	pL LEHMANN Item no.	Designation	Size [mm]	L from spindle (without jaws) [mm]	Pneumatic	Manual	Centered	Fixed jaw	Jaw stroke [mm]	Clamping force [kN] *	Max. pressure [bar]	Max. torque [Nm]	Max. range with standard jaws ** [mm]	Weight [kg]	Max. speed *** [rpm]	Required rotary union ***	SCHUNK catalog reference	SCHUNK Item no. incl. adapter flange
d80	SCH.510-KSP64	KSP-Z plus 64	64 x 64	65.7	•			•	2	4.5	9		40	100	DDF.91x-04-d80	0405102	40105124	
	SCH.510-KSP100	KSP-Z plus 100	100 x 100	80.2	•	•		•	2	18	9		70	100	DDF.91x-04-d80	0405202	40106193	
	SCH.510-KSP100LH	KSP-LH-Z plus 100	100 x 100	80.2	•			•	6	8	9		70	100	DDF.91x-04-d80	0405222	40106253	
	SCH.510-KSP100F	KSP-F-Z plus 100	100 x 100	80.2	•			•	4	18	9		70	100	DDF.91x-04-d80	0405212	40106195	
	SCH.510-KSA100	KSA-Z plus 100	100 x 100	85.2		•	•		2	18	9	8	70	100			0405291	40106194
	SCH.510-KSA100LH	KSA-LH-Z plus 100	100 x 100	85.2		•	•		6	18	9	20	70	100			0405295	40106196
	SCH.510-KSA100F	KSA-F-Z plus 100	100 x 100	85.2		•	•	•	4	18	9	8	70	100			0405293	40106197
	SCH.510-KSP160	KSP-Z plus 160	160 x 160	102.7	•		•		3	45	9		120	15.80	100	DDF.91x-04-d80	0405302	40101546
	SCH.510-KSP160LH	KSP-LH-Z plus 160	160 x 160	102.7	•		•		8	20	9		120	16.00	100	DDF.91x-04-d80	0405322	40101547
	SCH.510-KSP160F	KSP-F-Z plus 160	160 x 160	102.7	•		•		6	45	9		120	15.80	100	DDF.91x-04-d80	0405312	40101548
KK5	SCH.510-KSA160	KSA-Z plus 160	160 x 160	107.7		•	•		3	45	9	10	120	15.80	100		0405391	40101549
	SCH.510-KSA160LH	KSA-LH-Z plus 160	160 x 160	107.7		•	•		8	45	9	25	120	15.80	100		0405395	40101550
	SCH.510-KSA160F	KSA-F-Z plus 160	160 x 160	107.7		•	•	•	6	45	9	10	120	15.80	100		0405393	40101551
	SCH.520-KSP250	KSP-Z plus 250	250 x 250	128.2	•		•		5	55	6		170	50.00	100	DDF.91x-04-KK5	0405502	40101552
	SCH.520-KSP250LH	KSP-LH-Z plus 250	250 x 250	128.2	•		•		15	20	6		170	50.00	100	DDF.91x-04-KK5	0405522	40101553
	SCH.520-KSP250F	KSP-F-Z plus 250	250 x 250	128.2	•		•	•	10	55	6		170	50.00	100	DDF.91x-04-KK5	0405512	40101554

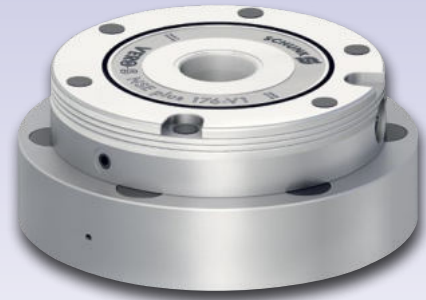
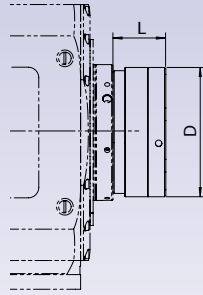
* at max. pressure and / or max. torque
** with standard jaws KTR 64 / 100 / 160 / 250 (processing must be carried out by the customer)
*** see p. 25, matching spindle adapter (p. 56) included in order item
**** only indexing allowed



KSPZ plus 250 on EA-91x



SCHUNK-clamping unit on SCHUNK VERO-S (p. 63)



Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

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

	pL LEHMANN Item no.	Designation non-rusting	Pneumatic 6 bar Turbo function non-rusting	D [mm]	L from spindle [mm]	Draw-in force [kN]	Increased draw-in force with turbo function [kN]	Max. retention force [kN]	Weight [kg]	Max. speed ** [rpm]	Open Anti-twist protection	Required rotary union*	SCHUNK catalog reference	SCHUNK item no. incl. adapter flange
d80	SCH.510-90ix	VERO-S NSE mini 90-V1	• • •	ø90	35	0.5	15	25		100	• •	DDF.91x-04-d80	0435105	40105125
KK5	SCH.520-138ix	VERO-S NSE3 138-V1	• • •	ø138	79	7.5	28	75		100	• •	DDF.91x-04-KK5	1313723	40105132
	SCH.520-176ix	VERO-S NSE plus 176-V1	• • •	ø176	90	9	40	75	12.00	100	• •	DDF.91x-04-KK5	0471096	40101346

* see p. 25, matching spindle adapter (p. 56) included in order item
** only indexing allowed

Increased accuracy = 1/2 tolerance values; Item no. NPS.5xx-GEN

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



NSE plus 90-V1

Empty chuck

Centric clamping unit KSA plus 100

NSE3 138-V1

Empty chuck

Diaphragm chuck

ROTA-S plus

Centric clamping unit KSC 65

Centric clamping unit KSC 125

Centric clamping unit KSO 100

Centric clamping unit KSK 65

NSE plus 176-V1

Empty chuck

Overview & Facts

System & iBox

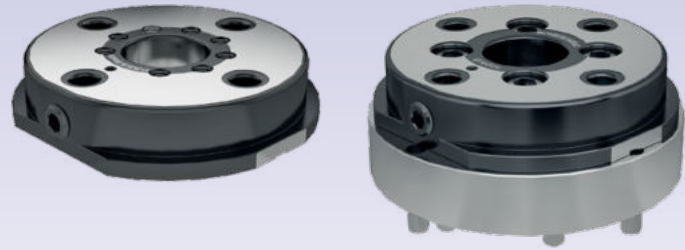
Rotary tables

KAB, CNC, WMIS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



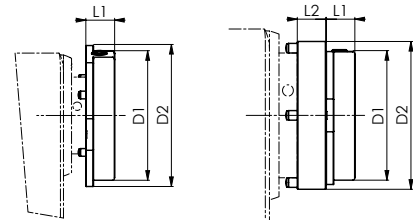
* Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

Further information: 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
KK5 GRE.520-GRU*	gredoc round	•	ø135	154	30	30	6.4		SPI.91x-KK5	NGS.010.007.01

Technical data	Unit	Dimensions
Mechanical system		Yes
Repeat accuracy	(mm)	< 0.01
Draw-in 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]	Workpiece weight (perm.) [kg]	Weight [kg]	max. speed [rpm]	GRESSEL catalog reference	Base body required
GRE.SOL-40	solinos 40-4V-IT	•	148 x 135 x 135	198		8			KLM.040.020.01	GRE.5xx-GRU
GRE.SOL-65	solinos 65-4V-IT	•	193 x 164 x 164	243		18.5			KLM.065.020.01	
GRE.C165-grip	C1 65 grip	•	178 x 65 x 67	117		2.9			CGM.065.001.01	
GRE.C165-präz	C1 65 precision	•	178 x 65 x 67	117		2.9			CGM.065.002.01	
GRE.C280-grip	C2 80 with reversible jaw grip	•	157 x 80 x 78	128		4			CGM.080.001.01	
GRE.C2125-grip	C2 125 L-160 with reversible jaw grip	•	208 x 125 x 83	133		8.7			CGM.125.001.01	
GRE.SPZ	gredoc collect chuck	•	ø148 x 47.5	97.5	ø148	1.5			NGS.010.030.01	
GRE.LP	empty pallet	•	ø148 x 30	80	ø148	2.0			NGA.000.002.01	
GRE.LRP	Pallet with hole grid	•	ø148 x 30	80	ø148	2.0			NGA.000.003.01	
GRE.AB	Mounting pin, incl. fastening screw	•	ø40			0.1			NGA.000.001.01	

All items must be ordered separately! (Example of Lehmann EA-507: NGS.010.015.01 + CGM.080.001.01 + NGA.000.001.01)

Possible applications

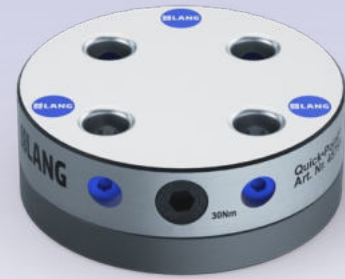
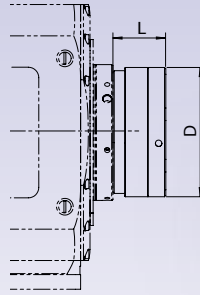




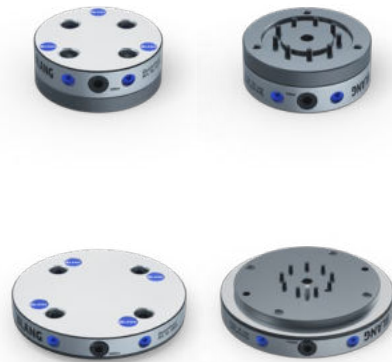
einfach. zukunft. greifen.

** Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

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



LANG zero point clamping system

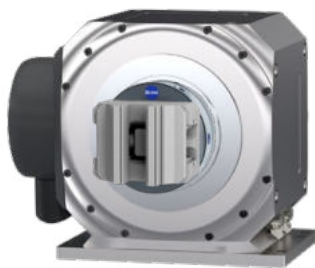


pL LEHMANN item no.	LAN.5xx-QP52**
Designation	Quick-Point® 52 incl. adapter flange
Dimensions	D x L Ø 116 x 43 mm
Weight [kg]	3.60
max. speed [rpm]	400
suitable for LEHMANN spindle adapter	SPI.91x-d80
suitable for LANG 5-axis vices*	48085-46 / 48085-77 / 48120-46 / 48120-77 / 48160-77
LANG item no.	45751-1000

pL LEHMANN item no.	LAN.5xx-QP96**
Designation	Quick-Point® 96 incl. adapter flange
Dimensions	D x L Ø 196 x 37 mm
Weight [kg]	
max. speed [rpm]	
suitable for LEHMANN spindle adapter	SPI.91x-d80
suitable for LANG 5-axis vices*	48155-77 / 48155-125
LANG item no.	45820-1000

* The maximum length of the vice base body depends on the rotary axis type.
Longer vice variants may be possible. Please inquire.

Vices suitable for the LANG zero point clamping system



Example of application
Makro-Grip® 77 with Quick-Point® 52 on
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	pL LEHMANN Item no. LAN.5xx-QP52
LAN.MG77-S85	Makro-Grip® 77, length 102 mm Jaw width 77 mm	0 – 85	2.30	400	48085-77	or
LAN.MG77-S120	Makro-Grip® 77, length 130 mm Jaw width 77 mm	0 – 120	2.90	400	48120-77	LANG Item no. 45751-1000
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-QP96
LAN.MG125-S155	Makro-Grip® 125, length 160 mm Jaw width 125 mm	0 – 155	8.40	400	48155-125	or LANG Item no. 45820-1000

All LANG vices 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.

Overview & Facts

System & iBox

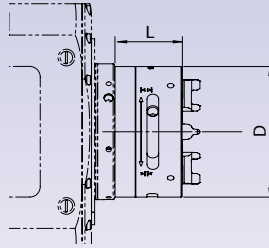
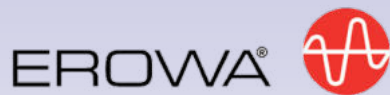
Rotary tables

KAB, CNC, WMIS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

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

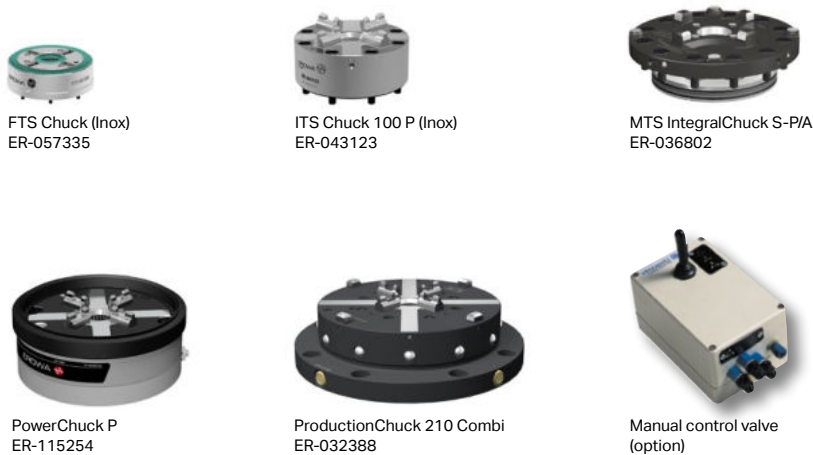
	pL LEHMANN Item no.	Designation (incl. flange)	Manual	Pneumatic	D [mm]	L from spindle [mm]	Pallet sizes [mm]	Workpiece weight (perm.) [kg]	Weight [kg]	Max. speed [rpm]	Open	Clean Z-support	Rotary union	Chuck weight (incl. adapter flange) [kg]	EROWA Catalog Reference	EROWA Item no. incl. adapter flange
d80	ERO.5xx-FTS ix	FTS Chuck (Inox)	•		ø74	46.5	ø72	4	1.50	4,000	•	•	1)	1.5	ER-057335	ER-073469
	ERO.5xx-QC ix	QuickChuck 100 P (Inox)	•		ø100	50	□50/ø148	35	2.60	3,000				2.6	ER-036345	ER-073351
	ERO.5xx-ITS 100ix	ITS Chuck 100 P (Inox)	•		ø100	50	□50/ø148	35	2.50	5,000	•	•	1)	2.5	ER-043123	ER-073433
	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
	ERO.520-P210	ProductionChuck 210	•		ø81/ø210	98	ø210	120	16.60	4,500	•	•	2)	16.6	ER-032964	ER-073461
	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

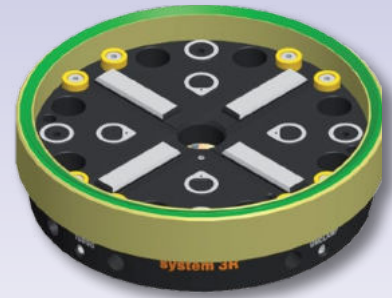
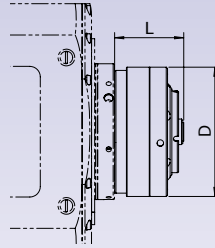
for all automatic chucks		
ERO.HSV	Manual control valve	supplied loose with all necessary cables and hoses, ready to connect
ERO.ASV-2	Automatic control valve	supplied loose, for installation in the control cabinet, with all necessary cables/hoses

Additionally required rotary union (see p. 25):
1) = DDF.91x-04-d80, 2) = DDF.91x-04-KK5

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.



system 3R



Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

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

	pL LEHMANN Item no.	Designation (incl. flange)	Pneumatic	D [mm]	L from spindle [mm]	Pallet sizes [mm]	Workpiece weight (perm.) [kg]	Weight [kg]	Max. speed [rpm]	Open	Clean Z-support	Clean cams	incr. clamp force/venting	Rotary union	SYSTEM 3R Catalog Reference	SYSTEM 3R item no. incl. adapter flange
d80	S3R.5xx-G70	3R GPS 70	•	ø99	56	ø70	10	2.70	5,450	•	•			1)	C198700	X663000
	S3R.510-MGC*	3R Magnum Chuck	•	ø162	60	ø156, with index pin	100	7.70	5,450	•	•	•	1)	3R-SP26712	90940.12	
	S3R.510-MCC	3R Macro Chuck	•	ø100	63	54x54, 70x70	10	3.50	5,450	•	•	•	1)	3R-600.14-30	90940.11	
KK5	S3R.520-G120	3R GPS 120	•	ø118	70	ø120	20	5.00	5,450	•	•			2)	C188770	X663020
	S3R.520-G240	3R GPS 240	•	240x240	84	240x240	100	20.70	1,500	•	•	•	2)	C219200	X663030	
	S3R.520-G240ix	3R GPS 240, rust-resistant	•	240x240	84	240x240	100	21.00	1,500	•	•	•	2)	X607620	X663040	
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. 25):
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



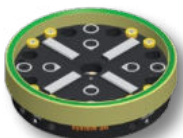
GPS 70



GPS 120



Macro



Macro Magnum



GPS 240

Overview & Facts

System & iBox

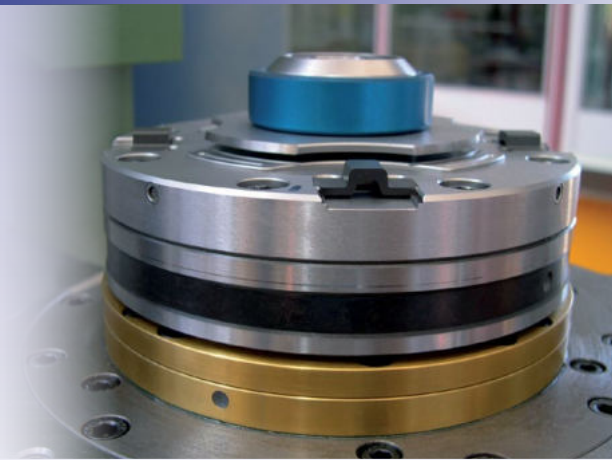
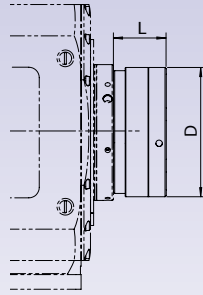
Rotary tables

KAB, CNC, WMIS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

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

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

	pL LEHMANN Item no.	PAROTEC catalog reference	Manual	Pneumatic	Hydraulic	D (mm)	L from spindle (mm)	Pallet sizes (mm)	Workpiece weight (perm.) (kg)	Weight (kg)	Max. speed (rpm)	Open (bar)	Clean Z-support	With re-tightening	Required rotary union*	PAROTEC Item no. incl. adapter flange
d80	PAR.5xx-PGmp6	POWER GRIP 160	●			ø145	56	□158	50			6				PT 1160102710
	PAR.5xx-PGp6	POWER GRIP 160		●		ø145	56	□158	50			6	●	●	DDF.91x-04-d80	PT 1160142710
	PAR.5xx-PYmp130	POLY GRIP	●			ø130	55	ø70-148	30			6		○		PT9911020710
	PAR.5xx-PYp110	POLY GRIP		●		ø110	55	ø70-148	50			6	●	●	DDF.91x-04-d80	PT9911320710
	PAR.5xx-DGp142	DEFO GRIP 100		●		ø142	55	ø100-148	20			6	●	●	DDF.91x-04-d80	PT6101032710

* see p. 25, matching spindle adapter (p. 56) included in order item

○ = optional

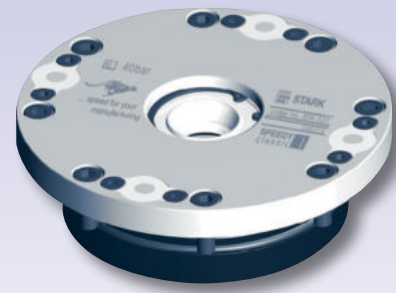
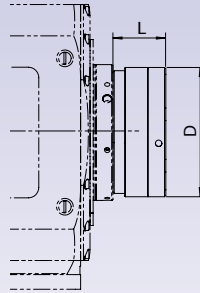
Increased accuracy = ½ tolerance values; Item no. NPS.5xx-GEN

Technical data	Unit	POWER GRIP	POLY GRIP	DEFO GRIP
Repeat accuracy	(mm)	+/- 0.002	+/- 0.002	+/- 0.005
Retention force without re-tightening	(kN)	17*	7	0.75
Retention force with re-tightening	(kN)	30*	12	1.2

* For POWER GRIP 160-2 and 160-4 = Value x2 and x4, resp.



ROEMHELD
HILMA ■ STARK



Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

Further information: www.stark-inc.com
Request installation and operating instructions directly from manufacturer

Increased accuracy = 1/2 tolerance values; Item no. NPS.5xx-GEN

pL LEHMANN Item no.	Designation	Hydraulic	D [mm]	L from spindle [mm]	Max. pull-out torque [Nm]	Open [bar]	Weight [kg]	Max. speed [rpm]	Suspension mechanism	Manual loading	Can be automated	X-Y-Z positioning/clean support	Z-contact check	Clamping check	Integrated media passage	Increased clamping force	Required rotary union*	STARK catalog reference	STARK item no. incl. adapter flange
d80	STA.510-01	•	ø250	60	1740	40			•	•							-	804 331	SL1-63-0-0-2-01
	STA.510-02	•	ø250	60	2620	80			•	•						•	-	804 348	SL1-63-0-0-3-01
	STA.510-03	•	ø250	60	1740	40			•	•					•	DDF.91x-04-d80	804 331	SL1-63-0-1-2-01	
	STA.510-04	•	ø250	60	2620	80			•	•					•	DDF.91x-04-d80	804 348	SL1-63-0-1-3-01	
	STA.510-05	•	ø250	60	1740	40			•	•				•	DDF.91x-04-d80	804 331	SL1-63-1-1-2-01		
	STA.510-06	•	ø250	60	2620	80			•	•				•	DDF.91x-04-d80	804 348	SL1-63-1-1-3-01		
	STA.510-21	•	ø250	63	1740	40			•	•	•	•			•	DDF.91x-04-d80	804 500	SL1-63-0-1-2-11	
	STA.510-22	•	ø250	63	2620	80			•	•	•	•			•	DDF.91x-04-d80	804 501	SL1-63-0-1-3-11	
	STA.510-23	•	ø250	63	1740	40			•	•	•	•			•	DDF.91x-04-d80	804 500	SL1-63-1-1-2-11	
	STA.510-24	•	ø250	63	2620	80			•	•	•	•			•	DDF.91x-04-d80	804 501	SL1-63-1-1-3-11	

* see p. 25, matching spindle adapter (p. 56) included in order item

Note permissible pull-out torque (use counter bearing if necessary)

Version 20 kN			Version 30 kN		
Distance [mm]	Force [kN]	Weight [kg]	Distance [mm]	Force [kN]	Weight [kg]
200	8.8	897	200	13.1	1335
300	5.9	601	300	8.8	897
400	4.4	449	400	6.6	673
500	3.5	357	500	5.3	540
600	2.9	296	600	4.4	449



915

Overview & Facts

System & iBox

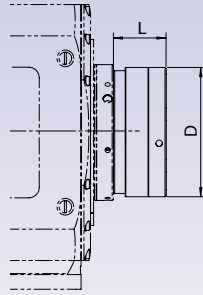
Rotary tables

KAB, CNC, WMIS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



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

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

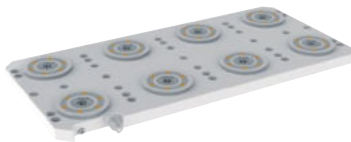
AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

	pL LEHMANN Item no.	Designation	Pneumatic, 5 bar Hydraulic, 50 bar	D [mm]	L from spindle [mm]	Weight [kg]	Max. speed [rpm]	Draw-in and closing force up to	Retention force	Indexing	Contact check	Required rotary union*	AMF catalog reference	AMF item no. incl. adapter flange
d80	AMF.510-6206-S1	6206ILA-10	•	ø112	47			10 kN	25 kN	•	•	DDF.91x-04-d80	428771	533216
KK5	AMF.520-6206-S1	6206ILA-20	•	ø138	90			17 kN	55 kN	•	•	DDF.91x-04-KK5	428797	533232

* see p. 25, matching spindle adapter (p. 56) included in order item



AMF zero point clamping system

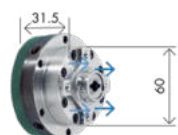


Further information: <http://fr.yerlymecanique.ch/>
Request installation and operating instructions directly from manufacturer

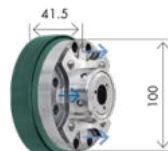
	pL LEHMANN Item no.	Designation	Pneumatic	D [mm]	L from spindle [mm]	Workpiece size, approx. [mm]	Weight [kg]	max. speed [rpm]	Required spindle adapter	Required rotary union**	YERLY Catalog Reference	YERLY item no. incl. adapter flange
d80	YER.510-060P-*	YERLY* NPS 60	•	60	85	0.1...60				DDF.91x-04-d80	MD-60-*	YER.510-60P-*JT
	YER.510-100P-*	YERLY* NPS 100	•	100	108	0.1...100				DDF.91x-04-d80	MD-100-*	YER.510-100P-*TI
	YER.510-100M-*	YERLY* NPS 100	•	100	85	0.1...100			SPI.91x-d80		MD-100-*	YER.510-100M-*TI

* 2 = 2-jaw chuck, 3 = 3-jaw chuck, 4 = 4-jaw chuck
** see p. 25, matching spindle adapter (p. 56) included in order item

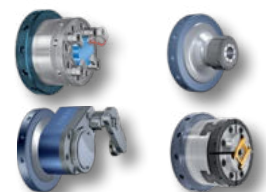
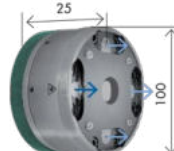
Yerly Basis 60P



Yerly Basis 100P



Yerly Basis 100M



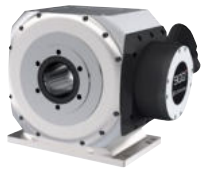
Examples of YERLY chuck attachments. Can be adapted to any chuck type



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

Centering vice – Type CM

pL LEHMANN Item no.	Designation	Size	Clamping capacity [mm]	Weight [kg]	Required accessories	Evard Item no.
EVA.2020	CM centering vice	20	25	0.220	adapter flange	2020
EVA.2021	Inox CM centering vice	20	25	0.220	adapter flange	2021
EVA.5000	CM centering vice	50	89	2.3	adapter flange	5000
EVA.8000	CM centering vice	80	137	6.45	adapter flange	8000
EVA.1050	CM centering vice	105	178	15.5	adapter flange	1050



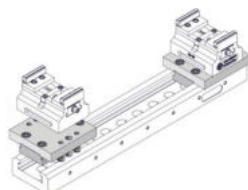
Combine the EA-91x rotary table with the CM 20 centering vice and split the μ's.

Jaws

	pL LEHMANN Item no.	Designation	Size [mm]	Weight [kg]	Required accessories	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

Adapter plate for CM 50 on Polymut

pL LEHMANN Item no.	Designation	Size of the CM [mm]	Size of the Polymut [mm]	Required accessories	Evard Item no.
EVA.500054	Adapter plate for CM 50 on Polymut 80	50	80	See Monoblock tower	500054
EVA.500057	Adapter plate for CM 50 on Polymut 50	50	50	See Monoblock tower	500057



Overview & Facts

System & iBox

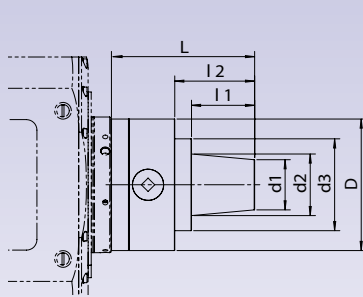
Rotary tables

KAB, CNC, WMIS

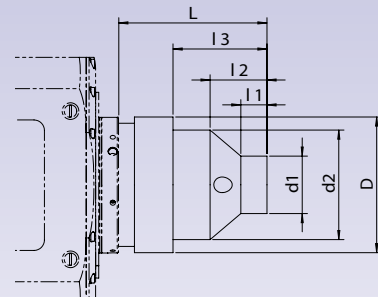
AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



Mounting chuck, manual



Mounting chuck, automatic Type B axfix

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

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

pL LEHMANN Item no.	Designation	System	axfix	Manual	Power-actuated	L [mm]	l1 [mm]	l2 [mm]	l3 [mm]	D [mm]	d1 [mm]	d2 [mm]	d3 [mm]	Weight [kg]	max. speed [rpm]	For required options see p. 56/57	Niederhauser item no. incl. adapter flange
d80 ZSP.510-B32Aka	Mounting chuck	B32	•	•	•	135	25	54.5	90	130	55	105				SPZ.91x-z3	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

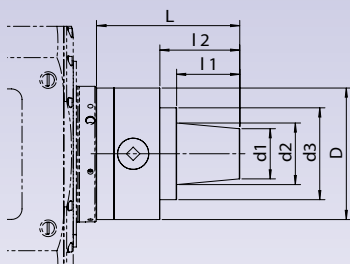


with pointed B32 collet

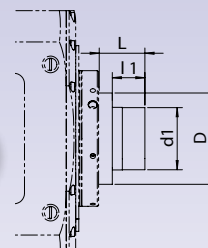


with standard B32 collet





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. 56/57	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
	ZSP.520-W25Am	Mounting chuck	W25	•		151	60	76	130	48	59	88			SPI.91x-KK5	520-W25
	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	
	ZSP.91x-W25k	with HSK application	W25		•	39	15		130	47.5					SPZ.91x-z3	
	ZSP.91x-W31k	with HSK application	W31.75		•	39	15		130	47.5					SPZ.91x-z3	

Collet adapters (Type W) pL LEHMANN®



W20



W25



W31.75 (5C)

Collet holder W25



with standard W25 collet

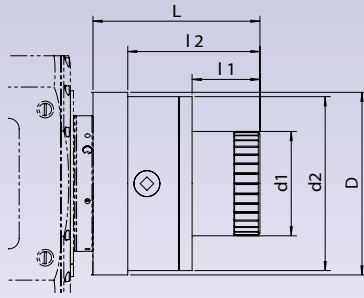


Further information:
www.ki-mech.ch
Request installation and
operating instructions
directly from manufacturer

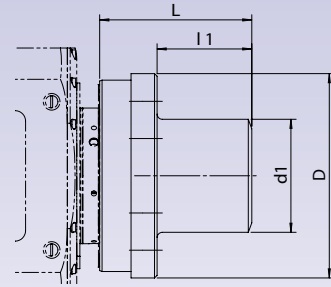
- Rugged and slim design for better accessibility
- Radial run-out < 0.005 mm

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



Mounting chuck, manual Type F



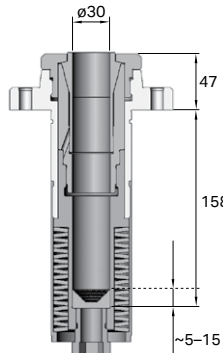
Mounting chuck, hydraulic Type F

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

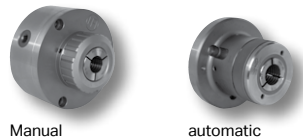
Collet clamping Type F

	pL LEHMANN Item no.	Designation	Manual	Pneumatic	Hydraulic	System	Clamping capacity [mm]	L [mm]	L1 [mm]	D [mm]	d1 [mm]	Weight [kg]	max. speed [rpm]	For required options see p. 56/57	Niederhauser item no. incl. adapter flange
d80	ZSP.510-F35Am	Mounting chuck	•			F35	1...30	129	40	160	90			SPI.91x-d80	510-F35
	ZSP.510-F35Ak	Mount. chuck, power-actuated			•	F35	1...30	1144	73.4	112	85			SPZ.91x-z9	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							SPZ.91x-s9d30	

* available with bar feed, see p. 57



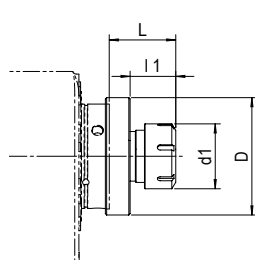
Schaublin F35 Clamping system



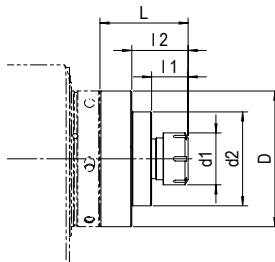
Manual automatic

Collect clamping Type ER

	pL LEHMANN Item no.	Designation	Manual	System	Clamping capacity [mm]	L [mm]	L1 [mm]	L2 [mm]	D [mm]	d1 [mm]	d2 [mm]	Weight [kg]	max. speed [rpm]	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
	ZSP.520-E32Am	Mounting chuck	•	ER-32	1...22	88	38	50	130	50	90			520-ER32
	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

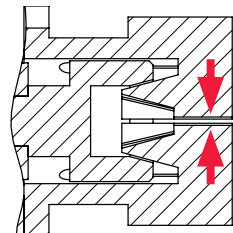


OTTET collet clamping

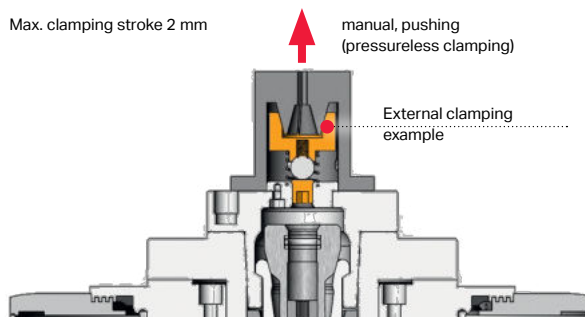
pL LEHMANN Item no.	Designation	Max. speed [rpm]	Required palletizing system ripas and clamping cylinder*
ZSP.91x-OTk	With HSK adapter, power-actuated		RIP.91x-63m-OT and SPZ.91x-s3 required
ZSP.91x-OTm	With HSK adapter, manual		RIP.91x-63p and SPZ.91x-z9 required

* see p. 58/59

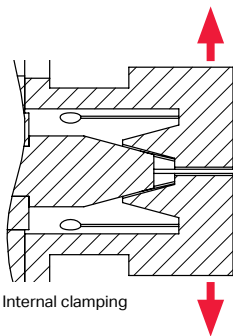
The collet chuck with clamping piston inside is suitable for internal and external clamping, pneumatically actuated.



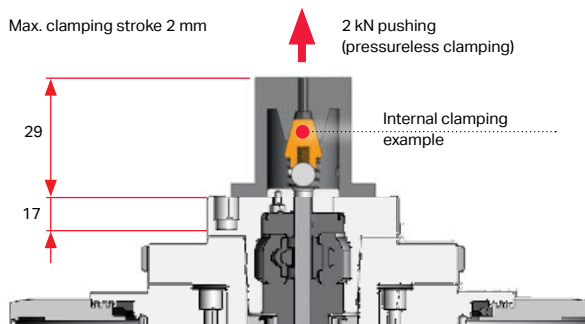
External clamping



ripas automatic (or manual), OTTET manual



Internal clamping



ripas manual (automatic not possible), OTTET automatic



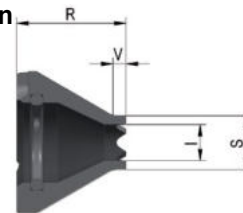
Further information: www.roehm.biz
Request installation and operating instructions directly from manufacturer

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

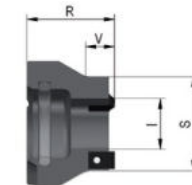
pL LEHMANN Item no.	Designation	Overhang [mm]	Max. workpiece weight [kg]	Max. axial load [kN]	Weight [kg]	Max. speed [rpm]	Required spindle adapter	RÖHM Item no., incl. adapter flange
d80 RÖH.510-SM	Face driver	65	100	20			SPL91x-d80	1340450

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

pL LEHMANN Item no.	Designation	S Clamping circle Ø	Associated center Ø	R Overhang [mm]	I [mm]	V [mm]	Weight [kg]	RÖHM Item no.
RÖH.MS-DV08	Driver plate	8	4	38	4.5	4		1209000
RÖH.MS-DV10	Driver plate	10	4	38	4.5	4		1209001
RÖH.MS-DV12	Driver plate	12	6	36	7	4		1209002
RÖH.MS-DV16	Driver plate	16	10	33	11	4		1209003
RÖH.MS-DV20	Driver plate	20	12	30	13	4		1209004
RÖH.MS-DV25	Driver plate	25	16	30	17	8		1209005
RÖH.MS-DV32	Driver plate	32	16	30	22	10		1209006
RÖH.MS-HM20	Driver plate	20	6	30	7	8		1209007
RÖH.MS-HM25	Driver plate	25	10	30	11	8		1209008
RÖH.MS-HM32	Driver plate	32	16	30	17.5	10		1209009
RÖH.MS-HM40	Driver plate	40	16	30	27	16		1209010
RÖH.MS-HM50	Driver plate	50	16	30	36			1209011
RÖH.MS-HM63	Driver plate	63	16	30	49			1209012
RÖH.MS-HM80	Driver plate	80	16	30	66			1209013



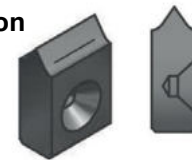
Driver plate, directly geared 1209000



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

Accessories: Metal carbide driver plates, clockwise and counterclockwise rotation

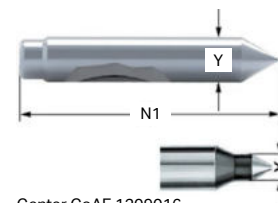
pL LEHMANN Item no.	Designation	Clamping circle Ø	Size	Weight [kg]	RÖHM Item no.
RÖH.HMP-20	Metal carbide plate	20-32	6 x 3.2		88970
RÖH.HMP-40	Metal carbide plate	40-80	9.5 x 3.2		87931



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		1209016
RÖH.ZS-12	Center	12	6	90		1209017
RÖH.ZS-16	Center	16	10	90		1209018
RÖH.ZS-20	Center	20	12	90		1209019
RÖH.ZS-25	Center	25-80	16	90		1209020



Center CoAE 1209016

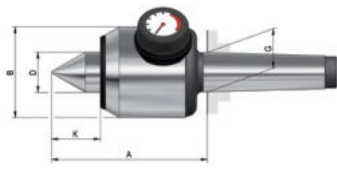
Overview & Facts
System & iBox
Rotary tables
KAB, CNC, WMS
AGG, DDF, RST, LOZ
Service & Technology
Workpiece clamping system



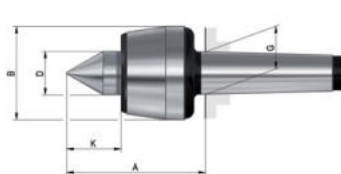
Further information: www.roehm.biz
Request installation and operating instructions directly from manufacturer

Revolving centers

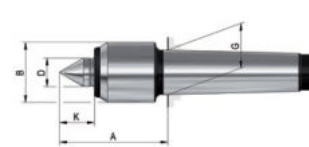
	pL LEHMANN Item no.	Designation	Mount MK	Max. run-out deviation [mm]	Max. workpiece weight [kg]	Max. radial load [daN]	Max. speed [rpm]	D Moving-tip Ø [mm]	B Housing Ø [mm]	A [mm]	G [mm]	K [mm]	Weight [kg]	RÖHM Item no.
Tailstock options / accessories	RÖH.ZS-DAMK3	with pressure display and length compensation; 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



Mikó 60798



Mikó 43115 / 42315



Mikó 5336 / 5429

Overview & Facts

System & iBox

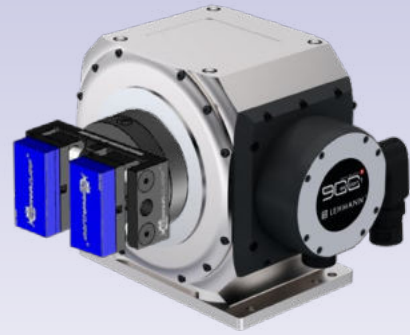
Rotary tables

KAB, CNC, WMIS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



Further information: www.piranha-clamp.ch
Request installation and operating instructions directly from manufacturer

Zero-point clamping plates on rotary table

pL LEHMANN Item no.	Designation	Dimensions [mm]	Weight [kg]	Max. speed [rpm]	Required spindle adapter	PiranhaClamp catalog reference	PiranhaClamp item no., incl. HSK adapter
d80	Flange 510	Ø 130 x 25			SPI.91x-d80	551159	551159
	Zero point clamping plate Ø 130 mm	Ø 130 x 26			SPI.91x-d80	551161	551161

Zero point clamping plate to faceplates (axial discs) from p. 61

pL LEHMANN Item no.	Designation	Dimensions [mm]	Weight [kg]	Max. speed [rpm]	PiranhaClamp catalog reference	PiranhaClamp item no.
d80	Zero-point clamping plate Butterfly to face plate (axial disc)	170 x 170 x 26 Positioning pin Ø 40			540283	540283-510



EA-915 mit NSP

Compatible centering vices

Article no.	Designation	Dimensions [mm]	Clamping capacity [mm]	Weight [kg]	Speed [rpm]
551112	PV75 clamping vice	75 x 56 x 55	19 – 49 / 25 – 55, 0 – 31 / 5 – 35		
540362	Snapper 170 clamping vice	170 x 90 x 55	5 – 75 / 53 – 118		
540446	Snapper 170 clamping vice with higher jaws	170 x 90 x 65	5 – 75 / 53 – 118		
551076	Snapper 170 double station	170 x 90 x 55	2x 6 – 30 / 2x 26 – 52		
551075	Snapper 170 double station with higher jaws	170 x 90 x 65	2x 6 – 30 / 2x 26 – 52		
540444	Gepard 170 clamping vice, incl. aluminum jaws XS	170 x 90 x 85	0 – 155, varies with jaw type		
551079	Gepard 170 double station, incl. aluminum jaws XS	170 x 90 x 85	2 x 0 – 75		

Ripas

pL LEHMANN Item no.	Designation	Manual	Clamping capacity [mm]	Centering vice length [mm]	Centering vice dimensions [mm]	Weight [kg]	max. speed [rpm]	PiranhaClamp Catalog Reference	PiranhaClamp item no., incl. HSK adapter
d80	PV75, incl. flange	2)	19 – 49 / 25 – 55 0 – 31 / 5 – 35	75	75 x 56 x 55			551112	551112-63
	Snapper 170, incl. flange	2)	5 – 75 / 53 – 18	170	170 x 90 x 55			540362	540362-63
	Gepard 170 with aluminum jaws XS, incl. flange	2)	0 – 155 varies with jaw type	170	170 x 90 x 84			540444	540444-63
KK5	PV75, incl. flange	3)	19 – 49 / 25 – 55 0 – 31 / 5 – 35	75	75 x 56 x 55			551112	551112-63
	Snapper 170, incl. flange	3)	5 – 75 / 53 – 18	170	170 x 90 x 55			540362	540362-63
	Gepard 170 with aluminum jaws XS, incl. flange	3)	0 – 155 varies with jaw type	170	170 x 90 x 84			540444	540444-63
	Snapper 300, incl. flange	3)	5 – 191 / 53 – 238	300	300 x 120 x 66			540401	540401-63
	Gepard 300 with aluminum jaws XS, incl. flange	3)	0 – 268 varies with jaw type	300	300 x 120 x 105			540400	540400-63

Additionally required clamping system (see p. 59)
2) = RIP.510-63m,
3) = RIP.520-63m

With some minor adjustment, all PiranhaClamp clamping devices can also be assembled to other zero-point clamping systems (Lang, Erowa, Schunk, AMF...).



PV 75 Ripas



Snapper 170 Ripas



Snapper 300 Ripas



Gepard 170 Ripas

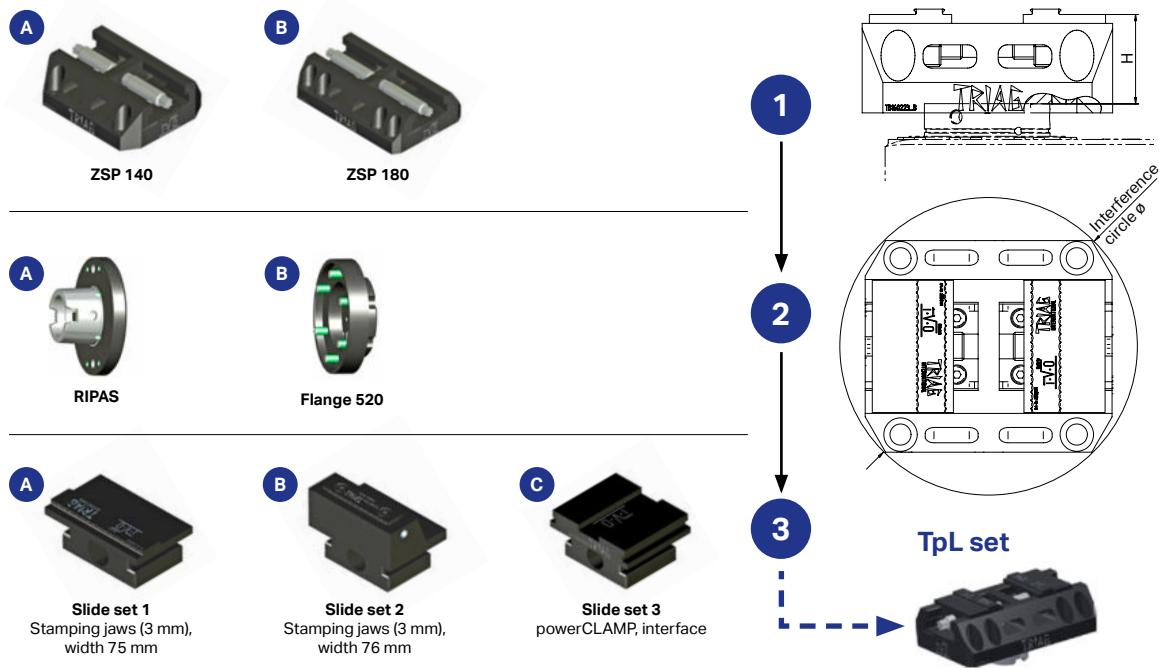


Gepard 300 Ripas



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

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



		1	2	3	H [mm]	Interference circle ø [mm]	Weight, approx. [kg]	Max. Speed [rpm]	Required	IVO item no.	
HSK	IVO.5xx-140ada	ZSP 140 140 x 120 x 50	ripas adapter A	A	50	184	4.8		RIP.91x-63x	26299-1-1-1	
				B			5.8		RIP.91x-63x	26299-1-1-2	
				C			5.6		RIP.91x-63x	26299-1-1-3	
	IVO.5xx-180ada	ZSP 180 180 x 120 x 50	ripas adapter A	A		216	6	RIP.91x-63x	26299-2-1-1		
				B			7	RIP.91x-63x	26299-2-1-2		
				C			6.8	RIP.91x-63x	26299-2-1-3		
KK5	IVO.520-140fla	ZSP 140 140 x 120 x 50	Flange B	A	52.5	184	6.2			26299-1-4-1	
				B			7.2			26299-1-4-2	
				C			7			26299-1-4-3	
	IVO.520-180fla	ZSP 180 180 x 120 x 50		Flange B		A	216		7.4		26299-2-4-1
						B			8.4		26299-2-4-2
						C			8.2		26299-2-4-3

Overview & Facts
 System & iBox
 Rotary tables
 KAB, CNC, WMIS
 AGG, DDF, RST, LOZ
 Service & Technology
 Workpiece clamping system

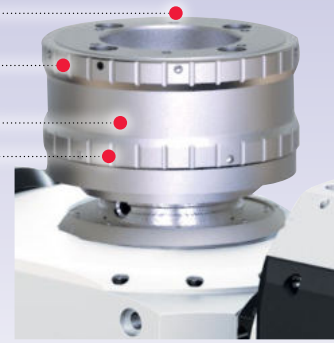


COCN interface, chuck 3R GPS 70 (image) or GPS 120/70

Front clamping stroke setting

Integrated, pneumatic clamping cylinder 600...5'800 N (1...10 bar), stroke 6 mm

Rear clamping stroke setting



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

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

Integrated collets on pallet GPS 70

Blanks collets: COCN-XX, COCN-XX-ET

SYST-ER, Kit Mecatool, TGCPF1-17, TGCPF2-17, TGCEC-16, TGCMEC-17

COCN interface (Ottet), GPS70, GPS120/70

SCPB5XX_XX

integrated

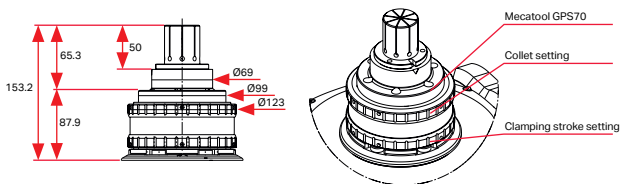
OTTET principle of operation

External clamping: Automatic

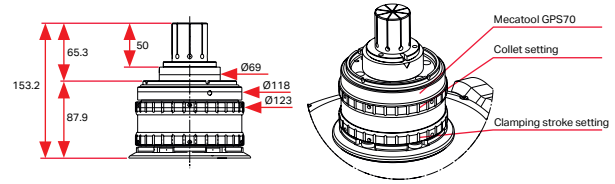
Internal clamping: Manual

Following versions available for both EA and TAP9, versions «compact» on request

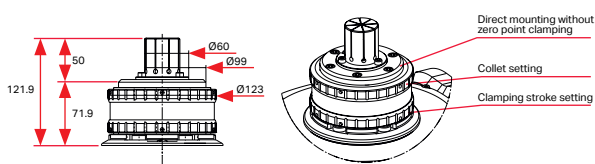
System 3R, GPS 70



System 3R, GPS 70/120



System OTTET (COCN)



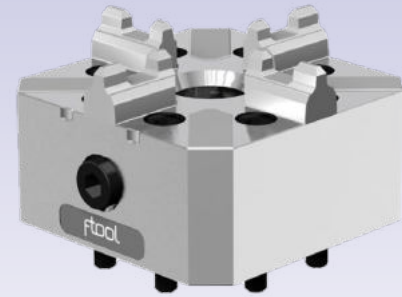
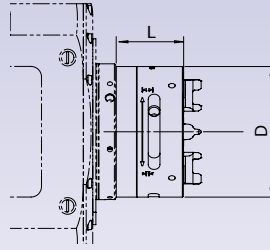
Order items

Item no.	Designation
TGC.91x-G70	Clamping device TG Colin, GPS 70, max. speed on request
TGC.91x-G12070	Clamping device TG Colin, GPS 120/70, max. speed on request
TGC.91x-COCN	Clamping device TG Colin, COCN, max. speed on request



Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

Further information: www.f-tool.com
Request installation and operating instructions directly from manufacturer



	pL LEHMANN Item no.	Designation	Manual	D [mm]	L from spindle [mm]	Pallet sizes, max. [mm]	Workpiece weight (perm.) [kg]	Chuck weight (incl. adapter flange) [kg]	Weight [kg]	Max. speed [rpm]	Required spindle adapter	F-Tool Catalog Reference	F-Tool Item no., incl. adapter flange
d80	FTO.5xx-80P	Chuck 80 P	•	ø103	51	ø148	35	2.3		250	SPI.91x-d80	FT 01043	FT 02404
	FTO.5xx-50	Chuck 50	•	ø78	50	ø72	15	1.4		250	SPI.91x-d80	FT 02110	FT 02406
	FTO.5xx-MC150P	Manual Chuck 150 P	•	ø150	55	ø148	50	4.3		250	SPI.91x-d80	FT 02443	On request
	FTO.5xx-PIN	PIN centering chuck	•	ø80	48	ø100	15	2.3		250	SPI.91x-d80	FT 01716	FT 02407



Chuck 80 P
FT 01043



Chuck 50
FT 02110



Manual Chuck 150 P
FT 02443



PIN centering chuck
FT 01716

Overview &
Facts

System &
iBox

Rotary tables

KAB, CNC, WMIS

AGG, DDF,
RST, LOZ

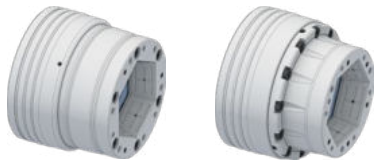
Service &
Technology

Workpiece
clamping system

The clamping device serves as the starting point on the Lehmann CNC rotary table and can 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.

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

Rotating clamping means



TOPlus
Chuck

TOPlus mini
Chuck



SPANNTOP
Chuck

SPANNTOP mini
Chuck



TOROK hand chuck

Stationary clamping means



MANOK plus manual vise



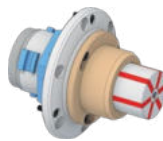
HYDROK hydraulic vise

Clamping element

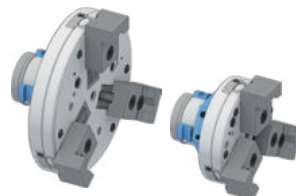


Clamping head – external clamping

Clamping adapters



MANDO Adapt mandrel –
Internal clamping



Jaw module, size 145 or 215 –
Jaw clamping



Face driver
adaptation

Morse taper
adaptation



Magnet module

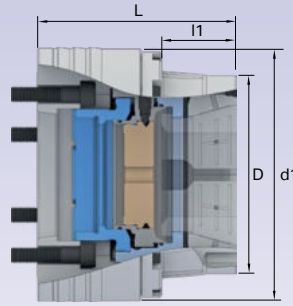
- all-around clamping
- 3 different versions: for tubular material, fine machining or boring out yourself
- Multitude of profile clamping options
- Coolant-resistant rubber-metal connection, keeps swarf out of the clamping means
- Clamping capacity $\varnothing 3 - 100$ mm
Clamping capacity RD $\varnothing 3 - 160$ mm
- 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 $\varnothing 8 - 190$ mm
- axfixe 3-jaw clamping
- Can be used in rotating (moving) and stationary applications
- Convert from clamping head or mandrel to jaw clamping in less than 2 minutes
- Enormous flexibility
- Self-centering of adapter in the chuck ≤ 0.003 mm
- Extremely fast conversion without disassembling the chuck [1 min.]
- End face axial clamping via neodymium magnet
- High planar changeover accuracy
- High retention force of 140 N/cm²
- Assembly in 30 sec. without aligning
- Low maintenance, since resistant to contamination



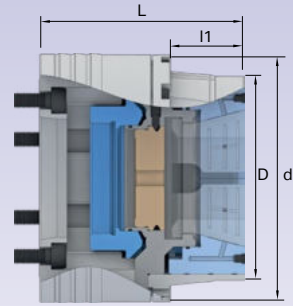
Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

Further information: www.hainbuch.com

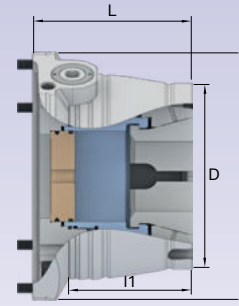
Request installation and operating instructions directly from manufacturer



TOPlus mini Axzug
SPANNTOP mini Axzug



TOPlus mini Axfix
SPANNTOP mini Axfix



TOROK SE Axzug [TOPlus]
TOROK RD Axzug [SPANNTOP]

HAINBUCH chucks TOPlus | TOROK

pL LEHMANN Item no.	Designation	Manual / Hydraulic		Size	Clamping capacity [mm]	L [mm]	l1 [mm]	D [mm]	d1 [mm]	Weight [kg]	Max. speed [rpm]	Required clamping cylinder	Compatible with modu- lar system	HAINBUCH item no. incl. adapter flange
		Manual	Hydraulic											
d80 HAI.510-tp-axz	TOPlus mini Axzug	●		52	4...52	103.5	42	119 f7	150			SPZ.91x-z9	●	10908/0002
HAI.510-tp-axf	TOPlus mini Axfix	●		52	4...52	104.5	44	119 f7	150			SPZ.91x-z9	●	10909/0002
HAI.510-tp-to	TOROK SE Axzug	●		52	4...52	137	65.8	125 f7	174				●	10913/0001



TOPlus mini

TOPlus

- 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 | TOROK

pL LEHMANN Item no.	Designation	Manual / Hydraulic		Size	Clamp- ing capacity [mm]	L [mm]	l1 [mm]	D [mm]	d1 [mm]	Weight [kg]	max. speed [rpm]	Required clamping cylinder	Compatible with modu- lar system	HAINBUCH Item no. incl. adapter flange
		Manual	Hydraulic											
d80 HAI.510-st-axz	SPANNTOP mini Axzug	●		52	4...52	103.5	45	90 f7	150			SPZ.91x-z9	●	10910/0002
HAI.510-st-axf	SPANNTOP mini Axfix	●		52	4...52	104.5	44	98 f7	150			SPZ.91x-z9	●	10911/0002
HAI.510-st-to	TOROK RD Axzug	●		52	4...52	137	65.8	125 f7	174				●	10912/0001



SPANNTOP mini

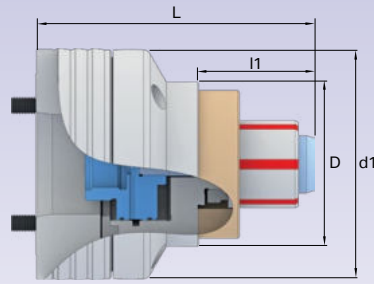
SPANNTOP

- 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

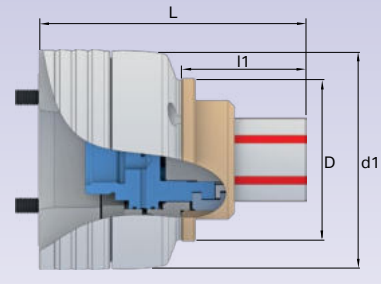


Clamping devices assembled by pL LEHMANN
(if ordered together with a rotary table)

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]	l1 [mm]	D [mm]	d1 [mm]	Weight [kg]	max. speed [rpm]	Required clamping cylinder	HAINBUCH Item no. incl. adapter flange
HAI.510-ma-axz1	MANDO T212 Axzug	•	s	16...21	112.5	47.5	70	141	7.60	5,450	SPZ.91x-z9	10915/0003
HAI.510-ma-axf1	MANDO T812 Axfix	•	s	16...21	117.5	49.5	70	141	7.90	5,450	SPZ.91x-z9	10916/0003
HAI.510-ma-axz2	MANDO T211 Axzug	•	0	20...28	115.5	40.0	65	141	7.20	5,450	SPZ.91x-z9	10914/0001
HAI.510-ma-axz3	MANDO T212 Axzug	•	0	20...28	123.5	58.5	90	141	8.10	5,450	SPZ.91x-z9	10915/0004
HAI.510-ma-axf2	MANDO T812 Axfix	•	0	20...28	129.5	60.5	90	141	8.50	5,450	SPZ.91x-z9	10916/0004



MANDO T211



MANDO T212
MANDO T812

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
- 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



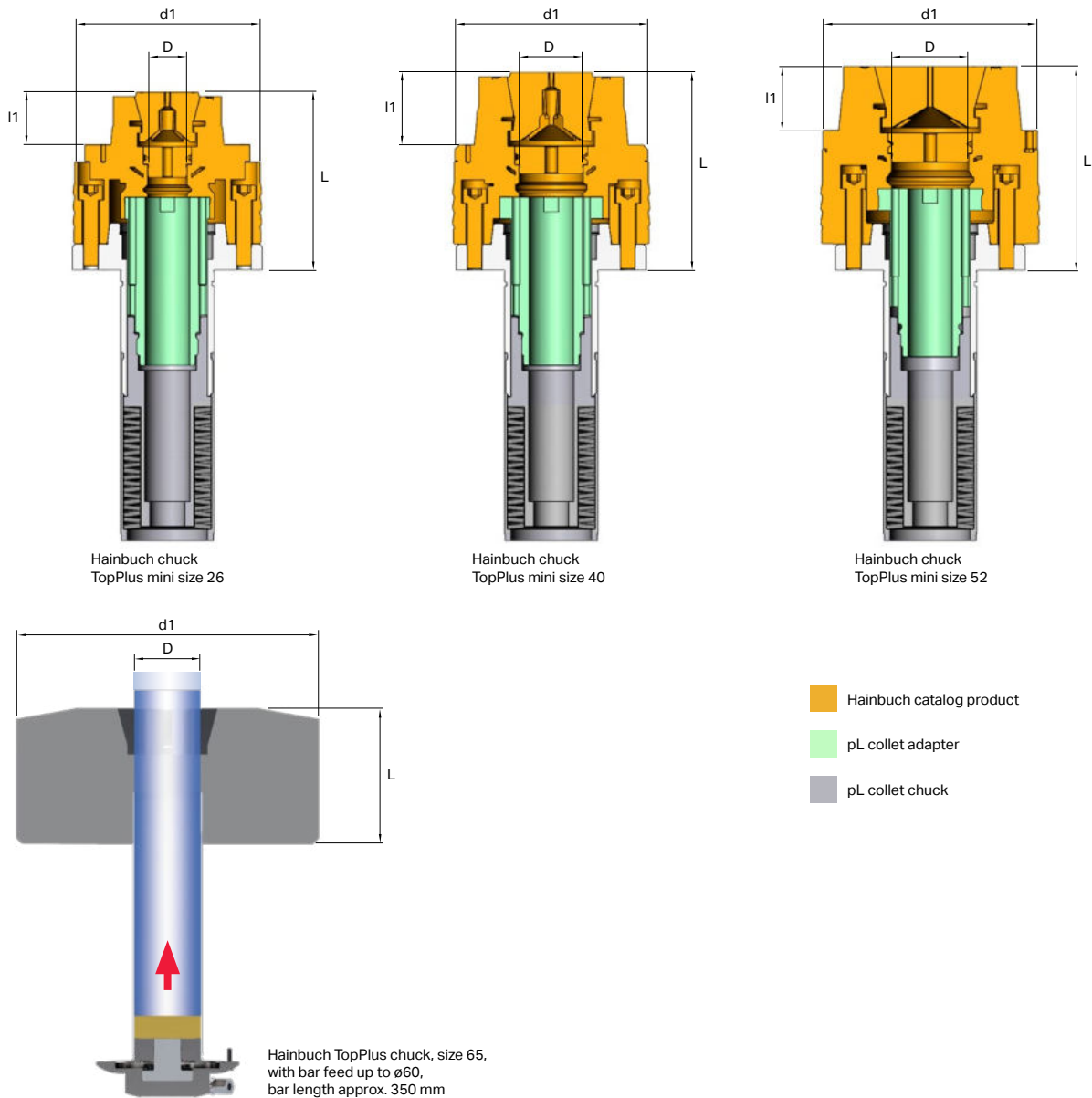
TOPlus mini Axfix size 52 on EA-915

Overview & Facts
System & iBox
Rotary tables
KAB, CNC, WMS
AGG, DDF, RST, LOZ
Service & Technology
Workpiece clamping system

pL LEHMANN Item no.	Designation	Pneumatic Size	Clamping capacity [mm]	L [mm]	l1 [mm]	D [mm]	d1 [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	10,000	6.90	SPZ.91x-s9d30	
HAI.91x-tp40-axf**	TopPlus mini size 40	• 40	4...40	136	47	44	135	7,000	9.10	SPZ.91x-s9d30	
HAI.91x-tp52-axf**	TopPlus mini size 52	• 52	4...52	140	44	53	150	7,000	15.60	SPZ.91x-s9d30	
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. 57





Further information: www.vb-tools.com
Request installation and operating instructions directly from manufacturer

SAFE and AirLine zero point clamping systems

	pL LEHMANN Item no.	Designation	Manual	open, pneumatic 6 bar	open, hydraulic 65 bar	D1 [mm]	D2 [mm]	L from spindle [mm]	Weight [kg]	Max. speed [rpm]	Draw-in force [kN]	Retention force [kN]	Required spindle adapter	Required rotary union*	vb Item no. incl. adapter flange
d80	VBO.510-al	AirLine		•		120	130	52				40		DDF.91x-04-d80	755 510-04
	VBO.510-SAh	SAFE20			•	120	130	50			>9	40		DDF.91x-04-d80	752 510-04
	VBO.510-SAm	SAFE20	•			120	130	50			>9	40	SPI.91x-d80		752 510-04-M

* see p. 25, matching spindle adapter (p. 56) included in order item

Clamping means for SAFE and AirLine zero point clamping systems

	pL LEHMANN Item no.	Designation	Interference circle Ø [mm]	L from support [mm]	Clamping capacity [mm]	Dimensions LxWxH [mm]	Weight [kg]	Max. speed [rpm]	vb Item no.
Center clamp	VBO.al-76	AirLine vb centro76	175	75	5-74/44-120	Ø148x90x75			vb-centro76 AL
	VBO.al-76P	AirLine vb centro76 pendulum	175	75	22-74/62-120	Ø148x90x75			vb-centro76 P AL
	VBO.sa-76	SAFE20 vb centro76	175	75	5-74/44-120	Ø148x90x75			vb-centro76 S
	VBO.sa-76P	SAFE20 vb centro76 pendulum	175	75	22-74/62-120	Ø148x90x75			vb-centro76 P S
Empty pallets	VBO.al-PalQ	AirLine Index pallet	206	35		150x150x35			755601 PL
	VBO.al-PalR	AirLine Index pallet, round	160	35		Ø160x35			755602 PL
	VBO.sa-PalQ	SAFE20 Index pallet	206	35		150x150x35			752601 PL
	VBO.sa-PalR	SAFE20 Index pallet, round	160	35		Ø160x35			752602 PL

Center clamp on ripas or directly on spindle

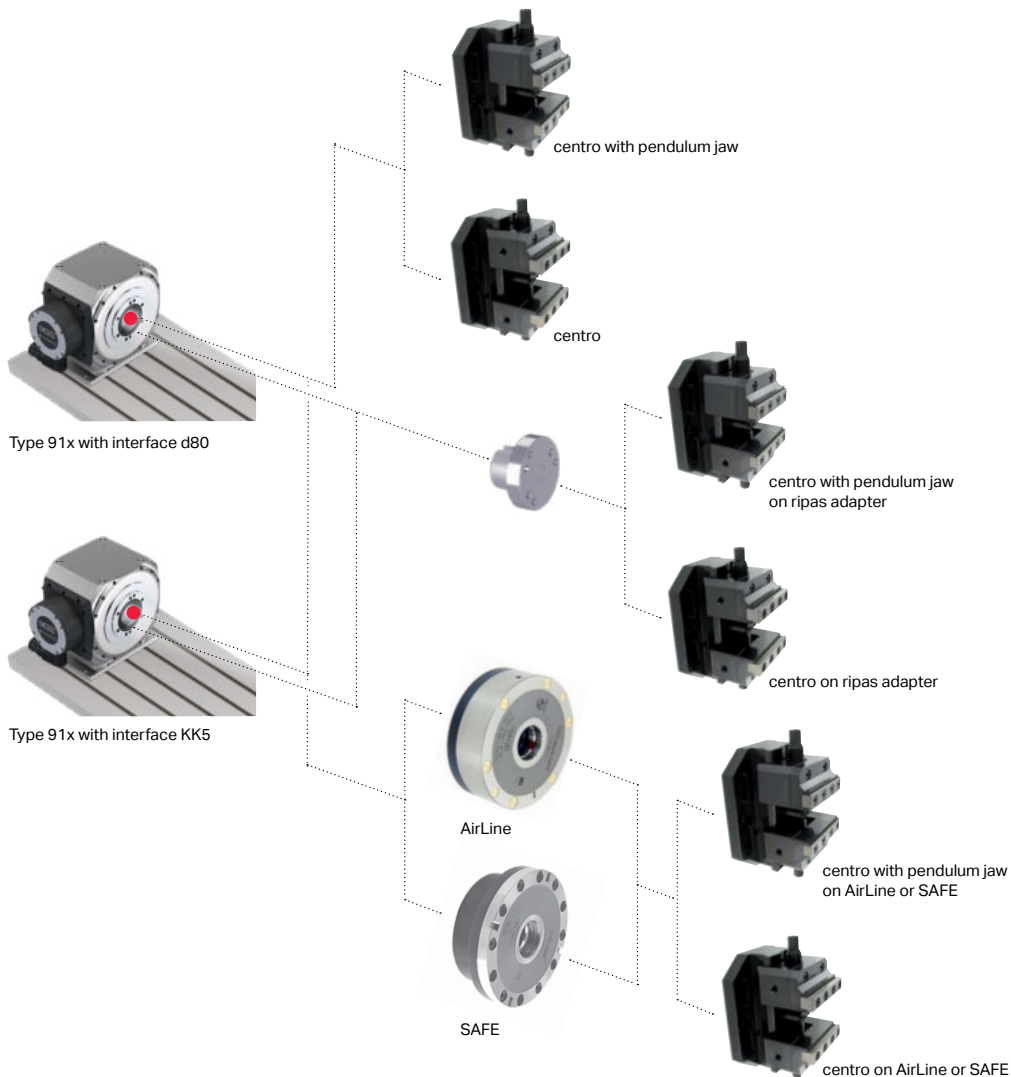
	pL LEHMANN Item no.	Designation	Interference circle Ø [mm]	L from support [mm]	Clamping capacity [mm]	Dimensions LxWxH [mm]	Weight [kg]	Max. speed [rpm]	vb Item no.
ripas	VBO.RIP-76	vb centro76, ripas	175	83	5-74/44-120	Ø148x90x83			vb-centro76 Ri
	VBO.RIP-76P	vb centro76 pendulum, ripas	175	83	22-74/62-120	Ø148x90x83			vb-centro76 P Ri
d80	VBO.510-76	vb-centro76, direct	175	67	5-74/44-120	Ø148x90x75			vb-centro76 pL 510
	VBO.510-76P	vb-centro76 pendulum, direct	175	67	22-74/62-120	Ø148x90x75			vb-centro76 P pL 510



Further information: www.vb-tools.com
Request installation and operating instructions directly from manufacturer

vb-centro76 jaw line

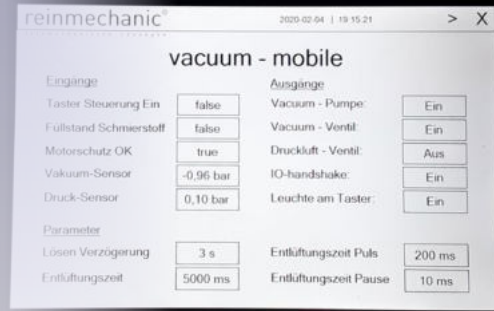
	vb Item no.	Designation	Dimension (LxWxH)	Weight [kg]	Speed [rpm]
Soft jaws	748-086ST	Soft steel jaws	86x60x40		
	748-086AL	Soft aluminum jaws	86x60x40		
Grip jaws	748-76-04-ST	Grip jaw, standard			
	748-76-04-RG	Grooved / Grip jaw			
	748-76-04-AL	Grip jaw for aluminum			
	748-76-04-L	Positive-fit jaws			
Accessories	748-76-M8	Workpiece stop			
	748-NM	Torque wrench			
	748-SW12	Wrench socket, 12 mm			



Overview & Facts
System & iBox
Rotary tables
KAB, CNC, WMIS
AGG, DDF, RST, LOZ
Service & Technology
Workpiece clamping system

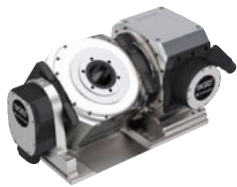
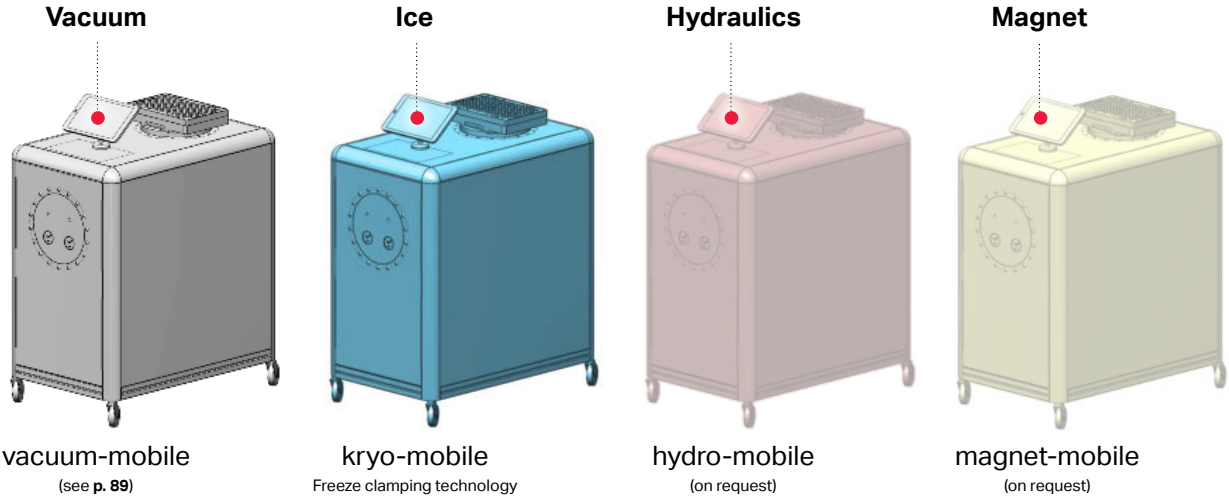
Control and monitor workpiece-dependent clamping technology using an integrated approach

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



mobile - systems

Technology on a common basis



pL-compatible

Highlights

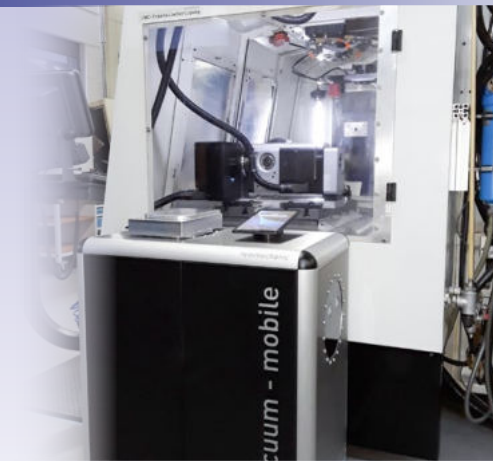
- Flexible and mobile
- Standardized modular system
- Available quickly, adaptable easily
- Reliable control & monitoring

mobile - system (e)

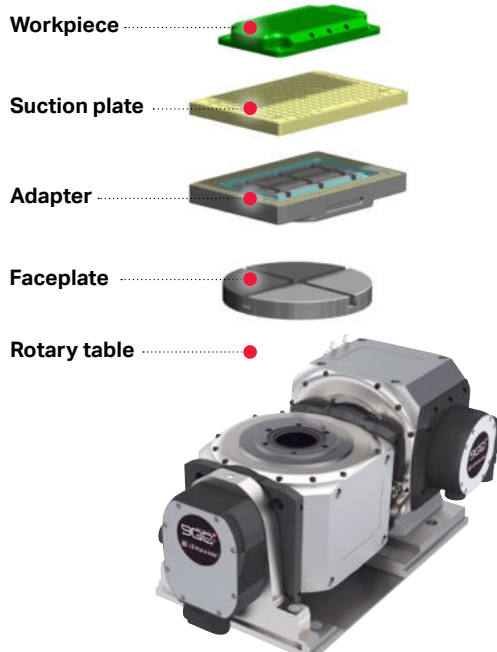
- Intelligent clamping technology
- Plug & play

Vacuum clamping technology for mounting thin-walled workpieces, housings, plates ...

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



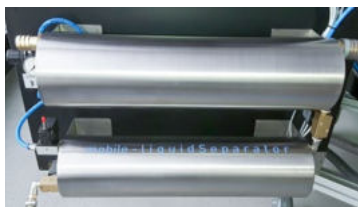
Example: vacuum - mobile Workpiece mount for rotary tables



pL rotary table T1-91x915 with reinmechanic-vacuum adapter and mechanical-universal suction plate

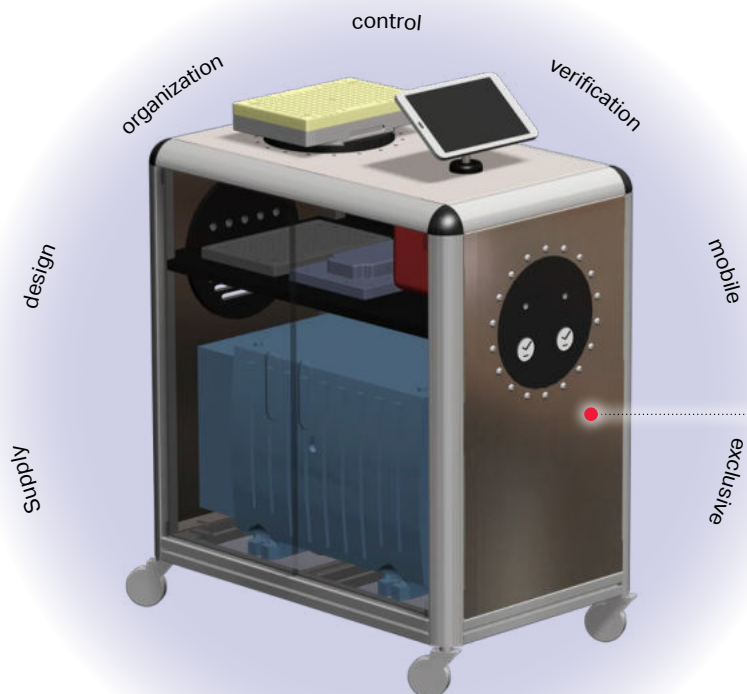
mobile-liquidSeparator

- Optional liquid separator
- Process-monitored
- Automatic feedback



Features of the reinmechanic-vacuum system:

- pl-compatible (ready to use)
- Production-oriented solution (manufacturing solutions)
- Individual sizing (lean production)
- reinmechanic adapter service (individual adapter service)
- Manufacturer-independent (all-round use)
- Industry 4.0 compatible
- Touchscreen control (easy handling)
- Self-monitoring overall system (self-monitoring)
- Command transfer to machine control (I/O handshake)



reinmechanic-vacuum-mobile «premium» with mechanical-vacuum adapter and mechanical-universal suction plate

mobile-systems available in three versions

«standard»

- Complete design
- Required functions
- Economical

«professional»

- Complete design
- Advanced functions
- Semi-automated

«premium»

- Complete design
- Industry 4.0-capable
- Touchscreen control

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

reinmechanic®
feinmechanische Lösungen

Automation 4.0 - fully integrated

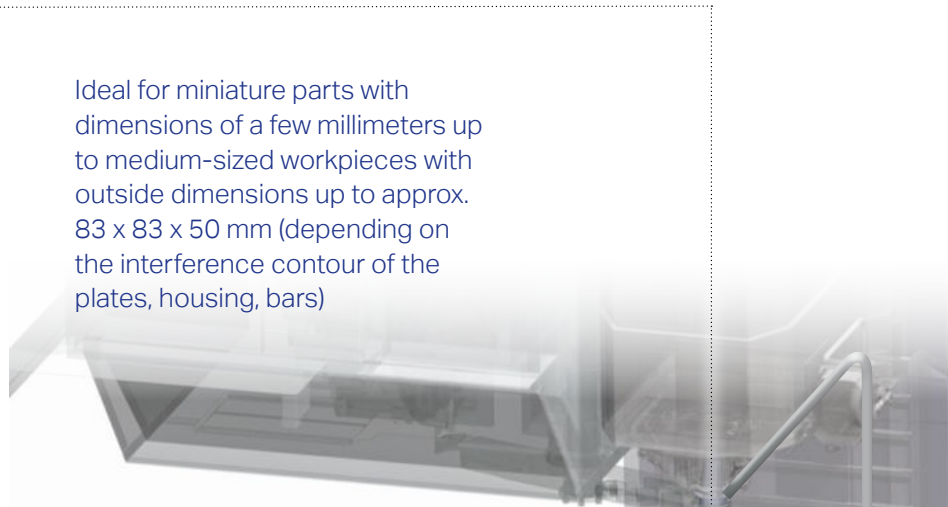


mobile - transferTool

handling «easy - in»

- Standardised gripper from Schunk (PGN+ xx)
- Easy handling via tool management
- Individual gripper jaws
- Control via internal cooling (beneficial with air)

Ideal for miniature parts with dimensions of a few millimeters up to medium-sized workpieces with outside dimensions up to approx. 83 x 83 x 50 mm (depending on the interference contour of the plates, housing, bars)



mobile - transferBox

Workpiece magazine directly where needed

- Storage area protected from chips
- Time-optimized provision
- Short transfer paths
- Configuration of individual, specific placement displays
- High reference accuracy
- Optional with workpiece cleaning function



ROTOMATION solution with

- Rotary table EA915 DD
- mobile - transferBox (mtB)
- mobile - partTablet (mpT)

More information: request our brochure ROTOMATION

mobile - control

Control processes interactively

Various reinmechanic products can be fitted with an optional control system (mobile - control) for enhanced control, monitoring and management



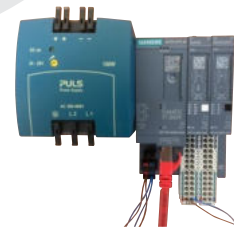
mobile-controlBox

- Fully integrated I/O Profinet solution for control



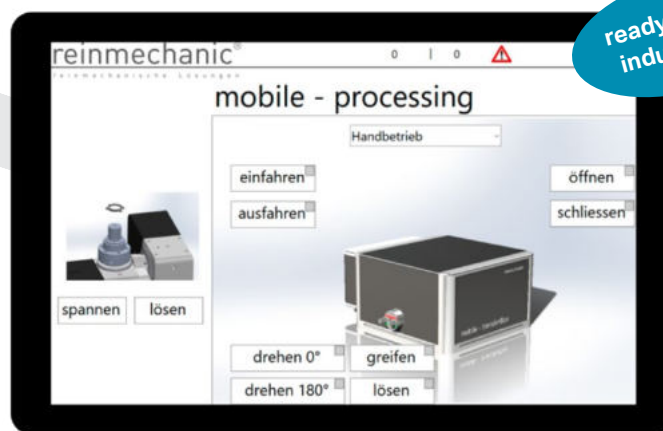
mobile-processBox

- Communication with NC system
- Standard M-commands
- For installation in control cabinet
- Easy integration



mobile controlTablet

- For visualization and operation of the mobile-control software



mobile - add-ons software modules

- **mobile - wireless**
WLAN / Bluetooth
- **mobile - data**
XML format; Windows-based
- **mobile - assist**
Intelligent and self-monitoring functions
- **mobile - service**
Remote maintenance and maintenance manager
- **mobile - mail**
Fault message and process message via e-mail
- **mobile - processing**
I/O Profinet for integrated automation
- **mobile - test**
Functions to test / simulate sequences
- **mobile - remoteVideo**
Video monitoring of you processes

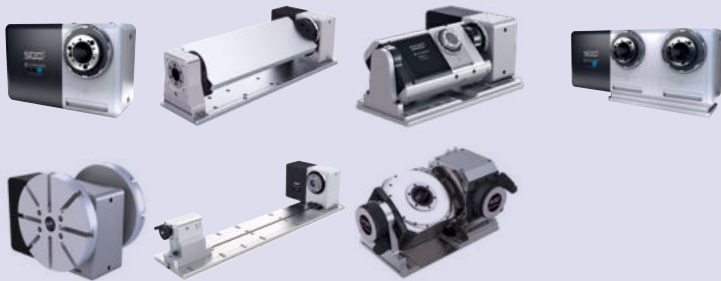
More information: request our brochure GO DIGITAL

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

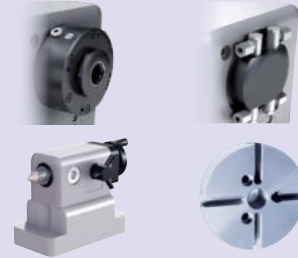
ROTOMATION – The ideal expansion with standardized automation. Economical. Professional. Simple.

Standard

Rotary tables, see pp. 14–19

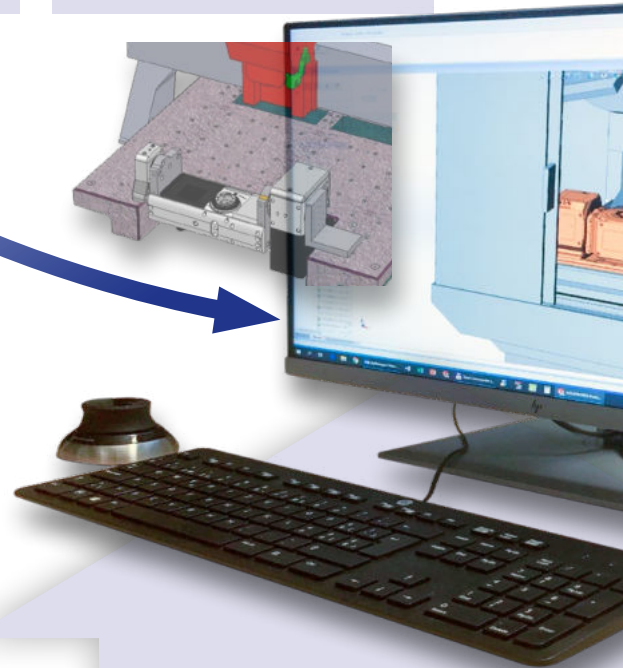


Accessories see p. 25–27, 54–61



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)



Overview & Facts
System & iBox
Rotary tables
KAB, CNC, WMS
AGG, DDF, RST, LOZ
Service & Technology
Workpiece clamping system

*Examples



ROTOLUTION

CAD & adaptation

- Installation check
- Adjustment to standard parts
- Special parts

CAD & clamping means

- Workpiece clamping
- Standard/special

see p. 62–87

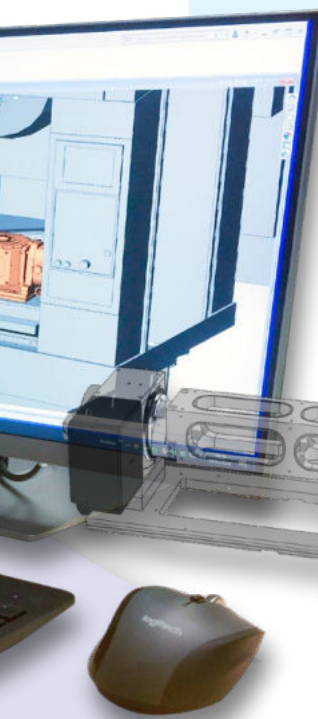
*Examples

ROTOMATION

CAD & automation

- Workpiece handling
- Partnerships (GU with partners) e.g. reinmechanic – mobile - concept

see p. 88–91



Plug-&-work package

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

Customer

Project management and execution, direct if needed



Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMIS

AGG, DDF, RST, LOZ

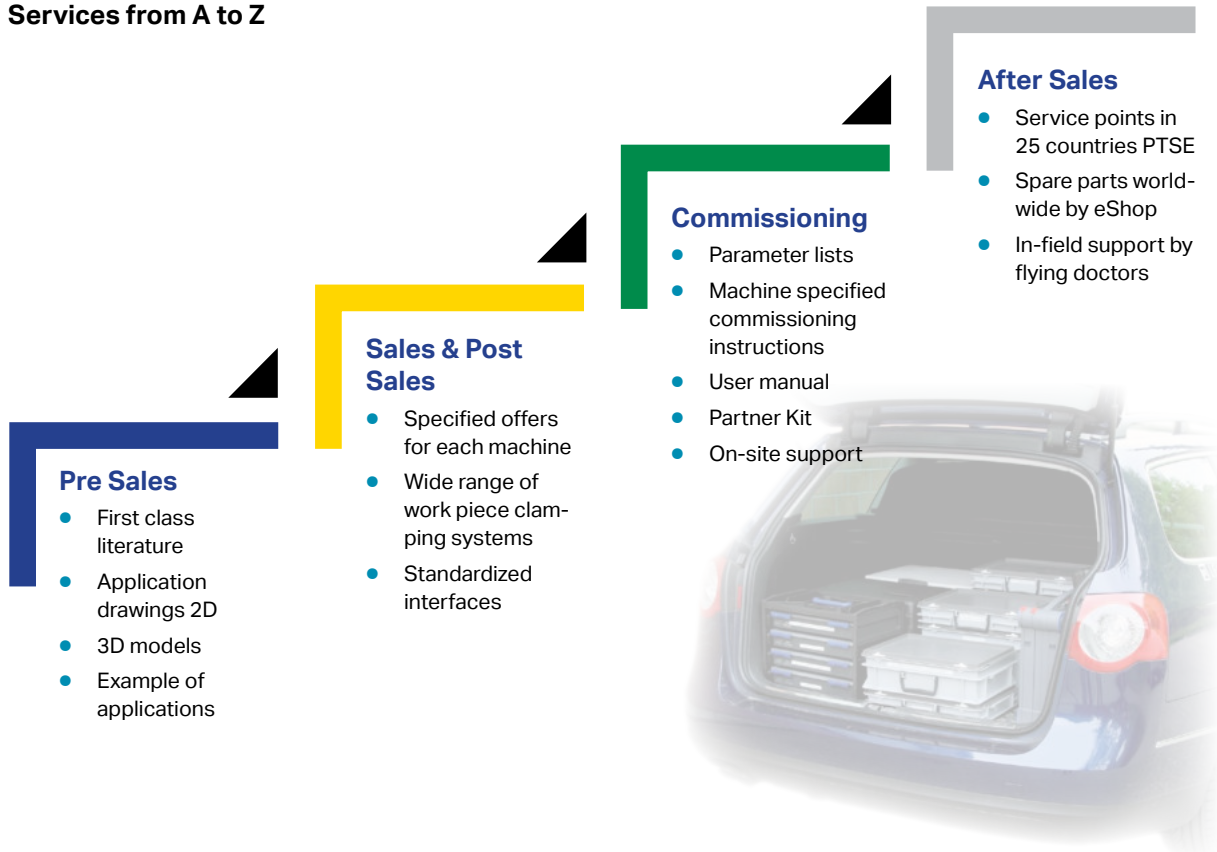
Service & Technology

Workpiece clamping system

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

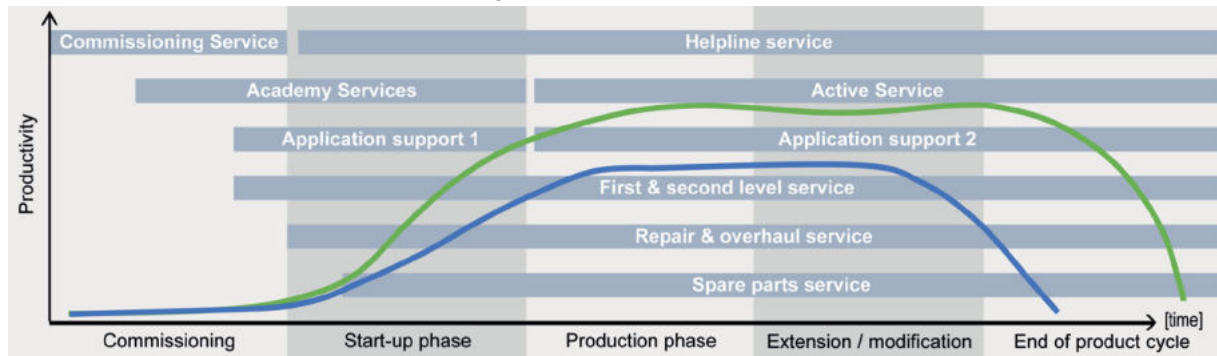


Services from A to Z



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

For more information please request our service brochure.

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system

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



Pallet 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

Overview & Facts

System & iBox

Rotary tables

KAB, CNC, WMIS

AGG, DDF, RST, LOZ

Service & Technology

Workpiece clamping system



LEHMANN®

ROTARY TABLES · PRECISION TECHNOLOGY · SOFTWARE

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Global network

Europe

- Austria
- Benelux
- Czech Republic
- Denmark
- Finland
- France
- Germany
- Hungary
- Ireland
- Italy
- Norway
- Poland
- Portugal
- Russia
- Slovenia
- Spain
- Sweden
- Turkey
- UK

America

- Brazil
- Canada
- Mexico
- USA

Asia

- China
- India
- Japan
- Malaysia
- Singapore
- South Korea
- Taiwan
- Thailand
- Vietnam



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

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