LADU

2019

The farther we penetrate the unknown, the vaster and more marvelous it becomes.

Charles A. Lindbergh, Aviator and Pioneer

INFORMATION THAT GOES INTO MORE DEPTH – JUST LIKE OUR DRILLING SYSTEMS.

L.ADU

L.ADU pneumatic

L.ADU electronic

L.ADU pneumatic

L.SMR

MORE KNOWLEDGE, MORE EXPERIENCE, MORE COMPETENCE. BECAUSE MORE MEANS MORE FOR OUR CUSTOMERS.

The ever growing standard range of drilling systems has been used for a wide variety of applications in the aerospace industry since 1994. This is how LÜBBERING has gained an excellent reputation internationally as a specialist for developing and manufacturing complex drilling units. And this is not just because every single detail is taken into account: from developing mechanical and electronic components and manufacturing all modules to set-up and servicing, LÜBBERING offers complete systems tailored exactly to the needs of its customers.

Increasingly complex and sensitive material combinations require more and more flexible, high-performance drilling units. With this in mind the features of the LÜBBERING Advanced Drilling Units (L.ADU) are continuously adapted – and always one idea ahead of developments.

LÜBBERING offers its customers a wide variety of standard systems from fully pneumatic (L.ADU pneumatic) to fully electronic units (L.ADU electronic).

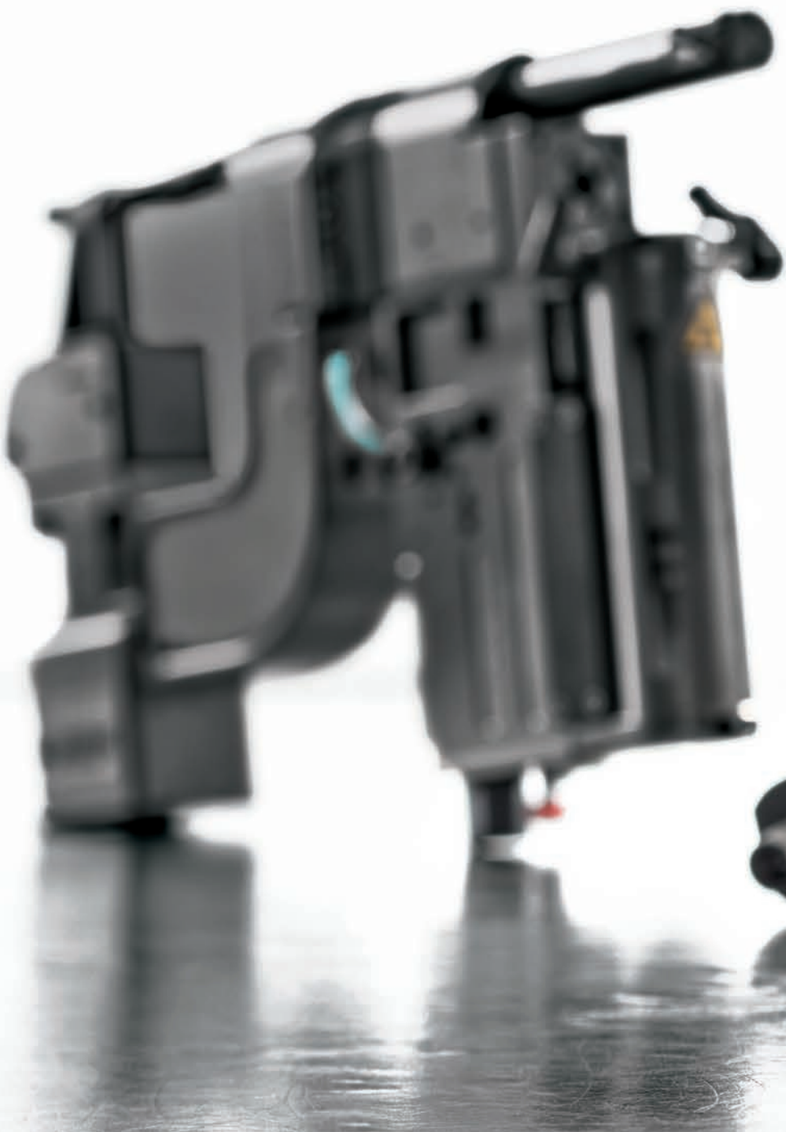
With a production depth of over 95%, LÜBBERING isn‘t just a specialist in high-precision tools, but also in complex and challenging production techniques.

1994	First LÜBBERING Drilling Unit: BVE 100 (still currently in use)
1998	First Generation of Electronic Advanced Drilling Units (longitudinal seams)
2001	First Pneumatic Advanced High Speed Drilling Unit
2003	First Generation of Pneumatic Advanced Drilling Units: Standard Programmeme
2006	Second Generation of Electronic Advanced Drilling Units for big hole sizes (since 2006 more than 400 machines in use)
2015	Relaunch of LÜBBERING Advanced Drilling Units: L.ADU pneumatic and L.ADU electronic
2016	L.ADU electronic 255/256
2019	First launch of L.ADU pneumatic 150 in new product design

YOUR BENEFITS

Modular configuration, ingeniously flexible and highly precise: L.ADU offers a whole new level of performance in every detail – to enhance the efficiency of your processes.

+ MORE ACCURATE	Process reliability through higher levels of accuracy
+ MORE COMPACT	Improved ergonomics through compact design
+ MORE MODULAR	Higher flexibility through modular design
+ MORE EFFICIENT	Cost savings from easy maintenance



REGARDING THE THOUSANDS OF MACHINES THAT WE HAVE SUCESSFULLY BROUGHT INTO SERVICE OVER THE PAST 20 YEARS, ONLY ONE IS ALWAYS THE MOST IMPORTANT TO US – YOURS.

HOW OUR MODULAR PNEUMATIC DRILLING MACHINES WORK. AND ABOVE ALL. NOW EVEN MORE ERGONOMIC.

Short drill cycle times, perfect drill hole quality, quick and easy cutting tool change, short set-up times, individual areas of application and minimum need for wear and spare parts – the highest level of quality requirements apply in the aerospace industry.

In order to meet these high quality standards LÜBBERING has developed a modular standard programme of pneumatic Advanced Drilling Units (L.ADU pneumatic). The modular Programme consists of a basis machine (L.ADU basis) with various locking systems (L.ADU locking system) and optional components (L.ADU option).

All L.ADU locking systems have a uniform interface. We supply a Quick Change System which allows a very fast and easy disassembly of the module. Once the L.ADU locking system has been dismantled, the cutting tool is freely accessible and thus can be easily cleaned or changed, if required.

This convenient function is just one of several options that are featured on the next pages.

This product range covers the complete spectrum of drillings from Ø 4.2 mm to Ø 25.4 mm. Aluminium, CFRP but also titanium or material stacks consisting of these materials can be drilled with L.ADU.

- **Can be individually configurated**
  thanks to the modular structure and an ergonomic design
- **Low maintenance**
  minimum requirement of wear and spare parts (< 10%)
- **Quick and easy cutting tool change, easy to clean**
- **All locking systems with uniform interface**
- **Perfect hole quality and performance**
- **No delamination in CFRP**
- **Burrless drilling**
- **Enormous time savings**
  thanks to the one-shot drilling and countersinking in combination with Sine-Feed
- **Basis machine in 3 different models**
  right-angled, inline, grip
- **3 different motor versions**
  which can be fitted with a turbine motor
- **Wide range of options**

DESIGNED TO PERFORM

Watch the video of L.ADU pneumatic

L.ADU pneumatic is available at three performance levels (55/56/57) and can be equipped with vane and turbine engines.

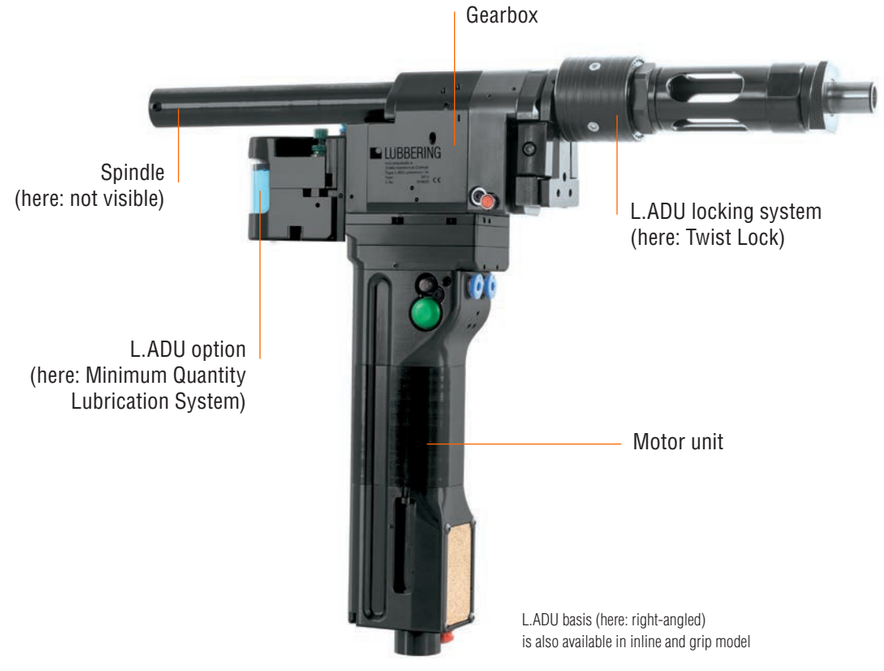
The different transmission ratios and feed gear sets enable speeds of 300-6,000 1/min and feed speeds of 0.03-0.15 mm/revolution. The final feed movement is performed out by a precision lead screw with an integrated drill adapter.

In order to ensure a consistent high repeat accuracy of countersinking and of the spindle rotation over the life time, the spindles are produced from polished, high quality steels. Adjustable coolant tanks deliver drilling emulsion through the spindle to the drill and therefore optimise the lifetime of the drill.

L.ADU is diversely configurable. As the interfaces are standardised, the customer is also able to subsequently adapt the L.ADU according to their needs.

Only limited information is necessary in order to be able to create your individual drilling unit:

- Drilling material
- Drilling diameter
- Type of cutting tool
- Access to the component:
  Machine model (right-angled, inline, grip)
- Type of L.ADU locking system



L.ADU basis (here: right-angled)
is also available in inline and grip model


PRECISION FOR THE BEST DRILLING
RESULTS. GUARANTEED.

THE MACHINE'S HEART: A GROUND SPINDLE FOR HIGHEST PRECISION.

In the in-house grinding shop, precision machines and CNC-Programmemed machining are used in the µ-range for inner and outer machining. The interface to the tool adapter as well as the outer thread of the spindle are milled in one machining step. This allows LÜBBERING to achieve extremely high spindle concentricity of under 5 microns.

High quality is reliably and continuously guaranteed by the in-house measuring laboratory.

The precise spindle which LÜBBERING offers in a variety of lengths, is one of L.ADU's particular quality characteristics.

In addition to all standard tool interfaces, LÜBBERING offers an impressive range of spindles with polygon tool interfaces, these allows the use of cutting tools with cylindrical shank instead of cutting tools with high costly threaded interfaces.

The hardened spindle in combination with brilliant surface quality guarantees practically wear-free drilling.

- **Highest spindle concentricity (under 5 microns)**
- **Ground spindle for highest precision**
- **Outer thread and cutting tool interface ground in one setup**
- **Spindles for all kind of cutting tool interfaces**
- **Lower cutting tool costs (< 30%)** thanks to simple cutting tool geometry (without thread)
- **Spindle with polygon tool interface**
- **No wear**
- **In-house production**

Spindles with a polygon interface for

Polygon Ø 6.00 mm
Polygon Ø 6.35 mm
Polygon Ø 8.00 mm
Polygon Ø 10.0 mm

are available in addition to all standard tool interfaces.

PRECISION PARTS MANUFACTURED IN-HOUSE. FOR EXTREMELY HIGH RUNNING ACCURACY.

The production site, located in Hans-Böckler-Straße in Herzebrock is the centerpiece of LÜBBERING. LÜBBERING high tech production contains manufacturing fields of milling, turning, gearing, grinding and eroding – everything on ultra-modern CNC machines.

In the areas of milling and turning, LÜBBERING uses exclusively machines produced by DMG MORI. For gearing, spur and bevel gears are manufactured on Gleason-Pfauter machines Swiss-made machines by Studer are used for grinding and Charmilles provides the machines for eroding. This ensures the highest level of precision.

Under the management of Markus Füchtenhans, a team of about 100 employees manufactures, assembles and inspects every single component in our products. Many of our production team have already completed their training in LÜBBERING or have worked here for many years. This is only one of the reasons why our employees can "sense" if something is going wrong with your product. You can rely on the long-standing experience of our employees of working in different areas of our production.

Using ultra-modern software, our production scheduling team, manages each step of the workflow; from your requested delivery date through the production and the assembly right up to dispatch.

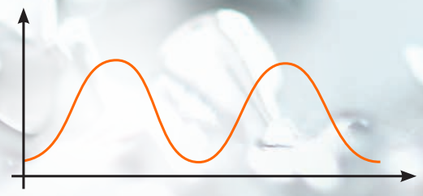
Our production team safeguards the highest quality of LÜBBERING products with professionalism and motivation and therefore fulfills our claim: "Made in Germany" – up to 95% inhouse.

- **In-house production > 95%**
- **Long-standing experience of our employees**
- **Ultra-modern CNC machines**
- **Ultra-modern software, production scheduling with GANTTPLAN**

"For best quality we go as deep as possible – with our production depth of over 95%."

Markus Füchtenhans, Director Manufacturing Technology

SMALL CAUSE, BIG EFFECT.
WE IMPRESSIVELY PROVE THIS PRINCIPLE ONCE AGAIN WITH THE SINE-FEED.



Axial spindle vibration with Sine-Feed to break chips.

FOR EVEN MORE RELIABLE DRILLING PROCESSES – THROUGH AND THROUGH: SINE-FEED.

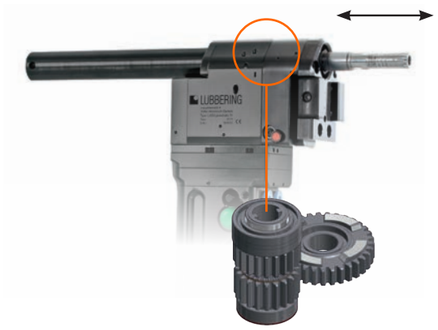
For accurate drilling through different material layers, every L.ADU pneumatic can be equipped with the Sine-Feed pulse drilling option (L.ADU option Sine-Feed).

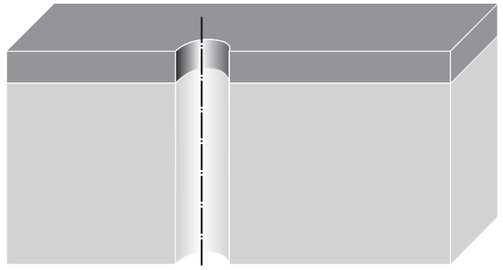
In drilling processes where it is used, an axial spindle vibration is generated by means of a periodic low frequency which, in combination with a constant spindle advance of an automated drilling unit, provides for outstanding chip removal.

The shearing chips arising in the process can be easily vacuumed, and prevented from damaging the material during the drilling process.

The integrated countersink process also provides for a clean surface, in which case the Sine-Feed is uncoupled in the countersink point.

- **Sine-Feed even for one-shot drilling and countersinking possible**
- **Micro chips even on piloted holes**
- **Durable, low heat evolution**
- **Not necessary to use MQL System:** Dry cutting possible (without MQL System)
- **Amplitude 0.17 – 0.27 mm** depending on feed
- **Frequency: 1.5 strokes per rotation**





Example of a material combination in aircraft production. The drilling transition from the CFRP layer to the titanium layer without damage is successful thanks to the pulse drilling.

Watch the video of L.ADU option Sine-Feed

Left: Result with L.ADU option Sine-Feed.
Right: Result without L.ADU option Sine-Feed.

WE DON‘T LIKE RESTRICTIONS: LOCKING SYSTEMS FOR EVERY APPLICATION.

L.ADU pneumatic is used in almost every area of aircraft production. The right choice and configuration of the machine with the matching locking system can be achieved by respecting the following parameters:

- Drilling, reaming or countersinking (or a combination)
- Drilling diameter
- Template type (milled metal template with locking bushings or a stripped metal or synthetic template)
- Access to the component
- Positioning and locking or positioning and gripping

The main function of the locking system is to clamp the L.ADU into a designated template, which is attached to the component (aircraft structure). Here the vertical positioning to the component is very important. Furthermore, the locking system serves to absorb the feed force. This means that L.ADU is designed to provide greater clamping force than the required drilling force and so even if higher drilling force is needed, it cannot be pushed out of the template.

+ Available for all standard applications

+ Integrated channel for the extraction of chips and dust

+ Optimum clamping and gripping force ensure high process reliability

+ Precise positioning to the component

The three most common L.ADU locking systems in the aerospace industry are:

Concentric Collet

This is mostly used for drilling and countersinking of different material combinations within one working step. It’s highly adjustable in gripping and pressing force and almost 100% chip and dust extraction is impressive. The attachment onto the front side of the component, means that no chip or dust can escape from the container which is being vacuumed. Moreover, the system exerts an axial strength on the component by locking on after clamping is activated. For this reason, air gaps are closed between the components, which is important especially for thinner metal stacks and so burrless drilling is possible.

Twist Lock

This is probably the most popular locking system in the world. It is used for locking drilling units and performing simple cylindrical drillings. The system, which is designed like a bayonet can be locked by a quarter turn in the locking bushing. Its robust style and its great feed drive allow even very large drillings.

C-Frame

A very efficient locking system for drilling and countersinking. It determines the position of the machine, presses together the components through the clamping force (ca. 1,200 N) of the C-Frame and creates the right position between unit and the component. It is ideal for requiring small medium-sized drilling diameters. This is mostly used in the assembly on the fuselage.

EACH APPLICATION IS DIFFERENT. SO ARE OUR LOCKING SYSTEMS. BUT ALL ARE PERFECTLY PRECISE – SUCH AS OUR CONCENTRIC COLLET.

L.ADU locking system Concentric Collet

THE IDEAL SOLUTION. FOR EVERY CASE.

Concentric Collet (CC)

- **Material stacks:** CFRP, Aluminium, Titanium
- **Process:** One-shot drilling and countersinking
- **Chip/dust exhaust:** nearly 100%
- **Clamping force:** up to 1.600 N

Twist Lock (TL)

- **Material stacks:** CFRP, Aluminium, Titanium
- **Process:** One-shot drilling and reaming
- **Chip/dust exhaust:** optional
- **Clamping force:** –

C-Frame (CF)

- **Material stacks:** CFRP, Aluminium, Titanium
- **Process:** One-shot drilling and countersinking
- **Chip/dust exhaust:** nearly 100%
- **Clamping force:** 1,000 N - 1,200 N

Taperlock (TPL)

- **Material stacks:** CFRP, Aluminium, Titanium
- **Process:** One-shot drilling and countersinking
- **Chip/dust exhaust:** nearly 100%
- **Clamping force:** adjustable

Vacuum Traverse (VT)

- **Material stacks:** CFRP, Aluminium
- **Process:** One-shot drilling and countersinking
- **Chip/dust exhaust:** nearly 100%
- **Clamping force:** up to 1,000 N

Geared Offset (GO)

- **Material stacks:** CFRP, Aluminium, Titanium
- **Process:** One-shot drilling
- **Chip/dust exhaust:** optional
- **Clamping force:** –

“As an engineer at LÜBBERING I like the challenge of improving consistently our drilling units. Even after 20 years, this is still as exciting for me as on the first day.“

Johannes Stafflage, Design Engineer

EASILY ADAPTABLE BECAUSE IT IS EXPANDABLE. PERFECT COMBINATIONS.

Quick Change System

The Quick Change System allows the cutting tool or L.ADU locking system to be changed quickly.
The standard interface is suitable for all L.ADU locking systems and therefore they can be easily exchanged. In addition to easy handling, another advantage is good access to the cutting tool, which makes it easy to clean.

- **Quick changeover**
- **Good access to the cutting tool** (e. g. for cleaning)
- **Low risk of damaging the cutting tool**
- **Interface for all L.ADU locking systems** as standard or also available with indexing
- **Consistently secure locking system**

Quick Change Indexing

Choosing the Quick Change Indexing brings the additional benefit of 360° rotation of the drilling unit. Just pull, turn and release – and the machine is locked in the desired position in only a second.

Cycle Counter

Each drilling cycle is counted with the Cycle Counter. The counter can be reset using a special magnet pen. Accidentally resetting or misusing the counter is impossible with this handling.

- **Digital LC display for all drill cycles**
- **Preventive maintenance** due to drill cycle information
- **Reset the counter with the magnetic pin**

Watch the video of L.ADU pneumatic options

Quick Change System | Quick Change Indexing

MQL System

Minimum Quantity Lubrication System is the process of applying minute quantities of high-quality lubricant directly to the cutting tool interface.

In order to achieve perfect hole quality, a cooling lubricant is added evenly to the whole drilling surface using a cutting tool with internal cooling channels. When drilling very hard materials such as titanium, high temperatures can occur. MQL System protects the surface quality.

- **Highest quality of coolant** thanks to the integrated filter
- **Constant feed of micro drops**
- **Quantity of coolant can be individually adjusted**
- **Easy to refill**

Two-Hand Grip

L.ADU basis inline can be supplied with a Two-Hand Grip. The optimum balance and handling provided by the grip make it suitable for overhead work, for example on the underside of a wing.

- **Convenient work**
- **Ideal for overhead work**

Cycle Counter

MQL System

Two-Hand Grip

EACH APPLICATION IS DIFFERENT. THIS IS WHY WE OFFER OUR CUSTOMERS MORE OPTIONS – COMPLETELY SYSTEMATICALLY.

RIGHT-ANGLED – THE RIGHT MODEL FOR COMFORTABLE DRILLING IN THE RIGHT ANGLE.

LADU basis in the right-angled version is the optimum shape for applications requiring frontal access to the working area.

The 90° position of the drill to the machine housing, which at the same time serve as the handle, means more comfortable handling. In addition to short process times, the L.ADU right angled also offers significant advantages due to the balanced arrangement of its component, which is both more ergonomic and reduces the setting up time between drillings.

- **Ergonomic design**
- **Modularly compatible**
- **Flexibly expandable**
- **High availability**
- **Precise run-out**
- **High repeat accuracy of countersinking**

Configuration example:
L.ADU basis right-angled | L.ADU locking system Concentric Collet | MQL System

L.ADU pneumatic 55 right-angled

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 1/4“ + CSK*	≤ 3/8“ + CSK	≤ 3/8“ + CSK

*CSK = countersinking

L.ADU basis 55

Weight: 1.8 kg

Vane power: 0.9 kW

Turbine power: 1.2 kW (on request)

Speed: 500 - 6,000 rpm

Feed rate: 0.03 - 0.15 mm/rev

L.ADU locking system

Concentric Collet (CC) | C-Frame (CF) | Vacuum Traverse (VT) | Twist Lock (TL)

L.ADU option

MQL System
(available in two versions)

Cycle Counter

Quick Change System

already included | *already included*

Quick Change Indexing

already included

L.ADU pneumatic 56 right-angled

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 1/2“ + CSK*	≤ 9/16“ + CSK	≤ 9/16“ + CSK

*CSK = countersinking

L.ADU basis 56

Weight: 2 kg

Vane power: 0.9 kW (on request)

Turbine power: 1.2 kW (on request)

Speed: 500 - 6,000 rpm

Feed rate: 0.03 - 0.15 mm/rev

\+

L.ADU locking system

Concentric Collet (CC)

C-Frame (CF)

Vacuum Traverse (VT)

Twist Lock (TL)

\+ \+ \+ \+

L.ADU option

MQL System
(available in two versions)

Cycle Counter

Quick Change System

already included

already included

Quick Change Indexing

already included

L.ADU pneumatic 57 right-angled

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 3/4“ + CSK*	≤ 1“ + CSK	≤ 1“ + CSK

*CSK = countersinking

L.ADU basis 57

Weight: 4.5 kg

Vane power: 1.2 kW (on request)

Turbine power: 2.3 kW

Speed: 300 - 3,000 rpm

Feed rate: 0.03 - 0.15 mm/rev

\+

L.ADU locking system

Taperlock (TPL)

Twist Lock (TL)

\+ \+

L.ADU option

MQL System
(available in two versions)

Cycle Counter

Quick Change System

already included

Quick Change Indexing

already included

INLINE MODEL – BE IN LINE WITH YOUR DRILLING AREAS, UP OR DOWN.

L.ADU basis in the inline version was developed for applications which require overhead work.

The worker stands below the working area and uses the L.ADU which has been ergonomically enhanced. On the one hand the straight and slim form which makes access to very narrow parts possible and on the other hand right clarity, possible during the use.

- **Ergonomic form**
- **Modularly compatible**
- **Flexibly expandable**
- **High availability**
- **Precise run-out**
- **High repeat accuracy of countersinking**

Configuration example:
L.ADU basis 57 inline with L.ADU locking system Taperlock.

L.ADU pneumatic 55 inline

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 1/4“ + CSK*	≤ 3/8“ + CSK	≤ 3/8“ + CSK

*CSK = countersinking

L.ADU basis 55

Weight: 1.8 kg
Vane power: 0.9 kW
Turbine power: 1.2 kW (on request)
Speed: 500 - 6,000 rpm
Feed rate: 0.03 - 0.15 mm/rev

L.ADU locking system

Concentric Collet (CC) | C-Frame (CF) | Twist Lock (TL)

L.ADU option

MQL System
(available in two versions)

Cycle Counter

Quick Change System

already included | *already included*

Quick Change Indexing

already included

L.ADU pneumatic 56 inline

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 1/2“ + CSK*	≤ 9/16“ + CSK	≤ 9/16“ + CSK

*CSK = countersinking

L.ADU basis 56

- Weight: 2 kg
- Vane power: 0.9 kW (on request)
- Turbine power: 1.2 kW (on request)
- Speed: 500 - 6,000 rpm
- Feed rate: 0.03 - 0.15 mm/rev

+

L.ADU locking system

Concentric Collet (CC)

C-Frame (CF)

Twist Lock (TL)

+ + +

L.ADU option

MQL System
(available in two versions)



Cycle Counter



Quick Change System


already included


already included

Quick Change Indexing


already included

L.ADU pneumatic 57 inline

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 3/4“ + CSK*	≤ 1“ + CSK	≤ 1“ + CSK

*CSK = countersinking

L.ADU basis 57

- Weight: 4.5 kg
- Vane power: 1.2 kW (on request)
- Turbine power: 2.3 kW
- Speed: 300 - 3,000 rpm
- Feed rate: 0.03 - 0.15 mm/rev

+

L.ADU locking system

Taperlock (TPL)

Twist Lock (TL)

+ + +

L.ADU option

MQL System
(available in two versions)


Cycle Counter


Quick Change System


already included

Quick Change Indexing


already included

Two-Hand Grip

That L.ADU option is only available for L.ADU basis inline.

GRIP MODEL – BEST HANDLING FOR ONE-HANDED DRILLING.

L.ADU basis in the grip version expands the product series with a middle handle variant which is unbeaten in terms of ergonomics and user comfort.

The handle's centre of gravity enables a fast changeover between a horizontal and vertical fields of work without affecting the operator. This lock, unlock and start of the L.ADU grip is carried out one handed without having to put down the machine.

- **Ergonomic design**
- **Modularly compatible**
- **Flexibly expandable**
- **High availability**
- **Precise run-out**
- **High repeat accuracy of countersinking**

Configuration example: L.ADU basis 56 grip with L.ADU locking system Twist Lock.

L.ADU pneumatic 55 grip

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 1/4“ + CSK*	≤ 3/8“ + CSK	≤ 3/8“ + CSK

*CSK = countersinking

L.ADU basis 55

Weight: 2 kg

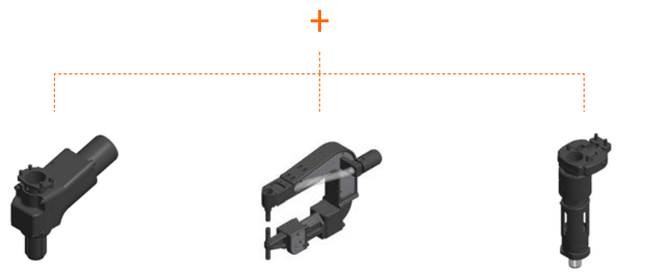
Vane power: 0.9 kW

Turbine power: 1.2 kW (on request)

Speed: 500 - 6,000 rpm

Feed rate: 0.03 - 0.15 mm/rev

L.ADU locking system



Concentric Collet (CC) | C-Frame (CF) | Twist Lock (TL)

L.ADU option

MQL System
(available in two versions)

Cycle Counter

Quick Change System

already included | *already included*

Quick Change Indexing

already included

L.ADU pneumatic 56 grip

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 1/2“ + CSK*	≤ 9/16“ + CSK	≤ 9/16“ + CSK

*CSK = countersinking

L.ADU basis 56

Weight: 2.2 kg

Vane power: 0.9 kW

Turbine power: 1.2 kW (on request)

Speed: 500 - 6,000 rpm

Feed rate: 0.03 - 0.15 mm/rev

+

L.ADU locking system

Concentric Collet (CC)

C-Frame (CF)

Twist Lock (TL)

+ + +

L.ADU option

MQL System
(available in two versions)

Cycle Counter

Quick Change System

already included

already included

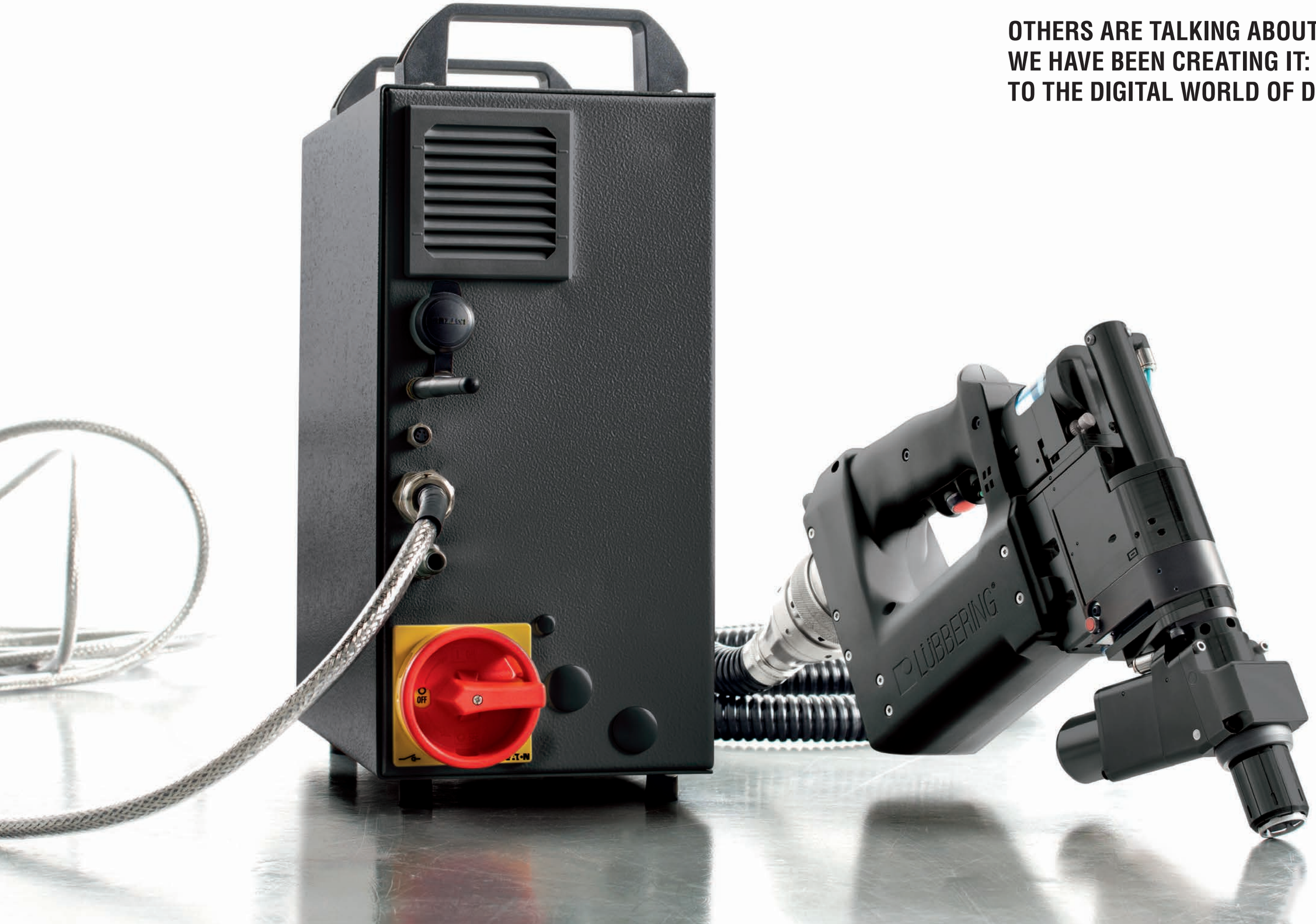
Quick Change Indexing

already included

SINCE 1994

AIRBUS IN HAMBURG HAVE BEEN USING OUR BVE 100 SERIES FOR THE LAST 20 YEARS.

**OTHERS ARE TALKING ABOUT FUTURE.
WE HAVE BEEN CREATING IT: WELCOME
TO THE DIGITAL WORLD OF DRILLING.**



THE SMARTEST WAY OF DRILLING IS BORN: L.ADU ELECTRONIC 255/256.

L.ADU combines all the advantages of a pneumatic drilling unit with the efficiency, solidity and programmability of an electronic one. The motor, which is maintenance-free, reduces energy consumption by up to 90% in comparison with a pneumatic unit.

Every material stack can be drilled with L.ADU electronic 255/256 at an optimum cutting speed. Functions like identifying different materials and penetrating through the material stack help to improve the quality and at the same time serve to reduce process times.

L.ADU electronic 255/256 can be integrated into the module system of L.ADU pneumatic and can also make use of the complete range of spindles, tool interfaces, interlocking systems and options. Therefore, pneumatic units can be replaced by L.ADU electronic without changing existing infrastructure or already qualified drilling processes in the production flow. Established maintenance processes and spare part inventory for our feed gears can be continued to use. For this, both L.ADU electronic and L.ADU pneumatic can efficiently be used in a parallel way.

- **Very short process times through programmable speeds**
- **Economical by saving up to 90% energy**
- **Ergonomic design ensures easy handling**
- **Environmentally friendly: The amount of cooling lubricant is regulated automatically by the machine due to material detection**
- **Modular and compatible to L.ADU pneumatic**
- **Robust and long-lasting**

DESIGNED TO PERFORM

SOME CALL IT BLACK BOX. WE CALL IT SMART BOX.

By linking an L.ADU electronic 255/256 to our “smart box“, the system meets all demands which are required on modern production devices in the digital world of today and tomorrow. The current process parameters are transferred online to any L.ADU which is attached and the item is identified via the type of the machine. The system registers every single drilling, and creates a log the drilling time and all relevant parameters. All activities and information are stored chronologically in the log file.

All relevant settings remain stored on every L.ADU electronic until the next update via the “smart interface“. This ensures the uninterrupted production flow should there be an error in the network. In this way the current settings are always available for analysis during servicing.

- **High availability through maintenance-free EC servo drive**
- **Virtually fail-safe and interchangeable through an integrated control system**
- **Electronic counter function for maintenance, operating tool time and lifetime of L.ADU**
- **Fully parameterizable**
- **User-friendly through an integrated LCD text display for all important functions**

THE INTELLIGENT SOLUTION FOR PRECISE DRILLING IN COMPLEX MATERIALS.

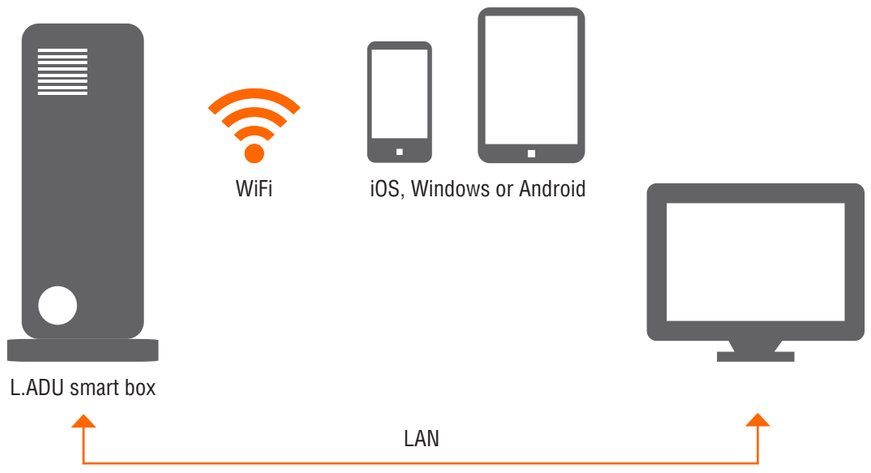
L.ADU smart interface serves as gateway between the operator's computer and the connected L.ADU. The integrated web server enables access to all platform-independent relevant data and parameters. A web browser is required whether on an iOS, Windows or android device. The installation of local software is not necessary.

The system can activate its' integrated WiFi. So, it allows access by mobile device without any other infrastructure. Different user levels always ensure security. A connection via LAN is also possible, even the access via internet worldwide.

In order to guarantee an internal real time clock of the L.ADU electronic, the machine can also be used when the "smart interface" is offline. A clock and sufficient memory for the data ensure that the information is always stored correctly, without connecting to the network. The data can then be collected later.

Standardized data formats like XML or XLSX are used for the data interchange with the L.ADU smart interface. These formats can also be managed, modified and evaluated irrespective of the platform. Special software is therefore not needed. This structure allows simple integration into existing IT systems. The server application of the L.ADU smart interface is designed to be open, Linux based and is thus really ready for the future. This is essential for today's tools which have long lifecycles.

- **An integrated web server allows access irrespective of the platform**
- **WiFi or LAN connection with an integrated DHCP server for easy access**
- **XML parameter files**
- **Creation of a dataset for every drill**



- **Automatic creation of an excel file including a design of the drilling process**
- **Log file for all activities and messages**
- **The customer does not need local software**
- **Creation of data diagrams online, in real time**
- **Maintenance functions for L.ADU**
- **Update functions for the server and the web interface via remote maintenance**

L.ADU electronic 255

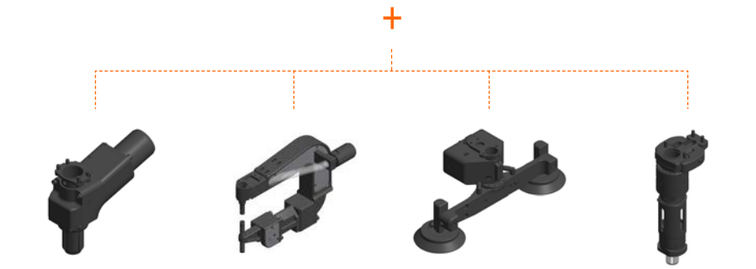
MATERIAL COMBINATION	AL/AL	AL/Ti	CFRP/CFRP	CFRP/Ti	CFRP/AL
DRILL HOLE SIZE	≤ 1/4“ + CSK*	≤ 1/4“ + CSK	≤ 1/4“ + CSK	≤ 1/4“ + CSK	≤ 1/4“ + CSK

*CSK = countersinking

L.ADU basis 255

- Weight: 2.8 kg
- Motor type: electronical servo motor
- Nominal power: 1 kW (1.5 kW peak)
- Control voltage: 24 V DC
- Motor voltage: 48 V DC
- Power supply: 230 VAC / 16 A
- Spindle speed: 50 – 7,000 rpm
- Feed rate: 0.03 mm/rev – 0.2 mm/rev

L.ADU locking system



Concentric Collet (CC) | C-Frame (CF) | Vacuum Traverse (VT) | Twist Lock (TL)

L.ADU option

MQL System

Quick Change System

already included | *already included*

Quick Change Indexing

already included

L.ADU electronic 256

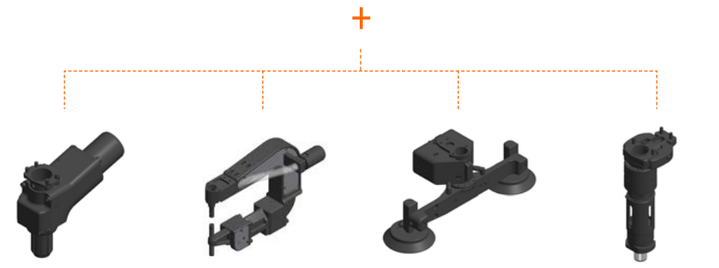
MATERIAL COMBINATION	AL/AL	AL/Ti	CFRP/CFRP	CFRP/Ti	CFRP/AL
DRILL HOLE SIZE	≤ 1/2“ + CSK*	≤ 1/2“ + CSK	≤ 1/2“ + CSK	≤ 1/2“ + CSK	≤ 1/2“ + CSK

*CSK = countersinking

L.ADU basis 256

- Weight: 2.95 kg
- Motor type: electronical servo motor
- Nominal power: ≤ 1.5 kW (peak)
- Control voltage: 24 V DC
- Motor voltage: 48 V DC
- Power supply: 230 VAC / 16 A
- Spindle speed: 50 – 7,000 rpm
- Feed rate: 0.03 mm/rev – 0.2 mm/rev

L.ADU locking system



Concentric Collet (CC) | C-Frame (CF) | Vacuum Traverse (VT) | Twist Lock (TL)

L.ADU option

MQL System

Quick Change System

already included | *already included*

Quick Change Indexing

already included

OUR IDEAS ENSURE GUARANTEED PROGRESS IN DRILLING. STEP BY STEP, LAYER BY LAYER.

ONE MACHINE FOR ALL MATERIALS WITH AUTOMATIC LAYER DETECTION.

Complex material combinations require increasingly flexible, high-performance drilling units. An important requirement of drilling machines is their ability to detect different material layers during the drilling process – this requirement is fulfilled by LÜBBERING electronic Advanced Drilling Units (L.ADU electronic).

In the aerospace industry, wings and the fuselage are increasingly being manufactured from CFRP (carbon fibre reinforced plastic) or material layers of CFRP and titanium, CFRP and aluminium or CFRP, aluminium and titanium. L.ADU electronic was developed specially for large drill holes in these sensitive combinations.

When machining CFRP, the quality of the drilling or milling machines and cutting tool plays a particular role as the material can lead to a high level of wear on the cutting tool due to abrasions.
This effect is critical mainly because the drilling results when working with CFRP must fulfil the highest quality requirements.

- **Large holes in sensitive combinations**
  Adaptive Drilling Performance: automatic spindle speed adjustment due to automatic material detection of stacks
- **Significant reduction of drilling cycle times**
  through cutter breakthrough sensor
- **Optimised and constant cutting speeds**
  through ground spindle
- **Time saving**
  by one-shot drilling | reaming and countersinking
- **Emergency stop**
  through button

In order to maintain the diameter tolerances, for instance, it is often necessary to integrate a reaming process as well. Countersinking is often carried out after drilling or reaming.

With the adaptive drilling performance, the L.ADU electronic can be used to make drill holes through different layers of material in a matter of seconds, as the speed of the L.ADU electronic can be automatically adapted to the material (see feed force diagram).

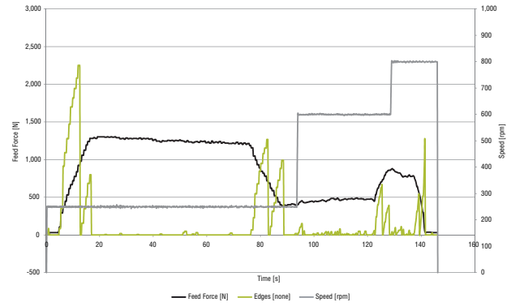
The integrated thrust sensor detects the cutter breakthrough of the material and adjusts the feed force to allow the drilling cycles to be considerably reduced compared to conventional drilling.

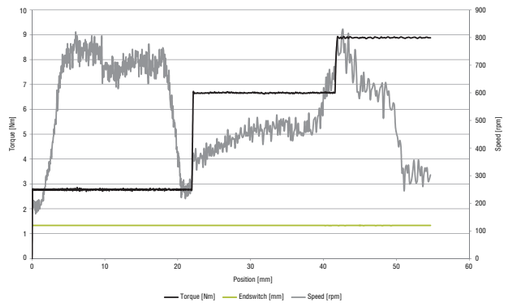
Besides extremely high drilling speed, the machine enables holes of up to 1 inch to be drilled in the under-carriage mounting.

In addition to special functions such as adaptive drilling performance and the thrust sensor, the speed can be infinitely adjusted, thus allowing for the cutting parameters to be adjusted at any time.

As the first supplier of L.ADU electronic, LÜBBERING shows the process parameters in a graph, analyses these parameters and adjusts them, if required, thereby achieving an optimum drilling process.

- **Overload protection**
  by controlled spindle speed and torque
- **Process information**
  by LC display and signal lights
- **Serial interface**
  for setup and maintenance
- **Full traceability of process data**
  via Feed Force and Position/Torque diagrams





Online presentation of the process parameters: LÜBBERING is the only supplier of Advanced Drilling Units that shows all data of a drilling process with L.ADU electronic in a graph, analyses the data, adjusts where required, thereby achieving an optimum drilling process. Typical values are: feed force, speed, torque and endswitch.

FOR BIG DRILLINGS IN BIG MATERIAL STACKS: L.ADU ELECTRONIC 520.

Besides extremely high drilling speed, the machine enables holes of up to 1 inch to be drilled in the undercarriage mounting.

In addition to special functions such as adaptive drilling performance and the thrust sensor, the speed can be infinitely adjusted, thus allowing for the cutting parameters to be adjusted at any time.

As the first supplier of L.ADU electronic, LÜBBERING shows the process parameters in a graph, analyses these parameters and adjusts them, if required, thereby achieving an optimum drilling process.

- **Different types of locking systems available**
- **Servo electronic driven positive feed unit**
- **Thrust sensor**
  detects the cutter breakthrough
- **Onboard electronic control unit (microcontroller)**
- **Spindle**
  - Rpm: freely adjustable
  - CW and CCW possible
  - Fast forward and fast retract function

Watch the video of L.ADU electronic

L.ADU electronic 520

MATERIAL *(also as multi stack)*	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 32 mm	≤ 45 mm	≤ 45 mm

*CSK = countersinking

L.ADU basis 520

Weight: 10 kg

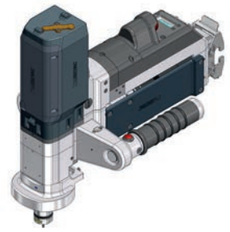
Motor type: electronical servo motor

Nominal power: ≤ 2.8 kW (peak)

Power supply: 400 VAC/16 A

Spindle speed: 50 – 2,500 rpm

Feed rate: 0.05 mm/rev - 0.15 mm/rev



L.ADU locking system

Taperlock (TPL)

Twist Lock (TL)

L.ADU option

MQL System		
Lifting handle		
Extraction manifold		
Cable protection		

HS 60 – THE LONGITUDINAL SEAM EXPERT. IT‘S ALL ABOUT HIGH-SPEED DRILLING.

L.ADU pneumatic HS 60 – the “turbo“ among drilling machines. At up to 16,000 rpm, this machine is able to carry out one-shot drilling and countersinking on the surface of the wings or fuselage (longitudinal and cross seams) in particularly short drilling cycles of approximately 2 seconds. L.ADU pneumatic HS 60 is ideally suited for quantitative precise drilling and trumps with enormous time savings as a result.

In addition to standard materials from the aerospace industry, L.ADU pneumatic HS 60 is also suitable for drilling in glass fibre reinforced polymer (GFRP), glass fibre reinforced aluminium (GLARE) and various honeycomb materials.

+ **High speed**
up to 16,000 rpm

+ **Time saving**
by one-shot drilling and countersinking

+ **Time saving**
by short drilling cycles of approximately 2 seconds

+ **Different vacuum traverses available**

L.ADU pneumatic HS 60

MATERIAL	Titanium	Aluminium	CFRP
DRILL HOLE SIZE	≤ 3/8” + CSK*	≤ 3/8” + CSK	≤ 3/8” + CSK

*CSK = countersinking

L.ADU basis HS 60

Weight: 2.5 kg

Vane power: 0.9 kW

Speed: 2,700 - 16,000 rpm

Feed rate: adjustable

+

L.ADU locking system

Vacuum Traverse (VT)

+

L.ADU option

MQL System

Cycle Counter

Quick Change

OUR DRILLING TECHNOLOGY TEST LABORATORY IS THE ONLY ONE OF ITS KIND IN THE WORLD. AND IT CAN BE SET TO ANY REQUIREMENT.

MORE RELIABILITY. MORE DURABILITY. MORE GOOD FEELING: WELCOME TO OUR SERVICES OF L.SMR

As a long-standing partner of the aerospace industry, we have expert knowledge of the complexity of drilling processes. Whether aluminium, titanium, CFRP or complex material stacks – with L.ADU every drilling is exactly like the other.

In order to meet all the demands of customers, we inspect all parameters in our own laboratory. This also ensures precise drillings. On our different test rigs, every machine including the designated locking system, is made ready for use by the customer. Speeds, feed speed, engine performance and all functions are inspected and the results are documented in a test log by our experts.

No matter whether before first delivery or after maintenance: Every machine's performance and functions are checked and a test log is made. So you can always rely on the precision and efficiency of your drilling unit.

- **Function and performance tests for all machines**
- **A team of experts with long-standing experience**
- **Test log documenting rotation speed, feed speed and engine performance**
- **Global service network**
- **Quick reaction times**
- **Service training** in Germany and abroad
- **Product, maintenance and application workshops**
- **3D product samples**

ARE CERTIFIED QUALITY AND ENVIRONMENTAL AWARENESS IMPORTANT TO YOU?

The reason why our products and services are so successful is both their high quality and our tireless endeavours to meet our customers' demands.

Our ISO 9001 quality management system has been in place for many years and contributes to improving our quality assurance and processes on a continuous basis. In 2014, we introduced the environmental management system according to ISO 14001 for the first time and successfully passed the certification. In June 2017 LÜBBERING successfully passed the certification process according to ISO 9001:2015 and ISO 14001:2015 which is valid until 2020.

- **High quality and environment awareness**
- **Certificate ISO 9001:2015**
- **Certificate ISO 14001:2015**

PLEASE GET IN TOUCH WITH US.

Detailed information about specific products is available on request.
You find your contact person on our website. Click on "The LÜBBERING Team".

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