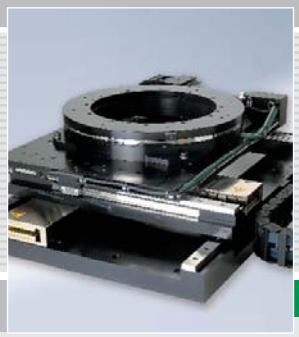
IDAM
INA Drives & Mechatronics





Direct Drive Technology

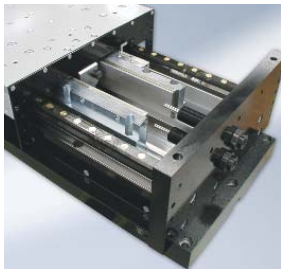
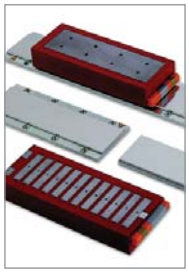
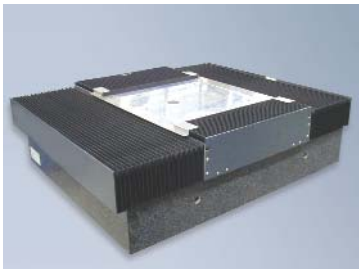
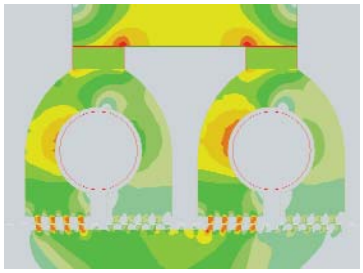
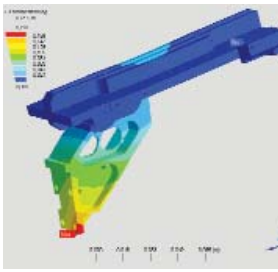
SCHAEFFLER GROUP
INDUSTRIAL

IDAM, INA - Drives & Mechatronics

Your partner for direct drive technologies.

INA - Drives & Mechatronics GmbH & Co. oHG (IDAM), a member of the Schaeffler Group Industrial, specializes in direct drive solutions. Direct drive technology is fascinating not only because of its precision and dynamic performance but also because of the many application options.

IDAM's product portfolio includes linear, rotary and two-coordinate direct drives covering a wide range of dimensions and performance. In addition, IDAM can supply all the required control technology for the system. Special attention should be given to the IDAM precision cross tables (X-Y) and the customer specific, high performance multi-axis (X-Y-Phi) systems.
Through the cooperation of INA, FAG and IDAM, a synergy has developed that ensures IDAM direct drive positioning systems are optimized and incorporate the latest technical advancements. INA - Drives & Mechatronics has comprehensive experience in the machine tools, automation, productronics, metrology and medical industries.

1 ***Precision.***

The principle of direct drive technology is this: power needed for motion is applied directly to the object that needs to be moved. Mechanical interfaces such as ball screws, belts, gear boxes and transmissions can be eliminated.
A direct drive solution reduces the number of components, simplifies assembly and thus reduces the overall cost of the system. All this while increasing the dynamic performance and precision of the system.
In short, productivity increases that cannot be realized with traditional drive systems can be realized with a direct drive solution.

All IDAM direct drives are characterized by five principles, which together stand for improved quality and cost-effectiveness.
IDAM engineers started about 15 years ago designing motors and systems for the highly innovative and demanding productronics industry. Today IDAM employees have expert knowledge in many different industries.
Where product development demands push technological limits, IDAM is experienced and ready to assist.

2 ***Dynamics.***

3 ***Flexibility.***

4 ***Safety.***

5 ***Compactness.***

Know-how & competence.

Advantages of direct drives

1 ***Precision:***
positioning accuracy in the submicron range | optimal synchronization values | extremely low path following error | precise positioning without backlash | high static and dynamic stiffness

2 ***Dynamics:***
high acceleration and velocity capabilities

3 ***Flexibility:***
more controller options | more adaptable to multi coordinate systems | more easily combined with bearing support systems | fewer components for a more simple design | easier assembly with fewer adjustments

4 ***Safety:***
wear-free motion and consistent precision over product life | overload protection of the motor and thus the machine | less complicated design

5 ***Compactness:***
smaller design options | easier retrofit into existing applications

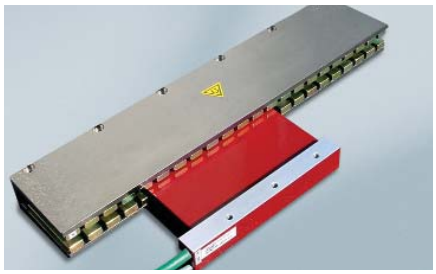
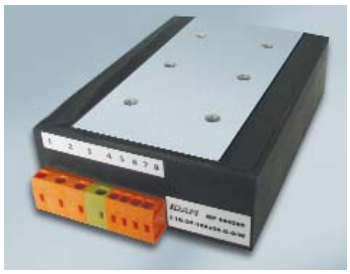
IDAM direct drives are at the forefront of modern technology and are an optimal solution for many applications. Let IDAM custom-made, high performance direct drive systems enable your company to gain a competitive edge. Partner with IDAM on your next project and receive the most advanced direct drive solutions available today. An overview of our core competences is shown on the next few pages.

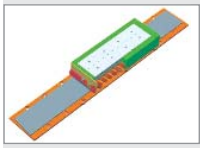
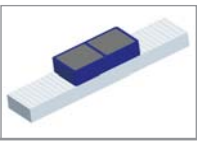
Linear Motors

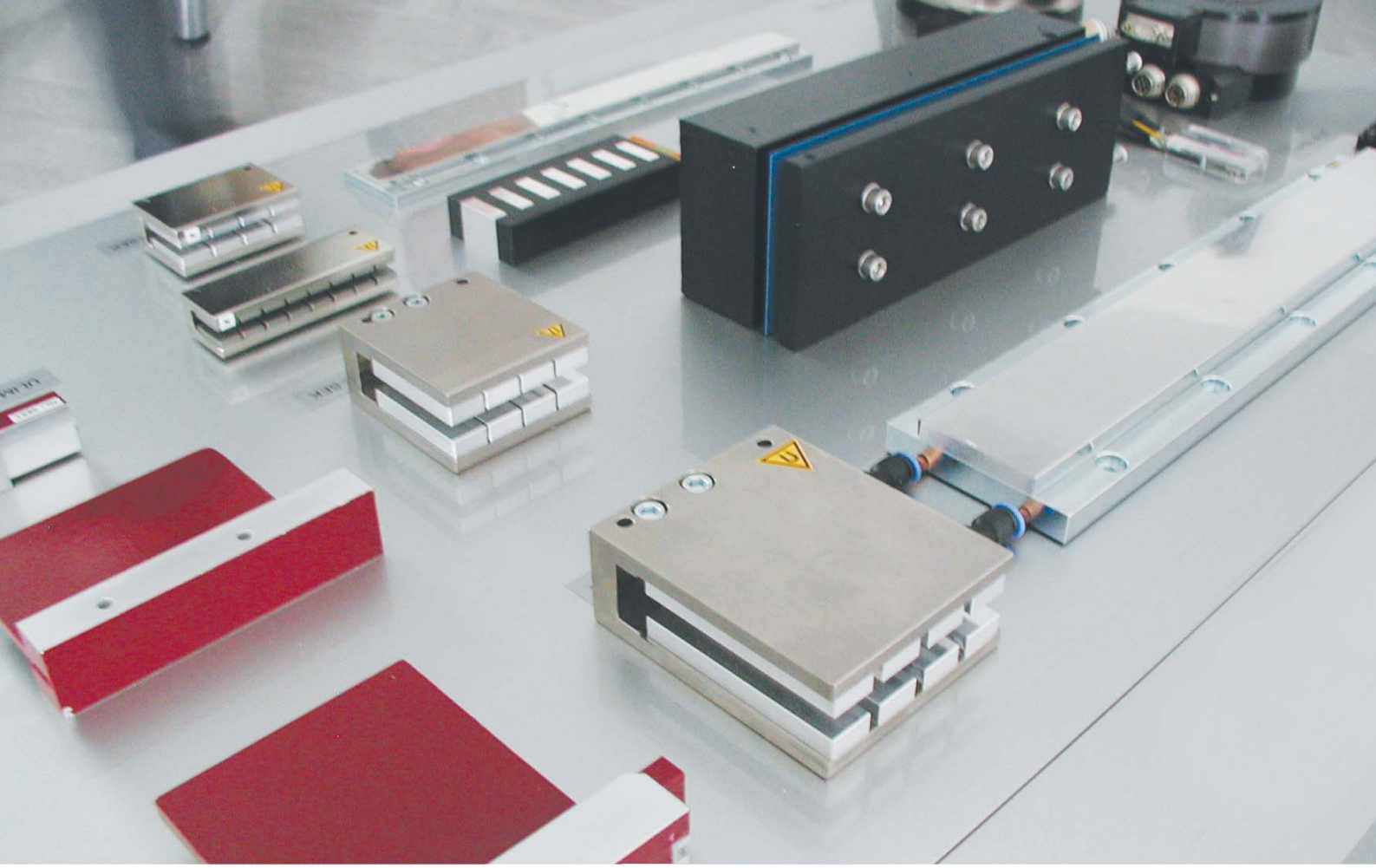
High dynamics & power.

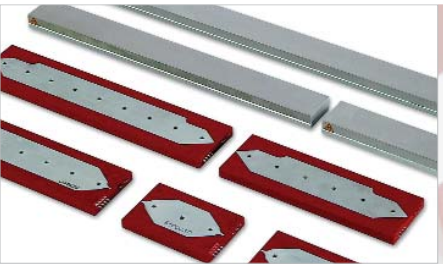
Thanks to our own AC synchronous and reluctance motor designs and expertise, IDAM is positioned to meet the growing demand for highly dynamic and precise motion control applications.

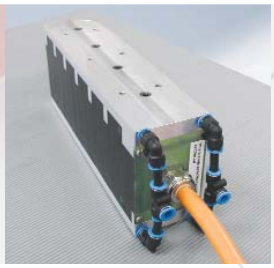
From extremely fast wire bonding machines, to highly precise measuring and processing machines, to fast material handling systems, IDAM has the expertise and infrastructure to assist with a wide variety of linear motor applications. IDAM can further optimize a linear motor system by combining it with either a mechanical bearing or air bearing support system.

Motor type	*Features*	*Design*
Ironless motors ULIM3-2P • ULIM4-2P • ULIM5-2P	high dynamics | no cogging | F_p up to 1,000 N | 2-phase	
ULIM4-3P • ULIM5-3P • ULIM7-3P	high dynamics | no cogging | F_p up to 2,500 N | 3-phase	
Slotless motors FSM-2P series	low profile | dynamic | no cogging | F_p up to 300 N	
Slotted Motors L1-3P series	compact | smaller sizes for lower masses | F_p up to 1,000 N	
L2-3P series	optional cooling | low cogging forces | F_p up to 10,000 N	
L2D-3P series	balanced motor design | efficient | dynamic | F_p up to 10,000 N	
Reluctance motors LRAM series	holding force: 10 N up to 400 N | resolution: 1 - 3 µm	







Advantages

- very good force mass ratio allows for highly dynamic motors
- precise positioning and uniform motion because of no cogging and very low active force pulsation
- better performance and force density is possible with optional cooling system
- precise control of the motor temperature
- high level of reliability from the use of modern manufacturing and testing technologies
- high quality, rare earth magnets are used for long life even in very demanding application enviroments

Applications

handling systems, pick and place applications, circuit manufacturing machines, measuring machines, machines for optical inspections, laser cutting, milling and grinding machines, packaging machines, plotter with laser direct imaging, machine tools

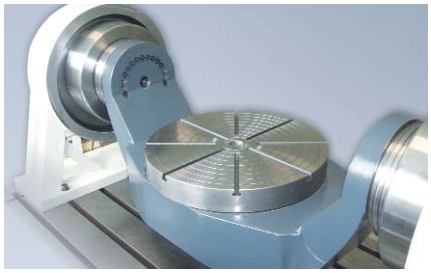
Single-phase linear motors (“Moving Coil” and “Moving Magnet”) work according to electro-dynamic principles. They are designed for precise positioning and high frequency oscillation applications with stroke lengths of a few millimeters.

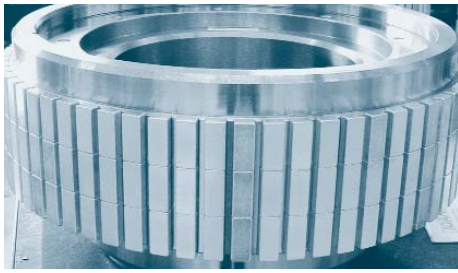
Rotary (Torque) Motors

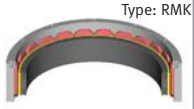
High torque, precision & dynamics.

Due to increased demands on the rotational axis, direct drive rotary motors are now more than ever replacing conventional motor and gearbox rotary systems.

Elasticity and friction is eliminated with rotary motors because there are no components for it to accumulate. Backlash is also completely eliminated. The designer's ability to create a more precise, dynamic, controllable rotary motion system is greatly simplified with the use of a rotary motor.



Motor type	*Features*	*Design*
Ironless motors URM series	customer specific | high dynamics | excellent synchronization | no cogging | for precision machines, measuring tools	Type: URM 
Slotless motors RMK / RMF series	customer specific or integrated motors | no cogging | any diameters up to 2.5 m | for peripheral speed up to 15 m/s	Type: RMK  Type: RMF 
Slotted motors RI / RE series	internal / external rotor | high torque up to 1,000 mm diameter | M_p up to 15,000 Nm	Type: Internal rotor 
HSR / HSRE series	internal / external rotor | high speed, up to 50 m/s peripheral speed | 50 kW	
HSRV / HSRVE series	internal / external rotor | high speed, up to 50 m/s peripheral speed | 50 kW | for spindle applications | customer specific	Type: External rotor 

Optimized motion

IDAM torque motors are ideal for machine tool applications where a high torque and very accurate motion control are required. A cooling system can also be incorporated into the motor to further enhance performance and maximize the force density.

IDAM offers standard product solutions that demonstrate outstanding performance. These include the optimal combination of the bearing and measuring system.
Based on an application analysis, IDAM will recommend a standard motor system that will deliver the required torque, velocity control and load carrying capabilities.

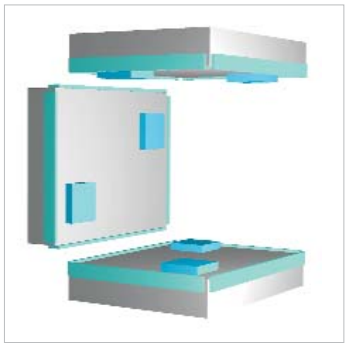
Enhanced optimization with custom-made drives

Since standard product solutions do not cover the entire range of possible applications, IDAM can also produce customized motor systems. Based on a detailed application analysis, IDAM will customize a motor design to better fit your specified requirements. This includes the option of integrating the motor directly into the machine structure. This motor integration can reduce the machine size and weight as well as reduce the overall cost. Ask your IDAM representative for an application analysis form. Let us help you optimize your design.

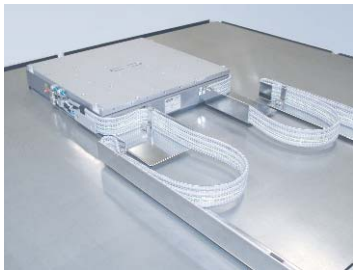
Planar Drives

High precision & flexibility.

Air bearing, planar drives are best suited for point-to-point positioning where the precision requirement is in the µm range.



With planar motor systems, force is produced via the reluctance principle. Because of the strong magnetic attraction of the forcer on the stator, a planar system can be used vertically as well as overhanging. This despite a 10 - 15 µm air gap between the stator and forcer that results in zero wear.
A planar system can also make more efficient use of workspace by utilizing more than one forcer per stator. Two or more forcers acting independently on the same stator can more effectively utilize constrained production process space.

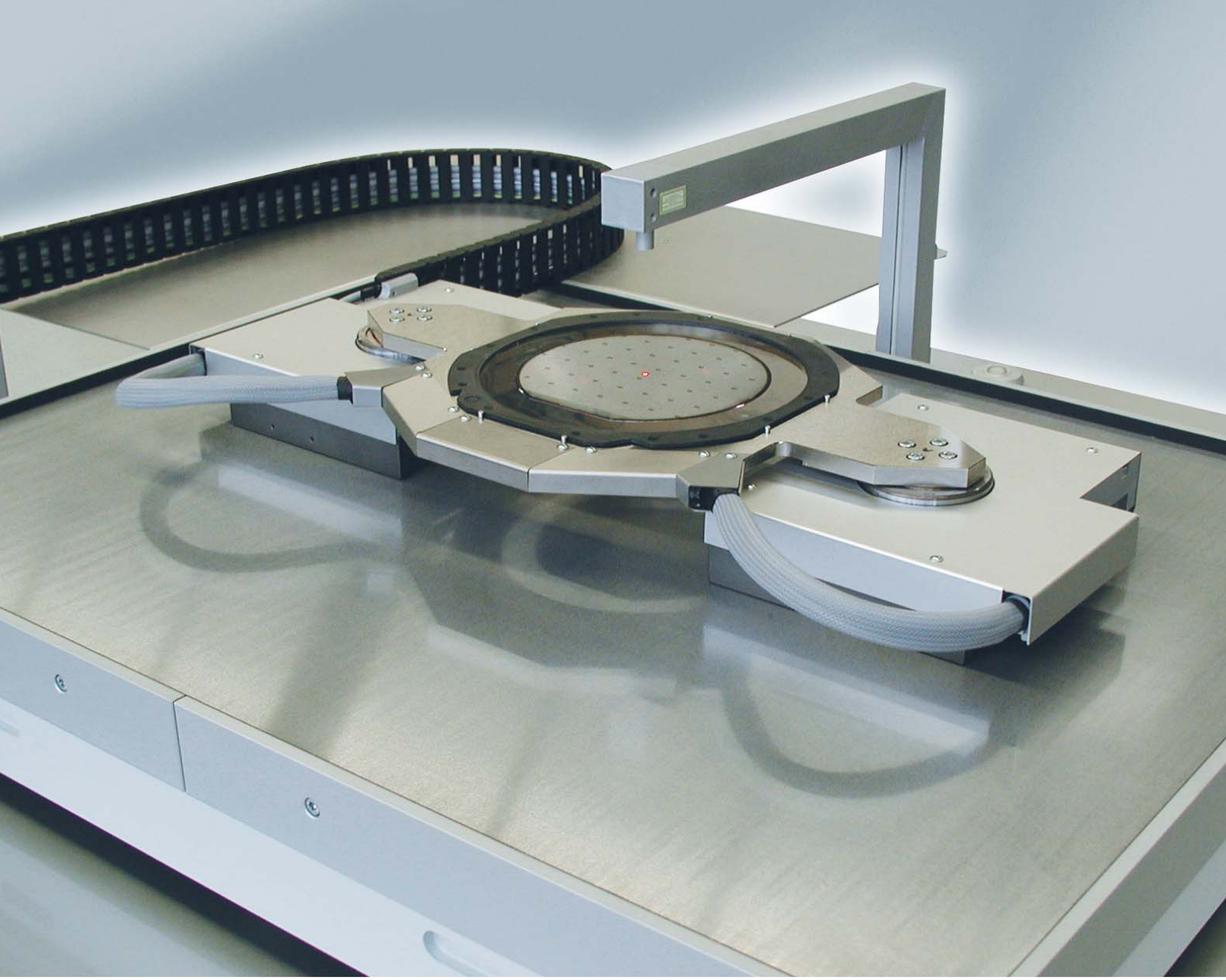


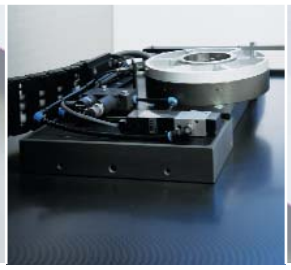
Technical features

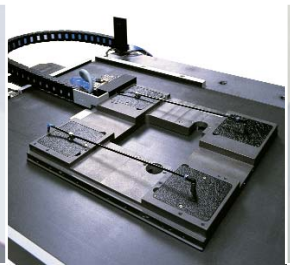
maximum stator size	up to 1,000 x 1,500 mm
maximum holding force	up to 330 N
speed	5 µm/s - 1.0 m/s
repeatability	1 µm - 3 µm
settling time	20 - 200 ms
guidance accuracy	up to 5 µm over 300 mm

Applications

assembly and repair of PCB's, bulb assembly with integrated testing, laser marking and trimming of resistors, component sorting, mini-production transport systems, pick and place, connector pin mounting with integrated testing, measuring and testing machines







Advantages

- single-plane design → X and Y axis are not stacked thus reduced height
- air bearings support → no wear | no slip stick | consistent motion over 100 million strokes
- multiple forcers on one stator → process optimization and space conservation
- operating in all positions in space → design flexibility: horizontal, vertical and overhanging
- low moving mass → high dynamic response
- closed loop in 3 coordinates (X, Y, Phi) → position controlled step motor | integrated, magnetic 3-coordinates measuring system
- integrated braking → loss of power will stop air and allow magnetic attraction
- design variation → open frame | gantry | additional angular motion
- light-weight stator design → application specific stator design optimization
- clean room compatible → ideal for clean room applications

Electronic Devices

Compact, high-performance and optimized.

When new and better components enter the market, IDAM is quick to improve motor designs by implementing their use. This constant product improvement also applies to electronic controls. Direct drive electronics must be constantly updated to ensure compatibility with future trends and customer demands.

From this, IDAM develops compact and powerful high performance servo drives. By constantly upgrading designs with the latest electronic technology, IDAM guarantees a high level of system accuracy, connection options, modern control structures and interfaces.




Components	*Features*
Digital Servo Module	**for three-phase synchronous motors without hall sensors / profile generator, digital position, velocity and current control, oversampling etc.**
DSMRW 253x	3 (1) x 230 V_{AC} | I_N = 12 A_{rms} | I_{max} = 30.5 A_{Peak} for ≤3 s | 18 kHz PWM
DSMRW 256x	3 x 400 V_{AC} | I_N = 8 A_{rms} | I_{max} = 20.4 A_{Peak} for ≤3 s | 18 kHz PWM
Amplifier PWM	**for two-phase synchronous motors with / without hall sensors**
SM2502	60 - 160 V_{DC} | 8 or 12.5 (max. 25) A | 14 or 16 TE, 3 HE
SM0502	‹45 V_{DC} | 2.5 (max. 3.5) A | 8 TE, 3 HE
Amplifier linear	**for two-phase synchronous motors**
AM1002	±35 V_{DC} | 5 (max. 10) A | 28 TE, 3 HE

Components	Features
Interpolators	**for 1 V_{pp} sin / cos signals**
IP0550	5 - 50 fold analog | 400 kHz 1 V_{pp}
IP-HBK01	5 - 50 fold analog | 400 kHz 1 V_{pp}
IP-HBK10	25 - 250 fold analog | 100 kHz 1 V_{pp}
Motor filter	**du/dt filter for U_{DCLV} = 600 V, with overvoltage protection, for top hat rail**
MOFI	I_{rms} = 5 / 10 / 20 A

More IDAM services

- customer specific multi-axis controllers with multiple mounting options like 19" cabinet (iPSD, PDCON,...)
- control of motion sequences with very high dynamics
- special cables (HBK) and connection units for linear and torque motor solutions

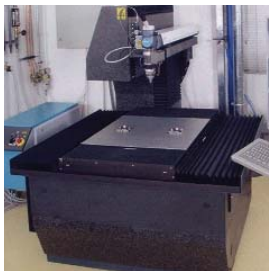
System Solutions

Highly innovative custom designs.

As a direct drive motor specialist, INA - Drives & Mechatronics is always striving to find new and better system solutions. Through customer collaboration and technical expertise, IDAM is always looking to improve products and reduce cost. This ensures that the most cost effective and technically advanced system is delivered to the customer.

Through modelling and simulation, IDAM determines the necessary options and the type of direct drive to be used. Only after consulting with the simulation team does IDAM implement performance enhancing modifications to an existing system.

IDAM offers custom engineered linear and rotary drive systems in combination with INA / FAG linear guide and bearing assemblies. By leveraging the expertise of INA with linear bearings and FAG with rotary bearings, IDAM has the ability to offer the most optimal direct drive solution in the market.



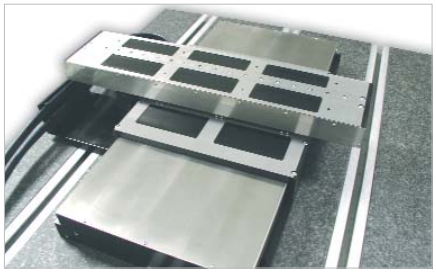


Handling system
for fineblanking press

High speed linear axis
for material handling and automation

Flexible receiver
for the accurate measuring of parts

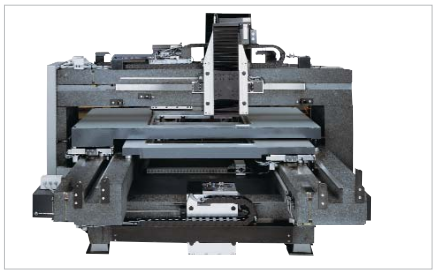
2-axis positioning system
for the productronics industry



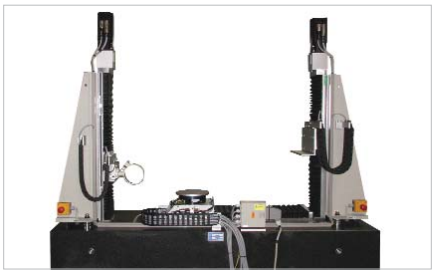
Rotary positioning unit
for the productronics and automation

Linear axis
for the packaging industry

Fully automated multilayer
measuring and drilling system



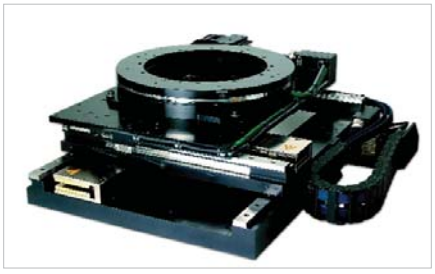
5-axis manipulator
for a x-ray measuring machine



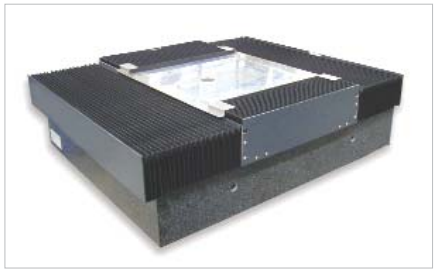
Air bearing, single-axis system
for the optical industry

Precision linear stage
for milling and grinding machines

Open frame transmitted light table
for the industrial productronics



Air bearing, precision cross table
for high accuracy CNC laser machining



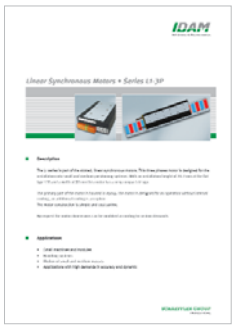
(system solutions: selected examples)

Technical Information and Application Analysis

Need-to-know & qualified.

You are interested in more detailed technical information?

We would be happy to send you our product brochures. Contact us.



Linear Motors:
Series L1

Linear Motors:
Series L2

Linear Motors:
Series L2D

Linear Motors:
Series FSM

Linear Motors:
Series ULIM

Rotary Motors:
Series RE

Rotary Motors:
Series RI

Rotary Motors:
Series RM

Rotary Motors:
Series HSR / HSRV

Planar Reluctance
Motors

Technically competent engineers and prompt service are your advantages with IDAM. An IDAM sales engineer will be happy to assist you with the selection of your next direct drive solution.

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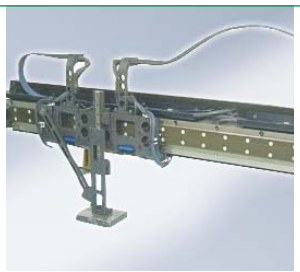

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