

# **PRECISION IN MOTION**

**EN**

Publisher



BUSCH Microsystems GmbH  
An der Altnah 34  
DE-55450 Langenlonsheim

All rights reserved. Reprinting, even in part, is not permitted without express permission.  
The technical data in this catalogue may be changed at any time without prior notice.  
The illustrations in this catalogue are for your orientation only. The size ratios do not correspond to the original sizes. Errors excepted.

# Content

■ Company .....	4
■ Engineering .....	6
■ High precision positioning systems .....	8
■ Product overview .....	9
■ CFRP .....	29
■ BCS – BUSCH Control System .....	30
■ Service & Maintenance .....	32
■ System partners .....	33
■ Technical Backgrounds .....	34

## BUSCH MICROSYSTEMS – QUALITY AND PRECISION IN PERFECTION

In 1999, BUSCH Microsystems was founded as an engineering consultant by Winfried Busch, Graduated Engineer, and has meanwhile evolved to an internationally active developer and manufacturer of high-precision machine components and positioning systems. Nowadays, Winfried manages the company with his daughter Nicola and considers the benefits of a classical medium-sized family enterprise as the company's strengths: focusing firmly on all processes, responding flexibly to the customer's requests and acting reliably.

Our core competence is the design and manufacture of high-precision machine components and positioning systems. Due to strong partnerships with several manufacturers of e.g. high performance machine controller or software solutions, BUSCH Microsystems provides complete systems from one source.

An enlarged production area, the latest machinery, designing offices with comprehensive simulating tools and a growing number of employees form a powerful unit. Herewith, BUSCH Microsystems is



able to support you capably from the very beginning of your project and design your system ideally. Highly precise gantry-systems, XY-linear and lifting stages, e.g. made of granite or CFRP; mechanical systems or with air bearings; with or without controller – BUSCH Microsystems will find the optimal solutions for you!

Our standardized positioning systems, which are presented to you in the following, are characterized by highest system accuracy and repeatability. Corresponding to the corporate philosophy, the team of sophisticated engineers and technicians gladly adapts these systems to the individual requirements of your application.

BUSCH Microsystems stands for personal responsibility of the employees and partnership cooperation with the customers.



*Second Generation Nicola Baumdicker-Busch*



*First Generation Dipl.-Ing. Winfried Busch*

*Get to know us.*



## WE DESIGN YOUR SOLUTION

BUSCH Microsystems modifies and adapts the basis systems to meet your specific and exact requirements. The following alternatives and options are possible:

- Various materials, such as granite or stainless steel
- Scalable strokes & sizes
- Different motor powers
- Optimization for higher loads
- Individual mounting holes
- Optical or magnetic measuring systems
- Connection cables in the required length
- Combinations with further axes
- Design for clean room operation
- With or without controller

*You wish for another adaption, which is not listed? Talk to us – together we will find a solution!*

### PROJECT PLANNING

Our system solutions range from individual precision components to an individually developed complete system according to customer

- We always have the requirements of our requirements of our customers.

### E-PANNING

Our e-planning is always prepared in accordance with the standard IEC 60204-1 standard. The planning of the electrical plans as well as the planning of the control cabinet, but as well as the design of the electrical components are prepared on the basis of EPLAN.





## HIGHLY PRECISE POSITIONING SYSTEMS

We offer positioning systems for precision and ultra-precision mechanical engineering, for example of granite or CFRP, that feature maximum system and repeatability.

Positioning systems made by BUSCH Microsystems provide numerous benefits:

- Highest precision and fast positioning
- Low inertia and high acceleration
- Compact construction and high rigidity
- Ready to mount systems & assemblies
- Virtually no friction & very smooth running
- Very low yaw, pitch and roll errors
- Low-maintenance
- Precise control, high repeatability and low thermal expansion



*Learn more about us and our  
high-precision positioning systems*

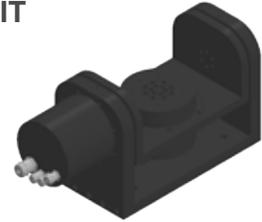


# PRODUCT OVERVIEW | SYSTEMS

**LINEAR STAGES**



**ROTARY SWIVEL UNIT**



**LIFTING STAGES**



**Z-AXES**



**XY-STAGES**



**GANTRY-SYSTEMS**



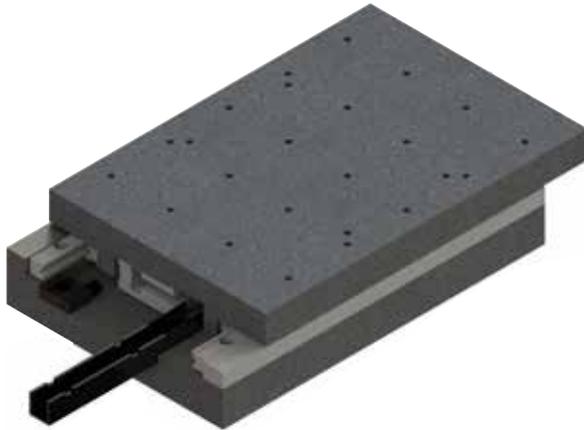
**ROTARY STAGES**



**3-AXIS SYSTEMS**



# LINEAR STAGES



## Characterization:

- Driven by ironless linear motor
- Cross roller guides
- Exact positioning due to accurate guidance
- No cogging
- Thread grid on the slide for the mounting of the payload
- Combinable as a stage system (e.g. XY-stage)
- Absolute measuring system

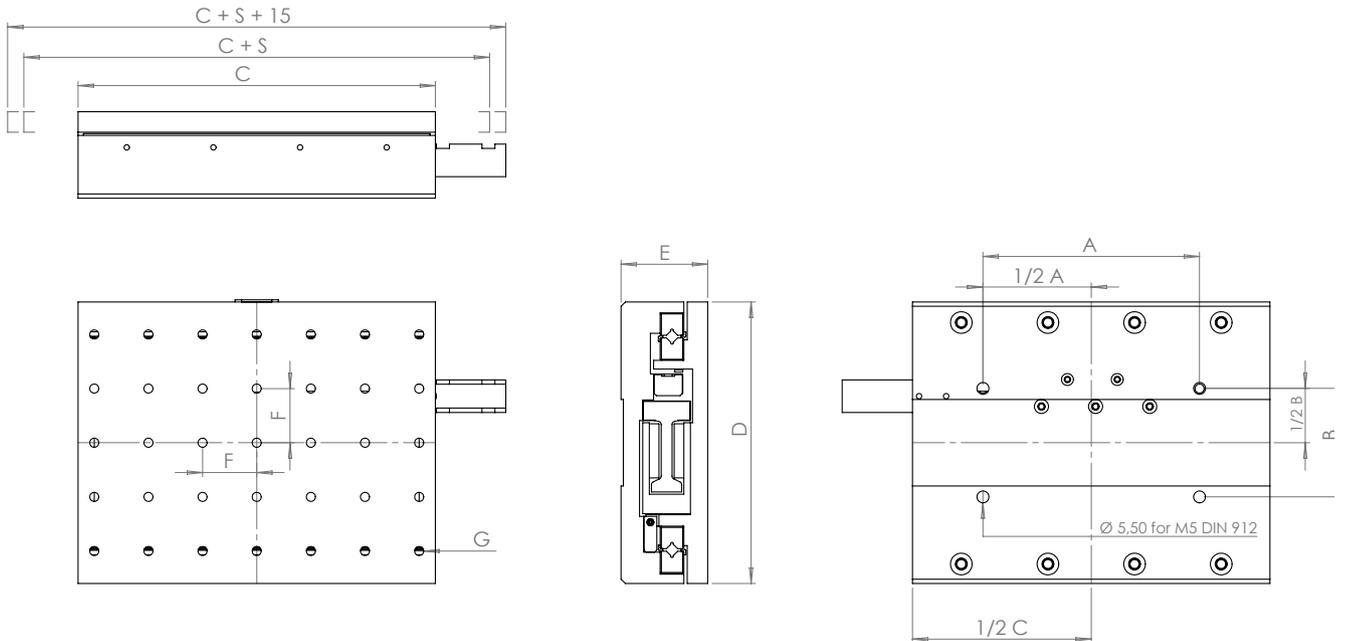
## Variations:

- Incremental measuring system
- With controller

## Basis data – configurable to your application

MODEL	LT-G-
<b>Kinematic</b>	
Axis type	Single axle
Travel path	50-300 mm
Max. speed	1 m/s
Max. acceleration	5 m/s <sup>2</sup>
Payload	10 kg
<b>Drive</b>	
Rail type	Cross rolls
Engine type	Linear engine
<b>Measuring system</b>	
Measuring type	Optical absolute
Type of system	open
Nominal pitch	30 μm
Resolution readhead	5 nm
<b>Accuracies</b>	
Straightness	1 μm
Flatness	5 μm

*\*with ACS controller*



MODEL	150	200
<b>Dimensions</b>		
S (travel distance)	150	200
A	120	120
B	75	75
C	245	285
D	165	165
E	60	60
F	45	45
G	20xM5	20xM5
T (safety tolerance)	45	45

## Z-AXES



### Characterization:

- Driven by servo motor
- Ground ball screw
- Self-locking design
- Diversely adaptable
- Precise base made of granite
- Provided with a motor brake
- Absolute measuring system
- Bellows/ Cover

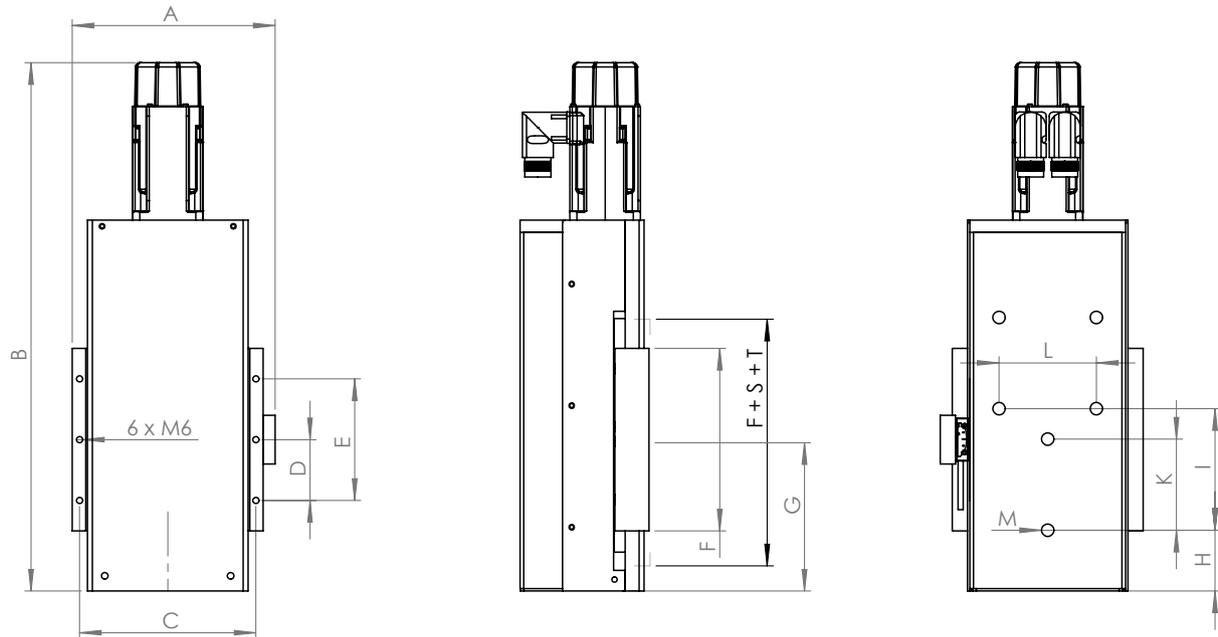
### Variations:

- Integrated energy chain
- Incremental measuring system
- With adapter plate
- With controller

### Basis data – configurable to your application

MODEL	ZA-
<b>Kinematic</b>	
Axis type	Single axle
Travel path	up to 500 mm
Max. speed	0,5 m/s
Max. acceleration	5 m/s <sup>2</sup>
Payload	up to 50 kg
Cover	yes
<b>Drive</b>	
Rail type	Profile rails
Engine type	Servo motor
<b>Measuring system</b>	
Measuring type	Optical absolute
Type of system	open
Nominal pitch	30 μm
Resolution readhead	5 nm
<b>Accuracies</b>	
Straightness	10 μm
Positioning accuracy*	5 μm
Flatness	15 μm

\*with ACS controller



MODEL	50	150	250	350
<b>Dimensions</b>				
S (travel distance)	50	150	250	350
A	170	170	170	170
B	450	550	650	750
C	145	145	145	145
D	50	50	50	50
E	100	100	100	100
F	150	150	150	150
G	125	175	225	275
H	50	50	50	50
I	100	100	100	100
K	75	75	75	75
L	80	80	80	80
M	6xM12	9xM12	9xM12	9xM12
T (safety tolerance)	10	10	10	10

## LIFTING STAGES



### Characterization:

- Cross roller guides
- Warp-resistant aluminum profiles (black anodized)
- Integrated connection via D-Sub port
- Thread grid on the slide for the mounting of the payload
- Absolute measuring system

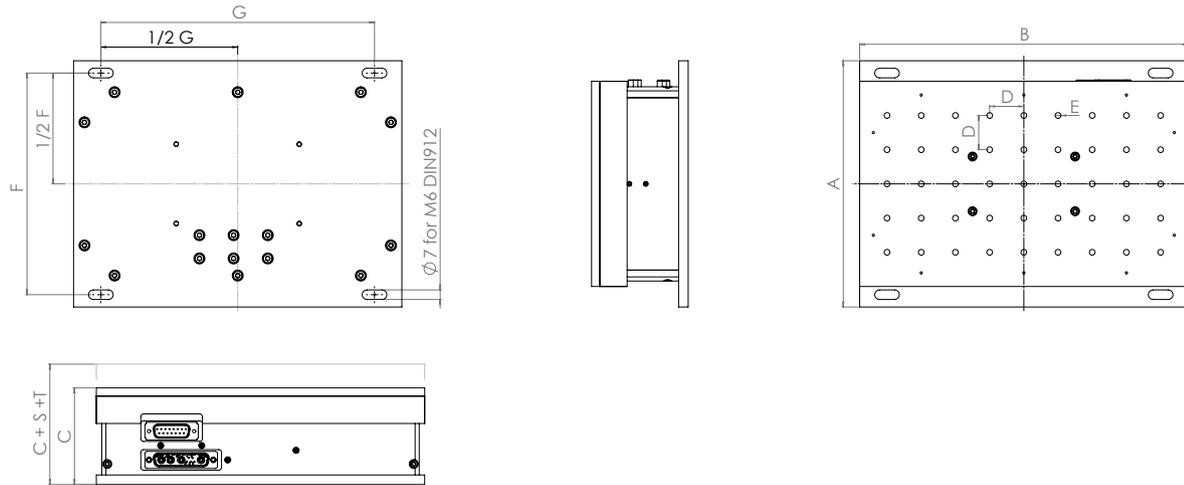
### Variations:

- Ironless linear motor or DC-motor with ball screw according to the system's stroke
- Incremental measuring system
- With controller
- pneumatic brake

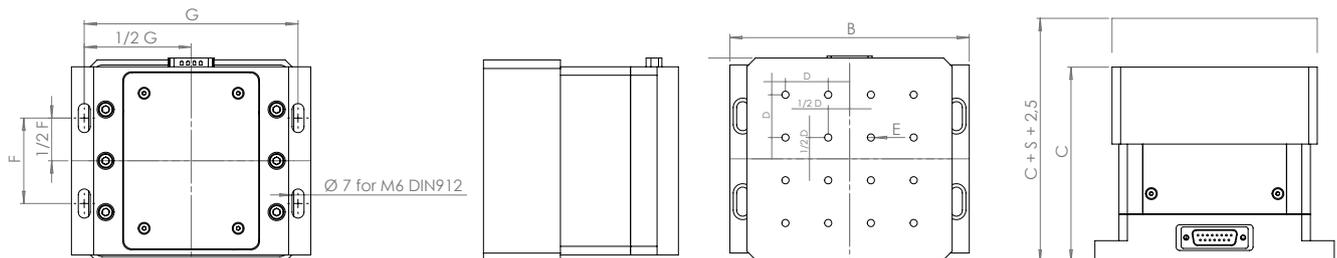
### Basis data – configurable to your application

MODEL	HT-
<b>Kinematic</b>	
Axis type	Single axle
Travel path	10-40 mm
Max. speed	0,2 m/s
Max. acceleration	2 m/s <sup>2</sup>
Payload	5 kg
<b>Drive</b>	
Rail type	Cross rolls
Motor type	Linear engine
<b>Measuring system</b>	
Measuring type	Optical absolute
System type	open
Nominal pitch	30 μm
Resolution readhead	5 nm
<b>Accuracies</b>	
Straightness	10 μm
Positioning accuracy*	5 μm
Flatness	5 μm

\*with ACS controller



MODEL	10	25
<b>Dimensions</b>		
S (travel distance)	10	25
A	240	120
B	180	140
C	65,5	115
D	25	25
E	45xM5	16xM6
F	200	50
G	162	125



## XY-STAGES

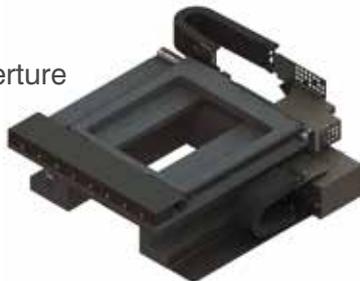


### Characterization :

- Driven by ironless linear motors
- Cross roller guides
- Exact positioning due to accurate guidance
- No cogging
- Thread grid on the slide for the mounting of the payload

### Variations:

- With or without aperture
- Incremental measuring system
- With controller



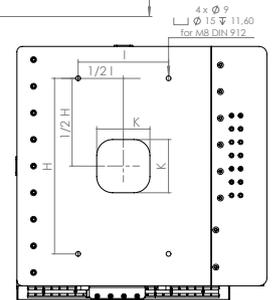
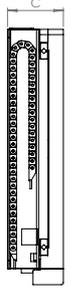
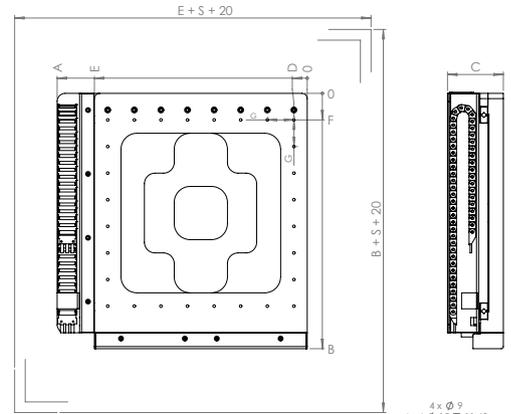
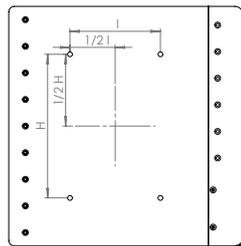
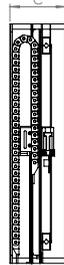
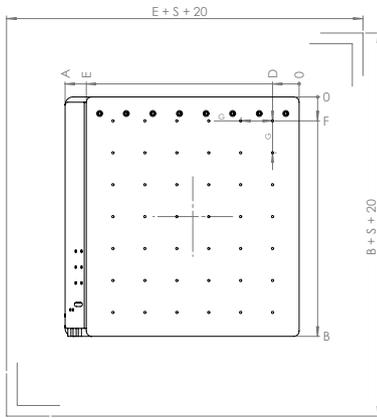
### Basis data – configurable to your application

MODEL	XY-G-	
	X-Axis	Y-Axis
<b>Kinematic</b>		
Travel distance	300 mm	300 mm
Max. speed	0,5 m/s	0,5 m/s
Max. acceleration	5 m/s <sup>2</sup>	5 m/s <sup>2</sup>
Payload	5 kg	
Total weight	25 kg	
<b>Drive</b>		
Rail type	Cross rolls	
Engine type	Linear engine	Linear engine
<b>Measuring system</b>		
Measuring type	Optic. absolute	Optic. absolute
Type of system	open	open
Nominal pitch	30 μm	30 μm
Resolution readhead	5 nm	5 nm
<b>Accuracies</b>		
Straightness	1,5 μm	1,5 μm
Positioning accuracy*	1,5 μm	1,5 μm
Flatness	5 μm	5 μm

\*with ACS controller



Experience our systems in motion



MODEL	200	300
<b>Dimensions</b>		
S (travel distance)	200	300
A	440	540
B	450	500
C	105	105
D	50	62,5
E	400	500
F	45	62,5
G	60	75
H	270	280
I	170	270
K	42xM6	42xM6
T (safety tolerance)	20	20

## ROTARY STAGES



### Characterization:

- Driven by torque motor
- High precision bearings for torque resistance
- Great dynamics with excellent running accuracy
- Integrated connection via D-Sub port
- Thread grid on the slide for the mounting of the payload
- Absolute measuring system

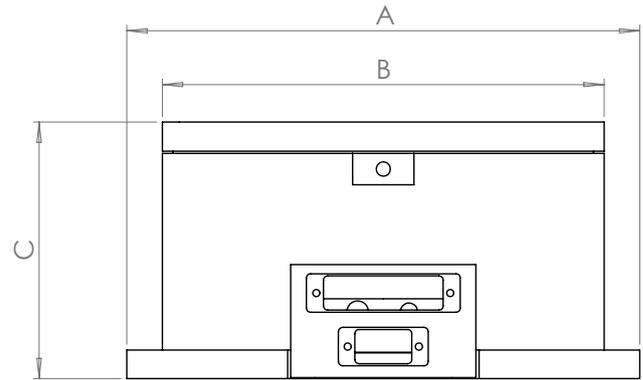
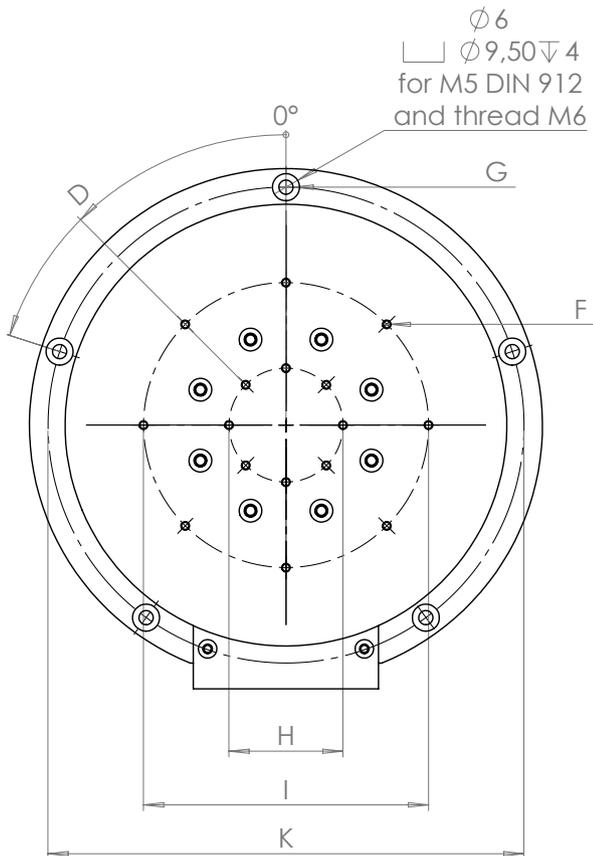
### Variations:

- Incremental measuring system
- With aperture
- With brake
- With controller
- Plate diameter adjustable

### Basis data – configurable to your application

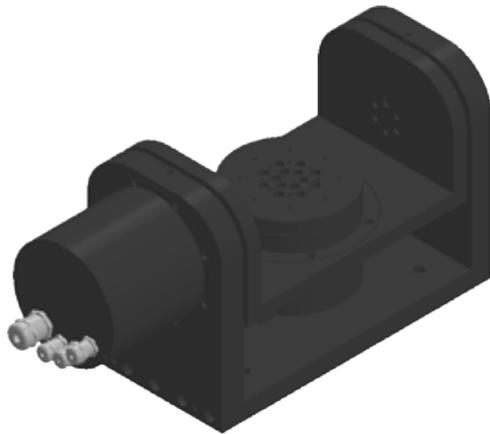
MODEL	DT-
<b>Kinematic</b>	
Travel distance	360°
Max. speed	95 rad/s
Max. acceleration	600 rad/s <sup>2</sup>
Payload	5 kg
Total weight	5,5 kg
<b>Drive</b>	
Rail type	Cross rolls
Engine type	Torque motor
<b>Measuring system</b>	
Measuring type	Optical absolute
Type of system	open
Nominal pitch	30 μm
Resolution readhead	5 nm
<b>Accuracies</b>	
Positioning accuracy*	+/-1 μm

\*with ACS controller



MODEL	155
<b>Dimensions</b>	
S (travel distance)	+/-360
A	180
B	155
C	90
D	45
E	72
F	16xM3
G	5xM5
H	40
I	100
K	167

# ROTARY SWIVEL UNIT



## Characterization:

- Driven by torque motor
- High precision bearings for torque resistance
- Great dynamics with excellent running accuracy
- Integrated connection via D-Sub port
- Thread grid on the slide for the mounting of the payload
- Absolute measuring system

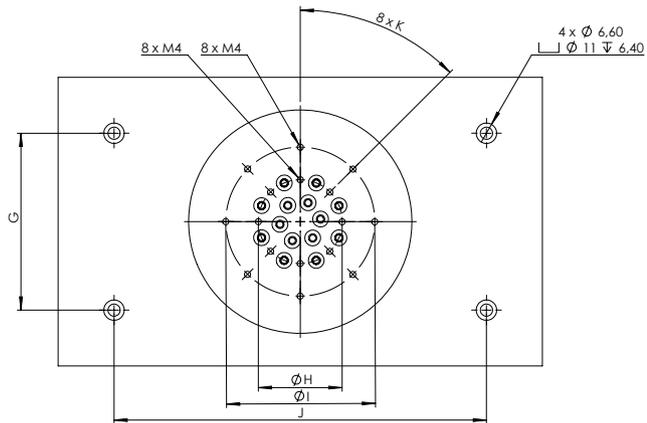
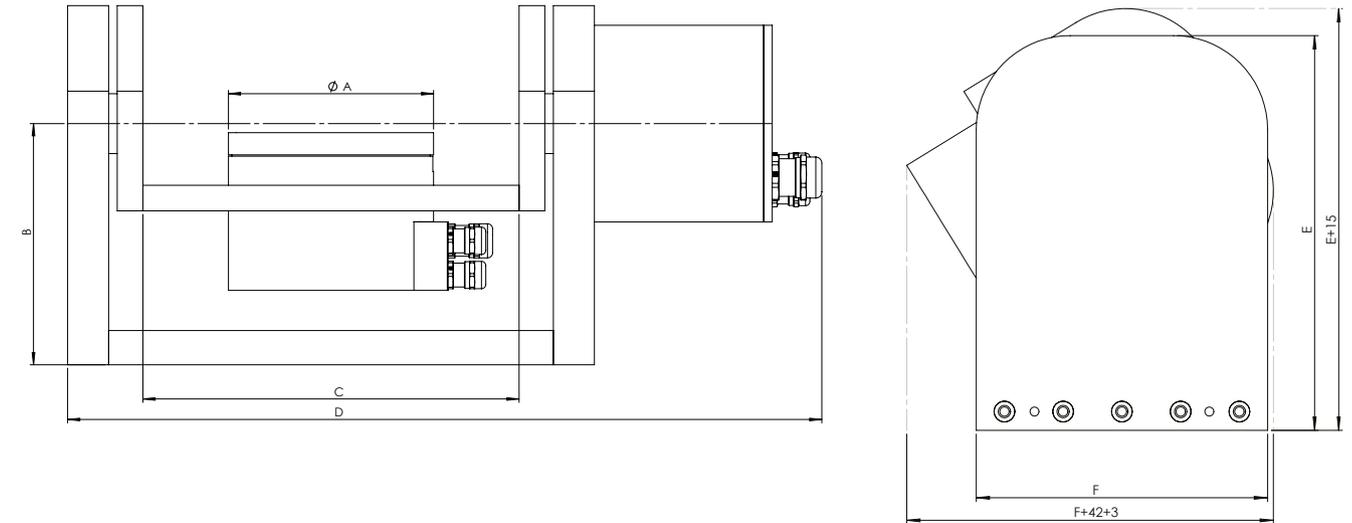
## Varianten:

- Flexible height of the swivel axis
- Incremental measuring system
- With brake
- With controller

## Basis data – configurable to your application

MODEL	DSE-	
	A	B
<b>Kinematic</b>		
Axis type	rotary axis	swivel axis
Travel distance	+/-360°	+/-95°
Max. speed	95 rad/s	45 rad/s
Max. acceleration	600 rad/s <sup>2</sup>	100 rad/s <sup>2</sup>
Payload	up to 80 kg	
Total weight	18 kg	
<b>Drive</b>		
Rail type	Cross rolls	
Engine type	Torque motor	Torque motor
<b>Measuring system</b>		
Measuring type	Optic. absolute	Optic. absolute
Type of system	open	open
Nominal pitch	30 μm	30 μm
Resolution readhead	5 nm	5 nm
<b>Accuracies</b>		
Positioning accuracy*	+/- 1 μm	+/- 1 μm

\*with ACS controller



MODEL	120/141
<b>Dimensions</b>	
Rotation angle ( $\alpha$ )	+/-360 (infinite)
Swivel angle ( $\beta$ )	+/- 95
A	120
B	141
C	220
D	441
E	210
F	155
G	95
H	45
I	80
K	200
L	45

# GANTRY-SYSTEMS



## Characterization:

- Basic construction made of granite
- Highest system accuracy due to ideal adjustment of all components
- Driven by linear motors
- Synchronized movement of the portal
- Traverse with single-sided floating bearings
- Profiled rail guide
- Absolute measuring system

## Varianten:

- Incremental measuring system
- Ironless or iron-core linear motors
- Air bearings for highest demands
- With steel frame, Z-axis or controller
- Variant CFRP

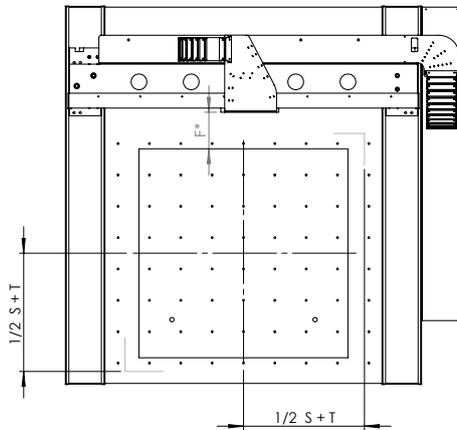
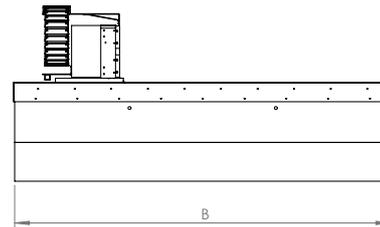
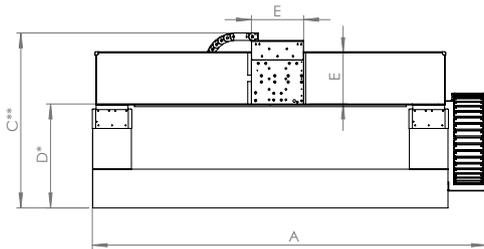
## Basis data – configurable to your application

MODEL	GS-	
	X-Axis	Y-Axis
<b>Kinematic</b>		
Axis type	Gantry	Gantry
Travel distance	up to 2800 mm	up to 4000 mm
Max. speed	5 m/s	5 m/s
Max. acceleration	50 m/s <sup>2</sup>	50 m/s <sup>2</sup>
<b>Drive</b>		
Rail type	Profile rail	Profile rail
Engine type	Linear engine	Linear engine
<b>Measuring system</b>		
Measuring type	Optic. absolute	Optic. absolute
Type of system	open	open
Nominal pitch	30 μm	30 μm
Resolution readhead	5 nm	5 nm
<b>Accuracies</b>		
Straightness	+/- 1,5 μm	+/- 1,5 μm
Positioning accuracy*	+/- 2 μm	+/- 2 μm
Flatness	5 μm	5 μm

\*with ACS controller

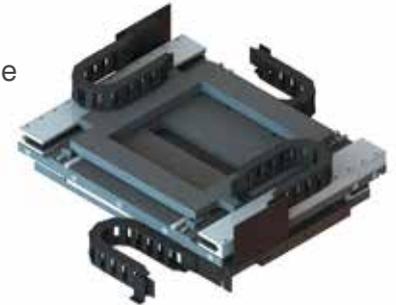


*Experience our systems in motion*



Possible Fabrication:

Gantry-XY-Table



Beam construction



Double gantry;  
i.e. two cross beams



MODEL	600	1000
<b>Dimensions</b>		
Sx (travel distance X)	600	1000
Sy (travel distance Y)	600	1000
A	1600	1900
B	1300	1800
C	1000	850
D	400	300
E	300	250
F	150	140
G	56xM10	72xM10
Txy (safety tolerance)	25	25

## 3-AXIS SYSTEMS



### Characterization: :

- Basic construction made of granite
- Highest system accuracy due to ideal adjustment of all components
- Driven by linear motors in XY, servo motor in Z
- Variable position of the Z-axis possible
- Particularly rigid design of the traverse
- Absolute measuring system



### Varianten:

- X-axis combined to a XY-stage or on the traverse
- Incremental measuring system
- Measuring systems made of Invar
- Air bearings for highest demands
- With steel frame and/or controller
- Additional Z-axes possible

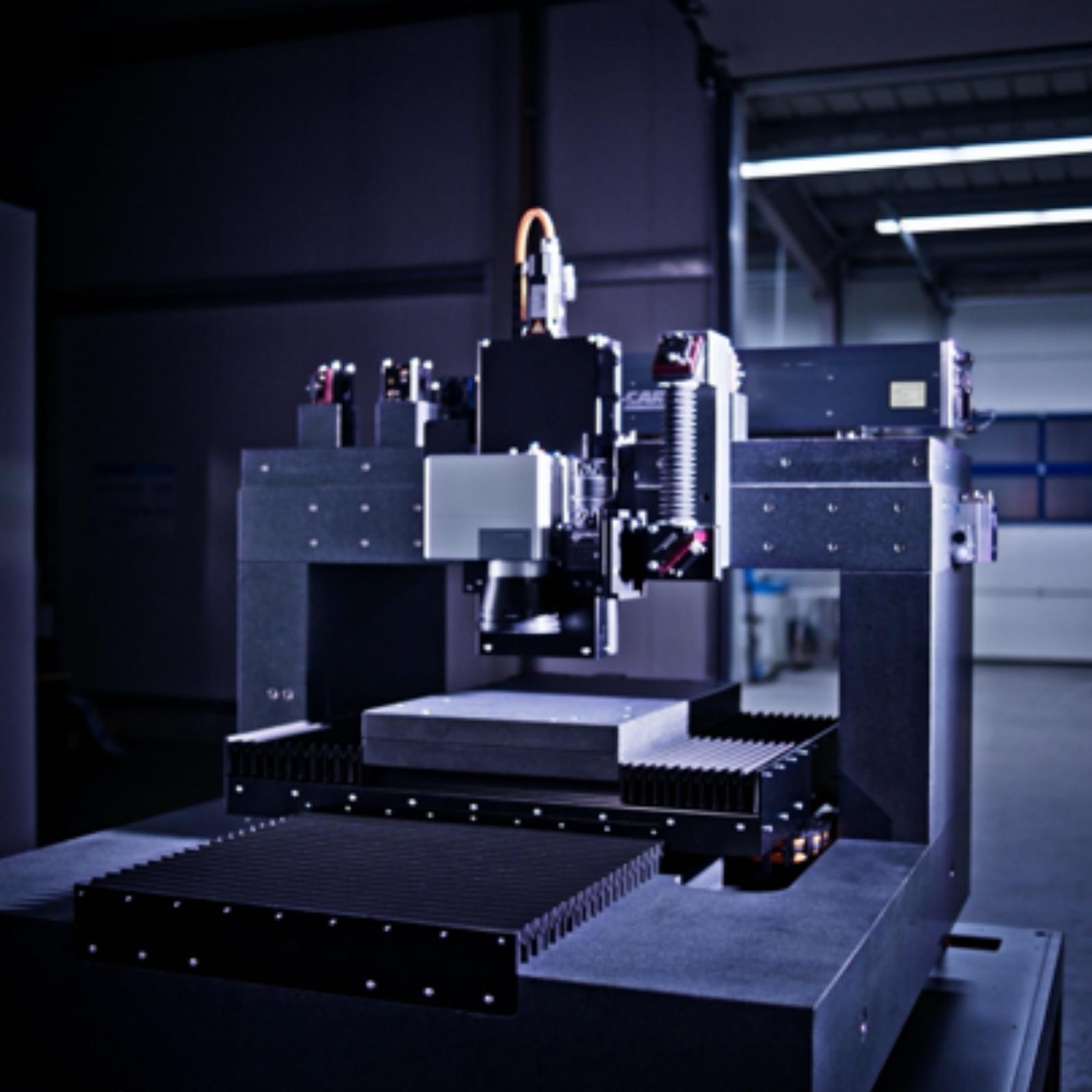


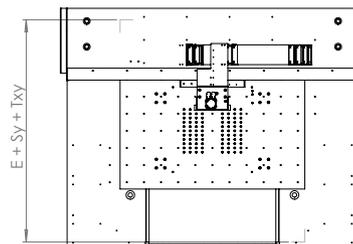
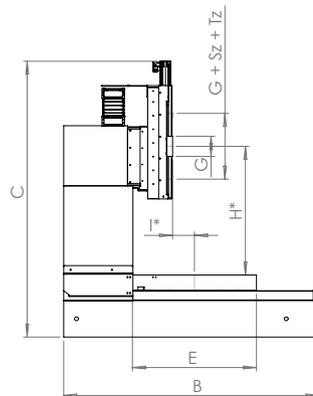
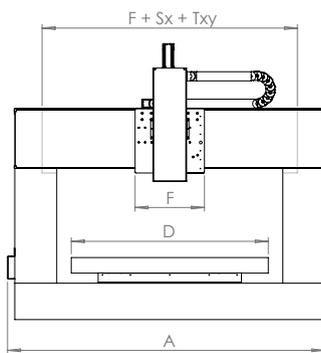
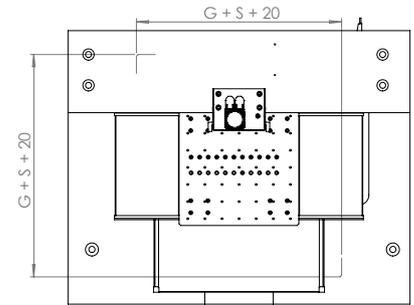
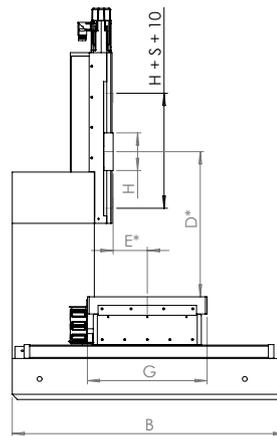
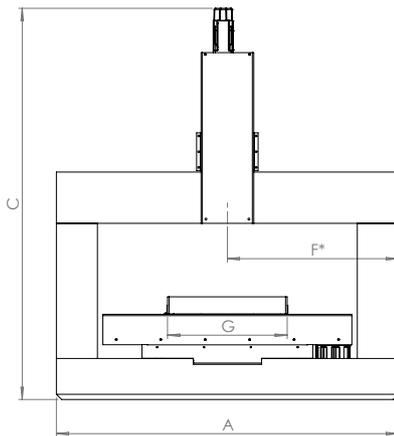
*Experience our systems in motion*

**Basis data – configurable to your application**

Specification	3-AXIS SYSTEMS			
	AS-XY		AS-T	
	X-Axis	Y-Axis	X-Axis	Y-Axis
<b>Kinematic</b>				
Axis type	Portal construction		Portal construction	
Travel distance	up to 300 mm	up to 600 mm	up to 600 mm	up to 1000 mm
Max. speed	1 m/s	1 m/s	1 m/s	1 m/s
Max. acceleration	10 m/s <sup>2</sup>	10 m/s <sup>2</sup>	10 m/s <sup>2</sup>	15 m/s <sup>2</sup>
Payload	5 kg		25 kg	15 kg
Bellows	possible		yes	yes
<b>Drive</b>				
Rail type	Cross rolls		Profile rail	
Engine type	Linear engine		Linear engine	
<b>Measuring system</b>				
Measuring type	Optical absolute		Optical absolute	
Type of system	open		open	
Nominal pitch	30 μm		30 μm	
Resolution readhead	5 μm		5 μm	
<b>Accuracies</b>				
Straightness	+/-1 μm		+/-1 μm	
Positioning accuracy *at a standstill*	+/-0,5 μm		+/-0,5 μm	
Flatness	5 μm		5 μm	

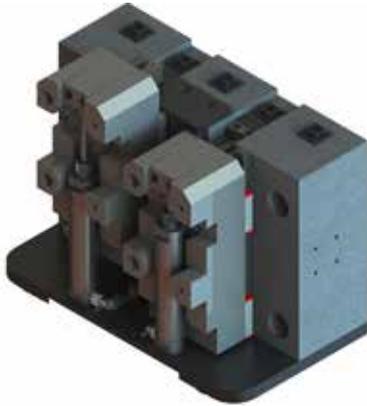
\*with ACS controller





MODEL	300	600
<b>Maße</b>		
Sx (travel distance X)	250	1000
Sy (travel distance Y)	300	600
Sz (travel distance Z)	250	350
A	1000	1740
B	800	1400
C	1200	1520
D	100	1080
E	500	600
F	350	380
G	110	110
H	49xM6	120
I		49xM6
Txy (safety tolerance)	20	20
Tz (safety tolerance)	10	15

# AUTOFOCUS AXIS



## Characterisation:

- Linear motor with weight compensation
- Precise positioning
- Number of individual axes can be extended as required
- Exact reproducibility
- Can move up to 15 kg dynamically

## Variants:

- Number of Z-axes
- Stroke



## Basis data – configurable to your application

MODEL	AF-
<b>Kinematics</b>	
travel	24 mm
max. speed	0,03 m/s
max. acceleration	0,5 m/s <sup>2</sup>
Payload	13 kg
<b>Drive</b>	
Guide type	Profile rail
Motor type	Linear motor
<b>Measuring system</b>	
Measuring type	Optical absolute
System type	open
Nominal pitch	30 $\mu$ m
Resolution readhead	5 nm
<b>Accuracies</b>	
Straightness	3 $\mu$ m
Positioning accuracy*	5 $\mu$ m

\*with ACS controller



Experience our systems in motion

## CFRP – CARBON FIBRE REINFORCED PLASTIC

A plastic that is low in weight and at the same time can withstand high loads is so-called CFRP. In mechanical engineering, CFRP is an established material as soon as a weight saving with the same rigidity is required. Other popular areas of application for the material are, for example, aerospace, vehicles and wind energy.

Due to the versatility of CFRP, it is an integral part of the hybrid machine structure at BUSCH Microsystems: granite is considered our basis, in return, highly dynamically stressed assemblies are realised from CFRP.



### Characterisation/ Advantages:

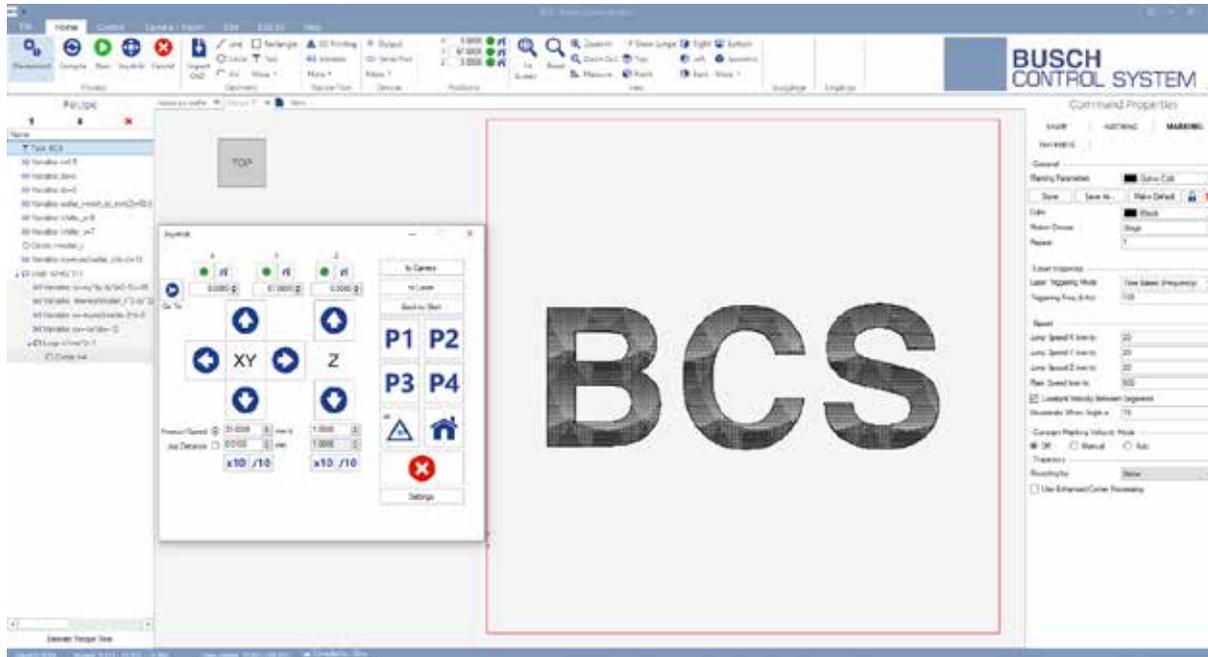
- Good damping properties
- Low water absorption
- High abrasion resistance
- Excellent sliding properties
- High chemical resistance



*Experience  
our systems  
in motion*



# BCS – BUSCH CONTROL SYSTEM



The BUSCH Control System is our interface between man and machine. In addition to controlling the high-precision motion part, the graphic interface is also used to handle any peripheral devices. Thanks to flexible programming, new software add-ons can be embedded for cameras, lasers, various sensors or even valves.

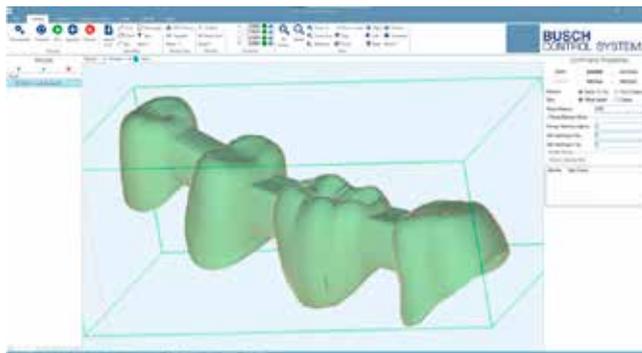
Complex, application-specific programmes can be generated and graphically displayed using simple modules. The import of CAD models also enables 5D component processing.

Characterisation/Advantages:

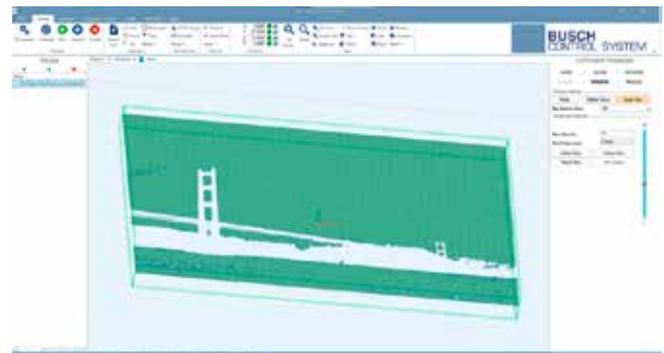
- Graphical user interface
- Programme creation with prefabricated modules or directly via programme code
- Motion simulation possible

- Control of all system elements in one software
- Manual operation via virtual joystick
- Programme creation with prefabricated modules or directly via programme code

## EXAMPLES OF BCS APPLICATION



*Laser Additive Manufacturing*



*Laser engraving*



*PCB Laser Processing*

## SERVICE-& MAINTANANCE

In addition to numerous solution approaches BUSCH Microsystems stands for customer orientation, service, long-term partnerships and the highest quality.

Our employees bring with them the necessary expertise that is indispensable for successful project completion. For this reason, we offer a service concept that can track every step of the project process.

### **Made by BUSCH, maintained by BUSCH.**

The range of the service concept includes both standardised and project- and system-specific services. Tailor-made service concepts are also part of our competence, in order to meet you and your individual positioning system.

Find out more about our service here:



We offer many other project and plant-specific further services, for example:

- Design, construction & simulation of systems according to your concept specifications
- Stocking and warehousing of customer-specific and time-critical components
- Initial assembly of our systems at the (end) customer
- Exact reproducibility
- Commissioning of the mechanics & electrics of our systems
- Preparation of documentation & test protocols for each of our products
- Dismantling, reassembly and recommissioning of our systems at the (end) customer
- Re-adjustment of guide rails etc.
- Technical workshops and training for your employees
- Identification and elimination of malfunctions

## SYSTEM PARTNERS – WELL-ESTABLISHED COOPERATION

Our overall systems are characterized by successful interaction of factors. In addition to the quality of all single components, the proper coordination is crucial for an efficient and precise overall system. This is precisely BUSCH's strength. BUSCH Microsystems designs your individual overall system and combines the most efficient

drive technology with high-performance controls. As our customer, you benefit from the combined competence, which results from the experience of the companies in their particular fields. We offer you innovative solutions for complex production processes from one source.



*Drive & control engineering*



*Software*



*CAD-construction*

# TECHNICAL BACKGROUNDS

## Technical characteristics granite:

Granite is particularly suitable for highly precise mechanical engineering.

It is distinguished by the following characteristics:

- Resisting force
- Hardness
- Low thermal expansion
- Variously adaptable
- Grindability
- Polishability

PROPERTIES	Granite	Aluminium	Steel
Density	2,9	2,7	7,85
Flexural strength	20	–	–
Compressive strength	320 +/- 10%	100-500	260-1200
Thermal expansion	5-7	23	12
Thermal conductivity	2	230	50
Spec. heat capacity	845	890	470
E-Module	80-90	60-70	210
Porosity	0,15	Ca. 0	Ca. 0
Hardness	6-8	–	–





BUSCH Microsystems GmbH  
An der Altnah 34  
DE-55450 Langenlonsheim  
+49 (0)671 / 201331 – 0  
sales@busch-microsystems-consult.de

## Contact Person

### ■ USA

JP Sercel TBC, LLC  
220 Hackett Hill Rd. Box 2  
Manchester, NH 03102  
+1 (603) 222-3703  
sales@sercelmicro.com

### ■ Israel

ELIMEC  
Electro-mechanical Engineering 1988 Ltd  
1 Lishansky st., PO Box 5006  
Rishon Le-Zion 7515001  
+972-73-2629600  
RFQ@elimec.co.il  
www.elimec-eng.com

### ■ The Netherlands

Vario Drive – Power in motion  
van Leeuwenhoekstraat 22  
3261 LT Oud-Beijerland  
+31186 – 636280  
sales@variодrive.nl  
www.variодrive.nl

### ■ Italy

Optoprim srl a socio unico  
Via Dei Quadri, 42  
20871 Vimercate  
(+39) 039 834977  
info@optoprim.it  
www.optoprim.it