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High-speed joining systems NCFQ

Type 2166A...

for high-speed assembly and joining technology

Kistler combines the high dynamics of LinMot's electromagnetic linear modules with piezoelectric measurement technology and the maXYmos NC process monitoring system to ensure precise joining processes even at high dynamics - optionally with integrated acceleration compensation for maximum data transparency, process reliability, and control.

- High dynamics for short cycle times
- Precise measurement results even at high process speeds
- Integrated acceleration compensation (optional)
- Virtually maintenance-free thanks to linear motor without mechanical wear

Fig. 1: Standard high-speed joining system NCFQ

Fig. 2: Advanced high-speed joining system NCFQ

Description

The NCFQ high-speed joining system is equipped with a high-precision piezoelectric force sensor as standard. This version is ideal for applications with high speeds and short cycle times where no acceleration compensation is required. For processes with extremely short cycle times, the Advanced System also offers integrated acceleration compensation, which detects and compensates for the acceleration forces of the linear module - a decisive advantage when there is no time for taring during the process.

Like the Standard System, the Advanced System also features a high-precision piezoelectric force sensor. A highly sensitive piezoelectric acceleration sensor and an industrial charge amplifier are also integrated. This combination makes it possible to automatically filter out the acceleration forces generated by the linear module so that only the actual joining forces are detected. This enables a significant reduction in production cycle times, while ensuring more precise measurement and comprehensive documentation of all quality-relevant joining forces.

The system can be configured with different sensors and linear modules in different stroke lengths and force ranges depending on requirements.

The magnet-based drive technology of the LinMot linear module enables accelerations of up to 50 m/s^2 and speeds of up to 5 m/s. In addition, the module features the magnetic spring MagSpring, which supports safe operation.

Application

The NCFQ high-speed joining system is ideal for dynamic applications with forces up to 572 N and high demands on quality and speed, e.g., in medical, semiconductor, electronics, and automotive manufacturing. It is suitable for automatic production systems as well as for manually controlled workstations with safety doors.

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Technical data

Linear modules		Size 1	Size 2	Size 3	Size 4	Size 5
Maximum force	N	73	137	255	360	572
Max. stroke	mm	290	270	695	275	285
Position resolution	mm	0.002		0.001		
Repeatability	mm	±0.05		±0,005		
MagSpring	N	11 / 17 / 22		40 / 50 / 60 / 70 / 90 / 100 / 110 / 140 / 160		
Max. acceleration	m/s^2	50				
Max. speed	m/s	5				
Position encoder system		incremental		absolute		

Servo drive		
Motor supply	VDC	72
Motor current	A	25
Logic supply	VDC	24
Fieldbus		SERCOS III
Configuration		RS232
Integrated safety functions		STO (2 Safety relays)

Switching power supplies		2166AZ012 (0150-1874)	2166AZ011 (0150-4535)
Mains voltage range	VAC	90 … 132 / 180 … 264 Automatic switchover	3x 340-550 V
Mains frequency	Hz	50/60	50/60
Efficiency	%	typ. 88	typ. 91.5
Internal fuse		16ATH/250VAC	
External fuse			16A (IEC), 20A (USA) required

For detailed data sheets and technical specifications, follow the QR codes on pages 4 and 5 to access the documentation on the websites.

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Functional principle of the standard NCFQ high-speed joining system

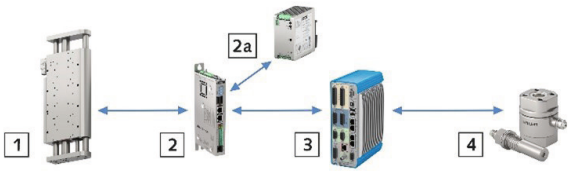

Fig. 3: Functional principle of the Standard high-speed joining system NCFQ

System description Standard high-speed joining system

The DM03 linear module (1) is controlled according to the specifications of the maXYmos NC process monitoring system, type 5847 (3), and the servo drive (2). The C1250 servo drive is connected to the power supply via the switching power supply (2a).

The maXYmos NC (MEM) (3) controls the servo drive, monitors, evaluates, and documents XY sequences, and communicates with the higher-level machine control system as required.

The piezoelectric force sensor, type 9217A or 9323AA (4), detects the force signal and transmits it to the maXYmos NC.

The **advanced high-speed joining system NCFQ** with integrated acceleration compensation is available as an option (Figure 4). It comprises the four modules of the standard high-speed joining system NCFQ plus a piezoelectric acceleration sensor and an industrial charge amplifier.

Functional principle of the advanced high-speed joining system NCFQ

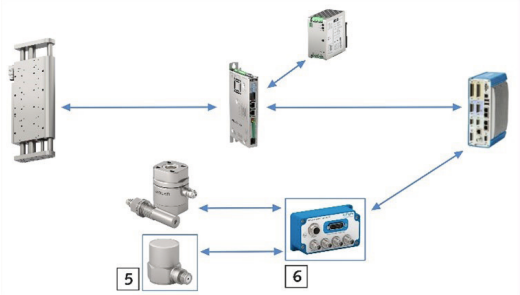

Fig. 4: Functional principle of the Advanced High-Speed Joining System NCFQ

System description Advanced High-Speed Joining System

The piezoelectric acceleration sensor, Type 8202A (5), measures the acceleration of the DM03 linear module and transmits the signals to the ICAM-B industrial charge amplifier.

The industrial charge amplifier ICAM-B, type 5073B (6), calculates the signals from the force sensor, type 9217A or 9323AA, with the signals from the acceleration sensor, type 8202A. This filters out the acceleration forces generated by the linear module so that only the force actually acting on the component is transmitted to the maXYmos NC.

LinMot is a registered trademark of NTI AG. For more information about the linear modules and the dimensions and technical details of the Servo Drive C1250 Multi Interface STO, please refer to the documentation on the manufacturer's website.

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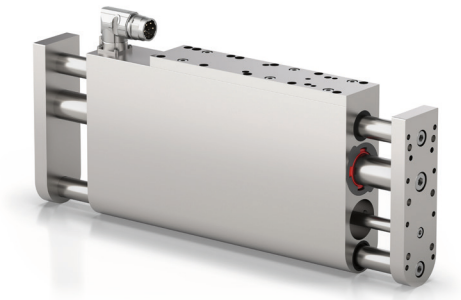
Linear modules
The DM03 linear modules are complete drive units with integrated linear guide, permanently installed linear motor, and MagSpring magnetic spring.

All components are arranged in a line, thus guaranteeing maximum compactness of the entire module. Precision shafts guided in linear ball bearings ensure precise linear movement. The choice of material and the selected design principle give the drive unit greater torsional rigidity with a comparatively small moving mass.

The user can thus achieve a force range of up to 572 N and strokes of up to 695 mm. The motor data, with accelerations of up to 50 m/s^2 and a maximum speed of 5 m/s, leave nothing to be desired in terms of dynamics.

The drives are extremely easy to commission, as all linear guides are equipped with plug-and-play technology. The required type parameters do not need to be selected manually, but are automatically read in by the servo drive.

The linear modules are available in 5 sizes (73 ... 592 N):



Linear module size 1:
Type 2166A-S1…
≤73 N
Stroke length 60 … 290 mm
Absolute encoder

Linear module size 2:
Type 2166A-S2…
≤137 N
Stroke length 80 … 270 mm
Absolute encoder

Linear module size 3:
Type 2166A-S3…
≤255 N
Stroke length 95 … 695 mm
Absolute encoder

Linear module size 4:
Type 2166A-S4…
≤360 N
Stroke length 65 … 275 mm
Absolute encoder

Linear module size 5:
Type 2166A-S5…
≤572 N
Stroke length 95 … 285 mm
Absolute encoder

Servo Drive with switching power supply

Servo Drives of the C1200 series are axis controllers with 32-bit position resolution and an integrated power stage for linear motors and rotary drives.

The Servo Drive C1250 is connected via the switching power supply and controls the linear module according to the specifications of maXYmos.

The servo drive is connected to the power supply via the switching power supply.

LinMot and MagSpring are registered trademarks of NTI AG

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Standard high-speed joining system

maXYmos NC

The maXYmos NC process monitoring system evaluates curve profiles and documents them, and also controls the servo drive that controls the linear module. Communication takes place in real time via SERCOS III, guaranteeing high repeat accuracy and maximum process control performance. The system can be easily commissioned via a PC or the optional touchscreen (DIM).

With the help of a wide range of powerful evaluation elements, even very complex XY curves can be monitored and controlled.

The maXYmos NC process monitoring system controls the servo drive, monitors, evaluates, and documents XY sequences, and communicates with the higher-level machine control system if necessary.

Piezoelectric force sensor

The force sensors of the Press-Force series are ideal for measuring dynamic and quasi-static forces. Pre-tensioned and equipped with practical adaptation options, they are ready for immediate use. The Press-Force force sensors are based on the piezoelectric measuring principle.

The force sensor measures the force signal and transmits it to the maXYmos process monitoring system.

An acceleration sensor and an industrial load amplifier are also installed for the **advanced high-speed joining system** with automatic acceleration compensation.

Acceleration sensor

The Type 8203A is a piezoelectric acceleration sensor with high impedance and charge mode. A ceramic shear sensor element generates a significant charge output that can be easily converted into a usable analog voltage signal via a charge amplifier.

The acceleration sensor measures the acceleration of the linear module and transmits it to the industrial charge amplifier.

Industrial charge amplifier

The industrial charge amplifier (ICAM-B) can be used wherever mechanical quantities are measured with piezoelectric sensors.
Piezoelectric sensors generate an electrical charge that changes in direct proportion to the load acting on the sensor.

The industrial charge amplifier calculates the signals from the force and acceleration sensors so that only the force acting on the component is transmitted to the maXYmos process monitoring system.

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In addition to the linear module, the following components are required for the **standard NCFQ high-speed joining system**:

	Type
▪ Servo drive	2166AZ001
▪ Servo drive connector set	2166AZ002
▪ Switching power supply	
– 1 000 W	2166AZ011
– 500 W	2166AZ012
▪ Motor cable R plug for NCFQ size 1 … 3	
– Standard	
° 2 m	2166AZ021
° 4 m	2166AZ022
° 6 m	2166AZ023
° 8 m	2166AZ024
– Suitable for trailing chains	
° 2 m	2166AZ025
° 4 m	2166AZ026
° 6 m	2166AZ027
° 8 m	2166AZ028
° 10 m	2166AZ029
– Extension (suitable for trailing chains)	
° 2 m	2166AZ041
° 4 m	2166AZ042
▪ Motor cable C plug for NCFQ size 4	
– Standard	
° 2 m	2166AZ051
° 4 m	2166AZ052
° 6 m	2166AZ053
° 8 m	2166AZ054
– Suitable for trailing chains	
° 2m	2166AZ059
° 4m	2166AZ060
° 6m	2166AZ061
° 8m	2166AZ062
– Extension (suitable for trailing chains)	
° 2 m	2166AZ081
° 4 m	2166AZ082

	Type
▪ Motor cable C plug for NCFQ size 5	
– Standard	
° 2 m	2166AZ055
° 4 m	2166AZ056
° 6 m	2166AZ057
° 8 m	2166AZ058
– Suitable for drag chains	
° 4 m	2166AZ064
° 6 m	2166AZ065
° 8 m	2166AZ066
° 10 m	2166AZ067
– Extension drag chain cable	
° 2 m	2166AZ083
° 4 m	2166AZ084
▪ Encoder cable (from size 3)	
– 0.5 m	2166AZ091
– 2 m	2166AZ092
– 4 m	2166AZ093
– 6 m	2166AZ094
– 8 m	2166AZ095
– 10 m	2166AZ096
▪ Servo drive parameterization adapter	2166AZ121
▪ maXYmos NC (MEM) evaluation device	5847B3
▪ SERCOS III connection cable	
– 1 m	KSM18029160-1
– 5 m	KSM18029160-5
– 10 m	KSM18029160-10
▪ Piezoelectric force sensor	9217A, 9323A, 9333A
▪ Force sensor cable (5 m)	1900A23A1205
– 1 m	1900A23A1201
– 5 m	1900A23A1205
– 10 m	1900A23A1210

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The following components are also required for the **advanced high-speed joining system NCFQ**:

	Type
▪ Piezoelectric acceleration sensor	8203A50 8202A10
▪ Acceleration sensor cable	
– 1 m	1900A23A1201
– 5 m	1900A23A1205
– 10 m	1900A23A1210
▪ Industrial load amplifier ICAM-B	5073B211
▪ ICAM – maXYmos connection cable	
– 2 m	2166AZ102
– 4 m	2166AZ103
– 6 m	2166AZ104
– 8 m	2166AZ105
– 10 m	2166AZ106

Accessories (optional)	**Typ**
▪ maXYmos display module (DIM) with stand	5877AZ000
▪ Cable maXYmos MEM to DIM, length 5 m	1200A161A5
▪ Top-hat rail adapter	5700A31

Our services for joining applications:

- Application consulting with Assembly Competence Center (ACC)
- Commissioning support
- User and operator training
- System optimization
- Accredited calibrations for force measurement chains and joining systems
- MCS / MSA
- Maintenance contracts – comprehensive package
- Maintenance and repair support
- Exclusive 24/7 hotline
- Emergency stock

Details and additional services on our website
Website: www.kistler.com/service/joining

Enquiries at:
Technical support hotline: +49 7172 184 333
Email: service@kistler.com

Order code for linear module *

Type 2166A-S1- ☐☐☐☐

Stroke	
60 mm	**060**
100 mm	**100**
160 mm	**160**
220 mm	**220**
290 mm	**290**
Position plug	
rechts	**CS00**
links	**CS10**
MagSpring **	
11 N	**MS11**
17 N	**MS12**
22 N	**MS13**
Encoder	
Incremental encoder	**EN00**

Order example for linear module:

Type 2166A-S1-100-CS10-MS11-EN00
Joining module NCFQ: **Type 2166A**

- Size: 255 N: **S1**
- Stroke: 100 mm: **100**
- Position plug: links: **CS10**
- MagSpring: 11 N: **MS11**
- Encoder: **Incremental encoder**

* The availability of the MagSpring depends on the respective stroke length.

** The selection of the MagSpring depends on the linear module used and the mounted tool weight. We are happy to assist you in selecting the appropriate linear module.

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Order code for linear module *

Type 2166A-S2- □□□□

Stroke	
80 mm	**080**
140 mm	**140**
210 mm	**210**
270 mm	**270**
Position plug	
right	**CS00**
left	**CS10**
MagSpring **	
11 N	**MS11**
17 N	**MS12**
22 N	**MS13**
Encoder	
Incremental encoder	**EN00**

Order example for linear module:

Type 2166A-S2-080-CS10-MS11-EN00
Joining module NCFQ: Type **2166A**
- Size: 255 N: **S2**
- Stroke: 80 mm: **080**
- Position plug: left: **CS10**
- MagSpring: 11 N: **MS11**
- Encoder: **Incremental encoder**

* Size, stroke length, MagSpring, and encoder type are not available in every combination.

** The selection of the MagSpring depends on the linear module used and the mounted tool weight. We are happy to assist you in selecting the appropriate linear module.

Order code for linear module *

Type 2166A-S3- □□□□

Stroke	
95 mm	**095**
185 mm	**185**
195 mm	**195**
275 mm	**275**
295 mm	**295**
395 mm	**395**
495 mm	**495**
595 mm	**595**
695 mm	**695**
Position plug	
left	**CS10**
MagSpring **	
40 N	**MS02**
50 N	**MS03**
60 N	**MS04**
70 N	**MS07**
90 N	**MS09**
100 N	**MS06**
110 N	**MS31**
140 N	**MS34**
160 N	**MS36**
Encoder	
Absolute encoder	**EN02**

Order example for linear module:

Type 2166A-S3-095-CS10-MS06-EN02
Joining module NCFQ: Type **2166A**
- Size: 255 N: **S3**
- Stroke: 95 mm: **095**
- Position plug: left: **CS10**
- MagSpring: 100 N: **MS06**
- Encoder: **Absolute encoder**

* Size, stroke length, MagSpring, and encoder type are not available in every combination.

** The selection of the MagSpring depends on the linear module used and the mounted tool weight. We are happy to assist you in selecting the appropriate linear module.

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Order code for linear module *

Type 2166A-S4- □□□□

Stroke	
65 mm	**065**
125 mm	**125**
185 mm	**185**
275 mm	**275**
Position plug	
left	**CS10**
MagSpring **	
40 N	**MS02**
50 N	**MS03**
60 N	**MS04**
70 N	**MS07**
90 N	**MS09**
100 N	**MS06**
110 N	**MS31**
140 N	**MS34**
160 N	**MS36**
Encoder	
Absolute encoder	**EN02**

Order example for linear module:

Type 2166A-065-CS10-MS06-EN02
Joining module NCFQ: Type **2166A**
- Size: 255 N: **S4**
- Stroke: 80 mm: **065**
- Position plug: left: **CS10**
- MagSpring: 100 N: **MS06**
- Encoder: **Absolute encoder**

* Size, stroke length, MagSpring, and encoder type are not available in every combination.

** The selection of the MagSpring depends on the linear module used and the mounted tool weight. We are happy to assist you in selecting the appropriate linear module.

Order code for linear module *

Type 2166A-S5- □□□□

Stroke	
95 mm	**095**
185 mm	**185**
285 mm	**285**
Position plug	
left	**CS10**
MagSpring **	
40 N	**MS02**
50 N	**MS03**
60 N	**MS04**
70 N	**MS07**
90 N	**MS09**
100 N	**MS06**
110 N	**MS31**
140 N	**MS34**
160 N	**MS36**
Encoder	
Absolute encoder	**EN02**

Order example for linear module:

Type 2166A-S5-095-CS10-MS06-EN02
Joining module NCFQ: Type **2166A**
- Size: 255 N: **S5**
- Stroke: 95 mm: **095**
- Position plug: left: **CS10**
- MagSpring: 100 N: **MS06**
- Encoder: **Absolute encoder**

* Size, stroke length, MagSpring, and encoder type are not available in every combination.

** The selection of the MagSpring depends on the linear module used and the mounted tool weight. We are happy to assist you in selecting the appropriate linear module.

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