JENNY SCIENCE +

moving precisely, within tight space

Forceteq® Force Measurement Technology

Forceteq® basic: Current based with self calibrated motor

The Forceteq® basic measurement technology is completely integrated in the XENAX® Xvi servo controller. This allows force-monitored control of all Jenny Science linear and rotary motor axes. The force is measured during the production process using the patented Forceteq® measurement technology, no external load cell is required. This allows you to acquire and record quality-relevant force-distance diagrams for all movements. Assembly operations can be monitored "in-process". Errors and discrepancies are detected immediately. This means better quality and higher throughput. Additional checking stations are no longer necessary.

- For Standalone
  Operation

- Up to 10 force
  sectors programm-
  able with
  WebMotion®

The individual axis types have different resolution and accuracy of the force and the measurable minimally measurable force.

Linear Motor	Force Constant	Minimally Measurable Force	Resolution
LINAX® Lxc F08	1N ~ 32 * 10 mA	0.5 N	0.25 N
LINAX® Lxc F10	1N ~ 28 * 10 mA	0.5 N	0.25 N
ELAX® Ex F20	1N ~ 12 * 10 mA	0.5 N	0.25 N
LINAX® Lxc F40	1N ~ 11 * 10 mA	1.0 N	0.5 N
LINAX® Lxu / Lxs F60	1N ~ 10 * 10 mA	10.0 N	5.0 N
LINAX® Lxs F120	1N ~ 6 * 10 mA	16.0 N	8.0 N

Rotativ-Motor ROTAX®	Torque Constant	Minimally Measurable Torque	Resolution
Rxvp 28-6T0.04	10mNm ~ 23 * 10mA	6 mNm	3 mNm
Rxhq 50-12T0.3	10mNm ~ 8 * 10 mA	20 mNm	10 mNm
Rxhq 110-50T1.5	10mNm ~ 2.5 * 10 mA	60 mNm	30 mNm
Rxhq 110-50T4.0	10mNm ~ 1.4 * 10 mA	100 mNm	50 mNm

Forceteq® pro: Precise with Signateq® and external load cell

With the new developed Signateq® measuring amplifier, a standard strain gauge load cell can be connected directly to the XENAX® Xvi 75V8S servo controller. By using a load cell, the measurement and control adjustment of Forceteq® measurement technology becomes much more precise.

Due to the two-stage measuring amplifier, the signal noise is reduced and sensors with low sensitivity can be used with no problems.

Signateq® Measuring Amplifier

Length	78mm
Width	27.5mm
Height	12mm

Signateq® connecting cable default length 1.5m

Connection cable load cell length as per manufacturer, can be cut back

| Sampling rate of load cell	2µs
Transmission rate of average values	100µs
Bandwidth Signateq® (Amplifier)	100Hz bis 5kHz
Range of sensitivity *)	0.1mV/V up to 4.6mV/V
Calculate resolution of force	Measuring range / 3'549pt

*) If the sensitivity is higher than 4.6mV/V the measuring range is limited upwards.

Example: Load cell type 8432 from Burster with overload protection.

Specific linearity variation	0,15 %
Measuring range	0 ... 2,5 N bis 0 ... 100 kN

Resolution of force

Art. No. Burster	Measuring range	Sensitivity	Resolution of force
8432-5005	0 - 5 N	0.75mV/V	1.3 mN / 0.13 gf
8432-5010	0 - 10 N	1.5mV/V	2.7 mN / 0.28 gf
8432-5020	0 - 20 N	2.0mV/V	5.4 mN / 0.55 gf
8432-5050	0 - 50 N	2.0mV/V	13.4 mN / 1.37 gf
8432-5100	0 - 100 N	2.0mV/V	26.8 mN / 2.73 gf
8432-5200	0 - 200 N	2.0mV/V	53.6 mN / 5.47 gf
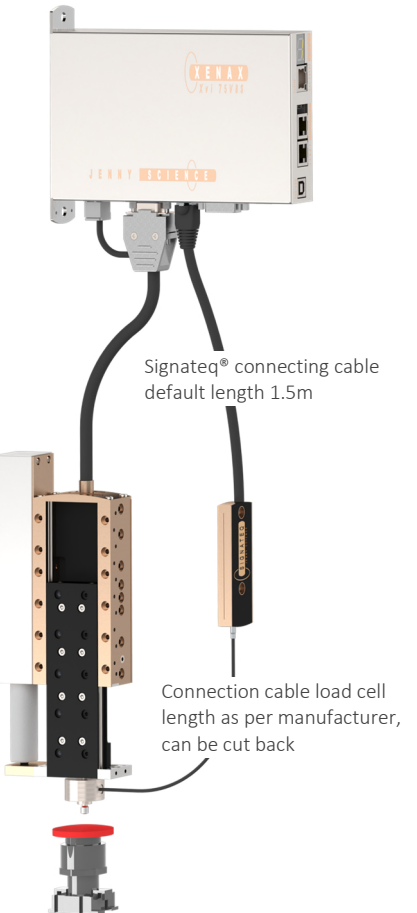
[gf] = gramm-force

Specifications of the available linear motor axes

Linear motor type Measuring system	Max. Force	Max. driving distance [mm]	Forceteq basic resolution	Forceteq pro resolution / range
LINAX® Lxc F08, 1µm/100nm opt.	24N	44*	0.25 N	5.4mN, with max. 20N
LINAX® Lxc F10, 1µm/100nm opt.	30N	85*, 135, 230	0.25 N	5.4mN, with max. 20N
ELAX® Ex F20, 1µm magn.	60N	30*, 50*, 80*, 110*, 150	0.25 N	13.4mN, with max. 50N
LINAX® Lxc F40, 1µm/100nm opt.	112N	80*, 176*, 272	0.5 N	26.8 mN, with max. 100N
LINAX® Lxu F60, 1µm magn./100nm opt.	180N	40*, 80*, 160*, 240, 320	5.0 N	53.6 mN, with max. 180N
LINAX® Lxs F60, 1µm magn./100nm opt.	180N	160 bis 1600	5.0 N	53.6 mN, with max. 180N

* Available with weight compensation for vertical installation, can reduce the force resolution of Forceteq® basic

Setup Forceteq® pro, Load cell & Signateq® Measuring Amplifier

Properties	Absolute precision Over the entire force range	Relative precision repeatable same force	Load cell Maximal 200N	Signateq® Sensitivity 0.1 bis 4.6 mV/V, from the data sheet of the load cell	Setting XENAX® / WebMotion® In the menu WebMotion®
Uncalibrated load cell, low-cost, simple set-up, reset 3 sensor parameters when replacing	normal	high	not calibrated	Linearised gain, default	Enter data load cell: Force range, sensitivity, zero point adjustment
		Sensor replacement	1:1		Enter the sensitivity of the new load cell again and perform a zero point adjustment.
Calibrated *) load cell, simple set-up, sensor exchangeable without parameterisation	normal	high	calibrated	Linearised gain, default	Enter data load cell: Force range, sensitivity, zero point adjustment
		Sensor replacement	1:1		None
Highest precision, uncalibrated load cell, during set-up and when replacing the sensor, record new correction table and parameterise in Signateq via WebMotion® of XENAX®.	high	high	not calibrated, or calibrated, no influence on precision	Gain from correction table **) exactly matching to load cell	Adjustment Correction Table Signateq **) thus the load cell and Signateq measuring amplifier are adjusted as a pair. A precise force measuring device with display is required for the adjustment.
		Sensor replacement	1:1		Adjustment Correction Table Signateq **) A precise force measuring device with display is required for the adjustment

*) Calibrated load cell means that the sensitivity and the zero point are adjusted to a fixed calibration value. This makes the load cell exchangeable without setting a parameter. Comparison of calibrated/uncalibrated sensor: Sensitivity 0.1 – 4.6 mV/V and zero point.

**) You can obtain the load cell together with the Signateq measuring amplifier as a pair, complete with correction table, calibrated from Jenny Science. We can procure the load cell (burster), or you can send us your load cell.

If you have an accurate force measurement with force display, you can record and enter the correction table on site. After the adjustment, the load cell and Signateq measuring amplifier are " paired " with each other. These must not be interchanged.

Recording of the force-distance diagram via Ethernet bus

The force values are transmitted as process data objects (PDO) cyclically according to the bus cycle time

EtherCAT, Powerlink, CANopen → CANopen over Ethernet

Forceteq® basic, without load cell, force-equivalent current values (I_Force) are transmitted

Parameter	Object (PDO)	Description
Position Actual [Inc]	6064h	Position actual
I_Force Actual [mA]	2005h	Force-equivalent current actual
Limit I_Force [x10mA]	6073h	Limitation of force-equivalent current

Forceteq® pro, with Signateq® measuring amplifier and load cell

Parameter	Object (PDO)	Description
Position Actual [Inc]	6064h	Position actual
Force Actual [mN]	200Ah	Force actual
Limit Force [mN]	2009h	Limitation of force

Ethernet/IP

Forceteq® basic, without load cell, force-equivalent current values (I_Force) are transmitted

Parameter	Classe	Instance	Id	Description
PositionActual [Inc]	0x66	0x1	0x24	Position actual
IForceActual [mA]	0x64	0x1	0x5	Force-equivalent current actual
LimitIForce [x10mA]	0x66	0x1	0x33	Limitation of force-equivalent current

Forceteq® pro, with Signateq® measuring amplifier and load cell

Parameter	Classe	Instance	Id	Description
PositionActual [Inc]	0x66	0x1	0x24	Position actual
ForceActual [mN]	0x64	0x1	0xA	Force actual
LimitForce [mN]	0x64	0x1	0x9	Limitation of force

Profinet

Forceteq® basic, without load cell, force-equivalent current values (I_Force) are transmitted

Parameter	PROFIdrive Telegram 9	I/O Data Number	Description
XIST_A [Inc]	Standard	4&5, 32 Bit	Position actual
I_Force Actual [mA]	Supplementary Data 4 Data 5	2&3, 32Bit 1&2, 32 Bit	Force-equivalent current actual
Limit I_Force [x10mA]	Supplementary Data 4 Data 5	1, 16 Bit 1, 16 Bit	Limitation of force-equivalent current

Forceteq® pro, with Signateq® measuring amplifier and load cell

Parameter	PROFIdrive Telegram 9	I/O Data Number	Description
XIST_A [Inc]	Standard	4&5, 32 Bit	Position actual
Force Actual [mN]	Supplementary Data 4 Data 5	4&5, 32Bit 3&4, 32 Bit	Force actual
Limit Force [mN]	Supplementary Data 4 Data 5	2&3, 32 Bit 2&3, 32Bit	Limitation of force

More information at: https://www.jennyscience.ch/en/download

∨ XENAX® Servocontroller

Bus Module (Manual, Sample, PLC Library)

- MANUAL_CANOPEN_OVER_ETHERCAT_POWERLINK_CAN.pdf (PDF)
- ETHERCAT_TWINCAT3_BECKHOFF_LIBRARY_V3.1.6.zip (ZIP)
- ETHERCAT_INDRAWORKS_BOSCH_REXROTH_LIBRARAY_V1.0.0.zip (ZIP)
- ETHERCAT_CODESYS_LIBRARY_V1.1.2.zip (ZIP)
- ETHERCAT_SYSMACSTUDIO_OMRON_SAMPLES_V2.1.0.zip (ZIP)
- PROFINET_SIEMENS_SAMPLES_V3.0.5A.zip (ZIP)
- ETHERNET_IP_STUDIO5000_ALLEN_BRADLEY_LIBRARY_V2.0.11b.zip (ZIP)
- ETHERNET_IP_MANUAL_V1.11.pdf (PDF)
- POWERLINK_AUTOMATION_STUDIO_B&R_LIBRARY_V3.0.6_EN.zip (ZIP)
- ETHERNET_TCPIP_LABVIEW_SAMPLE_V1.0.1.zip (ZIP)

Applications

In general

- Direct and accurate distance measurement (depth, overlap) thanks to linear motor
- Minimal cycle time thanks to fast prepositioning and fast return movement
- Force/distance recording over the complete distance range with the fully integrated system in the XENAX Xvi

Quality monitoring directly on the fly during the process

- Insert, join and assembly of parts
- Polishing glass fiber
- Insert wire contacts into housing with pull back locking check
- Soldering with pressing while melting the solder
- Bonding with predefined pressure and position controlKleben mit definiertem Druck und Positionskontrolle

Force-distance diagram recording for:

- Buttons
- Keyboards
- Switches
- Spring contacts (e.g. relay)

Position detection and monitoring

- Measuring by touch with specified force

Sensitive force-limited component handling

- Placing optical lenses (plastic or glass)

Example of Application

Soldering operation with force- / distance- and timing diagram

X-axis: Time
Y-axis: Force (red) and distance (blue)

Notes

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Brochure Forceteq® Signateq® EN V1.3