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70 Years

Superior Clamping and Gripping



6-Axis Force / Torque Sensors

The greatest Variety on the Market
with around 150 Variants

Superior Clamping and Gripping



Henrik A. Schunk, Kristina I. Schunk, brand ambassador Jens Lehmann, and Heinz-Dieter Schunk

Top Performance in the Team

SCHUNK is the world's No. 1 for clamping technology and gripping systems – from the smallest parallel gripper to the largest chuck jaw program.

As a competence leader, we recognize and develop standards with a large potential for the future, which will drive the rapid progress in many industries.

Our customers profit from the expert knowledge, the experience, and the team spirit of more than 2,300 employees in our innovative family-owned company.

The Schunk family wishes you the best end results with our quality products.

Heinz-Dieter Schunk

Henrik A. Schunk

Kristina I. Schunk

Superior Clamping and Gripping

Jens Lehmann stands for precise gripping, and safe holding. As a brand ambassador of the SCHUNK team, the No. 1 goalkeeper represents our global competence leadership for clamping technology and gripping systems. The top performance of SCHUNK and Jens Lehmann are characterized by dynamics, precision, and reliability.

For more information visit our website:
www.gb.schunk.com/Lehmann

Jens Lehmann



It's time to use your machine's full potential.

With superior components, find potentials in your machine, where you would never expect to find them. SCHUNK Synergy – the perfectly harmonized interplay of clamping technology and gripping systems turns our customers into productivity champions.



SCHUNK Gripper

Precise grip!
From a few grams
to over a ton.



Linear Modules

Moves precisely!
High speed in all axes.



Modular Assembly

Uniquely individual!
High flexibility of the
modular system.



Robot Accessories

Perfectly connected!
The interaction between
robot and tool.



Rotary Modules

They master it!
Limited or endless –
free or clocked.



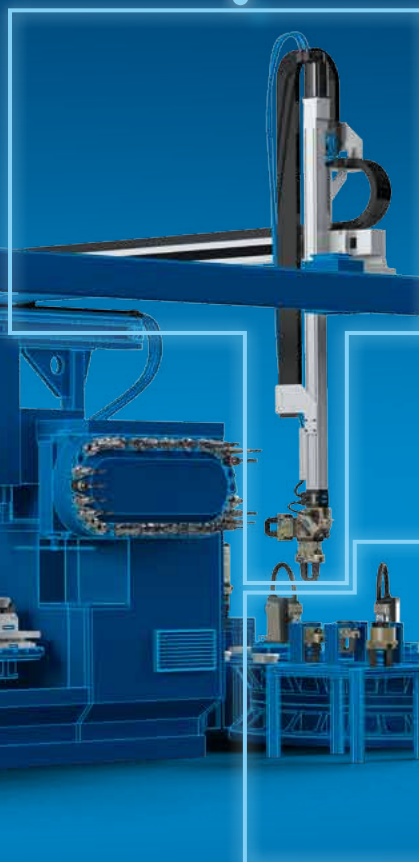
Mobile Gripping Systems

Technology for
handling the future.

Your Automated
Handling System



Your Automated Machine Loading



Your Automated Assembly



Your Service Robotics
Application

6-Axis Force /Torque Sensors

Versatile in Use and highly Accurate.



6-axis force /torque sensors available
in many sizes

	Page
General Information	5
Characteristics	5
Accuracy	5
Resolution	5
Technical Data	6
Use in Practice	6
Overview of various FT Sensors	
FTN – the All-Rounder for your Interfaces	7
FTD – for easy Data Collection with a PC	8
FTS – the independent Measuring System	9
FTW – Radio transmission system (WLAN) in pocket size	10
Calibration of 6-Axis Force /Torque Sensors (FTN, FTD, FTS, and FTW)	11
Check-List 6-Axis Force /Torque Sensors	12

General Information

The SCHUNK 6-axis force / torque sensors measure 6 components of force and moment (F_x , F_y , F_z , M_x , M_y , M_z) using a monolithically instrumented sensor. The SCHUNK FT sensors use silicon expansion measurement strips, which provide excellent interference resistance. The following interfaces are available for all sizes: **FTN (Ethernet, DeviceNet optionally with ProfiNet)**, **FTD (PCI, USB)**, **FTS (analog voltage 0 – 10 V, DIO)** or **FTW (Wireless)**.

Characteristics

The SCHUNK FT sensors provide a variety of high-performance functions:

- **Zero point offset:**
Offsets and / or rotates the FT reference system.
- **Demo program:**
Enables settings and measurement recording.
- **Set to zero:**
Provides an easy option for compensating for the tool weight.
- **Threshold compensation:**
Generates an output code when an automatically specified threshold is exceeded (FTN and FTS).
- **Built-in temperature equalization:**
Guarantees accuracy of the measured values over a large temperature range.

- **Overload:**
SCHUNK FT sensors are particularly robust and have a long service life. The safety factor can be up to 40 times the range of measurement, depending on the sensor size in question.
- **More interference-resistant measurement signal:**
Silicon expansion measurement strips provide a signal that is 75 stronger than conventional foil measurement strips reducing the signal noise to almost zero.
- **IP protection class:**
SCHUNK FT sensors are also available in versions with IP60, 65 or 68 protection.

Accuracy

Accuracy is the difference between the applied load and the load that is actually measured.
The maximum measuring accuracy as a percentage refers to the maximum value that can be measured with the sensor (see example below for Gamma SI-32-2.5).
Reproducibility or repeat accuracy is the difference between the measured values when the same load is applied multiple times.

Note:

It is not always necessary to know exactly how high the actual measured load is. What is important is that the same load always results in the same measured values.

Example: Gamma SI-32-2.5

Name	Calibration	F_x	F_y	F_z	T_x	T_y	T_z
Gamma	SI-32-2.5	0.75 %	1.00 %	0.75 %	1.00 %	1.25 %	1.00 %

F_x max. range of measurement is 32 N, max. measuring accuracy is 0.24 N.

F_z max. range of measurement is 100 N, max. measuring accuracy is 0.75 N.

Resolution

The resolution is the smallest change in load that results in a change to the values of the measured forces and moments.

The smaller the resolution of an FT sensor, the more sensitive or delicate the sensor is. This is important if the application needs a "sense of touch".

6-Axis Force /Torque Sensors

Technical Data | Use in Practice

Technical Data

Type	Evaluation	Output speed	Latency time
FTN	via Ethernet, DeviceNet on option with ProfiNet	7000 Hz 7000 Hz	500 µs 288 µs
FTD	via DAQ card (PCI)	16.67 kHz to 41.67 kHz	1 / output speed
FTS	analog voltage 0 – 10 V or DIO	560 Hz 2500 Hz	2585 µs 800 µs
FTW	Wireless, SD card	On request	On request

Use in Practice

SCHUNK 6-axis force /torque sensors are already used in a wide variety of robot-controlled applications:

- **Joining processes:**
Joining or fitting workpieces using a robot.
- **Chamfering, polishing, grinding:**
Optimal results due to constant pressure forces.
- **Force / moment feedback:**
Controlling manipulators (e.g. defusing bombs).
- **Medicine:**
Developing prosthetics and simulating operations.
- **Product tests:**
Haptic measurements for automotive parts and smart phone displays.
- **Research and development:**
Used in many universities and research institutes due to the high-precision and reproducible measurement results.
- **Service robotics**
Flexible and versatile due to its compact design.

The force / moment feedback between the robot and SCHUNK FT sensor significantly increases the quality of automated grinding of supply air chambers for stoves.



FTN – the All-Rounder for your Interfaces

The FTN sensor is connected to the system via Ethernet, DeviceNet, and / or ProfiNet (optionally ProfiNet). The web browser interface simplifies configuration and adjustment of the FTN sensor.

Product Features

- Completely ODVA™-compliant Ethernet / IP interface (optionally available with ProfiNet).
- The NetBox for the FTN system is available in protection class IP65.
- The NetBox is supplied using Power over Ethernet (PoE) or an external power supply (11 V to 24 V).
- Up to 16 sensor calibrations can be stored permanently in the system and selected by the user.



Scope of delivery:

FT sensor, sensor cable, NetBox, optional RJ45 adapter

- 1 FT sensor
- 2 Sensor cable
- 3 NetBox
- 4 Optional with RJ45 adapter

6-Axis Force /Torque Sensors

FTD – for easy data Collection with a PC

FTD – for easy Data Collection with a PC

The FTD sensor is connected to a PC via a DAQ card. The 6 analog output signals from the sensor are converted into digital signals by the electronics in the DAQ card which can then be directly connected to the DAQ card's inputs. The software (provided by the customer) then uses the calibration matrix to calculate the forces and moments and display this on the PC in graphical form.

Product Features

- Maximum possible output speed (see table on page 6).
- Variety of DAQ cards can be used (PCI, USB).
- Dual calibration possible.



Scope of delivery:

FT sensor, sensor cable, power supply box, optional with DAQ card (PCI or USB)

- ① FT sensor with sensor cable
- ② Power supply box
- ③ Optional with DAQ card (PCI)
- ④ Optional with DAQ card (USB)
- ⑤ Cable for DAQ card

FTS – the independent Measuring System

The SCHUNK FTS sensor is connected via the RS-232 software, analog outputs and/or individual I/O connections.

The stand-alone controller digitizes the sensor's 6 analog output signals and uses the calibration matrix to calculate the forces and moments in all six directions (F_x , F_y , F_z , M_x , M_y , M_z).

Product Features

- Independent measuring system.
- Dual calibration possible.
- Discrete I/O (e.g. good / bad check).
- Built-in RS-232 interface enables direct configuration on PC.
- Measured forces and moments are outputted via analog voltages ($\pm 5\text{ V}$ / $\pm 10\text{ V}$).



Scope of delivery:
FT sensor, sensor cable, stand-alone controller

- ① FT sensor with sensor cable
- ② Stand-alone controller
(left: rear view, right: front view)
- ③ Amplifier box (MUX box)
- ④ Connection cable from amplifier box
to stand-alone controller

6-Axis Force /Torque Sensors

FTW – Radio Transmission System (WLAN) in Pocket Size

FTW – Radio Transmission System (WLAN) in Pocket Size

The FTW is a radio transmission system (WLAN) in pocket size for up to six SCHUNK force-moment sensors. The FTW can transfer the signals for data collection, real-time motion control or user-defined signal processing on host devices of the user.

The FTW is available in two configurations: one for up to six force /torque sensors.

Product Features

- The FTW system is a radio-based transmission system for up to 6 SCHUNK FT sensors.
- Power is supplied via battery or power supply. The wireless standard 802.11b/g/n 2.4 GHz or 5.0 GHz is used.
- The FTW can transfer up to 1,200 six-axes measurements per second to the host device.
- Up to 3 sensors can be used with the FTW-3, and up to 6 sensors with the FTW-6.
- Battery-powered Wi-Fi® system, 2.4 GHz and 5 GHz.
- Micro SD™ card data logger.
- Exchangeable battery with USB battery charger.
- Impact, water, and dust protection.



Scope of delivery:
FT sensor, sensor cable, radio transmission system

- ① Radio transmission system
- ② Battery charger
- ③ FT sensor with cable

Calibration of 6-Axis Force /Torque Sensors (FTN, FTD, FTS, and FTW)

Each sensor size can be calibrated for different measuring ranges. The measuring range can be explained as follows:

Example: Mini45 SI 290-10

Sensor size: Mini45; measuring range $F_{x/y}$: ± 290 N; measuring range $T_{x/y}$: ± 10 Nm

Sensor type	Calibration
Nano17 Titanium	SI-8-0.05
Nano17 Titanium	SI-16-0.1
Nano17 Titanium	SI-32-0.2
Nano17	SI-12-0.12
Nano17	SI-25-0.25
Nano17	SI-50-0.5
Nano17 IP65 / IP68	SI-25-0.25
Nano17 IP65 / IP68	SI-50-0.5
Nano25	SI-125-3
Nano25	SI-250-6
Nano25 IP65 / IP68	SI-125-3
Nano25 IP65 / IP68	SI-250-6
Mini40	SI-20-1
Mini40	SI-40-2
Mini40	SI-80-4
Mini45	SI-145-5
Mini45	SI-290-10
Mini45	SI-580-20
Mini58	SI-700-30
Mini58	SI-1400-60
Mini58	SI-2800-120
Mini85	SI-475-20
Mini85	SI-950-40
Mini85	SI-1900-80
Gamma	SI-32-2.5
Gamma	SI-65-5
Gamma	SI-130-10
Gamma IP60	SI-32-2.5
Gamma IP60	SI-65-5
Gamma IP60	SI-130-10
Gamma IP65 / IP68	SI-32-2.5
Gamma IP65 / IP68	SI-65-5
Gamma IP65 / IP68	SI-130-10
Delta	SI-165-15
Delta	SI-330-30
Delta	SI-660-60
Delta IP60	SI-165-15
Delta IP60	SI-330-30
Delta IP60	SI-660-60
Delta IP65 / IP68	SI-165-15
Delta IP65 / IP68	SI-330-30

Sensor type	Calibration
Delta IP65 / IP68	SI-660-60
Theta	SI-1000-120
Theta	SI-1500-240
Theta	SI-2500-400
Theta IP60	SI-1000-120
Theta IP60	SI-1500-240
Theta IP60	SI-2500-400
Theta IP65 / IP68	SI-1000-120
Theta IP65 / IP68	SI-1500-240
Theta IP65 / IP68	SI-2500-400
Omega85	SI-475-20
Omega85	SI-950-40
Omega85	SI-1900-80
Omega85 IP65 / IP68	SI-475-20
Omega85 IP65 / IP68	SI-950-40
Omega85 IP65 / IP68	SI-1900-80
Omega160	SI-1000-120
Omega160	SI-1500-240
Omega160	SI-2500-400
Omega160 IP60	SI-1000-120
Omega160 IP60	SI-1500-240
Omega160 IP60	SI-2500-400
Omega160 IP65 / IP68	SI-1000-120
Omega160 IP65 / IP68	SI-1500-240
Omega160 IP65 / IP68	SI-2500-400
Omega191	SI-1800-350
Omega191	SI-3600-700
Omega191	SI-7200-1400
Omega191 IP60	SI-1800-350
Omega191 IP60	SI-3600-700
Omega191 IP60	SI-7200-1400
Omega191 IP65 / IP68	SI-1800-350
Omega191 IP65 / IP68	SI-3600-700
Omega191 IP65 / IP68	SI-7200-1400
Omega250 IP60 / IP65 / IP68	SI-4000-500
Omega250 IP60 / IP65 / IP68	SI-8000-1000
Omega250 IP60 / IP65 / IP68	SI-16000-2000
Omega331	SI-10000-1500
Omega331	SI-20000-3000
Omega331	SI-40000-6000

6-Axis Force / Torque Sensors

Check-List

Check-List

Description of application

Design information

Robot type	
Integration in robot control system	☐ yes ☐ no
Acceleration (m/s ²)*	
Max. force to be measured (N)	
Max. moment M_{xy} to be measured (Nm)	
Max. moment M_z to be measured (Nm)	
Max. distance to measuring point (mm)**	
Additionally occurring external forces (N)	
Occurring overload (F_{xyz} , M_{xyz})	
IP protection class ***	☐ None ☐ IP60 ☐ IP65 ☐ IP68

* 1 G $\hat{=}$ robot performance 25 – 50%, 2 G $\hat{=}$ robot performance 50 – 75%, 3 G $\hat{=}$ robot performance > 75%

** Distance from sensor to measuring point at which forces are applied.

*** Not available for all sizes.

Selecting the appropriate 6-axis force / torque sensor

Selected sensor	
Selected optional sensor	
Selected calibration (SI)	
Further calibration (SI)	
Optional Nano / Mini* cable outlet	☐ R ☐ E ☐ A
Gamma cable outlet or larger Radial cable outlet with strain relief	☐ R
Max. ambient temperature (°C)	

* R: radial cable outlet, E: radial cable outlet with strain relief, A: axial cable outlet

FTD system

DAQ card type	☐ PCI	☐ USB			
Nano / Mini cable length (m)	☐ 1.8	☐ 2.5	☐ 3.0	☐ 4.0	☐ 5.0
Gamma cable length or larger (m)	☐ 10.0	☐ 15.0	☐ 20.0		
PS-BOX to DAQ card cable length (m)	☐ 0.5	☐ 2.0	☐ 5.0		
Cable connector for DAQ card*	☐ M	☐ E	☐ U		

* M, E: series connectors for cards from National Instruments, U: cable with open wire strands

FTN system

Communication interface	☐ Ethernet	☐ DeviceNet	☐ Optional ProfiNet
Nano / Mini cable length (m)	☐ 1.8	☐ 2.5	☐ 3.0 ☐ 4.0 ☐ 5.0
Gamma cable length or larger (m)	☐ 10.0	☐ 15.0	☐ 20.0
Ethernet RJ45 adapter (0.2 m)	☐ yes	☐ no	
Power supply unit (230/24 V) for NetBox	☐ yes	☐ no	

FTS system

Nano / mMini cable length (m)	☐ 1.8	☐ 2.5	☐ 3.0	☐ 4.0	☐ 5.0
Amplifier box to controller cable length (m)*	☐ 7.6	☐ 15.2	☐ 22.8		
Gamma cable length or larger (m)	☐ 7.6	☐ 15.2	☐ 22.8		

* Only needed for Nano and Mini sizes.

FTW system

Interface communication	☐ Wireless			
For up to 3 sensors ☐	Sensor 1 _____	Sensor 2 _____	Sensor 3 _____	
For up to 6 sensors ☐	Sensor 4 _____	Sensor 5 _____	Sensor 6 _____	

Name	Customer number
Company	Contact person
Street	
Zip	City
Phone	Fax
Email	

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Greifsysteme | Gripping Systems



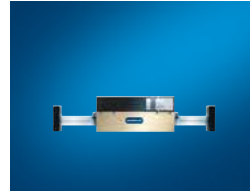
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Grippers



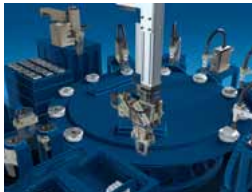
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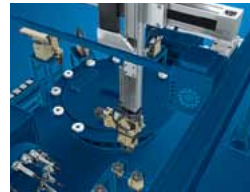
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☐ Werkzeughalter
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☐ Stationäre Spanntechnik
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Lathe Chucks



☐ Spannbacken
Chuck Jaws



☐ Magnetspanntechnik
Magnetic Clamping Technology



☐ Produktübersicht
Product Overview



☐ Kundenspezifische Lösungen
Hydro-Dehnspanntechnik
Technology Special Solutions



☐ Vakuumsanntechnik
Vacuum Clamping Technology



☐ Highlights
Neuheiten | New Products

Firma | Company

Name | Name

Abteilung | Department

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PLZ | ZIP

Ort | City

Tel.

Fax

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Reg. No. 003496 QM08

No. 1

for precise gripping
and safe holding.



J. Lehmann

Jens Lehmann, German goalkeeper legend,
SCHUNK brand ambassador since 2012
for precise gripping and safe holding.
www.gb.schunk.com/Lehmann

852 minutes without a
goal against him in the
Champions League

681 minutes without a goal
against him in the national team

2 intercepted penalties
in the 2006 World Cup

1 headed goal as a goalie

0 defeats English Soccer Champion

and

More than **2,000,000**
sold precision toolholders

About **1,000,000**
delivered SCHUNK grippers

More than **100,000**
lathe chucks and stationary
workholding systems are in use
worldwide

More than **16,000,000**
sold standard chuck jaws

More than **75,000**
implemented hydraulic expansion
customer-specific solutions

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