

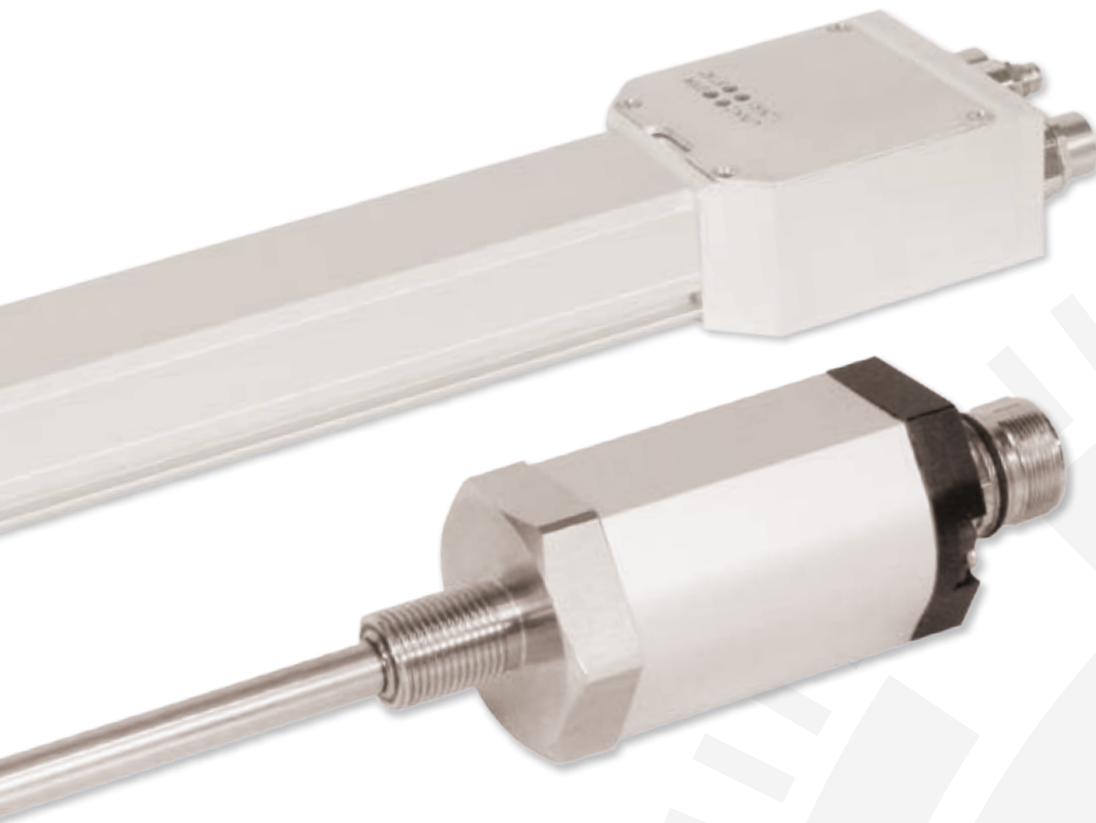
sensors
rotary
linear

motion

systems

controls

TR-Electronic Linear Encoder Overview



TR-Electronic – Your Partner in Automation










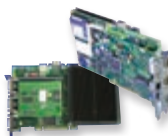






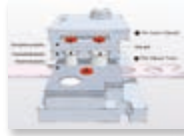

TR-Electronic can look back on more than 25 years of success, and is represented worldwide with an export share of more than 40 %. The core business comprises the development and manufacture of industrial angular and position measuring technology, as well as compact drive technology with integrated position control and measurement. The company is divided into three Business Units (BU) and is thus well positioned for further growth in the future.

Products in the **Rotary Encoder Business Unit** with optical or magnetic scanning precisely acquire position in steel production, wind power plants, cranes and ships as well as in explosion-proof versions in painting lines. Miniature versions ensure the correct position in medical technology. SIL3 approved absolute rotary encoders ensure the necessary safety.

In the **Linear Encoders Business Unit** magnetostrictive position sensors position injection molding machines, for example, or are directly integrated into hydraulic cylinders. Cascadable distance measurement sensors position parting units. With their high precision, glass scales on machine tools ensure precise position. Laser sensors based on phase difference measuring techniques position aisle stackers in warehousing and materials handling technology.

In the **Drives Business Unit** angle sensors are combined with compact drives: no external electronics are required, position, speed and torque controllers, power electronics and absolute rotary encoders are compactly integrated into the drive and thus bring intelligence directly to the drive shaft via the field bus. Compact drives are used for diverse applications in the printing and packaging industry and on palletizers.



Rotary Encoder	Linear Encoder	Drives	Components	Engineering	Unidor
 Incremental Encoder	 Magnetostriction	 Actuator	 I/O Module	Automation Solutions 	Punching and forming Measurement and control systems 
 Absolute Encoder	 Glass scale	 Positioning Drive	 Controls	Retrofit 	Sensors 
 Draw Wire Encoder	 TOF laser	 Processing Drive	 Industrial-PC	Process monitoring tools 	 Barcode Positioning

The portfolio is supplemented by the affiliated TRsystems with customized controls, industrial PCs, hydraulic controls as well as control units and sensors for punching and forming.

An essential factor for the success of TR-Electronic are the now more than 300 employees who actively help to shape the product portfolio with innovations and successfully implement customer projects. Through its commitment to the regional colleges, TR-Electronic supports the high quality training of young employees and thus guarantees the highest level of innovation and quality at its Trossingen location.

A high degree of vertical integration allows customer-specific requirements to be responded to very quickly. The constantly new requirements on the mechanical design of sensors, on innovative new operating interfaces and new plug connectors result in a rapidly increasing product diversity. With TR-Electronic you have a partner who can fulfil these requirements.

General/Definition
Linear Encoder
Laser
Accessories

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Products

Linear absolute distance measurement sensors	Stainless steel tube housing	12
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How to find your fitting linear encoder

Choose according to your requirements:

① Linear absolute distance measurement system LA

For measurement length up to 4.000 mm. When the positioning sensor is mechanically moved when turned off, the actual position is shown after turning on the supply voltage. The LA system works contactless and wear-free. The linear absolute positioning sensors are perfect to build into a hydraulic cylinder. The measurement rod achieves a compression strength up to 600 bar (TÜV proven).

Specialties	tainless steel rod, for assembling directly into the hydraulic cylinder
Measurement range	up to 4 m
Resolution	●●○○

② Linear absolute dist. measurement system in a profile housing LP

The difference to the LA positioning system is the version with the profile housing. The measured length is protected in an extruded section out of aluminum. The position sensor is also available with a measuring slide for easy mounting. The distance of the position sensor to the profile housing will be adjusted through the measuring slide, only the actuator is mounted on the measuring slide.

Specialties	aluminum profile, multiple magnet function
Measurement range	up to 20 m
Resolution	●●○○

③ High resolution absolute positioning sensors glass measuring LT

The LT measuring system works with a photo electronic scanning. The smallest possible measurement step is 0,1 µm. Therefore, it is ideally qualified for applications demanding high resolution and accuracy.

Specialties	aluminum profile high resolution
Measurement range	up to 3 m
Resolution	●●●●

④ Laser distance measurement system LE

Our laser distance measurement devices are optical sensors, which are able to capture longer distances contact-free and fast enough for closed loop position control. The individual components of the measuring system are light source, receiving optic, electronic evaluation and data interface as well as reflector.

Specialties	controller capable, closed loop control contact-free
Measurement range	0,2 up to 240 m
Resolution	0,1 mm

⑤ Barcode measurement system

The BE90 is a measuring system reading the measured length with a barcode. This is how you can capture an absolute position when having non-linear movements and curvy systems.

Specialties	also for non-linear movements and winding systems
Measurement range	up to 10 km
Resolution	1 mm

Interfaces (others on request)

SSI
ISI
Parallel
SIN/COS
FO



TR-Electronic – Your Partner in Automation

General/Definition



Programmable rotary encoder

The standard of automation technology, available with all current fieldbus systems: PROFIBUS, Interbus, CANopen, DeviceNet and Industrial Ethernet. Including TR-Electronic's variety of mechanics, interfaces and functions.

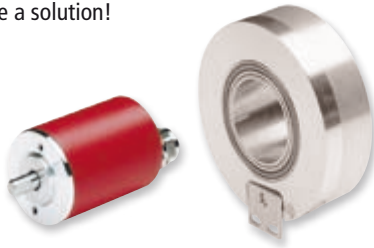


Linear Encoder



Incremental rotary encoder

From 24 mm external diameter up to 55 mm hollow shaft – we always have a solution!



Laser

Motor feedback systems

Feedback encoder for modern positioning drives. Optional integrated or directly mounted on the drive shaft via hollow shaft.



Accessories

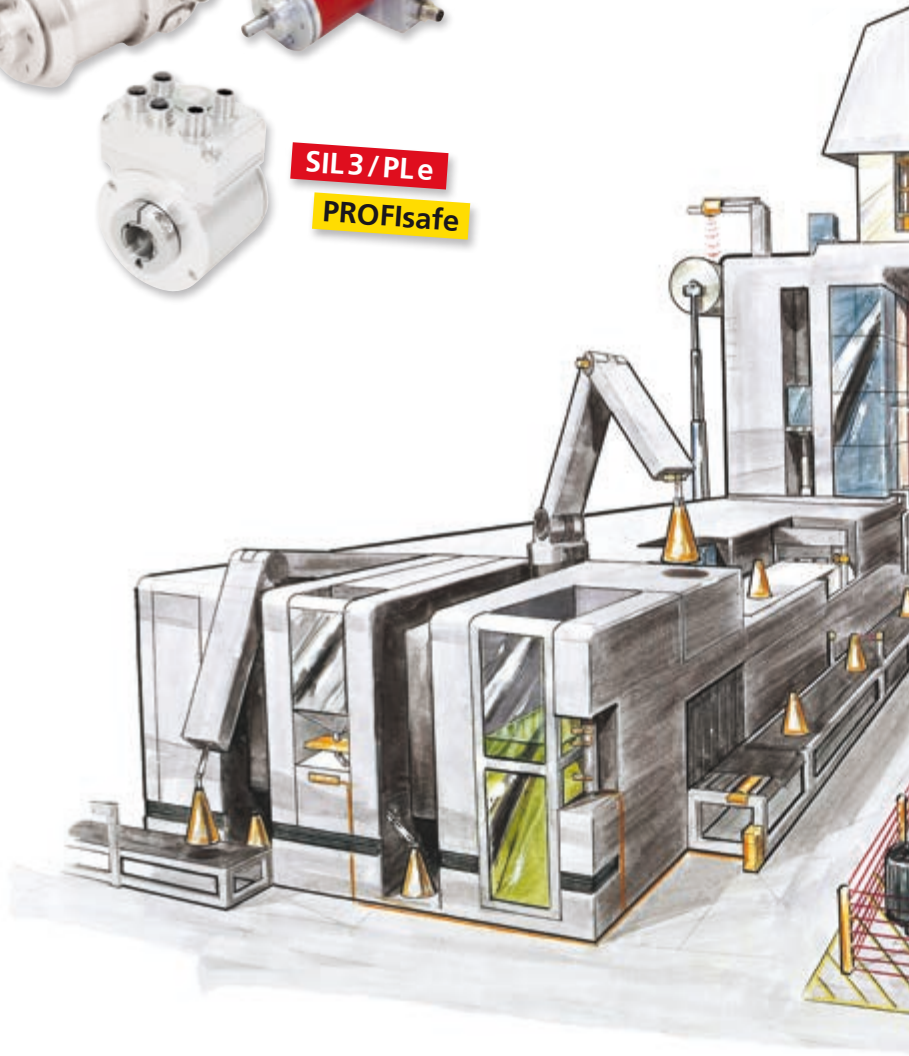
Linear absolute displacement sensors

The compact class for linear absolute measurement. Directly bus-ready, suitable for harsh environmental conditions and for installation in hydraulic cylinders.



Absolute high resolution linear measurement systems

Linear measurement with absolute sub-micron resolution without referencing.



Intelligent positioning drive

Absolute positioning directly via fieldbus. Integrated motor, power electronics, closed loop controller, absolute encoder, PLC functions and fieldbus interface.



Heavy-duty industrial PC

Double shock proof mounted housing isolates the electronics from vibration, while front access (MIPC) simplifies configuration and start up. Choose from our wide selection of housings.



SPC – the PLC for PC

Turns every PC into an efficient PLC under S5/S7 or IEC 1131 protocols. Combines the comfort of PC control with the safety of a separate processor for PLC tasks.



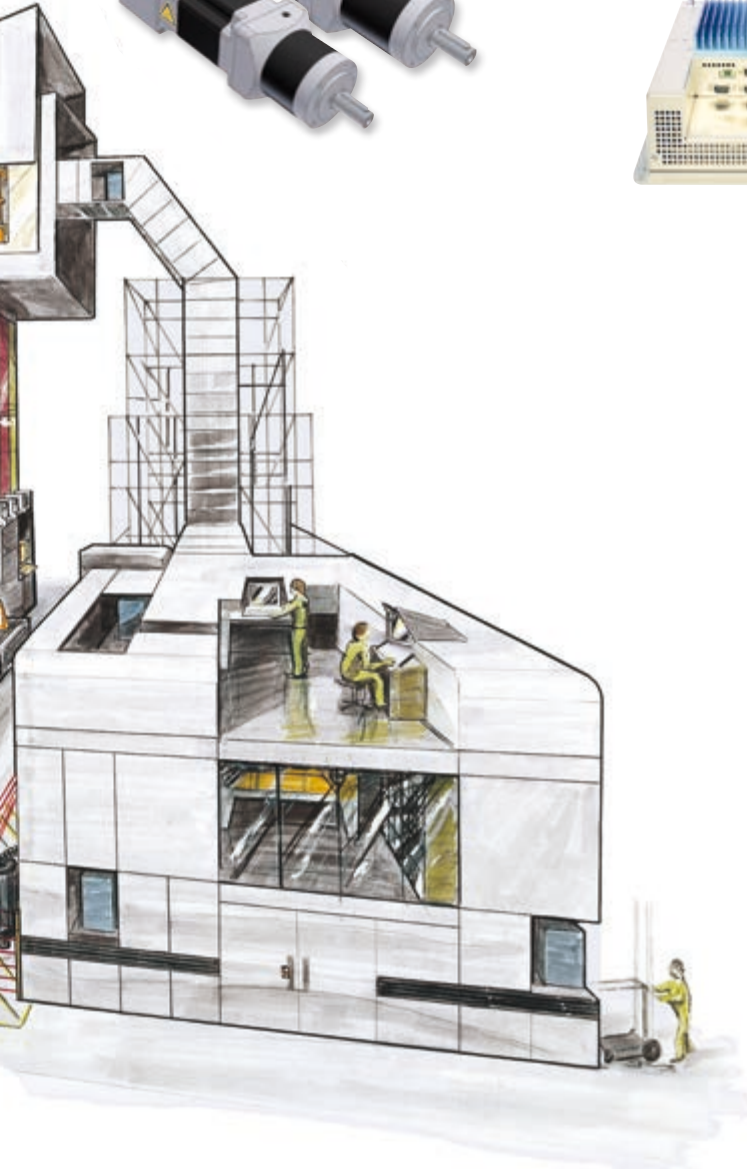
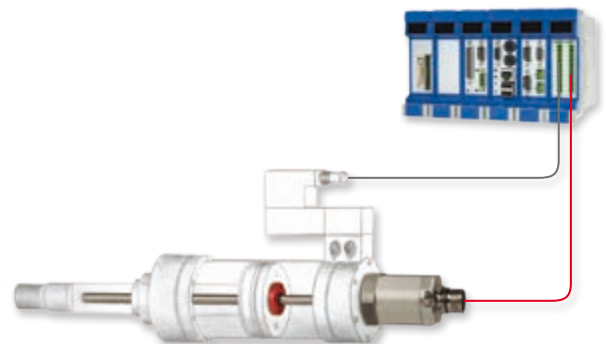
@ctivelO – more than fieldbus modules

Modular, rugged fieldbus node system I/O-node, small-scale PLC, decentralized axis controller, high performance cam controller, DIN-rail mounted industrial PC, servo controller for the hydraulic ... with commercial fieldbus systems, such as Profibus-DP, CANopen, DeviceNet, LightBus ... and ETH-ERNET as option!



Laser distance measuring systems

Absolute and wear-free measurement of distances up to 200 m via SSI, fieldbus and Ethernet.



TR-Electronic – For Each Sector the Perfect Solution

Storage and logistics

It is especially important for storage equipment such as rack feeders, transfer units and cranes to have an effective, decentralized measurement and control technology for easy project planning and fast start up.



Packaging industry

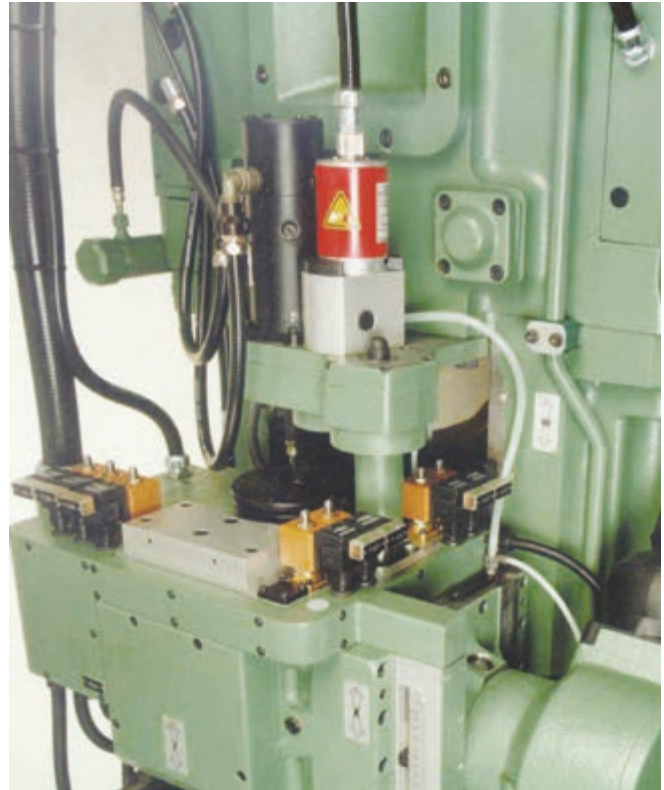
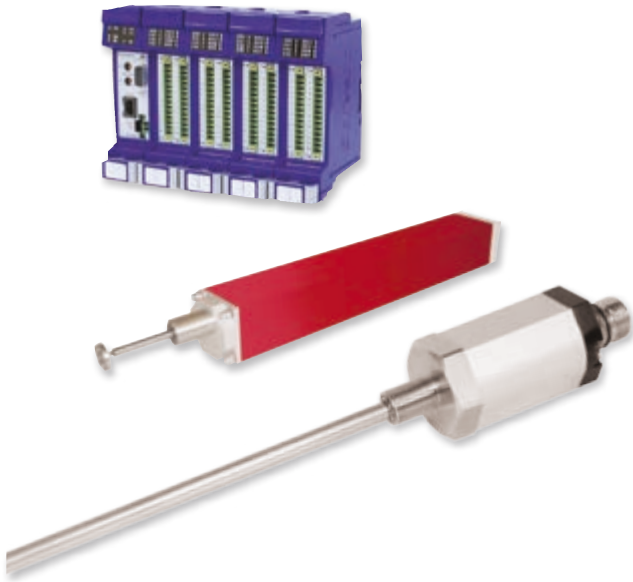
Flexible automation solutions according to our customers' wishes are the intelligent base for a successful machine concept within the packaging industry. High processing speed, enables fast cycle times and larger lot sizes. Absolute measurement systems save time consuming Homing Sequences. Highly integrated, intelligent sensors also allow for distributed control. When it comes to needing higher precision, we have a perfect solution.



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Metal working

For years the world of presses and stamping has been a specialty of TR-Electronic. We design and develop products from the beginning, in such a way that they resist high shock and vibration impacts.



Wood working

Intelligent, decentralized controlling concepts, efficient sensors with on-site signal processing and components that work reliably despite high temperature fluctuations, are the base for automation solutions within the wood-working industry. Our specialty is to equip and network transfer machines, machine centers and installation fields, especially if you have particular requirements for your machine.



TR-Electronic – For Each Sector the Perfect Solution

Print technology and paper conversion

Fast signal processing for printing machines enables higher accuracy and decentralized compact drives automate adjusting procedures. With stainless steel housings, rotary encoders even sustain aggressive mediums like groundwood pulp in paper machines. Small absolute rotary encoders measure movements in tight spaces.



Event technology

Our rotary encoders offer safety in all required classes for stage technology and other SAFE applications. From rotary encoders with additional incremental tracks up to SIL 3 certified safety rotary encoders, we offer the right solution for safety.

SAFETY INSIDE



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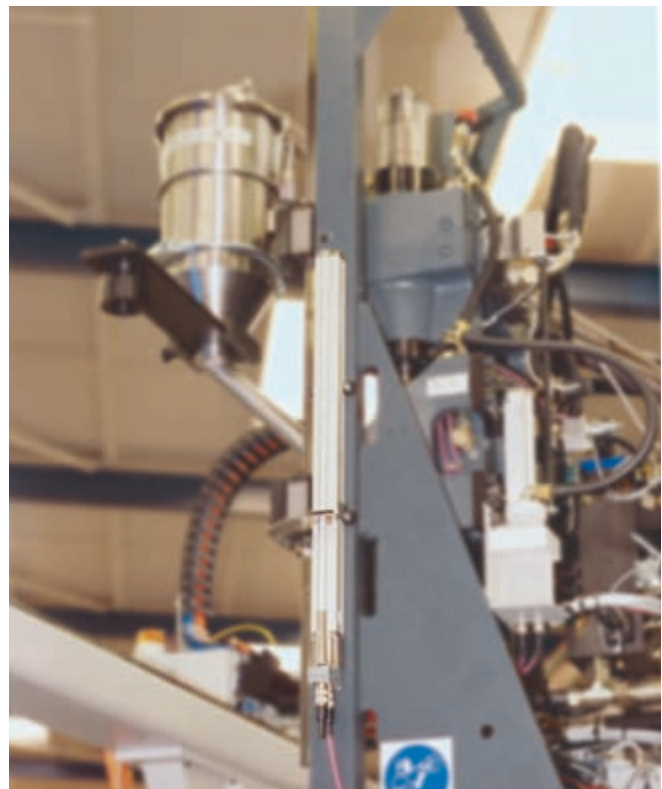
Renewable energy

With intelligent tracking of photovoltaic constructions the efficiency is improved and the automation accelerated. High resolution rotary encoders enable exact positioning. Compact drives reduce the number of connected components and provide years of orientation of your construction towards the sun.



Plastics processing

Various measurement tasks within plastic processing machines require fast signal processing and high precision. Linear measurement systems, for implementing into hydraulic cylinders, blend smoothly into injection molding machines. Industrial PCs are an universal platform for user specific control systems for series production and special machines.



Linear Measurement Systems for Special Applications

LMR 48 – positioning sensor to install into the hydraulic cylinder

Contact-free. Precise. Reliable.

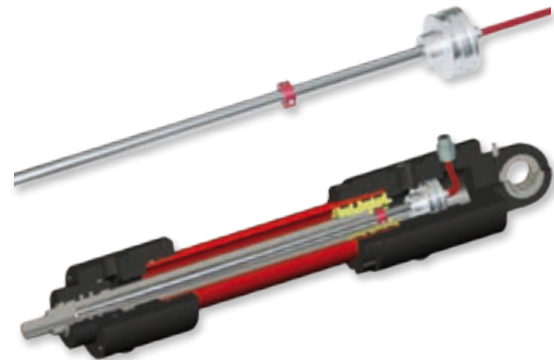
The new linear absolute positioning system measures contact-free and therefore wear-free. The established magnetostrictive measuring method provides for a precise and reliable positioning response and securely resolves up to 0,05 mm. The flat, compact design of the sensor makes the complete integration into the hydraulic sensor easier. On one hand the sensor is optimal protected and on the other the total length of the hydraulic drive is reduced. This is a big advantage especially when having less mounting space or docking cylinder onto a ball joint. The positioning system LMR 48 is available with a measuring length up to 2 m. The controller communicates with the sensor over analog signal or CANopen.

- + contact-free and wear-free
- + precise and reliable positioning response
- + the sensor is completely integrated into the hydraulic cylinder and therefore optimal protected
- + mounting the cylinder with ball joints is possible

Measurement length	up to 2 m
Resolution	0,1 mm
Interfaces	Analog and CANopen

Further information you will find on page 13

for implementing into hydraulic cylinders



LE 200 – up to 240 m contact-free measurement

Absolute. Contact-free. Controller suitable.

The series of the laser distance measuring devices are optical sensors. You can capture longer distances contact-free and fast enough for closed loop axis controllers.

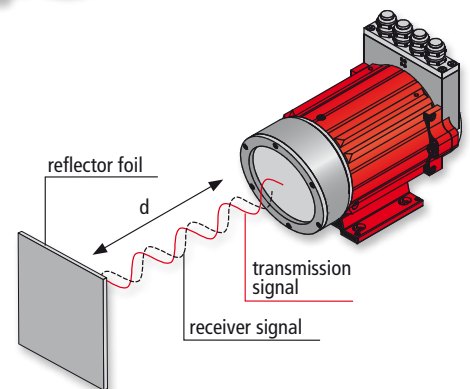
The components of the laser positioning system are the laser light source, light collector, electronic evaluation and data interfaces such as a reflector. The device sends out a modulated light beam which is reflected by the reflector. Out of the phase difference between the send and received light beam, the distance is calculated 1.000 times per second and issued with a adjustable resolution of up to 0,1 mm.

- + capturing of linear movements
- + particularly suitable for storage and logistics
- + programmable
- + optional with preliminary setup for connecting a cooling circuit
- + stability of the measurement through its intensity/ temperature control
- + robust design

Measurement length	0,2 m up to 240 m
Resolution	0,1 mm
Interface	PROFIBUS + SSI, CANopen, DeviceNet, Interbus-S, EtherNet/IP, SSI, PROFINET (others on request)

Further information you will find on page 18

contact-free up to 240 m





LMC 55 – cascadable up to 20 m, delivered in handy pieces

Mounting is very easy.

By adding profile houses of positioning sensors, you can achieve arbitrary measurement lengths. To achieve a continuous measurability of the measurement length, the individual systems have to overlap. After adding the housing parts together they are form-fit. The density of IP 65 is given for the entire measurement system when parts are mounted correctly.

- + handy sizes of the individual systems
- + individual elements can almost be installed in an arbitrary order – the internal addressing happens automatically
- + contact-free, magnetostrictive method – no wear or tear!
- + surface even installation possible

Possible applications:

- _cutter adjustment in a roller cutter machine
- _wear-free vertical axis in a high rack wearhouse
- _transfer vehicles and stage technology (stage wagon)

Measurement length	up to 20 m
Resolution	0,05 mm
Interface	PROFIBUS DP (other interfaces on request)

Further information you will find on page 15



LA 50, LA 80 – level measurement in chemical aggressive mediums

Both linear absolute positioning sensors (LA 50 and LA 80) are suitable for the level measurement in aggressive mediums. To achieve a high resistance against the mediums, the measurement systems and the electronic are put into a tube with a flange made of polypropylene.

- + suitable for the use in aggressive mediums
- + for the galvanic and the food production
- + plastic housing
- + capturing of linear movements
- + contact-free, wear-free scanning
- + capable of parametrization
- + adjustment over input

Measurement length	0,1 up to 4 m
Resolution	up to 0,005 mm (LA 50)
Interfaces	SSI, Analog

Further information you will find on page 13














Example for substances (others possible):

- _calcium chloride, watery (in each concentration)
- _calcium phosphate
- _calcium sulfate
- _quinine
- _chloride, gaseous dry and moist
- _chloroform (technical pure)
- _chromic acid, watery (concentration 50 %)
- _citrus juices
- _cola concentrate



- _sulfur dioxide, dry and moist (in each concentration)
- _sulfur acid, watery (concentration up to 50 %, 98 %)
- _sea water
- _soap solution, watery (in each concentration)
- _mustard
- _silver nitrate
- _silicon oil
- _liquor
- _sulfate, watery solution (each concentration)
- _turpentine oil (technical pure)

Linear Absolute Positioning Sensor in a Stainless Steel Housing

	LA 46	LA 46 H	LA 66
Specifics and specifications	Distance measurement, contact-free and wear-free, for installing into a hydraulic cylinder	With replaceable distance sensor, to set parameters, positioning value adjustment	For installing into a hydraulic cylinder, cam controller up to eight cams
Product picture			
Version	Stainless steel tube	Stainless steel tube	Stainless steel tube
Measurement length	50 ... 4.000 mm	50 ... 4.000 mm	100 ... 4.000 mm
Resolution (max.) - Analog Interface	0,005 mm 16 bit	0,005 mm 16 bit	0,01 mm 16 bit
Accuracy (typically)	±0,15 mm	±0,15 mm	±0,05 % measured length
Hysteresis (max.)	±0,02 mm	±0,02 mm	±0,1 mm
Interfaces (others on request)	SSI Analog   CANopen	SSI Analog   CANopen	Parallel Analog NSW FO FIPIO
Supply voltage	24 V DC, -20 %, +10 %	24 V DC, -20 %, +10 %	24 V DC, -20 %, +10 %
Connection technology - Cable connection - Connector	 axial	 axial	 axial, radial
Temperature range	0 ... +70 °C	0 ... +70 °C	0 ... +70 °C
Protection class, DIN EN 60529	IP 65	IP 65	IP 65
Programmability	TRWinProg, PT100 bus	TRWinProg, PT100 bus	TRWinProg, PT100 bus
Further options and accessories	Separate outer tube for easy sensor switch, for the direct mounting into the hydraulic cylinder	Optional work temperature: -20 °C ... +70 °C, multiple magnet function, up to 30 magnets, further interfaces deliverable	Multiple magnet function up to 12 magnets, further interfaces deliverable
For further information, please scan the QR-Code.			

Linear Absolute Positioning Sensor in a Plastic Housing

	LMR 48	LA 50	LA 80
Specifics and specifications	For complete installation into a hydraulic cylinder (also with ball joint), short total length	For using in aggressiv media or the area of galvanic	For using in aggressive media, with float
Product picture			
Version	Compact, flat design	Plastic tube	Plastic tube
Measurement length	up to 2.000 mm	100 ... 1.000 mm	100 ... 4.000 mm
Resolution (max.) - Analog Interface	0,1 mm 12 bit	0,005 mm 16 bit	0,05 mm 16 bit
Accuracy (typically)	±0,05 % measured lenght	±0,15 mm	±0,05 % measured lenght
Hysteresis (max.)	±0,2 mm	±0,02 mm	± 0,05 mm
Interfaces	Analog CAN _{open} (further interfaces on request)	SSI Analog	SSI Analog
Supply voltage	12 V DC, -5 %, +10 %	24 V DC, -10 %, +10 %	24 V DC, -20 %, +10 %
Connection technology - Cable connection - Connector	✓ axial	✓ on the cable	✓ on the cable
Temperature range	-40 ... +85 °C	0 ... +70 °C	0 ... +70 °C
Protection class, DIN EN 60529	IP 65	IP 68	IP 68
Programmability	TRWinProg, bus	TRWinProg, PT100	TRWinProg, PT100
Further options and accessories	Over 2.000 mm on request	Thread M18×1.5 further interfaces available, optional PROFIBUS with external box	Thread DIN 259 - RS2
For further information, please scan the QR-Code.		—	

Linear Absolute Positioning Sensor in a Aluminum Profile Housing

	LP 46	LMP 30	LMP 30 BUS
Specifics and specifications	Distance measurement for engineering with a guided magnet	Distance measurement in a flat profile housing	Distance measurement in a flat profile housing
Product picture			
Version	aluminum strand casting profile	aluminum strand casting profile	aluminum strand casting profile
Measurement length	50 ... 4.000 mm	50 ... 4.000 mm	50 ... 4.000 mm
Resolution (max.) - Analog Interface	0,005 mm 16 bit	0,05 mm 12 bit	0,005 mm
Accuracy (typically)	±0,15 mm	±0,2 mm	±0,1 mm*
Hysteresis (max.)	±0,02 mm	±0,02 mm	±0,02 mm
Interfaces	SSI Analog   	SSI Analog Start-Stop 	  EtherCAT   
Supply voltage	24 V DC, -20 %, +10 %	24 V DC, -20 %, +10 %	24 V DC, -20 %, +10 %
Connection technology - Cable connection - Connector	 axial	 on the cable	- axial
Temperature range	0 ... +70 °C	0 ... +70 °C	0 ... +70 °C
Protection class, DIN EN 60529:	IP 65	IP 65	IP 65
Programmability	TRWinProg bus	-	bus
Further options and accessories	Multiple magnet function - up to 3 magnets: 0,005 mm resolution - up to 30 magnets: 0,05 mm resolution	-	Multiple magnet function - up to 3 magnets: 0,005 mm resolution - up to 30 magnets: 0,05 mm resolution *up to 1.000 mm
For further information, please scan the QR-Code.			









High Resolution Absolute Positioning Sensors

	LT-S	LT-PI	LT-RV
Specifics and specifications	Distance measurement, high resolution	Distance measurement, high resolution, usable in a running production	Distance measurement, high resolution For the use in heavy industry
Product picture			
Version	measuring slider	decoupled measurement axis	protection housing
Measurement length	140 ... 3.040 mm	100/150/200/250 mm	400/520 mm
Resolution (max.)	0,1 µm	0,1 µm	0,1 µm
Accuracy (typically)	±5 µm	±5 µm	±5 µm
Interfaces	SSI, incremental 5V/24V, SIN/COS	SSI, incremental 5V/24V, SIN/COS	SSI, incremental 5V/24V, SIN/COS
Supply voltage	8 ... 27 V DC	8 ... 27 V DC	8 ... 27 V DC
Connection technology - Cable connection - Connector	✓ on the cable	✓ on the cable	✓ on the cable
Temperature range	0 ... +65 °C	0 ... +65 °C	0 ... +65 °C
Protection class, DIN EN 60529	IP 50	IP 66	IP 66
Programmability	TRWinProg	TRWinProg	TRWinProg
Further options and accessories	Analog,  ,  and  over interface adapter, also with multiple sensing heads within the same system	Analog,  ,  and  over interface adapter Return spring	Analog,  ,  and  over interface adapter Return spring
For further information, please scan the QR-Code.			

Notes

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Laser Distance Measurement System

	LE 200	LLB 65	LLB500
Specifics and specifications	Distance measurement	Distance measurement	Distance measurement
Product picture			
Version	reflector	without reflector	without reflector
Measurement length	0,2 ... 240 m	0,05 ... 65 m (without reflector)	0,05 ... 65 m (without reflector) 0,05 ... 500 m (with reflector)
Resolution (max.)	0,1 mm	0,1 mm	0,1 mm
Accuracy (typically)	±2 mm	±1,5 mm	±1 mm
Cycle time	0,001 s	0,15 ... 4 s	0,04 ... 4 s
Interfaces	SSI        	Analog 	Analog + SSI 
Supply voltage	18 ... 27 V DC	9 ... 30 V DC	13 ... 30 V DC
Connection technology - Cable connection - Connector	radial / axial radial / axial	 axial	 axial
Temperature range	0 ... +50 °C	-10 ... +50 °C	-10 ... +50 °C
Protection class, DIN EN 60529	IP 65, laser safety class 2	IP 65, laser safety class 2	IP 65, laser safety class 2
Programmability	TRWinProg bus	over PC bus	over PC bus
Further options and accessories	Heating for the inside of the housing and front window Cooling	Heating for the inside of the housing	Heating for the inside of the housing
For further information, please scan the QR-Code.			

Electrical and Mechanical Accessories

Programming adapter

Connects the device to the PC. Changes signals from USB to encoder programming interface and is electrically isolated. We suggest the use in conjunction with one of our switch cabinet modules. Serial (RS 232) to encoder to encoder conversion on request.



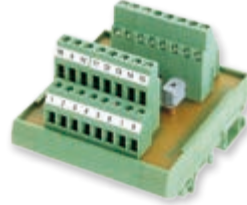
SSI-Parallel converter PU10

Converts absolute position and CAM signals from SSI interface to parallel output bits with max. 32 bit.



Switch cabinet module

The perfect aid for transparent rotary encoder cabling. Correct grounding of signal wires and easy connection to our programming adapter.



For linear absolute measurement systems

Double clamping for linear absolute measuring systems in profile housings (magnetostriction: LP) and magnets for linear absolute position measuring system (magnetostriction: LA, LP).



Optical data transfer ID 200

- + optical datatransfer
- + range 120 m, 200 m
- + PROFIBUS/RS 485
- + Interbus-S 500 kBit/s, RS 422
- + Interbus-S 2 MBit/s, FO

Range	0,2 ... 200 m
Transmitting diode	infrared light, wave length 880 m
Protection class	IP 65
Housing	aluminum die casting light entry/exit glass
Work temperature	-30 °C ... +70 °C
Weight	ca. 1.200 g
Supply voltage	18 ... 30 V DC
Opening angle	±0,5° to optical axis



Universal display TA-Mini

Is displaying actual values of the SSI measuring system (TR-Electronic and other producers).



Existing SSI connections between measuring system and the controller can be monitored and the position can be shown without influencing the connection.

- + comfortable display function
- + scale
- + zero shift
- + decimal, hexadecimal, binary
- + leading zero, prefix ...

Is displaying actual values and other parameters of rotary encoder (rotary encoder of TR-Electronic with arbitrary process and programming interfaces). The process interface remains free.

_Programming module

The display itself can be programmed via USB or PC (TRWinProg).

Over the display the measuring system can be programmed (those that are connected to the programming interface). The TA-Mini takes over the function of the PC adapter.

_Signal converter

Parameters read in over the programming interface can be displayed as SSI value.

Therefore, you easily can retrofit, for example, a LLB 60 Analog with a SSI interface or via programming interface readout speed ... that can be send via SSI.

_Linked displays

Values shown can be transmitted to other TA-Minis (display at a machine, master display). The scale can be taken over or independently adjusted.

_Displaying differences

For each display can be chosen, when having two linked displays with their own SSI measuring system, if one would like to show its own position or the one of the other measuring system or the difference of it.

For further information, please scan the QR-Code.



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