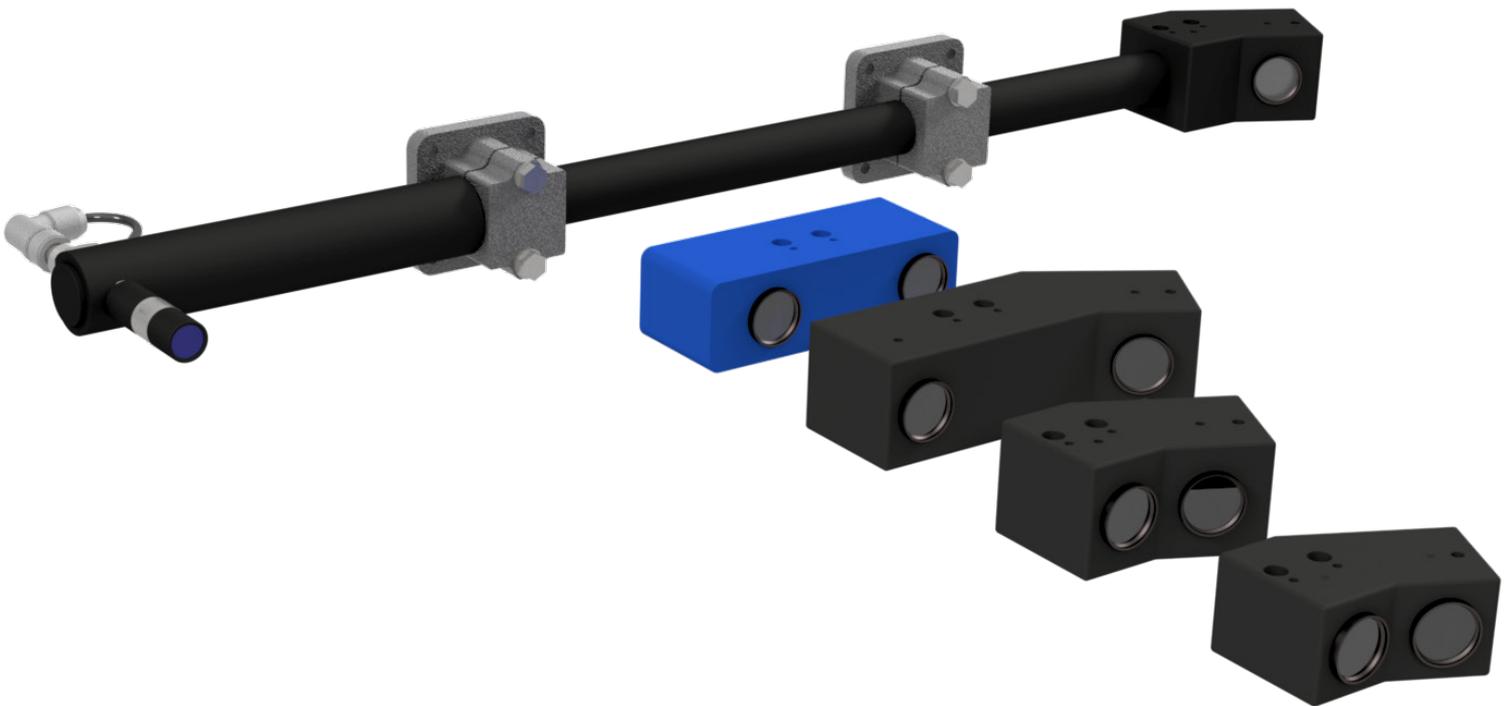


LaserCheck

Bending Angle Measurement System



LaserCheck

Fast facts

- Laser-based Bending Angle Measurement System
- Innovative sensors for measuring bending angles on press brakes
- High-tech products “Made in Germany”
- Very high accuracy
- Works contactless
- Integration in existing press brakes possible
- No modifications of tools necessary
- Parallel use of 2 or 4 sensors
- Spring-back calculation by using force detection with strain gauges or by detecting the end of angle variation
- Connection to ESA, Cybelec, Delem, Amada and Robosoft controls
- Integrated OEM solutions for ESA, Amada, Robosoft and others
- Easy to use
- Delivered fully wired and calibrated

Working principle

The bending angle is measured by scanning the projection of the laser beam on the surface of the sheet metal with the integrated camera. The angle between the laser and the camera axis enables an angle measurement. With a second sensor at the opposite site the bending angle is calculated.

Characteristics

The LaserCheck sensor is mounted on the press brake, below the die, with an angle of 35° - 55° to the vertical. The working distance (between sensor and sheet) is 90-380 mm, depending on the sensor type. It is moveable along the die either manually or automatically. Due to its mounting position the measuring range is 30° to 180° bending angle. For each measuring position 2 sensors are used. Four sensors enable an independent correction of the beam to compensate angle differences in long bends. Motorized sensors allow crowning correction.

Designed for industrial applications

The sensors in the LaserCheck product range are especially designed for sheet metal applications. Due to their robust construction and user friendly technical features, they achieve precise measurement results even in harsh ambient conditions.

By carefully miniaturising every component, we have created small and robust sensors, that fit on any press brake.

Manufacturing sheet metal parts with accurate bending angles that are kept constant all times often meets a problem during the actual production process: different parameters in material thickness and stresses.

In order to solve this problem and to make use also of minor quality materials safe for the user, data M Engineering has developed a powerful solution for measuring bending angles in press brakes - the LaserCheck.

LaserCheck enables the user to determine the exact bending angle for press brakes by using laser triangulation together with strain gauges - and it works contactless.

Spring-back-measurement

Spring-back is measured by releasing the sheet metal in two different ways:

- Opening until end of angle variation. The spring-back angle is measured directly. This strategy is necessary for bends with small forces.
- Opening until the bending force is falling below a predefined limit. Strain gauges are measuring the bending forces simultaneously at both side frames. The spring-back angle is calculated from angles and forces and the sheet metal will be overbent accordingly. Force measurement with residual forces is improving the accuracy when using tools with larger radii or asymmetric parts when a complete release is not possible without losing the correct bending position.

In both cases the spring-back compensation is automatically applied.



Integration into controls

Standard Interfaces:

- Serial Interface for Amada controls
- Combined TCP/IP-Modbus interface for Delem controls. The angles are sent to a DM-101RS module via Modbus. Force sensors are connected to an analogue input of the module.
- ModBus for the hand-wheel interface of Delem DA66T und DA69T.
- Open TCP/IP interface for Cybelec VisiTouch, ESA and Robosoft controls.



Real time measurement

The fast GigE cameras inside the LaserCheck sensors allow real time measurement with refresh rates up to 100Hz per sensor. This results in 200 interpolated angle measurements every second. USB sensors are supporting refresh rates up to 20Hz each.

Advantages:

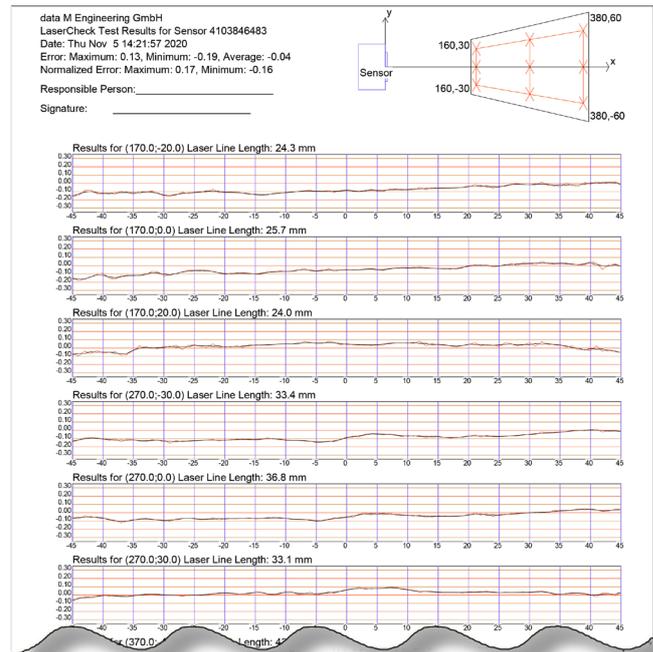
- Bending process is not interrupted
- Fast bending process
- Spring-back measurement without force measurement

Calibration & Accuracy

The sensor accuracy is better than $\pm 0.1^\circ$. The bending accuracy is influenced by the control, the machine accuracy, the tools and the material. Bending accuracies of $\pm 0.3^\circ$ are typically achieved. To increase the bending accuracy the sensors can be calibrated after mounting, so the mounting tolerance is reduced.

Pre-Calibration

All sensors are pre-calibrated in order to work with reasonable results also without calibration. Only the mounting angle must be defined. Linear error corrections can be input for different measuring situations by the machine user.



To document the performance capability of the LaserCheck sensors, each sensor is supplied with its own calibration certificate. It shows the measurement accuracy in relation to the bending angle.

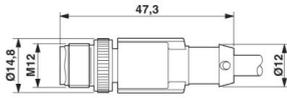
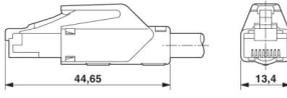
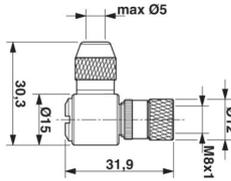
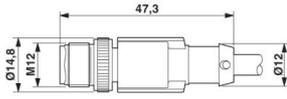
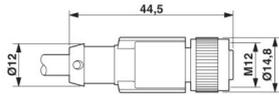
Specification LaserCheck	LaserCheck 10	LaserCheck 11	LaserCheck 12
			
Die width [mm]	from V6 to V60	from V6 to V100	from V6 to V100
Die height [mm]	from 55 to 85 ⁽⁴⁾	from 55 to 85 ⁽⁴⁾	from 55 to 85 ⁽⁴⁾
Stand-off distance[mm] ⁽¹⁾	90-220	90-220	165-380
Mounting angle	55°	45° ±10°	45° ±10°
Cable lengths	max. 5m (machine length max. 3m)	max. 50m	max. 50m
Measurement range	30°-180°		
Typical scan rate ⁽²⁾	20 Hz	50-100 Hz	50-100 Hz
Precision of sensor ⁽³⁾	±0.2°	better than ±0.1°	
Camera Interface	USB 2.0	Gbit Ethernet (1 Gbit/sec)	
Optical class	1/2"-CMOS	1/1.8"-CMOS	
Resolution (h x v)	1280x1024 (1,3 MP)		
Inputs		Trigger-Signal	Trigger-Signal
Input voltage Power	5 VDC 500mA via USB	24 VDC 90mA	
Laser wavelength	670 nm (red visible)		
Laser class	2M		
Life time: Laser diode	at 0°C 50.000 h at 40°C 10.000 h		
EMC test	EMC-conform according EN 61000		
Protection class	III, as per EN 61140		
Enclosure rating	IP64		
Air humidity	max. 90% RH, non-condensing		
Temperature	in operation 0 - 40° C in storage -20 - 70° C		
Interface	TCP/IP, Modbus, RS232, EtherCAT		
Image processing	Control computer with Win10 IoT		

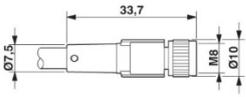
(1) Optimum distance between the sensor and the sheet metal (2) Scan rate is dependent on the configured field of view, measurement range & exposure time (3) After calibration on the machine

LaserCheck X	LaserCheck XR	mit Option Range Extender DRE (diagonal adjustment)	Option Range Extender WRE (width adjustment)
			
from V6 to V100	from V6 to V800	from V6 to V140	from V6 to V200 (max. V400)
from 55 to 85 ⁽⁴⁾	customer specifications	from 55 to 120	
200 - 450	250 - 2000		
45° ±10°	variable	55° fix (optional 35° or 45°) ⁽⁵⁾	55° fix
max. 50m	max. 50m		
30°-180°			
better than ±0.1°			
Gbit Ethernet (1 Gbit/sec)			
1/1.8"-CMOS			
2056x1542 (3,17 MP)			
IEEE 802.3at PoE	24VDC 90mA ⁽⁶⁾	24VDC 300mA	24 VDC 2A + Sensor
450 nm (blue) or 670 nm(red)	670nm	450nm	
2M	2M	3B	
at 0°C 50.000 h at 40°C 10.000 h			
EMC-conform according EN 61000			
III, as per EN 61140			
IP68		IP54	
max. 90% RH, non-condensing			
in operation 0 - 40° C in storage -20 - 70° C			
TCP/IP, Modbus, RS232, EtherCAT			
Enterprise LTSB 64 Bit (Direct sensor connection to the control mostly possible.)			

(4) Die height difference max. 30mm, e.g. 55-85, 85-115, 100-130 (5) different mounting angles only with limited workpiece visibility (6) depending on the model

Cables

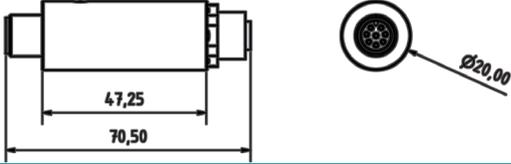
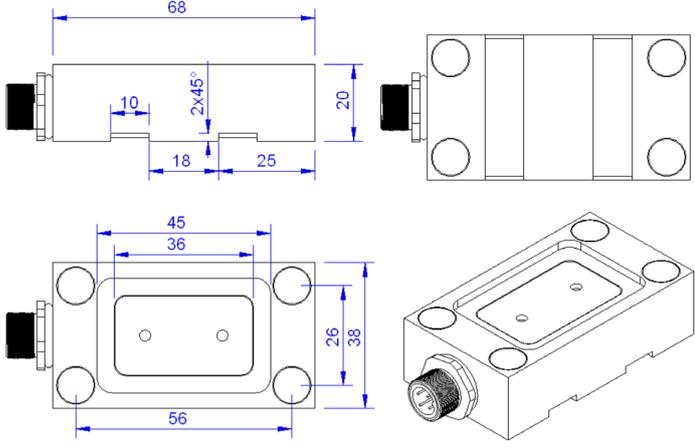
Ethernet connecting cable (for LaserCheck 11 + 12)	
GigE connecting cable	Ethernet cable, CAT6A, M12 plug on RJ45 plug Variable cable length (up to 50m)
Cable	Ethernet 10 Gbit PUR cable, shielded, flame retardant, oil-resistant, bio-oil-resistant, hydrolysis resistant and microbe resistant, outer diameter: D = 6.4mm ±0.2mm Minimum bending radius: - Fixed installation: 26mm - Flexible installation: 52mm
Connector	Head 1: M12 straight male plug, 10G, X-coded, 8-pin, shielded, IP67 Head 2: RJ45 IP20
	 
Item number: 10006108 (10m cable) Item number: 10005154 (15m cable)	
USB connecting cable (for LaserCheck 10L)	
USB 2.0 special-cable	Max. 5m
Cable	TPE cable, shielded, flame retardant, oil-resistant, bio-oil-resistant, hydrolysis resistant and microbe resistant, adapted to the requirements in drag chains, outer diameter: 5mm ±0.2mm Minimum bending radius: Fixed installation: 37.5mm Flexible installation: 50mm
Connector	Head 1: M8 female plug, 4-pin, shielded, IP67 Head 2: USB A connector
Straight plug:	Angle plug:
	 
Item number: 10005026	Item number: 10005512
Motor cable (for LaserCheck with Range Extender)	
Motor cable	connected to sensor & USB/RS485 Bus coupler Variable cable length (up to 40m)
Cable:	PUR halogen-free cable, flame retardant, oil-resistant, bio-oil-resistant, hydrolysis resistant and microbe resistant, adapted to the requirements in drag chains. Outer diameter: 5.9mm ±0.2mm Minimum bending radius: Fixed installation: 47.2mm Flexible installation: 59mm
Connector:	Head 1: M8 female plug, straight or angle, 4-pin., IP67 Head 2: not connected
	 
Item number: 10006199 (10m cable)	

Power cable (for LaserCheck 11 + 12)	
Power supply and trigger cable	M8 connector / free cable end 12-24V Cable length up to 40m
Cable	PUR halogen-free cable, flame retardant, oil-resistant, bio-oil-resistant, hydrolysis resistant and microbe resistant, adapted to the requirements in drag chains. Flexible cable conduit capable Outer diameter: 4.4mm Minimum bending radius: Fixed installation: 26mm Flexible installation: 52mm
Connector	Head 1: M8 female plug, straight or angle, 4-pin., IP67 Head 2: not connected
	
Item number: 10005851 (10m cable) Item number: 10006036 (15m cable)	

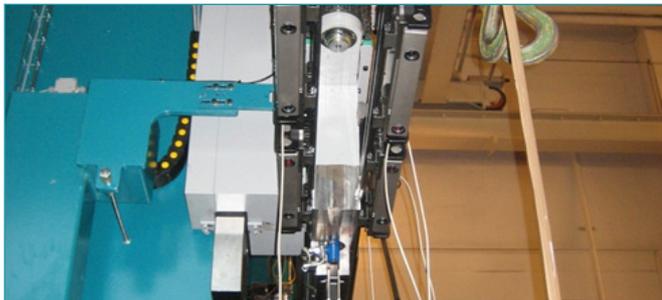
Accessoires

Gigabit Ethernet Switch	
Industrial 5-port slim type switch DIN-Rail data transmission speed: 10/100/1000 Mbps (RJ45) Power supply: 24V DC via terminal block Item number: 10005853	
USB 2.0 Extension cable	
5m extension Item number: 10003666	
USB 2.0 Hub with 4 Ports	
Easy installation with included DIN-Rail Kit Power supply: 7-24V DC via terminal block Item number: 10005631	
USB 3.2 Gen1 Hub with 4 Ports	
Easy installation with included DIN-Rail Kit, 15KV ESD Surge Protection, Power supply: 7-24V DC via terminal block Item number: 10006884	

Accessories

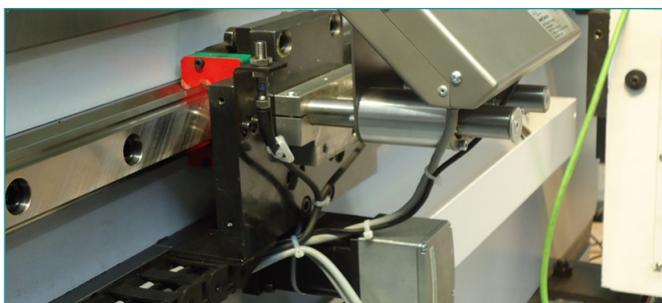
Force measurement	
Special sensors for spring-back measurement without fully releasing the sheet metal, due to asymmetry / weight / stiffness of parts or tools etc	
Strain gauge amplifier GSV-6K-S	Special amplifier with autoscaling function for strain gauges
	
Strain gauges DA68	<p>High-resolution extensometer for indirect measurement of bending forces during the deformation of the machine frame. Time-consuming drilling of threads are not required because of integrated high-performance magnets.</p> <p>Mounting: 4 integrated magnetic clamps; glued to C-frame Connection: M12 Plug 4 pins (male) Housing: aluminium alloy</p>
	
Force measurement Kit:	<ul style="list-style-type: none"> ▪ One Amplifier with two strain gauges ▪ Fully wired ▪ All parts pluggable/screwable

Options



Sensors

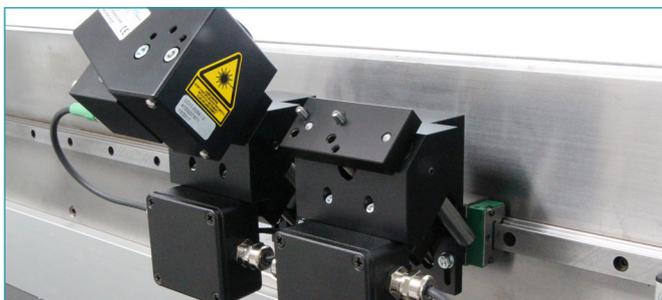
for measuring from the punch with long working distance up to 2000mm (LaserCheck XR)



Longitudinal Adjustment

Necessary for different measuring stations

With servo- or stepping-motors with inductive proximity switch (fully wired and parametrised)



Range Extender DRE

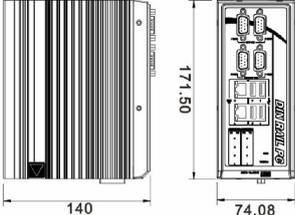
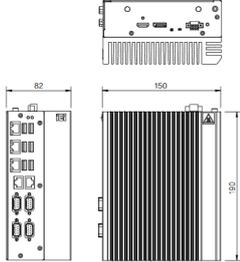
for LaserCheck 11 and 12
necessary for large tool heights



Range Extender WRE

for LaserCheck 11 und 12
necessary for large die width

Image processing - Industrial computer

Computer	DRPC Atom	DRPC i5
System	Fanless DIN-Rail Embedded System	Fanless DIN-Rail Embedded System
Housing	Mini chassis for wall mounting or DIN-Rail mounting	Mini chassis for wall mounting or DIN-rail mounting
Dimension	74.1 x 140 x 171.5 mm (W x D x H)	81 x 150 x 190 mm (W x D x H)
Processor	Intel® Atom™ E3845 Processor 1.91 GHz (Quad-Core CPU)	Intel® Core™ i5-8365UE Processor 1.6 GHz (Quad-core CPU)
System memory	4 GB DDR3L SO-DIMM	8 GB DDR4 SO-DIMM (up to 32 GB)
Storage medium	Industrial 2.5" SSD with 64GB	Industrial 2.5" SSD with 64GB
USB-ports	2 x USB 2.0 2 x USB 3.0	6 x USB 3.2 Gen 2
Ethernet	2 x GbE	3 x GbE
COM Ports	2x RS-232 2x RS-422/485	4 x RS-232/422/485 with AFC (DB9) 2 x RS-232 (RJ45)
Display & Resolution	1 x VGA 1 x HDMI	1 x HDMI, 1 x DP
Input power range	3-pin terminal block: 9-28VDC	3-pin terminal block: 12-24VDC
Operating temperature	-20°C ~ 60°C with air flow 5% ~ 95% air moisture, non condensing	-20°C ~ 60°C with air flow 10% ~ 95% air moisture, on condensing
Operating Vibration	MIL-STD-810F 514.5C-2 (SSD)	MIL-STD-810G 514.6C-1 (SSD)
Operating system	Windows® 10 IoT Enterprise LTSC (64Bit)	Windows® 10 IoT Enterprise LTSC (64Bit)
		
		

Why LaserCheck?

- LaserCheck is a complete system to be connected to press brakes. It includes angle measurement sensors, different interfaces for press brake controllers, strain gauge sensors to detect spring-back and motorized systems for sensor movements.
- Well established technology. The separation of sensors and CPUs allows cost efficient solutions if the controls are able to run the LaserCheck software (Cybelec and ESA controls).
- Long time support for all components
- Bending angle correction during the bend process - perfect results from the first bend
- World wide setup support
- Training and support worldwide or in-house



Why data M Engineering?

Training in our premises in Holzkirchen,
where you will learn:

- How to mount LaserCheck
- Parameterisation
- Interfacing to LaserCheck (TCP/IP, Modbus and others)
- LUA programming for Delem controls

Software Development

- Software development for different measuring jobs
- Software modifications for special interfaces

Engineering Services

- Customised solutions for special purpose like bending hexagonal tubes
- Customised sensors with long working distances up to 2000 mm
- Additional axes for sensor movements including controls
- Sensor dependent crowning control



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