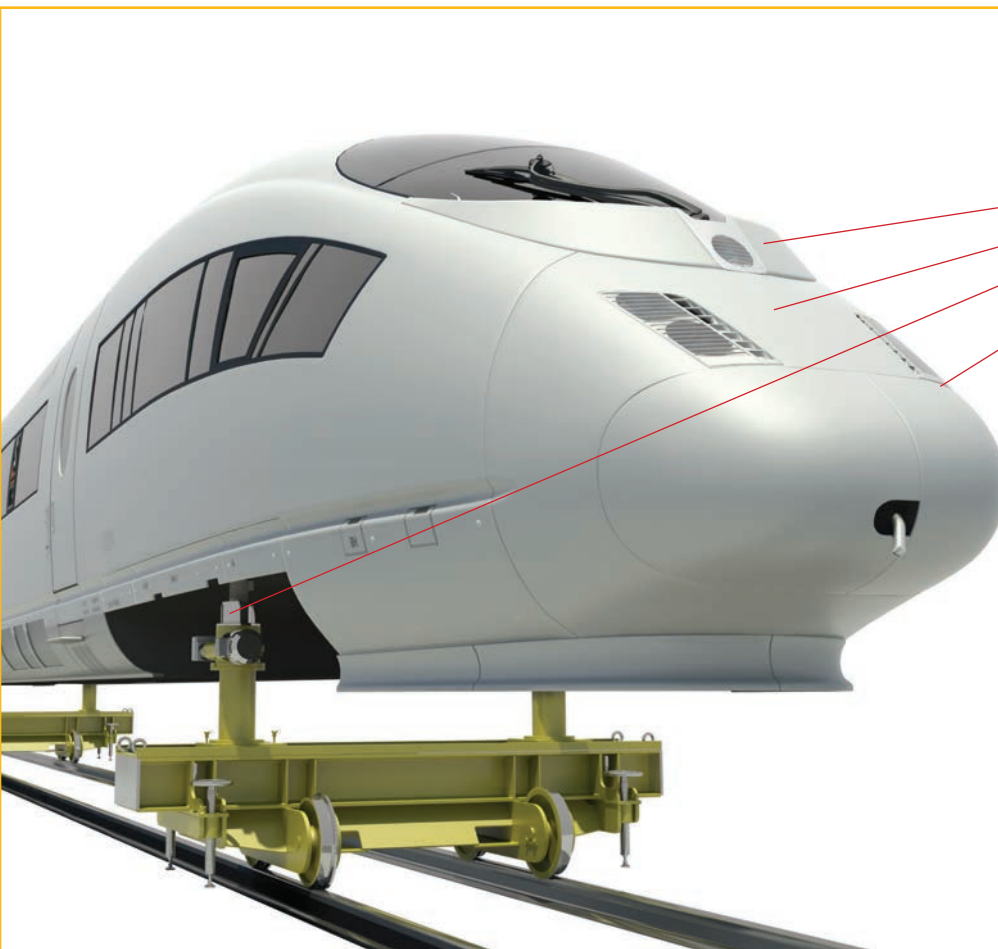
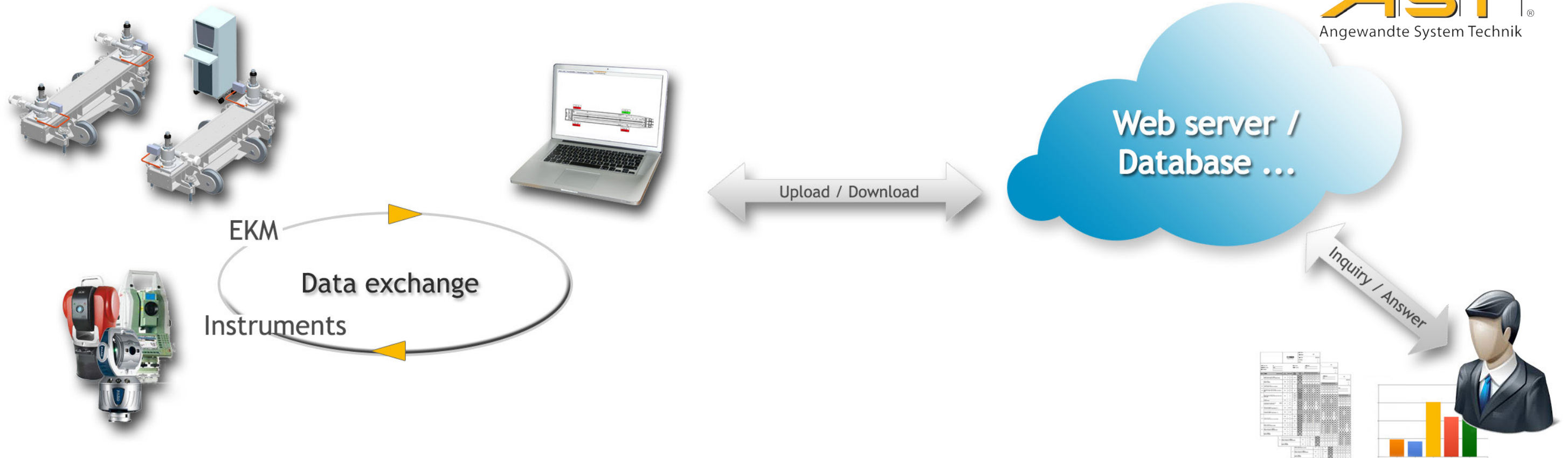


Railway Systems

The system to determine and adjust the rolling stock to torsion free position





The system to determine and adjust the rolling stock to torsion free position

EKM 305 – Systems for the quality assurance of rolling stock, providing the torsion free (tension free) position of rail vehicles, combined with a geometrical measurement solution. A.S.T. provides the highest precision, which is required for manufacturers and during the refurbishment of railway vehicles.

The force and geometrical measurement processes of passenger coach are one of the most important parts of the quality assurance process in rolling stock manufacturing and refurbishment.

Any torsion of the vehicle can cause derailment, particularly for vehicles operating on high speed. For that reason the rolling stock is measured several times during the production process. In most cases the force measurement and the collection of geometrical data is carried out according to German standards DIN 25043.

A.S.T. is an experienced partner for numerous national and international rolling stock manufacturers. Decades of experience in construction,

enhancement and improvement of the systems, arises the technology and accumulates the know-how with each individual project. The rolling stock which has been inspected by A.S.T. systems can obtain an increased safety during the operation, improved running properties and reduced costs by reducing the wear and tear of the wheels.

The quality of each product is primarily based on the quality of the production. To ensure the quality, A.S.T. systems can be used during several stages of production to inspect the initial force and geometrical data. A high degree of functional safety, compliance with the construction gauge and safety against derailment will be the benefit. Furthermore these benefits are also applicable during the service and refurbishment of railway vehicles.

There are two types of corner force measurement systems: EKM305-S for the shell production and EKM305-F for the final production. The difference between the types is the mechanical substructure for the precision hoist gear.

Ideally any torsion of the car body should be recognized and adjusted during the shell production. The torsion-free position should be maintained during the extension process and only monitored by measurements. If the torsion-free position is to be adjusted on a finished vehicle, installed masses and their distribution must be taken into account.

The advantages of geometric measurement solution (CBM) are evident in the combination with the whole EKM305 processes both in shell and final productions. The initial reference point of geometric measurement is based on the torsion free position of rolling stock, to confirm and collect the archiving physical recorded measurement data of car body.

EKM305 measures vehicle bodies according to the four points' method on a straightening jig. It records the four points forces and height tolerance, calculates the nominal forces via the position of the vehicle's center of gravity. As a result of the measurement, the position and thickness of the shims are determined which

permanently maintain the vehicle on the torsion free position.

To ensure the EKM 305 systems are consistent in a high measuring accuracy level, A.S.T. also provides the force calibration unit. The systems should be regularly calibrated, remain in an optimum condition.

Also, A.S.T. offers the RAK402 systems which used for confirm each wheel load on the rail track of whole railway vehicle.



Management
System
ISO 9001:2015

www.tuv.com
ID 0910075027

EKM 305-S

The highest standard in shell production

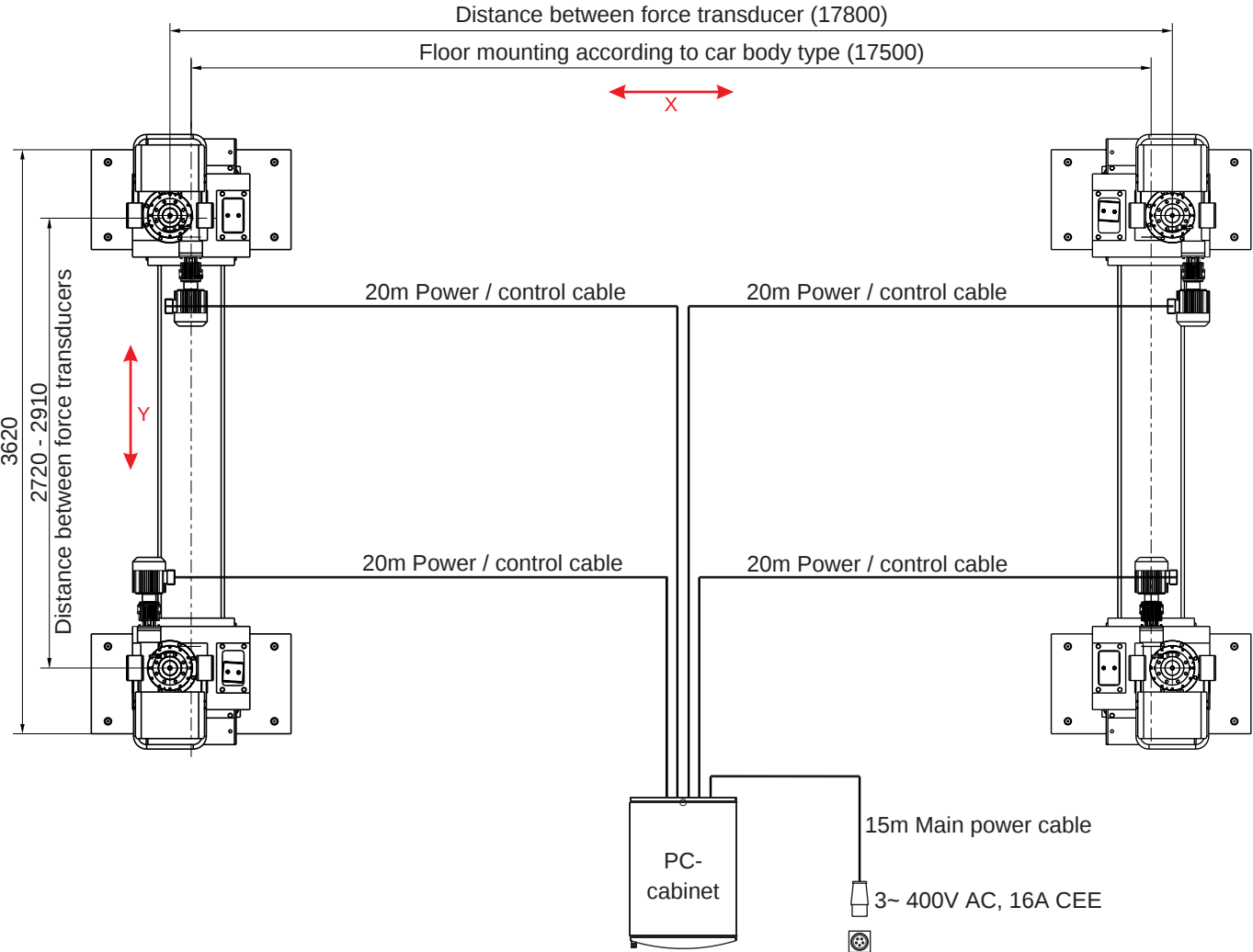
In consideration of the corner force measurement method, the system determinates and adjusts the passenger car bodies to torsion free position and its centre of gravity, according to DIN 25043 standard.

The EKM 305-S combines the corner force measurement of passenger car bodies with typical shell production processes such as straightening, welding, rework and mounting. Therefore the EKM 305-S is based on a special measurement and straightening stand. The stationary fixed straightening stand ensures accurate corner force measurement and brings highest robustness for mechanical processing on the car body. The measurement results can be applied immediately in the shell production process.

With the four measuring units (precision lifting gears) the car body is moved into torsion free position as essential initial step for geometrical measurement of the car body.

EKM systems are delivered with the latest version of EKM operating software XKS 305. All relevant data and measurement results are stored in a database, including a viewer for measurement protocols.

System overview

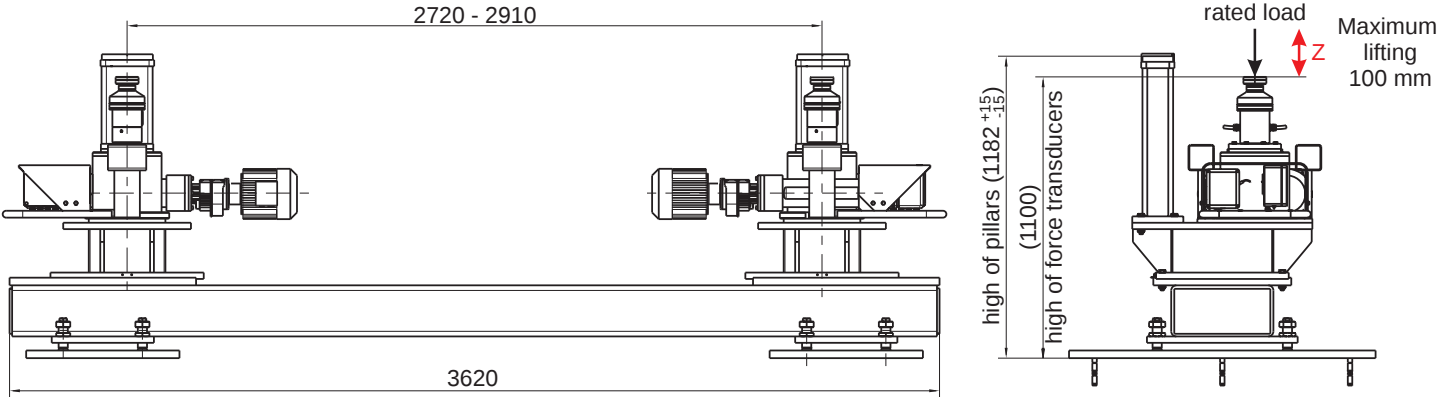


Customer's dimension is available, based on requirement.

EKM 305-S specification

Supported car bodies		All types of passenger coaches
Max. weight	t	40
Max. width of car body measuring points	mm	up to 2720 - 2910
Adaptation to car body measuring points by various adapters to be fitted onto sensor		
Load measurement		
Sensor rated force (F_{nom})	kN	up to 100
Sensor accuracy	%	0.1
Displacement measurement		
Integrated in precision hoisting gear, accuracy	mm	0.1
Force generation		
By electric gear motor 1.1 kW and precision lifting gear box,		
Fixed speed	mm/s	0,4
Lifting speed during the working process	mm/s	0.04
Max. stroke	mm	100
Measuring and straightening stand (2 in 1 system)		
Total weight with lifting gears	t	2.1
adjustable in y direction for car type adjustment		
adjustable in z direction for initial horizontal levelling		
PC Cabinet		Electrical switching box
Equipment		Industrial 19" PC with TFT monitor and laser printer
		Various add on cards as interfaces
Protection class of cabinet and cable		IP 54
Weight	kg	240
Power supply		3~400 V AC, 16A CEE
Cables		
Cable from lifting gear to PC-cabinet	m	4 x 20
Power cable	m	1 x 15
Ethernet cable	m	1 x 20
All cables detachable		
Main software functions		Automatically touching of the sensor against the car body
		Automatically adjustment of the torsion free position
		- tilting of the car body in torsion free position
		- hardcopy or export of the measurement report
		- car body database
		- user access administration
		- hardware monitoring
Languages		English, Chinese, German
Operation System, additional software		MS-Windows 7(Multilingual), MS-Office (English)
The software completely complies to draft standard DIN 25043:2012 Rail applications – measuring of rail vehicle during production part1 (abstract), part 2 (geometrical) and part 4 (corner forces)		

Detail view



EKM 305-F

The highest standard in final assembly

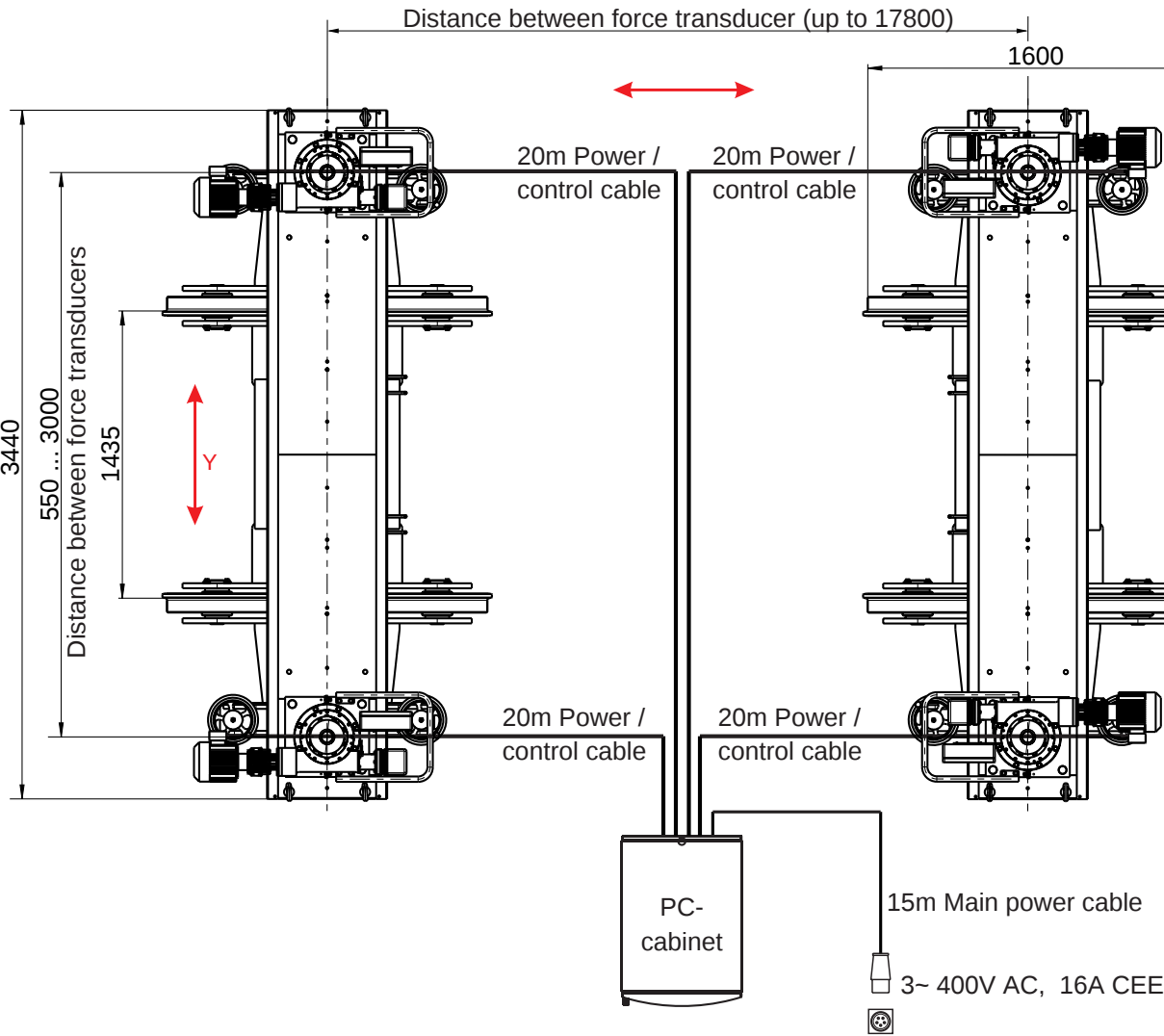
In consideration of the corner force measurement method, the system determinates and adjusts the passenger car bodies to torsion free position and its centre of gravity, according to DIN 25043 standard.

The EKM 305-F is the suitable corner force measurement system for final assembly of rail car bodies. Its measurement bogies are designed as perfect compromise between flexibility and robustness. They are easily moveable by hand under the lifted finished car body. The rigid design ensures accurate corner force measurement as well as displacement among each lifted corner of the car body.

Similar to the EMK 305-S the well-proven measuring units (precision lifting gears) are used to move the car body in the torsion free position. The result of the measurement process allows a declaration about the height of necessary bogie shims. The final geometrical measurement can be operated during the car body placed on the EKM 305-F.

EKM systems are delivered with the latest version of EKM operating software XKS 305. All relevant data and measurement results are stored in a database, including a viewer for measurement protocols.

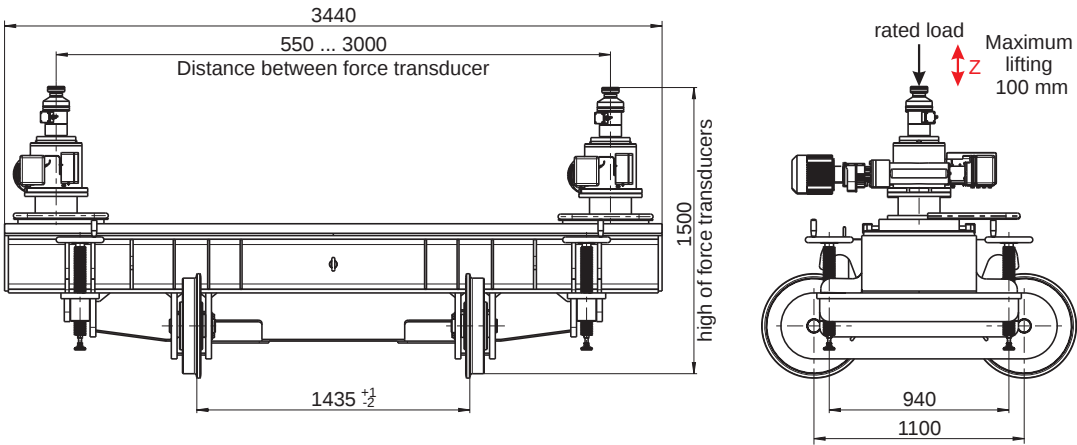
System overview



EKM 305-F specification

Supported car bodies		All types of passenger coaches
Max. weight	t	60
Max. width of car body measuring points	mm	550 - 3000
Adaptation to car body measuring points by various adapters to be fitted onto sensor		
Load measurement		
Sensor rated force (F_{nom})	kN	up to 200
Sensor accuracy	%	0.1
Displacement measurement		
Integrated in precision hoisting gear, accuracy		0.1
Force generation		
By electric gear motor 1.1 kW and precision lifting gear box,		
Fixed speed	mm/s	0,4
Lifting speed during the working process	mm/s	0.04
Max. stroke	mm	100
Measuring and straightening stand (2 in 1 system)		
Total weight with lifting gears	t	3.7
adjustable in y direction for car type adjustment		
adjustable in z direction for initial horizontal levelling		
PC Cabinet		Electrical switching box
Equipment		Industrial 19" PC with TFT monitor and laser printer
		Various add on cards as interfaces
Protection class of cabinet and cable		IP 54
Weight	kg	240
Power supply		3~400 V AC, 16A CEE
Cables		
Cable from lifting gear to PC-cabinet	m	4 x 20
Power cable	m	1 x 15
Ethernet cable	m	1 x 20
All cables detachable		
Main software functions		Automatically touching of the sensor against the car body
		Automatically adjustment of the torsion free position
		- tilting of the car body in torsion free position
		- hardcopy or export of the measurement report
		- car body database
		- user access administration
		- hardware monitoring
Languages		English, Chinese, German
Operation System, additional software		MS-Windows 7(Multilingual), MS-Office (English)
The software completely complies to draft standard DIN 25043:2012 Rail applications – measuring of rail vehicle during production part1 (abstract), part 2 (geometrical) and part 4 (corner forces)		

Detail view



XKS 305

Software for automatic force measurement, torsion free positioning and reporting

The EKM software XKS 305 is the interface between the corner force measurement system and the operator. The software is installed on an industrial PC terminal and enables the monitoring of all control and measurement functions.

The operator is lead through the structured measurement sequence by the software using clear dialogues:

- touching and lifting the car body
- moving the car body into leveled reference plane (only with EKM305-F)
- measurement of the corner forces
- determination of the center of gravity
- moving the car body in torsion free position
- calculation process and measurement report

The step-by-step procedure minimizes the danger of operating errors and guarantees precise repeatability of the measurements. Certainly all calculations and settings are carried out according to DIN 25043. XKS 305 provides a database for up to 100 different types of car bodies. There all mechanical dimensions which are relevant for the calculation process can be stored for each type of car body.

Additional service functions for maintenance and repair work on the EKM 305 complete the scope of the EKM software.

EKM305 - measurement report

Print Save Export to MS EXCEL OK

measurement report

Type: **AST-Sample 123**

car identification nr.: 123

Method calculated forces DIN 25043-4

Basic data to the calculation

XM1 = 888,0 mm
XM2 = 888,0 mm
YM1 = 888,0 mm
YM2 = 888,0 mm
XL1 = 888,0 mm
XL2 = 888,0 mm
YL1 = 888,0 mm
YL2 = 888,0 mm

Fad1L = 0,0kg
Fad1R = 0,0kg
Fad2L = 0,0kg
Fad2R = 0,0kg

Standard gravity = 9,80665m/s²

Load in kN	end 1 left	end 1 right	end 2 left	end 2 right
lifting load FE (initial position)	7,85	7,88	8,15	9,02
lifting load FE (tension free position)	7,85	7,88	8,15	9,02
lifting load FE without adapters	7,85	7,88	8,15	9,02
calculated load FT	7,85	8,08	8,35	8,82
difference FE-FT	0,20	-0,20	-0,20	0,20
supporting load from running gear FF	7,85	8,08	8,35	8,82

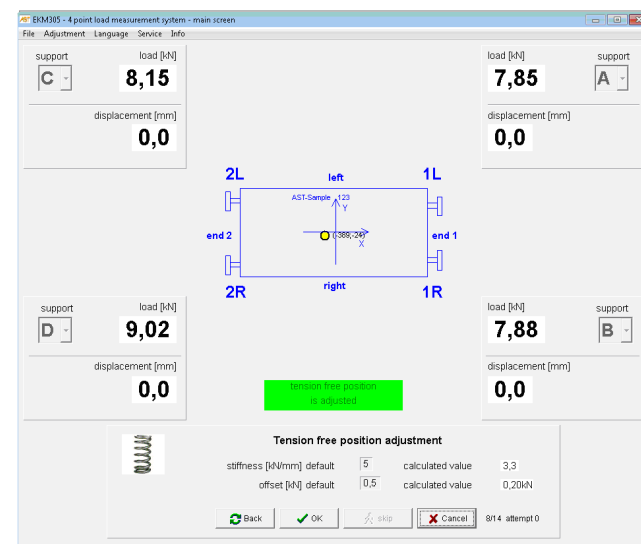
load force GM in kN	weight in t
32,90	3,35

run way in mm	end 1 left	end 1 right	end 2 left	end 2 right
tilt left to right	0,0	0,0	0,0	0,0
tension free	0,0	0,0	0,0	0,0
difference in height	0,0	0,0	0,0	0,0

centre of gravity in mm	nominal value	tolerance	true value	direction
XS in mm	888,0	-88,0 88,0	389,0	end 2
YS in mm	888,0	-88,0 88,0	-24,3	right

Date: tester: administrator signature: _____

Customized measurement report



Main screen of the control application software EKM 305

Force Calibration Set

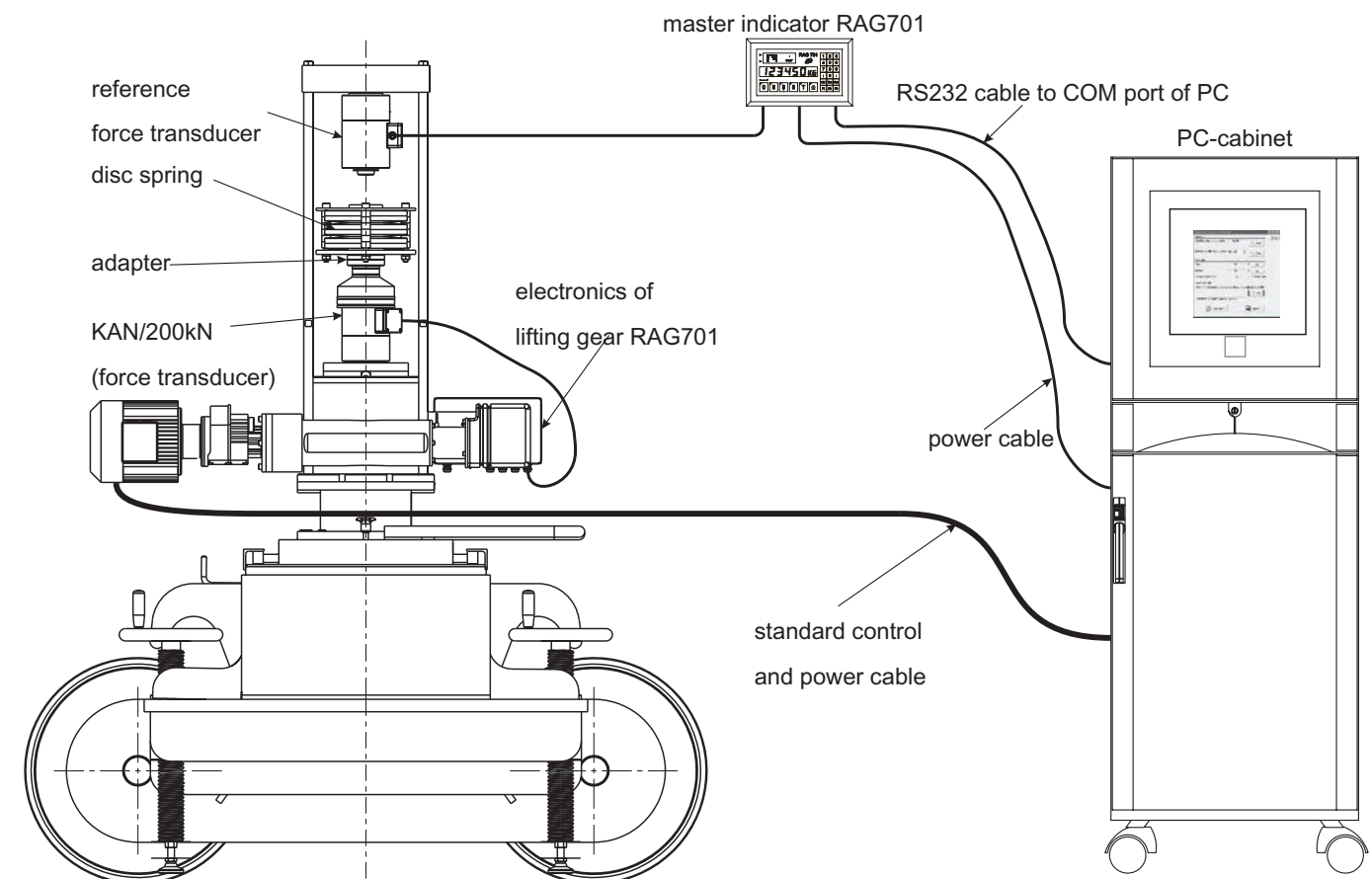
For EKM systems A.S.T. also offers calibration sets for the force transducers. To work in the correct way these should be re-calibrated every year or after impact or after a repairing.

The requirement for a successful recalibration of the force transducer of each lifting gear is a current calibrated reference unit consisting of reference force transducer KAN/200kN (master) connected with an indicator RAG 701.

The force generation is achieved by moving the lifting gear about a short distance in combination with a disk spring. The generated calibration force is applied on both transducers: on the transducer of lifting gear and on the master transducer (reference). If necessary, force values can be adjusted in the electronics of the lifting gear. Calibration values are storable on the PC system.



Overview Calibration Set



RAK 402

A.S.T. Wheel Load Measuring System for Rail Vehicles

A.S.T. RAK 402 is a highly accurate wheel load measuring system for rail passenger vehicles. It contains 8 weighing modules for measuring 4 axles of rail car as a standard configuration. It also has either single or dual gauges on each weight module, or combines with more weight modules together based on the requirement.

RAK 402 system is designed for easy for installation or adjustment, and is user friendly to operate or calibrate. It complies to the German standard DIN 27201-5: "State of railway vehicles - Basic principles and production technology - Part 5: Checking of wheel forces and vertical wheel set forces of railway vehicles". The weight modules will be installed in concrete pits. Only a fixed installation provides an accuracy and process capability as required in the German standard.

The purpose of using wheel load measurement systems is to prevent derailment of railway vehicle, and to assure to lower wear and tear the static vertical load distribution within the two wheels on an axle, which must be rather even. The wheel load measurement has to be carried out after the following tasks.

- mounting of car body onto bogie during manufacture;
- accidents where a wheel load might be influenced;
- working on the springs of the bogie;
- change out of the wheel set or the bogie

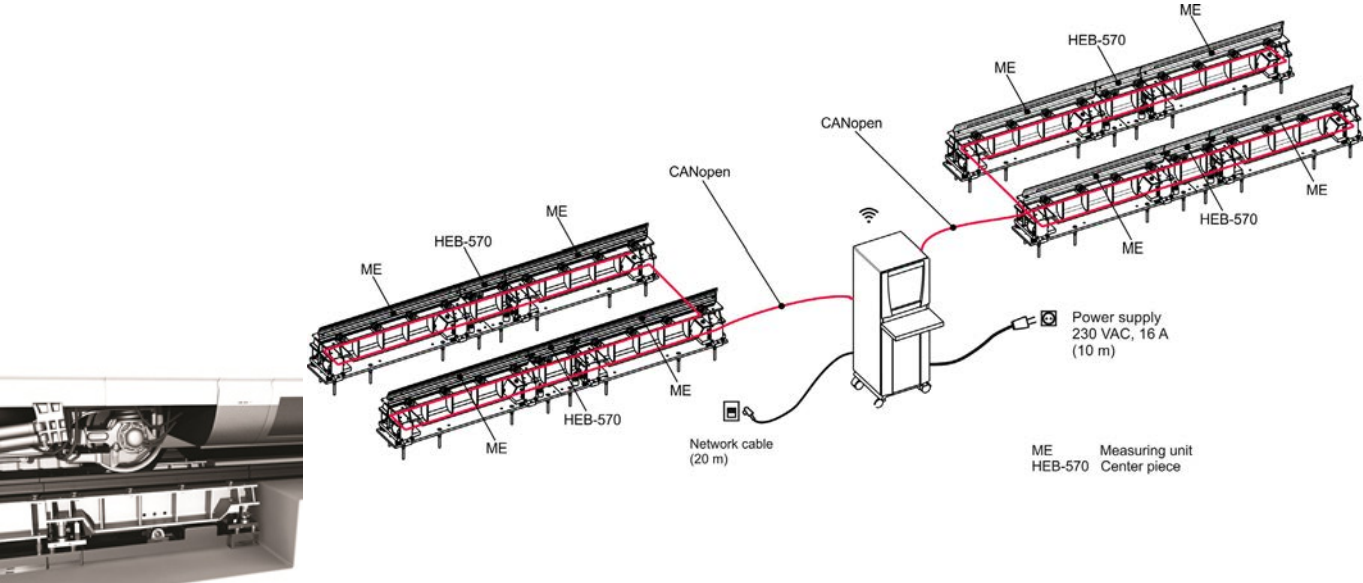
There are many critical measurements of the wheel loads because it is so important for the safety of the railway vehicles

The system is a highly flexible with the identification of the individual wheel or axle loads. By interconnection of a number of required weighing modules, you will get a test profile for all wheel loads of a bogie or vehicle.

The calibrating track includes the RAK 402 features a flatness of better than 1mm. Each of the eight wheels of a passenger car will be positioned onto a weighing module. In total there are 8 weighing modules to cover the variety of length of the vehicles. Weighing modules are rigid enough to cope with moving vehicles to 60 tons with a moving speed up to 5km/h. The calibration is carried out by an accredited body.

The wheel load on each weighing module are recorded and displayed by downstream high-precision amplifier, which are also manufactured by A.S.T. The measured values of the weighing modules are combined via a CANopen BUS. The evaluation is carried out using software on an industrial PC.

System overview



RAK 402 Specifications

Cars supported	All types of passenger cars	
Max. weight	t	60
Rail track		
Track gauges	mm	1435
Distance of axles	mm	2500 (other dimensions are possible on prior consultation)
Rail planarity	mm	max. 1 (adjustable use setting nuts)
RAK-Measuring module		
Rated load per wheel	kN	150
Limit load	kN	225
Accuracy class	%	0,1 / <0,5% reproducible in the same vehicle
Track length	mm	1795
Measuring lengths	mm	1500
Weight	kg	482
Resolution	bit	16
Measuring rate	1/s	20
Max. installation height	mm	500
Height adjustments	mm	ca. +/- 5
Max. installation width	mm	300
Max. riding speed	Km/h	5
PC-Cabinet		
Equipment	19" PC, TFT Monitor and printer	
Software	XKS 402, Microsoft Windows; Microsoft Office	
Dimensions (hight x wide x depth)	mm	1600 x 600 x 850
Environmental protection		IP 54
Weight	Kg	200
Voltage supply	VAC	230
Power consumption	VA	500

The software main screen displays all important information and can be adapted to customer demands. It meets the requirements of DIN 27201.

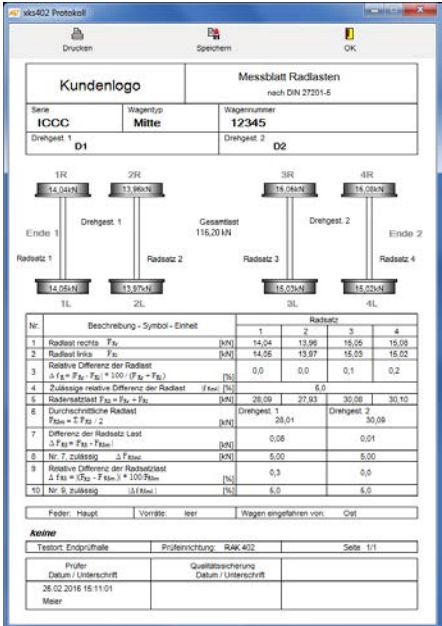
The PC control unit displays the values, calculates and prints out measuring reports. All measurement reports are stored in a database.



Main screen of Software XKS 402 for RAK 402



PC control unit



Customer-specific measurement protocol



A.S.T. Angewandte System Technik GmbH
Mess- und Regeltechnik
Marschnerstraße 26
01307 Dresden, Germany
Phone: +49 (0) 351 - 44 55 491
www.ast.de e-mail: sales@ast.de