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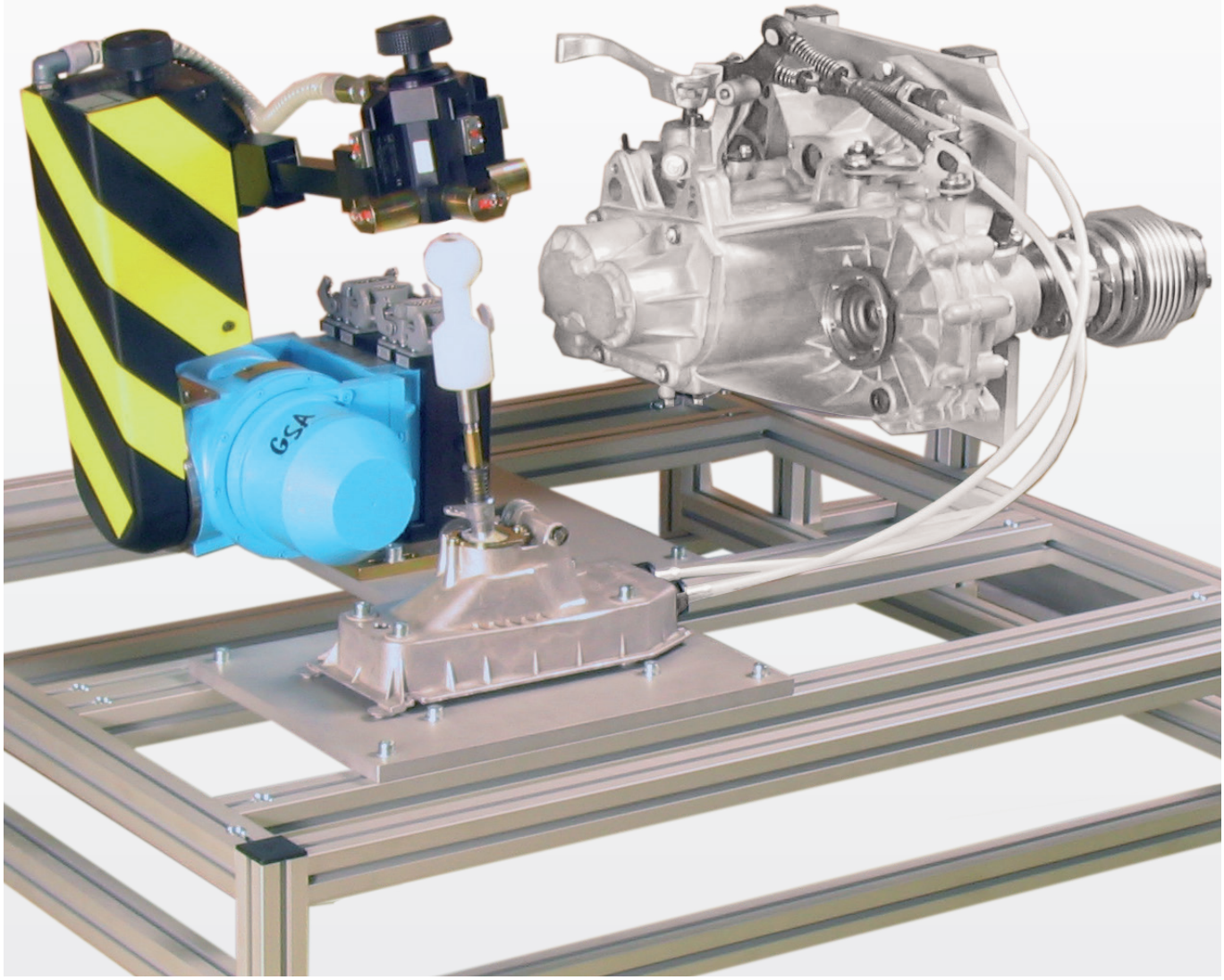
Automatic Gearshift Control GSA9001s

Automation system for shifting and testing of vehicle gearboxes directly at the shift lever



Automatic Gearshift Control GSA9001s

The automatic gearshift control GSA9001s is an automation system for shifting and testing of vehicle gearboxes, consisting of an actuator with integrated synchronous motors and travel-sensoring system as well as the appropriate power- and signalling electronics.

The GSA9001s is used for practice-oriented gearbox shifting in stationary power train test benches and for testing of gearboxes. A variety of software modules for gearbox testing is available.

Main features

- Max. shifting travel in 2 axes: 260 mm (320 mm)*
- Max. shifting force in 2 axes: 300 N (700 N)*
- Max. shifting speed: 1 m/s (1.5 m/s)*
- Effective shift lever length: 250 mm (300 mm)*
- Resolution and repetitive accuracy: <± 0.05 mm
- Electronically controlled, electro-mechnical system, self learning
- Max. 8 forward gears, 4 reverse gears, 1 idle position can be stored in 32 data files per gearbox
- Equipment is available in a version for passenger cars or commerical vehicles*

Benefits and advantages

- Menu-guided operation and display of shifting conditions as well as parameters by means of the delivered hand terminal HT9201
- A lot of possibilities for setting of parameters like e.g. type of gearbox, number of forward- and reverse gears, shifting modes, shifting ramps, shifting speeds, shifting forces and number of test steps, etc.
- Data files for max. 32 different gearboxes can be stored. Selection via code designation. All data files are stored in the automatic gearshift control computer. No external storage is required
- Signal exchange with an external computer via serial interface (standard: RS232) to activate a multitude of functions like e.g. selection remote-controlled/manual operation, gearbox selection, gear selection, etc.

The actuator

The actuator

The actuator consists of a robot joint movable in three axes. The gearbox is directly operated at the shift lever, only the grip has to be replaced by a ball-shaped adapter. When the shift arm is lifted off after gear change operation the shift lever becomes free from forces. Menu-guided manual setting by motor force. Data files for as many as 32 different gearboxes can be stored.

Servo Controller SCR9801

The servo controller

Power supply of the motors is made by three servo controllers SCR9801 generating from the mains voltage the necessary supply voltage for the motors in amplitude and frequency. Each servo controller has a microcomputer-controlled guide- and control system converting in a dynamically high-quality manner the requested set values for speed, torque and position via the fed motors into the relating parameters. Each SCR9801 generates the intermediate circuit voltage as well as the required low voltages for the signal electronics from the mains voltage by itself.

The 3RU-19¨-contorl rack

The 3RU-19¨-control rack

The coordination of the motion sequence is made by the 19¨control unit. This rack contains a microcomputer and all required low voltage network components.

Hand terminal HT9201

The operation

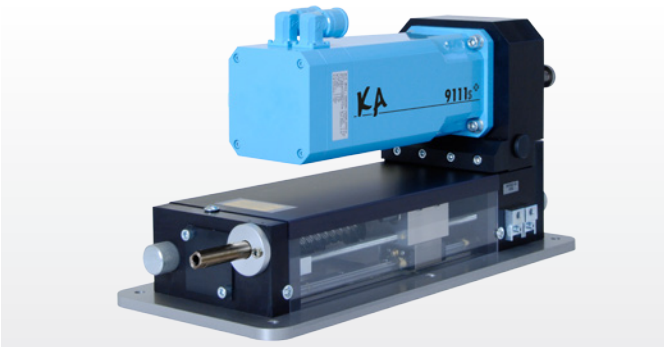
Operation by a removable hand terminal HT9201 with a large LC-display and an appropriate keyboard. A serial interface allows a remote-controlled operation by means of an external computer or a stored program control (SPC).

Options and accessories for the Automatic Gearshift Control GSA9001s

Force measuring equipment

Force measuring equipment

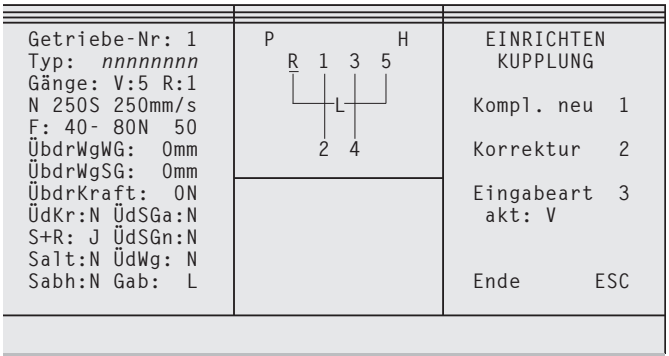
Most realistic gearshifting is feasible with the optional force measuring equipment, recognizing the rise in force at the synchronization point and a force-dependent passing-through of the synchronizing range. Furthermore actual travel and force values are output as potential free analog voltages.



Clutch function KA9111+

Clutch function

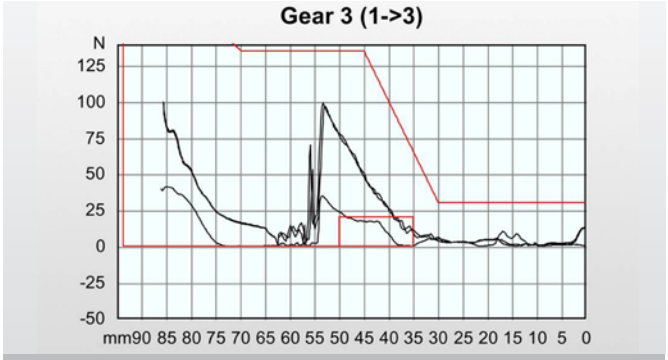
This clutch-actuator KA9111+ is integrated by hard- and software into the control computer of the Gearshift Equipment GSA9001s. Power supply of the clutch-motor is made by a fourth servo controller SCR9801. The clutch is operated via the hand terminal HT9201. With this terminal the clutch setting as well as the adjustment of all required parameters are made.



Software modules

Software modules

Software modules for testing of manual gearboxes, checking of double shiftings by input of a shifting gate offset, testing for smooth operation of selector travels resp. shifting gates by force-controlled positioning of the shift lever resp. shifting gates and travel-controlled passing-through the selector travel resp. shifting gates, and the operation of automatic gearboxes are available.



Force- and travel measuring curve

Force- and travel measuring equipment

The GSA9001s offers the out put of parameters as digital display on the hand terminal HT9201 and as potential free analog voltages. Realistic shifting by recognizing the sychronization and build-up of a force ramp at the synchronization point. Shifting force-controlled further movement.

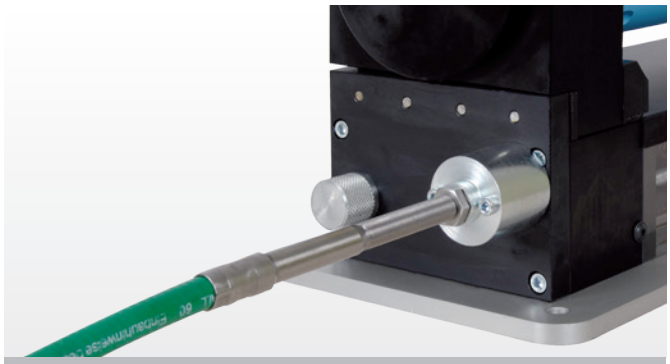
More options

- Software module for setting and shifting of automatic gearboxes. For each gearbox type up to 11 shifting steps can be stored
- Software module for setting and shifting of Tiptronic-gearboxes
- Software module for evaluation of synchronization incl. scratching noise detection
- Signals for clutch actuation with hydraulic or pneumatic adjusting cylinders
- Pull and push equipment to pull or push the shift lever for reverse gear shifting. Acutation force push/pull: 300 N max
- Actuation of clutch pedal via automatic clutch KA9111+
- Connection of a superior test-PC for test step presetting, evaluation and filing of test data (on request)

Accessories

Plastic gearshift lever knob suitable for GSA9001s

Front panel



Flexball® cable type DZ60 for Automatic Clutch KA9111+

Steel rod for Automatic Clutch KA9111+

Data sheet for the Automatic Gearshift Control GSA9001s

Actuator (Standard version)

Robot joint with integrated synchronous motors and travel sensoring systems, all feeders led on plug connectors. Infrared sensor for shift lever operation.	
Dimensions:	450 mm x 200 mm x 231 mm (L x W x H)
Weight:	42kg (107kg)*
Protection:	IP54
Shifting travel:	260mm (320mm)* max. in 2 axes
Shifting force:	300N (700N)* max.
Shifting speed:	1m/s (1.5m/s)* max.
Effective shift lever length:	250mm (300mm)*
Setting range:	230 up to 270mm (280 up to 350mm)*
Angular velocity:	1000 degrees/s max.
Resolution (actual travel value) and repetitive accuracy:	< ± 0.05 degrees

Temperature range actuator

Admissible range:	0 °C up to max. + 40 °C (No condensing humidity allowed)

Electronics

3 servo controllers (SCR9801) for driving the motors. (For the clutch function there is an additional converter SCR9801 and motor needed.) 19¨-control rack to coordinate all motions, hand terminal HT9201.	
Dimensions SCR9801:	482.6 mm x 307 mm x 3 RU (L x W (without plugs) x H)
Dimensions control rack:	482.6 mm x 307 mm x 3 RU (L x W (without plugs) x H)

Temperature range electronics

Admissible range:	0 °C up to max. + 40 C (No condensing humidity allowed)

*Truck version

Software

The standard software for operating the GSA9001s has the following essential features:	
- Operating modes of GSA9001s:	- Setting via hand terminal HT9201 - Manual operation via hand terminal HT9201 - Remote-controlled operation via serial interface - Test functions via hand terminal HT9201
- Menu guided setting manual, motor force or semi automatically	
- A lot of possibilities for setting by means of parameters like type of gearbox, number of forward- and reverse gears, shifting modes, number of test steps	
- Data files for max. 32 different gearboxes can be stored	
- 8 forward gears, 4 reverse gears, 1 idle position can be stored per gearbox	
- Two-dimensinal shifting position monitoring of shift lever after having shifted a gear incl. lever search by installed sensor	

I nterfaces to peripheral units

Binary signals:	Optocoupler
Analog signals:	±10V, potential free
Serial interfaces	
Type:	RS232, RS422, TTY, Profibus
Connection possibility for a second hand terminal HT9201	

Power supply

Rated voltage servo controller:	3/PE AC 380V ... 480V ±10%
Frequency servo controller:	50 ... 60 Hz
Safeguarding servo controller:	1.4kVA
Rated voltage control rack:	1/N/PE AC 230V ±10%
Frequency control rack:	50 ... 60Hz
Safeguarding control rack:	2A

Data sheet for the optional Automatic Clutch KA9111+

Actuator (Standard version)

Linear positioning unit with integrated brushless, convection cooled servomotor, absolute travel measuring system.			
Dimensions:	450 mm x 200 mm x 231 mm (L x W x H)		
Weight:	22 kg		
Protection:	IP54		
Shifting travel:	180 mm		
Shifting force (Ta ≤ 70 °C):	1500 N (static) 2000 N (temporarily: 60 sec./25% duty cycle)		
Shifting force (Ta ≤ 40 °C):	2000 N (static)		
Shifting force with FLEXBALL® cable DZ60, 1.5 m	Travel	Push forces	Pull forces
	160 mm	500 N	1250 N
	180 mm	350 N	850 N
Shifting speed:	0.64 m/s max.		
Resolution (actual travel value) and repetitive accuracy:	<± 0.05 mm		

Temperature range actuator

Admissible range for the standard version:	– 20 °C up to max. + 70 °C (No condensing humidity allowed)
Option:	– 40 °C up to max. + 70 °C

Electronics

Control and power unit as a 3RU-19¨ rack. IGBT-converter for the servomotor. LC-display and keyboard at the front panel for operation of the KA9111+. The front panel of the power and control panel is removable.	
Dimensions:	482.6 mm x 307 mm x 3 RU (L x W (without plugs) x H
Weight:	13 kg
Protection:	IP20

Temperature range electronics

Admissible range:	0 °C up to max. + 40 °C (No condensing humidity allowed)

Software

The standard software for operating the KA9111+ has the following essential features:	
- Operation of the KA9111+ with	- Analog interface - Binary inputs - Hand terminal - Serial interface (RS232) - Option: CAN (potential free)
- Manual or automatic set-up	
- Max. 32 parameter sets can be stored for the modes of operation accelerator pedal, selector lever or pedal set-point adjuster	
- Diagnostic functions	
- German, English or French language module	

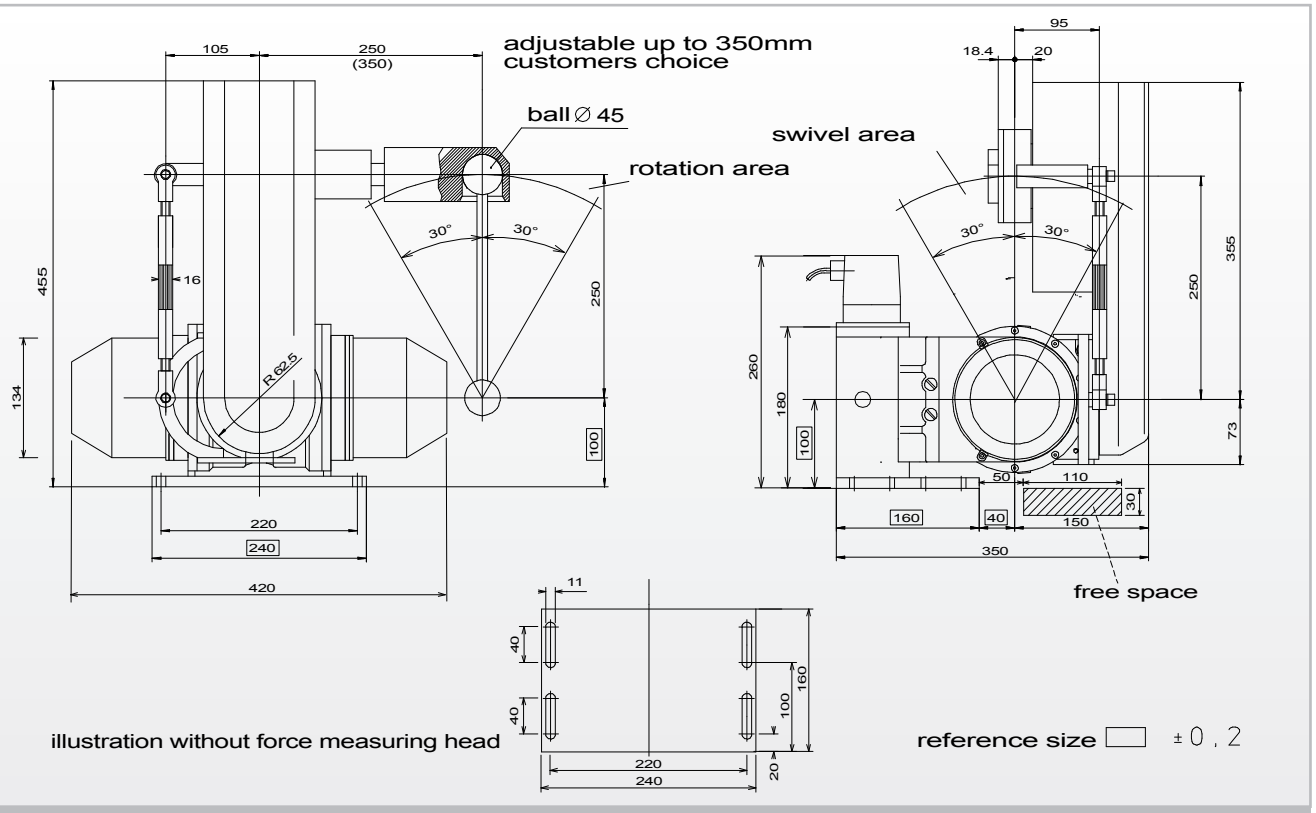
Interfaces to peripheral units

Binary signals	
Relay contact outputs:	50 V/100 mA
Optocoupler inputs:	15 V up to 24 V
Plug-in connection:	Phoenix MC 1.5/16-STF-3.81
Analog intefaces	
Analog outputs:	0 up to ± 10 V/max. 5 mA
Analog inputs:	0 up to 10 V/> 20 kΩ (each potential free)
Plug-in connection:	Phoenix MC 1.5/16-STF-3.81
Serial interfaces	
Type:	RS232 (potential free)
Plug-in connection:	D-Sub-9
External connection for hand terminal	
Type:	RS422
Plug-in connection:	D-Sub-15
Connections for Miniterminal MT1	
Plug-in connection:	Push-Pull

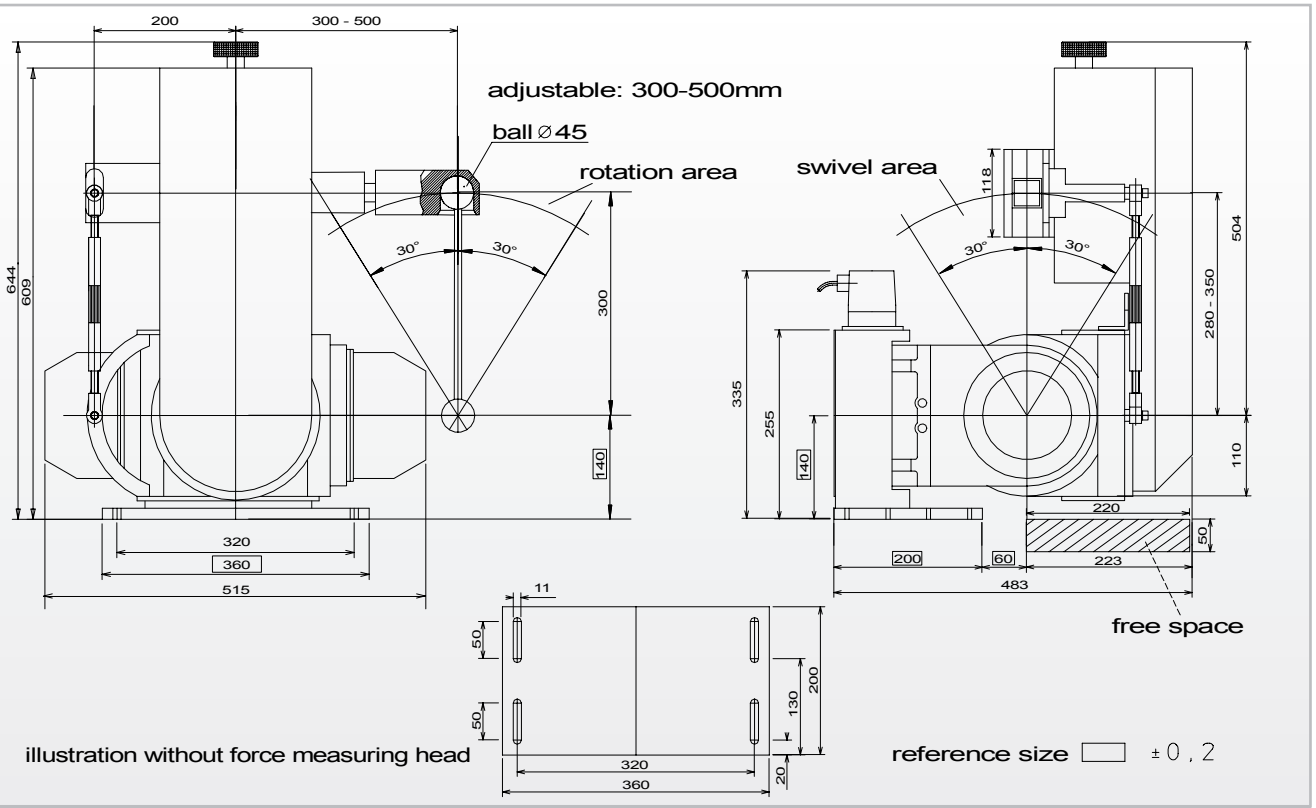
Power supply

Rated voltage:	3/PE AC 380 V ... 480 V ± 10 %
Frequency:	50 ... 60 Hz
Installed load:	1.4 kVA
Plug-in connection:	6-poles connector pair

Dimensions for the Automatic Gearshift Control GSA9001s

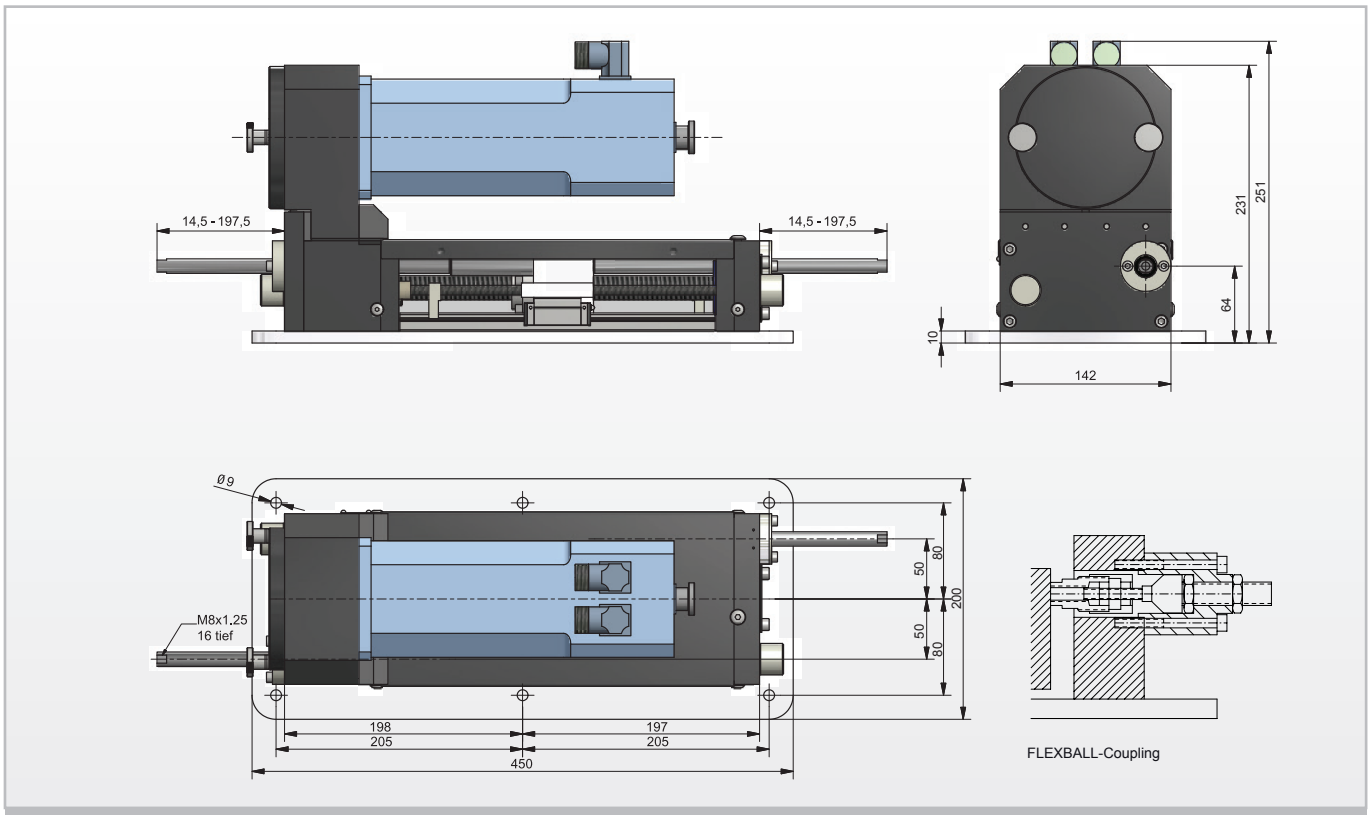


Passenger car version



Truck version

Dimensions for the optional Automatic Clutch KA9111+



Actuator standard version with optional steel rod

Order information for the Automatic Gearshift Control GSA9001s

1. Gearshift Control GSA9001

	Order information
1.1	Automatic gearshift control GSA9001s in „Passenger car version“, shifting force 300 N, incl. all connector pairs and connection cables inside an electronic cabinet (without electronic cabinet) and hand terminal HT9201 and GSx-release box, incl. setting up of GSA9001s at place of application and instruction of operating staff (max. 3 working days, without travel expenses)
1.2	Automatic gearshift control GSA9001s in „Passenger car version „ - without liftaxis -, shifting force 300 N, incl. all connector pairs and connection cables inside an electronic cabinet (without electronic cabinet) and hand terminal HT9201 and GSx-release box, incl. setting up of GSA9001s at place of application and instruction of operating staff (max. 3 working days, without travel expenses)
1.3	Automatic gearshift control GSA9001s in „Truck version“, shifting force 700 N, incl. all connector pairs and connection cables inside an electronic cabinet (without electronic cabinet) and hand terminal HT9201 and GSx-release box, incl. setting up of GSA9001s at place of application and instruction of operating staff (max. 3 working days, without travel expenses)

2. Options:

	Order information
2.1	Force- and travel measuring equipment for GSA9001s incl. software module and potential free analog output signals of force and distance
2.2	Signals for clutch actuation with hydraulic or pneumatic adjusting cylinders
2.3	Software-Modul 1 - Checking of double shiftings - Testing for easy operation of selector travels and shifting gates (Force- and travel measuring equipment required)
2.4	Software-Modul 2 - Selector lever operation of automatic gearboxes
2.5	Software-Modul 3 - Extension of Software module 2 to Tiptronic-gea
2.6	Software-Modul 4 - Evaluation synchronization - Scratching noise detector (Force- and travel measuring equipment required)
2.7	Potential free interface type RS232
2.8	Potential free interface type RS422
2.9	Potential free interface type TTY
2.10	Field bus connection Profibus
2.11	Field bus connection CAN

3. Accessories:

	Order information
3.1	External second hand terminal HT9201 incl. connection cable, 3 m and connector
3.2	Electronic cabinet (Schroff, RAL7035) incl. installation and commissioning of GSA9001s components
3.3	Electronic cabinet (Rittal, RAL7035) incl. installation and commissioning of GSA9001s components
3.4	Installation and commissioning of components of GSA9001s in a special cabinet requested or made available by the customer (cabinet not included)
3.5	Air/Air-cooling unit incl. mounting into an electronic cabinet for increased ambient temperature range from 0 °C up to +55 °C
3.6	Air/Water-cooling unit incl. mounting into an electronic cabinet for increased ambient temperature range from 0 °C up to +55 °C
3.7	Climate control door, air/air-cooling incl. mounting into an electronic cabinet fo increased ambient temperature range from 0 °C up to +55 °C

4. Cables:

	Order information
4.1	Connection cable between electronic cabinet and actuator of GSA9001s with force measurement, length 20 m
4.2	Connection cable between electronic cabinet and actuator of GSA9001s with force measurement, customized length

5. Service:

	Order information
5.1	Installation and commissioning of GSA9001s at the place of application incl. instruction of the operating staff of max. 3 persons (without travel expenses)

Order information for the optional Automatic Clutch KA9111+

1. Automatic Clutch KA9111+

	Order information
1.1	Automatic clutch actuator KA9111+ for GSA9001s, without inserts and mechanical coupling elements, incl. all connector pairs and connection cables inside an electronic cabinet, (only in combination with GSA9001s), incl. Installation and commissioning of at the place of application (without travel expenses)

2. Options:

	Order information
2.1	Force- and travel measuring equipment for KA9111+ incl. software module

3. Accessories:

	Order information
3.1	Steel rod with insert for version without force measuring, 180 mm travel
3.2	Steel rod with insert for version with force measuring, 180 mm travel
3.3	FLEXBALL® cable insert for version without force measuring
3.4	FLEXBALL® cable insert for version with force measurement
3.5	FLEXBALL® cable type DZ60, 1.5 m, 180 mm travel
3.6	FLEXBALL® cable type DZ60, customized length
3.7	Miniterminal MT1 incl. connection cable, 1.5 m and connector
3.8	Hand terminal HT9201 incl. connection cable, 3 m and connector
3.9	One hand grease press. incl. grease filling (370 g) for the extended temperature range standard temperature – 40 °C ... + 70 °C
3.10	Grease refill tube (370 g) for the temperature range – 40 °C up to + 70 °C

4. Cables:

	Order information
4.1	Connection cable set between control rack and actuator, length 15 m
4.2	Connection cable set between control rack and actuator, length 20 m
4.3	Connection cable set between control rack and actuator, customized length

5. Service:

	Order information
5.1	Installation and commissioning of KA9111+ into electronic cabinet (electronic cabinet not included)

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