STÄHLE

Autopilot System
SAP2000

for computer controlled driving of cars on test stands

precise · reliable · efficient

- Human drive style speed control
- Different human drive styles selectable
- Extreme high repeatability
- Very fast and simple vehicle installation
- Dynamic and accurate actuator and drive system
- For M/T and A/T vehicles
- For combustion engine – hybrid – fuel cell – electric powered vehicles

STÄHLE ROBOT SYSTEMS

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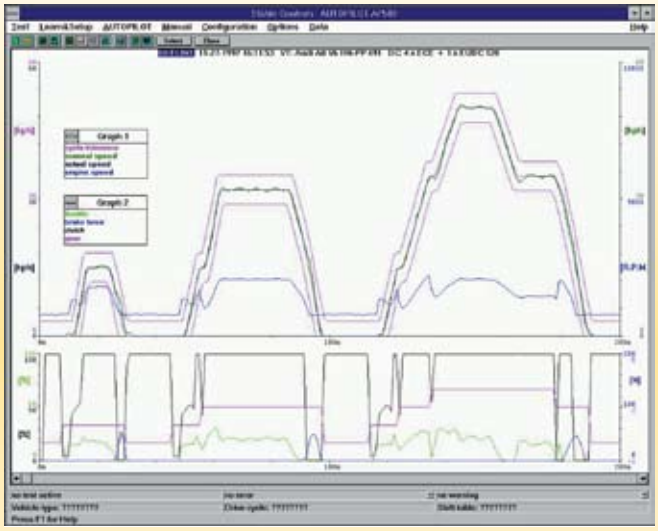
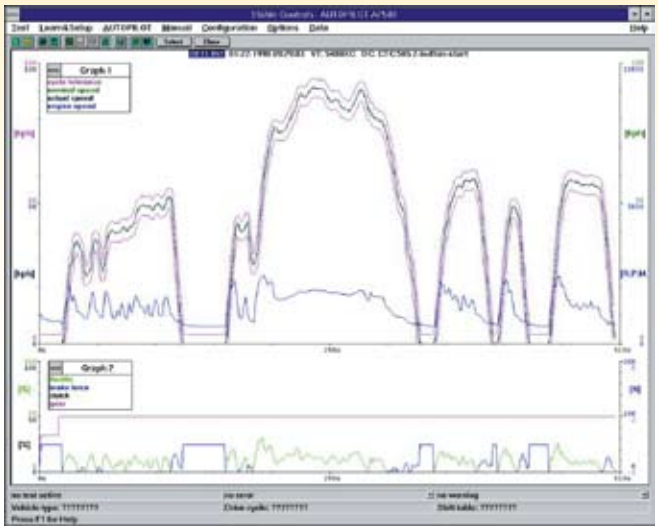
Objective measuring procedure = clear results



ECE emissions cycle, generated by STÄHLE AUTOPILOT



FTP/EPA emissions cycle, generated by STÄHLE AUTOPILOT

The ideal robot test driver for research, development and quality control

After many years of development work, the new generation of robot drivers – exemplified by the **AUTOPILOT SAP2000** – can take advantage of control software that has now fulfilled in reality what was once set up as visionary targets.

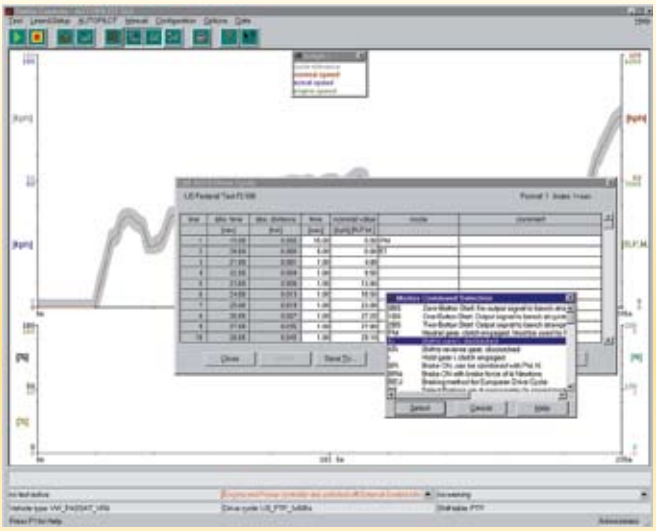
Targets

- Human driving style with comparable emissions results
- High driving accuracy
- Selectable driving styles
- Ultra high reproducibility

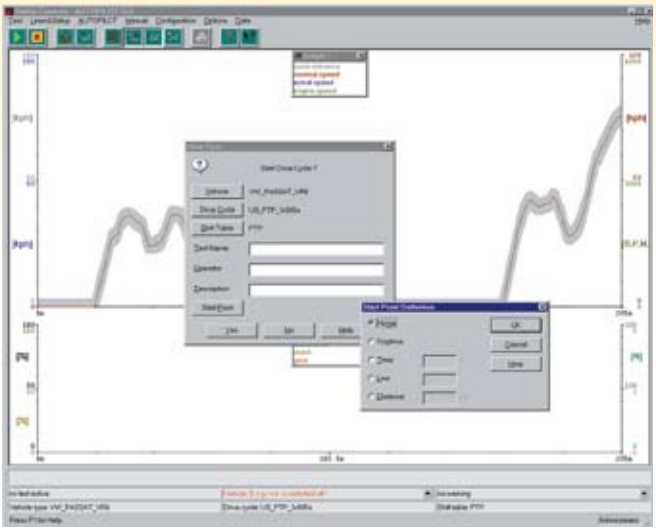
Reality

- The emission values are within the central cluster of the results obtained from test cycles driven by human drivers
- Typical driving accuracy is ≤ 0,25 km/h in “high-accurate” driving style mode
- Driving style options: smooth – accurate – high-accurate
- The typical distance error in an 11 kilometer driving cycle is ≤ 2 m

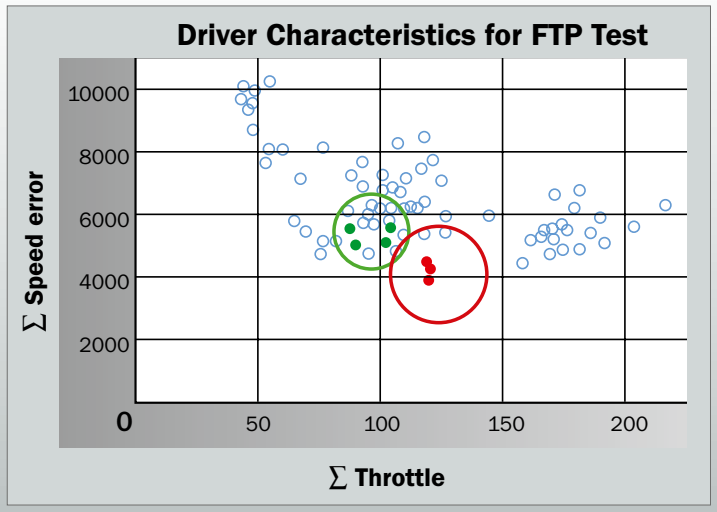
AUTOPILOT SAP2000 for computer-controlled driving on chassis dynamometers



Programming driving cycles



Selecting starting point



The AUTOPILOT SAP2000

can be linked to emission benches, chassis dynamometers and host computers. The drive mechanism is suitable for any climate and durability testing. Thus, the same mechanism can be used for a wide variety of testings without the necessity for modification.

- Emmission measurements
- Acoustic measurements
- Durability testing mileage accumulation
- Transmission testing
- Calibration of engine control systems
- Climate measurements
- Correlation measurements
- Running-losses measurements

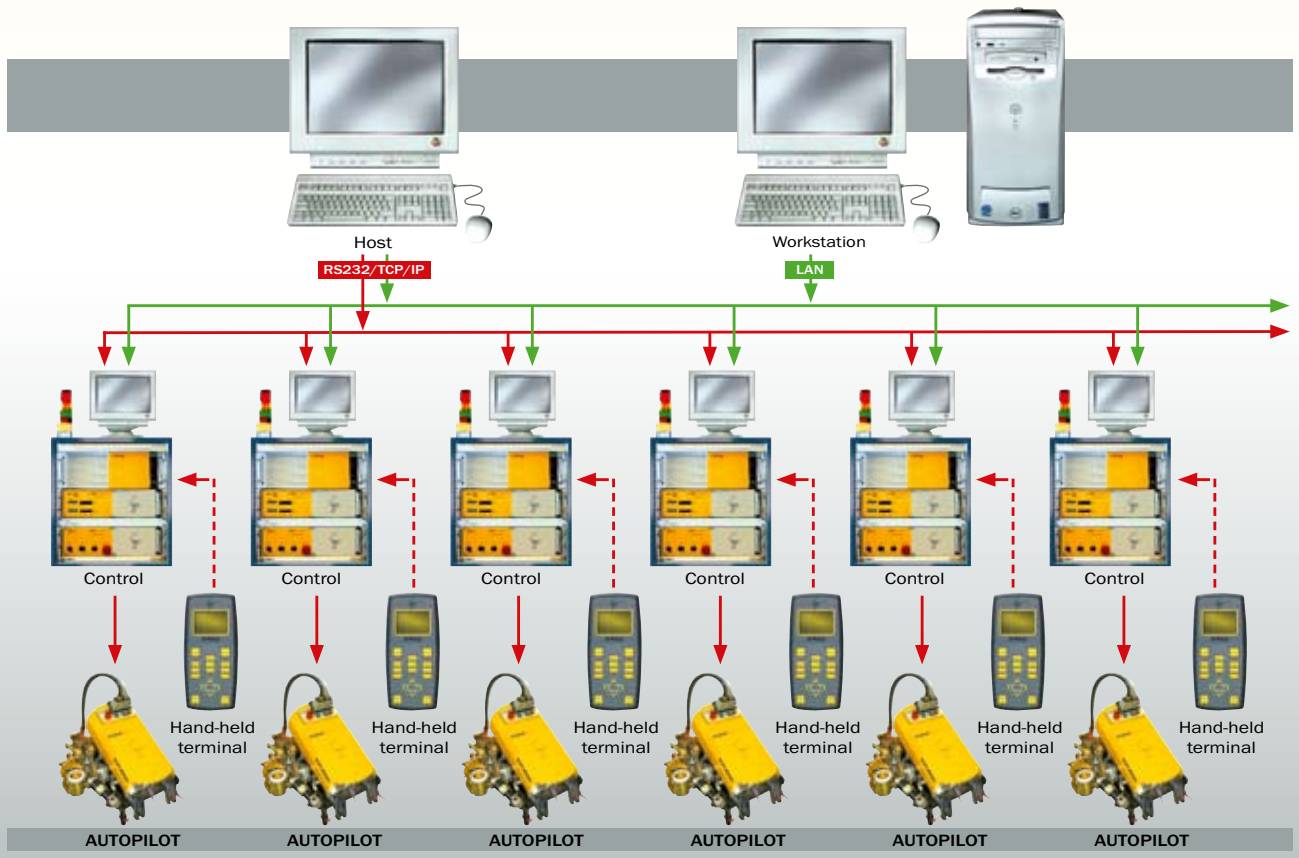
Features + technical specifications

Features

- Stand-alone system
- Can be installed on the driver`s seat without any modification to the vehicle (approx. 8 min.)
- Hardware and software designed for one-man operation
- Self-learning function in special selflearn cycle
- Constant control behavior during tests
- Mechanism designed for continuous operation and any climate
- Automatic compensation for installation tolerances between robot and accelerator pedal
- Continuous learning of the clutch bite point when clutch is released during start-up (compensates for clutch wear)
- Highest safety standards:
  Without power
  - **Clutch pedal is depressed**
  - **Accelerator pedal is released**
- Driving style options
  - **smooth • accurate • high-accurate**

Technical specifications
Robot driver SAP2000

Total weight	30 kg approx.
Component weight	max. 16 kg
Control voltage	24 V
Working temperature	-40° C...+80°C
Accelerator actuator	
Actuation system	electrical
Stroke	max. 150 mm
Force	max. 100 N
Velocity	max. 0.45 m/s
Brake actuator	
Actuation system	electrical
Stroke	max. 150 mm
Force	max. 350 N
Velocity	max. 0.3 m/s
Clutch actuator	
Actuation system	electrical
Stroke	max. 200 mm
Force	max. 200 N
Velocity	max. 0.35 m/s
Shift actuator	
Actuation system	electrical
Shift Stroke (X-axis)	max. 250 mm
Lateral Stroke (Y-axis)	max. 200 mm
Force	max. 250 N
Velocity	max. 0.6 m/s



Variations and options

Variations

SAP2000	E	M	MP	ACT
Accelerator	+	+	+	+
Brake	+	+	+	+
Clutch	+	+	+	+
Gear shift arm left-hand drive	+	+	+	+
Gear shift arm right-hand drive	0	0	0	0
Gear shift arm steering-column shift	0	0	0	0
Keyboy SBX/SCX (rotary) fail – safe	0	0	0	0
Keyboy SPX (plush-button) fail – safe	0	0	0	0
Pedal touch detection switch accelerator & brake	+	0	-	-
Adapter for steering-column shift N - D	0	0	0	0
Actuator for steering wheel paddle +/- shifting	0	0	0	0
Steering actuator systems	0	0	0	0
Safety brake actuator systems	0	0	0	0
Gear shift lever release	0	0	0	0
Gear shift force measurement & control	0	0	0	0
Truck adapter	0	0	0	0
Hand-held terminal	+	+	+	+
Universal vehicle self-learn cycle (basic)	+	+	+	-
Universal vehicle self-learn cycle with Auto tune	+	+	-	-
Human drive style speed control	+	+	-	-
Selectable human drive styles	+	-	-	-
Manual driving mode	+	+	+	+
Manual Set-point mode	+	+	+	-
Braking via chassis dynamometer	+	+	+	-
Road gradient output to chassis dynamometer	+	+	+	-
Data acquisition & Graphic cycle protocol	+	+	+	-
Hybrid & Fuel Cell & electric engine support	+	+	+	+
Stop & Start engine support	+	+	+	+
WINDOWS user interface WIN32	+	+	+	+
Analog inputs for MAP / tractive effort	+	+	+	-
Adapter for seat rail mounting	0	0	0	0

E: emission test
M: mileage accumulation / durability testing
MP: mileage accumulation with PID controller
ACT: actuator

\+ standard
0 optional
\- not possible

Optional hardware

- Shift arm for full - range column shifting
- RHD and LHD shift actuators
- Dash board shifter set
- Shift release mechanism
- Push/Pull actuator for shift lever
- Shift unlock / release actuators
- Shift Force measurement
- Pedal force measurement
- 2-axis push-button actuator for steering wheel +/- and paddle shift actuation
- Truck adapter set
- Truck Range select and splitter gear select actuation
- Ignition key actuators: Keyboys for rotary or push-button style ignition keys
- Universal push-button actuators
- Steering actuators
- Safety brake actuators
- Seat rail mounting device
- Autonomous driving package for driving on proving grounds
- Vehicle motion sensor


Seat rail adapter


Full-range column shifter

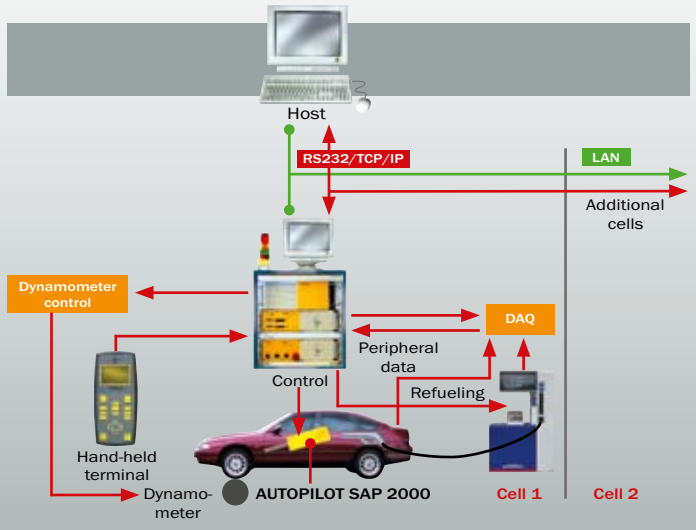

Vehicle motion sensor


Speed measuring wheel


Keyboy SCX (rotary)


Keyboy SPX (push-button)


Gear shift lever release



Optional system interfaces

- Host computer interface: Extended AK protocol - serial / TCP/IP
- Hybrid bit – parallel & analog interface
- Fieldbus Interface to vehicle on-board data through OBD / CAN interface
- Fieldbus Interface to chassis dyno for LifeData exchange
- Fieldbus Interface to data acquisition system
- Interface to refueling system for refueling process defined by cycle and fuel tank level
- UDP or OPC Server/Client interface
- Customized interfaces on request

Company portrait + Product range

Company portrait

STÄHLE GmbH was founded in 1987. It is a high-performance family-run enterprise with CAM-supported CNC machines. Development of hardware and software goes on at the engineering offices of Ing. Büro Kurt Stähle. Design work is performed at 3D-CAD work stations with FE optimization. We see ourselves as being conservative only in the sense of being obligated to our customers to be a competent and reliable partner.

Further products


Autopilot System SMC2000


Autopilot SAP-RAPID-HE-TRUCK


Autopilot System SAP-RAPID


Universal Push/Pull actuator SAM-AC


Robot Shifter SA-RAPID


Robot Shifter AP-SA


Steering System SSP3000


Steering Systems for Autopilot


Throttle actuator AP-G F.10


Throttle actuator AP-G 2.10


Throttle actuator AP-G FR.10


Actuator for EMC measurement


Autonomous driving package

Represented by:

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STÄHLE Robot Drivers – in use world-wide.

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