

GRAMMER AG Seating Systems

Driver's seat Grammer Maximo Evolution

Ergonomics

DLG Test Report 5537 F



**Manufacturer and
registering company**
GRAMMER AG Seating Systems
Köferinger Straße 9-13
92245 Kümmerbruck
Telephone: 0049 (0) 9621 8800
Telefax: 0049 (0) 9621 880130
e-mail: info@grammer.com
web: www.grammer.com



Deutsche Landwirtschafts-
Gesellschaft e.V.
DLG Testzentrum
Technik & Betriebsmittel

Evaluation – short version

Test criteria	Test result	Evaluation
Ergonomic design	very good	++
Seat adjustment	simple, individually adaptable	++
Seat climate control		
Seat ventilation	efficient	++
Seat heating	not adjustable	+

Evaluation range: ++ / + / o / - / -- (o = standard)

Scope and conditions of the test

For agricultural and industrial use, the Grammer company offers the driver's seat Maximo Evolution with automatic adjustment to the driver's weight and active seat temperature control.

The DLG FokusTest is based on technical measurements under laboratory conditions, practical

tests of the ergonomic design of the driver's seat and the arrangement of the operating elements, and a survey among users.

Other criteria were not tested.

(Description see page 4.)

Test results

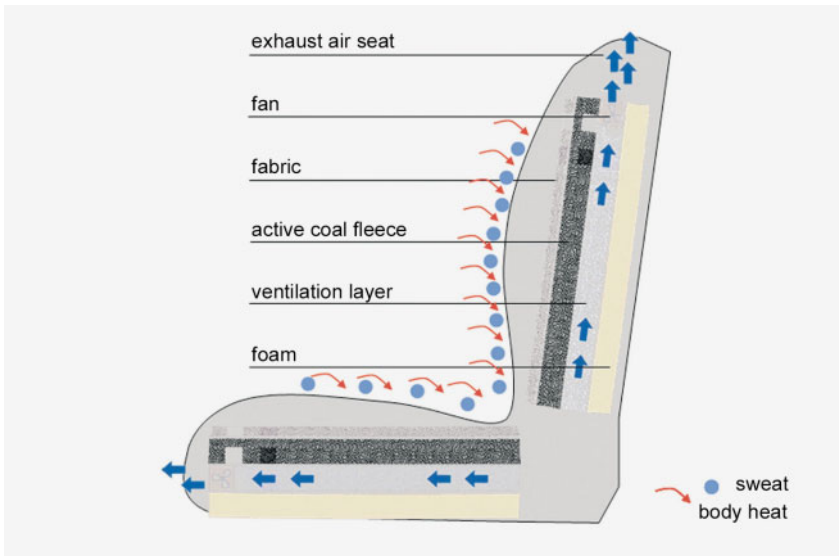


Figure 1:
active climate upholstery

Active seat temperature control

The driver's seat Maximo Evolution features thermo-physiologically adapted temperature control in the seat contact area, which is achieved by means of special upholstery components and their specific layer arrangement. A rocker switch either allows seat heating or seat ventilation to be activated. Stepless seat temperature control is not possible.

By ventilating the driver's seat, heat and moisture are removed directly from the driver. For this purpose, body sweat is drained via the cover material and temporarily stored in the active coal layer underneath. Cool, dry air flows through the ventilation layer and dehumidifies the active coal layer, and the seat surface is cooled and dried. Thus, moisture storage by clothing is reduced, and overheating of the body is prevented by means of evaporation cooling and convective heat withdrawal.

Test set-up

The temporal courses of temperature and moisture in the micro-climate of the seat area are used to evaluate this climate control func-

tion. During the DLG FokusTest, the driver's seat Maximo Evolution was subject to micro-climatic tests. A driver's seat from the same series (Maximo XXL) without the possibility of climate control served as reference.

Under the usual indoor climate conditions of 21°C and a relative humidity (r. h.) of 50%, the heat and moisture generation of a sitting person producing an average quan-

tity of sweat was simulated using a micro-climatic simulation implement ("climate dummy"). For this purpose, a defined quantity of moisture is given off continuously via the pores on the under side of the test body (1 pore / cm²). The micro-climatic situation at the contact area climate dummy / seat surface was measured using two combined temperature and moisture sensors having a measuring accuracy (at 23°C) of +/- 0.3 K for temperature measurement and +/- 1.5% for moisture measurement. The values were measured in a 60s rhythm. The sensors were positioned centrally in the area of the fold of the buttock and in the right thigh area (figure 2). The measurements were taken over a period of 7 hours. One test and one test repetition were carried out with each seat.

Results

The micro-climatic tests show that both temperature and moisture in the person-seat contact area change over the measuring period of 7 hours. Figures 3 and 4 show the average value curves of the test

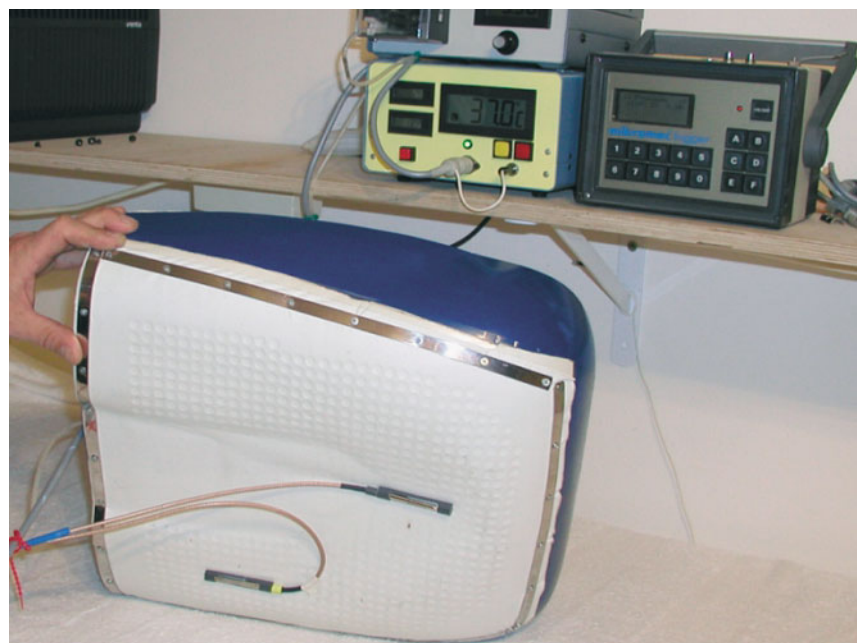


Figure 2:
Climate dummy with temperature and moisture sensors

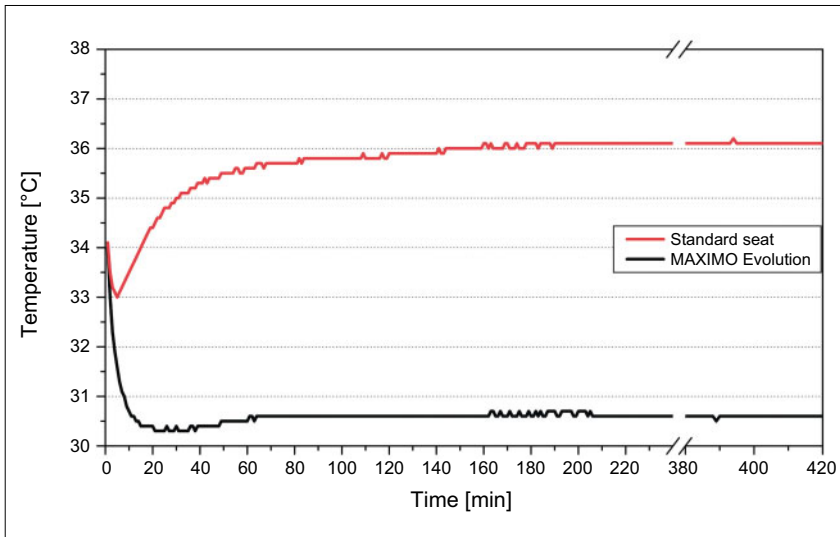


Figure 3:
Temperature curve

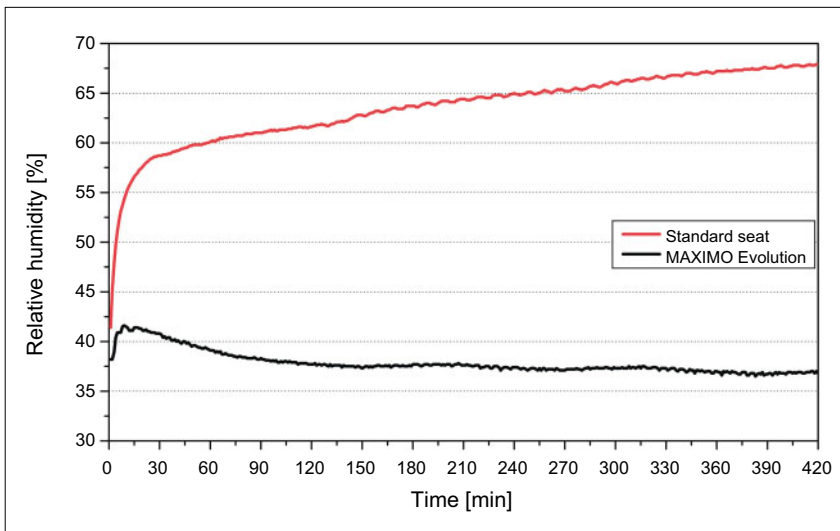


Figure 4:
Moisture curve

and the test repetition for temperature and moisture. At the beginning of the test, the initial temperature of the standard seat and Maximo Evolution was 34°C in both cases. After 15 minutes, the use of seat ventilation led to a temperature reduction of 3.6 K. By the end of the measurement, the surface temperature of the seat surface stabilized at a level of 30.6°C. The seat surface temperature of the standard seat increased to 36.1°C (figure 3).

In the case of the standard seat, the measured course of moisture in the contact area (figure 4) reaches up to 67.9% r.h. over the entire measuring period. After a measuring period of 10 minutes, the seat ventilation of the Maximo Evolution

develops its effect. This means that the stored water quantity is removed from the seat core, and a constant moisture flow from the seat surface to the ventilated seat core establishes itself. The measured moisture value sinks steadily from 41.5% r.h. to 36.9% r.h. at the end of the test. After 10 minutes, the standard seat already reaches a moisture value of 54.8% r.h., which increases to up to 67.9% r.h.

The activation of the seat ventilation of the driver's seat Maximo Evolution leads to more intensive heat dissipation (5.5 K lower temperature level) and better moisture removal (31% r.h. lower moisture level) and, consequently, low contact surface temperatures and

moisture. In the person-seat contact area, a comfortable sitting climate within the limits of physiological compatibility establishes itself.

Operation

Operating comfort is determined by ergonomic user control of the seat and can be measured using the arrangement of the adjusters. The driver's seat Maximo Evolution features a large number of functions relevant to ergonomics:

- pneumatic vibration insulation with body-weight-independent seat height adjustment,
- adaptation of seat depth and seat surface inclination,
- the possibility of setting backrest height and lumbar support,
- a wide range of armrest angle adjustment,
- inclination adjustment of the backrest

The adaptation of the seat cushions to the body contours provides good lateral stability, and the ergonomically shaped backrest supports the lumbar area. Thus, the body is automatically put into the right sitting position, and wrong sitting positions are avoided. Seat- and backrest geometry and necessary adaptations to different user measurements fully meet ergonomic requirements. Solutions for shoulder-support adaptation and armrest angle setting as well as in particular the individually adjustable two-piece lumbar support must be emphasized. The logical arrangement and the easily visible and adjustable seat setting and operating elements facilitate the acceptance of correct seat adjustment. The individual setting functions are operated by means of well-designed control elements, whose function is clearly indicated by means of appropriate arrangement and labelling (figure 1).

A comparison with ergonomic recommendations largely shows well adapted operating forces (table 1) and operating equipment conforming to expectations (frontwards, outwards: stronger, higher; backwards, inwards: weaker, lower).

Table 1:
Operating functions of the seat setting functions

Adjuster	Position	Operation	Operating force
Longitudinal seat adjustment	Front centre of the seat	Bar, 4 fingers	40 N
Inclination of the seat surface	Front left side of the seat	Key, 3 – 4 fingers	45 N
Adjustment of seat depth	Front right side of the seat	Key, 3 – 4 fingers	60 N
Turning of the seat	Front left side of the seat	Key, 3 – 4 fingers	not measured
Damping	Seat, centre left	Rotary button, 2 fingers	20 – 60 N
Seat height	Seat, left, rear top	Key, 3 – 4 fingers	15 N
Blocking of horizontal suspension	Seat, left, rear, bottom	Key, 3 – 4 fingers	80 N
Backrest inclination	Seat / backrest axle	Key, 3 – 4 fingers	30 N
Top lordosis	Backrest left, height of lordosis	Rocker key, 1 finger	4 N
Bottom lordosis	Backrest left, height of lordosis	Rocker key, 1 finger	4 N
Seat heating/ -ventilation	Backrest left, height of lordosis	Rocker switch, 1 finger	3 N
Armrest height and -inclination	Under the armrest	Turning wheel, 3 fingers	without load: easy to operate

Installation

The installation of the seat is very easy. When delivered, the seat is already equipped such that all mechanical and electric connections are configured for the individual tractor. All components necessary for its function are integrated in the seat.

Survey among users

A survey among tractor drivers who use the driver's seat Maximo Evolution confirms the test results. The survey covered the evaluation of seat functions, seat quality and-comfort, and suspension comfort. All those questioned gave the operation and the benefit of the seat functions the evaluation good to very good. Seat quality and seat comfort were also given the assessment good to very good by the drivers. The possibility of active

seat climate control, which allows the seat contact areas to be cooled and heated, was emphasized. Only by means of stepless seat climate control could an improvement be achieved here. Suspension comfort was considered very pleasant by all those questioned. The driver's seat was given a good to very good overall evaluation by all those surveyed. All in all, the subjective evaluations match the objective test results and thus prove the very good ergonomic overall concept of the Grammer Maximo Evolution.

Description

Air suspension driver's seat with automatic weight setting for agricultural and industrial use

- anthracite-coloured fabric cover perforated in the contact area
- folding arm rests adjustable in height and inclination
- telescoping back extension
- pneumatic, two-piece lumbar support
- adjustable inclination of the back rest
- 20° swivelling range of the seat
- adjustable seat depth
- seat inclination adjustment
- horizontal position adjustment of the seat
- automatic height adjustment
- lateral-horizontal suspension
- adjustable damper
- longitudinal-horizontal suspension
- active seat temperature control (summer / winter)
- weight: 57 kg
- compatible with common tractor manufacturers cabs
- optional equipment: actively controlled suspension

Realisation of the test

DLG-Test Centre for
Machinery and Equipment
Max-Eyth-Weg 1
D-64823 Groß-Umstadt

Reporting engineer

Dipl.-Ing. agr. Harald Kögler

Project leader

Dipl.-Ing. (FH) Ottmar Degrell



ENTAM – The European Network for the Testing of Agricultural Machines is the association of European test centres. It is the goal of ENTAM to spread test results Europe-wide to farmers, agricultural machinery dealers and manufacturers.

You will find more information about the network under www.entam.com or under the e-mail address: info@entam.com

October 2005

© DLG



German Agricultural Society
DLG Test Centre Technology and Farm Inputs

Max-Eyth-Weg 1, D-64823 Groß-Umstadt, Telephone: 06078 9635-0, Fax: 06078 9635-90
e-mail: tech@dlg.org, web: www.dlg-test.com

Downloading of all DLG-test reports from: www.dlg-test.com!

The Net-Magazine which supplements the Internet Page www.dlg-test.de

DLG-Test.de – more than just the internet.

dlg-test.de is the unique cross-media concept in the agricultural machinery industry. Consisting of the internet, test reports and in particular the test magazine bearing the same name, it offers the farmer answers to all technological ques-

tions. This concept is unique because we provide you with all important and highly current information via a free electronic newsletter. You do not need to subscribe. Just wait for the newsletter announcement and order the new magazine on-line.

Neutral, independent and competent.

The net magazine dlg-test.de offers the farmer all information about tested technology. Coloured reports give you the possibility to find out everything about DLG tests: what was tested how and with what result. Free of advertising, this magazine is a neutral, attractive and independent source for objective and reputable information about modern agricultural machinery.

Comprehensive information twice a year.

Reporting on trends in agricultural machinery development, the test magazine dlg-test offers in-depth background information about one focus topic in each of its two issues. No matter if it is a milking robot test, a comparison of stepless tractors or electronics on the test stand: the well-versed DLG engineers do not leave out any current topic for the farmer and professionally show who is competent in tests for farmers in Europe. Various „hot“ topics ranging from traffic safety to internet trends

competently round off the magazine and provide future-oriented farmers with a tool for their successful way into the future.

Your way to dlg-test.de:

Use the possibilities which the media package dlg-test.de offers you. Subscribe to the complimentary newsletter under www.dlg-test.de and order on-line. Or visit the DLG stand at the exhibitions EuroTier and Agritechnica and pick up your personal copy. Or order directly from the DLG publishing company, and you will receive your current copy via mail.

Order now!

DLG-Verlag
Eschborner Landstraße 122
60489 Frankfurt am Main
Telephone: 069 2478 8-451
Fax: 069 24788-480

