Technical Handbook

Dynamometer

ASM Performance

for passenger cars

Manufacturer

MAHA Maschinenbau Haldenwang GmbH & Co. KG

Hoyen 20

D-87490 Haldenwang

Telephone:	+49-8374-585-0
Telefax:	+49-8374-585-449
Internet:	http:\\www.maha.de
E-Mail:	maha@maha.de

Subject to alterations of a technical or subject-related nature without notice.

Table of Editions

Date	Edition	Software	Changes
06/98	D1 3903TH7-GB01	from EPROM V 2.20	1st Edition

Table of Contents

Pay attention to the following safety precautions

WARNING	**Warning means that non-compliance with the operating instructions can endanger persons.**

ATTENTION	**Attention means that non-compliance with the operating instructions can cause damage to the equipment.**

NOTE Notes provide additional information.

Cross references are shown in brackets

A cross reference with a position number or - character is shown in brackets.

e. g. (A, Fig. 3-4)

This means: This component is shown in figure 3, position 4.

Operating instructions are numbered

Operating Instructions are characterized by bold numbers.

e.g. **1** Select menu point.

2 Press „X“ key.

An individual operating instructions is also numbered.

Screen displays are shown in italics.

e.g. *CALIBRATION EXACT*

1 Safety

1.1 Safety Instructions

Safety instructions are provided to warn about dangerous situations and to help avoid injury to people.

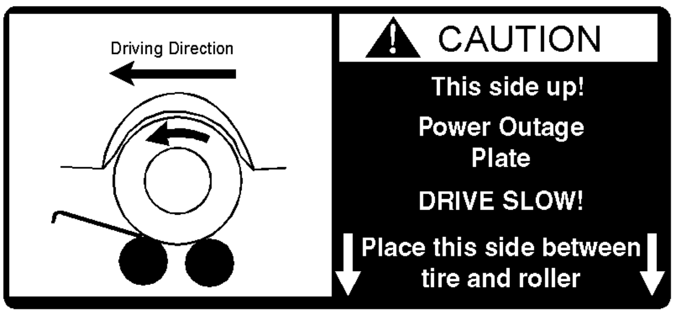
WARNING	**Only trained authorized personnel may operate the test stand**

WARNING	**Rotating rollers are highly dangerous! Hands, feet and clothing should never come into contact with rotating rollers!**

The test stand is equipped with an internal drive for coast-down and warm-up procedures and it is therefore very important that even in a standstill state no one walks on the rollers!

WARNING	**Risk of injury!** **Safety goggles should be worn at all times!** **Particles may be loosened due to rotating rollers.** **Check the tires and remove any particles which may become loosened and fly off.** **Check the balancing weights on the rim to make sure they are securely attached.**

ATTENTION	**At power outage an drive-off assistance plate is needed for both tires to remove the vehicle from the roller set.** **The flat edge should be positioned between roller and tire.** **Pay close attention that the bent edge is always positioned down!** **Drive off slowly.**

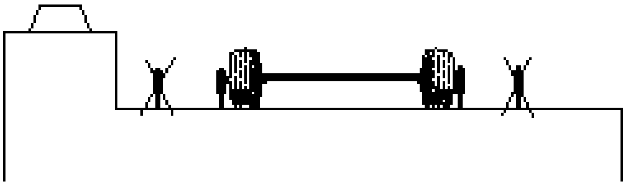


WARNING	**Potential carbon monoxide poisoning!** **The test stand should only be erected in rooms in which it is guaranteed that the air supply is exchanged at least 4x per hour.**

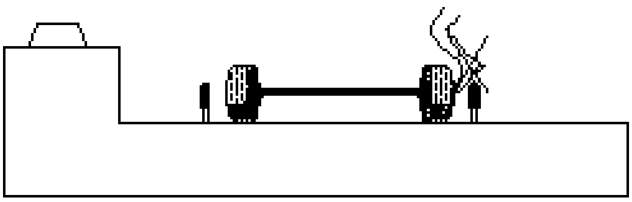
WARNING	**Running motors can be dangerous!** **Potential carbon monoxide poisoning!**

WARNING	**Risk of explosion!** **The test stand is not to be erected in rooms liable to contain explosive mixtures!** **Standard test stands have no EX-protection!**

ATTENTION	**Pay close attention that the restraint rollers used in the restraint system are placed in the hole closest to the tire!**



WARNING	**Never put your foot between or near the restraint roller and the tire!**



1.2 Safety Instructions for Operation

All official Accident Prevention Regulations must be thoroughly complied with!
The Accident Prevention Regulations of the country in which the test stand is being operated apply.

Noise emission protection!
The working area around the test stand should be protected from noise.

Use ear protection!
Appropriate ear protection must be used.

WARNING	**Pay close attention that no feet are not placed between roller set and the floor!**

Never step onto the rollers or the lifting bar!

Before repair-/maintenance-/set up work, turn off main switch and secure against tampering.

Never do adjustment or maintenance work when rollers are turning!

All work done on electrical parts of the equipment is to be carried out by trained, qualified electricians or service technicians only!

Protect all parts of the installation from humidity and moisture!

All work done on impulse sensors and proximity switches should be carried out by trained electricians.

Keep the test stand and the surrounding work area clean.

The test stand may only be operated within its power capacity limits!

Avoid tire damage!
Regularly check the tightness of the fastening screws on the cover plates.

Test vehicles must be deemed roadworthy before they are tested!

The vehicle should be driven slowly onto the test stand to avoid putting any unnecessary strain on vehicle or test stand.

Damage to low-lying vehicle parts are not covered by warranty!

The test stand should be secured and/or covered when not in use and when located in an area to which the public has access.

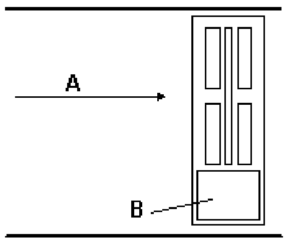
2 Installation

2.1 Introduction

The ASM-P -Performance dynamometer (**A**cceleration **S**imulation **M**ode-**P**erformance) is a combined exhaust/Performance roller test stand.

The test stand which has been specially developed to meet the specifications of BAR 97 for an exhaust emission test.

Figure 2-1 **Test Stand**



A driving direction

B eddy-current brake

The ASM-P is installed in a foundation.

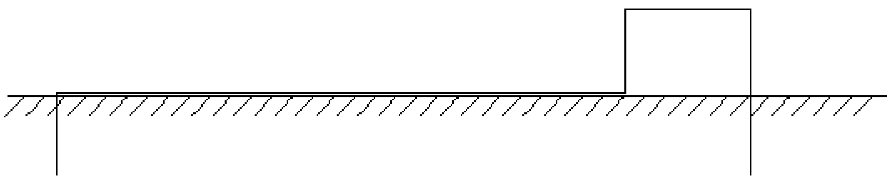
This type of installation is called In Floor.

The test stand can be operated bi-directionally, i.e. both front and rear wheel driven vehicles can be tested.

The type of testing can be set via a softdip.

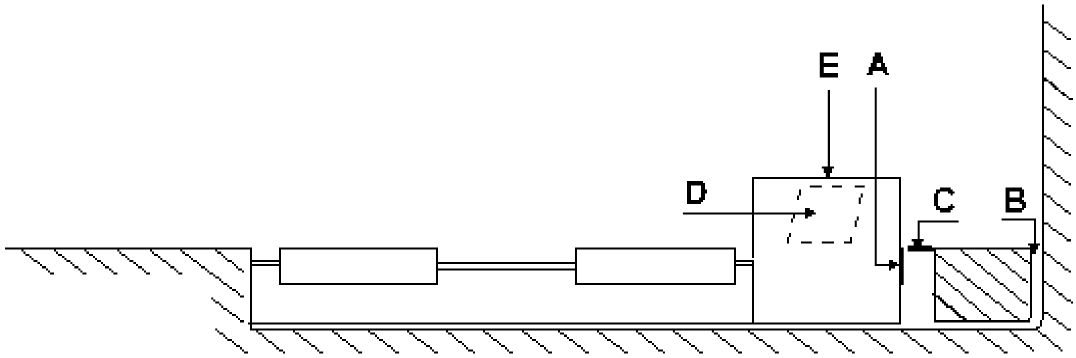
2.2 Installation of the ASM-P (In Floor)

Figure 2-2 **ASM-P In Floor Installation**



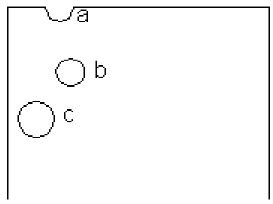
1 Lead the lines to the connection point through the foundation pipe (B)

Figure 2-3 **Protection cover**



A Side cover with recesses for

- a RS232 interface
- b power supply box
- c compressed air connection



B lead-in of the connecting lines

C Foundation cover

D Circuit box (internal)

E Cover eddy-current brake

2.3 Connection ASM-P

1 Connect the RS232 cable with RS232- interface connection (a, Figure 2-3)

2 Connect the power supply cable to the power supply socket (220V/20A/60Hz) (b) (green: GND)

3 1/4" NPT-sleeve (c) with compressed air hose.

NOTE In order to gain access to the circuit box (D) for maintenance work, the cover of the eddy-current brake (E) must be removed.

2.4 Installation Instructions

The ASM-P test stand should always be securely attached in the foundation.

When installing the test stand attention should be paid that the test stand sets accurately in the foundation. After installation, the test stand must be aligned. The foundation dimensions and measurements may be taken from the following foundation plans:

- FPL-43003.00.01.001 below floor installation.

ATTENTION **The danger of frame distortion may lead to mechanical failure during test stand operation!**

The preparatory work on the foundation pit should be carried out with the greatest care and accuracy. If this is not observed, the positioning of the roller set may not be as accurate as required!
This can lead to twisting on the roller set frame and consequently to operational malfunctions.

2.4.1 Test Stand Installation and Anchoring

1 Clean the test stand foundation, especially the supporting platform and remove any remaining cement.

ATTENTION **Do not pinch electrical connections!**
Pay close attention to the electrical connections when lowering the roller set into the foundation.

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2 Place the test stand in the foundation (see chapter 2.6, Transport).

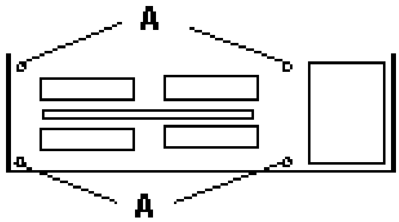
3 Align the test stand in the foundation.

4 Make sure the test stand is centered properly in the gap which is between the roller set and foundation.

5 Align the roller set horizontally using a spirit level. If necessary, place metal plates underneath.

6 Anchor the roller set in the foundation on the four points (A, figure 2-4) with dowels and screws
Use Express Anchors 10/90 (i.e. ∅ 10 mm and 90 mm long) and M10 screws.

Figure 2-4 **Anchoring points of the ASM**



A anchoring points

2.5 Technical Specifications

2.5.1 General

Nominal voltage .... 230V ± 10%
Nominal current .... 20 A
Frequency ....60 Hz
Fuse protection .... 20 A slow
Axle load.. 6000 lbs (2722 kg)
Test stand weight .... 2161 lbs (980 kg)

2.5.2 Roller Set

Test speed .... max. 120 mph (193 km/h)
Roller set length...139.3 inch (3539 mm)
Roller set width...28.3 inch (718 mm)
Roller set height ....17.7 inch (450 mm)
Roller set diameter ....8.56 inch (217 mm)
Roller axle center separation....................................17.3 inch (439 mm)
Roller length .... 33.5 inch (850 mm)
Interior track width vehicle ....30 inch (762 mm)
Exterior track width vehicle.....................................100 inch (2540 mm)
Roller surface ....powdered coated
Driving direction ....bi-directional
Operating temperature....................................35°F to 110°F (1.7°C to 43.3°C)

2.5.3 Lift Beam

Construction... one piece
Operation ....pneumatic
Compressed air ca. .... 87-116 psi (6 -8 bar) max. 145 psi (10 bar)

2.5.4 Eddy-Current Brake with Flywheel

Type ....Pentar P-5.1-206
Number of coils ASM .... 8 St.
max. current per coil .... 2.5 A
Voltage per coil.. 96 V
Range of flywheel mass (traction mode) . 2000 lbs - 6000 lbs (907 kg - 2722 kg)
Mechanical flywheel mass ....2000 lbs ± 40 lbs (907 kg ± 18 kg)
Width of brake ....36.6 inch (930 mm)
Height of brake ....28.5 inch (725 mm)

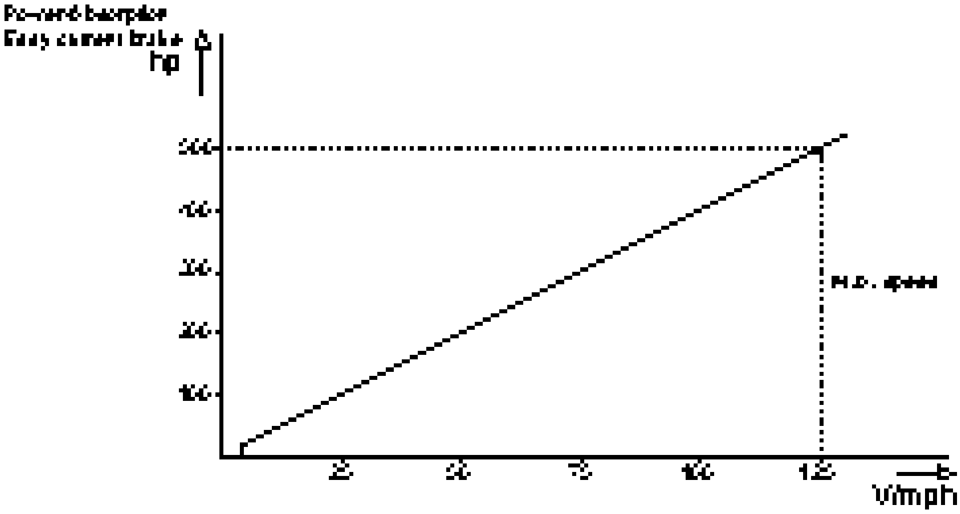
2.5.5 Drive

Three phase motor ....with 2 shaft ends between each roller pair
Power.. 2.2 kW
Speed max. ....31 mph (50 km/h)

2.5.6 Weighing System

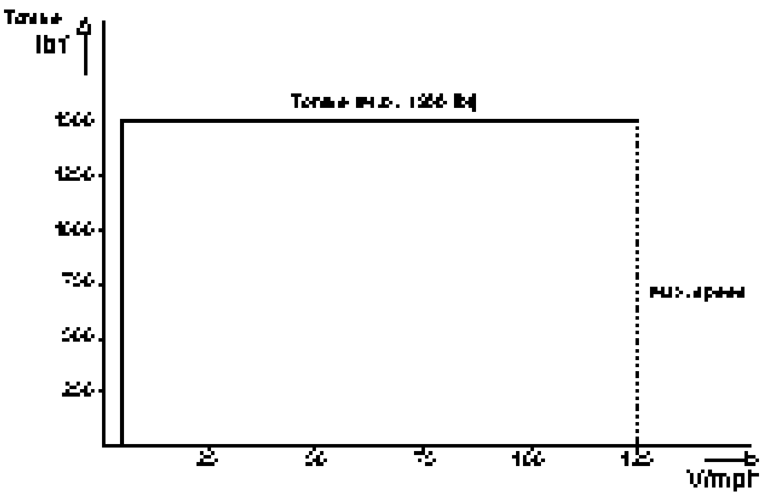
Sensors..integrated in the lift beam
Weighing range .... 800 lbs - 6000 lbs (363 kg -2722 kg)
Accuracy .... ± 100 lbs (± 45 kg)

2.5.7 Power Diagram of the ASM-P



Eddy Current Brake	Power-Absorption-Duration
25 hp: ✳ duration	250 hp: 5 min
50 hp: 15 min	350 hp: 3 min
100 hp: 7.5 min	500 hp: 1 min

ATTENTION **The power absorption of the ASM-P is dependent upon the driving direction. (due to belt connection).**
Power absorption: in driving direction forward max. 500 hp
in driving direction backwards max. 150 hp



1 lbf ❻ 4,44 N

1 hp ❻ 0,74 kW

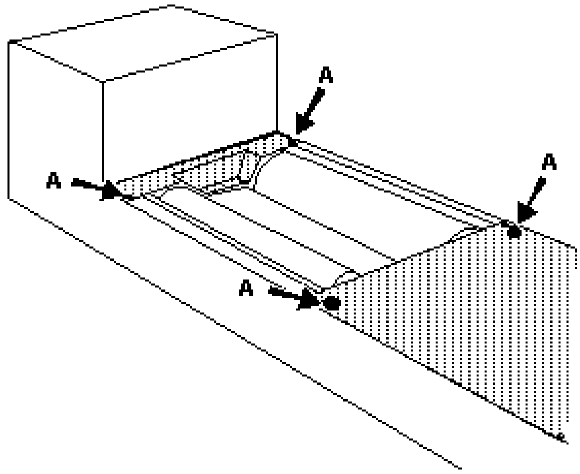
1 mph ❻ 1,609 km/h

2.6 Transport

ATTENTION **The test stand center of gravity is not in the middle. Pay attention to the center of gravity marking on the packing box.**

1 Remove screws (A) to transport the ASM roller set. (Figure 2-5).

Figure 2-5 **Disassembly of the covers -ASM**



2 Screw the ring bolts (A, Abbildung 2-6) which are included in the shipment completely into the prepared screw sockets (B).

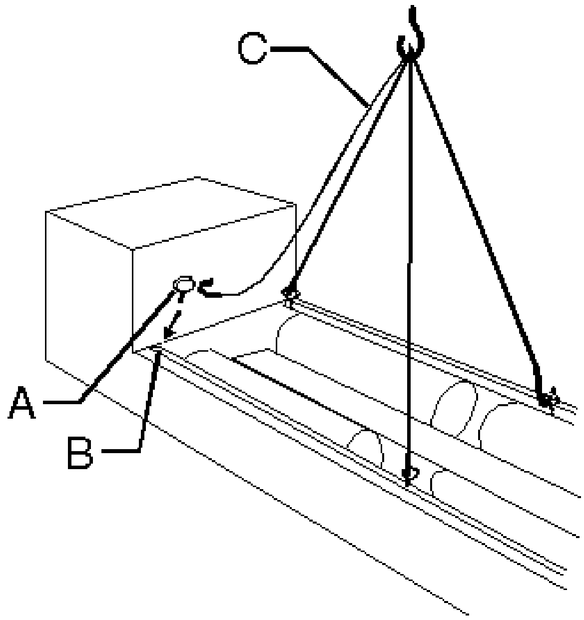
ATTENTION **The steel-cable/chain must have sufficient strength to withstand the weight of the roller set!**
(also see 'Technical Specifications' 2.5 in this chapter

3 Attach a steel-cable/chain (C) to the 4 ring bolts.

ATTENTION	**The crane or lift beam used should have a minimum of 2161 lbs (980 kg) lifting capacity.**

4 Lift the roller set.

Abbildung 2-6 **Transporting of the Roller set**



2.7 Lift Beam Connection

The connection for the lift beam is installed at the peripherie of the eddy-current brake.

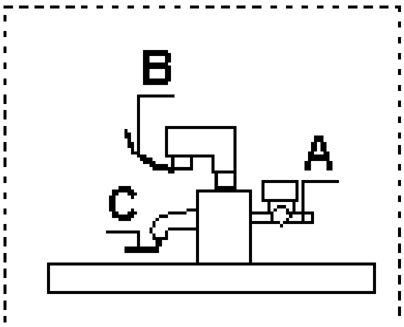
The workshop compression hose is connected to A. (A, figure 2-7) Connection A is lead out from the side cover.

Depending on local conditions a pressure regulator or a servicing unit should be installed.

Cable (B) leads to the electrical connection of the lift beam to the control PCB.

Hose (C) leads to the air bellows of the lift beam.

Figure 2-7 **Connection of the lift beam**



	bar	psi
Connecting pressure	max. 10	max. 145
Adjustable pressure range	6 - 8	87 - 116
Operating pressure (lift beam)	6 - 8	87 - 116

2.7.1 Lift Beam Pressure Adjustment

The operating pressure of the lift beam is set with the black adjusting screw (A, Figure 2-8). The pressure can be checked on the indicator (B).

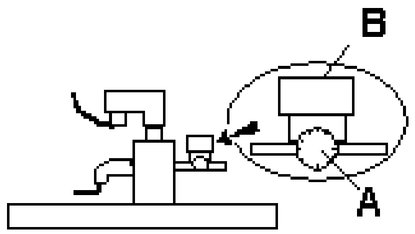
1 Pull out the black adjustmen screw. (A)

ATTENTION **The pressure on the pressure connection may not exceed 145 psi (10 bar)!**

2 Adjust pressure, read on indicator(B).

3 Push in black adjustment screw again.

Figure 2-8 **Adjustment of the operating pressure**

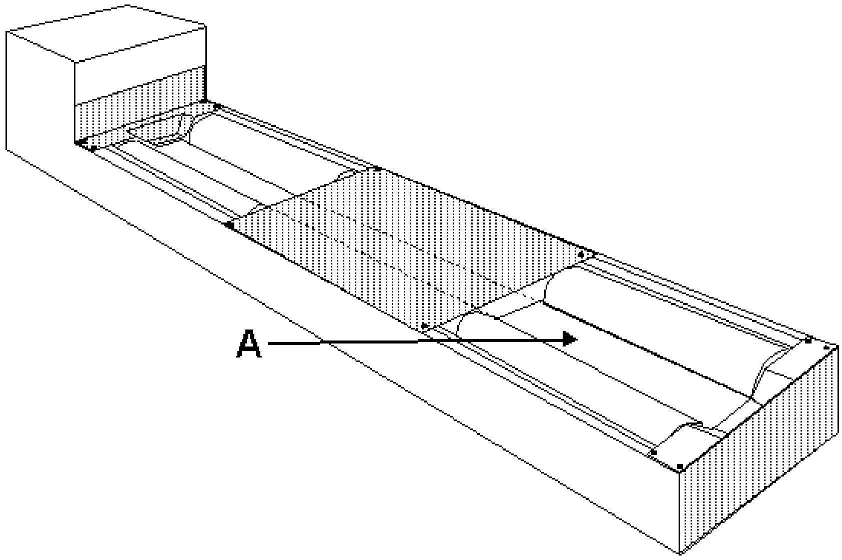


2.8 Weighing System

The weighing system is used for determining the axle weight of the drive axles.
The axle weight is used then for compensating the tire roll losses.
Test range of the axle weight: 800 lbs - 6000 lbs
Test accuracy: ± 100 lbs

The weighing system is integrated into the lift beam (A, Figure 2-9).

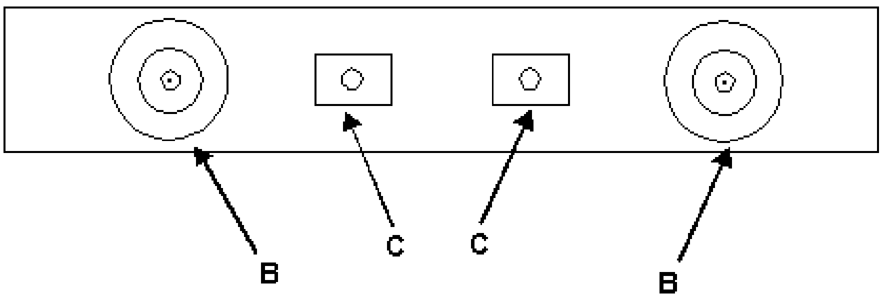
Figure 2-9 **Weighing system**



A lift beam

The weighing cells (B, Figure 2-10) are located under the cover of the lift beam.

Figure 2-10 **Weighing sensors**



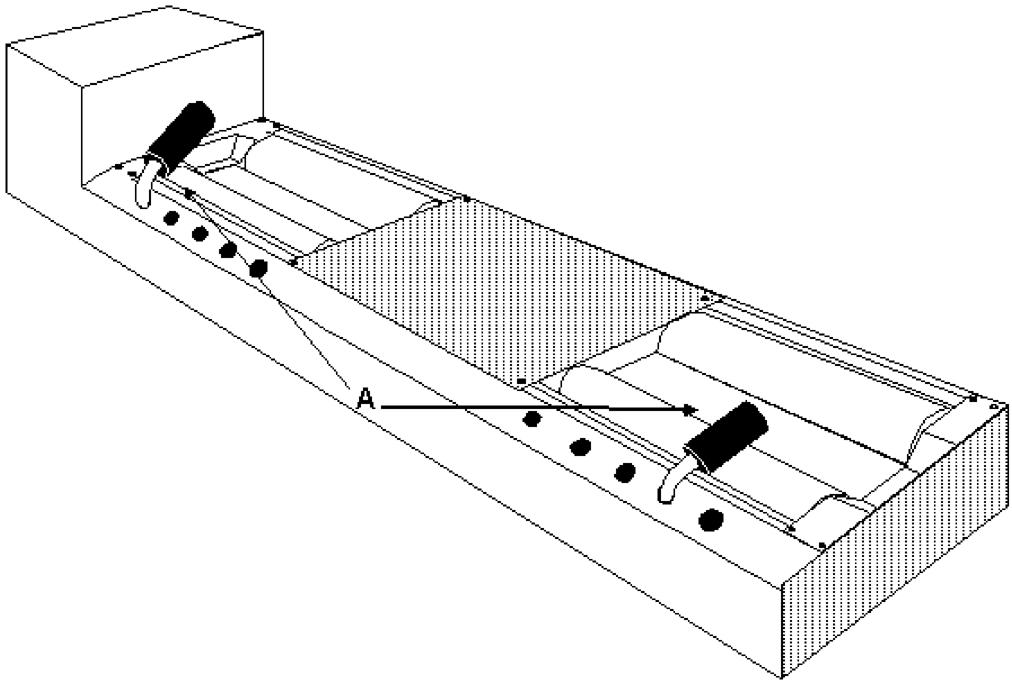
B weighing cells

C guidance bolts

2.9 Restraint-System

The restraint-system is a safety feature and prevents the vehicle from skidding off the rollers.

Abbildung 2-11 Restraint-System



A restraint rollers

ATTENTION **Insert each restraint roller into the positioning hole which is positioned closest to the tire.**

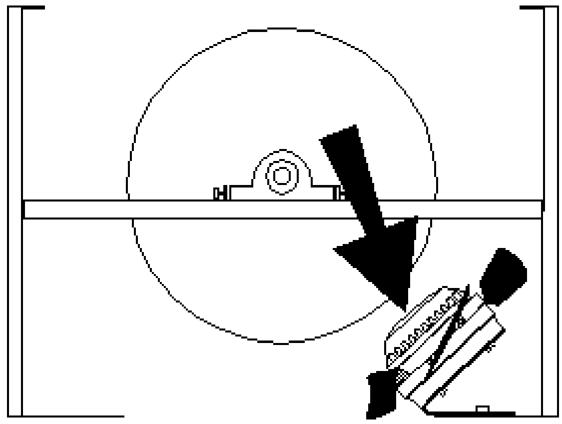
1 Insert one restraint roller on the left side and one on the right side (A, Abbildung 2-11) into the positioning holes of the roller set frame.

NOTE Care should be taken that the holes are always properly lubricated so that the restraint roller slips easily and completely into the correct position.

The restraint rollers are equipped with a monitoring system, i.e. the status is signalized via interface when the restraint rollers are properly positioned.

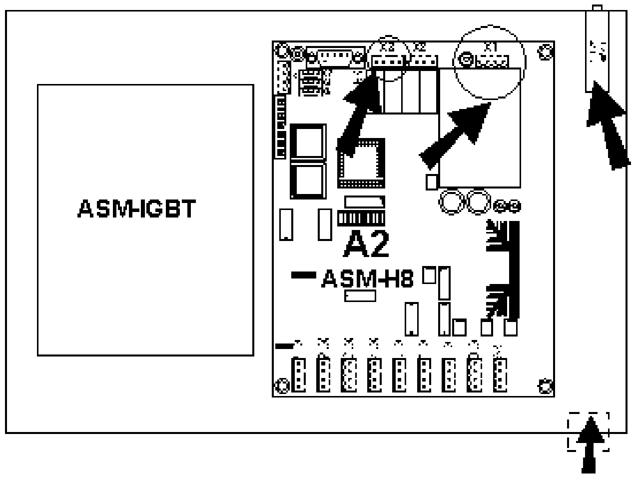
2.10 Ventilator Installation

Figure 2-12 **Ventilator**



The connection of the ventilator takes place on the PCB A2.(ASM-H8).

Figure 2-13 **Connection on the PCB**



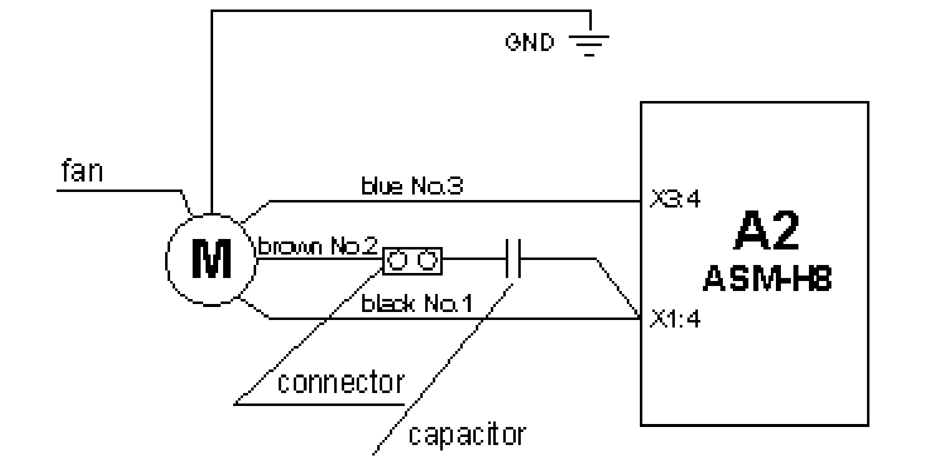
1 Fixing of the condensator on upper right-hand side of the circuit box..

2 Pull in the cable through the opening intended for that purpose on the circuit box.

3 Electrical connection of the ventilator.

NOTE The ventilator is switched using the software. It runs after a certain load has been reached. The duration of running time depends upon the times of the load which has been added together.

Figure 2-14 **Electrical Connection**

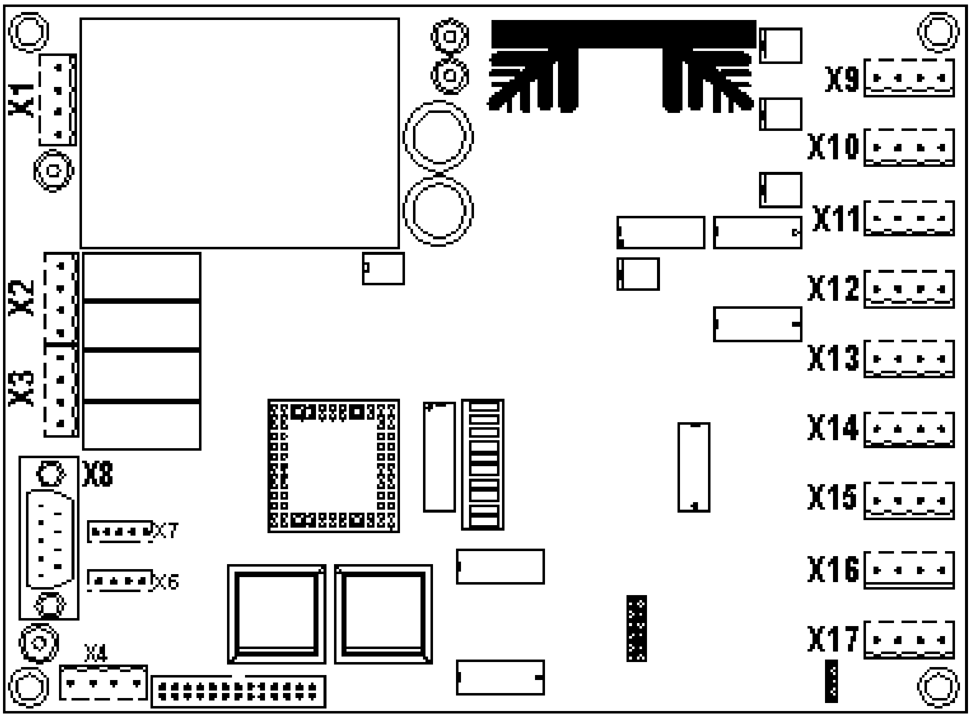


3 Description of the PCB

3.1 Description of the ASM-V1.4 PCB.

The ASM-V1.4 circuit board controls the test stand and the digital proccessing of the measured data. There are 17 different connectors located on the circuit board (Figure 3-1).

Figure 3-1 **Connector location**



X1	connection electrical power supply	X10	scale right
X2	Lifting beam/ Sliding unit	X11	connection strain gauge
X3	only for 4WD test stands	X12	impulse sensor of the support roller
X4	ASM-IGBT PCB supply	X13	Restraint-System
X5	not used	X14	roller cover
X6	not used	X15	only for 4WD test stands
X7	RS232 interface (JST)	X16	Temperature sensor
X8	RS232 interface (SUB-D)	X17	not used
X9	scale left		

3.1.1 Connector Description

3.1.1.1 Connector X1 (Connection of electrical power supply)

Pin	Signal
1	connection 230 V, phase
2	bridged to Pin 1
3	bridged to Pin 4
4	connection 230 V, neutral conductor

3.1.1.2 Connector X2 (Connection of lift beam)

Also intended for connection of the wheel-base adjuster on 4WD test stands.

Pin	Signal
1	connection lifting beam (+24V)
2	connection lifting beam (GND)
3	connection display lamp (OUT)
4	connection display lamp (+24V)

3.1.1.3 Connector X3 (Connection of 4WD functions) Connection of the Ventilators

Pin	Signal
1	connection relay K4 (potential free)
2	connection relay K4 (potential free)
3	connection relay K3 (potential free)
4	connection relay K3 (potential free), ventilator

3.1.1.4 Connector X4 (18V AC supply voltage for ASM-IGBT PCB)

Pin	Signal
1	18V~
2	0V
3	not assigned
4	not assigned

3.1.1.5 Connector X5

not used

3.1.1.6 Connector X6 (RS 485 interface)

IC5 on the PCB must be installed.

Pin	Signal
1	24 V AC, phase
2	24 V AC, neutral conductor
3	TxD
4	RxD

3.1.1.7 Connector X7 (RS232 interface)

Parallel to connector X8.

Pin	Signal
1	TxD
2	RxD
3	CTS (not used)
4	RTS (not used)
5	GND

3.1.1.8 Connector X8 (Serial interface)

Pins not assigned are not listed.

Pin	Signal
2	RxD
3	TxD
5	GND
7	RTS (not used)
8	CTS (not used)

3.1.1.9 Connector X9 (Connection scale left)

Pin	Signal
1	+12V
2	+ input scale left
3	- input scale left
4	GND

3.1.1.10 Connector X10 (Connection scale right)

Pin	Signal
1	+12V
2	+ input scale right
3	- input scale right
4	GND

3.1.1.11 Connector X11 (Connection strain gauge with force measurement cell)

NOTE: A 500 Ω resistor must be soldered between PIN 2 and 3 (parallel to power sensor)

Pin	Signal
1	+12V
2	+ Eingang DMS
3	- Eingang DMS
4	GND

3.1.1.12 Connector X12 (Connection of the impulse sensor for speed measurement)

Pin	Signal
1	+ input support roller
2	- input support roller
3	not assigned
4	not assigned

3.1.1.13 Connector X13 (Inputs for restraint system)

Pin	Signal
1	restraint system front
2	GND
3	restraint system rear
4	GND

3.1.1.14 Connector X14 (Input for roller cover)

Pin	Signal
1	roller cover
2	GND (roller cover)
3	reserve, not assigned
4	GND (reserve)

3.1.1.15 Connector X15 (Inputs for selector switch 4WD)

Pin	Signal
1	S1-4WD
2	GND (S1-4WD)
3	S2-4WD
4	GND (S2-4WD)

3.1.1.16 Connector X16 (Connection of eddy-c. brake/ strain gauge temp. sensor)

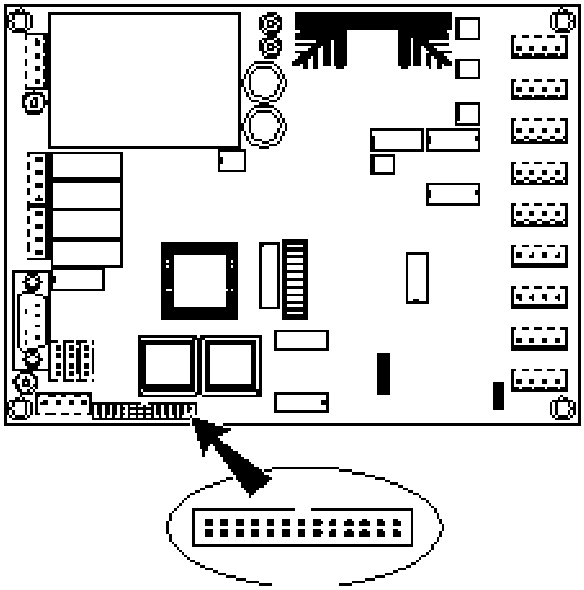
Pin		Signal
1	————	temperature sensor eddy current brake
2	————	GND (temperature sensor brake)
3	————	temperature sensor strain gauge
4	————	GND (temp. sensor strain gauge)

3.1.1.17 Connector X17 (not assigned)

Pin		Signal
1	————	analog output (not assigned)
2	————	analog output (not assigned)
3	————	LON-connection (not assigned)
4	————	LON-connection (not assigned)

3.1.2 Connector Strip ST1

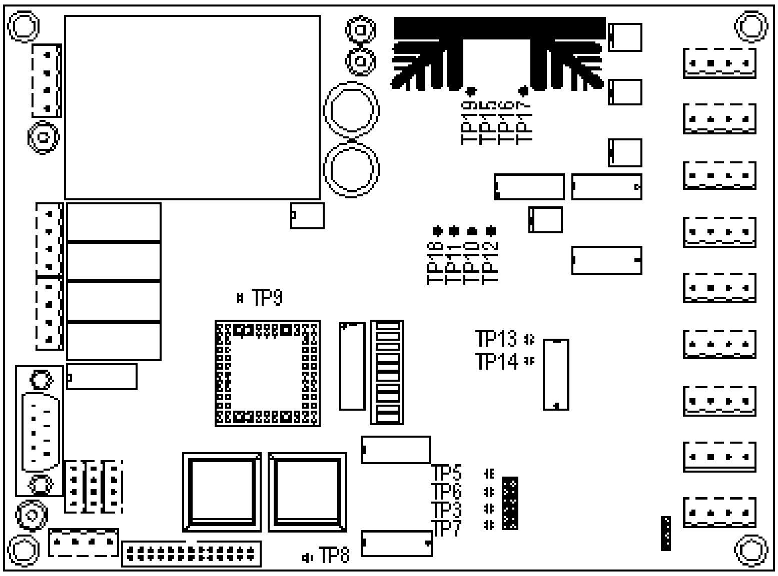
The 26-pin connector strip connects the ASM PCB with the ASM-IGBT PCB.



Pin	Signal
1	TEMP-KK (heat sink)
2	ERROR (H8)
3	GND
4	PWM1 H
5	GND
6	PWM2 H
7	GND
8	PWM3 H
9	GND
10	PWM1 L
11	GND
12	PWM2 L
13	GND
14	PWM3 L
15	GND
16	PWM-brake
17	GND
18	IGBT-current
19	GND
20	intermediate circuit
21	+ 5 V
22	+ 12 V
23	not assigned
24	not assigned
25	not assigned
26	not assigned

3.1.3 Test Points

Figure 3-2 Test points

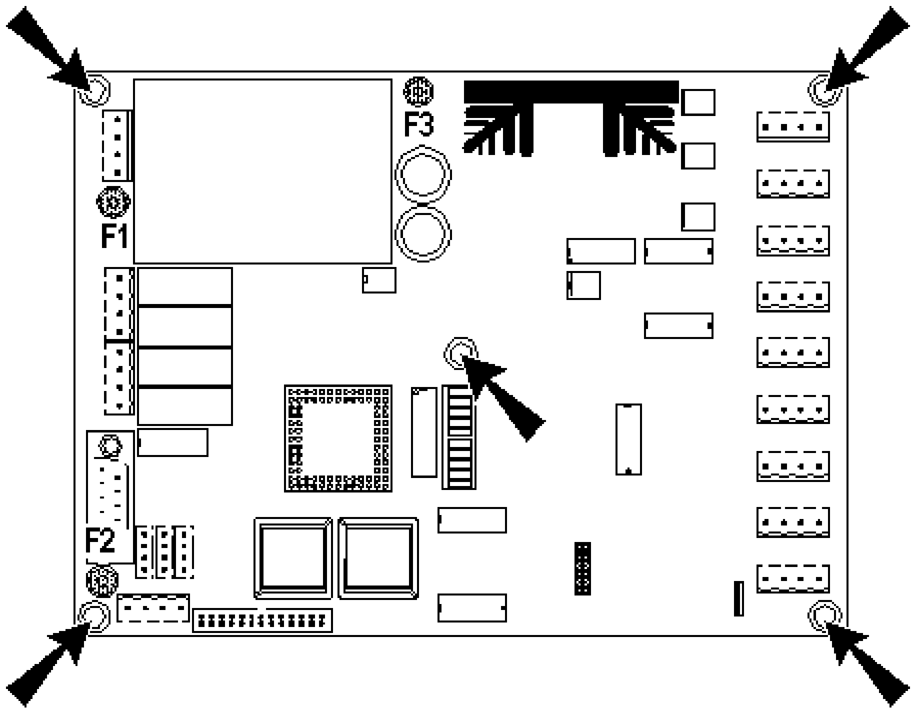


Test Point	Remark	Signal
3	eddy-current brake control signal	
5	impulse of the roller	
6	impulse of the roller	
7	not used	
8	IGBT- current on connector strip ST1	
9	TEMP-KK applied to H8	
10	signal scale left	
11	signal scale right	
12	signal strain gauge	
13	signal temperature sensor eddy-current brake	
14	signal temperature sensor strain gauge	
15	internal supply voltage	+ 24 V
16	internal supply voltage	+ 12 V
17	internal supply voltage	+ 5 V
18	internal supply voltage	+ 5 V-reference
19	internal supply voltage	GND

3.1.4 Fuses and Grounding on the ASM PCB

The PCB must be connected to the unit-housing ground. The grounding points are marked with arrows.

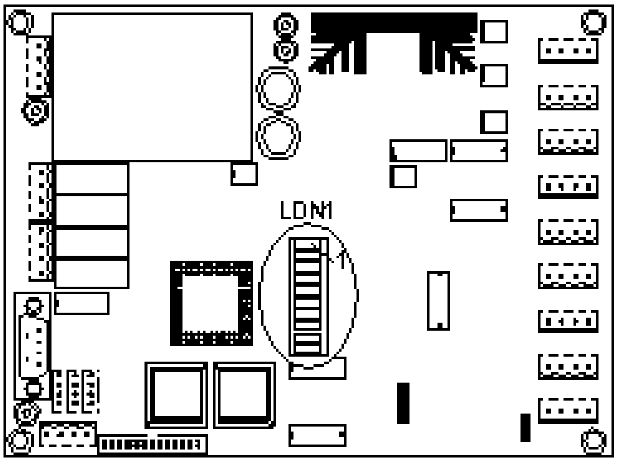
Figure 3-3 **Fuses and grounding points**



Fuse	Nominal Current	Remarks
F1	0,4 A slow	input transformer
F2	1,25 A slow	output 1 transformer
F3	1,25 A slow	output 1 transformer

3.1.5 LEDs on the ASM PCB

Figure 3-4 LEDs



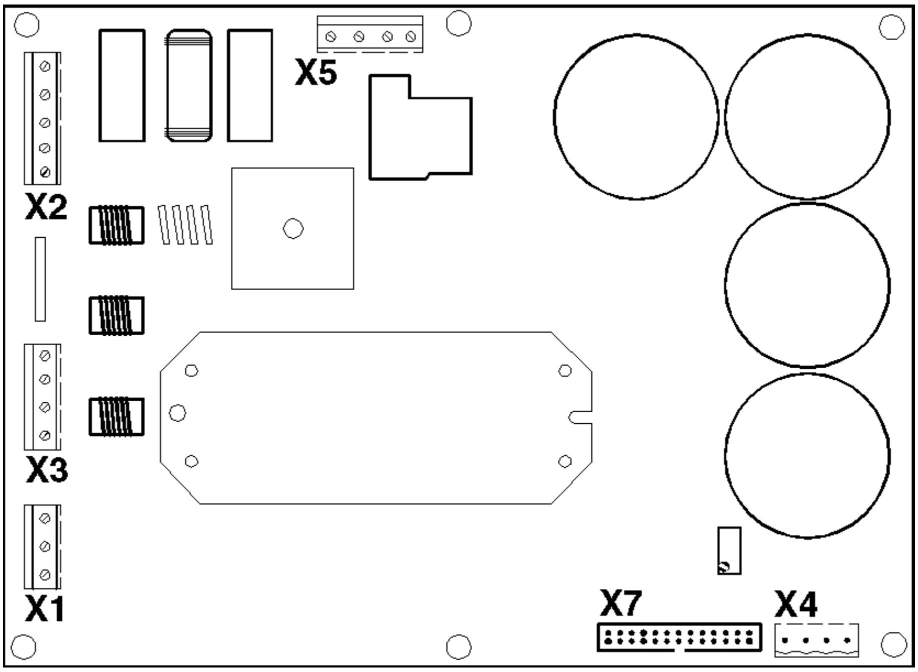
LED	Function
1	lift beam (relay K1)
2	lift beam (relay K2)
3	4WD 1 (relay K4)
4	4WD 2 (relay K3)
5	intermediate circuit relais on the PCB ASM-IGBT
6	Restraint system front (X13)
7	Restraint system rear (X13)
8	roller cover (X14)
9	S1-4WD (X15)
10	S2-4WD (X15)

3.2 Description of the ASM-IGBT-V1.4 PCB

The ASM-IGBT-V1.4 PCB controls the performance of the test stand.

There are 6 different connectors mounted on the PCB. The location of these connectors is displayed in Figure 3-5.

Figure 3-5 **Connector location**



X1	controls eddy current brake	X4	PCB supply voltage
X2	mains supply	X5	connection for choke coils
X3	controls three-phase motor	X7	connector strip for connection to ASM PCB

3.2.1 Connector Description

3.2.1.1 Connector X1 (Control and power supply of eddy-current brake)

Pin	Signal
1	eddy-current brake phase
2	eddy-current brake neutral conductor
3	PE

3.2.1.2 Connector X2 (Connection of 230 V supply voltage)

Pin	Signal
1	P
2	bridged to Pin 1
3	N
4	bridged to Pin 3
5	PE

3.2.1.3 Connector X3 (Control and power supply of three-phase motor)

Pin	Signal
1	L1
2	L2
3	L3
4	PE

3.2.1.4 Connector X4 (18V AC supply voltage for connector X4 on ASM PCB)

Pin	Signal
1	18 V~
2	0 V
3	PE
4	PE

3.2.1.5 Connector X5 (Connection of choke coils)

Pin	Signal
1	choke 1
2	choke 2
3	choke 1
4	choke 2

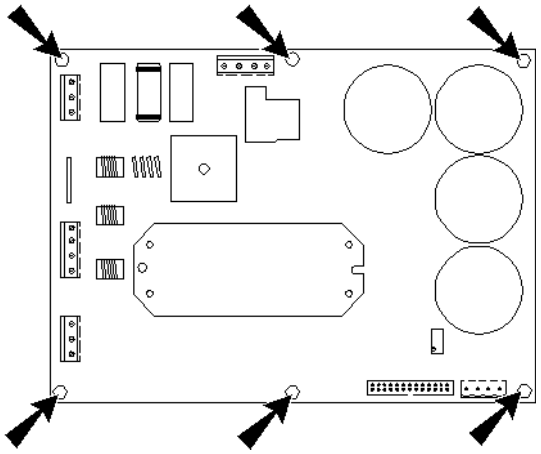
3.2.1.6 Connector X7 (Connection to ASM PCB)

Pin	Signal
1	TEMP-KK
2	ERROR (H8)
3	GND
4	PWM1 H
5	GND
6	PWM2 H
7	GND
8	PWM3 H
9	GND
10	PWM1 L
11	GND
12	PWM2 L
13	GND
14	PWM3 L
15	GND
16	PWM-brake
17	GND
18	IGBT-current
19	GND
20	intermediate circuit
21	+ 5 V
22	+ 12 V
23	not assigned
24	not assigned
25	not assigned
26	not assigned

3.2.2 PCB Grounding

The PCB must be connected to the unit-housing ground. The grounding points are marked with arrows (Figure 3-6).

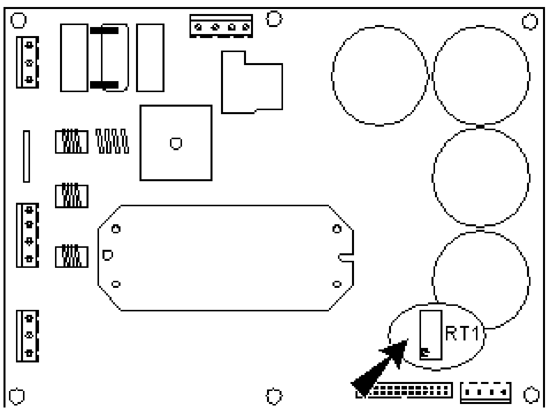
Figure 3-6 Grounding points



3.2.3 Potentiometer on the ASM-IGBT PCB

The potentiometer RT1 adjusts the measurement current that is evaluated by the H8-processor (Figure 3-7).

Figure 3-7 Potentiometer



ATTENTION **Do not adjust R1. The potentiometer has been set at the MAHA factory.**

Leerseite

4 PC-Interface Protocol

4.1 General Information

4.1.1 Serial Interface Configuration

- V.24-Interface RS 232C
- Start/Stop
- ASCII-Code
- 9600 Baud
- 8 Data bits
- 1 Start bit
- 1 Stop bit
- no Parity

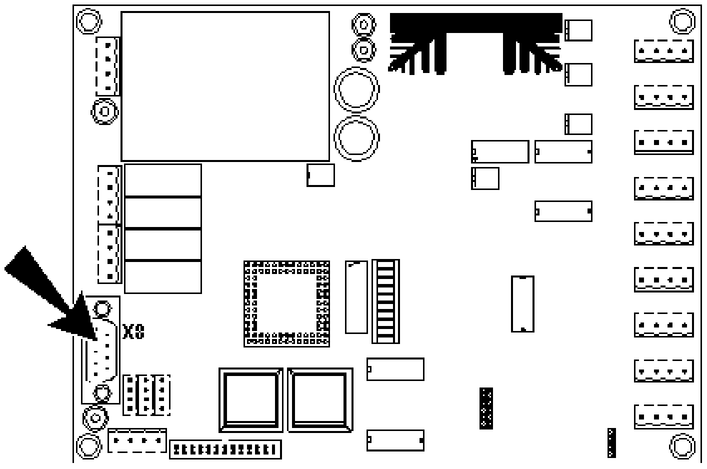
Control symbols such as RTS, CTS, DTR are not used.

The pin assignment corresponds with a 9-pin plug on IBM-PC:

- Pin 2 = RxD
- Pin 3 = TxD
- Pin 5 = ground
- Screened cable

The interface is located on the ASM-V1.4 board at connector X8.

Figure 4-1 **Interface of the ASM-V1.1 PCB**



4.1.2 Data Set Transmission

The ASM Dyno-Controller is ready to receive the data record mode only after it has been given the test machinery address. The ASM has B4 hex as an address.

If the control word has been selected the corresponding data record will be transmitted after each prompt from the PC (ENQ). If no data is available the command NAK is used. The control word determines the data to be transmitted or received.

PC		ASM
1. ADR	==>	
2. DC1	==>	
3. Control word	==>	
4. ENQ	==>	
	<==	NAK, if data record is not ready

if NAK, then a renewed try after 0,2 second

5. ENQ	==>	if test is complete
	<==	STX Data ETB CKS $

If transmission is OK

6. ACK	==>	data record is deleted

If not OK

7. NAK	==>	repeat starting at point 5

4.1.3 Data Record Structure

A data record begins with STX, followed by the data.
Data records end with ETB.

Then the check sum follows. (XOR coupling of all output characters).

$ is sent as final character.

Data transmission:

STX - Data - ETB - CKS - $

4.1.4 Control Words

Control words characterize the data record to be transferred.

For the data transmission between PC and ASM four data sets are available.

At request and/or transfer of data the control word must also be transmitted.

Identification	data set
C (ASCII)	send test values
D (ASCII)	send status
E (ASCII)	read parameters
F (ASCII)	write parameters

In addition to the four control words listed above there are 21 more control words to control the test stand functions.

4.2 Data Record Set-Up

In the following tables the format will be generally given in ASCII code. Formats in hex code will be marked separately. The identification <CR> means the transmission of the sign Carriage Return, the identification _ the transmission of a space.

4.2.1 Send Test Values

	Transmission	Format	Length
	PC => ASM		
1	address	B4 hex	1 byte
2	control sign	11 hex	1 byte
3	control word	C	1 byte
4	ENQ data request	05 hex	1 byte
	ASM => PC		
5	STX begin data record	02 hex	1 Byte
6	power (RAM-variable 211)	211=±xxx.x_hp<CR>	14 Bytes
7	torque (RAM-variable 221)	221=±xxxx.x_lbf<CR>	16 Bytes
8	speed (RAM-Variable 209)	209=xxx.xx_mph<CR>	15 Bytes
9	ETB end of data record	17 hex	1 Byte
10	check sum EXOR- coupling from STX to ETB	xx	2 Bytes
11	$ end transmission		1 Byte

4.2.2 Send Status

	Transmission	Format	Length
	PC => ASM		
1	address	B4 hex	1 byte
2	control sign	11 hex	1 byte
3	control word	D	1 byte
4	ENQ data request	05 hex	1 byte
	ASM => PC		
5	STX begin data record	02 hex	1 byte
6	status The status of the test stand will be transmitted with 16 bytes. Therefore a byte can have the value 0 (no) or the value 1 (yes). 1 lift beam up 2 lift beam down 3 torque too high 4 ASM-speed too high 5 augmented breaking enabled 6 power too high 7 brake excess temperature 8 impule sensor error 9 short circuit 10 auto-offset-error 11 roller covers 12 restraint-system 13 bearing excess temperature 14 converter motor current and temperature 15 reserve 16 driving motor running	0 / 1	16 bytes
7	ETB end of data record	17 hex	1 byte
8	check sum EXOR- coupling from STX to ETB	xx	2 bytes

9	$ end transmission		1 byte

4.2.3 Read Variables

The PC reads out the RAM-variable (starting from variable 200) indicated by the ASM.

	Transmission	Format	Length
	PC => ASM		
1	address	B4 hex	1 Byte
2	control sign	11 hex	1 Byte
3	control word	E	1 Byte
4	variable number	xxx	3 Bytes
5	ENQ data request	05 hex	1 Byte
	ASM => PC		
6	STX begin data record	02 hex	1 Byte
7	variable	xxx=xxxx.x_xx<CR>	
8	ETB end of data record	17 hex	1 Byte
9	check sum EXOR- coupling from STX to ETB	xx	2 Bytes
10	$ end transmision		1 Byte

4.2.4 Write Variables

The RAM-variable concerned (starting at number 200) will be overwritten.

	Transmission	Format	Length
	PC => ASM		
1	address	B4 hex	1 Byte
2	control sign	11 hex	1 Byte
3	control word	F	1 Byte
4	indication of the variable number, which will be overwritten and indication of the new value	xxx=xx.xx_xx<CR>	
5	ETB end of data record	17 hex	1 Byte
6	check sum EXOR- coupling from DC1 to ETB	xx	2 Bytes
7	$ end transmision		1 Byte

The ASM checks the check sum and indicates the PC with ACK (ok) or NAK (not ok), if the check sum was correct.
If not, the data transmission will be repeated.

Example:

Variable 203 (air resistance power loss at v_ref) should be changed.

The transmission 4 has now the following format:

	Transmission	Format	Length
4	variable number and value	203=xx.xx_hp<CR>	13 bytes

4.3 Send Control Words

Control Word ASCII-identification	Command	Requirements
0	regulator off	
1	v-regulator on	Variable 200 (set value for speed regulation) must be set.
2	torque regulator on	Variable 201 (set value for torque regulation) must be set
3	drive-resitance simulation regulator on	Following variables must be set: 202 (vehicle mass), 203 (air resistance), 204 (flex resistance), 205 (rolling resistance-power loss), 212 (A_t), 213 (B_t) and 214 (C_t)
4	ASM-regulator on	
5	lift beam up	If this command is carried out, the rollers of the test stand must be at standstill.
6	lift beam down	If this command is carried out, the rollers of the test stand must be at standstill.
7	restraint-system up	If this command is carried out, the rollers of the test stand must be at standstill.
8	restraint-system down	If this command is carried out, the rollers of the test stand must be at standstill.
9	reset distance measurement	
A	augmented braking enable	
B	augmented braking disable	
C	described in paragraph 4.4	
D	described in paragraph 4.5	
E	described in paragraph 4.5	
F	described in paragraph 4.7	
G	restraint-system stop	If this command is carried out, the rollers of the test stand must be at standstill.
H	stop watch enable	Variable 207 (start speed for the stop watch 1) and 208 (final speed for the stop watch 1) must be set.
I	stop watch disable	
J	drive motor on	If this command is carried out, the rollers of the test stand must be at a stand still and the lift beam must be down (status lift beam down = ASCII 1).
K	drive motor off	
L	calibrate zero point	If this command is carried out, the rollers of the test stand must be at standstill.

Control Word ASCII-identification	Command	Requirements
M	calibrate amplification	If this command is carried out, the rollers of the test stand must be at standstill.
N	terminate zero point-/amplification calibration by storing	
O	switch on IGBT-Test	Set variable 206 (control for the brake-test).
P	switch off IGBT-Test	
Q	switch on variable-load regulator	
R	stop watch 2 enable	Variable 234 (start speed for stop watch 2) and 235 (end speed for stop watch 2) must be set.
S	stop watch 2 disable	
T	switch on auto-offset-adjustment defined	
U	switch off auto-offset-adjustment defined	
V	put auto-offset-adjustment to normal function	
X	switch on 12 V voltage	
Y	switch off 12 V voltage	
a	belt compensation on	
b	belt compensation off	

After getting the command, the test stand is sending ACK.

NOTE

If the command cannot be carried out because the requirements "rollers must be at standstill" (v-test stand ¹ 0) or "lift beam up" are not fulfilled, the test stand reports NAK.

Example:

Enable brake test

	Transmission	Format	Length
	PC => ASM		
1	address	B4 hex	1 byte
2	control sign	11 hex	1 byte
3	control word	O	1 byte
	ASM => PC		
4	ACK	06 hex	1 byte

4.4 Example of a Data Record

PC sends data record to start the ASM regulator at the Dyno.

Default:

Tire-roller losses at 15mph	=	1.14 hp
ASM power at 15 mph	=	8.50 hp
Speed ASM50/15	=	15.0 mph

Before starting the ASM 50/15 following variables must be set:

- tire-roller losses
- ASM speed and
- ASM power

The ASCII-data record is set up as follows:

- the dyno responds to address B4
- the control sign DC1 announces a data record
- the control word ´F´ signals the Dyno that the PC is sending parameters
- a parameter value consists of:
  - the variable number
  - the sign ´=´
  - a parameter value with values before the decimal point, the decimal point and values after the decimal point
  - a blank ´_´
  - and the unit.

  The parameter value ends with carriage return <CR>.
- Now other parameter values may follow:
  - end of data transmission (ETB)
  - check sum to check the data record (2 bytes)
  - the sign $, which signals the end of the data record.

Once the Dyno has received the data record, *ACK* is sent if check sum is OK, *NAK* if check sum is not OK.

	PC	ASM Test Stand
1.	address of the Dyno (Hex B4)	
2.	DC1 (Hex 11)	
3.	´F´ (PC sends parameters to dyno)	
4.	229=1.14_hp<CR> (tire-roller losses = 99.99_hp<CR>)	
7.	ETB (Hex 17)	
8.	XX (2 bytes check sum in ASCII, EXOR-coupling from DC1 to ETB)	
9.	$	ACK ACK if check sum OK End of transmission NAK if check sum not OK Repeat transmission starting from point 3.
10.	address of the dyno (Hex B4)	
11.	DC1 (Hex 11)	
12.	´F´ (PC sends parameters to dyno)	
13.	230=15.0_mph<CR> (speed ASM=999.9_mph<CR>)	
14.	ETB (Hex 17)	
15.	XX (2 bytes check sum in ASCII EXOR- coupling from DC1 to ETB)	
16.	$	ACK ACK if check sum OK End of transmission NAK if check sum not OK Repeat transmission starting from point 12.
17.	address of the dyno (Hex B4)	
18.	DC1 (Hex 11)	
19.	´F´ (PC sends parameter to dyno)	
20.	228=8.50_hp<CR> (speed ASM=99.99_hp<CR>)	
21.	ETB (Hex 17)	
22.	XX (2 bytes check sum in ASCII EXOR- coupling from DC1 to ETB)	

	PC	ASM Test Stand
23.	$	ACK ACK if check sum OK End of transmission NAK if check sum not OK Repeat transmission starting from point 3.

After setting the RAM variables, the ASM regulator is switched on with a control word:

	PC	ASM Test Stand
1.	address (Hex B4)	
2.	DC1 (Hex 11)	
3.	´4´ (ASM-regulator on)	
4.		ACK

5 Test Stand Control

5.1 Set Value for Speed Regulation

ATTENTION **The maximum brake power of the test stand is 150 hp at 125 mph (200 km/h)!!**

Any target speed can be preselected in this mode (RAM-variable 200). When the vehicle reaches the preselected speed, the eddy-current brake is activated and the preselected speed is kept constant. (max. brake power of the test stand 500 hp @ 125 mph).

Also see Figure 6-3, Speed regulator.

The testing cycle is started by accelerating the vehicle up to the desired speed.

The regulator is triggered when the speed set in variable 31 (EEPROM) is reached (default-value: 5 km/h).

Preselection of the target speed is possible between 6 and 200 km/h.

5.1.1 Procedure

ATTENTION **The RAM-Variable 200 for the target speed should only be set if the test stand rollers are at a standstill!**

5.1.1.1 Setting of Variable 200

1 Set variable 200 (Set value for speed regulator).

Example:

The variable value should be set to 40 km/h, i.e. the speed regulator will be started at 40 km/h.

	Transmission	Format
1	address	B4 hex
2	DC1	11 hex
3	control word	F = 46 hex
4	input set speed	200=_40.0_kmh<CR>= 2 = 32 hex 0 = 30 hex 0 = 30 hex = = 3D hex _ = FF hex 4 = 34 hex 0 =❻ 30 hex . = 2E hex _ = FF hex k = 6B hex m = 6D hex h = 68 hex <CR> = 0D hex
5	ETB end data set	17 hex
6	check sum EXOR- coupling from DC1 to ETB	00 hex
7	$ end transmission	

*) The unit in which the measurement values are transferred depends on the setting of variable 36 (variable 38 = 0 -> SI-units, variable 38 = 1 -> USA-units);
In the example the variable 38 has to be 0.

2 Check variable 31.

5.1.1.2 Activating the Speed Regulator

The speed regulator is activated by sending the control word.

NOTE The speed regulator should only be activated, if the test stand rollers are at a standstill. Otherwise the ASM transmits an error message (NAK).

1 Activate speed regulator with control word.

	Transmission	**Format**
	PC => ASM	
1	address	B4 hex
2	mode	11 hex
3	control word	1 = 31 hex
	ASM => PC	
	transmission	Format
4	ACK	06 hex

5.2 Target Value for Torque Regulation

ATTENTION	The applied load to the test stand may not exceed 500 hp !

In this mode any torque can be preselected (variable 201). Once the vehicle reaches a preset speed (variable 30, default-value 15 km/h), the eddy-current brake is activated holding the preselected torque constant (maximum brake power of the test stand 500 hp @ 125 mph).

See Figure 6-4, Torque regulator

The target value for torque which can be set is between 0 N and 3000 N

5.2.1 Procedure

ATTENTION	The target values may be set only while the test stand rollers are at a standstill! The regulator is activated when the speed set in variable 30 (15 km/h) is reached.

5.2.1.1 Setting Variable 201

1. Set variable 201 (target value for torque regulator).
2. Check variable 30.

5.2.1.2 Activating the Torque Regulator with Control Word

1. Activate the torque regulator with the control word.

5.3 Vehicle Mass for Drive Resistance Regulation

This value is necessary to initiate a proportional torque from the eddy-current brake at a preselected acceleration determined by the vehicle.

torque force F ~ acceleration a

F [N] = m [kg] · a [m/s^2]

Torque selection is possible between 0 kg and 4000 kg.

5.3.1 Setting Variable 202

1 Data set "Write variables "
(4) 202=1250_kg<CR>

If this value is assigned to the variable, a target vehicle mass of 1250 kg is preset.

5.4 Vehicle Resistance Coefficients

The vehicle loading coefficients are set in the variables 203 - 205. The total resistance coefficient is calculated as follows:

$$THP = A_V + B_V + C_V$$

$$THP = IHP + PLHP + GTRL$$

THP	=	Total horsepower
IHP	=	Indicated horsepower
PLHP	=	Parasitic loss horsepower
GTRL	=	Generic tire roll losses

5.4.1 Vehicle Resistance Coefficient C_V

The value C_V is required for the calculation of the air-resistance power loss. During the drive resistance simulation test, this value is used to simulate the vehicle resistance C_V which arises at the preselected speed v_ref (50 mph; 80 km/h).

The preselection is possible between 0 and 99,99 hp.

5.4.1.1 Setting Variable 203

1 Data set "Write variables"
(4) 203=30_hp<CR>

If this value is assigned to variable 203, C_V = 0,3 hp is preset.

5.4.2 Vehicle Resistance Coefficient B_V

This value is required for the calculation of the flex resistance power loss. During the drive resistance simulation test, this value is used to simulate the vehicle resistance B_V which arises at the preselected speed v_ref (50 mph; 80 km/h).

The preselection is possible between 0 and 99,99 hp.

5.4.2.1 Setting Variable 204

1 Data set "Write variables "
(4) 204=100_hp<CR>

If this value is assigned to variable 204, B_V = 1,0 hp is preset.

5.4.3 Vehicle Resistance Coefficient A_V

This value is required for the calculation of the rolling resistance power loss. During the drive resistance simulation test, this value is used to simulate the vehicle resistance A_V which arises at the preselected speed v_ref
(50 mph; 80 km/h).

The preselection is possible between 0 and 99,99 hp

5.4.3.1 Setting Variable 205

1 Data set "Write variables"
(4) 205=80_hp<CR>

If this value is assigned to variable 205, A_V = 0,8 hp is preset.

5.5 Eddy-Current Brake Function Test (Variable 106)

The eddy-current-brake function test (IGBT-Test; Insulated Gate Bipolar Transistor) is designed for test and service purposes only. The IGBT-test checks the power controller with the eddy-current-brake.

ATTENTION **Only specially trained service technicians are allowed to use the IGBT-test!**
The IGBT-test should not be used during a normal vehicle test cycle!

Variablen 206 controls the IGBT-Test. It is possible to set a value between 0 (no control) and 255 (corresponds to 100% control).

The IGBT-Test is activated/deactivated with control words.

5.5.1 Setting Variable 206

Example:

1 Data set "Write variables
(4) 206=255<CR> => 100%-control = 100% power

2 Activate IGBT-Test: Data set "Send control word": (3) O

3 Deactivate IGBT-Test: Data set "Send control word": (3) P

Eddy-current brake control	Variable value 206
0%	0
10%	26
20%	51
30%	77
40%	102
50%	128
60%	153
70%	179
80%	204
90%	230
100%	255

5.6 Tire-Roll Losses GTRL (Generic Tire Roll Losses)

5.6.1 Tire-Roll Losses Coefficient A_t

This value is needed when doing a driving resistance simulation to compensate for the losses which occur between tires and test stand rollers. (e.g. tire/roll loss)

Preselection is possible between 0 and 99,99 hp.

5.6.1.1 Setting Variable 212

1 Data set "Write variables"
(4) 212=80_hp<CR>

If this value is assigned to variable 212, A_t = 0,8 hp is set.

5.6.2 Tire-Roll Losses Coefficient B_t

This value is needed when doing a driving resistance simulation to compensate for the losses which occur between tires and test stand rollers. (e.g. tire/roll loss)

Preselection is possible between 0 and 99,99 hp.

5.6.2.1 Setting Variable 213

1 Data set "Write variables"
(4) 213=100_hp<CR>

If this value is assigned to variable, B_t = 1,0 hp is set.

5.6.3 Tire-Roll Losses Coefficient C_t

This value is needed when doing a driving resistance simulation to compensate for the losses which occur between tires and test stand rollers. (e.g. tire/roll loss)

Preselection is possible between 0 and 99,99 hp.

5.6.3.1 Setting Variable 214

1 Data set "Write variables "
(4) 214=30_hp<CR>

If this value is assigned to variable 214, C_t = 0,3 hp is set.

NOTE The GTRL can be determined depending on the axle weight of the test vehicle. This requires a weighing device which is optionally available.

6 Service-Programm

6.1 ASM-Program Installation

NOTE

For the installation of the DOS-Version, please also observe the instructions in appendix A, DOS Service-Program.

When installing the ASM program under Windows, the directory „asm“ will automatically be created.
There are 8 other sub-directories and 14 files in the „asm“ directory.

The program group ASM is automatically estabalished in the program ASM in the program manager.

The start file can be found in the directory c:\ASM\bin\asm.exe.

1 Start Windows.

2 Insert the installation disk in the disk drive a:\.

3 Activate the command "Execute" in the program-manager in the menu "File".

4 Enter the path a:\setup in the input field which appears.

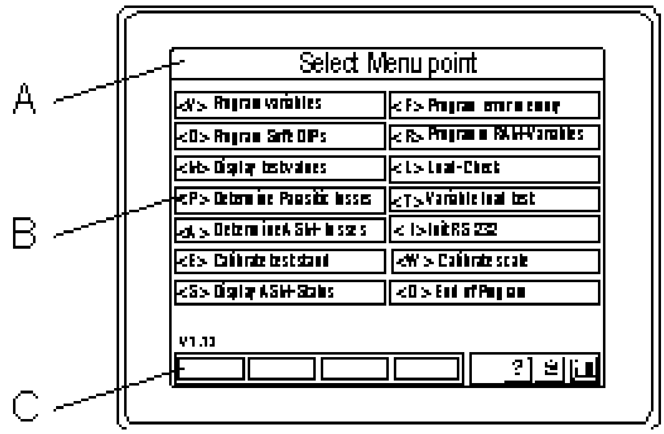
The connection to the ASM is via the 9-pin D-sub socket of the ASM-PCB. (Connector X8) and the serial interface of the PC.

The interface COM 2 is given as a basic setting in the file c:/asm/bin/asm.ini in the ASM-PC- program. If this interface is not available in the PC, the program must be changed accordingly.

In addition check the setting of the interface using the Control Panel
(see paragraph 4).

6.2 Calling up and Operation of the Service Program

The main menu will appear after the program has been started::

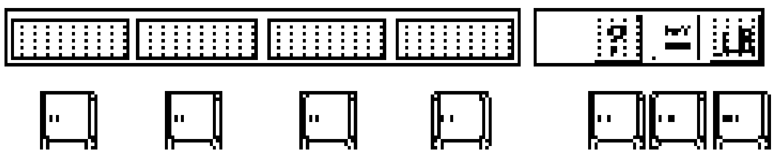


A status line
The name of the menu appears in this line as well as further instructions

B middle range

C button bar

The button bar is the same in all menu points. The buttons correspond with the following keys:

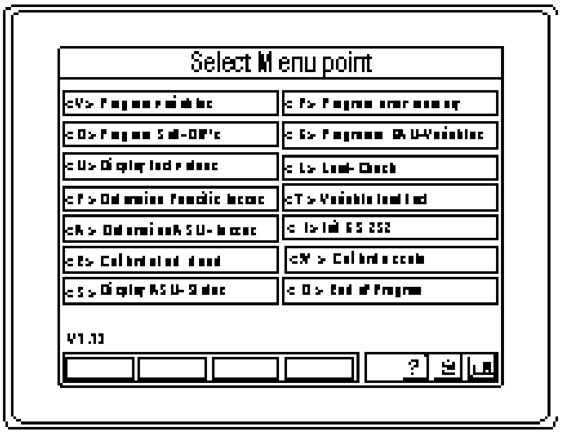


The menu can be operated with the mouse or the keyboard.

The keys and/or buttons for Help (<F1>) and for printing (<F12>) are integrated only in the screens but not yet in the program. i.e. they re not yet assigned.

6.3 Main Menu

The menu points displayed can be called up from the main menu.



6.3.1 Call up Menu Points

1 Call up menu point.

Key <V> for programming variables
<D> for programming Soft-dip switches
<M> for displaying test values
<P> for determining parasitic losses
<A> for determining ASM-losses
<E> for calibrating the test stand
<S> for displaying ASM-status
<F> for programming error memory
<R> for programming RAM-variables
<L> for load-check
<T> for variable load test
< I> for Init RS 232
<W> for calibrating scale
<Q> for program-end

or

2 Click desired menu point.

6.3.2 End ASM-PC-Program

1 Press <Q> key.

or

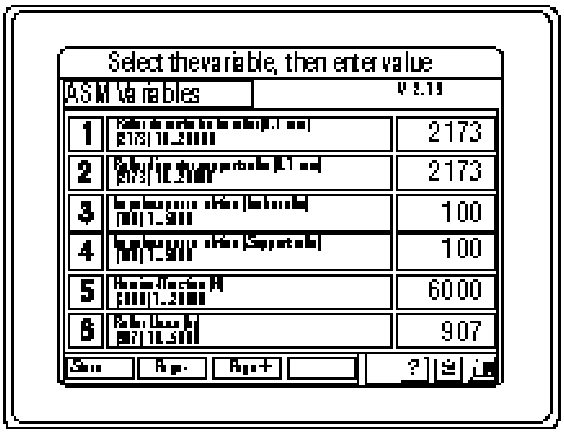
2 Click menu point <Q> program-end.

NOTE

This button is deactivated.
The program can not be exitted once this button has been clicked on.

6.4 Program Variables

After this menu point has been selected, the ASM-Variables (EEPROM) will be loaded. A list of the EEPROM-Variables can be found in chapter 10.



6.4.1 Variable durchblättern

1 Page forward 20 variables: Press <F7> key,
Page back 20 variables: Press <F6> key,
Go to the first screen: Press <Pos1> key,
Go to the last screen: Press <End> key.

2 Display next page: Click on <Page -> button
Display previous page: Click on <Page +>

6.4.2 Select Variables

1 Use cursor keys <↓> or <↑>

2 Auf den Wert der gewünschten Variablen klicken.

6.4.3 Change Variables

The variable value can be changed once the variable has been selected. The value will then be highlighted red. A black cursor is located after the variable value..

1 Select variable.

2 Use the < ← > or < → > key to position the cursor at the desired position.

3 Enter the new value using the digit keys.

6.4.3.1 Return to Main Menu without Storing

1 Press <ESC> key..

2 Click this button

6.4.3.2 Storing Changed Variable Values

1 Press <F5> key

2 Enter Code number: **9864**.

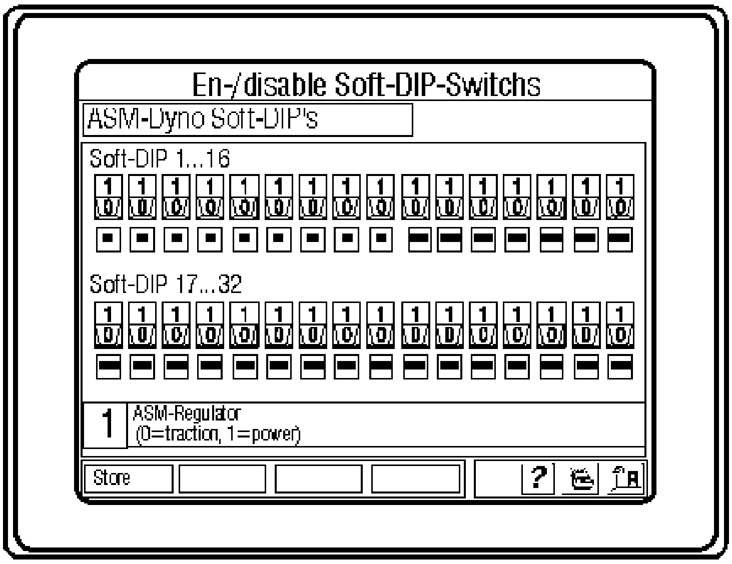
Press <Enter> key.

3 Click the <Store> button.

The changed variable values will be stored and the menu point will be ended.

6.5 Program Soft-Dips

The soft-dip switch will be displayed after selecting this menu point.



The Soft-Dips 1-9 are assigned as follows:

1	ASM-regulator	0 = torque 1 = power
2	speed reference from variable load-regulator	0 = speed from the table 1 = actual speed
3	torque display	0 = torque not displayed at 0 km/h 1 = torque displayed at 0 km/h
4	auto-offset-alignment of torque with rollers at standstill	0 = not possible 1 = possible
5	compensation methods of parasitic losses during ASM-test	0 = parasitic losses at 15/25 mph 1 = compensation with ABC-coefficients
6	reverse calibration	0 = forward calibration 1 = reverse calibration
7	automatic lift beam down	0 = disable 1 = enable
8	polynom degree for determination of parasitic losses	0 = polynom 2nd degree 1 = polynom 3rd degree
9	scale on	0 = disable 1 = enable

10	belt protection	0 = not possible 1 = possible
11	speed sensor check	0 = not possible 1 = possible
12	acceleration plausibility check	0 = not possible 1 = possible
13	performance dyno	0 = no 1 =yes
14	limitation of neg. nominal data for drive resistance regulator	0 = no 1 = yes

6.5.1 Select Soft-Dips

1 Use the < ← > or < → > key to position the cursor at the desired position.

2 Click the number of the desired softdip. The Soft-Dip will be simultaneously toggled.

The selected softdip will be highlighted green.

6.5.1.1 Enable/Disable Soft-Dips

1 Press <Enter> or <Return> key.

2 Click on the number of the desired Soft-Dip.

6.5.1.2 Return to Main Menu without Storing

1 Press <ESC> key.

2 Click on the  button.

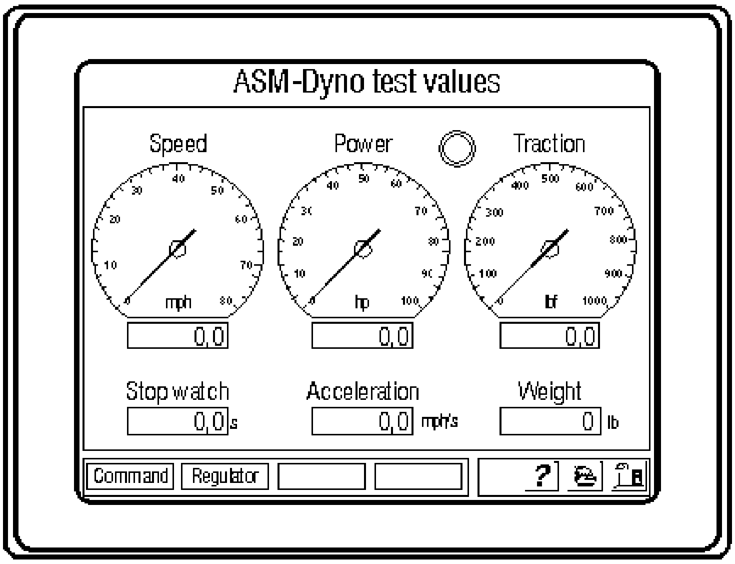
6.5.1.3 Storing Changed Soft-Dip Settings

1 Press <F5> key.

2 Click on the button <Store>.

If this button is selected the Soft-Dip settings will be stored and the menu point will be ended.

6.6 Display Test Values



6.6.1 Call up Menu Points

6.6.1.1 Call up the Menu Point *SELECT COMMAND*

1 Press <F5> key.

2 Click on the <Command> button.

6.6.1.2 Call up the Menu Point *SELECT REGULATOR*

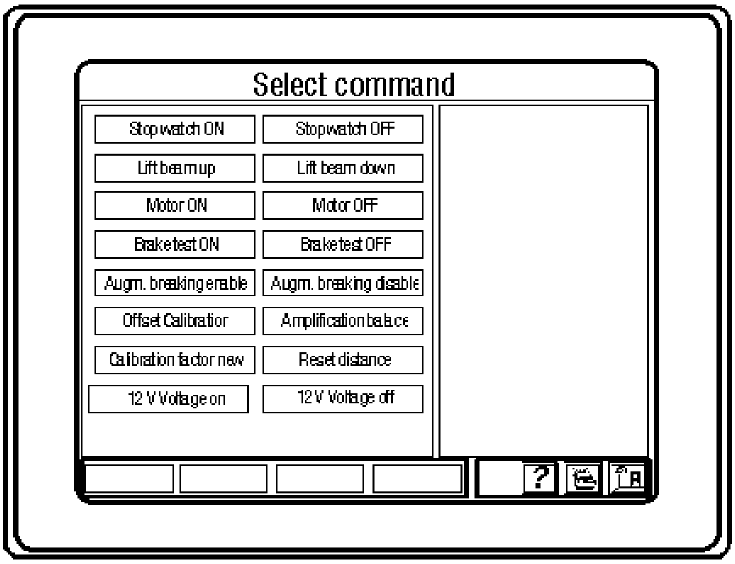
1 Press <F6> key.

2 Click on the <Command> button.

If the total torque exceeds 3000N,
a warning appears on the screen.

6.6.2 Select Commands

After selecting this menu point various commands can be given.

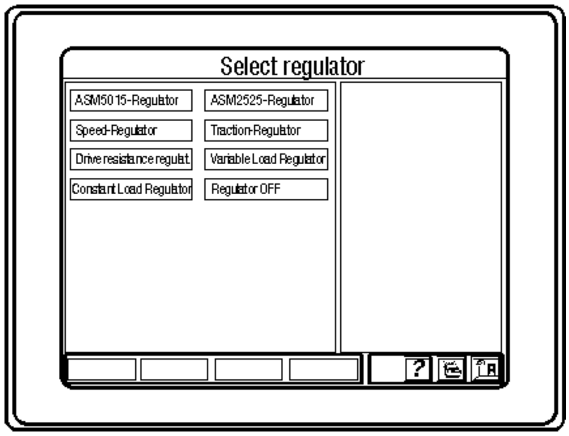


6.6.2.1 Select Command and Start

1. Select Command with the cursor keys and start with the <Return> or <Enter> key.
2. Click on the desired command.

6.6.3 Select Regulator

After this menu point has been called up various regulators can be selected:



The following regulators are most important for the operation of the ASM

- ASM 5015
- ASM 2525

6.6.3.1 Select and Activate Regulator

1 Select the regulator using the cursor keys and activate with the <Return> or <Enter> key.

2 Click on the desired regulator.

NOTE

Depending on the regulator which has been selected certain data must be entered:

- ASM 5015-Regler
  hp-Setting
  Losses Tires/Roller [hp]

- ASM 2525-Regler
  hp-Setting
  Losses Tires/Roller [hp]

- Speed-regulator
  Speed target value [mph]

- Torque-regulator
  Torque target value
  At, Bt, Ct: Losses Tires/Roller[hp]

- Drive resistance-regulator
  Mass [lb]
  Roller resistance-loss power Av
  Flex resistance- loss power Bv
  Air resistance-loss power Cv

- Variable load regulator
  Constant load regler
  hp-Setting Losses Tires/Roller [hp]

The variables will be set based on the data which is entered here.

6.6.3.2 Regulator Diagram

Abbreviations:

THP = total horsepower (tire losses and parasitics) for an ASM test
IHP = determined values which are to be set
PLHP = parasitic losses due to internal friction
GTRL = general tire/roll losses (flex losses)

Figure 6-1 ASM 5015-regulator

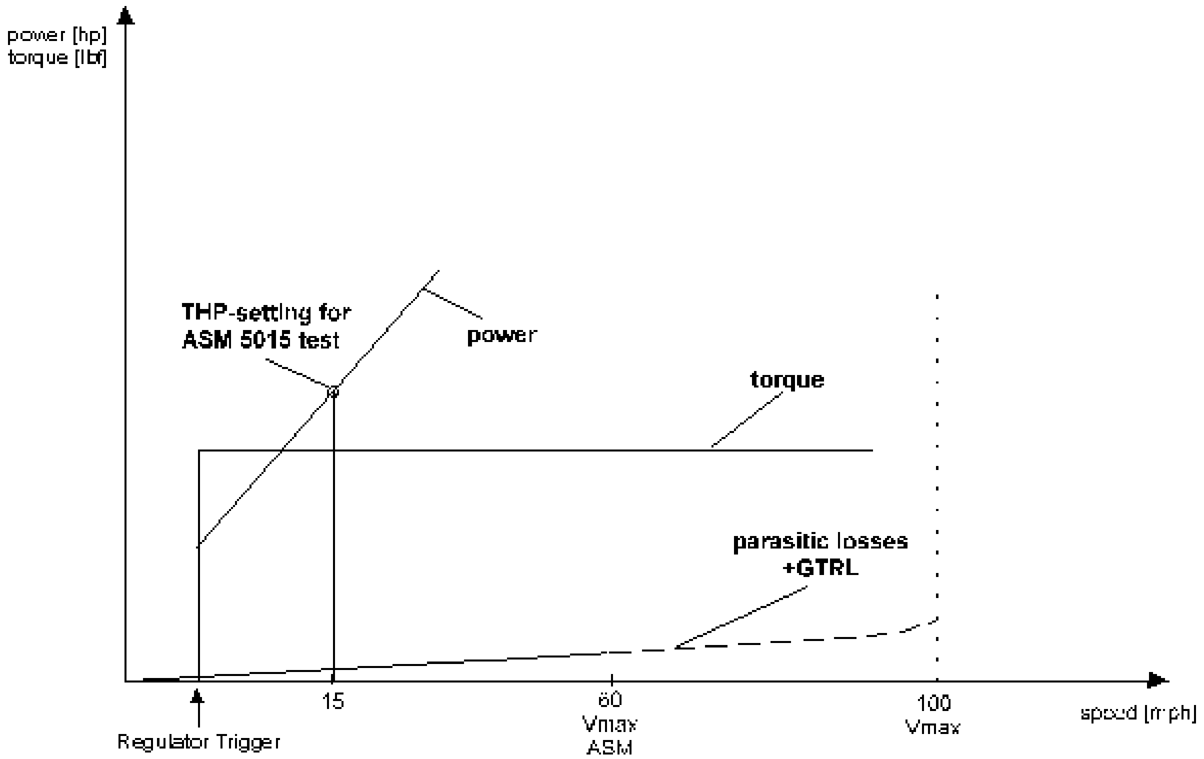


Figure 6-2 ASM 2525-regulator

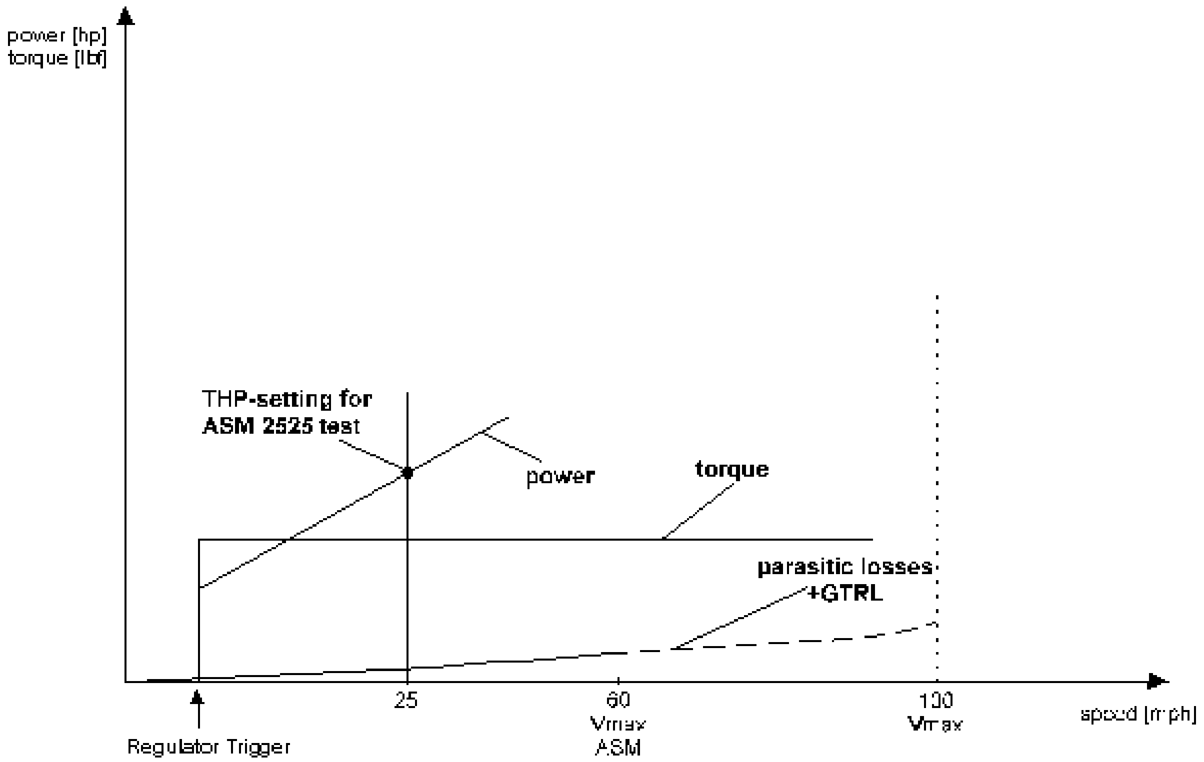


Figure 6-3 Speed regulator

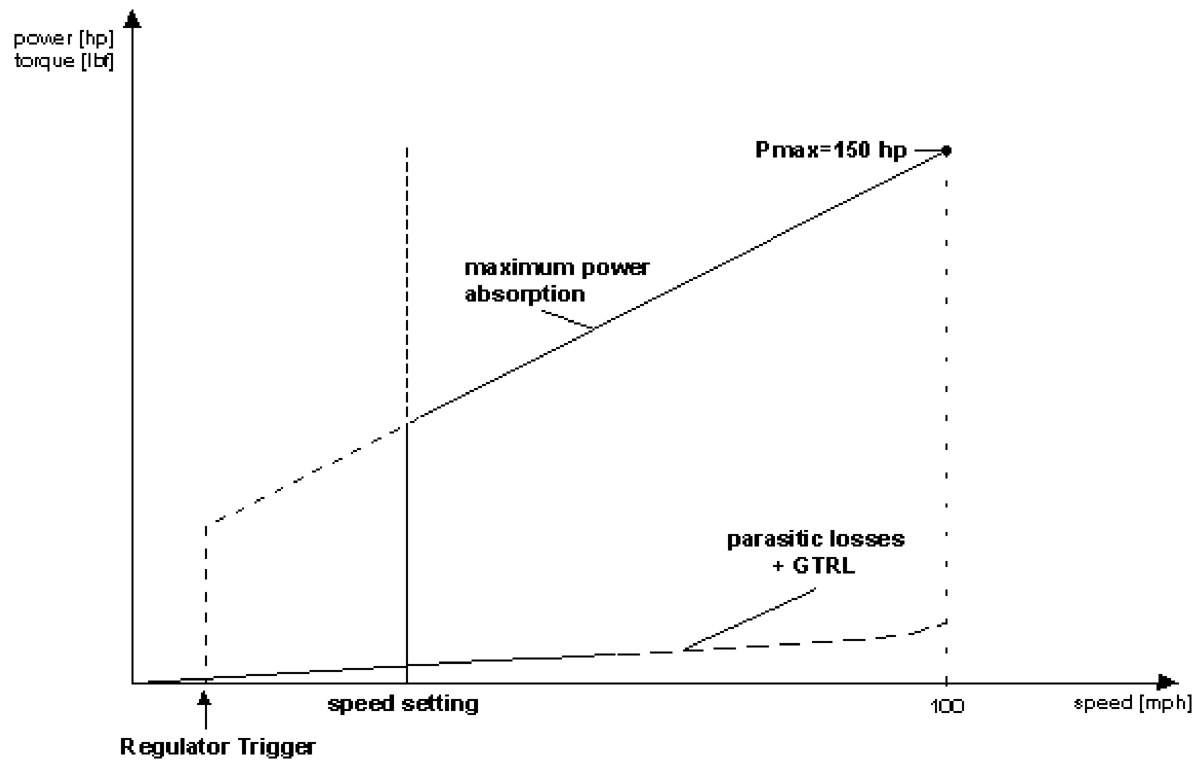


Figure 6-4 Traction regulator

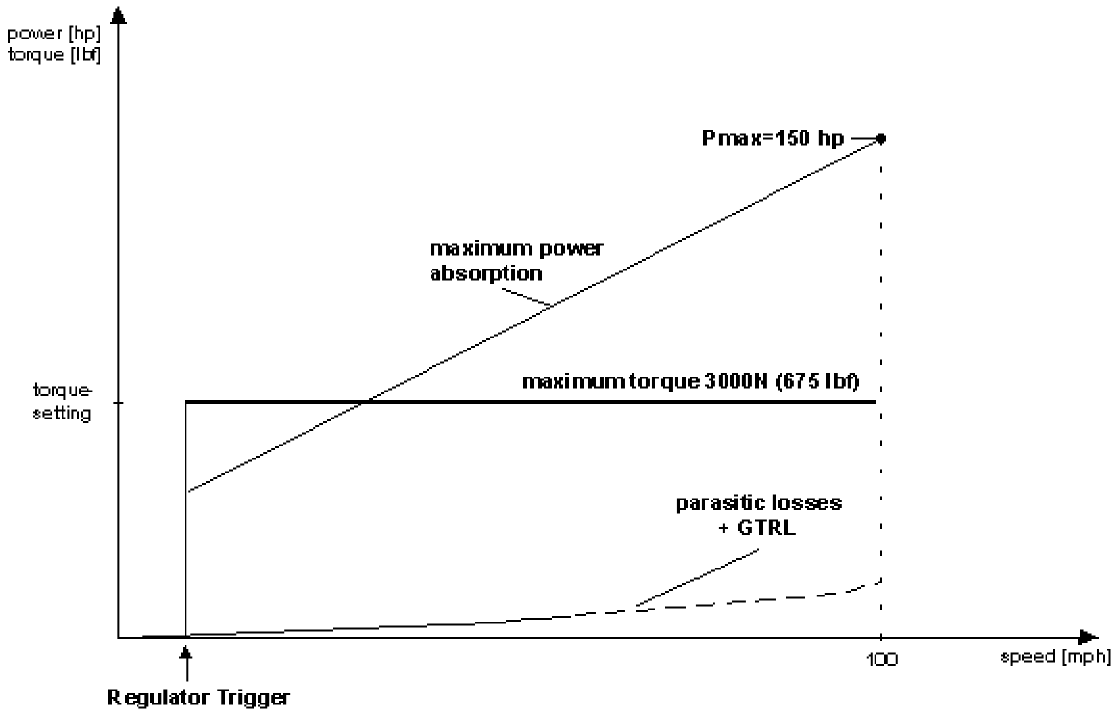


Figure 6-5 Drive-resistance regulator

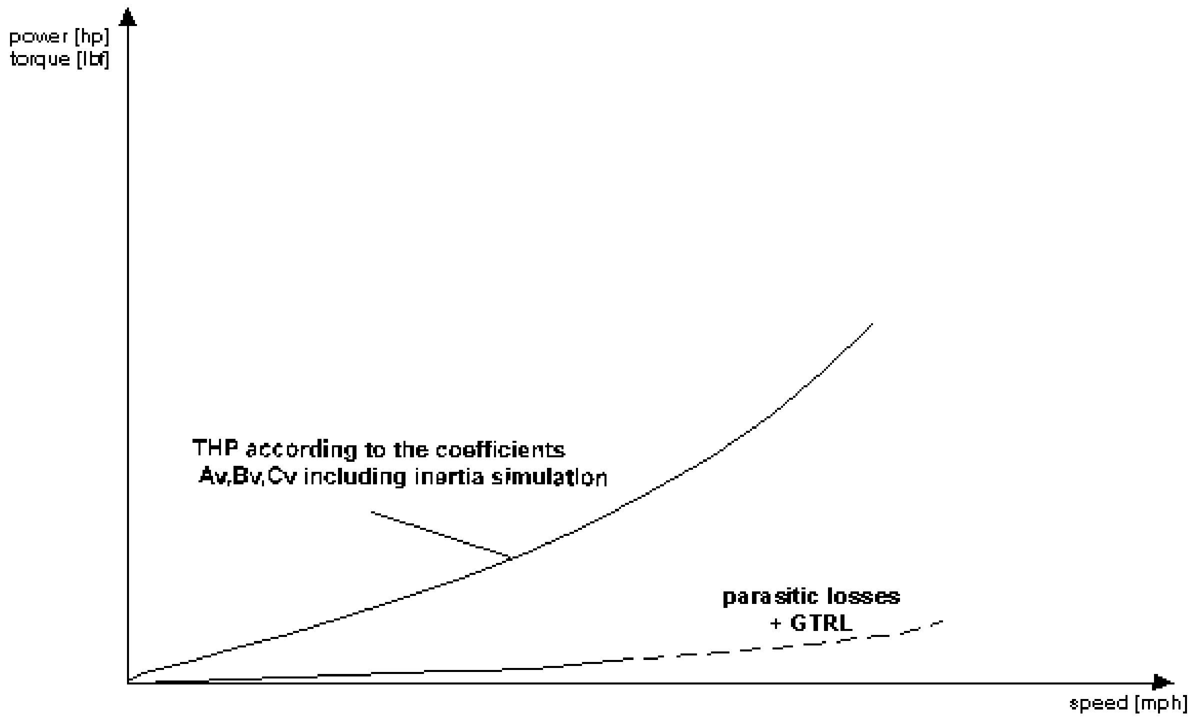
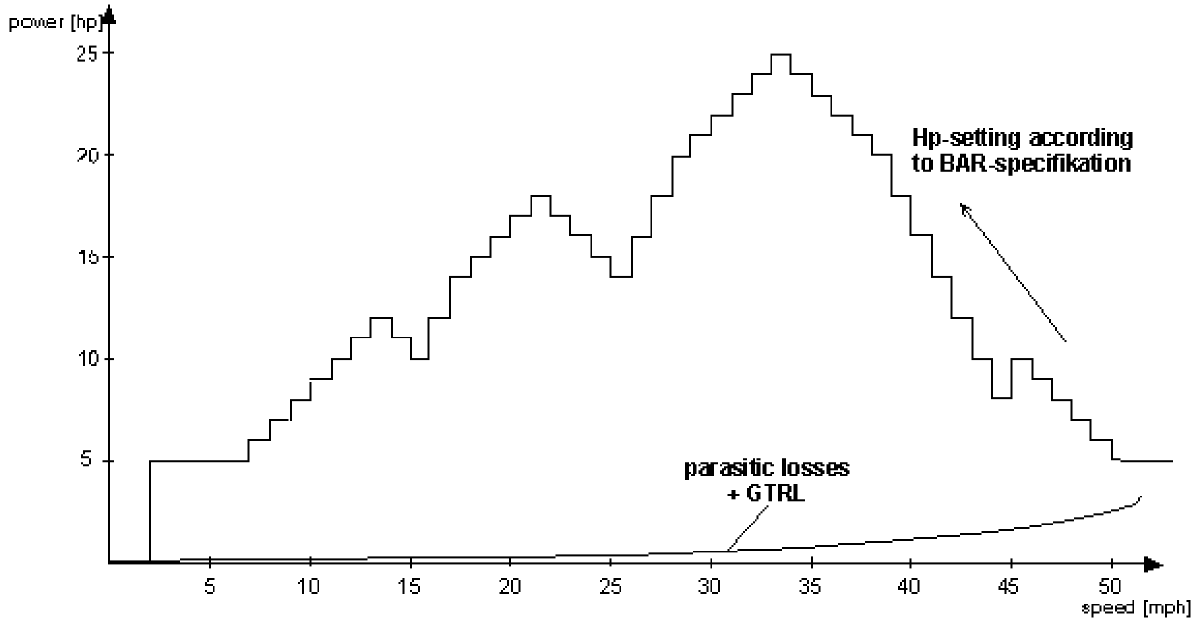


Figure 6-6 **Variable-load regulator**



SPEED	HPLOAD
50	5
49	6
48	7
47	8
46	9
45	10
44	8
43	10
42	12
41	14
40	16
39	18
38	20
37	21
36	22
35	23

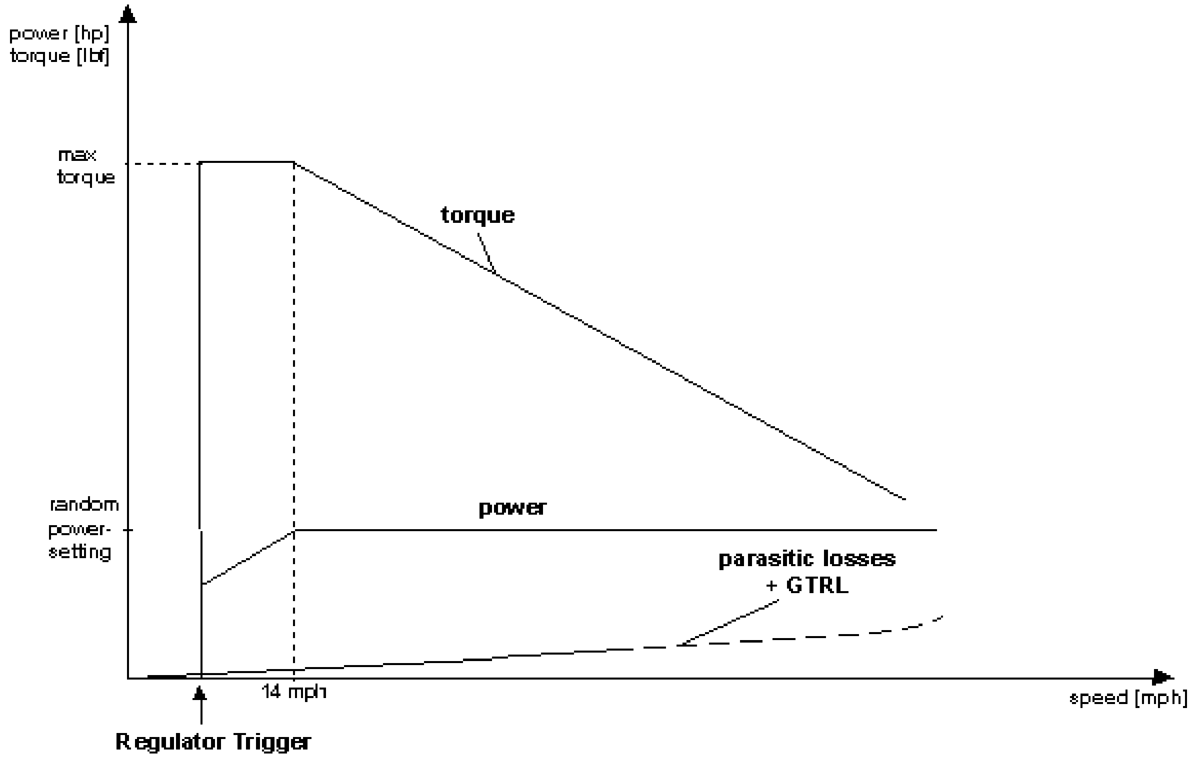
SPEED	HPLOAD
34	24
33	25
32	24
31	23
30	22
29	21
28	20
27	18
26	16
25	14
24	15
23	16
22	17
21	18
20	17

SPEED	HPLOAD
19	16
18	15
17	14
16	12
15	10
14	11
13	12
12	11
11	10
10	9
9	8
8	7
7	6
6	5
5	5

Initial Speed	Final Speed	Nominal Time*	Tolerance
50.00	5.00	25.31	4.00%
45.00	10.00	15.35	2.00%
38.00	27.00	3.92	3.00%

* calculated for flywheel mass of 2000 lbs

Figure 6-7 **Constant-Load Regulator**



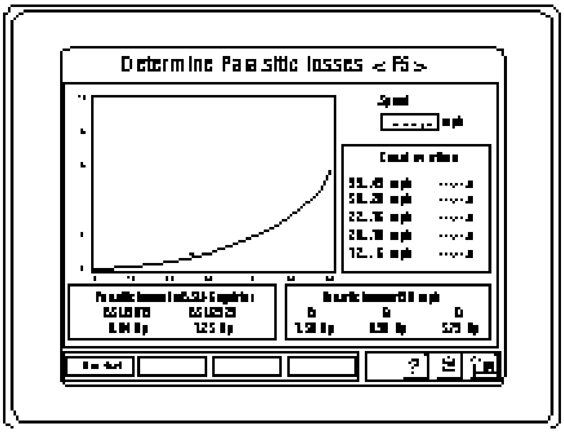
6.7 Determine Parasitic Losses

The determination of the parasitic losses must take place after each installation / commissioning.

1 Calibration of the measurement sensor.

2 Determining the parasitic losses.

3 Conduct a Load-Check to check the losses.



The rollers are accelerated to a speed of 33 mph for the coast down trial used to determine the parasitic losses.
The regulator is switched off once the speed is reached. The time it takes to reach a speed of 30 mph is monitored using the internal stop watch.

This trial is carried out for various speed ranges.

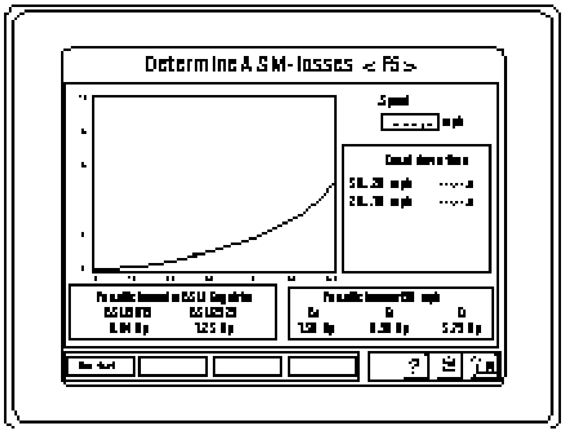
The parasitic losses are determined using these time values. The variable 51 51 (A_p), 52 (B_p) and 53 (C_p) are described using these losses.

6.8 Determine ASM-Losses

NOTE

The ASM-losses will only be defined if the rollers are at standstill when point *New Test* was selected.

The determination of the ASM-losses must take place in the pre-set time intervals set down in the BAR 97-specifications.



The ASM-losses are also determined by a coast down trial. The rollers are accelerated to a speed somewhat higher than 30 mph through the built in motors. After the speed has been reached the regulator will be switched off. An internal stop watch monitors the time it takes to reach the speed of 20 mph. This trial will also be conducted for the speed range 20 mph - 10 mph.

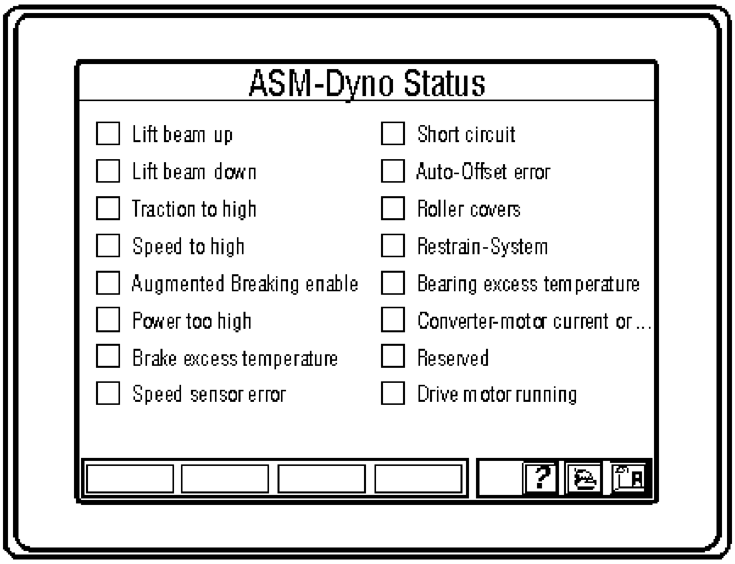
The ASM losses with the reference speeds of v = 25 mph and v = 15 mph are set with help of the determined time values.

6.9 Calibrate Test Stand

The calibration procedure is described in paragraph 7.2.

6.10 Display ASM-Status

The status of the test stand is displayed in this menu point.



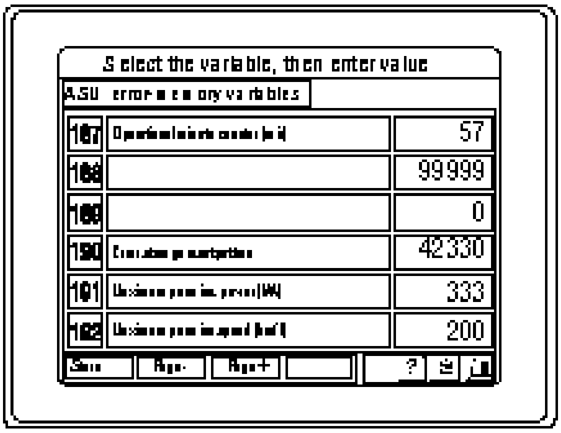
Also see paragraph 4.2.2 „Send Status“.

6.11 Program Error Memory

After selecting this menu point the EEPROM-Variables 187 - 199 are loaded. A list of the EEPROM-Variables can be found in chapter 10.

NOTE

These variables can only be read. A password is necessary in order to reverse-set the error variables.



6.11.1 Page through Variables

1 Page forward through variables: Press <F7>key,
Page backward through variables: Press <F6> key,
Go to the first screen: Press <Pos1> key,
Go to the last screen: Press <End> key.

2 Display next page: Click on <Page -> button,
Display previous page: Click on <Page +> button

6.11.2 Select Variables

1 Use cursor keys <↓> or <↑>.

2 Click on the desired variable value

6.11.3 Change Variables

The variable value can be changed once the variable has been selected. The value will then be highlighted red. A black cursor is located after the variable value.

1 Select variable.

2 Use the < ← > or < → > key to position the cursor at the desired position.

3 Enter the new value using the digit keys

6.11.3.1 Return to Main Menu without Storing

1 Press <ESC> key.

2 Click on the button.

6.11.3.2 Storing the Changed Variable Value

1 Press <F5> key

2 Click on the <Store> button

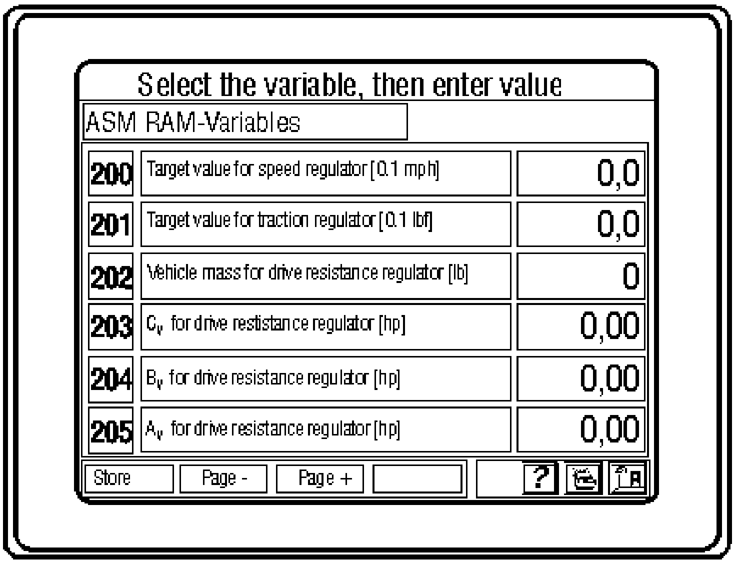
The changed values will be stored and the menu point ended.

3 Enter Code number 7080 and confirm <Enter>.

4 The changed values will be stored and the menu point ended.

6.12 Program RAM-Variables

After selecting this menu point the RAM-Variables are loaded. A list of the RAM-Variables can be found in Chapter10.



6.12.1 Page through Variables

1. Page forward through variables: Press <F7>key,
   Page backward through variables: Press <F6> key,
   Go to the first screen: Press <Pos1> key,
   Go to the last screen: Press <End> key.
2. Display next page: Click on <Page -> button
   Display previous page: Click on <Page +> button

6.12.2 Select Variables

1. Use cursor keys <↓> or <↑>.
2. Click on the desired variable value

6.12.3 Change Variables

The variable value can be changed once the variable has been selected. The value will then be highlighted red. A black cursor is located after the variable value.

1 Select variable.

2 Use the < ← > or < → > key to position the cursor at the desired position.

3 Enter the new value using the digit keys.

6.12.3.1 Return to Main Menu without Storing

1 Taste <ESC> drücken.

2 Click on the button..

6.12.3.2 Storing Changed Variable Values

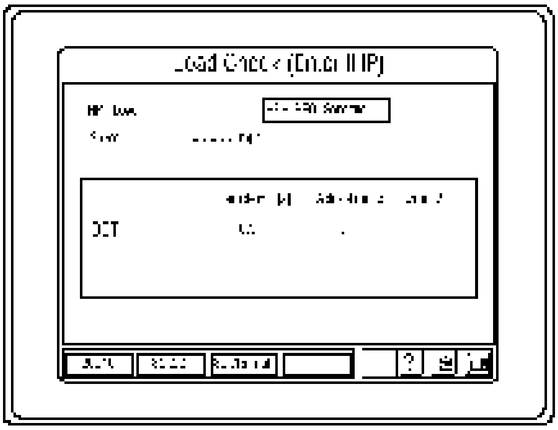
1 Press <F5> key

2 Click on the <Store> button.

The changed variable values are stored and the menu point is ended.

6.13 Load Check

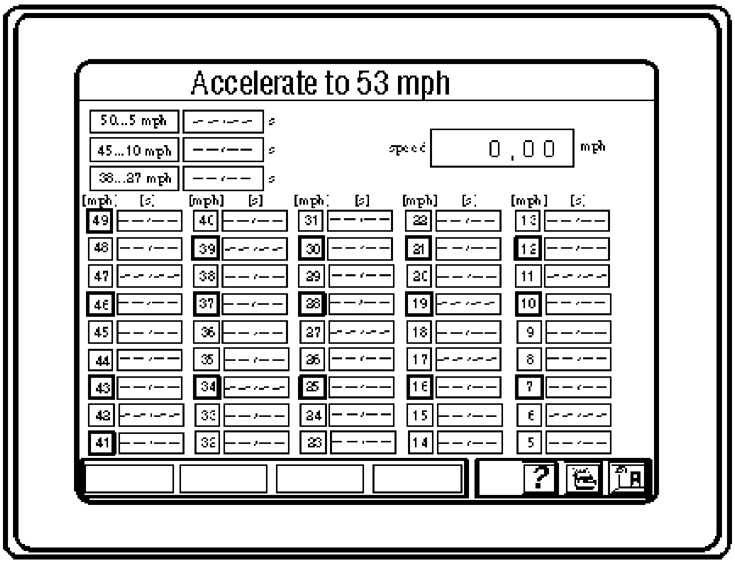
The load check must take place in the pre-set time intervals set down in the BAR 97-specifications. A power of between 8 - 18 hp can be entered for the load check or can be set using the random sequence generator.



The coast down times DET (25 mph / 15 mph) are determined under load by a coast down trial. Depending on the pre-selected power there is a target time for these times. The test stand determines the actual time using an internal stop watch. The error is calculated using both these times. This error must be within the pre-set error tolerance limits specified in BAR 97 specifications.

If this limit is exceeded the test stand must be calibrated again.

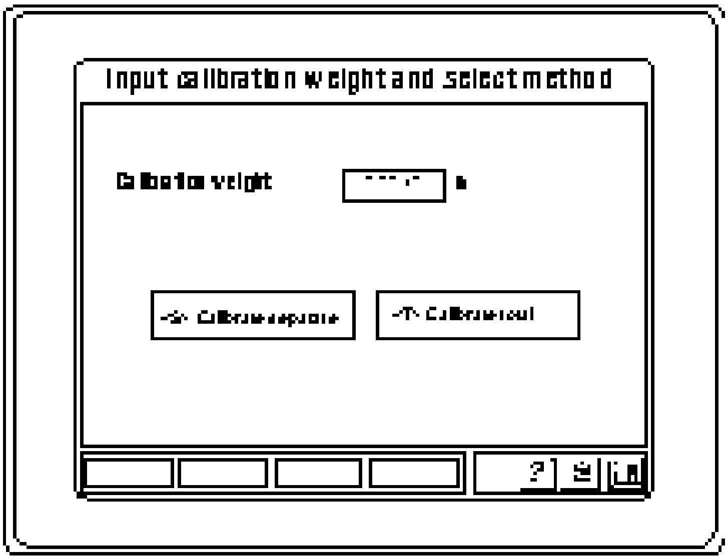
6.14 Variable load test



The test stand is accelerated with an external drive to ca. 53 mph. After the drive has been switched off the roller set is allowed to coast down. The Variable-Load-Regulator is triggered at 50 mph as shown in Figure 6-1. The times in the respective speed windows is determined by decelerating the test stand.

6.15 Weighing Scale Calibration

Periodically it may be necessary to verify that the weighing scales accurately measure the weight that is placed onto the dyno. For that purpose, weight scale calibration is possible.



There are two possible ways of calibrating for accuracy the weighing scales; calibrate total weight and calibrate separate.

6.15.1 Calibrate Total Weight

For this method, a known reference weight, such as a car axle, is used and confirmed on the scales.

6.15.2 Calibrate Separate

For this method a calibration tool, specifically designed for this purpose, is used.

7 Calibration

ATTENTION **At the beginning of a calibration, all variables must be checked for their correct setting.**

7.1 Basic Mechanical Setting

Before the electronic calibration may be started, several mechanical basic settings must be carried out first.

- the strain gauge is adjusted as described in paragraph 8.5.2

- the RPM sensor is adjusted as described in paragraph 8.4.2

- the roller brake is adjusted as described in the paragraphs 8,7.4 and 8.7.5.2.

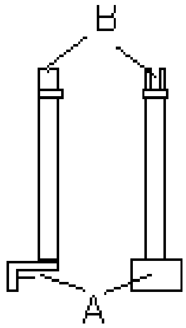
- the air pressure supply line is connected as described in paragraph 2.5.1.

7.2 ASM Calibration

7.2.1 ASM Calibration Device

The test stand will be calibrated with the help of a special calibration device. The stator of the eddy-current brake will be loaded with a pre-determined force. The applied force is measured by a wire strain gauge and can be used as a reference value.

The calibration device consists of:

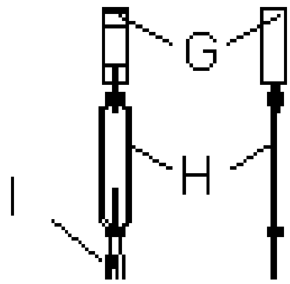


Pick-up attachment for the calibration arm

A	fasten the pick-up attachment to the side plate of the ASM
B	take-up for the calibration arm

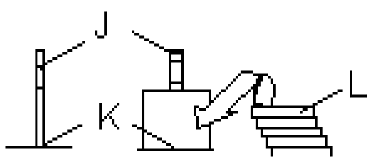
Calibration arm

C	notch for turnbuckle
D	place the calibration device onto the pick-up attachment
E	water level indicator
F	notch for calibration weight box



Tension belt

G	fasten the tension belt to the calibration arm
H	turnbuckle
I	fasten the tension belt to the stator of the eddy-current brake

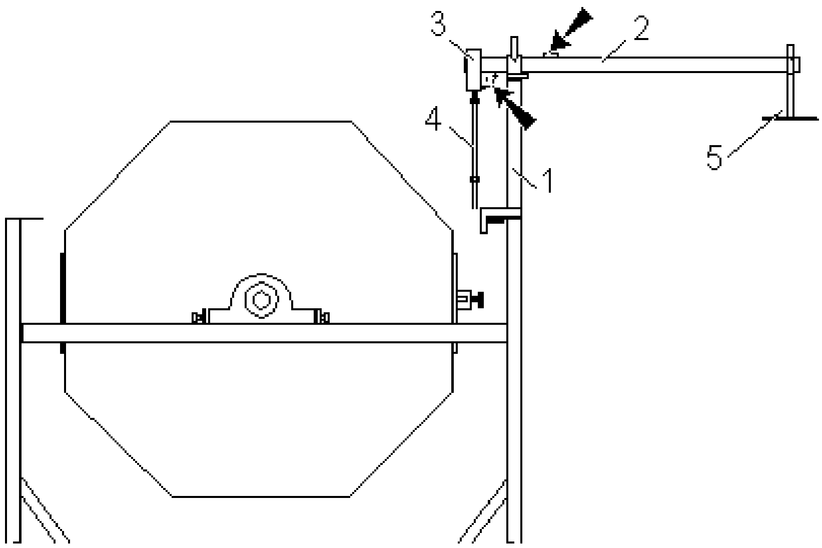


Box for the calibration weights

J	hook up the box onto the calibration arm
K	receiving for wheel weights
L	wheel weights (per weight 135 lbf, accuracy: ± 0.5%) Each wheel weight simulates a test stand torque of 600N.

7.2.2 ASM Calibration Device Installation

Figure 7-1 **Installation of the calibration device**



1 Loosen the tension belt from the stator and fasten it to the turnbuckle (4) (3, Figure 7-1).

2 Hook up the turnbuckle onto the calibration arm.

3 Shift the pick-up attachment for the calibration arm to the side plate.
Pay attention to the guide rail of the pick-up attachment.
Pick-up attachment and stator must be aligned with each other.

4 Position the calibration arm (2) onto the respective marking and align the arm centrally.
Make sure that the calibration arm does not touch the lateral sides of the pick-up attachment.

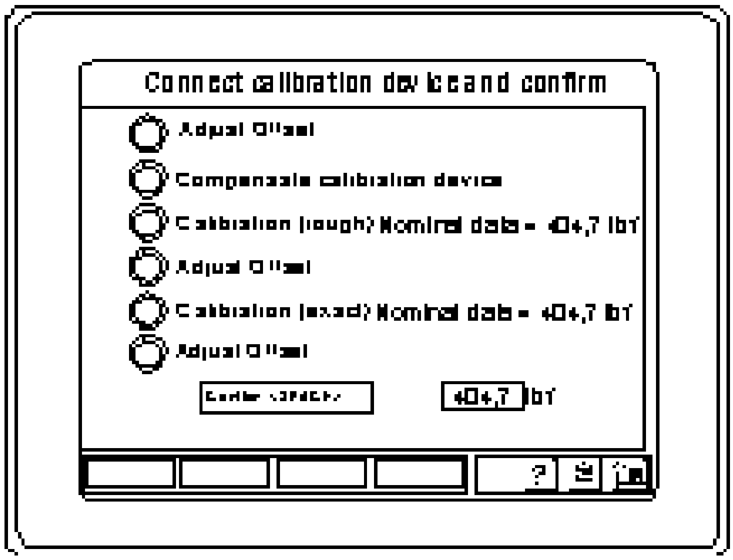
5 Now adjust the calibration device by using a spirit level.
Adjust the calibration arm to a horizontal position by using the tightener (4).

6 Hook up the calibration weight box (5) onto the respective marking and align the calibration device again.

7.2.3 Description

The calibration is executed in the Service-Program after the menu point *Calibrate Test Stand* has been called up (described in chapter 6).

The instructions appearing in the status line of the screen will guide the user through the calibration program. A light control method indicates if the test stand has terminated the respective calibration step (the light switches to green) or not (light switches to red).



7.2.4 Procedure

1 Call up calibration menu.

2 Press <Space> key.
ADJUST OFFSET will be displayed.

3 Install the calibration device and balance as described before.

4 Press <Space> key.
COMPENSATE CALIBRATION DEVICE appears

5 Place 5 weights then balance (Variable 88 =18000).

6 Press <Space> key.
CALIBRATION ROUGH will be displayed.

7 Remove all weights then balance.

8 Press <Space> key.
ADJUST OFFSET appears.

9 Place 5 calibration weights and balance.

10 Press <Space> key.
CALIBRATION EXACT appears.

11 Remove weights and the calibration device.

12 Press <Space> key.
ADJUST OFFSET is shown.

NOTE

If an EPROM-Reset is done before the calibration variable set specifically for the ASM-Performance must be set again after the calibration.

7.3 Weighing Scale Calibration

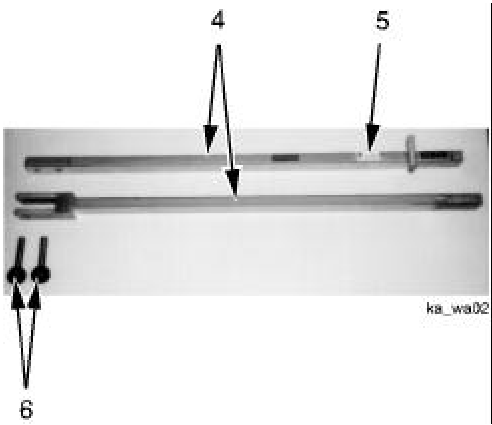
7.3.1 Weighing Scale Calibration Device

The weighing scale will be calibrated with the help of a calibration device. During calibration, the weighing cells will be loaded with a predetermined force.

The calibration device consists of:

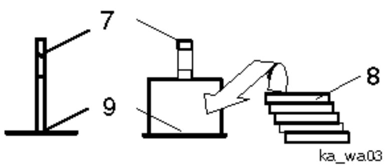
Pick-up attachment for the calibration arm

1 + 3 take-up for the calibration arm
2 hook up the calibration device onto the square tube



Calibration arm

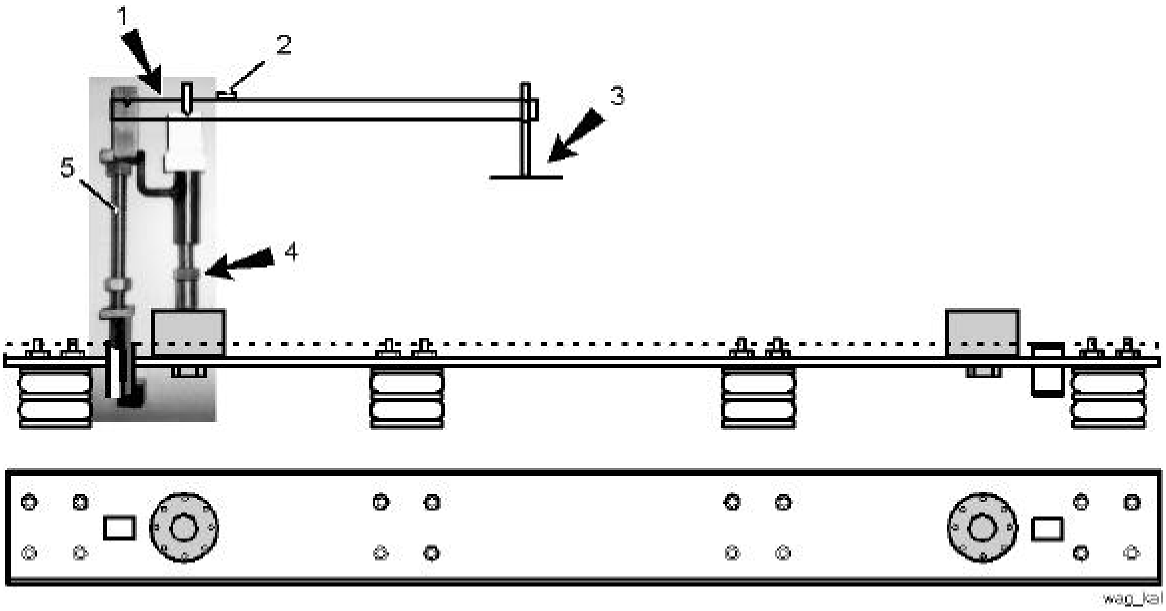
4 calibration arm
5 spirit level
6 insert pins



Box for calibration weights
7 hook up the box onto the calibration arm
8 weights (per weight 1970 g)
9 receiving for wheel weights

7.3.2 Installation of the Weighing Scale Calibration Device

Figure 7-2 **Installation of the calibration device**



1 Insert the calibration device into the square tube as shown in Figure 7-2 and lock with a nut.

2 Hook up the calibration arm (1) and align the arm centrally.
Make sure that the calibration arm does not touch the lateral sides of the pick-up attachment.

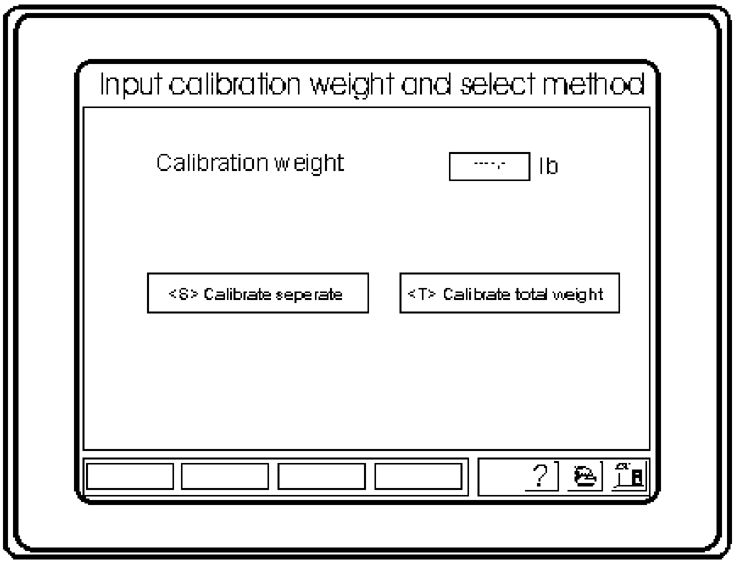
4 Adjust the calibration device using a spirit level (2).
Adjust the calibration arm to a horizontal position by using the adjustment screw (4).

5 Hook up the calibration weight box (3) onto the respective marking and align the calibration device again.

7.3.3 Description

The calibration is executed in the Service-Program after the menu point *Calibrate Scale* has been called up (described in chapter 6).

The instructions appearing in the status line of the screen will guide the user through the calibration program. A light control method indicates if the test stand has terminated the respective calibration step (the light switches to green) or not (light switches to red).



7.3.4 Procedure

The calibration of the scale can be carried out „separate“ (left and right scale will be individually calibrated) or „total“ (a known reference weight is used, e.g. a vehicle, of which the weight has been determined before in a reference test).

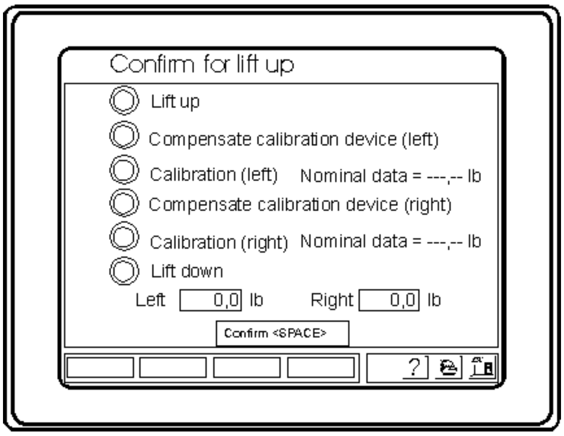
NOTE The reference test on an external scale must be carefully executed.
(Pay attention to the operating instructions of the scale-manufacturer!)
During the reference test and during the scale calibration, the vehicle’s angle of slope must be identical. Different angles of slope will lead to inaccurate calibration results.

7.3.4.1 Calibration separate

1 Enter weight.
440.92 lbs. (5 weights)

2 Press <Enter> key.

3 Select *Calibration Separate*.
The following menu appears:
LIFT UP is shown.



4 Press <Space> key.
COMPENSATE CALIBRATION DEVICE (LEFT)
appears.

5 Install calibration device on the left side and balance..

6 Press <Space> key.
CALIBRATION (LEFT) is shown.

7 Place 5 calibration weights and balance.

8 Press <Space> key.
COMPENSATE CALIBRATION DEVICE (RIGHT)
appears.

9 Install calibration device on the right side and balance

10 Press <Space> key.
CALIBRATION (RIGHT) is shown.

11 Place 5 calibration weights and balance.

12 Press <Space> key.
LIFT DOWN appears.

13 Remove weights and the calibration device

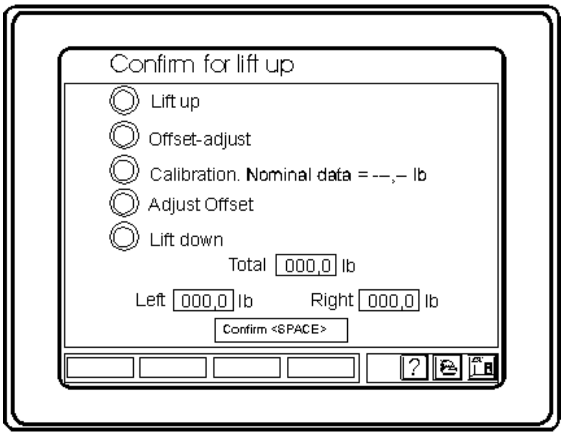
14 Press <Space> key.
ADJUST COMPLETED is shown.

7.3.4.2 Calibration total weight

1 Enter weight..

2 Press <Enter> key.

3 Select *Calibrate Total Weight*.
The following menu appears:
LIFT UP is shown.



4 Press <Space> key.
OFFSET ADJUST
is shown.

5 Press <Space> key.
CALBRATION
appears.

6 Place calibration weight (e.g. vehicle).

7 Press <Space> key.
ADJUST OFFSET
is shown.

8 Press <Space> key.
LIFT DOWN appears.

9 Remove calibration weight.

10 Press the <Space> key.

The lift beam lowers.

8 Maintenance

8.1 Maintenance Work on the Circuit Box

Maintenance work on the circuit box is described in 2.2.

8.2 Working on the Toothed Belt

In order to maintain an optimal transmission of power between the drive roller and the eddy-current brake special care should be taken to maintain a correct belt tension at all times.

A reduced transmission of power will be the result due to damaged or loose belts.
Belts which have too much tension tend to wear out quickly and may cause premature bearing failure.

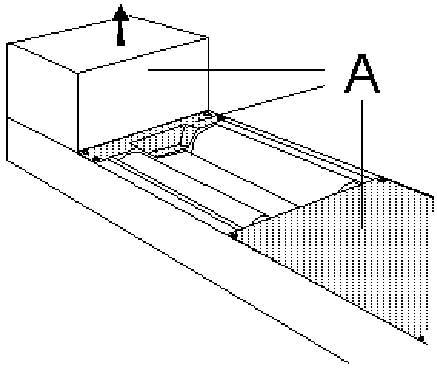
8.2.1 Setting the Tension of the Toothed Belt

NOTE

In order to remove the cover plate of the ASM-AF more easily, slightly lift the cover of the lift beam.

1 Remove the cover screws (A, Figure 8-1) and remove the cover plate.

Figure 8-1 **Removing the ASM cover-plate**

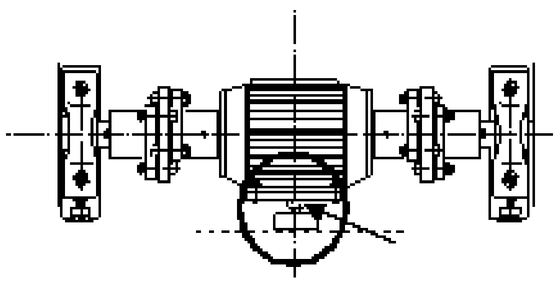


2 The rollers must always have the same separation **d.**

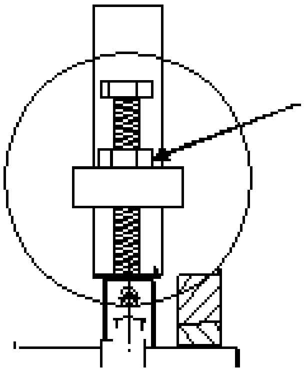
Figure 8-2 **ASM-P**

3 Loosen the bearing screws **(A)** of the rollers on the drive on side.

4 Loosen the rubber buffer screws **(C).**



5 Set the belt tension using a turnbuckle **(B)**



ATTENTION **The tension of the toothed belt must be 70 lbs. Under no circumstances may it exceed 70 lbs otherwise the internal motor can no longer able to drive the test stand. (parasitic losses too high) The belt tension must be checked according to the operating instruction of the used 'Tension Load Tester'!**

6 Check on the belt tension by using a tension load tester (Figure 8-4). Place the tension load tester centrally on the belt pulley.

Figure 8-3 **Belt tension test**

7 After setting the proper tension retighten the bearing screws on the belt side.

8 Measure the separation of the rollers. (d)

NOTE Der Rollenabstand (linke und rechte Rollen) muß an jeder Stelle gleich sein. Falls notwendig, müssen alle Lager der Stützrolle auf diesen Abstand ausgerichtet werden.

9 Retighten the screws of the rubber buffer.

10 Reinstall the cover plates.

8.2.2 Tension Load Tester

The tension load tester shown in Figure 8-4 consists of:

- a frame with graduation
- a measuring spring and drag pointer
- a finger lashing

Figure 8-4 **Tension load tester**

The tension load tester should be used as shown in Figure 8-5.

Once a certain pressure is applied with a finger on the tension load tester a clicking sound can be heard.

Figure 8-5 **Tension load test**

The point where the drag pointer intersects with the scale graduation indicates the measured tension.

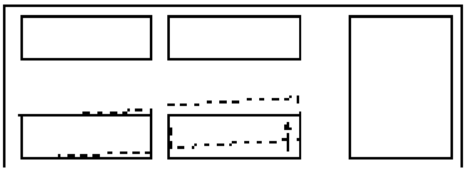
8.3 Toothed Belt Exchange

1 Remove the cover as described paragraph 8.2.1

2 Loosen the right and middle bearing screws **(A)** of the roller on the drive on side.

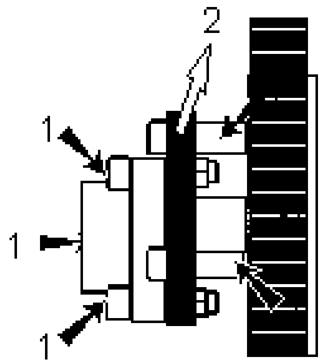
3 Loosen the turnbuckle completely.

4 Pull the roller towards the front.



5 The roller is joined to the eddy-currrent brake on one side via the joint disc coupling. Dismount the joint disc of this coupling. Loosen the 6 screws **(1)** of the coupling flange and pull out the joint disc. **(2)**

Figure 8-6 **Coupling with Joint Disc**



6 Remove the old toothed belt and place on the new one.

7 Remount joint disc

8 Tension the toothed belt as described in paragraph 8.2.1

9 Retighten bearing screws and turnbuckle.

10 Reinstall the cover plates..

8.3.1 Toothed Belt Data

NOTE The following values are valid for the Poly Chain GT belt.

Roller set	ASM-P
Belt type	14 M
Belt length	1568 mm
Width	37 mm
Number of teeth	112
Tension load	70 lbs

8.4 Impulse Sensor Exchange

The roller speed is sensed by an impulse sensor in connection with a toothed wheel.

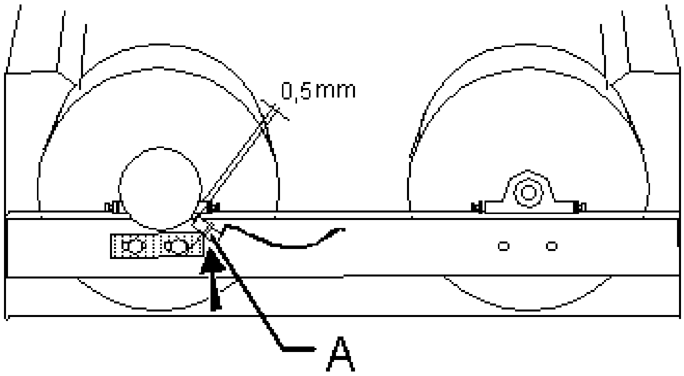
Figure 8-7 shows the installation instructions of the impulse sensor.

Figure 8-7 **Impulse sensor**

8.4.1 Impulse Sensor Removal

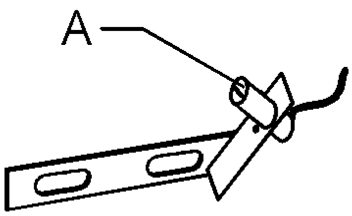
1 Remove necessary coverings.

Figure 8-7 **Impulse sensor**



2 Unscrew the impulse sensor (A) from the bracket. The bracket itself must not be unscrewed.

Figure 8-8 **Impulse sensor with bracket**



3 Disconnect the impulse sensor cable.

8.4.2 Impulse Sensor Installation

ATTENTION **The impulse sensor has a flat end on the front side. (4, Figure 8-10). The flat end must be positioned parallel to the teeth of the toothed wheel.**

1 Connect the new impulse sensor to the bracket (4).
Make sure that the sensor is correctly positioned. Secure with Loctite.

2 Properly connect and attach the wiring of the impulse sensor.

Figure 8-10 **Setting of the impulse sensor**

ATTENTION **The clearance between impulse sensor and tooth wheel of 0,5 $^{\pm 0,1}$ mm must be accurately maintained.!**

Wrong clearance leads to erroneous or missing measurement results and/or damage to the impulse sensor!

3 Adjust the clearance between impulse sensor (2) and toothed wheel (5) by using a thickness gauge at the bracket.

4 Secure screws (3) with Loctite and retighten the screws.

5 Reinstall the covers.

8.5 Strain Gauge Exchange

8.5.1 Strain Gauge Removal

WARNING **Before any work on or near the strain gauge is started, the power supply to the test stand must be disconnected!**

NOTE Maintenance work on the circuit box is described in the paragraph 2.2 .

1 Electrically clamp the strain gauge cables in the circuit box.
Note down the colors of the cable wires.

2 Loosen the screw-type conduit fittings and pull out the cables.

3 Turn up the circuit box.

4 Loosen the lock nuts (3, Figure 8-11)

5 Loosen the setting screws (2).

Figure 8-11 **Removal of the strain gauge**

6 Remove the fixing screws (4) of the strain gauge.

7 Unscrew the temperature sensor (5).

8 Remove the strain gauge. (1)

8.5.2 Strain Gauge Installation

The reinstallation of the strain gauge is accomplished by reversing the steps of the removal.

ATTENTION **After the installation of a new strain gauge, it is necessary to recalibrate the test stand!**

When installing the strain gauge pay attention to the following:

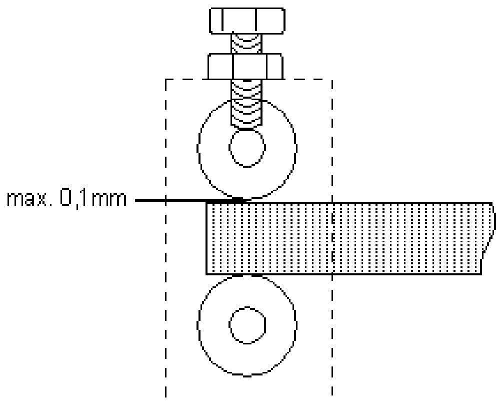
1 The strain gauge must be centered in the counter bearing, as shown in Figure 8-12.

Figure 8-12 **Installation of the strain gauge**

2 Set a play of 0,1 mm (Figure 8-13) between the strain gauge and the upper roller bearing by using the setting screws (2, Figure 8-11).

ATTENTION **The front fixing screw (4, Figure 8-11) must have a quality of 10.0!**

Figure 8-9 **Strain gauge counter bearing**



8.6 Eddy-Current Brake Exchange

8.6.1 Removal of the Eddy Current Brake

WARNING **Danger to life!**
Before any work on or near the eddy-current brake is started, the power supply to the test stand must be disconnected!

1 Disconnect the power supply to the test stand.

2 Remove the cover grids of the eddy-current brake and the lateral roller covers on the brake-side.

3 Remove the cable conduit for the brake connection line.

4 Open the eddy-current brake connection box, mark the connection line and clamp it electrically.

5 Unscrew the circuit box.

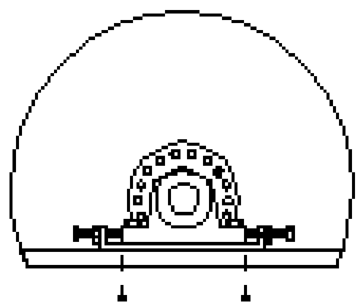
6 Remove the strain gauge (see paragraph **Fehler! Verweisquelle konnte nicht gefunden werden.**).

7 Remove temperature sensor.

8 Remove the joint disc of the coupling. Loosen the 6 Screws **(1)** of the coupling flange and pull out the joint disc **(2)** (see paragraph 8.3)

9 Mark the position of both brake bearings on the frame. (Figure 8-14).

Figure 8-10 **Marking the brake bearing**

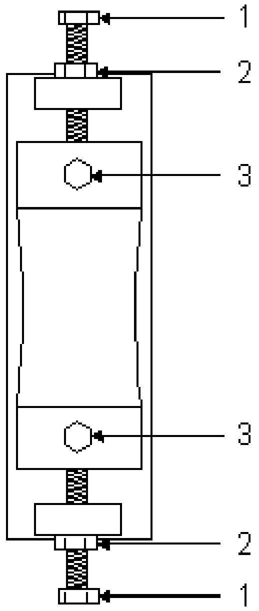


10 Loosen the lock nuts (2, Figure 8-15) of the centering screws.

11 Loosen the centering screws (1) of both brake bearings.

12 Remove the screws (3) and discs of both brake bearing and remove the eddy current brakes.

Figure 8-11 **Brake bearing**



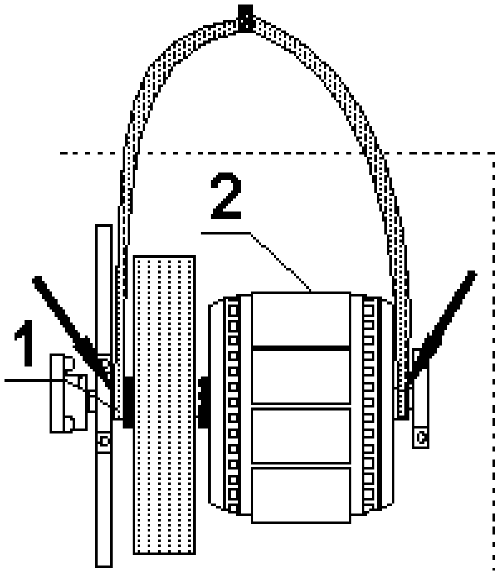
WARNING **The crane and the lift band must have sufficient strength to lift the weight of the eddy-current brake!**

ATTENTION **Ensure that the coils are not damaged when the eddy-current brake is being lifted out of its housing. When lifting the eddy-current brake with the lift band do not lift by the coils! Lift from center shaft only!**

13 Attach the lifting band and the lifting device to the axle (1) of the eddy-current brake. (2)

14 Lift out the eddy-current brake.

Figure 8-12 **Lifting out the eddy-current brake**

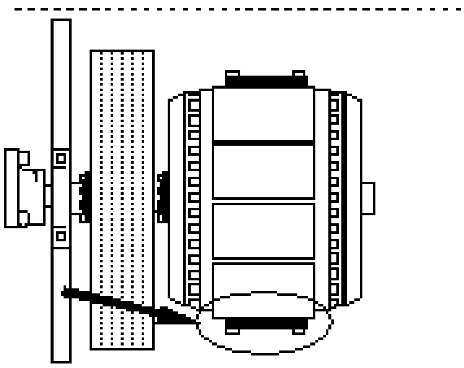


1 Axle

2 Eddy-current brake

15 Disassembly strain gauge holder and reassemble again on the new eddy-current brake. (Figure 8-17).

Figure 8-13 **Exchange of the strain gauge holder**



8.6.2 Installation of the Eddy-Current Brake

WARNING **The crane and the lift band must have sufficient strength to lift the weight of the eddy-current brake!**

ATTENTION **Ensure that the coils are not damaged when the eddy-current brake is being lifted out of its housing. When lifting the eddy-current brake with the lift band do not lift by the coils! Lift from center shaft only!**

1 Attach the lifting band and the lifting device to the axle of the eddy-current brake.

2 Lower the eddy-current brake into the test stand.

3 Align the eddy-current brake roughly with the markings for the brake bearings (on the frame) (Figure 8-14).

NOTE The center of the eddy-current brake must be on a line with the center of the strain gauge. (Figure 8-18).

Figure 8-14 **Positioning the eddy-current brake**

4 Screw the coupling together, turned at 60° from original position, with 3 screws, size M16x100 and with placed adjusting bush. Check the play of the three adjusting bushes. (c.a. 2/10 mm).

5 Place the screws (3, Figure 8-15) and discs of both brake bearings and tighten slightly.

6 -Slightly tighten the centering screws of both brake bearings. (1, Figure 8-15)

7 Tighten the screws (3) of both brake bearings.

8 Tighten the centering screws of both brake bearings. (1)

9 Tighten the lock nuts (2) of the centering screws.

10 The grub screw of the coupling flange must be drilled again. Drill about 3mm deep, clean the drill hole, glue the screw with Loctite 243 and screw in tightly.

11 Then loosen the three screws, turn the coupling 60° to the original position, screw together again with the 6 screws and glue.

Figure 8-15 **Fixed and Loose Bearing**

12 Drill the grub screws of the fixed bearings 3mm deep with a drill machine. (A, Figure 8-19) ∅ 8,5; clean the drill hole.

13 Put a nut lock on the grub screw and screw in tightenly.

14 Drill the grub screws of the fixed bearings 3mm deep with a drill machine. (B, Figure 8-19) ∅ 8,5; clean the drill hole.

15 Put a nut lock on the grub screw and screw in tightenly. After screwing in turn the grub screw back one rotation (max. 1mm) so that the bearing can move freely.

16 Mount the temperature sensor. Pay attention to cable guide.

17 Install the strain gauge as described in paragraph 8.5.2

18 Install the cable conduit for the brake connection lines.

19 Install a traction relief clamp to the connection line.

20 Connect the grounding wire and connection line of the eddy-current brake.
Pay attention to cable identifications.

21 Close the circuit box.

22 Install the roller side covers. (brake side)

23 Connect the test stand to power supply.

8.6.2.1 Final Check

ATTENTION **Make sure that cables or hoses do not touch rotating parts!**

1 Make sure that cables and hoses are correctly installed and positioned.

2 Conduct a trial run in Service-Program, Motor ON, Motor OFF .
Pay attention to smooth running and untypical noises.

3 Reset and store parasitic losses with Service-Program.

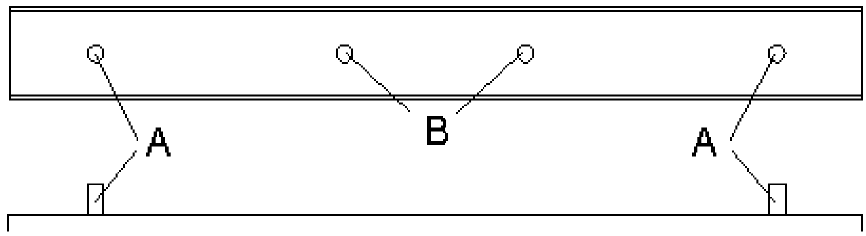
4 Test Load check with Service-Program.

5 Install cover grid.

8.7 Working on the Lift Beam

8.7.1 Lift Beam Structure

Figure 8-16 **Cover of the lift beam: top- and side view**



A guide bolt for lift beam

B guide sleeve for guide bolt

Figure 8-17 **Base unit of the lift beam: top view and side view**

C air bellow and holding of the air bellow

D guide sleeve for guide bolt

E weighing cell of the scale

8.7.2 Weighing Cell Replacement

1 Loosen the four screws of the middle cover and remove the cover plate.

2 Remove the cover of the lift beam.

3 Disconnect the wiring of the weighing cell.

4 Loosen the screw with a special wrench (arrow in Figure 8-18) and remove the old weighing cell.

5 Fasten the new weighing cell and connect it electrically.

Figure 8-18 **Replacement of the weighing cell of the scale**

8.7.3 Air Bellow Replacement

If one of the lower air bellows is to be replaced the respective upper air bellow must also be removed.

Figure 8-19 **Arrangement of the air bellows**

8.7.3.1 Air Bellow Removal

1 Remove the middle- and side covers of the roller set.

2 Remove the cover from the lift beam.

3 Remove both brake shoes.

4 Set the operating pressure of the lift beam to 2 bar.

5 Raise the lift beam in the Service Program.

6 Place wooden chocks (approx 12 cm high) in the middle of the frame on both sides under the lift beam.

7 Lower the lift beam in the Service Program.

8 Disconnect the impulse sensor (RPM sensor).

WARNING **Danger!**
Disconnect test stand from power supply!

9 Disconnect test stand from power supply.

10 Remove the air pressure hose from the air bellow to be replaced.
Press onto the blue ring and remove the air hose.

11 Remove the fixing screws of the air bellow to be replaced and remove the air bellow from below.

8.7.3.2 Air Bellow Installation

The reinstallation of the new air bellow is accomplished by reversing the steps of the removal.

NOTE

Adjust the lift beam pressure to operating pressure as described in paragraph 2.7.1.

8.7.4 Mechanical Adjustment of the Lift Beam

1 Slightly loosen the nut (B, Figure 8-21) on the threaded rod of the brake lever.

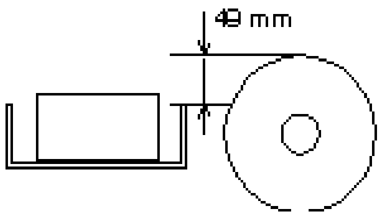
2 Lift the lift beam with operating pressure.

ATTENTION

When the lift beam is raised, the brake shoes (D, Figure 8-21) must touch the rollers evenly.
Make sure that the lift beam is not tilted when the brake shoes are attached to the rollers!

3 Adjust the lift beam by tightening the nut. The distance between the top edge of the roller and the top edge of the lift beam tube must be 49 mm (Figure 8-20).

Figure 8-20 **Lift beam adjustment**



NOTE

If the cover cannot be properly installed, although the lift beam is correctly adjusted,

- the number of cup springs,
- the brake shoe installation,
- the wear of the brake and
- the brake lever installation

must be checked.

8.7.5 Brake Shoe Replacement

In order to replace the brake shoes, the respective brake lever must be removed. The position of the two brake levers is shown in Figure 8-21.

Figure 8-21 Brake shoe replacement

A	brake lever	C	threaded rod	E	roller
B	nut	D	brake shoe		

8.7.5.1 Brake Lever Removal

1 Remove the middle cover plate of the test stand.

2 Remove the cover of the lift beam.

3 Unscrew the self-locking nut (B, Figure 8-21), the metal plate and the cup springs.

4 Completely remove the brake lever.

5 Replace brake shoes (D).

8.7.5.2 Brake Lever Installation

1 Insert the brake lever.

2 Shift the metal plate and the cup springs over the threaded rod and secure it with the nut (B).
Only slightly tighten the nut.

3 Readjust the lift beam, as described in paragraph 8.7.4.

8.8 Three-Phase Motor Exchange

The rollers of the ASM test stand are driven by a three-phase motor which is connected to the rollers via a shaft plate coupling. The motor is fastened with two screws to prevent twisting. (arrow in Figure 8-22).

Figure 8-22 Three-phase motor

8.8.1 Three-Phase Motor Removal

1. Remove the middle cover plate of the roller set.
2. Release the rubber buffers of the motor support.
   The motor must freely suspend in the axles.
3. Loosen the upper screws of the motor circuit box.
4. Raise the lift beam in the Service-Program.
5. Loosen the lower screws of the motor circuit box.
6. Lower the lift beam in the Service-Program.
7. Disconnect the test stand from power supply.
8. Remove the cover of the motor circuit box and electrically clamp the motor cables and thermo protection cables.

9 Measure the distance between the two couplings and note it down (Figure 8-23).

Figure 8-23 **Distance measurement**

10 Mark the position of the coupling flanges (1, Figure 8-24) with a text marker.

Figure 8-24 **Marking the couplings**

11 Remove 5 fixing screws (2) on each coupling flange.

12 Lift the motor with a lifting band and/or a lifting device to release the couplings.

13 Remove the last two fixing screws from the couplings.

14 Pull out the shaft plates (3) and lift out the motor.

15 Loosen the headless screws (1, Figure 8-25) of the coupling flanges of the old motor.

16 Remove the coupling flanges (2) from the shaft by using a detaching device.

Figure 8-25 **Coupling flange removal**

8.8.2 Three-Phase Motor Installation

1 Slide the couplings onto the shafts of the new motor.

2 Install the motor to the test stand frame.

NOTE For the adjustment of the correct clearance special 18 mm spacers can be used instead of shaft plates.

3 Insert spacers or shaft plates (3, Figure 8-24).

4 Slightly tighten all fixing screws (2) of the coupling flanges.
Pay attention to the markings (1).

5 Align the couplings to the clearance marked before (Figure 8-23).
This is not necessary if spacers were used.

6 Retain the coupling flanges with the motor shafts, clean the drilling holes and glue the headless screws (1, Figure 8-25) with Loctite 243.

NOTE In case spacers were used to set the correct clearance, the spacers must now be replaced by shaft plates.

7 Turn the rollers by several rotations.

8 Fasten the optical leveling instrument with the magnet holder to the test stand frame. Adjust the measuring peak to the highest point of the right side of the motor housing.

9 Turn rollers by several rotations and determine the highest position.

10 Align the right motor coupling by using a rubber hammer.

11 Repeat step 9 and 10 until the deviation is 0,3 mm or less.

12 Tighten the fixing screws of the right coupling.

13 Fasten the optical leveling instrument with the magnet holder to the test stand frame. Adjust the measuring peak to the highest point of the left side of the motor housing.

14 Turn rollers by several rotations and determine the highest position.

15 Align the left motor coupling by using a rubber hammer.

16 Repeat step 14 and 15 until the deviation is 0,3 mm or less.

17 Tighten the fixing screws of the left coupling.

18 Remove the optical measuring device.

19 Install the motor cables and the cables of the thermo-protection.
Pay attention to the rubber grommets.

20 Connect the test stand to power supply.

21 Tighten the upper screws of the motor circuit box.

22 Raise the lift beam in the Service-Program.

23 Tighten the lower screws of the motor circuit box.

24 Lower the lift beam in the Service-Program.

25 Fasten the rubber buffers of the motor support.
Slightly tighten the screws and lock them.

8.8.2.1 Final Check

ATTENTION **Make sure that cables or hoses do not touch rotating parts!**

1 Make sure that cables and hoses are correctly installed and positioned.

2 Conduct a test run in the Service-Program. Carry out Motor ON, Motor OFF.
Pay attention to untypical noises and check on truth of rotation.

3 Re-determine and store parasitic losses in the Service-Program.

4 Conduct a „Load Check“ with the Service-Program.

5 Install middle cover plate of the roller set.

9 List of Variables

The following variables are divided up into two groups:

- EEPROM-Variables: 0 - 199
- RAM-Variables: starting from 200

9.1 RAM-Variables

Variable	Description	Unit
200	Target value for speed regulator [0.1 mph]	mph
201	Target value for torque regulator [0.1 lbf]	lbf
202	Vehicle mass for drive resistance regulator [lb]	lb
203	Cv for drive simulation regulator [hp]	hp
204	Bv for drive simulation regulator [hp]	hp
205	Av for drive simulation regulator [hp]	hp
206	Control for the brake test [%]	%
207	Start speed for the stop watch 1 [mph]	mph
208	Stop speed for the stop watch 1 [mph]	mph
209	Brake roller speed [mph]	mph
210	Acceleration	mph/s
211	Power [hp]	hp
212	A_t for tire-roll losses [hp]	hp
213	B_t for tire-roll losses / Roller [hp]	hp
214	C_t for tire-roll losses / / Roller [hp]	hp
215	Support roller speed [mph]	mph
216	Weight scale right [lb]	lb
217	Weight scale left [lb]	lb
218	ISE (Inertia Simulation Error) [%]	%
219	Performance Test Flag	
220	Torque minus losses (A_V, B_V, C_V)	lbf
221	Torque plus losses (A_V, B_V, C_V)	lbf
222	Temperature of the force sensor	F
223	Line current [A]	A
224	Temperature of the bearings [F]	F
225	Distance	mi
226	not assigned	

Variable	Description	Unit
227	Stop watch 1	s
228	Power target value for ASM-Regulator	hp
229	Losses tires/roller for ASM Regulator	hp
230	Speed reference for ASM-Regulator [mph]	mph
231	Torque [lbf]	lbf
232	Speed for intermediate test	mph
233	Stop watch 1 intermediate time	s
234	Start speed for the stop watch 2	mph
235	Stop speed for the stop watch 2	mph
236	Stop watch 2	s
237	Enable loss compensation [0/1]	
238	Total weight [lb]	lb
239	Compensated Ap of the parasitic losses	hp
240	Compensated Bp of the parasitic losses	hp
241	Compensated Cp of the parasitic losses	hp
242	Compensated parasitic losses for ASM 5015	hp
243	Compensated parasitic losses for ASM 2525	hp
244	Measuring direction (0 = normal, 1 = reverse)	
245	I^2t for temperature-switch off [0.01]	A^2s

9.2 EEPROM-Variables

Variable	Description	Default	Limits
0	Software version	126	1-65535
1	Roller diameter brake roller [0.1 mm]	2173	10 - 20000
2	Roller diameter support roller [0.1 mm]	2173	10 - 20000
3	Impulses per revolution (brake roller)	100	1 - 5000
4	Impulses per revolution (support roller)	100	1 - 5000
5	Nominal-torque [N]	6000	100 - 20000
6	Base inertia [kg]	907	10 - 5000
7	Rotating vehicle mass [kg]	60	0 - 1000
8	Filter Type for acceleration: 0 = Filter with critical damping 1 = Bessel-filter 2 = Butterworth-filter 3 = Tschebyscheff-filter with 0.5 db ripple	1	0 - 3
9	Degree of the acceleration filters 0 = Filter switched off 1 = first degree 2 = second degree	1	0 - 2
10	Limit frequency of the acceleration-Filters [0.01 Hz]	900	1 - 2500
11	Filter Type for torque: 0 = Filter with critical damping 1 = Bessel-filter 2 = Butterworth-filter 3 = Tschebyscheff-Filter with 0.5 db rippel	1	0 - 3
12	Degree of the torque filter: 0 = Filter switched off 1 = First degree 2 = Second degree	2	0 - 2
13	Limit frequency of the torque filter [0.01 Hz]	30	1 - 2500
14	Time for lift beam up [s]	10	1 - 200
15	Time for lift beam down [s]	10	1 - 200
16	Nominal speed of the test stand [0.1 km/h]	1600	500 - 3000
17	P-part of the torque regulator [0.01]	250	0 - 65000
18	I-part of the torque regulator [ms]	200	1 - 65000
19	D-part of the torque regulator(in 10 ms)	2000	0 - 65000
20	T-part of the torque regulator(in 10 ms)	2000	0 - 65000
21	P-part of the speed regulator(in 0.01)	2000	0 - 65000
22	I-part of the speed regulator (in ms)	100	1 - 65000
23	D-part of the speed regulator (in 10 ms)	0	0 - 65000
24	T-part of the speed regulator (in 10 ms)	0	0 - 65000

Variable	Description	Default	Limits
25	Prebrake range of the speed-regulator (in 0.1 km/h)	60	0 - 5000
26	P-part of the drive resistance-regulator (in 0.01)	160	0 - 65000
27	**I**-part of the drive resistance-regulator (in ms)	250	1 - 65000
28	D-part of the drive resistance-regulator(in 10 ms)	0	0 - 65000
29	T-part of the drive resistance-regulator(in 10 ms)	0	0 - 65000
30	Regulator release at torque regulation [0.1 km/h]	50	0 - 500
31	Regulator release at speed regulation [0.1 km/h]	50	0 - 500
32	Regulator release at drive resistance regulation [0.1 km/h]	5	0 - 500
33	Reference speed of the drive resistance [0.1 km/h]	805	100 - 3000
34	Maximum control of the eddy-current brake [%]	**40**	0 - 100
35	Timing frequency of the pulse interval modulator [Hz]	1250	375 1250 5000
36	Torque calibration factor [Digit]	1600	1 - 2048
37	Relative belt compensation [in 0.1 %]	1000	10 - 60
38	Torque calibration factor (reverse) [Digit]	1600	1 - 2048
39	Size of the acceleration buffer	2	1 - 10
40	Filter type for the acceleration (display): 0 = Filter with critical damping 1 = Bessel-filter 2 = Butterworth-filter 3 = Tschebyscheff-filter with 0.5 db rippel	1	0 - 3
41	Degree for the acceleration filter (display) 0 = Filter switched off 1 = First degree 2 = Second degree	2	0 - 2
42	Limit frequency of acceleration filter (display) [0.01 Hz]	200	1 - 2500
43	Minimum limit of the **I**-part at the torque regulator	0	0 - 32000
44	Maximum limit of the **I**-part at the torque regulator	2000	0 - 32000
45	Minimum limit of the **I**-part at the speed regulator	1000	0 - 32000
46	Maximum limit of the **I**-part at the speed regulator	2000	0 - 32000
47	Temperature monitoring of the eddy-current brake [°C]	120	0 - 200
48	Prebrake hysterese of the speed regulator [0.1 km/h]	20	0 - 100
49	Mass for 'augmented braking' [kg]	500	0 - 5000
50	EEPROM Reset	42330	0 - 65535
51	A_p of the parasitic losses [0.01 kW]*	xxx	0 - 32000
52	B_p of the parasitic losses [0.01 kW]*	xxx	0 - 32000
53	C_p of the parasitic losses [0.01 kW]*	xxx	0 - 32000

Variable	Description	Default	Limits
54	Motor drive type of operation 1 = Motor slip 2 = Time ramp	2	1, 2
55	Maximum Auto-Offset balancing [N] for error flag	100	0 - 3000
56	Temperature monitoring of the bearings [°C]	100	0 - 200
57	Temperature monitoring of the cooling unit 0 = no 100....1023 = yes	500	
58	Zero point scale 1	0	0 - 32000
59	Amplification scale 1	3483	0 - 32000
60	Zero-point scale 2	0	0 - 32000
61	Amplification scale 2	3483	0 - 32000
62	Rotating field freq. for Generator-monitoring [0.01 Hz]	1000	0 - 5000
63	Window for amplification balancing [Digit]	10	1 - 254
64	Window for Offset-balancing	2	1 - 254
65	Absolute belt compensation [in 0.1 N]	200	0 - 32000
66	Maximum Frequency [0.01 Hz]	7500	0 - 32000
67	Motor slip [0.01 Hz]	100	0 - 32000
68	Amplitude offset	100	0 - 32000
69	Rotating field sequence 0 = right 1 = left	0	0, 1
70	v- test stand [0.1 km/h]	500	0 - 3000
71	Speed correction factor for constant load regulator	700	0 - 32000
72	Offset for constant load regulator [0.1 kW]	0	0 - 32000
73	Frequency at maximum voltage for PWM [0.01 Hz]	5250	0 - 32000
74	I^2t limit for motor-temperature error [0.01 A^2s]	9999	0 - 65000
75	Speed correction faktor for variable load regulator	700	0 - 32000
76	Assumed Current while motor cooling down [A]	30	0 - 32000
77	Ramp time up to 10 km/h [s]	5	0 - 32000
78	Ramp time up to 20 km/h [s]	30	0 - 32000
79	Ramp time up to 30 km/h [s]	45	0 - 32000
80	Ramp time up to 40 km/h [s]	60	0 - 32000
81	Ramp time up to 50 km/h [s]	80	0 - 32000
82	Calibration factor for bearing-temperature [0.1 %]	1150	0 - 32000
83	ADC-value at 0 °C (bearing) [ADC-Digit]	290	0 - 1023

Variable	Description	Default	Limits
84	Temperature-comp. of parasitic losses [0.01%/10°C]	1350	-32000... 32000
85	Temperature at calibration of parasitic losses [°C]	28	0 - 32000
86	Variable load offset [0.1 Hp]	20	
87	Auto-Offset Mode for scale 0 = No automatic offset calibration but weight at v = 0 km/h 1 = Automatic offset calibration + weight at v = 0 km/h 2 = Automatic offset calibration + weight = 0 at v = 0 km/h	1	0, 1, 2
88	Calibration weight for torque of the force sensor [0.1 N]	18000	0 - 65535
89	Temperature with torque balancing (°C)	26	0 - 32000
90	Potentiometer zero point	127	0 - 255
91	Potentiometer amplification	127	0 - 255
92	Start speed ISE [0.1 km/h]	80	0 - 9999
93	Stop speed ISE [0.1 km/h]	966	0 - 9999
94	Maximum line current [0.1 A]	300	0 - 1000
95	Calibration factor for DMS temperature [0.1 %]	1100	0 - 32000
96	ADC-value at 0 °C (force sensor) [ADC-Digit]	290	0 - 1023
97	Temperature-compensation of the torque [0.01%/10°C]	30	-32000 ... 32000
98	Test stand losses at 15 mph [0.01 kW]*	xxx	0 - 1000
99	Test stand losses at 25 mph [0.01 kW]*	xxx	0 - 1000
100	Correction factor for determination of parasitic losses	1000	100 - 2000

* The values of these variables are automatically written in once the 'Parasitic Loss Determination' has been done.

9.2.1 Read only Variables

Variable	Description	Default	Limits
187	Operational minute counter (Wert * 10000)	4	0 - 65535
188		99999	
189		99999	
190	EEPROM reset for variable 180-199 when the value of variable 190 is not 42330.	42330	0 - 65535
191	Performance limit value to determine a test stand overload (in kW)	333	0-32000
192	Speed limit value to determine a test stand overload (in 0,1 km/h)	200	0-32000
193	Torque limit value to determine a test stand overload (in N)	6000	0-32000
194	Time duration of power overload (in s)	0	0-32000
195		99999	
196	Time duration of exceeded speed (in s)	0	0-32000
197		99999	
198	Time duration of torque overload limit value (in s)	0	0-32000
199		99999	

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