527

US Department
of Transportation

**National Highway
Traffic Safety
Administration**

DOT HS 806 874

September 1983

Final Report

Research MIV
Modified Integrated Vehicle
Volume II/4 Side Impact

This document is available to the public from the National Technical Information Service Springfield Virginia 22161

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear only because they are considered essential to the object of this report.

Technical Report Documentation Page

1 Report No DOT HS 806 874	2 Government Accession No	3 Recipient's Catalog No
4 Title and Subtitle Research MIV (Modified Integrated Vehicle)		5 Report Date September 1983 6 Performing Organization Code
7 Author(s) Dr. U. Seiffert Volkswagenwerk AG - Research Division		8 Performing Organization Report No
9 Performing Organization Name and Address Volkswagenwerk AG Research & Development Division 3180 Wolfsburg/W.Germany		10 Work Unit No (TRAIS) 11 Contract or Grant No DTNH 22-81-C-17085
12 Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Washington, D.C. 20590		13 Type of Report and Period Covered Final Report January 1981 September 1983 14 Sponsoring Agency Code

15 Supplementary Notes

16 Abstract

Vehicle and vehicle occupant response data and technical data from side impact test No. 4 - Crabbed Barrier/Production 4 door Rabbit at 60° impact angle and v = 40 mph impact speed are summarized in this report.

Volume II/4

17. Key Words Occupant Response Moving Barrier Crash Testing	18 Distribution Statement Document is available to the public from the National Technical Information service, Springfield, Virginia 22161

19 Security Classif (of this report)	20 Security Classif. (of this page)	21. No. of Pages 157	22. Price

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

THE TEST RESULTS RELATE SOLELY TO THE SPECIFIED NHTSA TEST CONFIGURATIONS FOR SIDE IMPACTS WITH THE CRABBED CHEVROLET CITATION AND THE NEW TEST DEVICES, DEFORMABLE CRABBED BARRIER AND HSRI SIDE IMPACT DUMMY (SID) BOTH OF WHICH ARE CURRENTLY UNDER DEVELOPMENT

NHTSA PROJECT DTNH 22-81-C-17085

Volume II/4

Table of Contents

	Page
o Technical Report Documentation Page	2
o List of Illustrations and Tables	7 - 9
1. Introduction	10
2. Method	11
2.1 Test Devices and Test Configuration	12 - 15
2.2 List of Accelerometer Location	16 - 17
2.2.1 Target Vehicle Instrumentation	18 - 19
2.2.2 Side Impactor Instrumentation	20
2.2.3 Dummy Instrumentation	21
2.3 Camera Location and Frame Rate	22 - 23
3. Test Parameter and Results	24
3.1 Crash Test Summary	
3.1.1 Target Vehicle	25
3.1.2 Side Impactor (19° Crabbed Barrier)	26
3.2 Pre-Test Conditions	27
3.2.1 Driver Pre-Test Position	28
3.2.2 Rear Passenger Pre-Test Position	29
3.3 Vehicle Pre- and Post-Test Position	30
3.4 Post-Test Observations	31

			Page
3.5	Dummy Test Response		
	3.5.1	Dummy Test Response Summary - Driver	32
	3.5.2	Dummy Test Response Summary - Rear Passenger	33
	3.5.3	AIS and Coefficients	34
3.6	Target Vehicle Test Response		
	3.6.1	Pre- and Post-Test Dimension Measurements	35
	3.6.2	Exterior and Interior Vehicle Measurement	36 - 39
	3.6.3	Exterior and Interior Static Crush (Top View)	40 - 47
	3.6.4	Exterior and Interior Static Crush (Front View)	48 - 49
3.7.	Crabbed Barrier Test Response		
	3.7.1	Exterior Static Crush	50
	3.7.2	Pre- and Post-Test Frontal Profiles	51
3.8	Dummy Calibration		
	3.8.1	Dummy Calibration Driver	52 - 53
	3.8.2	Dummy Calibration Rear Passenger	54 - 55
	3.8.3	SID Chest Deflection and Impactor Deceleration	56

Appendix A

Photographs

Appendix B

Vehicle and Dummy Test Response
Acceleration-/ and Velocity/Time History

B.1 Vehicle Test Response
- B.1.1 Target Vehicle
- B.1.2 Crabbed Barrier

B.2 Dummy Test Response
- B.2.1 Driver
- B.2.2 Rear Passenger

List of Illustrations and Tables

Figure		Page
1	19° Crabbed Barrier Test Device	12
2	HSRI Side Impact Dummy	13
3	Test Configuration	14
4	Side Impact Test Configuration Crabbed Barrier/VW Rabbit	15
5	Target Vehicle Instrumentation	18
6	Side Impactor Acceleration Locations	20
7	Location of 18 Accelerometer for Side Impact Dummy	21
8	Camera Location - Ground based	22
9	Camera Locations - on Board	23
10	Vehicle Measurement Side (Exterior)	36
11	Vehicle Measurement Side (Interior)	38
12	Exterior and Interior Static Profiles at the Longitudinal Distance 610 mm from Door	48
13	Longitudinal Distance 914 mm	49
14	SID Chest Deflection and Impactor Deceleration	56

Table		Page
1	List of Accelerometers - Location	16-17
2	Summary of Target Vehicle Instrumentation	19
3	Crash Test Summary for Target Vehicle	25
4	Crash Test Summary for Side Impactor	26
5	Pre-Test Conditions	27
6	Driver Pre-Test Position	28
7	Rear Passenger Pre-Test Position	29
8	Vehicle Pre- and Post-Test Position	30
9	Summary of Post-Test Observations	31
10	Side Impact Dummy Test Response Summary	32
11	Side Impact Dummy Test Response Summary	33
12	AIS and Coefficients	34
13	Pre- and Post-Test Measurements	35
14	Exterior Static Crush for VW Rabbit	37
15	Interior Static Intrusion for VW Rabbit	39
16	Pre- and Post-Test Exterior Profiles at 305 mm above Ground Level	40

Table		Page
17	Profiles at 508 mm	41
18	Profiles at 660 mm	42
19	Profiles at 812 mm	43
20	Pre- and Post-Test Interior Profiles at 318 mm above Ground Level	44
21	Profiles at 432 mm	45
22	Profiles at 610 mm	46
23	Profiles at 876 mm	47
24	Exterior Static Crush for Side Impactor	50
25	Pre- and Post-Test Frontal Profiles for Side Impactor	51
26	Dummy Calibration Driver	52 - 53
27	Dummy Calibration Rear Passenger	54 - 55

1. Introduction

The objective of the MIV project was to optimize two contradictory design considerations - the greatest possible reduction in dummy loadings at the lowest possible vehicle weight increase (max. increase 20 lbs./vehicle) with the precondition that the design be suited to mass production.

The MIV is by definition not a totally integrated concept as discussed and presented by Volkswagenwerk AG during the 8th ESV Conference or as demonstrated in the form of the Volkswagen Integrated Research Vehicles IRVW I and II. The MIV, in contrast, does not include consideration of special energy saving or special emission reduction engine/transmission concepts.

Because vehicle layout, according to established criteria and subsequent reinforcement for modified design criteria, always leads to substantial weight increases with commensurate limitations upon producebility, it was decided not to use the "add-on" strategy, but to develop an all new "Integrated Structure" for the 4 door MIV. This concept requires that the largest possible number of components be effective during the specified frontal and side impacts.

NHTSA's design goals were the 35 mph head-on fixed barrier impact and the 30 mph side impact with the new 1.565 kg (3,450 lbs) deformable 19° crabbed Barrier and the new HSRI Dummy which were specially developed for the side impact.

In addition to these tests, the effectiveness of the MIV vehicle layout was to be evaluated in vehicle-to-vehicle lateral impacts with the crabbed Chevrolet Citation striking the side of the MIV at 60° and 90° at 40 and 34 mph respectively.

A qualitative analysis of the force/deflection characteristics of front structure, mass and bumper heigt of the striking vehicle and their effect upon dummy loadings and side structure deformation of the struck vehicle was to be performed by computer simulation. To validate the computer program a 90° side impact test was to be run with the crabbed Citation and baseline vehicle at 34 mph simulating the bumper/sill engagement.

2. Method

2.1 Test Devices and Test Configuration

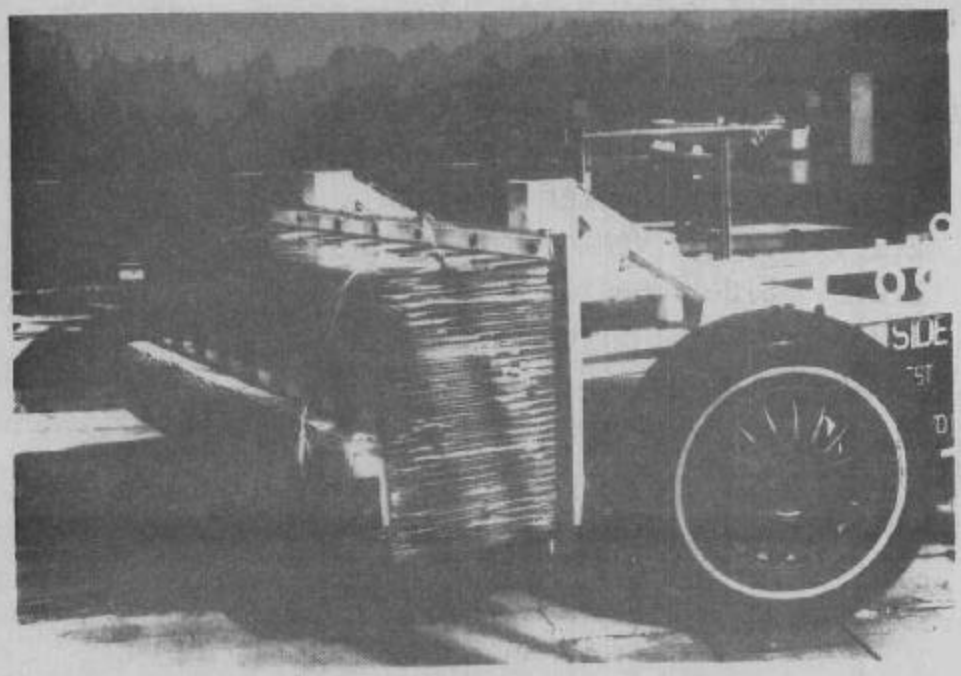
2.2 List of Accelerometer Location

2.2.1 Target Vehicle Instrumentation

2.2.2 Side Impactor Instrumentation

2.2.3 Dummy Instrumentation

2.3 Camera Location and Frame Rate



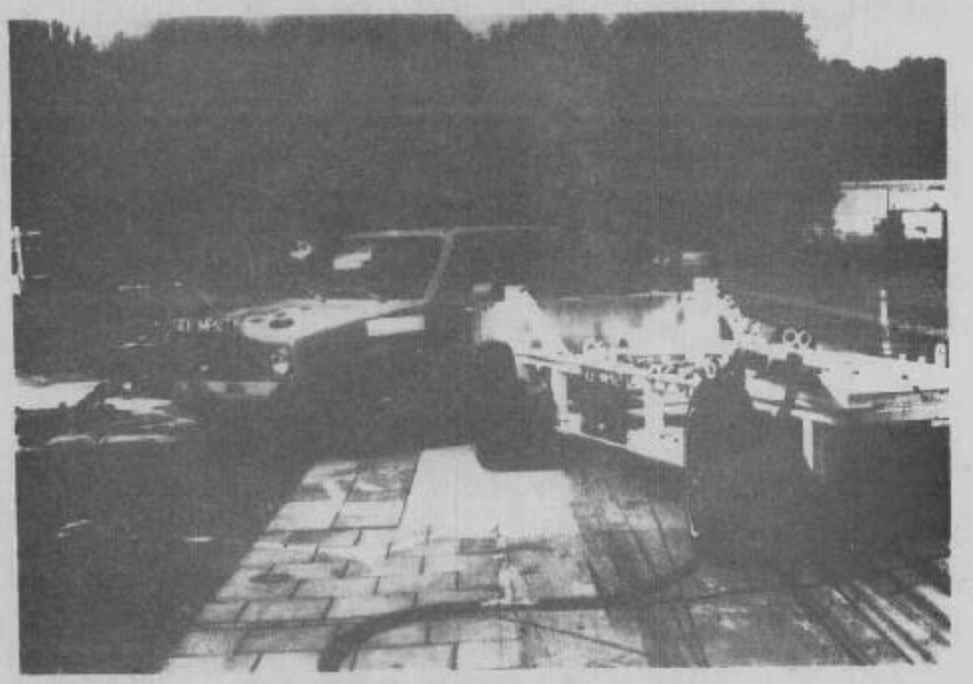


FIGURE 1 : 19° CRABBED BARRIER TEST DEVICE

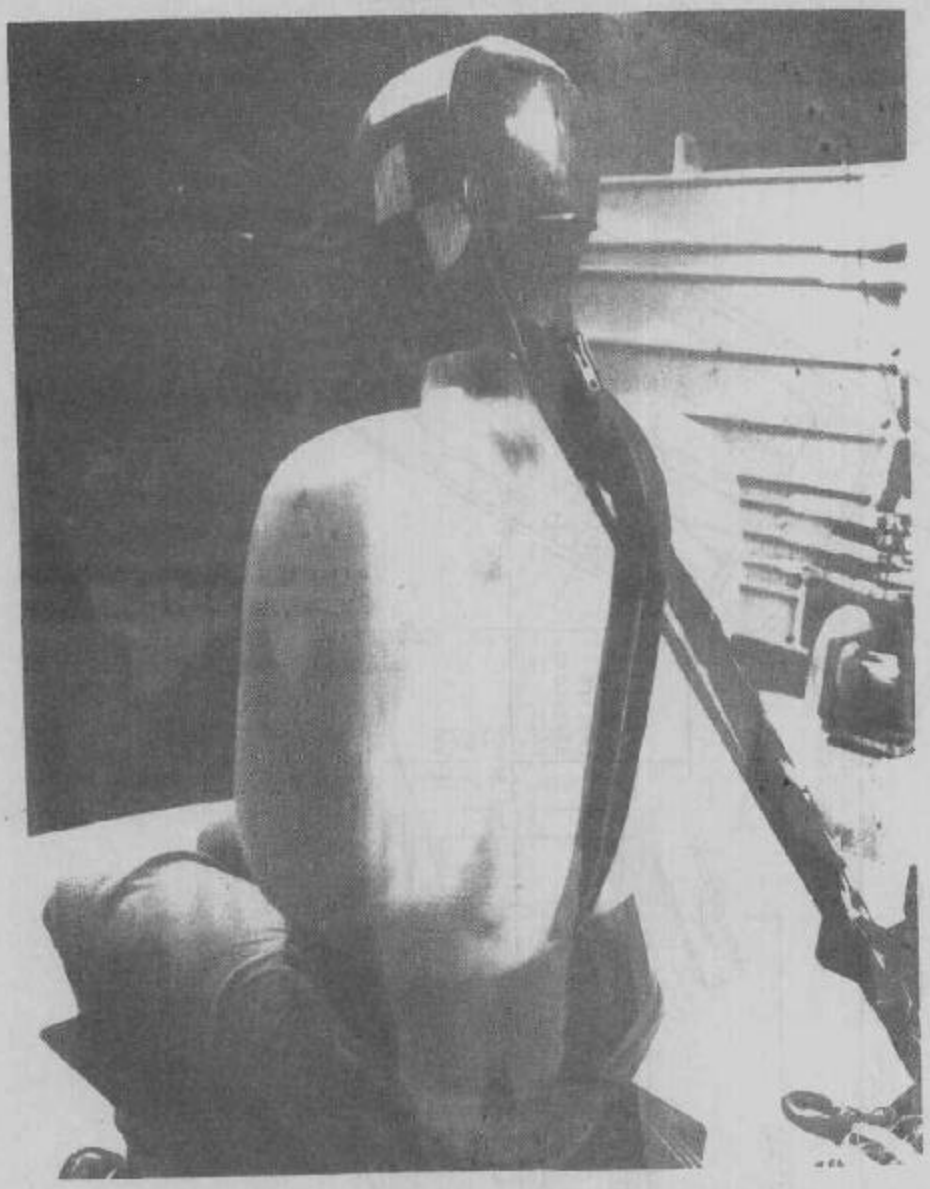
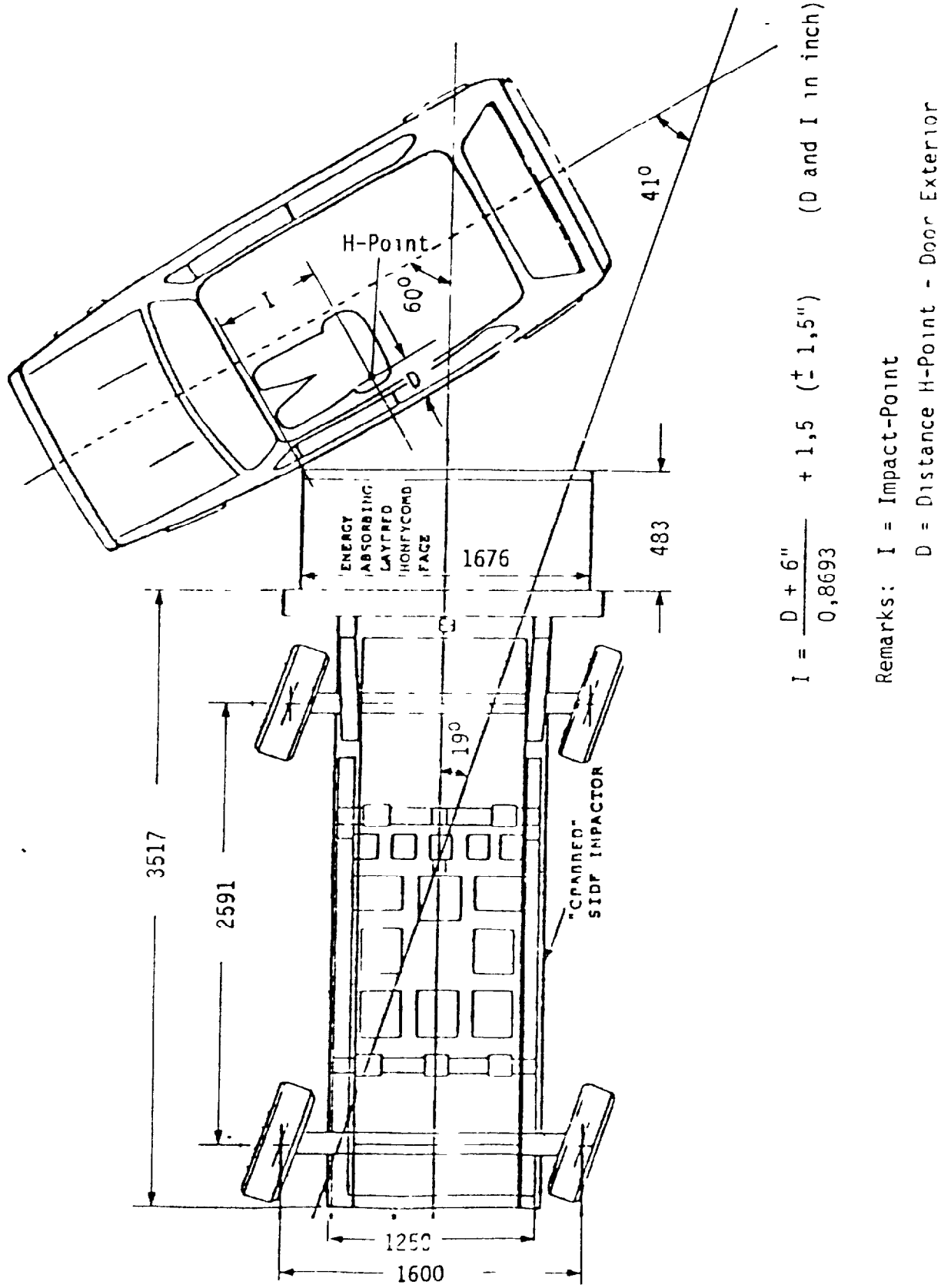


FIGURE 2: HSRI SIDE IMPACT DUMMY



$$I = \frac{D + 6''}{0{,}8693} + 1{,}5 \quad (\pm 1{,}5'')$$

(D and I in inch)

Remarks: I = Impact-Point
D = Distance H-Point - Door Exterior

Figure 3: Test Configuration

Form FF 74a

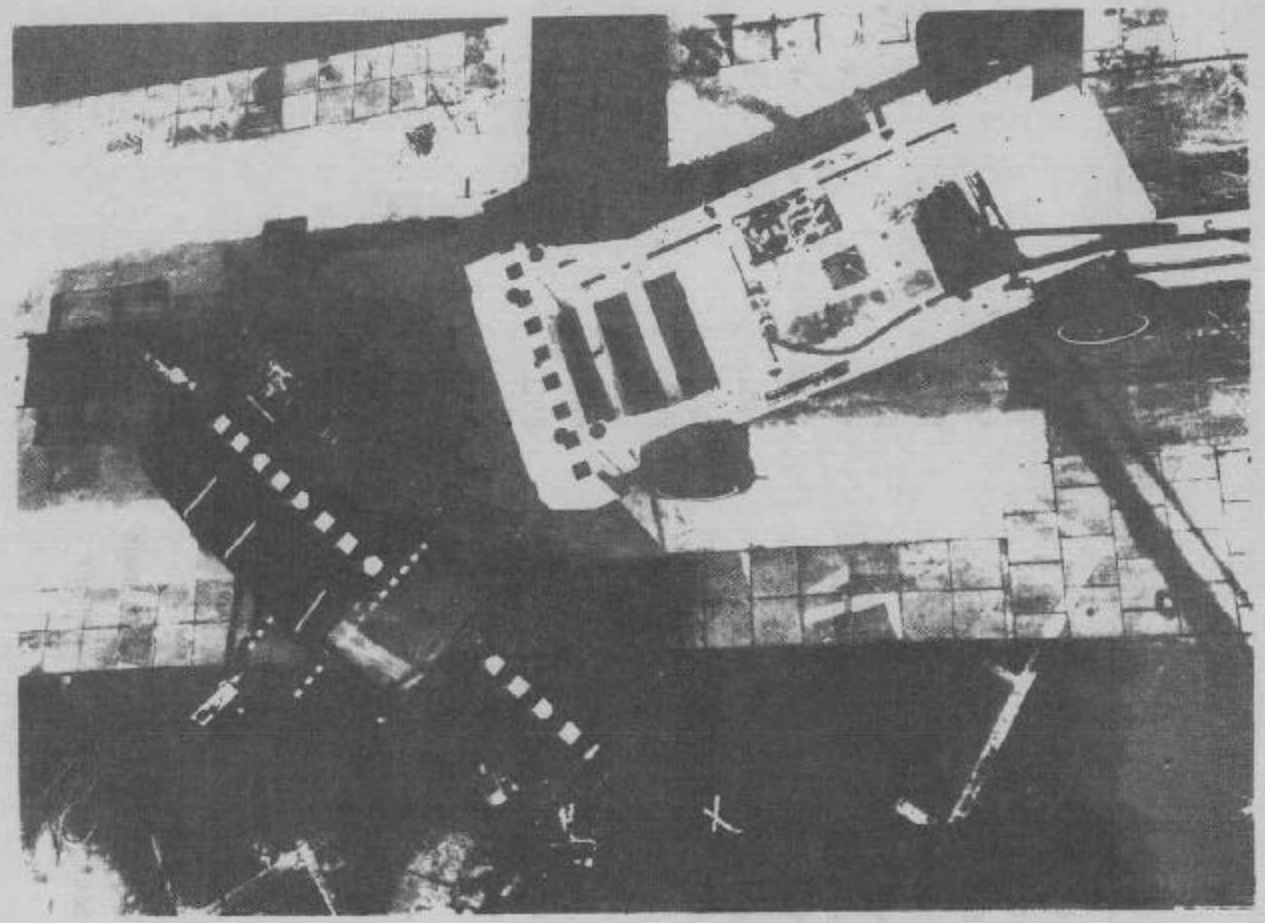


FIGURE 4 : SIDE IMPACT TEST CONFIGURATION

CRABBED BARRIER / VW RABBIT

Table List of Accelerometer - Location

VEHICLE

No.	Location	Shortened Form	Direction
1	Right Front-Doorsill	TSVR	Y
2	Left Front-Doorsill	TSVL	Y
3	Left Rear-Doorsill	SHHL	Y
4	Rear Deck over Centerline	KOBO	X, Y, Z
5	Front Firewall over C_L	SWMI	X, Y, Z
6	Mid-front Edge of left Front-Door	TTRV	Y
7	Middle of left Front-Door	TTRM	Y
8	Shoulder Contact at Front-Door	SASL	Y
9	Pelvis Contact at Front-Door	BASL	Y
10	Left Front-Door on Windowsill	FBVL	Y
11	Right Front-Door on Windowsill, directly across No. 10	FBVR	Y
12	Left B-Pillar near Door Latch	BSLL	Y
13	Right B-Pillar across No. 12	BSLR	Y
14	Underneath left Front Seat attached to Seat	SGFA	Y
15	Vehicle Center of Gravity	RTMI	X, Y, Z
16	Left Front-Door Intrusion	FTWE	Y
17	B-Pillar Intrusion	THWE	Y
18	Shoulder Contact Driver	SK01K	
19	Pelvis Contact Driver	BK01K	
20	Shoulder Contact Left Rear Passenger	SK03K	
21	Pelvis Contact Left Rear Passenger	BK03K	

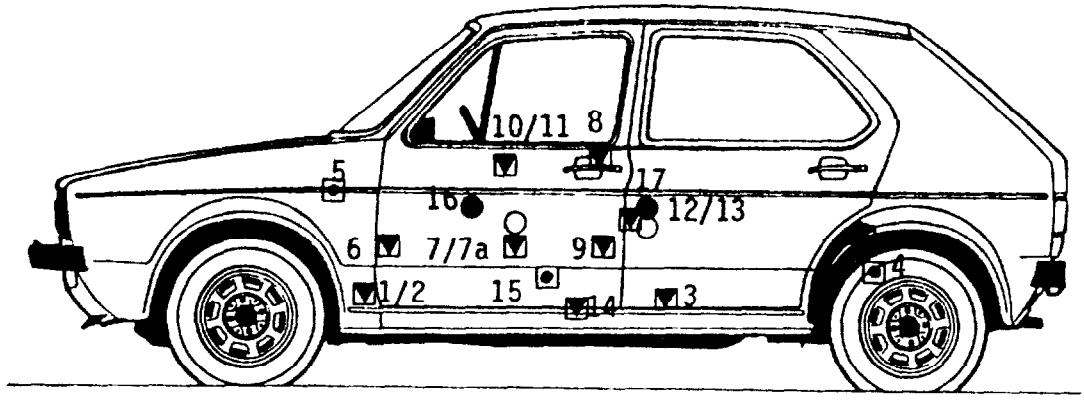
19° CRABBED SIDE IMPACTOR

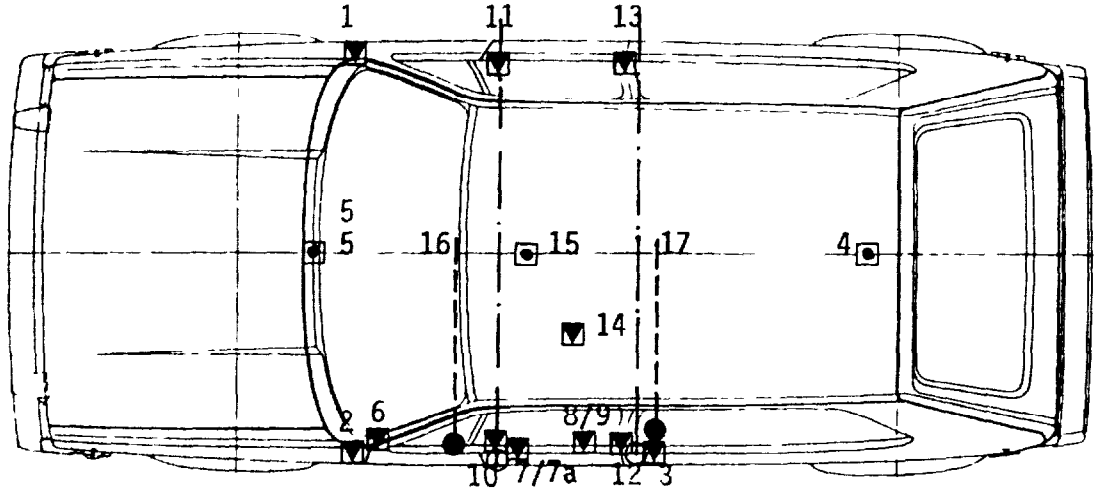
1	Right Frame Rail	LTRR	X
2	Left Frame Rail	LTRL	X
3	Front Crossmember at C_L	QTVM	X
4	Right Rear Vertikal Framerail	RHTR	X, Y
5	Center of Gravity	SPKT	X, Y, Z

Declaration: X = Longitudinal
Y = Lataral
Z = Vertikal

Location of Accelerometer for the HSRI Side Impact Dummies

Location	Shortened Form	Direction
DRIVER		
Head Triaxial	K001	X, Y, Z
Upper Sternum	B001	X
Lower Sternum	BU01	X
Left upper Rib	L001	Y
Left lower Rib	LU01	Y
Right upper Rib	R001	Y
Right lower Rib	RU01	Y
Upper Thorax (T 1)	T001	X, Y, Z
Lower Thorax (T 12)	TU01	X, Y, Z
Pelvis Triaxial	BE01	X, Y, Z
Chest Deflection	WE01	Y
Shoulder Beltforce	GU01SA	
REAR LEFT PASSENGER		
Head Triaxial	K003	X, Y, Z
Upper Sternum	B003	X
Lower Sternum	BU03	X
Left upper Rib	L003	Y
Left lower Rib	LU03	Y
Right upper Rib	R003	Y
Right lower Rib	RU03	Y
Upper Thorax (T 1)	T003	X, Y, Z
Lower Thorax (T 12)	TU03	X, Y, Z
Pelvis Triaxial	BE03	X, Y, Z
Chest Deflection	WE03	Y
Pelvis Beltforce	GU03BA	





Axial Accelerometer (Y - Direction)

Biaxial Accelerometer (X, Y - Direction)

Triaxial Accelerometer (X, Y, Z -Direction)

Displacement Tube

Displacement Transducer

Note: See Table for Additional Information

Figur 5 : Targ t V hicle Instrumentation

Accelerometer -		Coordinates (mm)			Results (Gmax)		
No.	Location	X *	Y *	Z *	X	Y	Z
1	Occupant Compartment, right Front-Doorsill	2630	620	300		17.5	
2	Occupant Compartment, left Front-Doorsill	2630	-620	300		106.6	
3	Occupant Compartment, left Rear-Doorsill	1410	-560	290		168.1	
4	Rear Deck over Vehicle Centerline	910	0	440	18.1	25.1	13.2
5	Front Firewall over Vehicle Centerline	2890	0	650	16.8	6.9	7.0
6	Mid-front Edge of Left Front Door	2550	-620	457		-	
7	Middle of left Front Door	2060	-620	630		133.5	
8	Shoulder Contact Front Door	1775	-665	850		210.9	
9	Pelvis Contact Front Door	1840	-660	480		146.2	
10	Left Front Door on Windowsill, slightly forward of surrogate s	2050	-650	850		138.4	
11	Right Front Door on Windowsill, directly across from Nr. 10	2050	650	850		24.3	
12	Left B-Pillar near Door Lock	1480	-650	670		109.3	
13	Right B-Pillar across from Nr. 12	1480	650	670		43.3	
14	Underneath left Front Seat attached to Seat	1960	325	285		131.2	
15	Vehicle Center of Gravity				11.9	62.8	17.0
16	Displacement Transducer Front Door	2235	-	670		0.225m	
17	Displacement Transducer B-Pillar	1415	-	850	not available		

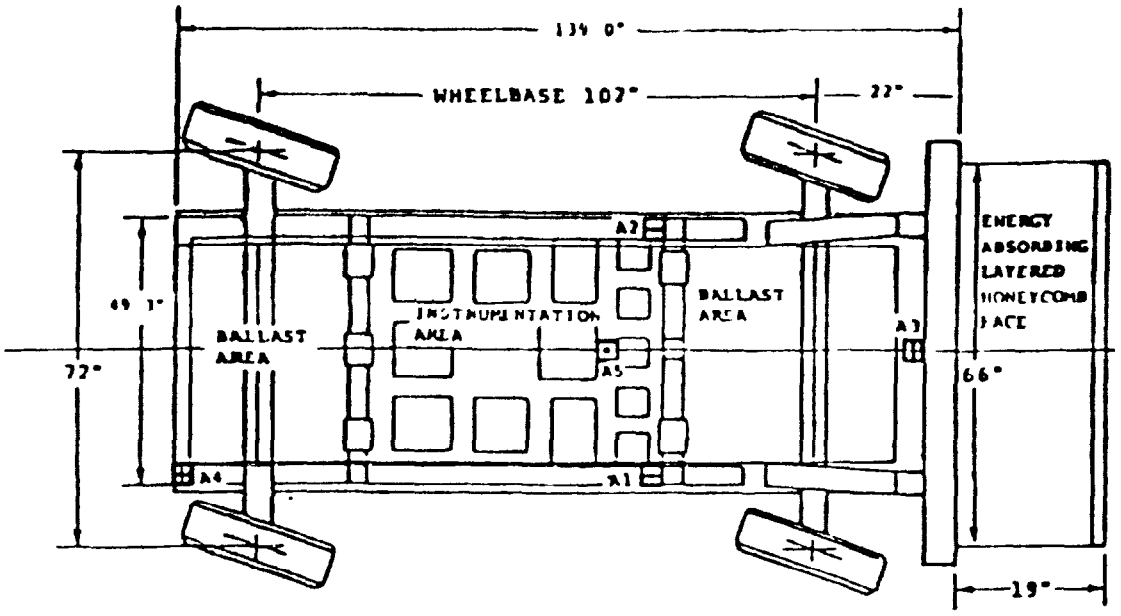
* Reference Points: X - Rear Bumper
Y - Vehicle Centerline
Z - Ground Level

Tabl 2 : Summary of Target Vehicle Instrum ntation

TEST NO . 4

Form PE 76e

TEST NO : 4



Axial Accelerometer, Longitudinal

Biaxial Accelerometer, Long., Lat.

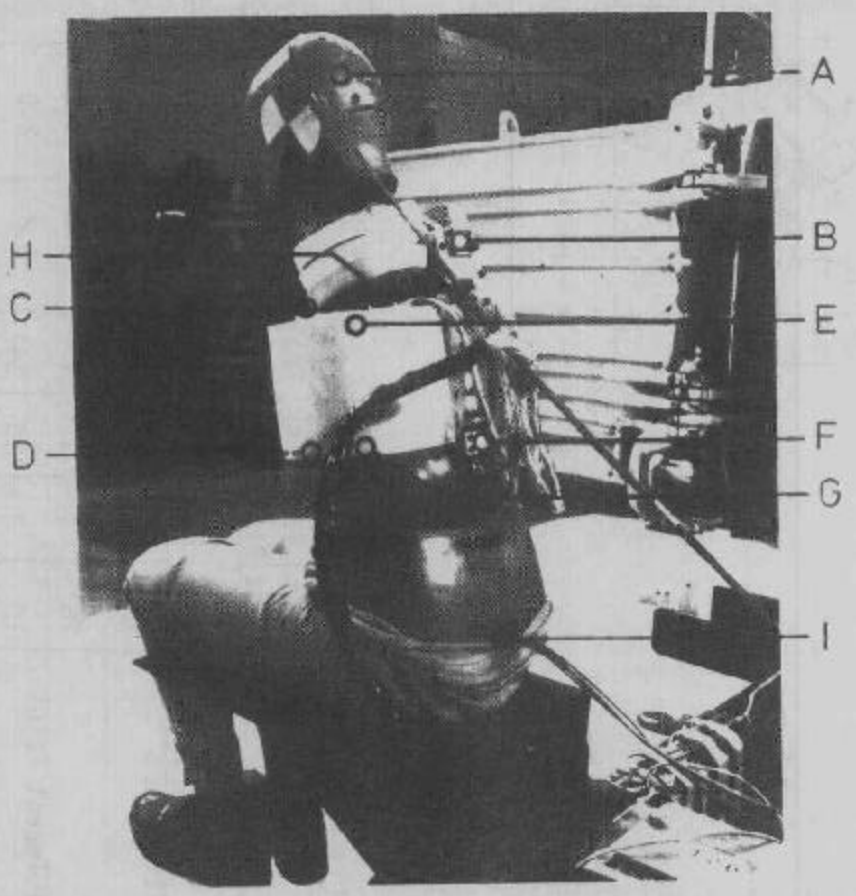
Triaxial Accelerometer, Long., Lat., Vert.

No.	Accelerometer - Location	Coordinates [mm]			Results [G]		
		X	Y	Z	Long	Lat	Vert
A 1	Right Frame Rail	2134	584	508	15.6		
A 2	Left Frame Rail	2134	-584	508	13.2		
A 3	Front Crossmember at Centerline	3300	0	610	17.2		
A 4	Right rear vertikal Frame Rail	228	560	407	18.5	30.2	
A 5	Side Impactor Center of Gravity	1727	0	305	23.3	16.8	18.8

Reference Plane: X - Rear of Side Impactor
Y - Side Impactor Centerline
Z - Ground

FIGURE 6 : SIDE IMPACTOR INSTRUMENTATION

Form PE 760



A. Head Triaxial
B. Upper Thorax (T1), Triaxial
C. Upper Sternum, Longitudinal
D. Lower Sternum, Longitudinal
E. Left Lower Rib, Lateral
(also on right)
F. Lower Thorax (T12), Triaxial
G. Left Lower Rib, Lateral
(also on right)
H. Displacement Transducer
I. Pelvis, Triaxial

FIGURE 7 : LOCATION OF 18 ACCELEROMETER FOR SIDE IMPACT DUMMY

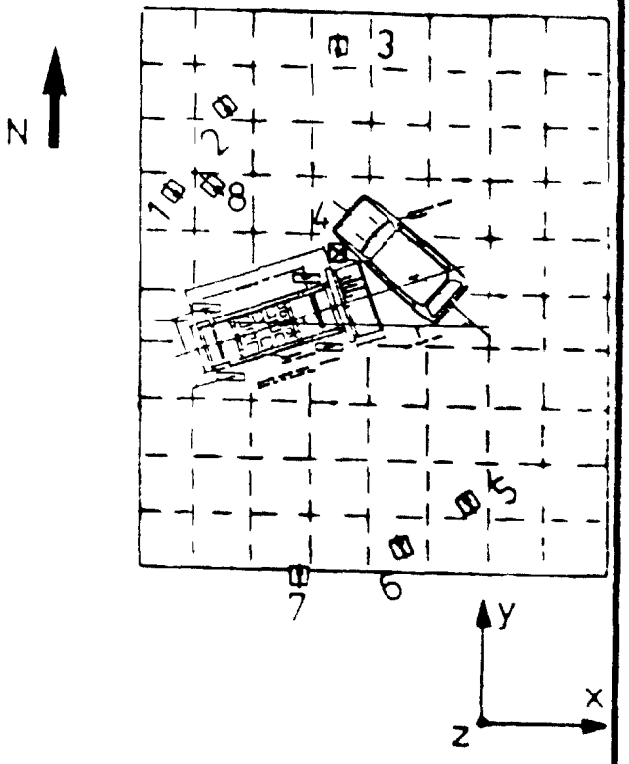
Test No: 4 Test Date: 11.06.1981

Test Type: 60° Side Impact Simulation

Vehicle A : Side Impactor

Vehicle B: VW-Rabbit

Comments: Side Impactor "Crabbed" 19°



Camera	Yes
Stills	
Movie	
Slides	
Polaroid	

Camera Symbols

- Pit
- Ground
- Barrier
- Overhead
- On-Board

Frame Rate

1. 1000 fr/sec
2. 25 fr/sec
3. 400 fr/sec

Timing Light, Speed

1. 100 Hz (10 msec/light)
2. Other

Loc. No.	Location	Field of View	Lens Size	Frm Rate	Tmng Spd	Real Fr.R.	Impact Dist-X	C. L. Dist-Y	Cam [m] Dist-Z
1	North Side -Parallel To Bullet	Overall of Both Vehicles (Locam)	16	3	10	337	-7.0	4.0	1.3
2	North Side -Parallel to Target	Close-up of Both Vehicles at Impact (Locam)	10	3	10	400	-3.0	4.5	2.2
3	North Side-Perpendicular to Bullet	Overall of Both Vehicles (Locam)	26	3	10	413	8.0	4.0	1.3
4	Overhead	Elevated - Looking Down at Impact Point (Photosonics)	10	3	10	327	-0.8	2.0	7.0
5	South Side -Parallel to Target	Close-up of Both Vehicles at Impact (Locam)	16	3	10	334	10.0	-12.0	1.3
6	South Side- Perpendicular to Target	Overall of Both Vehicles (Arri 16)	16	2	-	---	5.0	-12.0	1.0
7	South Side	Overall of Both Vehicles (Locam)	16	3	10	340	2.0	-12.0	1.[illegible]
8	North Side	Overall of Both Vehicles (Mitchel)	50	2	-	---	-4.5	4.0	1.[illegible]

Figure 8 :Camera Location - Ground based

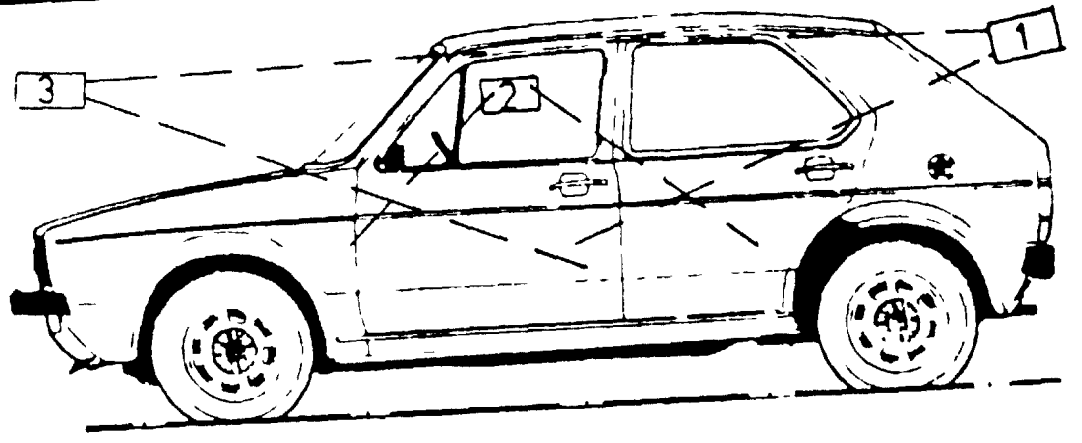
Test No.: 4 Test Date: 11.06.1981

Test Type: 60° Side Impact Simulation

Vehicle A: Side Impactor

Vehicle B: VW-Rabbit

Comments: Side Impactor "Crabbed" 19°



Camera Symbols

- □ on-Board
- [1] Ground
- △ Overhead

Frame Rate

1. 1000 fr/sec
2. 400 fr/sec
3. Other _____ fr/sec

Timing Light, Speed

1. 100 Hz (10msec/light)
2. Other _____

Loc. No.	Location	Field of View	Lens Size	Frm Rate	Tmng Spd	Real Fr.R	Impact Dist-X	C. L. Dist-Y	CAM Dist-Z [m]
1	Vehicle Rear Hatch-back Door	Front and Rear Occupant Compartment (Photosonics)	8	1	1	1000			
2	Vehicle Right Front Door	Front Occupant Compartment (Photosonics)	8	1	1	1000			
3	Vehicle Front Right Side	Front and Rear Occupant Compartment (Photosonics)	8	1	1	1000			

Figure 9: Camera Locations - on Board

3. Test Parameter and Results

3.1 Crash Test Summary

3.1.1 Target Vehicle

3.1.2 Side Impactor (19° Crabbed Barrier)

3.2 Pre-Test Conditions

3.2.1 Driver Pre-Test Position

3.2.2 Rear Passenger Pre-Test Position

3.3 Vehicle Pre- and Post-Test Position

3.4 Post-Test Observations

3.5 Dummy Test Response

3.5.1 Dummy Test Response Summary - Driver

3.5.2 Dummy Test Response Summary - Rear Passenger

3.5.3 AIS and Coefficients

3.6 Target Vehicle Test Response

3.6.1 Pre- and Post-Test Measurements

3.6.2 Exterior and Interior Vehicle Measurement

3.6.3 Exterior and Interior Static Crush (Top View)

3.6.4 Exterior and Interior Static Crush (Front View)

3.7 Crabbed Barrier Test Response

3.7.1 Pre- and Post-Test Frontal Profile

3.7.2 Exterior Static Crush

Table 3 : Crash Test Summary for Target Vehicle

VEHICLE DATA	TEST 4
Test Vehicle	VW Rabbit 4-Door
Overall Length/Width (mm)	3923 / 1613
Test Weight by Wheel (kp)	LR 272 RR 259 LF 341 RF 353
Total Weight (kp)	1225
Wheelbase (mm)	2402
Longitudinal C.G. (from Center of Front Axle) (mm)	1041.19
Impact Angle (Clock)*	60
Impact Speed (mph)	0 (stationary)
Maximum C.G. Resultant Velocity Change (mph/msec)	
Maximum C.G. Resultant Acceleration (G's/msec)	
Maximum Peak Acceleration (G's/msec)**	
Maximum Exterior Static Crush (mm)	
Level 4 (32.0")	375
• Level 3 (26.0")	368
• Level 2 (20.0")	391
Level 1 (12.0")	230
Maximum Post-test Intrusion (mm)	376
OCCUPANT	
Type	SID SID
Location	Driver Left Rear Pass.
Restraint	RA Pelvis Belt
INSTRUMENTATION	
Number of Data Channels	68
Number of [illegible] (On Board)	3

* [illegible]

** [illegible]

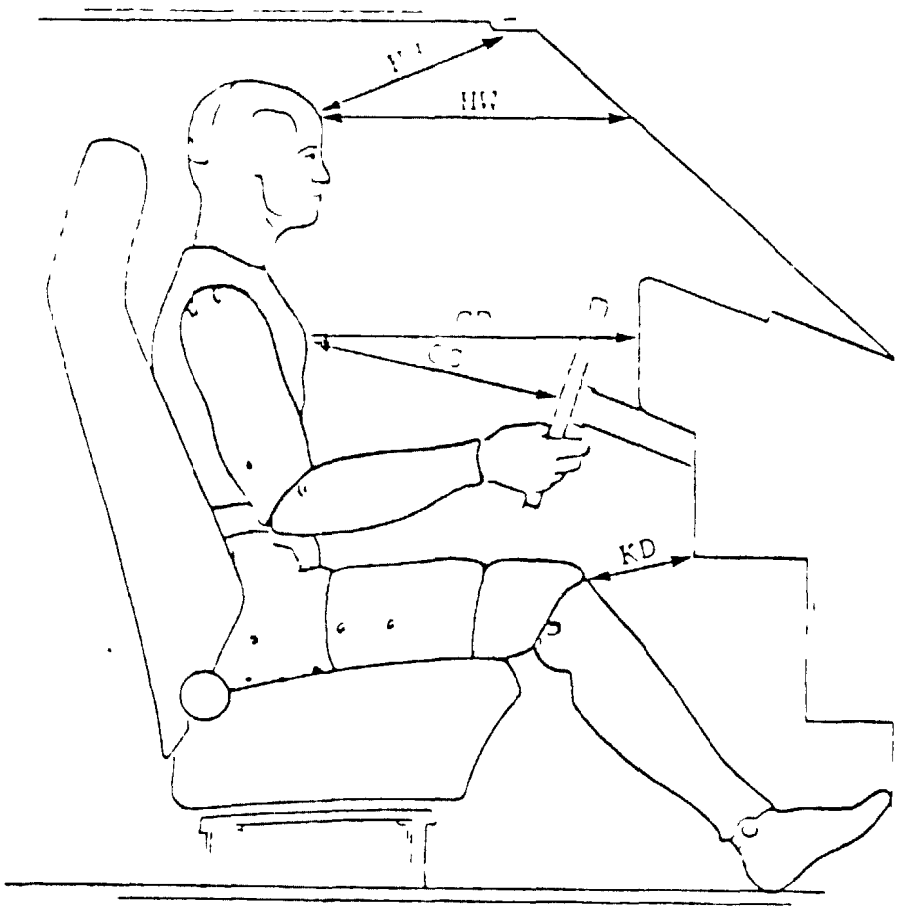
Table 4 : Crash Test Summary for Side Impactor

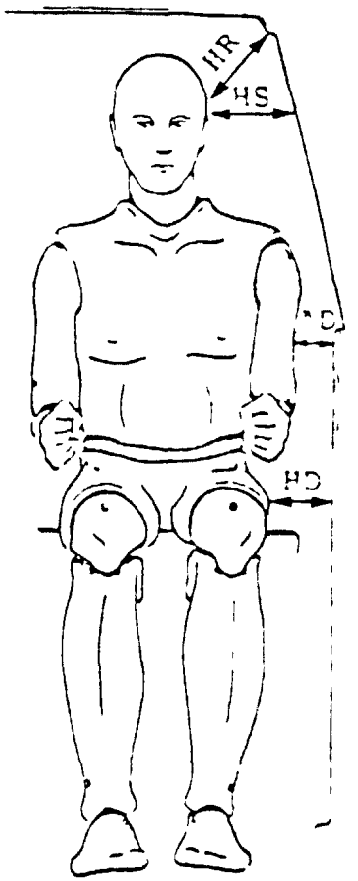
VEHICLE DATA	TEST 4
Test Vehicle	19° Crabbed Side Impactor
Overall Lenght/Width (mm)	4000 / 2155
Test Weight by Axle (kp)	LR 398 RR 383 LF 390 RF 401
Total Weight (kp)	1572
Wheelbase (mm)	2591
Longitudinal C.G. (from Center of Front Axle) (mm)	1266
Impact Angle (deg)	60
Impact Speed (mph)	40.05
Maximum C.G. Resultant Velocity Change (mph [illegible])	
Maximum C.G. Average Resultant Compartment Acceleration (G [illegible])	
Maximum Static Crush (mm)	
• Row C (Top of Stack Level)	370
• Row B (Mod-Stack Level)	230
• Row A (Bumper Level)	285
OCCUPANTS	
Type	-
Location	-
Restraint	-
INSTRUMENTATION	
Number of Data Channels	10
Number of Cameras (Ground Based)	7

Test No.: 4 Vehicle: 4 LF 341 (kp) RF 353 (kp)
Test Date: 11.06.81 Total Test Wt. 1225 (kp) LR 272 (kp) RR 259 (kp

HEAD RESTS - up down other none
FRONT SEAT - forward midpoint rearward latched welded
FRONT SEAT TILT - forward midpoint back other 25° none
REAR SEAT - in place removed
STEERING WHEEL - up midpoint down not adjustable
SUN VISORS - up down removed
GLOVE COMPARTMENT - locked closed none
SEAT BELT - fastened unfastened removed none
SHOULDER HARNESSES - fastened unfastened removed
VENT WINDOW _ closed open removed none stationary
LEFT FRONT WINDOW - up down removed
RIGHT FRONT WINDOW - up down removed
LEFT REAR WINDOW - up down removed
RIGHT REAR WINDOW - up down removed
BACKLIGHT - in place removed
LEFT FRONT DOOR - closed locked removed
RIGHT FRONT DOOR - closed locked removed
LEFT REAR DOOR - closed locked removed
RIGHT REAR DOOR - closed locked removed
ENGINE - in place removed mounts modified
TRANSMISSION - neutral other _____ removed
DRIVESHAFT - in place removed
PARKING BRAKE - off on disconnected
FRONT BUMPER - in place removed none
REAR BUMPER - in place removed none
HOOD - in place removed
WINDSHIELD WIPERS - in place removed
FUEL TANK - 95 Percent full empty other _____
RADIATOR - full empty none removed
BATTERY - in place removed drained
SPARE TIRE - in place removed none
JACK - in place removed none
WHEEL COVERS - in place removed none
BALLAST - none _____ kg
DUMMY LOCATION - LF RF LR RR none
DUMMY POSITIONING CRITERIA - FMVSS 208 side impact criteria other

Table 5 : Pre-Test Conditions



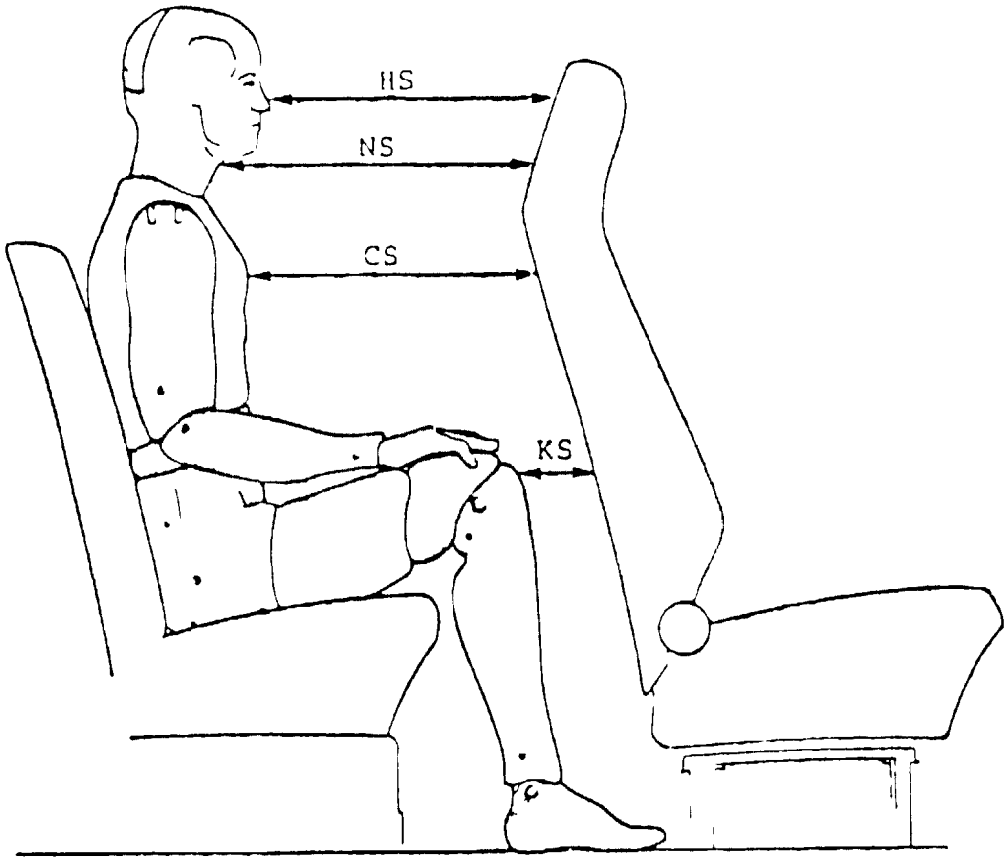


HH=	415
HW=	545
CD=	540
CS=	330
KD=	90

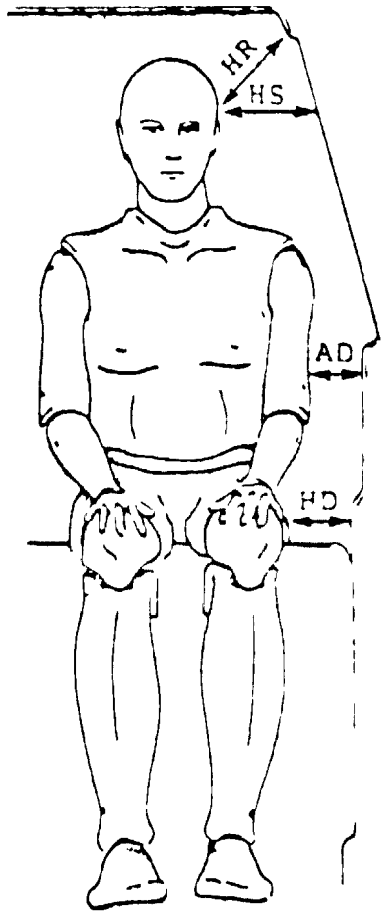
(ALL DIMENSION IN MM)

HR=	150
HS=	190
AD=	90
HD=	150

Table 6: **Driver Pre-Test Position**



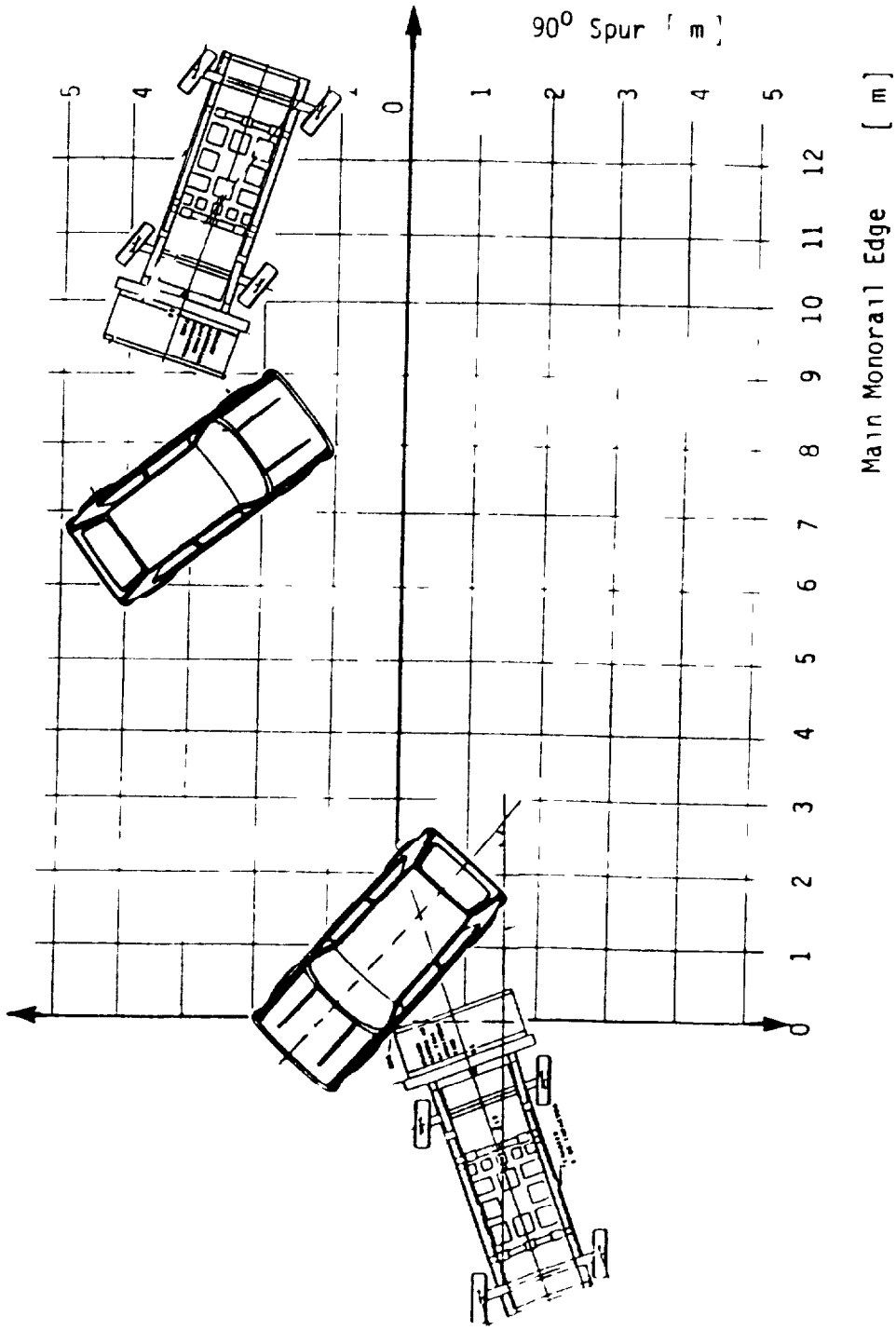
HS	475
NS	500
CS	412
KS	75



HR	108
HS	215
AD	150
HD	190

Table 7 : **Rear Passenger Pre-Test Position**

Table 8 : Vehicle Pre- and Post-Test Position



Form FE 76a

Table 9 : Summary of Post-Test Observations

VEHICLE: VW Rabbit 4

Test No. (Moving Test Device) 4

Dummy Contact Points:	Left Front	Left Rear
Head	no Contact	Contact at C-Pillar and Roof-Line
Chest	Upper Door Panel and lower Window-Sill	Upper Door Panel and lower Window-Sill
Knees/Hip	Lower Front-Door Panel	Lower Rear-Door Panel

Glazing: Left Front- and Rear Side-Window shattered. Windshield cracked.

Doors: Left Front- and Rear-Door damaged, would not open.

Seat Belt Anchorages: Left Seat Frame damaged, but Seat Anchorages remained intact. Seat Legs and - Runner not separated from Floor-Rails. Seat Support damaged.

Restraints: Driver (RA) and Left Rear (Lap - Belt) in use.

Fuel Leakage: None

General Observations: Impact Point 650 mm from Front Axle.

Side Impactor Bumper impacted under the Door Beams. Buckling on the Area of the B-Pillar. B-Pillar damaged and bended on the Level of the Window-Sill. Left Front-Door separated from lower Sill. Knee-Bolster supported the A-Pillar. A-Pillar turned.

Driver-Dummy - no damage

Left Rear-Dummy - Damper, Damper-Frame and Potentiometer bended. Leather tore up from Spine on the left Side.

TEST NO. 4 TEST DATE 11.06.1981

TEST CONFIGURATION:

Target Vehicle VW-Rabbit 4-Door Speed 0 [mph]

Bullet Vehicle 19° Crabbed Side Impactor Speed 40.05 [mph]

Impact Location behind Front Axle 650 [mm] Angle 60 [deg]

PASSENGER: D R I V E R

HEAD RESPONSE:

Peak a_R 112.84 [g] Impacted Object none

HIC 593.52 Time T 1 49 [ms] T2 81 [ms]

CHEST RESPONSE:

Location	[g]	≥ 3ms [g]	SI	Δv_y [mph]	Imp.Time [ms]	Time a-max [ms]
Upper Sternum (X)	77.29	54	--	---	33	75
Lower Sternum (X)	48.94	37	--	---	33	74.5
LUR (Y)	114.94	96	--	25.39	30	42
LLR (Y)	112.82	87	--	22.10	28	42
RUR (Y)	68.17	62	--	19.42	35	47
RLR (Y)	107.84	90	--	27.14	37	44.5

CHEST DEFLECTION: Damper - DY 35 [mm]

VERTEBRAL COLUMN RESPONSE:

Location	Pk ay[g]	Pk a_R[g]	> 3 ms[g]	SI	Δv_y[mph]	Imp.Time [ms]	Time a-max [ms]
Upper Thorax (T1)	101.41	102.56	84	925	31.61	30	45.5
Lower Thorax (T12)	115.38	115.82	114	1020	27.61	30	42.5

PELVIS RESPONSE:

Pk a_R[g] 119.59 SI 776 ≥3 ms [g] 88.08 Impact Time [ms] 25

IMPACT TIME:

Shoulder 30 msec ; Pelvis 30 msec

Table 10: Side Impact Dummy Test Response Summary

TEST NO. 4 TEST DATE 11.06.1981

TEST CONFIGURATION:

Target Vehicle VW Rabbit 4-Door Speed 0 [mph]

Bullet Vehicle 19° Crabbed Side Impactor Speed 40.05 [mph]

Impact Location behind Front Axle 650 [mm] Angle 60 [deg]

PASSENGER: L E F T R E A R

HEAD RESPONSE:

Peak a_R 160.01 [g] Impacted Object C-Pillar and Roof-Line

HIC 734.72 Time T 1 72 [ms] T2 101 [ms]

CHEST RESPONSE:

Location	[g]	≥ 3ms [g]	SI	Δv_y [mph]	Imp.Time [ms]	Time a-max [ms]
Upper Sternum (X)	59.22	42	--	---	68	90.5
Lower Sternum (X)	88.57	74	--	---	65	75
LUR (Y)	95.76	70	--	30.35	63	77
LLR (Y)	125.94	85	--	19.43	60	80.5
RUR (Y)	75.28	70	--	23.51	63	77
RLR (Y)	103.61	92	--	25.69	60	77.5

CHEST DEFLECTION: Damper - DY 44.5 [mm]

VERTEBRAL COLUMN RESPONSE:

Location	Pk a_y[g]	Pk a_R[g]	≥3 ms[g]	SI	Δv_y[mph]	Imp.Time [ms]	Time a-max [ms]
Upper Thorax (T1)	113.67	118.59	104	826	24.75	39	85.5
Lower Thorax (T12)	87.29	92.43	83	712	26.59	39	75

PELVIS RESPONSE:

Pk a_R[g] 123.93 SI 1099.4 ≥3 ms [g] 112.4 Impact Time [ms] 37

IMPACT TIME:

Shoulder 58 msec ; Pelvis 60 msec

Table 11: Side Impact Dummy Test Response Summary

TEST NO.: 4 OCCUPANT: DRIVER

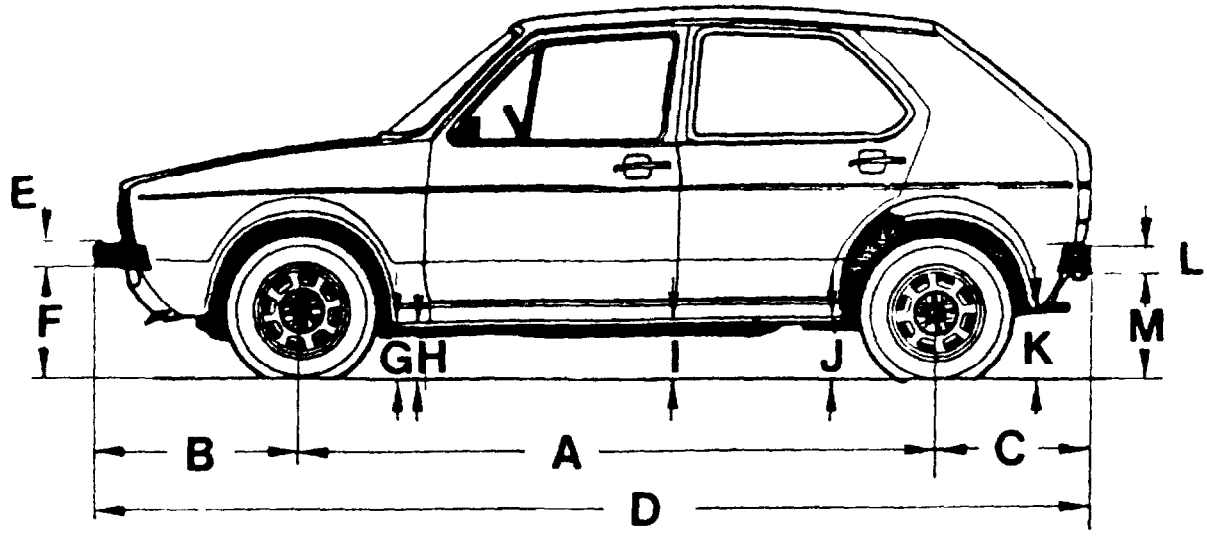
PREVIOUS AIS EVALUATION

LOCATION OF ACCELEROMETER	AIS B-PARAMETER	AIS AV. POWER	PAP	TB / TE (ms)	B	Q	V_{1050}	V_{1090}	RVS
LEFT UPPER RIB L U R	3.82	3.86	2390	38 / 46	7.0470	749.49	3.75	7.50	2.0000
LEFT LOWER RIB L L R	3.68	3.43	1945	38 / 46	6.9538	869.17	5.00	16.25	3.2500
UPPER THORAX T 1 Y	3.90	4.30	3404	42 / 59	7.0988	1222.0	6.25	14.37	2.3000
LOWER THORAX T 12 Y	4.01	4.13	2949	38 / 57	7.1728	1226.5	5.63	16.25	2.8889

NEW AIS EVALUATION

LOCATION OF ACCELEROMETER	ACCELERATION	AGE (YEARS) 20		30		40		50		60	
		FAT. R.	AIS	FAT. R.	AIS	FAT. R.	AIS	FAT. R.	AIS	FAT. R.	AIS
L U R	106.3	0.0000	0	0.0166	3	0.0346	3	0.0526	4	0.0706	4
L L R	96.0	0.0000	0	0.0000	0	0.0140	3	0.0320	3	0.0500	4
T 1 Y	90.9	0.0000	0	0.0034	2	0.0353	3	0.0674	4	0.0994	4
T 12 Y	116.9	0.0258	3	0.0618	4	0.0978	4	0.1338	4	0.1698	4

TABLE 12 : AIS AND COEFFICIENTS

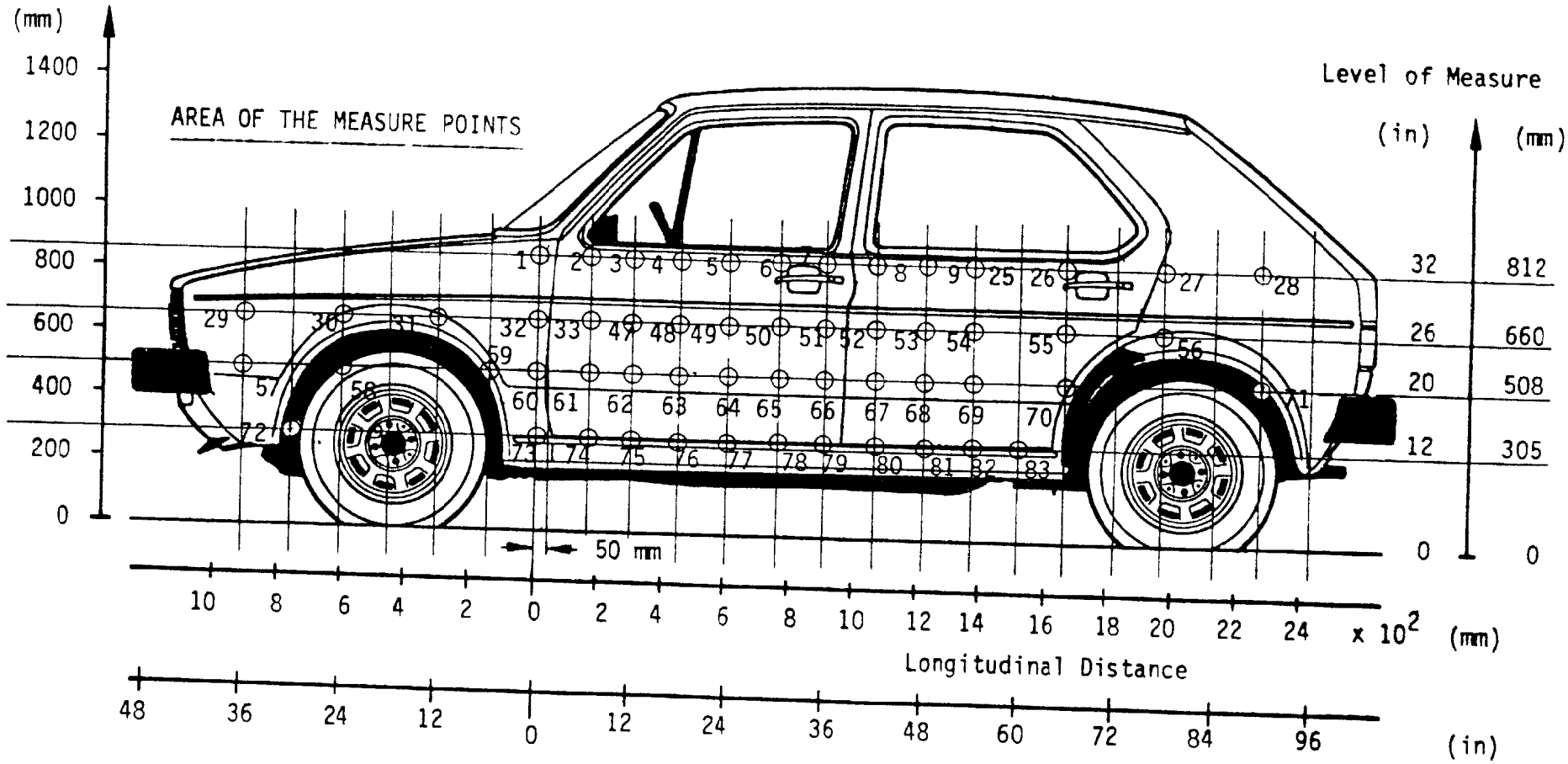


Static Measurement Front Door = 238 mm

Rear Door = 343 mm

	PRE - TEST	POST - TEST	Δ CHANGE
A	2402	2367.5	-34.5
B	825	820	- 5
C	700	690	-10
D	3927	3867.5	-49.5
E	125	125	0
F	385	405	20
G	190	185	- 5
H	160	187	27
I	155	173	18
J	153	180	27
K	190	200	10
L	126	126	0
M	295	233	-12

Table 13: Pre-and Post-Test Measurements



TEST NO : 4

VEHICLE NO : 705 110

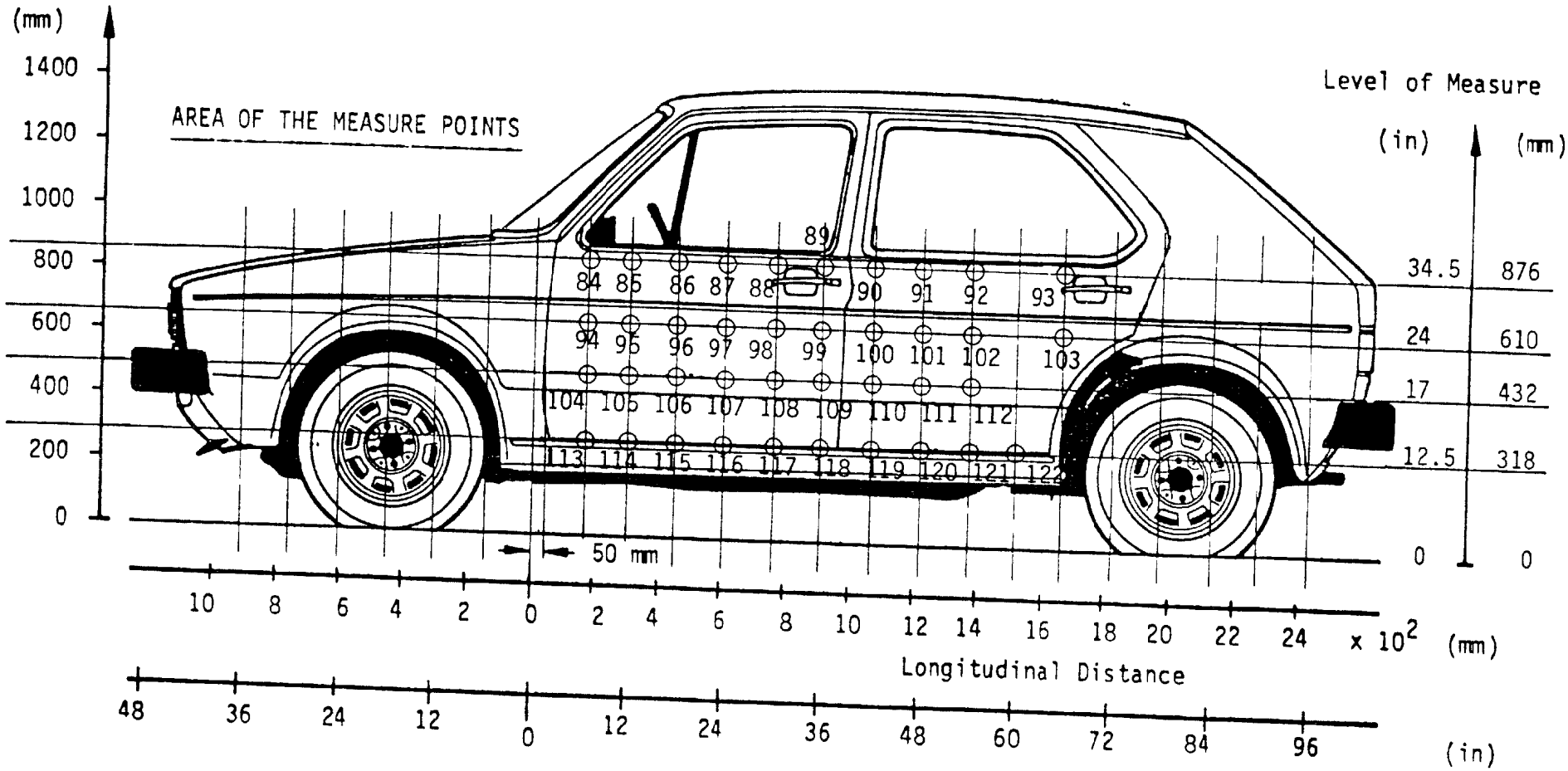
Figure 10: Vehicle Measurement Side (Exterior)

Table 14 : Exterior Static Crush for VW Rabbit

TEST NO : 4

Location	Height [mm] *	(Front) 762 (914 x)	610	457	305	152	0	152	305	457	610	762	914	1067	1220	1372	1524	1676	1829	1981	2286 (Rear)
		Zero Distance Located at Door [mm]																			
Window-Sill	812	-	-	-	-	-	6	52	148	225	284	341	363	375	325	160	-	130	-	11	+21
Bullet Vehicle Hood	660	+12x	+2	-	9	-	10	69	186	261	302	344	368	357	324	258	-	126	-	28	-
Mid-Door	508	+17x	+7	-	-	16	13	89	228	304	347	391	381	347	322	273	-	152	-	-	+ 4
Rocker-Sill	305	+22	-	-	-	-	11	73	102	132	160	198	224	230	159	94	58	-	-	-	-

* All heights measured above ground level.



TEST NO : 4

VEHICLE NO : 705 110

Figure 11: Vehicle Measurement Side (Interior)

Table 15: Interior Static Intrusion for VW-Rabbit

TEST NO: 4

Location	Height [mm] *	Zero Distance Starting at Door [mm]											
		0	152	305	457	610	762	914	1067	1220	1372	1524	1676
Windowsill Level	876	-	47	117	179	236	282	327	376	303	227	-	77
Mid-door Level	610	-	71	154	222	277	322	351	328	273	215	-	105
Bullet Vehicle Bumper Level	432	-	100	172	244	247	280	298	264	178	-	-	-
Doorsill Level	318	-	72	95	132	152	177	200	127	103	-	-	-

* Heights measured above ground level.

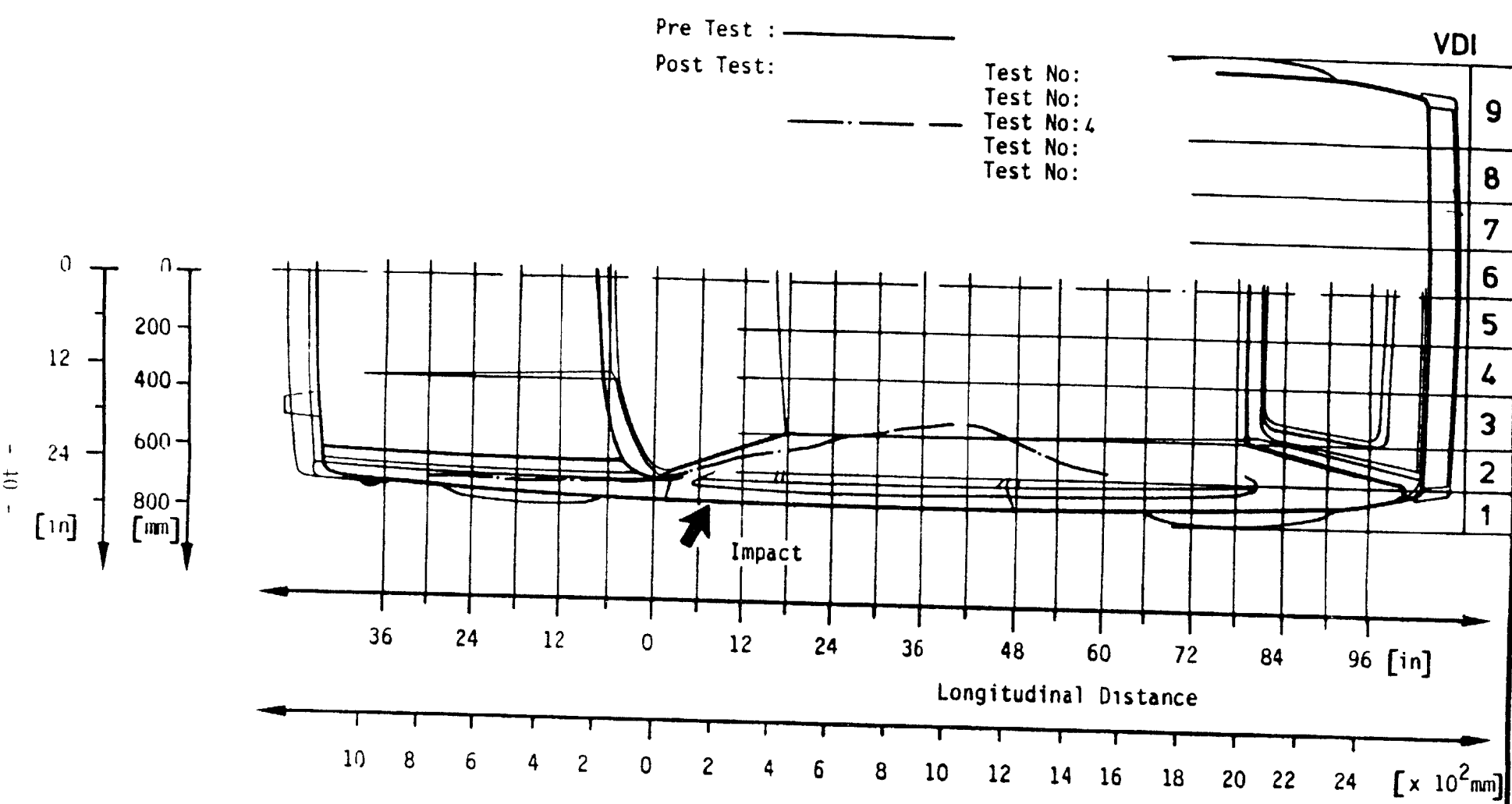


Table 16: Pre- and Post-Test Exterior Profiles at 305 mm abov Ground Level

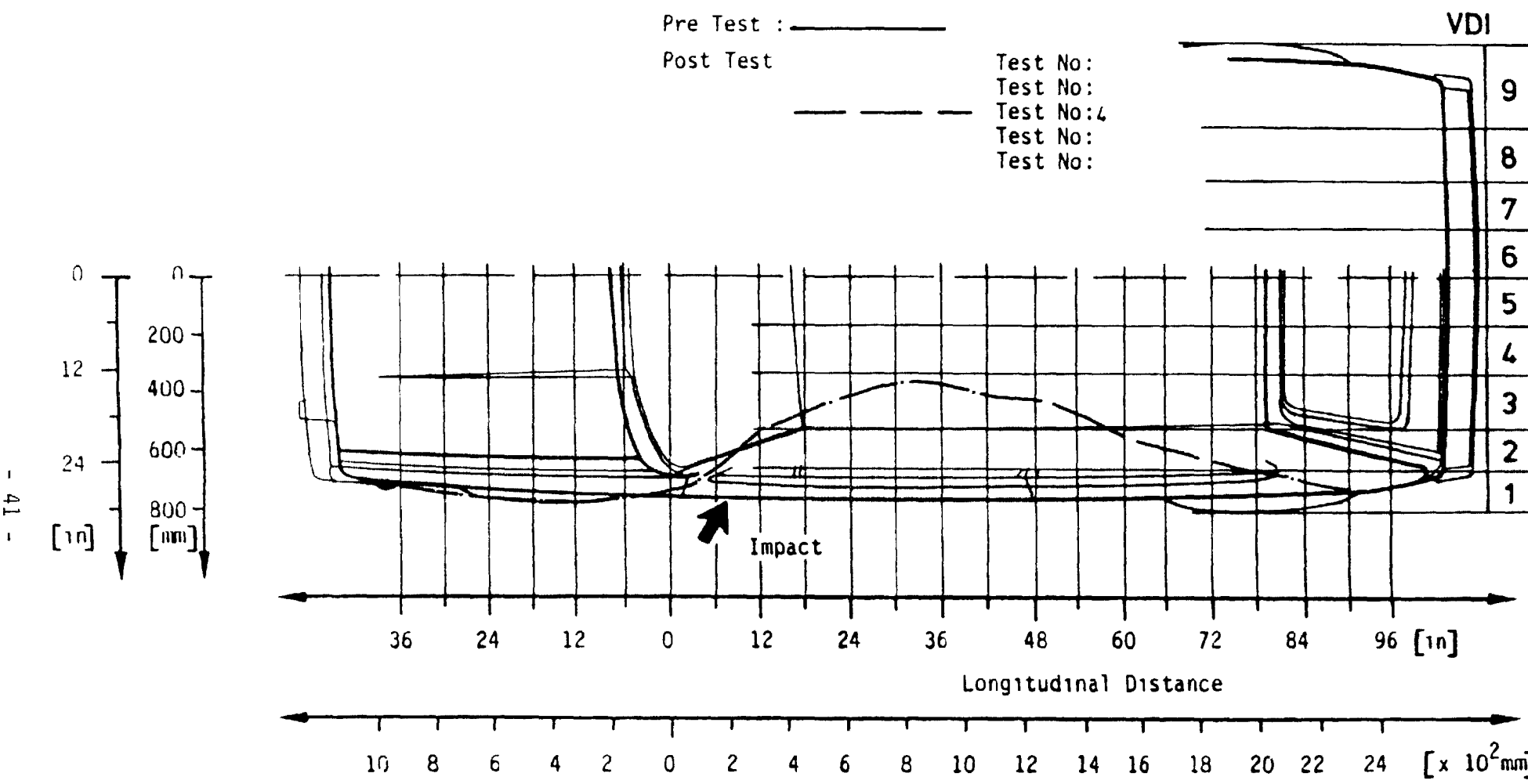


Table 17: Pre - and Post - Test Exterior Profiles at 508 mm abov Ground L vel

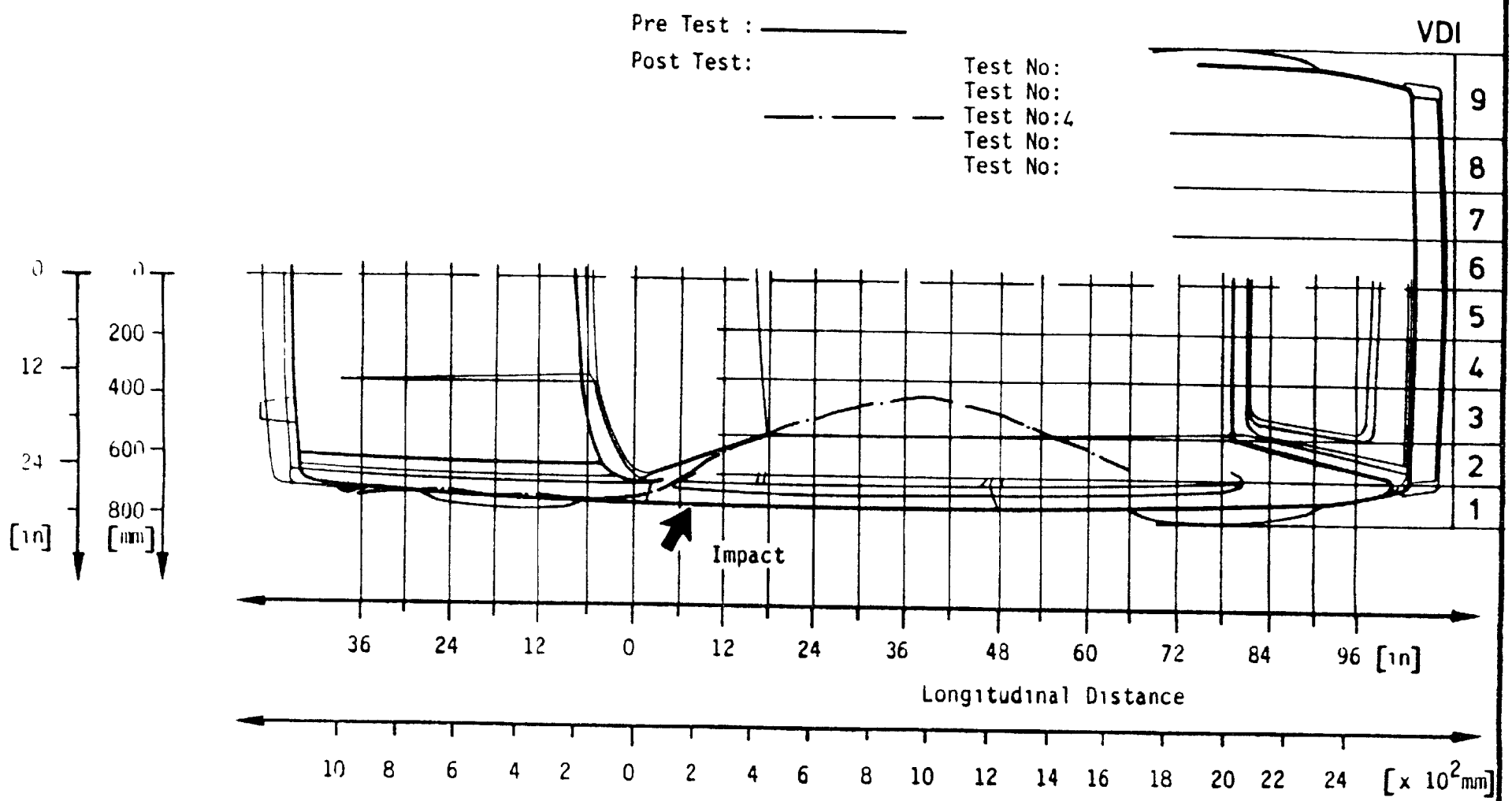


Table 18: Pre- and Post-Test Exterior Profiles at 660 mm above Ground Level

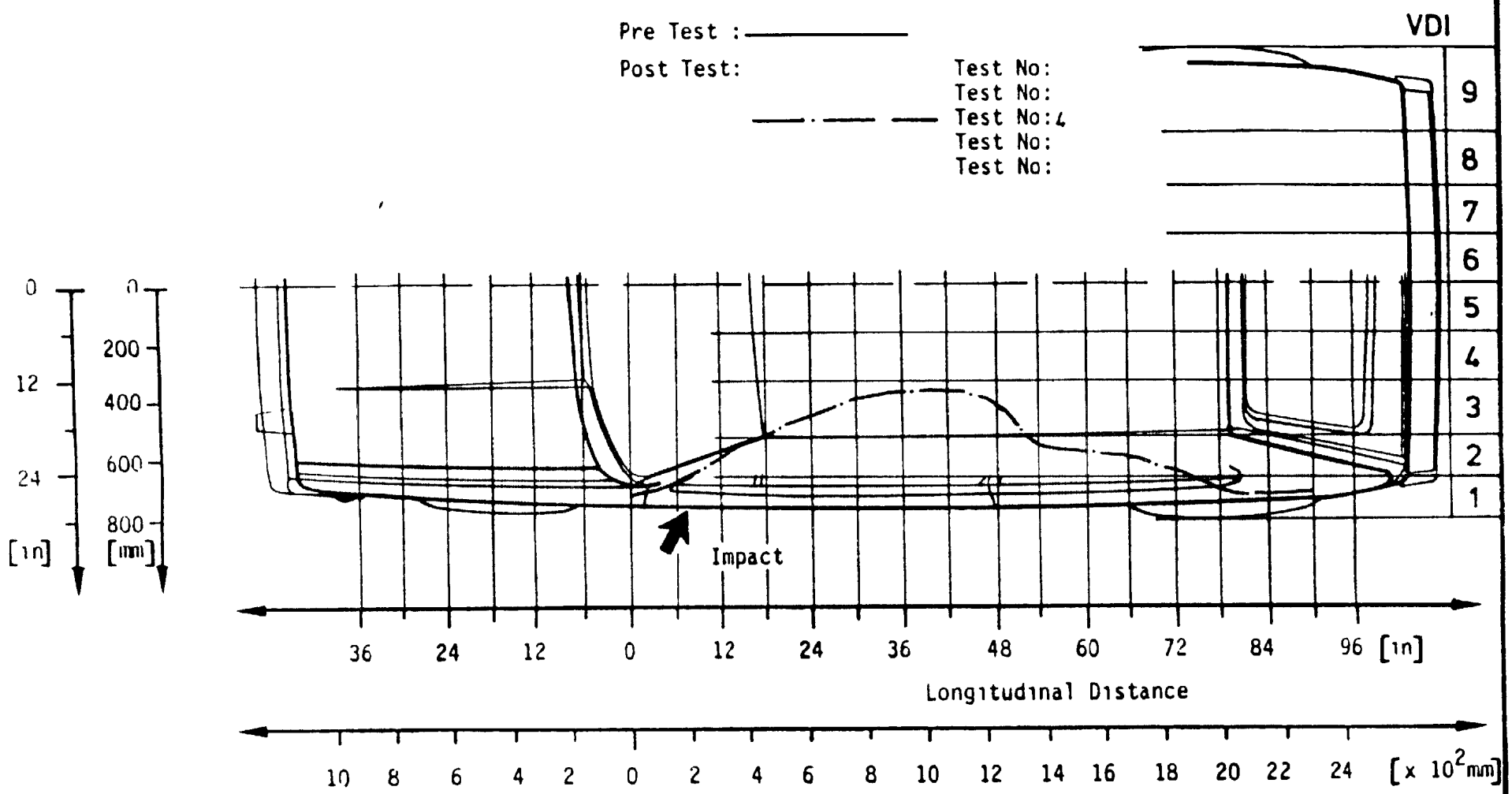


Table 19: Pre - and Post - Test Exterior Profiles at 812 mm abov Ground Level

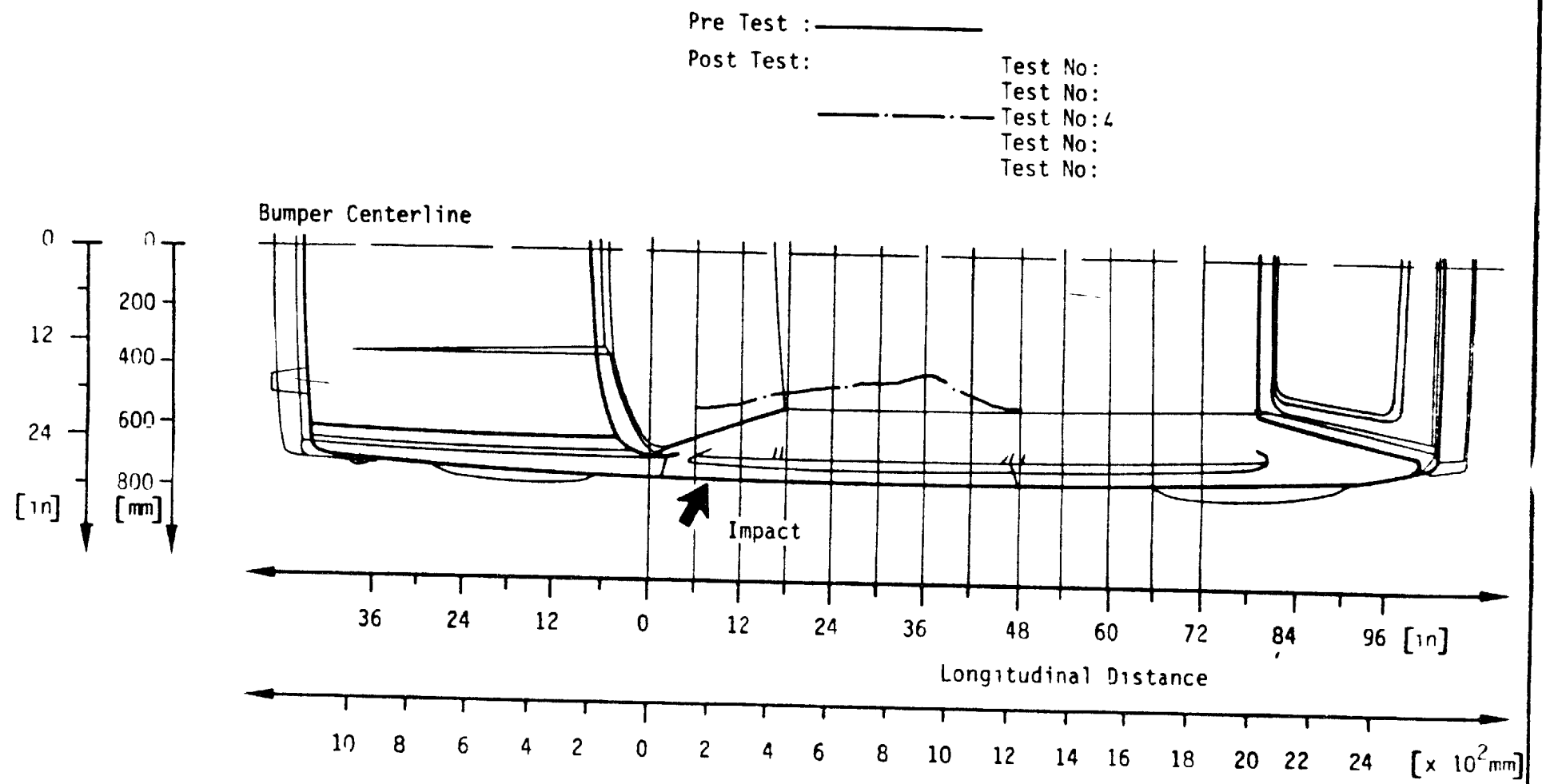
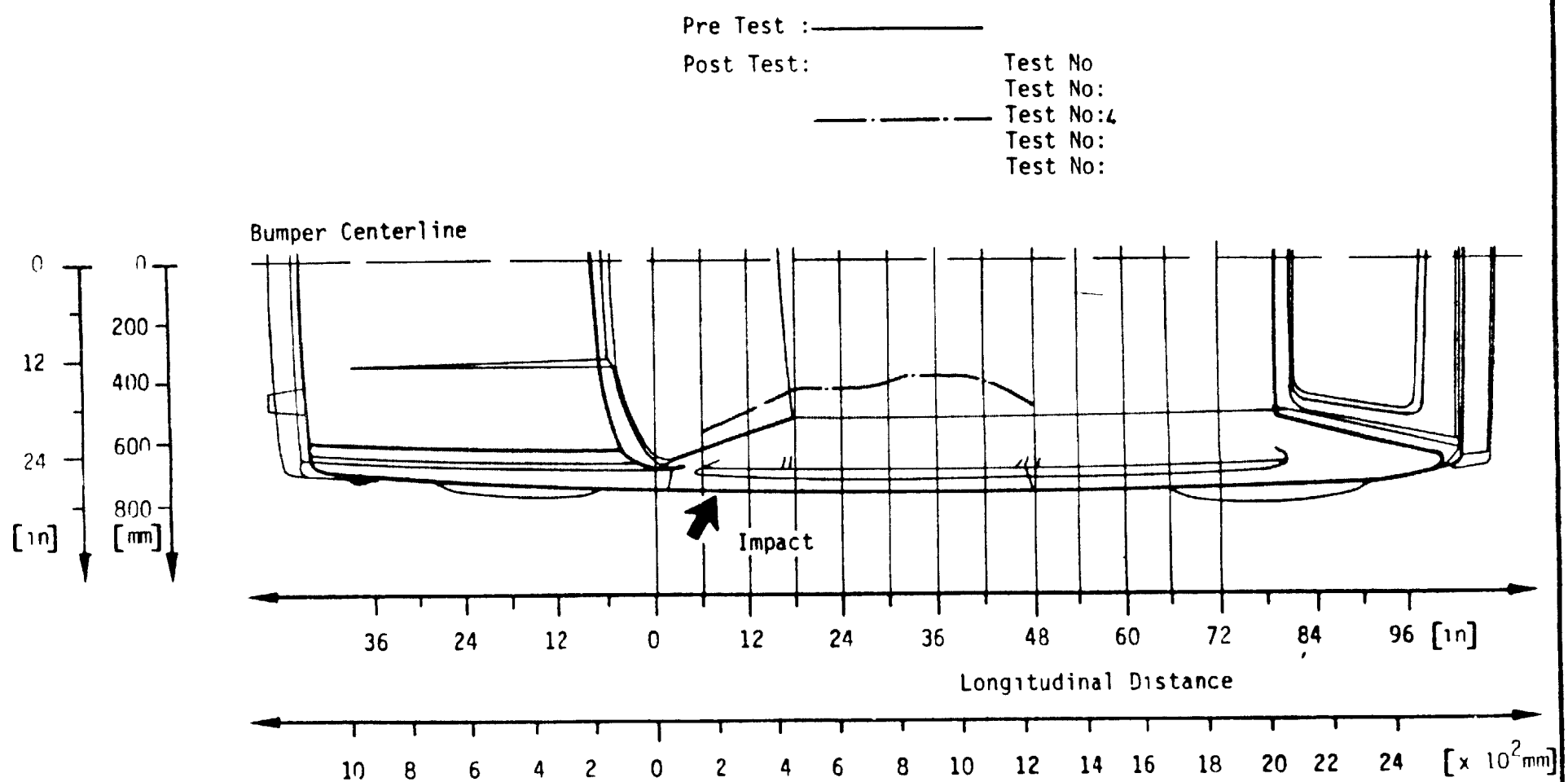


Table 20: Pre - and Post - Test Interior Profiles at 318 mm above Ground Level



Tabl 21: Pre-and Post-T st Interior Profiles at 432 mm abov Ground L v l

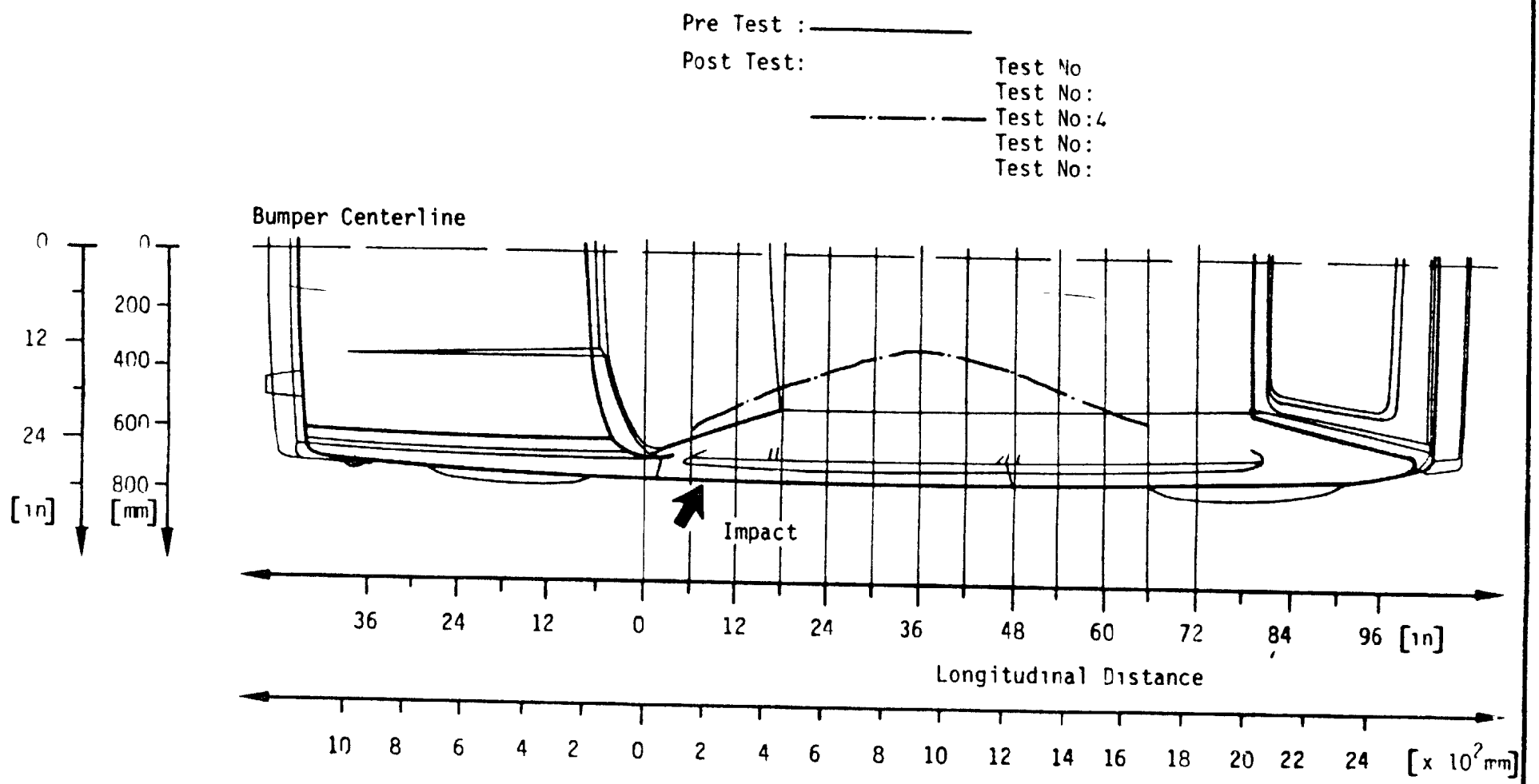
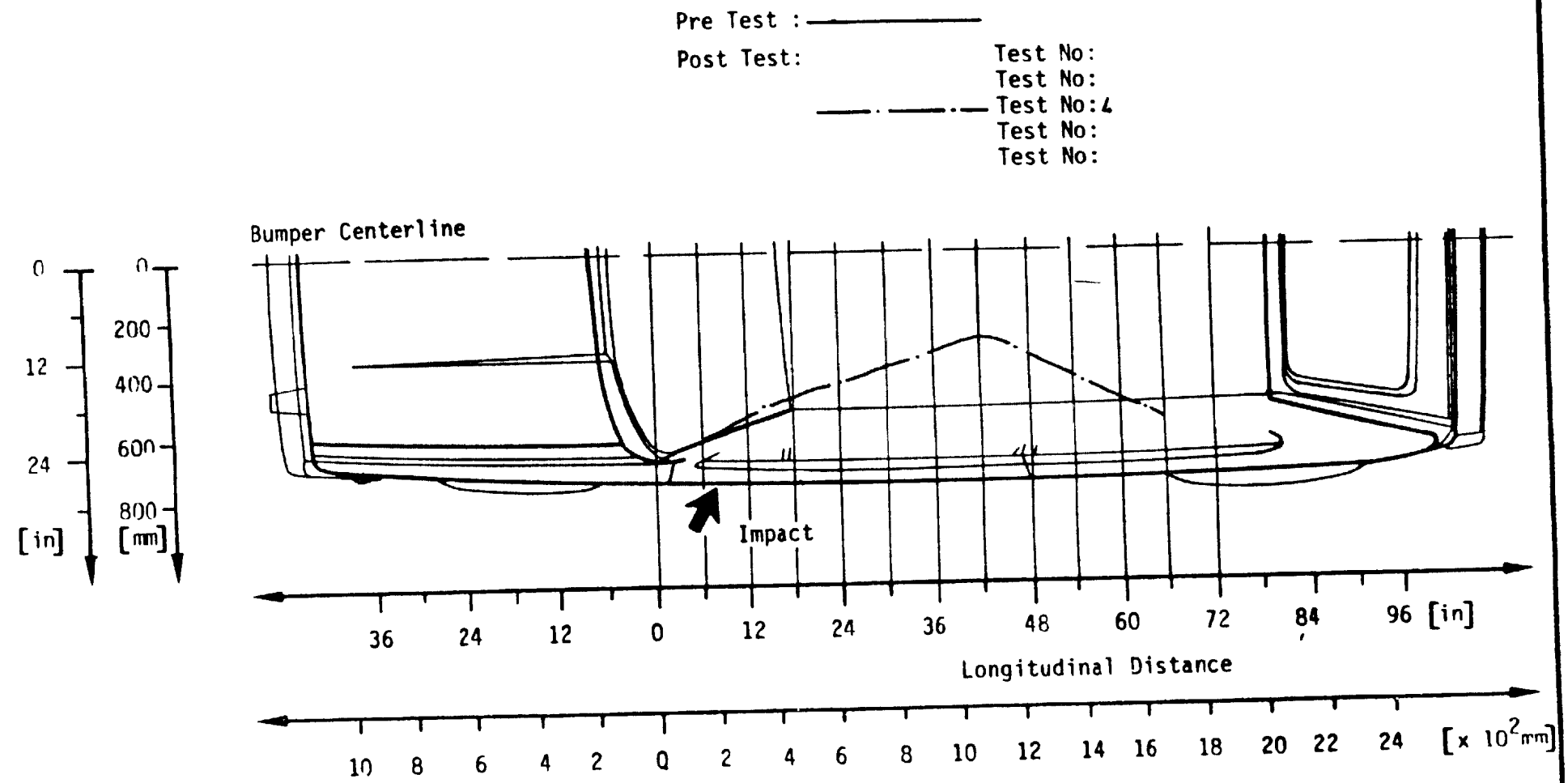


Table 22: Pre - and Post - Test Interior Profiles at 610 mm above Ground Level



Tabl 23: Pre-and Post-T st Int rior Profil s at 876 mm abov Ground L v l

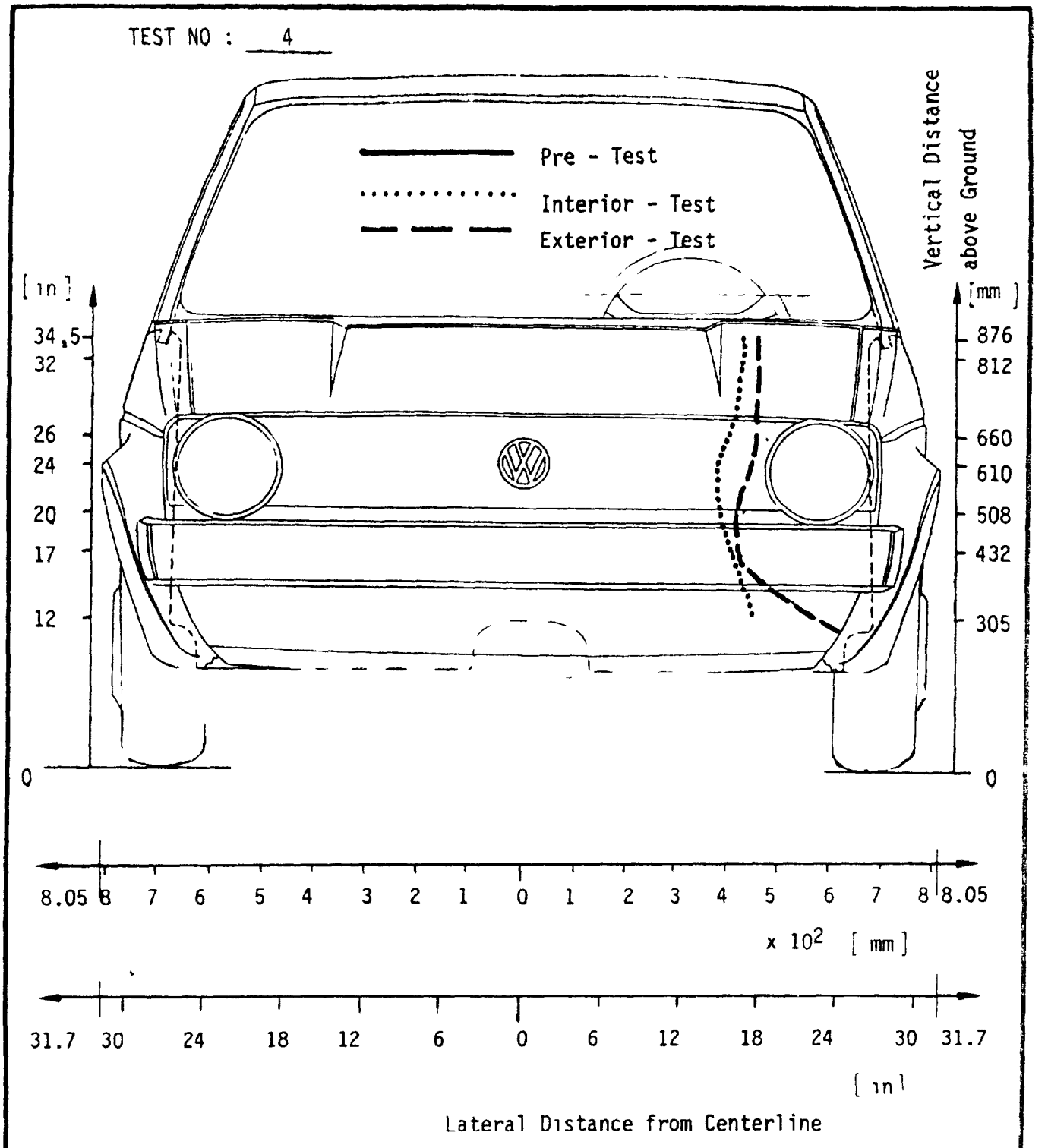


FIGURE 12 : EXTERIOR AND INTERIOR STATIC PROFILES AT THE LONGITUDINAL DISTANCE 610 MM FROM DOOR

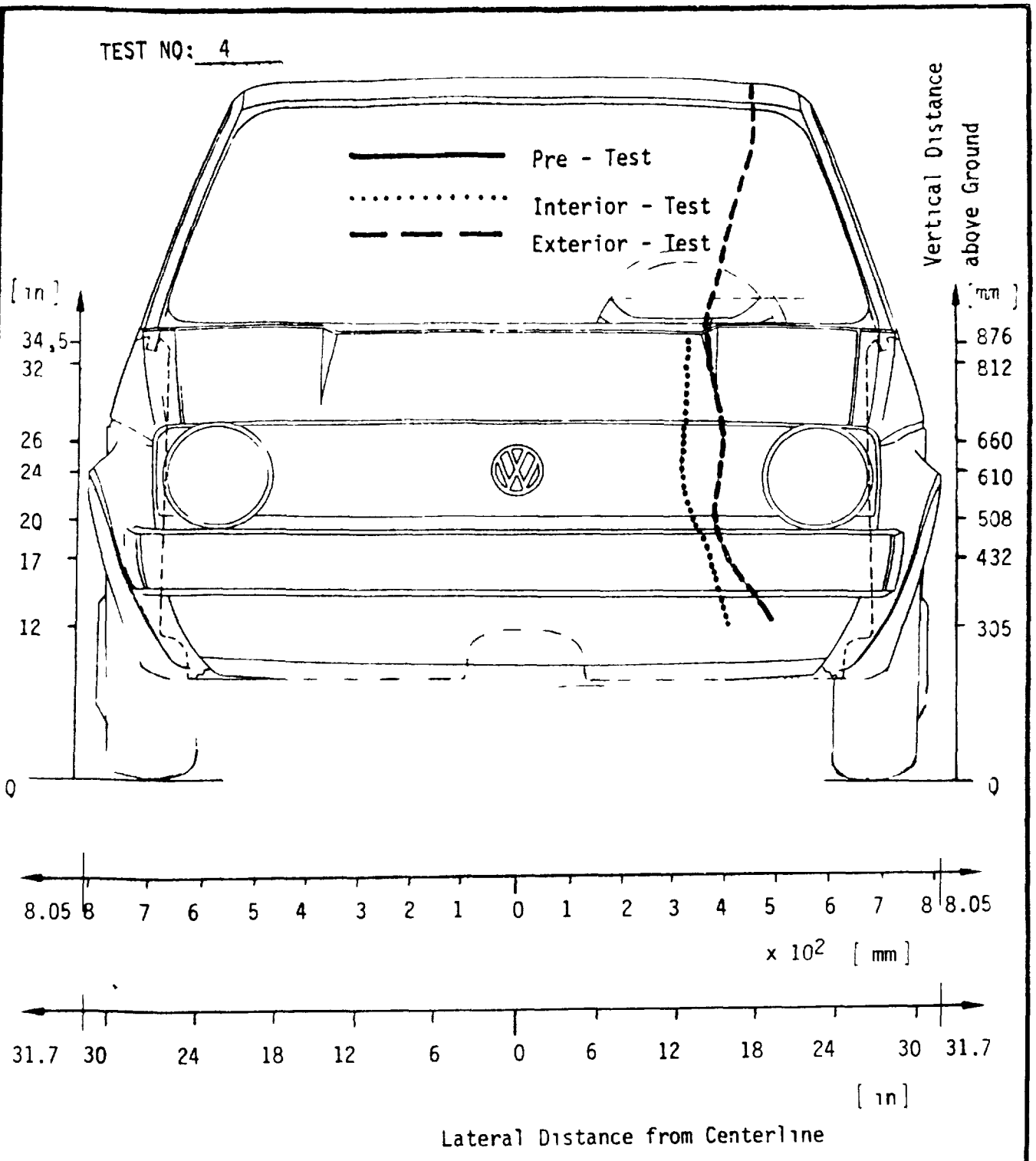


FIGURE 13 : EXTERIOR AND INTERIOR STATIC PROFILES AT THE LONGITUDINAL DISTANCE 914 MM FROM DOOR

Table 24: Exterior Static Crush for Side Impactor

TEST NO : 4

Location	Height at C_L *	Distance right of Center [mm]									Distance left of Center [mm] **							
		835	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	835
Top of Stack Level	813	0	0	0	0	2.5	9	18.5	28	35	38	40	42	34	58	140	215	370
Mid - Stack Level	554	+15	+12	+7.5	+ 1	9	24.5	36.5	47.5	53	59	65	76	95	121	154	190	230
Bumper Level	432	18	16	35	52	79	103	116	134	147	154	163	179	202	223	247	278	285

* Heights measured above ground level.

** Impact side.

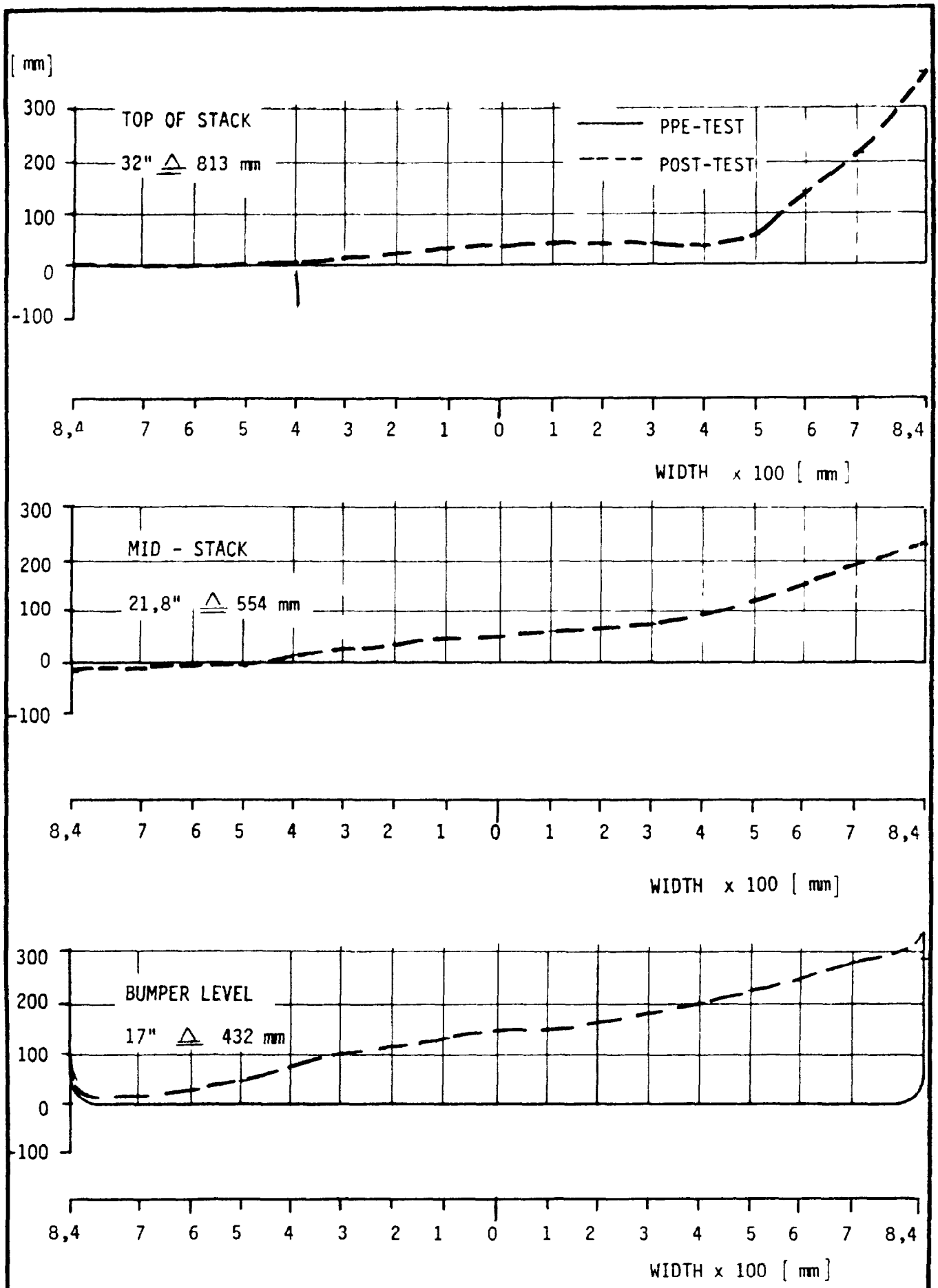


Table 25 : Pre- and Post-Test Frontal Profiles for Side Impactor (Test 4)

PART 572 DUMMY CALIBRATION TEST DATA

Dummy. Driver (Test 4)

Date of Dummy Calibration		28.10.81	10.11.81
Calibration Sequential Number for Dummy			
Temperature in Lab. (Spec. = 66 to 78 °F)		71.6	71.6
Relative Humidity in Lab. (Spec. = 10 to 70%)		36	45
Test Parameter	Specification	Pre - Test Calibration	Post - Test Calibration
1. Head Drop Test:			
a. Peak Resultant Accel.	210 - 260G	242	212
b. Peak Lateral Accel.	<10G		
c. Time above 100G	0.9 - 1.5 ms	1.17	1.21
2. Neck Bending Test:			
a. Pendulum Speed	21.5 - 25.5 fps	21.6	21.6
b. Pendulum Avg. Decel. (over $t_3 - t_2$)	20 - 24G	23.0	22.5
c. Peak Resultant Head Acceleration	26G Maximum	22.0	20.0
d. Pendulum Decel. ($t_2 - t_1$)	⩽ 3 ms	2.0	2.5
e. Pendulum Decel. ($t_3 - t_2$)	25 - 30 ms	25.0	25.0
f. Pendulum Decel. ($t_4 - t_3$)	⩽10 ms	3.5	7.5
g. Pendulum Direction Reversal Time	⩾123 ms		
h. Maximum Head Rotation	63 to 73°	70.5	71
i. Chordal Displacement:			
Head Rotation Angle			
0° Time	-2 - 2 ms	0	0
Displ.	-0.5 - 0.5 in.	0	0
30° Time	25.6 - 34.4 ms	26.0	27.0
Displ.	2.1 - 3.1 in.	2.95	2.74
60° Time	40.3 - 51.7 ms	43.0	42.0
Displ.	4.3 - 5.3 in.	5.11	4.96
Maximum (73°) Time	53.2 - 66.8 ms	60.0	62.0
Displ.	5.0 - 6.0 in.	5.92	5.91
60° Time	67.0 - 83.0 ms	77.0	79.0
Displ.	4.3 - 5.3 in.	5.08	4.98
30° Time	85.4 - 104.6 ms	98.0	99.0
Displ.	2.1 - 3.1 in.	2.4	2.3
0° Time	101.0 - 123.0 ms	113	114
Displ.	-0.5 - 0.5 in.	.21	.3

TABLE 26: DUMMY CALIBRATION - DRIVER

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

Dummy: Driver (Test 4)

Test Parameter	Specification	Pre - Test Calibration	Post - Test Calibration
3. Abdominal Compression Test: (Preload = 10 pounds)			
a. Force at 0.5 in.	14 - 26 lb	22.2	22.6
b. Force at 0.75 in.	27 - 40 lb	33.7	35.1
c. Force at 1.0 in.	40 - 53 lb	49.2	51.9
d. Force at 1.3 in.	63 - 78 lb	71.5	75.5
4. Lumbar Flexion Test:			
a. Force at 20°	22 - 34 lb	28.1	27.0
b. Force at 30°	34 - 46 lb	38.7	37.1
c. Force at 40°	46 - 58 lb	51.2	49.0
c. Return Angle	12° Maximum	18	20
5. Chest Impact Tests:			
a. High Speed			
1) Probe Speed	21.78-22.22 fps		
2) Peak Deflection	1.7 in. Maximum		
3) Peak Resistive Force	2250 lb Maximum		
4) Internal Hysteresis	50 - 70%		
b. Low Speed:			
1) Probe Speed	13.86-14.14 fps	13.98	13.98
2) Peak Deflection	1.1 in. Maximum	1.34	1.44
3) Peak Resistive Force	1450 lb Maximum	1262	1082
4) Internal Hysteresis	50 - 70%		
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps		
2) Maximum Force	1850 - 2500 lb		
3) Time 1000 lb	1.7 ms Minimum		
b. Left Side			
1) Probe Speed	6.76 - 7.04 fps		
2) Maximum Force	1850 - 2500 lb		
3) Time 1000 lb	1.7 ms Minimum		

TABLE 26A: DUMMY CALIBRATION - DRIVER

PART 572 DUMMY CALIBRATION TEST DATA

Dummy: Passenger (Test 4)

Date of Dummy Calibration		30.10.81	12.11.81
Calibration Sequential Number for Dummy			
Temperature in Lab. (Spec. = 66 to 78 °F)		71.6	71.6
Relative Humidity in Lab. (Spec. = 10 to 70%)		47	45
Test Parameter	Specification	Pre - Test Calibration	Post - Test Calibration
1. Head Drop Test:			
a. Peak Resultant Accel.	210 - 260G	220	224
b. Peak Lateral Accel.	<10G		
c. Time above 100G	0.9 - 1.5 ms	1.17	1.2
2. Neck Bending Test:			
a. Pendulum Speed	21.5 - 25.5 fps	21.6	21.6
b. Pendulum Avg. Decel. (over $t_3 - t_2$)	20 - 24G	24.0	22.3
c. Peak Resultant Head Acceleration	26G Maximum	22.0	18.0
d. Pendulum Decel. ($t_2 - t_1$)	⩽ 3 ms	2.0	2.8
e. Pendulum Decel. ($t_3 - t_2$)	25 - 30 ms	25.0	25.0
f. Pendulum Decel. ($t_4 - t_3$)	⩽10 ms	3.0	7.0
g. Pendulum Direction Reversal Time	⩾123 ms		
h. Maximum Head Rotation	63 to 73°	69	67
i. Chordal Displacement:			
Head Rotation Angle			
0° Time	-2 - 2 ms	0	0
Displ.	-0.5 - 0.5 in.	0	0
30° Time	25.6 - 34.4 ms	26.0	27.0
Displ.	2.1 - 3.1 in.	2.86	2.74
60° Time	40.3 - 51.7 ms	42.0	45.0
Displ.	4.3 - 5.3 in.	5.11	5.03
Maximum (73°) Time	53.2 - 66.8 ms	59.0	60.0
Displ.	5.0 - 6.0 in.	5.94	5.63
60° Time	67.0 - 83.0 ms	73.0	74.0
Displ.	4.3 - 5.3 in.	5.18	5.07
30° Time	85.4 - 104.6 ms	92.0	95.0
Displ.	2.1 - 3.1 in.	2.51	2.5
0° Time	101.0 - 123.0 ms	107.0	111.0
Displ.	-0.5 - 0.5 in.	.07	.11

TABLE 27: DUMMY CALIBRATION - REAR LEFT

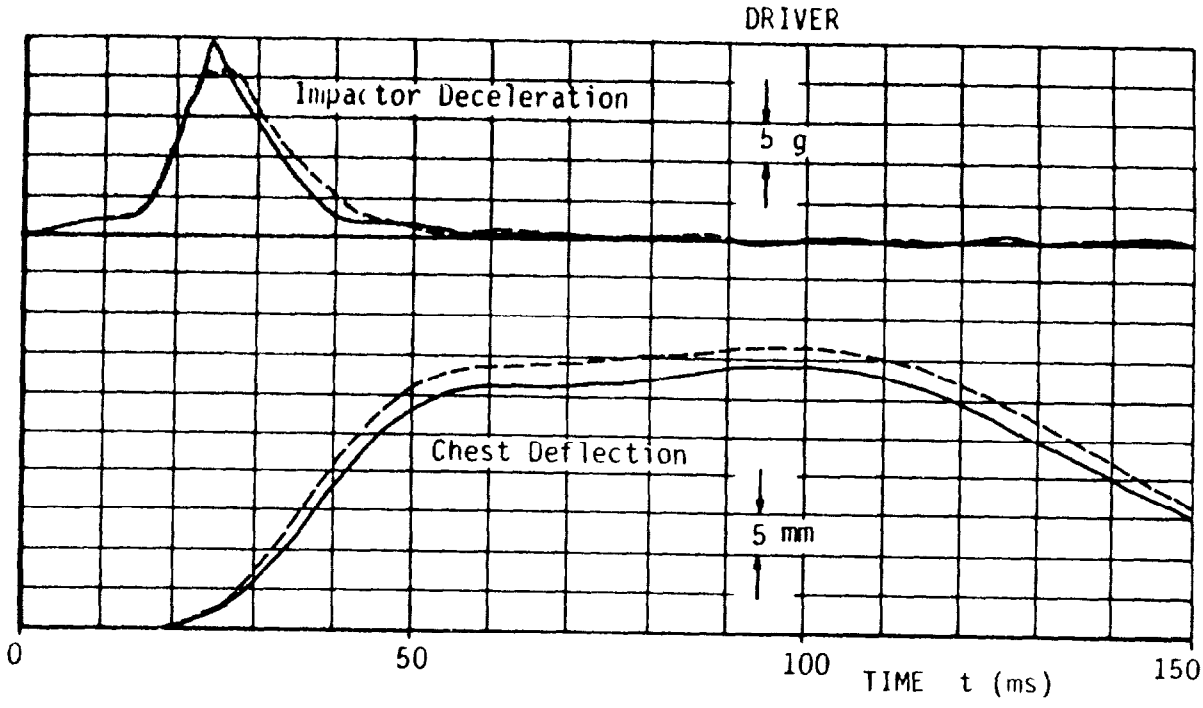
PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

Dummy: Passenger (Test 4)

Test Parameter	Specification	Pre - Test Calibration	Post - Test Calibration
3. Abdominal Compression Test: (Preload = 10 pounds)			
a. Force at 0.5 in.	14 - 26 lb	20.9	21.2
b. Force at 0.75 in.	27 - 40 lb	34.7	32.7
c. Force at 1.0 in.	40 - 53 lb	49.9	46.9
d. Force at 1.3 in.	63 - 78 lb	71.5	70.8
4. Lumbar Flexion Test:			
a. Force at 20°	22 - 34 lb	31.0	
b. Force at 30°	34 - 46 lb	42.7	
c. Force at 40°	46 - 58 lb	56.2	
c. Return Angle	12° Maximum	18	
5. Chest Impact Tests:			
a. High Speed			
1) Probe Speed	21.78-22.22 fps		
2) Peak Deflection	1.7 in. Maximum		
3) Peak Resistive Force	2250 lb Maximum		
4) Internal Hysteresis	50 - 70%		
b. Low Speed:			
1) Probe Speed	13.86-14.14 fps	13.98	13.98
2) Peak Deflection	1.1 in. Maximum	1.42	1.36
3) Peak Resistive Force	1450 lb Maximum	1236	1210
4) Internal Hysteresis	50 - 70%		
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps		
2) Maximum Force	1850 - 2500 lb		
3) Time 1000 lb	1.7 ms Minimum		
b. Left Side			
1) Probe Speed	6.76 - 7.04 fps		
2) Maximum Force	1850 - 2500 lb		
3) Time 1000 lb	1.7 ms Minimum		

TABLE 27A: DUMMY CALIBRATION - REAR LEFT

TEST NO: 4



——— Pre Test

– – – – – Post Test

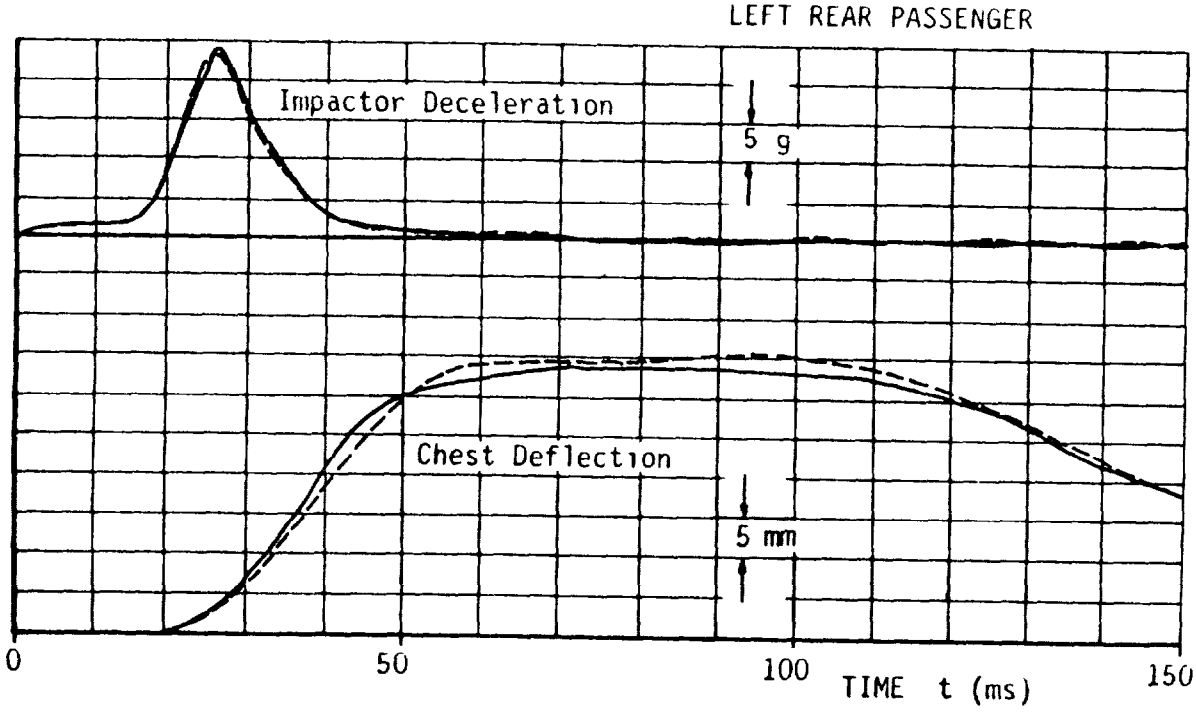


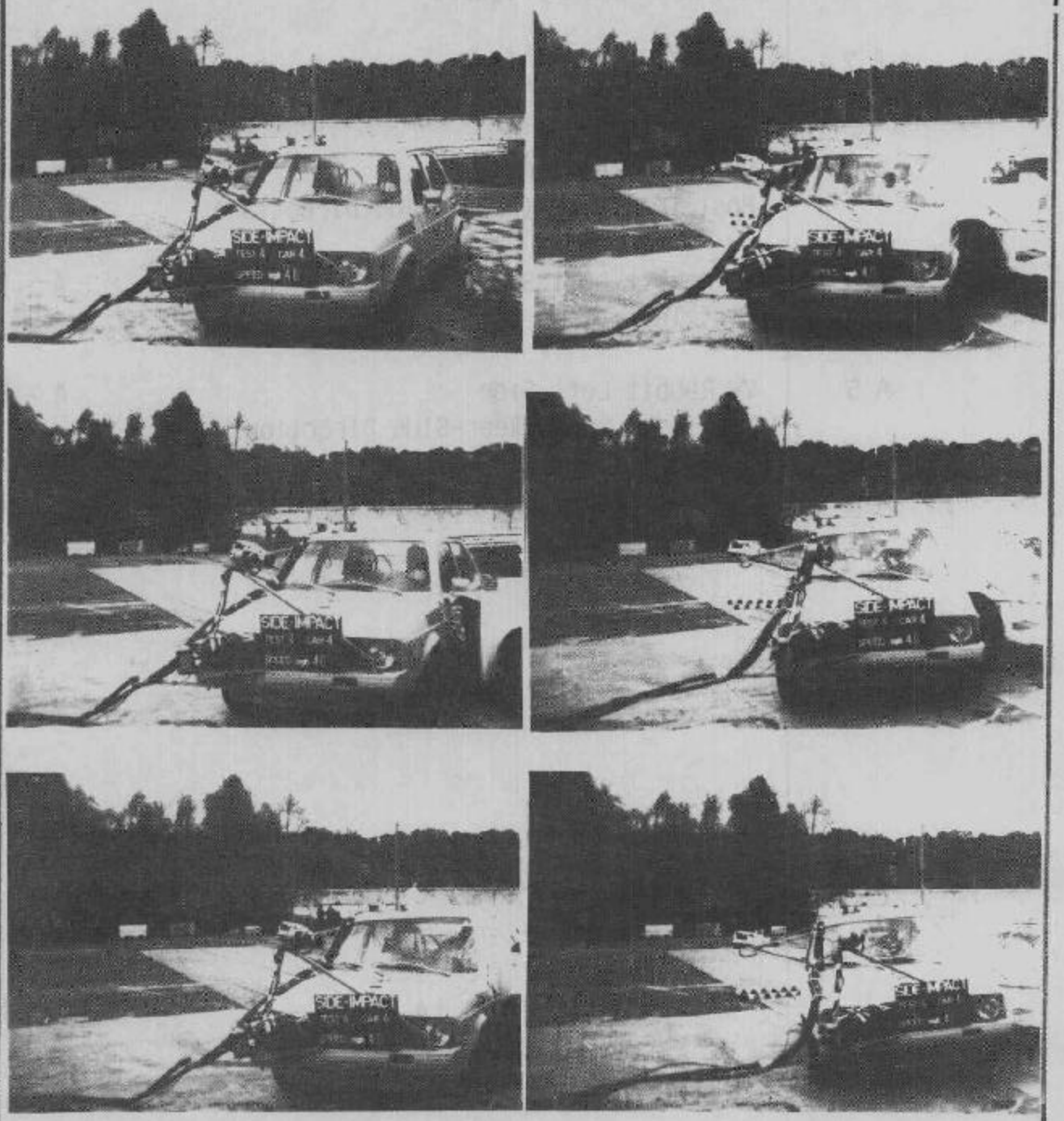
FIGURE 14 : SID CHEST DEFLECTION AND IMPACTOR DECELERATION

A P P E N D I X A

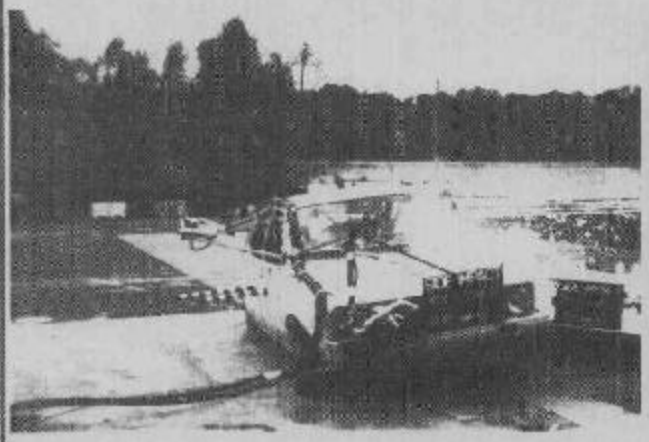
Photographs

Figure A1 : Crash Sequence Figures

TEST 4 - 40 mph



Form PR 76a



A - 2A

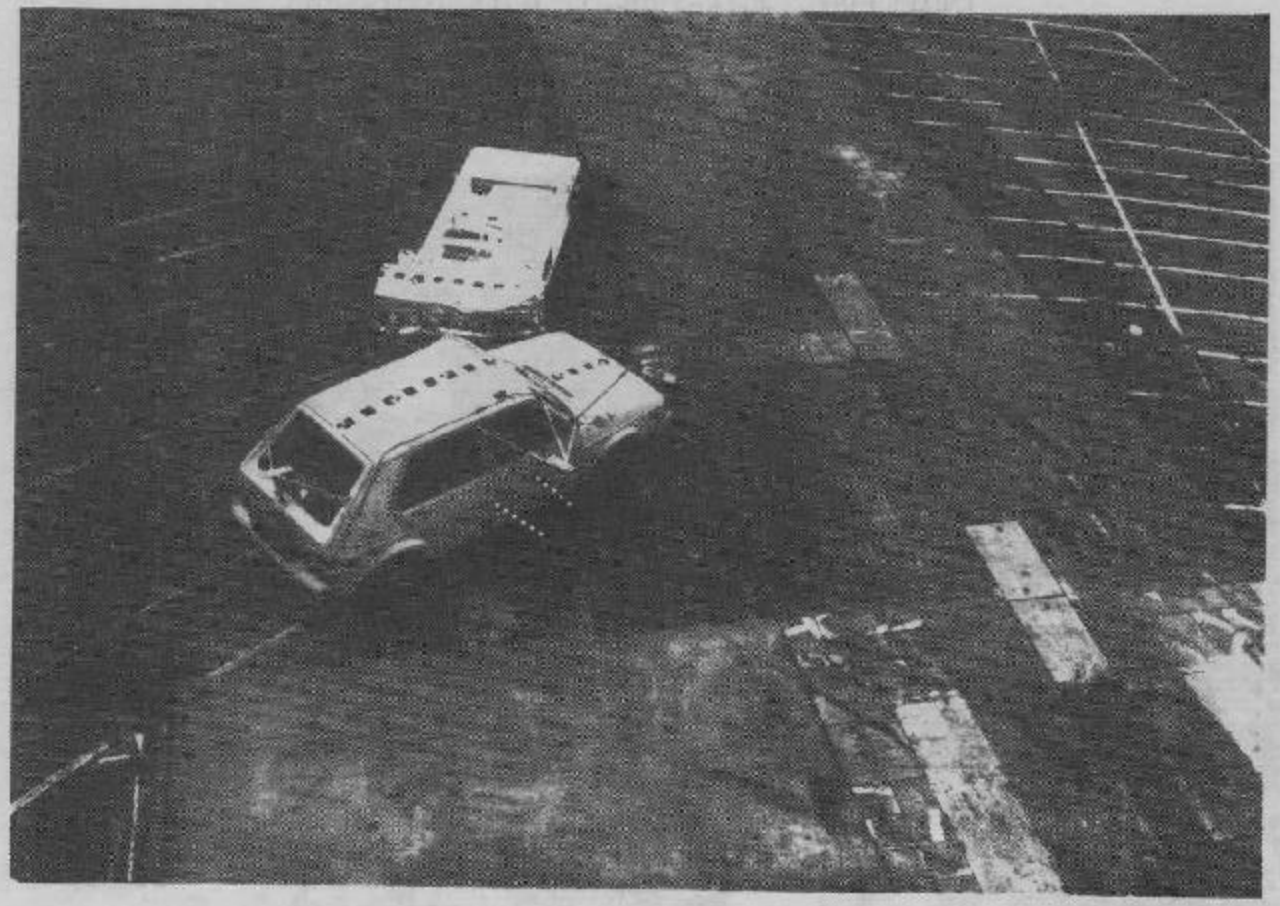


FIGURE A 2 : POST TEST 'POSITION'

CRABBED BARRIER AND VW RABBIT

FIGURE A 3 : VW RABBIT LEFT SIDE

POST TEST VIEW (FRONT-SIDE DIRECTION)

FIGURE A 4 : VW RABBIT LEFT SIDE

POST TEST VIEW

FIGURE A 5 : VW RABBIT LEFT SIDE

POST TEST VIEW (REAR-SIDE DIRECTION)

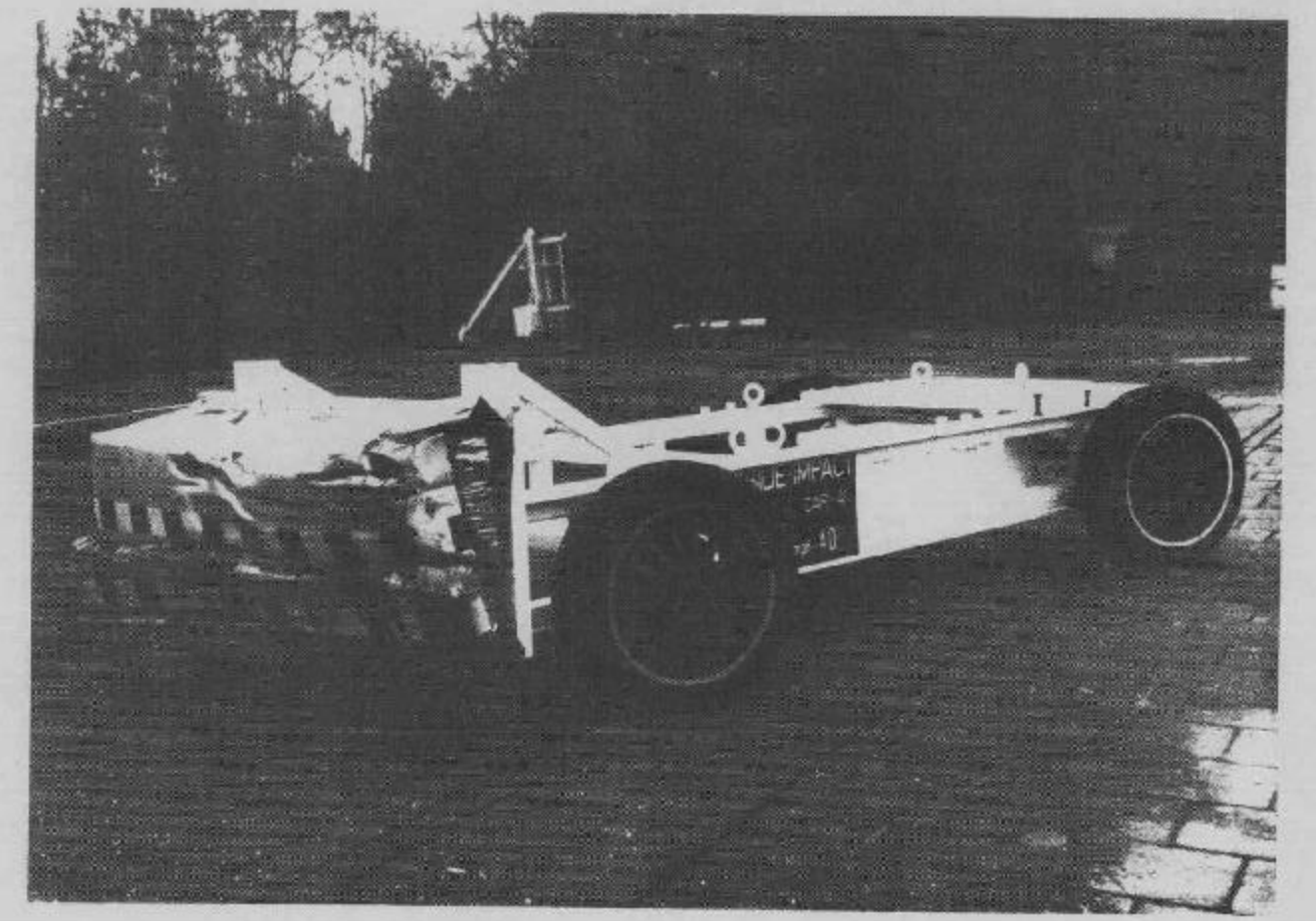


FIGURE A 6 : CRABBED BARRIER POST TEST VIEW

List of Illustrations

Figure		Page
A 1	Crash Sequence Figures	A - 2
A 2	Post Test 'Position' Crabbed Barrier and VW Rabbit	A - 3
A 3	VW Rabbit Left Side Post Test View (Front-Side Direction)	A - 4
A 4	VW Rabbit Left Side Post Test View	A - 5
A 5	VW Rabbit Left Side Post Test View (Rear-Side Direction)	A - 6
A 6	Crabbed Barrier Post Test View	A - 7

A P P E N D I X B

Vehicle and Dummy Test Respone
Acceleration/ - and Velocity/Time
History

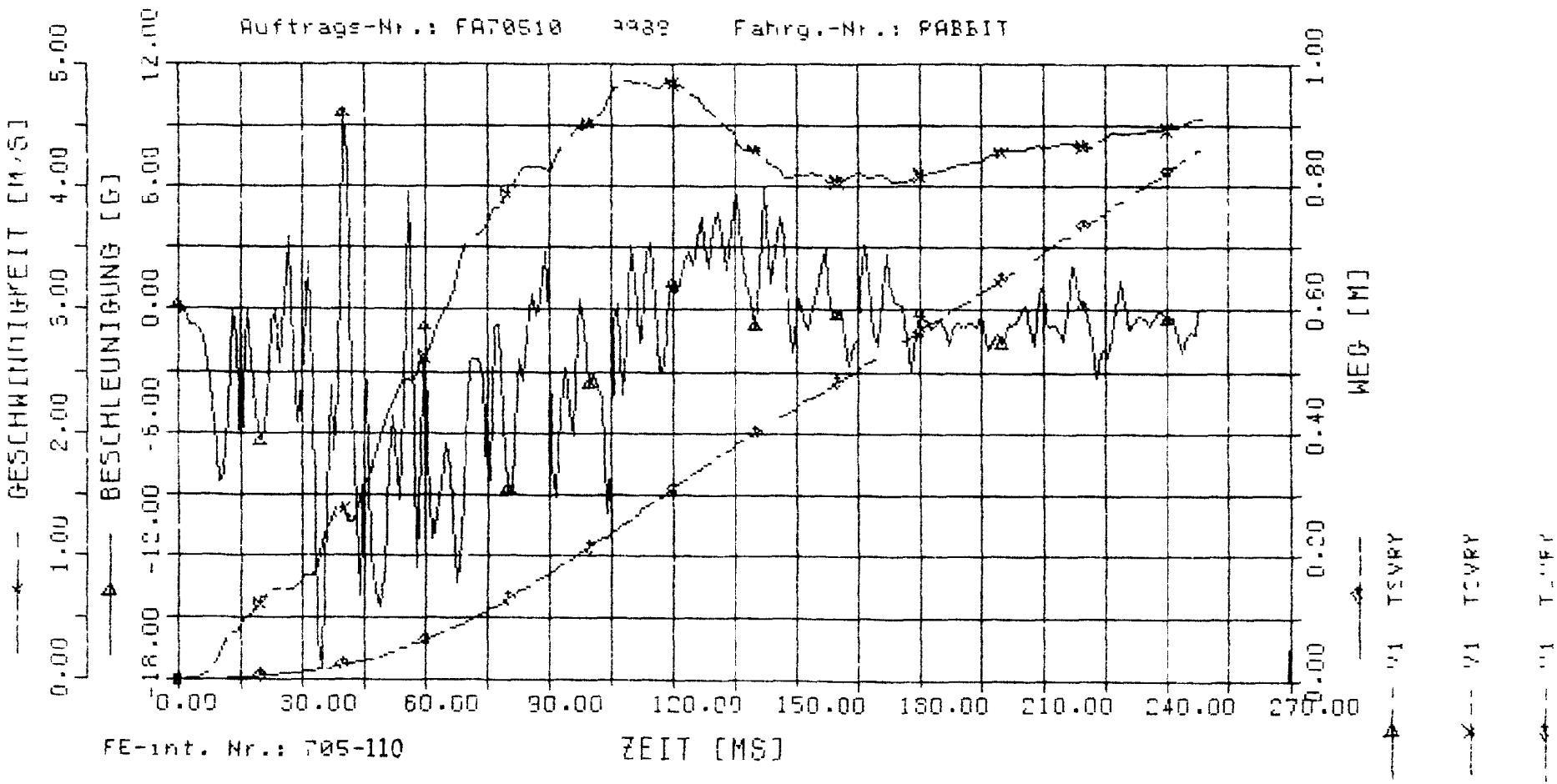
B.1 Vehicle Test Response
- B.1.1 Target Vehicle
- B.1.2 Crabbed Barrier

B.2 Dummy Test Response
- B.2.1 Driver
- B.2.2 Rear Passenger

B.1.1 Target Vehicle

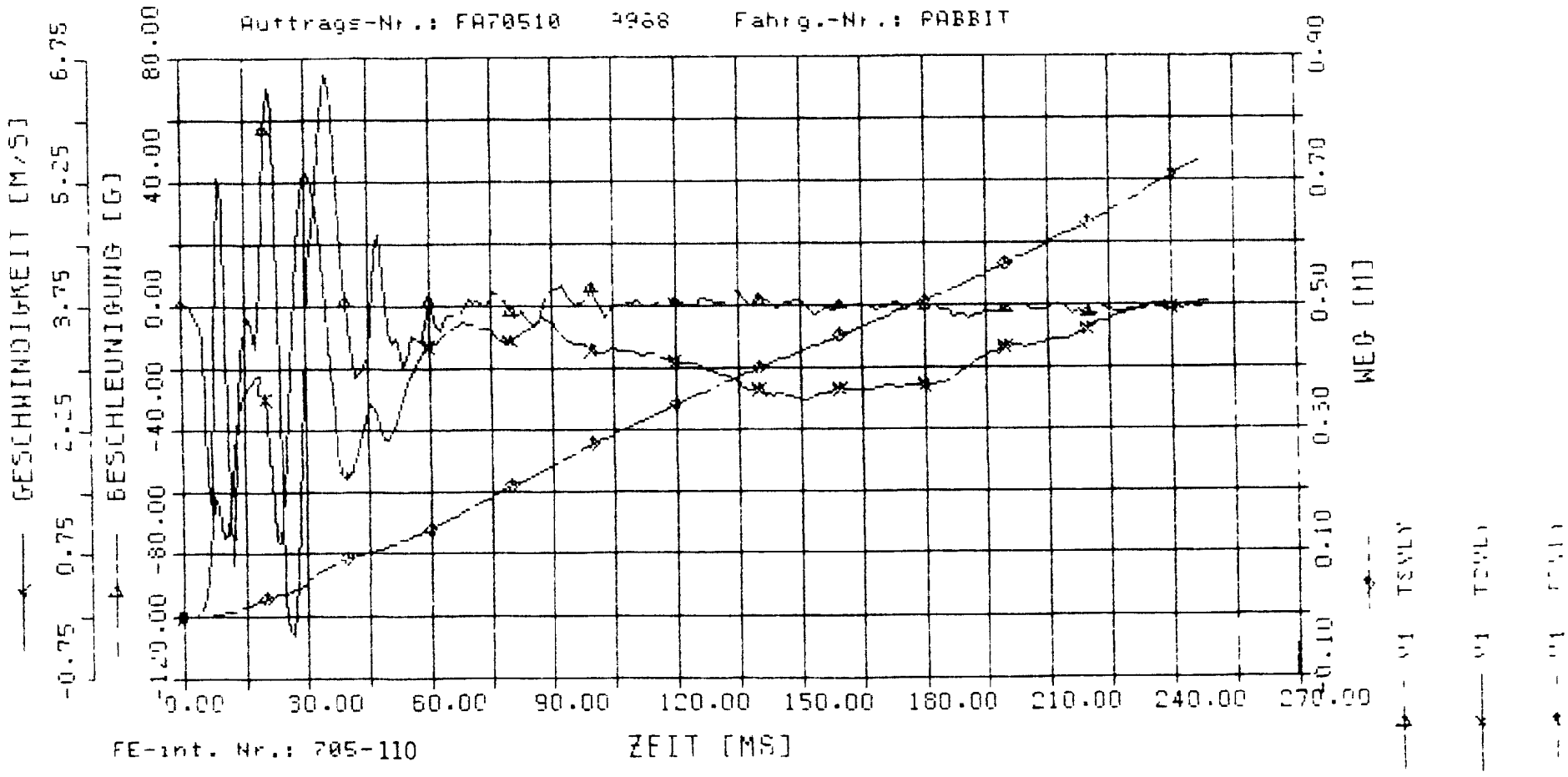
Kenn-Werte Auftrags Nr FA70510 Versuchs-Nr [illegible]

Messstelle	UP	bei Groesse	Extremum	t [ms]	SMS
[illegible]	V1	[illegible]	[illegible]	[illegible]	0.00
[illegible]	V1	GL [illegible]	4.854	[illegible]	0.00
[illegible]	V1	WL [illegible]	[illegible]	[illegible]	0.00



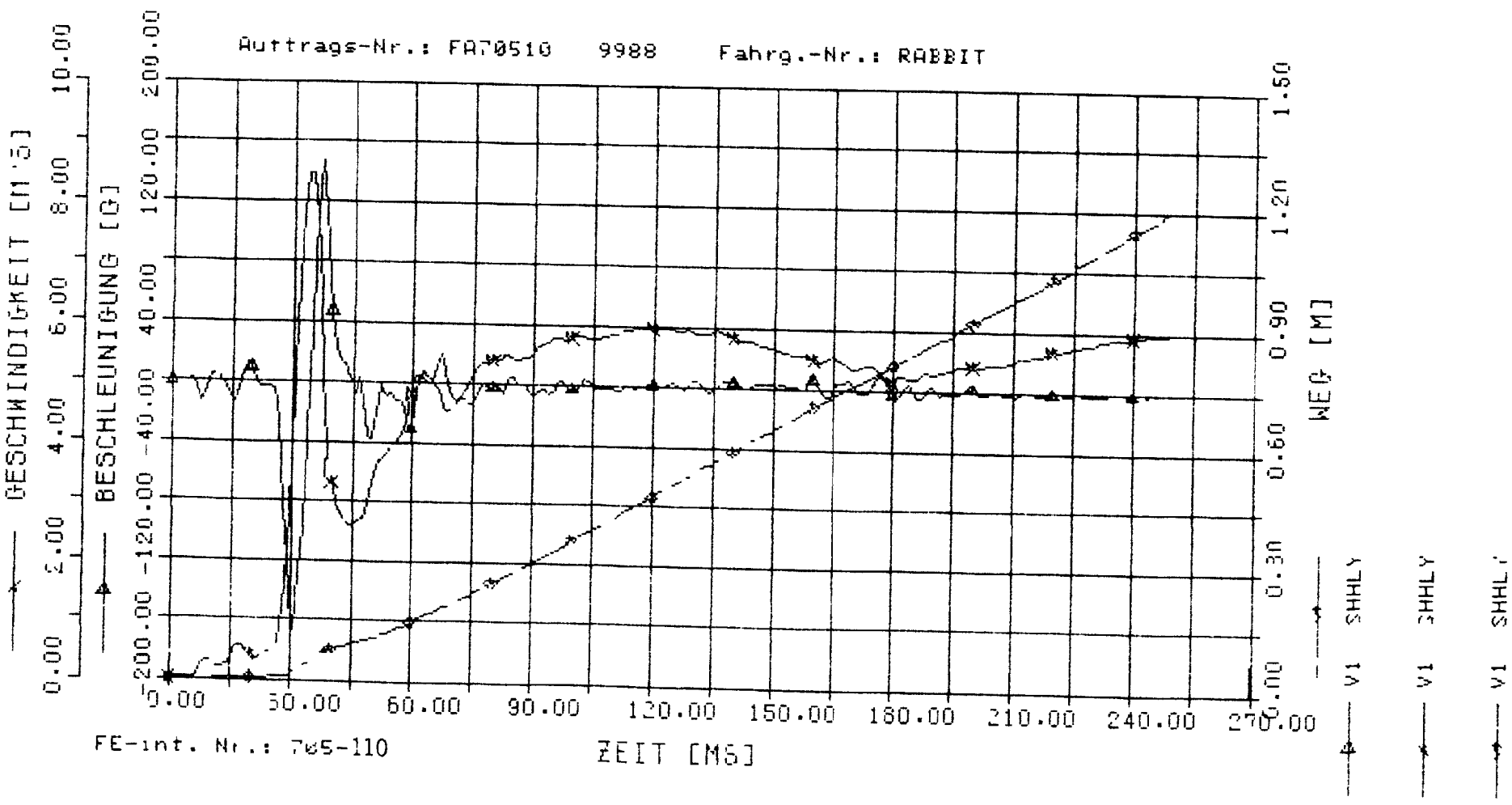
Kenn Werte Auftrag Nr FA70510 Versuchs Nr 9988

Mess Stelle	UP	ber Groesse	Extremum	t Extr	MS
TSVLY	V1	[illegible]	[illegible]	[illegible] 00	0 00
TSVLY	V1	[illegible]	[illegible]	30 00	0 00
TSVLY	V1	[illegible]	[illegible]	[illegible] 00	0 00



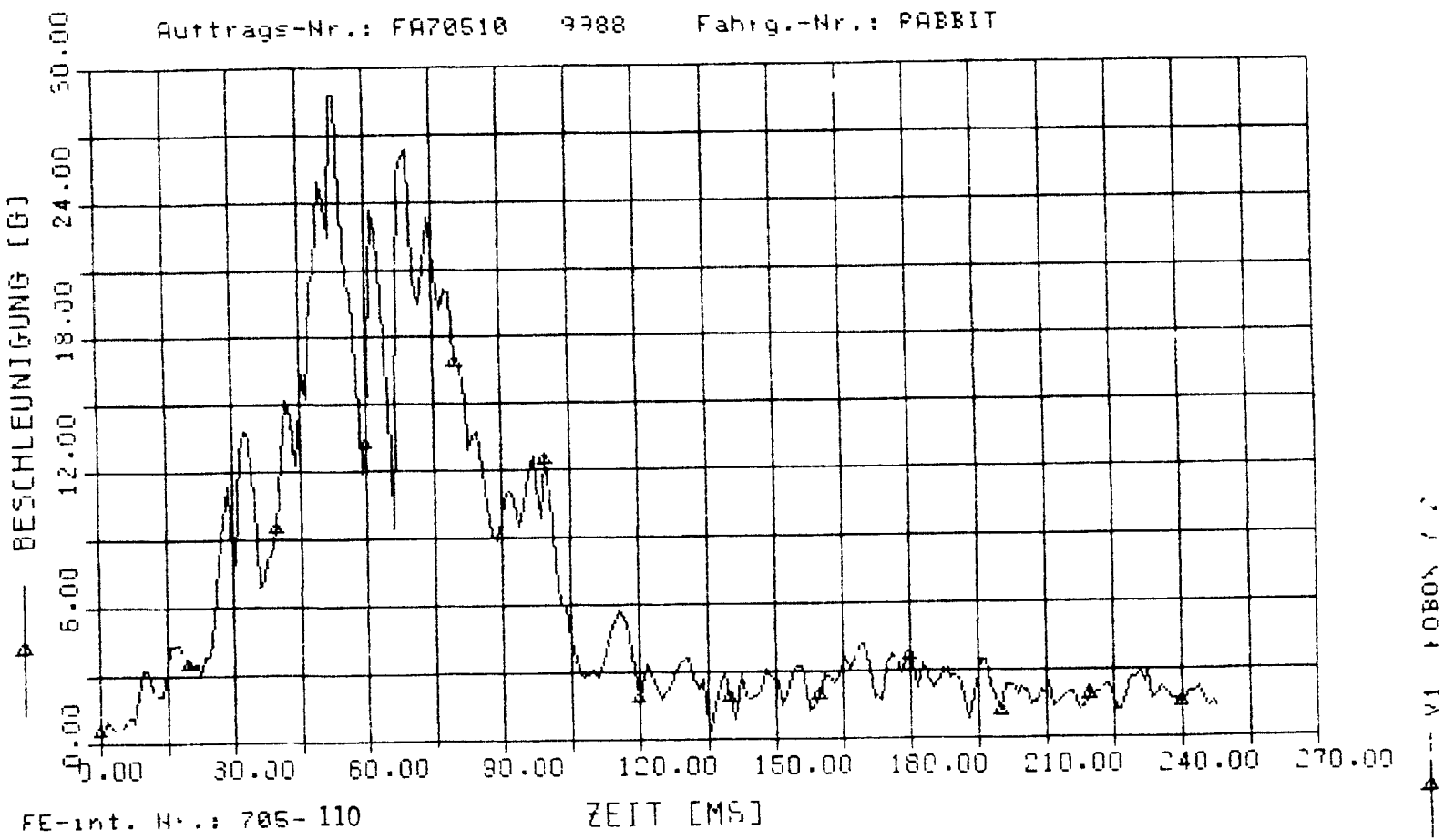
Kenn Werte Auftrags Nr FA70510 Versuchs Nr 9988

Messstelle	UP	ber Groesse	Extremum	t Ext.	MS
SHHLY	V1	BE g	168 105	31 00	0 00
SHHLY	V1	GE m/s	8 446	34 00	0 00
SHHLY	V1	WE m	1 233	255 00	0 00



Kenn Worte Auftrags Nr FA70510 Versuchs Nr 9988

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Groesse		Ext.	
[illegible]		V1	[illegible]	[illegible]	[illegible]	[illegible]

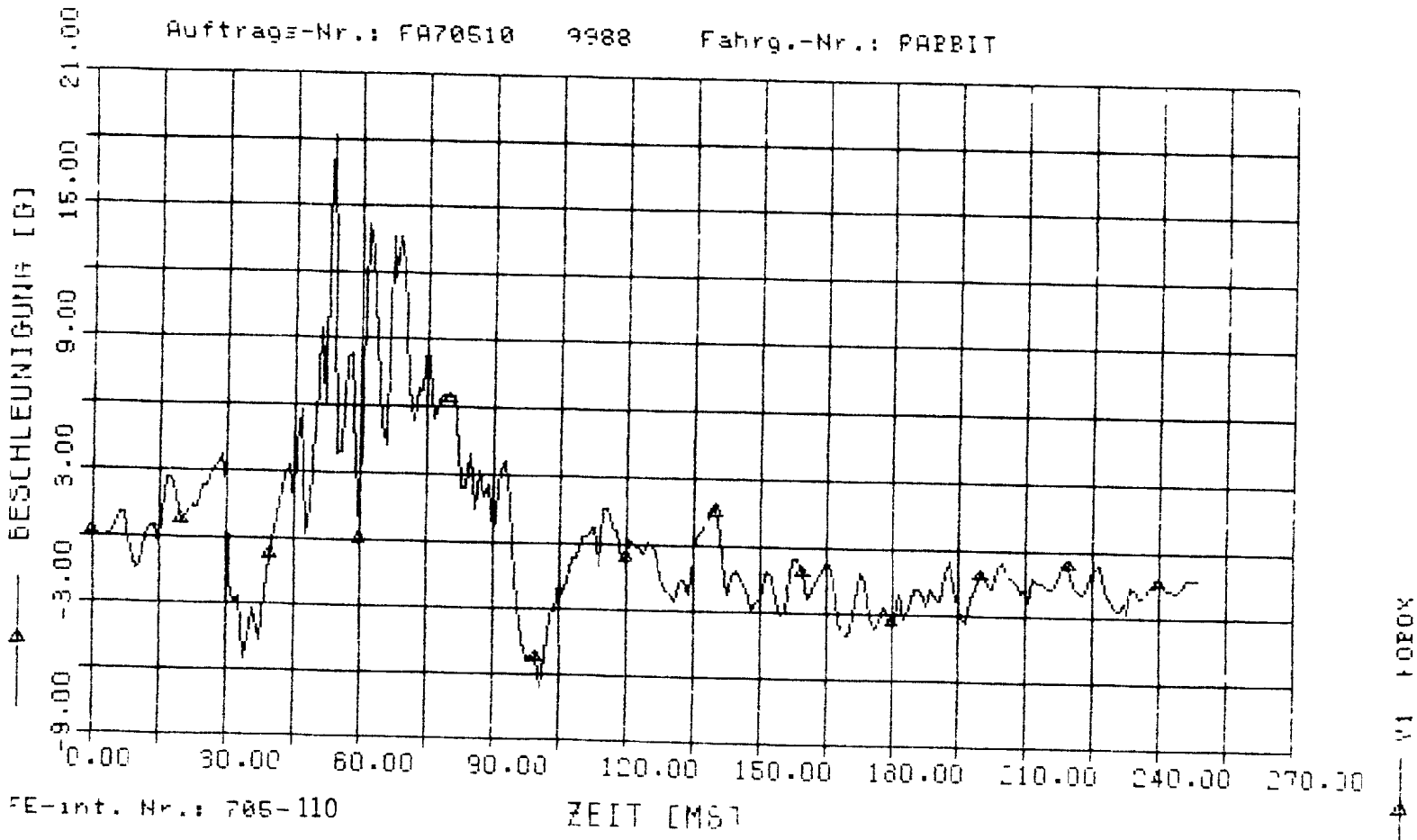


Kenn Werte Auftrags Nr FA70510 Versuchs Nr [illegible]

[illegible] UP [illegible] Extremum [illegible]

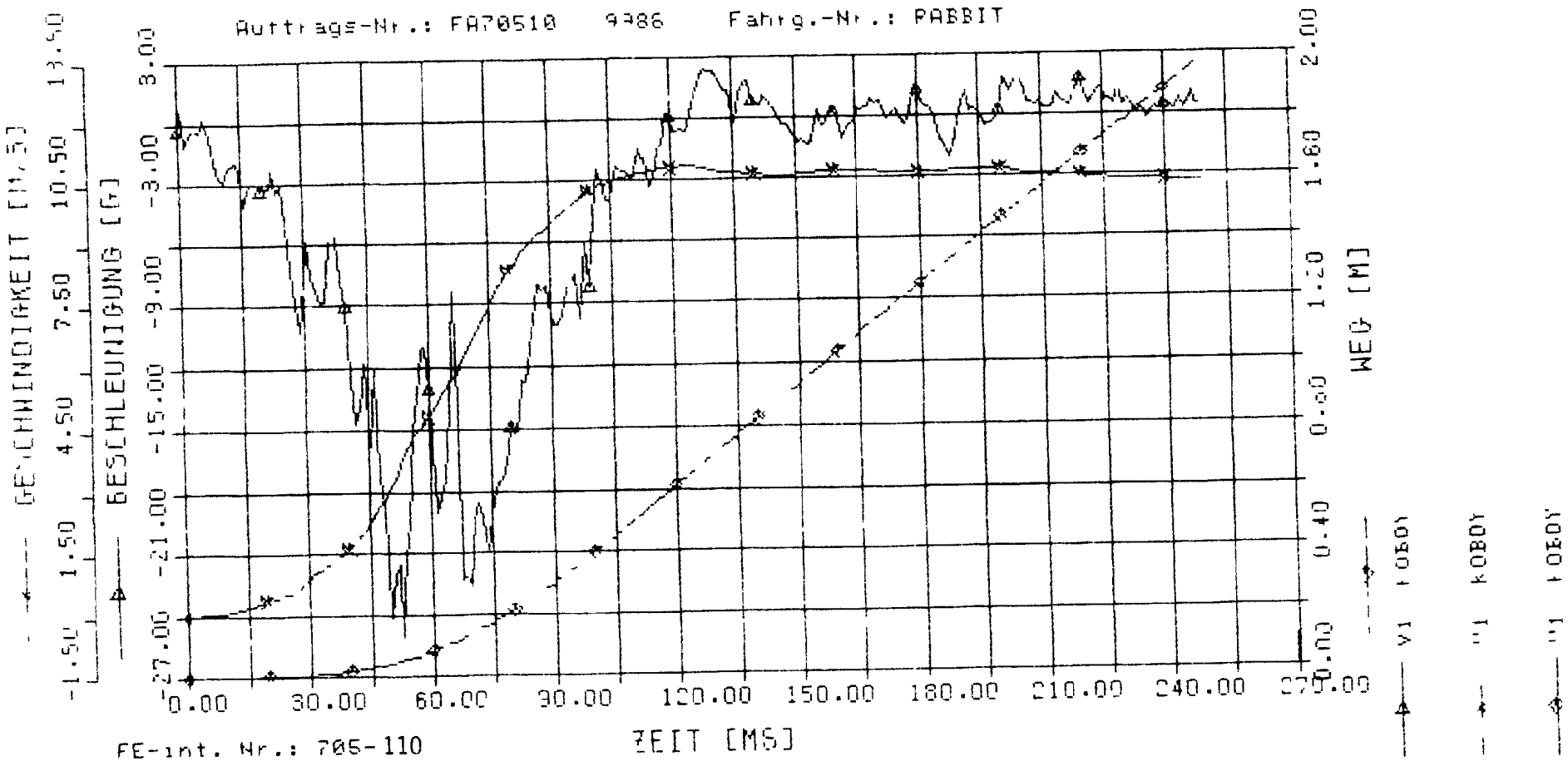
Groesse Extr

[illegible] V1 BC a 13 145 54 00 13 [illegible]



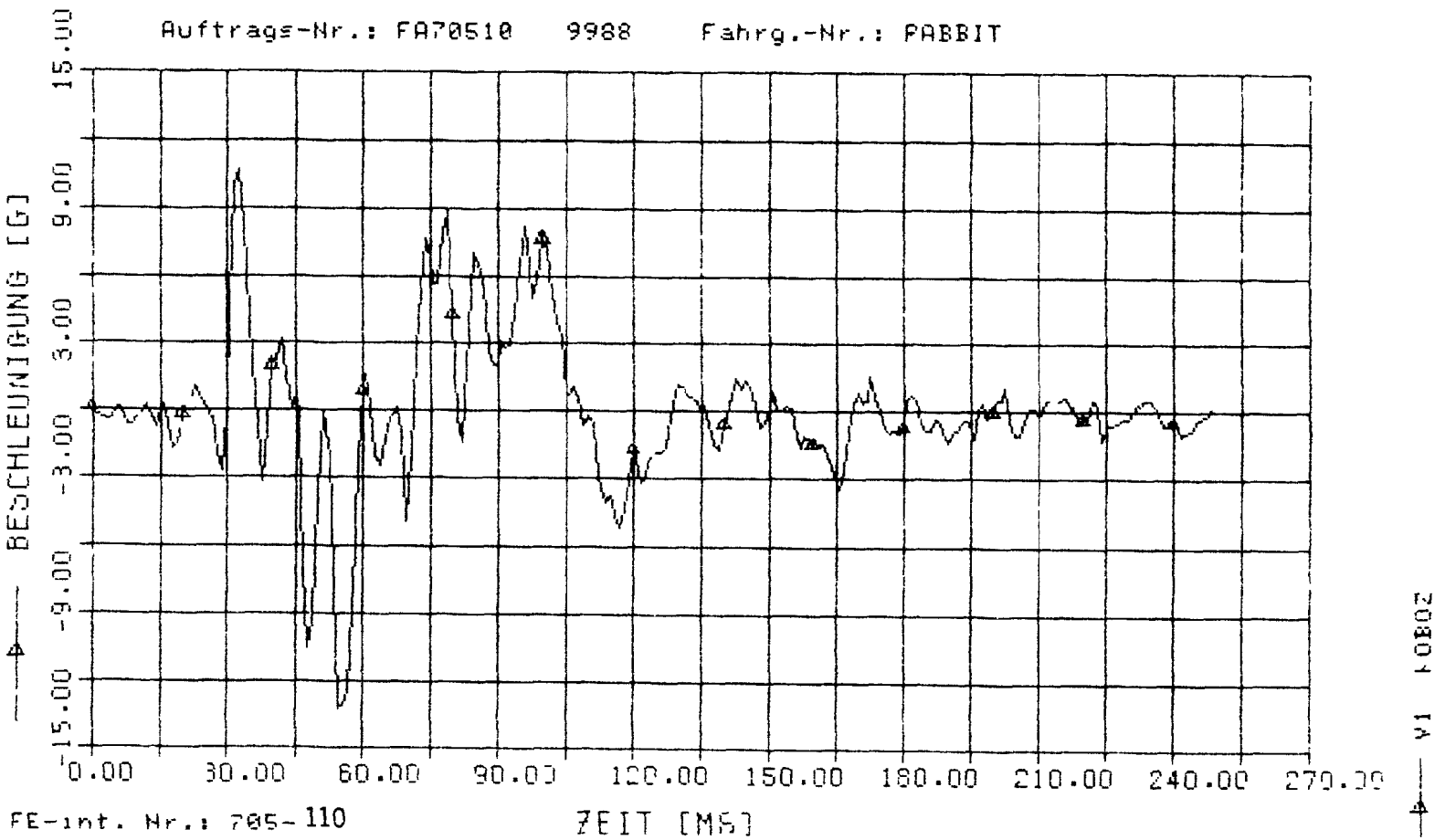
Kein Werte Auftrags Nr. FA 0510 Versuchs Nr. [illegible]

[illegible]	UP	Der	Ext [illegible]	t	[illegible]
		Grösse		Extr	
[illegible]	V1	BE [illegible]	25 10[illegible]	[illegible]3 00	2 0[illegible]
[illegible]	V1	GE [illegible]	10 790	12[illegible] 00	0 00
[illegible]	V1	WE [illegible]	2 035	2[illegible] 00	0 00



Kenn Werte Auftrags Nr FA70510 Versuchs Nr [illegible]

Messstelle	UP	Der	Extremum	t	MS
		Groesse		Extr	
KOBOZ	V1	[illegible]	13 1/1	[illegible] 00	8 24

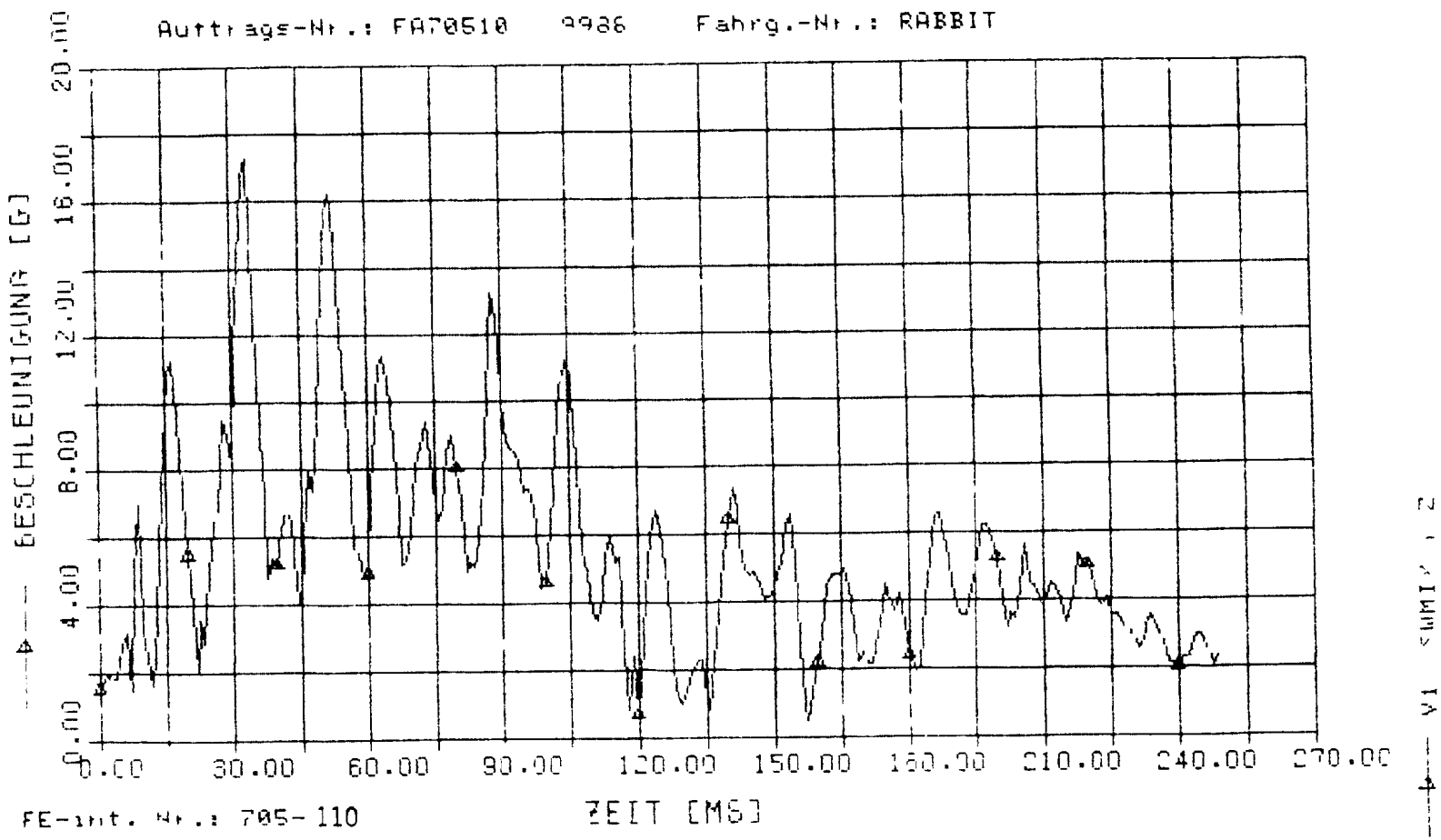


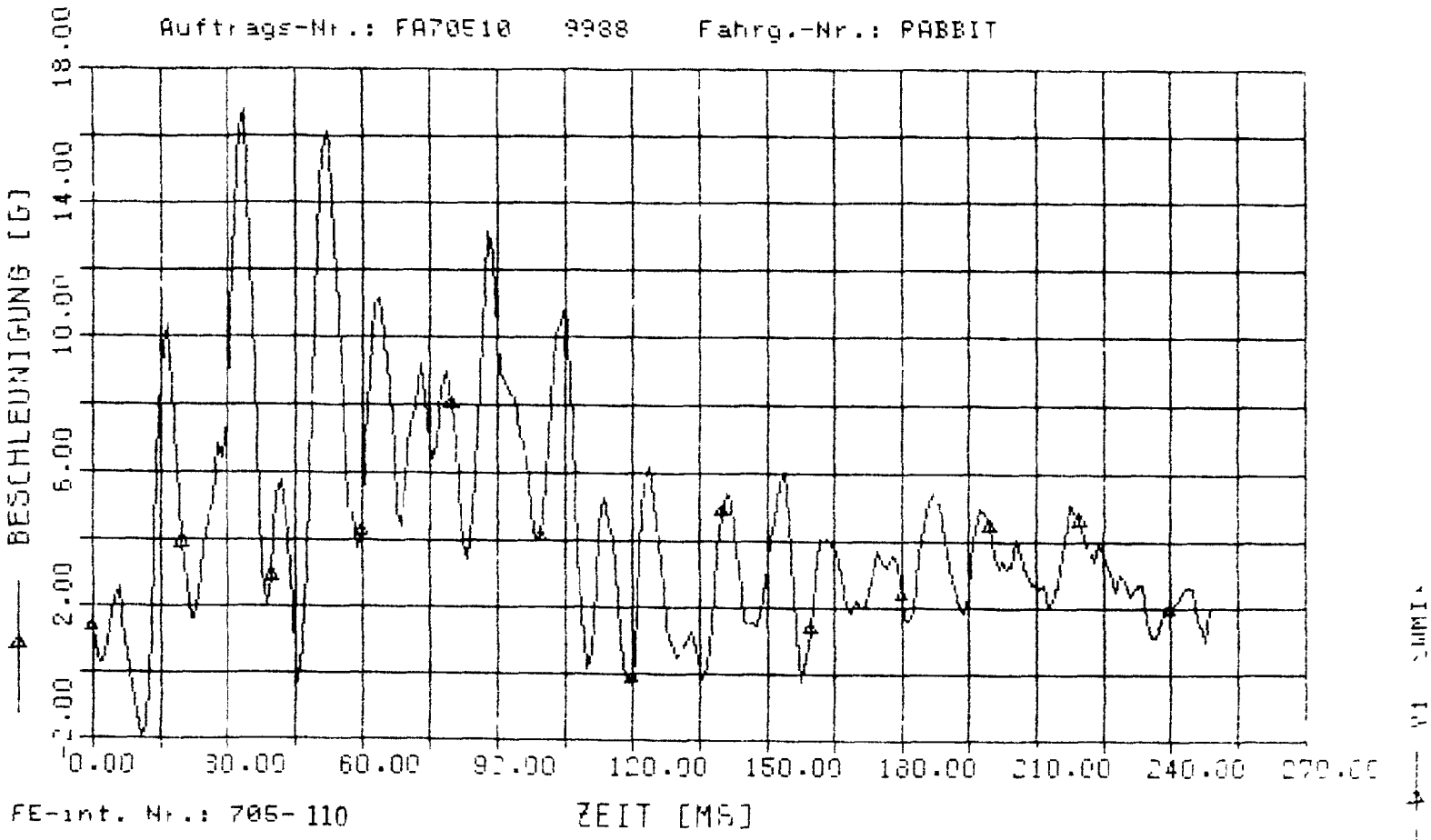
Kenn Werte Auftrag Nr FA 0510 Versuch Nr 2 08

Mess Stelle Ul her Strenum I MS

Grundlage Extr

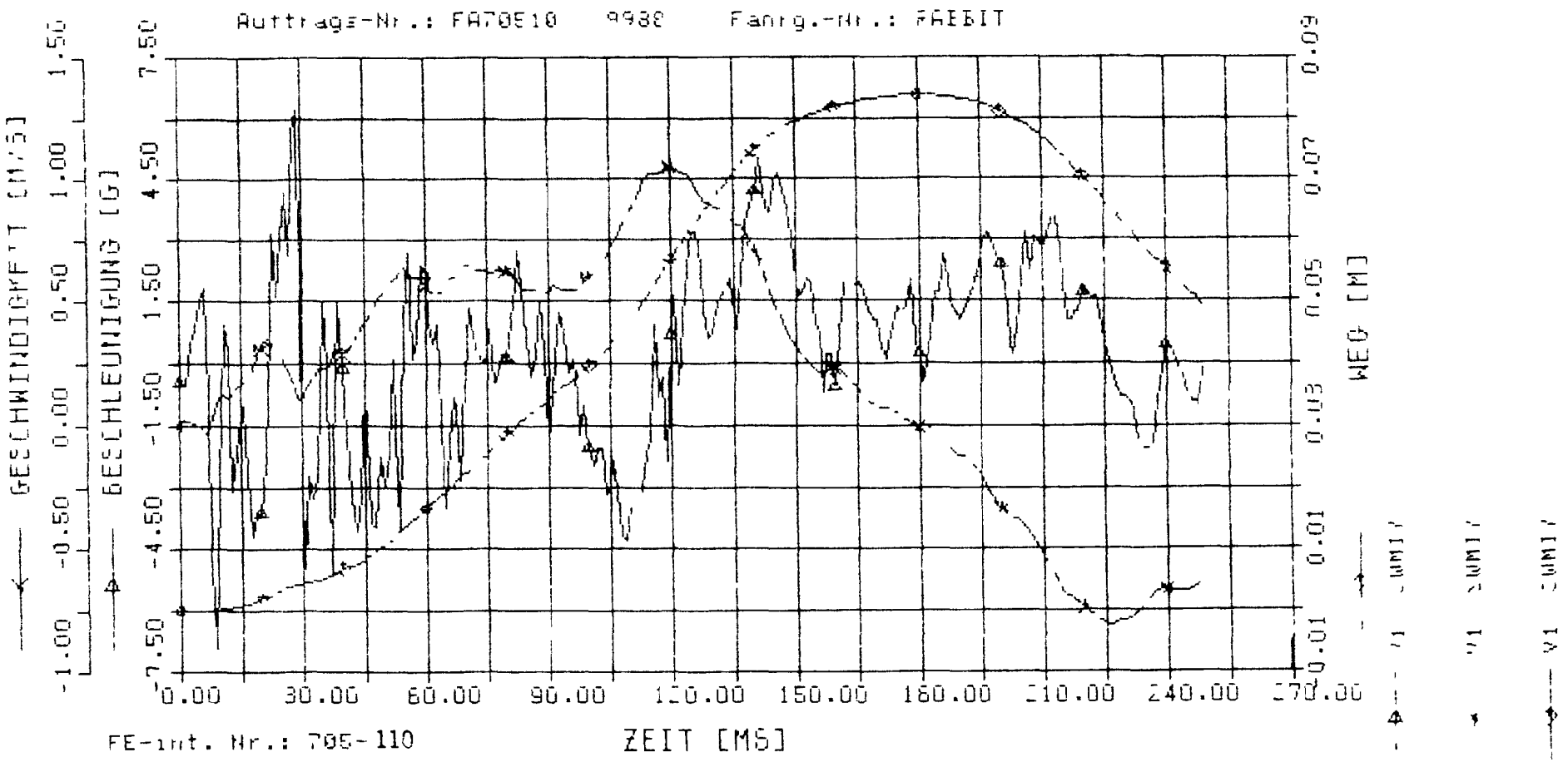
SWMI Vi [illegible] I 250 34 00 0 00




Auftrags-Nr.: FA70E10 9988 Fahrg.-Nr.: RABBIT
BESCHLEUNIGUNG [G]
18.00
14.00
10.00
6.00
2.00
-2.00
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
270.00
ZEIT [MS]
FE-int. Nr.: 705- 110

Kohn Werke Auftrag Nr. FA70510 Versuchs Nr. 9988

Mes. Stelle	UP	bei Grösse	Extremum	t Extr	SHS
SWM1X	V1	[illegible]	[illegible]	[illegible]	[illegible]
SWM1Y	V1	GL [illegible]	1 04[illegible]	170 00	[illegible]
SWM1Z	V1	WE [illegible]	0.33	[illegible]	[illegible]

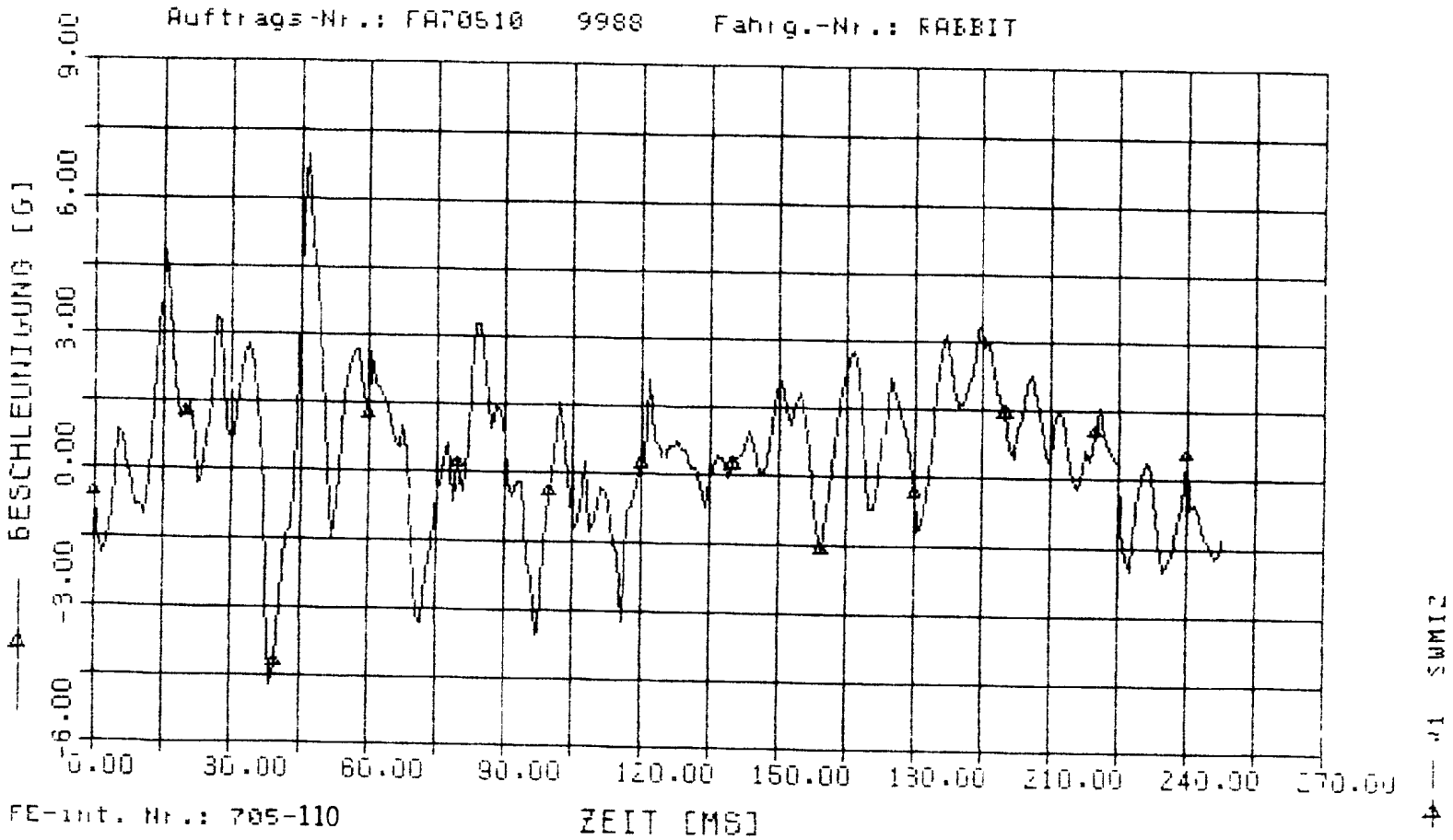


Kenn Werte Auftrag Nr. FA 0510 Versuchs Nr. 9988

Mess-Stelle UP Dor Extremum t MS

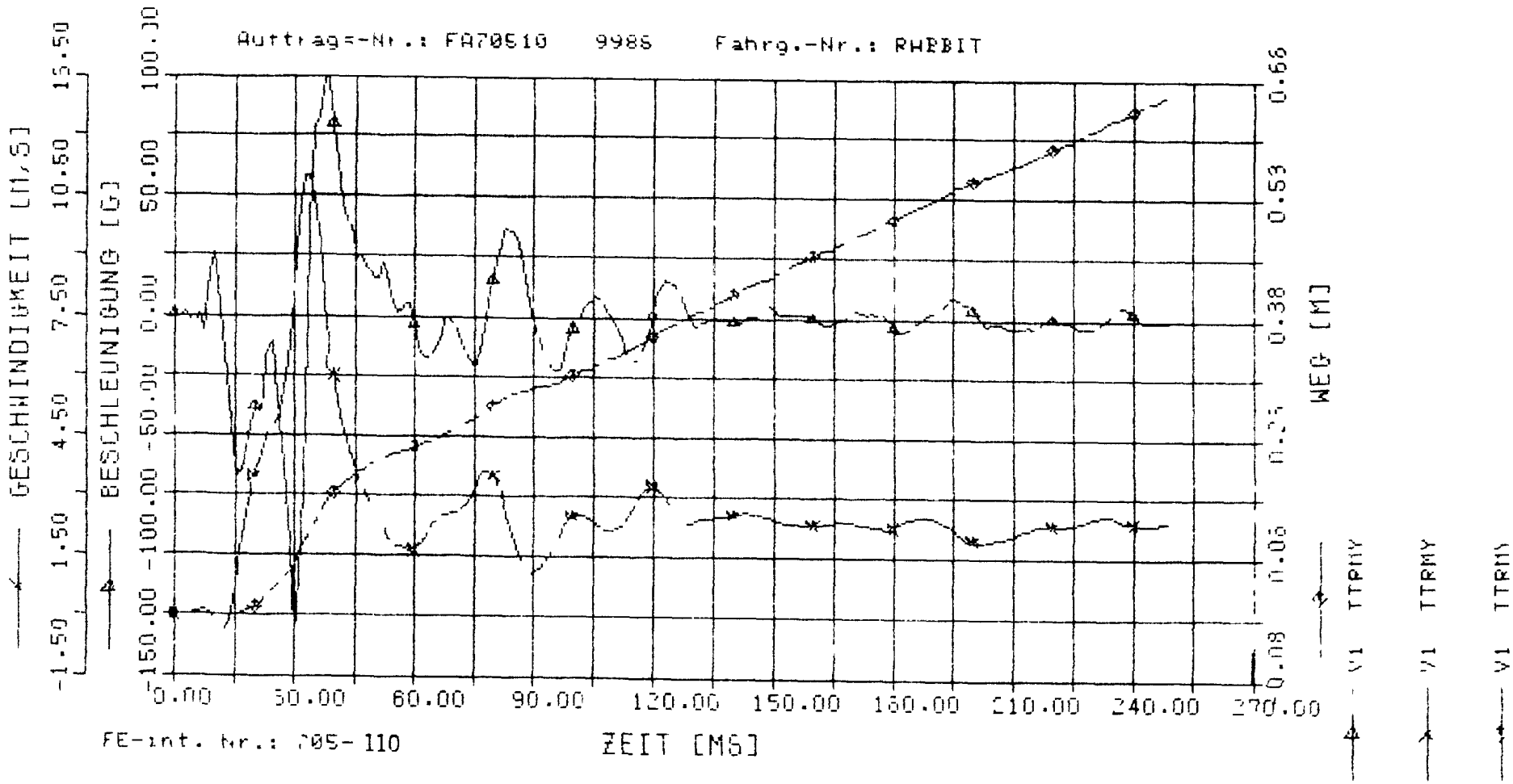
Grue e Extr

SWMI BL g 00



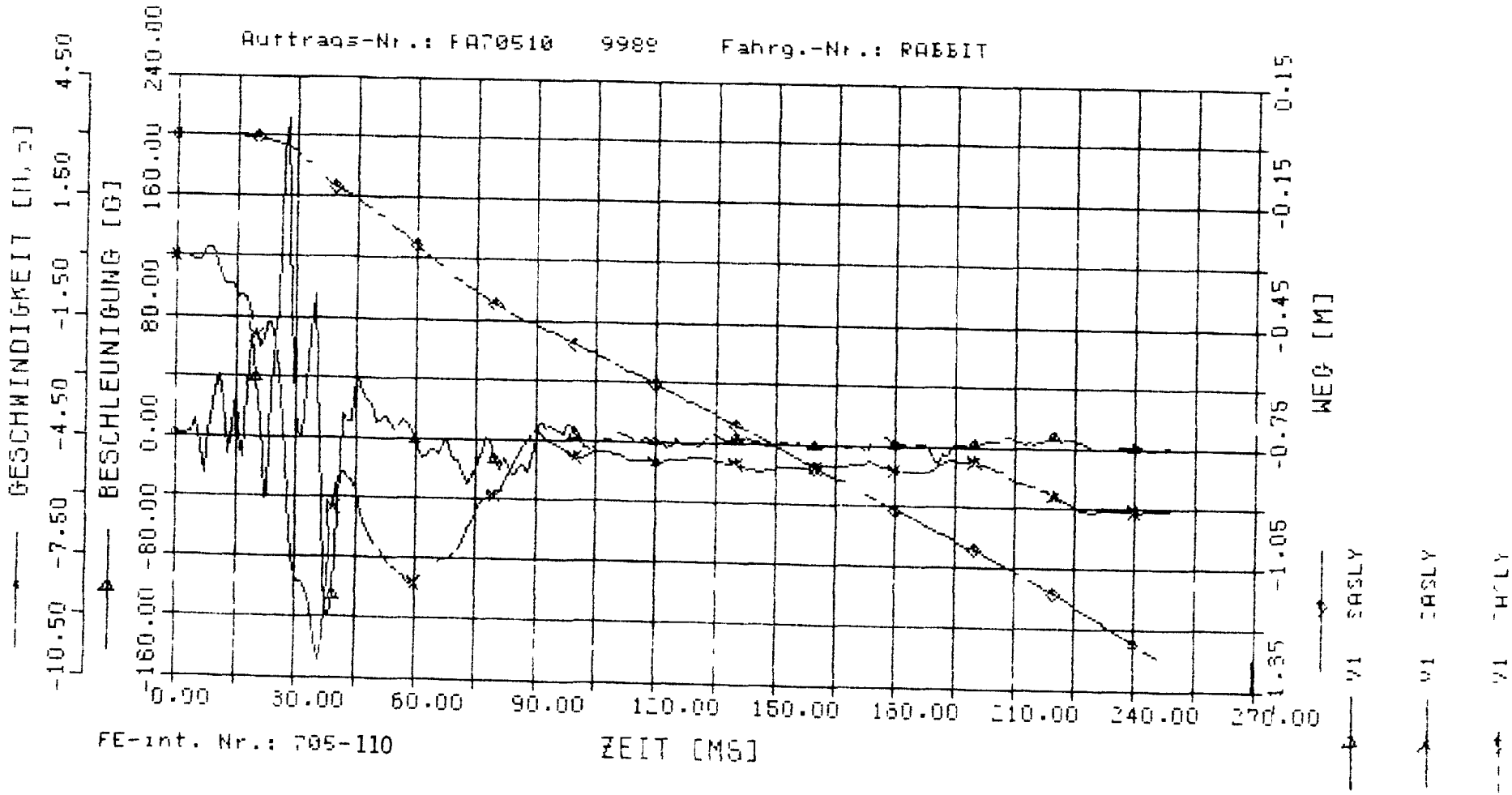
Kohn Wo[illegible] Au[illegible]rag[illegible] Nr [illegible] Versuch[illegible] Nr [illegible]

Mess Stelle	UE	[illegible]	[illegible]	[illegible]	[illegible]
		Gr[illegible]se		Extr	
TTRMY	V1	[illegible]	[illegible]	[illegible]	0.00
TTRMY	V1	GL m/s	10.979	[illegible]	0.00
TTRMY	V1	WL [illegible]	[illegible]	[illegible]	0.00



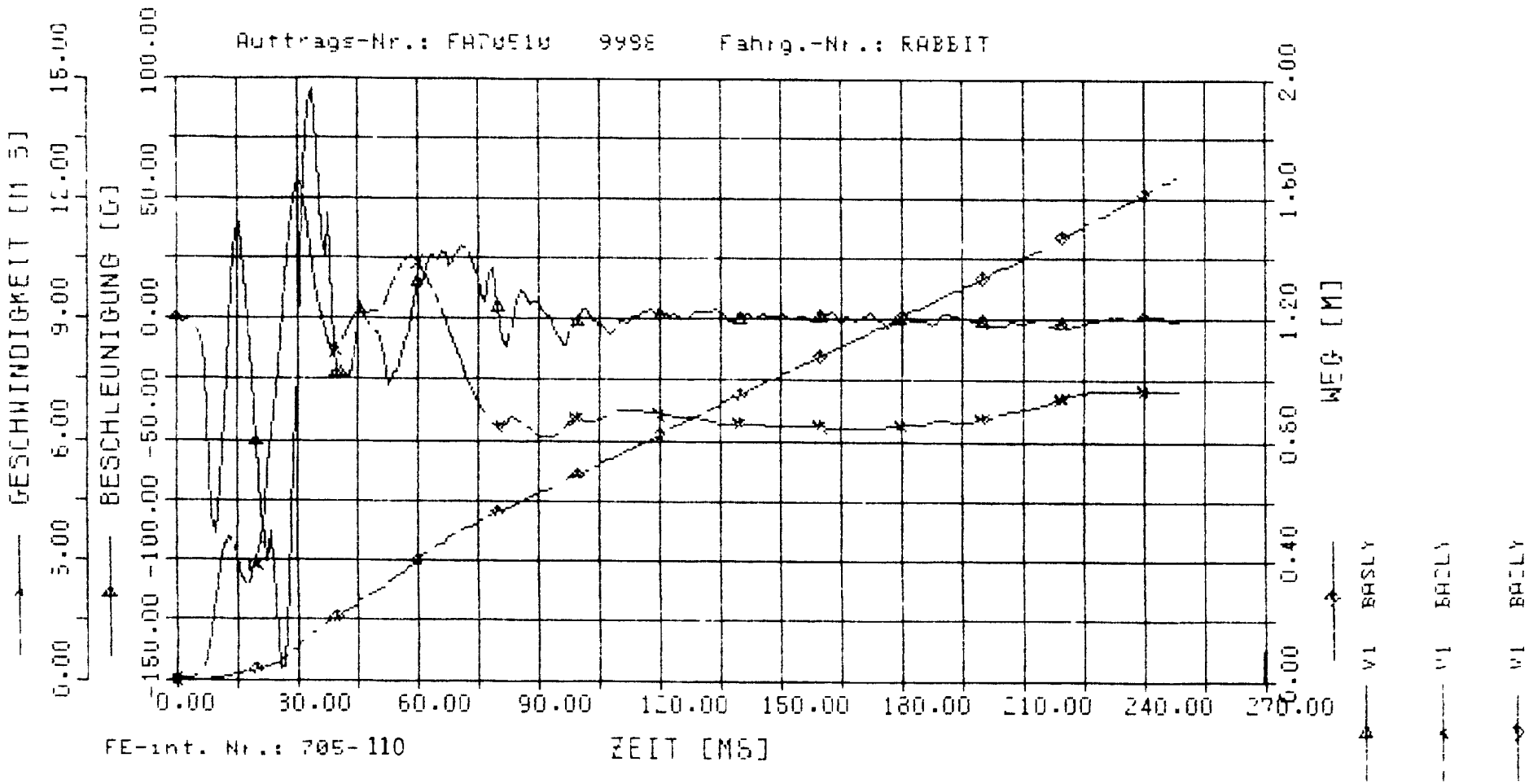
Kenn-Werte Auftrags Nr FA70510 Versuchs Nr 9989

Mess Stelle	Ul	Grösse	Extremum	Extr	[illegible]
SASLY	V1	BL g	[illegible]	[illegible]	0 00
SASLY	V1	GE m/s	10 07[illegible]	36 00	0 00
SASLY	V1	WE m	1 32[illegible]	[illegible] 00	0 00



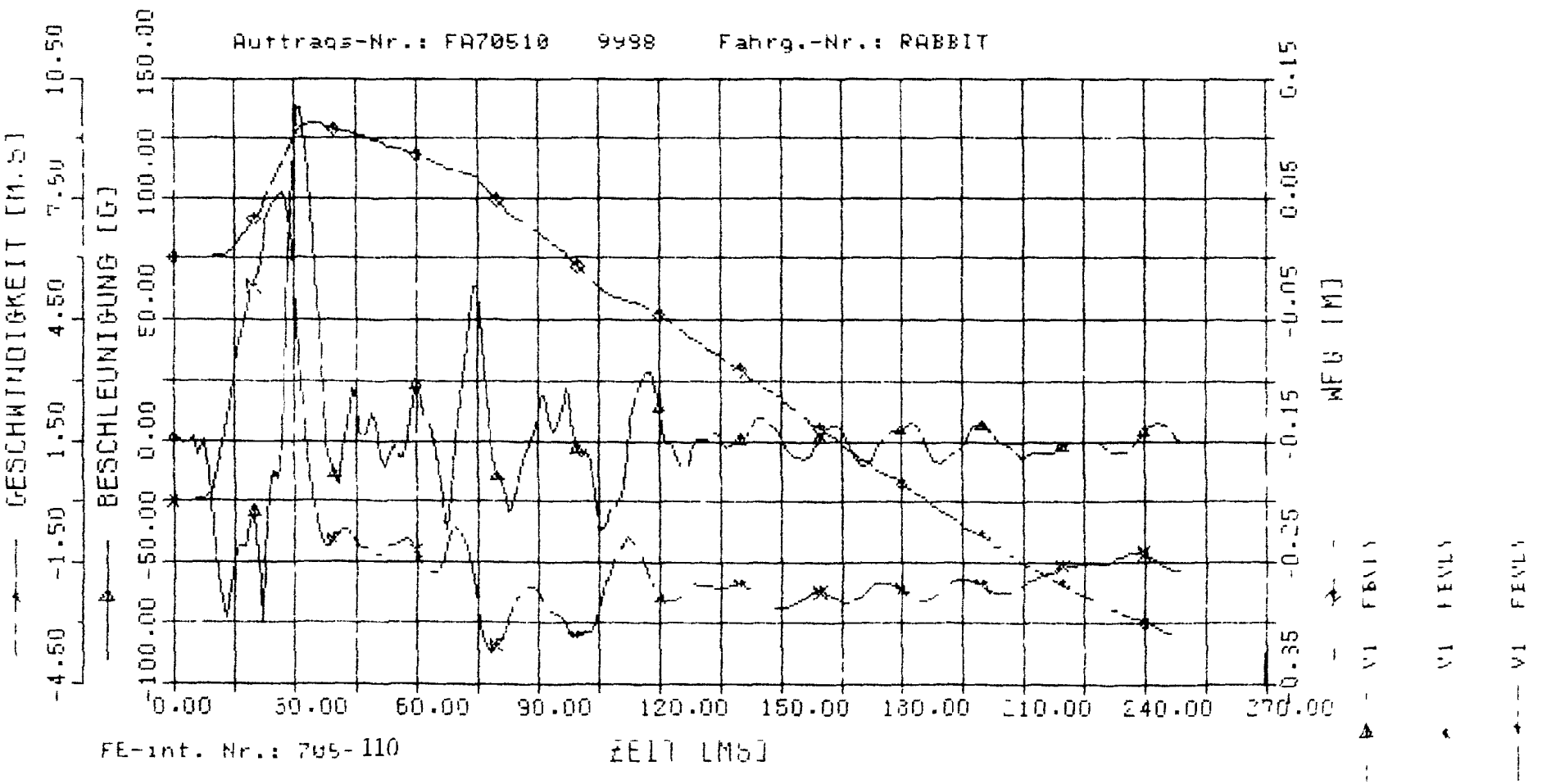
Kennwerte Auftrags Nr FA 0510 Versuch Nr [illegible]

Me Stelle	UI	der Groesse	Extremum	t Extr	[illegible]
BA[illegible]	V1	BL [illegible]	-1[illegible]	[illegible] 00	0 00
BASLY	V1	GE m/s	12 [illegible]	[illegible]0 00	0 00
BASLY	V1	WE [illegible]	1 7[illegible]	255 00	0 00



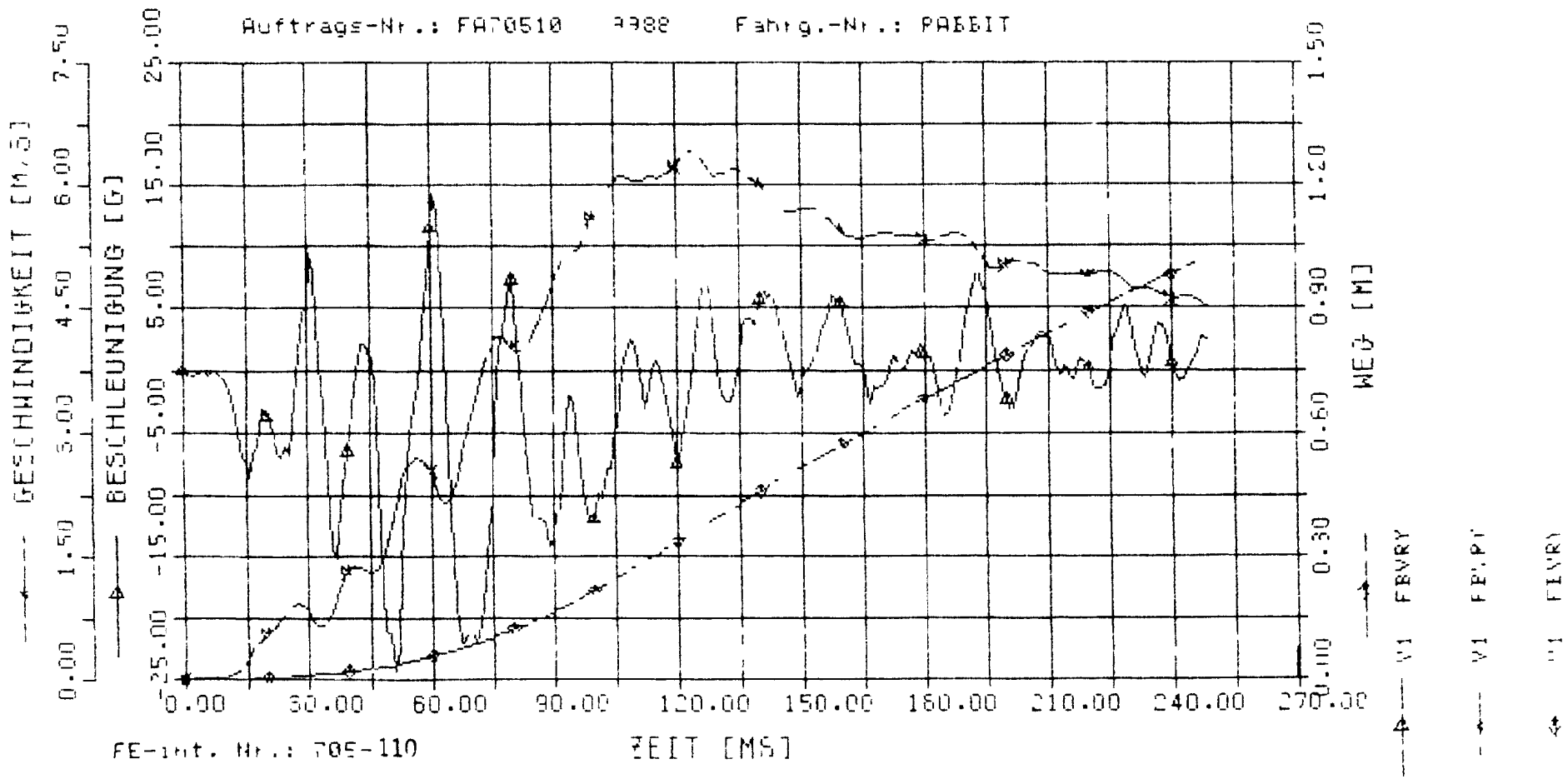
Kenn Worte Auftrag Nr FA7051 Versuchs Nr 9988

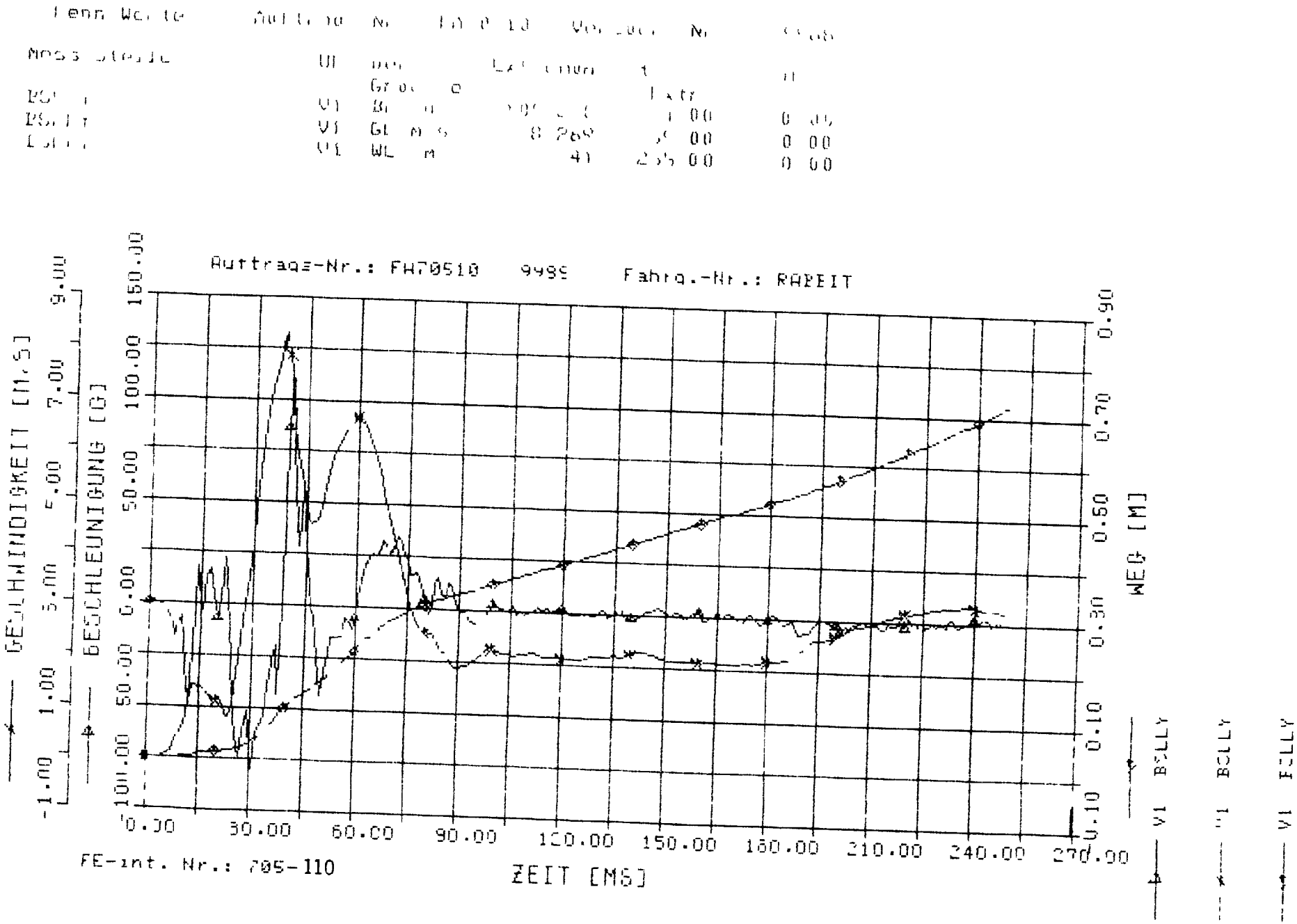
Messstelle	UP	Der Grösse	Extremum	t Extr	SAS
FBVLY	V1	BL g	13[illegible] 377	31 00	0 00
FEVLY	V1	GE m/s	7 632	27 00	0 00
FEVLY	V1	WF m	- 3[illegible]4	[illegible]5 00	0 00



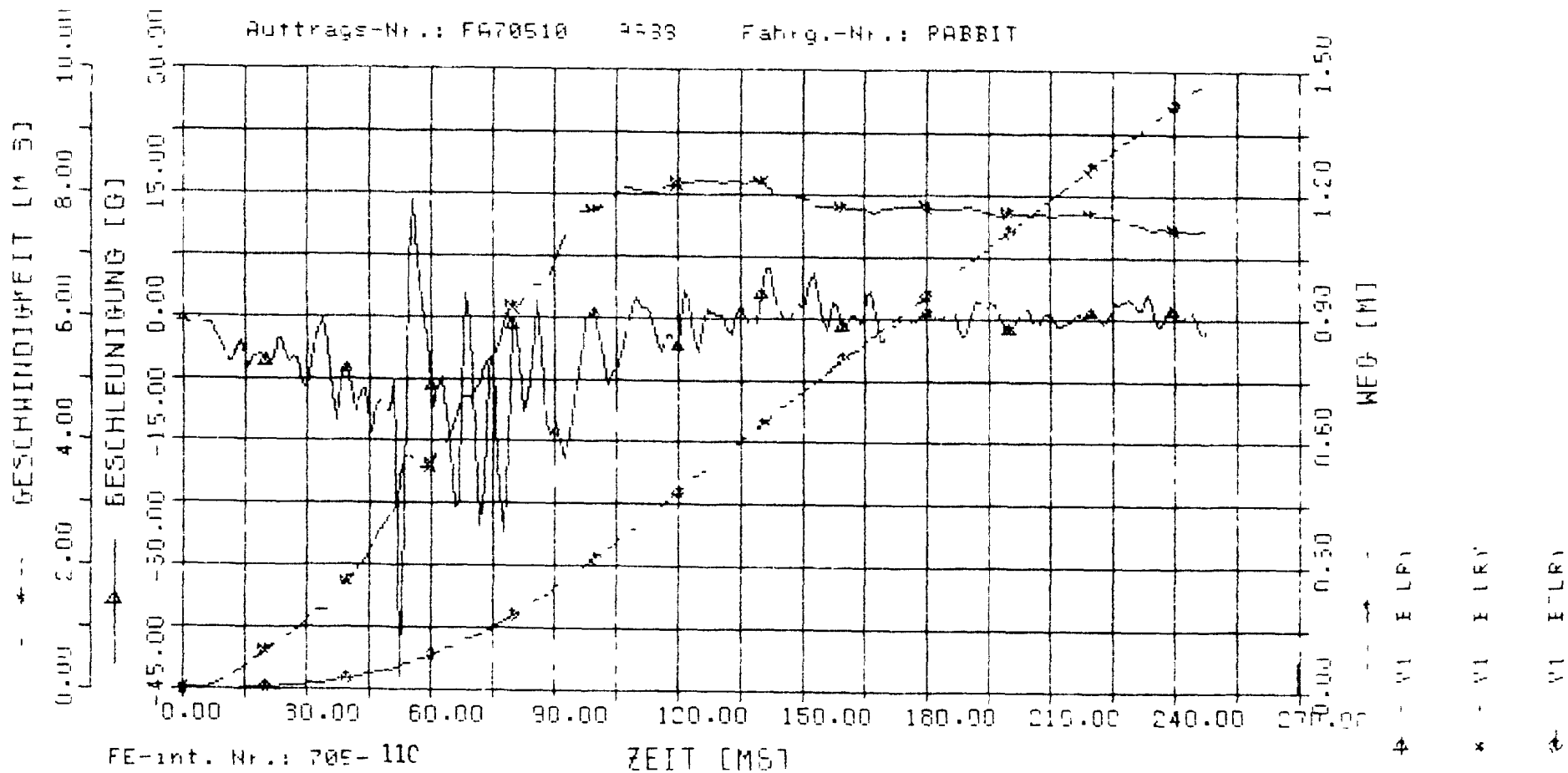
Kenn Werte Auftrag Nr. FA 0510 Versuch Nr. [illegible]

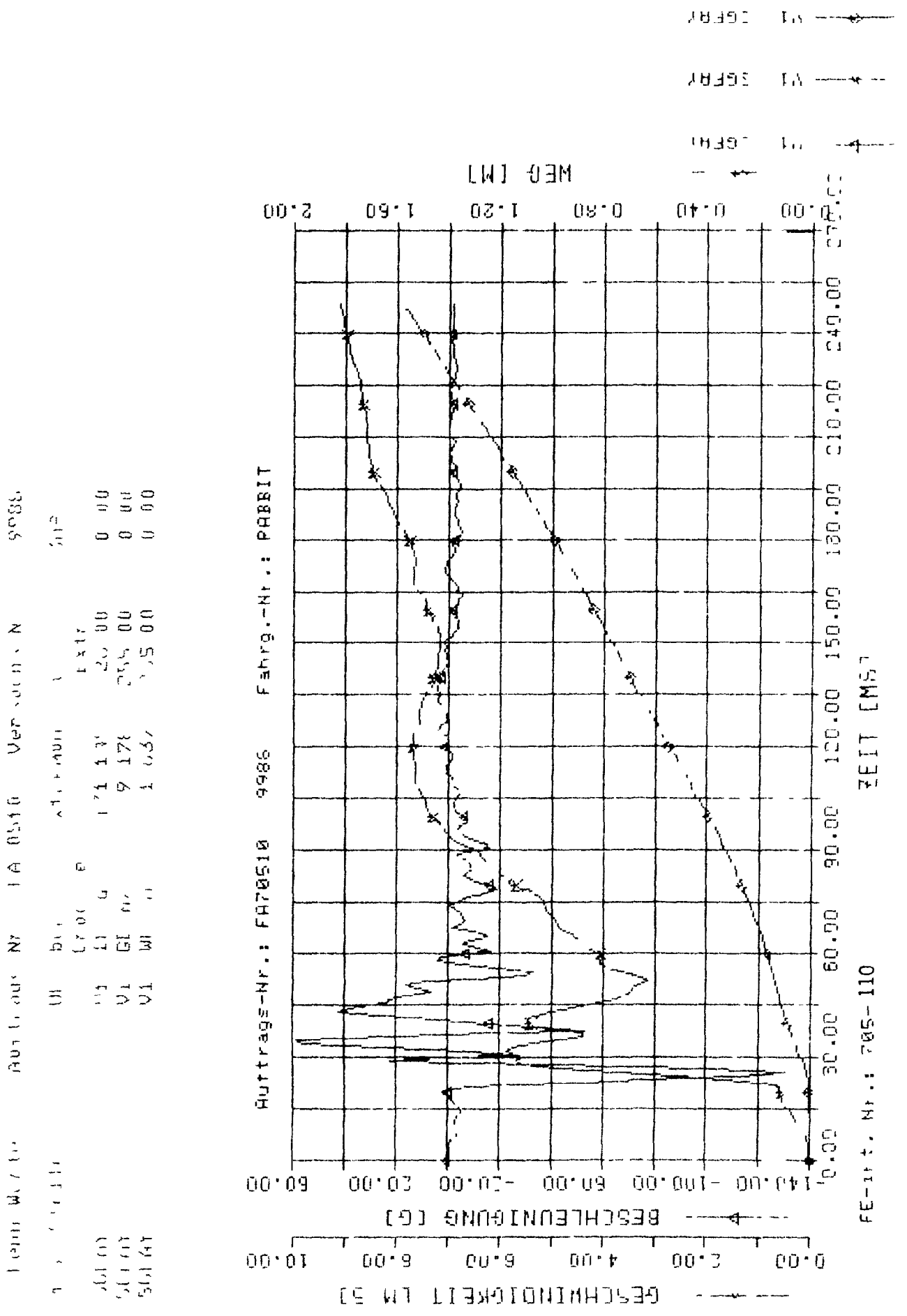
Mess Stelle	UP	Ber	extremum		[illegible]
		Grundsc		extr	
FBVRY	V1	BE g	24 [illegible]	[illegible] 00	[illegible] 00
FBVRY	V1	GE m/s	[illegible]	1[illegible]4 00	0 00
FBVRY	V1	W m	1 [illegible]	2[illegible]5 00	0 00

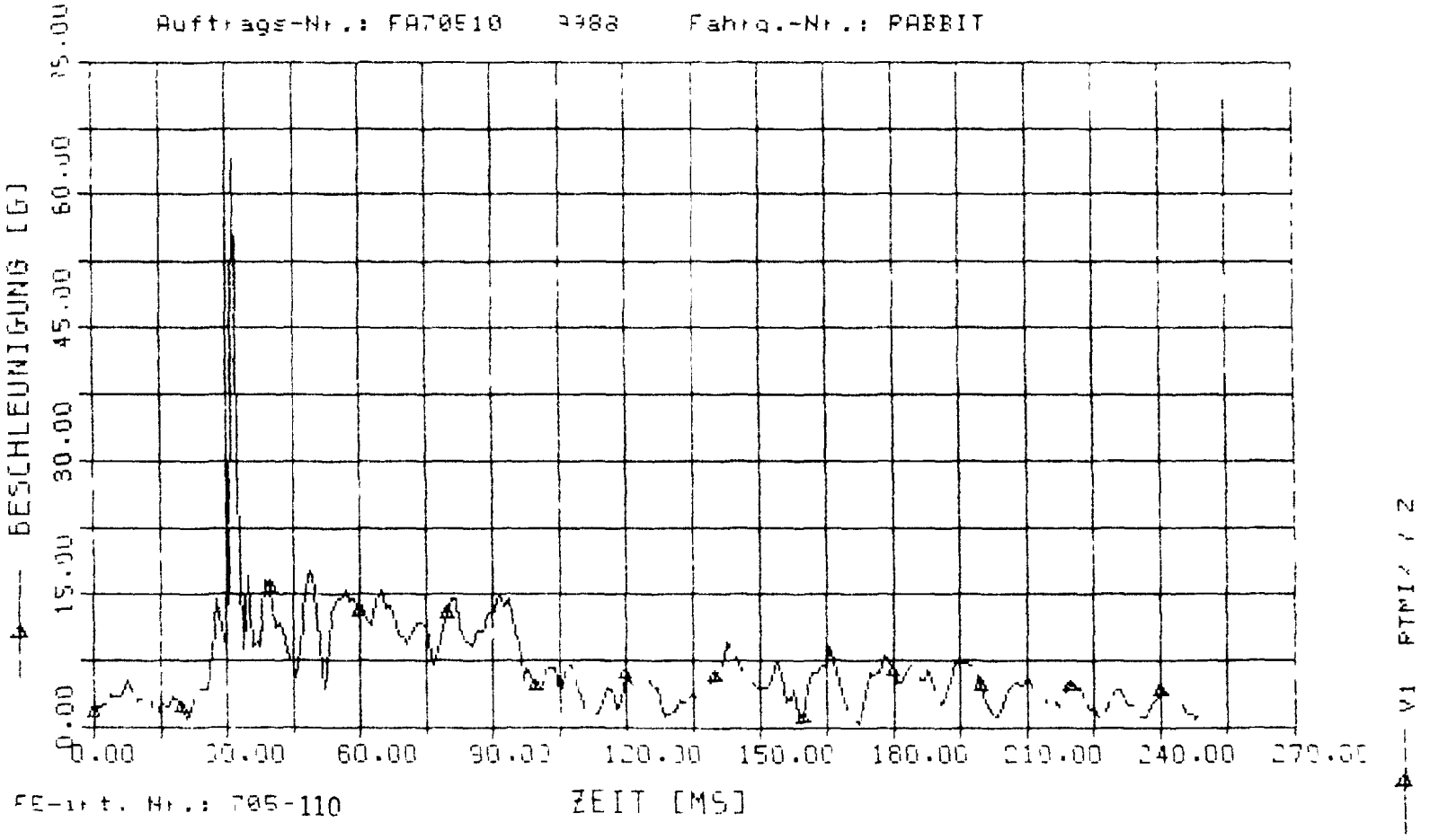



Auftrags-Nr.: FA70510 9989 Fahrg.-Nr.: RABEIT
GESCHWINDIGKEIT [M/S]
BESCHLEUNIGUNG [G]
WEG [M]
ZEIT [MS]
FE-int. Nr.: 705-110
V1 BOLLY
V1 BOLLY
V1 BOLLY

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

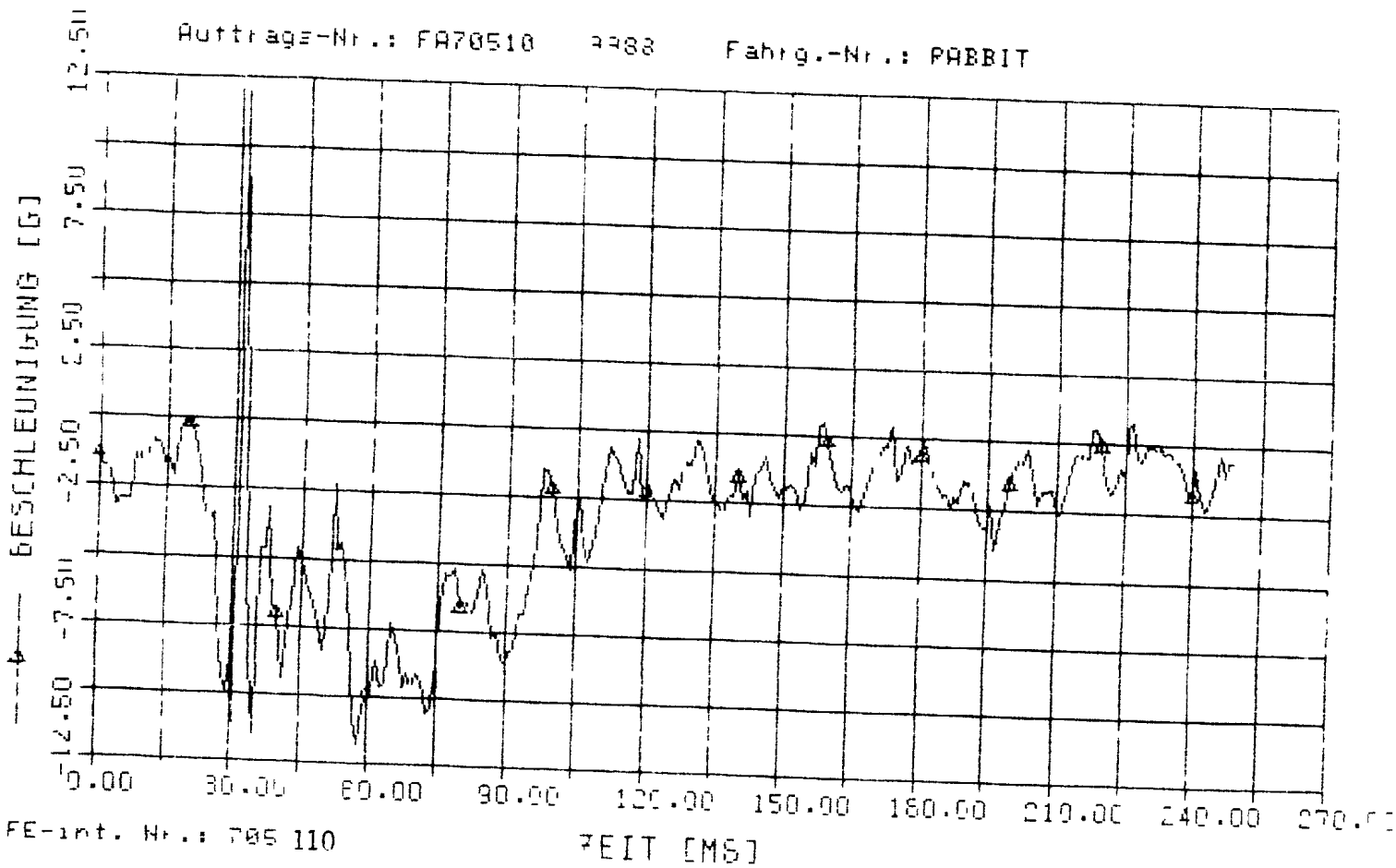

Auftrags-Nr.: FA70510 9533 Fahrg.-Nr.: RABBIT
GESCHWINDIGKEIT [M/S]
BESCHLEUNIGUNG [G]
WEG [M]
ZEIT [MS]
FE-int. Nr.: 705- 110
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
270.00
-45.00
-30.00
-15.00
0.00
15.00
30.00
0.00
2.00
4.00
6.00
8.00
10.00
0.00
0.30
0.60
0.90
1.20
1.50


Auftrags-Nr.: FA70510 9986 Fahrg.-Nr.: PABBIT
WEG [M]
ZEIT [MS]
BESCHLEUNIGUNG [G]
GESCHWINDIGKEIT [M S]
FE-Int. Nr.: 705-110


Auftrags-Nr.: FA70510 9988 Fahrg.-Nr.: RABBIT
BESCHLEUNIGUNG [G]
0.00
15.00
30.00
45.00
60.00
75.00
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
270.00
ZEIT [MS]
FE-Inst. Nr.: 705-110

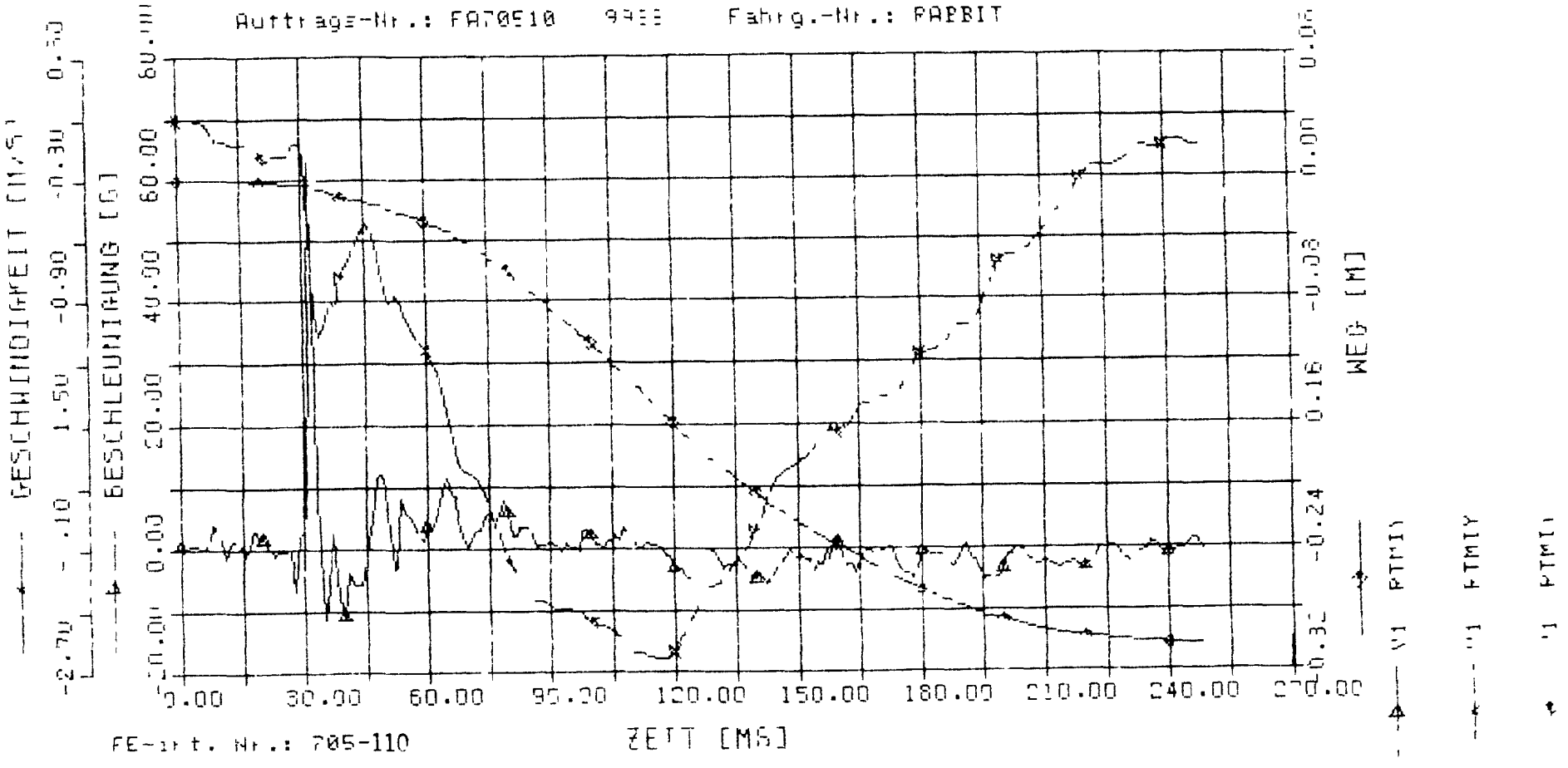
Kenn Werte Auftrags-Nr. FA 0510 Versuchs-Nr. [illegible]

[illegible]



Kenn Wo[illegible] Au[illegible] N FA [illegible] Versuch Nr [illegible]

Me[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]		[illegible]	
RTMIY	V1	[illegible]	[illegible] 301	00	0 00
RTMIY	V1	[illegible]	[illegible] 04[illegible]	[illegible] 00	0 00
RTMIY	V1	[illegible]	305	[illegible]5 00	0 00

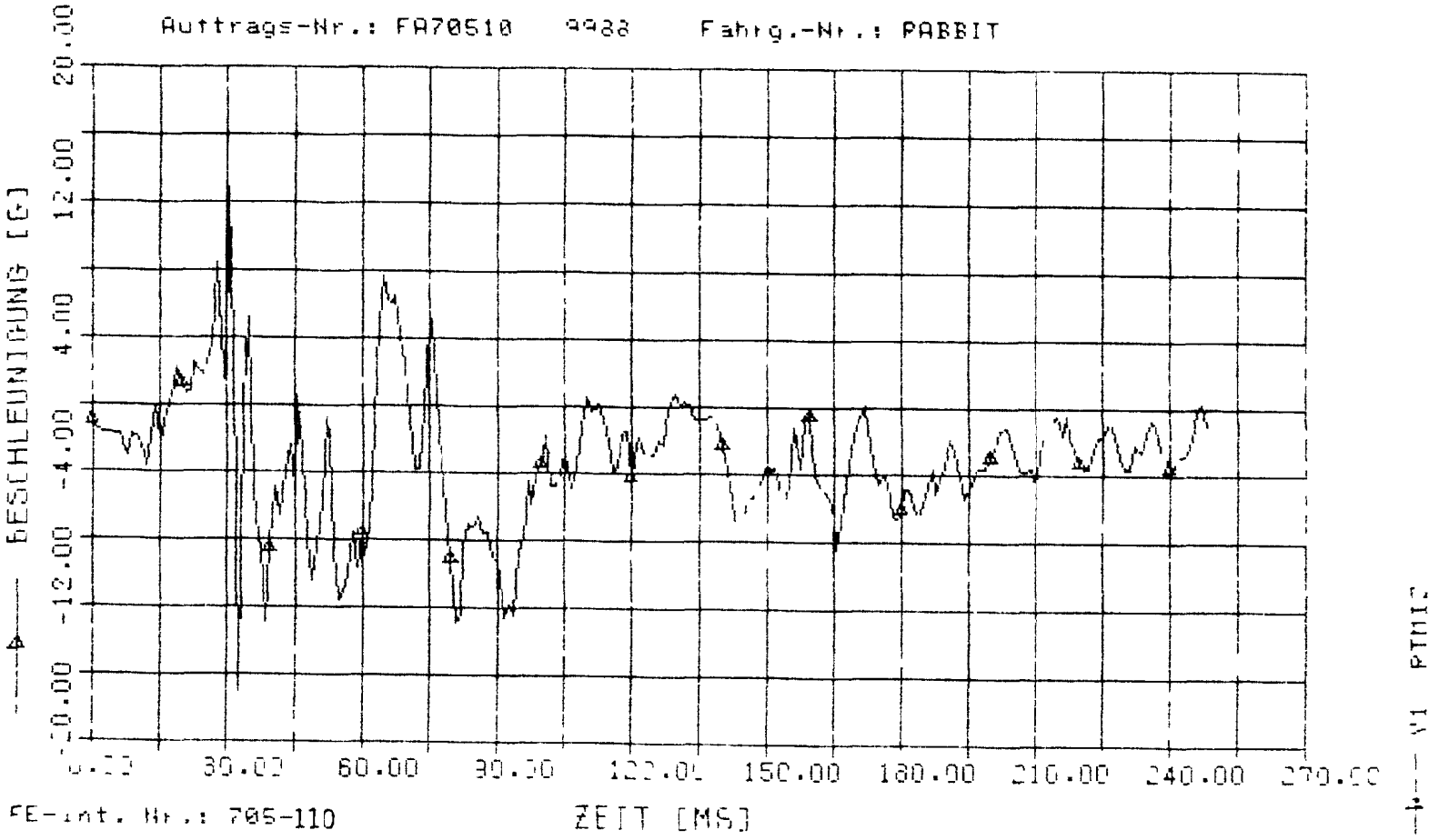


Kenn Worte Auftrags Nr FA 0510 Versuch Nr [illegible]

[illegible] UI Ber Extremum [illegible] MS

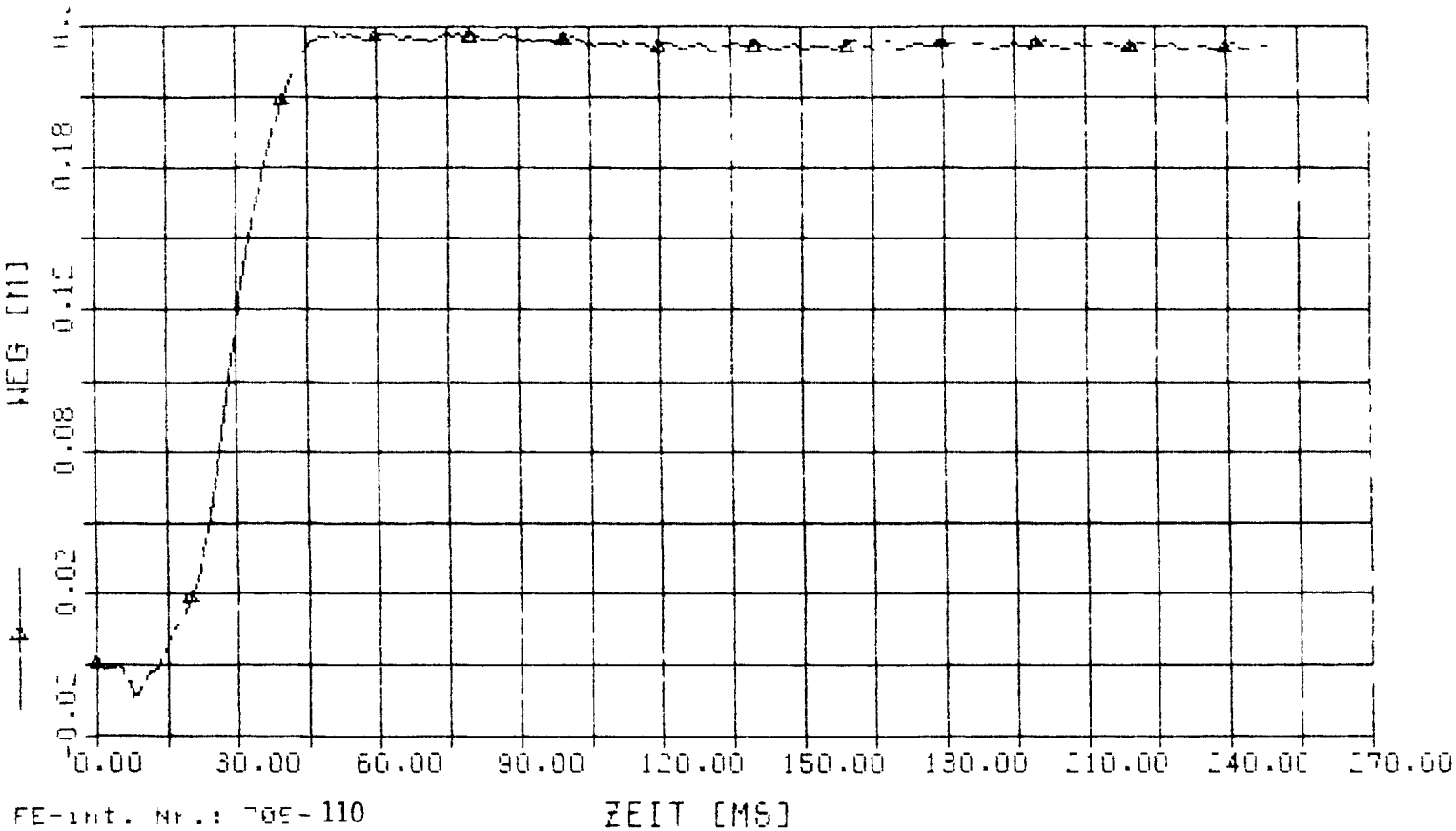
Grösse Extr

RTMIZ VI [illegible] [illegible] 010 [illegible] 00 0 00



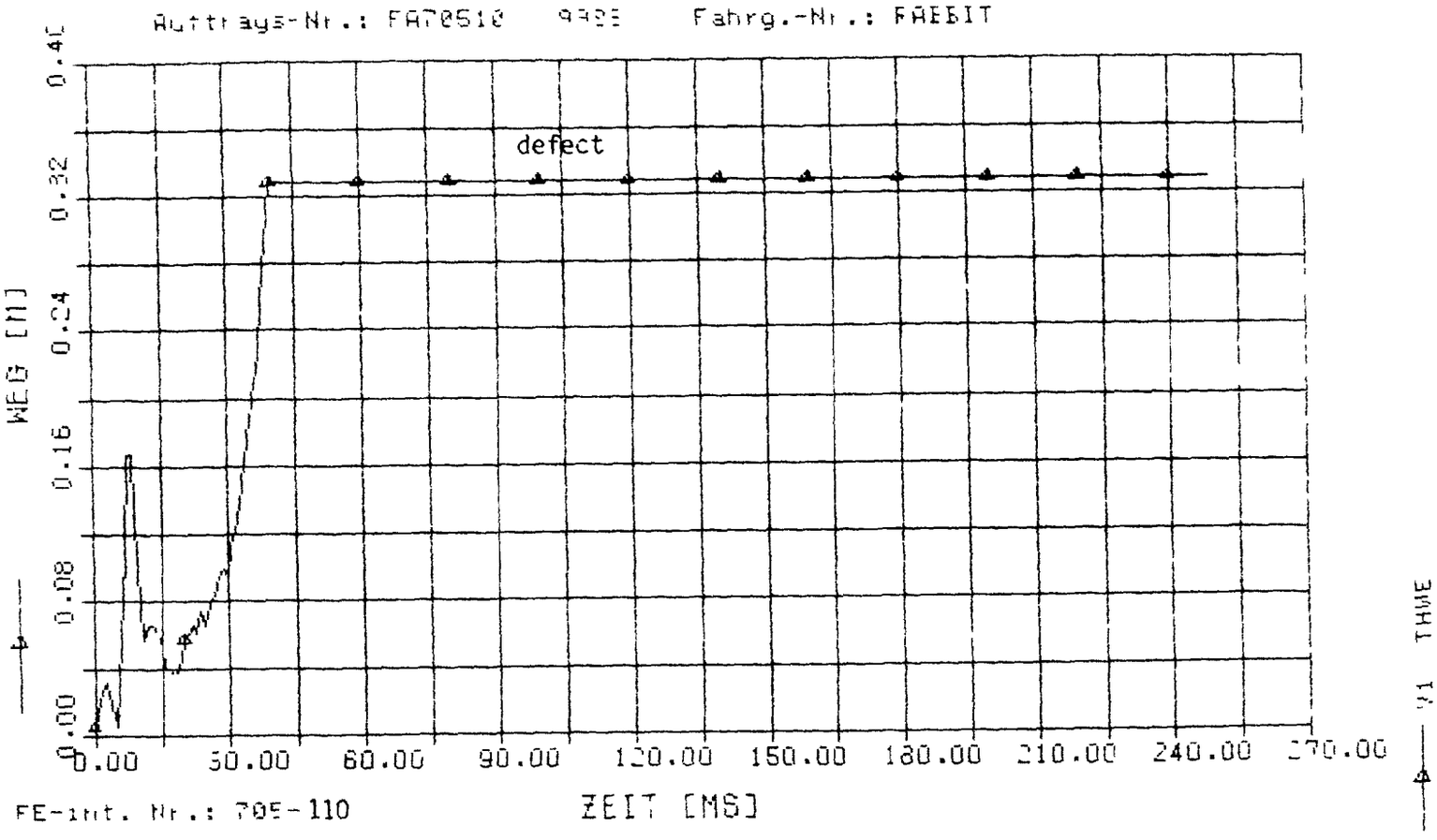
(Fahrertur) Front Door

Auftrage-Nr.: FA70E10 9966 Fahrg.-Nr.: FAIPIT



FE-Int. Nr.: 705-110

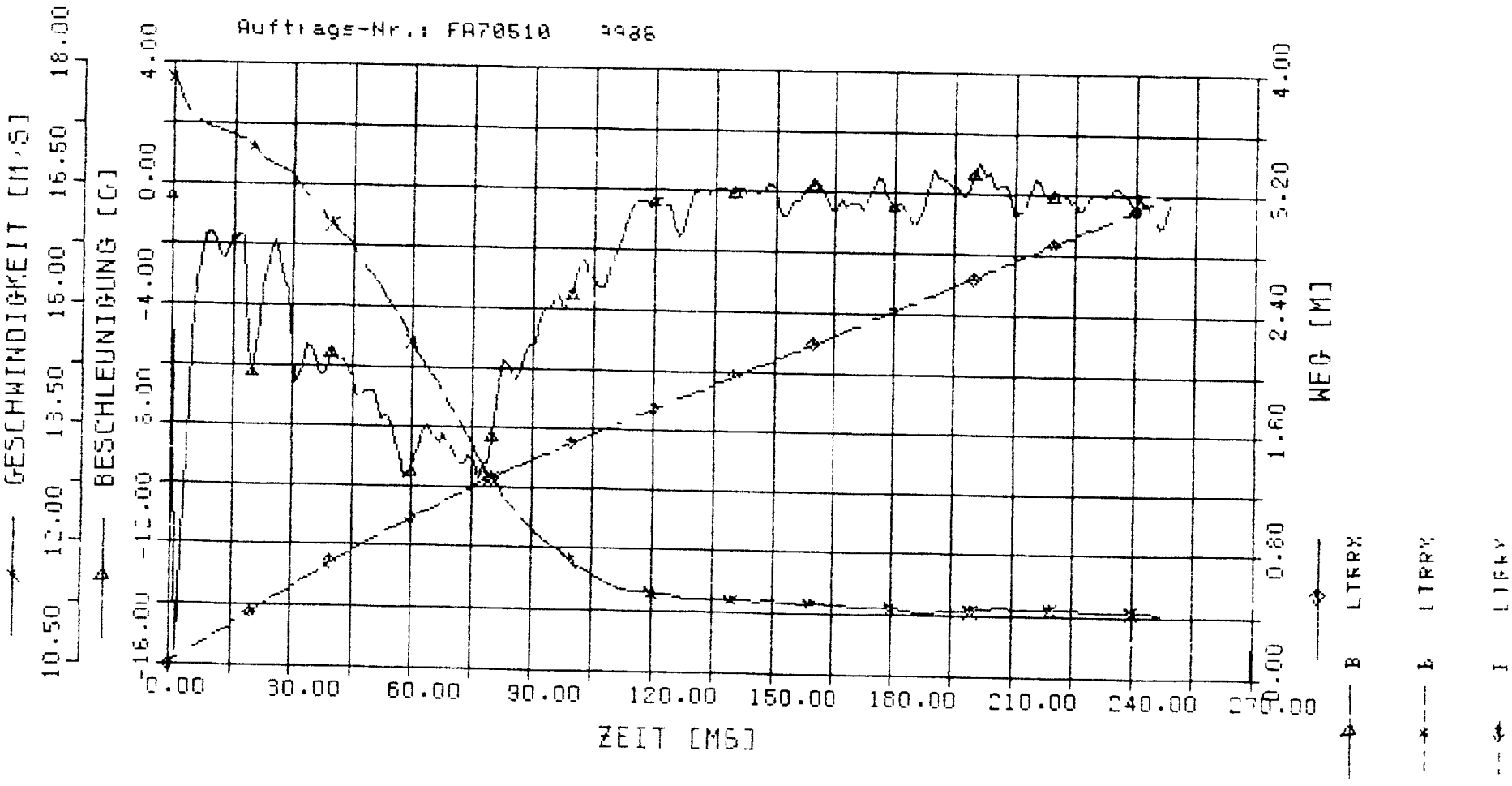
(Tur hinten) Rear Door



B.1.2 Crabbed Barrier

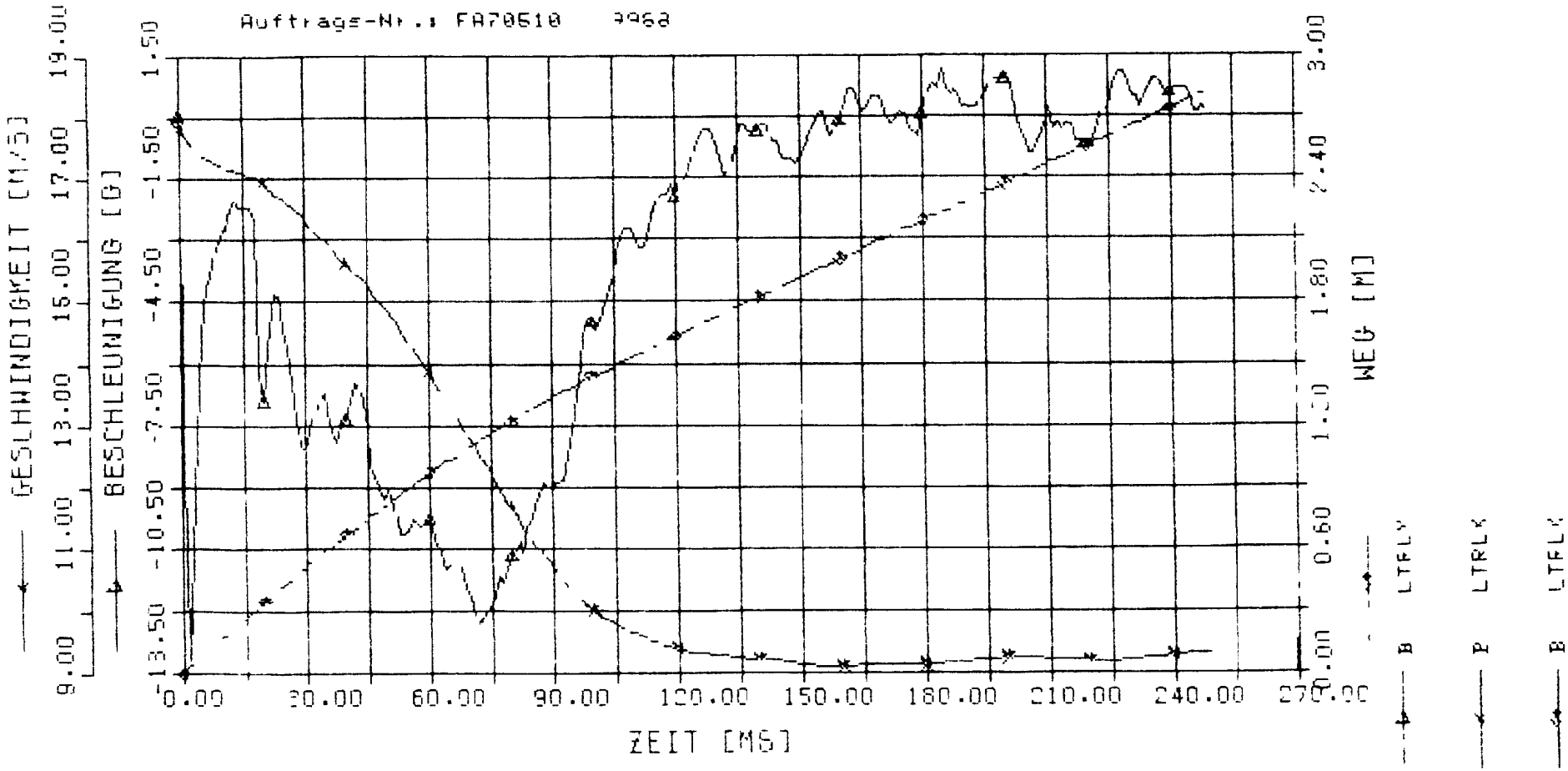
Kenn Werte Auftrag Nr FA70510 Versuch Nr 9988

Bes Teile	HP	Ber Grösse	Extremum	t Extr	nf
LTRR	L	BL g	15 60	2 00	0 00
LTRRX	I	GL m	1 80	0 00	0 00
LTRI	B	WE m	3 265	55 00	0 00



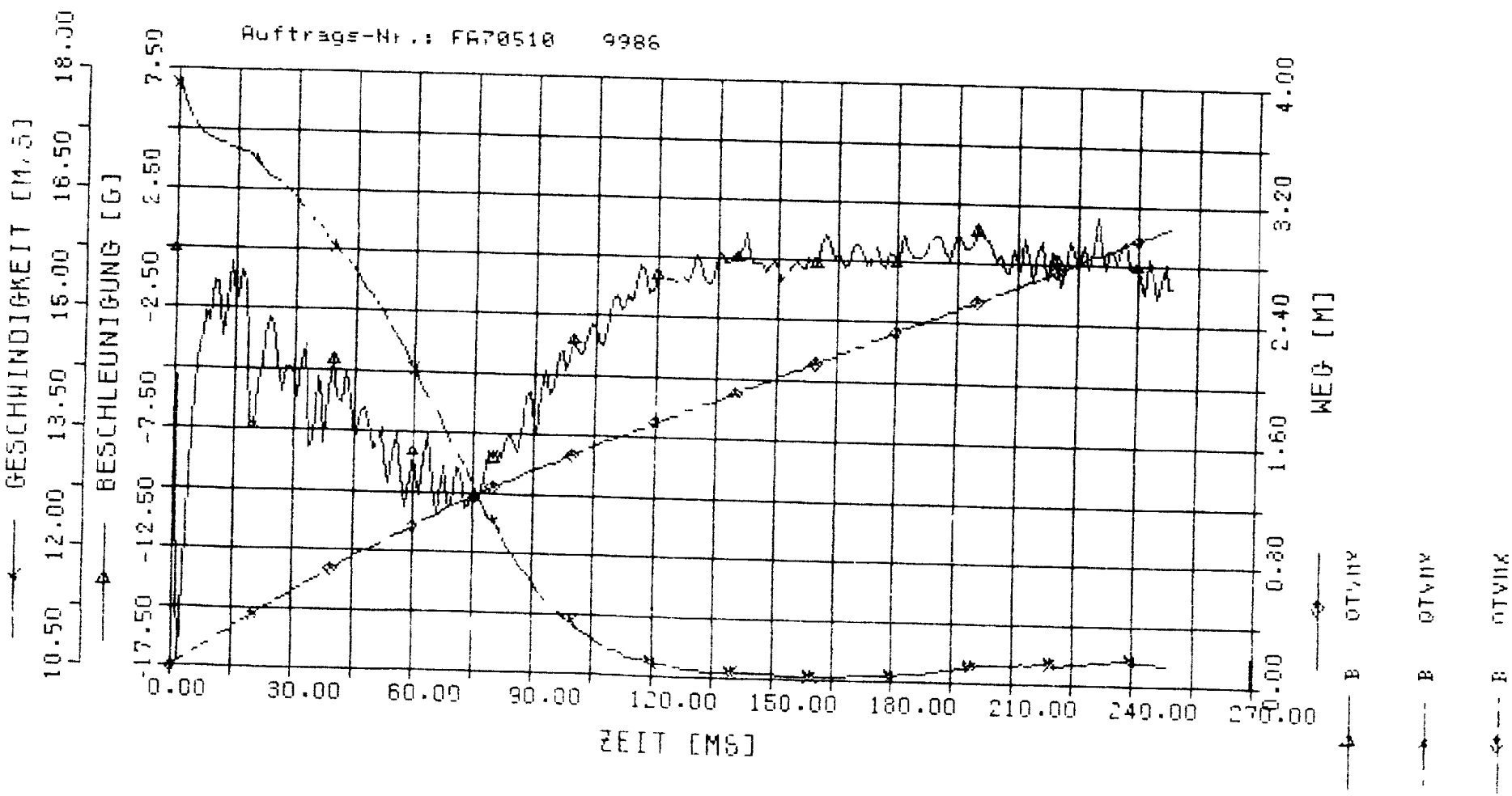
Kenn Worte Auftrags Nr FA 0510 Versuchs Nr 9988

Mes Stelle	Ol	Der Groesse	Extremum	t Extr	MS
LTRLX	B	BE g	13 21	2 00	0 00
LTRLX	B	GE m	1 80	0 00	0 00
LTRLY	B	WE m	2 373	5 00	0 00



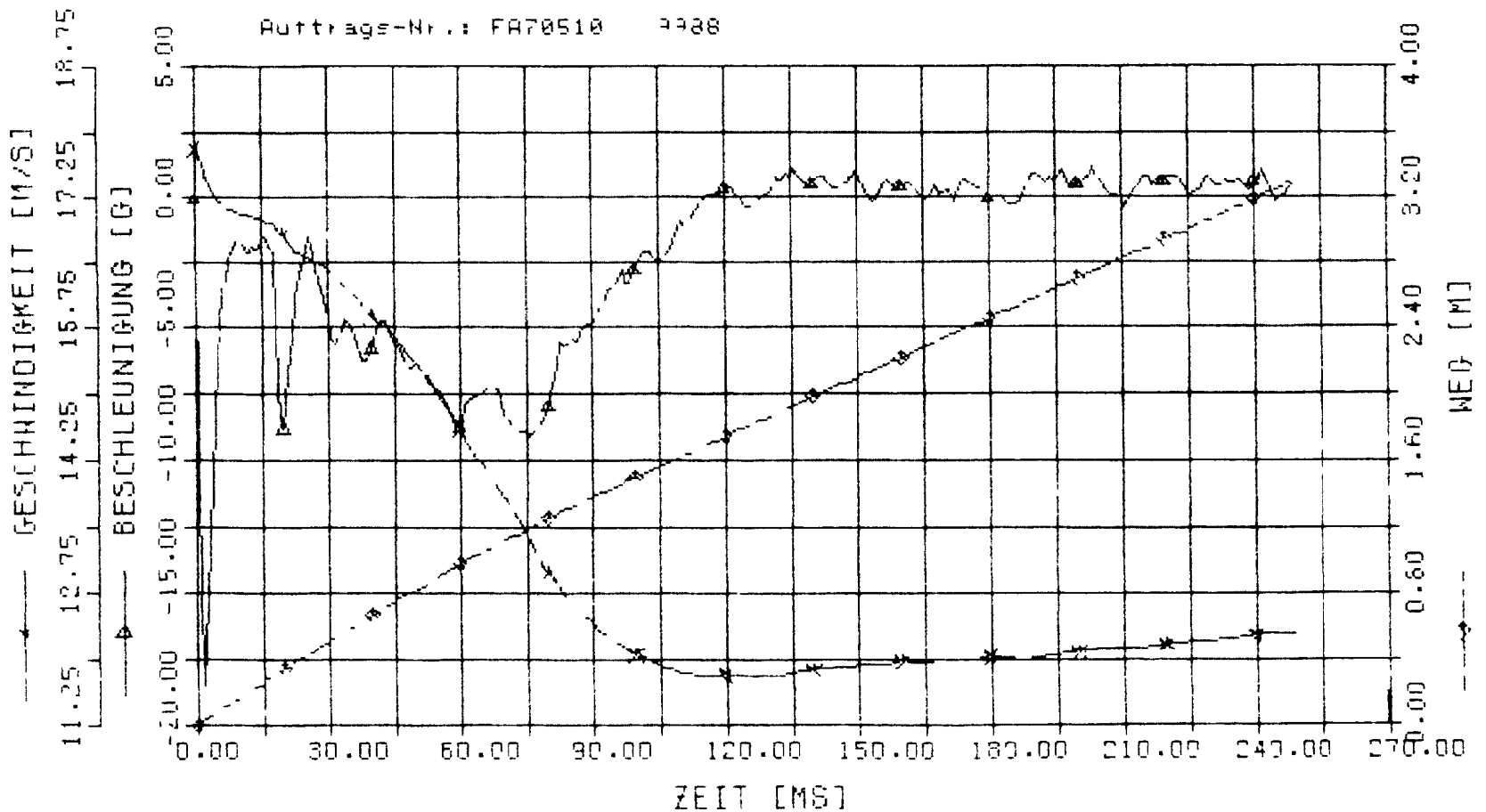
Kenn-Wert Auftrags Nr FA70510 Versuchs Nr 9986

Messstelle	UP	Ber	Extremum	[illegible]	[illegible]
		Grundlage		Ltr	
QTVMX	B	BL [illegible]	[illegible]	[illegible] 00	0 00
QTVMX	B	GI [illegible]	17 80	0 00	0 00
QTVMX	B	WI [illegible]	3 1[illegible]	[illegible]5 00	0 00



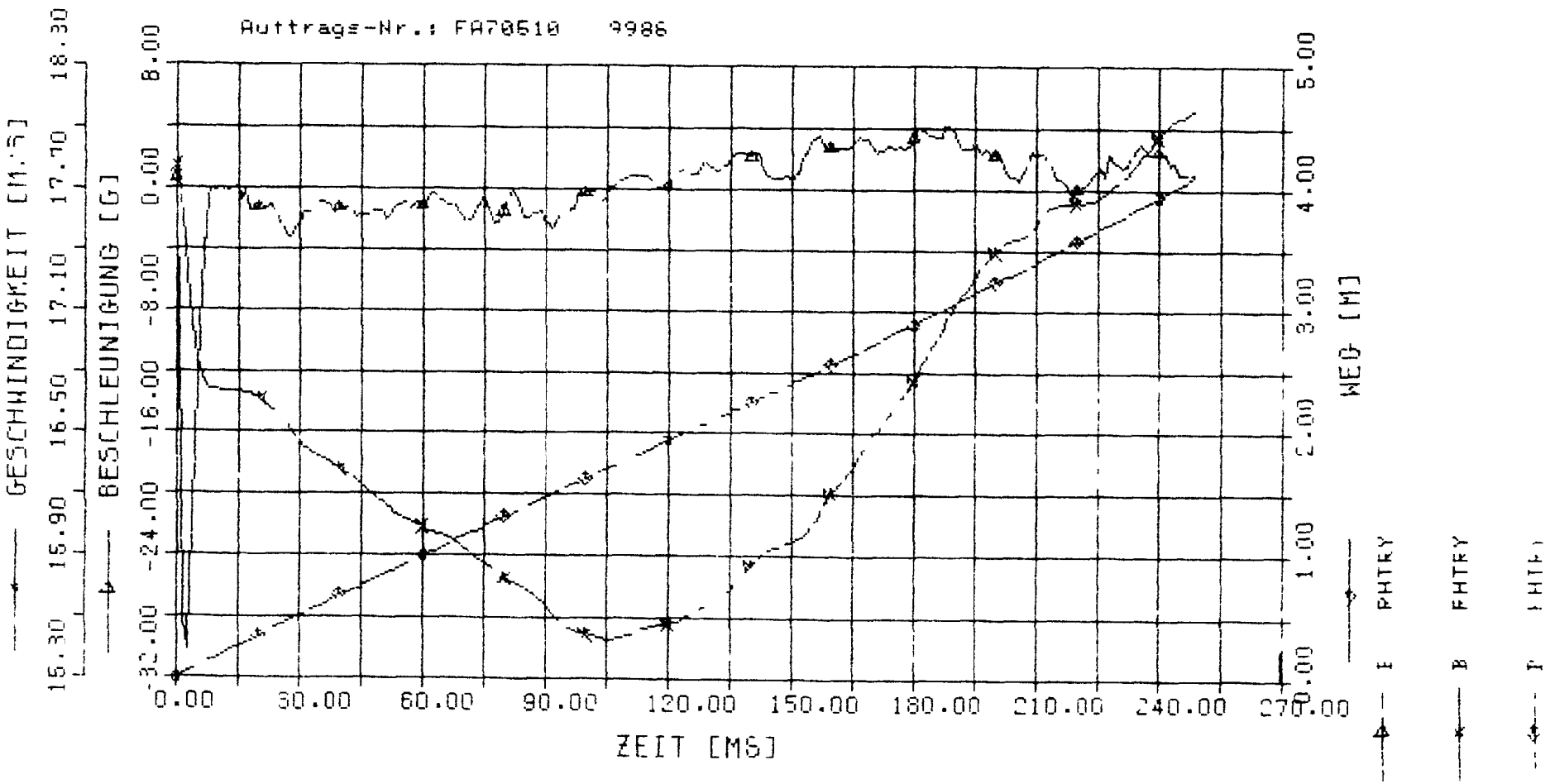
- Kenn Werte Auftrags Nr FA 0510 Versuch Nr [illegible]

Mess Stelle	UP	bei Groesse	Extremum	t Extr	[illegible]
RHTRX	[illegible]	BF g	18 43	[illegible] 00	0 00
RHTRX	E	GL [illegible]	17 [illegible]	0 00	0 00
RHTRX	B	WL [illegible]	3 [illegible]	[illegible] 00	0 00



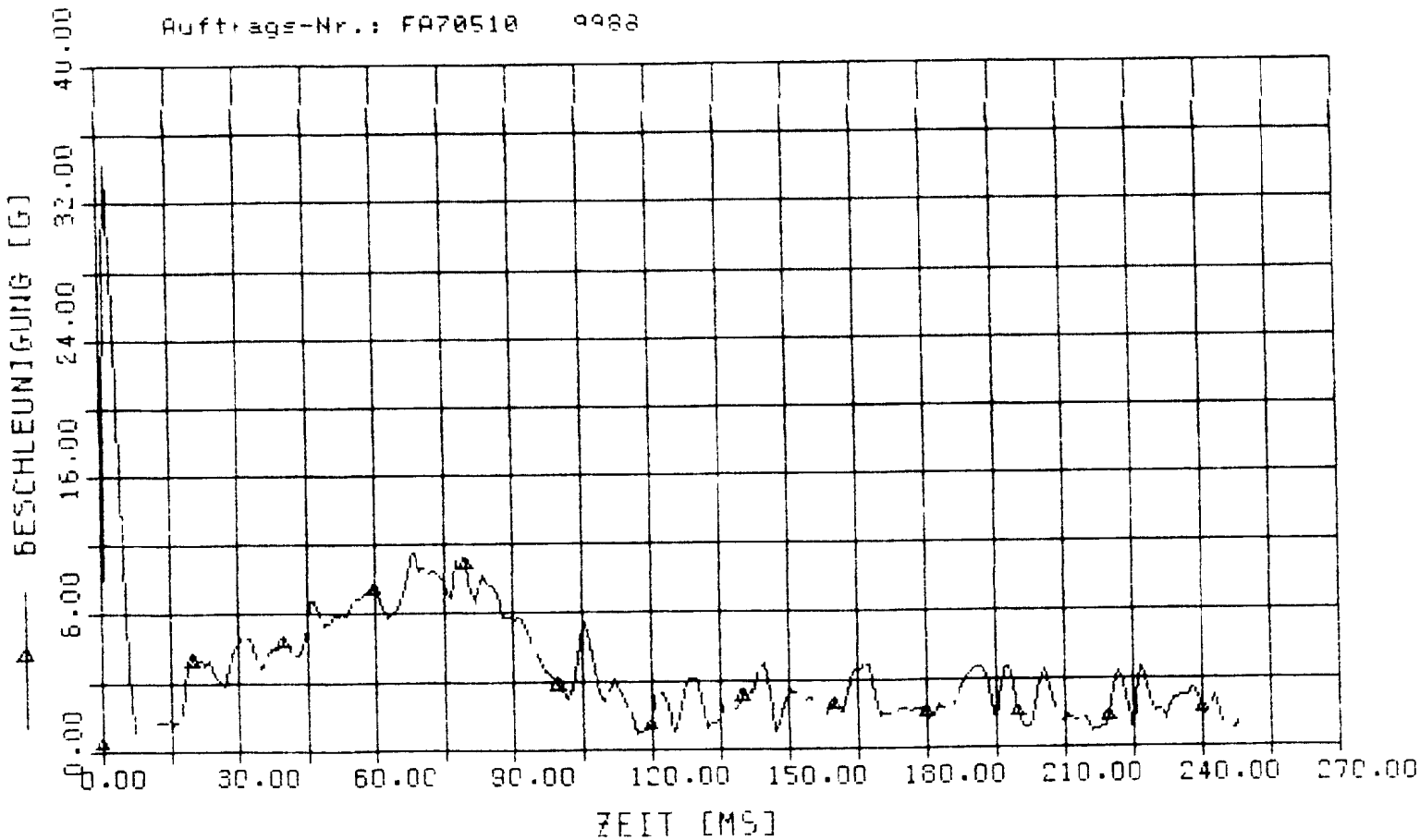
Kenn-Werte Auftrags Nr FA 0510 Versuchs Nr 9968

Mess Stelle	UI	ber Groesse	Extremum	t Extr	SMS
RHTRY	I	BE g	30 164	3 00	0 00
RHTRY	I	GL m/	18 127	255 00	0 00
RHTRY	I	WE m	4 214	255 00	0 00



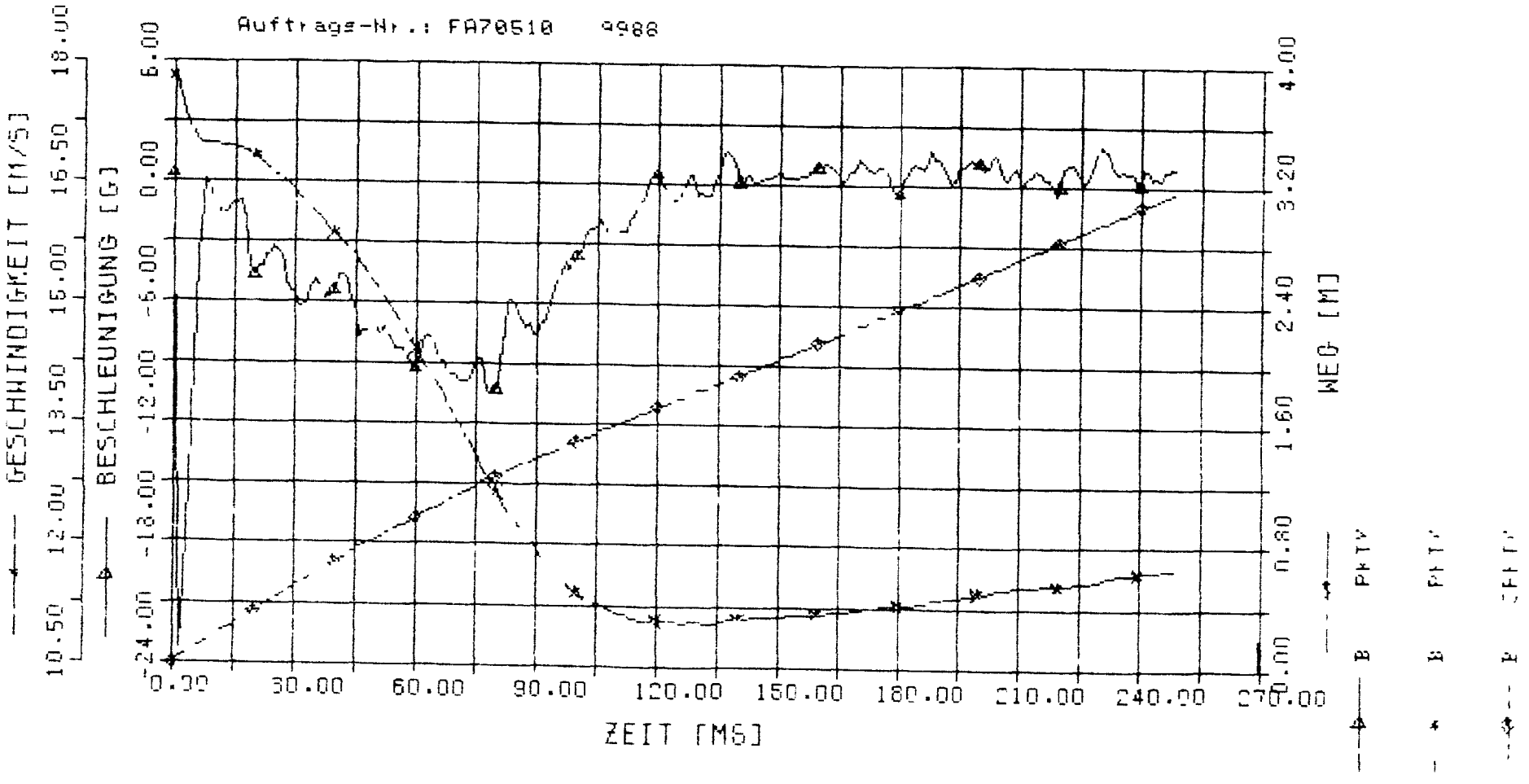
Kenn-Werte Auftrag Nr FA 0510 Versuch Nr [illegible]

Mess stelle	Ur	Ber	[illegible]	[illegible]	[illegible]
		Groesse		Extr	
SPKT	B	EL g	34 26[illegible]	[illegible] 00	0 00



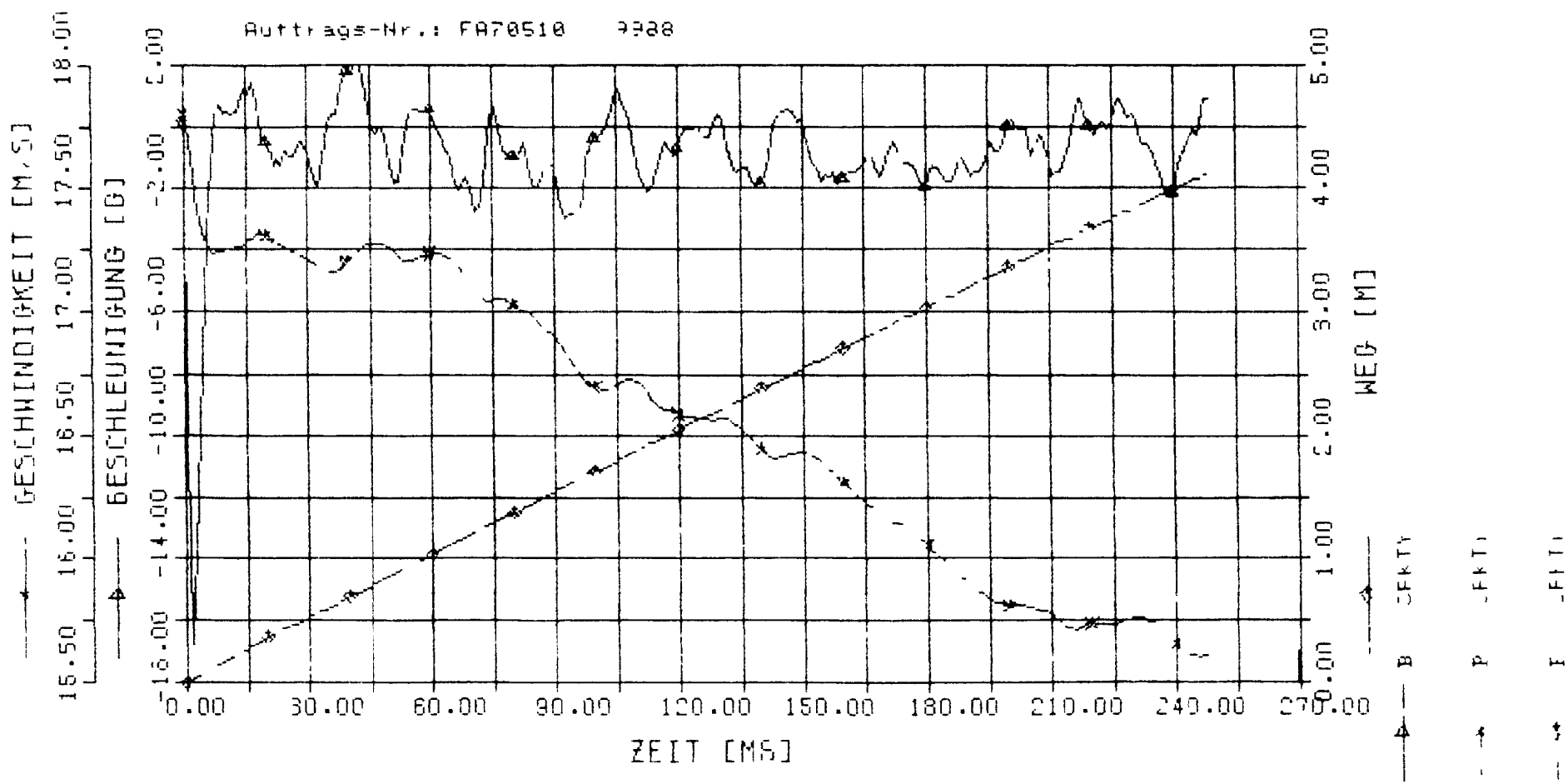
Lenn-wert[illegible] Auftrags Nr FA 0[illegible]10 Versuchs Nr [illegible]

Me[illegible]	Stelle	[illegible]	[illegible]	Ex[illegible]	[illegible]	[illegible]MS
			Gr[illegible]		Extr	
SPKT		I	BF [illegible]	2[illegible] [illegible]	[illegible] 00	0 00
SPKTx		B	GF [illegible]	17 803	0 00	0 00
SPKTx		I	WE [illegible]	3 23[illegible]	[illegible] 00	0 00



Kenn Werte Auftrag Nr FA 0510 Versuchs Nr [illegible]

Mess-Stelle	UL	Dir	Extremum	[illegible]	[illegible]
		Gruesse		Extr	
SEKTY	I	[illegible] g	16 [illegible]	[illegible] 00	0 00
CPKTY	B	GL m/s	17 80[illegible]	0 00	0 00
SEKTY	B	WL m	4 214	[illegible] 00	0 00

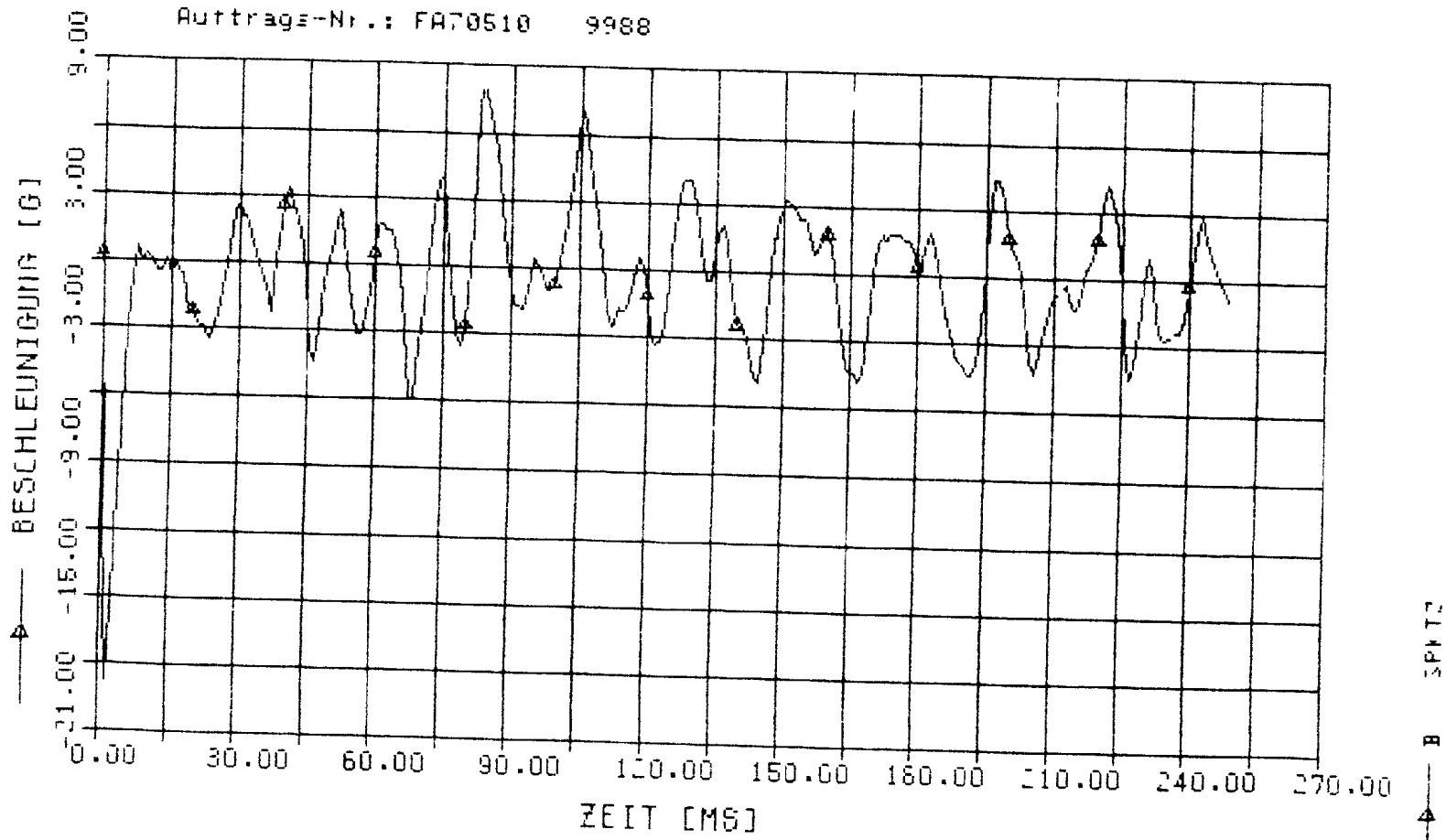


Kenn Werte Auftrags Nr FA70510 Versuchs Nr 9988

Mess Stelle UP ber Extremum t MS

Groesse Extr

SPITZ I BE g 18 751 2 00 0 00

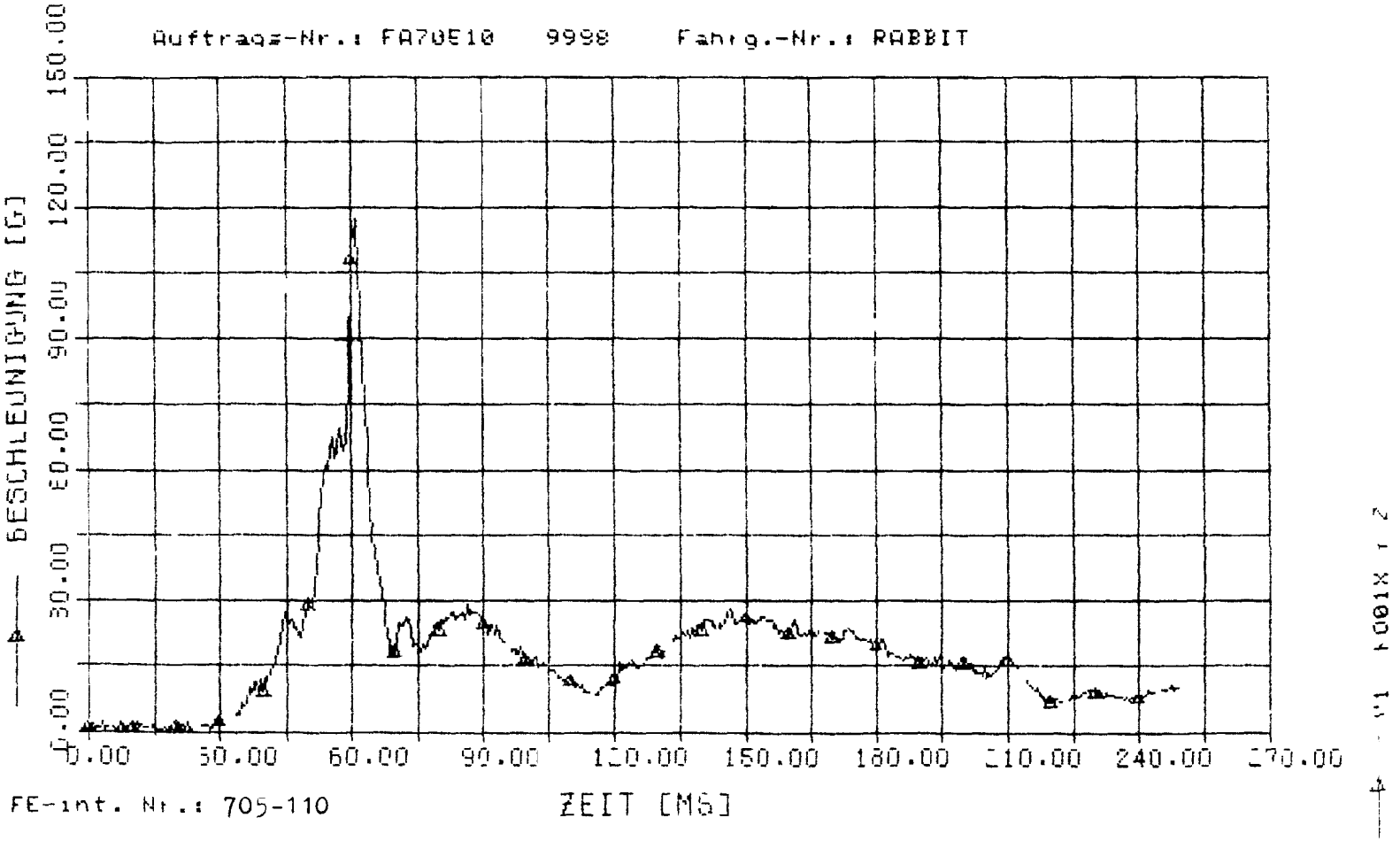


B.2 Dummy Test Response

B.2.1 Driver

Kenn Werte Auftrags Nr FA70510 Versuchs Nr 9988

Mess Stelle Ul ber Extremum 1 MS
Groesse Extr
KUO1 Vi Bl g 1/2 6 51 40 83 56

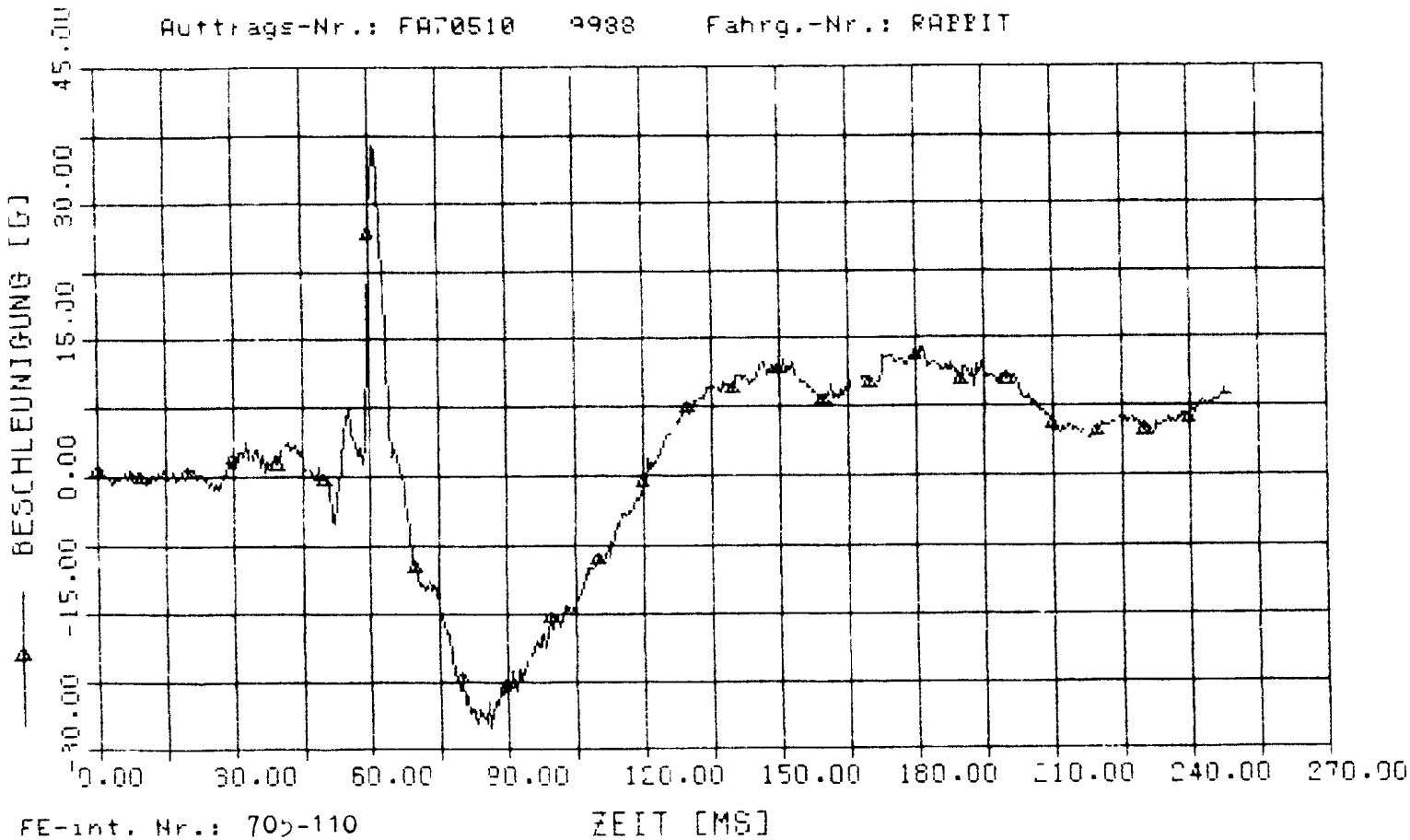


Kenn-Werte Auftrags Nr FA70510 Versuchs Nr [illegible]

[illegible] UB ber Extremum 1 [illegible]

Groesse Extr

[illegible] V1 1 [illegible] 2 [illegible]

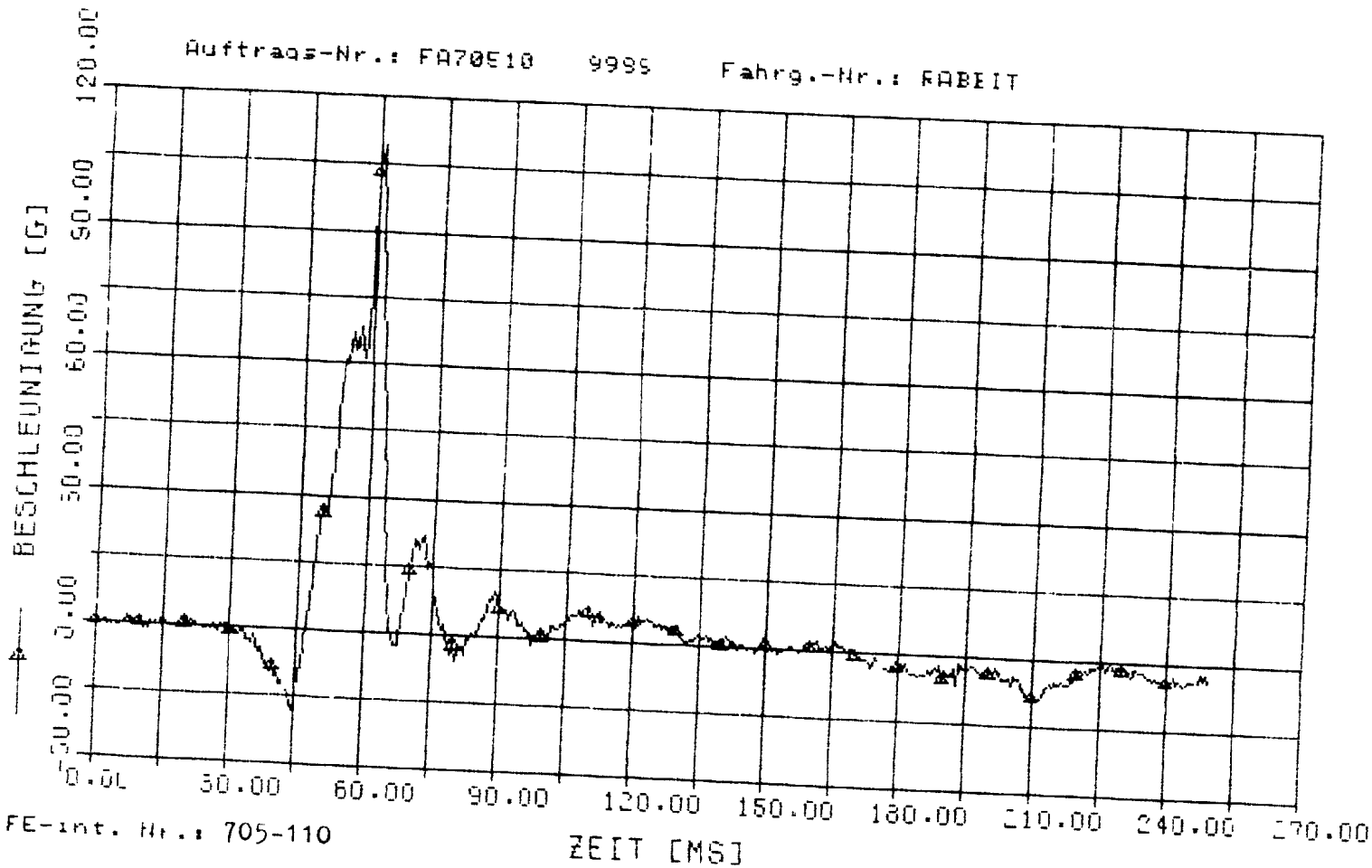


Kenn-Werte Auftrags Nr FA70510 Versuchs Nr 9988

Messstelle UP Ler Kanal 1 ms

K001 Grösse Extr

V1 80 0 113 9 1 40 80 01

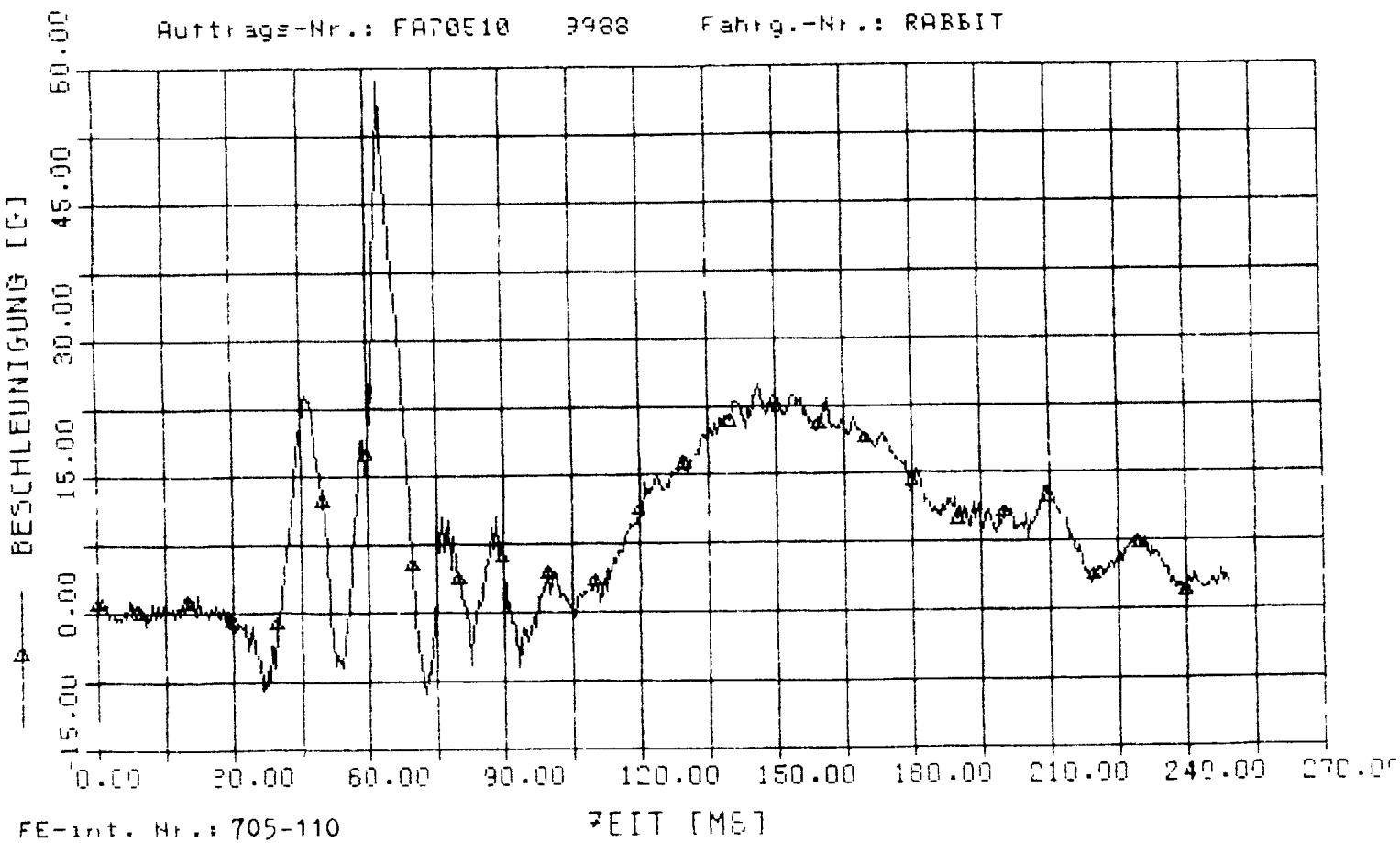


Kenn-Wert Auftrags-Nr. FA 0511 Versuch-Nr. [illegible]

[illegible] [illegible] Extremum [illegible]

Crossed Extr.

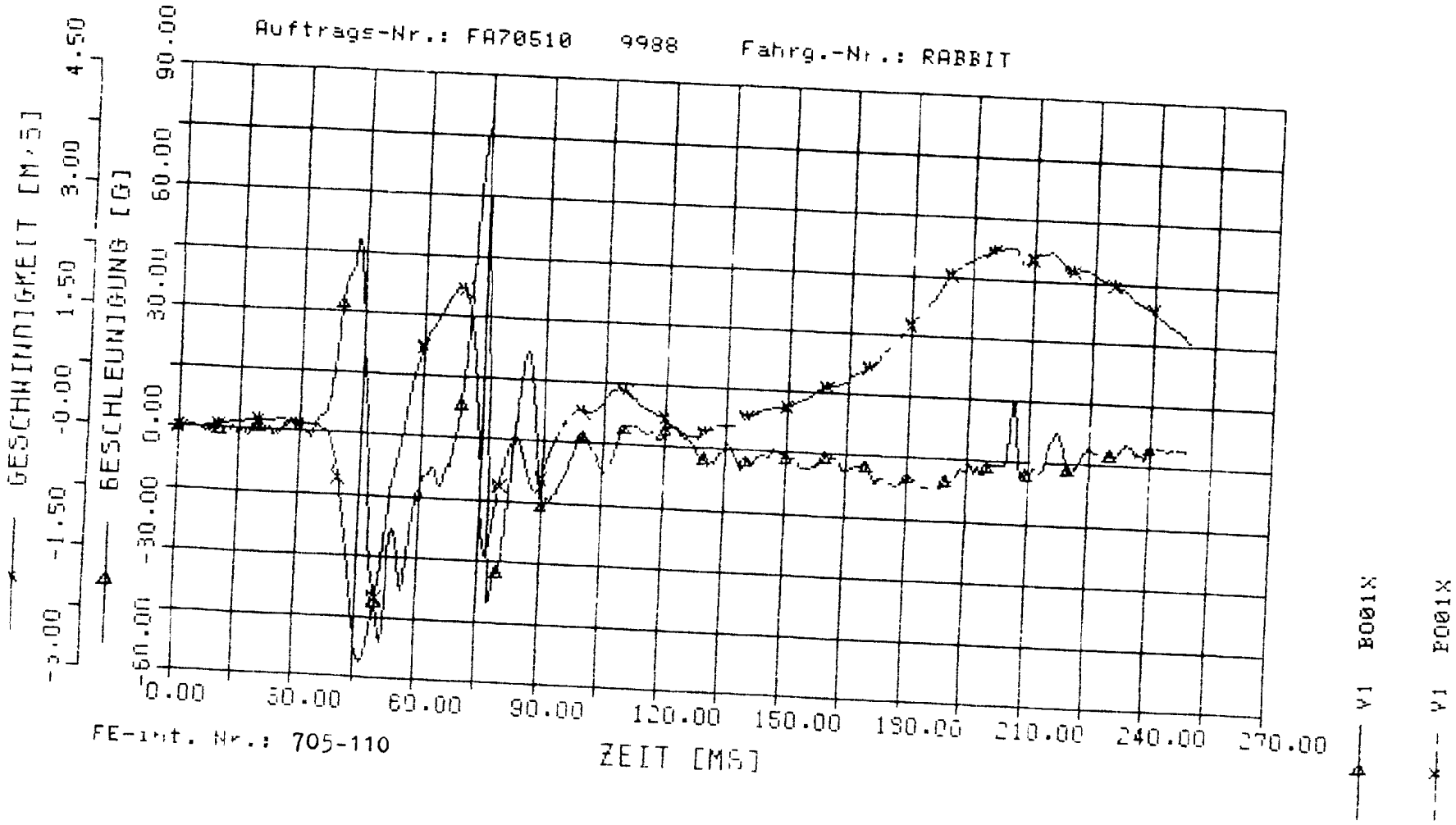
[illegible] [illegible] 58 [illegible] [illegible] 41 [illegible]



Kenn-Wer [illegible] Auftrag Nr. FA70510 Versuchs Nr [illegible]

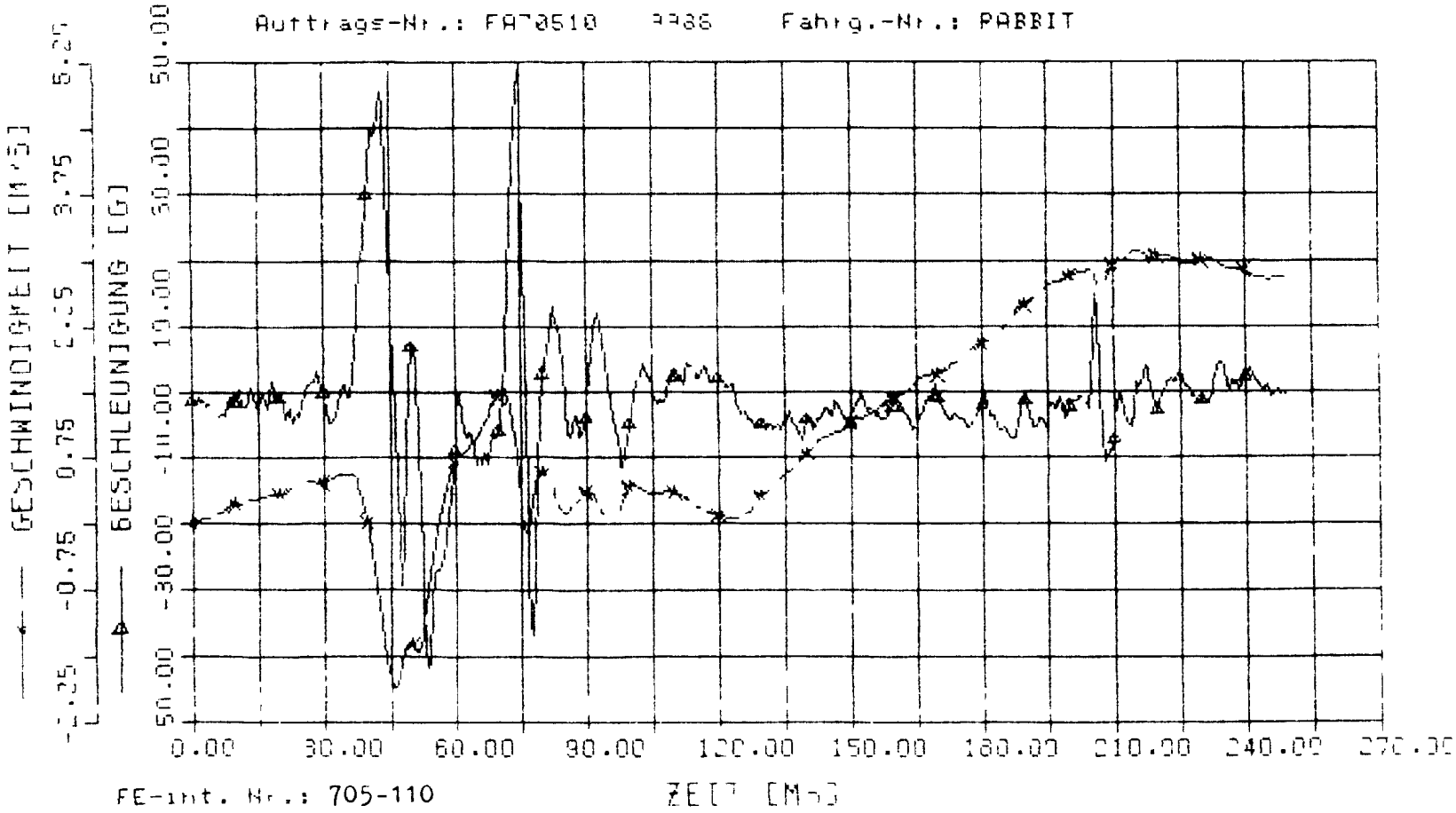
Mess-Stelle

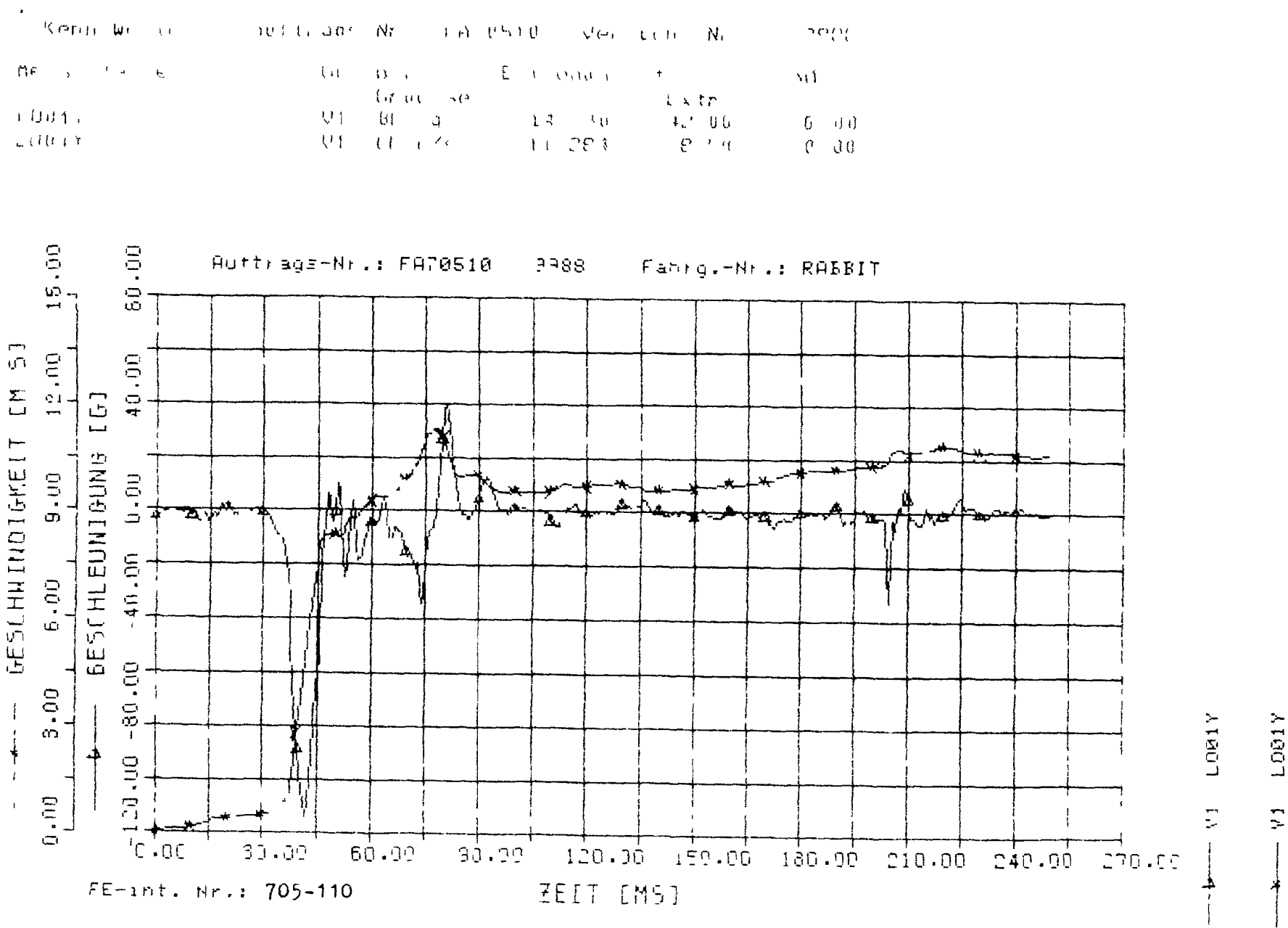
	UP	ber	Extremum	t	[illegible]
		Grou se		Extr	
B001X	V1	Bl q	[illegible]	[illegible] 00	0 00
B001X	V1	GE [illegible]	2 808	4[illegible] 00	0 00



Kenn Werte Auftrags Nr. FA 0510 Versuchs Nr. 9986

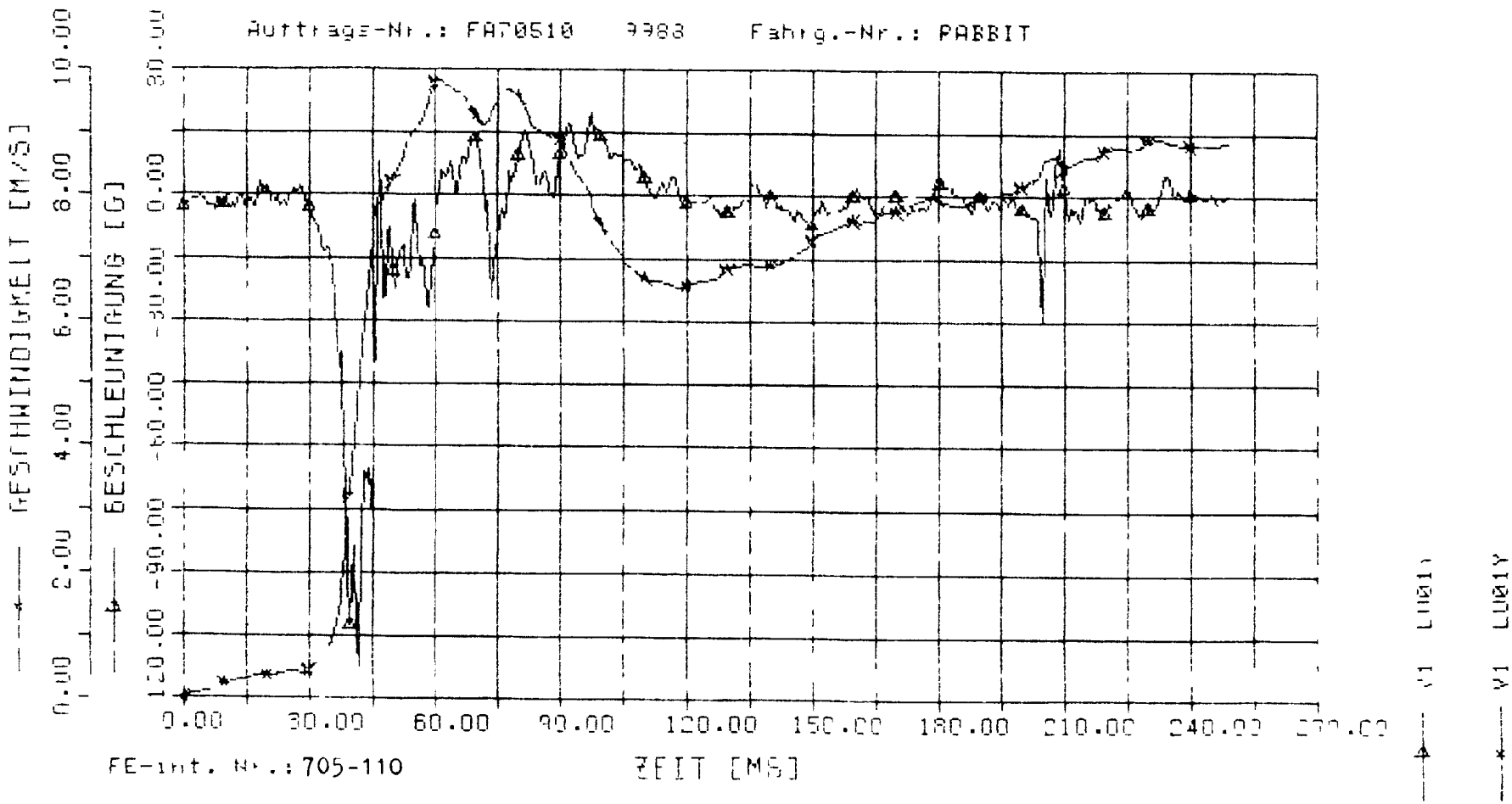
Messstelle	UF	Bez. Groesse	Extremum	t Extr.	MS
BU01X	V1	BE [illegible]	[illegible]	4.50	0.00
EU01X	V1	GE [illegible]	09[illegible]	21[illegible].00	0.00

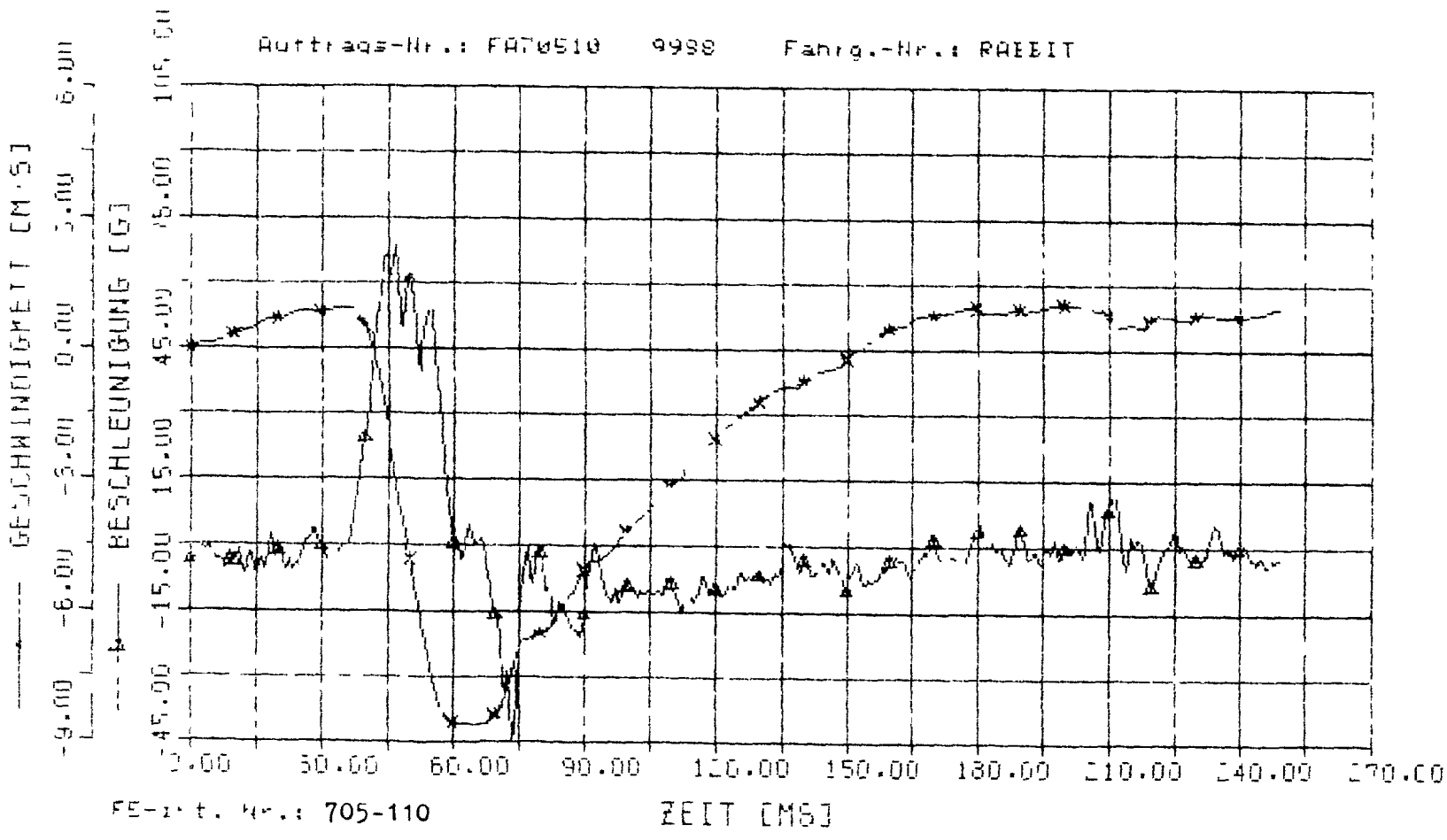


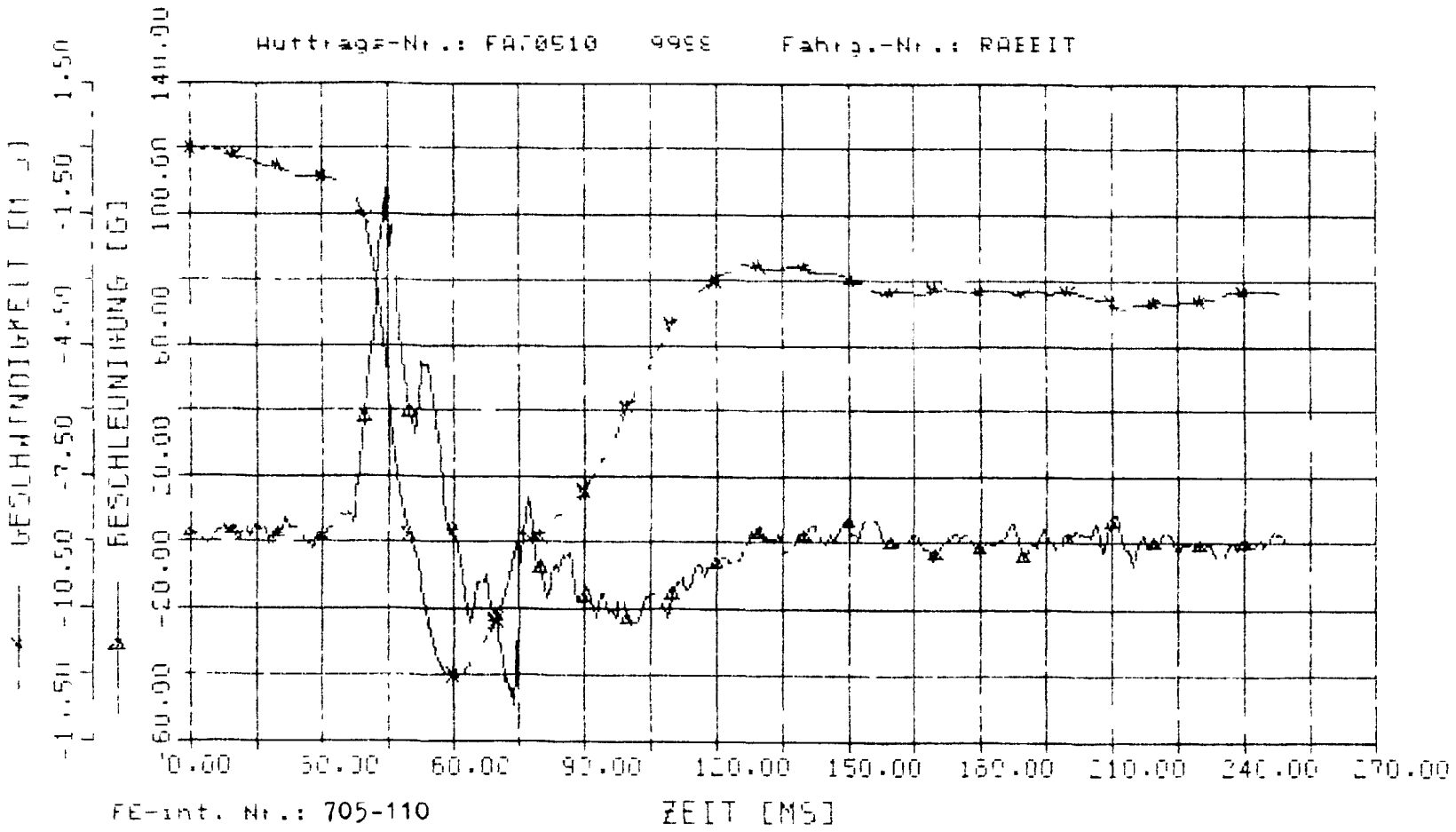

Auftrags-Nr.: FA70510 3988 Fahrg.-Nr.: RABBIT
GESCHWINDIGKEIT [M S]
BESCHLEUNIGUNG [G]
0.00
3.00
6.00
9.00
12.00
15.00
-120.00
-80.00
-40.00
0.00
40.00
80.00
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
270.00
ZEIT [MS]
FE-int. Nr.: 705-110
V1 L001Y
V1 L001Y

Kennwerte Auftrag Nr. FA 0510 Versuchs Nr. [illegible]

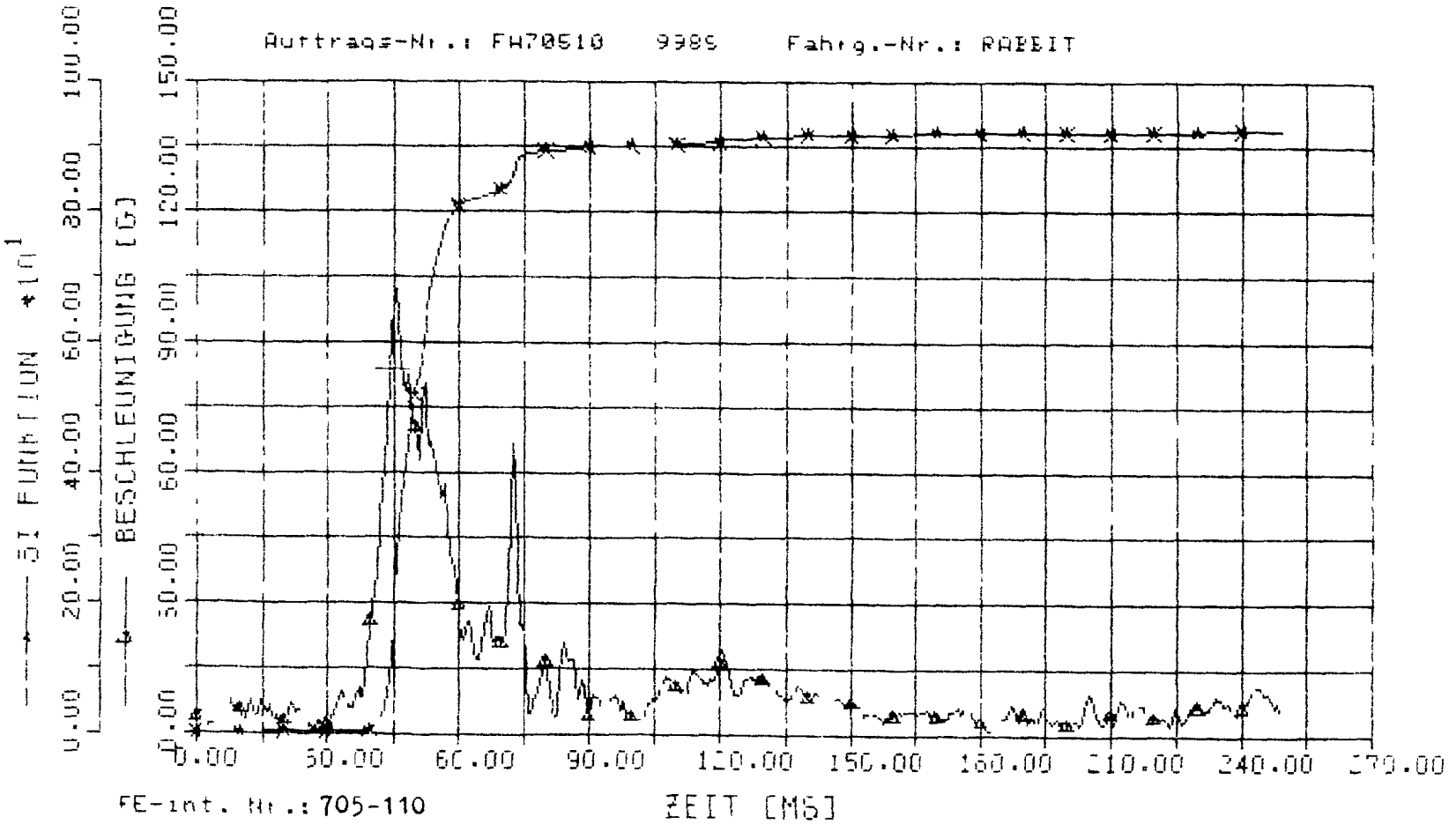
Passstelle	Ur	Be	Extr. Wert	t	Sys
		Grösse		Extr	
LU01	[illegible]	B[illegible]	11_8 [illegible]	[illegible] 50	0 00
LU01Y	[illegible]	Gl m	[illegible] 024	1 00	0 00



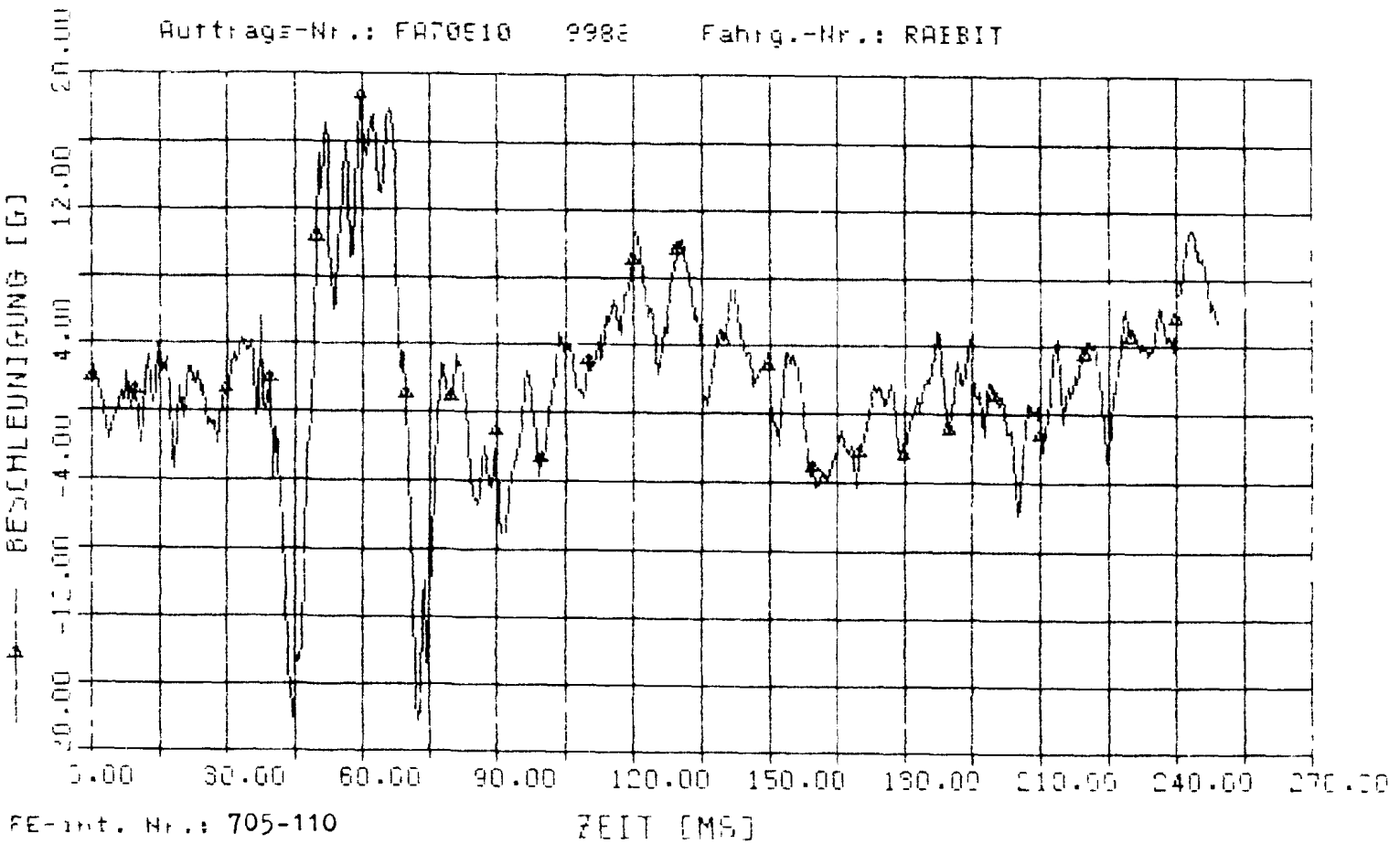

Auftrags-Nr.: FA70510 9998 Fahrg.-Nr.: RABBIT
GESCHWINDIGKEIT [M/S]
BESCHLEUNIGUNG [G]
ZEIT [MS]
FE-Int. Nr.: 705-110


Auftrags-Nr.: FA70510 9995
Fahrg.-Nr.: RAEEIT
GESCHWINDIGKEIT [M/S]
GESCHLEUNIGUNG [G]
ZEIT [MS]
FE-int. Nr.: 705-110

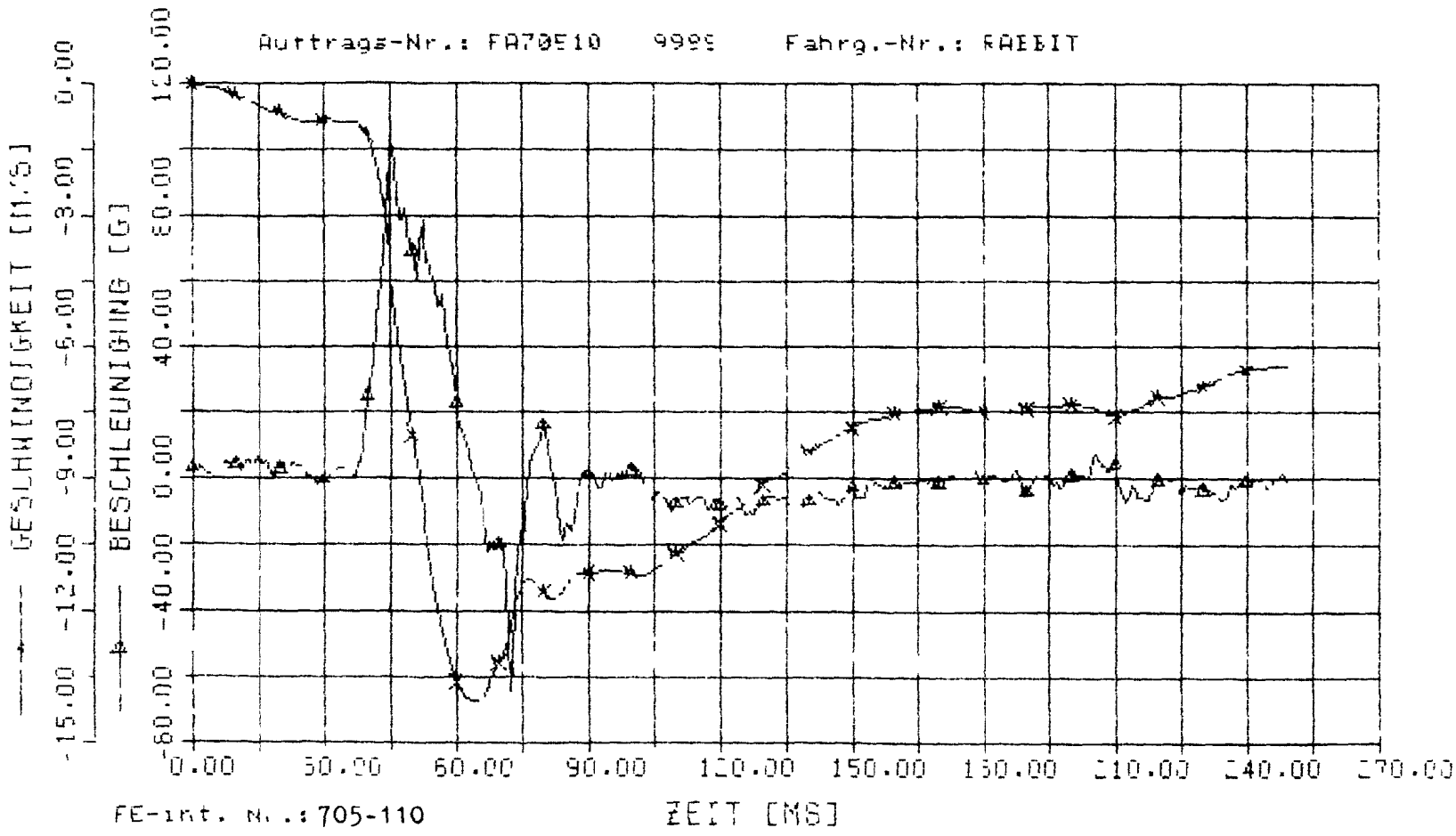
Auftrags-Nr.: FA70510 9985 Fahrg.-Nr.: RABBIT

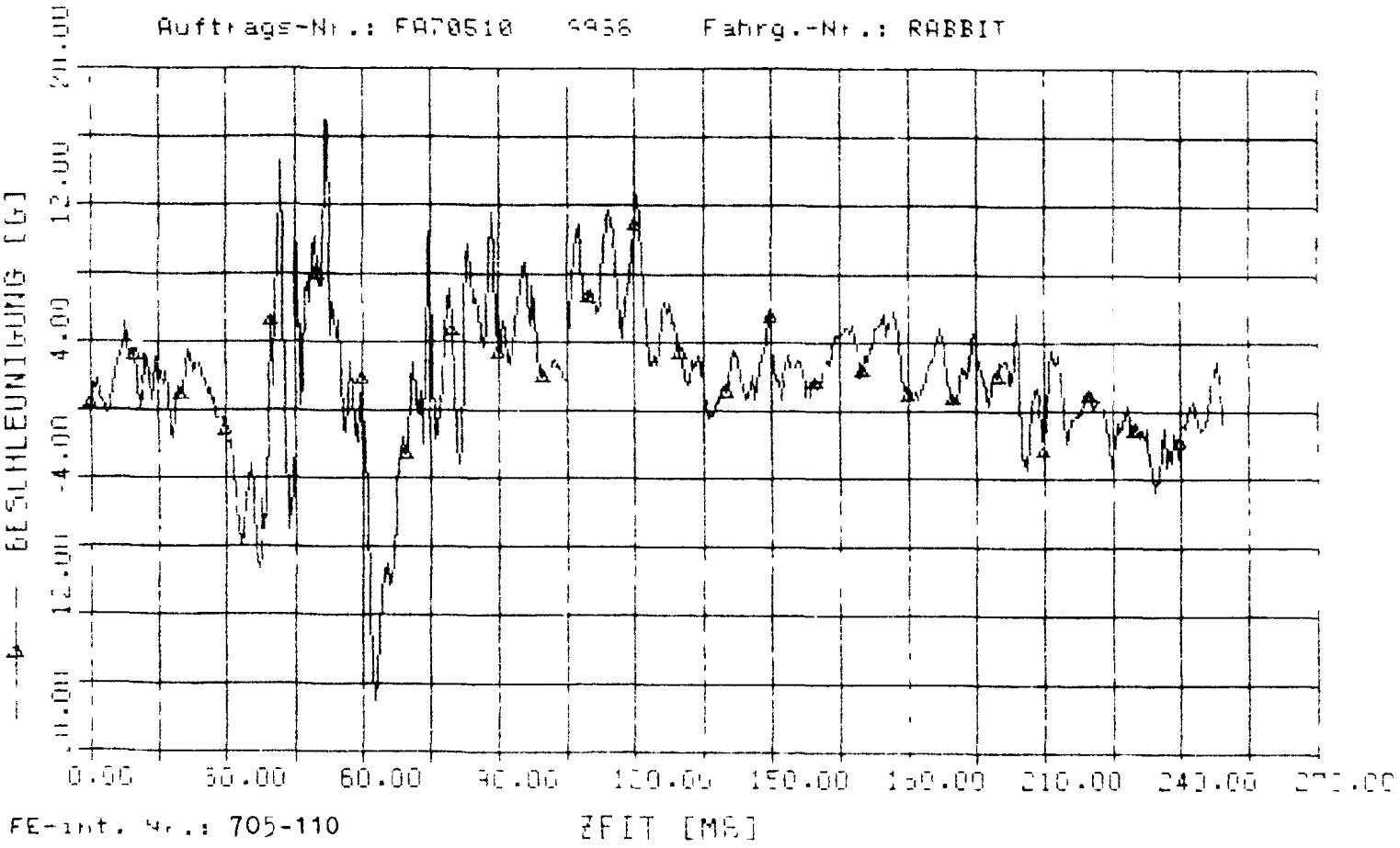


FE-int. Nr.: 705-110


Auftrags-Nr.: FA70510 9982 Fahrg.-Nr.: RAIBIT
BESCHLEUNIGUNG [G]
20.00
12.00
4.00
-4.00
-12.00
-20.00
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
270.00
ZEIT [MS]
FE-Int. Nr.: 705-110

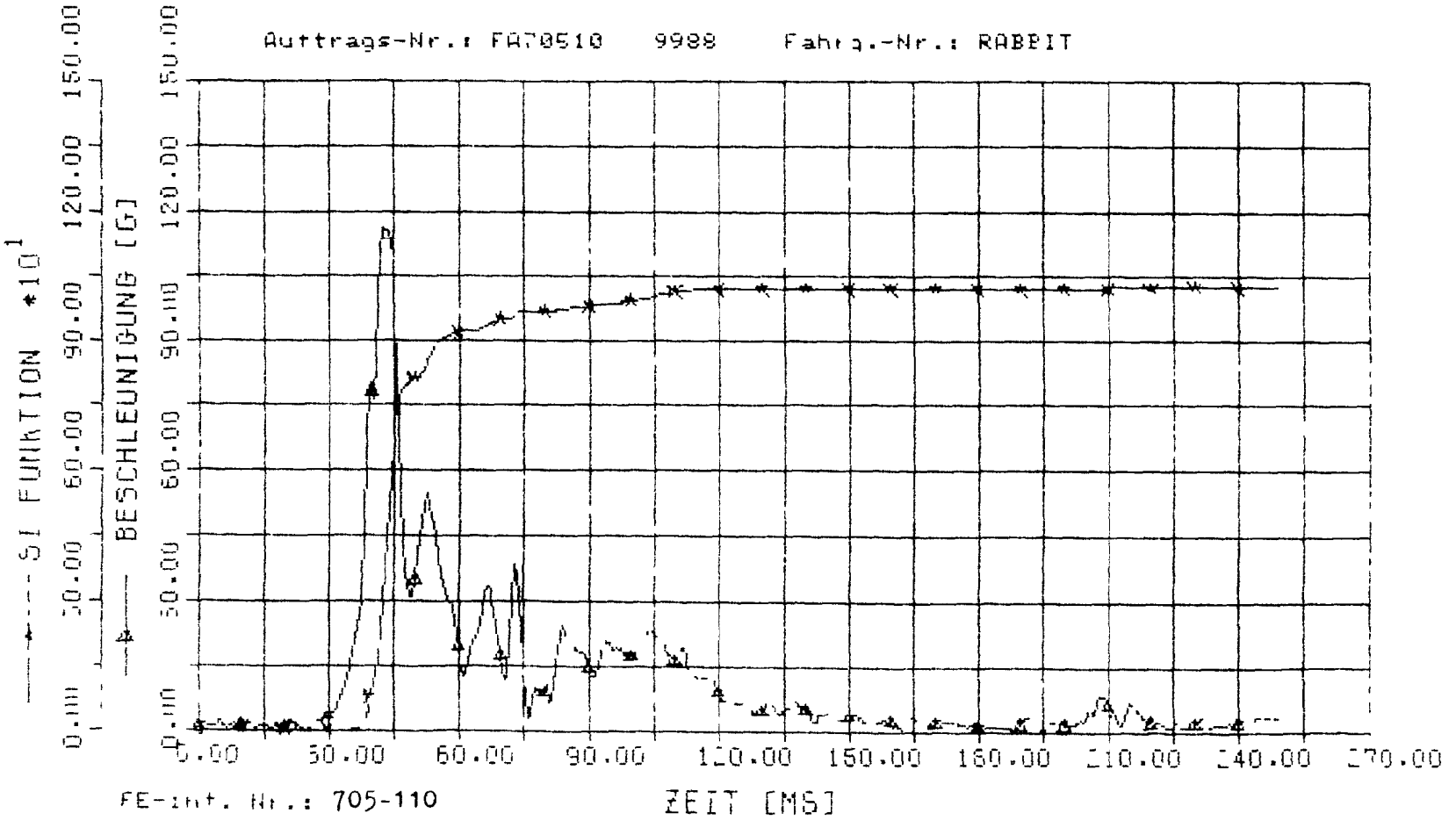
[illegible]	Au[illegible]	N[illegible]	FA 0[illegible]10	Ver[illegible] N[illegible]	[illegible]
[illegible] Stelle	UP	[illegible]	Ex[illegible]	t	[illegible]
		Gro[illegible]e		Ext	
T001Y	V1	[illegible]	[illegible]	[illegible]	[illegible]
T001Y	V1	[illegible]	14 04[illegible]	[illegible]	[illegible]




Auftrags-Nr.: FA70510 6956 Fahrg.-Nr.: RABBIT
BESCHLEUNIGUNG [G]
20.00
12.00
4.00
-4.00
-12.00
-20.00
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
270.00
FE-int. Nr.: 705-110
ZEIT [MS]

Kenn-Werte Auftrag Nr. [illegible] Versuch Nr. [illegible]

Mess Stelle	UP	Bor	Maximum	[illegible]	[illegible]
		Erreichen		[illegible]	
TU01	V1	[illegible]	[illegible]	[illegible] 50	0.00
TU01	V1	[illegible]	[illegible]	[illegible] 00	0.00

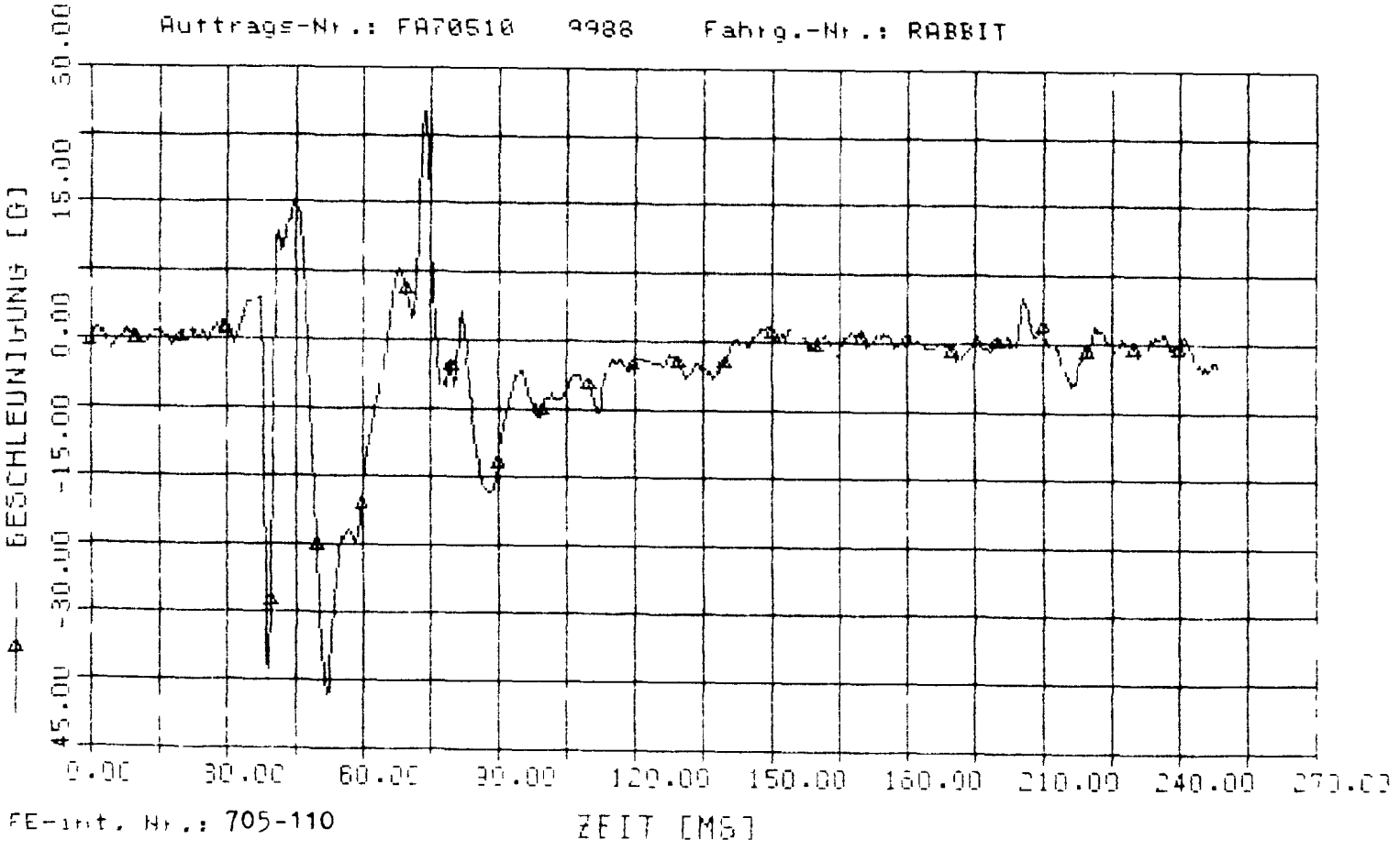


Kenn-Werte Auftrag Nr FA70510 Versuchs Nr 9988

Mess Stelle [illegible] Der [illegible] [illegible]

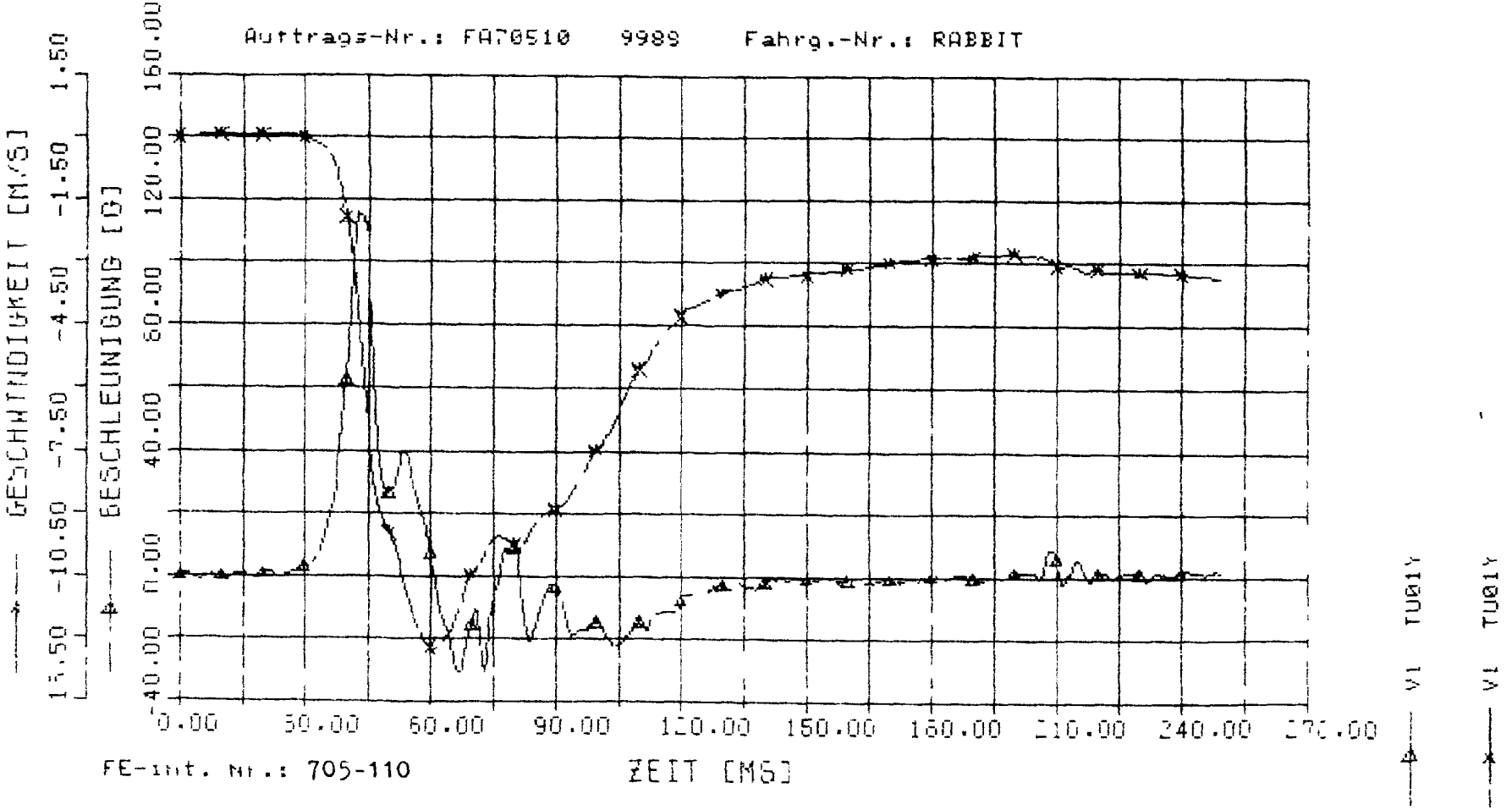
[illegible] Exp

TU01X [illegible] 0.00

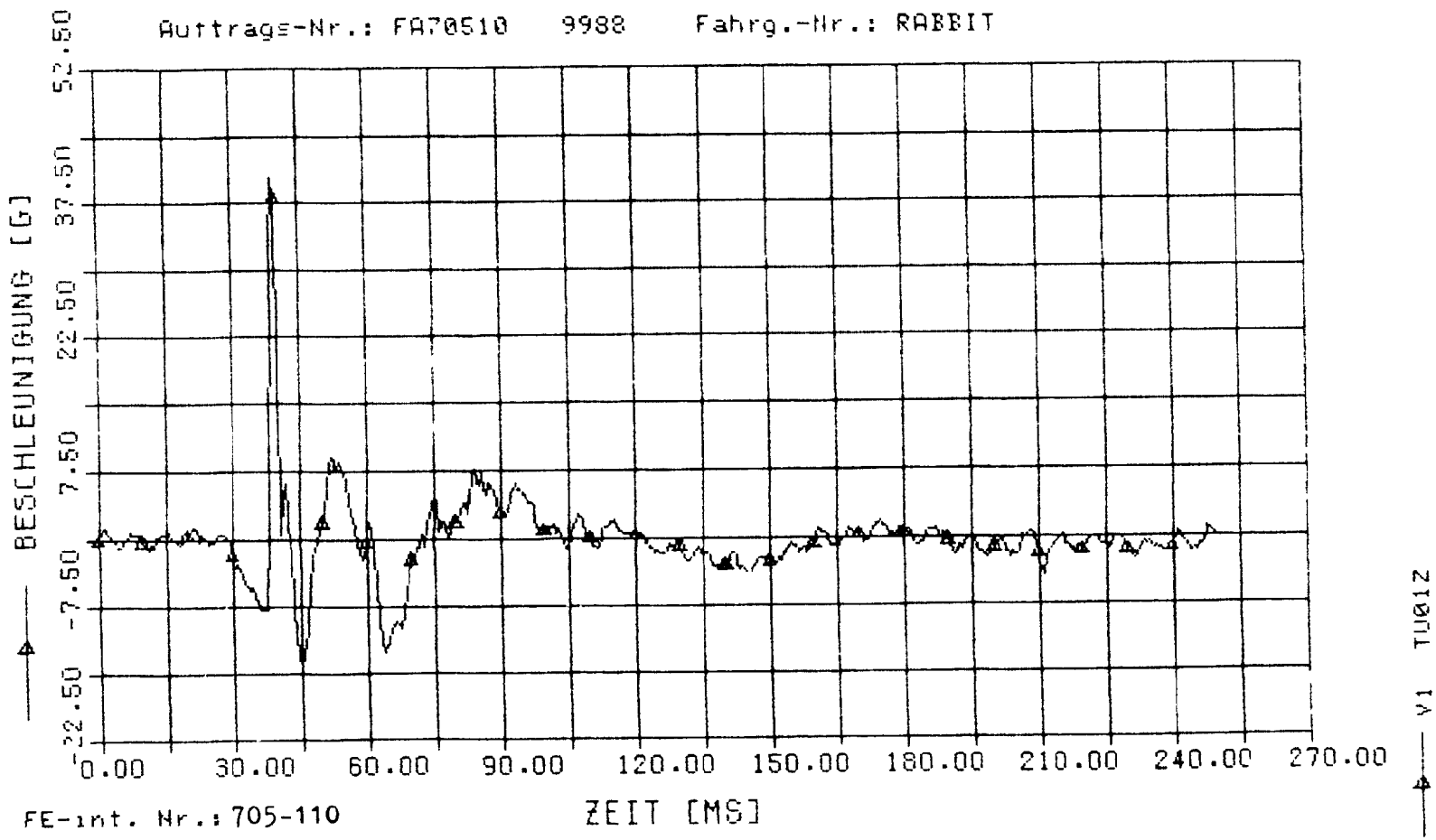


Kenn-Werte Auftrag Nr FA 0510 Versuchs Nr 9988

Mess Stelle	UP	bei Grosse	Extremum	Extr	SMS
TU01Y	V1	BE g	115 37	42 50	0 00
TU01Y	V1	GE m/s	12 27	61 00	0 00

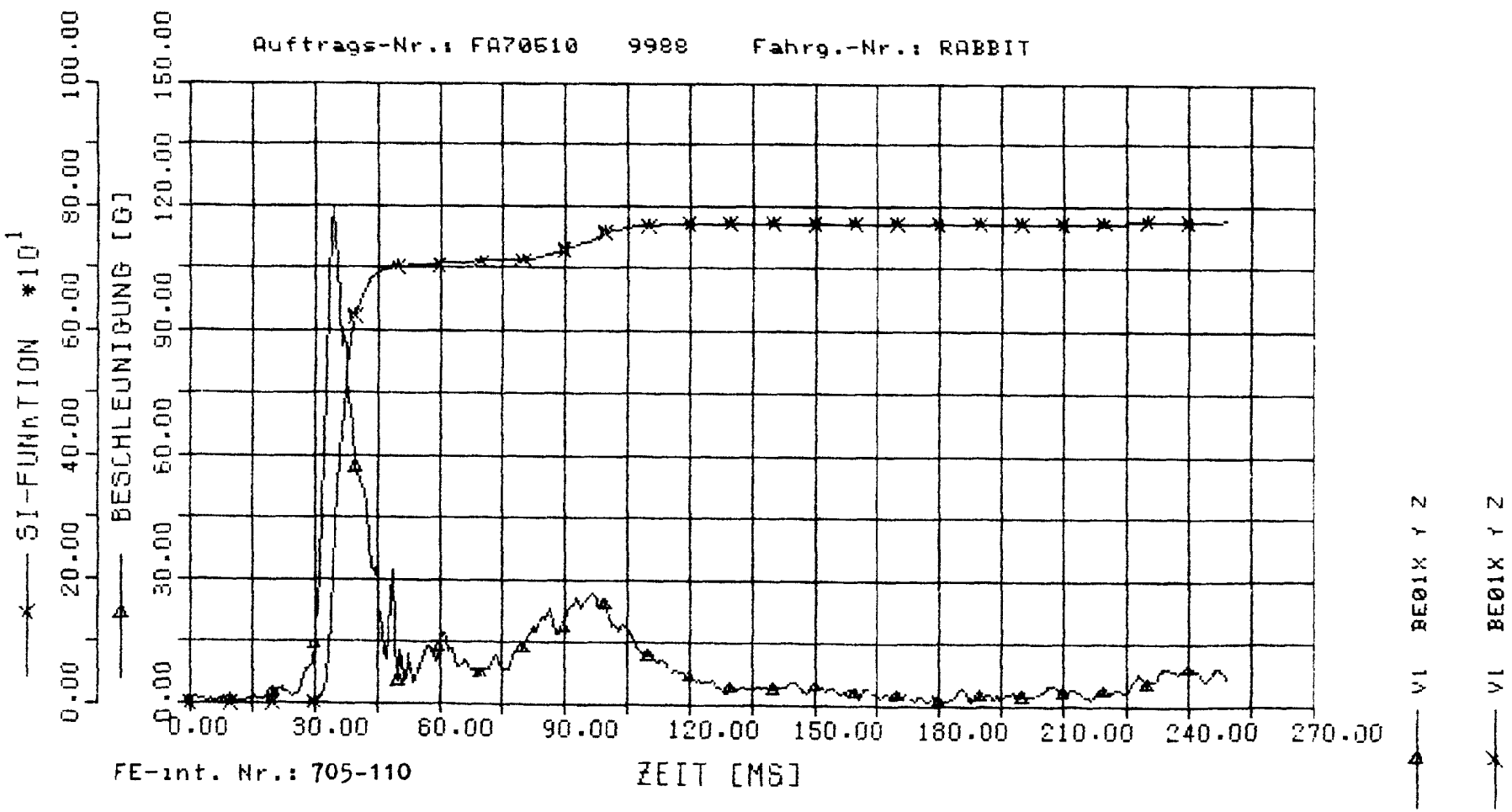


Kenn-We	Auftrags Nr	FA70510	Versuchs Nr	9988
Mess Stelle	UP	ber Groesse	Extremum	Zeit ms
TU01Z	V1	BE g	40 378	Extr 35 50	0 00



Kenn-Werte Auftrags Nr FA 0510 Versuchs Nr 9988

Mess Stelle	UP	ber Groesse	Extremum	t Extr	SMS
BE01	V1	BE g	117 587	34 50	88 08
BE01	V1	SI	775 835	250 00	0 00

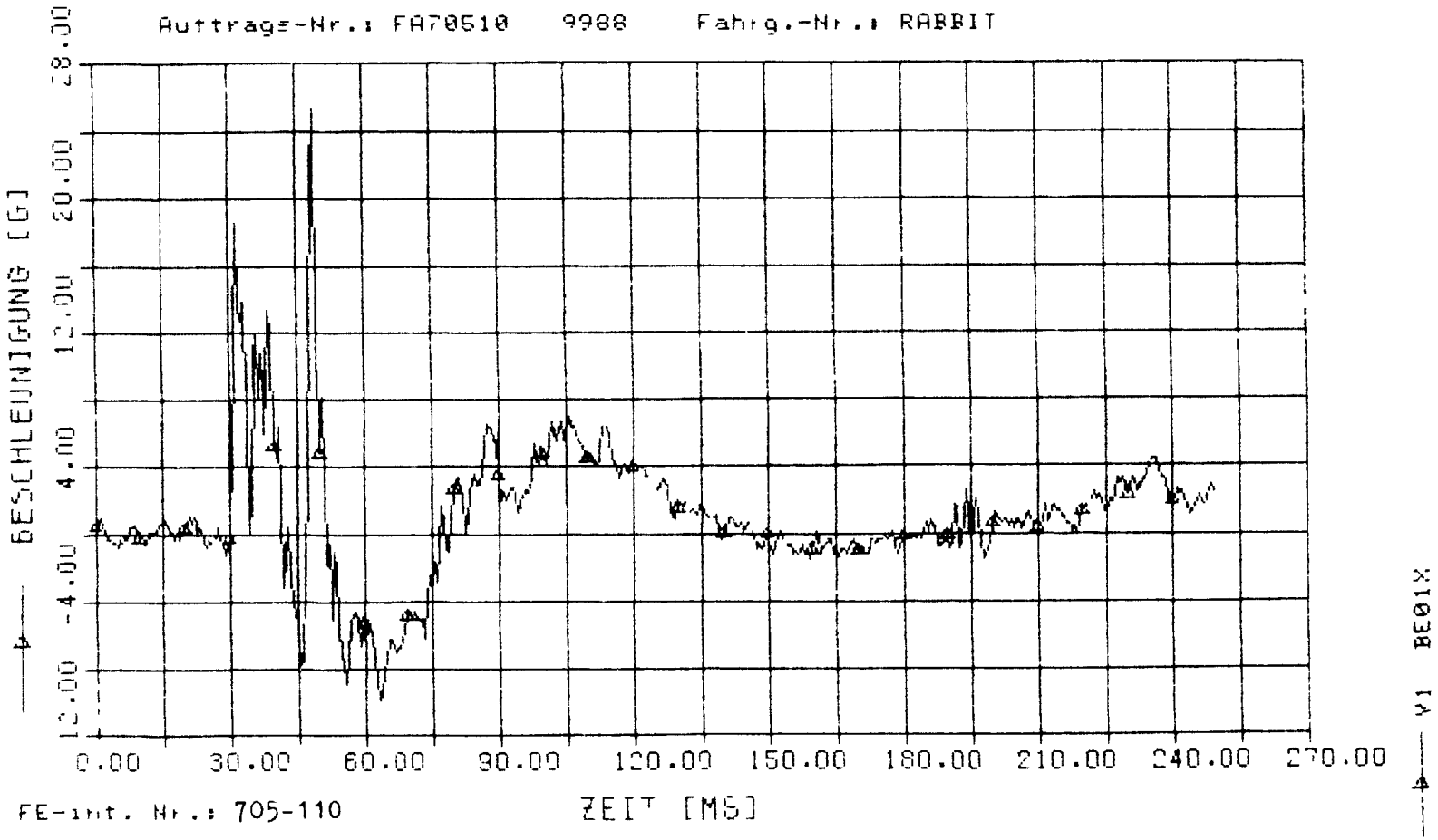


Kenn Worte Auftrags Nr FA70510 Versuch Nr 9988

Mess stelle UP bei Extremum t MS

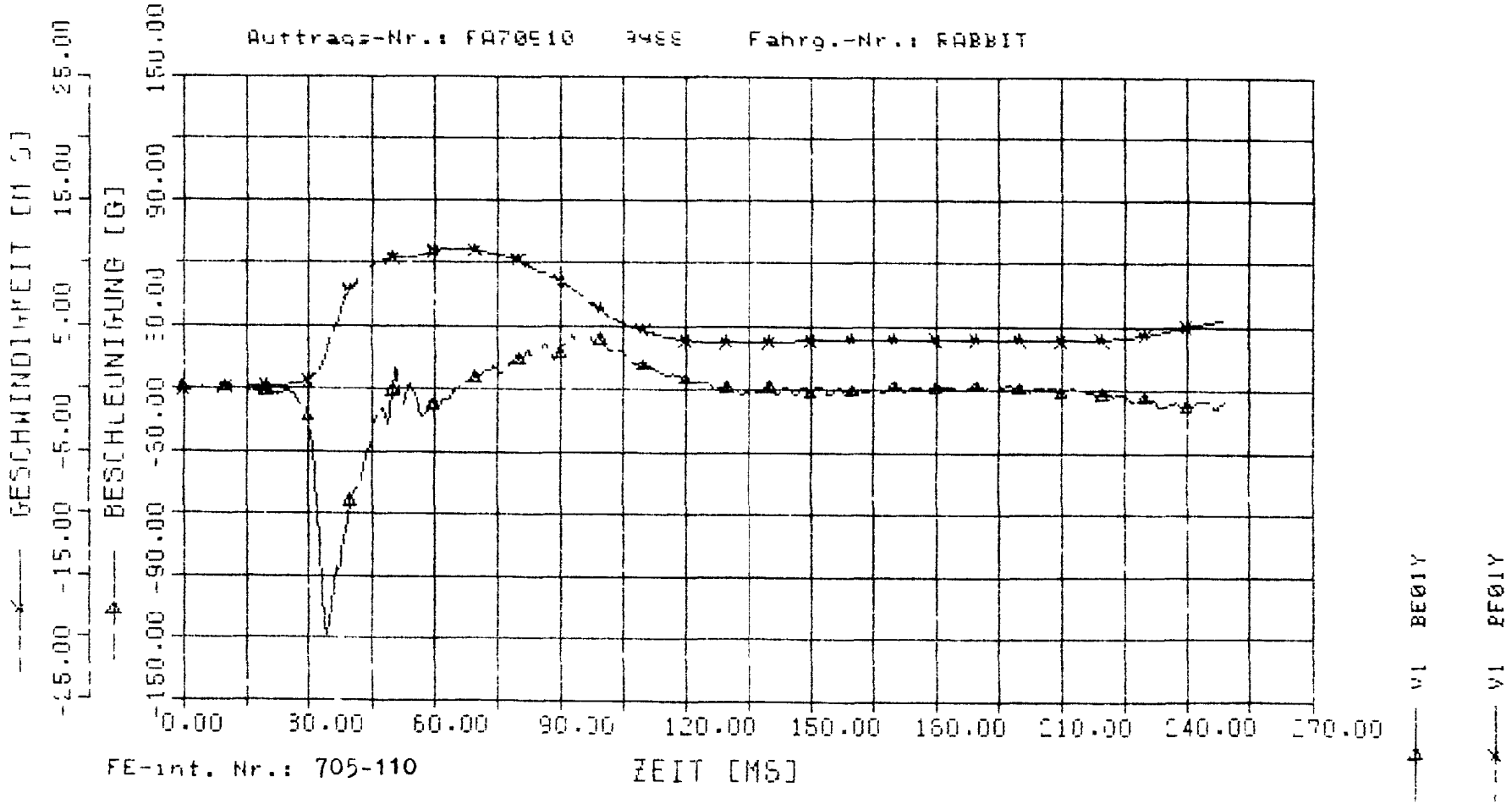
Grösse Extr

BE01X V1 BE g 25 32 40 00 12 1

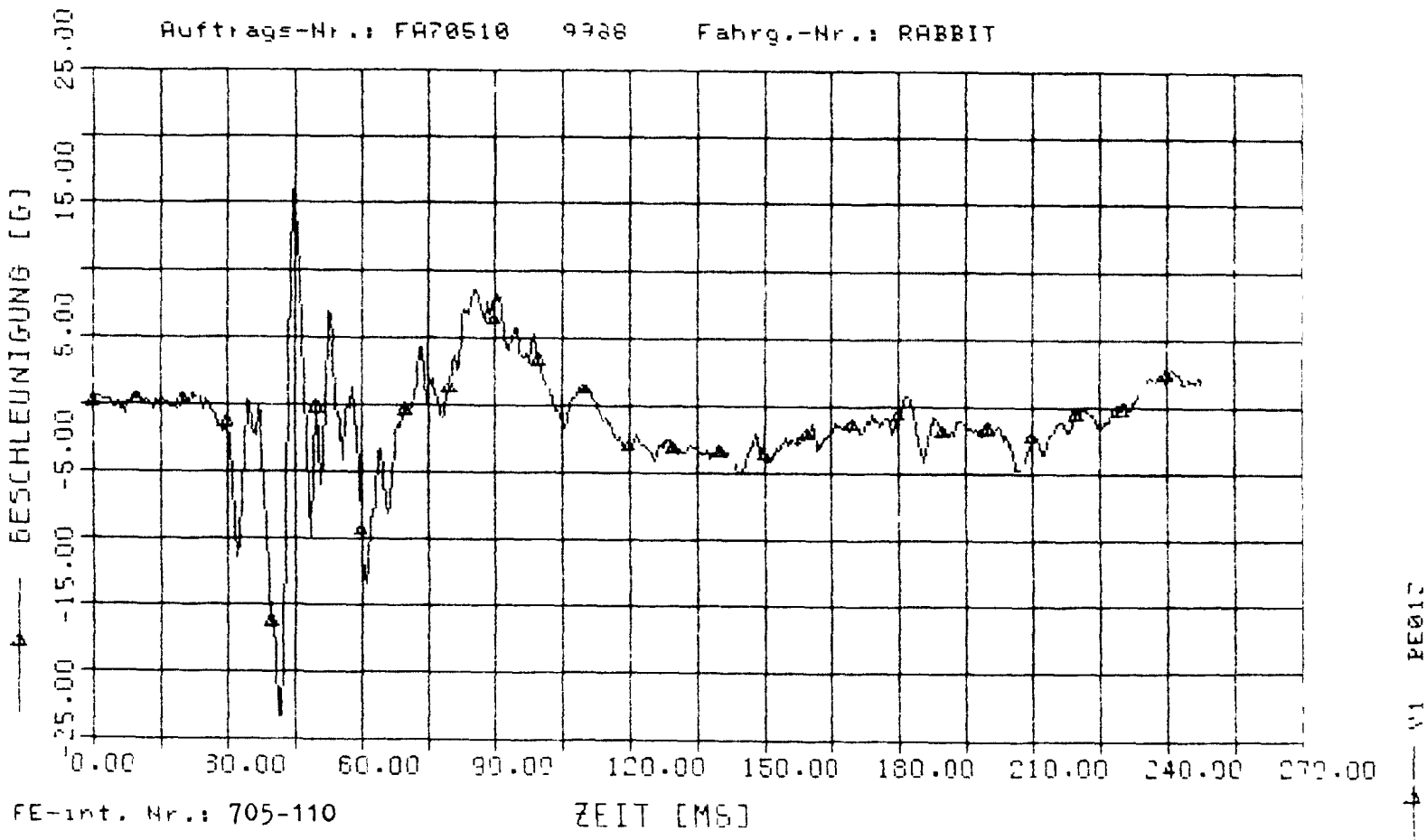


Kenn Worte Auftrag Nr FA 0510 Versuchs Nr [illegible]

Mess Stelle		Ur	her	Extremum	t	n
			Grösse		Extr	
BE01Y		V1	BE [illegible]	[illegible]	34 50	24 [illegible]
BF01Y		V1	GF [illegible]	[illegible]	[illegible] 50	0 00



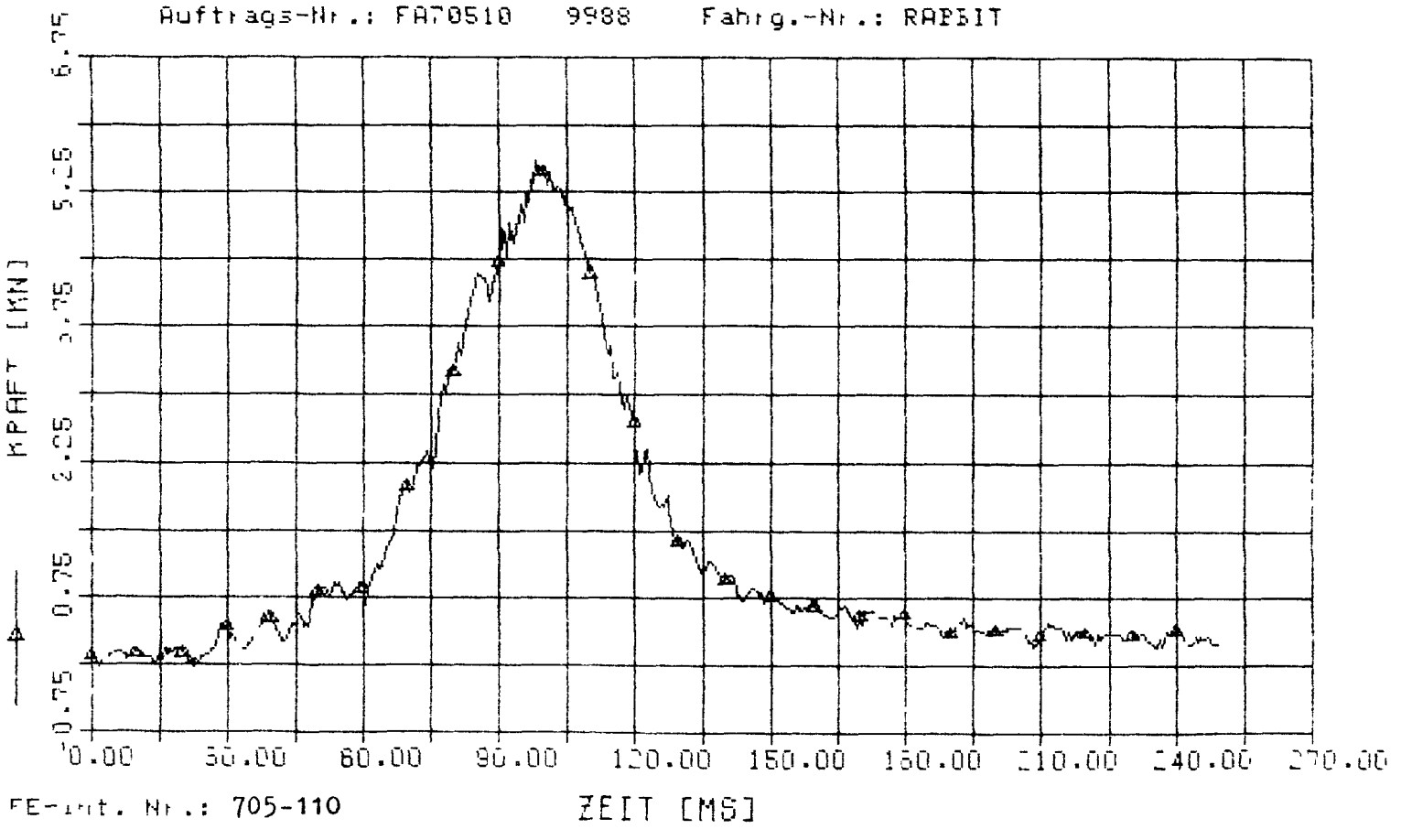
Kenn Werte	Auftrags Nr	FA 0510	Versuch Nr	9988
Mess Stelle	UP	ber Grosse	Extremum	t Extr	MS
B 01	V1	BL g	23 31	41 50	8 47



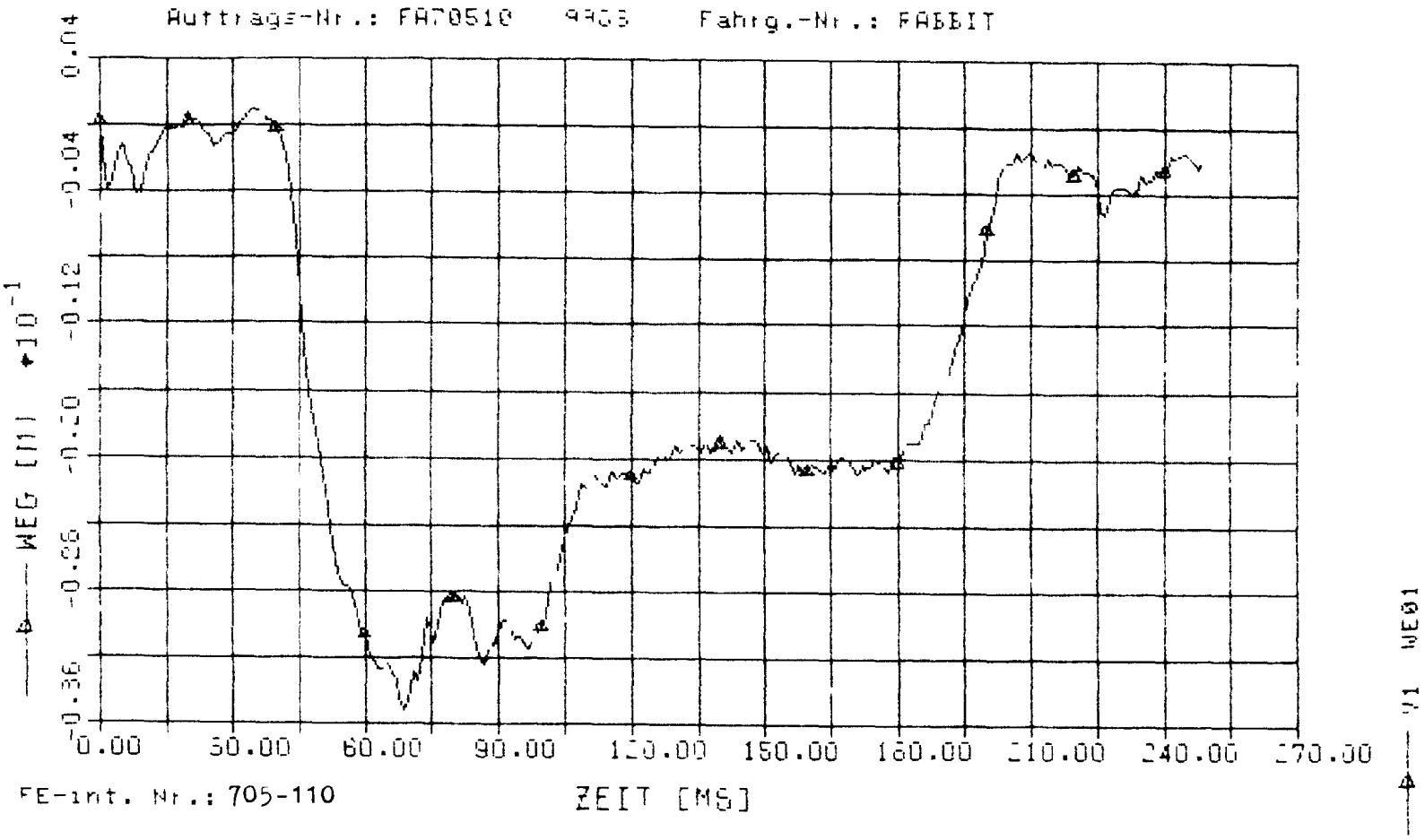
V1 PE017

Kenn Werte Auftrags Nr FA70510 Versuchs Nr 9988

Mess Stelle	UP	der Grösse	Extremum	t Extr	MS
GU01 A	V1	KR kN	5 560	73 50	0 00



Chest Deflection Driver = 35 mm



FE-int. Nr.: 705-110

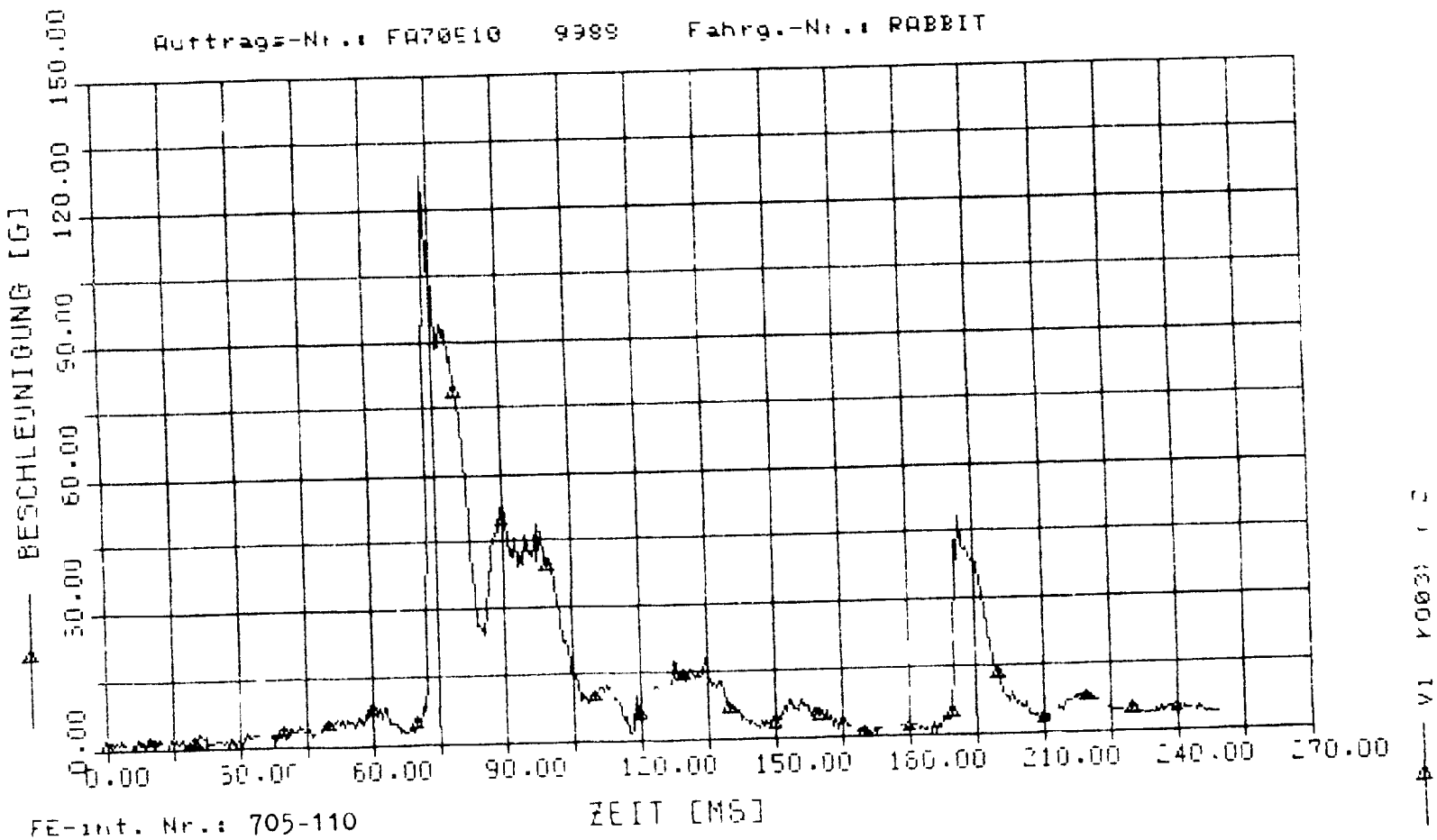
B.2.2 Rear Passenger

Kenn Werte Auftrags Nr FA70510 Versuchs Nr 9988

Mess Stelle Ul ber Extremum t ms

Groesse Extr

K003 V1 BE g 160 01. 24 20 94 51

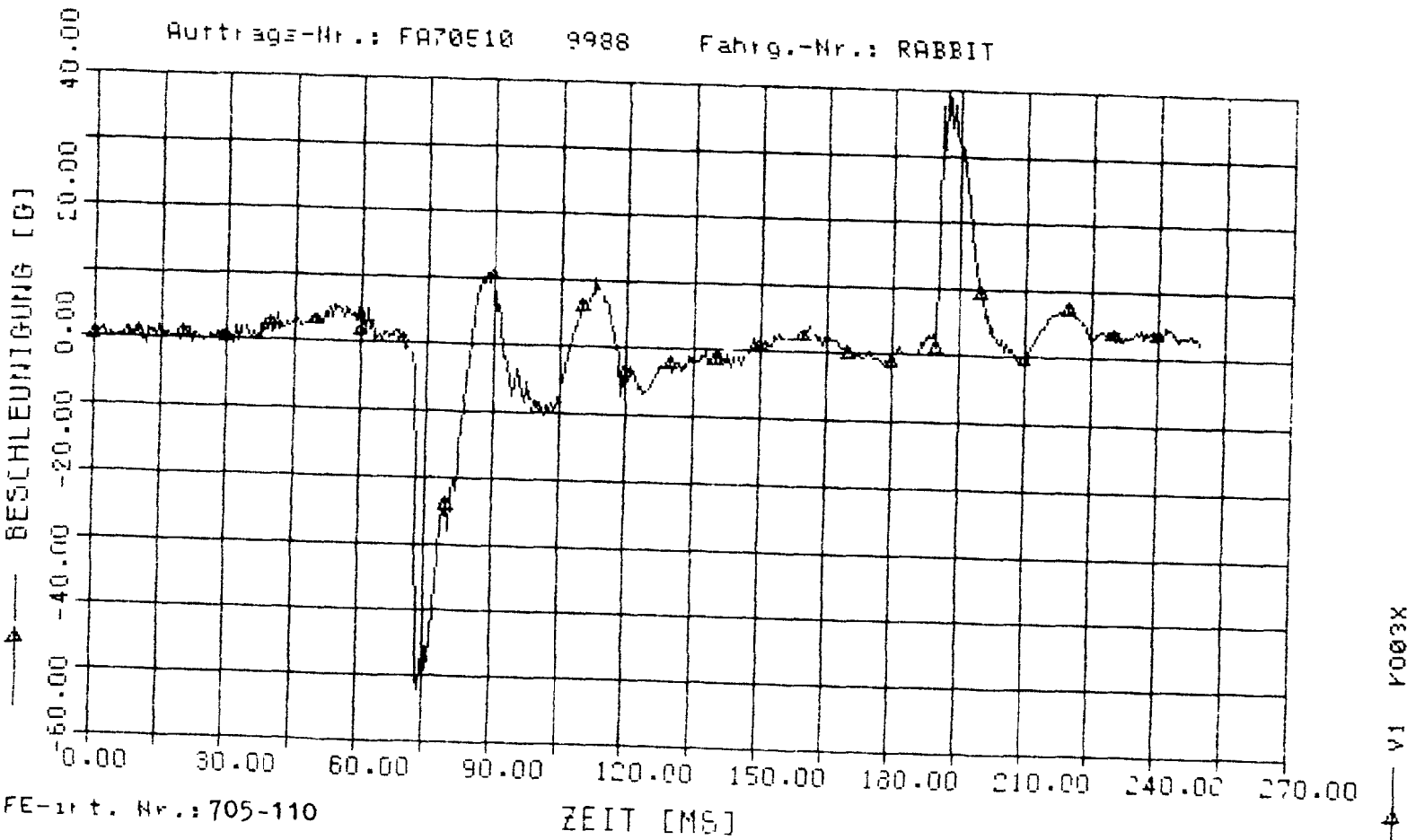


Kenn Werte Auftrags Nr FA 0510 Versuchs Nr 9988

Messstelle UI bei Extremum 1 SMS

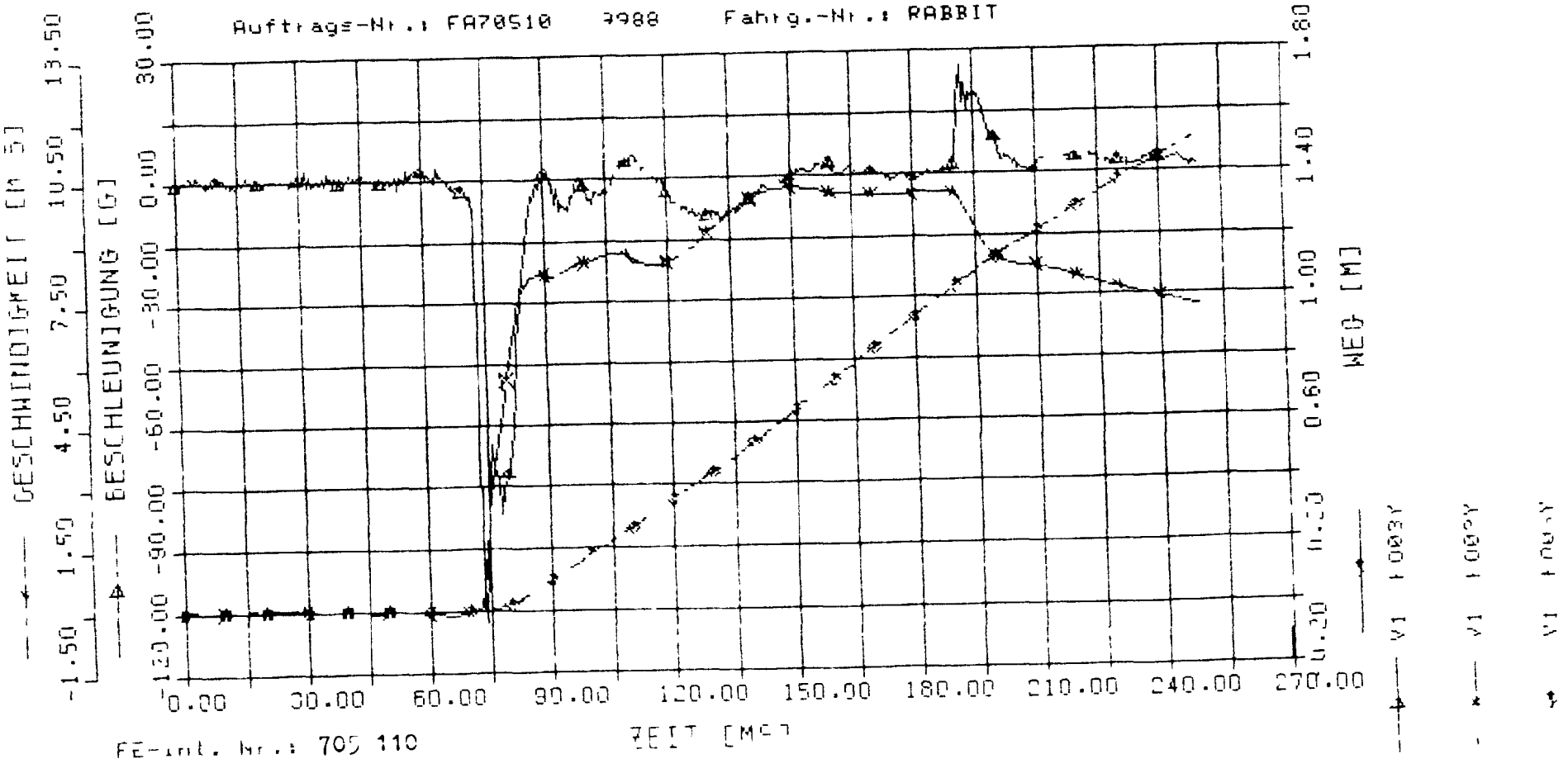
Groesse Extr

KO0 / V1 bis g 74 170 74 20 53 40



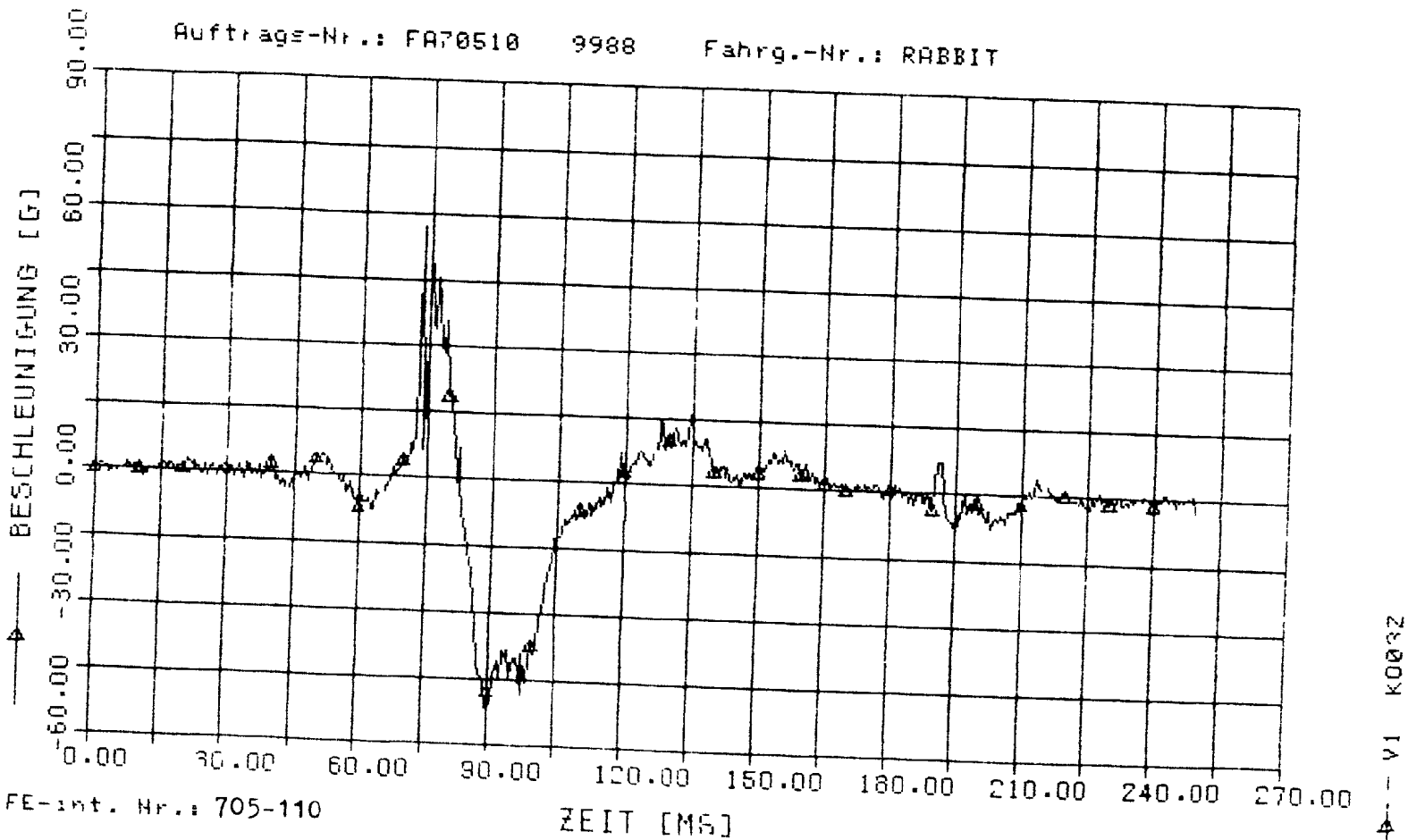
Kenn Werte Auftrags Nr FA70510 Versuchs Nr [illegible]

Mess Stelle	Ur	Der Groesse	Extr Chun	Extr	[illegible]
K003Y	V1	BE g	124 051	73 10	18 79
K003Y	V1	GF m s	10 213	150 20	0 00
K003Y	V1	WE m	1 560	255 90	0 00



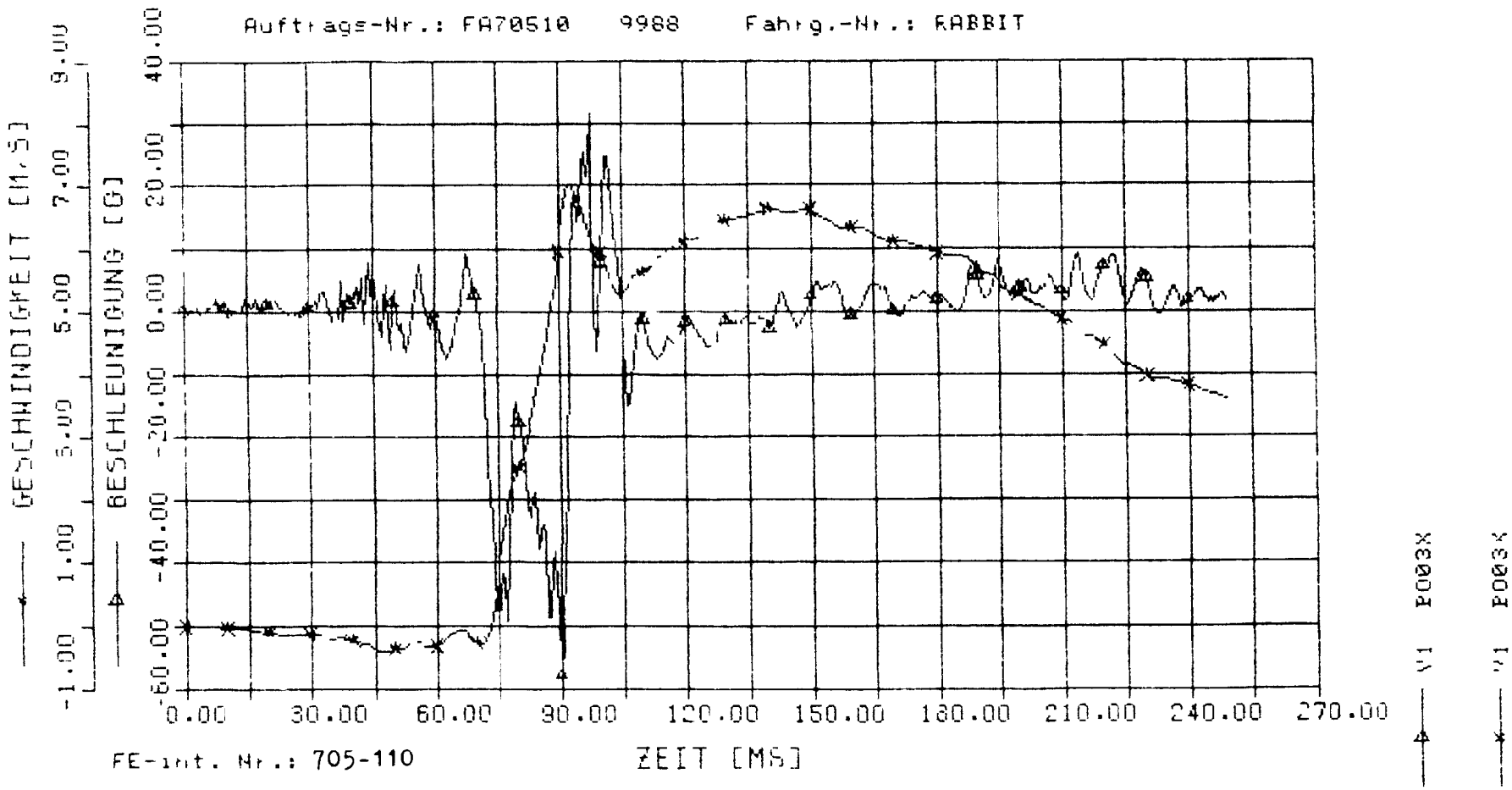
Kenn-Werte Auftrags Nr FA70510 Versuchs Nr 9988

Mess-Stelle					
	UP	bei Groesse	Extremum	t Extr	ms
K0032	V1	BE g	82 400	4 20	39 50



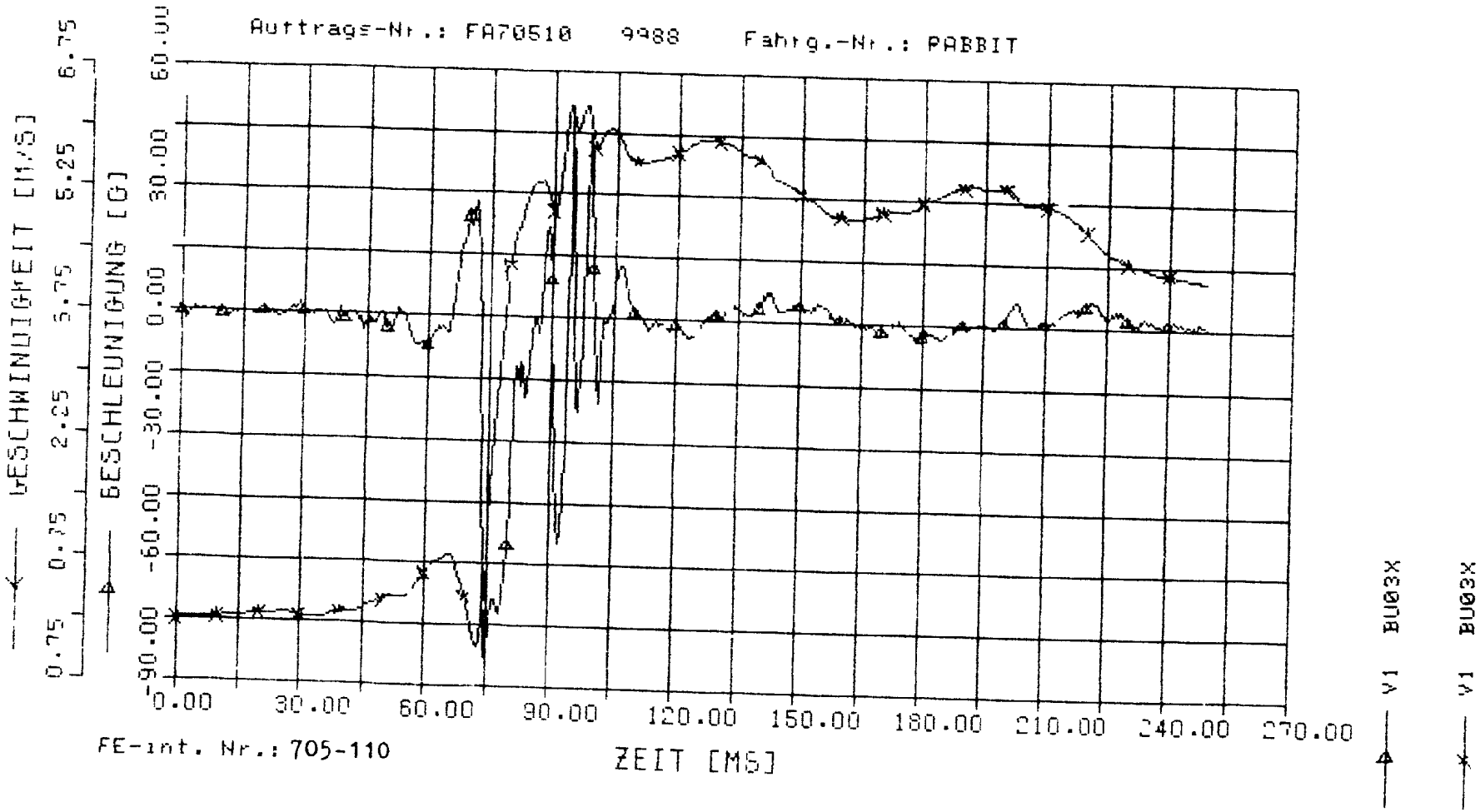
Kenn Werte Auftrag Nr FA70510 Versuchs Nr 9988

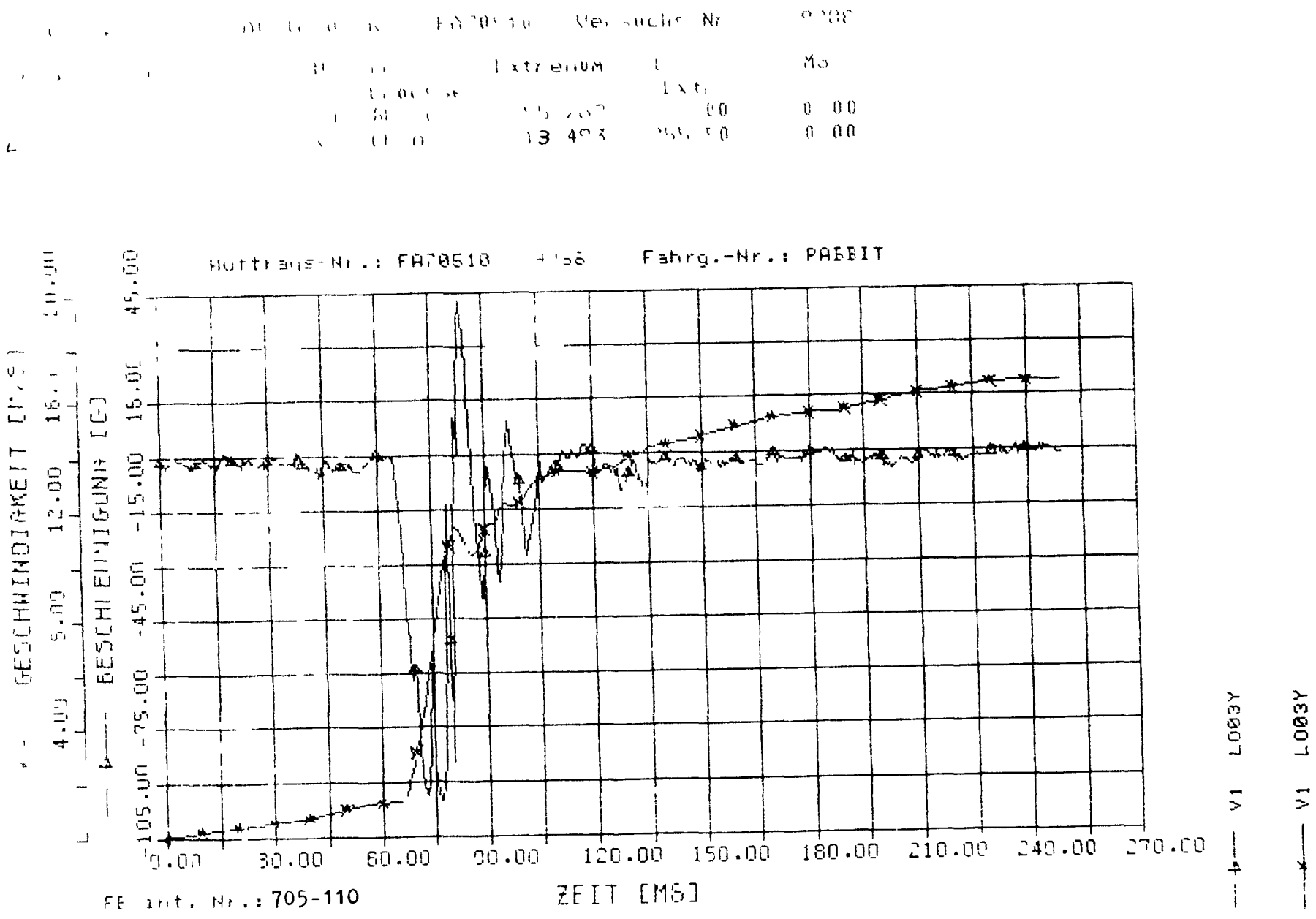
Mess-Stelle	UP	Bei Grösse	Extremum	Extr	MS
B003X	V1	Bl g	59 22	20 50	0 00
B003X	V1	Gl n	980	93 00	0 00



Kenn-Werte Auftrag Nr FA70510 Versuchs Nr 9988

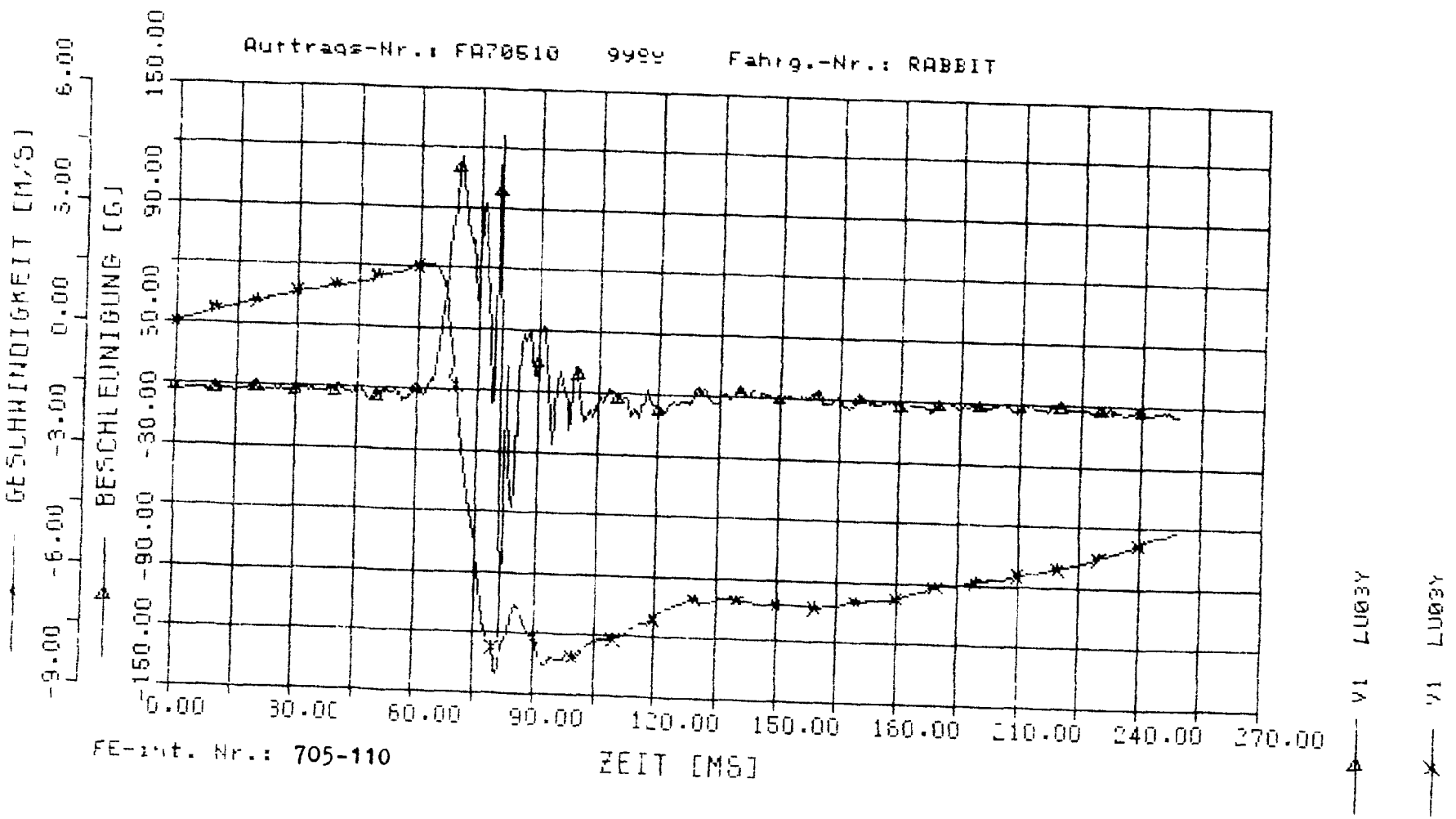
Mess Stelle	UP	ber Groesse	Extremum	t Extr	MS
BU03	V1	Bl g	88 56	75 00	0 00
BU03X	V1	Gl n/s	6 335	94 00	0 00




Auftrags-Nr.: FA70510
Fahrg.-Nr.: RABBIT
GESCHWINDIGKEIT [M/S]
BESCHLEUNIGUNG [G]
ZEIT [MS]
FE int. Nr.: 705-110
V1 L003Y
V1 L003Y

Kenn-Worte Auftrags Nr FA70510 Versuchs Nr 9988

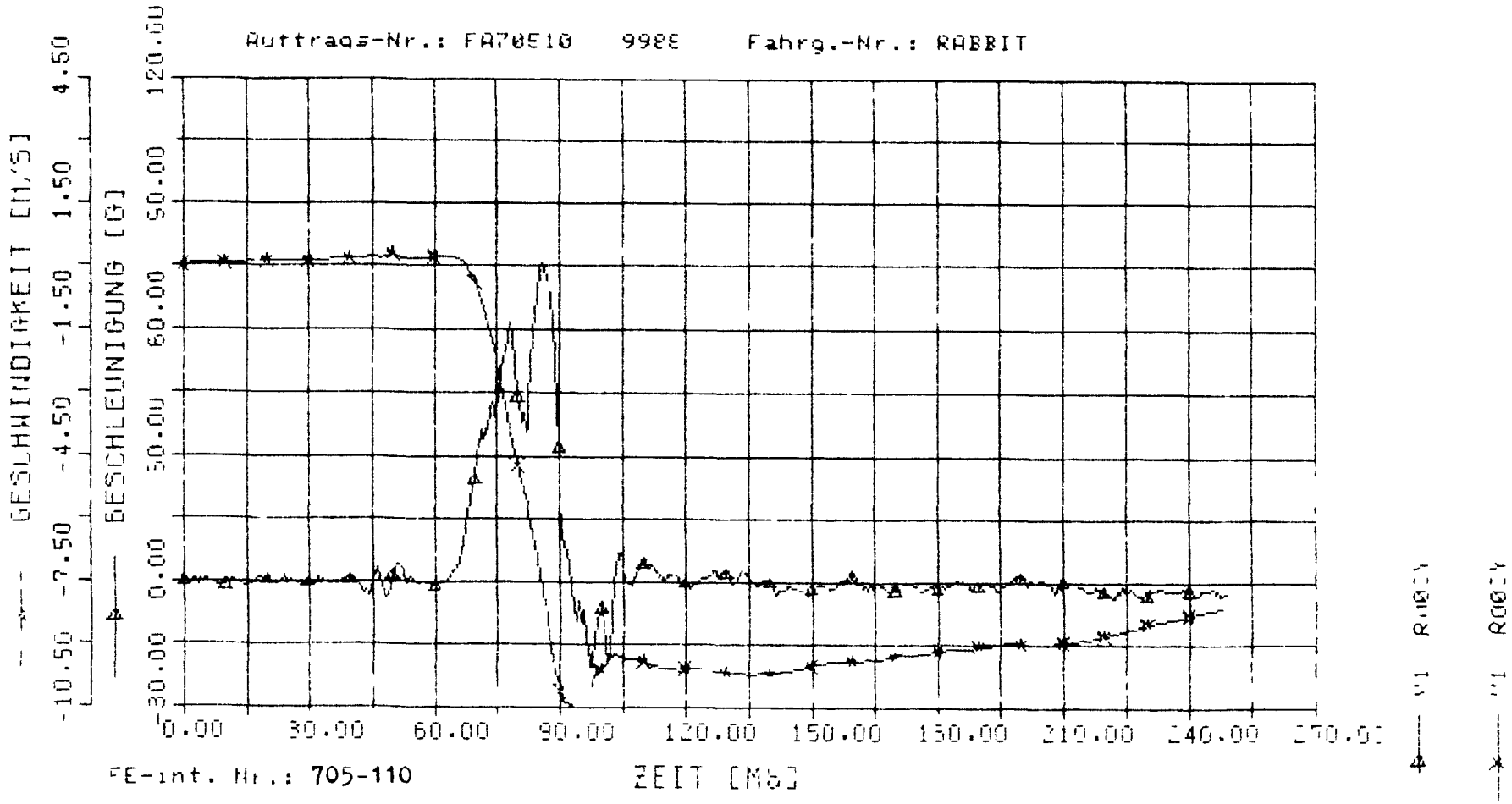
Mess Stelle	UP	Bez Größe	Extremum	t Extr	SMS
LU03Y	V1	[illegible]	125 943	80 50	0 00
LU03Y	V1	[illegible]	8 63[illegible]	81 00	0 00

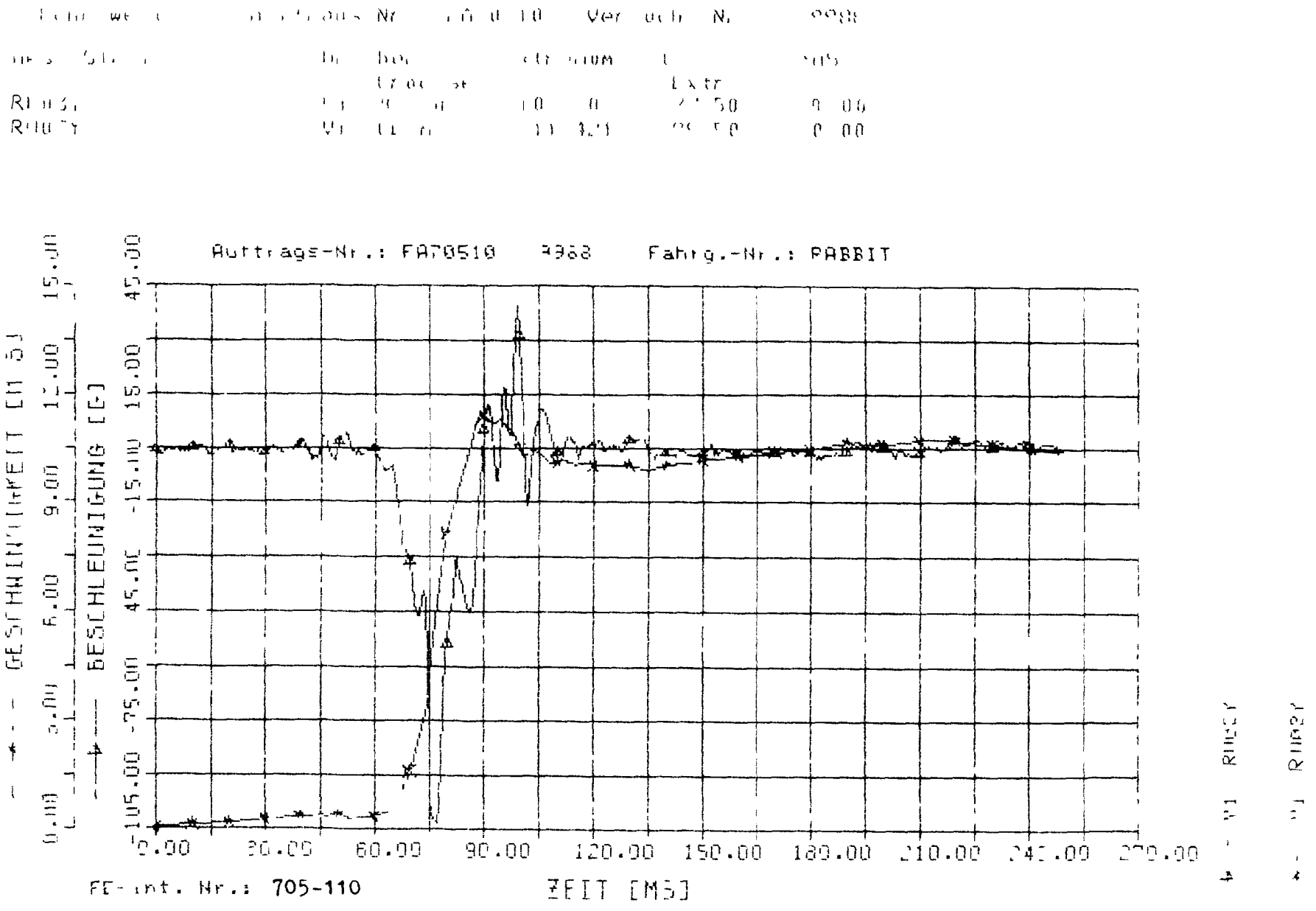


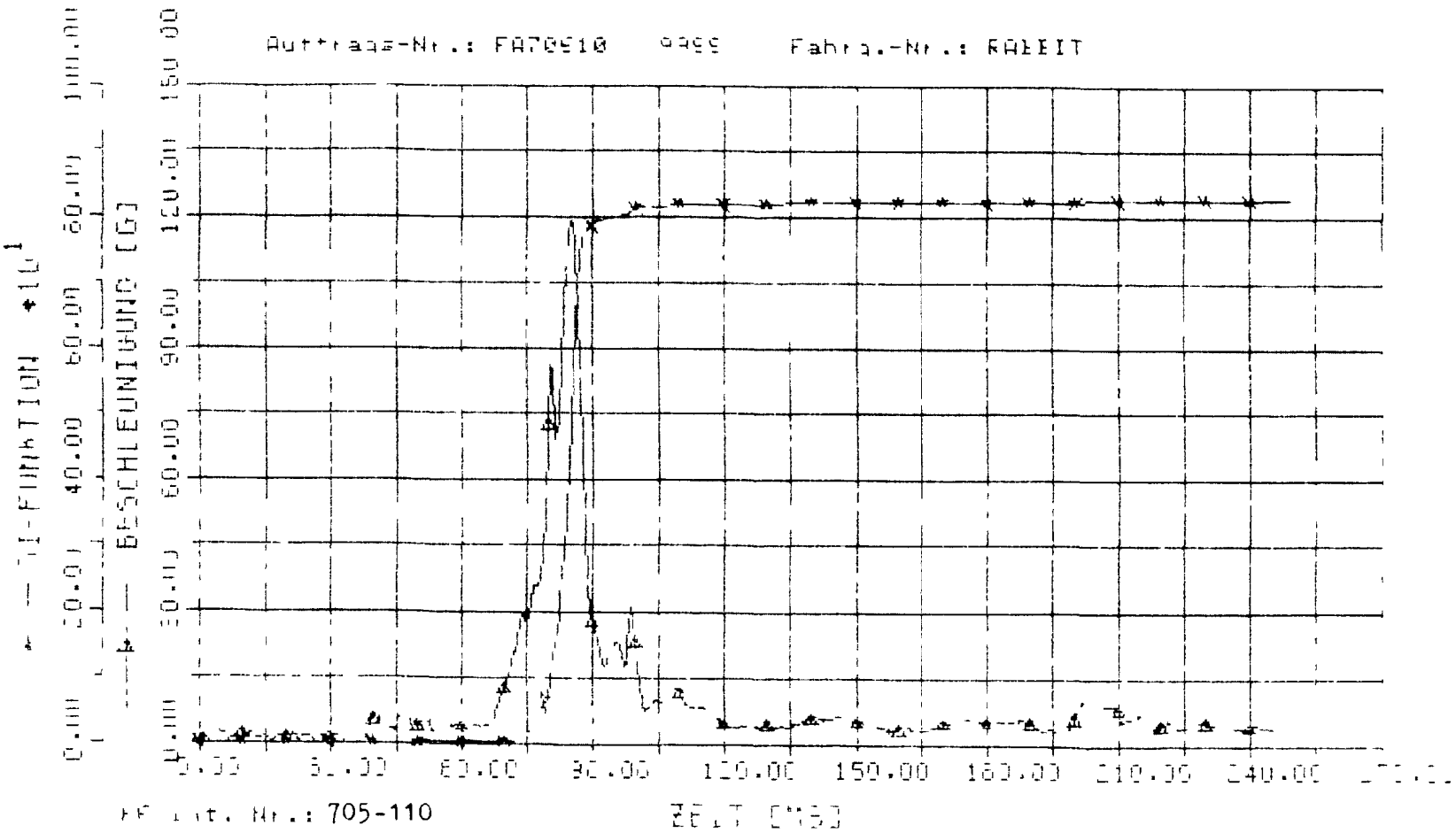
FE-int. Nr.: 705-110

Kenn Wort Auftrags Nr FA70E10 Versuchs Nr 9988

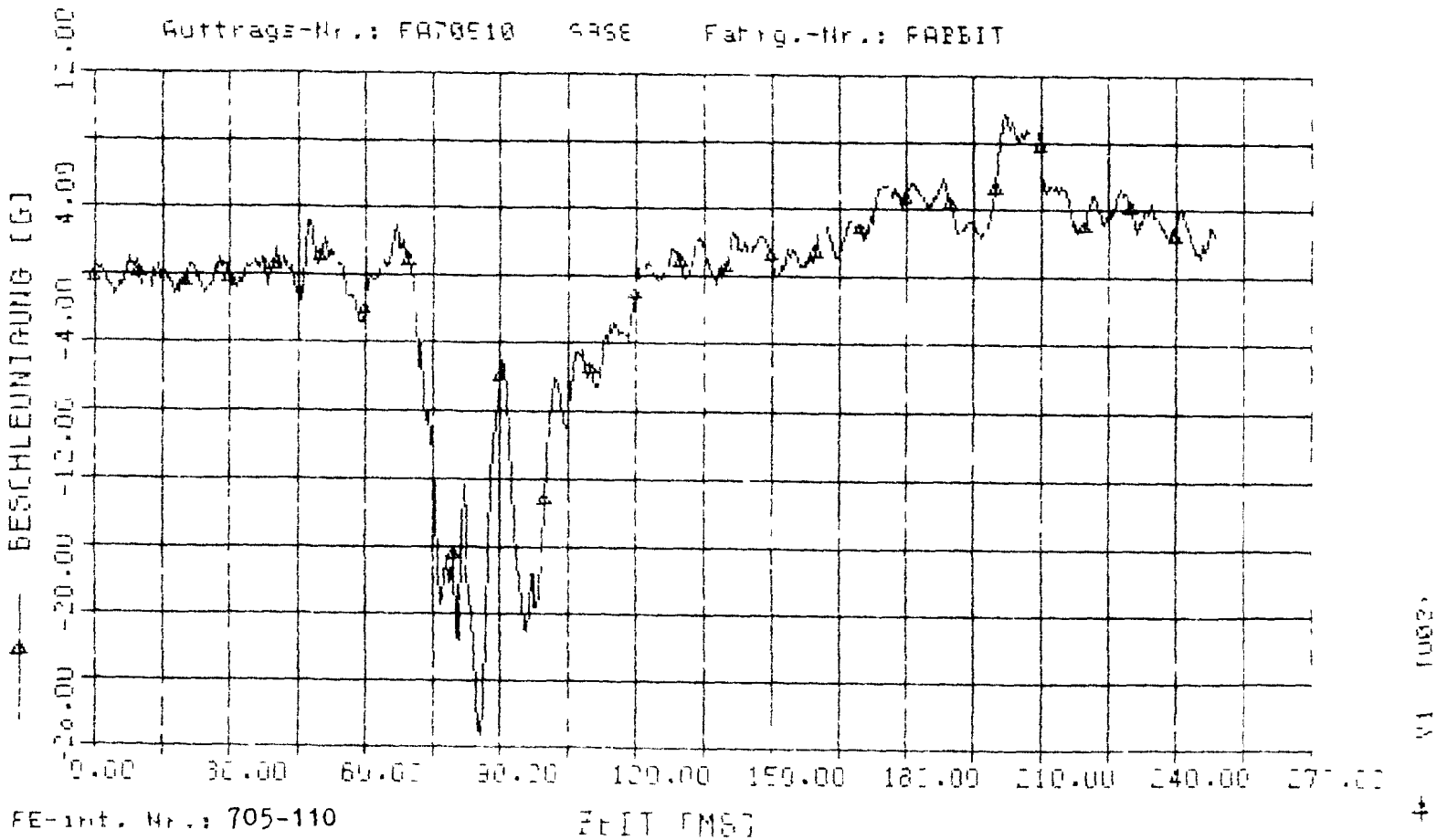
Mess Stelle	UI	Der Groesse	Extremum	t Extr	MP
R003Y	V1	BE g	5 275	30 00	0 00
R00[illegible]Y	V1	GE m/s	10 450	[illegible] 00	0 00

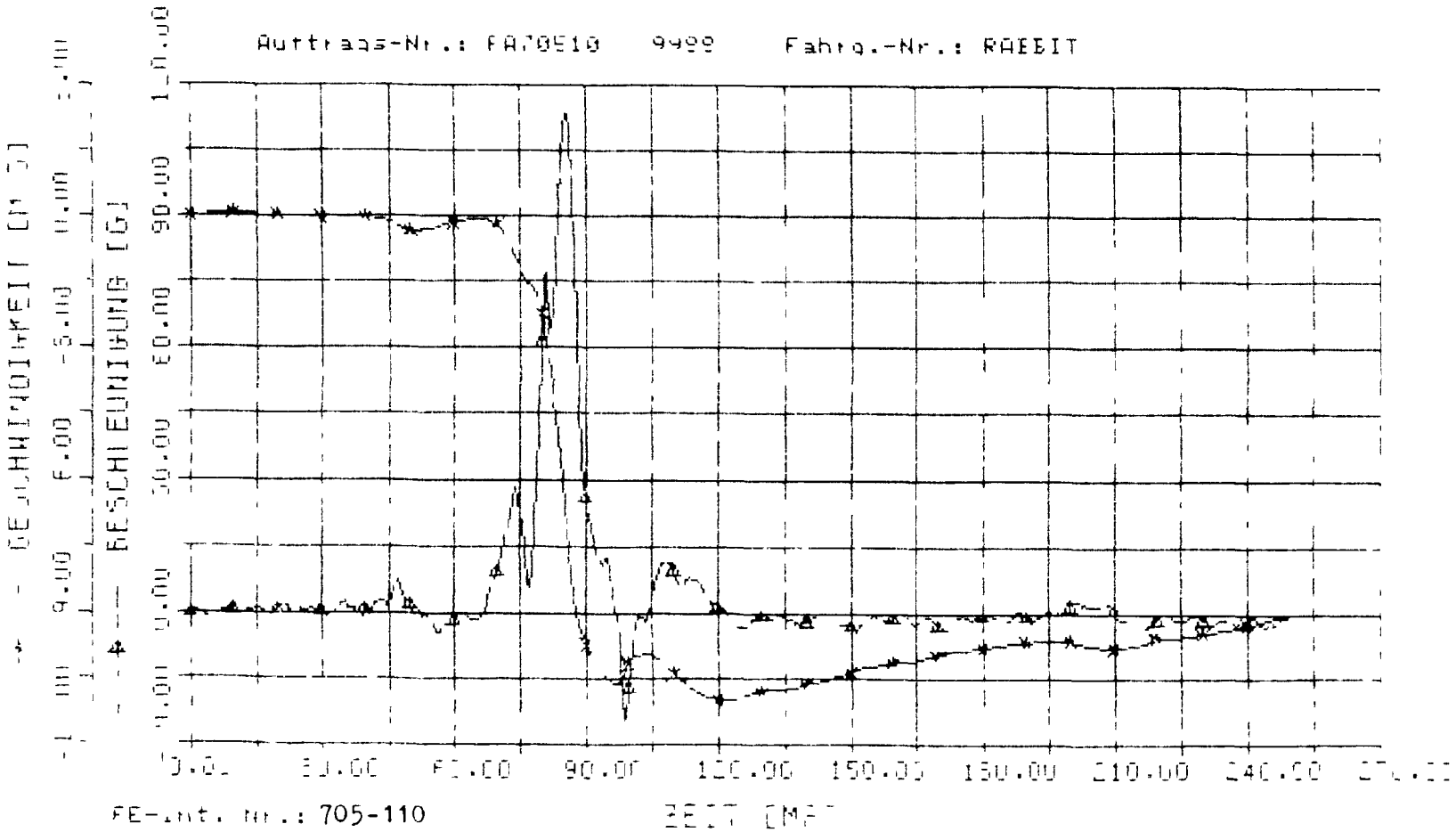



Auftrags-Nr.: FA70510 3968 Fahrg.-Nr.: RABBIT
GESCHWINDIGKEIT [M S]
BESCHLEUNIGUNG [G]
ZEIT [MS]
FE-int. Nr.: 705-110
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
270.00
45.00
15.00
-15.00
-45.00
-75.00
-105.00
15.00
12.00
9.00
6.00
3.00
0.00



Prüf. Nr.: 705-110


Auftrags-Nr.: FA70510 SASE Fahrg.-Nr.: FARBIT
BESCHLEUNIGUNG [G]
12.00
4.00
-4.00
-12.00
-20.00
-28.00
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
270.00
ZEIT [MS]
FE-Int. Nr.: 705-110

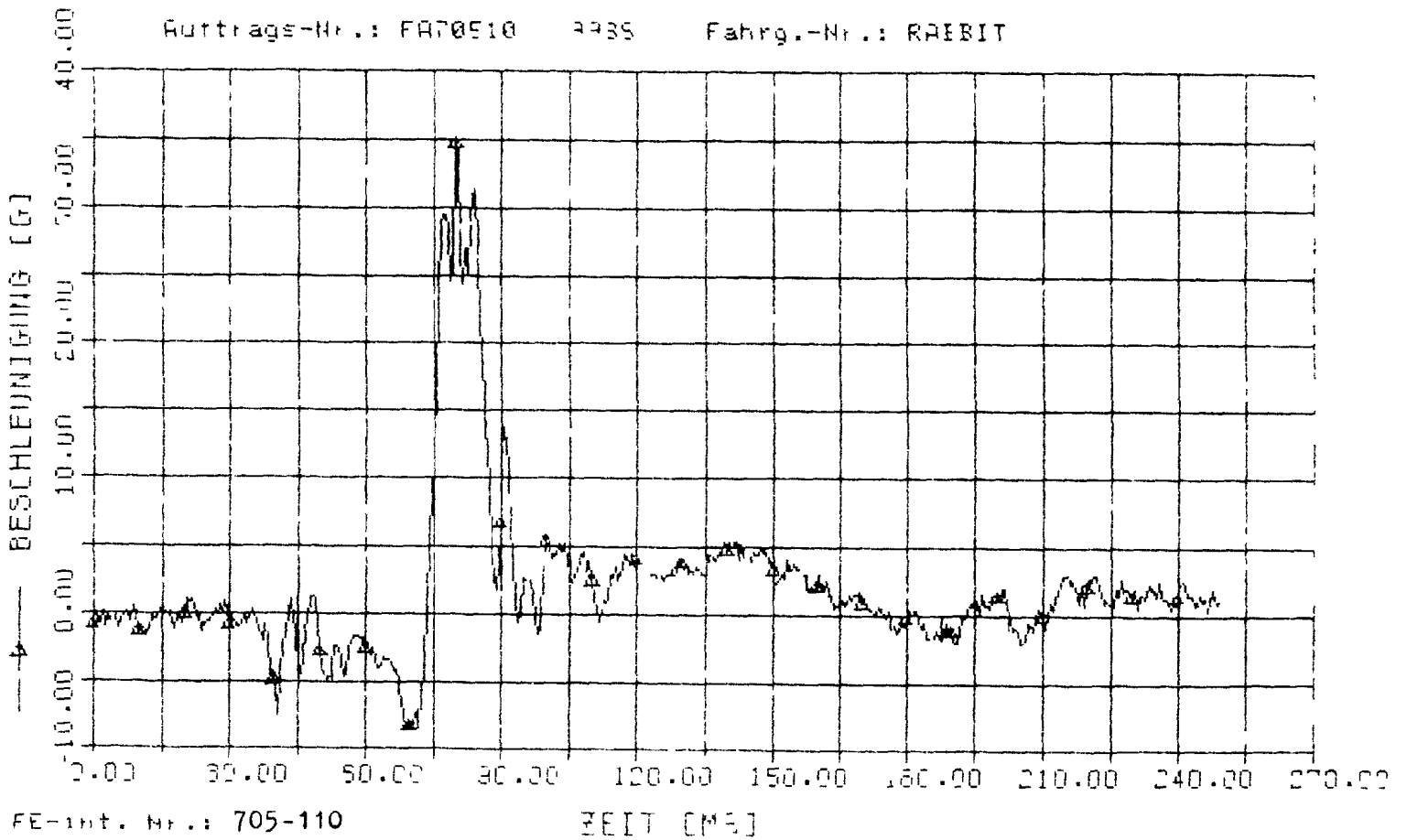

Auftrags-Nr.: FA70510 9999
Fahrg.-Nr.: RABBIT
BESCHLEUNIGUNG [G]
FE-Int. Nr.: 705-110
ZEIT [MS]

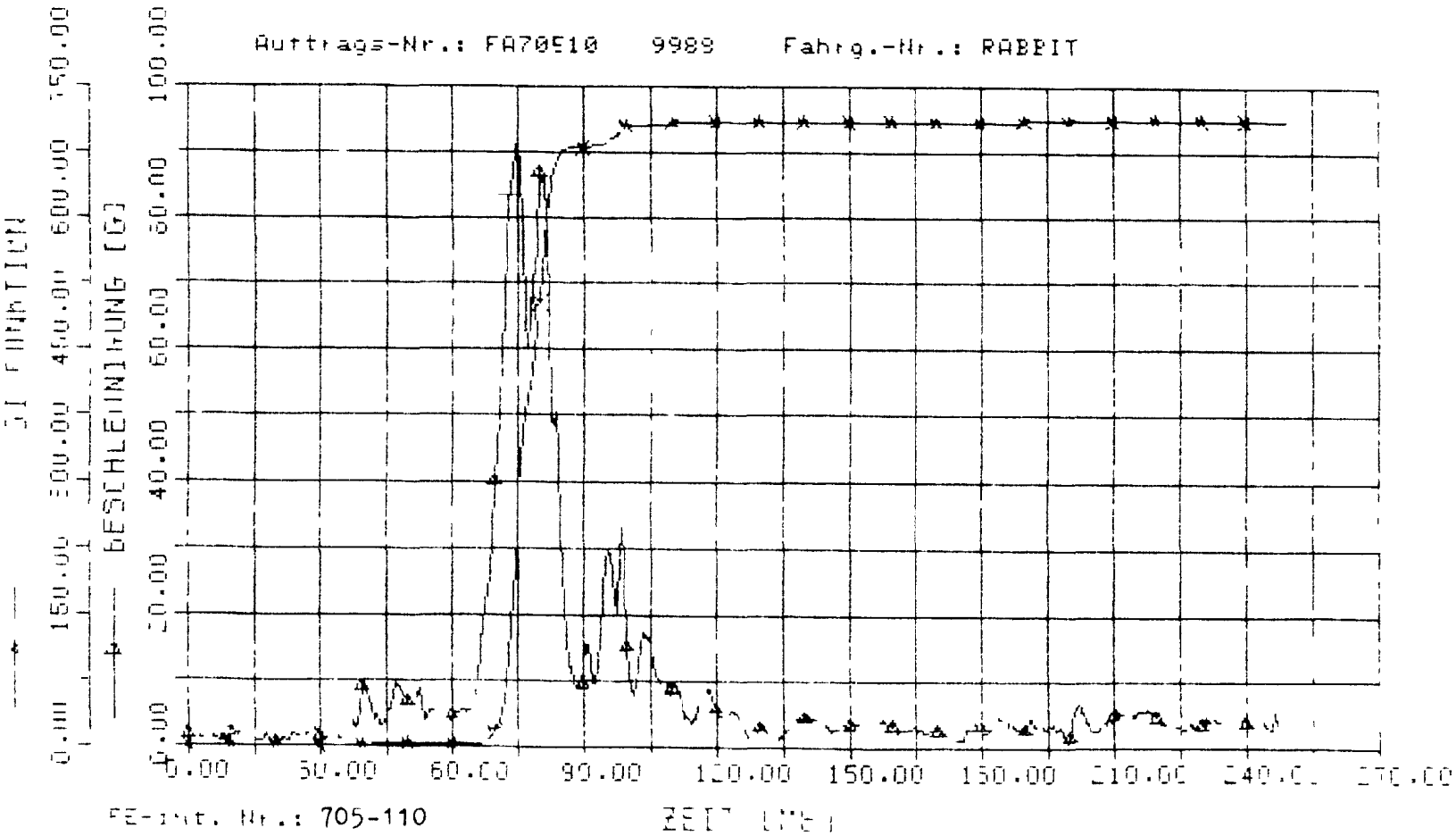
Fahrwerke Auftrag Nr. FA 0510 Versuchs Nr. 9936

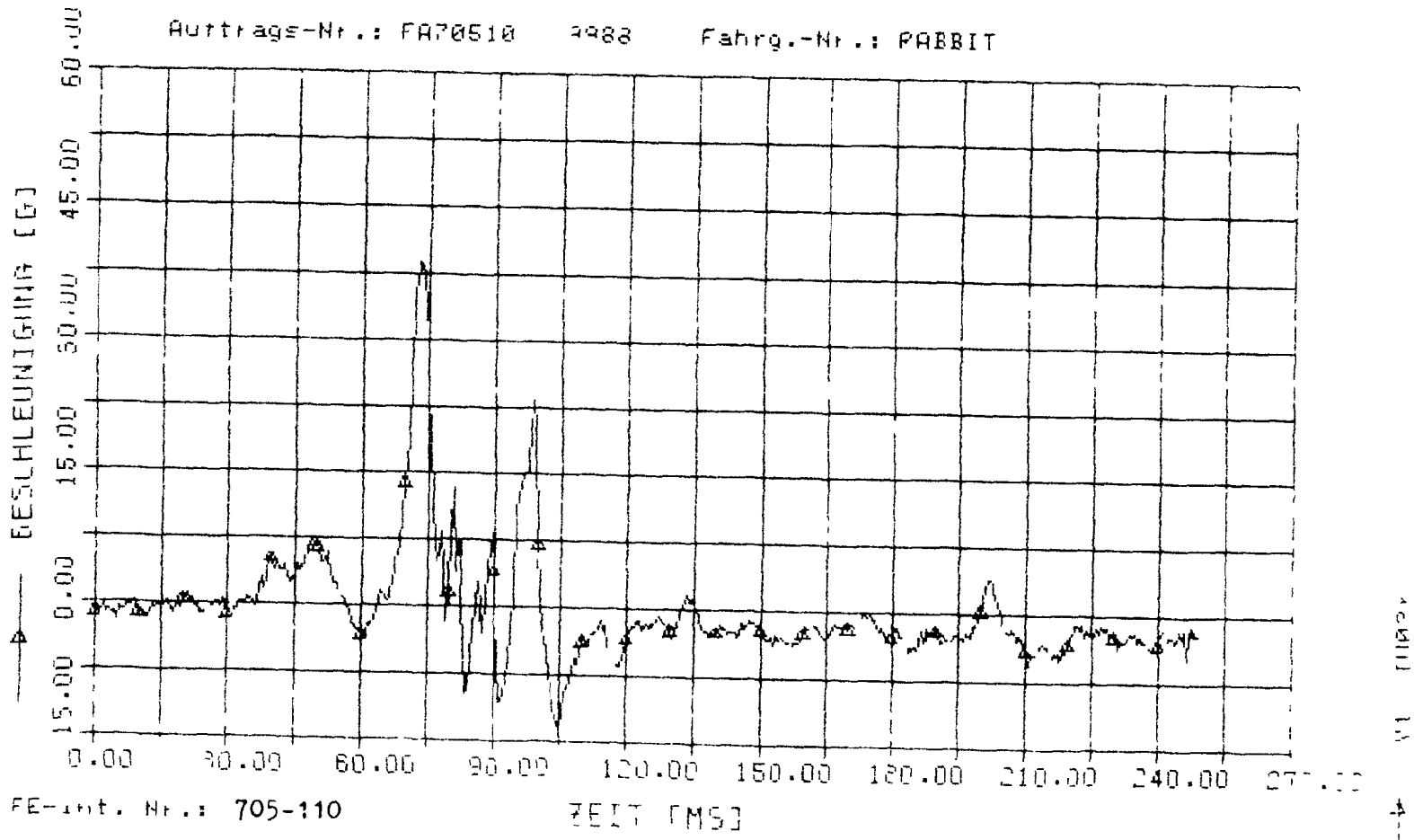
Messstelle UL Vor Extremum t MS

Grösse Extr

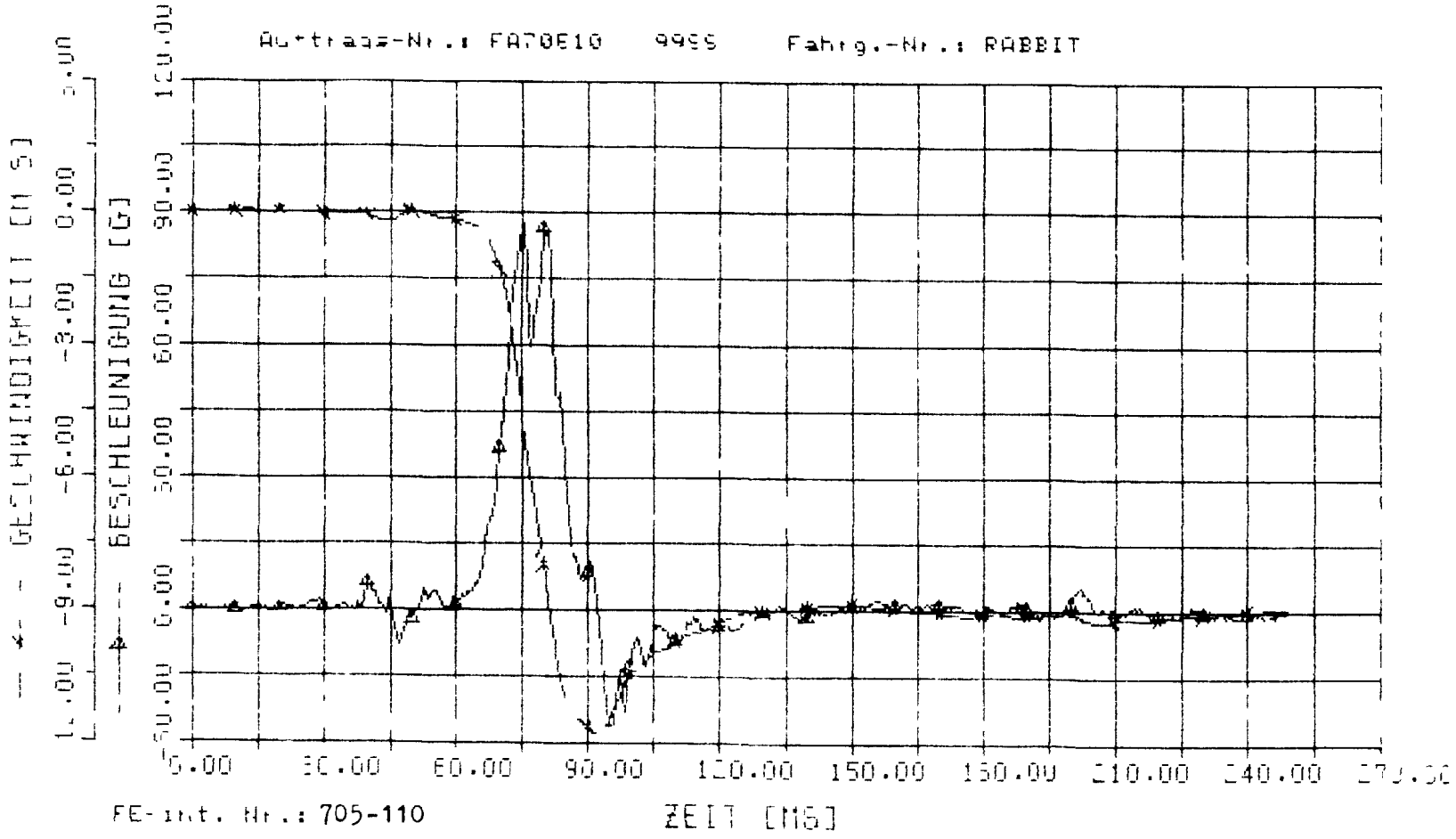
1063 V1 Bl u 34.6 30.00 0.00




Auftrags-Nr.: FA70510 9989 Fahrg.-Nr.: RABBIT
BESCHLEUNIGUNG [G]
ZEIT [MS]
FE-Int. Nr.: 705-110


Auftrags-Nr.: FA70510 3988 Fahrg.-Nr.: RABBIT
BESCHLEUNIGUNG [G]
60.00
45.00
30.00
15.00
0.00
15.00
0.00
30.00
60.00
90.00
120.00
150.00
180.00
210.00
240.00
ZEIT [MS]
FE-int. Nr.: 705-110

Kern Wert	Auftrag Nr.	FA 0510	Versuch Nr.		[illegible]
[illegible] Stelle	[illegible]	Bei	Extremum	[illegible]	MS
		Grösse		Extr	
[illegible]	V1	[illegible]	8 [illegible]	[illegible] 00	0 00
[illegible]	V1	[illegible]	11 [illegible]	92 50	0 00

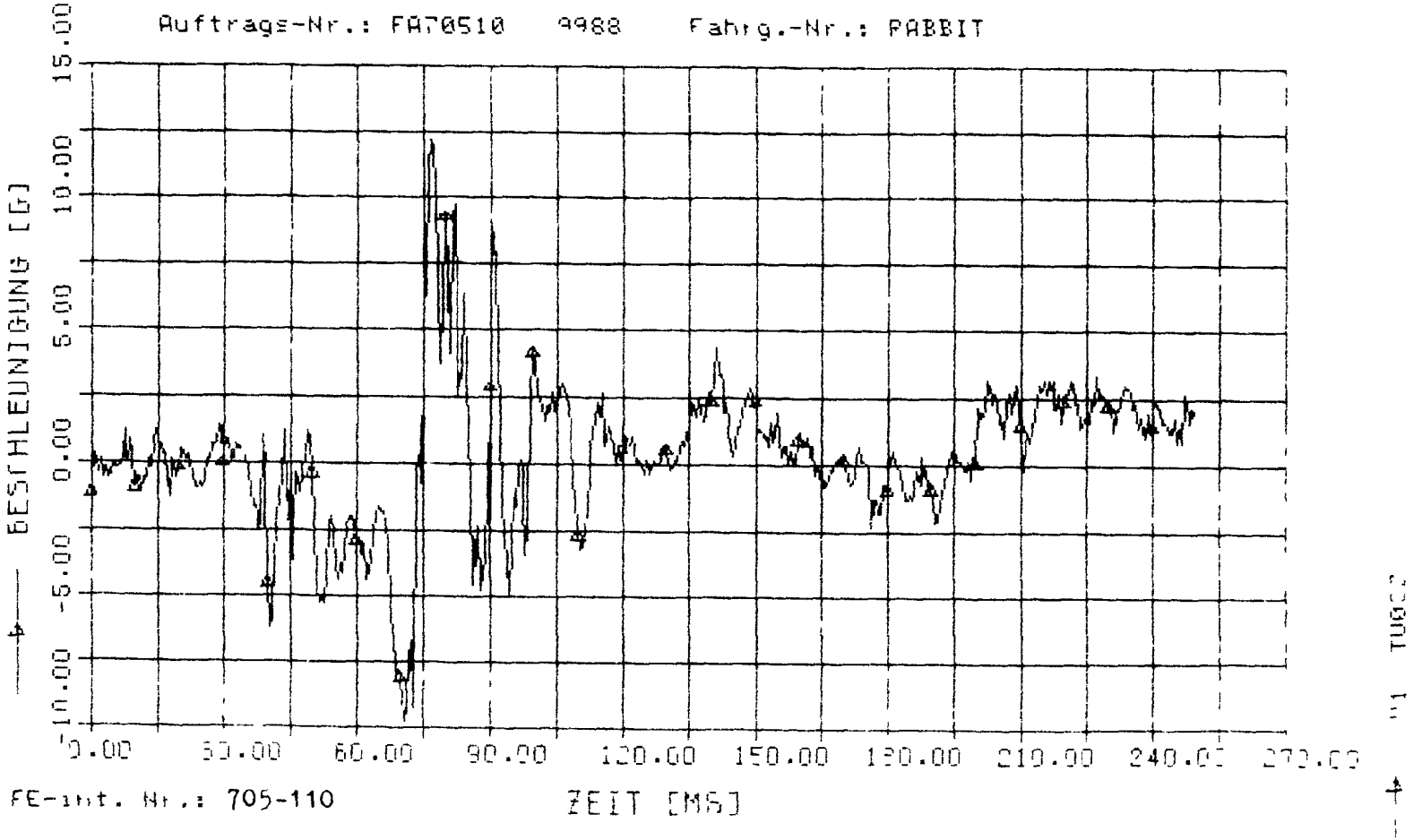


Fenn Werte Auftrag Nr FA70510 Versuchs Nr 9988

Mess Stelle UP Gr Extremum t 3M5

Groesse Extr

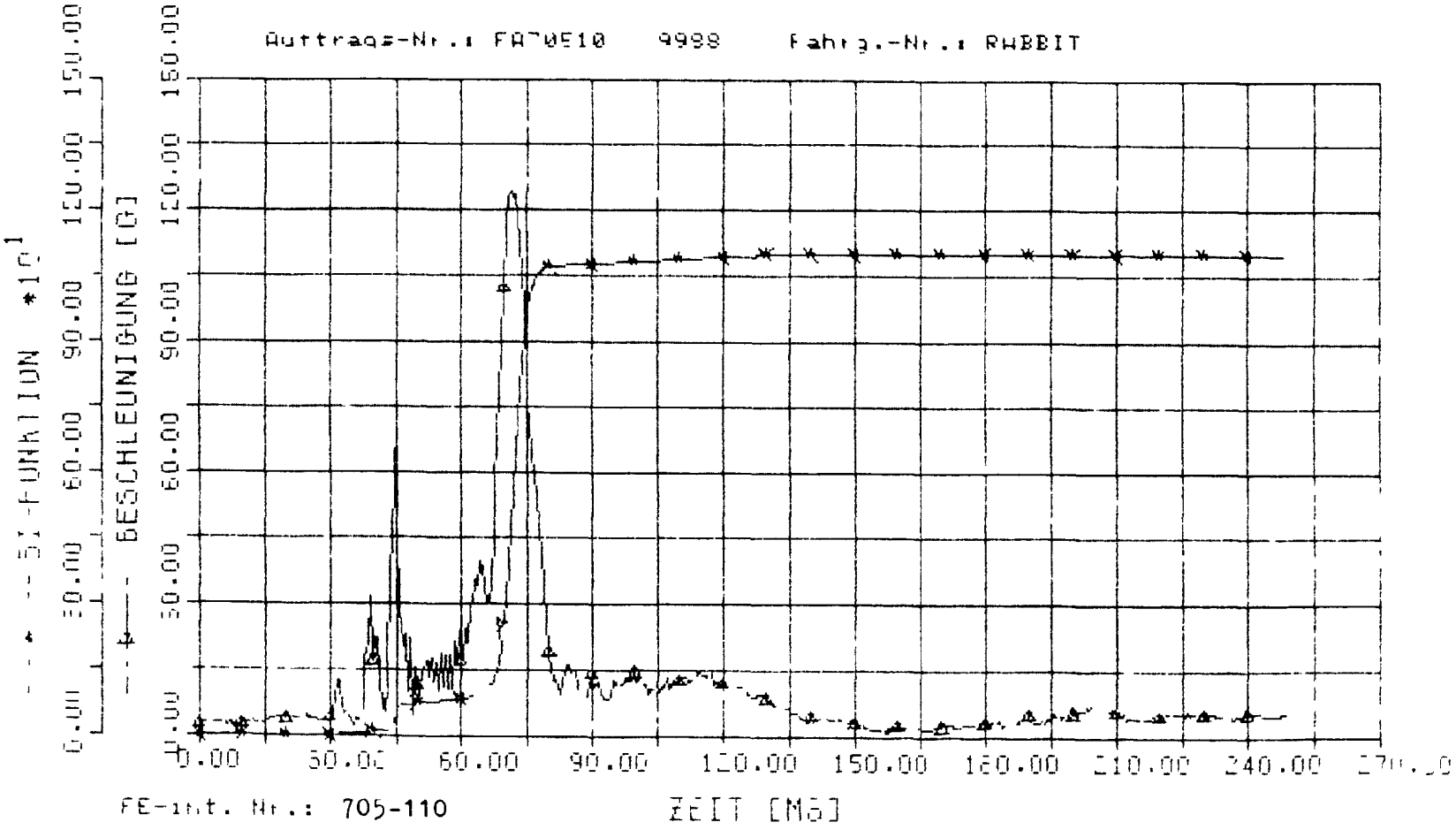
TU032 V1 Br a 1 246 7 00 0 00



TU032

Kenn Worte Auftrag Nr. FA 0510 Versuch Nr. [illegible]

Mess Stelle	Ü	bc	Extremum	t	[illegible]
		Grad [illegible]		Extr	
[illegible]	V1	[illegible]	12 [illegible]	[illegible] 50	112 40
[illegible]	V1	SI	1000 745	250 00	0 00

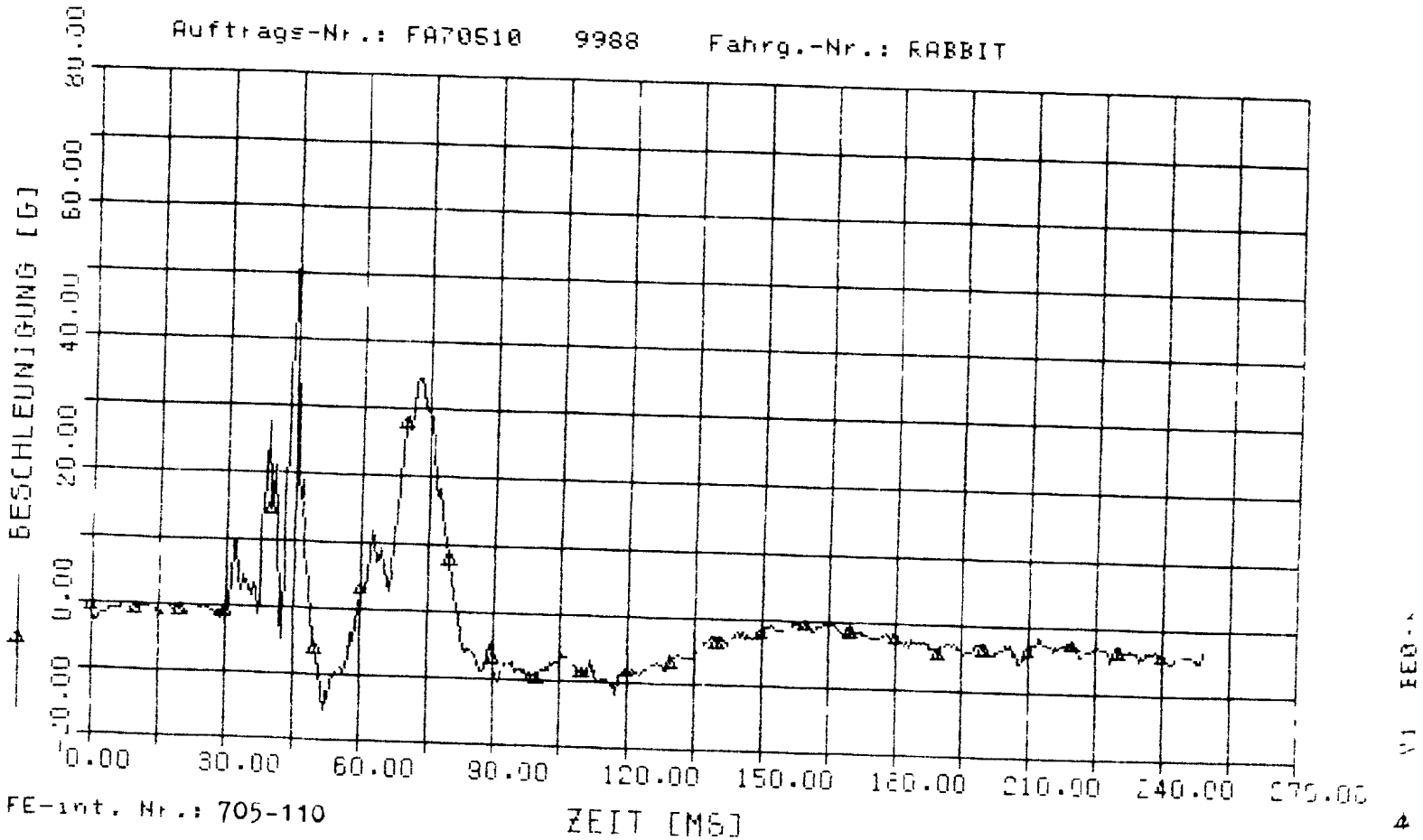


Kenn Worte Auftrag Nr FA 0510 Versuchs-Nr 9988

Mess Stelle UP bei Extremum [illegible] [illegible]MS

Gr[illegible]se Extr

BI 037 V1 BI q [illegible] [illegible] 33 1

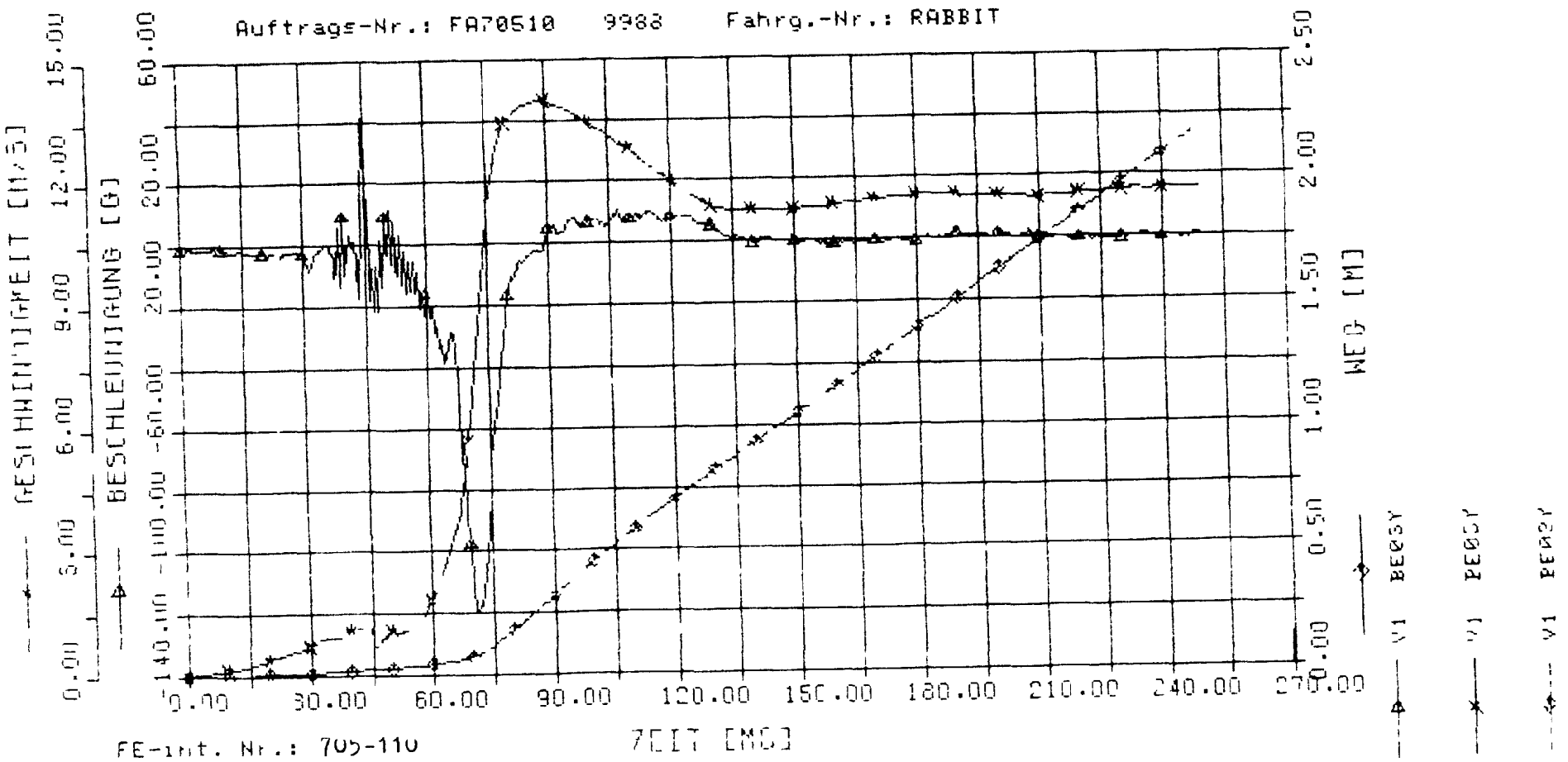


V1 BE0-x

4

Kenn Worte Auftrag Nr FA70510 Versuchs Nr 9988

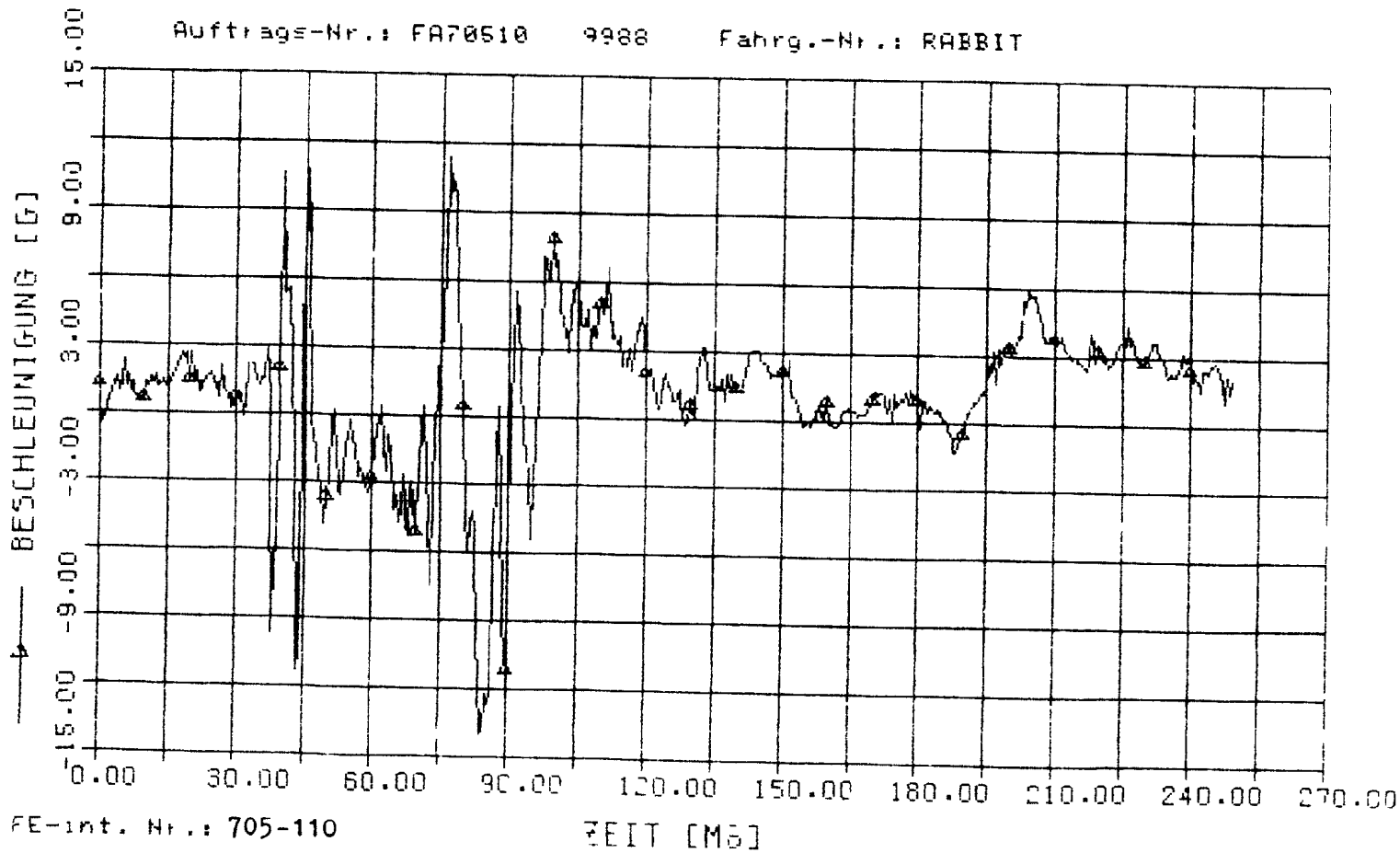
Mess Stelle		Der Groesse	Extremum	Extr	
BL03Y	V1	BE g	120 34	71 50	9 00
BL03Y	V1	GE m/s	13 990	89 50	0 00
BL03Y	V1	WI m	2 263	255 50	0 00



FE-int. Nr.: 705-110

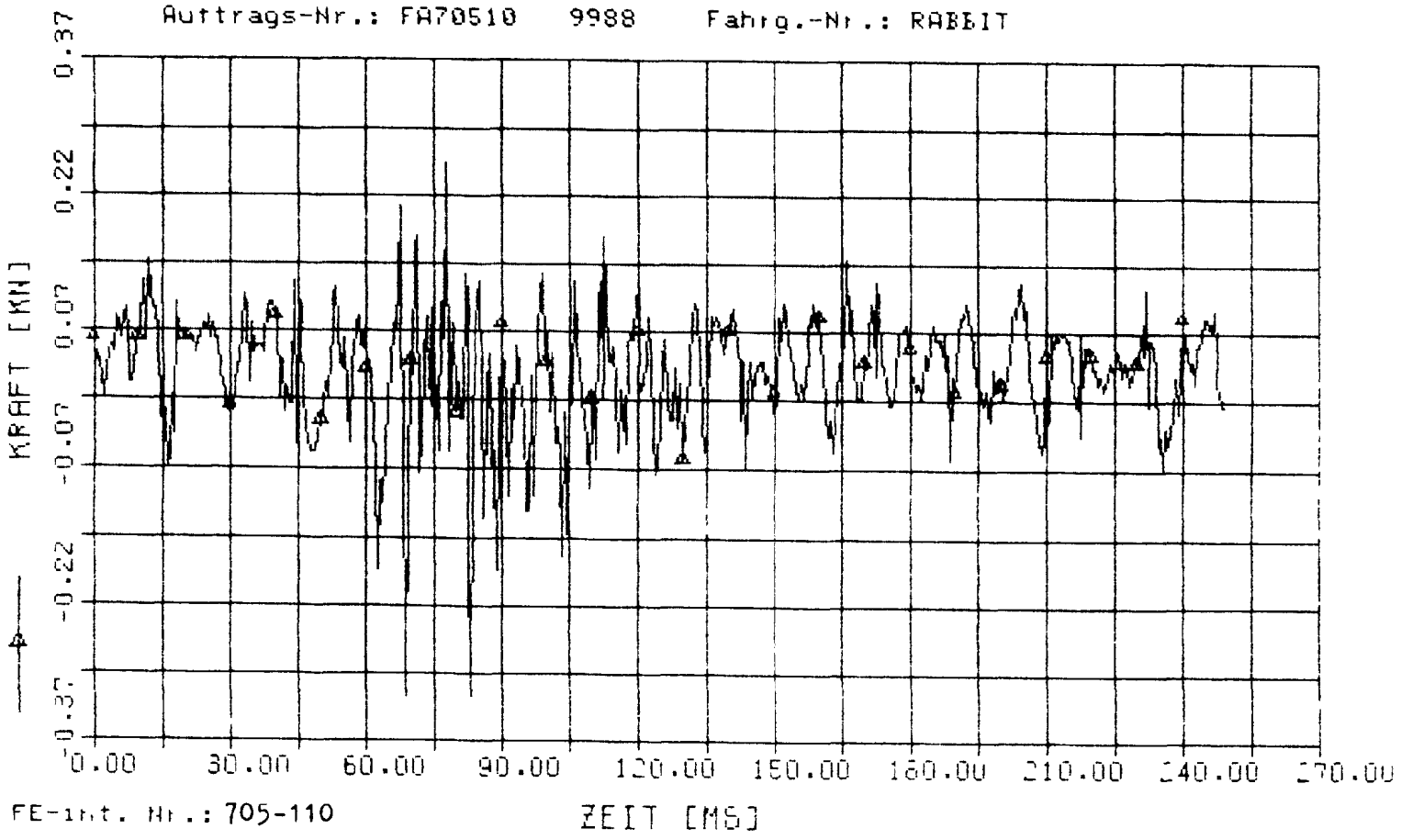
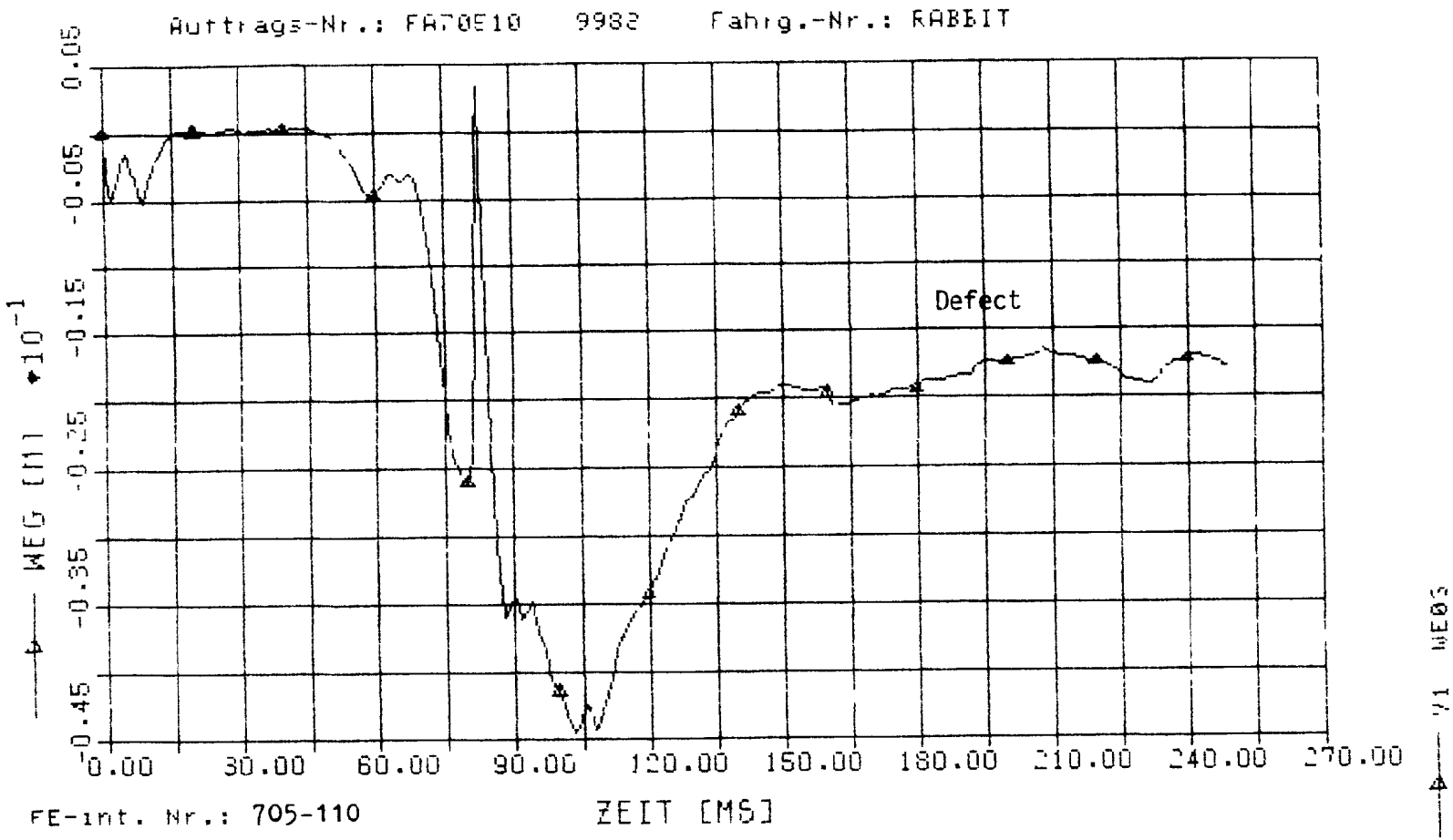
Kenn Werte Auftrags Nr FA70510 Versuchs Nr 9988

Mess Stelle	Ul	ber Grosse	Extremum		MS
BE03Z	V1	Bl u	13 753	Extr 34 50	7 1



Kenn-Werte	Auftrags Nr	FA70510	Versuchs Nr	9988

Mess Stelle	UP	bei Groesse	Extremum	t Extr	ms
GU03BA	V1	KR kN	3.24	83.50	0.00



Chest Deflection Rear Left = 44.5 mm