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Tittel

Charged Potential Measurments in Mofjellet in Spring 1975

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Malm/metall	Pb Zn

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

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22 - 82

CHARGED POTENTIAL MEASUREMENTS IN MOFJELLET IN SPRING 1975

SUOMEN MALMI OY

1975-11-04

PEKKA MIKKOLA

CHARGED POTENTIAL MEASUREMENTS IN MOFJELLET IN SPRING 1975

Appendices

1. INTRODUCTION

According to the contract between Nord Norge Bergverksällskap A/S and Geobor A/S, Suomen Malmi Oy carried out charged potential (mise-a-la-masse) measurements in the neighbourhood of the Mofjellet Mine during the period 1975-05-26...06-05. Mainly three different active groundings were used and altogether 2 937 meters of drillholes and 10.2 kilometers of ground profiles covering an area of 3 km^2 were measured. The measurements were incorporated in the VLF-magnetic measurements made by Suomen Malmi Oy in the same area (report 23-83, 1975-10-30).

The purpose of the measurements was to investigate the contunuity of the mined ore formation and to locate possible outcrops to the east of the mine. The electric lines running through the area in east-west direction disturbed the measurements and make the interpretation somewhat speculative. Ore lense II grounded in a ventilation shaft in the mine served as the most important grounding. Beside this, active groundings made to Ore lense II and III in drillhole GM 2 were used in drillhole measurements.

The results of the ground measurements are portrayed in the form of contourmaps and profiles in appendices 1 - 18 and 26 and the results of drillhole measurements correspondingly in the form of contoured drillhole sections and drillhole profiles in appendices 19 - 25.

The field crew consisted of a geophysicist, a foreman and three observers. In the case of ground measurements the separation of adjacent lines varied between 200 and 600 meters and the point interval was 20 meters. In the case of drillhole measurements the point interval varied between 5 and 20 meters.

2. MEASUREMENTS

A Geoscience frequency-domain IP-apparatus equipped with a phase indicator was used in the measurements. The frequency of the input current was 1.0 Hz and the magnitude between 0.1 - 0.5 A. The accuracy of the measured potentials was better than 0.1 mV in ground measurements and better than 1 mV in drillhole measurements. The remote grounding was placed about 4 km to the south of of the measured area at the point x = 21.98; y = 41.93. The fixed reference point in the measurements with the active grounding in Ore lense II in the mine was placed at the point x = 25.48 ; y = 43.55. In the measurements with other active groundings the reference point was x = 25.33 ; y = 43.87.

The most important active groundings were made to Ore lense II and III in the following places (the symbols used in the appended profiles are in the parenthesis):

(x) BH 372 Ore lense II
(o) GM 2-220 m, Ore lense II
(+) GM 2-267 m, Ore lense III

In addition to the mentioned groundings some extra groundings were used in test measurements.

Fifteen ground profiles have been measured using the grounding (x). The results are presented as contour maps in appendices 1 - 3. In this presentation the active grounding has been regarded as the positive pole and the potential values correspond the current magnitude of 0.5 Amperes. Thus the potential values have to be multiplied by two to be directly comparable to the other results which have been normalized to correspond the current of 1 A. The mentioned 15 groundprofiles are presented as well in the form of profiles in appendices 4 - 18. In this case the active grounding has been regarded as the negative pole exceptionally. In addition to the mentioned ground measurements the grounding (x) has been used in measuring the drillholes GM 1, GM 2, 69 - 30 and 69 - 31. These drillholes and the ground profile y = 43.80 have been measured using active groundings (o) and (+) as well. The contour map presentations of the drillhole section are given in appendices 19 - 21, the drillhole profiles in appen-

dices 22 - 25 and the ground profile in the appendix 26. The depths have been measured from the top of drillhole casing to the center of the 80 cm long measuring electrode.

2.1 Ground measurements

The most used active grounding (x) was made to Ore lense II in the ventilation shaft 372 in the mine. This grounding gives two distinctive anomaly zones running through the area in ground measurements. The interpretation of these anomalies is, however, quite complicated and ambiguous compared to the interpretation of charged potential measurements as a rule. One of the anomaly zones (zone A) is situated some 150 - 300 meters to the north of the electric line running through the area in east-west direction. The other anomaly zone (zone B) runs roughly paralled to zone A (east-west strike) but 100 - 150 meters to the south of the electric line. On the basis of the presentation in profile form still a third zone (zone C) can be noticed quite near the southern edge of the measuring area. All these mentioned zones have been marked in the appendices 1 - 3 with dotted lines.

Zone A seems to have the best contact to the active grounding. Most likely this zone represents the shortest distance to the grounded Ore lense II or to another conductor in a galvanic contact to Ore lense II. The highest potential has been measured on profile y = 44.00. To the east of this line the potential values diminish smoothly due to the moderate conductivity all the way to profile y = 46.20. To the east of this point the potential drop is clearly stronger, which indicates weakening in the galvanic contact between profiles y = 46.20 and y = 46.80.

Especially the interpretation of zone B is uncertain. In the western part of the area the potential values remain clearly lower than in zone A, but on the other hand the potential drops towards the east are smaller than in zone A. Zone B seems to continue all the way to profile y = 48.40 although it is very weak on profile y = 47.80. Apparently zone B is not caused

at least directly of the electromagnetic field of the electric lines judging on the fact that the zone continues further to the east than the electric line. Instead of this it possibly represents a conductor which is not in connection ti the active grounding but rather a conductor to which the electric line is grounded. Where the grounding of electric line is made is not known. A third possibility is that zone B represents a conductor connected to the active grounding.

Zone C differs essentially from the above mentioned zones. It is not in such a connection to the active grounding or to the grounding of the electric line to cause an extreme value point in the potential field. However, an inflection point repeating itself from line to line can be noticed in the profile presentation (appendices 13 - 18). This inflection point has been interpretated to be caused by a conducting formation.

2.2 Drillhole measurements

All the active groundings have been used in the drillhole measurements and besides these, groundings (x, o, +) have been used on profile y = 43.80.

With grounding (x) made to Ore lense II in the mine the highest potential values are obtained in hole GM 1 between depths 240 - 245 m and 185 - 190 m. However, the connection has to be considered quite poor. Towards the north the potentials continue to diminish and in hole GM 2 the potential peak is between 265 - 280 m. Holes 69 - 31 and 69 - 30 don´t reach the peak value at all, which shows that the best connection is deeper than the ends of the holes.

Active grounding (o) is made to Ore lense II in hole GM 2 at the depth of 220 m. When the grounding point itself is measured it gives a very high potential value, which shows that no massive conductor is in question. Best connection in hole GM 1 is between 210 - 225 m, but the potential drop is quite large which shows that the conductivity is poor. Towards the north

the potential does not diminish quite as rapidly and the best connection in hole 69 - 31 is at the depth of 200 m. In hole 69 - 30 the peak value is not reached because the conductor lies deeper than the bottom of the hole.

Active grounding (+) is made to Ore lense III in hole GM 2 as well, but at the depth of 267 m. The results in the hole GM 2 give a picture that the grounded conductor is perhaps more massive than the grounding (o). The best connection to hole GM 1 is at the depth of 275 m where the potential remains clearly at a higher level than with the grounding (o). In holes 69 - 31 and 69 - 30 the peak potential values are not reached because of the shortness of the holes. However the maximum value in hole 69 - 31 is bigger than the peak value in hole GM 1. Also it is noticeable that in holes 69 - 31 and 69 - 30 the potentials of the grounding (+) increase steeper and reach a higher level than the potentials of the grounding (o).

All the mentioned groundings were also used in measuring the ground profile y = 43.80. The results are presented in the appendix 26. All the three groundings give a maximum between x = 25.58 - 25.64. The values of the potential peaks seems to depend of the distance to the corresponding active grounding. The peak of the grounding (x) lies furthest to the south and the peak of the grounding (+) furthest to the north.

3. SUMMARY

The interpretation of the results was disturbed by the effect of the electrical line running through the measured area parallel to the geological strike. Another difficulty is caused by the moderate conductivity of the investigated formations.

As the most important result might be regarded the results obtained in the ground measurements with the grounding in Ore lense II in the mine. These results indicate that the formation continues at least 2 km to the east. Whether this zone is an ore formation or not can be solved by diamond drilling. In addition to

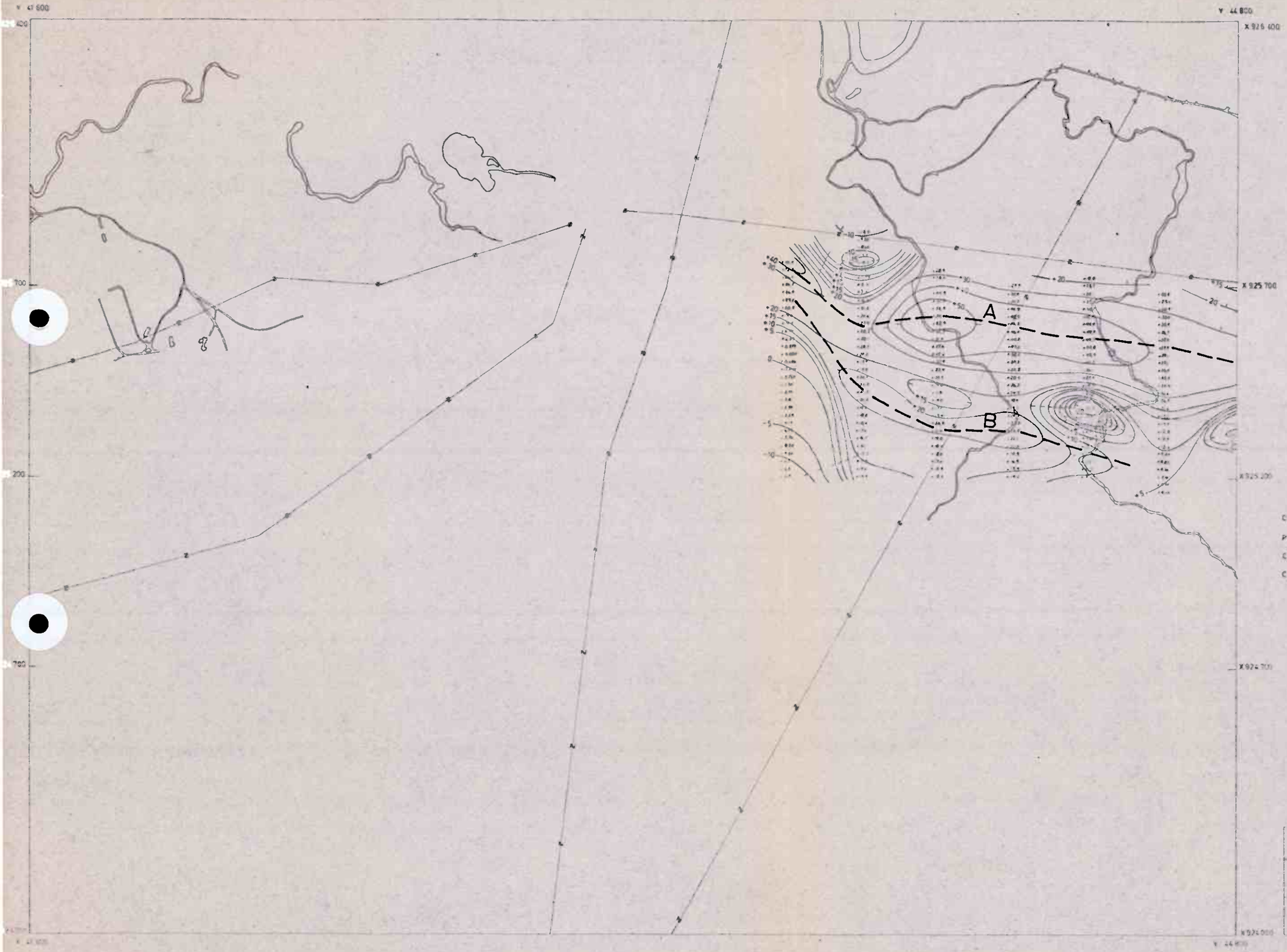
the mentioned zone another dominant conductor was revealed. No certain remarks of the connection of this conductor to Ore lense II cannot, however, be made due to the electric line.

The drillhole measurements showed that the investigated formations were poor conductors but that they can be traced with charged potential measurements at least in the neighbourhood of the active grounding. The best conductor in the drillholes seems to be Ore lense III grounded in hole GM 2 at the depth of 267 m. To the south of the grounding the conductor is penetrated but on the northern side the drillholes are too short to reach the grounded conductor.

Espoo 1975-11-04

SUOMEN MALMI OY
Geophysical Department

Pekka Mikkola
Geophysicist



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Charged potential map		
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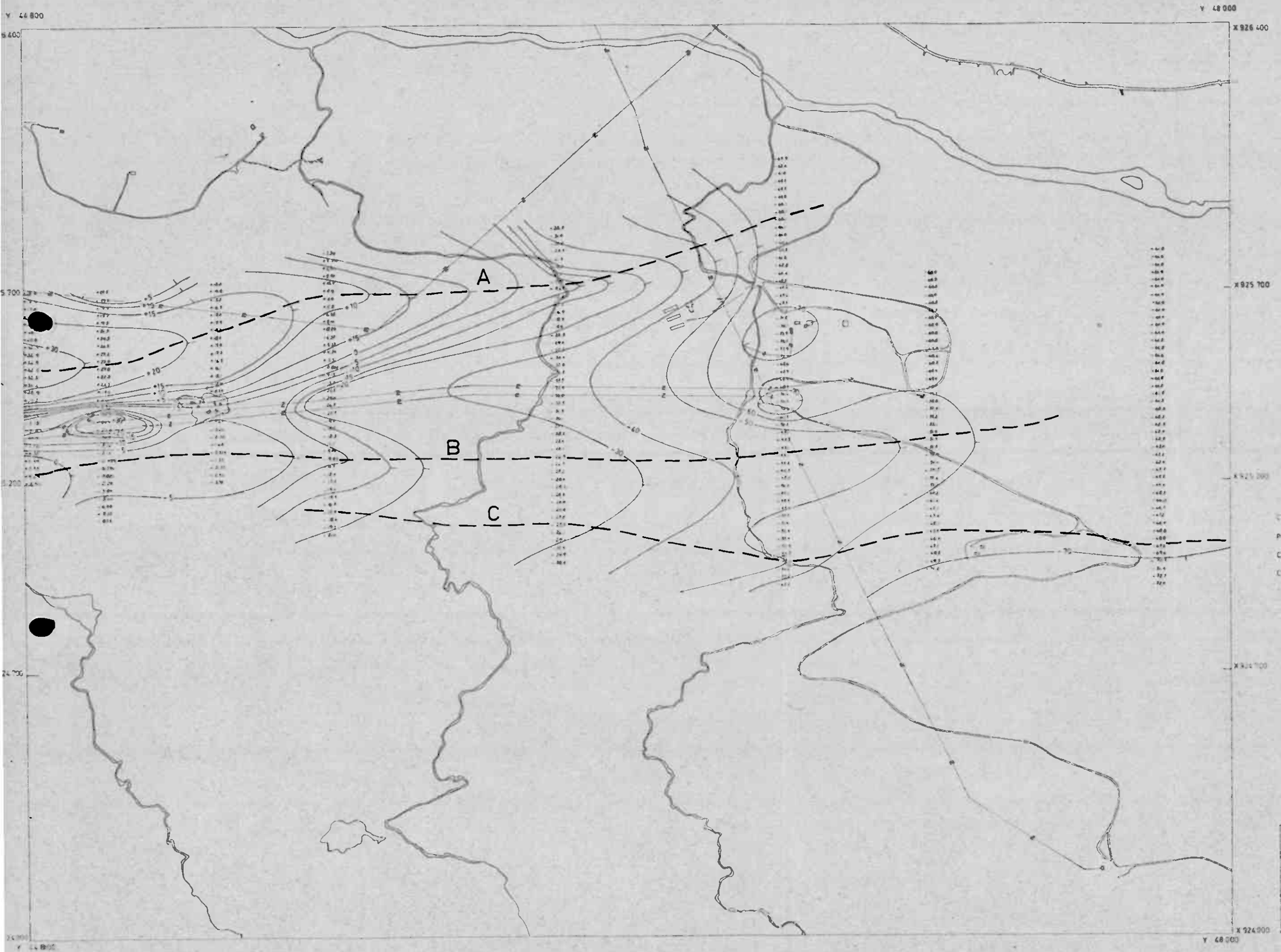

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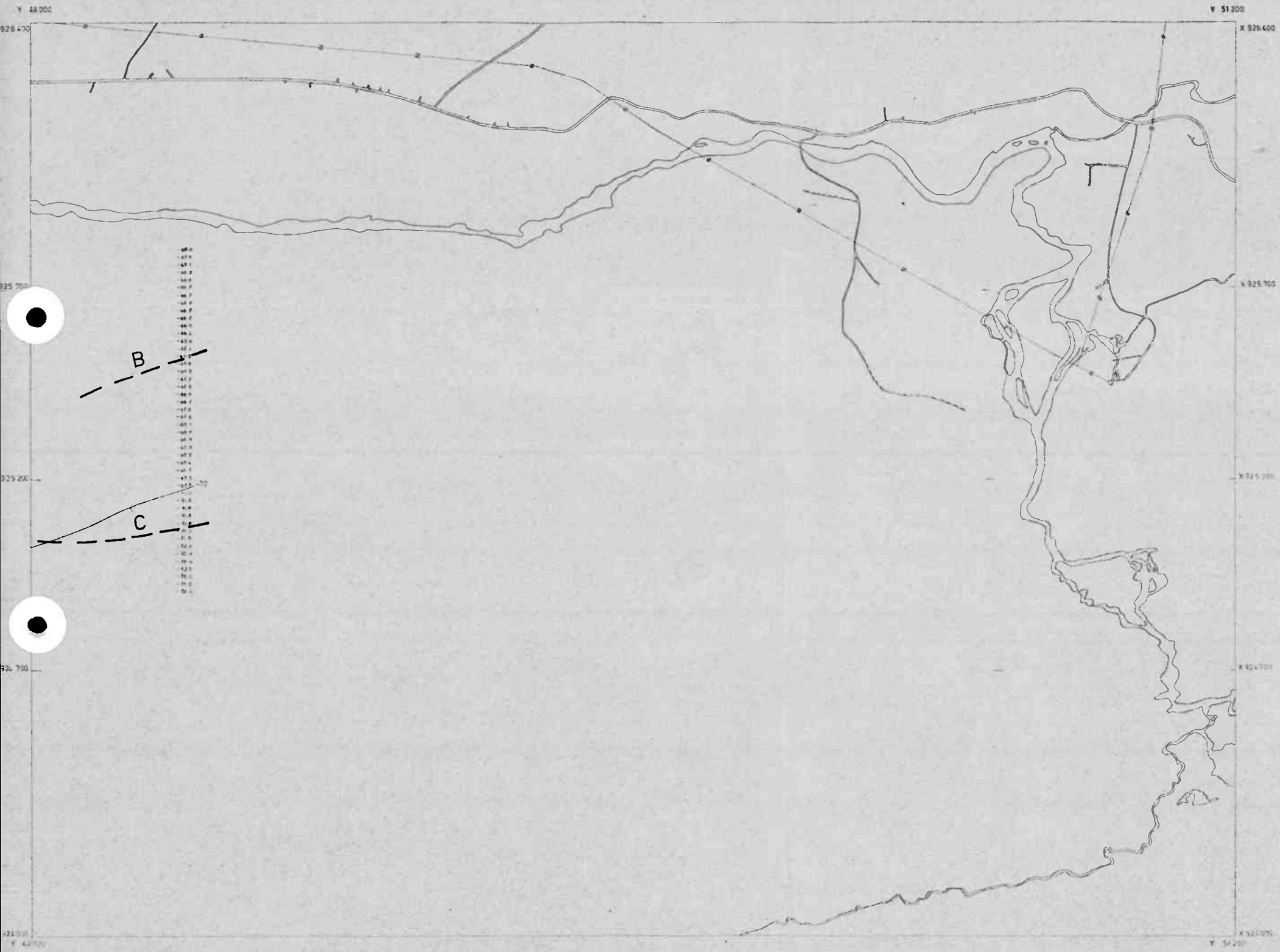

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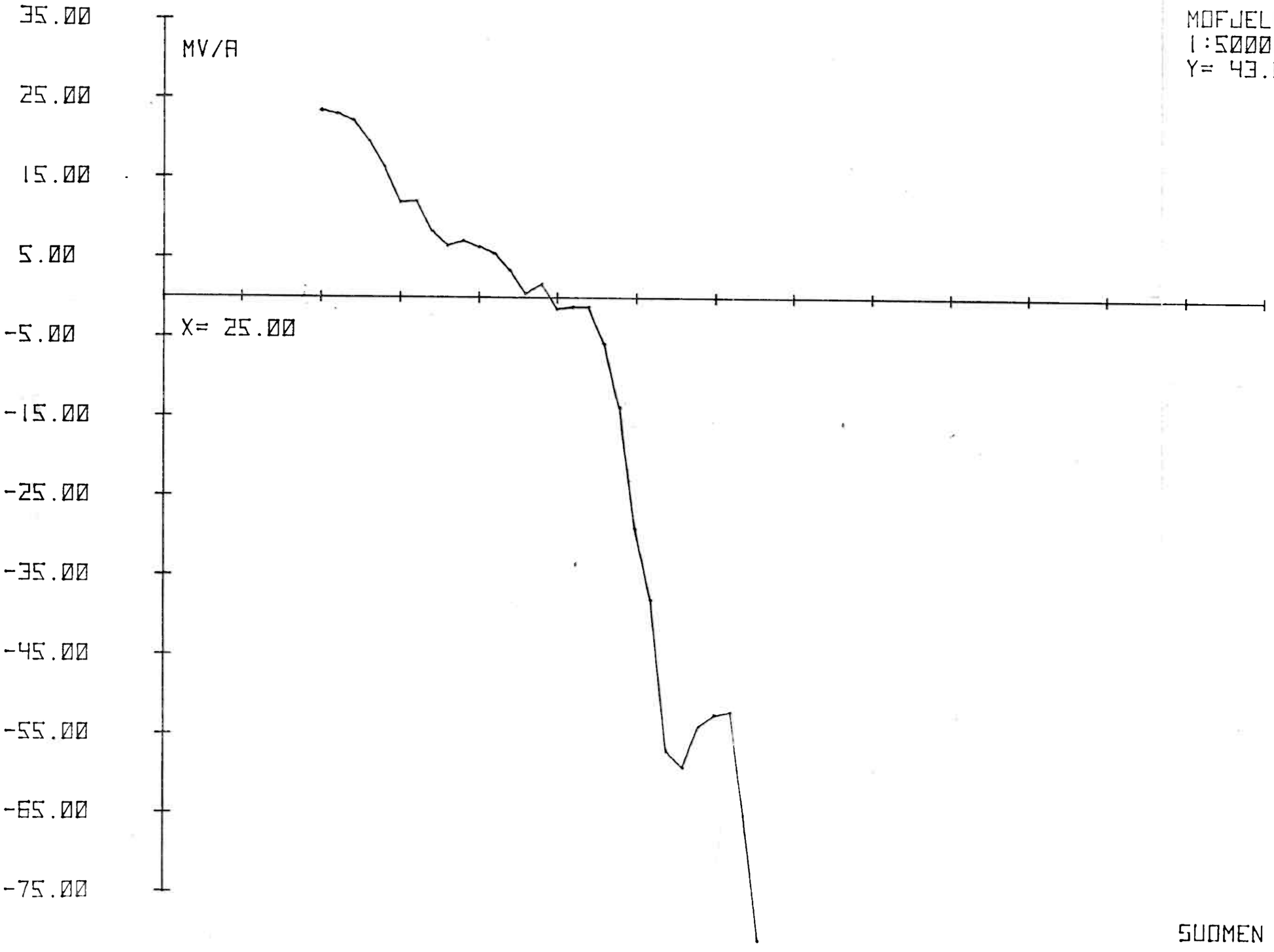
Y= 43.60



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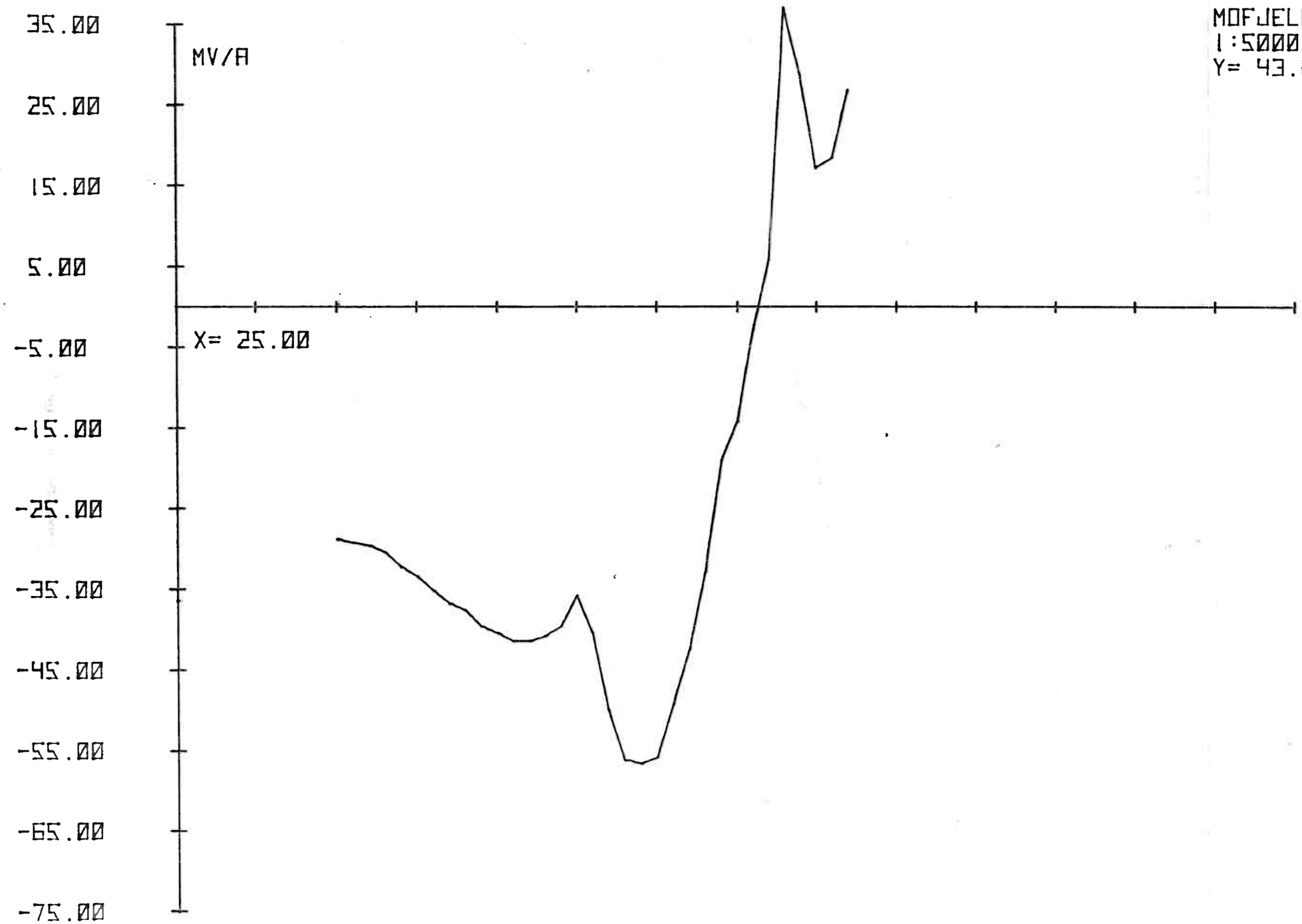

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Y= 43.80

SUOMEN MALMI OY

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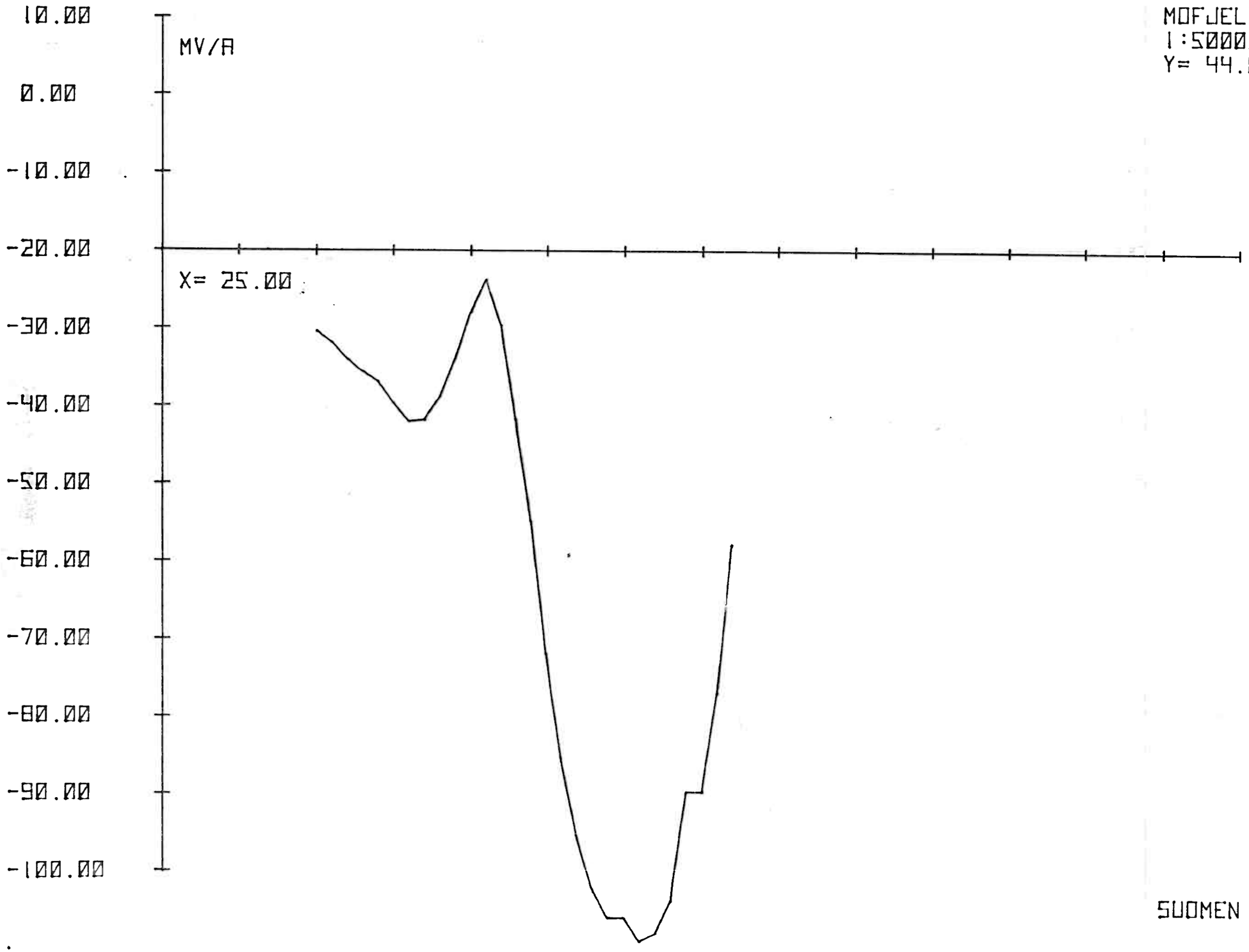

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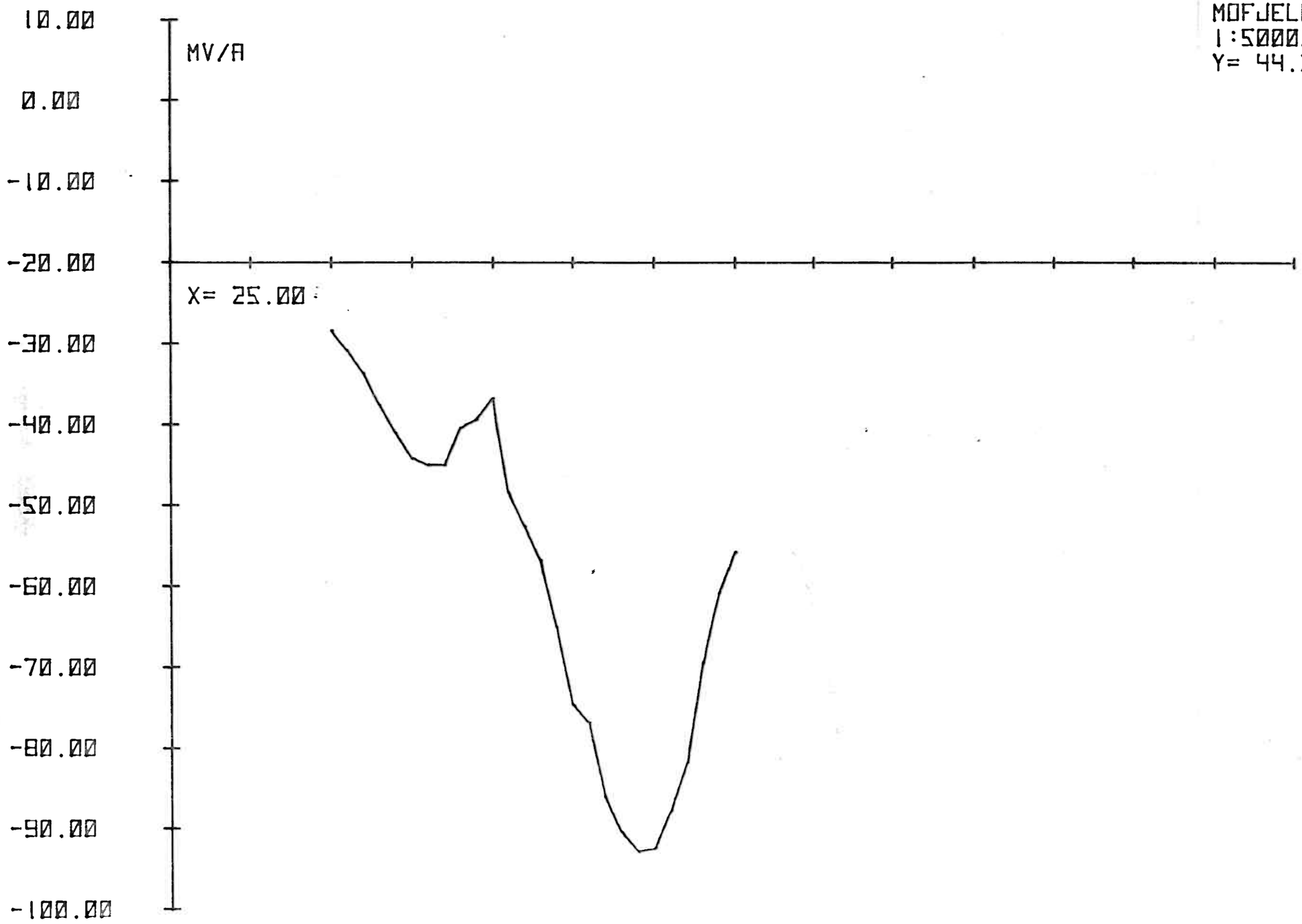

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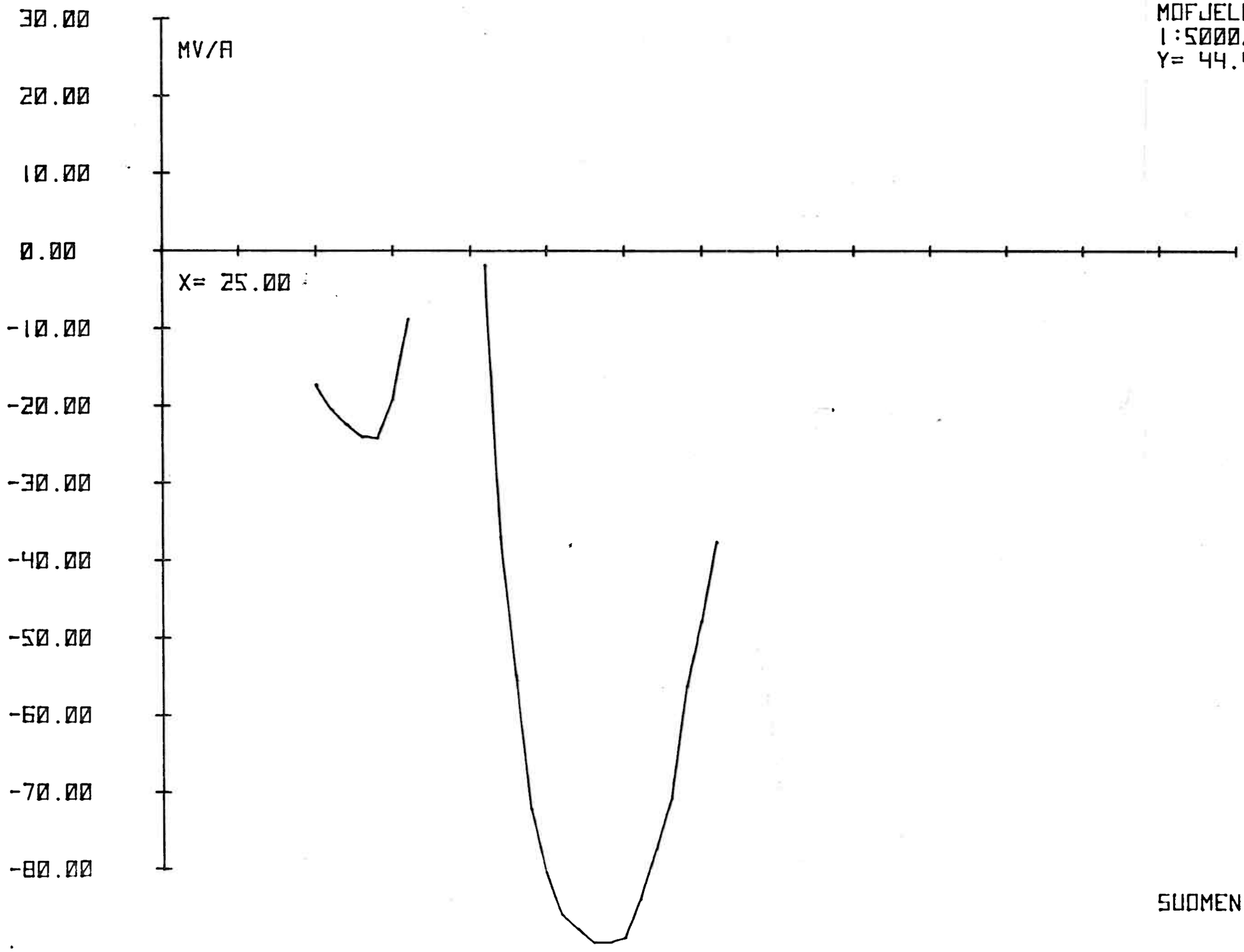

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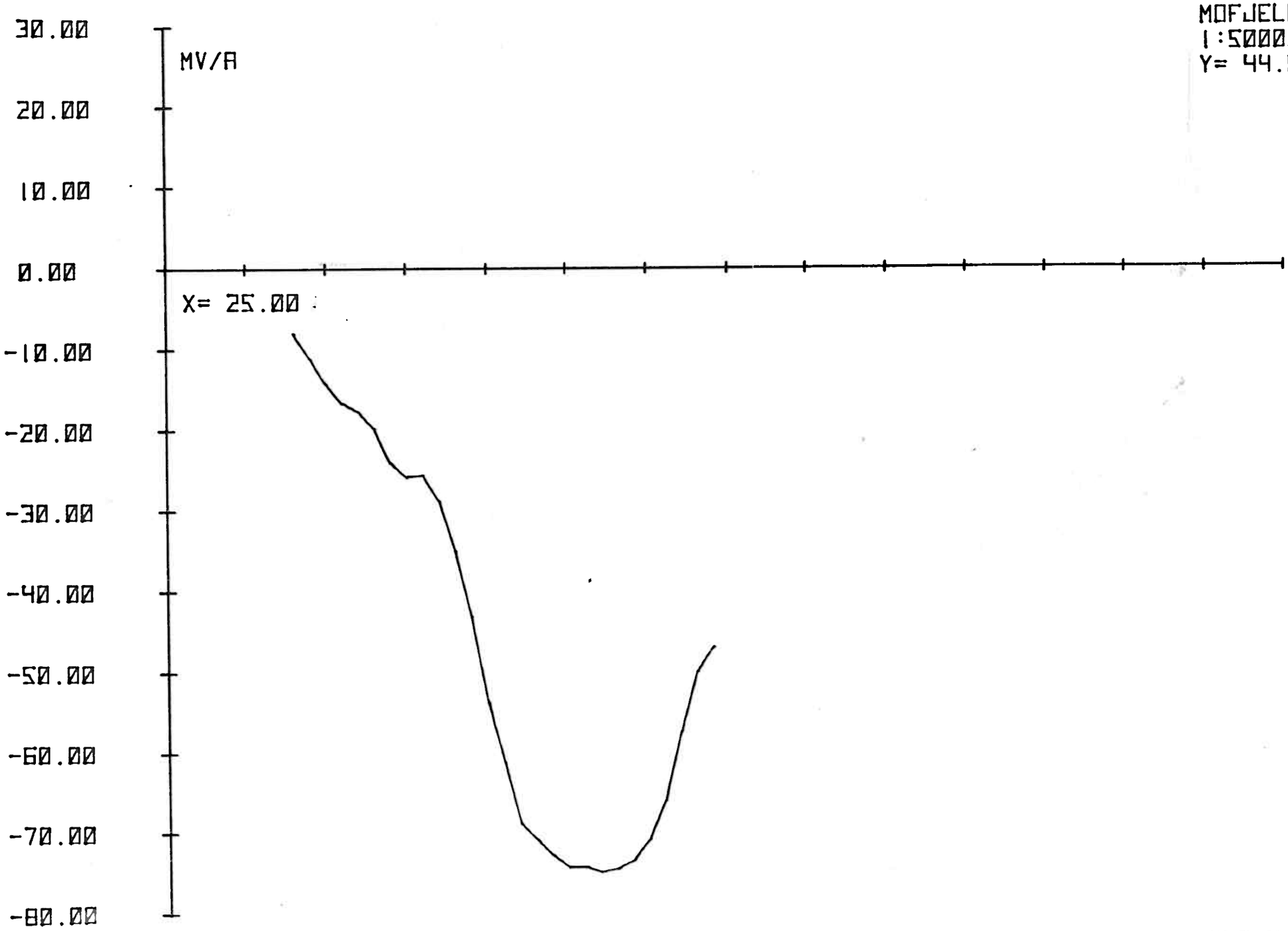

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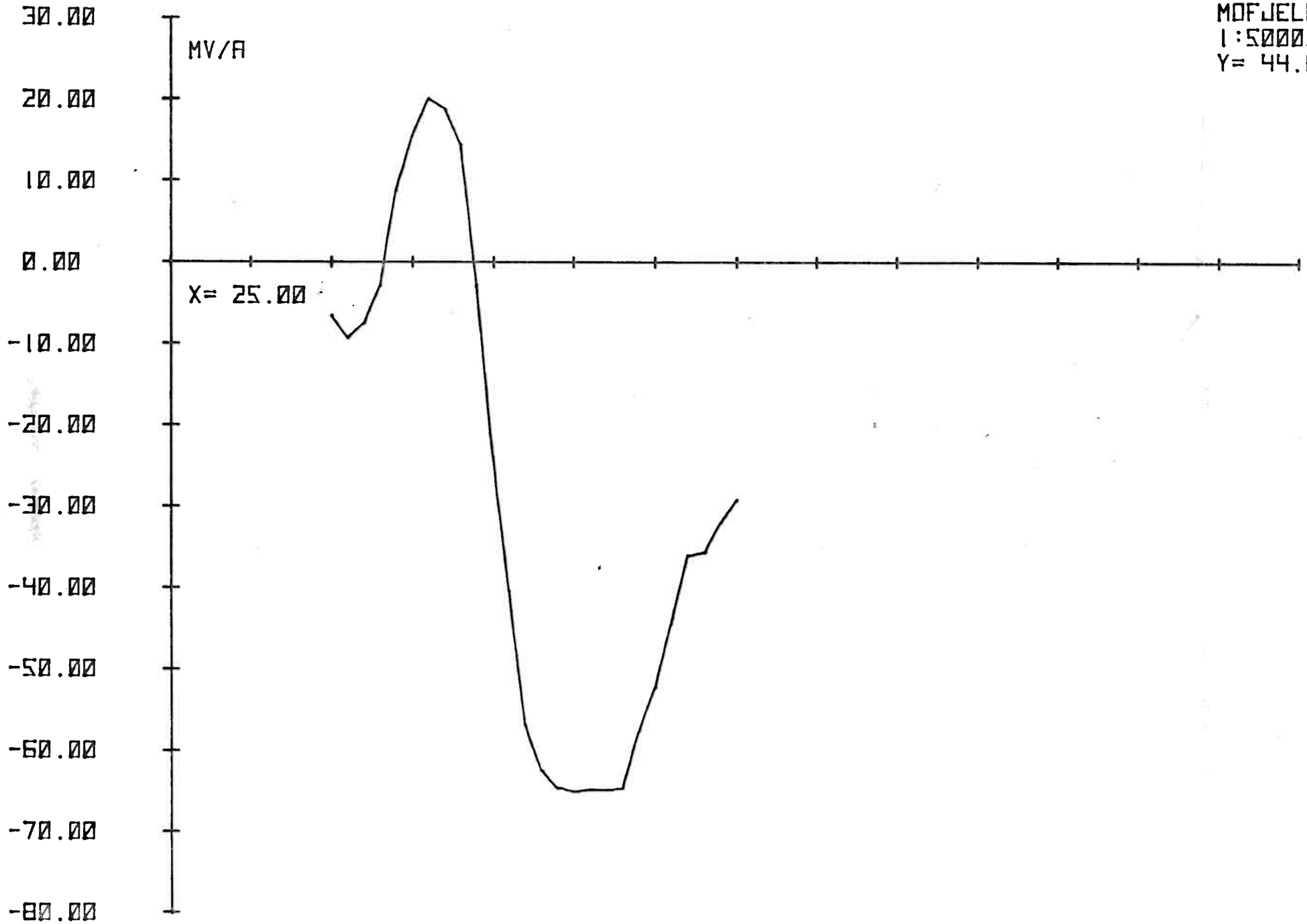

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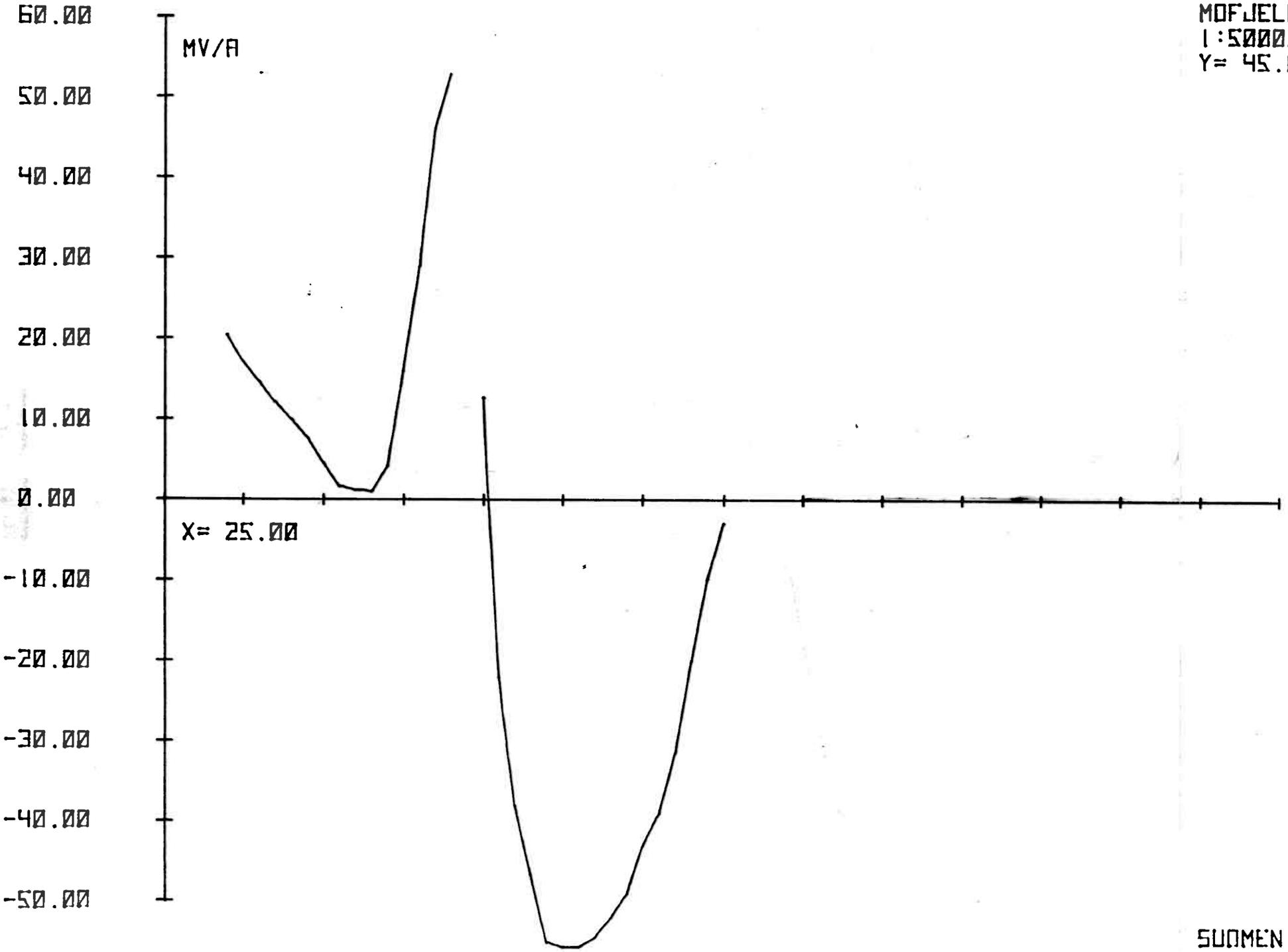

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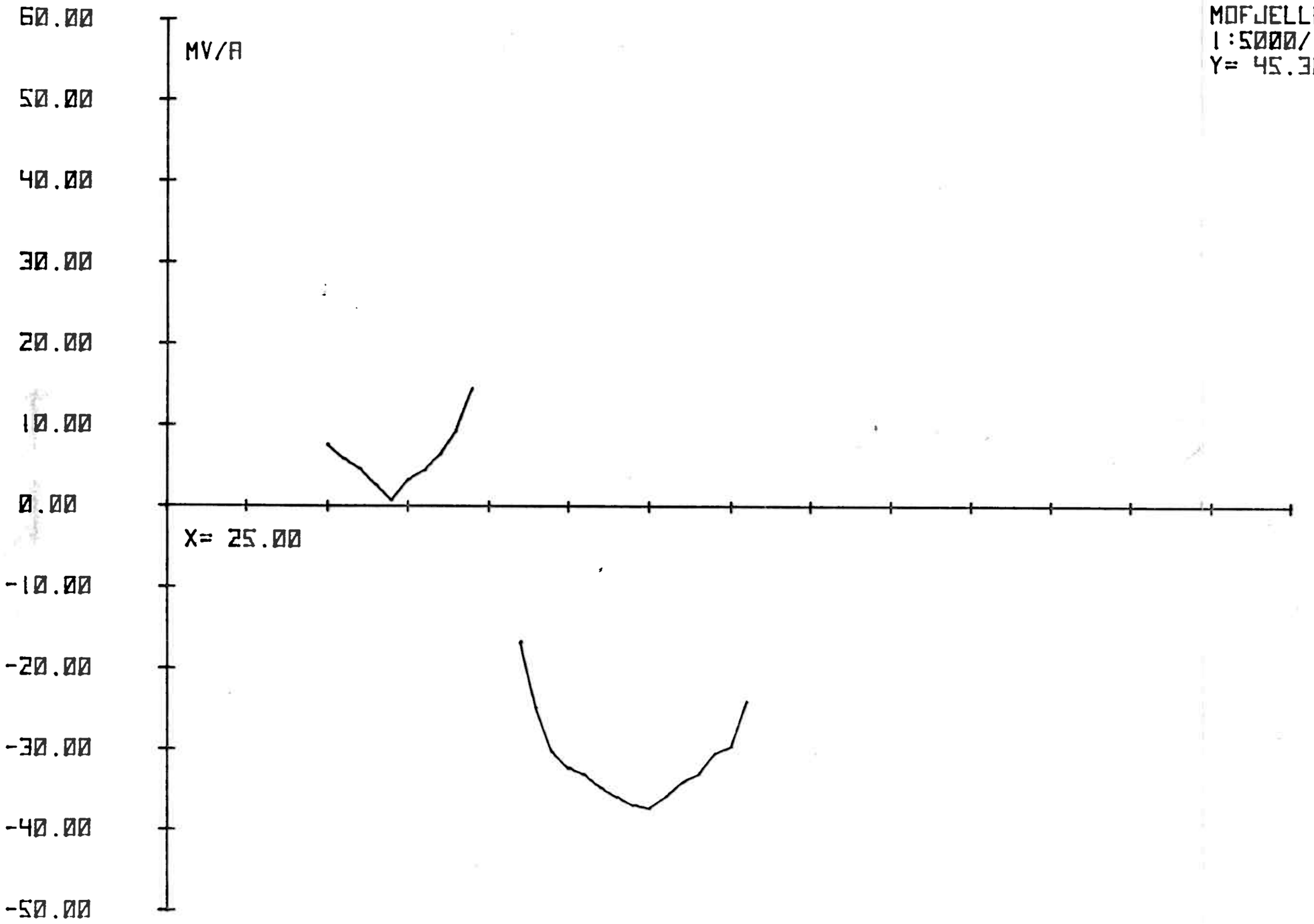

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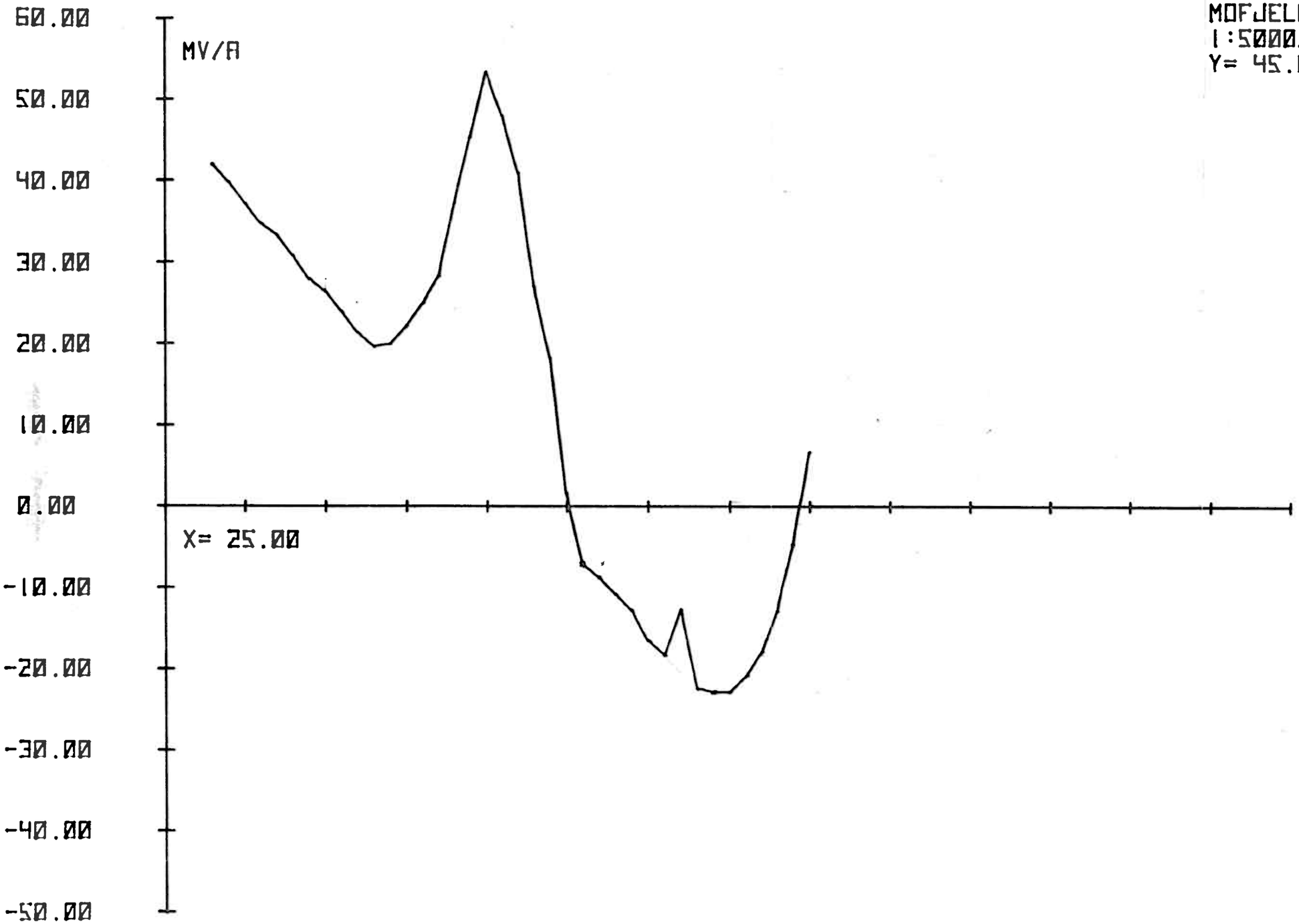

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Y= 45.60

SUOMEN MALMI OY

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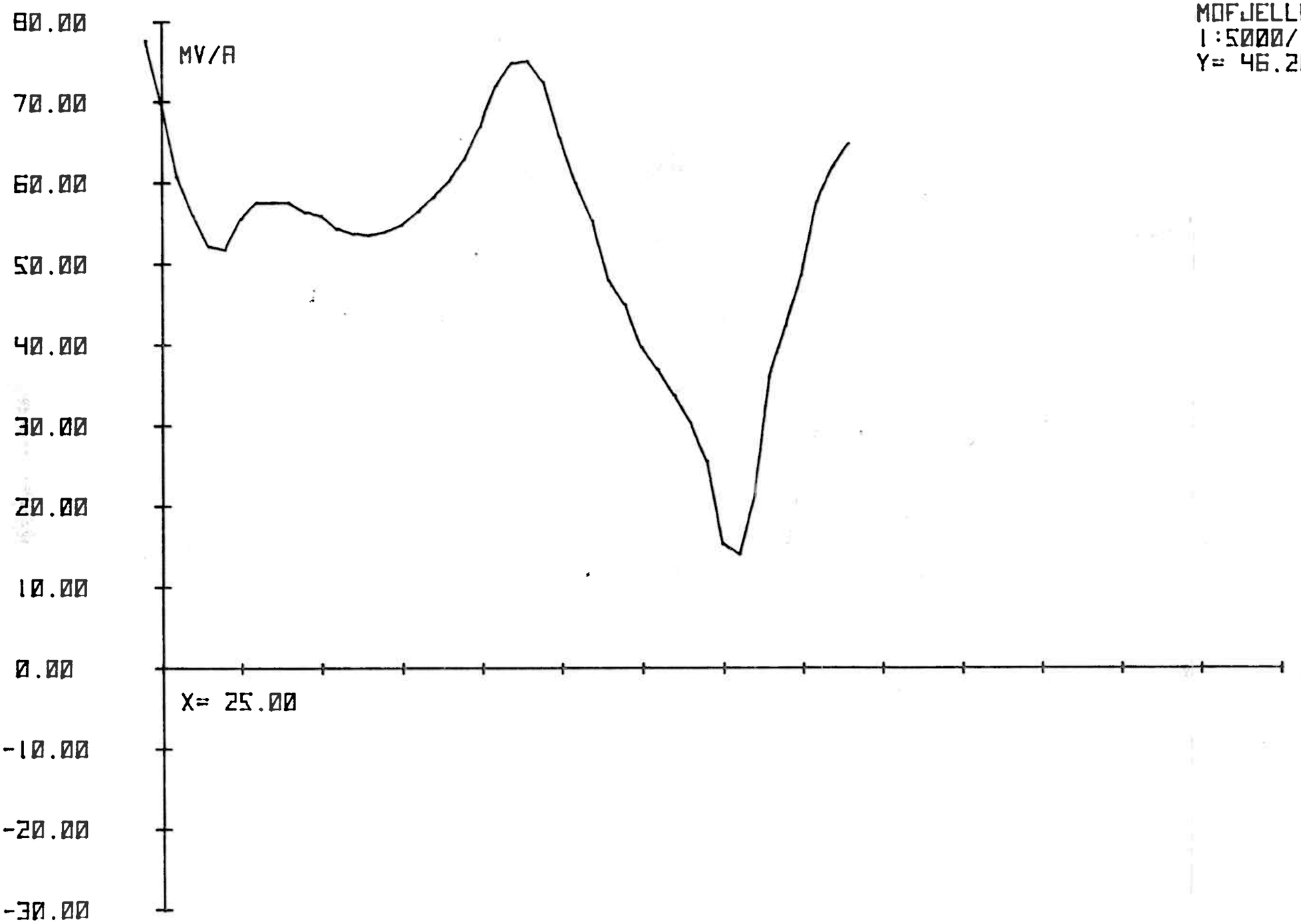

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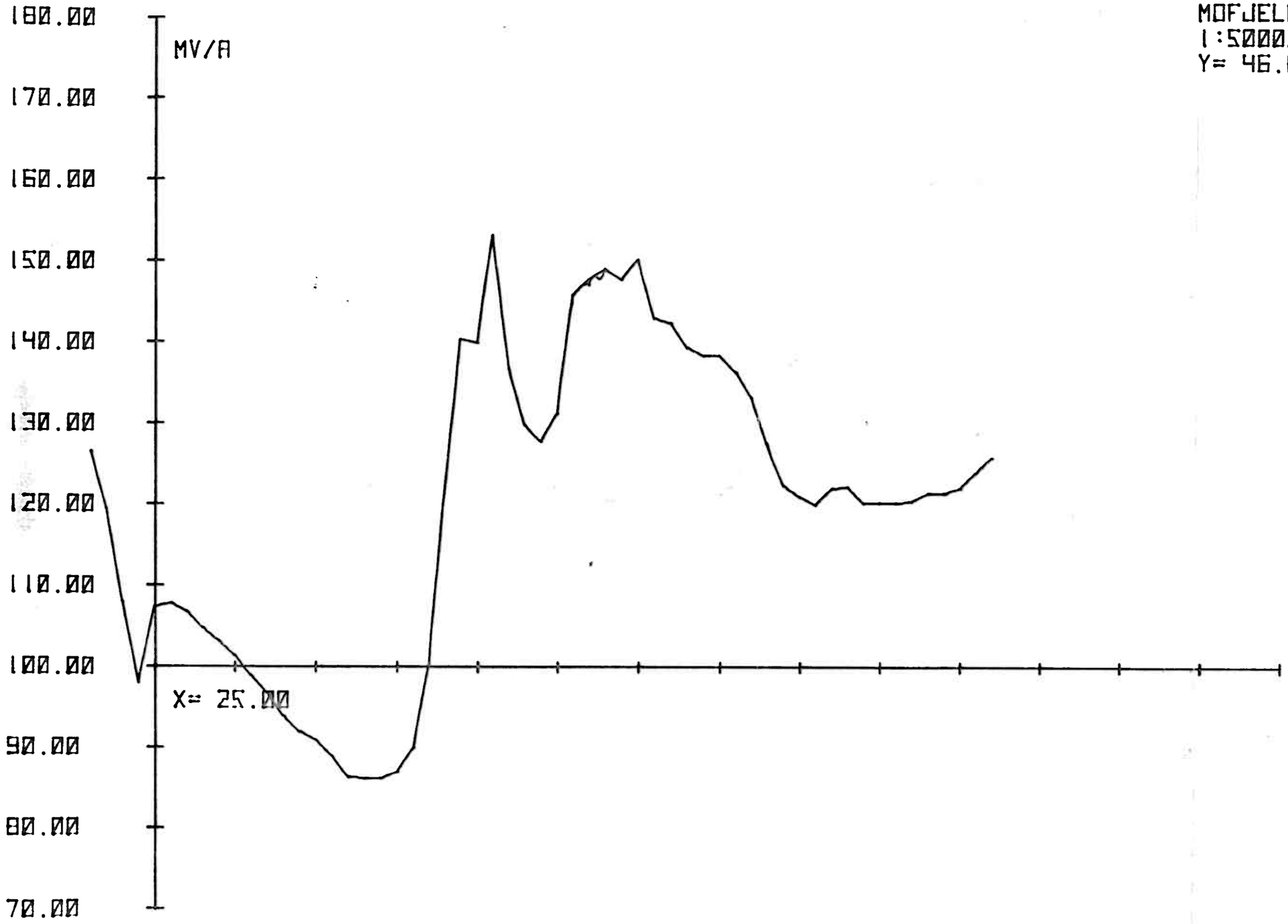

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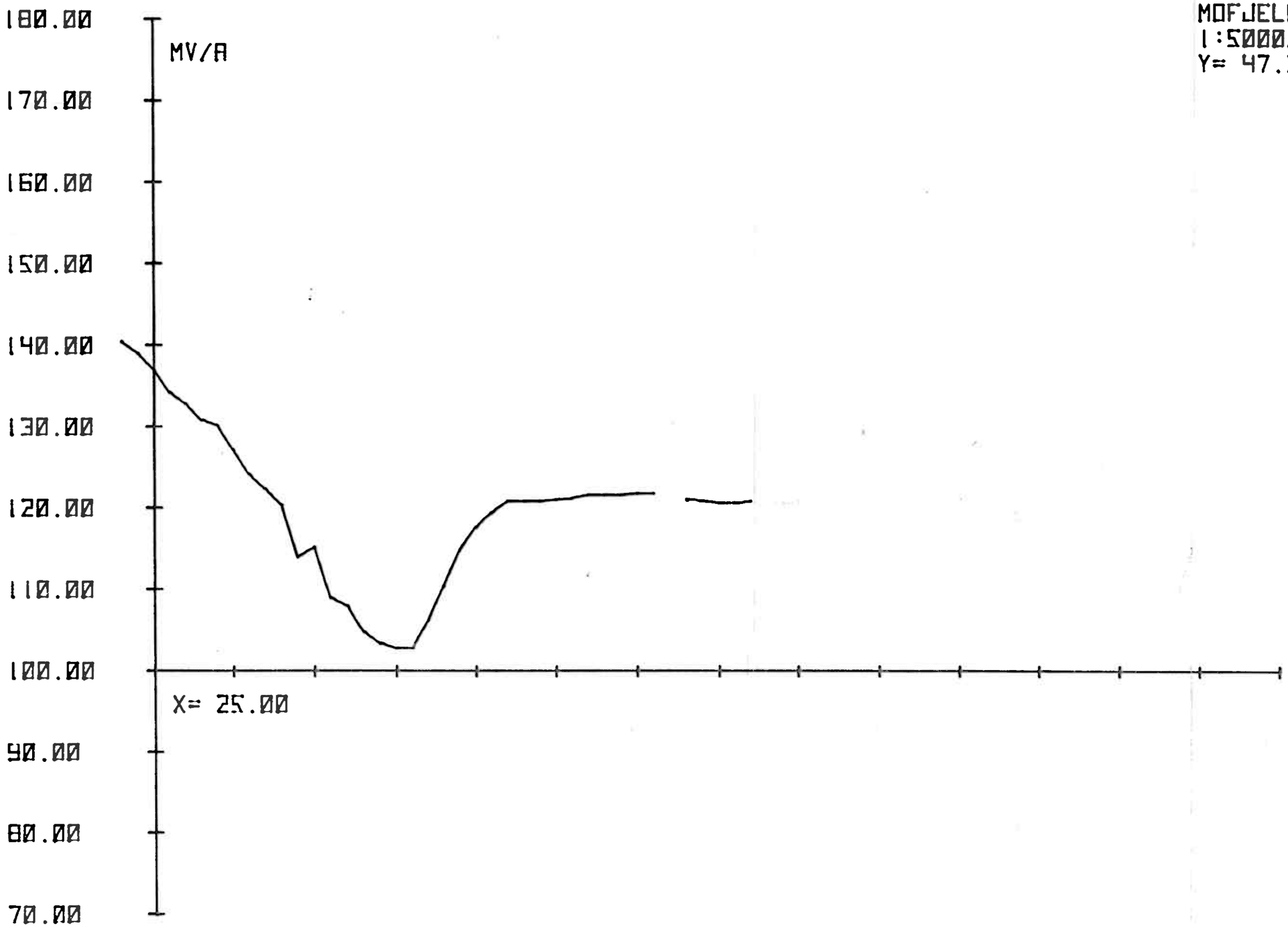

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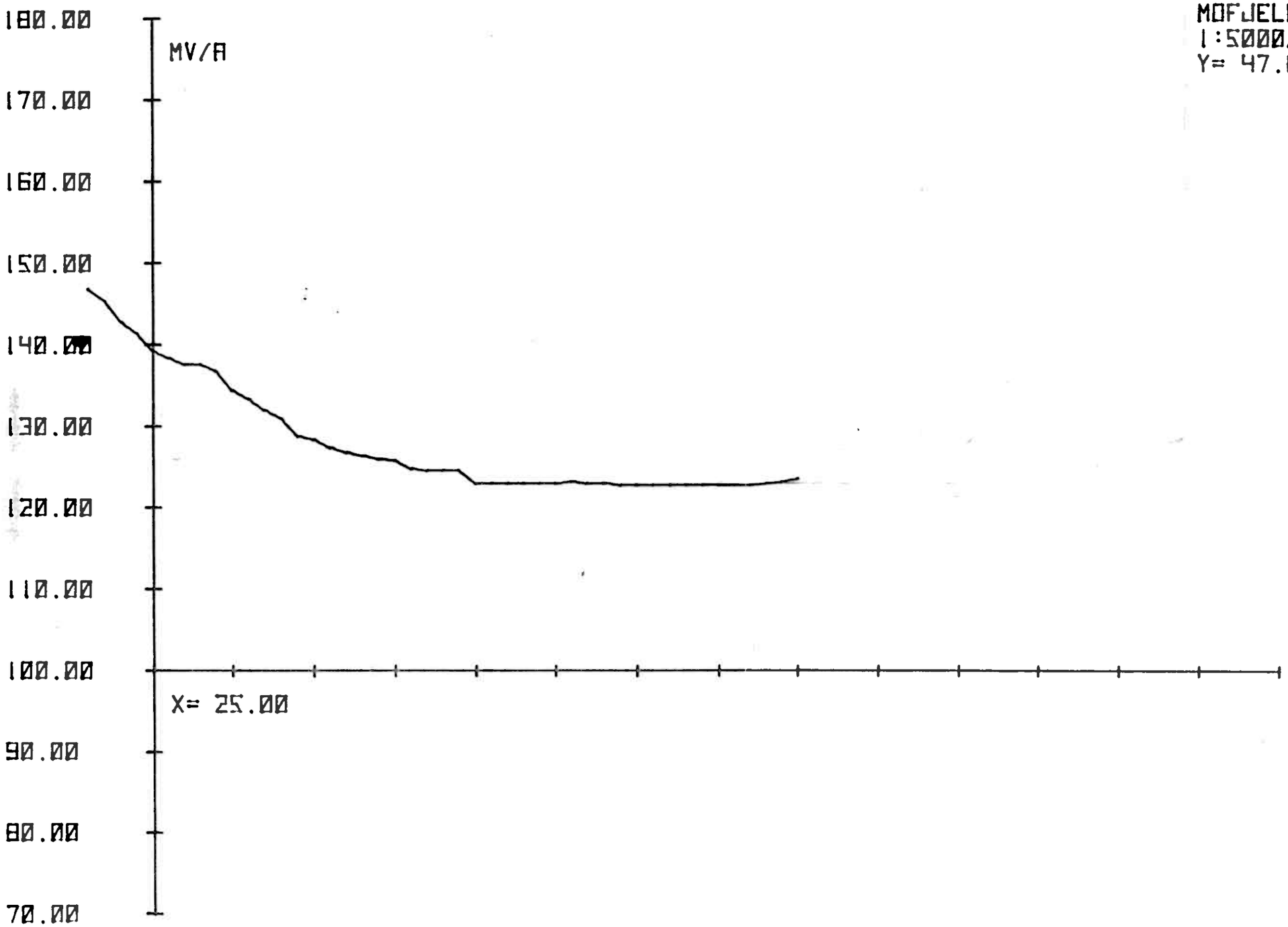

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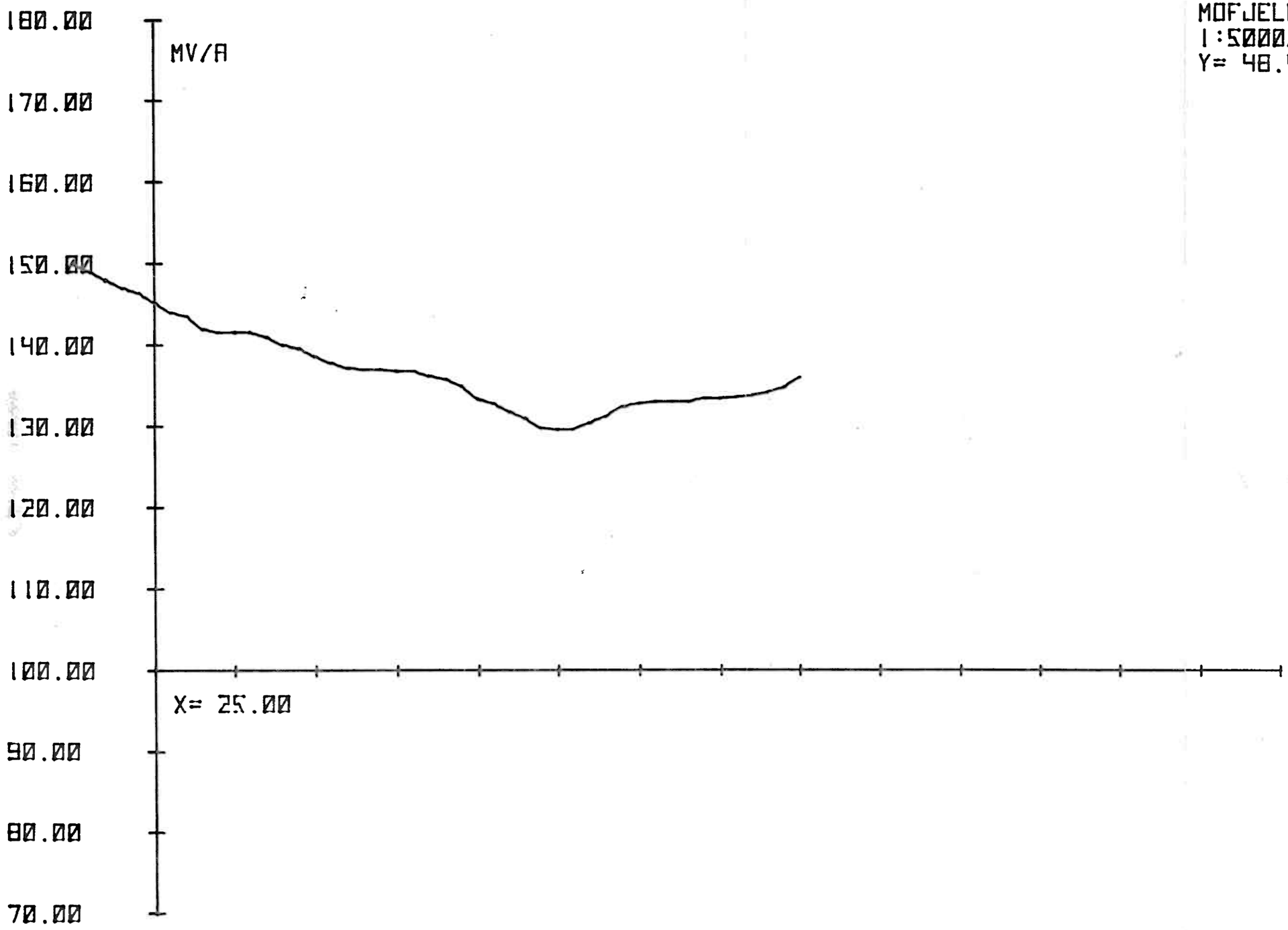

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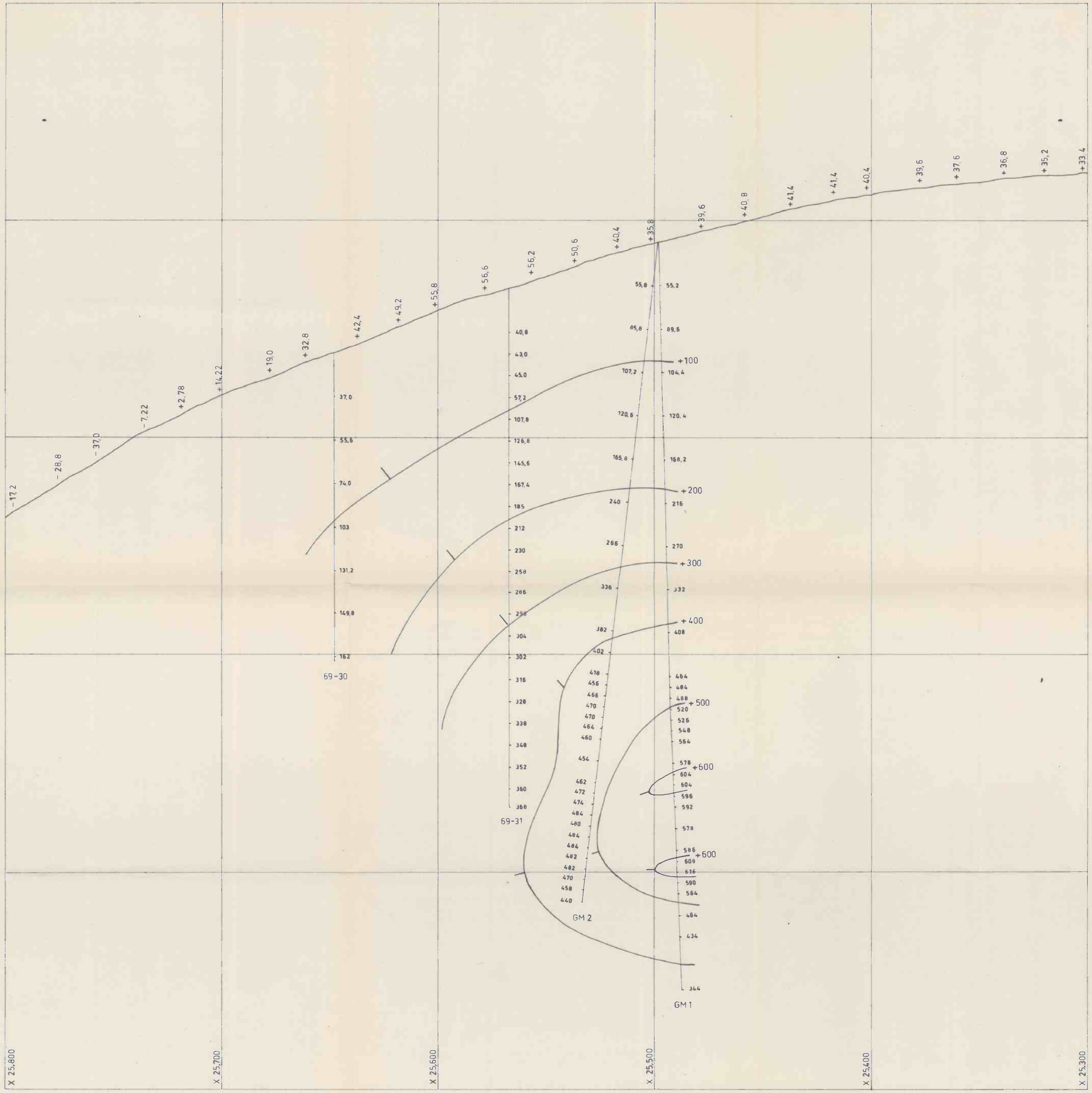

Current source: Ore lense II, BH 372

Potential referencepoint: X 25,48 Y 43,55

Contours: +100, 200, 300, 400, 500, 600 mV/A

Current 1A

Distant grounding: X 21,98 Y 41,93

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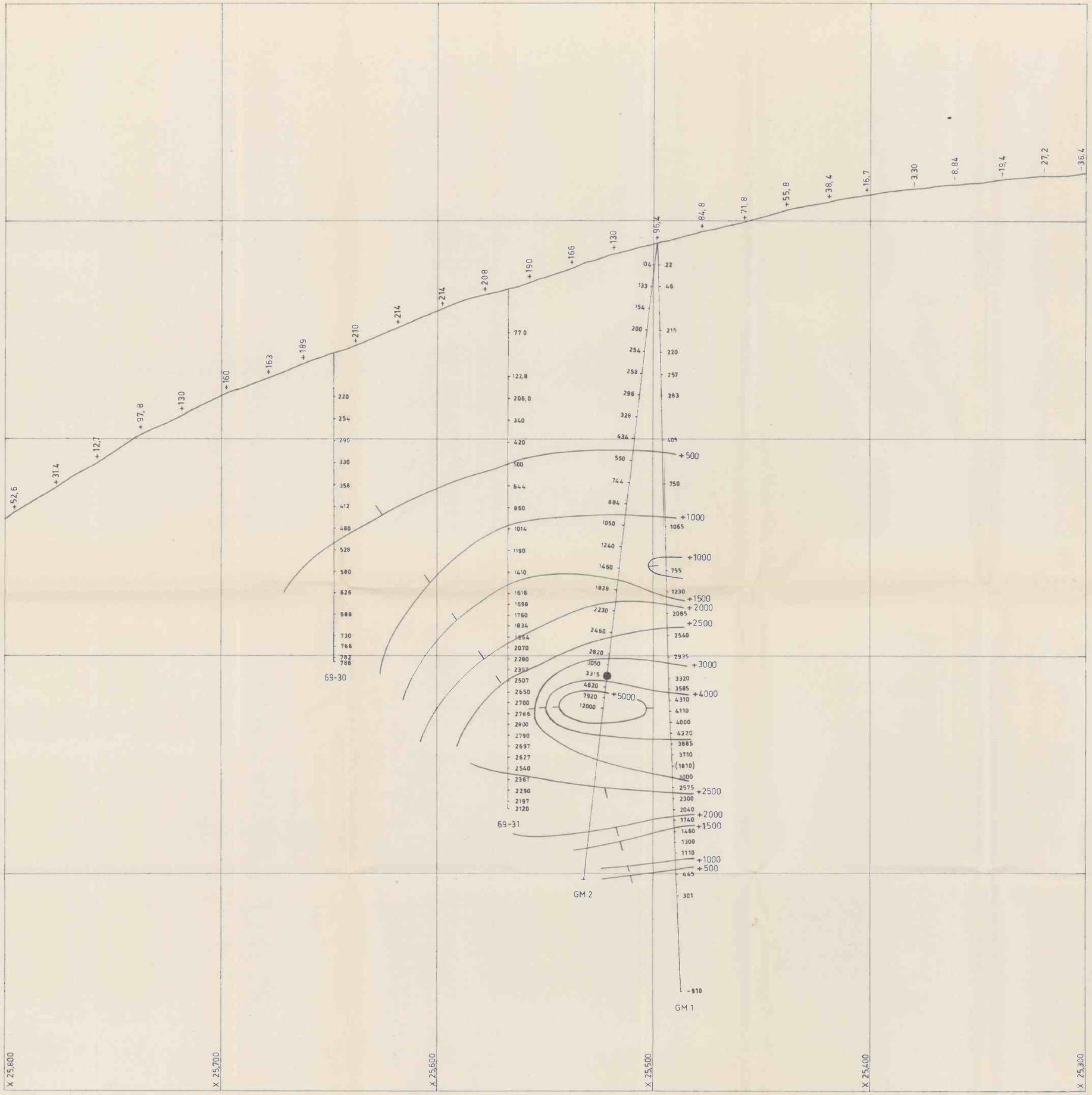
		insp.	PM	11.75
Charged potential map				
MOFJELLET				



Current source: Ore lense II, GM 2-220 m

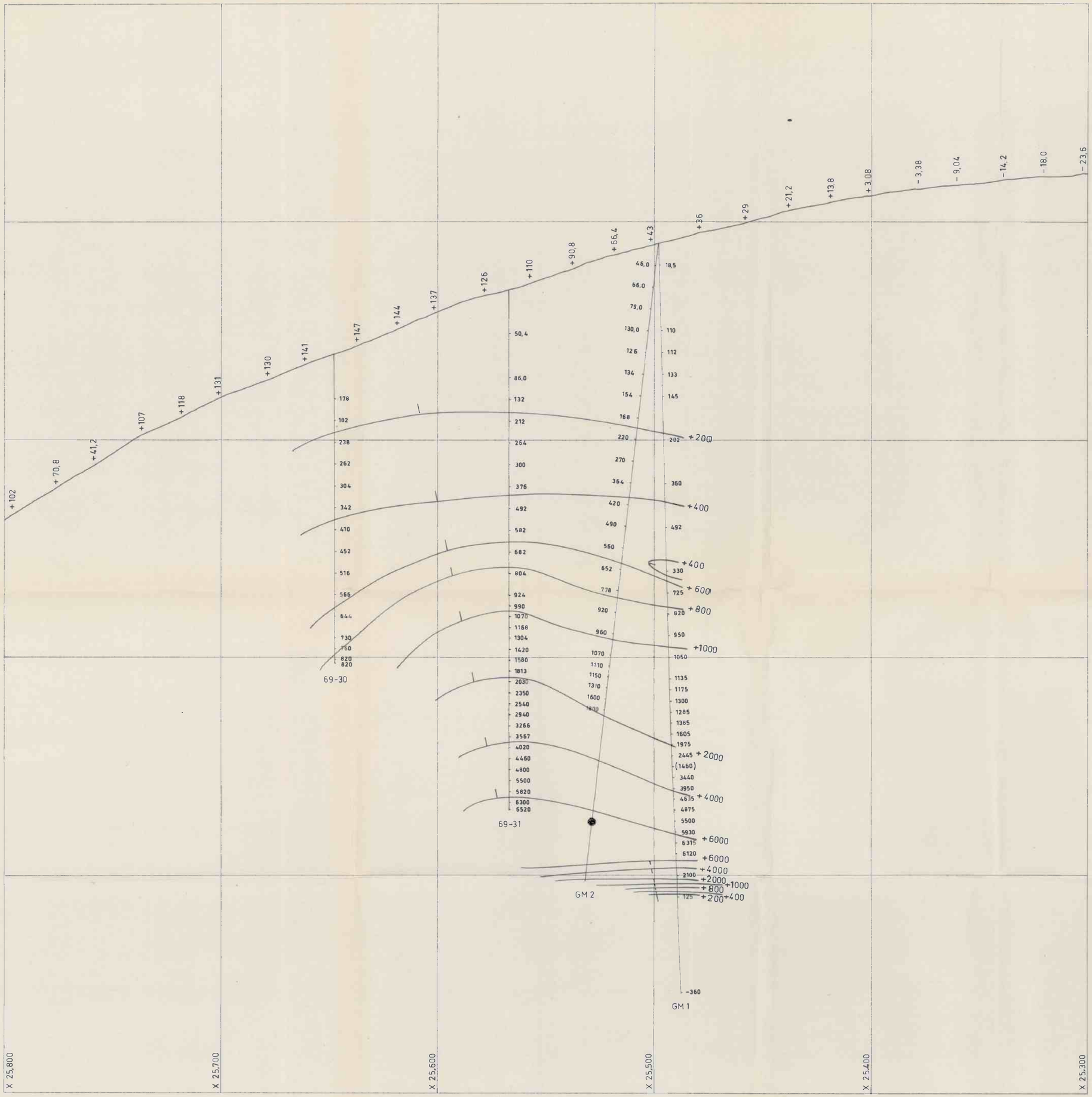
Potential referencepoint: X 25,33 Y 43,87

Contours: +500, 1000, 1500, 2000, 2500, 3000, 4000, 5000 mV/A

Current 1 A

Distant grounding: X 21,98 Y 41,93

SUOMEN MALMI OY	1 : 1000	meas.	TK	5.75
		draw.	MM	11.75
		insp.	PM	11.75
Charged potential map				
MOFJELLET				



Current source: Ore lense III, GM 2 - 267 m

Potential referencepoint: X 25,33 Y 43,87

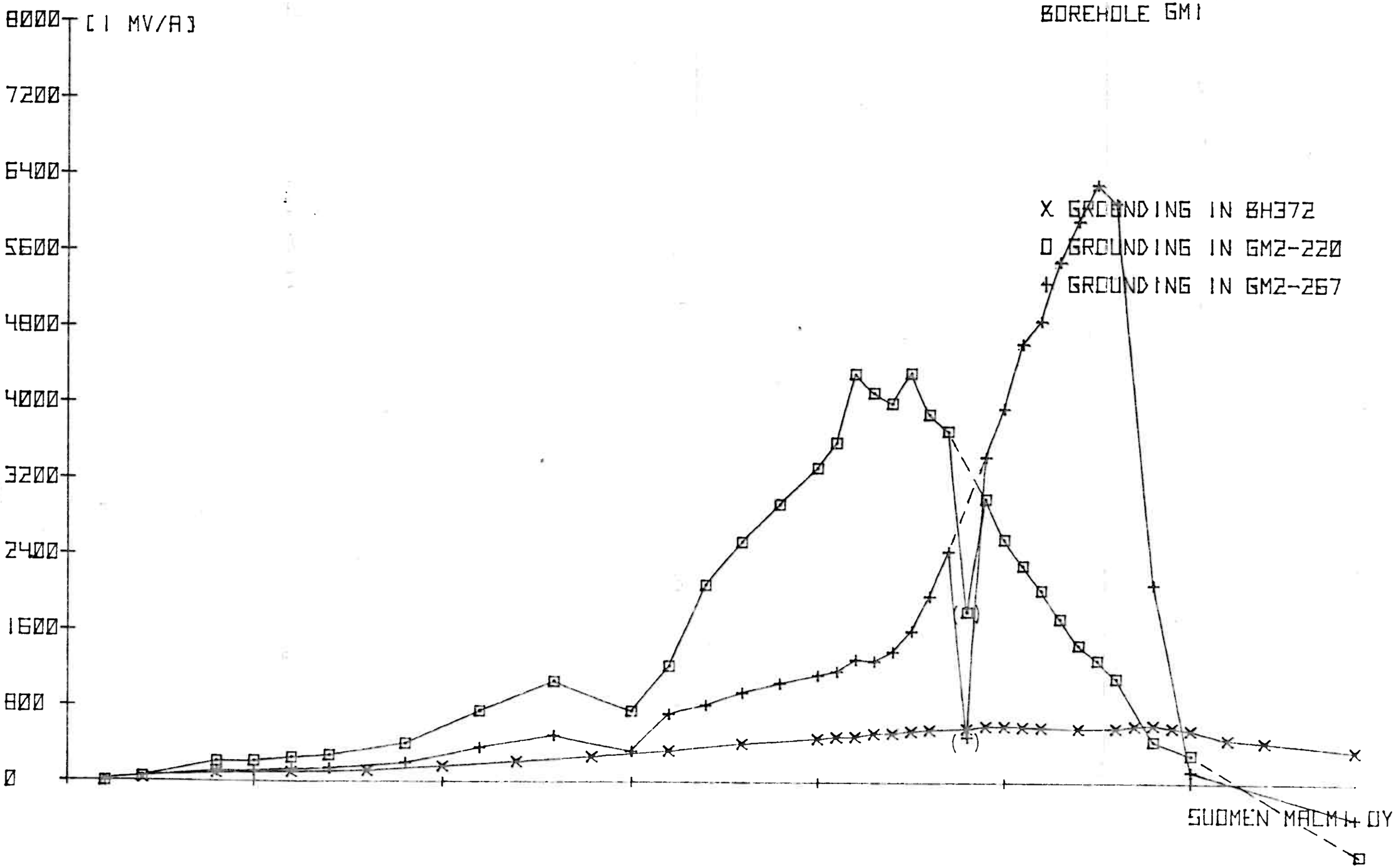
Contours: +200, 400, 600, 800, 1000, 2000, 4000, 6000 mV/A

Current 1A

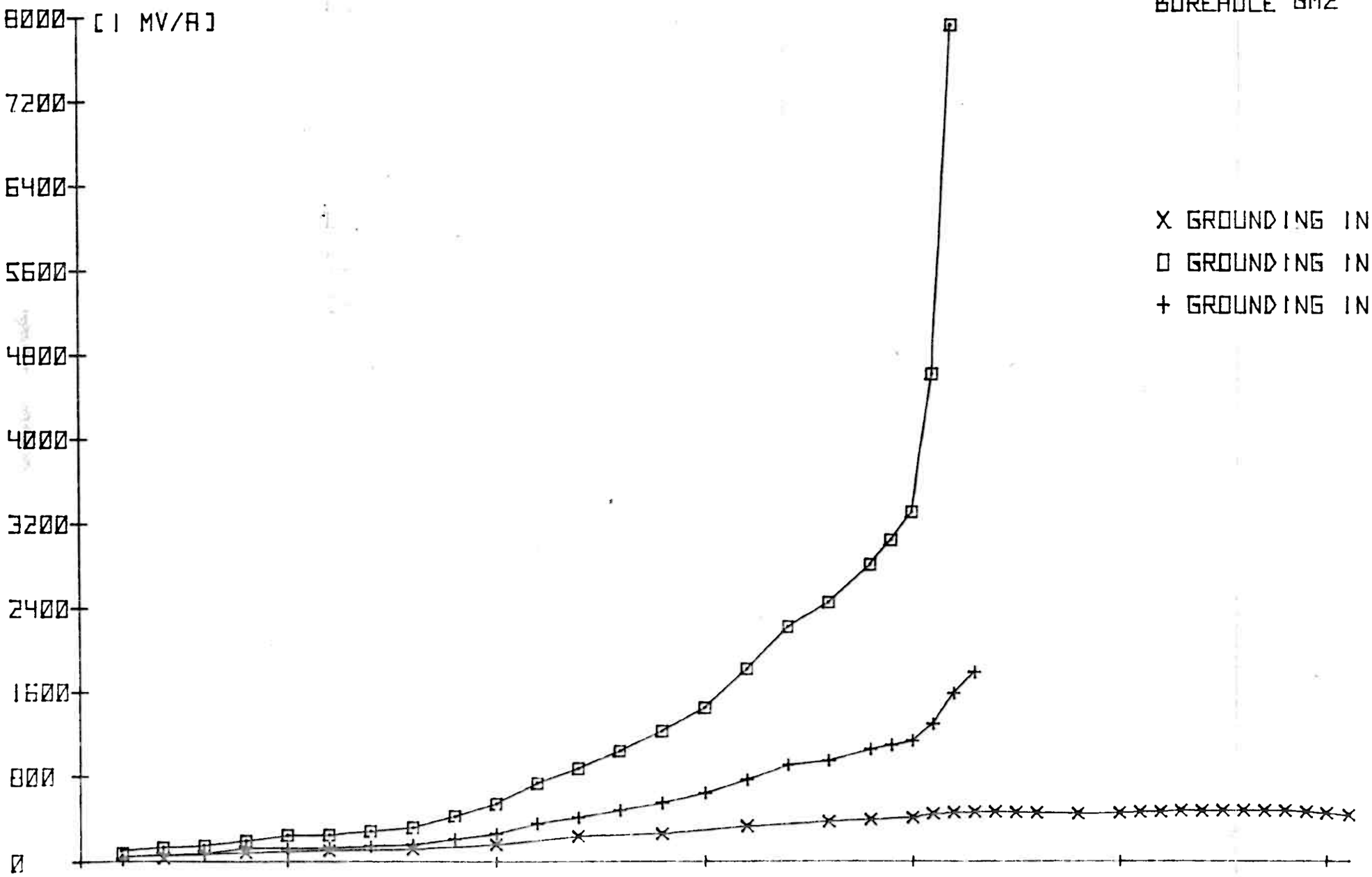
Distant grounding: X 21,98 Y 41,93

SUOMEN MALMI OY	1:1000	meas.	TK	5.75
		draw.	MM	11.75
		insp.	PM	11.75
Charged potential map				
MOFJELLET				

CHARGED POTENTIAL PROFILE
MOFJELLET / MAY 1975
SCALE 1 TO 1000
BOREHOLE GM1



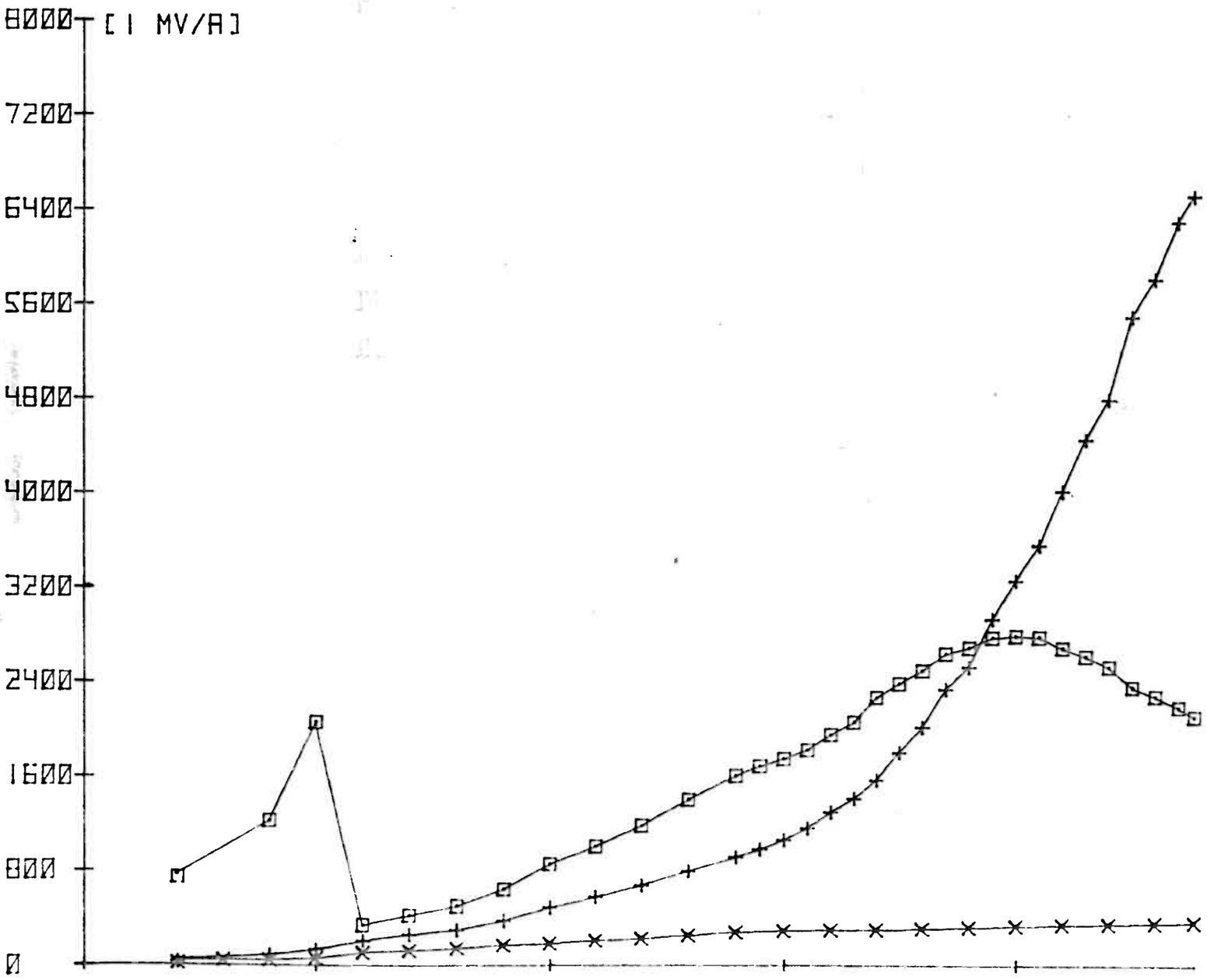
CHARGED POTENTIAL PROFILE
MOFJELLET / MAY 1975
SCALE 1 TO 1000
BOREHOLE GM2



X GROUNDING IN BH372
□ GROUNDING IN GM2-220
+ GROUNDING IN GM2-267

SUOMEN MALMI OY

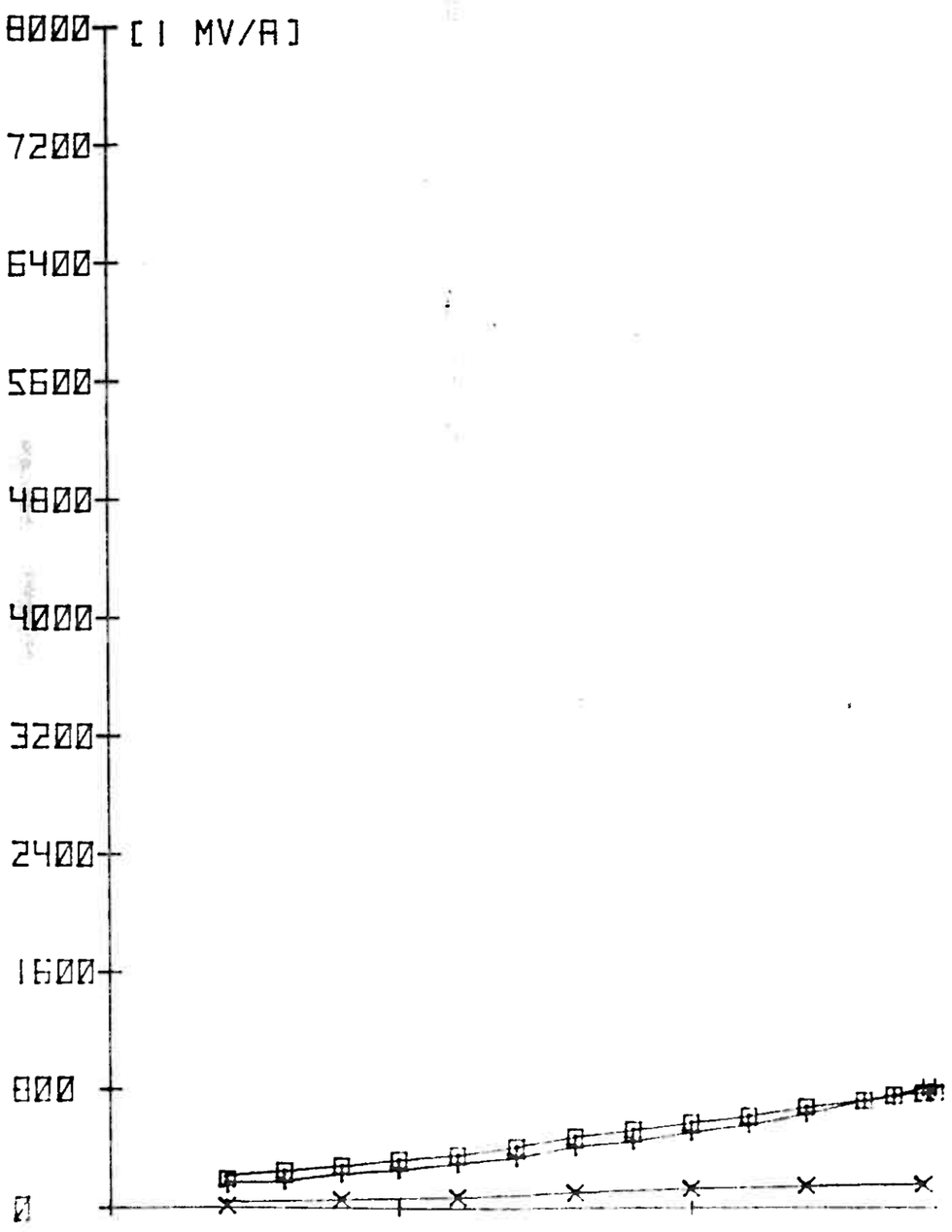
CHARGED POTENTIAL PROFILE
MOFJELLET / MAY 1975
SCALE 1 TO 1000
BOREHOLE 69-31



X GROUNDING IN BH372
□ GROUNDING IN GM2-220
+ GROUNDING IN GM2-267

SUOMEN MALMI OY

CHARGED POTENTIAL PROFILE
MOFJELLET / MAY 1975
SCALE 1 TO 1000
BOREHOLE 69-30



X GROUNDING IN BH372

□ GROUNDING IN GM2-220

+ GROUNDING IN GM2-267

MOFJELLET-CP/MAY 1975
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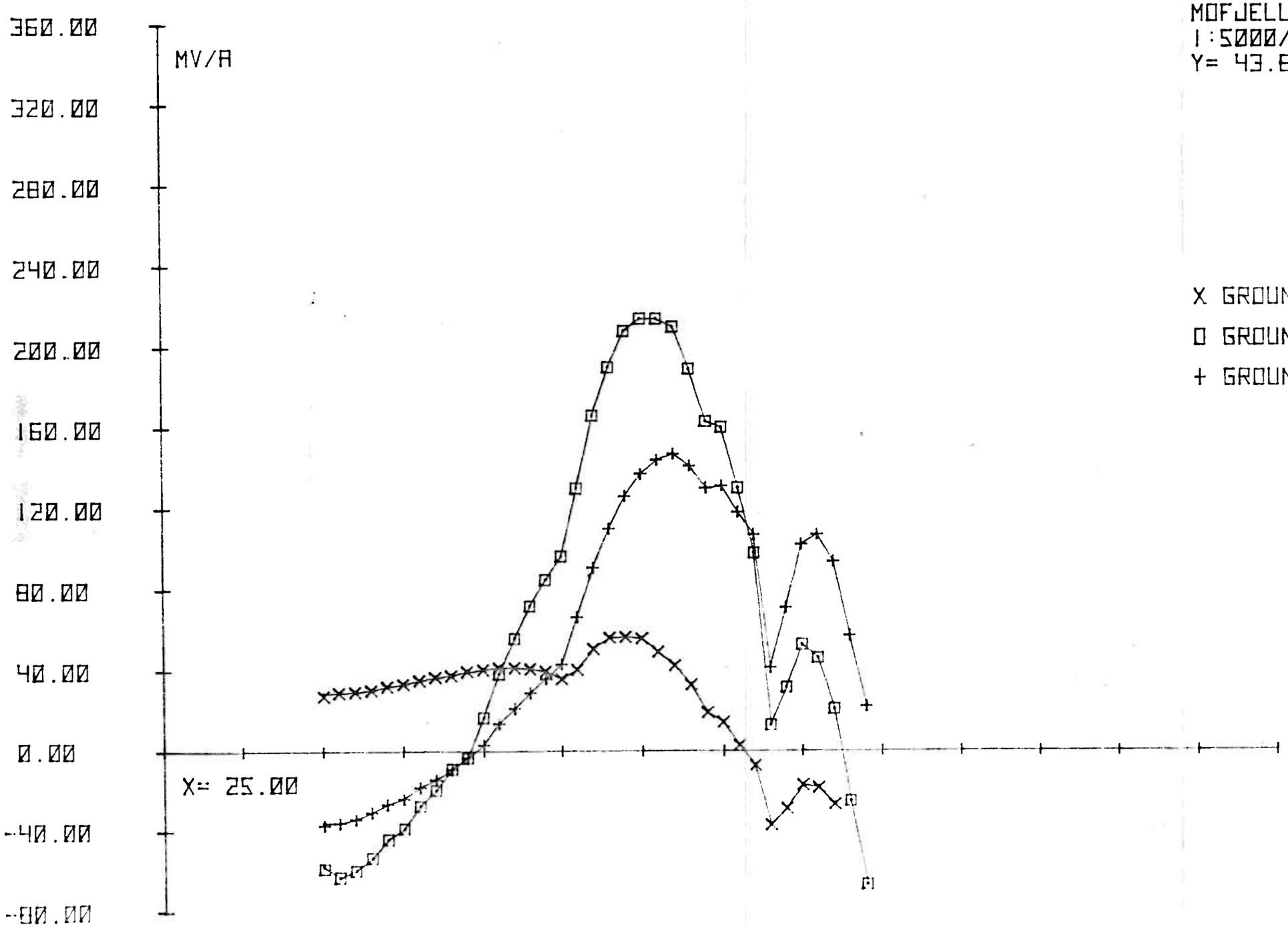
Y= 43.80



X GROUNDING IN BH372
□ GROUNDING IN GM2-220
+ GROUNDING IN GM2-267

SUOMEN MALMI OY