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Datum/Date                      Beteckning/Reference                      Sida/Page  
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## Environmental test of traffic radar

(2 appendices)

### 1 Client

Sensys Traffic AB, Box 3169, 550 03 Jönköping, Sweden.

### 2 Test items

1 piece of SENSYS 240, number 10-0008 Rev. D, serial number E5BACB020000.

### 3 Commission

The commission comprises environmental tests according to IEC standards.

### 4 Performance and result

#### 4.1 Functional test

Sensys Traffic delivered the functional test equipment and Joakim Lindeblom performed the functional test.

The functional test consists of a testing programme on a personal computer which communicates with the test unit via the combined power and CAN cable. The programme was running during each test when the test item was in operation and also running after each test when the test item was not in operation.

**4.2 Test order**

<i>Order</i>	<i>Test</i>	<i>Date</i>
1	Dry heat test, in operation	00-02-03 – 00-02-04
2	Dry heat test	00-02-04 – 00-02-08
3	Cold test, in operation	00-02-08 – 00-02-09
4	Cold test	00-02-10 – 00-02-14
5	Random vibration test and shock test	00-02-18
6	Damp heat cyclic test	00-02-19 – 00-02-21
7	Thermal chock test	00-02-21 – 00-02-23
8	Fall test, transport and storage	00-05-15

**4.3 Dry heat test, in operation**

Joakim Lindeblom performed the climatic test. The test was performed according to IEC 60068-2-2, test Bb.

Temperature: +55 °C / 16 hours

The test item was exposed to the temperature according to page 1 in appendix 2.

Uncertainty in temperature measurement was  $\pm 0.37$  °C.

The functional test of the test item was carried out without remarks.

**4.4 Dry heat test**

Joakim Lindeblom performed the climatic test. The test was performed according to IEC 60068-2-2, test Bb.

Temperature: +70 °C / 96 hours

The test item was exposed to the temperature according to page 2 in appendix 2.

Uncertainty in temperature measurement was  $\pm 0.37$  °C.

The functional test of the test item was carried out without remarks.

**4.5 Cold test, in operation**

Joakim Lindeblom performed the climatic test. The test was performed according to IEC 60068-2-1, test Ab.

Temperature: -30 °C / 16 hours

The test item was exposed to the temperature according to page 3 in appendix 2.

Uncertainty in temperature measurement was  $\pm 0.37$  °C.

The functional test of the test item was carried out without remarks.

**4.6 Cold test**

Joakim Lindeblom performed the climatic test. The test was performed according to IEC 60068-2-1, test Ab.

Temperature: -40 °C / 96 hours

The test item was exposed to the temperature according to page 4 in appendix 2.

Uncertainty in temperature measurement was  $\pm 0.37$  °C.

The functional test of the test item was carried out without remarks.

#### 4.7 Random vibration test

Joakim Lindeblom performed the vibration test. The test was performed according to IEC 60068-2-64, test Fh.

Frequency range: 10 - 500 Hz

ASD:

10 - 20 Hz: 0.05 g<sup>2</sup> / Hz

20 - 500 Hz: -3 dB / octave

Duration: 30 minutes / axes, 3 orthogonal axes

Uncertainty in acceleration measurement was  $\pm 3.2$  %.

Uncertainty in frequency measurement was  $\pm 0.5$  Hz, (5 Hz – 100 Hz) and 0.5 %, (100 Hz – 12.8 kHz.)

The functional test of the test item was carried out without remarks.

#### 4.8 Shock test

Joakim Lindeblom performed the shock test. The test was performed according to IEC 60068-2-29, test Eb.

Peak Acceleration: 25 g

Pulse duration: 6 ms half sinusoidal

Number of shocks: 500 positive and 500 negative shocks in each of three orthogonal axes.

Uncertainty in acceleration measurement was  $\pm 3.2$  %.

Uncertainty in frequency measurement was  $\pm 0.5$  Hz, 5 Hz – 100 Hz and 0.5 %, 100 Hz – 12.8 kHz.

The functional test of the test item was carried out without remarks.

#### 4.9 Damp heat cyclic test, two cycles

Joakim Lindeblom performed the climatic test. The test was performed according to IEC 60068-2-30, test Db.

Temperature: 25 / 40 °C

Humidity: 98 / 93 % Rh

Duration: 12 + 12 hour

Number of cycles: 2

The test item was exposed to the temperature and humidity according to page 5 and 6 in appendix 2.

Uncertainty in temperature measurement was  $\pm 0.37$  °C.

Uncertainty in humidity measurement was  $\pm 1.6$  % Rh.

The functional test of the test item was carried out without remarks.

#### 4.10 Thermal chock test

Joakim Lindeblom performed the climatic test. The test was performed according to IEC 60068-2-14, test Nb.

Temperatures: -40 / 30 °C  
Duration: 3 hour in each temperature  
Temperature change: 1 °C / min  
Number of cycles: 5

The test item was exposed to the temperature according to page 7 in appendix 2.

Uncertainty in temperature measurement was  $\pm 0.37$  °C.

The functional test of the test item was carried out without remarks.

#### 4.11 Fall test, transport and storage

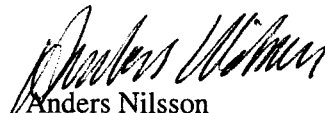
Joakim Lindeblom performed the fall test. The test was performed according to IEC 60068-2-32, test Ed, procedure 1.

Number of falls: 2 falls on the bottom on the transport case  
Test surface: Concrete  
Height of fall: 100 mm  
Test set up is shown in Appendix 1.

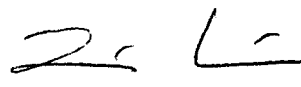
Uncertainty in height measurement was  $\pm 2$  mm.

The functional test of the test item was carried out without remarks.

### SP Swedish National Testing and Research Institute Electrotechnics/Electronics



Anders Nilsson  
Technical Manager



Joakim Lindeblom  
Technical Officer

The test results relate to the tested item only.

#### Appendices

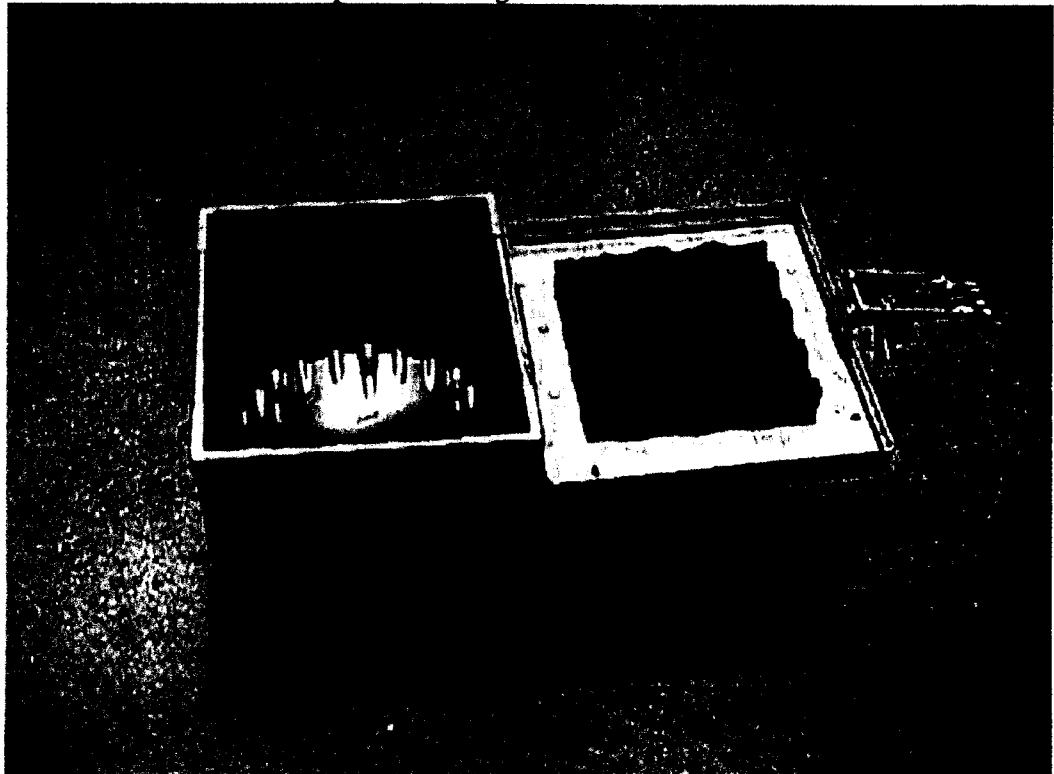
No: 1 Photos of test set up in fall test.

No: 2 Temperature and humidity diagrams.

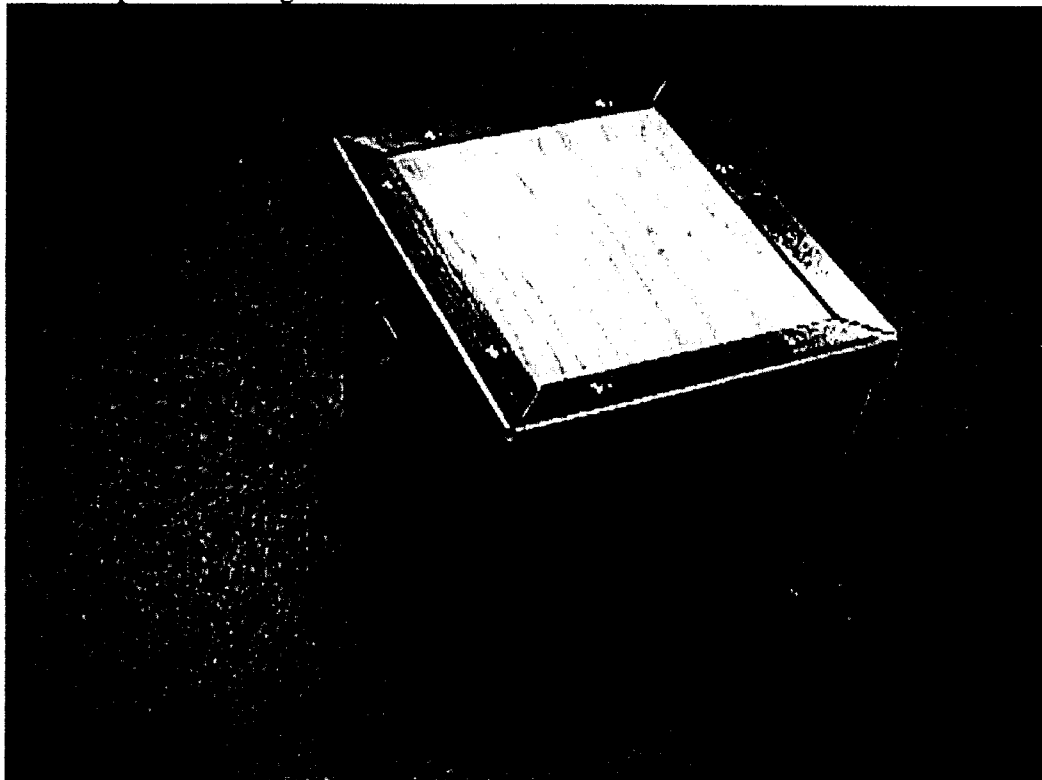
The traffic radar.



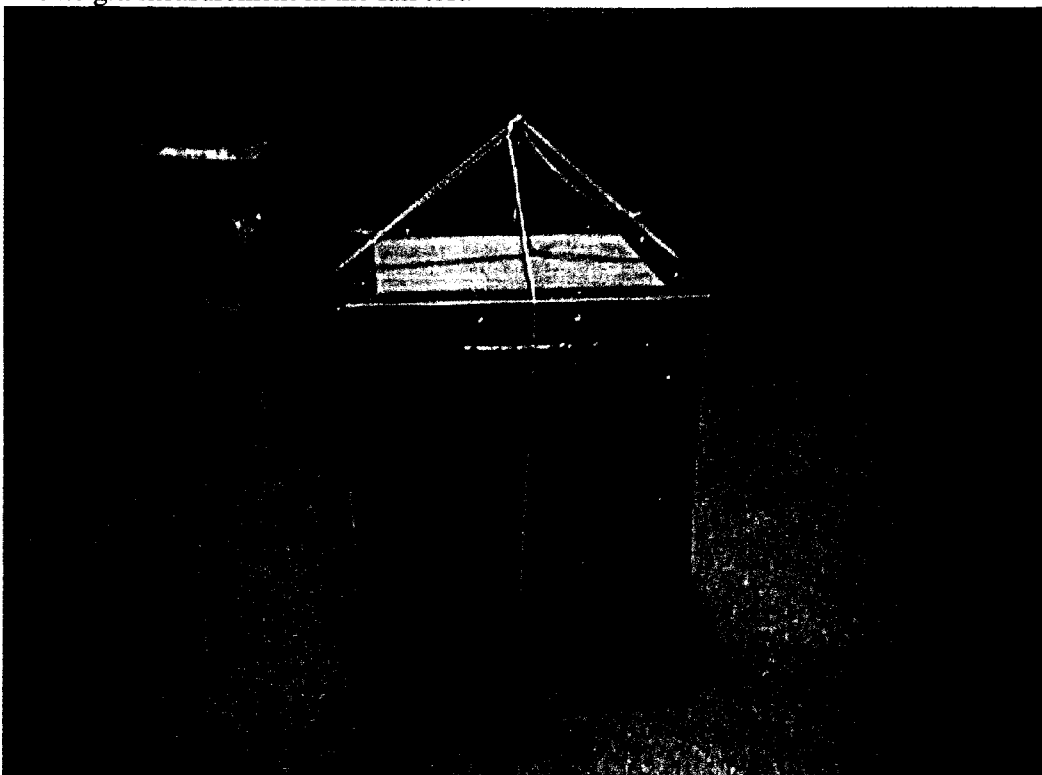
The traffic radar in its transport and storage case.



The transport and storage case.

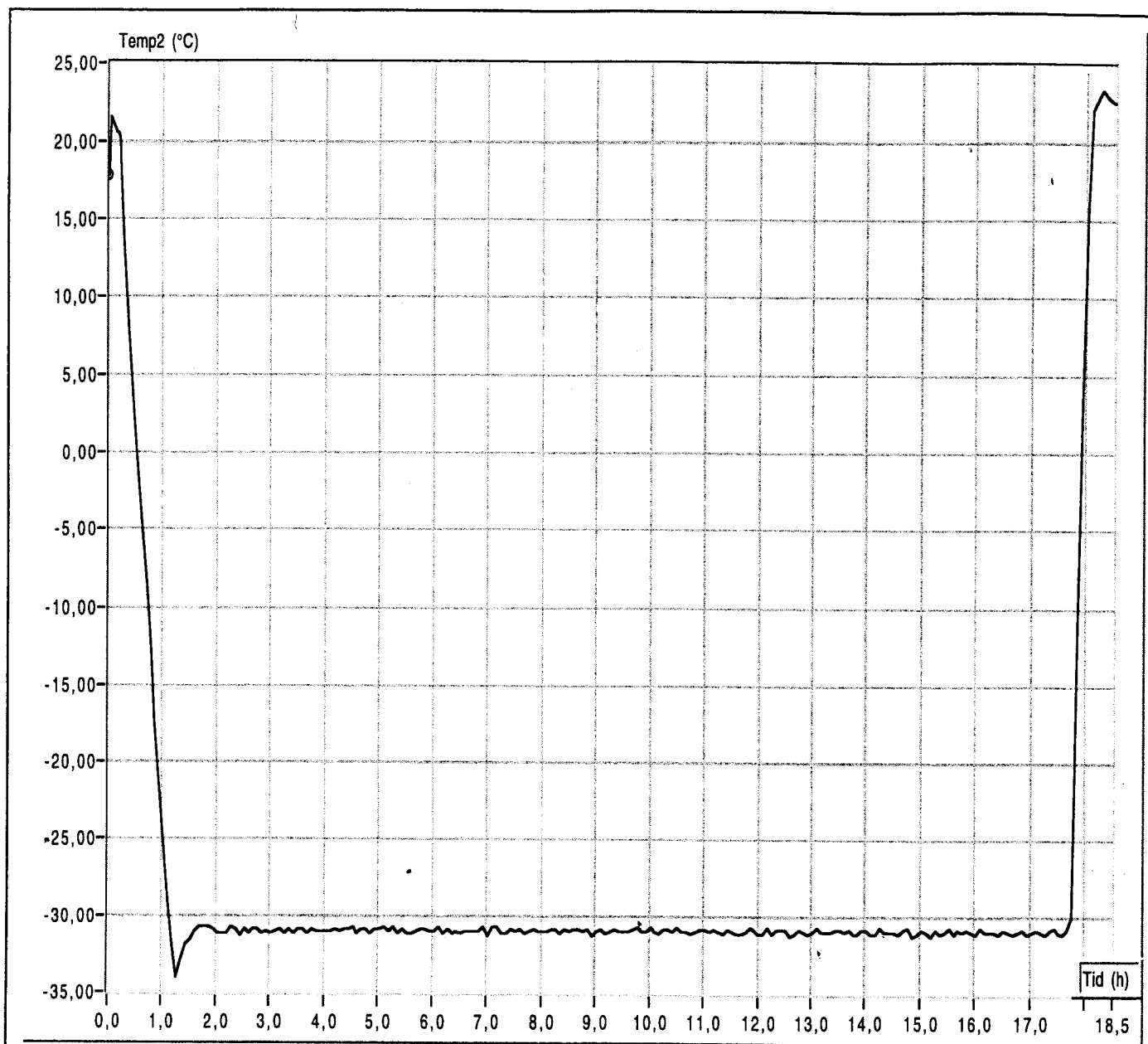


The height measurement in the fall test.



**Cold test, in operation**

The test item was exposed to the temperature below.



Skåp/kammare: Bogn nr 9

Projektnummer: f001024

Provföremål: radar

Registrering påbörjad: 2000-02-08, kl 17:08

Resultat fr o m: 2000-02-08, kl 17:08

Ansvarig för provningen: jl

Uppdragsgivare: sensys traffic AB

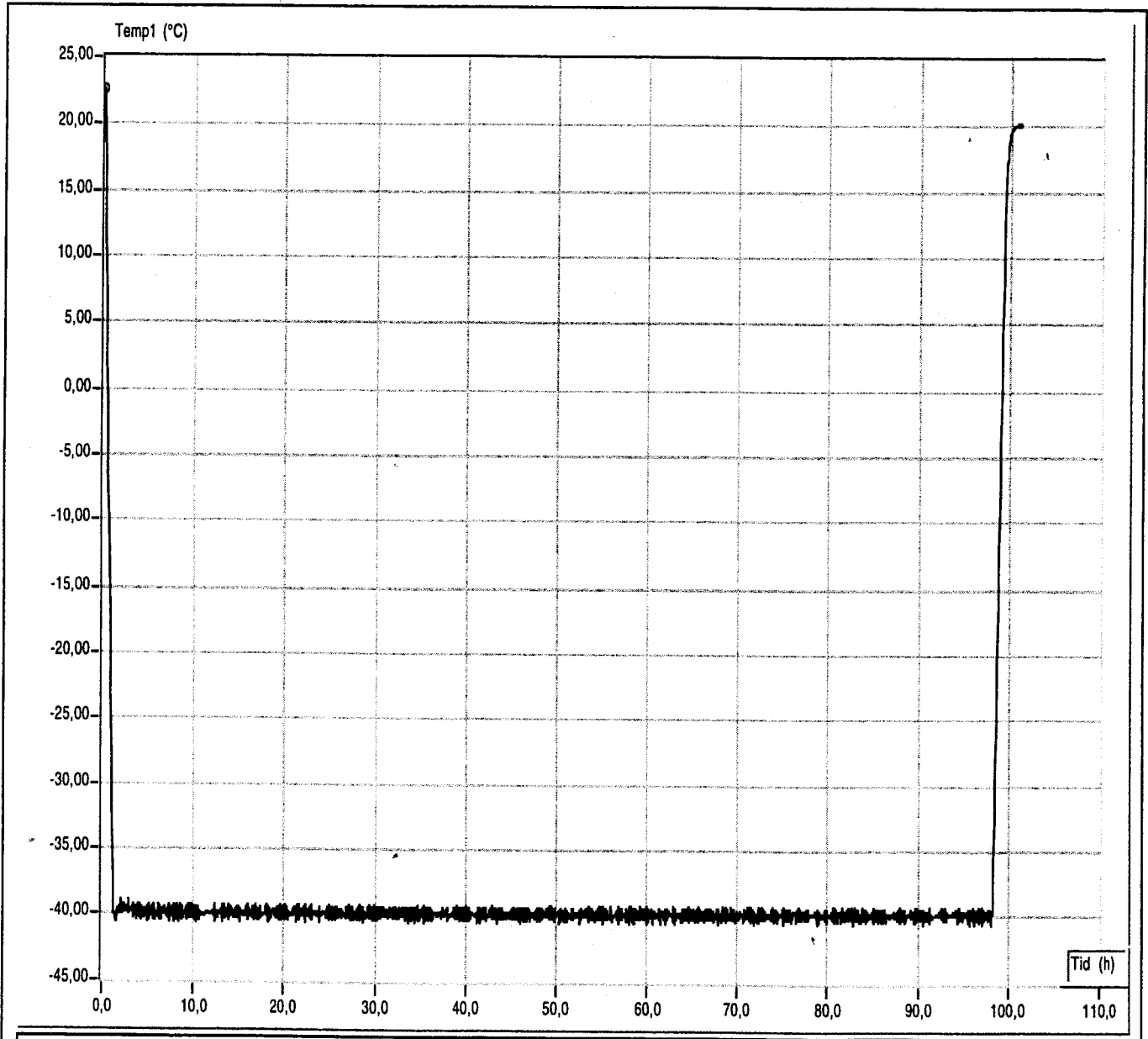
Prov: -30°C, 16 timmar, kontinuerlig drift

Registrering avslutad: 2000-02-09, kl 11:40

Resultat t o m: 2000-02-09, kl 11:38

**Cold test**

The test item was exposed to the temperature below.



Skåp/kammare: Bohn nr 17

Projektnummer: F001024

Provföremål: Radarhastighetsmätare

Registrering påbörjad: 2000-02-10, kl 10:48

Resultat fr o m: 2000-02-10, kl 10:48

Ansvarig för provningen: JE

Uppdragsgivare: Sensys Traffic AB

Prov: Köldprov, lagring, -40°C, 96 timmar

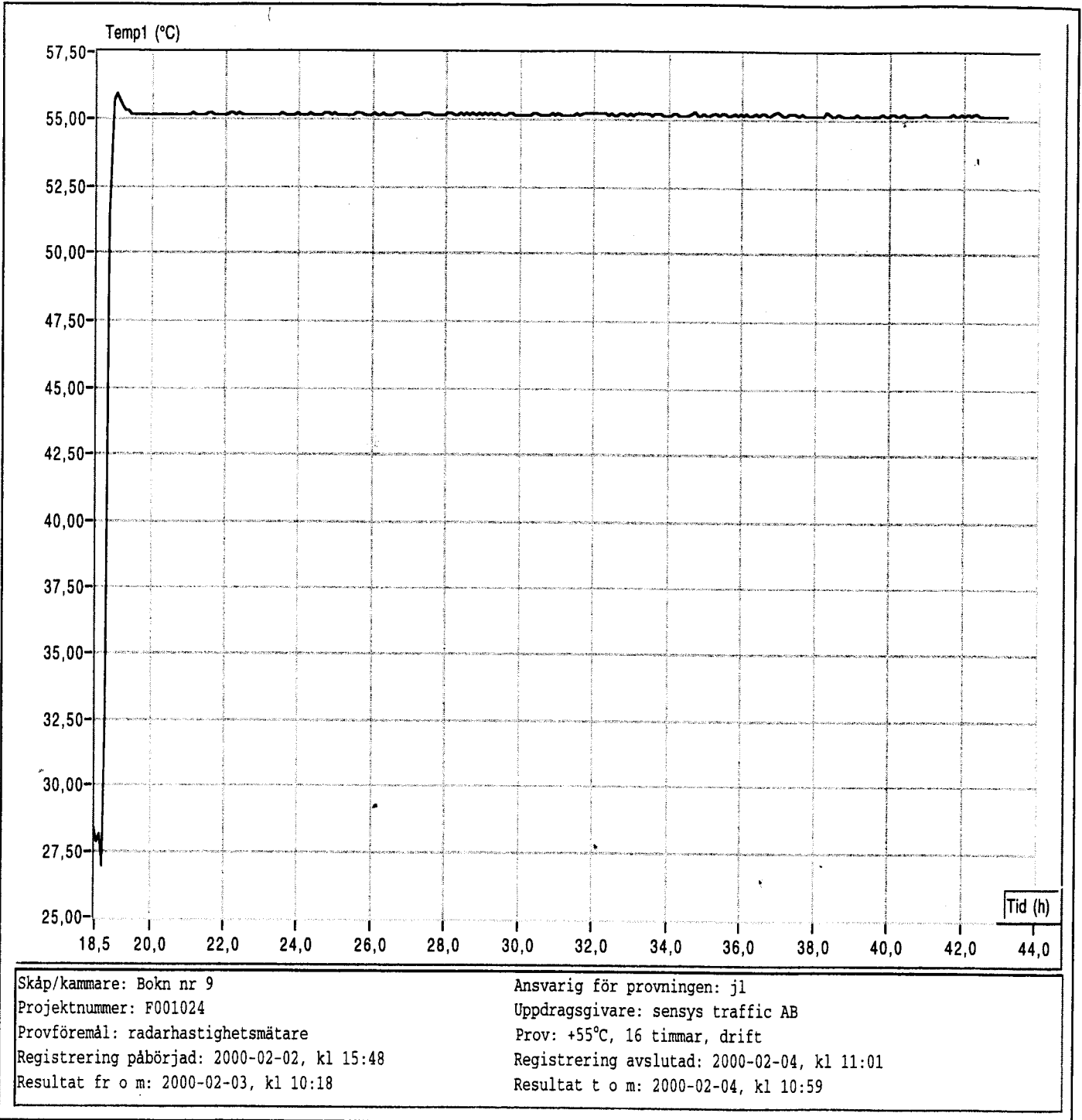
Registrering avslutad: 2000-02-14, kl 15:55

Resultat t o m: 2000-02-14, kl 15:55



**Dry heat test, in operation**

The test item was exposed to the temperature below.



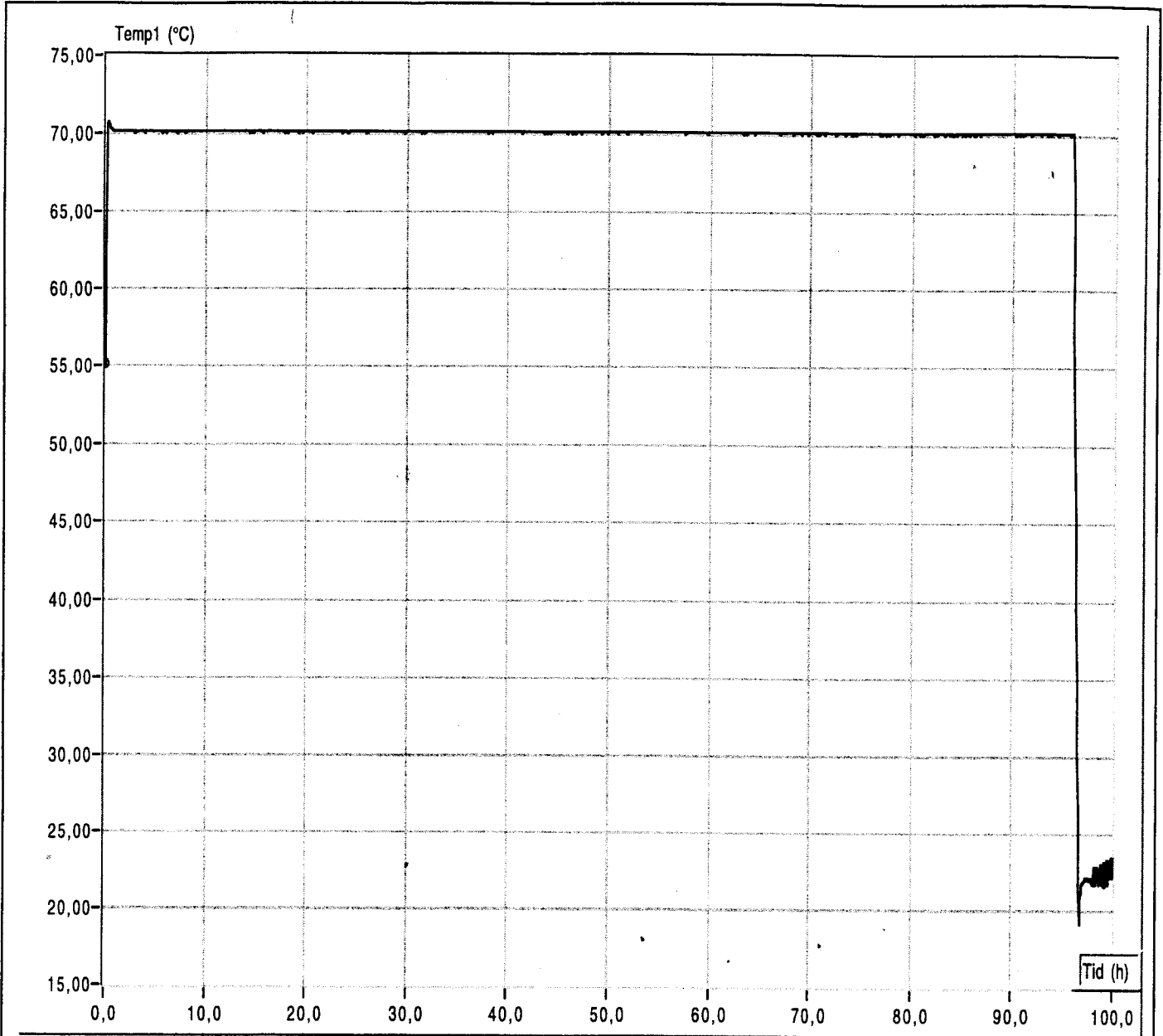
Skåp/kammare: Bogn nr 9  
 Projektnummer: F001024  
 Provföremål: radarhastighetsmätare  
 Registrering påbörjad: 2000-02-02, kl 15:48  
 Resultat fr o m: 2000-02-03, kl 10:18

Ansvarig för provningen: jl  
 Uppdragsgivare: sensys traffic AB  
 Prov: +55°C, 16 timmar, drift  
 Registrering avslutad: 2000-02-04, kl 11:01  
 Resultat t o m: 2000-02-04, kl 10:59



Dry heat test

The test item was exposed to the temperature below.

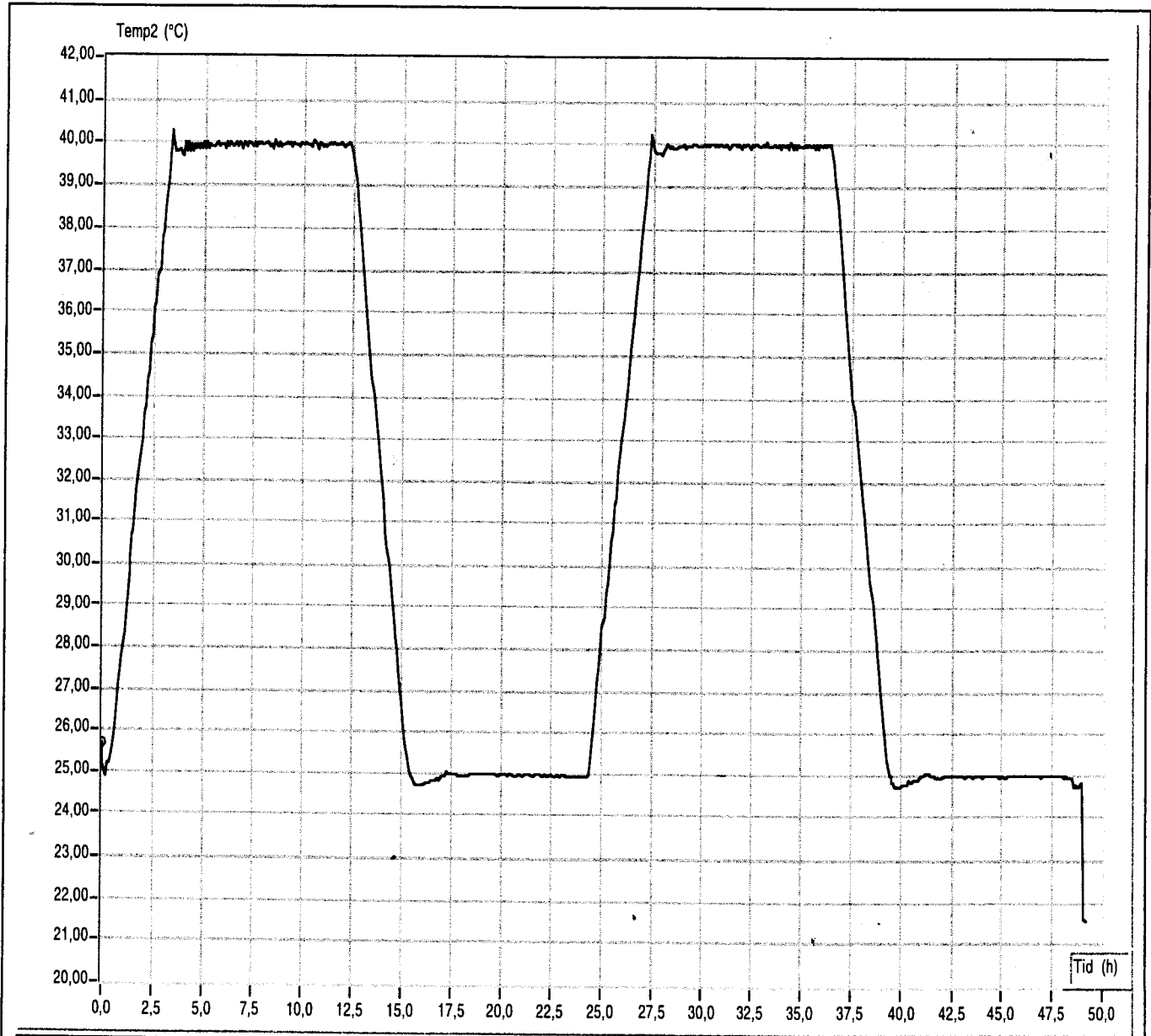


Skåp/kammare: Bogn nr 9  
Projektnummer: F001024  
Provföremål: radar  
Registrering påbörjad: 2000-02-04, kl 11:18  
Resultat fr o m: 2000-02-04, kl 11:18

Ansvarig för provningen: jl  
Uppdragsgivare: sensys trafic AB  
Prov: +70°C, 96h, ej i drift  
Registrering avslutad: 2000-02-08, kl 17:04  
Resultat t o m: 2000-02-08, kl 15:18

**Damp heat cyclic test, two cycles**

The test item was exposed to the temperature below.



Skåp/kammare: Bogn nr 5

Projektnummer: f001024

Provföremål: radar hastighetsmätare

Registrering påbörjad: 2000-02-19, kl 15:03

Resultat fr o m: 2000-02-19, kl 15:03

Ansvarig för provningen: jl

Uppdragsgivare: sensys traffic AB

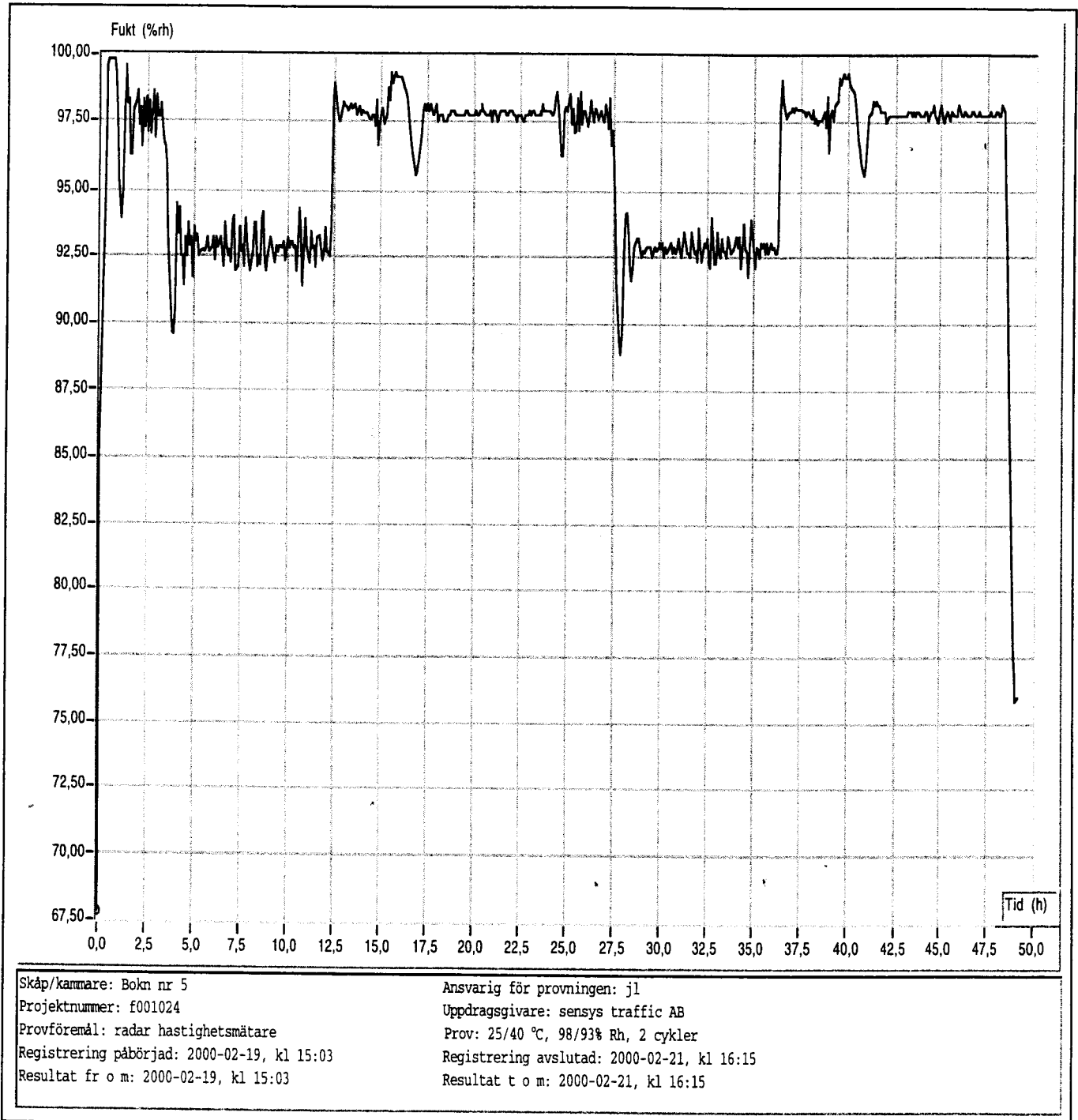
Prov: 25/40 °C, 98/93% Rh, 2 cykler

Registrering avslutad: 2000-02-21, kl 16:15

Resultat t o m: 2000-02-21, kl 16:15

**Damp heat cyclic test, two cycles**

The test item was exposed to the humidity below.



Skåp/kammare: Bohn nr 5

Projektnummer: f001024

Provföremål: radar hastighetsmätare

Registrering påbörjad: 2000-02-19, kl 15:03

Resultat fr o m: 2000-02-19, kl 15:03

Ansvarig för provningen: jl

Uppdragsgivare: sensys traffic AB

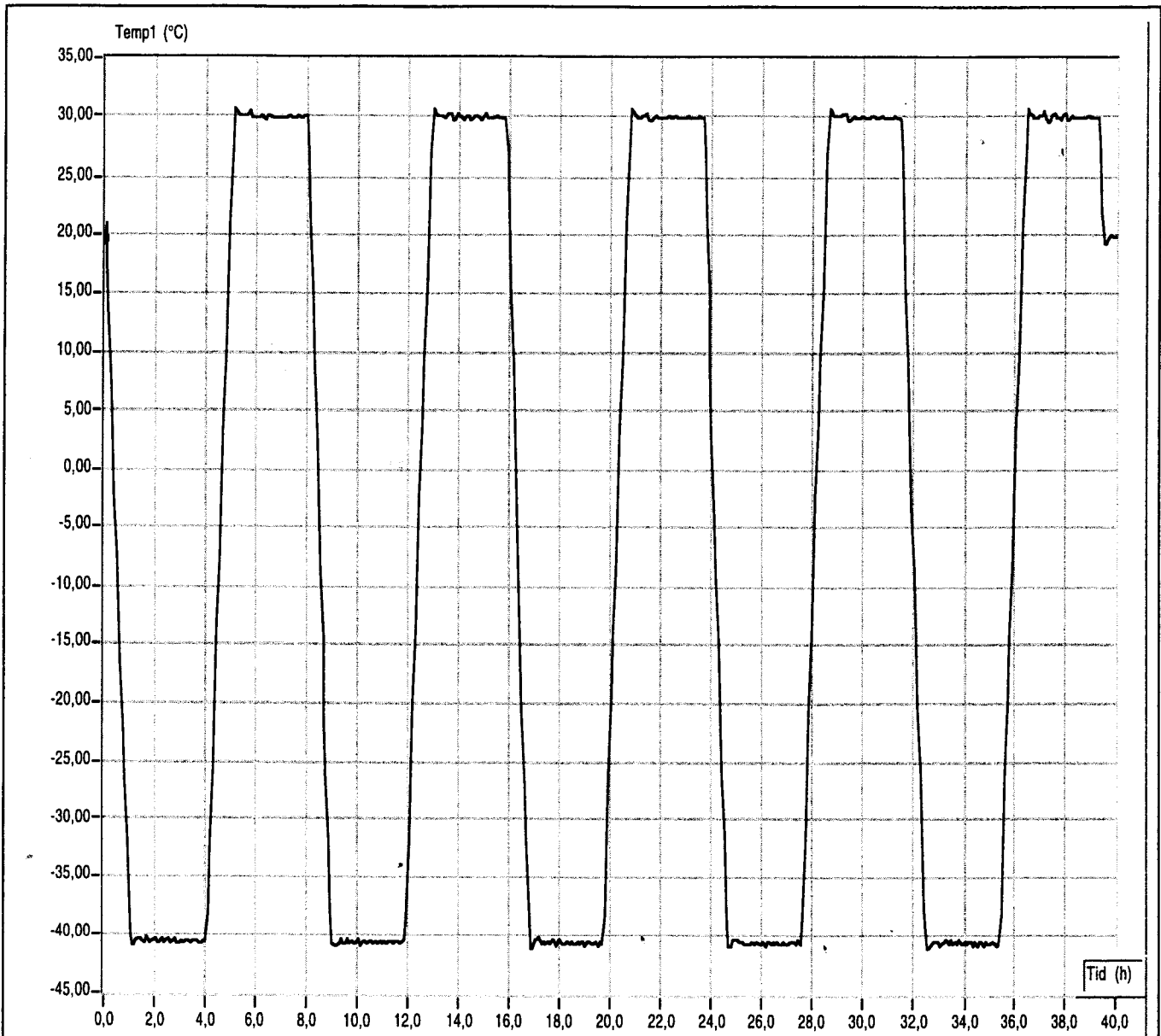
Prov: 25/40 °C, 98/93% Rh, 2 cykler

Registrering avslutad: 2000-02-21, kl 16:15

Resultat t o m: 2000-02-21, kl 16:15

**Thermal chock test**

The test item was exposed to the temperature below.



Skåp/kammare: Bohn nr 5

Projektnummer: F001024

Provföremål: Radarhastighetsmätare

Registrering påbörjad: 2000-02-21, kl 16:42

Resultat fr o m: 2000-02-21, kl 16:42

Ansvarig för provningen: JE

Uppdragsgivare: Sensys Traffic AB

Prov: Temperaturväxling, -40 / +30°C, 3 tim

Registrering avslutad: 2000-02-23, kl 09:07

Resultat t o m: 2000-02-23, kl 08:42