

## MOBY<sup>®</sup> I

### Heat Resistant Data Carrier MDS 439 E

#### Technical Description

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6GT2 097-3AJ00-1DA2

Published in January 2004

## Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:



### Danger

indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.



### Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.



### Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken.

### Caution

indicates that property damage can result if proper precautions are not taken.

### Note

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

## Qualified Personnel

The device/system may only be set up and operated in conjunction with this manual.

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

## Correct Usage

Note the following:



### Warning

This device and its components may only be used for the applications described in the catalog or the technical description, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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Siemens AG  
Automation and Drives  
Special Products, Projects Automotive Industry, Training  
PO Box 4848, D-90327 Nuernberg

Siemens Aktiengesellschaft

### Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Technical data subject to change.

Order No. 6GT2 097-3AJ00-1DA2

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## 1 Application

The heat resistant data carrier can be used in all instances where a temperature higher than 85 °C is encountered at any stage of the process. It has degree of protection IP68. Typical applications are:

- Base coating, KTL area, electrophoresis with associated drying ovens
- Top coating area with drying oven
- Washing area at temperatures > 85 °C
- Other applications with higher temperatures

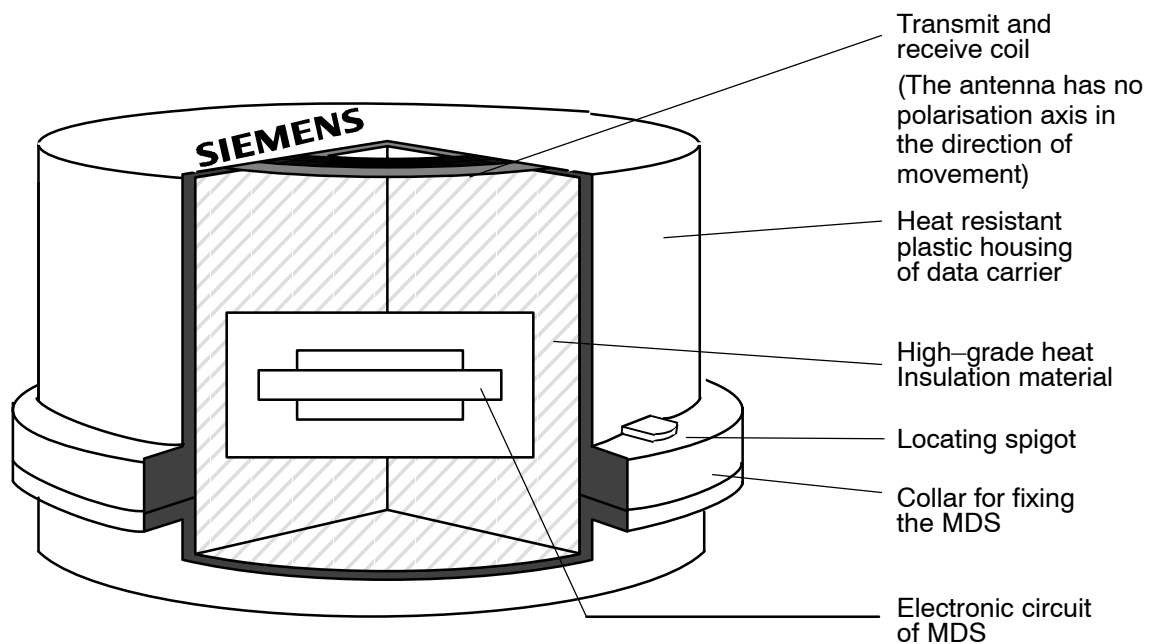
Data carrier without accessories:

MDS type	Order No.	Memory capacity
MDS 439 E (without holder)	6GT2000-0CD30-0AC0	8 kByte EEPROM

Accessories:

Order No.	Description
6GT2090-0QA00	Holder (short version)
6GT2090-0QA00-ZA31	Holder (long version)
6GT2090-0QB00	Covering hood (optional)

## 2 Layout and function of mobile data carrier



### Function:

The heat resistant data carrier can be cyclically exposed to temperatures of up to 220 °C. The heat insulation material protects the electronic circuitry from being heated above the critical temperature of 110 °C. The data carrier must have left the hot area before this temperature is reached, so that the electronic circuitry can cool down again. Only then can another cycle commence. For detailed information , see section 3.2.

### 3 Project planning

The same project planning rules apply to the heat resistant data carrier as to other types of MDS in the KT21 catalogue and the manual on configuration, installation and service, with the exception of the maximum distance and the field length at temperatures over 85 °C. When calculating the transmission window, for example, a factor of 0.8 is used; this takes into account manufacturing tolerances and the influence of temperature up to 85 °C.

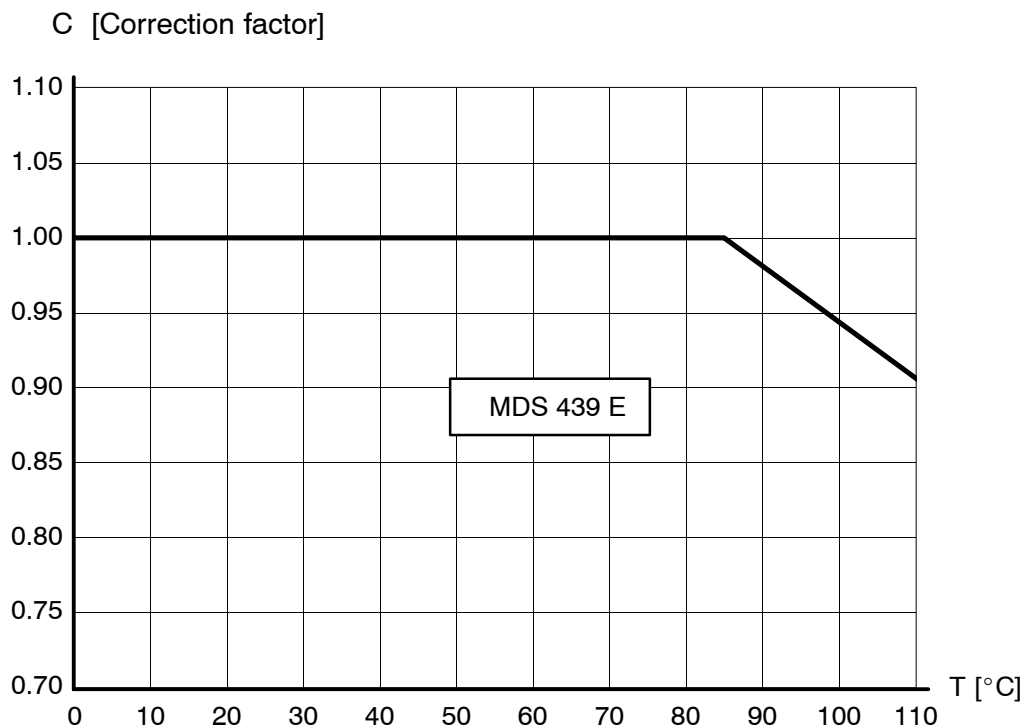
However, in practice this factor is not a constant, but a function of temperature that must be taken into account when the temperature exceeds 85 °C (up to 110 °C). Thus, if the average internal temperature of the data carrier exceeds 85 °C, an additional correction factor must be included in the calculation according to section 3.3.

$$t_v [T < 85 \text{ °C}] = \frac{L \cdot 0.8}{V_{\text{MDS}}}$$

$$S_g [T > 85 \text{ °C}] = S_g \cdot C; \quad L [T > 85 \text{ °C}] = L \cdot C$$

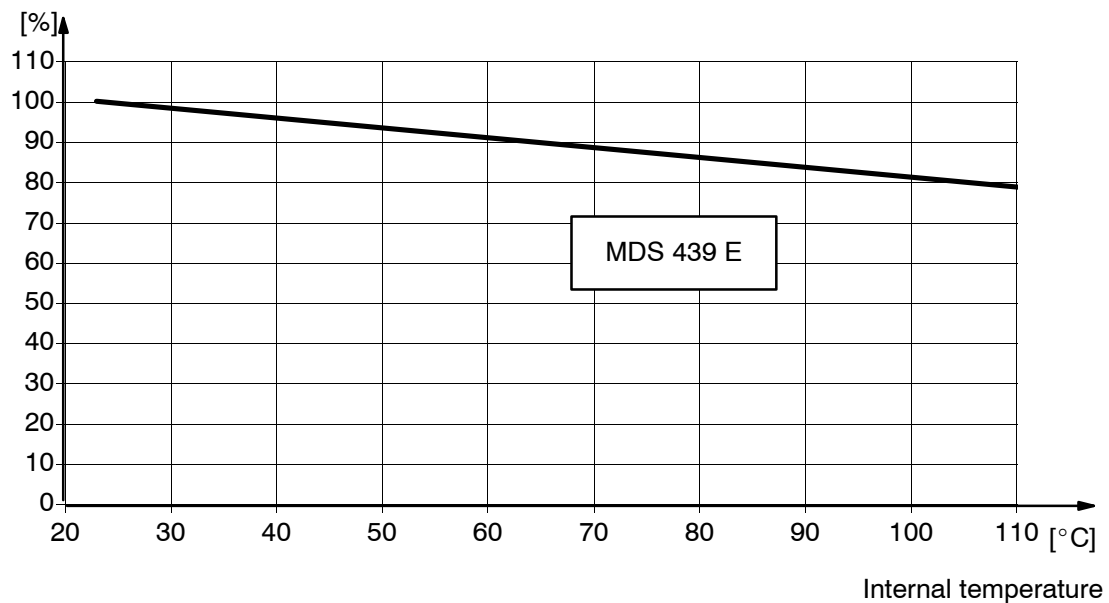
$$t_v [T > 85 \text{ °C}] = \frac{L \cdot C \cdot 0.8}{V_{\text{MDS}}} \quad \frac{[m]}{[m/s]}$$

- L = Field length
- S<sub>g</sub> = Maximum distance MDS – SLG
- V<sub>MDS</sub> = Speed of the MDS
- C = Correction factor for temperatures > 85 °C (see diagram)
- t<sub>v</sub> = Dwell period of the MDS



The following diagram shows the reduction of the maximum distance and the field length at increased process temperatures (internal temperature of the MDS).

**Reduction of field length and maximum distance**



The reduction of the field data at higher temperature is due to the higher current consumption of the electronic circuitry.

### 3.1 Field data of MDS 439 E and SLG

The following table shows the field data of the MDS 439 E and SLG. This information allows the correct SLG to be chosen.

The figures shown below are typical values and are valid for an ambient temperature of 25 °C. Manufacturing and temperature related tolerances of ±20 % are permissible.

MDS type SLG type	MDS 439 E	
<b>Length of transmission window in mm (L)</b>		
	L	2L
SLG 42	120	210
SLG 43	190	330
SIM 4x	75	100
<b>Width of transmission window in mm (B)</b>		
SLG 42	48	
SLG 43	76	
SIM 4x	30	
<b>Operating range in mm (S<sub>a</sub>)</b>		
SLG 42	10 to 55	
SLG 43	20 to 80	
SIM 4x	0 to 25	
<b>Max. distance in mm (S<sub>g</sub>)</b>		
SLG 42	70	
SLG 43	125	
SIM 4x	33	
<b>Distance from MDS to MDS in mm (D1)</b>		
SLG 42	> 500	
SLG 43	> 600	
SIM 4x	> 300	

#### Minimum distance from SLG to SLG:

The values given below must be rigorously observed. For values less than these there is a risk of influencing the inductive fields. The data transmission time would be extended by an unknown amount or a command would be aborted with an error.

SLG	SLG 42	SLG 43	SIM 4x
SLG 42	> <b>800</b>	> 2000	> 800
SLG 43	> 2000	> <b>2000</b>	> 2000
SIM 4x	> 800	> 2000	> <b>700</b>



### 3.2 Cyclic operation

For ambient temperatures up to 110 °C, cyclical operation is not necessary, i.e. the MDS can remain in operation all the time up to this temperature.

For ambient temperatures > 110 °C, measures must be taken to ensure that the internal temperature of the MDS does not exceed the critical level of 110 °C. Thus, each heating phase must be followed by a cooling phase. Some cycles are shown in the following table:

T <sub>u</sub> (Heating)	Heating	T <sub>u</sub> (Cooling)	Cooling
220 °C	0.5 h	25 °C	> 2 h
200 °C	1 h	25 °C	> 2 h
190 °C	1 h	25 °C	> 1 h 45 min
180 °C	2 h	25 °C	> 5 h
170 °C	2 h	25 °C	> 4 h

The internal temperature of the MDS follows an exponential function. It is thus possible to calculate the internal temperature and the suitability of the MDS in advance. This is particularly important in temperature-critical applications or applications with a complex temperature profile.

The calculation of temperature curves can be carried out by Siemens on request.

An exact knowledge of the internal temperature simplifies the project planning for time-critical applications.

**Ambient temperature > 220 °C:**

If the data carrier is exposed to ambient temperatures > 220 °C, any liability under warranty will be declared null and void.

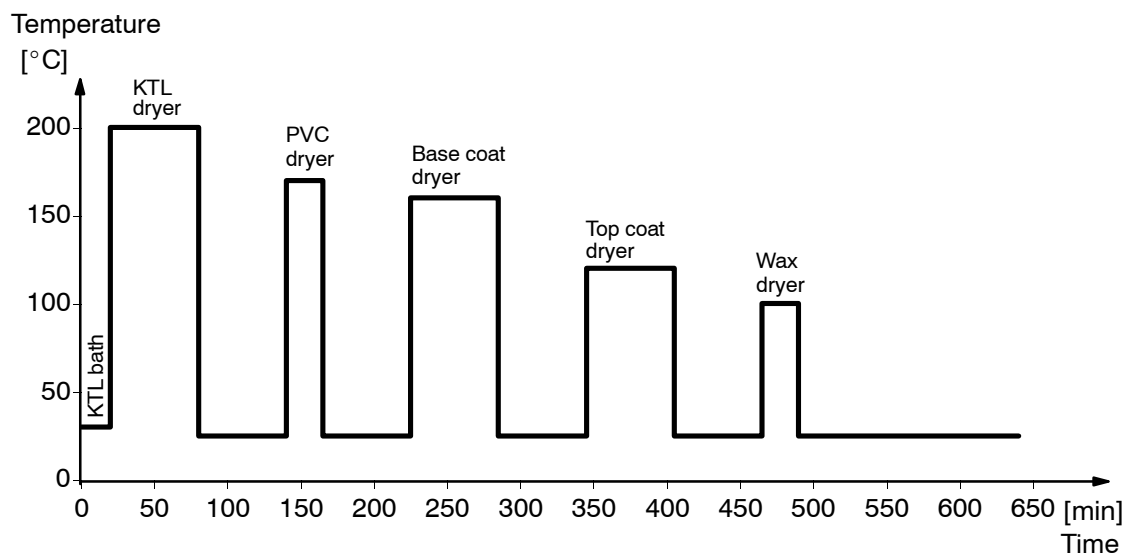
The mechanical stability is however maintained up to 230 °C !

### 3.3 Example of a cyclical process

The typical temperature profile for an application in a paintshop area would be as follows:

Start of MDS at initial point	Duration [min]	Ambient temperature [°C]
KTL bath	20	30
KTL dryer	60	200
Transportation	60	25
PVC dryer	25	170
Transportation	60	25
Base coat dryer	60	160
Transportation	60	25
Top coat dryer	60	120
Transportation	60	25
Wax dryer	25	100
Transportation	150	25

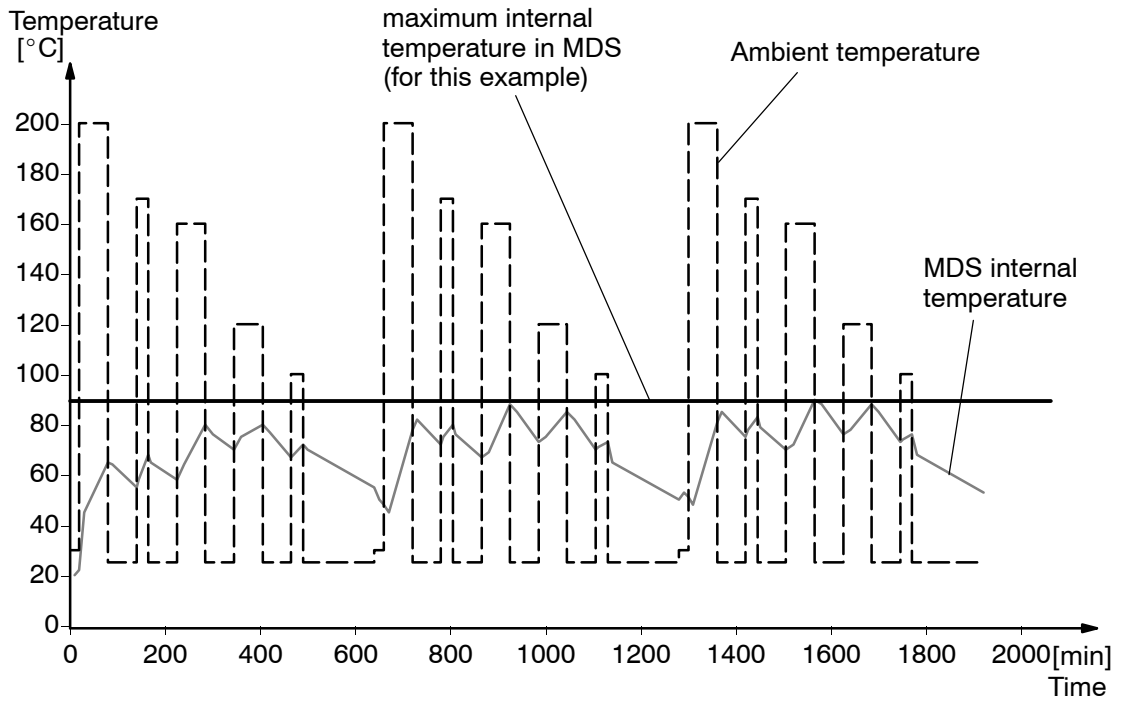
The temperature profile is as follows.



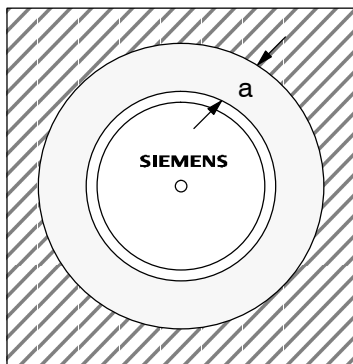
**The simulation gives the following result:**

During a 36.5 hour simulation a total of 3 cycles were performed and a resulting internal temperature of 90 degrees Celsius was reached.

The full temperature profile can be seen below:

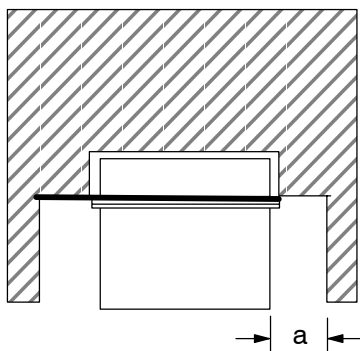


### 3.4 Metal-free area



$a = 40 \text{ mm}$

- the mounting bracket does not infringe the metal free area
- the optional protective cover does not infringe the metal free area



Cross-Section:  
the upper half of the MDS (above the mounting bracket) does not require the preservation of the metal free area.

### 3.5 Service life of the mobile data carrier

The service life of the data carrier is influenced by several factors such as:

- Service life of the electronic circuitry
- Number of temperature cycles
- Type of temperature cycles
- Number of write operations
- Ageing of the housing
- Ageing of the thermal insulation material
- Frequency of write operations
- Data retention time of the EEPROMs
- Physical load

**Of the above, the frequency of write operations has the biggest impact on the service life of the data carrier.**

#### Operation with ECC driver

The ECC driver provides additional confidence in the accuracy of the data on the MDS.

The memory manufacturer guarantees only 100,000 write operations.

If the ECC driver is activated, the user can be assured of data integrity for the entire lifetime of the MDS.

#### For ECC operation please note:

- The access times to MDS data are longer (less data can be processed in dynamic mode)
- The net capacity of the MDS will be less
- When carrying out a data correction, the response can be delayed by up to one second.

#### **Internal temperature > 110 °C:**

If the MDS is operated at an internal temperature > 110 °C , all warranty liabilities are declared null and void. With internal temperatures > 110 °C the data content of the EEPROM may be lost. (An error message is output at the next process stage: the error state can be corrected by initialising the MDS.)

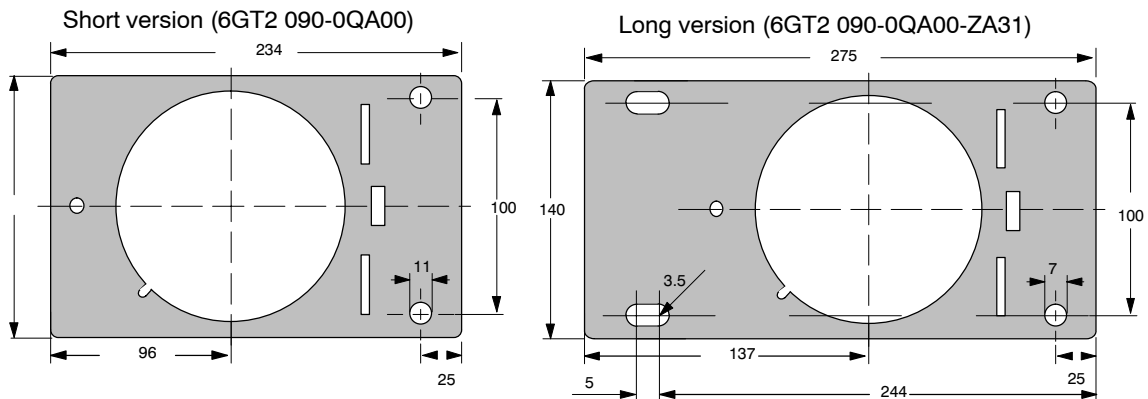
#### 4 Holders for mobile data carriers

A special holder made from V2A sheet steel has been developed for fixing the MDS. The holder is so designed that the MDS will not suffer damage due to shock and vibration below the maximum values given. Likewise, mechanical tolerances are included for the thermal expansion of MDS and holder.

**Warning:**  
**For these reasons, the MDS must always be used with a genuine holder. We strongly advise against the use of user-specific holders.**

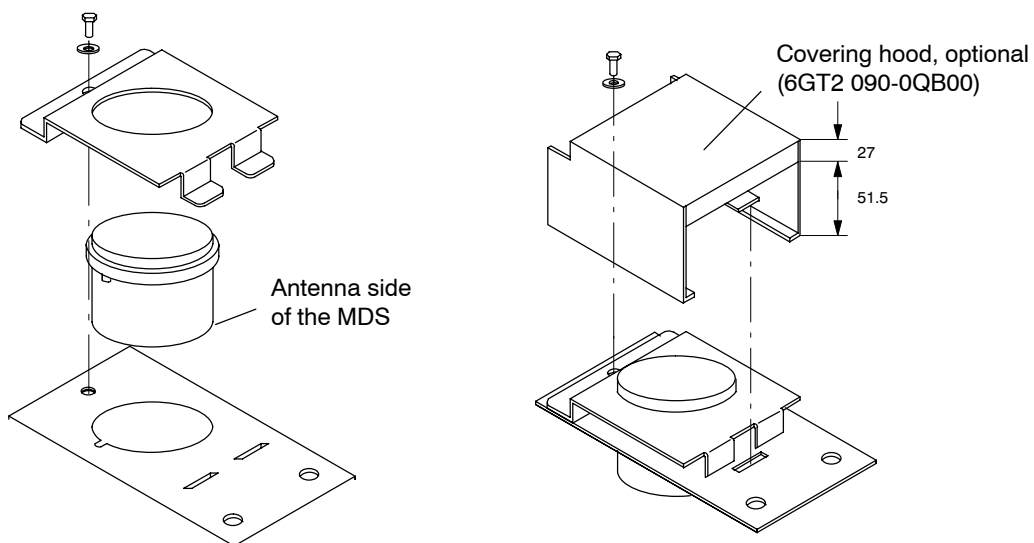
##### Design of the holder:

Dimensions:



Material: stainless sheet steel (chrome-nickel steel)  
 with thickness of 2.5 mm

Assembly:

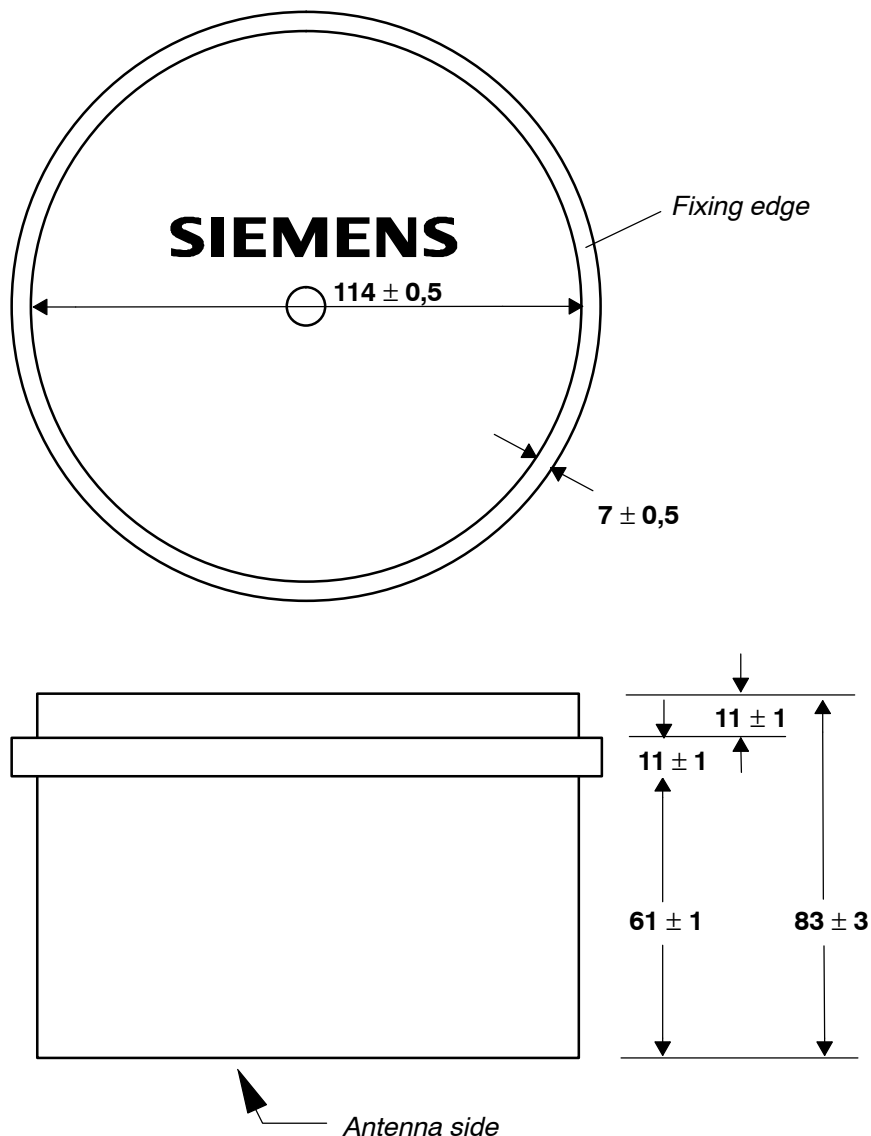


The holder is supplied with all parts required for assembly. Mounting screws for fixing the holder are not included. The fixing screws should be M10 diameter. Minimum length: 25 mm. The optional covering hood can be used for both the long and short versions of the holder.

**When used in paintshops, we recommend the use of a protective cover for the data carrier. More information is available from your local Siemens sales office.**

## 5 Dimensions

MDS 439 E:



**Housing colour: brown**

*All dimensions in mm*

## 6 Cleaning the mobile data carrier

In paintshop areas, overspray occurs, which can settle on the data carrier and bake on in the oven. Normal coats of paint on the active surface of the data carrier do not affect the transmission of data. Even with paint coatings up to 2 cm thick, no reduction of the field data is detectible.

Metallic paint only marginally affects the transmission field. With a 2 cm coating of metallic paint, the maximum distance is reduced by about 10%. A < 1 mm coating of metallic paint does not affect the field data at all.

**Warning:**

**The use of mechanical tools such as spatulas, screwdrivers or chisels for cleaning the data carrier is to be strongly discouraged!**

**Working on the housing with sharp objects will lead to damage and premature failure of the mobile data carrier.**

Should cleaning nevertheless be unavoidable, the following options may be considered:

Chemical cleaning:

The data carrier housing is resistant to many chemicals and solvents (see chapter 7). Since the MDS is hermetically sealed, it can be cleaned using suitable chemicals in a cleaning machine.

Example for chemical cleaning:

Caustic Soad (Sodium Hydroxide):	24%
Duration:	24 hours
Temperature of cleaning bath:	93 °C (200 °F)
Minimum time between cleaning:	6 months*

\* This time interval of 6 months should not be reduced as each cleaning process stresses the material of the MDS.

For more effective cleaning the MDS should be removed from the mounting bracket.

Protection from direct contamination:

1. The data carrier can be mounted under a protective cover to protect it against contamination
2. The data carrier can be covered with a heat resistant protective foil (e.g. cooking foil or similar). The foil can be changed when necessary.

Ultrasonic cleaning:

Ultrasonic cleaning is **not** permissible, since the internal electronic circuitry can be damaged or destroyed.

Sand blasting:

Do **not** clean by sand blasting since this can damage the plastic housing.

## 7 Chemical resistance

The housing of the data carrier consists of polyphenylene sulphide (PPS). The chemical resistance of the data carrier is excellent. No known solvent will dissolve the plastic at temperatures under 200 °C. A deterioration of the mechanical properties was observed in weak solutions of hydrochloric acid (HCl) and nitric acid (HNO<sub>3</sub>) at 80 °C.

Particularly notable is the very good resistance to all kinds of vehicle fuel including methanol. The following table gives a summary of the chemicals that have been tested:

Substance	Test conditions		Evaluation
	Time [Days]	Temperature [°C]	
Acetone	180	55	+
n-butanol (butyl alcohol)	180	80	+
Butanon-2 (methyl ethyl ketone)	180	60	+
n-butyl acetate	180	80	+
Brake fluid	40	80	+
Calcium chloride (saturated)	40	80	+
Diesel fuel	180	80	+
Diethyl ether	40	23	+
® Frigen 113	40	23	+
Anti-freeze	180	120	+
Kerosene	40	60	+
Methanol	180	60	+
Motor oil	40	80	+
Sodium chloride (saturated)	40	80	+
Sodium hydroxide (30%)	180	80	+
Sodium hypochlorite (5%)	30	80	/
	180	80	-
Caustic soda solution (30%)	40	93	+
Nitric acid (10%)	40	23	+
	40	80	-
Hydrochloric acid (10%)	40	23	+
	40	80	/
Sulphuric acid (10%)	40	23	+
(10%)	40	80	+
(30%)	180	80	/
Test fuel: (FAM-DIN 51 604-A)	180	80	+
Toluene	180	80	/
1, 1, 1-Trichlorethane	180	75	+
Xylene	180	80	+
Zinc chloride (saturated)	40	80	+

**Evaluation:**

- + resistant, weight increase <3% or weight loss < 0.5% and/or reduction of tensile strength < 15%
- / limited resistance, weight increase 3 to 8% or weight loss 0.5 to 3% and/or reduction of tensile strength 15 to 30%
- not resistant, weight increase > 8% or weight loss > 3% and/or reduction of tensile strength > 30%

### **Behaviour when exposed to flame:**

The data carrier housing is inherently flame resistant.



## 8 Technical data

<b>Memory capacity:</b>	8 Kbyte EEPROM
<b>Number of write operations:</b>	10 <sup>4</sup> guaranteed, 1 x 10 <sup>5</sup> typical
<b>Degree of protection:</b>	IP68
<b>Dimensions:</b> (diameter without fixing edge x height)	114 x 83 mm
<b>Weight (without holder):</b>	860 g
<b>Operating temperature:</b> <sup>1)</sup>	
permanent	–25 °C ... 110 °C
cyclic	–25 °C ... 220 °C
<b>Housing material:</b>	Polyphenylene sulphide (PPS)
<b>Housing colour:</b>	brown
<b>Mechanical resistance:</b> (Values can only be guaranteed with genuine holder!)	
Proof of mechanical resistance is provided by an oscillation test with variable frequency in accordance with part 2–6 of DIN IEC 68.	
Stress in succession on three vertical axes, one on top of the other	
Frequency range	10 to 500 Hz
Amplitude	1.5 mm (10 to 58 Hz)
Acceleration	5 g (58 to 500 Hz)
Test duration per axis	20 frequency cycles
Throughput speed	1 octave/min
Proof of mechanical resistance provided by continuous shock stress in accordance with part 2–29 of DIN IEC 68.	
Test conditions	50 g, 6 msec, 500 shocks per axis

**Caution:**

**The values for shock and vibration are maximum values and may not occur continuously.**

**Note:**

Spring-cushioned holders for higher shock and vibration requirements are available on request.

**Temperature gradient:** 100 °C/min  
(Heating, cooling)

<sup>1)</sup> The data carrier can be processed by an SLG immediately after leaving the hot area (with possible reduction of the field data).

## Appendix

### CE Seal

The electronic product described here meets the requirements of EG guideline 89/336/EWG on electromagnetic compatibility and carries the CE seal as of 01.01.1996.

The EG declaration of conformity is available as required by the above EMC guideline for the appropriate authorities at the following address.

Siemens Aktiengesellschaft  
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A&D PT7 M2  
P.O. Box 4848  
D-90327 Nuernberg

MOBY I products are designed for industrial use and meet the following requirements.

Emission: FTZ 17 TR 2100, February 1989  
Immunity: Draft pr ETS RES 0809, March 1995  
(Reference: DE/RES-0970)  
Class: 1

The mounting guidelines must be adhered to when installing and operating the product described here.



## WARNING

- The temperatures and temperature cycles stated in this description may not be exceeded. Non-observance can lead to death, serious personal injury or considerable damage to property.
- Above 230 °C, the mechanical stability of the heat resistant data carrier will be destroyed. The mechanical deformation and its effect on the manufacturing process must be considered.
- If the data carrier has been seriously damaged (e.g. due to incorrect cleaning), ingress of moisture followed by heating may cause it to explode.