



Fig 1 Magneto-electrical measuring transducer MEM

### Introduction

The user manual serves as an aid to correct installation as well as operation and maintenance of the magneto-electrical measuring transducer (MEM).

Read the instructions carefully before you install the device and put it into operation.

Specially designed or customised models and specialises applications are not included in the manual.

All instruments are carefully checked for order conformity and functional capability prior to despatch. On receiving the equipment please carry out a visual inspection to detect any damage that could have arisen during shipment. Please contact your responsible sales field service if you should discover any defects. In such cases we require the description of the defect, the type and the serial number of the device.

MECON GmbH can assume no guarantee for repair work carried out by the customer without prior notification and consultation. In case of complaint, the rejected parts must be returned to us, if no other provisions have been made.

### Application

The measuring transducer MEM is installed in the flowmeter FVA 250. In this manner the range of volume flow measurement is covered. The measuring transducer MEM is designed for installation in a housing that is, at least compliant with Protection Category IP20.

### Mode of operation and system structure

#### Measuring principle

The setting of the rotameter is transmitted to the pointer axis by means of a magnetic system on the pointer axis. The measuring transducer MEM measures the field of a magnet mounted to the pointer axis (sensor signals A, B) and generates a resulting output current 4...20mA. The, as a rule, non linear scale is linearised with a maximum of 16 support points in the process. The earth magnetic field and homogeneous external magnetic fields, if not too high, are more or less compensated by the differential measurement applied.

#### System structure

An indicator prepared for the seating of a measuring transducers MEM consists of a base plate, special bearing unit with pointer and mounted magnets as well as stay bolts for the mounting of the MEM.

### Technical data MEM

#### Output

Analogue output	Signal output 4-20 mA with HART®-protocol.
Binary outputs N1/ N2 (option)	2 switching outputs in accordance with EN60947-6-6:2000 available as limit signal transducer or pulse output

#### Electrical connection terminals

Power supply $U_B$	14V...30V DC
Load	max. load $R_B$ is dependent on power supply:
	$R_B = \frac{U_B - 14V}{22mA}$

$R_B > 250 \Omega$  on application of the HART®-protocol

#### Operating conditions

Installation indications	Installation in housing compliant with degree of protection of at least IP20 External magnetic fields (e.g. due to adjacent valves) must be prevented.
Ambient temperature	from -40 °C to + 70 °C (approved for safety-related reasons) An upstream display must be employed for a high measuring substance temperature.
Storage temperature	from -40 °C to + 80 °C

#### Measuring accuracy

- in the supporting structure <  $\pm 0.2\%$  of URV
- Influence of power supply < 0.1 % of measured value
- Influence of load (0.2...680  $\Omega$ ) < 0.1 % of measured value
- Influence of ambient temperature <  $\pm 0.5\%$  of URV/10°K

Reproducibility typically < 0.1 % of URV

Resolution typically 0.05% of URV

#### Conformity

- Electromagnetic compatibility (EMC)
- EN61000-6-2:1999
  - EN50081-1
  - EN55011:1998+A1:1999 Group1, Class B
  - NAMUR NE21

Explosion protection

II 2G EEX ia IIC T6 (-40°C ... +70°C)

$U_i = 30 \text{ V DC}$   
 $I_i = 150 \text{ mA}$   
 $P_i = 1 \text{ W}$   
 $L_i = 0.24 \text{ mH}$   
 $C_i = 16 \text{ nF}$   
 BVS 07 ATEX E 033

## Technical data binary outputs

Switching principle	NAMUR switch in accordance with EN60947-6-6:2000
Number	2
Control state	
• open	typically 0.4 mA
• closed	typically 4.0 mA
Function	limit signal transducer or pulse output
Explosion protection	II 2G EEx ia IIC T6 (-40°C ... +70°C) U <sub>i</sub> = 30 V DC I <sub>i</sub> = 20 mA P <sub>i</sub> = 100 mW L <sub>i</sub> = 4 µH C <sub>i</sub> = 16 nF BVS 07 ATEX E 033

## Installation and operating instructions

Remove the hood.

Guide the signal leads under the MEM from the cable connection to the terminal block and connect according the terminal diagram below. **It is essential that the polarity is observed.**

Remount the hood.

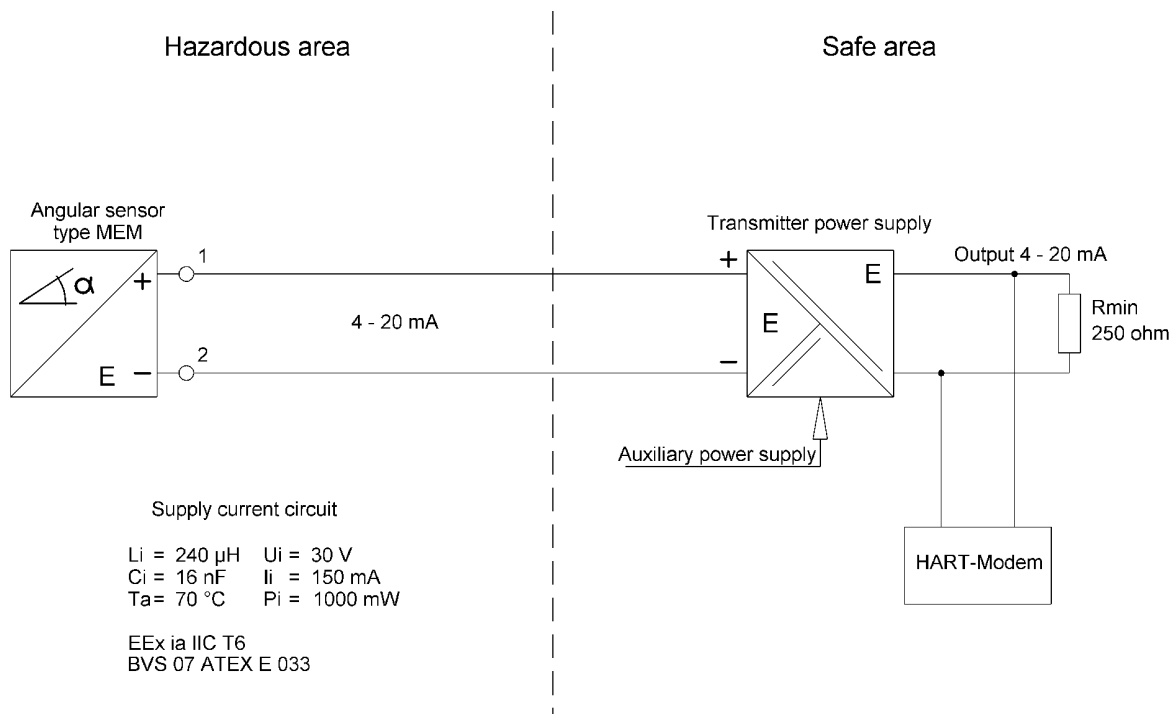
### Setting into operation

Following activation of the power supply a current in the range of 3.5mA to 4mA will flow for a few seconds. Only then will a current proportional to the indications of the display flow. In consequence of the influence of the float magnet, the measuring transducer MEM only emits the appropriate current when the pointer setting is induced by the displacement of the float. Turning the pointer leads to deviating values but also permits a spot check on the tendency.

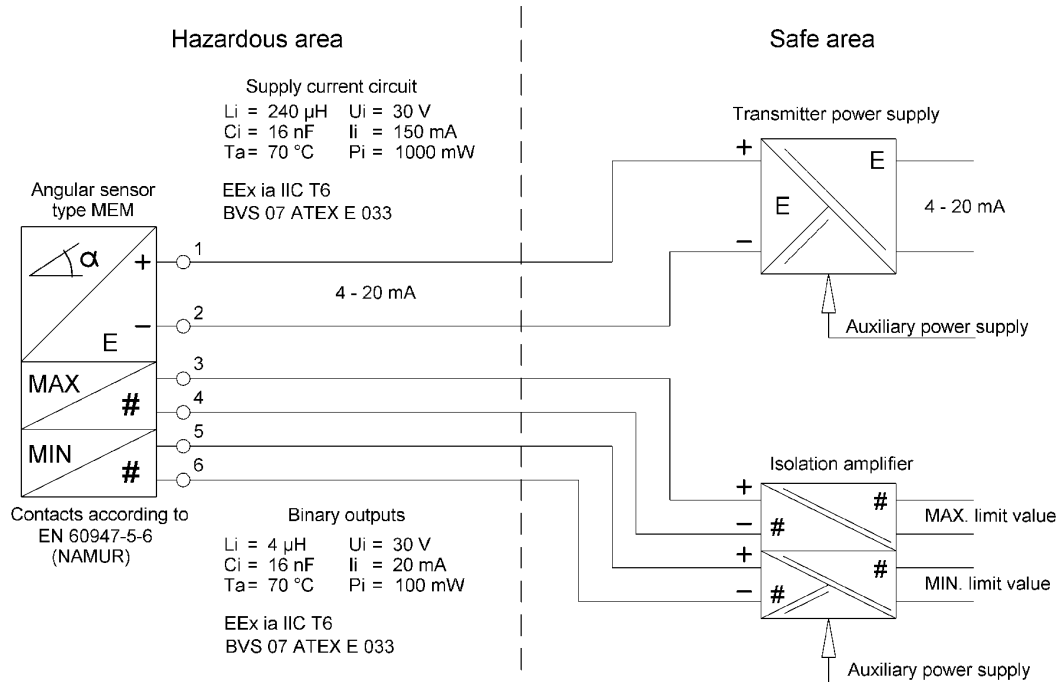
### Retrofitting the MEM

The retrofitting of a MEM in a fitting that has been installed is only conditionally possible. If the fitting is calibrated with a pointer axis that does not yet bear a measuring magnet, the scale must be recalibrated. The reason for this measure is the reaction of the supplementary measuring magnet on the float magnet.

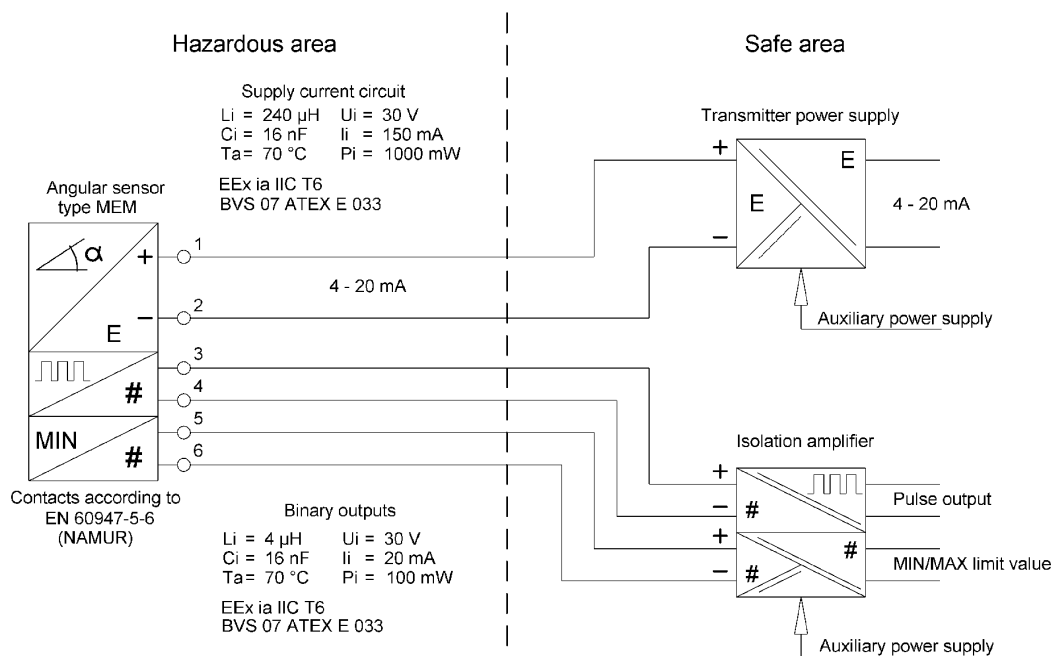
### a) Terminal diagram for measuring transducer MEM (signal output 4-20 mA with HART®)



### b) Terminal diagram for measuring transducer MEM with 4-20mA output and 2 limit contacts



### c) Terminal diagram for measuring transducer MEM with 4-20mA output, pulse output and limit contact



## Certification and approval

### Explosion protection

EC Declaration of compliance  
BVS 07 ATEX E 033

### CE-conformity

The measuring transducer MEM complies with the **EC Directives 94/9/EC (Explosion Protection)** and **89/336/ECC (Electromagnetic Compatibility)** including all modifications or endorsements published before 28.05.2001.

Industrial standards applied:

- EN61000-6-2:1999  
Immunity to interference in industrial areas (immunity)
- EN50081-1  
Emitted interference in residential areas (emission)
- EN55011:1998 + A1:1999 Group 1, Class B  
Limits and Measuring Processes
- NAMUR NE21

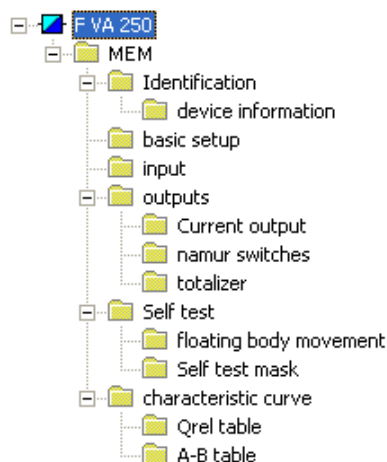
The compliance with the tested prototype is confirmed by the attachment of the CE mark.

## Parameters

The MEM is equipped with the HART®-protocol.

With the help of this interface, data can be transmitted to the MEM by means of a PC, the data can influence the performance of the MEM or serves as pure information.

For reasons of clarity these parameters are integrated in logic units.



### Identification

General information on devices that enable the clear definition of the device can be deposited in this parameter block.

The following parameters can be deposited:

- **TAG**
- **Description**
- **Date**
- **Message**
- **Works number**

### Basic settings

The time response of the MEM can be set in this parameter block.

#### • Damping

A time constant within the range of 0 to 60 seconds can be selected via these parameters. On expiry of this time the measured value reaches 63.7% of the final condition with an abrupt change of the input signal.

### Input

All parameters that are involved in the acceptance of the measured value in the MEM are included in this block.

#### • Unit

The unit of the measured variable is defined via this parameter. The following values are available to achieve this purpose:

- m<sup>3</sup> /h, /min, /s
- l /h, /min, /s
- Us gal /h, /min, /s
- IMP gal /h, /min, /s
- kg /h
- t /h
- g /h

In case of alteration of the unit no conversion of the measured value or the upper range value is conducted.

#### • MIN/MAX

These two parameters define the top and the bottom limit of the relative flowrate.

The exceeding /or shortfalling of MAX/MIN can be transmitted as an alarm at power output (see description of self test) as well as via the binary outputs (see description of outputs)

#### • Final value

This parameter (at HART® known as „URV“) serves the adaptation of the power output to the measuring range (20mA = 100%).

The initial value of the measuring range (at HART® known as „LRV“) is not supported by the MEM and reset to zero.

#### • Leak flow volume

This parameter is a percental value and determines a minimum flowrate value (in relation to the final value). Below the leak flow volume, the measured value is reset to zero.

### Outputs

This block comprises all parameters that define the behaviour of the current output and the binary outputs.

#### • Power output – power in case of alarm

An alarm status of the MEM (see description of self test) can optionally be displayed at the current output.

In such cases the value of the current can be selected between

- >20.5mA ( typically 21.6mA )
- <3.8mA ( typically 3.6mA )
- unused

#### • Namur switch – function

The binary outputs N1 and N2 (Namur switch) are constructed as optocouplers with downstream transistor and comply with the industrial standard EN60947-6-6:2000.

The functions of the outputs are controlled by the microprocessor and may comprise the following functions:

N1	N2
MAX	MIN
Pulse output	MIN
Pulse output	MAX
Pulse output	MIN/MAX

The parameters MIN and MAX are the limits of relative flow defined in the parameter block *Input*.

- **Namur switch – activated state**

The activated status of the NAMUR switches N1 and N2 can be set via this parameter.

This can be selected between:

- closed
- open

The set active status also applies to N1, if this is configured as a pulse output.

- **Meter (pulse output)**

Both the meter and the pulse output measures volume and measuring units.

The dimension unit of the meter pursues that of the flowrate (e.g. if the flowrate unit is l/h, the meter will measure in litres).

Pulses are optionally displayed at binary output N1. It must be observed that the maximum impulse rate amounts to approx. 10Hz. The pulse width is approx. 50ms.

- **Meter**

The metering function of the MEM can be switched ON or OFF via this parameter.

The meter reading is saved in EEPROM when the instrument is switched off. The meter can be reset via a HART®-command.

- **Self test**

The MEM possesses various self-test functions for continuous monitoring of the current measuring values, which may be used to trigger an alarm in case of error.

- **Self test mask**

The MEM self test possesses the following function range, whereby each control function can be individually switched ON and OFF:

- **Q > 103%** (rel. flowrate > 103%)
- **Q <> Sensor limits** (rel. flowrate outside the sensor limit)
- **Sensors too hot/cold** (temperature in device too high / too low)
- **A-B unreasonable** (sensor signals implausible)
- **Meter overflow**
- **MIN/MAX-limit** (exceeding / shortfalling of MAX or MIN)

The incidence of a self test error is signalled under HART® in status and, if necessary, transmitted as an alarm at the current output.

- **Maintenance**

The MEM is maintenance-free. The MEM should be replaced in the case of malfunction. A malfunction prevails, for example, when the output current supplied by the instrument deviates considerably from the anticipated value (the deviation cannot be explained by temperature drift, for example).

The instrument must be returned to the manufacturer when there are justifiable doubts that the instrument is functioning correctly. The instrument must not be repaired by the user.

- **HART®-protocol**

The MEM is equipped with a HART®-protocol. The product PDM from SIEMENS AG is available as parameterising software.



**The parameters for the configuration and evaluation of the measurement signal can be changed via the communication interface. This can lead to function incapacity in the case of wrong programming. Each alteration of the parameters is undertaken at the sole responsibility of the user. Errors caused by wrong programming are not covered by the guarantee.**

**The same applies to consequential damage caused by changing the measuring range or the pick-up characteristic.**

### Parameterising software PDM (Siemens)

The software PDM (Process Device Manager) from Siemens AG serves the parameterising and measured value indication via the HART®-protocol. A computer is required with a vacant COM-interface and Windows95/98/ME/NT/2000/XP. The connection to the field unit is accomplished via a HART®-modem (plug into COM), for example, SIEMENS AG (MLB-No. 7MF4997-1DA).

The version 5.1 in association with the SIMATIC Manager 5.1 is described by the PDM software. For further details we refer to the operating instructions of PDM.

PDM supplies the opportunity to work offline and prepare data sets irrespective of the availability of a field unit. To achieve this purpose, the data set of a MEM must already be archived in the computer. Subsequently the procedure in online operation should be described.

First of all the connection to the field unit must be set up. In „measured value display“ you will have the opportunity to look at the measured values issued by the unit via the HART®-protocol. The measured values recorded in the graphic display can also be saved as a file.

With the aid of the PDM software you receive a writing access to a selection of parameters. The calibration of the device is not accessible.

### • Setting up the connection to the field unit

For the creation of the communication between the field unit and the PC a corresponding project must first be defined in the SIMATIC Manager.

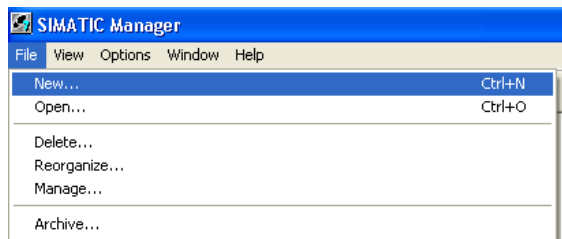
The structure of the communication network is defined here.

This consists of the field unit with integrated HART®-interface and the PC, to the serial interface of which a HART®-modem is connected.

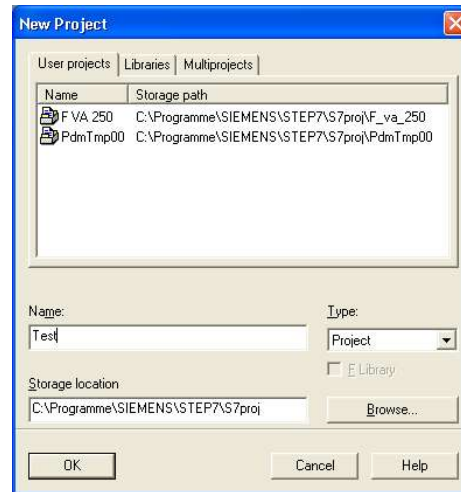


### Procedure for the creation of project:

- Enclosure of a new project via the menu point *File | New*



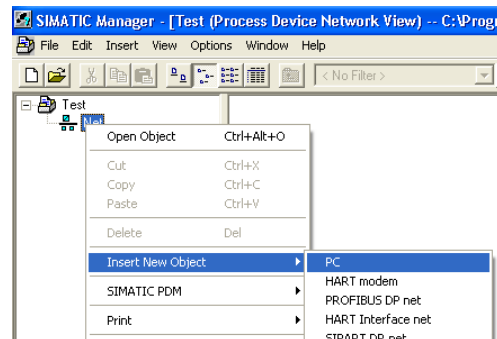
### Designation of project name and the location of the project file



### Integration of the PC into the communication network

In the project explorer of the SIMATIC Manager you can proceed to the required context menu by means of a right click on the node **Net**.

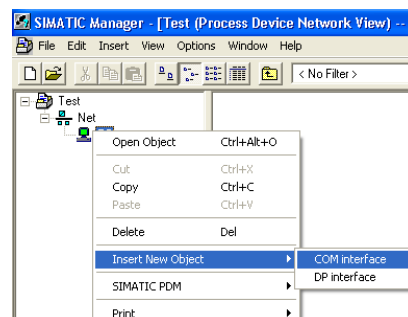
Via the command *Insert New Object | PC* the PC is integrated into the communication network.



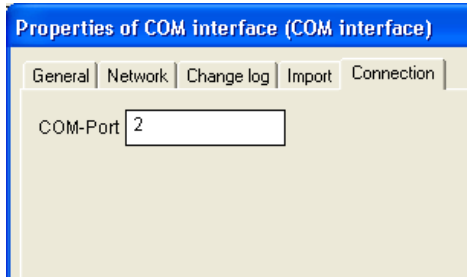
### Entering the serial interface (PC)

The context menu that is required to insert the interface is opened in the Project Explorer by a right click on the previously pasted node PC.

Via the command *Insert New Object | COM-interface* the required serial port is pasted.

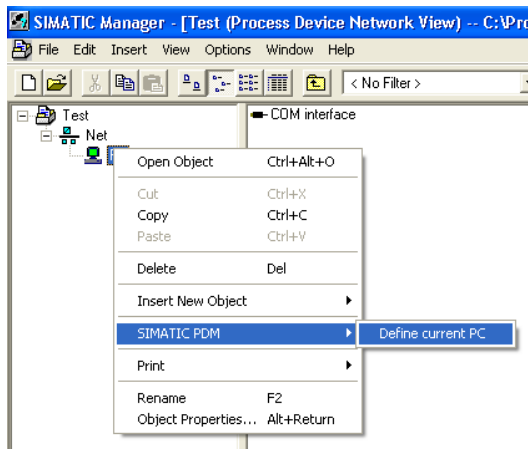


You can proceed to the assigned context menu by means of a right click on the newly pasted component **COM interface**.



The parameters of the interface can be entered via the item *Object properties*. The number of the COM-Port must be inserted in the tab Connection data, to which the HART® modem will later be connected.

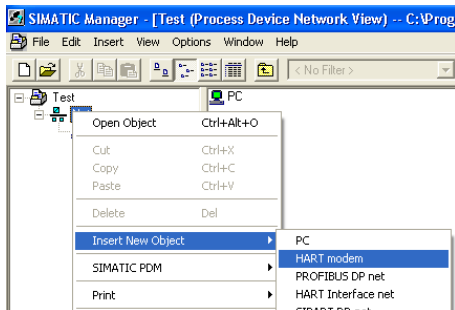
Finally the allocation of the PC is required. This is also achieved via the context menu of the node **PC**. Define the allocation to the respective PC via the entry *SIMATIC PDM | Define current PC*.



### Entering the HART® modem in the communication network

The **HART® modem** is also entered into the Project Explorer of the SIMATIC Manager via the context menu of the node **Net**.

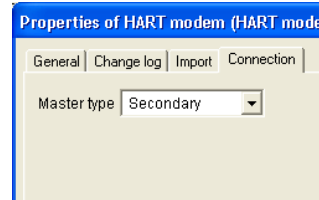
By selection of the command *Insert New Object | HART modem* the corresponding node will be integrated into the communication network.



The setting of the connection data of the HART® modem is subsequently undertaken.

By means of a right click on the pasted node **HART modem** you will proceed to the allocated context menu.

The connection data can be set via the entry *Object properties*. Select the Master Type „**Secondary**“.



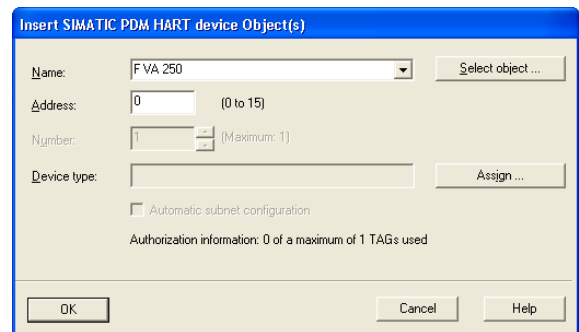
### Entering the field unit into the communication network

The field unit with the integrated HART® interface is allocated to the HART® modem. The allocation is achieved in the SIMATIC Manager in the following manner:

By means of a right click on the pasted node **HART modem** the required context menu will open.

The field unit is allocated via the command *Insert New Object | HART device*.

A name e.g. FVA 250 can now be specified for the newly pasted field unit in the opening dialog.



### Entering the HART® modem in the communication network

The **HART® modem** is also entered into the Project Explorer of the SIMATIC Manager via the context menu of the node **Net**.

By selection of the command *Insert New Object | HART modem* the corresponding node will be integrated into the communication network.



## Magneto-electrical measuring transducer MEM

By clicking the button **Assign** you will proceed to the HART® instrument catalogue of the SIMATIC PDM software.

Here the compatible instrument *Sensors | Flow | Variable Area | SIEMENS | MEM* is selected and the selection confirmed.



Parameters that can be set by the user are categorically highlighted in white – whereas the remaining attributes are protected and highlighted in grey.

Changes made to the parameters do not take effect immediately, but first after the transmission of the data to the field unit.


### Transmission of the changed parameters from the PC to the field unit

If the desired changes have been carried out on the parameters of the field unit on the PC, they must first be transmitted to the field unit before they can take effect.

This is achieved via the menu point *Unit | Load in unit*

### Setting the parameters for the field unit

The SIMATIC PDM software is started automatically by a double click on the field unit node (see Chapter 13.1).



**To conduct the following steps it must be ensured that the electrical connections between the field unit and the PC have been carried out in the correct manner in accordance with the terminal diagrams shown in Chapter 7.**

### Transmission of the instrument configuration of the field unit to the PC

Via the menu point *Unit | Load in PG/PC* of the SIMATIC PDM software the HART® communication is set up between the field unit and the PC, The current instrument configuration is transmitted to the PC and displayed on the PC.

Parameter	Value	Unit	Status
<b>ES</b>			
<b>Identification</b>			
Manufacturer	MECON		Initial val
Device Type	MEM		Initial val
<b>Device Information</b>			
Device Type	MEM		Initial val
HART Device ID	1		Initial val
Universal Revision	1		Initial val
Device Revision	1		Initial val
Software Revision	1		Initial val
Write Protection	Not Write Protected		Initial val
TAG	MEM		Initial val
Descriptor	F VA 250		Initial val
Date	25.05.2007		Initial val
Message			Initial val
Final Assembly Number	1		Initial val
<b>Basic Setup</b>			
Damping	1	s	Initial val
<b>Input</b>			
Unit	kg/h		Initial val
Min	1	%	Initial val
MAX	1	%	Initial val
Lower Value	1.00	kg/h	Initial val
Upper Value	1.00	kg/h	Initial val
low_flow_cutoff	1	%	Initial val
<b>Output</b>			
<b>Current output</b>			
output alarm	not_used		Initial val
<b>Alarm switches</b>			
Function	1 MAX_2_MIN		Initial val
active state	closed		Initial val
<b>totalizer</b>			