

# Industrial Automation DIN Rail Equipment

## HART Communication Manual



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Industrial Automation

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#### Important Notes

All HIMA products mentioned in this manual are protected with the HIMA trade-mark. As not differently noted down this is possibly also valid for other mentioned manufactueres and their products.

All listed modules are CE certified and meet the requirements of the EMC Guideline of the European Community.

All technical statements and data in this manual have been worked out very carefully, and effective checks and inspections have been applied. This manual may however contain flaws or typesetting errors. Therefore HIMA does not offer any warranties nor assume legal reponsibility nor any liability for the possible consequences of any errors in this manual. HIMA would appreciate being informed on possible errors.

The technology is subject to changes without notice.

#### Delivery Conditions

For our deliveries and services apply the "General Conditions for Delivery of Products and Services of the German Electrical Industry " - edition January 2002 -, resp. the "Conditions of Delivery for System Software and Peripheral Devices for the HIMA Automation System" (e. g. programmer units, printers, screen monitors). The products of this price list are subject to the valid export regulations.

Eventual complaints can be recognized only when we are being notified within 14 days after receipt of the merchandize.

The prices shown in a special list are valid ex works, packing charges excluded. The prices are subject to change

## About this Manual

The knowledge of regulations and the technically perfect transfer carried out by qualified staff are prerequisites for the safe installation, start-up and for the safety during operation and maintenance of the HART devices described in this manual.

In case of unqualified interventions into the automation devices, de-activating or bypassing safety functions, or if advices of this manual are neglected (causing disturbances or impairments of safety functions), severe personal injuries, property or environmental damage may occur for which we cannot take liability.

This manual describes the combined use of the isolator H 6200 and the multiplexer H 6210 for establishing HART communication between one or several transmitters and other partners, e.g. a process control system as an OPC client running on a PC.

### Intended readership

This manual is intended for project engineers, programmers and maintenance staff with general knowledge in the area of automation devices.

It is recommended to have the data sheets of the modules H 6200 and H 6210 available.

### Certification

The safety-related HIMA HART devices are tested and certified for functional safety in accordance to the standards listed below:

IEC 61508, parts 1-7: 2000	up to SIL 3
EN 954-1: 1996	up to Category 4
DIN VDE 0116: 1989, prEN 50156-1: CDV 2000	
EN 298: 1994	
NFPA 8501: 1997	
NFPA 8502: 1999	
EN 61131-2: 1994 und A11: 1996, A12: 2000	
EN 61000-6-2: 2000, EN 50082-2: 1996, EN 50081-2: 1993	
F 60 und F35: EN 54-2: 1997, NFPA 72: 1999	

All devices are labelled with the  sign.

## Further Documents

For project planning of the HART devices, the following documents are available:

Name	Contents	Document No. D = german E = english	Part-Nr.
H 6200 datasheet	Technical data	HI 800 170 (D) HI 800 172 (E)	Pdf file
H 6210 datasheet	Technical data	HI 800 171 (D) HI 800 173 (E)	Pdf file
Examination certificate *	Basics for examination, results	(D)	Pdf file

\* Delivered only in conjunction with a device

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## Terminology

Term	Definition
EN	European Standard
FSK	Frequency Shift Key
HART	Highway-addressable remote transmitter
IEC	International standards for die electrical engineering
SCADA	Supervisory Control And Data Acquisition
SIL	Safety Integrity Level (according to IEC 61508)
OPC	OLE for Process Control

This manual contains specially highlighted advices that indicate safety requirements:



**Important information regarding situations or operations.**

**Failure to observe these instructions could cause personal injury and/or damage to property.**

These notes

- indicate danger,
- help you avoid danger,
- make you aware of the consequences.

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**Note**

Special instructions to aid understanding and correct use

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These instructions will help you operate the devices correctly and provide you with better understanding of the system.

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# 1 Communication

The modules support communication with the transmitters connected, using the HART protocol (FSK).

The multiplexer H 6210 can transfer the HART communication using an RS 485 interface, often to a PC with a HART server installed. A process control or SCADA system, may be connected via OPC to the HART server.

The module H 6210 itself is a HART device, and can execute HART commands. The commands supported are described in the datasheet.

## 1.1 HART Server

The HART server is an OPC server for the communication with one or several field devices. The HART server runs on a PC on which may also run a process control system – or the like – as an OPC client.

The PC has to be connected to the RS 485 interface of the module H 6210.

An OPC client may request a list of data objects maintained by the server (“Browse”). The client may select some objects and combine them in groups (“Subscribe”). For these data objects, the server then delivers new values (“Publish”). The frequency of delivering new values depends on the settings of the parameters refresh rate and value change (dead band). The client may even suspend updating the values.

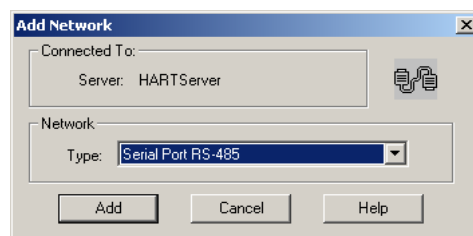
The HART Server and the configuration files (.ini) can be obtained from HIMA.

The HIMA Hart server version 2.1 and the configuration files “hartopc.ini” and “harttables.ini” are available on the ELOP II installation CD.

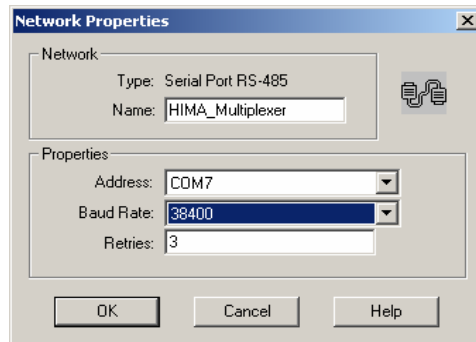
### 1.1.1 Configuration of the HART Server to Operate an H 6210

The following steps are required to enable the HART server to operate the multiplexer H 6210 and the HART enabled transmitters connected to it – after installing the hardware and the software:

1. Start the HART server
2. Enter new configuration, or extend an existing one
3. “Add Network”  
In the first dialog, select the network type “Serial Port RS 485”



In the second dialog:



- Enter a name
- Select the COM port the RS 485 bus is connected
- Select the baud rate, which is set at the DIP switch of the H 6210

(It is also possible to extend existing networks)

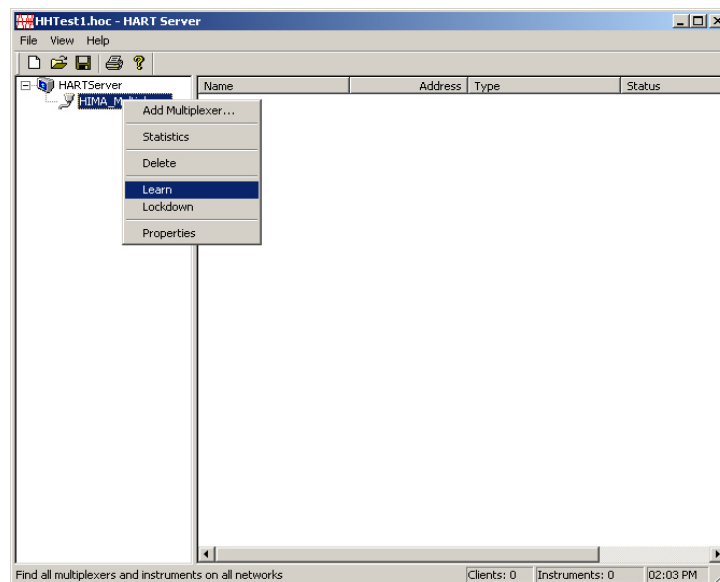
4. Add a multiplexer of type H 6210:

Either

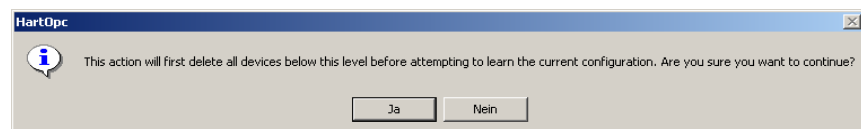
- “Add Multiplexer” – in the dialog window, the RS 485 address of the multiplexer H 6210 must be entered, as set at the DIP switch.

or

- “Learn” – in this case the following partial steps are run through:

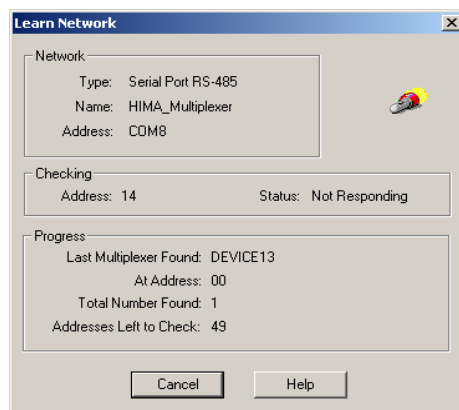


- A warning appears, stating that all devices below the network selected will be deleted

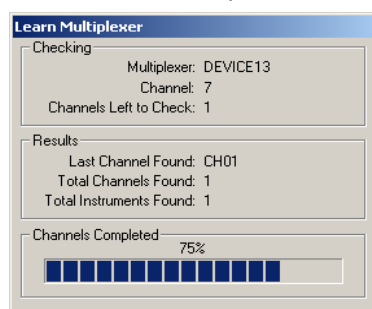


- If the warning is acknowledged by clicking “OK”, the server tries out all RS 485 addresses

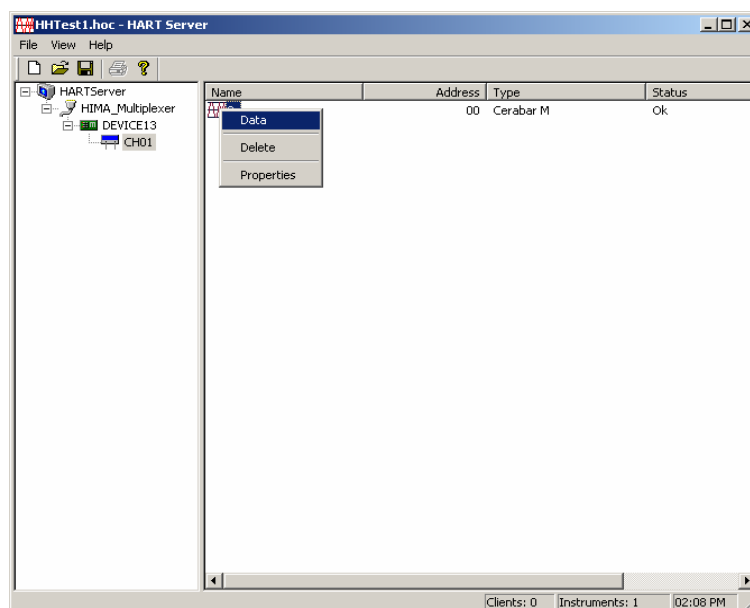




and adds the multiplexer/s with the connected modules



The result is shown as a tree structure



5. The configuration of the HART server has to be stored in order to be available immediately after restarting the HART server.

Now, the user can access the server using an OPC client, e.g. a process visualisation system.

### 1.1.2 Connection of HIMA HART Devices to non-HIMA Products

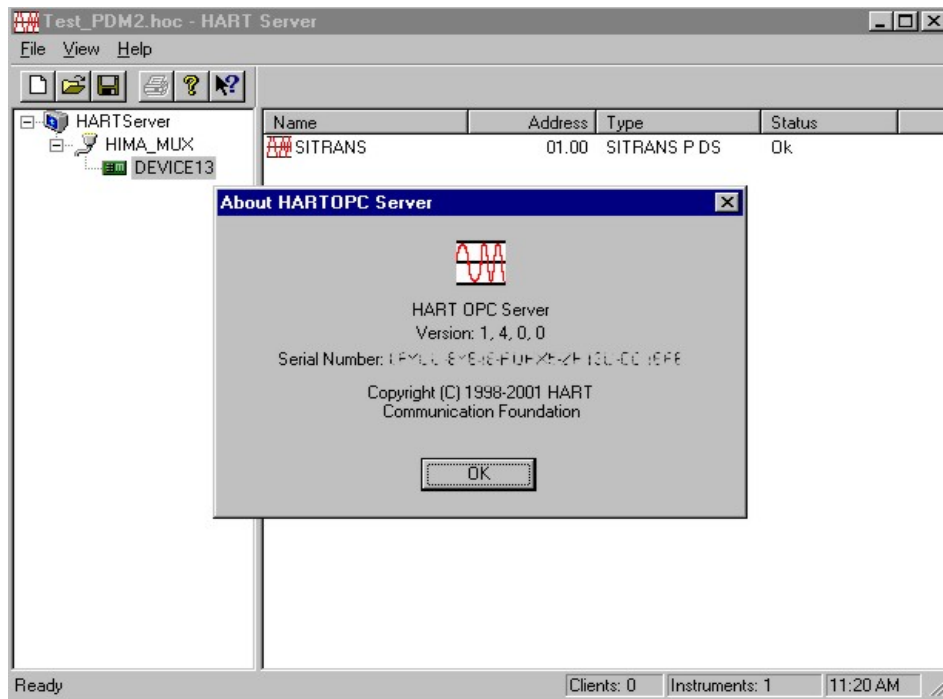
If HIMA HART devices are used in connection with OPC clients of other companies, e.g. visualization systems, it has to be made sure that the OPC clients are able to interact with the HART server version 2.1.

If necessary, an older version of the HART server has to be used, and the configuration files "hartopc.ini" and "harttables.ini" have to be adapted to this version.

## Example: Siemens PDM

If HIMA HART devices are applied in connection with the Siemens PDM system, it may be impossible to use the HART server (version 2.1)!

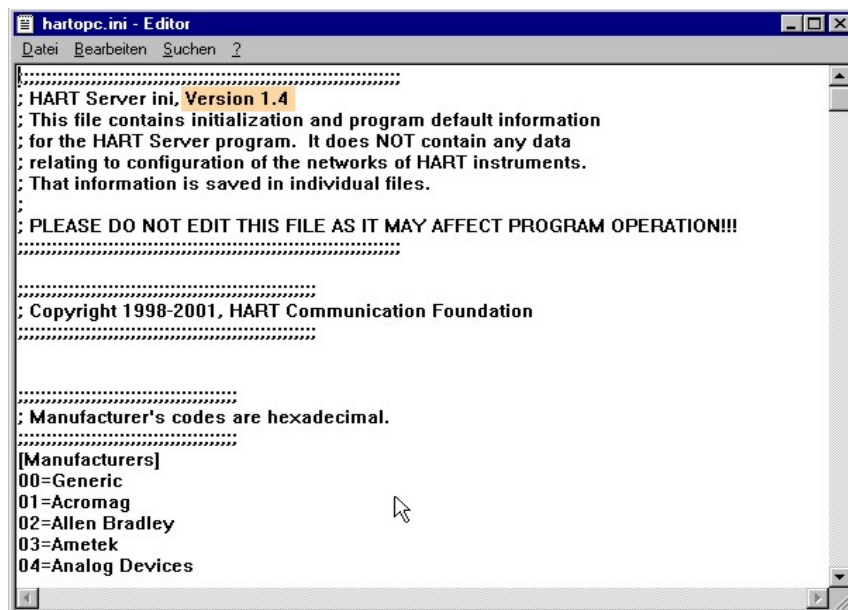
If a Siemens PDM system is installed needing the HART server version 1.4, the HART server delivered with the PDM system has to be used, i.e. version 1.4 (see picture).



Configuration files adapted for the version 1.4 of the HART server are also available on the ELOP II CD.

After installing the HART server from the Siemens CD, these files have to be copied into its installation directory overwriting the ones already existing there.

The configuration file "hartopc.ini" contains the version number as a comment. This is highlighted in the figure.



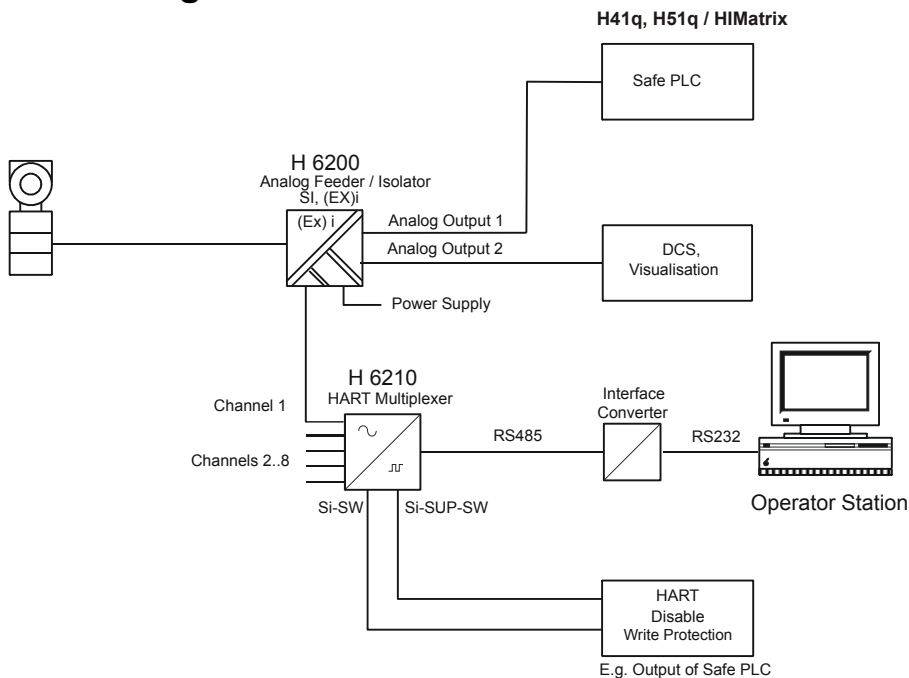
## 2 Application of the Modules

At most 8 isolators H 6200 can be connected to a HART multiplexer H 6210. This can communicate via an RS 485 interface to other devices or systems: e.g. the multiplexer may be connected to a process control system by means of the HART server.

The analog outputs of the H 6200 are designed for being connected to a safety-related control device, e.g. HIMA H41q/H51q or HIMatrix, or to other analog consumers as visualisation devices/systems, etc.

For safety-related write-protection, or disable of HART communication, an appropriate output of a control device or other appropriate circuitry has to be used.

### 2.1 Block Diagram



As shown in the picture, the RS 485 bus can be connected to the RS 232 interface of the PC, via an interface converter.

Instead of that, other possibilities of connecting RS 485 may be used, e.g.:

- PCI cards, which connect the RS 485 bus directly to the PC
- Converters, which connect several RS 485 channels by means of an Ethernet cable.

Up to 64 multiplexers H 6210 can be connected to one RS 485 channel, and therefore up to  $64 * 8 = 512$  transmitters.

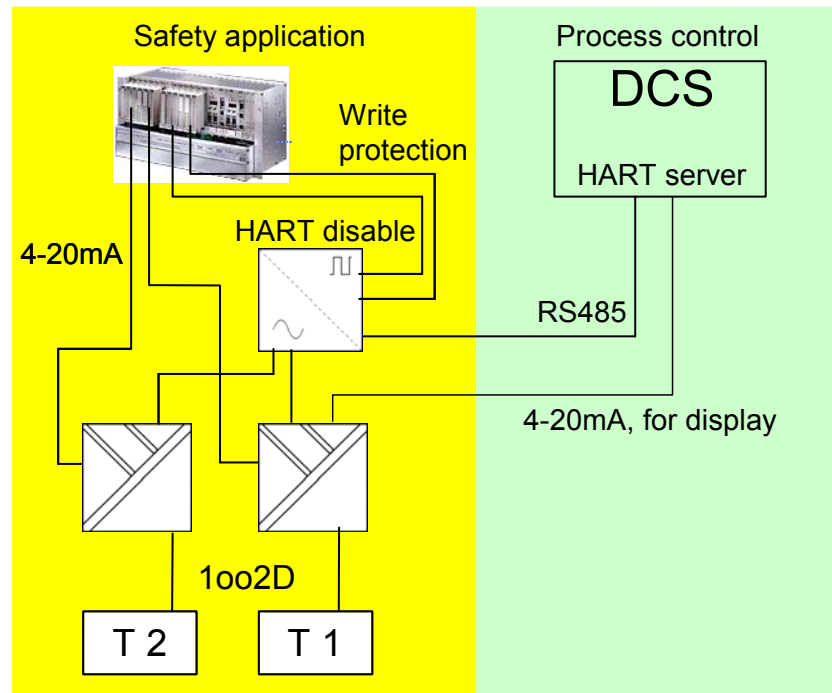
### 3 HART Communication for Safety-related Applications

HART communication offers the possibility of write access to the transmitters, and by this, of modifying the transmitter's configuration.

As the HART protocol was not developed according to the requirements of IEC 61508, the data delivered by HART must not be considered as a reliable source for safety-related functions.

But the information provided via the HART protocol may be used within process control systems for diagnosis, etc.

Therefore, the safety-related analog values and the HART data are within different parts of the automation system (protection layers according to IEC 61511), the process control system on one hand, and the safety system on the other.



#### 3.1 Safe Analog Processing

The module H 6200 assures safety-related processing of the analog signal according to SIL 3 with Ex(i) isolation of the input from the output terminals.

At the same time, it is assured that no error is carried over from the process control circuit to the safety system into the measurement circuit. The absence of reaction is ensured for applications up to SIL 3.

#### 3.2 Absence of Reaction

The HART multiplexer H 6210 has no electrical reaction to the attached isolators H 6200 and the transmitters (Ex and non-Ex) connected to those.

#### 3.3 HART Filtering

There are two filter functionalities:

- the HART communication either can be restricted to reading from the transmitters, or
- it can be interrupted completely.

Terminals at the HART multiplexer H 6210 control the filtering.

However, filtering does not influence the HART communication to/from the H 6210 itself.

The control signals for HART filtering must be taken from a safety-related output of a control

device (e.g. H41q/H51q or HIMatrix), or they must be the results of adequately classified circuitry, in order to reach the named SIL values.

### 3.3.1 Write Protection

The signal at the safety-related input can block HART commands performing write access to the transmitter. This can e.g. inhibit configuration changes, whereas reading is still possible. This safety functionality is performed with SIL 2. If the value 0 is applied or the terminal is not connected, no write operations are possible, i.e., configuration changes neither.

This feature does not require appliances to switch off the write operations within the transmitters, but is possible for any HART-enabled transmitters.

Which commands are forwarded is described in the datasheet.

Writing to the HART device H 6210 itself is possible nevertheless.

### 3.3.2 Deactivating HART Communication

The safety-related supply connector SI-SUP-SW supplies the HART modem. Thus, the complete HART communication to the transmitters – even reading, can be deactivated completely by switching off the supply voltage of the HART modem.

The safety integrity level of this connector is determined by the supply connected to it. If e.g. a digital output of a PLC of SIL 3 is connected, the supply voltage can be switched off achieving SIL 3.

A safety-related relay, e.g. H 4135, contacting to the supply output SI-SUP, which provides 24 VDC for this purpose, can also be connected to SI-SUP-SW.

## 3.4 Fault Diagnosis

The modules H 6200 and H 6210 each have LEDs to indicate the state of operation or failure of the module and/or its external circuitry. Thus, in the case of a failure, a quick diagnosis of a faulty module is possible.



**HIMA**  
**...the safe decision.**



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