Industrial Automation
Devices

H 6210
Data Sheet / Operating Instructions

HIMA Paul Hildebrandt GmbH
Industrial Automation

HI 800 173 CEA

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 manufacturers 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 responsibility 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.

H 6210

HART multiplexer, 8-fold H 6210
safety-related, in electronic housing
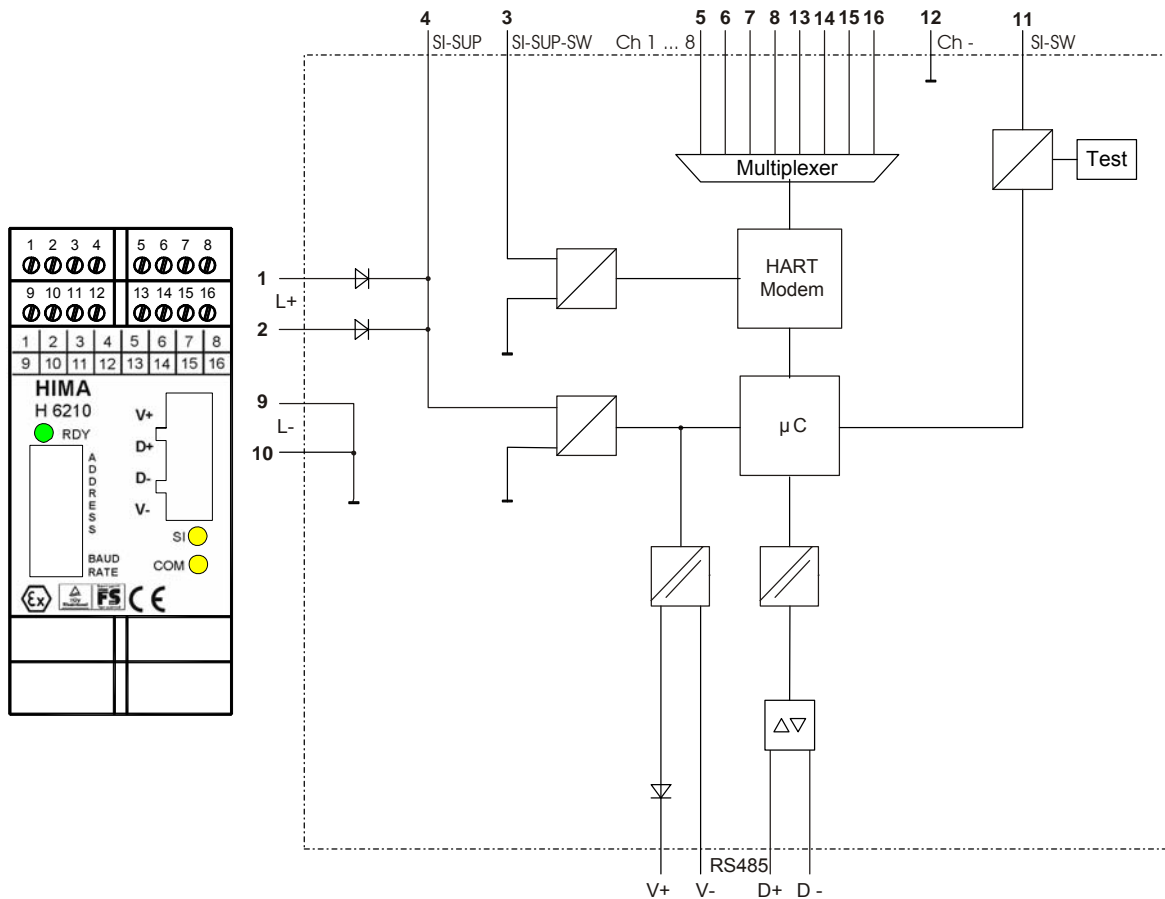
HART multiplexer, 8-fold H 6210

safety-related, in electronic housing
The module is TÜV - tested according to IEC 61508 for SIL 2,
according to EN 954-1 for category 2, 3.
Type Examination Certificate 04 ATEX 7063 X
(Zone 2, Zone 22)

1   Technical Data

Operating voltage	24 V = min. 20.4 V ($\cong$ - 15 %), max. 28.8 V ($\cong$ + 20 %)
Current consumption	60 mA
Ripple W_{SS}	$\leq \pm$ 15 %
Communication interface	RS 458
Number of bus subscribers	max. 64
SI-SUP power supply output for SI-SUP-SW Output voltage	24 V =
SI-SUP-SW power supply <u>input</u> for HART modem HART modem active at " de-activated at Must be connected to safety output module (SIL 3) or to appropriate wiring, <u>if not used: to SI-SUP</u> (terminal 3)	13...30 V @ 25 mA max. Input not connected

SI-SW: Input for write protection
 Writing to transmitter
          enabled at
          blocked at
 Must be connected to safety output module (SIL 2) or to appropriate wiring, <u>if not used: to SI-SUP</u> (terminal 3)
	20...30 V @ 8 mA
	 < 5 V

Supply output for RS 485 connector Voltage Current load	4 V typical max. 50 mA
HART voltage	Max. 12 V_{PP}
Ambient temperature	0 °C...+60 °C
Storage temperature	-40 °C...+85 °C
Protection class	IP20
Weight	210 g
Dimensions (H W D)	99 x 45 x 114,5 mm

The module complies to the following standards:
IEC 61131-2, IEC 61010-1, IEC 61326-1

2   Operational States and Display Readings

The module passes the HART commands, sent over the RS 485 connector, to the 8 channels, respectively to the devices connected there, and it sends the answers back. Controlled by two safety-related inputs, the module can block either only the writing, or all HART commands.

The operational state is displayed by three LEDs:
    RDY (Ready) green color,
    COM (RS485-Communication) yellow color
    SI (Safety state) yellow color

Possible states are

LED RDY (green)	LED COM[1] (yellow)	LED SI (yellow)	State
On	On	On	Initialisation after power-on
On	On/Off	Off	Normal operation, non-safe
On	On/Off	On	Normal operation, write-protection active (SIL 2), Reading HART communication is possible
On	OnOff	Blinking (slow)	HART communication is de-activated. The host communication over RS 485 continues undisturbed
Flashing	Off	Off	System failure. The module must be exchanged

Setting the RS 485 Adress and Baud Rate

On the front side there is the DIPswitch, by which the bus address within the RS 485 bus, and the baud rate can be set.

OFF		ON
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
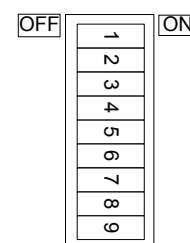
Switch Number (counted from top)	Usage					
1 to 6	**Bus address**, switch S1 = lowest bit					
	Address	S6	S5	S4	S3	S2	S1
	0	Off	Off	Off	Off	Off	Off
		Off	Off	Off	Off	Off	
	. . .						
	62	On	On	On	On	On	Off
	63	On	On	On	On	On	On
7	Currently not used					
8 to 9	**Baud rate:**		S9		S8	
	9600		Off		Off	
	19200		Off		On	
	38400		On		Off	

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[1] On/Off means: On, if communication over the RS 485 interface is active, otherwise Off

3   Safety

PFD and PFH calculations have been carried out for the module in accordance to IEC 61508.

IEC 61508-1 sets a PFD of 10^{-3} to 10^{-2} and a PFH of 10^{-7} to 10^{-6} per hour for SIL 2, and a PFD of 10^{-4} to 10^{-3} and a PFH of 10^{-8} to 10^{-7} per hour for SIL 3.

For the module applies:

PFD : $7.1 * 10^{-4}$
PFH : $1{,}6 * 10^{-8}$ /h
SFF :   94,3 %

Safety function SIL 2: Filtering of HART commands

Safety function SIL 3: Switching off the HART modem
The HART modem is switched off in this operating state and cuts off the communication to the field devices.
All safety-related data must be derived from the device supplying or turning off the HART modem.

3.1   Offline Proof-Test

The offline proof-test recognizes dangerous concealed faults that would affect the safe function of the plant.

The **interval** for the repeat test for the module is set to **10 years** (Off-line Proof Test, see IEC 61508-4, paragraph 3.8.5).

The execution of the offline proof test depends on the configuration of the plant (EUC = equipment under control), which risk potential it has, and which standards for operation are applied and form the bases for the approval by the test authority in charge.
According to the standards IEC 61508 1-7, IEC 61511 1-3, IEC 62061, and VDI/VDE 2180 sheet 1 to 4, in case of safety-related systems the operating company has to arrange for proof tests.

The H 6200 can be proof tested by executing the full safety loop.
In practice the input and output field devices have a shorter proof test interval (e.g., every 6 or 12 months) than the H 6200. If the end-user tests the complete safety loop because of the field devices then the H 6200 is automatically included in these tests. No additional periodic tests are required for the H 6200.
If the proof test of the field devices does not include the H 6200 then the PES needs to be tested as a minimum once in 10 years. This can be done by executing **a restart** of the H 6200.

4   Mechanical Design and Dimensions
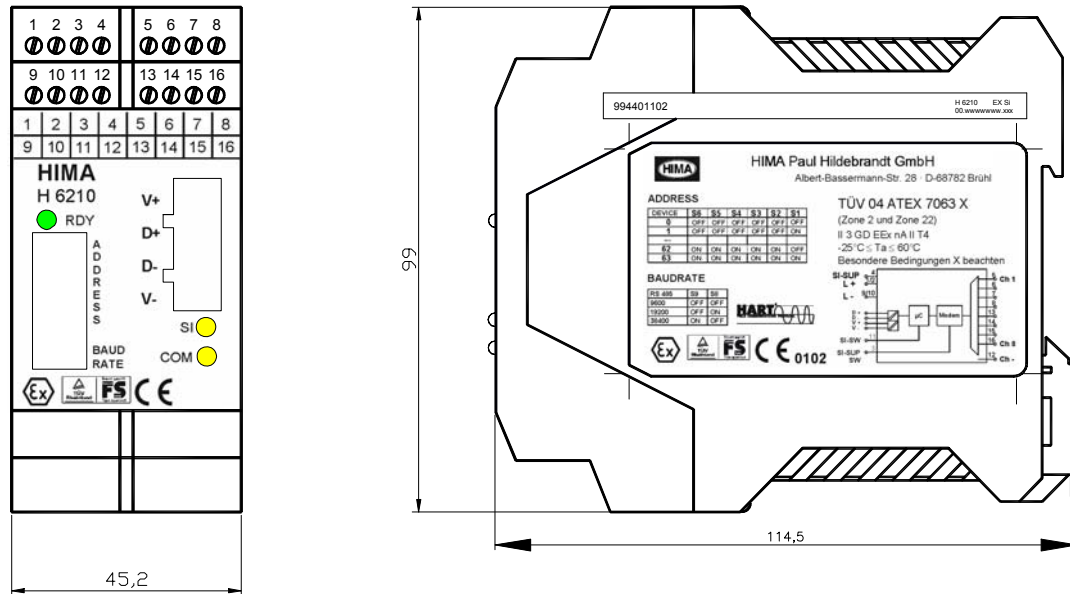
Housing dimensions: 99mm x 45 mm x 114,5mm (H W D)

Terminal Assignment of the Module H 6210

Terminal No.	Designation	Function
1	L+	Supply voltage 24 V
2	L+	Terminals are decoupled by internal diodes
3	SI-SUP-SW	Safety-related input for de-activation of the HART com-munication
4	SI-SW	Supply voltage for safety-related input SI-SUP-SW
5	Ch1	HART channel 1
6	Ch2	HART channel 2
7	Ch3	HART channel 3
8	Ch4	HART channel l 4
9	L-	Ground (internally connected)
10	L-	
11		Input for write-protection
12	Ch-	Ground for FSK channels
13	Ch5	HART channel 5
14	Ch6	HART channel l 6
15	Ch7	HART channel 7
16	Ch8	HART channel 8

⚠️ **Confusing the terminator plugs may damage the module,
or the modules connected to it!**

Voltage supply
The 24 VDC voltage supply of the controller must be supplied from a power supply with pro-
tective separation.
The power supply must fulfil the requirements of SELV (Safety Extra Low Voltage) or PELV
(Protective Extra Low Voltage), refer to EN 61010.
The power supply of the module must be protected externally with a fuse ≤ 16 A.

> ⚠️ **The module is grounded via the DIN rail. That is why the rail also must be galvanically connected to the cabinet's grounding system!.**

EMC
Using of shielded cables improves the EMC conditions significantly. In this case, the shield must be grounded.

Only personnel who have knowledge of ESD protective measures are permitted to carry out system modifications and replace modules.

> ⚠️ **An electrostatic discharge can damage the built-in electronic components.**

- Touch an earthed object to discharge any static in your body.
- When carrying out work on the module, make sure to use an ESD protected working area and wear an earthing strip.
- When the module is not in use, ensure it is protected from electrostatic discharges, e. g. keep it in its packaging.

RS 485 Terminal
On the front side there is a terminal to connect the RS 485 bus used to send HART commands to the module, and their answers back. The corresponding plug has the following pin assignment:
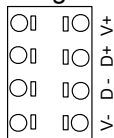
The right and the left clamp of each row are interconnected; therefore, two bus cables can be attached to each plug.

| **Note** | If the module is the first or the last station of the RS 485 bus, then a bus terminator must be connected. In principle, this is built up as shown in the figure: |
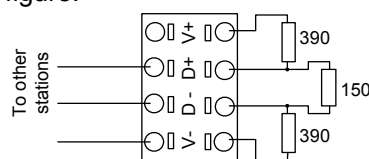
For the RS 485 bus, the use of shielded cables is mandatory for cables longer than 3 m. In this case, the shield must be grounded.

Assembly
The devices are fitted to a standard rail as described below:
- attach the guide on the back of the device to the upper edge of the standard rail,
- press the device against the rail, until the latch snaps in to lock the device onto the rail.

Removing the module from the standard rail:

- Insert a flathead screwdriver into the gap between the housing and the latch, use the screwdriver as a lever to move the latch downward, at the same time lifting the device off of the rail.

Note	•	In case of horizontal mounting position, there must be a distance of at least 100 mm to the next row of devices with power dissipation above and below the device; the same applies to the lateral gaps in the case of vertical mounting position.
	•	The device may not be fitted above heating equipment or any source of heat.

Arrangement of the Modules

A group of up to 8 isolators H 6200 can be mounted next to an 8-fold multiplexer in a horizontal or vertical position on a DIN rail. The isolators can be placed close to each other and close to the multiplexer; a distance of 50 mm between each group must be observed
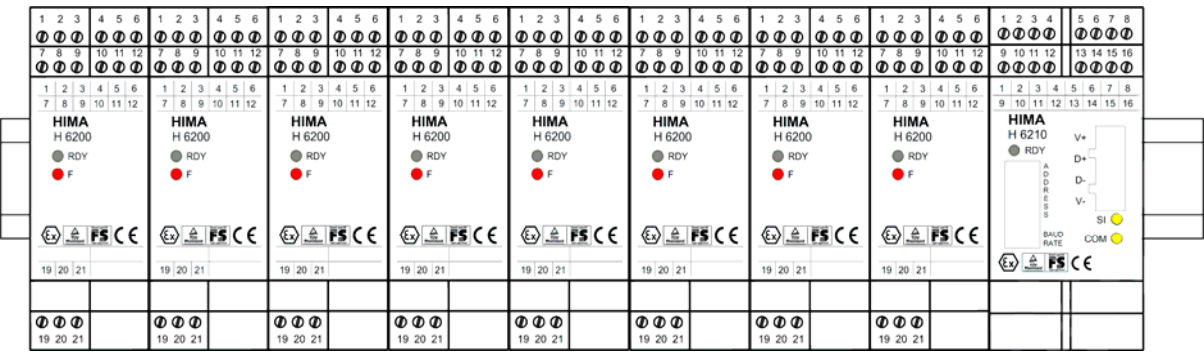
Horizontal mounting position
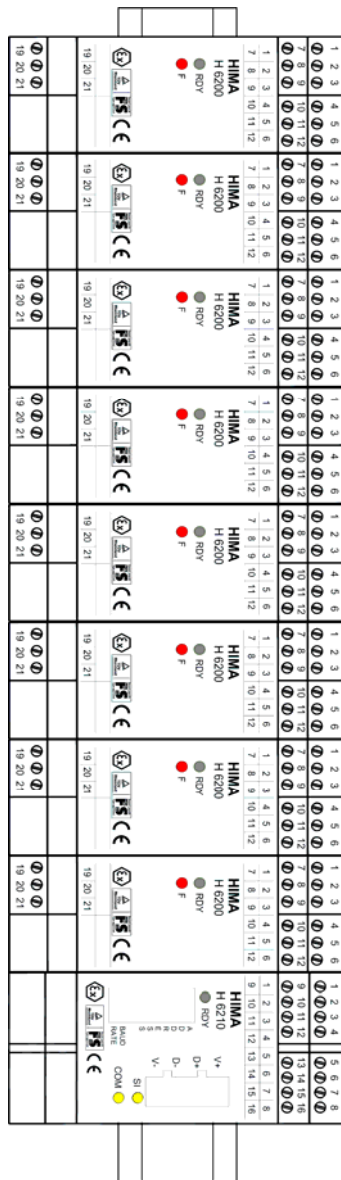
Vertical mounting position

In the case of vertical mounting position, the multiplexer H 6210 must always be mounted below the isolators H 6200.

If this assembly is not used, shielded cables with a maximum length of 3 m within the cabinet must be used:

- If the H 6200s and the H 6210 are distributed, e.g. over several DIN rails, star wiring with pairwise twisted wires must be used.
- If the H 6210 is installed remotely from a group of H 6200s as shown above, then the wiring between the group of H 6200s and the H 6210 can be made using *one* cable.

Hint for wiring
If a module is defective, the pluggable terminals are pulled out, the module is replaced, and then the terminals are plugged in again.
Attention must be paid not to disconnect any other module from the power supply.
This may occur if the wiring is wrong – if the circuit is only closed in the module to be replaced. The picture shows the wrong and the correct wiring.
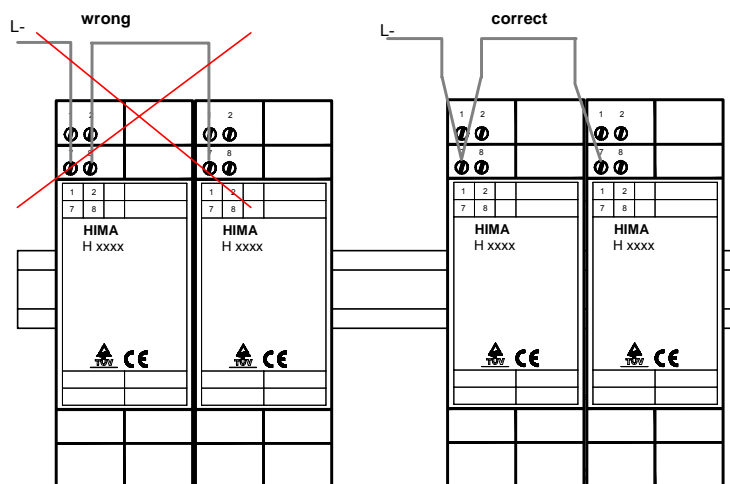
Enhancement of Availability
The HART multiplexer H 6210 allows feeding in the supply voltage L+ redundant and de-coupled by internal diodes. A short-circuit in one power supply has no influence on the second one.
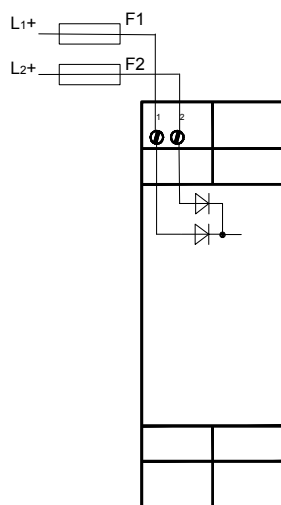
5   Operating Instructions

5.1   Application

The module can be used to interconnect up to 8 HART transmitters to a process computer which is physically connected via a RS 485 interface. The transmitters must be physically connected by using a module of type H 6200.

HART commands

The HART multiplexer itself is a device that can receive commands via the HART protocol, and can execute them – beside the task of sustaining the HART communication between the field devices and the HART server.

The module H 6210 supports the following HART commands:
- all „Universal Commands"
- the following "Common Practice Commands":
  Command 38, Reset Configuration Changed Flag;
  Command 41, Perform Self Test;
  Command 42, Perform Device Reset;
  Command 71, Lock Device;
  Command 72, Squawk;
  Command 76, Read Lock Device State
  Command 106, Flush Delayed Responses.
- the following "Device Specific Commands"
  Command 144, Read Retry Limits;
  Command 145, Write Retry Limits;
  Command 150, Read Gender;
  Command 151, Write Gender;
  Command 155, Copy Command and Reply.

These HART commands cannot be influenced by the safety-related inputs for write protection and HART de-activation!

Write protection, SIL 2

The safety-related input can block HART commands performing <u>write</u> access to the transmitter. This can lock out configuration changes, whereas reading is still possible. This safety functionality is performed with the quality SIL 2. If the value 0 is applied, no write operations are possible, i.e., configuration changes neither.

The HART commands being forwarded to the transmitters in this operation mode are:
- from the group of the "Universal Commands" the following
  Command 0, Read Unique Identifier
  Command 1, Read Primary Variable
  Command 2, Read Current and Percentage
  Command 3, Read All Variables
  Command 7, Read Loop Configuration
  Command 8, Read Dynamic Variable Classifications
  Command 9, Read Device Variables with Status
  Command 11, Read Unique Identifier Associated with Tag
  Command 12, Read Message
  Command 13, Read Tag, Descriptor, Date
  Command 14, Read Primary Variable Transducer Information
  Command 15, Read Device Information
  Command 16, Read Final Assembly Number
  Command 20, Read Long Tag
  Command 21, Read Unique Identifier Associated with Long Tag
- from the group of the "Common Practice Commands" the following
  Command 33, Read Device Variables
  Command 48, Read Additional Device Status
  Command 50, Read Dynamic Variable Assignments
  Command 54, Read Device Variable Information
  Command 57, Read Unit Tag, Descriptor, Date
  Command 60, Read Analog Channel and Percent Of Range

Command 63, Read Analog Channel Information
Command 70, Read Analog Channel Endpoint Values
Command 72, Squawk
Command 73, Find Device
Command 74, Read I/O System Capabilities
Command 75, Poll Sub-Device
Command 76, Read Lock Device State
Command 80, Read Device Variable Trim Points
Command 81, Read Device Variable Trim Guidelines
Command 105, Read Burst Mode Configuration.
- <u>no</u> commands from the group of the "Device Specific Commands".
Writing to the HART device H 6210 itself is possible nevertheless.

HART de-activation, SIL 3
The supply connector SI-SUP-SW supplies the HART modem. Thus, the HART communication to the transmitters – even reading, can be deactivated safely 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 contact connecting to the supply output SI-SUP, which provides 24 VDC for this purpose, can also be the connected to SI-SUP-SW.

For more detailed information on HART commands refer to the documentation, which can be obtained e.g. from the HART foundation (HCF).

The cooperation between the devices H 6200 and H 6210 is described in the document
HI 800 175 "HART Communication Manual".

Note	If the safety-related input SI-SUP-SW - to block the HART communication completely - is not used, it must be bridged to SI-SUP. Therefore, connect the terminals 3 and 4.

For installation of the module within zone 2 and zone 22, the following must be taken into account:

▪ Considering the special conditions X, the module may be installed in zone 2 or zone 22. The special conditions X are to be taken from the appendix of the Type Examination Certificate.
▪ Good knowledge of the relevant standards for the installation in zone 2 and zone 22 is necessary.

The applicable regulations and standards must be complied with, especially

EN 50014: 1997 + Corrigendum: 1998 + A1: 1999 + A2: 1999
(VDE 0170/0171, Part 1: 2000, DIN EN 50014: 2000-02)

EN 50281-1-1: 1998 + EN 50281-1-1/A1: 2002
(VDE 0170/0171 Part 15-1-1, DIN EN 50281-1-1: 1999-10
    +VDE 0170/0171 Part 15-1-1/A1, DIN EN 50281-1-1/A1: 2002-11)

EN 60079-15: 2003
(VDE 0170/0171 Part 16, DIN EN 60079-15: 2004-05)

EN 60079-14: 1997
(VDE 0165 Part 1, DIN EN 60079-14: 1998-08)

EN 50281-1-2: 1998 + EN 50281-1-2/A1: 2002
(VDE 0165 Part 2, DIN EN 50281-1-2: 1999-11
    + A1, DIN EN 50281-1-2/A1: 2002-11)

5.2   Maintenance

In case of a failure, the defective module must be replaced with the same, or with another approved type.

  Any repair of the module must be carried out by the manufacturer only.

TÜV Rheinland Group

(1) # TYPE-EXAMINATION CERTIFICATE
(Translation)

(2) Equipment and Protective Systems intended for Use in Potentially Explosive Atmosphere - **Directive 94/9/EC**

(3) Type-Examination Certificate Number

TÜV 04 ATEX 7063 X

(4) **Gerät:**   **H 6210 / HART-Multiplexer Si**

(5) **Hersteller:**   **HIMA Paul Hildebrandt GmbH + Co KG**

(6) **Anschrift:**   **D-68782 Brühl**   **Albert-Bassermann-Straße 28**

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents referred to.

(8) The TÜV CERT-Zertifizierungsstelle for ex-protected products of TÜV Industrie Service GmbH, TÜV Rheinland Group certifies this equipment has been found to comply with the Essential Health and Safety Requierements relating to the design and construction of equipment and protective systems intended for use in potentially eyplosive atmosphere, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report 194 /Ex063.00/04

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with

EN 60079-15: 2003   EN 50281-1-1: 1998

(10) IF the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requierements of this Directive apply to the manufacture and supply of this equipment.

(12) The marking of the equipment shall include the following:

⟨Ex⟩ II 3 GD   EEx nA II T4

TÜV CERT-Zertifizierungsstelle für Explosionsschutz   Köln, 11.10.04

Dipl.-Ing. K. Wettingfeld

This Type Examination Certificate may only be circulated without alterations. German version is valid. Extracts or alterations must be approved by TÜV CERT-Zertifizierungsstelle of TÜV Industrie Service GmbH, TÜV Rheinland Group

(13)   Annex to

(14)   **Type Examination Certificate**
                                    TÜV 04 ATEX 7063 X

(15)   **Description of the Equipment**

The HART multiplexer (H 6210) with 8 times multiplexer is designed for use with up to 8
HART separation amplifiers (H 6200). The requests arriving from the host system via RS485
are processed by the multiplexer and transmitted further to one of the eight FSK channels.

Parameters

Voltage supply: U_B 20.4 V ... 28.8 V

Ambient temperature range: -25 °C to +60 °C

The maximum power loss of the equipment is 1.4 W.

(16)   **Test Report Number:** 194 / Ex 063.00 / 04

(17)   **Special Conditions for Reliable Operation**

1) To satisfy the category 3G requirement, the HART multiplexer must be installed in a
   housing which meets or exceeds the IP 54 requirements included in EN 60079-15 or EN
   50021.

2) To satisfy the category 3D requirement, the HART multiplexer must be installed in a
   housing which meets or exceeds the IP 54 requirements included in EN 50281-1-1. In
   conductive dust conditions protection type IP6X is required.
   The maximum outer surface temperature of the housing must be determined.

3) When installing the HART multiplexer in a housing, ensure that the maximum power loss
   is considered.

4) Working on the HART multiplexer is only permitted with the voltage removed.
   Exception: No explosive atmosphere and/or explosive dust conditions present.

(18)   **Basic Safety and Health Requirements**

met by the above mentioned standards

TÜV Rheinland Group

TÜV CERT-Zertifizierungsstelle für Explosionsschutz   Cologne, 11 October 2004

Dipl.-Ing. Klaus Wettingfeld

9/504_04.04

HIMA
...the safe decision.

(0643)