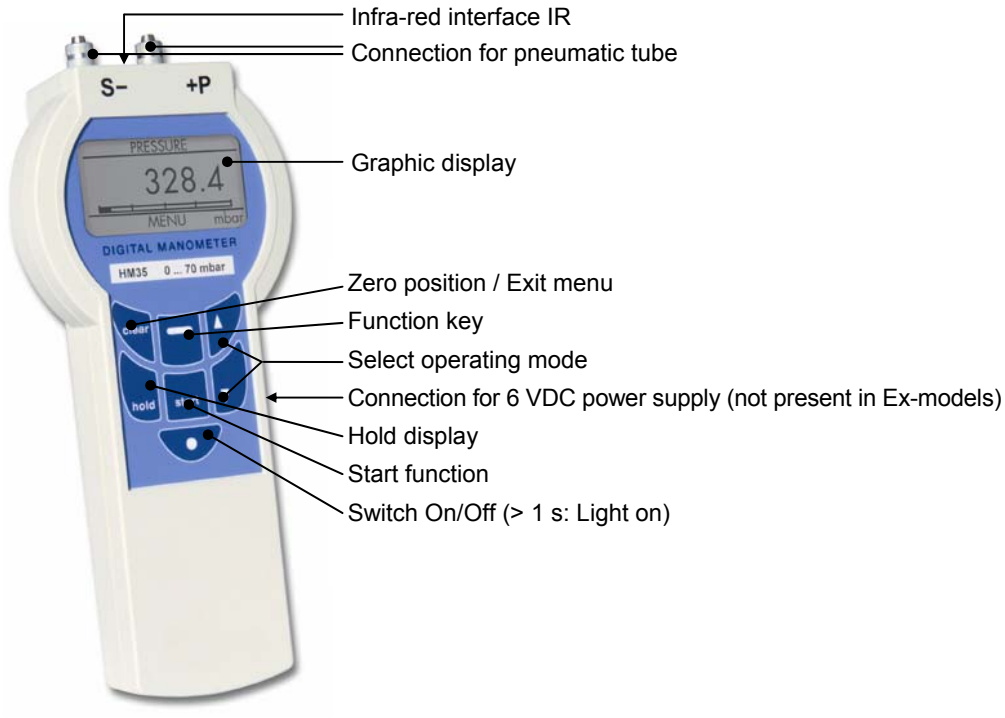
Operating instructions
Digital handheld pressure gauge

HM35

Operating Instructions

Contents

Operating Elements



Please note this warning symbol in these operating instructions!

EC Declaration of Conformity

We declare on our own responsibility that this product conforms to the following standards:

- EN 61326-1/A1

1 Description

The HM35 digital pressure gauge is a pressure-measuring instrument with an integrated pressure sensor for the measurement of differential, relative or absolute pressures and vacuum. Its versatile range of functions and high precision render it suitable for a wide range of applications. Via the infrared interface (IR) and SCPI (**S**tandard **C**ommands for **P**rogrammable **I**nstruments) commands, the HM35 can communicate with a PC. Its operation is very simple, and supports the user in his measurement tasks.

Operating modes

- Pressure measurement / Differential pressure
- Min./Max. values
- Mean value (average)
- Pressure change rate
- Data logging

Selectable configuration possibilities

- Data logging
  → Interval time, print/transfer, deleted memory
- Configuration
  → Measurement units, display filter, auto. switch-off time, auto zero, lighting level, etc.
- Average period (period for determining average value)
- Date and Time (real-time clock)
- Calibration
  → Date of last calibration date, manual recalibration

2 Safety information

- **The pressure values and overload levels** stated on the rating plate and quoted in these operating instructions **must not be exceeded,** as otherwise the **pressure sensor could be destroyed** or there could be **a risk of injury.**
- Only use pressure hoses with a maximum loading capacity corresponding to that necessary for the application.
- Ensure that the pneumatic hoses are securely fitted! Do not use damaged or kinked hoses.
- Do not open up the instrument (this would void the guarantee).
- The instrument must be stored within the permissible storage temperature range.

The instrument must not be put into operation in an explosive environment!

Wear eye protection if working with pressures > 1bar!

3 Operation

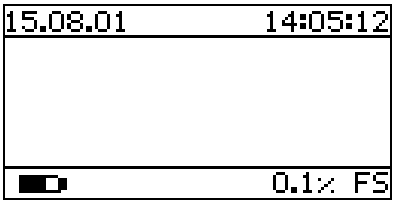
3.1 Switching on and off

Switching on Briefly press the **On/Off** key ( ) (< 1 s)
For precise measurements, the HM35 must first be switched on for at least 1 minute (warm-up phase).

Switching off Briefly press the **On/Off** key ( ) (< 1 s),
or
automatic switch-off 3, 10 or 60 minutes after the last time key operation (automatic switch-off does not take place during Average, Change Rate and Data Logging measurements or in IR and network operation).

Notes

- The HM35 switches on automatically when the supply voltage is connected.
- The HM35 continues to work in battery mode following an interruption of the supply voltage
- In case of a change in temperature, the HM35 must be allowed to adapt to the new ambient temperature for a least 30 minutes while switched off in order to attain the best measurement accuracy.
- The day/time, battery level and accuracy will be briefly displayed at switch on:



- After switch-on, the HM35 switches to the last operational mode used, e.g.:

- With the display filter activated, wait until the transient effect finishes (approx. 5 s).

3.2 Lighting

Switching on Press the **On/Off**-key ( ) for > 1 s

Brightness control In the **Menu,** select the **Configuration** → **Lighting** function and select an adjustment of **Off, Level 1, Level 2** or **Level 3**.

Switching off Briefly press the **On/Off** key ( ) (< 1 s)
(switch off the instrument),
or automatic switch-off after 20 s.
With mains operation, the HM35 must be switched off manually.

3.3 Pneumatic connection

Designation	Pressure range
Hose 4/6 mm	≤ 7,5 bar
NPT1/8“ internal	10 ... 90 bar
Plug in nipple „Rectus“ Type 20	≤ 30 bar
M10 x 1 internal thread (for „Minimess“ connector)	all

Ensure that the pneumatic hoses are connected correctly!

+P Higher pressure

S- Lower pressure (not available with the absolute and relative pressure version)

When screwing onto a coupling, it is important to hold the coupling steady with a wrench to prevent any turning!

Never secure by holding the casing itself!

3.4 Functions and operating modes

Key		clear	hold	[redacted] [1]	Start [2]
	Functions				
	PRESSURE	Zero: sets measured value to zero [3]	Freezes all current measurement values	To Menu selection	--
	DIFFERENCE				
▲	**MIN/MAX**	Sets Max/Min to current measured value			
▼	**AVERAGE** [4]	Sets measured value to zero [3]		Stop/Menu	Starts measuring
	CHANGE RATE [5]				
	DATA LOGGING		--		Starts data logging

Notes

1) Once a measurement procedure has been started, the menu selection is blocked.
2) During a measurement procedure (after Start has been pressed), you can switch between functions. This permits, for example, the observation of the Min/Max function during data logging.
3) The Clear key has no function in the absolute pressure instruments.
4) The AVERAGE function creates an arithmetic average value of all measured values during the time period selected in the menu. After expiry of the time period, the average value will be displayed.
5) Measurement of the leak rate (diff/gauge sensor) or tendency (abs. sensor). The pressure change (CHANGE RATE) from the start time to the current time will be displayed. The first display occurs 10 s after the start.

3.5 Menu selection and set-up

Navigation within the Menu selection

clear	**Brief (< 1 s)**	**1 level back**
	Long (> 1 s)	**Back to the function level/operating modes**
▲▼	**Selection of Set-up/Functions**	

The functions shown inverted on the display will be carried out if the **Function** key ([redacted]) is pressed.
The currently selected setting for values is marked with '✓'. In the following table, the default values are correspondingly marked (factory settings).

Key	[redacted]	[redacted]	[redacted]	Notes
	Data logging			
		Interval		Interval period
			manual	
			25 M./s	
			10 M./s	
			1 s	
			✓ 2 s	
			5 s	
			10 s	
			30 s	
			1 min	
			2 min	
			5 min	
			10 min	
			30 min	
			1 h	
			3 h	
			6 h	
			12 h	
			24 h	
			user	Set with ▲/▼/ **EDIT/OK**
▲		Print Data Logging		
▼			Press 'Start'	Print/send via IR
		Clear Memory		
			Press 'Clear'	Deletes the data memory
	Configuration			
		Pressure Unit		
			✓ mbar	
			bar	
			Pa	
			hPa	
			kPa	
			MPa	
			kg/cm^2	
			kg/m^2	
			mmHg	
			cmHg	
			mHg	
			inHg	
			mmH_2O	
			cmH_2O	
			mH_2O	
			inH_2O	
			ftH_2O	
			psi	
			lb/in^2	
			lb/ft^2	
			torr	
			atm	

Key	[redacted]	[redacted]	[redacted]	Notes
		Display Filter		Filters the display values 1)
			✓ On	
			Off	
		Auto-Off		Auto. switch-off
			3 min	
			✓ 10 min	
			60 min	
		Auto-Zero		
			On	Sensor auto-zeros at switch-on if measured value < 1% FS
			✓ Off	
		Beep		Warning beeper
			✓ On	
			Off	
		Lighting	Off	
			Level 1	Only Level 1 possible for Ex-models
			Level 2	
▲			✓ Level 3	
▼		IR Interface		
			✓ On	At switch-on, the automatic connection to the PC is activated for 2 minutes
			Off	Automatic connection is de-activated
	Average period			Time period for average value
		10 s		
		30 s		
		1 min		
		2 min		
		✓ 5 min		
		10 min		
		30 min		
		1 h		
		3 h		
		6 h		
		12 h		
		24 h		
		user		Set with ▲/▼/**EDIT/OK**
	Date & Time			
		dd.mm.yyyy		Set with ▲/▼/ **EDIT/OK**
		hh:mm:ss		Set with ▲/▼/ **EDIT/OK**
	Calibration			
		History		Displays the last calibration date
		Manual re-calibration		Manual re-calibration of the zero point and limit value

Note

1) With the filter function active, short-term measurement variations should be suppressed, resulting in a steadier display. Measured values via the interface and in the Data Logging Memory will not be filtered.

3.6 Data logging

3.6.1 Data recording

Every time that the Data Logging is started, an information header ("**Header**") will first be saved: The measured values will then be saved sequentially. "**Stop**" will be saved after every interruption of the logging or if manual storage is carried out. At the end of all the data loggings, "**End**" will be saved. Measured values can be uniquely identified by their header.

Designation	Example 1	Data Logging	Type of Data [2]
Date	01.01.2001	Header	INTEGER
Time	12:00:00		
Interval	30 s		DISCRETE
Function	PRESS		
Unit	mbar		
	1000.0	Measurement series [1]	FLOAT
	1001.1		
	1001.5		
	1000.3		
	999.7		
	Stop		DISCRETE
	End		DISCRETE

Designation	Example 2	Manual saving	Type of Data [2]
Date	01.01.2001	Header 1st measurement	INTEGER
Time	12:00:00		
Interval	Manual		DISCRETE
Function	PRESS		
Unit	inHg		
	29.92	1st measured value [1]	FLOAT
	Stop		DISCRETE
Date	01.01.2001	Header 2nd measurement	INTEGER
Time	12:00:33		
Interval	Manual		DISCRETE
Function	PRESS		
Unit	inHg		
	29.29	2nd measured value [1]	FLOAT
	Stop		DISCRETE
Date	01.01.2001	Header 3rd measurement	INTEGER
Time	12:01:45		
Interval	Manual		DISCRETE
Function	PRESS		
Unit	inHg		
	28.00	3rd measured value [1]	FLOAT
	Stop		DISCRETE
	End		DISCRETE

Notes
1) „Over“ (data type DISCRETE) for invalid pressure value
2) For the Data Type key, refer to the table on Page 18.
3) User-interval period will, for example, be displayed as follows, “user 01:15:00”

3.6.2 Transfer of data to a PC

(with HM35 Communication Software)

1. Install the IR (IrDA) -adapter according the instructions of the manufacturer.
2. Install the HM35 Communication Software.
3. Start the HM35 Communication Software.
4. Place the instrument max. 20 cm from the IR (IrDA)-Adapter and switch it on. Ensure a line-of sight connection between instrument and IR-adapter!
   If there is no communication with the instrument for more than 2 minutes, the IR interface of the instrument turns off automatically! By restarting the instrument the IR interface is reactivated.

3.6.3 Deleting data

1. In the **Menu,** select the **Data Logging** → **Clear Memory** function.
2. Press the **Clear** key.

3.7 Communication

3.7.1 IR/RS232-Protocol

COM-Port Settings

Baudrate	9600
Data bits	8
Parity	no
Protocol	no
Stop bit	1

Communication Protocol

Coding
The characters are transfered as ASCII-Code.

Sending a command from PC to the instrument

<SCPI Command> [SP <Parameter 1>] [, <Parameter 2>] [, <Parameter 3>] [, ...]
HT [* <CS>] CR

Examples:

Setting the time to 07:08:09:

S Y S T : T i m e SP 0 7 , 0 8 , 0 9 HT * 2 5 5 CR (with checksum)
S Y S T : T i m e SP 0 7 , 0 8 , 0 9 HT CR (without checksum)

Reading the time:

S Y S T : T i m e ? HT * 1 4 2 CR (with checksum)
S Y S T : T i m e ? HT CR (without checksum)

Response from instrument to PC

<Return Value 1> [, <Return Value 2>] [, <Return Value 3>] [, ...] HT * <CS> CR

SCPI Command: SCPI command according the table on following pages
CS: Checksum
Return Value: Response from instrument
[ ] Option

ASCII-character	Hex-Code	Meaning
SP	0x20	Space
HT	0x09	Horizontal Tabulation
CR	0x0D	Carriage Return
*	0x2A	Asterisk
,	0x2C	comma

SCPI Commands

There is no difference between small and capital letters.

Checksum (CS)

The use of the checksum is optional. A * indicates a following checksum. The ASCII-character * is included in the calculation of the checksum. The checksum is calculated from the low byte.

Example:

Reading the date

S	Y	S	T	:	D	a	t	e	?	HT	*	
53	59	53	54	3A	44	61	74	65	3F	09	2A	hex
83	89	83	84	58	68	97	116	101	63	09	42	dez

sum: 37D hex low byte: 7D hex
893 dez 125 dez

The checksum is 125 decimal.

Command:

S Y S T : D a t e ? HT * 1 2 5 CR (with checksum)
S Y S T : D a t e ? HT CR (without checksum)

Return Value

Command processed:
Return Value = o k
Example for response: o k HT * 1 3 CR

Error

Return Value	Meaning
er-001	RS232 Protocol checksum Error
er-110	Header Error; Too short Header Error; Too many subnodes Header Error; Query not at leaf node Header Error; Multiple querys Header Error; Characters after query Header Error; Too long
er-113	Undefined Header; Undefined command
er-109	Missing parameter Missing parameter; Boolean expected Missing parameter; String expected Missing parameter; Discrete expected Missing parameter; Not of expected type
er-101	Invalid character; Terminator expected
er-108	Invalid parameter; Out of bounds Invalid parameter; Too long
er-203	Command Protected
er-999	EEProm Read/Write Error
er-002	Fatal Command Execution Error

Example: Checksum Error
Response: e r – 0 0 1 HT * 200 CR

After command with response value

Example: reading time (07:08:09)
Response: 0 7 , 0 8 , 0 9 HT * 1 9 5 CR

After every command wait for the response of the instrument (max. 680 ms).

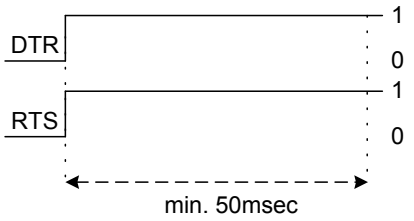
3.7.2 IR-Hardware of the instrument

The **hardware** of the IR-connection of the instrument is compatible with **IrDA - Standard 1.0**.

IR (IrDA)- Adapter

A **passive IrDA - adapter** has to be used which is compatible to **IrDA - Standard 1.0**. The IrDA adapter ACT-IR220Lplus is available as accessory.
The following explanations apply to this type:

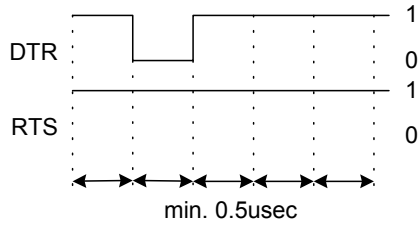
Initialisation



Remarks

ACT-220L/220L+ are programmed by toggling the control lines RTS and DTR. These lines may not be low at the same time during operation. In this condition the ACT-220L/220L+ goes in power down mode. If DTR and RTS are low at the same time or in an undefined condition, both lines must be set high for at least 50 ms to leave the power down mode.

Setting the baudrate



Remarks

Before setting the baudrate the ACT-220L/220L+ has to be initialised according **Initialisation**. The baudrate is set to 9600 bps according the opposite diagram.
A PC usually needs more than 0.5 us for an I/O-Instruction.

Control commands

The control commands are largely defined by the **Standard Commands for Programmable Instruments (SCPI)**.

Command	Sub-node 1	Sub-node 2	Transfer Parameters	Parameter Data Type
MEASure	:PRESsure		<interval>	INTEGER
	:PRESsure?		---	---
	:TEMPerature?		---	---
UNITs	:PRESsure		<unit>	DISCRETE
	:PRESsure?		---	---
SYSTem	:DATE		<yyyy>,<mm>,<dd>	INTEGER
	:DATE?		---	---
	:TIME		<hh>,<mm>,<ss>	INTEGER
	:TIME?		---	---
	:ERRor	[:NEXT]?	---	---
	:VERSion?		---	---
	:BEEPer	:STATe	<state>	BOOLEAN
	:BATTery?		---	---
	:RANGe?		---	---
	:TOLerance?		---	---
	:IDENt?		---	---
	:SET	:FILTer	<state>	BOOLEAN
		:ZERO	---	---

Parameter limits	Feedback data	Feedback data type	Description	Remarks
0, 10, 25	<value>	FLOAT	Continuous transfer of measured values	Continuous measurement with 10 or 25 M/s. Stops with Interval=0
---	<value>	FLOAT	Query measured pressure value	Individual value
---	<value>	FLOAT	Query sensor temperature	°C, individual value
mbar, bar,.... atm	---	---	Pressure unit input	
---	<unit>	DISCRETE	Query pressure unit	E.g., mbar, bar,.... atm
yyyy: 2001 ...2099 mm: 1...12 dd: 1... xx	---	---	Input date	yyyy: year, mm: month dd: day
---	<yyyy>,<mm>,<dd>	INTEGER	Query date	yyyy: year, mm: month dd: day
0...23, 0...59, 0...59	---	---	Input time	hh: hours, mm: minutes ss: seconds
---	<hh>,<mm>,<ss>	INTEGER	Query time	hh: hours, mm: minutes ss: seconds
---	<Error_number>, "<Error_description> (;<Device-dependent info>)"	INTEGER, STRING	Query SCPI Error Queue	STRING with ‚fixed text' and optional ‚free text', separated by a semicolon, maximum 255 digits
---	<version>	FLOAT	SCPI query and firm-ware version	e.g. '2001.0' , 'FW:300'
ON, OFF	---	---	Beeper enable / disable	
---	<value>	INTEGER	Query battery state	Range 0...100, value in %
---	<range>	STRING	Query sensor measurement range (in mbar)	e.g. "1,000 mbar“
---	<tolerance>	STRING	Query sensor tolerance	e.g. '0.05 %FS'
---	<type, MOD, S/N>	STRING	Query instrument identification	e.g. "HM3500DLH200, MOD00A,1234567“
ON, OFF	---	---	Set filter for display	
---	---	---	Zero measure pressure value (ZERO)	

Command	Sub-node 1	Sub-node 2	Transfer parameter	Parameter data type
SYSTem	:SET	:AOFF	<time>	DISCRETE
		:OFF	---	---
		:AZERo	<state>	BOOLEAN
		:INTerval	<interval>	DISCRETE
		:AVERage	<interval>	DISCRETE
	:CONFig	:IRDA	<status>	BOOLEAN

DIAGnostic	:ERRors?		---	---

DISPlay	:BRIGhtness		<level>	DISCRETE

MEMory	:COPY	:DLOG?	---	---
	:DELete	:ALL	---	---

***CLS**			---	---
***IDN?**			---	---
***STB?**			---	---
***TST?**			---	---
***RST**			---	---

Parameter limits	Feedback data	Feedback data type	Description	Remarks
3min, 10min, 60min	---	---	Set auto Off time	
---	---	---	Switch off instrument	
ON, OFF	---	---	Enable/disable auto zero	
25M./s, 10M./s, 1s ... 24h	---	---	Set interval time for Data Logging	Similar to Menu
10s, 30s ... 24h	---	---	Set time period for Average	Similar to Menu
OFF	---	---	Set auto IrDA connection	

---	<err>,<err>,<err>... <message>	INTEGER DISCRETE	Query the BIT-Error memory Query the BIT-error memory	Variable amount of Feedback data, err: 0...255 If Error memory deleted: 'No Errors!'

OFF, level 1, level 2, level 3	---	---	Brightness setting for LCD backlight	EX-instrument only OFF and Level 1, similar to Menu

---	<data>	diverse	Select Memory Data Logging (cyclic)	Complete reading, Format: see 3.6.1
---	---	---	Delete Memory Data Logging	

---	---	---	Delete Status and Error Memory	
---	<type, MOD, S/N>	STRING	Query instrument identification	See SYST:IDENT?
---	<data>	INTEGER	Query Status Byte	
---	<data>	INTEGER	Initiate a Self-Test	
---	---	---	Reset command	

Data Type Key

Designation	Description	Example
INTEGER	Decimal number, whole numbers only	123
FLOAT	Floating-point number	123.45
I-FLOAT	Floating-point number, transferred as an INTEGER. This means that it will not be transferred in the floating-point format, but as an INTEGER – value coded according to the IEEE-754 standard.	3242721280 (corresponds to -12.5)
DISCRETE	Discrete values, do not use “ in the text, similar to Menu selection	mbar
BOOLEAN	Boolean values: ON or OFF (similar to DISCRETE)	ON
STRING	Character string	"ABCDE“

Notes regarding control commands

- Cyclical commands — Commands that last longer are processed cyclically. They will be automatically interrupted if a command occurs that requires an output.
- " (Inverted commas) — A STRING is identified by inverted commas and a full-stop. These must be transferred with it (unlike DISCRETE).
- ' (apostrophe) — An apostrophe is used, for example for emphasis. The apostrophe itself will not be transferred.
- ( ) (brackets) — Parameter inside round brackets are optional The brackets themselves will not be transferred.
- , (comma) — The comma is used to separate arguments. The next argument must follow immediately after the comma (no SPACE, ASCII-Code 32_{dez}).

3.8 Battery replacement

- Open the battery compartment and insert 3 x 1,5 V Mignon cell AA, IEC LR6.

Always replace all three batteries at the same time!
Ensure correct polarity!

Dispose of used batteries in accordance with environmental regulations!

3.9 Calibration

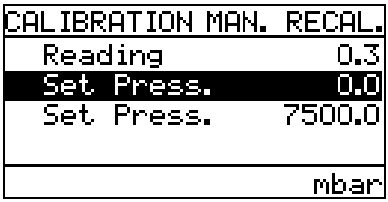
Re-calibration may only be carried out by specialist staff and with the corresponding pressure standards.
We recommend that you have the HM35 re-calibrated at least once a year, and, in case of highest demands for precision, several times a year.

Manual re-calibration

- In the **Menu,** select the **Calibration** → **Manual Calibration** function.

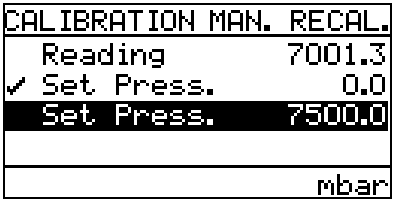
Zero point (Offset)

1. Open the pressure connection or, with the absolute pressure unit, set the given pressure value to the normal pressure.
2. Press the **Function** key (▬)
➔ the zero point will be re-calibrated.



Full-scale value

1. Set the given pressure value to the normal pressure.
2. Press the **Function** key (▬)
➔ the full-scale value will be calibrated and the HM35 returns to normal operation.



Notes

- The calibration is always carried out in **mbar**.
- The calibration must take place at a stable room temperature of **22 °C ± 2 °C**.
- A calibration value will only be accepted if it lies **within ± 5 %** of the full-scale value of the HM35.
- With the pressure connections open, it is possible to only re-calibrate the zero point.
- The date of the last calibration will be stored in the **Calibration History**.
- In case of manual re-calibration, the previous measurement will become invalid. You should always carry out a complete accuracy check afterwards.

4 Specifications

4.1 Technical data

Measuring media	Instrument air or inert gases
Media-compatibility	all media that is compatible with stainless steel 18/8 (DIN 1.4305)
Linearity, hysterisis and repeatability accuracy	according to measuring range and use See Table 4.2
Units	according to measuring range and use See Table 4.3
Operating temperature	0 °C to 50 °C
Storage temperature	-20 °C to 60 °C
Humidity	max. 95 % rH. (non-condensing)
Case protection	IP 54
Power supply	• 3 x 1,5 V Mignon-cell AA, IEC LR6 or accumulator • regulated 6 VDC plug-in mains supply unit (min. 6, max. 9 VDC
Current consumption	< 25 mA without display light, IR and beeper
Battery life	approx. 90 hours
Infra-red interface	serial IR-protocol
Measuring rate	max. 25 measurements/s (Data logging, IR) 5 measurements/s (normal operation)
Display rate	2 measurements/s

Memory size	max. 10’742 measurements
Memory interval	manual, 10, 25 measurements/s 1, 2, 5, 10, 30 s 1, 2, 5, 10, 30 min 1, 3, 6, 12, 24 h user-defined (user)
Average period	10, 30 s 1, 2, 5, 10, 30 min 1, 3, 6, 12, 24 h user defined (user)
Display	LCD graphic display 128 x 64 points Background lighting
Pneumatic connection	4/6 mm hose (M8 x 0,5) or NPT 1/8" Plug in nipple „Rectus“ Type 20 M10 x 1 inner thread (for connector „Minimess“)
Case dimensions	200 x 93/58 x 39/28 mm
Weight including batteries	approx. 300 g

4.2 Measuring Range and Precision

The measured values display works in the range from -10 % to 110 % of the measurement range.

Measuring rage	Unit	Pressure type	Resolution	Max. Loading	Max. static pressure
		1)			
0 ... 10	inH_2O	d,g	0.0001	50 inH_2O	245 psi
0 ... 28	inH_2O	d,g	0.001	140 inH_2O	245 psi
0 ... 80	inH_2O	d,g	0.001	600 inH_2O	245 psi
0 ... 120	inH_2O	d,g	0.001	600 inH_2O	245 psi
0 ... 200	inH_2O	d,g	0.001	1600 inH_2O	245 psi
0 ... 14.5	psi	d,g	0.0001	58 psi	245 psi
0 ... 15.9	psi	a	0.0001	58 psi	--
0 ... 29	psi	a,d,g	0.001	100 psi	245 psi
0 ... 100	psi	a,d,g	0.001	245 psi	245 psi
0 ... 145	psi	d,g	0.001	390 psi	390 psi
0 ... 245	psi	d,g	0.01	390 psi	390 psi
0 ... 500	psi	g	0.01	1000 psi	--
0 ... 1000	psi	g	0.01	2000 psi	--
0 ... 1300	psi	g	0.01	2000 psi	--

Measuring range	Unit	Accuracy			
		Inert gases		Media compatibility	
		% FS	% Rdg.	% FS	% Rdg.
			2)		2)
0 ... 10	inH_2O	0.1 / 0.2	--	--	--
0 ... 28	inH_2O	0.05 / 0.1 / 0.2	0.1	--	--
0 ... 80	inH_2O	0.1 / 0.2	--	--	--
0 ... 120	inH_2O	0.05 / 0.1 / 0.2	0.1	--	--
0 ... 200	inH_2O	0.1 / 0.2	--	--	--
0 ... 14.5	psi	0.05 / 0.1 / 0.2	0.1	0.1 / 0.2	--
0 ... 15.9	psi	0.1 / 0.2	--	--	--
0 ... 29	psi	0.05 / 0.1 / 0.2	0.1	0.1 / 0.2	--
0 ... 100	psi	0.05 / 0.1 / 0.2	0.1	0.1 / 0.2	--
0 ... 145	psi	0.1 / 0.2	--	0.1 / 0.2	--
0 ... 245	psi	0.05 / 0.1 / 0.2	0.1	0.1 / 0.2	--
0 ... 500	psi	--	--	0.1 / 0.2	0.1
0 ... 1000	psi	--	--	0.1 / 0.2	0.1
0 ... 1300	psi	--	--	0.1 / 0.2	0.1

1) a = absolute pressure
   d = differential pressure
   g = relative pressure

2) 0.1 % Rdg., but not less than 0.03 %FS.

4.3 Measurement units

The following units of measurement can be selected depending on the measuring range:

Measurement ranges		mbar	bar	Pa	hPa	kPa	MPa	kg/cm²	kg/m²	mm Hg	cm Hg	mm Hg
								1)	1)	1) 2)	1) 2)	1) 2)
0 ... 10	inH_2O	•	--	•	•	•	--	--	•	•	•	--
0 ... 28	inH_2O	•	--	•	•	•	--	--	•	•	•	--
0 ... 80	inH_2O	•	•	•	•	•	--	•	•	•	•	•
0 ... 120	inH_2O	•	•	•	•	•	--	•	•	•	•	•
0 ... 200	inH_2O	•	•	•	•	•	--	•	•	•	•	•
0 ... 14.5	psi	•	•	•	•	•	--	•	•	•	•	•
0 ... 15.9	psi	•	•	•	•	•	--	•	•	•	•	•
0 ... 29	psi	•	•	•	•	•	--	•	•	•	•	•
0 ... 100	psi	•	•	•	•	•	--	•	•	•	•	•
0 ... 145	psi	•	•	--	•	•	•	•	•	•	•	•
0 ... 245	psi	•	•	--	•	•	•	•	•	•	•	•
0 ... 500	psi	•	•	--	•	•	•	•	•	•	•	•
0 ... 1000	psi	•	•	--	•	•	•	•	•	•	•	•
0 ... 1300	psi	•	•	--	•	•	•	•	--	•	•	•

Measurement ranges		in Hg	mm H_2O	cm H_2O	m H_2O	in H_2O	ft H_2O	psi	lb/in² (psi)	lb/ft²	torr (mmHg)	atm
		1) 2)	1) 3)	1) 3)	1) 3)	1) 3)	1) 3)	1)	1)	1)	1)	1)
0 ... 10	inH_2O	•	•	•	•	•	•	•	•	•	•	--
0 ... 28	inH_2O	•	•	•	•	•	•	•	•	•	•	--
0 ... 80	inH_2O	•	•	•	•	•	•	•	•	•	•	•
0 ... 120	inH_2O	•	•	•	•	•	•	•	•	•	•	•
0 ... 200	inH_2O	•	•	•	•	•	•	•	•	•	•	•
0 ... 14.5	psi	•	•	•	•	•	•	•	•	•	•	•
0 ... 15.9	psi	•	•	•	•	•	•	•	•	•	•	•
0 ... 29	psi	•	•	•	•	•	•	•	•	•	•	•
0 ... 100	psi	•	•	•	•	•	•	•	•	•	•	•
0 ... 145	psi	•	•	•	•	•	•	•	•	•	•	•
0 ... 245	psi	•	•	•	•	•	•	•	•	•	•	•
0 ... 500	psi	•	•	•	•	•	•	•	•	•	•	•
0 ... 1000	psi	•	•	•	•	•	•	•	•	•	•	•
0 ... 1300	psi	•	--	•	•	•	•	•	•	•	•	•

1) In relation to the acceleration due to gravity of 9,81 m/s²
2) at 0 °C 3) at 4 °C

Conversion factors

1 mbar	=	0,0010	bar	1 mbar	=	10,1974	mmH_2O (at 4 °C)
1 mbar	=	100	Pa	1 mbar	=	1,01974	cmH_2O (at 4 °C)
1 mbar	=	1,0	hPa	1 mbar	=	0,0101974	mH_2O (at 4 °C)
1 mbar	=	0,1	kPa	1 mbar	=	0,40147	inH_2O (at 4 °C)
1 mbar	=	0,00010	Mpa	1 mbar	=	0,033456	ftH_2O (at 4 °C)
1 mbar	=	0,00102	kg/cm²	1 mbar	=	0,01450	psi
1 mbar	=	10,20	kg/m²	1 mbar	=	0,01450	lb/in²
1 mbar	=	0,75006	mmHg (at 0 °C)	1 mbar	=	2,08854	lb/ft²
1 mbar	=	0,075006	cmHg (at 0 °C)	1 mbar	=	0,75006	torr
1 mbar	=	0,00075	mHg (at 0 °C)	1 mbar	=	0,00099	atm
1 mbar	=	0,02953	inHg (at 0 °C)				

4.4 Mains supply unit connection

The unit can be operated from a regulated plug-in mains supply unit.

Input	100 - 240 V, 50 - 60 Hz
Output	6 VDC ± 10 %, 1,5 W

5 Maintenance and storage

The HM35 requires no maintenance. It can be cleaned with a damp cloth. Do not use cleaning agents containing solvents!
See the relevant chapters for **battery replacement** und **re-calibration**.

During longer storage, remove the batteries from the instrument.
Do not drop below or exceed the admissible storage temperatures of -20 °C to 60 °C!

6 Warning messages and faults

Code	Fault / Display	Possible cause	Correction
	Does not switch on	Power supply missing	Possibly replace the batteries. Battery possibly inserted incorrectly. Possibly plug in power supply correctly.
	Instrument inaccurate	• Re-calibration carried out inaccurately • Not zeroed • Natural aging of the pressure sensor	• Re-calibrate • Vent and press Zero • Have it re-calibrated
	No change of the measured value	Excess pressure on sensor	Send instrument to the manufacturer for repair.
14	PRESSURE OUT OF RANGE!	Measurement range has been exceeded by more than 10 %.	Set up the permissible measurement pressure.
13	PRESSURE OUT OF RANGE!	• Excess pressure on sensor • Electrical fault	Send instrument to the manufacturer for repair.
06	TEMPERATURE OUT OF RANGE!	Pressure sensor exposed to temperature outside permissible range (< -5 °C or > 55 °C)	Observe permissible operating temperature and temperature of the medium.
04	TEMPERATURE OUT OF RANGE!	Used outside permissible temperature range	Observe permissible operating temperature.
15	REF. VOLTAGE FAILURE!	Internal reference voltage error	Send instrument to the manufacturer for repair.
07	NOT CALIBRATED!	Incorrect calibration of the instrument	Send instrument to the manufacturer for repair.
05	LOW BATTERY!	Battery voltage too low	Replace batteries
	No IR communication	• Line-of-sight connection interrupted • Separation too large • PC-configuration	• Re-establish line-of-sight connection • Max. distance 50 cm • Check IR connection

7 Accessories

Standard 3 x 1,5 V batteries IEC LR6
Operating instructions
SCS Test certificate

Options 6V mains supply unit 100 - 240 V, 50 - 60 Hz, 1,15 A
Leather case with carrying strap
Service-Set (transport case)
Hand pump
Infrared RS232 serial adapter
NPT 1/8" adapter
„Rectus“ adapter, type 20
Communication software for MS-Windows® (95/98, 2000, XP)

8 Summary of technical characteristics

Characteristics	HM35	Remarks
Basic functions		
1 pressure sensor installed	•	
Absolute pressure	•	
Differential pressure	•	
Relative pressure	•	
Vacuum (relative under-pressure)	•	The instrument is only calibrated
for inert gases	•	in the over-pressure range
Media compatibility rel./abs.	•	
Measuring ranges / Accuracy		See separate table
Calibrated temperature range 0 ... 50 °C	•	
Measuring functions		
Pressure / Differential pressure	•	
Min/Max	•	
Average	•	Average per time period
Change Rate	•	Tendency / leak rate
Other functions		
Set-up/Configuration		
Unit switchable	•	
Display filter	•	
Auto-off	•	
Record interval	•	Free choice
Average period	•	Free choice
Display rate	2 M/s	
Max. measurement rate	25 M/s	Approx..
Date / Time (real time)	•	
Analogue bar display	•	
Real time data logging	•	
Data logging / manual record	•	
Print record	•	
Number of records	10742	Max.
Zeros with key	•	
Automatic zeroing	•	
Hold	•	
Display accuracy at start-up	•	

Characteristics	HM35	Remarks
Low battery display	•	
Acoustic signal	•	For out-of-range / fault operation
Self-test	•	
Housing		
Hand-held	•	
Splash proof IP54	•	
Connections		
Tube 4/6 mm	•	M8 x 0,5
NPT1/8“ internal	•	
Plug-in nipple „Rectus“ Type 20	•	
M10 x 1 internal thread	•	For „Minimess“ 1215
Power supply socket	•	
Display		
Graphic display	•	
Lighting	•	Reduced brightness in Ex-version
Automatic contrast adjustment	•	for temperature changes
Power supply		
Battery	•	
External plug-mounted power module	•	
Digital interfaces		
Infrared interface	•	
SCPI protocol	•	Standard Commands for Programmable Instruments
Environmental conditions		
Operating temperature 0 ... 50 °C	•	
Storage temperature -20 ... 60 °C	•	
Humidity max. 95 %r.F.	•	Non-condensing

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I-HM35/0208, Art. Nr. 70 792 155