Thermo SCIENTIFIC

Technical Description DT-019-971204 E

Remote–Control Commands for the Infrared Interface FH 40 G

Version_check

Rev.	Rev. version	Responsible Dept.	Name	Rev. Page	Cat. *)	Explanation
A	31.01.98	SM-GE	Schl	3-2, 3-3, 3-7, 3-9	S	**Firmware 2.42** Commands New: Rx Change: c, cycl. sending Cancel: Q0, Q1
B	03.08.98	SM-GE	Schl	3-2, 3-8, 4-1, 4-3	S	Commands were added Firmware **V 2.44**
C	13.01.99	SM-GE	Schl	3-9, 4-4	S	Several states and xE number were changed
D	25.06.01	SM-GE	Tr	3-9	S	Version identification H*(10), **V 2.67**
E	07.07.03	SM-GE	Schl	2-1	V	RTS, DTR line, Time intervals
F	02.05.04	SM-GE	Tr	3-1 3-3 3-8 3-12	S	Set of external alarm thresholds extended V2.72 Neutron dose, total dose Dose value, autosend Reading of calibration “KP”
G	12.02.07	RM&P-ES	Schl	3-8 3-10 3-12	S	from **V 3.00** Automatic sending Test operation HV commands
H	13.09.07	RM&P-E	Tr	2-1, 3-8	S	**from V 3.21**: Preamble for polling and autosend changed

*) Category K: editorial correction
V: explanatory improvement
S: substantial change

An explanation is required at least for category S.

Contents :

1. Connection to a PC

The FH 40 G features an infrared interface allowing for direct connection to a PC with V24/RS232 interface when a special adapter cable (42540/30) is used.

In this manner, transfer of stored measured values and the configuration of the unit are possible.

For these tasks special Windows PC programs are available.

2. Data transmission method

Data transmission is performed in ASCII code using the following parameters:

- 9600 Baud
- Start bit
- 7 data bits
- Parity bit: even
- 2 stop bits

To allow for remote control of the FH 40 G unit via the PC, the following data transmission procedure has to be observed:

- PC sends any character to the FH 40 G
- FH 40 G replies with the character „>„.
- PC sends a remote-control command within 25 ms (> V 3.20: 40 ms), but not prior than 200 µs, where the last character must be a line feed character <LF> (0A). Before the line feed character, there may be a carriage return character <CR> (0D).
- FH 40 G replies with „#“ as positive acknowledgement signal, or with „?“ in case of an error. Starting from version V 3.21 the FH 40 G answers with @ @ #. This is sufficient for activating sleeping Zig Bee modems.
- If an output was prompted, the output data will follow now.
  Versions < V 3.21 may have an interval up to 180 ms between # and output data.
  Versions V 3.21 and greater send Preamble @ @ # and output data continuously.
- The FH 40 G terminates each transmission with <CR> <LF>.

Following control lines are needed for the power supply of the interface adapter cable and must be set by the PC:

- RTS (Ready To Send) must always have at positive voltage level! No Hand shake!
- DTR (Data Terminal Ready) must always have a negative voltage level!

3. Remote-control commands

For remote control, the following commands may be sent to the FH 40 G.

3.1 Limit values

jR	Reading the threshold for dose rate alarm. Response: number in the smallest possible unit. e.g. `0.1234E+4` in the device unit µSv/h or µR/h respectively
jW Number	Setting the threshold for dose rate alarm. Number = 0.nnnnEnn (E-format) in the smallest possible unit e. g. µSv/h.
A0	Resetting the alarm auto reset A1 Setting the alarm auto reset
AR	Reading the threshold for the dose alarm Response e. g. `0.1005E+4` in the device unit µSv or µR respectively
AW Number	Setting the threshold for the dose alarm Number = 0.nnnnEnn, e.g. in appliance unit µSv/h or µR/h respectively
	Version **2.71** and smaller:
mR	Reading the threshold for the rate alarm with an uncalibrated external probe being connected. Unit: cps, s^{-1} or cpm. Please refer to unit / command eR. Response e. g. `0.1005E+4`
mW	Setting the threshold for the rate alarm with an uncalibrated external probe being connected.
	Version **2.72** and up:
mR	Reading the thresholds of external uncalibrated probes [cps, s-1, cpm] Gamma, Alpha, Beta/Gamma, Neutron Response e. g. `0.1000E+5 0.2500E+4 0.1000E+5 0.5000E+4`
xR	Reading the thresholds of external calibrated probes Gamma, Alpha, Beta/Gamma, Neutronen Response e. g. `0.2500E+5 0.3700E+5 0.3700E+6 0.2000E+4`
mW, xW	Setting the thresholds of external probes, (mR und xR)

3.2 Measured values

R

Reading the display value

Response: display value / unit / status

e. g.: `0.6009E-1 0 00`

Whereat

Unit = 0 : µSv/h
1 : µGy/h
2 : µR/h

when connecting an external uncalibrated probe:

3 : cpm
4 : 1/s
5 : cps
6: calibrated probe for contamination, unit e.g. BQ/CM2

The status is put out hexadecimally

Status = 00 – Internal probe
01 – External probe
02 – Display range exceeded
04 – Dose rate alarm / internal probe
08 – Dose rate alarm / external probe
10 – Artificial radiation (external probe FHT 672)

By adding the above numbers correspondingly, status combinations can be indicated (e. g. 18 = artificial radiation and alarm external probe).

Rx

Reading the measured value of internal and external probe

Response: Value(I) Unit(I) Value(E) Unit(E) Status

(I) = Internal probe (E) = External probe

e. g.: `0.1234E+0 0 0.6009E-1 4 00`

Whereat

Unit = 0 : µSv/h
1 : µGy/h
2 : µR/h

when connecting an external alpha/beta detector:

3 : cpm
4 : 1/s
5 : cps
6: calibrated probe for contamination, unit e.g. BQ/CM2

Status = 01 – undefined
02 – Display range exceeded
04 – Dose rate alarm
08 – Dose rate alarm / external probe
10 – Artificial radiation (external probe FHT 672)

By adding the above numbers status combinations can be indicated.

r	Reading the maximum displayed value in the device unit µSv/h or µR/h respectively Response: number e.g.: `0.1352E+0`
m	Reading the mean value of the display values Response: number and averaging time in seconds e.g.: `0.6670E-1 565`
u	Resetting the mean value
D	Reading the dose of internal detector Response: Number in µSv (µR, µGy) e.g.: `0.122E+1`
Dn	Reading the dose of external neutron detector
Dt	Reading of total dose, sum of internal and neutron dose
clr	Resetting the dose of internal detector
clrn	Resetting the dose of external neutron detector and total dose

3.3 Counter mode

G	Starting the counter measurement
?	Inquiry, if measurement runs Response: 0, if measurement is terminated 1, if measurement runs
c	Reading measured values, units (see command „R“) and measurement time for internal and external probes in seconds Response: Measured value(I) Unit(I) Measured value(E) Unit(E) Measurement time (I) = internal probe (E) = external probe e.g.: `0.1234E+0 0 0.1234E+0 0 20`
F1	Automatic storage of the measured value once the counter measurement has been terminated (via Start), not via the interface
F0	No automatic storage
S	Stopping the counter measurement, the measured value is not calculated

TR	Reading the measurement time in seconds. e.g.: `120`
TW Number	Entering the measurement time in seconds e.g.: `TW120` setting the measurement time to 120 seconds
PR	Reading the number of pulses preset e.g.: `8000`
PW Number	Entering the number of preset pulses, number > 4.0E2 e.g.: `PW 8.0E3`

3.4 Mesured values storage

H — Reading the contents of the measured values storage

As response, the complete contents of the storage is transmitted, each data record ending with <CR> <LF>. The character “E” indicates the end of the transfer.

The data record transmitted first contains the most recent, the data record transmitted last contains the oldest measured value.

A line is structured as follows:

Year
Month
Day
Hour
Minute
Second
Internal unit
FH 40 G-internal value
External probe type
External probe unit
Status
External probe measured value
Measurement time
Identification (0 - 65535, e.g. selection of measuring point)

Please note:
The value for the identification is only unlike 0, if a number has bee read in via the optical interface, e.g. by a barcode reader, before storage of the measured value. This identification may be used to mark a measurement position.

q	Deleting the measured values storage
nnnn	Entering the measured values identification nnnn: number 0 - 65535 Leading zeroes or spaces are permitted. Once the number was read in successfully, the unit gives out a short acoustic signal. When storing the measured values in the measured values storage, the number read in will be stored as identification. It remains valid until a new value has been read in. Once the unit has been switched on, the identification will have the value 0. When entering numbers having more than 5 digits, only the first 5 digits are evaluated.

3.5 Date and Time

ZR	Reading date and time Response in the format: year, month, day, hour, minute, second (JJMMTTHHMMSS). e.g.: `940927172845`
ZW Date Time	Setting date and time Format: as described above

3.6 Device description

YWText	Writing the device description The text may contain up to 6 characters (upper case characters only) or digits. This description is displayed in the bottom display line when the unit is switched on.
YR	Reading the device description Response: Text

3.7 Unit

DR — Reading the display unit of the FH 40 G

Response:
0 - µSv/h
1 - µGy/h
2 - µR/h

eWn — Setting the display unit for the alpha/beta-detector (external) .

n =
3 : cpm
4 : 1/s
5 : cps

eR — Reading the display unit for the alpha/beta-probe (external)

Response:
3 - cpm
4 - 1/s
5 - cps

QR — Reading the unit of a calibrated contamination probe
e.g.: `BQ/CM2`

QW — Writing the unit of a calibrated contamination probe
Save with command EW to EEPROM.

3.8 Standby

B1 — When switching off, the measuring device will change to standby mode. Date, time and the measured values storage are maintained.

B0 — When switching off, the unit is switched off completely. Date, time and measured values storage will be lost.

3.9 Additional functions

SWCharacter string — Selecting the additional functions that can be invoked.
e.g.: In user mode, the functions 5, 17, 4, 10 shall be callable in this sequence.
The command then is `SW0511040A`.
Please note that the function numbers have to be entered in hexadecimal format.

Table A-1: Function numbers

Nr. (hex)	Designation
1 (01)	ALARM
2 (02)	MAX
3 (03)	DOSE I
4 (04)	MEAN
5 (05)	Time (clock symbol)
6 (06)	Date (calendar symbol)
7 (07)	MEM
8 (08)	SET AL
9 (09)	SET DO
12 (0C)	MAXCLR
13 (0D)	DOSCLR
14 (0E)	MEANCLR
15 (0F)	MEMCLR
16 (10)	TIMSET
17 (11)	PRCNT
18 (12)	INTERN
19 (13)	SEND
20 (14)	START
21 (15)	STORE
22	SET AB
23	CAL672
24	-
25	-
26	-
27	(display function)
28	AL DOS
29	DOSE (1D total dose)
30	DOSE (1E Neutron dose)
31	- (IF)
32	- (Set functions)
33	-

sR — Reading the numbers of the active additional functions.
E.g. for a response: `0511040A`

3.10 Expert mode

L0 — The expert mode may be invoked by pressing the function key during switch-on.
L1 — The expert mode is locked.

3.11 Automatic sending

X0 Deactivating cyclic sending of the dose rate measurement value.

X1 Activate cyclic sending of the dose rate measurement value. The dose rate measurement value is sent every second.

Warning:
Cyclic sending is performed with a transmission rate of **2400** Baud for FH40G **versions < 3.0**.
This way, also a simple sender/transmitter may be triggered. Reception continues to be performed at 9600 Baud, where, however, data can be received only during breaks in sending (half-duplex).
Starting from **version 3.0,** cyclic sending is performed with a transmission rate of **9600** Baud.

Space STX value(I) Dim(I) value(E) Dim(E) Status Instrument designation value(D) BCC ETX

Example:

```
_   <STX> 0.7451E-1 0 0.1234E+2 4 00 FH40G 0.0425E+2<BCC><ETX><CR><LF>
```

Space: char 0AH, pause of ca. 60 ms
starting from V 3.21. Preamble @ @ @ @ is sent without pause

Value(I) = Measured value of dose rate, internal probe,

Dim(I) = Unit of internal probe / value (see 3.7)

Value(E) = Measured value external probe

Dim(E) = External probe unit (3.7)

Status = 8 bits as hexadecimal char value
01 – undefined
02 – Display range exceeded
04 – Dose rate alarm
08 – Dose rate alarm / external probe
10 – Artificial radiation (external probe FHT 672)
20 – Battery low

Instrument designation: Text in alphanumerical 6 character display during power on

Value(D) = Measured value of dose, internal probe,
same unit as Value(I) (Sv, R, Gy), Version 2.51 and up

Formation of a BCC (block check character):
Modulo 256 sum of <STX> up to the last character before the BCC (including), coded as hexadecimal ASCII-number (e.g. 1F).

3.12 Battery voltage

UW Number — Setting the ADC correcting value for the battery voltage:
E.g.:
`UW30` sets the correcting value such a way that the voltage just measured is displayed as 3.0 V.

UR — Reading the battery voltage; output in the unit “tenth of a volt”,
e.g.: `27` means 2.7 V

3.13 Version number

V — Reading the version number
e.g.: `V 2.65L`
In the version number the unit versions PTB/export,
full-/light version and Hx-/H*(10) version are marked.
PTB-/export `V 2.65L / E 2.65L` : cannot be calibrated /can be calibrated without release
full/light version: `V 2.65L / V 2.65` measurement range 100mSv/h, 1Sv/h
From V 2.67:
Hx-/H*(10) version: `Vx2.67L / V*2.67L`: only H*(10) - and measuring devices designed for export display dose rate of PTB approved external probes in Sv/h .

3.14 Various states

K? — Response: number1 number2 number3 number5 number6 number7 number8 number9 number10; e.g.: `0 0 1 0 0 0 1 1 0 0`
number1 = 1, when high-dose counter tube is available (always 0)
number2 = 1, when calibration is locked
number3 = 1, when automatic storage is activated; Set/Reset: `F1`/`F0`
number4 = 1, when standby is activated
number5 = 1, when automatic sending is activated
number6 = 1, when expert mode is locked
number7 = 1, when alarm acknowledgement is activated; Set/Reset: `A1`/`A0`
number8 = 1, when acknowledgment is activated with removal of external probe Set/Reset: `Z1`/`Z0`
number9 = 1, when beeper is activated with recognized artificial radiation by external probe FHT 672 Set/Reset: `b1`/`b0`
number10 = 1, when chirper offset is activated Set/Reset: `f1`/`f0`
When the corresponding status is not activated, the corresponding number n = 0.

3.15 Test operation

Not linearized pulse/s (dead-time corrected) are put out, no advanced digital filter:

Mod0	Switching off the test mode, switching to normal measuring mode.
Mod1	Test mode 1: Channel 1 = Internal LD counter tube, channel 2 = external probe
Mod2	Test mode 2: Channel 1 = Internal HD detector, channel 2 = external probe
Mod3	Test mode 3: Channel 1 = Internal LD counter tube, channel 2 = reference channel
Mod4	Test mode 4: Channel 1 = Internal LD counter tube, channel 2 = current measurement
Mod5	-
Mod6	Amplifier is checked every second via test pulses (otherwise every 32 seconds).
c	Counter mode: Reading measured values, units (see command „R“) and measurement time referring test mode settings Mod0… Mod6 Response: Measured value(1) Unit(1) Measured value(2) Unit(2) Measurement time (1) = Channel 1 (2) = Channel 2 e.g.: `0.1234E+0 0 0.1234E+0 0 20`
%	Output of the number of pulses measured during one second, by channels 1and 2 Response: Channel 1 Channel 2 (depending on test mode Mod 1…Mod6) **For versions < V 3.00**: If the unit is measuring mode (Mod0), no response is received. **For versions from V 3.0:** If the unit is measuring mode (Mod0), the following response is received. Response: Internal detector External probe current measurement reference channel HV-Offset

3.16 Error status

e

Reading the error status

Response:

The errors are coded bit-by-bit and are put out hexadecimally as a byte.

E.g.: `84`

means:

Hexadezimally	8	4
Binary:	1 0 0 0	0 1 0 0
Bit number	7 6 5 4	3 2 1 0

The single bits are set when the error occurs.

j

Bit 0:	free
Bit 1:	free
Bit 2:	Error, while reading the EEPROM
Bit 3:	Pre-amplifier test is negative
Bit 4:	Detector is not in the working position (plateau)
Bit 5:	32kHz-oscillator does not oscillate correctly
Bit 6:	Error while reading the calibration data of a FH 40 G-e external probe
Bit 7:	Calibration error or unit is not calibrated.

t

Reading and resetting transfer error counter.

Response:

0 – no error

n – error number

3.17 Device serial number

#R

Reading the device serial number

e.g.: `12879 0`

When an external probe FH 40 G is connected, the probe's device number is given instead of the 0.

3.18 Calibration parameters

KP — Calibration parameters of FH 40 G or a connected external probe

- Calibration factor in µSv/h) / cps or in display unit / cps with contamination probes.
- Dead time
- Dead time coefficient
- Background (subtract value in cps)
- Date of calibration (JJMMDD)
- Type of detector : 03: probe with high/low switchover,
  04: Standard dose rate probe
  05: Contamination, 06: Neutron, 10: NBR
  09: no access to external EEPROM or checksum error

Example no external probe e.g.:

```
0.4220E+0  0.2000E-5  0.0000E+0  0.0000E+0  040422 00
```

Example with external probe (FHZ 732GM) e.g.:

```
0.2100E+0  0.6000E-4  0.0000E+0  0.0000E+0  031017 05
```

3.19 Nominal value of high voltage

vR — Reading nominal value for high voltage in volt

vW — Setting nominal value for high voltage in volt

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