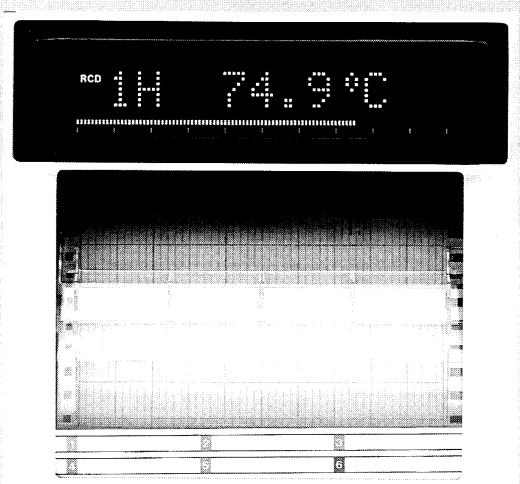


Point recorder KS 3560

Fast print-out of 6 channels in 10s

Universal inputs, i.e. any combination of voltage, thermocouples, Pt 100, logic signals

Simple, interactive operation and configuration

Alpha-numeric print-out of measured values and messages

Options:
Mathematic functions, plug-in memory card (1 Mbyte), RS 422A interface, remote control

PROFILE

The KS 3560 is a compact point recorder with a recording width of 100 mm for 6 channels. The inputs are freely configurable, which means that all conventional signals such as DC voltage/current, thermocouples, resistance thermometers and logic signal can be connected without changes in hardware.

Apart from the analog record, a numeric print-out of date, time, measured value, TAG no., engineering unit, scale values, chart speed, alarms, calculated values, etc. is possible.

The high reliability of the recorder is ensured by special contactless techniques, e.g. a stepping motor and a solid-state scanner. An 11-digit alpha-numeric display provides good readability. In addition, the measured values are displayed as an analog bargraph.

Configuration and parameter setting is done inter-actively and is therefore very simple. The KS 3560 can be used for monitoring or for quality-control purposes in numerous application areas, e.g. for process temperatures and pressures, environmental measurements, production supervision, or furnace monitoring. Similarly, it can be used in medical diagnostics, in aircon applications, etc.

TECHNICAL DATA

INPUT

Measuring interval: 2,5 s for 6 channels

Integration time of A/D converter
20 ms (50 Hz) or 16,7 ms (60 Hz)

Signal types
Direct voltage: from 20 mV to 20 V
Thermocouples: Types R, S, B, K, E, J, T, N, W, L, U
Resistance thermometer: Pt 100
Logic signals: contact or DC voltage, TTL level
Direct current: with 50Ω shunt across input terminals

Max. permissible input voltage
For ranges up to 2 volts and for thermocouple input:
DC ±10 V (continuous).
For 6 volt and 20 volt ranges: DC ±30 V (continuous).

Temperature compensation for thermocouple measurement
Built-in or external, configurable per channel.

Error of temperature compensation
Types R, S, B, W: ≦±1°C
Types K, J, E, T, N, L, U: ≦±0,5°C

Thermocouple break monitoring
ON/OFF configurable per channel, upscale or downscale configurable (valid for all channels).
Normal: <2 kΩ; Break: >10 MΩ.
Sensing current: approx. 100 nA.

Filter
For damping the input signal, ON/OFF configurable per channel.
When ON: mean-value generation from 2 to 16 measurements.

Calculation

Difference measurement
Between any two channels. The number of the reference channel must always be lower than the number of the measurement channel. Possible with DC voltage, thermocouple and Pt100 inputs.
Both channels must be configured for the same range.

Linear scaling
Possible with DC voltage, thermocouple and Pt100 inputs.
Scaling limits: –20.000 to 20.000
Decimal point: configurable by user.
Engineering unit: configurable, up to 6 characters (alphanumeric and special).

Square rooting
Possible with DC voltage input.
Scaling limits: –20.000 to 20.000
Decimal point: configurable by user.
Engineering unit: configurable, up to 6 characters (alphanumeric and special).

Measuring ranges and error limits

Input signal and span	Range limits	Error limits [1] of display		Resolution
Direct voltage				
20 mV	-20,00 ... 20,00 mV	±0,2%	±3 digit	10 µV
60 mV	-60,00 ... 60,00 mV	±0,2%	±2 digit	10 µV
200 mV	-200,0 ... 200,0 mV	±0,2%	±2 digit	100 µV
2 V	-2,000 ... 2,000 V	±0,1%	±2 digit	1mV
6 V	-6,000 ... 6,000 V	±0,3%	±2 digit	1mV
20 V	-20,00 ... 20,00 V	±0,3%	±2 digit	10mV
Thermocouples				
R Pt 13% Rh-Pt	0 ... 1760 °C	±0,15%	± 1 K[2]	0,1 K
S Pt 10% Rh-Pt	0 ... 1760 °C	±0,15%	± 1 K[2]	
B Pt 13% Rh-Pt 6% Rh	0 ... 1820 °C	±0,15%	± 1 K[2]	
K NiCr-Ni	-200 ... 1370 °C	±0,15%	± 1 K	
E NiCr-CuNi	-200 ... 800 °C	±0,15%	±0,5 K	
J Fe-CuNi	-200 ... 1100 °C	±0,15%	±0,7 K	
T Cu-CuNi	-200 ... 400 °C	±0,15%	±0,7 K	
L Fe-CuNi (DIN)	-200 ... 900 °C	±0,15%	±0,7 K	
U Cu-CuNi (DIN)	-200 ... 400 °C	±0,15%	±0,7 K	
N Nicrosil-Nisil	0 ... 1300 °C	±0,15%	±0,7 K	
W W 5% Re-W 26% Re	0 ... 2315 °C	±0,15%	± 1 K	
Resistance thermometers				
Pt 100 (DIN)	-200 ... 600 °C	±0,15%	±0,3 K	0,1 K
Digital (logic) input				
Voltage	TTL level, OFF = < 2,4 V; ON = > 2,4 V			
Contact	ON/OFF (potential-free)			
Direct current				
0 ... 20 mA ≙ 0,000 ... 1,000 V via 50 Ω shunt				
4 ... 20 mA ≙ 0,200 ... 1,000 V via 50 Ω shunt				
(one shunt per channel, see Accessories)				

[1] The %-value is referred to the display value.
[2] Not specified for the range 0 ... 400 °C

Measurement error
The values in the table apply for a recorder used under the following standard conditions:
Temperature 23°C ±2°C, relative humidity 55% ±10%, supply voltage AC 90 to 132 V, or 180 to 250 V, frequency 50/60 Hz ±1%, warm-up time at least 30 minutes.
Other conditions, e.g. vibration should not have a negative effect on recorder operation.

INPUT CONDITIONS

Input resistance
>10 MΩ (thermocouples and DC voltage up to 2 V)
Approx. 1 MΩ (6 V and 20 V ranges).

Source resistance
Thermocouples and DC voltage: ≦2kΩ.
Resistance thermometer: ≦10Ω per lead. The 3 lead resistances must be equal.

Quiescent input current
<10 nA (approx. 100 nA with configured TC break monitoring)

Max. common mode interference
AC 250 V_{rms} (50/60 Hz)

Common mode suppression
120 dB (50/60 Hz ±0,1%)

Series mode suppression
40 dB (50/60 Hz ±0,1%)

Insulation resistance
Between each terminal and ground: >20 MΩ, measured with AC 500 V

Test voltages
Mains input against ground:
AC 1500 V (50/60 Hz), 1 minute.
Switching outputs against ground:
AC 1500 V (50/60 Hz), 1 minute.
Measuring inputs against ground:
AC 1000 V (50/60 Hz), 1 minute.
Between input channels: AC 1000 V (50/60 Hz), 1 minute, (except with Pt100, where „b" terminals are interconnected)

RECORDING AND PRINT-OUT

Recording method
Wire-dot printer with inked ribbon

Recording colours
Channel 1: purple, channel 2: red, channel 3: green, channel 4: blue, channel 5: brown, channel 6: black.

Recording error
For trend recording: ≦±0,3% of span
Resolution: 0,1 mm

Recording speed
6 channels in 10 seconds, AUTO/FIX configurable.
AUTO: The recording speed is matched automatically to the chart speed.
FIX: Recording is done at the fastest speed possible.

Chart paper
Folded chart, 16 m long
Effective recording width: 100 mm

Chart speed
Configurable 1 to 1500 mm/h, in steps of 1 mm.

Chart speed switch-over
2 speeds can be configured, switch-over by means of external contact. The „remote control" option (Type code R1) is necessary.

Chart speed error
≦±0,1% with recordings >1000 mm (does not include stretching or shrinking of the chart).

Recording format

a) Analog record
Zone recording:
Zone width ≧5 mm, configurable in steps of 1 mm.
Range expansion (zoom of partial span):
Limit positions: 1 to 99%
Limit values: within the recording range

b) Numeric print-out
Alarms:
On the right-hand edge of the chart, type of alarm and time (h/min) are printed. Alarm print-out can be made when alarm occurs and when it disappears, or only when it occurs, or suppressed completely (selected configuration valid for all channels).

Periodic print-out:
On the left-hand edge of the chart, date (month/day), time (h/min), chart speed and measured value are printed for each channel.
Printing interval INT/EXT is configurable.
INT: Uses the internal timer. Depends on chart speed or the configured interval (up to 24 hours).
EXT: Triggered by external contact. The „remote control" option (Type code R1) is necessary.

Print-out of channel number or TAG number: 5 characters configurable for each channel.

Print-out of measured value:
ON/OFF configurable for every channel.

Print-out of scaling:
ON/OFF configurable, valid for all channels.
With ON and recording zone >50 mm, the values are printed at 0% and 100%.For measurements with range expansion, the limit value is also printed.
Print-out of messages:
Via operating keys or external contacts. The „remote control" option (Type code R1) is necessary. Up to 5 messages possible.
Contents: Time and message (up to 16 characters).

Start of print-out:
ON/OFF configurable.
With ON, the starting time is also printed.

Print-out of chart speed:
ON/OFF configurable.
With ON, the time of chart speed switch-over is printed.

Listing:
Prints a list of all ranges, alarm settings, etc.

Manual print-out:
Via operating keys or an external contact, the latest measured values are printed (analog recording is interrupted). The „remote control" option (Type code R1) is necessary.

SET-UP listing:
This prints a list of all settings configured during SET-UP.

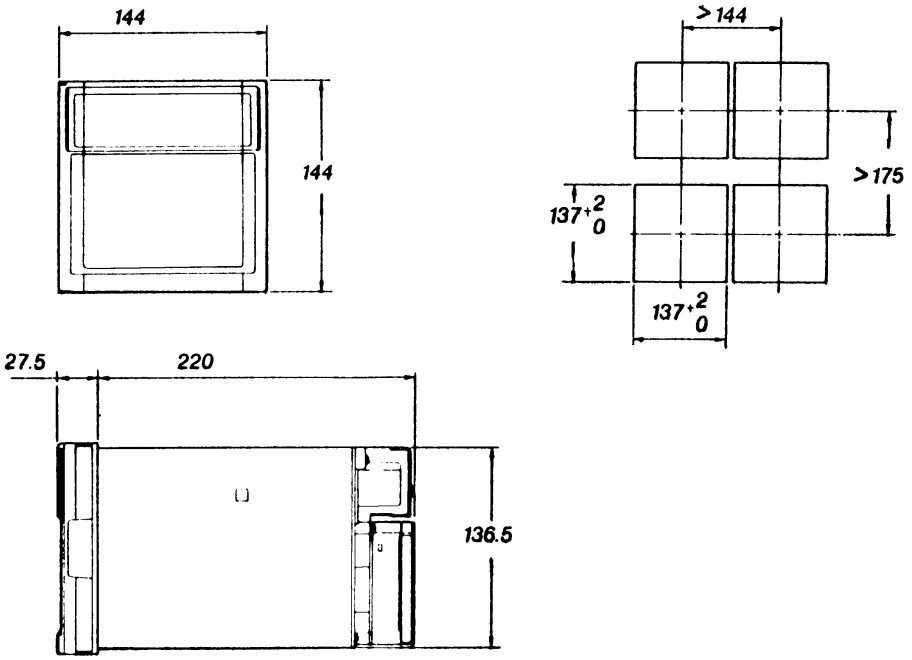
DISPLAY AND OPERATION

Display type
Vacuum-fluorescent display with 11 characters, 5x7 dot matrix

Digital display
AUTO: Cyclic display of each channel (channel number, type of alarm, measured value, engineering unit).
MAN: Permanent display of a selected channel (channel number, type of alarm, measured value, engineering unit).
DATE: Displayed as year/month/day.
TIME: Display of time (h/min/s).
VIEW: Display of operating status.

Bargraph display
Measured values: reference point configurable at left (0%) or at center (50%) for each channel.
Alarm: segment of alarm set-point blinks on alarm.

Dimensions (in mm)



Other displays
RCD: recording in progress.
POC: pen-offset compensation ON.
SET: set-up mode.

ALM: common alarm (not referred to a particular channel).
Alarm status: on alarm, the channel umber is displayed.
CHT: chart end (Type code F1).
BAT: back-up battery low, replacement necessary.

Disabling the operating keys
With key switch.
Keys which are to remain in operation can be defined by configuration.

ALARMS

Number of limit values
Up to 4 per channel

Type of alarm
MIN/MAX alarm (L/H)
MIN/MAX difference alarm (dL/dH)
MIN/MAX gradient alarm (RL/RH)
The reference time of the gradient alarm is configurable (1 to 15 measurement intervals).

Alarm display
Limit values are highlighted as a line in the bargraph, which blinks on alarm.

Hysteresis
Approx. 0,5% of measuring span (or 0%) configurable (valid for all channels and values)

Display when ALARM ACK key is pressed

HOLD not active:
Pressing the ALARM ACK key has no effect on display.

HOLD active:
On alarm, the display starts to blink. When the ALARM ACK key is pressed, the alarm status is displayed (continuously lit or off).

POWER SUPPLY

Nominal voltage
AC 115 V or 230 V, recorder adjusts automatically.
Permissible tolerances:
90...132 V and 180...250 V

Mains frequency
50 or 60 Hz, ±2%, switchover not necessary

Power consumption
Max. 40 VA

Back-up battery for memory
Lithium battery fitted in recorder to secure the adjusted parameters. Useful life approx. 10 years. Low battery is displayed at recorder front.

ENVIRONMENTAL CONDITIONS

Operating temperature: 0...50°C
Relative humidity: 20...80% (in the range 5...40°C)
Vibration: 10 to 60 Hz, ≦0,5 g
Shock: not allowed

Magnetic field strength
<400 A/m (DC and AC, 50/60 Hz)

Electromagnetic compatibility
To IEC 801, RFI suppression to German PTT regulation Vfg 1046/84.

Permissible interference levels

Common mode interference
Voltage input: the peak value must be less than 1,2 x of measuring span.
Thermocouples: the peak value must be less than 1,2 x the thermovoltage.
Resistance thermometer: <50 mV

Series mode interference
<AC 250 V_{rms} (50/60 Hz) for all ranges

INFLUENCING FACTORS

Temperature effect
(with a change of 10°C)
Display: ≦±0,1% of display ±1 digit
Recording: ≦±0,2% of recording span

Power supply effect
Operating voltage AC 90...132 V or 180...250 V
Display: <±0,1% of display ±1 digit
Recording: like digital display

Effect of magnetic fields
AC (50/60 Hz) or DC field of 400 A/m:
Display: <±0,1% of display ±1 digit
Recording: <±0,5% of recording span

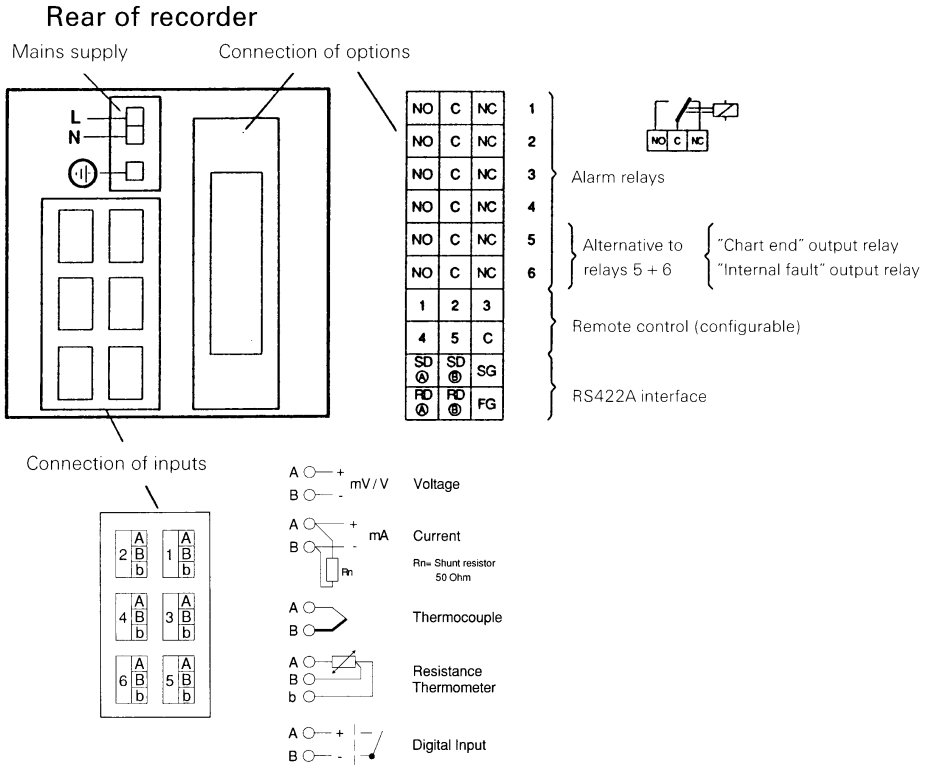
Effect of source resistance
For a change of 1 kΩ:

DC voltage
Ranges <2 V: <±10 µV
Ranges >6 V: <±0,1% of display

Thermocouples
<±10µV (<±100 µV, if TC monitoring has been configured)

Resistance thermometer
Effect of 10 Ω per lead (the three lead resistance must be equal):
Display: <±0,1% of display ±1 digit
Recording: <±0,1% of recording span

Connections



OPTIONS

Alarm relays
Type code A1: 2 alarm relays
Type code A2: 4 alarm relays
Type code A3: 6 alarm relays (not possible in combination with Type code F1).

Switching outputs
One potential-free switchover contact per relay.
Contact rating: DC 250 V; 0,1 A or AC 250 V; 3 A
Normally-open or normally-closed operation configurable.

Additional functions
Logic connection of outputs (AND/OR).
Alarm acknowledgement enable/disable (key ALARM ACK)

RS 422A interface
(Type code C3)
Via this interface, data can be transmitted to a host computer. In addition, the recorder can be configured from the computer.
Transmission principle: Asynchronous, 4-wire, half-duplex
Transmission speed: 75 to 9600 bits/s
Word length: 7 or 8 bits
Stop bit: 1 or 2
Parity: uneven, even, or none
Lead length: max. 500 m

Socket for memory card
For inserting a memory card with max. 1 Mbyte.
Type Code E1:
Write/read of configuration data.

Type Code E2:
Write/read of configuration and measurement data.

The 64 kbyte memory card can only be used with Type Code E1. Up to 5 configuration files can be stored.

Internal fault and chart end detection
(Type code F1)
A fault in the CPU and the end of the recording chart are signalled by separate relays.
Output: potential-free switchover contact

Contact rating: DC 250 V; 0,1 A
AC 250 V; 3 A,
Not possible in combination with 6 alarm relays (Type code A3).

Door with non-reflective glass
(Type code H3)

Mathematical functions
(Type code M1)
One input channel is used for the calculations.
Available functions:
Basic operations +, -, x, :
SQR square rooting
ABS absolute value
LOG logarithm to base 10
EXP exponent
Comparing operations: $<, >, =, \neq$
Logic combinations: AND, OR, XOR, NOT (only possible between two channels).

Constants: K01 to K10
Example of configuration:
03=(01+02):K01; K01=2
Channels 1 and 2 are added and then divided by the value 2. The result is output on channel 3.

Statistical calculations:
MAX: maximum value
MIN: minimum value
AVE: average value
SUM: sum
A record of the statistical values is only possible as a numeric print-out. For the recording interval, see „Recording format".

Remote operation
(Type code R1)
Five of the following remote functions can be configured. Control is by means of external contacts.
- Start/Stop of recording
- Switchover to 2nd chart speed
- Start of message printing (max. 5 messages)
- Start of manual print-out
- TLOG Start/Reset (only in combination with Type code M1)
- Start of periodic print-out
- Start transfer of measurement data to the memory card (Type code E2 necessary).

GENERAL

Housing
Material: sheet steel
Door frame: die-cast aluminium, grey finish

Mode of protection
Front: IP 54 to IEC 529 (DIN 40 050)

Mounting method
In panel cut-out
Panel thickness: 2...26 mm

Mounting position
Forward incline: 0 degrees
Backward incline: max. 30 degrees

Error of internal clock
100 ppm

Safety standards
to IEC 348 (VDE 0411)

Warm-up time
Ready for operation approx. 30 minutes after switch-on.

Weight: approx. 3,8 kg

ORDERING DATA

KS 3560	Order no.
6 – channel point recorder	**9404 350 60001**

OPTIONS (Order separately. Options are fitted into recorder, whereby several are possible in one instrument. Retro-fitting not possible)

Description			Type code	Order no.
Alarm relay		2 relays	A1	**9404 350 00011**
	or	4 relays	A2	**9404 350 00021**
	or	6 relays	A3	**9404 350 00031**
RS 422-A interface			C3	**9404 350 00041**
Internal fault & chart end detection				
Relay output [1]			F1	**9404 350 00051**
Remote control (5 inputs)			R1	**9404 350 00061**
Socket for memory card				
only for configuration data			E1	**9404 350 00071**
for configuration and measurement data			E2	**9404 350 00111**
Mathematical functions			M1	**9404 350 00081**
Door with non-reflective glass			H3	**9404 350 00091**
Portable housing, with handle and rubber feet [2]			H5F	**9404 350 00121**
Supply voltage 24 VDC (tolerance 21,6...26,4 V)			P1	**9404 350 00141**

[1] Not possible with 6 alarm relays (Type code A3)
[2] Not possible with type codes P1.

CONSUMABLES AND ACCESSORIES

Description		Order no.
Ink ribbon cassette		**4012 027 45508**
Folded chart, 16 m long, graduation linear		**4012 027 45489**
graduation to specification		**9404 392 38001**
Memory card	64 kbyte	**4012 027 45499**
	256 kbyte	**4012 027 45501**
	512 kbyte	**4012 027 45502**
	1 Mbyte	**4012 027 45507**
Shunt resistor for current measurement, 50Ω ± 0,1 %		**4012 151 57322**
Certificate with calibration protocol		**9404 350 00211**
Additional operating instructions		
for recorder and options A1, A2, A3, F1, R1:	in English	**9499 040 25811**
	in German	**9499 040 25818**
for options C3, E1, E2, M1:	in Englisch	**9499 040 27711**
	in German	**9499 040 27718**

PMA
Prozeß- und Maschinen-
Automation GmbH
P.O. Box 31 02 29
D-34058 Kassel
Tel.: +49 - 561 - 505 13 07
Fax: +49 - 561 - 505 17 10
e-mail: mailbox@pma-online.de
Internet: http://www.pma-online.de

Your local representative:

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