Line recorder
KS 3640

Available with 1, 2, 3 or 4 input channels

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

Simple, interactive operation and configuration

Multi-language operation

Alpha-numeric print-out of measured values and messages

Options:
Mathematic functions, RS 422A interface, remote control

PROFILE

The KS 3640 is a compact line recorder with a chart width of 100 mm and continuous recording. 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Apart from the analog record, a numeric print-out of date, time, measured value, TAG no., engineering unit, scale values, chart speed, alarms, calculated values, etc.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 brushless DC motor and an ultrasonic position detector. An alphanumeric 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 3640 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:
125 ms per channel

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

Signal types
Direct voltage: from 20 mV to 50 V
Thermocouples: Types R, S, B, K, E,J,T, N,W, L, U, WRe
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 200 mV and for thermocouple input:
DC ±10 V (continuous).
For 2 volt ranges: DC ± 60 V (continuous).

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

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

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 30.000
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 30.000
Decimal point: configurable by user.
Engineering unit: configurable, up to 6 characters (alphanumeric and special).

Measuring ranges and error limits

Input	Range	Measuring (digital display)		Recording (analog)	
		Measurement Accuracy	Max. Resolution	Recording Accuracy	Resolution
DC V	20mV	± (0.1% of rdg+2 digits)	10µV	Measurement accuracy ± (0.3% of recording span)	Pen model dead band: 0.2% of recording span Dot printing model resolution: 0.1mm
	60mV		10µV		
	200mV		100µV		
	2V		1mV		
	6V		1mV		
	20V		10mV		
	50V	± (0.1% of rdg+3 digits)	10mV		
	1-5V	± (0.1% of rdg+2 digits)	1mV		
TC (excluding the accuracy of reference junction compensation)	R S B	± (0.15% of rdg+1°C) but R, S : 0 to 100°C, ± 3.7°C 100 to 300°C, ± 1.5°C B : 400 to 600°C, ± 2°C, and is not guranteed below 400°C	0.1°C	Measurement accuracy ± (0.3% of recording span)	Pen model dead band: 0.2% of recording span Dot printing model resolution: 0.1mm
	K	± (0.15% of rdg+0.7°C) but –200 to –100°C ± (0.15% of rdg+1°C)			
	E J T	± (0.15% of rdg+0.5°C) but : –200 to –100°C ± (0.15% of rdg+0.7°C)			
	N	± (0.15% of rdg+0.7°C)			
	W	± (0.15% of rdg+1°C)			
	L U	± (0.15% of rdg+0.5°C) but : –200 to –100°C ± (0.15% of rdg+0.7°C)			
	WRe	± (0.2% of rdg+1.0°C)			
RTD	Pt100 JPt100	± (0.15% of rdg+0.3°C)	0.1°C	Measurement accuracy ± (0.3% of recording span)	Pen model dead band: 0.2% of recording span Dot printing model resolution: 0.1mm

Measurement error

The values in the table apply for a recorder used under the following standard conditions:
Temperature 23 °C ± 2 K, relative humidity 55% ± 10%, supply voltage AC 90 to 132 V, or 180 to 264 V, frequency 50/60 Hz ± 1%, warm-up time at least 30 minutes.
Other ambient conditions like vibration should not adversely affect the recording operation.

INPUT CONDITIONS

Input resistance

> 10 MΩ (thermocouples and DC voltage up to 2 V)
Approx. 1 MΩ (with effect from 2 V).

Source resistance

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

Quiescent input current

< 10 nA (without 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:
AC1500 V (50/60 Hz), 1 minute.
Measuring inputs against ground:
AC1000 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

Replaceable fibre-tipped pens for continuous recording, replaceable plotter pen for alpha-numeric printing.

Settling time

about 1 s

Recording error

For trend recording: ≦ ± 0,3% of adjusted span
Sensitivity (dead zone) ≦ ± 0,2% of span

Pen offest compensation

Configurable ON/OFF

Chart paper

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

Chart speed

Configurable 1 to 12.000 mm/h, in 82 steps.

Chart speed switch-over

2 speeds can be configured, switch-over by means of external contact. The "remote control" option 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 1mm.
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 is necessary.

Print-out of channel number or TAG number: 6 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 > 40 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 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 is necessary.

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

DISPLAY AND OPERATION

Display type

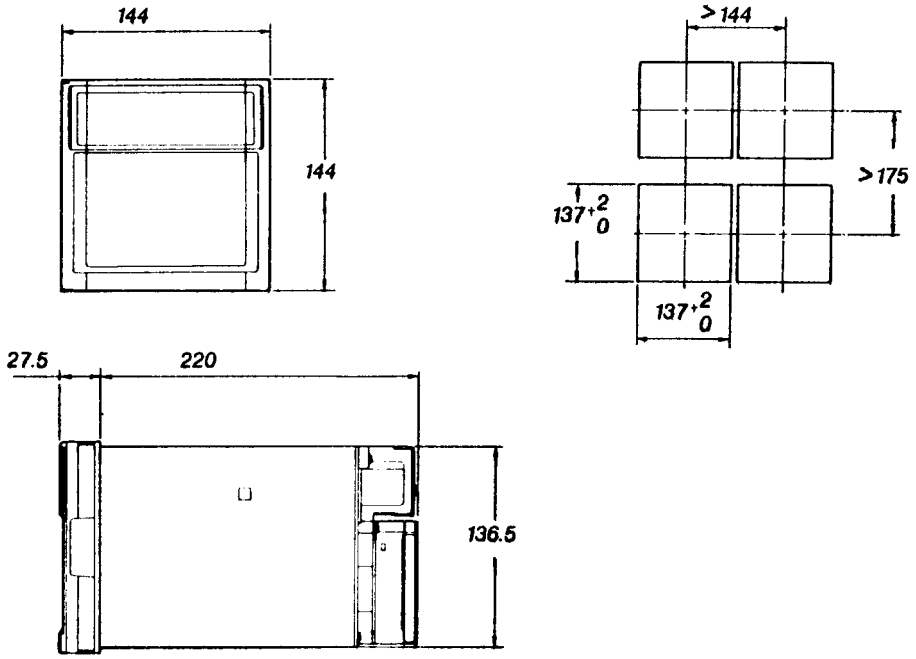
Vacuum-fluorescent display with 101x16 dot matrix
The display for operator guidance is selectable for English, French, or German.

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).
Automatic switch-over from Winter Time to Summer Time is configurable.

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 alarmset-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).
CHT: chart end.
BAT: back-up battery low, replacement necessary.

Disabling the operating keys

With password.
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

0.0 to 1.0% (0.1% step) of recording span (only High, Low alarm, common for all channels and all levels).

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 100 V or 240 V, recorder adjusts automatically.
Permissible tolerances:
90 . . . 132 V and 180 . . . 264 V

Option 24VDC/AC Power Supply

Rated power supply: 24 VDC/AC
Allowable power supply voltage range: 21.6 to 26.4 VDC/AC

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, ≦ 0,02 g
Shock: not allowed

Magnetic field strength

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

Electromagnetic compatibility

To EN 61326.

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 K)
Display: ≦ ± 0,1% of display ± 1 digit
Recording: ≦ ± 0,2% of recording span

Power supply effect

Operating voltage AC 90. . .132 V or 180 . . . 264 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 AT/m:
Display: ± 0,1% of display + 1 digit
Recording: < ± 0,5% of recording span

Effect of source resistance

For a change of 1 kΩ:

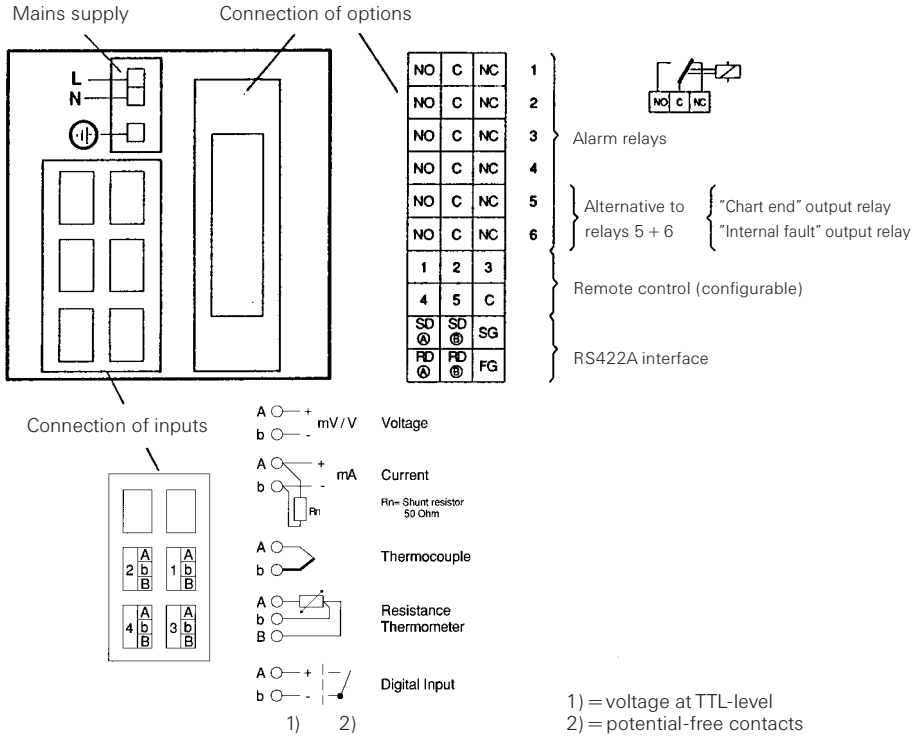
DC voltage
Ranges < 200 mV: < ± 10 µV
Ranges > 2 V: < ± 0,1% of display

Thermocouples
< ± 10 µV (< ± 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

Rear of recorder



OPTIONS

Alarm relays

2 alarm relays
4 alarm relays
6 alarm relays (not possible in combination with remote inputs).

Switching outputs
One potential-free switchover contact per relay.
Contact rating: DC 250 V; 0,1 A or AC250 V; 3 A
Normally-open or normally-closed operation configurable.

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

RS 422A interface

Via this interface, data can be transmitted to a host 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. 1200 m

Cu10, Cu25 RTD input

This option allows Cu10 and Cu25 RTD inputs to be added to the standard input types.

Expansion Inputs

This option allows 14 types inputs such as Pt50, PR40-20, PLATINEL inputs to be supported besides the standard input types.

Ethernet Interface

Electrical and mechanical specifications:
Conforms to IEEE 802.3
Transmission media: 10 Base-T
Protocol: TCP, IP, UDP, ICMP, ARP

Internal fault and chart end detection

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

Non-glare Door Glass

Provides non-reflective glass in the front door.

Mathematical functions

One input channel is used for the calculations. "ON/OFF selectable for each

channel"
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 K30
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 control

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 mathematics
- Start of periodic print-out
- Alarm ACK

CONFORMITY TESTS

The instrument has CE-marking

Electro-magnetic compatibility

EMI: EN 55 011, Group 1, Class A

EMC: EN 55 082-2

GENERAL

Housing

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

Mode of protection

Front: IP 54 to 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 and EMC standards

CSA

CSA22.2 No.61010-1 (NRTL/C*) installation category II, measurement category II pollution degree 2
* For marking that includes NRTL, a mark with "US" (USA) printed on the right side of the CSA mark, and "C" (Canada) printed on the left side appears on this instrument.

CE

EMC directive:
EN61326 compliance (Emission: Class A, Immunity: Annex A)
EN61000-3-2 compliant
EN61000-3-3 compliant
EN55011 compliant, Class A Group 1
Low voltage directive:
EN61010-1 compliant, installation category II
measurement category II, pollution degree 2

C-Tick

AS/NZS CISPR11 compliant, Class A Group 1

Warm-up time

Ready for operation approx. 30 minutes after switch-on.

Weight: 2,1 . . . 2,4 kg

Accessories:

1 ribbon cassette colour
1 chart folded
2 fixing sundries
1 operating instructions

Order number	KS3640 – x – x x x x x
Channel	
1 channel PEN printer	1
2 channel PEN printer	2
3 channel PEN printer	3
4 channel PEN printer	4
Interface	
no communication interface	0
serial Interface RS485	1
ethernet interface	2
Alarm output	
no alarms	0
2 alarms	1
4 alarms	2
6 alarms	3
fail / chart end detection	4
2 alarms and fail /chart end detection	5
4 alarms and fail / chart end detection	6
Option 1	
no further options	0
math option	1
remote input interface	2
math option and remote input interface	3
Option 2	
no further options	0
expansion of the inputs to special TC and RTD	1
expansion of the inputs to CU10 / Cu25 inputs	2
expansion of the inputs to special TC, RTD, Cu10 and Cu25	3
portable version	4
portable version + expansion of the inputs to special TC and RTD	5
portable version + expansion of the inputs to CU10 / Cu25 inputs	6
portable version + expansion of the inputs to special TC, RTD, Cu10 and Cu25	7
Option 3	
no further options	0
non glare door glass	1
24 VDC power supply	2
calibration correction	3
non glare door glass +24 Volt	4
non glare door glass +24 Volt + calibration correction	5
non glare door glass + calibration correction	6
24 VDC power supply + calibration correction	7

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