

# KS 40

## Compact industrial controller

- Simplest operation
- Bright LED display
- Plug-in controller module
- Confident handling under extreme conditions
- Precise control behaviour
- Self-tuning
- Long life
- Low price and fast delivery

**PROFILE**

The new generation of KS 40 compact controllers features microcomputer operation for precise, cost-effective temperature control in all branches of industry: from flow-soldering lines to textile driers, from steam boilers to packing machines, from mould heating to furnaces. An optional digital interface permits communication with computers and PLC's.

Consistent application of modern technology (mask-programmed processor, ASIC, SMD) enabled the volume of the electronic components to be reduced to a minimum, which also means low internal temperatures. Modern production methods ensure highest quality and reliability, plus short delivery times.

Furthermore, the KS 40 controllers meet European Standards EN 50 081 - 1 and EN 50 082 - 2, and have therefore qualified for CE-marking. Their construction meets the safety regulations of VDE 0411. Each unit is tested with 3 kV before shipment.

**DESCRIPTION**

**Plug-in controller modules**

KS 40 controllers are plug-in modules which ensures fast replacement without any tools. Electrical connections are made via rear flat-pin connectors.

**Two hardware versions, freely configurable**

Version 406 with single display has a circuit board with 2 relays. Version 407 with dual display is available with 2 or 3 relays or as a continuous controller with one alarm contact; an optional digital interface is possible. Input, control function and alarms are freely configurable.

Fig. 1 Operating concept

Standard on all versions are self-tuning, a second set-point with ramp function, an additional input for monitoring heating current, a logic output for heating, and a 115/230 V mains transformer.

#### Simple operation

Only three robust keys are used for all settings and adjustments. Tactile feedback from the keys and an automatic increase in rate of change when a key is pressed for a longer period ensure fast and safe settings.

#### Clear operating concept and lockable parameter adjustment

All operating functions are user-friendly and clearly structured as follows:

**Operating Level** for set-point adjustment.

**Parameter Level** for adjusting the required control parameters, limit values, etc.

**Configuration Level** for adjusting the controller functions.

An internal switch provides controlled access to the Parameter and Configuration levels.

#### Display and operating functions

It is possible to disable set-point adjustment and display in the Operating level. On version 407 the permissible set-point limits can be adjusted in the Parameter level.

#### Input circuit monitoring

In case of faults in sensor or leads, the built-in monitor provides increased operational safety. When the monitor is triggered, controller output is upscale on version 406, and can be configured for upscale or downscale action on version 407.

The outputs are set to 0% with three-point controllers.

#### Thermocouple input

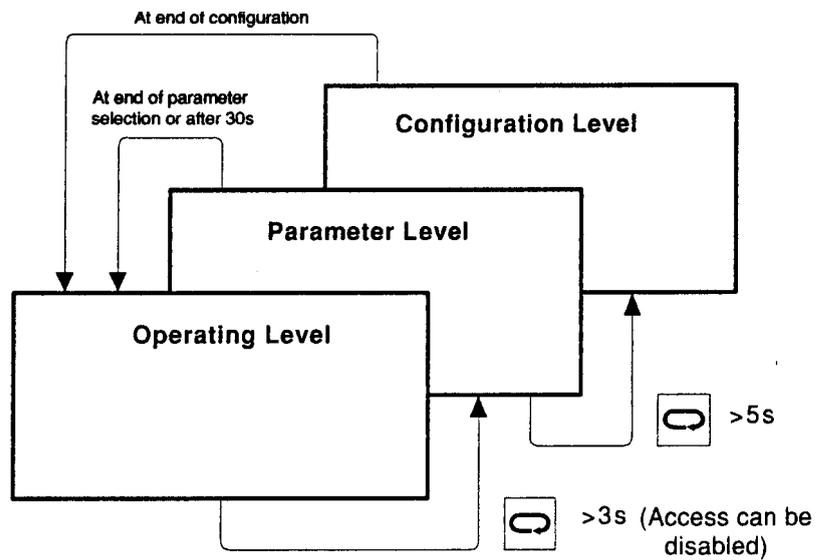
The monitor detects an open-circuit sensor and also if the polarity is reversed.

#### Resistive input

The input is monitored for a break or a short circuit in the sensor and leads.

#### Input 4...20 mA (version 407)

The monitor is triggered if the current is less than 2 mA.



#### Monitoring and display of heating current

**Version 406:** These versions are fitted only with monitor for defective heating.

**Version 407:** The controllers are fitted with an input for connection of an external current transformer. The heating current and its adjustable limit value are displayed as a parameter. With configuration "Monitoring for actuator break and short circuit", the monitor is activated with relay 1 energized or active logic output and exceeded minimum limit and also with relay 1 de-energized or inactive logic output and heating current above 0,4 A: Red LED, alarm contact. When configured for "Excess current monitoring", monitoring is only active with relay 1 energized or active logic output and exceeded maximum limit.

#### Controller and positioner functions

**Version 406:** The unit is configurable as a two-point controller (heating), or as a three-point controller (heating/cooling).

When configured as a positioner, the unit works without an input signal. The output has an adjustable duty cycle of 0...100%.

**Version 407:** When fitted with 2 or 3 relays, the unit is configurable as a signaller, two-point controller, three-point controller or three-point stepping controller. When fitted with a continuous output and an additional relay, it is possible to configure the function "logic output for heating/continuous output for cooling".

When configured as a positioner, the output has an adjustable duty cycle of 0...100% or an adjustable current signal of 0...105%.

With the three-point stepping positioner it is possible to operate the motor actuator manually. Process value x is displayed with these functions.

The controller structure can be modified by disabling the integral and/or derivative action.

#### Disabled outputs

The controller outputs can be disabled by adjusting the set-point to a value under the lower limit (all outputs in de-energized state).

#### Alarm functions

The alarm contact output is configurable as follows:

- a) **Relative alarm** for monitoring the control deviation (relative to set-point).
- b) **Absolute alarm** for limit monitoring (independent of set-point setting).
- c) **Relative alarm with alarm suppression (Version 407)**. The alarm is not triggered during start-up or after a change of set-point.

#### Second set-point with ramp function and the program controller

The external control contact W/W2 is used to activate a second set-point (safety set-point, which is also effective after a mains failure).

The second set-point becomes effective after an adjustable time has elapsed.

**Version 407:** Three additional set-points with corresponding segment times can be used for program control. Start and re-start after mains failure are executed from the momentary process value x.

#### Set-point gradient function

**Version 407:** The set-point gradient function (see Fig. 3) can be adjusted by means of parameter Gr with the corresponding controller version. In case of set-point adjustment, after re-start and switch-over from W2 to W, set-point changing starts from process value x at the adjusted speed (e.g. 50 °C/min) and LED W2 blinks. With Gr = ----, the function is switched off.

#### Version 407 with optional digital interface

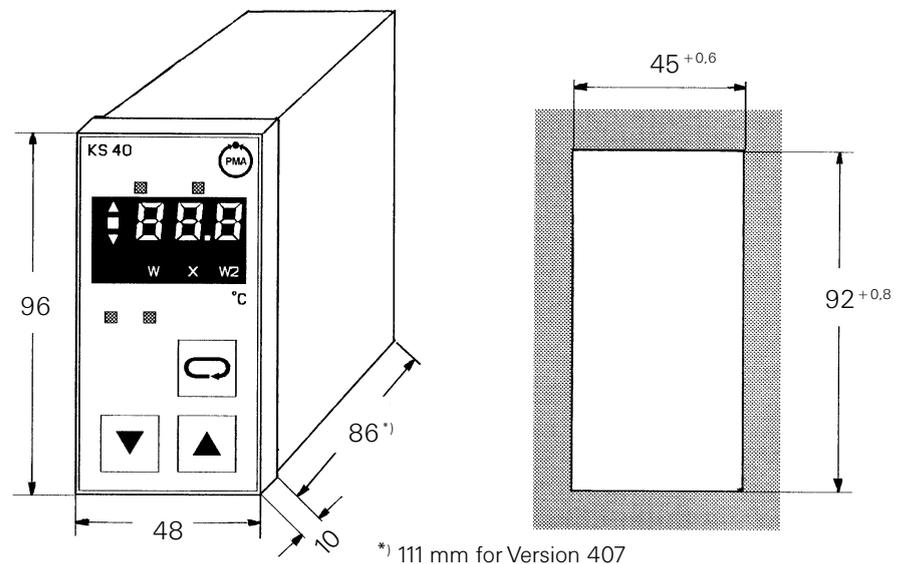
A separate RS 422/485 interface module is available, making the controllers bussable. Max. 4 controllers can be connected to each module via interface cables of 1m length. The max. transmission speed is 19.600 bits/s.

#### External operation and visualization with IQT 150

Max. six interface modules, each of which incorporates 4 controllers, enable central control and monitoring of systems, incorporating 24 controllers. Operation and visualization is performed by the IQT unit. The required software is integrated and enables application-specific pictures of the process, flow diagrams and specific input sections to be generated.

The distance between interface modules and IQT can be max. 1,000 m.

Fig. 4 Overall dimensions and panel cut-out (mm)



<b>TECHNICAL DATA</b>	<b>VERSION 406</b>	<b>VERSION 407</b>
<b>INPUTS</b>	Configurable	Configurable
<b>Thermocouples</b>	Types L, J	Types L, J, K, N, S, R
Ranges	See Ordering Data Display in °C	See Ordering Data Display in °C or °F
Linearization	Built in	Built in
Display error	$\leq 3K \pm 1$ digit	$\leq 3K \pm 1$ digit
Input resistance	$> 1 M\Omega$	$> 1 M\Omega$
TC break monitor	Sensor current 1 $\mu A$	Sensor current 1 $\mu A$
Polarity monitoring	Triggered when $X < 0^\circ C$	Triggered when input signal is $> 30 K$ below span start
Action on break	Upscale	Downscale or upscale, selectable
<b>Resistance thermometer</b>	Pt 100 DIN/IEC	Pt 100 DIN/IEC
Measuring ranges	0...99,9 °C or 0...400 °C	-99,9...500,0 °C or -148...932 °F
Linearization	Built in	Built in
Display error	$\leq 1K \pm 1$ digit	$\leq 1K \pm 1$ digit
Connection	3-wire technique, no lead adjustment	3-wire technique, no lead adjustment
Lead resistance	$\leq 5 \Omega$ per lead	$\leq 30 \Omega$ per lead
Sensor current	$\leq 1,5$ mA	$\leq 1,5$ mA
Input circuit monitor	Break in sensor or lead, or short circuit	
Action on break	Upscale	Downscale or upscale, selectable
<b>Direct current</b>	—	0/4...20 mA linear
Input resistance	—	15 $\Omega$
Measurement limits	—	Selectable within -999...9999, decimal point adjustable
Display error	—	$< 0,1$ %
Input circuit monitor	—	4...20 mA: with $I < 2$ mA
Action on break	—	Upscale or downscale, selectable
<b>Direct voltage</b>	—	0...10 V linear
Input resistance	—	$\geq 110 k\Omega$
Measurement limits	—	Selectable within -999...9999, decimal point adjustable
Display error	—	$< 0,1$ %
<b>Measurement earth</b>	Connection to system earth or protective earth	
<b>Current transformer input</b>	Fitted as standard. See "Accessory equipment" for current transformer.	
<b>Control inputs</b>		
Switch W2	Ramp	Ramp/programmer
Switch L/R	—	Local/Remote switchover with digital interface
Control signal	Contacts, npn-transistor, or active logic signal: Low $\leq 1$ V, High = 3...6 V	
<b>Digital interface</b>	—	RS 422/485 (optional)
Interface module and interface cable	—	See "Accessory equipment"
Controller address	—	0...99
Transmission speed	—	2400, 4800, 9600, 19200 bits/s

OUTPUTS		Can be disabled with setting W----
<b>Switching controllers</b>	2 relays and 1 logic output	2 or 3 relays and 1 logic output
Relay contacts	Open when de-energized	Open when de-energized
Contact rating	Max.500 VA, 250 V, 3 A; 48...62 Hz; resistive load	
Logic output (galvanically connected with input)	0/≥ 5 V with a load of ≥ 500Ω, or 10 mA with a load of ≤ 500 Ω	0/13 V with a load of ≥ 1300 Ω, or 10 mA with a load of ≤ 1300 Ω
<b>Continuous controller with 1 relay (limit contact)</b> (input and output are galvanically connected)	—	0/4...20 mA
Working point Y <sub>0</sub> (P-controller)	—	0 or 4 mA
Resolution	—	<0,1 mA
Load / load effect	—	≤ 500 Ω / ≤ 0,1 %
Relay data	—	See switching controllers
<b>POWER SUPPLY</b>	230 V AC / 115 V AC; +10...-15%, 48...62 Hz	
Power consumption	approx. 4,5 VA	approx. 6,5 VA
<b>CONTROL CHARACTERISTICS</b>	Configurable as:	Configurable as:
	—	Signaller (switching differential 0,2%)
	Two-point controller with DPID behaviour	Two-point controller with DPID behaviour
	Three-point controller with DPID/DPID behaviour	Three-point controller with DPID/DPID behaviour
	—	Three-point stepping controller with DPI behaviour (shortest step 200 ms)
	—	Continuous controller with DPI behaviour
<b>Control parameters</b>	Self-tuning or fixed parameters: See "Functions and parameter settings" (Fig. 6)	Self-tuning or adjustable parameters: See "Functions and parameter settings" (Fig. 11)
<b>Positioner function</b>	Selectable for "heating" or "heating/cooling" (or stepping output with 407)	
<b>ALARM FUNCTIONS</b>	Configurable as relative or absolute alarm, optionally in combination with the heating current monitor (or as relative alarm with alarm suppression on Version 407).	
<b>HEATING CURRENT MONITOR</b>		
Display of heating current	0...30,0 A <sub>rms</sub> with resistive load, external current transformer (see "Accessory equipment")	
Display error	±5%	±5%
Heating current limit	Adjustable 0...30,0 A, optionally acting on alarm relay	
Alarm indication	Red LED lights, if current is below the limit value	Version with monitoring for actuator break and short circuit: Red LED on with heating current below limit value or heating current above 0,4 A (actuator short circuit) Version with excess current monitoring: Red LED on with heating current above limit value
<b>SET-POINT</b>		
Adjustment range	Same as measuring range	Upper and lower limits adjustable

**DISPLAYS**

Multi-function display	Red 3-digit LED display Digit height 10 mm	Two red 4-digit LED displays Digit height: process value X = 10 mm set-point W = 7,6 mm
Display range	0...999	-999...9999
3 LEDs for control deviation:	yellow-green-yellow green $X_w = 0... \pm 1\%$ yellow & green $X_w = \pm 1... 2\%$ yellow $X_w > 2\%$	
LEDs for status display:	yellow for set-point W yellow for process value X yellow for set-point W2	yellow for set-point W2 or programmer "On", or remote operation
LEDs for relay status:	Both versions: yellow = relay 1 "On" or relay 2 "On"	
LED for alarm relay:	Both versions: green = process within limits	
LED for heating current:	Both versions: red = current below limit value	
Input circuit monitoring:	Both versions: FbF (sensor break) and POL (reversed polarity)	

**ENVIRONMENTAL CONDITIONS** (both versions)

<b>Permissible temperatures</b>	Operation	0...60 °C
	For specified accuracy	0...55 °C
	Storage and transport	-20...70 °C
<b>Climatic category</b>	KUF to DIN 40 040 Relative humidity: $\leq 75\%$ yearly average, no condensation	

**INFLUENCING FACTORS** (both versions)

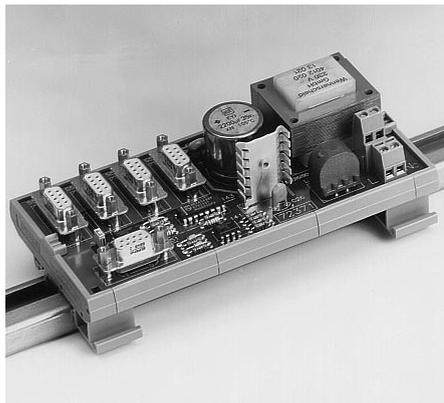
<b>Power supply effect</b>	None (with mains failure, data security is ensured by a non-volatile EEPROM)
<b>Series mode interference</b>	<0,1 V
<b>Low-frequency magnetic field</b>	No effect up to 400 A/m at 50 Hz
<b>High-frequency field</b>	<1K with types L and J up to 300 MHz; 3V/m (IEC 801-3, Sect. 9.2)
<b>Shock and vibration</b>	Vibration test Fc: to DIN IEC 68-2-6 Transport test: 10...150 Hz; 0,15 mm; 2g (Operational test 1g)  Shock test Eb: to DIN IEC 68-2-29 Transport test: 10 g, 16 ms

**GENERAL** (both versions)

<b>Housing</b>	Plug-in module, inserted from front
Material	Makrolon 9415 non-flammable, self-extinguishing
Flammability class	UL 94 VO
Front dimensions	48 mm x 96 mm
Depth behind panel	86 mm (111 mm for version 407)
<b>Protection mode</b> (to DIN VDE 0470 / EN 60 529)	Front: IP 54 (vertical mounting $\pm 15^\circ$ ) Housing: IP 20    Terminals: IP 00
<b>Electrical safety</b>	According to EN 61010-1 (VDE 0411-1); Overvoltage category II; Contamination class 2; Working voltage range 300 VAC; Protection class I
<b>Electromagnetic compatibility</b>	Complies with EN 50 081-1 and EN 50 082-2 for unrestricted use in rural and industrial areas.
<b>Electrical connections</b>	Flat-pin connectors to DIN 46 244 for 1 x 6,3mm or 2 x 2,8 mm
<b>Mounting method</b>	Panel-mounting with 2 fixing clamps at top/bottom or sides
<b>Weight</b>	Approx. 0,35 kg (version 407 approx. 0,45 kg)
<b>Accessories</b>	Operating instructions and 2 fixing clamps

## ACCESSORY EQUIPMENT

### Interface module / interface cable



Interface module/interface cable  
Up to four controllers can be connected to the interface module; also in combination with other PMA equipment. Connection is by means of the separately-ordered interface cable (1 m long).

Via the RS 422/485 interface (D-type connectors), the data are transmitted up to a distance of 1 km. The data protocol conforms to ISO 1745 (fast select mode).

#### Supply voltage

230 VAC or 115 VAC, depending on version

Voltage tolerance: + 10 ... - 15 %

Frequency: 48 ... 62 Hz

Power consumption: approx. 5 VA

#### Electrical connection

Screw terminals: 2,5 mm<sup>2</sup> solid or 1,5 mm<sup>2</sup> flexible

#### Mounting

To standard rail, e.g. type NS 35 (U-rail) or type NS32 (C-rail)

#### Protection mode

Type IP 00 (mounting in enclosure)

#### Permissible temperatures

For operation: 0 ... 60 °C

For storage: - 20 ... + 70 °C

Relative humidity:  $\geq$  75 % yearly average, no condensation

**Mounting position:** Not critical

#### Dimensions

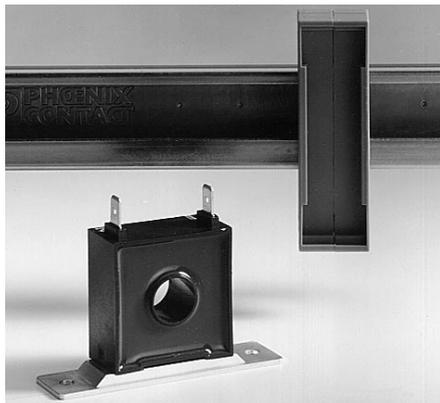
158 x 78 x 60 mm (L x W x H)

**Weight:** approx. 0,37 kg

#### Accessories

Operating leaflet

### Current transformers



Current transformers are available in single-phase and three-phase versions. All versions are suitable for mounting to standard rails. The mounting clip for the single-phase version (photo) must be ordered separately (e.g. Phoenix).

#### Dimensions

Single-phase: 38 x 38 x 20 mm

Three-phase: 137 x 77 x 86 mm

#### Weight

Single-phase: 70 g

Three-phase: 310 g

### ORDERING DATA FOR ACCESSORY EQUIPMENT

Description	Order no.
<b>Single-phase transformer</b> 0...30 A, complete with mounting plate for wall mounting	<b>9404 407 50001</b>
<b>Three-phase transformer</b> 3 x 10 A or 3 x 30 A depending on connection	<b>9404 407 50021</b>
<b>Interface module</b> for max. 4 controllers 230 VAC	<b>9404 429 98001</b>
115 VAC	<b>9404 429 98011</b>
<b>Interface cable</b> Length 1 m, one per controller	<b>9404 407 50011</b>
<b>Dummy panel</b> black, 48 x 96 mm	<b>9404 723 11231</b>
<b>Labels</b> for engineering unit (qty. 27)	<b>4012 140 66041</b>

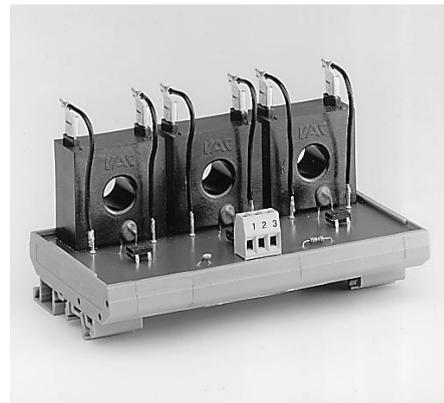


Fig. 5 Connecting diagrams for Versions 406 and 407

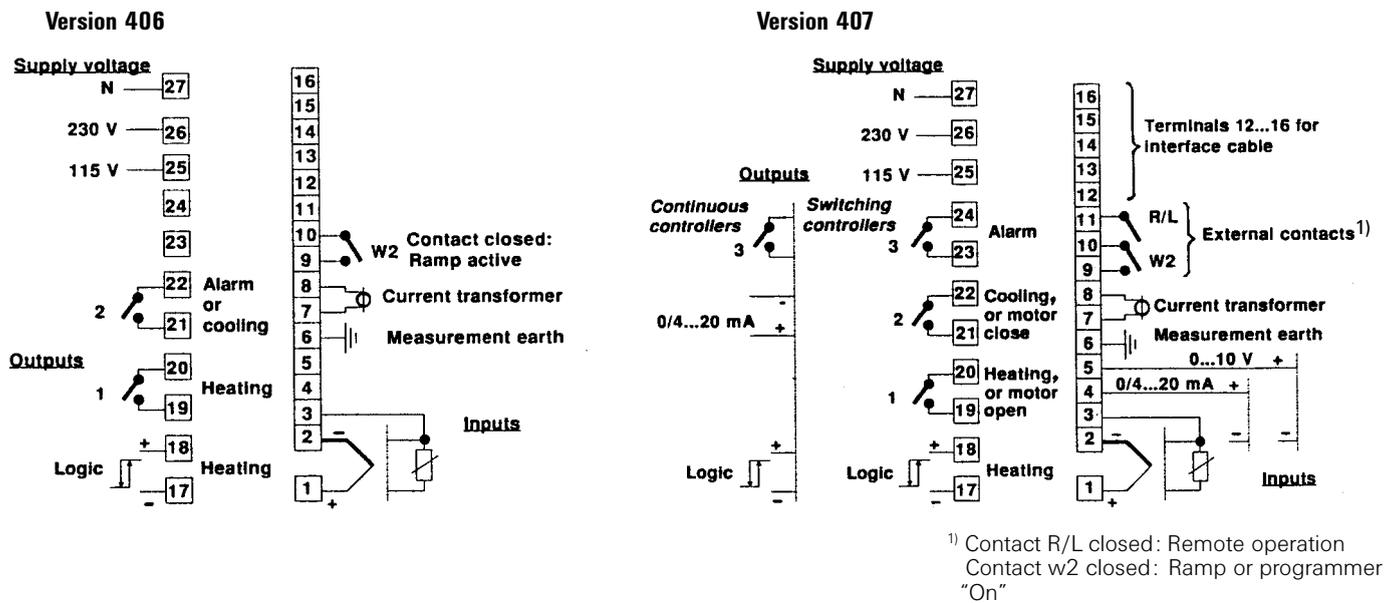


Fig. 6 Parameter adjustment for Version 406

Parameter	Symbol	Adjustment
Second set-point w2	<b>SP2</b>	as measuring range
Segment time t2 (ramp)	<b>Pt2</b>	0 ... 999 min
Low limit contact	<b>LCL</b> <sup>2)</sup>	0 ... 999 (1...999 with rel. alarm)
High limit contact	<b>LCH</b> <sup>2)</sup>	0 ... 999 (1...999 with rel. alarm)
Heating current	<b>HC</b>	only display
Heating current alarm	<b>HCA</b>	0 ... 30,0 A
Blocking of operation External contact	<b>Loc</b>	0 ... 3 (see below)

- Loc 0:** Display of x and w with adjustment and self-tuning
- Loc 1:** Display of x and w with adjustment
- Loc 2:** Only display of x and w
- Loc 3:** Only display of x

<sup>2)</sup> Switching difference 1 digit

Fig. 7 Second set-point w2 with ramp

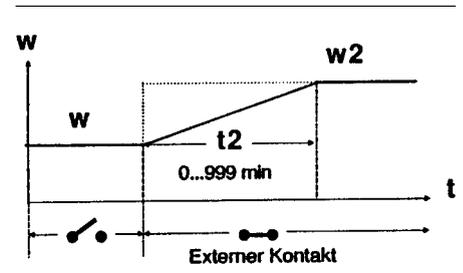
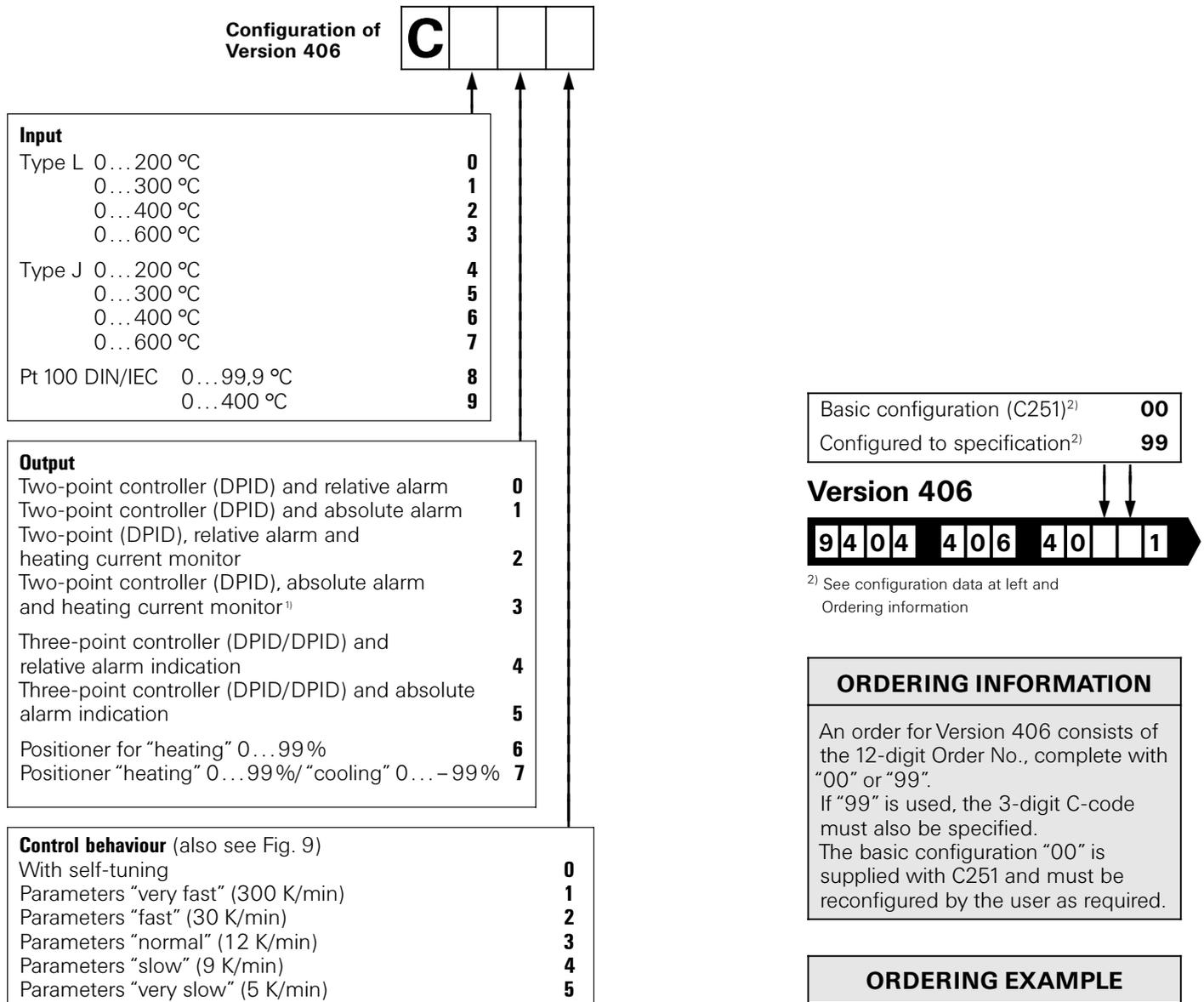
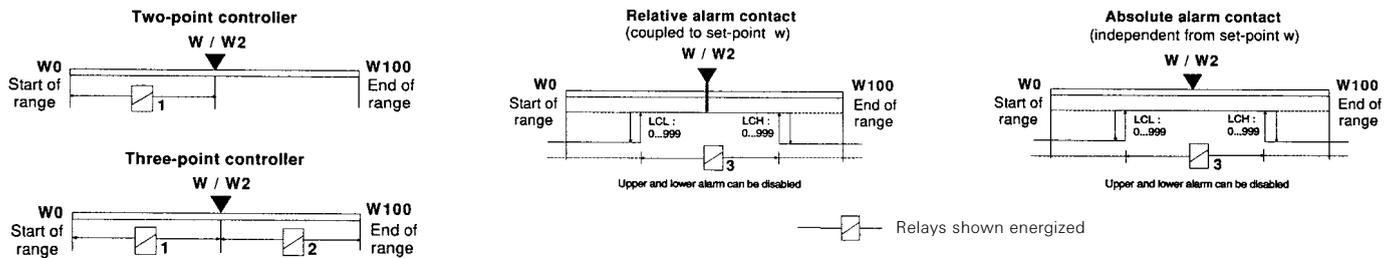
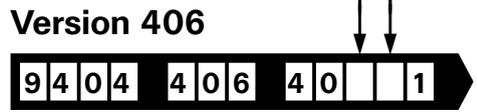


Fig. 8 Controller and alarm functions of Version 406



Basic configuration (C251)<sup>2)</sup> **00**  
 Configured to specification<sup>2)</sup> **99**



<sup>2)</sup> See configuration data at left and Ordering information

**ORDERING INFORMATION**

An order for Version 406 consists of the 12-digit Order No., complete with "00" or "99".  
 If "99" is used, the 3-digit C-code must also be specified.  
 The basic configuration "00" is supplied with C251 and must be reconfigured by the user as required.

**ORDERING EXAMPLE**

Item	Order no./Description	Qty.
1	9404 406 40991 C620	1
2	Current transformer 9404 407 50001	1

<sup>1)</sup> Current transformer required, see Accessory Equipment

Fig. 9 Control loop characteristics

Code	Loop behaviour	Delay time $T_u$	Rate of change $V_{max}$	On/off ratio and switching frequency	
<b>1</b>	very fast	5 s	5,0 K/s	1 s	60/min
<b>2</b>	fast	40 s	0,5 K/s	5 s	12/min
<b>3</b>	normal	120 s	0,2 K/s	15 s	4/min
<b>4</b>	slow	180 s	0,15 K/s	20 s	3/min
<b>5</b>	very slow	300 s	0,08 K/s	20 s	3/min

Fig. 10 Controller and alarm functions of Version 407

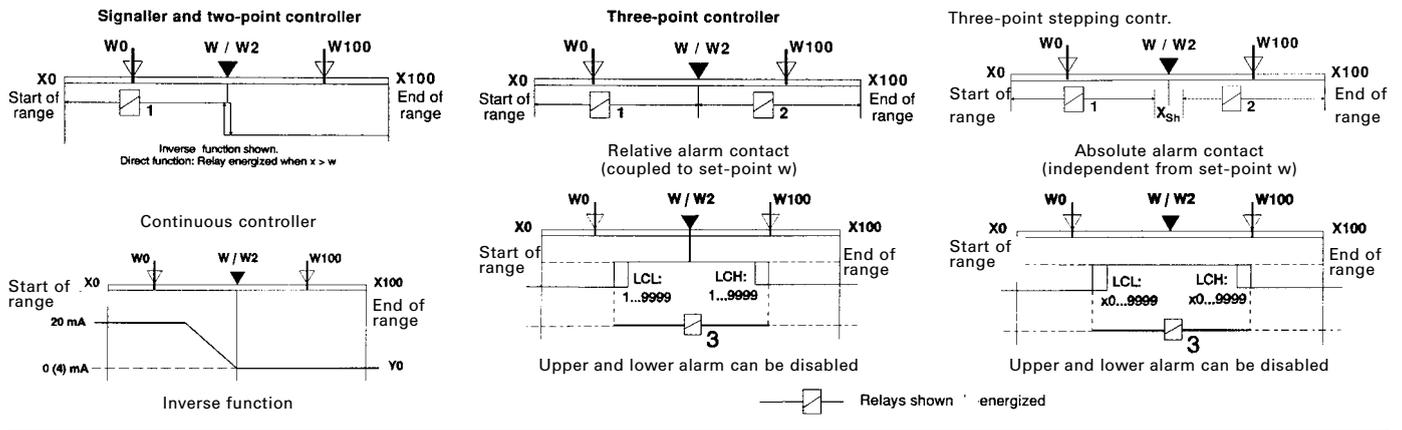
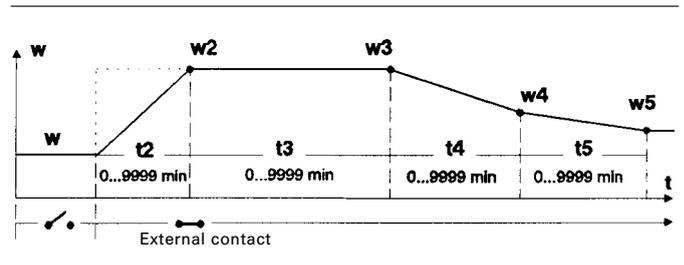


Fig. 11 Parameter adjustment

Parameter	Symbol	Adjustment range <sup>1)</sup>
2nd set-point w2 (ramp)	<b>SP2</b>	w0...w100
Segment time t2 (ramp)	<b>Pt2</b>	0...9999 minutes
3rd set-point w3	<b>SP3</b>	w0...w100
Segment time t3	<b>Pt3</b>	0...9999 minutes
4th set-point w4	<b>SP4</b>	w0...w100
Segment time t4	<b>Pt4</b>	0...9999 minutes
5th set-point w5	<b>SP5</b>	w0...w100
Segment time t5	<b>Pt5</b>	0...9999 minutes
Low limit contact	<b>LCL</b>	Relative: 1...9999 Absolute: x0...9999
High limit contact	<b>LCH</b>	Relative: 1...9999 Absolute: x0...9999
Switching difference x <sub>sd</sub> for both limit contacts	<b>Sd</b>	1...9999
Heating current	<b>HC</b>	only display
Heating current alarm	<b>HCA</b>	0...30,0A
Blocking of operation	<b>Loc</b>	0...3 (see right)
Lower set-point limit w0	<b>SPL</b>	x0...x100
Upper set-point limit w0	<b>SPH</b>	x0...x100
Set-point gradient	<b>Gr</b>	0,1...999,9/min
Proport. band Xp1 (heating)	<b>Pb1</b>	0,1...999,9%
Proport. band Xp2 (cooling)	<b>Pb2</b>	0,1...999,9%
Integral action time Tn	<b>ti</b>	0...9999 seconds (0 = no I-action)
Derivative action time Tv	<b>td</b>	0...9999 seconds (0 = no D-action)
Motor actuator time Tm	<b>tt</b>	20...300 seconds
Switching differential Xsh	<b>SH</b>	0,2...20%
Duty cycle for heating	<b>t1</b>	0,4...999,9 sec
Duty cycle for cooling	<b>t2</b>	0,4...999,9 sec
Decimal point	<b>dP<sup>2)</sup></b>	0 or 1 (0 = no dec. point)
Measuring span start x0	<b>InL<sup>2)</sup></b>	-999...9999
Measuring span end x100	<b>InH<sup>2)</sup></b>	-999...9999
Interface addresses	<b>Adr</b>	0...99

<sup>1)</sup> Values in % referred to range x0...x100  
<sup>2)</sup> Only with input 0/4...20 mA or 0...10 V

Fig. 12 Set-point w2 with ramp and program controller



Blocking of operation

- Loc 0:** Display of x and w with adjustment and self-tuning
  - Loc 1:** Display of x and w with adjustment
  - Loc 2:** Only display of x and w
  - Loc 3:** Only display of x
- Note: After selecting Loc 1, 2 or 3, all subsequent parameters are not displayed.

## ORDERING EXAMPLES

### Example 1

Required is a two-point controller with inverse output, absolute alarm contact, Pt 100 input, and interface for 9600 Bd:

Pos.	Order no./Description	Qty.
1	9404 407 41991 C06313000	1
2	Interface module 9404 429 98001	1
3	Interface cable 9404 407 50011	1

### Example 2

Required is a three-point stepping controller, absolute alarm, input 0...20 mA, programmer, no interface:

Item	Order no./Description	Qty.
1	9404 407 42991 C07910100	1

### Example 3

Required is a continuous controller, display in °F, thermocouple Type N, relative alarm with current monitor, and output 0...20 mA:

Item	Order no./Description	Qty.
1	9404 407 44991 C23820010	1
2	Current transformer 9404 407 50001	1

## ORDERING INFORMATION

An order for Version 407 consists of the 12-digit Order No., complete with "00" or "99".

If "99" is used, the 8-digit C-code must also be specified.

The basic configuration "00" is supplied with C00510100 (3 relays) or C00310100 (2 relays) or C00710110 (continuous) and must be re-configured by the user as required.

### Output configuration of Version 407

Versions with:	Configuration as:	Output 1 Relay 1	Output 2 Relay 2/ Continuous	Output 3 Rel. 3 (Alarm)	Logic Output
	<b>2 relays</b> 9404 407 40xx1 9404 407 41xx1 9404 407 60xx1 9404 407 61xx1	<b>0/1</b> Signaller	Signalling	-	LC/HCA
	<b>2/3</b> Two-point DPID	Heating	-	LC/HCA	Heating
	<b>4</b> Positioner	Heating	-	see above	see above
<b>3 relays</b> 9404 407 42xx1 9404 407 43xx1 9404 407 62xx1 9404 407 63xx1	<b>0...4</b> see above	see above	-	see above	see above
	<b>5</b> Three point DPID/ DPID	Heating	Cooling	LC/HCA	Heating
	<b>6</b> Positioner "H/C"	Heating	Cooling	HCA	Heating
	<b>7</b> Positioner "stepping"	Motor open	Motor close	-	Motor open
	<b>9</b> Three-point stepping	Motor open	Motor close	LC	Motor open
<b>Continuous</b> (with relay 3) 9404 407 44xx1 9404 407 45xx1 9404 407 64xx1 9404 407 65xx1	<b>0...3</b> for logic output	-	-	LC/HCA	Signalling/ Heating
	<b>4</b> Positioner	-	0/4...20 mA	-	-
	<b>5</b> Three-point DPID/ DPID	-	0/4...20 mA Cooling	LC/HCA	Heating
	<b>6</b> Positioner "H/C"	-	0/4...20 mA Cooling	HCA	Heating
	<b>7</b> Continuous, direct	-	0/4...20 mA	LC	-
	<b>8</b> Continuous, inverse	-	0/4...20 mA	LC	-

#### Note

On versions with 2 or 3 relays, output 1 (heating) is available in parallel as a relay contact and a logic signal. For optimum control of fast control loops ( $T_u < 30$  s), an on/off ratio of  $< 10$  s is necessary. For such applications, the wear-free logic output should be used together with a solid-state relay.

Relay 1 can be disabled by opening a wire-hook switch.

**Configuration of Version 407**



<b>Display/input circuit monitor</b>	
Degrees C/upscale	0
Degrees C/downscale	1
Degrees F/upscale	2
Degrees F/downscale	3

<b>Input</b>	
Type L 0... 900 °C	0
Type J 0... 900 °C	1
Type K 0... 1350 °C	2
Type N 0... 1300 °C	3
Type S 0... 1760 °C	4
Type R 0... 1760 °C	5
Pt 100 DIN/IEC – 99,9... 500,0 °C	6
0... 20 mA, linear	7
4... 20 mA, linear	8
0... 10 V, linear	9

<b>Controller function</b> (outputs 1 and 2)	
Signaller, direct	0
Signaller, inverse	1
Two-point DPID, direct	2
Two-point DPID, inverse	3
Positioner "heating"	4
Three-point-DPID/DPID <sup>1)</sup>	5
Positioner "heating/cooling" <sup>1)</sup>	6
Continuous, direct (or 3-point stepping positioner)	7
Continuous, inverse	8
Three-point stepping	9

<b>Alarm contact</b> (output 3)	
<i>Relay de-energized on alarm</i>	
Relative alarm	0
Absolute alarm	1
Relative alarm with current monitoring <sup>2)</sup>	2
Absolute alarm with current monitoring <sup>2)</sup>	3
Relative alarm with alarm suppression	8
<i>Relay energized on alarm</i>	
Relative alarm	4
Absolute alarm	5
Relative alarm with current monitoring <sup>2)</sup>	6
Absolute alarm with current monitoring <sup>2)</sup>	7
Relative alarm with alarm suppression	9

<b>Heating current monitoring</b>	
0 Monitoring for actuator break and short circuit	
1 Excess current monitoring	

<b>Output</b>	
0 Switching	
1 0... 20 mA	
2 4... 20 mA	

<b>Program controller</b>	
0 Ramp output	
1 Programmer output	

<b>Interface/Transmission speed</b>	
0 Without interface	
1 2400 bits/s	
2 4800 bits/s	
3 9600 bits/s	
4 19200 bits/s	

Basic configuration <sup>1)</sup>	00
Configured to specification <sup>2)</sup>	99

**Version 407**



2 relays for heating/alarm	0
2 relays as above, with digital interface	1
3 relays for heating/cooling/alarm or three -point stepping/alarm	2
3 relays as above, with digital interface	3
Continuous with 1 relay (alarm contact) and logic output	4
Continuous as above, with digital interface	5

<sup>1)</sup> Continuous controller also configurable as follows:  
 "Heating" via logic output,  
 "Cooling" with 0 (4) ... 20 mA

<sup>2)</sup> Current transformer required, see Accessory Equipment

<sup>1)</sup> See Ordering Information (previous page)  
<sup>2)</sup> See configuration data at left