PMA Prozeß- und Maschinen-Automation GmbH

PMA

Industrial controller KS 92

Operating Instruction

9499 040 44111

Valid from : 8371

Contents

Symbol definition:


General warning (caution, following the warnings in the instruction)


Protective earth


Earth connection

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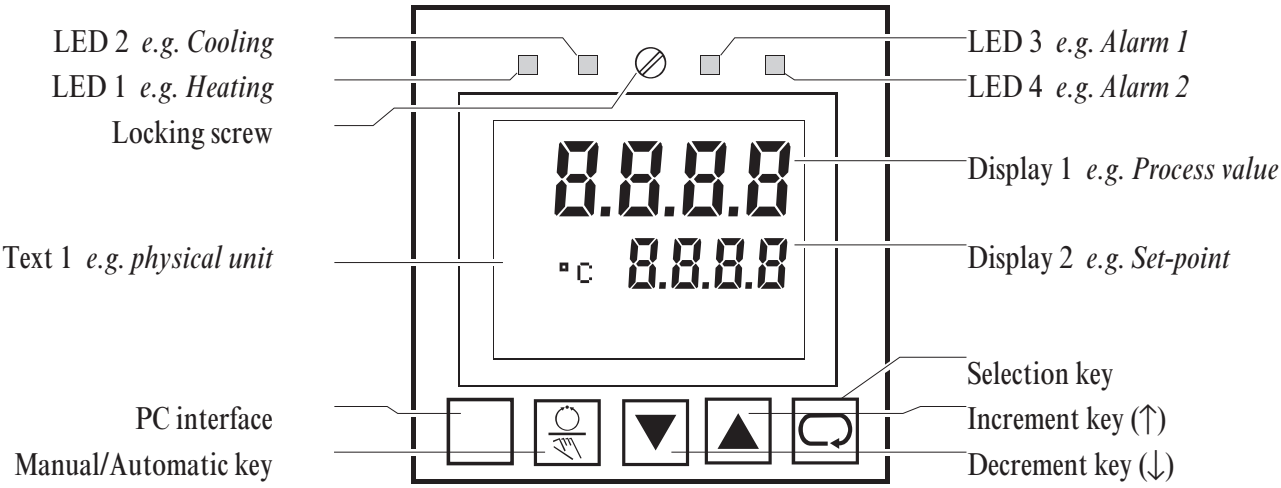
1. Front view



- **Locking screw**: Locks the controller module in the housing.
- **LED**s: indicates the statuses of controller outputs Y1, Y2 and alarms LIM1, LIM2 (other settings at configuration level C.800; LEd →page 26).
- **Display 1**: indicatess process value at operating and parameter level, or the configuration code at configuration level.
- **Display 2**: indicates the set-point (automatic mode) or the correcting value (manual mode) in operating level. The values are adjustable directly with ▲▼. Further displays at operating level → page 7. In parameter and configuration level, values and codes described with text1 are indicated (→ page 11).
- **Text 1**: indicates the short-form dialogue or the unit of display 2.
- **Text 2**: indicates the output bargraph (other selections possible in configuration level C.800).
- **Keys** ▼▲: For the certain function → pages 8 and 11.
- **PC interface**: PC connection for configuration/parameter setting/operation with an engineering tool.

2. Safety notes

Following the enclosed safety instructions 9499 047 07101 is indispensable!
The insulation of the instrument conforms to EN 61 010-1 with pollution degree 2, overvoltage category III, operating voltage 300 V and protection class I. Additional with horizontal installation, a protection to prevent live part, e.g. wire ends, from dropping into the open housing of a withdrawn controller must be fitted.

3. Electromagnetic compatibility

The instrument conforms to **European Directive 89/336/EEC** and will be provideed with the CE-marking. The following European Generic Standards are met: **Emission: EN 50081-2** and **Immunity: EN 50082-2**. The unit is suitable for use in industrial areas (in residential areas, RF interference may occur). The electromagnetic radiation can be reduced decisively by installing the unit in a grounded metal switch cabinet.

4. Technical data → data sheet, order no. 9498 737 28333

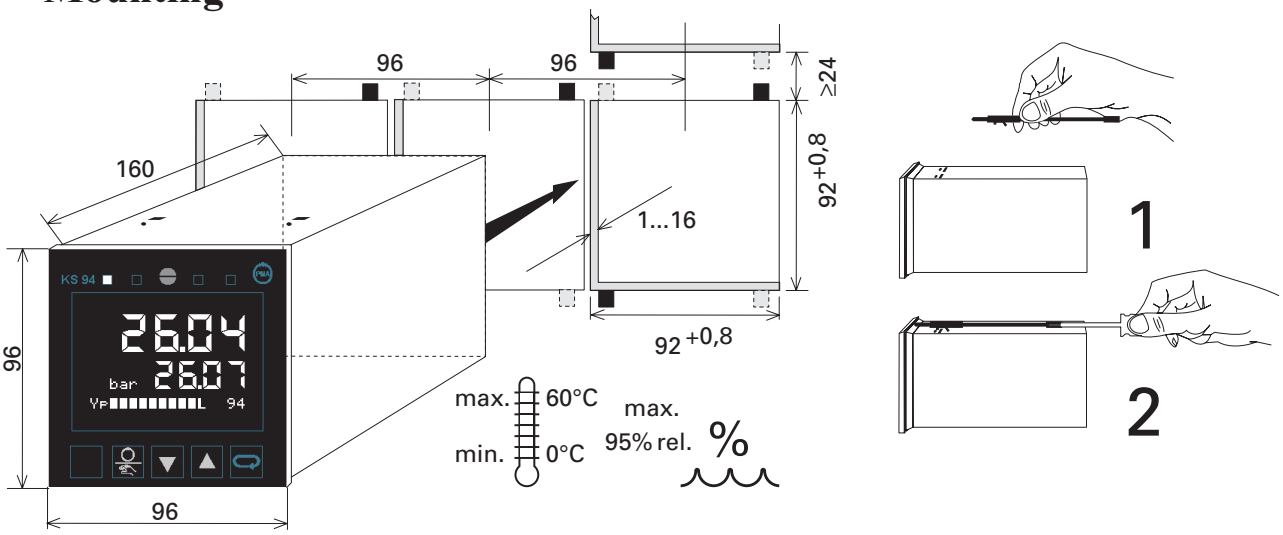
5. Maintenance / Behaviour in case of trouble

The controller needs no maintenance. The rules to be followed in case of trouble are:
• Check mains (voltage, frequency and correct connections), • check, if all connections are correct, • check the correct funktion of the sensors and final elements, • check the configuration words for required functions and • check the adjusted parameters for required operation. If the controller still does not work properly after these checks, shut down the controller and replace it.
Cleaning: Housing and Front can be cleaned by means of a dry, lint-free cloth. No use of solvents or cleansing agents!

6. Further information

A manual with the order no. 9499 040 44811 gives further information to the chapters of this operating notes.

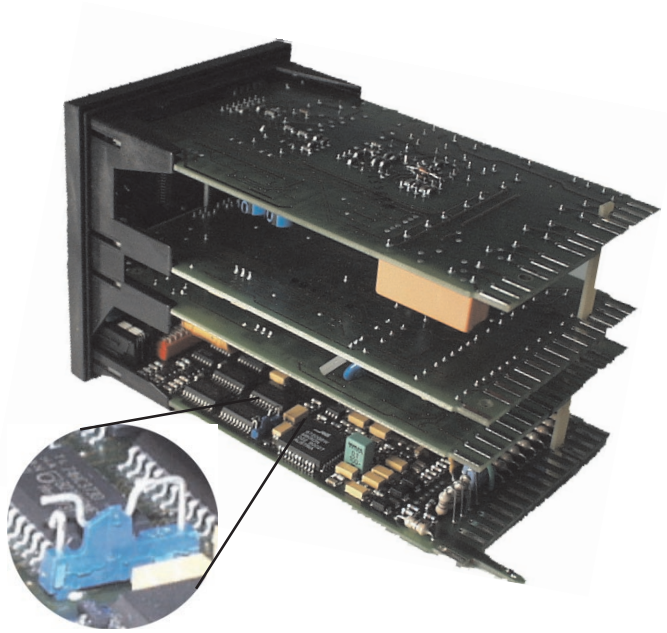
7. Mounting



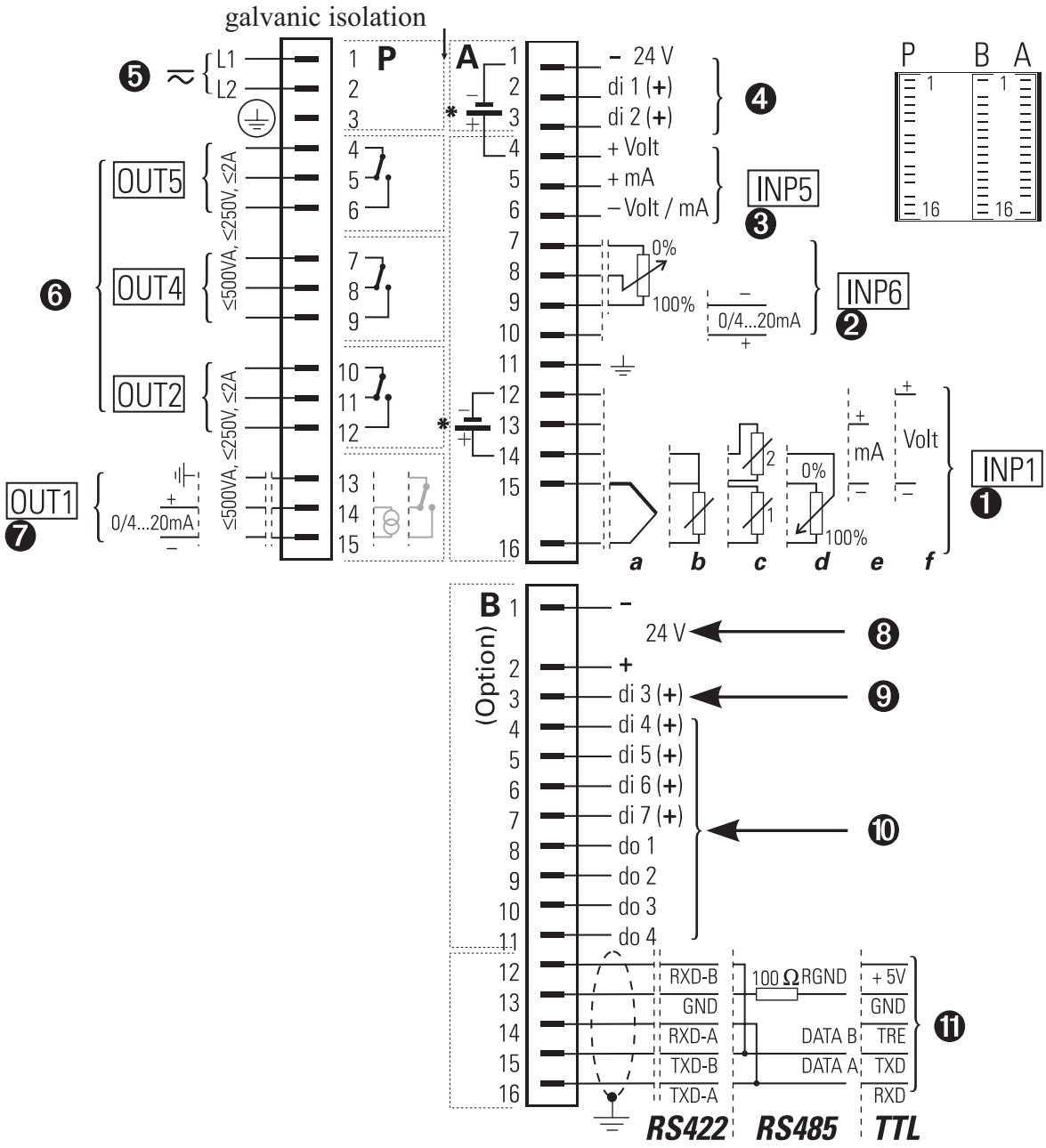
S.I.L. switch: with the switch closed, transition to parameter and configuration level is disabled. When making an attempt to change over to the parameter level, "ParaL" is displayed (text1). Correcting variable, set-point and parameters at the "extended operating level" remain available for selecting and changing. For access to the S.I.L. switch, release the locking screw and withdraw the instrument module from the housing. Subsequently, re-insert the controller module into the housing and mount it with screws.

Protection mode IP65: 4 fixing clamps must be used. The instruments insert must be placed strongly an locked strongly by means of the locking screw.

Caution! The instrument contains ESD-hazarded components.



8. Electrical connections



* Versions with integrated supply voltage (connection example look at page 7)

8.1. Notes

- ❑ The ground connection of earth terminal A11 (terminal P13 with continuous controllers, too) should be kept **separate** from the mains and as short as possible (15 cm during test). Keep **mains cables separate** from signal and measurement input leads. We recommend twisted and screened measurement input leads (screen contacted to measurement earth).
- ❑ When connecting a contactor to a relay output, an RC protective circuit is necessary, to avoid voltage peaks which can cause trouble to the controller.
- ❑ Individual or common fuse protection must be fitted (1 A per instrument).

8.2. Connecting input INP1 ❶

Input for main process value x1 (actual value).

x1

a Thermocouple ***b*** Resistance thermometer (Pt 100) ***c*** Temperature difference (ϑ1-ϑ2) (2x Pt 100)

d Potentiometric transducer ***e*** Current (0/4...20mA) ***f*** Voltage (0/2...10V)

8.3. Connecting input INP6 ❷

For position feedback with 3-point stepping controller
(other selections possible in configuration level C.180).

8.4. Connecting input INP5 ❸

x2

Input for process value x2 or external set-point or external set-point offset (configuration level C.180). With voltage signals, A6 must be connected to the reference potential at A9.

8.5. Connecting the power supply ❺

Depending on the version, the instrument is supplied with: 230 V AC ***or*** 115 V AC.. The indicated values are the limits. The protective earth must be connected to terminal P3.

8.6. Connecting the outputs OUT2/4/5 ❻

Relay outputs, corresponding to the controller output Y2 or the alarms LIM1 / LIM2 (other selections possible in configuration level. See page 23).

8.7. Connecting output OUT1 ❼

Depending on the version, OUT1 is a relay, logic or continuous output corresponding to the controller output Y1 (other selections in configuration level). With logic and continuous outputs, P13 must be connected to the earth terminal. The logic signal is 0 / >20 mA (load ≤600Ω) or 0 / >12 V (load ≥600Ω).

8.8. Digital inputs and outputs (di / do) ❹❽❾❿⓬⓭⓮

The inputs operate as current sink (IEC 1131 type1), logic „0" = -3...5 V, logic "1" = 15...30 V.
The outputs operate as „grounded load". They are short circuit protected and contain recovery diodes.
The digital input and supply voltage (24V) must be connected on each circuit board.

❹ **di1** / **di2** control various actions (set in configuration level C.190 / C.191 and parameter Blck1 / Blck2)

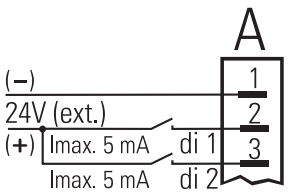
❾ **di3** is used for changeover Local mode(0) ↔ Remote mode(1).

❿ **di4...di7** and **do1...do4** are correlated to the programmer as follows:

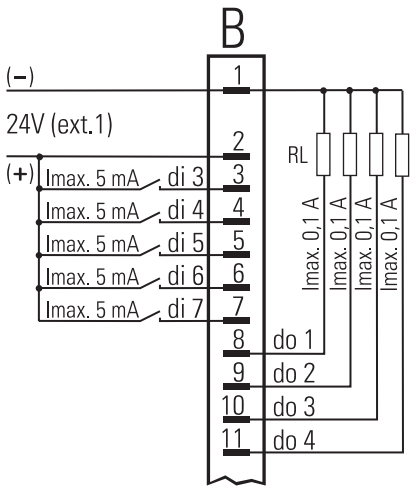
di4	Program STOP (0) ↔ RUN (1)	do1 Status fo control output 1
di5	Program normal (0) ↔ RESET (1)	do2 Status fo control output 2
		do3 Status fo control output 3
		do4 Status fo control output 4

❽ The digital inputs and outputs must be supplied from one or several external 24 V dc sources (current consumption 5 mA/input, max. load = 0,1 A/output). Examples:

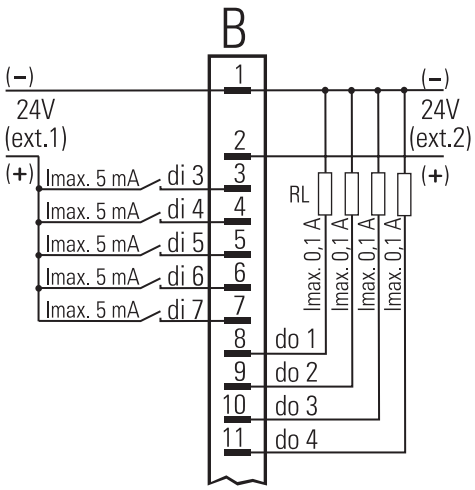
Digital inputs (connect. A)



Digital inputs and outputs with one dc source (e.g. connector B)



Digital inputs and outputs with two dc sources (e.g. connector B)

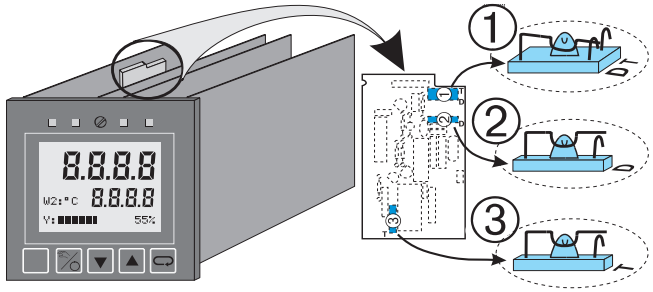


8.9. Connecting the bus interface

TTL level or RS422 or RS485. With TTL level, an interface module for conversion to RS422/RS485 is required. 4 units may be connected to an interface module.

8.10. Versions with integrated supply voltage

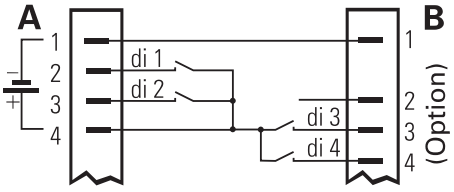
The supply voltage can be used only for energization of a 2-wire transmitter or for energization of max. 4 control inputs. The supply voltage is potential-free and can also be used for energizing inputs INP3 ... INP6 or for other units. Selection of supply voltage or digital inputs is by S.I.L. switches (see figure below).



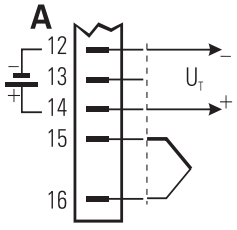
	Transmitter supply voltage	Digital input
①	Position T	Position D
②	open	closed (D)
③	closed (T)	open

The supply voltage is only applied to terminals A12 and A14 with INP1 configured for **current** or **thermocouple** (C.200 ; type) and the S.I.L. switches set for transmitter supply (factory setting)! With the S.I.L. switches set to digital input, the voltage is applied to terminals A1 and A4 independent of the configuration of input INP1. In this case, the voltage input of INP5 is not available.

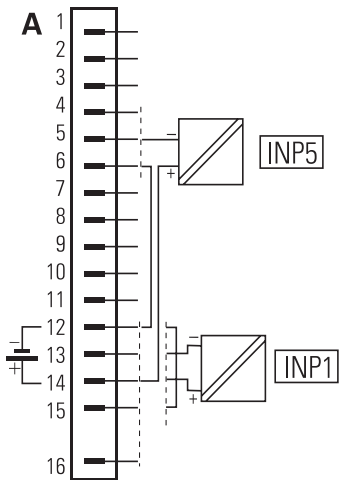
Supply voltage for energization of digital input (e.g. di1...di4)



External use of the supply voltage



Connection of a 2-wire transmitter on example of INP1 or INP5



9. Operation (survey)

☞ The user manual (order no. 9499 040 44811) is required for the complete operation.

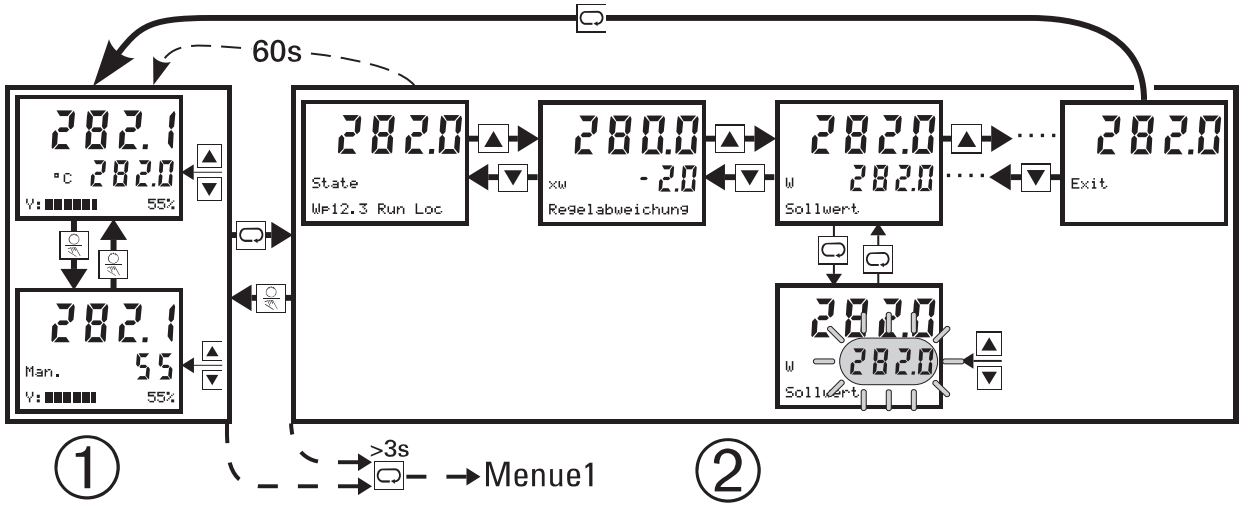
9.1. The menues 1...3

Apart from the parameter and configuration words, the following dialogue words are used (Text1):

Text1		Signification
CBus	CFrnt	PC communication via interface at terminals B12...B16 or connection on the unit front
Clear		The additional display selected at operating level is deleted (→ Mark)
Clock		Adjust the clock
Conf		Transition to configuration level
End		Return to the previous selection menu
Exit		Return to operating level (main display)
Hold		The displayed parameter is determined as standard indication.
Mark		The displayed parameter is stored as additional display at operating level (→ Clear)
More		The configuration level area described with MORE is accesible
OStar	OStop	Self-tuning will be started or stopped
Para		Transition to parameter level
PRun	PStop	Programmer will be started or stopped
PSet	PRes	Programmer will be set to a specified program point or reset to the reset point
Quit		Return to operating level (main display) without storage of the values changed last

9.2. The operating level

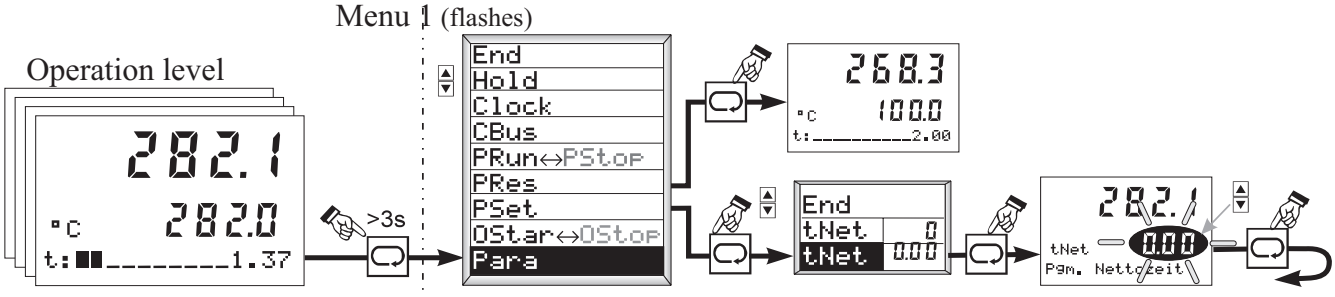
The operating level comprises main display ① and extension ②. During the main display, automatic or manual operation can be selected ([☞]). With automatic, the set-point, and with manual, the correcting value can be adjusted directly ([▲][▼]). In the extension, the number and sequence of displays is dependent of selected functions. Max. 12 parameters from the parameter level can be displayed (Mark ↔ Clear). Some of these parameters are directly adjustable ([▲][▼]). A parameter can be displayed continuously with the Hold function. (Press [⟲] < 3s → Select parameter (press [▲][▼]) → [⟲] > 3s → Select Hold (Press [▲][▼]) → [⟲]).The extension can be left with Exit and [⟲] or after a timeout of 60 s or with [☞]. With [☞], the other operating mode is also selected.



☞ If the set-point is set to '– –' by means of [▼], the controller is switched off!!
Menu 1 is always selectable at operating level: deletion of additional display (Clear), communication interface switch-over (CBus ↔ CFrnt) and starting (OStar) or stopping (OStop) the self-tuning, setting the clock (Clock), operate the programmer (PRun ↔ PStop; PRes; PSet) and transition to parameter level (Para).

9.3. Operating the programmer:

The programmer can be operated (run, stop, reset, preset) with menu 1, via digital inputs or via the interface (process management system).

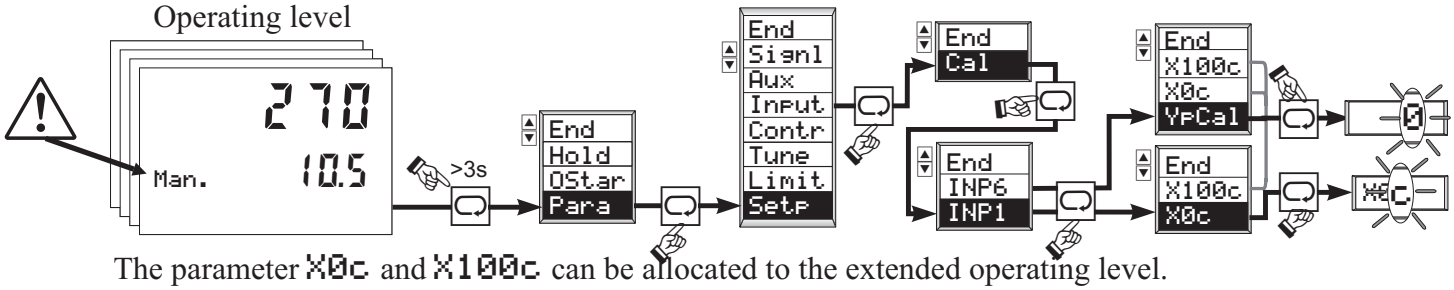


When entering the preset time (parameter setting: Pmode = 1) the time can be entered up to 99.59 in **hours** . **minutes**, or only in **hours** with longer times.

9.4. Calibration:

Calibation is only possible with the controller set to manual mode.
Calibration from INP1/6 (Typ = 40; Potentiometric transducer) is in two steps.

- Select x0c → Press ↻ (c blinking) → set transducer to 0%, wait 6s and confirm with ↻.
- Select x100c → Press ↻ (c blinking) → set transducer to 100%, wait 6s and confirm with ↻.
  Manual calibration of INP6 is only possible with the DAC function switched off. With the DAC function switched on, automatic calibration is possible (→ DAC page 9).
- For selecting YpCal , press → ↻ (0 blinks) change to 1 with ▲ and acknowledge with ↻ → automatic calibration is started.



The parameter X0c and X100c can be allocated to the extended operating level.

9.5. DAC – motor actuator monitoring (Digital Actor Control DAC®)

With all controllers with position feedback Yp, the motor actuator can be monitored for functional troubles.
CFunc = 08 = 3-point stepping controller with position feedback as a potentiometer
CFunc = 09 = continuous with position feedback as a potentiometer
CFunc = 12 = continuous with current feedback via Yp (INP6)
The system detects the following stepping controller errors:

- defective motor
- defective capacitor (wrong rotating direction),
- wrong phase followers
- defective force transmission at spindle or drive,
- excessive backlash due to wear
- jamming of the control valve e.g. due to foreign body

With the continuous controllers, monitoring if output signal and position feedback exceed a difference of 10 % after elapse of a 20 s filter time is provided. The DAC® function can be switched on or off at parameter setting level (DAC = 0/1). A detected trouble is indicated, the controller switches to manual mode and no pulses are output any more.

During Yp calibration, the DAC® function is activated! Otherwise, disabling would be detected when reaching the limits and the controller would be switched to “off” (r calibration).

9.6. Self-tuning (automatic optimization of control parameters)

After starting by the operator, the controller makes an attempt for optimization by determining the parameters for fast line-out at the set-point without overshoot from the process characteristics.

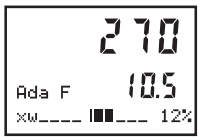
Optimization start:
the operator can start the optimization attempt at any time (see opposite drawing).

Preparation for self-tuning:

- PID, PI, PD or P control behaviour can be selected by the user by switching off Tn=0 or Tv=0 before self-tuning start.
- Determine the output step change (dYopt).
- Determine the stable correcting variable (YOptm).
- Determine the `process-at-rest' mode (C.TOO ; OCond)
- Is the set-point reserve (x-w) > 10% of W100-W0?

Self-tuning cancelation:
The operator can cancel the optimization attempt at any time. This is possible by pressing key ⎋ (→controller switches to 'manual') or via OStop in menu1 (→ controller switches to `automatic'). The controller continues operating with the **old** parameter values.

Optimization problems:
With process conditions which prevent successful optimization, the controller cancels the attempt for optimization (Ada F is displayed). The controller outputs are switched off to prevent the set-point from being exceeded. Afer self-tuning cancelation, controlling is continued with the **old** parameter values.

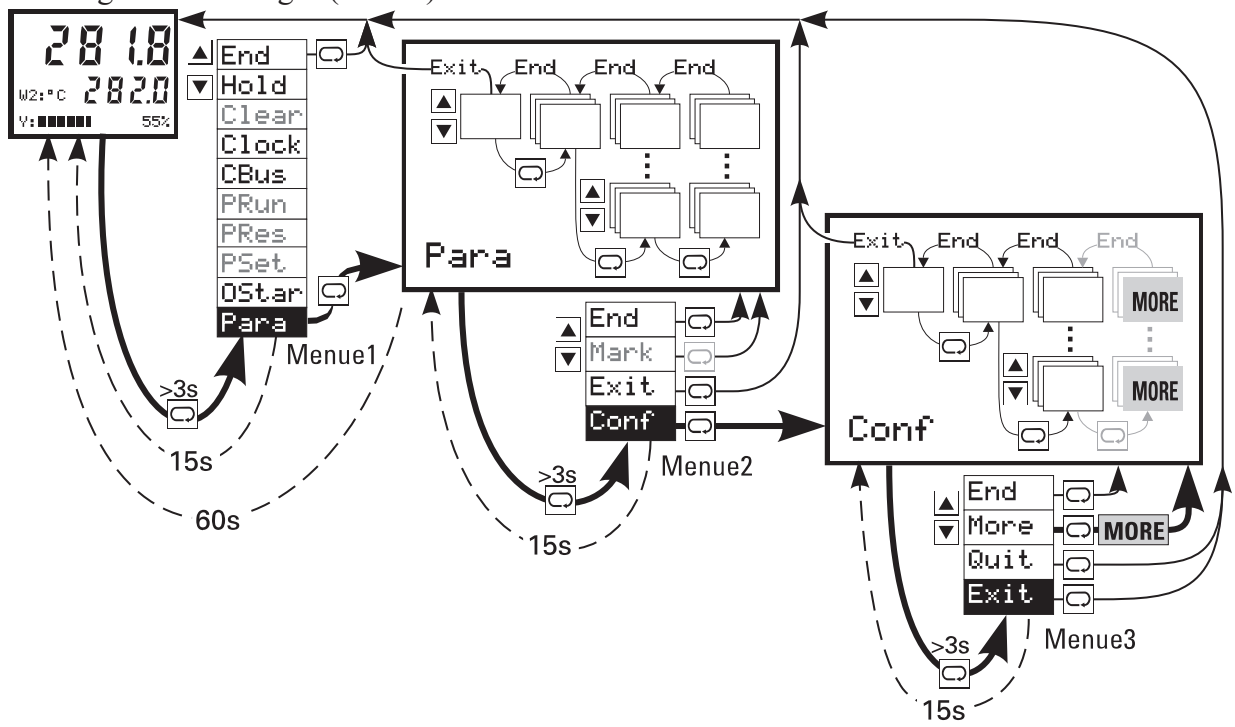


9.7. Parameter and configuration level

Menu 1 is always selectable at operating level: several operations and transition to parameter level (Para).

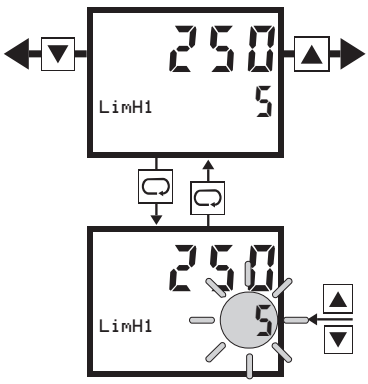
Menu 2 is always selectable at parameter level: selection of additional displays (Mark), return to parameter level (End), return to operating level (Exit), transition to configuration level (Conf).

Menu 3 is always selectable at configuration level: permitting the MORE area (More), return to configuration level (End), return to operating level without storage of the last changes (Quit) or with storage of the changes (Exit).

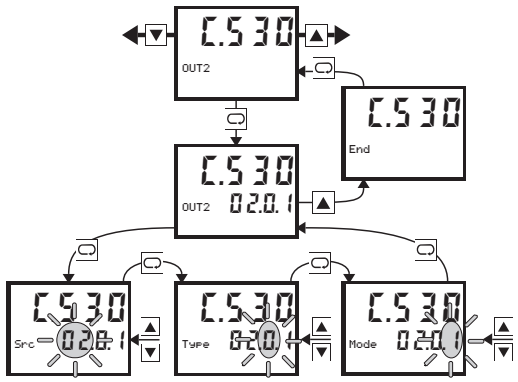


Value adjustment is as follows (parameter values / configuration codes):

Example for a single value



Example for combined data (e.g. C-codes)



10. Configuration

10.1. General

The KS92 controller configuration for quick and easy function selection during subsequent operation is described in this section. During configuration, the required functions are selected from a large variety of available functions. The configuration determines the basic structure for solution of an application.

The configuration structure is designed so that determination of the required functions for a large number of applications is possible by adjustment of as few configuration words as possible. Moreover, the structure was designed flexible enough to permit additional configurations also for realization of special applications.

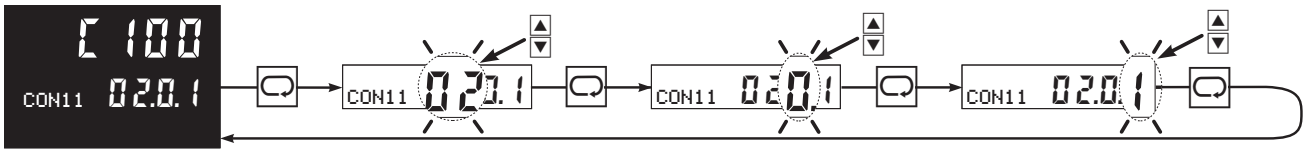
10.2. Basic structure

The first menu level permits selection of the main configuration group.
The user can be guided through all function configurations, or he can configure the specific functions required for his application directly.

For all 'complex' main groups, a two-level configuration concept which enables the user to select the 'correct' setting for his application by defining only one configuration word was determined. If necessary, special functions can be determined separately. For the 'normal user', however, the configuration words are preset to purposeful default values! For simplification, the hierarchic configuration dialogue is structured so that the user can and must adjust only the 'required' configuration words.

The user configuration dialogue is started via selector key ⟲ and 'increment' / 'decrement' keys ▲▼, like with the other KS92/94 operating levels:

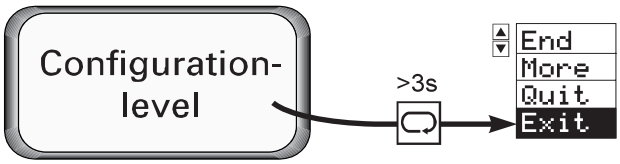
- Press the selector key to select menu items / input values / input positions within a 'level' and to change over to the next higher level at the end of a 'level'.
- Press the 'increment' / 'decrement' keys for returning to a lower level and for modification of input values.



The configuration structure is shown on the two following pages (10 and 11). All possible configuration words are listed. Configuration words which are irrelevant for a function are not displayed during the dialogue!

Switch-over to a selection menu is possible from anywhere during configuration by pressing key ⟲ >3s.

End: Return to configuration level
More: Activating the More function
Quit: Return to operating level (configuration changes are not effective)
Exit: Return to operating level (configuration changes are effective and the controller is re-initialized).



10.3. Main groups

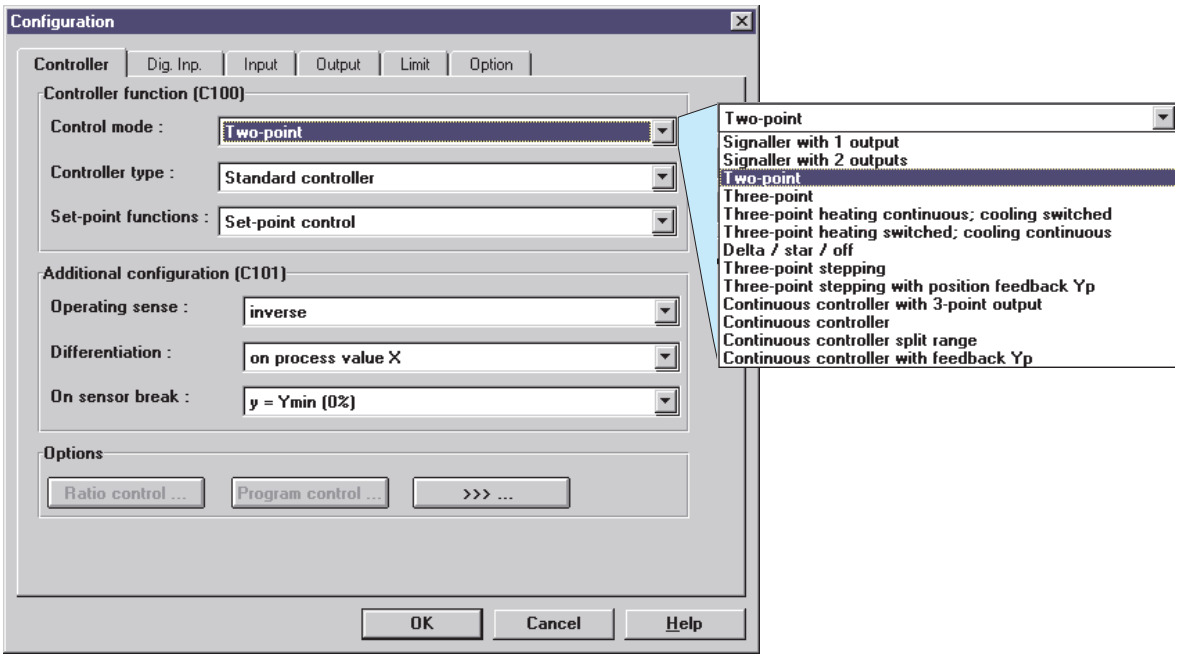
The following main configuration groups are available for KS9x controller configuration:

Contr	Controller function	C.100	...	C.139	→ page 16
Sourc	Input allocation	C.180	...	C.192	→ page 18
Input	Input function	C.200	...	C.487	→ page 20
Outpt	Output function	C.500	...	C.597	→ page 23
Alarm	Alarm function	C.600	...	C.660	→ page 25
Tune	Self-tuning	C.700			→ page 26
Disp	User interface	C.800			→ page 26
Aux	Additional function	C.900	...	C.994	→ page 27

The main configuration groups are structured in a hierarchical order, whereby determination of a dialogue for prompting only the really relevant configurations is possible.

ENGINEERING TOOL 'ET/KS 94'

Engineering Tool ET/KS94 permits realization of all operations which are possible via the KS94 front panel on a PC, whereby controller configuration and parameter setting are facilitated considerably. The engineering tool offers the following functions:



- Creation and modification of the parameter set
- Transmission of a parameter set to KS94
- Read-out of a parameter set from a KS94
- Long-term storage of various parameter sets on hard disk or floppy
- Display of operating data

Connection of PC and KS94 controller is via an RS232/TTL adaptor cable, which must be ordered separately (ordering information → see page 43 section 12). In conjunction with the 'SIM/KS 94' controller simulation, a graphic trend display of the real process data is available!

Fig.: 1 Survey of configuration

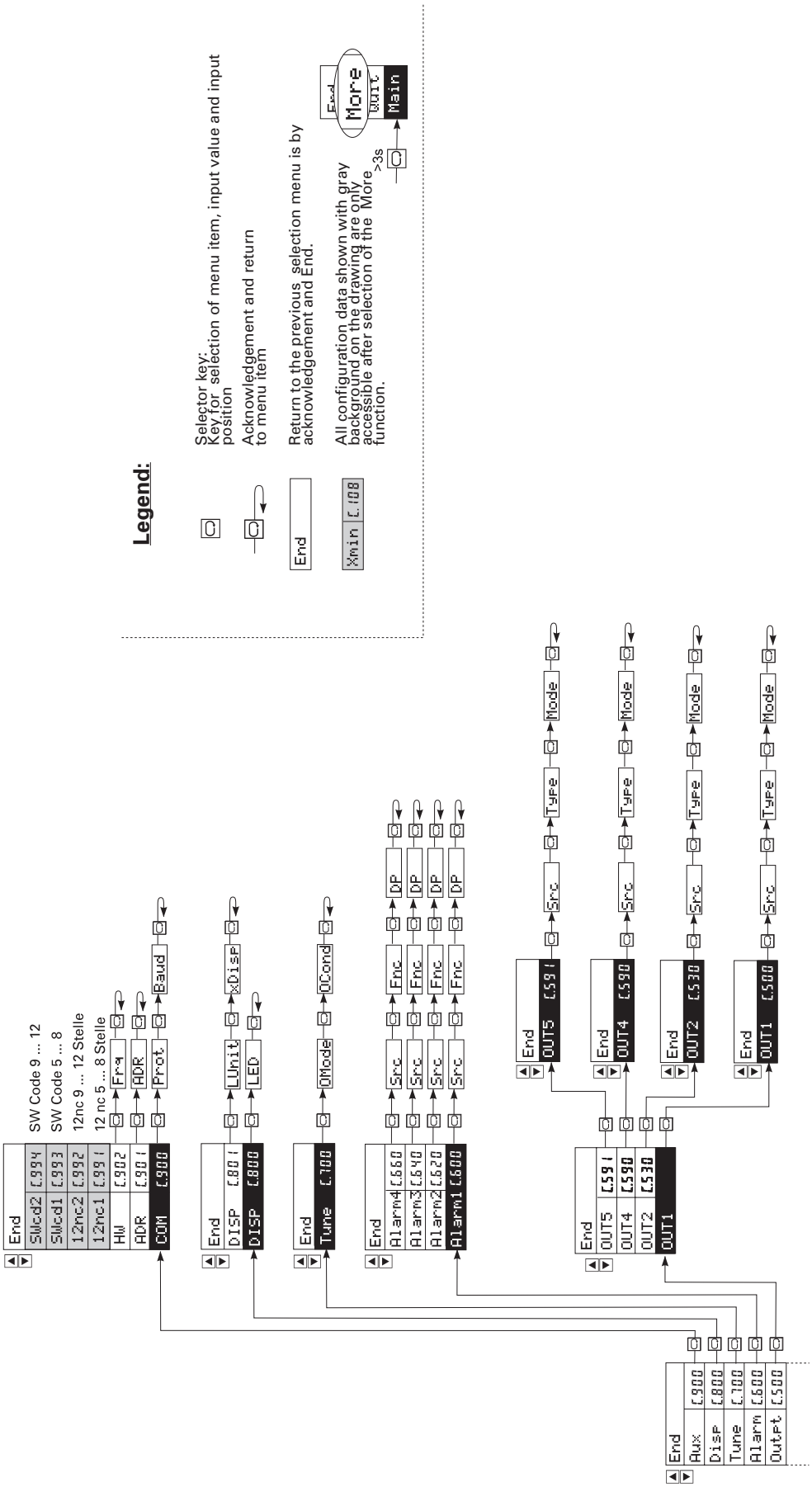
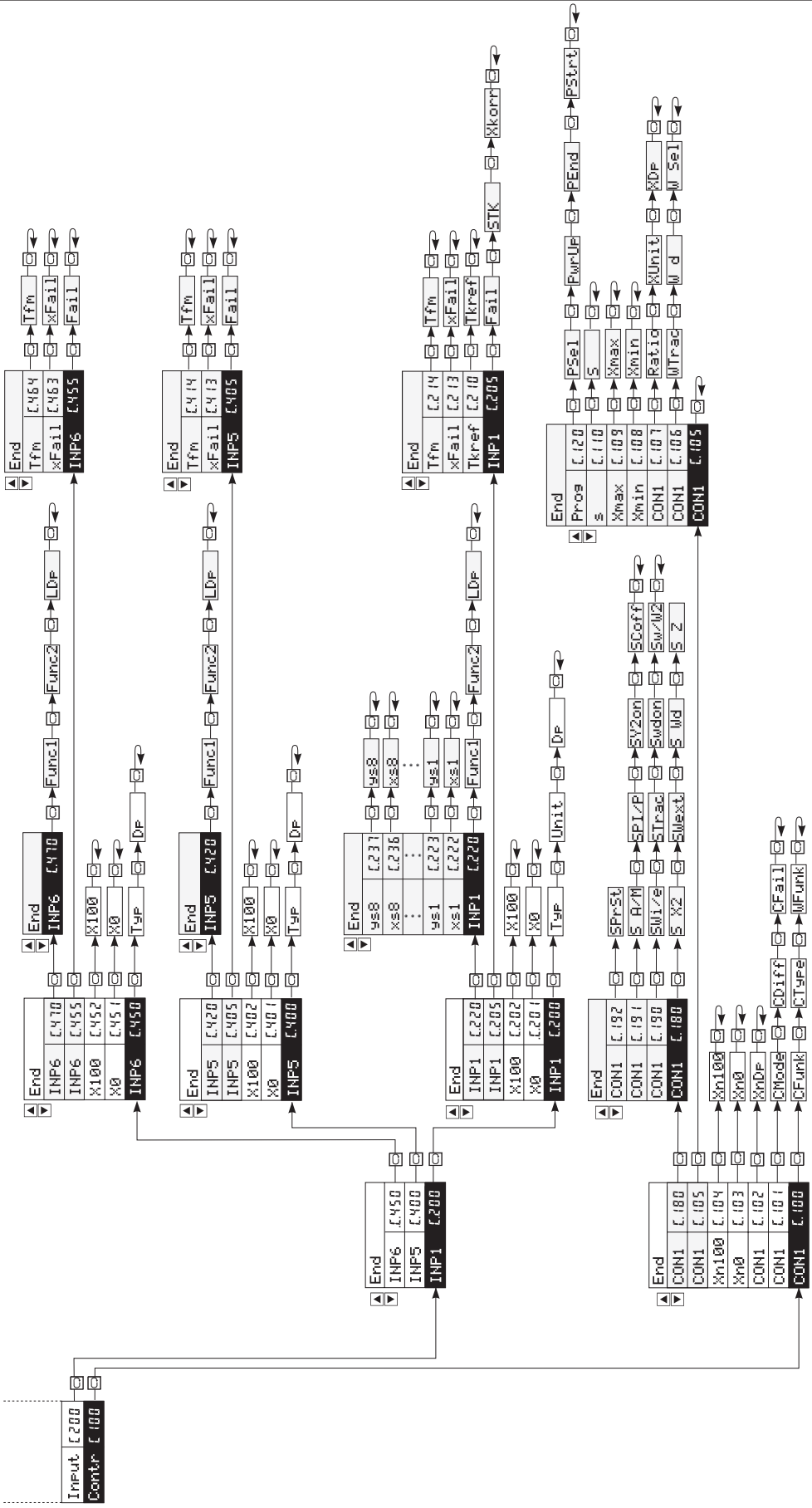


Fig.: 2 Survey of configuration



10.4. CONTR: Controller

This main group determines the controller structure and function, which is used as starting point for controller configuration for a particular application. The main controller configuration C.100 leads to an input and output pre-adjustment (C.180 .. C.190, C.500 .. C591). This 'proposal' must always be checked before commissioning and corrected, if necessary. After determination of this word, no further settings are required for a large number of applications. Additional function adaptions are possible via configuration words C.105 and the following configurations.

Main controller configuration 1:

CFunc (Control behaviour)	CType (Controller type)	WFunc (Set-point function)
00: signaller 1 output 01: signaller 2 outputs 02: 2-pnt.controller 03: 3-pnt.controller (heating switching and cooling switching) 04: 3-pnt.controller (heating continuous and cooling switching) 05: 3-pnt.controller (heating switching and cooling continuous) 06: Δ/Y-off 07: 3-pnt.stepping 08: 3-pnt.stepping with Yp (INP6) 09: continuous with position controller 10: continuous 12: continuous with current feedback via Yp (INP6)	0: standard controller 1: ratio controller (→ C.107) 2: 3-element controller 3: mean value $x_{eff} = (1-b) \cdot x1 + b \cdot x2$	0: set-point 1: set-point / cascade 2: programmer 3: set-point with ext. offset 4: set-point / cascade with internal offset 5: set-point / cascade with external offset 6: programmer with internal offset 7: programmer with external offset

Main controller configuration 2:

CMode (Output action)	CDiff (Differentiation)	CFail (Controller behaviour with main variable sensor break)
0: inverse 1: direct	0: differentiate Xw 1: differentiate X	0: neutral (controller outputs switched off) 1: Ypid = Ymin (0) 2: Ypid = Ymax (100) 3: Ypid = Y2 (adjustment via front panel not possible) 4: Ypid = Y2 (adjustment via front panel possible)

More

Use of an auxiliary variable and external y limiting:

CAux (Auxiliary variable z via INP3)	COVC (Output limiting)
00:no 01:in conjunction with the process value without differentiation 02:in conjunction with the process value with differentiation in both directions 03:in conjunction with the process value with differentiation and positive change 04:in conjunction with the process value with differentiation and negative change 05:in conjunction with the correcting variable without differentiation 06:in conjunction with the correcting variable with differentiation in both directions 07:in conjunction with the correcting variable with differentiation and positive change 08:in conjunction with the correcting variable with differentiation and negative change	0: no external limiting

More

Set-point functions:
(only with Wext)

WTrac (Behaviour of Wint when switching over from Wext to Wint with the w tracking input switched on)	dW (Type of set-point tracking.)
0: Set-point tracking 1: Process value tracking	0: additive 1: factor

More

Ratio functions: (only with ratio controller)

Ratio (Ratio control function)	XDP (Process value decimal point)
1: (x1 + N0) / x2 2: (x1 + N0) / (x1 + x2) 3: (x2 - x1 + N0) / x2	0: no digit behind decimal point 1: 1 digit behind decimal point 2: 2 digits behind decimal point 3: 3 digits behind decimal point

More

Span start X0: (only with ratio controller)
Xmin:(min. process value limiting Xmin)
Numeric value:-999 ... 9999

More

Span end X100: (only with ratio controller)
Xmax:(max. process value limiting Xmax)
Numeric value:-999 ... 9999
and Xmin Xmax

More

Factor for stoichiometric ratio s: (only with ratio controller)
S:stoichiometric ratio
Numeric value:00.00 ... 99.99 (2 fixed digits behind decimal point)

More

Programmer configuration:
(only with programmer configured)

PSel (Source for program selection)	PwrUp (Behaviour with mains recovery)	PEnd (Behaviour with program end)	PStrt (Source for Run/Stop)
0: program selection via operation 1: program selection via control input	0: continue program 1: stop program and switch over to Wint 2: continue program after automatic research 3: continue program after successful automatic research otherwise switch over to Wint 4: continue program at the time mark of mains recovery	0: continue with following program 1: following program and reset (start required)	0: start/stop and reset together*. control with int/ext (without Option B) 1: start/stop and reset separate. (Option B)

*C.190;SWi/e **select the source for int/ext-switching.**

10.5. SOURCE: Input signal allocation

Input signal allocation is dependent of main controller configuration 'C.100'. this proposal must always be checked before commissioning and corrected, if necessary. Therefore, input signal allocation 'SOURCE' is no independent main item and considered as additional configuration of 'CONTR'.

Signal allocation analog signals:

S X2 (Signal source for X2 with ratio)	SWext (Signal source for Wext with controller with external set-point)	S dW (Signal source for W with controller with set-point offset	S Z (Signal source for auxiliary variable)
0: X2 switched off 1: X2 of INP5	0: Wext switched off 1: Wext of INP5 2: Wext of INP6	0: dW switched off 1: dW of INP5 2: dW of INP6	0: z switched off 2: z of INP6

Allocation of digital signals for set-point processing:

SWi/e (Set-point switch-over from internal to external)[1]	STrac (Bumpless switch-over to int. set-point with int./ext. switch-over)	SdWon (Effective set-point offset)	Sw/W2 (Switch-over to set-point w2)
0: only internal set-point 1: W/Wext via front 2: di1=external set-point 3: di2=external set-point 4: di1= internal set-point 5: di2= internal set-point	0: no tracking[2] 1: tracking on 2: di2 = tracking on 4: di2 = tracking off	0: no offset[2] 1: offset on 2: di1 = offset on 3: di2 = offset on 5: di1 = offset off 6: di2 = offset off	0: no W2[2] 1: fixed to W2 2: di1 = W2 3: di2 = W2 5: Timer = W2 6: di1 = W 7: di2 = W

Allocation of digital signals for the controller functions:

S A/M (Automatic / manual (manual switch-over)	SPI/P (feedback off, otherwise PI / P switch-over)	SY2on (Output of safe correcting value)	SCoff (Switch-off controller)
0: auto/manual via front 1: fixed to manual 2: di1 = manual 3: di2 = manual 4: Backup run 5: di1 = auto 6: di2 = auto	0: PI fixed[2] 1: fixed to P action 2: di1 = P action 3: di2 = P action 4: di1 = PI action 5: di2 = PI action	0: Y no Y2)[2] 1: fixed to Y2 2: di1 = Y2 3: di2 = Y2 4: timer = Y2 5: di1 = Y 6: di2 = Y	0: controller on/off via front (W = '----') 1: controller fixed to off 2: di1 = controller off 3: di2 = controller off 4: timer= controller off 5: di1= controller on 6: di2= controller on

Allocation of digital signals for the programmer:
(only with programmer configured)

SPrSt (Signal source for programmer run/stop)
0: Run/Stop: Front 1: Run/Stop: di4 2: Run/Stop: di4 and timer 1

1) With the programmer configured, switch-over is between internal and external program set-point.
2) Can be switched over via interfaces (e.g. engineering tool; operating data)

10.6. INPUT: inputs

The signal inputs for the previously selected controller configuration are determined in this main group. The signal inputs required for the selected controller function are displayed in the Configurationmenu. As during control function configuration, a large number of applications can also be covered by determining the main configuration. At the second level, special cases can be matched and adjusted by additional, optional configuration. Signal inputs INP1, INP5 and INP6 are provided with KS92. All analog inputs (wether used for controlling or not) can be used for supervising (e.g. alarmprocessing)

10.6.1 Signal input 1 / INP1 (main variable x1)

Configuration is for main variable x1. This signal input is a universal input for which extensive functions can be configured.

Main configuration:
The main configuration word is used for determination of input sensor type and physical unit. Additional input configurations can be determined using the additional configuration.

Type (Sensor type)		Unit (Unit)*	Dp (Number of decimals)
Thermocouple:	**Resistance thermometer:**	0: at Typ 30...40	0: no decimal point
00: Type L 0 ... 900 °C	20: Pt 100 -99.9 ... 850.0 °C	1: °C	1: 1 digit behind the decimal point
01: Type J 0 ... 900 °C	21:Pt 100 -99.9 ... 250.0 °C	2: °F	2: 2 digits behind the decimal point
02: Type K 0 ... 1350 °C	25: 2 x Pt 100 -99.9 ... 850.0 °C		3: 3 digits behind decimal point
03: Type N 0 ... 1300 °C	26: 2 x Pt 100 -99.9 ... 250.0 °C		
04: Type S 0 ... 1760 °C	**Standard signals:**		*only with type: 20 ... 40*
05: Type R 0 ... 1760 °C	30: 0 ... 20 mA		
06: Type T 0 ... 400 °C	31: 4 ... 20 mA		
07: Type W 0 ... 2300 °C	32:0 ... 10 V		
08: Type E 0 ... 1000 °C	33: 2 ... 10 V		
09: Type B (0) 400 …	**Potentiometric transducer:**		
	40: 0 ... 500 Ohm		
1820°C			

* Unit settings for scaling of Typ 00...26. With Typ 30...40 the value is fixed to 0. For this case the unit to be displayed will be configured by C.801.

x0:
(physical value at 0%)
numeric value -999 ... 9999
select only with type = 30 ... 40

x100:
(physical value at 100%)
numeric value -999 ... 9999 , X0 ≠ X100!
select only with type = 30 ... 40

More

Additional configuration:
Via the additional configuration, the default setting for the signal input can be changed or matched dependent of sensor type class.

Fail (Signal behaviour with sensor fault)	STk (Temperature compensation)	XKorr (Process value correction enable)
1: upscale(X100) 2: downscale(X0) 3: XFail (C.2 13)	0: not effective 1: internal TC 2: external TC (TC fixed in C.2 10!)	0: not effective 1: with process value correction (adjustable via parameters x1in,x1out,x2in,x2out)
type: 00...26, 31, 40	type: 00 ... 09	
Non-selectable digits are marked by '0'		

More

Tkref:
(external TC)
numeric value:-99 ... 100 °C or °F
select only with type: 00...08 and STk = 2

More

XFail:
(substitute value with sensor error)
numeric value: -999 ... 9999

More

Tfm:
(filter time constant for input value processing)
numeric value: 0.0 ... 999.9

More

Optional configuration 1:
The optional configuration can be used to determine the functions for two signal pre-processing levels.

Func1, Func2 (Function selection for signal pre-processing)	LDP (decimal point for gain, Xeff and yki)
0: no function, signal is output directly 1: scaling (parameters: m,b) 2: linearization (segment points xs1,ys1 ...) 3: filter (parameter: Tf) 4: square root extraction with factor (parameter:gain)	0: no decimal point 1: 1 digit behind the decimal point 2: 2 digits behind the decimal point 3: 3 digits behind decimal point

More

Linearization parameters:

The configuration parameters for linearization are stored as follows.

C.222 xs1	C.223 ys1	value pair 1
C.224 xs2	C.225 ys2	value pair 2
C.226 xs3	C.227 ys3	value pair 3
C.228 xs4	C.229 ys4	value pair 4
C.230 xs5	C.231 ys5	value pair 5
C.232 xs6	C.233 ys6	value pair 6
C.234 xs7	C.235 ys7	value pair 7
C.236 xs8	C.237 ys8	value pair 8

Note that the input values (x-values) must be entered in ascending order. (xs1<xs2<xs3...)

The range for these configuration words is between -999 and 9999 or '----' (switched off)!

For limiting the number of parameters, these functions can be used only once during pre-processing levels 1 or 2! Linearization segment points which are not required can be switched off by setting '----'.

10.6.2 Signal input 5 / INP5 (ratio variable x2, ext. set-point Wext)

The signal for ratio variable x2 or external set-point Wext is configured with option p.c.b. not fitted in the controller and the function selected during controller configuration. The configuration words for INP5 are explained in section (see following table).

Main configuration	C.400	see	C.200	only 0/4...20mA and 0/2...10V (type: 30...33)
X0	C.401	„	C.201	
X100	C.402	„	C.202	
Additional configuration	C.405	„	C.205	only 'Fail'
XFail	C.413	„	C.213	
Tfm	C.414	„	C.214	
Optional configuration 1	C.420	„	C.220	without linearization (Func1/2: 2)

10.6.3 Signal input 6 / INP6 (auxiliary variable yp, feedback yp)

The signal for the auxiliary variable yp or for the position feedback is configured, if this was selected during controller configuration.
The configuration words for INP6 are explained in section (see following table).

Main configuration	C.450	see	C.200	only 0/4...20mA (type: 30/31) and additional poten-
X0	C.451	„	C.201	tiometric transducer for Yp (type: 40)
X100	C.452	„	C.202	
Additional configuration	C.455	„	C.205	only 'Fail'
XFail	C.463	„	C.213	
Tfm	C.464	„	C.214	
Optional configuration 1	C.470	„	C.220	without linearisierung (Func1/2: 2)

10.7. OUTPT: outputs

10.7.1 Signal output 1 / OUT1

The output for controller correcting variable y1 is configured. This signal output is a universal output which can be configured for extensive functions.

Main configuration:

Src (Signal source)	Type (Output stage)	Mode (Motor actuator output action)
00: output switched of 01: controller output Y1/Yout1 02: controller output Y2/Yout2 03: output Ypid 04: position feedback Yp 05: controlling deviation Xw 10: process value Xeff 11: X1 12: X2 20: set-point W 21: external set-point Wext 22: external offset dWe 23: set-point Weff 24: programmer set-point Wprg 25: alarm 1 (limit1) 26: alarm 2 (limit2) 27: alarm3 (limit3) 28: alarm 1 (limit4)	0: relay (switching) 1: 0 ... 20 mA (continuous output) 2: 4 ... 20 mA (continuous output) 3: 0 / 20 mA (logic)	0: not selectable 1: direct / normally open 2: inverse / normally closed

More

Additional configuration Out1:

Via the options configuration, the functionality for a signal post-processing stage can be determined.

This configuration word is displayed only with the option enabled.

Func (Function selection for signal output processing)	Dp (decimal point for xsi,x0,x100)
0: no function, signal is output without change (0%...100%) 1: scaling (reference values C.5 10 and C.5 11 are effective)	0: no decimal point 1: 1 digit behind decimal point 2: 2 digits behind decimal point 3: 3 digits behind decimal point

More

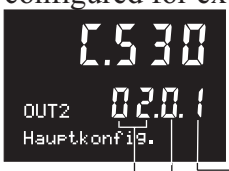
X0:
(physical value at 0%)
Numeric value -999 ... 9999

More

x100:
(physical value at 0%)
Numeric value -999 ... 9999

10.7.2 Signal output 2 / OUT2

Used for configuring the source of output OUT2. This signal output is a universal output and can be configured for extensive functions.



Main configuration:

Src (Signal source)	Type (Output stage)	Mode (Motor actuator output action)
00: output switched off 01: controller output Y1/Yout1 02: controller output Y2/Yout2 25: alarm1 (limit1) 26: alarm2 (limit2) 27: alarm3 (limit3) 28: alarm4 (limit4)	0: relay (switching)	0: not selectable 1: direct / normally open 2: inverse / normally closed

10.7.3 Signal output 4 / OUT4

Used for configuring the source of output OUT4. This signal output can be configured for extensive functions.

Main configuration:

Src (Signal source)	Type (Output stage)	Mode (Actuator output action)
00: output switched off 01: controller output Y1/Yout1 02: controller output Y2/Yout2 25: alarm 1 (limit1) 26: alarm 2 (limit2) 27: alarm 3 (limit3) 28: alarm 4 (limit4) 29: programmer output 1 30: programmer output 2 31: programmer output 3 32: programmer output 4 33: program end	0: relay (switching)	0: not selectable 1: direct / normally open 2: inverse / normally closed

10.7.4 Signal output 5 / OUT5

Here the source for output 5 is configured for programmer/alarm. This signal output can be configured for extensive functions.

Main configuration:

Src (Signal source)		Type (Output stage)	Mode (Actuator output action)
00: output switched off	30: programmer output 2	0: relay (switching)	0: not selectable
01: controller output Y1/Yout1	31: programmer output 3		1: direct / normally open
02: controller output Y2/Yout2	32: programmer output 4		2: i nverse / normally closed
25: alarm 1 (limit1)	33: program end		
26: alarm 2 (limit2)			
27: alarm 3 (limit3)			
28: alarm 4 (limit4)			
29: programmer output 1			

10.8. ALARM: alarms

10.8.1 Alarm 1 / (limit 1)

The function for alarm 1, (output via output OUT 4) is configured.

Main configuration:

Src (Alarm signal source)		Fnc (Alarm function)	Dp (Decimals for alarm limits)
00: no source	11: Ypid	0: no alarm (don't care)	0: no decimal point
01: Xeff	13: WMIN/MAX (Wsel)	1: sensor fail	1: 1 digit behind the decimal point
02: Xw*	14: INP1	2: sensor fail or measurement value alarm	2: 2 digits behind the decimal point
03: x1	18: INP5	3: sensor fail or measurement value alarm with suppression with set-point switch-over or start-up	3: 3 digits behind the decimal point
04: x2	19: INP6	4: measurement value alarm	
06: auxiliary variable z	20: program time (net)	5: measurement value alarm with suppression with set-point change or start-up	
07: Wext	21: program time (gross)		
08: Δw	22: program rest time		
09: Weff	24: faulty actor		
10: Yp			

*Limit comparator, all other versions are fitted with limit contact.

10.8.2 Alarm 2 (limit 2)

The function for alarm 2 (output via OUT 5) is configured.

Main configuration C.620 see C.600

10.8.3 Alarm 3 (limit 3)

The function for alarm 3 (output via OUT 1) is configured.

Main configuration C.640 see C.600

Selection is possible with OUT1 configured as alarm output.

10.8.4 Alarm 4 (limit 4)

The function for alarm 4 (output via OUT 2) is configured.

Main configuration C.660 see C.600

Selection is possible only with OUT2 configured as alarm output

10.9. TUNE:self-tuning

The type of controller self-tuning and the type of controlled self-tuning can be adjusted!

Main configuration:

OMode (Controller self-tuning)	OCond (Process-at-rest mode)	OCntr (Controlled self-tuning mode) no effect with KS92	ODP (Decimals for OCntr)
0: Standard	0: grad = 0 1: grad < 0 with inverse controller or grad > 0 with direct controller 2: grad ≠ 0	0: no function 1: selectable control / disturbance behaviour 2: switch-over via operation 3: switch-over via control input 4: switch-over controlled by Weff 5: switch-over controlled by Xeff 6: switch-over controlled by Ypid 7: switch-over controlled by X-W	0: no decimal point 1: 1 digit behind the decimal point 2: 2 digits behind the decimal point 3: 3 digits behind the decimal point

10.10. DISP: User interface for operation

Configuration of display function signification via front panel

L1 process operation:

LED (Function of Front-LED's)
0: Y1, Y2, LIM1,LIM2
1: LIM 1, 2, 3, 4
2: Prog D1...D4
3: LIM1, Y1, Y2, LIM2
5: Y2, Y1, LIM1, LIM2
6: LIM 1,Y2,Y1,LIM2

Unit display:

LUnit (Unit selection for text 1)		xDisp (select process value for disp.)	WDisp (select set-point for disp.)
00: no unit	06: t/h	0: Process value =xeff	0: set-point disp. = Standard
01: °C	07: m3/h	1: Process value =x1	1: set-point disp. = Weff
02: °F	08: 1/min	2: Process value =x2	
03: %	99: freely selectable		
04: mbar	Engineering tool		
05: bar	necessary		

10.11. Additional functions

The interface function and operating frequency for suppression of interference on inputs are configured.

10.11.1 COM (serial interface)

Mainconfiguration:
(IS01745, PROFIBUS)
Only with HW option B

Prot (Interface protocol)	Baud (Baud rate)
0: IS0174	00: not adjustable
	01: 2400 Bd
	02: 4800 Bd
	03:9600 Bd
	04:19200 Bd

Addr (Interface address)
ISO1745
0 ... 99 (default 0)

10.11.2 Hardware

The hardware-related functions are configured.
Main configuration:
Operating frequency for suppression of interference on inputs is configured.

Fre (Mains frequency)
0: 50 Hz
1: 60 Hz

10.11.3 Hard-/Software Codenumber

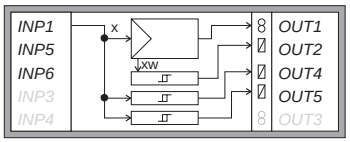
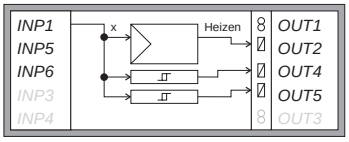
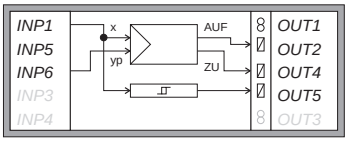
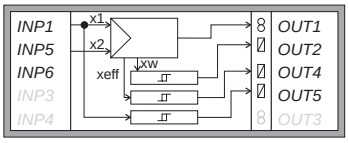
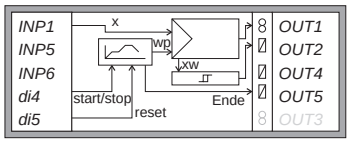
The following configuration dates are not changeable. They show the hardware version (C.991 u. C.992) and the software version (C.993 u. C.994) of the instrument.

Example: 9407 **923 31201**

Example:4012 **157 25320**

More

Configuration

Block diagram	Configuration, different from default			
9407-901-xxxxx  **Continuous controller,** **1 xw-alarm, 2 process value alarme**	C.100 CFunc CTyP WFunc C.200 TyP C.500 Src C.530 Src	= 10 (continuous) = 0 (standard controller) = 0, 1, 4 or 5 = sensor type = 01(controller output y1) = 28 (alarm 4)	C.590 Src C.591 Src C.600 Src C.660 Src C.640 Src	= 25 (alarm 1) = 26 (alarm 2) = 02 (xw-alarm) = 03 (process value x1) = 03 (process value x1)
9407-901-xxxxx  **Two-point controller +** **2 process value alarms**	C.100 CFunc CTyP WFunc C.200 TyP C.500 Src C.590 Src	= 02 (2-pnt.controller) = 0 (standard controller) = 0, 1, 4 or 5 = sensor type = 01(controller output y1) = 25 (alarm 1)	C.591 Src C.660 Src C.640 Src	= 26 (alarm 2) = 03 (process value x1) = 03 (process value x1)
9407-901-xxxxx  **Three-point stepping controller +** **Process value alarm**	C.100 CFunc CTyP WFunc C.200 TyP C.530 Src C.590 Src	= 03 (3-pnt.stepping) = 0 (standard controller) = 0, 1, 4 or 5 = sensor type = 01 (controller output y1) = 02 (controller output y2)	C.591 Src C.620 Src	= 26 (alarm 2) = 03 (process value x1)
9407-901-xxxxx  **Ratio controller (continuous)** **1 xw alarm, 2 process value alarms**	C.100 CFunc CTyP WFunc C.180 S X2 C.200 TyP C.500 Src	= 10 (continuous) = 1 (ratio controller) = 0, 1, 4 or 5 = 1 (INP5) = sensor type = 01(controller output y1)	C.530 Src C.590 Src C.591 Src C.600 Src C.660 Src C.640 Src	= 28 (xw-alarm) = 25 (alarm 1) = 26 (alarm 2) = 02 (xw-alarm) = 01 (xeff) = 03 (process value x1)
9407-901-1x2xx  **Programmer (continuous)** **1 xw alarm**	C.100 CFunc CTyP WFunc C.192 SPrSt C.200 TyP C.500 Src	= 10 (continuous) = 1 (standard controller) = 3 (mean value) = 1 (di4) = sensor type = 01(controller output y1)	C.530 Src C.591 Src C.600 Src	= 28 (alarm 4) = 33 (program end) = 02 (xw-alarm)

11. Parameters

11.1. General

This section gives a survey of the KS92/94 parameter data and general hints for parameter handling. The parameter operation and effect on the controller operation are described with the operating principle.

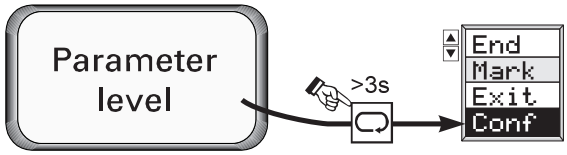
The parameter setting dialogue is realized via selector key ⮌ and 'increment' / 'decrement' keys ▲▼, like at the other operating levels:

- Press the selector key to select menu items / input values within one level and to change to the next higher level.
- Press the 'increment' / 'decrement' keys to return to a lower level or to change input values.

The controller parameter structure is given on the following page. All parameters are listed. Parameters which are not relevant for a function (configuration-dependent) are not displayed!

A selection menu can be displayed anywhere at parameter level by pressing key ⮌ >3s.

End:	return to parameter level
Mark:	mark the selected parameter for display at 'extended' configuration level.
Exit:	return to operating level.
Conf:	transition to configuration level.



11.1.1 Allocation of parameters to the 'extended operating level'

Up to 12 parameters can be allocated to the 'extended operating level' (see Fig.3:), whereby the controller operation is simplified, since changing over to parameter level whenever one of these parameters must be changed is omitted.

Allocation: select required parameter, press 'selection' key ⮌ during >3s (Para blinks) Select Mark with 'up' key ▲ and acknowledge with 'selection' key ⮌ (see Fig.3:).

Delete: select the required parameter at the extended operating level, press 'selection' key ⮌ during >3s (Para blinks) and acknowledge with 'up' key ▲.

Select Clear and acknowledge with 'selection' key ⮌ (see Fig.4:).

Hold: The Hold function can be used for selecting a parameter from the extended operating level for being visible continuously. For this, select the required parameter at the extended operating level, press 'selection' key ⮌ during >3s (Para blinks) select Hold with 'up' key ▲ and confirm with 'selection' key ⮌ (see Fig.4:).

Fig.: 3 Marking a parameter

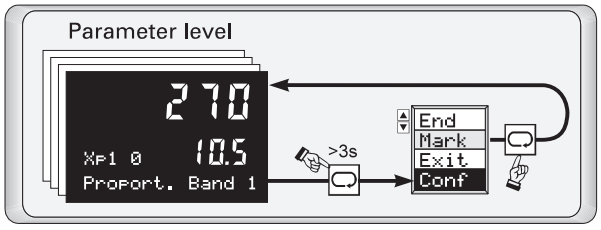
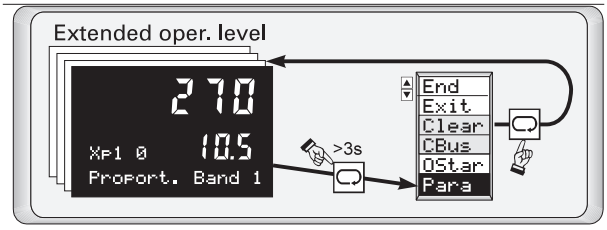


Fig.: 4 Deleting a parameter

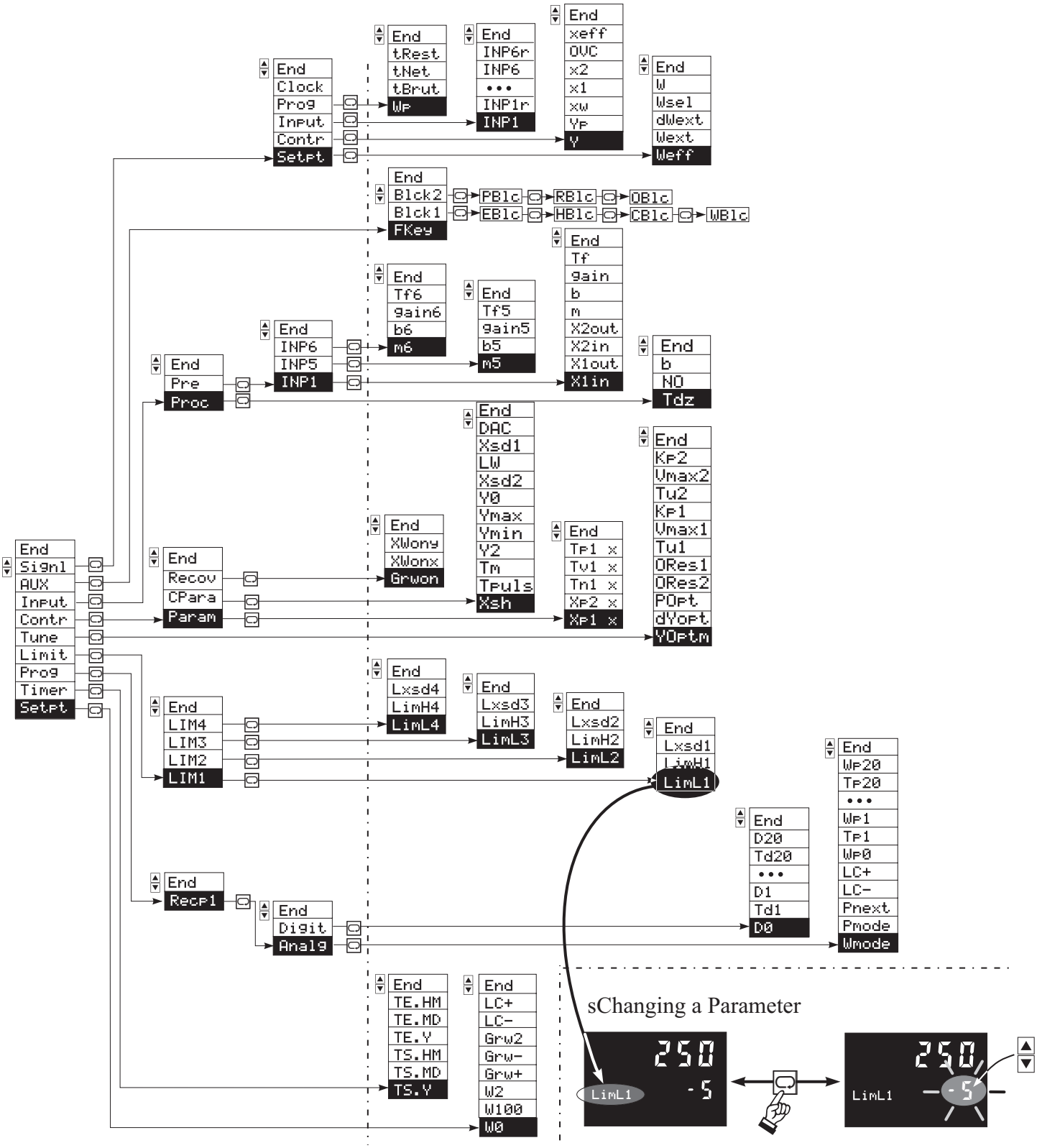


Applications:

- During optimization, frequent access to defined parameters (Xp1, Xp2, Tn and Tv) is required.
- During commissioning, limit value (LimH1, LimH2, ...) or measurement value corrections must be changed frequently.
- With the parameter level disabled, access to the selected parameters is possible for the operator. Deleting a parameter from the 'extended operating level' must be done at this level (see Fig.4:)

Fig.: 3 Survey parameters KS 92

Selection menus **KS 92 parameters**



11.2. Set-point function

Text 1	Description	Range	Default
SetPt	**Set-point parameter**		
LC+	Band width upper limit	0...9999	'----' (switched off)
LC-	Band width lower limit	0...9999	'----' (switched off)
W0	lower set-point limit for Weff	-999 ... 9999	0
W100	upper setpoint limit for Weff	-999 ... 9999	1350
W2	additional set-point	-999 ... 9999	100
Grw+	set-point gradient plus with W[w/min]	0.01 ... 99.99	'----' (switched off)
Grw-	set-point gradient minus with W[w/min]	0.01 ... 99.99	'----' (switched off)
Grw2	set-point gradient with W2[w/min]	0.01 ... 99.99	'----' (switched off)

11.3. Time function

Text 1	Description	Range
Timer	**Timer-parameters**	
TS.Y	Start value: Year	0...255
TS.MD	Start value: Month and day	Month:1...12; Day: 1...31
TS.HM	Start value: Hour and minutes	Hour:0...23; Minutes: 0...59
TE.Y	Final value: Year	0...255
TE.MD	Final value: Month and day	Month:1...12; Day: 1...31
TE.HM	Final value: Hour and minutes	Hour:0...23; Minutes: 0...59

11.4. Programmer functions

RecP1 Programmer recipe 1

Analog				Digital			
Text 1	**Description**	**Range**	**Def.**	**Text 1**	**Description**	**Range**	**Def.**
Wmode	Change mode	0: Ramp 1: Step 2: Ramp with time priority	0	D0	Reset value control output 1..4	0000..1111	0000
				Td1	Time segment 1	0...9999[min]	0
Pmode	Preset mode	0: Segment start 1: Program time	0	D1	control output 1..4 for segm. 1	0000..1111	0000
				...			
Pnext	Successive program	1..3 or '——'	1	Td20	Time segment 20	0...9999[min]	0
LC-	Band width lower limit	0...9999	'----'	D20	control output 1..4 for segm. 20	0000..1111	0000
LC+	Band width upper limit	0...9999	'----'				
WP0	Reset value W0	-999...9999	0				
TP1	Time segment1	0...9999 [min]	0				
WP1	Set-point segment 1	-999...9999	0				
...							
TP20	Time segment 20	0...9999 [min]	0				
WP20	Set-point segment 20	-999...9999	0				

11.5. Alarm function

Text 1	Description	Range	Default
LIM1	**Alarm 1**		
LimL1	Low limit	-999 ... 9999	'----' (switched off)
LimH1	High limit	-999 ... 9999	'----' (switched off)
Lxsd1	Switching difference	-999 ... 9999	0
LIM2	**Alarm 2**		
LimL2	Low limit	-999 ... 9999	'----' (switched off)
LimH2	High limit	-999 ... 9999	'----' (switched off)
Lxsd2	Switching difference	-999 ... 9999	0
LIM3	**Alarm 3**		
LimL3	Low limit	-999 ... 9999	'----' (switched off)
LimH3	High limit	-999 ... 9999	'----' (switched off)
Lxsd3	Switching difference	-999 ... 9999	0
LIM4	**Alarm 4**		
LimL4	Low limit	-999 ... 9999	'----' (switched off)
LimH4	High limit	-999 ... 9999	'----' (switched off)
Lxsd4	Switching difference	-999 ... 9999	0

11.6. Self-tuning

Text 1	Description	R/W	Range	Default
Tune	**Optimization**			
YOptm	Correcting variable whilst process at rest	R/W	-105 ... 105	0
dYopt	Step width during identification	R/W	5 ... 100	100
ORes1	Self-tuning result during heating	R	0: **No test** (or cancelled during test) 1: **Cancellation** (wrong output action) 2: **Finished** (successful optimization; reversal point found) 3: **Cancellation** (process does not react or is too slow) 4: **Cancellation** (reversal point found; estimation unsafe) 5: **Cancellation** (reversal point not found; estimation unsafe) 6: **Finished** (optimization cancelled due to exceeded set-point risk; reversal point not reached so far; estimation unsafe) 7: **Cancellation** (correcting variable too low $\Delta Y < 5\%$) 8: **Cancellation** (set-point reserve too low)	
ORes2	Self-tuning result during cooling	R	0 ... 8 (see ORes1)	
Tu1	Delay time heating	R	000,0 ... 999,9 s	
Vmax1	Vmax heating	R	000,0 ... 999,9 /s	
Kp1	Process amplification heating	R	000,0 ... 999,9	
Tu2	Delay time cooling	R	000,0 ... 999,9 s	
Vmax2	Vmax cooling	R	000,0 ... 999,9 /s	
Kp2	Process amplification cooling	R	000,0 ... 999,9	

11.7. Control algorithm

Text 1	Description	Range	Default
CPara	**Controller parameters**		
Dac	Digital Actor Control DAC®	0 = off / 1 = on	0
Tpuls	Min. pulse length	0.1 ... 999.9 s	0.3
Tm	Actuator response time	10 ... 9999 s	30
Y2	Additional correcting value	-105 ... 105 %	0
Ymin	Min. correcting variable limiting	-105 ... 105 %	0
Ymax	Max. correcting variable limiting	-105 ... 105 %	100
Y0	Correcting variable working point	-105 ... 105 %	0
Xsd2	Switching difference of additional contact	0.1 ... 999.9 %	1
LW	Trigger point separation of additional contact	-999 ... 9999	0
Xsd1	Switching difference of signaller	0.1 ... 999.9 %	1
Xsh2	Neutral zone (Xw > 0)	0.0 ... 999.9 %	0
Xsh1	Neutral zone (Xw < 0)	0.0 ... 999.9 %	0
Xsh	Neutral zone	0.2 ... 999.9 %	0.2
Param	**Parameter set 0**		
Xp1	Proportional band 1	0.1 ... 999.9 %	10
Xp2	Proportional band 2	0.1 ... 999.9 %	10
Tn1	Integral action time	0 ... 9999 s	180
Tv1	Derivative action time (parameter set 1)	0 ... 9999 s	10
T1	Min. cycle time (parameter set 1)	0.4 ... 999.9 s	10
T2	Min. cycle time (parameter set 2)	0.4 ... 999.9 s	5
Recov	**Rapid Recovery (with controller "on" ;(C.191: SCoff))**		
XWony	X-W limit value for Y tracking	0 ... 9999 *	'----'
XWonx	X-W limit value for X tracking	0 ... 9999 *	'----'
Grwon	set-point gradient with X tracking active	0,01 ... 99,99 /min	'----'

11.8. Input processing

11.8.1 Process value handling

Text 1	Description	Range	Default
Istw			
Tdz	Differentiation time constant for z	0 ... 9999 s	10
N0	Zero offset / ratio	-999 ... 9999	0
a	Factor a / 3-element control	-999 ... 9999	1
b	Factor b / mean value control	-999 ... 9999	0.5

11.8.2 Signal pre-processing

Text 1	Description	Range	Default
INP1	**Signal processing for INP1**		
X1in	Measurement value correction	-999...9999	0
X1out	Measurement value correction	-999...9999	0
X2in	Meaurement value correction	-999...9999	100
X2out	Measurement value correction	-999...9999	100
m	Scaling: gradient m	-9.99... 99.99	1
b	Scaling: offset b	-99.9 ... 999.9	0
gain	Square root extraction: gain	0 ... 9.999	1

Tf	Filter: filter time constant	0 ... 999.9 s	0.5
INP5	**Signal processing for INP5**		
m5	Scaling: gradient m	-9.99 ... 99.99	1
b5	Scaling: offset b	-99.9 ... 99.99	0
gain5	Square root extraction: gain	0 ... 9.999	1
Tf5	Filter: filter time constant	0 ... 999.9 s	0.5
INP6	**Signal processing for INP6**		
m6	Scaling: gradient m	-9.99 ... 99.99	1
b6	Scaling: offset b	-99.9 ... 999.9	0
gain6	Square root extraction: gain	0 ... 9.999	1
Tf6	Filter: filter time constant	0 ... 999.9 s	0.5

11.9. Miscellaneous

Text 1	Description		Range				Def.
Aux	General						
Fkey	Function of front panel key.		0: no function 1: automatic / manual 2: Wext / Wint				1
Blck1	EBloc	extended operating level	0: free	1: blocked	2: blocked by di1	3: blocked by di2	0
	HBloc	auto/man- key	0: free	1: blocked	2: blocked by di1	3: blocked by di2	0
	CBloc	controller off	0: free	1: blocked	2: blocked by di1	3: blocked by di2	0
	WBloc	setpoint	0: free	1: blocked	2: blocked by di1	3: blocked by di2	0
Blck2	PBloc	programmer preset	0: free	1: blocked	2: blocked by di1	3: blocked by di2	0
	RBloc	programmer run/stop/reset	0: free	1: blocked	2: blocked by di1	3: blocked by di2	0
	OBloc	selftuning	0: free	1: blocked	2: blocked by di1	3: blocked by di2	0

11.10. Signals

Signl	Description
Setpt	**Setpoint signals**
Wint	Internal set-point
Wext	External set-point
dWext	External correction
dW	Set-point offset
Wsel	Min/max set-point
Contr	**Controller signals**
Y	Correcting value
Yp	Position feedback
xw	Control deviation
x1	Main input x1
x2	Auxillary input x2
OVC	External correcting variable limiting
xeff	Effectiv process value

Input	**Input signals**
INP1	Input 1
INP1r	Raw measure 1
...	
INP6	Input 6
INP6r	Raw measure 6
Prog	**Programmer signals**
Wp	Programmer setpoint
tBrut	Brutto time (inc. all pause times)
tNet	Netto time (without pause times)
tRest	Rest time
PNr	Programmer no.
Clock	**Current time**

11.11. Input and output allocation with pre-configured units

The signal (e.g. X1, Y1, alarms) allocation to the inputs and outputs for the relevant pre-configuration (factory setting) is given in the following table. Allocation can be altered at any time via front panel or interface and should be corrected before commissioning, if necessary.

	Order numbers and functions for pre-configured units					
	9407-9x(0;3;7) -xxx**1**x Two-point controller (relay output)	**9407-9x(1;4;8)** -xxx**1**x Two-point controller (logic output)	**9407-9x(0;3;7)** -xxx**2**x Three-point stepping controller	**9407-9x(1;4;8)** -xxx**2**x Three-point stepping controller	**9407-9x(1;4;8)** -xxx**3**x Continuous controller	**9407-9x(1;4;8)** -xxx**4**x 3-point controller (‘heating’ = logic; ‘cooling’ = relay)
Inputs						
INP1	X1					
INP5	X2; Wext; Wd				Wext	X2; Wext; Wd
INP6	Hilfsgröße ‘Z’					
di1	W/Wext					
di2	Auto/man					
di3	Local / remote					
di4	Programmer start / stop					
di5	Programmer reset					
Outputs						
OUT1	Y1			-	Y1	
OUT2	-	-	Y2	Y1	-	Y2
OUT4	Alarm1			Y2	Alarm1	
OUT5	Alarm2					
do1	Programmer output 1					
do2	Programmer output 2					
do3	Programmer output 3					
do4	Programmer output 4					

12. Versions

	KS 92	0
	KS 92 with supply voltage	1
Basics	230 VAC supply, 4 Relais (OUT1, OUT2, OUT4, OUT5)	0
	230 VAC universal version continuous/switching 3 relays and 1 current/logic output (OUT1, OUT2, OUT4, OUT5)	1
Option B (Interface)	No interface	0
	TTL interface with 5 control inputs (di3...di7), 4 control outputs (do1...do4)	1
	RS422/485 interface with 5 control inputs (di3...di7), 4 control outputs (do1...do4)	2
Extrafunctions	No additional functions	0
	With measurement value correction	1
	With measurement value correction and programmer	2
Preconfiguration	Standard (to be configured by the customer)	0
	2-point controller	1
	3-point stepping controller	2
	Continuous controller (current output necessary)	3
	3-point controller (logic/relay current output necessary)	4
	Adjustment as desired	9