BCU 56x & 580

Burner control unit for Multiple burner applications

15.06.2015

elster Kromschröder

BCU 560 / 580: overview

- For modulating or stage-controlled burners
- Control cabinet installation
- Programming and diagnostics using BCSoft
- Optional: bus, TC, HT- operation, menox®
- Separate operator-control unit OCU
- Global approvals to be obtained (in preparation)

BCU 56x & 580 added value

Project planning time
System costs
Design safety
Installation dimensions

Storage area required
Transport costs

Installation costs
Commissioning costs

Energy costs
Designed lifetime
Product quality

Downtimes
Maintenance frequency

Design

Application
menox®
Capa City control
VPS / TC
Safety related start gas
OCU
Bus communication
MFC / LDS
Project planning information
Device variants

Logistics

Order handling
Programmability
Housing and connectivity
PCC Parameter chip card
BCSoft
Approval
Replacement IFS /IFD

Start-up

Simple wiring
Programmability
Documentation of parameter settings
OCU Operator control unit
Manual Mode

Operation

Start attempt
Restart
Running time
Optimized flame amplifier
VPS / TC
HT- Operation

Servicing

Status display
BCSoft diagnostics
Programmability
Operator control unit OCU
Device statistic
Manual mode
PCC

Wrong button !!!!!!

Kromschröder burner control units

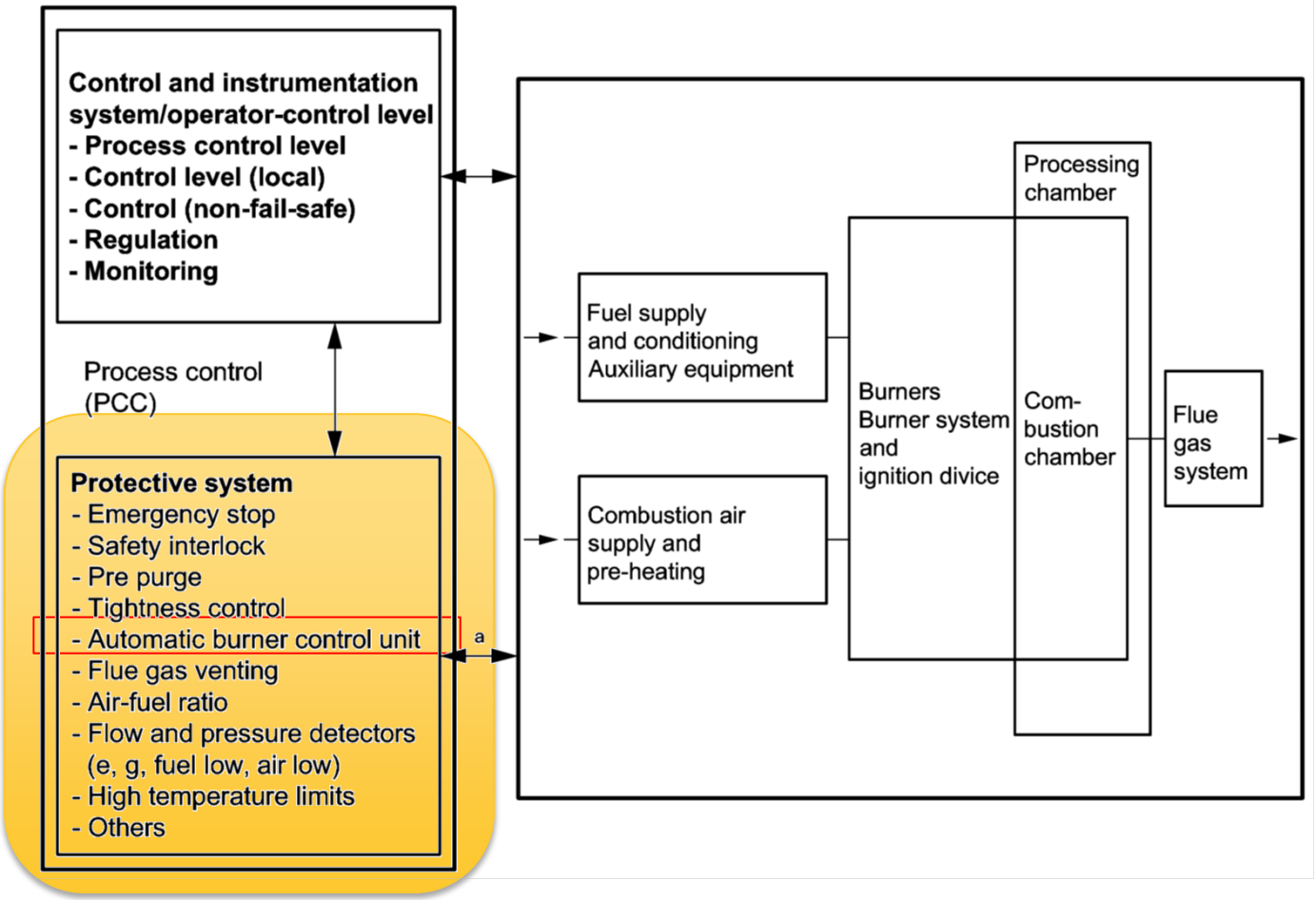
Coordinated product families for various applications

- **Multiple burner applications**
  with central air supply

- **Single burner applications**
  with fan

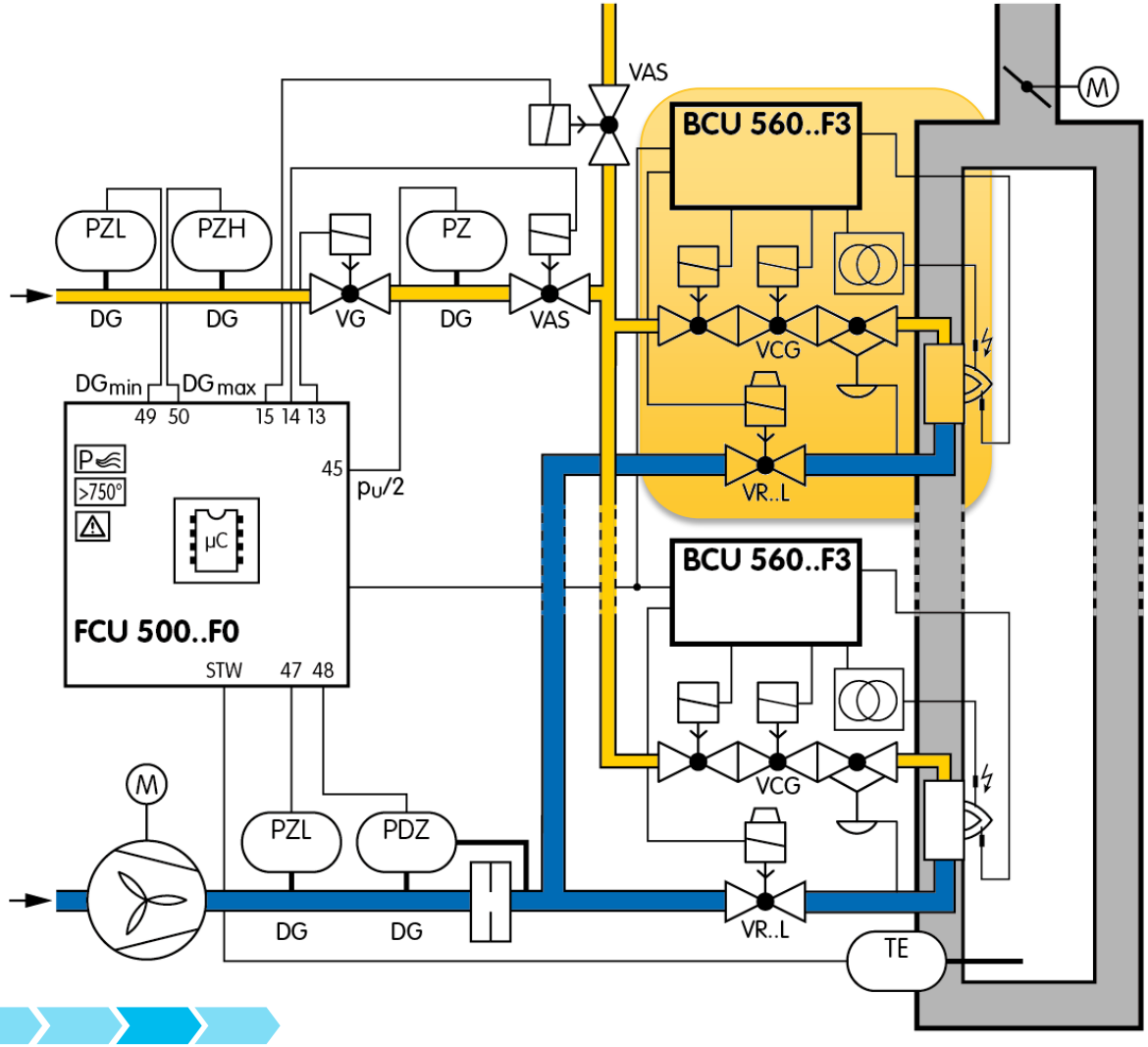
Protective system pursuant to EN 746-2:2010

Components required for the functional safety of the system



Application: staged control

On/Off or High/Low operation of the burners



Application

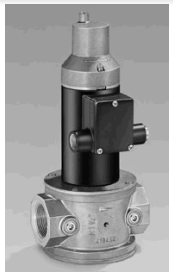
Unit variants optimised for different applications

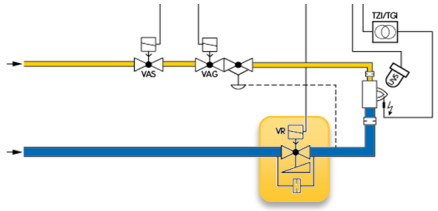
Unit type	Burner type	Burner control
BCU 560	Direct ignition	One-stage, Modulating with external air control
BCU 560-F3 BCU 560..F1/F2	Direct ignition	Two-stage On/Off with start gas rate, Two-stage High/Low Modulating-controlled burner
BCU 565-F3 BCU 565-F1	Radiant tube burner,direct ignited Low NOx burner	One-stage On/Off, Two-stage High/Low menox® >850°C
BCU 580-F3	Ignition with pilot burner	Main burner On/Off, Main burner, two-stage, Main burner, modulating

Capacity control by BCU

Capacity modulation with different actuators

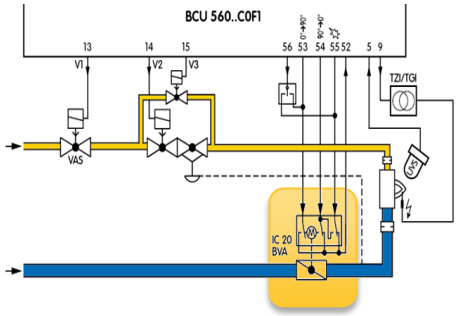
Air valve





IC 20 / IC 50

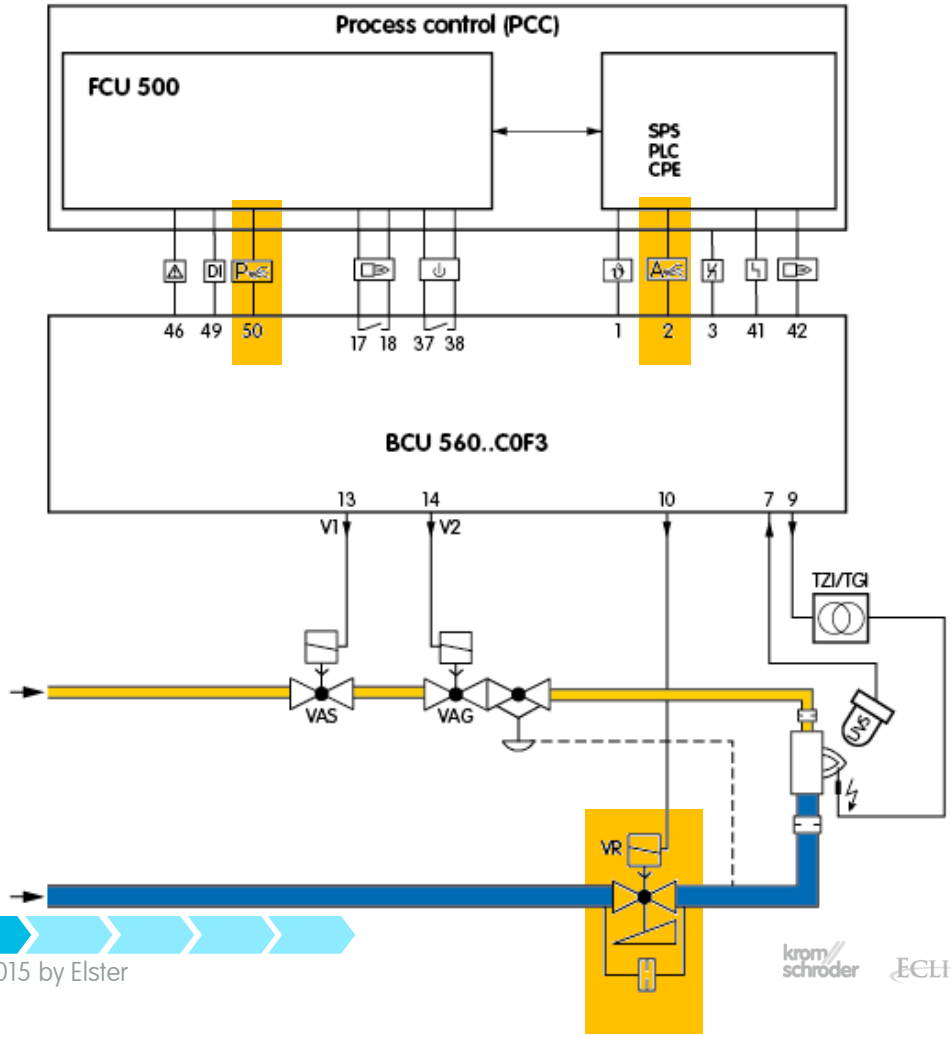
IC 40



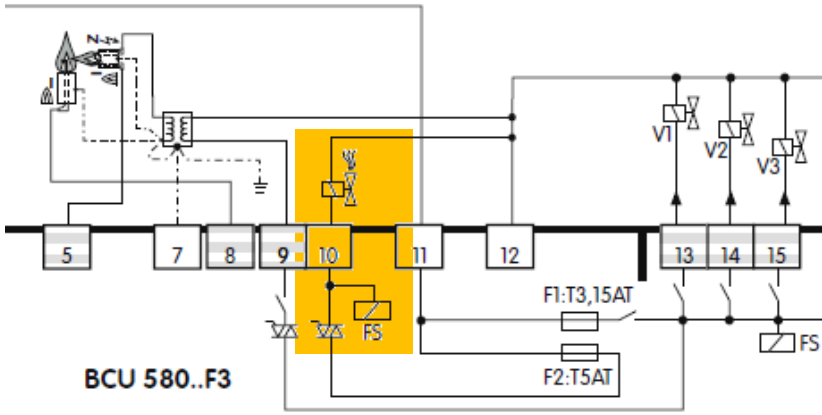
Honeywell „RBW“

Integrated air valve control

Integrated air valve control reduces external components and facilitates fail-safe implementation of the function



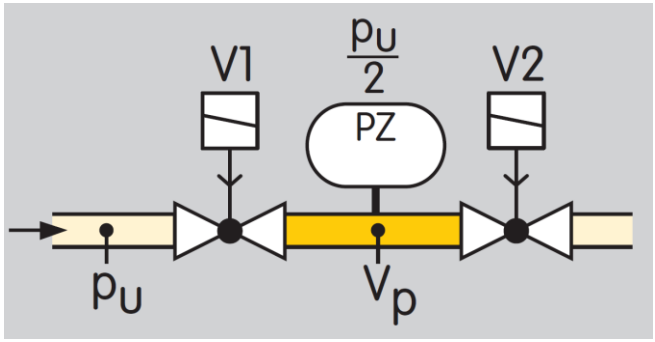
- P≈ Pre-purge function
- A≈ Cooling and capacity control

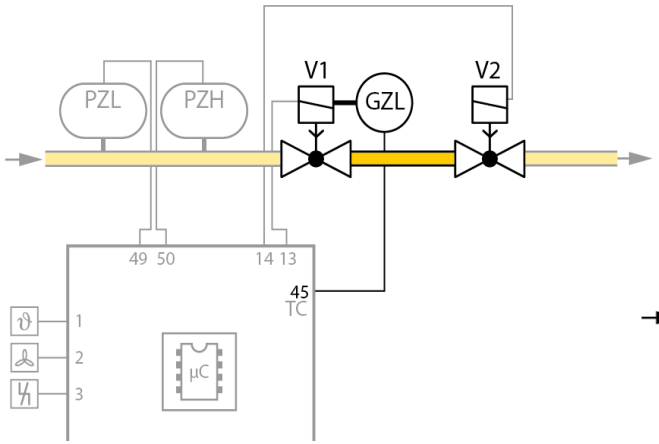


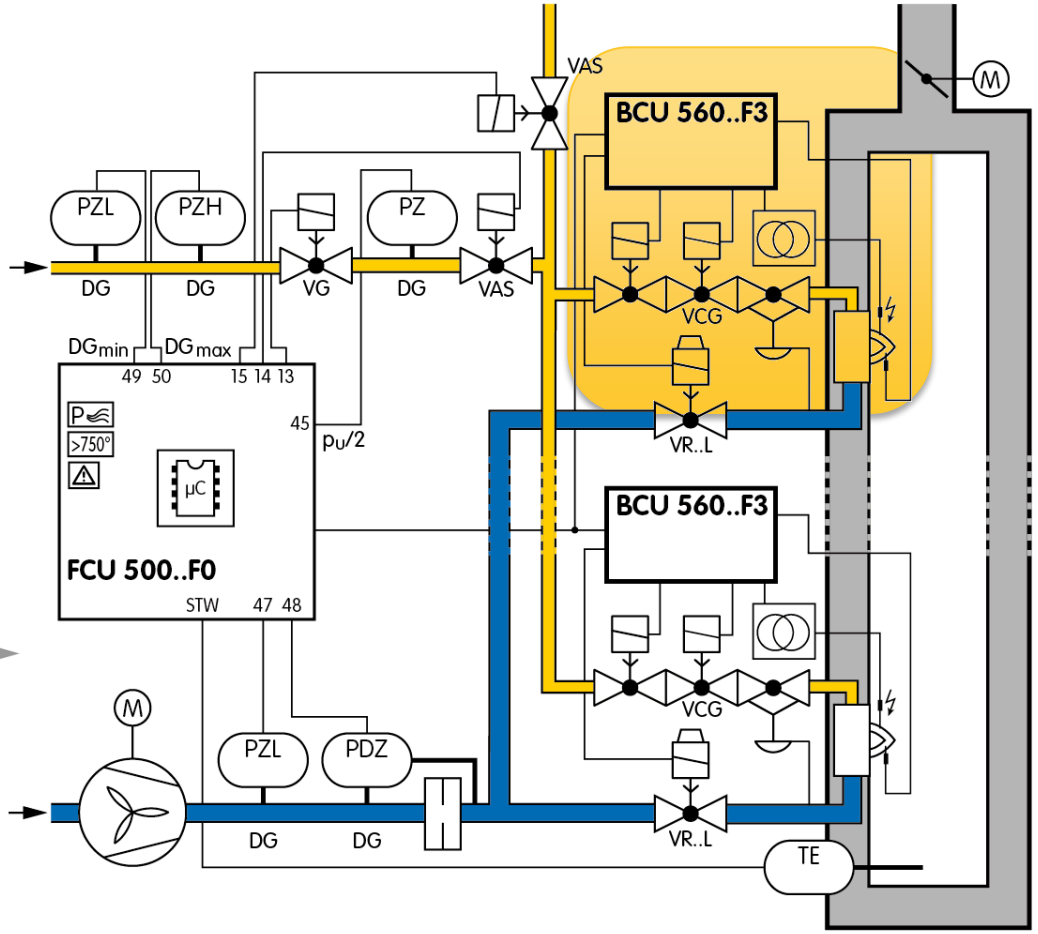
solid-state output!

Valve proving system

Tightness control function and POC

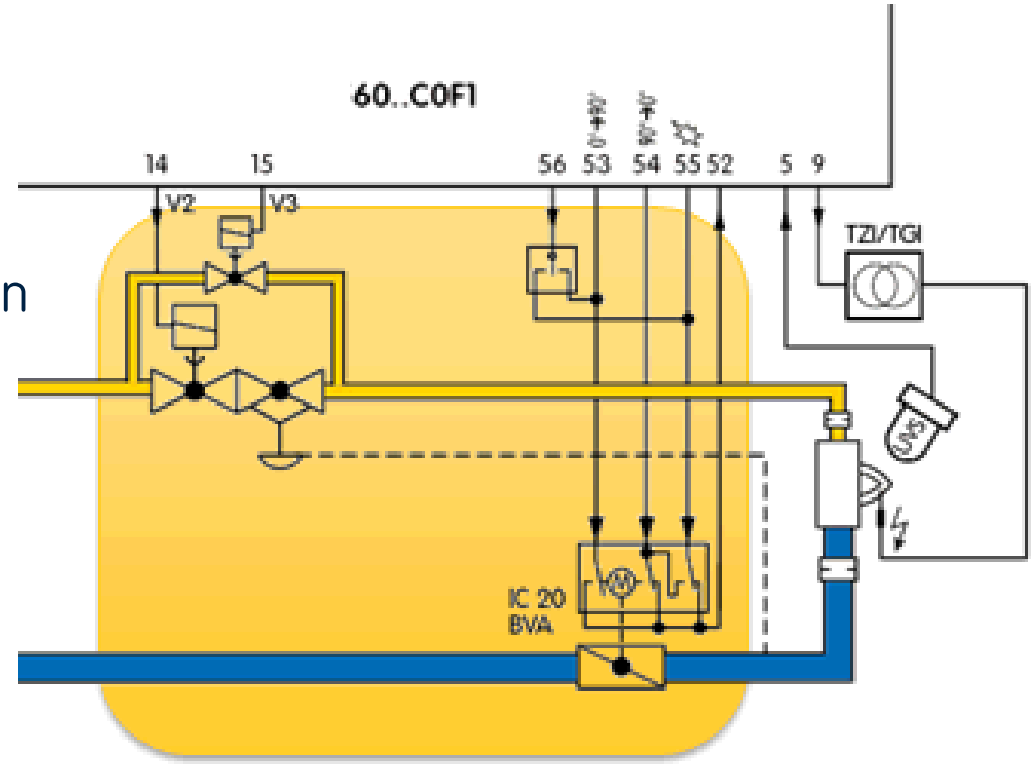






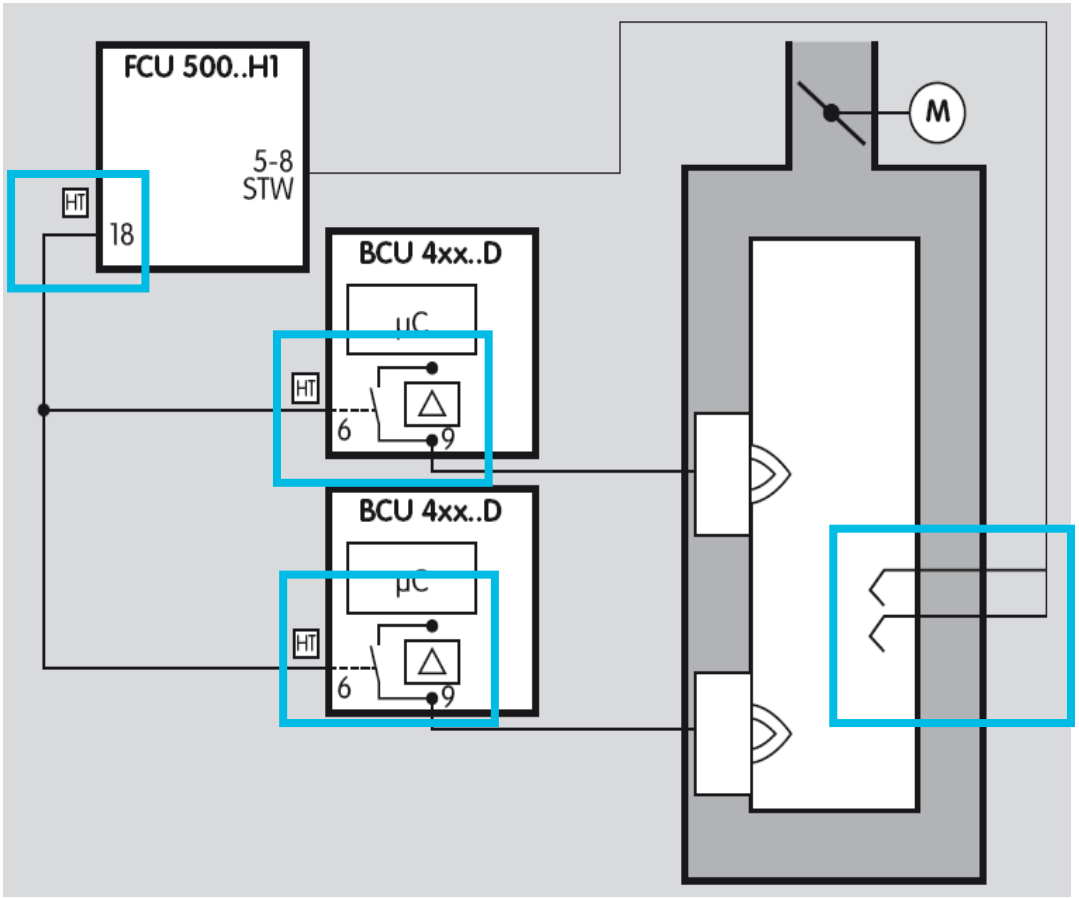
Limitation of the start up burner power

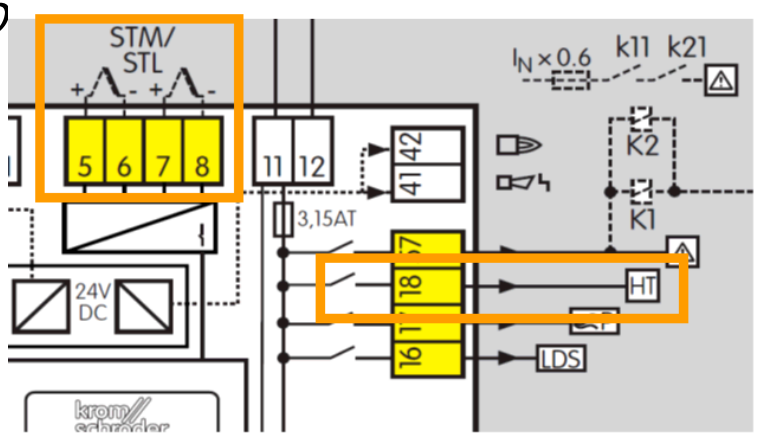
- Limitation of the power for the start up of the burner
- SIL / PL- conform
  - V3 ⇨ during start up
  - V2 ⇨ during operation



High temperature operation

Increased operational safety thanks to temp





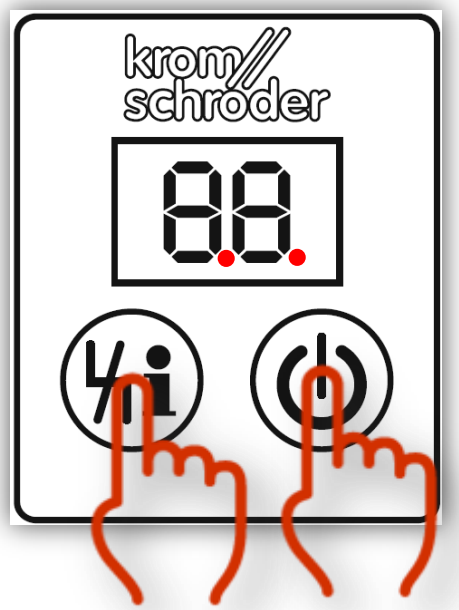
Manual mode

Simplified commissioning

thanks to the manual operation mode

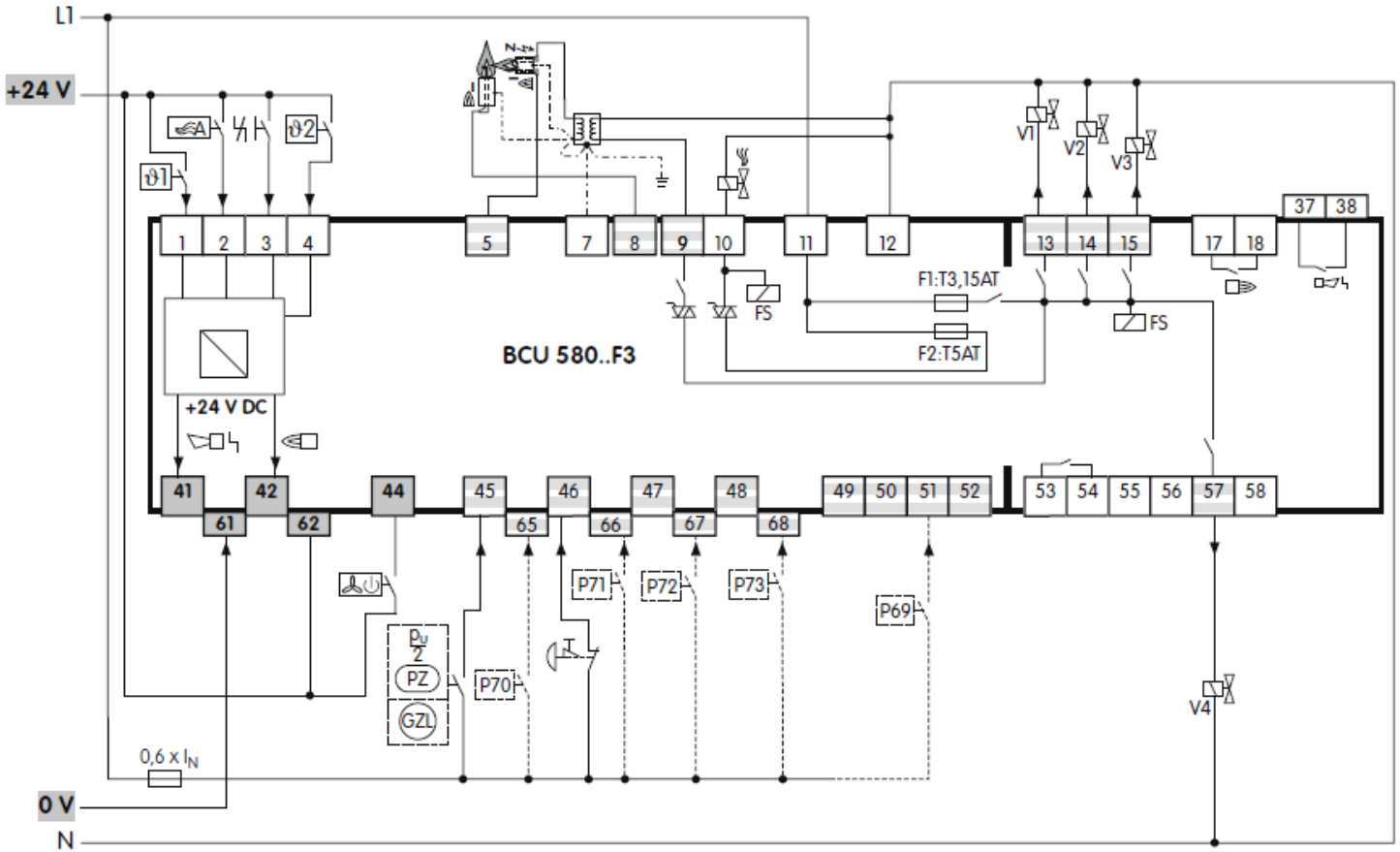
- Operation at the BCU or the OCU
- All safety functions remain active
- Manual switching to the next program step
- With or without temporal limitation?

  (Adjustable by different parameterization)



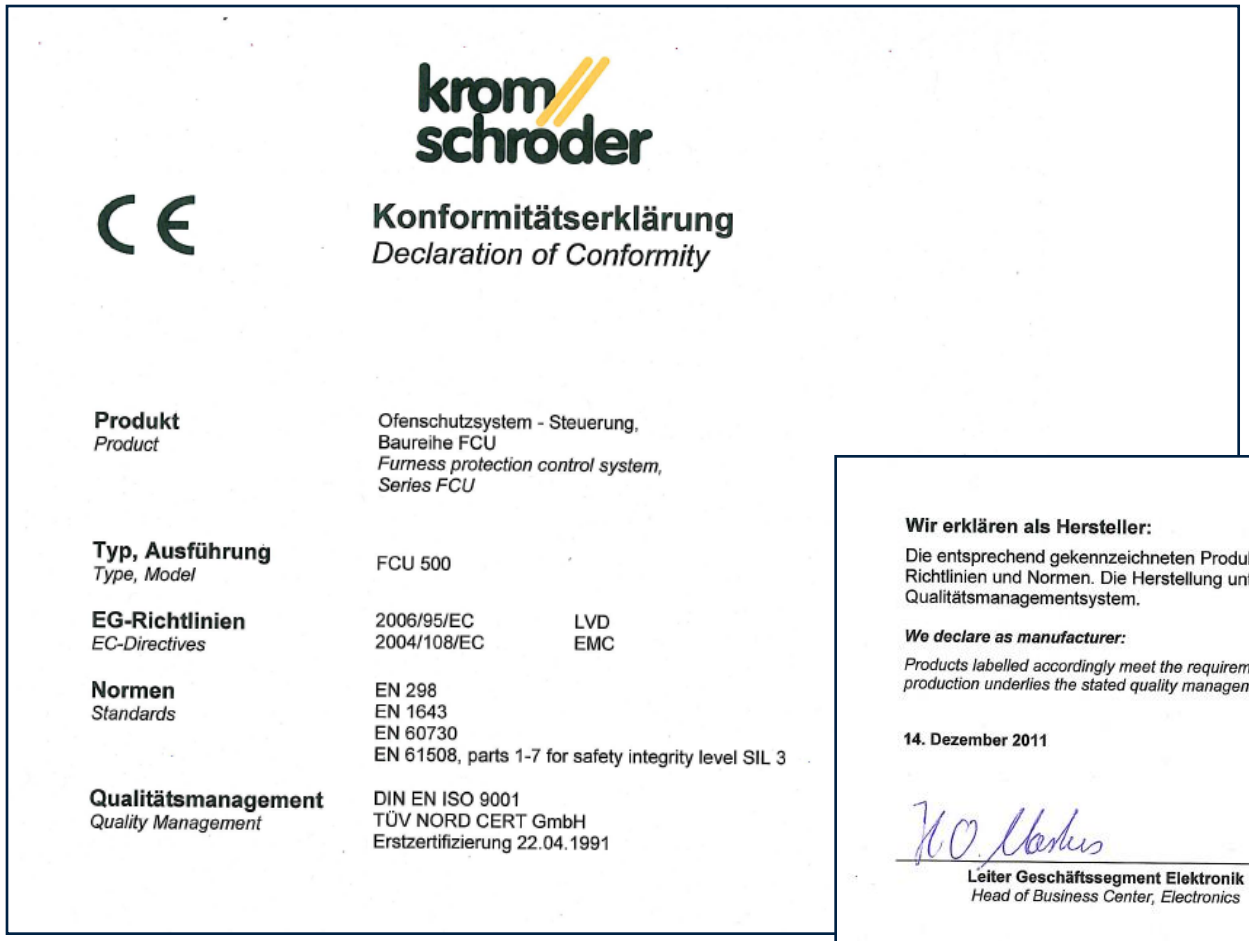
Wiring diagram BCU 580

Reduced wiring costs thanks to easy connection of other devices and integration of various functions



Approval FCU 500

Declaration of conformity according to EN 298 etc.



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CE

Konformitätserklärung
Declaration of Conformity

Produkt *Product*	Ofenschutzsystem - Steuerung, Baureihe FCU *Furness protection control system,* *Series FCU*	
Typ, Ausführung *Type, Model*	FCU 500	
EG-Richtlinien *EC-Directives*	2006/95/EC 2004/108/EC	LVD EMC
Normen *Standards*	EN 298 EN 1643 EN 60730 EN 61508, parts 1-7 for safety integrity level SIL 3	
Qualitätsmanagement *Quality Management*	DIN EN ISO 9001 TÜV NORD CERT GmbH Erstzertifizierung 22.04.1991	

Wir erklären als Hersteller:

Die entsprechend gekennzeichneten Produkte erfüllen die Anforderungen der aufgeführten Richtlinien und Normen. Die Herstellung unterliegt dem genannten Qualitätsmanagementsystem.

We declare as manufacturer:

Products labelled accordingly meet the requirements of the listed directives and standards. The production underlies the stated quality management system.

14. Dezember 2011

Leiter Geschäftssegment Elektronik
Head of Business Center, Electronics

Zuständiger Konstrukteur
Responsible Technical Designer

Elster GmbH, Postfach 2809, D – 49018 Osnabrück; Strotheweg 1, D – 49504 Lotte (Büren)

Approval FCU 500

FCU 500 is rated according SIL/PL

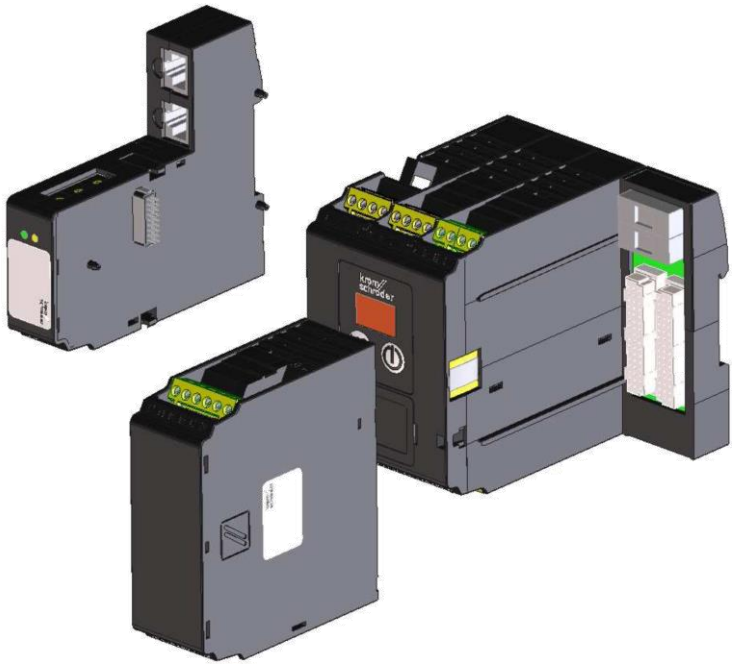
Safety specific values	
Safety integrity level	SIL 3
Diagnosis coverage DC	98,2%
Type of subsystem	Type B according to EN 61508-2, 7.4.3.1.4
Operating mode	with high demand according to EN 61508-4, 3.5.12
Average probability of dangerous failure PFH_D	1,89 x 10^{-8} 1/h
Meantime to dangerous failure $MTTF_d$	$MTTF_d$ = 1 / PFHD
Safety failure fraction	SFF 99,6 %

PL	SIL
a	–
b	1
c	1
d	2
e	3

Design of housing

Modular housing concept

- For cabinet installation
- Plug-in terminals
- Replaceable load module
- Plug-in parameter chip card PCC
- Integrated status display
- Operation via foil keypad
- Plug-in bus communication module



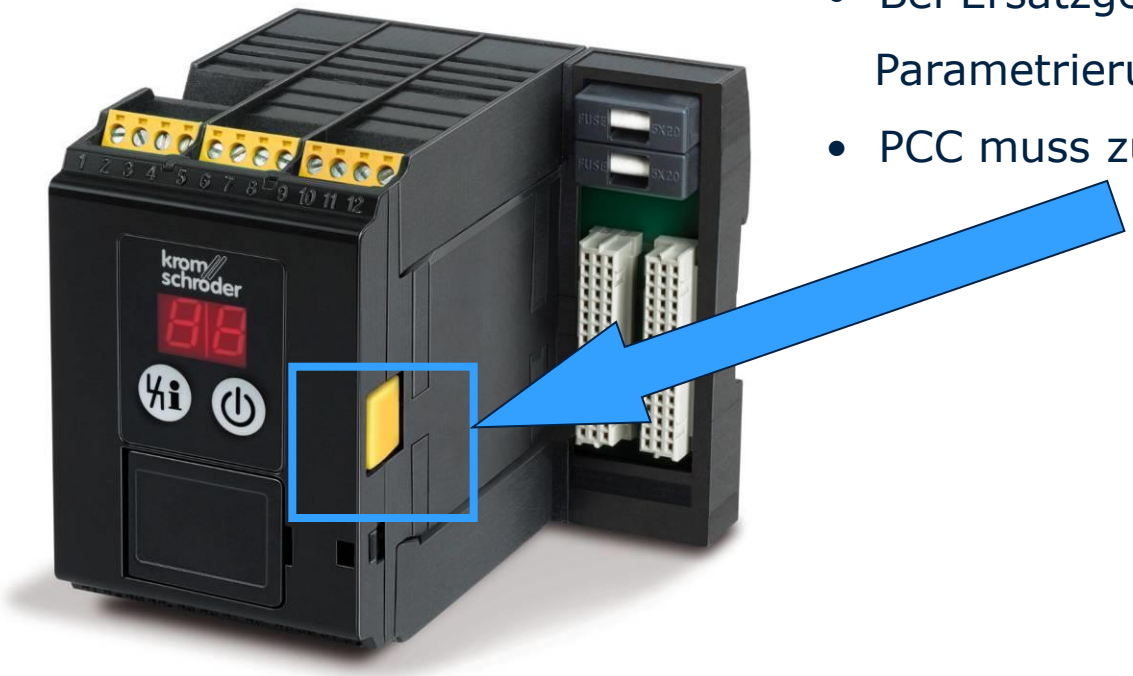
Connectivity

Plug-in terminals in two different versions

- Screw terminals
- Spring force terminals (enables „Daisy chain")

Parameter-Chip-Card

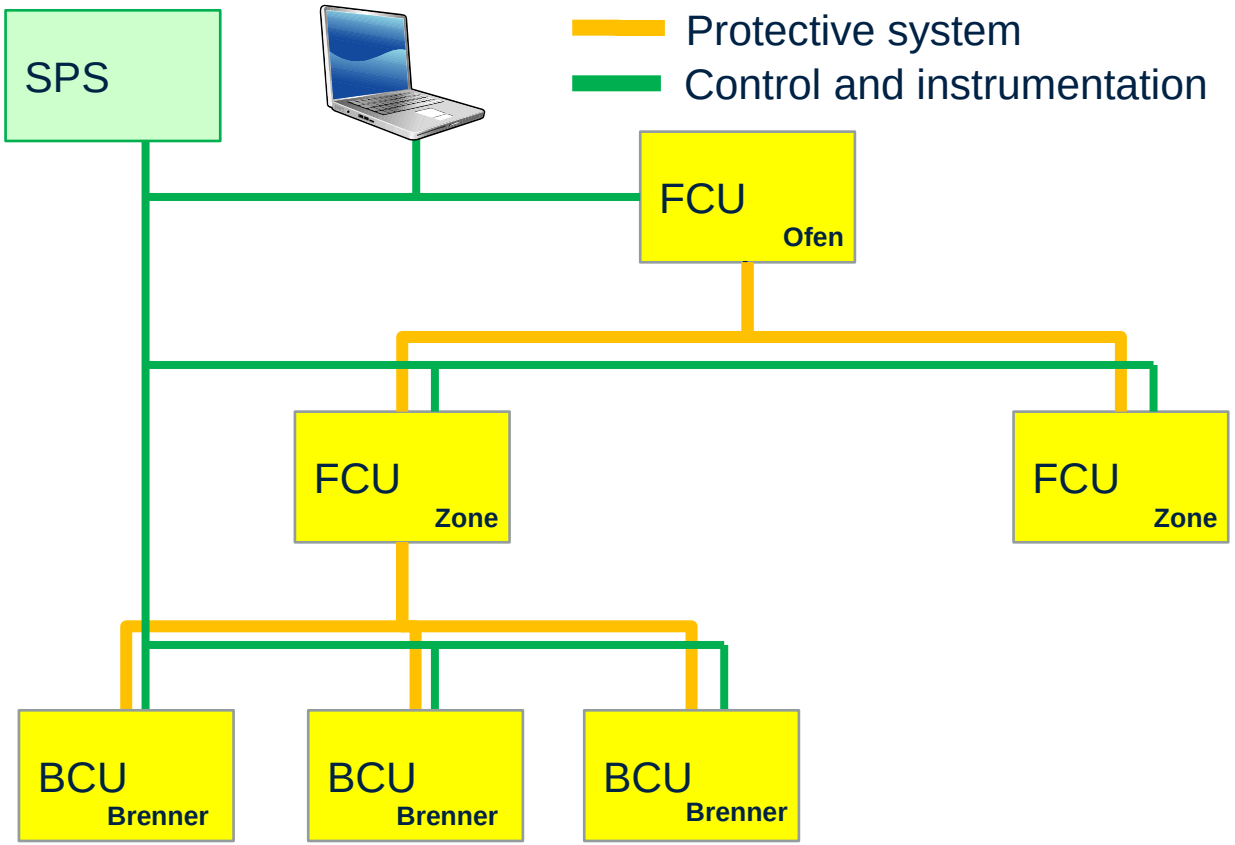
Austauschbarer Parameterspeicher optimiert Logistik und erleichtert Gerätetausch

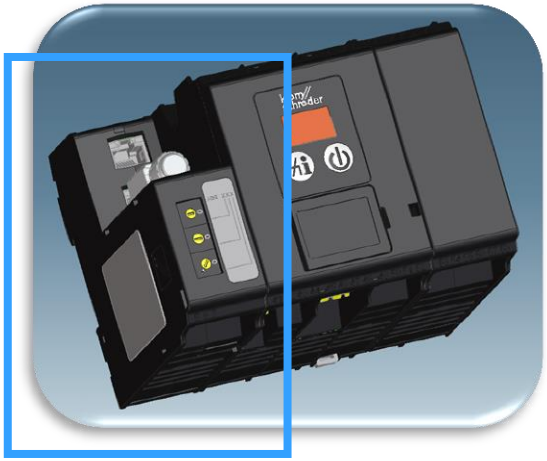


- Speicherkarte enthält Parametrierung und Gerätestatistik
- Bei Ersatzgeräten Übertragung der Parametrierung durch Wechsel der PCC
- PCC muss zur Hardware passen

Automation: network connection

Integration in digital communication systems

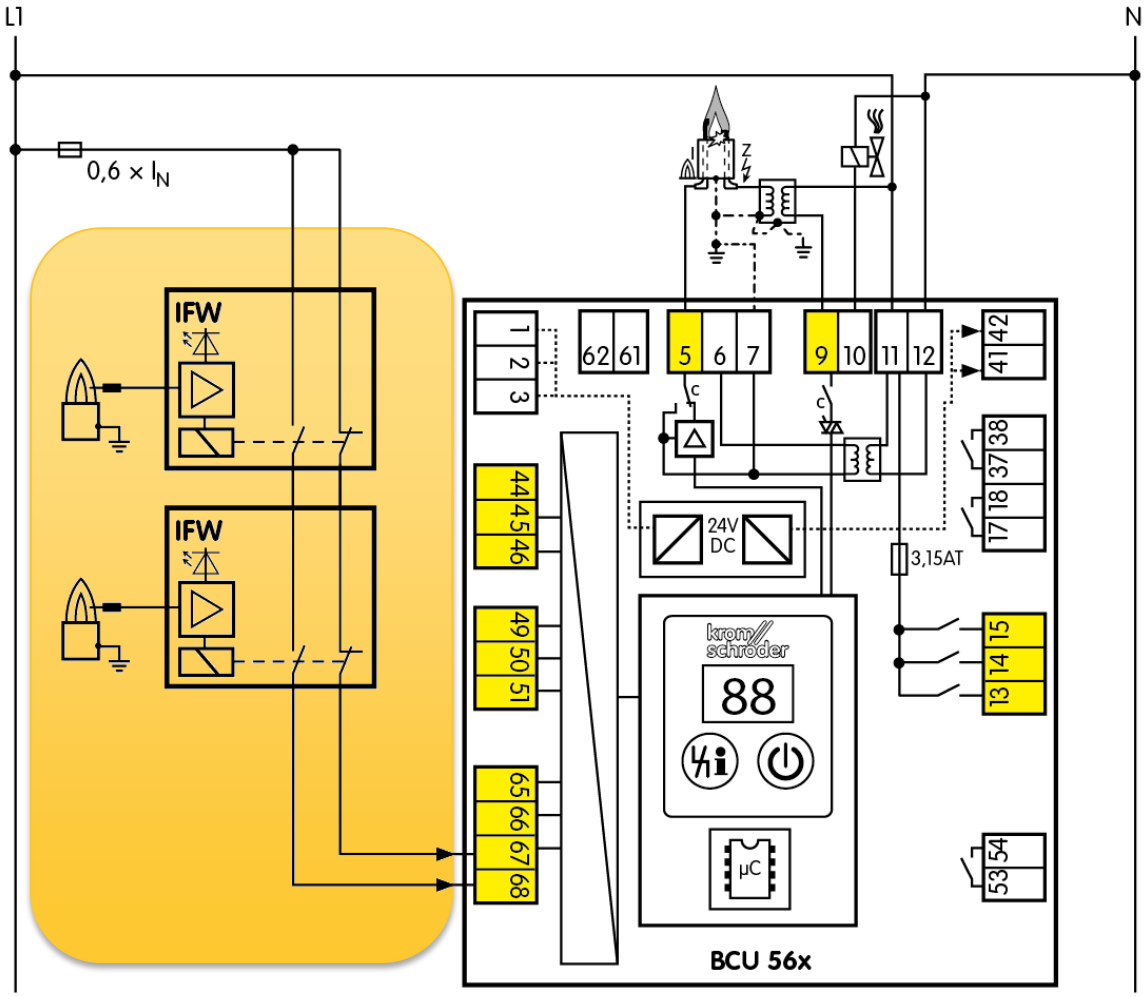




First realization: Profinet

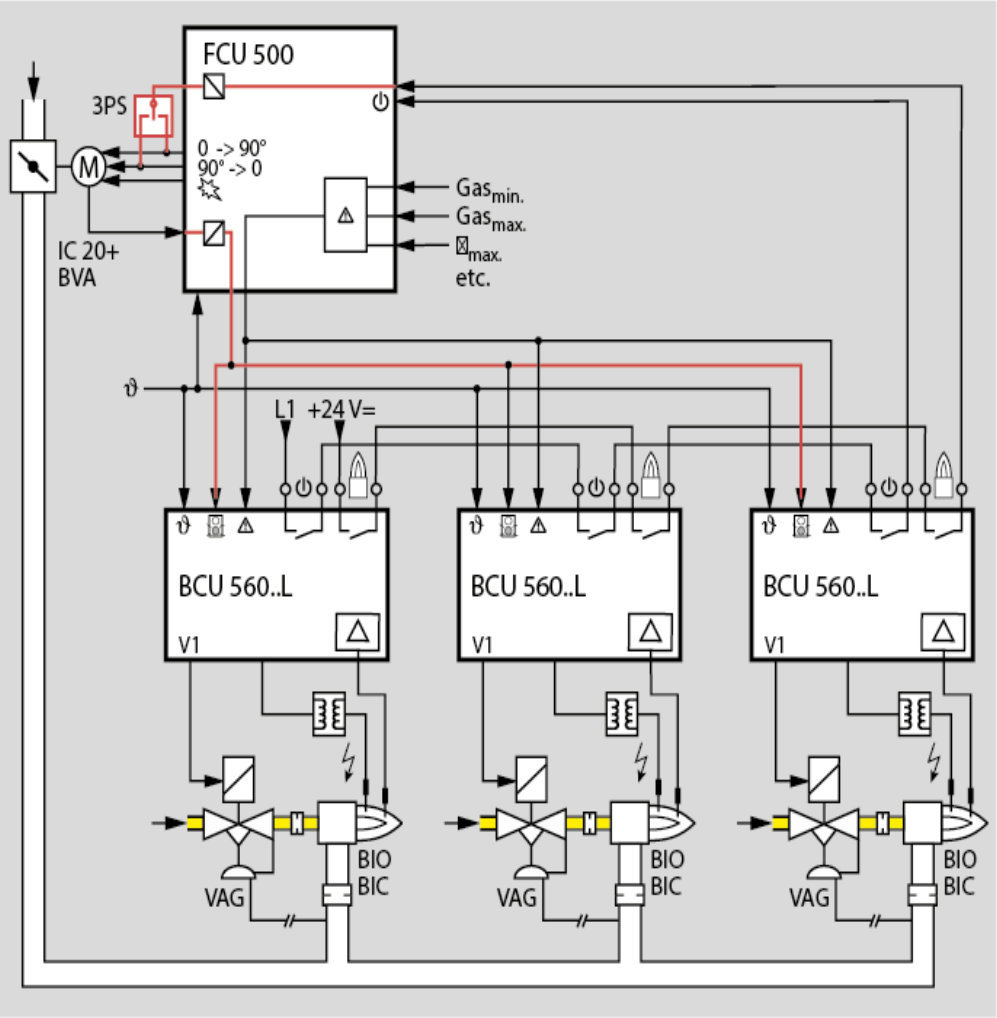
multi-flame control system

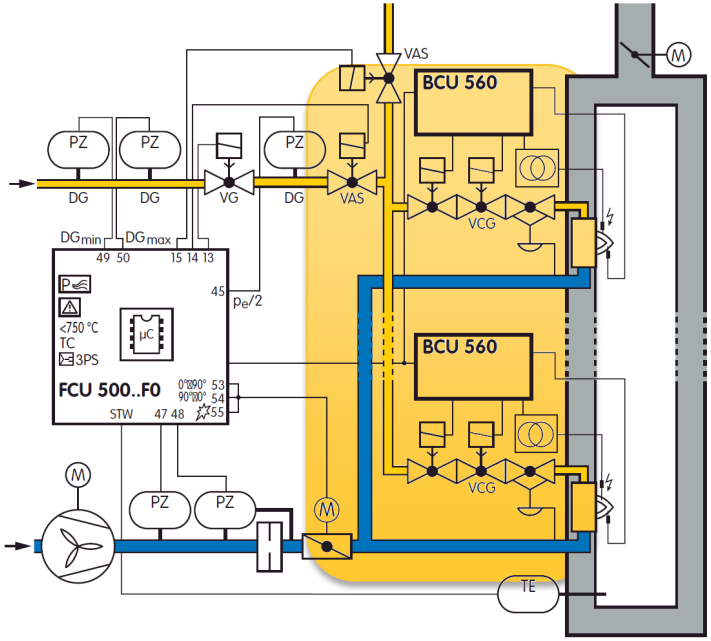
Burner start-up and flame monitoring of all burners synchronously



LDS

Ensure the ignition position





burner start-up only in ignition position!

- *actuators*
  - IC 20
  - IC 40
  - RBW

Separate operation control unit OCU

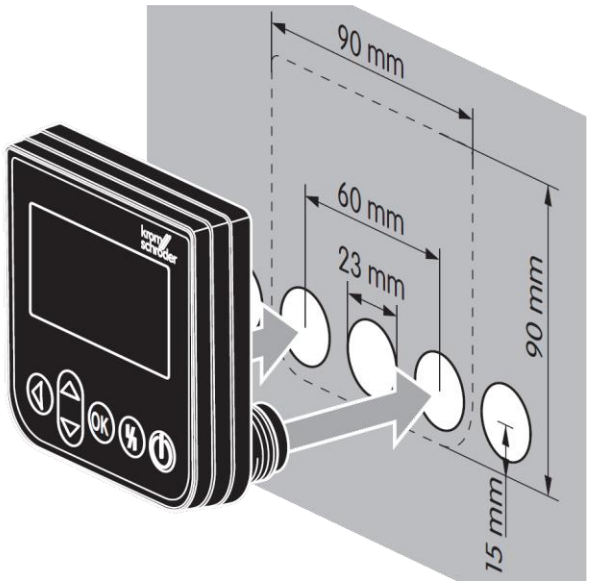
Operation with multilingual plain text display

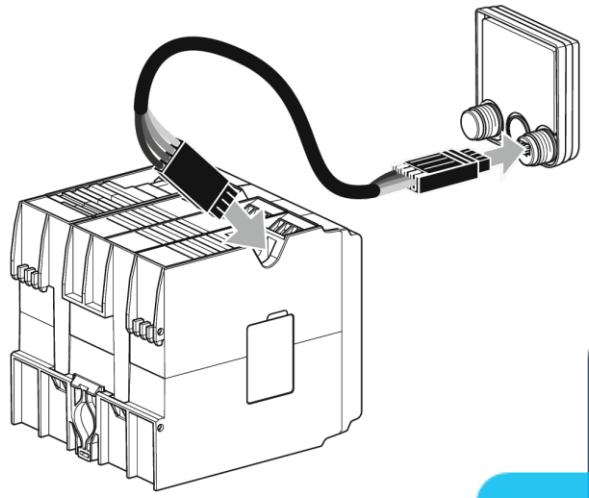
- Easy visualization and operation outside of the cabinet, without additional PLC-system
- Complete operation possible
  - Turn ON and OFF the BCU 570
  - Displaying of flame signal, parameter settings, device statistic and error history
  - Burner manual mode
  - advanced commissioning support for the calibration of the actuator
- different languages switchable
  - 4 versions each with 6 different languages sets

Separate operation control unit OCU

- Easy installation by standard mounting
- Protective level IP 65, NEMA 3
- Connection to the BCU

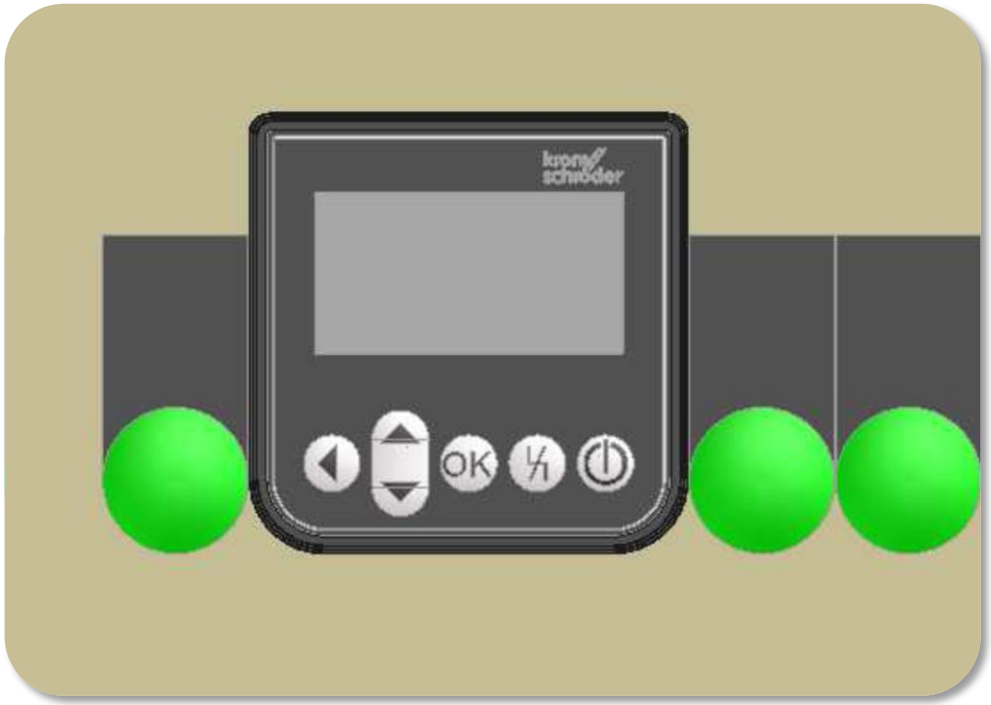
  with a standard four wire cable
- Cable length up to 10 m





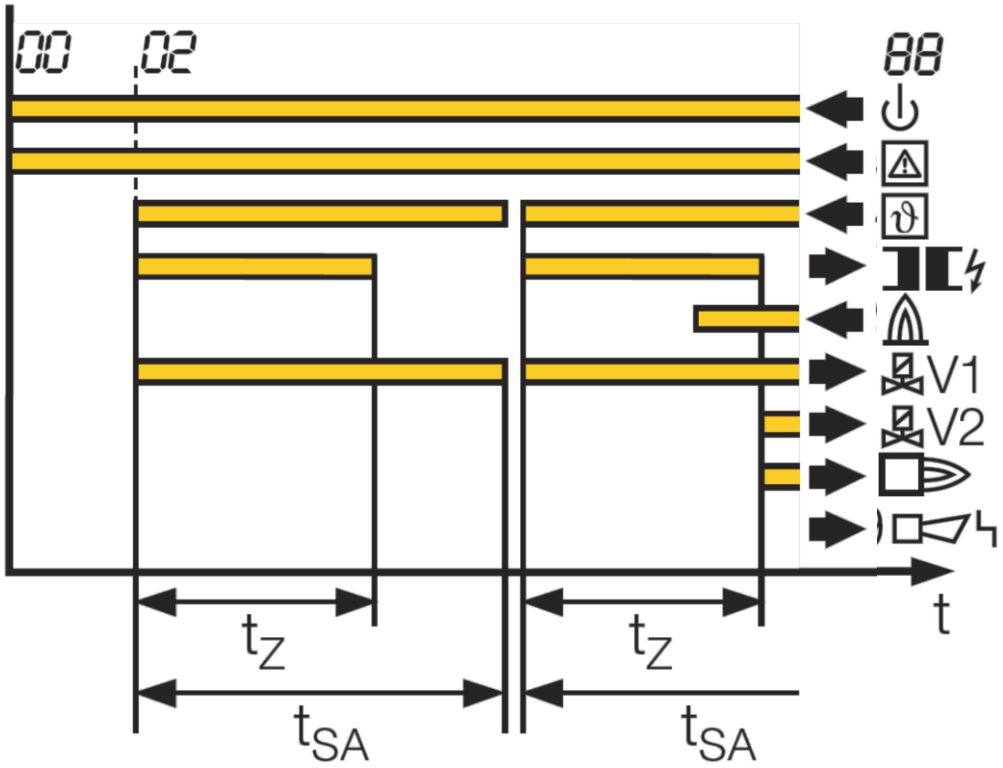
Separate operation control unit OCU

Installation in the control cabinet door with a standard grid



Start-up attempts

*Maximum safety when starting up thanks to repeated start-up attempts **



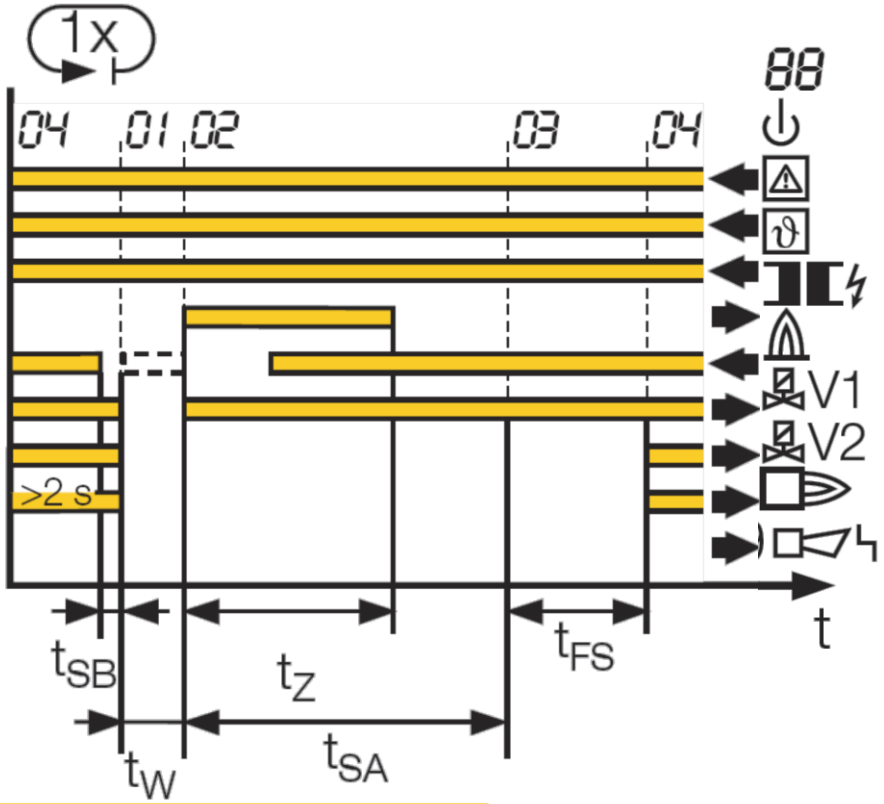
t_{SA}: 3;5;10s

Start-up attempts burner: 1;2;3

* If safety is not impaired

Restart

*Increased operational safety thanks to restart after flame failure during operation **

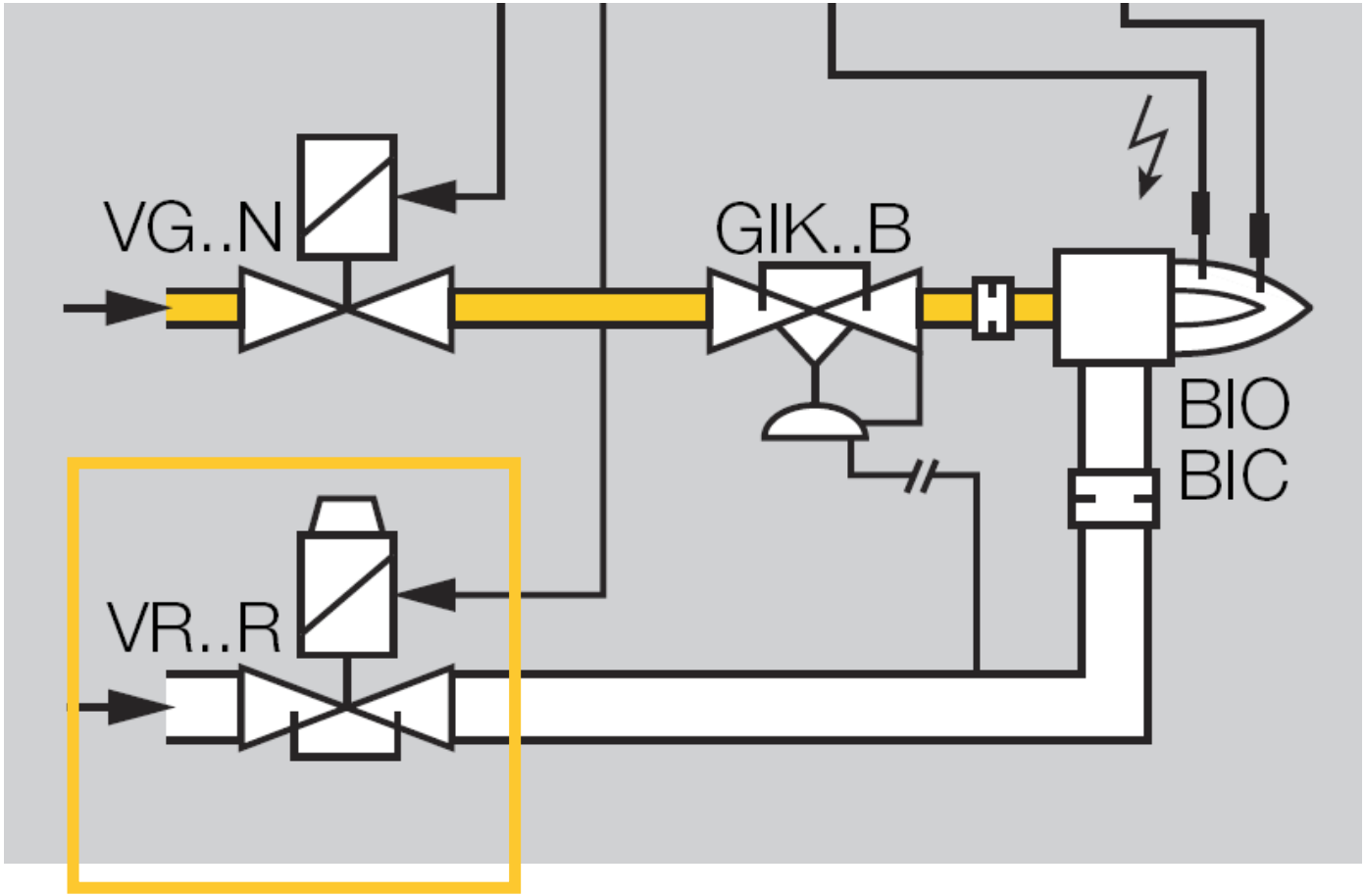


Restart burner: 0;1

* If the safety of the installation is not impaired

Restart

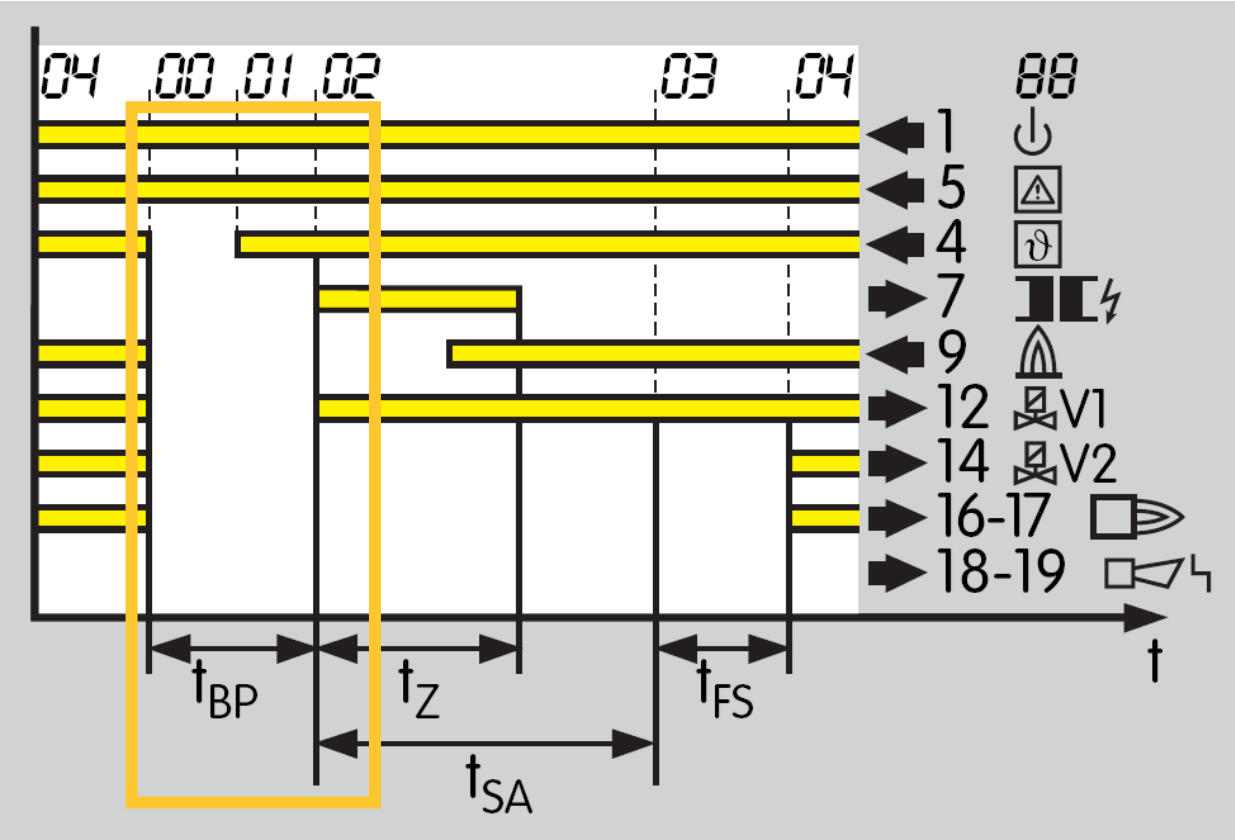
Activation possible ?

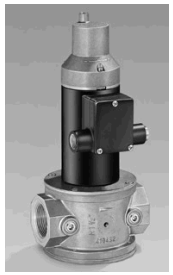


slow-closing air valve, restart condition ?

Running time

Running time allows activation of restart with slow-closing air valve

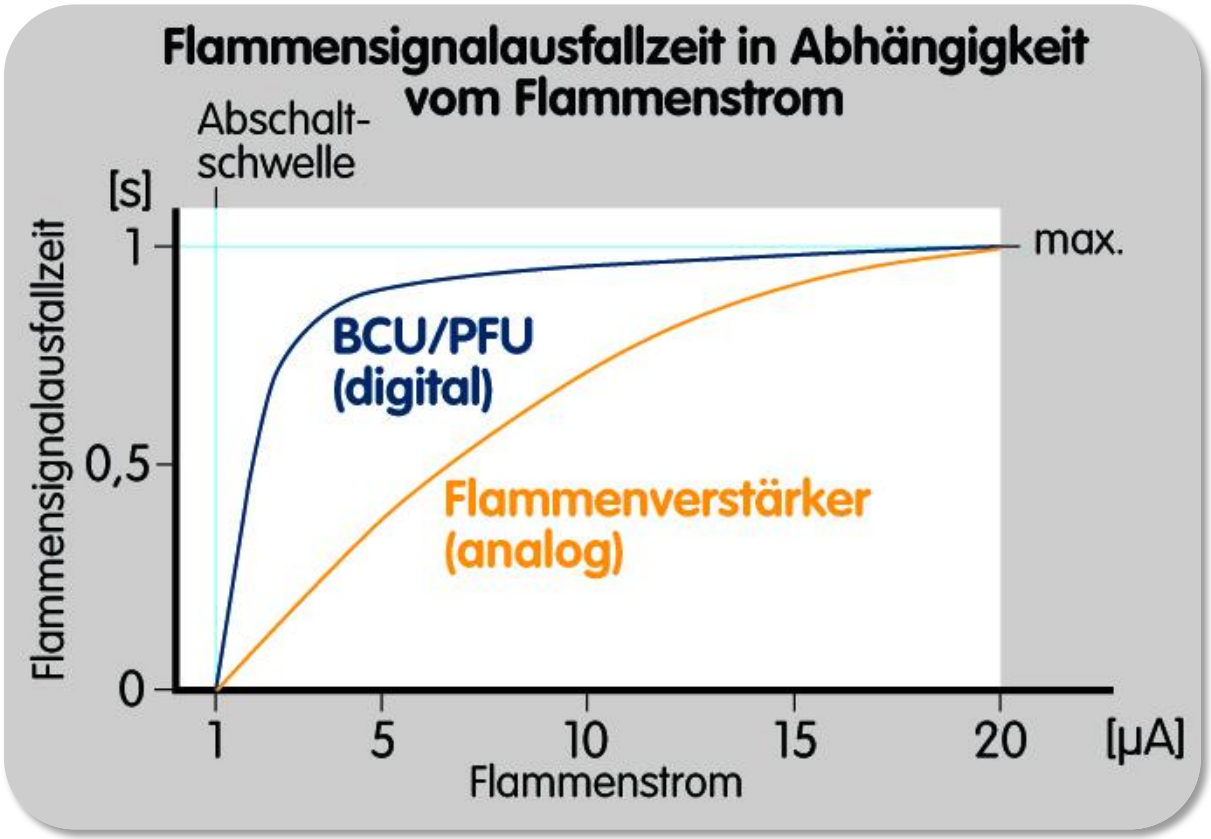




t_{BP} (P21): 0-250s

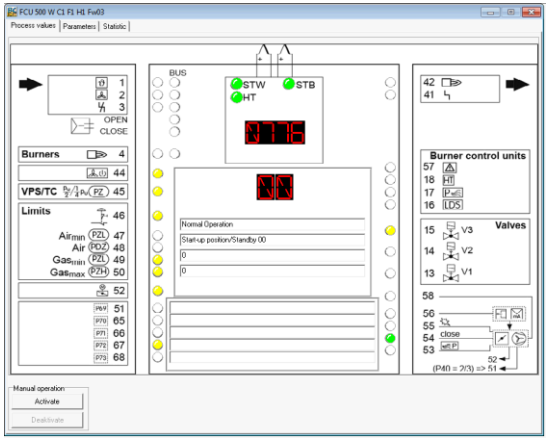
Optimized flame amplifier

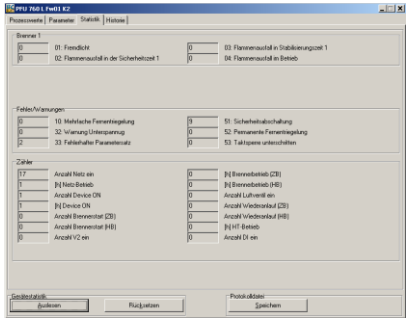
- High tolerance by fully utilizing the permissible response time
- Short-term signal interruptions will be tolerated

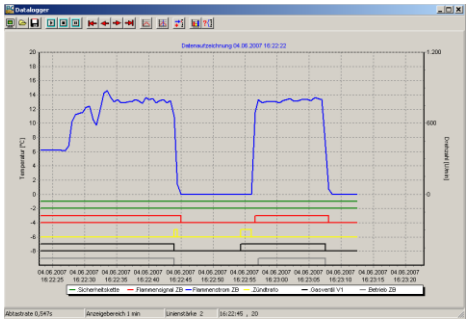


BCSoft: overview

- Programming tool: "Setting tool"
- Analysis tool
- Documentation on changes
- PC software Windows 98 …
- Communication via USB or Bluetooth
- For:
  - BCU, PFU burner control units
  - IC 40 actuators
- Update from the Docuthek







Project planning information

Presentation of important additional information in the TI

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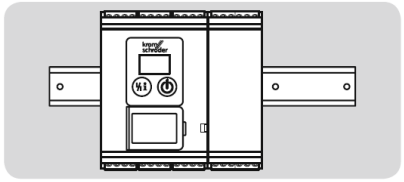
10 Project planning information

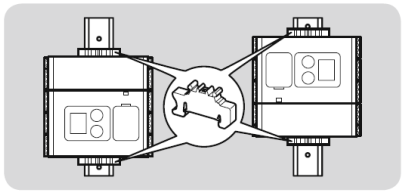
10.1 Installation

Installation position: any.

The BCU mounting is designed for horizontally aligned 35 × 7.5 mm DIN rails.



If the DIN rail is aligned vertically, end clamps are required (e.g. Clipfix 35 by Phoenix Contact) to prevent the BCU from slipping.



Environment

Install in a clean environment (e.g. a control cabinet) with an enclosure ≥ IP 54, whereby no condensation is permitted.

10.2 Commissioning

Do not start the BCU until the parameter settings and wiring are correct and the faultless processing of all input and output signals complies with the local standards.

BCU 570 · Edition 09.13 77

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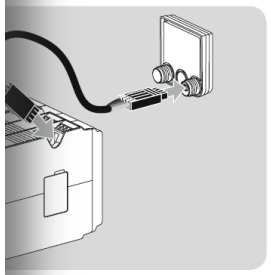

and telecommunications systems are
iring the supplied plug connectors:
m, 4-pin,
24),
22).

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BCU 570 · Edition 09.13 79

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the butterfly valve closed reduces the
e fan motor.

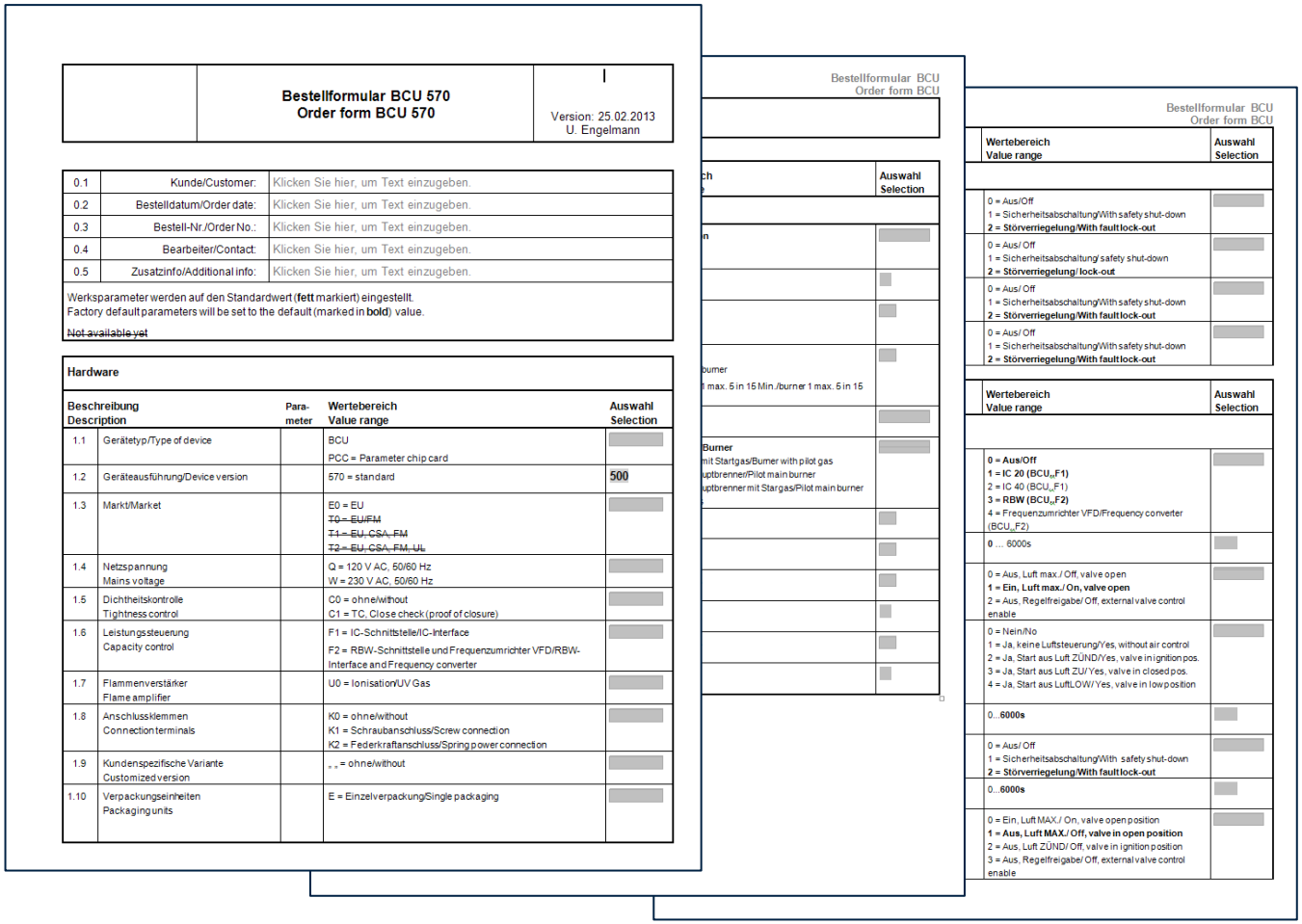
hip card

card must be installed in the unit for the
parameter chip card contains the valid
BCU. If a BCU is replaced, the parameter
moved from the old unit and inserted into
CU must be disconnected from the electri-
this purpose. The valid parameters are
new BCU.

BCU 570 · Edition 09.13 80

BCU order form

Definition of factory default unit settings



Bestellformular BCU 570
Order form BCU 570

Version: 25.02.2013
U. Engelmann

0.1	Kunde/Customer:	Klicken Sie hier, um Text einzugeben.
0.2	Bestelldatum/Order date:	Klicken Sie hier, um Text einzugeben.
0.3	Bestell-Nr./Order No.:	Klicken Sie hier, um Text einzugeben.
0.4	Bearbeiter/Contact:	Klicken Sie hier, um Text einzugeben.
0.5	Zusatzinfo/Additional info:	Klicken Sie hier, um Text einzugeben.

Werksparameter werden auf den Standardwert (**fett** markiert) eingestellt.
Factory default parameters will be set to the default (marked in **bold**) value.

~~Not available yet~~

Hardware

Beschreibung Description		Para-meter	Wertebereich Value range	Auswahl Selection
1.1	Gerätetyp/Type of device		BCU PCC = Parameter chip card	
1.2	Geräteausführung/Device version		570 = standard	500
1.3	Markt/Market		E0 = EU ~~T0 = EU/FM~~ ~~T1 = EU, CSA, FM~~ ~~T2 = EU, CSA, FM, UL~~	
1.4	Netzspannung Mains voltage		Q = 120 V AC, 50/60 Hz W = 230 V AC, 50/60 Hz	
1.5	Dichtheitskontrolle Tightness control		C0 = ohne/without C1 = TC, Close check (proof of closure)	
1.6	Leistungssteuerung Capacity control		F1 = IC-Schnittstelle/IC-Interface F2 = RBW-Schnittstelle und Frequenzumrichter VFD/RBW-Interface and Frequency converter	
1.7	Flammenverstärker Flame amplifier		U0 = Ionisation/UV Gas	
1.8	Anschlussklemmen Connection terminals		K0 = ohne/without K1 = Schraubanschluss/Screw connection K2 = Federkraftanschluss/Spring power connection	
1.9	Kundenspezifische Variante Customized version		„ „ = ohne/without	
1.10	Verpackungseinheiten Packaging units		E = Einzelverpackung/Single packaging	

Bestellformular BCU
Order form BCU

Auswahl
Selection

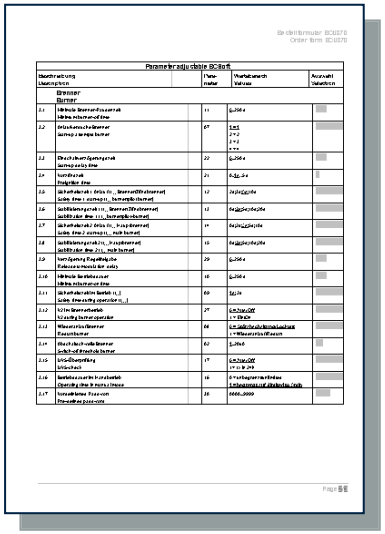
Bestellformular BCU
Order form BCU

Wertebereich Value range	Auswahl Selection
0 = Aus/Off 1 = Sicherheitsabschaltung/With safety shut-down **2 = Störverriegelung/With fault lock-out**	
0 = Aus/ Off 1 = Sicherheitsabschaltung/ safety shut-down **2 = Störverriegelung/ lock-out**	
0 = Aus/ Off 1 = Sicherheitsabschaltung/With safety shut-down **2 = Störverriegelung/With fault lock-out**	
0 = Aus/ Off 1 = Sicherheitsabschaltung/With safety shut-down **2 = Störverriegelung/With fault lock-out**	

Wertebereich Value range	Auswahl Selection
0 = Aus/Off **1 = IC 20 ($BCU_{..}F1$)** 2 = IC 40 ($BCU_{..}F1$) **3 = RBW ($BCU_{..}F2$)** 4 = Frequenzumrichter VFD/Frequency converter ($BCU_{..}F2$)	
0 … 6000s	
0 = Aus, Luft max./ Off, valve open **1 = Ein, Luft max./ On, valve open** 2 = Aus, Regelfreigabe/ Off, external valve control enable	
0 = Nein/No 1 = Ja, keine Luftsteuerung/Yes, without air control 2 = Ja, Start aus Luft ZÜND/Yes, valve in ignition pos. 3 = Ja, Start aus Luft ZU/ Yes, valve in closed pos. 4 = Ja, Start aus LuftLOW/ Yes, valve in low position	
0…**6000s**	
0 = Aus/ Off 1 = Sicherheitsabschaltung/With safety shut-down **2 = Störverriegelung/With fault lock-out**	
0…**6000s**	
0 = Ein, Luft MAX./ On, valve open position **1 = Aus, Luft MAX./ Off, valve in open position** 2 = Aus, Luft ZÜND/ Off, valve in ignition position 3 = Aus, Regelfreigabe/ Off, external valve control enable	

BCU 500 logistics: processing

Variant system allows a high degree of flexibility

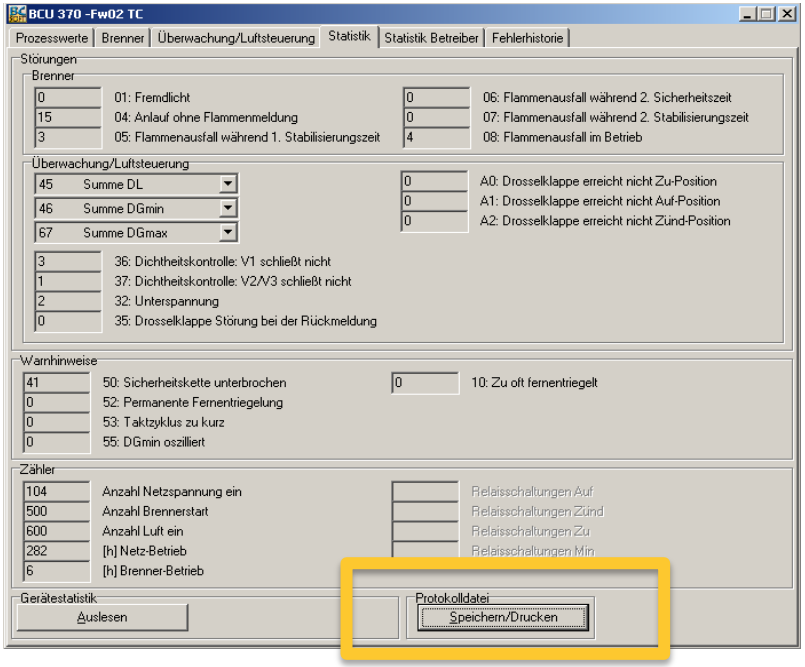


- Definition of hardware
- Definition of parameterization
  - Order form
- Processing the units in SAP
  - Configurable material for KMBCU5
  - Dependencies are stored
  - Confirming the hardware as well as parameterization in order confirmation and delivery note

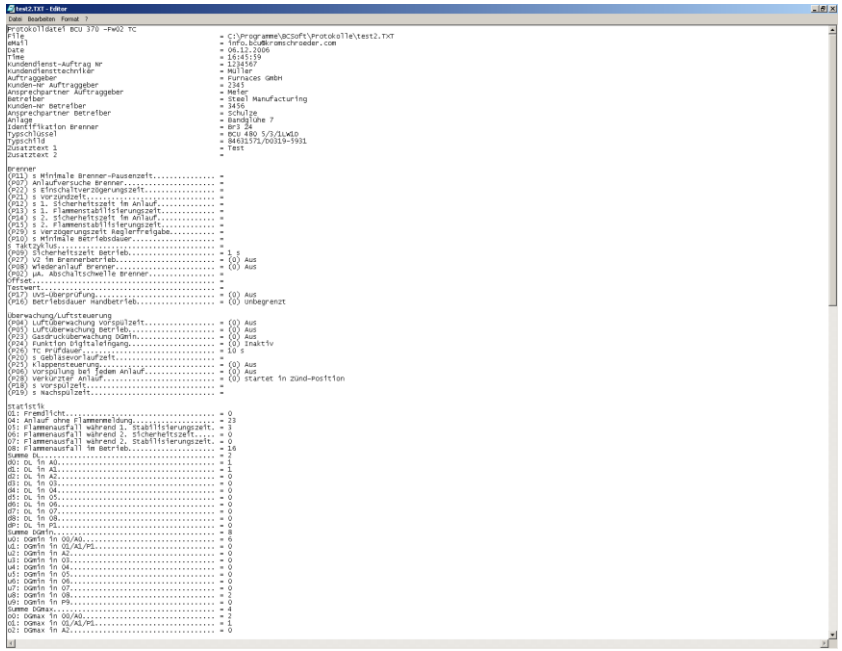
- All parameters can be changed after entering the password

Documentation of parameter changes

Simple documentation of all settings and statistical data



BCSoft protocol function



Protocol file

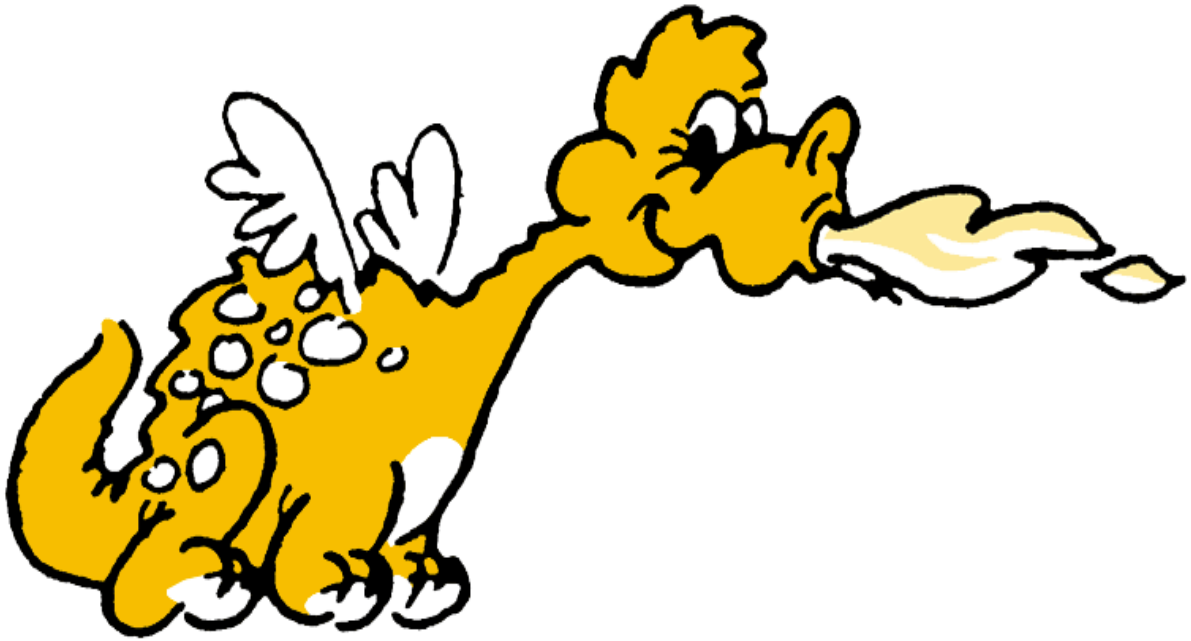
End of production IFS / IFD

Stop of the production to the 1th January 2016

	Last Order New applications	Repair / Replacement
IFS 11x IM	01.10.2015	2023
IFS 13x	2000	2020
IFD 45x	01.10.2015	2023

Any questions?

You have now received an overview of the most important functions and features of the burner control unit BCU .



Thank you

Aloys Quatmann
aloys.quatmann@elster.com

Andreas Büscher
andreas.buescher@elster.co

Produktmanagement

elster
Kromschröder

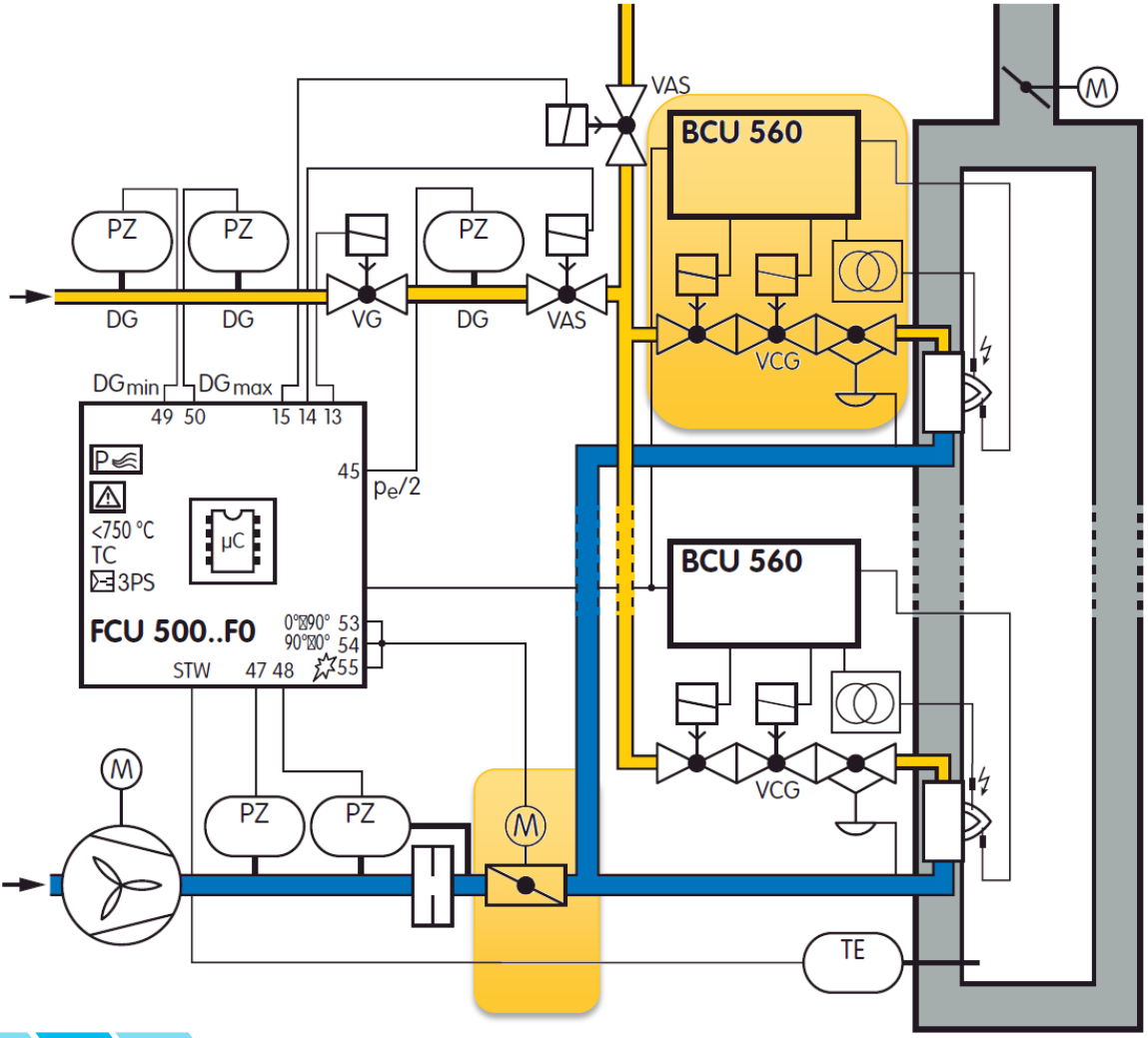
Do you have any questions?

Your local branch office will assist you.

elster
Kromschröder

Application: modulating control

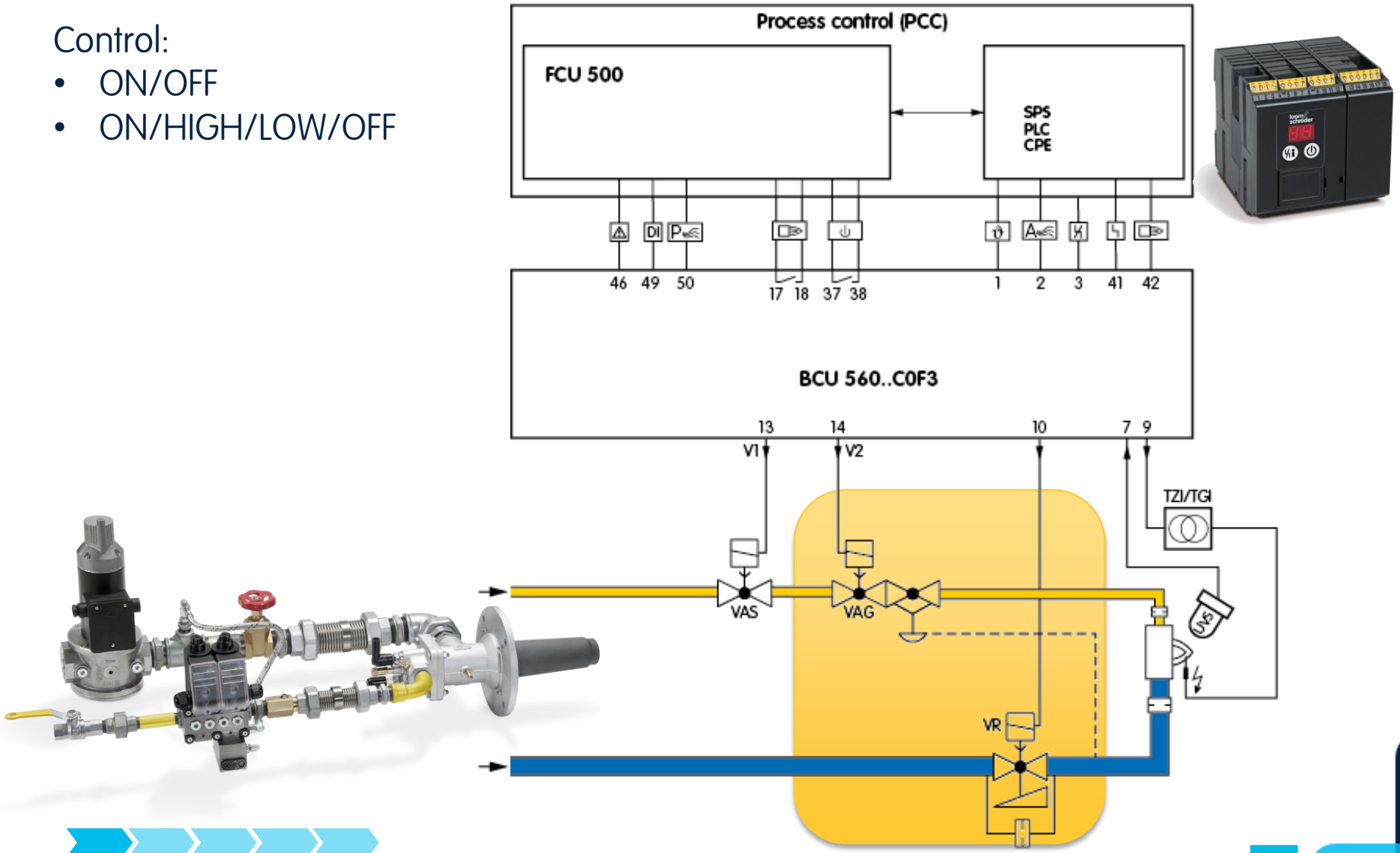
Furnace modulation via common air valve



BCU 560:Two-stage-controlled burner

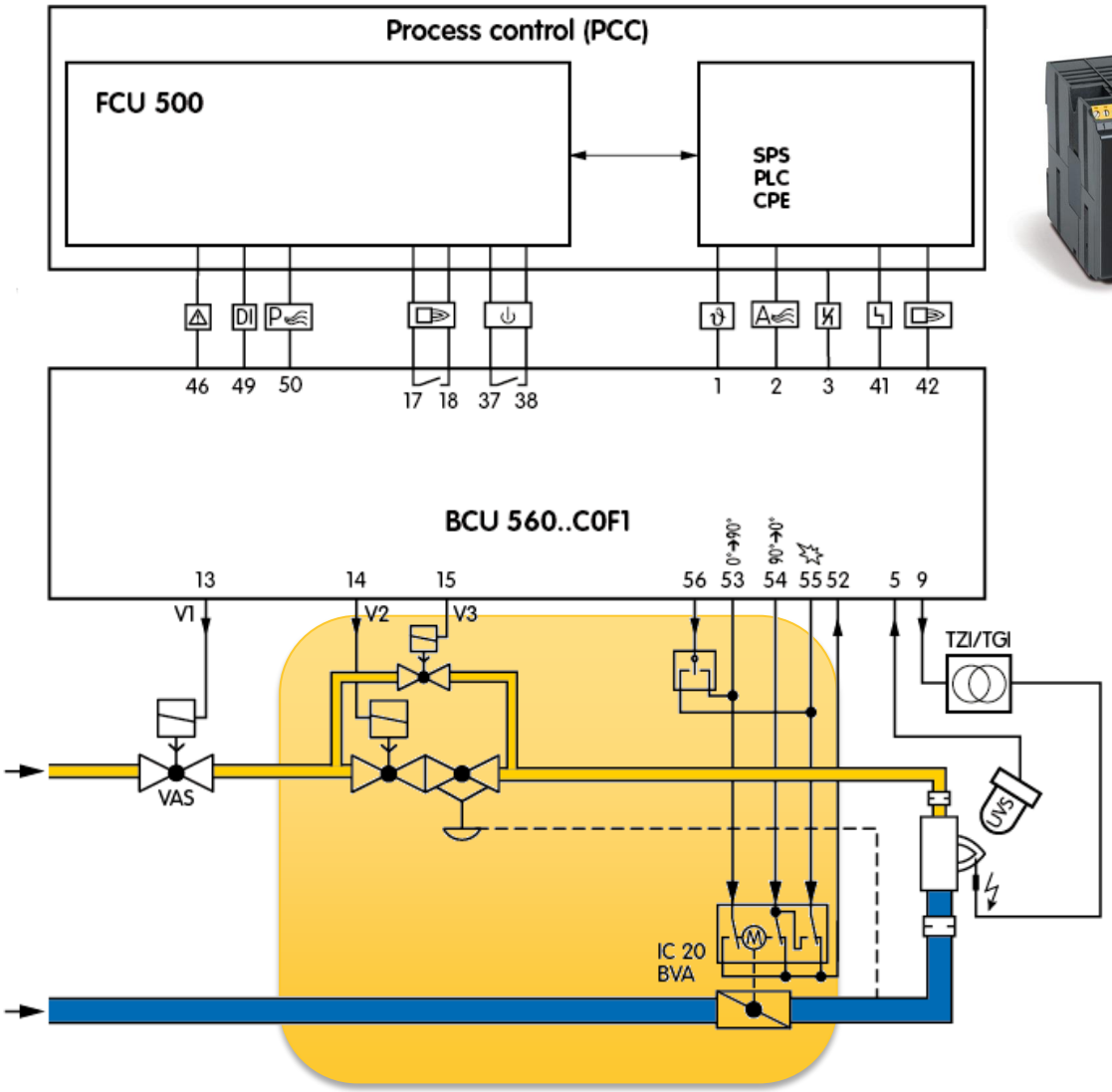
Control:

- ON/OFF
- ON/HIGH/LOW/OFF



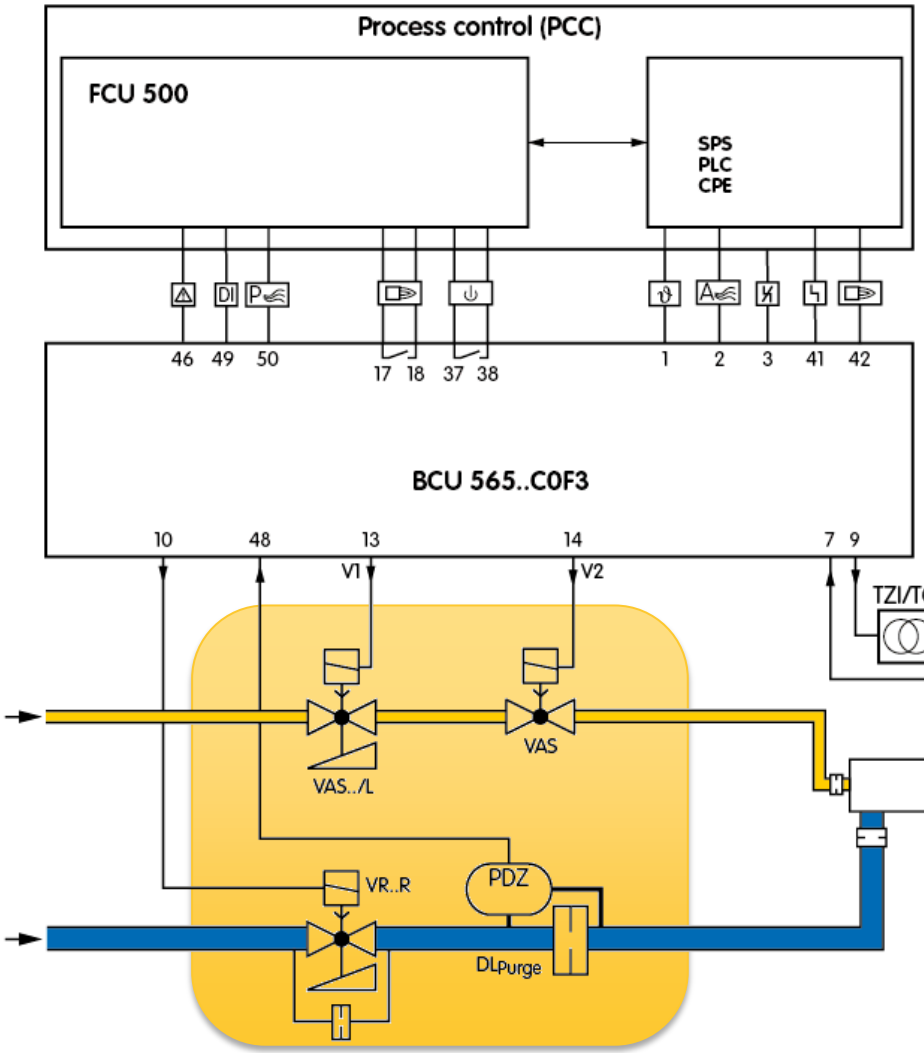
BCU 560: Modulating-controlled burner

capacity control function
BCU..F1 and BCU..F2



Application BCU 565 F3

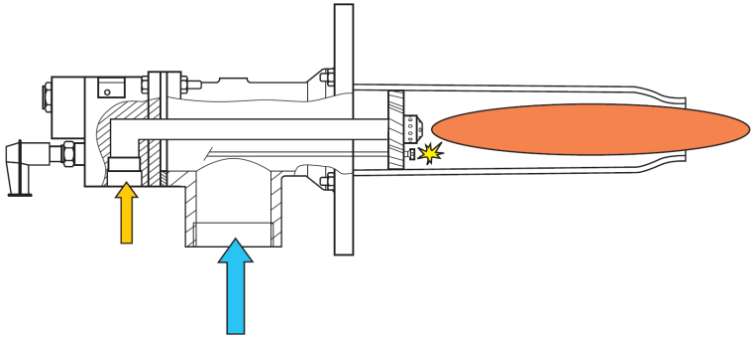
On/Off controlled radiant tube burner



menox® – Low-NOx for impulse burners

Flame monitoring for heat up the furnace

- with electrical ignition
- flame monitoring with ionisation



menox® >850°C

- without electrical ignition

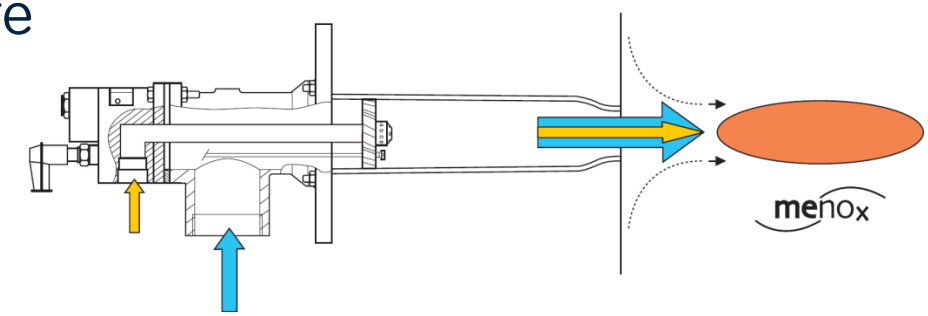
flame monitoring via the temperature

- adapted program flow

  Flame operation -> menox ®

  menox ®

  menox ® -> flame operation

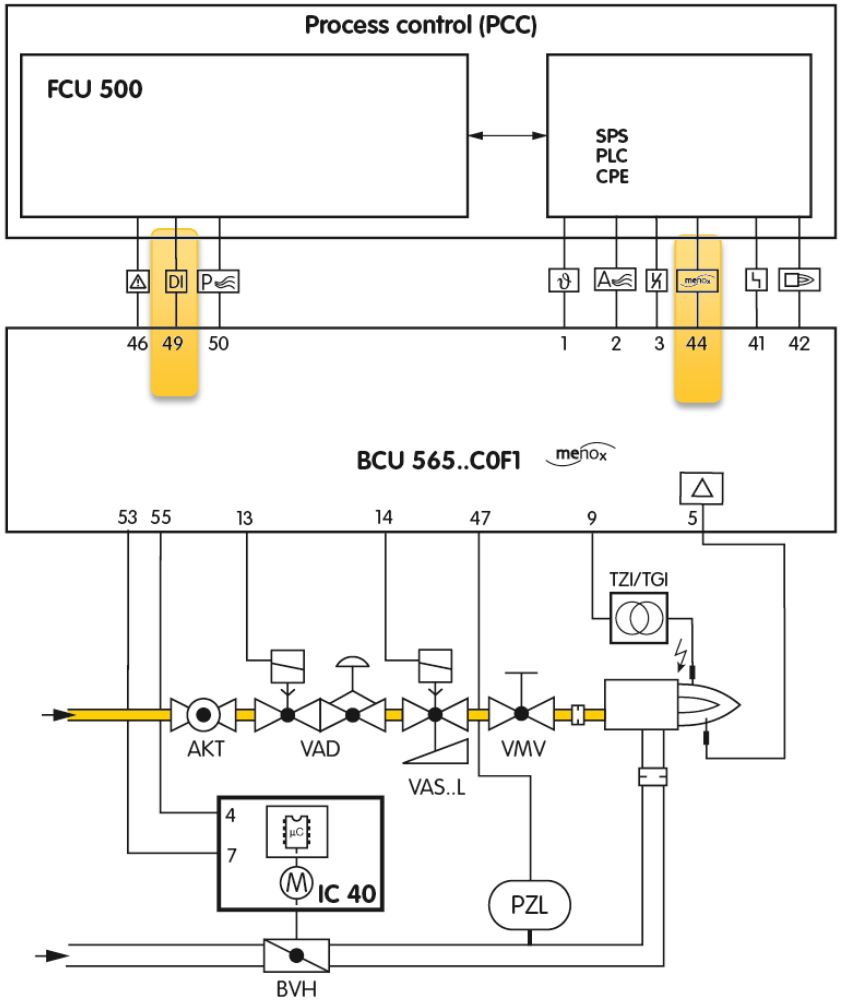


menox® – Low-Nox for impulse burners

System solution with special burner control unit (BCU 565 .. F1)

2 dig. inputs
a) for HT-operation via STM
b) for menox-Signal

- important functions
  Air pressure monitoring
- start: without ignition
- pre- ventilation for menox ®
  2 open positions for air and gas



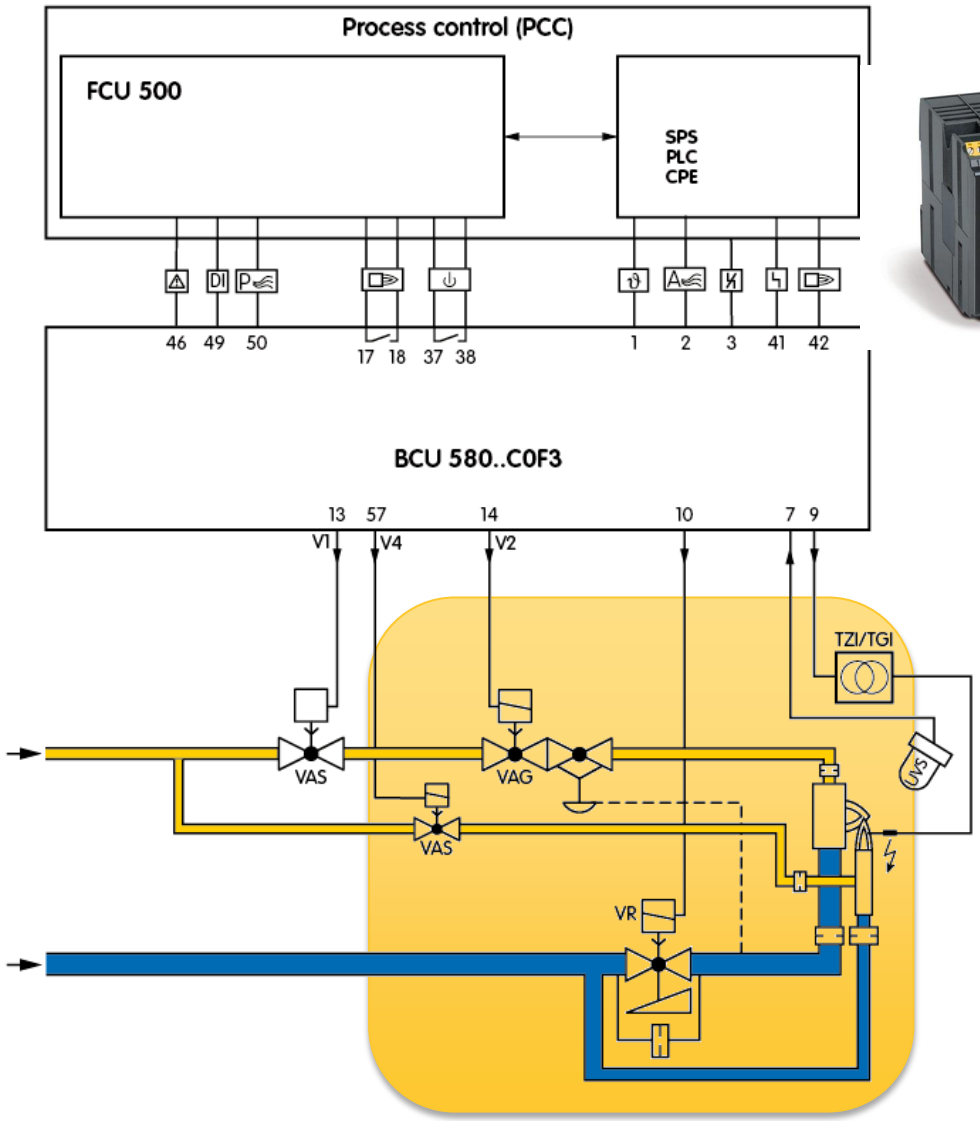
BCU 580: Two-stage-controlled burner

Control:

- ON/OFF
- ON/HIGH/LOW/OFF

Main burner BBG with integrated pilot burner ZMI

Main burner ZIO with integrated pilot burner ZMI

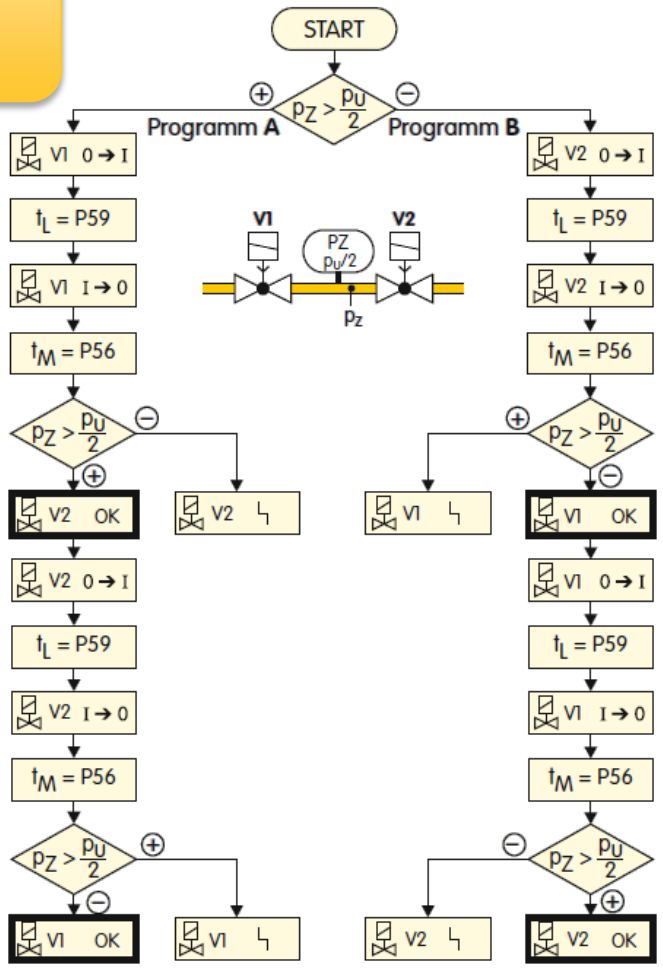


VPS as tightness control function

elster Thermal Solutions

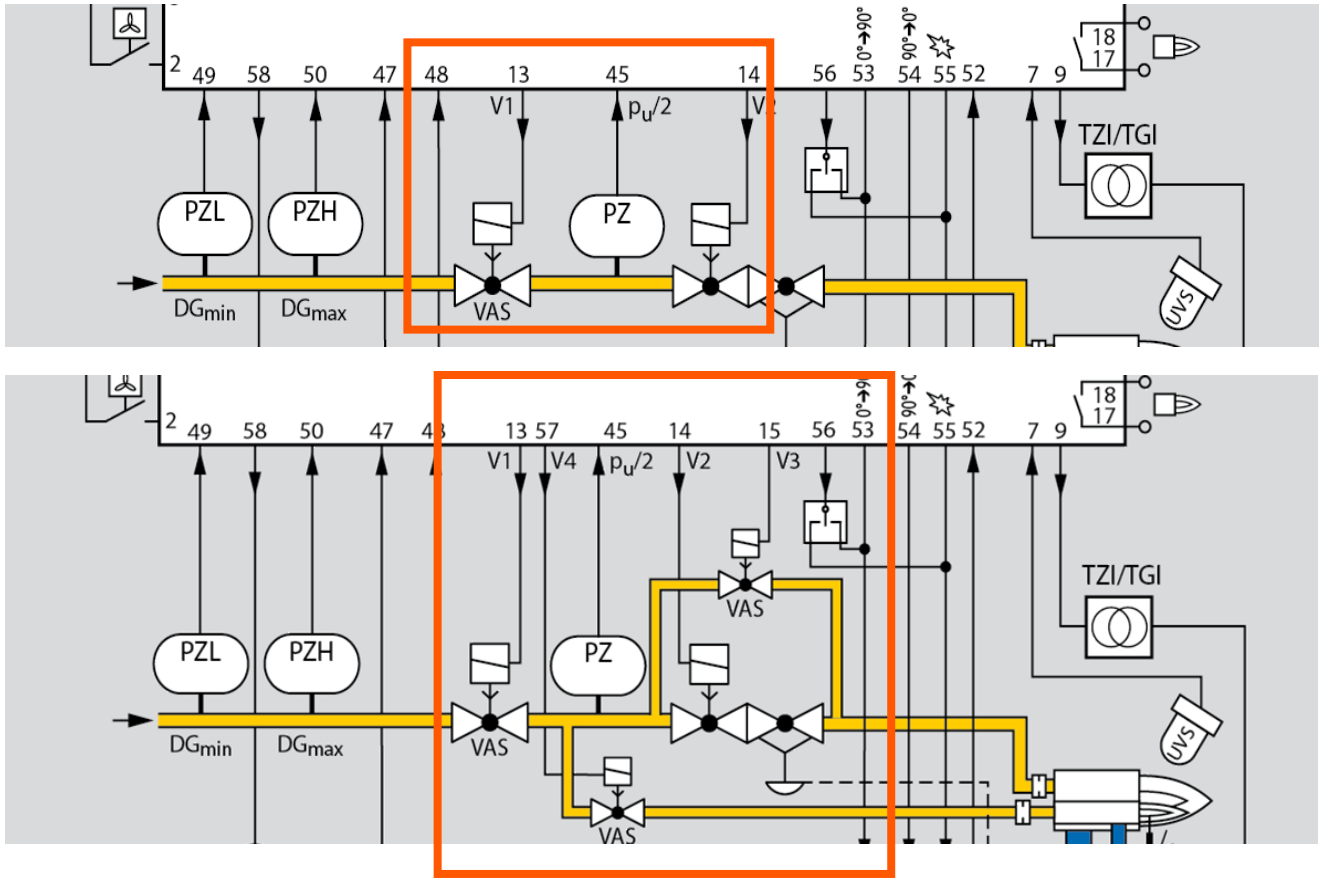
☞Tightness control of the gas valves and the piping between the valves

- Test method:
  - Gas pressure switch between gas valves
  - Testing for pressure drop during the measurement time t_M of up to 3.600s
- Required for:
  - Burner capacity ≥ 1.200kW
  - Quick start option if capacity > 70kW
- Adjustable test sequence:
  - before burner start
  - after burner shut down
  - or both



System set-up

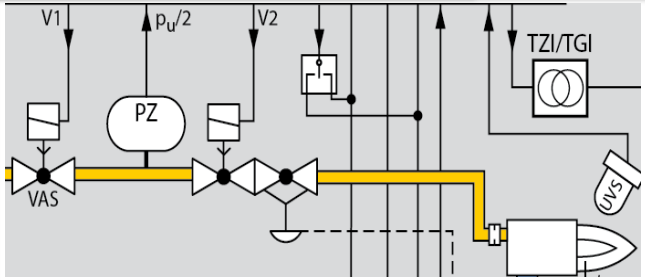
Optimized system set-up, with optional tightness control



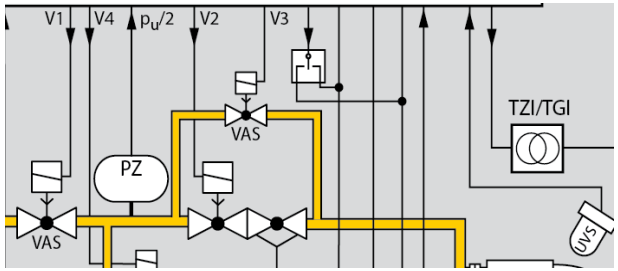
TC function: selectable relief valve

Optimized for the relevant application

Direct ignition

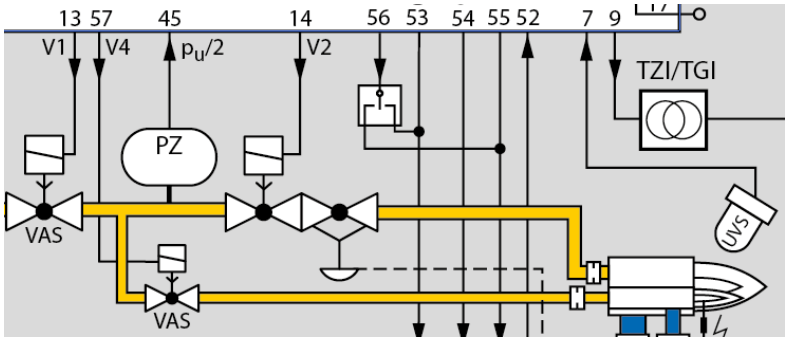


Relief valve: V2 (during pre-purge) (P52 = 2)

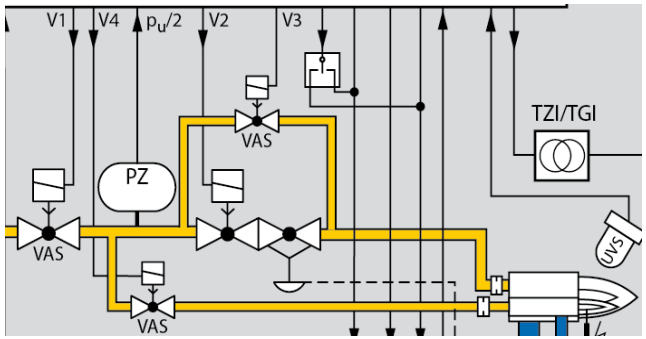


Relief valve: V3 (P52 = 3)

Pilot/main burners



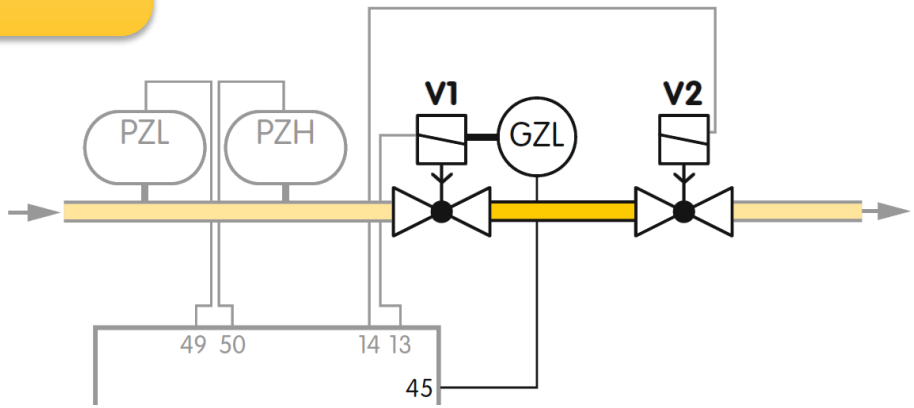
Relief valve: V4 (P52 = 4)



Relief valve: V4 (P52 = 4)

VPS as proof of closure function

☞ Valve proving system with limit switch for proof of closure

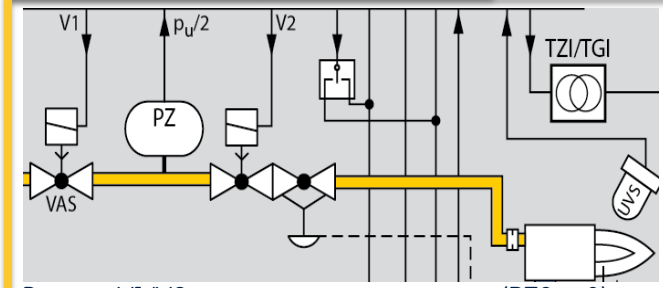


- Valve proving system for the American and Australian market
- Test method:
  - **P**roof **O**f **C**losure Switch (POC)
- Continuous function monitoring:
  - must be activated while valve is closed ⇨ Terminal 45=„1"
  - must be deactivated while valve is opened ⇨ Terminal 45=„0"

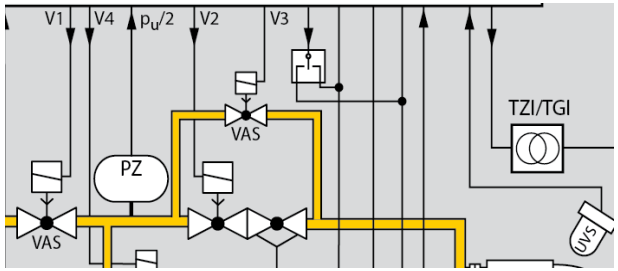
Gas supply to the burner

Optimized for the relevant application

Direct ignition

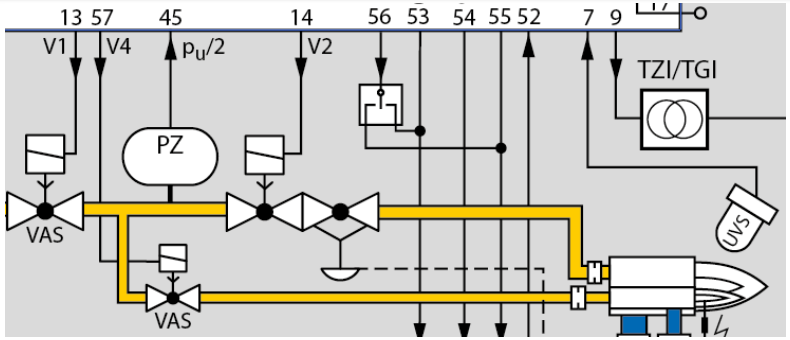


Burner: V1/V2 (P78 = 0)

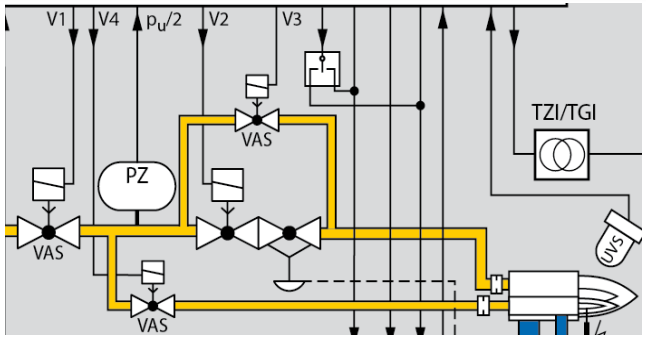


Burner: V1/V2, V3 for start gas (P78 = 1)

Pilot/main burners



Burner 1: V1/V4 (possibly shut down)
Burner 2: V1/V2 (P78 = 2)

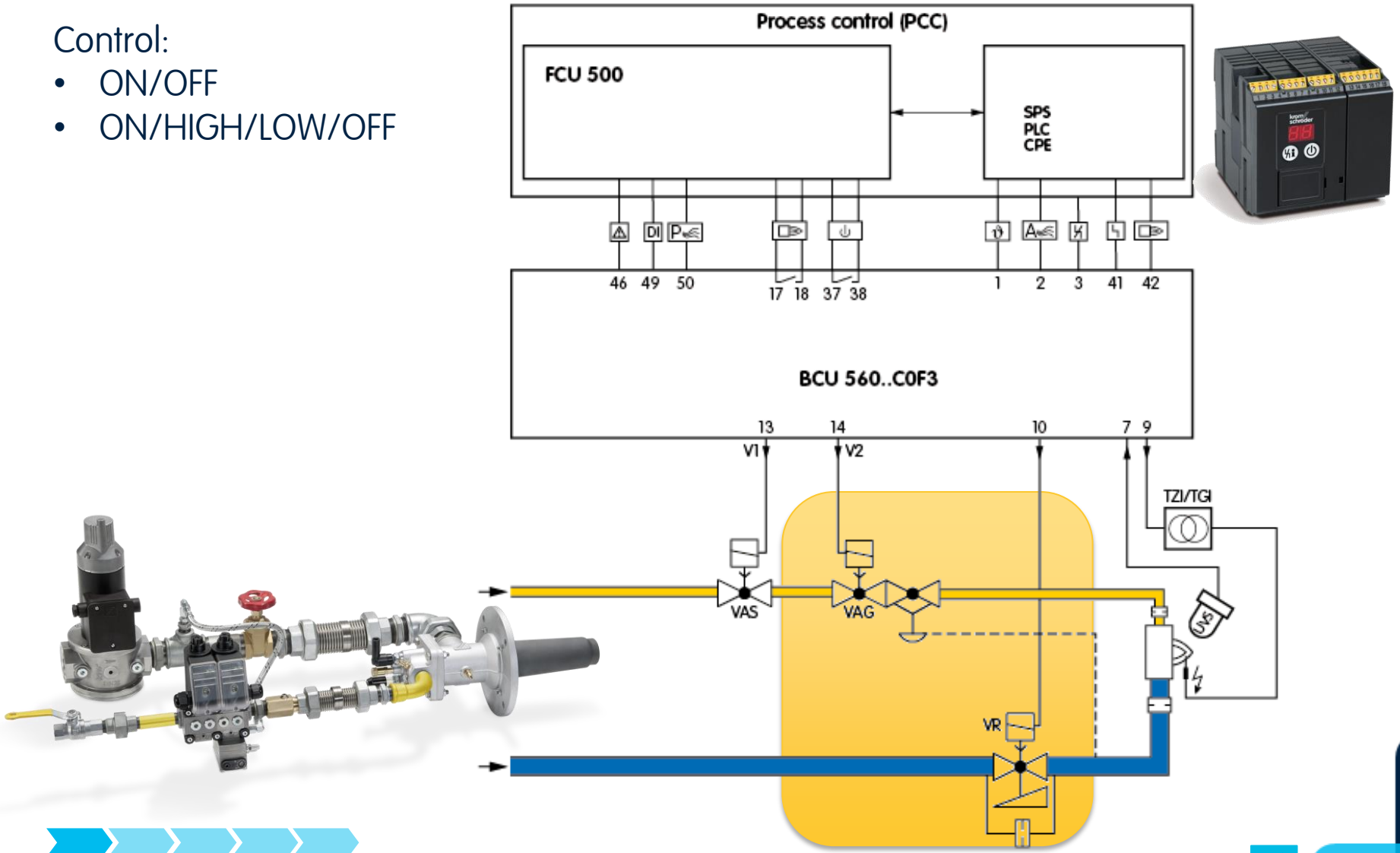


Burner 1: V1/V4 (possibly shut down)
Burner 2: V1/V3 -> V1/V2, V3 for start gas (P78 = 3)

BCU 560:Two-stage-controlled burner

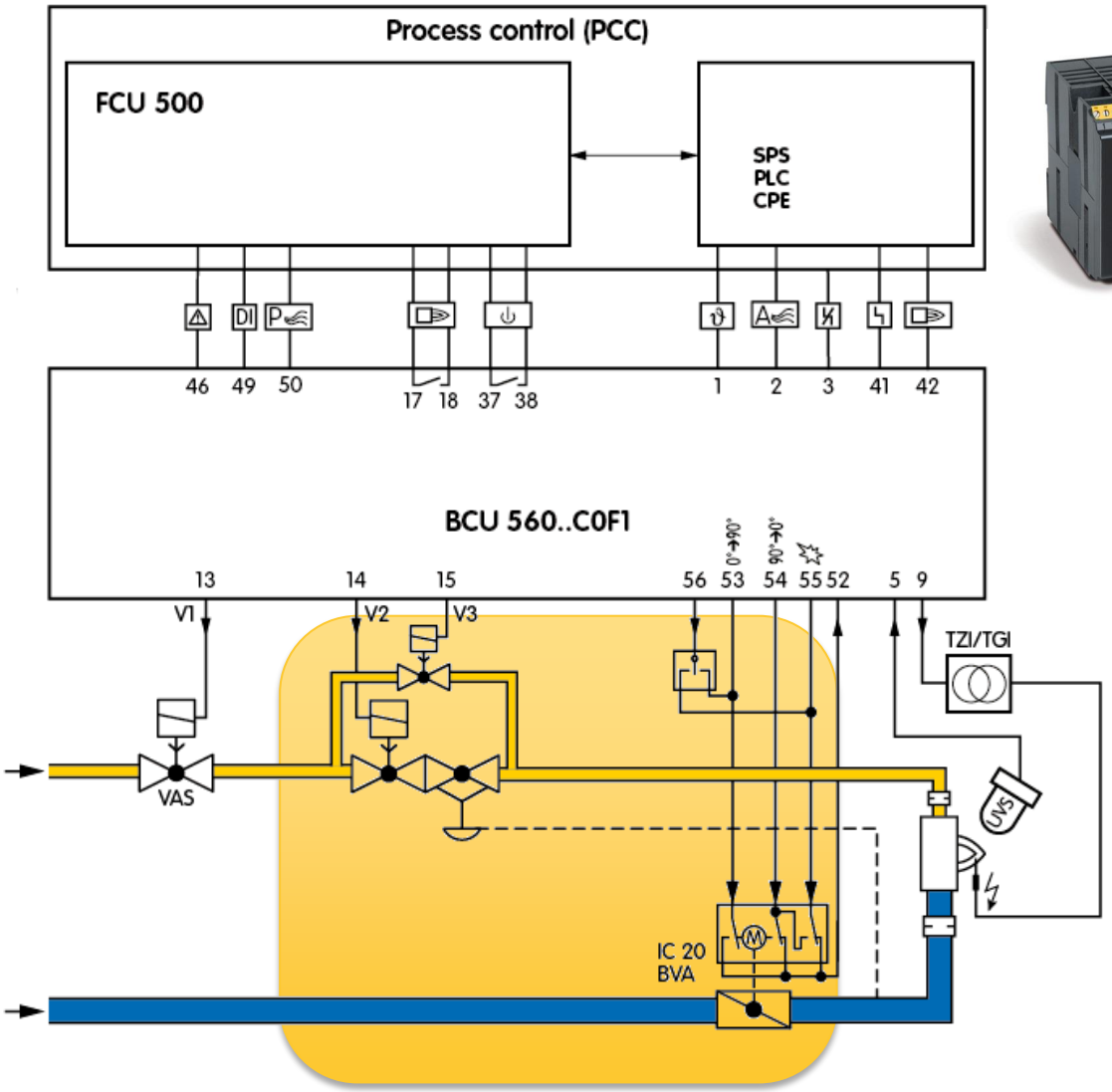
Control:

- ON/OFF
- ON/HIGH/LOW/OFF



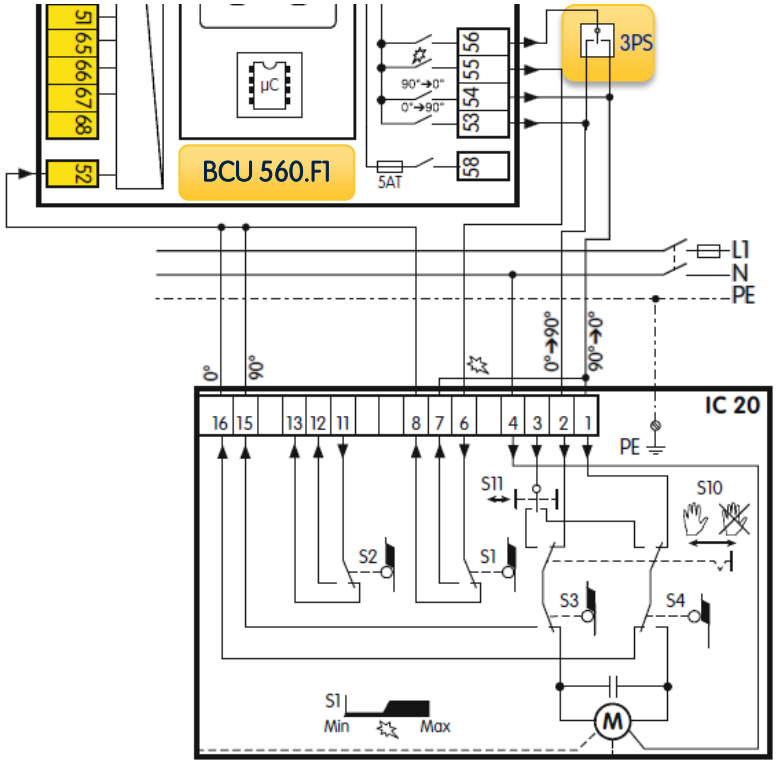
BCU 560: Modulating-controlled burner

capacity control function
BCU..F1 and BCU..F2



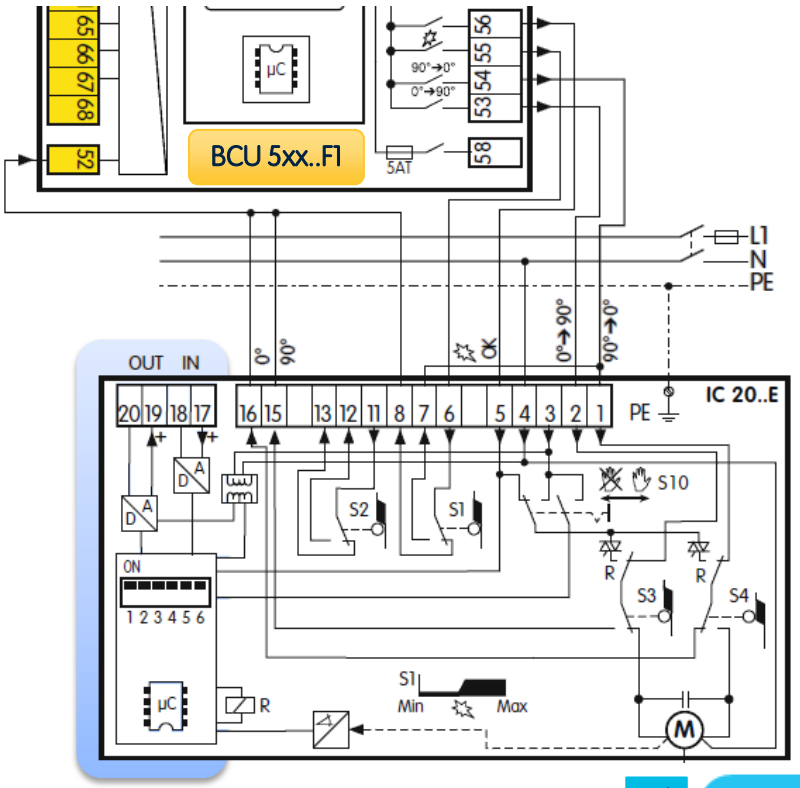
Interface for actuator IC 20

- Burner startup sequence by BCU
- With controller enable the control takes over to a temperature controller
- Continuous control by an ext. three-point-step temperature controller



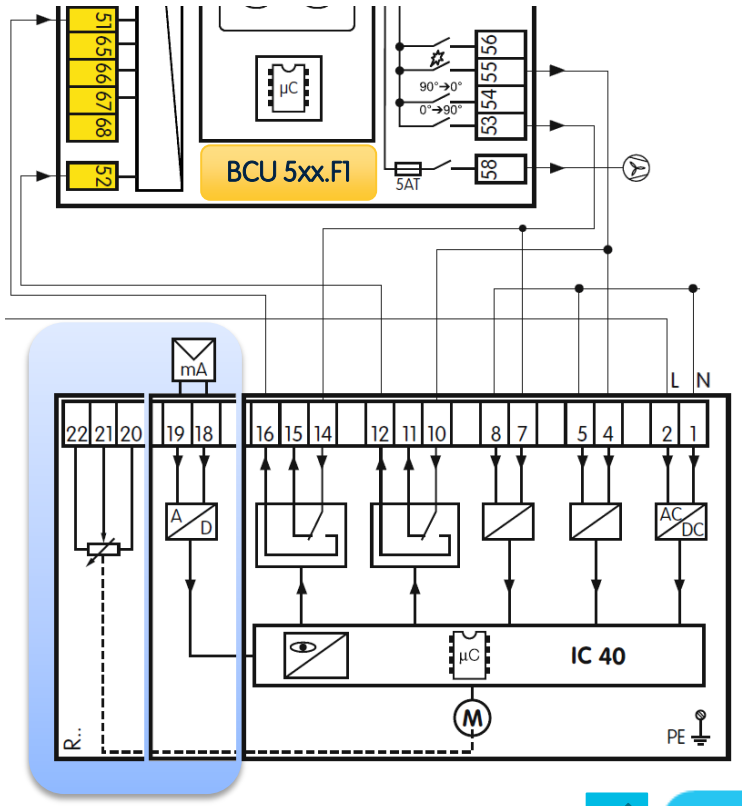
Interface for actuator IC 20..E

- Burner startup sequence by BCU
- With controller enable the control takes over to a temperature controller
- Continuous control by an ext. continuous temperature controller (0/4..20mA)



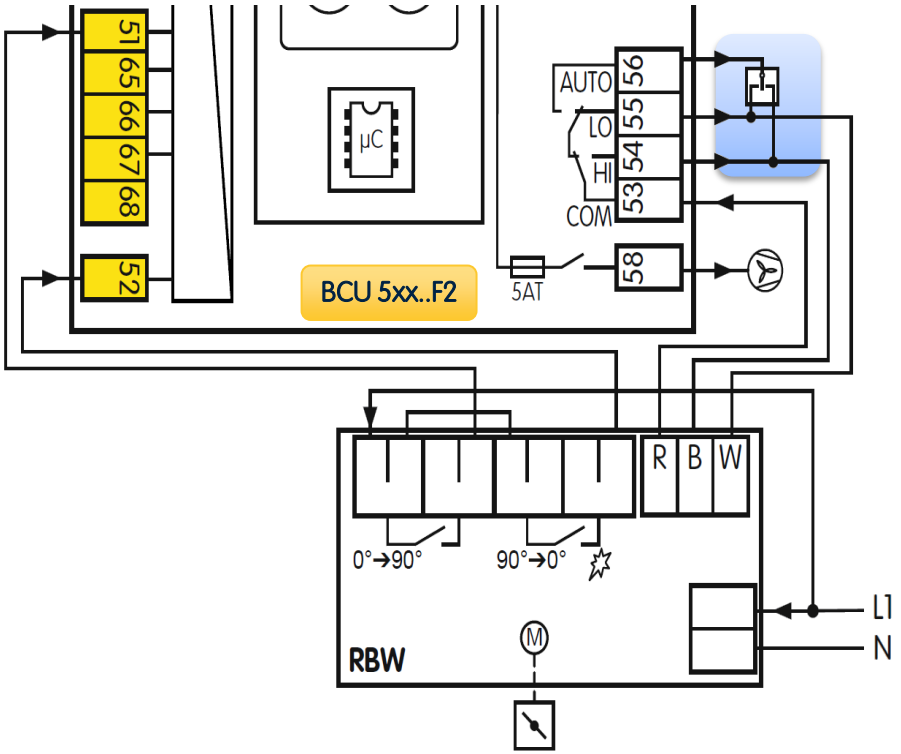
Interface for actuator IC 40

- Burner startup sequence by BCU
- With controller enable the control takes over to a temperature controller
- Continuous control by an ext. continuous temperature controller (0/4..20mA)



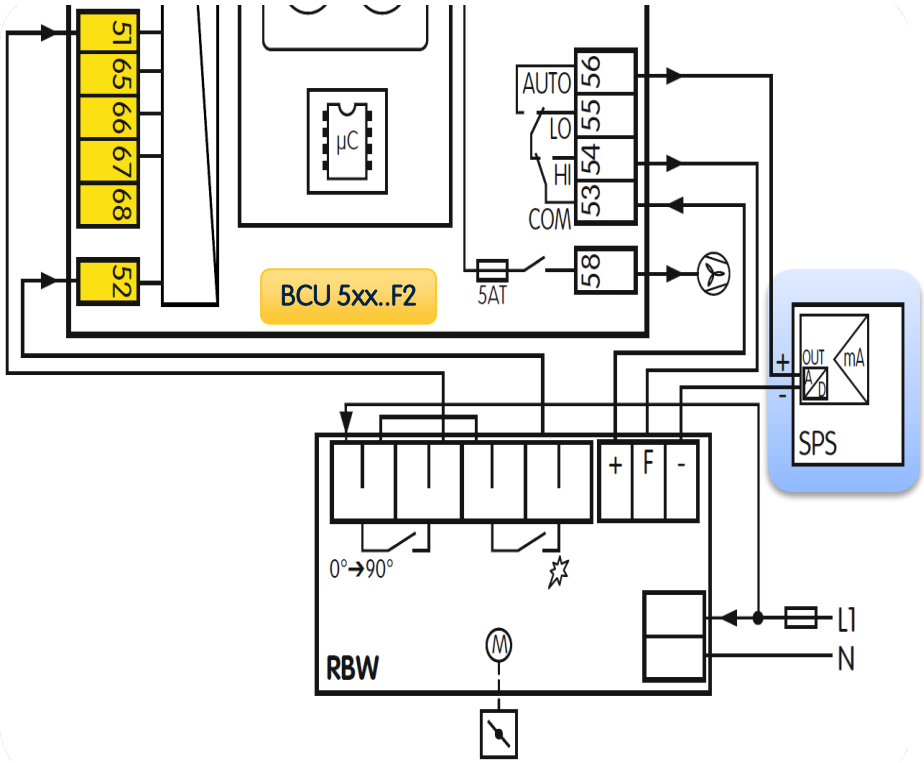
Interface for Honeywell actuator (RBW)

- Burner startup sequence by BCU
- With controller enable the control takes over to a temperature controller
- Continuous control by an ext. three-point-step temperature controller



Interface for Honeywell actuator (RBW)

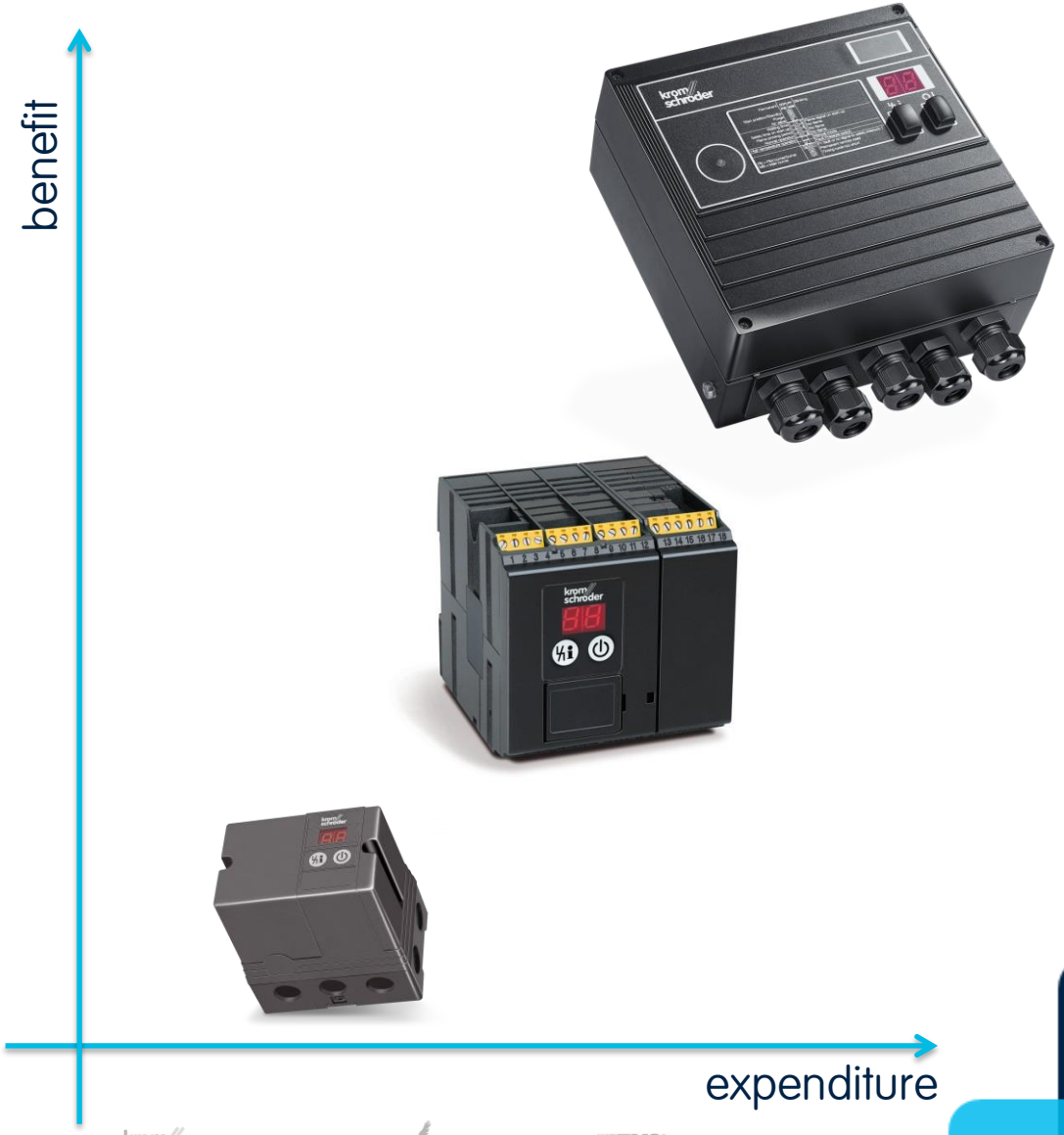
- Burner startup sequence by BCU
- With controller enable the control takes over to a temperature controller
- Continuous control by an ext. continuous temperature controller (0/4..20mA)



Replacement for IFS / IFD

Replacement with new products

- BCU 4xx
- BCU 560
  - SOP ca. Q1 2015
- IFD 258



Replacement with BCU 5xx

Integration of features optimises costs and increases design safety

Replacement with BCU 4xx

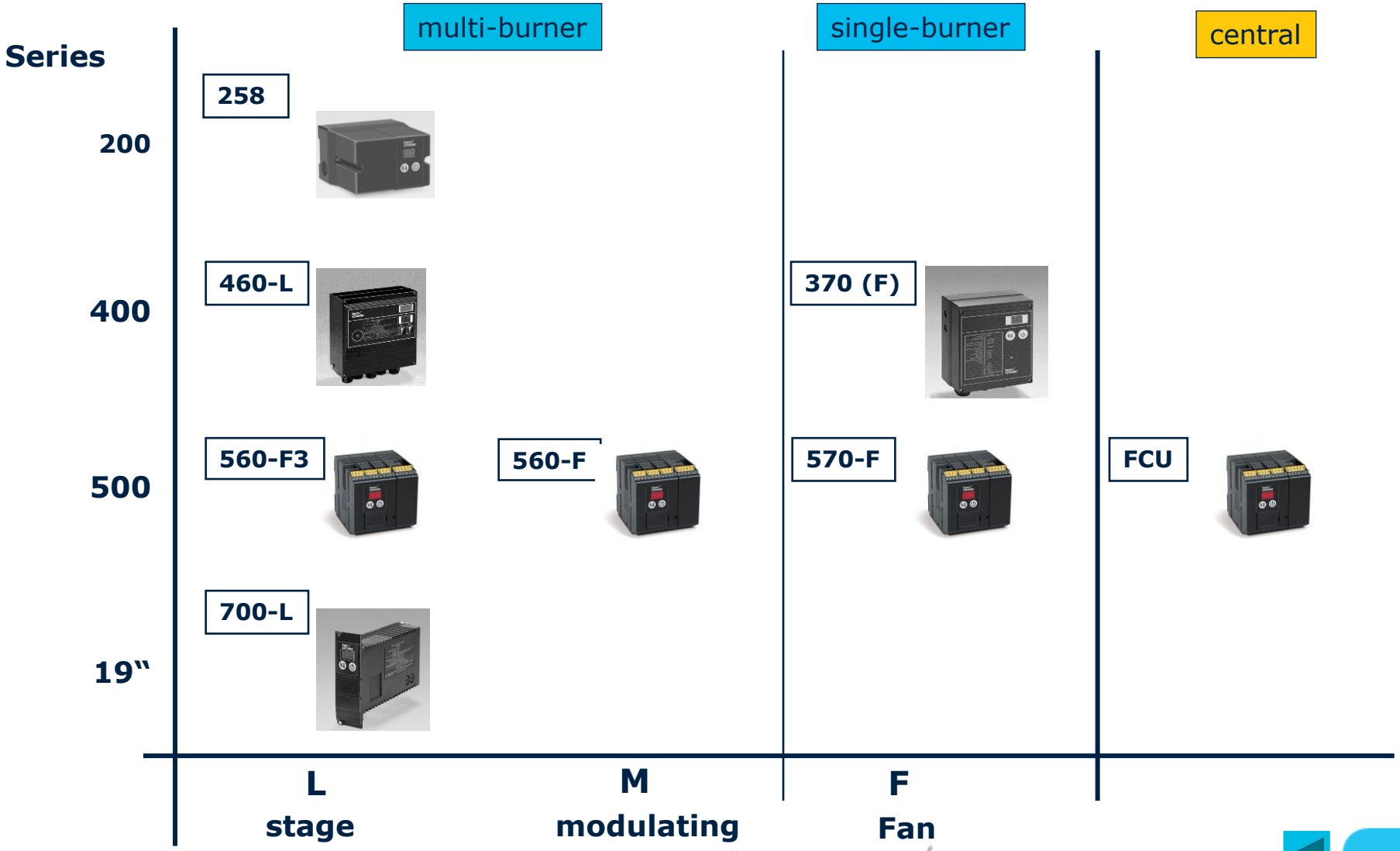
Integration of features optimises costs and increases design safety

- $ Burner control
- $ Ignition transformer
- $ Wiring
- $ Air valve control
- $ Housing
- $ Terminals
- $ Operating/diagnosis interface

- $ Logistics
- $ Engineering

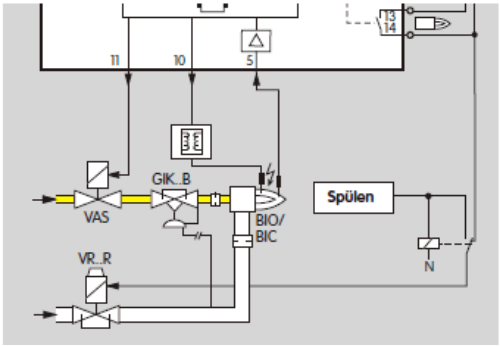
Product overview Kromschröder burner controls industrial

elster Thermal Solutions



Arguments for the replacement

- permanent operation
- visualization
- bus communication
- Savings in the wiring
  - 24V input and output
- air control
  - how does it work at all with the current devices?
- Approval

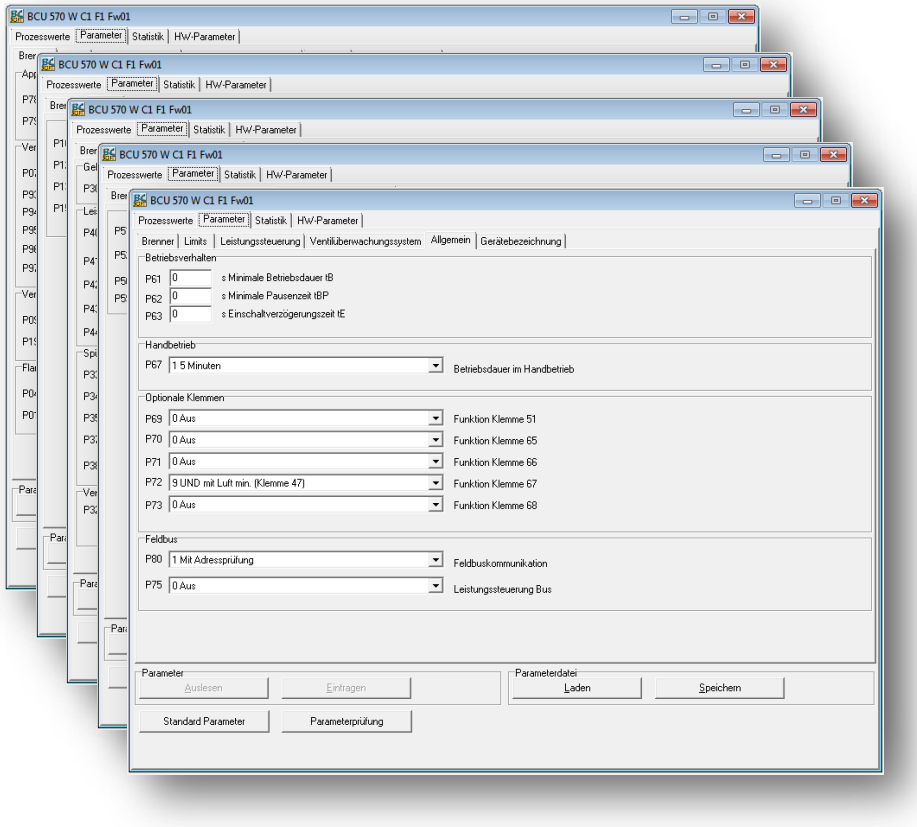


Parameter setting

Parameter setting defines the function of the device

BCSoft parameter windows:

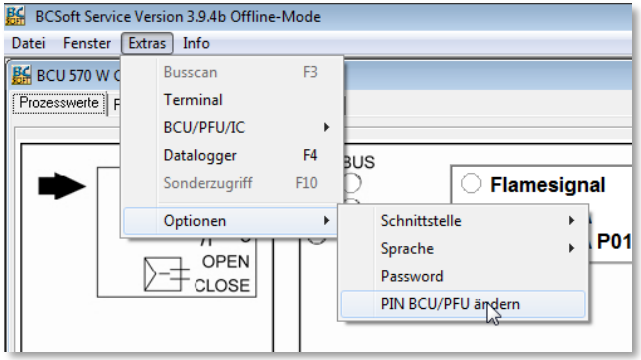
- Burner
- Limits
- capacity control
- Valve proving system
- Common
- Device name



Parameter setting

Protection of device settings

- Password protected parameter changing
- Password will be specified when ordering
- Parameter settings and changing with BCSoft
- Documentation and archiving BCSoft

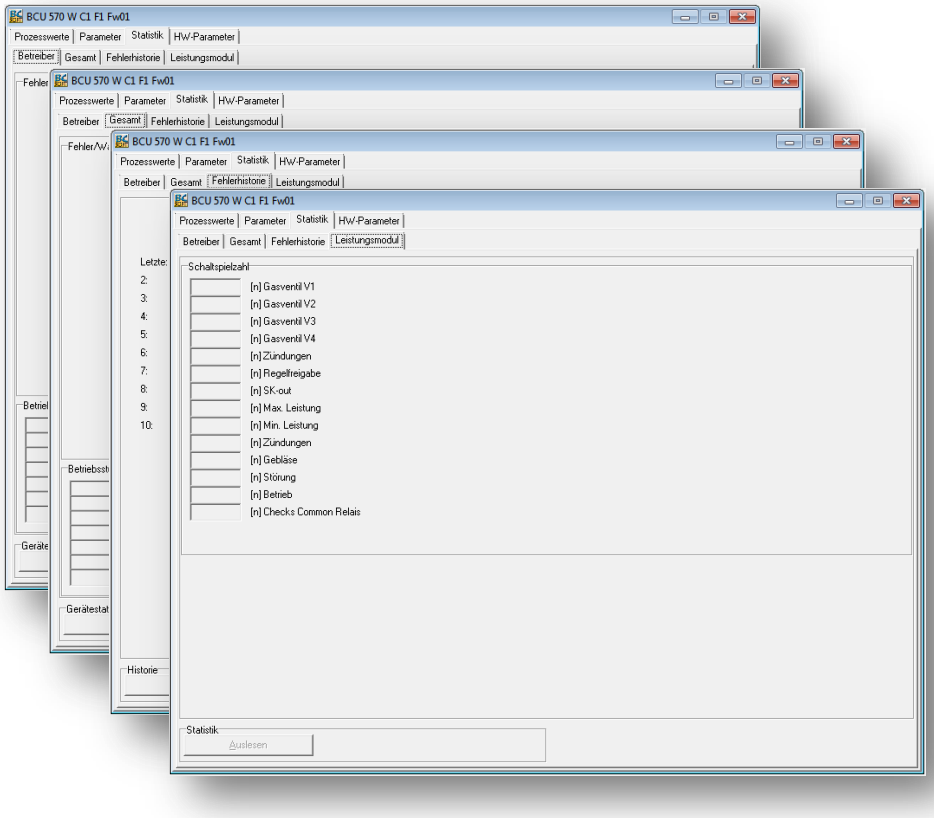


Importand:

In case of afterwards parameter changing this must be documented and archived with BCSoft.

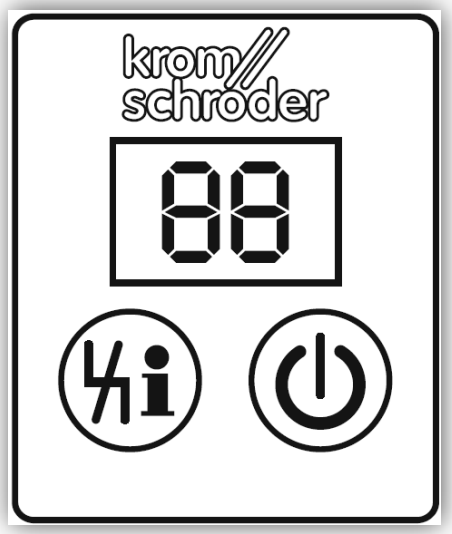
Device statistic

- Operator statistic
  - can be reset
- Device statistic
  - can <u>not</u> be reset
- Error history
- History of load module



Status display BCU 5xx

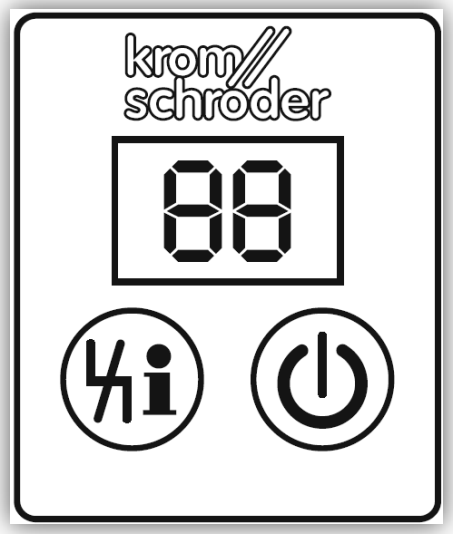
- Easy system diagnostics using the two digit display
- Unique program step and status display



DISPLAY	Program status
00	Start-up position/standby
d0	"No flow" state check of air deficiency cut-out
d1	Air deficiency cut-out scan
H0	Minimum pause time
H2	Waiting for start enable
H8	Waiting for burner operating signal
Ac	Approach minimum capacity/closed position
Ao	Approach maximum capacity
A,	Approach ignition capacity
P1	Pre-purge time t_{PV}
P9	Post-purge time t_{PN}
tc	Valve check
01	Fan run-up time t_{GV}
03	Pre-ignition time t_{VZ}
04	First safety time t_{SA1}
05	First flame proving period t_{FS1}
06	Second safety time t_{SA2}
07	Second flame proving period $t_{FS\ 2}$
08	Operation/controller enable
09	Over-run time up to minimum capacity
C1	Controlled air flow
U1	Remote control with OCU
Sr	Data transfer (programming mode)
--	Unit off

Fault message BCU 5xx

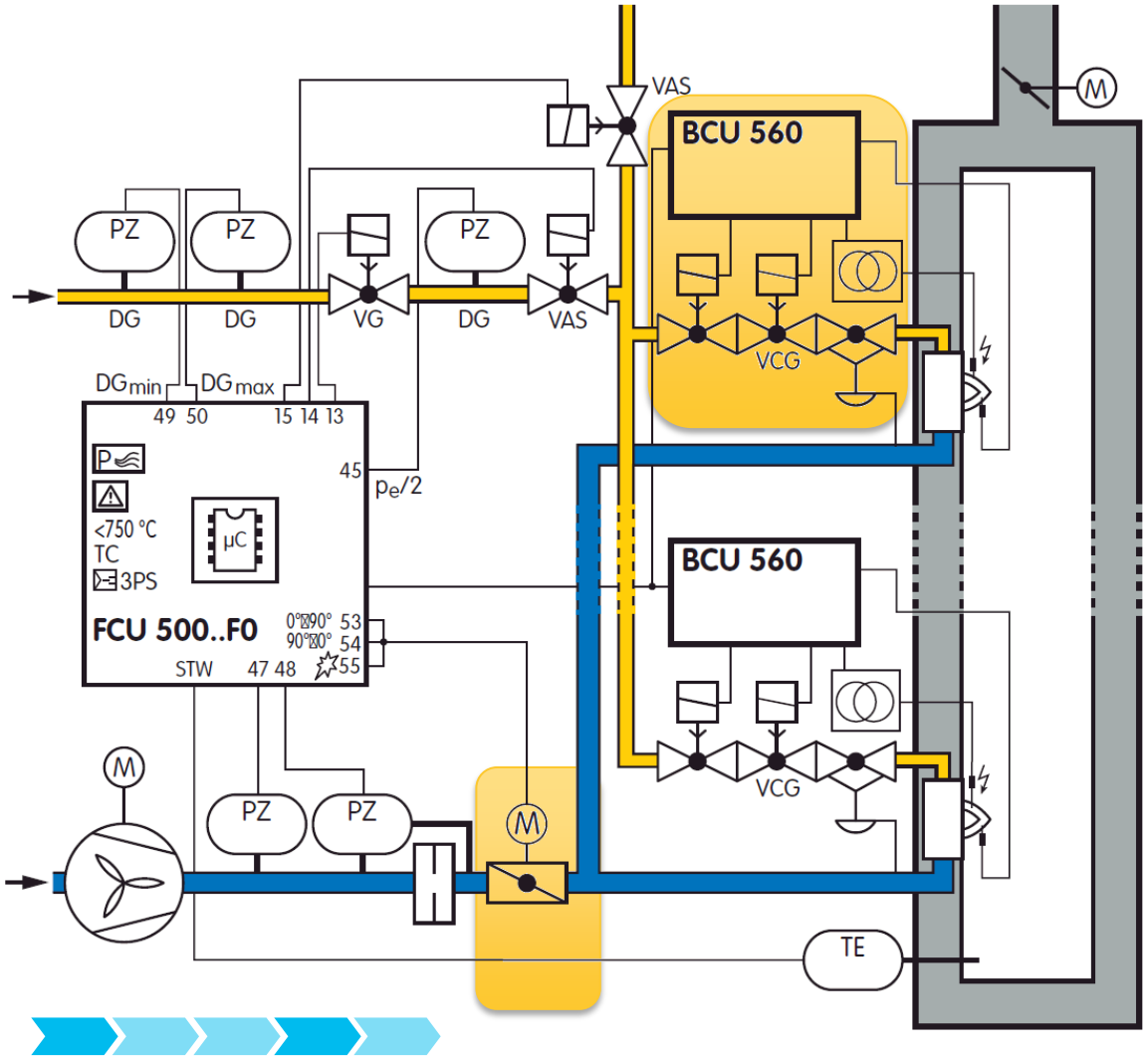
Quick system diagnosis and trouble shooting thanks to specified status messaging



Fault message (blinking)	DISPLAY	Description
Flame simulation	01	Flame signal before ignition
Start-up without flame signal	04	No flame formation to end of 1st safety time
Flame failure during 1st flame proving period t_{FS1}	05	
Flame failure during 2nd safety time t_{SA2}	06	No flame formation to end of 2nd safety time
Flame failure during 2nd flame proving period t_{FS2}	07	
Flame failure during operation or during the controller enable signal delay time t_{RF}	08	
Too many remote resets	10	Remote reset activated > 5 × in 15 min.
Too many restarts	11	> 5 restarts in 15 minutes
Feedback of controller enable	20	Faulty feedback
Simultaneous activation of inputs at terminals 51 and 52	21	"Purge position" and "Ignition position" feedback from butterfly valve set simultaneously
Faulty butterfly valve control	22	Faulty wiring of terminals 52 to 55
Feedback from actuator/frequency converter	23	Purge/Ignition position is not constantly signalled back to terminal 52
Bus control	24	Bus control "Purge" and "Close" set simultaneously
Non-fail-safe parameters (NFS) inconsistent	30	NFS parameter range is inconsistent
Fail-safe parameters (FS) inconsistent	31	FS parameter range is inconsistent
Over-/Undervoltage	32	Operating voltage too high/low
Faulty parametrization	33	Parameter set contains illegal settings
Power module defective	36	Relay contact error
Fan feedback	38	Fan defective
Inlet valve(s) leaking	40	Leak found on inlet valve
Outlet valve(s) leaking	41	Leak found on outlet valve

Application: modulating control

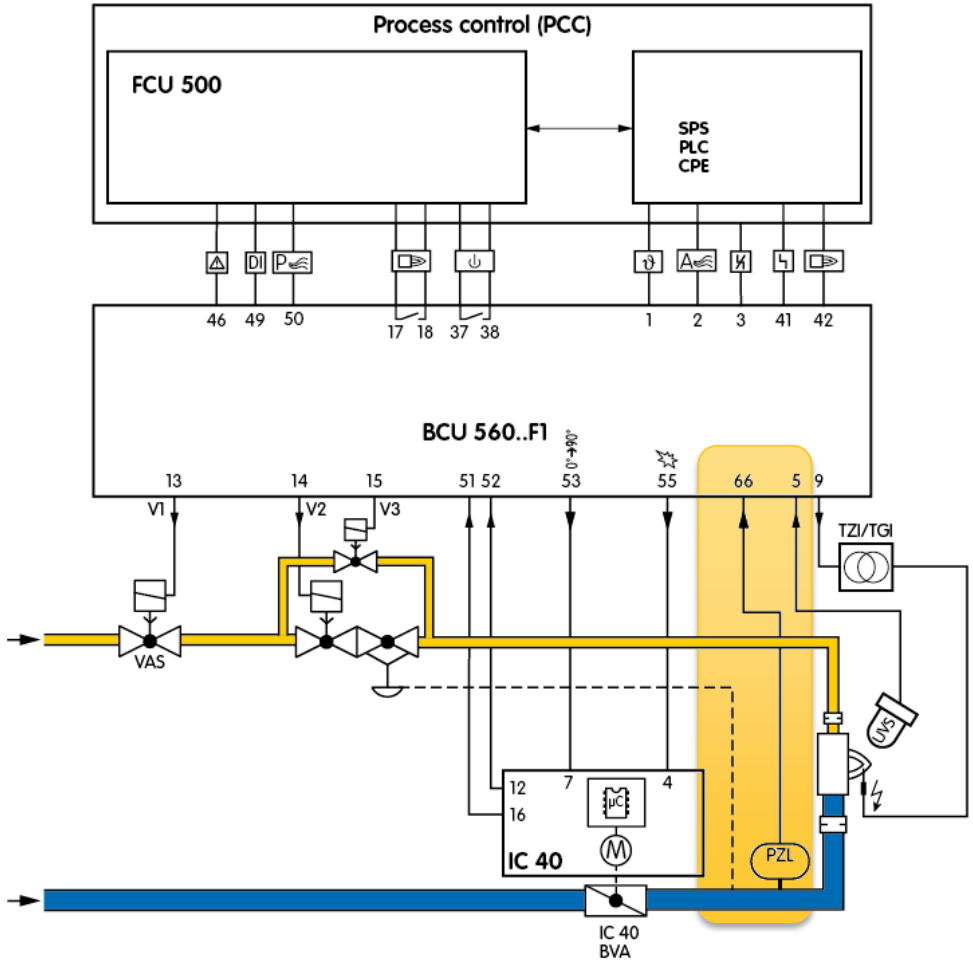
Furnace modulation via common air valve



Burner start-up only in ignition position !
P71 = 20 (LDS)

IC 40 with monitoring of the ignition position

Monitoring of the ignition position



Burner start-up only in ignition position !
P71 = 20 (LDS)


Thank you
elster
Kromschröder