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# APPROVAL REPORT

## BCU 370 BURNER CONTROL UNIT FOR BURNER APPLICATIONS

Prepared for:


Kromschroeder AG  
Postfach 2809  
D49018 Osnabrueck  
GERMANY

Project ID: 3023457

Class: 7611

Date of Approval:

Authorized by:

*17 NOVEMBER 2005*  
  
R. Martell Asst. Vice President.

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## BCU 370 BURNER CONTROL UNIT FOR BURNER APPLICATIONS

from

**Kromschroeder AG  
Postfach 2809  
D49018 Osnabrueck  
GERMANY**

### I INTRODUCTION

1.1 Kromschroeder AG (manufacturer) has requested Approval of their BCU 370 Burner Control Unit for compliance with the standard listed in 1.3.

1.2 This Report may be freely reproduced only in its entirety and without modification.

#### 1.3 Standards

Title	Class No.	Issue Date
Combustion Safeguards and Flame Sensing Systems	7610	June 1997

1.4 This examination and Approval includes only the items covered in this Report against the Class Standards listed above. It does not include additional products and classifications that may be included in the Application and/or Operation Manuals.

1.5 **Listing:** The equipment will be listed in the Fire Protection Book, Chapter 9 of the *Approval Guide* a publication of FM Approvals under the heading *COMBUSTION SAFEGUARDS, Automatic-Lighted Burners* as follows:

Type BCU 370 W (or Q) I1\* (or I2\*\*, I3\*\*) FE U0 (or U1) D1 (or D3) B1\*-3\* Z001\* (or up to Z999) V\*. For use with UVD1,UVS6 (or 8) ultraviolet flame sensors. Nominal operating voltage, 120 or 230Vac, 50/60Hz

\*Code omitted if not applicable. \*\*I2 only for 230V, I3 only for 120V

### II DESCRIPTION

The BCU 370 Burner Control Unit controls, ignites and monitors industrial forced draught burners. Programmability is achieved through the BCSOFT PC software and optical interface. The software allows configuration of the Flame Failure Response Time for 1 or 2 seconds, Pilot and Main Flame Trial for Ignition time from 2 to 10 seconds, and Pre-Purge time from 0 to 250 seconds. Additional adjustable parameters are shown on the attached manufacturer's document. The controller contains relays for signaling the external butterfly valves. The controller operates at a nominal voltage of 120Vac (option "Q") or 230Vac (Option "W"). The manufacturer's operating ambient temperature range is -20°C to +60°C.

### III MARKINGS

Marking meets standard requirements as illustrated by the attached label drawing. Marking is on adhesive backed nameplates attached to the side of the controller.

### IV EXAMINATIONS AND TESTS

#### 4.1 General

Representative samples of the BCU 370 Burner Control Unit configured for 120 and 230Vac, with and without Profibus, connected to a UVS8 Flame Sensor were examined and tested by FM Approvals in Norwood, MA to determine their acceptability in accordance with the applicable standard. Additional testing for 1 sec. FFRT at a flame cut-off threshold of  $1\mu\text{A}$  was conducted at Kromschroeder AG's facility in Lotte (Bueren), Germany, and witnessed by FM Approvals' Senior Engineer David Baer. Examination showed that the samples were constructed in accordance with the manufacturer's drawings and description and FM Approval requirements. Results of the applicable examination and testing are outlined below.

#### 4.2 Operating Characteristics – Combustion Safeguards

The sample BCU 370 Controllers operated properly through their specified normal start-up and shut-down procedures. Presence of a flame signal prior to the ignition cycle resulted in a shutdown and lockout.

#### 4.3 Flame Failure Response Time (FFRT)

Flame Failure Response Time (FFRT) was measured for 10 operational cycles with the BCU 370 120Vac version set at the maximum setting of 2 seconds. The average response times, including  $3\sigma$  (standard deviation), was 2 seconds. Measurements were taken on a BCU 370 230Vac ProfiBus version at the minimum setting of 1 second and at the maximum setting of 2 seconds. The average response times, including  $3\sigma$  (standard deviation), was 0.829 seconds and 2.19 seconds respectively. The measurements are below 110% of the manufacturer's specified maximums and the 4 second maximum allowed by FM Class 7610 and is acceptable.

#### 4.4 Trial For Ignition (TFI)

Trial for Ignition was measured for 10 operational cycles with the BCU 370 120Vac version set at the minimum setting of 2 seconds and at the maximum setting of 10 seconds. The average response times, including  $3\sigma$  (standard deviation), was 1.929 seconds and 9.928 seconds respectively. The measurements are below 110% of the manufacturer's specified maximums as required by FM Class 7610 and are acceptable.

#### 4.5 Purge Cycle

The Purge cycle was measured for 10 operational cycles with the BCU 370 120Vac version set at  $t_5$  seconds. The average response times, including  $3\sigma$  (standard deviation), was 6.42 seconds. The measurements are not less than the manufacturer's specified value as required by FM Class 7610 and are acceptable.

#### 4.6 Durability

The output relays are Tyco Schrack Miniature Power PCB Relay MSR; V23061-A1005-A30 (P/N 35446362 -2) and Tyco Schrack Power PCB Relay RT1 Inrush; RT33L012 (P/N 35453616). These relays are the same as those used in the FM Approved BCU 4xx Controllers approved under Project ID 3006558; therefore no further testing was required.

**4.7 Voltage Variation**

The BCU 370 120Vac version was subjected to an input voltage of 102Vac (85% of rated voltage) and 132Vac (110% of rated voltage). There was no change in operating characteristics or FFRT. Testing of this sample was considered representative of the BCU 370 series. These results are acceptable.

**4.8 Ambient Temperature Effects**

The BCU 370 was conditioned for a minimum of four hours at -20°C and +60°C. The controller operated properly and consistently at these temperatures and upon return to room temperature. There was no change in FFRT measurements. These results are acceptable.

**4.9 Safety Related Operating Characteristics**

The equipment was examined to determine that an operator cannot readily access or alter safety characteristics. Operating characteristics other than those described herein cannot be manipulated by the operator.

**V REMARKS**

5.1 Installations shall comply with the requirements of the relevant edition of the National Electrical Code (ANSI/NFPA 70).

5.2 Installations shall comply with the latest edition of the manufacturer's instruction manual.

5.3 Tampering and replacement with nonfactory components may adversely affect the safe use of the system.

**VI FACILITIES AND PROCEDURES AUDIT**

The Kromschroeder AG manufacturing site in Osnabrueck, Germany has been audited to determine the suitability of the manufacturing facilities. This site is subject to follow-up audit inspections. The facilities and quality control procedures in place were found to be satisfactory to manufacture product identical to that examined and tested as described in this report.

**VII MANUFACTURERS RESPONSIBILITIES**

Documentation considered critical to this Approval is on file at FM Approvals and listed in Section VIII. No changes of any nature shall be implemented unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The Approved Product Revision Report, Form 797, shall be forwarded to FM Approvals as notice of proposed changes.

## VIII DOCUMENTATION

The following critical documents were used for this examination and are filed under Project ID 3023457.

Drawing No.	Description	Rev.
3250470	Installation Manual	10.05
34000609	Housing, Lower Part, BCU 300	1
34000610	Housing, Upper Part, BCU 370	1
34337422	PCB Layout BCU3xx	4
34337423	PCB Layout BCU3xx L1	1
34337424	PCB Layout BCU3xx R1	1
35453630	Ignition Transformer 1-Pole E4718/55	0
35454468	Ignition Transformer 2-Pole E4718/54	0
35454932	Power Transformer - Netztrafo E148/9VA	0
35455280	Ignition Transformer EBI 1P 120V	0
35455281	Ignition Transformer EBI M 120V	0
74337425	PCB & BOM BCU3xx SMD	2
74337426	PCB & BOM BCU3xx 230V	1
75454715	Programming Instructions BCU3xx	2
75455756	Name Plate Overview	0
75455766	BCU 370 Model Code	0
S4214009	Circuit Diagram	1
S5454710	BCU 300 M Connections L1, R1	0
V4337741	Assembly BCU 3xx Profibus	0
V4337742	Assembly BCU 3xx	0
V5455463	Housing - Lower UnitBCU37xk W(Q)	0
V5455464	Housing - Lower UnitBCU37xk W12	0
V5455465	Housing - Lower UnitBCU37xk W11	0
V5455466	Housing - Lower UnitBCU37xk W(Q) B1	2
V5455467	Housing - Lower UnitBCU37xk W12 B1	2
V5455468	Housing - Lower UnitBCU37xk W11 B1	2
V5455470	Housing - Lower UnitBCU37xk Q11	0
V5455471	Housing - Lower UnitBCU37xk Q13	0
V5455472	Housing - Lower UnitBCU37xk Q11 B1	1
V5455473	Housing - Lower UnitBCU37xk Q13 B1	1

**IX CONCLUSION**

The apparatus listed in Section 1.5 meets FM Approvals requirements. Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective the date of this report.


**EXAMINATION AND TESTING BY:** C. Gagliardi, D. Baer

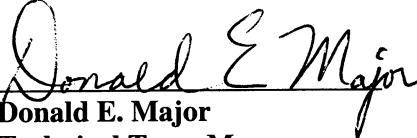
**PROJECT DATA RECORD:** 3023457

**ATTACHMENTS:** Dwg. 75455756, Rev. 0 – Name Plate Overview  
Dwg. 75455766, Rev. 0 – Model Code Drawing  
Parameter Description

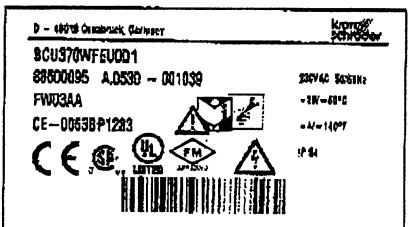
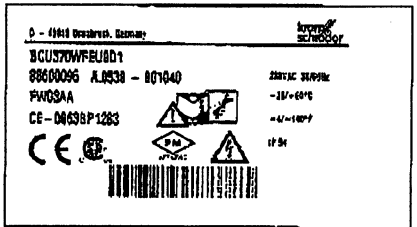
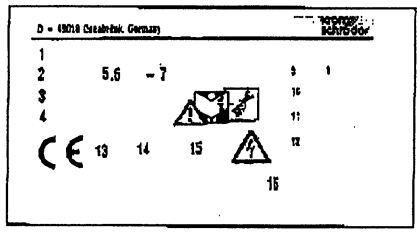
**REPORT BY:**

**REPORT REVIEWED BY**

  
Cheryl A. Gagliardi  
Senior Engineer  
Electrical Systems

  
Donald E. Major  
Technical Team Manager  
Electrical Systems

Field No.:	Field Name:	Example	New Field Entries
1	Type Code	BCU370WFEU0D1	
2	Ident-Number:	88600095	
3	Firmware:	FW03AA	
4	CE Approval Pin Number	CE-0063BP1283	
5	Construction State	A	
6	Week and Year of Production	0530	
7	Serial Number	001040	
8	Supply Voltage	230VAC	
9	Supply Voltage Frequency	50/60Hz	
10	Temperature Celsius	-20/+60 °C	
11	Temperature Farenheit	-4/+140 °F	
12	Symbol Zulassung:	CE	
13	Approval Mark	CSA	
14	Approval Mark	UL	
15	Approval Mark	FM	
16	Bar Code		



**Applicable Models:**

- BCU 370 Type
- BCU 370..W..
- BCU 370..W..I1..
- BCU 370..W..I2..
- BCU 370..W..I3..
- BCU 370..Q..
- BCU 370..Q..I1..
- BCU 370..Q..I2..
- BCU 370..Q..I3..
- BCU 370..W.....B1..
- BCU 370..W..I1..B1..
- BCU 370..W..I2..B1..
- BCU 370..W..I3..B1..
- BCU 370..Q.....B1..
- BCU 370..Q..I1..B1..
- BCU 370..Q..I2..B1..
- BCU 370..Q..I3..B1..

Ersatz für:			Name Plate Overview			
Änderungsinfo	Name	Datum				
ÄM-Nr						
Kurztext	Geräte-Kurzbezeichnung: BCU 3xx					
<p>D - 49018 Osnabrück, Germany</p>			Name	Datum		
			Erstellt:	Borgmann 12.08.2005	75455756	0
			Freigabe:		Zeichnungsnummer	Index
			Status:	In Arbeit	Bl.Nr. 1/1	

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## Model designation BCU 370

<b>BCU</b>	<b>3</b>	<b>70</b>	<b>W</b>
Type	Product line	Version	Supply voltage
Burner control unit BCU	3	70 = modulating	W = 230 V AC, 50/60 Hz Q = 120 V AC, 50/60 Hz

Continued:

<b>I1*</b>
Ignition
I1 = Electronic ignition, single-pole I2 = Electronic ignition, double-pole** I3 = Electronic ignition, double-pole with neutral conductor**

Continued:

<b>F</b>	<b>E</b>	<b>U0</b>
Fan control	Valve control	Flame control
F = Fan control	E = Valve control	U0 = Ionisation control (continuous or intermittent op.) or UV control (intermittent op. with UVS) U1 = UV (continuous operation with UVD 1)

Continued:

<b>D1</b>	<b>B1*</b>	<b>-3*</b>
D1 = Maximum Gas Pressure monitoring D3 = Integrated tightness control	B1 = For Profibus-DP	-3 = Three-point step control via Profibus-DP


Continued:

<b>Z001*</b>	<b>V*</b>
Zxxx = Customer specific parameter setting***	V = without bottom section

\*) If "none", this specification is omitted

\*\*) I2 only for 230 V, I3 only for 120 V

\*\*\*) xxx is increased from 001 up to 999 for every customer specific parameter setting

Ersatz für:			<b>BCU 370 Model Code</b>		
Änderungsinfo	Name	Datum			
AM-Nr.			Geräte-Kurzbezeichnung:		
Kurztext			Name	Datum	75455766 0
 D - 49018 Osnabrück, Germany			Erstellt:	Borgmann	09.11.2005
			Freigabe:		
			Status:	in Arbeit	
					Bl.Nr. 1/1



## Parameters

Description	Parameter	Value range	Default	Adjustable <sup>1)</sup>
Burner flame signal	01	0–25 $\mu$ A		
Burner switch-off threshold	02	1–20 $\mu$ A	1 $\mu$ A	○
Last fault signal	03	XX		
Air monitoring during pre-purge	04	0 = Off; 1 = On	1	●
Air monitoring during operation	05	0 = Off; 1 = On	1	●
Pre-purge	06	0 = Quick start; 1 = On each start-up	1	●
Burner start-up attempts	07	1–4	1	●
Behaviour in the event of flame failure during operation	08	0 = Fault lock-out; 1 = Restart	0	●
Safety time during operation $t_{SB}$	09	1; 2 s	1 s	●
Minimum combustion time $t_B$	10	0–250 s	0 s	●
Minimum burner pause time $t_{BP}$	11	0–250 s	0 s	●
1st safety time on start-up, burner/pilot burner $t_{SA1}$	12	2; 3; 5; 10 s	5 s	●
1st flame proving period, burner/pilot burner $t_{FS1}$	13	0; 2; 5; 10; 20 s	2 s	●
2nd safety time on start-up, main burner $t_{SA2}$	14	0; 2; 3; 5; 10 s	3 s	●
2nd flame proving period, main burner $t_{FS2}$	15	0; 2; 5; 10; 20 s	2 s	●
Operating time in manual mode	16	0 = Unlimited; 1 = Limited to 5 minutes	1	●
UVS check (1 x in 24 hours)	17	0 = Off; 1 = On	0	●
Pre-purge time $t_{PV}$	18	0–250 s	30 s	●
Post-purge time $t_{PN}$	19	0–250 s	0 s	●
Fan run up time $t_{GV}$	20	0–25 s	2 s	●

Description	Parameter	Value range	Default	Adjustable <sup>1)</sup>
Pre-ignition time $t_{VZ}$	21	0–5 s	1 s	●
Switch-on delay time $t_E$	22	0–250 s	0 s	●
Min. gas pressure monitoring	23	0 = Off; 1 = On	1	●
Digital input function	24	0 = – 1 = $DG_{max}$ . 3 = Tightness control.	1	○
Valve control	25	0 = Off; 1 = On	1	●
Tightness test period $t_p$	26	10; 20; 30–250 s	10 s	○
V2 during burner operation	27	0 = Off; 1 = On	0	●
Quick start starts in	28	0 = Ignition position; 1 = Closed position	0	●
Controller enable signal delay time $t_{PF}$	29	0; 10; 20; 30–250 s	0 s	●
User-defined password	30	0000–9999	XXXX	● <sup>2)</sup>
Bus control activation (on BCU..B1-3)	31	0 = Off; 1 = On	1	○
Bus control limitation (on BCU..B1-3)	32	0 = Closed position 1 = Low position 2 = Ignition position	2	○
The last 10 fault messages	81–90	XX		

1) Adjustable using BCSOft software and a PC opto-adaptor.

2) Will not be displayed.

● = Adjustable

○ = Depends on hardware configuration