SERVICE MANUAL

SAFE 2010 / MAXI SAFE 2010

ID 807245

Symbols used in this manual

	**WARNING** Used in case of danger of a serious accident or when documentation needs to be consulted.
☞	**NOTE** Used to direct attention to a special item.

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1. Introduction

This Service Manual for SAFE 2010/MAXI SAFE 2010 is meant to assist in performing service. It is to be used in conjunction with the Instruction Manual.

2. Test and adjustment procedures

The test procedures are only given as guide lines. Special rules in different countries may require specific procedures.

To ensure safe operation the setting of the alarm of SAFE 2010/MAXI SAFE 2010 should be checked/adjusted whenever maintenance/repair has been performed.

☞	All measuring instruments used for testing and adjusting must be calibrated and traceably to a national standard. When a technician choose an alternate measuring method than the standard measuring method, described in the Installation Manual (81-09-IM), the responsibility of the correlation between the measuring methods lays upon the technician and his company.

2.1. Alternative leak tests using a linear particle counter

The particle counter method is an alternative to the photometer method, but the two methods are not necessarily equivalent (IES-RP-006.2-1996 §6.2).

Apparatus for this test consist of:

- A discrete-particle counter having a known sample flow rate and the capability to detect the particle size designated in the challenge aerosol.
- A sampling probe of square or rectangular configuration, whose inlet air velocity approximates.
- The filter exit air velocity when, used with the discrete particle counter.
- A suitable aerosol source appropriates challenge aerosol concentration. The generator must be of the Laskin nozzle type-atomiser.
- A suitable dilution for using in measuring the upstream challenge concentrations when necessary.

Procedure:

1. Let the unit run in nominal speed for 15 minutes.

2. Induce the challenge aerosol through the “challenge” valve in the unit.

3. Measure the upstream concentration through the “measuring” valve on the unit.
If available, set in a dilution equipment between the measuring valve and the particle counter. Adjust at the generator the amount of aerosol to > 2.000 particles /cu.ft, and register the concentration. The upstream concentration should be stable over time and uniform over the area immediately upstream of the filter area under test.

4. Scan the entire face of the filter for leaks, using slightly overlapping strokes of the probe, and moving the probe at a rate not exceeding the linear scan rate. The probe should be hold 25mm from the filter plane during scanning.

5. Scan the frame and the perimeter of the filter in order to locate any leaks from sealant etc.

Acceptance:

Any detected particle count equal or greater than the number of particle counts, which characterise the designated leak, should be cause for sustained residence time of the probe at the leak position. The acceptance limit of a local penetration is 0,05% ≙ 1/2000 of the upstream concentration.

Example: Upstream measuring 350.000 particles pr cu.ft.

Dilution factor 50

Acceptance downstream filter: $\frac{350.000 * 1}{50 * 2000} = 3.5 \approx 3$ particle pr. cu.ft

2.2. Alternative test for measuring inflow air velocity

Measuring of the inflow velocity with reduced aperture:

This method can only be a guideline in estimating the inflow velocity.

The user should be able to verify the validity of the result.

The method is encumbered with a number of error possibilities why the method is only intended as a guide. Errors often occur by:

- False calculation of the reduction factor due to a difficult positioning of the anemometer and lack of control measuring of the height of the reduced aperture.
- Positioning of the anemometer in the correct geometrical measuring point. There is a tendency of tipping the probe either too far in the aperture or to far out from the interface between the cabinet and the laboratory.

Procedure

1. Reduce the aperture and measure the inlet air velocity in 5 even dealt spots over the reduced opening.

2. Calculate the mean value of the inflow velocities and convert it to a mean value for the whole aperture by a reduction of the measured flow in proportion to the reduction.

Example: The aperture is reduced from 200mm to 50 mm corresponding to a reduction factor on $\left(\frac{200}{50}\right) = 4$.

The measured mean inflow is converted with the reduction factor.

E.g. $\frac{1.68}{4}$ = 0.42 m/s

Fixture

A method to elimination some of the systematic errors is to manufacture a fixture to the specific anemometer probe and establish a correlation to well-documented method.

The fixture can be made out of steel plate and is able to keep the anemometer in a constant position during the measuring. The pins fit into two of the holes in the tabletop.

Figure 1

A gauge block establishes the same height at each measuring.

With a fixture like this it is possible to establish a measuring with an accuracy that do not jeopardise the operator safety.

Figure 2

2.3. Flow sensor alarm adjustment

Equipment required

Anemometer (Flow Master).
Stand.
Screwdriver made from plastics.
Variotransformer.

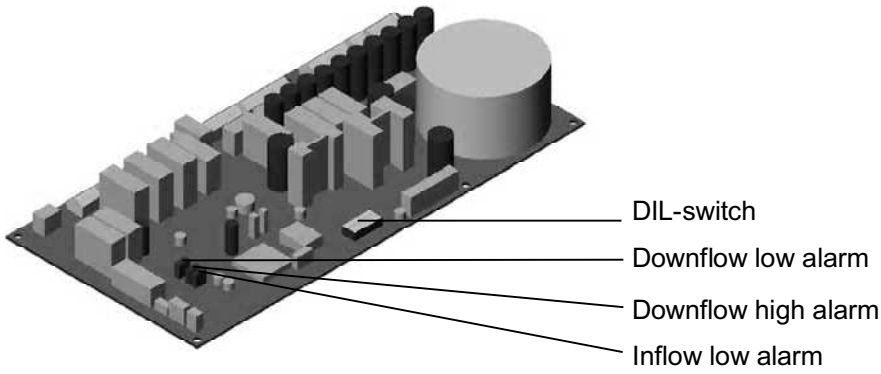


Figure 3.

Procedure for low alarm adjustment

1. Disconnect from mains.

2. Remove the cover for the electromechanical panel (See section 3.2) and you have access to the PCB Controller Board.

3. Set the DIL-switch 3 to ON (See section 4.9)

4. Connect to mains and check the display to be in calibration mode.

5. Await the numbers in the display to stabilise.

6. Place the front window in work position.

7. Place the anemometer upon a stand 250 mm above the tabletop.

8. Measure the air velocity in the laminar flow as described in the Installation Manual (See section 7.1)

9. Find the minimum air velocity.

10. Place the anemometer where the minimum air velocity is measured.

11. Decrease the air velocity with the variotransformer until the air velocity indicator indicates mean velocity x 0,8 m/s. (Adjust to a minimum of 175 V or the electronics will not be stable.) Record the voltage over the fan.

12. Adjust potentiometers for downflow alarm so the red diode just lights up.

13. Press ∇ on the display. Check that only two segments in the bargraph will be lit.

14. Seal the screw of the potentiometer.

15. Disconnect from mains and set DIL-switch 3 to OFF.

16. Reconnect to mains and adjust the variotrafo to nominal setting.

17. Observe that alarms go out.

Procedure for high alarm adjustment

1. Position the anemometer where the highest down-flow is measured.

2. Increase the down-flow velocity with the variotransformer to mean velocity x 1.2 m/s.

3. Adjust the potentiometer on the Controller Board until the yellow light comes on.

4. Decrease the voltage until the high alarm goes off.

5. Readjust the voltage to achieve mean velocity x 1,2 m/s and record the voltage over the fan.

6. Seal the potentiometer.

2.4. Inflow alarm adjustment

Equipment required

Balometer or Anemometer.
Screwdriver made from plastics.
Variotransformer.

Procedure for In flow alarm adjustment

1. Measure the Inflow velocity either with the Balometer (See section 7.2 in the Installation manual), or as an alternate with the anemometer. (See section 2.2)

2. Determine the lowest permissible limit for the air velocity 0.4 m/s in the work opening by reducing the voltage on the variotransformer.

3. Adjust the potentiometer for Inflow alarm so that the red diode just lights up.

4. Adjust the variotransformer to nominal setting and check the alarm to go out.

5. Seal the potentiometer.

3. Dismantling and replacement instructions

☞	Prior to performing any work in the chamber ensure that the cabinet is disinfected and/or neutralised.

3.1. Fans

The SAFE 2010/MAXI SAFE 2010 are equipped with 1 or 2 main fans and 1 exhaust fan. They are all directly driven AC models designed for long life performance and are all lifetime lubricated. They have built-on capacitors and may be adjusted by changing voltage on the transformers in the electric compartment.

Equipment required

Fan.
Phillips screwdriver.
13 mm fork wrench.

Procedure for replacement main fan

1. Position the front window in upper position.

2. Disconnect from mains.

3. Open the front cover.

4. Remove the main filter as described in section 11.1.2 in the Instruction manual.

5. Dismantle the wire from the terminal block on the fan.

6. Unscrew the fan from plenum.

7. Hang the fan on the fitting in the cabinet ceiling.

8. Remove the main plenum.

9. Exchange the fan.

10. Reassemble in reverse order.

Procedure for replacement of exhaust fan

Perform steps 1 to 9 (excluding step 6) in the procedure for main fan, and continue:

10. Remove the exhaust filter according to the section concerning filter change.

11. Dismantle the wire from the terminal block on the fan.

12. Remove plenum and the fan by lifting the boom iron at the fitting on the rear.

13. Exchange the fan in plenum.

14. Reassemble in reverse order.

3.2. Access to the electromechanical panel

To gain access for alarm setting, window positioning, controller board, motor console and transformers the cover above the electromechanical panel must be removed.

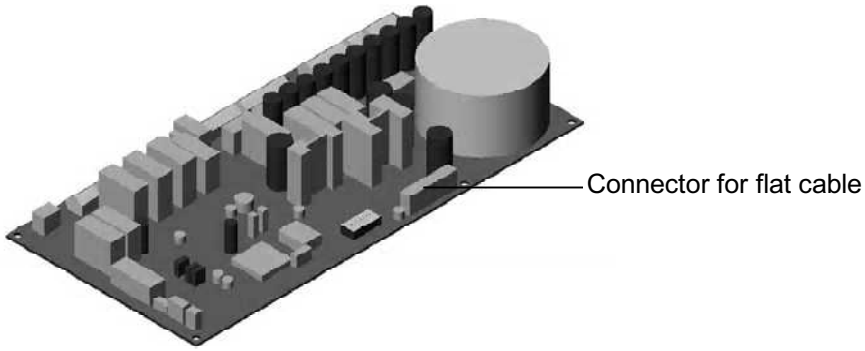


Figure 4.

Equipment required

Phillips screwdriver

Procedure

1. Unscrew the cover for the fuse compartment.

2. Remove the plug for the flat cable and terminal for earth and slide it through the slot in the cover. Be careful you don't damage the flat cable.

3. Push the rubber hose next to the opening down.

4. Remove the cover by unscrewing the 2 screws in either side and carefully lift it off.

3.3. Windows

Front window

Equipment required

Front window including wire and wire lock.
Phillips screwdriver.
Support for the window e.g. tall trestles.
Food inspection approved lubricant.

Procedure for replacement of front window

1. Lower the front window.
Stop immediately prior to reaching the lowest position to avoid the window from sticking to the frame.

2. Disconnect the cabinet from mains.

3. Dismantle the front cover.

4. Remove the cover from the electromechanical panel

5. Push the window gently upwards and out of the guides.
Leave it resting against the supports so there is no tension on the wires.

6. Remove the wire from the wire wheels on the motor console by unscrewing the screw on the end of the axle. Wheel and wire may now be removed.

7. Window and wire may be removed and replaced by a new.

8. Reassemble in reverse order.
Assembling wire and wire wheel is described in section. Do remember lubrication.

Side window

Equipment required

Right or left side window.
Phillips screwdriver.
Sharp knife for cleaning off silicone joints.
Silicone detergent.

Procedure for replacement of side window

1. Drive the window to the top position.

2. Open the front cover.

3. Disconnect from mains.

4. Unscrew the side cover from the side profile.

5. Unscrew the 6 screws holding the side profile.

6. Cut away the silicone joint.

7. Carefully pull the side profile forward to enable removal of the side window.

8. Clean away silicone remains.

9. Install the new window and apply silicone.

10. Reinstall in reverse order. Remember to tighten the top threaded bushing holding the lampshade. Access is gained by removing the cover of the electromechanical panel.

3.4. Wire for the sliding front window

Description

The hoisting mechanism for raising and lowering the front window is designed with two wires, in which the window hangs. These wires must always be tight during operation. To ensure this, the mechanism is equipped with a micro switch, which is normally switched on. In case of irregularity with the wires, e.g. slack or broken wires, the micro switch will ensure that the window can't be raised.

Each wire is designed to hold approximately 10 times the weight of the window. If both wires break simultaneously - which is highly unlikely - the safety latch will catch the falling window.

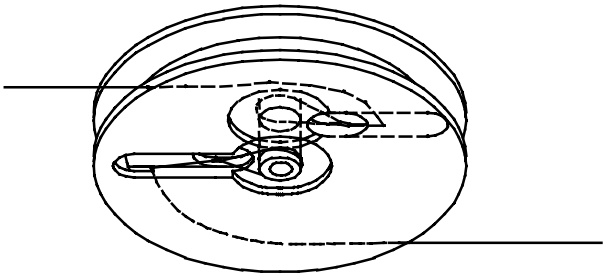


Figure 5.

Equipment required

Lubricant
Set of wires
7 mm fork wrench.
Phillips screwdriver

Procedure for replacement of wire

1. Perform steps 1 to 7 of the procedure for exchanging the front window.

2. Remove the 2 small clamp fitting on the window frame.

3. Remove the safety latch and then the wire may be removed.

4. Reassemble in reverse order with the new wire in place.
Do remember lubrication.

5. The inner wire must be twisted counter clockwise and be moved to the left.

6. The outer wire must also be twisted counter clockwise but moved to the right.

7. Note that the wire wheel is not symmetrical. The flat side must be inwards.

8. Adjust the window to horizontal by pushing motor console sideways. Unscrewing the 2 threaded rods from the brass wheel and loosening the 6 nuts on the motor console performs this. When the window hangs straight adjust the threaded rods so they both push the fork ends in either side maximum (without bending).

3.5. Motors for sliding front window

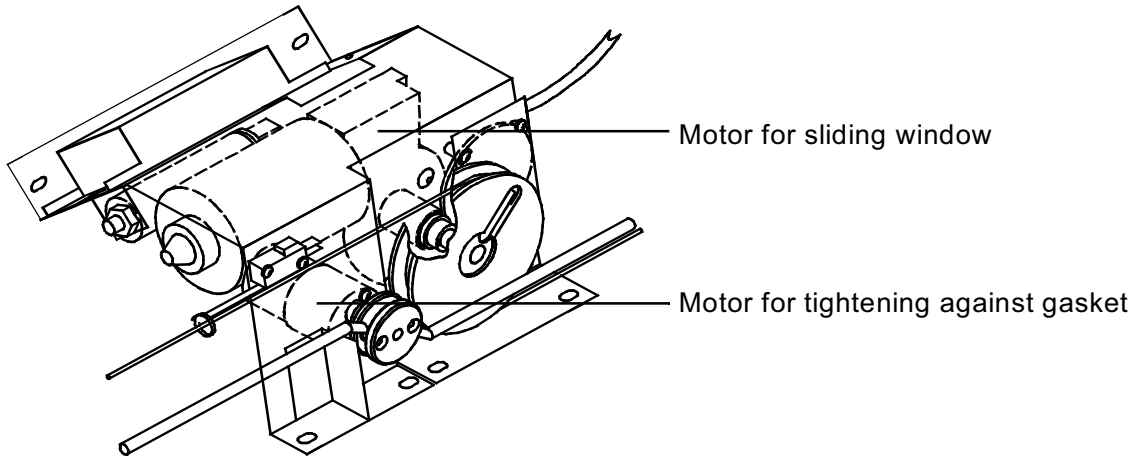


Figure 6a.

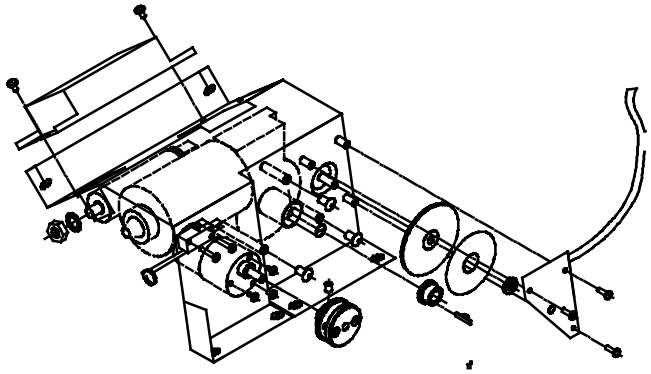


Figure 6b.

Equipment required

Large gear motor.
Phillips screwdriver.
7mm wrench.

Procedure for replacing the motor for the sliding front window

1. Lower the front window to lowest position.

2. Disconnect from mains.

3. Dismantle the cover of the electromechanical panel as described in section 3.2.

4. Dismantle the wires for motor and the Window Position PCB on the controller print.

5. Remove the wire wheel and the wire.

6. Remove the gear wheel.

7. Dismantle the threaded rods on the brass wheel.

8. Unscrew the motor console.

9. Replace the motor and reassemble in reverse order.

10. See section 3.7 concerning high adjustment of the front window.

3.6. Motor for tightening against gasket

Equipment required

Small gear motor.
Allan key size 3 mm.
Small Phillips screwdriver.
Food inspection approved lubricant.

Procedure for exchange of motor for tightening against gasket

1. Follow steps 1 to 3 in section 3.5.

2. Cut off the thread bars.

3. Remove the brass wheel using the Allen key.

4. Remove the electric wires.

5. Unscrew the motor.

6. Reassemble in reverse order. Do remember lubrication.

3.7. Position of Front Window

The window position is detected by an optical system on the electromechanical panel.

Activate ◇ and △ and ▽ simultaneously and the position is displayed.

In the table below window position and corresponding detection values are shown.

If e.g. position 3 and the window are in work position - agreement exists.

Window position	Display
Bottom position	Pos. 01
Lower range (lower 200 mm)	Pos. 02
Work position (At 200 mm ± 5 mm)	Pos. 03
Upper range (upper 200 mm)	Pos. 04
Top position	Pos. 05
Between upper range and top position	Pos. 06
Between lower range and bottom position	Pos. 07
ERROR	Pos. 00

Disagreement between the values might be caused by incorrect adjustment of the encoder disk for window position detection. The disk may be adjusted by twisting the print on the motor console around the centre or by changing the mesh between the two gear wheels. See figure 6b in section 3.5.

3.8. Controller board PCB

Equipment required

Controller board PCB.
5 mm wrench.
Anti-static wristband.

Procedure for exchange of the PCB

1. Drive the window to the lowest position.

2. Disconnect from mains.

3. Using anti static wristband connected to the frame when the prints are touched, dismantle all wires and sockets on the print.

4. Unscrew the print.

5. Reassemble in reverse order.

6. Reprogram functions according to the Instruction Manual.

7. Adjust the flow alarms. See section 2.3.

8. Set the DIL-switches as on the removed print.

3.9. E-prom

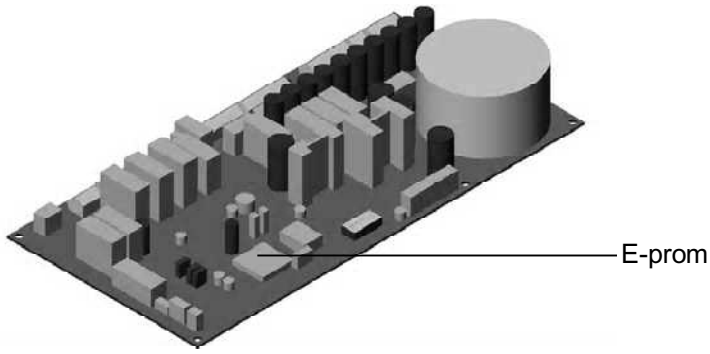


Figure 7a.

Figure 7b.

Equipment required

PLCC extraction tool.
E-prom.
Anti-static wristband.

Procedure for exchange of E-prom

1. Disconnect from mains.

2. Using anti static wristband connected to the frame when the prints are touched, dismantle the cover of the electromechanical panel as described in section 3.2.

3. Exchange the E-Prom making sure the orientation is correct.

4. Reprogram functions according to the Instruction Manual.

5. Adjust the flow alarms. See section 2.4 and 2.5.

3.10. Display PCB

Equipment required

Display PCB.
Phillips screwdriver.
5mm wrench.

Procedure for replacement of display PCB

1. Bring the front window in the lowest position.

2. Disconnect from mains.

3. Dismantle the flat cable.

4. Lift the front cover.

5. Remove the cover over the display PCB by pushing it against the top.

6. Disconnect the wire to the key switch.

7. Unscrew the print and reassemble in the reverse order.

8. Check all functions.

3.11. Key switch

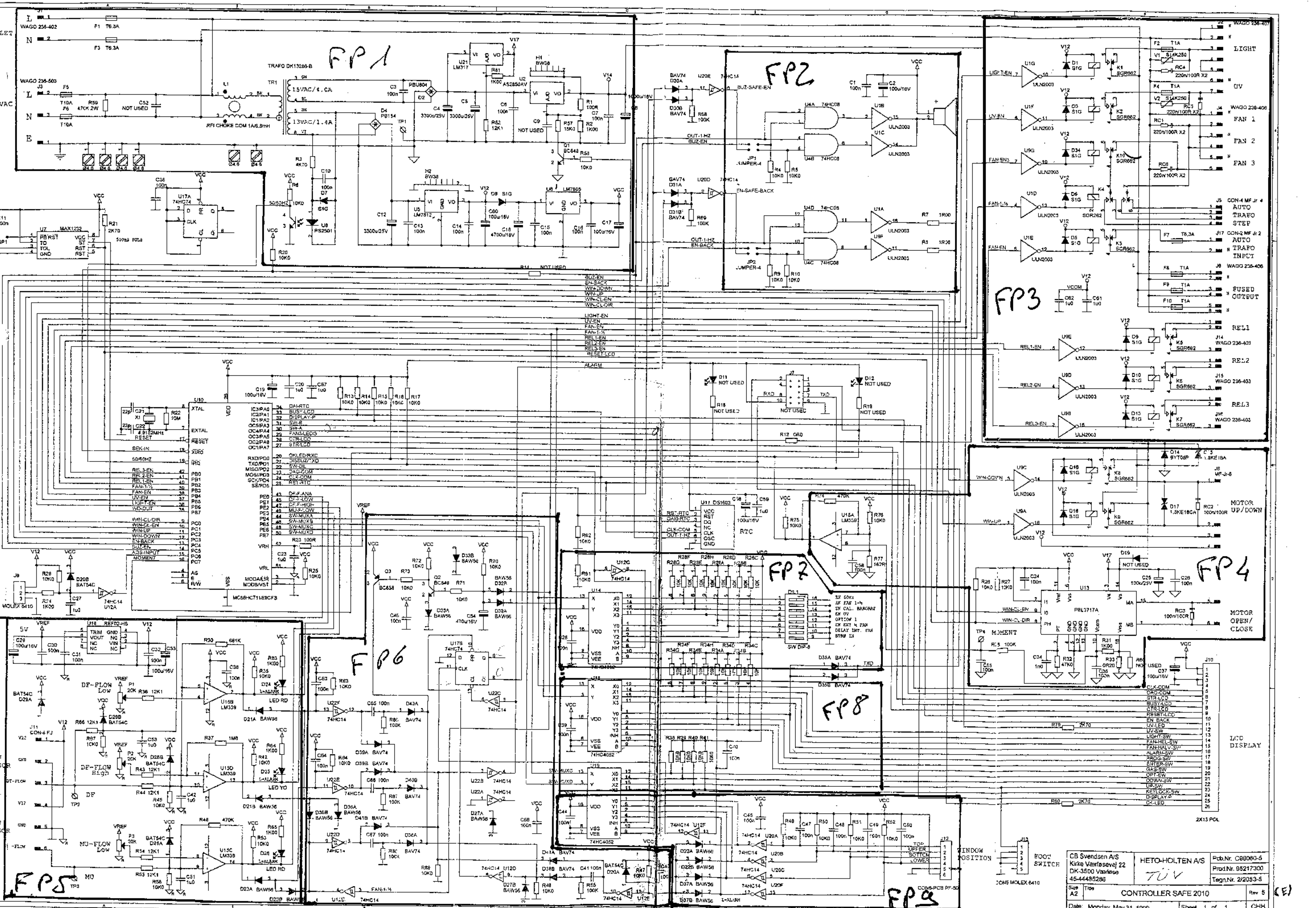
Equipment required

Key switch including keys.
20 mm wrench or fork wrench.
Graphite dust (Optionally).

Procedure for replacement of key switch

1. Adhere to the procedure for replacement of display PCB.

2. Unscrew the key switch and replace it. In case the key is hard to turn, use graphite dust.


FP1
FP2
FP3
FP4
FP5
FP6
FP7
FP8
FP9
TRAFO DK13286-B
RFI CHOKE COM 1A/6.8mH
WAGO 236-402
WAGO 236-503
LIGHT
UV
FAN 1
FAN 2
FAN 3
AUTO TRAFO STEP
AUTO TRAFO INPUT
FUSED OUTPUT
REL1
REL2
REL3
MOTOR UP/DOWN
MOTOR OPEN/CLOSE
MC68HC711E9CFS
MAX1232
DS1603
RTC
PBL3717A
74HC4052
LM339
ULN2003
SW DIP-8
DF-FLOW Low
DF-FLOW High
MU-FLOW Low
DF
MO
LCD DISPLAY
2X13 POL
WINDOW POSITION
FOOT SWITCH
CB Svendsen A/S
Kirke Værløsevej 22
DK-3500 Værløse
45-44485266
HETO-HOLTEN A/S
TÜV
Pcb.Nr. C98060-5
Prod.Nr. 95217300
Tegn.Nr. 2/2053-5
Size A2
Title
CONTROLLER SAFE 2010
Rev 5
Date: Monday, May 31, 1999
Sheet 1 of 1
CHH

4. Electric diagrams

4.1. Main diagrams

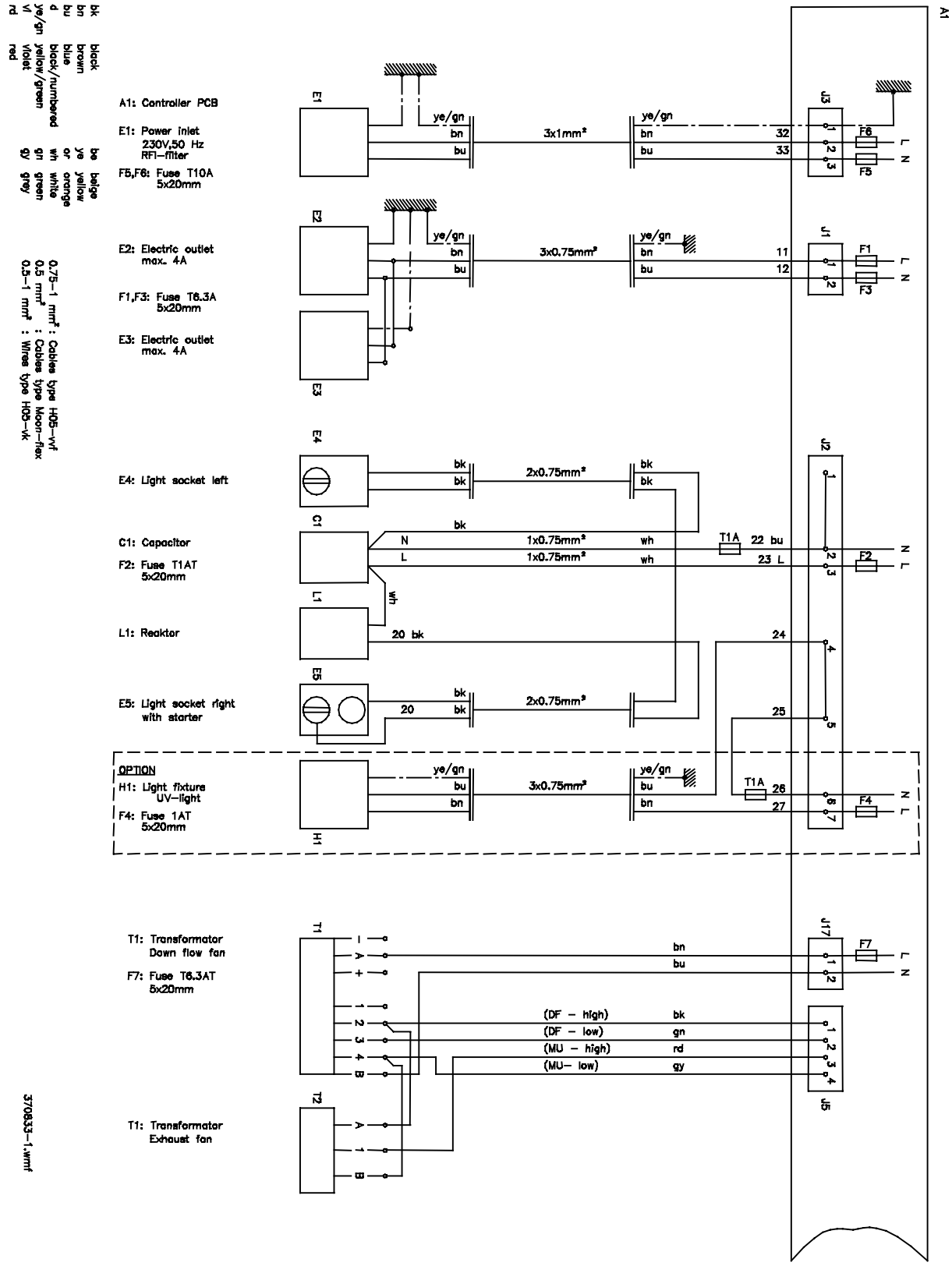


Figure 8a.

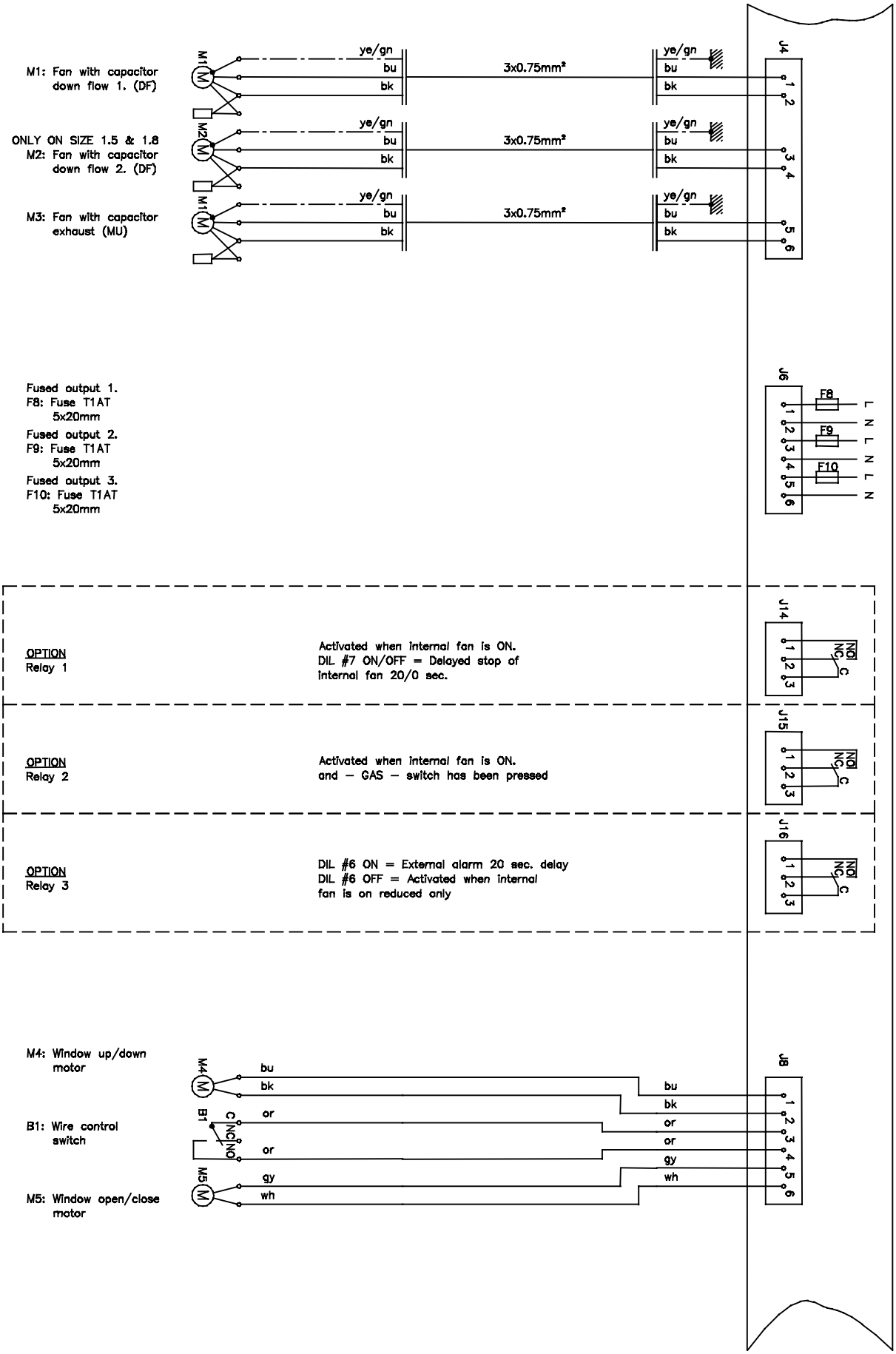

M1: Fan with capacitor down flow 1. (DF)
ONLY ON SIZE 1.5 & 1.8
M2: Fan with capacitor down flow 2. (DF)
M3: Fan with capacitor exhaust (MU)
ye/gn
bu
bk
3x0.75mm²
J4
Fused output 1.
F8: Fuse T1AT 5x20mm
Fused output 2.
F9: Fuse T1AT 5x20mm
Fused output 3.
F10: Fuse T1AT 5x20mm
J6
F8
F9
F10
L N L N L N
OPTION
Relay 1
Activated when internal fan is ON.
DIL #7 ON/OFF = Delayed stop of internal fan 20/0 sec.
J14
OPTION
Relay 2
Activated when internal fan is ON.
and – GAS – switch has been pressed
J15
OPTION
Relay 3
DIL #6 ON = External alarm 20 sec. delay
DIL #6 OFF = Activated when internal fan is on reduced only
J16
NO
NC
C
M4: Window up/down motor
B1: Wire control switch
M5: Window open/close motor
or
gy
wh
J8
370833-2.wmf

Figure 8b.

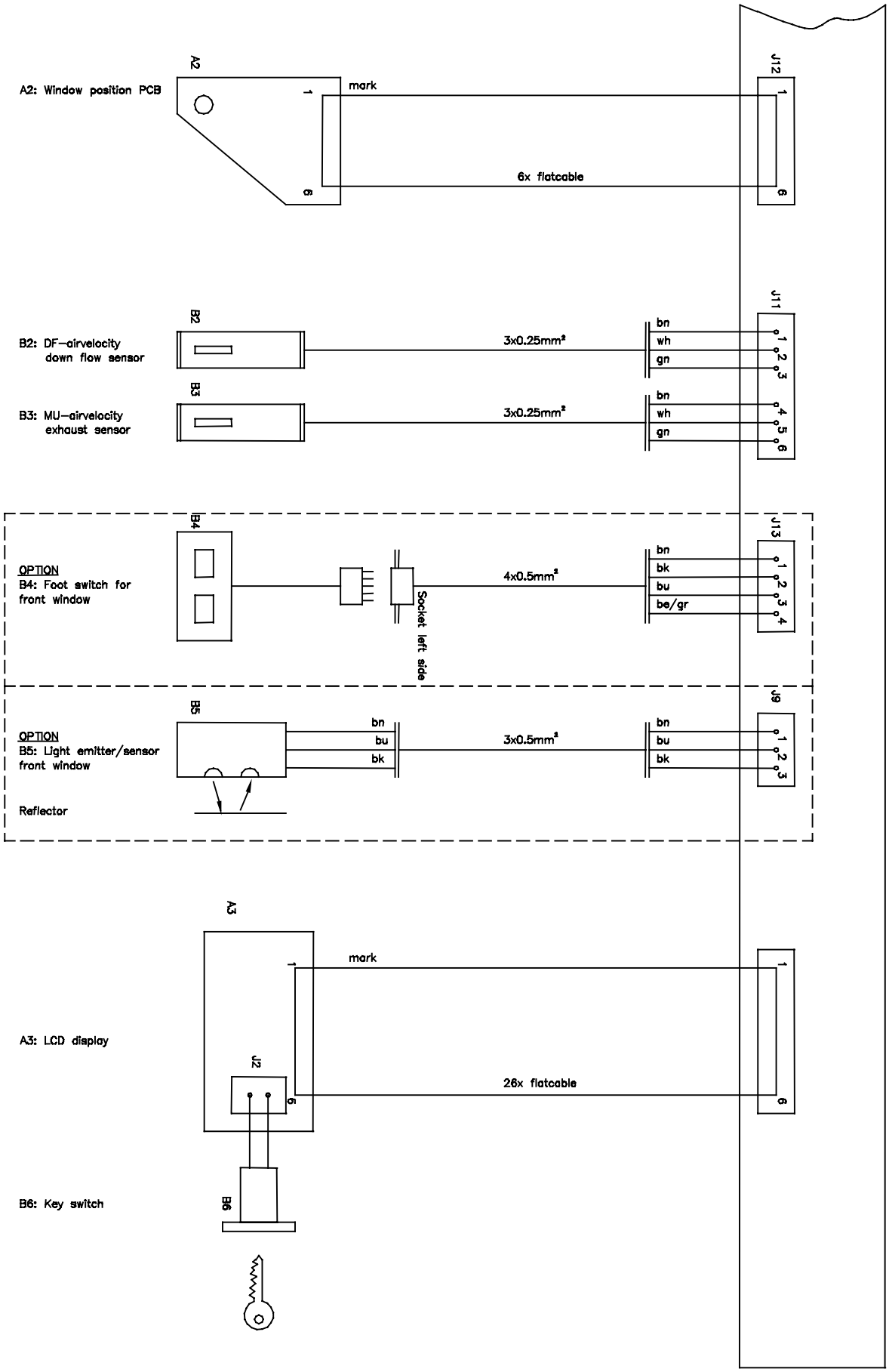
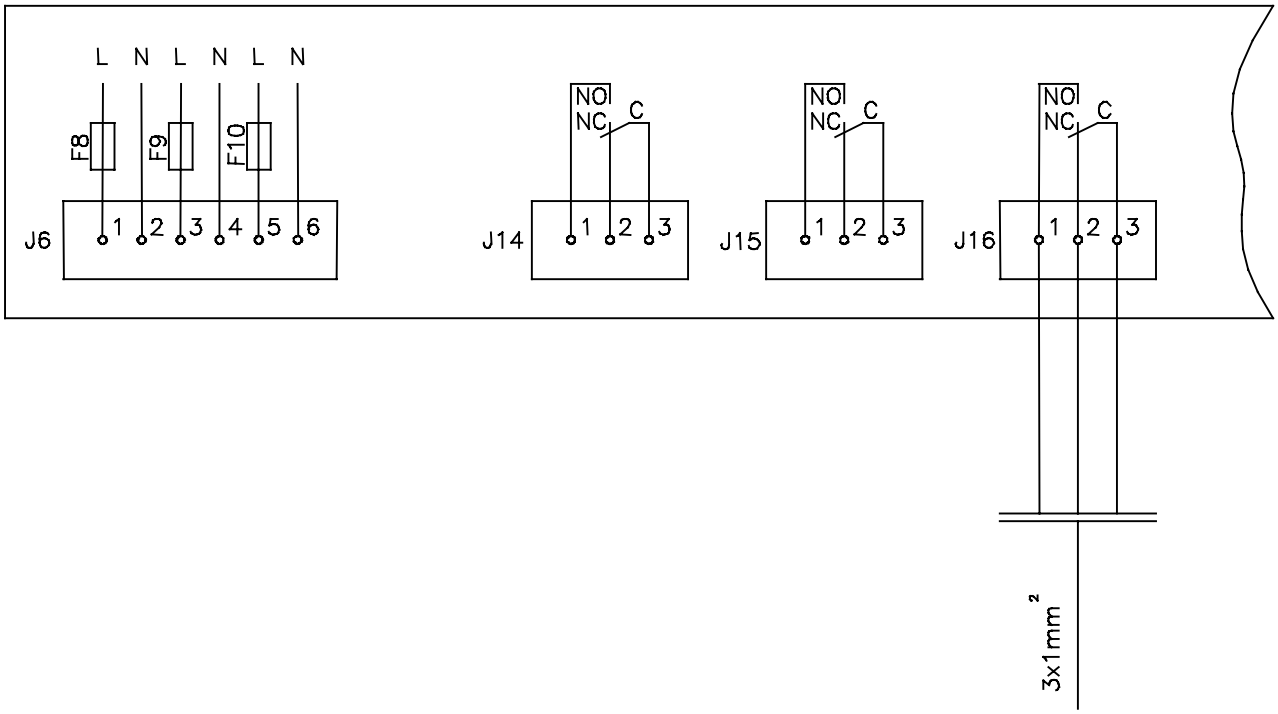

A2
A2: Window position PCB
mark
6x flatcable
J12
B2
B2: DF–airvelocity
down flow sensor
3x0.25mm²
bn
wh
gn
J11
B3
B3: MU–airvelocity
exhaust sensor
3x0.25mm²
bn
wh
gn
B4
OPTION
B4: Foot switch for
front window
4x0.5mm²
Socket left side
bn
bk
bu
be/gr
J13
B5
OPTION
B5: Light emitter/sensor
front window
Reflector
3x0.5mm²
bn
bu
bk
J9
A3
A3: LCD display
mark
J2
26x flatcable
B6
B6: Key switch
370833-3.wmf

Figure 8c.

4.2. External alarm



DIL #6: ON
Relay 3: External alarm 20 sec. delayed
Max. load 230V 1 Amp.

Figure 9.

4.3. Coupled control internal fan

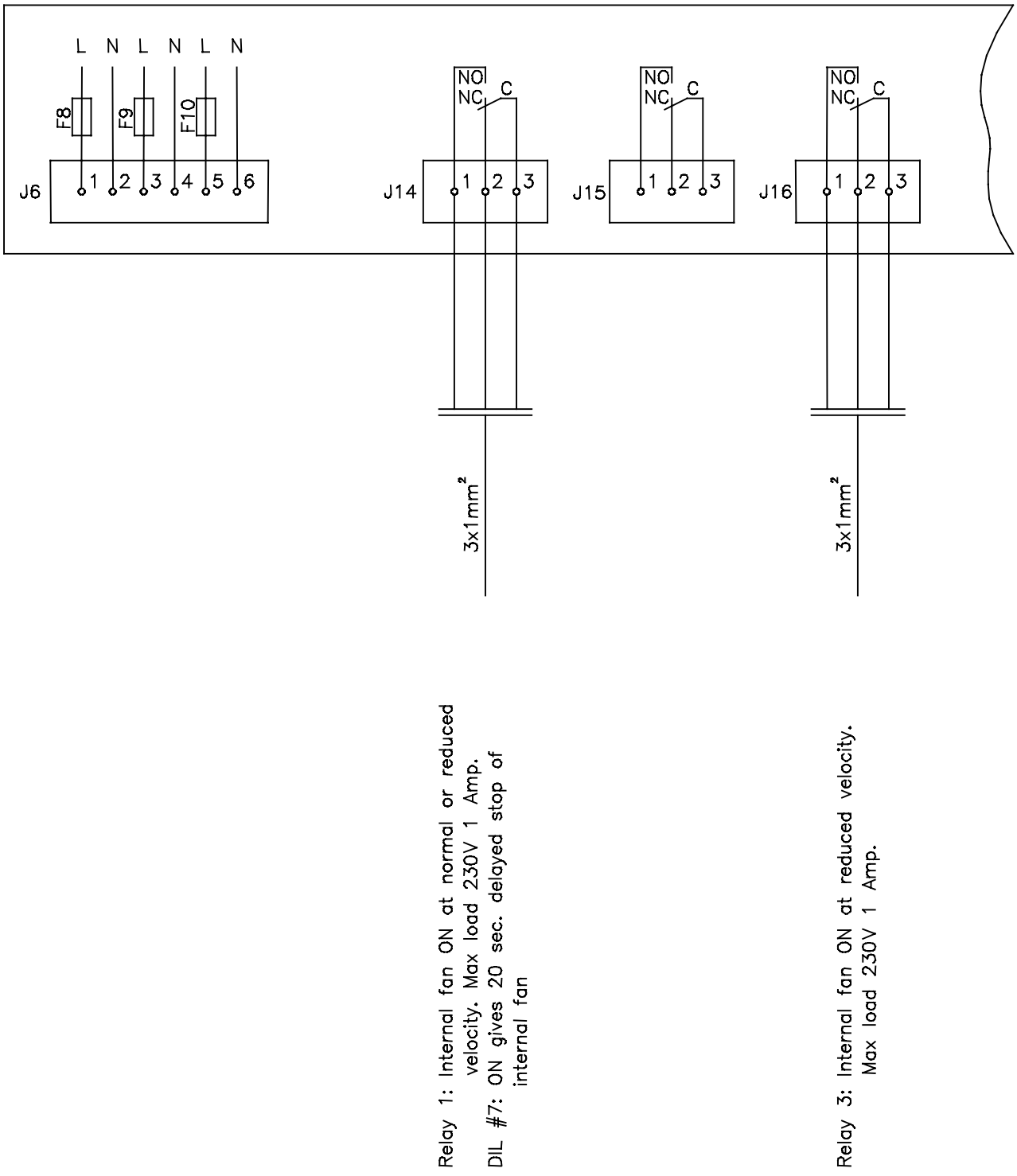
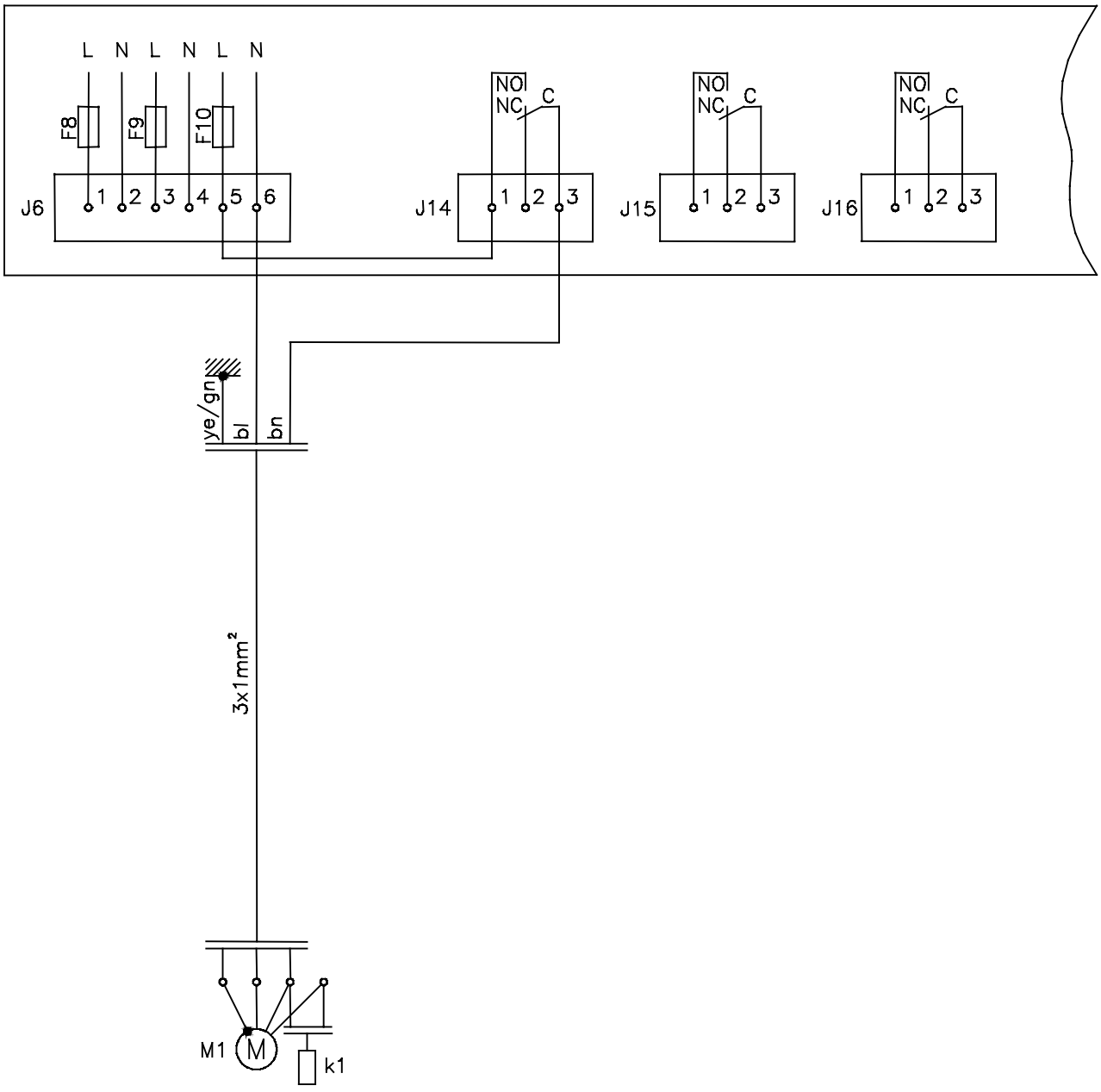


Figure 10.

4.4. Coupled control external fan



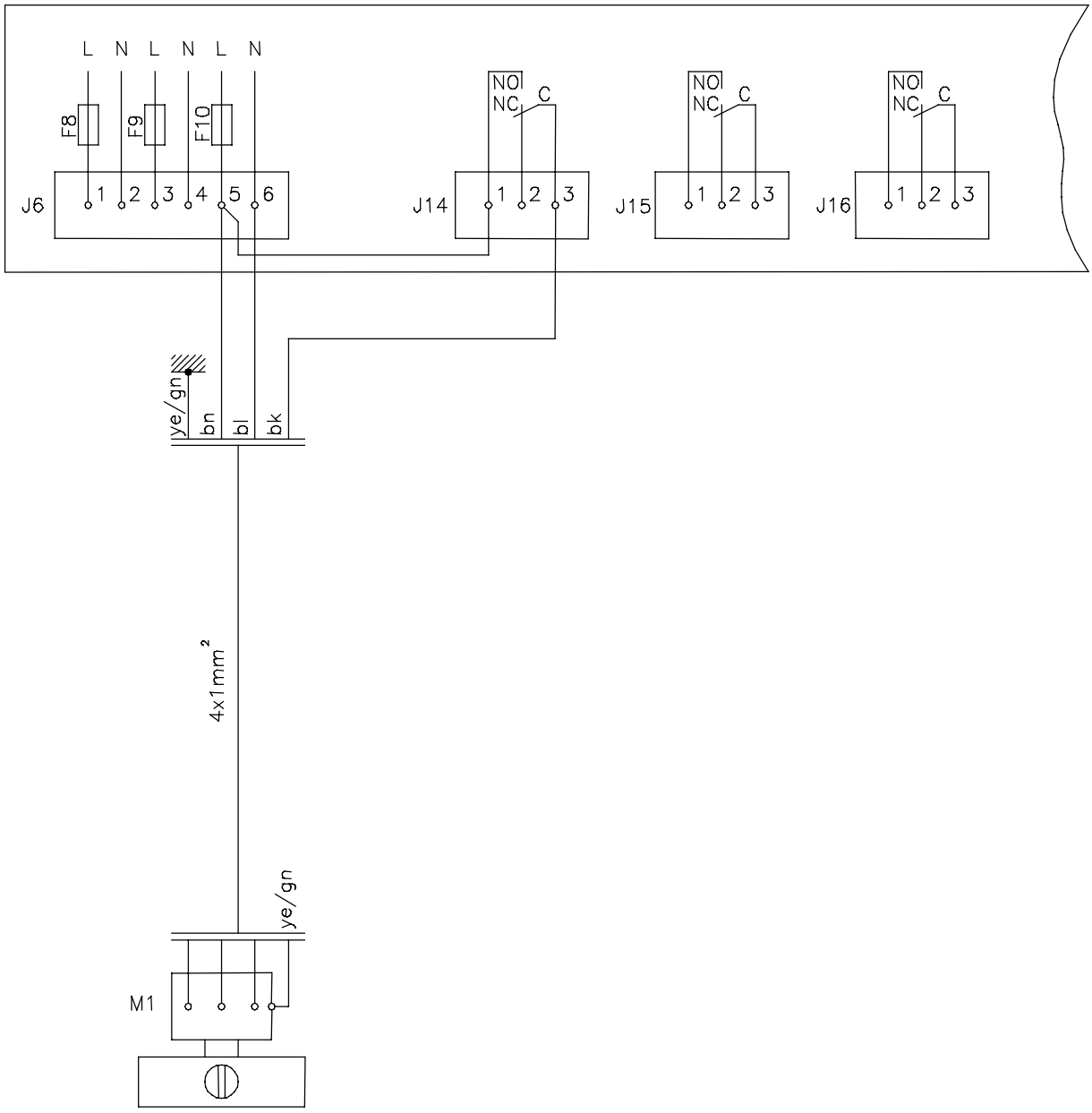
M1: External fan
230V 50 Hz
max. 200 VA

F10: Fuse T1A
5x20mm

bk	black	be	beige
bn	brown	ye	yellow
bl	blue	or	orange
d	black/numbered	wh	white
ye/gn	yellow/green	gn	green
vi	violet	gr	grey
rd	red		

Figure 11.

4.5. Coupled control damper motor



When using both fan and damper for the same cabinet, remember to built in relays between option relay and unit.

M1: Damper motor
230V 50 Hz
F10: Fuse T1A
5x20mm

bk	black	be	beige
bn	brown	ye	yellow
bl	blue	or	orange
d	black/numbered	wh	white
ye/gn	yellow/green	gn	green
vi	violet	gr	grey
rd	red		

371400.wmf

Figure 12.

4.6. Coupled control external fan normal and reduced speed

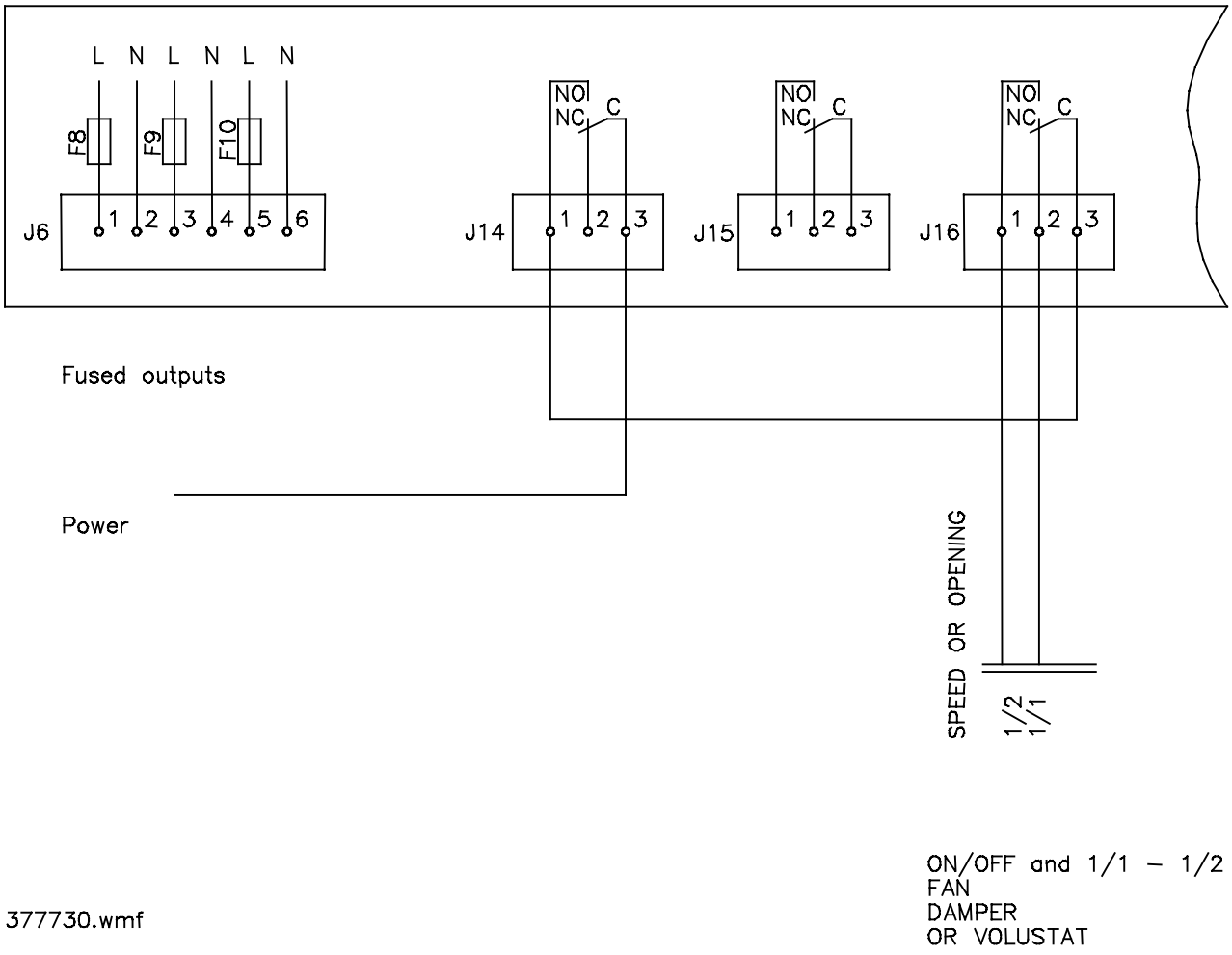


Figure 13.

4.7. Solenoid valve

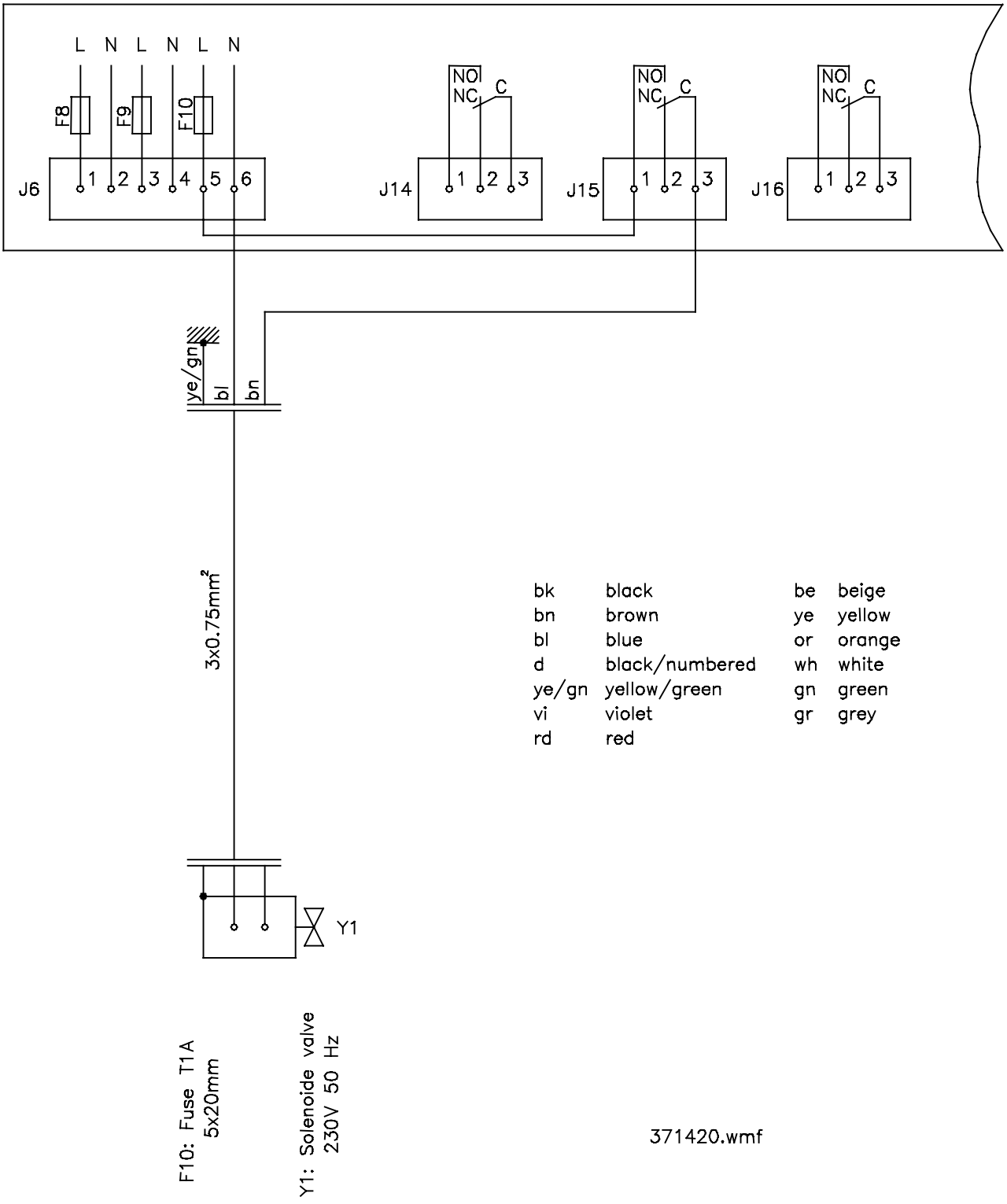
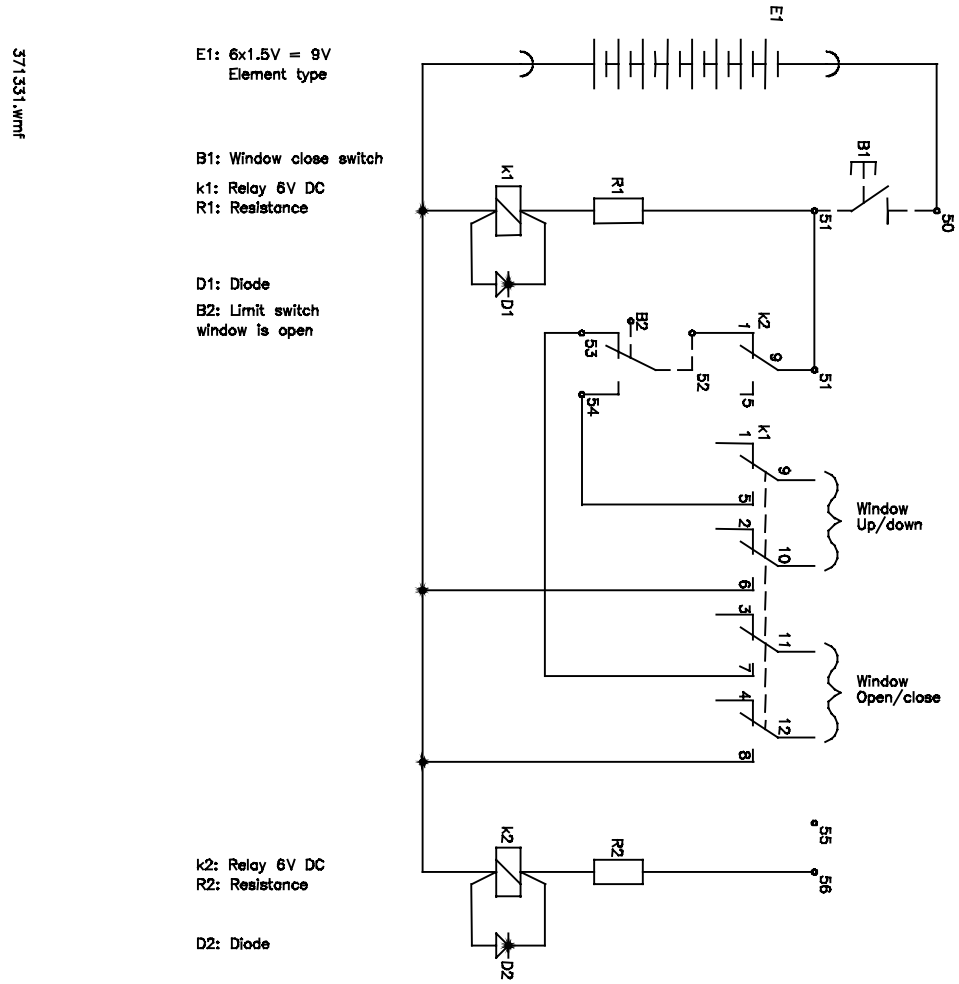


Figure 14.

4.8. Battery backup



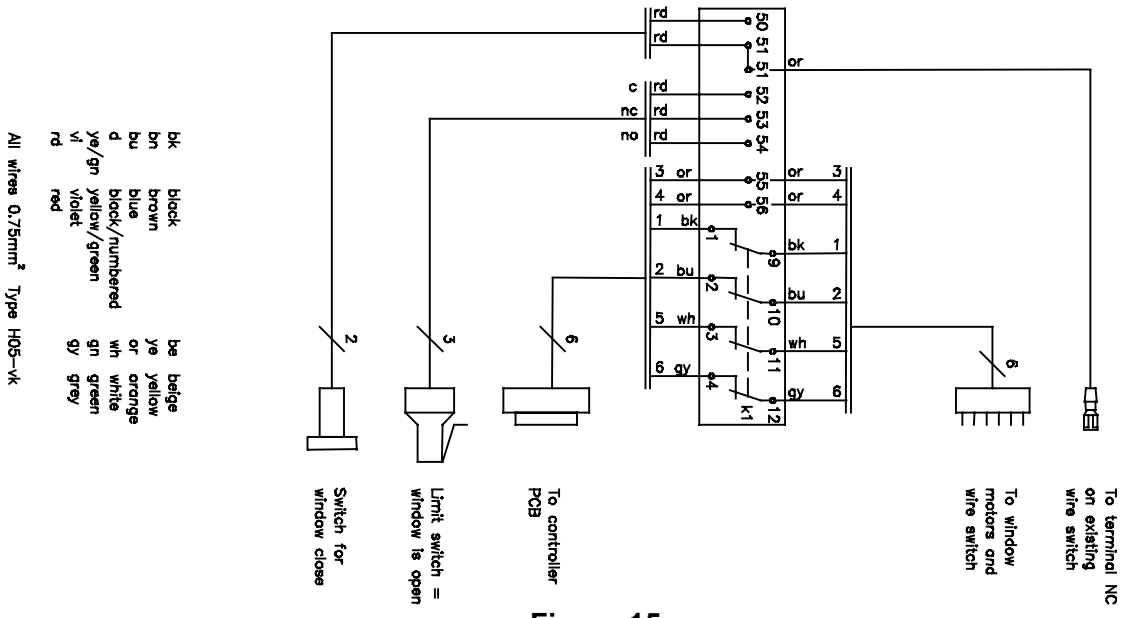


Figure 15.

4.9. Setting the DIL-switches

During installation of options available for the SAFE 2010 / MAXI SAFE 2010 cabinet the DIL-switches positioned on the controller board PCB must be adjusted.

Before adjusting the DIL-switches the cabinet must be turned off.

The table shows the position of the DIL-switches depending on the option:

DIL-switches decoding

DIL-switch no.	OFF	ON
1	50 Hz	60 Hz
2	Ventilator function NORMAL	Only NORMAL and reduced ventilator enabled
3	NORMAL operations mode	Calibration mode
4	UV function not enabled	UV function enabled
5	NORMAL operation mode	Programme switch mode
6	External signal when velocity reduced	External signal on alarm, a delay of 20 seconds is in effect
7	No tails on the internal ventilator	20 seconds tails on the internal ventilator when the external ventilator is engaged
8	NORMAL operations mode	Burn in test program

Find the controller board PCB on which the DIL-switches are located. See section 3.2 regarding access to the electromechanical panel, where the PCB is located.

5. Setting of autotransformer for fan

Primary autotransformers

ASU 96A maximum 3A
ASU 96 CH maximum 6A
230V AC

Secondary autotransformer

ASU 78A - 29112

Description

The construction of the transformer offers a number of possibilities for adjustments. The fans may be adjusted to deliver the desired volume of air. The tables below offer a wide selection of possibilities for voltage supply to the fan.

Equipment required

Phillips screwdriver
Small screwdriver for slotted screws.

Procedure for setting air velocity

1. Always disconnect from mains when the transformers are being adjusted.

2. Adjust the down flow using the black wire on the primary autotransformer (ASU 96….) until the average volume of air is measured according to section 2.3 at 0.4 m/s. Table 1 or3 below.

3. Adjust the exhaust air volume using the secondary (ASU 78A) autotransformer - set the red wire in terminal point 1. The supply to the small transformer is dependent on the adjustment of the large transformer leaving limited adjustment possibilities.

4. Move the white and grey wires from A and B on the secondary autotransformer to terminal points on the primary autotransformer according to the table 2 and 4 on the following pages.

5. Find the terminals for the green (gr) and the grey (gy) wires for reduced velocity. A terminal already in use may be used for maximum one additional wire.

Standard settings:

Preconditions:	Mains voltage	230V	
Primary auto transformer	Blue wire in terminal	B	
	Green wire in terminal	4	DF,R
	Grey long wire in terminal	4	MU,R
Sec. Auto transformer	White wire in terminal	A	
	Grey short wire in terminal	B	
	Red wire in terminal	1	MU,H

Table 1.

Setting possibilities for **Downflow** fan normal and reduced speed, and In flow fan reduced speed.

Combination	Brown wire	Black wire	Voltage $Fan_{DF,N}$ V	Voltage $Fan_{DF,R}$ V	Voltage $Fan_{MU,R}$ V
A-3	A-	3	112	86	86
A-2	A-	2	140	86	86
A-1	A-	1	165	86	86
A3	A	3	118	92	92
A2	A	2	147	92	92
A1	A	1	175	92	92
A+3	A+	3	126	98	98
A+2	A+	2	157	98	98
A+1	A+	1	189	98	98

Table 2.

Setting possibilities for **In flow** fan normal speed in proportion to above mentioned combination possibilities.

			Combination A-1,A-2,A-3	Combination A1,A2,A3	Combination A+1,A+2,A+3
Combination	White print card wire	Grey print card wire	Voltage $Fan_{MU,N}$ V	Voltage $Fan_{MU,N}$ V	Voltage $Fan_{MU,N}$ V
23	2	3	118	126	135
13	1	3	125	135	145
12	1	2	145	155	164
21	2	1	152	163	174
A+2	A+	2	160	170	180
A+1	A+	1	170	180	190
1A+	1	A+	185	190	200

For certain types of cabinets it may be suitable to use below table for settings:

Alternate settings:

Preconditions:	Mains voltage	230V	
Primary auto transformer	Brown wire in terminal	B	
	Green wire in terminal	2	DF,R
	Grey long wire in terminal	2	MU,R
Sec. Auto transformer	White wire in terminal	A	
	Grey short wire in terminal	B	
	Red wire in terminal	1	MU,H

Table 3.

Setting possibilities for **Downflow** fan normal and reduced speed, and In flow fan reduced speed.

Combination	Blue wire	Black wire	Voltage $Fan_{DF,N}$ V	Voltage $Fan_{DF,R}$ V	Voltage $Fan_{MU,R}$ V
NA-3	A-	3	112	86	86
NA3	A	3	105	77	77
NA+3	A+	3	98	68	68

Table 4.

Setting possibilities for **in flow** fan normal speed in proportion to above mentioned combination possibilities.

			Combination NA-3	Combination NA3	Combination NA+3
Combination	White print card wire	Grey print card wire	Voltage $Fan_{MU,N}$ V	Voltage $Fan_{MU,N}$ V	Voltage $Fan_{MU,N}$ V
34	3	4	133	122	115
B3	B	3	151	145	141
B4	B	4	169	164	161

Recommended settings:

Model	Normal setting	High setting	Low setting
S2010 0,9	A-3/23	A3/13	NA3/34
MS2010 0,9	A+3/13	A-2/21	A3/13
S2010 1,2	A3/13	A+3/23	A-3/13
MS2010 1,2	A2/12	A+2/12	A-2/21
S2010 1,5	NA3/B3	A-3/12	NA+3/B4
MS2010 1,5	A3/A+1	A+3/21	A-3/A+2
S2010 1,8	A-3/21	A3/21	NA+3/B4
MS2010 1,8	A+3/21	A-2/A+1	A3/A+2

Compensation for Mains voltages different from 230V: $V = V_{Actual} / 230 \times V_{Table}$

E.g. Mains voltage = 240 V and table value = 160V: V = 240 / 230 x 160 = 167

6. Spare parts

See Instruction Manual regarding filters, light tubes (normal and UV), starter and fuses.

Model **Catalogue number** **Item**	**S0.9** **57240200**	**MS0.9** **47240200**	**S1.2** **57250200**	**MS1.2** **47250200**	**S1.5** **57260200**	**MS1.5** **47260200**	**S1.8** **57270200**	**MS1.8** **47270200**
Main fan*	822458							
Exhaust fan	822459							
Primary transformer	847225				847226			
Secondary transformer	847227							
Controller board	849136**/849141**							
E-prom	849139***/849143***							
Display board	849137							
Window position PCB	849145							
Flow sensor	849118							
Key switch	841048							
Safety switch	903325							
IEC connector filter	88856008							
Motor console (complete)	57240260		57250225					
Large gear motor	88847441		88847442					
Small gear motor	88847439							
Choke coil	844050		844059		844060			
Capacitor	847002				847003			
Front cover	57240204		57250204		57260204		57270204	
Gas spring	822221		822205		822205		822226	
Wire	2x973120		973120+973121		973120+973122		973120+973123	
Front window	57240205		57250205		57260205		57270205	
Gasket	2.3x832441		2.6x832441		2.9x832441		3.2x832441	
Flock filter	973066		973067		973068		973069	
Pulley fitting	2x903309							
Safety latch (set)	57250211							
Fork	88822942							
Distance piece for display PCB	973119							
Set of belts	2x973128+2x973129							
Side windows Left Right	85440263 85440264							
Tabletop	973005							
Valve Ballofix ½"	88823746							
Arm rest	973169							
Silicone (tube)	88831212							

* S/MS 1.5 and1.8 has 2 main fans

** Revised Version 849141 for cabinets produced subsequent to August 1999 is rear compatible with 849136

*** Revised Version 849143 to controller PCB 849141.

INSTALLATION KITS	
Item	**Catalogue number**
Gas re-settable solenoid valve	80100001
Gas	80100022
Carbon-dioxide	80100023
Vacuum	80100024
Nitrogen	80100025
Oxygen	80100026