

# Automatic Filling Device

## GUIDANCE IN INSTALLATION AND CORRECT USE OF THE AUTOMATIC FILLING DEVICE FOR HS-TARM/BAXI BIOMASS BOILER MULTI-HEAT

**AUTOMATIC FILLING DEVICE** can be used for the following biomass fuels:

- Wood pellets
- Corn

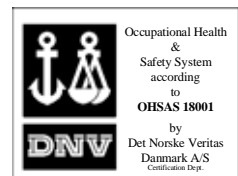
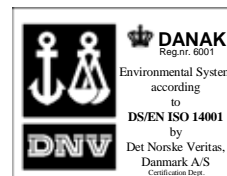
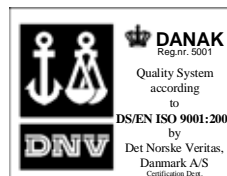


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Due reservations are made regarding construction amendments and possible printing errors.

## 1 Specification of the system

### 1.1 General

The AUTOMATIC FILLING DEVICE can be connected to an external storage or a silo via a piping system (corn/grain auger, flexible auger and the like in tubes). AUTOMATIC FILLING DEVICE can be used as optional extra /accessory for both existing and new Multi Heat boilers.

The unit is to be mounted on top of the standard hopper in place of the existing cover. In case of serious stops in operation of the auger system which transports the fuels from an external storage or silo to the boiler, the AUTOMATIC FILLING DEVICE can be dismantled and the hinged cover for the hopper can be mounted again. In this way production of heat can be maintained and continue in proper and safe way.

### 1.2 Description of operation

(For further reference please see system diagrams in part 4)

The function of AUTOMATIC FILLING DEVICE is repeatedly to fill the hopper of the **Multi-Heat. It is carried out having two levels in the hopper, namely:** minimum **N2** and maximum **N1**

**The unit itself works also as a fire damper, so that in between the fillings an airtight hopper is ensured and there is no risk of burn back to the external hopper or silo.**

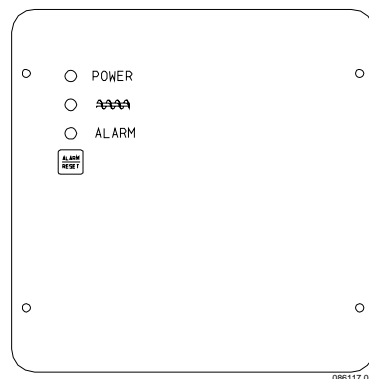
The fire damper opens when the level in the hopper is at minimum (**N2**). When the fire damper is fully open the control board sends a signal, which will start the auger motor (or something similar) which will transport the fuel from the external storage or silo to the hopper of the boiler.

When the level of fuel in the hopper reaches maximum (**N1**) the control will stop the auger motor and a little while later the fire damper will be closed. Should there be a power failure during the filling of the hopper then the fire damper will shut mechanically without the need for electricity.

### 1.3 Start up

When everything is mounted (and the Multi Heat boiler is shut off) the hopper should be filled to the lowest level (sensor N2) to ensure that the hopper can be filled when power is connected. The control in the ADF has maximum 30 minutes to fill from N2 to N1. If one should wish to fill up to the lowest sensor (N2) by means of the automatic, this can also be done. However, there might be a risk that the control will go on alarm and must be reset and the process can begin again. One can unscrew the small cover beside the AUTOMATIC FILLING DEVICE and take a visual check to see if everything is in place. Remember to mount the cover again and ensure air cannot penetrate the cover.

### 1.4 The control



The control consists of a panel with 3 lamps with the following meanings:

**Green (POWER) = Power is on**

**Yellow ((external) auger) = in operation/filling up**

**Red = Alarm and an alarm reset button.**

The panel contains a control circuit board, a motor protection and the contactor which supplies current to the motor which shall bring the fuel to the AUTOMATIC FILLING DEVICE.

On the opposite side of the AUTOMATIC FILLING DEVICE a motor is located which opens and closes the fire damper.

**NB!** The motor protection (thermal contactor) which is to be used is 1.1-1.6A. If a bigger motor is to be used, a bigger motor protection (the motor's rated current) is necessary. (Motor protection 1.8-2.5A product number 210784 and motor protection 2.2-3.2A product number 210785. - Other amperage ratings also available).

The damper motor, the level sensors and the sync cable are to be connected to the control via the already mounted sockets.

There is a possibility to electrically connect a lamp or any other form of signal through the alarm call of the control in order for this to be seen and heard a long way away from the boiler (power tag block J1 number 1 and 2 can be connected to maximum 240 volts 3 A).

## 1.5 Alarm [Red lamp]

The control gives an error signal if one of the following malfunctions occurs:

The error signal can, for instance, be because the level in the hopper is at the minimum, the fire damper opens and the auger motor for the filling of the hopper starts up. If the level does not rise (within a given time), for instance if no fuel is coming from the external silo or storage (silo/external storage is empty), or a defect by the sensor that is measuring the level of fuel, the control will sound an alarm.

### 1.5.1 Malfunctions:

If the damper has not opened after 180 seconds then:

- The damper will close and the external auger motor will not start and consequently:
- The alarm will be activated.

If the damper does not shut within 120 seconds after the sensor N1 has been activated consequently:

- The damper will shut and the external auger motor will stop and consequently:
- The alarm will be activated.

If sensor N1 is not activated within 30 minutes after the signal has been given that the fire damper is open:

- The damper will shut and the external auger motor will stop and consequently:
- The alarm will be activated.

If the auger is stuck and the motor protection cuts the current/power consequently:

- The damper will shut and the external auger motor will stop and consequently:
- The alarm will be activated.

### 1.5.2 Deactivating the alarm [ALARM RESET]

The alarm is deactivated by pressing *alarm reset* button for 3-4 seconds. As soon as the alarm is deactivated the control is ready to start over/run again.

## 1.6 Recommendations

The AUTOMATIC FILLING DEVICE is recommended for fuels such as wood pellets and corn/grain. The connecting pipe on the AUTOMATIC FILLING DEVICE is Ø120.0 mm outside diameter.

### 1.6.1 Handling of the fuel (wood pellets)

It is important that the amount of dust and/or sawdust in the wood pellets is at a minimum. A high percentage of dust/sawdust will have the effect of a bad economical fuel and the risk of burn back is much higher than with pellets of high quality.

The amount of dust/sawdust can be viewed and determined through the extra cover in the hopper cover. Unscrew the inspection cover and look into the hopper. A sample can be taken out. Remember to correctly mount the cover again airtight.

A lot of dust/sawdust can be due to:

- 1) Low quality wood pellets,
- 2) The way the wood pellets has been delivered (blown into storage/silo, transport through wrong sized auger system etc. and
- 3) The transport of wood pellets from external hopper/silo and into the boiler hopper smashes or crushes the pellets (see part 2.3.4).

#### **IMPORTANT!**

**The boiler hopper must be inspected frequently** to ensure that dust/sawdust does not block the wood pellets / corn / grains admission to the auger. If this is the case, the dust/sawdust must be removed.

## 1.7 Possibility of coupling several Multi-Heats [Sync-cable]

If two or more boilers are connected to the central heating installation these can be connected to the same external storage or silo. This can be carried out by connecting every AUTOMATIC FILLING DEVICE of each hopper in series with a synchronicity cable.

The connection between each unit controls which hopper is being filled.

If a unit is activated because the level in the hopper is at a minimum, and the same is the case on the next boiler's hopper, then this unit gets a signal that it has to wait until the first one is done filling up!

It is important that the last boiler on the auger/fuel feeder is not turned off while the others are being used. If more fuel is being feed and this cannot be removed, then eventually the auger will "run shut". It is recommended to normally only run two boilers on one silo. Why this? If an operational failure occurs on one system the other will keep the heat production running.

## 2 Installation

All boilers and attached accessories must be installed in accordance with national, state and local plumbing, heating and electrical codes and regulations.

**DO NOT INSTALL IN A MOBILE HOME.**

### 2.1 Installer Qualifications

It is the responsibility of the person installing the system that he or she has the necessary training and authorisation in order to design the heating system and install the boiler. Moreover, it is the responsibility of the installing contractor and/or dealer to see that all controls are installed correctly and operating properly when installation is complete.

### 2.2 Components / Packing list

1. AUTOMATIC FILLING DEVICE with control and damper motor mounted (connecting piece to auger system Ø120.0 mm)
2. M6 nut (24 pieces)
3. Cover with two holes and gaskets
4. Rail with two sensors (N1 and N2)
5. PG coupling pieces/union joints, 2 pcs. including socket for sensors
6. Bolt M6x22 (8 stk.) for mounting of cover and rail
7. Cover 295x185x4 for the inspection hole in the hopper cover
8. Socket –for synchronicity cable
9. Jacket (2 pieces)
10. 4 sets (screws and nuts) for mounting of the jacket

Subject	Voltage	Signal and the like
AUTOMATIC FILLING DEVICE	1 x 240 VAC or 3 x 240 VAC	
PC board (control)	1x240V	6 input and 2 output
Contacto <sup>r</sup> w. <u>motor protection</u>	1 x 240 VAC or 3 x 240 VAC	Motor protection 3.5 – 6.3 A Motor protection 1.1 – 1.6 A Motor protection 0.8 – 1.2 A
Damper motor AF 24-S	24 VDC	1 and 2 = Voltage for motor S1-S6 = contact maker/block (A and B)
Rail holder		
N1 Capacity sensor	24 VDC (PNP)	+ and - (NC or NO)(+ to be used)
N2 Capacity sensor	24 VDC (PNP)	+ and - (NC or NO)(+ to be used)

#### 2.2.1 Components purchased from separate supplier

Subject	Voltage	Signal and the like
Auger motor (external)	1x240 VAC or 3x240 VAC	1-3 phases, neutral and ground
Lamp or signal for alarm	24V or 230-240 V max 3A	NC
Auger and pipe system	-	Min. speed see table 1

## 2.3 Assembly of the AUTOMATIC FILLING DEVICE

### 2.3.1 Mounting on the Multi-Heat boiler

**NOTE!** The cover must be turned in the correct direction so that the pintle (on the new cover) pushes the contactor plug pin down.

The cords from the sensors must not be shortened when the socket is being mounted.

The hinged hopper cover and various holders shall be de-mounted and the new cover shall be mounted instead.

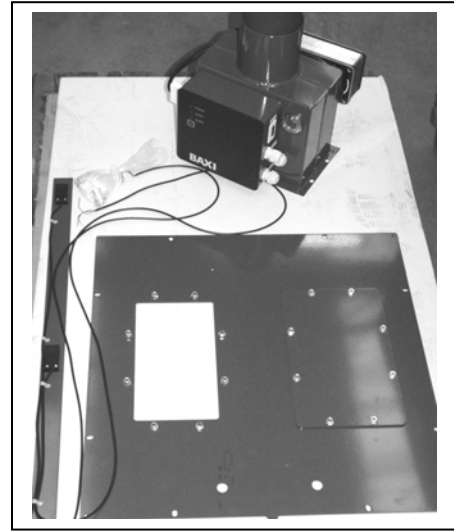
The rail with the sensors is to be placed inside the hopper, toward the auger /gear motor and the contact on the cover.

The wire of the sensors is to pass through the cover in two PG-coupling pieces/union joints, and after this the sockets can be mounted in the indicated counterpart in the control. (**NOTE!** No wires or cords and the like must hang on the front of the sensor, so that the sensor sends the signal that the hopper is full).

The *AUTOMATIC FILLING DEVICE* is to be placed over one of the two holes in the cover.

It is possible to turn the unit 180 degrees and place it respectively in the right or the left side – either due to the chimney or the operation of the unit.

The cover (next to the unit itself) is to be mounted as the last thing you do, when the operation of the device has been tested and has filled the hopper successfully the first time.



### 2.3.2 The external fuel feed auger.

The *AUTOMATIC FILLING DEVICE* is to be connected to an external storage / silo via a set of pipes (corn/grain auger, flexible auger etc. for ordinary agricultural use). The *AUTOMATIC FILLING DEVICE* can be used as an accessory to both new as well as existing Multi-Heat boilers. The *AUTOMATIC FILLING DEVICE* is to be mounted on top of the standard hopper in place of the existing cover.

The external auger motor to transport fuel from the external storage / silo must be dimensioned according to the length of transportation of the fuel.

**Important!** The external auger motor must not turn too fast when wood pellets are used as fuel, because the pellets will be smashed to sawdust (Speed about 50-300 rpm. is recommended, please see table 1 - paragraph 2.3.4).

**NOTE!** In case of serious stop in operation by the system which transports the fuel from the external storage / silo to the boiler, the *AUTOMATIC FILLING DEVICE* can be de-mounted and the original hinged hopper cover can be remounted in order to continue the production of heat in a safe way.

### 2.3.3 Adjusting the level sensors N1 and N2

The level sensors N1 and N2 control the *AUTOMATIC FILLING DEVICE*. These sensors are placed in the boiler hopper. The sensors are adjusted by the manufacturer and the adjusting screw is sealed with a BAXI-label. In that N1 and N2 are capacity sensors - which reacts to the humidity of the air – in some cases it can be necessary to adjust the setting at the address of installation. If the *AUTOMATIC FILLING DEVICE* is not working even if the hopper of the boiler is empty, please be sure to inspect and adjust the sensitivity of N1 and N2:

De-mount the sensors from the rail and place it in a comfortable working position.

Remove the BAXI-control label from the sensor.

Adjust the adjusting screw below the sensor, so that the yellow lamp is lit, when a piece of wet paper is held at a distance of 0 – 10 mm

from the sensor active zone (marked with a circle). When the wet piece of paper is held farther than 10 mm from the sensors active zone, no light should come up in the yellow control lamp.

Re-mount the sensor in its place in the hopper.

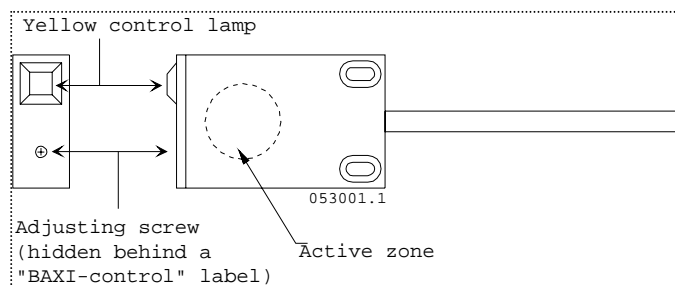


Fig. 2.3.3

## 2.3.4 Speed/velocity of the fuel feed auger

If wood pellets are used as fuel the speed/velocity of the auger must not be too high. Otherwise the wood pellets will be crushed to dust/sawdust. On the other hand the speed or velocity must not be too slow, because what will happen is that the control will signal a failure if the level distance (from N2 to N1) is not filled up within the designated time, which is 30 minutes.

Hopper [L]	Pipe/auger diameter [Ø in mm]	Rotations (auger) minimum [rounds/minutes]	Flow of fuel [kg/hr]	Flow of fuel [lb/hr]
200	90 / 70	25	160	350
350	90 / 70	42	300	660
200	75 / 55	40	160	350
350	75 / 55	72	300	660
360	90 / 70	30	200	440
600	90 / 70	60	400	880
360	75 / 55	60	200	440
600	75 / 55	120	400	880

Table 1: Recommended minimum filling speed to the Multi-Heat boiler hopper with the AUTOMATIC FILLING DEVICE.

**IMPORANT!** The auger must not exceed more than 300 rounds /minutes with wood pellets. This applies in pipes with a diameter up to 100 mm with flexible auger mounted. If the diameter is over 100 mm and a solid auger is used the speed has to be adjusted slower.

**Determining the right rounds/minute is dependent on the inclination of the auger.**

## 2.3.5 Electrical wiring connections

The control uses 230/240 VAC, but the power block terminal strip can be connected to 3 x 240VAC if a 3 x 240V motor is used for the external auger.

The external auger motor is to be connected to the contactor inside the control ( $U=T_1$   $V=T_2$   $W=T_3$ ). If 3 x 240V are to be connected to the power terminal strip X1 (6=L3, 5=L2, 4=L1, 3=neutral (blue) and 2 and 1=ground (yellow/green)). An extra cable outlet is available making it possible to draw the 3 x 240V + neutral and ground on to the Multi-Heat.

**NOTE!** The motor protection is 1.1-1.6A, if a bigger motor is used for the auger a bigger motor protection is needed! (Motor protection 1.8-2.5A product no. 210784 and motor protection 2.2-3.2A product no. 210785. - Other amperage ratings also available).

# 3 Electrical wiring diagram and Technical data

## 3.1.1 Explanation to electrical wiring diagram

F1 Fuse 315mAT

J1 Potential free outlet, Alarm: max 24 Volt - 3 Amp or max 230 Volt - 3 Amp

K1 Relay

L1-L3 Phases

N Neutral

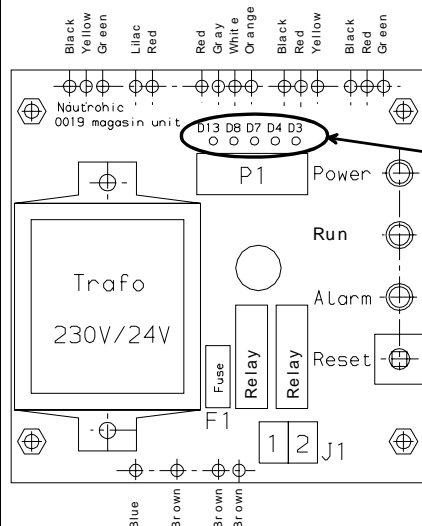
P1 Prandram unit [PROM]

T Motor protection

T1-T3 Motor connection

X1 Power terminal strip

## 3.1.2 PC board

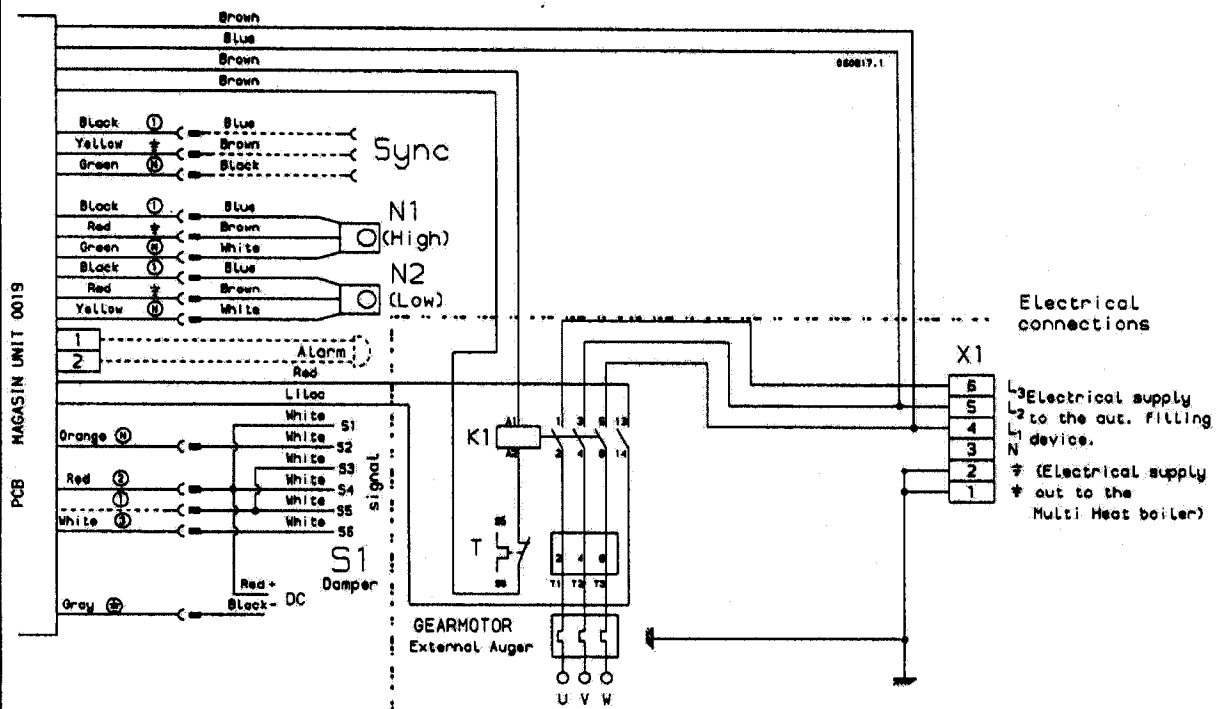


Diodes light (L for light) if:

- D13 L = Auger motor in operation
- D8 L = Damper motor more than 60% open (Contact maker/block B is activated)
- D7 L = Damper motor closed (Less than 5% open – End-stop A is activated)
- D4 L = The lowest level sensor N2 is not activated as fuel is missing - meaning D4 shuts off when the fuel rises above the level N2
- D3 L = Upper level sensor N1 is not activated, fuel is missing – i.e. D3 shuts off when fuel rises above the level N1.

## 3.2 Electrical wiring diagram

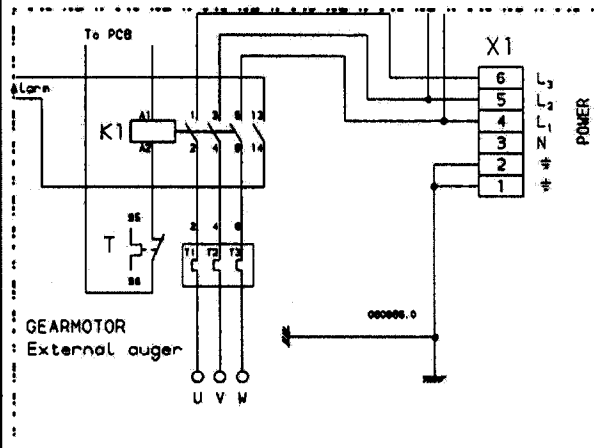
Wiring diagram



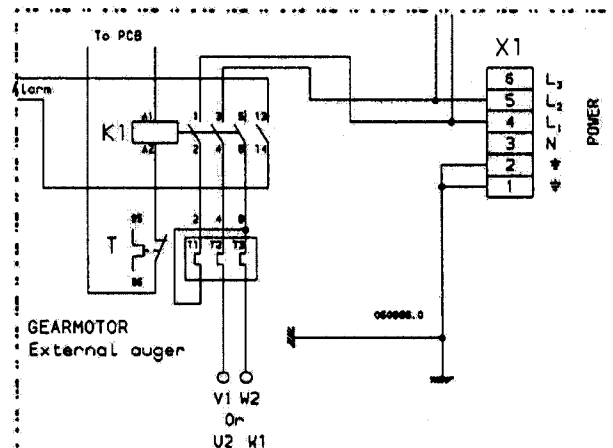
### 3.2.1 Special wiring for 240 VAC - 60Hz

For North American versions of the AFD

3x240V60Hz motor supply



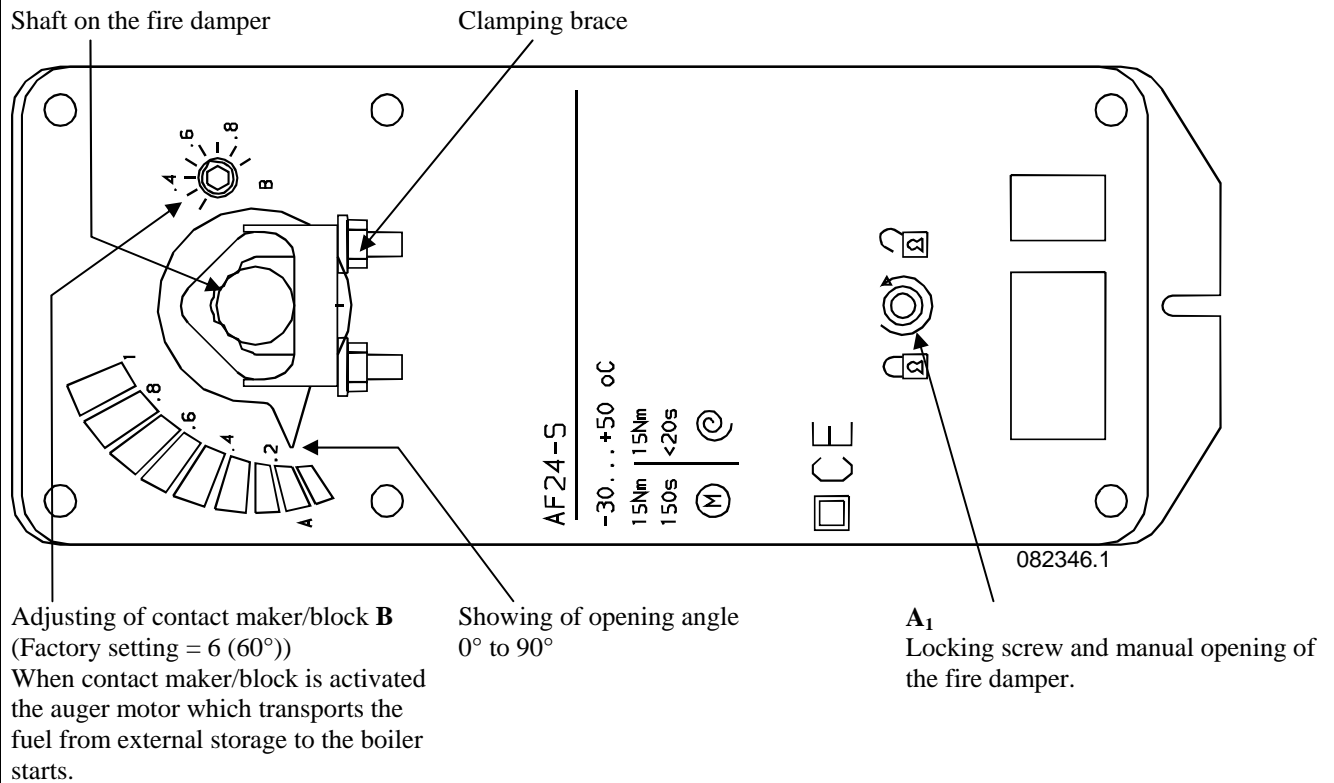
As supplied from the american supplier  
240V 60Hz motor supply



depend on the motor type!



### 3.2.2 Damper motor



The co delivered 6 edge key can among others be used for the adjusting of contact maker/block B and also the locking screw A - this may be the case after having serviced the damper motor

### 3.2.3 Instruction on remounting of damper motor after servicing

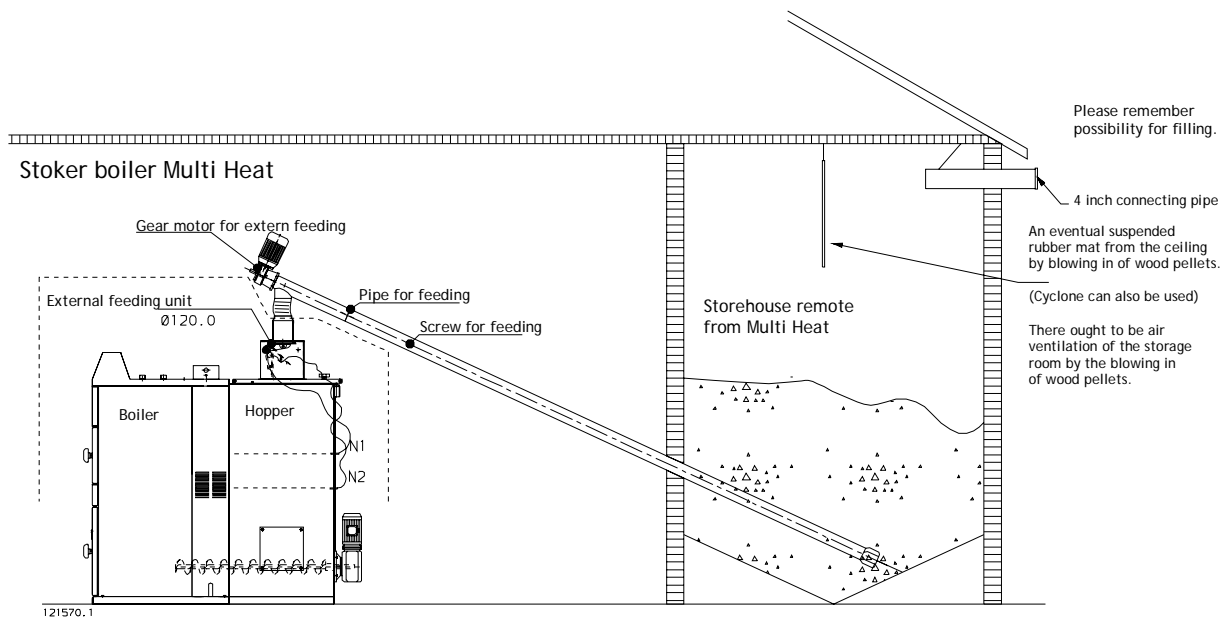
- 1 Clamping brace must be loosened so the motor is loose on the shaft
- 2 The motor opens so that is 5° open = (Point A on the scale – please see above). This is done by inserting the 6 edge key in (A<sub>1</sub>), turn it approx. twice in the direction of the arrow (anti clock wise) until point A on the scale. After this it is locked by turning the 6 edge key quickly the other way (clockwise).
- 3 The fire damper closes manually by pressing the fire damper upwards. This can be done by turning the shaft anti clock wise (possibly with a screw driver or the like to the shaft of the fire damper).
- 4 The clamping brace is to be tightened on the shaft of the fire damper.
- 5 The locking screw A<sub>1</sub> is to be loosened with the 6 edge key, whereby the elastic force/ spring power closes the fire damper completely.
- 6 A test of operation has to be carried out.  
The damper motor should open when the fuel is below the lowest sensor, - then the damper motor opens, -when the damper is open at point B, a signal is given to the external feeder motor (external auger motor), - the fuel will be filled until the upper sensor is covered, - after this the external motor stops and the fire damper closes.

### 3.3 Technical data

			Unit for MH 1,5	Unit for 2,5 & 4,0
A	Depth - Total	mm	428	428
B	Width unit	mm	286	286
C	Height	mm	339	339
-	Dimensions of covers for hopper (1 x b)	mm	472x472	590x590
D	Width Hopper	mm	500 / 900	600 / 1000
-	Hopper size	litre	200 / 350	360 / 600
-	Height to connecting piece from bottom of hopper	mm	1320	1635
-	Connecting piece to unit outer diameter (external storage)	mm	120	120
Weight unit with damper motor and control		kg	35	35
<hr/>				
Types of fuel	Wood pellets	approx. 8 % moisture	5-20 mm	5-20 mm
	Corn/grain	approx. 15 % moisture	X	X
Damper motor - by opening		W	5	5
- in open position		W	1,5	1,5
Damper motor - torque (motor and spring-return)		Nm	15	15
Damper motor - electrical connection		V	24	24
Noise level		dB(A)	<62	<62
Capacity sensor (N1 and N2) - electrical connection		V	24	24
Auger motor for external storage - 3 x 240 V+J – 60 Hz 0.8-1.2A			X	X
<b>NOTE!</b> Remember to change motor protection if auger motor is bigger than 1.2A			part 2.3.5	Part 2.3.5
<b>Multi-Heat stoker boiler</b>				
Auger motor effect		kW	0,12	0,37
Blower motor effect		W	90	90
Power use		kW	0,21	0,46
Electrical connection / fuse sizes	3 x 240 V+N+J – 60 Hz / 10 A		X	X

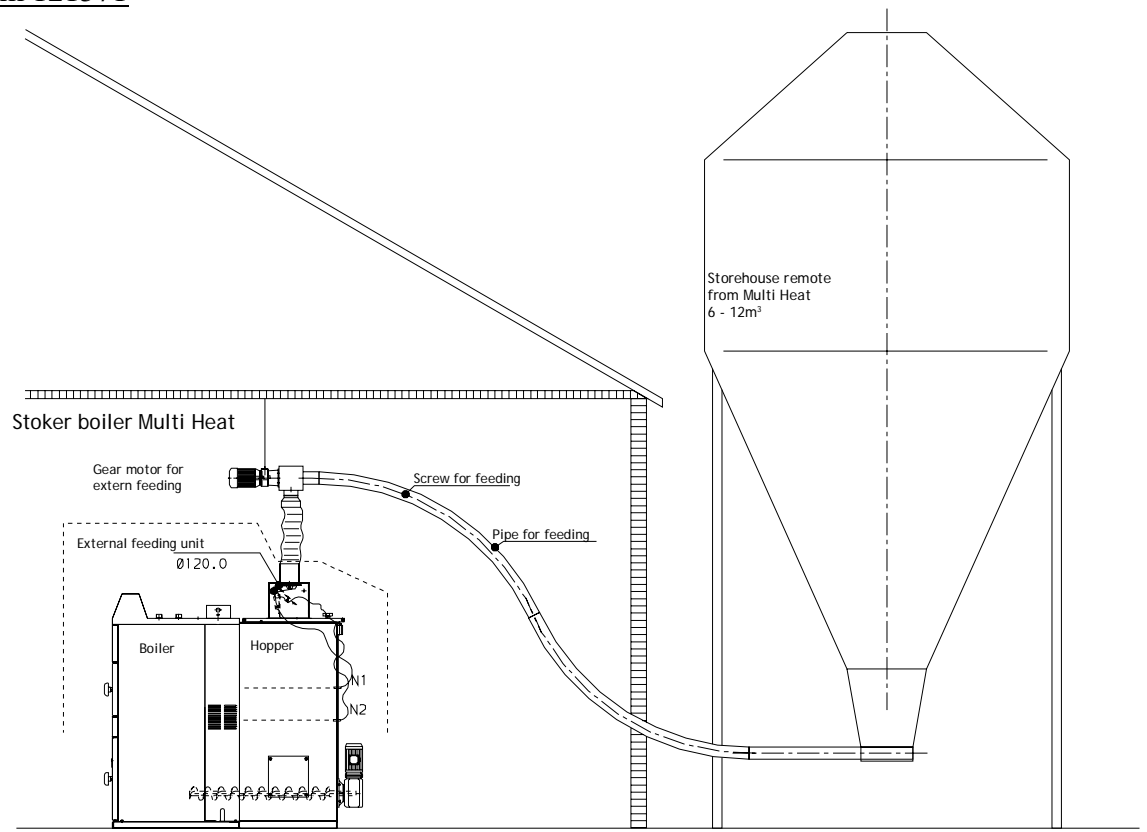
## 4 System concept diagrams

### System diagram 121570

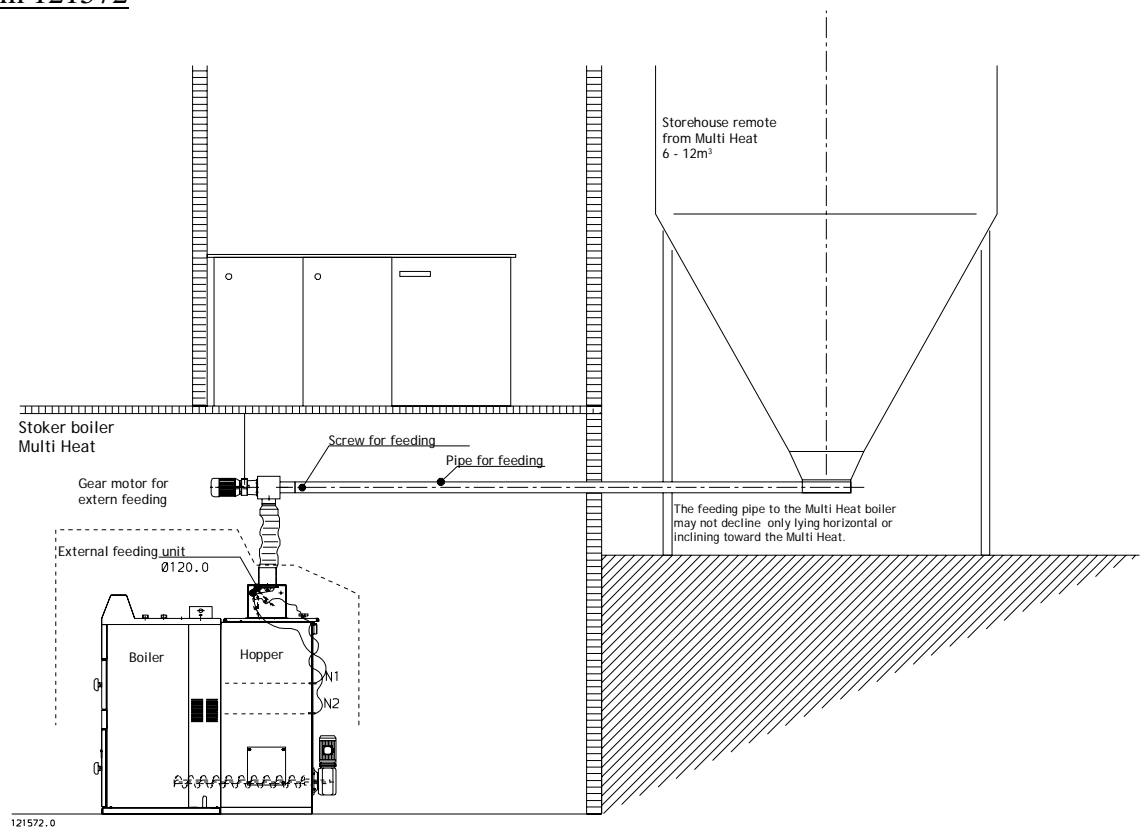


System diagrams no: 121570, 121571, 121572 and 121574 show examples of how the automatic feeder unit can be installed. These are suggestions only for the installer. The manufacturer nor the distributor cannot accept responsibility for defects or losses based on these suggestions.

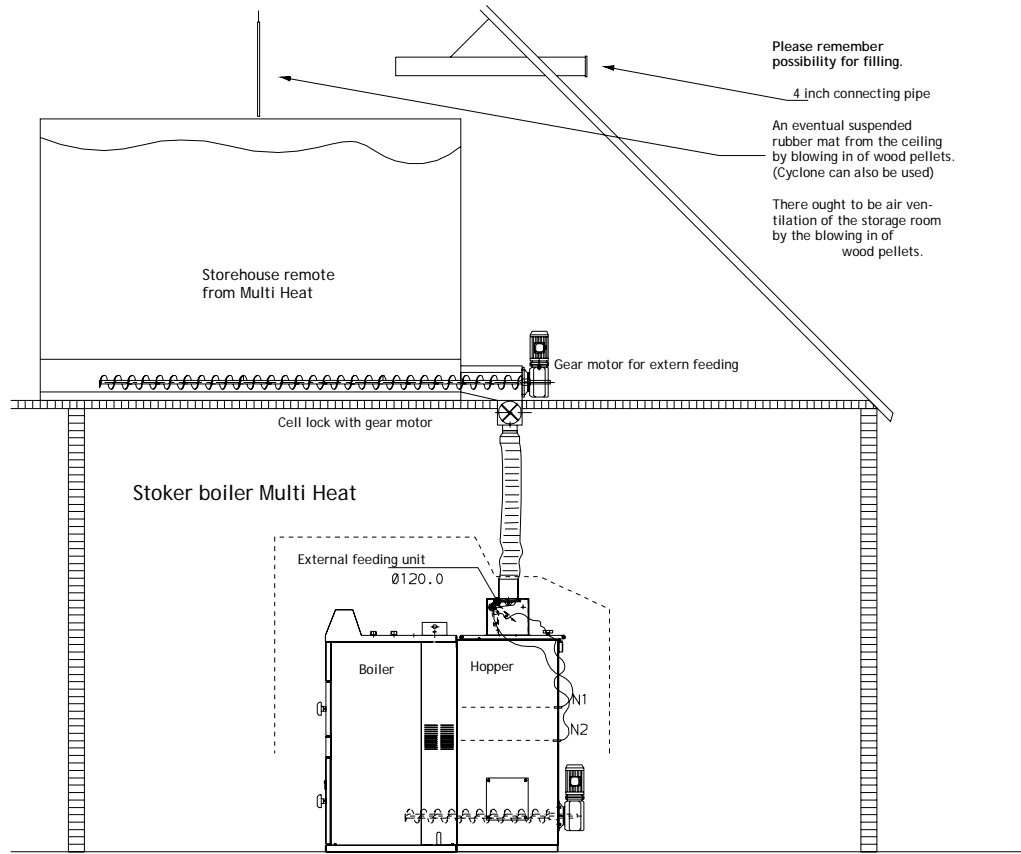
System diagram 121571



System diagram 121572



### System diagram 121574



121574.0