

PST Controller



Montage- og brugsanvisning for Kongskilde PST plantørringsstyring

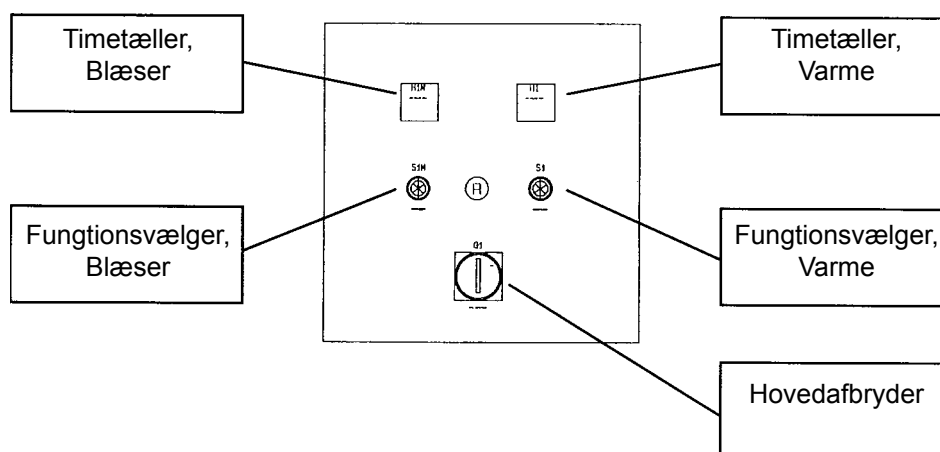
Generelt

Kongskilde PST plantørringsstyring anvendes til automatisk start/stop af lavtryksblæser og varmeovn i plantørringsanlæg.

- PST styring sikrer en effektiv og økonomisk nedtørring af korn og frø med et minimum af manual indsats.
- PST styring kan spare mange penge på energiforbruget til lavtryksblæser og brænder ved korrekt og effektiv drift.
- PST tjener penge ved afregning af korn, da PST i nogen grad giver mulighed for at nedtørre afgrøden til et niveau tæt på den ønskede slutfugtighed.

PST styring består af et kontrolpanel med følgende funktioner:

1. Funktionsvælgere med stillingerne MAN. - 0 - AUT. for lavtryksblæser og brænder.
2. Timetællere for lavtryksblæser og brænder. Ved at multiplicere lavtryksblæserens kW + varmeovnens kW forbrug og brænderens olieforbrug pr. time med drifttimerne, beregnes det samlede energiforbrug for tørringen.
3. Indbygget automatisk stjerne/trekant starter for lavtryksblæseren.
4. Hygrostater for måling af luftens relative fugtighed, dels i hovedkanalen og dels udenfor.



PST styringens varmestyring er i princippet en "ON-OFF" styring, som kan sættes i forbindelse med centralvarmeanlæggets cirkulationspumpe, eller der kan

monteres en motor- eller magnetventil på rørstrengen til varmefladen. Varmetilsætningen afpasses således ved at styre vandgennemgangen i varmefladen.

Bestillingsnumre:

| Type | Motorstørrelse | Bestillingsnummer |
|-----------|------------------------|-------------------|
| PST 100 | 7,5 kW | 113 000 092 |
| PST 250 | 11,0 - 18,5 kW | 113 000 094 |
| PST 400 | 22,0 - 30,0 kW | 113 000 095 |
| PST 500 | 37 kW | 113 000 096 |
| PST 600 | 45 kW | 113 000 097 |
| Hygrostat | (Normalt 2 stk. nødv.) | 100 503 082 |

Standardudførelse er for 3 x 400v, 50 Hz

Brugsanvisning

Brugen af plananlæg kan opdeles i:

1. Indlægning
2. Tørring
3. Køling
4. Lagring

Det er vigtigt at der løbende noteres målte fugtigheder og temperaturer for afgrøderne, så disse data kan vise, hvorledes forholdene udvikler sig. En afgrødedagbog giver den nødvendige baggrund for behandling af afgrøden på den rigtige måde, så kvaliteten bevares ved min. indsats og udgifter.

1. Indlægning

Hvert læs kontrolleres for fugtighed og temperatur.

Tilstræb at korn med ensartet fugtighed lægges over den enkelte sidekanal/anlægsafsnit.
Blæs så snart en sidekanal er dækket af 1,0 m korn.

2. Tørring

Tørringen skal afsluttes så snart efter høst som muligt for at reducere svampeudvikling mm. Det kræver desuden meget højere energiforbrug, hvis der skal tørres senere ved lave temperaturer. Under tørringen skal lagtykkelse, luftmængde og tørrelufttemperatur afpasses efter afgrødens fugtighed.

Tørreluften skal altid have en lavere relativ fugtighed end ligevægtsfugtigheden svarende til afgrødens vandindhold - se nedenstående ligevægts-tabel.

Ligevægtstabel

Luftens relative luftfugtighed (%) og vandindhold (%) i korn & frøafgrøder ved 15° C.

| Relativ fugtighed | 40 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
|-------------------|------|------|------|------|------|------|------|------|------|------|
| Afgrøde | | | | | | | | | | |
| Byg | 10,1 | 11,8 | 12,6 | 13,4 | 14,3 | 15,2 | 16,5 | 17,8 | 19,4 | 21,9 |
| Hvede | 11,0 | 12,2 | 13,0 | 13,5 | 14,3 | 15,2 | 16,3 | 17,3 | 19,0 | 20,5 |
| Havre | 10,0 | 11,3 | 12,0 | 12,5 | 13,3 | 14,0 | 15,4 | 17,0 | 19,3 | 22,6 |
| Rug | 10,7 | 11,6 | 12,4 | 13,2 | 14,0 | 14,8 | 15,8 | 17,0 | 19,0 | 21,5 |
| Raps | 5,7 | 6,6 | 7,0 | 7,5 | 8,0 | 9,0 | 10,0 | 11,3 | 12,7 | 14,3 |
| Ærter | 10,3 | 11,9 | 12,7 | 13,5 | 14,3 | 15,0 | 16,0 | 17,1 | 19,0 | 22,0 |
| Græsfrø* | 9,2 | 10,5 | 11,1 | 11,8 | 12,8 | 13,8 | 15,4 | 17,0 | 19,4 | 22,5 |

* Lette græsfrø - ligevægtsfugtighed varierer en del

Håndregel:

Ved korntørring svarer 65 % relativ luftfugtighed til ca. 15 % korn slutfugtighed.
1° C opvarmning af tørreluften sænker den relative luftfugtighed med ca. 5 %.

Driftskema

Ved 20% - 24% fugtigt korn har udeluften normalt en tilstrækkelig tørreevne og der køres konstant med blæseren uden varmetilsætning alene styret af udehygrostaten.

Ved 18% - 20% fugtigt korn har udeluften tilstrækkelig tørreevne i en stor del af døgnets timer og der køres med blæseren uden varmetilsætning alene styret af udehygrostaten.

Ved 18% - 20% fugtigt korn er det økonomisk fordelagtigt, at tilsætte varme i de timer i døgnnet som har

for høj relativ luftfugtighed. Dette giver mulighed for at tørre effektivt i alle døgnets timer. Herved forkortes tørretiden, den ønskede slutfugtighed nås så hurtigt som muligt. Blæseren kører konstant. Varmekilden styres af en hygrostat anbragt i hovedkanalen.

Varmekildens hygrostat indstilles til en relativ fugtighed svarende til kornets ønskede slutfugtighed. Udehygrostaten indstilles så blæser/varmekilde automatisk afbrydes ved udeluft med ekstrem høj relativ fugtighed. Genindkobling sker automatisk, når udeluftens relative fugtighed er sunket til et acceptabelt niveau.

| | Max. tykkelse | Luftopvarmning °C | Driftsform |
|---|---------------|-------------------|-------------------------------|
| Korn og græsfrø 22 - 24% Raps 16 - 18% | | | |
| Korn | 1,0 - 1,5 m | Uopvarmet | Lavtryksblæser kører konstant |
| Raps | 0,7 - 0,8 m | Uopvarmet | Lavtryksblæser kører konstant |
| Græsfrø** | 0,8 - 0,7 m | Uopvarmet | Lavtryksblæser kører konstant |
| Korn og græsfrø 20 - 22% Raps 12 - 14% | | | |
| Korn | 1,5 - 2,0 m | Uopvarmet | Lavtryksblæser kører konstant |
| Raps | 0,85 - 0,90 m | Uopvarmet | Lavtryksblæser kører konstant |
| Græsfrø** | 0,85 - 0,90 m | Uopvarmet | Lavtryksblæser kører konstant |
| Korn og græsfrø 18 - 20% Raps 10 - 12% | | | |
| Korn | 2,0 - 2,5 m | 5° opvarmet | * |
| Raps | 0,90 - 1,0 m | 5° opvarmet | * |
| Græsfrø** | 0,90 - 1,0 m | 5° opvarmet | * |
| Korn og græsfrø 16 - 18% Raps 8 - 10% | | | |
| Korn | 2,5 - 3,0 m | 5° opvarmet | * |
| Raps | 1,0 - 1,2 m | 5° opvarmet | * |
| Græsfrø** | 1,0 - 1,2 m | 5° opvarmet | * |
| Korn og græsfrø 14 - 16% Raps 8 - 10% | | | |
| Korn | 3,0 - 4,0 m | 5° opvarmet | * |
| Raps | 1,2 - 1,5 m | 5° opvarmet | * |
| Græsfrø** | 1,2 - 1,5 m | 5° opvarmet | * |

* Ved brug af styring:

Med varmetilsætning.

Hygrostat anbringes i hovedkanal og styrer varmekilde. Indstilles på relativ fugtighed svarende til afgrødens slutbalancefugtighed.

Alternativ uden varmetilsætning:

Hygrostat anbringes ude og styrer lavtryksblæser. Indstilles på relativ fugtighed svarende til lidt under afgrødens aktuelle balancefugtighed. Hygrostatens indstilling reguleres nedad til afgrødens slutbalancefugtighed efterhånden som tørringen skrider frem.

** Lette græsfrø - ideel lagtykkelse varierer en del.

Overslagsmæssigt regnes med, at 12.000 m³ luft kan tørre 1 tons korn 1%.

3. Køling

Efter tørring følger snarest en nedkøling med gennemblæsning af uopvarmet udeluft. Der vælges perioder hvor udeluftens temperatur og relative fugtighed er lavere end afgrødens temperatur og balancefugtighed - sene formiddagstimer og tidlige aftentimer er normalt godt.

Køling gentages et antal gange i efteråret indtil afgrøden har nået en temperatur på ca. 5° C.

4. Lagring

Igennem lagerperioden tages prøver af kornfugtigheden og temperatur forskellige steder i lageret - lige efter høst med ca. en uges interval og senere når forholdene er stabile med længere intervaller.

Hvis afgrødens temperatur og fugtighed stiger, ventileres med udeluft med lav temperatur og relativ fugtighed indtil de oprindelige forhold er genetableret.

Under alle omstændigheder er det fordelagtigt for kornets kvalitet at gennemlufte det nogle timer med 3 - 4 ugers mellemrum.

Yderligere gode råd om plantørring.

Måleudstyr

For at kunne betjene et plantørringsanlæg sikker og økonomisk er det nødvendigt med forskelligt måleudstyr:

- Et termometer til måling af lufttemperatur samt et ca. 3 meter langt spyd til måling af kornetemperaturen.
- Prøveudtager, så kornet kan udtages i forskellige dybder.
- Modtryksmåler monteret på hovedkanal, - viser anlæggets luftryk som ved hjælp af lavtryksblæserens ydelseskurve kan omsættes til den aktuelle luftydelse (normalt arbejdsområde er 85 - 140 mm VS)
- Fugtighedsmåler, så kornfugtighed kan bestemmes og tørrebehov fastlægges. Evt. kan fugtighedsmåleren justeres til at passe med kornhandlerens apparater.
- Hygrometer, til aflæsning af luftens relative fugtighed - Ved høj relativ luftfugtighed er det vanskeligere at tørre korn og frø.

Lagtykkelse

Måles fra gulv til overfladen. For at sikre en jævn luftstrøm er det vigtigt, at afgrøden er jævnet ud, så der er samme lagtykkelse overalt.

Luftrate

Luftrate angives i m³ luft/m² gulv/time under forudsætning af at lagtykkelse afpasses efter afgrødens fugtighed - se ovenstående driftskema.

Overslagsmæssigt anvendes:

| | |
|-----------------------|--|
| Ved tørring | 350 m ³ luft/m ² gulv/time |
| Ved beluftning/køling | 100 m ³ luft/m ² gulv/time |

Antal sidekanaler i funktion

Regn ud hvor mange m² gulv hver sidekanal forsyner med luft. Derefter udregnes hvor mange m³/time hver sidekanal aftager.

Antal sidekanaler i funktion regnes ud ved at dividere nødvendig luftmængde pr. kanal op i lavtryksblæserens luftydelse ved modtrykket målt i hovedkanalen.

Den maksimale luftmængde pr. sidekanal afhænger af sidekanalens areal. Anbefalede luftmængder er:

| | |
|-----------|---------------------------|
| Type 900 | 2500 m ³ /time |
| Type 1600 | 4400 m ³ /time |
| Type 2500 | 6900 m ³ /time |

Luftopvarmning

Til plantørring anbefales en opvarmning på 4-6° C over udeluftens temperatur.

Det kræver overslagsmæssigt 1,5 kcal at opvarme 1 m³ luft 5° C.

Planlægning af drift

Normalt kommer man bagud i tørreprocessen. Ved et veldimensioneret anlæg foreslås at man tørrer intensivt på en del af anlægget med den nødvendige luftrate i 20-22 timer pr. døgn. Derefter beluftes/køles på den ventede afgrøde i 2-4 morgentimer afhængig af fugtigheden.

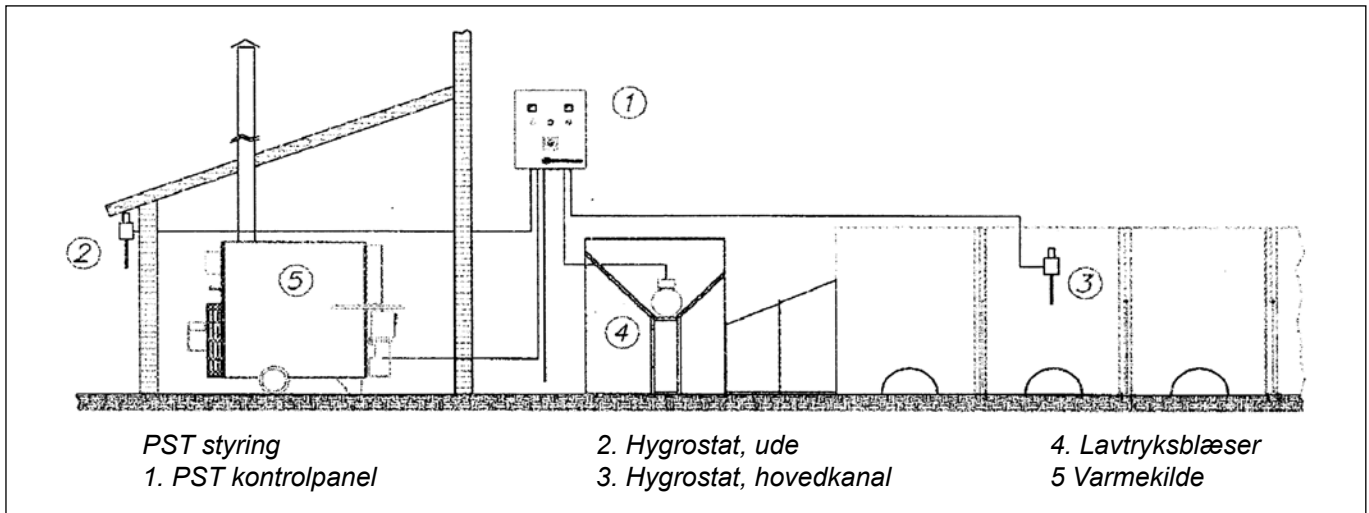
Sikkerhed

Før indgang i hovedkanal bør lavtryksblæseren altid startes kortvarigt for at sikre operatøren imod ildebefindende pga. iltmangel.

Visse afgrøder er meget levende, og det kan være farligt at gå i bunken. der skal altid være en ekstra person tilstede når der arbejdes i rummene.

Vægsystem/hovedkanal i et plananlæg er udsat for meget store korntryk. Det er vigtigt at alle dele er beregnet korrekt og alle materialer er friske og med fuld bæreevne. Alle dørbeslag, støtter og trækband skal være monteret så stabiliteten er intakt.

Montageanvisning



PST kontrolpanelet (1) anbringes nær lavtryksblæseren for en nem elektrisk tilslutning. En passende højde er ca. 1,2 m fra gulv til bunden af panelet, så betjening og aflæsning sker så nemt som muligt.

PST kontrolpanelet skal anbringes på en stabil væg, så rystelser fra blæser eller transportudstyr ikke forstyrrer de indbyggede relæer.

Kontrolpanelet er opbygget i et IP 65 støv og stønktæt kabinet, som skal overdækkes og skjermes for direkte regn og sol.

Frontdøren på kabinettet skal holdes lukket, så støv og vand ikke kommer ind og skaber brandfare eller ødelægger de elektriske dele.

Udehygrostaten (2) anbringes så den er i god kontakt med udeluften i nærheden af frisklufttilgangen til brænder/blæser. Hygrostaten placeres så den er nem at betjene og samtidig beskyttet for regn og direkte solpåvirkning, f.eks. under bygningsudhæng eller under en ca. 60 x 60 cm skrå overdækning, hvor hygrostaten er placeret på en bestående ydervæg.

Indehygrostaten (3) anbringes i hovedkanalen på en sidevæg med stutse for sidekanaler, så det sikres at den er i god kontakt med tørreluften. En placering ca. 2,0 m fra indblæsningen i hovedkanalen og ca. 0,8 m fra gulv vil normalt være godt.

For nem justering af hygrostat og betjening af lemme for sidekanaler anbefales det at etablere lys i hovedkanalen i nærheden af hygrostaten.

Beskyttelse af hygrostater

På ude- og indehygrostater monteres det medsendte hvide plastrør omkring følerne så disse beskyttes mod overlast, vand, sol og høje lufthastigheder.

Da hygrostater generelt er følsomme for et rått omgivelsesmiljø, anbefaler vi, at den elektriske tilslutning er udført med stik, så hygrostaterne kan tages indendørs, for opbevaring vinteren over i et tørt/opvarmet rum, når kornet er tørret og nedkølet.

Elektrisk tilslutning

Se tilslutningsdiagrammer.

Kontrolpanelet forbindes til blæserens motor koblet i stjerne/trekant og til brænderens elforsyning, samt termostat tilslutning. Der anvendes kabler ifølge stærkstrømsreglementet i forbindelse mellem kontrolpanelet og blæser, samt brænder. Faste kabler skal være med stålarmring for sikring mod gnavern.

Brug af PST kontrolpanelet til styring af varmeblade til centralvarme

Kontrolpanelet er opbygget for brug sammen med olie- og gasbrændere, som styres vha. deres termostattilslutning.

Det er normalt også muligt at anvende PST styringen sammen med varmeblader til centralvarmeanlæg.

Installation and operation instructions for Kongskilde PST controller for on floor drying systems

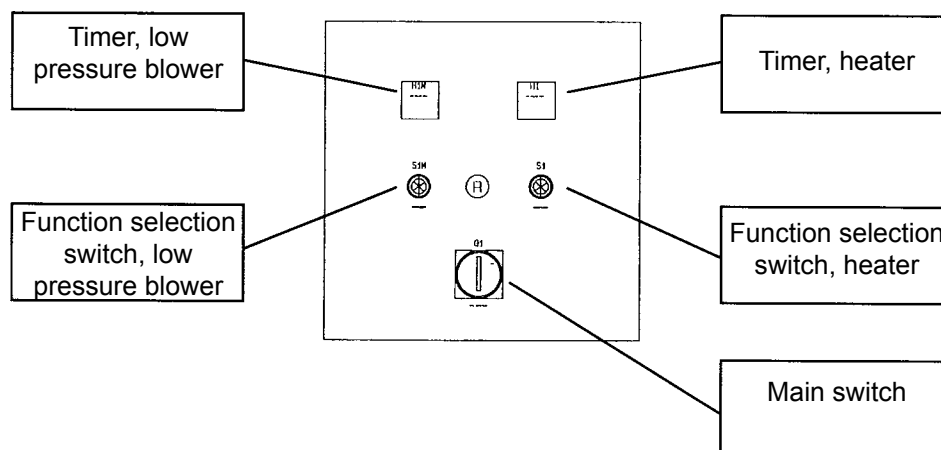
General information

Kongskilde PST controller is used for the control of automatic start and stop of low pressure blowers and heaters in on floor drying systems.

- The PST controller ensures effective and economical drying of grain and seeds with a minimum of manual effort.
- Proper and effective use of the PST controller can help you save a lot of money on power consumption of low pressure blower and heater.
- The PST controller helps you earn extra money on your grain and seed, because it to a huge extent gives a possibility to dry the crops to a level which is close to the desired end-humidity.

The PST controller consists of a control panel with the following functions:

1. Function selection switches for low pressure blower and heater, with options MAN. – 0 – AUT.
2. Timers for low pressure blower and heater. By means of multiplying the low pressure blower's and the heater's kW consumption and the heater's consumption of oil pr. hour with the number of hours of operation, it is possible to calculate the total consumption of energy during the drying process.
3. Integrated automatic star/delta starter for the low pressure blower.
4. Hygrostats for the measurement of relative air humidity in the main channel and outside.



The heater control function of the PST controller is in principle an ON/OFF control, which can be connected to the circulation pump of a central heating system. Alternatively a motor or solenoid valve can be mounted

on the pipe which leads to a heating surface. In such case the heating is controlled by means of regulating the flow of water through the heating surface.

Order numbers:

| Type | Motor kW | Order number |
|-----------|----------------------------|--------------|
| PST 100 | 7.5 kW | 113 000 092 |
| PST 250 | 11.0 - 18.5 kW | 113 000 094 |
| PST 400 | 22.0 - 30.0 kW | 113 000 095 |
| PST 500 | 37 kW | 113 000 096 |
| PST 600 | 45 kW | 113 000 097 |
| Hygrostat | (Normally 2 are necessary) | 100 503 082 |

The standard version is for 3 x 400 V, 50 Hz.

Operating instructions

The process of using on floor drying systems can be divided into the following stages:

1. Loading
2. Drying
3. Cooling
4. Storing

It is important continuously to register the results of crop humidity and temperature measurements, since these data show the direction of development of conditions.

A day log provides necessary background information for the correct treatment of the crops in order to maintain their quality at a minimum cost and effort.

1. Loading

Humidity and temperature of each load must be controlled. Grain with approximately the same level of humidity should, as far as possible, be placed over the

same side channel/in the same section of the drying installation.

Use the blower when a side channel becomes covered by 1.0 m thick layer of grain.

2. Drying

Drying should be performed as soon as possible after the harvest in order to reduce fungal growth etc. Moreover, drying the grain in a later period when the outside temperatures are lower, demands much higher energy consumption. During the drying process, the thickness of grain layer and the quantity and temperature of drying air must be adjusted to the level of grain humidity.

The relative humidity of drying air should always be lower than the equilibrium humidity, which corresponds to the water content of the crops – see the table below.

Equilibrium humidity

Relative humidity of air (%) and water content (%) of grain and seeds at 15°C.

| Relative humidity | 40 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
|---------------------|------|------|------|------|------|------|------|------|------|------|
| Crop | | | | | | | | | | |
| Barley | 10.1 | 11.8 | 12.6 | 13.4 | 14.3 | 15.2 | 16.5 | 17.8 | 19.4 | 21.9 |
| Wheat | 11.0 | 12.2 | 13.0 | 13.5 | 14.3 | 15.2 | 16.3 | 17.3 | 19.0 | 20.5 |
| Oats | 10.0 | 11.3 | 12.0 | 12.5 | 13.3 | 14.0 | 15.4 | 17.0 | 19.3 | 22.6 |
| Rye | 10.7 | 11.6 | 12.4 | 13.2 | 14.0 | 14.8 | 15.8 | 17.0 | 19.0 | 21.5 |
| Oilseed rape | 5.7 | 6.6 | 7.0 | 7.5 | 8.0 | 9.0 | 10.0 | 11.3 | 12.7 | 14.3 |
| Peas | 10.3 | 11.9 | 12.7 | 13.5 | 14.3 | 15.0 | 16.0 | 17.1 | 19.0 | 22.0 |
| Grass seeds* | 9.2 | 10.5 | 11.1 | 11.8 | 12.8 | 13.8 | 15.4 | 17.0 | 19.4 | 22.5 |

* In case of light grass seeds, the equilibrium humidity varies a lot.

Rule of thumb:

In case of grain, 65% relative air humidity corresponds to approximately 15% end-humidity of the grain. The increase of temperature of drying air by 1°C lowers the relative air humidity by approximately 5%.

Operation scheme

If the humidity of grain is 20-24%, the drying capacity of outside air is normally sufficient and the blower, controlled only by the outside hygostat, should be running continuously without heat.

If the humidity of grain is 18-20%, the drying capacity of outside air is sufficient for the most of time and the blower, controlled only by the outside hygostat, should be running without heat.

If the humidity of grain is 18-20%, it is economically advantageous to have the heat on during these hours of the day and night, in which the relative air humidity is too high.

This makes it possible to dry the grain effectively all the time. The total drying time becomes shorter and the desired end-humidity is achieved as quickly as possible. The blower should be running continuously. The heat source is controlled by means of hygostat which is placed in the main channel.

The hygostat which controls the heat source should be set to a relative humidity level corresponding to the desired end-humidity of the grain. The outside hygostat should be set in such a way that the blower/heat source will stop automatically if the relative humidity of the outside air becomes extremely high. Restart takes place automatically when the relative humidity of the outside air has sunk to an acceptable level.

| | Max. thickness | Air heating, °C | Mode of operation |
|---|----------------|--------------------------------|-------------------------------------|
| Grain and grass seeds 22-24% Oilseed rape 16-18% | | | |
| Grain | 1.0 - 1.5 m | Heat off | Low pressure blower runs constantly |
| Oilseed rape | 0.7 - 0.8 m | Heat off | Low pressure blower runs constantly |
| Grass seeds** | 0.8 - 0.7 m | Heat off | Low pressure blower runs constantly |
| Grain and grass seeds 20 - 22% Oilseed rape 12 - 14% | | | |
| Grain | 1.5 - 2.0 m | Heat off | Low pressure blower runs constantly |
| Oilseed rape | 0.85 - 0.90 m | Heat off | Low pressure blower runs constantly |
| Grass seeds** | 0.85 - 0.90 m | Heat off | Low pressure blower runs constantly |
| Grain and grass seeds 18 - 20% Oilseed rape 10 - 12% | | | |
| Grain | 2.0 - 2.5 m | Heat on, temp. increase by 5°C | * |
| Oilseed rape | 0.90 - 1.0 m | Heat on, temp. increase by 5°C | * |
| Grass seeds** | 0.90 - 1.0 m | Heat on, temp. increase by 5°C | * |
| Grain and grass seeds 16 - 18% Oilseed rape 8 - 10% | | | |
| Grain | 2.5 - 3.0 m | Heat on, temp. increase by 5°C | * |
| Oilseed rape | 1.0 - 1.2 m | Heat on, temp. increase by 5°C | * |
| Grass seeds** | 1.0 - 1.2 m | Heat on, temp. increase by 5°C | * |
| Grain and grass seeds 14 - 16% Oilseed rape 8 - 10% | | | |
| Grain | 3.0 - 4.0 m | Heat on, temp. increase by 5°C | * |
| Oilseed rape | 1.2 - 1.5 m | Heat on, temp. increase by 5°C | * |
| Grass seeds** | 1.2 - 1.5 m | Heat on, temp. increase by 5°C | * |

* If the PST controller is used:
With heat on.

Hygostat should be placed in the main channel and control the heat source. The hygostat should be set to a relative humidity level corresponding to the desired end-humidity of the corn.

Alternatively without heat on:

Hygostat should be placed outside and control the low pressure blower. The hygostat should be set to a relative humidity level slightly below the actual equilibrium humidity of the grain. As the drying process proceeds, the setting should gradually be adjusted down to the end-humidity of the grain.

** In case of light grass seeds, the ideal layer thickness varies a lot.

It is estimated that 12,000 m³ of air can dry 1 ton of grain by 1%.

3. Cooling

When the drying process is finished, it is important to start cooling the crops down as quickly as possible by means of blowing unheated air. Choose periods in which outside temperature and relative air humidity is lower than the temperature and equilibrium humidity of the crops – late afternoon and early evening hours normally offer appropriate conditions.

The cooling process should be repeated a number of times during the autumn season until the temperature of the crops fall down to approximately 5°C.

4. Storing

In the storage period, measurements of grain humidity and temperature should be made regularly in different parts of the storage space – approximately once a week in the period right after harvest and at rarer intervals when the conditions have stabilized.

If the temperature and humidity of the crops rises, the storage space should be ventilated with outside air having low temperature and humidity until the original conditions have been re-established.

Under any circumstances it is beneficial for the quality of grain to ventilate it for some hours once every 3-4 weeks.

Further advice for on floor drying.

Measuring devices

In order to operate the on floor drying system in a safe and economical manner, it is necessary to use various measuring devices:

- Thermometer for the measuring of air temperature and approx. 3 m long probe for the measuring of grain temperature.
- Sampling tool in order to take samples of grain from different depths.
- Back pressure meter placed on the main channel – shows the value of air pressure in the system, which, based on the performance curve of the low pressure blower, may be converted into the current air output (normal working range is 85-140 mm WG).
- Humidity meter in order to measure the humidity of grain and to determine the drying demand. The humidity meter may be adjusted in such a way that it matches the instruments used by the corn trader.
- Hygrometer for the measuring of relative air humidity – high relative humidity makes the drying process difficult.

Layer thickness

Should be measured from the floor to the surface level. In order to ensure a steady flow of air it is important that the surface of grain is levelled so that the layer thickness is the same in the whole storage area.

Air rate

The air rate is indicated in m³ air/m² floor surface/hour, based on the assumption that the layer thickness is correctly adjusted to the humidity of the crop – see the table under "Operation scheme".

It is estimated that the following air rates should be used:
For drying: 350 m³ air/m² floor surface/hour
For ventilating/cooling: 100 m³ air/m² floor surface/hour

Number of side channels in operation

Calculate the number of square meters of floor surface which are supplied with air by each side channel. Then calculate how many cubic meters of air per hour are extracted by each side channel.

The number of side channels in operation is determined by means of dividing the necessary quantity of air per channel by the air output of the low pressure blower, at back pressure level measured in the main channel.

Maximum air quantity per side channel depends on its surface area. Recommended air quantities are as follows:

| | |
|-----------|---------------------------|
| Type 900 | 2500 m ³ /hour |
| Type 1600 | 4400 m ³ /hour |
| Type 2500 | 6900 m ³ /hour |

Air heating

For on floor drying systems it is recommended to heat the air to the temperature which is 4-6°C higher than the temperature of outside air.

It is estimated that approximately 1.5 kcal is necessary in order to warm 1 m³ of air by 5°C.

Operation planning

Usually the effects of drying process are below expectations. If the system is well-dimensioned system it is recommended to dry the crops intensively with the necessary air rate for 20-22 hours per day. Then the crops should be ventilated/cooled for 2-4 hours in the morning, dependant on humidity.

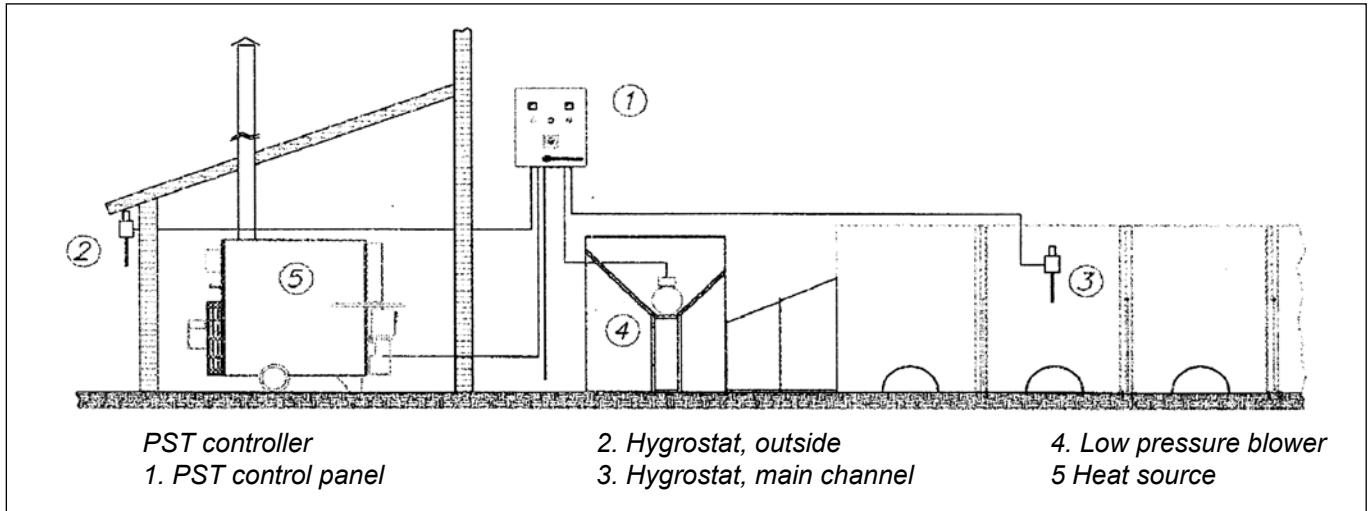
Safety

Before entry into the main channel, the low pressure blower should be started and run for a moment in order to protect the operator from the effects of possible lack of oxygen.

Some crops are very "active" and it can be dangerous to move around in the drying and storage area. Therefore, an additional person should always be present during all works performed in that area.

The walls/main channel of the system are exposed to very high load caused by the weight of grain. It is important that all parts of the system are well dimensioned and all materials are new and have full carrying capacity. All door fittings, supporting elements and reinforcing bands should be mounted in order to insure complete stability.

Installation instructions



Control panel of the PST controller (1) should be placed close to the low pressure blower to facilitate the connection of power supply. The appropriate height is approximately 1.2 m from the floor surface to the bottom of the panel – it makes the operation and reading of data as easy as possible.

The control panel should be fixed to a stable wall, so that vibrations from the blower or transport equipment do not cause interference in the work of its relays.

The control panel has a dust and splash proof IP 65 cabinet which must be roofed and shielded from direct sun and rain.

The front door of the cabinet must be kept closed so that water or dust do not penetrate into the device and cause fire danger or destroy the electrical parts.

The outside hygrostat (2) should be mounted in a place in which it will have good contact with the outside air, close to the fresh air supply to the heater/blower. Put it in a place, in which it will be easy to operate and at the same time protected from direct sun and rain, e.g. under the eaves of the building or on an external wall under an approximately 60 x 60 cm inclined roof.

The inside hygrostat (3) should be mounted in the main channel on a side wall with connection to side channels to ensure its good contact with the drying air. Usually the appropriate position is approximately 2.0 from the air input to the main channel and approximately 0.8 m from the floor surface.

It is recommended to provide lighting near the hygrostat in the main channel in order to facilitate the regulation of hygrostat settings and operation of hatches of the side channels.

Protection of hygrostats

Use the white plastic pipe which is delivered together with the hygrostats and place it around the sensors of both the outside and inside hygrostat in order to protect them from overload, water, sun, and strong blasts of air. Hygrostats are generally sensitive to rough ambient conditions and therefore it is recommended to equip their electrical connection with a plug so that, when the grain has been dried and cooled down, the devices may be taken inside for the winter and kept in a dry and warm place.

Electrical connection

See connection diagrams.

The PST control panel should be connected to the motor of the blower (star/delta starter), to the power supply of the heater and to the thermostat. Use proper cables (in accordance with the relevant regulations for power cables) for the connection of control panel to the blower and heater. Use steel wire armoured cables for the protection against rodents.

Use of the PST control panel for the control of heating surface in central heating systems.

The control panel is designed to be used for oil and gas burners which are controlled by means of a thermostat.

Normally it is also possible to use the PST controller for heating surfaces in central heating systems.

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