Operating instructions
String pinsetter
airOsetter

Issue: v3_2021

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1 Identification

Manufacturer's Name:	**NGT-Bowling e.K.**
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Ort:	D-52428 Jülich
Tel:	+49 2461 99 52 111
Fax:	+49 2461 99 52 112
Email:	info@ngt-bowling.com
Internet:	www.ngt-bowling.com
Plant Designation:	String pinsetter
Type:	airOsetter
Year of manufacture:	from 2020

2 User instructions

2.1 Purpose of the document

These operating instructions contain important information on how to operate the system safely, properly and economically. Observing them helps avoid hazards, reduce repair costs and downtime and increase the reliability and service life of the plant.

The operating instructions must be read and implemented by all personnel assigned to work on the system.

Personnel assigned to work on the system must have read the operating instructions before starting work on the plant. This applies in particular to personnel who only occasionally work on the plant, for example while carrying out maintenance and servicing work.

The operating instructions must be available at all times. Keep a copy of these operating instructions at the plant's operational location at all times!

In addition to the operating instructions, all mandatory accident prevention regulations in force in the country and place of use must be observed. In addition, all recognised technical rules for safe and professional work must also be observed.

The instructions in the operating manuals of the components supplied must be observed in all circumstances (see appendix)!

2.2 Target groups

- The **operator**, as the superior legal entity, is responsible for the proper use of the plant and for the training and deployment of authorised personnel. On behalf of his company, he shall define the binding competences and authority to issue instructions for the authorised persons.
- A **skilled** person is defined as a person who, on the basis of his technical training, knowledge and experience, can assess the work assigned to him and recognise possible hazards. He also has knowledge of the relevant provisions. Only trained specialist personnel or personnel who have been found capable after selection by the operator may be considered.
- A **trained/instructed person** is a person who has been instructed and, if necessary, trained in the tasks assigned to him/her and any possible hazards arising from improper behaviour. Such a person must also be instructed in any protective devices and protective measures required. Personnel to be trained, instructed or undergoing general training may only work under the constant supervision of an experienced person.
  Responsibilities must be clearly delineated and defined. The le-

gally permissible minimum age must be observed!

2.3 Liability and warranty

All information in these operating instructions is given to the best of our knowledge, taking into account our experience and knowledge to date.

The original version of these operating instructions was written in German and has been factually checked by us. The translation into the a suitable national/contractual language has been carried out by a recognised translation agency.

These operating instructions have been compiled with the greatest care. However, if you find any incompleteness and/or errors, please let us know in writing. Your suggestions for improvement will help to design a user-friendly operating manual.

A warranty of two years is granted for the technical parts and functioning of the machine. The warranty only applies insofar as the equipment is used in accordance with our guidelines and regulations. If a seal is broken or if covers are removed without authorisation, the warranty is void from that point onwards.

2.4 Reordering and Copyright

Further copies of these operating instructions can be ordered from the address given in the Identification chapter. Please take into account that there is a charge for reordering.

3 General safety instructions

The instructions in the operating manuals of the components supplied must be observed in all circumstances (see appendix)!

The basic prerequisite for the safe handling and trouble-free operation of this system is a knowledge of the basic safety instructions. In addition to the instructions given in this operating manual, the safety instructions relating to the components supplied in the documentation attached in the appendix must be taken into account.

1. The use of the equipment for any purpose other than that intended by the manufacturer is not permitted.
2. If the personnel discover faults or hazards, the operator or his authorised representative must be informed immediately.
3. If several people are working on the system, good cooperation and precise coordination of activities is necessary.
4. Safety devices and measures must never be removed or bypassed during the normal operation of the equipment.
5. If the dismantling of safety devices is absolutely necessary, the reassembly and inspection of such safety devices must take place immediately after completion of the work.
6. Hazardous zones in the plant may only be entered by persons designated for this.
7. Work on technical equipment (e.g. electrics) may only be carried out by appropriately qualified personnel.
8. When handling oils, greases and other chemical substances, the safety regulations applicable to the product must be observed!
9. Hot parts must not come into contact with explosive or highly flammable chemicals.

Protective devices must be refitted in their protective position after dismantling.
Damage to safety devices and misalignments must be rectified immediately.

3.1 Staff training

Hint!
Also observe the notes in the original operating instructions of the components supplied.

Hint!
The plant was pre-assembled by skilled personnel at **NGT-Bowling e.K..**

Work on the electrical and mechanical equipment of the system may only be carried out by suitably qualified personnel.

Observe the notes regarding personnel in the appropriate chapters of these operating instructions.

3.2 Presentation of safety instructions

In these operating instructions, the following designations and symbols are used as safety instructions:
Failure to observe these instructions may result in serious health hazards, including life-threatening injuries!

This symbol indicates an imminent danger to the life and health of personnel. Failure to follow these instructions will result in severe adverse health effects, including life-threatening injuries.

The symbol indicates possible damage to property and/or the environment.

This symbol indicates important facts and particularly useful information.

Warning of electrical voltage

Warning against hand injuries

Warning against automatic start-up

No trespassing

Do not stand under the load

Do not switch

Aufsteigen verboten

Hineinfassen verboten

Pull out the mains plug

Use foot protection

Use hand protection

Environmentally hazardous

3.3 Symbols on the system

All safety and hazard warnings on the equipment must be kept in a legible condition at all times.
The following pictogram is affixed to the control cabinet:

- Warning of electrical voltage

The following pictogram is attached to the airOsetter unit:

- Warnung vor Handverletzung

The following pictogram is attached to the superstructure:

- Aufsteigen verboten

The following pictogram is attached to the outlet of the airOlift unit / hood:

- Hineinfassen verboten

3.4 Personal protective equipment

The personal protective equipment required by regulations must be provided by the operator.

The wearing of personal protective equipment is mandatory, depending on the activity to be performed. This is pointed out separately in the individual chapters of these operating instructions.

3.5 Safety and protective devices

The system corresponds to the state of the art and recognisd safety rules. Nevertheless, dangerous situations can arise.

All safety and protective equipment must be maintained in perfect condition.

Only use the system when it is in perfect technical condition, in accordance with its intended use, aware of safety issues and hazards manner, observing the operating instructions! In particular, faults that could impair safety must be eliminated immediately (or have them eliminated)!

Protective devices must be refitted in their protective position after dismantling.

The system may only be operated with permanently mounted and functioning safety devices.

If the safety devices have to be removed for maintenance or repair work, they must be reassembled immediately after the relevant work has been completed. All work of this type may only be carried out by qualified personnel.

3.5.1 Overlapping main switch (mains disconnection device) and shut-off cocks

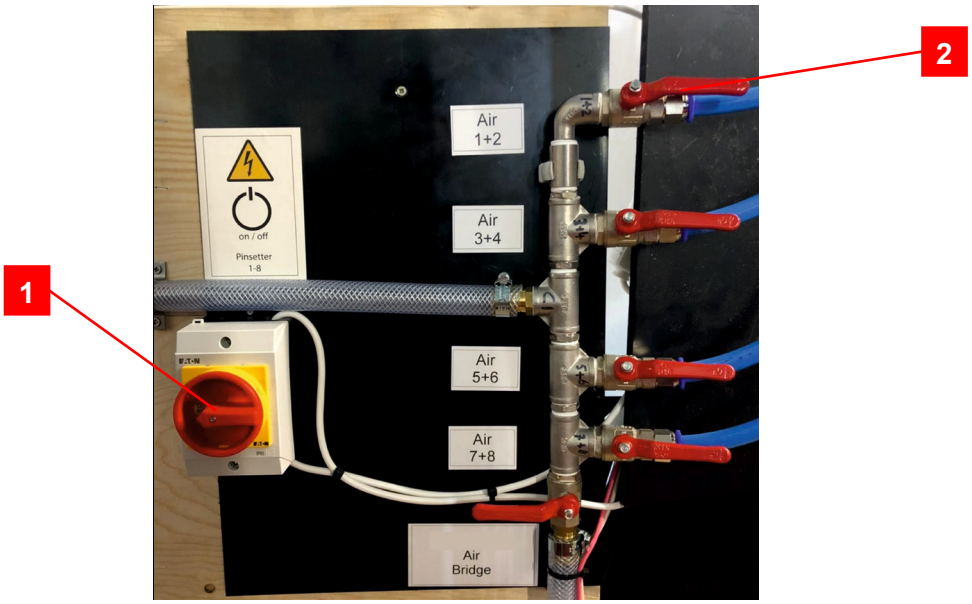

Figure 1: Main switch (mains disconnection device)

No.	Designation	Function
1	Overlapping main switch	Switching on/off the power supply of the specified pinsetter
2	Pneumatic stopcock (1 of 5)	Switching on/off the compressed air supply of the specified units

The universal main switch is used to switch on and off the power supply of the pinsetters specified above switch

Attention! When the main switch is switched off, the entire control cabinet may still be live.

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3.5.2 Main switch (mains disconnection device)

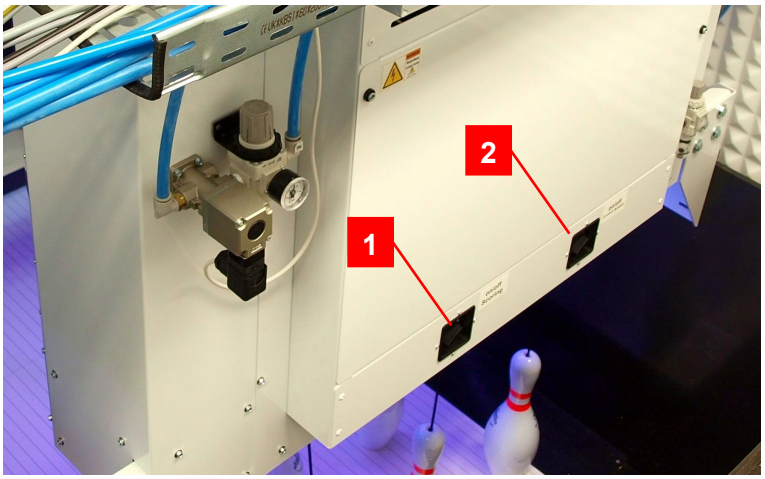

Figure 2: Main switch (mains disconnection device)

No.	Designation	Function
1	Main switch 1	Turning On/Off the Scoring System Power Supply
2	Main switch 2	Switching on/off the airOsetter, airOvator, airOlift power supply

The main switches are located on the back of the airOsetter and are used to switch the above-mentioned functional units on and off.

Attention! When the main switches are switched off, the entire control cabinet may still be live.

3.5.3 Protective enclosure with protective covers airOsetter (Hood)

The airOsetter may only be operated with a permanently mounted and functional protective enclosure with protective covers that are correctly and firmly mounted.

If the protective housing or the protective covers have to be removed for maintenance or repair work, they must be reassembled immediately after the relevant work has been completed.

Observe the additional notes in the individual chapters of these operating instructions!

3.5.4 Deflecting guards on the airOvator and airOlift

The airOvator and the airOlift may only be operated with the permanently mounted and functioning deflecting protective device (protective enclosure).

Sollte die Schutzeinrichtung zu Wartungs- bzw. Reparaturarbeiten entfernt / geöffnet werden müssen, muss die Remontage / das Schließen unmittelbar nach Abschluss der entsprechenden Arbeiten erfolgen.

Observe the additional notes in the individual chapters of these operating instructions!

3.6 Instructions regarding special types of hazards

3.6.1 Electrical energy

Warning of dangerous electrical voltages!
Observing the following instructions is essential.

Work on the plant's electrical equipment may only be carried out by electrically qualified personnel in accordance with the electrical regulations.

Those parts of the plant on which inspection, maintenance and repair work is carried out must - where specified - be disconnected from the power supply. First check exposed parts to ensure that they are not live, then earth and short-circuit them, shielding adjacent live parts!

Only use original fuses with the specified amperage! In the event of a fault in the electrical power supply, switch off the system immediately!

Inspect/check the plant's electrical equipment of the regularly. Eliminate any defects immediately.

If it is necessary to work on live parts, a second person must be called in who, in an emergency, can operate the relevant main switch. Shut off the work area with a red and white safety chain and a warning sign. Only use insulated tools!

Observe the safety instructions in the appropriate operating manual supplied by the relevant manufacturer.

3.6.2 Protection against start-up/accidental switching-on

To ensure that the system is not live, the following procedure must be followed:

- When the plant is at a standstill, pull out the mains plug

3.6.3 General ways of working before commissioning

Before starting up the plant, it is the operator's duty to make sure that no one is in the its danger zone.

3.6.1 Pneumatics

Work on pneumatic equipment may only be carried out by personnel with specialist knowledge and experience in pneumatics!

Separate safety regulations apply to pneumatic systems.

Nach Abschalten des Systems die im System vorhandene und potentiell gefährliche Rest-Energie berücksichtigen.

Risk of crushing!
Risk of injury from residual energy.

Relieve the residual pressure in the system before repairing or servicing pneumatic systems. Due to the pressure relief, some parts or components of the system may fall down. Drain valves should be used in emergencies. Secure parts or components that could fall down during pressure relief using mechanical means (screws, clamps). It is essential that the operating instructions are observed.

Regularly check all lines, hoses and screw connections for leaks and any externally visible damage! Resolve any damage immediately!

Lay and assemble pneumatic lines professionally! Do not mix up the connections! The fittings, length and quality of hose lines must meet the specifications.

3.6.1 Noise

The A-weighted equivalent continuous sound pressure level is below 70 dB(A).

3.6.2 Oils and emulsions

Oils, fats and emulsions can penetrate the skin. The operator must match skin protection products to the hazardous substances used.

Take care when handling hot operating materials (risk of burning or scalding)!

3.6.3 Detergent

Observe the safety data sheets!

3.6.4 Fire-fighting

Fire-fighting equipment must be installed in the immediate vicinity of the plant.

Warning

Risk of injury when using unsuitable equipment for fire-fighting.

3.6.5 Organisational measures

The operating instructions must always be kept within easy reach at the plant's operational location! The safety instructions in the components' operating manuals must be observed.

Any generally applicable, legal and other binding regulations for accident and environmental protection must be observed and personnel must be trained in them!

The operator must provide comprehensive training for the operating personnel. The operator must ensure that information concernng possible hazards is provided. The operating personnel must be comprehensively trained by the operator using safety and operating instructions.

Before starting work, personnel assigned to work on the plant must have read the operating instructions, in particular the chapter concerning safety. This applies in particular to personnel who only occasionally work on the plant (cleaning and maintenance work).

At least occasionally, check that the personnel are aware of safety issues and dangers while working in accordance with the operating instructions!

Any personal protective equipment (PPE) that may be required must be worn.

Here, the operator guidelines or the specifications laid down in the operating instructions for components supplied must be observed!

Observe all safety and hazard information on the plant!

Maintain all safety and hazard notices on/at the plant in legible condition!

In the event of changes being made to the plant or its operation that may affect safety, shut down the plant immediately!

Do not make any changes to the plant that could impair safety without the manufacturer's approval! Spare parts must comply with the technical requirements specified by the manufacturer. This is always guaranteed by using original spare parts.

Observe the timelines for recurring tests/inspections!

The operator must ensure that the lighting is adequately designed and installed.

The operating personnel must be made aware of fire alarm systems and the locations of fire extinguishing equipment.

4 System description

The instructions in the operating manuals for the components supplied must be observed in all circumstances (see appendix)!

4.1 Identification data

These operating instructions belong to the String Pinsetter airOsetter, including the airOvator, the airOlift and the control unit.

The identification/type plate on the airOsetter contains the data shown below.

D&K Electronics b.v.
Wilhelminastraat 19
6621 BA Dreumel
Netherlands

String pinsetter

Type: airOsetter
Serial no:
Year of manufacture:
Weight:

Mains voltage: 100-240 V AC
Frequency: 50/60 Hz
Installed power: 60 W
Mains fuse: 16 A

For information on the safe use of the equipment, see the operating instructions.

4.2 Intended use

The system is intended for commercial use. The plant can therefore be used by the public from the age of 12 years (game operation). As part of his supervisory duty, the operator must always ensure that no unauthorised persons (players/guests) are present in those areas of the plant that do not form part of the players' area. The operator may delegate this supervisory duty to suitable personnel of full age, who must be instructed in the safe use of the plant.

. The equipment may only be used in accordance with its intended purpose, as described in these operating instructions. Any use beyond this is considered to be improper. The manufacturer is not liable for any damage resulting from such actions.

This plant is built according to the latest state of the art and is operationally safe if the operating instructions and the plant and operation-specific specifications are observed.

Nevertheless, certain activities may cause danger to the life and limb of the user or third parties, or impairment of the plant and other material assets.

Only operate the plant when it is in perfect technical condition, in accordance with its intended use and in a safety and hazard-conscious manner, observing the operating instructions! Immediately eliminate (or have eliminated) any faults that might impair safety!

Changes and/or adjustments to the system are possible in certain cases. In such cases, prior written approval must be obtained from the manufacturer.

In particular, the following are not permitted:

- Non-observance or insufficient observance of the information in these operating instructions;
- Use of spare parts or parts that are not approved by the manufacturer;
- Incorrect operation;
- Removal of, tampering with or failure to install guards;
- Changing functions;
- Unauthorised modifications to the facility;
- Improper execution of maintenance;
- Improper use

4.3 Foreseeable misuse

The equipment may be dangerous if it is used improperly or not in accordance with its intended use.

The operating instructions must be available to the user and maintenance and repair personnel during the entire period of use of the plant. Keep a copy of these operating instructions with the plant! Keep a copy of these operating instructions available for maintenance and repair work!

The operational safety of the delivered system is only guaranteed if it is used as intended in accordance with our order documents, in particular the order confirmation. The limit values specified in the order documents must not be exceeded under any circumstances.

The information in the operating instructions must be followed without fail! Deviating use of the system excludes liability and warranty by the manufacturer!

Pollutants must be discharged in such a way that there is no danger to personnel or the environment. Leakages of hazardous substances also pose a risk to the environment. The statutory provisions must be complied with.

4.4 Structure and components of the system

Figure 3: Design and components - airOsetter

1	Housing (protective enclosure)	3	Hood (transparent, 1 of 2)
2	Pin Unit (1 of 10)	4	Pin (1 of 10)

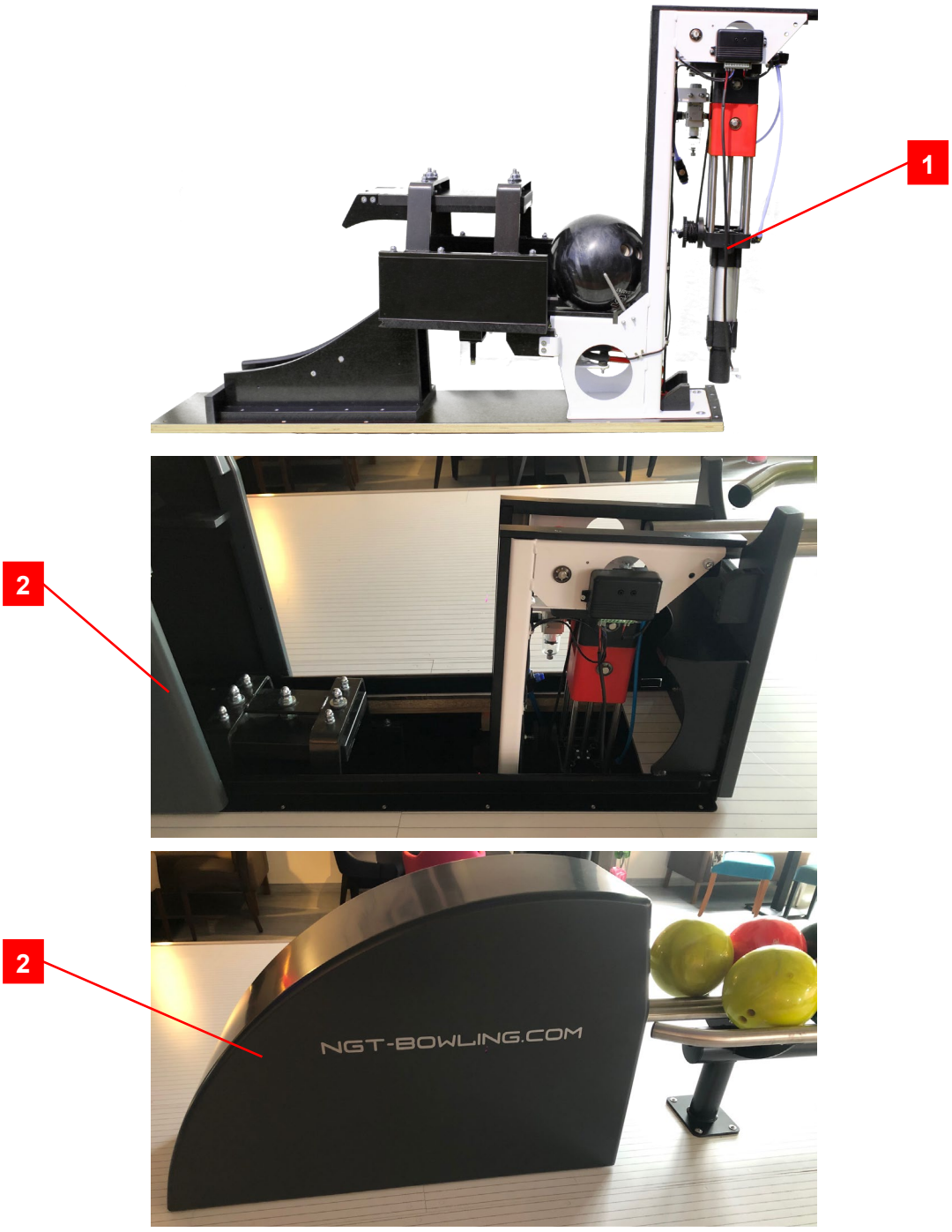

Figure 4: airOlift and Hood

1	Pneumatic unit	2	Hood (protective cover)

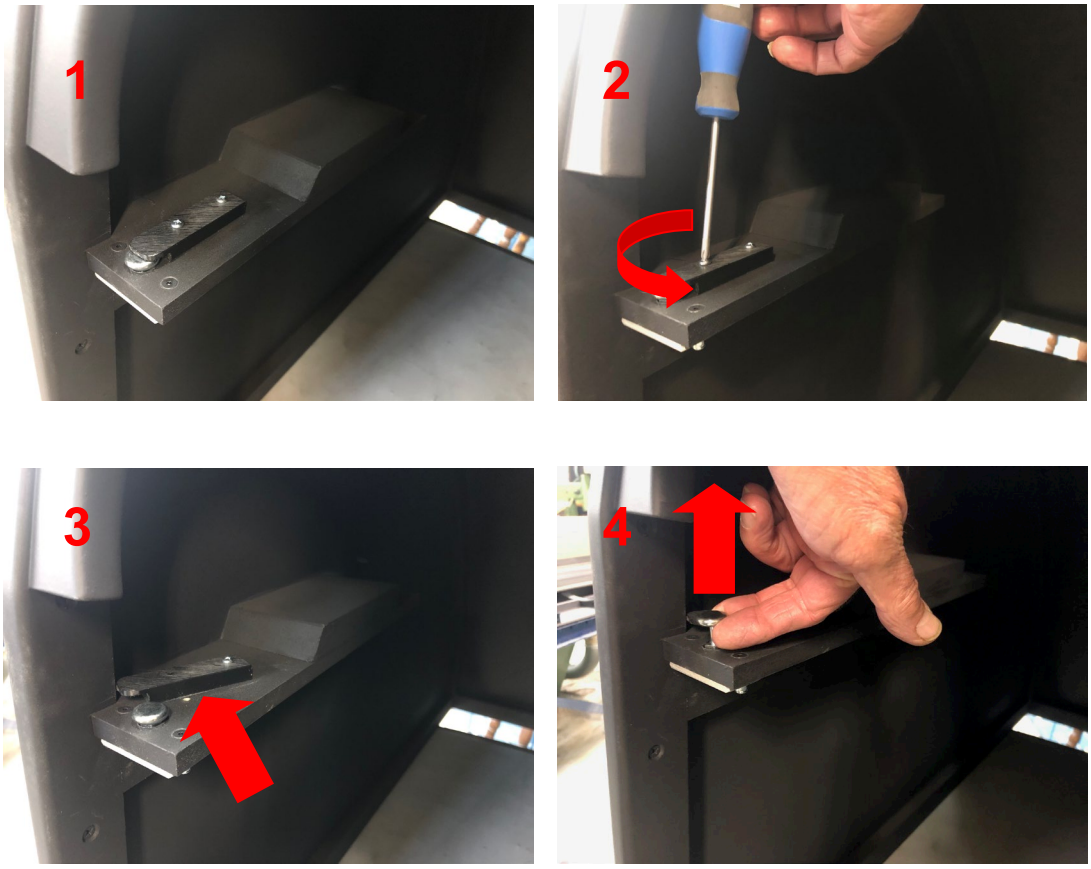

Figure 5: Opening mechanism - Hood

When the pin has been pulled out, the hood can be folded away.

The hood must always be kept closed and screwed down during normal operation.

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Figure 6: Hood without airOlift (variant/option)

Smaller versions of the system are equipped with a firmly bolted hood, with no airOlift underneath.

Figure 7: airOvator

1	Pneumatic unit	2	Protective device

4.5 Functional description

The airOsetter uses low air pressure with a maximum of 3 bar (45 psi). This system has been developed to be highly energy-efficient in accordance with international regulations; only a small amount of electrical energy is consumed by the electronics and pneumatics.

The airOsetter only consumes additional energy during operation.

It is designed as a modular system so that parts can be easily replaced if necessary.

An interface connection for our scoring system is included as standard.

The airOvator ball lifter is built between two pinsetters and supports the ball return for two lanes at the same time. Only 5 bar (75 psi) air pressure and a maximum of 24 VDC / 3.5 W is required for the electronics and the error-free operation of the pneumatic solenoid. The 24VDC power supply is located on the airOsetter.

The ball is returned to the ball stand within approximately 12 seconds. The airOlift Ball Lift picks it up and completes the automatic ball return.

The airOvator and the airOlift use almost the same technology and components as the airOsetter, so spare parts for the bearings are reduced to a minimum.

4.6 Technical data

4.6.1 Technical data airOsetter

Rated voltage:	100-240 V AC
Frequency:	50/60 Hz
Control voltage:	24 V
Rated current:	16 A
Performance:	60 W max.
Resting power:	< 10 W (excl. LED pin illumination)
Total weight (approx.):	approx. 80 kg
Max. inlet pressure:	6 bar
Operating pressure:	3 bar
Scoring outcome:	The scoring interface (NPN) is compatible with a wide range of scoring systems. The Standard P&P direct connection is guaranteed to work with the following systems: ScoreMaster and NGT Pro. All outputs have Open Drain Mosfe signals with a 100mA output current
RGB LED pin lighting:	Standard DMX512 RGB controller/decoder (RJJ45 / XLR in/out)

4.6.2 Technical data airOvator / airOlift

Rated voltage:	24 V DC
Performance:	3.5 W
Resting power:	0.0 Watt
Frequency:	50/60 Hz
Max. inlet pressure:	6 bar
Operating pressure:	5 bar
Weight:	approx. 20.5 kg (airOvator) / 32.5 kg (airOlift)

5 Installation and transport

The instructions in the operating manuals for the components supplied must be observed in all circumstances (see appendix)!

Any personal protective equipment (PPE) that may be required must be worn.

Here, the operator guidelines or the specifications laid down in the operating instructions for components supplied must be observed!

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5.1 Set up and install the system

Note!
The installation was assembled and put into operation by qualified personnel from**NGT-Bowling e.K..**

The equipment, incl. software, has been installed by a technician authorized by **NGT-Bowling e.K.** and has been declared functional in every respect. If you encounter any problems, follow the instructions in this manual before contacting NGT Bowling under your warranty.

5.1.1 Type and place of installation

The system must be installed in a dry, frost-free and ventilated hall.

Ensure a clean and dust-free working environment.

Ambient temperature: 10 – 35 °C

Humidity: 40 % - 60 %

Storage temperature: 10 – 30 °C

Achtung

5.2 Transporting the plant

The transport should be carried out by personnel who are capable of carrying out such work on the basis of their own knowledge and experience in the field of transport.

The following personal protective equipment (PPE) must be worn during transport.

- Foot protection (safety shoes)
- Hand protection (protective gloves) if necessary

Observe internal transport regulations and the relevant accident prevention regulations!

Other connections and joints between the plant and the hall or other plant groups must be removed.

Only transport vehicles that are suitable and lifting gear that is adequately dimensioned may be used to lift the system / system components. Transport by crane is not permitted.

Pay attention to the loading diagram and the relevant accident prevention regulations!

Risk of injury from unsuitable means of transport and lifting equipment.
Check transport equipment and lifting gear for sufficient load-bearing capacity.

Risk of injury from tipping parts.
Ensure that the plant or components do not tip over during transport (note the centre of gravity).

Risk of injury due to improper transport.
When transporting the system or components, comply with local regulations and accident prevention rules.

Do not step under raised loads!

Disconnected wiring should be stored in such a way that no damage can occur to the cables and plug connections during transport. There should be no risk of tripping over.

At the beginning or immediately after completion of the loading work, the transport safety devices must be attached to or removed from the plant components.

Before the system is moved, the required environmental conditions must be created at the new location (see chapter 4.6 "Technical Data").

5.2.1 Connecting the system

After operations such as the internal transport of the plant are complete, the connections to the plant must be re-established.

6 Commissioning

The instructions in the operating manuals for the components supplied must be observed in all circumstances (see appendix)!

6.1 Initial commissioning

Note!
The facility was assembled by specialist personnel from **NGT-Bowling e.K.** and put into operation for the first time.

6.2 Renewed commissioning

Take account of the following:

- Make sure that the EURO power cable is connected and mains power is available.
- Ensure an earthed connection when scoring systems and keyboards/monitors are connected.
- When using HDMI connections, make sure that both connected devices/power supplies are earthed.
- Never remove / install HDMI cables when power is connected to the systems.
- The two power switches on the rear of the machine can be used to separately switch on or off the power supply for the airOsetter, airOvator and airOlift electronics and the NGT / ScoreMaster scoring system. Set both to the "On" position.
- Ensure that the air pressure matches the explicitly specified settings by reading the pressure gauge on the back of the airOsetter.
- Also, make sure that the air pressure is supplied at the specified settings for the airOvator and the airOlift by reading the two gauges involved.
- If the scoring system is connected via HDMI, please refer to the earthing specifications.

6.3 Setup / Basic settings / Controls

The basic settings may only be changed by suitably qualified personnel and following consultation with the manufacturer.

7 Operation

The instructions in the operating manuals for the components supplied must be observed in all circumstances (see appendix)!

General rules for the plant include: No trespassing

The system is intended for commercial use. The plant can therefore be used by the public from the age of 12 years (game operation). As part of his supervisory duty, the operator must always ensure that no unauthorised persons (players/guests) are present in those areas of the plant that do not form part of the players' area. The operator may delegate this supervisory duty to suitable personnel of full age, who must be instructed in the safe use of the plant.

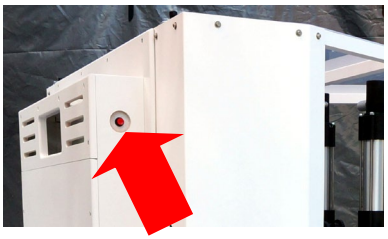
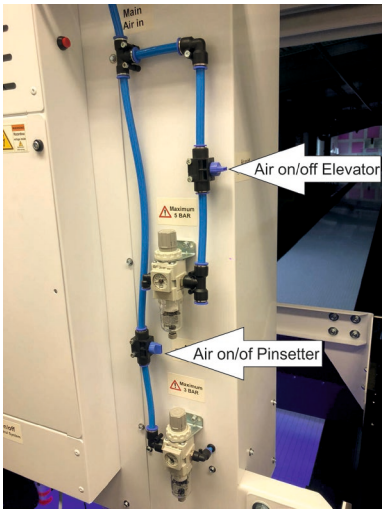
The system can start suddenly and automatically when a ball is thrown or someone activates the ball contact.

Climbing on the superstructures in the rear area of the plant is prohibited!

The setting/programming and testing of the plant may only be carried out by qualified personnel.

All workplaces and passageways must be kept clear. The operator is responsible for ensuring adequate lighting.

7.1 Operating and display elements

No.	Designation	Function
1	Pull-cord push-button 	On the right side of the machine (seen from the back) there is a button for lifting all pins. This function is used for maintenance and cord adjustment or, for example, when the lanes need to be cleaned. Press this button again to release all pins. This button has the same function as the "Pins up / down" button on the control panel.
2	Compressed air regulator with pressure gauges 	The regulators are used to set suitable pressures. The specified pressures must not be changed.
3	Control Panel	see Chapter 7.3

7.2 Plant operation

A stationary plant is not a safe plant!
Stored energy can be released unintentionally or as a result of improper maintenance procedures. Refer to the maintenance chapter for proper maintenance procedures, such as clearing a blockage while the equipment is in operation.

The normal methods of shutting down and all the relevant facilities must be made known to the personnel concerned. All access areas to these facilities must be free of obstructions. The equipment must be regularly checked for proper functioning.

7.2.1 Switching on the plant

Proceed as follows:

- Establish the compressed air supply
- Switch on the main switch ("ON")

7.2.2 Switching off the plant

Proceed as follows:

- Switch off the main switch ("OFF")
- Cut off the compressed air supply

7.2.3 Restart after a stoppage

After a stoppage of the control circuit, restarting must be carried out as follows:

- Eliminate the malfunction
- Acknowledge the malfunction
- Switching on the plant

7.3 Control Panel

7.3.1 Control Panel Version 1

The OLED display of the control panel shows the real-time status of the machine at all times. This control panel at the back of the machine can be used to set the general parameters for the relevant airOsetter and the associated airOvator and airOlift.

Many program options are available and these can be saved and re-viewed afterwards.

Press the "MENU" button to change or check settings. Use the arrow keys to scroll through the menu.

Change the selected parameter and press "ENTER" or press the "BACK" button to go back.

Use the "PINS up / down" button to move all pins up or down at the same time.

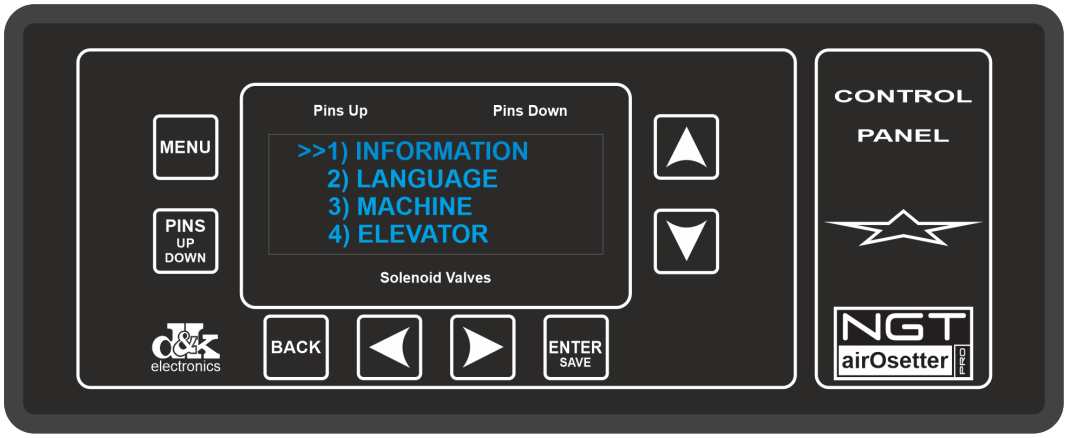


Figure 8: Control Panel Version 1

No.	Designation	Function
1	**Solenoid Valves**	Real-time display of the activity of the pneumatic valves for the relevant pins: when the display shows "X", these specific valves are activated.
2	**PINS UP DOWN** (Pins up / down)	When all (or some) of the pins are in the up position, the "U" symbols on the display light up. When all (or some) pins are positioned on the deck, the icons on the display light up with "n".
3	Sweep flap / curtain	When the sweep flap is in the up position, the display shows "/".

7.3.2 Control Panel Version 2

The control panel displays the real-time status of the machine at all times using LED lights. This control panel is used during a game (for example, when the machine is activated by the counter PC or an external switch), e.g., when a pin is not working well. It can be used without affecting the scoring. The control panel is located on the back of the machine and can be switched to the test phases by using the On / Off button (bottom right) on the control panel.

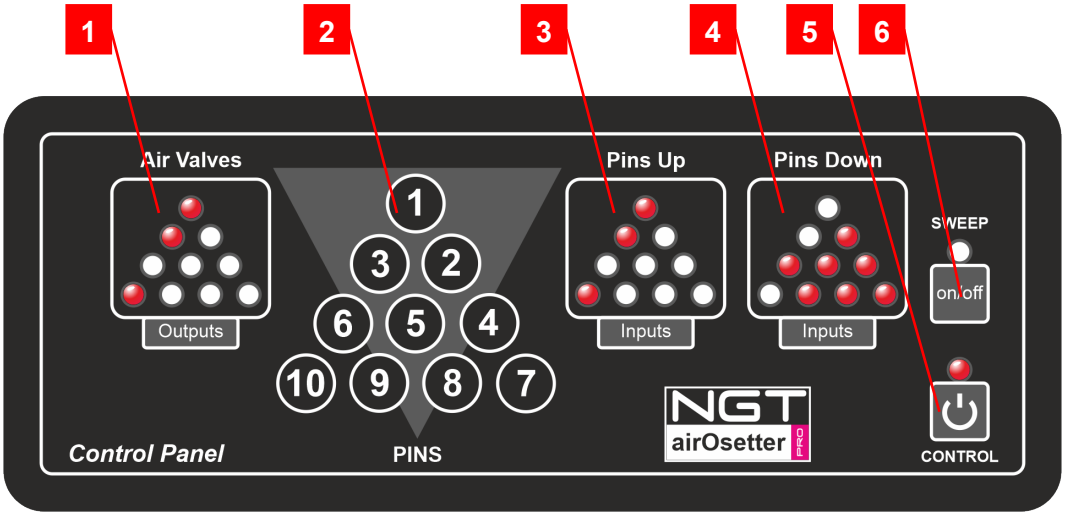


Figure 9: Control Panel Version 2

No.	Designation	Function
1	**Air Valves**	Real-time display of the activity of the pneumatic valves for the relevant pins: when the LEDs are lit, the specific valves are powered.
2	Keys 1 - 10	Using the numbers, each pin can be checked separately. The figures and numbers correspond to the pins. When a number is pressed, the pin is pulled up to the top position and placed back on the lane within 5 to 6 seconds. It is not possible to detect a pin in the up position. This action can also be performed even when a game has been started. The control panel should be switched on before the pins are checked.
3	**Pins Up**	Display of the pins: when all pins are in the up position, all LEDs are lit.
4	**Pins Down**	Pin indication: when all pins are in the down position, all LEDs are lit.

No.	Designation	Function
5	**Sweep** (sweep flap/curtain)	When the sweep flap is in the up position, the LED is lit. This also indicates that the device is active. When the control panel is switched on, the sweep function can be tested using the sweep button.
6	**Control** (On/Off button)	The key can be used to switch the control panel on or off.

8 Maintenance and servicing

The instructions in the operating manuals for the components supplied must be observed in all circumstances (see appendix)!

General rules for the plant include: No trespassing

The operator must ensure that no unauthorised persons (players/guests) are present in the relevant areas of the facility.

Bowling balls and flying pins can cause serious injuries.

Do not stand in front of the airOsetter or in the pit area behind the airOsetter, or place your hands, arms or head in the area behind the airOsetter and the pit without first making sure that no one is using the equipment (i.e. throwing a ball). The same applies to the input and output areas of the airOvator and airOlift

Do not wear untied long hair, ties, necklaces, loose clothing or jewellery during maintenance.

The system can start suddenly and automatically when a ball is thrown or someone activates the ball contact.

Before starting maintenance and repair work, the system must be switched off at the main switch and the mains plug must be disconnected. When working, the mains plug must be visible to the person carrying out the work. When switching off using the universal main switch, this it be switched off and secured against being switched on again using a padlock.

If necessary, close the shut-off cocks or disconnect the hose couplings to the compressed air supply and attach the "Do not switch" sign to the disconnecting devices such that it is clearly visible.

Switch off the main switch before opening the housing/control cabinet.

Attention! When the main switch is switched off, the entire control cabinet may still be live.

Work on the electrical and mechanical equipment of the system may only be carried out by suitably qualified personnel.

Climbing on the superstructures in the rear area of the plant is prohibited!

Maintenance work may only be carried out by trained/instructed personnel.

Maintenance work (repairs) may only be carried out by qualified personnel.

Protective devices must be refitted in their protective position after dismantling.

Regular maintenance and inspection of the system is of great importance. This reduces the occurrence of faults and increases operational safety.

8.1 Cleaning the plant

When using cleaning agents, the instructions on the packaging must be followed.

Always use fibre-free cleaning cloths to clean the plant!

Never clean electrical equipment with water or similar liquids.

Any personal protective equipment (PPE) that may be required must be worn.

Here, the operator guidelines or the specifications laid down in the operating instructions for components supplied must be observed!

8.2 Maintenance plan

Screw connections loosened during maintenance and repair work must always be tightened afterwards!

If it is necessary to dismantle safety equipment during set-up, maintenance and repair, such safety equipment must be reassembled and checked immediately after completion of said maintenance and repair work.

Ensure the disposal of operating and auxiliary materials as well as replacement parts to is safe and environmentally friendly Pollutants must be discharged in such a way that there is no danger to personnel or the environment. Leakages of hazardous substances also pose a risk to the environment. Local regulations must be complied with.

The electrical equipment in the plant must be regularly inspected/tested. Defects, such as loose connections or scorched cables, must be rectified immediately.

If work on live parts is required, a second person must be called in to operate the main switch with power release in the event of an emergency. The work area must be cordoned off with a red and white safety chain and a warning sign. Only use electrically insulated tools!

Before connecting or disconnecting cables, make sure that the power is off. Failure to do so may result in electric shock or equipment malfunction.

Work on the electrical equipment in the plant may only be carried out by a qualified electrician.

Only use original fuses with the specified amperage! In the event of a fault in the electrical power supply, switch off the system immediately!

Wearing and safety parts must be replaced immediately in the event of damage.

Various maintenance and inspection work sctivities must be carried out during the plant's service life. In this chapter the relevant intervals to be observed are laid down. In addition, the maintenance intervals for the purchased parts included in the appendix must be observed.

Where the usage conditions and ambient conditions are difficult, maintenance intervals must be shortened.

When performing maintenance, proceed as follows:

- Refer to the table to determine which component needs to be worked on.
- Read the contents of the relevant technical documentation and follow the instructions given there.

If no particular working method is laid down, carry out the required work in a professional manner.

Maintenance plan

Process		**Time span**	
P = Check	N = Retighten	t = daily	h = half-yearly
E = Adjust	S = Lubricate	w = weekly	j = annually
R = Clean	A = Exchange	m = monthly	

Component	Control	Process	Time span	Comments
General condition of the plant	Visual inspection	P	t	Look for corrosion, damage and defects
Protective housing	Visual inspection	P	t	Check for damage and defects (before starting work)
Safety devices	check for proper functioning	P	t	at least after each maintenance phase and before use (in the event of interrupted operations)
Warning signs and warning pictograms	check that everything is in order	P	m	replace if necessary
Electrical system	check	P	h	Loose connections or scorched cables must be eliminated immediately
Fittings	check for tight fit and re tighten if necessary	P/N	h	
Lines	Visual inspection for damage	P	h	
Pneumatic system components	Leak tightness of the pipes	P	m	
Pin cords	Visual inspection for wear	P/A	m	see Chapter 8.2.1
Valves	check for condensation	P		see Chapter 8.2.5
Air compressor	div.			see Chapter 8.2.6

8.2.1 Inspection and repair of pin cords

The cords should be checked regularly, once a month at a minimum.

Check the cords for wear, paying particular attention to the area around the head of the pin. To remove worn sections of cord, follow these instructions.

To avoid burning your hands, wear gloves or use a cloth to work the melted end of the cord.

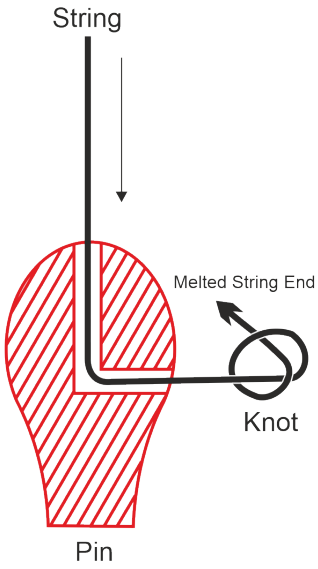


Figure 10: Pin cord

Proceed as follows:

1. If the cord is worn or frayed, cut the cord around the worn area.
2. Using a match or lighter, melt the end of the cord that is to be inserted into the head of the pin. While the cord is still hot, tie the end so it can easily pass through the holes in the head of the pin.
3. Thread the cord through the head of the pin and tie a knot in its end. There should be about 15 mm of cord protruding beyond the end of the knot.
4. Pull the cord back through the pin until the knot in the pin sticks out.
5. Using the adjustment wheel, readjust the cord tension for each pin where you have cut the cord.

8.2.2 Adjusting and replacing the cords

Good cord adjustment is the key to proper operation of the system.
Before making any other adjustment, please adjust the cord.

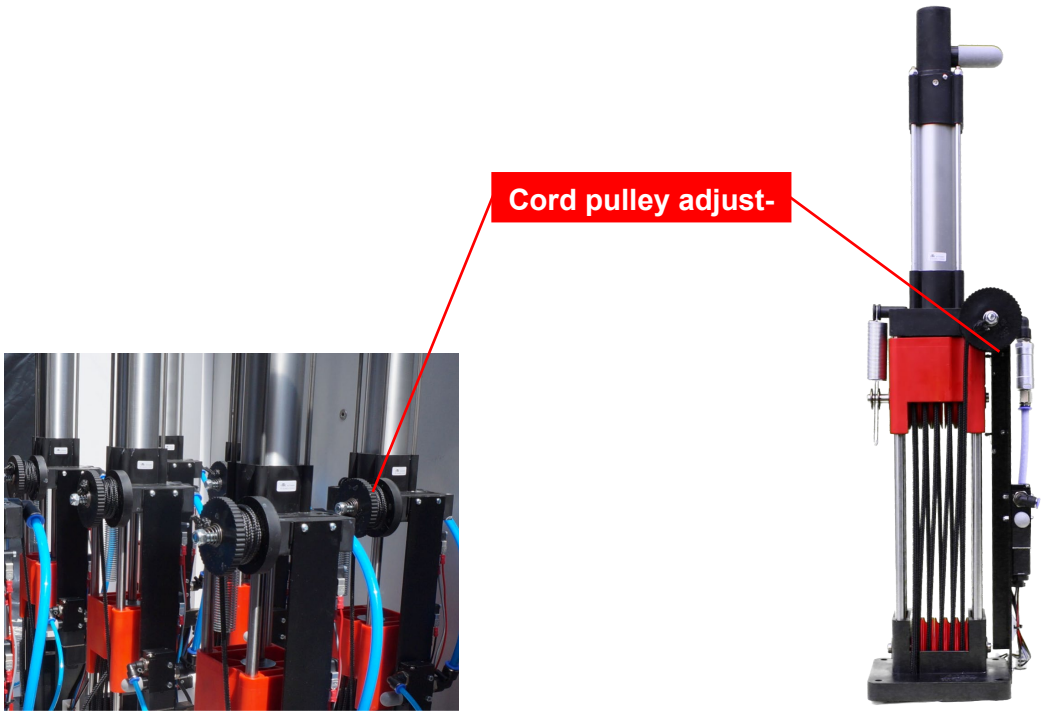


Figure 11: Pull cord adjustment by means of rope pulley

Proceed as follows:

6. Make sure the knot is firmly seated in the pinhole.
7. Lift all pins with the bypass button.
8. Use the adjustment wheel to ensure that the distance between the red and black blocks is approx. 0.5 - 1 mm. This gives the correct tension on the cord.
9. Pull and turn the adjustment wheel to set it to the correct position. Then release the wheel on the corresponding pinhole.

8.2.3 Installing / Reinstalling Separator / Boundary Blocks

The separating / limiting blocks are used to limit the unwinding capacity of the cords. These are therefore different for Pin 1, Pin 2-3, Pin 4-5-6 and Pin 7-8-9-10. These blocks are very important in achieving a performance similar to a machine without cords. Keep this in mind when replacing hoist units. The thickness of the limiting blocks is 1:10 with the unwinding capacity of the cords.

For example: 30 mm block thickness limits 300 mm cord unwinding!

The standard Pin1 has no limiting block and is completely unwound from the cord. In this case, it is two metres.

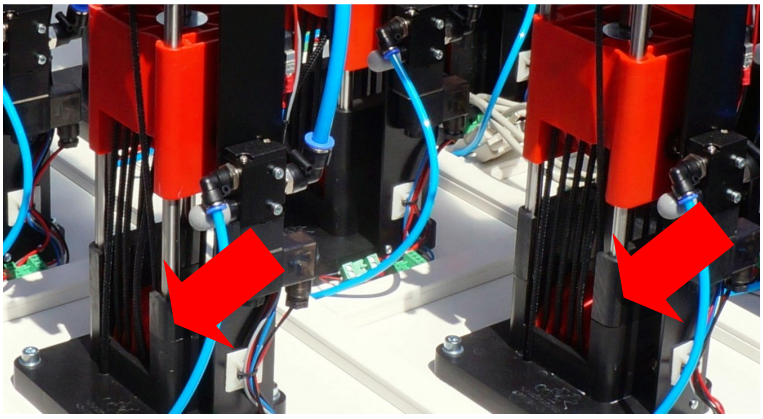


Figure 12: Position of the boundary blocks

8.2.4 Replacement of a complete pin unit

Figure 13: Pin unit

In the event of a malfunction, the unit can be replaced.

Proceed as follows:

1. Detach the pin from the cord.
2. Loosen the four mounting screws on the frame and pull off the 2-pin green connector and the 4-pin green connector.
3. Remove the device and loosen (do not click on) the limiting block.
4. Click on the limiting block of the new unit.
5. Place the new device on the frame.
6. Tighten the four screws again and connect the 2-pin green connector and the 4-pin green connector.
7. Knot the pin to the cord and check the cord tension. (see chapters 8.2.1 and 8.2.2)

After replacing the device, it is important to readjust the cord length and tension. When the pin is in the up position, the opening between the movable and fixed pulley blocks should be 0.5 to 1 mm.

8.2.5 Compressed air supply

Air with a pressure of 6 bar enters the airOsetter from the compressor. The machine uses less air pressure, so reducing valves are installed to reduce the air supply to the units of the machine.

For proper operation, these valves reduce the air pressure to approx. 3 bar.

For the airOvator and the airOlift, the reducing valve should be set to 5.0 bar. The valves should be checked regularly for condensation.

8.2.6 Maintenance of the air compressor

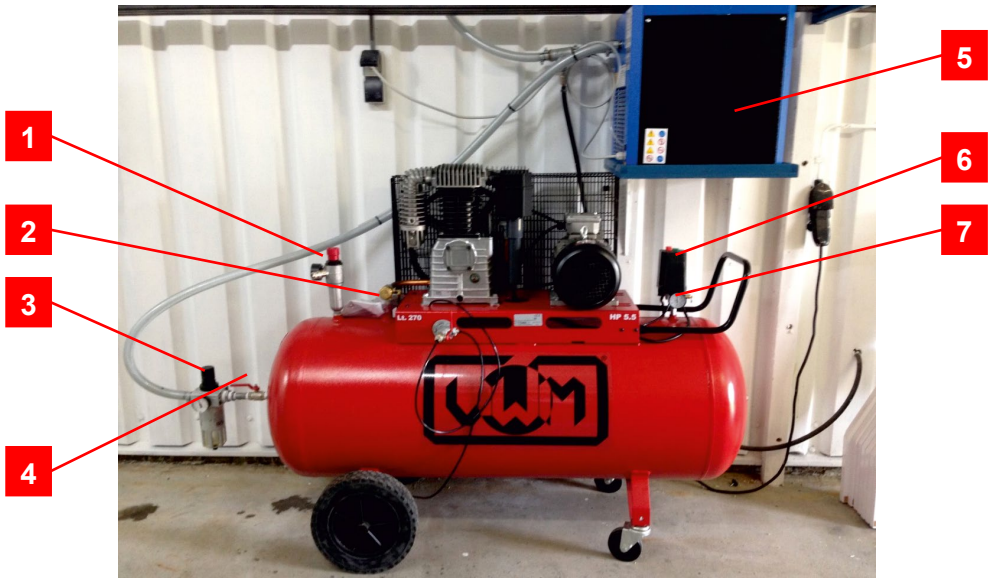


Figure 14: Air compressor

No.	Designation	Function / Notes
1	Service air outlet	Service air outlet
2	Boiler draining	Used to remove water from the boiler; this must be checked/performed weekly.
3	Air pressure outlet airOsetter system	Should be set to exactly 6 bar.
4	Main air shut-off valve	Shut off the compressed air supply
5	Air dryer	Drying function air
6	Mains switch on / off	We recommend that the compressor be switched off when not in use or that this be achieved by means of a central electrical cut-out.
7	Reducing valve with pressure gauge	The pressure should be set between 9 and 11 bar.

To ensure a good air supply, the water must be checked and drained weekly with the water tap, at the front of the compressor.

Make sure all pipes and hoses are securely connected to prevent leaks.

The compressor settings are adjusted during installation by one of our service technicians.

Notice: If the settings of the compressor are changed or disturbed, the warranty will be void!

Also observe the instructions in the compressor manufacturer's manual, supplied with the compressor.

8.3 Troubleshooting

Troubleshooting may only be carried out by trained/instructed personnel.

Work on electrical plant or equipment may only be carried out by a qualified electrician or by instructed persons working under the direction and supervision of a qualified electrician in accordance with the electrotechnical regulations.

If you have a problem with the plant, read this first, always checking the following points before replacing any plant components or contacting our service department:

- Check that the plant is supplied with power and air pressure.
- Check the compressor and air hoses for leaks.
- Make sure the ball detector is working.
- Check that all cables are connected correctly.

8.3.1 Fault table

Fault	Troubleshooting
Wiring problems / electrical cable problems	Any of the connectors connected to the cable may have come loose due to constant vibration. A cable may have been cut or pinched by a foreign object. Ensure that all connectors are well positioned, pushing down on each connector to ensure that the contact is secure. If the problem still persists, use a multimeter to check cable continuity.
Compressor problems	If the pins are being raised too fast or too slowly, there may be a problem with the air pressure of the compressor. Check the compressor air pressure. This value should be between 6 and 7 bar. Do not adjust the air pressure yourself under any circumstances. If you notice a problem with the compressor, contact one of our service technicians.
Problems with pneumatic valves	If the display shown on the control panel lights up, one of the valves may not be properly connected to the power supply. The corresponding pin is not working properly.
Problems with micro switches on the unit.	When all pins are in the UP position, all pins indicated by PINS UP should light up on the control panel. When all pins are in the DOWN position, all PINS DOWN should light up on the control panel. Check the micro switches on the pneumatic units for any malfunctions. When all pins are in the DOWN position, all PINS DOWN should light up on the control panel. Check the micro switches on the pneumatic units for any malfunctions.

8.4 Spare and wearing parts

Spare parts must comply with the technical requirements specified by us. This is always guaranteed by using original spare parts. We only provide a guarantee for original spare parts that have been supplied by us. The installation and/or use of spare parts not supplied by us may, under certain circumstances, negatively alter design properties and thus impair active and/or passive safety. Any liability and warranty on our part is excluded for damage caused by the use of any parts other than original spare parts or accessories.

Please address your spare parts orders to the customer service.

For a smooth and fast processing of your spare parts order we need the following information:

1. Client
2. Plant identification data
3. Designation of the spare part required
4. Desired number of pieces
5. Desired shipping method

Address:

You will find our address and telephone number in Chapter 1.

A correct completion of your order can only be ensured by communicating all data.

9 Decommissioning, dismantling, storage and disposal

The decommissioning, dismantling, storage and disposal of the plant may only be carried out by trained/instructed personnel.

The instructions in the operating manuals for components supplied must be observed in all circumstances (see appendix)!

Any personal protective equipment (PPE) that may be required must be worn.

Here, the operator guidelines or the specifications laid down in the operating instructions for components supplied must be observed!

9.1 Decommissioning and dismantling

The plant inludes a variety of dangerous parts that must be handled with care. Therefore, please take note of the following comments.

The following should be noted:

1. All electrical parts must first be completely de-energized and discharged before disassembly.
2. Special care should be taken when disassembling springs or parts under mechanical tension so that the mechanical energy stored in these parts does not cause injury.
3. Rechargeable batteries and batteries that may be in use in the plant must be disposed of separately in accordance with local regulations.
4. In addition, the instructions in the operating manuals for the purchased parts included in the appendix must be observed.

The following activities must be carried out:

- Disconnect all supply connections;
- Fasten any loose parts

Before dismantling, the system must be completely disconnected from the mains in a professional manner. The connections and fittings between the system and the extraction unit must be removed.

Make sure that there is no residual energy after disconnecting the connections. The system must be completely de-energized.

9.2 Storage

9.2.1 Packing

In order to prevent possible damage, the packing of the various parts should be carried out professionally. Here the steps taken must achieve the following purposes:

- Protection from rain during transport
- Protection against damage due to contact with doors, walls and other objects
- Protection against frost when there is water is in different parts of the plant

Protection against excessive moisture content in the air (risk of corrosion due to condensation water!)

Dispose of packaging and insulation in a professional and environmentally friendly manner. The national regulations must be observed.

9.2.2 Storage

Store the plant components such that any possible damage is avoided.

Store the plant complete with all its individual parts, otherwise important parts could be missing when the plant is put into operation again.

9.2.3 Unpacking

As far as possible, the packaging material should be reused or disposed of in accordance with local regulations.

Dispose of packaging and insulation in a professional and environmentally friendly manner. The national regulations must be observed.

9.3 Disposal

The following activities must be carried out:

- Complete disposal or recycling of plant components

Ensure the safe and environmentally friendly disposal of the materials used. Existing national regulations must be observed!

10 EC Declaration of Conformity

(according to Annex IIA of the Machinery Directive)

Us,

Company **NGT-Bowling e.K.**
Helmholtzstrasse 9
D-52428 Jülich
Germany

declare under their sole responsibility that the product:

Machine designation:	String pinsetter
Type:	airOsetter
Serial no:	AOS00001-xxxxx
Year of manufacture:	from 2020

to which this declaration refers is in conformity with the following directives and standards or other normative documents:

2006/42/EC Machinery
2014/35/EU Low voltage
2014/30/EU Electromagnetic compatibility
2011/65/EU RoHS

EN	614-1	2006+A1:2009	EN ISO	14120	2016
EN ISO	4414	2010	EN ISO	20607	2019
EN ISO	12100	2010	EN	60204-1	2018
EN ISO	13857	2008			

Mr. Mario Kilian, NGT-Bowling e.K., Helmholtzstraße 9, D-52428 Jülich, Germany
(Name and address of the person authorised to compile the relevant technical documentation)

Details of the signatory

Name: Kilian

First name: Mario

Position: Owner

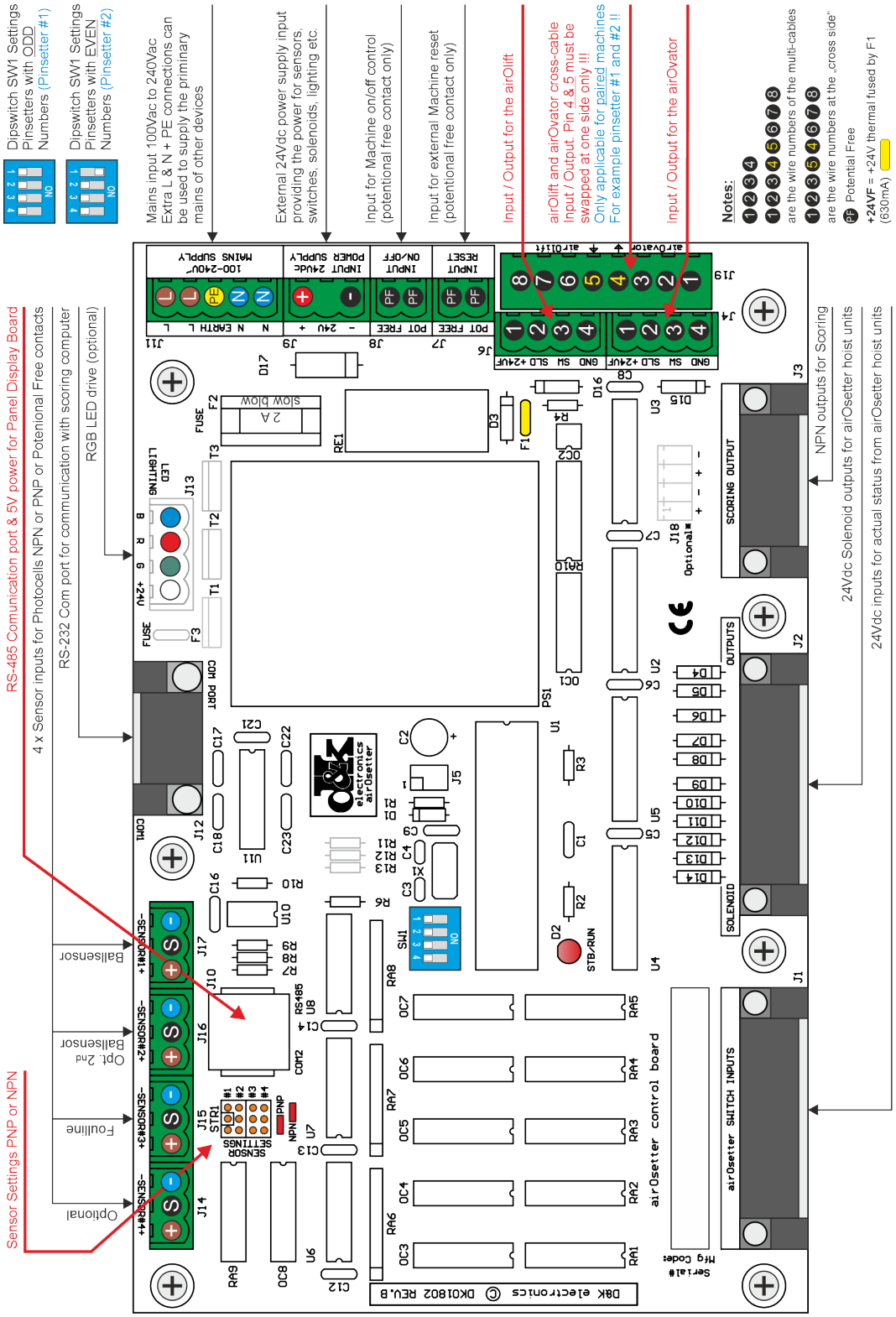
Germany
Jülich, 25.09.2020

Place and date

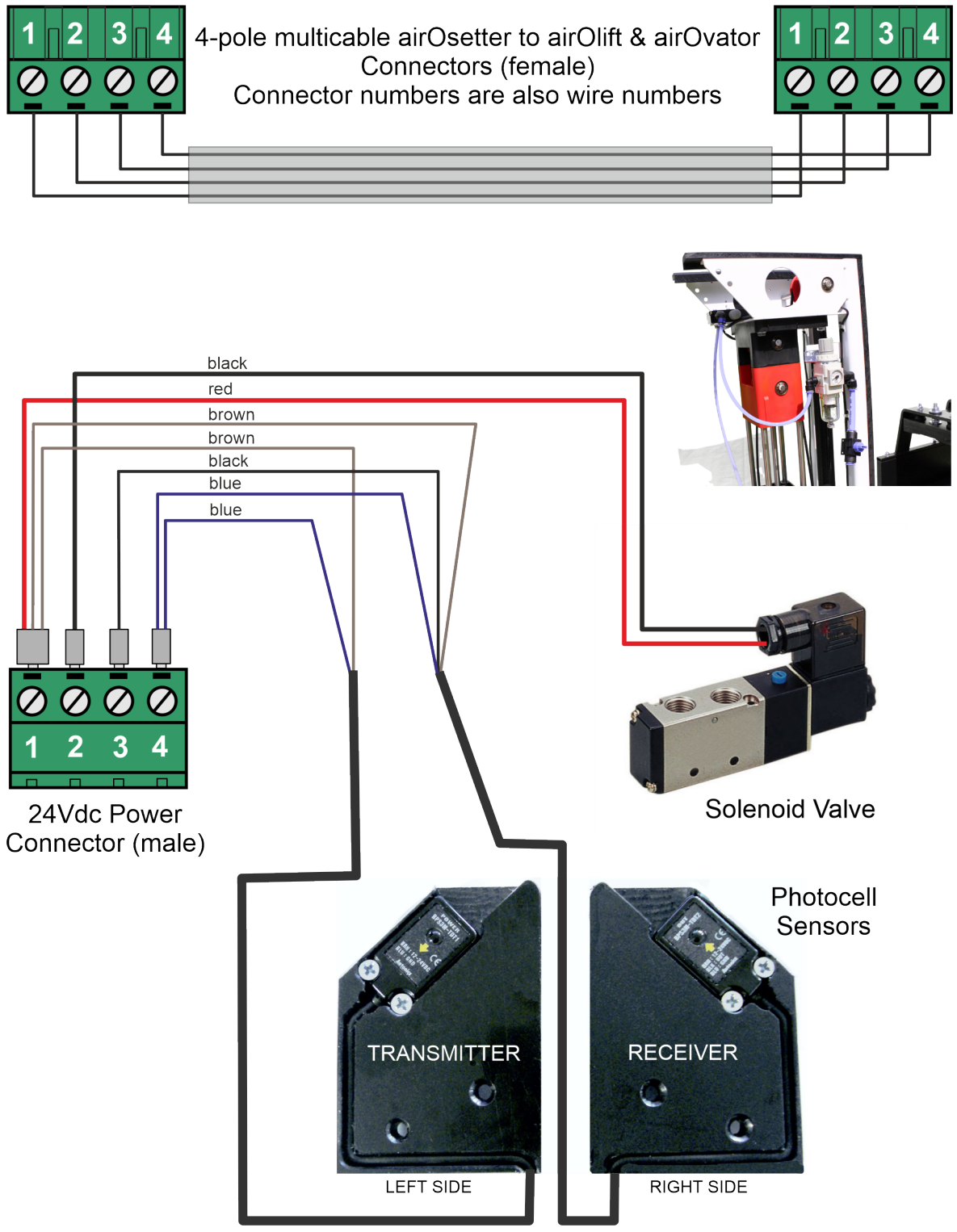
Signature

11 Appendix I: Circuit diagrams

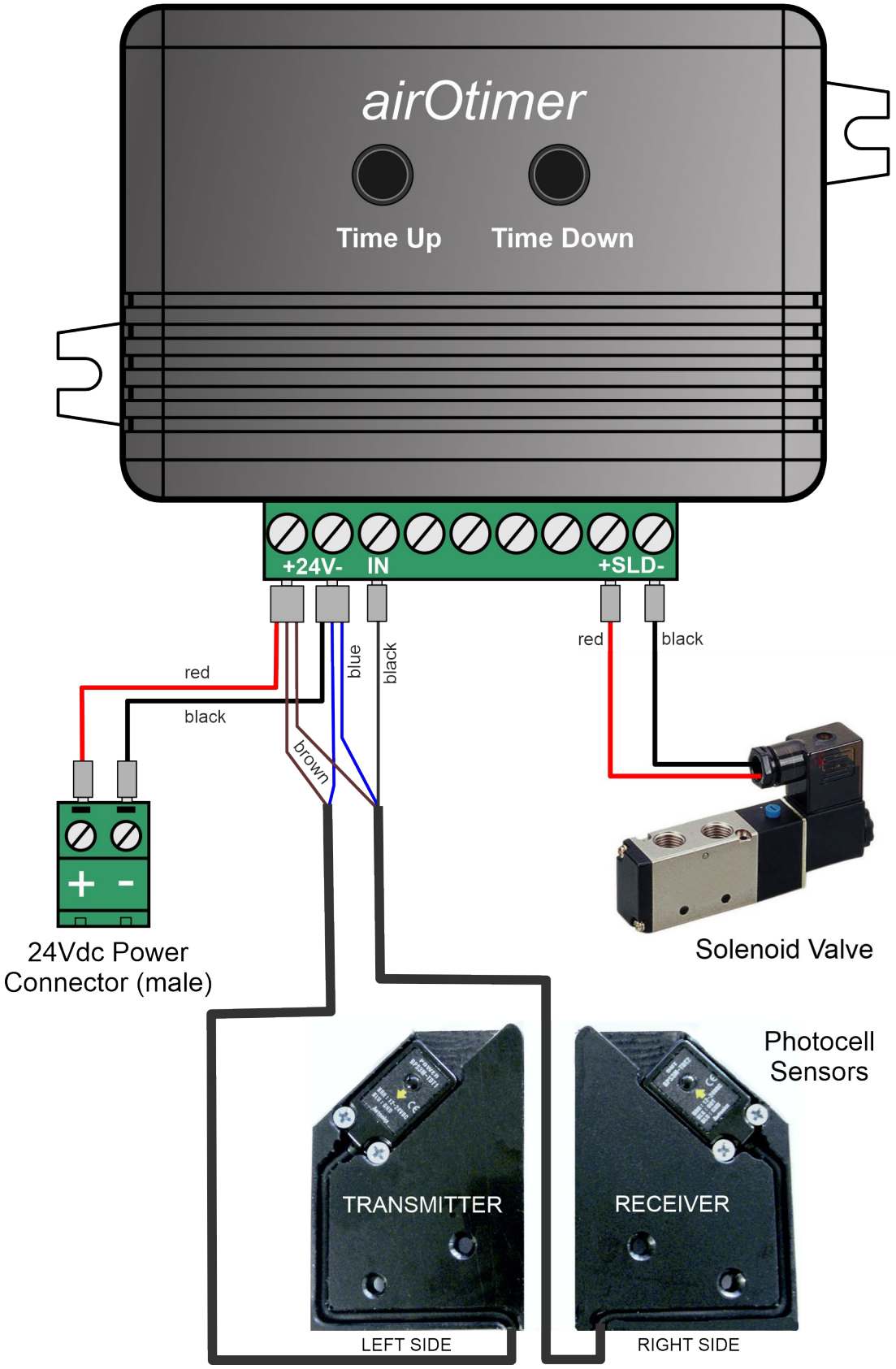
11.1 Circuit diagram of controller board DK01802 Rev. B



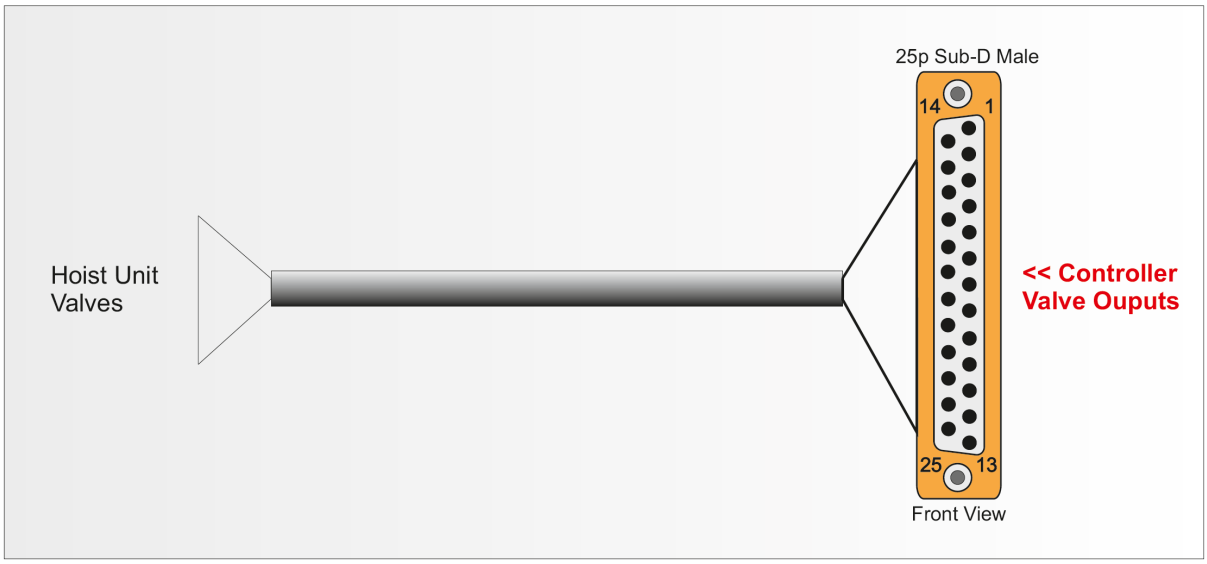
11.2 airOlift / airOvator IR photocell and valve connection



11.3 airOtimer IR photocell connections



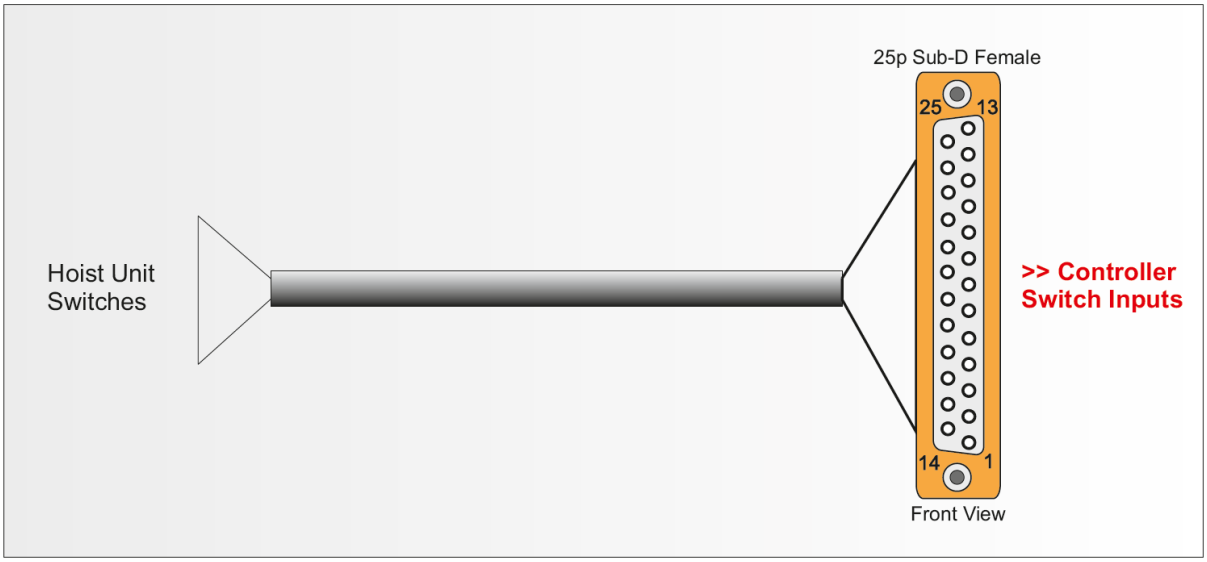
11.4 airOsetter internal cable connections: Direction of Hoist Unit valve inputs



airOsetter pneumatic valves control cable

25p Sub-D Male	Color	Function	Comment
1	brown	Pin1 (-24V)	Controller Output
2	brown/white	Pin2 (-24V)	Controller Output
3	red	Pin3 (-24V)	Controller Output
4	red/black	Pin4 (-24V)	Controller Output
5	red/white	Pin5 (-24V)	Controller Output
6	pink	Pin6 (-24V)	Controller Output
7	pink/black	Pin7 (-24V)	Controller Output
8	orange	Pin8 (-24V)	Controller Output
9	orange/black	Pin9 (-24V)	Controller Output
10	orange/white	Pin10 (-24V)	Controller Output
11	yellow	Sweep (-24V)	Controller Output
12	yellow/black	No Function	Not connected
13	green	No Function	Not connected
14	green/black	Pin1 (+24V)	Controller Output
15	green/white	Pin2 (+24V)	Controller Output
16	turquoise	Pin3 (+24V)	Controller Output
17	blue	Pin4 (+24V)	Controller Output
18	blue/white	Pin5 (+24V)	Controller Output
19	purple	Pin6 (+24V)	Controller Output
20	purple/white	Pin7 (+24V)	Controller Output
21	black	Pin8 (+24V)	Controller Output
22	black/white	Pin9 (+24V)	Controller Output
23	grey	Pin10 (+24V)	Controller Output
24	grey/black	Sweep (+24V)	Controller Output
25	white	No Function	Not connected

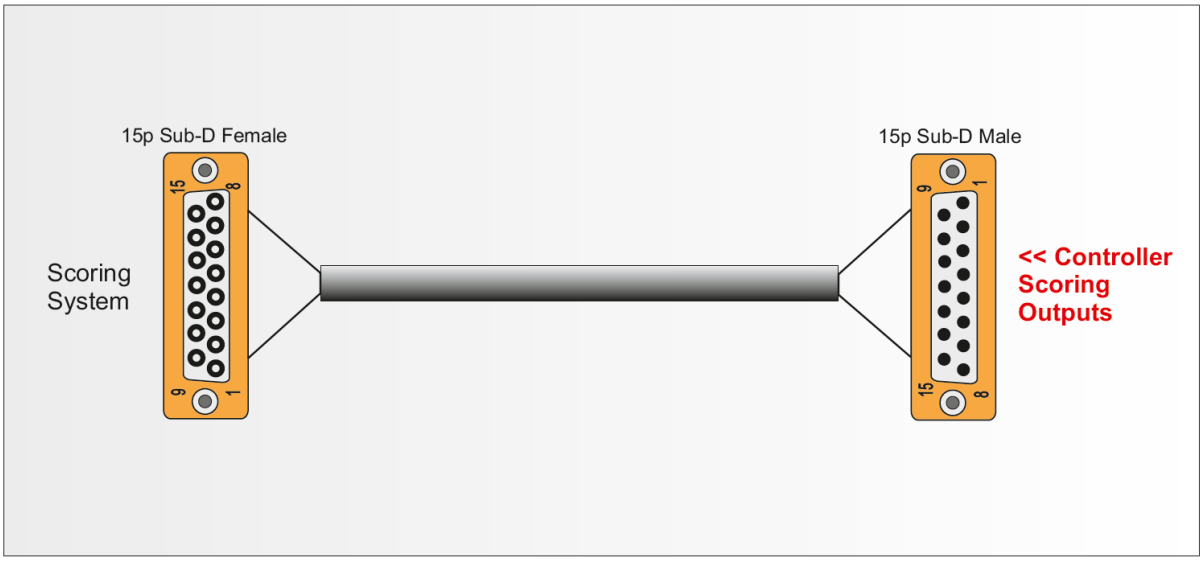
11.5 airOsetter internal cable connections: from Hoist Unit valve outputs



airOsetter switch control cable

25p Sub-D Female	Color	Function	Comment
1	brown	No Function	Not connected
2	brown/white	Switch up common	Controller Input
3	red	Switch up common	Controller Input
4	red/black	Switch up 10	Controller Input
5	red/white	Switch up 9	Controller Input
6	pink	Switch up 8	Controller Input
7	pink/black	Switch up 7	Controller Input
8	orange	Switch up 6	Controller Input
9	orange/black	Switch up 5	Controller Input
10	orange/white	Switch up 4	Controller Input
11	yellow	Switch up 3	Controller Input
12	yellow/black	Switch up 2	Controller Input
13	green	Switch up 1	Controller Input
14	green/black	Switch down common	Controller Input
15	green/white	Switch down common	Controller Input
16	turquoise	Switch down 10	Controller Input
17	blue	Switch down 9	Controller Input
18	blue/white	Switch down 8	Controller Input
19	purple	Switch down 7	Controller Input
20	purple/white	Switch down 6	Controller Input
21	black	Switch down 5	Controller Input
22	black/white	Switch down 4	Controller Input
23	grey	Switch down 3	Controller Input
24	grey/black	Switch down 2	Controller Input
25	white	Switch down 1	Controller Input

11.6 airOsetter external cable connections: Scoring outputs



All outputs are OPEN DRAIN "MOSFETS" switching to the internal Ground (-24V) of the airOsetter controller board. NOTE: There is no Ground (-24V) pin availlable at the connector.
These outputs switch to the internal Ground when a pin has fallen and / or represent the status of the pinsetter is ready for the first or second throw just as the Faulline. (if connected)
The DATA READY output indicates that the data is safe to read. Otherwise the outputs have no status.
The outputs are short circuit and overcurrent protected, capable of sinking/switching 150mA to the internal Ground. If Interface boxes of other professional Scoring Brands are also equipped with optical isolated NPN inputs, only a connection of the +24V is required to connect to their COMMON INPUT.
ScoreMaster and NGT Bowling scoring systems are Plug & Play 1:1

airOsetter scoring cable

15p Sub-D Male	Color (D&K cable)	15p Sub-D Female	Function	Comment
1	blue	1	Pin1	Output
2	red	2	Pin2	Output
3	black	3	Pin3	Output
4	white	4	Pin4	Output
5	pink	5	Pin5	Output
6	purple	6	Pin6	Output
7	brown	7	Pin7	Output
8	green	8	Pin8	Output
9	yellow	9	Pin9	Output
10	gray	10	Pin10	Output
11	while/yellow	11	1st Throw	Output
12	yellow/brown	12	2nd Throw	Output
13	white/green	13	Data Ready	Output
14	red/blue	14	Faul	Output
15	gray/pink	15	+24V	Output

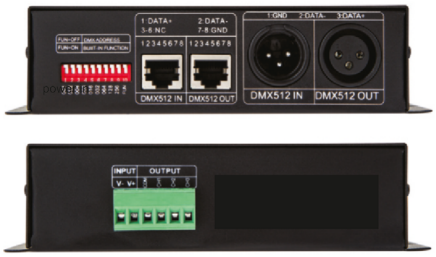
12 Appendix II: Decoder / light control (optional)

DMX512-Decoder / LED-Pin-Lichtsteuerung (optional)

Enthaltene Teile

1 - DMX Decoder
1 - männlicher XLR-Stecker
1 - Buchse XLR-Stecker

Übersicht

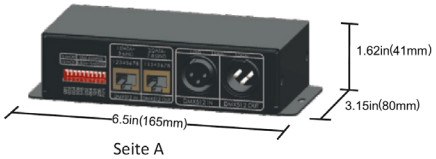


Der DMX512-Decoder wandelt das universelle Standard-DMX512-Signal in ein PWM-Signal zur Ansteuerung von RGB-LED-Produkten um. Der kompakte Decoder arbeitet mit 256 Graustufenausgängen pro Kanal. 0-100% Helligkeit und verschiedene Cahning-Effekte im FUN-Modus. Der Decoder ist mit DMX-Stabdard XLR-3, RJ45 Ein-/Ausgang ausgestattet. Für den Anschluss von RGB-LED-Lichtleisten und der Stromversorgung steht auf der Rückseite ein steckbarer Schnittstellenanschluss zur Verfügung.

Spezifikation

Eingangssignal	DMX512
Eingangsspannung	DC24V
Max. Laststrom	0,8A/CH (Standard-Luftspannungsversorgung)
Max. Gesamt-ausgangsleistung	50 W (Standard airOsetter 24V Versorgung)
Ausgangsskalierung	256 Stufen/CH (8bit/CH)
Ausgang LED-Kanäle	3x RGB PWM + Common
Buchsen DMX in/Out	RJ45 & XLR-3 parallel geschaltet
Arbeitstemperatur	-10 C - 50C
Abmessungen	166mm (6.53 in) x 57mm (2.24in) x 41mm (1.61 in)
Gewicht	(G.W.) 13.40oz. (380g)

Produkt-Maße



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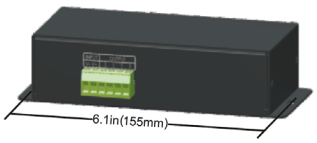


Einrichtung

Akzeptiert DMX512-Signale nur, wenn der DIP-Schalter FUN=OFF ist, (Abbildung 1)										
DIP	1	2	3	4	5	6	7	8	9	10
Adresse	001	002	004	008	016	032	064	128	256	FUN

Spezifikation

Der anfängliche DMX512-Adresscode entspricht der Gesamtsumme der DIP-Schalter von 1 bis 9, wenn der DIP-Schalter in der Position DOWN steht, ist er auf ON gesetzt. Wenn Sie den DIP-Schalter in die UP-Position stellen, wird der Wert auf OFF gesetzt.

Beispiel: Stellen Sie die Anfangsadresse auf 37 ein.
Wie in Abbildung 2, stellen Sie das 6., 3. und 1. Bit des DIP-Schalters nach unten auf "1", den Rest auf "0", die Gesamtsumme von 1 bis 9 ist 32+4+1, also ist der DMX512-Anfangsadresscode 37.

Wenn FUN = OFF, befindet sich der Decoder im DMX-Steuerungsmodus
Wenn FUN = ON, befindet sich der Decoder im Selbsttestmodus.

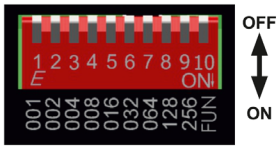


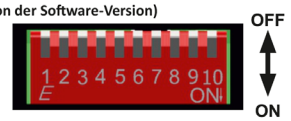
Abbildung 1

Abbildung 2

Beispiel 2: Setzen Sie die Anfangsadresse auf 328.
Setzen Sie das 4., 7., 9. Bit des DIP-Schalters nach unten auf "1", den Rest auf "0" (wie in Abbildung 3). Die Summe von 1 bis 9 ist 8+64 256, also ist der DMX512-Originaladresscode 328.

Abbildung 3

Testfunktion (abhängig von der Software-Version)



Wie abgebildet, FUN=ON: Testfunktion: 1-9 Dip-Schalter OFF=DUNKEL

DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	DIP 6	DIP 7	DIP 8	DIP 9
Red	Green	Blue	Yellow	Purple	Cyan	White	Jump	Gradual

1-7 ist für 8 Geschwindigkeitsstufen.
7 ist die schnellste Stufe, während Dip-Schalter 1-7 = OFF: die Geschwindigkeit ist 0.

DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	DIP 6	DIP 7
Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7

.Wie abgebildet, wird der Farbwechselmodus mit einer Geschwindigkeitsstufe von 7 gewählt, wenn alle Dip-Schalter = ON sind

Hinweis: Dieser DMX-Decoder ist optional erhältlich und gehört nicht zum Standardlieferumfang des airOsetter.

13 Appendix III: Documentation of the suppliers

- Air compressor / air dryer