wahlberg
MOTION DESIGN

Rotator
Item No 280 & 281

User Manual

Rotator (280)

Rotator (281)

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Safety Information

WARNING!
Read the safety precautions in this section before installing, powering, operating or servicing this product.

The following symbols are used to identify important safety information on the product an in this manual:

DANGER! Safety hazard. Risk of severe injury or death.

DANGER! Hazardous voltage. Risk of lethal or severe electric shock.

WARNING! Fire hazard.

WARNING! Burn hazard. Hot surface. Do not touch.

WARNING! Refer to user manual.

This product is for professional use only. It is not for household use.
This product presents risks for severe injury or death due to fire hazards, electric shock, and falls.

Read this manual before installing, powering or servicing the rotator; follow the safety precautions listed below and observe all warnings in this manual and printed on the rotator. If you have questions about how to operate the rotator safely, please contact you Wahlberg Motion Design supplier or Wahlberg Motion Design.

PROTECTION FROM ELECTRIC SHOCK

- Disconnect the Rotator from AC power before removing or installing any cover or part and not when in use.
- Always ground (earth) the Rotator electrically.
- Use only a source of AC power that complies with local building and electrical codes and has both overload and ground-fault (earth-fault) protection.
- Before using the Rotator, check that all power distribution equipment and cables are in perfect condition and rated for the current requirements of all connected devices.
- Power input throughput cables must be rated 20 A minimum, have three conductors 1.5 mm^2 (AWG16) minimum conductor size and an outer cable diameter of 5-15 mm (0.2-0.6 inch). Cables must be hard usage type (SJT or equivalent) and heat-resistant to 90°C (194°F) minimum. In the EU the cables must be <HAR> or equivalent.
- Use only Neutrik powerCON TRUE1 NAC3FX-W cable connectors to connect to power input sockets. Use only Neutrik powerCON TRUE1 NAC3MX-W cable connectors to connect to power throughput sockets.
- Assembly power supply cables following the instructions in this manual only (see page 15).
- Isolate the Rotator from power immediately if the power plug or any seal, cover, cable, or other component is damaged, defective, deformed, wet, or showing signs of overheating. Do not reapply power until repairs have been completed.
- Do not expose the Rotator to rain or moisture.

- Refer any service operation not described in this manual to a qualified technician.

PROTECTION FROM BURNS AND FIRE

- Do not operate the Rotator if the ambient temperature exceeds 40°C (104°F).
- The exterior of the Rotator becomes warm during use. Avoid contact by persons and materials. Allow the Rotator to cool for at least 10 minutes before handling.
- Do not modify the Rotator in any way not described in this manual.
- Install only genuine Wahlberg parts.

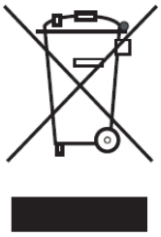
PROTECTION FROM INJURY

- Fasten the Rotator securely to a fixed surface, rig, or structure when in use. The Rotator is not portable when installed.
- Ensure that any supporting structure and/or hardware can hold at least 10 times the weight of all the devices including their load.
- If suspending from a rigging structure, fasten the Rotator using ALL the supplied Manfrotto slim couplers and M12 bolts, nuts, and washers supplied with the Rotator according to the manual, see page 12.
- Always install the Rotator as described in this manual. If the Rotator is installed in a location where it may cause injury or damage if it falls, install as described in page 12.
- If possible, allow enough clearance beneath the Rotator so it cannot cause any danger to personnel beneath it.
- Check that all external cobblers and rigging hardware are securely fastened.
- Block access below the work area and from a stable platform whenever installing, servicing or moving the Rotator.
- Do not operate the Rotator with missing or damaged covers, shields, or shaft.
- Do not use the Rotator over the head of people
- Do not use the Rotator to rotate people or animals.

Before each use

- Check that the **Rotator** is safely and correctly installed/mounted
- Inspect the **Rotator** for damage, wear, corrosion or abuse.
- Ensure that the attached load is correctly mounted, and does not exceed the work load limits.

Warning! Do not use the Rotator if any damage or error is found!



Disposing of this product

Wahlberg Motion Design products are supplied in compliance with Directive 2002/96/EC of the European Parliament and of the Council of the European Union on WEEE (Waste Electrical and Electronic Equipment), as amended by Directive 2003/108/EC, where applicable.

Help preserve the environment! Ensure that this product is recycled at the end of its life. Your supplier can give details of local arrangements for the disposal of Wahlberg Motion Design products.

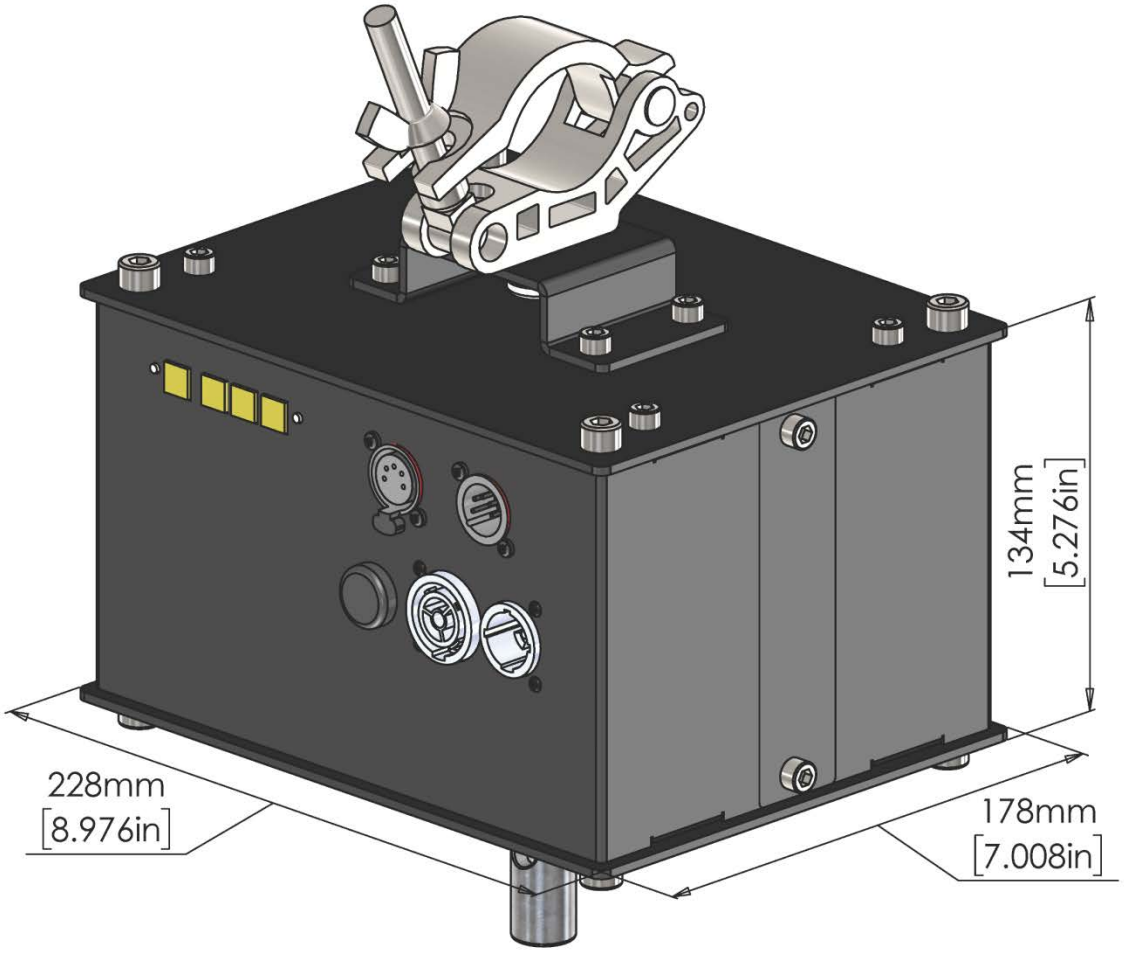
Index

Technical specifications

Model:	Rotator	
Item no.:	280 and 281	
Dimensions (L×W×H):	(Without mounting clamp)	
280	228 × 178 × 228 mm. / 8.98 × 7.0 × 8.98 in.	
281	258 × 178 × 317 mm. / 10.2 × 7.0 × 12.5 in.	
Power supply:		
280	115V / 230V AC 50 Hz/60Hz.	
281	100-240 V AC 50 Hz/60Hz.	
Power consumption:	Max 150 Watt	
Power inlet/outlet:	Neutrik powerCON TRUE1 NAC3PX (F/M)	
DMX control signal:	DMX 512 1990 + DMX512A / 7 channels used.	
DMX connection:	5 pole XLR, In & link	
Rotating limit:	No limit / Continuous rotation	
Rotating speed:	Variable,	
280	0.85-13.6 rpm	
281	0.15-6.8 rpm	
Working Load Limit (WLL):	**Rotator 280**	**Rotator 281**
Shaft - down	50 kg. (110 lb)	150 kg. (330 lb)
Shaft - up	NOT RECCOMENDED!	100 kg. (220 lb)
Shaft - sideways	NOT RECCOMENDED!	50 kg. (110 lb)
Safety factor:	10	
Noise emission:	~50 dB (max measured noise at 1 m/3.3 ft.)	
Ambient temperature	0-40°C (32-104°F)	
Own weight:		
280	7.6 kg (16.8 lb)	
281	11.8 kg (26 lb)	
Mounting clamp:		
280	1× Slim eye coupler 50 mm (2 in)	
281	3× Slim eye coupler 50 mm (2 in)	
Motor:	24 V DC, 28.9 Watt, IP30	
Maximum attachment current:	(Only Rotator 281)	
1+ / 1- / 2+ / 2- (1.5 mm^2):	10A through each conducting wire	
Inlet / Outlet	Neutrik SpeakON NL4MP/NL4FX	

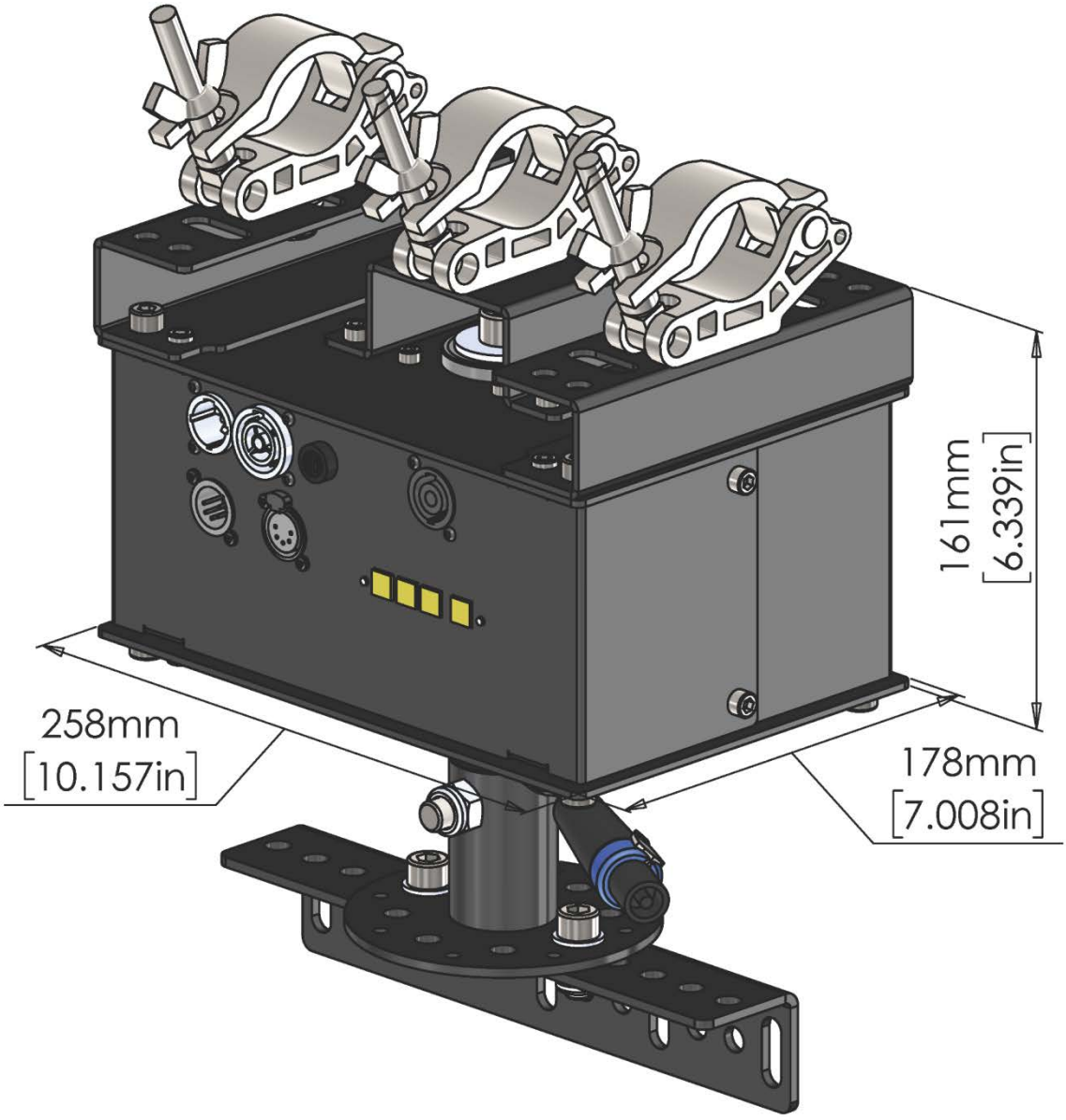
Drawing

Rotator (280)



More detailed drawings and from more angles can be found in Appendix 1 on page 30.

Rotator (281)



More detailed drawings and from more angles can be found in Appendix 2 on page 31.

Introduction

Thank you for selecting the Rotator, a DMX controlled Rotator from Wahlberg Motion Design. Before using the Rotator for the first time, please read this manual carefully. Failure in handling can cause injury of persons and/or damage the Rotator.

Package content

Rotator 280

1× Rotator 280
1× Manfrotte Slim coupler
1× Mounting bolts, nuts, and washers (M12) for slim coupler mounting
1× PowerCON TRUE1 NAC3FX-W Female plug for power cable
1× User manual
1× Cheat Sheet

Rotator 281

1× Rotator 281
3× Manfrotte Slim coupler
3× Mounting bolts, nuts, and washers (M12) for slim coupler mounting
1× PowerCON TRUE1 NAC3FX-W Female plug for power cable
1× SpeakON SPX NL4FX Female plug for power/signal-throughput
1× SpeakON SPX NL4FX Male plug for power/signal-throughput
1× Shaft Mounting Clamp
1× User manual
1× Cheat Sheet

Description

The Rotator is a spinning shaft unit with DMX control and an advanced positioning system for stage use, mainly for use in theatres, shows, and concerts. It Rotator can spin props, small set pieces, as well as lamps and other electrical devices.
The spinning shaft can rotate 360° continuously, and the positioning system enables precise movements, allowing the Rotator to stop the shaft at any desired position with 0.5° precision.
The Rotator can be used with the shaft mounted downwards, upwards (only 281), and sideways (only 281).

With the shaft mounted downwards the Rotator 280 can carry a load up to 50 kg with a rotation speed of 0.15-6.8 rpm, where the more advanced Rotator 281 can rotate up to 150 kg (shaft downwards) with a rotation speed of 0.15-6.8 rpm.

The Rotator is controlled by the standard DMX controlling signal, so a normal lighting desk can be used to control the movement, programmed as normal light.
For a low number of Rotators, a standard lighting desk can be used, but when many Rotators are used, more advanced desks should be used to maintain easy control of the units.

The Rotator uses 6 DMX channels, and they control the position, speed, limits, and reset functions.
The Rotator has an advanced internal positioning system with 16 bit, used for finding the position desired by the operator. With a 16 bit positioning channel (ch1 and ch2) the

operator set the desired position, and the Rotator will run to this position, with the speed applied on the speed channel (ch3).
With channel 4 and 5 it is possible to start continuous clockwise (CW) and counter clockwise (CCW) rotation. Optional, channel 4 and 5 can be used to set the soft clockwise (CW) and counter clockwise (CCW) limits of movement, adjusting the Rotators span of motion.
Channel 6 is used for *Mode* controlling with the possibility to change between positioning mode, positioning mode with soft limit save enabled, and angular mode.

Multiple Rotators are easily daisy chained with power in-out and DMX in-Out, allowing to create advanced and dynamic movements with 100's of Rotators working together in the same installation.

Safety functions

The control system ensures that the motor only is powered when:

- The control signal is reliable.
- The position and speed control is on.
- The motor position is calculated after which a PID regulator calculates the motor speed and distance.

The Rotator should only be operated by an experienced DMX-controlled-lighting-desk-operator.
The lighting desk has to be programmed according to the manual, so the Rotator will stop when the speed is put to 0 %. It is also possible for the user to stop the Rotator by disconnecting it from the main. After power failure the start position of the Rotator needs to be reset before the Rotator can function again.

Manual operation of the Rotator is intended for mounting, service, and tests. Other use than that, should only be carried out with an emergency stop switch attached. Contact Wahlberg Motion Design for enquiries regarding attachment of an emergency switch.

Area of use

For indoor use only!

Caution! To reduce the risk of electric shock or injury: use indoors only

Caution! To reduce the risk of electric shock, do not expose to rain: store indoors!

The Rotator is intended for indoor use only. It is designed for rotating material at the weight and speed stated in "Technical specifications" on page 6. Any other use of the Rotator may result in a risk of injury of persons or equipment damage.
Exceeding the load rating may cause failure of the equipment.
Use only approved rigging connectors to secure the load to the mounting clamp.

Do not modify the Rotator. For any modification of your Rotator, contact Wahlberg.

It is the customer's sole responsibility to comply with any relevant local laws, regulatory requirements, and restrictions, concerning the use of the Rotator.

Using for the first time

Important! The Rotator must be protected from environmental factors such as physical shocks and vibration during storage.

Warning! Read "Safety Information" on page 2 before installing, powering, operating, or servicing the Rotator. Before applying power to the Rotator:

- Check the Wahlberg Motion Design website at www.wahlberg.dk for the most recent documentation and technical information about the Rotator. Wahlberg user manual revisions are identified by the revision number in the bottom of each page.
- Carefully review the "Safety Instructions" on page 2.
- Check that the local AC mains power source is within the Rotator power voltage and frequency ranges.
- See "Power cables and power plug" on page 2. Install a Neutrik powerCON TRUE1 NAC3FX-W power input connector on a suitable power cable. If using the power from a mains power outlet, install a suitable power plug on the power cable.

Transport

Important! The Rotator must be protected from environmental factors such as physical shocks and vibration during transportation.

Use only the original packaging, flight case, or pallet frame for protecting the Rotator during transport. Contact Wahlberg for enquiries regarding flight cases or pallet frames.

Physical installation

Warning! The Rotator must be either fastened to a flat surface such as a roof, wall or floor, or clamped to a truss or similar structure in a safe way. Do not apply power to the Rotator if it is not securely fastened.

Warning! If fastening the Rotator to a flat surface, the supporting surface must be hard and flat. Fasten the Rotator securely.

Warning! If mounting the Rotator on a truss, use only the supplied rigging clamps and M12 bolts. The clamp must be screwed into the central holes in the rotator's mounting brackets using the supplied M12 washers and M12 locking-nuts. All supplied clamps must be used at all time!

Fastening the Rotator to a flat surface

The Rotator can be fastened to flat surface such as a roof, wall, or floor. Check that the surface can support at least 10 times the weight of all Rotators and equipment to be installed on it. For the Rotator 281, all three rigging points must be used at all time!

Mounting the Rotator on a truss

The Rotator can be clamped to a truss or similar rigging structure.

To clamp a Rotator to a truss:

1. Check that the rigging clamp is undamaged and that the rigging structure can support at least 10 times the combined weight of all Rotators and equipment to be installed on it.
2. Use the supplied rigging clamp or contact Wahlberg Motion Design for a replacement.
3. Fasten the clamp to the Rotator with the supplied M12 bolt, nut, and washers in the hole in the mounting clamp of the Rotator.
4. Block access under the work area. Working from a stable platform, place the Rotator on the truss. Tighten the rigging clamp.

Rotator 280

Rotator 281

Mounting the rotator in an angle

Warning! Always mount the load with the center of mass directly below the center of the axis.

Warning! The maximum load depends on the angle the rotator is mounted in. Refer to table below

The Rotator can be mounted in any angle.

Rotator 280

Shaft - down	50 kg. (330 lbs.)
Shaft - up	NOT RECCOMENDED!
Shaft – sideways	NOT RECCOMENDED!

Rotator 281

Shaft - down	150 kg. (330 lbs.)	only with all 3 rigging clamps mounted!
Shaft - up	100 kg. (220 lbs.)	only with support on all 3 rigging surfaces!
Shaft – sideways	50 kg(110 lbs.)	only with all 3 rigging clamps mounted!

Mounting the load

Attention! The load must be mounted on the shaft in a way to insure that the load never can run into the Rotator.

Secure the load to the Rotators clamp for shaft. Ensure that the bolts and nuts used for mounting the load have a minimum breaking load of at least 10 times the weight of the load.

AC power

Warning! Read "Safety Information" on page 2 before connecting the Rotator to AC mains power.

Warning! For protection from electric shock, the Rotator must be grounded (earthed). The power distribution circuit must be equipped with a fuse or circuit breaker and ground-fault (earth-fault) protection.

Warning! Socket outlets or external power switches used to supply the Rotator with power must be located near the Rotator and easily accessible so that the Rotator can easily be disconnected from power.

Warning! Check that the voltage range specified on the Rotator's serial number label matches the local AC mains power voltage before applying power to the Rotator. Do not apply AC mains power to the Rotator at any other voltage than that specified on the Rotator's serial number label.

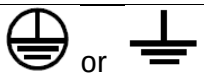
Power cables and power plug

The Rotator requires a power input cable with a Neutrik powerCON TRUE1 NAC3FX-W cable connector for AC mains power input. The cable must meet the requirements listed under "Protection from electric shock" on page 2.

Wahlberg Motion Design can supply the PowerCON input connector.

If you install a power plug on the power cable, install a grounding-type (earthed) plug that is rated 20 A. Follow the plug manufacturer's instructions. Table 1 shows standard wire color-coding schemes and some possible pin identification schemes; if pins are not clearly identified, or if you have any doubts about proper installation, consult a qualified electrician.

Table 1 - Colour guide

Wire Colour	Conductor	Symbol	Screw (US)
Brown	Live	L	Yellow or brass
Blue	Neutral	N	Silver
Yellow/green	Ground (earth)		Green

Installing a power input connector on a power cable

To install a Neutrik powerCON TRUE1 NAC3FX-W input connector on a power Cable, follow the original Neutrik instructions in Appendix 2.

Data link

A DMX 512 data link is required in order to control the Rotator via DMX. The Rotator has 5-pin XLR connectors for DMX data input and output. The pin-out on all connectors is pin 1 = shield, pin 2 = (-), and pin 3 = (+). Pins 4 and 5 in the 5-pin XLR connectors are not used in the Rotator but are available for possible additional data signals as required by the DMX512-A standard.

The Rotator is subject to the common limit of 32 devices per daisy-chained link. Note that if independent control of a Rotator is required, it must have its own DMX channels. Rotators that are required to behave identically can share the same DMX channels. To add more Rotators or groups of Rotators when the above limit is reached, add a DMX universe and another daisy-chained link.

Tips for reliable data transmission

Use shielded twisted-pair cable designed for RS-485 devices: standard microphone cable cannot transmit control data reliably over long runs. AWG24 cable is suitable for runs up to 100 meters (328 ft.).

Never split a DMX line without using an opto-isolated RS-485 splitter/amplifier.

Terminate the link by installing a termination plug in the output socket of the last Rotator. The termination plug, which is a male XLR plug with a 120 Ohm, 0.25 Watt resistor soldered between pins 2 and 3, “soaks up” the control signal so it does not reflect and cause interference. If a splitter is used, terminate each branch of the link.

Connecting the DMX

To connect the Rotator to data:

1. Connect the DMX data output from the DMX controller to the Rotator’s male 5-pin XLR DMX input connector (DMX 512 IN).
2. Connect the DMX output of the Rotator to the DMX input of the next Rotator and continue connecting Rotators output to input (DMX 512 OUT).
3. Terminate the last Rotator on the link with a 120 Ohm resistor.

The DMX lamp is the green led, next to the DMX-selectors.

- Glows constantly: DMX connection is correct.
- Flashes: DMX signal is missing or wrongly connected.

Attachment power (Only 281)

Warning! Read "Safety Information" on page 2 before connecting AC mains power to the attachment power inlet.

Warning! Socket outlets or external power switches used to supply the attachment with power must be located near the rotator and easily accessible so that the attachment can easily be disconnected from power.

Warning! Check that the voltage range specified on the Rotators serial number label for attachment power voltage matches the local AC mains power voltage before applying power to the Rotators attachment power inlet. Do not apply AC mains power to the rotators attachment power inlet at any other voltage than that specified on the rotators serial number label.

Attachment connection plug

The Rotator requires a power and data input a Neutrik speakON NL4FX cable connector. The cable for connecting the speakON plug on the rotator for the attachment power or data, must meet the requirements listed under "Protection from electric shock" on page 2.

The attachment connection has four 1.5 mm^2 conductors.

To install a Neutrik speakON NL4FX cable connector, follow the original Neutrik instructions in appendix 3 on page 34.

Connecting the power cable

Refer to the section "AC power" on page 15 for installation of the power connection.

Connecting the data link

Refer to the section "Data link" on page 16 for installation of the data connection.

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Set up

Warning! Read “Safety Information” on page 2 before installing, powering, operating, or servicing the Rotator.

Warning! Only experienced DMX users should operate the Rotator. Contact Wahlberg for further information and education on DMX protocol.

Block diagram

A block diagram of the control system can be found in Appendix 4 on page 35.

Connections

Rotator 280

The Rotator has 5 plugs. At the top there are 2 DMX plugs, one for connecting DMX in and one for daisy chaining the DMX connection to other devices.
Below there is a power connection plug for POWER in, and one plug that can be used to daisy chain the power connection between multiple devices.
To the left of these plugs is the fuse.

Rotator 281

The Rotator has 5 plugs. At the top there are power connection plug for POWER in, and one plug that can be used to daisy chain the power connection between multiple devices.
Below there is a 2 DMX plugs, one for connection DMX in and one for daisy chaining the DMX connection to other devices.
Next to the power plugs there is a fuse, and next to that, the power/data plug for attachments.

Emergency stop

There is no dedicated emergency stop for this Rotator. The Rotator is controlled from a lightning desk, where it should always be set up with a button that sets the speed of the Rotator in operation to 0%.
Normally lighting desks have a “blackout” button that sets all signals to 0% and this will also cause the Rotator to stop.

MODE setting

The MODE setting allows you to operate the Rotator in different ways. Each MODE setting has a given function. Each mode gives an opportunity for different operational settings of the Rotator. The MODE is selected using the MODE selector on the Rotator.

The Rotator needs to be reset, before the positioning MODE is possible. The Rotator can be reset manually or automatically. The Rotator must be reset each time its power supply has been disconnected.

Read the passage about controlling the soft clockwise (CW) and counter clockwise (CCW) limits, to explore and setup the rotator for your own particular needs.

Warning! Only operate the rotator when there is a clear view to the rotator and area beneath/above or besides it, depending on the method used for mounting.

Warning! Before running the rotator, ensure that the 'danger zone' next to the rotator is cleared to avoid risk of injury.

Warning! MODE 7 and MODE 8 is only for service and tests!

Warning! Before running the rotator in MODE 7 or MODE 8, ensure that the area beneath the rotator is cleared so no people can be harmed.

MODE	Function	Description	Note
0	Neutral Mode	The motor is not powered and the Rotator does not move.	
1	Positioning mode Slow speed change (Ramp)	Positioning mode with slow ramp	
2	Positioning mode medium speed change (Ramp)	Positioning mode with medium ramp	
3	Positioning mode Fast speed change (Ramp)	Positioning mode with fast ramp	
4,5,6	Neutral Mode	The motor is not powered and the Rotator does not move.	
7	Manual run CW (no DMX needed)	The rotator rotates clockwise (CW) with the speed set on the DMX-selectors. This function can be used as a test-function. E.g. Set the rotator to MODE 7 and the DMX address to 100, for a slow movement, or set the DMX address to 500 for fast movement.	The manual mode can be used for stand alone use without DMX.
8	Manual run CCW (no DMX needed)	The rotator rotates counter clockwise (CCW) with the speed set on the DMX-selectors. This function can be used as a test-function. E.g. Set the rotator to MODE 8 and the DMX address to 100, for a slow movement, or set the DMX address to 500 for fast movement.	The manual mode can be used for stand alone use without DMX.
9	Neutral Mode	The motor is not powered and the Rotator does not move.	

Table 2 - Overview of MODE functions

DMX ADDRESS setting

The DMX address, also known as the start channel, is the first channel used to receive instructions from the controller. For independent control, each Rotator must be assigned its own control channels.
The DMX address is configured using the three DMX ADDRESS selectors on the Rotator. The selected DMX address states from which channels, on the lighting desk, the Rotator is controlled. The DMX address can be selected from 1 – 505. The Rotator uses 6 DMX channels.

DMX channel	Function	Description
1	Position rough	This channel controls the position of the Rotator, with the speed (DMX channel 3). This rough position works together with the fine position (DMX channel 2). The rough position and the fine position are multiplied in to a 16 bit channel. The rough position is the *MSB*.
2	Position fine	This channel controls the position of the Rotator, with the speed set on DMX channel 3. This fine position works together with the rough position (DMX channel 1). The fine position and the rough position are multiplied in to a 16 bit channel. The fine position is the *LSB*.
3	Speed	This channel controls the speed and defines the maximum rotational speed of the Rotator. The Rotator runs with the set max speed, but slows down as closing in on the wanted position. This channel also works as a main brake; the motor does not run unless the channel is set above 0%. The speed-channel can also be used to make soft and slow movements or fast and sudden movements.
4	Manual CW / Set soft CW limit	This channel makes the rotator, rotate clockwise (CW). The channel value determines the speed. This channel controls the soft CW limit of the Rotator. If DMX channel 6 is set between 51-54%, the soft limits for position mode is saved. By adjusting this channel the Rotator rotates CW and when the channel is put to 0% the soft CW limit is saved (if channel 6 is 51-54%).
5	Manual CCW / Set soft CCW limit	This channel makes the rotator, rotate counterclockwise (CCW). The channel value determines the speed. This channel controls the soft CCW limit of the Rotator. If DMX channel 6 is set between 51-54%, the soft limits for position mode is saved. By adjusting this channel the Rotator rotates CCW and when the channel is put to 0% the soft CCW limit is saved (if channel 6 is 51-54%).
6	Mode control	Channel value 0-79% Position mode 51-54% Position mode with enable 'soft limit' lave 80-100% Angular mode **Attention! The positioning run in MODE 1, 2, and 3 works only, when the Rotator has been reset.**

Table 3 - Overview of DMX addresses

Manual reset

When the rotator is ready, the first thing to do is to reset it. The CW-position needs to be set manually, before the rotator is able to use for positioning run. To get the most precise run, fit for your own needs, it is possible to regulate the CW- and CCW- end positions. This is done manually on DMX channel 4 and DMX channel 5.

Reset example:

- The DMX channel 4 is set to 30% → the rotator starts to spin clockwise.
- Let it run until it reaches a desired position.
- Set DMX channel 5 is set to 30% → the rotator starts to spin counter clockwise.
- Let it run until it reaches a desired position.

The rotator is now reset and the CW-end position and the CCW-end position define the total travel length of the rotation.
If you want to change the rotating length, simply just use DMX channel 4 and 5 to set new end positions.

Positioning

When the Rotator has been reset and the soft limits is set, it is possible to use it for positioning run.

The green LED next to the MODE selector indicates by

- Fast flashing — The Rotator needs to be reset, before it can be used.
- Slow flashing — The Rotator's load is moving towards the set position
- Steady light — The set position has been reached and the motor has stopped.

The position is set on the DMX channel 1 and 2, which controls the rough-and fine-position. Where 100 % is the soft CW limit and 0 % is the soft CCW position.

The speed is set on the DMX channel 3, where 100 % is the fastest and 0 % is the slowest.

The Rotator does not run unless the DMX channel 3 is set above zero, and DMX channel 3, therefore also works as a main brake.
There are 2 modes the rotator position in. These are selected by the value on DMX channel 6.

Positioning Mode

If DMX channel 6 is 0-79%, the 0% position and 100% position is set by the user using DMX channel 4 and 5. When saving positions DMX channel 6 must be set between 50% and 55%. DMX channel 4 moves the rotator in the CW direction and sets the 100% position. Channel 5 moves the rotator in the CCW direction and sets the 0% position. When setting the end positions the 100% position set by channel 4 should always be set first.
When the 0% and 100% position has been set, DMX channel 1 and 2 can be used to position the rotator between 0-100% with the max speed determined by channel 3.

Angular Positioning Mode

When DMX channel 6 is 80-100% the rotator is in *angular positioning mode* and DMX channel 1 and 2 determines the angel the rotator moves to 0% is 0° and 100% is 360°. The rotator will always move the shortest way to the wanted position unless it was doing a continuous rotation set by channel 4 or 5 that was ended.
Example:

- The current position is 5° and the next set position is 350°.
  - → The rotator will move 15° back to the new position.
- The rotator is moving continuously (by having channel 4 or 5 set) and the next set position is 350°
  - → The rotator will continue in the same direction until it reaches the new position, when the continuous move is stopped.
  - → If the continuous move is stopped when the Rotator has moved 10° pass its wanted position it will not move back but do almost a full rotation to reach its position.

Synchronized movements of multiple Rotators

If several Rotators are installed to perform synchronized movements the best result is achieved by using a fading 16 bit position. The Rotators have a slight deviation in performance of the motors, so some motors have a slightly higher maximum speed than others.

This difference in speed can be solved by running the Rotators with fading positions, like when fading conventional light over time, the position of the Rotator should be faded from one position to another over a certain amount of time. In that way the Rotators will follow the fade-curve, and multiple Rotators can follow the same fade curve.

When fading the positions:

1. The speed channel should be a set to 100 to gain the highest possible speed.
2. The position channel should be assigned as a 16 bit channel with *MSB* and *LSB*.
3. The speed of the fade needs to be slower than the maximum speed, so the motors have speed enough to follow the fade-curve.

If the fade of the positions is too fast, the Rotators will move at the maximum speed, and you will see the difference in the motor speed.
If the fade is to slow the Rotators will move – stop – move – stop, when the position changes, thus giving a discontinuous movement.

Service and maintenance

Warning! Read “Safety Information” on page 2 before servicing the Rotator.

Warning! Disconnect the Rotator from AC mains power and allow cooling down for at least 10 minutes before handling.

Warning! Refer any service operation not described in this user manual to a qualified service technician.

Attention! Interval of inspections should be determined according to the frequency of use and the working scenario of the Rotator.

Attention! Signs of malfunction or poor operation should always lead to an inspection of the Rotator, and the Rotator should be taken out of operation until the error is eliminated.

Parts

Only parts ordered at or approved by Wahlberg should be used in the Rotator to ensure product function and stability. Contact Wahlberg Motion Design to inquire about spare parts.

On-site service

On-site service and maintenance can be provided by the Wahlberg Motion Design, giving owners access to Wahlberg Motion Design’s expertise and product knowledge in a partnership that will ensure the highest level of performance throughout the product’s lifetime. Please contact Wahlberg Motion Design for details.

Maintenance plan

The results of all the regular inspections are to be documented and kept available at the company. The written result of the last inspection must be kept available at the site of operation, e.g. by an inspection sticker on the Rotator showing the date of the inspection, the basis of the inspection and the name of the inspector.

Before every use and weekly

Every time when rigging the Rotator, before running the Rotator – and at least every week when the Rotator is in use:

- Check that the Rotator is safely and correctly installed/mounted
- Check that the Rotator's load and LEDs are visible from the operating station
- Check the shaft and clamp for shaft for bends, corrosion, and other damages.
- Check that the load is securely mounted
- Check the conductors through the rotator for conduction.

Monthly

At regular intervals – but at least every month when the Rotator is in use:

- Check the mounting clamp for damages and proper fastening.
- Change damaged parts according to this manual.

Yearly

The Rotator has to be inspected by a specialist every 12 months.

Every 48 months

The Rotator should be inspected by an authorised expert every 48 months.

Checklist

Use the checklist accordingly; before each use, each month etc.

Check	Type	Result
Installed / mounted correct	Inspection	
Load and LEDs visible for the operator	Inspection	
Condition of shaft and clamp for shaft	Inspection	
Load mounted safely	Inspection	
Conduction through rotator	Test	

Life time of the rotator

It is Wahlberg policy to apply the strictest possible calibration procedures and use the best quality materials available to ensure optimum performance and the longest possible component lifetimes. The extent of wear and tear depends heavily on operating conditions and environment, so it is impossible to specify precisely whether and to what extent the performance will be affected. The expected lifetime of the rotator depends on the load, mounted angle, as well as duty cycle.

Power defect

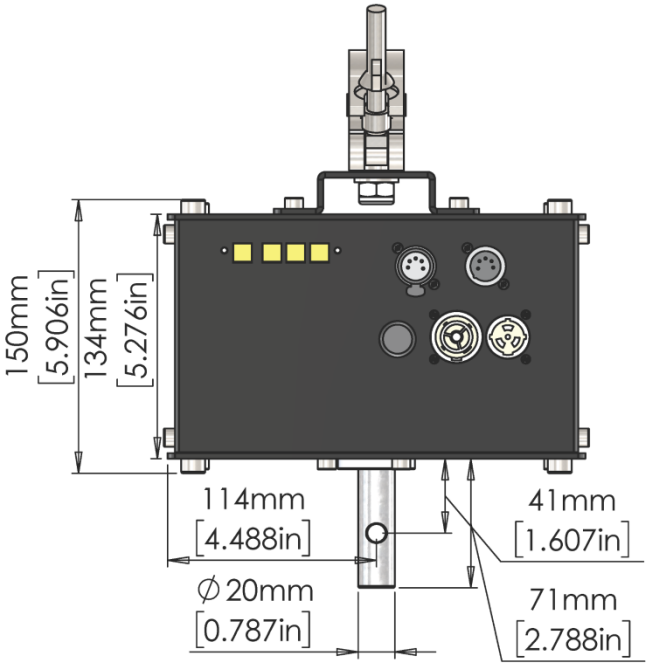
If the rotator does not react when the power is connected check the following:

- Check that the power plug is properly connected, both to the POWER IN plug on the rotator and to the main power plug.
- Check that the fuse is tightly screwed on in the fuse cap, also if it has just been changed.
- Check that the fuse is intact. It can be replaced with a new 2.0A fuse.

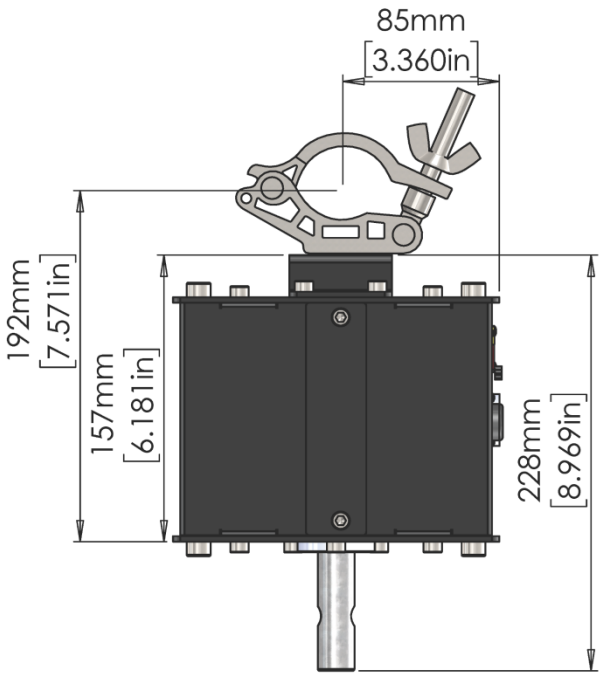
Appendix 1

Rotator 280

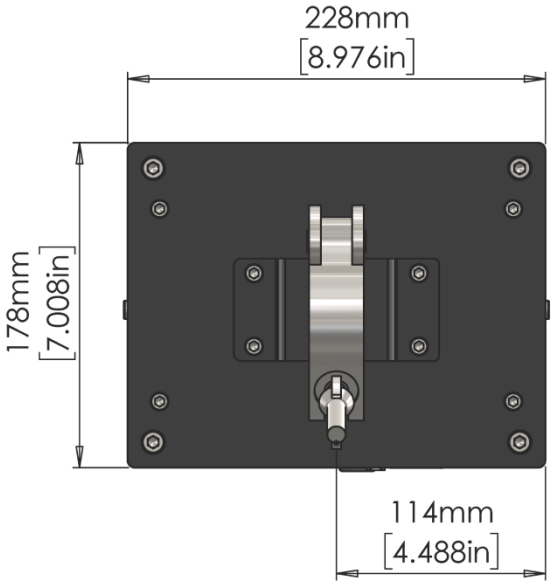
FRONT VIEW



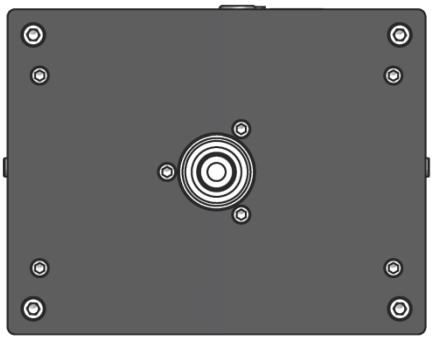
SIDE VIEW



TOP VIEW

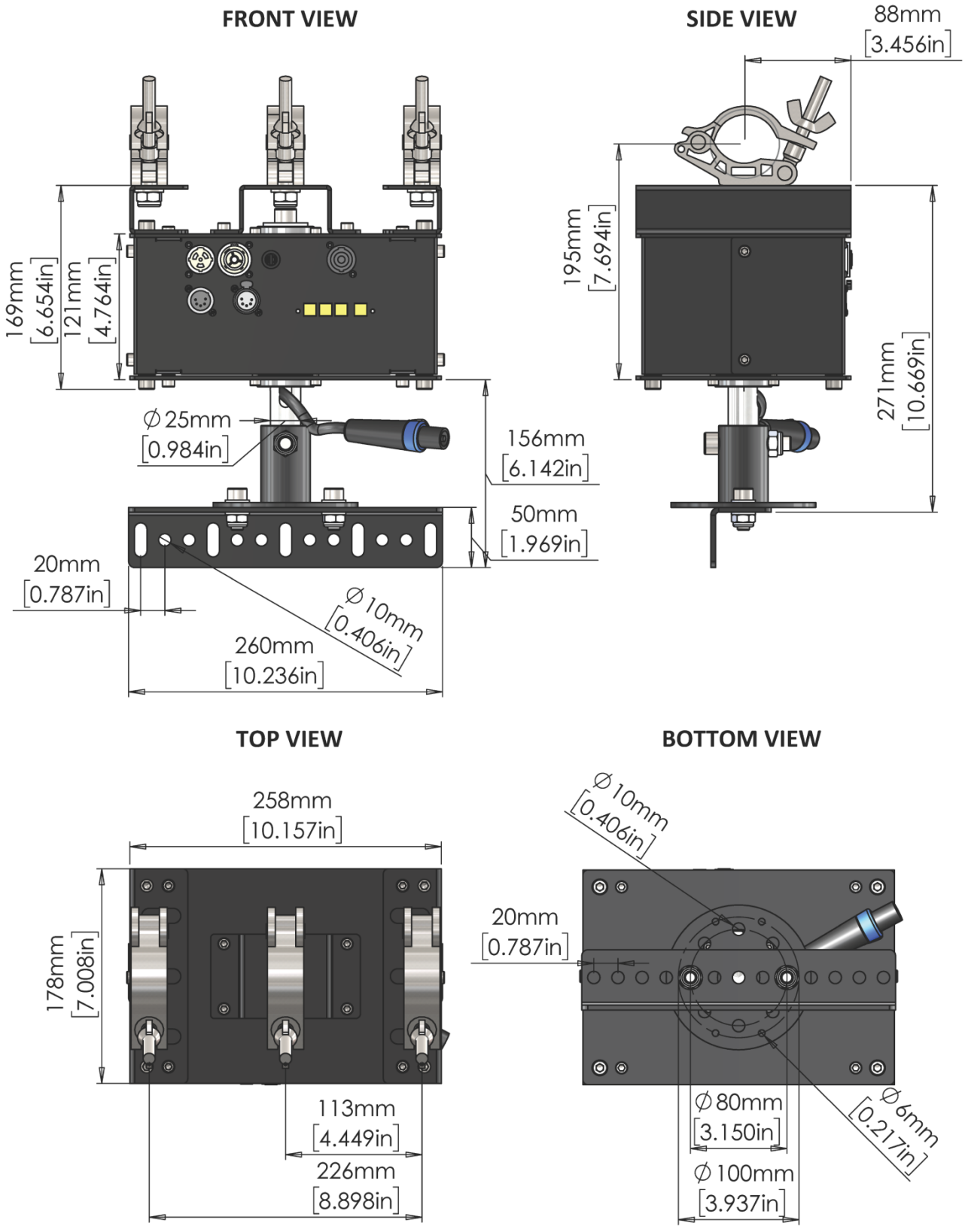


BOTTOM VIEW



Appendix 2

Rotator 281



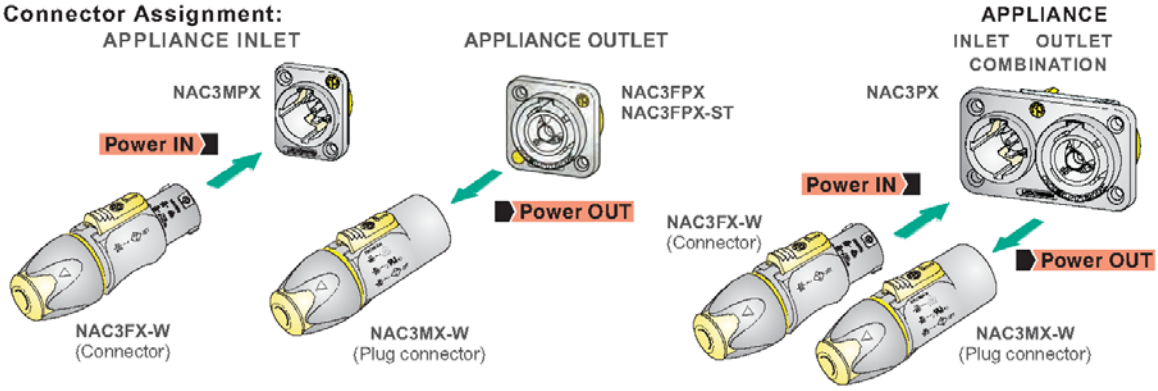
Appendix 3

OPERATING & ASSEMBLY INSTRUCTION
NAC3FX-W | powerCON TRUE1

A. OPERATING INSTRUCTION

Application:
The powerCON TRUE1 system is certified as connector with breaking capacity according IEC 60320, VDE 0625. It is intended for use as appliance couplers and interconnection couplers. It serves to supply power to an appliance and from an appliance to another equipment. To be installed by qualified person only.

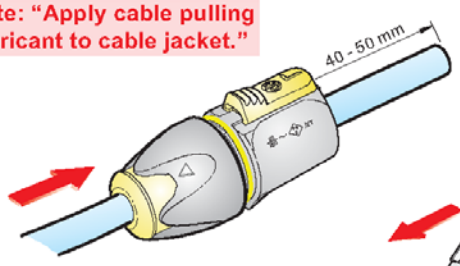
Connector Assignment:



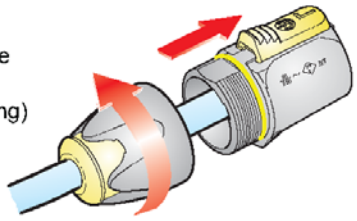
Approval based:	**VDE** EN 60320-1/EN60320-2-2 ✓	**UL** UL 498 / CSA C22.2 No. 182.3 ✓
Rating:	250 V ac / 16 A	250 V ac / 20 A
Cable Type:	H05VV-F3G 1.0 mm², Length max. 2 m H05VV-F3G 1.5 - 2.5 mm² H07RN-F3G 1.5 mm²	SJTOW, SJOOW 3 x 12 AWG
Strain Relief:	White chuck	White chuck
Cable O.D.:	6.0 - 12.0 mm	6.0 - 12.0 mm

B. ASSEMBLY INSTRUCTION

Ⓐ Insert cable into the bushing and housing.
Note: "Apply cable pulling lubricant to cable jacket."

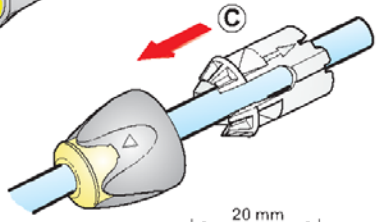


Ⓑ Separate the housing from the bushing (cable remain in bushing)

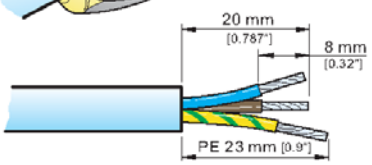


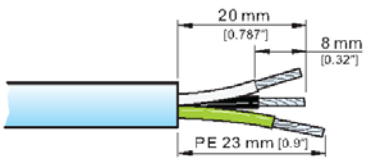
ⓘ **Recommendation:**
Wire Pulling Lubricant - LUB-I/0.95 from 3M™

Ⓒ Place chuck over the cable.



Ⓓ Prepare cable as shown.





VDE (EN 60320-1/EN60320-2-2) | **UL** (UL 498 / CSA C22.2 No. 182.3)

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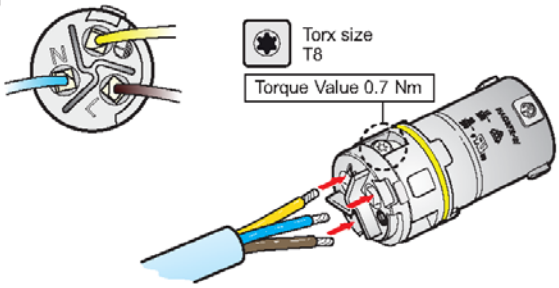
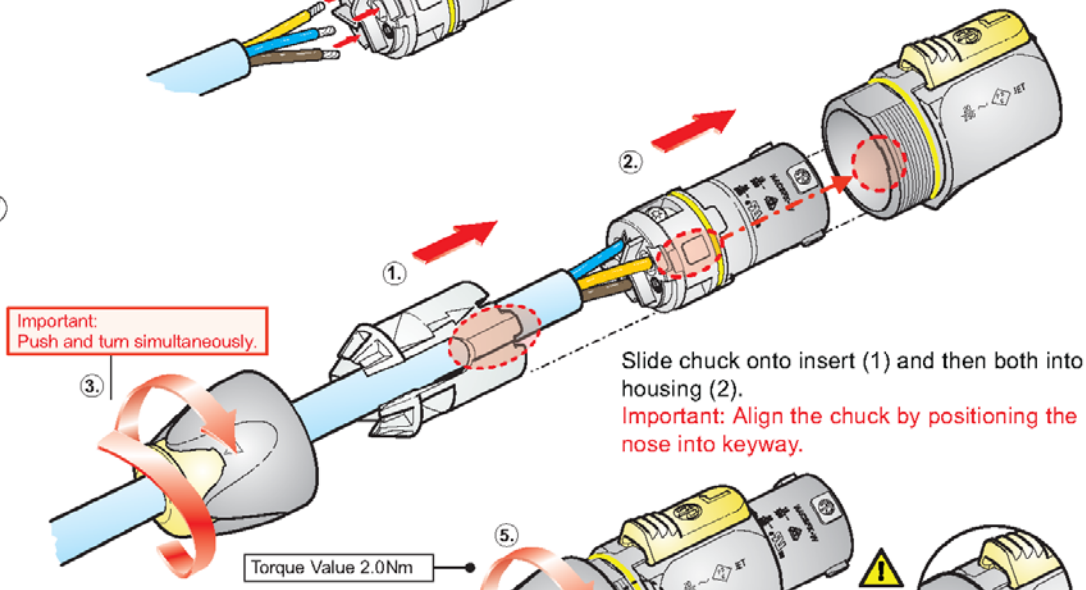
Ⓔ



Slide the cable into the contacts and clamp with the screw with Torx size T8.

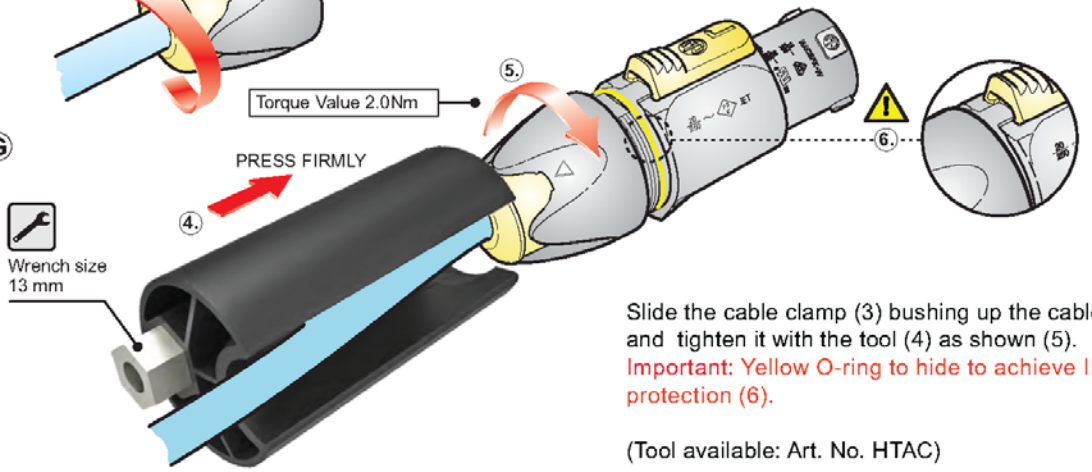
Wiring	VDE	UL
L ⇒	brown	black
N ⇒	blue	white
⏚ ⇒	green/yellow	green

Ⓕ



Slide chuck onto insert (1) and then both into housing (2).
Important: Align the chuck by positioning the nose into keyway.

Ⓖ

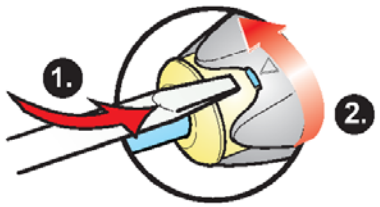


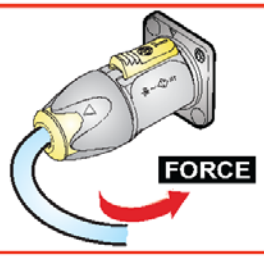
Slide the cable clamp (3) bushing up the cable and tighten it with the tool (4) as shown (5).
Important: Yellow O-ring to hide to achieve IP protection (6).

(Tool available: Art. No. HTAC)

FOR DISASSEMBLY - OPEN TWIST LOCK!

1. Press with screw driver to unlock
2. Turn bushing 360°.
3. Repat step ①+② until bushing is unscrewed.





CAUTION

To ensure protection category, do not expose the connection to bending forces (e.g. do not attach loads to the cable, no free-dangling cable windings etc.).

SAFETY WARNING

For safety and certification reasons the connector must be replaced in case of any broken parts or serious damage.

NEUTRIK AG	LI	T: +423/237 24 24	F: +423/232 53 93	NEUTRIK France	FR	T: +33 1/4131 6750	F: +33 1/4131 0511
NEUTRIK USA Inc.	USA	T: +1 704 / 972 3050	F: +1 704/438 9202	NEUTRIK Tokyo Ltd.	JP	T: +81 3/3663 4733	F: +81 3/3663 4796
NEUTRIK (UK) Ltd.	UK	T: +44 1983 / 811 441	F: +44 1983/811 439	NEUTRIK Hong Kong Ltd.	HK	T: +852/2687 6055	F: +852/2687 6052
NEUTRIK Vertriebs GmbH	DE/NL/AT/DK	T: +49 8131 / 280 890	F: +49 8131/280 830	NEUTRIK India Pvt. Ltd.	IND	T: +91/982 05 43 424	F: +91/22 26163 540

Draft. Nr.: BDA 378 | Update: 09.06.2017 |

Appendix 4

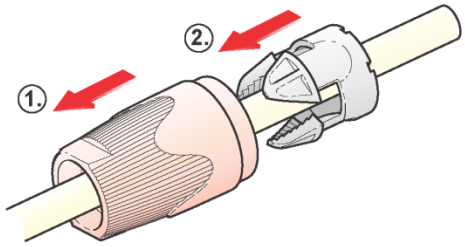
ASSEMBLY INSTRUCTION
NL4FX / NL4FRX
speakON® SPX Series | Lockable Loudspeaker Connector

IMPORTANT SAFETY INSTRUCTION

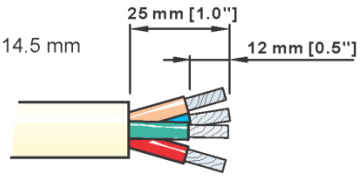
Electrical Rating acc. UL & CSA: "CAUTION: NOT FOR INTERRUPTING CURRENT"
USR: 40A/250V, CNR: 25A/250V "ATTENTION: NE PAS UTILISER POUR COUPER LE COURANT"

Attention: speakON is not to be used as an AC mains or power supply connector!

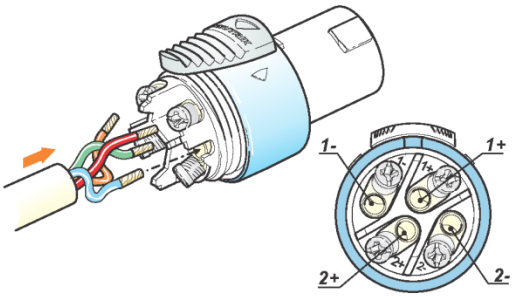
Ⓐ



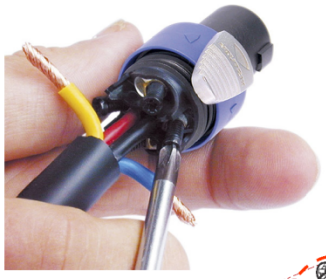
Ⓑ **Cable O.D.** 7.0 - 14.5 mm
[0.24 - 0.39"]
Wire size 4 mm²
(AWG 12)

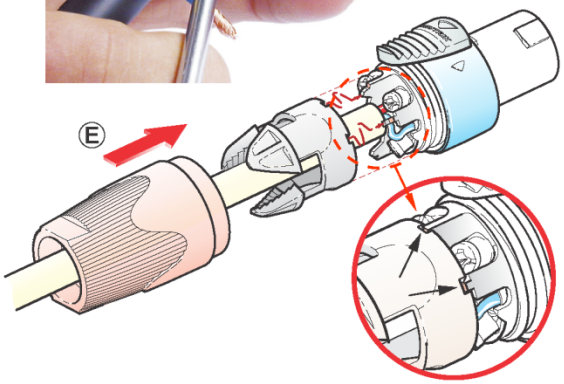


Ⓒ



Ⓓ





Assembly of the Connector:

Ⓐ **Place the bushing and chuck over cable.**

Ⓑ **Prepare the cable as shown.**

Important is the stripping length of 25 mm and 12 mm.

Ⓒ **Insert wires into terminals and secure clamp terminals with screw driver (POZIDRIV® #1) at max. torque 0.8 Nm.**
For 6 mm² (AWG 10) remove screws, clamping sheet and solder.

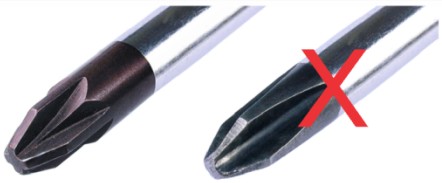
Ⓓ **For easy wiring especially on big cables, first screw on the inner conntacts 1+ and 2+ and afterwards the outer contacts 1- and 2- !**

Ⓔ **Push chuck up to housing .**

Important: Align the chuck by positioning the nose into the recess.

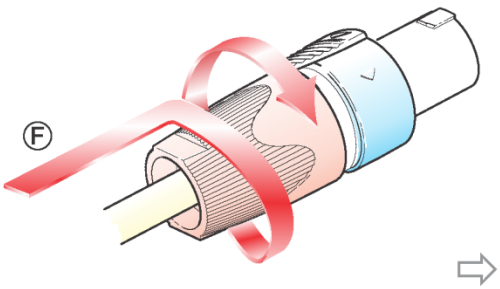
Ⓕ **Tighten the bushing**

INFO to the screw driver:

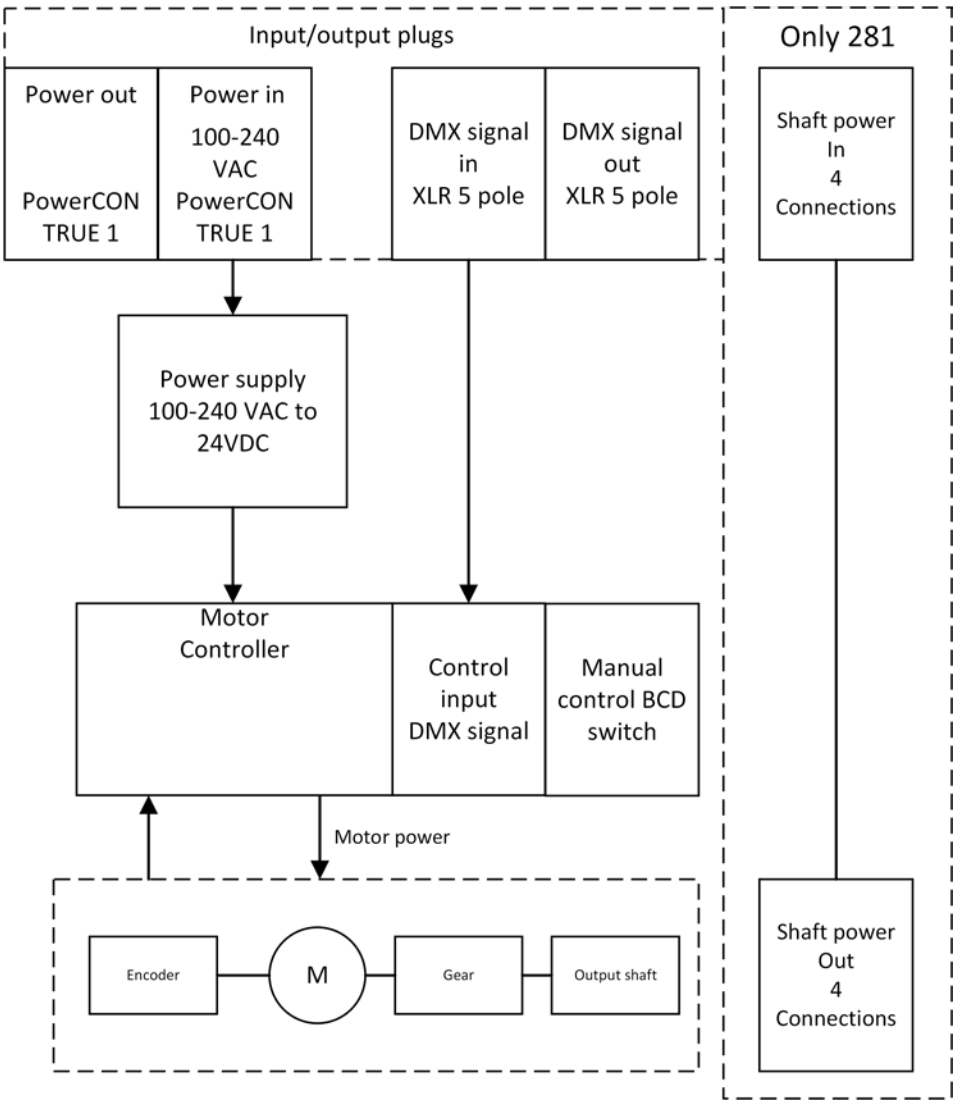


DO NOT USE!

POZIDRIV® #1	Philips



Appendix 5



Block diagram of the control system of the Rotator.

Rotator - Cheat Sheet

MODE	Functions	DMX channels	Function
0	Neutral function – motor stops	1	Position rough (Hi of a 16 bit DMX channel)
1	Slow speed change (Ramp)	2	Position fine (Lo of a 16 bit DMX channel)
2	Normal sleep change	3	Set the maximum speed
3	Fast speed change	4	Manual CW / Set soft CW limit
4,5,6	Neutral function – motor stops	5	Manual CCW / Set soft CCW limit
7	Manual clockwise up (DMX address = speed)	6	Mode control 0-79% Position mode 51-54% Position mode 'soft limit' save enabled 80-100% Angular mode
8	Manual counter clockwise (DMX address = speed)		
9	Neutral function – motor stops		

How to get started

1. Mount the rotator according to the instructions on page 12.
2. Set the DMX address using the 100, 10, and 1 switches. Set MODE 1
3. Apply DMX from a Lighting desk, best is a desk with manual faders. Pull all channels on to 0%
4. Apply power to the rotator.
   DMX lamp should be lit, and the mode lamp should be flashing.

Position mode

5. Set channel 6 to 52 % and channel 4 to 30%
   The rotator will slowly turn CW.
6. When the wanted CW end position is found - set channel 4 to 0% and channel 5 to 30 %
   The rotator will slowly turn CCW.
7. When the wanted CCW end position is found - set channel 5 to 0%.
8. Set channel 3 to 50% and channel 1 to 25%
   The rotator starts to rotate, with 50% speed, to the position 25% from soft CW limit.

Angular positioning mode

9. Set all channels (1 – 6) to 0%
10. Set channel 6 to 100% (Angular mode)
11. Set channel 3 to 50% (Max speed) and channel 4 to 30% (Manual CW).
    Now the rotator will slowly turn CW. Let the rotator run minimum one rotation
    (must be done for each power cycle, so the Rotator identifies its angular zero position)
12. Set channel 4 to 0% and channel 1 to 25% (Position).
    Now the rotator will rotate CW until it reaches 90 degrees with 50% speed
13. Set channel 1 to 75%.
    Now the rotator will rotate CW until it reaches 270 degrees with 50% speed

Note: It is possible to change between constant CW or CCW rotation and angular positioning mode while the rotator is running. During change from constant CW/CCW rotation the rotator will always continue in the same direction until the wanted angular position is found. When the rotator is in angular positioning mode it will select the rotation direction that will give the shortest direction.

Before each use

- Check that the **Rotator** is safely and correctly installed/mounted
- Inspect the **Rotator** for damage, wear, corrosion or abuse.
- Ensure that the attached load is correctly mounted, and does not exceed the work load limits.

Warning! Do not use the Rotator if any damage or error is found!