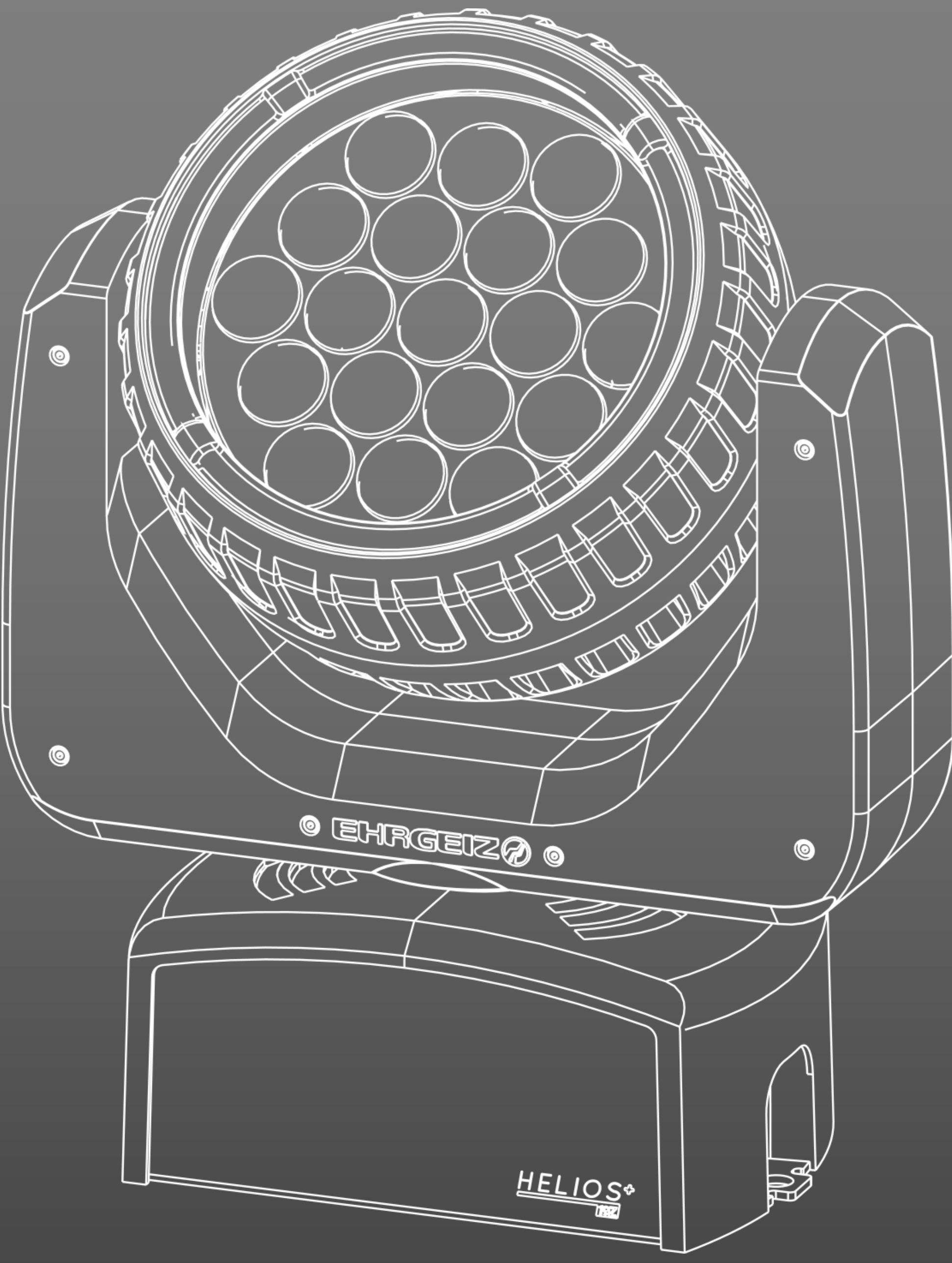
EHRGEIZ


EHRGEIZ
HELIOS+
19Z

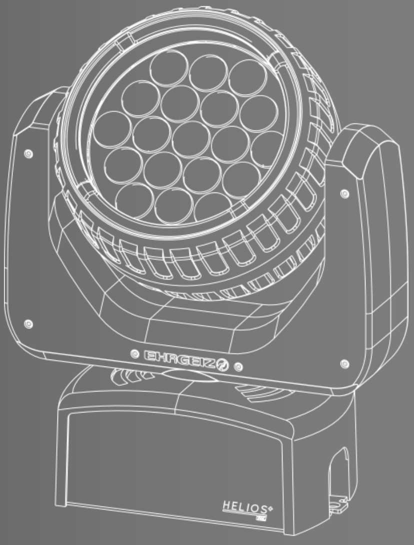
# HELIOS+

# USER MANUAL 19Z

EHRGEIZ

# HELIOS+

USER MANUAL 19Z



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# Introduction

Thank you for your purchase and usage of the Ehrgeiz Helios+ 19z.

You have chosen a reliable product with outstanding features like the uniqe 8 segment ring. The device is easy to use and is made of high quality components.

Every Ehrgeiz Product is checked before shipping to secure that you receive a great product without compromise. This is not a toy. Our ambitious aim is to give you a reliable working tool.

## Safety Instructions

### IP20 protection rating

The fitting is protected against penetration by solid bodies of over 12,5 mm (0.47”) in diameter (first digit 2), but not against dripping water, rain, splashes or jets of water (second digit 0).

### Prevention from electrical shock

Make sure to ground (earth) the fixture electrically. (It’s essential to connect the yellow/green conductor to earth)

### Main Connection

Do not apply any AC mains power to the fixture at any other voltage than that specified.

Never let the power-cord come into contact with other cables. Treat the power cord and all connections with the mains with particular caution.

Make sure the power-cord is never crimped or damaged by sharp edges.

### Rigging

Check that all external covers and rigging hardware are securely fastened.

When choosing the installation-location, please make sure that the fixture is not exposed to extreme heat, moisture or dust. There should not be any cables lying around. You endanger yourself and the safety of others.

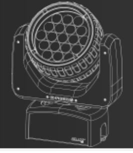
Make sure that the area below the installation place is cordoned off when rigging, de-rigging or servicing the fixture.

If suspending from a rigging structure, fasten the fixture to a rigging clamp with an M10 bolt screwed into the threaded hole in the center of the base of the fixture. The bolt must be screwed at least 20-25mm into the fixture. If the fixture is suspended by any other method, an M10 bolt must be screwed into this hole so that it is at least 20-25mm into the fixture.

Make sure all fixtures are operated and installed by a qualified electrician with the relevant national certifications.

In order to maintain the condition and to ensure a safe operation, it is important for all users to follow the safety instructions and warning notes written in this manual.

Do not operate the fixture with missing or damaged covers, shields or any optical component.



Please consider that unauthorized modifications to the device are forbidden due to safety reasons.

If the device is operated in any way that's not described in this manual, the product may suffer damage and the guarantee will become void. Furthermore, misuse may lead to dangers like short-circuit, burns, electric shock, burns due to ultraviolet radiation, lamp explosion, crash, etc.

**Liability**

The manufacturer will not accept liability for any resulting damages caused by the non-observance of this manual or any unauthorized modification or repair of the fixture.

**Minimum distance to illuminate objects**

The fixture must be positioned at least 0.2m minimum distance to illuminate objects.

**Minimum distance from inflammable materials:**

Keep all inflammable materials at least 0.2m from this fixture.

**Positioning:**

Allow to place the fitting on an inflammable surface.

Install as described in this manual and add a secondary attachment such as a safety wire that is approved by an official body. The safety wire must comply with EN 60598-2-17 Section 17.6.6 and be capable of bearing a static suspended load ten times the weight of the fixture.

**Maximum ambient temperature of unit location**

The maximum ambient temperature of 45°C may not be exceeded.

**Exterior surface temperature:**

The exterior of this fixture can reach an untouchable temperature during operation. Avoid contact by persons and materials.

**Maintenance:**

This fixture is for professional use only. It is not for household use.

Always unplug the mains for any maintenance.

**Risk of eye injury:**

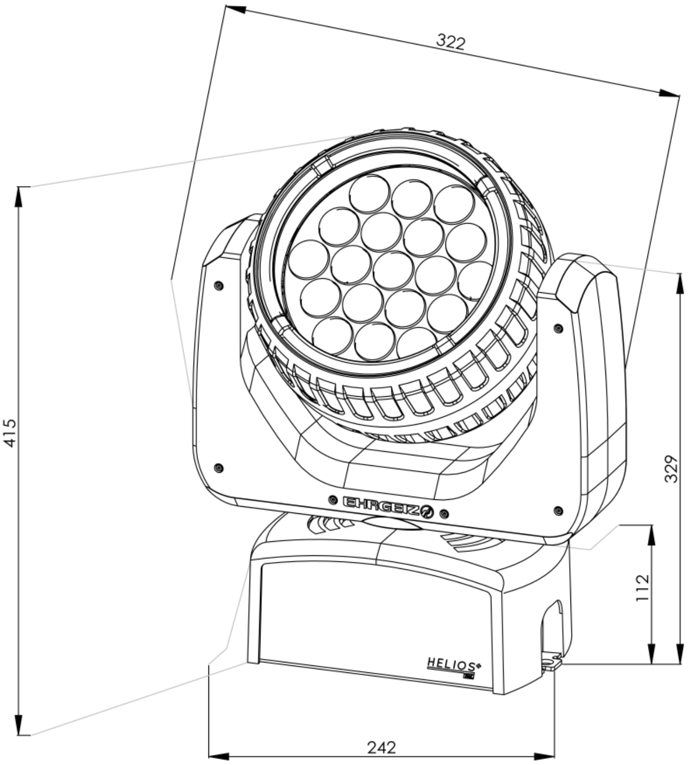
Do not stare directly into the light when it is switch on. (Do not look at LEDs with magnifying glasses, telescopes, binoculars, or similar optical instruments that may concentrate the light output.

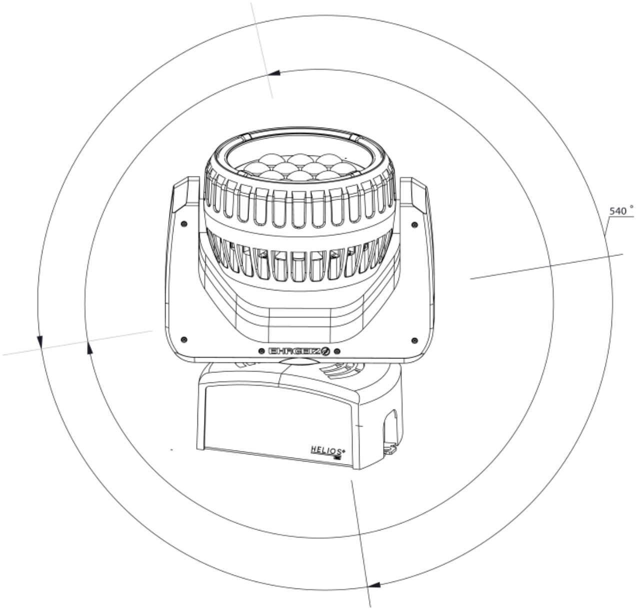
## Delivery Contents

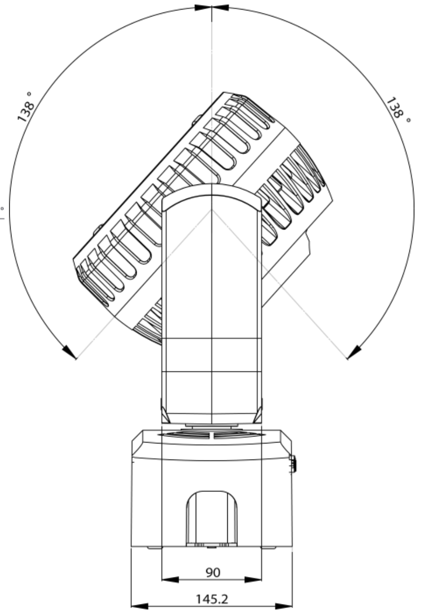
You received your Helios+ 19z with the following content

| | |
|---|---|
| - Helios+ 19z | 19x 15W Moving Head |
| - Powercord | Powercable with Neutrik powerCON plug |

## Fixture Dimensions


322
415
329
112
242
HELIOS+




138 °
138 °
90
145.2

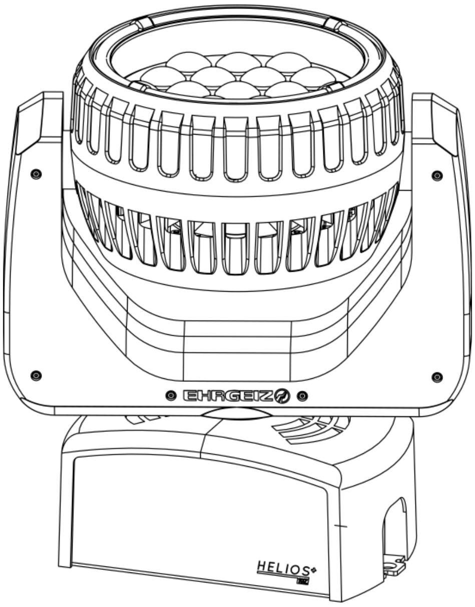
Dimensions in mm

# Installations

Your Helios+ 19z can be installed in every kind of following positions. Please see the explanations and rely to the Instructions for a safe operation and secure handling.

## Installation On Floor

You can place the Helios+ 19z on the floor. Please make sure the surface is plane and the reliability of the floor is sufficient.

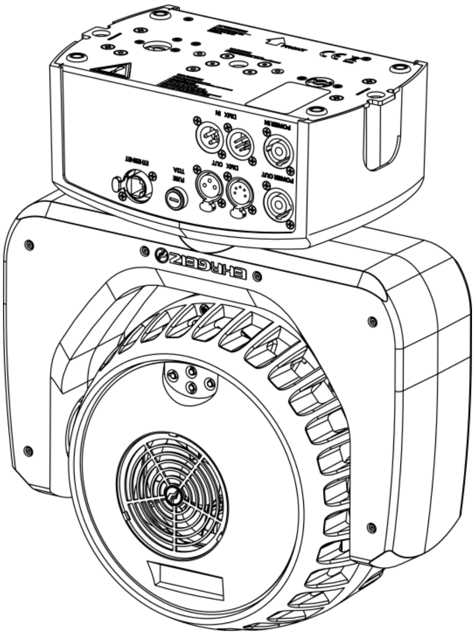


## Installation Hanging

You can attach the Helios+ 19z to a Truss or Pipe facing down.

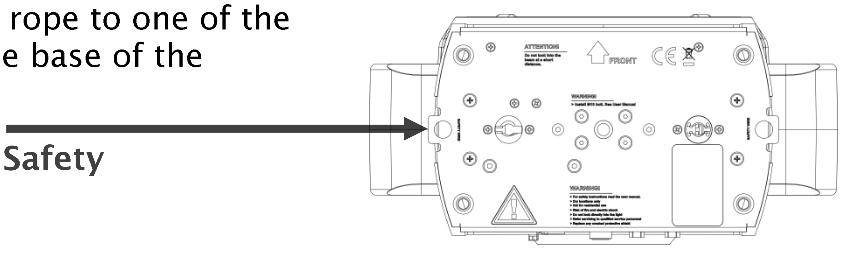
If you wish to install the fixture using a Clamp, make sure that the length of the M10 bolt does not exceed 25mm!

When installing the fixtures one to another the distance between the middle of the installation clamps has to be more than 350 mm.



## Safety Attachment

Please attach the Safety rope to one of the two safety eyelets on the base of the housing.

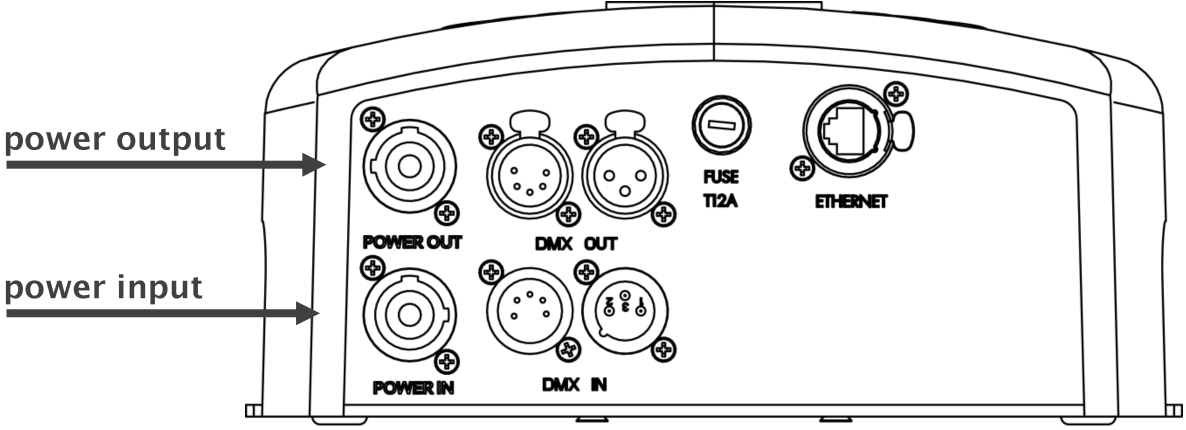


# Connections

## Mains

The connection of the power supply has to be done by qualified personnel only. Do not connect the Helios+ 19z if you are not able to survey the consequences.

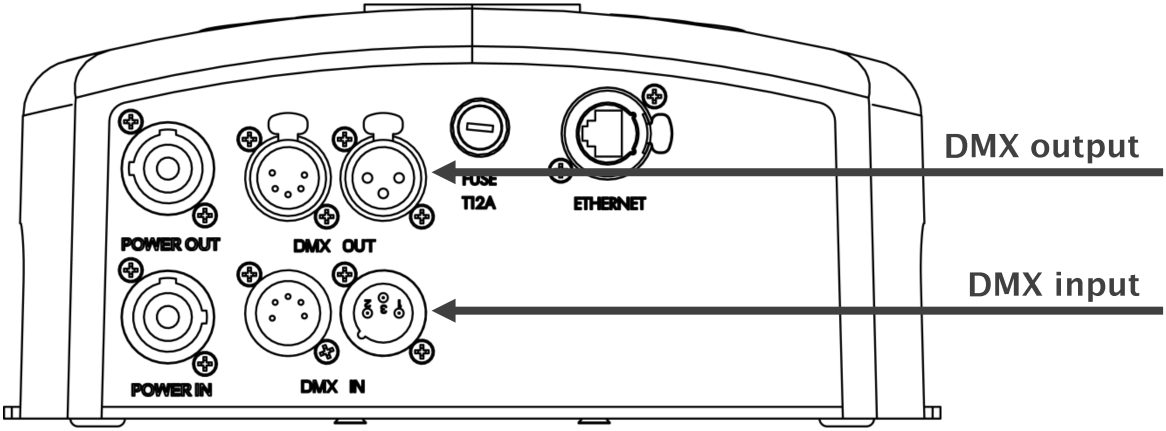
The Helios+ 19z is equipped with original NEUTRIK powerCON In- and Output.


power output
power input
POWER OUT
DMX OUT
FUSE
T12A
ETHERNET
POWER IN
DMX IN

Do not try to connect another type of plug than an original NEUTRIK powerCON. Do not use any force to connect the powerCON plug. You can use the outlet for connecting additional devices. The internal wiring is done with a cable cross section of 2,5mm$^2$.

## DMX

Your Helios+ 19z is equipped with original NEUTRIK XLR connectors for In- and Output.


POWER OUT
DMX OUT
FUSE
T12A
ETHERNET
DMX output
POWER IN
DMX IN
DMX input

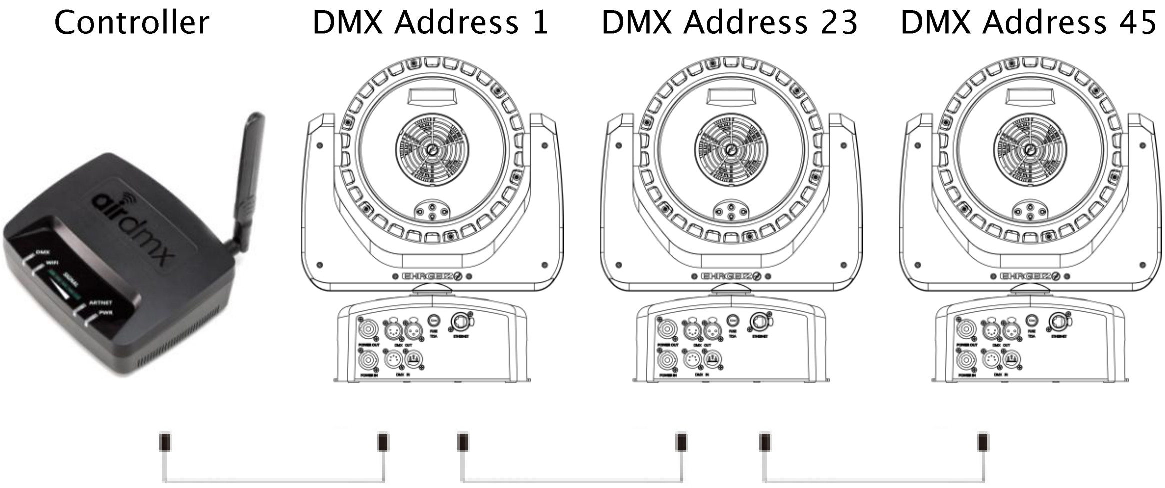
We recommend the use of high quality XLR connectors like original NEUTRIK. Please use real DMX cables with a surge impedance of 110 Ω.

You can choose one input and output 3 or 5 pin; please don't use the device as a splitter.

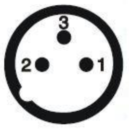
Please notice that the USITT DMX Standard does allow the use a max of 32 DMX fixtures in one line. You should terminate the signal by a 120 Ω resistor.

In Standard mode the Helios+ 19z uses 22 DMX channels.

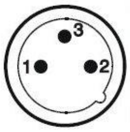
Connect the devices and increase the value of the DMX channel by 22 from one device to another


Controller
DMX Address 1
DMX Address 23
DMX Address 45
airdmx

## DMX Pin Definition:



1: Ground
2: Signal –
3: Signal +



## Artnet

Your Helios+ 19z is equipped with an Artnet input.

Although there are a lot of possibilities for this protocol the “normal” setup is not that complicated.

According to the standard the Address should be in a range of
2.X.X.X or 10.X.X.X

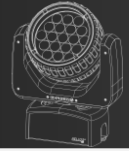
Just set your controller to an IP Address like 2.0.0.XXX choose another address for your Helios+ 19z devices. Keep in mind that none of the devices should have the same IP address, even if you would like them to behave the same way.

Set the controller and your Helios+ 19z to the same Subnet and Universe. Patch your Console and select the same DMX start address on the device.

For more information on using Artnet see the Artistic License Page:

[http://www.artisticlicence.com/](http://www.artisticlicence.com/)

You will be able to find a lot of information, as well as some useful software tools for Network analysis like the DMX-Workshop there.

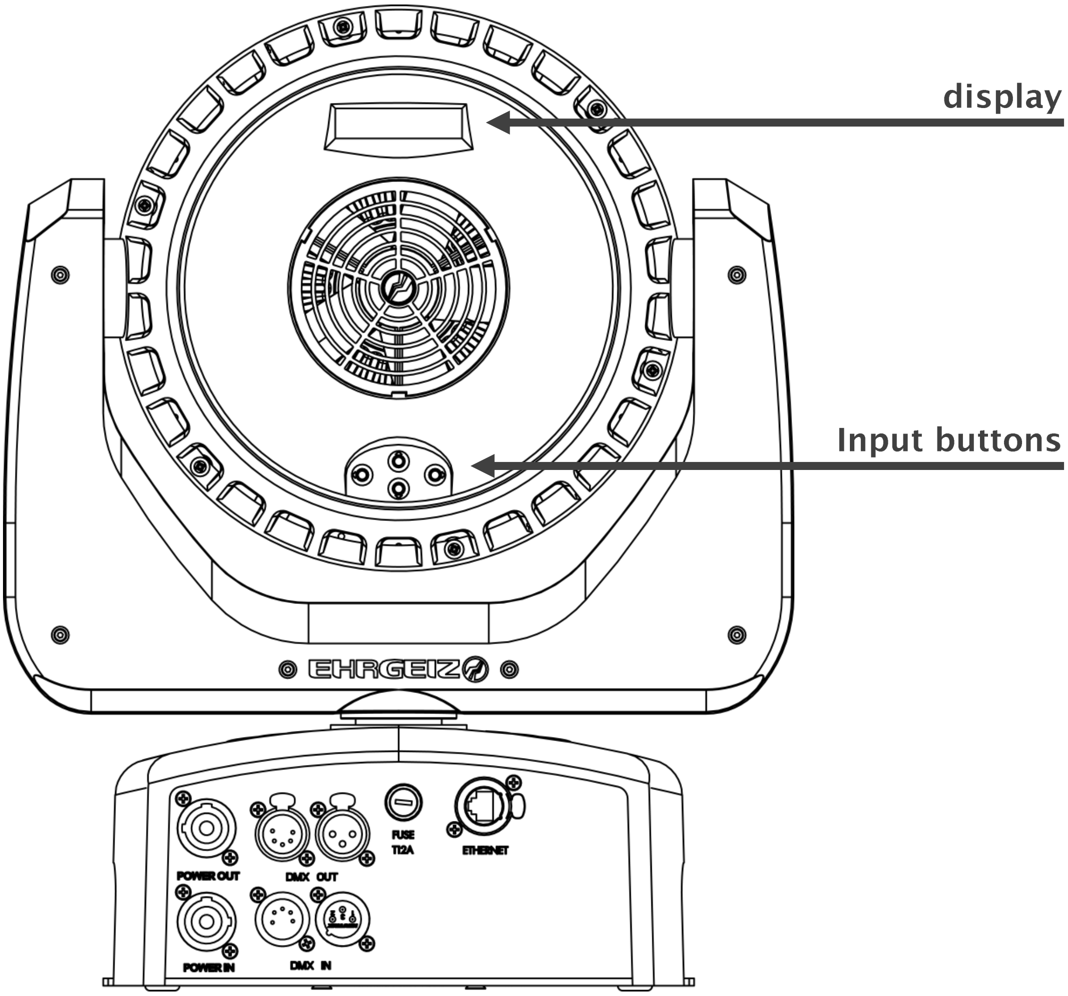


# Operations

## Menu Control

Your Helios+ 19z uses an innovative way to change the menu settings.

The display, as well as the input buttons, are aligned in the head of the device. This allows you to do your settings in every way you are able to approach the device. Simply press any button 2 times and the motors are free. Do your Settings and the motors will go back to controlled mode after 10 seconds. (Motor free can be disabled in the Personality Settings)

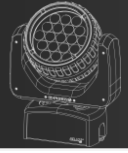


The Menu of the Helios+ 19z is very intuitive. You will find a menu map on the following pages. The four buttons are used to scroll the values, select a setting or hop back in the menu structure:

| | |
|---|---|
| ◀ | Go back in the menu structure or leave value as it is |
| ▶ | Go forward in the menu structure or confirm the selected value |
| ▲▼ | Scroll up / down in the menu structure or scroll the selected value |

# Menu Map

| | | | | |
|---|---|---|---|---|
| DMX ADDRESS | Address + / - | 1 - 512 | | ▶ Choose your DMX address |
| | Ethernet Setup | Ethernet Enable | ON / Off | ▶ Enable Artnet input |
| | | IP Address | Default IP | ▶ 2.0.0.1 |
| | | | Custom IP | ▶ set your own IP |
| | | | Netmask | ▶ set Netmask |
| | | Subnet | | ▶ Set Subnet 0 - 15 |
| | | Universe | | ▶ Set Universe 0 - 15 |
| Personality | DMX Mode | Standard Mode | | ▶ 22 channels with most effects included |
| | | Advanced Mode | | ▶ 31 channels with 16 bit colour mixing |
| | | Full Control | | ▶ 165 channels with RGBW control for every pixel & Ring |
| | | Pixel Mapping | | ▶ 137 channels Pixel Mapping for Main LED's only |
| | | Compressed RGBW | | ▶ 15 channels with RGBW control only |
| | | Pattern Control | | ▶ 59 channels with multiple Pattern layers for main LED's & Ring |
| | Remote DMX Add. | On | | ▶ Enable the Remote DMX adressing |
| | | Off | | |
| | P / T Setting | P / T Speed | Normal / Fast / Slow | ▶ choose PAN / TILT speed |
| | | PAN Invert | On / Off | ▶ invert the PAN control |
| | | Tilt Invert | On / Off | ▶ invert the TILT control |
| | | Feedback | On / Off | ▶ Turn off the error correction |
| | | P / T Release | On / Off | ▶release the P/T motors while in setup |
| | Dimmer Curve | Linear | | ▶ Set up the Dimmer Curve; see Appendix / page VI |
| | | Square Law | | |
| | | Inverse Square | | |
| | | Theatrical | | |
| | Dimmer Speed | Fast | | ▶ Set up the speed of the dimmer |
| | | Smooth | | |
| | Cooling Mode | Auto | | ▶ Regulate the fan according the fixtures temp. |
| | | Standard | | ▶ Medium Fan speed |
| | | Silent | | ▶ light output will lower if device get's too warm |
| | | High Power | | ▶ Fan always spins at highest level |
| | MIC Enable | Disable / Enable | | ▶ Enable the built-in Mic |
| | Mic Sensitivity | Low | | ▶ Set the sensitivity for "Sound Active Mode" |
| | | Normal | | |
| | | High | | |
| | Reset via DMX | On | | ▶ Choose if device can be resetted via DMX |
| | | Off | | |



# Operations → Menu Map

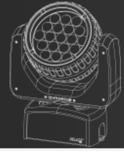
| | | | | | | |
|---|---|---|---|---|---|---|
| | Display Setting | Intensitiy | 0 – 10 | | | ▶ set Display intensity |
| | | Shutoff Time | 2m – 60 m / off | | | ▶ set time when display light turns off |
| | | No Signal Flash | On / Off | | | ▶ display flashes if no DMX input |
| Stand Alone | Test Sequences | Dynamic Mode | Run / Cancel | | | ▶ Test Sequence without movement |
| | | Static Mode | Run / Cancel | | | ▶ Test Sequence including movement |
| | Master / Slave | Alone | | | | ▶ Set unit to Alone (No Master or Slave) |
| | | Master | | | | ▶ Set unit to Master (in Program Mode) |
| | | Slave | | | | ▶ Set unit to slave (in Program Mode) |
| | Program Edit | Program 1 | Prog 1 Max Step (01 – 30) | Select Step | 01 – 30 | ▶ Select amount of Steps |
| | | | | Capture DMX | | ▶ Capture and Safe the actualDMX input |
| | | | | Hold Time | | ▶ Select hold time in seconds (0 – 999) |
| | | | | Fade Time | | ▶ Select fade time in seconds (0 – 999) |
| | | Program 2 | | | | ▶ see above |
| | | Program 3 | | | | ▶ see above |
| | Program Play | Program 1 | No / Yes | | | ▶ Play Program 1 |
| | | Program 2 | No / Yes | | | ▶ Play Program 2 |
| | | Program 3 | No / Yes | | | ▶ Play Program 3 |
| | | Program All | No / Yes | | | ▶ Play Program 1, 2 & 3 in a Loop |
| Service | Reset | Reset All | No / Yes | | | ▶ Reset all Motors |
| | | PAN / TILT | No / Yes | | | ▶ Reset PAN / TILT |
| | Factory default | Load | No / Yes | | | ▶ Set device back to factory defaults |
| Information | Fixture Time | Resettable | XXX hours | | | ▶ see the resettable fixture time |
| | | Total | XXX hours | | | ▶ see total working time of the device |
| | | Clear resetable | Clear / Cancel | | | ▶ clear the resettable fixture time |
| | Fixture Temp | Head LED | Actual | | | ▶ see temp. meassured at LED's |
| | | | Max | | | ▶ see max. temp. till last reset |
| | | | Reset | No / Yes | | ▶ reset max. temp. |
| | | Head Driver | Actual | | | ▶ see temp. meassured at Driver Board |
| | | | Max | | | ▶ see max. temp. till last reset |
| | | | Reset | No / Yes | | ▶ reset max. temp. |
| | Version | V. XXXX.XX | | | | ▶ See the installed Firmware Version |
| | Serial Number | XXXXXXX | | | | ▶ See the Serial Number of this device |
| DMX Live | Refresh Rate | XX Hz | | | | ▶ See the refresh rate of the received DMX signal |
| | PAN | 0 – 255 | | | | ▶ input value of PAN channel |
| | PAN Fine | 0 – 255 | | | | ▶ input value of PAN fine channel |
| | TILT | 0 – 255 | | | | ▶ input value of TILT channel |
| | TILT Fine | 0 – 255 | | | | ▶ input value of TILT fine channel |
| | Control | 0 – 255 | | | | ▶ input value of control channel |

| | | | |
|---|---|---|---|
| | CTO | 0 – 255 | ▶ input value of CTC channel |
| | Color Wheel | 0 – 255 | ▶ input value of Color Wheel channel |
| | Red | 0 – 255 | ▶ input value of Red channel |
| | Green | 0 – 255 | ▶ input value of Green channel |
| | Blue | 0 – 255 | ▶ input value of Blue channel |
| | White | 0 – 255 | ▶ input value of White channel |
| | Dimmer | 0 – 255 | ▶ input value of Dimmer channel |
| | Strobe | 0 – 255 | ▶ input value of Strobe channel |

## Software Updates

Your Helios+ 19z can be updated via the XLR connection, so no need to open it.

If you experience issues which could probably be solved by an Firmware Update please contact your Ehrgeiz Dealer for further instructions.



# DMX Modes

You can set up your Helios+ 19z in 6 different DMX Modes:

**Standard Mode**

Page 13; Uses 22 DMX channels

**Advanced Mode**

Page 14; Uses 31 DMX channels

**Full Control Mode**

Page 15; Uses 165 DMX channels

**Pixel Mapping Mode**

Page 17; Uses 137 DMX channels

**Pattern Control Mode**

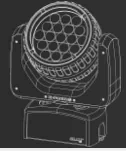
Page 18; Uses 59 DMX channels

**Compressed RGBW Mode**

Page 20; Uses 15 DMX channels

## Standard Mode

| CH | Value | Function |
|---|---|---|
| **1** | 0 – 255 | **Pan** |
| **2** | 0 – 255 | **Pan fine** |
| **3** | 0 – 255 | **Tilt** |
| **4** | 0 – 255 | **Tilt fine** |
| **5** | 0 – 255 | **Colour Wheel** (see Colour Wheel chart / Appendix Page IV) |
| **6** | 0 – 255 | **Red** |
| **7** | 0 – 255 | **Green** |
| **8** | 0 – 255 | **Blue** |
| **9** | 0 – 255 | **White** |
| **10** | 0 – 255 | **Shutter effects** (see Shutter effects chart / Appendix Page VI) |
| **11** | 0 – 255 | **Dimmer** |
| **12** | 0 – 255 | **CTO** |
| **13** | 0 – 255 | **Zoom** |
| **14** | 0 – 255 | **LED Ring Colour wheel** (see Colour Wheel chart / App. Page IV) |
| **15** | 0 – 255 | **LED Ring Shutter** (see Shutter effects chart / Appendix Page VI) |
| **16** | 0 – 255 | **LED Ring Dimmer** |
| **17** | 0 – 255 | **Pattern** (see Pattern effects table / Appendix Page VII) |
| **18** | 0 – 255 | **Pattern Speed** |
| **19** | 0 – 255 | **LED Ring Pattern** |
| **20** | 0 – 255 | **LED Ring Pattern Speed** |
| **21** | 0 – 255 | **Control** (see Control channel table / Appendix Page V) |
| **22** | 0 – 255 | **Remote DMX address** |

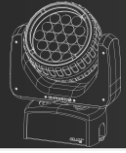


## Advanced Mode

| CH | Value | Function |
|---|---|---|
| **1** | 0 – 255 | **Pan** |
| **2** | 0 – 255 | **Pan fine** |
| **3** | 0 – 255 | **Tilt** |
| **4** | 0 – 255 | **Tilt fine** |
| **5** | 0 – 255 | **Colour Wheel** (see Colour Wheel chart / Appendix Page IV) |
| **6** | 0 – 255 | **Red** |
| **7** | 0 – 255 | **Red fine** |
| **8** | 0 – 255 | **Green** |
| **9** | 0 – 255 | **Green fine** |
| **10** | 0 – 255 | **Blue** |
| **11** | 0 – 255 | **Blue fine** |
| **12** | 0 – 255 | **White** |
| **13** | 0 – 255 | **White fine** |
| **14** | 0 – 255 | **Shutter effects** (see Shutter effects chart / Appendix Page VI) |
| **15** | 0 – 255 | **Dimmer** |
| **16** | 0 – 255 | **Dimmer fine** |
| **17** | 0 – 255 | **CTO** |
| **18** | 0 – 255 | **Zoom** |
| **19** | 0 – 255 | **Zoom fine** |
| **20** | 0 – 255 | **LED Ring colour wheel** (see Colour Wheel chart / App. Page IV) |
| **21** | 0 – 255 | **LED Ring red** |
| **22** | 0 – 255 | **LED Ring green** |
| **23** | 0 – 255 | **LED Ring blue** |
| **24** | 0 – 255 | **LED Ring Shutter** (see Shutter effects chart / Appendix Page VI) |
| **25** | 0 – 255 | **LED Ring Dimmer** |
| **26** | 0 – 255 | **Pattern** (see Pattern effects table / Appendix Page VII) |
| **27** | 0 – 255 | **Pattern Speed** |
| **28** | 0 – 255 | **LED Ring Pattern** |
| **29** | 0 – 255 | **LED Ring Pattern Speed** |
| **30** | 0 – 255 | **Control** (see Control channel table / Appendix Page V) |
| **31** | 0 – 255 | **Remote DMX address** |

## Full Control Mode

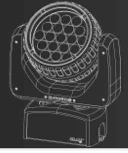
| CH | Value | Function |
|---|---|---|
| **1** | 0 – 255 | **Pan** |
| **2** | 0 – 255 | **Pan fine** |
| **3** | 0 – 255 | **Tilt** |
| **4** | 0 – 255 | **Tilt fine** |
| **5** | 0 – 255 | **Colour Wheel** (see Colour Wheel chart / Appendix Page IV) |
| **6** | 0 – 255 | **Red** |
| **7** | 0 – 255 | **Red fine** |
| **8** | 0 – 255 | **Green** |
| **9** | 0 – 255 | **Green fine** |
| **10** | 0 – 255 | **Blue** |
| **11** | 0 – 255 | **Blue fine** |
| **12** | 0 – 255 | **White** |
| **13** | 0 – 255 | **White fine** |
| **14** | 0 – 255 | **Shutter effects** (see Shutter effects chart / Appendix Page VI) |
| **15** | 0 – 255 | **Dimmer** |
| **16** | 0 – 255 | **Dimmer fine** |
| **17** | 0 – 255 | **CTO** |
| **18** | 0 – 255 | **Zoom** |
| **19** | 0 – 255 | **Zoom fine** |
| **20** | 0 – 255 | **LED Ring colour wheel** (see Colour Wheel chart / App. Page IV) |
| **21** | 0 – 255 | **LED Ring red** |
| **22** | 0 – 255 | **LED Ring green** |
| **23** | 0 – 255 | **LED Ring blue** |
| **24** | 0 – 255 | **LED Ring Shutter** (see Shutter effects chart / Appendix Page VI) |
| **25** | 0 – 255 | **LED Ring Dimmer** |
| **26** | 0 – 255 | **LED 1 Red** |
| **27** | 0 – 255 | **LED 1 Green** |
| **28** | 0 – 255 | **LED 1 Blue** |
| **29** | 0 – 255 | **LED 1 White** |
| **30** | 0 – 255 | **LED 1 Shutter** |
| **31** | 0 – 255 | **LED 1 Dimmer** |
| **..** | 0 – 255 | **LED X Red** |
| **..** | 0 – 255 | **LED X Green** |
| **..** | 0 – 255 | **LED X Blue** |
| **..** | 0 – 255 | **LED X White** |
| **..** | 0 – 255 | **LED X Shutter** |
| **..** | 0 – 255 | **LED X Dimmer** |
| **134** | 0 – 255 | **LED 19 Red** |
| **135** | 0 – 255 | **LED 19 Green** |
| **136** | 0 – 255 | **LED 19 Blue** |
| **137** | 0 – 255 | **LED 19 White** |
| **138** | 0 – 255 | **LED 19 Shutter** |
| **139** | 0 – 255 | **LED 19 Dimmer** |
| **140** | 0 – 255 | **LED Ring Segment 1 red** |
| **141** | 0 – 255 | **LED Ring Segment 1 green** |



| CH | Value | Function |
|---|---|---|
| **142** | 0 – 255 | **LED Ring Segment 1 blue** |
| **..** | 0 – 255 | **LED Ring Segment X red** |
| **..** | 0 – 255 | **LED Ring Segment X green** |
| **..** | 0 – 255 | **LED Ring Segment X blue** |
| **161** | 0 – 255 | **LED Ring Segment 8 red** |
| **162** | 0 – 255 | **LED Ring Segment 8 green** |
| **163** | 0 – 255 | **LED Ring Segment 8 blue** |
| **164** | 0 – 255 | **Control** (see Control chanel table / Appendix Page V) |
| **165** | 0 – 255 | **Remote DMX address** |

## Pixel Mapping Mode

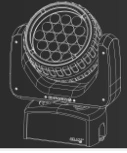
| CH | Value | Function |
|---|---|---|
| **1** | 0 – 255 | **Pan** |
| **2** | 0 – 255 | **Pan fine** |
| **3** | 0 – 255 | **Tilt** |
| **4** | 0 – 255 | **Tilt fine** |
| **5** | 0 – 255 | **Colour Wheel** (see Colour Wheel chart / Appendix Page IV) |
| **6** | 0 – 255 | **Red** |
| **7** | 0 – 255 | **Green** |
| **8** | 0 – 255 | **Blue** |
| **9** | 0 – 255 | **White** |
| **10** | 0 – 255 | **Shutter effects** (see Shutter effects chart / Appendix Page VI) |
| **11** | 0 – 255 | **Dimmer** |
| **12** | 0 – 255 | **CTO** |
| **13** | 0 – 255 | **Zoom** |
| **14** | 0 – 255 | **LED Ring colour wheel** (see Colour Wheel chart / App. Page IV) |
| **15** | 0 – 255 | **LED Ring red** |
| **16** | 0 – 255 | **LED Ring green** |
| **17** | 0 – 255 | **LED Ring blue** |
| **18** | 0 – 255 | **LED Ring Shutter** (see Shuttereffects chart / Appendix Page VI) |
| **19** | 0 – 255 | **LED Ring Dimmer** |
| **20** | 0 – 255 | **LED 1 Red** |
| **21** | 0 – 255 | **LED 1 Green** |
| **22** | 0 – 255 | **LED 1 Blue** |
| **23** | 0 – 255 | **LED 1 White** |
| **24** | 0 – 255 | **LED 1 Shutter** |
| **25** | 0 – 255 | **LED 1 Dimmer** |
| **..** | 0 – 255 | **LED X Red** |
| **..** | 0 – 255 | **LED X Green** |
| **..** | 0 – 255 | **LED X Blue** |
| **..** | 0 – 255 | **LED X White** |
| **..** | 0 – 255 | **LED X Shutter** |
| **..** | 0 – 255 | **LED X Dimmer** |
| **128** | 0 – 255 | **LED 19 Red** |
| **129** | 0 – 255 | **LED 19 Green** |
| **130** | 0 – 255 | **LED 19 Blue** |
| **131** | 0 – 255 | **LED 19 White** |
| **132** | 0 – 255 | **LED 19 Shutter** |
| **133** | 0 – 255 | **LED 19 Dimmer** |
| **134** | 0 – 255 | **LED Ring Pattern** |
| **135** | 0 – 255 | **LED Ring Pattern Speed** |
| **136** | 0 – 255 | **Control** (see Control channel table / Appendix Page V) |
| **137** | 0 – 255 | **Remote DMX address** |



## Pattern Control Mode

| CH | Value | Function |
|---|---|---|
| **1** | 0 – 255 | **Pan** |
| **2** | 0 – 255 | **Pan fine** |
| **3** | 0 – 255 | **Tilt** |
| **4** | 0 – 255 | **Tilt fine** |
| **5** | 0 – 255 | **Colour Wheel** (see Colour Wheel chart / Appendix Page IV) |
| **6** | 0 – 255 | **Red** |
| **7** | 0 – 255 | **Green** |
| **8** | 0 – 255 | **Blue** |
| **9** | 0 – 255 | **White** |
| **10** | 0 – 255 | **Shutter effects** (see Shutter effects chart / Appendix Page VI) |
| **11** | 0 – 255 | **Dimmer** |
| **12** | 0 – 255 | **CTO** |
| **13** | 0 – 255 | **Zoom** |
| **14** | 0 – 255 | **LED Ring colour wheel** (see Colour Wheel chart / App. Page IV) |
| **15** | 0 – 255 | **LED Ring red** |
| **16** | 0 – 255 | **LED Ring green** |
| **17** | 0 – 255 | **LED Ring blue** |
| **18** | 0 – 255 | **LED Ring Shutter** (see Shutter effects chart / Appendix Page VI) |
| **19** | 0 – 255 | **LED Ring Dimmer** |
| **20** | 0 – 255 | **Pattern 1 Red** |
| **21** | 0 – 255 | **Pattern 1 Green** |
| **22** | 0 – 255 | **Pattern 1 Blue** |
| **23** | 0 – 255 | **Pattern 1 White** |
| **24** | 0 – 255 | **Pattern 1 Shutter** |
| **25** | 0 – 255 | **Pattern 1 Dimmer** |
| **26** | 0 – 255 | **Pattern 1 Pattern** |
| **27** | 0 – 255 | **Pattern 1 Pattern Speed** |
| **28** | 0 – 255 | **Pattern 2 Red** |
| **29** | 0 – 255 | **Pattern 2 Green** |
| **30** | 0 – 255 | **Pattern 2 Blue** |
| **31** | 0 – 255 | **Pattern 2 White** |
| **32** | 0 – 255 | **Pattern 2 Shutter** |
| **33** | 0 – 255 | **Pattern 2 Dimmer** |
| **34** | 0 – 255 | **Pattern 2** |
| **35** | 0 – 255 | **Pattern 2 Pattern Speed** |
| **36** | 0 – 255 | **Pattern 3 Red** |
| **37** | 0 – 255 | **Pattern 3 Green** |
| **38** | 0 – 255 | **Pattern 3 Blue** |
| **39** | 0 – 255 | **Pattern 3 White** |
| **40** | 0 – 255 | **Pattern 3 Shutter** |
| **41** | 0 – 255 | **Pattern 3 Dimmer** |
| **42** | 0 – 255 | **Pattern 3 Pattern** |
| **43** | 0 – 255 | **Pattern 3 Pattern Speed** |
| **44** | 0 – 255 | **LED Ring Pattern 1 Red** |
| **45** | 0 – 255 | **LED Ring Pattern 1 Green** |

| | | |
|---|---|---|
| **46** | 0 – 255 | **LED Ring Pattern 1 Blue** |
| **47** | 0 – 255 | **LED Ring Pattern 1 Shutter** |
| **48** | 0 – 255 | **LED Ring Pattern 1 Dimmer** |
| **49** | 0 – 255 | **LED Ring Pattern 1 Pattern** |
| **50** | 0 – 255 | **LED Ring Pattern 1 Pattern Speed** |
| **51** | 0 – 255 | **LED Ring Pattern 2 Red** |
| **52** | 0 – 255 | **LED Ring Pattern 2 Green** |
| **53** | 0 – 255 | **LED Ring Pattern 2 Blue** |
| **54** | 0 – 255 | **LED Ring Pattern 2 Shutter** |
| **55** | 0 – 255 | **LED Ring Pattern 2 Dimmer** |
| **56** | 0 – 255 | **LED Ring Pattern 2 Pattern** |
| **57** | 0 – 255 | **LED Ring Pattern 2 Pattern Speed** |
| **58** | 0 – 255 | **Control** (see Control channel table / Appendix Page V) |
| **59** | 0 – 255 | **Remote DMX address** |



## Compressed RGBW Mode

| CH | Value | Function |
|---|---|---|
| **1** | 0 – 255 | **Pan** |
| **2** | 0 – 255 | **Pan fine** |
| **3** | 0 – 255 | **Tilt** |
| **4** | 0 – 255 | **Tilt fine** |
| **5** | 0 – 255 | **Colour Wheel** (see Colour Wheel chart / Appendix Page IV) |
| **6** | 0 – 255 | **Red** |
| **7** | 0 – 255 | **Green** |
| **8** | 0 – 255 | **Blue** |
| **9** | 0 – 255 | **White** |
| **10** | 0 – 255 | **Shutter effects** (see Shutter effects chart / Appendix Page VI) |
| **11** | 0 – 255 | **Dimmer** |
| **12** | 0 – 255 | **Zoom** |
| **13** | 0 – 255 | **LED Ring Colour wheel** (see Colour Wheel chart / App. Page IV) |
| **14** | 0 – 255 | **LED Ring Shutter** (see Shutter effects chart / Appendix Page VI) |
| **15** | 0 – 255 | **LED Ring Dimmer** |

# Services

## Trouble Shooting

| **Problem** | Causes | Solutions |
|---|---|---|
| **No Display / Not switched on** | No power to fixture | Check AC mains power and connections |
| | | Inspect connections and cables. Correct poor connections. Repair or replace damaged cables |
| | | Check the power supply voltage. |
| **Fixture does not respond to DMX correctly.** | Incorrect fixture DMX addressing | Check the fixture is assigned to correct DMX address (See Page 9) |
| | Incorrect DMX mode | Check fixture is set to correct DMX mode (See Page 12) |
| | Fault on data link | check for the data link is correctly linked from the DMX source if all cables are in good condition |
| | Other device on DMX link defective. | Unplug XLR IN and OUT connectors and connect them directly together to bypass one fixture at a time until normal operation is regained |
| | Data transmission lines should be terminated. | Insert termination plug in OUTPUT of the last fixture on the link. |
| **LC-Display works but no light outputs can be generated.** | Faulty DMX link | Run built-in test mode or OBD control mode to verify if LEDs are illuminated |
| | Broken parts / wires / LEDs | Have fixtures serviced by an Ehrgeiz service technician |
| **Cooling Fan does not spin*.** | Fixture is set to Auto cooling mode and fixture is still cool | Set the cooling mode to other modes other than Auto mode (See Menu Map on Page 9) |
| | | Set the fixture to generate light output, the fan will start to work when temperature reached 35 deg. Celsius (95 deg. Fahrenheit) |
| | Broken Fans | Have the fan replaced by an Ehrgeiz service technician |

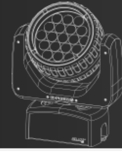
## Maintenance

There are no serviceable parts inside your Helios+ 19z. If problems occur contact your Ehrgeiz dealer or an qualified Ehrgeiz service technician.

Use a slightly moist and smooth cloth to clean the device. Do not use any aggresive detergents.

If you want to replace the fuse make sure to use a fuse of the recommended type. Do not use any other kind of fuse as this might result in a damage of the device or even serious injuries of persons.

We are sure you will have a sophisticated experience with your Helios+ 19z.



# Appendix

## Specifications

**Light source**

- 19x 15 Watt class RGBW LED
- Rated lumen output : 7.600 lm
- LED Life Expectancy: approx. 50.000 hours

**Optical system**

- ConsistentColor™ Zoom Optics
- Rapid Zoom with 0.8s maximum speed
- Beam angle 11°- 58°

**Functions**

- RGBW, 8 or 16 bit color mixing
- SteadyColor™ Dimming
- Seamless CTO
- Virtual color wheel with 39 colors including whites
- (2.700 K, 3.200 K, 4.200 K, 5.600 K, 7.200 K and 8.000 K)
- Individual LED colors control
- Individual shutter/dimmer for each LED
- Pattern effects with variable speed
- High resolution dimmer 0-100% Selectable dimmer curves
- Strobe with variable speed (max. 20Hz )
- Pre-programmed random strobe & pulse effects

**Movement**

- High precision 2 phase stepping motors
- 16-bit Pan/Tilt control
- Position feedback
- Pan and Tilt movement range: 540°/270°

**Thermal**

- Maximum ambient temperature: 45° C (113° F)
- Intelligent fan control
- 4 fan modes

**Control and programming**

- Setting & Addressing: 2x 16 characters LC display & 4 buttons
- Protocols: USITT DMX-512, Art-Net 3
- Control channels: 15, 22, 31, 59, 137, 165
- 6 DMX protocol modes
- 3-editable programs, each up to 25 steps
- Stand-alone mode
- Art-Net Node function
- Firmware update via DMX-line
- DMX In/Out: Neutrik XLR-3, XLR-5
- Power In/Out: Neutrik powerCON®
- Art-Net : Neutrik etherCON®

**Electrical Specification**

- Electronic switching power supply with auto-sensing
- Input voltage: 100-240V AC, 50/60 Hz
- Max. power consumption: 350 W
- Fuse protection : T10A (6.3x 32 mm)

**Mechanical Specification**

- Height: 398.5 mm (15.68“)
- Width: 320 mm (12.59“)
- Depth: 158 mm (6.22“)
- Weight: 7.4 kg (16.31 lbs)

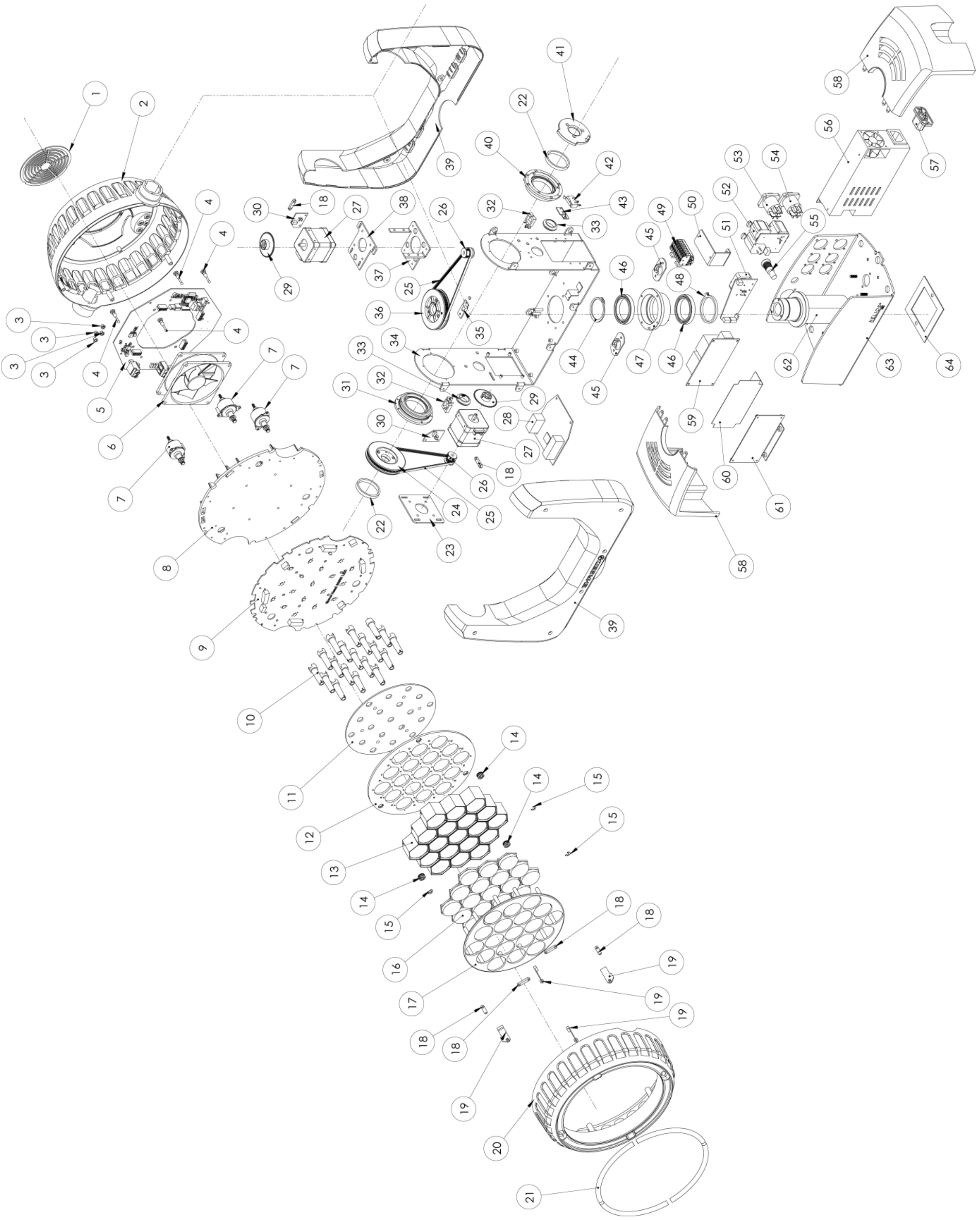
**Rigging**

- Centered M10 insert nut
- Two 1/4th turn mounting inserts for omega bracket
- 2 attachment points for safety wire

**Available Accessories**

- Case for 6x Helios+19Z
- Omega Bracket for Helios+ 19Z

## Exploded Drawing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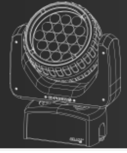
# Spareparts

| # | Description (EN) | Q'TY | Item No |
|---|---|---|---|
| **1** | Fan grille-fixture top | 1 | 111068 |
| **2** | Fixture head housing-base | 1 | 111069 |
| **3** | Input button rubber cap | 4 | 106914 |
| **4** | Head cooling fan rubber rivet | 4 | 106915 |
| **5** | Control & driver board | 1 | 105721 |
| **6** | Head cooling fan 12V | 1 | 111070 |
| **7** | Z axle motor | 3 | 111071 |
| **8** | Heat sink | 1 | 111072 |
| **9** | LED board | 1 | 105718 |
| **10** | Light guide ass'y | 19 | 111073 |
| **11** | Light guide holder plate | 1 | 111074 |
| **12** | Lens holder plate (base) | 1 | 111075 |
| **13** | Lens holder | 19 | 111078 |
| **14** | Z axle motor shaft bushing | 3 | 111076 |
| **15** | E type retaining ring (4mm) | 3 | 111077 |
| **16** | Optical lens | 19 | 111079 |
| **17** | Lens holder plate (top) | 1 | 111080 |
| **18** | Cable guide | 6 | 111081 |
| **19** | Ring LED board | 4 | 111082 |
| **20** | Fixture head housing-top | 1 | 111083 |
| **21** | Ring light guide | 4 | 111084 |
| **22** | Arm bearing collar | 2 | 111034 |
| **23** | Stepping motor bracket-Y axle | 1 | 111086 |
| **24** | 65 teeth timing gear | 2 | 106924 |
| **25** | Timing belt 375L | 2 | 111085 |
| **26** | 13 teeth timing gear | 2 | 111029 |
| **27** | Stepping motor-Helios series | 2 | 111032 |
| **28** | Motor control board | 1 | 105722 |
| **29** | Encoder | 2 | 111033 |
| **30** | Encoder board | 2 | 105715 |
| **31** | Bearing seat ass'y-Y axle right | 1 | 111035 |
| **32** | Cable tie mount | 2 | 111088 |
| 33 | Snap bushing KSS-GMQ-2015 | 2 | 111087 |
| 34 | Fixture arm bracket | 1 | 111089 |
| 35 | Hall sensor board | 1 | 105720 |
| 36 | 65 teeth timing gear | 2 | 106924 |
| 37 | Stepping motor bracket-X axle | 1 | 111048 |
| 38 | Adjustable belt-tension mount | 1 | 111047 |
| 39 | Fixture housing-arm | 2 | 111099 |
| 40 | Bearing seat ass'y-Y axle left | 1 | 111044 |
| 41 | Y axle angular plate limiter | 1 | 111045 |
| 42 | Limit switch | 1 | 111043 |
| 43 | Limit switch mount | 1 | 111042 |
| 44 | C type retaining ring | 1 | 111049 |
| 45 | 1/4 Turn fast lock mount | 2 | 111090 |
| 46 | X-axle bearing | 2 | 111050 |
| 47 | Bearing seat ass'y-X axle | 1 | 111051 |
| 48 | Reset collar-X axle | 1 | 111053 |
| 49 | 7P terminal block | 1 | 111091 |
| 50 | Terminal block mount | 1 | 111092 |
| 51 | Artnet control board | 1 | 105723 |
| 52 | 3 & 5-Pin XLR Board | 1 | 105724 |
| 53 | Neutrik powerCON-Output | 1 | 111057 |
| 54 | Neutrik powerCON-Input | 1 | 111055 |
| 55 | Fuse holder | 1 | 111056 |
| 56 | Power supply (400W) | 1 | 111097 |
| 57 | AC socket | 1 | 111098 |
| 58 | Fixture housing-base | 2 | 111094 |
| 59 | Power supply (120W) | 1 | 111095 |
| 60 | Isolation Pad for PSU | 1 | 114010 |
| 61 | Power supply bracket | 1 | 111058 |
| 62 | Center shaft | 1 | 111093 |
| 63 | Fixture base housing | 1 | 111096 |
| 64 | Fixture clamp insert-Helios | 1 | 111063 |

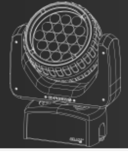


## Colour Wheel

| Value | Function |
|---|---|
| 0 – 5 | No Function, RGBW Colour mixing |
| 6 – 10 | LEE 790–Moroccan Pink |
| 11 – 15 | LEE 157–Pink |
| 16 – 20 | LEE 332–Special Rose Pink |
| 21 – 25 | LEE 328–Follies Pink |
| 26 – 30 | LEE 345–Fuchsia Pink |
| 31 – 35 | LEE 194–Surprise Pink |
| 36 – 40 | LEE 181–Congo Blue |
| 41 – 45 | LEE 071–Tokyo Blue |
| 46 – 50 | LEE 120–Deep Blue |
| 51 – 55 | LEE 079–Just Blue |
| 56 – 60 | LEE 132–Medium Blue |
| 61 – 65 | LEE 200–Double CT Blue |
| 66 – 70 | LEE 161–Slate Blue |
| 71 – 75 | LEE 201–Full CT Blue |
| 76 – 80 | LEE 202–Half CT Blue |
| 81 – 85 | LEE 117–Steel Blue |
| 86 – 90 | LEE 353–Lighter Blue |
| 91 – 95 | LEE 118–Light Blue |
| 96 – 100 | LEE 116–Medium Blue Green |
| 101 – 105 | LEE 124–Dark Green |
| 106 – 110 | LEE 139–Primary Greem |
| 111 – 115 | LEE 089–Moss Green |
| 116 – 120 | LEE 122–Fern Green |
| 121 – 125 | LEE 738–JAS Green |
| 126 – 130 | LEE 088–Lime Green |
| 131 – 135 | LEE 100–Spring Yellow |
| 136 – 140 | LEE 104–Deep Amber |
| 141 – 145 | LEE 179–Chrome Orange |
| 146 – 150 | LEE 105–Orange |
| 151 – 155 | LEE 021–Gold Amber |
| 156 – 160 | LEE 778–Millennium Gold |
| 161 – 165 | LEE 135–Deep Golden Amber |
| 166 – 170 | LEE 164–Flame Red |
|  | Colourwheel rotation effects |
| 171 – 185 | Coulourwheel rotation forward (fast – slow) |
| 186 – 190 | Coulourwheel rotation stop |
| 191 – 205 | Coulourwheel rotation backward (fast – slow) |
| 206 – 210 | Coulourwheel rotation stop |
|  | Random colours |
| 211 – 225 | Fast – slow |
|  | White hue |
| 226 – 230 | Warmwhite – 2700K |
| 231 – 235 | Warmwhite – 3200K |
| 236 – 240 | Neutralwhite – 4200K |
| 241 – 245 | Coldwhite – 5600K |
| 246 – 250 | Coldwhite – 7200K |
| 251 – 255 | Coldwhite – 8000K |

# Special Control Channel

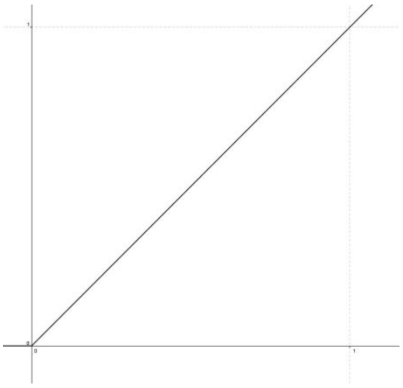
| Value | Function |
|---|---|
| 0 – 10 | Reserved |
| 11 – 15 | fan Regulated |
| 16 – 20 | fan Silent |
| 21 – 25 | fan Standard |
| 25 – 30 | fan High power |
| 31 – 35 | Reserved |
| 36 – 40 | Remote DMX Address-Low (001-256)<br>Must work with "Remote DMX Add." channel to set with value for 1+ |
| 41 – 45 | Reserved |
| 46 – 50 | Remote DMX Address-High (257-512)<br>Must work with "Remote DMX Add." channel to set with value for 257+ |
| 51 – 55 | Reserved |
| 56 – 60 | Dimmer Speed: Smooth |
| 61 – 65 | Dimmer Speed: Fast |
| 66 – 70 | Reserved |
| 71 – 75 | Dimmer Curve: Linear |
| 76 – 80 | Dimmer Curve: Threatrical |
| 81 – 85 | Dimmer Curve: Sqaure Law |
| 86 – 90 | Dimmer Curve: Inverse Sqaure Law |
| 91 – 95 | Reserved |
| 96 – 100 | P/T speed slow |
| 101 – 105 | P/T speed Normal |
| 106 – 110 | P/T speed Fast |
| 111 – 115 | Reserved |
| 116 – 120 | Pan Invert: ON |
| 121 – 125 | Pan Invert: OFF |
| 126 – 130 | Tilt Invert: ON |
| 131 – 135 | Tilt Invert: OFF |
| 136 – 140 | Reserved |
| 141 – 145 | Position Feedback: ON |
| 146 – 150 | Position Feedback: OFF |
| 151 – 155 | Reserved |
| 156 – 160 | Pan Reset |
| 161 – 165 | Tilt Reset |
| 166 – 170 | Reserved |
| 171 – 175 | All Motors Reset |
| 176 – 180 | Fixture Reset |
| 181 – 255 | Reserved |



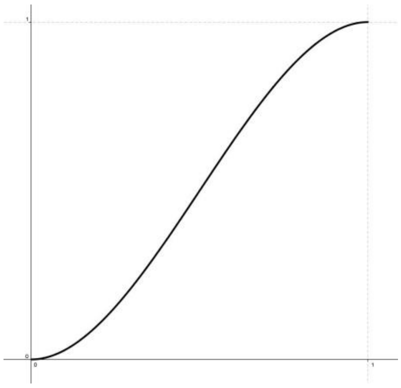
# Shutter Channel

| Value | Function |
|---|---|
| **0 – 15** | Shutter Closed |
| **16–47** | Random Strobe (slow – fast) |
| **48–79** | Random Ramp Up (slow – fast) |
| **80–111** | Random Ramp Down (slow – fast) |
| **112–143** | Random Ramp UP & down (slow – fast) |
| **144–199** | Strobe Pause 5s – 1s (slow – fast) |
| **200–239** | Strobe 1Hz – 20 Hz (slow – fast) |
| **240–255** | Shutter Open |

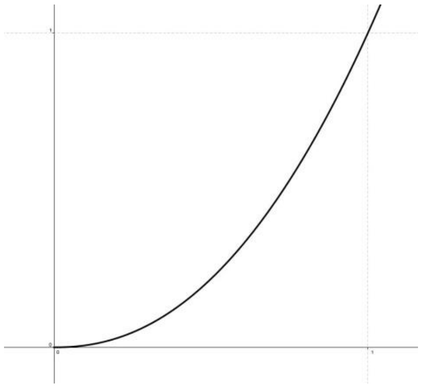
# Dimmer Curves



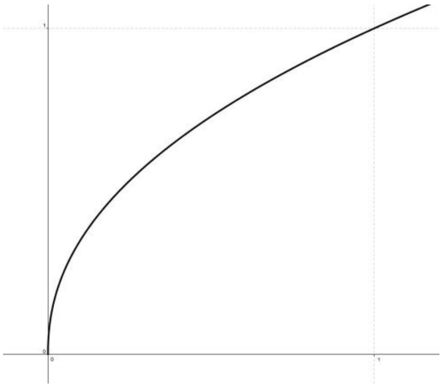
Linear



Theatrical



Square

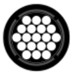
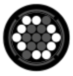
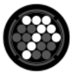
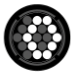
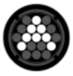
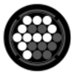
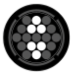
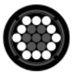
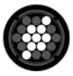
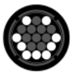
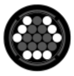
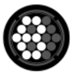
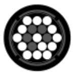
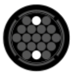
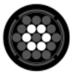
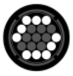
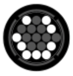
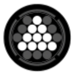
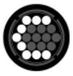
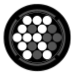
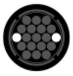
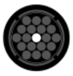
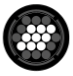
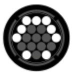
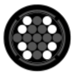
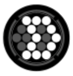
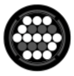
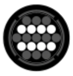
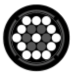
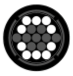
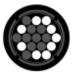
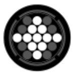
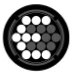
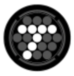
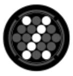
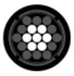
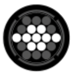
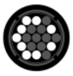
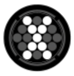
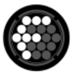
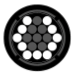
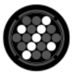
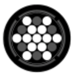
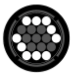
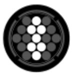
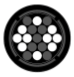
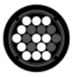
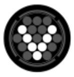
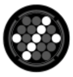
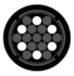
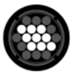
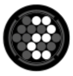
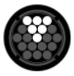
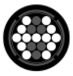
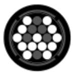
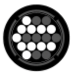
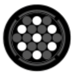
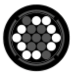
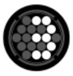
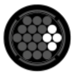
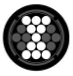
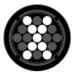
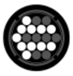
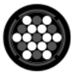
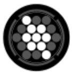
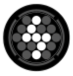
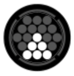
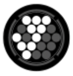
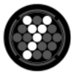
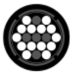
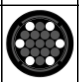
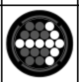
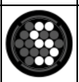
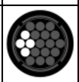
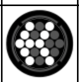
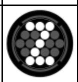
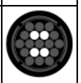
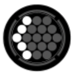
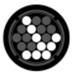
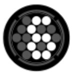
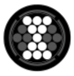
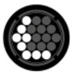
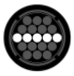
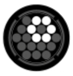
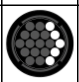
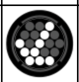
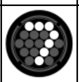
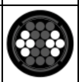
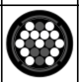
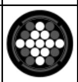
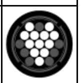
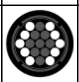
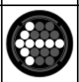
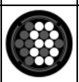
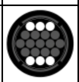
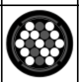
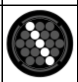
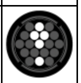
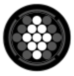
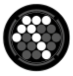
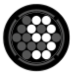
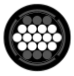
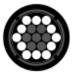
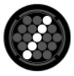
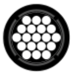


Inverse square

# Patterns

Helios+ 19z Animation Patterns
DMX 000 – 115 = Static
DMX 116 – 181 = Chase Animation – works with Pattern speed table
DMX 185 – 250 = Fade Animation – works with Pattern speed table
value after / = animation runs reversed

## Static

| Value | pattern | Value | pattern | Value | pattern | Value | pattern | Value | pattern | Value | pattern | Value | pattern |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 000–002 |  | 017 |  | 032 |  | 047 |  | 062 |  | 077 |  | 092 |  |
| 003 |  | 018 |  | 033 |  | 048 |  | 063 |  | 078 |  | 093 |  |
| 004 |  | 019 |  | 034 |  | 049 |  | 064 |  | 079 |  | 094 |  |
| 005 |  | 020 |  | 035 |  | 050 |  | 065 |  | 080 |  | 095 |  |
| 006 |  | 021 |  | 036 |  | 051 |  | 066 |  | 081 |  | 096 |  |
| 007 |  | 022 |  | 037 |  | 052 |  | 067 |  | 082 |  | 097 |  |
| 008 |  | 023 |  | 038 |  | 053 |  | 068 |  | 083 |  | 098 |  |
| 009 |  | 024 |  | 039 |  | 054 |  | 069 |  | 084 |  | 099 |  |
| 010 |  | 025 |  | 040 |  | 055 |  | 070 |  | 085 |  | 100 |  |
| 011 |  | 026 |  | 041 |  | 056 |  | 071 |  | 086 |  | 101 |  |
| 012 |  | 027 |  | 042 |  | 057 |  | 072 |  | 087 |  | 102 |  |
| 013 |  | 028 |  | 043 |  | 058 |  | 073 |  | 088 |  | 103 |  |
| 014 |  | 029 |  | 044 |  | 059 |  | 074 |  | 089 |  | 104 |  |
| 015 |  | 030 |  | 045 |  | 060 |  | 075 |  | 090 |  | 105 |  |
| 016 |  | 031 |  | 046 |  | 061 |  | 076 |  | 091 |  | 106–115 |  |

## Animated

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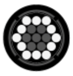
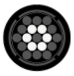
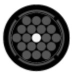
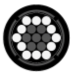
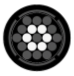
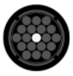
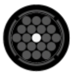
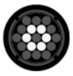
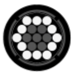
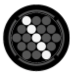
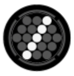
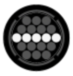
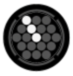
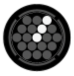
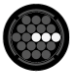
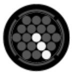
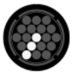
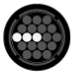
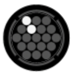
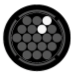
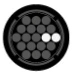
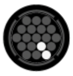
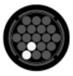
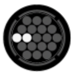
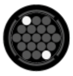
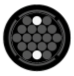
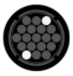
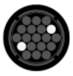
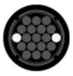
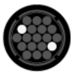
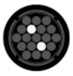
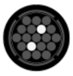
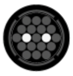
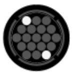
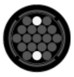
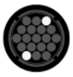
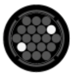
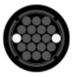
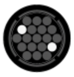
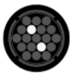
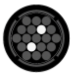
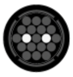
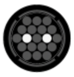
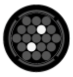
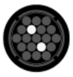
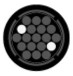
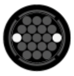
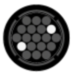
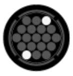
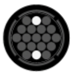
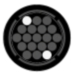
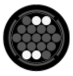
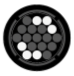
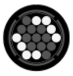
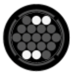
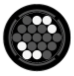
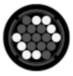
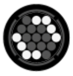
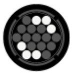
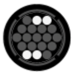
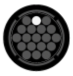
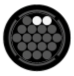
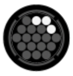
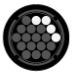
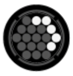
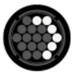
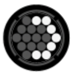
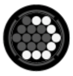
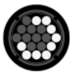
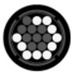
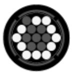
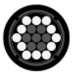
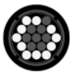
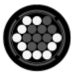
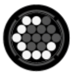
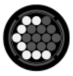
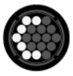
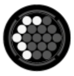
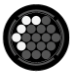
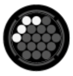
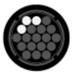
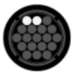
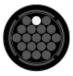
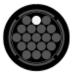
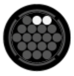
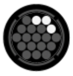
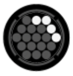
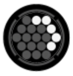
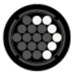
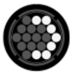
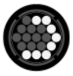
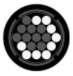
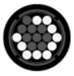
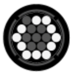
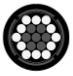
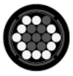
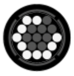
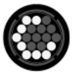
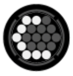
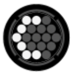
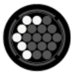
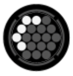
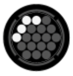
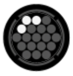
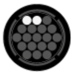
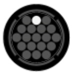
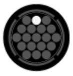
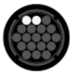
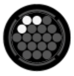
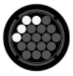
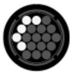
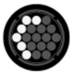
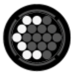
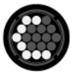
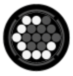
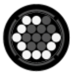
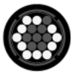
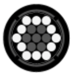
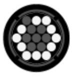
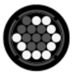
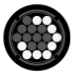
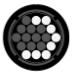
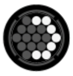
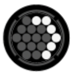
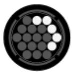
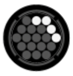
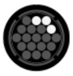
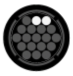
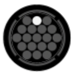
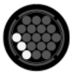
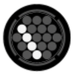
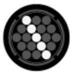
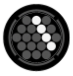
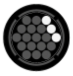
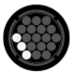
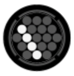
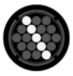
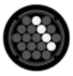
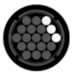
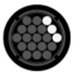
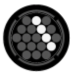
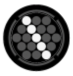
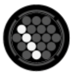
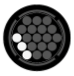
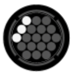
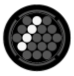
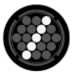
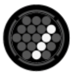
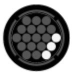
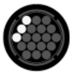
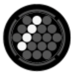
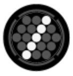
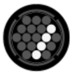
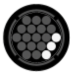
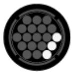
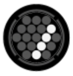
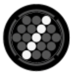
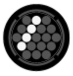
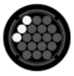
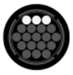
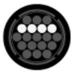
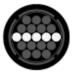
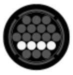
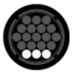
| 116/185 | 117/186 |  |  |  | | | | | | | | | |
| 118/187 | 119/188 |  |  |  |  |  |  | | | | | | |
| 120/189 | 121/190 |  |  |  | | | | | | | | | |
| 122/191 | 123/192 |  |  |  |  |  |  | | | | | | |
| 124/193 | 125/194 |  |  |  |  |  |  | | | | | | |
| 126/195 | 127/196 |  |  |  |  |  |  |  |  |  | | | |
| 128/197 | 129/198 |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  | | | | | | |
| 130/199 | 131/200 |  |  |  | | | | | | | | | |
| 132/201 | 133/202 |  |  |  |  |  |  | | | | | | |
| 134/203 | 135/204 |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  |  |  |  |  |  | |
| 136/205 | 137/206 |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  |  |  |  |  | | |
| 138/207 | 139/208 |  |  |  |  |  | | | | | | | |
| 140/209 | 141/210 |  |  |  |  |  |  |  |  |  |  | | |
| 142/211 | 143/212 |  |  |  |  |  | | | | | | | |
| 144/213 | 145/214 |  |  |  |  |  |  |  |  |  |  | | |
| 146/215 | 147/216 |  |  |  |  |  | | | | | | | |

## Appendix → Patterns

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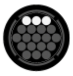
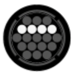
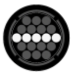
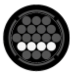
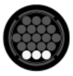
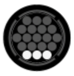
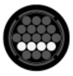
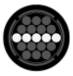
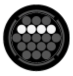
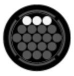
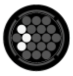
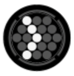
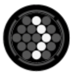
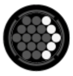
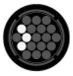
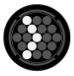
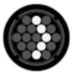
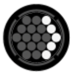
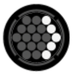
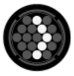
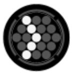
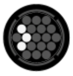
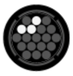
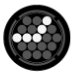
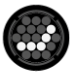
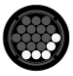
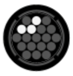
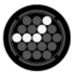
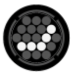
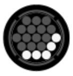
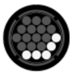
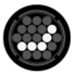
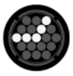
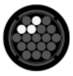
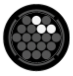
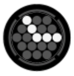
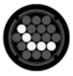
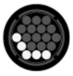
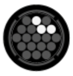
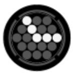
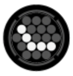
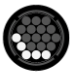
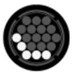
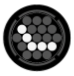
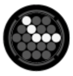
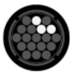
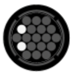
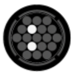
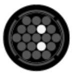
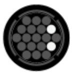
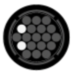
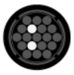
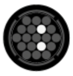
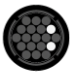
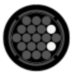
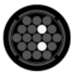
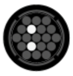
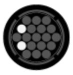
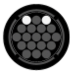
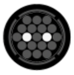
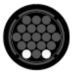
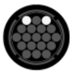
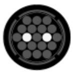
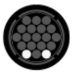
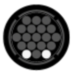
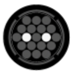
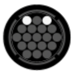
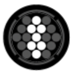
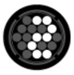
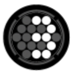
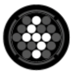
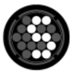
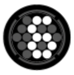
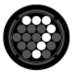
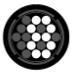
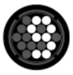
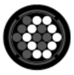
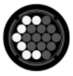
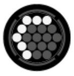
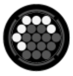
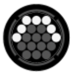
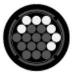
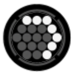
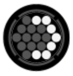
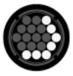
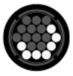
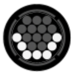
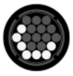
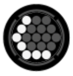
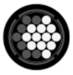
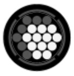
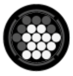
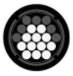
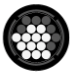
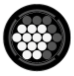
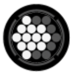
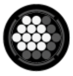
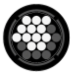
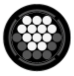
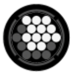
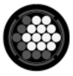
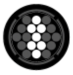
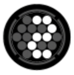
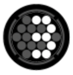
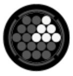
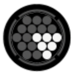
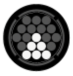
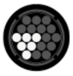
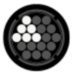
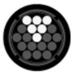
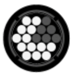
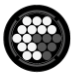
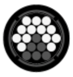
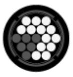
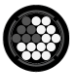
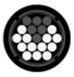
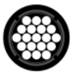
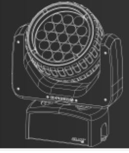
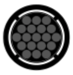
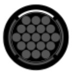
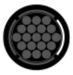
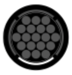
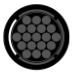
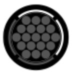
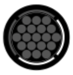
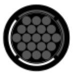
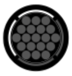
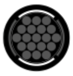
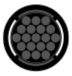
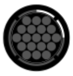
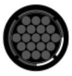
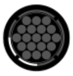
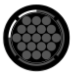
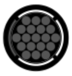
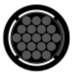
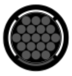
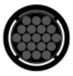
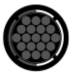
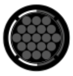
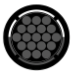
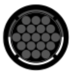
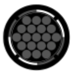
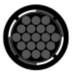
| 148/217 | 149/218 |  |  |  |  |  |  |  |  |  |  | | |
| 150/219 | 151/220 |  |  |  |  | | | | | | | | |
| 152/221 | 153/222 |  |  |  |  |  |  |  |  | | | | |
| 154/223 | 155/224 |  |  |  |  | | | | | | | | |
| 156/225 | 157/226 |  |  |  |  |  |  |  |  | | | | |
| 158/227 | 159/228 |  |  |  |  | | | | | | | | |
| 160/229 | 161/230 |  |  |  |  |  |  |  |  | | | | |
| 162/231 | 163/232 |  |  |  |  | | | | | | | | |
| 164/233 | 165/234 |  |  |  |  |  |  |  |  | | | | |
| 166/235 | 167/236 |  |  |  | | | | | | | | | |
| 168/237 | 169/238 |  |  |  |  |  |  | | | | | | |
| 170/239 | 171/240 |  |  |  |  |  |  |  |  |  |  | | |
| 172/241 | 173/242 |  |  |  |  |  |  |  |  |  |  |  |  |
| 174/243 | 175/244 |  |  |  |  |  |  |  |  |  |  |  |  |
| 176/245 | 177/246 |  |  |  | | | | | | | | | |
| 178/247 | 179/248 |  |  |  |  |  |  | | | | | | |
| 180/249 | 181/250 |  |  |  |  |  |  | | | | | | |
| 251-255 | |  | | | | | | | | | | | |



# Ring Patterns

Helios+ 19z Ring Animation Patterns
DMX 000 – 029 = Static
DMX 030 – 113 = Chase Animation – works with Pattern speed table
DMX 114 – 197 = Fade Animation – works with Pattern speed table
value after / = animation runs reversed

## Static

| Value | pattern | Value | pattern | Value | pattern | Value | pattern | Value | pattern | Value | pattern | Value | pattern |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001<br>-005 |  | 006 |  | 007 |  | 008 |  | 009 |  | 010 |  | 011 |  |
| 012 |  | 013 |  | 014 |  | 015 |  | 016 |  | 017 |  | 018 |  |
| 019 |  | 020 |  | 021 |  | 022 |  | 023 |  | 024 |  | 025 |  |
| 026 |  | 027 |  | 028 |  | 029 |  | | | | | | |

## Animated

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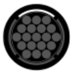
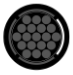
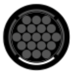
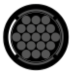
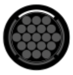
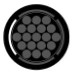
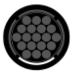
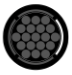
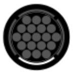
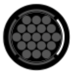
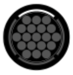
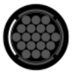
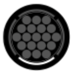
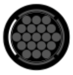
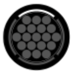
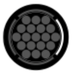
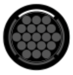
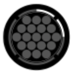
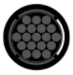
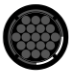
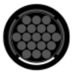
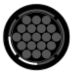
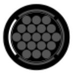
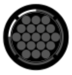
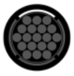
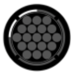
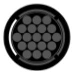
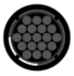
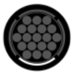
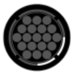
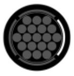
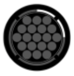
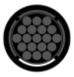
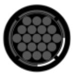
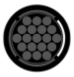
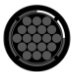
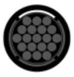
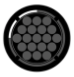
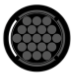
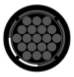
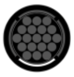
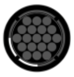
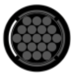
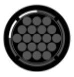
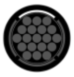
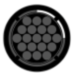
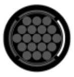
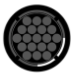
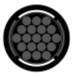
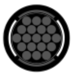
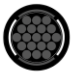
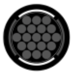
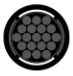
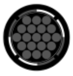
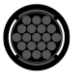
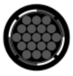
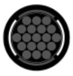
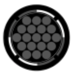
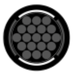
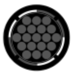
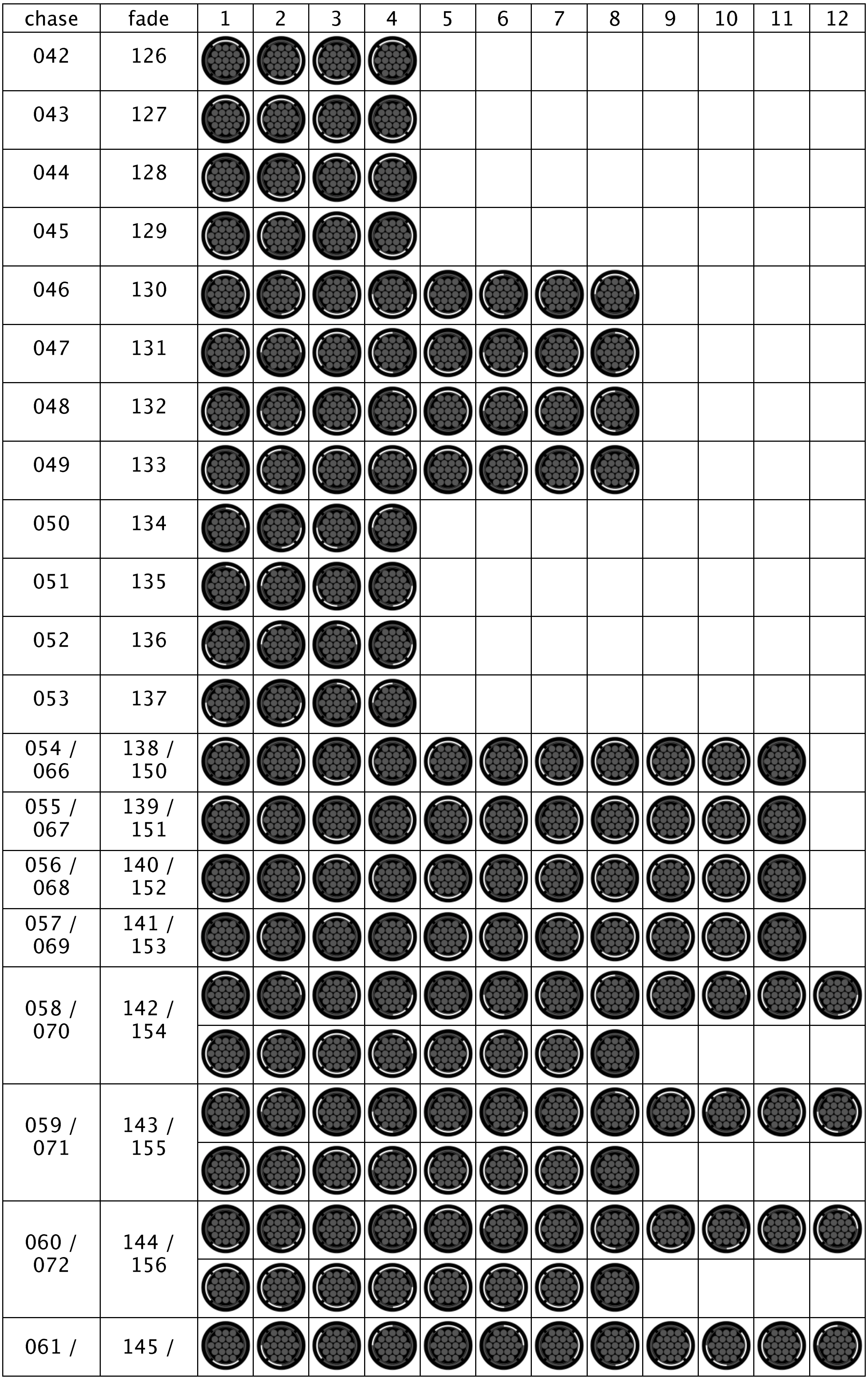
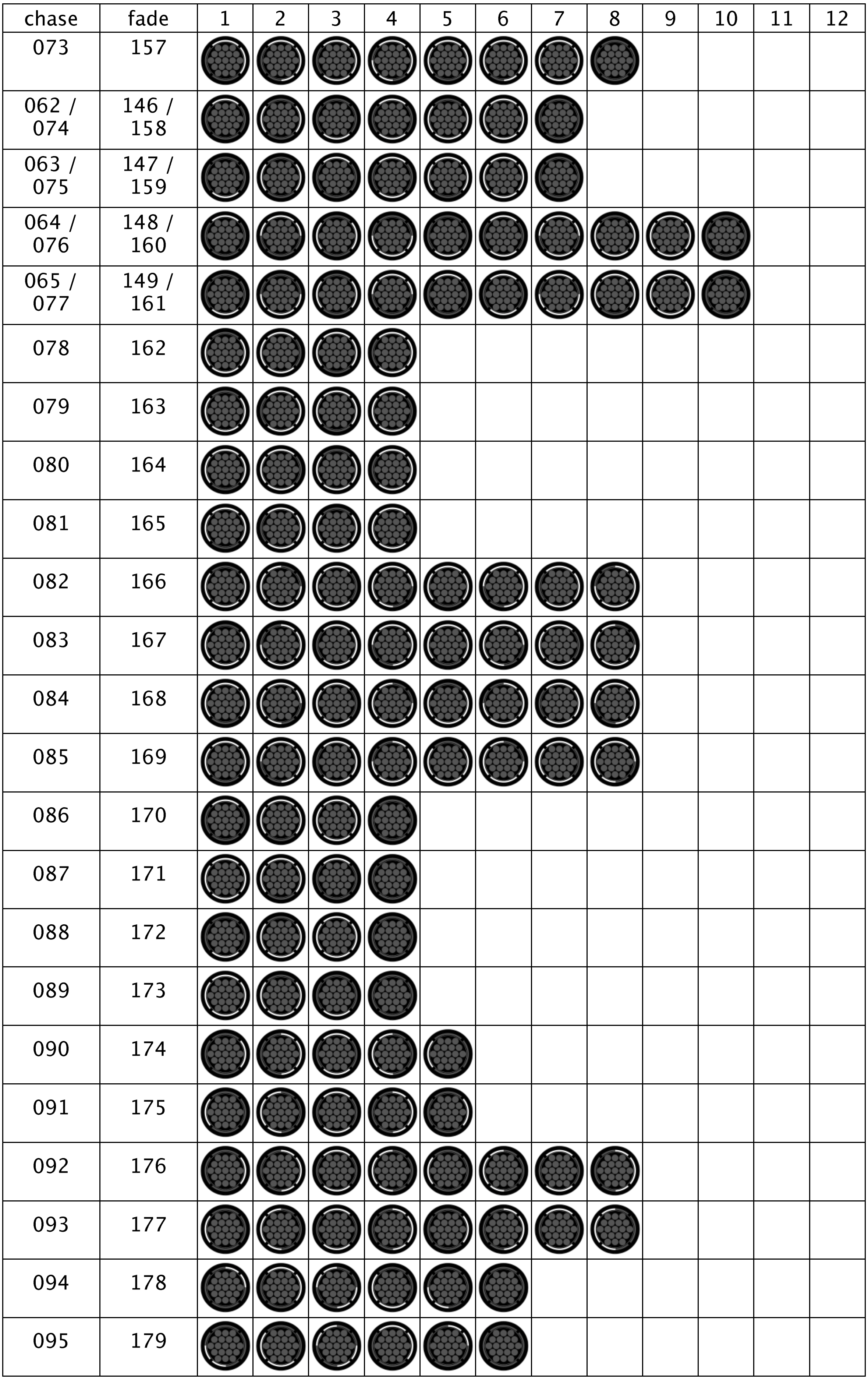
| 030 | 114 |  |  |  |  | | | | | | | | |
| 031 | 115 |  |  |  |  | | | | | | | | |
| 032 | 116 |  |  |  |  | | | | | | | | |
| 033 | 117 |  |  |  |  | | | | | | | | |
| 034 | 118 |  |  |  |  |  |  |  |  | | | | |
| 035 | 119 |  |  |  |  |  |  |  |  | | | | |
| 036 | 120 |  |  |  |  |  |  |  |  | | | | |
| 037 | 121 |  |  |  |  |  |  |  |  | | | | |
| 038 | 122 |  |  | | | | | | | | | | |
| 039 | 123 |  |  | | | | | | | | | | |
| 040 | 124 |  |  |  |  | | | | | | | | |
| 041 | 125 |  |  |  |  | | | | | | | | |

# Appendix → Ring Patterns

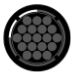
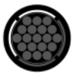
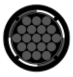
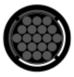
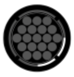
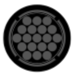
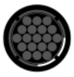
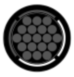
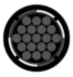
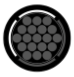
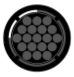
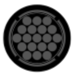
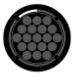
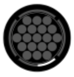
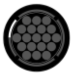
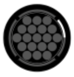
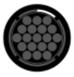
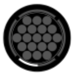
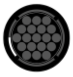
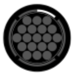
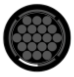
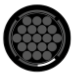
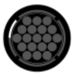
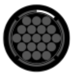
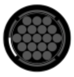
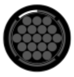
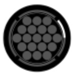
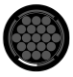
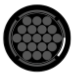
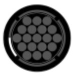
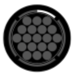
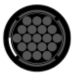
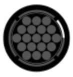
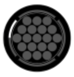
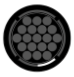
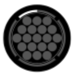
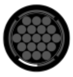
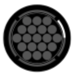
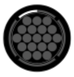
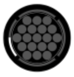
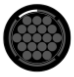
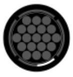
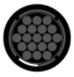
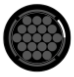
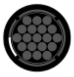
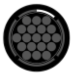
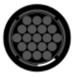
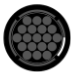
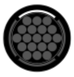
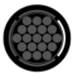
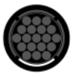
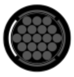
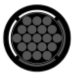
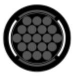
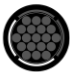
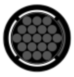
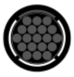
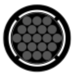
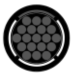
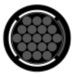
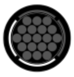
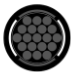
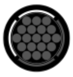
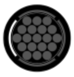
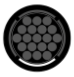
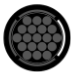
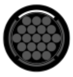
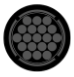
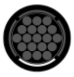
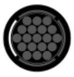
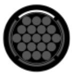
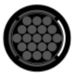
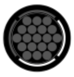
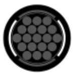
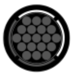
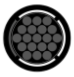
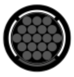
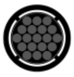
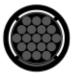
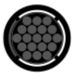
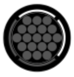
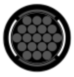
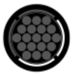
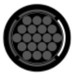
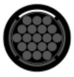
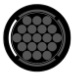
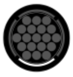
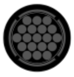
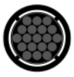
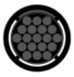
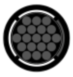
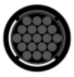
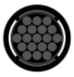
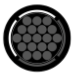
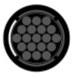
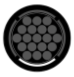
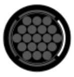
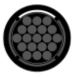
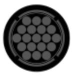
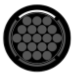
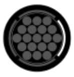
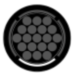
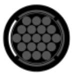
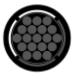
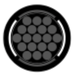
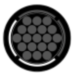
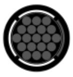
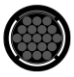
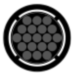
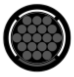
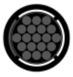
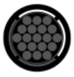
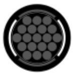
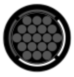
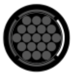
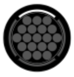
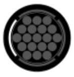
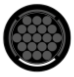
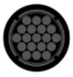
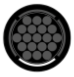
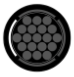
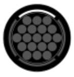
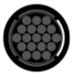
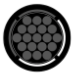
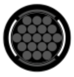
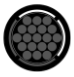
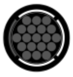
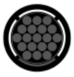
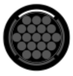
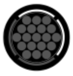
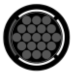
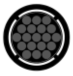
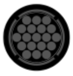
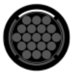
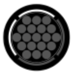
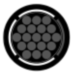
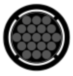
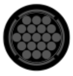
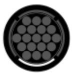
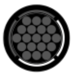
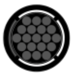
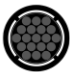
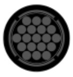
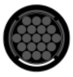
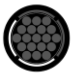
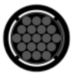
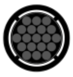
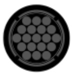
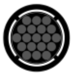
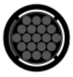
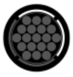
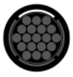
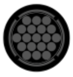
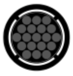
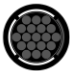
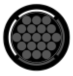
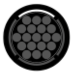
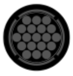
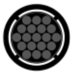
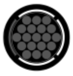
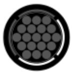
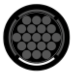
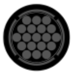
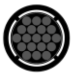
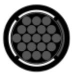
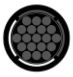
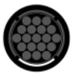
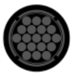


| chase | fade | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 042 | 126 | ● | ● | ● | ● | | | | | | | | |
| 043 | 127 | ● | ● | ● | ● | | | | | | | | |
| 044 | 128 | ● | ● | ● | ● | | | | | | | | |
| 045 | 129 | ● | ● | ● | ● | | | | | | | | |
| 046 | 130 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 047 | 131 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 048 | 132 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 049 | 133 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 050 | 134 | ● | ● | ● | ● | | | | | | | | |
| 051 | 135 | ● | ● | ● | ● | | | | | | | | |
| 052 | 136 | ● | ● | ● | ● | | | | | | | | |
| 053 | 137 | ● | ● | ● | ● | | | | | | | | |
| 054 / 066 | 138 / 150 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 055 / 067 | 139 / 151 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 056 / 068 | 140 / 152 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 057 / 069 | 141 / 153 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 058 / 070 | 142 / 154 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 059 / 071 | 143 / 155 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 060 / 072 | 144 / 156 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 061 / | 145 / | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |



| chase | fade | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 073 | 157 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 062 / 074 | 146 / 158 | ● | ● | ● | ● | ● | ● | ● | | | | | |
| 063 / 075 | 147 / 159 | ● | ● | ● | ● | ● | ● | ● | | | | | |
| 064 / 076 | 148 / 160 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |
| 065 / 077 | 149 / 161 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |
| 078 | 162 | ● | ● | ● | ● | | | | | | | | |
| 079 | 163 | ● | ● | ● | ● | | | | | | | | |
| 080 | 164 | ● | ● | ● | ● | | | | | | | | |
| 081 | 165 | ● | ● | ● | ● | | | | | | | | |
| 082 | 166 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 083 | 167 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 084 | 168 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 085 | 169 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 086 | 170 | ● | ● | ● | ● | | | | | | | | |
| 087 | 171 | ● | ● | ● | ● | | | | | | | | |
| 088 | 172 | ● | ● | ● | ● | | | | | | | | |
| 089 | 173 | ● | ● | ● | ● | | | | | | | | |
| 090 | 174 | ● | ● | ● | ● | ● | | | | | | | |
| 091 | 175 | ● | ● | ● | ● | ● | | | | | | | |
| 092 | 176 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 093 | 177 | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 094 | 178 | ● | ● | ● | ● | ● | ● | | | | | | |
| 095 | 179 | ● | ● | ● | ● | ● | ● | | | | | | |

## Appendix → Ring Patterns

| chase | fade | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 096 | 180 |  |  |  |  |  |  | | | | | | |
| 097 | 181 |  |  |  |  |  |  | | | | | | |
| 098 | 182 |  |  |  |  |  |  |  |  |  | | | |
| 099 | 183 |  |  |  |  |  |  |  |  |  | | | |
| 100 | 184 |  |  |  |  |  |  |  |  |  | | | |
| 101 | 185 |  |  |  |  |  |  |  |  |  | | | |
| 102 | 186 |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  |  |  | | | | |
| 103 | 187 |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  |  |  | | | | |
| 104 | 188 |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  |  |  | | | | |
| 105 | 189 |  |  |  |  |  |  |  |  |  |  |  |  |
| | |  |  |  |  |  |  |  |  | | | | |
| 106 | 190 |  |  |  |  |  | | | | | | | |
| 107 | 191 |  |  |  |  |  | | | | | | | |
| 108 | 192 |  |  |  |  |  | | | | | | | |
| 109 | 193 |  |  |  |  |  | | | | | | | |
| 110 | 194 |  |  |  |  |  | | | | | | | |
| 111 | 195 |  |  |  |  |  | | | | | | | |
| 112 | 196 |  |  |  |  |  | | | | | | | |
| 113 | 197 |  |  |  |  |  | | | | | | | |

## For Your Notes

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