

# MagnaDrive™

*The Next  
Industrial  
Revolution*



**“Green”  
Energy Saving  
Product**



**MGD / MGTL**

**MagnaGuard Delay  
& Torque Limiting  
Couplings**

10 — 2,000 Hp

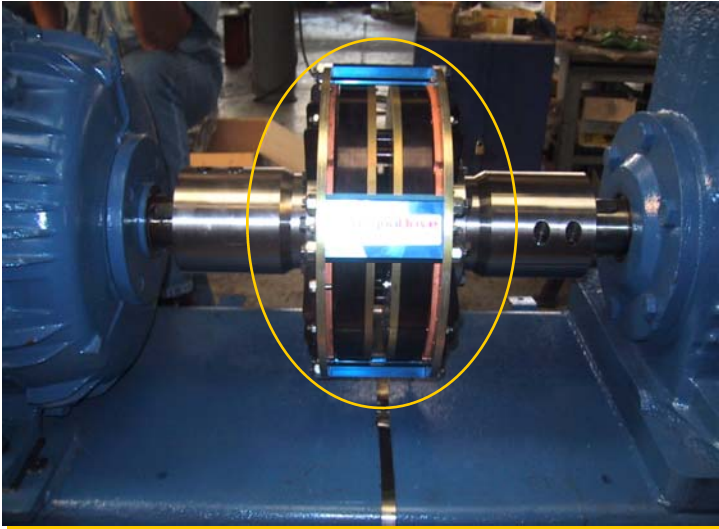
#### **Key Features & Benefits:**

- **Substantial Energy Savings**
- **“Green” Technology**
- No Physical Connection Between Motor and Load
- No Lubrication Required
- Lowest Total Cost of Ownership
- Efficient Torque Transfer
- Accepts Misalignment
- Cushioned and Delay Start
- Torque Limiting to Protect Equipment
- Eliminates Vibration Transfer Between Motor and Load
- Low Maintenance
- Simple Installation & Operation
- Increases Seal & Bearing Life

#### **Ideal for Applications Subject to:**

- Vibration
- Periodic Load Seizure
- Pulsating Loads
- Thermal Expansion
- Shock Loading
- Tight Space Constraints
- **Fluid Coupling Problems**

# Principle of Operation



The MagnaDrive family of disconnected magnetic couplings is available in four different styles, each providing unique motor to load torque transfer and protection features. These couplings are the MagnaGuard Economizer (MGE, see specific brochure for more information), Fixed Gap Coupling (FGC, see specific brochure for more information), MagnaGuard Delay (MGD), and MagnaGuard Torque Limiting (MGTL). In general, each of these couplings transmits torque from the motor to the load using the same principles of operation with NO PHYSICAL CONNECTION of the driver shaft to load shaft.

The main components of the magnetic coupling are a Magnet Rotor that is surrounded by a Conductor Rotor.

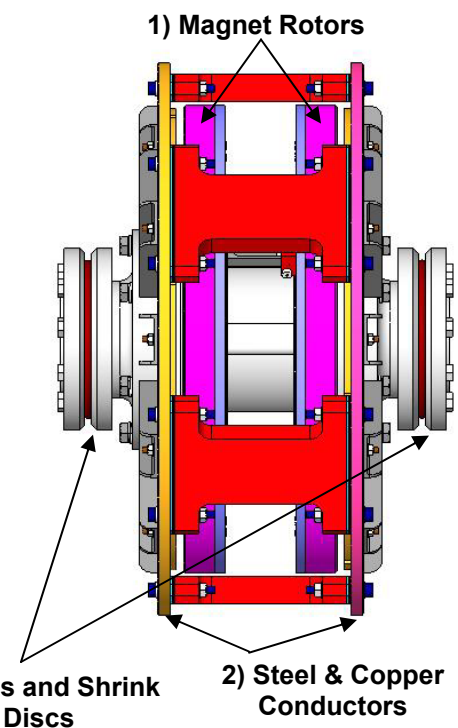
The Magnet Rotor and Conductor Rotor are NEVER IN CONTACT with each other. Torque is transmitted through an air gap in the coupling by the relative motion between the Conductor Rotor and extremely powerful permanent magnets contained in the Magnet Rotor. This relative motion creates a magnetic field in the Conductor that forms a very strong flux field with the magnets thereby transmitting torque across the space between the Magnet Rotor and Conductor Rotor components.

In addition to the Conductor Rotor and Magnet Rotor, the MGD and MGTL couplings have two hubs that are connected to the motor and load shafts with a unique locking mechanism called a shrink disc. The shrink disc is a compression fitting that grips the shaft with tremendous compression forces. No keyways or pins are required.

1) **Magnet Rotor** – A precision-machined aluminum Rotor that contains the powerful rare-earth magnets. The magnets are manufactured from a Neodymium-Iron-Boron (NdFeB) alloy with a half-life of more than 2,000 years. The Magnet Rotor is usually mounted to the load hub.

2) **Steel Conductor** – The Conductor Rotor assembly is fabricated of a steel housing with copper conductor rings attached to the inside surface facing the Magnet Rotor. The Conductor Rotor assembly is mounted to the motor shaft.

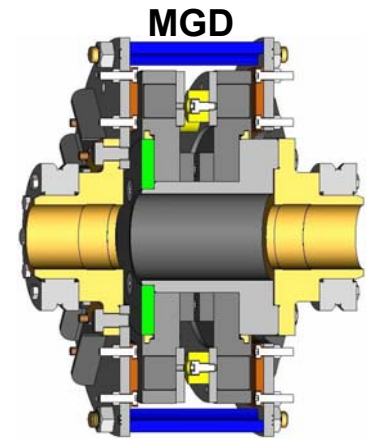
3) **Hubs and Shrink Discs** – The coupling hubs are attached to the motor and load shafts using high strength shrink discs. The shrink disc applies radial compression forces to fasten the hubs to the shafts. These forces are so high that no keyway or pins are required for installation.



Like all MagnaDrive couplings, the MagnaGuard Delay (MGD) and Torque-Limiting (MGTL) couplings provide a cushioned start. However, both the MGD and MGTL provide extra cushioning by a momentary delay in full torque-transfer. Immediately upon start of the motor there is a large amount of slip between the Conductor Rotor and the Magnet Rotor, so starting shock is cushioned. During start-up, when slip is greatest, there is also a natural repulsive force between the magnets and the conductors. The MGD and MGTL couplings allow the Magnet Rotors to slide away, increasing the air-gap by an additional 1/8" (1/16" per side). In this position the starting torque is reduced, providing additional cushioning of starting shock. As the Magnet Rotor accelerates and approaches motor speed, the repulsive forces are reduced, and the Magnet Rotors shift to their normal full-torque position.

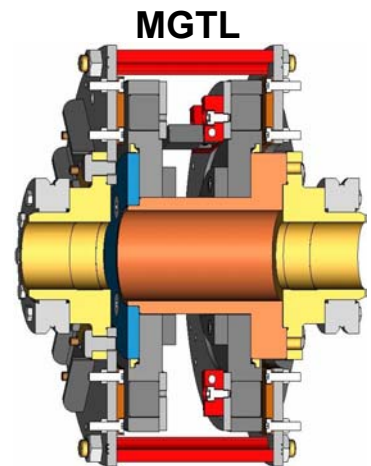
## MGD (MagnaGuard Delay) Coupling

During a load seizure, the high differential speed (slip) between the magnet and Conductor Rotors causes the high repulsive force to be re-instated. This allows the MGD to shift to its lower-torque position, and the load is partially disengaged. This provides additional mechanical cushioning of a load seizure. The MGD can be installed in horizontal or vertical positions, and can operate in forward or reverse direction of rotation.



## MGTL (MagnaGuard Torque Limiting) Coupling

The MGTL operates like the MGD, but with the additional ability to completely disconnect the load from the motor in the event of a load seizure or other over-torque condition. Upon start-up, the Magnet Rotors shift to a reduced-torque position, like the MGD coupling. In the MGTL, “flippers” control this axial shift. At normal running speed, centrifugal force causes these flippers to pivot out of the way. The Magnet Rotors remain in their full-torque position. During a load-seizure, the repulsive force causes the Magnet Rotors to move more than 1” away from the conductors, because the “flippers” are no longer limiting the rotor shift. With such a large air-gap, torque transfer is minimal and the load is completely disengaged from the motor. The MGTL can operate in this condition indefinitely without damage. Stopping the motor allows the Magnet Rotors to reset and the flippers to return to the starting position. The load must be cleared before restarting the equipment. Other than stopping the motor and clearing the load, the MGTL requires no operator intervention. The MGTL is for horizontal installations only, and cannot accommodate reverse rotation applications.



## Typical Industries

- Mining & Cement
- Power Generation
- Oil & Gas
- Chemical Processing
- Pulp & Paper
- HVAC
- Water & Wastewater
- Irrigation
- Maritime
- General Manufacturing
- And many more

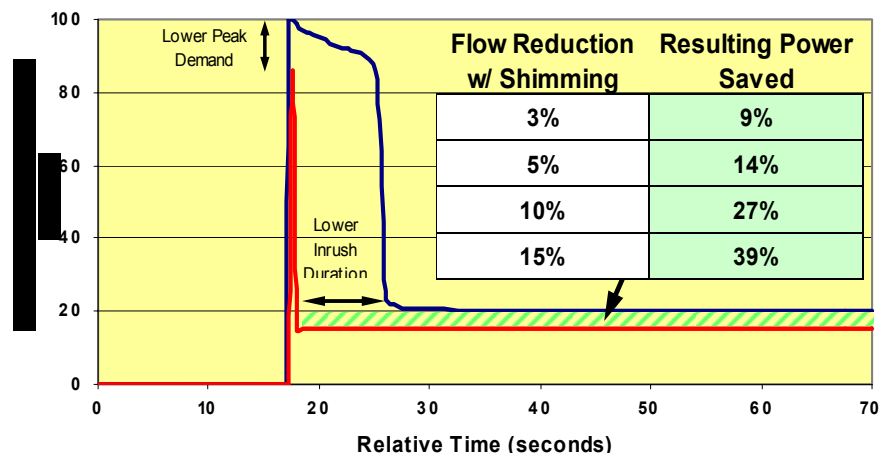
## Typical Applications

- Conveyor Belts, Bucket Elevators & Other Bulk Handling Equipment
- Pumps
- Compressors
- Centrifuges
- Fans, Blowers
- Chippers, Shredders
- Pulpers, Re-Pulpers
- Crushers, Hammermills
- Mixers

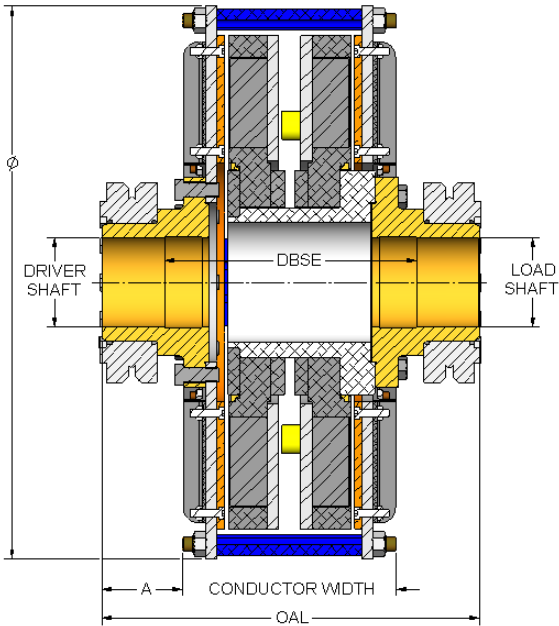
**MagnaDrive Couplings provide a disconnected, Cushioned Start. Because the motor does not have to overcome load inertia, the Peak Demand Current and duration of Inrush are reduced significantly. This Cushioned Start results in energy savings (see Graph) and reduced equipment wear. For many applications a lower Peak Demand Current may contribute to lower electrical power rates. Also, the Coupling air gap can be adjusted during installation to operate a pump, fan or blower at less than maximum flow, with sizable energy savings based on the centrifugal Affinity Laws.**

Energy Saving Coupling Comparison

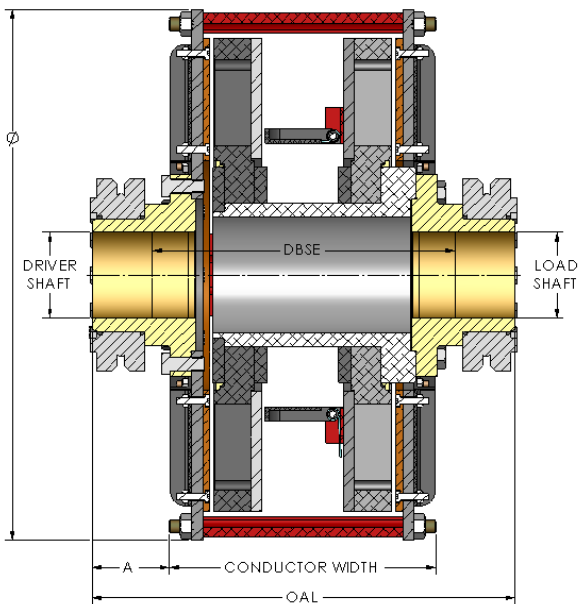
— Direct Coupled  
— MagnaDrive Coupling



# Technical Data



| Model      | Conductor Side Assembly |        |        |        |                                           |                          |        |
|------------|-------------------------|--------|--------|--------|-------------------------------------------|--------------------------|--------|
|            | Ø                       | Width  | A      | Weight | Distance to CG (at min. shaft engagement) | WR <sup>2</sup>          |        |
|            | (inch)                  | (inch) | (inch) | (lb)   | (inch)                                    | (lbf*inch <sup>2</sup> ) |        |
| <b>MGD</b> | 12/20                   | 11.75  | 6.21   | 1.85   | 37                                        | 2.41                     | 615    |
|            | 14/30                   | 14.50  | 6.21   | 1.85   | 55                                        | 2.71                     | 1,340  |
|            | 14/40                   | 14.50  | 6.21   | 1.85   | 55                                        | 2.71                     | 1,340  |
|            | 14/50                   | 14.50  | 6.21   | 1.85   | 55                                        | 2.71                     | 1,340  |
|            | 16/60                   | 16.50  | 6.21   | 1.85   | 71                                        | 2.87                     | 2,280  |
|            | 16/75                   | 16.50  | 6.21   | 1.85   | 71                                        | 2.87                     | 2,280  |
|            | 16/100                  | 16.38  | 7.09   | 2.23   | 79                                        | 3.30                     | 2,510  |
|            | 16/125                  | 16.38  | 7.09   | 2.23   | 79                                        | 3.30                     | 2,510  |
|            | 16/150                  | 16.38  | 7.09   | 2.23   | 79                                        | 3.30                     | 2,510  |
|            | 16/200                  | 16.38  | 7.09   | 2.23   | 79                                        | 3.30                     | 2,510  |
|            | 18/250                  | 18.50  | 7.09   | 2.23   | 101                                       | 3.48                     | 4,070  |
|            | 18/300                  | 18.50  | 7.09   | 2.23   | 101                                       | 3.48                     | 4,070  |
|            | 20/350                  | 22.13  | 7.26   | 2.88   | 175                                       | 3.53                     | 10,160 |
|            | 20/400                  | 22.13  | 7.26   | 2.88   | 175                                       | 3.53                     | 10,160 |
|            | 22/450                  | 24.13  | 7.26   | 2.88   | 203                                       | 3.65                     | 14,120 |
|            | 22/500                  | 24.13  | 7.26   | 2.88   | 203                                       | 3.65                     | 14,120 |
| 22/600     | 24.13                   | 7.26   | 2.88   | 203    | 3.65                                      | 14,120                   |        |
| 24/700     | 27.80                   | 8.14   | 3.98   | 299    | 4.08                                      | 27,320                   |        |
| 24/1000    | 27.80                   | 8.14   | 3.98   | 299    | 4.08                                      | 27,320                   |        |



|             |        |       |       |      |      |        |        |
|-------------|--------|-------|-------|------|------|--------|--------|
| <b>MGTL</b> | 14/40  | 14.50 | 7.84  | 1.85 | 56   | 3.38   | 1,390  |
|             | 14/50  | 14.50 | 7.84  | 1.85 | 56   | 3.38   | 1,390  |
|             | 16/60  | 16.50 | 7.84  | 1.85 | 72   | 3.56   | 2,350  |
|             | 16/75  | 16.50 | 7.84  | 1.85 | 72   | 3.56   | 2,350  |
|             | 16/100 | 16.38 | 9.22  | 2.23 | 81   | 4.12   | 2,590  |
|             | 16/125 | 16.38 | 9.22  | 2.23 | 81   | 4.12   | 2,590  |
|             | 16/150 | 16.38 | 9.22  | 2.23 | 81   | 4.12   | 2,590  |
|             | 16/200 | 16.38 | 9.22  | 2.23 | 81   | 4.12   | 2,590  |
|             | 18/250 | 18.50 | 9.22  | 2.23 | 102  | 4.34   | 4,170  |
|             | 18/300 | 18.50 | 9.22  | 2.23 | 102  | 4.34   | 4,170  |
|             | 20/350 | 22.13 | 9.39  | 2.88 | 180  | 4.37   | 10,620 |
|             | 20/400 | 22.13 | 9.39  | 2.88 | 180  | 4.37   | 10,620 |
|             | 22/450 | 24.13 | 9.39  | 2.88 | 207  | 4.52   | 14,640 |
|             | 22/500 | 24.13 | 9.39  | 2.88 | 207  | 4.52   | 14,640 |
|             | 22/600 | 24.13 | 9.39  | 2.88 | 207  | 4.52   | 14,640 |
|             | 24/700 | 27.80 | 10.76 | 3.98 | 302  | 5.02   | 27,950 |
| 24/1000     | 27.80  | 10.76 | 3.98  | 302  | 5.02 | 27,950 |        |

\* These dimensions may vary per application



# MagnaDrive = Lowest Total Cost of Ownership

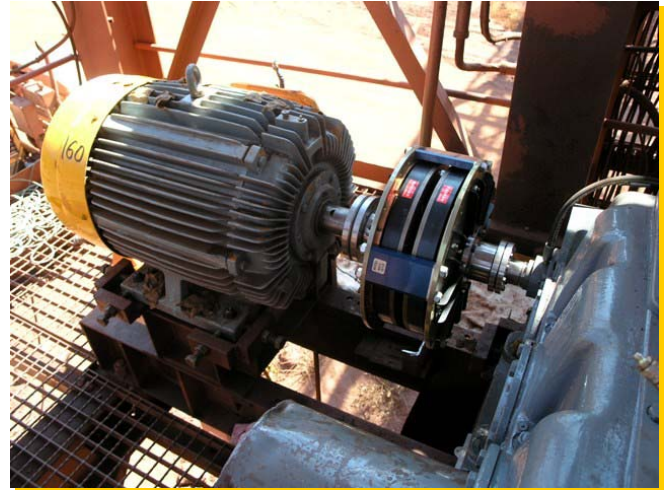
|                                          |  Fluid Couplings                 |  Rigid Couplings |  Disk Couplings | <b>MagnaDrive</b><br>MGD/MGTL                                                            |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Direct Coupled</b>                    | Yes                                                                                                               | Yes                                                                                               | Yes                                                                                                | No                                                                                       |
| <b>First Cost</b>                        | High                                                                                                              | Low                                                                                               | Medium                                                                                             | Medium                                                                                   |
| <b>Total Cost of Ownership</b>           | High                                                                                                              | High                                                                                              | High                                                                                               | Low                                                                                      |
| <b>Environmental Issues</b>              | Oil leak / contamination and oil disposal problems                                                                | Uses grease                                                                                       | na                                                                                                 | None. Completely clean / <b>Green</b> technology                                         |
| <b>Installation Issues</b>               | Usually very heavy and bulky equipment requiring extra labor and time to install as well as setting-up oil levels | Time spent with alignment                                                                         | Time spent with alignment                                                                          | Easy to install                                                                          |
| <b>Space Requirements</b>                | High                                                                                                              | Low                                                                                               | Low                                                                                                | Less than Fluid Couplings<br>Easy to retrofit into existing Fluid Coupling Installations |
| <b>Alignment Issues</b>                  | Needs periodic laser alignment                                                                                    | Needs periodic laser alignment                                                                    | Needs periodic laser alignment                                                                     | None                                                                                     |
| <b>Overload Torque Protection</b>        | Some, but likely will melt / blow off fusible plug ejecting oil                                                   | No                                                                                                | No                                                                                                 | Yes                                                                                      |
| <b>Cushioned / Delayed Start</b>         | Moderate                                                                                                          | No                                                                                                | No                                                                                                 | Yes                                                                                      |
| <b>Conveyor Delay Start Feature</b>      | Difficult to control Belt Uplift and prone to overtorque / oil spill                                              | No                                                                                                | No                                                                                                 | Minimizes Belt Uplift and overtorque during startup                                      |
| <b>System / Maintenance Requirements</b> | Medium Requires spare parts and oil                                                                               | High Requires spare parts                                                                         | High Requires spare parts                                                                          | Low                                                                                      |
| <b>Equipment Life Issues</b>             | Vibration transfer causes lower equipment life                                                                    | Vibration transfer causes lower equipment life                                                    | Vibration transfer causes lower equipment life                                                     | MagnaDrive offers the longest life on bearings, seals, and other equipment               |

MagnaDrive's "**Green**" disconnected torque-transfer technology reduces your total cost of ownership by lowering maintenance and operating costs, increasing process availability, and improving system reliability.





▲ MGD 20/400, 300HP, 1800RPM, Mining, Gear Box in Bulk Conveyor System, AZ, USA



▲ MGD 18/250, 150HP, 1500RPM, Iron Mill, Australia



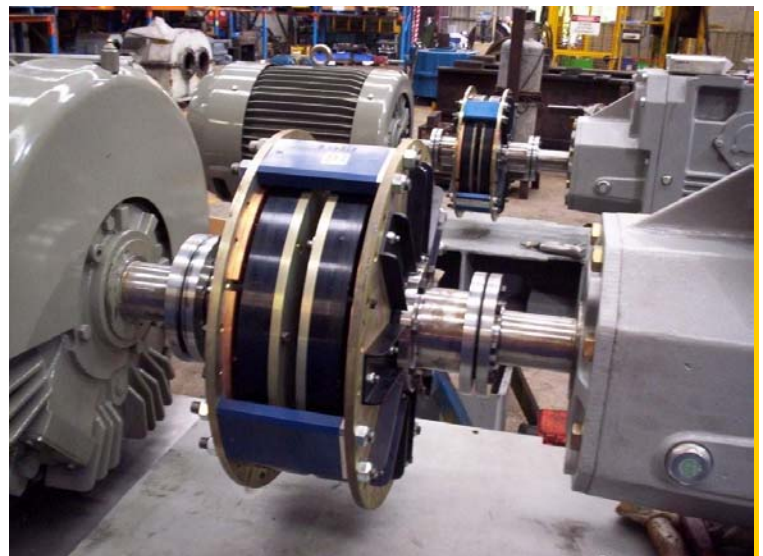
▲ MGTL 18/250, 240HP, 1800RPM, Mining, Conveyor System, UT, USA



▲ MGTL 12/20, Power Generation, Conveyor System, TX, USA



▲ MGD 18/250, 150HP, 1500RPM, Steel Mill, Conveyor System, Australia



▲ MGD 16/125, 55HP, 1480RPM, Mining, Bulk Material Handling Conveyor System, Australia

# MagnaDrive

C O R P O R A T I O N

## MGD / MGTL Sample Installations



▲ MGD 20/400, 250HP, 1500RPM, Conveyor System, Mining, Botswana



▲ MGD 24/700, 700HP, 1800RPM, Pulp & Paper, Pulper Drum Application, WA, USA



▲ MGD 14/40, 40HP, 1800RPM, Airport Conveyor System TN, USA

### About MagnaDrive

MagnaDrive Corporation was founded in 1999, and is based out of Bellevue, WA. The company's breakthrough magnetic technology provides a cost effective solution to increase reliability and lower maintenance expense while achieving energy savings and process control. The impact and potential of the technology was recognized by Industry Week magazine, which selected MagnaDrive as Technology of the Year in 2001. MagnaDrive was selected by Inc. Magazine as one of the 500 fastest growing private companies in the United States. Recently, Deloitte named MagnaDrive one of the 100 fastest growing technology companies in North America. MagnaDrive offers a family of products to accomplish a broad range of operating objectives: Reliability, Speed Control, Torque Management, Cushioned Start, Vibration Control and Misalignment Tolerance.

Deloitte  
Technology Fast 100

Inc.  
500

IndustryWeek  
Technology of the Year



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