OmniPulse™ DC Drives
Frequently Asked Questions

MAGNETEK MATERIAL HANDLING
ELECTROMOTIVE SYSTEMS

Q: When do I need a Regenerative Power Module (RPM) on my DC Bus? (OmniPulse DDC)

A: Regenerative Power Modules are used to quickly discharge excess energy generated when any motor is overhauling. This protects your DC power supply and DC equipment from overvoltage failures and nuisance faults.

Most DC busses powering overhead cranes need some form of regenerative energy protection, whether the circuit is in the DC power supply or a separate RPM unit. For example, if three cranes are powered by one DC power supply, any combination of those cranes could be lowering a load at a given time. Protection against the worst-case scenario, all three hoists lowering, must be present. In that case the following formula should be used to size for regenerative energy protection:

$$I_{REGEN} = \sum (FLA_{HOIST} * 0.8) + \sum (FLA_{TRAVEL} * 0.3) \qquad (1)$$

There are two specific cases when a RPM may not be needed:

1. The DC power supply has a regenerative energy protection circuit sized to equation (1).

2. Another consistent load is powered from the same DC supply (for example a conveyor system). In this case the conveyor system must be able to consume the entirety of the regenerative energy or a RPM unit will still be required.

Q: When do I use a "common bus" versus and "non-common bus" RPM?

A: A non-common bus RPM is used to dissipate the regenerative energy of a single motion.

A common bus RPM is used to protect all devices on the DC bus from regenerative energy and is thus sized for the worst-case regenerative current. As the number of regenerative motions increases, there is a crossing point where going to a common bus RPM becomes a more cost-effective solution.

Q: ***Why is the type of supply voltage an area of concern when applying the OmniPulse DDC?***

A: The reason for concern on the type of supply voltage feeding the crane is due to the potential of compatibility issues, which could affect the overall package cost.

- Voltage regulated SCR supply can be problematic, therefore we may supply:
  - DC line choke to avoid overvoltage nuisance tripping.
  - Blocking diode with regenerative power module (RPM) to isolate regenerative energy from the DC bus.
- Diode rectified supply may cause problems if the hoist on the crane is 150HP or larger.
  - DC line choke to avoid overvoltage nuisance tripping.
  - Regenerative power module (RPM) to isolate regenerative energy from the DC bus.
- If there is an existing regenerative power package there may be compatibility issues, because they are usually too slow.
  - May need a DC braking chopper and resistor.
- AC ripple can cause problems, because the capacitor passes AC current through
  - AC ripple should be measured (more often a problem with voltage regulated SCR supply) if possible, and may require DC line choke.
  - AC voltage ripple will increase the DC bus voltage and possibly cause over voltage trips.
  - AC current ripple will increase the RMS current flowing in the circuit.

Q: ***Why does the DDC need a dynamic braking resistor, but the DSD does not?***

A: Dynamic braking resistors can be used in both OmniPulse DC drives; however, a dynamic braking resistor is needed for DDC hoists because they are powered from a secondary, local DC power supply. Within one second following a power supply failure the DDC will no longer regulate motor speed and the motor will begin to regenerate. The dynamic braking resistor provides a safe path to dissipate the regenerative energy and control motor torque while the series brake sets.

The DSD has two motor contactors that disconnect the motor armature from the drive and a shunt brake that will close during power loss. Magnetek recommends the use of high speed contactors that open within 30-50 ms of power loss. If the contactor fails to open, the drive has a back-up DC bus fuse for protection. Power limit switch resistors are also optional in a DSD armature circuit.

Q: Why does the DDC use tachometer feedback, but the DSD uses encoder feedback?

A: The OmniPulse DDC is usually installed as a retrofit to DC Constant Potential control where tachometer feedback would have been used.

The OmniPulse DSD was originally designed by Magnetek as an Elevator drive for new installations where speed feedback is specified from the start of a project and higher position accuracy is required.

Using encoder or tachometer feedback, either drive can attain 0.1% speed regulation. Using encoder feedback the DSD can provide over speed protection; using tachometer feedback the DDC can improve its motor stall protection.

Q: Why is "speed control ratio" not published for the OmniPulse DC drives?

A: A speed control ratio is not published in the OmniPulse DC drive manuals because they can control down to zero speed, providing an infinite speed control ratio. The next slowest speed the DDC can be programmed to would be 0.1% of base speed, with 5% (of base speed) regulation. The DSD's next speed increment would be 1.0% of base speed, with 5% (of base speed) regulation.

Q: With 5% regulated speed, do we lose the ability to raise an empty hook at higher speeds?

A: No, the OmniPulse DDC and DSD offers high-speed hook operation when lightly loaded.

- In the lower or hoist (raise) direction, hook speed will be dependent upon the load lifted, as well as the maximum speed setting in the drive parameters.
- The traditional DCCP could not provide high speed lowering when lightly loaded.
- Magnetek recommends that an encoder be used to operate the DSD above base speed.

Q: What types of motors can I connect to my OmniPulse DC drives?

A: The OmniPulse DSD can control both shunt wound and compound wound DC motors. If a compound wound motor is used, the series field winding cannot be connected to the drive.

The OmniPulse DDC is designed to control series wound motors, but can also control shunt and compound wound motors. When a shunt wound motor is use and external current transformer is used to compensate for the lower current. If a compound wound motor is used, any combination of the fields can be wired.

NOTE: Disconnecting the series or shunt field of a compound wound motor will change its speed-torque characteristics. Controlling a compound wound motor with the DDC will also change its speed-torque characteristics.

Q: What if I have a footbrake on my travel motion?

A: The OmniPulse DDC and DSD have analog inputs that can be programmed as a torque regulator with an on/off selector switch to prevent brake drive through.

The OmniPulse DDC also has programmable torque limits for each speed. These limits can be set to prevent brake drive through.

Q: What voltage levels are within OSHA 1910 requirements for overhead cranes?

A: OSHA 1910.179(g) requires that all control voltage not exceed 600 V for AC or DC current. The voltage at pendant push-buttons shall not exceed 300 V for DC current. However, the AC voltage at pendant push-buttons shall not exceed 150 V.

Q: What is a NEMA rating, and how does it relate to an OmniPulse DDC drive?

The National Electrical Manufacturers Association (NEMA) published ICS 8-2000 Industrial Control and Systems: Crane and Hoist Controller standard, defining various classifications and ratings for motor controls for crane and hoist applications.

Each DDC model is designed specifically to meet the Maximum Intermittent-Duty Rating requirements of ICS 8-2000. Those current ratings range from 67 Amps to 2000 Amps DC. From here, the DDC is split into two voltage classes: 200-320 VDC and 360-720 VDC.

Q: What happens to two mechanically coupled motors controlled by two OmniPulse drives?

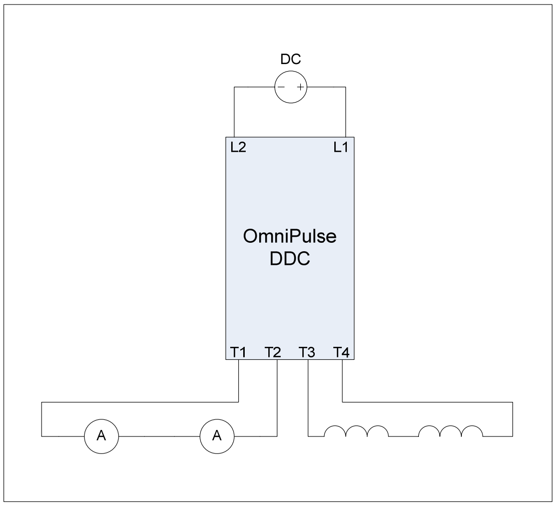
A: Both the DDC and DSD have programmable analog inputs and outputs that can be configured as torque followers for load sharing.

Consult Magnetek Material Handling for torque following applications.

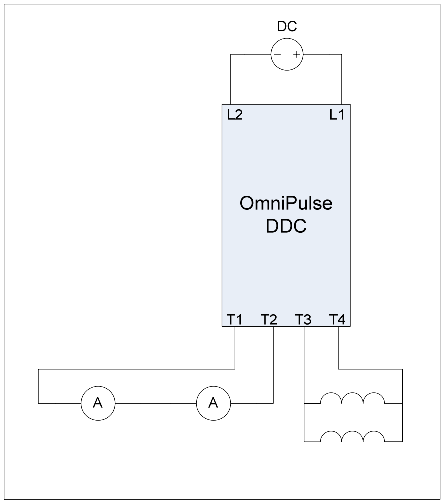
Q: *Can two or more motors be connected to one OmniPulse drive?*

A: Yes, below are example circuits showing the DDC connected to two series motors and two shunt motors.

Two Series Wound Motors



Two Shunt Wound Motors



Because motor speed is proportional to armature voltage, when two armatures are wired in series the T1-T2 voltage is split and motor speed is cut in half (three armatures by a third and so forth). The reduced motor speed can be offset by increasing the drive's armature voltage parameter. It should also be noted that the OmniPulse drives without encoder or tachometer feedback use armature voltage feedback to calculate motor speed and speed monitors and settings will not correlate to actual motor speed.

Since motor impedances are not identical uncoupled motors will not operate at the same speed. Trim control components can be added to the motor circuit to improve speed matching.

Q: *Can the OmniPulse drives be adapted to a bucket crane application?*

A: The OmniPulse drives are capable of being using for hold and close line bucket applications. Consideration must be given to the special requirements of operation to coordinate both independent hoist motors.

Consult Magnetek Material Handling for application assistance.

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Q: ***Since customers and/or technicians are comfortable with current DCCP (contactor) technology, how do we educate them on the DDC technology?***

A: Although education/training is an ongoing process, Magnetek provides numerous opportunities for the customer/technicians to learn more about the OmniPulse DDC product.

1. Product training can be arranged at your location.
2. Magnetek offers 24/7/365 after-market support.
3. Local support is available through our crane dealers.
4. OmniPulse DDC product is flexible and easy to use:
    - Software / parameters can be easily adjusted in the field for application specific set-up requirements.
    - Support and programming manual are easy to use
    - Mechanical system layout is designed similar to DCCP technology to make transition of technology easier on personnel
    - Electrical connection design is similar to DCCP technology to make installation quick and easy.

Q: ***Where will the customer see his Return on Investment (ROI) when upgrading from traditional DCCP technology to the OmniPulse DDC and DSD?***

A: The customer's return on investment can be seen in the following areas:

1. Reduction in maintenance costs
    - Fewer parts = less maintenance
    - Labor savings due to less frequent maintenance required
    - Reduced wear on the mechanical drive train
2. Improved Reliability (increased Up-time)
    - OmniPulse drives use solid-state devices -- less parts to fail
    - Higher reliability in digital technology
    - Ease of troubleshooting and diagnostics
    - Modular design of the OmniPulse DDC provides easier serviceability
3. Inventory Savings
    - Reduction in inventory of DCCP component spares
    - OmniPulse DDC and DSD offers common hardware
        - Control & interface board is universal for all sizes
        - 2 power frame sizes covers entire OmniPulse DDC product offering
3. Energy Savings
    - Significant cost savings are seen with the OmniPulse DDC and DSD.
4. Flexibility to Production Requirements
    - OmniPulse DDC and DSD drives are easily adaptable to changing production requirements

Q: Where has the OmniPulse DDC technology been successfully installed?

A: The OmniPulse DDC technology can be installed in any application where DC contactor and resistor control is now installed. The DDC technology has been successfully installed in crane and hoist applications, as well as draw bench, rolling mill, and quench car applications. Installation locations include:

- Algoma Steel
- ISG – Indiana Harbor, Sparows Point, & Burns Harbor
- Timken
- California Steel
- Pechiney Aluminum
- Corus Steel - UK
- General Electric
- SMI
- Dofasco
- US Steel – Great Lakes, Mon Valley, & Irvin
- Wheeling Pitt
- Nucor – Kent Washington

For a complete installation reference list, please contact the factory.