**Master-follower applications**
The master-follower communication functions are designed for controlling several drives connected to the same machinery. In the master-follower arrangement one of the drives operates as master to the other drives. Typical applications include conveyors, hoists, and winders. The master-follower function enables mutual co-ordination and load sharing for different kinds of motors connected to the same system. Most of the ABB industrial drives software products have master-follower functionality*. The master-follower functionality together with the required fibre optic cables can be ordered using the specific plus code.

* The ABB industrial drives multipump master-follower solution is not described in this document.

**Master-follower control modes**
The master is normally speed-controlled. The master sends the actual speed and actual torque to the follower drives via a noise-free optical connection.

The follower can have the following control modes:
- Torque control: the follower uses the actual torque of the master as the torque reference. This creates a natural load share between drives.
- Torque control with speed window: the follower uses the actual torque of the master if the actual speed of the follower is within the user-specified speed window. The speed window is the allowed error in the follower reference speed and actual speed. When the speed error moves outside the window, the excess part of the error value is communicated to the speed controller. The additional value from the speed controller output is added to the torque reference. This helps to bring the speed back to the specified speed window.
- Torque control with minimum or maximum torque selection of speed control output or torque control reference: this function can be used, for example, in winder applications, to prevent the motor rushing when the web is broken.
- Speed control: the follower uses the actual speed of the master as the speed reference. This mode is useful when the master and follower drives are flexibly coupled to each other, so that a slight speed difference between the drives is possible.
Drooping
The drooping function is typically used when the master and followers are all speed-controlled. It is used in drives where the mechanical connection is not strong enough to enable the use of torque control. Drooping prevents conflict between the master and follower stations by allowing a slight speed difference between them. Drooping decreases the drive speed slightly as the load increases. The actual speed decrease at a certain point depends on the droop rate setting and the drive load.

Speed controlled follower with load share
Speed-controlled followers can be used in several applications where load sharing is also needed between the master and follower stations. This is implemented in practice by using an additional term for speed reference based on the torque reference of the master drive. A speed-controlled follower with load share is especially advantageous for applications without pulse encoder feedback.

Benefits achieved with this control mode:
- Better control in the follower drive due to the speed control mode, particularly when starting
- Followers do not need a pulse encoder interface as with a purely torque-controlled follower drive

Reference handling
The data sent from master to follower depends on the application. Typically this is the actual speed and torque of the master to be used as the follower speed and torque reference. The master command word is also sent to the follower in order to give the start and stop commands. At the fastest setting, the reference coming from the master station to the follower station is read on two millisecond time level.

Master-follower link
A master-follower link is formed by connecting the DDCS CH2 channels of two or more drives in a ring or star configuration. A ring configuration can be used in most applications. A star configuration is an option if more redundancy in the system is required. The star configuration requires an additional branching board (NDBU).

For more information please contact your local ABB representative or visit:
www.abb.com/drives
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