

WEST RIVER CONVEYORS | BEHIND THE STEEL SERIES #6

A **Constant Tension Winch Assembly** is a key component of take-up units and high-capacity belt storage units used on conveyor systems, particularly in mining, quarrying, and heavy material handling applications. Its main purpose is to maintain consistent belt tension automatically while compensating for belt stretch, load changes, and temperature fluctuations without manual adjustment.

BEARINGS

Bearings on either side of the winch drum support the drum shaft by maintaining alignment under high radial and axial loads. They provide precise alignment of the rotating components, ensuring constant tension control accuracy and long equipment life.

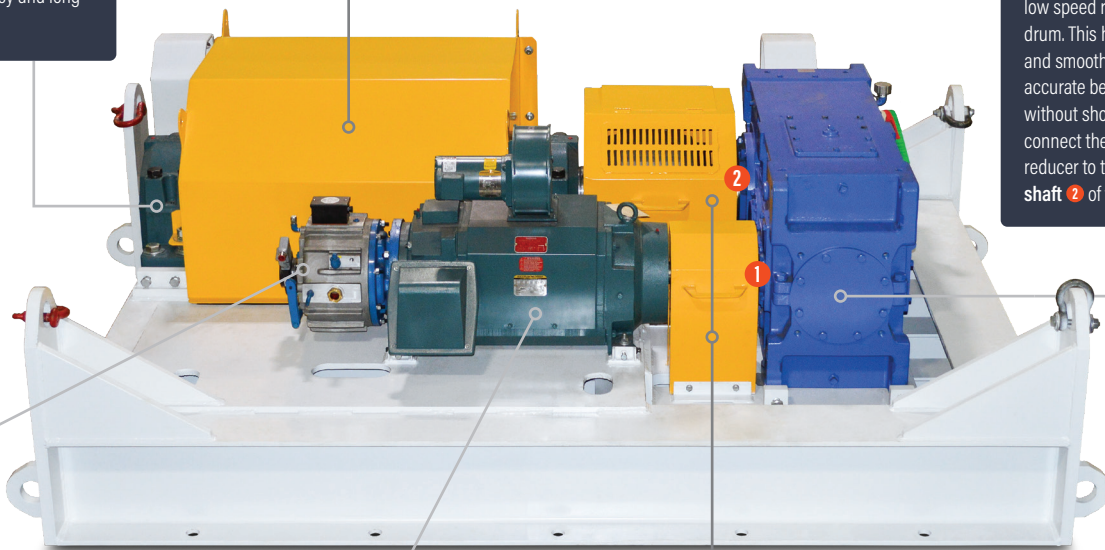
WINCH DRUM

The winch drum spools and unspools wire rope attached to the take-up carriage. If tension decreases, the drum reels in cable to pull the carriage forward; when tension increases, it lets out cable to relieve stress. Grooves in the drum prevent the wire rope from collapsing on a flat surface. The wire drum stores sufficient cable length to allow the carriage a full range of travel.



REDUCER

The reducer is the mechanical link between the motor and the winch drum. It converts fast, low-torque motor rotation into slow, high-torque low speed rotation required for the drum. This happens in a controlled and smooth motion, resulting in accurate belt tension adjustments without shock. Grid couplings connect the **input shaft 1** of the reducer to the motor, and the **output shaft 2** of the reducer to the drum.



MOTOR

The motor plays a few key roles in maintaining precise belt tension. It provides rotational power that drives the winch drum and responds to load changes caused by belt movement and temperature variations. The 150HP motor in this example provides a smooth, controllable torque and is ideal for variable-speed applications.

MOTOR BRAKE

A motor brake prevents uncontrolled payout or back-driving of the drum. It has a locking mechanism for maintenance and emergency stop, and pressure relief devices. This totally enclosed unit is able to stop activity that could deform or damage motor shafts in high-torque applications. The "quick mount" design of this component allows for easy connection to a drive motor.

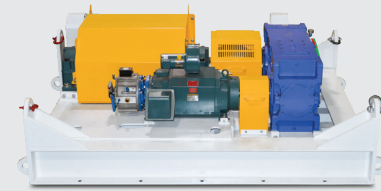


GRID COUPLINGS

Grid couplings connect the motor to the reducer, and the reducer to the winch drum. Their main purpose is to transmit high torque smoothly from the electric motor to the reducer, and from the reducer to the drum — while accommodating slight misalignments and dampening shock loads. The coupling type pictured above has tapered grid style hubs, grids, and covers.

Depending on operational needs, a winch assembly can be set up for roof/"back" mount. Vertical beams are attached to support the unit from above, allowing for proper connection to a take-up. Safety guarding adds extra protection from moving parts.





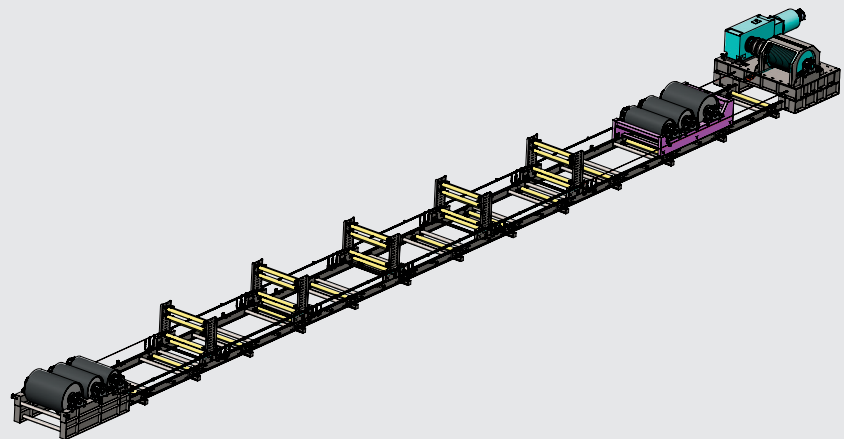
Constant Tension Winch Assembly

Key Differences:

FEATURE	CONSTANT TENSION WINCH	HYDRAULIC TAKE-UP	MANUAL/GRAVITY/SCREW
MOTOR TYPE	Electric motor with brake, typically TEFC + VFD; high-ratio gearbox; fail-safe brake holds during e-stop.	Electric motor driving hydraulic power unit (HPU) for cylinders; sometimes servo-quality VFD on HPU for fine control.	None (gravity) or small electric for screw jacks (intermittent), or purely mechanical handwheel.
USE/BEST FIT	Long belts, multiple drives, high starts/hour, variable loads; where belt tension must be tightly controlled to prevent slip and manage take-up travel.	Medium-long belts, shock-prone duty (load surges, transfers), dirty/wet environments; good when space restricts long gravity travel.	Short belts, light/steady loads, low start frequency; simplest/lowest cost where periodic manual adjustment is acceptable.
INTEGRATION	Ties into master drive PLC (interlocks, anti-rollback logic, start sequences).	Ties into plant PLC for permissives/pressure OK; local HPU panel controls.	Minimal integration; limit switches for travel ends (if any).
MAINTENANCE	Rope/drum inspection, brake wear, load cell calibration, gear oil; periodic encoder checks.	Hoses/seals, filters, fluid, accumulator pre-charge, sensor calibration.	Bearings/screws/ropes (if gravity), structural checks; very low instrumentation upkeep.
RISK IF UNDER-TENSIONED	Low — system corrects quickly.	Low to moderate — depends on pressure control accuracy/health.	Higher — depends on operator diligence and belt condition.

CONSTANT TENSION WINCH BENEFITS:

- Keeps conveyor belt properly tensioned by applying continuous tension under dynamic loads to relieve motor overload regardless of belt speed
- Allows for smooth take-up travel and prevents "snap-back" or shock loading that can damage belt and structure
- Varying amounts of line pull and greater belt storage capacity
- Quicker response time
- Prevents belt slippage on the drive pulley during startup, load surges, or braking
- Commonly used with belt storage units



CAD drawing of a belt storage unit with a constant tension winch