Gen III Precision Shape Correction Levelers

Machine Concepts

Designers & Builders
of Innovative Metal
Processing Equipment

Performance Advantage

Precision shape correction levelers eliminate shape defects such as coil set, cross bow, edge wave and center buckle in flat rolled metal products.

www.machineconcepts.com

Standard Features Common to all Machine Concepts, Inc. Gen III Precision Shape Correction Levelers

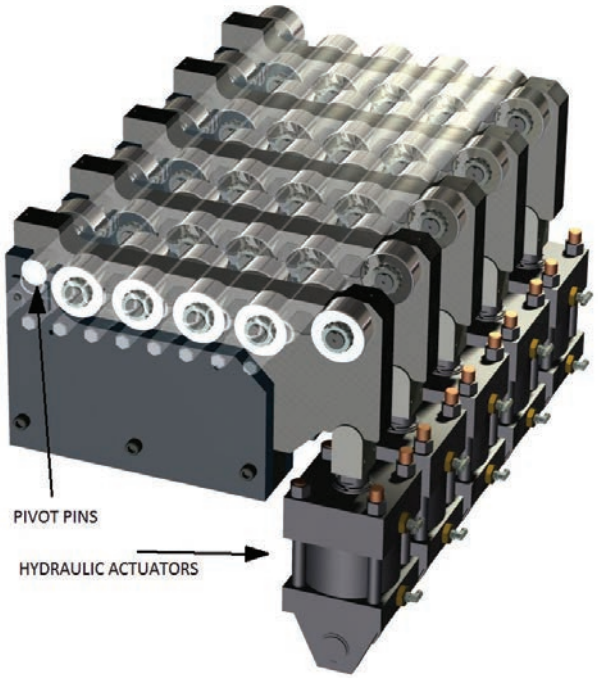
Gen III Shape Correction Levelers

Gen III levelers will correct shape defects such as coil set, cross bow, edge wave, center buckle, etc. in flat rolled metal products. Gen III levelers are utilized in many strip processing applications including cut-to-length, slitting line, press feed and continuous coil to coil process lines.

Gen III levelers incorporate a hybrid design using robust screw jacks on the four corners for overall penetration and hydraulic actuators to control the bottom roll entry penetration and roll bending. The screw jacks provide rigid support for high separating loads and maintain parallelism between the upper and lower bolsters. Backlash is eliminated in the jack adjustment. Pivot style roll bending provides aggressive roll bending on the entry end and feathers out to straight exit rolls. A flat strip exits from straight rolls. Exit geometry stays constant when changing roll shape or entry penetration. It is not necessary to re-adjust exit penetration after making entry adjustments. Hydraulic actuators provide overload protection and are well suited to dynamic adjustments.

Gen III levelers are well-engineered, high quality levelers with many advanced features available in a wide range of sizes and styles to meet process needs. While Machine Concepts offers standard designs and configurations, we are noted for custom applications.

Gen III styles include: G3B basic leveler, G3DC drawer cassette leveler, G3CC cassette cart style leveler and G3N narrow space leveler. Each has its own merits, features and options to meet a wide range of applications.



Standard Features

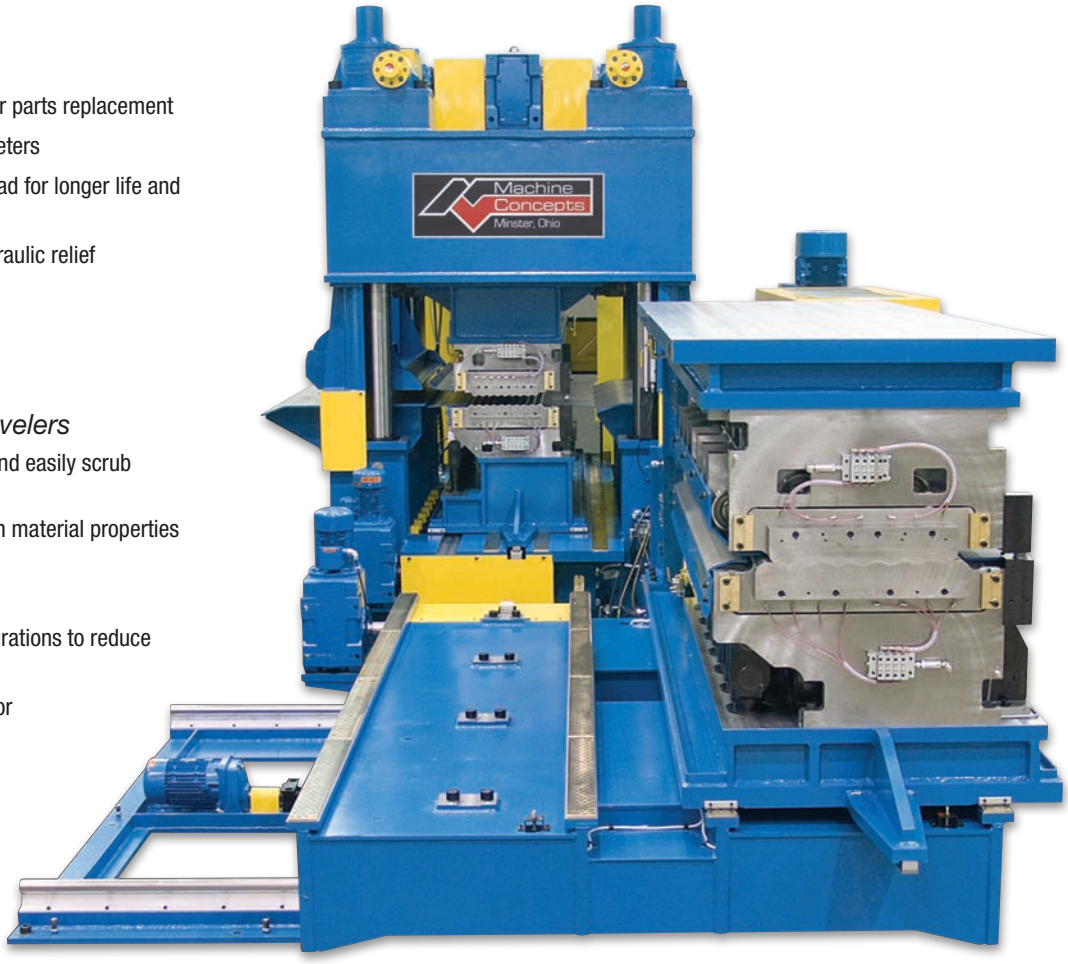
Common to all Gen III Levelers

- Automatic self-calibration after roll grind or parts replacement
- Automatic setup based on material parameters
- Floating journals reduce journal bearing load for longer life and better roll bend control
- Overload protection via drive load and hydraulic relief
- Automatic journal bearing lube system

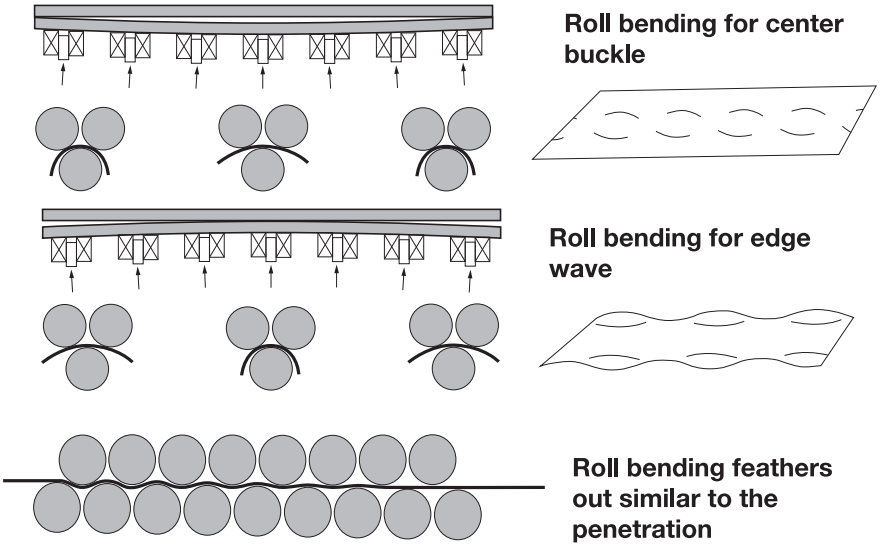
Optional Features

Available options for all Gen III Levelers

- Patented roll cleaning process to quickly and easily scrub work rolls between coils
- Lateral tilt to compensate for differences in material properties from edge to edge
- Job and product recipe storage
- 5 high and 6 high intermediate roll configurations to reduce backup bearing marking
- Blank center speed control with loop sensor
- A variety of threading aids and strip handling equipment



Roll Bending Changes Differential Path Through Leveler

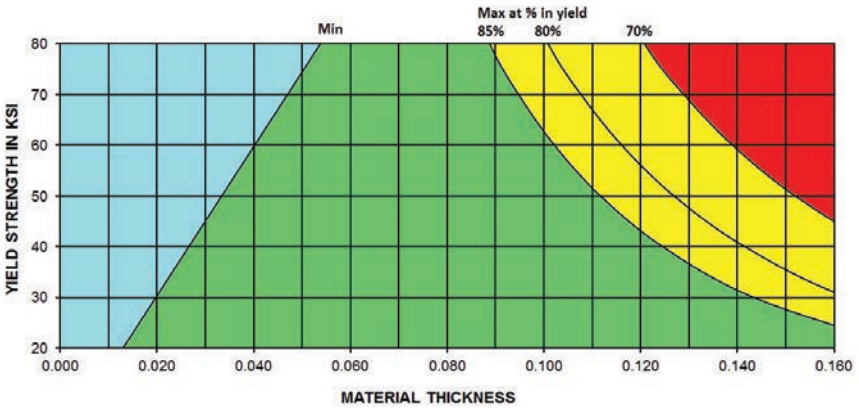


Roll bending for center buckle

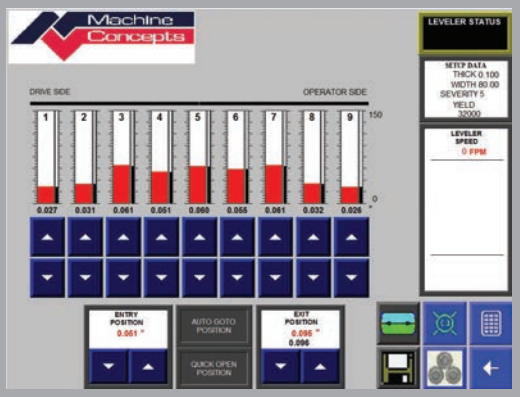
Roll bending for edge wave

Roll bending feathers out similar to the penetration

Typical Gage vs. Yield Curves for 2.25” Rolls



Gen III shape correction levelers are well-engineered, high quality levelers with many advanced features available in a wide range of sizes and styles to meet process needs. Additionally, they feature very user-friendly control screens.



Main Screen

Set Up Screen

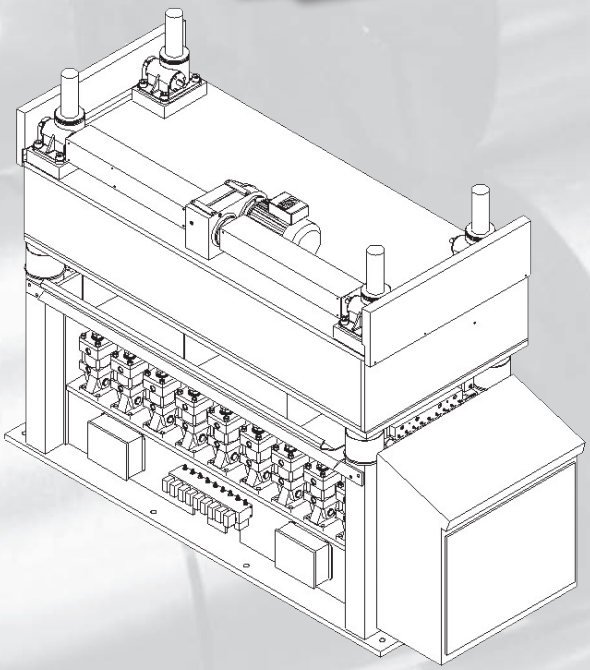
Roll Configurations & Capacities

Standard Roll Configurations	Approximate Gage Range For Steel @ 50 KSI & 70% in Yield (inches)		Approximate Gage Range For Steel @ 80 KSI & 80% in Yield (inches)	
0.875” x 23 rolls	.007	.025	.100	.017
1.3” x 21 rolls	.012	.045	.029	.036
1.5” x 19 rolls	.018	.085	.043	.060
1.75” x 17 rolls	.023	.112	.055	.088
2.25” x 17 rolls	.034	.151	.081	.120
3” x 15 rolls	.053	.241	.128	.190
4” x 13 rolls	.088	.371	.211	.294
5” x 11 rolls	.119	.469	.286	.371
6.5” x 9 rolls	.204	.725	.491	.573

G3B

BASIC LEVELER

The G3B leveler is a basic non-cassette leveler designed with one roll diameter for a specific product range. Although the G3B is cost effective, it is still a high-quality leveler with many high-end features. With the range of sizes and options available, the G3B can be configured to match your needs and budget.



Features

- Automatic self-calibration after roll grind or parts replacement
- Automatic setup based on material parameters
- Floating journals reduce journal bearing load for longer life and better roll bend control
- Overload protection via drive load and hydraulic relief
- Automatic journal bearing lube system
- Can be opened to approximately 6” for cleaning and service
- Work roll modules can be quickly removed as sub-assembly for cleaning and service

Frame and Roll Sizes

- Frame sizes: 40,000 lb. up to 600,000 lb. separating load
- Widths: 36” to 84”
- Roll sizes: 0.875”, 1.3”, 1.5”, 1.75”, 2.25”, 3”
- Typical max gage: Approximately .250” for largest roll size depending on width and yield

Available Drive Systems

- Pull thru for coil to coil lines
- Pull thru with pull roll after leveler for very light gage CTL applications
- Upper roll assist drive for either coil to coil lines or used with optional pull roll
- All rolls driven via pinion box and universal joints
- Split cluster drive system compensates for differential roll speed and reduced drive stress

Optional Features

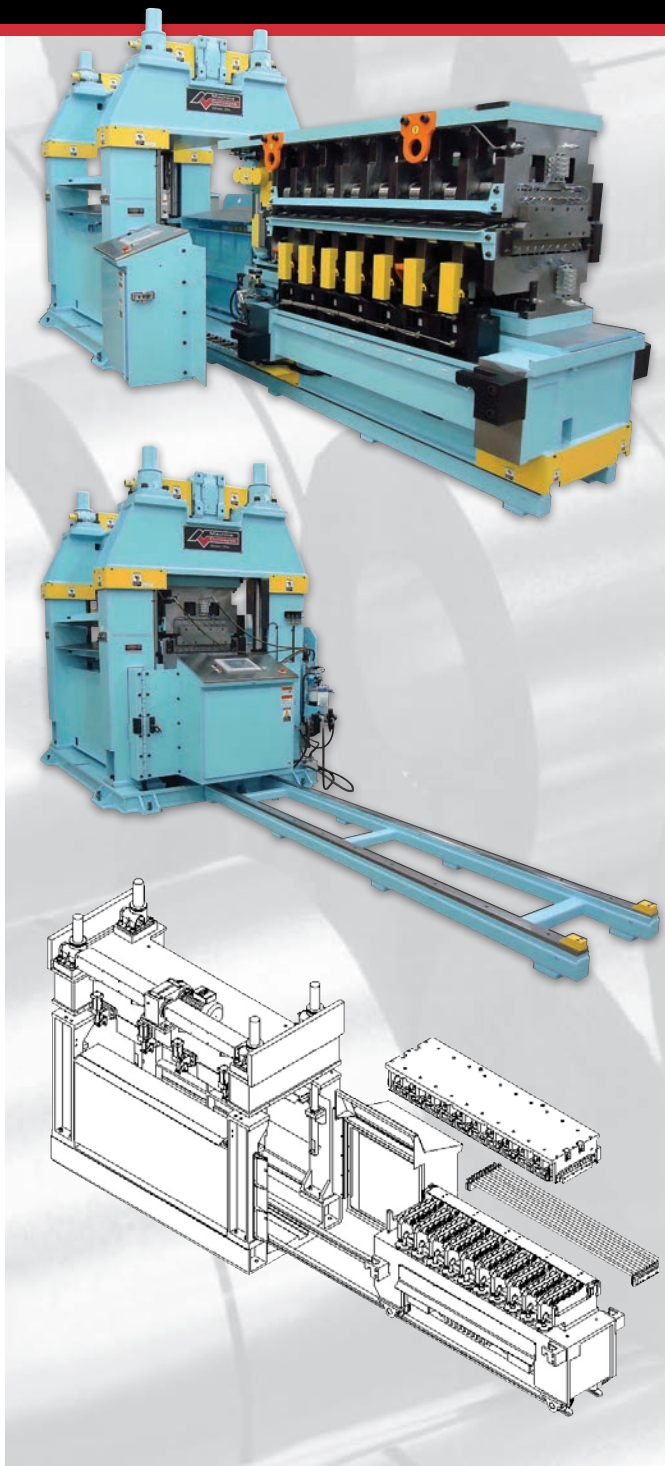
- Patented roll cleaning process to quickly and easily scrub work rolls between coils
- Lateral tilt to compensate for differences in material properties from edge to edge
- Work roll removal cart for quick extraction and installation of work rolls
- AutoFlat® automatic shape control system
- Job and product recipe storage

Cassette Cart Style Leveler

G3CC

CASSETTE CART STYLE LEVELER

The G3CC leveler provides the ability to easily remove the cassette for cleaning, maintenance, exchange, etc. The lower bolster is actually a motor driven cart that supports the cassette and rolls in and out of the leveler frame. The G3CC does not require a cassette docking station as the cart serves that purpose; however, an exchange system for two cassettes is common. Note: This style leveler lends itself well to coil to coil applications.



Features

- Automatic self-calibration after roll grind or parts replacement
- Automatic setup based on material parameters
- Floating journals reduce journal bearing load for longer life and better roll bend control
- Overload protection via drive load and hydraulic relief
- Automatic journal bearing lube system
- Removable roll cassette for cleaning or changing work rolls. Different diameter cassettes can be exchanged to expand leveler gage range.
- Work roll modules can be quickly removed as sub-assembly for cleaning and service
- Open bypass mode lowers lower work rolls and raises upper work rolls. Used for coil to coil applications when leveler is not in use to prevent roll scuffing from strip.

Frame and Roll Sizes

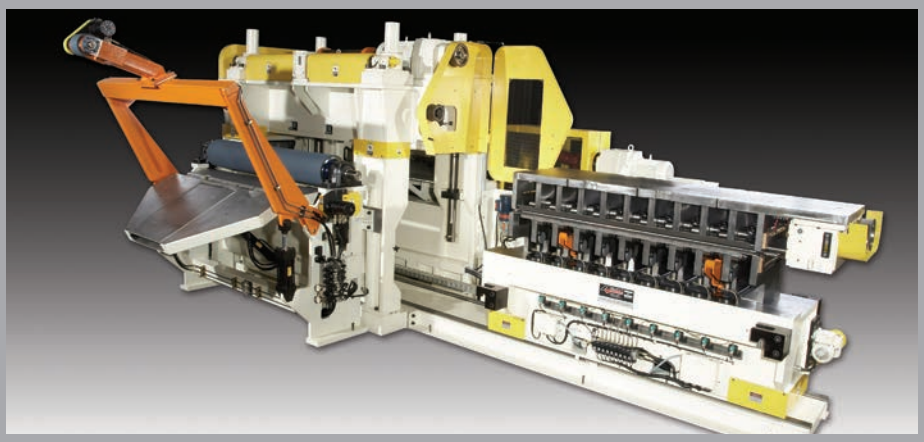
- Frame sizes: 40,000 lb. up to 280,000 lb. separating load
- Widths: 36” to 84”
- Roll sizes: 0.875”, 1.3”, 1.5”, 1.75”, 2.25”
- Typical max gage: Approximately .135” for largest roll size depending on width and yield

Available Drive Systems

- Pull thru for coil to coil lines
- Pull thru with pull roll after leveler for very light gage applications
- Upper roll assist drive for either coil to coil lines or used with optional pull roll
- Split cluster drive system compensates for differential roll speed and reduced drive stress

Optional Features

- Cassette exchange system to receive and store cassettes
- Off-line lifting bale and upper cassette rotator for easy cleaning and service of cassette
- Patented roll cleaning process to quickly and easily scrub work rolls between coils
- Lateral tilt to compensate for differences in material properties from edge to edge
- AutoFlat® automatic shape control system
- Job and product recipe storage



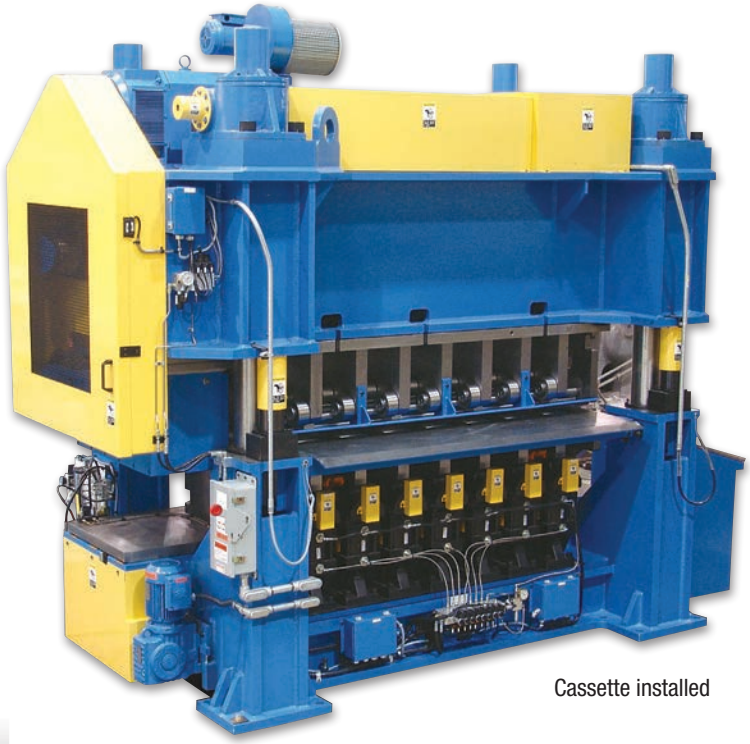
G3DC

DRAWER CASSETTE STYLE LEVELER

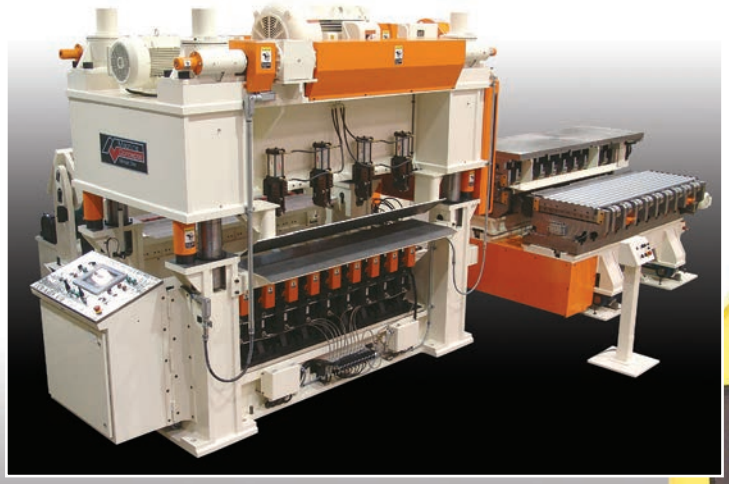
The G3DC leveler provides the ability to easily remove the entire cassette for cleaning, service, exchange, etc. The G3DC requires either a docking station or exchange system to remove the cassette.

Features

- Automatic self-calibration after roll grind or parts replacement
- Automatic setup based on material parameters
- Floating journals reduce journal bearing load for longer life and better roll bend control
- Overload protection via drive load and hydraulic relief
- Automatic journal bearing lube system
- Removable roll cassette for cleaning or changing work rolls. Different diameter cassettes can be exchanged to expand leveler gage range.
- Work roll modules can be quickly removed as sub-assembly for cleaning and service



Cassette installed



Cassette removed from leveler onto docking station

The G3DC allows for easily removing the entire cassette for cleaning, service, exchange and more.

Frame and Roll Sizes

- Frame sizes: 80,000 lb. up to 1,200,000 lb. separating load
- Widths: 48” to 96”
- Roll sizes: 0.875”, 1.3”, 1.5”, 1.75”, 2.25”, 3”, 4”, 5”, 6.5”
- Typical max gage: Approximately .750” for largest roll size depending on width and yield

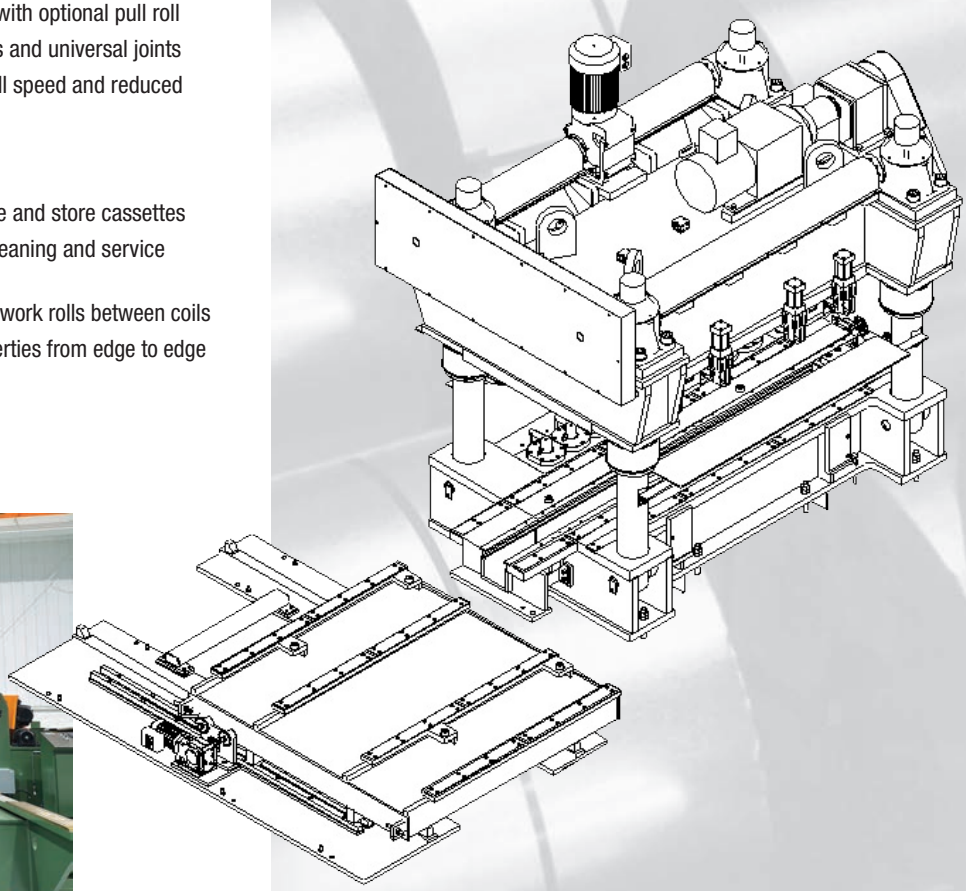
Available Drive Systems

- Pull thru for coil to coil lines
- Pull thru with pull roll after leveler for very light gage CTL applications
- Upper roll assist drive for either coil to coil lines or used with optional pull roll
- All rolls driven via separate upper and lower pinion boxes and universal joints
- Split cluster drive system compensates for differential roll speed and reduced drive stress

Optional Features

- Cassette exchange system or a docking station to receive and store cassettes
- Off-line lifting bale and upper cassette rotator for easy cleaning and service of cassette
- Patented roll cleaning process to quickly and easily scrub work rolls between coils
- Lateral tilt to compensate for differences in material properties from edge to edge
- AutoFlat® automatic shape control system
- Job and product recipe storage

In addition to the standard designs and configurations, Machine Concepts also specializes in custom designed levelers.



G3N

NARROW LIMITED SPACE LEVELER

The G3N is a specialty leveler typically built for existing coil to coil lines where there is limited space available. It is available as either a lift out or slide out design so the leveler can be removed from the line for cleaning and service.

Features

- Automatic self-calibration after roll grind or parts replacement
- Automatic setup based on material parameters
- Floating journals reduce journal bearing load for longer life and better roll bend control
- Overload protection via drive load and hydraulic relief
- Automatic journal bearing lube system
- Hanging bolster design eliminates adjustment backlash and reduces machine deflection
- Open bypass mode lowers lower work rolls and raises upper work rolls. Used for coil to coil applications when leveler is not in use to prevent roll scuffing from strip.
- Work roll modules can be removed as sub-assembly for cleaning and service

Frame and Roll Sizes

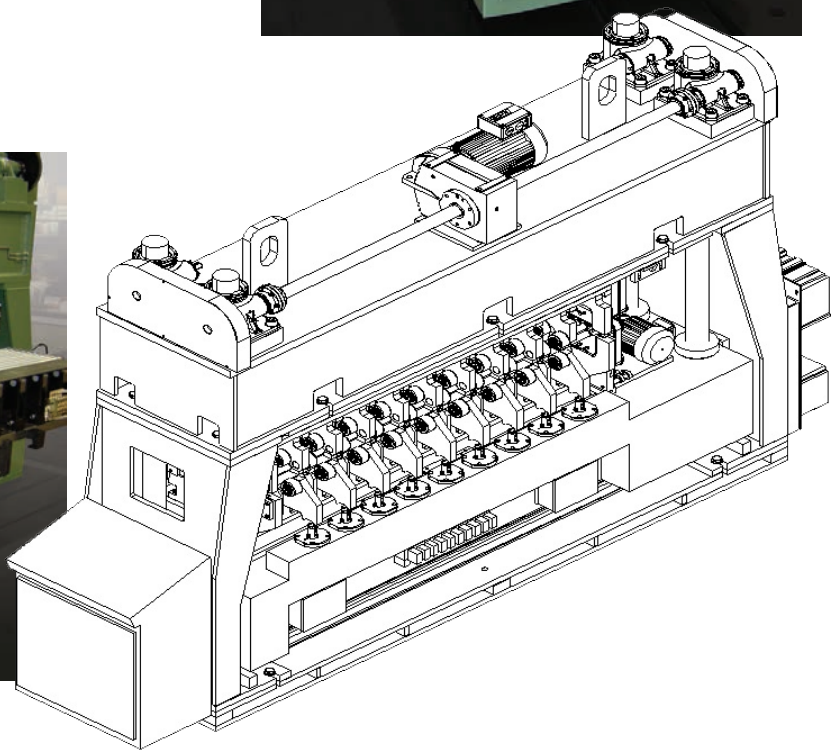
- Frame sizes: 40,000 lb. up to 80,000 lb. separating load
- Widths: 36” to 84”
- Roll sizes: 0.875”, 1.3”, 1.5”, 1.75”
- Typical max gage: Approximately .100” for largest roll size depending on width and yield

Available Drive Systems

- Pull thru only – no drive available

Optional Features

- Slide out cassette after leveler is removed from line
- Off-line lifting bale and upper cassette rotator for easy cleaning and service of cassette
- Patented roll cleaning process to quickly and easily scrub work rolls between coils
- Lateral tilt to compensate for differences in material properties from edge to edge
- AutoFlat® automatic shape control system
- Job and product recipe storage



Machine Concepts has several drive systems available for the Gen III leveler depending on the application.

Pull Through

The simplest drive is actually no drive system at all. A pull through leveler is used in coil to coil applications where downstream equipment, such as bridles or a rewind, supply the strip tension to pull the strip through the leveler.

Upper Roll Assist Drive

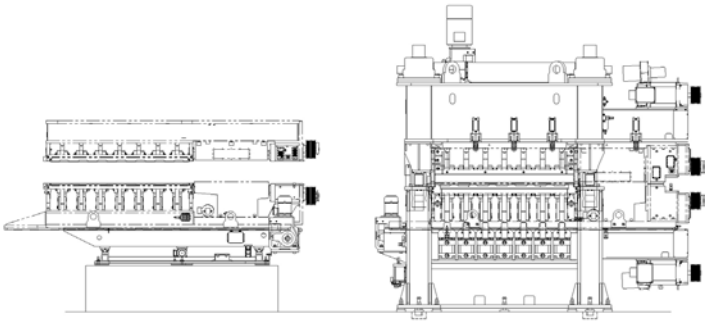
It is common to have just the upper rolls only driven as an assist drive. This is used quite often in coil to coil applications when there is insufficient strip tension to pull the strip through. The assist drive pinion box is designed with the output shafts on the same centers as the work rolls. This feature eliminates universal joint drive shafts resulting in less maintenance. The upper roll assist drive can also be used with the optional pull roll after the leveler.

All Rolls Driven Via Pinion Box

The all rolls driven is the traditional pinion box with an output for each leveler work roll and input driven by one motor. The outputs are coupled to the work rolls via universal drive shafts. While cost effective, this drive system does have some limitations and is recommended to be used on lightly loaded applications.

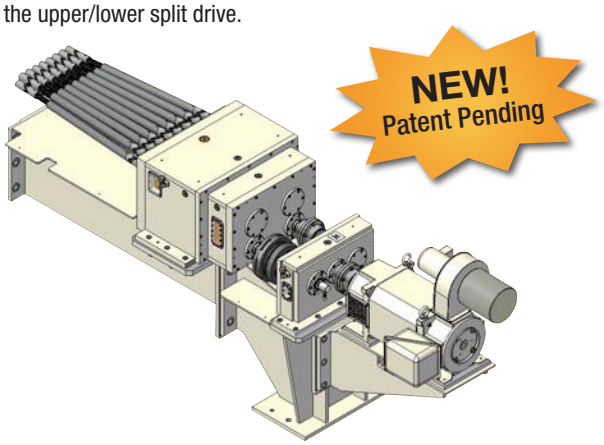
Upper / Lower Split Drive

The upper / lower split drive is used with removable cassette applications so the upper half of the cassette can be removed from the lower half of the cassette without disconnecting all the drive shafts. A pinion box is part of each cassette half. Different roll sized cassettes each have their own pinion boxes. The upper / lower split drive is also used for the patented roll cleaning system operation when all rolls are driven.



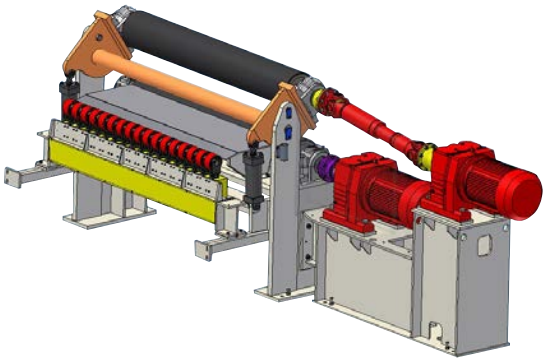
DRS Comp (Split Cluster) Drive System

Each work roll drive pinion box has independent entry and exit cluster inputs. The entry and exit inputs are driven by a single motor with variable torque control on the entry cluster input. By controlling entry cluster input torque, the system distributes drive torque equally between entry and exit clusters. This drive system compensates for “differential roll speed” (DRS) between entry and exit clusters caused by deeper entry roll plunge. The benefits include greatly reduced internal torque windup and generates tension between the clusters, which improves the leveling process. The DRS Comp Drive is available with the standard “all rolls driven” pinion box as well as the upper/lower split drive.



Pull Roll After the Leveler

A pull roll located after the leveler is used for several applications. One is to assist driving material thru the leveler when the work roll drive system is near maximum capacity. The pull roll can be used to pull very light gages thru a pull thru leveler therefore eliminating the work roll drive system. And the pull roll is used for the patented AutoFlat® system to generate the tension zone for the shape sensors to read shape. The pull rolls are available with different roll coverings depending on the application with either the lower or both rolls driven. The design uses a rigid assembly with an equalizer to maintain parallelism and adjustable pinch pressure.

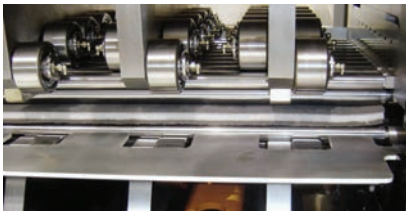


Gen III Leveler Options

Patented Roll Cleaning System

Available on Any Style Gen III Leveler

The roll cleaning system is a patented cleaning process designed to quickly and easily clean the work rolls. The procedure is to insert a scotch bright cleaning pad assembly. Then a pushbutton roll clean start will close the leveler to a preset position and scrub the rolls in a back and forth function. Upper and lower rolls run in opposite directions to prevent driving the scotch bright pad out of the leveler. The leveler opens when cleaning is complete.



Intermediate Rolls

Available on Any Style Gen III Leveler

Intermediate rolls are available in 5 high and 6 high configurations, and are used for surface critical materials to reduce witness striping from backup bearings.

Chrome Work Rolls

Available on Any Style Gen III Leveler

Flash chrome plating increases surface hardness and reduces adhesion of contaminates, such as oxide pickup, on the roll surface.

Blank Center Speed Control with Laser Loop Sensor

Available on Any Driven Gen III Leveler

The blank center speed control monitors the press or shear stroke rate and calculates the required speed for the leveler. The operator can adjust the loop fill and the laser sensor is used to maintain the loop position.

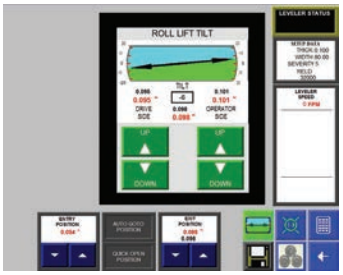
High Speed Lift

Available on Any Style Gen III Leveler

The high speed lift provides rapid open and close. This option is typically only required for continuous operation coil to coil lines to pass a stitch through with minimal unprocessed material.

Lateral Tilt

Available on Any Style Gen III Leveler

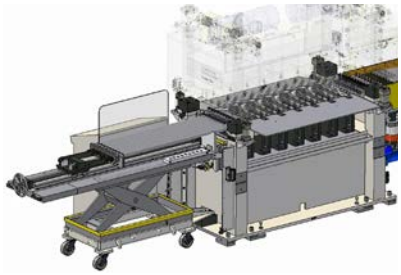


Incoming strip can have slightly different properties on one edge as compared to the other edge, such as slight differences in thickness, variations in yield strength, or even camber. These irregularities can cause the process to be slightly different on one side versus the other. The crown lateral tilt provides the ability to make minor adjustments to the exit penetration independently from side to side. This is useful to correct one edge curl on sheets when the material properties differ from one edge of the strip to the other.

Work Roll Removal Cart

Available on G3B Leveler Only

The work roll removal cart is used with the basic leveler to extract and install the work roll modules for cleaning and maintenance. The free-wheeling cart has a hydraulic lift function to line up with either upper or lower work rolls. A hand crank mechanism is used to extract/install the work roll module.



Upper Cassette Clamps

Available on the G3DC or G3CC Cassette Style Leveler

The standard method of clamping the upper cassette into the leveler is with bolts. This option replaces the bolts with cassette locking clamps, reduces time to exchange cassettes and eliminates the need for the operator to enter the line.

Cassette Exchange System

Available on the G3DC or G3CC Cassette Style Leveler

The cassette exchange system is used to swap cassettes in the leveler and store the unused cassette. The unit consists of a base frame with a two position sliding storage rack. The rack traverse and cassette traverse are powered functions and pushbutton controlled.

Lifting Bail & Upper Cassette Rotator

Available on the G3DC or G3CC Cassette Style Leveler

The lifting bail is used to lift the upper half of the cassette off the lower half when the cassette is out of the leveler. The base unit provides 180° upper cassette rotation for cleaning and servicing upper work rolls and backup rails.

Machine Concepts AutoFlat® System

Machine Concepts patented and proven AutoFlat® system takes automation to the next level.

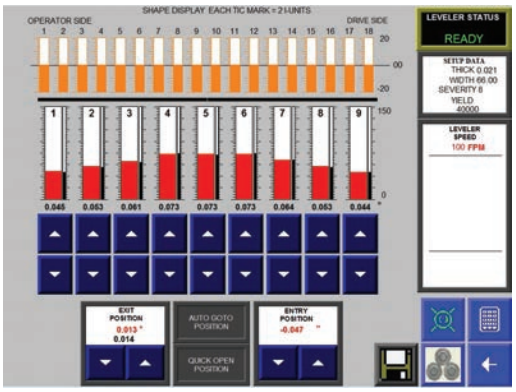
The AutoFlat system reads the shape of the strip as it leaves the leveler and by closed loop control automatically adjusts roll bending to achieve and maintain a flat strip. The AutoFlat system relieves the operator from adjusting the roll bending on the leveler.

The system works on the fly with the strip under tension and provides a dynamic readout of strip shape. AutoFlat will seek the correct flight positions automatically and dynamically controls work roll bending even when the incoming strip changes shape.

It has been proven that shape is most accurately read under tension. Unlike other systems that use lasers, AutoFlat is unique in that it is the only system that can truly do this on a leveler application.

Machine Concepts recently developed a high resolution sensor for the AutoFlat system that doubles the resolution on strip edges.

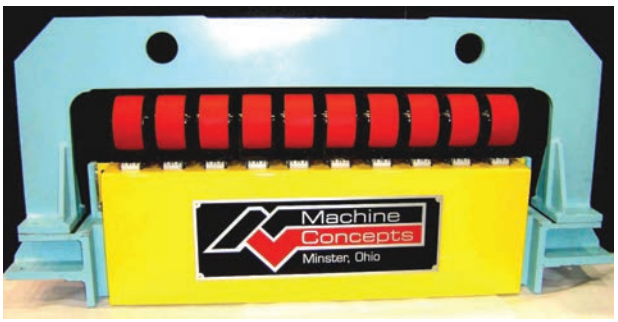
NEW! Patent Pending

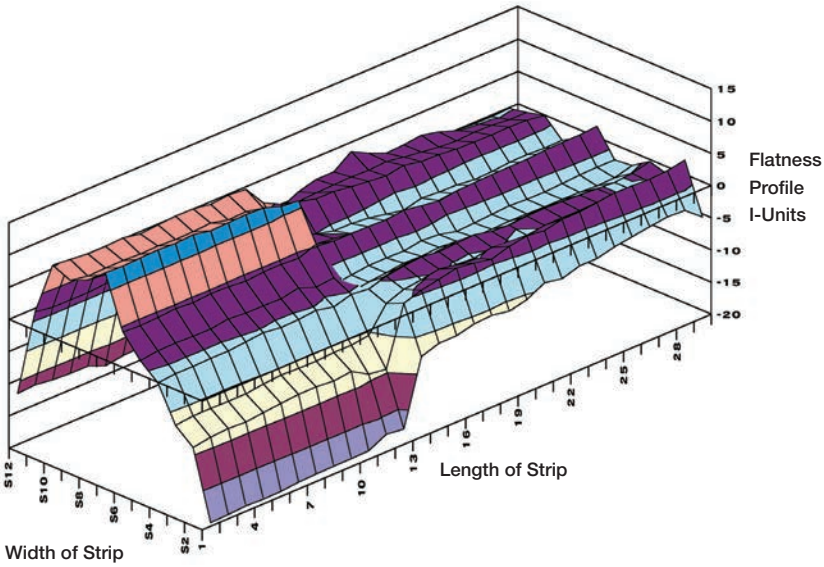


Main Screen with Shape Display

AutoFlat® System Features

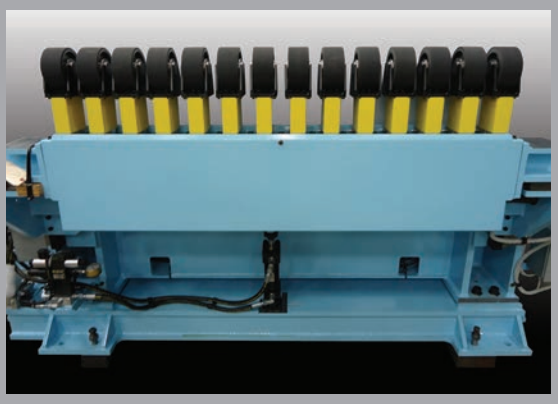
- Shape sensing rolls integrated onto the leveler
- Lift mechanism used to retract the shape sensors
- System controller and proprietary software
- Real-time dynamic readout of outgoing material shape
- Closed loop control provides automatic roll bending by monitoring exit strip shape
- Pull roll after the leveler to provide tension zone for loop lines
- Two types of shape measurement systems available: air bearing sensor or displacement sensor





Manual Leveling (1-14) vs. Automatic Leveling (14-30)

Test data collected from actual production machine



Precision Roll Services

New work rolls, intermediate rolls and repair/ reconditioning services for multi-roll levelers, tension levelers and straighteners

Machine Concepts recognizes the need for work roll replacement and/or reconditioning with fast turnaround to minimize downtime. We have highly trained personnel with thorough knowledge of work roll design utilizing high-end equipment for all your precision roll service needs.

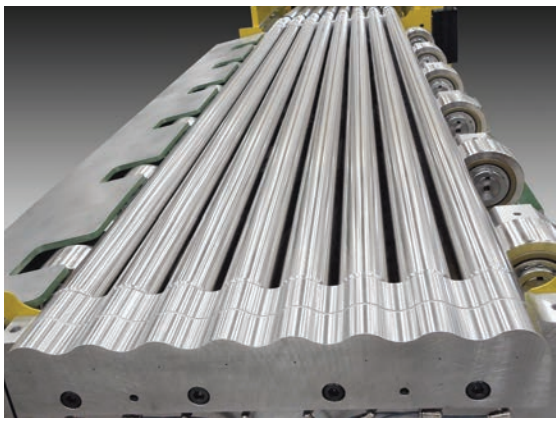
New Rolls

- Extensive experience in work roll design – based on customer parameters or reverse engineering of customer supplied rolls
- High-performance rolls with enhanced durability and longevity
- Suitable for a wide range of machines and applications, such as work rolls and intermediate rolls
- Various finishes available including micro finish and chrome plating
- Precise tolerances are held to customer's satisfaction
- Wide range of roll sizes available

Roll Reconditioning

- Capability to recondition rolls back to original specifications, including:
  - Repair damaged roll ends
  - Straighten bent rolls
  - Regrind and finish worn rolls
- Extend roll service life reducing downtime and maintenance costs
- Inspection reports and documentation – pre and post repair
- Full service support as needed
- Emergency roll repair service

Reconditioned back up and individual rolls



Rebuilt cassette module

Rebuilt back up bearing assemblies

Machine Concepts

Designers & Builders of Innovative Metal Processing Equipment

Machine Concepts Inc. modern engineering and manufacturing facility

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