



WHY YOU NEED PILOT CELL ASSEMBLY LINE

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Digatron Systems

A PILOT LINE...

- Increases manufacturing quality and consistency
- Provides consistent assemblies of cells through automation and eliminates variations due of cells made by different people.
- Increases automation and provides consistency while minimizing or eliminating manual assembly.
- Increases throughput compared to manual cell assembly and provides certainty in throughput
- Enables customers to provide larger sample lots of larger / standard sized cells to their customers
- Enables “small” production run of high margin low volume cells for specific applicaitons.
- Enables acceleration of design validation process (avoid valley of death)
- Evaluate different chemistries with minimal process changes



AGENDA

- Digatron Overview
- Pouch Cell Assembly
- Cylindrical Cell Assembly
- Finishing & Forming
- Automated Formation & Aging



DIGATRON OVERVIEW

DIGATRON HISTORY

Digatron Power Electronics

- Developing and manufacturing battery test and formation equipment for over 50 years
- First installation shown here at Varta in Hannover, Germany in 1969.
- Have offices in USA, Germany, China, and India

Digatron Systems

- New division for cell assembly equipment
- Added new team and office in Italy last year



EQUIPMENT FOR LITHIUM CELL AND BATTERY MODULE ASSEMBLY



CELL PROTOTYPING, PILOT PRODUCTION EQUIPMENT

- Single station machines for pouch and cylindrical cell pilot manufacturing
- Integrated automatic assembly lines for pouch and cylindrical cell production



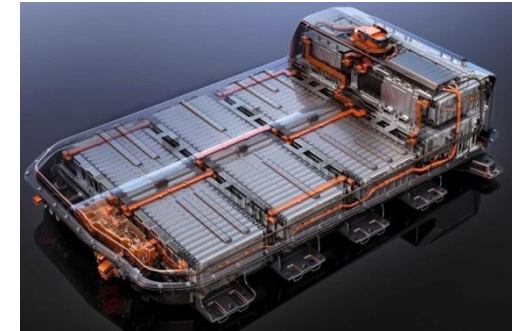
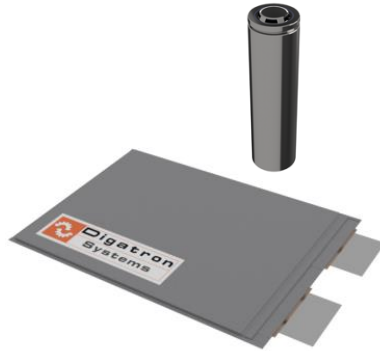
MASS PRODUCTION EQUIPMENT

- Formation and aging automated plant
- Production line for module assembly



SUPPORT

- Commissioning
- Spare parts service
- Free hotline
- Training courses
- Repairs



ELECTRODE PREPARATION

CELL ASSEMBLING

CELL FINISHING

MODULE ASSEMBLING

PACK ASSEMBLING

ELECTRODE PREPARATION

- MIXING
- COATING
- DRYING
- CALENDERING
- SLITTING

POUCH & CYLINDRICAL CELL ASSEMBLING

- ELECTRODE CUTTING
- CELL STACKING/WINDING
- TAB WELDING
- POUCH FORMING
- CAN GROOVING
- CELL FILLING
- CELL SEALING

CELL FINISHING

- SOAKING
- FORMATION
- AGING
- DEGASSING
- OCV TEST
- IR TEST
- GRADING
- SORTING

MODULE ASSEMBLING

- CELL SORTING
- CELL STACKING
- TAB BENDING
- BUS BAR SET & WELDING
- BMS SETTING
- COVER SETTING
- EOL AUTOMATION

PACK ASSEMBLING

- MODULES SORTING AND POSITION
- MODULES FIX
- ELECTRIC & THERMIC INTEGRATION
- IN LINE QC TEST
- END PLATE & LEAK TESTING
- CHARGING & FLASHING
- EOL AUTOMATION

POUCH CELL ASSEMBLY

POUCH CELL ASSEMBLY

- Digatron Systems' pouch cell pilot assembly line includes a complete series of stations, from electrode cutting and cell stacking to cell sealing, filling and degassing.
- Different cell sizes can be manufactured with the same line by switching the tooling.
- The typical throughput of the pilot cell manufacturing is affected by factors such as cell dimension, capacity, and number of machine operators.



ELECTRODE
CUTTING

CELL
STACKING

TAB
WELDING

POUCH
FORMING

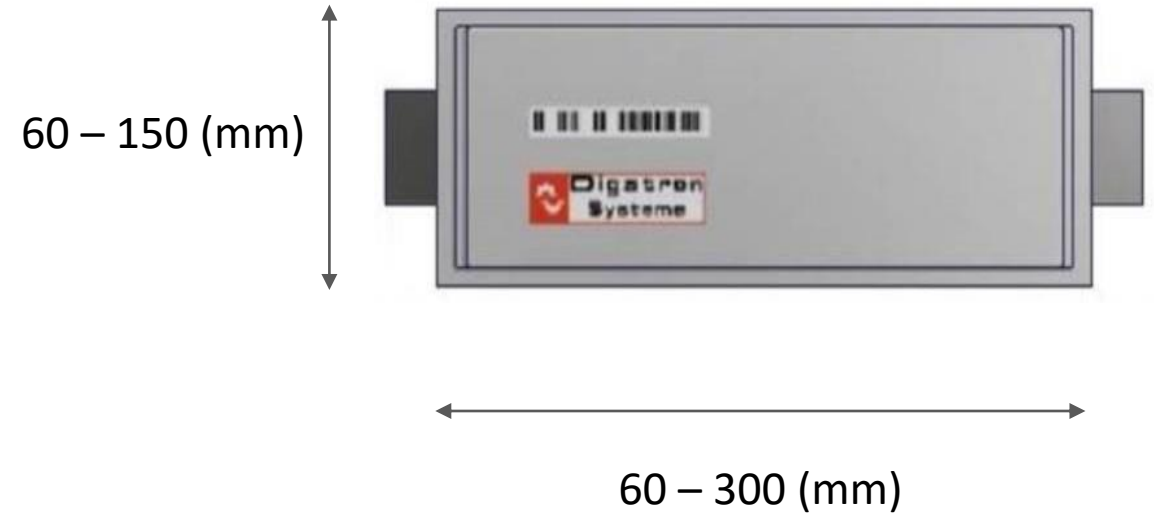
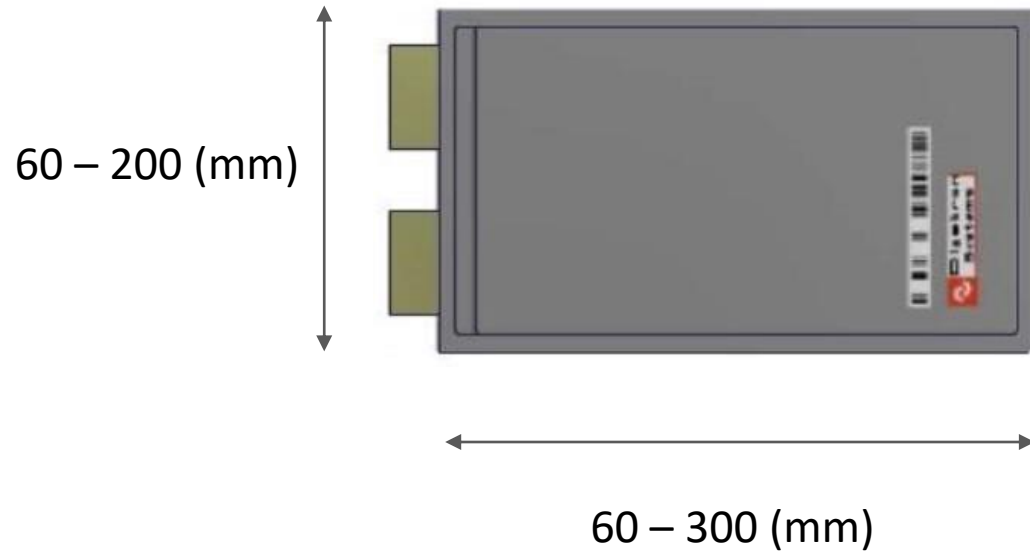
CELL
SEALING

CELL
FILLING

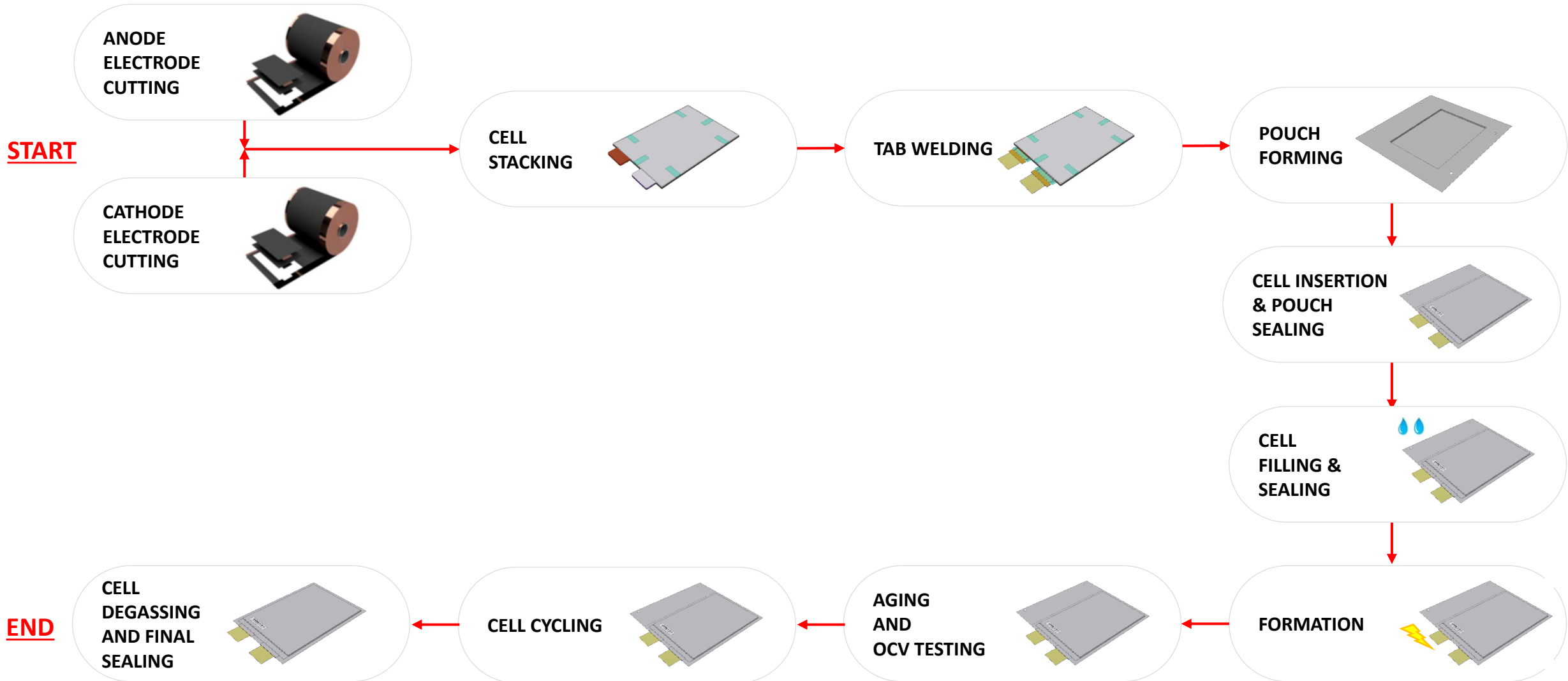
POUCH CELL ASSEMBLING

Digatron Systems Confidential Proprietary

POUCH CELL DIMENSIONS



LITHIUM POUCH CELL ASSEMBLY PROCESS FLOW



ELECTRODE CUTTING



Digatron Systems ECU, electrode cutting unit, is an automatic electrode die cutting machine designed to punch electrodes from coated aluminium and copper rolls.

CELL Z.FOLD STACKING



Digatron Systems ZSU, Z.Fold stacking unit, is an automatic electrode stacking and separator folding machine.

CELL SHEET STACKING



Digatron Systems SSU, sheet by sheet stacking unit, is an automatic electrode stacking and separator folding machine.

TAB WELDING



Digatron Systems TWU, tab welding unit, is an automatic electrode current collector trimming and ultrasonic tab welding machine.

POUCH FORMING



Digatron Systems PFU, pouch forming unit, is an automatic pouch film cold-forming machine.

POUCH SEALING



Digatron Systems PSU, pouch sealing unit, is an automatic pouch cell heat sealing machine.

CELL FILLING



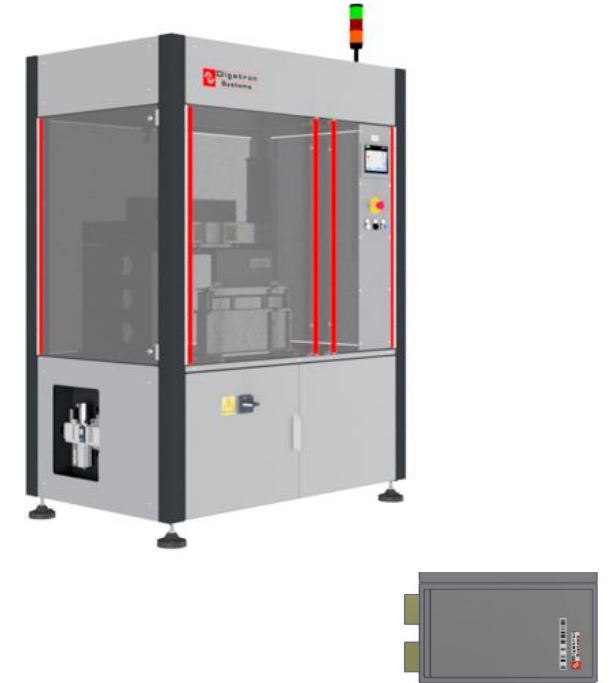
Digatron Systems CFU, cell filling unit, is an automatic pouch cell filling and vacuum-sealing machine.

CELL FILLING EX (GLOVE BOX)



Digatron Systems CFU EX, is an automatic pouch cell filling and degassing machine with glove box.

CELL DEGASSING



Digatron Systems CDU, cell degassing unit, is an automatic pouch cell degassing and vacuum-sealing machine.

ELECTRODE CUTTING

CELL STACKING

TAB WELDING

POUCH FORMING

CELL SEALING

CELL FILL/DEGASS

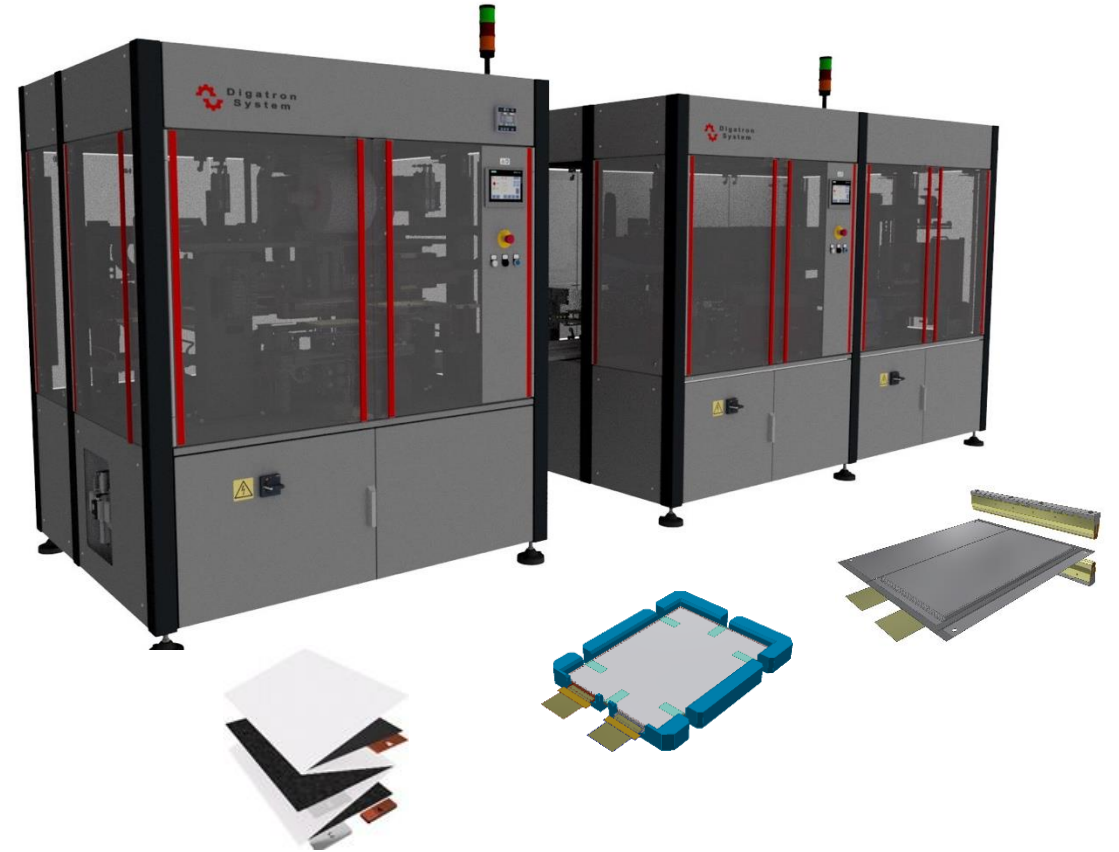
POUCH CELL ASSEMBLING

AUTOMATED CELL ASSEMBLY LINE

Digatron Systems SWS 300, is an automatic integrated pouch cell assembly line. By integrating three processes and automating component handling, production throughput, cell consistency and quality is increased and improved, while reducing manufacturing cost.

LINE CONFIGURATION

- Cell Z.fold stacking unit (ZSU) or cell sheet stacking unit (SSU)
- Tab welding unit and Current collector trimming unit (TWU)
- Pouch cell sealing unit (PSU)
- Automated cell component handling systems



ELECTRODE
CUTTING

CELL
STACKING

TAB
WELDING

POUCH
FORMING

CELL
SEALING

CELL
FILLING

POUCH CELL ASSEMBLING

CYLINDRICAL CELL ASSEMBLY

CYLINDRICAL CELL ASSEMBLY

- Digatron Systems' cylindrical cell pilot assembly line includes a complete series of stations, from electrode cutting and cell winding toward tabs welding, cell filling and sealing.
- Different cell sizes can be manufactured with the same line by switching the tooling.
- The typical throughput of the pilot cell manufacturing line depends on cell size, capacity, number of machine operators, etc.



ELECTRODE
CUTTING

TAB
WELDING

CELL
WINDING

- TAB/CAN
WELDING

CELL CAN
GROOVING

+TAB/CAP
WELDING

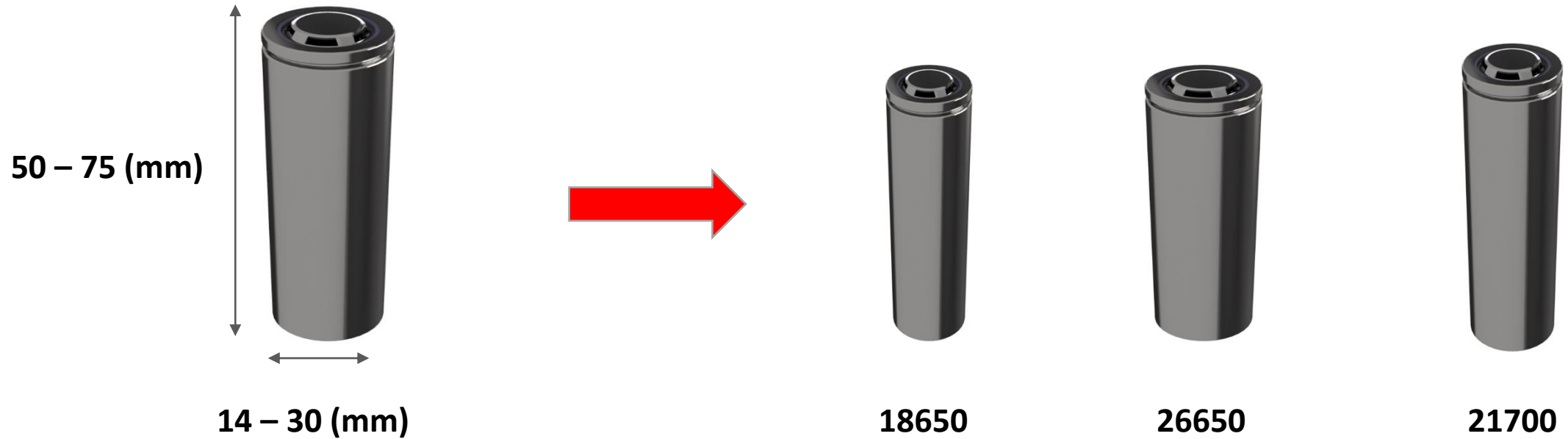
CELL FILLING

CELL SEALING

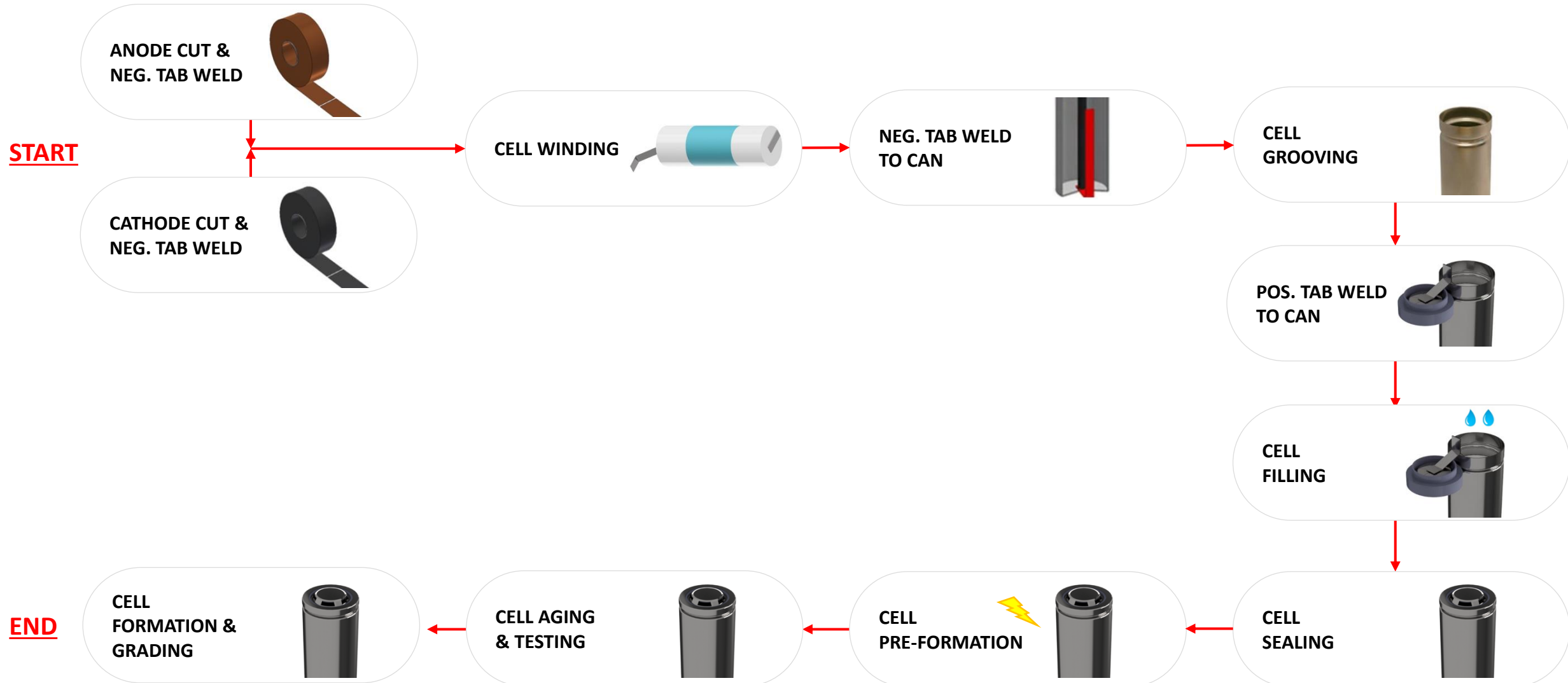
CYLINDRICAL CELL ASSEMBLING

Digatron Systems Confidential Proprietary

CYLINDRICAL CELL DIMENSIONS



LITHIUM CYLINDRICAL CELL ASSEMBLY PROCESS FLOW



ELECTRODE CUTTING & TAB WELDING



Digatron Systems ECW 225 is a semi-automatic electrode cutting machine designed to cut electrode strips from coated reels and to weld the tabs onto the electrode or foil uncoated area.

Two separate electrode beds help to prevent cross-contamination between anode and cathode materials.

Electrode strips can be cut into several lengths to allow different jelly roll diameters.

One or two ultrasonic welding systems to weld the current collector tabs to the uncoated foil portion of the electrodes.

CELL WINDING



Digatron Systems CPW 226, Cell Pilot Winder, is an automatic cell winding machine.

The winding machine has separate Anode and Cathode adjustable beds with a built-in vacuum guiding system, designed to keep the electrodes in place during winding.

There are two independent separator spools, with an automatic edge position control unit, dedicated independent tensioning and cutting system.

Automatic jellyroll sealing with tape and automatic ejection from the winding mandrel into a buffer container.



TAB WELDING & CELL GROOVING



Digatron Systems CGW, is automated and designed to perform three production steps within the cylindrical cell manufacturing process:

- Station 1: Negative tab welding to the cell can
- Station 2: Cell can grooving
- Station 3: Positive tab welding to the cap assembly

Each station is independent and can be operated individually or simultaneously, in batches of 6 cells per cycle.

CELL FILLING & SEALING



Digatron Systems CFS, is automated and designed to perform the last two production steps of the cylindrical cell manufacturing process:

- Station 1: filling of cells under vacuum
- Station 2: cell sealing by means of mechanical progressive compression of the cell rim onto the cell cap.

Each station is independent and can be operated individually or simultaneously, in batches of 6 cells per cycle.

FORMING & FINISHING

FORMATION AND FINISHING

Digatron Systems' pilot finishing line includes a complete series of machines for formation and temperature-controlled aging of pouch, cylindrical, and prismatic cells.



CELL
FORMATION

CELL
DEGASSING

CELL
AGING

CELL FINISHING

LFU – LAB FORMATION UNIT

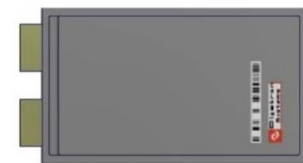
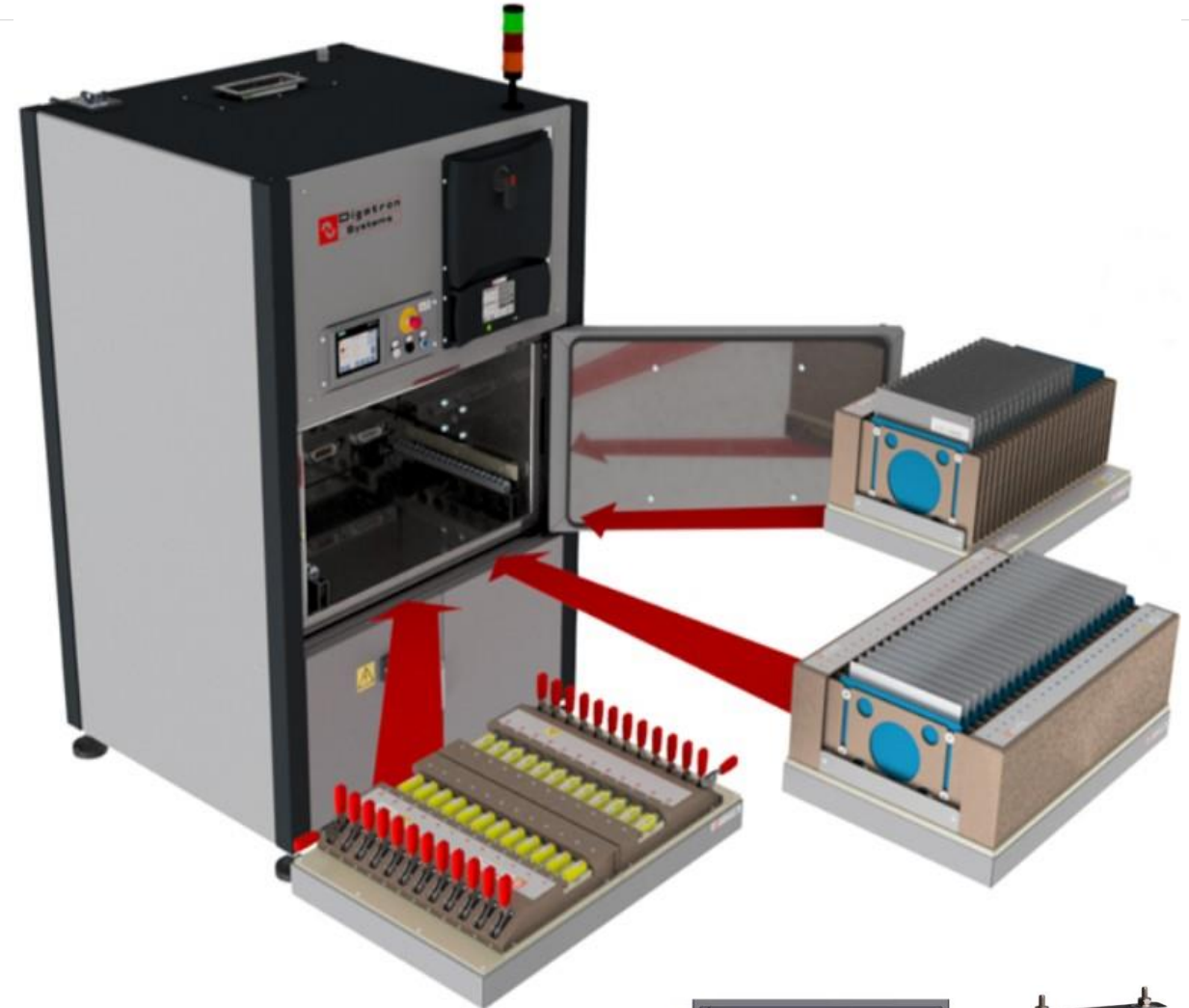
Digatron Systems LFU, Lab Formation Unit, is an automatic cell formation machine.

Powered by our latest design of our regenerative power electronics formation hardware, the machine is designed to form cells at controlled current, voltage, and temperature. The formation cycle is fully automatic.

The operator manually loads and unloads the trays containing the cells. This unit can be equipped with different types of cartridges, suitable to process different types of cells, such as pouch, cylindrical, and prismatic.

Special pneumatically operated cartridges are available for compressing the cells during formation.

LFU can be equipped with optional safety components such as smoke detectors, inert gas injection systems, and other options.



AVU – LAB AGING UNIT

Digatron Systems AVU, cell Aging Unit, is an automatic pouch cell aging equipment.

The machine is designed to age lithium cells at controlled temperature.

The aging cycle is fully automatic.

The operator manually loads and unloads the cartridges containing the cells.

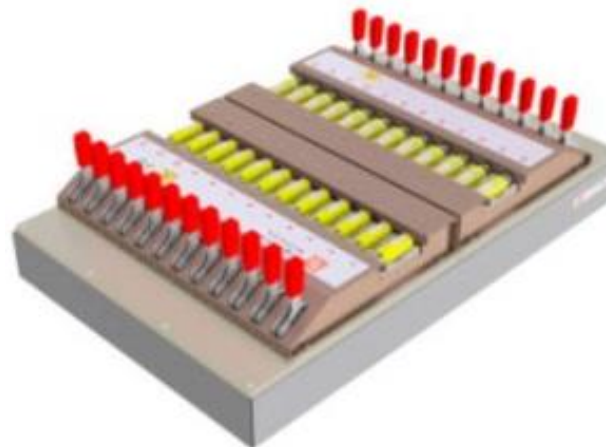
This unit can be equipped with several type of cartridges, suitable to process different type of cells, such as pouch, cylindrical and hard case prismatic.

LFU can be equipped with optional safety components such as smoke detectors, inert gas injection systems, and other options.



FORMATION AND AGING CARTRIDGES

- Each cartridge can hold up to 24 cells.
- Cartridges have four point DC connections and optional thermocouples built in.
- Cartridges have blind mate connectors for plug and play connection into the formation or aging unit.
- Pouch cell contact is provided our proprietary conductive flexible plate mechanism. Optional compressions plates can be added to ensure cells are under constant pressure during formation.
- Cylindrical cell contact is provided by spring-loaded pins



CELL
FORMATION

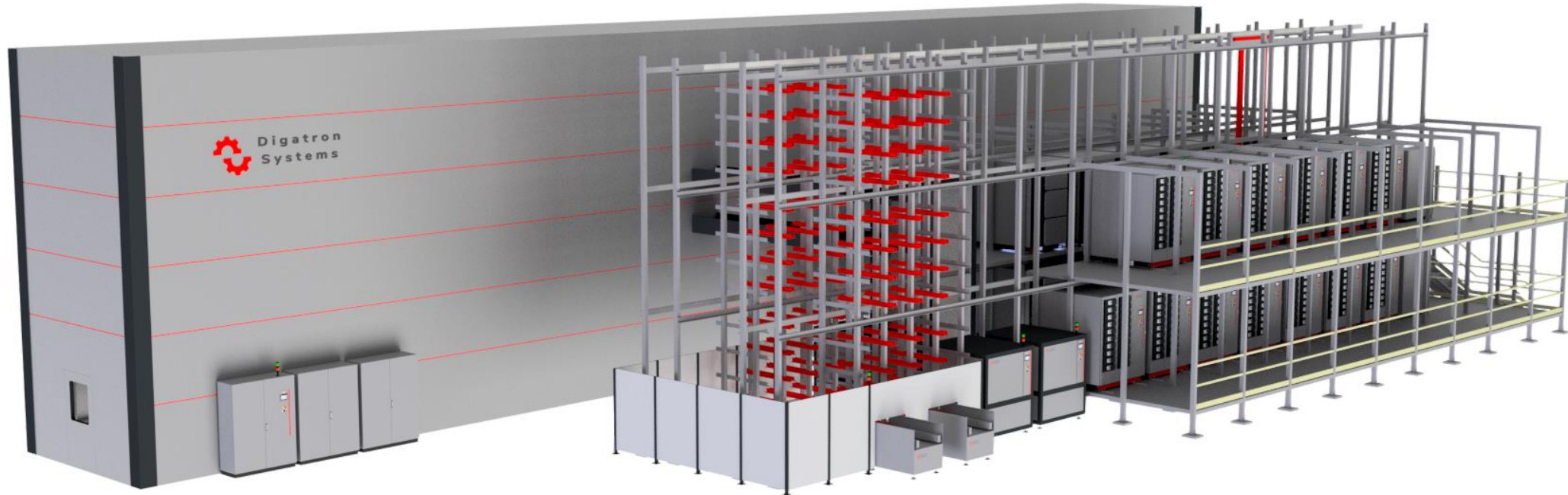
CELL
DEGASSING

CELL
AGING

CELL FINISHING

LARGE SCALE FORMATION & AGING

FORMATION AND AGING AUTOMATED PLANTS



Turn-key production plant for complete formation, aging and finishing process of Pouch, Cylindrical and Prismatic lithium cells

- Soaking
- Formation
- Temperature aging towers
- Degassing
- DC IR - AC IR test
- OVC test
- Grading
- Sorting

CELL FORMATION

CELL DEGASSING

CELL AGING

CELL FINISHING

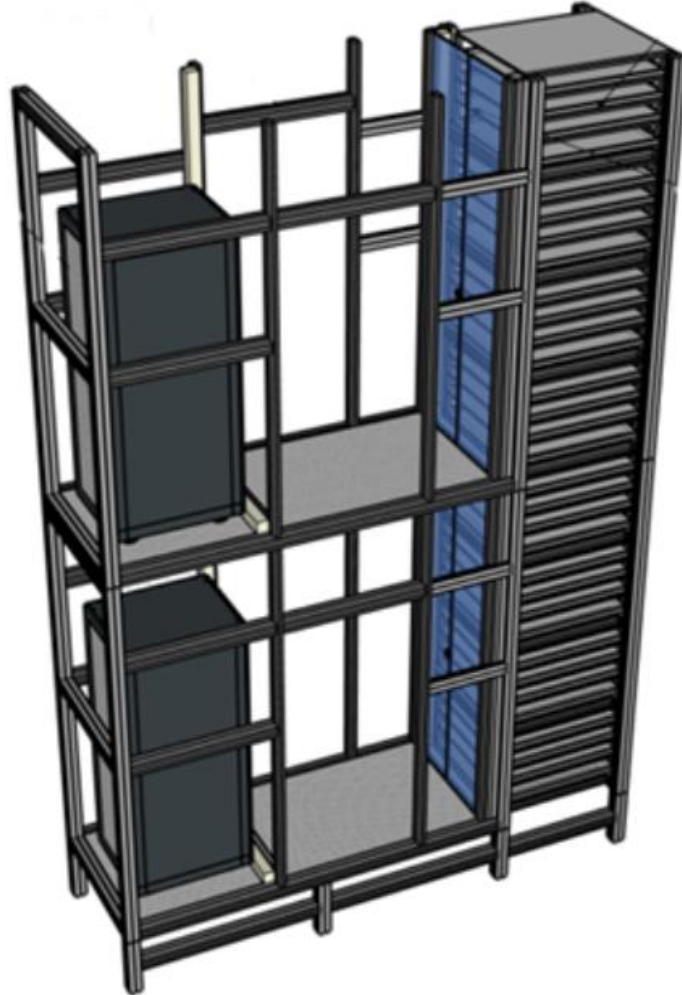
FORMATION AND AGING AUTOMATED TOWERS



MODULAR FORMATION TOWERS

- Temperature controlled or ambient temperature formation, aging, grading, OCV and IR test modules
- Flexible modular finishing line configuration
- Customized cell trays
- Automatic air flow control
- Automatic calibration system
- Automatic safety features
- Formation modules are regenerative and may reduce operating costs by reusing the cell discharge energy. This energy can be used to charge other cells or directed to the AC grid.

AUTOMATED FORMATION AND AGING TOWERS **LARGE SCALE FORMATION 40 A – POUCH CELLS**



**ANY QUESTIONS ?
PLEASE CONTACT US :**



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