MPI Bench for Turbine Blades

Model DF B 100 AL B TR — Magnetic particle inspection, wet fluorescent method

NDT Supply.com, Inc.
7952 Nieman Road
Lenexa, KS 66214-1560 USA
Phone: (913)-685-0675
Email: sales@ndtsupply.com



Why a Dedicated Blade Bench

Blade geometry sets the requirements: variable sections, difficult pole contact, defects in any orientation.

- Surface and near-surface cracks must be detected on safety-critical ferromagnetic parts
- A standard bench lacks multi-axis magnetization, orientable contact heads and cycle recording
- The bench must adapt to the part, not the opposite



Example of a part inspected on this bench

DeltaFlux

The DF B 100 AL B TR Bench

Modular bench for wet fluorescent MPI on turbine blades — circular and longitudinal magnetization on one machine. Adjacent conductor option is available for smaller blades.

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Product Model

DF BD 100 AL TR

MPI bench for turbine blades — wet fluorescent method

Modular Aluminium Structure

Limits residual magnetic field on the structure itself.

Stainless Steel Tanks

Recovery tank plus containment and recirculation tank, placed in a separate area.

Recorded Parameters

Current, demagnetization, UV value and residual field logged on Delta Screen for each cycle.

Wide Blade Range

Tilting poles and movable coil cover a broad range of blade types and lengths.



Complete MPI bench — DF B 100 AL B TR



Turbine blade loaded between the contact poles

Poles, Contacts and Clamping

Both poles are orientable and pneumatically operated, with digital pressure adjustment.

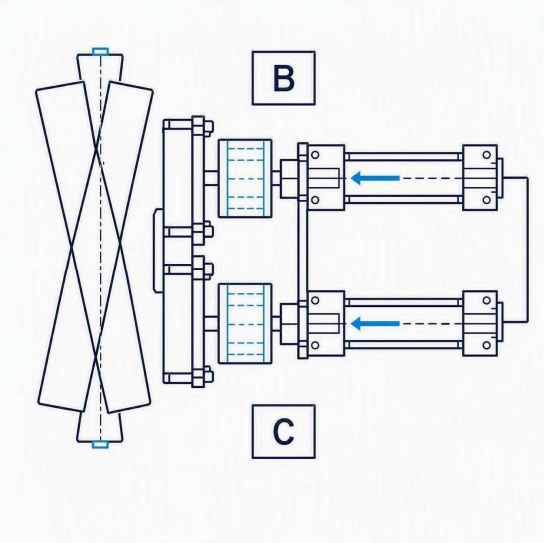
Tilting system
To follow the blade surface, keeping electrical contact on irregular profiles.

Contact Heads
Tinned copper braid, current delivered: even distribution, less arcing.

Pneumatic Clamping
Digitally adjustable closing pressure, repeated identically on every part.

One-Touch Set-Up
Clamping and contact no longer depend on the operator: the cycle is repeated automatically.

Tilting system — contact compensation on the blade between poles B and C



Source: offer PC 4345-16 M Rev.1

Coil, Rotation and Irroration

Motorised 5-turn coil: automatic travel, part rotation and irroration in one cycle.

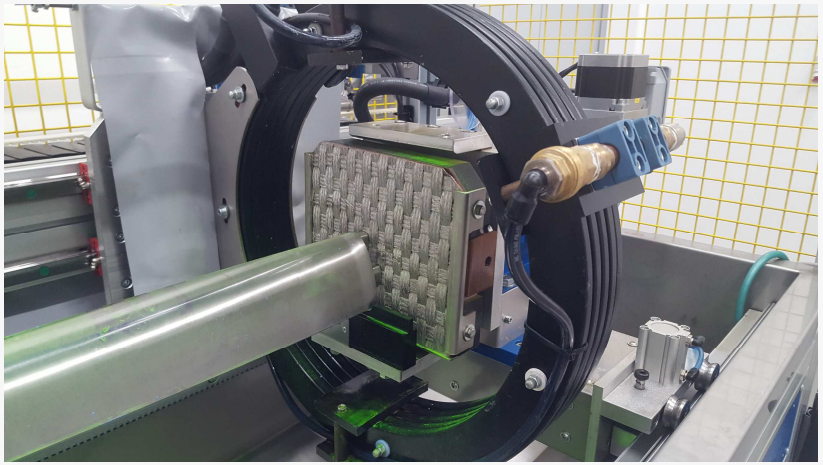
Movable 5-Turn Coil
The coil travels automatically from one pole to the other, covering the full blade length.

Automatic Part Rotation
The part rotates between the poles during the cycle: all surfaces exposed without unclamping.

Coil-Integrated Nozzles
Nozzles fitted on the coil apply the fluorescent suspension automatically and uniformly.

Recipe-Driven Cycle
Coil travel, rotation and irroration times are stored per part type and repeated identically.

Multi-turn coil travelling from pole to pole



Source: offer PC 4345-16 M Rev.1

Magnetization Methods

Circular, longitudinal and adjacent conductor — AC or FW DC single phase, to UNI EN ISO 9934.

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Circular Magnetization

- **Current type:** AC / FW DC single phase
- **Cycles:** A-B / A-C / B-C, current passed directly through the part
- Measured with probe, to customer specification

Current: supplied: **4.000 Ampere**

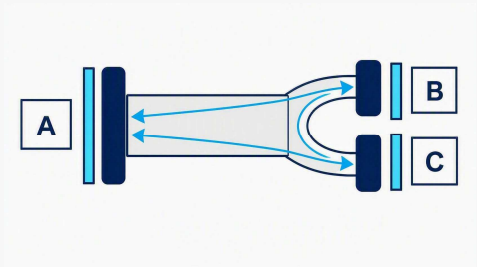
Longitudinal Magnetization

- **Current type:** AC / FW DC single phase
- **Multi-turn coil,** automatically movable from one pole to the other

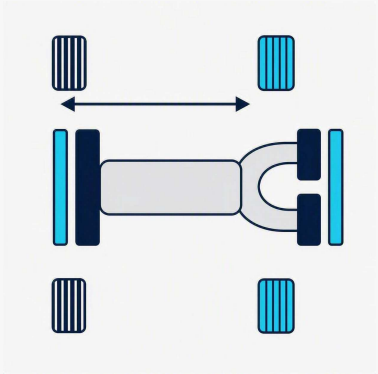
Field strength: **4.000 Ampere**

Adjacent Conductor

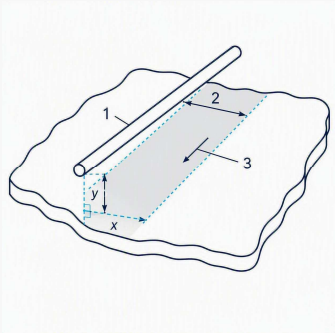
- **Delrin flat support** + copper bar as adjacent conductor
- For small parts or thin sections at the contact points
- Gives circular magnetization without direct pole contact



Circular magnetization: current through the part, A-B / A-C / B-C



Longitudinal magnetization: multi-turn coil travelling from pole to pole



Adjacent conductor: copper bar, no direct pole contact

48 V socket on board: for an AC/DC electromagnetic yoke, used on parts that are difficult to magnetize.

Demagnetization

AC and DC with cyclical decreasing cycle, on both magnetization axes.

1 **DC Decreasing Ramp**
Cycles and times set by the operator for each part type.

2 **Both Axes**
Performed in both directions — **circular** (direct current pass) and **longitudinal** (flux pass).

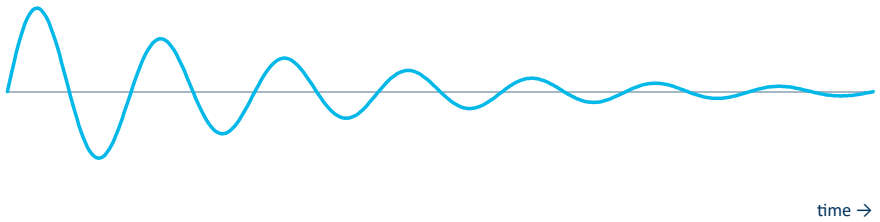
Additional AC cycle — can be added when the standard ramp does not reach the required value.

Recorded on Delta Screen II — residual field value written into the report of each cycle.

Stored in the recipe — number of cycles and timing saved per part type.

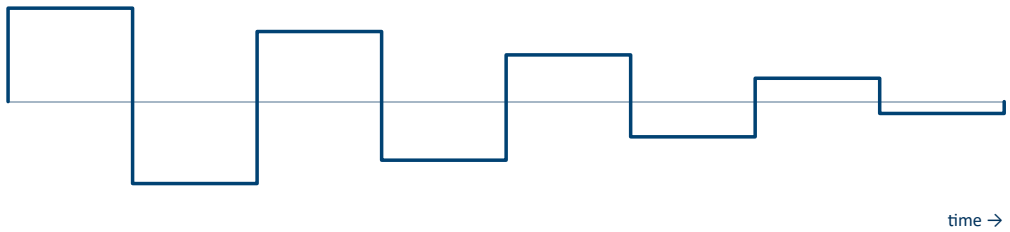
AC Demagnetization Ramp

Alternating field with progressively decaying amplitude



DC Demagnetization Ramp

Polarity reversals with decreasing amplitude, step by step



DeltaFlux

Part Rotation and Irroration

Electrically controlled rotating poles and two irroration modes, manual and automatic.

Electrically Adjustable

Rotating Poles 360°

At the end of the magnetization cycle the part rotates to let the operator view all surfaces without unclamping.

Operator-Directed

Manual Irroration

Hand nozzle for targeted application on specific zones.

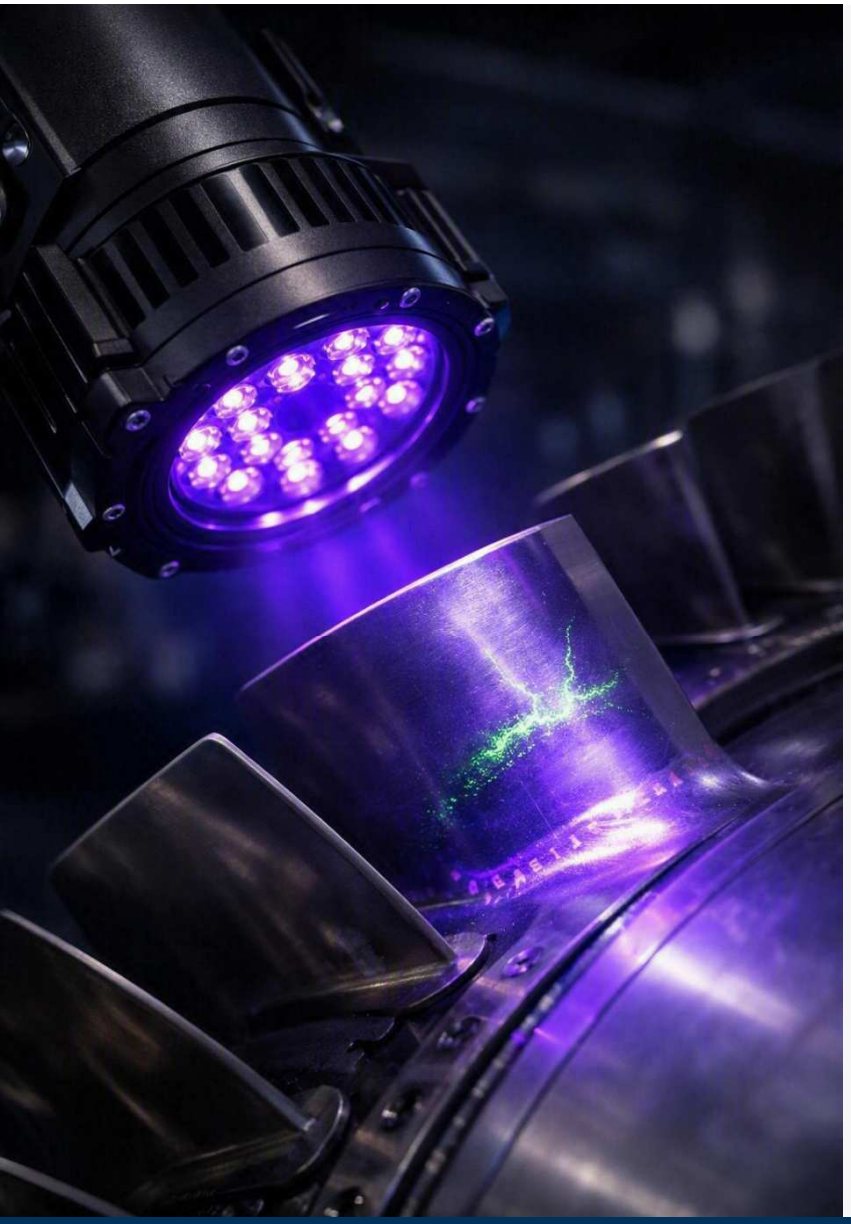
Coil-Integrated Nozzles

Automatic Irroration

Nozzles fitted on the coil give uniform coverage during the cycle.

Both Modes in One Recipe

Manual and automatic irroration can be combined in the same inspection programme.



UV Inspection

UV Inspection

Latest-generation UV LED lamps on a guided support moving longitudinally and transversally.

- **Manual or Overhead UV LED lamps of the latest generation**
- **Guided support with longitudinal and transversal movement — the lamp reaches any point without moving the part (for Overhead lamps)**
- **UV emission value entered and recorded on Delta Screen**
- **Uniform illumination over the inspection area**

Latest-Gen LED
Higher intensity, longer service life

2-Axis Movement
Full blade coverage, no repositioning (for overhead lamps)

Recorded UV Value
Logged via Delta Screen panel

Delta Screen II Operator Panel

Backlit touch screen: parameter setting, recipe storage, report generation and data export.

Touch Screen Interface
Backlit touch screen showing bench status and all set parameters.

Recipes
Parameter sets stored and recalled per part type.

Reports
One report per cycle, customisable in layout and content at order stage.

Data Export
USB in JPG, Excel over the network, remote control for service.

Data recorded on each cycle

- **Date and time** of the test
- **Magnetization current** — set value and delivered value
- **Residual field** — value measured after demagnetization
- **UV light value** — measured and entered by the operator
- **Operator and part codes** — plus type of exam and demagnetization



Delta Screen II operator panel on board the bench

Operator Level
Use and monitoring

Supervisor Level
Programming and configuration

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