MAGAZON EBU / SBU SERIES

MAGNETIC PARTICLE INSPECTION (MPI) BENCHES

INTRODUCTION

Baugh & Weedon Ltd is a trusted supplier of MPI equipment to the NDT industry. Their MAGAZON series of benches have a proven track record for reliability and durability, and are in daily use by most of the leading UK Aerospace companies. Designed and produced in Hereford, UK, the MAGAZON series offers testing for components of all sizes that require substantial magnetising currents.

The benches are available in varying sizes, a wide range of magnetising modes and current waveforms with a variety of accessories and ancillary equipment. Their design allows the freedom to build benches to individual specifications offering the optimum combination of technical and commercial satisfaction.

CONSTRUCTION

The MAGAZON series construction is based on a heavy-duty framework fitted with a stainless steel drain tank. The frame design usually allows the power pack to be mounted integrally. Alternatively, the power pack can be housed in a separate cabinet.

Bed bars which support a fixed position headstock and movable tailstock, are mounted in the tank. For ease of movement the tailstock has sintered phosphor bronze bearings and is fitted with a simple lock. The head and tailstocks are equipped with test piece supports and easily replaceable copper mesh contact pads.

Pneumatic clamping prior to magnetising is operated by a footswitch.

On the Magazon SBU, the clamping pressure can be reduced, which affords protection to delicate components. A small piece device can also be fitted, which provides rotation of the component for easy viewing. For heavier testpieces support rollers mounted on the bed bars are available.

CONTROLS & METERING

Instrument controls and digital ammeters are on an eye-level console located above the headstock. Digital metering is standard on all units and can be calibrated to display the output current in PEAK, RMS, or 2xMEAN. Two meters are provided, each with independent control. One meter displays HEAD current, and the other displays FLUX/COIL current.

Selection of magnetising mode, current waveform and shot time is by rotary switches. Indicator lamps show power ON and READY, while illuminated push-buttons allow initiation of magnetising and demagnetising cycles. Each console is populated in accordance with the options provided on the particular unit and a typical example is illustrated,

The MAGAZON EBU and SBU Series has a universal, microprocessor based, electronic system which allows many additional features to be incorporated. These include:

+ Current pre-selection. The required current level once selected is automatically achieved when the magnetising “shot” is initiated.

+ Built-in memory. An integral memory will store up to 99 sets of data including all test parameters for each component. This feature is extremely useful when testpiece batches are small, and frequent changes are needed.

POWER PACKS

For the Magazon SBU, a nominal 2500 A power pack provides AC, with HWDC (half wave rectified) and single phase, or 3-phase FWDC (full wave rectified) waveforms as options.

For the Magazon EBU, nominal 3000A or 5000A AC power packs are standard, though alternative options are available subject to technical appraisal.

The provision of HWDC (half wave rectified) or FWDC (full wave rectified) waveforms can also be accommodated.

On standard models infinitely variable current control is achieved using thyristors resulting in a complex current waveform. However, where a sinusoidal waveform is required for compliance with some test specifications, the option of variable transformer control is available for both the Magazon SBU and EBU.

PRODUCTION LINE OPERATION

In a high volume production line, component throughput is vital and can be a limitation on output. Two further options are available with a standard MAGAZON Series bench to provide increased inspection capacity.

+ Multi-directional magnetising or “Swinging Field” allows two magnetising circuits to operate simultaneously, eliminating the need for multiple “shots”. Defects in any orientation are highlighted in a single operation and consequently only one viewing is necessary.

+ Automatic sequencing provides a degree of automation which can be selected depending on the application. A semi automated sequence would limit operator involvement to loading the testpiece, initiating the cycle and unloading. The normal sequence of clamping, inking, magnetising and unclamping can be achieved automatically. During this time the operator is able to inspect the previously magnetised component.

INK APPLICATION & INSPECTION

The MAGAZON Series is suitable for use with either kerosene or water based magnetic particle inspection inks. Ink is applied to the testpiece by a manually controlled spray or from an overhead shower with timed control related to the magnetising shot. Excess ink drains to a separate free standing stainless steel reservoir, fitted with an integral pumped recirculation system which maintains the particles in suspension. The inking system is a self contained unit with its own controls mounted on the reservoir to assist emptying and cleaning.

Where fluorescent inks are specified, inspection conditions are critical. To satisfy specified lighting requirements ultraviolet lamps and a viewing canopy are available. The free standing canopy consists of a metal frame covered in a heavy flame-resistant material with front opening curtains, and can enclose sufficient area to include an inspection station or a supply of testpieces. The canopy has an extractor fan, white light and power point for the ultraviolet lamp, fitted as standard.

OPTIONAL FEATURES (EBU)

A wide range of additional equipment may be fitted to, or powered by, a MAGAZON EBU series bench to extend its capability.

+ Encircling Coils. A range of interchangeable encircling coils is available. The coil carriage is track mounted at the rear of the bench and is adjustable in height. It can accommodate coils with internal diameters between 300 mm and 600 mm while maintaining the centre of the contact pads in line with the coil centre. Head and tailstock design allows coil “parking” behind the faceplate affording clear access to a testpiece. If the coil is not in use it can be folded back, out of the way. Either round or square split coils, mounted directly to the bedbars, can also be supplied.

+ Flux Coils. Magnetising coils with laminated cores built into the head and tailstock provide the magnetic flux for “Flux Flow” or “Mag Flow”.

+ Special Coils. Alternative coils to meet special applications can be supplied, either mounted on the bench if space permits, or on a separate free-standing frame. These include spiral or “pancake” coils, encircling coils with laminated cores and split coils, or knife switch coils, with a turntable to rotate the testpiece.

+ Remote Magnetising. Components which are difficult to load because of their size or shape can be magnetised off the bench. Output sockets allow the bench power supply to be connected to prods, leeches or wrapped cables.

+ Testpiece Supports. V-block supports are fitted to the head and tailstock as standard. Adjustable support rollers fitted to the head or tailstock, or mounted on the bed bars, can be supplied. A small piece device affords protection to delicate components is also available.

SPECIFICATION

Max Testpiece:	EBU: 1000	1500	2000	2500	3000	SBU: 800	1000	1200
Length, mm:	1000	1500	2000	2500	3000	800	1000	1200
Weight, kg:	250	250	250	250	250	25	25	25
Equipment Dimensions:								
Width, mm:	2000	2500	3000	3500	4000	1400	1600	1800
Depth, mm:	850	850	850	850	850	650	650	650
Height to bed bar, mm:	885	885	885	885	885	975	975	975
Bed to pad centre, mm:	430	430	430	430	430	200	200	200

	STANDARD MODELS	OPTIONS & ALTERNATIVES
Power Pack:	EBU: AC waveform with rated output currents as follows:- 1) 3 Series - 3000 A (RMS). 2) 5 Series - 5000A (RMS). SBU: AC waveform with rated output current of 2500 A (RMS).	EBU: HWDC (half wave rectified) and single or 3 phase FWDC (full wave rectified) waveforms. SBU: HWDC (half wave rectified) and single phase FWDC (full wave rectified)) waveforms.
Current Flow Magnetising:	EBU: Max nominal outputs AC:- 1) 3 Series - 4200 A (peak) 2) 5 Series - 7000A (peak) measured through a standard shunt. Carriage mounted, 5 tum, 300mm to 600mm ID, length 120 mm. SBU: Max output nominal 3500 AC (peak), measured through a standard shunt.	EBU: Max norninal outputs HWDC: 1) 3 Series - 4200 A (peak) 2) 5 Series 7000 A (peak) measured through a standard shunt. SBU: Max output nominal 2800 A FWDC (peak)
Encircling Coil Magnetising:	Carriage mounted, 5 tum, 300mm ID coil, length 100 mm. EBU: Nominal maximum output/centre field strength in an empty coil. 1) 3 Series - 6000 AT AC (RMS) / 34 kA/m. 2) 5 Series - 9000 AT AC (RMS) / 47 kA/m. Coil can be parked at either head or tailstock, or folded away. SBU: Carriage mounted, 5 turn, 300 mm ID coil, length 100 mm. Nominal maximum output / centre field strength in an empty coil. 4200 AT AC (RMS) / 17.5 kA/m. Coil can be parked at either head or tailstock.	EBU: Alternative sizes 400, 500 and 600mm ID. SBU: Max output nominal 5400 AT HWDC (peak) for a 300mm coil. Smaller ID coils for clamping between head and tailstock.
Flux Flow Magnetising:		EBU & SBU: Head and tailstock integral flux coils powered by AC, HWDC, single or 3-phase FWDC.
Multi-Directional Magnetising:		EBU & SBU: Swinging Field: Simultaneous operation of two magnetising circuits, to produce a “swinging field” or rotating vector.
Current Control System:	EBU & SBU: Variable thyristor, with resulting complex waveform.	EBU & SBU: A variable transformer can be fitted to provide a sinusoidal current waveform.
Working Range:	EBU & SBU: Current range: 10% to 100% of maximum output.	EBU:Extended working range subject to requirements. SBU: Extended working range down to 150 A (peak) minimum.
Metering:	EBU & SBU: Digital metering, calibrated to display PEAK, RMS or 2 x MEAN, to within 5% over working range to meet customer requirements.	EBU: AC output displayed as rms (variable transformer only). HWDC and FWDC output displayed as peak. SBU: AC output displayed as rms (variable transformer only). HWDC and FWDC output displayed as peak. Calibration outside working range:- 150 to 350 A (peak): 10%
Shot Time:	EBU & SBU: Pre-set single shot of 1, 2 or 3 seconds (other timings can be accommodated).	EBU & SBU: Any shot-time combination can be catered for, including multiple shots.
Duty Cycle:	Dynamic duty cycle from 20% at maximum output, to 100% at around 1000A PEAK.	
Max “ON” Time:	EBU & SBU: 3 seconds at 20% duty cycle.	
Demagnetising:	EBU & SBU: Automatic decaying AC DEMAG..	EBU only: FWDC DEMAG: Low frequency, reversing polarity, current step-down method.
Headstock:	EBU: Pneumatically operated, with footswitch control. Clamping stroke: 50mm. Contact pads: 160mm x 160mm with V-block. SBU: Pneumatically operated, manual control. Clamping stroke: 25mm. Contact pads: 100mm x 100mm. Adjustable clamping pressure (optional).	EBU: Special designs of faceplate and contact pads available. SBU: Foot switch operation. Alternative clamping travel.
Tailstock:	EBU & SBU: Fully adjustable, manual positioning over entire bed length. Manual quick release locking mechanism.	
Testpiece Support:	EBU: V-blocks on head and tailstocks. SBU: V-blocks on head and tailstocks.	EBU: Integrally mounted roller supports. Removable small piece device for rotating delicate components. Bed bar mounted adjustable supports. SBU: Removable small piece device for rotating delicate components. Bed bar mounted adjustable support.
Inking System:	EBU & SBU: Ink Tank: 50 litre stainless steel (covered) reservoir with recirculating pump, manual application & integral controls.	EBU & SBU: Automatic inking as part of the automated process sequence.
Services: Power Supply:	EBU: 380/415V 50 Hz, 3 phase + neutral + earth, current drawn as follows: 1)3Series - 100A max. 2)5Series - 200A max. SBU: 230V 50 Hz, 1-phase + neutral + earth, cunent drawn approx 60 A. 230V 50Hz, 2-phase + neutral + earth, current drawn approx 30A.	SBU only: The multi-directional magnetising option requires 415 V, 50 Hz, 3 phase + neutral + earth: Current drawn approx 65 max.
Air Supply:	EBU & SBU: 6 bar. (FR unit fitted as standard).	

Document number BR1001: Issue 1

Baugh & Weedon Ltd.
Beech Business Park, Tillington Road, Hereford, HR4 9QJ
Tel: +44 (0) 1432 267671 Fax: +44 (0) 1432 359017 Email: sales@bandwndt.co.uk **www.bandwndt.co.uk**