

VDF **Universal** **Turning Machines** **E 560 / M 670** **V 800.**

Swing over bed: from 610 to 1000 mm.
Driving power: from 18.5 to 30 kW.
Speed range: 200:1.
24 spindle speeds.
Progression ratio: 1.25.
Thread leads for all thread types: 227.
Turning length: up to 10 000 mm (and more)
Torque: up to 4500 Nm.

VDF

BOEHRINGER
Advanced Technology.

100 Years of Boehring Universal Turning Machines.

For introduction: 100 years have passed since we first offered a lathe on the market which could properly be called a "German lathe"—our first self-designed machine—so to speak the ancestral prototype of many thousands of BOEHRINGER turning machines now installed all over the world.

Since about 50 years, our machines have been well known under the trade mark VDF—the lettering VDF having become a synonym for top quality in lathe building of worldwide reputation. Times have surely changed in many respects since then—but the original VDF philosophy has remained a challenge to us, and a responsibility to offer our customers quality and precision—and no efforts spared.

Perhaps no other machine series in "conventional design" of recent years is so very typical of the VDF tradition as the types E, M, V from BOEHRINGER, which we are introducing to you in the following. Or expressed differently: if there are men who can rightly be said to personify the VDF idea, body and soul, so there are machines which embody the VDF technology in its purest concept—for instance the machines E 560, M 670 and the, by now, really legendary V 800.

In spite of motor-driven rapid traverse, power-operated chucking fixtures, and other additions for the convenience of the operator, the machines of the series E, M, V are truly hand-operated machines, now as before. Special attention has been paid continually to ease of operation, for a turner who no longer has to exert himself, who can operate his machine effortlessly, without fatigue, — such a man produces less scrap but a considerably greater number of workpieces of prime quality.

Instead of using the old-fashioned ball knob levers still found on many machines of other makes, we apply all kinds of ergonomically shaped handles; instead of spoked wheels, our machines have conveniently profiled hand-wheels (with the emphasis on "hand").

Clear, functional lines, surfaces and shapes, easy to keep clean, dominate. The working area is designed with an optimum relation between swing over bed and carriage, and width of bed. This means: the economic utilization of an E 560, M 670 or V 800 is, so to say, pre-programmed by their design and ergonomic conception.

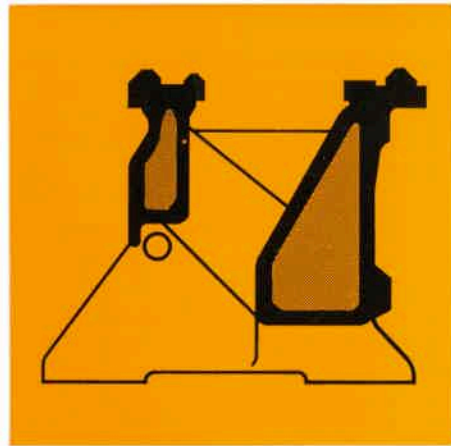
Incidentally: the machine series E, M, V is a typical example for the application of the building block principle, resulting in a useful efficiency for our customers. In these machines, we combine accepted features of long standing (which cannot be further improved) with the latest technical knowledge. In other words: our customers get a very mature machine of most recent technology, at a very reasonable price. The assembly groups fitted are manufactured in series, of identical inherent quality, by experienced specialists, and on machine tools of the same high quality standards as the product — your machine.

The bed is a rigid beam of a completely closed box-type cross section, re-enforced by profiled cross walls equally spaced at 50 cm. Incidentally, we cast our own beds, and the core sand is left in the chambers for a better damping effect.

The ultimate result: The Machine Series E, M, V.

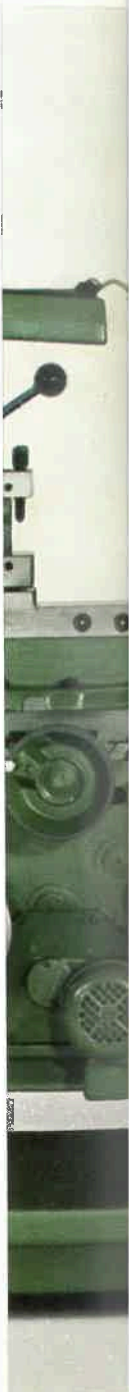
The configuration of the cross ribbing ensures a free fall of chips along inclined passages through relatively big chutes so that no hot chips can accumulate, and a warming up of the bed is avoided. Possible errors from heat expansion influencing the accuracies are thus eliminated.

The guideways of the bed are double Vees which, as proved by past experience, are the best solution for horizontal beds — in particular, if rather heavy machining units will be mounted on the carriage



remote from the turning centre line, for instance: a boring rest with boring bar or similar. In such cases, the rear Vee is responsible for a parallel guiding of the carriage, and a so-called "crabbing" is impossible.

The guiding surfaces are amply dimensioned for a favourable distribution of the load. We decided on mating grey cast iron with hardened grey cast iron, and all carrying guideways are induction hardened and precision ground. — This measure, together with all the features mentioned above, run into costs but all have been taken for the sole purpose of keeping the wear of the ways from sliding friction as low as ever possible. In the interest of our customers it is an assurance of a lifelong inherent accuracy. As co-founders of the VDF, we accept this to be our responsibility, as a matter of course.



A rigid bed of extreme stiffness, free fall of chips.

Special attention has been paid to the configuration and design of the apron which, after all, is the place normally occupied by the operator. We profited here from the most recent results of researches into ergonomics which we jointly conducted with an institute for work studies (REFA) of reputation, and also with other professional bodies and associations. We can justly say that particularly our apron answers to-day's requirements for safety of operation — evidenced by the "Seal of Approval"

On request: a D.C. main drive.

awarded by the competent German Supervisory Board of Industries for safety in factories.

A centrally arranged directional lever controls all directions of feed motion. The position of the lever indicates the sense of the feed traverses. A second lever is arranged on the same level, for actuating the half-nuts and the overload protection. This means that whenever the carriage contacts a dead stop, the overload protection immediately trips the

A carriage with optimum guiding properties.

carriage feed motion — even if high feed rates and heavy longitudinal forces are applied. Just a handbreadth to the right is one of the two remote control levers for starting the main spindle. The handwheel for longitudinal displacement of the carriage is very easy to the operator's grip. It is provided with a graduated collar as a matter of course.

A comprehensive assortment of special tools and tool carriers.

The tailstock is a massive, rigid casting which, after release of its clamping, can nevertheless be easily moved on the bed as spring-loaded rollers sustain most of its weight. The tailstock quill locking acts from below to rule out diameter or cylindricity errors. The quill again is very rigid and sturdy.

On request, we of course supply tailstocks of special design — for instance, a power-operated drilling tailstock as illustrated on the opposite page.

On request: logical extra equipment.

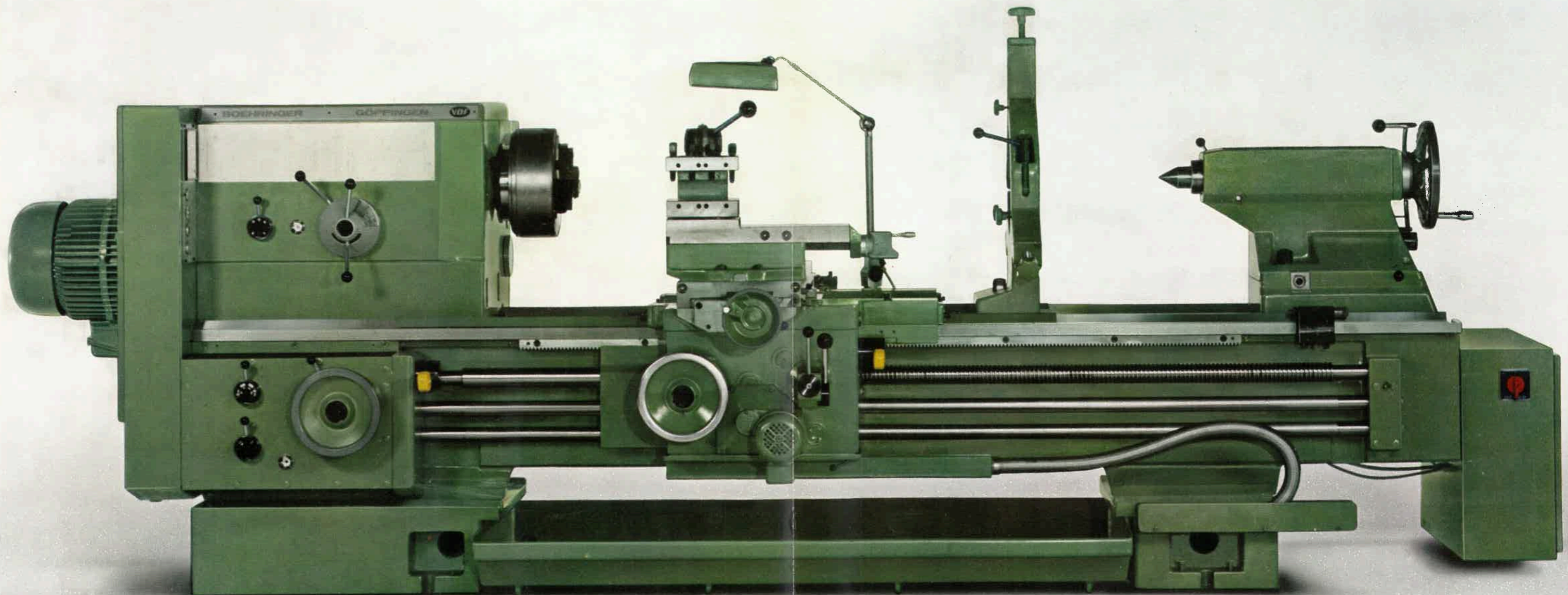
The machines can be equipped with copying units for cylindrical or out-of-round copying work. See illustration on extreme left.

To be noted: the VDF-universal turning machines E, M, V (of course, also available with toolroom accuracies) form a logical, complementary series of machines — with common features as to equipment, operation, service, spare parts, and tooling. Although differing as to their working range, they are absolutely identical in their basic

Big chip collection space. Efficient chip discharge during operations.

concept and general design.

The advantage for our customers: once familiar with one machine — always familiar with all others of any size — for universal application: as precision turning machines in the toolroom, to assist in prototype engineering, for use in production. Not to forget: VDF remains VDF — whether big or small, grey, green or BOEHRINGER yellow to RAL 1007 (two-component machine paint on synthetic resin basis).



A VDF headstock fully proved in thousands of applications.

The careful machining of the guideways is best demonstrated when moving the carriage: easily displaced by hand, smallest diameter settings (via handwheel) without the slightest effort. On the other hand, the complete carriage is sturdy enough to permit high chip removal rates when roughing, and outstanding accuracies and surface quality when finishing. The cross screw is nitrated so that practically no wear will occur.

The massive and rigid tailstock, and other equipment as well, are guided in a separate, combined Vee-flat guideway, exactly parallel to the carriage. The guideways also serve for an exact location of the headstock which in addition is dowelled and screwed to the bed for absolute rigidity.

The headstock is a well-proven assembly from the VDF building block system for universal turning machines. Many thousand units have been made so far. The headstock sits on a wide base on the bed. It is designed in such a manner that a favourable dynamic, and at the same time balanced behaviour, combined with a symmetric reaction to heat expansion is ensured, which again is an assurance of high rigidity and accuracy, under all working conditions. Further special features are: central lubrication, three-lever visual control, induction hardened and precision ground spur gears, electro-mechanical main spindle brake requiring no maintenance. It goes without saying that all rotating parts are dynamically balanced.

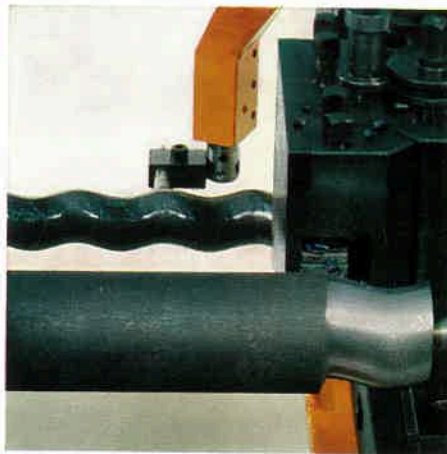
Special attention has been paid to the bearing arrangement for the main spindle which is carried in the front and in the rear in high-precision double-row cylindrical bearings, the front bearing sitting immediately behind the spindle flange for a minimum leverage of the attacking forces. The axial forces are taken up by pre-loaded thrust ball bearings. The obvious advantages of such an arrangement: high rigidity when taking heavy cuts, or if heavy workpieces are machined, and good carrying accuracy even at maximum spindle speeds. Or in other words: excellent surface quality when finishing, high chip removal rate when roughing,

An extremely stiff main spindle of computer-aided optimum design.

application of high cutting speeds when machining both small and large diameters.

A total of 24 speeds are available at a progression ratio of 1.25. Forward rotation and reversal are engaged by two disc clutches on the input shaft.

The drive is an A.C. 3-phase flange-mounted motor; a D.C. motor can be supplied against extra for infinitely variable speeds, and v-constant (constant surface speed)



operation, together with the suitable controls. The quick-response of the D.C. motor is an assurance for remarkably short reversing times. When decelerating, the current is fed back to the mains. The infinitely variable speeds, and the v-constant feature permit considerably shorter machining times.

The switchgear cabinet, containing all necessary electric/electronic control and switchgear is normally arranged at the tailstock end of the bed. If an expanded electrical equipment should be required, for instance if the machine will receive semi or fully automatic sequence of operations, a larger switchgear cabinet is then provided for separate installation.

The feed drive, in which the feed and thread cutting values are selected, is a 10-step basic gearbox and a 4-step multiplying gearing.

This combination results in a total of 40 control positions. A further gearing permits the change-over from metric to Whitworth leads for screw cutting, and still another combined gear train takes care of the reversing of feed rod and lead-screw, and change-over between these two shafts. All in all, there are 68 standardised feed values available for longitudinal and transverse feed, in a progression ratio of 1.12, and 32 of these, i.e. the normal and fine feed rates, can be set and read directly at the selector drum.

The normal and coarse thread leads are available in the ratio of 1 : 160, for a lead range of 0.25 to 560 mm metric threads obtained through the transmissions in the feed gearbox. The setting positions for the thread leads are also marked by code numbers all 40 of which can be read directly at the selector drum. The selector drum is interlocked while the gearing is engaged so that the display invariably represents the selected value. — The lever for engagement of the gearing is arranged co-axial with the selector drum and immediately behind it. Since these two control elements are frequently operated, they have been arranged for the convenience of the operator.

There are also two smaller control levers for the following functions: change over from "feed motion with main spindle in clockwise rotation" to "r.h. threads" or "feed motion with main spindle in counterclockwise rotation" to "l.h. threads" — and switching from metric to imperial thread cutting, and vice versa.

By the way, the input shaft is connected with the output shaft of the headstock through change gears which have identical numbers of teeth for all machine sizes, and for 12 mm or 1/2" pitch leadscrews. If module or D.P. threads are to be cut, just one gear need be changed.

Technical Main Data.

Working Range

Changes in technical specifications reserved

Type		E 560	M 670	V 800	
				size I	size II
Swing over bed	mm	610	690	820	1000
Swing over long cross slide	mm	330	415	515	710
Height of centres over flatway	mm	290	335	400	500
Width of bed	mm	500		560	
Spindle nose to DIN 55022 or Camlock ASA B 5.9	size No.	8 8	11 11		
Spindle bore diameter	mm	82	128		
Leadscrew pitch	mm (in)	12 (½)			
Cross section of tool shank, max. to DIN 770	mm	25×40			
Centre, M.T.	No.	6			
O.D. of tailstock quill	mm	100	125		
Stroke of quill	mm	280			

Main Drive

Driving power	kW	18.5	22	22 (30)
24 main spindle speeds through gears	rpm	9–1800	71–1400	
Progression ratio		1.25		
Speed range		200:1		
Torque at main spindle	Nm	4500		

Feeds and Thread Leads

Feeds on selector drum: 32 longitudinal feeds	mm/rev	0.08–2.8		
32 transverse feeds	mm/rev	0.04–1.4		
Total feeds: 68 longitudinal feeds	mm/rev	0.05–112		
68 transverse feeds	mm/rev	0.025–56		
66 metric threads	mm	0.25–560		
60 Whitworth threads	tpi	80–1/16		
60 module threads*	module	0.1–50		
40 diametral pitch threads*	t/π''	160–0.5		

Dimensions and Weights

Total width	mm	1400		1500	
Total length plus turning length (TL)	mm	2800		3000	
Machine weight, approx: with 1000 mm TL	kg	4400	4550	5200	5600
with 1500 mm TL	kg	4650	4800	5500	5900
with 2000 mm TL	kg	5000	5150	5900	6300
with 3000 mm TL	kg	5600	5750	6700	7100
with 4000 mm TL	kg	6300	6450	7300	7700
with 5000 mm TL	kg	7000	7150	8000	8400
with 6000 mm TL	kg	7700	7850	8800	9200
* extra equipment					

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