

Heesemann

Reliability by proven design



Automatic Sanding Machine LSM 4

Automatic Sanding Machine

The automatic sanding machine LSM 4 is suitable for versatile application, its equipment meets all possibilities in accordance with the latest state of the art. The machine can be incorporated in production lines or installed as a separate machine. It is suited to veneer and solid workpiece sanding as well in combination with calibrate sanding, buffable polyester lacquer sanding and, in addition, for intermediate lacquer or filler surface sanding. Design and function of the LSM 4 fulfil all demands with reference to quality and rational production.

Design features of the LSM 4:

- Longitudinal sanding or cross sanding method
- Compact construction, thus reduced space requirements
- Constant working height, prerequisite for use in production lines

- Modular system with optional arrangement of cross and longitudinal sanding units
- Convenient retrofitting of a further sanding unit if corresponding transport length is available, also a later unit interchange is possible
- Area sanding cut with wide pressure beams
- Large adjustable oscillation range of wide sanding belts
- Free and multi-track feed with automated electronic pressure beam control
- Automatic tolerance compensation up to at least 2 mm
- Electronic sensing for sanding of workpieces with varying contours
- Integrated frame sanding program for the sanding of cross and longitudinal frame elements in the grain direction

- Determination of the sanding intensity in the edge area, also asymmetrically
- Several sanding belt speeds, also infinitely variable
- Simple and clear operation via terminal display
- Integrated computer system for memorizing and set value polling
- Automatic machine run-up while retaining prior setting data
- Optimized dust extraction and compressed air energy utilization

■ New development: Infinitely variable effective pressure force using the CSD Sanding System

Machine concept

The LSM 4 machine construction is a combination of many years of experience and outstanding new features. In order to adapt the machine to the envisaged sanding work, we adhere to a consequent modular principle. The machine operates in accordance with the longitudinal or cross sanding principle dependent on the application.

The transport bed allows the installation of one to six longitudinal or cross sanding units along its length in any sequence. The sanding work determines the unit selection. In this manner one to four longitudinal sanding units can be consecutively arranged, or cross and longitudinal sanding units can be combined on the bed permitting cross sanding. Many

years of experience have shown that the **cross sanding method** provides the best surface quality. With the sanding belt running across the grain direction, the wood fibres are more intensively sanded against the pore edges, the subsequent longitudinal sanding removes the cross sanding marks. Furthermore the sanding belt grit stages can be matched to the required surface quality by the use of two or more longitudinal sanding units. In addition, cross and longitudinal sanding units can also be employed permitting cross veneered workpieces to be processed with a final longitudinal sanding cycle. Cross sanding also offers additional advantages for the removal of jointing paper.

Frequently when reaching a purchase decision a certain number and arrangement of sanding units suffices to obtain the desired sanding effect. The question which must then be asked is: does the machine permit retrofitting of a further unit to meet future sanding requirements? The initial machine arrangement can allow a **reserve space** for retrofitting a further cross or longitudinal sanding unit. The cross and longitudinal sanding **units** can also be **interchanged at a later date**. Subsequent sanding unit sequence changes can prove advantageous, if during a model change within the furniture industry the surface treatment work sequence requires matching to other workpiece structures. Thus the customer avoids the later problem of having selected an automatic sanding machine

with pressure beam system for workpiece tolerance compensation up to at least 2 mm

arrangement which no longer meets his requirements. The initial equipment choice can be made without considering possible later sanding unit sequence changes.

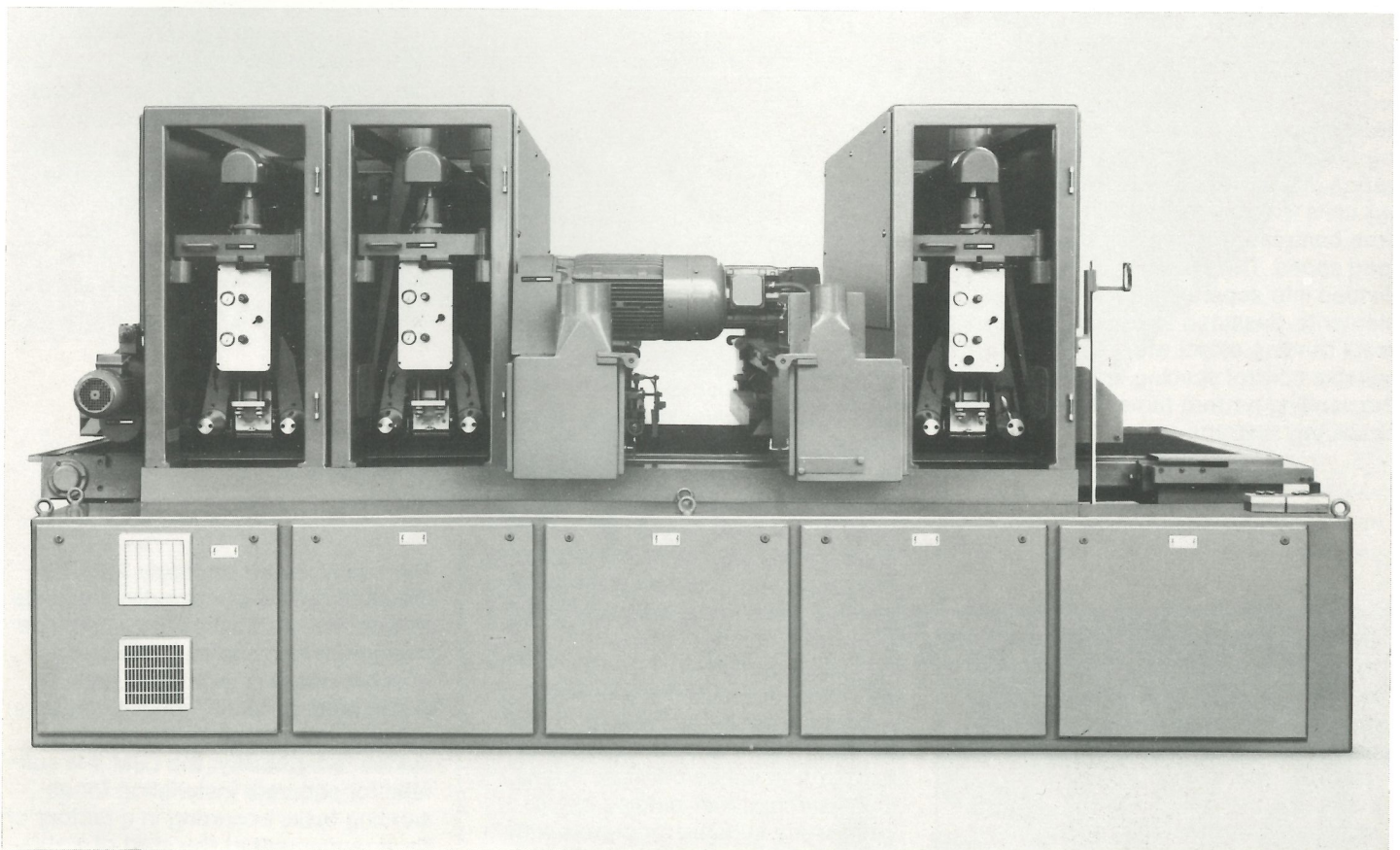
The comprehensive LSM 4 modular system offers the certainty of having available an automatic sanding machine which can not only be initially adapted to the production conditions but which also provides for later changes by altering the unit sequence or by the addition of a further unit. For examples of practical unit arrangements see the graphical illustrations.

The sanding width is 1300 mm (or 1100 mm), the **operating height** being **constant**. The machine upper section is centrally height adjustable in accordance with the workpiece thickness. The machine thus offers

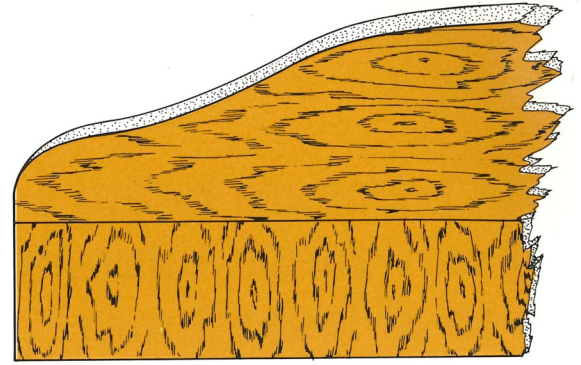
the prerequisites for location at the start of a surface line. Readjustment of the individual sanding unit height settings because of altered operating conditions (e.g. belt wear) becomes entirely obsolete, as this adaption is automatically and continuously performed by the individual effective pressure elements.

The transport bed is equipped with a group of narrow transport belts, upon request also with a wide transport conveyor, which constantly feeds the workpieces below the sanding units. The **feed speed** is **infinitely** variable between 4 and 25 m/min. The pressure rollers arranged in front and behind each sanding unit ensure a solid base for the workpiece. If processing is not exclusively limited to large surface area parts, such as door panels, to ensure workpieces are securely held, the machine is equip-

ped with an **intensive workpiece suction clamping unit**, the vacuum strength being automatically controlled dependent upon the transport bed area occupied. During operation the transport belt is kept free of sanding dust by a **reversing belt blow down device** located beneath the transport bed. This arrangement ensures the efficiency of the suction clamping device, and prevents the formation of a slick surface on the transport belt resulting from dust deposit. A special device also allows the suction table interior to be cleaned.



3 longitudinal sanding units, 2 cross sanding units, 1 brushing unit



Sanding system

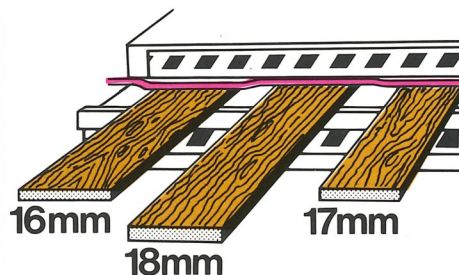
The sanding technique uses the **large area pressure beams**, having the same construction in both the cross and longitudinal sanding units. The extremely wide pressure beam achieves a high degree of efficiency through the large sanding belt contact area. The constant sanding pressure on each section of the workpiece ensures a uniform sanding effect over the complete surface.

The pressure beam system developed by us offers maximum adaptability to the workpiece. The contour of the workpieces feeding through is assessed by a row of small contact rollers at the machine infeed and transmitted to the effective pressure beam surface by an **electronic control system**. We have been awarded domestic and foreign patents protection for this automatic workpiece operated control system. The values with reference to the position and form of workpiece, which can also be fed randomly or offset, are centrally determined in front of the first sanding unit. The pressure beam application of each of the following sanding units is then made automatically, time controlled, depending on the set feed speed. The pressure beams are divided into separate pressure elements, designed to provide an areal sanding effect with the smallest suitable control spacing, ensuring that the sanding pattern remains absolutely uniform.

The pressure system guarantees the **compensation of workpiece tolerances of up to 2 mm and more**. These thickness variations can be within the workpiece or between one through-feeding workpiece and the other. Without accessory appliance the tolerances are automatically taken into

A special setting possibility is available for workpieces with cross and longitudinal veneered sections. In order to perform the subsequent cycle of sanding in the grain direction on frames or stitched longitudinal and cross veneers in all areas, a **frame sanding program** can be integrated. A uniform sanding finish is obtained on the longitudinal and cross veneer sections avoiding annoying cross sanding marks during later stain finishing.

consideration by the pressure beam. The effective pressure area of the pressure beam follows the surface contour even with thin veneers or extremely thin lacquer applications, there is no danger of sanding through, not even at the edges. The height adjustment to the workpiece thickness does not require precision regulation which considerably increases the operating ease and sureness.



Edge area sanding is always particularly sensitive. In order to ensure sanding safety in this critical sector, the **sanding intensity is adjustable in the edge area**. For longitudinal edges the effective pressure beam area is controlled to ensure that the sanding matches the workpiece conditions, thus providing a perfect edge area sanding finish without the danger of sanding through. This also applies to veneered parts with curved profiles and frames. The sanding intensity can be set differently on the control panel for the left and right workpiece edges. This asymmetrical sanding cut is particularly suitable for panels with a solid lipping projecting on one

side, such as semi-circular table tops. With free workpiece infeed the lipping is thickness sanded and the opposite veneered edge sanded normally.

The pressure beam touch down point can be advanced or retarded with reference to the workpiece leading and trailing edges, in order to intensively or carefully sand in this area.

The edge zone sanding intensity can be adjusted separately for each sanding unit, and the corresponding values are reproducible. A change to the feed speed or other pressure conditions does not necessitate readjustment of the pressure beam control. The workpieces feeding through should be spaced to allow the effective pressure surface of the pressure beam to be individually adapted to each workpiece.

The machine can be **freely fed**. The pressure beams of the individual units automatically adjust to the workpiece position, shape and size, irrespective whether round or oval table tops, frame parts or other special contours are processed. Due to the sanding system adaptability, the LSM 4 is suitable for separate installation for all sanding tasks occurring in a factory or for arrangement at the start of a surfacing line.



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LSM 4

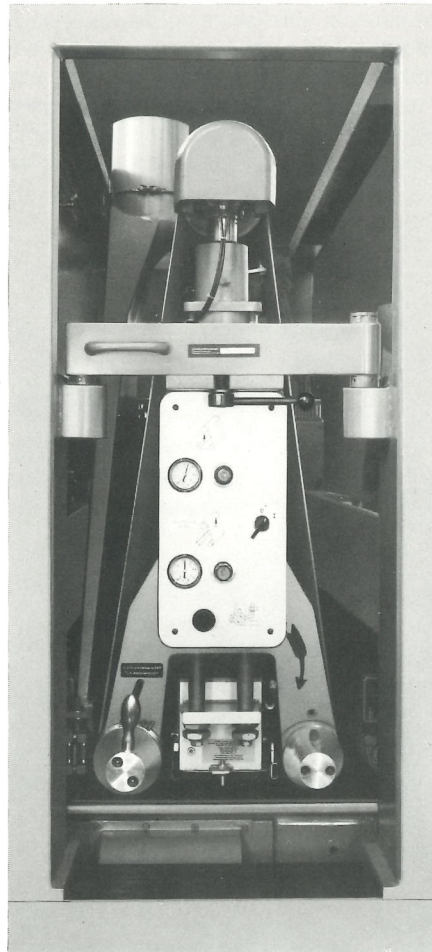
Unit design

The longitudinal and cross sanding units are provided with wide sanding beams and electronic controls of identical construction.

The **sanding belt** of the **longitudinal sanding unit** is **driven by the upper roller** so that operational conditions remain constant in the sanding belt contact zone and free of any vibration, even under varying loads. To overlap sanding marks and to utilize the complete sanding belt width, the wide sanding belt follows a controlled laterally oscillating movement. **An infrared sensing and control device** regulates the central running of the belt and permits the setting of the oscillating path. Due to the self-cleaning assembly the function of the infrared controls is not influenced by possible dust accumulation. The sanding belt generally runs against the feed direction. There exists, however, the possibility of running in or against the feed direction in order to increase the sanded surface smoothness of specific wood types. Due to the wide sanding belt manufacturing process, different edge lengths might be encountered. These differences are automatically compensated for on the unit thus excluding manual adjustment.

The sanding cut on the **cross sanding unit** is intensified by a driven lamella belt. Due to the spaced lamella arrangement the contact surfaces between the circulating belts are constantly displaced by the belts running in the same direction at a different speed, so that constantly changing sanding belt sections come into contact. In this manner uniform sanding is maintained, heating of the sanding belt avoided and extraction of the sanding dust simplified.

An oscillating belt air jet device removes the dust from the cross and longitudinal belts. The **intermittent operating mode of the air jet** is

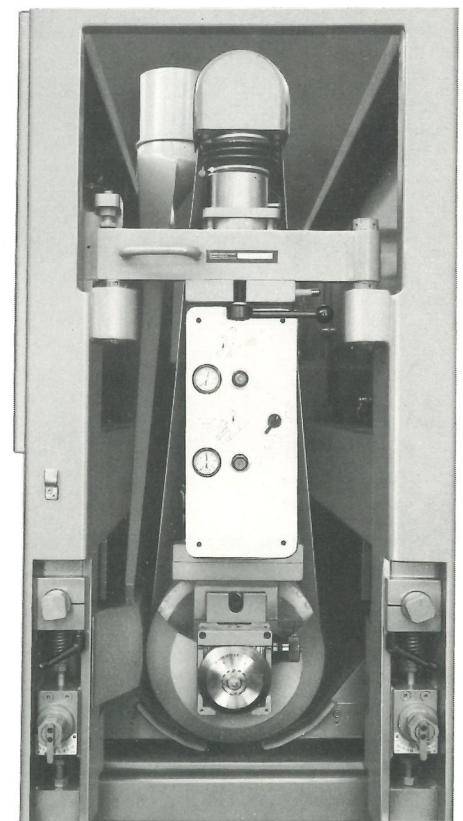


Longitudinal sanding unit, wide pressure beam and additional small sizing roller

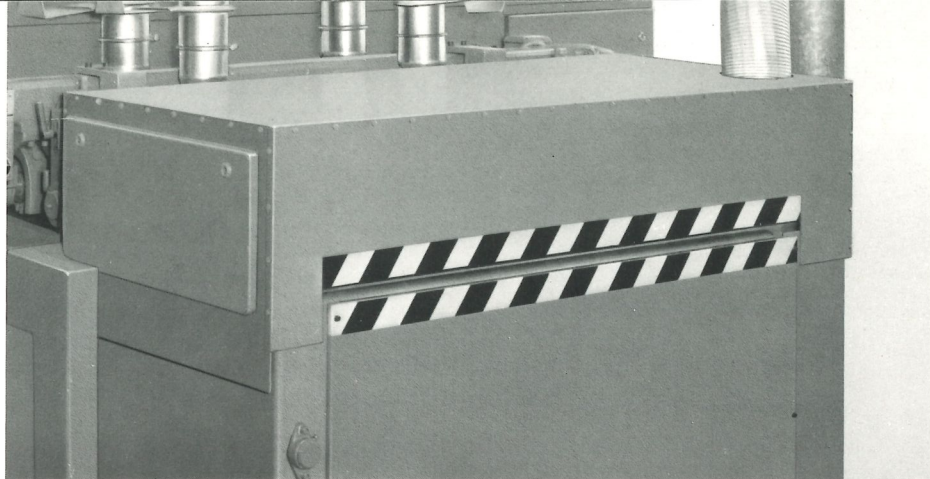
dependent upon the workpiece through-feed and contributes considerably to reducing compressed air consumption. For a fast belt change and constant stretching compensation the sanding belts on the longitudinal and cross sanding units and the pressure lamella belt are **pneumatically tensioned**.

Pole changeable drive motors offer **two sanding belt speeds**, 10 and 20 m/s for longitudinal and 12 and 24 m/s for cross sanding units, thus allowing the sanding belt speed to be

matched to the surface material. If additionally lacquer intermediate sanding shall be effected, a triple pole changeable motor is installed permitting a change-over to a low sanding belt speed of 3,5 m/s. Lacquer sanding often requires a sanding belt speed precisely matched to the lacquer type and application thickness. In such a case the sanding speed is infinitely adjusted, providing a wide speed range of 2 – 20 m/s, or a different regulating range, through a frequency control system. In machine designs with several sanding units the equipment offering the additional low belt speeds is limited to the units to be employed for lacquer sanding.



Large diameter contact roller



Dust removing device at the machine outfeed side

In case of calibrating prior to fine sanding a longitudinal sanding unit with a **contact roller** (320 mm diameter) is required. The drive capacity is uprated and the Shore hardness of the roller covering determined to correspond to the calibrating work. In order to permit light sizing work to be performed without additional units, the front guide roller on the first longitudinal sanding unit generally has a larger diameter and is provided with an adjustment device. If required this steel roller is put into sanding position to permit plane sanding, e.g. of frame components.

As a supplement to the belt sanding units a **smoothing roller** with a special polishing material can be added to additionally smooth the surface or provide a rustic effect for the subsequent surface treatment. If cross veneered components are encountered, a brush belt with sanding material can be used.

The **brushing unit** at the machine outfeed removes residual sanding dust from the sanded workpieces. The separately driven brushing roller is centrally height adjustable and provided with an extraction hood. It is also possible to use a brush with mixed fibre bristles which apart from cleaning also has a smoothing effect.

If the sanding machine is positioned at the start of a surface line, the careful cleaning of residual dust from the workpiece is vital. Not only the surfaces but also the edges must be free of dust. For this purpose a **dust removing unit** is installed at the machine outfeed which operates with a corresponding high-rated fan in a circulating air system and which is supplemented by an **ionizer** to discharge any electrostatic charge. This unit is linked to the machine transport and is centrally height adjustable together with the sanding units.

Controls

All machine functions may be set from a **numeric terminal**, which also gives a clear indication of the functions selected. In its expanded form, the terminal is able to **store 20 different sanding programs**. The setting devices are clearly grouped with reference to the individual units. The controlled sanding sequence can be followed on **light indicators**. For constant and simple monitoring any motor and electrical switching function fault is optically displayed on a **fault source indicator**.

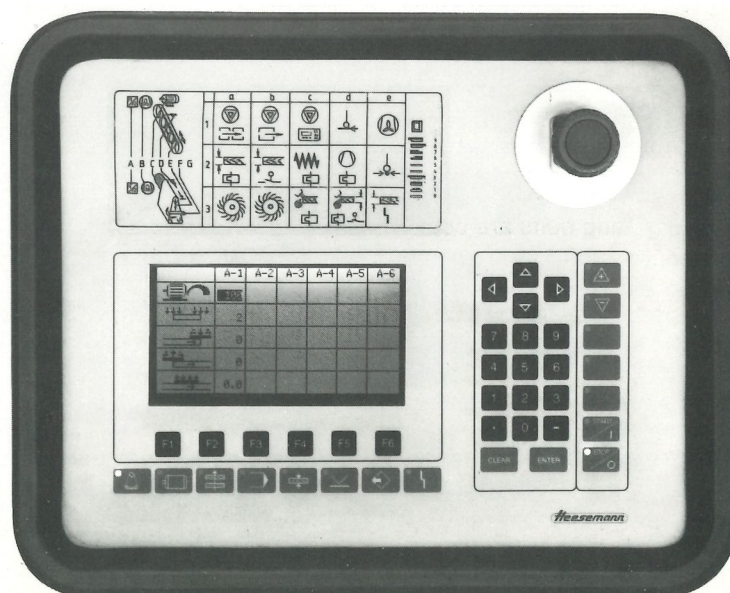
The **automatic machine run-up** while retaining the set data, ensures an immediate effective capacity following an interruption in machine operation. Machine height adjustment and feed speed can be set directly on the terminal. Gauging of the workpiece thickness outside of the machine is feasible using the **automatic thickness setting**.

All areas of the electronic system are clearly arranged to allow simple and fast control. The electric wiring allows for in-line sander operation in a production line. A special **safety circuit** immediately stops the complete

machine in the event of a sanding belt tear or run-off or failure of the compressed air system, thus avoiding further damage to the machine. An electronic counter current brake of the drive motors prevents the after-running of the belt following switching off. The pneumatic system is also protected against sudden pressure loss by an equalizing reservoir. This ensures the interim stable function of compressed air dependent units and avoids damage to the workpieces in the machine.

The machine can be constructed in explosion-proof design wherever specific safety regulations have to be observed when installed in a lacquer zone.

The **operating side** can be on the **right or left** in relation to the terminal arrangement and sanding belt fitting side on the longitudinal sanding units in accordance with the factory conditions.



Numeric terminal

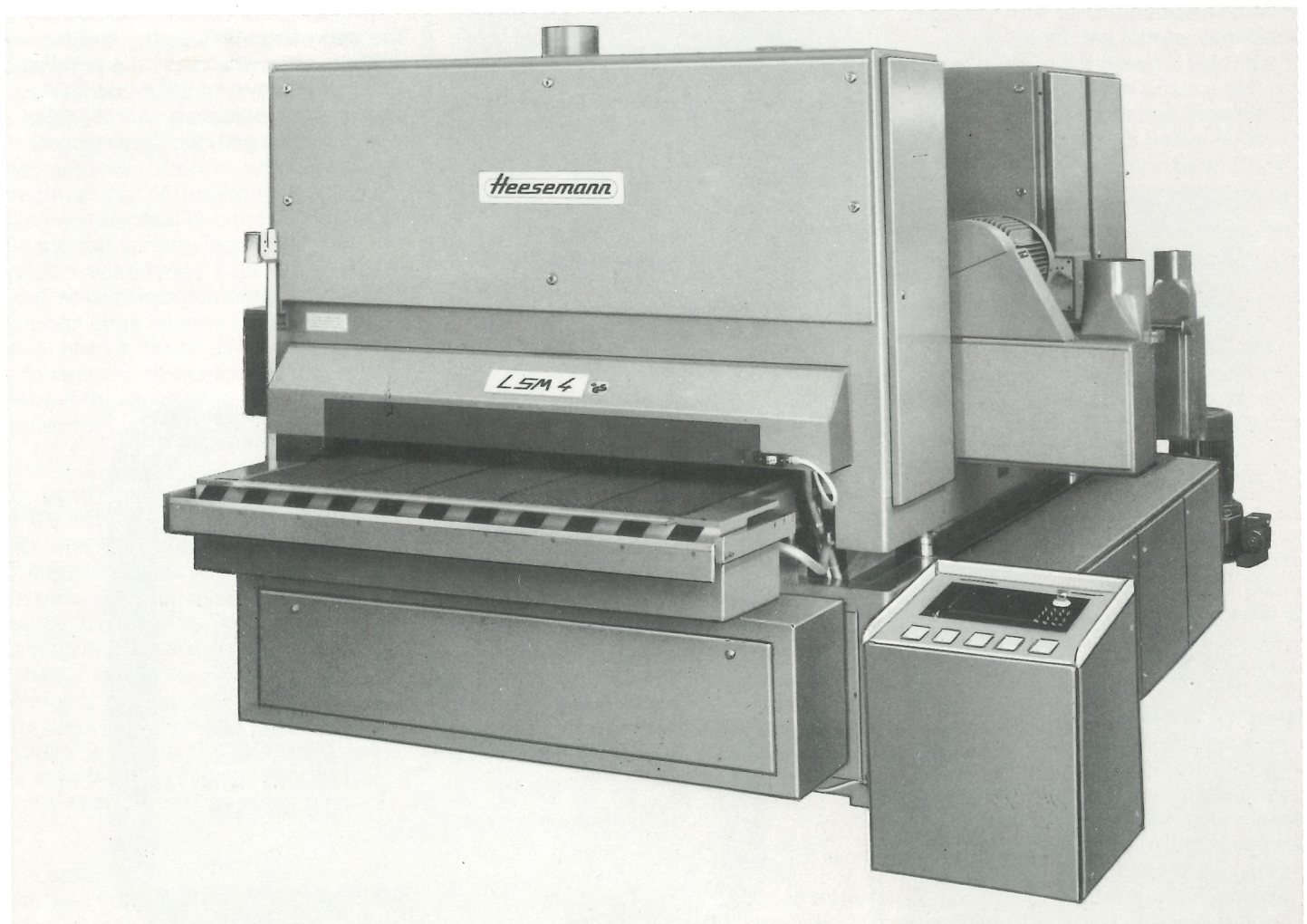
CNC

In furniture production increasing emphasis is placed on the fast machine matching to small batch sizes, which set differing demands on the machine setting values. The resetting time must be as short as possible, to guarantee a workflow without long interruptions. For the type LSM 4 we have developed an **integrated computer system** to store the setting data and permit polling of subroutine numbers at any time. The individual programs contain the values of sanding belt drive motor speed, feed speed, right moment for pressure beam application (sanding start and sanding end), sanding intensity in the

edge area as well as of sanding pressure.

In addition, the computer informs the operator of height adjustment and sanding belt grit sizes. Input and monitoring of the set values are undertaken on a screen. The screen also displays any fault occurring in the machine electrics permitting fast location. If a certain value requires changing while the program is running, the program can be accessed without stopping the machine. Also new programming can be performed with the program running. The CNC design permits the integration of the LSM 4 into fully automatic higher ranking processing line control systems.

An extension of the computer system permits the connection of an operating data acquisition system, so that the sanding capacity in square meters can be constantly determined in relation to the surface area. Capacity data acquired in this manner provides important evidence for the production sequence, the belt change times and machine maintenance in general.



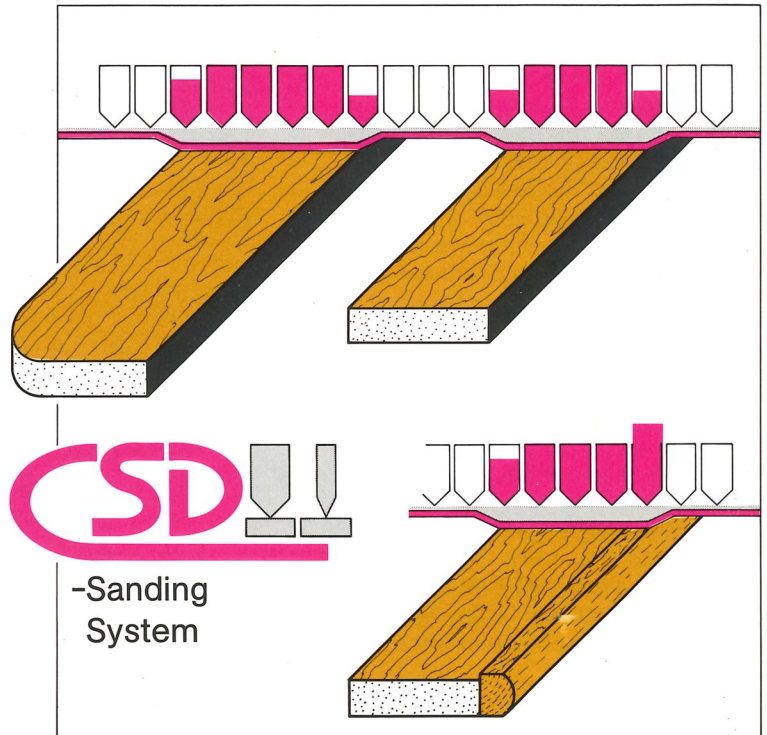
Arrangement of computer controlled longitudinal and cross sanding units

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	AGG	MG	SB	SE	SD	SKI	BK	R1	R2	R3	R4	R0	
+0	1	L	+1	+000	+000	02.0	03	100	0	0	0	0	0
+0	2	Q	+2	+000	+000	01.8	03	120	0	0	0	0	0
+000	3	Q	+000	+000	+000	01.4	03	150	20.35	50.65	00.00	00.00	00
+000	4	L	-050	+000	+000	01.8	03	150	21.34	51.64	00.00	00.00	00
+0	5	L	+1	+000	+000	01.6	03	180	0	0	0	0	0
0	B	I			55.0		programming						
0	VDR	10.0			00.0		program number:		02				
0	SSP	1					up. thickness:		55.0				
information:							production						
							program number: 02						
							up. thickness: 55.0						

Example of a computer registered sanding program of a 5 head machine

CSD Sanding System

We adapted electronics very early for the control of sanding cycles and supported the machine operation by a computer, this increased utilization of electronics paved the way to the new CSD sanding system, however, without neglecting the proven construction of our automatic sanders. The sanding pressure is decisive for stock removal during the sanding cycle. The workpiece properties, above all in the edge area, set the condition which determines the processing pressure to be used. By workpiece sensing in very small steps the workpiece contour is exactly detected. This data is computer processed and immediately transferred to the individual pressure beam elements. The effective **pressure force** of the individual pressure elements is **infinitely** applied dependent upon requirements. If the workpieces are veneered up to the edge, the pressure elements operate in this area with a correspondingly reduced pressure. If certain workpieces, such as for example table tops with solid lippings have to be heavily sanded on the edge, the pressure in this area appropriately increases. For panels with single sided solid edges the workpiece format is sanded with the corresponding asymmetric force.



Due to the computer controlled selective pressure regulation (CSD) and the high tolerance absorption the LSM 4 machine offers an optimum in quality

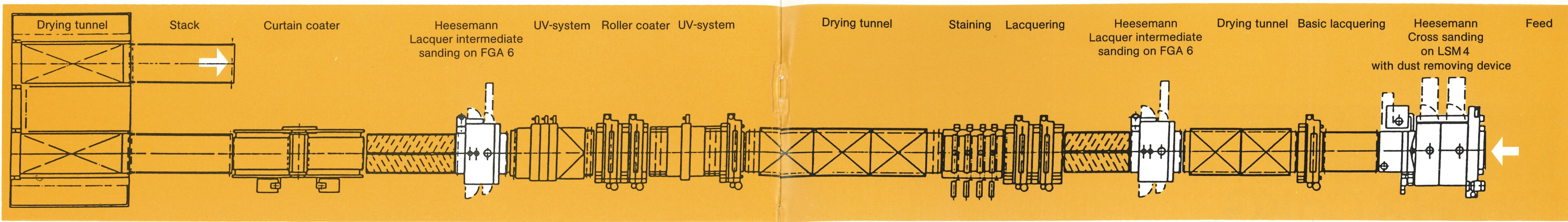
and reliability when sanding differing surface shapes. The CSD sanding system, too, is patent protected both on the domestic and foreign markets.

Energy utilization

An important question is the energy consumption of the sanding machine. With reference to dust extraction and compressed air consumption we have undertaken all steps to keep the energy requirements as low as possible. The dust is extracted in the immediate vicinity of occurrence i.e. close to the sanding belt cutting zone. The belt air jet device operates directly on the sanding belt guide roller, whereby a thorough cleaning effect is achieved. Specially designed dust conveying ducts considerably reduce the air volume.

The belt air jet device has the largest compressed air consumption. It has an **intermittent operating mode** for belt cleaning, determined by the workpiece through-feed, no compressed air is wasted while the machine runs idle. The self-cleaning device of the infrared belt control uses no compressed air.

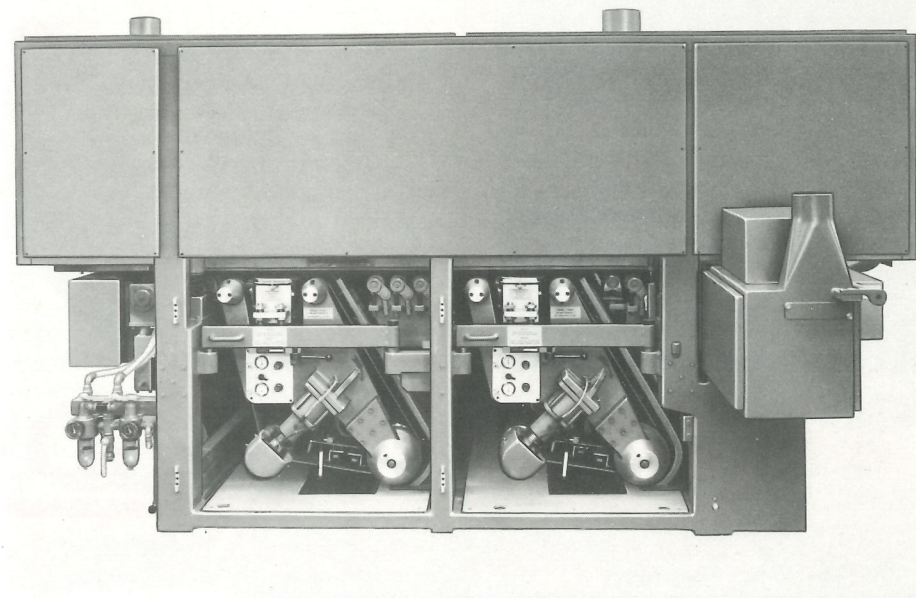
Adequate drive motor power rates keep the current consumption stable, also under varying loads.



Example of finishing line

LSM 4-U

To sand both sides of the workpiece in one pass, the LSM 4 machine is combined with the **LSM 4-U machine operating from below**. By an exactly adjustable feed the two automatic sanding machines can be arranged immediately after each other without an intermediate transport. Often a driven conveyor is placed between the top and bottom sander for better accessibility regarding operation and maintenance as well as for workpiece control. The type LSM 4-U can be equipped as a longitudinal sander or automatic cross sander in accordance with the LSM 4 technical data. Also the wide abrasive belts of the longitudinal sanding units have the same length as in type LSM 4 so that operating life of the belts is the same and stock holding can be co-ordinated.



Bottom Sander Type LSM 4-U

Technical data:

LSM 4 - sanding width 1300 mm

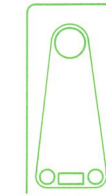
	Longitudinal sanding unit	Cross sanding unit
Sanding belt speeds m/s	10 and 20 (upon request infinitely variable from 2-20 m/s)	12 and 24
Drive capacity per unit	13/17 kW or 16.5/21 kW	13/17 kW
Sanding belt dimensions	2620 x 1350 mm (special sanding belt lengths upon request)	6200 x 150 mm
Pressure segment belts	-	4850 x 150 mm
Dust extraction:		
per sanding belt	1 x 180 mm Ø	1 x 120 mm Ø and 1 x 180 mm Ø
per brush	1 x 140 cm Ø	
Workpiece suction device	140 mm Ø (machine with 2 sanding units) 160 mm Ø (machine with 3, 4 or 5 sanding units)	
Transport belt cleaning	140 mm Ø	
Air speed min.	20 m/s	
Feed speed	5 - 25 m/min infinitely variable	
Compressed air min.	6 bar	
Space requirement and weight	according to machine equipment as per special execution drawing.	

Rights to changes reserved
Domestic and foreign patents pending
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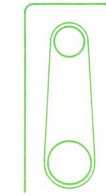
Examples of some machine executions LSM 4/LSM 4-U

Definition of symbols

- Cleaning or smoothing roller
- Cross sanding unit

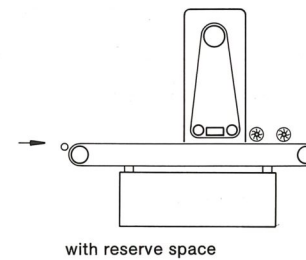
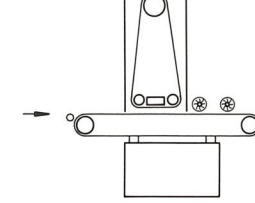


Longitudinal sanding unit with pressure beam

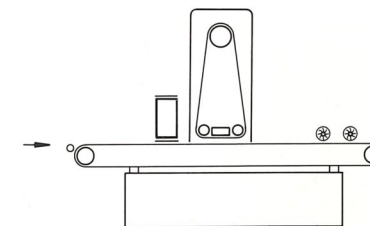
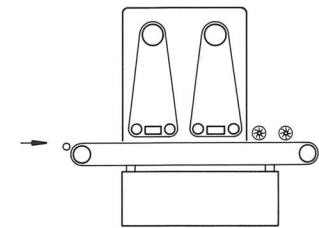
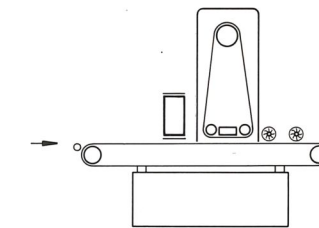


Longitudinal sanding unit with contact roller

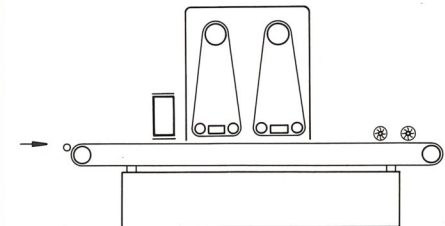
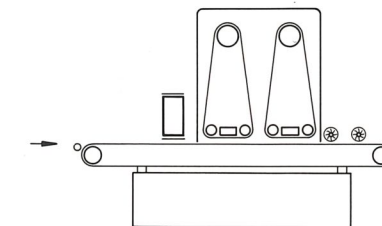
LSM 4



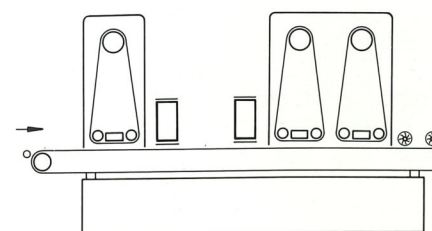
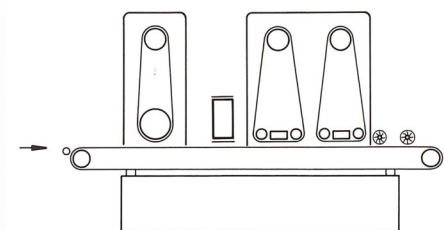
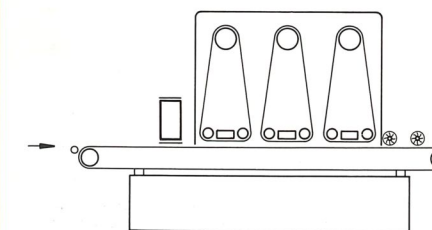
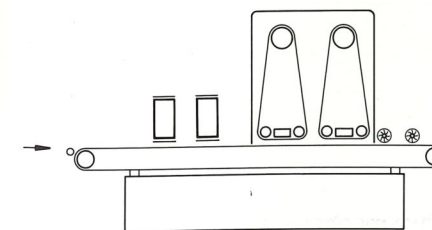
with reserve space



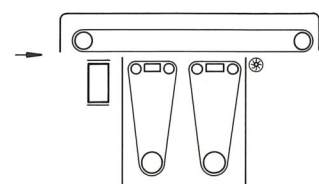
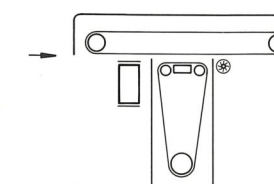
with reserve space



with reserve space



LSM 4-U



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Our production range for wood, lacquer and foil sanding
incorporates conventional and computer controlled

- cross sanding machines
- longitudinal sanding machines
- lacquer and smoothing sanding machines
- belt sanding machines
- surface form sanding machines
- automatic veneer sheet sanding machines
- universal automatic edge and profile sanding machines,
- automatic polishing machines for surfaces and profiles

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