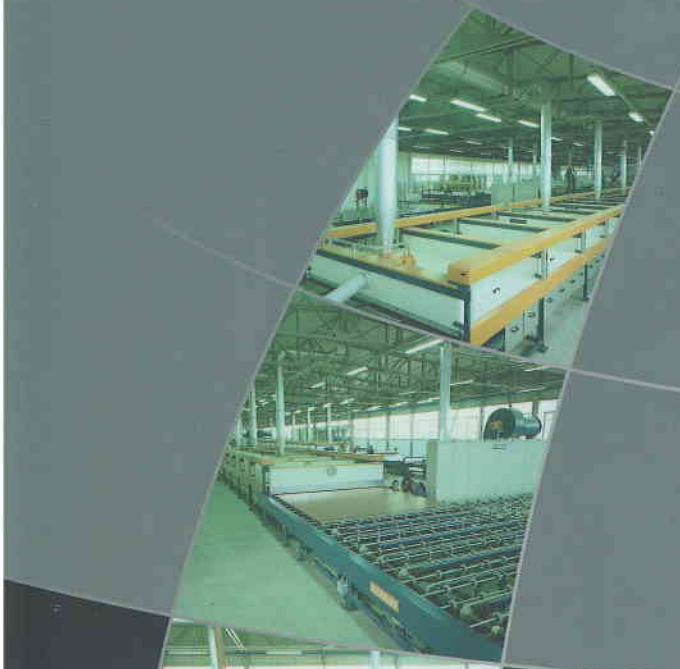
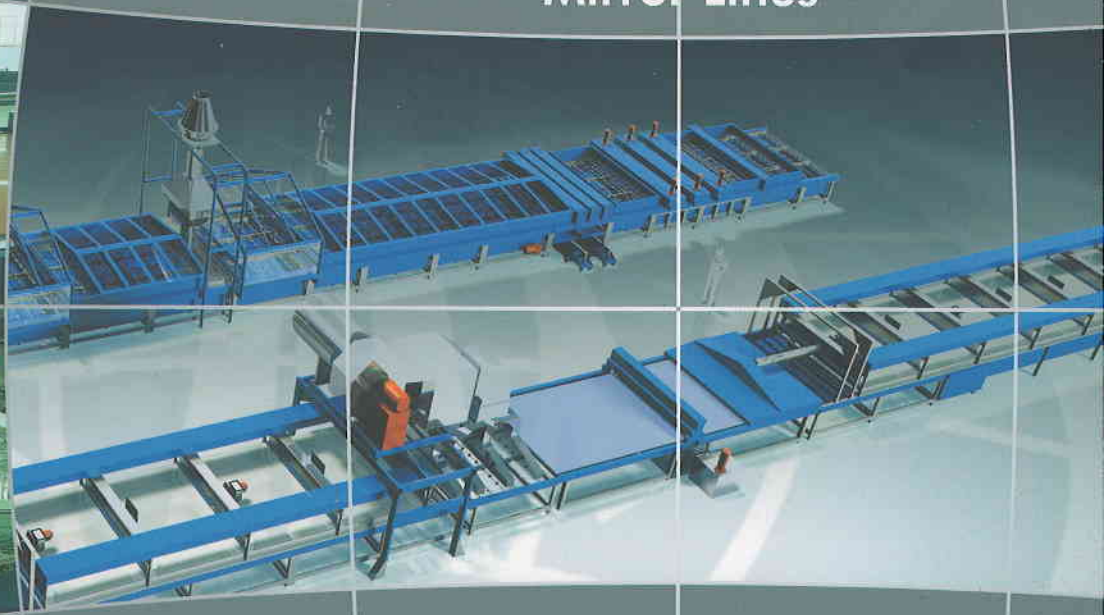
KLÖPPER
MASCHINENTECHNIK

Mirror Lines





PLAN YOUR SUCCESS WITH KLÖPPER

Whether it involves an installation for the manufacture of mirrors, flat laminated glass or a washing machine for bent glass, manufacturers worldwide trust Klöpper installations.
And rightly so: our designs and solutions persuade by virtue of the combination of innovative components and tried-and-tested construction principles. The result is convincing installations, thanks to their efficiency, durability and rapid return on investment.

Traces of our beginnings as an engineer's office can still be seen at Klöpper today. Well-informed advice, installations planned in detail, and individual designs as required, are all the expression of our special know-how. This will be to your advantage if, for example, you wish to increase production gradually or extend it. Today we will plan for contingencies and allow you to increase your production capacity and make use of new processes. Additional coatings, or adjustments to new chemical or technological processes, are easily implemented.

For the inclusion of additional work, we will also be pleased to take charge of co-ordination with foreign suppliers in order to proceed with construction as efficiently and smoothly as possible.

If long-lasting success is your goal, you will find us to be the ideal partner.

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EXTENSIVE KNOW-HOW, INTERNATIONAL EXPERIENCE

We view mirror lines as part of a whole. You need to adapt effectively to your production process, must be able to respond to change, and be prepared to expand as needed. In the same way, all mirror line components also form part of a whole.

Any component can be combined with products of other manufacturers, thus enabling you to retrofit existing installations with Klöpper technology.
The interfaces, both mechanical and those related to control engineering, are designed by us in such a way that everything can be integrated without any difficulty.

We have already proven in many countries around the world how well this works.
Every country has differing climatic conditions, different legal requirements regarding environmental protection, production formats and production methods.

Needless to say, all installations designed by us comply with national and international safety and environmental protection requirements. Our experts are completely familiar with such varying requirements and take them into account on designing installations. In this way, you can benefit from the more than 100 installations we have already set up worldwide.

All renowned mirror manufacturers currently use Klöpper installations.

THOUGHT OUT IN DETAIL

Step 1:
Cleaning the glass

Thorough cleaning of glass surfaces to be silvered is essential for their subsequent quality. In Klöpper installations, cleaning is accomplished in three stages:

a) In the preliminary wash, cutting oils, production residues and releasers are removed. The addition of small amounts of detergent to the rinsing water improves the removal of stubborn particles.

b) Polishing area surfaces are thoroughly cleaned and conditioned for the silvering process by means of rotating brushes and special cleaning procedures.

c) A washing machine with 4 roller brushes removes any residues and detergent left-overs.

This entire installation section and all other areas are completely covered to avoid any further soiling of the glass.

Step 2:
Activation zone

The surface must be activated in advance with suitable chemical solutions so that silver will adhere to the glass. Depending on the process selected, after working the solution in and rinsing off, there follows an additional stage in the process, namely activation with the appropriate chemical solutions and rinsing prior to depositing the silver.

Step 3:
Metal coating

This is the basic mirror manufacturing process. The silver layer is deposited on the glass surface by means of an even distribution of silver and reduction solution. Here it involves a precise dosing of chemical reagent pairs, and optimal temperature control of solutions and glass surfaces. With Klöpper installations both are guaranteed. Very high usage of silver solution, high efficiency, and *thus* an outstandingly economic use of this costly element, is the result.
Moreover, if your customers order mirror formats for which your installation width is not ideally designed, our installation will automatically adjust itself:
It will deposit the correct amount of silver solution on the glass, thus avoiding unnecessary waste.
Where gas-forming reaction products have unwanted effects on the process, or an odour problem arises, the extraction unit will put matters to rights.

Step 4:
Passivation

Whether with or without copper, to prepare the silver layer for subsequent painting, you need a precise dosage and distribution of the chemicals involved. Our mirror lines are prepared as standard for all current processes. If your market allows or requires the supply of differing products, the necessary connection changes and adjustments can be carried out in just a few steps.

MIRROR LAYER ELEGANCE WITH A BUILT-IN FUTURE

In every detail of our mirror lines, there is built-in potential for enhancement: speed increase, extra coats of paint, etc. At the same time, all our installations are built on the basis of a modular design so that they can be expanded or upgraded at any time.

Items made by other manufacturers can also be integrated to suit by means of the interfaces produced for this purpose. Data transfers from one installation unit to another are programmed by us in such a way that control is over a unitary system.

Investment in flexibility

If it is anticipated that you will want to increase your production speed at a later date, the current installation design should take this into account. Through an insignificant additional investment today, you will save on expansion costs and reduce conversion times later on, and thus production downtime as well.
Benefit from our experience with these installations so as to make your investment as safe as possible. Our experts are already thinking about your future today.

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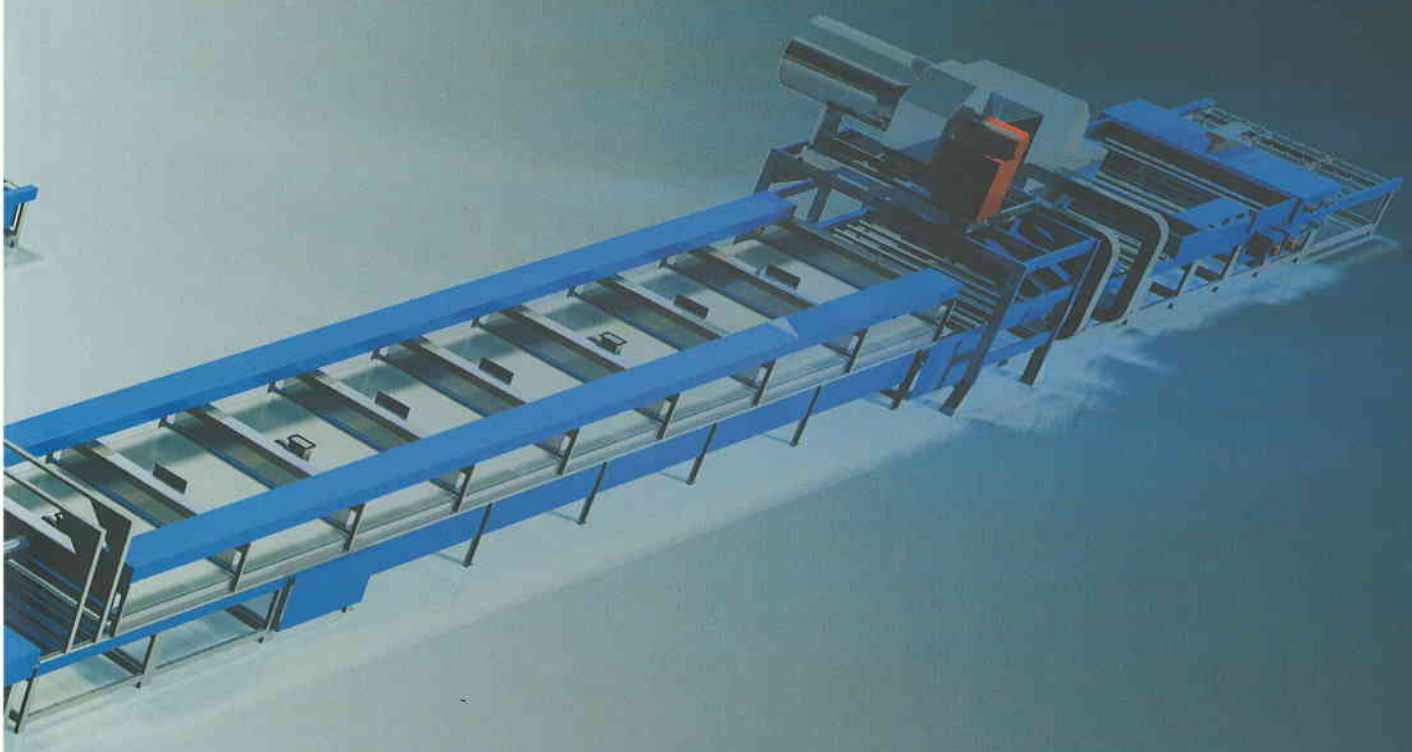

Formats and production performance

Length of mirror lines - dimensions without loading and unloading

With one Curtain Coater	m	48	59	71	84	95	112	125	138	163
	feet	157	194	233	276	312	367	410	453	535
Speed	m / min	1	2	3	4	5	6	7	8	10
	feet / min	3´3"	6´7"	9´10"	13´1"	16´5"	19´8"	23´	26´3"	32´10"
With two Curtain Coaters	m	62	77	93	110	125	146	163	180	213
	feet	203	253	305	361	410	479	535	591	699

Pane length max.3.660 mm (144") - for pane length of max. 6.100 mm (240") the below data have to be added to the above:

one curtain coater 7 m (23´)
two curtain coaters 14 m (46´)

Capacities of mirror lines

Speed in m/min	Working width in mm											
	1300		1600		2000		2300		2600		3300	
	day	year	day	year	day	year	day	year	day	year	day	year
1	500	120.000	615	147.600	768	184.320	880	211.200	995	238.800	1.230	295.200
2	1.000	240.000	1.230	295.200	1.536	368.640	1.760	422.400	1.990	477.600	2.460	590.400
3	1.500	360.000	1.845	442.800	2.304	552.960	2.640	633.600	2.985	716.400	3.690	885.600
4					3.072	737.280	3.520	844.800	3.980	955.200	4.920	1.180.800
5	calculation base								4.975	1.194.000	6.150	1.476.000
6	day = 8 h, 80% utilisation								5.970	1.432.800	7.380	1.771.200
7	year = 240 days, 8h, 80% utilization								6.965	1.671.600	8.610	2.066.400
8	data in sq meter										9.840	2.361.600
10	1 sq meter = 10,75 sq feet										12.300	2.952.000

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Step 5: Metal drying

In order to obtain greater metal coating adhesion on glass, panes are evenly heated with infra-red radiators. If you need to halt the production process, the control system will automatically prevent surface overheating. The radiators will be lowered in good time.

Step 6: Painting (Curtain Coater)

Firstly, the paint protects the silver deposit. With one or two coats of paint, the metal layer is sealed. Application using a painting machine ensures an even thickness of each coat and functions with no paint wastage.

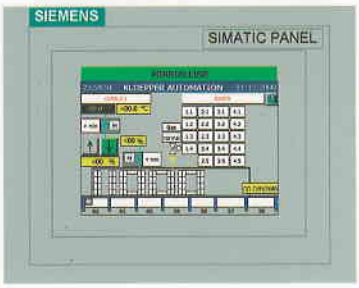
Step 7: Drying and cooling of paint

In order to dry the paint and thus allow it to set, *infra-red radiators are used. As well as the normal electrically-driven components, Klöpper also supplies ovens driven by natural gas. If this economic energy source is available, running costs can be substantially reduced.* As the ovens are insulated with suitable ceramic components, heat losses are minimised. Also, during subsequent air-cooling, blowers are adjusted to operate economically and efficiently. Thus, with Klöpper installations, you save on *operating costs*. Monitoring by means of contact-free temperature sensors and automatic adjustment prevents glass shattering caused by overheating and over-rapid cooling.

Step 8: Water cooling and final cleaning

Before mirrors leave the installation, the front is cleaned again of any contamination from the metal coating process. In this way, water cools panes down further, efficiently and rapidly. Moreover, water cooling provides independence of current climatic conditions.

MODULAR EXPANDABILITY



Demineralisation plant

The quality of your water is decisive for the quality of your mirrors. At the pane-cleaning phase, and especially when applying the coating, mirror manufacture requires almost totally demineralised water.

Depending on the requirements of the mirror lines, we will configure the performance, type and composition of the various parts needed for complete demineralisation plant.

Application and drying of special paints

In order to set special paints (such as UV paints) rapidly and durably, temperature limits and processes, as well as a predetermined temperature profile, must be adhered to. Our drying ovens will be ideally adjusted to suit the paints and coatings you use.

Process display

With the most modern control technology, you can monitor all installation units and operating conditions at any time. The installation display will show you all important process parameters, such as temperature, pressure, levels and speeds.

Loading and unloading

Depending on performance, pane size and local conditions, loading and unloading will take place manually, or semi or fully automatically.
We will manufacture the required installation parts ourselves at our plant, or obtain them from partners with whom we have successfully worked together in this field for many years past.

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KLÖPPER – EXACTLY WHERE YOU NEED US

No matter on which continent you wish to produce, we will always be where our customers need us. Klöpper installations are already successfully in operation in more than 40 countries around the world.

Thanks to our decades of experience, we are completely familiar with international requirements and take country-specific problems into account right at the start of the planning process.

We will train your staff so that they will be able to operate and maintain the installation themselves. Comprehensive, practical documentation will help with any questions that may arise, and with specifying and ordering replacement parts. And if there are any problems with the installation, you will be able to reach a personally assigned contact person at any time. It is possible to resolve many problems over the telephone.

Our service departments think globally, just as you do. You will have most spare parts to hand and will be able to resume production as quickly as possible. If the problem should turn out to be more complex, our service technicians will come out to you, wherever you may be.

Klöpper installations in more than 40 countries around the world

Survey of Products

Flat laminating plants

Mirror lines

Automotive glass plants

Glass washing machines

Further consolidated companies:

Klöpper Automation

Klöpper Elektrotechnik

Hard-& Software Technologie

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