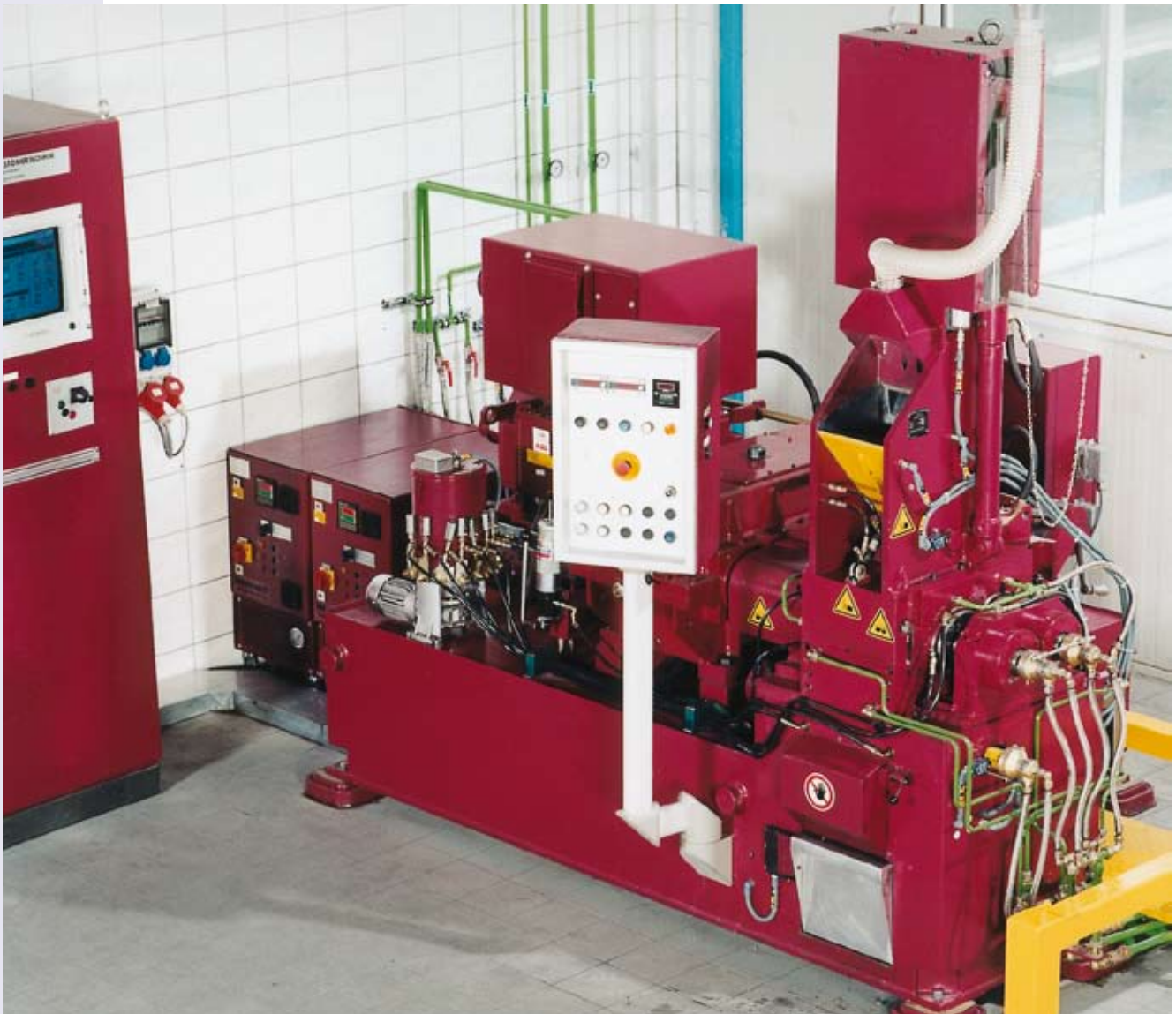


## Laboratory internal mixers for rubber compounding technology.



### Tailor-made mixing systems from Harburg-Freudenberger

As a result of decades of engineering and production expertise, and the continual exchange of ideas and experience with customers, our laboratory internal mixers have distinguished themselves through high reliability and durability. They have consistently proven their suitability by their outstanding performance in daily use in our customer's laboratories.



*GK5E Laboratory internal mixer with thyristor controlled DC drive*



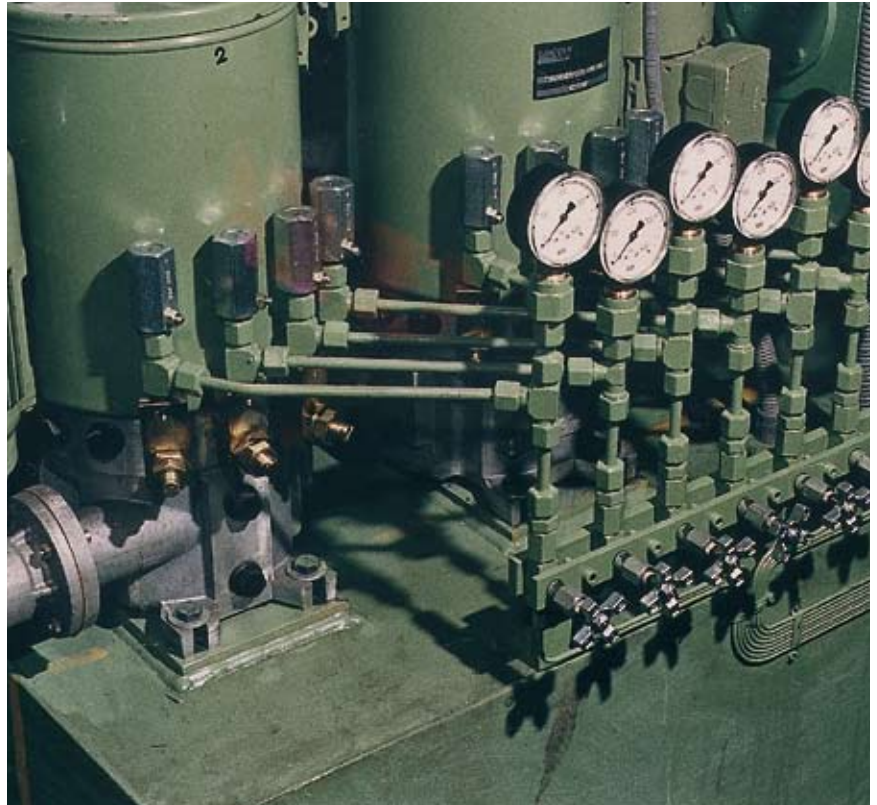
### General design principles

The laboratory internal mixer, together with the main drive system and all other auxiliary devices, required for the correct functioning of the machine, are mounted onto a common base plate:

- Mixer unit with ram
- Gear reducer for friction (N-type) or even speed (E-type) operation, with hand wheel for the manual rotation of the rotors to assist in cleaning the mixing chamber and rotors
- Main drive motor designed as a thyristor controlled DC motor or frequency controlled AC motor, for infinitely variable rotor speeds
- User-friendly multi-function control panel for machine operation

### Special design features

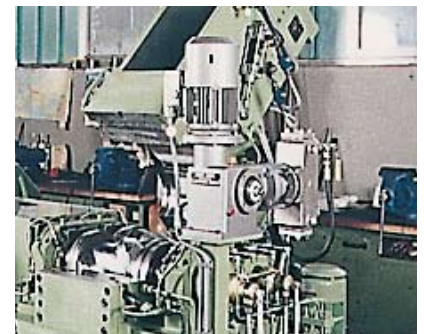
- Easy cleaning of the mixing chamber and rotors. The mixing chamber is split along its horizontal centre line to give direct access into the chamber and rotors
- Temperature control units, with direct or indirect cooling, for the mixing chamber, rotors and drop door
- Process oil injection nozzle. For the injection of oils into the closed mixing chamber during the mixing process
- Dosing and injection unit for process oils
- Compound Temperature Sensors. Compound temperature measurement by thermocouples in the mixer sidewall or drop door
- Supervision of dust ring lubrication
- Ram position indicator



*Supervision of dust ring lubrication (Typical example)*



*Hydraulic tilt mechanism for the top half of the mixing chamber (Typical example)*



*Dosing and injection unit for process oils (Typical example)*

### Special split mixing chamber

In contrast to a production machine, the chamber of the laboratory internal mixer can be split along its' horizontal centre line. For cleaning the chamber can be opened by a hand crank and spindle mechanism, or by a hydraulic tilt mechanism if required. This ensures easy access to the mixing chamber and rotors and so ensures optimum cleaning.

### Optimum wear protection

All machine parts that come into contact with the compound are hard-chrome plated to protect them from wear and corrosion.

### Dust rings

The rotor shafts are fitted with spring-loaded, externally adjustable, dust

ring seals. When worn the split sealing rings can be replaced easily and quickly.

### Compound temperature measurement

A thermocouple located in the sidewall of the mixing chamber provides accurate measurement of the compound temperature. If required a thermocouple can also be located in the drop door.

### Mixer drive

Laboratory internal mixers from Harburg-Freudenberger are equipped with a thyristor controlled DC motor, or with a frequency controlled AC motor to provide infinitely variable rotor speeds.

The rotors are driven through a special spur gear unidrive gearbox.

### Electrical control

The manual push-button control system of the laboratory internal mixer is designed as a programmable logic control (PLC) system and is housed in a separate cabinet. It contains all the circuit, display and control elements required for the operation of the machine. A multi-function operators' panel, equipped with the most important operating and display elements, is attached directly to the mixer for convenient manual operation.

As with other types of mixer, the laboratory internal mixer can be connected to a process control system.

Process control systems and other monitoring devices, e.g. for torque or pressure measurement can also be supplied by Harburg-Freudenberger.



GK 1,5 E Laboratory internal mixer with pneumatic ram

### GK-E Intermeshing Rotor System

The intermeshing rotor system facilitates high energy input within the shortest possible time, thereby considerably improving compound

quality. The exceptionally low volume to cooling surface area ratio means that even heat sensitive compounds, where high quality is required, can be processed without problems.

#### GK-E Series (Intermeshing rotor geometry)

		GK 1,5 E	GK 5 E
Chamber volume	approx. l	1.55	5
Useful volume (fill factor 0.70)	approx. l	1	3.3
Batch weight at specific gravity 1.2	approx. kg	1.2	4
Rotor speeds	1/min	20-100	20-100
Rated motor power	kW	24	60
Specific ram pressure at 8 bar*)	N/cm <sup>2</sup>	10-45	10-45
Air consumption at 60 double strokes/h	approx. Nm <sup>3</sup> /h	2.5	10.6
Ram cylinder - diameter	mm	110	160
Useful volume of feeding hopper:			
Up to feeding door shaft (including mixing chamber)	approx. l	2.5	7
Size of feeding hopper	length mm	156	240
	width mm	100	140
Drop door opening	length mm	156	240
	width mm	100	140
Space requirements for mixer, with gearbox and motor	length approx. mm	2450	3000
	width approx. mm	1300	1700
	height approx. mm	1900	2500
Weight	approx. kg	2200	4100

(\*) For hydraulic ram the specific ram pressure is variable within the same range.



*PES rotor geometry for GK-E Intermeshing system*

### GK-N Tangential Rotor System

The tangential rotor system allows a high fill factor in the mixer, with short filling and discharge times. It is parti-

cularly suitable for high output applications producing less thermally sensitive compounds and is used extensively in the tire industry.

#### GK-N Series (Tangential rotor geometry)

		GK 1,5 N	GK 5 N
Chamber volume	approx. l	1.45	5
Useful volume (fill factor 0.75)	approx. l	1	3.8
Batch weight at specific gravity 1.2	approx. kg	1.2	4.5
Rotor speeds	1/min	22.2/20-111.2/100	22.2/20-111.2/100
Rated motor power	kW	24	60
Specific ram pressure at 8 bar*)	N/cm <sup>2</sup>	10-60	10-54
Air consumption at 60 double strokes/h	approx. Nm <sup>3</sup> /h	2.5	10.6
Ram cylinder - diameter	mm	100	160
Useful volume of feeding hopper:			
Up to feeding door shaft (including mixing chamber)	approx. l	2.5	6.4
Size of feeding hopper	length mm	140	240
	width mm	75	125
Drop door opening	length mm	140	240
	width mm	80	125
Space requirements for mixer, with gearbox and motor	length approx. mm	2450	3000
	width approx. mm	1300	1700
	height approx. mm	1900	2500
Weight	approx. kg	2150	4100

\*) For hydraulic ram the specific ram pressure is variable within the same range.



*ZZ2 rotor geometry for GK-N Tangential system*

### **Harburg-Freudenberger**

We develop, build and distribute machines, lines and systems across our three company divisions based on 150 years of company tradition.

### **Rubber mixing technology**

We provide the most comprehensive range of machines for the rubber and caoutchouc industry including all major preparation and processing stages.

- Complete mixing room systems
- Internal mixer
- Mixing mills
- Dump extruder

### **Caoutchouc technology**

Production machines and lines for the manufacture of tires and technical rubbergoods from raw material feeding to vulcanisation:

- Extruder
- Extrusion lines
- Tire building machines
- Curing presses

### **Edible Oil Technology**

Machines for processing oilseed, crude oils of vegetable origin and animal raw materials as well as screw presses for the dewatering of synthetic caoutchouc and similar products:

- Screw presses
- Extraction lines
- Refining lines
- Process engineering

### **We are always at your service**

With our foreign offices and our service points we have a global presence.

If you would like to learn more about Harburg-Freudenberger or if you require information on specific services, please do not hesitate to contact us.



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