

Equipment for research, development
and production in chemical, pharma-
ceutical and related industries.

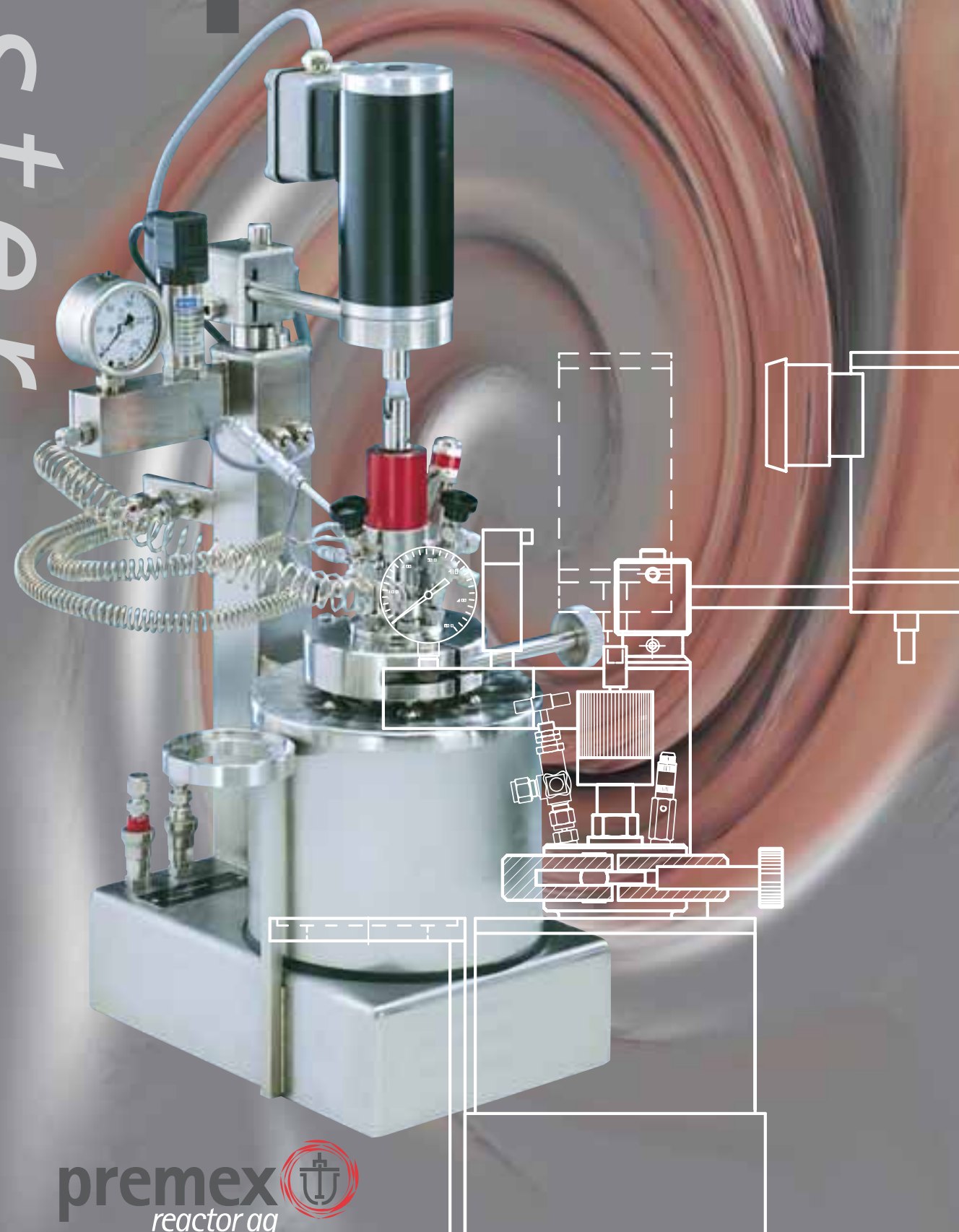
twister

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hp twister



premex
reactor ag



*We are proud to present another of
our success stories – the hpm-twister,
an innovative and amazingly versatile
product that can be used in a range
of applications.*

**Premex Reactor AG – one step ahead
of technology!**

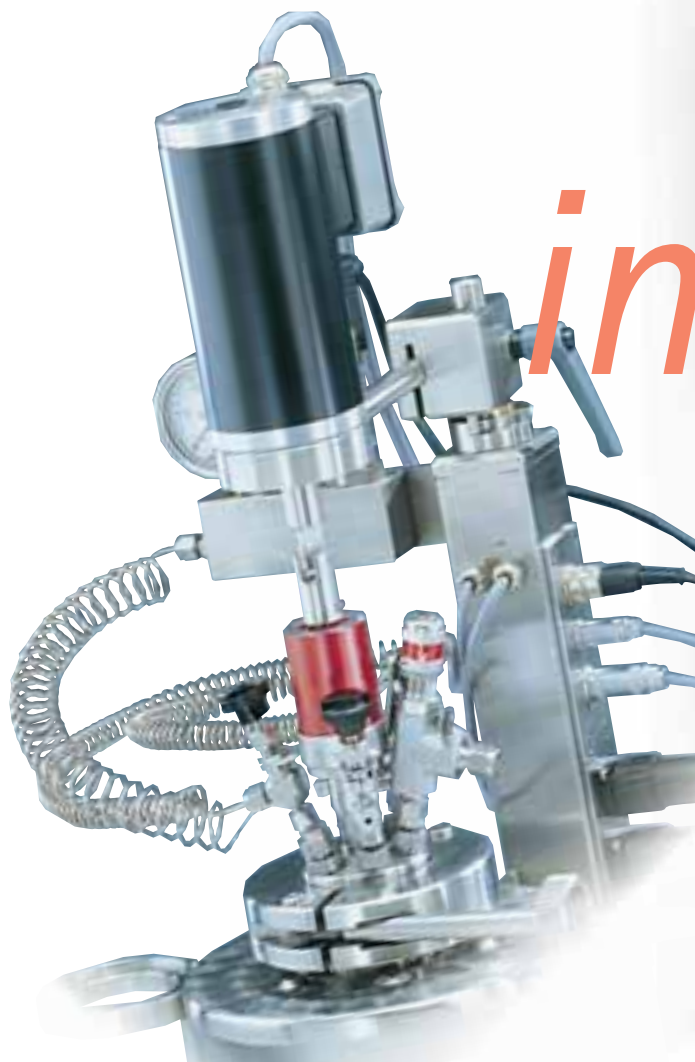
the hpm-twister

hpm-t



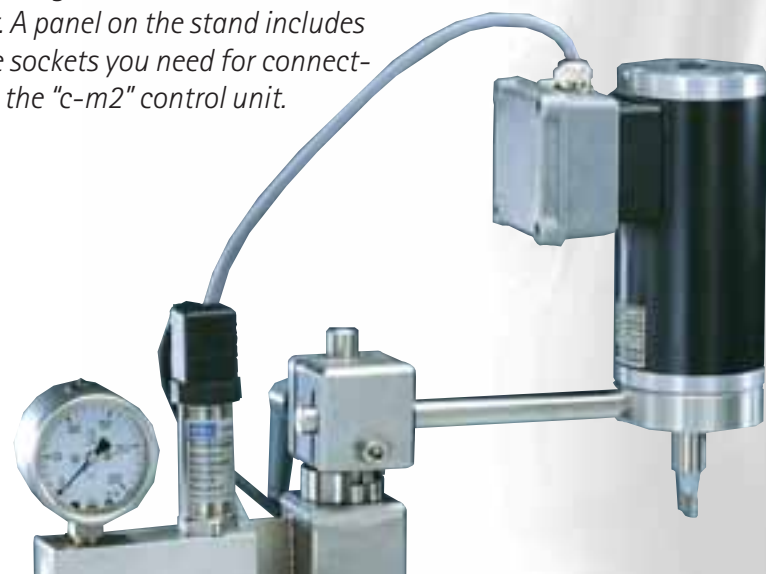
well designed innovative

flexible



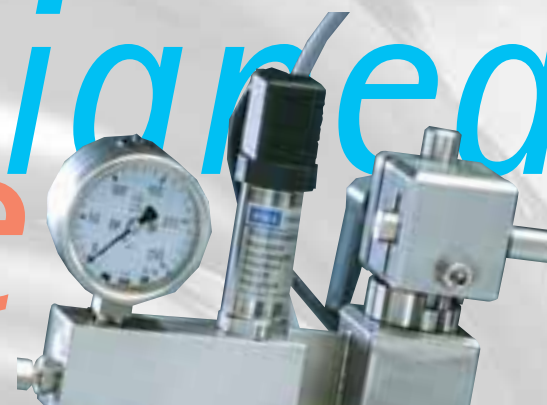
Socket panel on stand

Connecting our "twister" couldn't be easier. A panel on the stand includes all the sockets you need for connecting to the "c-m2" control unit.



Swivel attachment for stirrer motor

The precision swivel attachment means that the stirrer motor can be disengaged from its flexible engagement coupling and swung out to one side. The speed of the stirrer motor is determined by the "c-m2" control unit.



Pressure station on stand

The pressure gauge and measuring transducer are vital instruments, which are combined in the stand-mounted pressure station. Coiled spiral pipework is used to pass pressure readings from the interior of the autoclave to the instruments.

Rest for autoclave cover

The rest for the autoclave cover is another practical idea. The magnetic stirrer head and all the other fittings can be removed from the vessel together with the autoclave cover, then carefully placed on the rest. The flexible pipework is easy to manoeuvre. The submerged tubes and the stirrer are left untouched, suspended from the rest. At this point the vessel can be removed.



Jaw lock

The jaw lock is easy to open and close with no force required. Our secret? The lock is in two halves that close around the autoclave and are sealed effortlessly using a hand wheel.



Coolant supply and return

We keep the "twister" cool so you can concentrate on other things. The cooling system is a complete package – with the electric cooling valve in the base, the supply and return pipes on the stand, and the power supply on the socket panel.

Heating or cooling units and removing the vessel

Premex Reactor AG offers two alternative heating and cooling systems for the "twister". You can choose either electric heating or a double-shell design using thermal oil. The standard equipment for electric heating includes an aluminium shell incorporating the heating elements and the cooling spiral for cold water. Heat is transferred quickly and evenly from the aluminium shell to the autoclave vessel, via a copper shell. The end result is an even transfer of heat, with no sudden temperature increases. The cooling spiral is extremely effective and is sufficient, under normal circumstances even for exothermal reactions. The double-shell thermal oil heating/cooling is also designed in two parts. The outer segment is the double shell, equipped with fins to guide the oil. Copper, the optimum conductor of heat, is used here too, transferring the heat inwards to the autoclave vessel. Something else that makes Premex Reactor AG heating systems so special is the ability to remove the autoclave as a completely separate unit.

Flexible pipework

The pipework used by Premex Reactor AG is as flexible as we are. Coiled pipes run from the autoclave cover to the fixed connections, providing maximum freedom of movement. The autoclave cover can be lifted, complete with its fittings, and placed in its rest without the need to disconnect any of the valves or connections. That means it is never difficult to remove the vessel for emptying or cleaning.

1 AC motor controlled by a frequency converter. A flexible coupling is used to connect it to the magnetic stirrer head.

2 Swivel attachment for stirrer drive. The stirrer motor can be swung in and out until it reaches the precision stop.

3 Stand-mounted pressure station, including pressure gauge and measuring transducer, connected to the autoclave cover by means of coiled pipes.

4 Stand with socket panel on side for electrical connections.

5 Frame mount for fixed connections. Flexible coiled pipes run from the autoclave cover to the fixed connections.

6 Flexible coiled pipes work like springs to provide maximum freedom of movement.

7 Magnetic stirrer head, complete with engagement coupling (for connecting to motor). The speed can be measured directly at the drive shaft of the magnetic stirrer head, with the readings processed digitally.

8 The standard unit is supplied with the following fittings: sample-taking valve with submerged tube to the bottom of the autoclave, gas input valve, pressure release valve, spring pressure safety valve, submerged temperature sensor and connection to stand-mounted pressure station.

9 Practical rest for the autoclave cover.

10 There is a choice of gas injection stirrer, disk blade stirrer, propeller stirrer or anchor stirrer. One of these stirrer options is supplied with the autoclave.

11 Premex Reactor AG offers two different lock systems: the tried-and-tested jaw lock, or high-tensile bolts and nuts for pressures exceeding 200 bar.

Perfectly formed technology, tested in every particular. We renew this philosophy every day. We are proud of the performance of our high-pressure autoclaves.

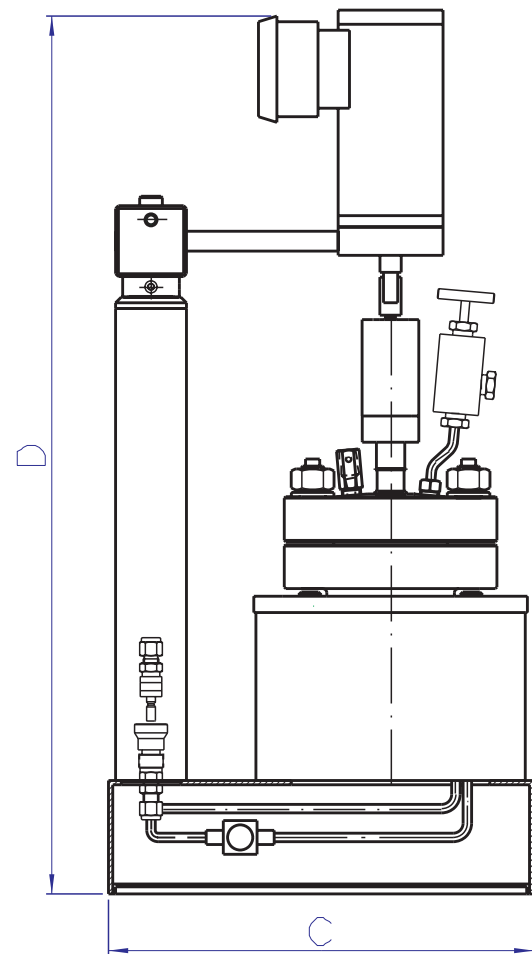
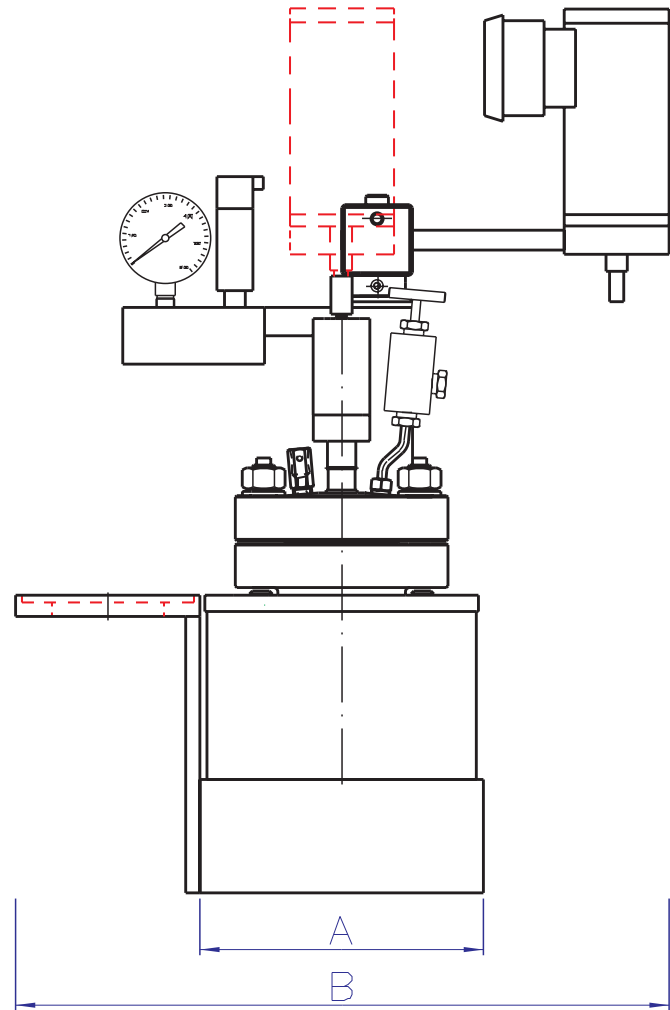
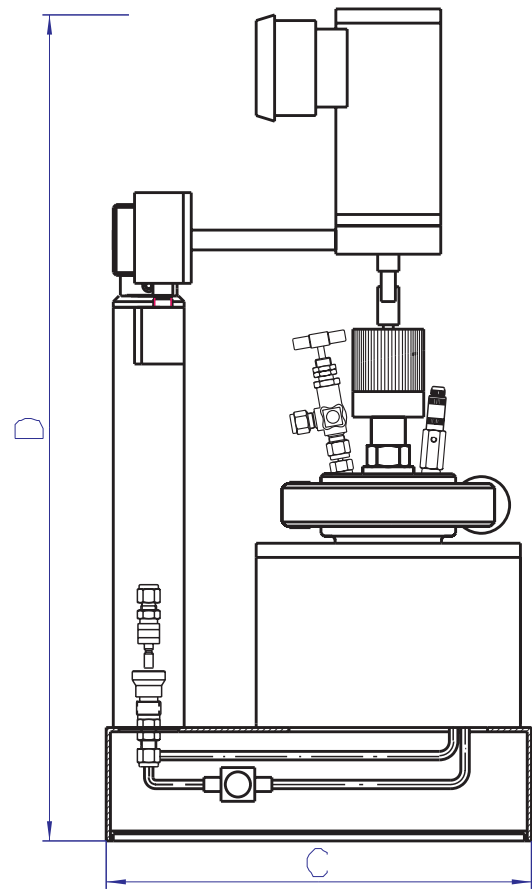
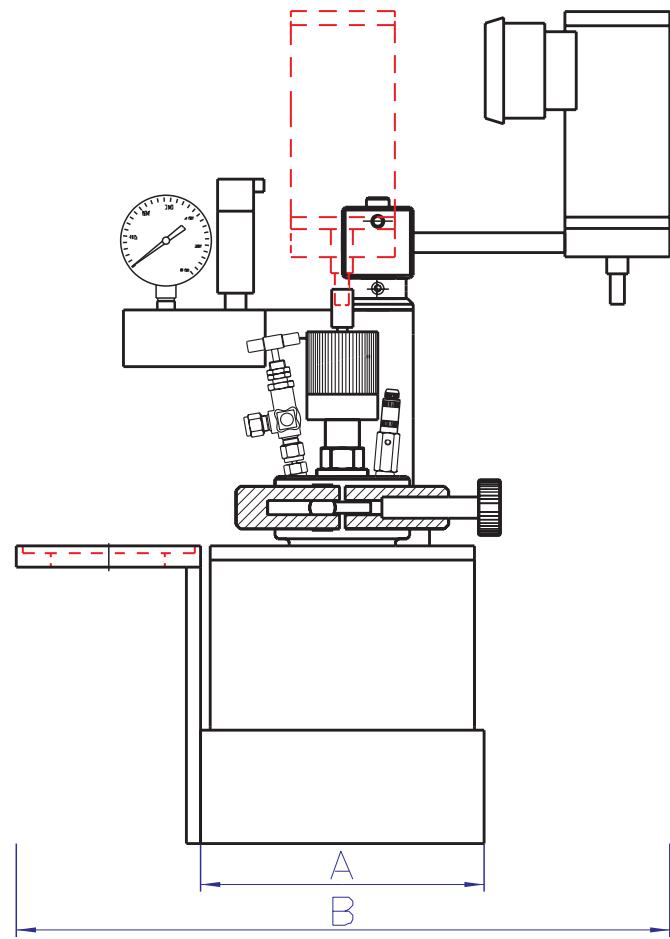
12 The autoclave vessel can be removed from the heating/cooling unit as a separate unit. In the locking system using the two half jaws, the sealing ring rests loose in the autoclave vessel. In the high-tensile bolt system, the flat seal is fixed to the autoclave cover.

13 In the jaw lock system, the O ring seal between autoclave cover and vessel is made of Kalrez, EPDM or Viton. The standard model can be used for temperatures up to 250°C with a Kalrez seal. The high-tensile bolt system uses flat seals made of pure silver, PTFE carbon or Graphoil. The standard model, when used for temperatures up to 350°C, is supplied with a silver seal.

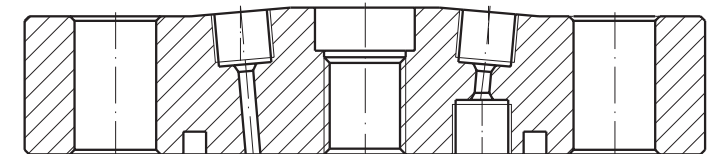
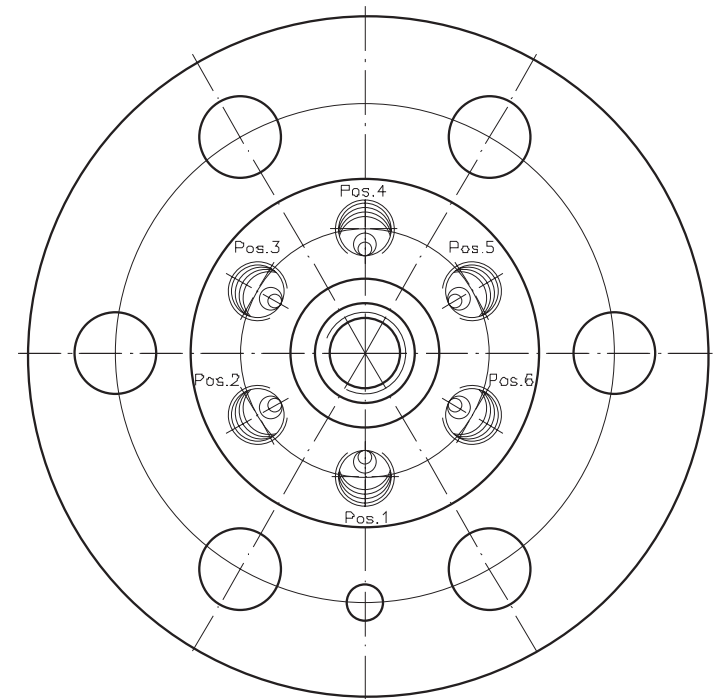
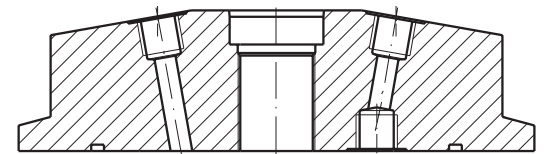
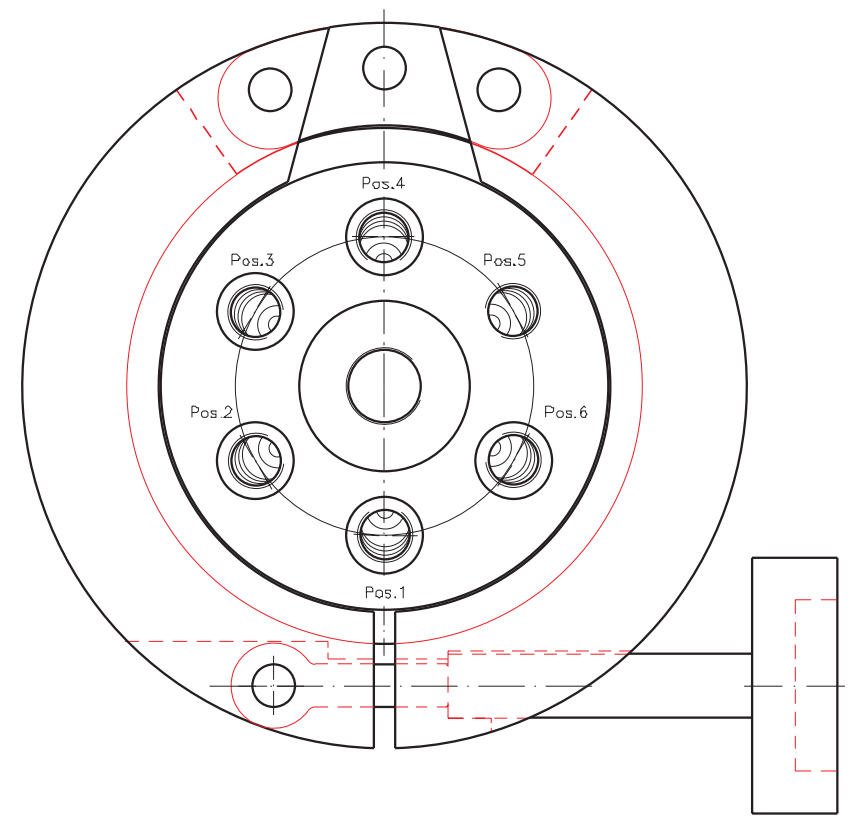
14 We offer two different heating/cooling systems – one using electric heating, and the other using a double shell for thermal oil. The electric system incorporates the heating elements and a cooling spiral for cold water within an aluminium block. Heat as well as cold are transferred via the aluminium block to the inner copper shell, and on to the autoclave vessel. The thermal oil system uses a double-shell design. This double-shell is equipped with fins to guide the oil, and an inner copper shell transfers the heat, as well as cold, on to the autoclave vessel.

15 The rear of the autoclave base includes two plug-type connections for coolant supply and return. The cooling valve is built into the base. The plug-type connections and the cooling valve are only fitted on models using the electric heating system.





hpm *twister*



High-pressure autoclave
Type: hpm-twister
Model: Jaw lock

Electric heating

	hpm-t-0070eb	hpm-t-0125eb	hpm-t-0380eb	hpm-t-0600eb	hpm-t-1200eb
Rated volume, l	0,07	0,125	0,38	0,6	1,2
Working volume, l	0,05	0,1	0,3	0,5	1,0
Working temperature, °C	250	250	250	250	250
Working pressure, bar	200	200	200	150	80
Autoclave material AISI	316 Ti	316 Ti	316 Ti	316 Ti	316 Ti
Fittings material AISI	316	316	316	316	316
Torque of magnetic coupling, Ncm	20	20	40	60	90
Rated output of AC motor, W	40	40	120	120	120
Drive shaft speed, rpm *	200–1500	200–1500	200–1500	200–1500	200–1500
Heating output, W	1000	1200	1500	2000	2500
Cooling output, W	2000	2400	3000	4000	5000
Cover connections	1/8"G	1/8"G	1/4"G	1/4"G	1/4"G
Unit width A, mm	200	200	200	200	280
Overall width B, mm	430	430	450	480	600
Unit depth C, mm	380	380	380	380	450
Height D, mm	650	650	720	750	800

Double-shell thermal oil heating

	hpm-t-0070ob	hpm-t-0125ob	hpm-t-0380ob	hpm-t-0600ob	hpm-t-1200ob
Rated volume, l	0,07	0,125	0,38	0,6	1,2
Working volume, l	0,05	0,1	0,3	0,5	1,0
Working temperature, °C	250	250	250	250	250
Working pressure, bar	200	200	200	150	80
Autoclave material AISI	316 Ti	316 Ti	316 Ti	316 Ti	316 Ti
Fittings material AISI	316	316	316	316	316
Torque of magnetic coupling, Ncm	20	20	40	60	90
Rated output of AC motor, W	40	40	120	120	120
Drive shaft speed, rpm *	200–1500	200–1500	200–1500	200–1500	200–1500
Heating output, W	1000	1200	1500	2000	2500
Cooling output, W	2000	2400	3000	4000	5000
Cover connections	1/8"G	1/8"G	1/4"G	1/4"G	1/4"G
Unit width A, mm	200	200	200	200	280
Overall width B, mm	430	430	450	480	600
Unit depth C, mm	380	380	380	380	450
Height D, mm	650	650	720	750	800

*adjustable for other speeds

e = electric heating
o = double-shell heating
b = jaw lock
d = high-tensile bolt lock

High-pressure autoclave
Type: hpm-twister
Model: High-tensile bolt lock

Electric heating

	hpm-t-0125ed	hpm-t-0380ed	hpm-t-0600ed	hpm-t-1200ed
Rated volume, l	0,125	0,38	0,6	1,2
Working volume, l	0,1	0,3	0,5	1,0
Working temperature, °C	350	350	350	350
Working pressure, bar	325	325	325	325
Autoclave material AISI	316 Ti	316 Ti	316 Ti	316 Ti
Fittings material AISI	316	316	316	316
Torque of magnetic coupling, Ncm	20	40	60	90
Rated output of AC motor, W	40	120	120	120
Drive shaft speed, rpm *	200–1500	200–1500	200–1500	200–1500
Heating output, W	1200	1500	2000	2500
Cooling output, W	2400	3000	4000	5000
Cover connections	1/4"G	1/4"G	1/4"G	1/4"G
Unit width A, mm	200	200	200	280
Overall width B, mm	450	470	500	630
Unit depth C, mm	380	380	380	450
Height D, mm	650	720	750	800

Double-shell thermal oil heating

	hpm-t-0125od	hpm-t-0380od	hpm-t-0600od	hpm-t-1200od
Rated volume, l	0,125	0,38	0,6	1,2
Working volume, l	0,1	0,3	0,5	1,0
Working temperature, °C	350	350	350	350
Working pressure, bar	325	325	325	325
Autoclave material AISI	316 Ti	316 Ti	316 Ti	316 Ti
Fittings material AISI	316	316	316	316
Torque of magnetic coupling, Ncm	20	40	60	90
Rated output of AC motor, W	40	120	120	120
Drive shaft speed, rpm *	200–1500	200–1500	200–1500	200–1500
Heating output, W	1200	1500	2000	2500
Cooling output, W	2400	3000	4000	5000
Cover connections	1/4"G	1/4"G	1/4"G	1/4"G
Unit width A, mm	200	200	200	280
Overall width B, mm	450	470	500	630
Unit depth C, mm	380	380	380	450
Height D, mm	650	720	750	800

*adjustable for other speeds

e = electric heating
o = double-shell heating
b = jaw lock
d = high-tensile bolt lock

1 Control unit case. A modern, light-grey aluminium case, with an integral three-position support that doubles as a carrying handle. The natural silver coloured front and rear panels have abrasion-resistant markings, anodised under the final coating. The "c-m2" control unit is 320 mm wide (including support), 350 mm deep and 210 mm high.

2 The AC758 controller is a cascade controller and programmable controller combined. A cascade controller is able to regulate the internal temperature and shell temperature simultaneously, thereby preventing the internal temperature rising above the set value. The software-based "programmable controller" can be used to implement small and large scale temperature programs, with gradual temperature changes, holding times and sequential operations. And there is more – the AC758 controller includes a digital motor speed indicator at the bottom right of the display.

3 SA3 security switch. This safety cut-out monitors the internal temperature and/or shell temperature, checking it against an adjustable maximum setting. If the temperature exceeds the maximum setting, the heating is cut off with no override possible. The cooling remains unaffected. The upper display of the security switch also shows the pressure inside the reactor.

4 Main switch. The green illuminated pushbutton is used to switch on the power to all components in the control system.

5 Heating switch. The red illuminated pushbutton can be used to switch the heating on and off independently of the controller.

6 Cooling switch. Pressing the blue illuminated pushbutton activates cooling immediately, independently of the controller. To activate "controller cooling", this function must be switched off.

7 Stirrer switch. The yellow illuminated pushbutton switches the stirrer on and off.

8 Stirrer motor speed control. The central component in controlling the stirrer motor is the potentiometer (rotary knob). The speed is shown in rpm at the bottom right of the AC758 controller display. The fuses are at the rear of the control unit, with electrical plug-type connections for attaching the autoclave.

9 Connection to stirrer motor. A seven-pin plug is used to connect to the stirrer motor. The stirrer motor is controlled by the built-in frequency converter, which has a maximum load of 370 W.

10 Connection to heating. A four-pin, two-phase plug is used as the main heating connection. Maximum heating output: 3000 W.

11 Connection to cooling valve. A three-pin plug is used as the connection to the cooling valve integrated into the autoclave frame. It is controlled automatically via the programmable controller, or manually by pressing the illuminated pushbutton.

12 Connection to temperature sensor 1. This connection is used to attach the 2 x Pt100 temperature sensor (three leads) of type K or type N, and allows the temperature inside the medium to be measured (product temperature).

13 Connection to temperature sensor 2. This is the connection for the 2 x Pt100 temperature sensor (three leads) used for monitoring the heating control and security switch. If type K or type N sensors are used, it only performs the function of heating monitoring – an additional connection is required for the security switch.

14 Connection to temperature sensor 3. A connection for a type K or type N sensor carrying out the security switch function.

Premex Reactor AG offers a fully-integrated concept, encompassing the high-pressure autoclave, the control unit, and the online visualisation software. The "c-m2" control unit described here was designed specifically to regulate and control high-pressure autoclaves.

15 Connection to motor speed display. A two-pin plug is used to transmit the measured speed of the stirrer to the AC758 controller, where it is shown in the lower display.

16 Connection to emergency cooling valve. This connection is used to control an emergency cooling valve which is regulated by an adjustable alarm signal at the temperature controller. This optional extra is required for strongly exothermal reactions.

17 Analogue output to printer. The analogue printer output means that data – such as product temperature readings, heating readings, medium temperature settings or the speed of the stirrer motor – can be permanently recorded.

18 Connection to pressure indicator. This socket is used to transmit the pressure reading from the pressure measuring transducer to the SA3 – security switch, where the pressure is shown in bar at the top of the display.

19 RS485 interface. When used in combination with the specially developed software suite, the RS485 data logging and PC connection interface opens up a wealth of applications. The two sockets, one above the other, make it possible to interconnect a number of control units, or connect auxiliary equipment via the software.

20 Socket for mains power 230 V/A.

21 Fuses for heating, one for each phase, 2 x 10 A.

22 Fuse for electronic system, 2.5 A.



The "allview" data capture and recording software allows the user to visualise the progress of the experiment in real time on a PC screen, while also storing all relevant readings in an ASCII or Excel file.

Online and Flowchart

While the experiment is underway, "allview" generates an x-y chart on the screen, just like a standard plotter output. The real-time chart plots curves for temperature, pressure, stirrer speed, etc. in relation to the duration of the experiment. The standard software is supplied with "Flowchart", which displays in real time all the important readings in a diagram of the high-

pressure autoclave. This component allows the user to track and monitor progress in the system (outside the reaction cavity) directly on the screen.

Readings

The following readings can be displayed from experiments carried out in the autoclave:

- Internal temperature reading of autoclave in °C
- Internal temperature setting of autoclave in °C
- Shell temperature reading of autoclave in °C
- Shell temperature setting of autoclave in °C
- Heating and cooling output of the heating block
- Stirrer speed in rpm
- Autoclave pressure in bar
- Safety limit /cut-out value in °C

"allview" interface

The latest release of "allview" requires a Windows interface, i.e. Windows 95, Windows 98 or Windows NT 4.0. Because Windows NT 4.0 is a multitasking environment, a number of applications can be run simultaneously, for example "allview" with Excel or MS Word.

PC hardware requirements

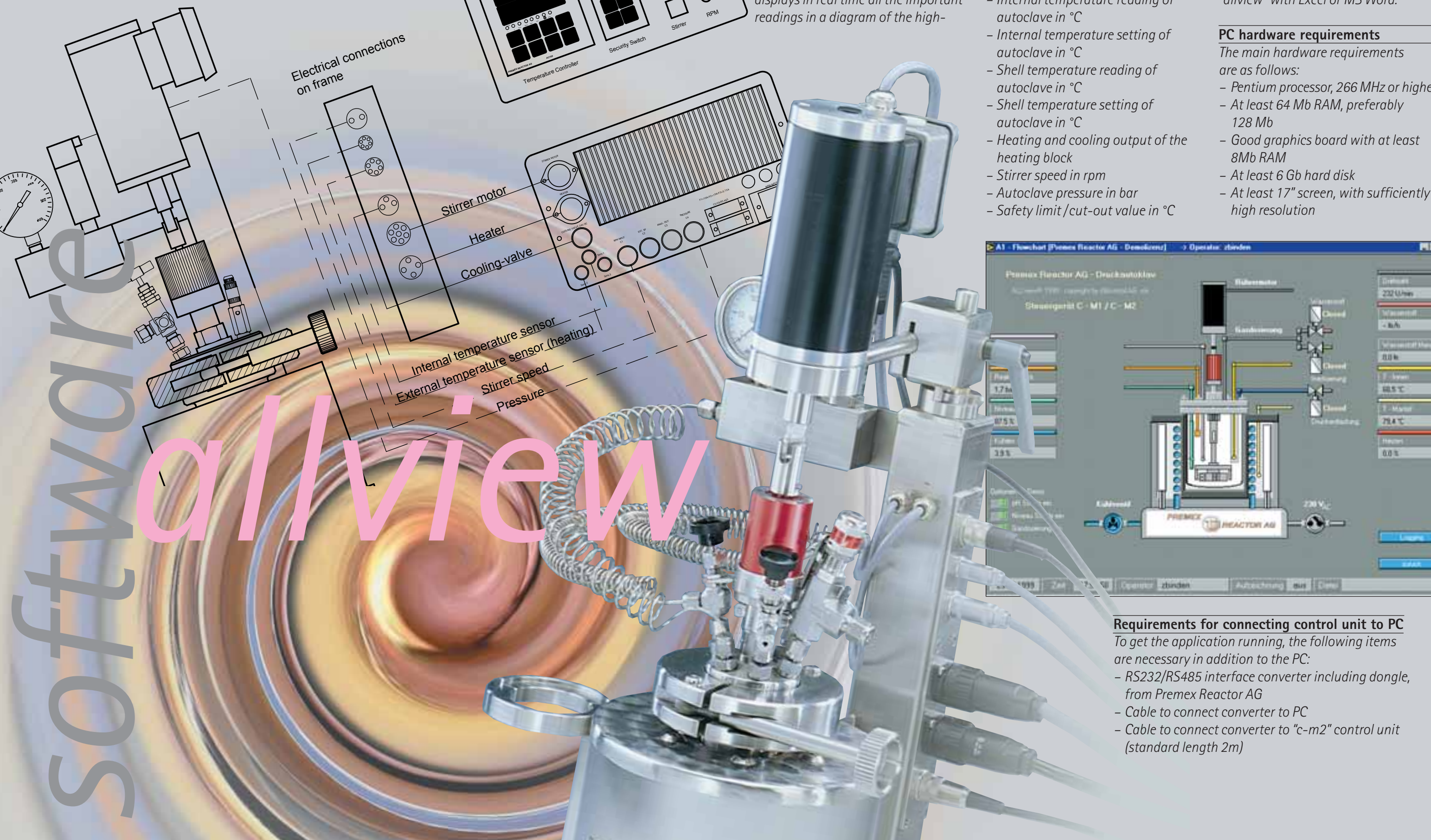
The main hardware requirements are as follows:

- Pentium processor, 266 MHz or higher
- At least 64 Mb RAM, preferably 128 Mb
- Good graphics board with at least 8Mb RAM
- At least 6 Gb hard disk
- At least 17" screen, with sufficiently high resolution

Requirements for connecting control unit to PC

To get the application running, the following items are necessary in addition to the PC:

- RS232/RS485 interface converter including dongle, from Premex Reactor AG
- Cable to connect converter to PC
- Cable to connect converter to "c-m2" control unit (standard length 2m)



Standard	Model codes e = Electric heating o = Double-shell heating b = Jaw lock d = High-tensile bolt lock * Available	Jaw lock				High-tensile bolt lock			
		Electric heating		Double-shell heating		Electric heating		Double-shell heating	
		hpm-t-0070eb Vol. 70 ml	hpm-t-0125eb Vol. 125 ml	hpm-t-0380eb Vol. 380 ml	hpm-t-0600eb Vol. 600 ml	hpm-t-1200eb Vol. 1200 ml	hpm-t-0070ob Vol. 70 ml	hpm-t-0125ob Vol. 125 ml	hpm-t-0380ob Vol. 380 ml
Working pressure	80 bar								
	150 bar								
	200 bar								
	325 bar								
	700 bar*								
Working temperature	250 °C								
	350 °C								
Material Standard									
	AlSi 316Ti – DIN 1.4571								
	AlSi 660 – DIN 1.4980*								
	Alloy C22 – DIN 2.4602*								
	Alloy C276 – DIN 2.4819*								
	Titanium Grade 2 – DIN 3.7035*								
	Special materials on request:								
	Alloy B2/3 – DIN 2.4617/2.4600								
	Alloy 400 – DIN 2.4360								
	Alloy 600 – DIN 2.4816								
	Alloy 718 – DIN 2.4668								
	Zirconium Grade 702								
	Tantalum								
	Nimonic 105 – DIN 2.4634								
	Fast-acting jaw lock								
Cover lock	High-tensile bolts and nuts								
	Elastomer O rings:								
Autoclave seal	EPDM*								
	Viton*								
	Kalrez								
	Flat seals:								
	Pure silver								
	PTFE carbon*								
	Graphoil*								
	Gas injection stirrer								
	Propeller stirrer								
	Disk blade stirrer								
Stirrer element	Anchor stirrer								
	Sitec valves (Nova valves)								
	Whitey valves								
	Pressure gauge								
	Measuring transducer								
Temperature sensors	Sensing membrane HC/Ti*								
	Type K*								
	Type N*								
Magnetic stirrer head	Type Pt 100								
	Type MINI 100								
	MRK 10 – 17 series								
Torque of magnetic coupling	MRK 30 – 37* series								
	20 Ncm								
	40 Ncm								
	60 Ncm								
	90 Ncm								
Drive shaft bearing	CN steel ball bearings								
	PTFE / carbon friction bearings*								
	Carbon/graphite CBT friction bearings*								
AC motor	Power supply:								
	3 x 400 / 240 V, 50 Hz								
	Rated output:								
	40 W								
Output speed	120 W								
	200 – 1500 rpm (ball bearings)								
Heating system	200 – 1300 rpm (friction bearings)								
	Electric heating								
Options for standard models	Double-shell heating								
	Inspection window								
	Gas flow meter								
	pH electrode								
	pH protective tube in SS/HC/Ti								
	Level probe in SS/HC								
	IR manometric probe								
Computation and acceptance	Catalyst cage with baffle								
	Computation as per TÜV guidelines								
	Item subject to compulsory acceptance								
Cascade control	Not subject to compulsory acceptance								
	"c-m2" control unit								
PC software	LR3-S-750 control unit								
	"allview" V 1.0X								
	"allview" V 3.0X								