

## MINIPLANT TECHNOLOGY RDAD REACTION AND DISTILLATION UNIT

### STANDARD UNIT FOR DISCONTINUOUS OPERATION

M116E.1

#### GENERAL

RDAD is short for the described discontinuously operated standard reaction and distillation unit which has been designed to perform liquid phase reactions and to distillate off the low boiling substances or solvent, respectively. The unit described is a multi-purpose unit characteristic for our MINIPLANT TECHNOLOGY modular system which can be used as a base module of the modular engineering system in various ways.

The reaction vessel with a capacity of 10 l to 25 l can either be used for conventional synthetical work and separation or bioreaction tasks.

Further advantages of this unit are:

- It can be operated permitting a pressure range of 1 mbar to 1500 mbar and temperatures of up to 200°C.
- As all components in contact with the media are made of borosilicate glass 3.3 components, PTFE, SiC, KALREZ or PFA, you can use it for chemically aggressive substances.
- A visual check is given by using glass as the predominant material.
- The progress of any reaction process can be controlled at a particular level by using both the reproducible dosing of a reactant and the reproducible heating of the mixture.
- The stirrer features an adjustable speed control.
- The capability to measure the temperature within the GMP-tapered bottom outlet valve allows handling even small quantities.

As it is a dead space free solution, the bottom can be completely drained.

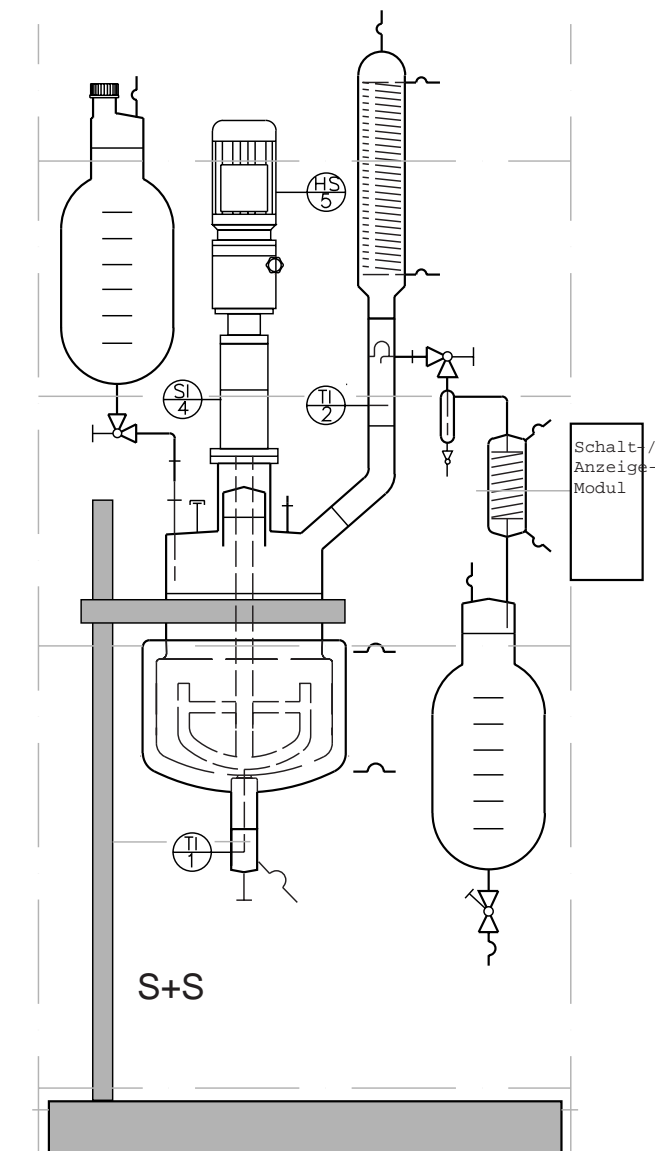
- Taking off solids as well as cleaning the reactor can easily be managed by using the lowering and swiveling arrangement.
- The measuring and control instrumentation has been designed to fit modular use. It can be extended from a manual to a fully automated version step by step.
- The reactor height/diameter ratio equals the value of approximately 1, and can easily be scaled up.

#### STRUCTURE

The scope of delivery of a RDAD reaction unit is shown in figure 1.

The reactor vessel has been designed as a jacketed vessel made of borosilicate glass 3.3 featuring a robust KF-flange used to guarantee a grease-free PTFE-sealing.

The heat transfer liquid will tangentially be filled into the jacket to guarantee a constant action of heat. The



thermostat needed for heat control of the reaction vessel is a part of the special equipment which is normally provided by the user. The temperature of the reaction medium is monitored by a temperature sensor within the reaction mixture and at the bottom outlet valve. The bottom outlet valve integrated in the glass jacket seals the bottom of the vessel using a PTFE stamp without any dead space so that the vessel can also be drained completely.

The mature design of this special valve guarantees an easy handling even after a long service life.

Aside from the connections for connecting the condenser, the hopper and stirrer 3, the glass vessel cover is equipped with further connections for the sensor and additional feed connections. The lowering and swiveling arrangement (S+S) allows to lower the reaction vessel or swing it sideways by 45°. So it is possible to facilitate either the oftaking of solid particles as well as the cleaning.

The stirrer drive is equipped with a speed sensor so that a producible heat transfer and a thorough intermixing is guaranteed. To increase the efficiency of a stirrer, PTFE anchors are fixed on the PTFE-coated stirrer shaft made of CrNi steel.

It is advisable to dose the substances off a graduated feed vessel.

The reactor is equipped with a condenser and a distillate offtake. It is possible to separate the low boiling substances or the solvent, respectively by using the distillate offtake. The quality of the distillate can be monitored via the temperature sensor. The distillate passes a siphon featuring a sampling valve, a distillate cooler and is then conveyed into the distillate receiver(s).

For safety reasons, a stainless steel pan has been designed to be placed within the stainless steel framework.

## ADDITIONAL EQUIPMENT

In addition to the rotary thermostat, this standard unit can easily be extended by equipping it with additional sensors. By using a process control system, any time/temperature monitoring can be realized.

This unit is especially suitable if gases need to be added to the process.

By using our hands-on modular design system, this reaction base unit can be extended even to a rectification column.

And here is a choice of additional equipment being available on request:

- pressure measuring
- vacuum generation
- circular cooler
- level control
- measurement of concentration
- additional drop funnel
- dosing funnel for solid matter
- double acting sliding ring seal
- rectification column
- inert gas feeding
- gas feeding

## SPECIAL EQUIPMENT

In contrast to the additional equipment, components of the standard unit version may be replaced. Alternatively, such as replacing the feed dosing hopper by a weight enabled dosing pump will improve reproducibility.

There are virtually no other limitations concerning the extension of this unit, but may have consequences in terms of the application of entire assemblies. All this is useful to discuss along with you to achieve a specific, hands-on solution.

A choice of special equipment available:

- Reaction vessels and covers made of metallic materials
- Reaction vessels made of glass lined steel
- Different stirrers made of various materials
- Dosing pump systems
- Dosing hopper featuring a heating jacket

## TECHNICAL DATA<sup>1)</sup>

Capacity	l	10	16	20	25
Nominal Diameter <sup>2)</sup>	DN	DN 200	DN 200	DN 300	DN 300
Cover connections	number	7			
Hopper and distillate receiver	l	6	10	10	15
Stirrer shaft	mm	20	20	32	32
Heat exchange area	m <sup>2</sup>	0.3	0.3	0.6	0.6
Operating temperature	°C	-40°C - +200 °C			
Operating pressure <sup>3)</sup>	mbar	1 – 1500			
Power supply <sup>4)</sup>	V/Hz/W	400/50/500			
Height xLengthxWidth	m	2.5 x 1.0 x 0.75		2.75 x 1.25 x 0.75	
Order No.		M-SY/RDAD 10	M-SY/RDAD 15	M-SY/RDAD 20	M-SY/RDAD 25

<sup>1)</sup> Other versions on request

<sup>2)</sup> Reactor nominal diameter

<sup>3)</sup> Absolute pressure

<sup>4)</sup> Power supply of the standard unit without additional equipment

## QVF ENGINEERING GMBH

PO box 33 69  
D-55023 Mainz  
Hattenbergstraße 36  
D-55122 Mainz

fon: (+49) 0 61 31/ 97 04-0  
fax: (+49) 0 61 31/ 97 04-500  
mail@qvf.de  
www.qvf.com

