

# E-grade<sup>®</sup> Explore for Unistats<sup>®</sup>



## Inspired by temperature

The E-grade Explore turns an Unistat into a  
Process engineering development tool

**huber**



# E-grade<sup>®</sup> EXPLORE for Unistats<sup>®</sup>

## The E-grade Explore turns your Unistat into a development tool for Process engineering

E-grade Explore is a further development of the Unistat technology and utilizes the extensive features and capabilities of the Unistats to display important process data directly on the Pilot ONE. Temperatures, temperature differences, heating / cooling capacities and pump data are all displayed in real time directly on the Pilot ONE controller. Relevant measurements can also be processed via the digital interfaces.

E-grade Explore enables the Unistat to be used as a process technology and process engineering development

tool. The advantage is obvious: The user can make changes to the system on the bench (e.g. impede flow) and observe the change in control and other effects of the chemistry and process.

### Examples of applications for E-grade Explore

- Process development and optimisation
- Estimation of heat balances and termination criteria
- User tests of base materials
- Advanced data collection for scale-up experiments

# The tool in detail:

## Development and optimisation of processes made easy

In many laboratories of the chemical and pharmaceutical manufacturing industry, temperature control units are used to give the required temperature to jacketed reaction vessels. Until now it was possible only to set a target value for temperature and to read the temperature of jacket and the process temperature. Additional measurement systems were required to evaluate the thermodynamic data of the process. This made process development costly and complex. The E-grade Explore is a tool which will greatly facilitate process development.

### Relevant process data clear and concise

Fig. 1 shows process temperature (red) and jacket temperature (green) in different exothermic processes with constant duration. It can be seen that the exothermic reactions within the process are being controlled. The greater the

exothermic reaction, the lower the jacket temperature. The temperature difference between the jacket temperature and the process temperature increases. The temperature conditions of the jacket (reactor inlet and outlet temperatures) were, until now, not accessible and also the actual cooling power being consumed. This data is now available thanks to the E-grade Explore. E-grade Explore delivers this system relevant data visually and via the Pilot ONE interfaces. Using the Data log function, this data can be directly recorded onto a USB Stick in Excel Format, for analysis (Fig. 3).



Fig. 1: Controlling a process temperature with different and constant exothermic reactions.

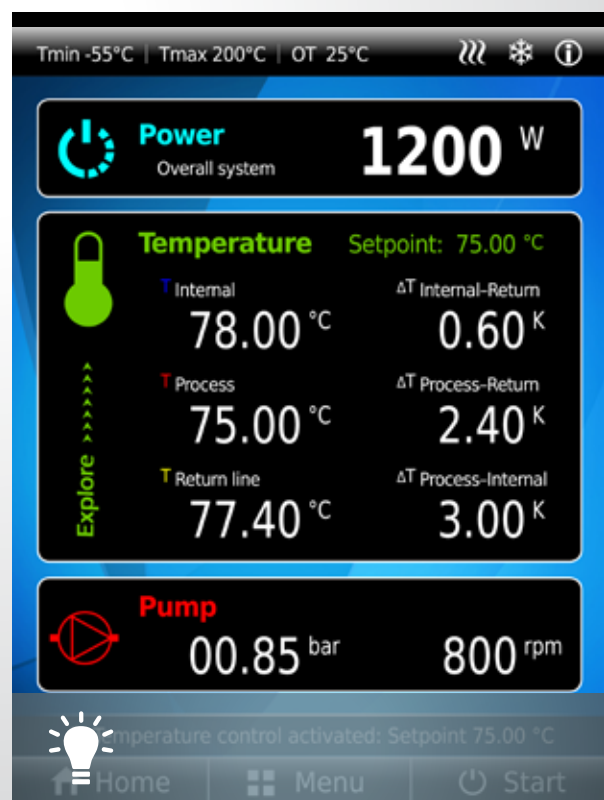


Fig. 2: The E-grade Explore shows relevant system data in process temperature control made via an additional display.

### E-grade Explore expands process development possibilities

Fig. 2 shows power currently being delivered by the Uni-stat. The negative values indicate cooling and positive indicate heating power (Watts). It also shows jacket temperature (reactor inlet temperature), return temperature (reactor outlet temperature), process temperature, the temperature differential and, optional, thermal fluid flow rate (external flow meter required).

E-grade Explore simplifies the development and optimisation of processes and procedures. It is now possible to document procedures and processes in a comparatively simple manner and to obtain important insights. Explore allows, for example, investigation of how products and processes change when the volume flow rate and hence, the inlet and outlet temperatures at the reactor are changed. A scale-down procedure is available to scale down processes from a production level to a laboratory level. The process parameters can then be changed, refined and optimised. Once completed, the process can be scaled back to production level. The advantages are clear:

#### ► Process information without additional equipment

- Improved reproducibility
- Extensive documentation possibilities

#### ► Targeted process- and procedure optimisation

- Improved quality
- Increased yield

#### ► Monitor capacity usage of your temperature controller

- Increased operation safety and improved planning

	A	B	C	D	E	F
1	[TYPE]	PROCESS_DATA				
2	[VERSION]	1.0				
3	[TITLE]	UserData				
4	[DATE]	42200,00				
5	[TIME]	0,40				
6	[DEVICE]	petite fleur				
7	[SERIALNO]	114697,00				
8						
9						
10	[SIGNAL]		100,00	1,00	2,00	3,00
11	[UNIT]	s	°C	°C	°C	°C
12	[EXPONENT]	0,00	0,00	0,00	0,00	0,00
13	[DATA]	time	SP	TI	TR	TE
14		0,00	20,00	19,98	20,24	20,09
15		5,00	20,00	19,90	20,19	20,07
16		10,00	20,00	19,85	20,16	20,06
17		15,00	20,00	19,85	20,30	20,08
18		20,00	20,00	19,88	20,24	20,04
19		25,00	20,00	19,92	20,26	20,07

Fig. 3: Available process data can be easily recorded as a CSV-file, and then further process for example with Microsoft Excel. Recording is done directly onto a USB Stick or via interface (USB, RS232).

### ► Development at lab scale

- Save on cost

The following charts that have been recorded with the data recorder function (Logging) on a Petite Fleur with Pilot ONE:

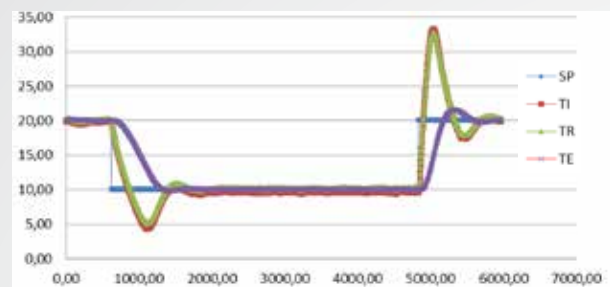


Fig. 4: Temperature profiles (Target value SP, jacket temperature TI, Return temperature TR)

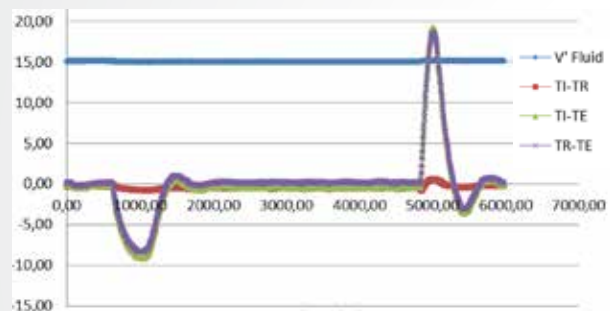


Fig. 5: Volume flow V Fluid and Temperature differences

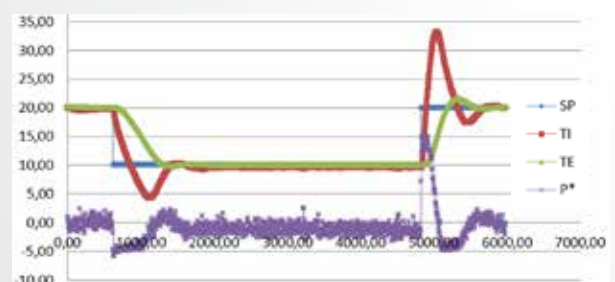


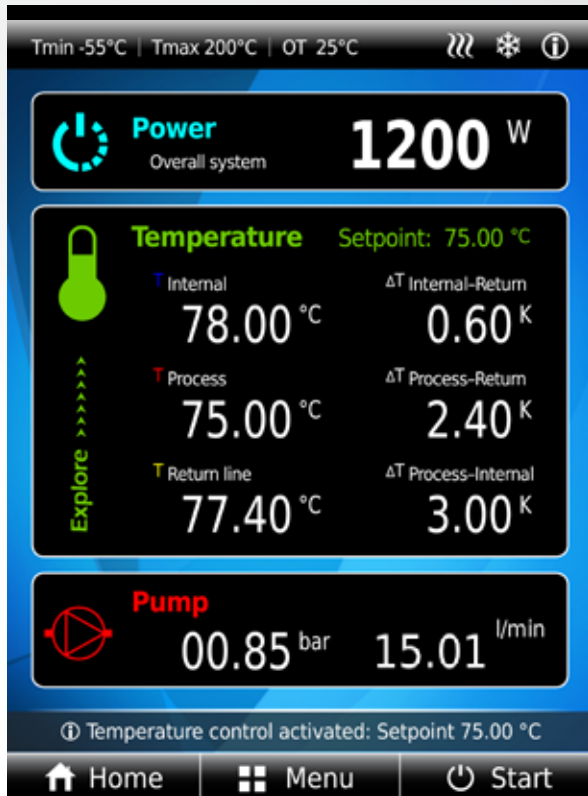
Fig. 6: Temperature profile and Power P\* (for clarity displayed as P/100). A value 15 is, for example, 1500 Watt (Heating power).

#### Summary:

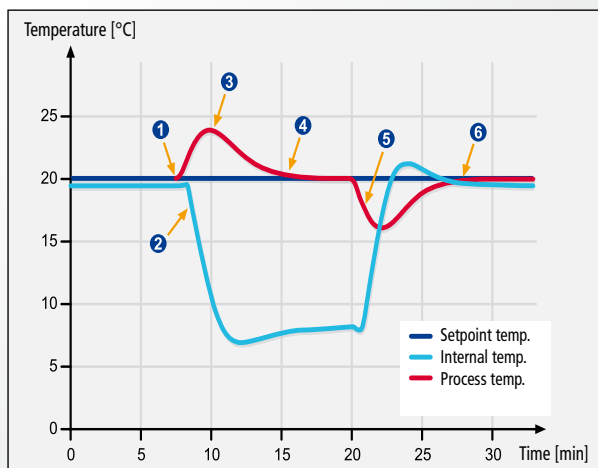
The new E-grade® Explore offers a wide range of possibilities and supports users with process engineering.



# Development Tool for Process Engineering



Additional screen for the most important process data



E-grade Explore enables targeted process optimisation for process scale-up (example graphic: controlled exothermic reaction) based on set point, actual values, temperature differences and heating / cooling capacity data.

## The process at a glance:

- Performance: Current heating or cooling capacity of the system
- Temperature values: Setpoint, internal, process, return
- Temperature differences:  $\Delta T$  internal return,  $\Delta T$  process return,  $\Delta T$  process internal
- Circulation pump: Pressure / speed (depending on model)

## Advantages:

- ✓ Access to critical process data directly from the Unistat
- ✓ No additional hardware required
- ✓ Display of process data directly on the device display of Pilot ONE
- ✓ Transmission, recording and visualisation via data interfaces (USB, LAN, RS232, etc.)

E-grade for Pilot ONE

Cat.No.

E-grade Explore

10495

Note: The E-grade Explore is only available for Unistats

www.huber-online.com



Inspired by **temperature**  
designed for you



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