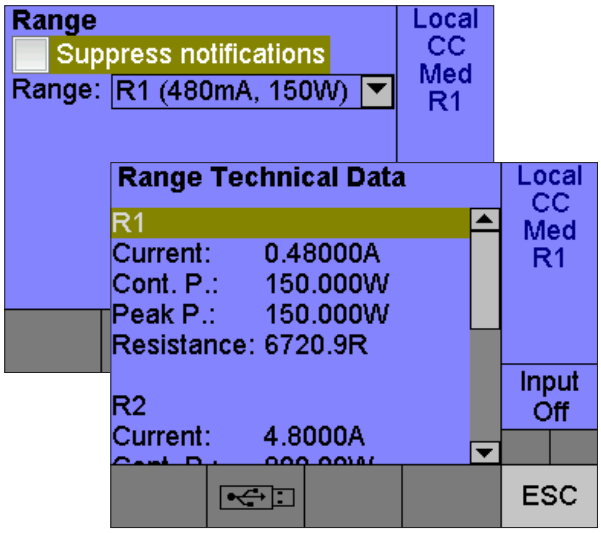
Höcherl & Hackl
The electronic load

Application Note #20

Range Switching With Multi-Range Loads

If setting and measuring accuracies over a wide range play a major role when selecting an electronic load, multi-range loads with 2, 3 or 4 setting and measuring ranges score highly. There are a few things to understand and observe when switching ranges. This application note is intended to help with this.



Safety Instructions

Read the operating instructions of your device and especially the general safety instructions before starting operation!

Operating Modes and Settings

Electronic loads from H&H have 4 operating modes:

- CC Constant current
- CP Constant power
- CR Constant resistance
- CV constant voltage

A group of settings is active in each operating mode. When the operating mode is changed, the settings last active in the desired operating mode are automatically set. The following setpoints are of interest when changing the range, i.e. they may need to be adjusted:

Setting of each operating mode
Triggered setting of each operating mode
Settings of LIST functions
Setting for rectangular function
Setting for current limitation
Trigger current
Stop criterion for current in discharge function
Setting values of the load currents for internal resistance measurement

Table 1

Ranges

The selected setting and measuring range (R1, R2, R3, (R4)) is active in all operating modes. There is therefore no operating mode-specific range.

Conditions for a change of range:

- No function (e.g. list execution, discharge function) and no data acquisition may be active.
- All setting values for current, power and resistance operation from Table 1 must be within the new range.

If the desired range for one of the active settings is too low when changing the range, this causes a settings conflict error. Settings may therefore have to be adjusted before the range change, regardless of whether the load input is switched on or which operating mode is currently active.

Example

Electronic load PLI580MR3

	CC Range*	CP Range	CR Range	CV Range
R1	0.06 A	48 W	143378 Ω	800 V
R2	0.6 A	300 W	14337 Ω	
R3	6 A	500 W	1433 Ω	

Table 2 * maximum current in all operating modes

Active settings:
0.1 A in CC
0 W in CP
10 kΩ in CR
800 V in CV
R2 is the active range.

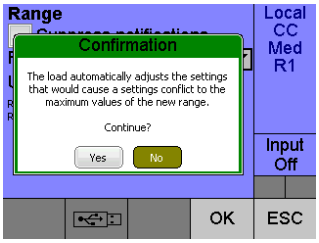
Change from R2 to R1
0.1 A would cause a settings conflict in R1 (max. 0.06 A).
0 W does not cause an error. 10 kΩ does not cause an error in R1 (max. 143.378 kΩ).
--> The CC setting must be set to below 60 mA before R1 is set.

Change from R2 to R3
0.1 A does not cause an error in R3 (max. 6 A). 0 W does not cause an error. 10 kΩ would trigger a settings conflict in R3 (max. 1.433 kΩ).
--> The CR setting must be set to below 1433 Ω before R3 is set.
--> Consider the resulting increase in load current! If necessary, switch off the load input before R3 is set.

Type of Operation

Operation via User Interface

If the operator allows this, in manual operation the electronic load automatically corrects setting values that are too high by setting the largest value of the lower range. When correcting, the relevant settings are permanently overwritten!



Analoge Remote Control

With analog remote control, the analog control signal from 0 to 10 V always refers to the active range from 0 to the fullscale value of the active operating mode.

⚠ If the range is increased in CC mode, 10 times the load current suddenly will flow while the control signal remains constant!
--> If necessary, switch off the load input before R3 is set.

Digital Remote Control

For remote control via one of the data interfaces, the settings must be checked and adjusted if necessary before changing the range. The parameters of the following SCPI commands are affected.

Change to a higher range
`RES:LEV:IMM`
`RES:LEV:TRIG`
`LIST:RES` (all list elements)

Change to a lower range
`CURR:LEV:IMM`
`CURR:LEV:TRIG`
`CURR:PROT:LEV`
`LIST:CURR` (all list elements)
`TRIG:LEV:CURR`
`FUNC:DISC:STOP:CURR`
`FUNC:MEAS:IRES:CURR`
`POW:LEV:IMM`
`POW:LEV:TRIG`
`LIST:POW` (all list elements)

As with manual operation, the settings are automatically corrected and overwritten in the H&H Load Control software tool.