

Neware Database Documentation

General Description:

A test is defined by a protocol, which is a list of steps with their settings.

Example of a protocol:

1. rest for 10'
2. charge at constant current (CC phase) of C/5 for 6h
3. charge at constant voltage (CV phase) of 4.3V, cutoff current C/20 for 1h
4. rest for 10'
5. discharge at constant current of C/2 for 3h
6. rest for 10'
7. repeat from step 2 for 999 times

The database is composed by the following tables:

1. channel_status
2. cycle
3. step
4. record
5. schedule
6. log

Each table resumes the performed test on a different aggregation level:

Channel status table describes the current status of all the available channels, the rows of this table are fixed to the number of channels.

Cycle table is the highest aggregation level, it describes the parameters of the test for each cycle, which is defined by the steps from the first charge step to the last discharge step (from 2 to 6 in the example). Example: the charged capacity will be the sum of the charged capacity of the step 2 and 3, the cycle duration is the sum of the duration of the step from 2 to 6, etc..

Step table describes the parameters of the test for each step (the steps from 1 to 6 in the example). Example: there will be the duration of each step, the charged capacity for the CC and the charged capacity for the CV phase, etc..

Record table is the lowest aggregation level and it can be very big, it contains all the datapoints of the test. Example if the sampling rate is 1Hz (1 point every second) only the step 1 of the Example protocol will produce 36000 rows! The least amount of parameter to measure are voltage, current, capacity, energy and power, so the corresponding table for the step 1 will contain $36000 \times 5 = 180000$ elements!!

Schedule table resumes the protocol executed in each test.

Log table describes the logs of each test.

In the following there is the description of the name, data type and unit of each parameter of the tables.

Table Channel_status

Resume of the State of the available channels

Select	Parameter	Unit	Decimal point	Data Type	Field name	Description	comments
True	Device ID			int	equiptCode	Chamber number	
True	Unit ID			int	channelNo	Cycler Number	
True	CH ID			int	channelCode	Channel Number	
True	Local IP			string	localIP		empty
True	Computer name			string	pcName		
True	Barcode			string	packBarCode	Barcode	
FALSE	System state			string	systemStatus		in chinese
FALSE	Test program name			string	solutionName		empty
FALSE	Test project name			string	projectName		empty
FALSE	Test project number			string	projectNO		empty
True	Step Index			int	stepNO	Number of the current step of the protocol	
FALSE	Cycle group number			string	cycleGroupNO		empty
True	Cycle count			int	cycleCount	Number of the current cycle	
True	Step Time	hh:mm:ss		string	stepTime	Duration of the current step	
True	Total Time	hh:mm:ss		string	totalTime	Total Elapsed time of the protocol	
True	Charge and discharge system state			string	btsSysState	current channel operation satus (running, finish, stop, pause, protect)	
True	Charge and discharge operation mode			string	btsRunMode		in chinese
True	Charge and discharge control mode			string	btsControlMode		in chinese
True	Voltage	V	3	float	voltage	real time voltage	
True	Current	A	8	float	current	real time current	
True	Power	W	3	float	power	real time power	
True	Capacity	Ah	8	float	stepAH	real time capacity of the current step	
True	Total capacity	Ah	8	float	totalAH	Current test total capacity (positive charge, negative discharge)	
True	Energy	kWh	8	float	stepKWH	real time energy of the current step	can we use Wh?
True	Total energy	kWh	8	float	totalKWH	current test total energy	can we use Wh?
True	Total Chg Cap.	Ah	8	float	totalChargeAH	Sum of the capacity of all the charging step of the test	empty
True	Total DChg Cap.	Ah	8	float	totalDisChargeAH	Sum of the capacity of all the discharging step	empty
True	Total Chg Eng.	kWh	8	float	totalChargeKWH	Sum of the energy of all the charging step	empty - can we use Wh?
True	Total DChg Eng.	kWh	8	float	totalDisChargeKWH	Sum of the energy of all the discharging step	empty - can we use Wh?

Select	Parameter	Unit	Decimal point	Data type	Field name	Description	comments
True	Voltage setting value	V	3	float	voltageSetting	For CC is the cut out voltage, for CV is the voltage value set	
True	Current setting value	A	3	float	currentSetting	for CV is the cut out	
True	Aux. Vmax	V	3	float	maxSingleVoltage		
True	Aux. Vmin	V	3	float	minSingleVoltage		
True	Aux. Tmax	°C	2	float	maxSingleTemperature		
True	Aux. Tmin	°C	2	float	minSingleTemperature		
True	Date	hh:mm:ss		string	transmitTime		
True	Aux CH volt.	V	3	float	singleVoltage		not exported
True	Aux CH temp.	°C	2	float	singleTemperature		not exported
False	Laboratory			string			
False	Area			string			
False	Supplier			string			
False	ΔTemperature	°C		string			
False	Step Name			string			
False	Device IP			string			
False	Upload time	hh:mm:ss		string	uploadTime		
False	End time	hh:mm:ss		string			

Table Cycle

Resume of the parameters for each cycle.

Select	Parameter	Unit	Decimal point	Data type	Field name	Description	Comment
True	CH ID			string	chl_id		
True	Cell bar code			string	barcode		
True	Cycle Index			int	cycle_id		
True	Chg. Cap.	Ah	4	float	charge_capacity		
True	DChg. Cap.	Ah	4	float	discharge_capacity		
True	Chg. Energy	Wh	4	float	charge_energy		
True	DChg. Energy	Wh	4	float	discharge_energy		
True	Net DChg. Cap.	Ah	4	float	Net_cap_dchg		
True	Net DChg. Energy	Wh	4	float	Net_eng_dchg		
False	Chg. Med. Volt.	V	4	float	chg_mid_voltage		
False	DChg. Med. Volt.	V	4	float	dc_mid_voltage		
True	Process name			string	batch_no		
True	Remarks			string	Remark		
False	Starting time	hh:mm:ss		string			
False	End time	hh:mm:ss		string			
TRUE	Builder			string			
False	Active material			string			
False	Active materialUnit			string			
True	Discharge capacity attenuation rate (%)	%	4	float	soh		Use 4 th cycle
False	Aux. Tmax	°C		float			
False	Aux. Tmin	°C		float			

False	Upload time	hh:mm:ss		string	
False	Data upload completion identification			string	
False	Charge capacity retention rate	%		string	
False	Discharge capacity retention rate	%		string	
False	Charge energy retention rate	%		string	
False	Discharge energy retention rate	%		string	
False	Charge capacity retention rate	%		string	
False	Discharge capacity retention rate	%		string	
False	Mutation retention rate	%		string	
False	Chg.-DChg. Eff	%		string	
False	constant volt ratio	%		string	
True	Charging capacity		4	float	specific_charge_capacity
True	Specific discharge capacity		4	float	specific_discharge_capacity
True	Charge specific energy		4	float	specific_charge_energy
True	Discharge specific energy		4	float	specific_discharge_energy

Table Step

Select	Parameter	Unit	Decimal point	Type of data	Field name	Description	Comments
True	CH ID			string	chl_id		
True	Cell bar code			string	barcode		
True	Cycle Index			int	cycle_id		
True	Step Number			int	step_num		
True	Original step			string	step_id		
True	Step Name	工步简称		string	step_type		
True	Step Time	min	4	float	step_time		
TRUE	Step file name			string			
True	Chg. Energy	Wh	8	float	chg_energy		
True	DChg. Energy	Wh	8	float	dc_energy		
False	Chg. Med. Volt.	V	4	float	chg_mid_voltage		
True	Chg. Cap.	Ah	8	float	chg_capacity		
True	DChg. Cap.	Ah	8	float	dchag_capacity		
False	DChg. Med. Volt.	V	4	float	dc_mid_voltage		
True	Net DChg. Cap.	Ah	8	float	Net_cap_dchg		
True	Net DChg. Energy	Wh	8	float	Net_eng_dchg		
True	Chg. Time	s	4	float	chg_time		
True	DChg. Time	s	4	float	dchg_time		
True	Oneset Volt.	V	4	float	start_voltage		
True	End Voltage	V	4	float	end_voltage		
True	End T	°C	4	float	end_temp	weird	
True	Process name			string	batch_no		
False	Starting time	hh:mm:ss		string			
False	End time	hh:mm:ss		string			
True	Remarks			string	Remark		
TRUE	Builder			string			
False	Active material			string			
False	Active materialUnit			string			

False	Starting current	A		float
False	End Current	A		float
False	Capacity	Ah		float
False	Energy	Wh		float
False	Constant current ratio	%		float
False	Upload time	hh:mm:ss		string
False	Data upload completion identification			string
False	First current at non-zero time	A	4	string
False	First voltage at non-zero time	V	4	string
True	Nominal capacity	mAh		float

Table Record

Select	Parameter	Unit	Decimal point	Type of data	Field name	Description	Comments
True	CH ID			string	chl_id		
True	Cell bar code			string	barcode		
True	Cycle Index			int	cycle_id		
True	Step Number			int	step_num		
True	Original step			string	step_id		
True	DataPoint			string	record_id		
True	Step Name	工步简称		string	step_type		
True	Record time	s	4	float	record_time		
True	Voltage	V	4	float	voltage		
True	Current	A	8	float	current		
True	Capacity	mAh	4	float	capacity		
True	Energy	Wh	4	float	energy		
True	Power	W	4	float	power		
True	Date	hh:mm:ss		string	abs_time		
True	Aux CH temp.	°C	4	float	temperature		
True	Process name			string	batch_no		
True	Remarks			string	Remark		
TRUE	Builder			string			
True	Active material			string	active_material		
False	Active materialUnit			string			
False	Aux. Vmax	V		float			
False	Aux. Vmin	V		float			
False	Aux. Tmax	°C		string			
False	Aux. Tmin	°C		string			
False	Upload time	hh:mm:ss		string			
False	Data upload completion identification			string			
False	Customize settings			string			

False	Customize settings2	string
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False	Equipment remarks	string
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True	Total Time	s	4	string	TotalTime
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Table Schedule

Select	Parameter	Unit	Decimal point	Type of data	Field name	Description	comments
True	CH ID			string	chl_id		
True	Cell bar code			string	barcode		
True	Step Index			int	step_id		
True	Step Name	工步简称		string	step_type		
True	Step Time	hh:mm:ss.ms	4	string	step_time		
True	Voltage	V	4	float	setting_voltage		
True	C-rate			string	setting_rate		
True	Current	A	4	float	setting_current		
True	Cut-off C-rate			string	cut_of_rate		
True	Cut-off curr.	A	4	float	cut_of_current		
True	Energy	Wh	4	float	energy		
True	-ΔV	V	4	float	DV		
True	Power	W	4	float	power		
True	Resistance	mΩ	4	float	IR		
True	Capacity	Ah	4	float	capacity		
True	Record settings	s,V,A		string	recording_conditions		
True	Aux.CH recording condition	s,V,A		string	aux_record_conditions		
True	Max Vi	V		float	MaxVi		
True	Min Vi	V		flaot	MinVi		
True	Max Ti	°C		float	MaxTi		
True	Min Ti	°C		flaot	MinTi		
True	Segment record1			string	record1		
True	Segment record2			string	record2		
True	Test start time	hh:mm:ss		string	StartTime		

True	Test end time	hh:mm:ss	string	EndTime
True	Remarks		string	Remark
False	P/N		string	
True	Builder		string	Builder
True	Active material		string	Active_material
False	Cut-off voltage	V	float	
False	Start step ID		string	
False	Cycle count		string	
False	Upload time	hh:mm:ss	string	
False	Customize settings		string	
False	Customize settings2		string	
True	Equipment remarks		string	DevRemark

Table Log

Select	Parameter	Unit	Decimal point	Type of data	Field name
True	CH ID			string	chl_id
True	Time			string	log_time
True	Cell bar code			string	barcode
True	Log code			string	log_code
True	Class			string	log_level
True	Event			string	log_event
False	Upload time			string	upload_time

List of Queries

#coin cells BQV

```
SELECT test_id, chl_id, Builder, StartTime, EndTime, barcode, Remark, Active_material
FROM `testlab-db`.schedule
WHERE barcode LIKE 'RDCC%';
```

#old pouch cells BQV

```
SELECT test_id, chl_id, Builder, StartTime, EndTime, barcode, Remark, Active_material
FROM `testlab-db`.schedule
WHERE barcode LIKE 'RDML%';
```

#pouch cells BQV in Vicarli

```
SELECT test_id, chl_id, Builder, StartTime, EndTime, barcode, Remark, Active_material
FROM `testlab-db`.schedule
WHERE barcode LIKE 'BQV%' or barcode LIKE '1003-%';
```

#pouch cells CIC

```
SELECT test_id, chl_id, Builder, StartTime, EndTime, barcode, Remark, Active_material
FROM `testlab-db`.schedule
WHERE barcode LIKE 'CIC%' or barcode LIKE 'NMC%' or barcode LIKE 'WW%' or barcode
LIKE 'GLIL%';
```

#pouch cells BQV 5Ah

```
SELECT test_id, chl_id, Builder, StartTime, EndTime, barcode, Remark, Active_material
FROM `testlab-db`.schedule
WHERE barcode LIKE '1004-%';
```

#pouch cells BQV 20Ah

```
SELECT test_id, chl_id, Builder, StartTime, EndTime, barcode, Remark, Active_material
FROM `testlab-db`.schedule
WHERE barcode LIKE '1610-%';
```

#relevant quantity for quick comparison

```
SELECT barcode,
       Remark,
       test_id,
       cycle_id,
       CONVERT(REPLACE(specific_discharge_capacity, ',', ''), DOUBLE) AS
specific_dchg_capa,
       100*CONVERT(REPLACE(specific_discharge_capacity, ',', ''),
DOUBLE)/CONVERT(REPLACE(specific_charge_capacity, ',', ''), DOUBLE) AS ce,
       100*CONVERT(REPLACE(specific_discharge_energy, ',', ''),
DOUBLE)/CONVERT(REPLACE(specific_charge_energy, ',', ''), DOUBLE) AS rte,
       Net_eng_dchg,
       soh
FROM `testlab-db`.cycle c;
```

#4th cycle specific discharge capacity

```
SELECT barcode,
       Remark,
```

```
test_id,  
    cycle_id,  
    CONVERT(REPLACE(specific_discharge_capacity, ',', ''), DOUBLE) AS  
specific_dchg_capa  
FROM `testlab-db`.cycle c  
WHERE CONVERT(cycle_id, UNSIGNED) = 4;
```

```
#relevant parameter from cell manufacturing request XL  
SELECT Number, Vicarli_system_ID, Cathode_batch as Cathode_type, Active_material AS  
Cathode_material, Anode_Type, Electrolyte_Gen, Number_Cathode_Layers,  
Cathode_Area, Active_mass, Rated_Capacity FROM `testlab-db`.pouch_cell_parameters  
WHERE Vicarli_system_ID not like 'nan'  
ORDER BY CONVERT(Number, UNSIGNED) ASC;
```