TORKEL 840/860
Battery Load Units

- **Batteries can be tested “in service”**
- **Unit adjusts to include load currents in the test parameters**
- **User adjustable alarm and shutdown points to avoid excessive discharge**
- **Easily expandable for larger battery banks using TXL extra load units**
- **View test parameters/results “real time” as testing progresses using TORKEL WIN software (optional)**
- **Easily save results to a PC for analysis, report generation and storage**

Description

Batteries in power plants and transformer substations must provide the equipment they serve with standby power in the event of a power failure. Unfortunately, however, the capacity of such batteries can drop significantly for a number of reasons before their calculated life expectancy is reached. This is why it is so important to check batteries at regular intervals, and the only reliable way of measuring battery capacity is to conduct a discharge test.

TORKEL™ 840 - UTILITY is used for battery systems ranging from 12 to 250 V – often encountered in switchgear and similar equipment. Discharging can take place at up to 110 A, and if higher current is needed, two or more TORKEL 840 units or extra load units, TXL, can be linked together. Tests can be conducted at constant current, constant power, constant resistance or in accordance with a pre-selected load profile.

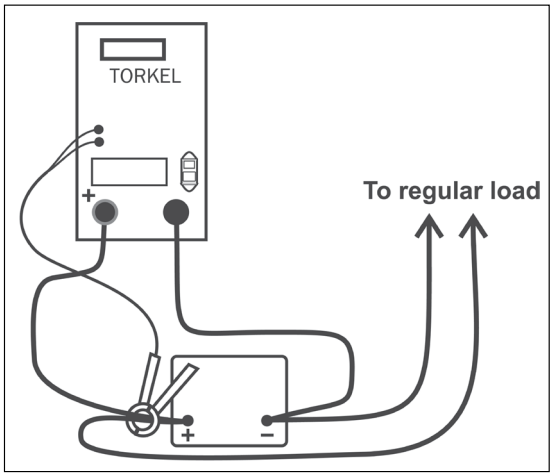
TORKEL 860 - MULTI is designed primarily for people who travel from place to place to maintain battery systems having different voltages. It features excellent discharging capacity plus a broad voltage range and outstanding portability – a unique combination.

TORKEL 860 is used for systems ranging from 12 to 480 V, and discharging can proceed at up to 110 A. If higher current is desired, two or more TORKEL 860 units or extra load units, TXL, can be linked together. Discharging can take place at constant current, constant power, constant resistance or in accordance with a pre-selected load profile.

Application example

Testing can be carried out without disconnecting the battery from the equipment it serves. Via a DC clamp-on ammeter, TORKEL measures total battery current while regulating it at a constant level.

The TORKEL is connected to battery, the current and the voltage alarm level are set. After starting the discharge TORKEL keeps the current constant at the preset level. When the voltage drops to a level slightly above the final voltage, TORKEL issues an alarm. If the voltage drops so low that there is a risk for deep discharging the battery, TORKEL shuts down the test. The total voltage curve and the readings taken at the end of the test are stored in TORKEL Later, using the TORKEL Win program (optional), you can transfer these readings to your computer for storage, printout or export. If your PC is connected to TORKEL during the test, TORKEL Win builds up a voltage curve on the screen in real time and displays the current, voltage and capacity readings. You can also control the test using TORKEL Win.



Features and benefits

1. Display
2. External measurement input used to measure current in an external path by means of a clamp-on ammeter or a current shunt.
3. Keys for operation and settings.
4. Alarm output equipped with a relay contact for triggering an external alarm device.
5. Start/Stop input used for starting and stopping discharging from an external device. Galvanically isolated.
6. Indicating lamps. Operating, Stop/Limit
7. TXL output used for control of TXL Extra Loads. Galvanically isolated.
8. Serial port used for connection to a PC or other controlling equipment.
9. Voltage controlled circuit breaker that connects / disconnects the loading circuits in TORKEL from the battery.
10. Positive current connection for battery being tested.
11. Input for sensing voltage at the battery terminals.
12. Negative current connection for battery being tested.
13. Mains connector, equipped with ON/OFF switch.

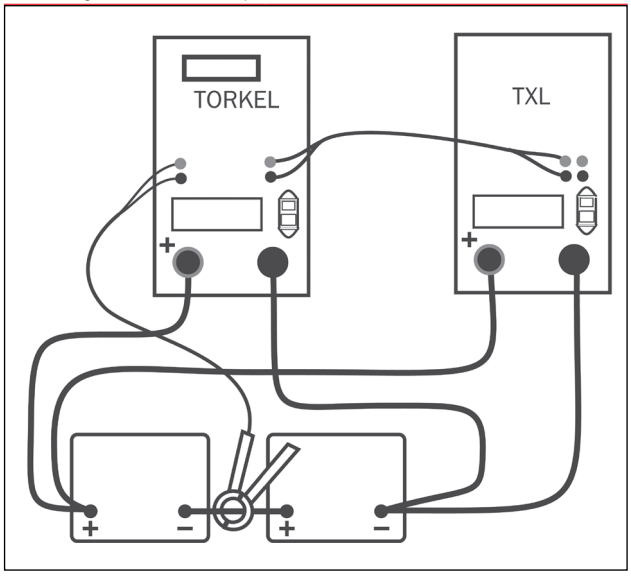
Application examples with TORKEL/TXL systems

TORKEL and TXL can be combined into systems to match up for different battery capacities. These resistive extra loads do not perform any regulating functions. They are designed for use together with TORKEL Battery Load Units. Their purpose is to provide higher load currents for use in constant current or constant power tests. Together, TORKEL and the TXL Extra Loads form a system that can discharge batteries with currents of up to several kA. TXL Extra Loads are connected directly to the battery, and TORKEL measures the total current using a clamp-on ammeter.
TXL Extra Loads are shut down automatically when TORKEL is stopped.

TORKEL / TXL - systems examples

Max. constant current (A)	Number of TORKEL-units	Number of TXL-units
TORKEL 840/860 + TXL830, 24 V battery (12 cells)[1]		
263	1	1
670	2	2
1005	3	3
TORKEL 840/860 + TXL850, 48 V battery (24 cells)[1]		
264	1	1
909	2	3
TORKEL 840/860 + TXL870, 110 V battery (54 cells)[1]		
188	1	1
532	2	4
845	2	8
TORKEL 840/860 + TXL870, 120 V battery (60 cells)[2]		
194	1	1
557	2	4
895	2	8
TORKEL 840/860 + TXL870, 220 V battery (108 cells)[1]		
94	1	1
266	2	4
423	2	8
TORKEL 840/860 + TXL890, 440 V battery (216 cells)[1]		
59	1	1
86	1	2

1) Discharge from 2.15 V to 1.8 V per cell
2) Discharge from 2.15 to 1.75 V per cell



TORKEL and the extra load TXL

Specifications TORKEL 840/860

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Environment

Application field	The instrument is intended for use in high-voltage substations and industrial environments.
Temperature	
Operating	0°C to +40°C (32°F to +104°F)
Storage & transport	-40°C to +70°C (-40°F to +158°F)
Humidity	5% – 95% RH, non-condensing

CE-marking

EMC	2004/108/EC
LVD	2006/95/EC

General

Mains voltage	100 – 240 V AC, 50/60 Hz
Power consumption (max)	150 W
Protection	Thermal cut-outs, automatic overload protection
Dimensions	
Instrument	210 x 353 x 700 mm (8.3" x 13.9" x 27.6")
Transport case	265 x 460 x 750 mm (10.4" x 18.1" x 29.5")
Weight	21.5 kg (47.4 lbs) 38 kg (83.8 lbs) with accessories and transport case.
Display	LCD
Available languages	English, French, German, Spanish, Swedish

Measurement section

Current measurement

Display range	0.0 – 2999 A
Basic inaccuracy	±(0.5% of reading +0.2 A)
Resolution	0.1 A

Internal current measurement

Range	0 – 300 A

Input for clamp-on ammeter

Range	0 – 1 V
mV/A-ratio	Software settable, 0.3 to 19.9 mV/A
Input impedance	>1 MΩ

Voltage measurement

Display range 0.0 – 60 V

Basic inaccuracy	±(0.5% of reading +0.1 V)
Resolution	0.1 V

Display range 0.0 – 500 V

Basic inaccuracy	±(0.5% of reading +1 V)
Resolution	0.1 V

Time measurement

Basic inaccuracy	±0.1% of reading ±1 digit

Load section

Max. battery voltage	288 V DC (TORKEL 840) 480 V DC (TORKEL 860)
Max. current	110 A
Max. power	15 kW
Load patterns	Constant current, constant power, constant resistance, current or power profile
Current setting	0-110.0 A (2999.9 A) [1]
Power setting	0-15.00 kW (299.99 kW) [1]
Resistance setting	0.1-2999.8 Ω
Battery voltage range, TORKEL 840	4 ranges, selected automatically at start of test
Battery voltage range, TORKEL 860	5 ranges, selected automatically at start of test
Stabilization (For internal current measurement)	±(0.5% of reading +0.5 A)

	Battery voltage	Highest permissible current	Resistor element (Nominal values)
Range 1	10 – 27.6 V	110 A	0.165 Ω
Range 2	10 – 55.2 V	110 A	0.275 Ω
Range 3	10 – 144 V	110 A	0.55 Ω
Range 4	10 – 288 V	55 A	3.3 Ω
Range 5 [2]	10 – 480 V	55 A (max power 15 kW)	3.3 Ω

1) Maximum value for a system with more than one load unit
2) TORKEL 860

Inputs, maximal values

EXTERNAL CURRENT MEASUREMENT	1 V DC, 300 V DC to ground. Current shunt should be connected to the negative side of the battery
START/STOP	Closing/opening contact Closing and then opening the contact will start/stop Torkel. It is not possible to keep the contacts in closed position.
Delay until start	200 – 300 ms
Stop delay	100 – 200 ms
Battery	480 V DC, 500 V DC to ground
VOLTAGE SENSE	480 V DC, 500 V DC to ground
SERIAL	< 15 V
ALARM	250 V DC 0.28 A 28 V DC 8 A 250 V AC 8 A

Outputs, maximal values

START/STOP	5 V, 6 mA
TXL	Relay contact
SERIAL	< 15 V
ALARM	Relay contact

Discharging capacity, examples

Final voltage	Constant current	Constant power
12 V battery (6 cells) [3]		
1.80 V/cell (10.8 V)	0 – 50.0 A	0 – 0.54 kW
1.75 V/cell (10.5 V)	0 – 49.0 A	0 – 0.51 kW
1.67 V/cell (10.0 V)	0 – 46.0 A	0 – 0.46 kW
24 V battery (12 cells) [3]		
1.80 V/cell (21.6 V)	0 – 110 A	0 – 2.37 kW
1.75 V/cell (21.0 V)	0 – 110 A	0 – 2.31 kW
1.60 V/cell (19.2 V)	0 – 100 A	0 – 1.92 kW
48 V battery (24 cells) [3]		
1.80 V/cell (43.2 V)	0 – 110 A	0 – 4.75 kW
1.75 V/cell (42.0 V)	0 – 110 A	0 – 4.62 kW
1.60 V/cell (38.4 V)	0 – 110 A	0 – 4.22 kW
110 V battery (54 cells) [3]		
1.80 V/cell (97.2 V)	0 – 110 A	0 – 10.7 kW
1.75 V/cell (94.5 V)	0 – 110 A	0 – 10.4 kW
1.60 V/cell (86.4 V)	0 – 110 A	0 – 9.5 kW
120 V battery (60 cells) [3]		
1.80 V/cell (108 V)	0 – 110 A	0 – 11.9 kW
1.75 V/cell (105 V)	0 – 110 A	0 – 11.5 kW
1.60 V/cell (96 V)	0 – 110 A	0 – 10.5 kW
220 V battery (108 cells) [3]		
1.80 V/cell (194 V)	0 – 55 A	0 – 10.7 kW
1.75 V/cell (189 V)	0 – 55 A	0 – 10.4 kW
1.60 V/cell (173 V)	0 – 51.0 A	0 – 8.82 kW
240 V battery (120 cells) [3]		
1.80 V/cell (216 V)	0 – 55 A	0 – 11.9 kW
1.75 V/cell (210 V)	0 – 55 A	0 – 11.5 kW
1.60 V/cell (192 V)	0 – 55 A	0 – 10.5 kW
UPS battery (180 cells) [3] (TORKEL 860)		
1.70 V/cell (306 V)	0 – 38 A	0 – 15 kW
1.60 V/cell (288 V)	0 – 38 A	0 – 15 kW
UPS battery (204 cells) [3] (TORKEL 860)		
1.80 V/cell (367 V)	0 – 34 A	0 – 15 kW
1.60 V/cell (326 V)	0 – 34 A	0 – 15 kW

3) 2.15 V per cell when test starts

Specifications TXL830/850/870/890

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Environment

Application field	The instrument is intended for use in high-voltage substations and industrial environments.
Temperature	
Operating	0°C to +40°C (32°F to +104°F)
Storage & transport	-40°C to +70°C (-40°F to +158°F)
Humidity	5% – 95% RH, non-condensing

CE-marking

EMC	2004/108/EC
LVD	2006/95/EC

General

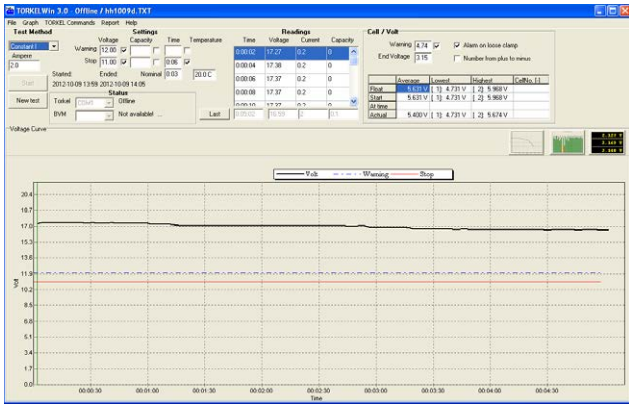
Mains voltage	100 – 240 V AC, 50/60 Hz
Power consumption	75 W (max)
Protection	Thermal cut-outs, automatic overload protection
Dimensions	
Instrument	210 x 353 x 600 mm (8.3" x 13.9" x 23.6")
Transport case	265 x 460 x 750 mm (10.4" x 18.1" x 29.5")
Weight	13 kg (28.7 lbs) 21.4 kg (47.2 lbs) with transport case
Cable sets	
for TXL830/850	2 x 3 m (9.8 ft), 70 mm2, 270 A, with cable lug. Max. 100 V. 5 kg (11 lbs)
for TXL870/890	2 x 3 m (9.8 ft), 25 mm2, 110 A, with cable clamp/lug. Max. 480 V. 3 kg (6.6 lbs)

Load section

	TXL830	TXL850	TXL870	TXL890
Voltage (DC) max.	28 V	56 V	140/280 V	230/480 V
Current max.	300 A	300 A	112 A at 140 V 56 A at 280 V	63 A at 230 V 32 A at 480 V
Power max.	8.3 kW	16.4 kW	15.8 kW	15.4 kW
Internal resistance, 3-position selector				
Position 1	**TXL830**	**TXL850**	**TXL870**	**TXL890**
Current	0.275 Ω	0.55 Ω	4.95 Ω	14.10 Ω
100 A	at 27.6 V (12 x 2.3 V)	at 55.2 V (24 x 2.3 V)	–	–
78.5 A	at 21.6 V (12 x 1.8 V)	at 43.2 V (24 x 1.8 V)	–	–
50.1 A	–	–	at 248.4 V (108 x 2.3 V)	–
39.2 A	–	–	at 194.4 V (108 x 1.8 V)	–
32.3 A	–	–	–	at 469.2 V (204 x 2.3 V)
26.0 A	–	–	–	at 367.2 V (204 x 1.8 V)
Position 2	**TXL830**	**TXL850**	**TXL870**	**TXL890**
Current	0.138 Ω	0.275 Ω	2.48 Ω	7.05 Ω
200 A	at 27.6 V	at 55.2 V (24 x 2.3 V)	–	–
156 A	at 21.6 V	43.2 V (24 x 1.8 V)	–	–
35.2 A	–	–	–	at 248.4 V (108 x 2.3 V)
27.8 A	–	–	–	at 194.4 V (108 x 1.8 V)
Position 3	**TXL830**	**TXL850**	**TXL870**	**TXL890**
Current	0.092 Ω	0.184 Ω	1.24 Ω	3.52 Ω
300 A	at 27.6 V	at 55.2 V (24 x 2.3 V)	–	–
235 A	at 21.6 V	43.2 A (24 x 1.8 V)	–	–
100 A	–	–	at 124.2 V (54 x 2.3 V)	–
78.4 A	–	–	at 97.2 V (54 x 1.8 V)	–
70.5 A	–	–	–	at 248.4 V (108 x 2.3 V)
55.2 A	–	–	–	at 194.4 V (108 x 1.8 V)

Optional accessories

TORKEL Win



- Shows the complete voltage curve
- Last recorded time, voltage, current and discharged capacity
- Scroll-window for all recorded values
- Remote control of TORKEL
- Report functions

Note: TORKEL Win PC SW is delivered with TORKEL but an optional license (SW key) must be ordered to run it together with a TORKEL.

Clamp-on-ammeters

- Clamp-on ammeters, 200 A DC and 1000 A DC
- To measure current in circuit outside TORKEL

Extra loads

- Four extra loads available: TXL830, TXL850, 870 and TXL890

BVM

- Automates battery voltage measurement during capacity tests
- "Daisy-chain" design allows expandability up to 120 units
- High accuracy and stability for precise data collection
- Integrates with TORKEL Win (included) and PowerDB Test Data Management software (freeware)
- For complete information see the BVM data sheet

Cables

- Cable set (GA-00554)

Sensing leads

- Sensing lead set (GA-00210)

Included accessories

Cable set

Cable set GA-00550

Ordering information

Item	Art. No.
TORKEL 840	BS-49094
TORKEL 860	BS-49096
Included accessories	
Mains cable	
Cable set, GA-00550	
CD with TORKEL Win (SW locked for use together with a TORKEL)	
Transport case, GD-00054	
Optional accessories	
TORKEL Win *Including*: CD with TORKEL Win SW license (SW key) for one TORKEL unit USB cable and USB to RS232 converter *Note: If you buy TORKEL Win for use together with a TORKEL you already have, please state the serial No. of your TORKEL.*	BS-8208X
TXL830 Extra load Incl. Cable set GA-00554 (max 28 V), Transport case	BS-59093
TXL850 Extra load Incl. Cable set GA-00554 (max 56 V), Transport case	BS-59095
TXL870 Extra load Incl. Cable set GA-00550 (max 280 V), Transport case	BS-59097
TXL890 Extra load Incl. Cable set GA-00550 (max 480 V), Transport case	BS-59099

Item	Art. No.
Cable set for TXL830 and TXL850 2 x 3 m, 70 mm², with cable lug. Max 100 V 270 A. Weight: 5.0 kg (11 lbs)	GA-00554
Cable set for TXL870 and 890 2 x 3 m, 25 mm², with cable clamp. Max 480 V 110 A. Weight: 3.0 kg (6.6 lbs)	GA-00550
Extension cable set 2 x 3 m, 25 mm². Max 480 V 110 A Weight: 3.0 kg (6.6 lbs)	GA-00552
Sensing lead set Cable set for measuring voltage at battery terminals. 2 x 5 m (16.4 ft)	GA-00210
DC clamp-on ammeter, 200 A To measure current in circuit outside TORKEL	XA-12992
DC clamp-on ammeter, 1000 A To measure current in circuit outside TORKEL	XA-12990
BVM *Including*: TORKEL Win license (SW key) for one TORKEL Dolphin clips, Power & signal connector, Power supply, Connection cables and Carrying case	
BVM150, System of 16 BVM units With TORKEL Win software	CJ-59092
With PowerDB software	CJ-59192
BVM300, System of 31 BVM units With TORKEL Win software	CJ-59093
With PowerDB software	CJ-59193
BVM600, System of 61 BVM units With TORKEL Win software	CJ-59096
With PowerDB software	CJ-59196

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