

# proceq

## Calibration of the Proceq DY-2



# According to EN ISO 7500-1

Proceq DY-2 is calibrated according to EN ISO 7500-1 Annex C – Alternative Method of Testing Machine Classification.

This is a method recommended for automated calibration processes.

Class of machine range	Maximum permissible value %				
	Relative error of				Relative resolution <i>a</i>
	accuracy <i>q</i>	repeatability <i>b</i>	reversibility <sup>a</sup> <i>v</i>	zero <i>f<sub>0</sub></i>	
0,5	± 0,5	0,5	± 0,75	± 0,05	0,25
1	± 1,0	1,0	± 1,5	± 0,1	0,5
2	± 2,0	2,0	± 3,0	± 0,2	1,0
3	± 3,0	3,0	± 4,5	± 0,3	1,5

<sup>a</sup> According to 6.4.8, the relative reversibility error is only determined when required.

Most pull-off testing standards require class 2 accuracy.

Proceq DY-2 meets the requirements for Class 1 from 20% - 100% of the maximum load.

4.11 *Pull off test equipment*, complying with EN 24624 with a pulling capacity sufficient to cause tensile bond failure of the specimen. The accuracy shall be within ±2%. (A capacity of 10 kN is sufficient for most applications). The pull-off equipment shall be capable of applying the load according to 3.1 of EN 24624:1992 and shall be provided with a measurement device that displays the exerted force by an analogue or digital system. The measurement device shall retain the reading of maximum force exerted.



# Example of calibration certificate

## DY-2 Device Calibration Certificate

**Model** DY-225  
**Serial No.** DT03-000-0002  
**Software Version** 1.4.0  
**Display Resolution** 0.01 kN

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**Test Load** 25.00 kN

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**Calibration Device** F13.1348  
 KVZ 50.10.015

The device specified alongside was subjected to Proceq quality inspection. Proceq SA certifies herewith that this device meets all product specifications and quality requirements.

**Date of Calibration** Schwerzenbach  
 2013-02-18

**Inspector** sm

## Results of Calibration

Step[%]	Nominal Load			Deviation[%] between Test Unit & Cal. Device			Accuracy 1%	Repeatability 1%	Resolution 0.5%
	kN	lbf		1.Series	2.Series	3.Series	q	b	a
20	5.00	1124		0.63	0.59	0.39	0.54	0.73	0.20
30	7.50	1686		0.39	0.22	0.14	0.25	0.69	0.13
40	10.00	2248		0.02	0.07	0.02	0.04	0.16	0.10
50	12.50	2810		-0.39	-0.39	-0.38	0.39	0.03	0.08
60	15.00	3372		0.01	0.09	-0.03	0.04	0.04	0.07
70	17.50	3934		0.14	0.19	0.32	0.22	0.09	0.06
80	20.00	4496		0.01	0.03	0.01	0.02	0.09	0.05
90	22.50	5058		-0.04	-0.04	0.03	0.04	0.01	0.04
100	25.00	5620		-0.29	-0.34	-0.35	0.33	0.14	0.04

## Remarks

Calibration conforms to the requirements of ISO EN 7500-1.

# Typical calibration set-up

Display instrument to read the load from the reference load cell

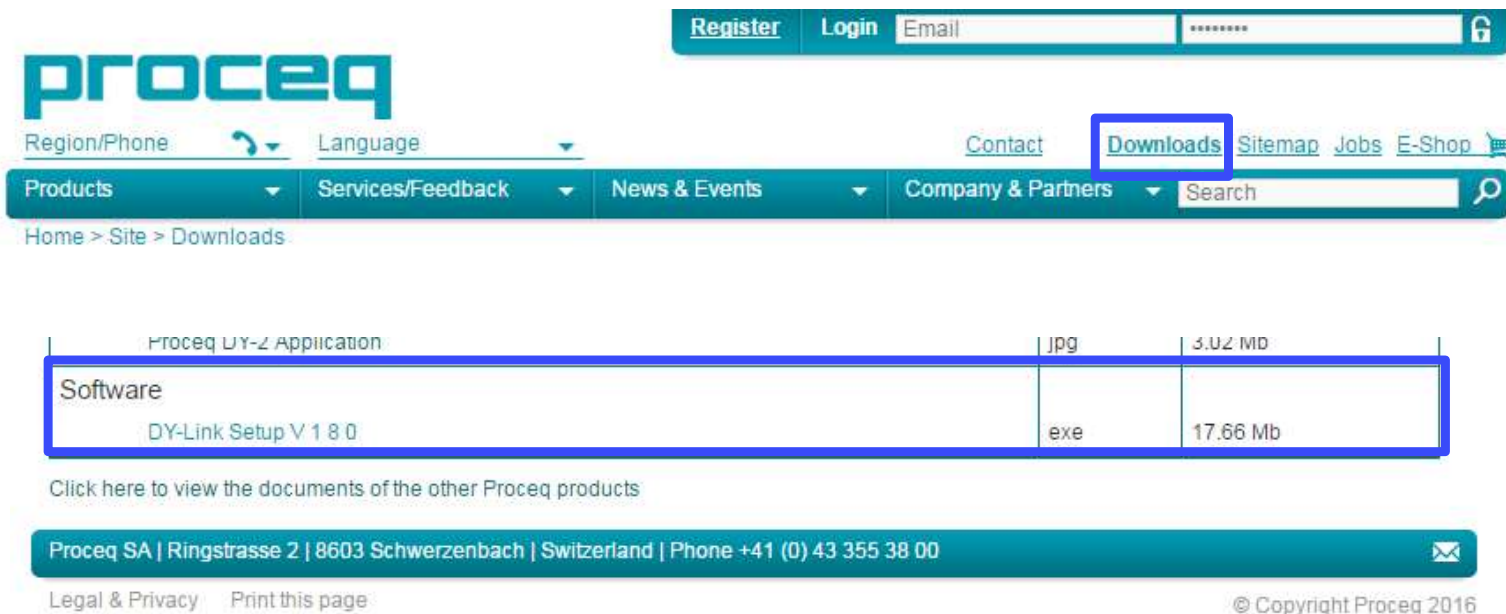
Reference load cell

PC running Proceq DY-Link software

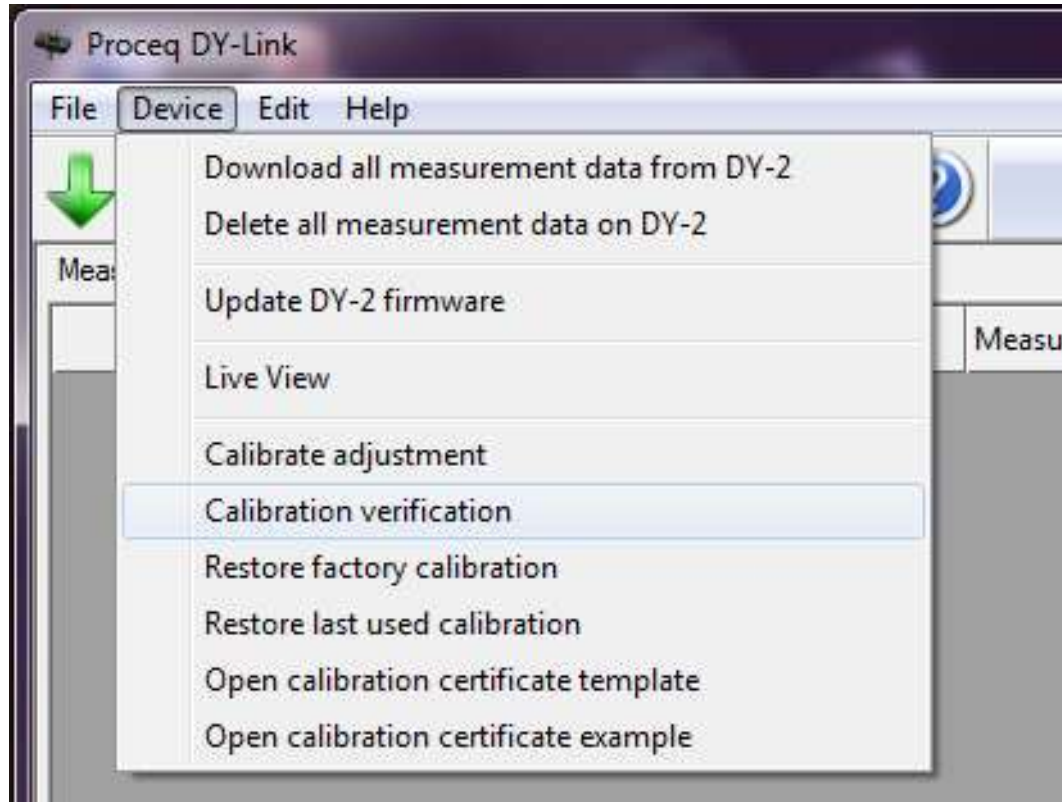


# Proceq DY-Link software

- The Proceq DY-Link software provided with the instrument, includes the calibration software. It allows any reference load cell to be used to calibrate the Proceq DY-2.
- It is necessary to use this software also if the instrument is sent to an independent calibration institute.
- Available on our website under “Downloads”:



# Proceq DY-Link calibration menu



# Typical calibration procedure

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1. Verify the current calibration.
2. If calibration is within the required tolerance – STOP.
3. If calibration is out of tolerance – Perform a calibration adjustment.
4. Repeat calibration verification.

# Calibration Verification

Load Measurements of DY-2 Device

When all verification runs are complete, press the 'Copy Data' button to copy DY-2 load measurements to the clipboard.

Load Unit: N

No.	Step (%)	Nominal Load	Run # 1	Run # 2
1	10	1600	1525	1522
2	20	3200	3113	3115
3	30	4800	4729	4722
4	40	6400	6336	6342
5	50	8000	7946	7954
6	60	9600	9540	9558
7	70	11200	11147	11158
8	80	12800	12748	
9	90	14400	14345	
10	100	16000	15961	

Calibration Verification (according to ISO EN 7500-1 Annex C)

Test Setup

Tester: dc Temperature: 0 °C

Facility: PQ Reference Device S/N: KVZ50-08.007

Load Unit: N Number of cycles: 2  Pause between cycles

Connect DY-2 Port Number: 5 (0 for auto detection) Test Sound

DY-2: Connected [Load: 11132 N] | S/N:DT02-002-0022 HW Revision:A1 SW Version:1.6.3

Stop

Status

22) ...Next step: 50%

23) ...Next step: 100%

24) ----- RUNNING VERIFICATION CYCLE #2 -----

25) ...Next step: 10%

26) ...Next step: 20%

27) ...Next step: 30%

28) ...Next step: 40%

29) ...Next step: 50%

30) ...Next step: 60%

31) ...Next step: 70%

32) ...Next step: 80%



# Excel calibration certificate template

	A	B	C	D	E	F	G	H	I
1	Serial Number	DT02-002-0022		Nominal Load	16 kN	Resolution	10		
2	HW	A1							
3	SW								
4									
5	<b>Verification Reference Reading True Force (F)</b>								
6	<b>Step</b>	<b>1st run</b>	<b>2nd run</b>						
7	10%	1.44	1.45	Enter the true force value (F) indicated by the reference device for each load step.					
8	20%	3.01	3.01						
9	30%	4.63	4.63						
10	40%	6.22	6.23						
11	50%	7.84	7.84						
12	60%	9.44	9.43						
13	70%	11.04	11.03						
14	80%	12.64	12.64						
15	90%	14.24	14.23						
16	100%	15.84	15.84						
17									
18	<b>Verification DY-2 Reading (F<sub>i</sub>)</b>								
19	<b>Step</b>	<b>1st run</b>	<b>2nd run</b>						
20	10%	1.527	1.535	Copy the Load values read from DY-2 here using CTRL-C, CTRL-V					
21	20%	3.119	3.12						
22	30%	4.739	4.731						
23	40%	6.333	6.334						
24	50%	7.952	7.963						
25	60%	9.563	9.557						
26	70%	11.162	11.151						
27	80%	12.761	12.767						
28	90%	14.358	14.353						
29	100%	15.953	15.955						

# Calibration Certificate



Calibration Certificate Template - Microsoft Excel

	A	B	C	D	E	F	G	H	I
	Step	Reference Value (F) 1	Measured value (F <sub>i</sub> ) 1	Relative error of accuracy q in %	Reference Value (F) 2	Measured value (F <sub>i</sub> ) 2	Relative error of accuracy q in %	Repeatability b in %	Relative Resolution a in %
1									
2	10%	1.54	1.528	-0.78%	1.53	1.518	-0.78%	0.01%	0.16%
3	20%	3.14	3.125	-0.48%	3.14	3.135	-0.16%	0.32%	0.08%
4	30%	4.77	4.75	-0.42%	4.74	4.732	-0.17%	0.25%	0.05%
5	40%	6.37	6.354	-0.25%	6.36	6.353	-0.11%	0.14%	0.04%
6	50%	7.97	7.956	-0.18%	7.96	7.954	-0.08%	0.10%	0.03%
7	60%	9.56	9.553	-0.07%	9.58	9.573	-0.07%	0.00%	0.03%
8	70%	11.17	11.159	-0.10%	11.18	11.18	0.00%	0.10%	0.02%
9	80%	12.78	12.766	-0.11%	12.78	12.765	-0.12%	0.01%	0.02%
10	90%	14.38	14.367	-0.09%	14.37	14.359	-0.08%	0.01%	0.02%
11	100%	15.94	15.912	-0.18%	15.96	15.933	-0.17%	0.01%	0.02%

Ready | Calibration | Verification | Calibration Certificate | 277% | 16:09 10.06.2016

## Adjustment procedure

1. Set up is the same as for verification.
2. This time we record the results on the calibration sheet as there are now 20 steps.
3. Again there is a warm up cycle and two complete cycles.
4. On completion of 2nd run, copy the results into the table provided and press calibrate Proceq DY-2.

Complete process takes about 10 minutes.

### **Notes:**

- The previous calibration data are deleted when we start.
- A previous calibration or the initial factory calibration can be restored if there is a problem.

# Calibration Adjustment

Load Measurements of Reference Device

Please fill the table with the load measurements read from the reference device.  
When complete, press the 'Calibrate DY-2 Device' button.

Load Unit: kN Calibrate DY-2 Cancel

No.	Step (%)	Nominal Load	Reference Load 1	Reference Load 2
1	5	0.800	0.66	
2	10	1.600	1.39	
3	15	2.400		
4	20	3.200		
5	25	4.000		
6	30	4.800		
7	35	5.600		
8	40	6.400		
9	45	7.200		
10	50	8.000		
11	55	8.800		
12	60	9.600		
13	65	10.400		
14	70	11.200		
15	75	12.000		
16	80	12.800		
17	85	13.600		
18	90	14.400		
19	95	15.200		
20	100	16.000		

Calibration Adjustment (according to ISO EN 7500-1 Annex C)

Test Setup

Tester: DC Temperature: 20 °C  
Facility: PQ Reference Device S/N: KVZ50-08.007  
Load Unit: kN Number of cycles: 2  Pause between cycles

Connect DY-2 Port Number: 5 (0 for auto detection) Test Sound

DY-2: Connected [Load: 1.948 kN] \

S/N:DT02-002-0022 HW Revision:A1 SW Version:1.6.3

Stop Exit

Status

- 1) ...Not connected
- 2) ...Connecting ...
- 3) ...Connected
- 4) ...Calibration process has started ...
- 5) ...Deleting old calibration ...
- 6) ...Started warm up run
- 7) ...Finished warm up run
- 8) ...----- RUNNING CALIBRATION CYCLE #1 -----
- 9) ...Next step: 5%
- 10) ...Next step: 10%
- 11) ...Next step: 15%



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## Conclusion



## Pull-off testing with Proceq DY-2

- The Proceq DY-2 family of pull-off testers makes it easy to **work in accordance with the standards**.
- This is achieved by simple entry of the key parameters, a **fully automated test and a complete record of the test** including the load development and the failure mode.
- The accuracy of the instrument **exceeds the typical requirements** of pull-off standards.
- Calibration of the instrument in **accordance with EN ISO 7500-1** has been simplified with the DY-Link software included.
- A **complete set of test discs and accessories** completes the offering.