



Vital Signs
Rebound – Schmidt



Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

Silver Schmidt

OS8200



Original Schmidt

OS8000



Download on the
App Store



GET IT ON
Google Play





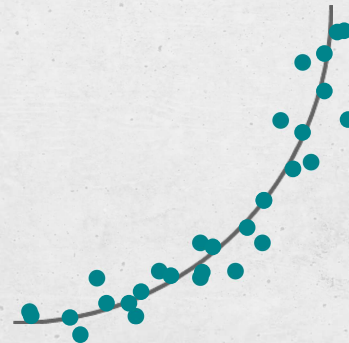
Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

Measure

Convert to Strength

Result



MPa

Original Schmidt



mechanical

R

historic reference

10

70



Silver Schmidt



optical

Q

higher accuracy

5* 10

100

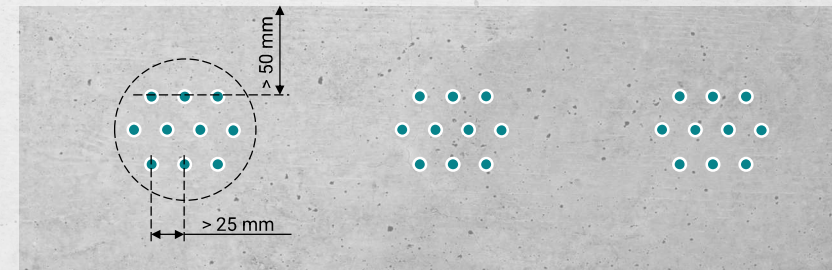
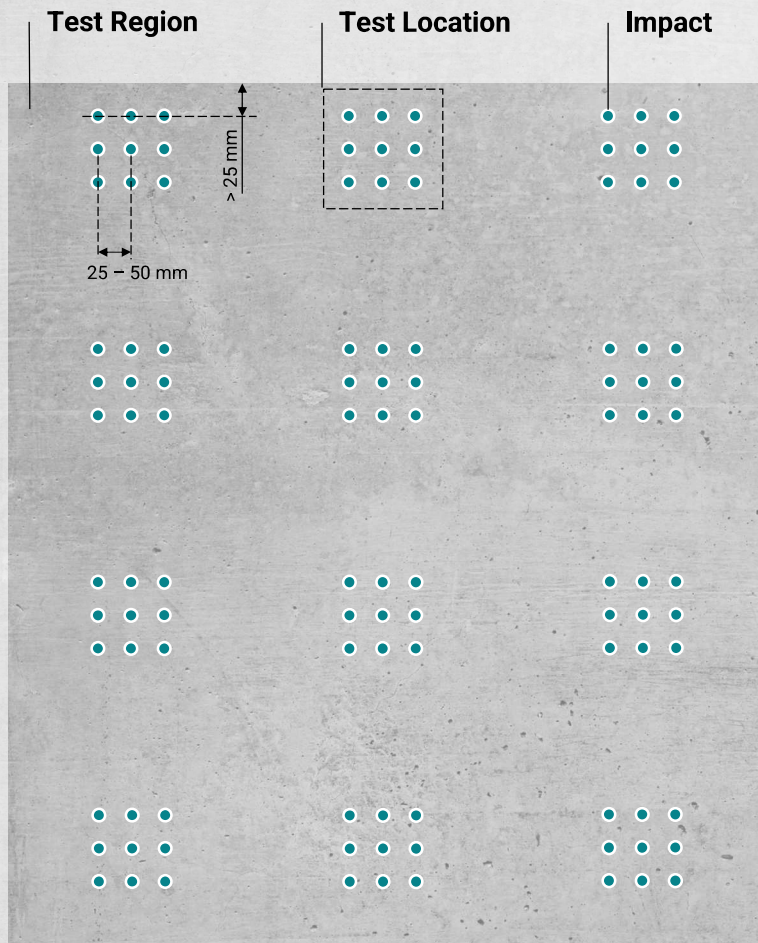


* with Mushroom Head



Vital Signs

Strength & Uniformity ► Rebound (Schmidt)



ASTM C805 "Standard Test Method for Rebound Number of Hardened Concrete"



Example with 12 Test Locations

EN 12504-2 "Testing concrete in structures. Non-destructive testing. Determination of rebound number"
EN 13791 "Assessment of in-situ compressive strength in structures and precast concrete components"





Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

Inspection Procedure - Original Schmidt OS8000 & Silver Schmidt OS8200

- EN 12504-2 “Testing concrete in structures. Non-destructive testing. Determination of rebound number”
- EN 13791 “Assessment of in-situ compressive strength in structures and precast concrete components”

1. Smoothen the concrete surface in the Test Location with a grinding stone
2. Perform a minimum 9 Impacts in a Test Location
3. Determine mean Q or R value (if > 20% of Impact values differ from median > 30%, discard test series)
4. Perform steps 1 to 3 for multiple (minimum 9) Test Locations within a Test Region
5. Review **Uniformity** of the Mean Values of the Test Location across the Test Region
6. Determine **Concrete Strength Class** (EN13791)
 - **Weak Spots in the Test Region**
 - **Characteristic Compressive Strength f_{ck}**
7. If the value determined by the rebound test alone is deemed insufficient, then a combination with core data can be used for verification
8. Use the data collected from the rebound testing to determine the ideal location for cores
9. Create custom curve correlating rebound and data from coring to determine the compressive strength at any location in the test region

Steps 3 to 6 and 9 are fully automated with the Original Schmidt App





Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

Determine Concrete Strength Class according EN13791

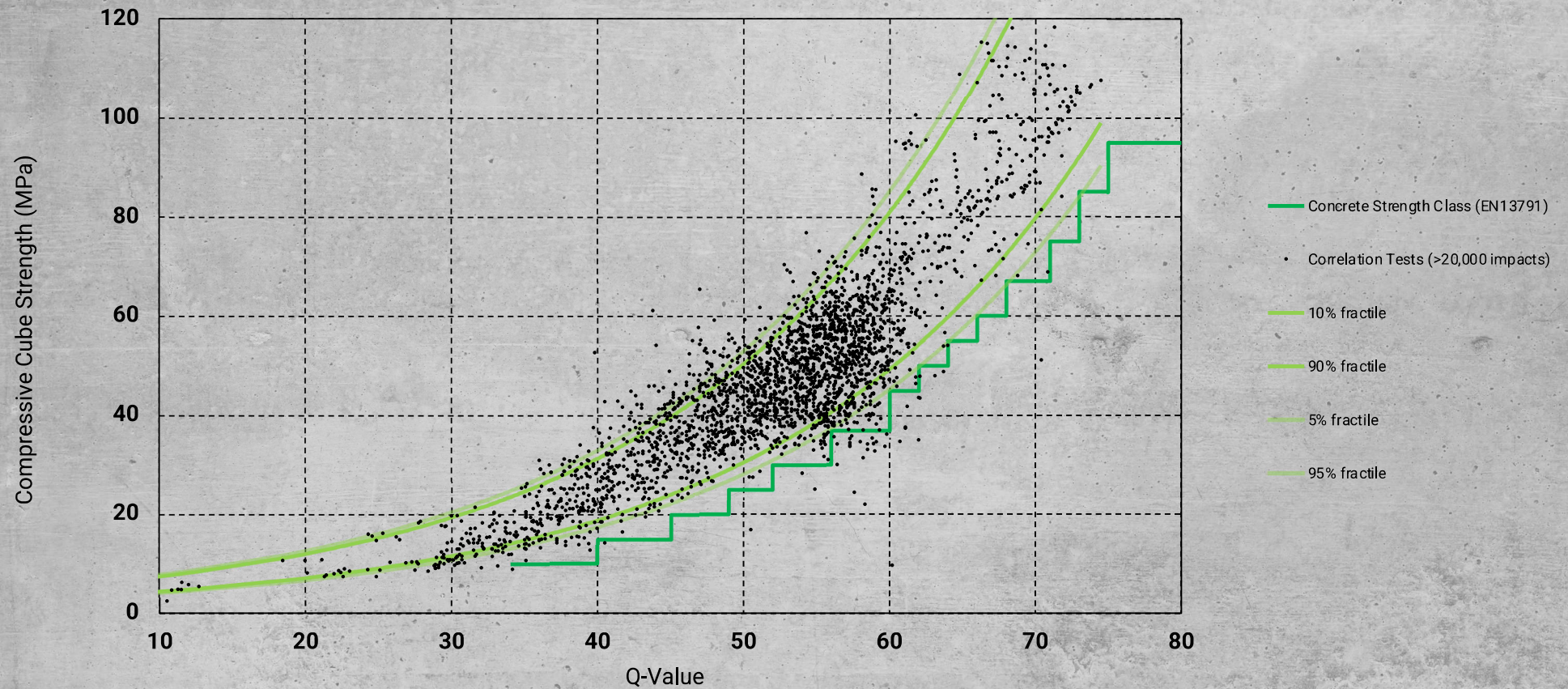
Q		$f_{ck,cylinder} / f_{ck,cube}$	R	
Lowest for all Test Locations	Median for Test Region	Compressive Strength Class EN206	Lowest for all Test Locations	Median for Test Region
25	34	C8/10	26	30
29	40	C12/15	30	33
36	45	C16/20	32	35
42	49	C20/25	35	38
46	52	C25/30	37	40
51	56	C30/37	40	43
56	60	C35/45	44	47
59	62	C40/50	46	49
60	64	C45/55	48	51
62	66	C50/60	50	53
64	68	C55/67		
66	71	C60/75		
69	73	C70/85		
71	75	C80/95		

EN 13791 "Assessment of in-situ compressive strength in structures and precast concrete components"



Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

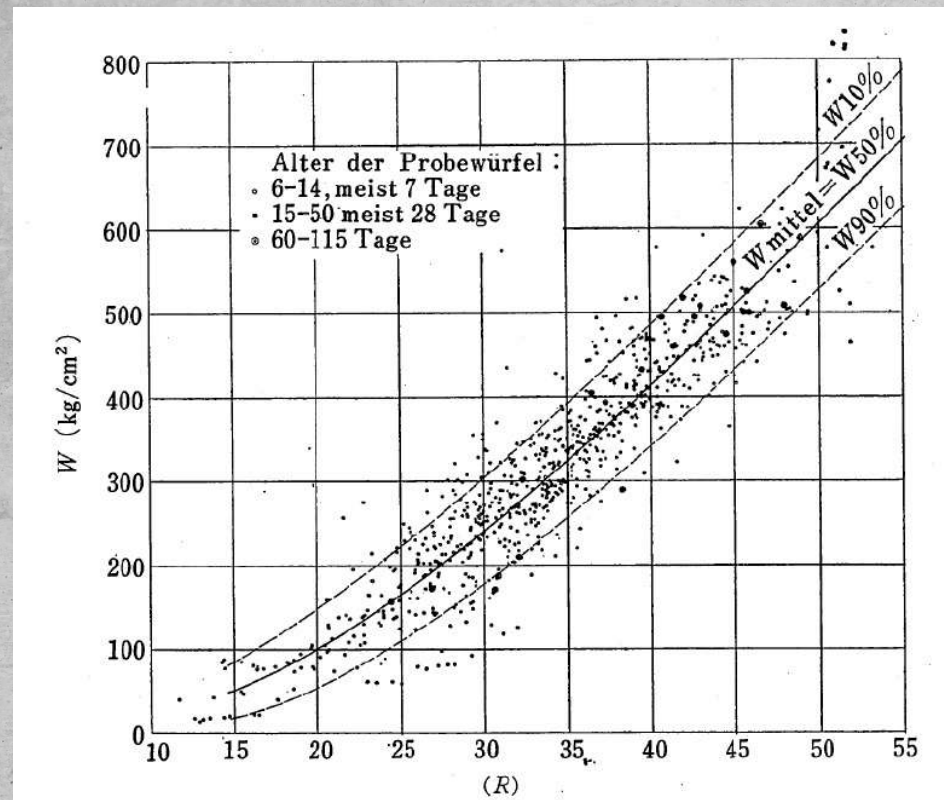


Silver Schmidt Data correlating Q and Compressive Strength



Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

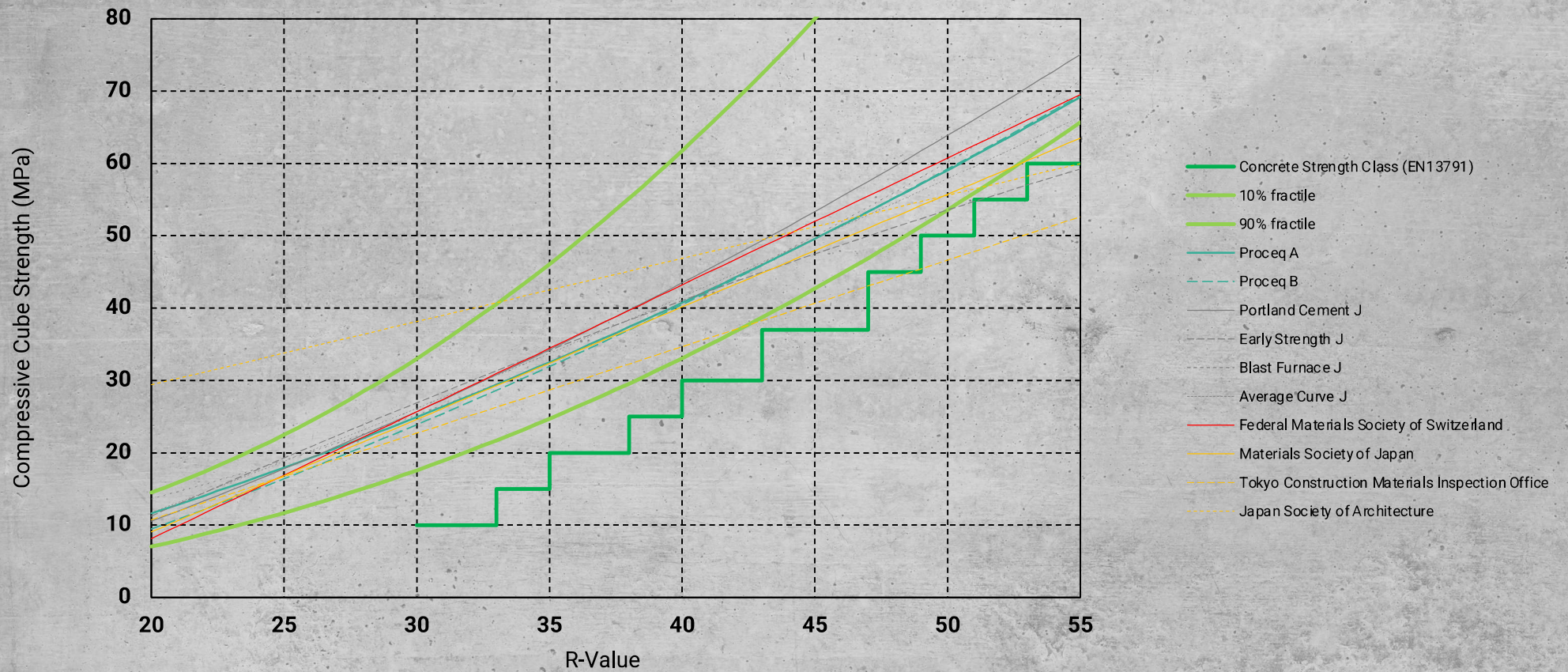


Original Schmidt N data collected in 1960 by Dr. A. Gaede
(German Committee for Reinforced Concrete)



Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

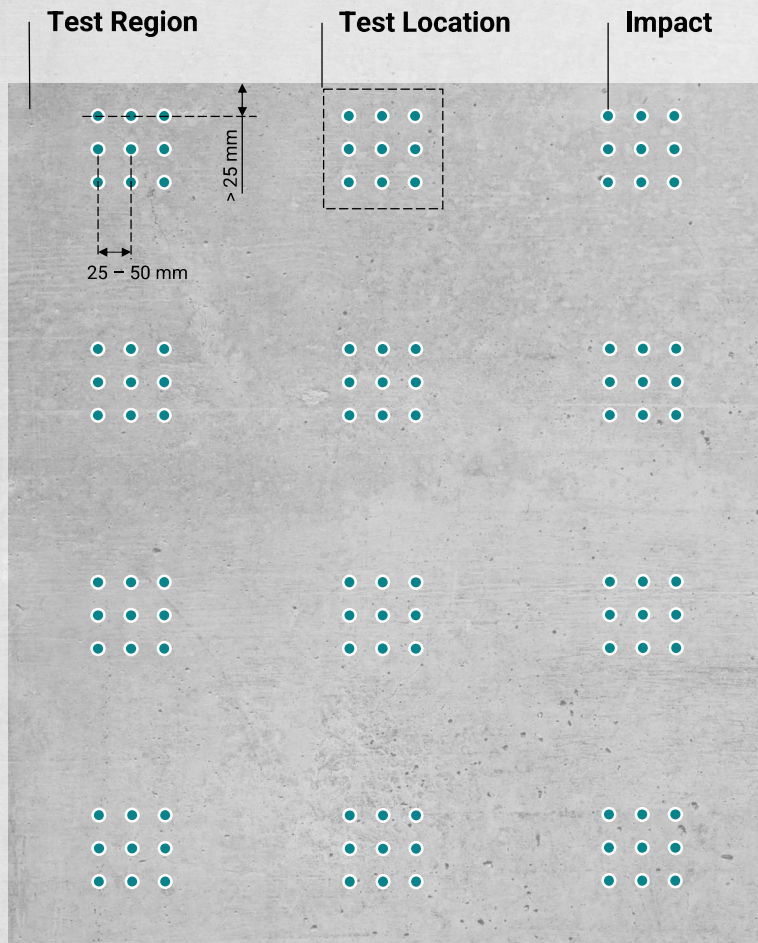


Original Schmidt Curves correlating R and Compressive Strength



Vital Signs

Strength & Uniformity ► Rebound (Schmidt)



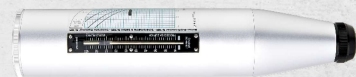
Test Region with 12 Test Locations

Prepare ► Measure ► Characteristic Compressive Strength ► Report



Silver Schmidt (Digital)

► 6 minutes



Original Schmidt (Analogue)

► 90 minutes

Productivity **15x**



Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

Cores for structural assessment according to EN13791 with and without Schmidt testing

Purpose	Test region	Minimum Number of	
		Test Locations with Schmidt	Cores
Conforming compressive strength class		9	0
Doubtful compressive strength class	30 m ³	9	2 at locations with lowest NDT result
	60 – 120 m ³	12	3 1 at lowest NDT test location 2 at median NDT test location
	150 – 180 m ³	20	
Compressive strength with Cores only		not required but recommended	10

EN 13791 "Assessment of in-situ compressive strength in structures and precast concrete components"



Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

Important

1. Silver Schmidt or Original Schmidt Hammer
 - **Silver Schmidt**, for higher accuracy, Concrete Strength 5 - 100 MPa
 - **Original Schmidt**, if compared to historic R value records, Concrete Strength 10 - 70 MPa
2. Type N or Type L
 - **Type N** for Concrete Thickness > 10cm
 - **Type L** for Concrete Thickness < 10cm
3. Measure over Rebar with low cover
 - as for cores, rebars in the test region can influence the strength measurement
 - use [Profometer](#) to secure that impacts are not performed over rebar
4. Carbonated Concrete
 - increases the hardness of the concrete surface to give higher Q and R values
 - EN13791 recommends a correction for carbonation > 5mm
 - carbonation values can be corrected directly in the Schmidt app for the Q (Silver Schmidt)
5. Regional Concrete Mix or Local Conditions
 - **custom correlation curve** between destructive cylinder or cube test vs. Q or R values

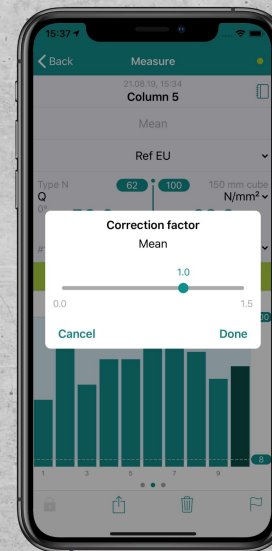
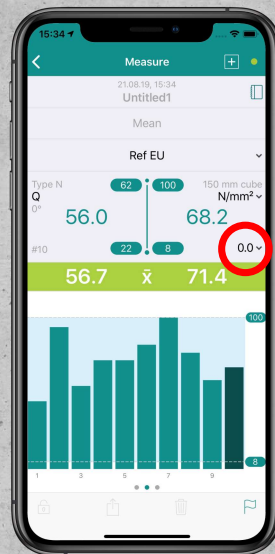


Vital Signs

Strength & Uniformity ► Rebound (Schmidt)

Carbonation Correction

1. Measure on the carbonated concrete
2. Remove the carbonated layer and measure directly on the non-carbonated concrete
3. Calculate the correction factor = measurement on non-carbonated concrete surface / measurement on carbonated surface
4. Enter correction factor directly in the Schmidt app (Q value and **Silver Schmidt** only)





International Standards & Guidelines

Rebound (Schmidt)



EN 12504-2
EN 13791
(Europe)

"Testing concrete in structures. Non-destructive testing. Determination of rebound number"
"Assessment of in-situ compressive strength in structures and precast concrete components"



ASTM C805
(USA)

"Standard Test Method for Rebound Number of Hardened Concrete"



ACI 228.1R
(USA)

"In-Place Methods to Estimate Concrete Strength"



ISO 1920-7
(International)

"Testing of concrete — Part 7: Non-destructive tests on hardened concrete"



JGJ/T 23
(China)

"Technical specification for inspecting of concrete compressive strength by rebound method"



CECS02-2020
(China)

"Technical specification for inspecting compressive strength of concrete by ultrasonic-rebound combined method"



JSCE-G504
(Japan)

"Hardened concrete test hammer strength test method"



JIS A1155
(Japan)

"Method of measurement for rebound number on surface of concrete"



GOCT 22690
(Russia)

"Determination of strength by mechanical methods of non-destructive testing"