



DECLARATION OF PERFORMANCE
DoP no. 1873-08422/1 EN

Version: 1

Print date: 04.01.2021

1. Unique identification code of the product-type: **TOX Liquix Multi 1**
2. Intended use/es:

Product	Intended use
Injektion system for use in concrete	For rebar connection

3. Manufacturer: **TOX-Dübel-Technik GmbH, Brunnenstraße 31, D-72505 Krauchenwies Ablach**
4. Authorised representative: --
5. System/s of AVCP: **1**
6. a) Harmonised standard: --
Notified body/ies: --
6. b) European Assessment Document: **EAD 330087-00-0601**
European Technical Assessment: **ETA-17/0502; 24.11.2017**
Technical Assessment Body: **DIBt**
Notified body/ies: **2873 TU Darmstadt**

7. Declared performance/s:

Mechanical resistance and stability (BWR1)

Essential characteristics	Performances
Amplification factor α_{lb} , Bond resistance f_{bd}	See Annex C1

Safety in case of fire (BWR 2)

Essential characteristics	Performances
Reaction to fire	Rebar connection satisfy requirements for Class A1
Resistance to fire	See Annex C2 and C3

8. Appropriate Technical Documentation and/or Specific Technical Documentation: --

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

i.A. Daniel Wilhelm (Applications Engineering)
Krauchenwies-Ablach, 04.01.2021

Minimum anchorage length and minimum lap length

The minimum anchorage length $\ell_{b,min}$ and the minimum lap length $\ell_{0,min}$ according to EN 1992-1-1:2004+AC:2010 ($\ell_{b,min}$ acc. to Eq. 8.6 and Eq. 8.7 and $\ell_{0,min}$ acc. to Eq. 8.11) shall be multiplied by the amplification factor α_{lb} according to Table C1.

Table C1: Amplification factor α_{lb} related to concrete class and drilling method

Concrete class	Drilling method	Bar size	Amplification factor α_{lb}
C12/15 to C50/60	Hammer drilling (HD), hollow drilling (HDB) and compressed air drilling (CD)	8 mm to 32 mm ZA-M12 to ZA-M24	1,0

Table C2: Design values of the ultimate bond stress f_{bd} in N/mm² for all drilling methods for good conditions

according to EN 1992-1-1:2004+AC:2010 for good bond conditions
(for all other bond conditions multiply the values by 0.7)

Rebar - \varnothing	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ									
8 to 25 mm ZA-M12 to ZA-M24	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
28 to 32 mm	1,6	2,0	2,3	2,7	3,0	3,4	3,7	3,7	3,7

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Amplification factor α_{lb}
Design values of ultimate bond resistance f_{bd}

Annex C 1

Design value of the ultimate bond stress $f_{bd,fi}$ under fire exposure for concrete classes C12/15 to C50/60, (all drilling methods):

The design value of the bond strength $f_{bd,fi}$ under fire exposure has to be calculated by the following equation:

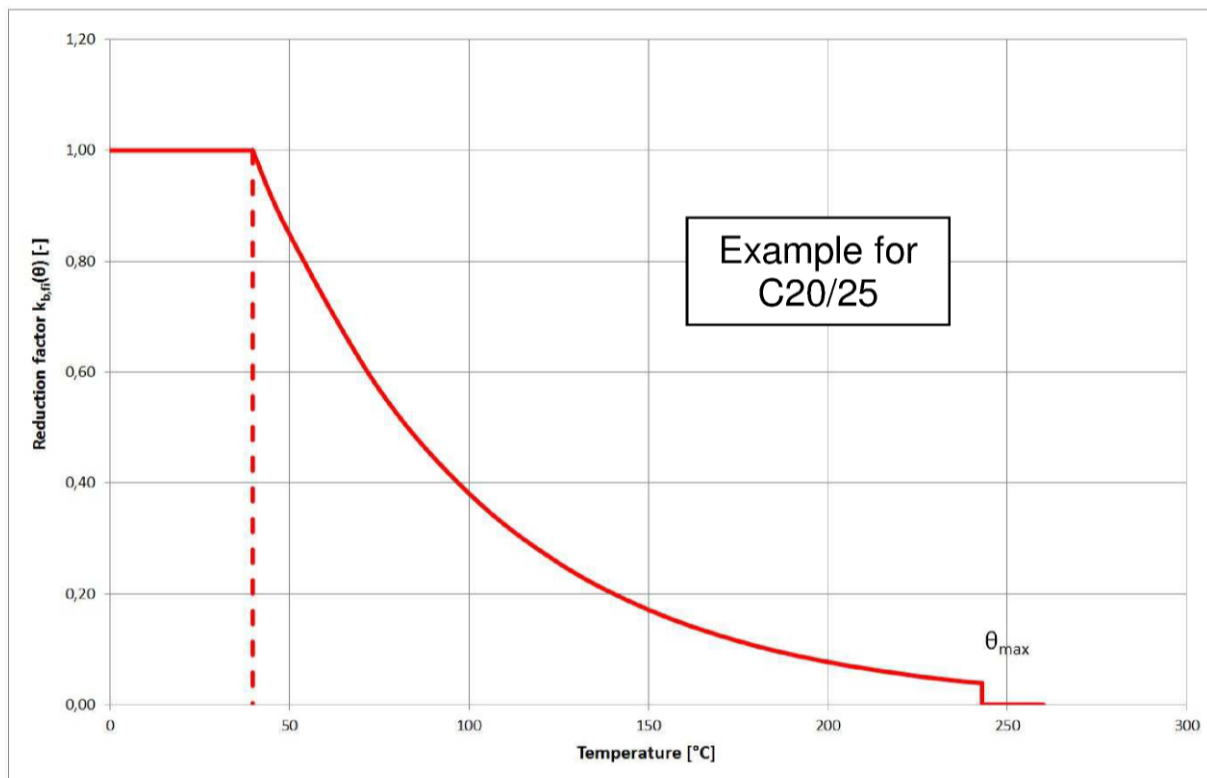
$$f_{bd,fi} = k_{b,fi}(\theta) \cdot f_{bd} \cdot \gamma_c / \gamma_{M,fi}$$

with: $\theta \leq 243^\circ\text{C}$: $k_{b,fi}(\theta) = 18,88 \cdot e^{(\theta - 0,016)} / (f_{bd} \cdot 4,3) \leq 1,0$
 $\theta > 243^\circ\text{C}$: $k_{b,fi}(\theta) = 0$

- $f_{bd,fi}$ Design value of the ultimate bond stress in case of fire in N/mm²
- θ Temperature in °C in the mortar layer.
- $k_{b,fi}(\theta)$ Reduction factor under fire exposure.
- f_{bd} Design value of the ultimate bond stress in N/mm² in cold condition according to Table C2 considering the concrete classes, the rebar diameter, the drilling method and the bond conditions according to EN 1992-1-1.
- γ_c partially safety factor according to EN 1992-1-1
- $\gamma_{M,fi}$ partially safety factor according to EN 1992-1-2

For evidence under fire exposure the anchorage length shall be calculated according to EN 1992-1-1:2004+AC:2010 Equation 8.3 using the temperature-dependent ultimate bond stress $f_{bd,fi}$.

Example graph of Reduction factor $k_{b,fi}(\theta)$ for concrete classes C20/25 for good bond conditions:



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Design value of bond strength $f_{bd,fi}$ under fire exposure

Annex C 2

Table C3: Characteristic tension strength for tension anchor ZA under fire exposure,

concrete classes C12/15 to C50/60, according to Technical Report TR 020

Tension Anchor				M12	M16	M20	M24
Steel, zinc plated (ZA vz)							
Characteristic steel strength	R30	$\sigma_{Rk,s,fi}$	[N/mm ²]	20			
	R60			15			
	R90			13			
	R120			10			
Stainless Steel (ZA A4 or ZA HCR)							
Characteristic steel strength	R30	$\sigma_{Rk,s,fi}$	[N/mm ²]	30			
	R60			25			
	R90			20			
	R120			16			

Design value of the steel strength $\sigma_{Rd,s,fi}$ under fire exposure

The design value of the steel strength $\sigma_{Rd,s,fi}$ under fire exposure has to be calculated by the following equation:

$$\sigma_{Rd,s,fi} = \sigma_{Rk,s,fi} / \gamma_{M,fi}$$

with:

$\sigma_{Rk,s,fi}$ characteristic steel strength according to Table C3

$\gamma_{M,fi}$ partially safety factor according to EN 1992-1-2

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Design value of the steel strength $\sigma_{Rd,s,fi}$ for tension anchor ZA under fire exposure

Annex C 3