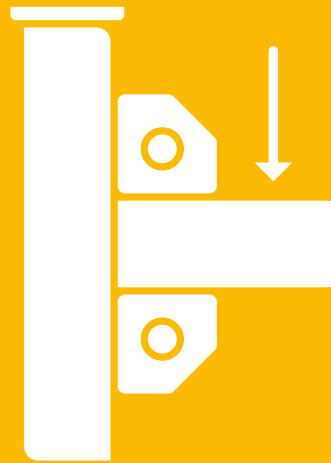


# sikla



**siMetrix**  
Guide Statique



|                                                       |           |
|-------------------------------------------------------|-----------|
| <b>Remarques préliminaires et principes de calcul</b> | <b>2</b>  |
| <b>Profil PRO 46</b>                                  | <b>4</b>  |
| <b>Construction en L</b>                              | <b>6</b>  |
| <b>Cadre</b>                                          | <b>8</b>  |
| <b>Etrier-profil - montage horizontal</b>             | <b>12</b> |
| <b>Etrier-profil - montage vertical</b>               | <b>14</b> |
| <b>Support en T</b>                                   | <b>16</b> |
| <b>Console murale fixée par chevilles</b>             | <b>18</b> |

## Contacts

### **Sikla France S.A.R.L.**

8 avenue Christian Doppler  
77700 Serris - France

Tel.: +33 (0)1 64 63 34 80

**[www.sikla.fr](http://www.sikla.fr)**

## Remarques préliminaires et principes de calcul

### Domaine d'application

Le "Guide statique" Sikla pour le système de montage siMetrix 46 permet à l'utilisateur de facilement sélectionner et planifier des structures de supportage. Il fournit les capacités de charge portantes admissibles pour des structures typiques Sikla.

### Critères de base et principes de calcul

La conception des structures Sikla typiques aux états limites ultimes et limites de service est basée sur les Eurocodes 0 et 3, *DIN EN 1990:2021-10*, ainsi que *DIN EN 1993-1-1:2010-12* et l'annexe internationale *DIN EN 1993-1-1 NA* et *DIN EN 1993-1-3:2010-12* et *DIN EN 1993-1-3 NA-2017-05*.

Considérant l'**état limite ultime (ELU)**, les valeurs caractéristiques de capacité de charge des composants sont diminuées par un coefficient partiel de sécurité  $\gamma_{M2} = 1.25$  selon le chapitre 6.1 « Règles générales », *DIN EN 1993-1-1:2010-12*.

**Les états de limite ultime dans la catégorie STR/GEO** sont vérifiés selon *DIN EN 1990:2021-10*, Chapitre 6.4 „Etat limite ultime“, suivant l'équation 6.8:  $E_d \leq R_d$ .

La base de la vérification est la combinaison d'actions dans des situations de conceptions permanentes ou temporaires (combinaison de base) selon *chapitre 6.4.3.2, formule (6.10)*.

Les coefficients partiels de sécurité  $\gamma_{G,i}$  pour des actions permanentes et  $\gamma_{Q,i}$  pour des actions temporaires, ainsi que les valeurs combinées  $\psi_{0,i}$  sont extraits du Tableau A2..4(B) - Valeurs des actions (STR/GEO) – Groupe B.

Les critères suivants s'appliquent:

- Des charges statiques permanentes  $G$  telles que les poids de la tuyauterie sont assignés un coefficient partiel de sécurité  $\gamma_G = 1.35$
- Des charges variables  $Q$  telles que les forces de friction additionnelles  $F_x = F_z \cdot \mu_{\text{Frict.}}$  pour des supports de tubes Sikla sur la surface zincmagnésium des profils siMetrix, qui sont calculées en tenant compte du poids du tube  $F_z$  et d'un coefficient de friction statique  $\mu_{\text{Frict.}} = 0.20$  (curseur à glissière et collier Sikla). Ces forces variables générées par la dilatation des tuyauteries sont assignées un coefficient partiel de sécurité  $\gamma_Q = 1.5$ .

Des supports guidés avec coefficients de friction statique  $\mu_{\text{Frict.}} > 0.2$  nécessitent une étude séparée.

La vérification des **états limites en service (ELS) dans la catégorie STR/GEO** est menée selon *DIN EN 1990:2021-10*, Chapitre 6.5 „Etat limite de service“, selon l'équation:  $E_d \leq C_d$ , où  $C_d$  correspond à la valeur de l'état limite en fonction du critère de service concerné.

Pour les structures Sikla, les critères de service sont la déflexion et la déformation. Dans ce cas, la vérification est basée sur la combinaison caractéristique (6.14 b) au Chapitre 6.5.3 « Combinaison d'actions ». Dans cette équation les coefficients partiels de sécurité sont supposés être 1.0..

### Charges admissibles

Les charges admissibles spécifiées correspondent aux charges maximales permanentes caractéristiques  $G_k$  et charges variables  $Q_k$ , et tiennent compte les états limites ultimes et états limites en service pour la structure en question.

Dans les modèles statiques, l'influence des connexions sur les états limites ultimes et limites en service est prise en compte en intégrant dans les calculs les capacités de charge et les propriétés d'élasticité des composants correspondants.

Les valeurs des charges admissibles indiquées donnent donc simultanément la preuve de capacité ultime et la preuve d'état de service. La valeur correspondante dans chaque cas est listée comme  $F_{z,perm}$ .

### Connexion aux structures existantes sur site

Lors de la mise en oeuvre de fixations par chevilles ou de raccordements aux rails inserts existants sur site, la preuve de la capacité de charge des produits utilisés doit être fournie séparément. Lors de connexions aux structures existantes en acier sur site, la capacité de portance de celles-ci ainsi que leur résistance à la charge et à la torsion doivent être testées indépendamment. De plus, lors de l'assemblage de structures à l'aide de crapauds ou d'étriers-profil il faut s'assurer que la friction statique entre la pièce de connexion et le support sur site remplisse la condition  $\mu_{\text{Frict.}} \geq 0.2$  (sliding surface class D).

Sauf indication contraire, le critère suivant s'applique:

- la direction de la force  $F_x$  = l'axe longitudinal du support.
- Les fixations dans le béton sont dimensionnées avec une fixation de type Goujon d'ancrage AN BZ plus M10 hef. 60 (ETA-10/0259), dans du béton de classification C20/25 et en tenant compte des spécifications  $h_{\min} \geq 1.5 h_{\text{ef}}$  et distance aux bords  $c \geq 120$  mm.
- Les écarts d'entraxes dépendent des composants mis en oeuvre.

### Informations techniques

Les limites et recommandations pour l'assemblage des structures sont compilées dans le document « Guide d'installation siMetrix ». On y trouve en particulier les spécifications à respecter concernant les couples de serrage, écartements entre vis, etc.

Les informations techniques fournies dans les fiches-produits respectives, au sujet de leur utilisation et de leur mise en oeuvre, doivent également être prises en compte.



Guide d'installation siMetrix

### La réutilisation des produits

Des produits ne peuvent être réutilisés qu'à condition de ne pas avoir été sollicités au-delà de leur capacité de charge admissibles préconisée, et de ne présenter aucun dommage au niveau de leur revêtement protecteur de surface.

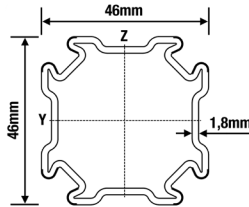
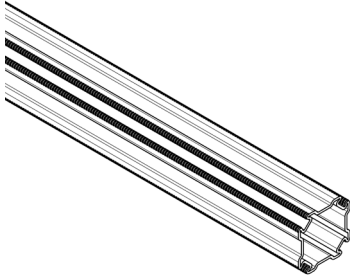
### Clause de non-responsabilité

Cette documentation est exclusivement destinée à l'utilisation par le destinataire et demeure en tous points la propriété de Sikla. Les représentations techniques et les consignes sont indiquées en toute bonne foi. Les illustrations et dessins sont sans engagement. Nous ne saurions être tenus pour responsable de toutes erreurs ou défauts d'impression.

Nous nous réservons de droit d'effectuer des modifications et d'améliorer la conception, en particulier en cas de progrès techniques.

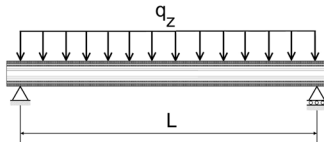
## Sollicitation admissible selon l'Eurocode 3

### Profil PRO 46



Liste des composants  
1x Profil PRO 46

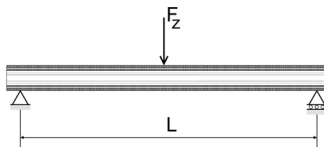
#### Charge uniformément répartie



| $L_{max}$ | $q_{z, perm}$ | $F_z (q_{z, perm} * L)$ |
|-----------|---------------|-------------------------|
| [mm]      | [kN/m]        | [kN]                    |
| 500       | <b>13.86</b>  | <b>6.93</b>             |
| 750       | <b>9.23</b>   | <b>6.92</b>             |
| 1000      | <b>5.53</b>   | <b>5.53</b>             |
| 1500      | <b>2.27</b>   | <b>3.40</b>             |
| 2000      | <b>0.96</b>   | <b>1.91</b>             |
| 2500      | <b>0.49</b>   | <b>1.22</b>             |

$q_z$  [kN/m] en tant que charge permanente par L

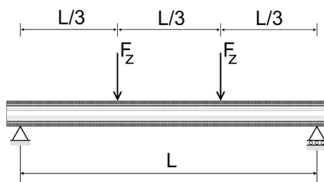
#### 1 Charge individuelle



| $L_{max}$ | $F_{z, perm}$ |
|-----------|---------------|
| [mm]      | [kN]          |
| 500       | <b>5.55</b>   |
| 750       | <b>3.69</b>   |
| 1000      | <b>2.76</b>   |
| 1500      | <b>1.83</b>   |
| 2000      | <b>1.20</b>   |
| 2500      | <b>0.76</b>   |

$F_z$  [kN] en tant que charge permanente pour L/2.

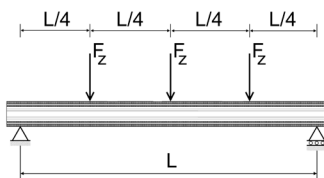
#### 2 Charges individuelles



| $L_{max}$ | $F_{z, perm}$ |
|-----------|---------------|
| [mm]      | [kN]          |
| 500       | <b>3.46</b>   |
| 750       | <b>2.77</b>   |
| 1000      | <b>2.07</b>   |
| 1500      | <b>1.25</b>   |
| 2000      | <b>0.70</b>   |
| 2500      | <b>0.45</b>   |

$F_z$  [kN] en tant que charges permanentes pour L/3 et 2\*L/3

#### 3 Charges individuelles



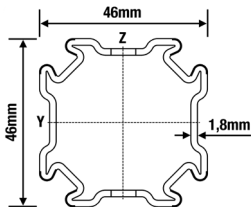
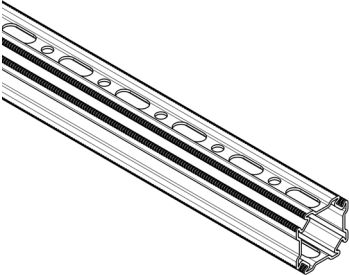
| $L_{max}$ | $F_{z, perm}$ |
|-----------|---------------|
| [mm]      | [kN]          |
| 500       | <b>2.31</b>   |
| 750       | <b>1.85</b>   |
| 1000      | <b>1.38</b>   |
| 1500      | <b>0.89</b>   |
| 2000      | <b>0.50</b>   |
| 2500      | <b>0.32</b>   |

$F_z$  [kN] en tant que charges permanentes pour L/4, L/2 et 3\*L/4

Profil simple sous charge monoaxiale.  
Poids propre du profil pris en compte. Flexion max. L/200.

Sollicitation admissible selon l'Eurocode 3

Profil PRO 46-P



Liste des composants  
1x Profil PRO 46-P

|                                                   |           |               |                              |
|---------------------------------------------------|-----------|---------------|------------------------------|
| <b>Charge uniformément répai</b><br>              | $L_{max}$ | $q_{z, perm}$ | $F_z (q_{z, perm} \times L)$ |
|                                                   | [mm]      | [kN/m]        | [kN]                         |
|                                                   | 500       | <b>11.76</b>  | <b>5.88</b>                  |
|                                                   | 750       | <b>7.83</b>   | <b>5.87</b>                  |
|                                                   | 1000      | <b>4.69</b>   | <b>4.69</b>                  |
|                                                   | 1500      | <b>1.92</b>   | <b>2.89</b>                  |
|                                                   | 2000      | <b>0.81</b>   | <b>1.62</b>                  |
|                                                   | 2500      | <b>0.42</b>   | <b>1.02</b>                  |
| $q_z$ [kN/m] en tant que charge permanente par L. |           |               |                              |

|                                                    |           |               |
|----------------------------------------------------|-----------|---------------|
| <b>1 Charge individuelle</b><br>                   | $L_{max}$ | $F_{z, perm}$ |
|                                                    | [mm]      | [kN]          |
|                                                    | 500       | <b>4.71</b>   |
|                                                    | 750       | <b>3.13</b>   |
|                                                    | 1000      | <b>2.34</b>   |
|                                                    | 1500      | <b>1.55</b>   |
|                                                    | 2000      | <b>1.01</b>   |
|                                                    | 2500      | <b>0.65</b>   |
| $F_z$ [kN] en tant que charge permanente pour L/2. |           |               |

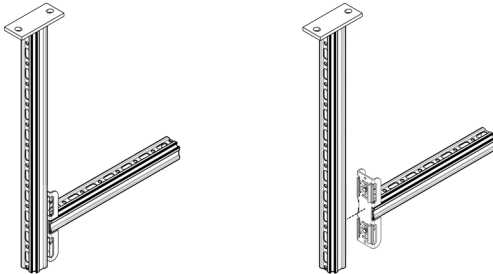
|                                                               |           |               |
|---------------------------------------------------------------|-----------|---------------|
| <b>2 Charges individuelles</b><br>                            | $L_{max}$ | $F_{z, perm}$ |
|                                                               | [mm]      | [kN]          |
|                                                               | 500       | <b>2.94</b>   |
|                                                               | 750       | <b>2.35</b>   |
|                                                               | 1000      | <b>1.76</b>   |
|                                                               | 1500      | <b>1.06</b>   |
|                                                               | 2000      | <b>0.60</b>   |
|                                                               | 2500      | <b>0.38</b>   |
| $F_z$ [kN] en tant que charges permanentes pour L/3 et 2*L/3. |           |               |

|                                                                   |           |               |
|-------------------------------------------------------------------|-----------|---------------|
| <b>3 Charges individuelles</b><br>                                | $L_{max}$ | $F_{z, perm}$ |
|                                                                   | [mm]      | [kN]          |
|                                                                   | 500       | <b>1.96</b>   |
|                                                                   | 750       | <b>1.57</b>   |
|                                                                   | 1000      | <b>1.17</b>   |
|                                                                   | 1500      | <b>0.76</b>   |
|                                                                   | 2000      | <b>0.43</b>   |
|                                                                   | 2500      | <b>0.27</b>   |
| $F_z$ [kN] en tant que charges permanentes pour L/4, L/2 et 3*L/4 |           |               |

Profil simple sous charge monoaxiale.  
Poids propre du profil pris en compte. Flexion max. L/200.

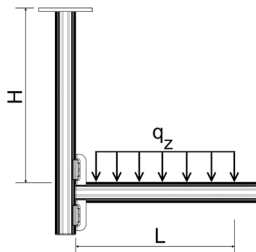
### Sollicitation admissible selon l'Eurocode 3

#### Construction en L



**Liste des composants**  
1x console murale AK 46-P  
1x console murale AK CC 46-P

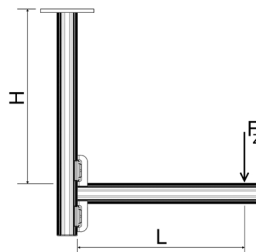
#### Charge uniformément répartie



| $H_{max}$ | $L_{max}$ | 200           |                 | 400           |                 | 600           |                 |
|-----------|-----------|---------------|-----------------|---------------|-----------------|---------------|-----------------|
|           |           | $q_{z, perm}$ | $F_z (q_z * L)$ | $q_{z, perm}$ | $F_z (q_z * L)$ | $q_{z, perm}$ | $F_z (q_z * L)$ |
|           | [mm]      | [kN/m]        | [kN]            | [kN/m]        | [kN]            | [kN/m]        | [kN]            |
| 300       |           | <b>4.70</b>   | <b>0.94</b>     | <b>1.28</b>   | <b>0.51</b>     | <b>0.56</b>   | <b>0.34</b>     |
| 600       |           | <b>3.97</b>   | <b>0.79</b>     | <b>1.05</b>   | <b>0.42</b>     | <b>0.46</b>   | <b>0.28</b>     |
| 900       |           | <b>3.31</b>   | <b>0.66</b>     | <b>0.89</b>   | <b>0.36</b>     | <b>0.39</b>   | <b>0.23</b>     |

$q_z$  [kN/m] en tant que charge permanente par L.

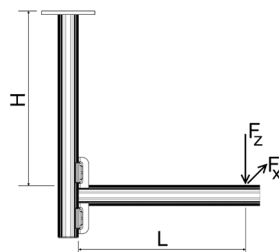
#### 1 Charge individuelle



| Direction de la charge Z                                                                                                                                 |                      |                      |                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|----------------------|
| <div><div><div><div><div></div><div><math>L_{\max}</math></div></div></div><div><div><div><math>H_{\max}</math></div><div></div></div></div></div></div> | 200                  | 400                  | 600                  |
|                                                                                                                                                          | $F_{z, \text{perm}}$ | $F_{z, \text{perm}}$ | $F_{z, \text{perm}}$ |
| [mm]                                                                                                                                                     | [kN]                 | [kN]                 | [kN]                 |
| 300                                                                                                                                                      | <b>0.51</b>          | <b>0.26</b>          | <b>0.17</b>          |
| 600                                                                                                                                                      | <b>0.42</b>          | <b>0.21</b>          | <b>0.14</b>          |
| 900                                                                                                                                                      | <b>0.35</b>          | <b>0.18</b>          | <b>0.12</b>          |

$F_z$  [kN] en tant que charge permanente pour L.

#### 1 Charge individuelle

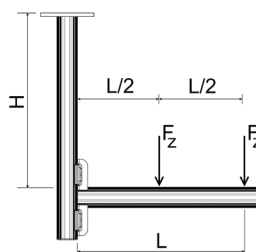


| Direction de la charge Z et X |               |               |               |               |               |               |
|-------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| $L_{max}$<br>$H_{max}$        | 200           |               | 400           |               | 600           |               |
|                               | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                           | <b>0.36</b>   | <b>0.07</b>   | <b>0.19</b>   | <b>0.04</b>   | <b>0.13</b>   | <b>0.03</b>   |
| 600                           | <b>0.30</b>   | <b>0.06</b>   | <b>0.16</b>   | <b>0.03</b>   | <b>0.11</b>   | <b>0.02</b>   |
| 900                           | <b>0.26</b>   | <b>0.05</b>   | <b>0.13</b>   | <b>0.03</b>   | <b>0.09</b>   | <b>0.02</b>   |

$F_z$  [kN] en tant que charge permanente pour L;

$F_x$  [kN] en tant que charge variable pour L.

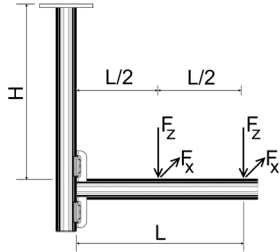
#### 2 Charges individuelles



| Direction de la charge Z |               |               |               |
|--------------------------|---------------|---------------|---------------|
| $L_{max}$                | 200           | 400           | 600           |
| $H_{max}$                | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ |
| [mm]                     | [kN]          | [kN]          | [kN]          |
| 300                      | <b>0.34</b>   | <b>0.17</b>   | <b>0.11</b>   |
| 600                      | <b>0.28</b>   | <b>0.14</b>   | <b>0.09</b>   |
| 900                      | <b>0.23</b>   | <b>0.12</b>   | <b>0.08</b>   |

$F_z$  [kN] en tant que charges permanentes pour L et L/2.

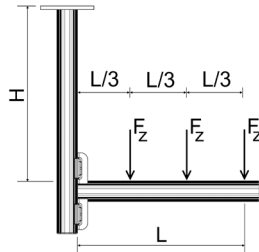
### 2 Charges individuelles



| Directions de la charge Z et X |               |               |               |               |               |               |
|--------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| $\frac{L_{max}}{H_{max}}$      | 200           |               | 400           |               | 600           |               |
|                                | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                           | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                            | <b>0.24</b>   | <b>0.05</b>   | <b>0.13</b>   | <b>0.03</b>   | <b>0.09</b>   | <b>0.02</b>   |
| 600                            | <b>0.20</b>   | <b>0.04</b>   | <b>0.11</b>   | <b>0.02</b>   | <b>0.07</b>   | <b>0.01</b>   |
| 900                            | <b>0.17</b>   | <b>0.03</b>   | <b>0.09</b>   | <b>0.02</b>   | <b>0.06</b>   | <b>0.01</b>   |

$F_z$  [kN] en tant que charges permanentes pour L et L/2;  
 $F_x$  [kN] en tant que charges variables pour L et L/2.

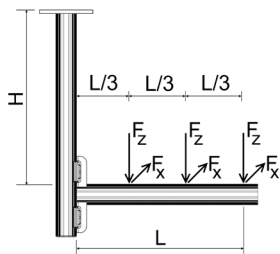
### 3 Charges individuelles



| Direction de la charge Z  |               |               |               |
|---------------------------|---------------|---------------|---------------|
| $\frac{L_{max}}{H_{max}}$ | 200           | 400           | 600           |
|                           | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ |
| [mm]                      | [kN]          | [kN]          | [kN]          |
| 300                       | <b>0.24</b>   | <b>0.13</b>   | <b>0.08</b>   |
| 600                       | <b>0.20</b>   | <b>0.10</b>   | <b>0.07</b>   |
| 900                       | <b>0.17</b>   | <b>0.09</b>   | <b>0.06</b>   |

$F_z$  [kN] en tant que charges permanentes pour L, 2L/3 et L/3.

### 3 Charges individuelles



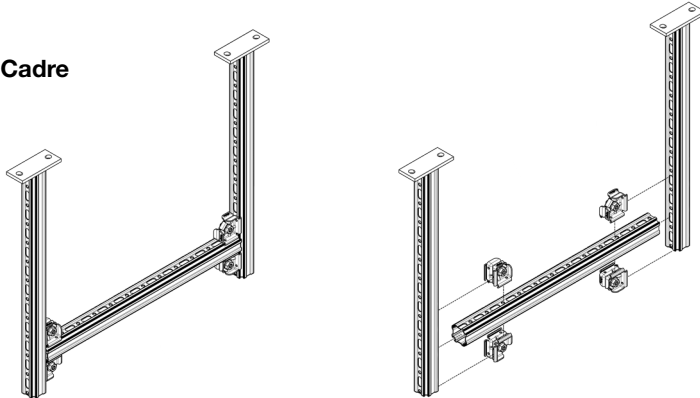
| Directions de la charge Z et X |               |               |               |               |               |               |
|--------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| $\frac{L_{max}}{H_{max}}$      | 200           |               | 400           |               | 600           |               |
|                                | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                           | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                            | <b>0.18</b>   | <b>0.04</b>   | <b>0.10</b>   | <b>0.02</b>   | <b>0.06</b>   | <b>0.01</b>   |
| 600                            | <b>0.15</b>   | <b>0.03</b>   | <b>0.08</b>   | <b>0.02</b>   | <b>0.05</b>   | <b>0.01</b>   |
| 900                            | <b>0.13</b>   | <b>0.03</b>   | <b>0.07</b>   | <b>0.01</b>   | <b>0.05</b>   | <b>0.01</b>   |

$F_z$  [kN] en tant que charges permanentes L, 2L/3 et L/3;  
 $F_x$  [kN] en tant que charges variables pour L, 2L/3 et L/3.

Toutes les constructions représentées peuvent aussi être utilisées fixées au sol.  
 Coefficient de frottement statique  $\mu_0$  pour le frottement dans le sens axial du tube.  
 Déformation max.  $H/100$ ;  $L/100$ .  
 La spécification des ancrages doit être considérée en fonction des conditions locales.

### Sollicitation admissible selon l'Eurocode 3

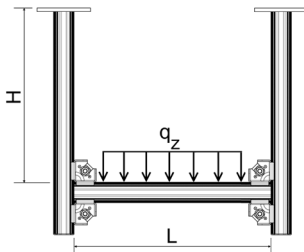
#### Cadre



#### Liste des composants

1x profil PRO 46-P  
2x consoles murales AK 46-P  
4x équerres CN 46

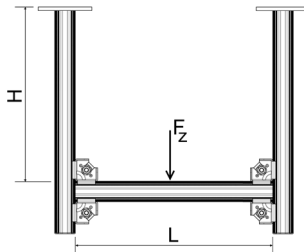
#### Charge uniformément répartie



| H<br>max | L <sub>max</sub> | 500                  |                      | 1000                 |                      | 1500                 |                      | 2000                 |                      | 2500                 |                      | 3000                 |                      |
|----------|------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|          |                  | q <sub>z, perm</sub> | F <sub>z, perm</sub> | q <sub>z, perm</sub> | F <sub>z, perm</sub> | q <sub>z, perm</sub> | F <sub>z, perm</sub> | q <sub>z, perm</sub> | F <sub>z, perm</sub> | q <sub>z, perm</sub> | F <sub>z, perm</sub> | q <sub>z, perm</sub> | F <sub>z, perm</sub> |
|          | [mm]             | [kN/m]               | [kN]                 | [kN/m]               | [kN]                 | [kN/m]               | [kN]                 | [kN/m]               | [kN]                 | [kN/m]               | [kN]                 | [kN/m]               | [kN]                 |
| 300      |                  | <b>5.96</b>          | <b>2.98</b>          | <b>2.98</b>          | <b>2.98</b>          | <b>1.95</b>          | <b>2.92</b>          | <b>1.11</b>          | <b>2.22</b>          | <b>0.61</b>          | <b>1.53</b>          | <b>0.37</b>          | <b>1.12</b>          |
| 600      |                  | <b>5.96</b>          | <b>2.98</b>          | <b>2.98</b>          | <b>2.98</b>          | <b>1.94</b>          | <b>2.91</b>          | <b>1.10</b>          | <b>2.20</b>          | <b>0.60</b>          | <b>1.51</b>          | <b>0.37</b>          | <b>1.11</b>          |
| 900      |                  | <b>5.96</b>          | <b>2.98</b>          | <b>2.98</b>          | <b>2.98</b>          | <b>1.94</b>          | <b>2.91</b>          | <b>1.09</b>          | <b>2.17</b>          | <b>0.60</b>          | <b>1.49</b>          | <b>0.37</b>          | <b>1.10</b>          |

q<sub>z</sub> [kN/m] en tant que charge permanente par L F<sub>z</sub> = (q<sub>z</sub> \* L).

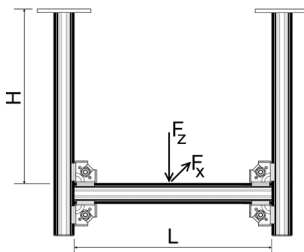
#### 1 Charge individuelle



| Direction de la charge Z                                        |                      |                      |                      |                      |                      |                      |
|-----------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <div><div>L<sub>max</sub></div><div>H<sub>max</sub></div></div> | 500                  | 1000                 | 1500                 | 2000                 | 2500                 | 3000                 |
|                                                                 | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> |
| [mm]                                                            | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 |
| 300                                                             | <b>2.98</b>          | <b>2.61</b>          | <b>1.81</b>          | <b>1.36</b>          | <b>0.93</b>          | <b>0.68</b>          |
| 600                                                             | <b>2.98</b>          | <b>2.60</b>          | <b>1.81</b>          | <b>1.35</b>          | <b>0.92</b>          | <b>0.67</b>          |
| 900                                                             | <b>2.98</b>          | <b>2.59</b>          | <b>1.80</b>          | <b>1.34</b>          | <b>0.91</b>          | <b>0.67</b>          |

F<sub>z</sub> [kN] en tant que charge permanente pour L/2.

#### 1 Charge individuelle

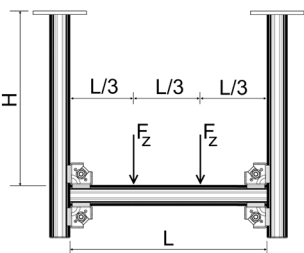


| Directions de la charges Z et X                                 |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |
|-----------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <div><div>L<sub>max</sub></div><div>H<sub>max</sub></div></div> | 500                  |                      | 1000                 |                      | 1500                 |                      | 2000                 |                      | 2500                 |                      | 3000                 |                      |
|                                                                 | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> |
| [mm]                                                            | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 |
| 300                                                             | <b>2.48</b>          | <b>0.50</b>          | <b>2.03</b>          | <b>0.41</b>          | <b>1.41</b>          | <b>0.28</b>          | <b>1.09</b>          | <b>0.22</b>          | <b>0.87</b>          | <b>0.17</b>          | <b>0.64</b>          | <b>0.13</b>          |
| 600                                                             | <b>2.48</b>          | <b>0.50</b>          | <b>2.03</b>          | <b>0.41</b>          | <b>1.40</b>          | <b>0.28</b>          | <b>1.09</b>          | <b>0.22</b>          | <b>0.87</b>          | <b>0.17</b>          | <b>0.63</b>          | <b>0.13</b>          |
| 900                                                             | <b>1.82</b>          | <b>0.36</b>          | <b>1.75</b>          | <b>0.35</b>          | <b>1.40</b>          | <b>0.28</b>          | <b>1.08</b>          | <b>0.22</b>          | <b>0.86</b>          | <b>0.17</b>          | <b>0.63</b>          | <b>0.13</b>          |

F<sub>z</sub> [kN] en tant que charge permanente pour L/2;

F<sub>x</sub> [kN] en tant que charge variable pour L/2.

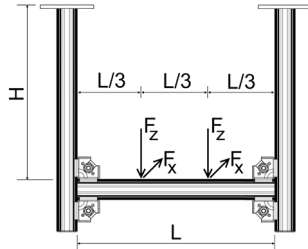
#### 2 Charges individuelles



| Directions de la charge Z                                                  |                      |                      |                      |                      |                      |                      |
|----------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <div><div><div>L<sub>max</sub></div><div>H<sub>max</sub></div></div></div> | 500                  | 1000                 | 1500                 | 2000                 | 2500                 | 3000                 |
|                                                                            | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> |
| [mm]                                                                       | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 |
| 300                                                                        | <b>1.49</b>          | <b>1.49</b>          | <b>1.33</b>          | <b>0.81</b>          | <b>0.56</b>          | <b>0.41</b>          |
| 600                                                                        | <b>1.49</b>          | <b>1.49</b>          | <b>1.30</b>          | <b>0.80</b>          | <b>0.55</b>          | <b>0.41</b>          |
| 900                                                                        | <b>1.49</b>          | <b>1.49</b>          | <b>1.30</b>          | <b>0.80</b>          | <b>0.54</b>          | <b>0.40</b>          |

F<sub>z</sub> [kN] en tant que charges permanentes 2L/3 et L/3.

### 2 Charges individuelles

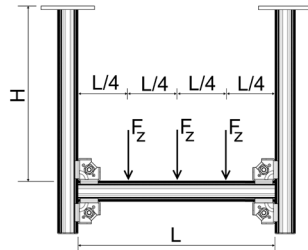


Directions de la charge Z et X

| $\frac{L_{max}}{H_{max}}$ | 500           |               | 1000          |               | 1500          |               | 2000          |               | 2500          |               | 3000          |               |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                           | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                      | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                       | <b>1.24</b>   | <b>0.25</b>   | <b>1.24</b>   | <b>0.25</b>   | <b>1.11</b>   | <b>0.22</b>   | <b>0.76</b>   | <b>0.15</b>   | <b>0.49</b>   | <b>0.10</b>   | <b>0.31</b>   | <b>0.06</b>   |
| 600                       | <b>1.24</b>   | <b>0.25</b>   | <b>1.24</b>   | <b>0.25</b>   | <b>1.11</b>   | <b>0.22</b>   | <b>0.76</b>   | <b>0.15</b>   | <b>0.49</b>   | <b>0.10</b>   | <b>0.31</b>   | <b>0.08</b>   |
| 900                       | <b>0.91</b>   | <b>0.18</b>   | <b>0.88</b>   | <b>0.18</b>   | <b>0.81</b>   | <b>0.16</b>   | <b>0.71</b>   | <b>0.14</b>   | <b>0.49</b>   | <b>0.10</b>   | <b>0.31</b>   | <b>0.08</b>   |

$F_z$  [kN] en tant que charges permanentes  $2L/3$  et  $L/3$ ;  
 $F_x$  [kN] en tant que charges variables pour  $2L/3$  et  $L/3$ .

### 3 Charges individuelles

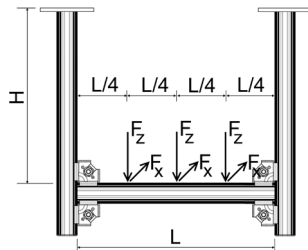


Direction de la charge Z

| $\frac{L_{max}}{H_{max}}$ | 500           | 1000          | 1500          | 2000          | 2500          | 3000          |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                           | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ |
| [mm]                      | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                       | <b>0.99</b>   | <b>0.99</b>   | <b>0.95</b>   | <b>0.58</b>   | <b>0.40</b>   | <b>0.29</b>   |
| 600                       | <b>0.99</b>   | <b>0.99</b>   | <b>0.94</b>   | <b>0.58</b>   | <b>0.40</b>   | <b>0.29</b>   |
| 900                       | <b>0.99</b>   | <b>0.99</b>   | <b>0.91</b>   | <b>0.57</b>   | <b>0.39</b>   | <b>0.29</b>   |

$F_z$  [kN] en tant que charges permanentes  $3L/4$ ,  $L/2$  et  $L/4$ .

### 3 Charges individuelles



Directions de la charge Z et X

| $\frac{L_{max}}{H_{max}}$ | 500           |               | 1000          |               | 1500          |               | 2000          |               | 2500          |               | 3000          |               |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                           | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                      | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                       | <b>0.83</b>   | <b>0.17</b>   | <b>0.83</b>   | <b>0.17</b>   | <b>0.73</b>   | <b>0.15</b>   | <b>0.55</b>   | <b>0.11</b>   | <b>0.38</b>   | <b>0.08</b>   | <b>0.28</b>   | <b>0.06</b>   |
| 600                       | <b>0.83</b>   | <b>0.17</b>   | <b>0.83</b>   | <b>0.17</b>   | <b>0.73</b>   | <b>0.15</b>   | <b>0.54</b>   | <b>0.11</b>   | <b>0.37</b>   | <b>0.07</b>   | <b>0.27</b>   | <b>0.05</b>   |
| 900                       | <b>0.61</b>   | <b>0.12</b>   | <b>0.59</b>   | <b>0.12</b>   | <b>0.55</b>   | <b>0.11</b>   | <b>0.48</b>   | <b>0.10</b>   | <b>0.37</b>   | <b>0.07</b>   | <b>0.27</b>   | <b>0.05</b>   |

$F_z$  [kN] en tant que charges permanentes  $3L/4$ ,  $L/2$  et  $L/4$ ;  
 $F_x$  [kN] en tant que charges variables pour  $3L/4$ ,  $L/4$  et  $L/4$ .

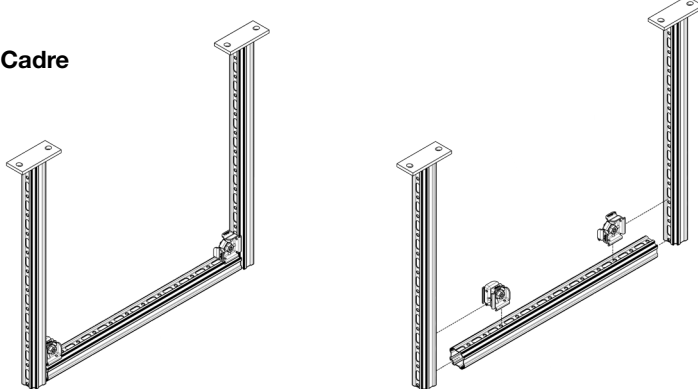
Toutes les constructions représentées peuvent aussi être utilisées fixées au sol.

Coefficient de frottement statique  $\mu_0 = 0.2$  pour le frottement dans le sens axial du tube. Déformation max.  $H/100$ ;  $L/200$ .

La spécification des ancrages doit être considérée en fonction des conditions locales.

### Sollicitation admissible selon l'Eurocode 3

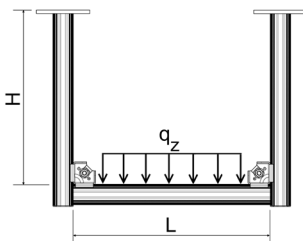
#### Cadre



#### Liste des composants

1x Profil PRO 46-P  
2x Consoles murales AK 46-P  
2x Équerres CN 46

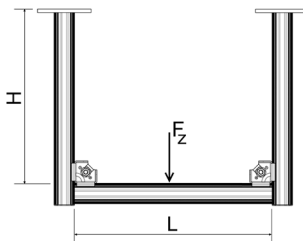
#### Charge uniformément



| L <sub>max</sub><br>H <sub>max</sub> | 500                            |                              | 1000                           |                              | 1500                           |                              | 2000                           |                              | 2500                           |                              | 3000                           |                              |
|--------------------------------------|--------------------------------|------------------------------|--------------------------------|------------------------------|--------------------------------|------------------------------|--------------------------------|------------------------------|--------------------------------|------------------------------|--------------------------------|------------------------------|
|                                      | q <sub>z, perm</sub><br>[kN/m] | F <sub>z, perm</sub><br>[kN] | q <sub>z, perm</sub><br>[kN/m] | F <sub>z, perm</sub><br>[kN] | q <sub>z, perm</sub><br>[kN/m] | F <sub>z, perm</sub><br>[kN] | q <sub>z, perm</sub><br>[kN/m] | F <sub>z, perm</sub><br>[kN] | q <sub>z, perm</sub><br>[kN/m] | F <sub>z, perm</sub><br>[kN] | q <sub>z, perm</sub><br>[kN/m] | F <sub>z, perm</sub><br>[kN] |
| 300                                  | <b>2.86</b>                    | <b>1.43</b>                  | <b>1.42</b>                    | <b>1.42</b>                  | <b>0.92</b>                    | <b>1.39</b>                  | <b>0.52</b>                    | <b>1.03</b>                  | <b>0.32</b>                    | <b>0.80</b>                  | <b>0.21</b>                    | <b>0.64</b>                  |
| 600                                  | <b>2.83</b>                    | <b>1.42</b>                  | <b>1.40</b>                    | <b>1.40</b>                  | <b>0.92</b>                    | <b>1.39</b>                  | <b>0.52</b>                    | <b>1.03</b>                  | <b>0.32</b>                    | <b>0.80</b>                  | <b>0.21</b>                    | <b>0.64</b>                  |
| 900                                  | <b>2.80</b>                    | <b>1.40</b>                  | <b>1.39</b>                    | <b>1.39</b>                  | <b>0.92</b>                    | <b>1.38</b>                  | <b>0.52</b>                    | <b>1.03</b>                  | <b>0.32</b>                    | <b>0.80</b>                  | <b>0.21</b>                    | <b>0.64</b>                  |

q<sub>z</sub> [kN/m] en tant que charge permanente par L F<sub>z</sub> = (q<sub>z</sub> \* L).

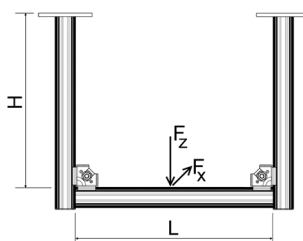
#### 1 Charge individuelle



| Direction de la charge Z             |                              |                              |                              |                              |                              |                              |
|--------------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| L <sub>max</sub><br>H <sub>max</sub> | 500                          | 1000                         | 1500                         | 2000                         | 2500                         | 3000                         |
|                                      | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] |
| 300                                  | <b>1.43</b>                  | <b>1.42</b>                  | <b>1.07</b>                  | <b>0.76</b>                  | <b>0.56</b>                  | <b>0.42</b>                  |
| 600                                  | <b>1.42</b>                  | <b>1.40</b>                  | <b>1.07</b>                  | <b>0.76</b>                  | <b>0.56</b>                  | <b>0.42</b>                  |
| 900                                  | <b>1.40</b>                  | <b>1.39</b>                  | <b>1.07</b>                  | <b>0.76</b>                  | <b>0.56</b>                  | <b>0.42</b>                  |

F<sub>z</sub> [kN] en tant que charge permanente pour L/2.

#### 1 Charge individuelle

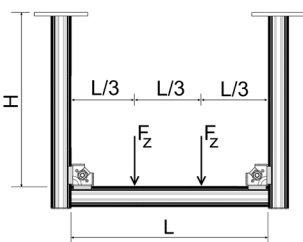


| Directions de la charge Z et X                                  |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |
|-----------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <div><div>L<sub>max</sub></div><div>H<sub>max</sub></div></div> | 500                  |                      | 1000                 |                      | 1500                 |                      | 2000                 |                      | 2500                 |                      | 3000                 |                      |
|                                                                 | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> |
| [mm]                                                            | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 |
| 300                                                             | <b>0.90</b>          | <b>0.18</b>          | <b>0.90</b>          | <b>0.18</b>          | <b>0.65</b>          | <b>0.13</b>          | <b>0.42</b>          | <b>0.08</b>          | <b>0.30</b>          | <b>0.06</b>          | <b>0.23</b>          | <b>0.05</b>          |
| 600                                                             | <b>0.90</b>          | <b>0.18</b>          | <b>0.90</b>          | <b>0.18</b>          | <b>0.65</b>          | <b>0.13</b>          | <b>0.42</b>          | <b>0.08</b>          | <b>0.30</b>          | <b>0.06</b>          | <b>0.23</b>          | <b>0.05</b>          |
| 900                                                             | <b>0.90</b>          | <b>0.18</b>          | <b>0.90</b>          | <b>0.18</b>          | <b>0.65</b>          | <b>0.13</b>          | <b>0.42</b>          | <b>0.08</b>          | <b>0.30</b>          | <b>0.06</b>          | <b>0.23</b>          | <b>0.05</b>          |

F<sub>z</sub> [kN] en tant que charge permanente pour L/2;

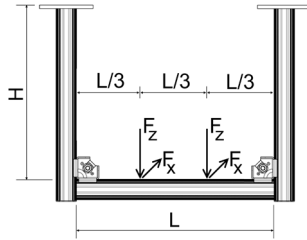
F<sub>x</sub> [kN] en tant que charge variable pour L/2.

#### 2 Charges individuelles



| Direction de la charge Z             |                              |                              |                              |                              |                              |                              |
|--------------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| L <sub>max</sub><br>H <sub>max</sub> | 500                          | 1000                         | 1500                         | 2000                         | 2500                         | 3000                         |
|                                      | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] |
| 300                                  | <b>0.71</b>                  | <b>0.71</b>                  | <b>0.64</b>                  | <b>0.42</b>                  | <b>0.32</b>                  | <b>0.25</b>                  |
| 600                                  | <b>0.71</b>                  | <b>0.70</b>                  | <b>0.59</b>                  | <b>0.42</b>                  | <b>0.32</b>                  | <b>0.25</b>                  |
| 900                                  | <b>0.70</b>                  | <b>0.70</b>                  | <b>0.59</b>                  | <b>0.42</b>                  | <b>0.32</b>                  | <b>0.25</b>                  |

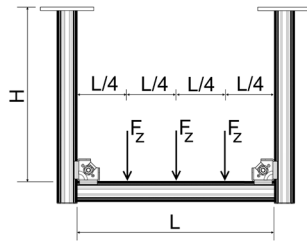
F<sub>z</sub> [kN] en tant que charges permanentes 2L/3 et L/3.

**2 Charges individuelles**

Directions de la charge Z et X

| $\frac{L_{max}}{H_{max}}$ | 500           |               | 1000          |               | 1500          |               | 2000          |               | 2500          |               | 3000          |               |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                           | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                      | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                       | <b>0.56</b>   | <b>0.11</b>   | <b>0.56</b>   | <b>0.11</b>   | <b>0.50</b>   | <b>0.10</b>   | <b>0.36</b>   | <b>0.07</b>   | <b>0.26</b>   | <b>0.05</b>   | <b>0.20</b>   | <b>0.04</b>   |
| 600                       | <b>0.56</b>   | <b>0.11</b>   | <b>0.55</b>   | <b>0.11</b>   | <b>0.50</b>   | <b>0.10</b>   | <b>0.36</b>   | <b>0.07</b>   | <b>0.26</b>   | <b>0.05</b>   | <b>0.20</b>   | <b>0.04</b>   |
| 900                       | <b>0.55</b>   | <b>0.11</b>   | <b>0.55</b>   | <b>0.11</b>   | <b>0.50</b>   | <b>0.10</b>   | <b>0.36</b>   | <b>0.07</b>   | <b>0.26</b>   | <b>0.05</b>   | <b>0.20</b>   | <b>0.04</b>   |

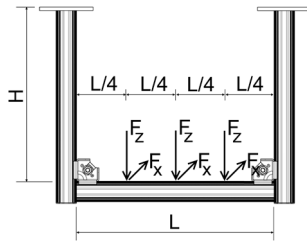
$F_z$  [kN] en tant que charges permanentes  $2L/3$  et  $L/3$ ;  
 $F_x$  [kN] en tant que charges variables pour  $2L/3$  et  $L/3$ .

**3 Charges individuelles**

Direction de la charge Z

| $\frac{L_{max}}{H_{max}}$ | 500           | 1000          | 1500          | 2000          | 2500          | 3000          |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                           | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ |
| [mm]                      | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                       | <b>0.48</b>   | <b>0.47</b>   | <b>0.46</b>   | <b>0.30</b>   | <b>0.23</b>   | <b>0.18</b>   |
| 600                       | <b>0.47</b>   | <b>0.47</b>   | <b>0.44</b>   | <b>0.30</b>   | <b>0.23</b>   | <b>0.18</b>   |
| 900                       | <b>0.47</b>   | <b>0.46</b>   | <b>0.42</b>   | <b>0.30</b>   | <b>0.23</b>   | <b>0.18</b>   |

$F_z$  [kN] en tant que charges permanentes  $3L/4$ ,  $L/2$  et  $L/4$ .

**3 Charges individuelles**

Directions de la charge Z et X

| $\frac{L_{max}}{H_{max}}$ | 500           |               | 1000          |               | 1500          |               | 2000          |               | 2500          |               | 3000          |               |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                           | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                      | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 300                       | <b>0.38</b>   | <b>0.08</b>   | <b>0.37</b>   | <b>0.07</b>   | <b>0.35</b>   | <b>0.07</b>   | <b>0.25</b>   | <b>0.05</b>   | <b>0.19</b>   | <b>0.04</b>   | <b>0.14</b>   | <b>0.03</b>   |
| 600                       | <b>0.37</b>   | <b>0.07</b>   | <b>0.37</b>   | <b>0.07</b>   | <b>0.35</b>   | <b>0.07</b>   | <b>0.25</b>   | <b>0.05</b>   | <b>0.19</b>   | <b>0.04</b>   | <b>0.14</b>   | <b>0.03</b>   |
| 900                       | <b>0.37</b>   | <b>0.07</b>   | <b>0.37</b>   | <b>0.07</b>   | <b>0.35</b>   | <b>0.07</b>   | <b>0.25</b>   | <b>0.05</b>   | <b>0.19</b>   | <b>0.04</b>   | <b>0.14</b>   | <b>0.03</b>   |

$F_z$  [kN] en tant que charges permanentes  $3L/4$ ,  $L/2$  et  $L/4$ ;  
 $F_x$  [kN] en tant que charges variables pour  $3L/4$ ,  $L/4$  et  $L/4$ .

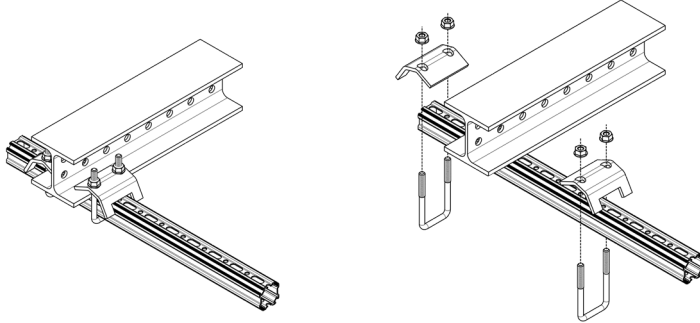
Toutes les constructions représentées peuvent aussi être utilisées fixées au sol.

Coefficient de frottement statique  $\mu_0 = 0.2$  pour le frottement dans le sens axial du tube. Déformation max.  $H/100$ ;  $L/200$ .

La spécification des ancrages doit être considérée en fonction des conditions locales.

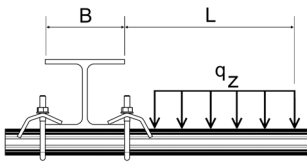
## Sollicitations admissibles selon l'Eurocode 3

### Etrier-profil - montage horizontal



**Liste des composants**  
1x Profil PRO 46-P  
2x Etrier-profil SB 46

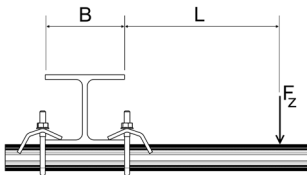
#### Charge uniformément



| B<br>[mm] | 200                     |                         | 400                     |                         | 600                     |                         |
|-----------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|           | $q_{z, perm}$<br>[kN/m] | $F_z (q_z * L)$<br>[kN] | $q_{z, perm}$<br>[kN/m] | $F_z (q_z * L)$<br>[kN] | $q_{z, perm}$<br>[kN/m] | $F_z (q_z * L)$<br>[kN] |
| 100       | <b>10.20</b>            | <b>2.04</b>             | <b>3.06</b>             | <b>1.23</b>             | <b>1.44</b>             | <b>0.87</b>             |
| 150       | <b>13.78</b>            | <b>2.76</b>             | <b>4.46</b>             | <b>1.79</b>             | <b>2.21</b>             | <b>1.32</b>             |
| 200       | <b>16.17</b>            | <b>3.23</b>             | <b>5.52</b>             | <b>2.21</b>             | <b>2.82</b>             | <b>1.69</b>             |
| 300       | <b>19.17</b>            | <b>3.83</b>             | <b>6.99</b>             | <b>2.80</b>             | <b>3.74</b>             | <b>2.24</b>             |

$q_z$  [kN/m] en tant que charge permanente par L

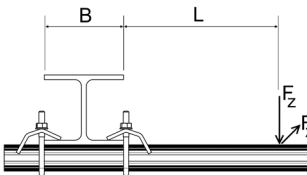
#### 1 Charge individuelle



| Direction de la charge Z |                       |                       |                       |
|--------------------------|-----------------------|-----------------------|-----------------------|
| B<br>[mm]                | 200                   |                       | 600                   |
|                          | $F_{z, perm}$<br>[kN] | $F_{z, perm}$<br>[kN] | $F_{z, perm}$<br>[kN] |
| 100                      | <b>1.23</b>           | <b>0.73</b>           | <b>0.51</b>           |
| 150                      | <b>1.76</b>           | <b>1.11</b>           | <b>0.81</b>           |
| 200                      | <b>2.16</b>           | <b>1.42</b>           | <b>1.06</b>           |
| 300                      | <b>2.70</b>           | <b>1.73</b>           | <b>1.15</b>           |

$F_z$  [kN] en tant que charge permanente pour L.

#### 1 Charge individuelle

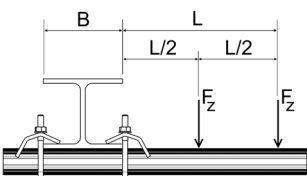


| Directions de la charge Z et X |                       |                       |                       |                       |                       |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| B<br>[mm]                      | 200                   |                       | 400                   |                       | 600                   |
|                                | $F_{z, perm}$<br>[kN] | $F_{x, perm}$<br>[kN] | $F_{z, perm}$<br>[kN] | $F_{x, perm}$<br>[kN] | $F_{z, perm}$<br>[kN] |
| 100                            | <b>0.58</b>           | <b>0.12</b>           | <b>0.34</b>           | <b>0.07</b>           | <b>0.24</b>           |
| 150                            | <b>0.84</b>           | <b>0.17</b>           | <b>0.52</b>           | <b>0.10</b>           | <b>0.38</b>           |
| 200                            | <b>1.02</b>           | <b>0.20</b>           | <b>0.67</b>           | <b>0.13</b>           | <b>0.50</b>           |
| 300                            | <b>1.28</b>           | <b>0.26</b>           | <b>0.91</b>           | <b>0.18</b>           | <b>0.70</b>           |

$F_z$  [kN] en tant que charge permanente pour L.;

$F_x$  [kN] en tant que charge variable pour L.

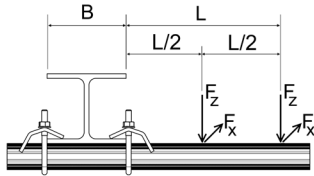
#### 2 Charges individuelles



| Directions de la charge Z |                       |                       |                       |
|---------------------------|-----------------------|-----------------------|-----------------------|
| B<br>[mm]                 | 200                   | 400                   | 600                   |
|                           | $F_{z, perm}$<br>[kN] | $F_{z, perm}$<br>[kN] | $F_{z, perm}$<br>[kN] |
| 100                       | <b>0.74</b>           | <b>0.45</b>           | <b>0.32</b>           |
| 150                       | <b>1.03</b>           | <b>0.67</b>           | <b>0.50</b>           |
| 200                       | <b>1.23</b>           | <b>0.85</b>           | <b>0.65</b>           |
| 300                       | <b>1.50</b>           | <b>1.11</b>           | <b>0.76</b>           |

$F_z$  [kN] en tant que charges permanentes L et L/2.

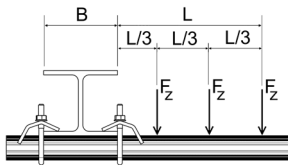
## 2 Charges individuelles



| Directions de la charge Z et X |                      |                      |                      |                      |                      |                      |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| B<br>L <sub>max</sub>          | 200                  |                      | 400                  |                      | 600                  |                      |
|                                | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> |
| [mm]                           | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 |
| 100                            | <b>0.35</b>          | <b>0.07</b>          | <b>0.22</b>          | <b>0.04</b>          | <b>0.16</b>          | <b>0.03</b>          |
| 150                            | <b>0.49</b>          | <b>0.10</b>          | <b>0.32</b>          | <b>0.06</b>          | <b>0.24</b>          | <b>0.05</b>          |
| 200                            | <b>0.59</b>          | <b>0.12</b>          | <b>0.41</b>          | <b>0.08</b>          | <b>0.31</b>          | <b>0.06</b>          |
| 300                            | <b>0.71</b>          | <b>0.14</b>          | <b>0.53</b>          | <b>0.11</b>          | <b>0.42</b>          | <b>0.08</b>          |

F<sub>z</sub> [kN] en tant que charges permanentes pour L et L/2;  
F<sub>x</sub> [kN] en tant que charges variables pour L et L/2.

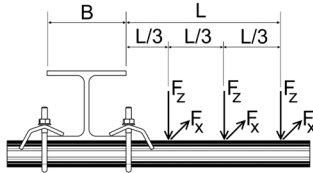
## 3 Charges individuelles



| Direction de la charge Z |                      |                      |                      |
|--------------------------|----------------------|----------------------|----------------------|
| B<br>L <sub>max</sub>    | 200                  | 400                  | 600                  |
|                          | F <sub>z, perm</sub> | F <sub>z, perm</sub> | F <sub>z, perm</sub> |
| [mm]                     | [kN]                 | [kN]                 | [kN]                 |
| 100                      | <b>0.52</b>          | <b>0.32</b>          | <b>0.23</b>          |
| 150                      | <b>0.72</b>          | <b>0.48</b>          | <b>0.36</b>          |
| 200                      | <b>0.86</b>          | <b>0.60</b>          | <b>0.46</b>          |
| 300                      | <b>1.03</b>          | <b>0.78</b>          | <b>0.57</b>          |

F<sub>z</sub> [kN] en tant que charges permanentes L, 2L/3 et L/3.

## 3 Charges individuelles



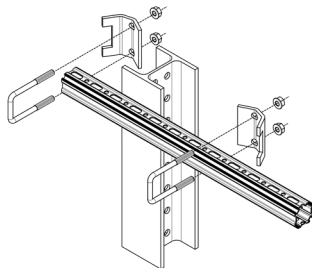
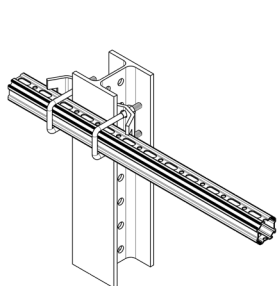
| Directions de la charge Z et X |                      |                      |                      |                      |                      |                      |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| B<br>L <sub>max</sub>          | 200                  |                      | 400                  |                      | 600                  |                      |
|                                | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> |
| [mm]                           | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 |
| 100                            | <b>0.25</b>          | <b>0.05</b>          | <b>0.16</b>          | <b>0.03</b>          | <b>0.11</b>          | <b>0.02</b>          |
| 150                            | <b>0.35</b>          | <b>0.07</b>          | <b>0.23</b>          | <b>0.05</b>          | <b>0.17</b>          | <b>0.03</b>          |
| 200                            | <b>0.41</b>          | <b>0.08</b>          | <b>0.29</b>          | <b>0.06</b>          | <b>0.22</b>          | <b>0.04</b>          |
| 300                            | <b>0.49</b>          | <b>0.10</b>          | <b>0.38</b>          | <b>0.08</b>          | <b>0.30</b>          | <b>0.06</b>          |

F<sub>z</sub> [kN] en tant que charges permanentes L, 2L/3 et L/3;  
F<sub>x</sub> [kN] en tant que charges variables pour L, 2L/3 et L/3.

Coefficient de frottement statique  $\mu_0 = 0.2$  pour le frottement dans le sens axial du tube. Déformation max. L/100.

### Sollicitation admissible selon l'Eurocode 3

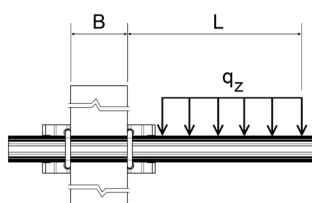
#### Etrier-profil - montage vertical



#### Liste des composants

1x Profil PRO 46-P  
2x Étriers-profil SB 46

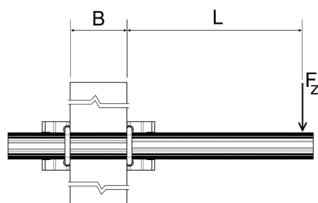
#### Charge uniformément



| L <sub>max</sub><br>B | 200                            |                                             | 400                            |                                             | 600                            |                                             |
|-----------------------|--------------------------------|---------------------------------------------|--------------------------------|---------------------------------------------|--------------------------------|---------------------------------------------|
|                       | q <sub>z, perm</sub><br>[kN/m] | F <sub>z</sub> (q <sub>z</sub> * L)<br>[kN] | q <sub>z, perm</sub><br>[kN/m] | F <sub>z</sub> (q <sub>z</sub> * L)<br>[kN] | q <sub>z, perm</sub><br>[kN/m] | F <sub>z</sub> (q <sub>z</sub> * L)<br>[kN] |
| 100                   | <b>2.28</b>                    | <b>0.46</b>                                 | <b>0.76</b>                    | <b>0.30</b>                                 | <b>0.38</b>                    | <b>0.23</b>                                 |
| 150                   | <b>2.80</b>                    | <b>0.56</b>                                 | <b>1.00</b>                    | <b>0.40</b>                                 | <b>0.52</b>                    | <b>0.31</b>                                 |
| 200                   | <b>3.14</b>                    | <b>0.63</b>                                 | <b>1.17</b>                    | <b>0.47</b>                                 | <b>0.62</b>                    | <b>0.37</b>                                 |
| 300                   | <b>3.56</b>                    | <b>0.71</b>                                 | <b>1.42</b>                    | <b>0.57</b>                                 | <b>0.79</b>                    | <b>0.47</b>                                 |

q<sub>z</sub> [kN/m] en tant que charge permanente par L

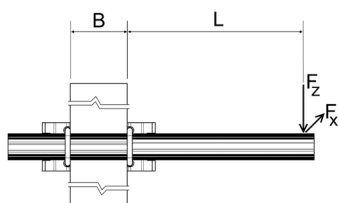
#### 1 Charge individuelle



| Direction de la charge Z |                              |                              |                              |
|--------------------------|------------------------------|------------------------------|------------------------------|
| L <sub>max</sub><br>B    | 200                          | 400                          | 600                          |
|                          | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] |
| 100                      | <b>0.30</b>                  | <b>0.18</b>                  | <b>0.13</b>                  |
| 150                      | <b>0.40</b>                  | <b>0.25</b>                  | <b>0.18</b>                  |
| 200                      | <b>0.47</b>                  | <b>0.31</b>                  | <b>0.23</b>                  |
| 300                      | <b>0.57</b>                  | <b>0.41</b>                  | <b>0.32</b>                  |

F<sub>z</sub> [kN] en tant que charge permanente pour L.

#### 1 Charge individuelle

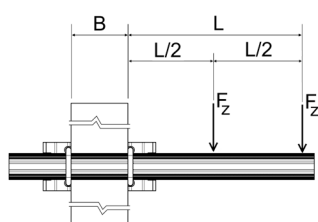


| Directions de la charge Z et X                    |                      |                      |                      |                      |                      |                      |
|---------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <div><div>L<sub>max</sub></div><div>B</div></div> | 200                  |                      | 400                  |                      | 600                  |                      |
|                                                   | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> | F <sub>z, perm</sub> | F <sub>x, perm</sub> |
| [mm]                                              | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 | [kN]                 |
| 100                                               | <b>0.29</b>          | <b>0.06</b>          | <b>0.17</b>          | <b>0.03</b>          | <b>0.12</b>          | <b>0.02</b>          |
| 150                                               | <b>0.38</b>          | <b>0.08</b>          | <b>0.24</b>          | <b>0.05</b>          | <b>0.18</b>          | <b>0.04</b>          |
| 200                                               | <b>0.45</b>          | <b>0.09</b>          | <b>0.30</b>          | <b>0.06</b>          | <b>0.22</b>          | <b>0.04</b>          |
| 300                                               | <b>0.54</b>          | <b>0.11</b>          | <b>0.39</b>          | <b>0.08</b>          | <b>0.30</b>          | <b>0.06</b>          |

F<sub>z</sub> [kN] en tant que charge permanente pour L;

F<sub>x</sub> [kN] en tant que charge variable pour L.

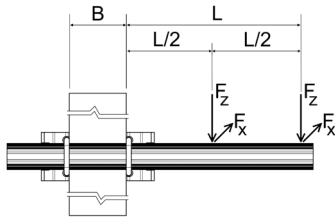
#### 2 Charges individuelles



| Direction de la charge Z |                              |                              |                              |
|--------------------------|------------------------------|------------------------------|------------------------------|
| L <sub>max</sub><br>B    | 200                          | 400                          | 600                          |
|                          | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] | F <sub>z, perm</sub><br>[kN] |
| 100                      | <b>0.18</b>                  | <b>0.11</b>                  | <b>0.08</b>                  |
| 150                      | <b>0.23</b>                  | <b>0.15</b>                  | <b>0.12</b>                  |
| 200                      | <b>0.27</b>                  | <b>0.19</b>                  | <b>0.14</b>                  |
| 300                      | <b>0.32</b>                  | <b>0.24</b>                  | <b>0.19</b>                  |

F<sub>z</sub> [kN] en tant que charges permanentes L et L/2.

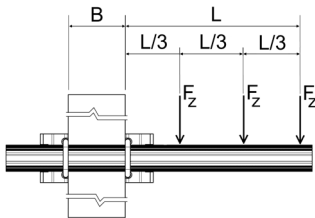
## 2 Charges individuelles



| Directions de la charge Z et X |                      |                      |                      |                      |                      |                      |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| B<br>[mm]                      | 200                  |                      | 400                  |                      | 600                  |                      |
|                                | $F_{z, \text{perm}}$ | $F_{x, \text{perm}}$ | $F_{z, \text{perm}}$ | $F_{x, \text{perm}}$ | $F_{z, \text{perm}}$ | $F_{x, \text{perm}}$ |
| 100                            | <b>0.17</b>          | <b>0.03</b>          | <b>0.11</b>          | <b>0.02</b>          | <b>0.08</b>          | <b>0.02</b>          |
| 150                            | <b>0.22</b>          | <b>0.04</b>          | <b>0.15</b>          | <b>0.03</b>          | <b>0.11</b>          | <b>0.02</b>          |
| 200                            | <b>0.26</b>          | <b>0.05</b>          | <b>0.18</b>          | <b>0.04</b>          | <b>0.14</b>          | <b>0.03</b>          |
| 300                            | <b>0.30</b>          | <b>0.06</b>          | <b>0.23</b>          | <b>0.05</b>          | <b>0.18</b>          | <b>0.04</b>          |

$F_z$  [kN] en tant que charges permanentes L et L/2;  
 $F_x$  [kN] en tant que charges variables pour L et L/2.

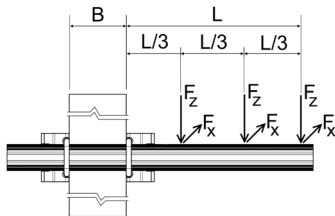
## 3 Charges individuelles



| Direction de la charge Z |                      |                      |                      |
|--------------------------|----------------------|----------------------|----------------------|
| B<br>[mm]                | 200                  | 400                  | 600                  |
|                          | $F_{z, \text{perm}}$ | $F_{z, \text{perm}}$ | $F_{z, \text{perm}}$ |
| 100                      | <b>0.13</b>          | <b>0.08</b>          | <b>0.06</b>          |
| 150                      | <b>0.16</b>          | <b>0.11</b>          | <b>0.08</b>          |
| 200                      | <b>0.19</b>          | <b>0.13</b>          | <b>0.10</b>          |
| 300                      | <b>0.22</b>          | <b>0.17</b>          | <b>0.14</b>          |

$F_z$  [kN] en tant que charges permanentes L, 2\*L/3 et L/3.

## 3 Charges individuelles



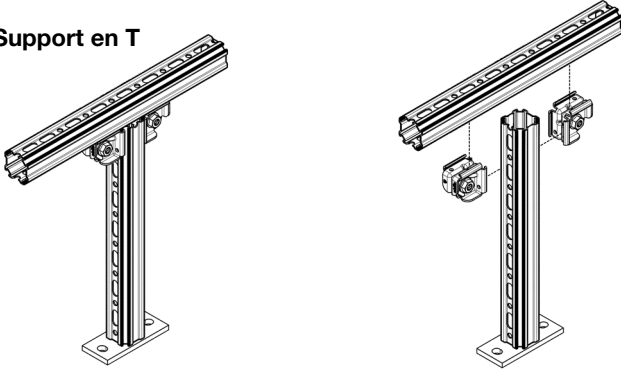
| Directions de la charge Z et X |                      |                      |                      |                      |                      |                      |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| B<br>[mm]                      | 200                  |                      | 400                  |                      | 600                  |                      |
|                                | $F_{z, \text{perm}}$ | $F_{x, \text{perm}}$ | $F_{z, \text{perm}}$ | $F_{x, \text{perm}}$ | $F_{z, \text{perm}}$ | $F_{x, \text{perm}}$ |
| 100                            | <b>0.12</b>          | <b>0.02</b>          | <b>0.08</b>          | <b>0.02</b>          | <b>0.06</b>          | <b>0.01</b>          |
| 150                            | <b>0.16</b>          | <b>0.03</b>          | <b>0.11</b>          | <b>0.02</b>          | <b>0.08</b>          | <b>0.02</b>          |
| 200                            | <b>0.18</b>          | <b>0.04</b>          | <b>0.13</b>          | <b>0.03</b>          | <b>0.10</b>          | <b>0.02</b>          |
| 300                            | <b>0.21</b>          | <b>0.04</b>          | <b>0.16</b>          | <b>0.03</b>          | <b>0.13</b>          | <b>0.03</b>          |

$F_z$  [kN] en tant que charges permanentes L, 2L/3 et L/3;  
 $F_x$  [kN] en tant que charges variables pour L, 2L/3 et L/3.

Coefficient de frottement statique  $\mu_0 = 0.2$  pour le frottement dans le sens axial du tube. Déformation max. L/100.

## Sollicitation admissible selon l'Eurocode 3

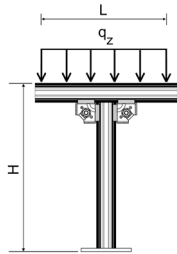
### Support en T



#### Liste des composants

1x Profil PRO 46-P  
1x Consoles murales AK 46-P  
2x Équerres CN 46

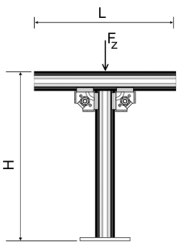
### Charge uniformément répartie



| $L_{max}$<br>$H_{max}$ | 250           |                 | 500           |                 | 750           |                 |
|------------------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|
|                        | $q_{z, perm}$ | $F_z (q_z * L)$ | $q_{z, perm}$ | $F_z (q_z * L)$ | $q_{z, perm}$ | $F_z (q_z * L)$ |
| [mm]                   | [kN/m]        | [kN]            | [kN/m]        | [kN]            | [kN/m]        | [kN]            |
| 250                    | <b>22.60</b>  | <b>5.65</b>     | <b>6.56</b>   | <b>3.28</b>     | <b>2.90</b>   | <b>2.18</b>     |
| 500                    | <b>22.60</b>  | <b>5.65</b>     | <b>6.53</b>   | <b>3.26</b>     | <b>2.89</b>   | <b>2.17</b>     |
| 750                    | <b>22.60</b>  | <b>5.65</b>     | <b>6.47</b>   | <b>3.23</b>     | <b>2.88</b>   | <b>2.16</b>     |
| 1000                   | <b>22.60</b>  | <b>5.65</b>     | <b>6.39</b>   | <b>3.20</b>     | <b>2.85</b>   | <b>2.14</b>     |

$q_z$  [kN/m] en tant que charge permanente par L

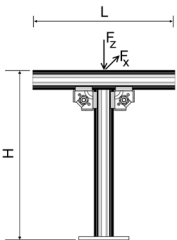
### 1 Charge individuelle



| Direction de la charge Z |                                          |
|--------------------------|------------------------------------------|
| $L_{max}$<br>$H_{max}$   | $L_{max} = 1 \text{ m}$<br>$F_{z, perm}$ |
| [mm]                     | [kN]                                     |
| 250                      | <b>2.83</b>                              |
| 500                      | <b>2.83</b>                              |
| 750                      | <b>2.76</b>                              |
| 1000                     | <b>2.52</b>                              |

$F_z$  [kN] en tant que charge permanente pour L/2.  
Charge centrée avec excentricité planifiée  $\pm 30 \text{ mm}$ .

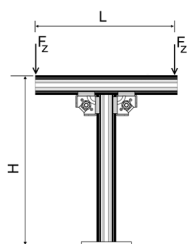
### 1 Charge individuelle



| Directions de la charge Z et X |                         |               |
|--------------------------------|-------------------------|---------------|
| $L_{max}$<br>$H_{max}$         | $L_{max} = 1 \text{ m}$ |               |
|                                | $F_{z, perm}$           | $F_{x, perm}$ |
| [mm]                           | [kN]                    | [kN]          |
| 250                            | <b>2.59</b>             | <b>0.52</b>   |
| 500                            | <b>1.32</b>             | <b>0.26</b>   |
| 750                            | <b>0.79</b>             | <b>0.16</b>   |
| 1000                           | <b>0.55</b>             | <b>0.11</b>   |

$F_z$  [kN] en tant que charge permanente pour L/2;  $F_x$  en tant que charge variable pour L/2;  
Charge centrée avec excentricité planifiée  $\pm 30 \text{ mm}$ .

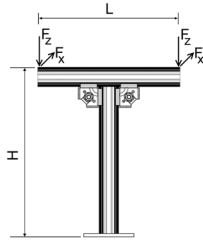
### 2 Charges individuelles



| Direction de la charge Z |               |               |               |
|--------------------------|---------------|---------------|---------------|
| $L_{max}$<br>$H_{max}$   | 250           | 500           | 750           |
|                          | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ |
| [mm]                     | [kN]          | [kN]          | [kN]          |
| 250                      | <b>1.64</b>   | <b>0.82</b>   | <b>0.54</b>   |
| 500                      | <b>1.63</b>   | <b>0.82</b>   | <b>0.54</b>   |
| 750                      | <b>1.62</b>   | <b>0.81</b>   | <b>0.54</b>   |
| 1000                     | <b>1.60</b>   | <b>0.81</b>   | <b>0.54</b>   |

$F_z$  [kN] en tant que charge permanente pour L.

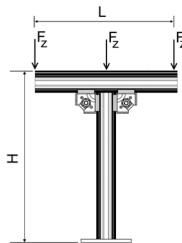
## 2 Charges individuelles



| Directions de la charge Z et X |               |               |               |               |               |               |
|--------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| $\frac{L_{max}}{H_{max}}$      | 250           |               | 500           |               | 750           |               |
|                                | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                           | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 250                            | <b>1.10</b>   | <b>0.22</b>   | <b>0.55</b>   | <b>0.11</b>   | <b>0.36</b>   | <b>0.07</b>   |
| 500                            | <b>0.75</b>   | <b>0.15</b>   | <b>0.55</b>   | <b>0.11</b>   | <b>0.36</b>   | <b>0.07</b>   |
| 750                            | <b>0.44</b>   | <b>0.09</b>   | <b>0.44</b>   | <b>0.09</b>   | <b>0.36</b>   | <b>0.07</b>   |
| 1000                           | <b>0.30</b>   | <b>0.06</b>   | <b>0.30</b>   | <b>0.06</b>   | <b>0.30</b>   | <b>0.06</b>   |

$F_z$  [kN] en tant que charges permanentes L.  
 $F_x$  [kN] en tant que charges variables pour L.

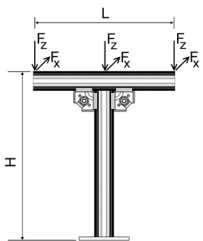
## 3 Charges individuelles



| Direction de la charge Z  |               |               |               |
|---------------------------|---------------|---------------|---------------|
| $\frac{L_{max}}{H_{max}}$ | 250           | 500           | 750           |
|                           | $F_{z, perm}$ | $F_{z, perm}$ | $F_{z, perm}$ |
| [mm]                      | [kN]          | [kN]          | [kN]          |
| 250                       | <b>1.41</b>   | <b>0.82</b>   | <b>0.54</b>   |
| 500                       | <b>1.41</b>   | <b>0.81</b>   | <b>0.54</b>   |
| 750                       | <b>1.41</b>   | <b>0.81</b>   | <b>0.54</b>   |
| 1000                      | <b>1.41</b>   | <b>0.80</b>   | <b>0.54</b>   |

$F_z$  [kN] en tant que charges permanentes L et L/2.

## 3 Charges individuelles



| Directions de la charge Z et X |               |               |               |               |               |               |
|--------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| $\frac{L_{max}}{H_{max}}$      | 250           |               | 500           |               | 750           |               |
|                                | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                           | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          | [kN]          |
| 250                            | <b>1.10</b>   | <b>0.22</b>   | <b>0.55</b>   | <b>0.11</b>   | <b>0.36</b>   | <b>0.07</b>   |
| 500                            | <b>0.50</b>   | <b>0.10</b>   | <b>0.50</b>   | <b>0.10</b>   | <b>0.36</b>   | <b>0.07</b>   |
| 750                            | <b>0.30</b>   | <b>0.06</b>   | <b>0.30</b>   | <b>0.06</b>   | <b>0.30</b>   | <b>0.06</b>   |
| 1000                           | <b>0.20</b>   | <b>0.04</b>   | <b>0.20</b>   | <b>0.04</b>   | <b>0.20</b>   | <b>0.04</b>   |

$F_z$  [kN] as a permanent loads at distance L et L/2.  
 $F_x$  [kN] en tant que charges variables pour L et L/2.

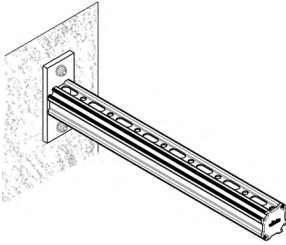
Constructions au sol uniquement.

Coefficient de frottement statique  $\mu_0 = 0.2$  pour le frottement dans le sens axial du tube. Déformation max.  $H/150$  et  $L/150$ .

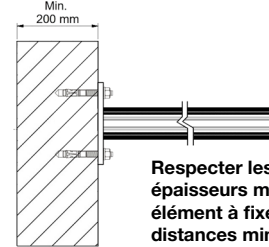
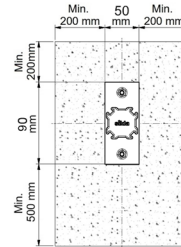
La spécification des ancrages doit être considérée en fonction des conditions locales.

## Sollicitation admissible selon l'Eurocode 3

### Console murale fixée par chevilles

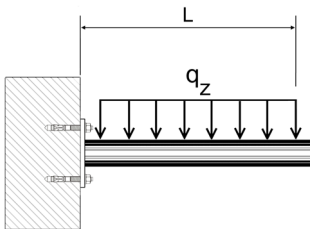


**Liste des composants**  
 1x Consoles murales AK 46-P  
 2x goujons d'ancrage AN BZ plus M10 hef. 60  
 (béton C20/25)



Respecter les épaisseurs min. de l'élément à fixer et les distances min. aux bords préconisées.

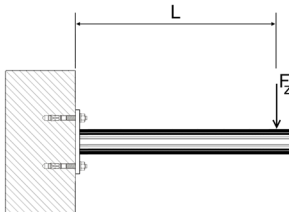
#### Charge uniformément répartie



| Direction de la charge Z |               |                 |
|--------------------------|---------------|-----------------|
| $L_{max}$                | $q_{z, perm}$ | $F_z (q_z * L)$ |
| [mm]                     | [kN/m]        | [kN]            |
| 200                      | <b>14.71</b>  | <b>2.94</b>     |
| 400                      | <b>4.29</b>   | <b>1.71</b>     |
| 600                      | <b>1.73</b>   | <b>1.04</b>     |
| 800                      | <b>0.89</b>   | <b>0.71</b>     |
| 1000                     | <b>0.53</b>   | <b>0.53</b>     |

$q_z$  [kN/m] en tant que charge permanente par L.

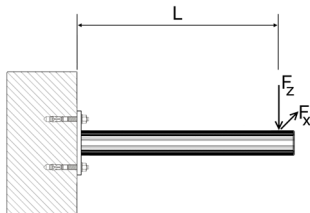
#### 1 Charge individuelle



| Direction de la charge Z |               |
|--------------------------|---------------|
| $L_{max}$                | $F_{z, perm}$ |
| [mm]                     | [kN]          |
| 200                      | <b>1.84</b>   |
| 400                      | <b>0.80</b>   |
| 600                      | <b>0.48</b>   |
| 800                      | <b>0.32</b>   |
| 1000                     | <b>0.23</b>   |

$F_z$  [kN] en tant que charge permanente pour L.

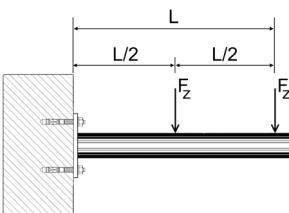
#### 1 Charge individuelle



| Directions de la charge Z et X |               |               |
|--------------------------------|---------------|---------------|
| $L_{max}$                      | $F_{z, perm}$ | $F_{x, perm}$ |
| [mm]                           | [kN]          | [kN]          |
| 200                            | <b>1.59</b>   | <b>0.32</b>   |
| 400                            | <b>0.78</b>   | <b>0.16</b>   |
| 600                            | <b>0.48</b>   | <b>0.10</b>   |
| 800                            | <b>0.32</b>   | <b>0.06</b>   |
| 1000                           | <b>0.23</b>   | <b>0.05</b>   |

$F_z$  [kN] en tant que charge permanente pour L;  
 $F_x$  [kN] en tant que charge variable pour L.

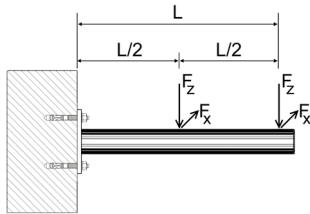
#### 2 Charges individuelles



| Direction de la charge Z |               |
|--------------------------|---------------|
| $L_{max}$                | $F_{z, perm}$ |
| [mm]                     | [kN]          |
| 200                      | <b>1.23</b>   |
| 400                      | <b>0.55</b>   |
| 600                      | <b>0.33</b>   |
| 800                      | <b>0.22</b>   |
| 1000                     | <b>0.16</b>   |

$F_z$  [kN] en tant que charges permanentes L et L/2.

### 2 Charges individuelles

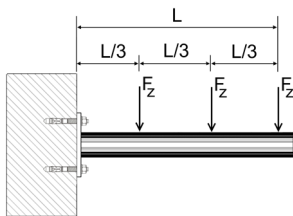


Directions de la charge Z et X

| $L_{max}$ | $F_{z, perm}$ | $F_{x, perm}$ |
|-----------|---------------|---------------|
| [mm]      | [kN]          | [kN]          |
| 200       | <b>1.06</b>   | <b>0.21</b>   |
| 400       | <b>0.52</b>   | <b>0.10</b>   |
| 600       | <b>0.33</b>   | <b>0.07</b>   |
| 800       | <b>0.22</b>   | <b>0.04</b>   |
| 1000      | <b>0.16</b>   | <b>0.03</b>   |

$F_z$  [kN] en tant que charges permanentes L et L/2  
 $F_x$  [kN] en tant que charges variables pour L et L/2.

### 3 Charges individuelles

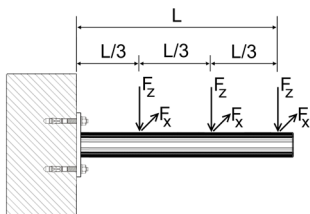


Direction de la charge Z

| $L_{max}$ | $F_z (q_z * L)$ |
|-----------|-----------------|
| [mm]      | [kN]            |
| 200       | <b>0.90</b>     |
| 400       | <b>0.42</b>     |
| 600       | <b>0.25</b>     |
| 800       | <b>0.17</b>     |
| 1000      | <b>0.13</b>     |

$F_z$  [kN] en tant que charges permanentes L, 2L/3 et L/3.

### 3 Charges individuelles



Directions de la charge Z et X

| $L_{max}$ | $F_{z, perm}$ | $F_{x, perm}$ |
|-----------|---------------|---------------|
| [mm]      | [kN]          | [kN]          |
| 200       | <b>0.80</b>   | <b>0.16</b>   |
| 400       | <b>0.39</b>   | <b>0.08</b>   |
| 600       | <b>0.25</b>   | <b>0.05</b>   |
| 800       | <b>0.17</b>   | <b>0.03</b>   |
| 1000      | <b>0.13</b>   | <b>0.03</b>   |

$F_z$  [kN] en tant que charges permanentes L, 2L/3 et L/3;  
 $F_x$  [kN] en tant que charges variables pour L, 2L/3 et L/3.

Coefficient de frottement statique  $\mu_0 = 0.2$  pour le frottement dans le sens axial du tube. Déformation max. L/100.

Les valeurs de charge indiquées sont également valables lors de l'utilisation des types d'ancrages suivants:

Mortier chimique VMU plus + tige VMU-A (5.8) M10

Mortier chimique VMZ + goujon VMZ-A 60 M10





