DAMPO

Dampo Dual Protect is a buckling restrained brace (BRB) type seismic energy dissipator. It was developed and patented by the National Autonomous University of Mexico. Currently, Dampo Systems S.A. de C.V. has the license to manufacture and market it.

The device takes advantage of the hysteretic behavior of steel by means of axial deformation in the core. The innovative steel jacket design restricts buckling and allows core integrity to be assessed from the outside after an earthquake. The geometry of the dissipators allows for different strength and can replace conventional braces.

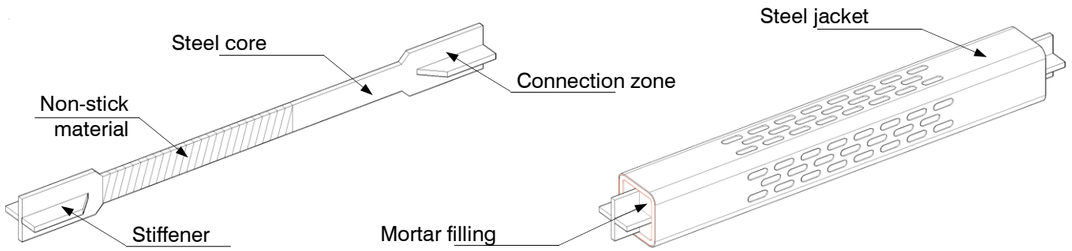


Figure 1. General features of Dampo Dual Protect dissipator

Thanks to its design, the Dampo Dual Protect dissipator exhibits stable non-linear behavior in both tension and compression, as shown in Figure 2a. This performance makes it ideal for incorporation into earthquake-resistant structures. The device is installed like a conventional brace as shown in Figure 2b.

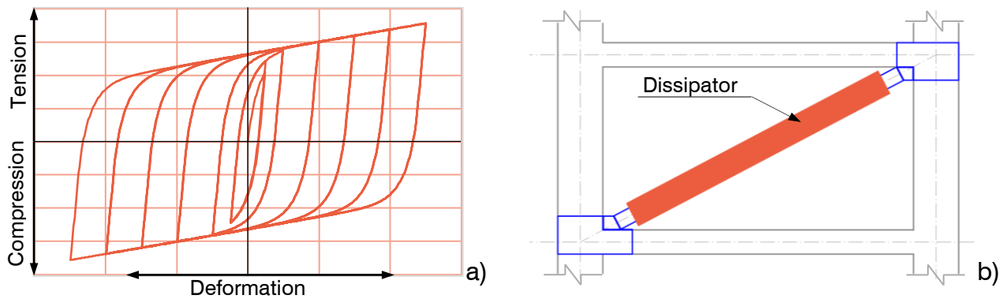


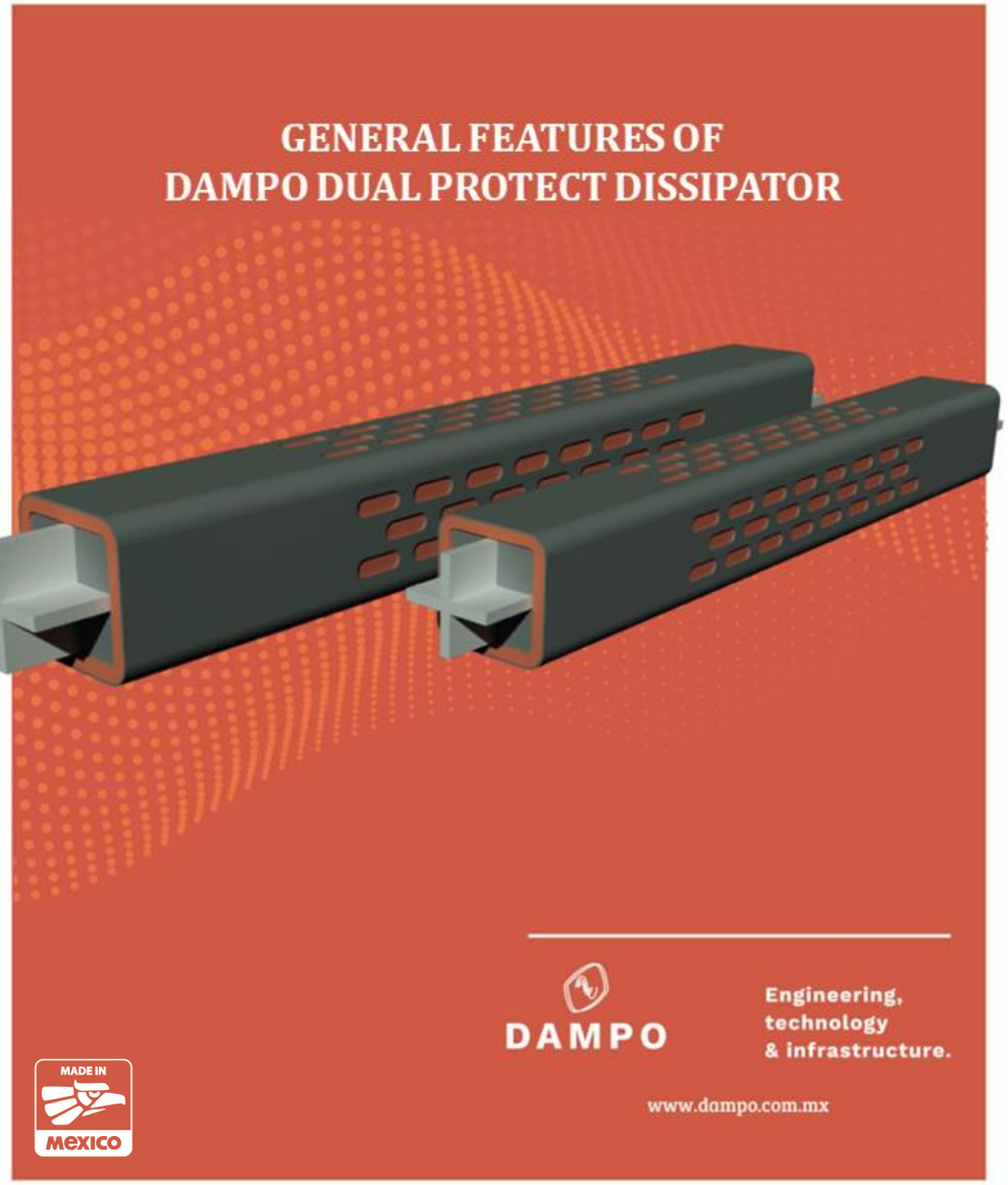
Figure 2. Hysteresis curves and placement sketch of DAMPO Dual Protect dissipator

Dampo Systems S.A de C.V

Download this manual in:

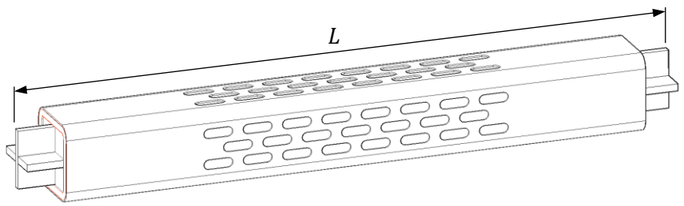
www.dampo.com.mx

DAMPO



DAMPO

Dampo Dual Protect dissipator can be modeled in commercial programs as an equivalent element with non-linear behavior, usually defined as a "link". The parameters required to model the behavior of the dissipators are the design strength (F_d) which is defined by the area of the core (A_n) and stiffness (k_d), which depends on the length of the dissipator (L), and a stiffness adjustment factor (f_k) that takes into account the stiffness provided by the connections. Table 1 shows typical dissipator properties.



$k_D = f_k \frac{A_n E}{L}$ = Dissipator stiffness

$F_d = A_n f_y$ = Design strength

W_d = Dissipator weight

Figure 1. Variables for modeling

Table 2 shows the parameters for non-linear modeling of the device in commercial programs. It is recommended to use the "Plastic Wen" model. The values of: f_k, W_D, F_d k_d and L can be obtained from Table 1 according to the needs of your project. The value of the experimental yield stress of the steel in the core is $f_y = 3500\ kg/cm^2$.

Table 2. Parameters for defining the equivalent element (link) in structural analysis software

"link" Type	Mass	Weight	Rotacional inertial	Axial deformation
Plastic Wen	$M_D = W_D/g$	W_D	$R_1 = R_2 = R_3 = 0$	Direction $= U_1$
Effective stiffness	**Damping**	**Expected yield load**	**Post-yield stiffness ratio**	**Yield exponent**
$k_D = f_k \frac{A_n E}{L}$	$= 0$	$F_D * 1.1$	0.016	3.0

Table 1. Properties of Dampo Dual Protect dissipators

Model	L (m)	F_d (t)	F_{fe} (t)	F_{max} (t)	d_y (mm)	d_{max} (mm)	f_k	k_d (kg/mm)	Section	W_d (kg)
40/4	4.0	40	44	67	4.8	28.8	1.31	8513	6 x 6	304
60/4	4.0	60	67	100	4.6	27.9	1.36	13180	7 x 7	424
80/4	4.0	80	89	133	4.4	26.3	1.44	18642	8 x 8	528
100/4	4.0	100	111	167	4.4	26.4	1.43	23202	8 x 8	544
120/4	4.0	120	133	200	4.3	25.9	1.46	28411	9 x 9	684
140/4	4.0	140	156	233	4.1	24.7	1.53	34691	10 x 10	793
160/4	4.0	160	178	267	4.1	24.3	1.55	40231	12 x 12	1068
180/4	4.0	180	200	300	3.9	23.4	1.62	47082	12 x 12	1083
200/4	4.0	200	222	333	4.1	24.7	1.53	49515	12 x 12	1144
220/4	4.0	220	244	367	4.0	23.9	1.58	56278	12 x 12	1163
240/4	4.0	240	267	400	3.9	23.2	1.63	63446	14 x 14	1467
40/6	6.0	40	44	67	7.5	44.9	1.26	5452	6 x 6	514
60/6	6.0	60	67	100	7.4	44.6	1.27	8234	7 x 7	681
80/6	6.0	80	89	133	7.1	42.7	1.33	11473	8 x 8	824
100/6	6.0	100	111	167	7.1	42.9	1.32	14276	9 x 9	1028
120/6	6.0	120	133	200	7.1	42.3	1.34	17364	9 x 9	1077
140/6	6.0	140	156	233	6.9	41.2	1.38	20822	10 x 10	1265
160/6	6.0	160	178	267	6.8	40.8	1.39	24013	12 x 12	1721
180/6	6.0	180	200	300	6.6	39.8	1.42	27660	12 x 12	1749
200/6	6.0	200	222	333	6.9	41.2	1.38	29730	12 x 12	1822
220/6	6.0	220	244	367	6.7	40.4	1.40	33336	12 x 12	1854
240/6	6.0	240	267	400	6.6	39.6	1.43	37105	14 x 14	2391
40/8	8.0	40	44	67	10.0	59.9	1.26	4090	7 x 7	876
60/8	8.0	60	67	100	10.0	59.9	1.26	6137	8 x 8	1123
80/8	8.0	80	89	133	9.9	59.4	1.27	8244	9 x 9	1370
100/8	8.0	100	111	167	9.9	59.4	1.27	10310	9 x 9	1453
120/8	8.0	120	133	200	9.8	58.8	1.29	12503	10 x 10	1698
140/8	8.0	140	156	233	9.6	57.3	1.32	14952	12 x 12	2301
160/8	8.0	160	178	267	9.5	57.2	1.32	17114	12 x 12	2374
180/8	8.0	180	200	300	9.4	56.3	1.34	19582	12 x 12	2416
200/8	8.0	200	222	333	9.6	57.6	1.31	21242	12 x 12	2501
220/8	8.0	220	244	367	9.5	56.9	1.33	23682	12 x 12	2545
240/8	8.0	240	267	400	9.3	56.0	1.35	26219	14 x 14	3315
40/10	10.0	40	44	67	12.5	74.8	1.26	3273	8 x 8	1415
60/10	10.0	60	67	100	12.5	74.8	1.26	4910	9 x 9	1763
80/10	10.0	80	89	133	12.4	74.6	1.27	6564	10 x 10	2110
100/10	10.0	100	111	167	12.5	75.3	1.26	8130	12 x 12	2835
120/10	10.0	120	133	200	12.5	74.9	1.26	9807	12 x 12	2906
140/10	10.0	140	156	233	12.3	73.8	1.28	11617	12 x 12	2941
160/10	10.0	160	178	267	12.3	73.7	1.28	13295	12 x 12	3027
180/10	10.0	180	200	300	12.1	72.7	1.30	15156	12 x 12	3233
200/10	10.0	200	222	333	12.3	74.1	1.28	16525	12 x 12	3334
220/10	10.0	220	244	367	12.2	73.3	1.29	18363	14 x 14	4178
240/10	10.0	240	267	400	12.1	72.5	1.30	20272	14 x 14	4239

Note: Table 1 presents the characteristics of typical Dual Protect dissipators; however, it is possible to increase the design strength of the dissipators and adjust the characteristics according to the needs of your project.