



LEADING THE WORLD IN ENERGY ABSORPTION



ELEVATOR
IMPACT
PROTECTION



ELEVATOR



Oleo is a leading expert in energy absorption technology supplying solutions to the elevator, industrial and rail sectors.

Oleo elevator buffers are designed to protect people and equipment from forces generated from an impact resulting from equipment failure or operator error.

Oleo has achieved this on most buffer types using hydraulic energy absorption systems combined with a gas return spring to give unsurpassed energy dissipation and recovery.

Oleo has a complete range of elevator buffers for every application offering a lighter, stronger, high quality product with minimum life-cycle costs.

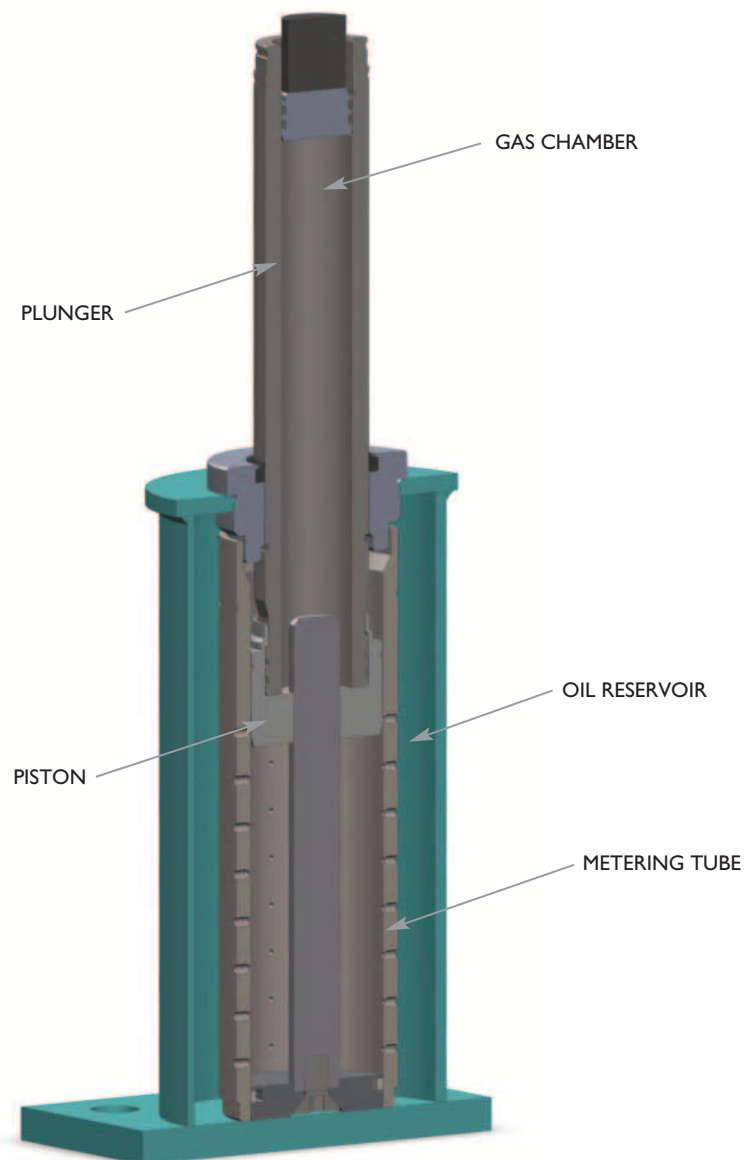
Our elevator buffers are sold worldwide offering exceptional performance across a wide mass and speed range. Oleo buffers have worldwide certification and approvals which include EN81.1, ASME A17.1 GB7588 and EK1002.

Oleo buffers are primarily available as standard designs but we would welcome the opportunity to look at a specific requirement.

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HYDRAULIC OPERATING PRINCIPLE



The illustration shows the robust construction of the Oleo elevator hydraulic buffer unit. On impact the plunger is forced down around the gas rod and through the metering tube displacing oil through holes, thereby decelerating the impact mass. Following impact the gas hydraulic buffer returns to its full height using a unique method of moving the gas within the chamber.

The buffer's performance on impact relies solely on oil displacement, the gas spring serves only to re-extend the plunger.

When the plunger is forced into the cylinder rapidly the oil displaced by the plunger has to pass through the metering holes at very high velocity. This raises the

pressure in the oil chamber to a level which optimizes the closure force of the unit.

This very useful feature is accomplished by Oleo's innovative metering designs which progressively alter the flow area as the unit closes. The actual metering designs are precisely calculated to provide the best possible protection.

The Oleo hydraulic unit therefore possesses the unique feature that its characteristics change according to operational needs. The majority of the impact energy is absorbed within the unit and the already low recoil force is damped by the reverse flow of oil, leaving very little energy and recoil force to be returned to the impacting vehicle.

ELEVATOR SAFETY

Elevator buffers are safety devices which are required to be mounted at the base of an elevator shaft. As with any safety device, elevator buffers have to meet with a variety of specifications. One of the most important of these specifications is the manner in which the buffers must bring an impacting elevator car to rest. There are different technical specifications for elevator buffers in different regions worldwide however all employ the same basic performance criteria.

Since the very early days of elevators, a variety of safety systems have been employed to ensure that the elevator will not free fall. The purpose of elevator buffers is to provide protection against the malfunction of an elevator control system resulting in the elevator continuing to travel past the lowest stop to the base of the elevator shaft. The buffers are specified in accordance with the operating velocity and mass of the elevator.

Although freefall is not a realistic event for an elevator, the specification and code requirements are based on the assumption of freefall.

The requirement for elevator buffers fall into two categories depending on the type of buffer.

1. **Energy accumulation buffers:** These can take the form of simple mechanical springs or polymer buffers which store the absorbed energy of the impact in the form of strain energy. In some accumulation buffers this stored energy can be dissipated on the return movement of the buffer leading to two separate requirements:
 - a) Buffers with linear and non linear characteristics – these can be used if the elevator does not exceed 197ft/min.
 - b) Buffers with buffered return movement – these can be used for elevators that do not exceed 315ft/min.
2. **Energy dissipation buffers:** These are usually hydraulic buffers which dissipate the energy of the impact in the form of heat during the travel of the buffer. This type of buffer can be used for all rated speeds, but must be used for speeds of 315ft/min or over.

BUFFER PERFORMANCE CRITERIA – ENERGY DISSIPATION BUFFERS

Performance criteria in all specifications is governed by 2 underlying rules which state that the buffer must arrest a freefalling mass travelling at 115% of the rated speed of the elevator:

- (i) **With an average deceleration not exceeding 1g.**
- (ii) **Without exceeding a deceleration of 2.5g for a time period greater than 0.04 seconds.**

In addition a further, but separate, requirement states that the buffer stroke must be at least as great as free fall distance required to reach 115% of the rated elevator velocity. It is this requirement that dictates the stroke and consequently the installation height of elevator buffers. Due to customer demands, most elevator buffers do not deviate far from the minimum stroke requirement.





MINIMUM BUFFER STROKES FOR SPECIFIC RATED SPEEDS

Rated Elevator Speed	Type Test Speed 115% of Rated Elevator Speed
ft/min	ft/min
197	226
256	294
315	362
354	407
400	460
500	575
620	713
701	806
799	919
1002	1152
1104	1270
1152	1324
1199	1379
1427	1641
1713	1969
1998	2286
2274	2615

MINIMUM POSSIBLE STROKE LENGTHS

Oleo Buffer Type				MIN Stroke	Rated Buffer Speed	MAX Buffer Speed (115% of Rated Elevator Speed)	Reduced Stroke Elevator Speed before striking terminal slowdown device (ASME A17.1)
				in	ft/min	ft/min	ft/min
LSB 10				2.9	197	226	289
	SEB 16			6.8	315	362	444
		LB 16		8.0	315	362	482
	SEB 18			8.6	354	407	500
		LB 18		9.8	354	407	533
	SEB 20			11.0	400	460	565
		LB 20		11.8	400	460	586
	SEB 25			17.1	500	575	706
		LB 25		18.2	500	575	891
		LB 32		27.5	620	713	1096
		LB 35		34.7	701	806	1232
		LB 40		44.9	799	919	1401
		LB 50		68.5	1002	1152	1732
		LB 55		83.0	1104	1270	1905
			HSL 58	92.52	1152	1324	2011
			LB 60	98.6	1199	1379	2077
			HSL 72	141.73	1427	1641	2490
			HSL 87	204.72	1713	1969	2994
			HSL 101	275.59	1988	2286	3474
			HSL 115	362.20	2274	2615	3982

ELEVATOR SAFETY

The design engineer must consider the stroke requirements in the overall height of the buffer. If telescopic solutions are not to be used then the overall height must be at least double the minimum stroke with a further height requirement to restrict lateral movement when the buffer is fully extended.

Lateral movement should be restricted to ± 0.2 in per ft of stroke from the center.

EMERGENCY TERMINAL SPEED LIMITING DEVICE

The function of an emergency terminal speed limiting device is to automatically reduce the speed of a car or counterweight by removing power from the driving machine. The device effectively slows the car or counterweight to the rated speed of the buffer before impact. This device would normally be independent of the normal terminal slowdown devices. This is important when selecting a buffer for a particular application. If the emergency terminal speed limiting device is part of the installation then the 'reduced stroke' rules can apply. This effectively reduces the size of the buffer required for a particular application.

REDUCED STROKE

The calculation for reduced stroke is based on the stroke of the buffer and not the speed of the elevator. The reduced stroke calculation differs in some countries but the basic rules are as follows:

The stroke must not be less than:

- a) One half (50%) of the stroke for elevators that do not exceed 787 ft/min.
- b) One third (33.3%) of the stroke for elevators where the speed exceeds 787 ft/min.

Minimum strokes also apply under some code requirements including EN81.1. Under EN81.1 the minimum stroke should be 16.5 in for 50% calculation and 21.25 in for the 33.3% calculation. This does not apply under all code requirements.

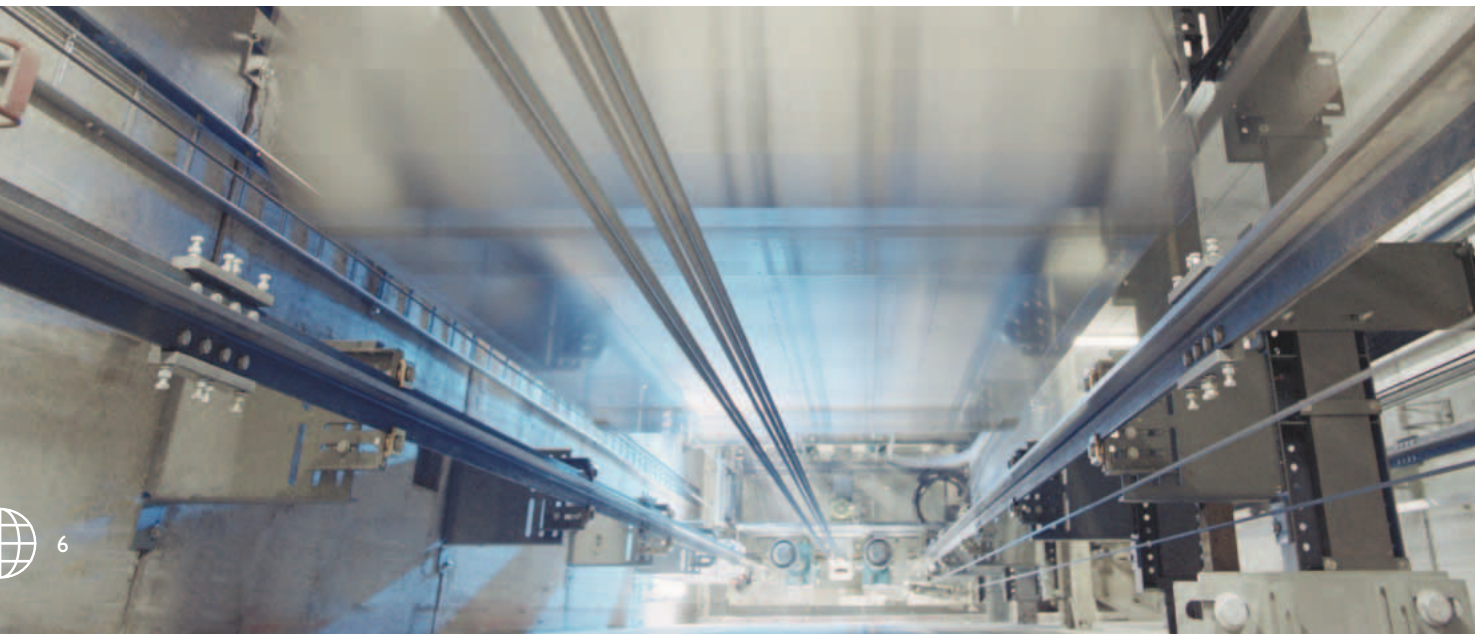
Using the reduced stroke calculation a buffer rated at 1002ft/min could be used on an installation of 1752 ft/min if used with a terminal speed limiting device.

BUFFER PERFORMANCE

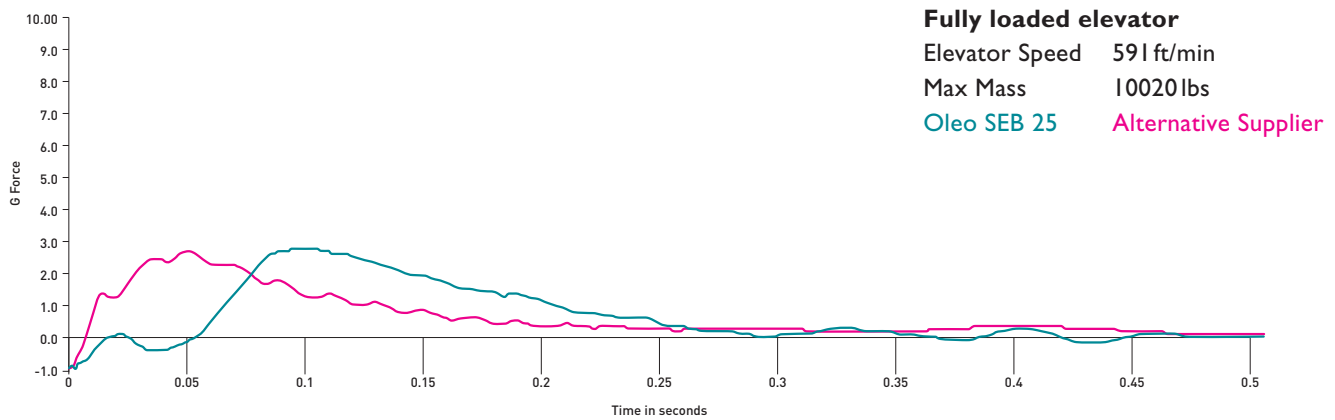
The minimum stroke for an elevator buffer is specified (within EN81.1 and ASME A17.1), as the necessary distance to bring an impacting mass, travelling at 115% of the buffer's rated speed, to rest with a uniform deceleration of $1g$. However, this is only true if the buffer exerts a constant retardation force over its entire stroke.

A hydraulic buffer can be designed to closely match this idealized performance. This is achieved by precise control of hydraulic oil flow across an orifice throughout the buffer stroke. However, this can only be achieved for one specific impact mass. The same performance is not achievable for the range of elevator masses that are encountered in the real world where the elevator car mass varies with passenger load.

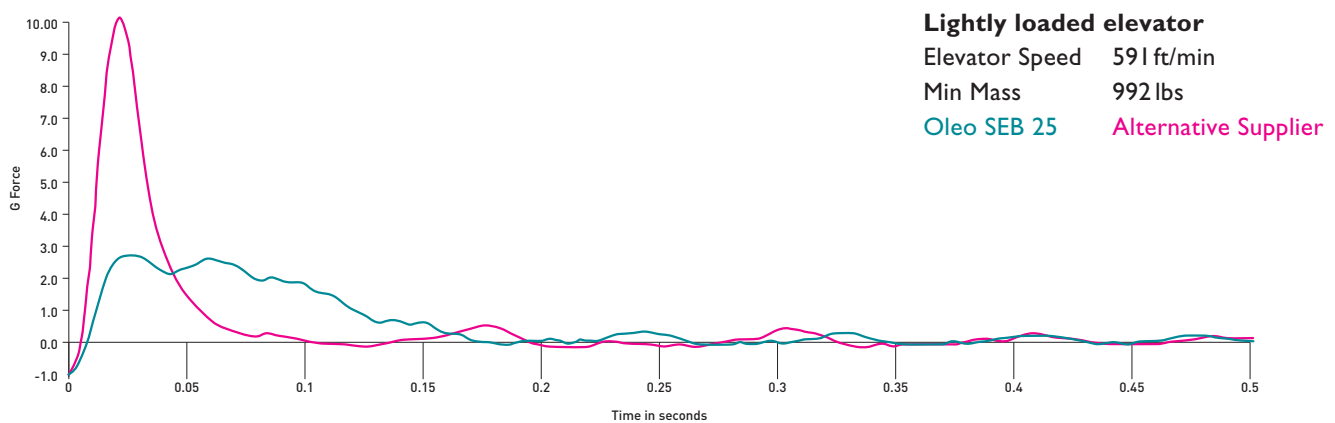
In the elevator application, where there is a need to protect passenger safety, it is important to try to minimize the deceleration experienced during stopping. This can be easily resolved when the elevator is fully loaded but at low loads the same retardation force will slow the elevator more quickly and therefore initially result in higher deceleration for the passenger.



The graphs below compare test data from two hydraulic buffers that both meet the elevator code specification requirement being used to stop an elevator car travelling at 591 ft/min. This shows the g force that will be experienced by passengers travelling in fully and lightly loaded conditions.



The performance of the Oleo and the alternative supplier’s elevator buffer is similar.



The performance of the Oleo buffer design shows its benefits with a much lower peak deceleration force of 2.6g in comparison to 10g for the alternative supplier’s elevator buffer.

In both load conditions both buffers keep the average deceleration below 1g and do not allow 2.5g for more than 40 milliseconds and therefore are both fully compliant with elevator code specification requirements.

The limiting of peak deceleration force is not required by any elevator code or industry specification. Alternative buffers achieve the average 1g criterion by an initial period of high deceleration followed by extending the final stages as the elevator is coming to rest. The other key elevator buffer specification requires that passengers do not experience more than 2.5g for more than 40 milliseconds but within this period g forces are not limited. However, as illustrated above, in certain conditions very high instantaneous g forces occur and this may cause passenger discomfort.

Oleo has an overall passenger safety aware approach and seeks to avoid the passenger discomfort that may arise from instantaneous deceleration that may even exceed 10g in some circumstances. Many years of in-house testing and the development of mathematical algorithms that accurately simulate the performance of hydraulic buffers enable Oleo unsurpassed force control. The design philosophy is to minimize g force for all passenger load conditions the benefits are highlighted in the test data shown above.

ELEVATOR SAFETY

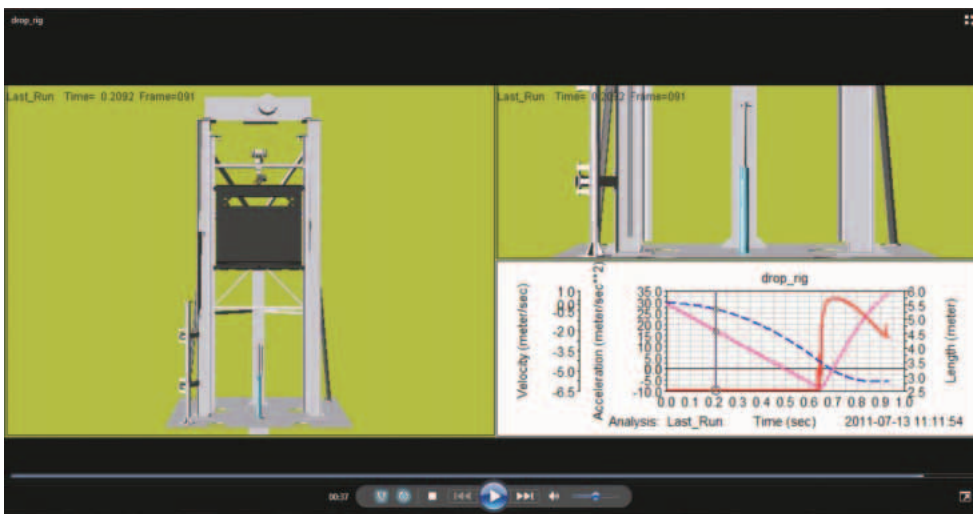
ELEVATOR SWITCHES

Oleo elevator buffers are designed to withstand many more maximum load impacts than elevators are likely to experience in their service life. Despite this, elevator buffers remain an emergency only device. It is never a desirable outcome in the real world to have to rely on buffers to bring your elevator to a stop – that said, it is absolutely essential that you can rely on the buffers in the event that they are required.

It is for this reason that many elevator buffers are fitted with a switch. The switch is positioned to detect that the buffer is fully extended and therefore ready for impact in the case of an emergency. If for any reason the switch does not detect full buffer extension, the entire elevator system is shut down.

MODELING AND ANALYSIS

Oleo employs computer modelling and analysis to refine elevator buffers performance. Simulations are compared directly with test results obtained on Oleo's own in-house dynamic test facility. The ability to both simulate and test, has allowed increased optimization of elevator buffer performance, providing benefits in terms of cost, safety and reliability.



Oleo provide elevator impact simulation to validate test results

BUFFER TYPE TESTING

Elevator buffers are subjected to a type test before they can be sold to the market. Type test requirements vary depending on country but most follow the guidelines of the European specification EN81.1 or ASME A17.1.

To comply with the requirements of EN81.1 the buffer must perform to the criteria detailed earlier. To establish this, the buffers are subject to drop tests. This is where a mass is dropped in freefall. The drop tests must take place at a temperature between 30 degrees F and 77 degrees F. Tests are conducted with masses at either extreme of the stated mass range of the buffer. Subsequent to the maximum mass drop, the mass must remain on the buffer for a minimum of 5 minutes, after which the buffer must fully re-extend within a time period of 90 seconds. Measurements must be made of the displacement, velocity and acceleration of the freefalling masses at a sample rate of at least 100Hz.

In order to eliminate erroneous noise and high frequency vibration from accelerometer traces, low pass filtering is usually applied to a signal sampled at a higher than required sampling frequency.

RANGE OVERVIEW

Buffer unit	Rated speed	Max speed (115%)	Stroke (min)	Impact mass range		Height (extended)	Height (compressed)	Height to reservoir top	Weight no oil (dry)	Oil volume
				min	max					
	ft/min	ft/min	in	lbs		in	in	in	lbs	gallons
				min	max	Dim H (max)	Dim C (min)	Dim F (nom)		
LSB 10	197	226	2.89	838	7165	8.8	5.7	4.0	7.9	0.1
SEB 16	315	362	6.81	992	10020	21.3	13.8	12.1	24.7	0.4
SEB 18	354	407	8.62	992	10020	25.3	15.9	14.3	28.2	0.5
SEB 20	400	460	10.98	992	10020	30.6	18.9	17.2	32.6	0.6
SEB 25	500	575	17.13	992	10020	44.4	26.5	24.8	44.1	0.9
LB 16	315	362	7.99	1102	18365	24.3	15.6	14.0	52.9	1.2
LB 18	354	407	9.80	1102	18365	28.5	17.9	16.3	58.3	1.5
LB 20	400	460	11.81	1102	18365	33.0	20.5	18.9	63.6	1.8
LB 25	500	575	18.19	1102	18365	47.7	28.8	27.1	85.1	2.6
LB 32	620	713	27.52	1543	18365	67.2	38.9	37.3	121.7	5.3
LB 35	701	806	34.69	2205	18365	83.0	47.6	45.9	146.5	6.5
LB 40	799	919	44.92	2205	18365	106.0	60.4	58.7	180.4	8.3
LB 50	1002	1152	68.50	3307	16535	166.0	96.0	92.2	459.4	7.3
LB 55	1104	1270	83.03	2756	16535	198.4	113.9	110.1	533.1	8.8
LB 60	1199	1379	98.58	3307	22046	243.3	141.6	136.0	1058.7	19.3
HSL 58	1152	1324	92.52	8818	22046	192.5	100.0	–	1763.7	25.9
HSL 72	1427	1641	141.73	8818	22046	287.0	145.3	–	2425.1	38.0
HSL 87	1713	1969	204.72	8818	22046	405.1	204.3	–	3527.4	54.7
HSL 101	1988	2286	275.59	11023	17637	494.8	165.1	–	6613.9	72.6
HSL 115	2274	2615	362.20	12125	17637	586.6	225.1	–	7709.6	129.4

A complete range of elevator buffers for every application

While we have made every effort to ensure that the information in this brochure is up to date and accurate, we do not accept responsibility for your reliance on the information contained herein. All products are subject to availability and may be withdrawn without prior notice. All products are subject to change without prior notice.



LSB 10

The LSB 10 is a self contained, maintenance free* unit designed for low and medium speed applications. The LSB 10 is designed to be low cost while maintaining Oleo's recognized performance standards.

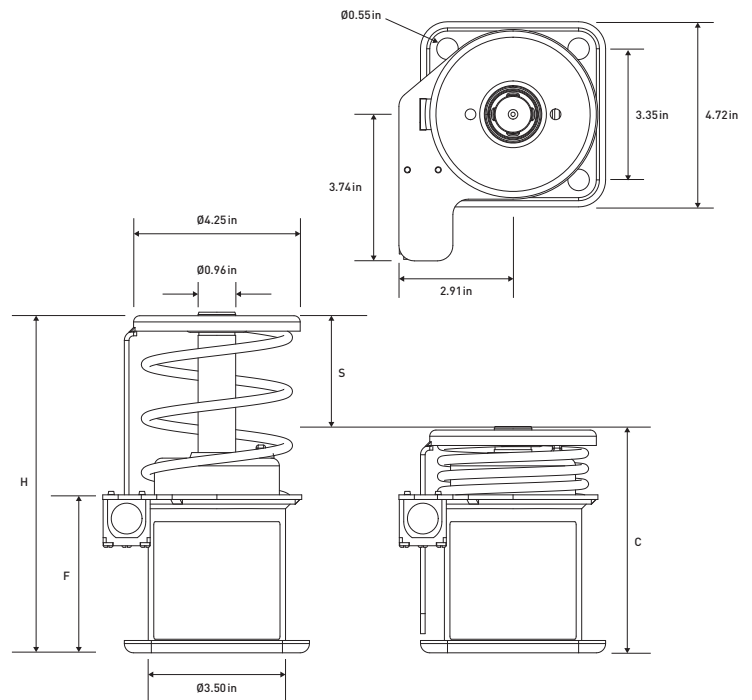
Oleo's LSB buffer weighs approx half of a conventional buffer and has a small space envelope, this means that shipping costs are significantly reduced. In addition there is the option to supply the buffers oil filled rather than with a separate container of oil saving valuable time during elevator installation and reducing the risk of errors and spillage.

The LSB 10 is designed and built according to strict engineering standards and is universally approved and globally certified.

*other than statutory inspections.



Model	LSB 10	
Rated speed	ft/min	197
Maximum speed (115%)	ft/min	226
Stroke 'S' (min.)	in	2.89
Impact mass range	lbs	838-7165
Height 'H' max. (extended)**	in	8.8
Height 'C' min. (compressed)**	in	5.7
Height 'F' to reservoir top	in	4.0
Weight no oil (dry)	lbs	7.9
Oil volume	gallons	0.1
Reduced stroke: Rated speed with terminal speed limiting device, based on ASME A17.1 rule 2.22.4.1.2		
Reduced stroke ASME A17.1	ft/min	289



In the event that the LSB elevator buffers are delivered without oil the buffers need to be filled with oil as per the installation instructions.

The oil used must conform to the specification on the buffer data plate – ISOVG68 – SG.88/90 at -18°F – hydraulic.

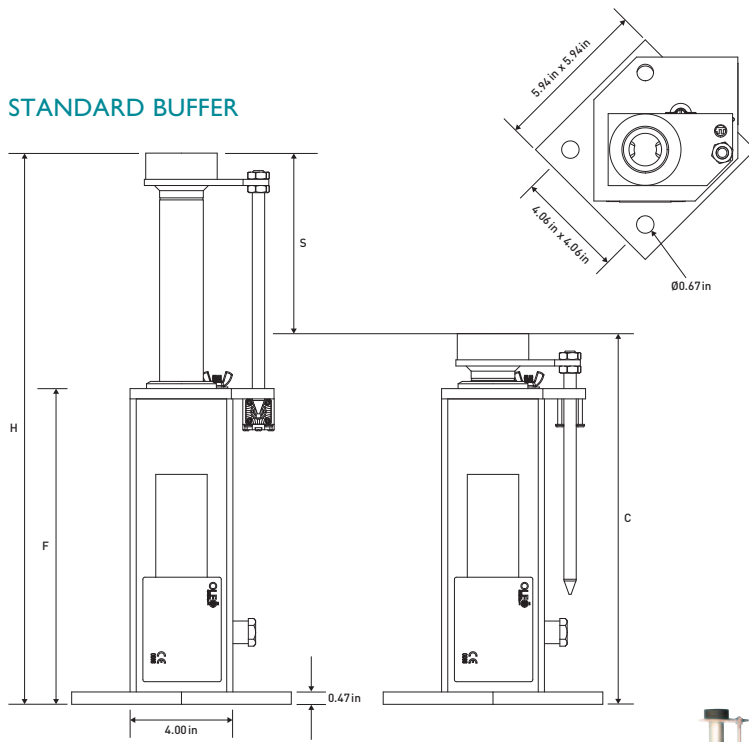
Pour point 60°F or lower. Viscosity index 75 or higher.

** The max and min figures provided take account of the extremes of the tolerance to provide absolute maximum and absolute minimum dimensions. For more details please request detailed installation drawings.



SEB SERIES

STANDARD BUFFER



Model		SEB 16	SEB 18	SEB 20	SEB 25
Rated speed	ft/min	315	354	400	500
Maximum speed (115%)	ft/min	362	407	460	575
Stroke 'S' (min.)	in	6.81	8.62	10.98	17.13
Impact mass range	lbs	992-10020	992-10020	992-10020	992-10020
Height 'H' max. (extended)**	in	21.3	25.3	30.6	44.4
Height 'C' min. (compressed)**	in	13.8	15.9	18.9	26.5
Height 'F' to reservoir top	in	12.1	14.3	17.2	24.8
Weight no oil (dry)	lbs	24.7	28.2	32.6	44.1
Oil volume	gallons	0.4	0.5	0.6	0.9
Reduced stroke: Rated speed with terminal speed limiting device, based on EN81.1 rule 10.4.3.2 and ASME A17.1 rule 2.22.4.1.2					
Reduced stroke ASME A17.1	ft/min	444	500	564	706
Reduced stroke EN81.1	ft.min	n/a	n/a	n/a	706

SEB elevator buffers are delivered without oil. Buffers need to be filled with oil as per the installation instructions.

The oil used must conform to the specification on the buffer data plate – ISOVG68 – SG.88/.90 at -18°F – hydraulic.

Pour point 60°F or lower. Viscosity index 75 or higher.

** The max and min figures provided take account of the extremes of the tolerance to provide absolute maximum and absolute minimum dimensions. For more details please request detailed installation drawings.

The SEB buffer range has been available for over twenty years with thousands successfully installed around the world.

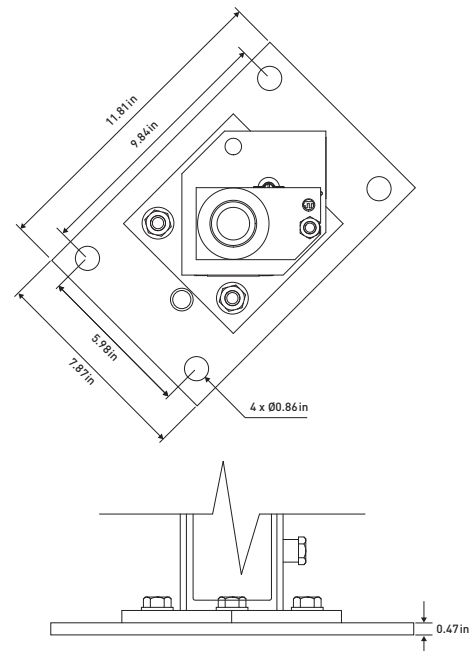
The SEB gas hydraulic buffer series provides a premium robust solution for medium speed applications.

A self contained, maintenance free* unit designed to weigh approximately half of a conventional buffer and have a small space envelope. This means that shipping costs are significantly reduced and allows for quick and easy installation.

The SEB series is designed and built according to strict engineering standards and is universally approved and globally certified.

*other than statutory inspections.

SPECIAL BASE OPTIONS



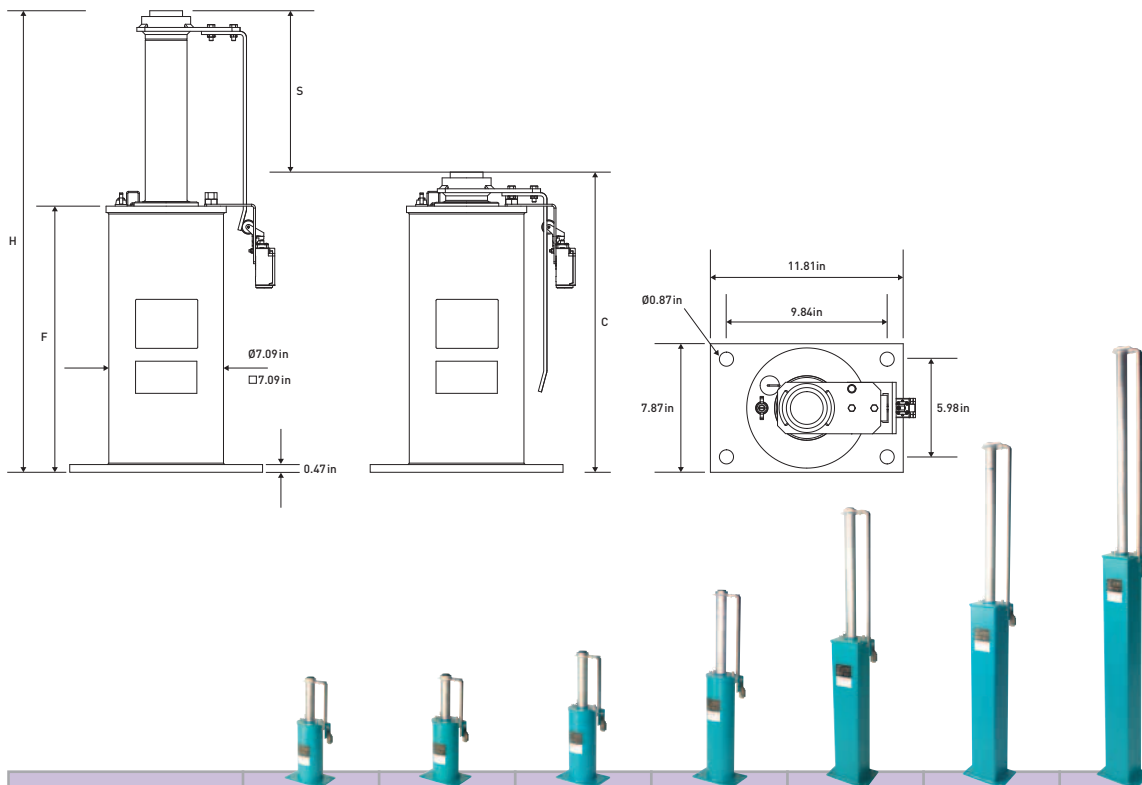
LB SERIES

Oleo has been offering the LB series for over thirty years. The Oleo LB gas hydraulic buffer series is globally recognized for its excellent performance and reliability. It is a self contained, maintenance free* unit designed for heavy and high speed installations offering our largest mass range.

Given the large mass range and rated speed of the LB series, this buffer can be found in a number of different installations including, low, medium and high rise buildings, vehicle and service elevators.

The LB series is designed and built according to strict engineering standards and is universally approved and globally certified.

*other than statutory inspections.



Model		LB 16	LB 18	LB 20	LB 25	LB 32	LB 35	LB 40
Rated speed	ft/min	315	354	400	500	620	701	799
Maximum speed (115%)	ft/min	362	407	460	575	713	806	919
Stroke 'S' (min.)	in	7.99	9.80	11.81	18.19	27.52	34.69	44.92
Impact mass range	lbs	1102-18365	1102-18365	1102-18365	1102-18365	1543-18365	2205-18365	2205-18365
Height 'H' max. (extended)**	in	24.3	28.5	33.0	47.7	67.2	83.0	106.0
Height 'C' min. (compressed)**	in	15.6	17.9	20.5	28.8	38.9	47.6	60.4
Height 'F' to reservoir top	in	14.0	16.3	18.9	27.1	37.3	45.9	58.7
Weight no oil (dry)	lbs	52.9	58.3	63.6	85.1	121.7	146.5	180.4
Oil volume	gallons	1.2	1.5	1.8	2.6	5.3	6.5	8.3
Reduced stroke: Rated speed with terminal speed limiting device, based on EN81.1 rule 10.4.3.2 and ASME A17.1 rule 2.22.4.1.2								
Reduced stroke ASME A17.1	ft/min	482	533	586	891	1096	1232	1401
Reduced stroke EN81.1	ft.min	n/a	n/a	n/a	728	1096	1232	1401

LB elevator buffers are delivered without oil. Buffers need to be filled with oil as per the installation instructions.

The oil used must conform to the specification on the buffer data plate – ISOVG68 – SG.88/90 at -18°F – hydraulic.

Pour point 60°F or lower. Viscosity index 75 or higher.

** The max and min figures provided take account of the extremes of the tolerance to provide absolute maximum and absolute minimum dimensions. For more details please request detailed installation drawings.

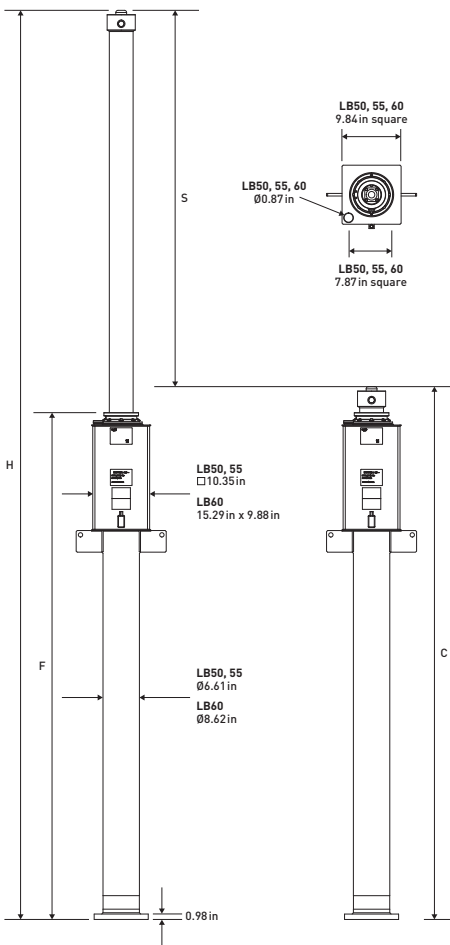
LB HIGH SPEED SERIES

The Oleo LB 50-60 gas hydraulic buffer range is designed specifically for high speed elevator applications typically seen in high rise buildings where speeds over 984 ft/min are achieved. If approved terminal speed limiting devices are employed by applying the reduced stroke calculation the LB 50-60 can deal with speeds up to 2287 ft/min.

The Oleo principle of designing self contained, maintenance free* buffer units is applied to the LB50-60 series of buffers and offers an easy installation process, this makes Oleo buffers the best solution for the life of the installation.

The LB series is designed and built according to strict engineering standards and is universally approved and globally certified.

*other than statutory inspections.



Model		LB 50	LB 55	LB 60
Rated speed	ft/min	1002	1104	1199
Maximum speed (115%)	ft/min	1152	1270	1379
Stroke 'S' (min.)	in	68.50	83.03	98.58
Impact mass range	lbs	3307-16535	2756-16535	3307-22046
Height 'H' max. (extended)**	in	166.0	198.4	243.3
Height 'C' min. (compressed)**	in	96.0	113.9	141.6
Height 'F' to reservoir top	in	92.2	110.1	136.0
Weight no oil (dry)	lbs	459.4	533.1	1058.7
Oil volume	gallons	7.3	8.8	19.3
Reduced stroke: Rated speed with terminal speed limiting device, based on EN81.1 rule 10.4.3.2 and ASME A17.1 rule 2.22.4.1.2				
Reduced stroke ASME A17.1	ft/min	1732	1905	2076
Reduced stroke EN81.1	ft.min	1732	1905	2076

LB elevator buffers are delivered without oil. Buffers need to be filled with oil as per the installation instructions.

The oil used must conform to the specification on the buffer data plate – ISOVG68 – SG.88/90 at -18°F – hydraulic.

Pour point 60°F or lower. Viscosity index 75 or higher.

** The max and min figures provided take account of the extremes of the tolerance to provide absolute maximum and absolute minimum dimensions.

For more details please request detailed installation drawings.

HIGH SPEED LIFT RANGE

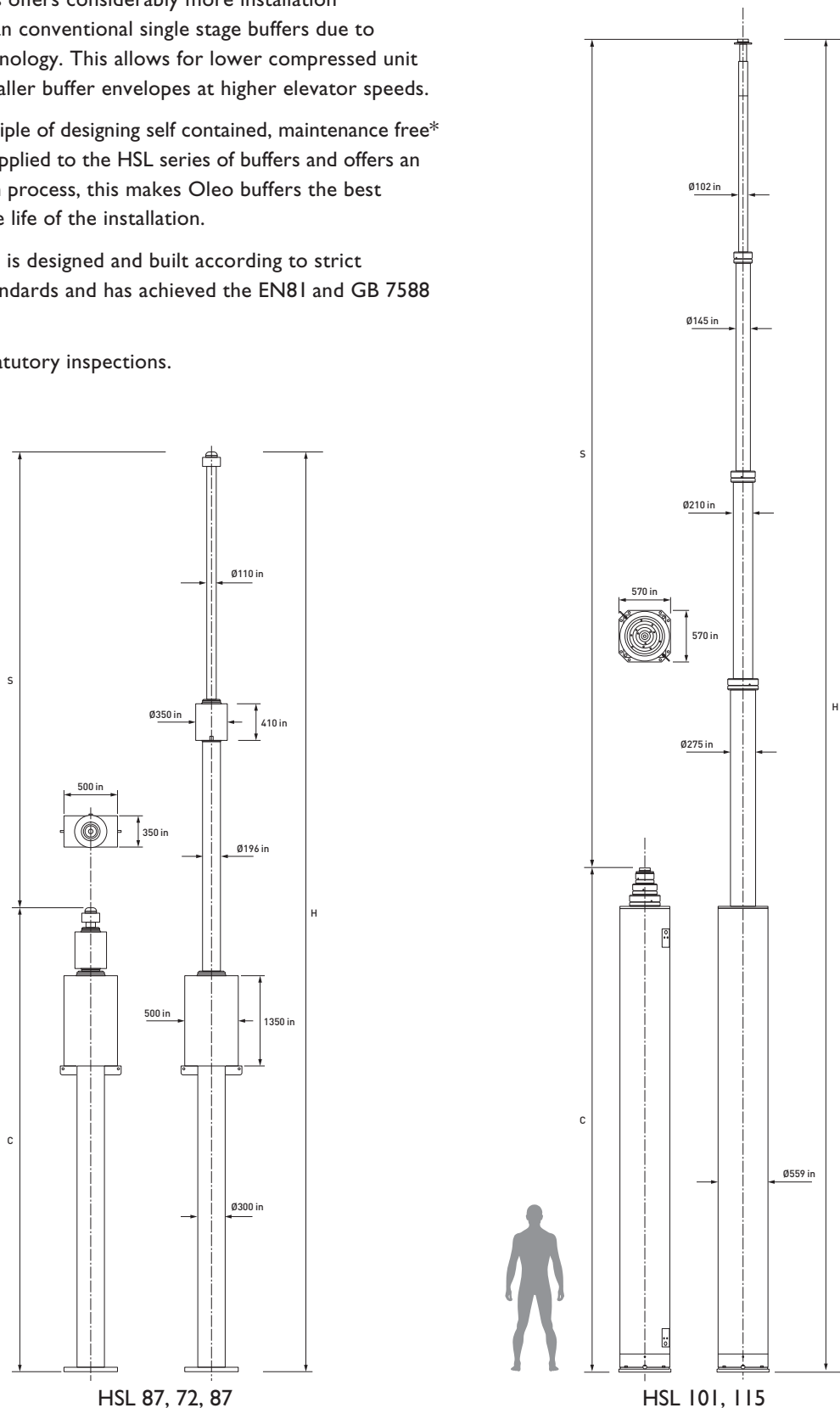
The new Oleo HSL telescopic gas hydraulic buffer range is designed specifically for high speed elevator applications typically seen in high rise buildings where speeds over 948 ft/min are achieved. If approved terminal speed limiting devices are employed by applying the reduced stroke calculation the HSL I15 can deal with speeds up to 3982 ft/min.

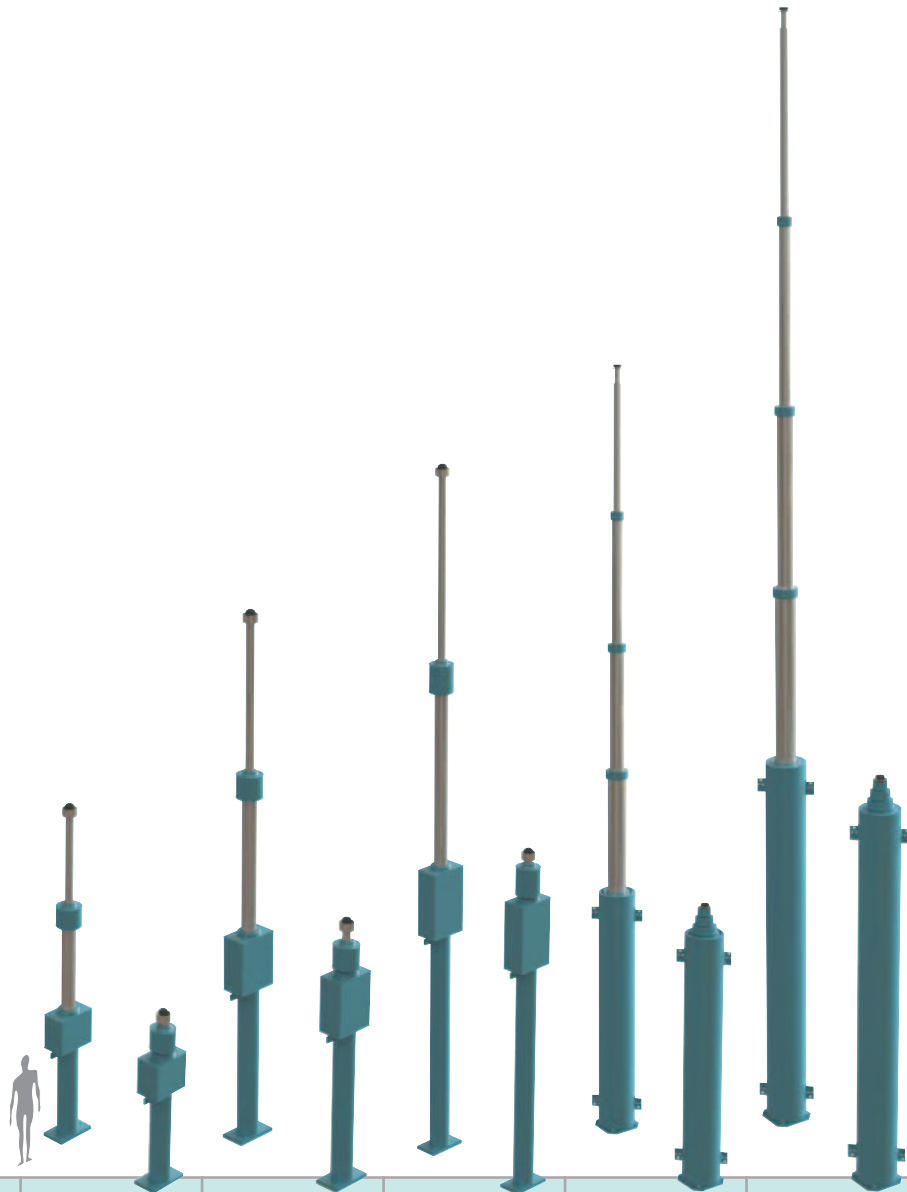
The HSL Series offers considerably more installation possibilities than conventional single stage buffers due to telescopic technology. This allows for lower compressed unit heights and smaller buffer envelopes at higher elevator speeds.

The Oleo principle of designing self contained, maintenance free* buffer units is applied to the HSL series of buffers and offers an easy installation process, this makes Oleo buffers the best solution for the life of the installation.

The HSL series is designed and built according to strict engineering standards and has achieved the EN81 and GB 7588 certification.

*other than statutory inspections.





Model		HSL 58	HSL 72	HSL 87	HSL 101	HSL 115
Rated speed	ft/min	1152	1427	1713	1988	2274
Maximum speed (115%)	ft/min	1324	1641	1969	2286	2615
Stroke 'S' (min.)	in	92.52	141.73	204.72	275.59	362.20
Impact mass range	lbs	8818-22046	8818-22046	8818-22046	11023-17637	12125-17637
Height 'H' max. (extended)**	in	192.5	287.0	405.1	494.8	586.6
Height 'C' min. (compressed)**	in	100.0	145.3	204.3	165.1	225.1
Weight no oil (dry)	lbs	1763.7	2425.1	3527.4	6613.9	7709.6
Oil volume	gallons	25.9	38.0	54.7	72.6	129.4
Reduced stroke: Rated speed with terminal speed limiting device, based on EN81.1 rule 10.4.3.2 and ASME A17.1 rule 2.22.4.1.2						
Reduced stroke ASME A17.1	ft/min	2011	2490	2994	3474	3982
Reduced stroke EN81.1	ft.min	2011	2490	2994	3474	3982

HSL elevator buffers are delivered without oil. Buffers need to be filled with oil as per the installation instructions. The oil used must conform to the specification on the buffer data plate – ISOVG68 – SG.88/90 at -18°F – hydraulic. Pour point 60°F or lower. Viscosity index 75 or higher.

** The max and min figures provided take account of the extremes of the tolerance to provide absolute maximum and absolute minimum dimensions. For more details please request detailed installation drawings.



ELEVATOR



END STOPS



INDUSTRIAL



RAIL

WE PROVIDE SOLUTIONS NOT JUST PRODUCTS

Notes for all Oleo Elevator buffers:

Environmental temperature acceptable conditions 5 degree F to 158 degree F. Note: for *special conditions* outside of this consult OLEO International.

Buffer must be securely supported and steadied vertically, parallel to guide rails +/- 0.2in per ft. For *non vertical applications* consult OLEO International.

Buffer to be mounted in a suitable structure to support deceleration forces in accordance with installation sheet.

Disclaimer:

While we have made every effort to ensure that the information in this brochure is up to date and accurate, we do not accept responsibility for your reliance on the information contained herein. All products are subject to availability and may be withdrawn without prior notice. All products are subject to change without prior notice.



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