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ULTIMATE SERIES SUBWOOFERS

UR10, UR12, UR15
SP12, SP15
SP15S, SP18S

WELCOME

Thank you for buying a DLS ULTIMATE subwoofer. The subwoofer must be installed correctly in order to work well. This manual will show you how to install it like a pro. Please read the entire manual before beginning the installation. Install the subwoofer yourself if you feel confident with our instructions and if you have the proper tools. However if you feel unsure, turn over the installation job to someone better suited to it.

The speakers are designed for enclosure mounting. In "open air" installations the power handling capacity is reduced by 30% from the nominal value. We don't recommend "open air" installations for Ultimate subwoofers.

CONNECTION OF SUBWOOFER

How to connect depends on what type of amplifier you use. The best is to follow the instructions given in the manual for the amplifier. Most amplifiers today have built-in lowpass crossover and possibilities to connect your subwoofer in bridge mode.

Two 4 ohm subwoofers are often connected in stereo mode since most amplifiers can't handle bridge mode loads below 4 ohms.

The UR10, 12 & 15 have dual, four ohm, voice coils. Each voice coil has an impedance of 4 ohms. If they are connected in series the resulting impedance is 8 ohms. If they are connected in parallel the resulting impedance is 2 ohms. Make sure to connect in a way that don't ruin the amplifier. If you have a DLS Ultimate amplifier it's possible to connect the voice coils in parallel, these amplifiers are 1 ohm stable.

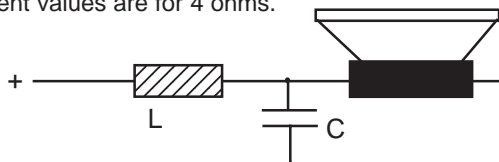
SP12 and 15 have dual, two ohm, voice coils which should be considered when you connect them.

We also recommend the use of a subsonic highpass filter. This gives a better bass reproduction with less "rumble". In most DLS amplifiers this feature is already built-in.

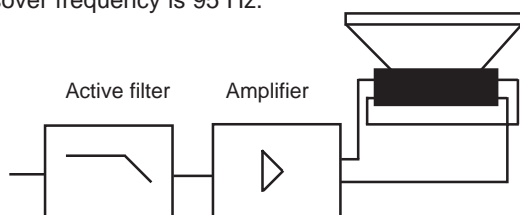
For wiring use high class speaker wires, min AWG13 (2.5 mm²). For example **DLS SC 2x2,5**.

If you have an amplifier without built-in crossover you must use a passive crossover between amplifier and subwoofer like in this example, one crossover for each voice coil.

Component values are for 4 ohms.



Connected with a 12 dB passive low-pass x-over = 10 mH coil in series and a bipolar capacitor of 300 microFarad in parallel. Crossover frequency is 95 Hz.



Connection in mono bridge mode with an active x-over. Voice coils connected in series. If you have a 1 ohm stable amplifier the voice coils should be connected in parallel for best performance (for example on a DLS monoblock).

SUBWOOFER ENCLOSURES, GENERAL

Build your enclosure in a stable and airtight material. The best is MDF-board, 19 mm, or particle board, 22 mm. Larger enclosures must have bracing inside to avoid vibrations. The enclosure must be completely airtight. Use sealing compound in all joints, also around the cable terminals. The size of the enclosure is decided by the speaker data.

SEALED ENCLOSURES

Sealed enclosures are easy to build. The size is not critical, but it can't be too small. The speaker data such as Fs, Qts, Vas and X-max decides the size of the enclosure.

Large speakers need larger boxes. Two speakers need a box of the double size etc. The enclosure must be completely airtight.

A sealed enclosure should be filled with acoustic wool up to 75 - 100%.

A sealed enclosure has a lower efficiency than vented enclosures but they can handle high power and are easy to build.

A subwoofer in a sealed enclosure creates a tight bass suitable for the audiophiles listening to classical music, jazz and soft rock. All the Reference subwoofers are recommended NOT to use in sealed enclosures.

VENTED ENCLOSURES

A speaker in a vented enclosure has a higher efficiency (3 dB) and higher power handling capacity than in a sealed enclosure. In a vented enclosure the sound from the speaker and the port work together creating a higher sound level. The sound from the port must come out in the same phase as from the speaker otherwise the result is bad.

The size of the vented enclosure is decided by the speaker data just as for the sealed one.

The size of the vehicle often decides the practical size of the enclosure. A smaller enclosure has a higher resonant frequency than the larger one. The size of the enclosure should not be so big that the speaker plays below it's own free air resonance (Fs), then it loses in power handling capacity.

The port does not have to be fully inside the enclosure as long as the area and length are correct. Sometimes you need two or more ports in an enclosure. You can convert from one to two or more ports as long as the total port area is the same.

All DLS subwoofers works well in vented boxes.

BANDPASS ENCLOSURES

In all bandpass enclosures the speakers are hidden inside the enclosure, all sound is coming out through the ports. There are different types of bandpass enclosures and they have in common that they are a bit more difficult to build. Most DLS subwoofers can be used in bandpass enclosures.

IMPORTANT!

The speaker cones of UR10,12 & 15 are made of magnesium, a material of low weight with excellent acoustic qualities.

We recommend you NEVER to touch the cone body with you fingers. Remaining deformation of the cone body will occur if you push it with your fingers.

Also think of the speaker weight when you mount it. If you don't mount it properly it can get loose.

TECHNICAL SPECIFICATIONS FOR DLS ULTIMATE SUBWOOFERS

Revised data for UR10 valid from production date 2003-07-01.

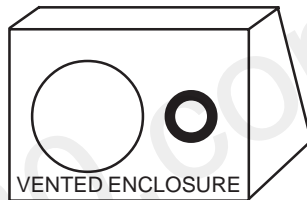
Revised data for UR12 valid from production date 2003-12-01.

	UR10	UR12	UR15	
Size	25 cm (10")	30 cm (12")	37,5 cm (15")	
Impedance	2 x 4 ohm	2 x 4 ohm	2 x 4 ohm	
Nom. power (RMS)	400 W (max 700)	500 W (max 800)	500 W (max 800)	
Freq. range	25 Hz- 2 kHz	20 Hz-2 kHz	15 Hz- 2 kHz	
Sensitivity	85,6 dB	87,2 db	90 dB	
Voice coil diameter	75 mm (3")	75 mm (3")	75 mm (3")	
Voice coil height	42 mm (1,65")	42 mm (1,65")	42 mm (1,65")	
Re	1,92 ohm*	1,6 ohm*	1,93 ohm*	* Data measured with
Voice coil inductance, 1 kHz	0,8 mH	0,89 mH	0,89 mH	VC connected in parallel
BL product	13,1	16,1	13,9	
X-max	+14 mm (0,55")	+14 mm (0,55")	+14 mm (0,55")	
Suspension compliance CMS	80,2	82	146	
SD- Effective piston area	314,6 cm ²	452,3 cm ²	854,8 cm ²	
Resonant freq. (Fs)	42,3 Hz	36,1 Hz	27,5 Hz	
Vas (liters)	13,9	24	116,7	
Vas (ft ³)	0,5	0,85	4,12	
Qms	5,62	4,98	4,31	
Qes	0,40	0,32	0,40	
Qts	0,37* (0,7 with single VC)	0,3* (0,6 with single VC)	0,36* (0,57 with single VC)	
Cone material	Magnesium	Magnesium	Magnesium	
Magnet weight	180 oz (5,1 kg)	200 oz (5,67 kg)	200 oz (5,67 kg)	
Magnet diameter	7,1" (180 mm)	8,7" (220 mm)	8,7" (220 mm)	
Installation depth	5,24" (133 mm)	5,9" (150 mm)	6,93" (176 mm)	
Mounting hole	9,29" (236 mm)	11,1" (282 mm)	14,17" (360 mm)	
Outer diameter	10,39" (264 mm)	12,2" (310 mm)	15,35" (390 mm)	
Weighth	20 lb (9,1 kg)	28,66 lb (13 kg)	29,54 lb (13,4 kg)	

RECOMMENDED ENCLOSURES FOR UR10, UR12 & UR15

RUNNING-IN PERIOD

Allow the speaker to play for at least 15-20 hours. After this time the performance is correct.



F3 = approximative lower frequency for vented boxes in Hz. Often called F-3 dB point = the point where the power is 50% lower.

Fb = Box resonant frequency

Subwoofer	Volume (liters/ft ³)	Port	Damping	F3	Fb
UR10*	vol: 19 / 0,67	3" x 40 cm/15,75"	Line inside	40,1 Hz	40,0 Hz
UR12*	vol: 27,4 / 0,95	3" x 33 cm/ 13"	Line inside	37,4 Hz	34,0 Hz
UR15/par	vol: 57 / 2,01	4" x 24 cm/9,45"	Line inside	51,2 Hz	39,8 Hz
UR15/ser	vol: 52 / 1,84	4" x 24 cm/9,45"	Line inside	43 Hz	39,8 Hz

* voice coils in either series or parallel

SEALED BANDPASS



Vb1=rear, Vb2=front

The speaker is installed in Vb1 playing into chamber Vb2 where the port(s) are installed.

UR12 (VC in parallel, 2 ohm)

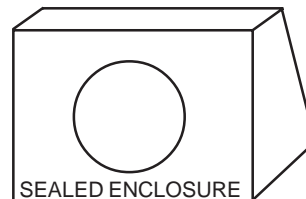
Vb1	Vb2	Port Vb2
19,5	11,16	1x6,8x32 cm
0,69 ft ³	0,39 ft ³	1 x 3" x 12,6" (US)

F3 Vb1: 40,5 Hz, Vb2: 73,6 Hz

UR15 (VC in parallel, 2 ohm)

Vb1	Vb2	Port Vb2
41,13	55,4	1x16x27 cm
1,45 ft ³	1,96 ft ³	1 x 6" x 10,6" (US)

F3 Vb1: 50 Hz, Vb2: 102,5 Hz



UR10 single voice coil:

15 liters / 0,53 ft³
F3: 49,9 Hz

UR12 single voice coil:

16 liters / 0,56 ft³
F3: 49,8 Hz

UR15 single voice coil:

55 liters / 1,94 ft³
F3: 52,4 Hz

use only one voice coils in sealed enclosures

TECHNICAL SPECIFICATIONS FOR DLS ULTIMATE SUBWOOFERS

	SP12	SP15	SP15S	SP18S
Size	30 cm (12")	37,5 cm (15")	37,5 cm (15")	45 cm (18")
Impedance	2 x 2 ohm	2 x 2 ohm	4 x 2 ohm	3 x 2 ohm
Nom. power (RMS)	500 W (max 800)	500 W (max 800)	500 W (max 800)	500 W (max 800)
Maximum power for SPL use	1200 W	1200 W	2000 W	2000 W
Freq. range	20 Hz- 2 kHz	15 Hz-2 kHz	15 Hz - 1 kHz	13 Hz - 1 kHz
Sensitivity	97,3 dB	99,9 db	88,1 dB	90,5 dB
Voice coil diameter	75 mm (3")	75 mm (3")	75 mm (3")	100 mm (4")
Voice coil height	32 mm (1,26")	32 mm (1,26")	28 mm (1,1")	32 mm (1,1")
Re	1,27 ohm*	1,25 ohm*	1,8 ohm**	2,2 ohm**
Voice coil inductance, 1 kHz	0,52 mH	0,57 mH	0,96 mH	1,16 mH
BL product	8,73*	8,49*	9,53**	12,07**
X-max	+12 mm (0,47")	+12 mm (0,47")	+12 mm (0,47")	+12 mm (0,47")
Suspension compliance CMS	344	240	753	936
SD- Effective piston area	452,3 cm ²	754,8 cm ²	754,8 cm ²	
Resonant freq. (Fs)	30,5 Hz	33,2 Hz	39 Hz	31,9 Hz
Vas (liters)	98,76	191,7	72,4	177
Vas (ft ³)	3,48	6,77	2,55	6,25
Qms	4,42*	4,22*	6,94**	5,33**
Qes	0,25*	0,35*	1,07**	0,8**
Qts	0,24*	0,32*	0,92**	0,7**
Cone material	Paper	Paper	Paper	Paper
Magnet weight	200 oz (5,67 kg)	200 oz (5,67 kg)	200 oz (5,67 kg)	200 oz (5,67 kg)
Magnet diameter	8,7" (220 mm)	8,7" (220 mm)	8,7" (220 mm)	8,7" (220 mm)
Installation depth	5,71" (145mm)	6,89" (175 mm)	6,89" (175 mm)	8,66" (220 mm)
Mounting hole	11,22" (285 mm)	14,17" (360 mm)	14,17" (360 mm)	16,9" (430 mm)
Outer diameter	12,4" (315 mm)	15,35" (390 mm)	15,35" (390 mm)	18,3" (465 mm)
Weight	28,66 lb (13 kg)	29,54 lb (13,4 kg)	29,54 lb (13,4 kg)	43,65 lb (19,8 kg)

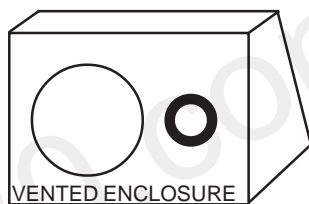
* Data measured with VC connected in parallel

** Data measured on single voice coil

VENTED ENCLOSURES FOR SP12 & SP15

RUNNING-IN PERIOD

Allow the speaker to play for at least 15-20 hours. After this time the performance is correct.



F3 = approximative lower frequency for vented boxes in Hz. Often called F-3 dB point = the point where the power is 50% lower.

Fb = Box resonant frequency

Subwoofer	Volume (liters/ft3)	Port	Damping	F3	Fb
SP12 single VC	vol: 41,9 / 1,48	4" x 35 cm/13,8"	Line inside	38,1 Hz	38,6 Hz
SP12 par. VC	vol: 36,9 / 1,30	3" x 25 cm/9,84"	Line inside	30 Hz	32 Hz
SP12 ser. VC	vol: 40,4 / 1,43	4" x 17 cm/6,7"	Line inside	50 Hz	50 Hz
SP15 single VC	vol: 60 / 2,12	2x4" x 35 cm/13,8"	Line inside	53 Hz	45,0 Hz
SP15 ser. VC	vol: 60,55 / 2,14	2x4" x 37 cm/14,5"	Line inside	44,7 Hz	44,0 Hz

BANDPASS ENCLOSURES



Vb1=rear, Vb2=front

The speaker is installed in Vb1 playing into chamber Vb2 where the port(s) are installed.

SP12, single VC

Vb1	Vb2	Port Vb2
29,4	17,3	1x10,2x29 cm
1,04 ft ³	0,61 ft ³	1x4"x11,4" (US)

F3 Vb1: 40 Hz, Vb2: 102 Hz

SP15, single VC

Vb1	Vb2	Port Vb2
52,8	58,3	2x16x25 cm
1,86 ft ³	2,05 ft ³	2 x 6" x 9,8" (US)

F3 Vb1: 50 Hz, Vb2: 111,6 Hz

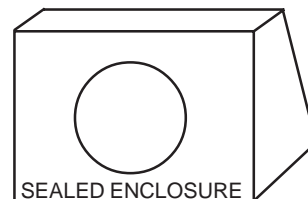
SPL ENCLOSURES FOR SP12, 15, 15S, 18S

The enclosure examples can be used only for the reproduction of normal music. If you want to use these subwoofers for SPL competition, which they are designed for, the design of an enclosure is more complicated. The vehicle must be modified in many ways and the enclosure must be individually designed for each vehicle type and also for the different competition classes.

You are welcome to contact DLS for advices.

On our website www.dls.se/support you will find some helpful hints (PDF document) regarding the build of SPL competition vehicles.

SEALED ENCLOSURE FOR SP15



SP15: 54,5 liters, F3: 67,5 Hz
1,92 ft³
(Use only one voice coil)

HINTS & TIPS FOR "DO IT YOURSELF" ENCLOSURE BUILDERS

ABOUT THE RECOMMENDED ENCLOSURES

The performance of these recommended enclosures will vary from vehicle to vehicle. It is more difficult to get a tight and well defined bass in a SEDAN vehicle because of the tightness between trunk and interior of the vehicle. In this case a band-pass box could be a better choice.

- All volumes are inside measures.
 - Volumes occupied by speaker and ports have already been added to the given enclosure volumes.
 - Use conical bass ports for best result. (DLS BP-75 or BP-110). If the ports are too long for the box you can use a bend. Either cut the tube and glue it together in angle, or use factory made tube bends. It's easier to use the factory made ones. The total length must be the same as for a straight tube. Make the measure in the center of the tube.
- The port opening inside the enclosure must not be closer to an interior wall than 3" (75 mm), otherwise it will have negative effects on the airflow.
- The enclosure must be very steady and completely air-tight. Use 22 mm particle board or 19 mm MDF-board. The particle board has a self resonant frequency of 14 Hz while the MDF has a resonant frequency of approx. 400 Hz. It's important to do some type of bracing inside the enclosure to avoid vibrations. Volume taken up by bracing should be added to the enclosure volumes.

ENCLOSURE DAMPING

Most enclosures should be damped inside with synthetic (acoustic) wool or damping mat (line). Attach the damping material on the wall opposite from the speaker and port. A sealed enclosure should be filled up to 70-100% with acoustic wool. In a vented enclosure the speaker and port should be on the same side, otherwise a fade-out of some frequencies can occur. In most vehicles, except for SEDAN cars, the speaker and port should be directed backwards for best result.

ENCLOSURE PLACING IN DIFFERENT TYPES OF VEHICLES

In **small vehicles** like VW Golf, Peugeot 306 and similar the bass box should be installed with both speaker and port directed backwards. Alternatively both speaker and port can be directed upwards. This way of mounting is valid for all types of vehicles where the trunk is incorporated with the inner compartment.

In **sedan vehicles** with the passenger compartment separated from the trunk, the enclosure should be installed with both speaker and port directed towards the rear seat. Some cars have an opening in the middle of the rear seat for loading skis etc. You can install the enclosure behind this opening and direct speaker or port through this opening. There must be some free space in front of the port, (between the rear seat and the port opening).

In **large vehicles** like station wagons the best sound is achieved with the enclosure installed behind the rear seat with both speaker and port directed backwards. Alternatively you can install the enclosure on one side of the luggage compartment.

CALCULATE YOUR ENCLOSURE

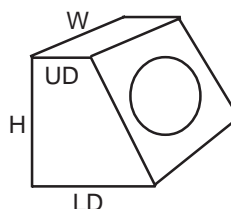
Box volumes:

When calculating the volume of an enclosure you simply multiply the width (W) x height (H) x depth (D).

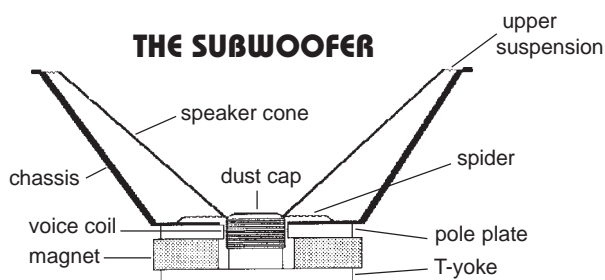
Use measures in dm and you will get the answer in liters.

A trapezoid box is calculated as below:

$$\text{Vol} = \frac{\text{width (W)} \times \text{height (H)} \times (\text{upper depth (UD)} + \text{lower depth (LD)})}{2}$$



Be sure to measure the inside dimensions.



WARRANTY SERVICE

This speaker is covered by warranty, depending on the conditions in the country where it is sold. If the speaker is returned for service, please include the original dated receipt with the product.



Technical Assistance

For technical assistance ask the shop where the product was sold or the distributor in your very country. You can always phone the DLS Helpdesk in Sweden + 46 31 840060 or send an e-mail to info@dls.se

Information can also be found on our WEB-site www.dls.se

We follow a policy of continuous advancement in development. For this reason all or part of specifications & designs may be changed without prior notice.



DLS Svenska AB
P.O. Box 13029
SE-40251 Göteborg, Sweden
Tel: +46 31 840060
Fax: +46 31 844021
E-mail: info@dls.se
www.dls.se