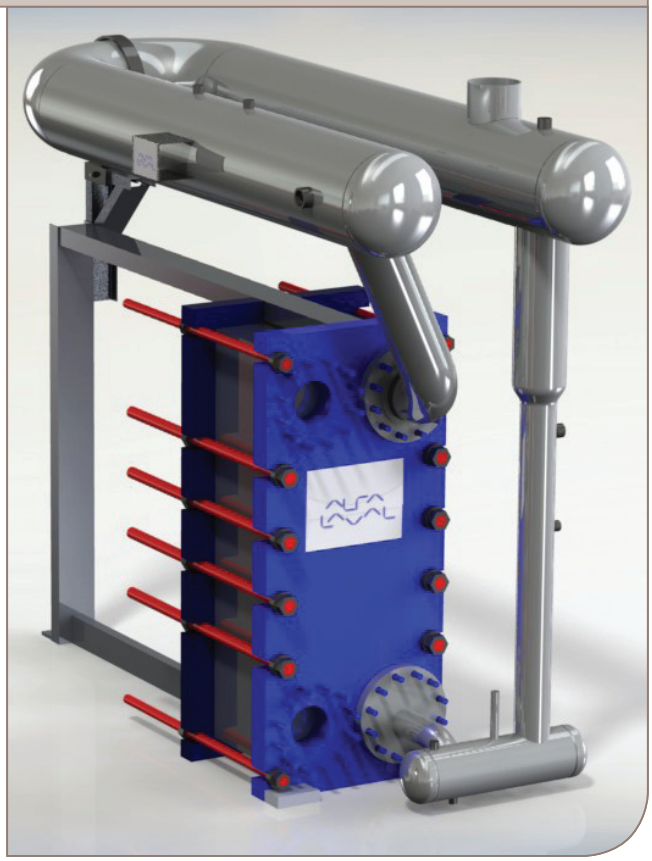
High efficiency with a small footprint

Alfa Laval U-Turn MK15 – plug'n'play module for flooded ammonia



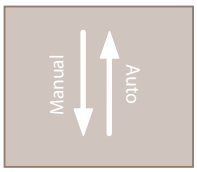
Turn to efficiency

U-Turn is a liquid separator especially designed for use with plate heat exchangers in ammonia applications. The module – including the separator and plate heat exchanger (PHE) ensures minimum pressure drop losses and maximum energy efficiency.

Plate heat exchangers from Alfa Laval can operate with the smallest LMTD (Logarithmic Mean Temperature Difference) as evaporators. To ensure this efficiency is not lost from a liquid column that is too small or large, or due to incorrect pressure drop, Alfa Laval has developed the U-Turn separator. The module provides an effective and compact installation with less vertical rise and smaller overall dimensions than any other solution. All ammonia connections are grouped on the same side which allows the module to be installed in close proximity to walls or on the perimeter of a main skid.

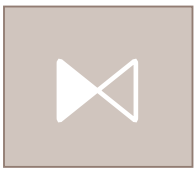
U-Turn in action

Alfa Laval U-Turn is designed to utilize the very best from Alfa Laval's plate heat exchanger technology. Installed above the plate heat exchanger, the self-contained U-Turn can be easily mounted onto the compatible MK15. It can cover ammonia capacities up to 414 TR at 32°F evaporation temperature and up to 145 TR at -40°F evaporation temperature.



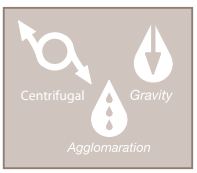
Nozzles for preferred oil drain method – various oil drainage options

Predefined liquid level and charge – information to run U-Turn module at peak performance

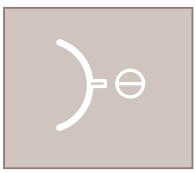


Check valve for start-up flow control – immediate safety operation

Self-contained unit – easy installation and full access, no skids or frame required



Multiple separation methods – enhanced separation efficiency and extremely low ammonia charge

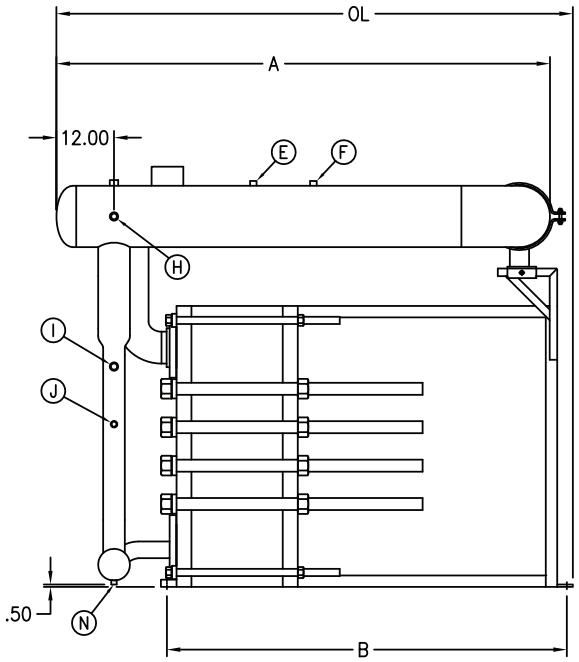


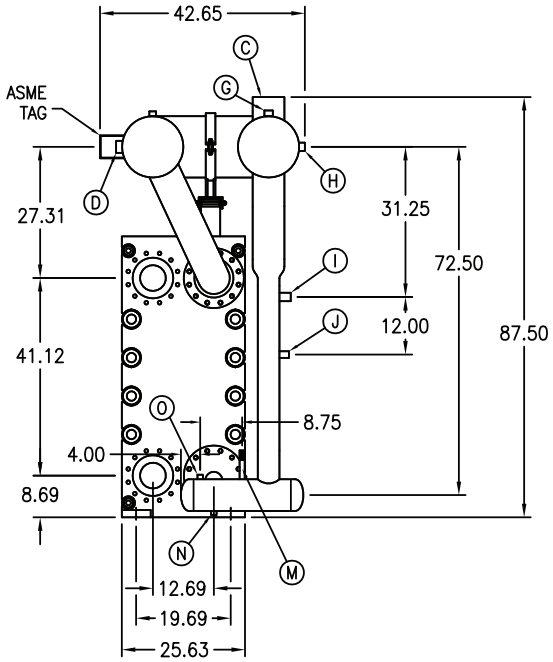
Nozzles for regulation and control devices – allow the option of preferred control system

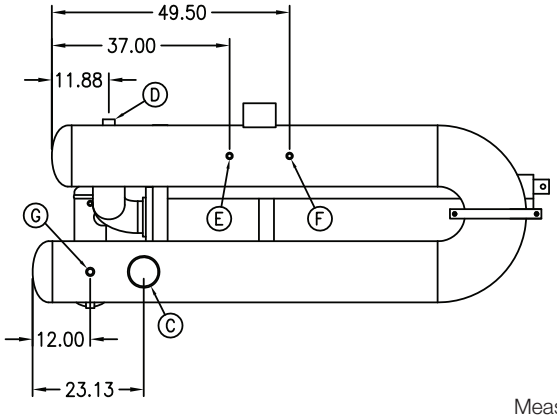
Capacity selection table														
		One-stage cycle								Part of two-stage cycle				
Evaporating temperature	F	50		32		14		-4		-22		-40		Length of carrying bar
Condensing temperature	F	105	85	105	85	105	85	105	85	41	14	41	14	
Model UR/UL-12-6C-M15-12-ASME	TR	265	279	211	222	164	171	124	129	104	110	71	75	1200
Model UR/UL-12-6C-M15-15-ASME	TR	332	350	266	277	206	216	155	162	131	138	90	95	1500
Model UR/UL-12-6C-M15-18-ASME	TR	401	421	320	336	242	260	186	195	157	166	108	115	1800
Model UR/UL-12-6C-M15-24-ASME	TR	535	535	414	414	332	347	250	262	211	222	145	155	2400

Separator capacities vs, gas- and reintrainment velocities									
Evaporating temperature	F	50	32	14	-4	-22	-40	Max. Number of cassettes 0.5mm	Max. Number of cassettes 0.6mm
Condensing temperature	F	105	105	105	105	41	41		
Model UR/UL-12-6C-M15-12-ASME									
Max. allowable capacity	TR	265	211	164	124	104	71	76/66	73/65
Gas velocity at max. capacity	f/s	7.5	8.5	9.5	10.8	12.5	14.1		
Reintainment velocity at max. capacity	f/s	23	27.9	34.4	43	54.1	69.6		
Model UR/UL-12-6C-M15-15-ASME									
Max. allowable capacity	TR	332	266	206	155	131	90	103/95	101/93
Gas velocity at max. capacity	f/s	9.5	10.8	12.1	13.8	15.4	17.7		
Reintainment velocity at max. capacity	f/s	23	27.9	34.4	43	54.1	69.6		
Model UR/UL-12-6C-M15-18-ASME									
Max. allowable capacity	TR	401	320	242	186	157	108	132/124	129/121
Gas velocity at max. capacity	f/s	11.5	12.8	14.8	16.7	18.7	21.3		
Reintainment velocity at max. capacity	f/s	23	27.9	34.4	43	54.1	69.6		
Model UR/UL-12-6C-M15-24-ASME									
Max. allowable capacity	TR	535	414	332	250	211	145	183/181	183/178
Gas velocity at max. capacity	f/s	13.8	17.4	19.4	22	24.9	28.5		
Reintainment velocity at max. capacity	f/s	23	27.9	34.4	43	54.1	69.6		

Weights and volumes						
	Model		Model UR/UL-12-6C-M15-12-ASME	Model UR/UL-12-6C-M15-15-ASME	Model UR/UL-12-6C-M15-18-ASME	Model UR/UL-12-6C-M15-24-ASME
Number of cassettes	Maximum		73	101	129	183
Weights	Frame	lb	2120	2165	2112	2304
	Stainless steel (AISI 304/AISI 316) 0.5 mm cassette per cassette		10.43			
	Stainless steel (AISI 304/AISI 316) 0.6 mm cassette per cassette		12.44			
	Stack of cassettes, at max. number		908	1257	1605	2277
	U-turn separator, max.		748	806	883	1036
	Total plate heat exchanger and U-turn separator		1656	2063	2488	3313
Volumes on refrigerant side	Channel volume per cassettes	USgallon	0.33			
	Channel volume at max. number of cassettes		24.1	33.3	42.6	60.4
	U-turn separator volume		60	77	91	103
	Total plate heat exchanger and U-turn separator volume		84.1	110.3	133.6	163.4
Oil volume	Oil pot volume	USgallon	2.7	2.7	2.7	2.7
Surfaces	Exposed surface plate heat exchanger	ft2	42	49.5	58.1	73.2
	Exposed surface U-turn separator		46.3	61.4	70	72.2
	Total surface		88.3	110.9	128.1	145.4



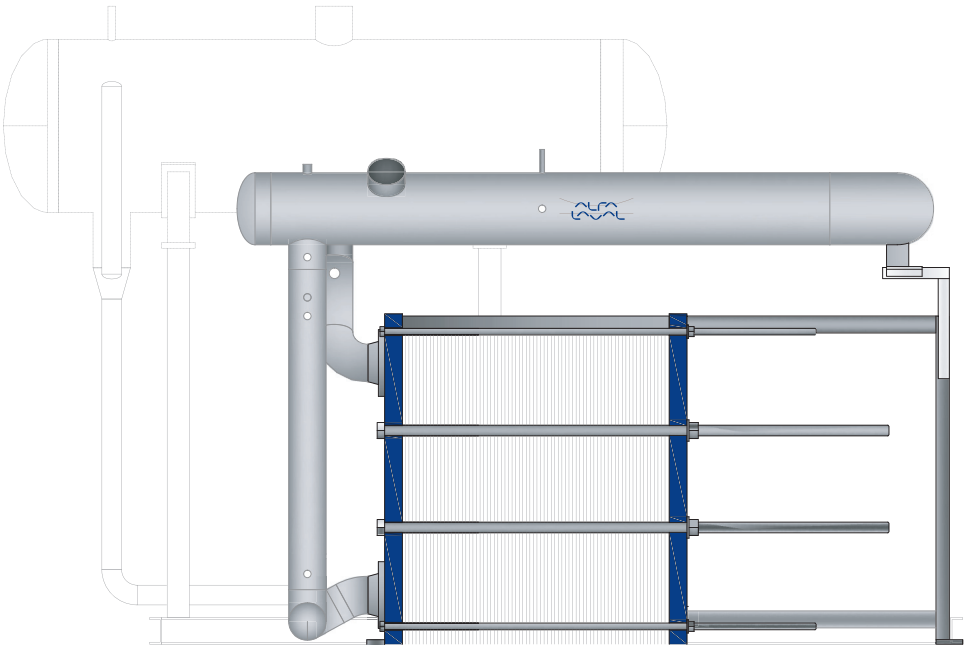




Measurements in inches. Authorized drawing at order.

Nozzle dimensions											
Nozzle	C	D	E	F	G	H	I	J	M	N	O
Function	Suction Outlet	Liquid feed	Guage	Saftey Relief	Liquid level	Liquid level	Liquid level	Oil Drain (Level Probe)	Oil Drain	Oil Drain w/Plug)	Gauge
Dim. (in)	6	1.5	0.75	0.75	1	1	1	0.75	0.75	0.5	0.5
Type	BW Pipe	CPLG.	CPLG.	CPLG.	CPLG.	CPLG.	CPLG.	CPLG.	CPLG.	CPLG./Plug	CPLG.

Main dimensions				
"LC Length of carry-ing bar mm (in)"	"OL Overall length (in)"	"LE Efficient length of separation (in)"	"A Uturn Vessel Length (in)"	"B Support Location length (in)"
1200 (47.24)	80.21	128	79.13	55.9
1500 (59.06)	95.88	152	91	71.63
1800 (70.87)	107.52	177	102.77	83.27
2400 (94.49)	131.13	223	126.38	106.88



The U-Turn evaporator module design versus traditional separator design.

The design that gives the U-Turn its name

- Compact dimensions
- Shorter height and length – packages can be installed onsite without dismantling
- Effective length (L_{eff}) of U-Turn follows the plate heat exchanger carrying bar length
- Three-point support – the U-Turn separator is supported entirely by the PHE, no additional support is needed.
- Easy maintenance – both sides of PHE fully accessible.
- All ammonia connections access the same side – easy installation
- Integrated oil drain
- Stainless steel – corrosion resistant and no need of surface treatment
- Available in left or right side configuration.

Ready to install

- Short delivery time due to standardization
- Fully functional module from one supplier
- Front plate gives easy access to primary/secondary connections
- CE-stamped and according to PED (Pressure Equipment Directive), or ASME based on Section VIII Div. 1 are available.
- CRN available on ASME models (Canadian Registration Number)

Opening a new chapter in evaporation

- Efficient separation – due to the use of four different separation methods
- Short vertical ammonia driving columns, allowing small temperature approaches and high system efficiency.
- Reduced hold-up/low charge, extremely low refrigerant charges
- Sliding support: allowing thermal expansion, ensuring no thermal tensions build up
- Significant oil pot volume in standard execution enough for manual drain
- Separation based on droplet size 0.15 mm
- Margin for separation is 25% plus one nominal diameter
- Maximum separation gas velocity is restricted to 60% of the re-entrainment velocity, avoiding liquid brought back to the gas flow
- Extra safety margin from 180° U-bend.

How to contact Alfa Laval
Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com.