ENGINEERING
TOMORROW

Application guidelines

Hybrid tandem
VSH with SH - R410A

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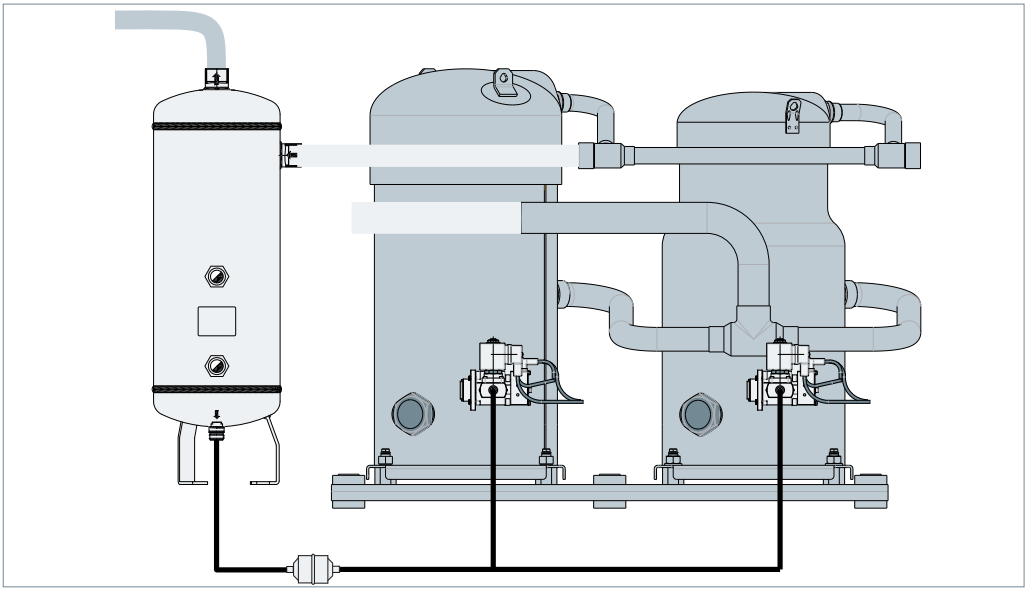
Introduction

Hybrid tandem is made of one variable speed compressor (Performer VSD - VSH series) in parallel with one fixed speed compressor (Performer - SH series).
Due to high mass flow variations generated by the variable speed compressor and dual compressor operation, an oil management system is necessary, to avoid compressors to run with non-sufficient oil level in the oil sumps. Instructions and Application Guidelines of each compressor series remain applicable, and associated recommendations must still be applied.



General recommendations

The recommendations in this document are for a high pressure oil management configuration system, where oil separator-reservoir and oil level regulators have to be installed.

Recommended oil separator-reservoirs are without internal floating ball, and regulators are built to work with high pressure.

System configuration and components (brands and models) described below have been qualified by Danfoss CC.

Any other solution must imperatively be approved by a Danfoss technical representative before implementation.

Unit piping design

The use of oil separator-reservoirs and oil regulators does not take away the need for good conception practices. This means great care must be taken regarding piping design, gas velocity inside all circuit parts, avoid oil traps, create U-traps and double rising pipes if necessary etc…

Components

Major system components selection, such as heat exchangers, is also very important. Exchangers circuiting, gas velocity inside the exchangers, oil traps, pressure drop throughout the exchangers are parameters with great influences on the system running conditions.

Approved hybrid tandem configurations and capacity range

Different configurations of hybrid tandems are possible:

Hybrid tandem		Minimum cooling capacity (kW)*	Maximum cooling capacity (kW)*
VSH model	SH model	VSH (30Hz)	VSH (90Hz) + SH (50Hz)
VSH088	SH120	12.3	71.2
VSH117	SH161	16.7	93.8
VSH117	SH184	16.7	99.7
VSH170	SH240	23.9	140.7

*ARI A/C, VSH operation from 30Hz to 90Hz, SH operation at 50Hz

Oil separator selection

Two specific oil separators have been selected to cover the needs of the above tandem configurations.

Technical drawings are available at the end of the document.

Product codes are listed below:

Tandem configuration	Oil separator reference
VSH088 + SH120	
VSH117 + SH161	103.0267P
VSH117 + SH184	
VSH170 + SH240	103.0268P

Oil separators must be ordered directly to the supplier Frigomec and not to Danfoss:

Frigomec S.p.A.
Via Massimo D'Antona, 5
37045 S. Pietro di Legnago (VR) Italy
Tel. +39.0442.629006 -
Fax. +39.0442.629091
Website : www.frigomec.com
email: frigomec@tin.it

To avoid refrigerant migration when the system is off, the oil separator should not be the coldest point of the system. If necessary, a belt heater can be installed, according to the location of the oil separator and eventual tests results.

Oil separator reference	Belt heater reference
103.0267P	120Z0055 (230V/40W)
	120Z0056 (400V/40W)
103.0268P	7773106 (230V/50W)

Oil regulator selection

Electronic oil level regulators are preferred because they can work with high pressure differential.

Teklab TK3 oil level regulators have been tested and approved for all described tandem configurations. They are mounted in place of the original compressor oil sight glass.

Product codes are shown below:

Product code	Description
TK3-1100010005055600	Oil level controller - Right version - with adapter 1"1/8 18UNEF
TK3-0100010005055600	Oil level controller - Left version - with adapter 1"1/8 18UNEF
TK3-00000010005055600	Oil level controller - Right version
TK3-10000010005055600	Oil level controller - Left version
TK3-A001000000000000	Adapter 1"1/8 18UNEF
TK3-CA03000000000000	Power valve cable 3m
TK3-CA06000000000000	Power valve cable 6m
TK3-CB03000000000000	Alarm relay cable 3m
TK3-CB06000000000000	Alarm relay cable 6m

Oil regulators must be ordered directly to the supplier Teklab, and not to Danfoss:

Teklab S.r.l.
Via Emilia Ovest, 1179
41123 Modena Italy
Tel. +39.059.375498
Fax +39.059.376294
Website: www.teklab.biz
email: info@teklab.biz

Oil quantity – Oil top up

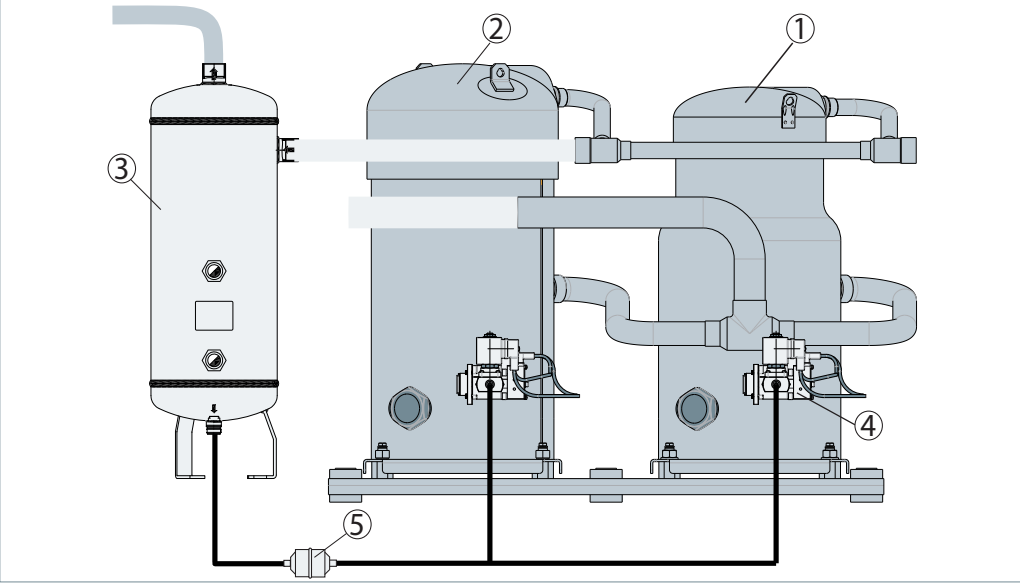
To ensure sufficient oil level in the compressors while running, other components of the system and mainly oil separator, must be pre-charged with oil.

Oil separator reference	Pre-charge oil volume
103.0267P	2 litres
103.0268P	4 litres

Following oils, available from Danfoss, can be used for top-up:

Code number	Description	Packaging	Pack size
7754023	1 litre can, POE lubricant, 160SZ	Multipack	12
7754024	2 litres can, POE lubricant, 160SZ	Multipack	8

Basic tandem construction recommandations



①: VSH compressor
②: SH compressor
③: Oil separator
④: Oil level regulator
⑤: Filter drier

The diameter of the oil distribution line must be large enough to allow the oil regulators to work properly. Recommended diameters are:
- 3/8" from oil separator to oil distribution header
- ¼" to feed the regulators from the header

A rotalock valve can be installed at the oil outlet of the separator. This valve can be purchased from Danfoss under the reference 8168027 (V01 valve, rotalock 1", 3/8" ODF, multipack of 6).

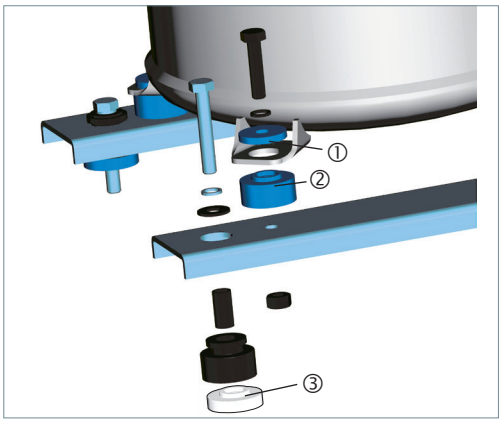
It is highly recommended to install a filter drier on the oil distribution line to avoid dirt and particles to block the proper operation of the regulators.
DML type filter driers from Danfoss can be used for this purpose.

Compressor/tandem mounting

A common base frame, rigid enough to support the weight of the compressors, must be used for installation.
Compressors must be assembled with 4 rigid spacers per compressor on the common base frame.
The common base frame must always be mounted on rubber grommets to reduce transmission of vibration to the floor.

It is recommended to install all control and safety devices on an independent frame from the compressors. These devices should be connected to the common frame using flexible tubing.
Suction and discharge lines must have adequate three-dimensional flexibility. For parallel systems, the simplest means of acquiring this is by the use of vibration absorbers.

Compressor mounting recommendations for VSH088/117 with SH120/161/184



① 4mm flat washer
② 14mm rigid spacer
③ 7mm rigid spacer

Supplied with the compressor
Included in kit 120Z0407
Included in kit 120Z0434
Not supplied

Mounting

To mount the compressor on the frame; use 8 pcs of 4 mm flat washers and 8 pcs of 14 mm rigid spacers from kit 120Z0407.

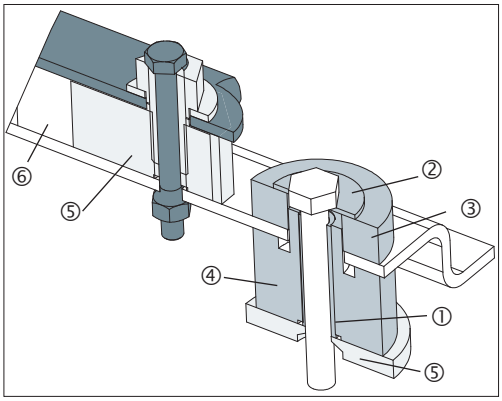
To mount the frame; use 8 grommets as supplied with the compressors and 8 pcs of 7 mm rigid spacers from kit 120Z0434.

Ordering

Tandem configuration	Kits code numbers to be ordered
VSH088 + SH120	120Z0407 + 120Z0434
VSH117 + SH161	
VSH117 + SH184	

Kit 120Z0407 contains 32 pcs of 4 mm flat washers and 32 pcs of 14 mm rigid spacers. Kit 120Z0434 contains 50 pcs of 7 mm rigid spacers.
These kits can be ordered from Danfoss.

Compressor mounting recommendations for VSH170 with SH240



① Grommet sleeve
② Flat washer
③ Rubber washers
④ Tandem grommet
⑤ & ⑥ Rigid spacers
⑦ Tandem rail

Included in kit 120Z0474
Included in kit 8156003
Supplied with the compressor
Not supplied

Mounting

SH240 compressors are delivered with rigid spacers, no need for 7777045.

VSH170 compressors are delivered with rubber grommets, to be replaced by rigid spacers from 120Z0474, available from Danfoss.

Ordering

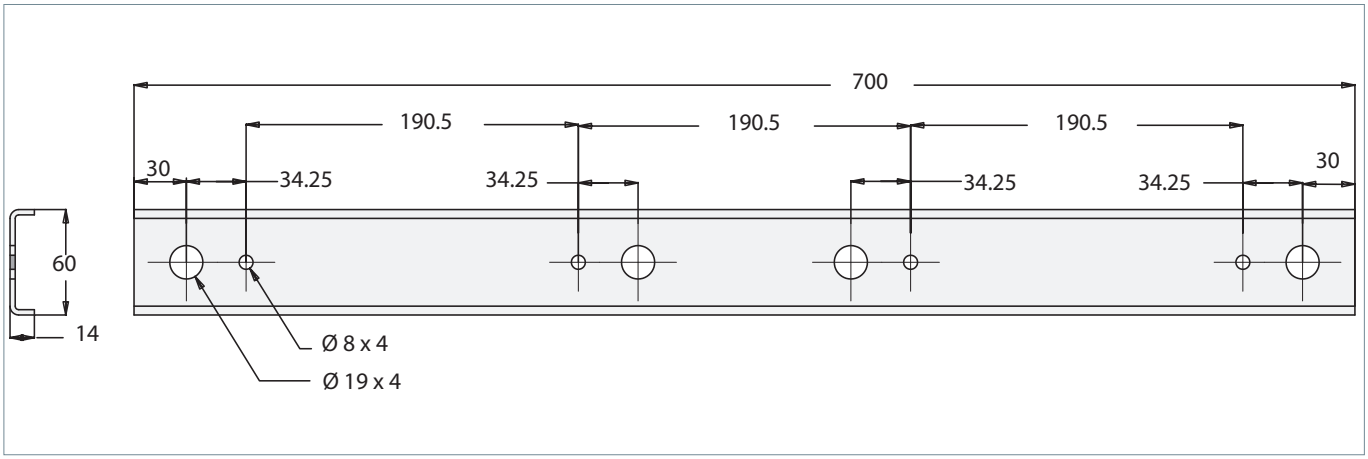
Tandem configuration	Kits code numbers to be ordered
VSH170 + SH240	8156003+7777045+120Z0474

8156003 is made of 4 pcs of rubber grommets, rubber washers and grommet sleeve.
7777045 is made of 4 pcs of complete rigid spacer.
120Z0474 is made of compressor rigid spacer and spacers to be placed below tandem grommets.
These kits can be ordered from Danfoss.

Tandem rail drawings

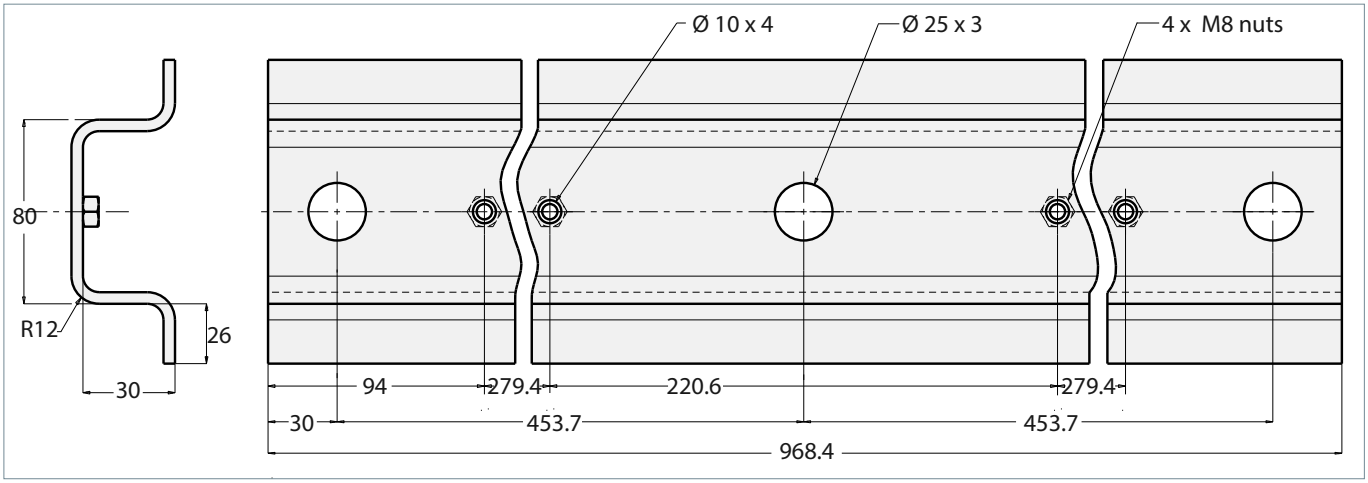
For tandem assemblies:

- VSH088 + SH120
- VSH117 + SH161
- VSH117 + SH184

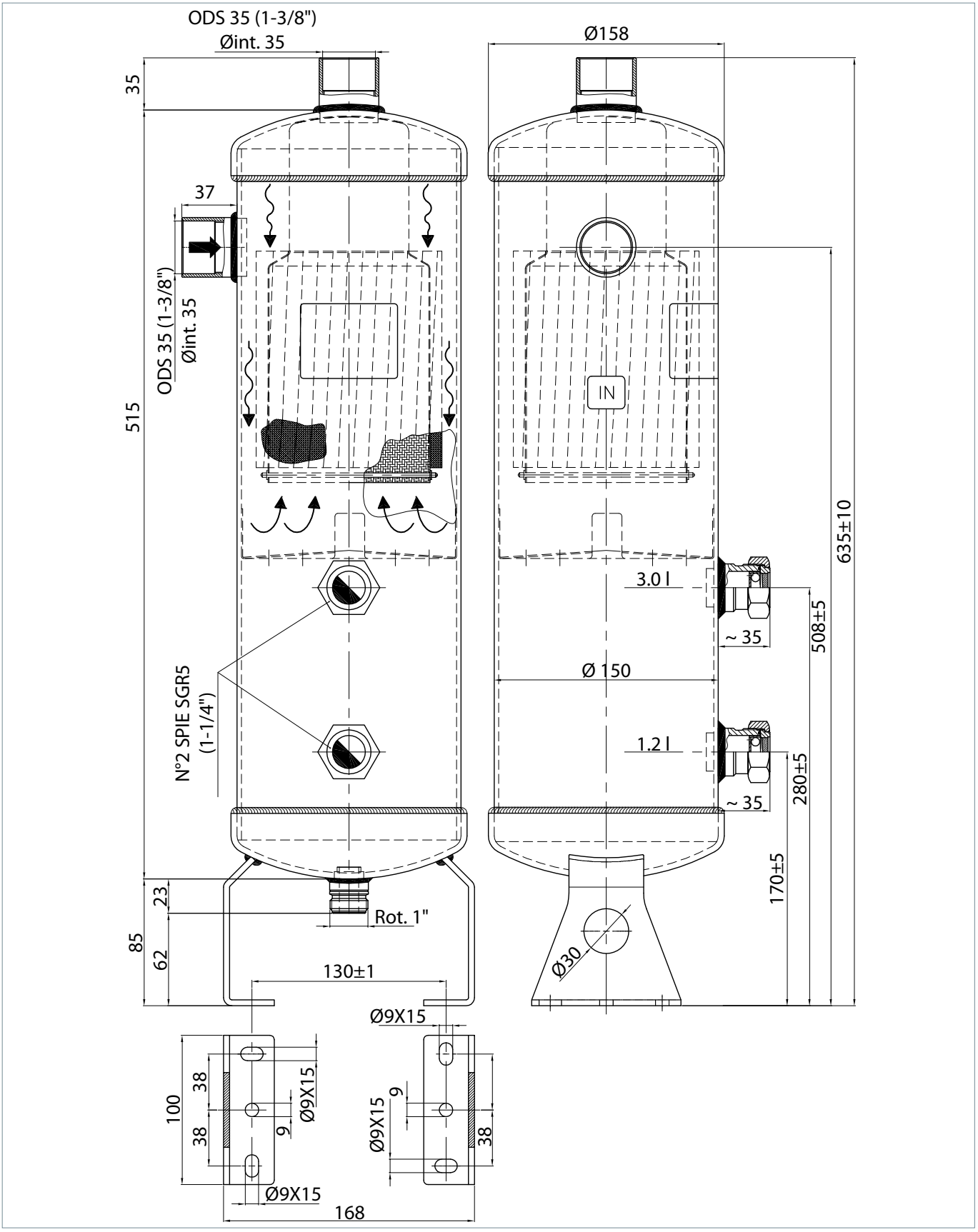


For tandem assembly :

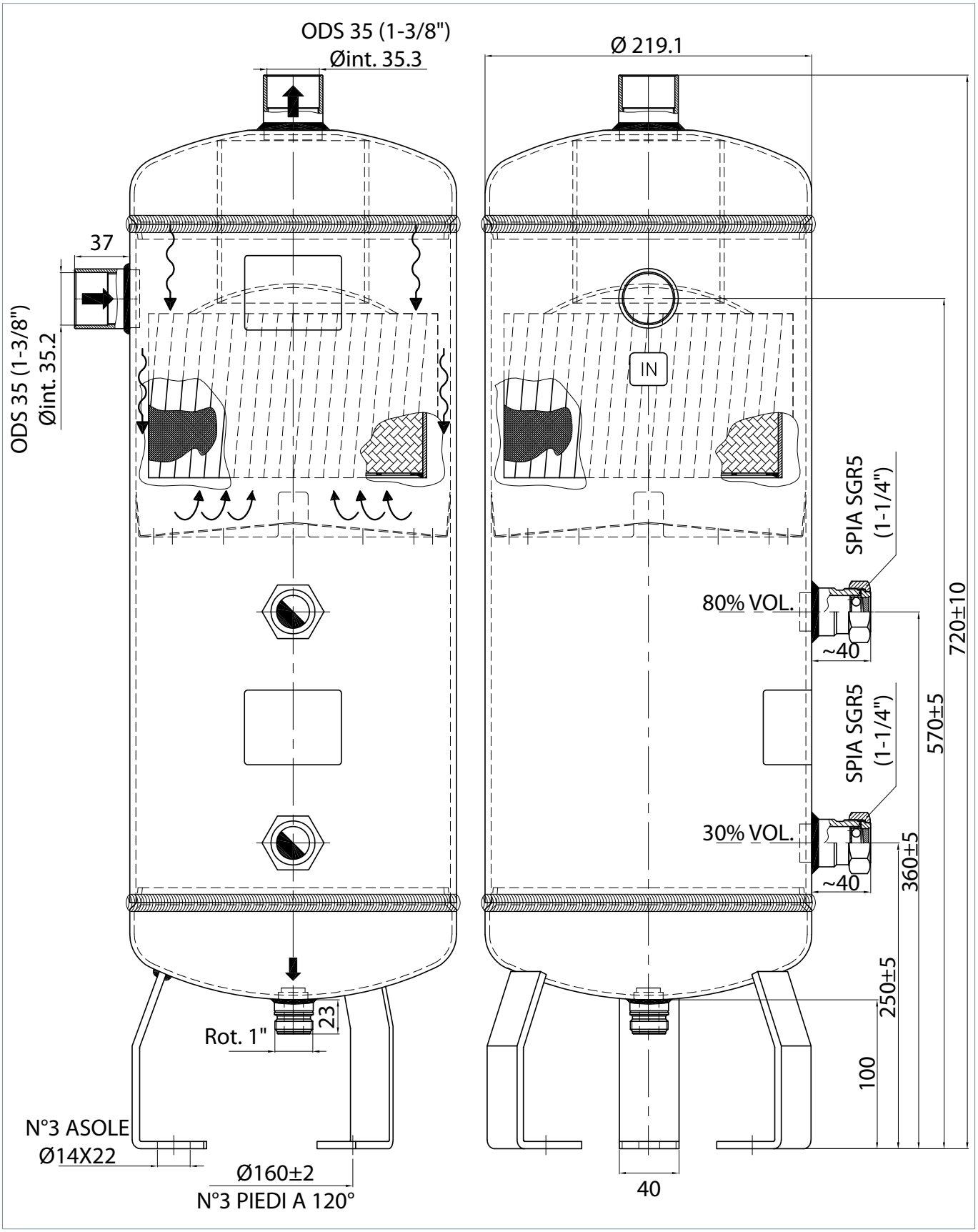
- VSH170 + SH240



Oil separator 103.0267.P



Oil separator 103.0268.P



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Danfoss Commercial Compressors

is a worldwide manufacturer of compressors and condensing units for refrigeration and HVAC applications. With a wide range of high quality and innovative products we help your company to find the best possible energy efficient solution that respects the environment and reduces total life cycle costs.

We have 40 years of experience within the development of hermetic compressors which has brought us amongst the global leaders in our business, and positioned us as distinct variable speed technology specialists. Today we operate from engineering and manufacturing facilities spread across three continents.

Danfoss Turbocor Compressors

Danfoss Inverter Scrolls

Danfoss Scrolls

Danfoss Optyma Condensing Units

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Our products can be found in a variety of applications such as rooftops, chillers, residential air conditioners, heatpumps, coldrooms, supermarkets, milk tank cooling and industrial cooling processes.

http://cc.danfoss.com

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