

BREATHERS VE Series

The best-selling traditional breather type, with hydraulic valve



AIR DEHYDRATING BREATHERS
for Power Transformers
Single body / hydraulic valve models
type VEP 01-29-49 and VE 50-80-100-150/F, flanged connection
and type TV75, VE 05 - 10 (thread connection) for Distrib Transf,

1. GENERAL INFORMATION

Air dehydrating breathers are transparent hollow cylinder tubes which contain chemically pure silicium salt (silicagel) with coloured indicator. The air breathed inside the transformer due to the thermal contraction of the oil mass, passes through the silicagel.

The silicagel absorbs the humidity, indicating the saturation degree by changing colour as follows:

ORANGE silicagel completely dry
 GREEN silicagel saturated with humidity

The salt contained in the breather, when saturated, may be easily removed and regenerated by heating it, inside a ventilated oven, at 120° - 150°C, until the colour becomes orange again.

The specific property of the silicagel is its high absorption power of humidity. This is total until the salt has absorbed water for about 15% of its weight, and saturation is reached when the salt has absorbed water for 30 to 40 % of its weight.

2. TECHNICAL FEATURES

The upper and lower parts are made in a non-porous corrosion-proof aluminium alloy casting. The hollow cylinder is made of Plexiglas (upon demand in glass) and it is protected by a stainless steel cylinder, with windows which allow the visual control of the silicagel colour.

In the bottom side of the breather, an hydraulic valve prevents continuous air contact with the silicagel and allows the air to pass in both direction (inlet or outlet) only when there is pressure deficiency or excess inside the transformer.

Pressure values for air passage into the dehumidifier are:

0.003 kg/cm² inlet , or 0.005 kg/cm² outlet

The hollow container and the hydraulic valve are separated by a drilled plate with a labyrinth system, which have the double purpose of diffusing inlet air uniformly, and of avoiding that any salt dust may damage the closing system.

3. DRAWINGS AND TECHNICAL DATA

A table on the drawings in the following pages shows, the general overall dimensions, the silicagel contained inside the cylinder, the max oil quantity, contained inside the transformer on which the breather must be installed, calculated for normal conditions, as below indicated, using the formula at paragraph 5:

Average air temperature	20°C
Average air humidity	60%
Average thermal cycle "Δ t "	20°C
Average duration of thermal cycle T	8 hours
Maintenance interval M	90 days

Different environment conditions of the site where the transformer is installed may influence the maintenance interval, when the choice of the size of the breather has been made.

4. PROTECTION OF OUTER SURFACES

Outer surfaces in aluminium painted with an epoxy primer coat and a finish paint suitable to resist to all weather conditions and ambient temperature between - 40°C and + 100°C. All the screws and nuts are in stainless steel.

5. CHOICE OF THE BREATHER SIZE (or of the maintenance interval)

The choice of the breather size (or maintenance interval) is directly related to the quantity of the breather silicagel contain. The mass of silicagel necessary for the proper functioning is given approximately by a function of 6 variable quantities, listed here following:

- Mass of oil "V" inside the transformer , denominated in dm³ or in litres.
- Average temperature of the air in the environment where the transformer is installed, denominated in °C
- Average Humidity of the air in the environment where the transformer is installed, denominated in %.
- Average thermal cycle "Δt" of the transformer, denominated in °C, to be calculated as difference between the minimum and the maximum temperatures reached by the oil inside the transformer within a time period.
- Average duration of thermal cycle "T" denominated in hours, to be calculated as the time interval between two thermal cycles.
- Maintenance interval "M" denominated in days.
- From the saturated steam table for water (see next pages), depending from the average temperature and humidity of the air, it is possible to calculate the quantity of water "A"(denominated in grams) for each m³ of air which enter inside the transformer.

Now, using the following formula, we are ready to calculate the quantity of silicagel (denominated in Kg) necessary for the proper functioning of the transformer:

$$\text{Mass of silicagel} = (127,056 \times 10^{-9} \times V \times \Delta t \times A \times M) : T \quad [\text{kg}]$$

It is important to note that the result of above formula is only a first approximation value, due to the simplification related to the average values considered as constant values for the duration of the thermal cycles between two following maintenance intervals

It is also evident that shortening the maintenance interval, the average conditions used in the formula simulate more exactly the true conditions of the transformer during its working life (i.e. the average temperature of the air for 30 days in January has a statistic scattering degree lower than the average temperature for 90 days in Dec/Jan/Feb); same comments must be done for humidity, thermal cycle duration and temperature

Only two data may be easily fixed without doubt: mass of oil inside the transformer and maintenance interval.

For a better understanding, we show here following three examples of the choice of quantity of silicagel necessary for the same transformer installed in three different places, but with the same thermal cycle and maintenance interval; the following conditions shall be the same in all the three cases:

- Average thermal cycle " Δt " 20 °C
- Average duration of thermal cycle T 8 hours
- Maintenance interval M 90 days
- Mass of oil V 10000 dm³

The mass of silicagel necessary for a good functioning of the transformer will be:

1° CASE: Transformer installed in normal European condition:

- Average air temperature 20 °C
- Average humidity 60%
- Silicagel mass 2,95 kg

Suggested size of the breather: size VEP 27/29

2° CASE: Transformer installed in tropical climate:

- Average air temperature 30 °C
- Average humidity 90%
- Silicagel mass 7,77 kg

Suggested size of the breather: size VE80-F

3° CASE: Transformer installed in desert condition:

- Average air temperature 35 °C
- Average humidity 40%
- Silicagel mass 4,50 kg

Suggested size of the breather: size VE50-F or VEP47/49 or VEL/VEP41

7. MANUFACTURING PROGRAM

We propose a full range of dehydrating breathers for *Power Transformers*, starting from 1 kg silicagel contain up to 15 kg; additionally, using dedicated modular unit, it is possible to assemble breathers in racks with high silicagel contain up to 45 kg, *see drg. 3482, 3536, 3537, 3632*.

All our models are identified with the letters 'VE' or 'VEP' followed by two figures which represent the size of each breather as indicated on the drawings, with a wide choice of silicagel contain, scaled in kg 1;3;5;8;10;15.

All these breathers can be connected to the tube coming from the conservator through a flanged connection (PN10); all models VEP have a special flange design which is suitable for fixation to a DIN 42567 flange with 3 holes and also to a DN25/PN10 standard flange; for threaded connections necessary to use adaptors, *see drg 3538*.

Starting from size VE50-F all the breathers are fitted with a side support which enable to make a bolted connection to a transformer wall or to a rack.

When there is a need of silicagel contain higher than kg 15, we propose a modular assy using multiple units of 5,8,10,15 kg silicagel contain each, as shown at page 5.50.B; the modular unit follow the same identification littering of the normal breathers adding the letter 'M' at the end

The dehydrating breathers, complete with salts are despatched in sealed packages in order to avoid alteration of the dry state of silicagel. Upon request, we supply also empty breathers with silicagel filling packed separately in hermetic bags, or even without filling, if the customer wants to manage silicagel separately from the breathers.

When they are mounted on the transformer, it is necessary to remove the protective plugs and pour mineral oil up to the mark on the jar.

For *Distribution Transformers* we propose the range of small breathers TV75/VE05 and VE10 which are available only with thread entry connection, *see drg 3535*.

8. ORDER INSTRUCTIONS

As said, the identification of a model start with two letters VE followed by two figures which identify the size of the breather and the letter M for the modular unit.

Few example, to make it completely clear:

- VEP 29 Breather with 3 kg silicagel contain
 - VE150-F Breather with 15 kg silicagel contain
 - VE100M-F Modular unit with 10 kg silicagel contain
- Special instruction must be indicated separately.

9. SATURATED STEAM TABLE FOR WATER

Showing the mass of water, in gram (10^{-3} kg), contained in one cubic meter of air (related to the air temperature and the air humidity).

°C	AIR TEMPERATURE				AIR HUMIDITY [%]					
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0	0.49	0.98	1.47	1.96	2.45	2.94	3.43	3.92	4.40	4.90
5	0.68	1.36	2.04	2.72	3.40	4.08	4.76	5.44	6.10	6.80
10	0.94	1.87	2.82	3.76	4.70	5.64	6.58	7.52	8.50	9.40
15	1.28	2.56	3.84	5.12	6.40	7.68	8.96	10.20	11.50	12.80
20	1.72	3.44	5.16	6.88	8.60	10.30	12.00	13.80	15.50	17.20
25	2.29	4.58	6.87	9.16	11.45	13.70	16.00	18.30	20.60	22.90
30	3.02	6.04	9.05	12.10	15.10	18.10	21.10	24.10	27.20	30.20
35	3.94	7.88	11.80	15.80	19.70	23.60	27.60	31.50	35.40	39.40
40	5.08	10.20	15.30	20.40	25.40	30.50	35.60	40.70	45.80	50.90
50	8.27	16.50	24.80	33.10	41.40	49.60	57.80	66.20	74.40	82.70
60	13.00	26.00	39.00	52.00	65.00	78.00	91.00	104.00	117.00	130.00

Manufacturing program

Type <i>drq 3482</i>	Silicagel contain in kg	Tube	Fixing Flange	Transformer oil	
				in kg	in dm3
VEP 01	1,00	PMMA	DN25/PN10	3500	4000
VEP 07		Glass			
VEP 29	3,00	PMMA	or DIN 42562	10000	12000
VEP 27		Glass			
VEP 49	5,00	PMMA	(3 holes)	18000	20000
VEP 47		Glass			

<i>drq 3536</i>					
VE 50-F STD	5,00	PMMA	DN40/PN10	18000	20000
VE 50-F TVT		Glass			
VE 80-F STD	8,00	PMMA	<i>(upon demand)</i>	28000	32500
VE 80-F TVT		Glass			
VE 100-F STD	10,00	PMMA	<i>DN25/PN10</i>	36000	40000
VE 100-F TVT		Glass			
VE 150-F STD	15,00	PMMA	<i>also available)</i>	56000	65000
VE 150-F TVT		Glass			

10. AIR DEHYDRATING BREATHER TYPE TV75 - VE05 – VE10 (*drq 3535*)

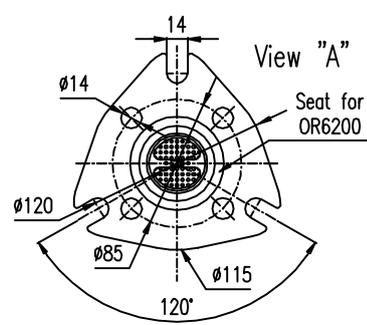
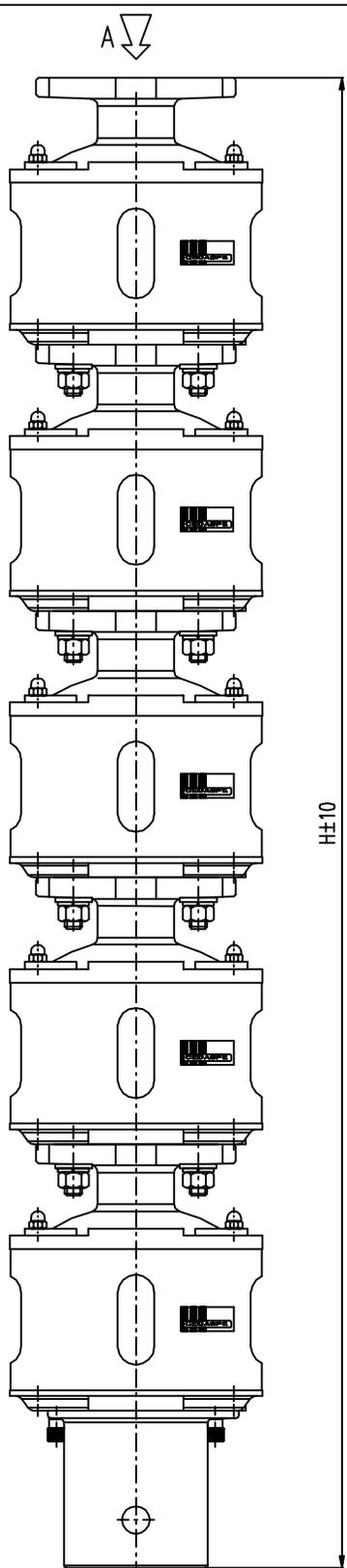
They are small sized dehydrating breathers, particularly fit for assembling on small distribution transformers

The type VE05 follows the same manufacturing principles of the bigger sizes like the type VE10.

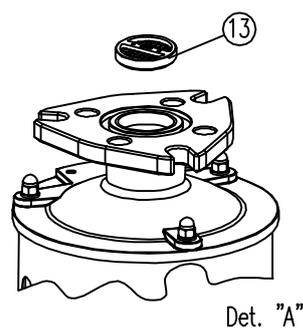
The type TV75 (or TV74) is the cheapest model of our breathers: its top flange is made in corrosion proof aluminium alloy.

The silicagel housing is made of cellulose triacetate (cellidor by Bayer), suitable for mineral oil; only upon request, this breather can be fitted with a stainless steel cylindrical protection.

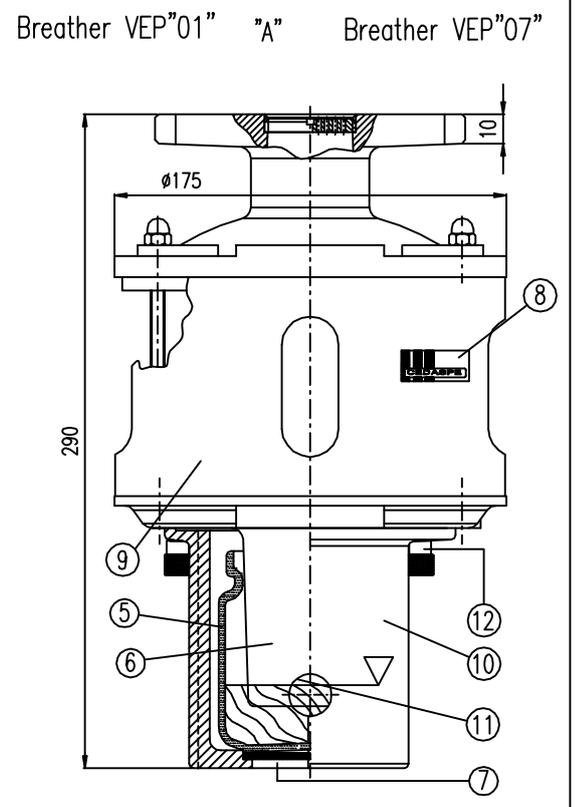
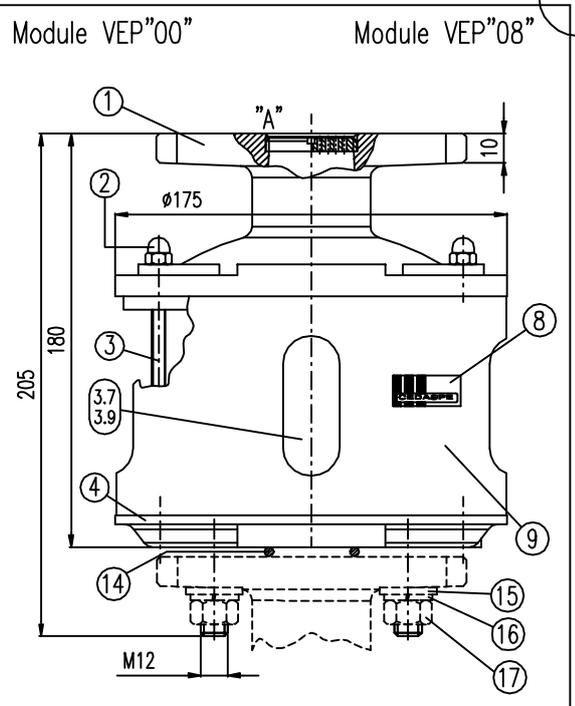
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 A4 (210x297)
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Double fixation:
 - DN25/PN10 4 holes flange
 or
 - DIN42562 3 holes flange



Pos.	Description
1	Top cap
2	Domed nuts M6 DIN1587
3	M6 rod
3.7	Gel container (glass)
3.9	Gel container (PMMA)
4	Bottom cap
5	Oil cup (transparent glass)
6	Fishing out cylider
7	Drain hole
8	Data plate
9	Stainless steel frame
10	Oil cup protection
11	Inspection window
12	knurled ferrule
13	Filter plug
14	OR6200
15	Stainless steel washer M12 DIN125
16	Spring washer M12 DIN127
17	Stainless steel nuts M12 DIN934



Breather with PMMA tube assembly Type					
	VEP'01	VEP'11	VEP'21	VEP'31	VEP'41
VEP'00	/	1	2	3	4
VEP'01	1	1	1	1	1
H(mm)	290	470	650	830	1010
G.W. Empty(Kg)	3.5	7	10.5	14	17.5
Silicagel Q.ty	1Kg	2Kg	3Kg	4Kg	5Kg
Vol.	1.35dm ³	2.7dm ³	4.05dm ³	5.4dm ³	6.75dm ³
"DIN" SIZE	1	2	3	4	5

Breather with glass tube assembly Type					
	VEP'07	VEP'18	VEP'28	VEP'38	VEP'48
VEP'08	/	1	2	3	4
VEP'07	1	1	1	1	1
H(mm)	290	470	650	830	1010
G.W. Empty(Kg)	3.5	7	10.5	14	17.5
Silicagel Q.ty	1Kg	2Kg	3Kg	4Kg	5Kg
Vol.	1.35dm ³	2.7dm ³	4.05dm ³	5.4dm ³	6.75dm ³
"DIN" SIZE	1	2	3	4	5

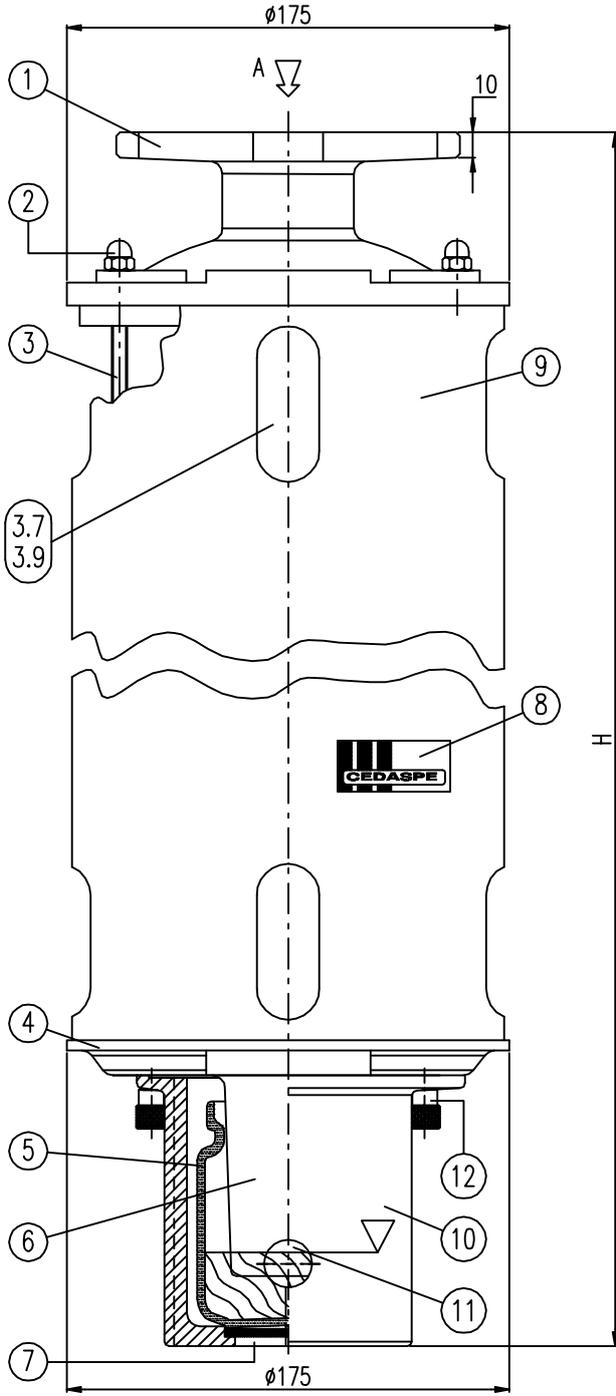
Scale 1:5



Titolo **Modular Breathers**
 assembly "VEP" series
 (PMMA/glass tube & S/S frame)

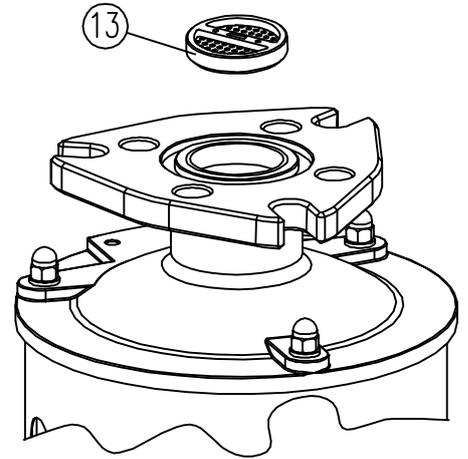
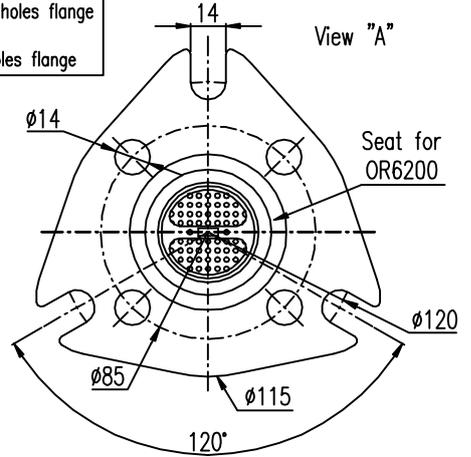
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Dis. Nr
3481
 1 2 3 4



Pos.	Description
1	Top cap
2	Domed nuts M6 DIN1587
3	M6 rod
3.7	Gel container (Glass)
3.9	Gel container (PMMA)
4	Bottom cap
5	Oil cup (transparent glass)
6	Fishing out cylinder
7	Drain hole
8	Data plate
9	Stainless steel frame
10	Oil cup protection
11	Inspection window
12	knurled ferrule
13	Filter plug

Double fixation:
 - DN25/PN10 4 holes flange
 or
 - DIN42562 3 holes flange



▽ Oil level

Type	Transf. oil (Kg)	H (mm)	Gel container material	G.W. Empty (Kg)	Silicagel Q.ty	Vol.
VEP "01"	3500	290	PMMA	3.5	1 Kg	1.35 dm ³
VEP "07"			Glass			
VEP "29"	10000	495	PMMA	5.5	3 Kg	4.05 dm ³
VEP "27"			Glass			
VEP "49"	18000	685	PMMA	7.5	5 Kg	6.75 dm ³
VEP "47"			Glass			

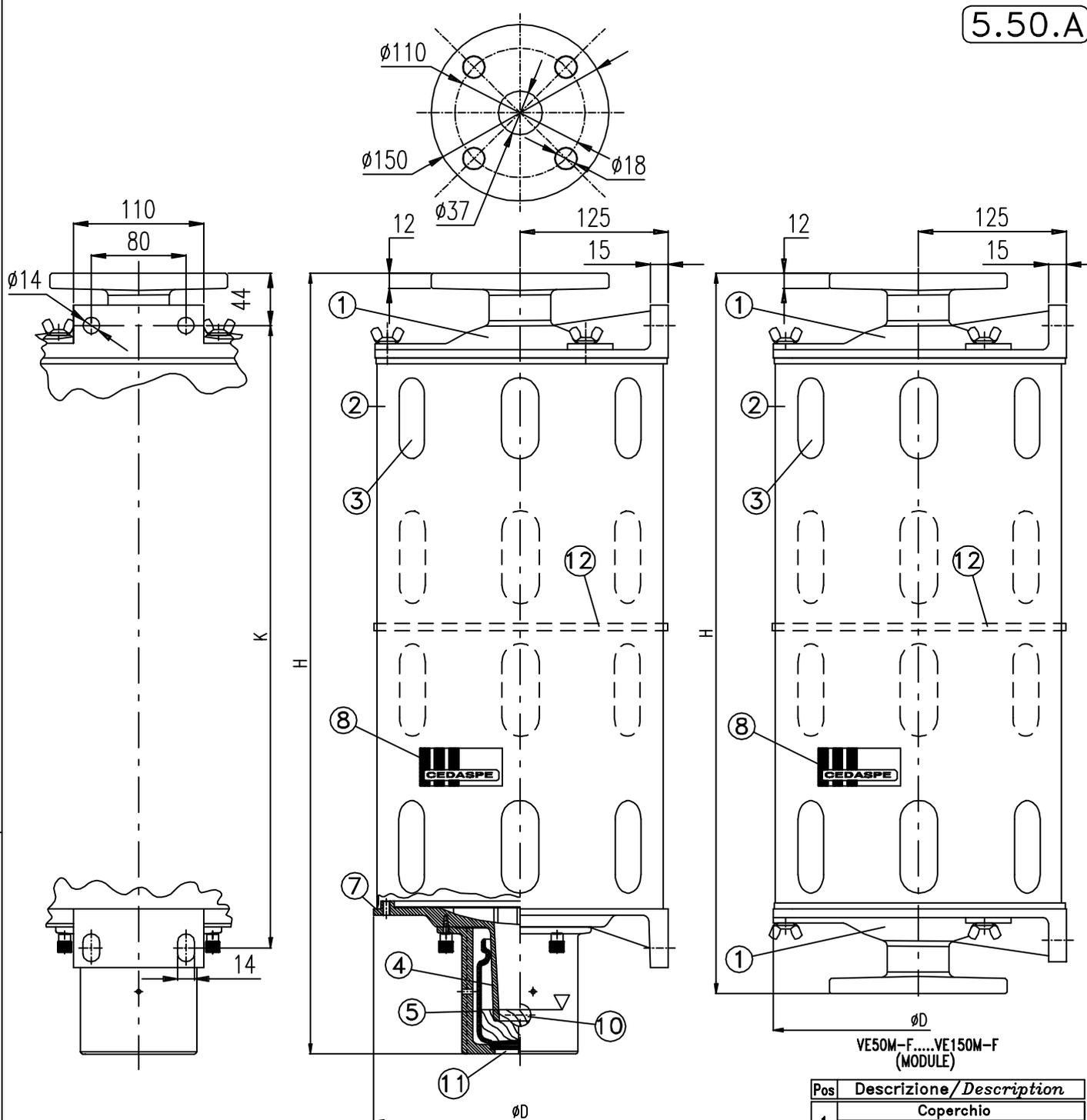


Titolo
Traditional single Breathers
 new "VEP" series

Data 19/05/11
 Scala 1:3
 Dis.
 Visto

Dis. Nr
3482
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 REV 02 DTD 20/10/17
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▽ Livello olio
Oil level

CEDASPE CODE ROOT	Tipo Type	Olio nel trasformatore Transformer oil	H	D	K	G.W. Empty (Kg)	Silicagel	
							Q. ty kg	Vol. dm ³
AEE050.....	VE50-F	18000 Kg	456 mm	247 mm	320 mm	7	5,00	6,70
	VE50M-F		410 mm					
AEE080.....	VE80-F	28000 Kg	546 mm	247 mm	410 mm	7,5	8,00	10,70
	VE80M-F		505 mm					
AEE100.....	VE100-F	36000 Kg	712 mm	247 mm	578 mm	9	10,00	13,50
	VE100M-F		670 mm					
AEE150.....	VE150-F	56000 Kg	900 mm	247 mm	760 mm	10	15,00	21,00
	VE150M-F		854 mm					

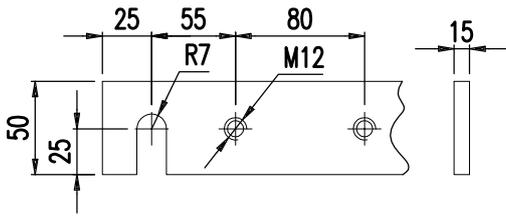
Pos	Descrizione/Description
1	Coperchio Top cap
2	Protezione acciaio inox Stainless steel housing
3	Contenitore trasparente di sali Gel container (transparent)
4	Pescante Fishing out cylinder
5	Coppa olio (vetro trasparente) Oil cup (transparent glass)
7	Coperchio inferiore Bottom cap
8	Targhetta d'identificazione Data plate
9	Scarico condensa Drain hole
10	Spia olio Oil window
11	Presca d'aria Air intake
12	Flangia intermedia Frame (VE100/150)

Scala 1:5 Dim. in mm Ex PAG.5.50.A

	Titolo		Data 27/09/11		Dis. Nr	
	Dehydrating breathers for power transformers New model VE50.....150-F		Scala 1:1		3536	
			Dis.			
			Visto		1 2	

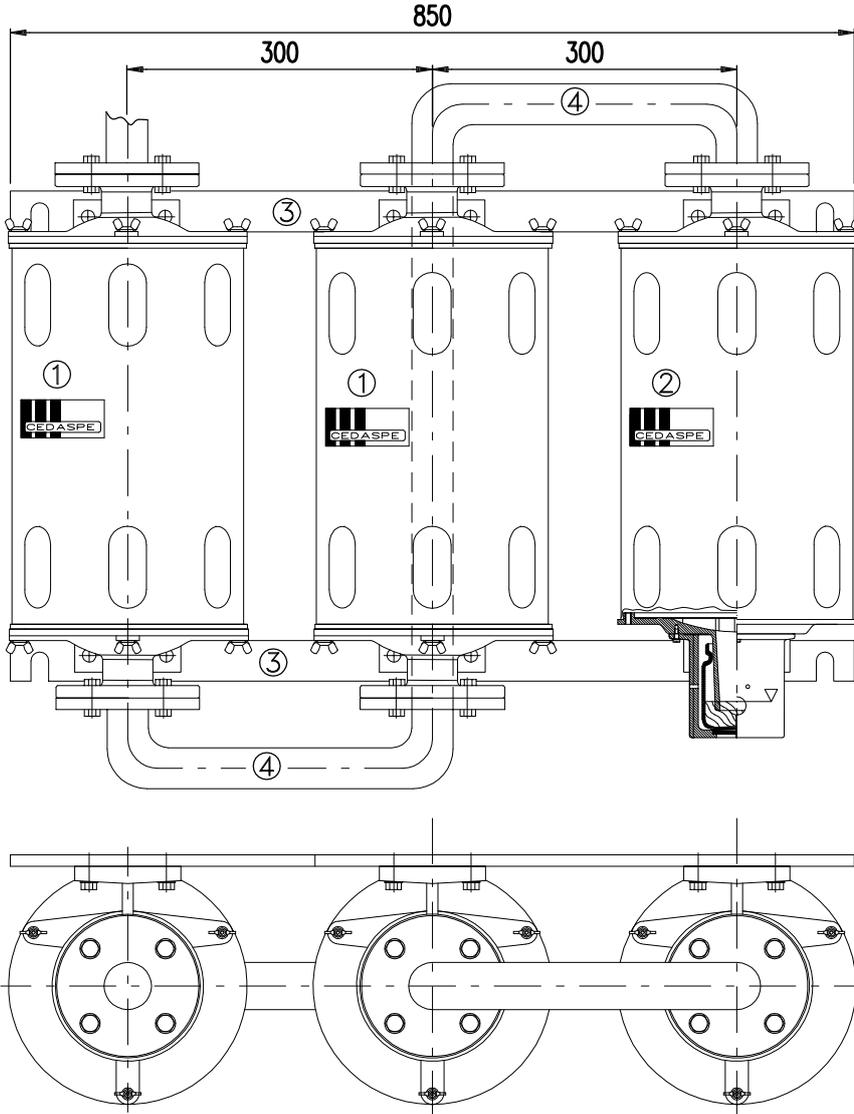
Fig. A1

– **Montaggio orizzontale**
– **Horizontal assembly**



Fixing Kit for vertical assembly

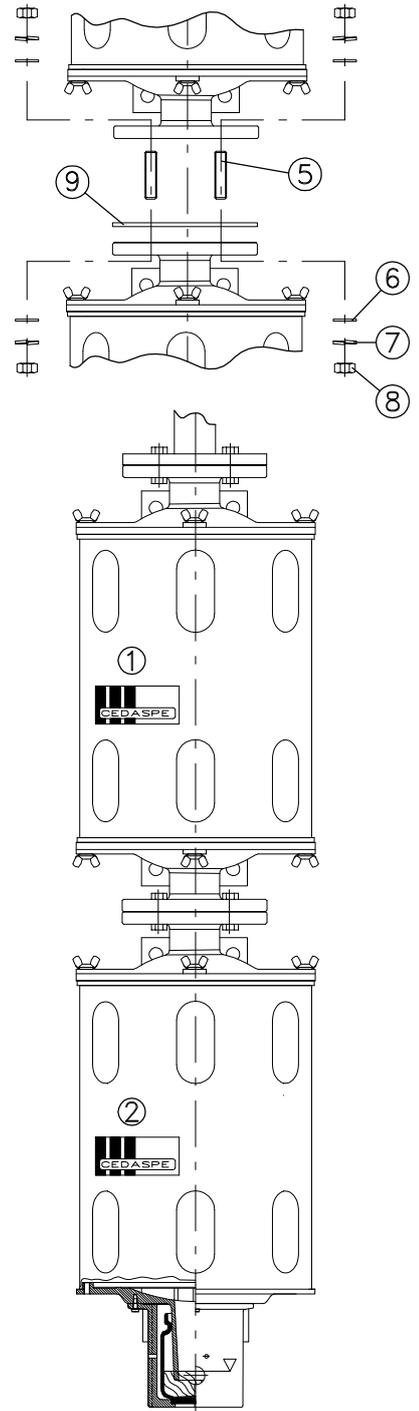
Pos.	Description	Q.ty
5	Stainless steel stud M12x50	4
6	Stainless steel washer M12 DIN125	8
7	Spring washer M12 DIN127	8
8	Stainless steel nuts M12 DIN934	8
9	Flange gasket	1



5.50.B

Fig. B1

– **Montaggio verticale**
– **Vertical assembly**



1	Breather module	VE50M-F	pag 5.49
		VE80M-F	pag 5.49
		VE100M-F	pag 5.49
		VE150M-F	pag 5.49
2	Breather	VE50-F	pag 5.47
		VE80-F	pag 5.47
		VE100-F	pag 5.48
		VE150-F	pag 5.48
3	Holder	Not supplied	
4	Connecting pipe	Not supplied	

1	Modulo essiccatore	VE50M-F	pag 5.49
		VE80M-F	pag 5.49
		VE100M-F	pag 5.49
		VE150M-F	pag 5.49
2	Essiccatore	VE50-F	pag 5.47
		VE80-F	pag 5.47
		VE100-F	pag 5.48
		VE150-F	pag 5.48
3	Supporto	Non fornito	
4	Tubo collegamento	Non fornito	

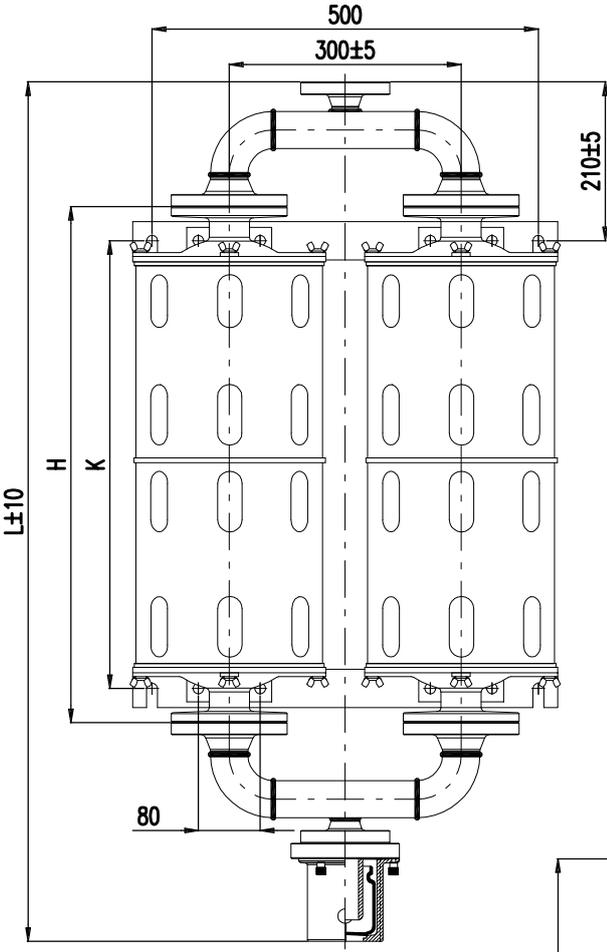
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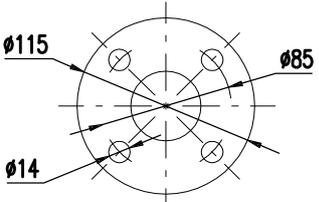
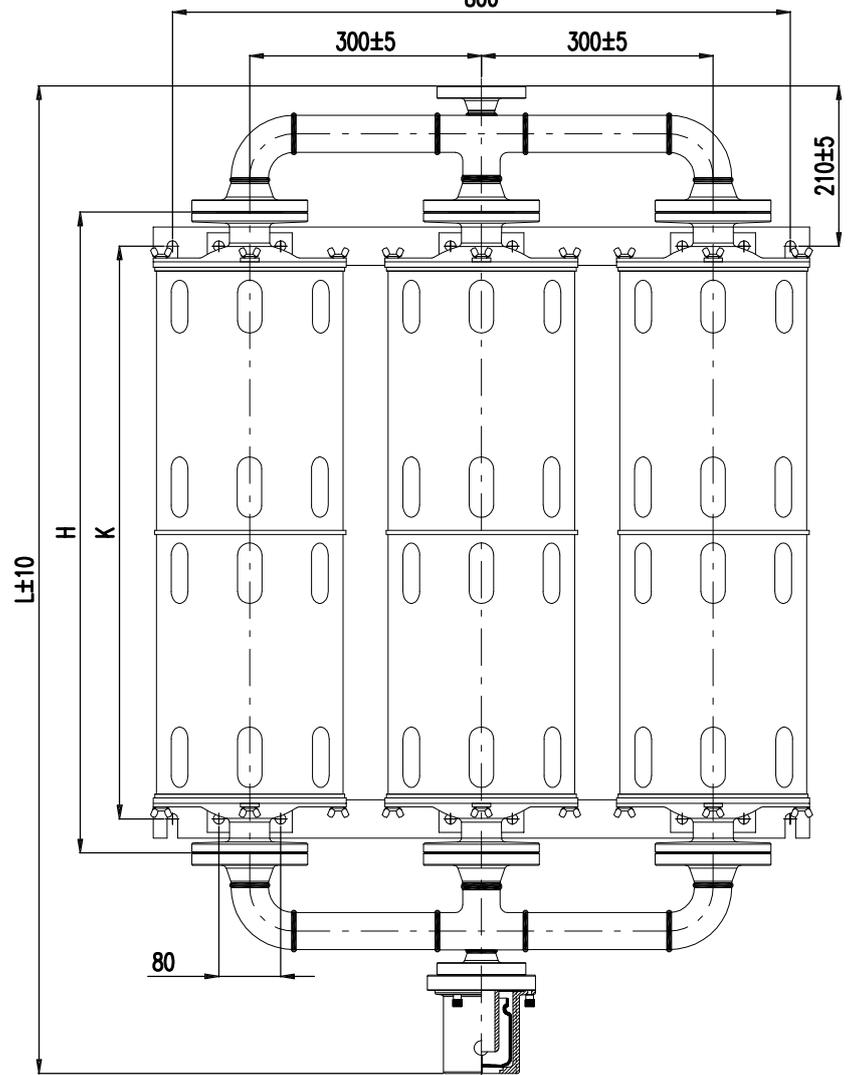
Titolo
Example of multiple assembly of dehydrating breathers

Data **27/09/11**
Scala **1:8**
Dis.
Visto

Dis. Nr
3537



3	VE450 (3 x VE150-M)	1310	747	853	45 Kg
2	VE300 (2 x VE150-M)	1310	747	853	30 Kg
1	VE200 (2 x VE100-M)	1130	567	673	20 Kg
Pos.	Breather	L	K	H	Q.ty of Silicagel



View "A"
Scale 1:2

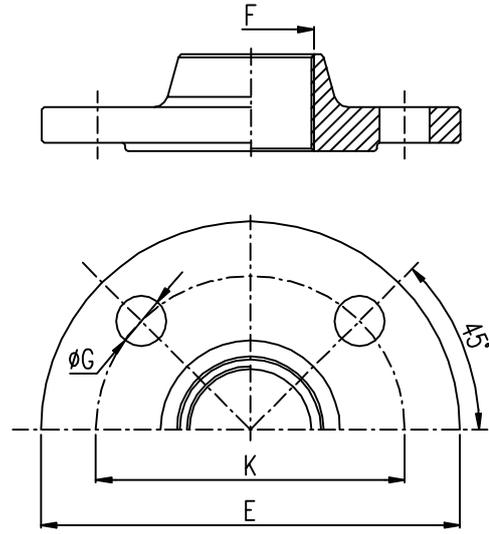
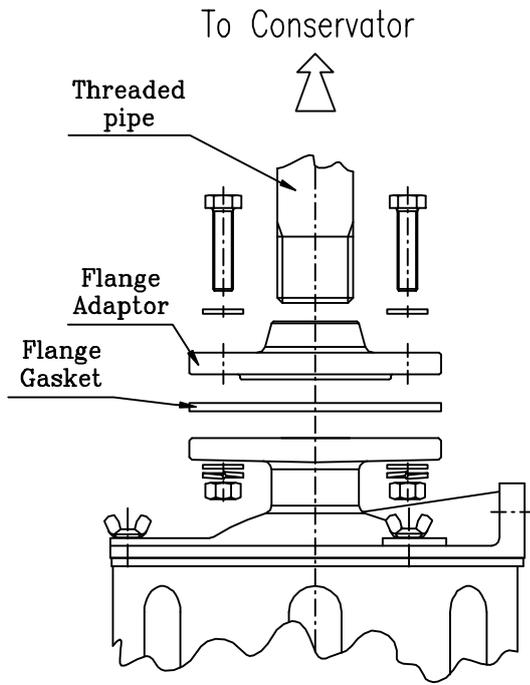


Titolo
**Multiple assembly
breathers VE Series**

Data **22/05/12**
Scala **1:10**
Dis.
Visto

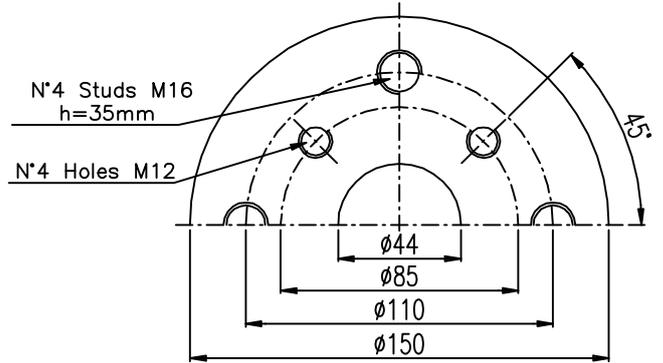
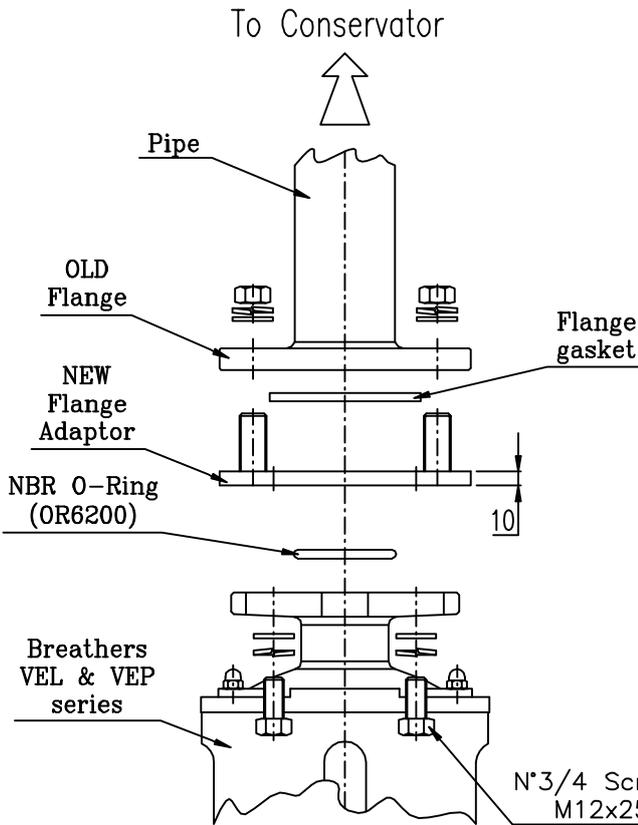
Dis. Nr
3632

5.50.C

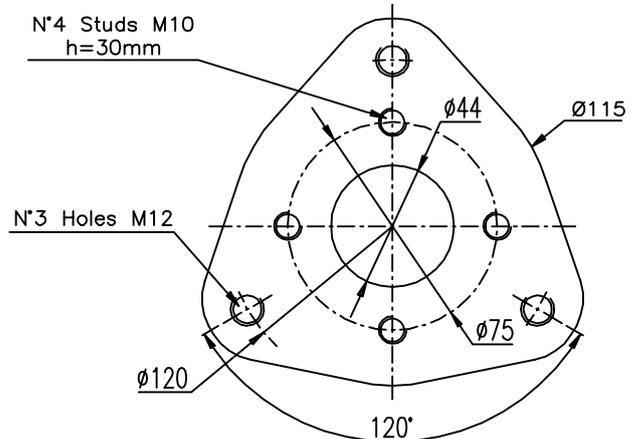


3	115	85	1"1/2 G	14	VEP27-29-47-49	VE30/VE4-EL	Flange adaptor to 1"1/2 BSP pipe	9CE04DBF015
2	115	85	1"G	14	VEP01 ÷ VEP07	VE10	Flange adaptor to 1" BSP pipe	9CE04DBF007
1	150	110	1"1/2 G	18	VE50 ÷ VE150	VE50...150-A1	Flange adaptor to 1"1/2 BSP pipe	9CE04DBF012
Pos.	E	K	F	øG	For breathers	Old breathers	Note	Code

Pos. 4 For breathers VEP27-29-47-49
Flange adaptor DN25 to DN40/PN10 (Ex VE30/VE4-EL)
Code: 9CE04DBF014



Pos. 5 For breathers VEP01 ÷ VEP07
Flange adaptor to DN25/PN6 (Ex VE10)
Code: 9CE04DBF013



Titolo
Special flange adaptor
for breathers

Data 30/09/11
Scala ==
Dis.
Visto

Dis. Nr
3538
1 2 3 4