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Carbon Tower

CAT100 – CAT1000 User Guide



ENGINEERING YOUR SUCCESS.

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General information

Manufacturer's details

Name and address



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Lancaster, NY 14086
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www.parker.com/igfg

Details on the adsorber

Standard equipment

Adsorber, comprising

- 1 single-chamber hollow section vessel, filled with purifying agent

Associated documents

- Operating instructions (present)
- Technical documentation (see annex)
- Operating manual for installed filters (separate document)

Notes on supplementary documents

Supplementary documents such as operating manuals for options or pertaining components must always be heeded. They contain additional information, e.g. regarding maintenance, and are therefore necessary for safe operation of the plant.

About these operating instructions

These operating instructions contain basic information on the safe use of the adsorber.

Characters and symbols used

- ▶ Work steps that you have to carry out in the sequence stated are marked by black triangles.
- Lists are marked by a small box.

Note:

These notes provide you with hints and information on the safe and efficient handling of machines and devices.



Warning!

These safety notes warn against damage to property and help you to avoid such damage.



Danger!

These danger notes with a grey background warn against personal injury and/or danger to life and limb; danger notes help you to avoid serious or life-threatening situations for yourself and/or third parties.

Target group of these operating instructions

These operating instructions are intended for all persons working on and using the adsorber.

Operating instructions: handling

These operating instructions must be continuously available at the site where the adsorber is used. We recommend to prepare a copy and to keep the same in a safe and freely accessible place next to the adsorber. Keep the original document in a safe place.

For your own safety

The adsorber has been built in accordance with the state of the art and the recognized technical safety regulations. Nevertheless, there is a risk of personal injury and damage to property when the adsorber is used, if

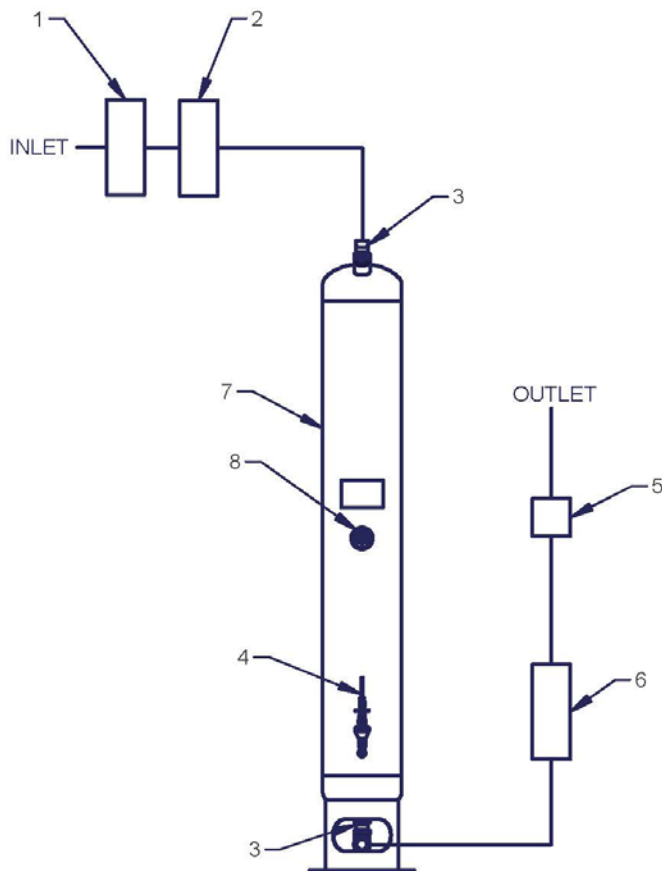
- it is operated by non-qualified personnel,
- not used within its intended design specifications,
- is repaired or maintained incorrectly.

Note:

For your own safety and to prevent machine damage, please note the information and safety notes in these operating instructions when working with the adsorber.



Signs and hazard areas on the adsorber

Signs and labels



Column	Column 2
1	COARSE INLET FILTER
2	FINE INLET FILTER
3	SCREEN NIPPLE
4	OIL INDICATOR
5	OVERPRESSURE DEVICE
6	OUTLET FILTER
7	CARBON TOWER TANK
8	PRESSURE GAUGE

Hazard areas on the adsorber

Hazard area	Symbol in operating instructions
<p>Warning against overpressure</p> <p>The entire adsorber is under fully. Before commencing any work, the adsorber vessel must be depressurized.</p>	
<p>Risk of damage to eyes</p> <p>If not properly secured, the indicator tube might be propelled out of its holder!</p> <p>When the needle valve is opened, the indicator tube is secured by a union nut. If the union nut is not properly tightened, or if the oil indicator has been interfered with, there is a risk that the tube might be propelled by the air flow so that it is shot out of its holder.</p> <p>When working at the oil indicator, always wear protective goggles.</p>	

Intended use of the adsorber

The adsorber is exclusively intended for purifying compressed air. Depending on the defined input conditions, it purifies compressed air for industrial use.

The adsorber is designed for compressed air, which is free from water, oil, and solid matter constituents.

As supplied, the adsorber is intended to be placed within a building and protected against the weather.

The adsorber must be operated only in accordance with the data on the serial plate and in accordance with the contractual conditions.

Suspected misuse

The adsorber must not be misused as a climbing aid! Pipes, valves, and similar fittings have not been designed for such loads. They could fracture, tear off, or become damaged in another way.

General safety notes



For your own safety, when carrying out any work on the adsorber comply with all applicable national safety regulations!

Personnel qualification

Only authorized and qualified specialist personnel may be tasked with the work on the adsorber described in these operating instructions.

Conversions and modifications

Without prior approval by the manufacturer, no conversion or modification shall be made to the adsorber! Any non-approved modification may restrict the operational safety of the adsorber and cause damage to property or personal injury.

Handling of purifying agents

The purifying agents used do not pose any risk to health. However, when filling and emptying the vessel, increased dust generation may occur. Please comply with the following instructions:

- When handling purifying agents, always wear a dust mask and eye protection!

Safety notes on specific operating phases

Transportation and siting

- During transportation all applicable national regulations for accident prevention must be complied with.
- Only use suitable and technically perfect lifting gear with a sufficient carrying capacity.
- Carefully secure the adsorber during transportation.

Start-up



Hazard due to a sudden release of pressure!

Never remove any parts of the adsorber, or manipulate the same in any way, for as long as the adsorber is still pressurized! A sudden escape of pressure may cause serious injuries.

Before carrying out any work on the adsorber, first fully depressurize the adsorber tank.

- Carry out all prescribed tests and checks.
- Before start-up, ensure that no tools or other foreign parts have been left lying in a part of the adsorber where they might pose a hazard to the adsorber being started up.

Emergency shutdown

- In the event of an emergency, immediately close and fully depressurize the respective system section. (see also chapter *Depressurizing and shutting down the adsorber*, page 22).

Monitor operation

- Only operate the adsorber within the permissible limits (see serial plate). By operating the adsorber in conditions that go beyond the defined values, the adsorber is subjected to loads for which it has not been designed. This may cause functional deficiency, catastrophic damage to adsorber, damage to property, or personal injury.
- Check the adsorber regularly for externally visible damage and defects.
- In the event of an emergency, immediately close and fully depressurize the respective system section. (see also chapter *Depressurizing and shutting down the adsorber*, page 22). The unit may only be restarted after all defects have been eliminated.

Maintenance of the adsorber and fault removal



Hazard due to a sudden release of pressure!

Never remove any parts of the adsorber, or manipulate the same in any way, for as long as the adsorber is still pressurized! A sudden escape of pressure may cause serious injuries.

Before carrying out any work on the adsorber, first fully depressurize the adsorber tank.

- Carry out maintenance work only when the tank has been fully depressurized.
- Bolted connections must be undone with care.
- Following maintenance work always test all flange and bolted connections for leaks.
- Only use replacement parts that are suitable for the relevant function and meet the technical requirements stipulated by the manufacturer.

Disassembly and disposal



Hazard due to a sudden release of pressure!

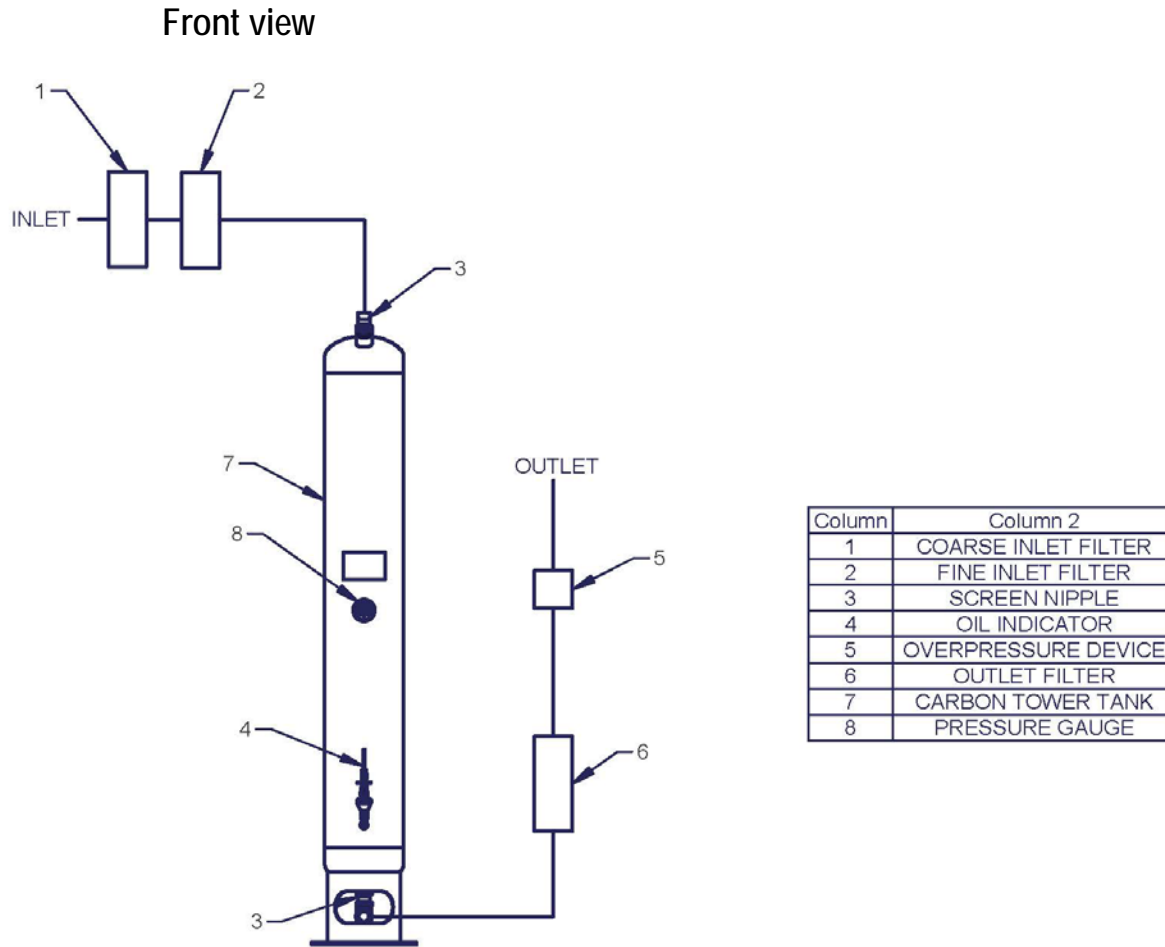
Never remove any parts of the adsorber, or manipulate the same in any way, for as long as the adsorber is still pressurized! A sudden escape of pressure may cause serious injuries.

Before carrying out any work on the adsorber, first fully depressurize the adsorber tank.

- Dispose all parts of the adsorber, the purifying agents and all other operating materials in an environmentally safe way and in accordance with all current statutory regulations.

Technical product description

Summary drawing



Function description

The pre-dried compressed air is fed into the adsorber, where oil vapor and other contaminants are removed from the compressed air, which is then made available for industrial use.

Before the compressed air is fed into the adsorber, it flows through upstream filters where dust and dirt as well as oil and water droplets are removed. The installed upstream filters therefore help extend the service life of the purifying agent.

The installed downstream filters clean the compressed air from purifying agent dusting before it is fed into the compressed air system.

Transportation, installation and storage

What to do in the case of transport damage occurring?

- ▶ Check whether only the packaging or the adsorber itself were damaged.
- ▶ Inform the hauler immediately in writing of any damages.
- ▶ Contact the manufacturer urgently in order to report the damage.



Warning!

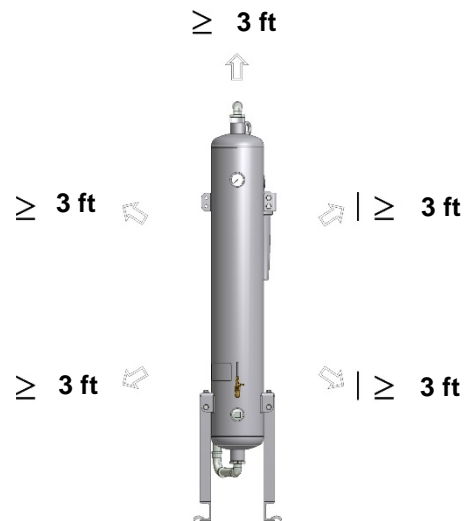
A damaged adsorber must not be taken into operation! Damaged components may lead to functional faults and possibly cause further damage.

Transporting and installing the adsorber

Requirements for the installation site

The conditions at the installation site have a large influence on the functional capacity of the adsorber and the service life of the activated carbon. In order to ensure a long life, and low maintenance, the installation site must meet the following requirements:

- The installation site must be located within a building to protect the adsorber against moisture.
- The ambient temperature must not drop below +35°F.
- The installation area must be level and firm. It must have the necessary carrying capacity for the weight of the adsorber. The weight of the adsorber is specified in the technical data section of the annex.
- The adsorber should be installed with sufficient spacing at the top, sides and rear, in order to be able to carry out maintenance work.



Necessary spacing at the top and sides = min. 3 ft

If in doubt, the installation site must be inspected by specialists. If you have any queries in this regard, please contact the manufacturer.

Transportation using lifting or forklift trucks



Warning against damage to property!

The adsorber may be delivered lying on its side on a transportation pallet.

Do not place any load onto the top face. Do not stack.

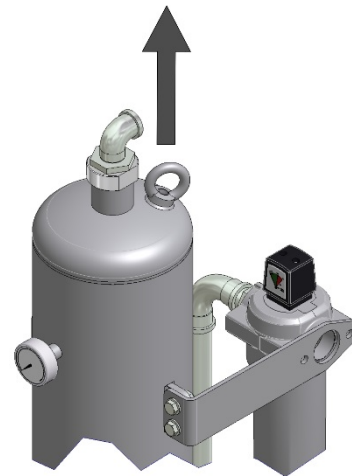
Always transport the adsorber on a lifting or forklift truck.

- ▶ Secure the adsorber on the lifting or forklift truck against sliding movements.
- ▶ Transport the adsorber to its installation site.

Installing and anchoring

Installing by crane

- ▶ Remove the packaging from the adsorber.
- ▶ Attach suitable lifting gear to the tank lifting lug.



Transport lugs on pressure vessel

- ▶ Place adsorber in an upright position, and position it at its installation site (see figure).

Anchoring the adsorber

- ▶ Use suitable attachment material to anchor the adsorber to the floor.
- ▶ In the case of vibrating floors: place the adsorber on suitable vibration dampers.

Storing the adsorber

If the adsorber is to be stored for an extended period of time, the storage location must meet the following conditions:

- The adsorber must not be stored in the open air.
- The storage room must be dry.
- The storage room must be free from dust or the adsorber must be covered by a protective sheet.
- The storage room must have an ambient temperature of at least 33°F.

In order to store the adsorber proceed as follows:

- ▶ Take adsorber out of operation as described on page 22.
- ▶ Ensure that the compressed air inlet valve installed by the owner, and the compressed air outlet valve installed by the owner, are both closed, and that the adsorber is fully depressurized.
- ▶ Disconnect adsorber from the compressed air system.
- ▶ Plug the inlet and the outlet of the adsorber to protect against any possible contamination.
- ▶ If possible cover adsorber with a protective sheet.

The adsorber can now be stored for long periods.

Note:

If you wish to place the adsorber back into service after an extended period of storage, please proceed as described for its first commissioning and start-up (see page 20).

Storing Activated Carbon

- ▶ Do not store A.C. in the open air.
- ▶ Protect A.C. against humidity.
- ▶ Keep the A.C. in its original packaging or a suitable sealed container or vessel.

Installation

For a correct installation the following preconditions must be met.

- Connections and lines for the infeed and outfeed of compressed air must be provided.
- The compressed air must be pre-dried before it reaches the adsorber. If the input air is not sufficiently dry, a suitable upstream filter equipped with an automatic condensate trap must be installed. The upstream filter must have a separation efficiency of $0.01\mu\text{m}$ (according to a residual oil content of 0.01 mg/m^3) Class 1.
- A compressed air inlet valve and a compressed air outlet valve as well as a relief valve must be installed by the owner, so that the adsorber can be installed and maintained in a depressurized condition (see also the installation example on page 17).
- All pipes, couplings, and connections must have the correct diameter and match the operating pressure.



Hazard caused by exceeding the limit values!

A safety device must be installed in order to protect against over pressurization.

The safety device must be installed so that the adsorber is reliably protected from over pressurization even when the temperature of the compressed gas increases.

The data required to meet these preconditions are contained in the technical documentation attached in the annex.



Warning!

If the above preconditions are not complied with, a safe operation of the adsorber cannot be assured. Also, the functionality of the adsorber may be detrimentally affected, catastrophic damage to adsorber, damage to property, or personal injury may occur.

Connect piping

In order to ensure that the adsorber operates optimally, the adsorber must be assembled into the compressed air system free of all stresses.

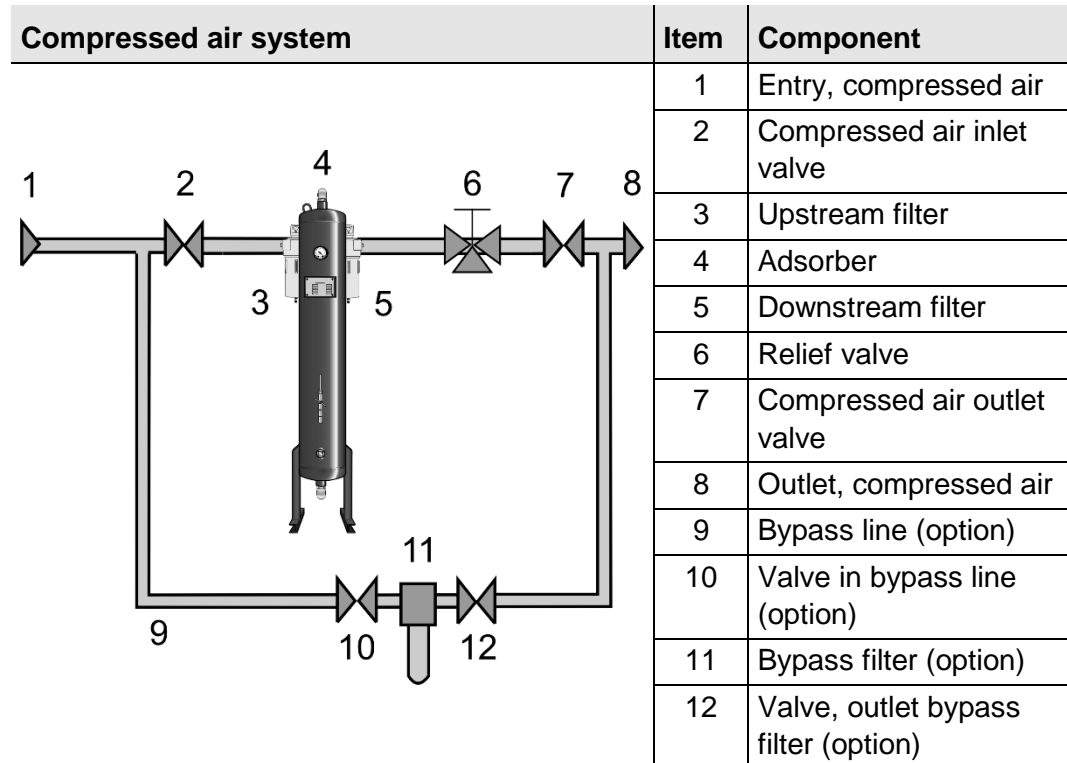
- ▶ Ensure before connection that all infeed and outfeed compressed air lines and valves are clean and undamaged.
- ▶ Check the bolt connections and retighten if necessary, as they could have worked loose during transportation.
- ▶ Remove plugs on the pressure inlet and outlet.



All external piping must be supported!
Pipes subject to stress may burst due to the load placed on them during operation. This may cause damage to property and personal injury.

- ▶ Use steel pipes to connect the adsorber to the compressed air system.

The following figure shows an installation example.



Example of an installation with bypass line

- ▶ The feed lines are to be installed at a slight incline in the direction of the adsorber.
- ▶ One shutoff valve each (2, 7) is to be installed at the compressed air inlet and outlet ends of the adsorber.
- ▶ A relief valve (6) is to be installed after the adsorber.
- ▶ If you fit a bypass line (9) with additional shutdown valve:
 - Fit the line such that, when carrying out maintenance work on the adsorber, the air system can continue to be supplied with compressed air.

Start-up

- Carry out all prescribed tests and checks.
- Before start-up, ensure that no tools or other foreign parts have been left lying in a part of the adsorber where they might pose a hazard to the adsorber being started up.

Requirements for initial start-up

For the first start-up the following preconditions must have been met:

- The pipe system is free from
 - scale
 - rust
 - other contaminants.
- All shutoff valves
 - of the compressed air inlet and outlet valves installed by the owner
 - of the relief valve installed by the owner
 - in the bypass line (if available) are closed.
- The adsorber is correctly situated and installed.

Checks before start-up

Ensure that

- all piping and bolted connections on the adsorber have been retightened,
- no pipes rub against body edges,
- all mountings are secure,
- the needle valve of the oil indicator is closed,
- owner-end and pressurized parts such as safety valves or other devices are not blocked by dirt or paint,
- all compressed air system parts which are pressurized (valves, hoses etc.) are free from wear and defects.

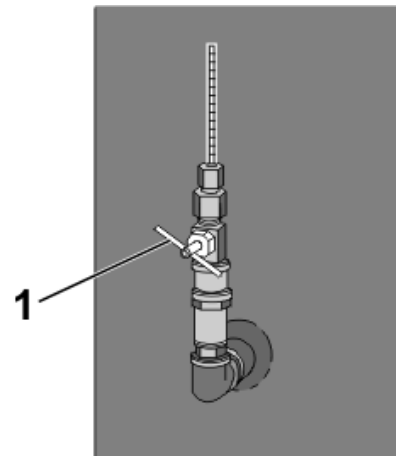
Overview of operating and control elements

Oil indicator

The adsorber is equipped with an oil indicator. The indicator allows for periodic measuring of the residual oil concentration in the purified compressed air.

The residual oil content should only be measured at set intervals, and the needle valve (1) at the indicator should be closed during normal operation.

For detailed instructions on the measuring procedure for residual oil, please refer to the respective section in the maintenance instructions, page 26.



Oil indicator

Emergency shutdown

In the event of an emergency, shut down the adsorber as described in section *Depressurizing and shutting down the adsorber*, on page 22.

Start up adsorber



Hazard due to a sudden release of pressure!

Never remove any parts of the adsorber, or manipulate the same in any way, for as long as the plant is still pressurized! A sudden escape of pressure may cause serious injuries.

Before carrying out any work on the adsorber, first fully depressurize the adsorber tank.

- Only operate the adsorber within the permissible limits. By operating the adsorber in conditions for which it has not been designed, functional faults may be caused, catastrophic damage to adsorber, damage to property, or personal injury may occur.
- In the event of an emergency or if a safety-relevant disruption occurs (e.g. escaping compressed air, defective component) immediately close and fully depressurize the respective system section. The unit may only be restarted after all defects have been eliminated.

Open compressed air supply

For start-up, please proceed in the sequence shown here.

- ▶ Ensure that the compressed air inlet and outlet valves and also the relief valve installed by the owner are closed (see installation example on page 17).
- ▶ Ensure that the compressed air system upstream of the adsorber is pressurized. If necessary, pressurize (switch on compressor).



Slowly open compressed air inlet valve!

Avoid sudden pressure build-up in any circumstance! If pressure builds up too fast, this may cause damage to the adsorber. Therefore, the compressed air inlet valve must always be opened slowly!

- ▶ Slowly open the compressed air inlet valve, installed by the owner, upstream of the adsorber.

Open compressed air outlet line



Slowly open compressed air outlet valve!

Avoid a sudden drop in pressure in any circumstance! If pressure drops too fast, this may cause damage to the adsorber. Therefore, the compressed air outlet valve must always be opened slowly!

- ▶ Slowly open the compressed air outlet valve installed by the owner. Observe the vessel pressure gauge. The pressure should not drop below the operating pressure (if poss.). If necessary, keep the compressed air outlet valve in a slightly open position until the compressed air system downstream of the adsorber has filled up completely; only then should the valve be opened fully.

In the event of a fault

In the event of an emergency or if a safety-relevant disruption occurs (e.g. escaping compressed air, defective component), immediately close and fully depressurize the respective system section. Then proceed as follows:

- ▶ Look up possible cause of the fault, and how to remedy the same, in the table on page 32.
- ▶ Remedy fault.
- ▶ Repeat the start-up procedure.

Monitoring adsorber operation

The adsorber operates fully automatically. However, you should carry out the regular checks described in the chapter *Maintenance and repair of the adsorber*.

The adsorber works by collecting vaporous contaminants and causing them to adhere to the surface of the activated carbon. Activated carbon life is determined by the amount of contaminants being brought into the vessel in the air stream and by the required purity of the air stream leaving. Adsorbent life can be extended by insuring the vessel has a correctly sized coalescing filter on the inlet side. Higher inlet concentrations reduce life and lower inlet concentrations increase life. A higher tolerance for hydrocarbon level leaving the vessel equates to longer adsorbent life.

Shutdown and restart adsorber

In the following cases, the adsorber must be fully shut down and depressurized:

- In the event of an emergency or malfunction
- For maintenance work
- For dismantling



Risk of injury from escaping compressed air!

Never remove any parts of the adsorber, or manipulate the same in any way, as long as the unit is pressurized! Suddenly escaping compressed air might cause serious injuries.

Prior to any work, release all pressure from the unit.

Depressurizing and shutting down the adsorber

Close compressed air feed line

- ▶ Close the compressed air inlet valve installed by the owner.

Disconnect adsorber from compressed air system

- ▶ Close the compressed air outlet valve installed by the owner.
- ▶ If available, open bypass line.

Depressurize adsorber

- ▶ Open relief valve installed by the owner.
- ▶ Check the depressurization: adsorber is depressurized when the pressure gauge indicates “0 psi”.

Restart

- ▶ Commission adsorber as described on page 20.

After the activated carbon has been replaced

The newly filled activated carbon contains minute dust particles that can block the downstream filter or other components. We recommend to complete the following steps before you restart the adsorber, in order to protect your equipment:

- ▶ Open relief valve (installed by the owner) downstream of the adsorber, or
- ▶ Remove the housing base and the filter element from the downstream filter.
- ▶ Ensure that the compressed air outlet valve (installed by the owner) is closed.



Wear eye protection and dust mask due to increased dust generation!

Blowing out might lead to increased generation of dust.

In order to avoid any eye irritations, wear protective goggles!

In order to avoid any dust inhalation, wear dust mask!

Restart the adsorber:

- ▶ Pressurize the adsorber as described in section *Open compressed air supply*, page 20.

Check that

- compressed air outlet valve (installed by the owner) is closed, and
- relief valve is open, or
- if there is a downstream filter, its housing is open and element removed.

Then proceed as follows:

- ▶ Operate the adsorber for approx. thirty minutes, blowing the dust particles off from the relief valve or, if available, from the downstream filter.

Then again fully depressurize the adsorber:

- ▶ Close the compressed air inlet valve installed by the owner.

Then close blow-out point and commission the adsorber:

- ▶ Close relief valve installed by the owner, or
- ▶ Reassemble the downstream filter and commission the adsorber (see the operating manual of the filter for the reassembly).
- ▶ Pressurize the adsorber as described in section *Open compressed air supply*, page 20.
- ▶ Check that the vessel and, if available, the downstream filter are leak tight.

Maintenance and repair of the adsorber

In order to allow maintenance work on the adsorber to be carried out efficiently and without danger for maintenance personnel, you should comply with the following instructions.

Notes on maintenance



Warning!

Maintenance tasks may be carried out only by authorized and qualified personnel, and only with the adsorber is in a fully depressurized condition.

Note:

When exchange or replacement parts are ordered, always state the adsorber type and the serial no. of the adsorber. These data are found on the type plate of the adsorber.

- Carry out all maintenance work only when the adsorber has been shut down and fully depressurized!
- Bolted connections must be undone with care!
- Following maintenance work, always check all flange and bolted connections for leakage and secure seating.
- Never leave tools, loose parts or cloths at or on the adsorber.
- Only use replacement parts that are suitable for the relevant function and meet the technical requirements stipulated by the manufacturer.

Regular maintenance intervals

Note:

If a vessel has been depressurized and the pressure remains above 0 psi, the vessel is pressurized by what is known as ram pressure.

The table provides an overview of the maintenance work to be carried out. The following pages describe some of these tasks. Maintenance work requiring the adsorber to be largely disassembled is not described. We recommend to have this work performed by authorized personnel.

Component	Maintenance task to be carried out	Maintenance interval				
		daily	monthly	6 months	12 months	See page
Complete adsorber	Carry out visual and function checks.	●				26
Oil indicator	Measure the residual oil content and the residual capacity of the activated carbon.		●			26
Activated carbon	Replace after maximum 12 months. If the feed compressed air is humid, the maintenance interval is reduced to 6 months.			(●)	●	32
Downstream filters	Please see the enclosed operating instructions for the attached filters. Maintenance work has to be carried out as specified in this document					

When carrying out any maintenance work, comply with the following safety instructions:



Danger!

There is a very considerable risk of personal injury, when carrying out work on the pressurized adsorber.

Before commencing any maintenance tasks always shut down the adsorber as described on page 22, *Depressurizing and shutting down the adsorber!*

Daily maintenance tasks

Carry out visual and function check on the complete adsorber

- ▶ Check adsorber for external damage or unusual noise generation.
- ▶ Eliminate any defects found.

Clean adsorber

- ▶ Remove any loose dust by means of a dry cloth, and, if required, also by means of a moist and well wrung cloth.
- ▶ Clean the surfaces with a moist well wrung cloth.

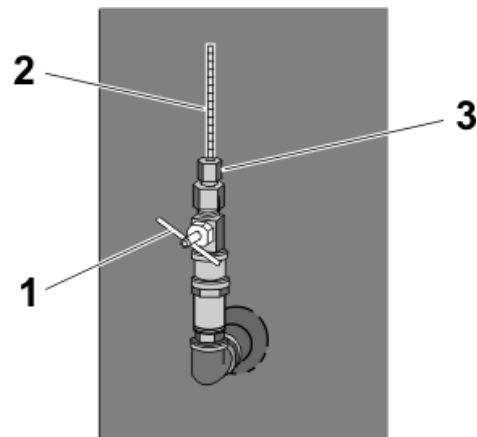
Monthly maintenance tasks

Measuring of residual oil content

The adsorber is equipped with an oil indicator. The indicator allows for periodic measuring of the residual oil concentration in the purified air.

It is recommended to measure the residual oil content every month, using the oil indicator; this allows the operator to determine the absolute residual oil content in the air and the available capacity of the activated carbon.

The measuring principle is as follows: For the duration of the measurement, the needle valve (1) is opened so that a pressure-reduced partial flow of purified compressed air is fed through the indicator tube (2). The indicator tube is secured by means of a union nut (3).



Oil indicator

Any residual oil contained in the air leads to a change of color of the scale segments of the tube, whereby a higher concentration leads to more segments being colored. The change of color is irreversible; after completion of the measurement, the indicator tube must be replaced. It is therefore useful to close the needle valve between measurements.

To measure the residual oil concentration, proceed as described below. A template of the measuring log used for this procedure is included in the appendix.



Risk of damage to eyes! If not properly secured, the indicator tube might be propelled out of its holder!

When the needle valve is opened, the indicator tube is secured by a union nut.

- if the union nut is not properly tightened, or
- if the oil indicator has been interfered with,

There is a risk that the tube might be propelled by the air flow so that it is shot out of its holder.

When working at the oil indicator, always wear protective goggles.

Prior to opening the needle valve, check that the union nut at the indicator tube is properly tightened.

Measuring procedure

- ▶ Prepare measuring log.
- ▶ Check union nut holding the indicator tube and retighten, if necessary.
- ▶ At the indicator tube, mark the highest segment with a color change, using a suitable pen.
- ▶ Open needle valve by turning its handle counterclockwise. Write down start date and time of the measurement.
- ▶ Leave needle valve open for the desired duration of measurement (e.g. 5 hours).
- ▶ Subsequently, close the needle valve. Write down end time of measurement.
- ▶ At the indicator tube, mark the highest segment with a color change, using a suitable pen. Write down the number of scale segments that have changed color since the start of the measurement.

Evaluation of measurement: determining the absolute residual oil content

To evaluate the test results, please refer to the table below:

Duration [h]	Number of first-ever colored scale units							
	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6
4	0.58	1.15	1.70	2.25	2.80	3.40	3.95	4.40
4.5	0.55	0.95	1.45	1.90	2.45	2.85	3.55	3.95
5	0.45	0.86	1.35	1.79	2.25	2.70	3.20	3.65
5.5	0.43	0.81	1.17	1.65	2.00	2.40	2.85	3.35
6	0.40	0.78	1.15	1.45	1.79	2.25	2.60	2.85
6.5	0.35	0.72	1.12	1.35	1.70	2.20	2.35	2.75
7	0.32	0.62	0.95	1.17	1.60	1.90	2.25	2.58
8.5	0.27	0.58	0.87	1.15	1.20	1.55	1.85	2.10
10	0.22	0.45	0.65	0.95	1.15	1.35	1.55	1.85
12.5	0.18	0.37	0.57	0.70	0.85	1.08	1.25	1.45
16.5	0.13	0.27	0.45	0.57	0.65	0.80	0.90	1.08
25	0.09	0.18	0.30	0.38	0.45	0.60	0.65	0.75
33	0.07	0.12	0.19	0.30	0.32	0.42	0.50	0.55
50	0.045	0.090	0.130	0.180	0.225	0.300	0.350	0.400
56	0.040	0.080	0.110	0.155	0.195	0.275	0.300	0.350
63	0.036	0.070	0.105	0.145	0.180	0.225	0.275	0.300
72	0.032	0.062	0.095	0.128	0.155	0.190	0.245	0.275
84	0.025	0.052	0.085	0.105	0.130	0.155	0.180	0.225
100	0.020	0.042	0.068	0.088	0.110	0.135	0.155	0.180
125	0.015	0.035	0.053	0.075	0.088	0.108	0.130	0.145
166	0.008	0.028	0.040	0.055	0.068	0.085	0.095	0.108
250	0.006	0.015	0.025	0.037	0.045	0.055	0.065	0.070
500	0.002	0.007	0.012	0.018	0.02	0.025	0.032	0.035
1000	0.001	0.003	0.005	0.007	0.008	0.012	0.014	0.018

Table for the determination of the residual oil content in [ppm] at 100 psi operating pressure

Note:

The evaluation is based on a pressure-reduced partial flow that is fed into the indicator tube at a pressure of 100 psi operating pressure.

For adsorbers with an operating pressure of less than 100 psi, please refer to the respective table in the appendix (for 60, 72 or 88 psi operating pressure).

- ▶ Determine the concentration in the above table, based on the duration of the measurement and the number of scale segments with color change.

<i>Example</i>	
Duration of measurement in [h]	5.0
Number of scale segment with color change	1.0
Residual oil concentration in [ppm]	2.25

- ▶ Write down the residual oil concentration in ppm, parts per million] in the measuring log.
- ▶ To determine the residual oil content in [mg/m³], multiply the above value by a factor 1.2. Write down this value in the measuring log.

Determining capacity reduction of purifying agent

To establish the remaining capacity of the activated carbon, you must carry out measurements of the same duration at fixed intervals.

- ▶ Choose a measuring interval (e.g. 4 weeks) and a duration of measurement (e.g. 4 hours).
- ▶ Determine the maximum admissible residual oil concentration in [mg/m³] for your specific application. Divide this value by 1.2 in order to obtain the maximum admissible residual oil concentration in [ppm].
- ▶ Refer to the table on page 28 and determine the corresponding number of scale segments with color change.

<i>Example</i>	
Maximum admissible residual oil concentration in [mg/m ³]	3.4
Maximum admissible residual oil concentration in [ppm]	2.83
Duration of measurement in [h]	4.0
Maximum admissible number of scale segments with color change (across entire measuring sequence)	1.0

If there are no additional segments with color change at the end of the measuring procedure, the purifying agent is working at full capacity.

As its capacity is reduced over time, the number of scale segments with color change in the tube is increased.

If the established maximum admissible number of segments with color change is reached, the purifying agent must be replaced (see also page 24 and 32).

If all scale segments in the indicator tube show a color change, the indicator tube is spent and must be replaced as described below.

Replacing indicator tube



Risk of damage to eyes! If not properly secured, the indicator tube might be propelled out of its holder!

When the needle valve is opened, the indicator tube is secured by a union nut. If

- the union nut is not properly tightened, or
- if the oil indicator has been interfered with,

There is a risk that the tube is propelled by the air flow so that it is shot out of its holder.

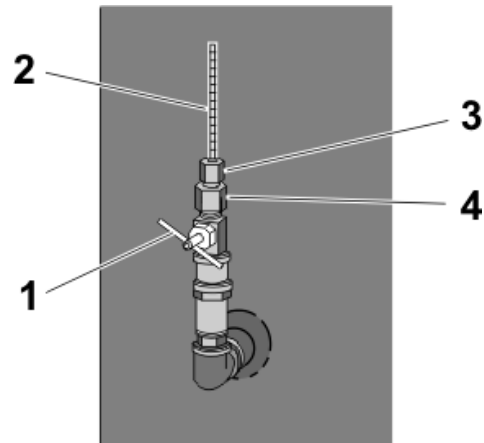
When working at the oil indicator, always wear protective goggles.

Prior to removing the indicator tube, ensure that the needle valve is closed and that the tube is not under pressure!

The color change of the tube segments (2) is irreversible. When all segments have changed color, the indicator tube must be replaced.

Prior to removing the tube:

- ▶ Ensure that the needle valve (1) is closed and that the indicator tube (2) is not under pressure. To close the needle valve, turn its handle clockwise.



Oil indicator

To remove the indicator tube:

- ▶ Loosen the reducer (4) below the union nut (3), using an appropriate tool.
- ▶ Dispose of spent indicator tube and reducer according to the application regulations.

To install new indicator tube:

- ▶ Screw indicator tube into the reducer, applying a non-locking thread seal.
- ▶ Check the union nut (3) and the reducer (4) to ensure that they are properly tightened.

To check tube:

- ▶ Open the needle valve (1) for a short time and check screw connections for tightness.

Notes on further maintenance work

Changing activated carbon

The active surface of the activated carbon can be reduced by oil residue and other contaminants. The purifying agent must therefore be replaced once every 12 months (after approx. 8,000 operating hours). If the compressed air is insufficiently dried before it reaches the adsorber (see technical data in the appendix), the service life of the activated carbon can be considerably shortened. In this case, the agent must be replaced every 6 months (after approx. 4,000 operating hours). Change the activated carbon by fully depressurizing the system and opening the bottom side fitting or flange cover to drain the carbon. Refill by removing the top side fitting or flange cover and filling the vessel with the required amount of carbon. The required amount of carbon and activated carbon part number is listed on page 38.

Identify and eliminate faults

Summary of faults

Faults on the adsorber become noticeable e.g. due to unusual noises and ram pressures.

The following table shows who is allowed to remedy a fault: the owner's specialist personnel or the manufacturer's service engineer.

Table of possible faults

Fault	Possible cause	Remedy	Spec. personnel	Service engineer
Excessive ram pressure	Dust sieve is contaminated.	Clean or renew dust sieve.	●	●
Vessel pressure is too low	Excessive differential pressure on the upstream filter (option).	Check differential pressure on the upstream filter, if necessary replace the filter element.	●	
No pressure build up	The compressed air system upstream of the adsorber is not pressurized.	Check whether the compressed air system upstream of the adsorber is pressurized. Remove any faults.	●	
Excessive compressed air consumption	Leakage.	Check screw and flange connections and reseal, if necessary. Check condensate trap at the upstream filter clean, if necessary.	●	●

Annex with technical documentation

This annex comprises the following information and technical documentation:

- Technical data
- Replacement and wear parts list
- Technical documents for the oil indicator
- Flow diagram
- Dimensional drawings

Technical data

Operating Range

Site Selection	frost-free indoor installation in a non-hazardous environment
Ambient temperature	35°F to 122°F (1.5 to 50°C)
Compressed air inlet temperature	77 to 122°F (25 to 50°C)
max. operating pressure	232 psi (16 bar) Or as marked on vessel
Medium	Compressed air and gaseous nitrogen

Performance data

Model	Nominal Flow (cfm)	Nominal Pipe Size	Max Pressure (psig)	Max Temperature (°F)
CAT100	100	1" NPT	232	122
CAT250	250	1 ½" NPT	232	122
CAT375	375	2" NPT	232	122
CAT500	500	2" NPT	232	122
CAT750	750	2" NPT	232	122
CAT1000	1000	3" NPT	232	122

Purifying agent

100 % Activated Carbon

Correction Factors

Pressure		Temperature			
		95°F	104°F	113°F	122°F
psi	bar	35°C	40°C	45°C	50°C
73	5	0.75	0.64	0.56	0.38
87	6	0.89	0.76	0.67	0.45
102	7	1.00	0.85	0.75	0.50
116	8	1.13	0.92	0.81	0.54
131	9	1.26	1.07	0.95	0.63
145	10	1.31	1.11	0.98	0.65
160	11	1.36	1.16	1.02	0.68
174	12	1.49	1.27	1.12	0.74
189	13	1.62	1.38	1.22	0.81
203	14	1.70	1.45	1.28	0.85
218	15	1.79	1.52	1.34	0.90

Note: Design conditions are 100 PSIG and 95°F.

Sizing Example

Actual Flow	600 scfm
Min. Pressure	73 psi
Max Inlet Temp	104°F
Factor from Table	0.64

$$\frac{\text{Actual Flow}}{\text{Factor}} = \frac{600 \text{ scfm}}{0.64} = 938$$

Select: CAT1000

Replacement and wear parts list

Note:

When exchange or replacement parts are ordered, always state the adsorber type and the build no. of the adsorber. These data are found on the type plate.

Replacement Parts

Order ID	For model	Maintenance intervall	Scope of delivery
P02/ZR	CAT100 – CAT1000	When necessary	Indicator tube for oil indicator

Activated carbon packs

Model	Replacement Activated Carbon Amount (lbs.)	Number of 55# Bags Required
CAT100	31	1
CAT250	78	2
CAT375	116	3
CAT500	154	3
CAT750	233	5
CAT1000	310	6
		BAG P/N
		TP3040-55

Technical documentation of the oil indicator

Measuring log

Number of measurement _____

Date of measurement _____

Adsorber no. _____

Completed by _____

Measured data

Start of measurement _____

End of measurement _____

Duration of measurement _____ [h]

Number of first-ever colored scale units _____

Evaluation

Evaluation table according to measuring pressure = _____ [psi]

From table: Residual oil content in
[ppm] = _____

x 1.2

Residual oil content in
[mg/m³] = _____

Evaluation tables for determination of the residual oil content

At 60 psi operating pressure

Duration/[h]	Number of first-ever colored scale units							
	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6
4	1.00	1.95	2.90	3.85	4.90	5.95	6.75	7.50
4.5	0.90	1.75	2.55	3.40	4.35	5.10	6.10	6.80
5	0.80	1.55	2.35	3.10	3.90	4.70	5.50	6.20
5.5	0.75	1.40	2.15	2.80	3.55	4.25	5.00	5.80
6	0.70	1.30	1.95	2.60	3.30	3.85	4.60	5.10
6.5	0.65	1.20	1.80	2.35	3.00	3.60	4.25	4.80
7	0.60	1.10	1.70	2.25	2.75	3.30	3.85	4.50
8.5	0.50	0.95	1.40	1.85	2.30	2.75	3.25	3.65
10	0.40	0.80	1.18	1.55	1.95	2.30	2.70	3.10
12.5	0.31	0.70	1.00	1.30	1.55	1.85	2.20	2.50
16.5	0.24	0.50	0.70	1.00	1.25	1.40	1.65	1.90
25	0.155	0.310	0.500	0.700	0.800	1.000	1.100	1.300
33	0.120	0.240	0.380	0.500	0.620	0.750	0.850	1.000
50	0.075	0.155	0.230	0.310	0.400	0.500	0.600	0.700
56	0.065	0.135	0.210	0.280	0.350	0.420	0.500	0.600
63	0.058	0.125	0.185	0.250	0.305	0.355	0.420	0.500
72	0.050	0.095	0.160	0.195	0.270	0.310	0.380	0.420
84	0.040	0.090	0.140	0.185	0.225	0.280	0.310	0.370
100	0.036	0.075	0.118	0.155	0.195	0.230	0.275	0.310
125	0.030	0.059	0.090	0.125	0.155	0.185	0.230	0.250
166	0.020	0.048	0.064	0.090	0.118	0.135	0.155	0.185
250	0.012	0.030	0.048	0.059	0.075	0.090	0.095	0.125
500	0.005	0.012	0.020	0.030	0.036	0.048	0.055	0.059
1000	0.002	0.005	0.010	0.012	0.015	0.020	0.025	0.030

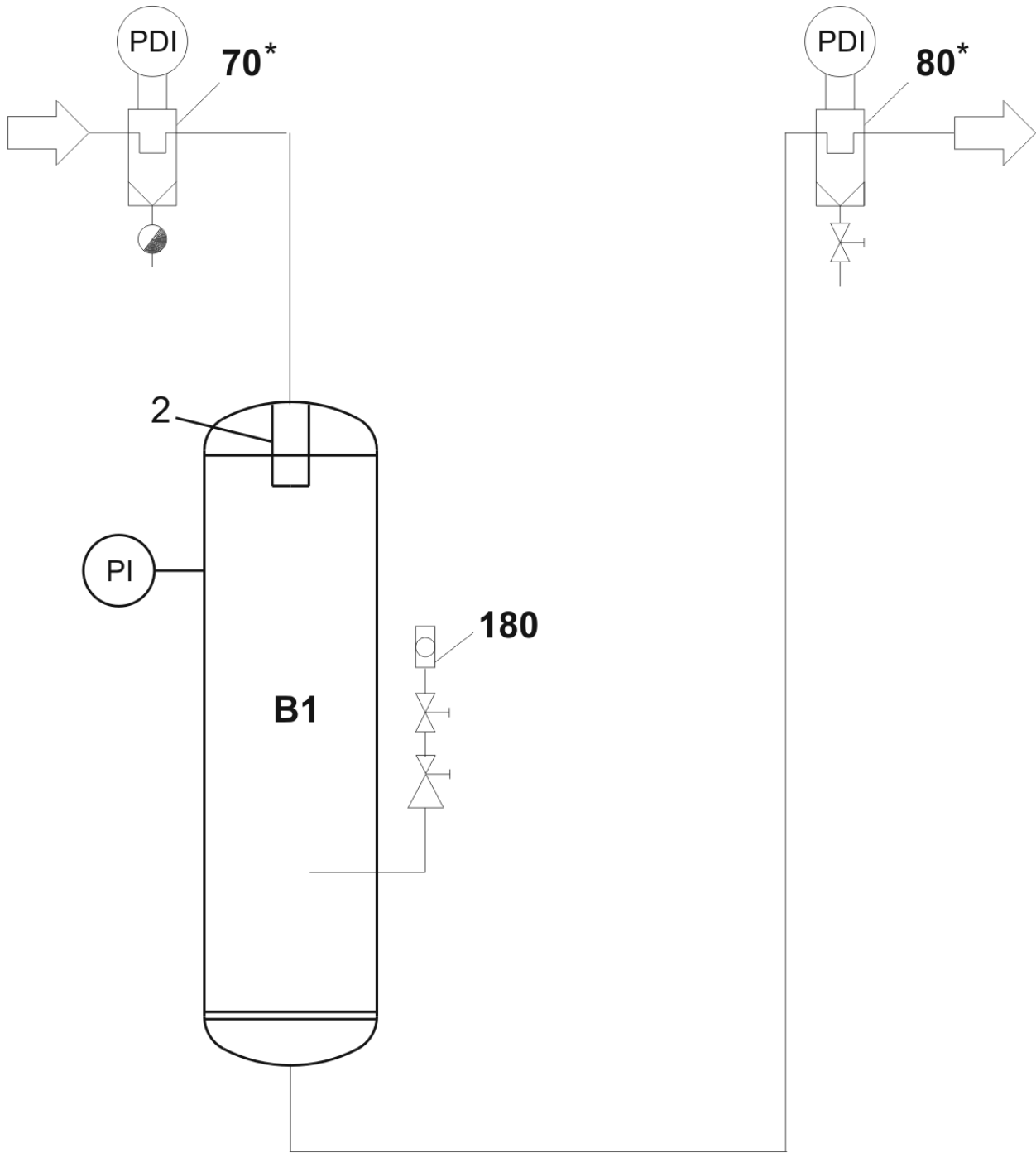
At 72 psi operating pressure

Duration/[h]	Number of first-ever colored scale units							
	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6
4	0.80	1.55	2.35	3.15	3.90	4.80	5.55	6.25
4.5	0.72	1.40	2.10	2.75	3.50	4.25	4.90	5.60
5	0.62	1.25	1.85	2.50	3.15	3.75	4.40	5.00
5.5	0.56	1.18	1.72	2.30	2.90	3.45	4.00	4.60
6	0.53	1.05	1.55	2.10	2.60	3.15	3.70	4.25
6.5	0.50	0.95	1.45	1.95	2.45	2.80	3.40	3.90
7	0.48	0.90	1.35	1.80	2.30	2.70	3.15	3.60
8.5	0.40	0.75	1.10	1.50	1.75	2.25	2.55	2.85
10	0.35	0.62	0.95	1.25	1.55	1.85	2.20	2.50
12.5	0.25	0.52	0.76	1.00	1.25	1.52	1.75	2.00
16.5	0.185	0.400	0.560	0.800	0.950	1.180	1.300	1.560
25	0.125	0.250	0.410	0.520	0.620	0.760	0.900	1.000
33	0.090	0.185	0.280	0.400	0.510	0.560	0.650	0.800
50	0.060	0.125	0.180	0.250	0.350	0.410	0.450	0.520
56	0.050	0.110	0.165	0.230	0.280	0.370	0.420	0.440
63	0.047	0.095	0.150	0.195	0.245	0.300	0.390	0.425
72	0.040	0.085	0.130	0.170	0.210	0.260	0.320	0.390
84	0.035	0.075	0.110	0.150	0.175	0.230	0.260	0.300
100	0.030	0.060	0.090	0.125	0.165	0.180	0.225	0.250
125	0.020	0.050	0.076	0.097	0.125	0.155	0.170	0.190
166	0.012	0.037	0.055	0.076	0.090	0.115	0.128	0.155
250	0.008	0.020	0.037	0.050	0.060	0.076	0.085	0.097
500	0.005	0.008	0.012	0.020	0.030	0.037	0.042	0.050
1000	0.002	0.005	0.006	0.008	0.010	0.012	0.015	0.020

At 87 psi operating pressure

Duration/[h]	Number of first-ever colored scale units							
	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6
4	0.65	1.30	1.95	2.60	3.25	3.85	4.75	5.40
4.5	0.62	1.20	1.70	2.20	2.80	3.55	4.10	4.75
5	0.52	1.05	1.55	2.10	2.60	3.25	3.70	4.25
5.5	0.48	0.95	1.32	1.90	2.35	2.75	3.50	3.80
6	0.44	0.90	1.30	1.70	2.10	2.60	3.0	3.55
6.5	0.40	0.82	1.25	1.60	2.00	2.40	2.70	3.50
7	0.39	0.70	1.10	1.40	1.85	2.20	2.60	2.90
8.5	0.35	0.62	0.92	1.15	1.45	1.80	2.10	2.45
10	0.27	0.52	0.81	1.05	1.30	1.55	1.80	2.10
12.5	0.21	0.42	0.55	0.85	1.05	1.29	1.48	1.65
16.5	0.16	0.35	0.49	0.55	0.81	0.95	1.08	1.20
25	0.10	0.21	0.35	0.48	0.52	0.55	0.70	0.85
33	0.07	0.16	0.22	0.35	0.40	0.49	0.60	0.66
50	0.05	0.10	0.17	0.21	0.27	0.35	0.38	0.48
56	0.04	0.09	0.16	0.20	0.22	0.27	0.34	0.38
63	0.036	0.082	0.120	0.165	0.210	0.250	0.280	0.355
72	0.035	0.070	0.110	0.160	0.200	0.210	0.270	0.280
84	0.033	0.065	0.090	0.120	0.160	0.200	0.210	0.250
100	0.025	0.050	0.070	0.100	0.120	0.160	0.200	0.210
125	0.018	0.035	0.060	0.075	0.100	0.120	0.150	0.180
166	0.014	0.032	0.038	0.060	0.075	0.090	0.110	0.125
250	0.008	0.020	0.033	0.036	0.050	0.060	0.070	0.075
500	0.002	0.008	0.012	0.018	0.025	0.033	0.034	0.035
1000	0.001	0.002	0.005	0.008	0.010	0.012	0.015	0.018

Flow diagram

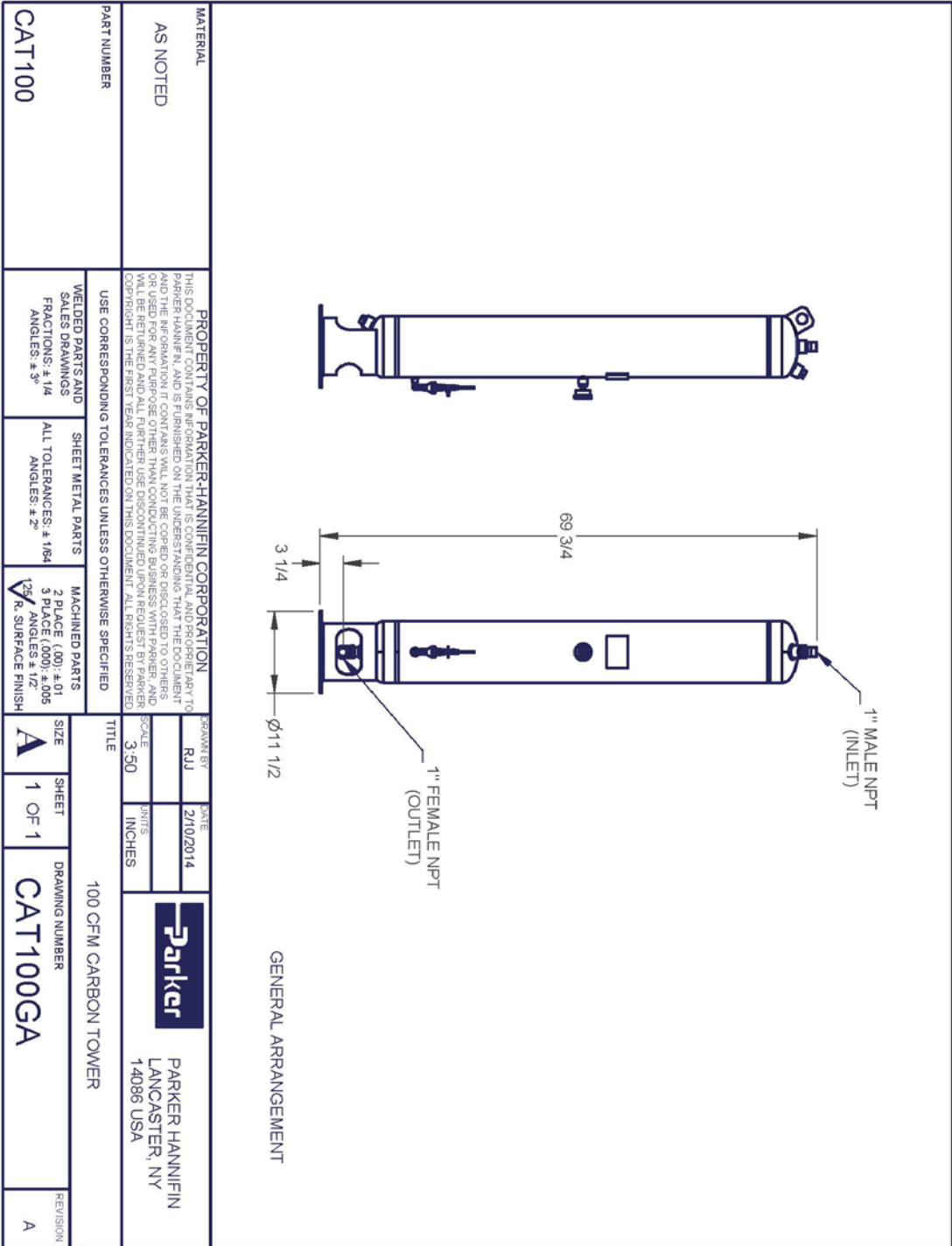


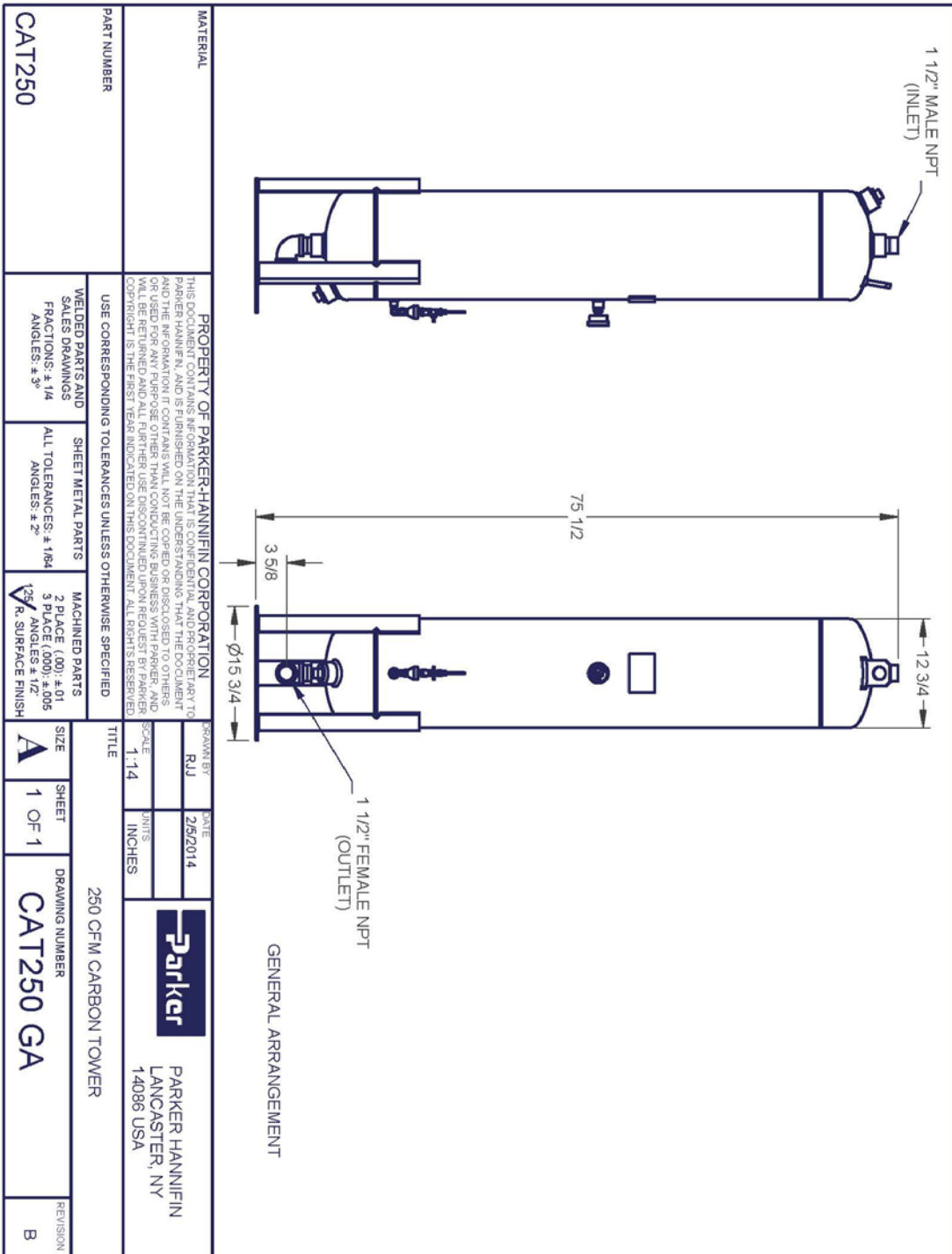
Pos.	Designation
2	Screen nipple
180	Oil indicator
P1	Pressure Vessel

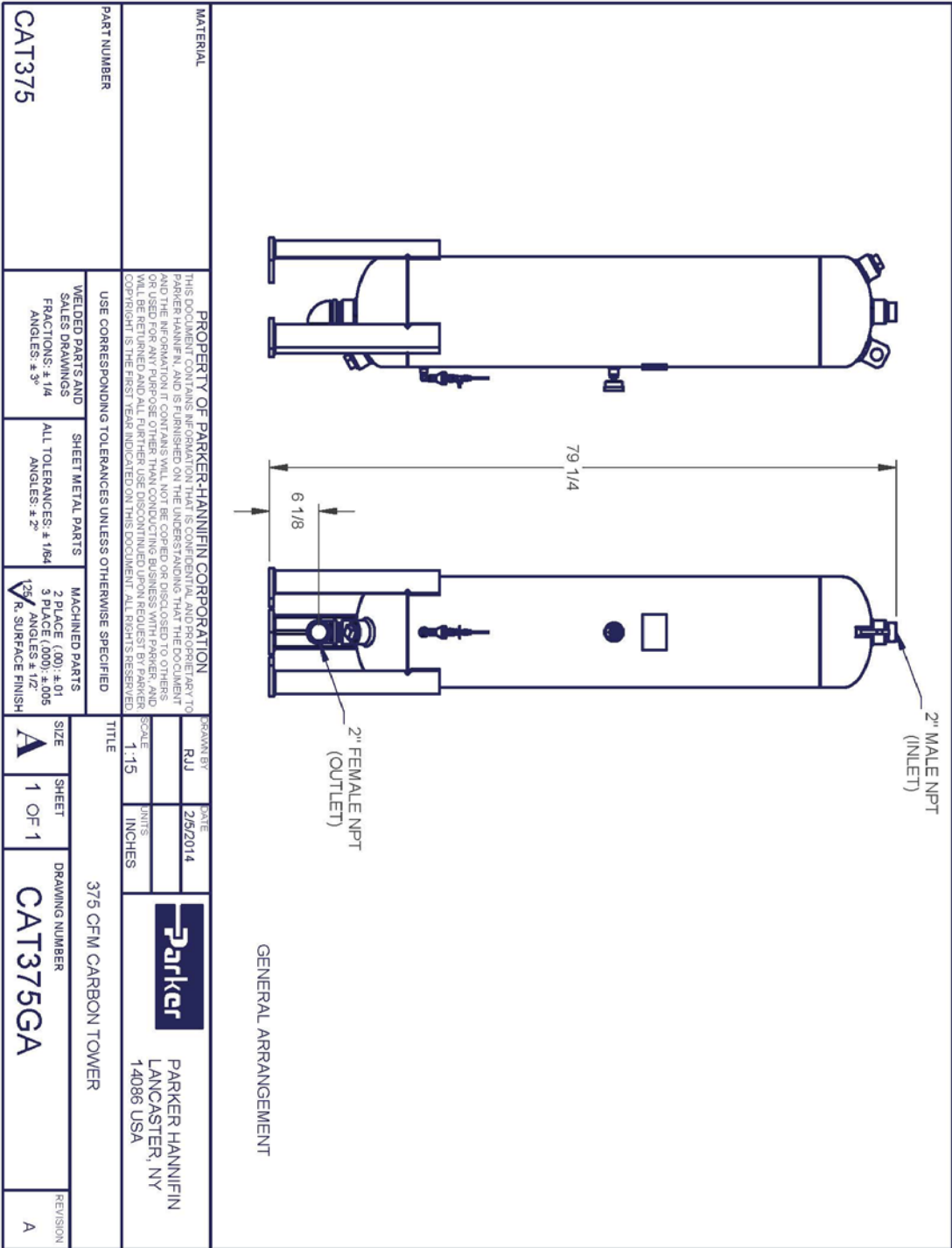
Pos.	Designation
70	Infeed Filter(s)
80	Outfeed Filter

Dimensional drawing

CAT 100







MATERIAL

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PART NUMBER

USE CORRESPONDING TOLERANCES UNLESS OTHERWISE SPECIFIED

CAT375

WELDED PARTS AND SALES DRAWINGS FRACTIONS: $\pm 1/4$ ANGLES: $\pm 3^\circ$

SHEET METAL PARTS ALL TOLERANCES: $\pm 1/64$ ANGLES: $\pm 2^\circ$

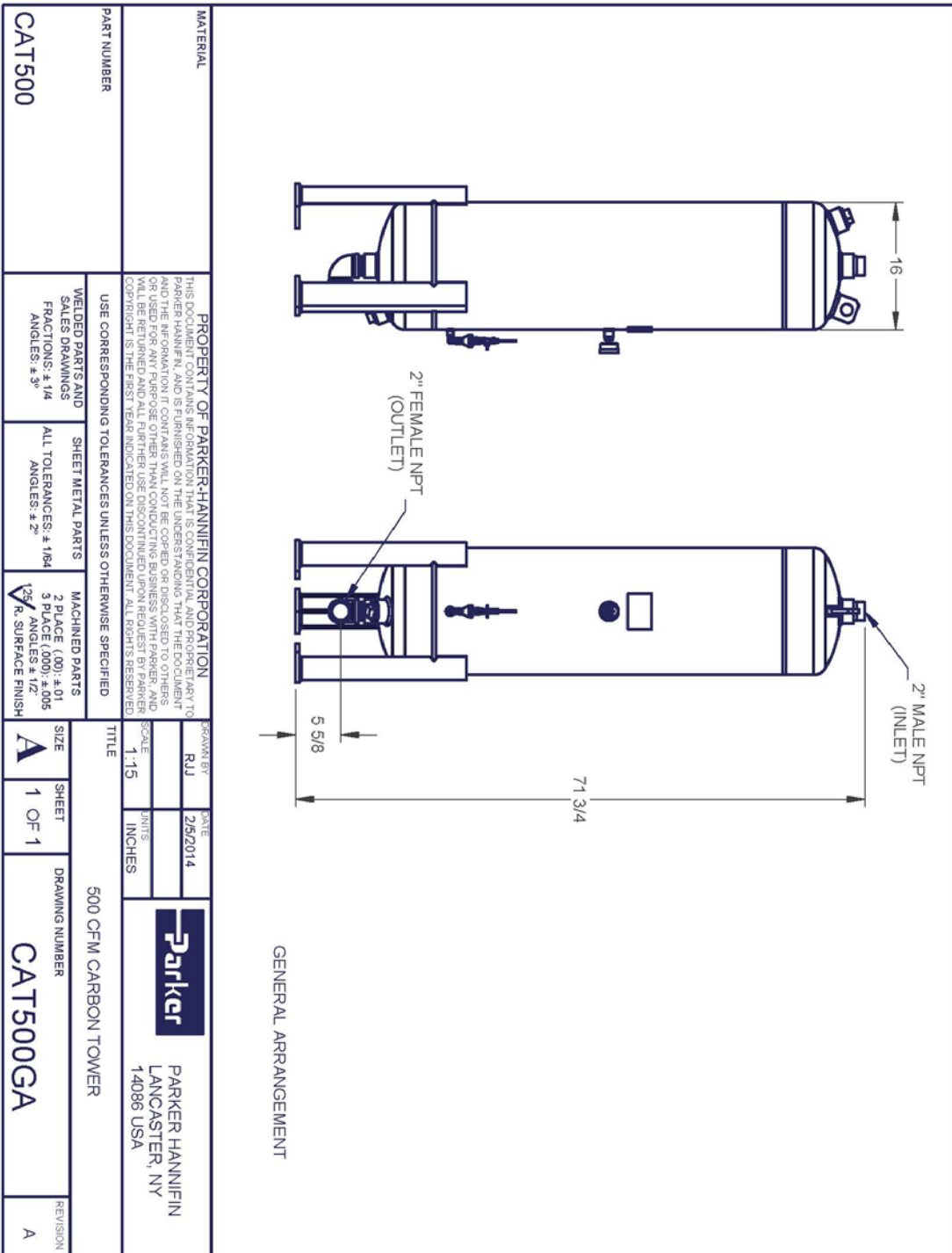
MACHINED PARTS 2 PLACE (.000): ± 0.01 3 PLACE (.000): ± 0.005 \sqrt{R} SURFACE FINISH

SIZE SHEET 1 OF 1

375 CFM CARBON TOWER
 DRAWING NUMBER
CAT375GA
 REVISION
A

DRAWN BY: RJJ DATE: 2/5/2014
 SCALE: 1:1.5 UNITS: INCHES

Parker
 PARKER HANNIFIN
 LANCASTER, NY
 14086 USA



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	DRAWN BY	DATE	SCALE
	RJ	2/5/2014	1:1.5
			INCHES

PART NUMBER	USE CORRESPONDING TOLERANCES UNLESS OTHERWISE SPECIFIED		
	WELDED PARTS AND SALES DRAWINGS FRACTIONS: ± 1/16 ANGLES: ± 3°	SHEET METAL PARTS ALL TOLERANCES: ± .164 ANGLES: ± 2°	MACHINED PARTS 2 PLACE (.001): ± .01 3 PLACE (.000): ± .005 ANGLES: ± 1/2° r. SURFACE FINISH
CAT500	TITLE 500 CFM CARBON TOWER		
	SIZE	SHEET	DRAWING NUMBER
	A	1 OF 1	CAT500GA
			REVISION
			A

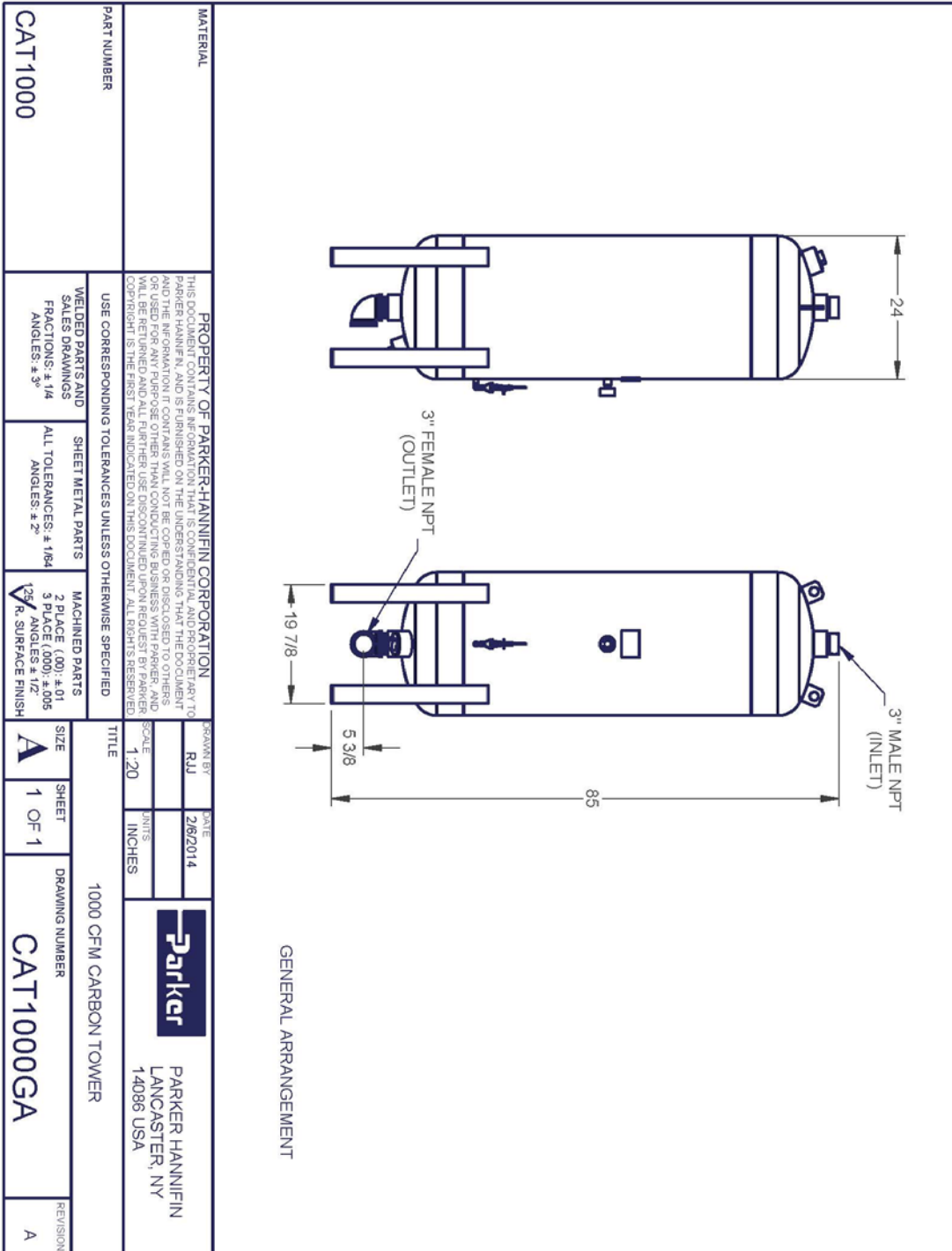
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PARKER HANNIFIN
LANCASTER, NY
14086 USA

CAT 750

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PART NUMBER CAT750	USE CORRESPONDING TOLERANCES UNLESS OTHERWISE SPECIFIED WELDED PARTS AND SALES DRAWINGS FRACTIONS: ± 1/4 ANGLES: ± 3° SHEET METAL PARTS ALL TOLERANCES: ± 1/64 ANGLES: ± 2° MACHINED PARTS 2 PLACE (.000): ± .01 3 PLACE (.000): ± .006 ANGLES: ± 1/2° R SURFACE FINISH
TITLE 750 CFM CARBON TOWER	SIZE: A SHEET: 1 OF 1 DRAWING NUMBER: CAT750GA REVISION: A

CAT 1000



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	USE CORRESPONDING TOLERANCES UNLESS OTHERWISE SPECIFIED		
PART NUMBER	WELDED PARTS AND SALES DRAWINGS FRACTIONS: 1/16 ANGLES: ± 3°	SHEET METAL PARTS ALL TOLERANCES: ± .164 ANGLES: ± 2°	MACHINED PARTS 2 PLACE (.001): ± .01 3 PLACE (.000): ± .005 12° ANGLES ± 1/2° R. SURFACE FINISH
	CAT1000		
DRAWN BY: RU		DATE: 2/6/2014	 PARKER HANNIFIN LANCASTER, NY 14086 USA
TITLE: 1000 CFM CARBON TOWER		DRAWING NUMBER: CAT1000GA	
SIZE: A	SHEET: 1 OF 1	REVISION: A	

Contact Us

Manufacturer's details

Name and address



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