CAJ/TAJ
Detailed Installation Instructions

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It is essential that you read this document in full.

The implementation, operation, maintenance, and end-of-life management of the products involves the observance of and adherence to strict rules and regulations in line with existing standards, norms, and best practice. Compliance with the applicable standards and norms in force and the legislation of the country in which the compressor is installed is essential, as is the application of the specific rules governing refrigerated and electrical connections.

These instructions cover the main points of the ISO standards. The EN directives and standards described below prevail within the European Union.

Caution: Safety First

Never energize the system unless:

1- The protective cover is securely fastened, and
2- The compressor is properly connected to ground.

1. *Declarations of conformity and incorporation*

These refrigerant compressors have been designed for incorporation within machines in accordance with the Machine Directive 2006/42/EC. They comply with the Low Voltage Directive 2014/35/EC and the Pressure Equipment Directive (PED) 2014/68/EC, They also meet the requirements of the Statutory instruments for the UK market.
They may only be put into service if installation has been carried out in accordance with the instructions below and if the machines comply with the regulations in force.

In the event of the use of fluids classified as A2L, A2, or A3 according to ISO 817, the safety rules and regulations specific to the inflammable fluids must be respected. The compressors will be installed and maintained in accordance with safety standards ISO 5149 or EN 378, EN60335-2.
The designations of the compressors in question are C/TAJ****U for R290, C/TAJ****N when they are running on R1234yf and AJ****P when they are running on R455A and R454C

2. Safety and risks associated with the implementation and use of inflammable refrigerant fluids, classified in categories A2L, A2, or A3

2.1. Inflammable refrigerant

The fluids are heavier than air; they will naturally migrate towards the bottom of the installation in the absence of ventilation"
Their main characteristics from ISO817 or supplier data are given as an indication in the table below:

Refrigerant		R-290	R-1270	R1234yf	R455A	R454C
Safety class		A3	A3	A2L	A2L	A2L
Lower flammability limit under normal conditions in volume/volume according to ISO 817	%	2.1	2	6,2 %	11,8%	6,2%
Lower flammability limit under normal conditions	kg/m³	0.038	0.046	0,289	0,431	0,293
Practical limit 20% LFL	g/m³	7.6	8	57,8	86	59
Auto-ignition temperature (according to ISO 817)	°C	470	455	405	473	> 400

Never use the product without first consulting the Safety Data Files, which can be obtained from your refrigerant supplier.

2.2. Scope of application of the standards and norms relating to refrigerating systems which use inflammable fluids

Provided that local regulations allow it, the quantities of flammable fluids that can be used in refrigeration systems are defined in the standards for these products, such as EN 60335-2-40, EN 60335-2-89 or EN 378.

2.3. Prevention of the formation of potentially explosive zones

The use of inflammable fluids can present a risk of an explosion in the event of a leak. It is therefore appropriate to ensure that the design of the refrigerating and ventilation system of the compressor does not permit the creation of an explosive zone.

2.4. Qualification of personnel

"It is essential that standard EN 378-3 is observed during installation and standard EN 378-4 during maintenance works.
To maintain and repair the installations, personnel must be authorised to handle refrigerants and correctly trained in the handling of flammable fluids in order to avoid the risk of the formation of an explosive atmosphere.

Consequently, personnel must know the tools, the transportation procedure for the compressor and refrigerant, and the safety precautions and regulations which apply to maintenance and repair work.
Remove ignition sources while handling flammable refrigerants"

2.5. Protection of the electrical terminal of the compressor

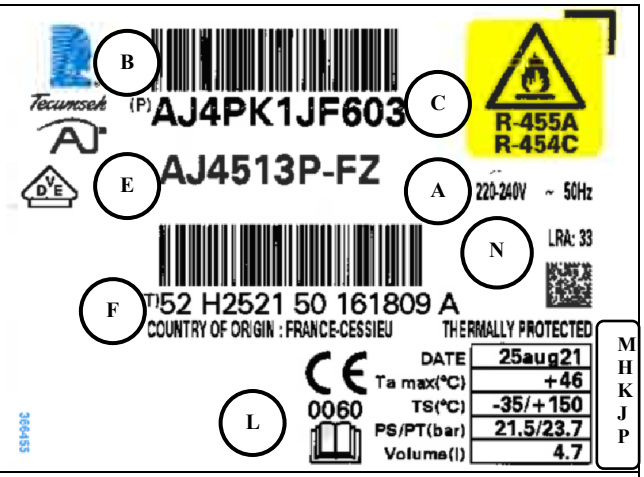
The disintegration of the insulation (glass bead) around an electrical power supply terminal of the compressor due to a physical shock, or extreme heating, could create a hole through which the refrigerant and the oil can escape. Upon contact with a spark, this mixture could ignite. Any accidental damage to the terminal during operation results in the compressor being scrapped.
The use of a terminal cover (Te-Connect) will protect the three-pole terminal from shocks.
Furthermore, especially when using inflammable fluids, Tecumseh recommends the use of a safety system in order to protect the users, the service personnel, and the installation. The system will be capable of detecting a current spike which would be likely to cause the insulation to melt ("pin venting" phenomenon) and if this occurs, will cut the electrical power supply to the compressor.
As the compressor is not equipped with protection in the event of an external fire, it is recommended that protection is fitted to protect the installation in order to prevent a fire. Adequate purging methods and measures to prevent the admissible limits from being exceeded (see conditions on the PED label) must also be put in place
The compressors must not be installed in a corrosive or dusty environment.

3. ***Specifications – Identification marking of compressors in the AJ range***

AJP, CAJP & TAJP products are intended for parallel assembly

3.1. Serial and designation label:

"Only T/CAJ****U, T/CAJ****N and AJ****P compressors comply with the Category II requirements under the Pressure Equipment Directive (PED) 2014/68/EC. Internal free volume 4.7L
The labels of Category II compressors contain additional information (*):"

Information in accordance with EN 378-2: Ref Designation A Voltage and phase B Nomenclature C Refrigerant E Designation F Serial number H Maxi ambient temperature J Maximum allowable pressure /Pressure test K Housing temperature mini / maxi L Registration number of the notified body M Manufacturing and test date N Start current P Free volume	
C/TAJ **** U compressors are qualified for operation with R290. AJ****P compressors are qualified for R455A and R454C C/TAJ****N compressors are qualified for R134a and R1234yf. They are equipped with a yellow warning label as per the adjacent label shown:	

For multi-fluid compressors, the printed PS pressure = the pressure of the most constraining fluid at Ta max.

Refrigerant	PS (b)	PED category
R-404A	20.1	I
R-452A	21	I
R-449A	20,4	I
R-448A	20,4	I
R-407C	19.1	I
R-290	14.7	II
R-455A	21,5	II
R-454C	18,4	II
R-1234yf	10,8	II
R-22	16.7	I
R-513A	11.5	I
R-134a	10.9	I

PS: relative pressure at the bubble point

3.2. Specifications

The housing of the compressors in the 'AJ' family is subject to the low pressure of the refrigeration system.

In line with the PED and in order to ensure the best level of quality of its products at all times, Tecumseh tests each compressor on an assembly line at a pneumatic pressure which is greater than or equal to the requirement 1.1 x PS, regardless of the refrigerant indicated and based on the calculation of the most restricted refrigerant, R455A.

For information: 1.1 * PS (46°C sat) = 23.7 bar rel for R455A.

Additional explosion tests are also performed periodically.

4. ***Transport – handling***:

Ex-works, the compressor is filled with oil and nitrogen (0.3 to 0.5 bar). It does not contain refrigerant on delivery.

For further information on delivery of the compressors, please see your terms and conditions of sale. Check that the equipment is in good condition and is free from defects on receipt (correct external appearance, no impact or deformation), in particular on the connection terminal.

Never handle the compressor by its pipes or tubes, by the Te-Connect or by the power supply cable. Use the plinth provided for this purpose. See our technical documentation for further information on storage positions and authorized transportation.

The recommendations for the transportation of systems filled with refrigerant fluids are the responsibility of the manufacturer of these systems.

5. ***Recommendations associated with the use and installation of a compressor in a refrigeration system:***

In the case of operating with flammable fluids, the installation must be designed on the basis of a risk analysis to avoid the accumulation of refrigerant in the event of leakage in areas that are potential ignition sources.

- Install a device which can detect an over-current at the compressor, in order to prevent a current peak which is likely to melt the insulation ("pin venting" phenomenon).

- Provide suitable protection which complies with local regulations to prevent the public, the user or any person having access to the application from damaging the product.

- Also provide suitable warnings regarding the flammable fluids on the entire installation so that the user or any person having access to the application is aware of the inherent risks due to their presence (provision of standardized icons to prevent the risk of fire or explosion).

- Put into place a suitable method of warning the user that they must employ a professional to handle the application.

5.1. Maximum admissible working pressure

Tecumseh compressors are designed to operate at a maximum ambient temperature of +46°C.
The compressor housing must not be subjected to temperatures below -35°C; the materials used cannot guarantee sufficient mechanical characteristics.
Observe and comply with the specific regulations to optimise the quantity of refrigerant in the installation and never exceed the maximum discharge pressure corresponding to the maximum condensation temperature of the compressor's operation.

5.2. Expansion element

Tecumseh recommends the use of thermostatic rather than capillary expansion elements for negative applications.

5.3. *Installation with a view to commissioning*

Tecumseh cannot be held liable if installation and maintenance are not carried out in accordance with the instructions and information provided in this document.
The directives and reglementation in force in the country in which the compressor is installed and the specific rules and regulations for refrigerant and electrical connections must be observed and complied with.

5.4. Location of the compressor and definition of the refrigerant load

5.4.1. Definition of the refrigerant load

The refrigerant load level must not exceed the quantity which can be stored on the high-pressure side. If migration into the compressor during shutdown times is likely, or if the load exceeds 1.5 kg, Tecumseh recommends the use of a crankcase heater and/or a non-return valve on the discharge line.

The return of liquid during transitory periods will be prevented by an anti-hammer reservoir.

The maximum load of flammable fluids is defined in the product standards according to the volume in which the refrigeration system is installed, its location and its type of occupation (not exhaustive).

5.4.2. Location of electrical components which are an ignition source in the event of the use of inflammable fluids A2L, A2, or A3

These components must be installed in a zone which is not potentially inflammable. Tecumseh recommends that they are installed at height and in a ventilated area.

5.4.3. Location of the compressor

The compressor must not prevent or interfere with the movement of persons or the opening of doors or shutters.
The base onto which the compressor will be installed must be sufficiently resistant (plinth, brackets, wall, etc.). Check that the compressor level is horizontal and that it is equipped with its silent blocks.
Ensure that the circulation of air around the electrical components is not blocked which is also required to cool the compressor.

5.5. Soldering, refrigerant connections

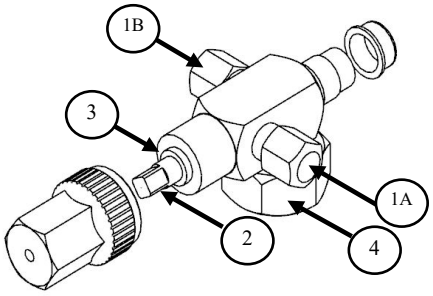
As a reminder, soldering may only be carried out on installations which do not contain a refrigerant load.

To ensure that the installation is functioning correctly, we advise that you:
- Perform soldering with dry nitrogen and keep all naked flames away from the electrical equipment
- Insulate the suction line as far as the compressor intake, to prevent condensation.

Cut and shape the tubes carefully in order to prevent the ingress of dust and metallic particles inside the system. Never use a saw. Use a special bending tool which is adapted to the tube diameter in order to avoid major restrictions.

Tecumseh recommends soldered connections rather than tube expander-type screwed connections to limit the probability of leaks over time. A leakage check is mandatory before commissioning.

5.6. Tightening torques for the suction valve (for use with non-flammable fluids)

1- SAE 1/4'' : 7 à 11 Nm A - Empty or loaded coupling B - Pressostatic connector 2- Square bit drive: 6 to 13 Nm1/4'' : 6 à 13 Nm 3- Cable gland: 5 à 13 Nm 4- Connector 1''- 14 UNS : 70 Nm à 85 Nm. Release the cable gland nut prior to handling the needle valve. Then retighten the cable gland nut.	

5.7. Soldering of the oil equalization connector for duo or parallel compressors

Before soldering the oil equalization tube for AJP compressors, tilt the compressor by at least 10° as shown.

5.8. Suspension

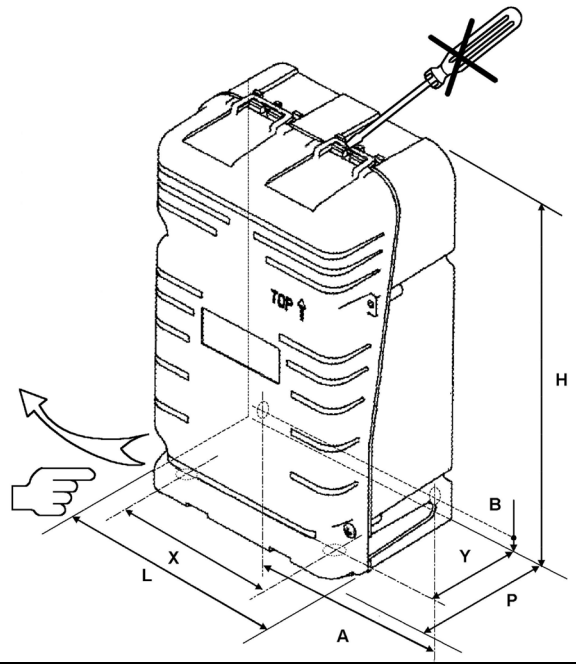
All Tecumseh compressors are supplied as standard with an external suspension kit comprising vibration absorbers and braces. These vibration absorbers are designed to dampen the transmission of the vibrations generated by the compressor through the base on which the compressor is mounted. In order to ensure this function is provided correctly, the vibration absorbers must never be restricted. For this purpose, the washer resting on the spacer must allow for a play of 1 to 4 mm with the top of the vibration absorber.
To avoid deformation of the spacer, apply a tightening torque between 8 and 13 Nm for M8 screws.

5.9. Electrical connections

The electrical connections will be carried out before the refrigerating system is loaded with refrigerant.
To preserve the quality of the Tecumseh compressor, the safety of the installation and to ensure correct operation and function, it is essential that the following is observed:
- Always wire the compressor when it is disconnected from the main voltage.
- Check the compatibility of the supply voltage for the installation with the supply voltage for the compressor (see serial label).
- Check the compatibility of the electrical diagram for the compressor with the electrical diagram of the installation.
- Dimension the connection cables (power, control) according to the characteristics of the installed compressor (see serial label).
- Protect the electrical power supply line and install a grounding cable.
- Perform the electrical connections in accordance with the regulations in force in the country of installation.
- Use the electrical components supplied with the compressor, even if other references appear to be satisfactory.

The electrical box is always installed vertically.

Dimensions	JUNIOR box	SENIOR box
L	125	180
H	206	232
D	82	90
X	91	130
Y	60	65
A	91	154
B	12	12



5.10. Circuit leak-tightness

Prior to loading the refrigerant, perform a systematic search for leaks at all connections and repair if necessary.

5.11. Vacuum purging

Vacuum purge the installation in order to achieve a residual pressure of around 200 micrometers of mercury (0.27 mbar), guaranteeing a good vacuum quality. It is advisable to vacuum purge the HP and LP circuits at the same time, in order to reduce the operating time and to ensure a vacuum level which is identical throughout the entire circuit.

6. ***Loading with refrigerant, connection to power for the first time and maintenance:***

If the operations described below are carried out in potentially explosive atmospheres, Tecumseh recommends reference to standard EN 378. Part 4 provides general safety advice and gives guidelines on performing work on equipment which uses flammable refrigerant fluids.

6.1. General recommendations:

Electrical boxes must be correctly installed and closed again prior to loading the refrigerant and before connecting the installation to the main power supply.
The airborne hydrocarbon or HFO levels will be monitored throughout the entire refrigerant loading period and during maintenance.
The leak detection equipment will be calibrated to 20% of the LFL for the refrigerant.
The work area will be ventilated during the entire operation.

6.2. Loading with refrigerant

The provisions indicated in parts 2, 3 et 4 of EN 378 must be applied to prevent the risk of an emission of refrigerant fluid during the filling and purging operations of the refrigeration system.

Limit the refrigerant load so that the pressures lie within the operational window defined by Tecumseh.

Never start the compressor if the vacuum is not broken in HP and LP.

The components will be grounded prior to commencing refrigerant loading.
Weigh the load using suitable scales (accuracy +/-5 g). The hoses will be as short as possible to help with load accuracy.
The installation should be loaded with one or the other refrigerant for which the compressor has been designed only (see serial label).
The refrigerant is always loaded in the liquid phase, in order to retain the correct mix ratio.
Never add any colorings or additives.

6.3. The risk of overloading with refrigerant

If the main parts of the compressor are immersed following an excessive refrigerant load, this may lead to a rupture of the compressor housing.
Immersion of the motor, the casing, the piston and the cylinder in the fluid will create a hydraulic blockage preventing the compressor from starting: therefore this is a blocked rotor situation.
If, for any reason whatsoever, the protection device for the compressor is not triggered quickly enough, an elevated current in the motor coil will lead to a rapid increase in its temperature. This will cause vaporization of the liquid and a rapid increase in the pressure inside the compressor housing which exceeds the limit.

By way of example of what you should never do while loading a system with refrigerant, never leave the loading cylinder connected to the system, even if the cylinder valve or manifold valve is closed. If a slight leak is found in one of these valves, the system will be overloaded by the risks indicated above.

6.4. Checks during commissioning and start-up

- Calibrate the protective electrical devices, adjust the set-points/cut-out of the regulation and safety devices.
- Fully open the service valves.
- Check the function of the oil heater, if one is installed.

Tecumseh compressors are protected by an external or internal protection device, with a principle based on a temperature/current combination. As with any protection device, it is normal that this device will cut the power supply to the compressor if the compressor functions outside of the ranges defined by the manufacturer.

When the operating regimes are stable, perform the following checks:

- Voltage and current absorbed by the compressor,
- High pressures and low pressures of the installation,
- Over-heating, under-cooling, gas return gas return temperature, discharge temperature,
- Perform a search for leaks,
- Carry out a general inspection of the installation (cleanliness, unusual noises, etc.), Perform a visual inspection of the refrigerating system (e.g. according to the list provided in Annex G of standard EN378-2).

For installations which run using a flammable refrigerant fluid, where necessary, check that the leak detection equipment functions correctly.

Do not add oil unless the pipes are longer than 20 m; if this is the case, use oil recommended by Tecumseh.

6.5. Maintenance

Tecumseh recommends that the maintenance zone is secured in accordance with standard EN 378 Part 4.

A non-exhaustive list of recommendations is provided below:

- Obtain the permit for working at high temperatures (where applicable);
- Make sure that no flammable materials are stored in the work area and that there is no source of sparks in the work area;

- Disconnect electrical appliances from the main power supply;
- Remove sources of heat to prevent an explosion;
- If a heat source is present in the work place, ensure that a fire extinguisher is provided;
- Make sure that the work area is ventilated in a suitable manner before performing any works on the refrigeration circuit or prior to welding or soft soldering;
- Mark off the work area in order to prevent the entry of unauthorized persons;
- Ensure that the leak detection system in use is anti-spark and is secured in an adequate fashion or has intrinsic safety;
- Make sure that all maintenance personnel have been trained.

Each time that this is possible, the refrigerant system which runs using a fluid classified as category A2L, A2, or A3 will be taken to a special workshop for maintenance.

Check that the refrigeration circuit pressure will not present any risk or hazard during the work (ejection of parts, refrigerant, etc.). An operational compressor can reach temperatures in excess of 120°C. Never work on the compressor without protection.

IMPORTANT: If the detection system which prevents a current peak that is likely to melt the insulation (pin venting) has been triggered, do not rearm it. Replace the compressor by following the installation and commissioning rules and recommendations (see section 5).

6.5.1. Recovery of flammable fluids

- Use a recovery plant suitable for flammable fluids
- Identify the fluid in the cylinder and affix the flammable warning sign.
- Never mix different refrigerants.

6.5.2. Rendering the refrigerant circuit inert and precautionary measures prior to soldering

- Make sure a fire extinguisher is available in close proximity,
- Render the system inert using oxygen-free nitrogen (or air),
- Ideally the flow should be ventilated outdoors.

6.5.3. Opening the refrigerant circuit and replacing the components

IMPORTANT: Soldering is prohibited during any work on installations loaded with a flammable refrigerant. Generally, it is essential that all ignition sources (sparks, flames, sources of heat) are kept away from the circuit.

After replacing the components, crimped connections are an alternative to soldering.

6.5.4. Vacuum purging

For flammable refrigerant fluids, check that the vacuum pump contactor is the sole ignition source.
Make sure that the vacuum pump does not operate near the ignition source (the vacuum pump outlet must be located in a safe area).
It is recommended to route the outlet outdoors.

6.5.5. Replacing the electrical components

- The electrical boxes will be correctly closed again prior to loading with refrigerant and restarting the installation.
- Replace faulty electrical components using other parts with the same reference in order to guarantee the continuity of the safety of the installation.
- Do not shift or switch the electrical components.

Check the following on a regular basis

- the safety and control components,
- the condition of the electrical and refrigerated connections (retightening, oxidation, traces of oil etc.),
- the operating conditions,
- the compressor fixings on its base,
- the oil heater function.

Perform a search for leaks once a year, or according to the local regulations.
Warning labels
The refrigerant used and its mass must be labeled whatever their type or properties.
In the case of a fluid classified as A2L, A2, or A3, the flammable logo will be visible and legible.

6.6. End of life of the product

Fluorinated fluids are recovered as per the requirements of the F Gas Regulations in the EU.
Tecumseh also advises that the compressor oil and the compressor itself are recycled.

7. *Warranty*

For all information on the compressor warranty, please see the general terms and conditions of sale.

In order to continuously improve its products, Tecumseh reserves the right to amend these instructions without prior notice