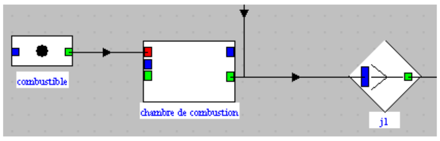
Representation of Components as Productive Units

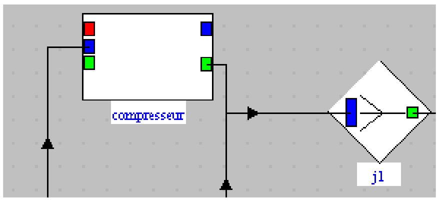
This document explains how the main components of Thermoptim are represented as Productive or Dissipative Units (PDUs). It distinguishes between exergy provider components (which increase the exergy of the fluid passing through them) and exergy receiver components (which decrease its exergy).

Exergy Provider Components

Component	R	P
Combustion	xq^+	Δxh

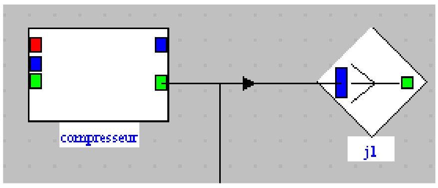


A combustion chamber converts the chemical exergy of the fuel xq^+ (entering via the red port) into an increase in fluid exergy Δxh (exiting via the green port). A junction must be placed downstream, with another inlet for the oxidizer (e.g., air). Any remaining chemical exergy in the flue gas is accounted for downstream.



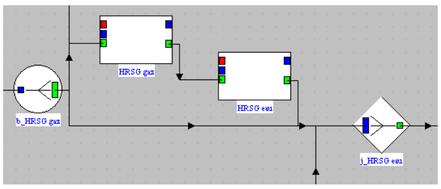
Component	R	P
Compressor internal τ	τ^+	Δxh

Un compresseur (ou une pompe) convertit la puissance mécanique τ^+ qu'il reçoit en accroissement d'exergie Δxh du fluide qui le traverse. Il faut donc placer en aval une jonction dont les autres entrées sont par exemple le comburant et la chambre de combustion. Le lien sortant provient du port vert
A compressor (or pump) converts mechanical power (τ^+, entering via the blue port) into an increase in fluid exergy (Δxh, exiting via the green port). A junction must be placed downstream, with other inlets (e.g., oxidizer, combustion chamber).



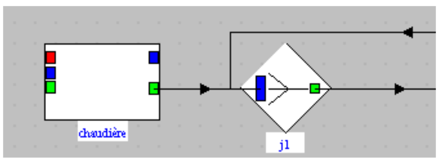
Component	R	P
Compressor external τ	τ^+	Δxh

If the mechanical power is internal to the system, it is represented by a link entering the blue port. If it is external, it does not appear in the diagram but must be specified in the exergy calculation screen.



Component	R	P
Internal Heat Exchanger Hot fluid upstream Cold fluid downstream	Δxh^+	Δxh

In an internal heat exchanger modeled as a coupling between two "exchange" processes, the resource corresponds to the exergy variation of the hot fluid, and the product to that of the cold fluid. The hot fluid must correspond to one branch of a divider, and the cold fluid to one branch of a junction. The two components are connected as shown in the figure.



Component	R	P
External Heat Exchanger Q>0 $T_k > T_0$	xq^+	Δxh

In heat exchange with an external source at a temperature higher than the environment, the resource is the heat-exergy xq^+ exchanged with the source. The product is the increase in fluid exergy Δxh, exiting via the green port. A junction must be placed downstream. l
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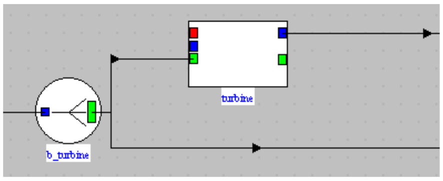
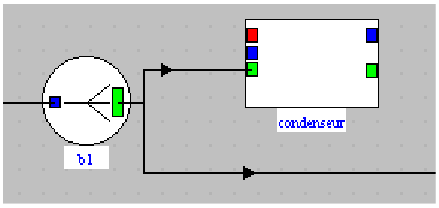
Exergy Receiver Components



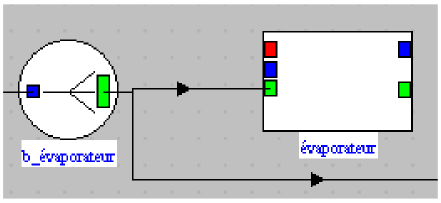
Turbine Δxh^+ τ

A turbine converts the decrease in fluid exergy (Δxh^+ entering via the green port) into mechanical power (τ, exiting via the blue port). A divider must be placed upstream, with at least one other outlet (e.g., atmospheric vent for expanded gases or a condenser for steam).



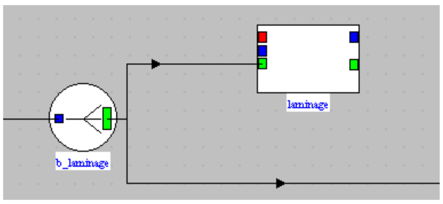
External Heat Exchanger Q<0
$T_k > T_0$ Δxh^+

In cooling with an external source at a temperature higher than the environment, the resource is the decrease in fluid exergy (Δxh^+ entering via the green port), and the product is the heat-exergy xq^+ transferred to the external source. The external source temperature T_k must be specified in the exergy calculation screen. A divider must be placed upstream with at least one other outlet.



External Heat Exchanger Q>0
$T_k < T_0$ Δxh^+

In heat exchange with an external source at a temperature lower than the environment, the resource is the decrease in fluid exergy (Δxh^+ entering via the green port), and the product is the heat-exergy xq^+ transferred to the external source. The external source temperature T_k must be specified in the exergy calculation screen. A divider must be placed upstream with at least one other outlet.



Throttling Valve Δxh^+ 0

In a throttling process, the total exergy of the fluid decreases between the inlet and outlet due to the pressure drop at constant enthalpy. A divider must be placed upstream. This is a dissipative component: the resource is the decrease in fluid exergy (Δxh^+ entering via the green port), and the product is 0 (no useful output). l