Fresia s.p.A.

SNOW REMOVAL EQUIPMENT AIRCRAFT TOWING TRACTOR

F90 2STi

2 stages
Self propelled 4x4 snow-blower

BORDER ROADS ORGANIZATION

Training course

Matteo ing. Panero

F90 2STi 2 stages *Self propelled 4x4 snow-blower*

F90 SERIES

Snow removal equipments

Self propelled snow-blower of compact design.

F 90 series snow-blower have demonstrated worldwide to be suitable for snow clearing operations in airports.

Four wheel drive and steering provide excellent maneuverability.

Advanced design of blower heads for high performance clearing in all kind of snow.

FRESIA

HYDROSTATIC TRANSMISSION

The vehicle is driven by a heavy duty hydrostatic transmission with variable pump.
Infinitely adjustable speeds regulation .
Automatic load controlled traction regulation during operation.

ENGINE

The standard power for the blower is a water cooled VOLVO PENTA engine.

Positioning	rear/centerline mounted
Model	TAD1643VE-B
Type	Direct injection, 4 cycle
Cylinders No	6 V
Maximum power	565 kW @ 1.900 rpm
Maximum torque	3200 Nm
Displacement	16,12 l

FRESIA

STEERING

Right-hand steering
Fully hydraulic powered
Four wheels steering

TRANSMISSION TO CUTTER AND IMPELLER

The unit is equipped with an heavy duty FRESIA mechanical transmission especially design for snow-blower operation with two working speed ranges: fast and low.

Mechanical drive line directly linked to the blower through the propeller shaft.

TWO STAGE BLOWER HEAD

FRESIA Two-stage blower head:
first stage helical ribbon type, center driven through a bevel gear;
second stage fan type configuration.

The blower is an advanced design for high performance clearing both in light powder and heavy snow.

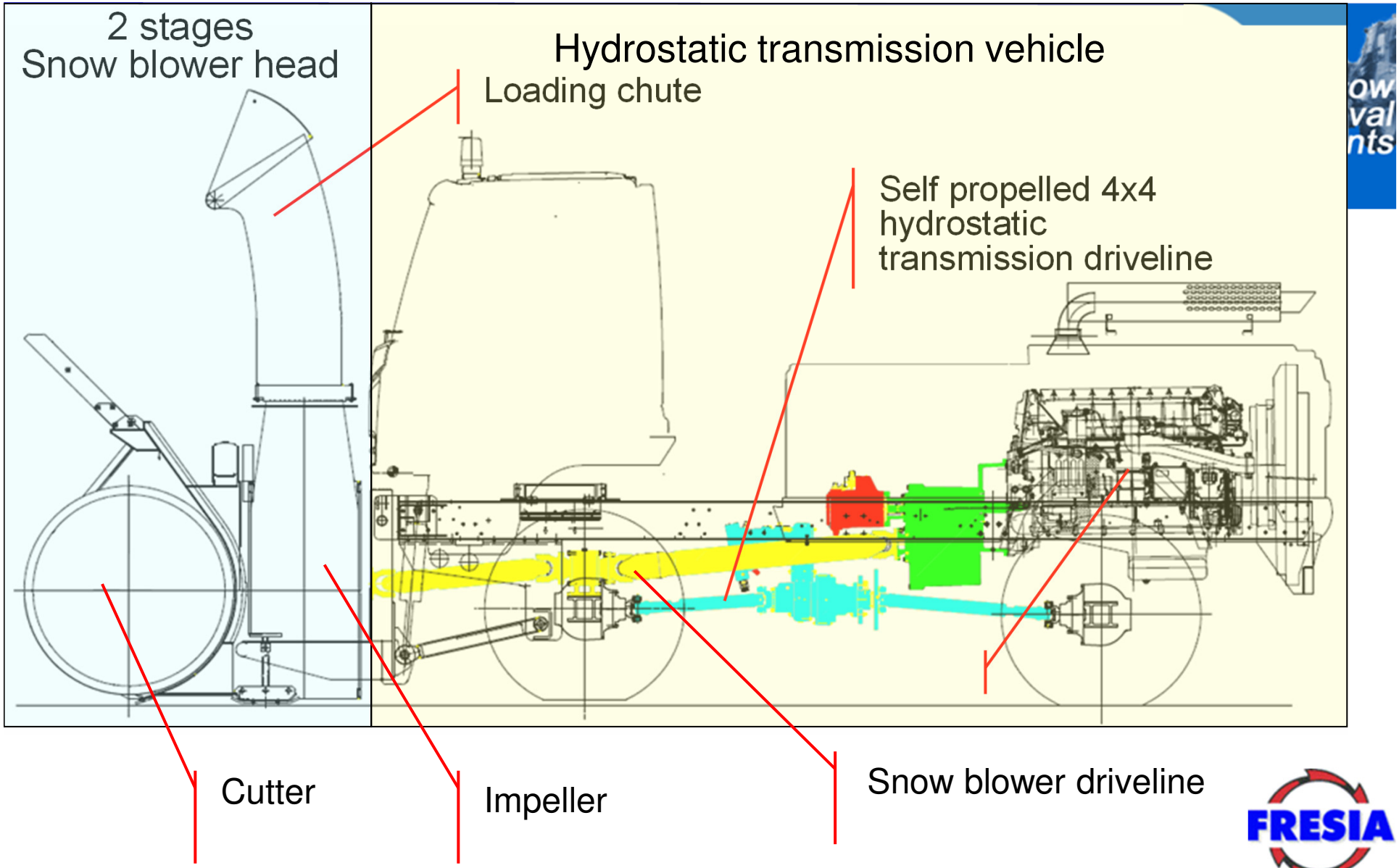
Clearing width	2500 mm
Augers diameter	1400 mm
Impeller diameter	1400 mm

LOADING CHUTE

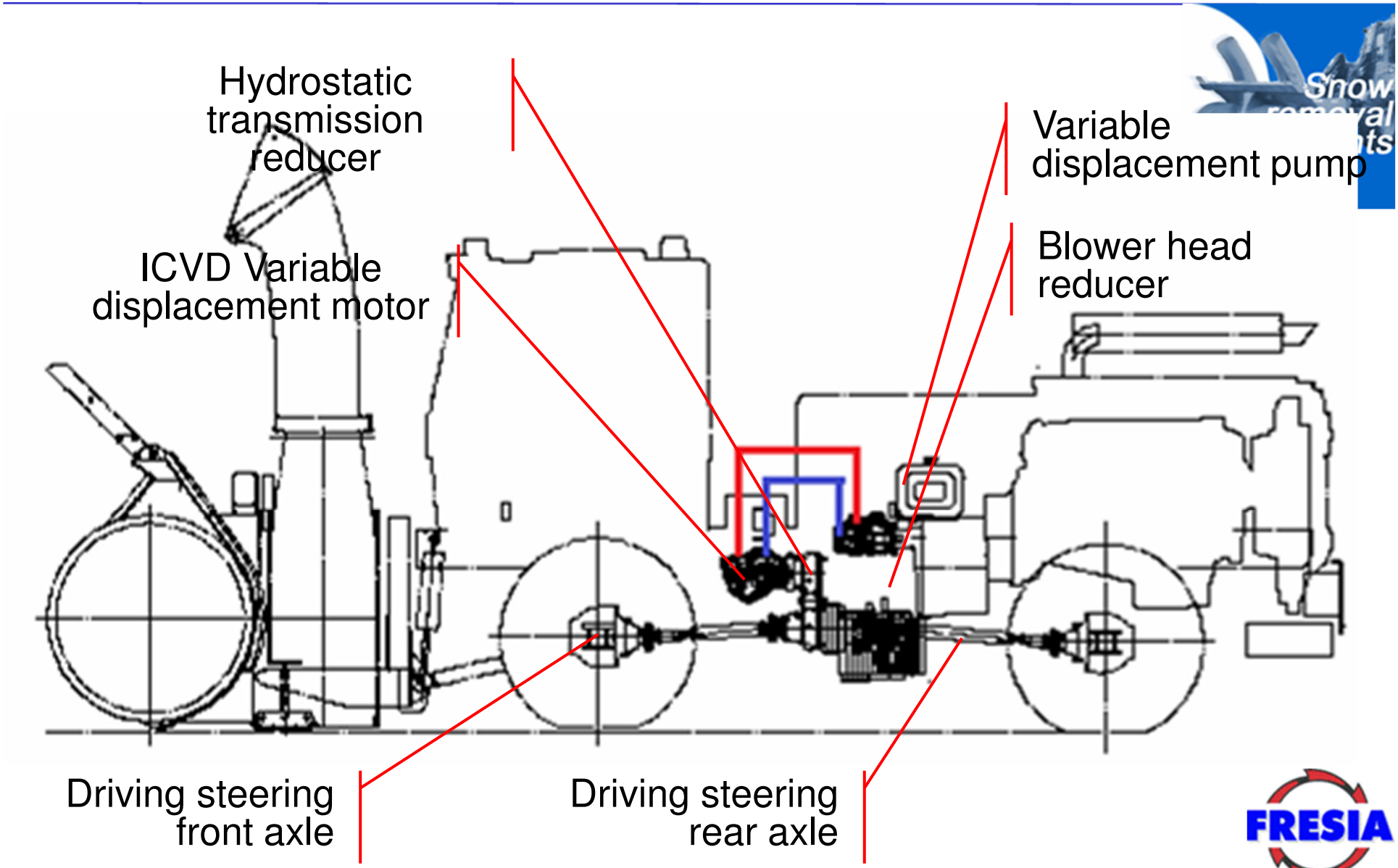
Casting chute rotated by hydraulic control in cab to permit casting to right and left; and loading of trucks on either side through an arc of 220 degrees.

FRESIA

F90 2STi 2 stages Self propelled 4x4 snow-blower



HYDROSTATIC TRANSMISSION VEHICLE



HYDROSTATIC TRASMISSION – FUNCTIONAL SCHEME

VOLVO PENTA ENGINE

TAD1643VE

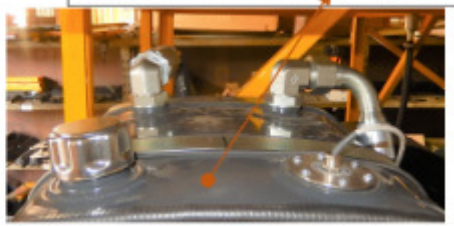
PUMP H1 130

variable displacement pump, 130 cc/rev

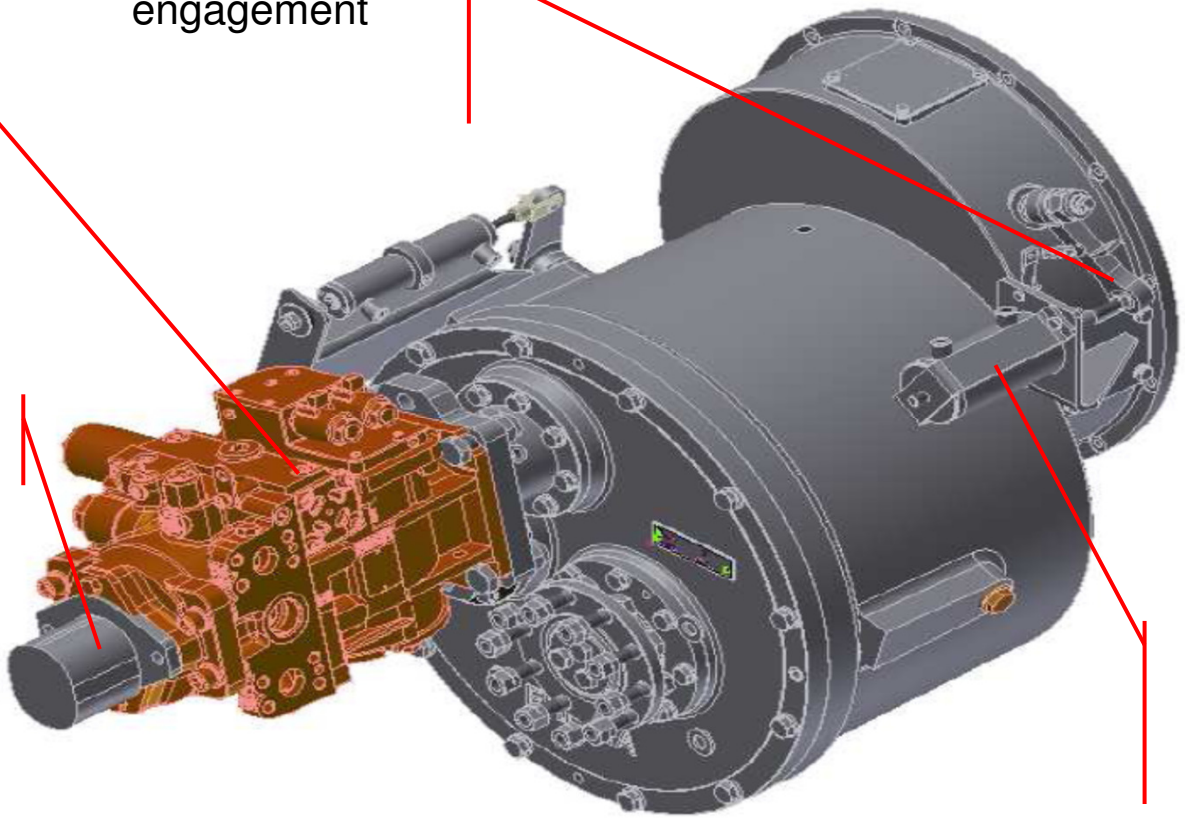
MOTOR H1 250 variable displacement motors with bent axis design

FRESIA STEERING AXLE

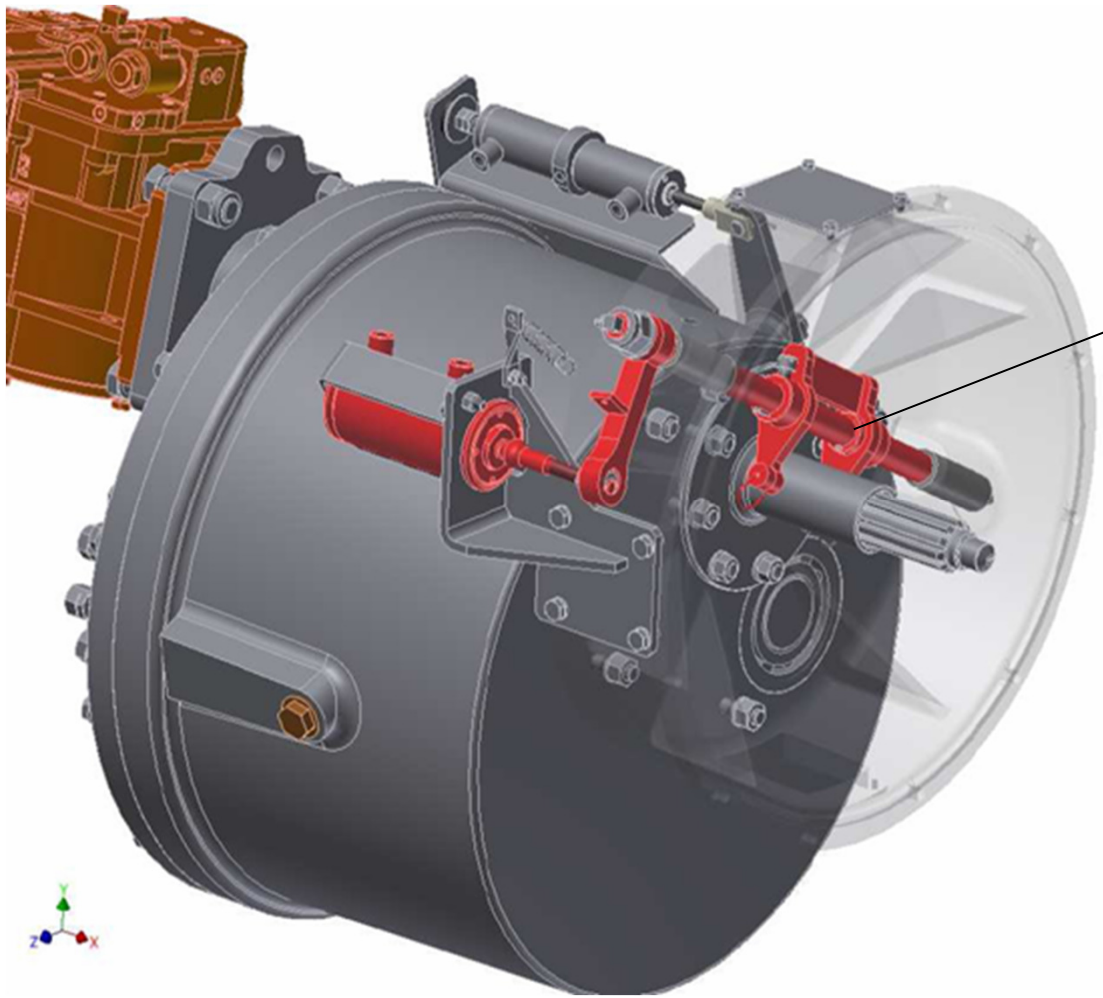
HYDROSTATIC TRANSMISSION - HYDRAULIC SCHEME



BLOWER HEAD REDUCER

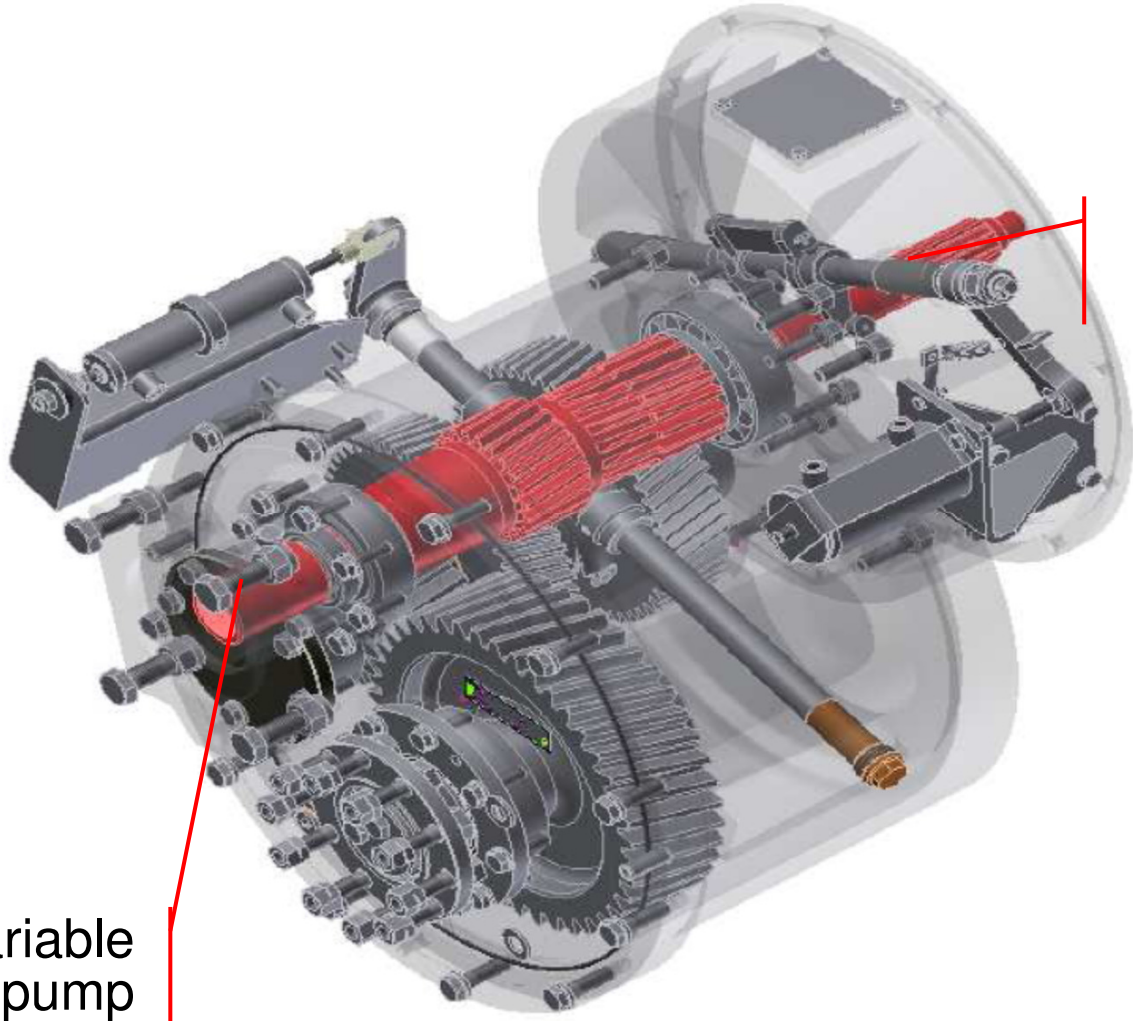


BLOWER HEAD REDUCER – CLUTCH ENGAGEMENT SYSTEM



clutch engagement system controlled by PLC system

HYDROSTATIC PUMP GEAR CONNECTION

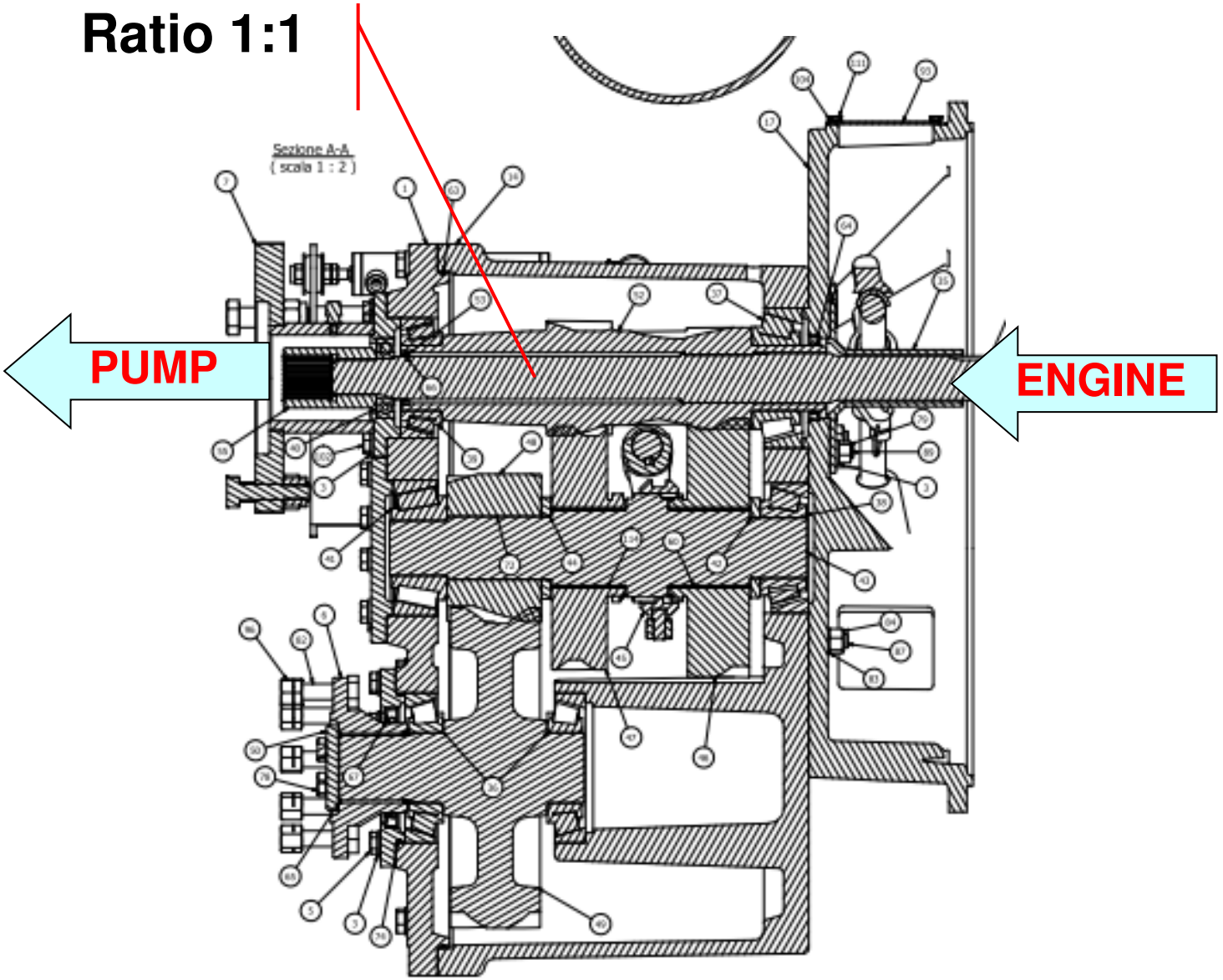


Engine coupling

Variable displacement pump coupling

Blower head reducer

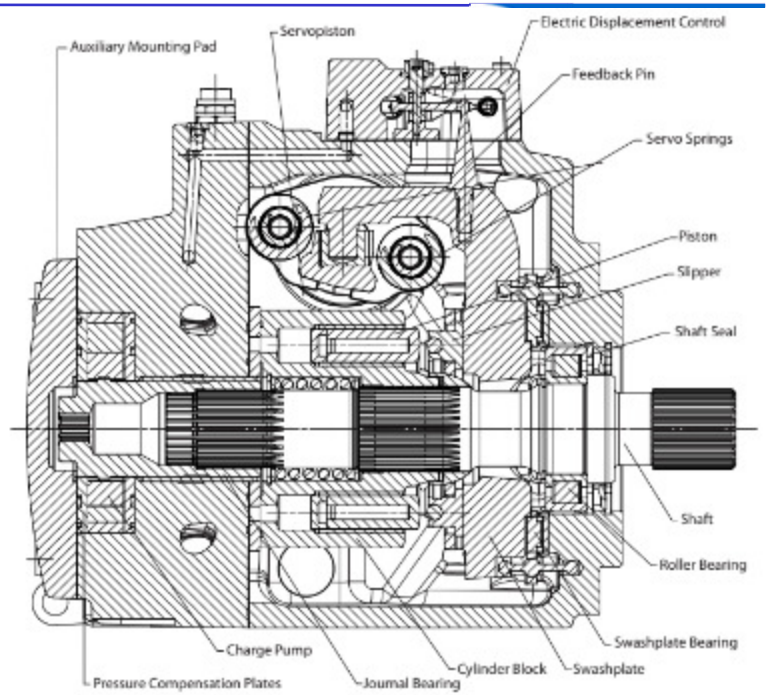
Ratio 1:1



VARIABLE DISPLACEMENT PUMP

Technical data

Feature	Unit		Size 115		Size 130	
Displacement	cm^3	[in^3]	115.2	[7.03]	130.0	[7.93]
Flow at rated (continuous) speed	l/min	[US gal/min]	371	[98]	419	[111]
Torque at maximum displacement (theoretical)	Nm/bar	[lbf-in/1000psi]	1.83	[1120]	2.07	[1260]
Mass moment of inertia of rotating components	$kg\cdot m^2$	[$slug\cdot ft^2$]	0.021		[0.0155]	
Mass [weight] dry (without auxiliary mounting flange and filter)	kg	[lb]	83		[187]	
Oil volume	liter	[US gal]	2.00		[0.5]	
Mounting flange	ISO 3019-1 flange 152-4 (SAE D)					
Input shaft outer diameter, splines and tapered shafts	ISO 3019-1, outer dia 44 mm - 4 (SAE D, 13 teeth) ISO 3019-1, outer dia 44 mm - 4 (SAE D, 27 teeth) Conical keyed shaft and similar to ISO 3019-1 code 44-3, taper 1:8					
Auxiliary mounting flange with metric fasteners, shaft outer diameter and splines	ISO 3019-1, flange 82 - 2, outer dia 16 mm - 4 (SAE A, 9 teeth) ISO 3019-1, flange 82 - 2, outer dia 19 mm - 4 (SAE A, 11 teeth) ISO 3019-1, flange 101 - 2, outer dia 22 mm - 4 (SAE B, 13 teeth) ISO 3019-1, flange 101 - 2, outer dia 25 mm - 4 (SAE B-B, 15 teeth) ISO 3019-1, flange 127 - 4, outer dia 32 mm - 4 (SAE C, 14 teeth) ISO 3019-1, flange 152 - 4, outer dia 44 mm - 4 (SAE D, 13 teeth)					
Suction port	Port ISO 11926-1 – 1 1/16-12 (SAE O-ring boss)					
Main port configuration	Ø31.5 - 450 bar split flange boss per ISO 6162, M12x1.75					
Case drain ports L2, L4 (SAE O-ring boss)	Port ISO 11926-1 – 1 1/16-12 (SAE O-ring boss)					
Other ports	SAE O-ring boss. See *Installation drawings at the back of this manual.*					
Customer interface threads	Metric fasteners					



Size 089/100 Single Pumps					*Technical Information, SD-Order Number*					***11069970***	***11071849***	
H1P089	89.2	[5.44]	3300	3800	450	[6525]	480	[6960]	62 [137]	EDC, FNR, NFPE	AC	C 4-bolt flange
H1P100	101.7	[6.21]			420	[6090]	450	[6525]				
Size 115/130 Single Pumps					*Technical Information, SD-Order Number*					***11063346***	***11071850***	
H1P115	115.2	[7.03]	3200	3400	450	[6525]	480	[6960]	83 [187]	EDC, FNR, NFPE	AC	D 4-bolt flange
H1P130	130.0	[7.93]			420	[6090]	450	[6525]				
Size 147/165 Single Pumps					*Technical Information, SD-Order Number*					***11063347***	-	
H1P147	147.2	[8.98]	3000	3100	450	[6525]	480	[6960]	96 [211]	EDC	-	D 4-bolt flange
H1P165	165.1	[10.08]			420	[6090]	450	[6525]				

The H1 axial piston variable displacement pumps are of cradle swashplate design and are intended for closed circuit applications.

The flow rate is proportional to the pump input speed and displacement.

The latter is infinitely adjustable between zero and maximum displacement.

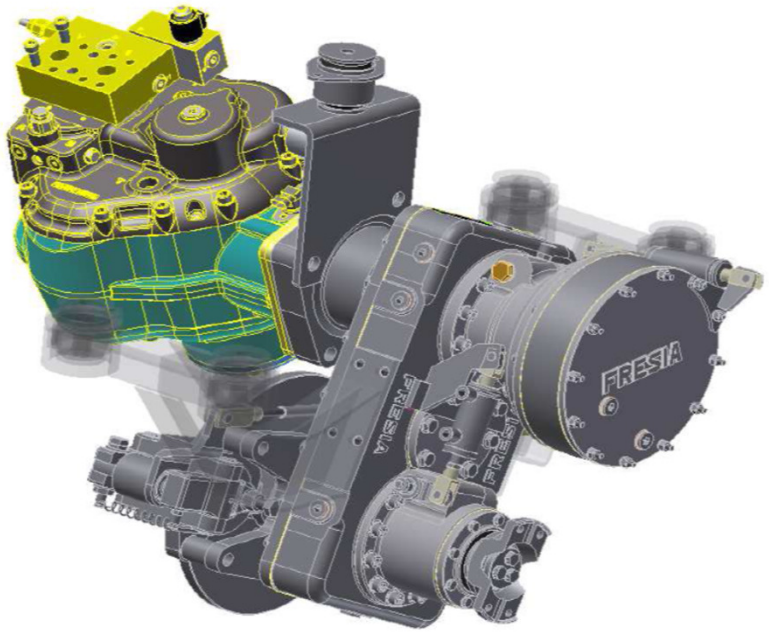
Flow direction is reversed by tilting the swashplate to the opposite side of the neutral (zero displacement) position.

PROPEL MOTOR

H1 B250 Bent Axis Variable Displacement Motors

Physical properties

Features	Unit	Size				
		060	080	110	160	250
Displacement maximum	cm^3 [in^3]	60 [3.66]	80 [4.88]	110 [6.71]	160 [9.76]	250 [15.25]
Displacement minimum	cm^3 [in^3]	12 [0.73]	16 [0.98]	22 [1.34]	32 [1.95]	50 [3.05]
Flow at rated speed and maximum displ. (theoretical)	l/min [US gal/min]	216 [57]	256 [68]	319 [84]	416 [110]	550 [145]
Flow at maximum speed and maximum displ. (theoretical)	l/min [US gal/min]	270 [71]	328 [87]	407 [108]	528 [139]	700 [185]
Torque at maximum displacement (theoretical)	N•m/bar [lbf•in/1000 psi]	0.96 [583]	1.27 [777]	1.75 [1069]	2.55 [1555]	3.98 [2426]
Theoretical corner power at rated speed and maximum working pressure (Δp = 450 bar [6527 psi])	kW [hp]	266 [357]	321 [430]	396 [531]	513 [689]	684 [917]
Mass moment of inertia of rotating components	$kg•m^2$ [$slug•ft^2$]	0.0038 [0.0028]	0.0062 [0.0046]	0.0108 [0.0080]	0.0211 [0.0156]	0.0402 [0.0296]

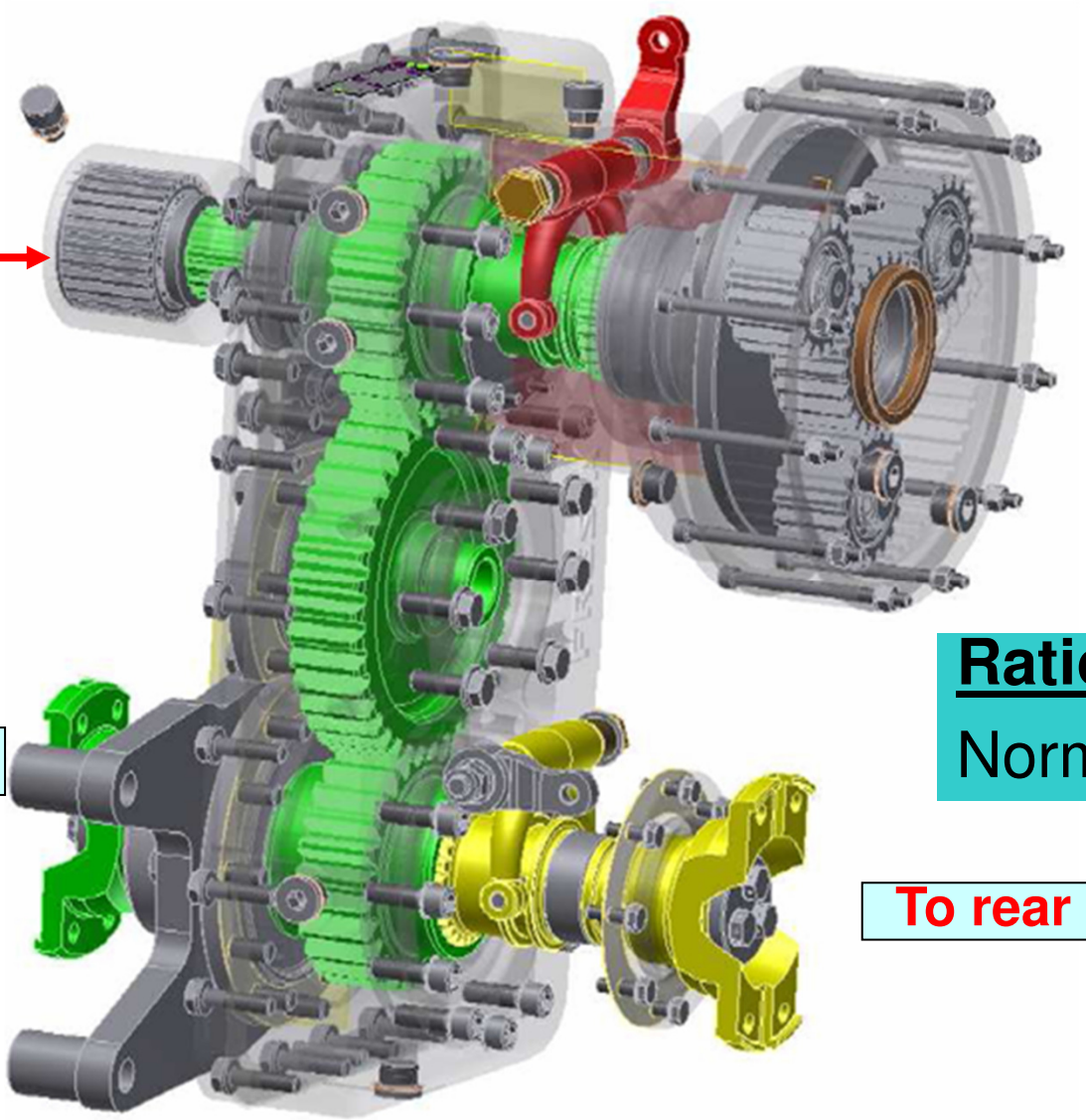


These motors are designed primarily to be combined with other products in closed circuit systems to transfer and control hydraulic power. Series H1 motors have a large maximum/minimum displacement ratio of 5:1 and high output speed capabilities.

FRESIA

HYDROSTATIC TRANSMISSION 2 SPEED REDUCER – Normal ratio

Propel motor



To front axle

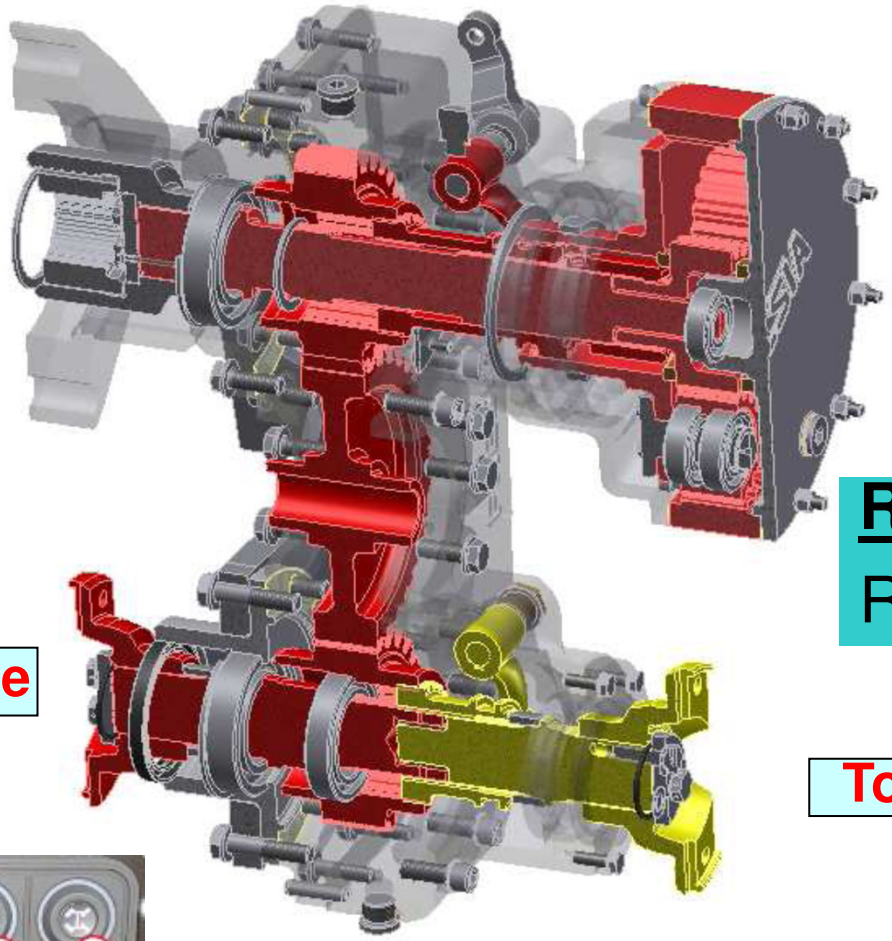
To rear axle

Ratio:

Normal 1:0,926

HYDROSTATIC TRANSMISSION 2 SPEED REDUCER – reduced ratio

ICVD Variable displacement motor



Ratio:

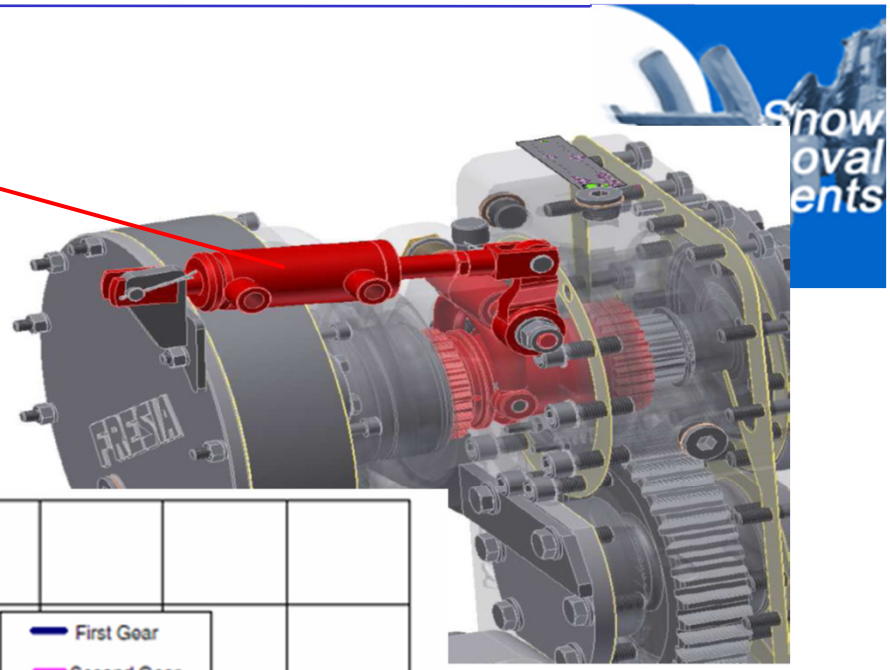
Reduced 1:3,24

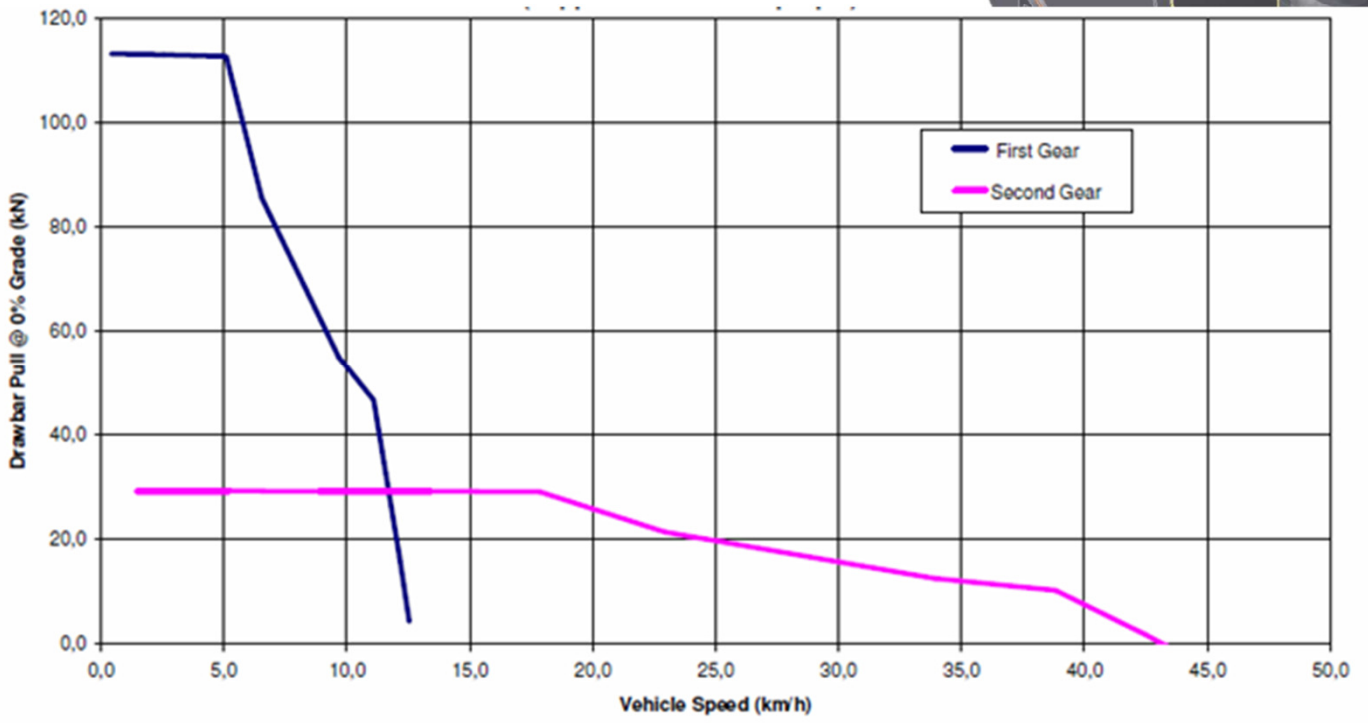
To front axle

To rear axle

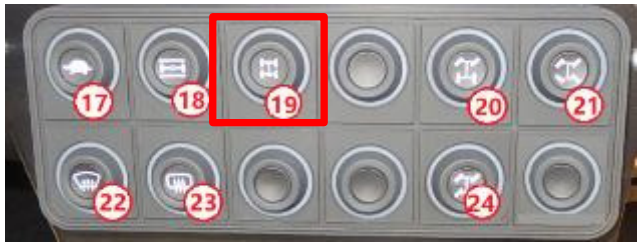
HYDROSTATIC TRANSMISSION 2 SPEEDS REDUCER
speed selector

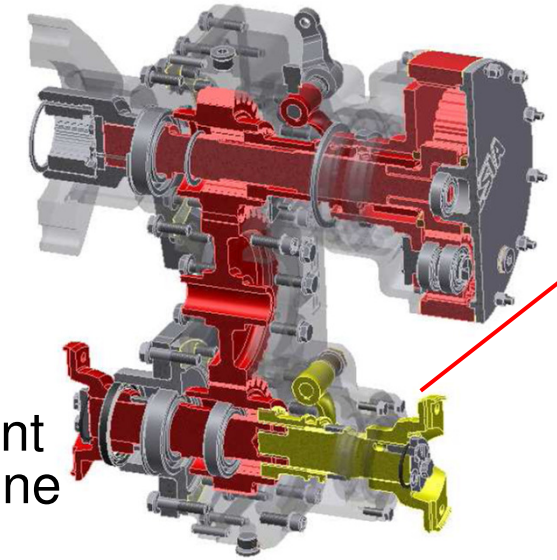
2 speeds engagement device





HYDROSTATIC TRANSMISSION 2 SPEED REDUCER
2WD/4WD engagement

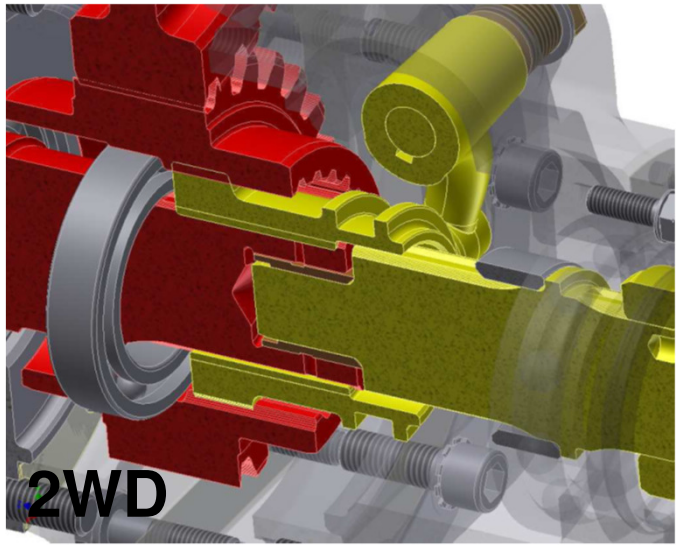


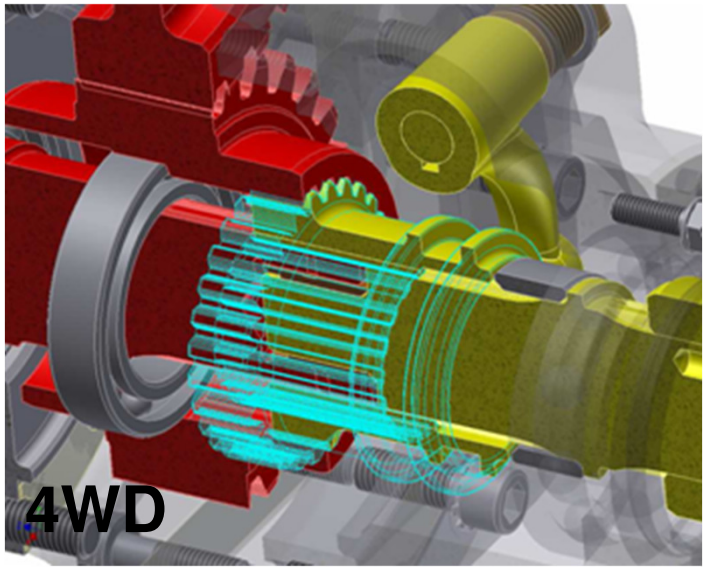


Snow removal equipments

2WD/4WD engagement device

Front wheel drive engagement operation must always be done with vehicle stationarity.



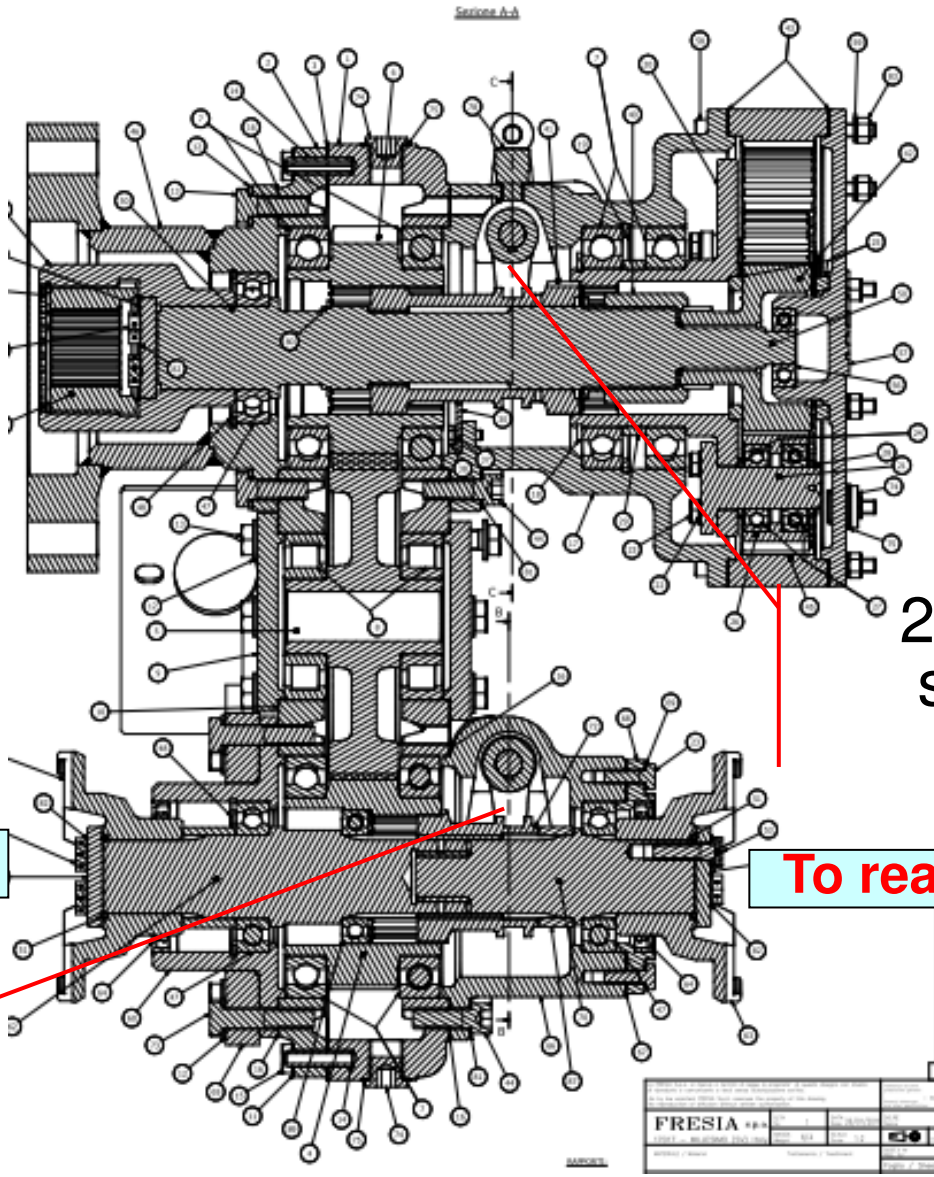


FRESIA

Hydrostatic transmission 2 speed reducer

Ratio:
Normal 1:0,926
Reduced 1:3,24

ICVD Variable displacement motor



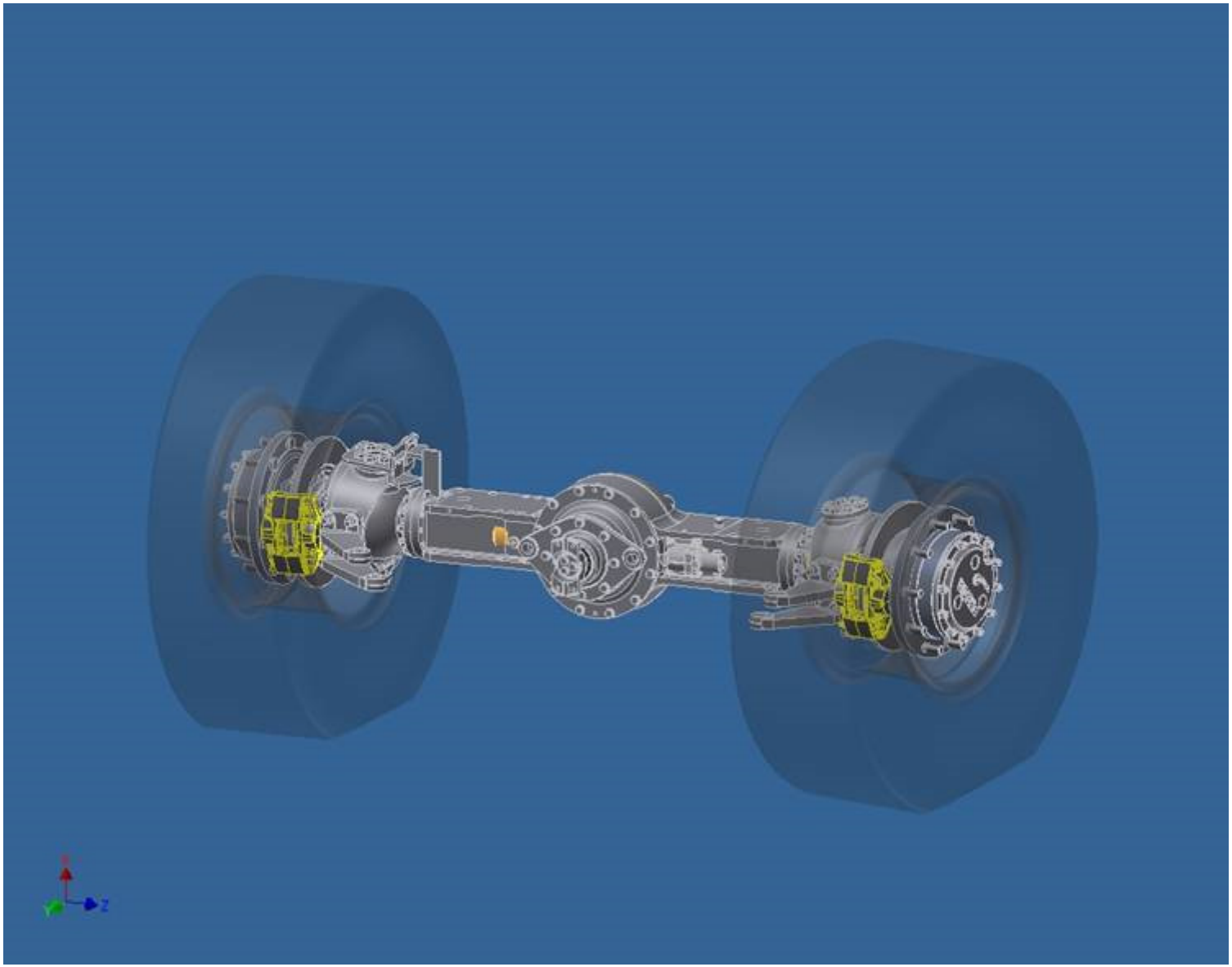
2 speeds selector

To front axle

To rear axle

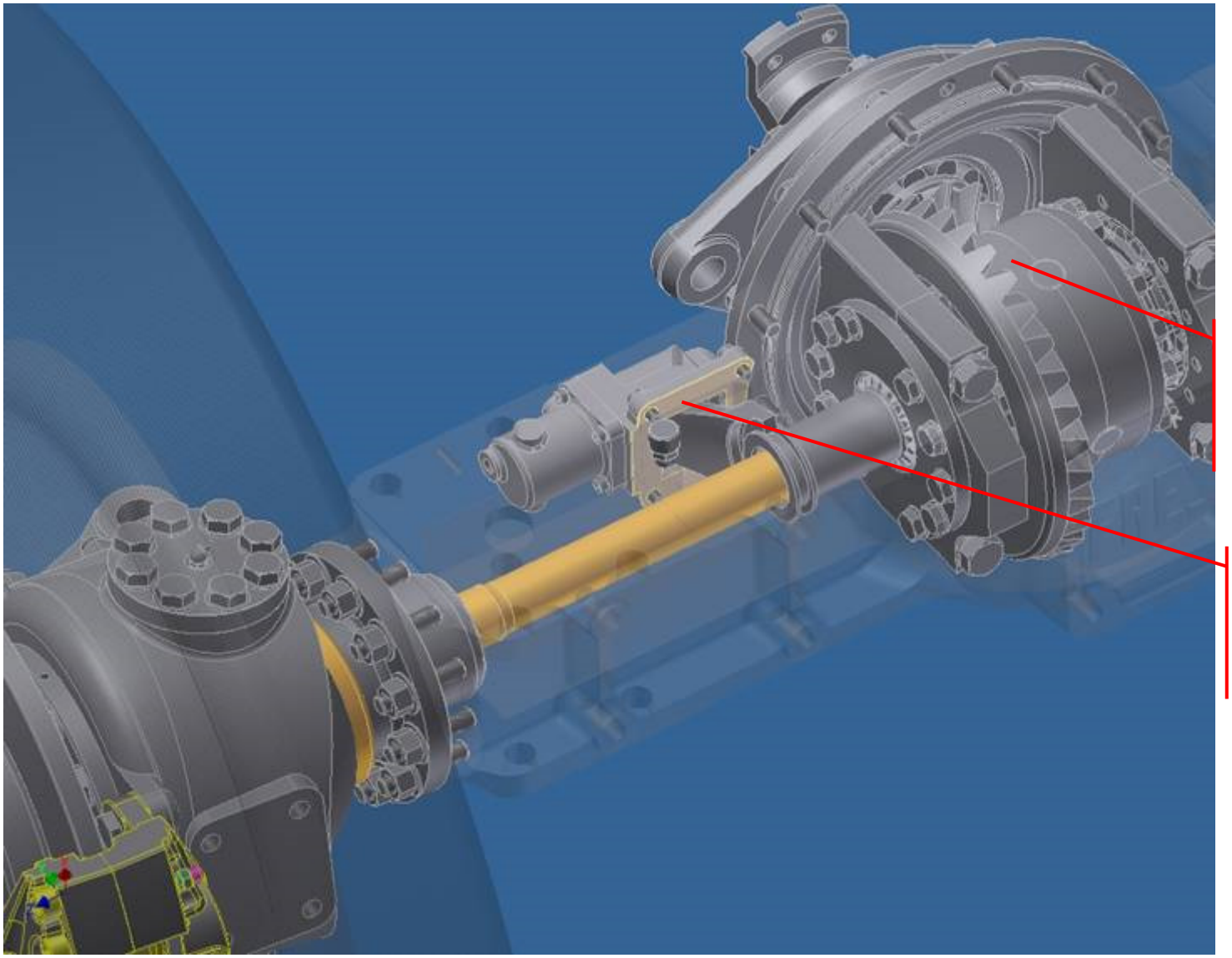
2WD/4WD selector

FRONT and REAR STEERING AXLES



FRESIA

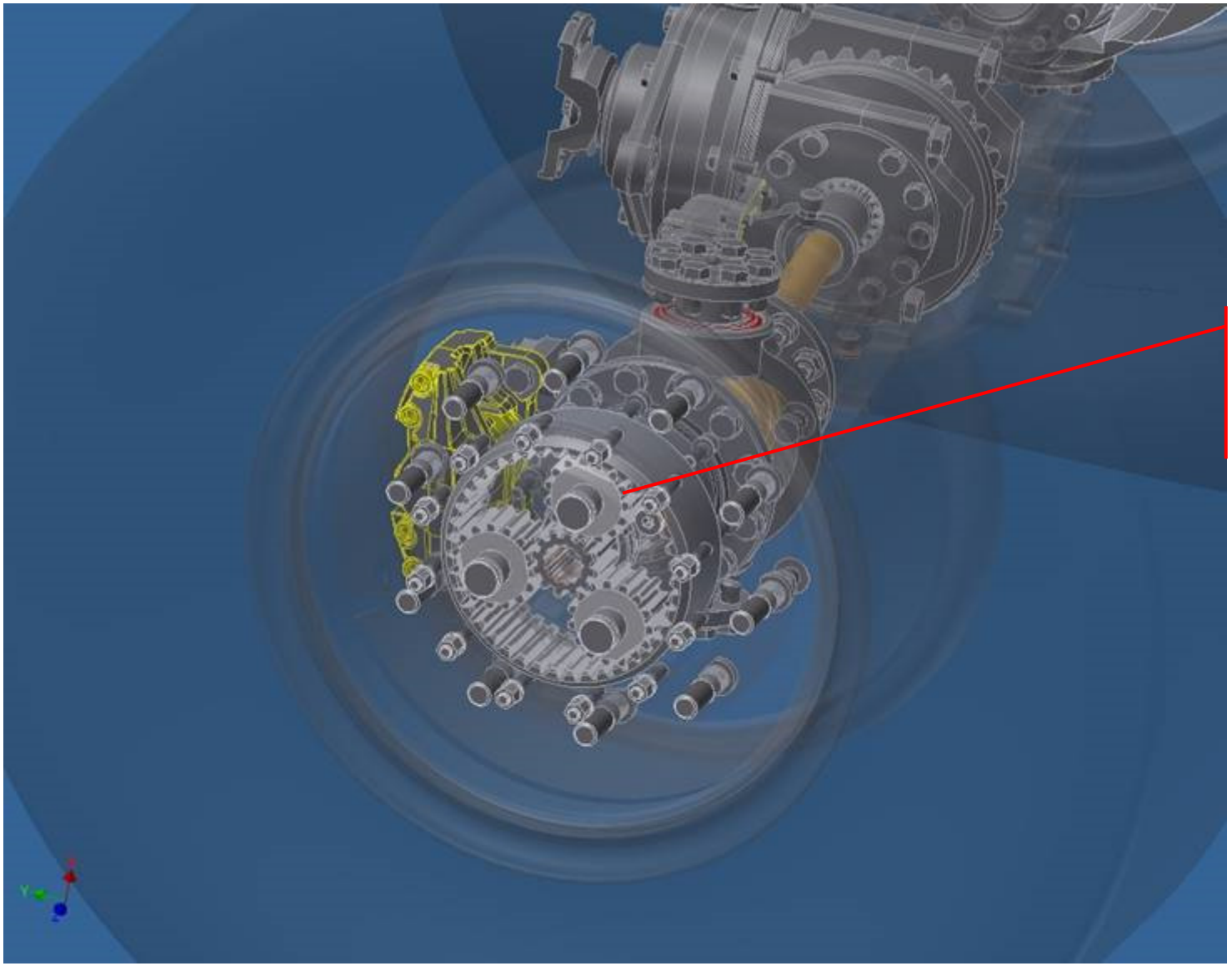
AXLE DIFFERENTIAL and DIFFERENTIAL LOCKING



Differential

Differential Locking device

HUB REDUCTION



Planetary Gear Reduction 1:13,091

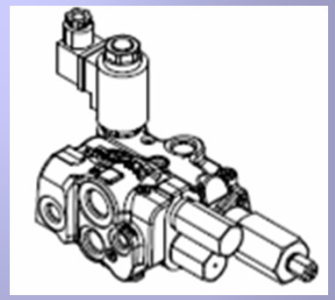
BRAKING AND STEERING HYDRAULIC SYSTEM

One single valve controls the output for steering and accumulators charge (braking).

The flow for the steering is on a priority level in respect to all other services.

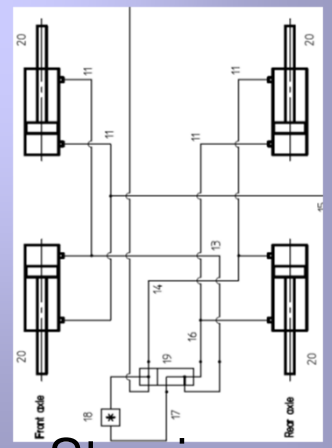
• The accumulators charge is on a priority level in respect to the excess flow, but not in respect to the steering.

Gear pump

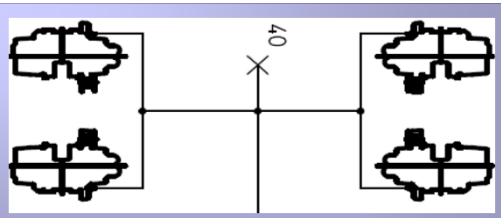


Master priority valve

Power steering



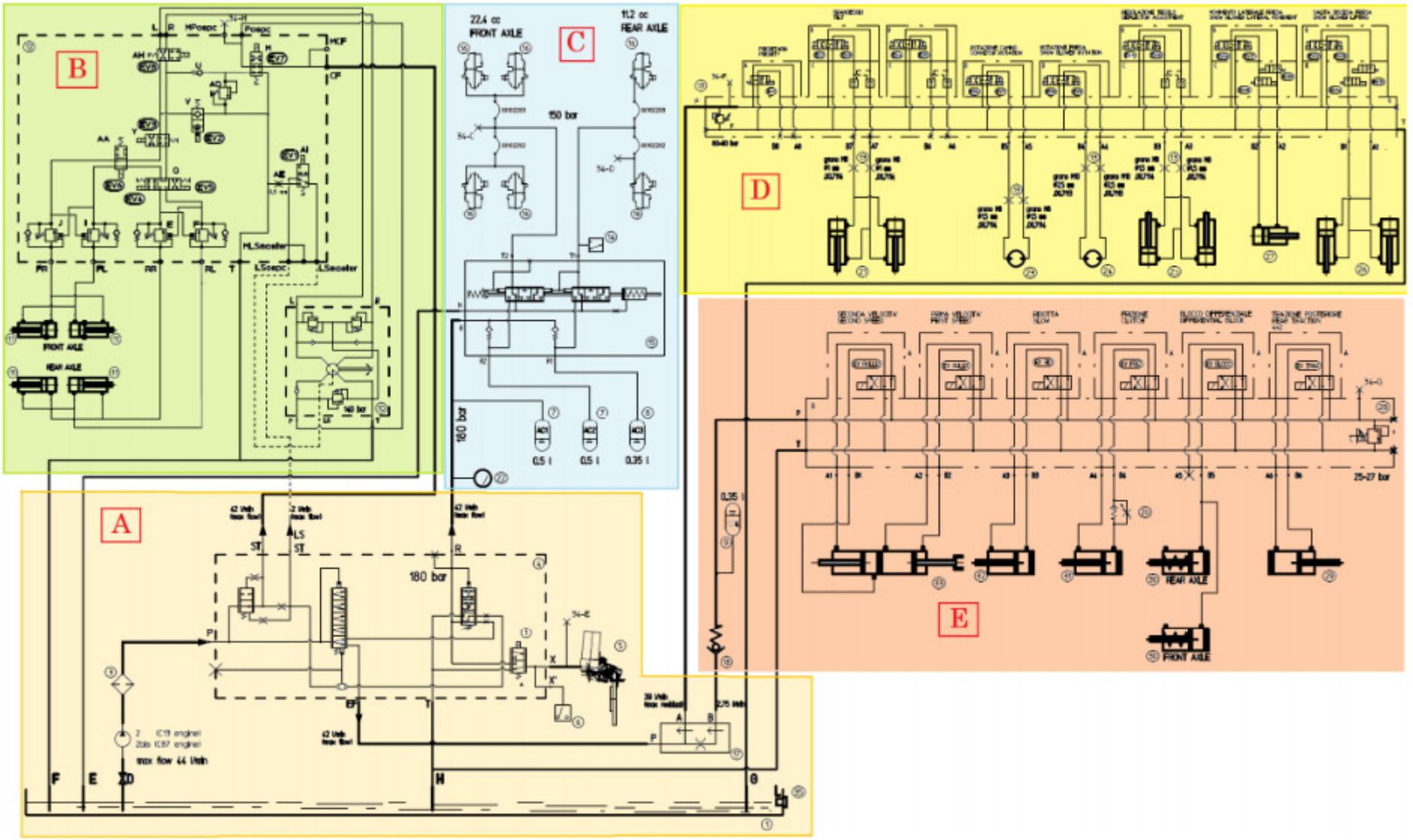
Steering cylinders



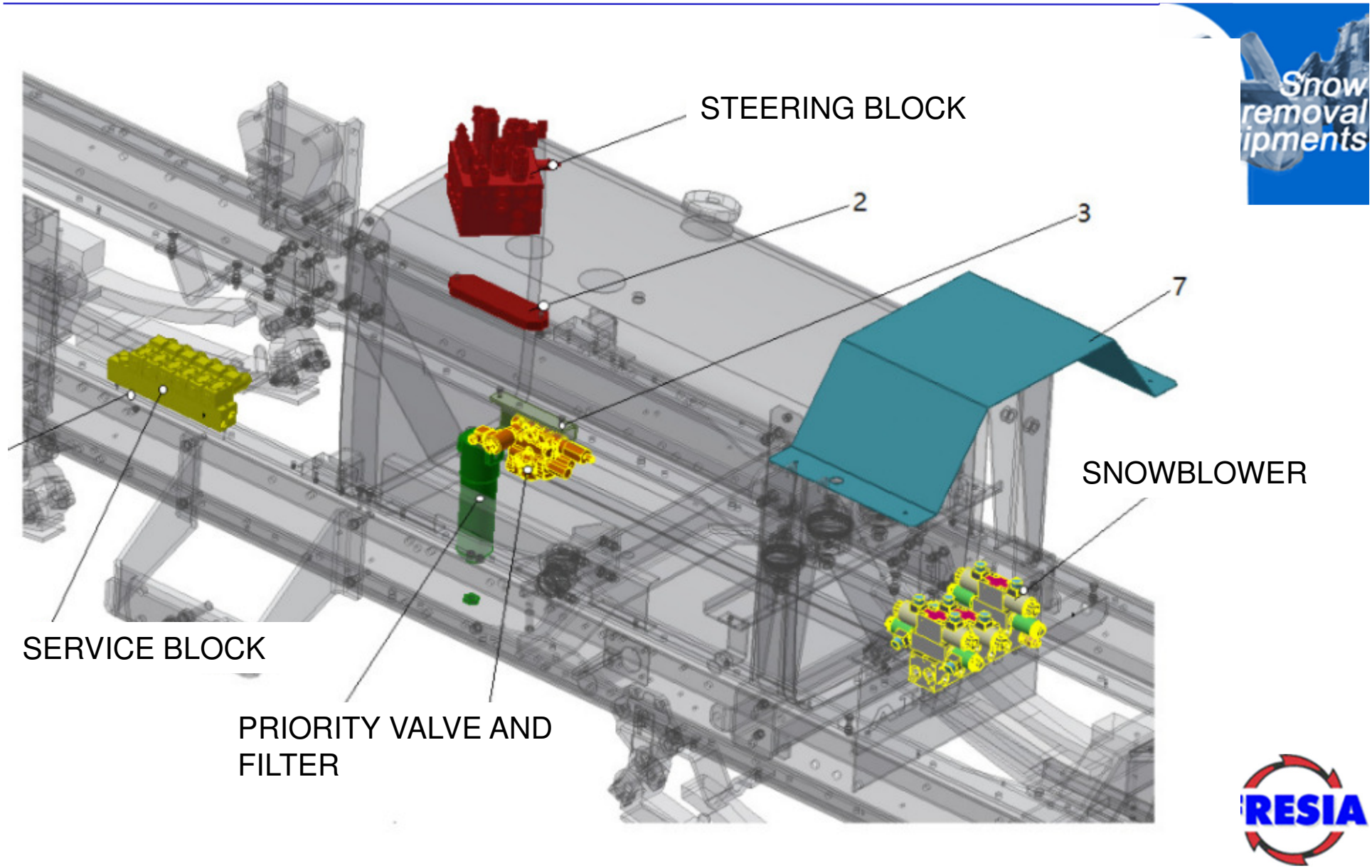
Braking system

Aux service

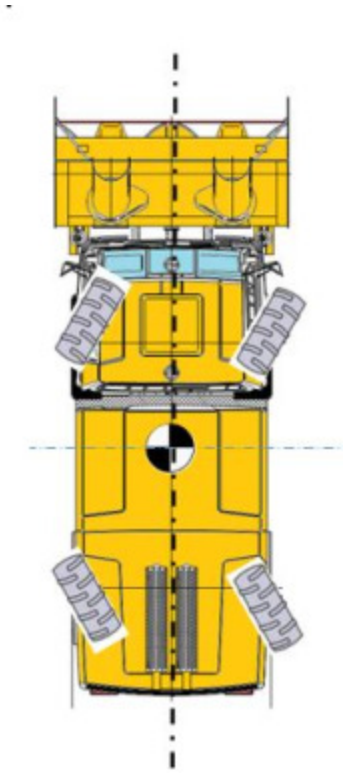
HYDRAULIC SYSTEM



HYDRAULIC BLOCKS LOCATION



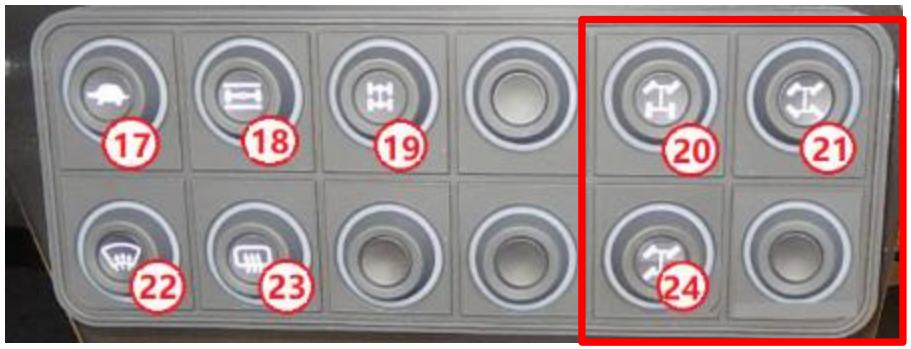
STEERING SYSTEM



The fully servo-assisted hydraulic steering system with ORBITROL-type servo-control with transmission to the wheels via hydraulic actuators and coupling bar.

The steering is completely servo-assisted with the possibility of selecting the following modes:

- front axle only;
- four wheels in phase opposition (concentric front and rear steering);
- crab (four steering wheels in phase concordance).



STEERING SYSTEM

The operator has the possibility to select the steering mode most suited to the required use.

The steering of the front axle only is ideal for transfers on the road or for work on high-traffic roads. In fact, to guarantee greater vehicle handling during the transfer phase, it is possible to use the steering of the front axle only while the rear wheels remain locked like a normal vehicle.

The steering with 4 steering wheels allows easy and safe driving in all operating conditions with great maneuverability. The reduced bending radius is ideal for mountain bends allowing clearing operations in a single maneuver and to allow the vehicle to operate between the snow walls and remain in the trajectory both in forward and in reverse;

Crab steering that allows lateral translations to be carried out, allowing the vehicle to exit from any gaps that are common enough when operating on roads

completely covered in snow and barely marked. In this last circumstance, for vehicles with articulated chassis the exit from the gut would make a much more difficult action.

Wheels alignment operations

Hydraulic system with disc brakes on four wheels, with independent circuits, front and rear.

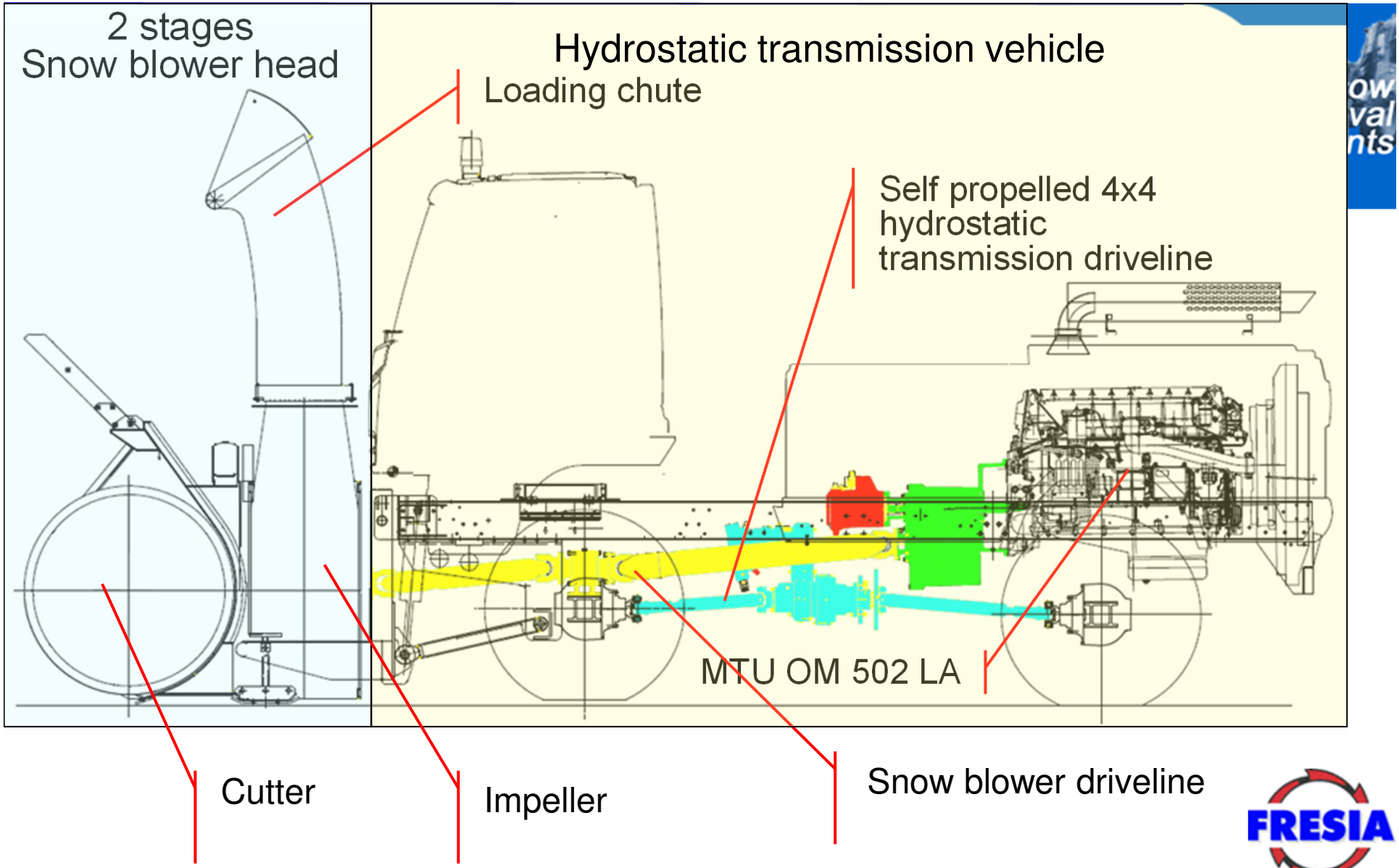
The disc parking brake acts on the transfer blocking the four wheels. The control is negative with a spring-loaded cylinder for automatic insertion in the event of a system failure.

All the components of the braking system are easily accessible, to ensure ease of maintenance and repair.

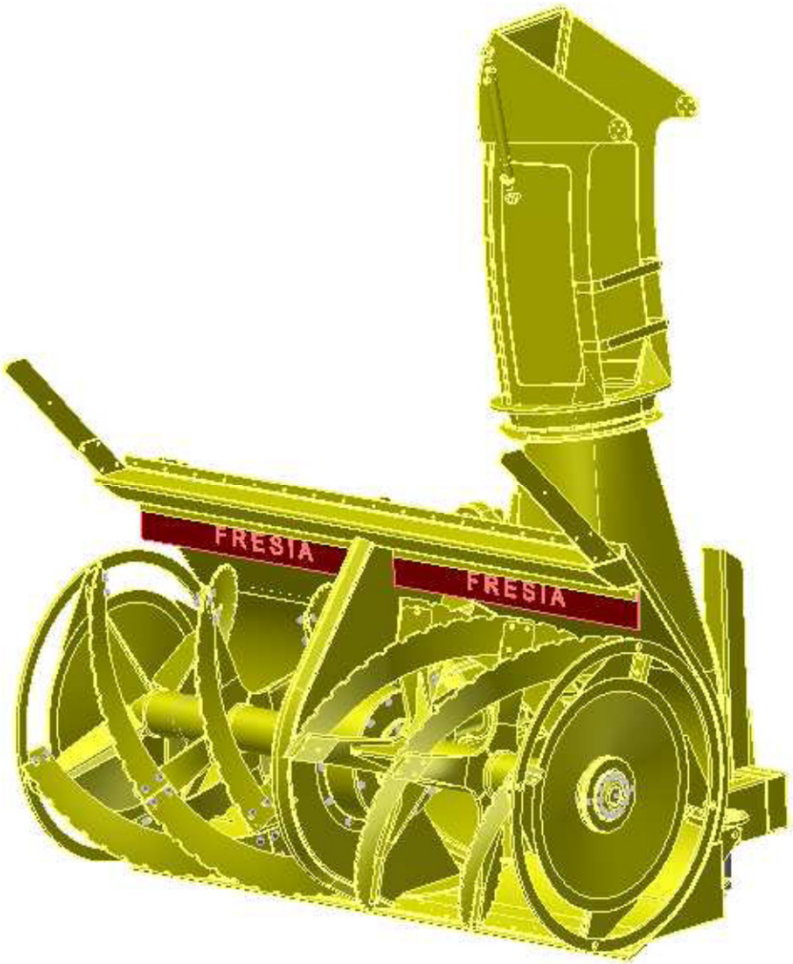
MAIN SCREEN


F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
T
W
1
2
A
TRANSPORT MODE
FRESIA
R N F
40
99
996.9
24
5.5 BAR
123
100
150 BAR
100
120
2000
RPM
20°C
CHECK
CHECK TRANS
CAN
Esc

F90 2STi 2 stages Self propelled 4x4 snow-blower



2 STAGES SNOW BLOWER HEAD



1st first stage helical ribbon type, center driven through a differential.

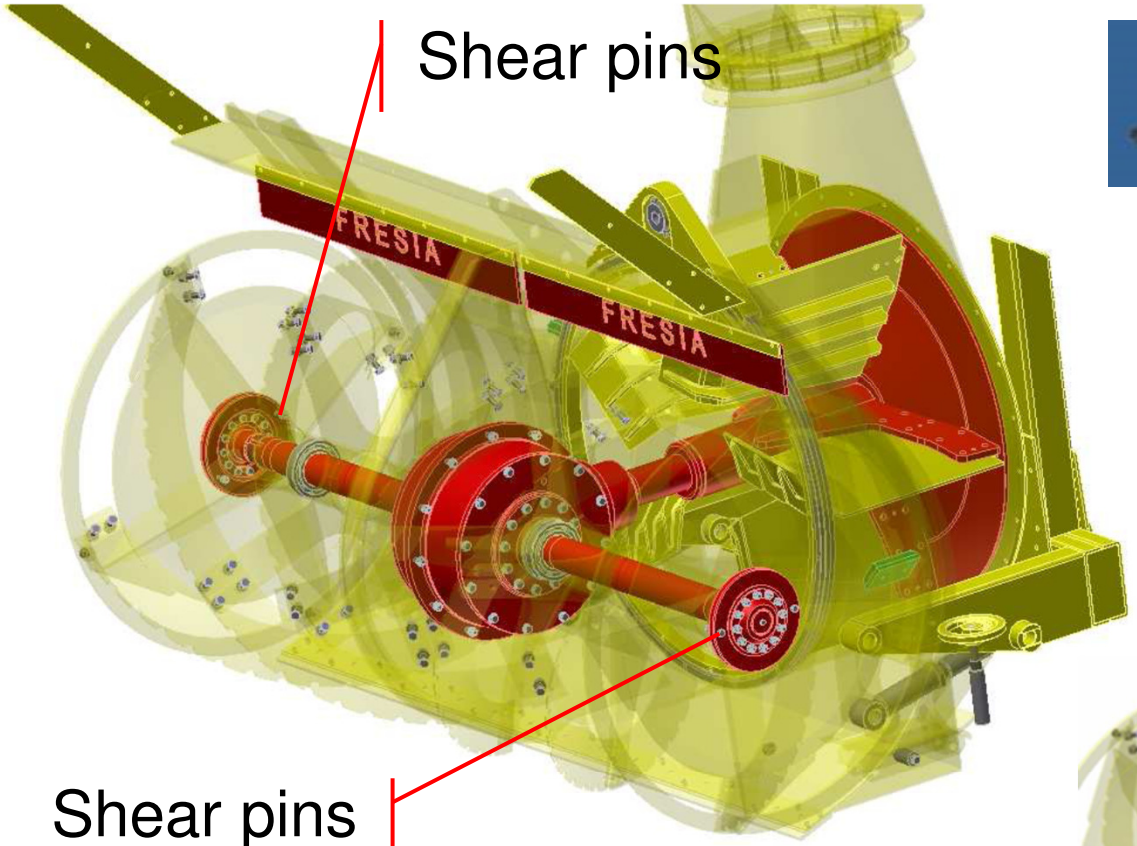
2nd stage fan type configuration.

The blower is an advanced design for high performance clearing both in light powder and heavy snow.

Clearing width	2500 mm
Augers diameter	1400 mm
Impeller diameter	1400 mm

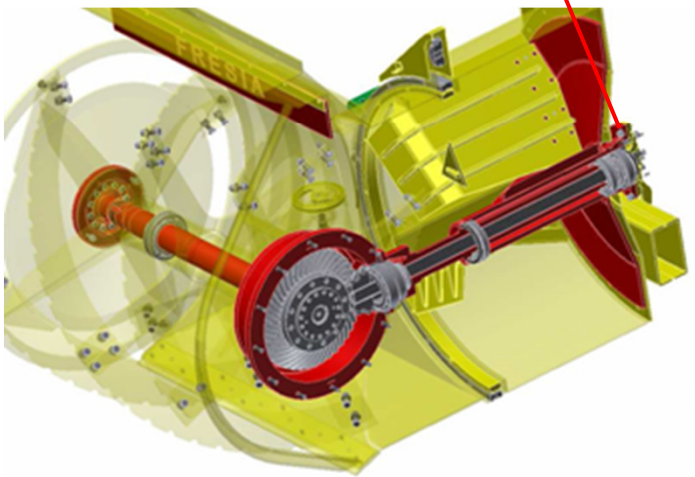
Shear bolts safety system.

1st STAGE BLOWER HEAD – BLOWER FAN



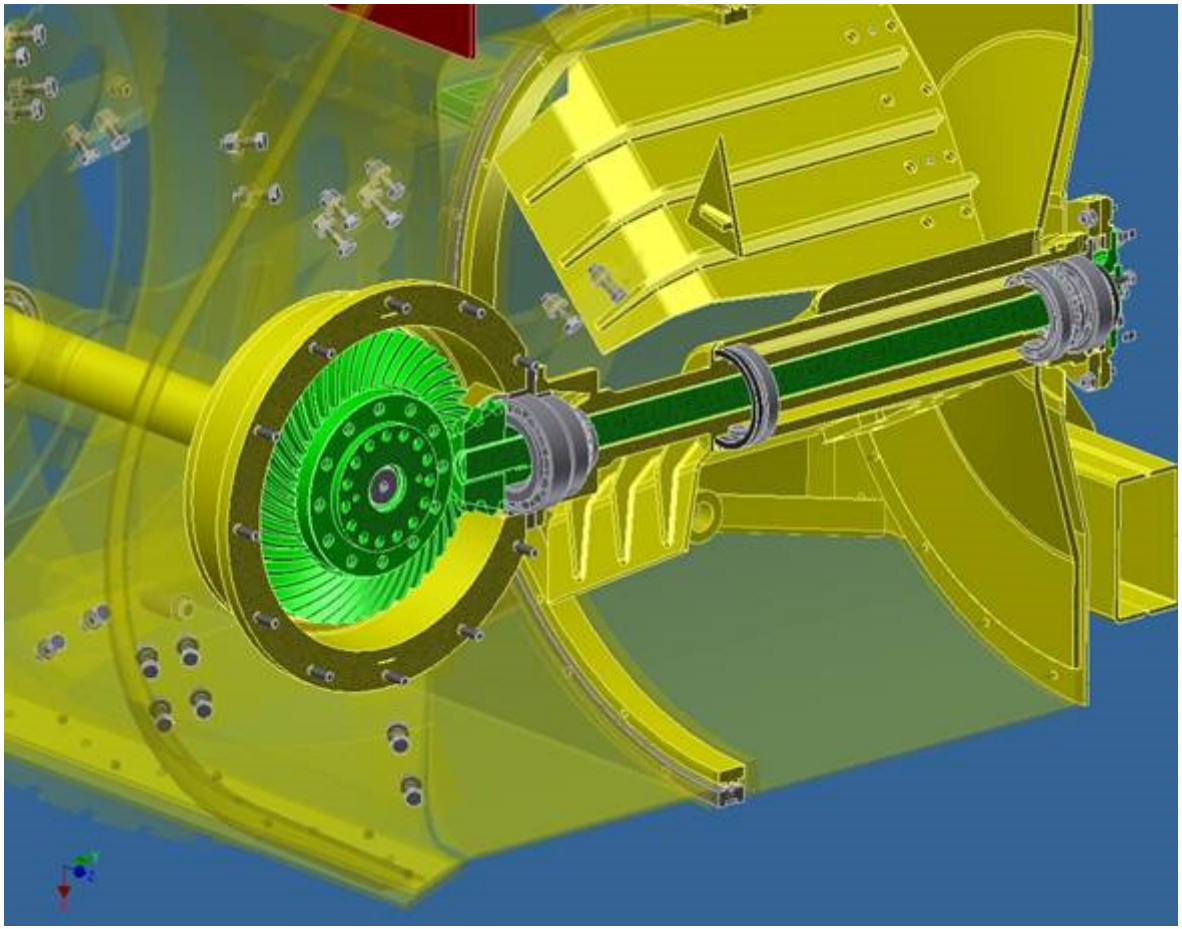
Fresia Shear bolts safety

Shear pins

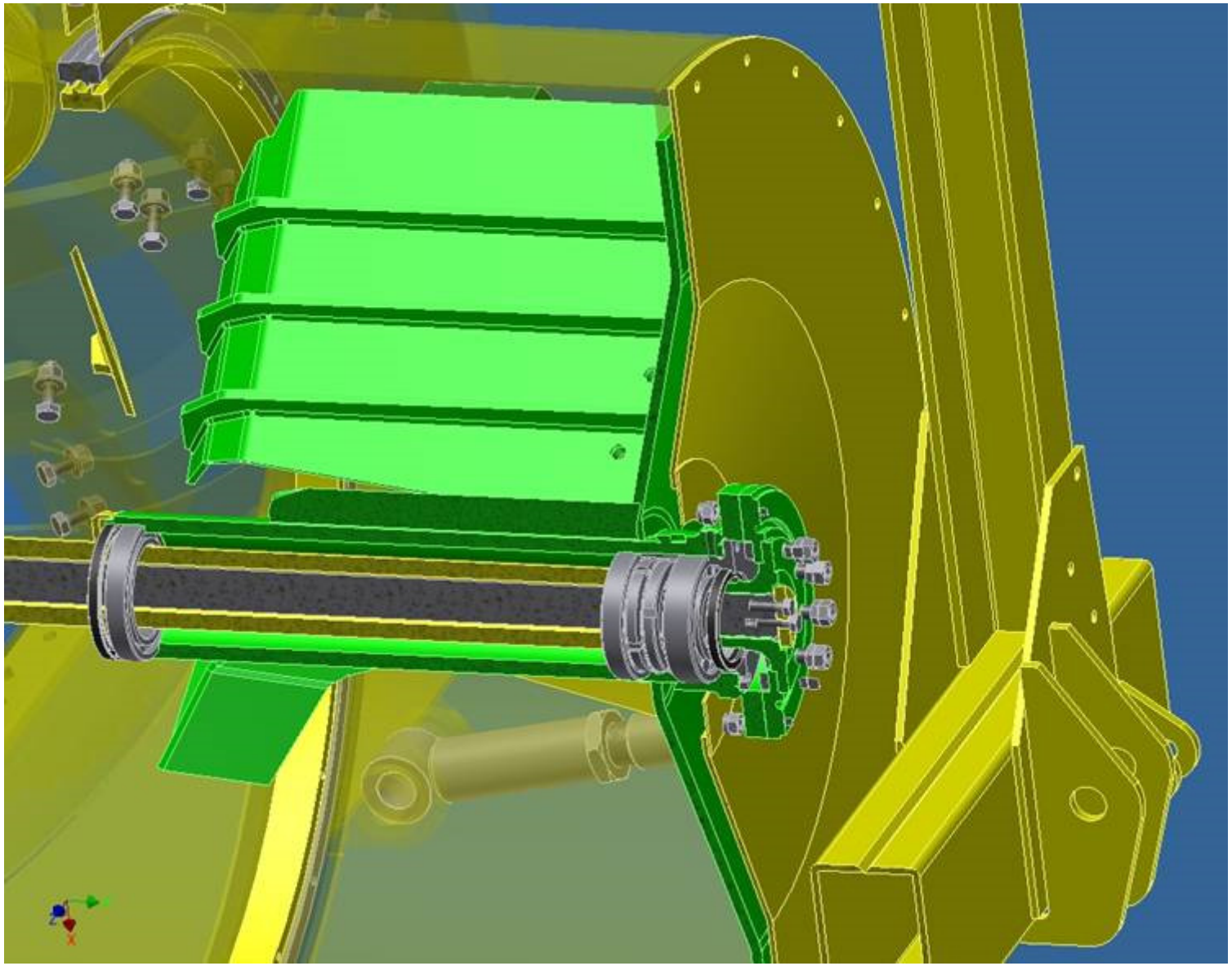


Shear pins

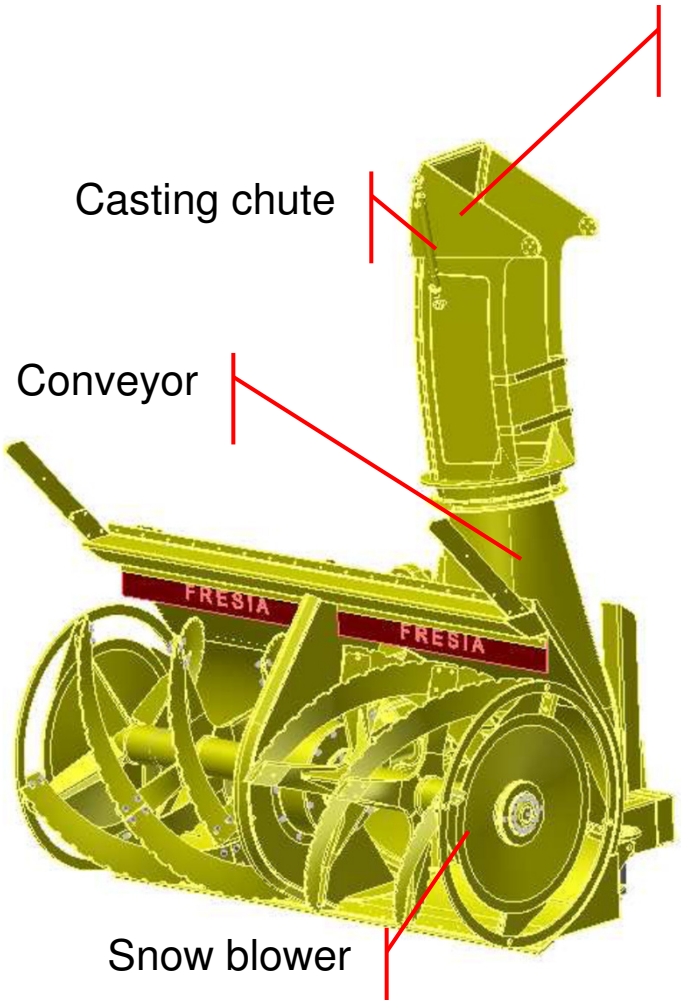
1st STAGE BLOWER HEAD – THE HELICAL RIBBON CUTTER BEVEL GEAR

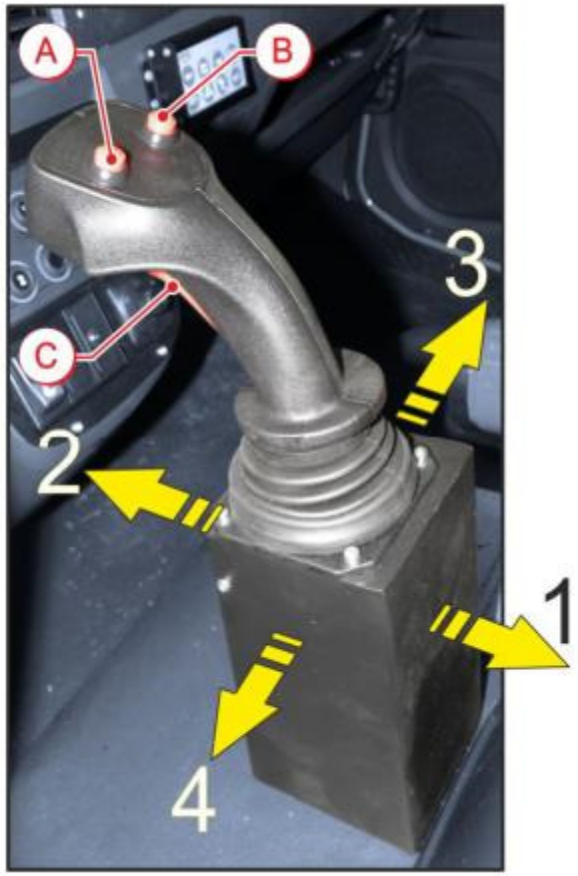


2nd STAGE BLOWER HEAD – FAN BLOWER DRIVELINE



SNOW BLOWER CONTROL JOYSTICK





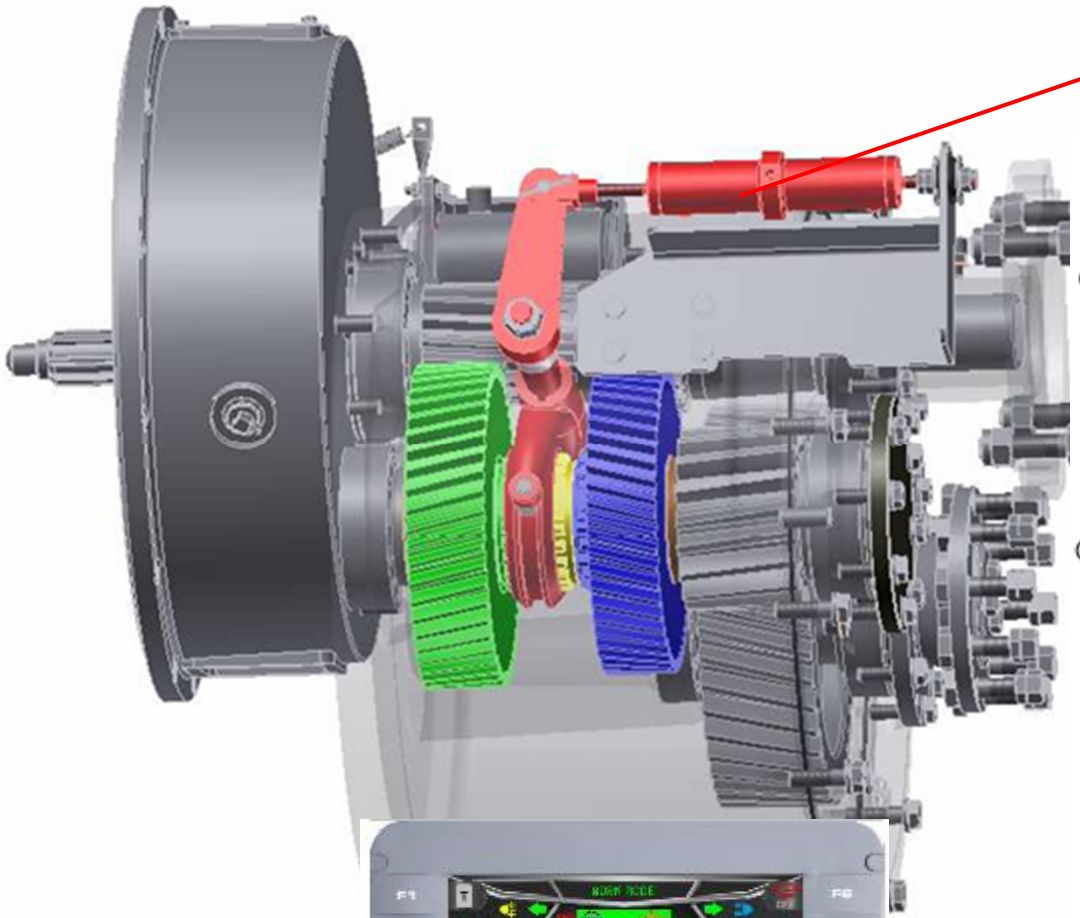
Snow removal equipments

The command is provided of the safety "**dead men**".

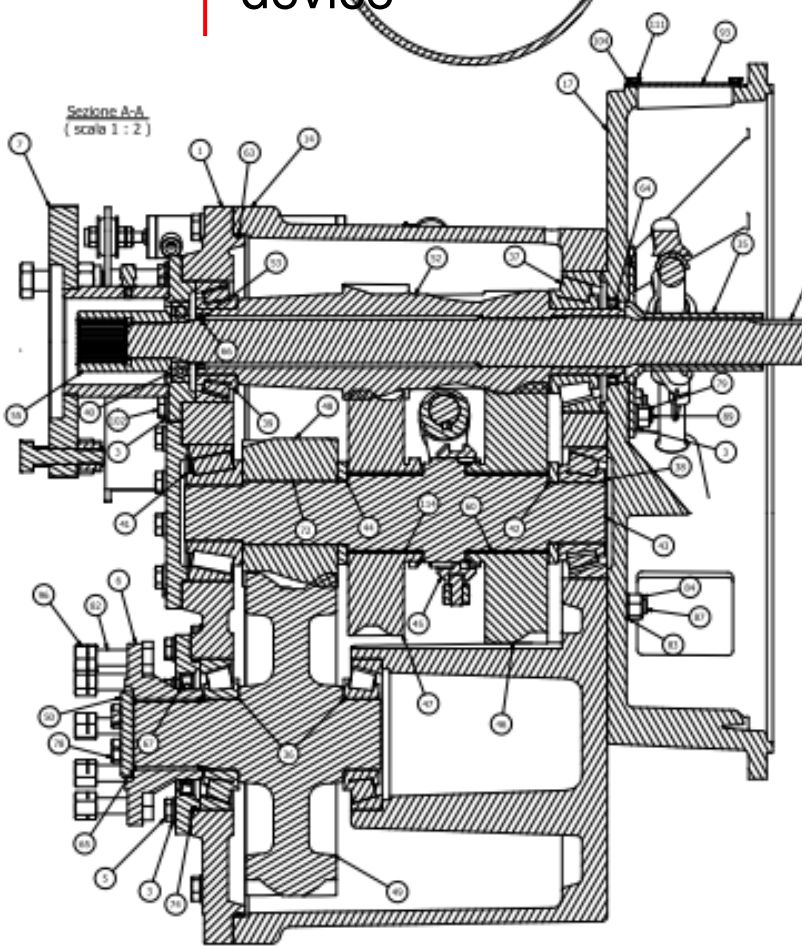
Therefore, it is always necessary to press the front button "**C**" to operate.

FRESIA

SNOW BLOWER SPEED SELECTION



2 speeds
Selector
device



Speed ratio
1:7.03 low
1:5.54 high

CONTROLLER

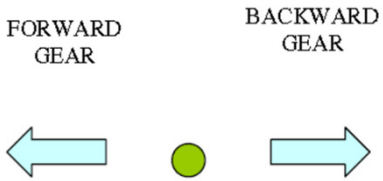
Controller

The vehicle is used in three main modes:

1- *Automotive*/transfer mode

2- *Working* Mode

3- *Automatic* Mode



AUTOMOTIVE MODE

Automotive or transfer mode is used for move the vehicle when it is not necessary to operate with the snow blower.

In *Automotive mode* the driver drives the vehicle with the throttle pedal.

In *Automotive mode*, in forward direction the vehicle reaches the maximum speed (pump max displ. and motor min displ.)

WORKING MODE

Working mode is used to operate the 2 stages blower. The rpm diesel engine can be setted at two different values:
850 (OFF)
1900 rpm (for clearing operation) by pushing the MAX switch

These values can be adjusted using the switch '+' and '–' on the display

The throttle pedal in these configuration control the displacement of the hydrostatic pump/motor for the operational speed (max 40 km/h).

SNOW BLOWER SPEED REGOLATOR

Snow removal equipments

Acting on the speed regulator switch it is possible change the snow blower speed.

Automatically the electronic system provides to:

- disengage the clutch between the gear box and engine;
- Set the engine at 850 rpm;
- wait the necessary time to stop the blower;
- act on the speed selector hydraulic device;
- engage the clutch

This operation has to be done in stationary condition

FRESIA

AUTOMATIC MODE

Automatic Mode is used to operate automatically the 2 stages blower with a fully automatic speed control of the traction of vehicle.

The speed is setted automatically according to the “percent load” parameter in order to supply always the maximum available power.

THANK YOU VERY MUCH FOR YOUR ATTENTION AND PATIENCE