Ermatest

Système industriel de test d'endurance de soufflets et ressorts

Strengths & educational Activities

✓Adjustments and settings of the system following the campaigns of test and the test items (springs or bellows)
✓Diagnosis
✓Disassembly, Assembly and mechanical adjustments (bearings, ball rail guides, blocker, reducer etc.)
✓Study and setting of functions Dialog and Communication (PC/PLC/Drive) with the communication option
✓Control and monitoring by local operator panel or remotely with a server of HTML pages for the aid to the maintenance (Option communication)
✓Cruise control on the rotation of the rod-crank
✓Survey of technologies: electrical, pneumatic, hydraulic and mechanical proportional
✓Servo position (Option proportional hydraulics)
✓Measures and hydraulic maintenance (optional carrying case measures hydraulic)
✓Programming
✓Change of technologies for the operative part

- Electric/Pneumatic (Test of gaiter with asynchronous motor or brushless motor option)
- Proportional Hydraulic Test (spring)

Specific Components

✓Moto-reducer brake associated with a speed controller communicating ATV71
✓System connecting rod-crank
✓Hydraulic Cylinder associated with a central hydraulic proportional
✓Sensors: mechanical, potentiometric, THEY and incremental encoder
✓Basic control cabinet equipped with a PLC TS37 with ATV71 controller and an Ethernet coupler ETZ510 server with HTML pages in option
✓Terminal Magelis dialog

References:

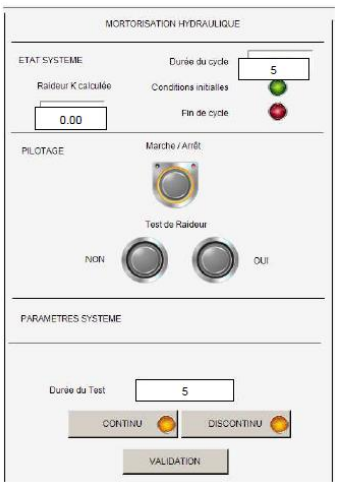
✓BM10: Backbone of test Ermatest (PLC, HMI and variator Schneider)
✓BM12-BM13: motorization electro-pneumatic with asynchronous motor (Test of bellows)
✓BM14-BM15: motorization proportional hydraulics (Test of springs)
✓BM11: Communication Option
✓BM16: Briefcase mechanical reducer / Connecting Rod Crank
✓BM17: Briefcase Blocker mechanical pneumatic / Hydraulic Cylinder
✓BM18: Hardware Kit for practical work (isolation controller and IP camera)
✓BM19: Kit of evolution toward motorization Brushless electric (test of bellows)
✓HY10: Suitcase analysis of oils
✓HY11: Carrying Case hydraulic measures.

Characteristics

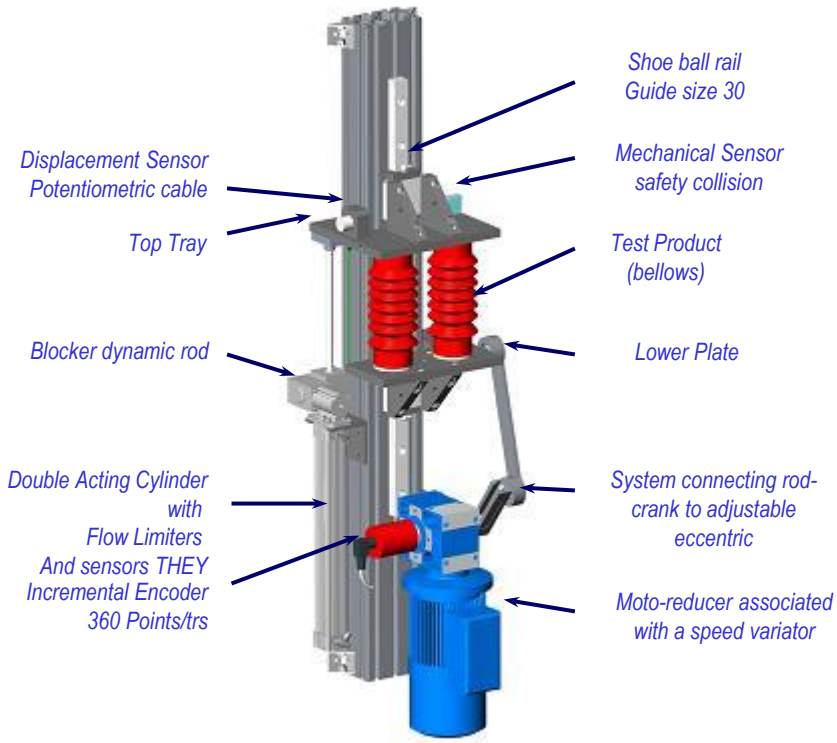
✓L/ l/ H: 1100 x 750 x 1900 mm
✓Electrical Energy: 400V-50Hz by sector (3P+N+T) through a circuit breaker 30mA differential snapshot IF and neutral system TT
✓Pneumatic Energy: pressure of 7 bar and flow rate of approximately 80 l/min
✓Mass: 250kg

Bac PRO MSPC
BTS MS – Electrotechnique - IUT
Universités - Ecoles d'ingénieurs

Pack IoT Sick



System Architecture



Motorization of basis: electrical and pneumatic

Description In functional electric engine/tire

✓The objects "bellows" manually installed between the two platens are undergoing compression efforts (endurance test)
✓Has the power of the Moto-reducer, The rotation of the rod-crank linked to the lower plate transmits to the latter a reciprocating movement whose amplitude is adjustable
✓The gaiters in position of compression can following a periodicity defined by the test campaign suffer an additional compression given by a pneumatic cylinder causing a lowering of the upper plate.

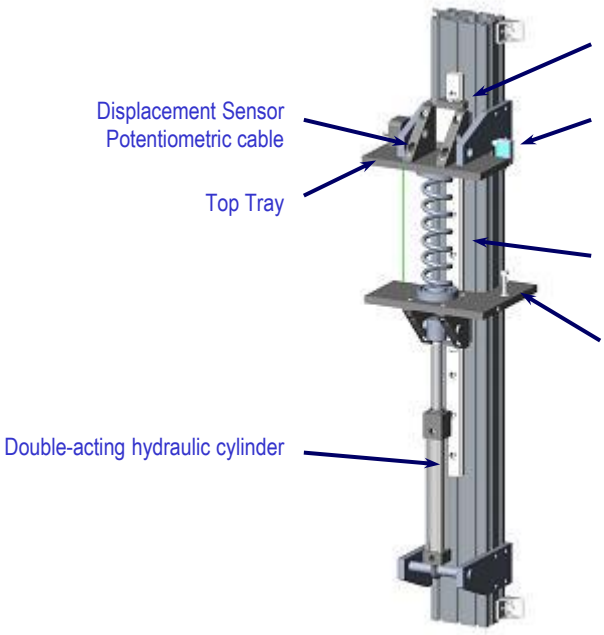
Kit of evolution toward motorization Brushless

✓It allows you to perform tests engine mountings of bellows in position of compression or stretching
✓It is mainly constituted of:
•A motor-gearhead of intelligent positioning of type Siemens Posmo 300W integrating variator and centerline card
•A set of mechanical parts of adaptation in place of the asynchronous motor

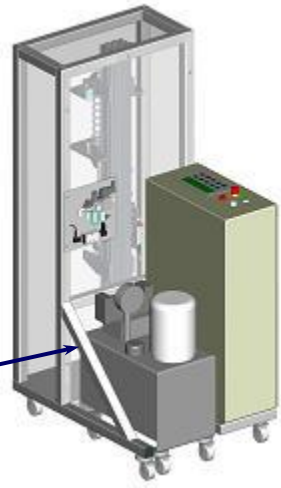
Sub-assembly Engine electrical and pneumatic

✓It allows you to perform the test of bellows.
✓It is mainly constituted of:
•A Moto-reducer Brake associated with a speed variator ATV71
•Of an incremental encoder 360points/turn at the end of the motor shaft allows the measurement and regulating the speed of rotation, as well as the command of the action of the pneumatic cylinder so that the additional compression on the bellows is created at the point 0 (top dead center)
•Of a system connecting rod-crank with eccentric adjustable from 0 to 80mm (either an alternating movement of the lower plate of 160mm), the rod being equipped with bearings to ball joint on balls for the compensation of alignment
•Of a pneumatic cylinder double effect stops in position by a blocker mechanical (detection by sensors THEY) and performing of shocks caused on the upper plate
•A sensor Potentiometric Cable to performing a control of the movement of plates
•A mechanical sensor to push for theAnti-collision The bottom and top plates

System Architecture (Continued)



Optional Engines: proportional hydraulic



Hydraulic Central 60 bars with:
- Proportional control valve
- Analog pressure transducer
- Analogue temperature sensor

Description Functional in motorization proportional hydraulic

✓The spring install manually between the two platens undergoes compression efforts through the hydraulic cylinder
✓Two tests can be performed on the spring:
- •Endurance of the spring by compression and decompression of the spring during a given time
- •Verification of the stiffness given by the manufacturer: measurement of effort of the spring as a function of its rate of compression (servo control in position with the sensor Potentiometric To cable) using a analog pressure transducer at the level of the cylinder (deduction from the next effort pressure / diameter cylinder / loss)

Sub-assembly hydraulic engine

✓It allows you to carry out the testing of springs
✓It is mainly constituted of:
- •A sensor Potentiometric Cable to performing a movement control of the tray
- •A hydraulic central 60 bars
- •A double-acting hydraulic cylinder diameter 25mm Stroke 200mm
- •A pressure sensor analog
- •A temperature sensor Analog

Control Console

✓The operating unit of the system is a remote console type of MAGELIS. It includes all of the constituents of dialog, allowing you to drive the system

Control Cabinet

✓It contains:
- •A switch disconnector
- •A safety relay Preventa Responsible for managing the emergency stop
- •The fuse holder
- •An electrical power supply to power the whole of TBT circuits
- •The contactors and relays to control the various electrical actuators
- •A variator communicating ATV71 allowing to manage the speed of rotation of the rod
- •A programmable controller of type TSX37 Telemecanique
- •A Ethernet coupler TSX ETZ510 with server HTML pages
- •Of Terminal Blocks Connecting

Pneumatic Distribution

✓The system includes:
- •A set of air treatment (Valve Padlockable, Filter-regulator, emergency stop valve with soft starter, pressure switch)
- •An electro-valve 5/2 Mono-stable
- •An electro-valve 5/3 open center bistable

Hydraulic Distribution

✓The system includes:
- •A proportional control valve
- •A proportional amplifier

Pedagogical Approach

Activities Pedagogical

✓Functional Analysis
✓Adjustments and settings of the system following the campaigns of test and the test items (bellows or springs)
✓Change of format possible for the operative part:
- •Electric and pneumatic (test of bellows)
- •Proportional Hydraulics (test of springs)

✓Diagnosis
✓Disassembly, Assembly and adjustments (bearings, ball rail guides, blocker, reducer, etc.)
✓Study and setting of functions Dialog and Communication (PC/plc/variator)
✓Programming
✓Improvements (ex: establishment of a clogging indicator on the hydraulic circuit)
✓Pilotage and local monitoring (Operating unit Magelis) Or remotely (Web Server on board charger option) for assistance to the maintenance
✓Cruise control on the rotation of the rod-crank
✓Servo position (Option proportional hydraulics)
✓Study and setting the hydraulic amplifier proportional (hydraulic Option)

Examples of TP proposed by ERM Automation Systems for the level IV

TP1.1: Diagnosis (context level 1) on a defective component (coil of the valve of the pneumatic cylinder)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and put in Service

TP1.2: Diagnosis (context level 3) on a defective component (relay coil power supply of the engine brake)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and put in Service

TP1.3: Diagnosis (context level 3) on a defective component (relay coil linked to the chain of security)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and put in Service

TP1.4: Diagnosis on an item set incorrectly (Screws flow reduction of the softstarter pneumatic)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service

TP1.5: Diagnosis (context level 5) on a defective item (Tread Adjust speed)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service

TP2.2: Repair of the well (Change of bearings of the Moto-reducer And the connecting rod)
✓*Chronology:* Record the equipment, remove the motor reducer, develop the range of disassembly reassembly of bearings, proceed with the exchange of standard bearings supplied, Deconsigner the equipment, return to service the equipment, establish a record of intervention

TP2.5: preventive maintenance (checking the insulation of engine of bench Ermatest)
✓*Chronology:* Identify the hazardous phenomena, determine the measures of prevention, apply the measures defined, locate the control points, adjust the devices or control materials, collect the results of measurements, write a record of intervention

TP4: improvement or modification of the well (establishment of a monitoring component of the pump of the hydraulic system)
✓*Chronology:* Identify the hazardous phenomena, determine the measures of prevention, apply the measures defined, install the components of the improvement, transfer the new program and proceed with the development, restore the environment of the well, put into service and check the correct operation of the well, complete the work order

TP5: Monitoring by Ethernet network
✓ *Chronology:* Check the IP addresses of the stations, to log on to the Web site drive and raise the settings stored, to log on to the Web site plc and raise the settings of hardware configuration

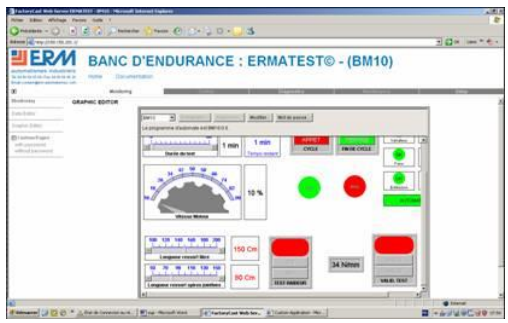
TP6.1: configuration change (Passage of the test of bellows to the test of springs)
✓ *Chronology:* Record the equipment, proceed to configuration change, Deconsigner the equipment, return to service the equipment

TP6.2: Repair of the well (Exchange of cylinder seals)
✓ *Chronology:* Record the equipment, remove the cylinder, proceed to the standard exchange of seals supplied, Deconsigner the equipment, return to service the equipment, establish a record of intervention

TP6.3: Improved well (define and put in place a system for monitoring implementation of the service of the cooling system of the oil (Aerorefrigerant)
✓ *Chronology:* Locate the system of monitoring, integrating an alarm message, proceed to the tests

TP7.1: Analyze the setting of a servo system
✓ *Chronology:* Identify the components of the control loop, analyze the current operation, analyze the role of proportional corrector by making changes to settings

TP8.1: Diagnosis on a faulty component (functional Chain faulty: pump Clutch Disengaged)
✓ *Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service



Screen of supervision Ermatest

Approche pédagogique

Exemples de TP proposés par ERM Automatismes pour le niveau III

TP1.1: Diagnosis (context level 1) on a defective component (coil of the valve of the pneumatic cylinder)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service

TP1.2: Diagnosis (context level 3) on a defective component (relay coil power supply of the engine brake)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service

TP1.3: Diagnosis (context level 3) on a defective component (relay coil linked to the chain of security)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service

TP1.4: Diagnosis on an item set incorrectly (Screws flow reduction of the softstarter pneumatic)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service

TP1.5: Diagnosis (context level 3) on a defective element (fuse on the board power supply protection encoder)
✓*Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service

TP2.2: Repair of the well (Change of bearings of the Moto-reducer And the connecting rod)
✓*Chronology:* Record the equipment, remove the motor reducer, develop the range of disassembly reassembly of bearings, proceed with the exchange of standard bearings supplied, Deconsigner the equipment, return to service the equipment, establish a record of intervention

TP2.3: Analysis of the operation of the blocker and justification of the failure modes
✓*Chronology:* Justify the establishment of the blocker, search for possible causes of failure

TP2.4: Change the pop-up blocker and validation of a range of Disassemble
✓*Chronology:* Perform the logging, remove the failed component, perform the exchange, establish and validate a graph of disassembly

TP2.5: preventive maintenance (checking the insulation of engine of bench Ermatest)
✓*Chronology:* Identify the hazardous phenomena, determine the measures of prevention, apply the measures defined, locate the control points, adjust the devices or control materials, collect the results of measurements, write a record of intervention

TP3.1: Monitoring the maximum time of rotation of the crank
✓*Chronology:* Define the conditions of rotation of the crank during the initialization phase, define a time envelope on the rotation of the crank, write of the monitoring program, integrate in the PLC program the monitoring solution, proceed with the tests to verify the operation of the monitoring procedure, integrate messages of faults on the dialog console.

TP3.2: Supervision of the detectors of cylinders of shock
✓*Chronology:* Simulate a failure and see the inappropriateness of the display of the fault message in the justifying, write the monitoring program, integrate in the PLC program the monitoring solution, integrate messages of faults on the dialog console, proceed with the tests to verify the operation of the monitoring procedure.

TP3.4: establishment of a monitoring circuit breaker trip
- ✓ *Chronology:* Identify the hazardous phenomena and the dangerous situations related to the maintenance activity, justify the choice and connect in the rules of the art the component, to update the electrical schematics, Perform adapted the software to exploit the information from component indicating the triggering, validate the intervention by a Test

TP3.5: establishment of a monitoring engine parameter
- ✓ *Chronology:* Identify the hazardous phenomena and the dangerous situations related to the maintenance activity, Connect in the rules of the art component, configure the drive, perform adapted the software to exploit the information outcome of the variator, validate the intervention by a test

TP3.6: establishment of a monitoring of the integrity of the bellows through a pressure sensor
- ✓ *Chronology:* Identify the hazardous phenomena and the dangerous situations related to the maintenance activity, Connect in the rules of the art component, configure the sensor, perform adapted the software to exploit the information from sensor, validate the intervention by a test

TP5: Monitoring by Ethernet network
- ✓ *Chronology:* Check the IP addresses of the stations, to log on to the Web site drive and raise the settings stored, to log on to the Web site plc and raise the settings of hardware configuration

TP6.1: configuration change (Passage of the test of bellows to the test of springs)
- ✓ *Chronology:* Record the equipment, proceed to configuration change, Deconsigner the equipment, return to service the equipment

TP6.2: Repair of the well (Exchange of cylinder seals)
- ✓ *Chronology:* Record the equipment, remove the cylinder, proceed to the standard exchange of seals supplied, Deconsigner the equipment, return to service the equipment, establish a record of intervention

TP6.3: Improved well (define and put in place a system for monitoring implementation of the service of the cooling system of the oil (Aerorefrigerant)
- ✓ *Chronology:* Locate the system of monitoring, integrating an alarm message, proceed to the tests

TP7.1: Analyze the setting of a servo system
- ✓ *Chronology:* Identify the components of the control loop, analyze the current operation, analyze the role of proportional corrector by making changes to settings

TP8.1: Diagnosis on a faulty component (functional Chain faulty: pump Clutch Disengaged)
- ✓ *Chronology:* Establish the finding of failure, locate the fault, identify the cause of the failure, control risks and return to service

Briefcase Reducer & Rod Ermatest

Carrying Case mechanical reduction gear and the connecting rod Ermatest

Strengths & educational Activities

✓Study and analysis of parts and/or materials
✓Mounts, teardowns, settings (maintenance Actions on mechanical system)
✓Mechanical Plans provided under Solidworks

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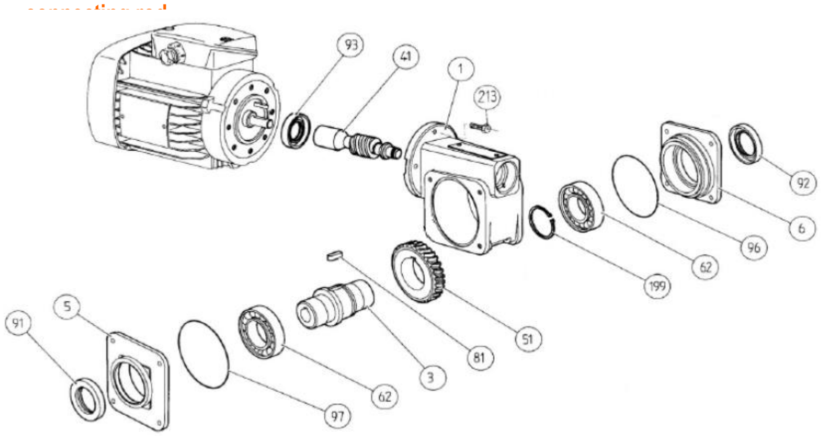
Contents of the briefcase

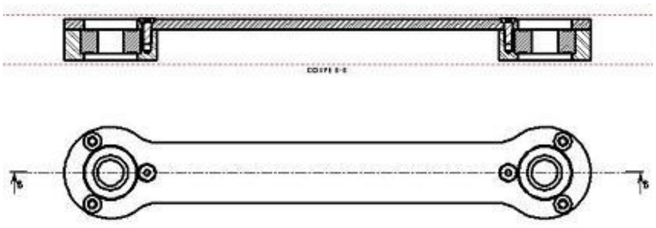
Qté	Désignation	Fournisseur	Fabricant
	Réducteur et pièces détachées pour réducteur		
1	**Réducteur complet** (Roue et vis avec bride – Rapport de réduction 10 – Arbre creux ∅ 20mm)	LEROY SOMER	
6	Roulement d'arbre lent creux	LEROY SOMER	
3	Roulement de butée de vis sans fin	LEROY SOMER	
3	Joint de palier	LEROY SOMER	
3	Joint à lèvre de vis sans fin	LEROY SOMER	
3	Joint à lèvre d'arbre lent creux	LEROY SOMER	
	Bielle et pièces détachées pour bielle		
1	**Système de Bielle** (1 Bielle, 2 roulements à rotule sur billes, 2 cages pour roulement à rotule sur billes, 6 vis, 2 rondelles élastiques, 2 axes bielle/manivelle)	ERM	
6	Roulement à rotule sur billes	ITAFAN	SKF
4	Rondelle élastique pour roulement à billes	MICHAUD	
6	Vis TFHC 5x16	SPB	
2	Axe bielle/manivelle	SPB	SPB
6	Circlips EXT D15	LEROY SOMER	
2	Cage pour roulement à rotule sur billes	ERM	TUS

3D views of the moto-reducer and the



Choice of bearings (Ball Joint on balls)

✓The system of connecting rod/Crank considered on the Ermatest allows you to create a translational movement of the alternating lower shelf mobile from the rotation of the motor shaft.
✓However, during the transformation of this rotational movement (motor shaft) in translational movement (lower plate), the system of connecting rod/crank may submit an alignment fault important. The bearings to implement on the system of connecting rod must therefore always compensate for alignment errors generated.
✓Knowing that the bearings to ball joint on balls contain two rows of balls and a gang of concave bearing landscaped common in the outer ring, we have, in a general way, bearings capable of automatically align and, therefore, insensitive to the alignment faults of the shaft in relation to the housing.

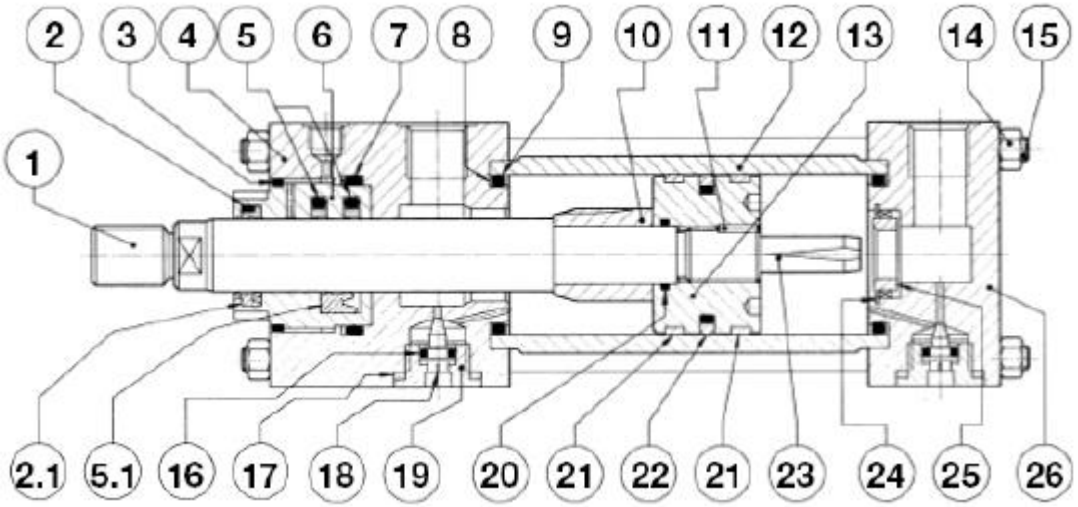


Mallette Bloqueur & Vérin

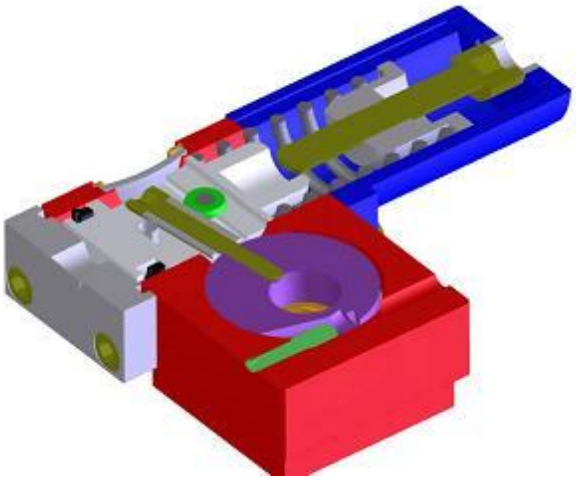
Mallette mécanique du bloqueur pneumatique et vérin hydraulique Ermatest

Strengths & educational Activities

- ✓Study and analysis of parts and/or materials
- ✓Mounts, teardowns, settings (maintenance Actions on mechanical system)
- ✓Mechanical Plans provided under Solidworks
- ✓Studies cutscenes on the pneumatic blocker



Section typique du vérin Type CK avec amortissement avant-arrière et drainage côté tige



Vue du bloqueur pneumatique

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