JR AUTOMATION™
FSA Technologies

Electric Press-fitting Unit

MMT Electronics

Maintenance Guide

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V6A

FABRICOM Systèmes d'assemblage S.A.
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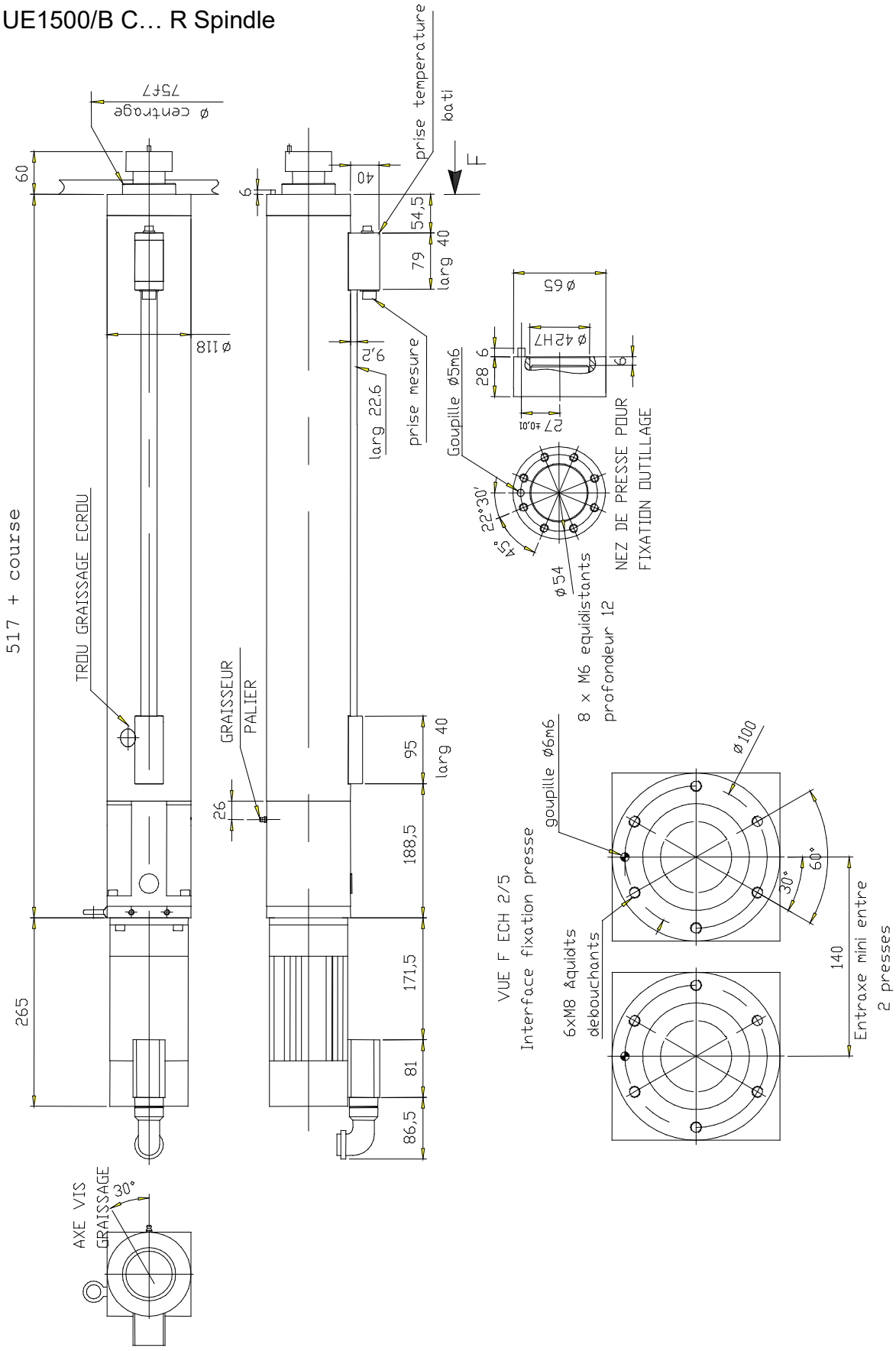
SOMMAIRE

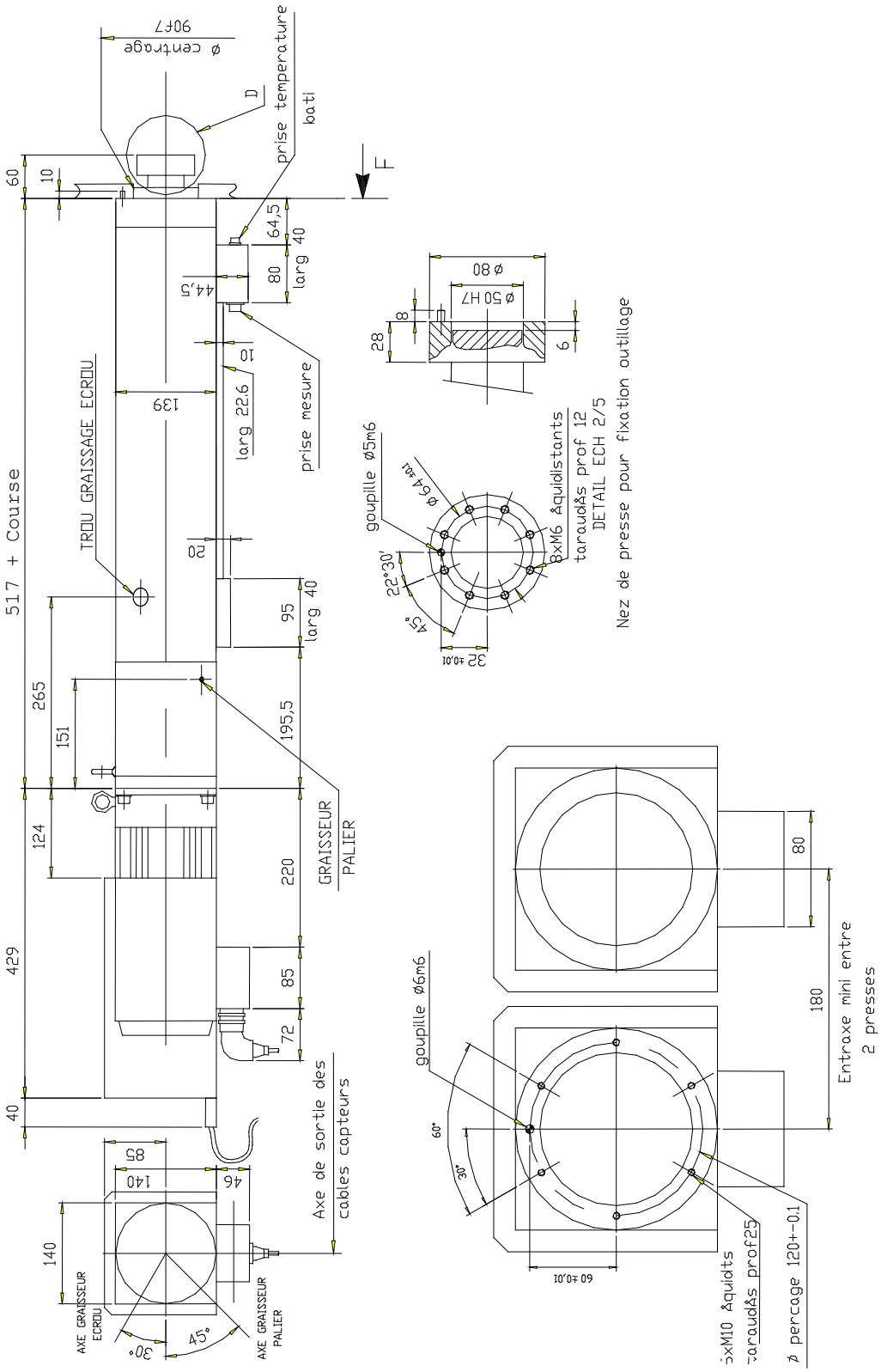
1 Presentation of Equipment

1.1 FABRICOM Spindles - Dimensions

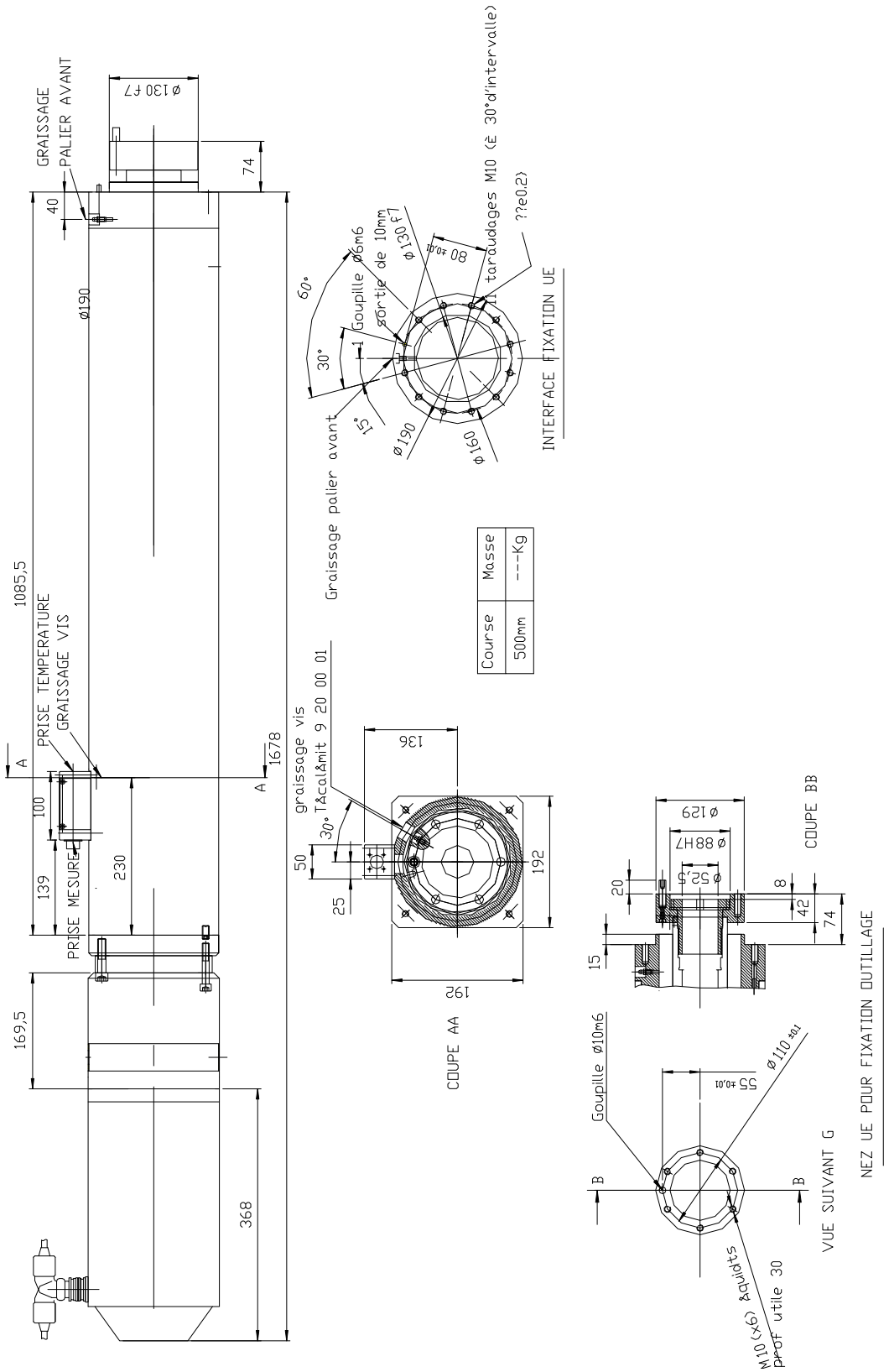
1.1.1 UE1500/B C… R Spindle



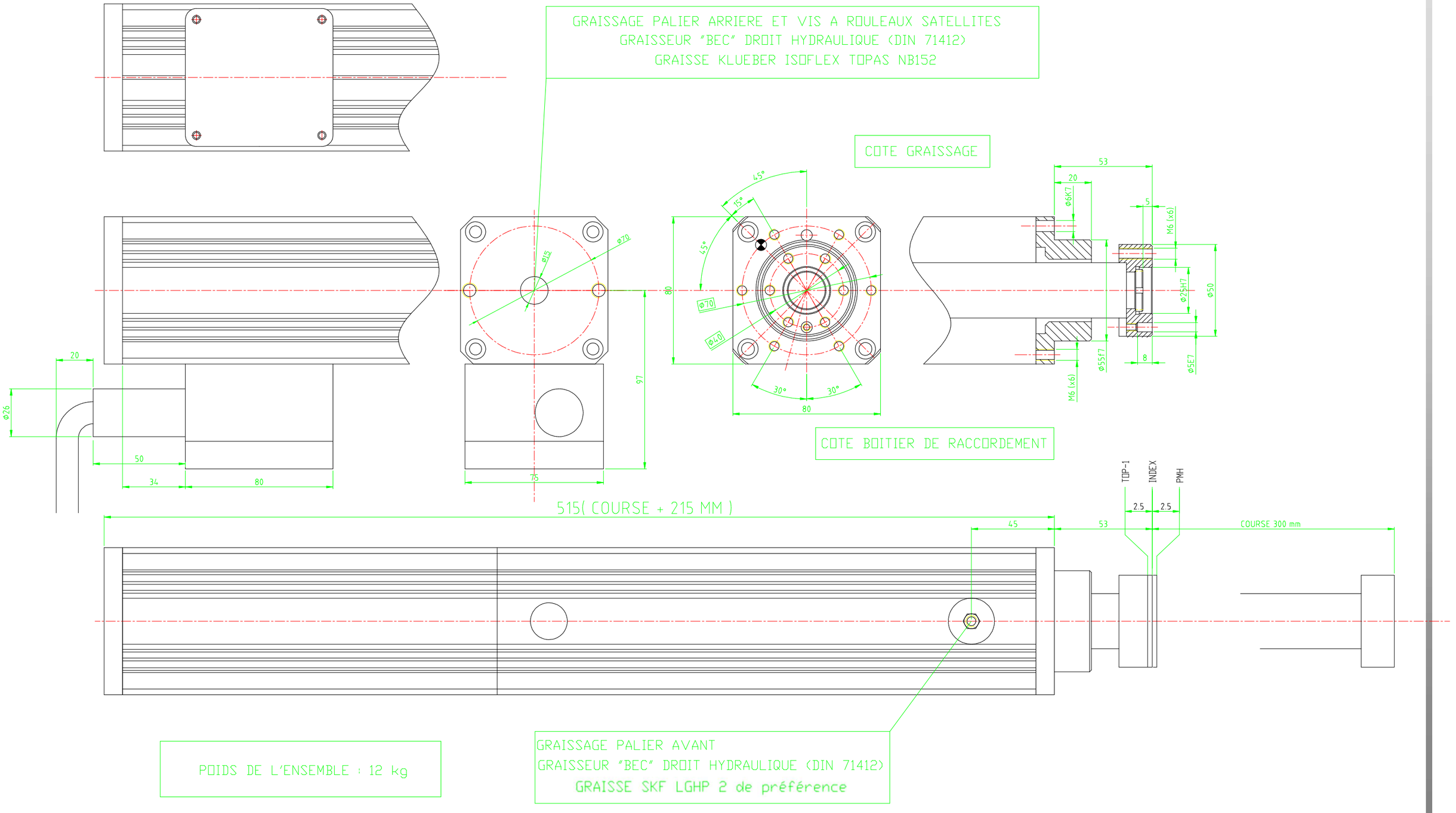
1.1.2 UE3000/B C… R Spindle



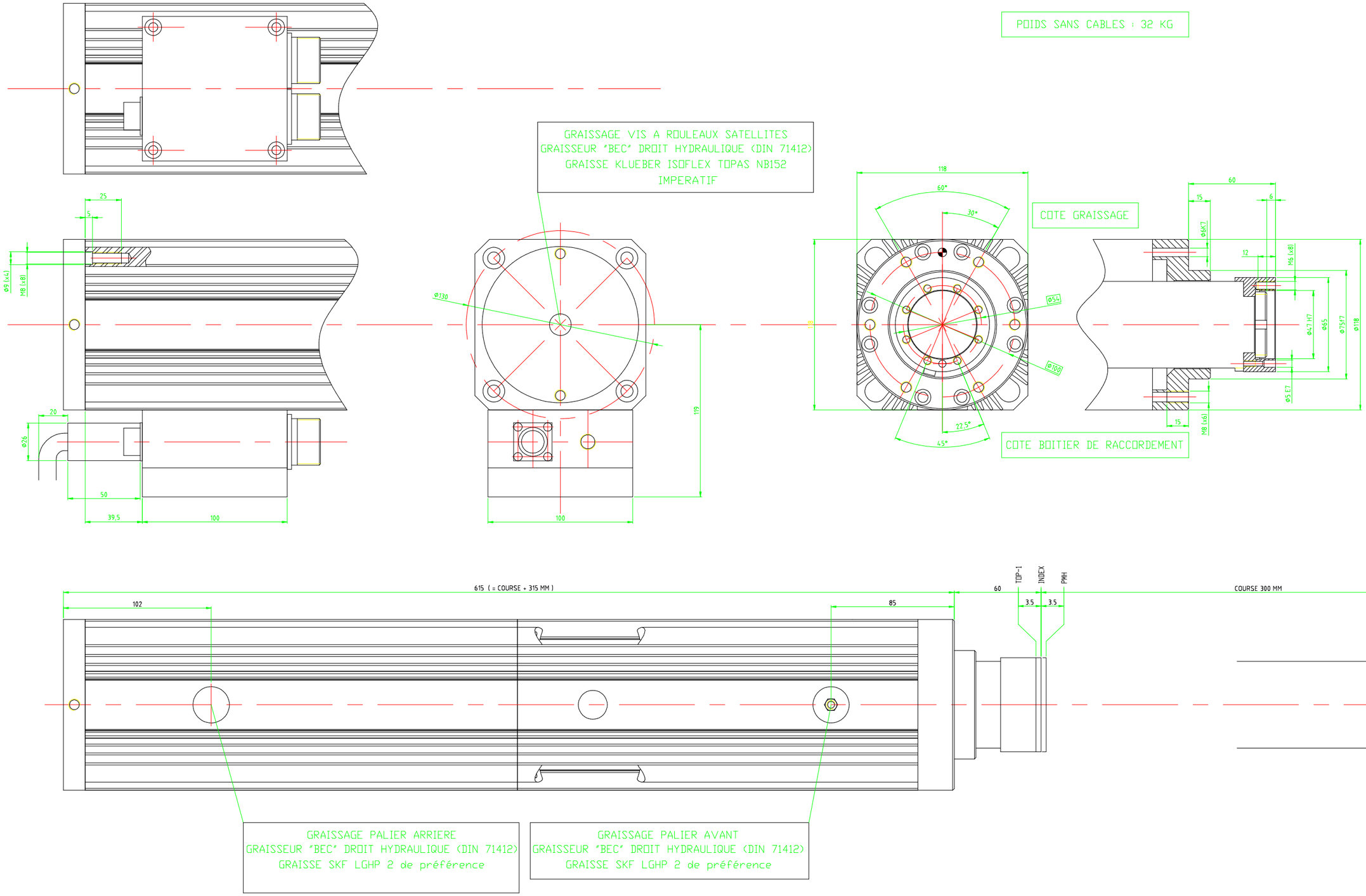
1.1.3 NG50kN365D/B C500, NG100kN365D/B C500, NG150kN220D/B C500, NG200kN145D/B C500 Spindles



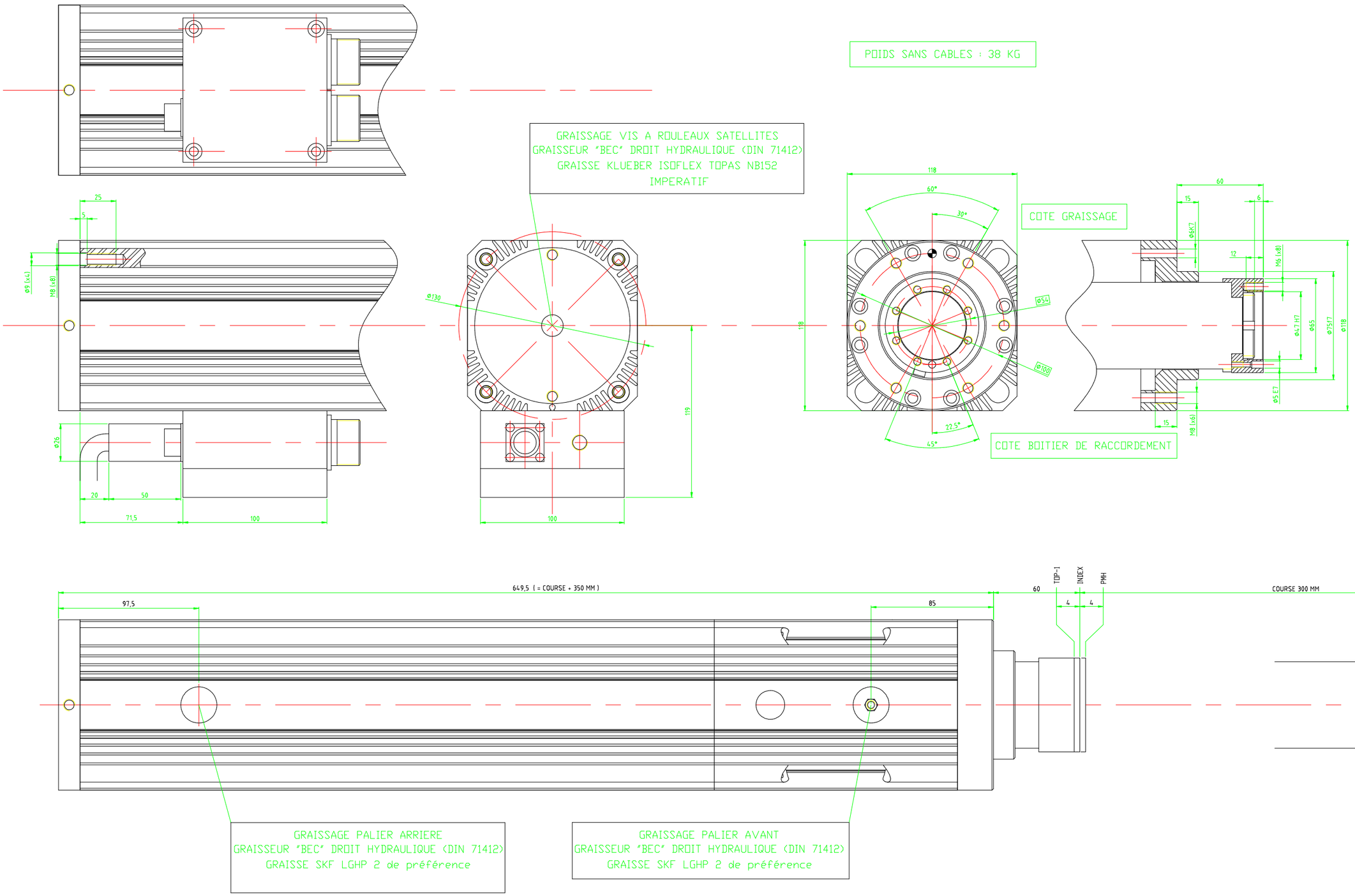
1.1.4 UG05kN330C300/B Spindle



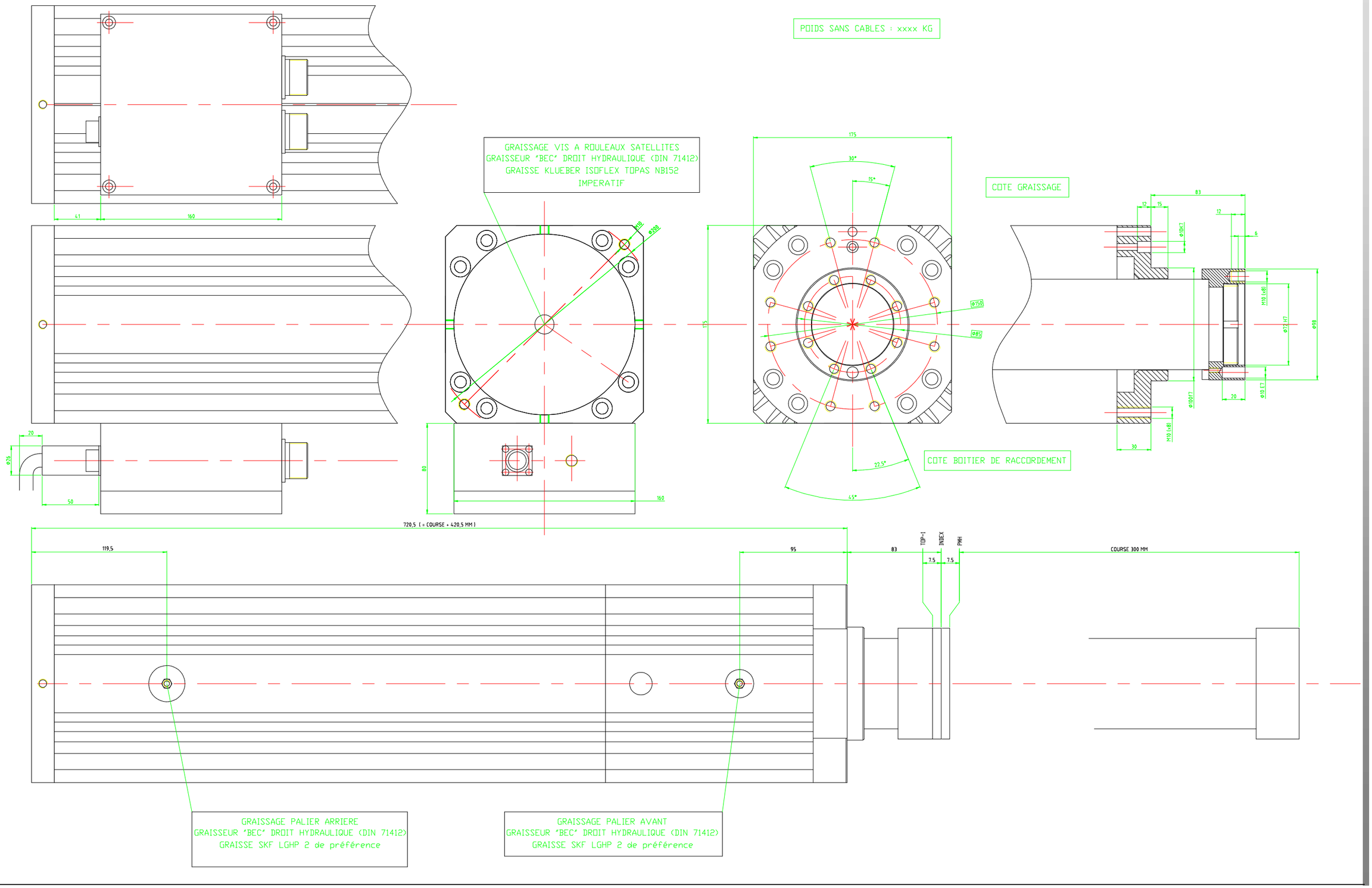
1.1.5 UG15kN525C300/B to C500/B Spindle



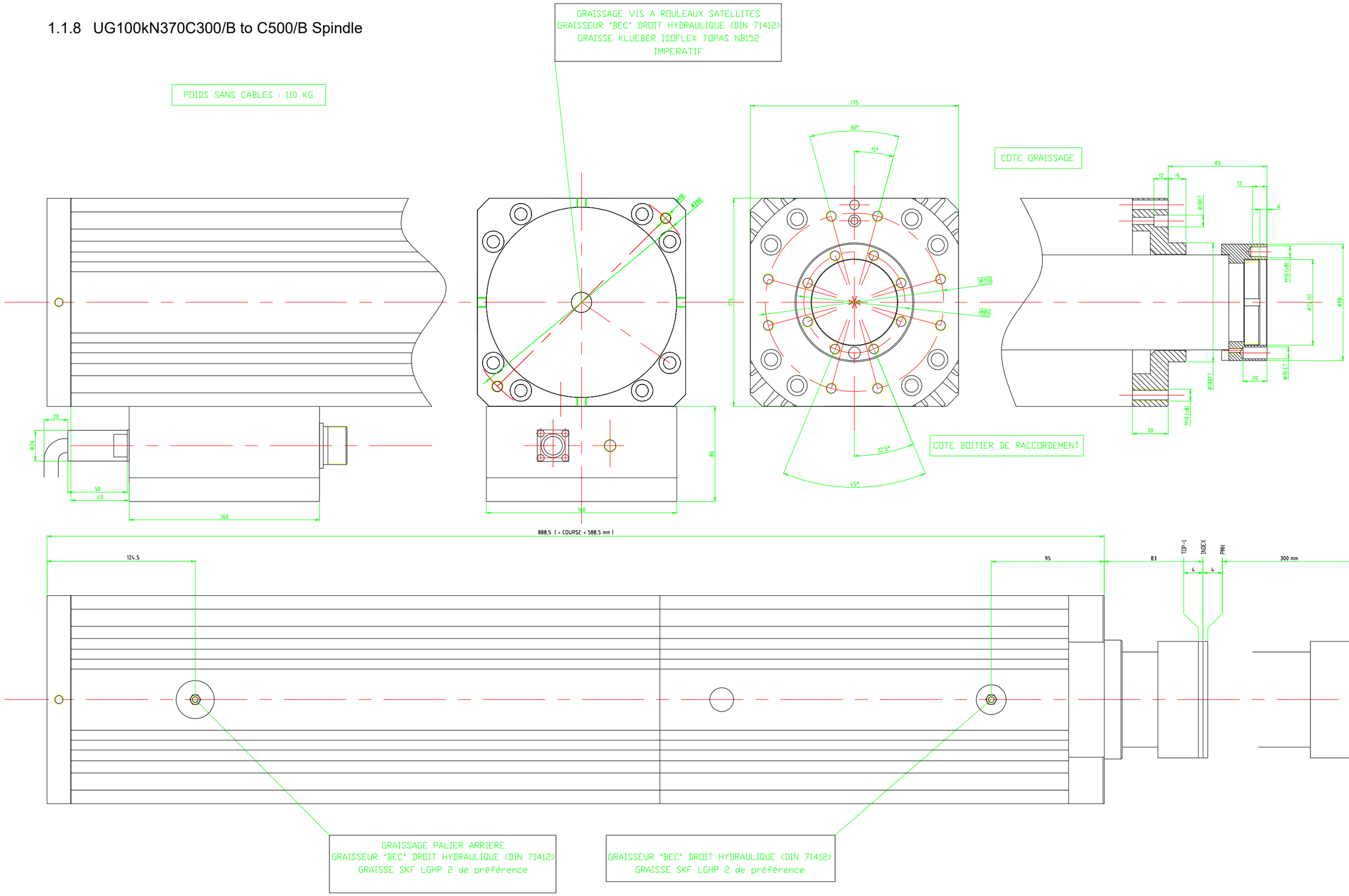
1.1.6 UG30kN460C300/B to C500/B Spindle



1.1.7 UG60kN700C300/B to C500/B Spindle



1.1.8 UG100kN370C300/B to C500/B Spindle



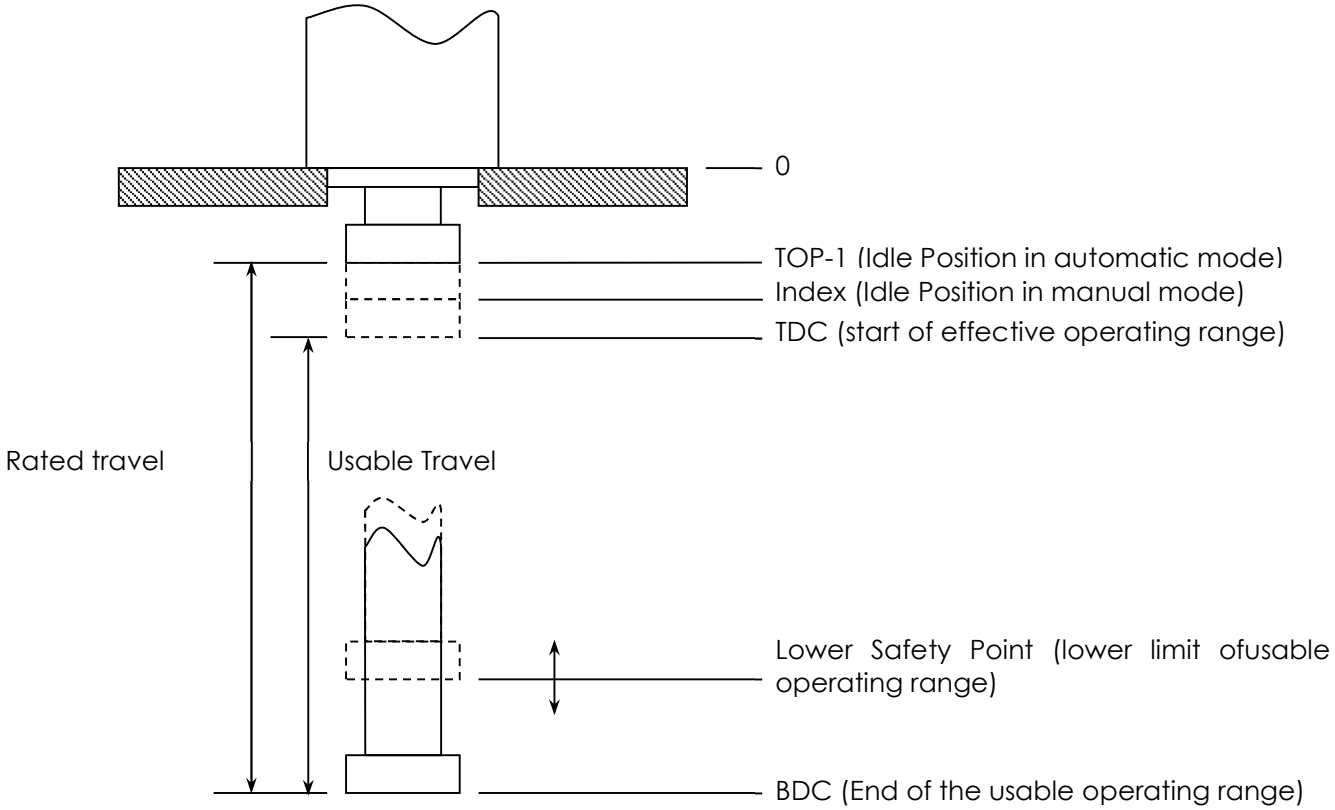
1.1.9 Travel & position definition table

The dimensions given below have an accuracy of +/- 1mm
In the table below, "C" means the rated spindle stroke

Positions	Comments	UE1500/B	UE3000/B	NG50kN	NG100kN	NG150kN	NG200kN	UG05	UG15	UG30	UG60	UG100
TOP-1 (PR)	Normal rear position of the axis in **automatic** mode. Corresponds to the 1st resolver pulse reached during axis retraction, after axis detection.	**60**	**60**	**72**	**72**	**72**	**72**	**50,5**	**56,5**	**56**	**75,5**	**79**
INDEX	Rear position of the axis in manual mode. Corresponds to the point where the rear position detector switches to "1" during axis retraction.	**63,5**	**64**	**77**	**77**	**75**	**74**	**53**	**60**	**60**	**83**	**83**
TDC	Rear position of the axis from which it is possible to set any accurate axis stop position.	**67**	**68**	**82**	**82**	**78**	**76**	**55,5**	**63,5**	**64**	**90,5**	**87**
Lower Safety Point	Corresponds to the max. possible axis extension that can be selected.	**60+C**	**60+C**	**72+C**	**72+C**	**74+C**	**72+C**	**50,5+C**	**56,5+C**	**56+C**	**75,5+C**	**79+C**
BDC	Corresponds to the maximum possible physical axis extension.	**60+C**	**60+C**	**589**	**589**	**589**	**589**	**50,5+C**	**56,5+C**	**56+C**	**75,5+C**	**79+C**

Diagram showing the using Travel:

Generally, after servo-drive setup, the position of the index is centered between the TOP-1 and the TDC.



1.2 INFRANOR Servo-drive - CD1-a Type

1.2.1 Overview

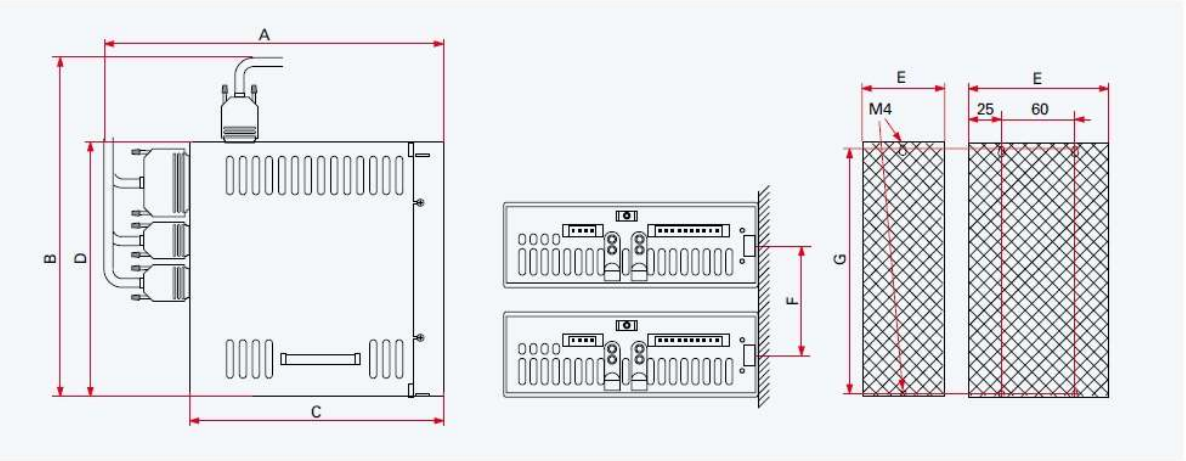
1.2.2 Assignment Table

List of Servo-drive used for the Electric Press-Fitting Units.

Unit Type	UE1500	UE3000	NG50 kN	NG100 kN	NG150 kN	NG200 kN	UG05	UG15	UG30	UG60	UG100
CD1 drive current (A)	**70**	**70**	**70**	**100**	**100**	**100**	**7,2**	**45**	**45**	**90**	**90**

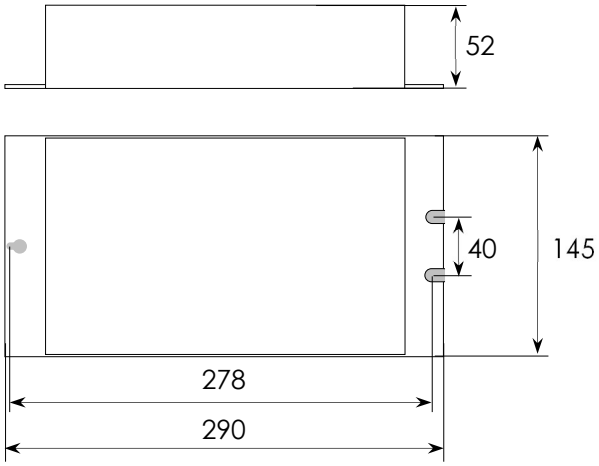
1.2.3 Dimensions

Drive:

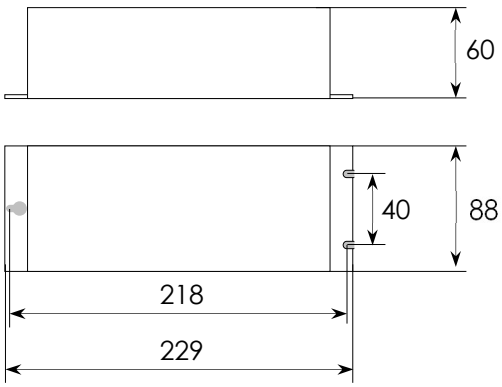


Dimensions [mm]	A	B	C	D	E	F	G
CD1-n 230 / ≤16.5	260	250	199	200	65	80	192
CD1-n 400 / ≤7.2	293	278	230	228	65	80	220
CD1-n 400 / 14	293	308	234	258	83	100	250
CD1-n 400 / ≤90	293	336	234	288	110	127	277

Discharging Resistor

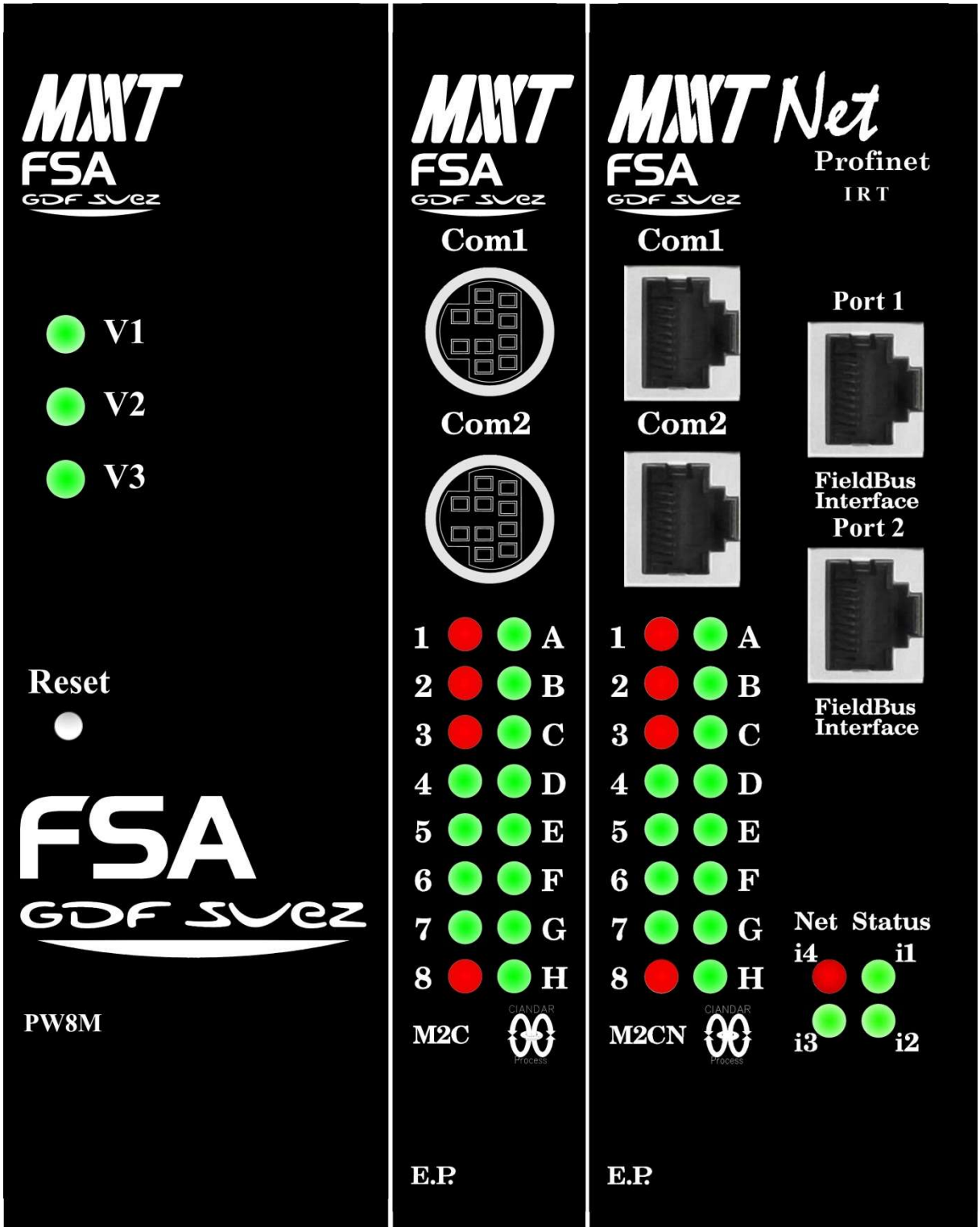


Main Filter (only for CD1 90 and 100 A)

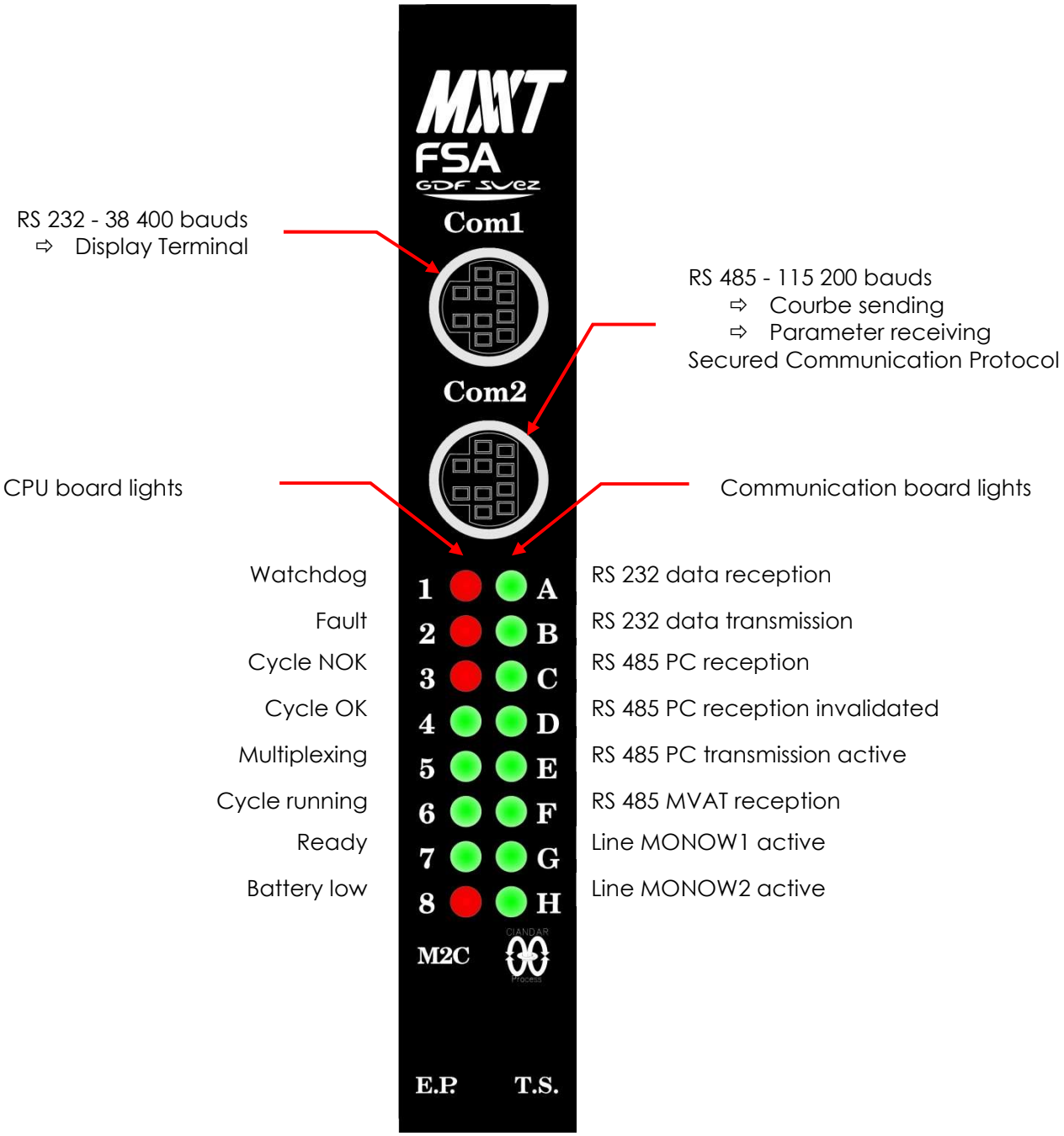


1.3 FABRICOM MVAT Servo control Electronics

1.3.1 Control Panels



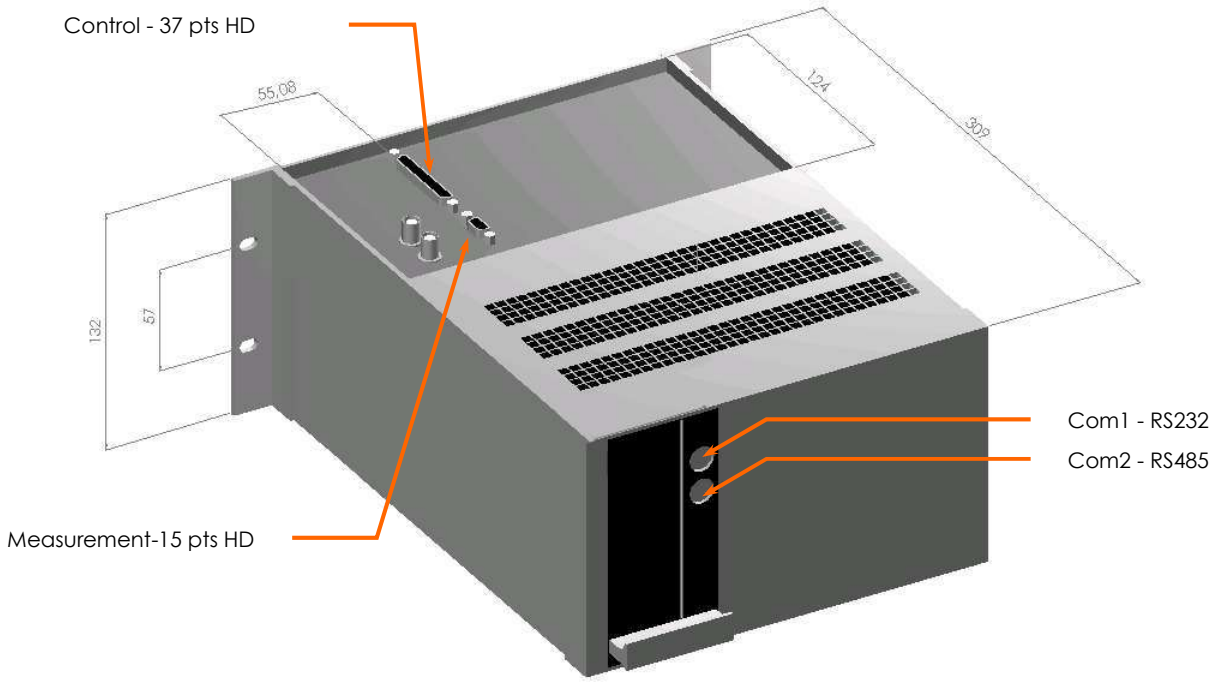
1.3.2 Explanation of Indicator Lights on MVAT M2C control Panel



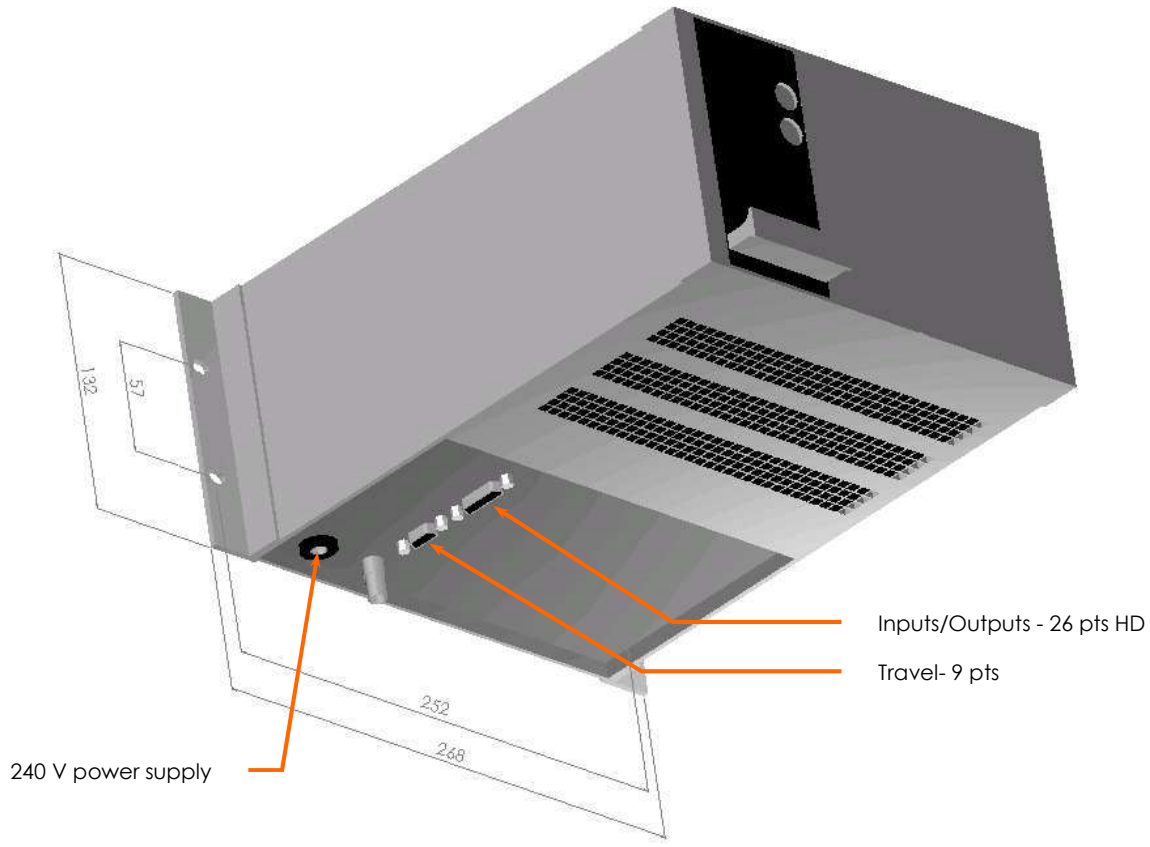
1.3.3 Dimensions

A clearance of at least 100mm must be left above and below the MVAT rack for the connectors. In front face, 80mm are needed left for the communication cables.

Top view



Bottom view



— 182 —
— 199 —
For the compact 2 channels version

1.4 Equipment Part Numbers

X Please check your equipment to keep in memory.

1.4.1 OG Spindles (Old Generation): UE1500/B C…R to UE3000/B C…R.

Part Number	Rated Force (kN)	Max Speed (mm/s)	Sensor rated Force (kN)	Motor type	Drive type (A/A)	Index Centering (mm)	x
UE 1500/B C300 R	15	400	15KN	BLS115	35/70	3,5	
UE 1500/B C500 R	15	400	15KN	BLS115	35/70	3,5	
UE 3000/B C300 R	30	360	30KN	BLS144	35/70	4	
UE 3000/B C500 R	30	360	30KN	BLS144	35/70	4	

1.4.2 NG Spindles (50kN to 200kN)

Part Number	Rated Force (kN)	Max Speed (mm/s)	Sensor rated Force (kN)	Motor type	Drive type (A/A)	Index Centering (mm)	x
50KN365D/B C500	50	365	100KN	BLS192	35/70	5	
100KN360D/B C500	100	360	200KN	BLS192	35/100	5	
150KN210D/B C500	150	210	200KN	BLS192	35/100	3	
200KN140D/B C500	200	145	200KN	BLS192	35/100	2	

1.4.3 UG Spindles (2kN to 100kN)

Part Number	Rated Force (kN)	Max Speed (mm/s)	Stroke (mm)	Sensor rated Force (kN)	Motor type	Drive type (A/A)	Index Centering (mm)	x
UG02kN660C300/B	2	660	300	3	FSA UG05	3,6/7,2	5	
UG02kN660C500/B			500					
UG05kN330C300/B	5	330	300	7,5	FSA UG05	3,6/7,2	2,5	
UG05kN330C500/B			500					
UG15kN525C300/B	15	525	300	20	FSA UG15	20/45	3,5	
UG15kN525C500/B			500					
UG15kN525C800/B		460	800					
UG30kN460C300/B	30	460	300	40	FSA UG30	20/45	4	
UG30kN460C500/B			500					
UG30kN460C800/B			800					
UG60kN700C300/B	60	700	300	100	FSA UG100	35/90	7,5	
UG60kN700C500/B			500					
UG60kN700C800/B			800					
UG80kN460C300/B	80	460	300	100	FSA UG100	35/90	5	
UG80kN460C500/B			500					
UG80kN460C800/B			800					
UG100kN370C300/B	100	370	300	100	FSA UG100	35/90	4	
UG100kN370C500/B			500					
UG100kN370C800/B			800					

1.4.4 MMT Spindles (200kN to 1000kN)

Part Number	*Rated Force (kN)*	*Max Speed (mm/s)*	*Sensor rated Force (kN)*	*Motor type*	*Drive type (A/A)*	*Index Centering (mm)*	**X**
MMT200kN900D600/B	200	900	300	PH1700	250/310	20	
MMT300kN790D600/B	300	790	400	PH1700	250/310	17,5	
MMT400kN560D600/B	400	560	500	PH1700	250/310	12,5	
MMT500kN450D600/B	500	450	600	PH1700	250/310	10,0	
MMT600kN335D600/B	600	335	750	PH1700	250/310	7,5	
MMT800kN220D600/B	800	220	1000	PH1700	250/310	5,0	
MMT1000kN175D600/B	1000	175	1200	PH1700	250/310	4,0	

1.4.5 MVAT Electronics

Designation	*Part Number*	x	*Other Part # (check on equipment)*	x
Rack NPN 1 channel	**3U 42E PLA EP 02/1**		**3U 42E PLA EP +Serial Number**	
Rack NPN 2 channels	**3U 42E PLA EP 02/2**			
Rack NPN 3 channels	**3U 42E PLA EP 02/3**			
Rack NPN 4 channels	**3U 42E PLA EP 02/4**			
Rack NPN 5 channels	**3U 42E PLA EP 02/5**			
Rack NPN 6 channels	**3U 42E PLA EP 02/6**			
Rack PNP 42E 1 channel	**3U 42E PLA EP 03/1**			
Rack PNP 42E 2 channels	**3U 42E PLA EP 03/2**			
Rack PNP 42E 3 channels	**3U 42E PLA EP 03/3**			
Rack PNP 42E 4 channels	**3U 42E PLA EP 03/4**			
Rack PNP 42E 5 channels	**3U 42E PLA EP 03/5**			
Rack PNP 42E 6 channels	**3U 42E PLA EP 03/6**			
Rack PNP 28E 1 channel	**3U 28E PLA EP 03/1**			
Rack PNP 28E 2 channels	**3U 28E PLA EP 03/2**			
Power Supply	**MVAT PW8M**			
Control Card (Firmware < V10)	**MVAT M2C EP**			
Control Card (Firmware ≥V10)	**MVAT M2C EP EXT**			
Fieldbus Interface Profibus	**MVAT.Net Profibus**			
Fieldbus Interface Ethernet I	**MVAT.Net Ethernet ModBus/TCP**			
Fieldbus Interface Ethernet II	**MVAT.Net Ethernet/IP**			
Fieldbus Interface Profinet IRT	**MVAT.Net Profinet IRT**			

1.4.6 FSA/INFRANOR part Numbers (Drives, motors and accessories)

Designation	*Part Number*	x	*Other Part # (check on equipment)*	x
SMT Rack	**BF 400-45/2.2.E V01 FSA**			
SMT Drive 30/60	**SMT-BD1/1A 400/60 r-T-BS FSA**			
SMT Drive 50/100	**SMT-BD1/1A 400/100 r-T-BS FSA**			
SMT main Filter	**F 400/45A**		**F 400/70A**	
SMT Discharging Resistor	**Ef/400V**			
CD1 Drive 3,6/7,2	**CD1A 400/7,2 FSA**			
CD1 Drive 20/45	**CD1A 400/45 FSA**			
CD1 Drive 35/70	**CD1A 400/70-E 2X33/280 FSA**			
CD1 Drive 35/90	**CD1A 400/90-E 2X33/280 FSA**			
CD1 Drive 35/100	**CD1A 400/100-E PCD1-29 FSA**			
CD1 Drive 3,6/7,2 opt STO	**CD1A 400/7,2 STO FSA**			
CD1 Drive 20/45 opt STO	**CD1A 400/45 STO FSA**			
CD1 Drive 35/70 opt STO	**CD1A 400/70-STO E 2X33/280 FSA**			
CD1 Drive 35/90 opt STO	**CD1A 400/90-STO E 2X33/280 FSA**			
CD1 Drive 35/100 opt STO	**CD1A 400/100-E STO PCD1-29 FSA**			
CD1 Main Filter	**F 400/70A**		**F 400/90A**	
Spindle Motor BLS 115	**BLS 115 00 310E FSA**			
Spindle Motor BLS 144	**BLS 144 00 310E FSA**		**BLS 144V 00 310E FSA** (fan)	
Spindle Motor BLS 192	**BLS 192 00 310E FSA**			

1.4.7 Operating Panel Part numbers (UExp-MVAT and accessories)

Designation	*Part Number*	x	*Other Part # (check on equipment)*	x
MVAT Webserver	**UExp-MVAT**			
Operating screen on Station	**Pan-MVAT**			
USB for Webserver	**USBKey-MVAT**			

1.4.8 Cables

« **XX** » has to be replaced by the required length.
« **YY** » has to be replaced by the required length among 5-10-15-20-25 m.
X Please check your equipment to keep in memory.

Power Cables *(spindle motor → drive)*	***Part Number***	***X***
Cable set (power+resolver) for BLS144 motor	**144C 18/21 LGXXm FSA**	
For Spindle UG02kN and UG05kN	**MVAT CAB/PU EPUG0 LGXXm**	
For Spindle UG15kN and UG30kN	**MVAT CAB/PU EPUG1 LGXXm**	
For Spindle UG60kN, UG80kN and UG100kN	**MVAT CAB/PU EPUG2 LGXXm**	
For Spindle MMT	**MVAT CAB/PU EPMMT LGXXm**	

Resolver Cables *(spindle motor → drive)*	***Part Number***	***X***
For SMT-BD1 A drive only	**MVAT CAB/RES EP LGXXm**	
For Spindle UG02kN, 05, 15, 30, 60, 80, 100kN	**MVAT CAB/RES EPUG LGXXm**	

Encoder Cable *(Spindle → drive)*	***Part Number***	
For side-motor spindle only	**MVAT CAB/COD EP LGYYm**	
For MMT spindle	**MVAT CAB/COD EPMMT LGXXm**	

Control Cable *(MVAT → drive)*	***Part Number***	***X***
For SMT-BD1 A drive	**MVAT CAB/COM EP LG1,5m**	
For CD1-A drive (spindle with coaxial-motor) (NOT UG spindle)	**MVAT CAB/COM EP2 LG3m**	
For CD1-A drive (spindle with side-motor OR UG spindle)	**MVAT CAB/COM EP3 LG3m**	

Measurement Cable *(Spindle →MVAT)*	***Part Number***	***X***
Standard	**MVAT CAB/MES EP LGXXm**	
Adaptor for Multi-Index box	**MVAT CAB/RAL EP LGXXm**	

Inputs/Outputs Cable *(MVAT → P.L.C.)*	***Part Number***	***X***
For MVAT rack type 02 (subD26HD → wires)	**MVAT CAB/ES2 EP LG3m**	
For MVAT rack type 02 or 03 Fieldbus (subD26HD → wires)	**MVAT CAB/ESP EP LG3m**	
For MVAT rack type 02 or 03 Fieldbus (subD26HD →SubD26HD)	**MVAT CAB/ESP EP1 LG3m**	
For MVAT rack type 02 or 03 Fieldbus Multi-index (subD26HD →wires)	**MVAT CAB/ESI EP LG3m**	

Communication cables					
Com type	***Communication Equipment type***	***Connection MVAT side***	***Connection equip. side***	***Part number***	***X***
RS232	NI ACKSYS ADV. EKI1522 et 1524	Mini Din-9 M	SubD-9 F	**MVAT CAB/232 LGYYm**	
RS232	ADV. EKI 1526 et 1528	Mini Din 9 M	RJ45	**MVAT CAB/232 AD6/8 LGYYm**	
RS485	NI	Mini Din-9 M	SubD-9 F	**MVAT CAB/485 LGYYm**	
RS485	ACKSYS 2 channels	Mini Din-9 M	SubD-9 M	**MVAT CAB/485 A2 LGYYm**	
RS485	ACKSYS 4/8 channels	Mini Din 9 M	SubD-25 F	**MVAT CAB/485 A4/8 LGYYm**	
RS485	ADV. EKI 1522 et 1524	Mini Din 9 M	SubD-9 M	**MVAT CAB/485 AD LGYYm**	
RS485	ADV. EKI 1526 et 1528	Mini Din 9 M	RJ45	**MVAT CAB/485 AD6/8 LGYYm**	
RS232 → RS485 Advantech convertor AD400E FSA				**MVAT CAB/485 AD400E LG0,065m**	

1.5 Recommendations – Limits of Use

This system should not be used in situations where it is subjected to impacts.

You are advised not to use the operating range above PLS-1 for returning to idle position.

You are advised not to extend the axis fully out without using a mechanical stop device.
In the manual mode, the "Manual Current" which is programmed in RHAPSODIE have to be very low to avoid destruction (5% is recommended)

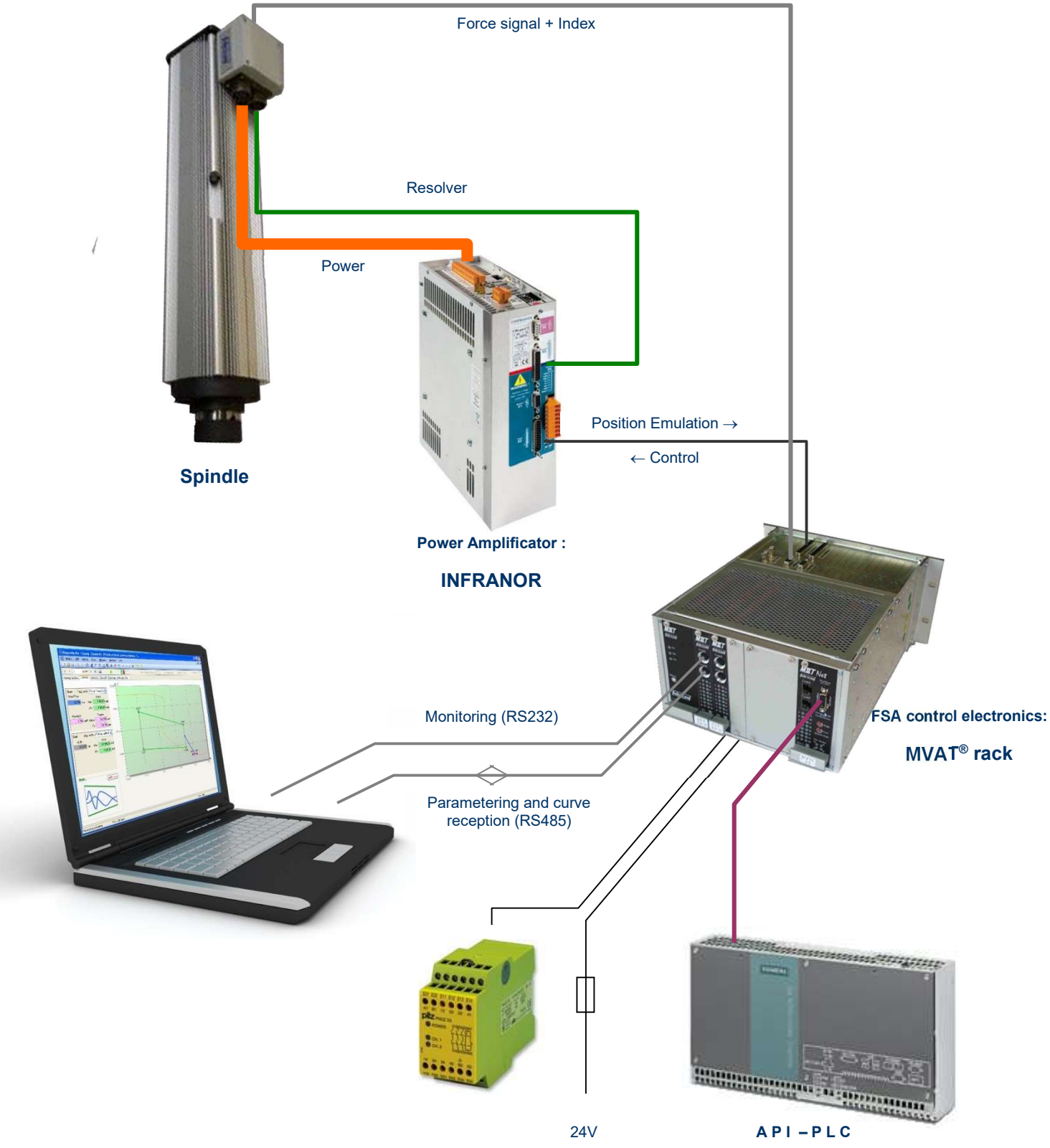
1.6 Handling the Spindles

The lifting rings are provided fixed on the spindle. In order to avoid spindle destruction, it has to be handled with a synthetic sling supporting 500kg minimum (for all spindles except MMT spindles which require 1000Kg minimum). This sling has to be shackled on the 2rings and handled high over the motor by the hang of the lift equipment. The lifting rings haven't to be released or replaced.

Important:
If lifting rings are missing, it is strongly recommended to use and mount the following fixtures:
NORELEM 07750-10 or **CODIPRO DSR M10 (tighten at 30Nm)**.

2 Connection Diagram

Note: it is truly essential to wire **ALL** grounding connections (motor → rack → cabinet → ground).



3 Preventive Maintenance

3.1 Mechanical maintenance of UE type spindles (UE1500/B to UE10000/B)

Item	*Action*	*Machine status*	*Time required*	*Frequency*	*Tools required*
Sleeve	Check attachment	Off	00:01:00	Annual	Allen wrench
Front bearing scraper seal	Check condition	Off	00:00:30	Annual	Visual Check

NB: The press-fitting unit must be returned to us every 8000 operating hours for inspection and complete lubrication change

3.2 Lubrication of UE type spindles (UE 1500/B à UE10000/B)

Part to be lubricated	*Type of lubricant*	*Machine status*	*Frequency*	*Quantity*	*Tools required*
1: Bearing	ISOFLEX TOPAS NB152 grease	Off	Every 2000 H	5 cm3	Pump
2: Satellite roller screw nut	ISOFLEX TOPAS NB152 grease	Off	Every 2000 H	See table below	Pump

The lubricators are shown on the spindle dimension drawings.

To access to the lubricator of the satellite roller screw nut, the shaft of the spindle should be at the right position. Use jog mode to put the lubricator in front of the lubrication hole present in the sleeve.

NB: The press-fitting unit must be returned to us every 8000 operating hours for inspection and complete lubrication change

Quantities of grease to be used to lubricate the screw nut:

Type of Spindle	*Travel (mm)*	*Required quantity of grease in cm³*
UE 1500/B	300	4
UE 1500/B	500	4
UE 3000/B	200	6
UE 3000/B	300	6
UE 3000/B	500	6
UE 5000/B	500	35
UE 7500/B	500	35
UE 10000/B	500	35
UE 10000/B	600	35

It is essential to scrupulously respect the quantities and grease type specified for lubrication, as this will invalidate the warranty.

3.3 Mechanical maintenance of NG type spindles (50kN to 200kN)

Part to be lubricated	*Type of lubricant*	*Machine status*	*Time required*	*Frequency*	*Tools required*
Sleeve	Check attachment	Off	00:01:00	Annual	Allen wrench
Splined shaft guide Bushing	Check condition	Off	00:00:30	trimestral	Visual check

NB: The press-fitting unit must be returned to us every 8000 operating hours for inspection and complete lubrication change

3.4 Lubrication of NG type spindles (50kN to 200kN)

Part to be lubricated	*Type of lubricant*	*Machine status*	*Frequency*	*Quantity*	*Tool required*
1 : Splined shaft guide Bushing	ISOFLEX TOPAS NB152 grease	Off	trimestral	100 cm^3	Pump
2 : Satellite roller screw Nut	ISOFLEX TOPAS NB152 grease	Off	trimestral	45 cm^3	Pump

The lubricators are shown on the spindle dimension drawings.

To access to the lubricator of the satellite roller screw nut, the shaft of the spindle should be at the right position. Use jog mode to put the lubricator in front of the lubrication hole present in the sleeve.

NB: The press-fitting unit must be returned to us every 8000 operating hours for inspection and complete lubrication change

3.5 Mechanical maintenance of UG type spindles (5kN to 100kN)

Part to be lubricated	*Type of lubricant*	*Machine status*	*Time required*	*Frequency*	*Tools*
Sleeve	Check attachment	Off	00:01:00	Annual	Allen wrench
Splined shaft guide Bushing	Check condition	Off	00:00:30	trimestral	Visual check

NB: The press-fitting unit must be returned to us every 8000 operating hours for inspection and complete lubrication change

3.6 Lubrication of UG type spindles (5kN to 100kN)

PAY ATTENTION : For all the UG range, before greasing, the rod has to be completely IN (on index or TOP-1 position)

3.6.1 UG05 spindle

Part to be lubricated	*Type of lubricant*	*Machine status*	*Frequency*	*Quantity*	*Tool required*
1 : Splined shaft guide Bushing	SKF LGHP 2 grease	Off	monthly	See table	Manual Pump
2 & 3 : (combined) - Satellite roller screw Nut - Thrust bearing (Rear bearing)	ISOFLEX TOPAS NB152 grease	Off	monthly	See table	Manual Pump

3.6.2 UG15 to UG100 spindle

Part to be lubricated	*Type of lubricant*	*Machine status*	*Frequency*	*Quantity*	*Tool required*
1 : Splined shaft guide Bushing	SKF LGHP 2 grease	Off	monthly	See table	Manual Pump
2 : Satellite roller screw Nut	ISOFLEX TOPAS NB152 grease	Off	monthly	See table	Manual pump
3 : Thrust bearing (Rear bearing)	SKF LGHP 2 grease	Off	monthly	See table	Manual Pump

The lubricators are shown on the spindle dimension drawings.

NB: The press-fitting unit must be returned to us every 8000 operating hours for inspection and complete lubrication change

3.6.3 Grease quantites

It is essential to scrupulously respect the quantities and grease type specified for lubrication, as this will invalidate the warranty.

Quantities of grease to be used to lubricate the screw nut and the thrust bearing (for indication, depends of the frequency of the greasing):

Type of Spindle	***Travel (mm)***	***1 : SHAFT GUIDE*** *Required qty of grease in cm^3*	***2 : SCREW NUT*** *Required qty of grease in cm^3*	***3 : THRUST BEARING*** *Required qty of grease in cm^3*
UG 05kN330C300/B	300	20	1	0
UG 15kN525C300/B	300	50	4	2
UG 15kN525C500/B	500	50	4	2
UG 30kN460C300/B	300	50	6	6
UG 30kN460C500/B	500	50	6	6
UG 60kN700C300/B	300	100	12	15
UG 60kN700C500/B	500	100	12	15
UG 100kN370C300/B	300	100	35	15
UG 100kN370C500/B	500	100	35	15
UG 100kN370C800/B	800	100	35	15

3.6.4 Greasing procedure

IMPORTANT : Greasing application procedure

1) Move the rod completely IN (index or Top-1 position)
2) Connect the grease plug of the pump to the grease nipple of the spindle
3) Pump slowy without force and STOP pumping as soon as you feel a resistance
4) Disconnect the pump
5) Move the shaft of the spindle in jog mode 5 to 10 times, to spread correctly the grease
6) Go back to 2) and make point until 4)

3.7 Electrical Maintenance

Item	*Action*	*Machine status*	*Required time*	*Frequency*	*Tool required*
ARMOIRE					
Emergency Stop	Functional test (checks that station effectively stops)	Production Off	00:00:30	Monthly	
Grounding Strip	Manually check attachment and connections tightened	Power Off	00:01:00	Every 3 months	Screwdriver
Electrical Cabinet	Check and ensure access is clear	Production On	00:02:00	Monthly	
MACHINE					
Connecting cables	Check insulation. Check for wear	Production Off	00:05:00	Every 3 months	Visual check

3.8 Screw Lubricator Positioning

This section is valid for all type of spindle. Lubricators are shown on the spindle dimension drawings.

3.8.1 Spindle Type UE or NG:

Release the plastic plug of the sleeve greasing hole. Lubricator appears when the spindle shaft in at home position.

If not, let move the shaft in jog mode (with PLC HMI)

After lubrication, replace the plug on the sleeve.

3.8.2 Spindle Type UG

For these spindles, the shaft has to be imperatively in home position before greasing (the greasing of the screw nut is made by the top of the spindle)

4 Checks before the first Power ON

4.1 Checking cables

Helping with electrical drawings, check the following cables:
- **Measurement cable** (15 pins male HD MVAT side, Amphenol 10 pins female press side),
- **Only for SMTBD1 drive : Encoder cable** (9 pins MVAT side , 12 pins female press side)
- **Control cable** (37 pins male MVAT side, 25 pins female NFRANOR drive side)

4.2 Checking the grounding

4.2.1 Spindle

Check that a grounding braid is connected between the spindle motor and the cabinet (the shortest possible).
Check the electrical continuity between:
- The ground of cabinet and plant ground
- The spindle sleeve and the spindle motor,
- The spindle sleeve and the frame of the machine,
- The spindle sleeve and the ground of the cabinet.

Check that the shield of the power cable of the motor is well connected, in a circular shape.

4.2.2 MVAT

Check that the ground conductor of the MVAT rack power cable (230V) is well connected to the ground of the cabinet.

4.2.3 Drive

Check the connection of:
- The ground conductor of the motor power cable on the ground of the drive
- The shield of the motor power cable on the fixture of the drive with a metallic collar.

Check that the motor power cable goes through the ferrite ring fixed on the fixture of the drive.

4.3 Checking the motor wiring

Check that no motor conductor is inverted (compare drive output: U – V – W and motor input).
Check the motor power conductor insulation: no continuity between conductors and ground.
Check that the discharge resistor match with the drive: ref EF/400V, and that the wiring is correct (electrical terminals #3, 4, 5 from the drive should be connected directly on the 3, 4, 5 electrical terminals of the discharging resistor).

5 First Power ON

5.1 Power supply Voltage

Switch on the general breaker of the cabinet.
Check the following voltage:
- MVAT 24V power supply
- MVAT 230V power supply
- INFRANOR rack auxiliary 230V power supply.

Then push the "Power ON" button.
Check the following voltage:
- INFRANOR rack main 400V power supply.

5.2 Infranor SMTBD1 or CD1-A drive

For the SMTBD1 drives, after switching off the general breaker of the cabinet, introduce the drive into the INFRANOR rack.
Switch ON the general breaker to switch on the auxiliary power supply off the rack (230V for SMTBD1 drives and 24V for CD1A one).
The 4 LEDs off the drive turn in the clockwise direction. After 5 seconds, only 2 of them remain on:

Then push the "Power ON" button, to switch ON the INFRANOR 400V main power supply. All the red LEDs are off, and the green one above remains ON.

WARNING: if the auxiliary supply is switched off, it is essential to **wait at least 30 seconds** before switching it on again.
When you switch off the main power supply, it is essential to wait **at least 3 minutes before disconnecting** and working on the INFRANOR racks and variable speed drives.

5.3 MVAT Rack

Switch off again the general breaker, introduce into MVAT rack the MVAT power supply module (MVAT PW8M), wait at least 30 seconds and then switch on the general breaker.
The 3 green LEDs of MVAT PW8M flash then remain ON.

5.4 MVAT controller

Do the operation again, but introduce this time the MVAT controller (MVAT M2C) into the MVAT rack.
At the first power ON, only red LED #2 remains ON (or flashes if no terminal is connected to the Com1 communication port of the board).
During the next power ON, if no equipment of the MVAT environment (MVAT rack, MVAT board, Spindle, INFRANOR drive), only green LED #7 remains ON ("MVAT is ready").

5.5 Equipment Validation

Every part of a MVAT insertion unit (MVAT rack, MVAT board, Spindle, INFRANOR drive) is equipped with an identification component that the MVAT board read at each power on or at each reset.
When powering-up for the first time or each time a press-fitting unit component is replaced, the equipment must be validated.
While this validation was not made, the card is blocked! (Red LED #2 ON or flashing)
To do this, open a terminal emulation on the PC (HyperTerminal or puTTY session), connect it to the RS 232 serial port connected to the MVAT "COM1", then set the communication parameters as shown below:

- Speed: **38400** bauds,
- Data bits : **8** bits per character,
- Stop bit : **1** stop bit,
- Parity : **No** parity,
- Flow control **Hardware**

Then Reset the MVAT. The text below is displayed:

```
Changement matériel
Châssis ou F P          : Nouveau ! (ou "Identique" ou "Différent conforme")
Broche Emmanchement     : Nouveau ! (ou "Identique" ou "Différent conforme")
Carte analogique        : Identique !
Tiroir de puissance     : Nouveau ! (ou "Identique" ou "Différent conforme")
Carte communication     : Identique !
Status Tetas            : 01 (ou 00)

Confirmer changement ? (O/N) :
```

Enter "O" for "Yes" then press ↵

If the message "`Absent ou non conforme !`" is displayed, the item concerned is either incorrectly wired or it is not the same type as the replaced item.

```
 - - - - attention - - - -"
Vous modifiez votre configuration matérielle"
Vous pouvez encore abandonner la procédure ! ! "
Confirmer changement ? (O/N) :
```

Enter "O" for "Yes" then press ↵

```
Entrer code d'accès :
```

Press ↵ since **no access code** is initially provided

```
Code d'accès accepté !
Fusiblage OK

--------------------------------------*--------------------------------------
-------------------------------------* *-------------------------------------
------------------------------------ M V A T ------------------------------------
------------------------------- * U E E A * -------------------------------
----------------------------- F A B R I C O M -----------------------------
------------------------- Systèmes d'Assemblage -------------------------
```

```
V XX.XX                          i 9 6 0            xx/xx/2000:xx/xx/2000

Ctrl(A) pour accéder au moniteur
Exécution emmanchement
Présence Index (ou Index NOK)
Position Origine NOK (ou OK)
Attente Départ Cycle
```

At this point, red LED No. 2 goes off and green LED No. 7 goes on. The MVAT board is now ready.

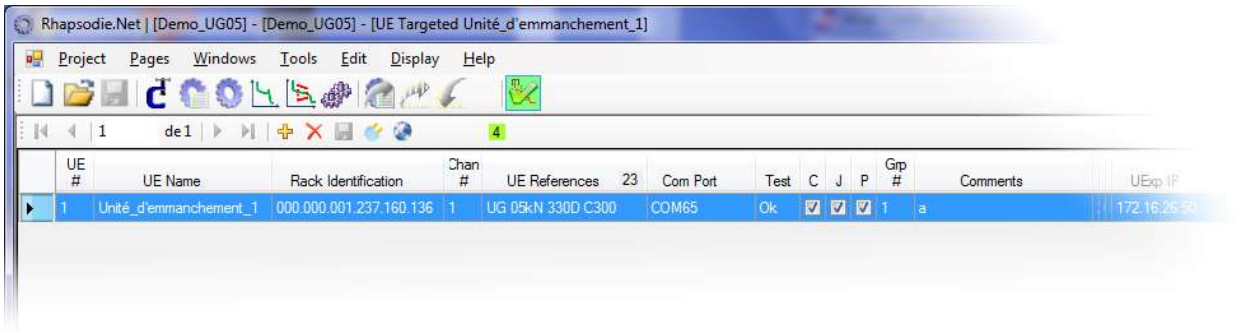
5.6 Getting the MVAT rack identification

Before transmitting the parameters to the MVAT board using the RHAPSODIE application, the fields "Rack Identification" and "Channel" must be entered in the "Press" page of the RHAPSODIE application.

To know the rack identification, just get it from the terminal after a reset:
The following line is displayed, giving identification in red, and channel in blue:

```
IP = 000.000.004.236.065.170.001
```

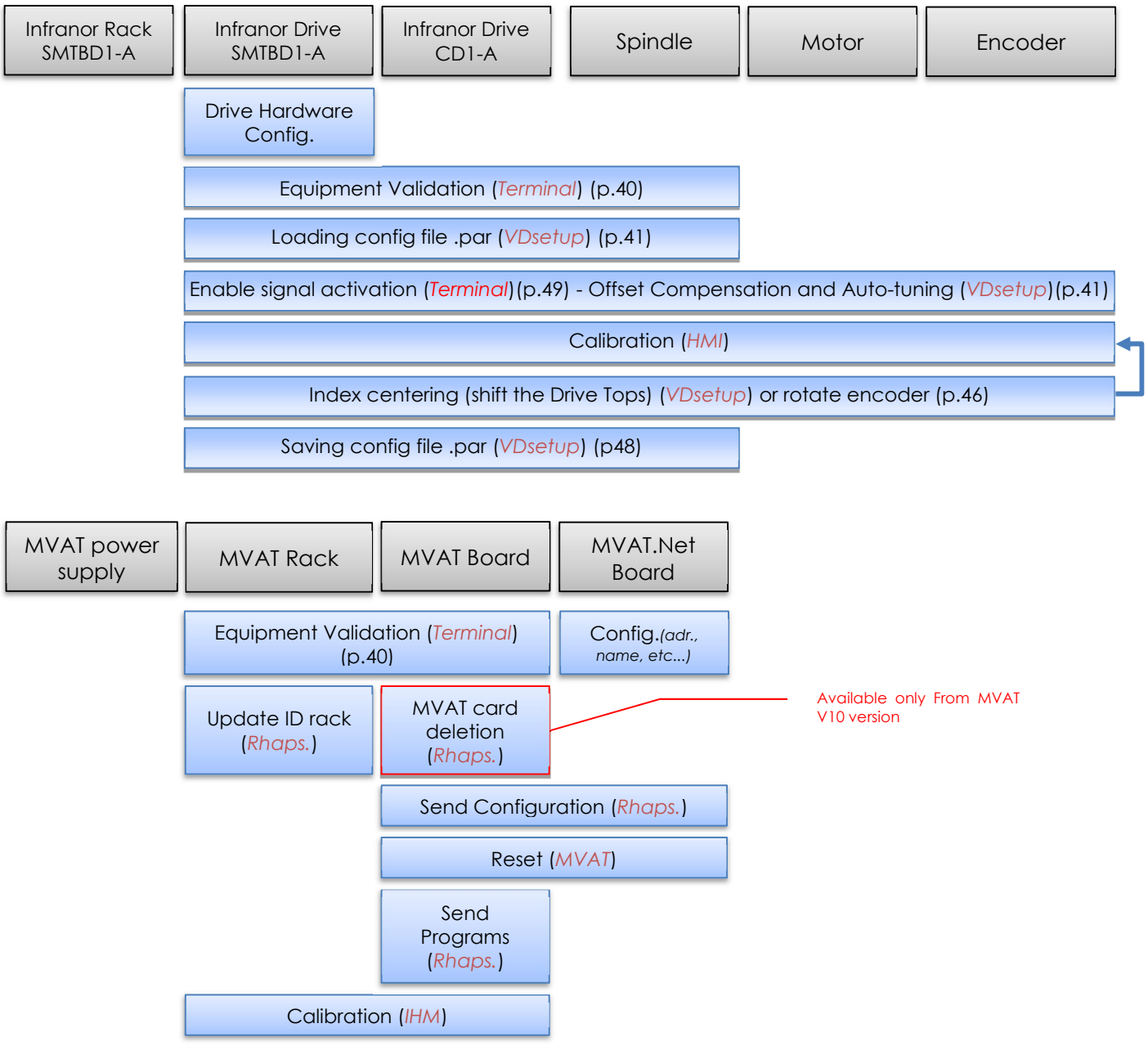
You just have to update this information in Rhapsodie (Unit page: “Rack Identification” and “Chan #”)



6 Replacing Equipment

Make sure that the main power supply is switched off before replacing any item.

6.1 Equipment replacement Synoptic



6.2 Replacing the INFRANOR rack (only for SMTBD1 type)

Switch off the main power supply then disconnect and remove the rack to be replaced. Check that the part numbers are compatible, then wire the new INFRANOR rack into the electrical cabinet. Retain the variable speed drive from the old rack and install it in the new rack.
Close the master cut-off in order to energize the INFRANOR 230V auxiliary supply.
The four variable speed drive LEDs light up one after the other in a clockwise direction. After a few seconds, only 2 of these LEDs remain lit:

Now press the power ON button to energize the INFRANOR 400V main power supply. All the red LEDs go off. Only the green LED remains on to indicate that the auxiliary power supply is on.

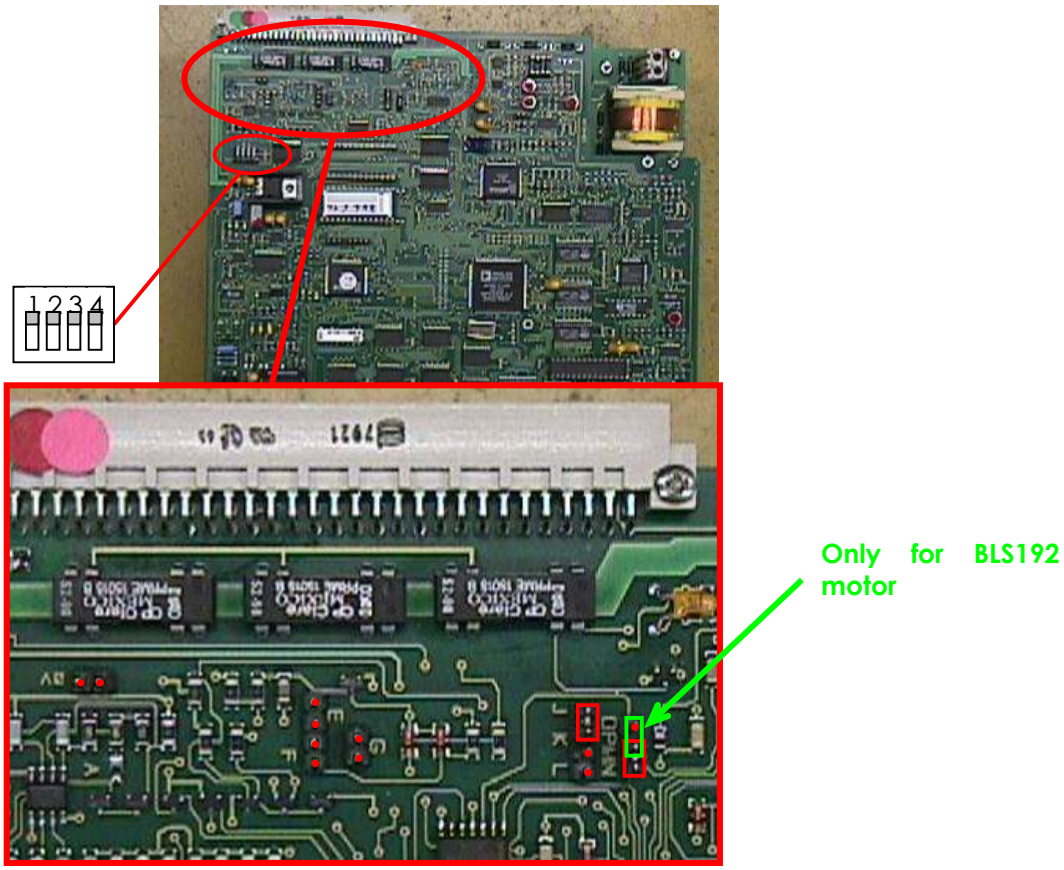
WARNING: if the auxiliary supply is switched off, it is essential to **wait at least 30 seconds** before switching it on again.
When you switch off the main power supply, it is essential to wait **at least 3 minutes before disconnecting** and working on the INFRANOR racks and variable speeds drives.

6.3 Replacing the INFRANOR Variable Speed Drive (VSD)

WARNING: Before replacing a defected drive, do not forget to store the original parameters of the drive, using VDSetup) (see chapter « Saving the drive parameters »)

6.3.1 Case of SMT-BD1 drive: hardware configuration before replacement

Before introducing the Infranor SMTDB1 into its rack, please check and correct the right configuration of the following jumpers, compare to the following picture:



Jumpers Configuration depending of the motor used:

	Spindle without BLS192 motor	Spindle with BLS192 motor
JK	Closed	Closed
KL	Open	Open
MN	Closed	Open
OP	Open	Closed
E	Open	Open
F	Open	Open
G	Open	Open
0v	Open	Open

6.3.2 Replacing the INFRANOR Variable Speed Drive (VSD)

Switch off the main power supply then remove the variable speed drive to be replaced. Check that the part numbers are compatible then install the new INFRANOR variable speed drive in the rack.
Close the master cut-off in order to energize the INFRANOR 230V auxiliary supply.
The four variable speed drive LEDs light up one after the other in a clockwise direction. After a few seconds, only 2 of these LEDs remain lit:

Now press the "POWER ON" button to energize the INFRANOR 400V main power supply. All the red LEDs go off. Only the green LED remains on to indicate that the auxiliary power supply is on.

WARNING: if the auxiliary supply is switched off, it is essential to wait at least 30 seconds before switching it on again.
When the main power supply is switched off, it is essential to wait at least 3 minutes before disconnecting and working on the INFRANOR variable speeds drives.

Then, following the "Equipment Replacement Synoptic", you must first validate the new equipment, then parameter the new drive, and then make the calibration of the unit.

6.4 Replacing the MVAT Rack

Switch off the main power supply. Disconnect the MVAT rack and connect the new rack. Retain the MVAT PW8M power supply and the MVAT M2C EP servo board from the old rack and install these in the new rack. Wait 30 seconds then close the master cut-off. The 3 green LEDs of the MVAT PW8M power supply flash then remain on. The LEDs of the MVAT M2C EP servo board flash then only red LED 2 remains flashing.
The equipment must now be validated and the new rack identification must be entered in the **RHAPSODIE application**.

6.5 Replacing the MVAT PW8M Power Supply

Switch off the main power supply. Install a new MVAT PW8M power supply module in its rack, wait 30 seconds then close the master cut-off.
The 3 green LEDs of the MVAT PW8M power supply flash then remain on.
The LEDs of the MVAT M2C EP servo board flash then only red LED No. 3 and 7 remains on (if "Drive Ready signal" is ON).

6.6 Replacing MVAT M2C EP controller board

Switch OFF the main power supply, and wait 30 seconds.
Unplug the 2 communication cables from the M2C MVAT card (COM1 and COM2), then untighten the 2 screws of the board, and release the MVAT board.
Place the new one, tight the 2 screws, and plug the 2 communication cables (BE CAREFUL, the pins of the connectors are very fragile).
Switch ON the main power supply.
The 3 green LEDs of the MVAT PW8M power supply flash then remain on.
The LEDs of the MVAT M2C EP servo board flash then only red LED #2 remains on. (Or keep on flashing if terminal is connected on COM1).
Then you must proceed successively to:

- Equipment validation (See §5.5 Equipment Validation p34),
- Send the configuration **only from the MVAT board #1 (channel 1)** (See Rhapsodie guide)
- Reset (white button MVAT power supply)

And when the MVAT card is ready:

- Clear MVAT programs (to delete data from factory) (see §6.12 Deleting programs of MVAT p53)
- Send programs to the MVAT ("Download to MVAT" using Rhapsodie.Net application).
- Make the calibration of the machine (see §6.11 Calibration (of the scaled displacement axis) procedure p51).

6.7 Replacing the Spindle

Switch OFF the general breaker. Wait at least 30 seconds.

WARNING:
The spindle motor could be very hot (>100°C) and the motor can be very hot and cause severe burns if touched.
Wait for cooling and take the necessary precautions (gloves screen, etc.)

The weight of some spindle can be significant (up to 220kg depending on the type), it is imperative to ensure the spindle with lifting rings designed for this use before dismantling..

Disconnect the measuring connector, power and resolver connectors, release the mounting screws, replace the spindle and reassemble in reverse order. Turn ON the main breaker.

The 3 green LEDs of the MVAT PW8M power supply flash then remain on.
The LEDs of the MVAT M2C EP servo board flash then only red LED No. 2 remains on. (Or keep on flashing if terminal is connected on COM1).
Then you must proceed successively to:

- Equipment validation (See §6.8 Equipment validation p40),
- Settling the drive (See §0 Setting the Drive p41),
- And make the calibration of the machine (see §6.11 Calibration (of the scaled displacement axis) procedure p51).

6.8 Equipment validation

Every part of a MVAT insertion unit (MVAT rack, MVAT board, Spindle, INFRANOR drive) is equipped with an identification component that the MVAT board read at each power on or at each reset.
When powering-up for the first time or each time a press-fitting unit component is replaced, the equipment must be validated.
While this validation was not made, the card is blocked! (Red LED #2 ON or flashing)
To do this, open a terminal emulation on the PC (HyperTerminal or puTTY session), connect it to the RS 232 serial port connected to the MVAT "COM1", then set the communication parameters as shown below:

- Speed: **38400** bauds,
- Data bits : **8** bits per character,
- Stop bit : **1** stop bit,
- Parity : **No** parity,
- Flow control **Hardware**

Then Reset the MVAT. The text below is displayed:

```
Equipment validation
MVAT Rack               : New ! (ou "Identical" ou "Different conforme")
Insertion Spindle       : New ! (ou "Identical" ou "Different conforme")
Analogical board        : Identical!
Servo Drive             : New ! (ou "Identical" ou "Different conforme")
Communication board     : Identical !
Status Tetas            : 01 (ou 00)

Confirm changement ? (O/N) :
```

Enter "O" for "Yes" then press ↵

If the message "Absent ou non conforme !" is displayed, the item concerned is either incorrectly wired or it is not the same type as the replaced item.

```
 - - - - pay attention - - - -"
You're going to modify the equipment configuration "
You can still cancel the procédure ! ! "
Confirm changement ? (O/N) :
```

Enter "O" for "Yes" then press ↵

```
Enter access code :
```

Press ↵ since **no access code** is initially provided

```
Access Code accepted !
Flashing memory OK

-------------------------------------*-------------------------------------
--------------------------------------* *------------------------------------
---------------------------------- M V A T ----------------------------------
--------------------------------- * U E E A * ---------------------------------
------------------------------ F A B R I C O M ------------------------------
--------------------------- Systèmes d'Assemblage ---------------------------
_____________________________________________________________________________
V XX.XX                          i 9 6 0            xx/xx/20xx:xx/xx/20xx

Ctrl(A) to access to monitor
Execution Insertion
Index Presence (or Index NOK)
Origin Position NOK (ou OK)
Pending for start cycle
```

At this point, red LED No. 2 goes off and green LED No. 7 goes on. The MVAT board is now ready.

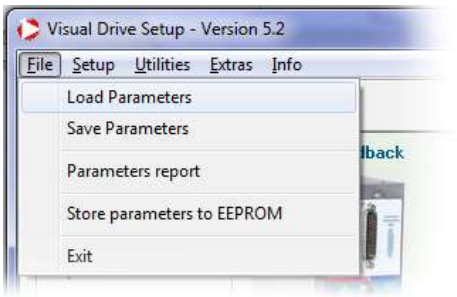
6.9 Setting the Drive

The INFRANOR VDSetup software will be used during the following steps. Icon: 
A serial communication port of the PC is connected to the drive (X5 connector – Serial Link), then you can launch VDSetup:

6.9.1 Loading the parameter file (xxxxx.par)

To implement into the new drive the parameter file saved from the old drive, use VDSetup :

In the main page, choose menu « File / Load Parameters », and select the « x x x x x.par » file corresponding to the drive :



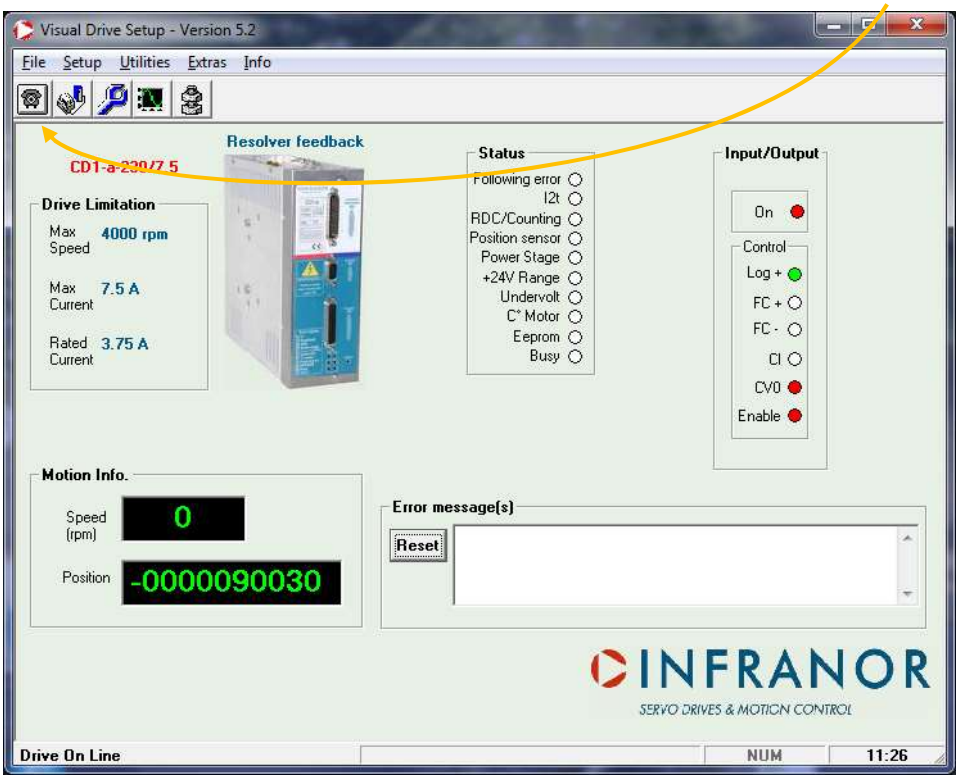
Then the procedure ends with the following message:

At this step, it's opportune to move the rod OUT for about 50mm, using HMI panel to allow after the auto-tuning without issue.

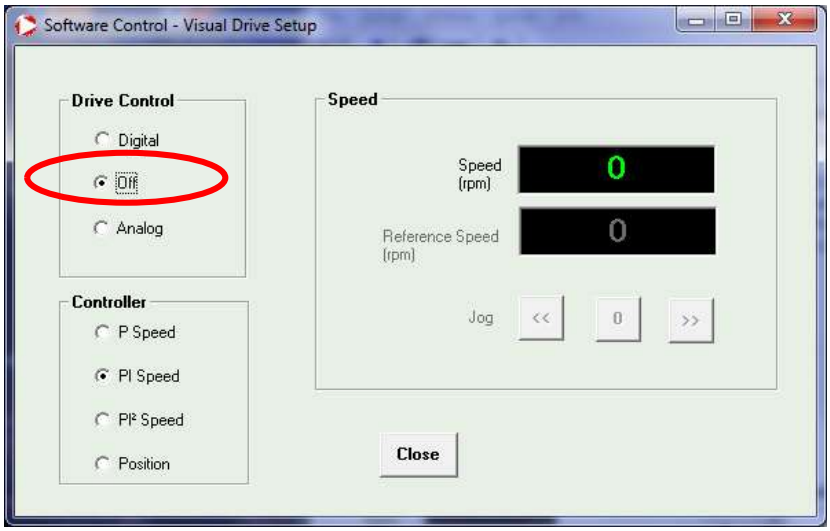
6.9.2 Offset Compensation (for speed reference)

This operation adjusts the 0V of the analogic speed reference of the drive to the 0V reference of the MVAT controller.

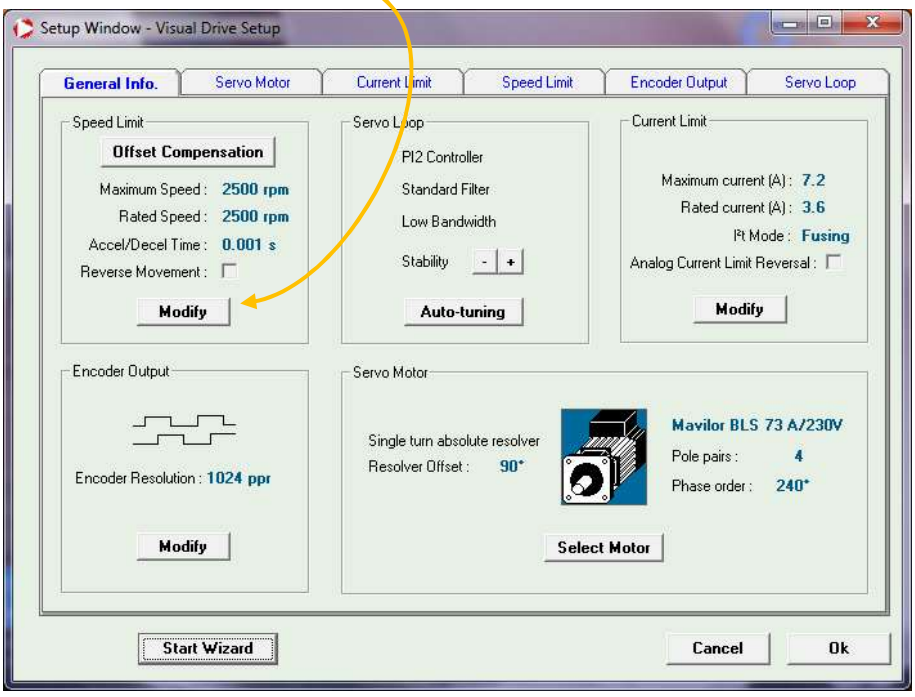
Put first to "Off" the drive by opening the « Drive control » page using button 



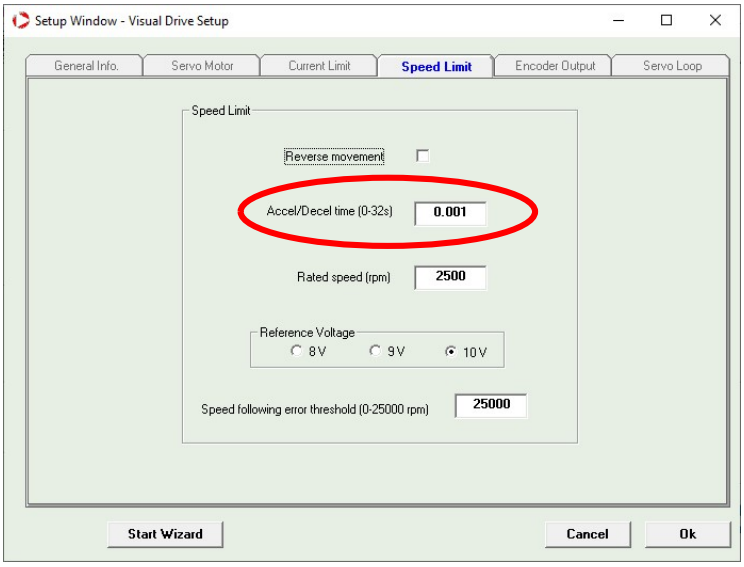
and by checking the « Off » checkbox :



- Then, open the "Drive Setup" window with the button  , and open the window "Speed Limit" with the button "Modify".

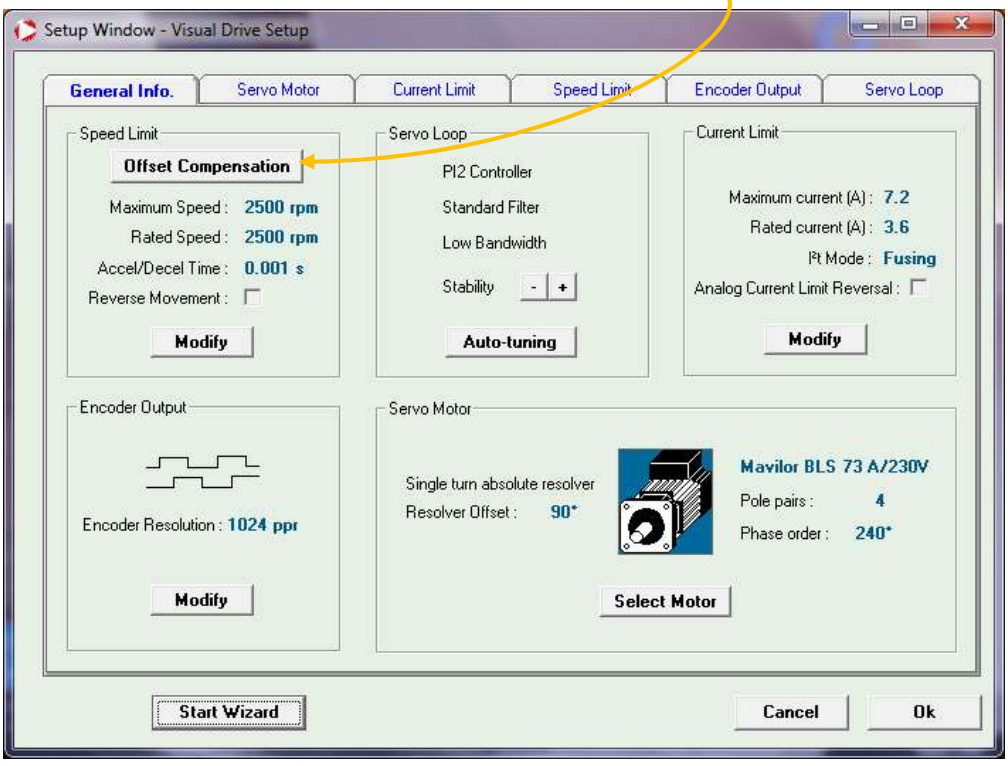


Check first that the Accel/Decel time is settled to the minimum value (0,001 sec) :



To be able to perform the "Offset Compensation" procedure, you must :

- Activate "Enable" input of the drive (see p 49 for more details).
- In VDSetup software, as the drive is already in "Off" mode, launch the "Offset Compensation" procedure by clicking on the button :



A message box appears, then click on OK (in fact, as the « Enable » is already activated, the speed analogic reference of the MVAT is already set to 0V).

At the end of the procedure (it takes a few seconds), a message box informs the user that procedure has been successfully executed :

6.9.3 Auto-tuning

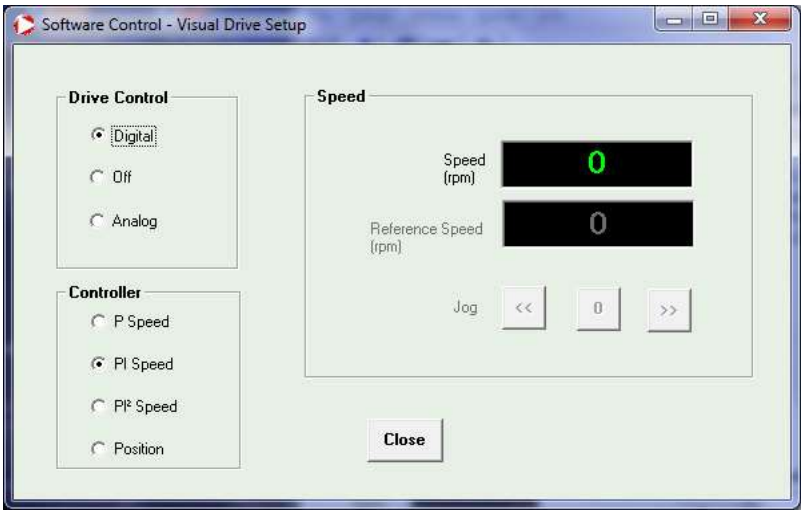
The Auto-Tuning procedure adjusts the parameters of the servo motor in an automatic way. This procedure is needed each time you replace the drive, the spindle or the motor, or when you modify the tooling (changing the weight).

Before launching the Auto-tuning, please check that the shaft of the spindle is not entirely back. If yes, please use the jog mode of the machine to let the shaft getting out of approximately 50mm.

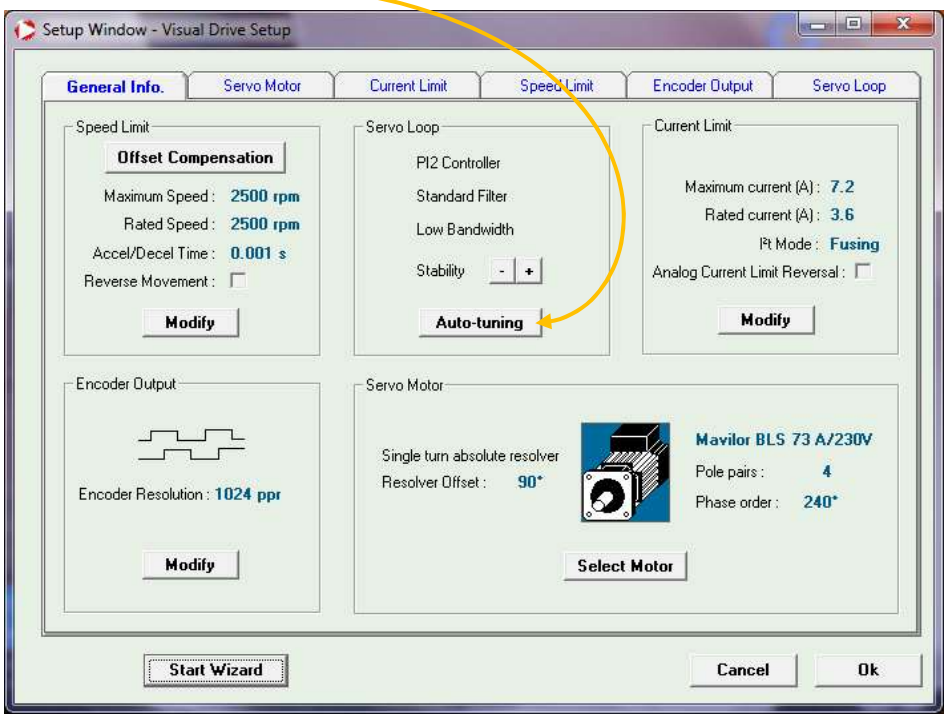
WARNING: To avoid mechanical damages, you must ALWAYS try to introduce between the nose of the press and the table (or tooling) a semi-resilient shim (in wood for example)

Then to run the Auto-tuning:

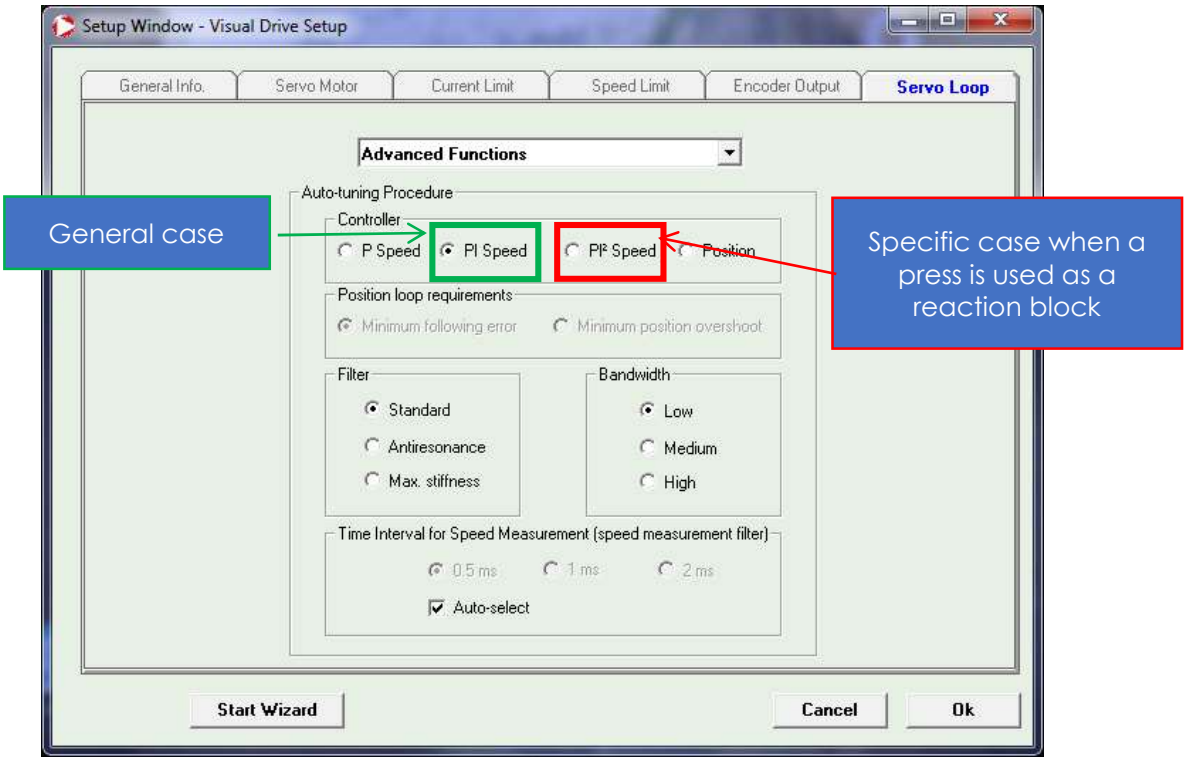
- Activate the "Enable" input of the drive (see §6.10 p 49 for more details).
- **IMPORTANT** : turn the drive in « **Digital** » mode with « Software Control » page (put first to "Off", then to "Digital") :



- In VDSetup software, open « Drive Setup » page with button  and launch the Auto-tuning procedure :



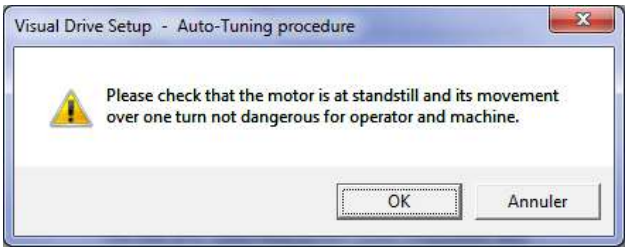
Then you go automatically to the « Servo Loop » sheet:



Make sure that the following checkbox are checked:

- « PI Speed» into the « Controller » area (**Or PI² when the press is used as a reaction block**)
- « Standard » into the « Filter» area
- « Low » into the « Bandwidth » area
- and « Autoselect » into the « Time interval » area

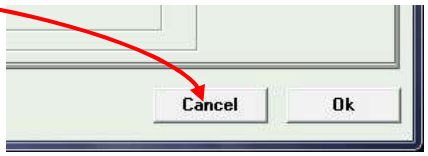
Then click on OK button and a message box asks to ensure that motor is standstill:



Pay attention : when you click on OK, if the following message box appears, that means that « Enable » input is not set to 1 for the drive. Please check that the safety line of the machine is not disabling this signal.

Then, when you click on OK, you can hear a thud near the motor. Auto-tuning procedure has ended.

You can leave the procedure with the « Cancel » button of the "Setup Window"



- Then put the drive back to « **OFF** » with the « Software Control » window
- Then disable the « Enable » signal by typing the « Esc » key in the terminal
- Then put the drive to « **Analog** » mode with the « Software Control » window

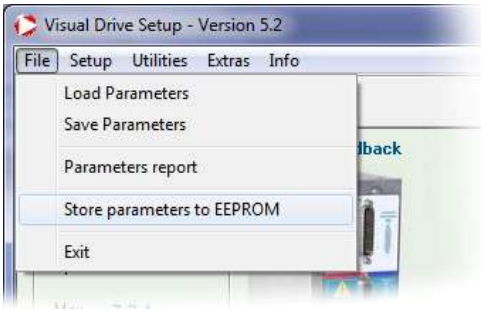
6.9.4 Encoder Resolution

In the "General Info" off the "Setup Window", click on « Modify » in the « Encoder Output » area. Then check that:

- « Output encoder Resolution » is set to 4096
- « Output encoder Dead band » is set to 8
- « Zero pulse origin shift » is set to 0

6.9.5 Ending Auto tuning procedure

To implement correctly the new parameters calculated by the Auto-tuning procedure, you have to « Store parameters to EEPROM », to be sure that these new parameters have been stored into the memory of the drive, to keep it resident even after shutting down the drive.



6.9.6 Index Centering by Zero pulse shifting

At the end of the calibration, chek the value "Index Centering" displayed in the terminal :

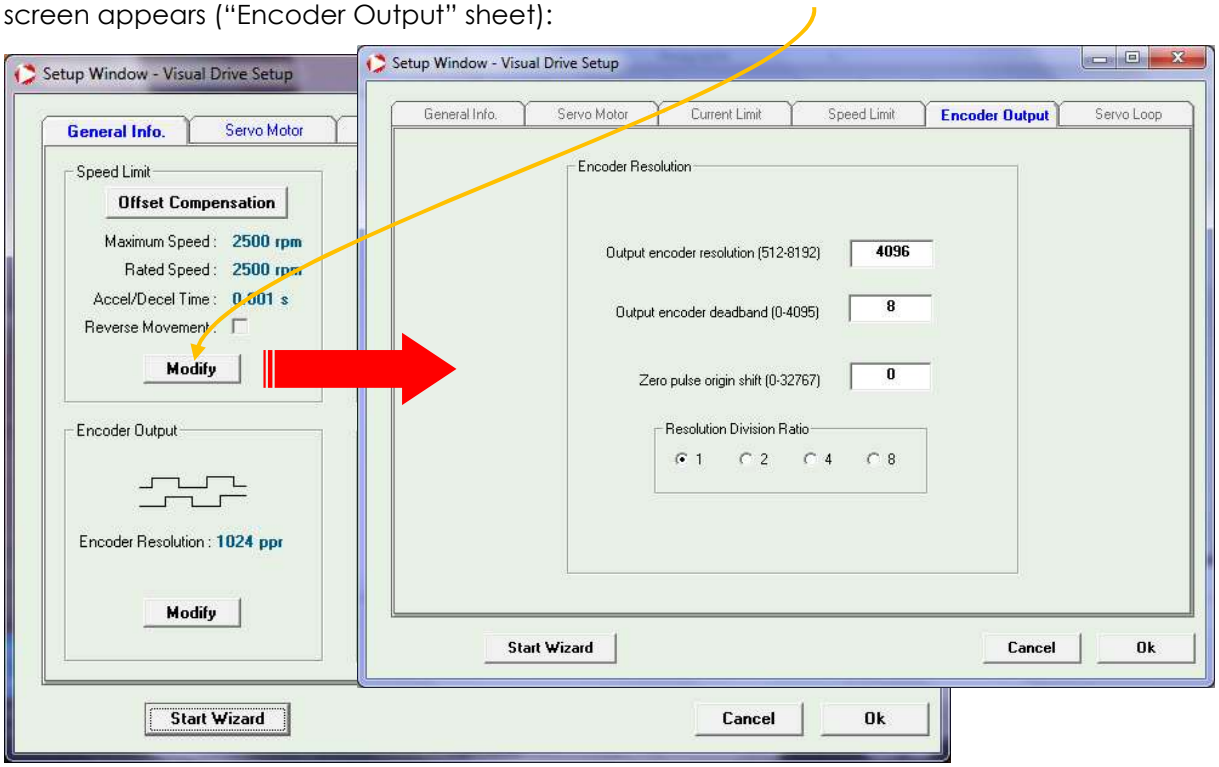
```
Calibration Force   :        2811.1   daN
-----------------------------------------
Resolution depl.    :      1212.050   I/mm
Press Opening       :       275.033   mm
Index centring      :         5.267   mm
Initial Offset      :          9.14   %
Final Offset        :         -0.04   %
Calibration Force   :        2811.1   daN
*****************************************
```

If the value is not close (± 0,3 mm) to **the half thread of the screw** (see screw thread table at §1.4 Equipment Part Numbers p21), this procedure has to be launched alternatively with the calibration procedure, until the resulting value "Index Centering" is **as close as the half thread of the screw.**
Depending of the spindle type, equipped or not with an external encoder (the spindles with a motor with the same axle than the spindle one have no extra encoder)

Let's use example to explain this adjustment:

<u>First Example : Spindle without external Encoder</u>

Let's say that the thread pitch of the screw is 8 mm.
After a first calibration sequence, the "Centrage Index" value is 6,245 mm. As the looked value is 4 mm (8mm/2), there is 2,245 mm more.
As 8 mm correspond to the 32768 pulses of the drive, 2,245 mm correspond to 9196 pulses.
Then we have to subtract 9196 to the actual value of the drive.
To do that, we click in the "General Info" sheet on the « Modify » button and the following screen appears ("Encoder Output" sheet):



In this example, the actual value is 0. Then, if you calculate 0 - 9196 = -9196, as a negative value is not allowed, we complement with 32768, what gives – 9196 + 32768 = 23 572.
Then, we make a new calibration cycle, and we check that now the "Centrage Index" value is much closed to 4 mm.

If the new "Centrage Index" value is not 4,000 mm but 8,49 (6,245+2,245), or 0,49 (because we overpass a Top of the drive), we mistake by subtracting 9196, we should add it to 0, then replace the 0 value by 9196 instead 23 572.

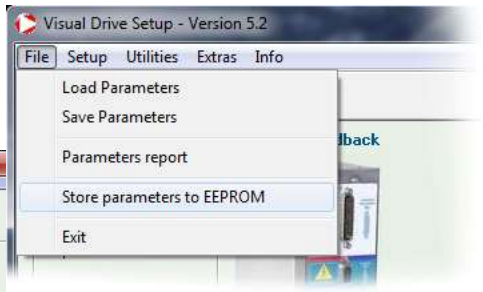
Second Example: Spindle with external encoder
Let's say that the pitch of the screw is 10 mm.
After a first calibration sequence, the "Centrage Index" value is 6,433 mm. As the looked value is 5 mm (10 mm / 2), there is 1,433 mm more.
We know that 10 mm correspond to 1 turn, or 360°, then 1,433 mm correspond to 51,6°.

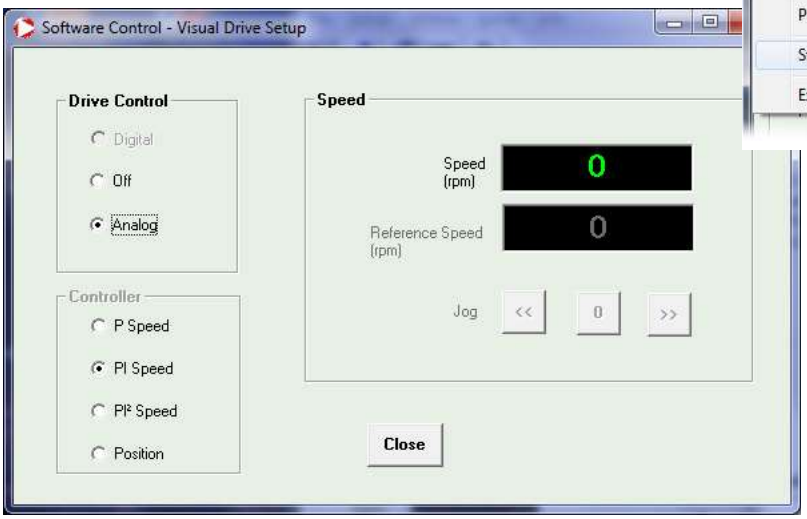
Then we have to turn the encoder of an angle equal to about 50° in the anti-clockwise direction.

Then, we make a new calibration cycle, and we check that now the "Centrage Index" value is much closed to 5 mm.

6.9.7 Ending the drive setting

To validate new parameters and to be sure to keep it the memory of the drive, only click on "Store parameters to EEPROM" of the "File" menu:





Then, in the "Drive Control" window, **DON'T FORGET to go back in Analog**.
A message box appears, then click on "OK".

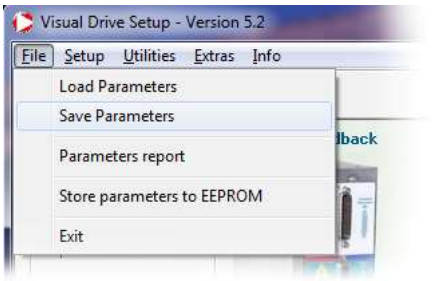
Then, the drive is ready to work with the spindle fitted with.

In the terminal, leave the "Esc-m-M" keyboard command by typing the ESC key.
The insertion unit can now work correctly.

6.9.8 Saving the new parameter file (xxxxx.par)

To keep a backup of the parameters in case of changing the drive, in VDSetup, we save the new parameter file by choosing « File / Save Parameters » menu:

And we choose the backup directory and filename.



6.10 Activate the Enable signal of the Drive

6.10.1 Case #°1 : PC with Rhapsodie.Net directly connected on MVAT board

The connection can be direct or trough Serial ➔ Ethernet converter, ADVANTECH EKI for example:

⇨ For MVAT board with firmware version **older than V10** :

- **ATTENTION** : Firstly uncheck the "Start Cycle Operating" checkbox in the "Appendix" sheet of the "Specifications", and send this modification to the MVAT board
- Then type into terminal the keyboard command « Esc m M » (ESC M SHIFT M)

⇨ Since the **V10 version**, you can type directly into terminal the keyboard command :

- « Esc m v M » (ESC M V SHIFT M).
- Then, if the MVAT board is ready ("Attente Depart Cycle" in terminal), you can hear the park break of the spindle to be released, and you can see in the terminal that the "Enable" command is activated:

For both versions, **don't forget to type the ESC key again to exit** of the command an d come back to « Pending for Start Cycle ».

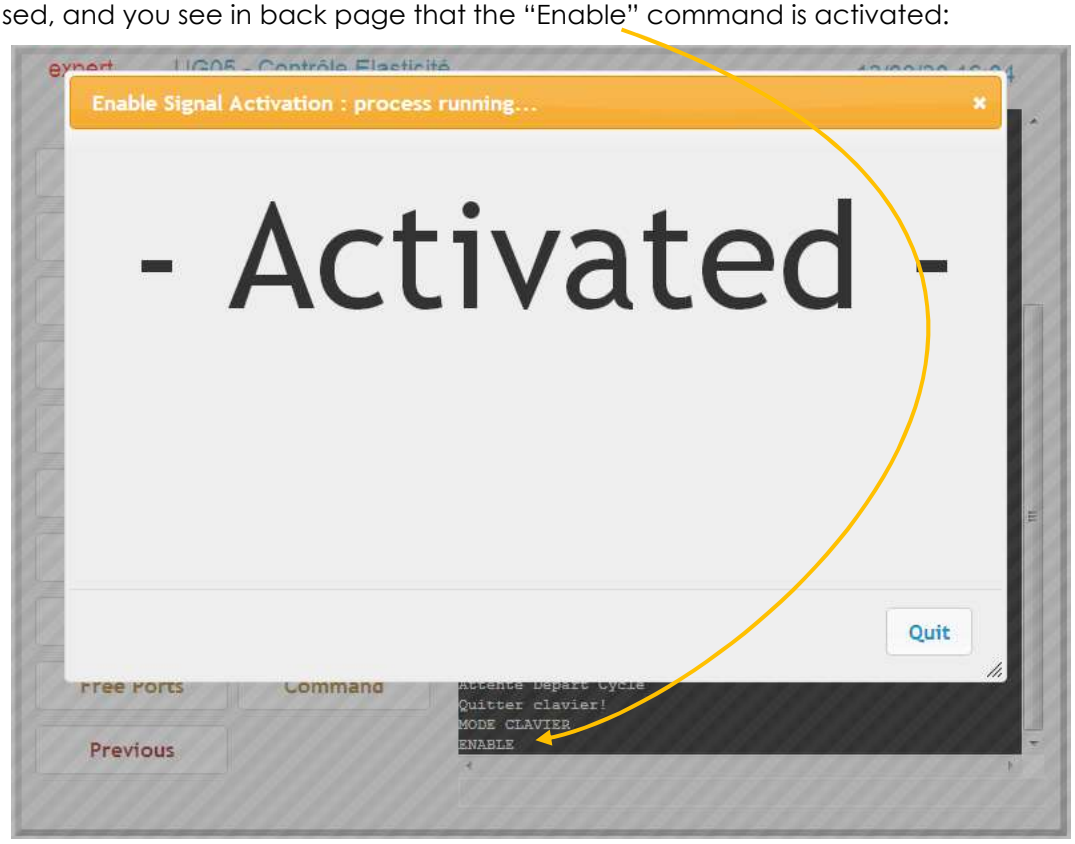
6.10.2 Case #°2 : A UExp-MVAT panel is used on the station

On the panel, do :

- Type login password to be connected : Login
- Then Update the panel : Update
- And in the MVAT-Term page : MVAT-Term, touch the « Enable Signal Activation » button :

- Then, if the MVAT board is in "Attente Depart Cycle", …

… the "Activated" window is opened,), you can hear the park break of the spindle to be released, and you see in back page that the "Enable" command is activated:



To exit this mode, just touch the « Exit » button to come back in « Attente Départ Cycle ».

WARNING : Don't stay in "Enable" mode more than 5mn to avoid motor heating.

6.11 Calibration (of the scaled displacement axis) procedure

6.11.1 Calibration in compression mode

This procedure has to be done **IMPERATIVELY** at the starting-up of the machine, and at each, changing of the MVAT environment (frame modification, tooling modification, spindle, drive, MVAT board).

The calibration procedure is made when machine is not producing. It is launch by the PLC. The hard Start Cycle (door switch or light curtain switch) has to be ON during all the sequence. The speed used for the calibration is the one that is programmed in Rhapsodie.Net (Specification page)

At the end of the calibration procedure, the MVAT system knows:
- The Zero position of the machine, and the working area of the press,
- The practical resolution for displacement axis (pulses / mm). To calculate this value, 2 gages are used: a lower gage to determine Zero position, and an Upper gage, which exact height is entered in Rhapsodie, to determine the practical resolution:

$$\frac{\text{Nb. puls. measured during upper gage - Nb. puls. during lower gage}}{\text{Upper gage height in mm - Lower gage height in mm}} = \text{Resolution (puls./mm)}$$

- The flexion of the frame and Spindle extension depending of the applied force.

Steps:
Firstly, check that values for lower and upper height have been entered correctly in Rhapsodie in the Specifications page. (Remark: it's possible to use only the upper gage, if the height of the lower gage is define to 0)
1- Put the Lower gage in the machine. If there's no lower gage, the shaft of the spindle will apply the force directly on the 0 reference.
2- Start cycle, and hold the start cycle signal until the end of the sequence (shaft in home position). If an emergency stop occurs, put the shaft back in home position and start again.
3- When the lower gage sequence is finished, you have to launch directly the upper gage sequence, with no other movement between.
4- Release the lower gage, and put the upper gage instead.
5- Launch the upper gage calibration.
At the end, calibration results are displayed in the terminal. (See §10 Execution p70)

To have a good calibration, you need :
- Resolution calculated has to be between the max and the min resolution defined in Rhapsodie in Specification page
  - If this value is out of tolerances, check the height of the gages compare to Rhapsodie definition, check the mounting of the gage. Check there is no hard spot during the calibration sequence (before the nose of the press touch the gage).
- Top Dead Center calculated has to be between the max and the min T.D.C. defined in Rhapsodie in Specification page.
  - If this value is out of tolerances, check the height of the lower gage, compare to the last calibration. Check there is no hard spot during the calibration sequence (before the nose of the press touch the gage).

Calculation of theoretical resolution: *(to enter min and max in Rhapsodie)*

- *With resolver : 4096 / pitch of the screw (in mm)*
- *With external encoder: 5000 / pitch of the screw (in mm)*

6.11.2 Procédure d'Etalonnage de la machine en traction

Cette fonction est destinée à l'acquisition de la fonction des déformations de la machine en traction, pour garantir une très bonne précision y compris dans le cas d'un cycle en traction qui applique un effort sur le produit.

Si la machine ne comporte pas de cycle de travail à l'effort en traction, où la précision de positionnement sous effort est nécessaire, **il n'est pas nécessaire de faire un étalonnage traction**.

Etapes

Un outillage mécanique est nécessaire pour l'exécution de cet étalonnage.

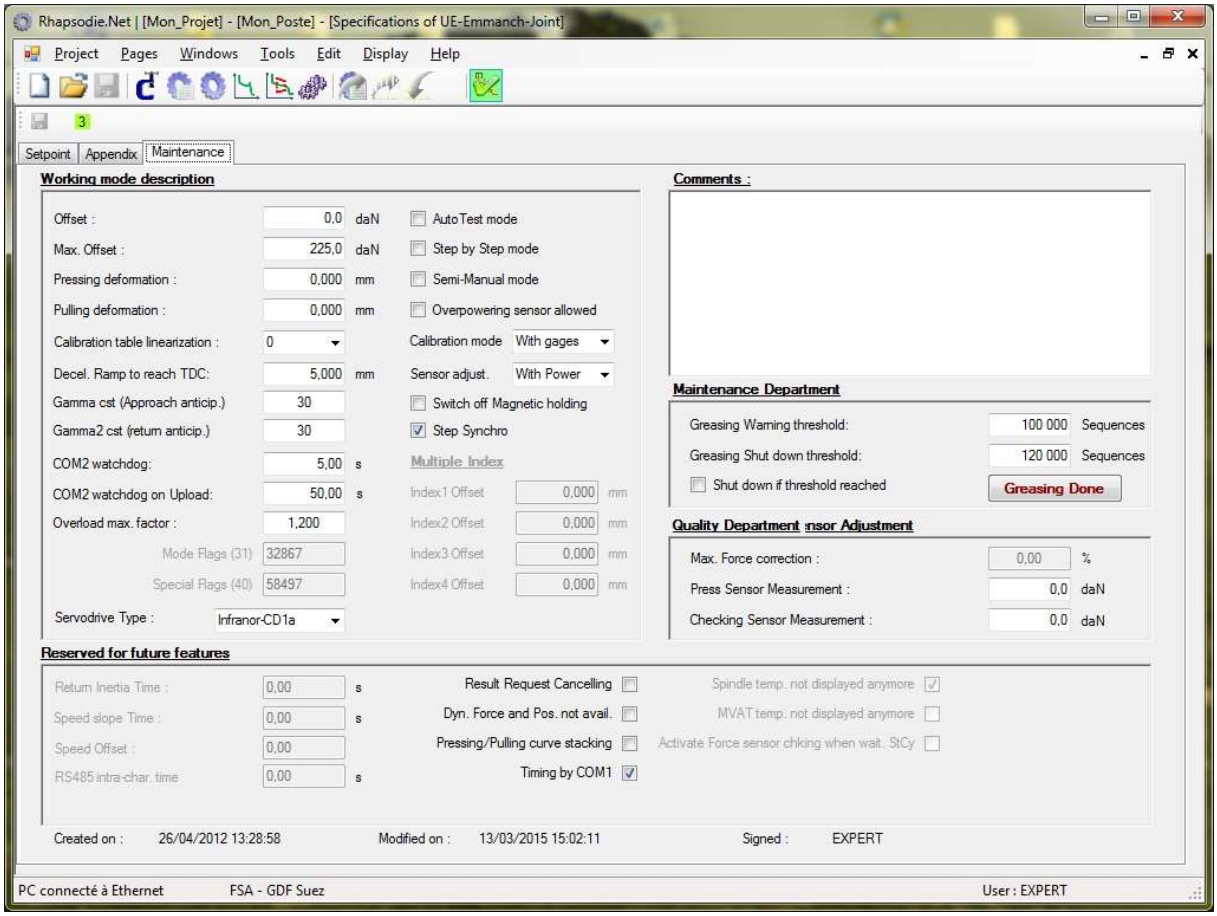
1- Le cycle de traction utilise le programme N° 1. Ce cycle permet d'avancer le nez de Broche à un point donné (paramétrable), afin de disposer l'outillage de traction.
2- Envoyer le départ cycle qui doit être maintenu. La Broche exécute le cycle correspondant au programme N° 1 (arrêt sur cote de déclenchement).
3- Lorsque la Broche est arrêtée sur la cote de déclenchement, mettre la cale qui va servir à la traction. Envoyer une impulsion sur l'entrée ES9 pour que la Broche continue son cycle.
4- La Broche exécute le cycle de traction et déclenche à la force d'étalonnage traction paramétrée dans le menu "spécifications". Dès que l'effort est atteint, la Broche revient à la position basse de l'étape précédente.
5- Arrêt de la Broche en position basse. Enlever la cale qui a servi à la traction. Envoyer une impulsion sur l'entrée ES9 pour que la Broche continue son cycle.
6- La Broche exécute le cycle de rappel en position initiale.

Remarque :
Si le cycle est interrompu (arrêt urgence), la broche reste toujours en étalonnage traction. Il faut alors recommencer le cycle étalonnage traction, soit :
a/ envoyer un cycle de remontée Broche
b/ relâcher le départ cycle
c/ envoyer le départ cycle pour un nouveau cycle étalonnage traction.

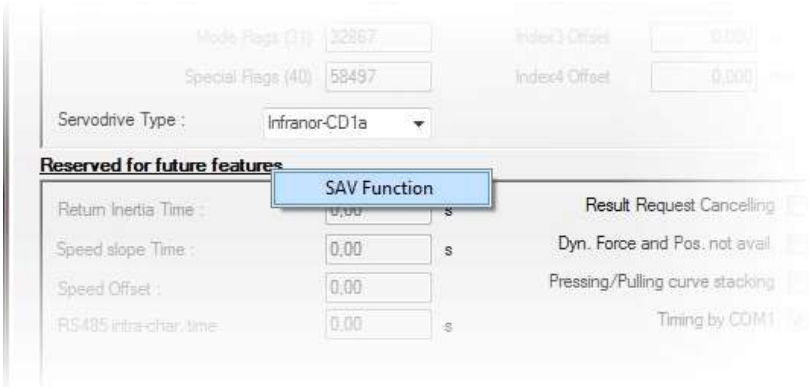
On peut recommencer les opérations a, b, c, autant de fois que l'on veut, tant que le cycle n'est pas réalisé correctement.

6.12 Deleting programs of MVAT board

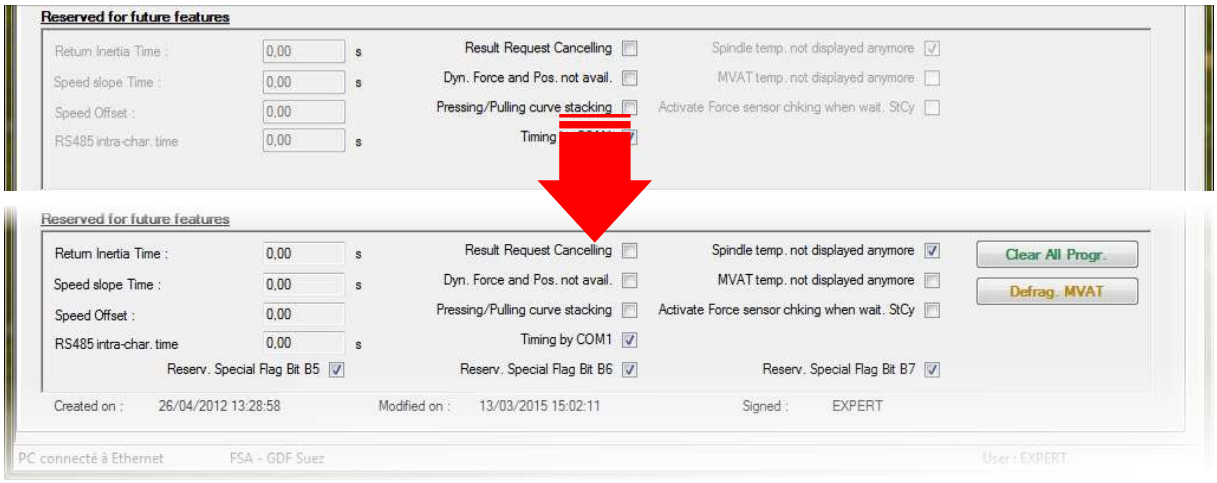
Each time you change a MVAT board, to avoid to upload old programs stored in the board, you have first to delete all the programs of the MVAT board.
To do that, first open the project with Rhapsodie, and go on "Maintenance sheet" of the "Specifications" page (you must log at the 3rd level minimum):



Then double-click on the text « Reserved for future features » (or « Reserve to ASS» depending of Rhapsodie version), and a new contextual menu « SAV Function » appears if you type a right-click on this text. (Warning, if the double-click has not be done, this menu still appears, but it is not enabled !) :



And if you click on this menu, 2 new buttons appear : (You can use these features only for MVAT V10 or more)



Clear All Progr. : Send a request of deleting all programs (specifications and calibration are not deleted)
Defrag. MVAT : Reserved to FSA after sales service, because Rhapsodie manage automatically the defragmentation of the memory of the MVAT board.

7 Replacing particular parts of Old Spindles

UG spindle range is not concerned by this section, as NO ELEMENT can be changed on these spindles by the customer.

In a general way, as spindle are composed of very accurate mechanical parts, it is strongly advised to replace completely the spindle, and to let FSA repair spindle with the good tooling. All spindles, new one or refitted one, are extensively tested on a test bench at FSA plant before to be delivering, following a procedure of 18 hours or 10000 cycles.

The customer who conducts himself with disassembly / reassembly, assumes all responsibility for repairs and replacements during replacement operations described in this manual. Once the repairs or replacements completed, the user must perform all operating controls and safety precautions.
Interventions on spindles that are not described in this manual may cause injury and / or property damage and therefore are not authorized by Fabricom which assumes no responsibility and will deny any claim or warranty.

Before replacing a component of the spindle, the spindle must be removed from its frame and carefully deposited on a solid work plan, if possible on a cradle for the guide and prevent rolling.

7.1 1.5 Tons Spindle : UE1500/B

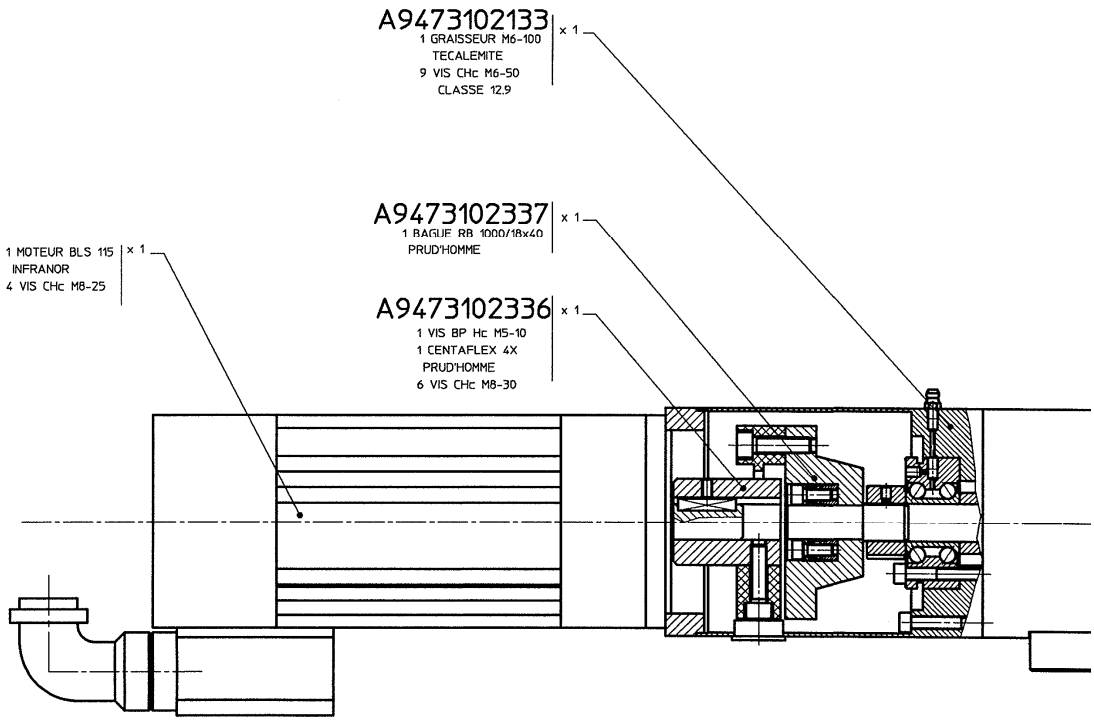
7.1.1 Replacing the spindle motor

After replacing the spindle motor, you have to follow the variable speed drive parameter setting procedure. (See "Setting the Variable Speed Drive Parameters" p40)

- - Lift up the plastic plug on the intermediary bearing rep. **A947 31 02 133**
- - Turn the chuck to let the screw of the coupling CENTRAFLEX CF4X PRUD'HOMME in front of the opening
- - Unscrew and remove the 3 screws CHc M8-30 of fixing of coupling on the semi coupling rep. **A947 31 02 336**
- - Unscrew and remove the 4 screws CHc M8-25 of fixing of the motor BLS 115 V 00 310E 00 INFRANOR
- - Remove the motor
- - Unscrew the screw Hc M5-10 which fixes the semi coupling rep. **A947 31 02 336** on the motor
- - Remove the semi coupling.

The reassembling will be accomplished reversing the order of the removing operations.

When assembling the motor, beware to align it to all the connections.
Before screwing the 3 screws **CHc M8-30** of fixing of the coupling **CENTRAFLEX CF 4X PRUD'HOMME stick** these to the brake thread 222 LOCTITE.



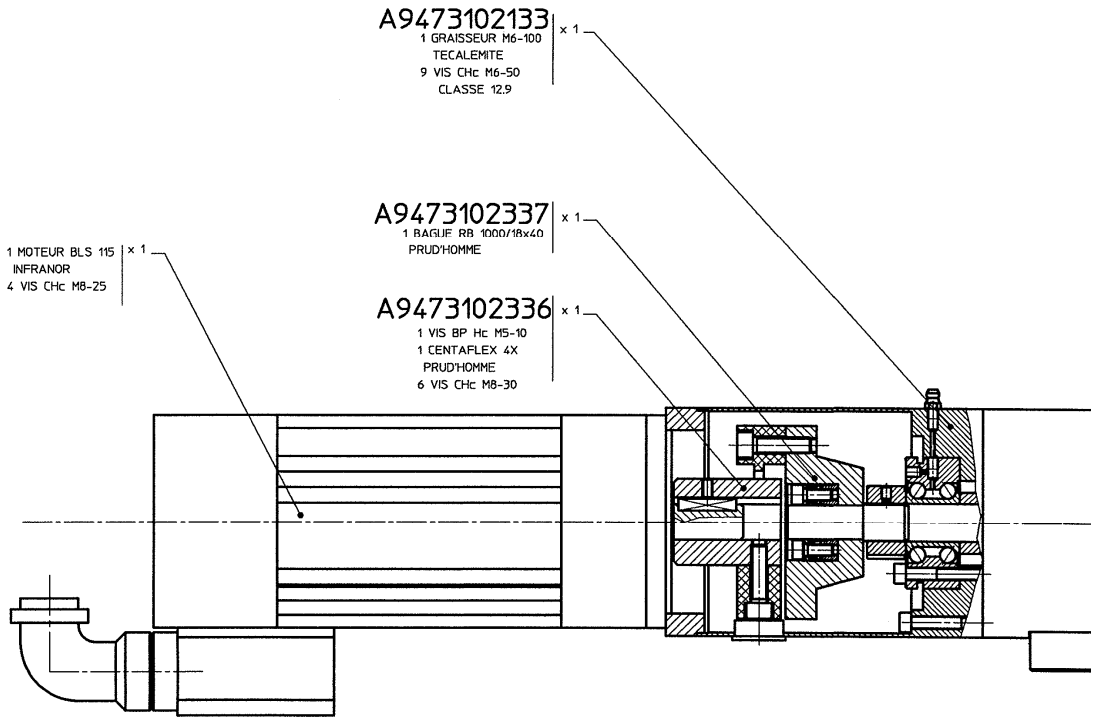
7.1.2 Replacing the Spindle Motor Coupling

After replacing the spindle motor coupling, you have to follow the variable speed drive parameter setting procedure. (See "Setting the Variable Speed Drive Parameters" p40)

- Lift up the plastic plug on the intermediary bearing rep. **A947 31 02 133**
- Turn the chuck to let the screw of the coupling CENTRAFLEX CF4X PRUD'HOMME in front of the opening
- Unscrew and remove the 3 screws CHc M8-30 of fixing of coupling on the semi coupling rep. **A947 31 02 336**
- Unscrew and remove the 4 screws CHc M8-25 of fixing of the motor BLS 115 V 00 310E 00 INFRANOR
- Remove the motor
- Unscrew and remove the 3 screws CHc M8-30 of fixing of the coupling on the lower semi coupling rep. **A947 31 02 337**
- Remove the coupling

The reassembling will be accomplished reversing the order of the removing operations.

When assembling the motor, beware to align it to all the connections.
Before screwing the 6 screws **CHc M8-30** of fixing of the coupling **CENTRAFLEX CF 4X PRUD'HOMME stick** these to the brake thread 222 LOCTITE.



7.2 3 Tons Spindle : UE3000/B

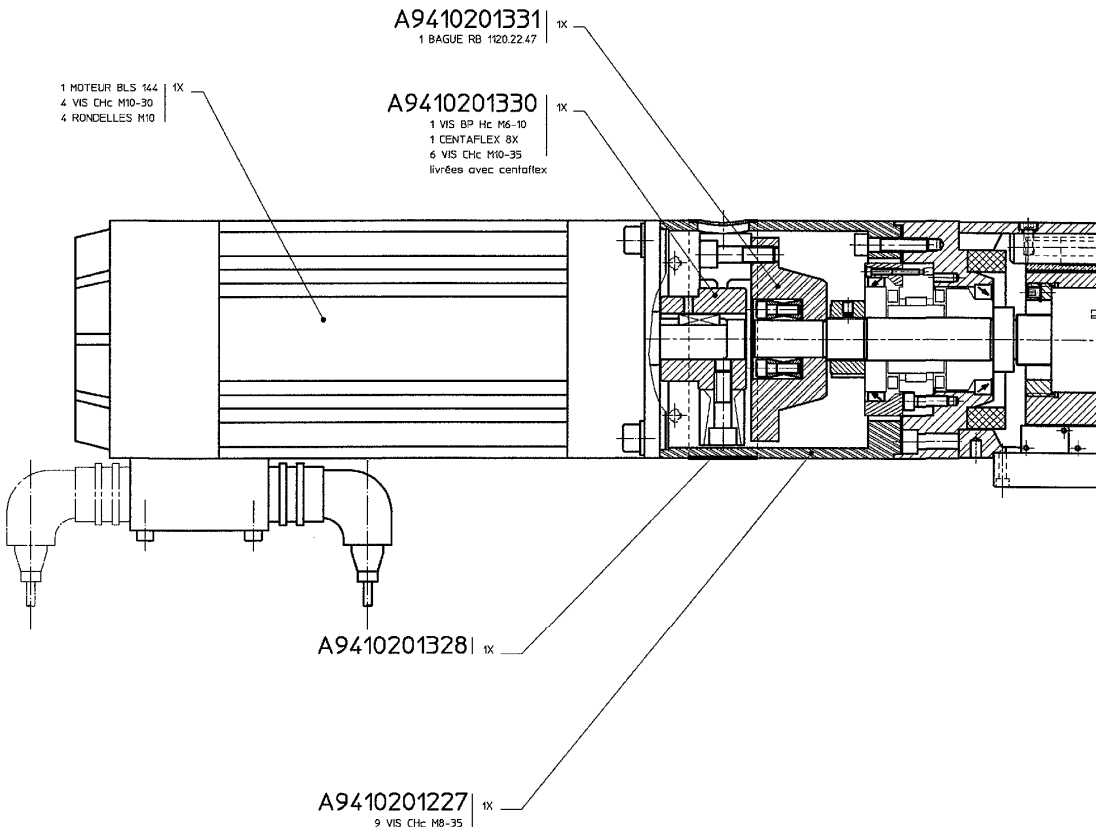
7.2.1 Replacing the Spindle motor

After replacing the spindle motor, you have to follow the variable speed drive parameter setting procedure. (See "Setting the Variable Speed Drive Parameters" p40)

- Rotate ring P/N **A941 02 01 328** to align the 3 Ø20 holes with the 3 Ø30 holes in motor mount P/N **A941 02 01 227.**
- Rotate the spindle to align the 3 screws of the **CENTRAFLEX CF.8X.0 PRUD'HOMME** coupling with the holes.
- Unscrew and remove the 3 **CHc M10-35** screws attaching the coupling to upper half-coupling **A941 02 01 330.**
- Unscrew and remove the 4 **CHc M10-30** screws attaching the motor **INFRANOR BLS 144 V 00 3 1 E.**
- Retain the **M10** washers.
- Remove motor.
- Remove the **Hc M6-10** screw attaching upper half-coupling P/N **A941 02 01 330** to the motor.
- Remove the upper half-coupling.

To reassemble, repeat the above dismantling operations in the reverse order.

When installing the motor, make sure it is correctly aligned with all the connections.
Before inserting the 3 **CHc M10-35** screws on the **CENTRAFLEX CF.8X.0 PRUD'HOMME** coupling, apply 222 LOCTITE weak hold.



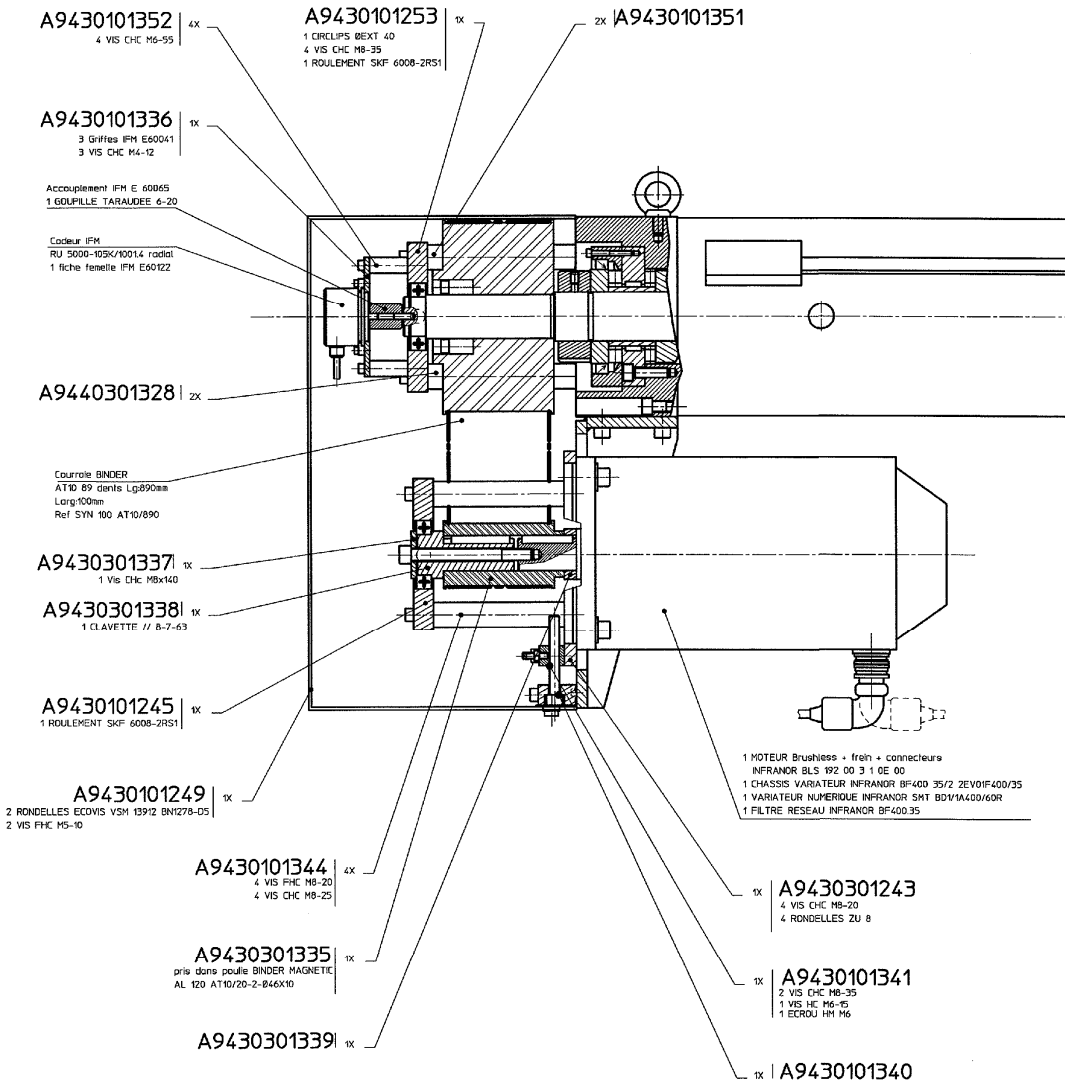
7.3 Spindles: 5 Tons - UE5000/B, 7,5 Tons - UE7500/B and 10 Tons - UE1000/B

7.3.1 Replacing the Spindle motor

After replacing the spindle motor, you have to follow the variable speed drive parameter setting procedure. (See "Setting the Variable Speed Drive Parameters" p40)

- Unscrew and remove the 2 screws FHc M5-10 of fixing of the case rep. **A943 01 01 249** (keep the 2 tub washers M5)
- Remove the case
- Unblock the 4 screws CHc M8-20 that strengthen the motor plate rep. **A943 03 01 243**
- Unblock then unscrew the screw Hc M6-15 on the piece rep. **A943 01 01 341**
- Unscrew the tension screw rep. A943 01 01 340 to release the cog belt SYN 100 AT 10/890 BINDER
- Unscrew and remove the screw CHc M8-140 that secures the maintaining of the motor coupling (keep the washer rep. **A943 03 01 337**)
- Unscrew and remove the 4 screws CHc M8-25 of fixing of the motor BLS 192 00 310E 00 INFRANOR
- Remove the motor
- Remove the spacer rep. **A943 03 01 339**.

The reassembling will be accomplished reversing the order of the removing operations.



When assembling the motor, beware to align it to all the connections.
Before screwing the screw **CHc M8-140** of fixing of the motor coupling **stick** it to the brake thread 222 LOCTITE.
While reassembling, screw the tension screw rep. **A943 01 01 340** with a torque indicator handle wrench with a couple of 1,6 Nm.

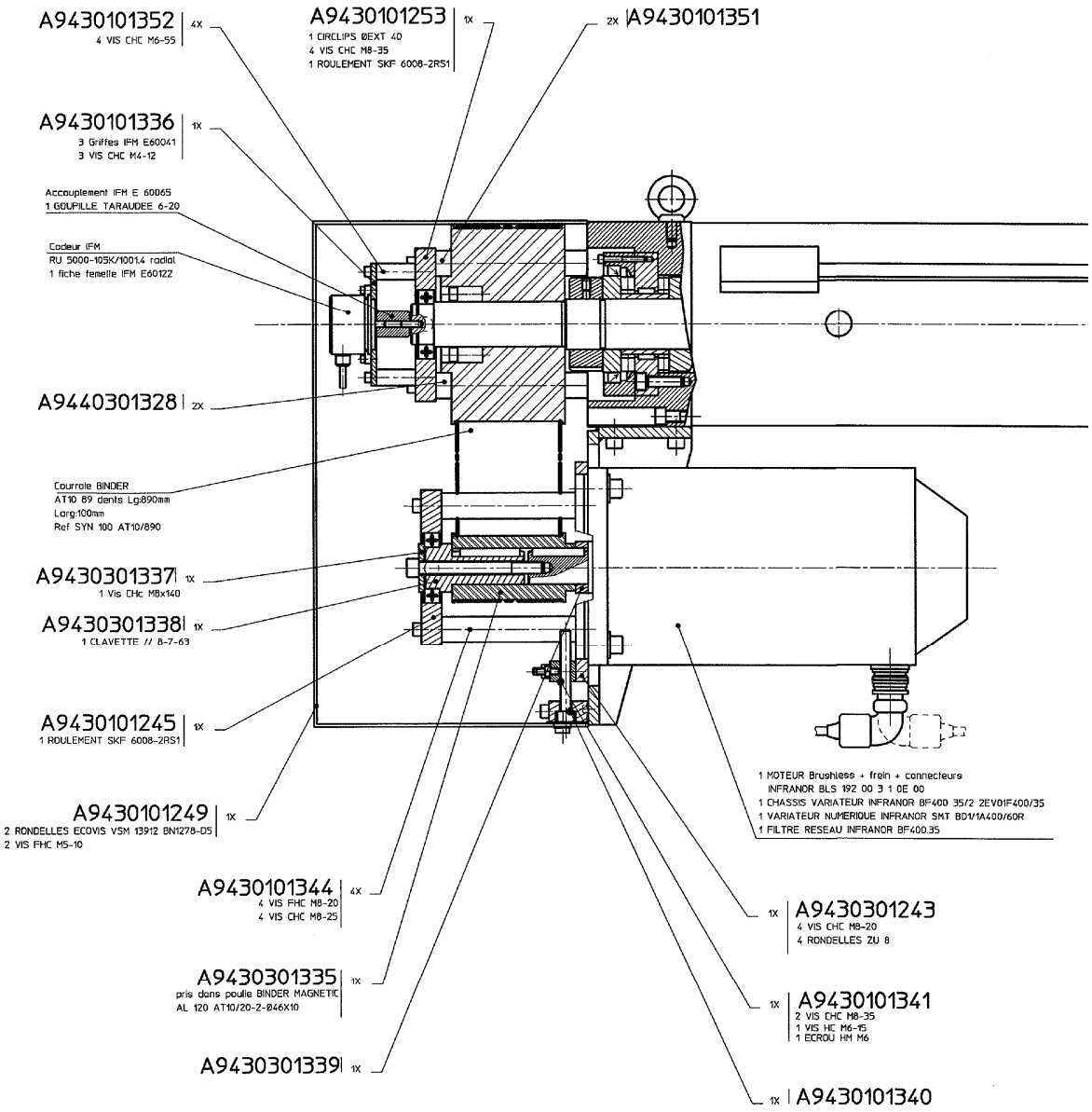
7.3.2 Replacing the belt

After replacing the belt, you have to follow the variable speed drive parameter setting procedure. (See "Setting the Variable Speed Drive Parameters" p40)

- Unscrew and remove the 2 screws FHc M5-10 of fixing of the case rep. **A943 01 01 249** (keep the 2 tub washers M5)
- Remove the case
- Unblock the 4 screws CHc M8-20 that strengthen the motor plate rep. **A943 03 01 243**
- Unblock then unscrew the screw Hc M6-15 on the piece rep. **A943 01 01 341**
- Unscrew the tension screw rep. **A943 01 01 340** to release the cog belt SYN 100 AT 10/890 BINDER
- Unscrew and remove the screw CHc M8-140 that secures the maintaining of the motor coupling (keep the washer rep. **A943 03 01 337**)
- Unscrew and remove the 4 screws CHc M8-25 that strengthen the bearing guide plate rep. **A943 01 01 245** (use an axle Ø5 to strengthen the lower masts rep. **A943 01 01 344** during unscrewing)
- Remove the bearing guide plate rep. **A943 01 01 245**
- Remove the motor wheel rep. **A943 03 01 335** and the axle rep. **A943 03 01 338**
- Unscrew the screw CHc M4 of the coupling E60065 IFM that secures qui assure the support of the threaded cotter pin GT 6-20
- Unscrew and remove the 4 screws CHc M6-55 that strengthen the encoder support rep. A943 01 01 336 (keep the 4 encoder support axles rep. **A943 01 01 352**)
- Remove the encoder support rep. **A943 01 01 336**
- Unscrew and remove the 4 screws CHc M8-35 that strengthen the bearing guide plate rep. A943 01 01 253 (use a 19 flat wrench to strengthen the axles rep. **A943 01 01 351** and rep. A944 03 01 328 during the unscrewing)
- Remove the bearing guide plate rep. **A943 01 01 253**
- Change the belt

The reassembling will be accomplished reversing the order of the removing operations.

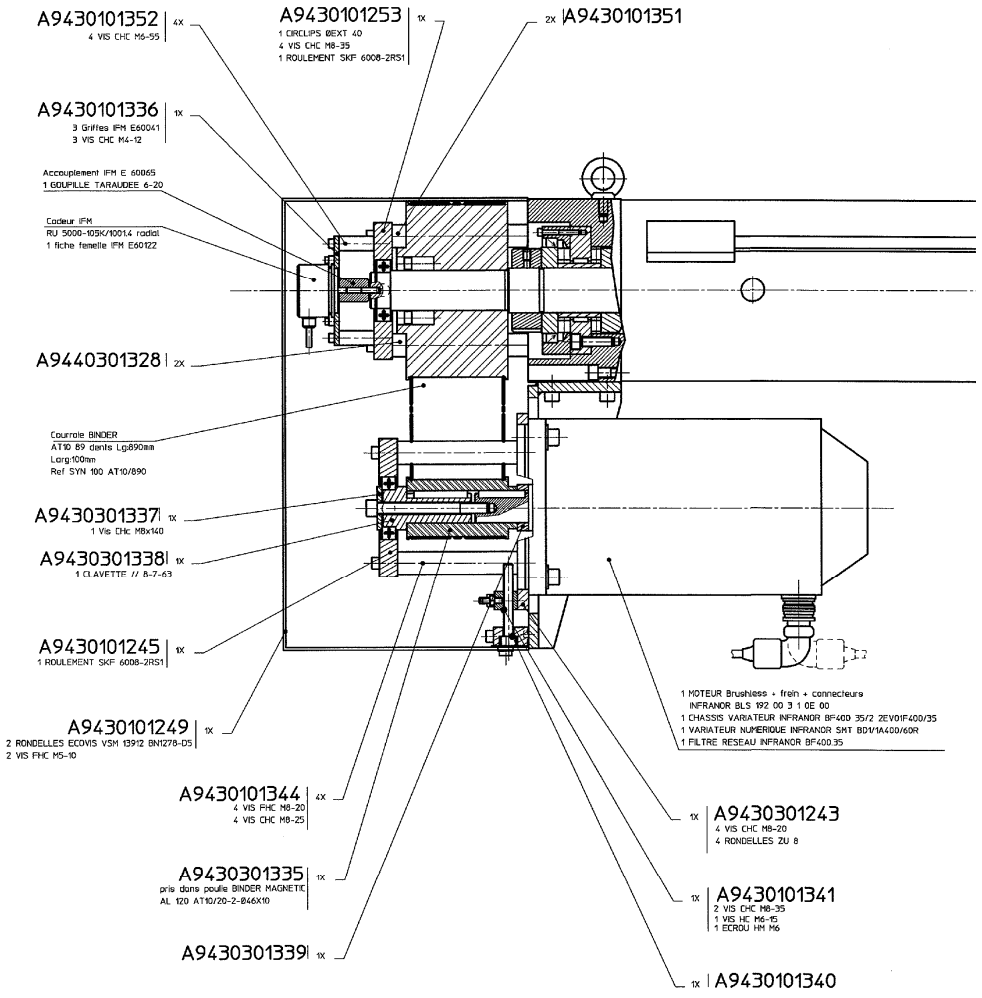
Before screwing the screw **CHc M8-140** of fixing the motor coupling **stick** it to the brake thread 222 LOCTITE.
While reassembling, screw the tension screw rep. **A943 01 01 340** with a torque indicator handle wrench with a couple of 1.6 Nm.
After this operation, the encoder must be reset.


A9430101352 4X
4 VIS CHC M6-55
A9430101253 1X
1 CIRCLIPS ØEXT 40
4 VIS CHC M8-35
1 ROULEMENT SKF 6008-2RS1
2X A9430101351
A9430101336 1X
3 Griffes IFM E60041
3 VIS CHC M4-12
Accouplement IFM E 60065
1 GOUPILLE TARAUDEE 6-20
Codeur IFM
RU 5000-105K/1001.4 radial
1 fiche femelle IFM E60122
A9440301328 2X
Courroie BINDER
AT10 89 dents Lg:890mm
Larg:100mm
Ref SYN 100 AT10/890
A9430301337 1X
1 Vis CHc M8x140
A9430301338 1X
1 CLAVETTE // 8-7-63
A9430101245 1X
1 ROULEMENT SKF 6008-2RS1
A9430101249 1X
2 RONDELLES ECOVIS VSM 13912 BN1278-D5
2 VIS FHC M5-10
1 MOTEUR Brushless + frein + connecteurs
INFRANOR BLS 192 00 3 1 0E 00
1 CHASSIS VARIATEUR INFRANOR BF400 35/2 2EV01F400/35
1 VARIATEUR NUMERIQUE INFRANOR SMT BD1/1A400/60R
1 FILTRE RESEAU INFRANOR BF400.35
A9430101344 4X
4 VIS FHC M8-20
4 VIS CHC M8-25
1X A9430301243
4 VIS CHC M8-20
4 RONDELLES ZU 8
A9430301335 1X
pris dans poulie BINDER MAGNETIC
AL 120 AT10/20-2-Ø46X10
1X A9430101341
2 VIS CHC M8-35
1 VIS HC M6-15
1 ECROU HM M6
A9430301339 1X
1X A9430101340

7.3.3 Tension of the belt

- Unscrew and remove the 2 screws FHc M5-10 of fixing of the case rep. **A943 01 01 249** (keep the 2 tub washers M5)
- Remove the case
- Unblock the 4 screws CHc M8-20 that strengthen the motor plate rep. **A943 03 01 243**
- Unblock the screw nut Hm M6 that blocks the screw Hc M6-15 on the piece rep. **A943 01 01 341**
- Unscrew the screw Hc M6-15
- Unscrew the tension screw rep. **A943 01 01 340** to release the cog belt SYN 100 AT 10/890 BINDER
- Screw in the tension screw rep. **A943 01 01 340** with a torque indicator handle wrench with a couple of 1,6 Nm

The reassembling will be accomplished reversing the order of the removing operations.



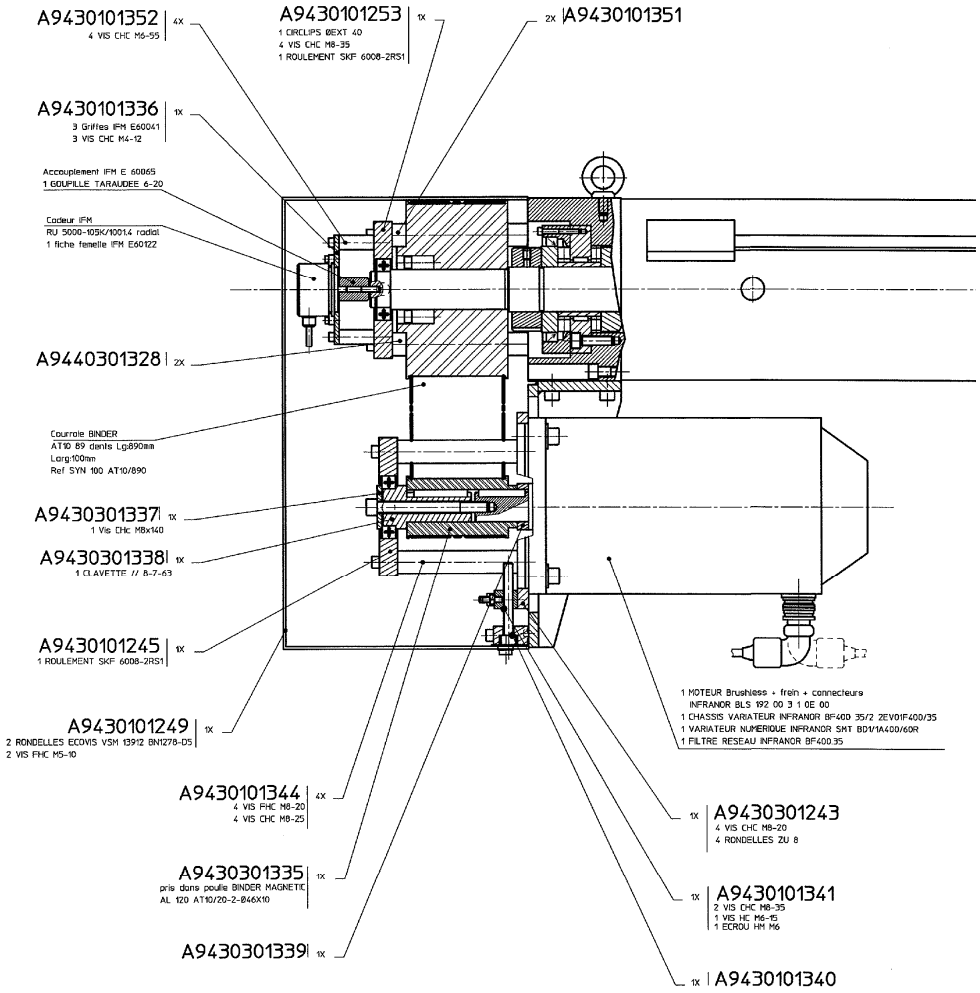
7.3.4 Replacing the encoder

After replacing the encoder, you have to follow the variable speed drive parameter setting procedure. (See "Setting the Variable Speed Drive Parameters" p40)

- Unscrew and remove the 2 screws FHc M5-10 of fixing of the case rep. **A943 01 01 249** (keep the 2 tub washers M5)
- Remove the case
- Unscrew the screw CHc M4 of the coupling E60065 IFM that secures the support of the encoder axle RU5000 105 K/1001.4 RADIAL IFM
- Unscrew and remove the 3 screws CHc M4-12 of fixing of the 3 clamps E60041 IFM (keep the 3 clamps)
- Remove the encoder

The reassembling will be accomplished reversing the order of the removing operations.

After this operation, the encoder must be reset.



7.4 Spindles NG15kN to NG200kN

NG Spindles are not dismountable and rebuildable without the proper tools.
A return to FSA plant is required to any intervention.

Attention FABRICOM recalls that:
Disassembly / reassembly risky and potentially makes the spindle mechanically dangerous for the user. The torque of the spindle can reach 320Nm with 35 kilowatts of power.

Interventions on spindles that are not described in this manual may cause injury and / or property damage and therefore are not authorized by Fabricom which assumes no responsibility and will deny any claim or warranty.

7.5 Spindles UG (5kN to 100kN)

UG Spindles are not dismountable and rebuildable without the proper tools.
A return to FSA plant is required to any intervention.

Attention FABRICOM recalls that:
Disassembly / reassembly risky and potentially makes the spindle mechanically dangerous for the user. The torque of the spindle can reach 320Nm with 35 kilowatts of power.

Interventions on spindles that are not described in this manual may cause injury and / or property damage and therefore are not authorized by Fabricom which assumes no responsibility and will deny any claim or warranty.

7.6 Replacing other components

Any work on the ball screw, the bearing or the instrumented shaft must be carried out by FSA ONLY.

8 Recommendations

8.1 Electrical equipment

A regulated power supply 24V, which has to be galvanically isolated from the main power supply is recommended for MVAT I/O. The maximum current to supply is 1A. However, a fuse of 100 mA is recommended.

For old installation, with wired I/O, you must use the following relay for the 5 MVAT outputs :

Brand : **PHOENIX CONTACT**
Reference : **EMG 22 - REL/KSR - G24/TRN35**

These relay are not provided by FABRICOM Systèmes d'assemblage S.A..
The Life Time given by the constructor is more than 5.10^7 cycles.

8.2 Electrical Wiring

It is strongly recommended to respect the wiring recommendations given by INFRANOR ("XtrapulsCD1-a", rev. 8.16_1 of april 2016, chapter 4.2 p29, and chapter 4.3 p33)

The INFRANOR documentations are provided on the installation CD-ROM of Rhapsodie, and also available after Rhapsodie.Net installation on the following directory:

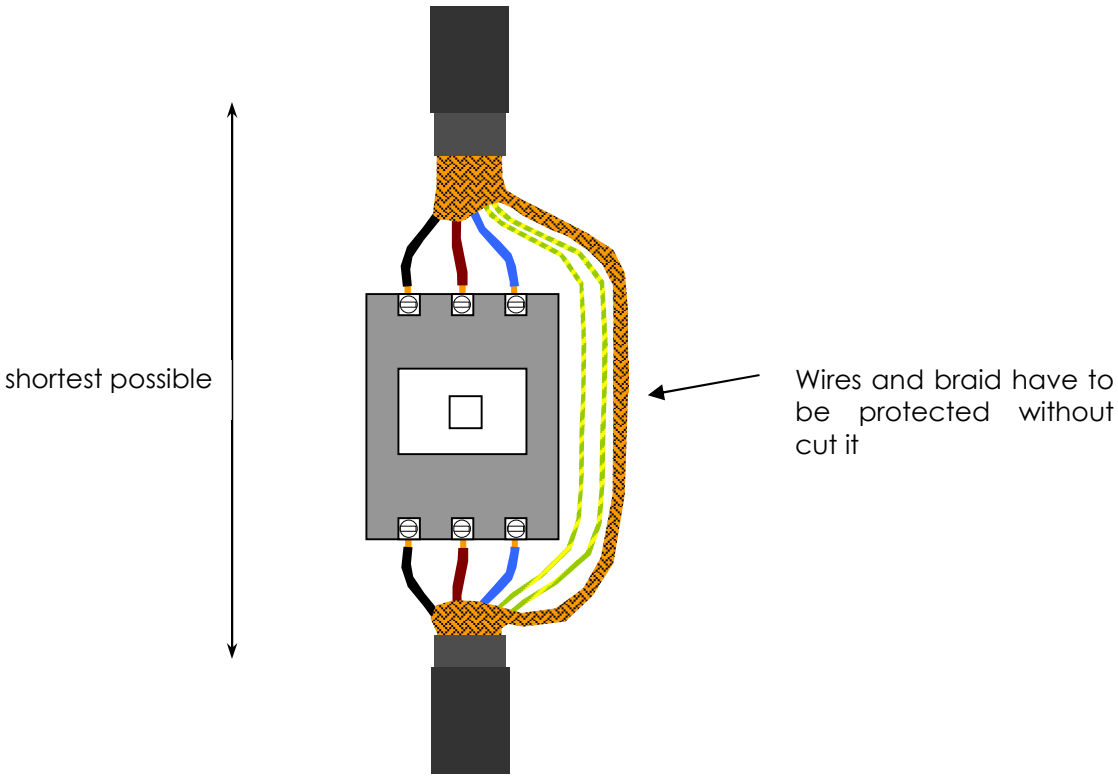
C:\Rhapsodie.Net\Documentation\INFRANOR

The following recommendations have to be strongly respected to avoid fault occurrence:

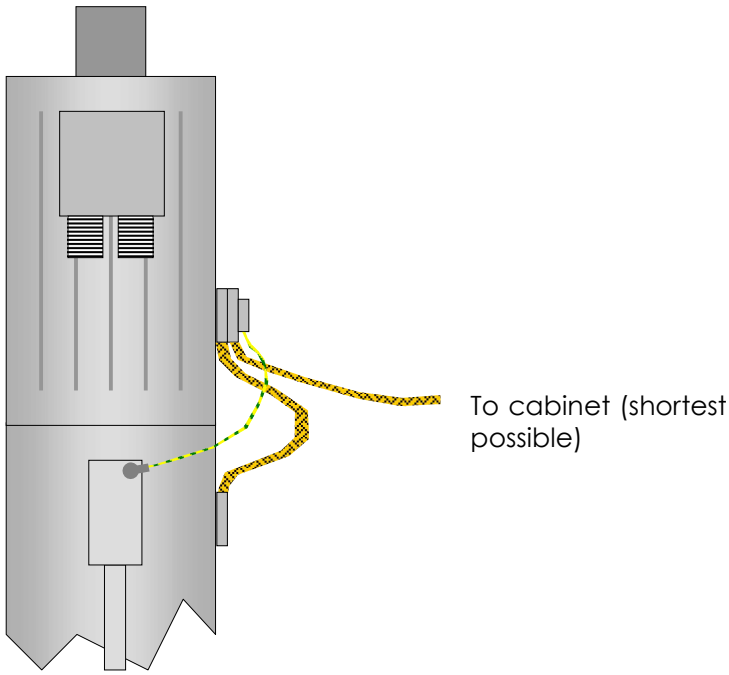
1. Good quality of the plant ground,
2. Check the good electrical continuity of the ground between the cabinet and the frame,
3. Check the ground wire of the MVAT power cable is well connected to the ground,
4. Wire between the motor and the ground of the cabinet a ground braid (minimum 1cm width)
5. Do the same between the motor and the sleeve of the spindle,
6. Do the same with a simple ground wire between the motor and the connection box of the spindle,
7. PLEASE DO NOT WIRE SIDE TO SIDE power cable and control cables (resolver cable, measurement cable, encoder cable). A minimum distance of 50 cm is necessary,
8. The length of cables mustn't exceed 15 m,
9. The measurement cable must ABSOLUTELY NOT turn around or near the motor,
10. The power cable of the motor has to be skinned on the shortest length possible (see INFRANOR documentation "XtrapulsCD1-a", rev. 8.13 of feb2012, chapter 4.2 p30, and chapter 4.3 p34),
11. If a contactor is inserted between the drive and the motor, the wiring has to conform to the drawing next page firstly, and the opening of this contactor can NEVER occur during the spindle shaft moves, or during spindle is applying force, under penalty of destruction of this one.
12. NO cut off other cable between the spindle and the drive or MVAT is accepted (NO bulkhead pass through).

The power cable can be cut only for station where operator has to work under the press at each cycle. In this case, a safety contactor will be inserted on this cable to avoid unexpected restart. But in this case, the shield braid and the ground wires of this cable MUST IN NO CASE be cut (see drawing above)

WIRING OF THE "ANTI-RESTART CONTACTOR"



WIRING THE GROUND BRAID AND WIRES ON THE SPINDLE



8.3 Mechanical frame and compliance

If the frame of the machine is a C-frame, the mechanical rigidity of the frame has to be sufficient in order to avoid being out of parallelism.
The shaft with the tooling mounted has to be able to:

- Travel out of a distance more than twice the screw pitch,
- Accept during calibration cycle a lower gage and upper gage, that height difference has to be at a minimum of 60 mm.

During calibration cycle, only elasticity of the frame and of the press can be learned. No compliance in the tooling is accepted because of the non-repeatability of this kind of mechanics.

To prevent injuries, the maintenance documentation provided to the final customer has to specify the use of a platform to access lubricators when those one which are over 2m height. This documentation has also to explain how to extract the spindle in case of replacement.

8.4 Serviceability limit

Shock working is not allowed to warranty the life time of the screw.

If the axis of the shaft is not the same than the axis of the insertion, the measurement of the real force applied is wrong and the life time of the shaft guiding is reduced.
MVAT electronics works only with 1 calibration. Then if the unit is working with different tooling depending on the part type to assembly, it is recommended to make the calibration with the tooling where the highest accuracy is needed for assembly.

It is not allowed to travel the shaft completely out without mechanics to resist. The manual speed has to be low (5%), and the manual intensity also (5%) to avoid degradations.

8.5 Automatism

The PLC program has to include the following features:

- To able to launch a simple sequence which only aim is to let the shaft come back in home position after a manual return,
- Count (for station where operator has to cut off the light curtain at each cycle) the number of emergency stop (not allowed light curtain cutting) when the shaft of the press was moving. This counter has to be displayed for the maintenance team who has to check the wear of the brake when 15000 times is reached.

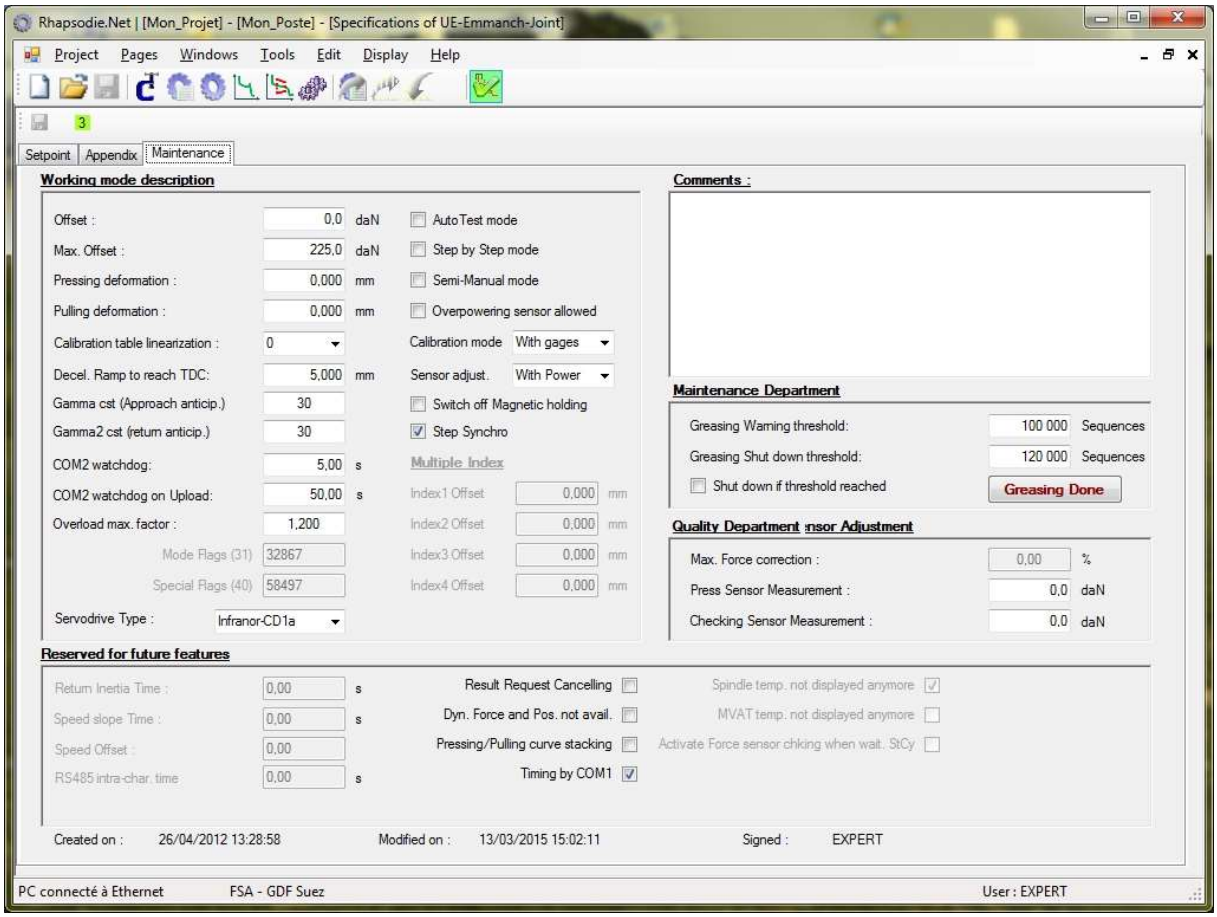
8.6 Safety

The safety force checked during the approach phase of a cycle, or during jog mode in compression is the "Pressing Safety Force" that you can parameter in Rhapsodie.Net in the "Set point" sheet of the "Specifications" page.
The safety force checked during jog mode in traction is the "Pulling Safety Force" that you can parameter in Rhapsodie.Net in the "Annexe" sheet of the "Specifications" page.

It is strongly advised to NOT USE an electrical press on a station with light curtain, as these one doesn't prevent the risk of bursting and projection.

9 "Maintenance" sheet in "Specifications" page of Rhapsodie.Net

A lot of parameters of this sheet are reserved to FSA technician, or Maintenance department for the greasing, or Quality department for the force adjustment.



Working Mode area: see Rhapsodie.Net user Guide

Quality Department area:

In this area, you can make a linear adjustment of the force sensor to match the force given by the MVAT (press) and the force given by an external checking sensor.

You can use it when a bad application of the force generates a linear and repetitive error. In no case, you can correct an offset between the 2 values. If you observe a constant offset between the 2 values, check that as soon as the tool touch the frame, the checking sensor start to see a force signal.

Max. Force correction: This is the maximum correction in % that you can apply. This will is automatically set to 10%, as soon as you enter the 2 other values.

Press sensor Measurement: This is the value for force displayed by the MVAT during the checking cycle. Please prefer the residual value after a holding time, to the peak value.

Checking sensor Measurement: This is the value for force displayed by the external checking sensor during the checking cycle.

Remarks:

- You have to enter both previous values, 0 value for both.
- Please parameter a holding time for the checking cycle, to let you see the value of the checking sensor. Do NOT put your checking sensor display in "MAX" mode.

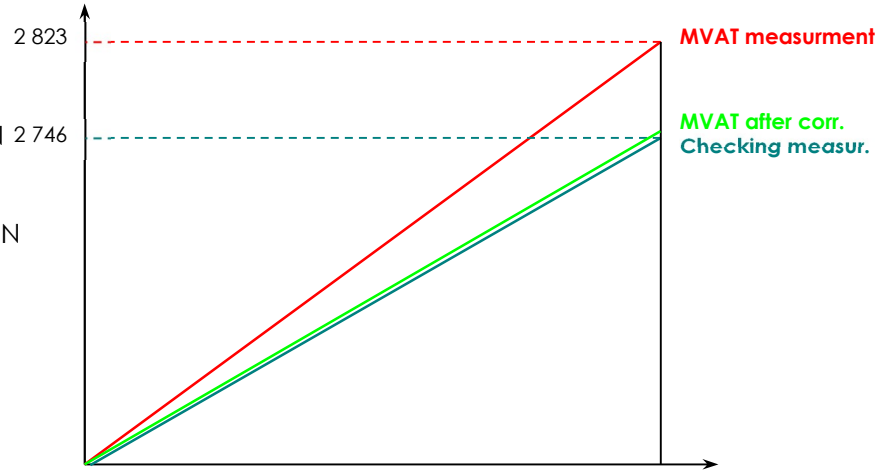
Example:

Spindle: UG30kN

Reference value MVAT: 2 800 daN

MVAT Measurement: 2 823 daN

Checking Measurement: 2 746 daN



Maintenance department area:

Greasing Warning threshold: When the press has run this number of sequences, a message "Alerte Graissage" appears in the terminal at the beginning of the sequence block:

```
****************************************
Poste/Voie/Adr.     : 000.000.001.237.160.136.001
J/M/A , H/M/S       : 29/03/2013 20/01/49,79
Alerte Graissage
Temps total séq.    :       7,26 s
Temper. Broche      :        23,03   Deg.
Temper. Bâti        :        22,99   Deg.
Temper. Module      :        37,05   Deg.
Numéro séquence     :            1
Séquence  BONNE
Résultat Numéro     :          318
Nb seq av Graiss    :         2000
Numero de courbe    :           17
Nombre de cycle     :            1
----------------------------------------
Numéro de cycle     :            1
...
...
```

The number of sequences left before reaching the "Greasing Shut down threshold" is displayed: "Nb seq av Graiss".

Greasing shut down threshold: When the press has run this number of sequences, a message "Arrêt Graissage" appears in the terminal at the beginning of the sequence block:

```
****************************************
Poste/Voie/Adr.     : 000.000.001.237.160.136.001
J/M/A , H/M/S       : 29/03/2013 20/01/49,79
Arrêt Graissage
Temps total séq.    :        7,26 s
Temper. Broche      :         23,03   Deg.
Temper. Bâti        :         22,99   Deg.
Temper. Module      :         37,05   Deg.
Numéro séquence     :             1
Séquence  BONNE
Résultat Numéro     :           318
Nb Seq av Graiss    :             0
Numero de courbe    :            17
Nombre de cycle     :             1
...
```

The number of sequences left before reaching the "Greasing Shut down threshold" is now equal to 0.

Shut down if threshold reached: If this checkbox is checked, the press will stop as soon as it has run this number of sequence. To start again, you need to proceed to the greasing, and to click on the 

button.

If you use a UExp-MVAT panel, you can also directly validate the greasing to start again.

10 Execution journal

See the Rhapsodie.Net documentation.

11 Keyboard Commands (Reserved for the use of FABRICOM Customer Support)

All these commands are executed on the terminal.

WARNING: ***certain of these commands (in red) must be used with caution, in particular commands, which induce movement of the spindle axis and could cause injuries and/or equipment damages.***
The user has to be quite capable of judging an checking there's no remanent risk, otherwise he has to refrain from using this commands.
He's assuming alone the responsibility of their use.

11.1 "Esc +..." Commands

To use these commands, it is necessary to first press "Esc".
Press "Esc" again to exit "Keyboard Commands" mode.

Key	Function	Comments and conditions of use
c	Carries out the following tests: - Tests the load sensor power supply up to the spindle connectors - Tests the current set point transmitted to the variable speed drive up to the MVAT connector - Tests the speed set point transmitted to the variable speed drive up to the MVAT connector - Checks that the load sensor is balanced - Checks that the offset is lower than the threshold indicated in the specifications.	To be carried out after loading the specifications into the RHAPSODIE application. See details after These tests are also run each time a cycle is started
d	Displays the fault in course	
i	Displays the inputs status	
j	Displays the date and the temperature	See details after
k	Runs the MVAT calculation	Cycle number 1 and curve number 1 have to be defined
m	Activates manual mode "–" to retract the axis "+" to extend the axis "R" to retract the axis slowly "D" to extend the axis slowly "M" activates the "Enable" input of drive "↵" or "space" or "A" to stop the axis "S" Enable/Disable CV0 command	"Start cycle button enable" must be set to "NO" Pressing this key repeatedly accelerates the speed Allows Auto-tuning without the use of a blanking plug
n	Runs the check calculation on the curve	It's possible to change the check type in Rhapsodie, send the change to the MVAT board and execute this command to know the new result of the checking.

o	Displays the offset value	Displays the offset value on the HyperTerminal LED 4 is on when no force is applied LED 3 goes on if the axis is pressed LED 5 goes on if the axis is drawn
q	Check the MVAT outputs	The MVAT outputs go on turn by turn. If at the first switching on off the MVAT, the "light caterpillar" speed is too high, it's useful to execute the "Esc k" command
r	Displays a sequence or calibration results	See the display description after
u	Send the curve buffer to the PC	
v	Displays the force value and the displacement in following mode	See details after
w	Displays the Sensor rated value and the sensibility	See details after
x	Check the RS485 communication	Displays "TEST 485" on the RS232 HyperTerminal

♦ Description of the results displayed after using the command "**Esc c**":

```
Contrôle OK
Sortie mode
```

Or if a fault appears :

```
Contrôle NOK ALIM (or OFF or DESI or INT or VIT or NOMI)
Sortie mode
```

Description of the fault messages :

ALIM : Sensor powering fault (cable, spindle box, board, rack)
OFF : Offset fault (cable, spindle box, board, rack, mechanics)
DESI : Unbalanced sensor (calibration missing, cable, spindle box, board, rack)
INT : current fault (board)
VIT : speed fault (board)
NOMI : Sensor rated value fault (programs)

♦ Description of the results displayed after using the command "**Esc i**":

```
PRESENCE INDEX OUI     (axis at least retracted on the fallback position)
ENTREE E0 OUI          (VSD ready)
ENTREE E1 NON          (Start cycle)
ENTREE E2 NON
ENTREE E3 NON
ENTREE E4 NON
ENTREE E5 NON
ENTREE E6 NON
ENTREE E7 NON
```

- Description of the results displayed after using the command "**Esc j**":

```
18/10/2000 15/04/42,55
24,83 deg.   (board temperature)
40,42 deg.   (internal spindle temperature. Warning: if 327,55 displayed, the t° circuit is not active)
21,25 deg.   (frame temperature if connected)
```

- Description of the results displayed after using the command "**Esc o**":

```
Test offset :
      5,6 daN
```

- Description des résultats affichés après "**Esc w**" :

```
030,000      (nominal Broche lu dans le circuit d'identification)
1,00000      (sensibilité Broche lue dans le circuit d'identification)
3000,0       (nominal théorique)
1,000        (classe saisie dans Rhapsodie)
1,000        (sensibilité calculée)
3000,0       (nominal utile calculé = nominal théorique x classe)
1,400        (coefficient de charge limite saisi dans Rhapsodie)
4200,0       (charge limite calculée = nominal théorique x coeff. charge limite)
```

- Description des résultats affichés après "**Esc v**" :

En mode standard :

```
DEPLACEMENT  0,000 mm   TOUR   000   FORCE  - 0,5 daN   FORCE AUX  - 2,9 daN
```

En mode semi-manuel :

```
DEPLACEMENT  0,000 mm   FORCE  - 0,5 daN
```

- Description of the results displayed after using the command "**Esc r**":

After a press-fitting cycle:

1	**371,409**	**371,416**	**2084,1**	**2021,3**	**0,007**	**4,012**	**B/M**	**1**
Selection	Previous distance (mm)	Distance reached (mm)	Peak force (daN)	Residual force (daN)	Distance difference (mm)	Index centering (mm)	Cycle quality (B : good; M : bad)	Cycle No.
1874,1	**48,2**	**7,455**	**-8,121**	( )	( )	( )	**2805,6**	**5,17**
Force at distance from end (daN)	Return force (daN)	Idle position (mm)	Lambda coefficient	For adjustment	For adjustment	For adjustment	Calibration force (daN)	Offset (daN)
000000	**ARDEP**	**FFEEE7**	**6,462**	**7853**	**2106,2**			
Displacement	Stop type	Displacement set point	For adjustment	For adjustment	Auxiliary force value (daN)			

After a calibration cycle:

1	**512,17**	**455,622**	**2084,1**	**2021,3**	**0,007**	**4,012**	**B/M**	**1**
Selection	Resolution (pulses/mm)	Top Dead Center (mm)	Peak force (daN)	Residual force (daN	Distance difference (mm)	Index centering (mm)	Cycle quality	Cycle No.
1874,1	**48,2**	**7,455**	**2063**	( )	( )	( )	**2805,4**	**5,17**
Force at distance from end (daN)	Return force(daN)	Idle position (mm)	Sigma coefficient	For adjustment	For adjustment	For adjustment	Calibration force (daN)	Offset (daN)

11.2 Direct Commands

For these keyboard commands, it is not necessary to first press "Esc".

E	Displays the last 5 lines of the calibration results block (see p70)	Only the first 3 lines are significant (Resolution, TDC and Index centering)
R	Displays the results block of the last sequence run	
F	Displays all the force values used in the curve check	The display will vary according to the type of check selected

Command **E**:

```
-----------------------------------------
Resolution dépl.  :     512,050   I/mm
Point Mort Haut   :     275,033   mm
Centrage Index    :       5,267   mm
Offset Initial    :        0,00   %
Offset Final      :        0,00   %
*****************************************
```

Command **R**:

The results blocks displayed are the same as those displayed during the cycle.

Command **F**: these windows results blocks are also displayed after each sequence after the result s block, if the field "Sending Windows results" of the "Appendix" sheet of the "Specification" page is set to "YES".

Example 1: "ALL" type check in 2-points mode (4 windows defined)

```
*********************************************************
Contrôle Courbe Compression Mode Tous
---------------------------------------------------------
F 1;    Fmax :      8,1   daN ; TP ; Fmin1 :     0,0 daN ; TP
F 2;    Fmax :      7,5   daN ; TP ; Fmin1 :     0,0 daN ; TP
F 3;    Fmax :      5,7   daN ; TP ; Fmin1 :     0,0 daN ; TP
F 4;    Fmax :     18,4   daN ; OK ; Fmin1 :     3,1 daN ; TP
*********************************************************
```

Example 2: "RELATIVE" type check in 2-points or 3-points mode according to the window (8 windows defined)

```
*************************************************************************************
Contrôle Courbe Compression Mode Relatif
-------------------------------------------------------------------------------------
F 1;    Fmax :      8,1   daN ; TP ; Fmin1 :     0,0 daN ; TP; Fmin2 :    0,0 daN ; TP
F 2;    Fmax :      7,5   daN ; TP ; Fmin1 :     0,0 daN ; TP; Fmin2 :    0,0 daN ; TP
F 3;    Fmax :      5,7   daN ; TP ; Fmin1 :     0,0 daN ; TP; Fmin2 :    0,0 daN ; TP
F 4;    Fmax :     18,4   daN ; OK ; Fmin1 :     3,1 daN ; TP; Fmin2 :    3,1 daN ; TP
F 5;    Fmax :      8,3   daN ; TP ; Fmin1 :     0,0 daN ; TP; Fmin2 :    0,0 daN ; TP
F 6;    Fmax :    288,1   daN ; OK ; Fmin1 :   123,3 daN ; OK; Fmin2 :  111,3 daN ; OK
F 7;    Fmax :     32,9   daN ; TP ; Fmin1 :     0,0 daN ; TP; Fmin2 :    0,0 daN ; TP
F 8;    Fmax :      8,6   daN ; TP ; Fmin1 :     0,0 daN ; TP; Fmin2 :    0,0 daN ; TP
*************************************************************************************
```

Example 3: "PEAK" type check (4 windows defined)

```
************************************
Contrôle Courbe Compression Mode Tous
```

```
-------------------------------------
F 1;    Fmax :      8,1   daN ; TP
F 2;    Fmax :      7,5   daN ; TP
F 3;    Fmax :      5,7   daN ; TP
F 4;    Fmax :     18,4   daN ; OK
*************************************
```

Example 4: "MEAN" type check (3 windows defined)

```
*************************************
Contrôle Courbe Compression Mode Tous
-------------------------------------
F 1;    Fmoyenne   :      8,1 daN ; TP
F 2;    Fmoyenne   :      7,5 daN ; TP
F 3;    Fmoyenne   :      5,7 daN ; TP
*************************************
```

Example 5: "POINT" type check (5 windows defined)

```
*************************************
Contrôle Courbe Compression Mode Tous
-------------------------------------
F 1;    Fpoint     :      8,1 daN ; TP
F 2;    Fpoint     :      7,5 daN ; TP
F 3;    Fpoint     :      5,7 daN ; TP
F 4;    Fpoint     :     18,4 daN ; OK
F 5;    Fpoint     :      8,3 daN ; TP
*************************************
```

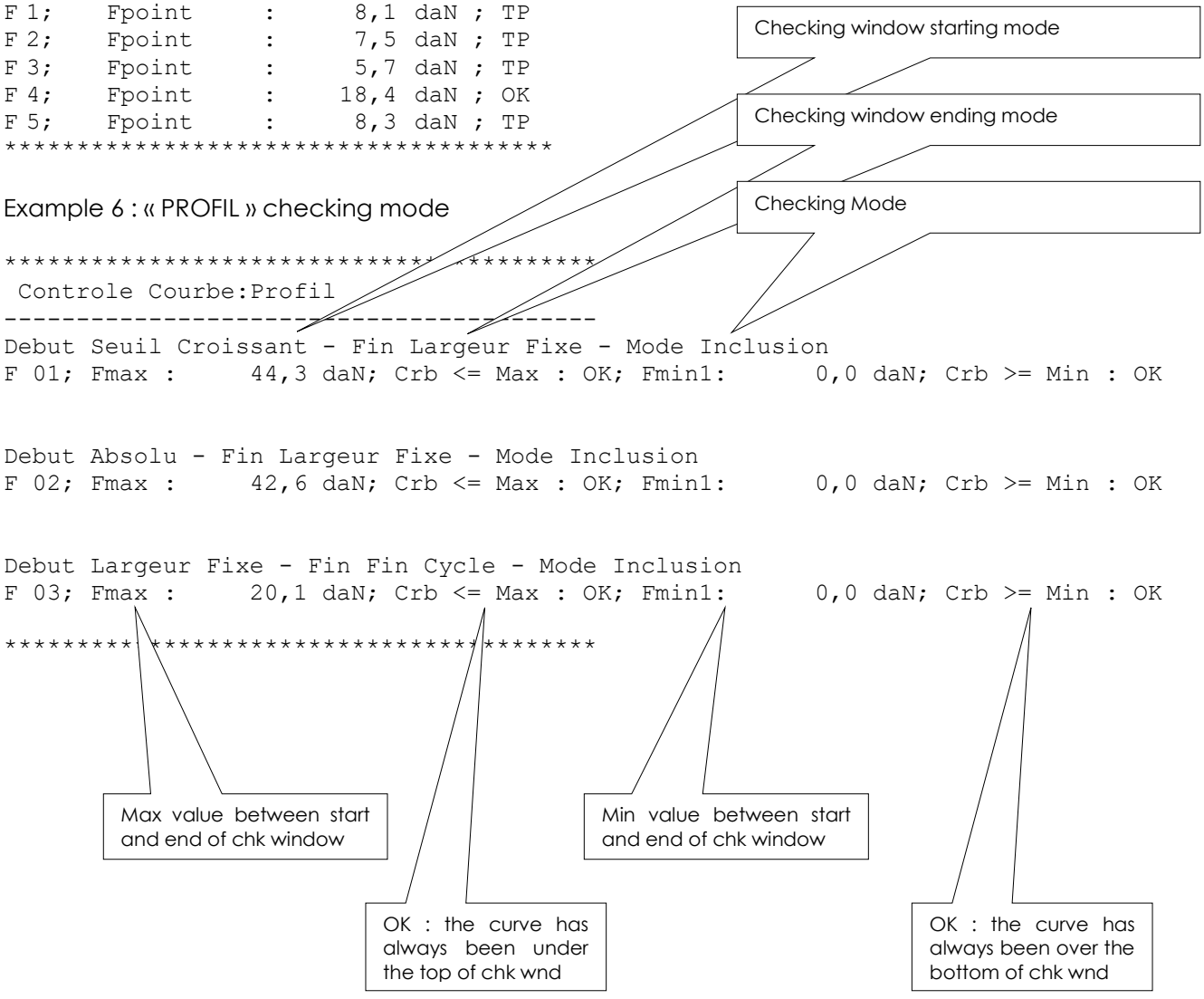
Example 6 : « PROFIL » checking mode

```
*************************************
 Controle Courbe:Profil
-------------------------------------
Debut Seuil Croissant - Fin Largeur Fixe - Mode Inclusion
F 01; Fmax :     44,3 daN; Crb <= Max : OK; Fmin1:      0,0 daN; Crb >= Min : OK

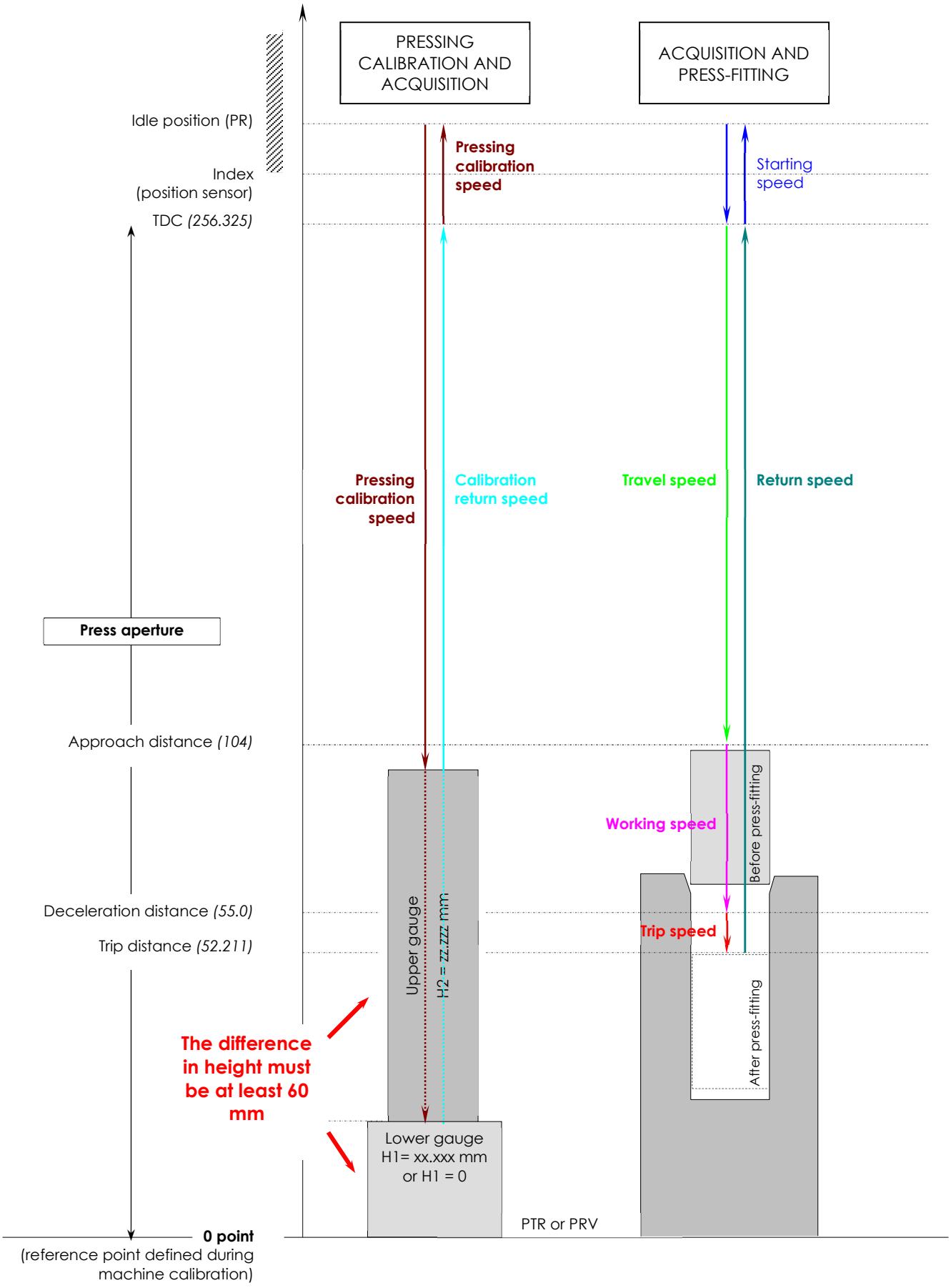

Debut Absolu - Fin Largeur Fixe - Mode Inclusion
F 02; Fmax :     42,6 daN; Crb <= Max : OK; Fmin1:      0,0 daN; Crb >= Min : OK


Debut Largeur Fixe - Fin Fin Cycle - Mode Inclusion
F 03; Fmax :     20,1 daN; Crb <= Max : OK; Fmin1:      0,0 daN; Crb >= Min : OK

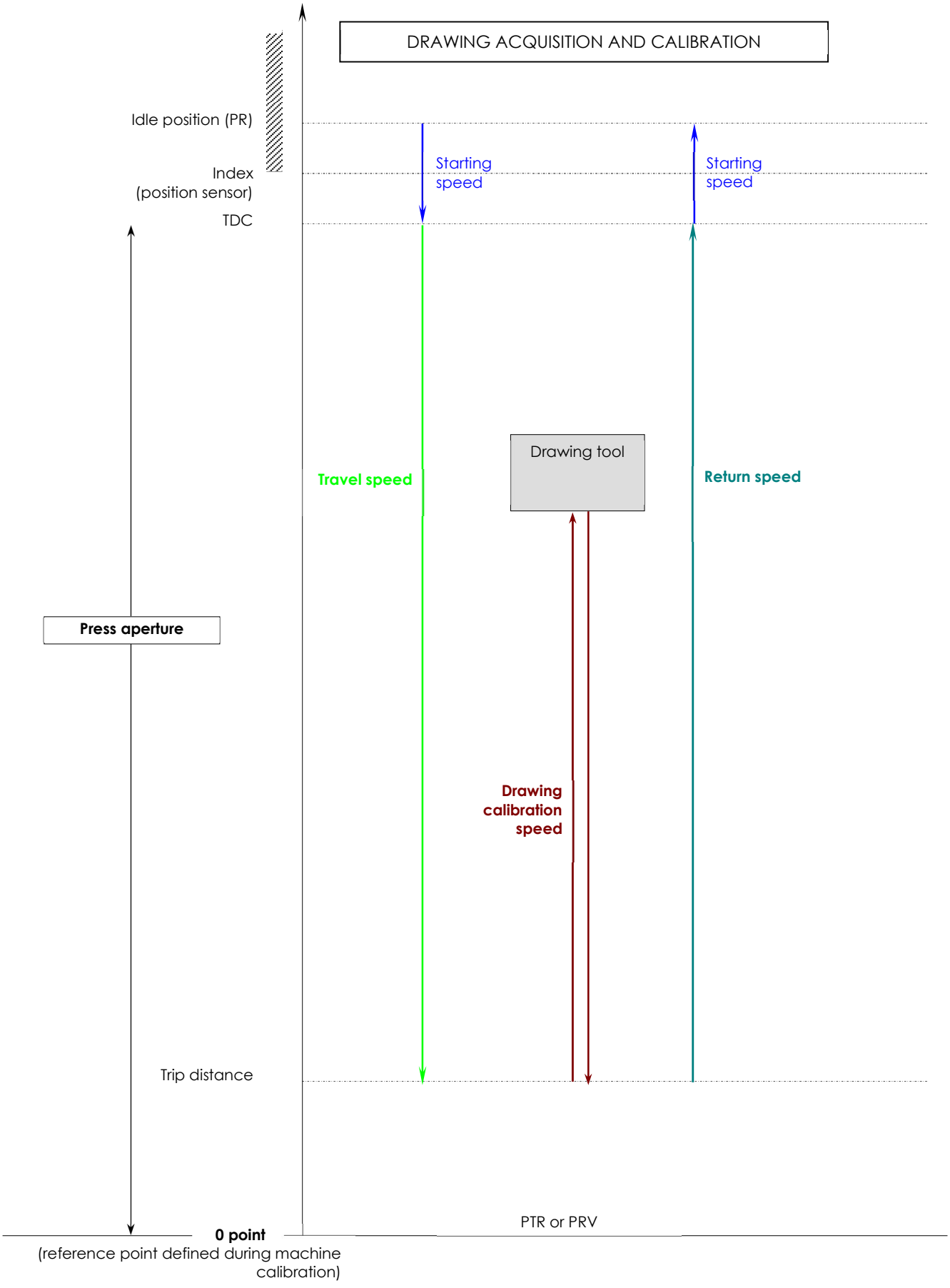
*********************************************
```



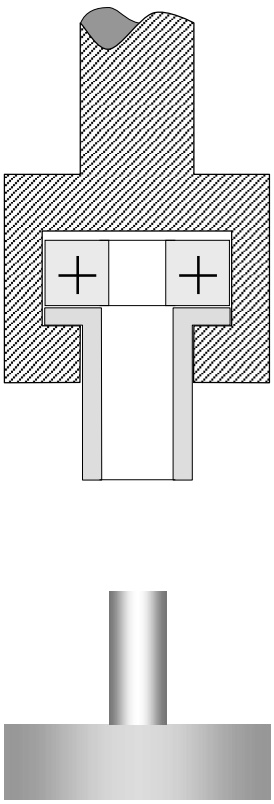
12 Distance and Speed Diagram



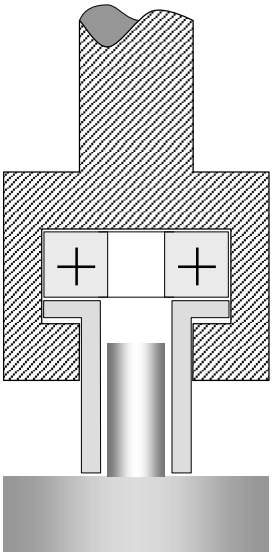
Distance and Speed Diagram



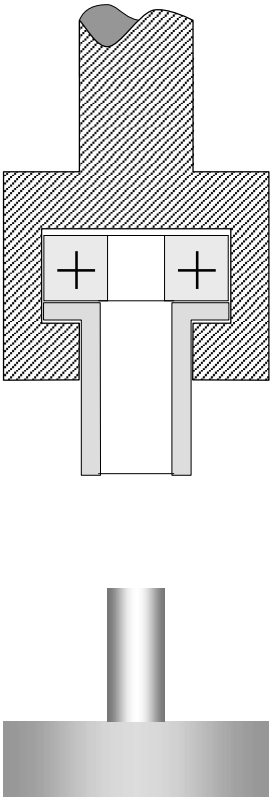
13 Acquisition and Press-Fitting: Example



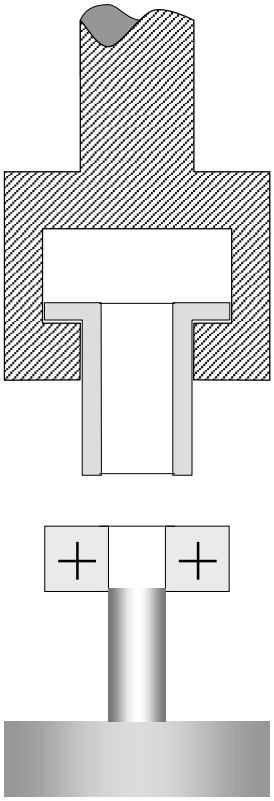
1: acquisition cycle with end part in stacker



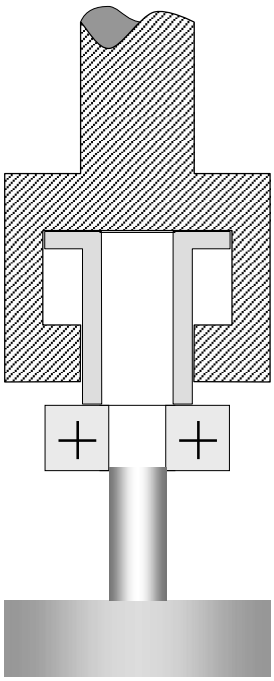
2: the initial distance is detected (acquired)



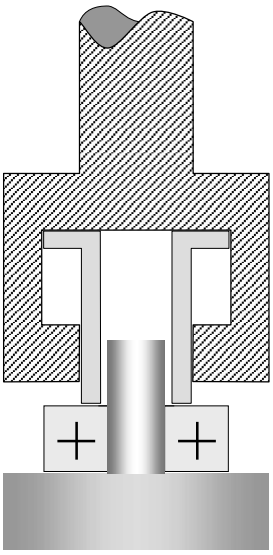
3: return to idle position



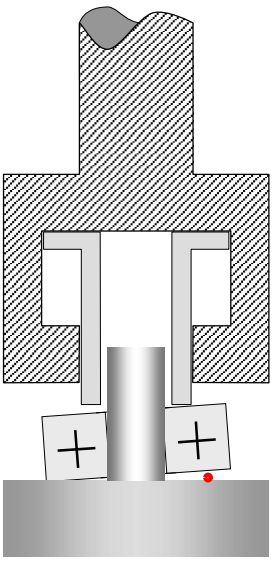
4: part ready for press-fitting



5: start of press-fitting



6: press-fitting completed. Max. diff. < final distance – initial distance < Min. diff.

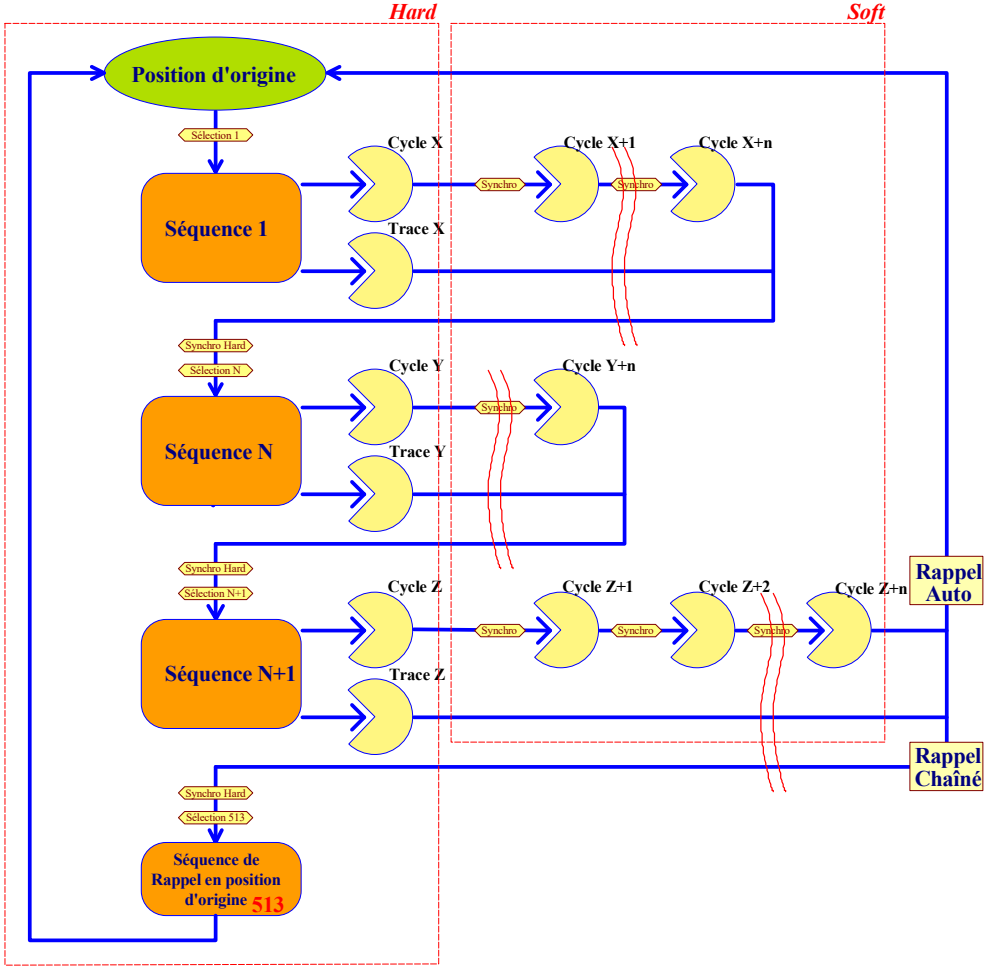


6 b: press-fitting completed. Final distance > initial distance

MVAT Presse

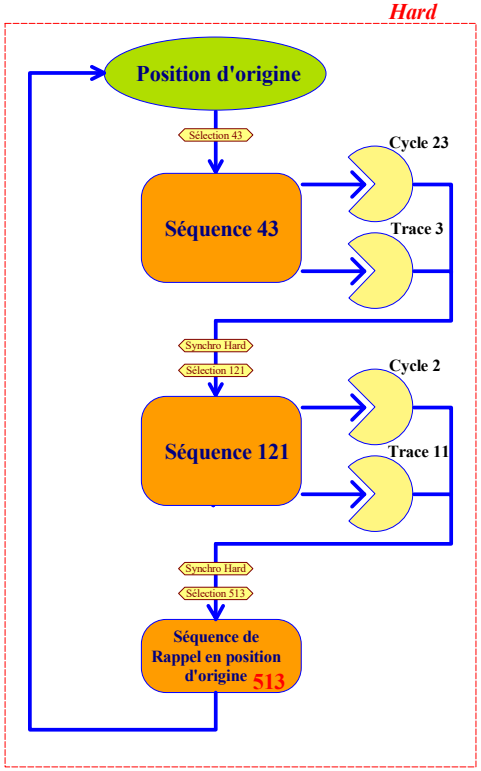
Principe

Gamme A



Exemple

Gamme 3



Préliminaire d'étude : Affectations d'E/S et définitions temporelles susceptibles d'évoluer sans préavis et sans appel.

Titre: *Diagramme E/S MVAT Presse*				F.S.A. Ets SORMEL Rue Becquerel Z.I. de Châteaufarine 25009 BESANCON
Format: A3	Numéro:	Par :	Révision:	
Fichier: C:\CAO\..\DIAG_ES0.SCH		Date: 29-Mar-2000	Heure: 16:42:45	Folio0 of 0

Diagramme E/S MVAT Presse

avec Automate

Séquence d'emmanchement

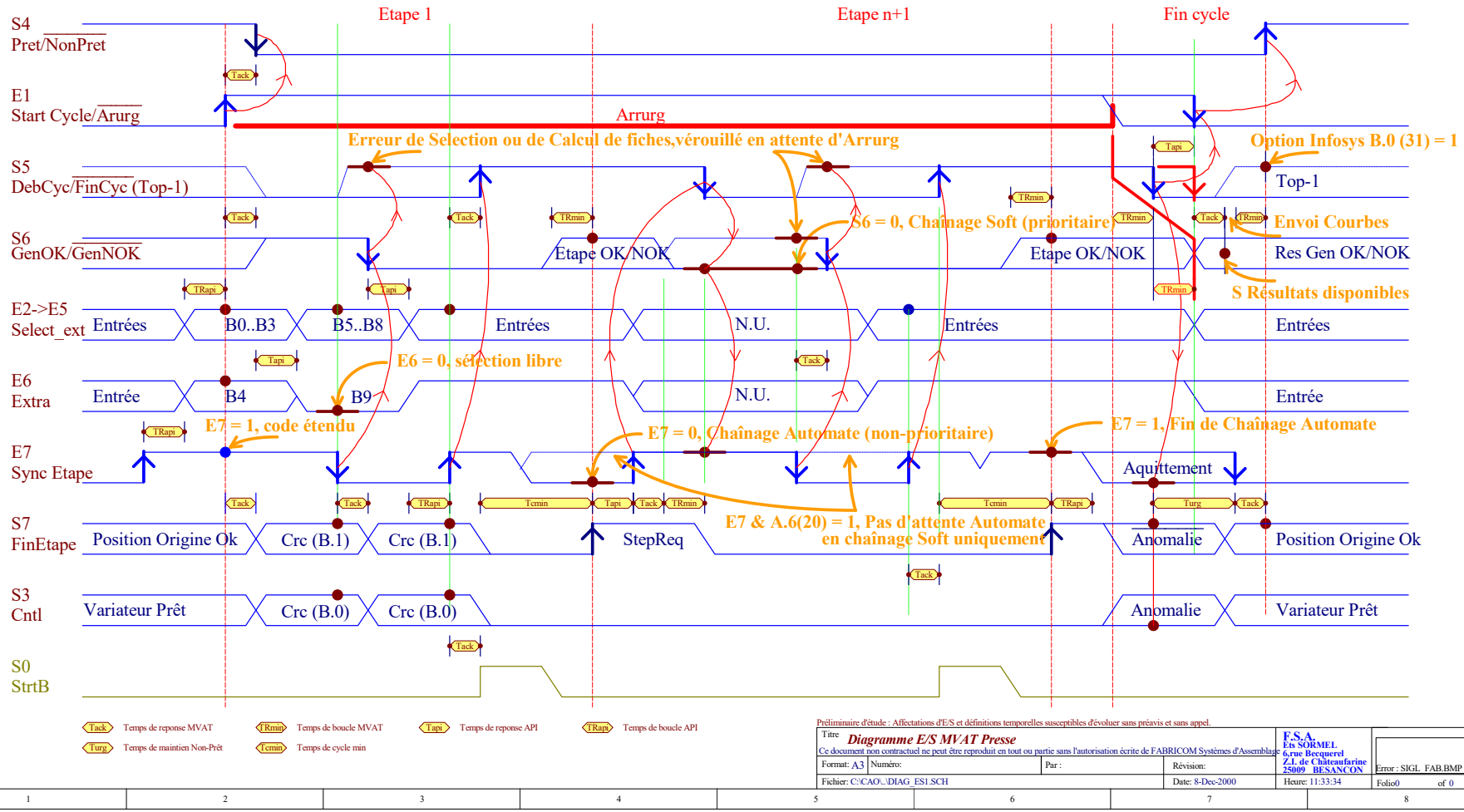
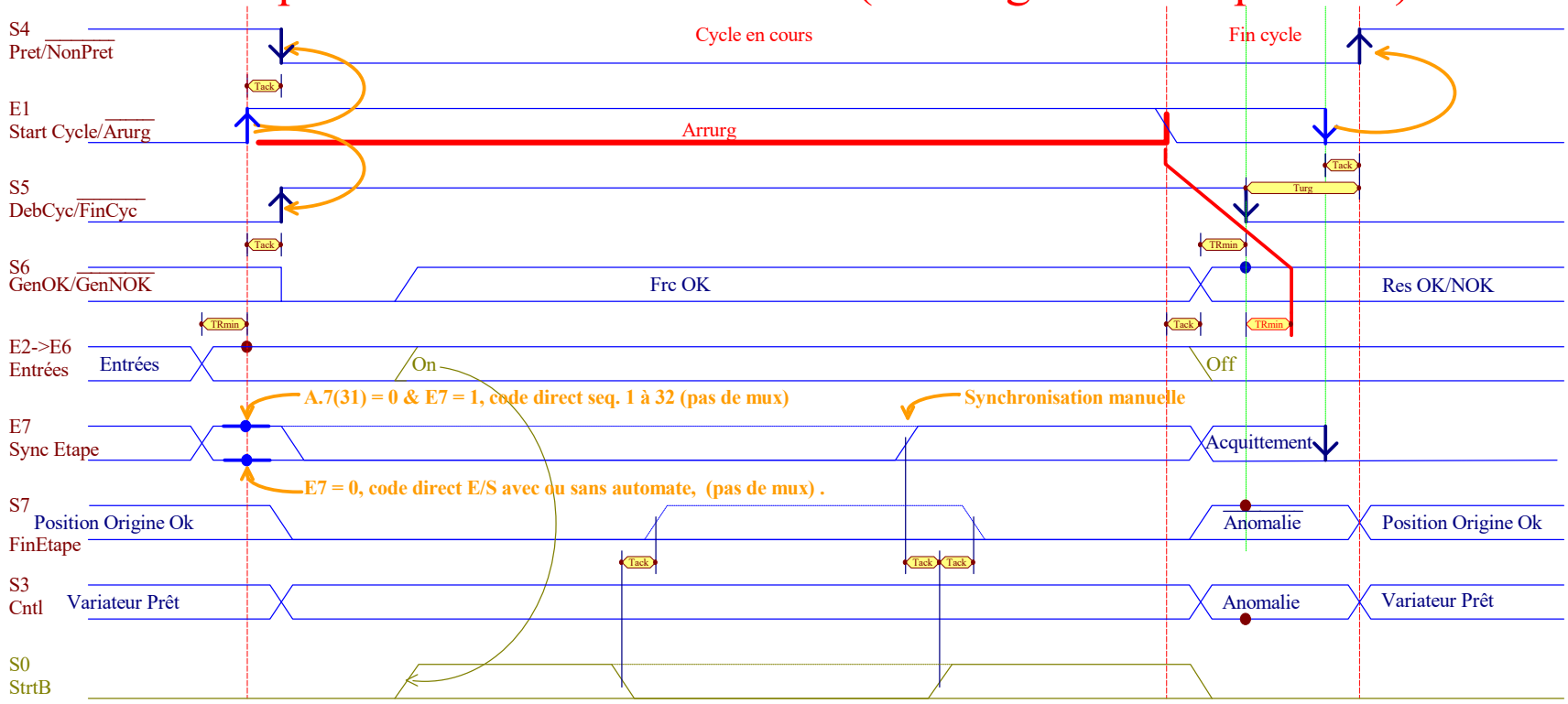


Diagramme E/S MVAT Presse sans Automate (Info Générales @31(A.7 = 0)

Séquence manuelle forcée (montée/descente)
Séquence d'étalonnage forcée (compression: cale b./h.)
Séquences manuelles de 1 à 32 (chaînage soft uniquement)



Séquences manuelles forcées

	E7	E6	E5	E4	E3	E2	Code Roues Codeuses	
@E1	0	1	1	x	x	1	(26d)	Etalonnage Compression Cale Haute
@E1	0	0	1	x	x	1	(10d)	Etalonnage Compression Cale Basse
@E1	0	1	0	x	x	1	(18d)	Etalonnage Traction
@E1	0	0	0	x	x	1	(02d)	Etalonnage Traction
@E1	0	1	0	x	x	0	(17d)	Montée Manuelle avec CdF
@E1	0	1	1	x	x	0	(25d)	Descente Manuelle avec CdF
@E1	0	0	0	1	0	0	(05d)	Montée Manuelle directe, avec CdF *
@E1	0	0	0	0	1	0	(03d)	Descente Manuelle directe, avec CdF *

* Si E5=1, Mont/Desc sans CdF (pour sortie de défaut de mesure de force)

Légende

E2 = Etalonnage/Manuelle
E3 = Descente
E4 = Montée
E5 = Compression(Desc)/Traction(Mont)
E6 = Caleh./Caleb.
CdF = Contrôle de Force

Séquences manuelles de 1 à 32

	E7	E6	E5	E4	E3	E2	Code Roues Codeuses
@E1	1	0	0	0	0	0	Séquence N°1
@E1	1	0	0	0	0	1	Séquence N°2
			"				
@E1	1	1	1	1	1	0	Séquence N°31
@E1	1	1	1	1	1	1	Séquence N°32

Préliminaire d'étude : Affectations d'E/S et définitions temporelles susceptibles d'évoluer sans préavis et sans appel.

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Diagramme E/S MVAT Presse

avec Automate

Séquence d'emmanchement

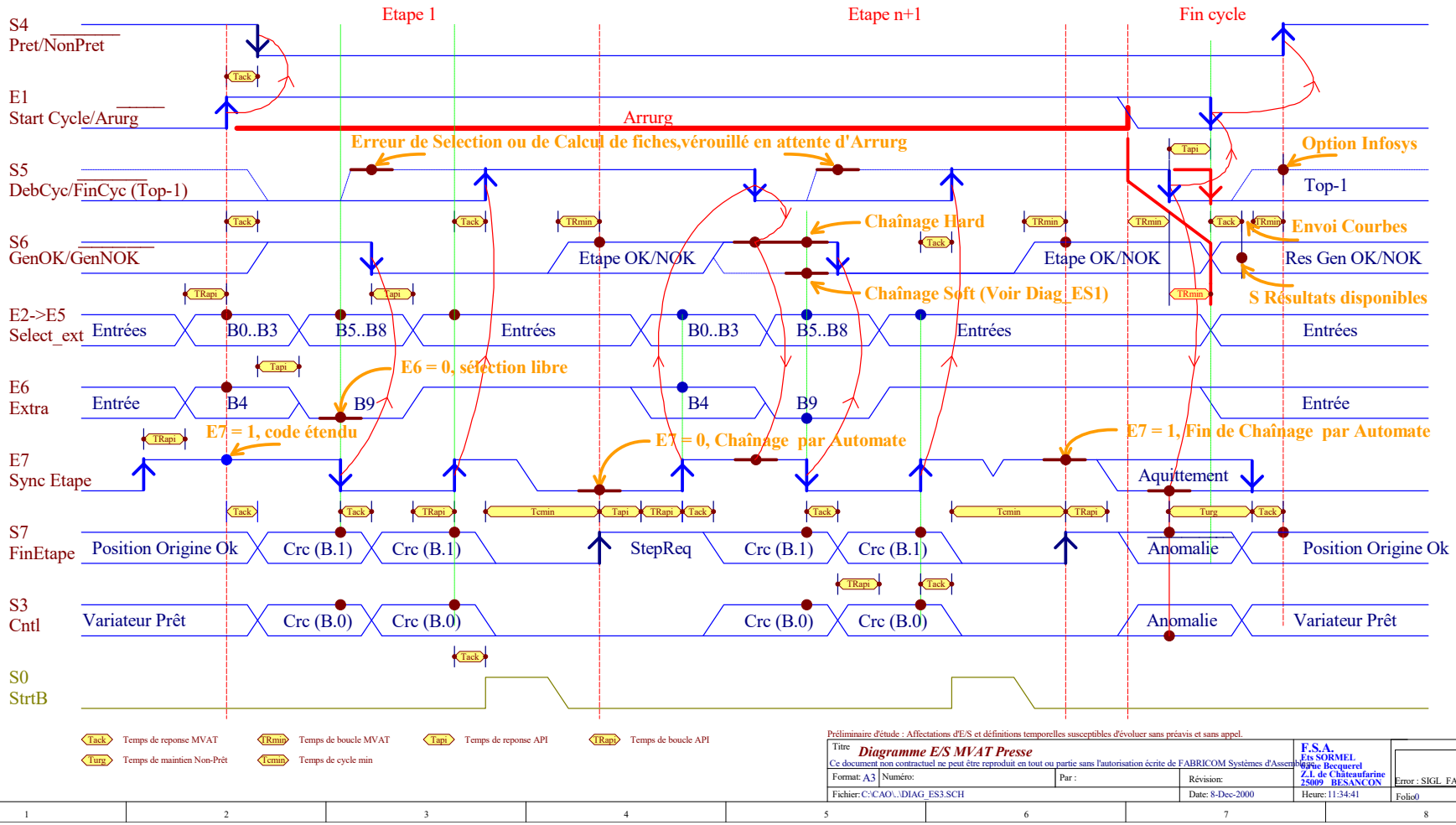
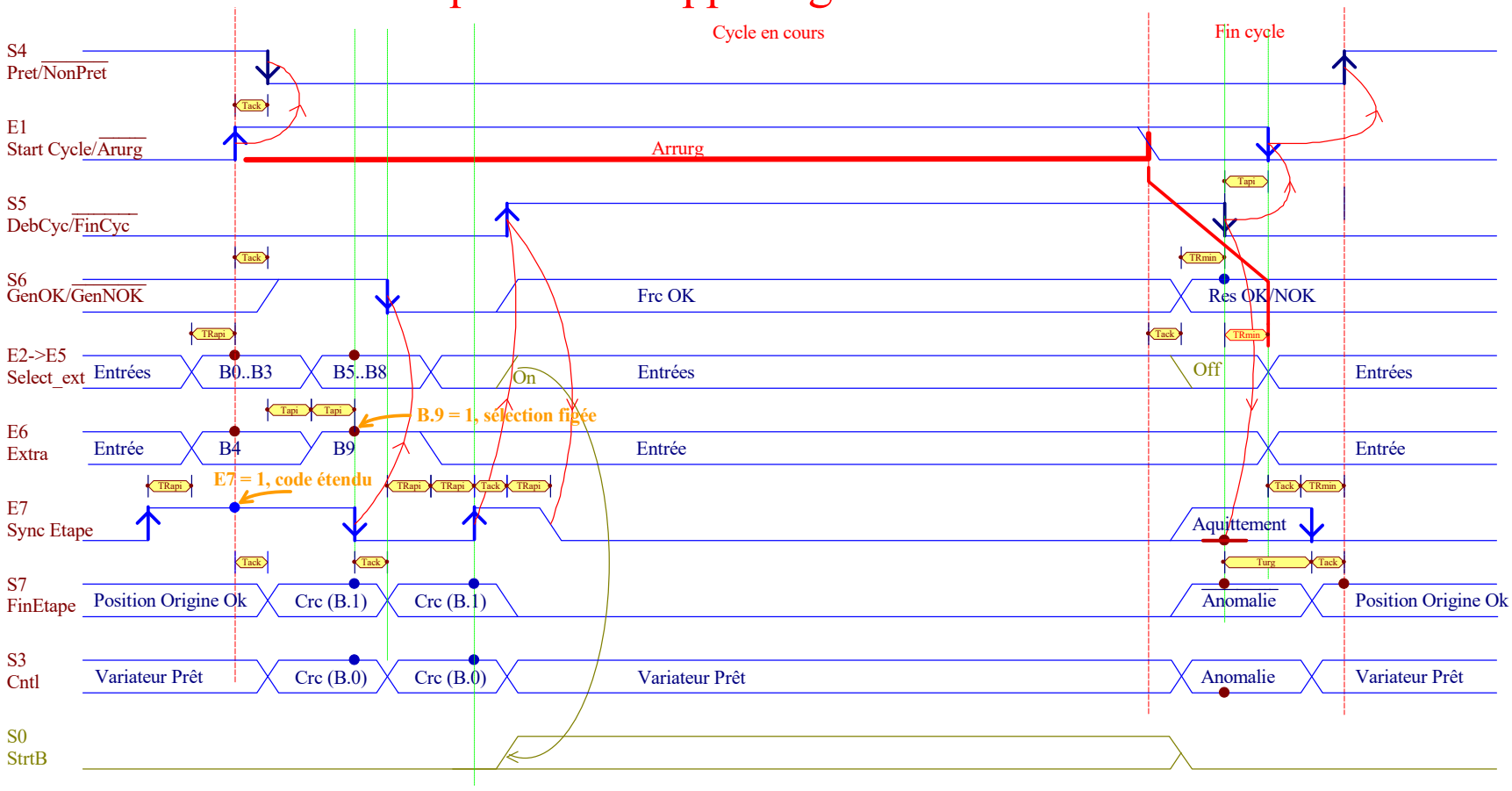


Diagramme E/S MVAT Presse avec Automate

Séquence manuelle figée (montée/descente) 2 modes
Séquence d'étalonnage figée (compression: cale b./h.)
Séquence d'étalonnage figée (traction cale unique)
Séquence de rappel figée



Préliminaire d'étude : Affectations d'E/S et définitions temporelles susceptibles d'évoluer sans préavis et sans appel.

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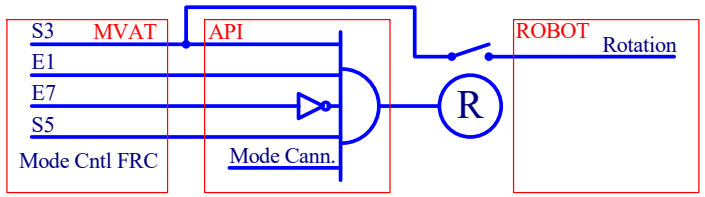
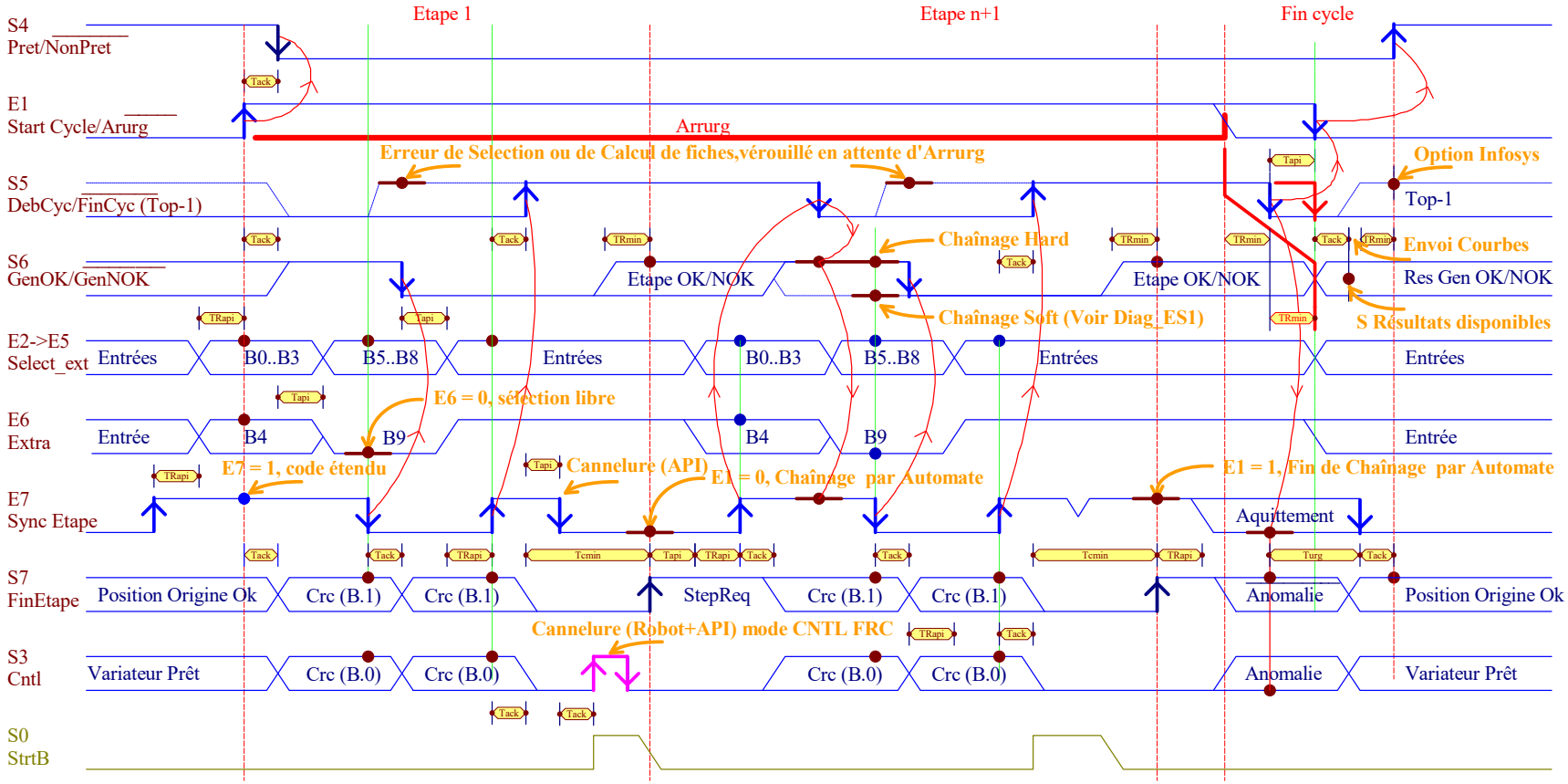
Fichier: C:\CAO\..\DIAG_ES4.SCH			Date: 29-Mar-2000	Heure: 16:00:17	Folio0 of 0

Diagramme E/S MVAT Presse avec Automate

Séquence d'emmanchement avec contrôle de force pour detection cannelure





MVAT Presse

Code sélection étendu

/ E1 E6 E5 E4 E3 E2 b9 b8 b7 b6 b5	E7 \ E6 E5 E4 E3 E2 b4 b3 b2 b1 b0	Valeur Hex/Dec	Selection Libre fiches de cycle	Entrées actives
0 0 0 0 0	0 0 0 0 0	000H/000	Code = 001 Cycle 1 à 384	E1
0 0 0 0 0	0 0 0 0 1	001H/001	Code = 002 Cycle 1 à 384	E1
"			"	E1
0 1 0 1 1	1 1 1 1 0	17EH/382	Code = 383 Cycle 1 à 384	E1
0 1 0 1 1	1 1 1 1 1	17FH/383	Code = 384 Cycle 1 à 384	E1
			Selection Scratch	
0 1 1 0 0	0 0 0 0 0	180H	Code = 485	
0 1 1 0 0	0 0 0 0 1	181H	Code = 486	
"			"	
0 1 1 1 1	1 1 1 1 0	1FEH	Code = 511	
0 1 1 1 1	1 1 1 1 1	1FFH	Code = 512	
			Selection Figée	**Entrées actives**
1 0 0 0 0	0 0 0 0 0	200H/512	Code = 513 Rappel pos. origine @E1	E1
1 0 0 0 0	0 0 0 0 1	201H/513	Code = 514 Calibr.Comp. Cale haute @E1	E1
1 0 0 0 0	0 0 0 1 0	202H/514	Code = 515 Calibr.Comp. Cale basse @E1	E1
1 0 0 0 0	0 0 0 1 1	203H/515	Code = 516 Calibr.Tract. @E1	E1
1 0 0 0 0	0 0 1 0 0	204H/516	Code = 517 Calibr.Tract. @E1	E1
1 0 0 0 0	0 0 1 0 1	205H/517	Code = 518 Montée Manuelle @E1	E1
1 0 0 0 0	0 0 1 1 0	206H/518	Code = 519 Descente Manuelle @E1	E1
1 0 0 0 0	0 0 1 1 1	207H/519	Code = 520 Mont/Desc	E1|$\overline{E6}$|$\overline{E2}$|(E4+E3)
			Prépositions et spéciales	
1 0 0 0 0	0 1 1 0 0	208H	Code = 521 Pré-position N°1	
1 0 0 0 0	0 1 1 0 1	209H	Code = 522 Pré-position N°2	
"			"	
1 0 0 0 0	1 1 1 1 0	21EH	Code = 542 Pré-position N°23	
1 0 0 0 0	1 1 1 1 1	21FH	Code = 543 Pré-position N°24	
1 0 0 0 1	0 0 0 0 0	220H	Code = 544 Rsrv 3	
"			"	
1 1 1 1 1	1 1 1 1 0	3FEH	Code = 1023 Rsrv 481	
1 1 1 1 1	1 1 1 1 1	3FFH	Code = 1024 Rsrv 482	

Préliminaire d'étude : Affectations d'E/S et définitions temporelles susceptibles d'évoluer sans préavis et sans appel.

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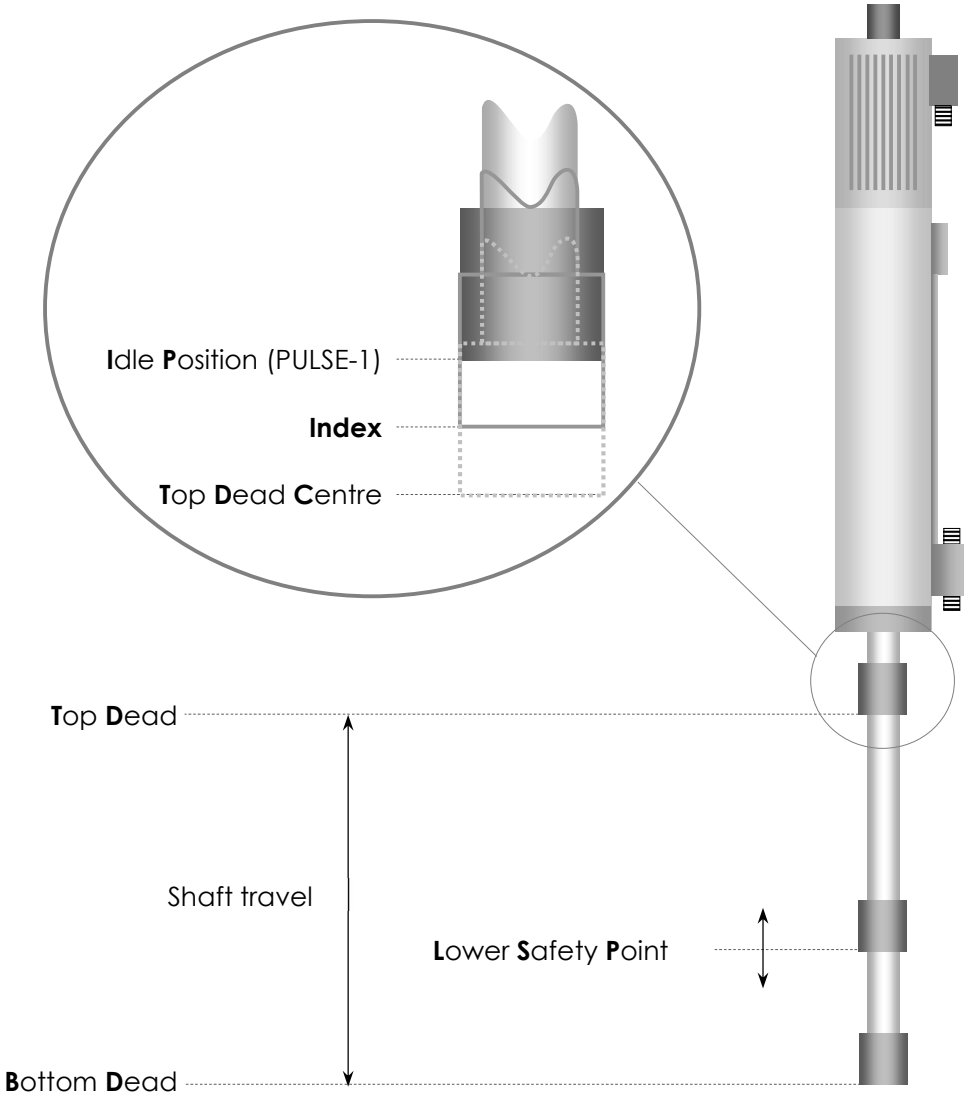
14 Glossary



Idle Position : Default position of the shaft at the start of each cycle. This position is only active after an initial cycle each time the equipment is switched on. This position may be configured between the Index (position given by the MVAT after calibration under the title "Index centring") and the position of PULSE-1. See "Specifications" However, it is recommended to operate with the field "Idle position from TDC" set to 0.

Index: The position of PULSE 0 and PULSE-1 must be either side of the position of the Index and at an equal distance for safe operation (i.e. "Index centring" equal to half of the screw pitch). This is the return position of the shaft until the pin has been initialised (by an initial cycle after power on).

Top Dead Centre: This is the effective starting point of displacement measurements.

Bottom Dead Centre: This is the maximum physical position the shaft can reach when it is fully extended.

Lower Safety Point: This is a limitation on this position obtained by programming in order to avoid damaging the pin

15 Analysis of malfunctions when first switched on

The application runs for the first time or after hardware replacement

Symptom of malfunction	*Message on RS232 Hyper terminal*	*Cause and solution*
Shaft exits or returns at maximum speed		Motor phases reversed relative to those of the synchro resolver
Pressing calibration: the shaft does not rise back up after application force		Force sensor wired wrong way round: check by command "**Esc O**"(see keyboard commands) Or current limited by RHAPSODIE.NET (calibration current) or by the speed controller settings.
Pressing calibration: shaft exits then stops	**"Force before pulse fault"**	Mechanical problem (sticking point, obstacle, etc.)
Pressing calibration: shaft exits then stops after a short distance		Check whether the brake has been disabled or whether the INFRANOR speed controller is not malfunctioning
	"Displacement change fault"	Resolver or coder pulses absent or PULSE absent Or travel time between the index release and the 1st PULSE is greater than 1 sec: increase the pressing calibration speed
	"Index change fault"	The index remains present all the time
Cannot start a cycle or carry out calibration	**"Index NOK"**	The shaft has not returned sufficiently or the index is absent.
	"Offset fault"	Sensor absent or wiring fault. Check using command "**Esc C**"
	"Unbalancing fault"	Force sensor wiring fault
	"Force before index release fault"	The max. force entered, protecting between PULSE-1 and the approach position, is too weak
During a cycle, the shaft stops on approach		Current limitation in the cycle (see RHAPSODIE.NET) Current limitation in speed controller (see BPCW 2.6) If speed controller fault I^2t => holding time too long for the trip force requested

16 List of faults

The fault number given in the sequence result block on the 3rd row is the number in the 1st column of the table

Fault no.	***Message on RS232 Hyper terminal***	***Cause and solution***
1	**EMERGENCY STOP FAULT**	Execution fault: cycle start release (E1) during sequence
2	**EXIT TIME FAULT**	Programming or execution fault: Programmed "Cycle time" in cycle page exceeded
3	**SEQUENCE TYPE FAULT**	Execution fault: start of the pulling calibration sequence was incorrect
4	**OFFSET FAULT**	Execution fault: the force sensor offset is greater than the "Offset Fault Threshold" setpoint Remedy: - Check the offset using the command "**ESC o**" - Increase the offset default threshold setting in the specification file (slightly) - Carry out calibration again
5	**INDEX NOT PRESENT AT START FAULT**	Execution fault: detector not present before pin motor starts Cause: — Remedy: - the pin is not in fallback position - Put the pin shaft back using manual mode - the index has not been seen by the MVAT - Check the wiring of the index
6	**FORCE BEFORE INDEX RELEASE FAULT**	Execution or programming fault: force encountered during detector presence. The force measured is greater than the "Safety force" or the "Maximum force" setpoint or, if calibrating, the "Pressing Calibration Force". It could also be an incorrect force measurement. Remedy: - Clear the tip of the pin - Check the force using the command "**ESC o**"
7	**FORCE BEFORE PULSE FAULT**	Execution fault: force encountered before the PULSE has been received (between the detector and the PULSE). The force measured is greater than the "Safety force" or the "Maximum force" setpoint or, if calibrating, the "Pressing Calibration Force". It could also be an incorrect force measurement. Remedy: - Clear the tip of the pin - Check the force using the command "**ESC o**"
8	**FORCE BEFORE APPROACH FAULT**	Execution fault: the MVAT measures a force before the "Approach position" setpoint. The force measured is greater than the "Safety force" setpoint or the "Trip force" setpoint or the "Maximum force" setpoint Remedy: - Clear the tip of the pin - Check the approach position
9	**STOP ON LOWER SAFETY IN CALIBRATION MODE FAULT**	Execution fault: - Maximum displacement reached in calibration mode (displacement measurement overflow 10000mm depends on the number of pulses) - Phase wiring reversed (IN+ and IN-) in this case the fault appears on the first PULSE Note: in the case where signals from the speed controller are used for displacement, if the direction of the motor is reversed in the Infranor program (Reverse movement), the IN+ and IN- wiring must also be reversed.

10	**STOP ON LOWER SAFETY IN CYCLE FAULT**	Execution fault: max. displacement reached in calibrating "Lower Safety Position" setpoint
11	**STOP ON MAX FORCE FAULT**	Execution fault: no "Trip Force" programmed stop on max end stop force ("Safety Force" setpoint or "Maximum force" setpoint)
12	**STOP ON LOWER SAFETY ON INERTIA FAULT**	Execution fault: during the "Holding time", the pin reaches the "Lower Safety Position" setpoint
13	**LINE SELECTION FAULT**	Programming fault: test whether the curve selection is between 0 and 16
14	**SETTINGS NOT CORRECT WITH THE CYCLE DEFINITION**	Programming fault: this is in the case of a positioning sequence (the sign of the value must relate to the cycle type
15	**PIN POSITIONING ERROR**	Execution fault: detector not present on the cycle start
16	**INDEXER BEFORE PULSE ON RETURN FAULT**	Execution fault: during the return phase, the MVAT see the presence of the "index presence" inductive detector Cause: interference of the indexer by the motor or the environment. Remedy: - Check the wiring, in particular the grounds, proximity of the measuring cable to the motors or power cable - Increase the index filtering time (Index filter field in the specification page).
17	**RECOVERY OF PULSE BEFORE INDEXER ON RETURN FAULT**	Execution fault: the MVAT sees PULSE-1 or the "Idle position from TDC" setpoint before seeing the presence of the detector. Cause: - Problem of coder coupling on UE with belt drive, check the coupling bellows - Index Centring incorrectly centred between the two resolver or coder pulses. Check the centring of the TOPs in the calibration result. (command "**e**" in the hyperterminal)
18	**STOP ON INDEXER MANUAL CONTROL**	indicates that the MVAT stopped on the detector
19	**STOP ON SAFETY FORCE MANUAL CONTROL**	Indicates that the MVAT stopped on the Safety Force or 10% of the true rated force
20	**CALIBRATION NOT DONE FAULT**	Execution fault: the MVAT card has not recorded a pressing calibration
21	**RATED FORCE PROGRAMMING FAULT**	Programming fault: "Sensor Rating" setpoint incorrect
22	**CALIBRATION FORCE PROGRAMMING FAULT**	Programming fault: "Pressing Calibration Force" setpoint incorrect
23	**SPEED PROGRAMMING FAULT**	Programming fault: the speeds on the specification screen page or the cycle screen page
24	**CYCLE DEFINITION PROGRAMMING FAULT**	Programming fault: the mode relating to the type of cycle is not defined or inconsistent
25	**FORCE BEFORE PULLING APPROACH FAULT**	Execution fault: the MVAT measures a force during the pulling approach phase. The force measured is greater than the "Trip force" setpoint or the "Maximum force" setpoint
26	**TRIP POSITION > APPROACH POSITION PROGRAMMING FAULT**	Programming fault: the pressing "Trip Position" setpoint is greater than the pressing "Approach Position" setpoint
27	**CALIBRATION FORCE < PRESSING FORCE PROGRAMMING FAULT**	Programming fault: the pressing "Trip Force" setpoint is greater than the "Pressing Calibration Force" setpoint
28	**SELECTION PROGRAMMING FAULT**	Programming fault: the selection of the cycle is incorrect
29	**NUMBER OF PULSES INCORRECT FAULT**	Execution or programming fault: the resolution (number of pulses/mm) found during pressing calibration is greater or less than the "Max. Resolution" and "Min. Resolution" setpoints
30	**APPROACH POSITION < WORKPIECE MAX HT POSITION PROGRAMMING FAULT**	Programming fault: the "Approach position" setpoint is less than the "Max. Position" (max. workpiece position)

31	**CALIBRATION REQUEST PROGRAMMING FAULT**	Programming fault: the "Pressing Calibration Force" is greater than the value of the pressing calibration force for the last recorded calibration (correct calibration)
32	**TRIP < APPROACH ENTERED PROGRAMMING FAULT**	Programming fault: the pulling "Trip Position" setpoint is less than the pulling "Approach Position" setpoint
33	**APPROACH DISPLACEMENT < TABLE OPENING PROGRAMMING FAULT**	Programming fault: the pressing "Approach position" setpoint is less than the "Top Dead Centre" (the opening of the U^E) found during calibration
34	**OPERATING MODE PROGRAMMING FAULT**	Programming or execution fault: the selected operating mode is incorrect
35	**SLOWING DOWN POSITION < TRIP POSITION PROGRAMMING FAULT**	Programming fault: the pressing "Slowing down Position" setpoint is less than the pressing "Trip Position" setpoint
36	**MAX CHAINING > 100 CYCLES PROGRAMMING FAULT**	Execution fault: the number of chained cycles is greater than 100
37	**APPROACH > WORKPIECE MIN POSITION ENTERED PROGRAMMING FAULT**	Programming fault: the pulling "Approach position" setpoint is greater than the "Min. Position" (min. workpiece position)
38	**SPEED OFFSET FAULT**	not active
39	**MEASUREMENT OVERFLOW FAULT**	Execution or programming fault: the allowed offset + the measurement exceeds the true rated force (useful force) example: offset = - 200 daN; true rated force = 3000 daN, measurement without offset correction = 2900 daN, true measurement = 2900 – (-200) = 3100 daN = exceeds the true rated force. This test is carried out when the value is stored. During execution, the saturation of the measurement is checked.
40	**SETPOINT OVERFLOW FAULT**	Execution or programming fault: the offset + requested force setpoint exceeds the true rated force (useful force)
41	**STOP ON RETURN FORCE FAULT**	Execution or programming fault: the MVAT measures a force during the return phase which is greater than the "Safety Return Force" setpoint Remedy: - Check the force using the command "**ESC o**" (warning, offset display does not work just after a RESET) - Increase the safety return force parameter in the specification tab
42	**EXTERNAL CHAINING PROGRAMMING FAULT**	not active
43	**PULLING TRIP POSITION > DISPLACEMENT CARRIED OUT PROGRAMMING FAULT**	Programming fault: the pulling "Trip Position" is greater than the current pin displacement
44	**SEMI-MANUAL MODE =>E3 OR E4 FAULT**	Keyboard command execution fault: if in SEMI-MANUAL MODE, inputs E3 or E4 must be active
45	**PULLING APPROACH POSITION > DISPLACEMENT CARRIED OUT PROGRAMMING FAULT**	Programming fault: the pulling "Approach Position" is greater than the current pin displacement
46	**CHAINING SELECTION NUMBER PROGRAMMING FAULT**	Programming fault: the number of chained cycles is greater than 384
47	**INPUTS (E3+E4) AT THE SAME TIME FAULT**	Keyboard command execution fault: on the start of the cycle, inputs E3 or E4 are simultaneously active
48	**CHAINING CONTINUATION AS CYCLE NOT OK FAULT**	Execution or programming fault: chaining is requested on a bad cycle although the "Cycle resume if Nok" flag is not enabled (box checked)
49	**SELECTION 0 ON CHAINING BY PLC FAULT**	Execution or program fault: automatic chaining but no cycle no.
50	**PULLING CALIBRATION FAULT**	Execution fault: pulling calibration not saved or initialised
51	**DISPLACEMENT CHANGE FAULT**	Execution or programming fault: safety time relating to the release of the detector and change in displacement measurement elapsed. Safety time = 2 secs. Cause: not enough pulses during a covering time delay. Remedy: - check the coupling in the case of a belt-driven press-fitting unit - check the encoder wiring in the case of a belt-driven press-fitting unit

		- check the programming of the number of pulses (infranor speed controller) in the case of a direct drive press-fitting unit
52	**NO AUTOMATIC RETURN FAULT**	Execution or programming fault: where the "Auto Return" flag is not enabled (the box is not checked) and the cycle requested is not 513 in non-automatic return mode, cycle 513 must be called to carry out the return
53	**AWAITING AUTHORISATION TO CONTINUE CYCLE FAULT**	not active
54	**INDEXER CHANGE FAULT**	Execution or programming fault: safety time relating to the start of the pin motor and release of the detector elapsed. Safety time = 2 secs. Cause: the index does not disappear after the pin starts, it is therefore impossible to raise it back up in manual mode. Remedy: check the wiring to the index
55	**SENSOR UNBALANCE FAULT**	Execution fault: before starting the pin, the MVAT card carries out a test on the force sensor and the measuring chain. This test involves unbalancing the sensor by a known amount (50% of the true rated value) and checking this value
56	**INDEXER FAULT DURING PULLING**	Execution fault: the MVAT sees the presence of the detector during the pulling phase
57	**STORAGE BUT NO TRACE SEQUENCE FAULT**	Programming fault: tracing has been requested by setting the flag "Store the Curve" to YES, but there is no curve number associated
58	**NO PROGRAM CYCLE START FAULT**	Execution or programming fault: indicates no program cycle start indicated
59	**CALIBRATION FORCE TOO SMALL FAULT**	Programming fault: indicates that the "Pressing Calibration Force" setpoint is less than 25% of the true nominal force (useful force)
60	**SPLINE HOLDING TIME FAULT**	Execution or programming fault: "Holding time" expired but no splines found
61	**NEW CALCULATED TRIP POSITION < LOWER SAFETY POINT FAULT**	Programming fault: the "Trip Position" setpoint calculated relative to the current displacement (positioning sequence) is less than the "Lower Safety Position" setpoint
62	**TABLE OPENING CALIBRATION FAULT**	Execution or programming fault: the pressing elasticity measurement is greater than the "Pressing elasticity" setpoint
63	**FILE ERROR FAULT**	Programming fault: indicates that there are one or more incorrect values in the cycle file selected
64	**MAX DISPLACEMENT REACHED ON PULLING**	Execution fault: where there is no programmed pulling trip position indicates that the MVAT reached position 0 which is the starting PULSE
65	**RATED CALCULATION FAULT**	Programming fault: the useful calculation force is not valid. The "Rated Calculation Error" message runs round in a loop. RATED CALCULATION ERROR: 01 sensitivity entry error 02 load limit overrun error (warning, the new rated value calculated with the "Overload max. factor" must be greater than the true rated value calculated with the sensitivity. In this case an Overload max. factor >1 must be entered, for example, 1.2) 03 class entry error 04 sensor power supply overrun error (15 volts) 05 sensor power overrun allowed (15 volts) 06 requested force correction > positive authorised percentage error 07 requested force correction > negative authorised percentage error (if in the Quality Department menu a value is entered in the Max. force correction field and nothing in the other fields, you will have this fault which scrolls on the screen with the nearest output flashing
66	**APPROACH > OPENING FAULT**	Programming fault: the "Approach position" setpoint is greater than the "Top Dead Centre" (the opening of the Ue) found during calibration
67	**MEASUREMENT SATURATION**	Execution or programming fault: indicates that the force measured exceeds the true rated force (useful force)
68	**FORCE BEFORE END YES BUT NO TRACING**	Programming fault: indicates that the "Force before stop result" is enabled (box checked) although the "Store the Curve" flag is disabled (box not checked)

69	**TABLE OPENING OFFSET FAULT**	Programming fault: indicates that the "Offset from Actual Working Plane (PRV)" is positive and greater than the Top Dead Centre (the opening of the UE) found during calibration
70	**DISPLACEMENT POSITION CALCULATION OVERFLOW FAULT**	Programming fault: indicates that there is a positive position setpoint greater than the opening of the UE for the sequence requested (cycle+curve). Example: opening 249.418mm; programmed position 250mm
71	**PULLING CURVE FAULT (POSITION FAULT IN THE CURVE CHECK; NO. OF PULLING WINDOWS NOT EQUAL TO NO. OF PRESSING WINDOWS)**	Execution or programming fault: expansion case: indicates that the number of pulling windows which have been executed is not equal to the number of pressing windows executed in order to carry out the curve check in pulling mode. The number of windows executed in pulling mode must equal the number in pressing mode.
72	**WINDOW FAULT (POSITION FAULT IN THE CURVE CHECK)**	Marker with the same address twice A window has been defined which could not be drawn (window outside the cycle) or the marker has been stored which should not have been
73	**NO. EXEC WINDOW FAULT**	The number of windows executed differs from the number of windows programmed
74	**PULLING CURVE RELOAD FAULT**	Programming fault: the sequence is trying to reload a curve on a pulling cycle in which storage has been requested
75	**ACCELERATION OVERFLOW FAULT**	Programming fault: the acceleration setpoint is too large
76	**SPEED AND ACCELERATION INCONSISTENCY**	Programming fault: The requested speed and acceleration distance are inconsistent
77	**POSITIONING CYCLE FAULT**	Programming fault: the first cycle in the sequence is a positioning cycle.
78	**INDEX SELECTION EXECUTION FAULT**	Execution fault: the index has been moved (case of multiple indexes)
79	**INDEX SETPOINT EXECUTION FAULT**	Execution fault: the index has been moved (case of multiple indexes)
80	**PLC STOP FAULT**	Execution fault: The PLC is no longer responding
81	**CURVE RELOAD AUTHORISATION FAULT**	Programming fault: Curve reloading is not authorised during a sequence
82	**OPENING FAULT**	Execution fault: The Top Dead Centre calculated at the end of calibration is outside tolerances (TDC Max and TDC Min in the "Setpoints" tab of the "Specifications" page
83	**MAX NO. OF PROFILE WINDOWS FAULT**	Programming fault: In profile mode, a maximum of 5 recording ranges is allowed.
84	**WINDOW MARKER FAULT**	Execution fault: An internal error has occurred in calculating the position of the check window.
85	**FORCE BEFORE STOP IN PROFILE MODE FAULT**	Programming fault: in advanced curve mode (Profile), the "Force before Stop Result" on the Cycle page may not be requested.
86	**WIN/CYCLE CONSISTENCY FAULT**	Programming fault: on a complete sequence, if one of the cycles has its "Force Before Stop per Cycle" box checked, it must be the same for all cycles in the sequence and the "Per cycle" box on the Curve page must also be checked for the curve associated with this sequence. In this mode, curve reload is possible with Hard chaining (but only for standard curves - curve prog. from 1 to 16) Similarly, on a complete sequence, if one of the cycles has its "Force Before Stop per Cycle" box unchecked, it must be the same for all cycles in the sequence and the "Per cycle" box on the Curve page must also be unchecked for the curve associated with this sequence.
87	**TRIP BY EXTERNAL INPUT**	Indicates that the trip has been carried out by an external input, ON/OFF input E5
88	**NO. OF RECORDINGS EXECUTED NOT EQUAL TO NO. OF RECORDINGS PROGRAMMED FAULT**	Fault linked to a curve reload => curve reload not possible. In PROFIL Mode, to reload a curve, a test must be made that all programmed recordings have been executed
89	**CALIBRATION FILE ERROR FAULT**	Programming fault: indicates that there are one or more incorrect values in the calibration file selected

90	**RESOLUTION MESSAGE ENTERED**	Calibration result message without gage
91	**HARDWARE RESOLUTION MESSAGE**	Calibration result message without gage
92	**SPEED DIRECTION FAULT**	The direction of the speed setpoint is not equal to the direction of the force measured
93	**CALIBRATION FUSE VALUE FAULT**	Calibration fuse value fault in the flash memory
94	**STOP MESSAGE ON THE POSITION IN CONTROL MODE**	In control mode, indicates that the stop is carried out on the position
95	**POSITION DISPLACEMENT NOT VALID IN CONTROL MODE FAULT**	This fault occurs in control mode: - If an absolute or relative ascent is requested after power on, then the shaft is not at its origin - If an absolute or relative descent is requested after power on, then the shaft is not at its origin - If a change is made to this mode without having started by descending
96	**NO POSITION IN CONTROL MODE FAULT**	This fault occurs in control mode: - If an absolute or relative ascent or descent is requested when no position has been entered
97	**MAX THRESHOLD TRIP FAULT**	A trip has occurred on the max threshold setpoint. The sequence is interrupted
98	**SPEED DECIMAL PLACES FAULT**	The MVAT has received a speed setpoint with 3 decimal places while the maximum is 2 decimal places
99	**FORCE BEFORE END BUT NO DISTANCE BEFORE END SETPOINT FAULT**	A force before end is requested although no distance before end setpoint has been programmed
100	**FORCE BEFORE END BUT NO CALCULATION FAULT**	Programming fault: the force before end is requested but the force before end has not been able to be calculated as: - we are in window/sequence mode ("Per Cycle" field in profile program not checked) while the recording windows have not all been run through - a force before end is requested while the curve check took place in the previous cycle - we are in window/sequence mode, and it is only possible to have the force before end at the same time as the curve calculation. i.e. once all windows have been executed.
101	**HARD CYCLE START NOT ACTIVE IN CONTROL MODE FAULT**	In control mode, the Hard cycle start (On/Off input E1) must be raised.
102	**CONTROL MODE NOT AUTHORISED FAULT**	Programming fault. The "Keyboard controlling enabled" box in the Appendix Specifications page is not checked.
103	**ABSOLUTE DESCENT POSITION IN CONTROL MODE FAULT**	In control mode, programming fault associated with the absolute descent command: - positive set point: Descent setpoint > table opening (TDC) - negative setpoint: Descent setpoint < Lower safety position
104	**ABSOLUTE ASCENT POSITION IN CONTROL MODE FAULT**	In control mode, programming fault associated with the absolute ascent command: - positive set point: Ascent setpoint > table opening (TDC) - negative setpoint: Ascent setpoint < current position
105	**RELATIVE ASCENT POSITION IN CONTROL MODE FAULT**	In control mode, programming fault associated with the relative ascent command: - positive set point: Ascent setpoint > current position - negative setpoint: Relative ascent setpoint must not be negative
106	**RELATIVE DESCENT POSITION IN CONTROL MODE FAULT**	In control mode, programming fault associated with the relative descent command:

		- positive set point: New descent position > safety setpoint Relative descent setpoint too big => overflow - negative setpoint: Relative descent setpoint must not be negative
107	**SPEED CONTROLLER NOT READY IN CONTROL MODE FAULT**	Execution fault. The speed controller is not ready
108	**SEQUENCE FINISHED**	In control mode only, the « MESSAGE » numbers are used by the UExp-MVAT panel to translate the message
109	**SPEED CONTROL FAULT IN FORCE FOLLOWING MODE**	In force following mode, a speed control fault occured.Check the parameters of this mode.
110	**CURRENT CONTROL FAULT IN FORCE FOLLOWING MODE**	In force following mode, a current control fault occured.Check the parameters of this mode. : - Either the current reference value is > than 50% max current when the press is triping under force - Or the current reference value calculated to compensate the force loosing is > than 50% of max. current.
111	**FORCE POSITIONNING CYCLE FAULT**	In Force incremental mode, an overflow calculation occured for the new force reference
112	**TEMPERATURE CORRECTION FAULT**	Could occure when temperature correction is activated, and if the external temperature sensor is missing during claibration or cycle.
113	**FORCE FOLLOWING MODE & SLOPE TRIPPING MODE TOGETHER**	The 2 incompatible working mode have been selected at the same time.
114	**SLOPE TRIPPING MODE PARAMETERING FAULT**	In Slope tripping mode,a parametering fault is present : - Eitehr the loop is too big - Or the tripping coefficient is too big
115	**MISSING CALIBRATION FAULT**	When you update from version MVAT V10.05 to V10.06, a calibration sequence is needed
116	**TEMPERATURE CORRECTION ACTIVATED WITHOUT TEMPERATURE SENSOR (CIT)**	Occurs when temperature correction is activated (a value in the field "Deform. Correct." has been entered) and there is no temperature circuit, OR the card has been updated from 10.05 version to 10.06 version, and the parameters havn't been send again to the MVAT card. Remark : when the MVAT card is updated from 10.05 version to 10.06 version, a full downloading is needed from Rhapsodie.Net.
117	**TEMPERATURE CORRECTION FAULT**	Occurs when temperature correction is activated (a value in the field "Deform. Correct." has been entered) and the frame deformation calculated with the actual temperature is too high.
118	**INCREMENTAL FORCE MODE FAULT**	When the Incremental Force mode is used : - the type of cycle has to be "Insertion" (logically, Rhapsodie doesn't allow to do otherwise) - the incremental Force mode has been used on the 1st cycle of the sequence.
119	**LUBRICATION STOP FAULT**	The "Greasing Shut down threshold" (Specifications page, Maintenance tab) is reached, and the "Shut down if threshold reached" checkbox has been checked, then the MVAT stops, and doesn't want to continue. Please proceed to the lubrication of the spindle, then validate by "Greasing Done" button in Rhapsodie, or on the MVAT panel.

17 Analyse des défauts Contrôle Courbe

Le N° de défaut donné dans le bloc résultat fenêtre en 2ème ligne est le N° en 1ère colonne du tableau

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**************************************
 Controle Courbe:Profil  Courbe N0:          57

Numero de defaut courbe : 02
----------------------------------------
Debut Largeur Fixe - Fin Fin Cycle - Mode Inclusion Compression
F 01; Fmax :    216,0 daN; Crb <= Max : OK; Fmin1:    203,9 daN; Crb >= Min : OK

Debut Seuil Croissant - Fin Seuil Croissant - Mode Inclusion Traction
F 02; Fmax :   -117,8 daN; Crb <= Max : OK; Fmin1:   -184,6 daN; Crb >= Min : OK

Debut Seuil Croissant - Fin Largeur Fixe - Mode Moyenne Traction
F 03; FMoyenne:    -64,2 daN;OK
**************************************
```

N° de défaut	***Message sur terminal RS232***	***Description***	***Cause et solution***
1	DEFAUT PARAM DEB > FIN	Défaut paramétrage fenêtre Début > Fin	Défaut contrôle fenêtre marqueurs : le marqueur début déplacement > marqueur fin déplacement : vérifier la programmation
2	DEFAUT SEUIL DEB CROISSANT	Défaut contrôle fenêtre : Seuil de décl. croissant pour le début de la Fenêtre non atteint	Défaut contrôle fenêtre : indique que le seuil d'effort croissant pour le début de la fenêtre n'a pas été atteint. Vérifier la programmation de la zone d'observation, ou la valeur du seuil.
3	DEFAUT SEUIL DEB DECROISSANT	Défaut contrôle fenêtre : Seuil de décl. décroissant pour le début de la Fenêtre non atteint	Défaut contrôle fenêtre : indique que le seuil d'effort décroissant pour le début de la fenêtre n'a pas été atteint. Vérifier la programmation de la zone d'observation, ou la valeur du seuil.
4	DEFAUT SEUIL FIN CROISSANT	Défaut contrôle fenêtre : Seuil de décl. croissant pour la fin de la Fenêtre non atteint	Défaut contrôle fenêtre : indique que le seuil d'effort croissant pour la fin de la fenêtre n'a pas été atteint. Vérifier la programmation de la zone d'observation, ou la valeur du seuil.
5	DEFAUT SEUIL FIN DECROISSANT	Défaut contrôle fenêtre : Seuil de décl. décroissant pour la fin de la Fenêtre non atteint	Défaut contrôle fenêtre : indique que le seuil d'effort décroissant pour la fin de la fenêtre n'a pas été atteint. Vérifier la programmation de la zone d'observation, ou la valeur du seuil.
6	DEFAUT DEB > DEB PLAGE	Défaut début fenêtre contrôle > Début plage enregistrement	Défaut contrôle fenêtre : La consigne dans le cas d'un début de la plage d'enregistrement positif : une des cotes de la fenêtre est supérieure à la cote début enregistrement
7	DEFAUT MARQUEURS PLAGE	Défaut marqueur plage enregistrement	Défaut plage enregistrement : Aucun marqueur de fin de plage d'enregistrement
8	DEFAUT DEB > FIN	Défaut début fenêtre contrôle > fin fenêtre contrôle ou fin plage enregistrement	Défaut contrôle fenêtre : le marqueur du début de la fenêtre de contrôle est supérieur au marqueur de fin de la fenêtre ou de la plage d'enregistrement. Vérifier votre programmation.

9	DEFAUT FCTRL HORS PLAGE	Défaut fenêtre contrôle en dehors de la plage d'enregistrement	Défaut contrôle fenêtre : les marqueurs de la fenêtre de contrôle calculés sont en dehors de la plage d'enregistrement. Vérifier la programmation par rapport à l'exécution physique.
10	DEFAUT FCTRL PRECED ABSENTE	Défaut Fenêtre de Contrôle précédente n'existe pas	Défaut fenêtre de contrôle : une fenêtre de contrôle doit être positionnée par rapport à la fenêtre de contrôle précédente, mais cette fenêtre de contrôle est soit non positionnée, soit absente.
11	DEFAUT FCTRL SUIVANT ABSENTE	Défaut Fenêtre de Contrôle suivante n'existe pas	Défaut fenêtre de contrôle : une fenêtre de contrôle doit être positionnée par rapport à la fenêtre de contrôle suivante, mais cette fenêtre de contrôle est soit non positionnée, soit absente.
12	DEFAUT EN NEG, DEB FEN > PLAGE	Défaut en cote négative, le début de la fenêtre de contrôle > plage d'enregistrement	Défaut de consigne de la fenêtre de contrôle : Cas d'une plage d'enregistrement dont la cote de début est négative. On teste si le début de la fenêtre de contrôle n'est pas supérieur au début de la plage d'enregistrement. Vérifier la programmation, et l'exécution physique.
13	DEFAUT FCTRL HORS PLAGE	Défaut fenêtre de contrôle en dehors de la plage d'enregistrement	Défaut contrôle fenêtre marqueurs : La fenêtre de contrôle n'appartient pas à la plage d'enregistrement à laquelle elle est affectée. Vérifier la programmation, et l'exécution physique.
14	RESERVE	Défaut réservé	Défaut non affecté - Réserve
15	DEFAUT INCLUSION STRICTE	Défaut d'Inclusion stricte	En inclusion stricte la fin de la courbe doit être à l'intérieur de la fenêtre de contrôle, sans quoi ce défaut apparait. Si l'inclusion stricte n'est pas nécessaire au process, corriger votre programmation.
16	DEFAUT SEUIL INFL. DEB	Défaut contrôle fenêtre : Seuil de décl. pour une recherche d'inflexion en début de Fenêtre non atteint	Le début de la fenêtre doit être placé par rapport à un changement de pente de la courbe, hors ce phénomène n'a pas été détecté. Vérifier les paramètres de recherche de ce phénomène.
17	DEFAUT SEUIL INFL. DEB	Défaut contrôle fenêtre : Seuil de décl. pour une recherche d'inflexion en fin de Fenêtre non atteint	La fin de la fenêtre doit être placé par rapport à un changement de pente de la courbe, hors ce phénomène n'a pas été détecté. Vérifier les paramètres de recherche de ce phénomène.
18	NON DISPONIBLE	Défaut non disponible	Défaut non affecté - Réserve
19	DEFAUT CALCUL SEUIL REGRESS	Défaut contrôle fenêtre : le calcul du seuil par régression linéaire est en dehors de la plage d'enregistrement	Le début de la fenêtre doit être placé par rapport au calcul de la cote de départ par régression linéaire entre le début et la fin de zone d'observation. Or ce calcul donne un départ en dehors de la plage d'enregistrement. Vérifier les paramètres de recherche de ce phénomène par rapport à l'exécution physique.
20	DEFAUT SENS REGRESS	Défaut contrôle fenêtre : le sens de le régression Linéaire est négatif	Le début de la fenêtre doit être placé par rapport au calcul de la cote de départ par régression linéaire entre le début et la fin de zone d'observation. Or la force en fin de zone d'observation est inférieure à la force en début de cette zone, ainsi le sens de régression est négatif. Vérifier les paramètres de recherche de ce phénomène par rapport à l'exécution physique.
21	DEFAUT POSITION FEN PRECED	Défaut contrôle fenêtre : la position de la fenêtre précédente n'a pas pu être établie	Défaut fenêtre de contrôle : une fenêtre de contrôle doit être positionnée par rapport à la fenêtre de contrôle précédente, mais cette fenêtre de contrôle n'a pas pu être positionnée, par exemple dans le cas d'un seuil.

18 ELECTRICAL DRAWINGS

See the technical folder of the project.