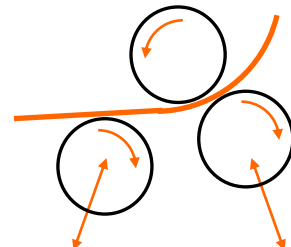




TECHNICAL DESCRIPTION RCS 135 to 360

The RCS bending roll machines are fully symmetrical pyramid type with both side pre-bending capacity and they allow:

- ⇒ **Flexibility and large range of use**
- ⇒ **Easy double pre-bending**
- ⇒ **Optimized lifetime with low maintenance**



1- MACHINE STRUCTURE

1-1 MACHINE FRAME

The rigid bottom frame is made of fabricated profiles which make set-up and machine fixing easier. The technology of machine structure combined with 2 frames guarantee the geometry stability whatever the machine load.

All machine sub-systems are protected by covers ensuring the right protection for the machines as well as the users.

The working height of this machine has been especially designed for running without a pit. (Up to model 350).

STRENGTH → RESISTANCE → SAFETY

1-2 ROLLS

- All our machines are normally fitted with forged steel rolls with selected and identified characteristics.
- The profiling of the rolls can be adapted to user special requests and the final crowning is made in order to better finalize the bending.
- On request, these rolls can also be provided with a polished finish adapted to special work requesting marbling on the material surface.
- On request, the rolls can be surface treated by specific treatment hardness which optimized roll lifetime even in case of bending steel material with very high spring back.
- The different selected treatment process brings surface hardness of the rolls between up to 50 and 60 HRC.

OPTIMISED CROWNING → CAREFUL FINISHING → ADDED LONGEVITY

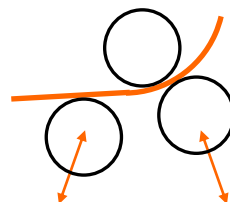


2- MACHINE FUNCTIONS

2-1 ROLLS MOTION

The lower rolls move independently in symmetrical linear slides :

- Each roll displacement is controlled by 2 high pressure two-way hydraulic jacks (one jack on each end).
- The power transmission is direct for a maximum performance.
- Rolls motion is driven by proportional distributors for high accuracy.



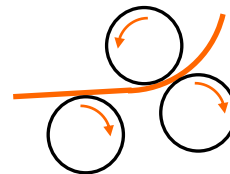
According to the chosen control device, rolls regulation and tilting (conical bending) is carried out by means of hydraulic or electro-hydraulic .

Both systems allow an optimal regulation and avoid any future machine adjustment.

The absence of parts subject to wear reduces at the very least interventions and expense of maintenance.

2-2 ROLLS ROTATION

- Rolls rotation is controlled by very robust hydraulic motors or moto-reducers directly coupled to shaft ends. This direct transmission ensures a maximum efficiency and reliability with an extremely reduced size.
- The direct hydraulic drive enables a perfect control of rolls rotation speed, especially during pre-bending, in order to produce an optimum result.



2-3 HYDRAULIC CIRCUITS

- A pressure limiter controls any excess pressure in the hydraulic circuits in order to assure a total safety operating. Maximum pressure: 200 to 280 bars according to models (2800 to 4000 PSI).
- All hydraulic components are carefully selected in order to have the best performance and reliability (motor, pump, distributors ...).

2-4 LUBRICATION

All machine bearings are lubricated by a central lubrication system with manually operated pump

3 – CONTROL DEVICE

The RCS roll bending machines can be equipped with 2 different types of control system:

- hydraulic control system
- electro-hydraulic control system (with or without numerical control)

The evolutionary design of the control desks of these machines allows the interchangeability between the various control desks.

It is thus possible to move from a simple control with digital displays (option N 12) towards a digital control (option N 13) or a CNC touch-screen control (option N 14) by a simple change of control desk.





3-1 HYDRAULIC REGULATION

Roll bending machines equipped with hydraulic regulation system are developed in order to have the best compromise between price, reliability and performance. This system is especially adapted for small series production.

3.1.1 – Standard machine



• Controls:

The motions are directly driven by hydraulic distributors with progressive flow, manually operated:

- Up / down displacement of front roll
- Up / down displacement of rear roll
- Rotation of the rolls
- Opening / closing of the yoke
(Optional for machine type 135, 150 and 170).

The drives are located on the right frame at the edge of the machine, which provide the operator with an excellent visual control of his work without having to move around.



• Parallelism regulation and tilting of rolls :

Rolls regulation is carried out by means of hydraulic synchronized valves. This system assures a good accuracy and reliability. The tilting angle of the lower rolls is set by hand graduated wheels.

• Position indicators :

During work process, the current positions of each lower roll are indicated on 2 digital displays. These 2 displays are located on the electric box, just in front of the operator.





3.1.2 – Machine with proportional distributors / Control desk with joysticks and digital displays



• **Controls :**

All drives are located on a moving control desk. It provides the operator with a better control of his work with the possibility to move around the machine to check his job.

The rolls motions are driven by proportional hydraulic distributors, operated by accurate proportional joysticks on the control desk:

- Up / down displacement of front roll
- Up / down displacement of rear roll
- Rotation of the rolls



The hydraulic motions of the yoke are actuated by a rotary switch on the control desk (Optional for machine type 135, 150 and 170).

• **Position indicators :**

During work process, the current positions of each lower roll are indicated on 2 digital displays on the control desk.

• **Parallelism regulation and tilting of rolls :**

Rolls regulation is carried out by means of hydraulic synchronized valves. This system assures a good accuracy and reliability. The tilting angle of the lower rolls is set by hand graduated wheels.





3-2 ELECTRO-HYDRAULIC REGULATION – PROPORTIONNAL DISTRIBUTORS



3.2.1 –Control desk with joysticks and graphic display

• Controls :

All drives are located on a moving control desk. It provides the operator with a better control of his work with the possibility to move around the machine to check his job.

- **Optimal control of all machine motions.** The rolls displacement are driven by proportional hydraulic distributors and operated by accurate proportional joysticks on the control desk:
 - Up / down displacement of front roll
 - Up / down displacement of rear roll
 - Up / down displacement of both pre-bending rolls
 - Rotation of rolls

The hydraulic motions of the yoke are actuated by the keypad of the control desk (Optional for machine type 135, 150 and 170).

- **Intuitive interface:**
 - A 28 key-keyboard with pictograms.
 - A fluorescent graphic display





- **Parallelism regulation and tilting of rolls :**

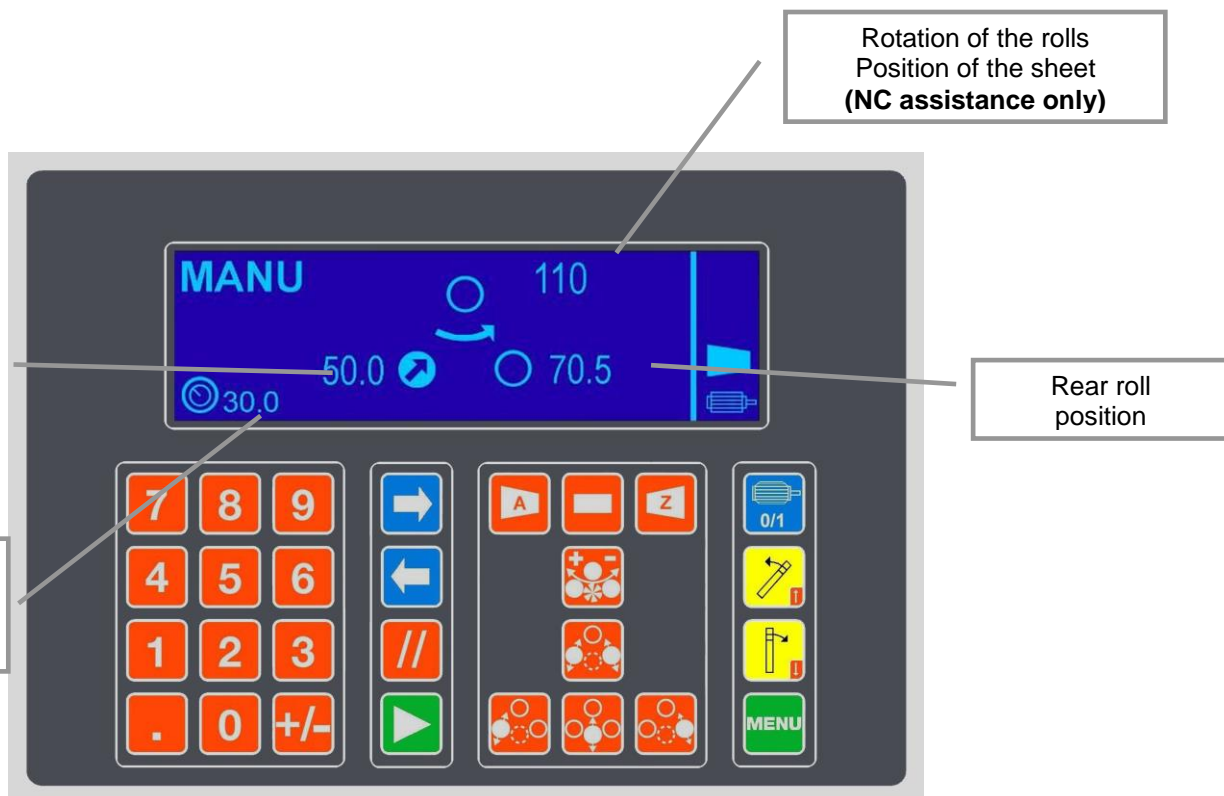
Rolls regulation is carried out by means of electronic boards and calculator:

- The electro-hydraulic regulation assures a **good accuracy and reliability**
- Fast and accurate tilting of the lower rolls for conical bending. The tilting angle is set by a graduated potentiometer on the control desk.

- **Interface description – Manual mode :**

The operator directly drives rolls motions by the 4 proportional joysticks on the control desk:

- The current positions of the lower rolls and the motions in progress are displayed on the screen
- If the machine is equipped with NC assistance, the rotation of the rolls (linked to the position of the sheet) is displayed at the top of the screen.



In manual mode, the tilting of rolls is enabled for conical bending. The tilting angle is set by the cone potentiometer and the current value of the tilting is displayed on the left bottom corner of the screen.



➤ **OPTION – NC ASSISTANCE :**

The NC assistance option is especially made for series production.

With the above electronic equipment, the RCS can be supplied with this system, which controls the bending process of the machine, allowing excellent repeatability of forming by duplication of the process.

In the case of serial part production, the first part is made manually and the numerical control ensures the recording of each stage of the forming process into a program.

A program stage includes:

- positioning of front pre-bending roll
- positioning of rear pre-bending roll
- rotation of the rolls.

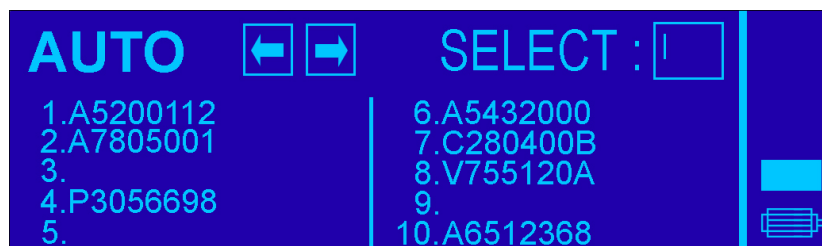
→ The rolls heights define the bending radius
(Depending on sheet material, thickness, width ...)

→ The rolls rotation defines the bent length

After bending the first metal sheet, and having recorded the different program stages, the roll bending machine can run the program and repeat each forming stage automatically.



- **Memory capacity: 500 programs of 50 stages**
- **Management of programs by 14 alphanumeric characters**
- **Selection of the program to run or edit from the list of programs:**



- **Possibility to make a backup of all the programs and machine parameters in a USB flash drive:**





3.2.2 –Control desk with joysticks and NC touch screen



• **Controls :**

All drives are located on a moving control desk. It provides the operator with a better control of his work with the possibility to move around the machine to check his job.

- **Optimal control of all machine motions.** The rolls displacement are driven by proportional hydraulic distributors
 - Up / down displacement of front roll
 - Up / down displacement of rear roll
 - Up / down displacement of both pre-bending rolls
 - Rotation of rolls

The hydraulic motions of the yoke are directly controlled on the touch screen (Optional for machine type 135, 150 and 170).

- **Easy use and optimal ergonomics with the 12 inches touch screen**





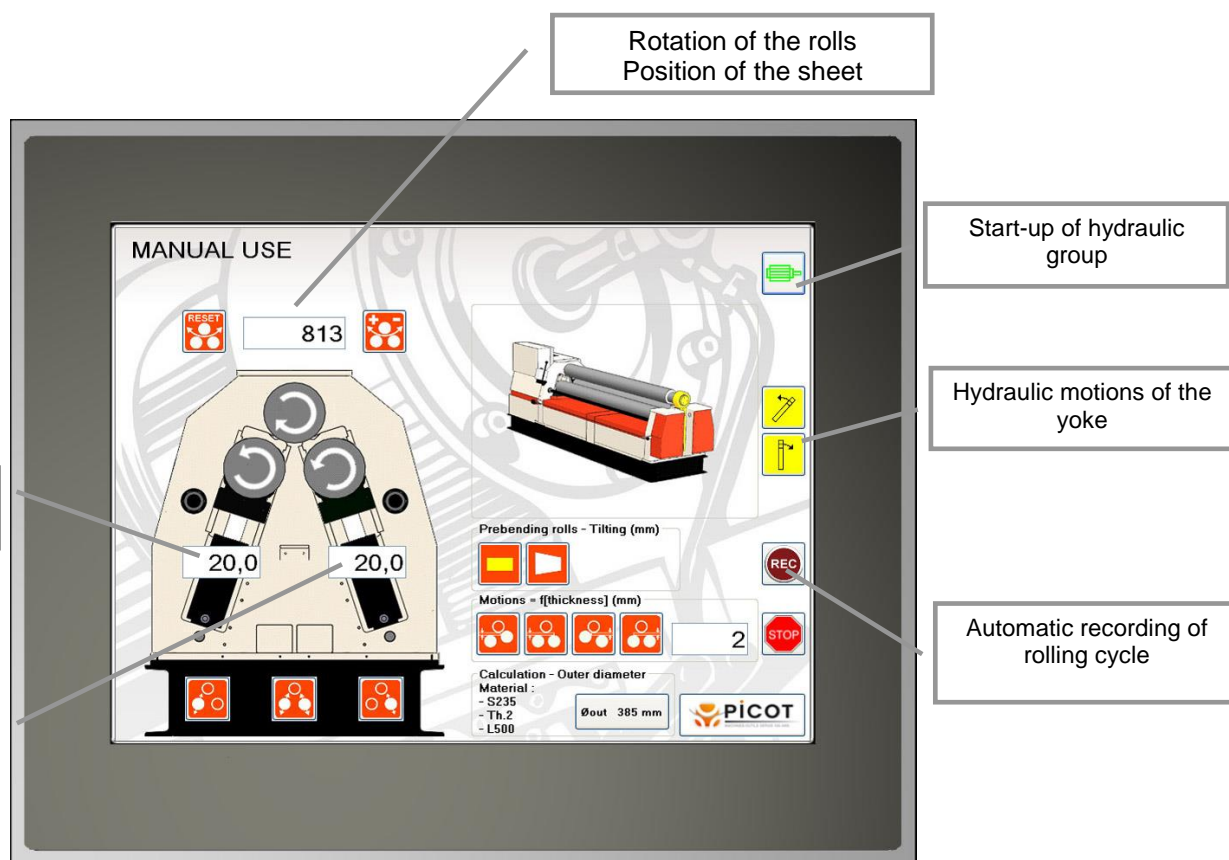
- **Parallelism regulation and tilting of rolls :**

Rolls regulation is carried out by means of electronic boards and calculator:

- The electro-hydraulic regulation assures a **good accuracy and reliability**
- Fast and accurate tilting of the lower rolls for conical bending. The tilting angle is directly set in the tilting cell of the software.

- **Interface description – Manual mode :**

The operator directly drives rolls motions by the 4 proportional joysticks on the control desk or with the available touches on screen:



Rolls motions driven by touches on the screen are automatic motions which allow the operator to go directly to the target position.

The target values of position, tilting or thickness are edited by using the touch screen numerical keypad:



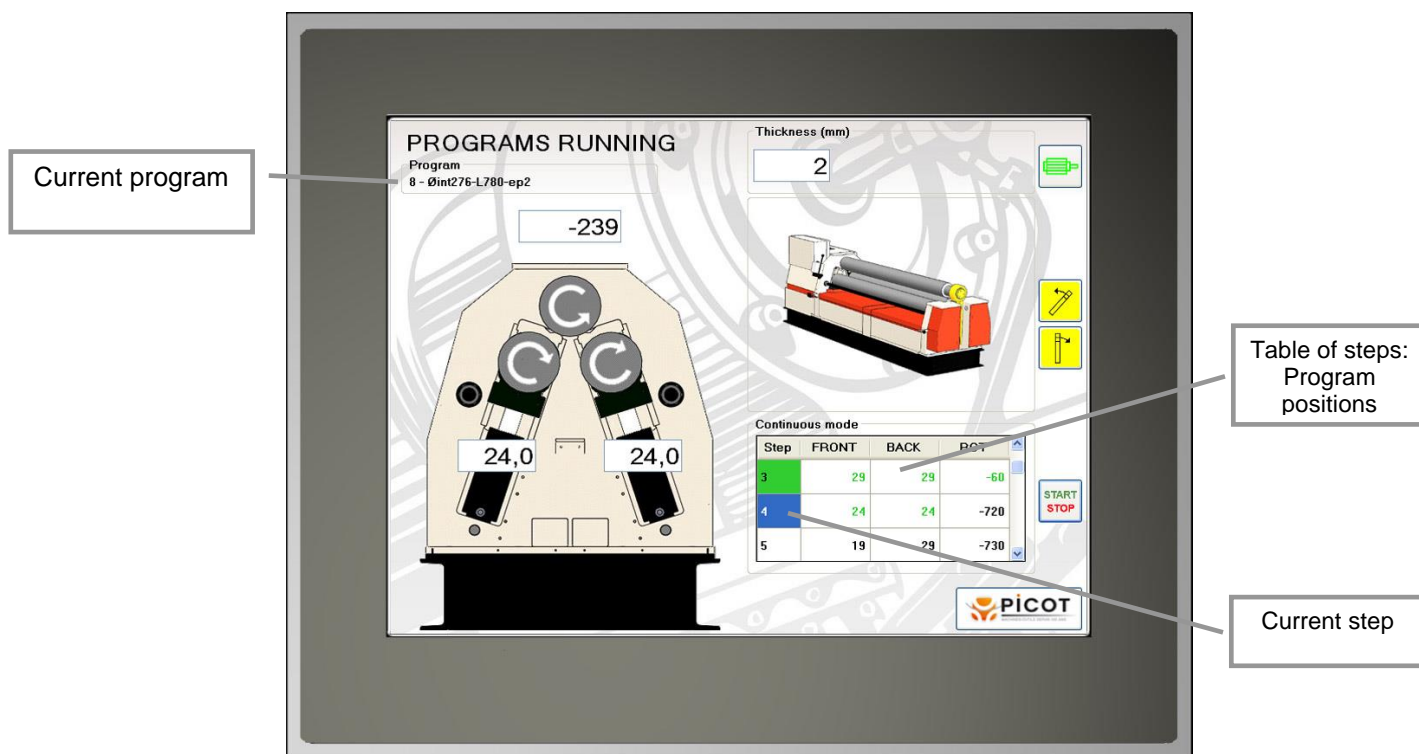
Conical bending :

In manual mode, the tilting of rolls is enabled for conical bending. The tilting angle is directly set in the tilting cell of the software.



- **Interface description – Program mode :**

The NC system is especially made for series production. It controls the bending process of the machine, allowing excellent repeatability of forming by duplication of the process.



Current program

Table of steps: Program positions

Current step

PROGRAMS RUNNING
Program
8 - Øint276-L780-ep2

Thickness (mm)
2

-239

24,0 24,0

Continuous mode

Step	FRONT	BACK	RCY
3	29	29	-60
4	24	24	-720
5	19	29	-730

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In the case of serial part production, the first sheet is made manually: the NC records automatically each stages of the manual forming process into a program.

Every stage of fabrication is memorized in a program step.

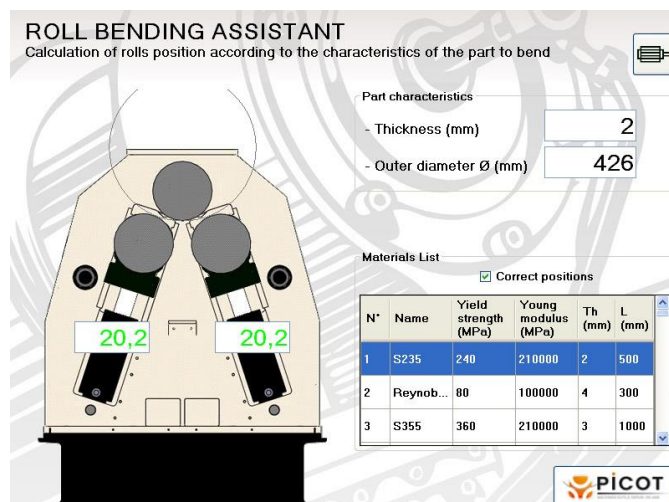
A program step includes:

- Position of front pre-bending roll
- Position of rear pre-bending roll
- Rotation of rolls

The rolls heights define the bending radius
(Depending on sheet material, thickness, width ...)
The rolls rotation defines the bent length

After having recorded the program, the roll bending machine can run the program and repeat each forming stage automatically.

- **Memory capacity: 1000 programs of 100 stages**
- **Management of programs by names and numbers**
- **Roll bending assistant :**
Calculate position according to the characteristics of the part to roll
- **USB flash drive**
Backup of all the programs and machine parameters



ROLL BENDING ASSISTANT
Calculation of rolls position according to the characteristics of the part to bend

Part characteristics

- Thickness (mm)
2

- Outer diameter Ø (mm)
426

Materials List

☒ Correct positions

N°	Name	Yield strength (MPa)	Young modulus (MPa)	Th (mm)	L (mm)
1	S235	240	210000	2	500
2	Reynob...	80	100000	4	300
3	S355	360	210000	3	1000

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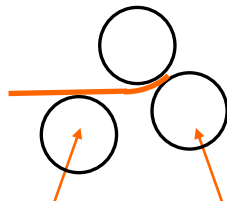
4- ROLL FORMING PROCESS

4-1 PRE-BENDING

The force supplied by the jacks and the symmetrical movement of bottom rolls allow to bend the edges of the sheets easily without handling out. This operation is carried out by clamping the edge of the metal sheet between the top roll and one of the side rolls and by bringing up the second side roll.

According to the operating mode chosen by the operator, the pre-bending operation can be carried out at first or last stage of the forming process.

Flat edges (with mild steel material): about $3 \times e$ (thickness)



4-2 CYLINDERS CALIBRATION

Thanks to their design, PICOT 3 rolls symmetrical bending machines with pre-bending capacity allow to adjust the circling of cylinders after welding.

By tilting up of the bottom rolls in cone or counter cone position, it is possible to improve the roundness of a cylinder made from a sheet which shows thickness variations along the width.

It is also possible to straighten a deformed cylinder by adjusting side rolls tilting up.

4-3 CYLINDER REMOVAL

The opening of the yoke is actuated by a hydraulic jack. On pre-bending machines type RCS 135, 150 and 170, the opening of the yoke is operated manually (hydraulic optional).

The top roll remains in horizontal position during the whole process, the handling operation for the removal of closed parts is made very easy.

4-4 CONE BENDING

To help the sliding of the sheet during the cone bending process, the machine can be equipped with a treated thrust set up under the top roll. It is automatically set up by a hydraulic jack during the closing of the top right bearing, but it is retractable during the opening (except for machines type 135, 150 and 170).

The tilting up of the bottom rolls is obtained by hand wheels or on control desk according to machine types.



5- REGULATION IN FORCE

Our machines are in accordance with European norms and safety regulations (C.E.).





GENERAL CONDITIONS OF SALE

1. Scope

Only the present General Conditions of Sale shall apply to any offer or order of products or services marketed by amb PICOT. Placement of an order for amb PICOT products or services by a customer or distributor implies unreserved acceptance by the latter of the present General Conditions of Sale.

2. Orders

Orders received shall be considered final only after written acceptance by amb PICOT and payment by the customer or reseller of the full amount of all sums involved in the order. Orders forwarded by resellers shall only be binding upon amb PICOT upon written confirmation from the latter.

Quantitative or qualitative changes to an order shall only become effective further to written agreement from amb PICOT.

Orders may only be cancelled with the written agreement of amb PICOT.

In the event of delays in the possibility to receive the equipment, the customer shall so advise amb PICOT at least 15 days before the planned delivery date, and any additional costs resulting from such delay shall be for the customer's account.

amb PICOT may refuse an order in whole or in part if such order should exceed the Company's production capacity and/or prevent it from satisfying the needs of its other customers, and no liability shall attach to the Company as a result of such refusal.

amb PICOT also reserves the right not to accept one or more orders if it should deem that the customer's liquidity resources would lead the Company to expect a full or partial payment default and/or if the order should originate from a customer with whom one or more payment delinquencies had been experienced in the past.

The customer undertakes to provide, together with its order, precise and complete information and documentation, such as nature of the applications, plans, etc. required for fulfilment of the deliverable constituting the subject of the order.

3. Delivery

Deliveries are effected either by direct handover to the customer or by means of an availability advice notice, by delivery at the amb PICOT works to a carrier either designated by the customer or, otherwise, chosen by amb PICOT.

Delivery date information is given as an indication only.

The purchaser may not claim potential delays to cancel the order and/or claim damages.

All freight, insurance, customs, handling, on-site delivery, shall be for the account and at the expense, risk and peril of the purchaser, who shall be responsible for verifying shipments upon arrival and for exercising, if necessary, any relevant recourse against the carrier(s), even if shipment was free. In the event of shipment by the seller, shipment shall be collect [payable by the consignee] or, at the lowest rates, except for explicit request from the purchaser, and, in all cases, under the latter's entire responsibility.

Products shall be unloaded at the place of delivery exclusively under the responsibility of the purchaser and by means of the latter's own handling resources.

The purchaser undertakes to receive the products at the place and on the date stated by amb PICOT. Should the purchaser fail thus to receive the goods, delivery shall be deemed to have taken place on that date for all intents and purposes.

The seller shall be automatically released from any commitment regarding delivery deadlines if the payment conditions have not been met by the purchaser or in the event of a case of force majeure or of events such as: lock-out, strike, epidemic, war, requisition, fire, flood, tooling accidents, scrapping of significant parts during manufacture, disruption or delay in transport or any other cause bringing about a full or partial work standstill for the seller or its suppliers. The seller shall keep the purchaser informed in a timely manner of any such cases or events. Cases of force majeure bringing about a full or partial stoppage or disorganisation of the plants manufacturing the products constituting the subject of orders placed with amb PICOT shall release the latter from the obligation to supply the products whose manufacture is suspended.

Reception of the products prior to shipment, if agreed upon at the time of ordering, shall bring about unreserved acceptance of the pertinent products and shall trigger payment of the amounts stipulated in the terms of payment.

4. Terms of payment

The invoice shall be issued on the date on which the equipment is made available.

Invoices shall be payable to amb PICOT following the terms of payment stipulated on the invoice.

In the absence of special contractual provisions, payment shall be due upon receipt of the invoice.

No early payment or cash discounts shall be granted.

Advances shall always be immediately due and payable.

Payment deadlines may not be extended for any reason whatsoever, even in the event of a dispute. It is hereby explicitly agreed upon that any failure to operate or required repairs in respect to the product shall in no event constitute grounds for non-payment or late payment of the amounts due by the purchaser.

In the event of deferred payments, payments within the meaning of the present clause shall consist in not merely a simple delivery of a bill of exchange or a cheque implying an obligation to pay, but rather in cash payment on the agreed upon due date.

The contract shall be automatically terminated in the event of a default or breach of either party in respect to its obligations within a cure period of eight days following formal notice sent by recorded delivery letter with acknowledgment of receipt.

Any amount not paid by the scheduled due date shall automatically accrue late-payment interest calculated on the basis of the Banque de France Lombard rate increased by 3 points, and this clause shall not affect the fact that the debt is payable.

5. Retention of ownership

Pursuant to Law 80.335 of 12 May 1980, amb PICOT shall retain ownership of the goods delivered until their price is paid in full.

The purchaser nonetheless assumes, from delivery onwards, the risks of loss or deterioration of such goods as well as liability for any damages they may cause.

Failure to pay on the due date may bring about a claim to return of the goods. Any payments on account already made shall remain the property of the seller by way of compensation.

6. Guarantee

The seller guarantees the parts and merchandise it supplies against all manufacturing defects. The seller's guarantee is strictly limited to its own supplies. The seller undertakes to replace, at its cost, in its workshops, any defective part or merchandise.

Except for special contractual conditions, the standard guarantee period is 12 months: In the event of a conflict of guarantees, only the special contractual guarantee conditions shall be admissible and taken into account.

Claims on the guarantee are subject to an explicit written request from the customer, formulated during the guarantee period, and to the prepaid return shipment of the defective supplies.

The guarantee does not cover labour costs (except as otherwise specifically agreed upon) or any costs resulting from disassembly, reassembly, freight and packaging operations.

The guarantee shall not cover any damage resulting from force majeure, normal wear and tear, inappropriate use or any damage due to accidents, negligence, erroneous assembly, repairs carried out by the customer or by a third party or resulting from storage conditions that are incompatible with the nature of the products, or if the commissioning conditions stated in the manufacturer's instructions have not been complied with or implemented in accordance with proper practice.

amb PICOT shall not be held liable for any accidents or incidents resulting from assembly defects or from improper use of its products.

7. Intellectual property rights

amb PICOT shall fully retain all intellectual property rights in regard to its methods, processes and procedures, draughts, designs and documents of all kinds. The customer acknowledges and undertakes to respect all property intellectual rights of amb PICOT. The customer undertakes not to reproduce, or cause to be reproduced, in whole or in part, any patents, trade marks, drawings, designs or models or any other industrial property right owned by or licensed to amb PICOT and/or not to disclose to third parties any information of any nature whatsoever enabling full or partial reproduction of the said rights.

8. Confidentiality

By way of example but not of limitation, the customer undertakes to hold strictly confidential all commercial, technical, financial or legal information concerning amb PICOT of which it may have become aware during the preliminary studies or the performance on the contract of sale. Failure to comply with the present clause may bring about the cessation of the business relationship without prejudice to any damages that may potentially be claimed.

9. Miscellaneous provisions

The fact that amb PICOT may not, at any given time, enforce any given stipulation of the present General Conditions of Sale shall not be interpreted as a waiver of that stipulation in the future.

Any situations not taken into account in the present General Conditions of Sale shall become subject to the application of the *Conditions Générales Intersyndicales de Vente de la Fédération des Industries Mécaniques et Transformatrices des Métaux* [General Interunion Conditions of Sale of the Federation of Mechanical and Metal Transformation Industries].

10. Applicable law and jurisdiction

By explicit agreement, **the exclusive jurisdictional competence is assigned to the Court of Lyon** for all disputes between the parties, regardless of origin and nature, even in the event of multiple defendants.

The entire relationship between the parties shall be exclusively governed by French law. In the event of translation of these presents to another language, the French language text shall prevail.

The present Conditions of Sale shall come into effect on 1 April 2008..