

Fapil SA

Automação de Processos Industriais



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A Fapil fabrica produtos de utilidade doméstica que auxiliem na higiene, limpeza, e arrumação do lar.

Sede:

Rua da Fapil ao Lamarão - Ap. 8 - 2669-909 MALVEIRA

Contacto:

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Produtos:





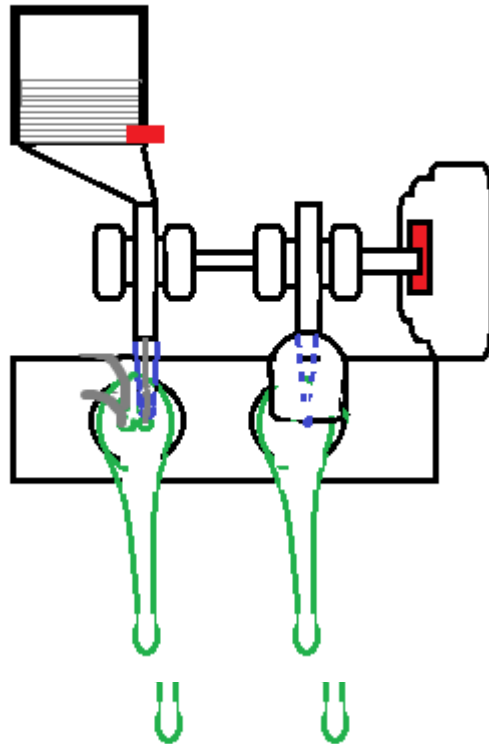
PRODUÇÃO

Máquina de Escovas





Exemplo de Funcionamento



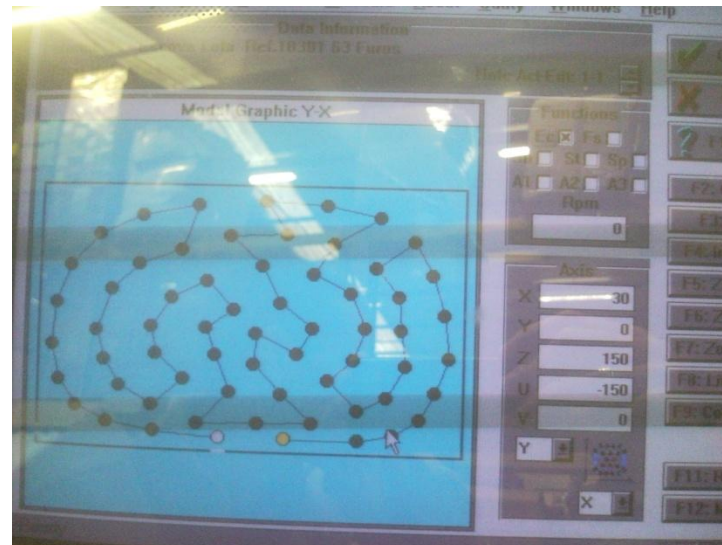
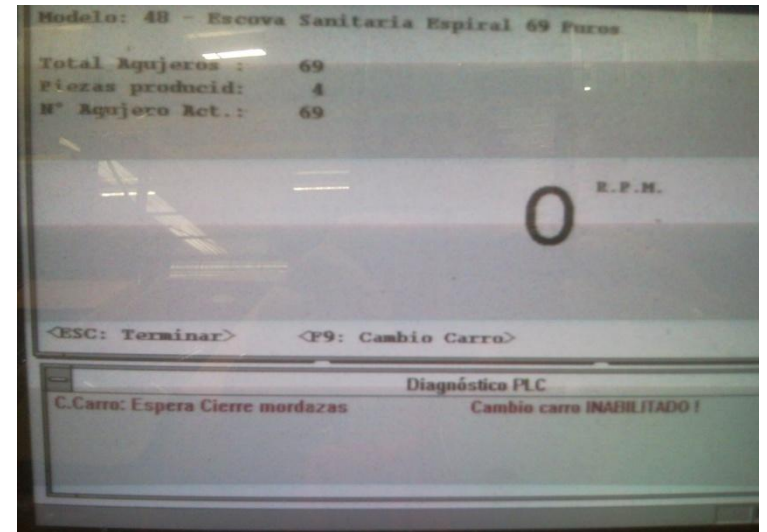
Inputs:

- Sensor de pressão que detecta presença de cepos
- Sensor de presença de monofilamentos
- Sensores segurança
- Sensor de presença de arame
- Coordenadas da furação

Outputs:

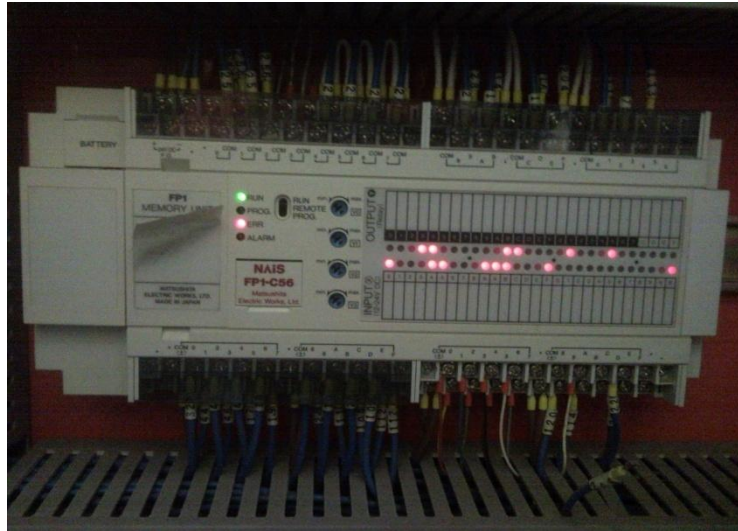
- Motor de perfuração
- Motor de colocação de pelos
- Alarmes de controlo e luzes
- Eixos da base móvel:
 - Horizontal
 - Vertical
 - Transversal

Controlo da máquina



PLC usado

Matsushita
FP1-C56 Series



Linguagens de Programação:

- Ladder logic programming
- Instruction list
- Function block diagram

Programmable using:
IBM compatible AT PC

Type description	C14/ 16	C24 (C)	C40 (C)	C56(C)/ 72(C)
Inputs / Outputs	8/6 8/8	16/8	24/16	32/24 40/32
Max. no. of I/O	54 56 14/40 16/40	104 24/40/40	120 40/40/40	136 152 56/40/40 72/40/40
Processing speed	1,6µs per logical instruction			
Programme capacity	900 Commands	2720 Commands	5000 Commands	
Memory Type	EEPROM	RAM Standard, EPROM and EEPROM plug-in		
Number of Commands				
Basic Commands	41	80	81	
Additional Commands	85	111	111	
Flags	256	1008		
Special Flags	64			
Timers / Counters	128	144		
Data Registers	256	1660	6144	
System Registers	70			
Index Registers	2 words			
Master Control Relays	16	32		
Label (JMP, LOOP)	32	64		
Step ladders	64	128		
Subroutines	8	16		
Interrupts	-	9		
Input time filtering (Selectable)	1 ms to 128 ms			
Pulse Catch Inputs (Selectable)	4	8		
Pulse outputs	1 (45 Hz-4,9 kHz)			2 (Multiplex) (45 Hz-4,9 kHz)
Analogue Timers	1	2	4	
Communications Interface	-	optional 1 RS232C (300 - 19200 Bit/s)		
Real Time Clock	-	available		
Self Diagnosis Functions	Watch-dog-Timer, Back-up Battery Supervision, Syntax Control			

Máquina de Vassouras





Máquina de Esfregonas



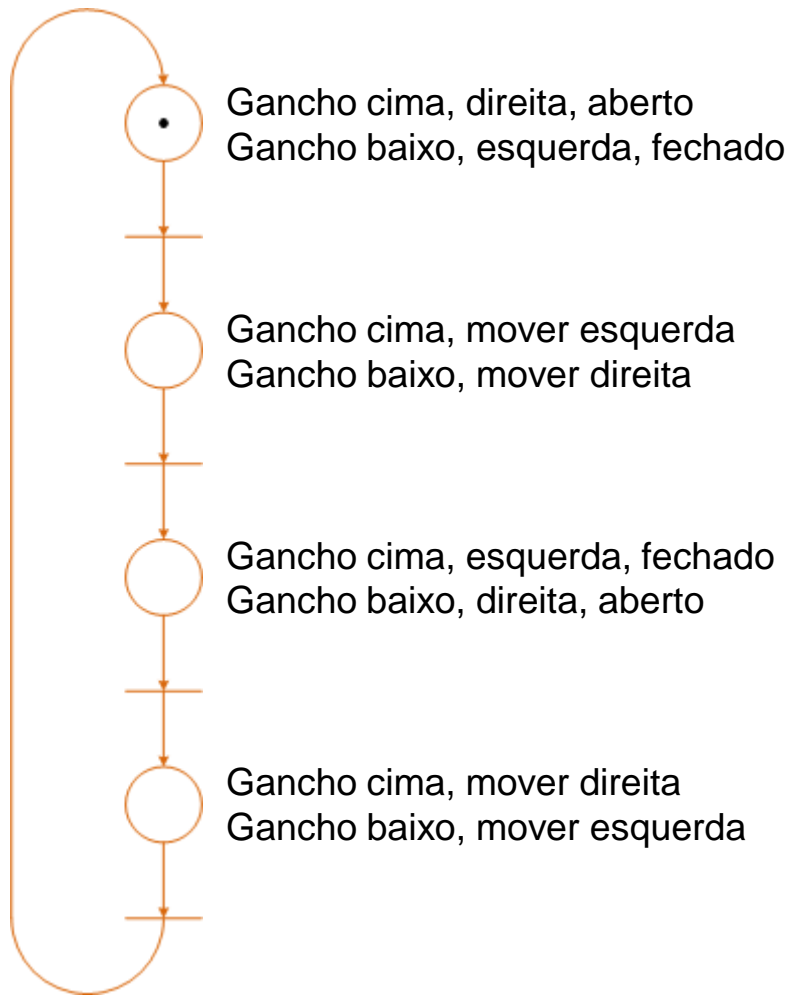


Função de cada estação

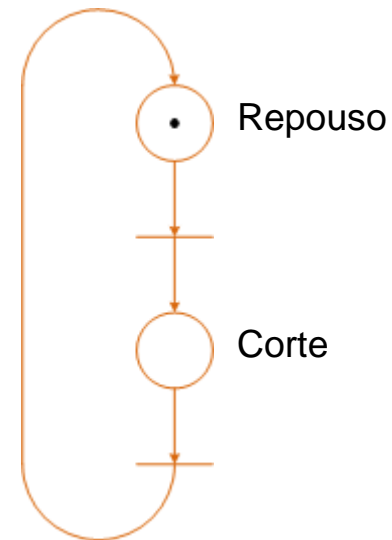
ROBOT	DESCRIÇÃO
Robot 1	Ganchos mecânicos que puxam fios de um conjunto de rolos para a estação de corte
Robot 2	Corta o agregado de fios presentes na estação de corte
Robot 3	Braço mecânico que transfere a esfregona recém cortada para a segunda plataforma de trabalho
Robot 4	Alinha e separa os fios da esfregona
Robot 5	Braço mecânico que puxa a esfregona para estação de empacotamento
Robot 6	Braço mecânico que alinha a esfregona à embalagem
Robot 7	Braço que faz o embalamento da esfregona
Robot 8	Corte e selagem da embalagem
Robot 9	Tapete rolante que transfere o produto final para caixa de despacho

Rede de Petri

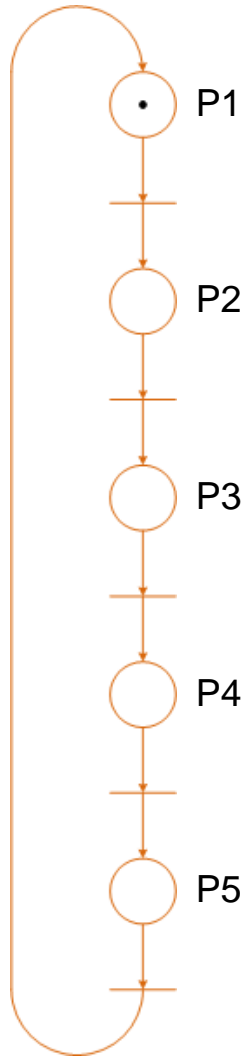
Robot 1



Robot 2

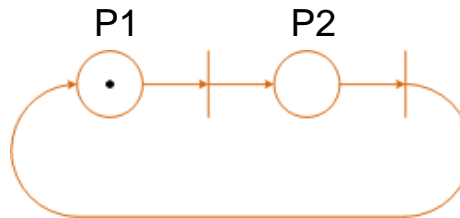


Rede de Petri

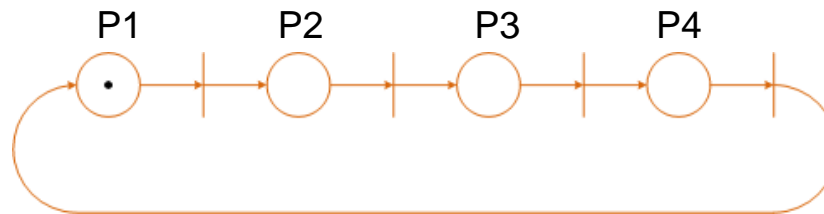


	Robot 3	Robot 5	Robot 7
P1	Repouso	Repouso	Repouso
P2	Agarra	Agarra	Agarra
P3	Movimento para dentro	Movimento para a direita	Movimento para a direita
P4	Solta	Solta	Solta
P5	Movimento para fora	Movimento para a esquerda	Movimento para a esquerda

Rede de Petri

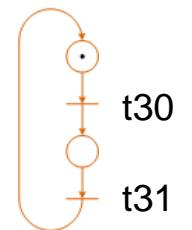
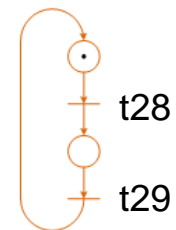
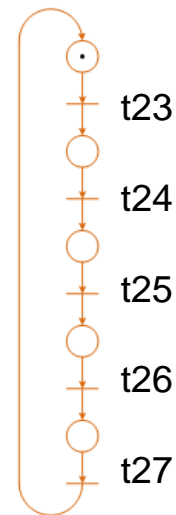
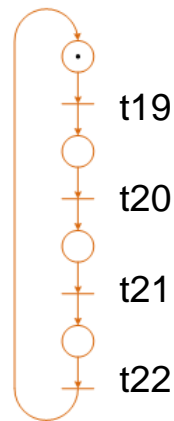
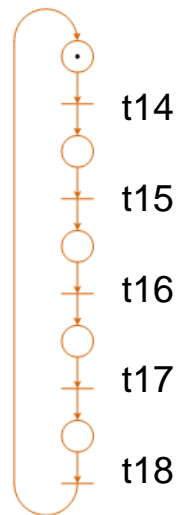
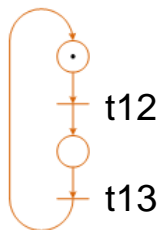
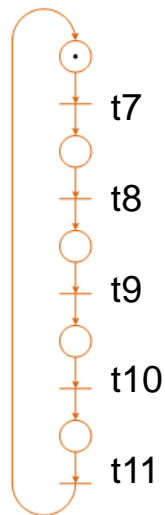
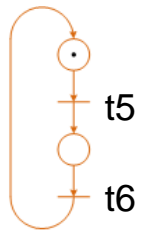
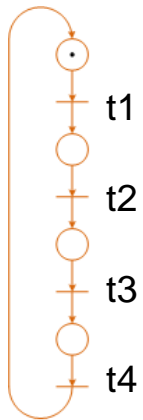


	Robot 4	Robot 8	Robot 9
P1	Repouso	Repouso	Tapete parado
P2	Separa	Corte	Tapete em andamento

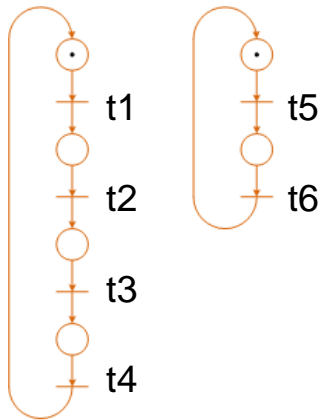


	Robot 6
P1	Solta
P2	Agarra
P3	Movimento para baixo
P4	Movimento para cima

Rede de Petri



Rede de Petri



Restrições:

$$q_5 \leq q_2 + q_4$$

$$q_1 + q_3 \leq q_6$$

$$q_7 \leq q_5$$

$$q_5 \leq q_{11}$$

$$q_{14} \leq q_9$$

$$q_9 \leq q_{18}$$

$$q_{12} \leq q_{15}$$

$$q_{19} \leq q_{16}$$

$$q_{21} \leq q_{18}$$

$$q_{14} \leq q_{22}$$

$$q_{17} \leq q_{20}$$

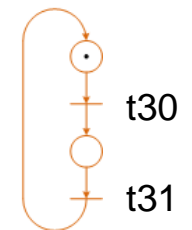
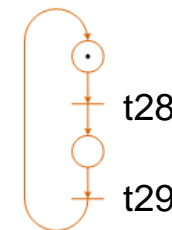
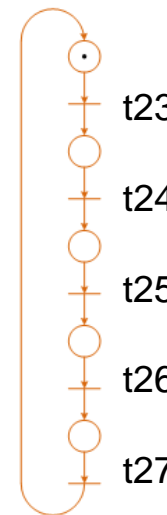
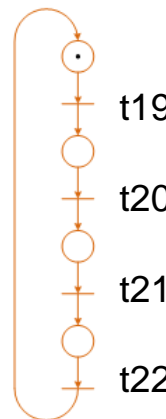
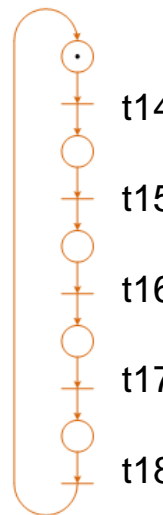
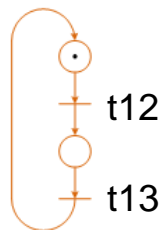
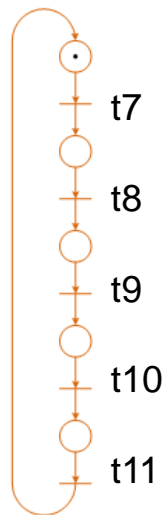
$$q_{23} \leq q_{22}$$

$$q_{22} \leq q_{27}$$

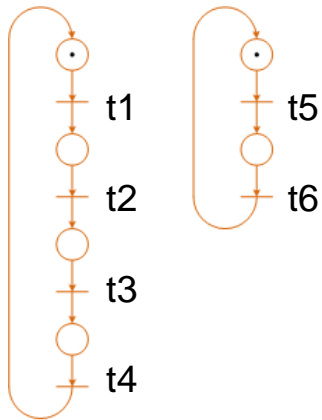
$$q_{28} \leq q_{26}$$

$$q_{24} \leq q_{29}$$

$$q_{30} \leq q_{29}$$



Rede de Petri



Restrições:

$$q5 \leq q2 + q4$$

$$q1 + q3 \leq q6$$

$$q7 \leq q5$$

$$q5 \leq q11$$

$$q14 \leq q9$$

$$q9 \leq q18$$

$$q12 \leq q15$$

$$q19 \leq q16$$

$$q21 \leq q18$$

$$q14 \leq q22$$

$$q17 \leq q20$$

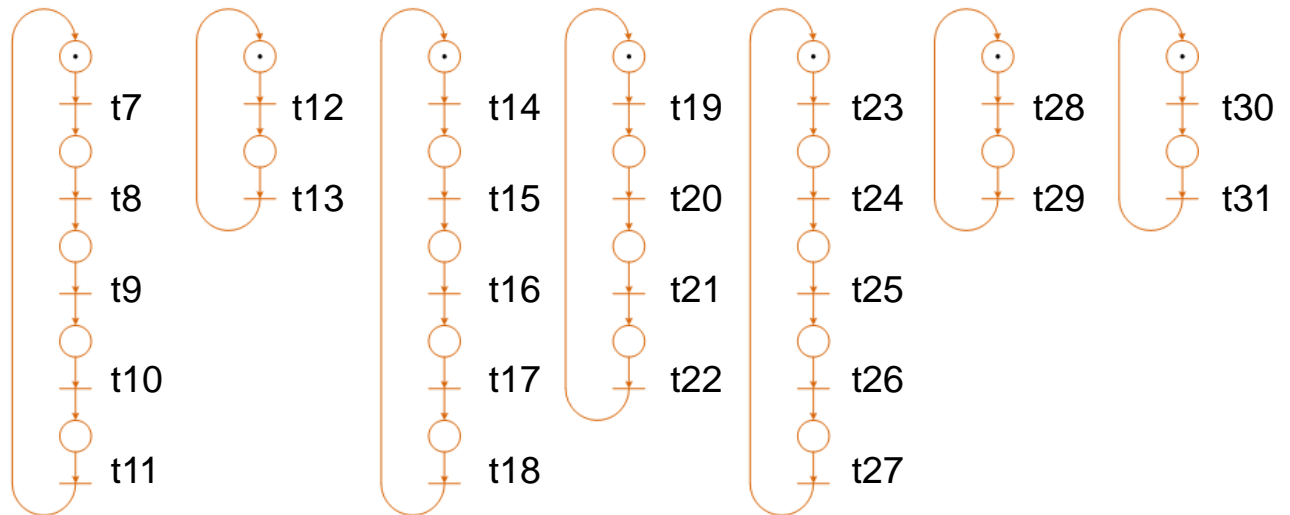
$$q23 \leq q22$$

$$q22 \leq q27$$

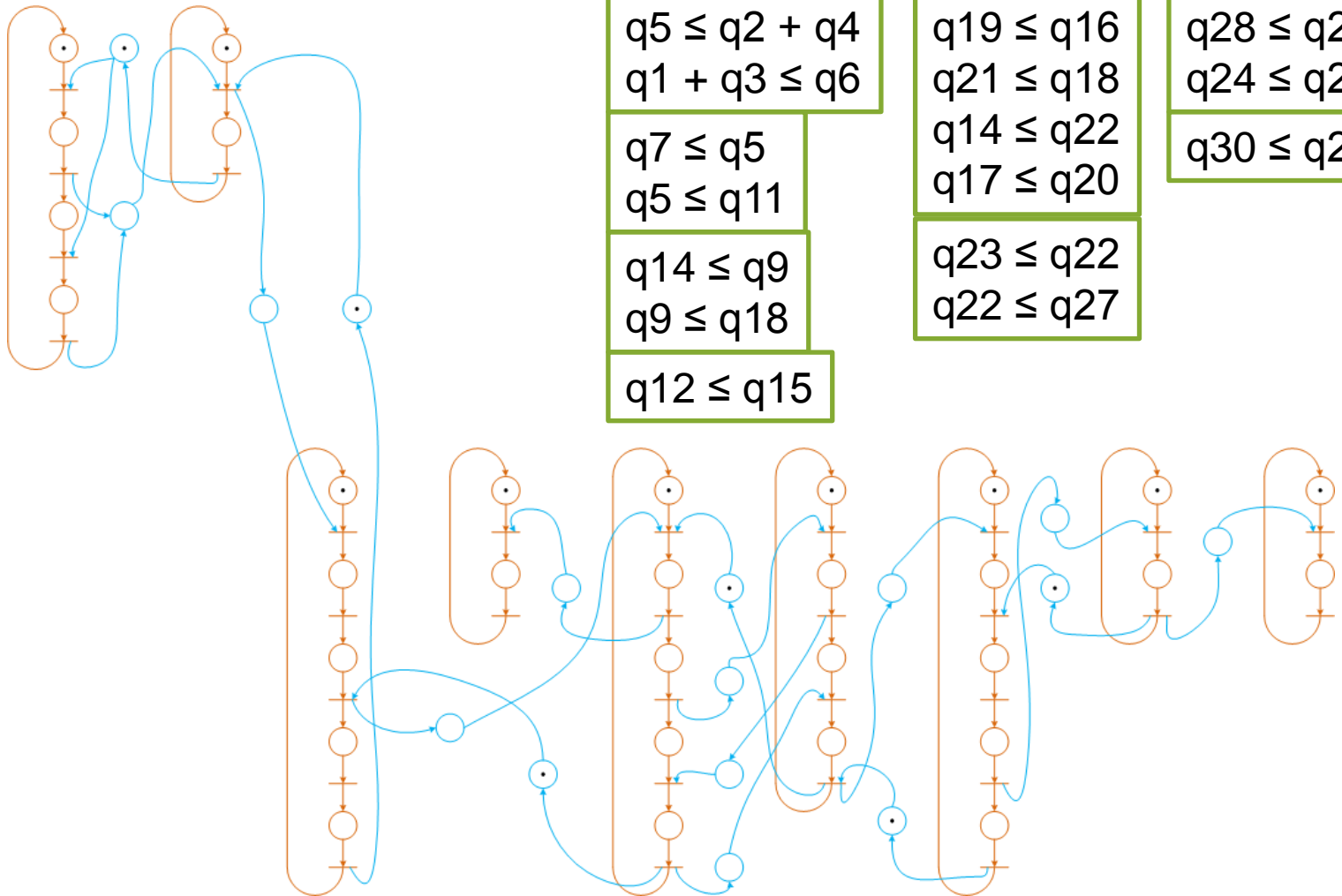
$$q28 \leq q26$$

$$q24 \leq q29$$

$$q30 \leq q29$$



Rede de Petri



Restrições:

$$q5 \leq q2 + q4$$
$$q1 + q3 \leq q6$$

$$q7 \leq q5$$
$$q5 \leq q11$$

$$q14 \leq q9$$
$$q9 \leq q18$$

$$q12 \leq q15$$

$$q19 \leq q16$$
$$q21 \leq q18$$
$$q14 \leq q22$$
$$q17 \leq q20$$

$$q23 \leq q22$$
$$q22 \leq q27$$

$$q28 \leq q26$$
$$q24 \leq q29$$
$$q30 \leq q29$$



- **Elaborado por:**

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- **Com a agradecida colaboração:**

Engenheiro Pedro Teixeira, director da Fapil

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