

# Smart pneumatics, voor (energie)- efficiënt machineontwerp

Quick wins om uw persluchtverbruik te reduceren



Machinebouw

12 december 2023, Congrescentrum 1931

# Voorstel rondje



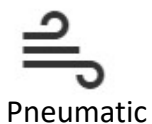
**Lennard van Onselen**  
Product Manager



**Peter Potters**  
Product Manager



# FESTO



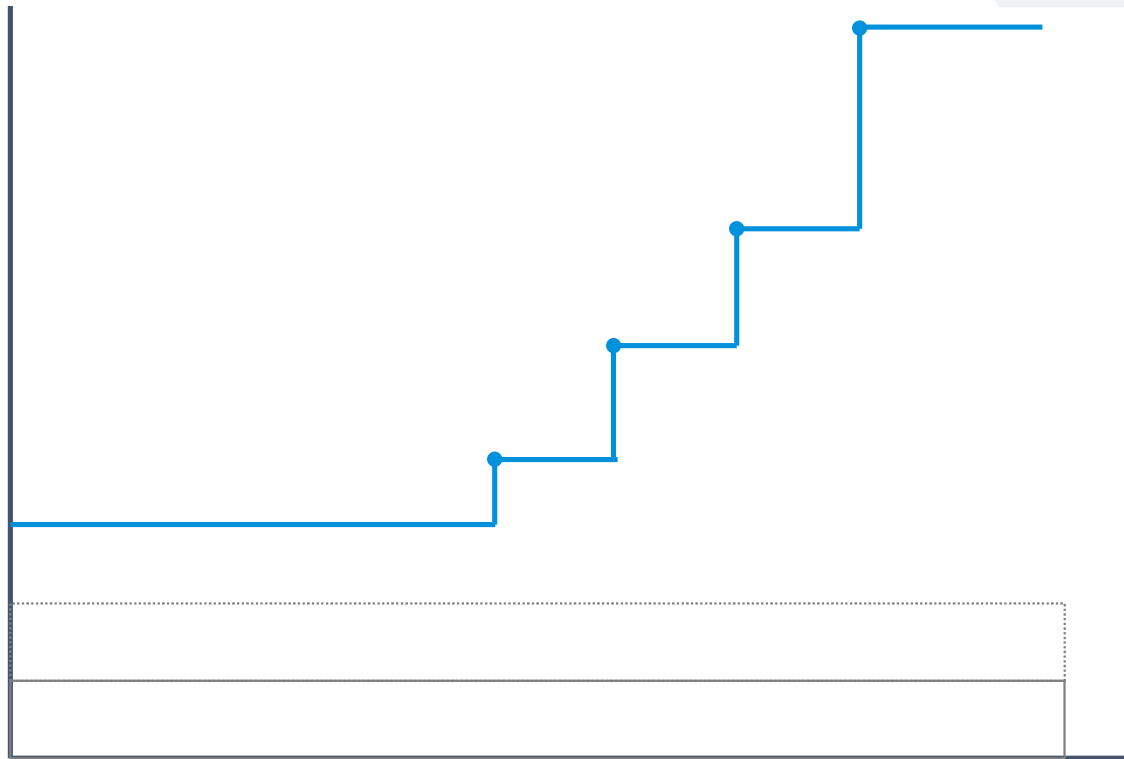
Automation



**Machinebouw**

12 december 2023, Congrescentrum 1931

# Pneumatiek & TCO?



Machinebouw

12 december 2023, Congrescentrum 1931

# Voorbeeldcase



	Cilinders	Slang OD [mm]	Slanglengtes [m]	Cycli [/min]
1376662	DSBC-40-160-PPVA-N3	8	2	20
1376662	DSBC-40-160-PPVA-N3	8	2,5	20
170872	DFM-50-50-P-A-GF	8	3	40
1462834	DSBC-40-550-PPVA-N3	8	2,8	6,6
1463598	DSBC-100-220-PPVA-N3	12	1,8	20
1462834	DSBC-40-330-PPVA-N3	8	1,8	6,6
1376429	DSBC-32-200-PPVA-N3	6	2	20
19251	DSNU-25-200-PPV-A	6	1	40
559284	DSNU-25-50-PPS-A	6	1	40
559285	DSNU-25-80-PPS-A	6	2,6	40
1463254	DSBC-32-550-PPVA-N3	6	3	20



**Dozen vouwmachine**

**Gebaseerd op bestaande machine**

**6 bar**

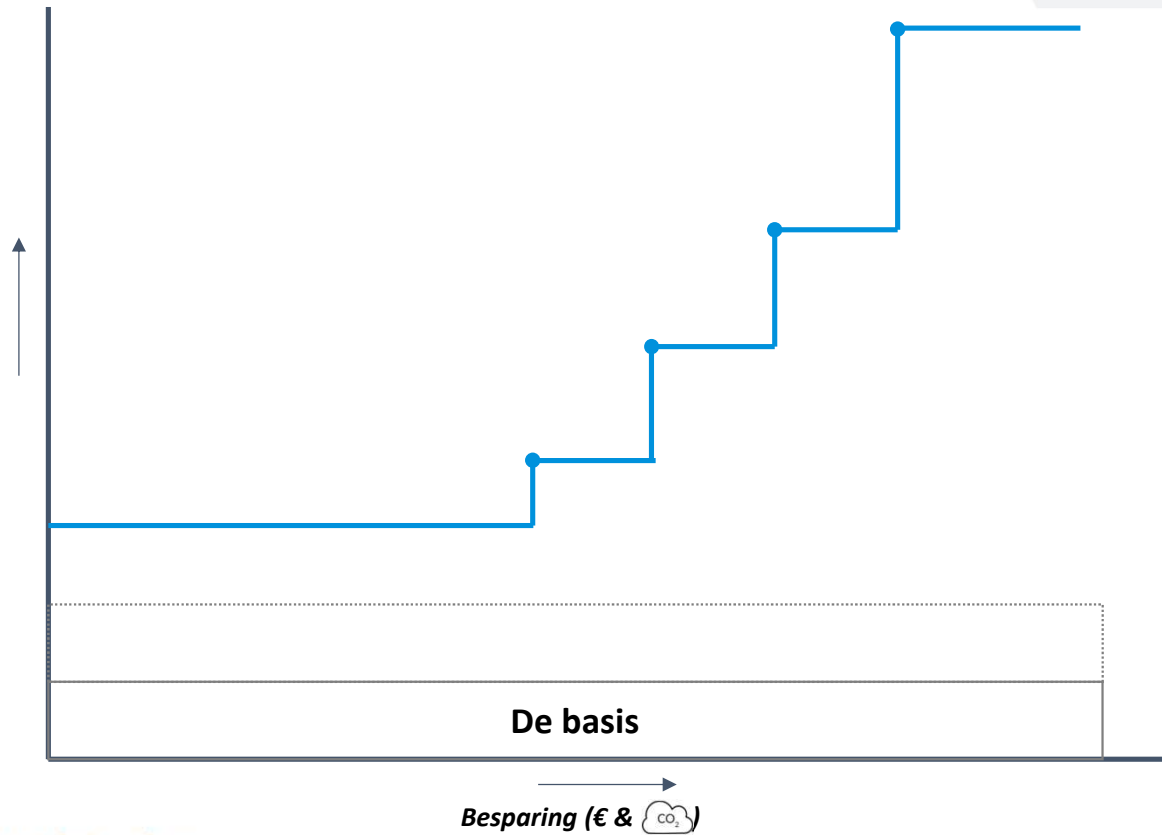
**1049 l/min**



● Machinebouw

12 december 2023, Congrescentrum 1931

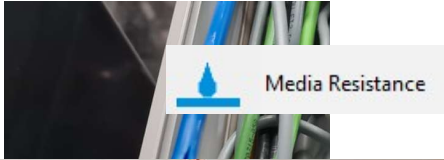
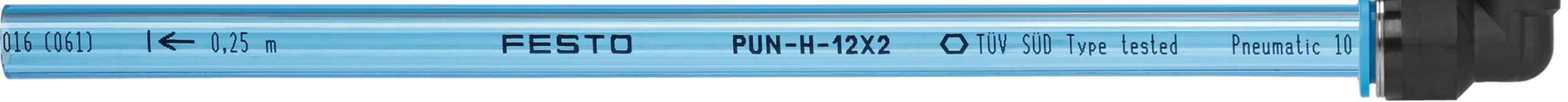
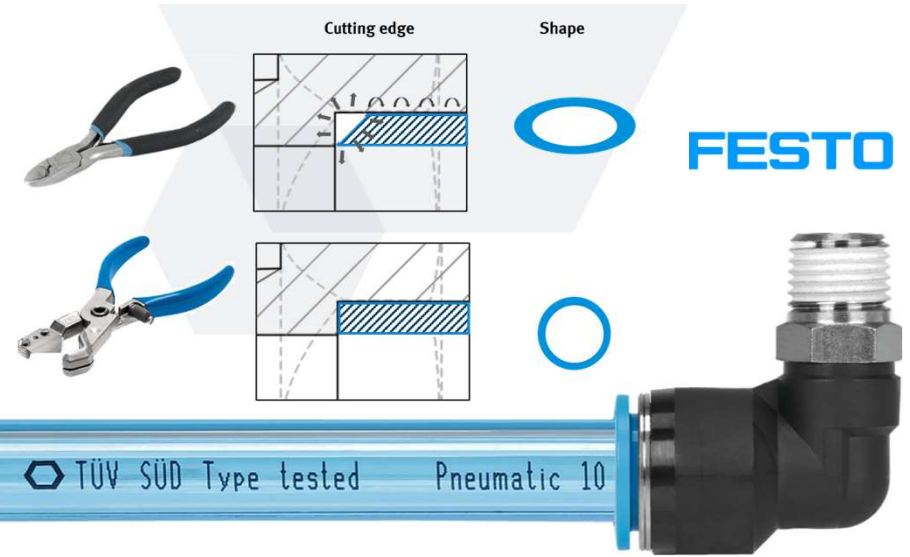
# De basis



● Machinebouw

● 12 december 2023, Congrescentrum 1931

# Kritische selectie



Industry



Environment



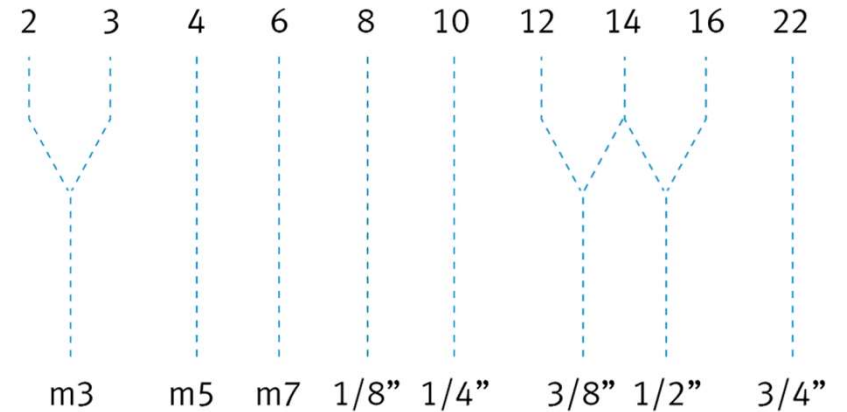
Pressure



Temperature



Features



PUN-H-10X1,5

TUV SUD TYP



Machinebouw

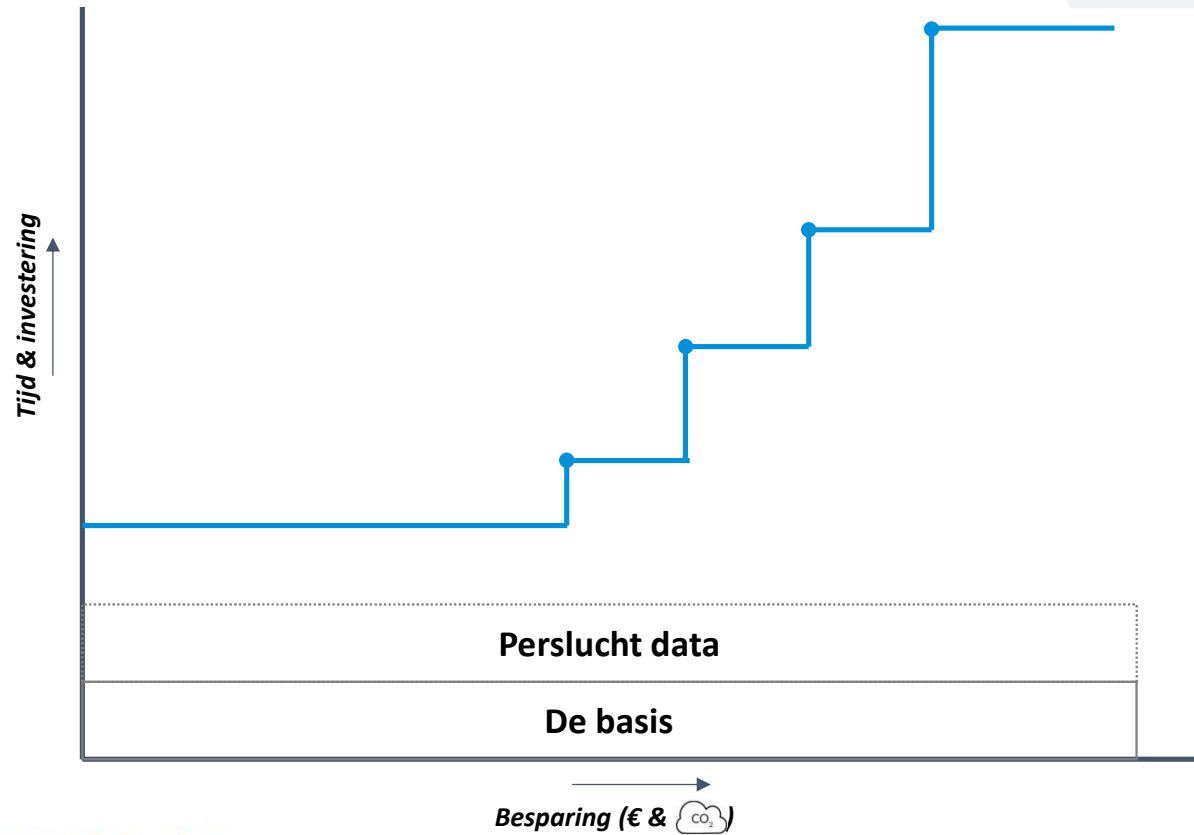
12 december 2023, Congressentrum 1931



# De juiste kwaliteit



# Data is key



Machinebouw

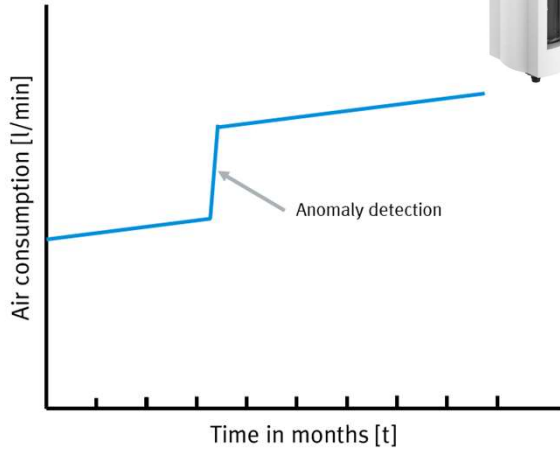
12 december 2023, Congrescentrum 1931



# Meten is weten



Pressure



Flow (rate)



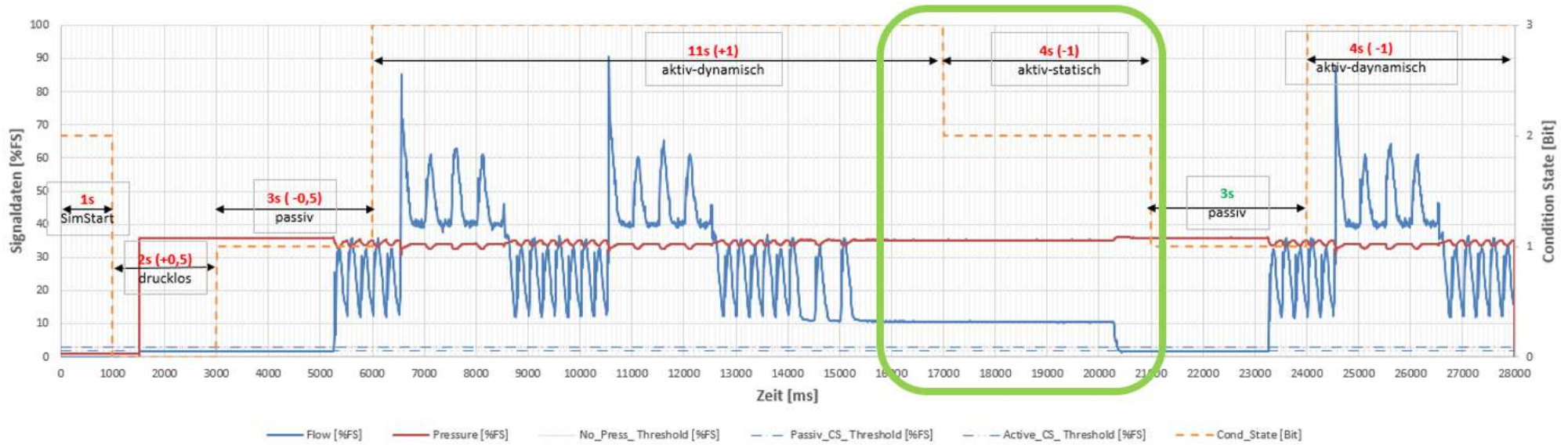
Machinebouw

12 december 2023, Congrescentrum 1931

# Machine status



FESTO



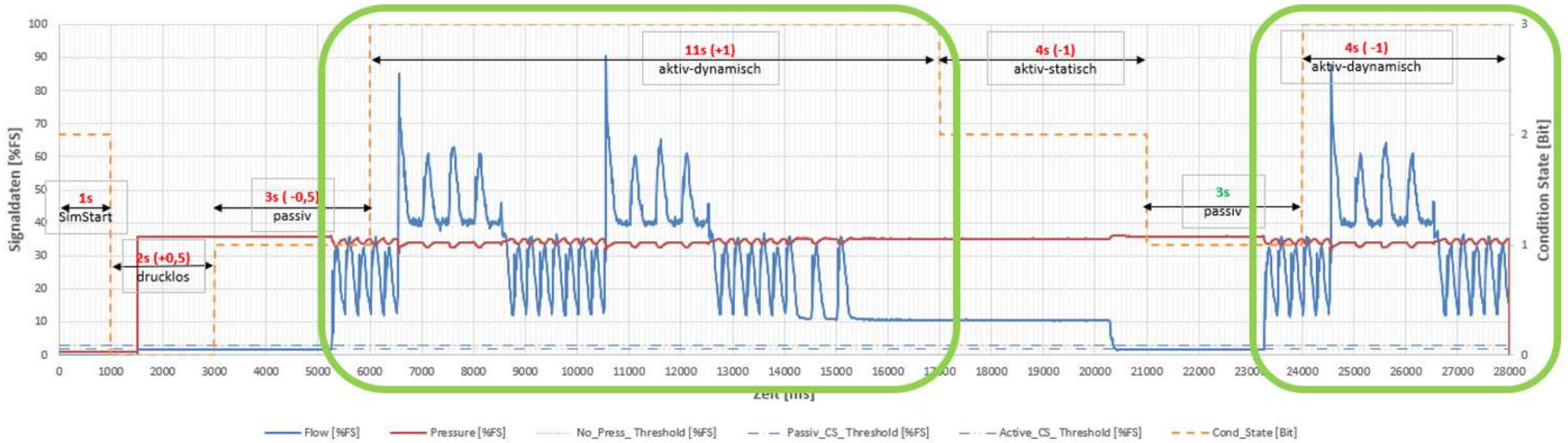
● ● ● Machinebouw

12 december 2023, Congressentrum 1931

# Machine status



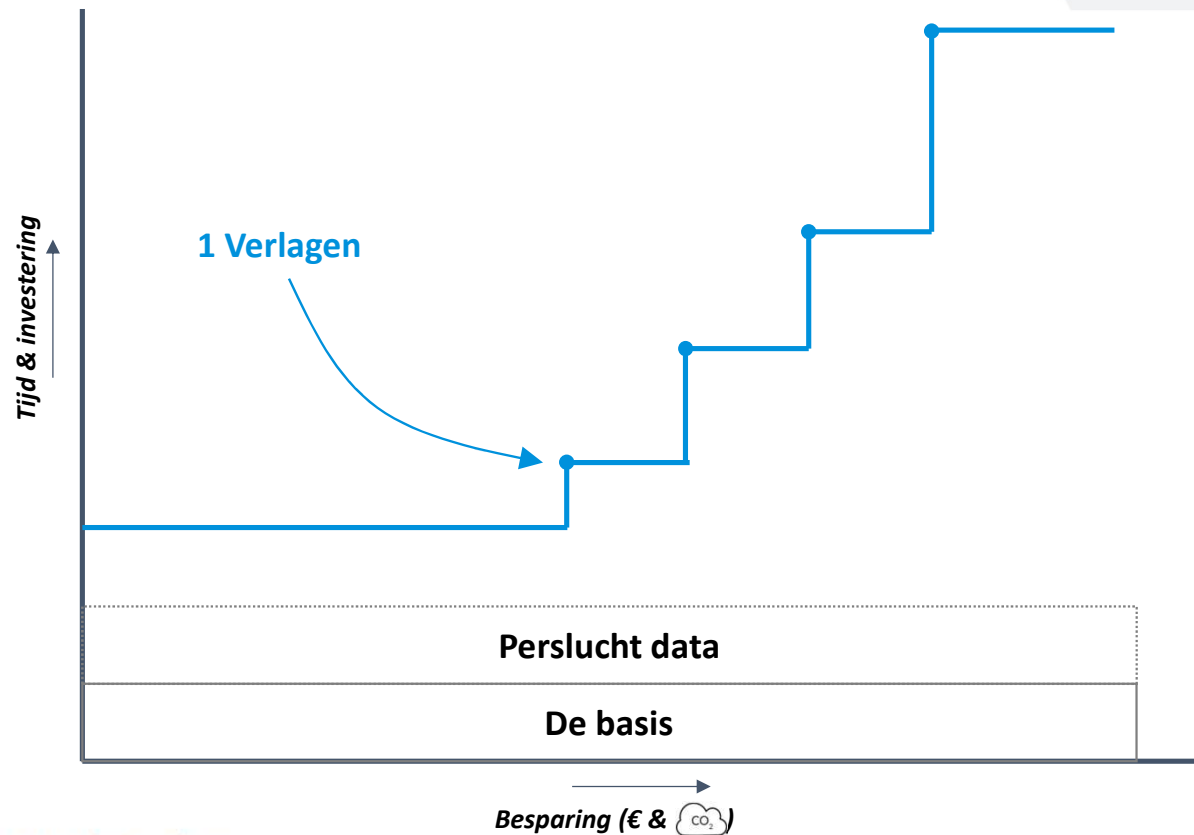
FESTO



● ● ● Machinebouw

12 december 2023, Congrescentrum 1931

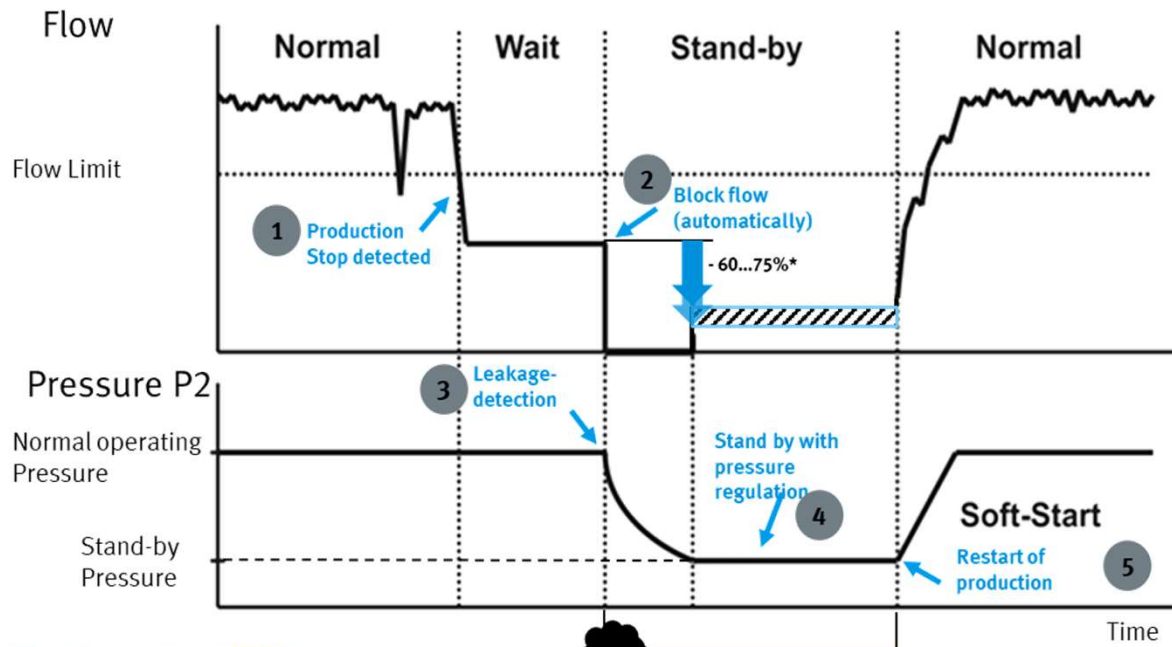
# Is 6 bar écht nodig?



Machinebouw

12 december 2023, Congrescentrum 1931

# No use? No pressure

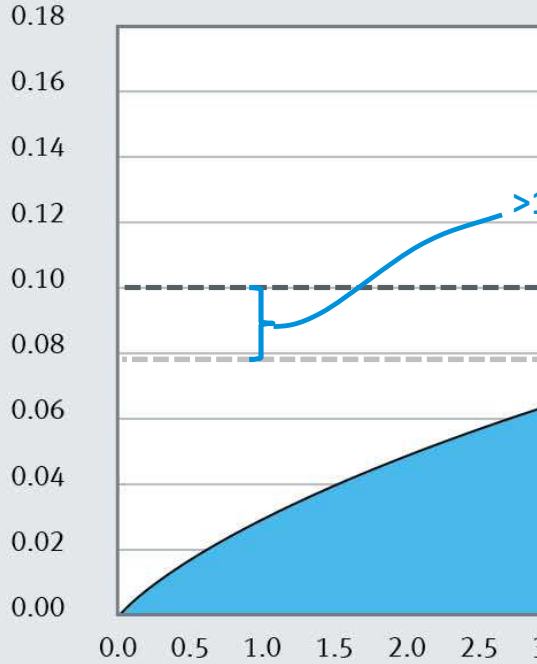


Automatisch afsluiten  
 Standby druk regeling  
 Buscommunicatie  
 Monitor functionaliteit



Specific energy consumption for compressors

[kWh/m³ i.N.]



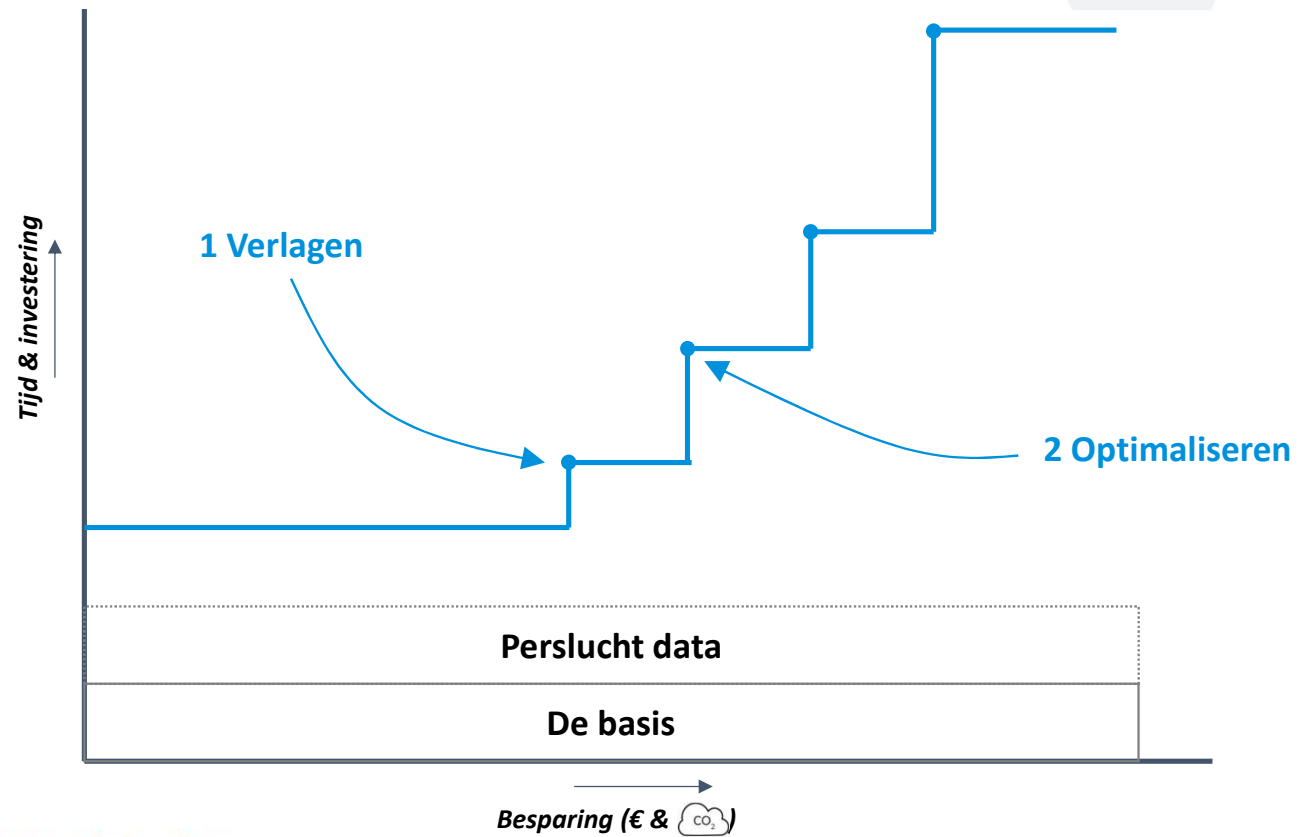
Op. Mode	Size [mm]	Stroke/Length [mm]	Pressure [bar]	Number of cycles [1/min]	6 bar standard		Reduced	
					Air Consumption per Cycle [l]	Air Consumption per Minute [l]	Air Consumption per Cycle [l]	Air Consumption per Minute [l]
double acting	40	160	6	20	2,59	51,79	1,85	37,00
Single tube (single acting)	5.5	2000	6	20	0,29	0,57	0,19	3,80
Single tube (single acting)	5.5	2000	6	20	0,29	0,57	0,19	3,80
double acting	40	160	6	20	2,59	51,79	1,85	37,00
Single tube (single acting)	5.5	2500	6	20	0,36	7,13	0,24	4,75
Single tube (single acting)	5.5	2500	6	20	0,36	7,13	0,24	4,75
double acting	50	50	6	40	1,26	50,58	0,90	36,13
Single tube (single acting)	5.5	3000	6	40	0,43	1,71	0,29	11,40
Single tube (single acting)	5.5	3000	6	40	0,43	1,71	0,29	11,40
double acting	40	550	6	6.6	0,89	58,75	6,36	41,97
Single tube (single acting)	5.5	2800	6	6.6	0,40	2,63	0,27	1,76
Single tube (single acting)	5.5	2800	6	6.6	0,40	2,63	0,27	1,76
double acting	100	220	6	20	23,43	468,69	16,74	334,78
Single tube (single acting)	8	1800	6	20	0,54	10,86	0,36	7,24
Single tube (single acting)	8	1800	6	20	0,54	10,86	0,36	7,24
double acting	40	330	6	6.6	5,34	35,25	3,82	25,18
Single tube (single acting)	5.5	1800	6	6.6	0,26	1,69	0,17	1,13
Single tube (single acting)	5.5	1800	6	6.6	0,26	1,69	0,17	1,13
double acting	32	200	6	20	2,09	41,87	1,50	29,91
Single tube (single acting)	4	2000	6	20	0,15	3,02	0,10	2,01
Single tube (single acting)	4	2000	6	20	0,15	3,02	0,10	2,01
double acting	25	200	6	40	1,26	50,58	0,90	36,13
Single tube (single acting)	4	1000	6	40	0,08	3,02	0,05	2,01
Single tube (single acting)	4	1000	6	40	0,08	3,02	0,05	2,01
double acting	25	50	6	40	0,32	12,64	0,23	9,03
Single tube (single acting)	4	1000	6	40	0,08	3,02	0,05	2,01
Single tube (single acting)	4	1000	6	40	0,08	3,02	0,05	2,01
double acting	25	80	6	40	0,51	20,23	0,36	14,45
Single tube (single acting)	4	2600	6	40	0,20	7,84	0,13	5,23
Single tube (single acting)	4	2600	6	40	0,20	7,84	0,13	5,23
double acting	32	550	6	20	5,76	115,15	4,11	82,25
Single tube (single acting)	4	3000	6	20	0,23	4,52	0,15	3,02
Single tube (single acting)	4	3000	6	20	0,23	4,52	0,15	3,02
					<b>1.049</b>		<b>772,52</b>	
							<b>-36%</b>	

ren

compressors

12.0 12.5 13.0

# It's in the details



Machinebouw

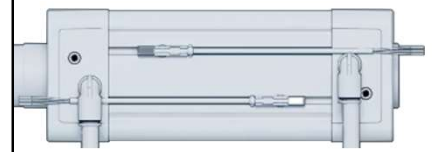
12 december 2023, Congrescentrum 1931

# Return mode

Op. Mode	Size [mm]	Stroke/Length [mm]	Pressure [bar]	Number of cycles [1/min]	6 bar standard		Energy mode (5 bar return)	
					Air Consumption per Cycle [l]	Air Consumption per Minute [l]	Air Consumption per Cycle [l]	Air Consumption per Minute [l]
double acting	40	160	6	20	2,59	<b>51,79</b>	2,42	48,42
Single tube (single acting)	5.5	2000	6	20	0,29	<b>0,57</b>	0,29	<b>0,57</b>
Single tube (single acting)	5.5	2000	6	20	0,29	<b>0,57</b>	0,24	4,75
double acting	40	160	6	20	2,59	<b>51,79</b>	2,42	48,42
Single tube (single acting)	5.5	2500	6	20	0,36	<b>7,13</b>	0,36	7,13
Single tube (single acting)	5.5	2500	6	20	0,36	<b>7,13</b>	0,30	5,94
double acting	50	50	6	40	1,26	<b>50,58</b>	0,12	47,28
Single tube (single acting)	5.5	3000	6	40	0,43	<b>1,71</b>	0,43	1,71
Single tube (single acting)	5.5	3000	6	40	0,43	<b>1,71</b>	0,36	1,43
double acting	40	550	6	6.6	0,89	<b>58,75</b>	8,32	54,92
Single tube (single acting)	5.5	2800	6	6.6	0,40	<b>2,63</b>	0,40	2,63
Single tube (single acting)	5.5	2800	6	6.6	0,40	<b>2,63</b>	0,33	2,20
double acting	100	220	6	20	23,43	<b>468,69</b>	21,81	436,29
Single tube (single acting)	8	1800	6	20	0,54	<b>10,86</b>	0,54	10,86
Single tube (single acting)	8	1800	6	20	0,54	<b>10,86</b>	0,45	9,05
double acting	40	330	6	6.6	5,34	<b>35,25</b>	4,99	32,95
Single tube (single acting)	5.5	1800	6	6.6	0,26	<b>1,69</b>	0,26	1,69
Single tube (single acting)	5.5	1800	6	6.6	0,26	<b>1,69</b>	0,21	1,41
double acting	32	200	6	20	2,09	<b>41,87</b>	1,96	39,11
Single tube (single acting)	4	2000	6	20	0,15	<b>3,02</b>	0,15	3,02
Single tube (single acting)	4	2000	6	20	0,15	<b>3,02</b>	0,13	2,51
double acting	25	200	6	40	1,26	<b>50,58</b>	0,12	47,28
Single tube (single acting)	4	1000	6	40	0,08	<b>3,02</b>	0,08	3,02
Single tube (single acting)	4	1000	6	40	0,08	<b>3,02</b>	0,06	2,51
double acting	25	50	6	40	0,32	<b>12,64</b>	0,30	11,82
Single tube (single acting)	4	1000	6	40	0,08	<b>3,02</b>	0,08	3,02
Single tube (single acting)	4	1000	6	40	0,08	<b>3,02</b>	0,06	2,51
double acting	25	80	6	40	0,51	<b>20,23</b>	0,47	18,91
Single tube (single acting)	4	2600	6	40	0,20	<b>7,84</b>	0,20	7,84
Single tube (single acting)	4	2600	6	40	0,20	<b>7,84</b>	0,16	6,53
double acting	32	550	6	20	5,76	<b>115,15</b>	5,38	107,54
Single tube (single acting)	4	3000	6	20	0,23	<b>4,52</b>	0,23	4,52
Single tube (single acting)	4	3000	6	20	0,23	<b>4,52</b>	0,19	3,77

1.049 982 -7%

Mass in one direction?



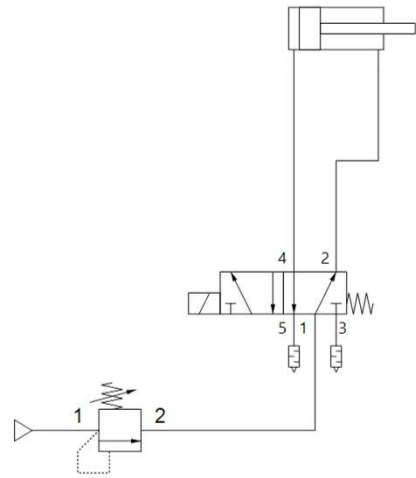
P\*a

7% besparing

6 → 5 bar

>30% besparing

6 → 4 bar



Machinebouw

12 december 2023, Congresscentrum 1931

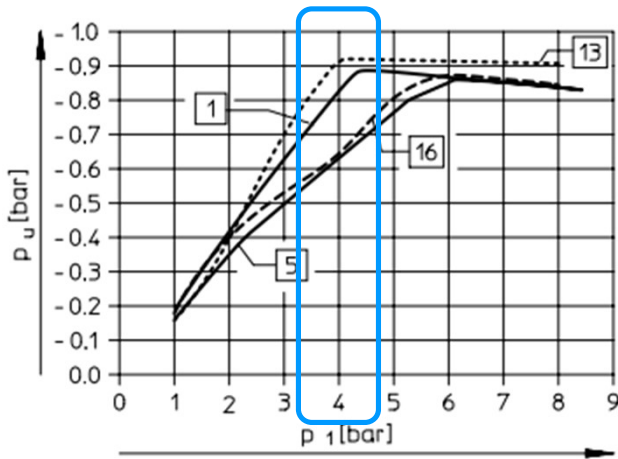


# Vacuüm focus



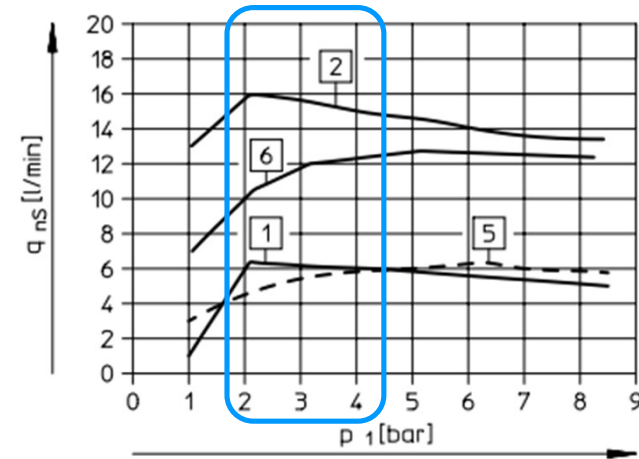
6 → 4 bar

30% besparing  
 Meer kracht  
 Sneller  
 Stiller



Vacuümniveau

als functie van de inlaatdruk



Vacuümflow

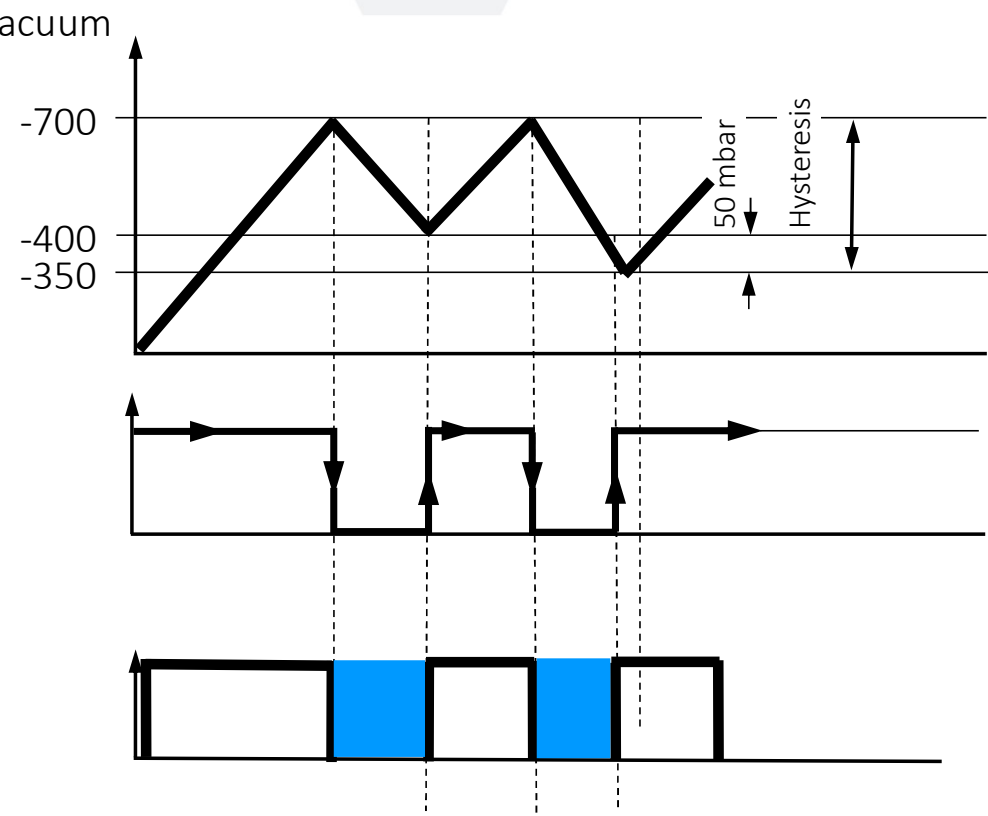
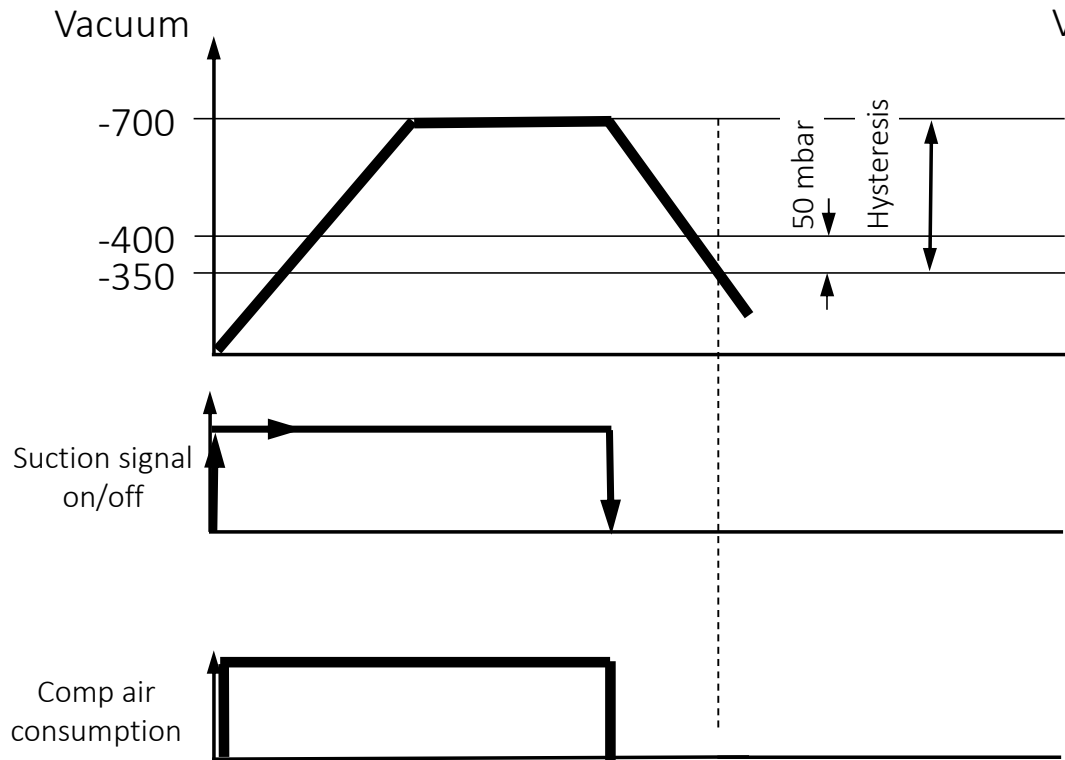
als functie van de inlaatdruk van de perslucht



Machinebouw

12 december 2023, Congrescentrum 1931

# Vacuüm schakelen



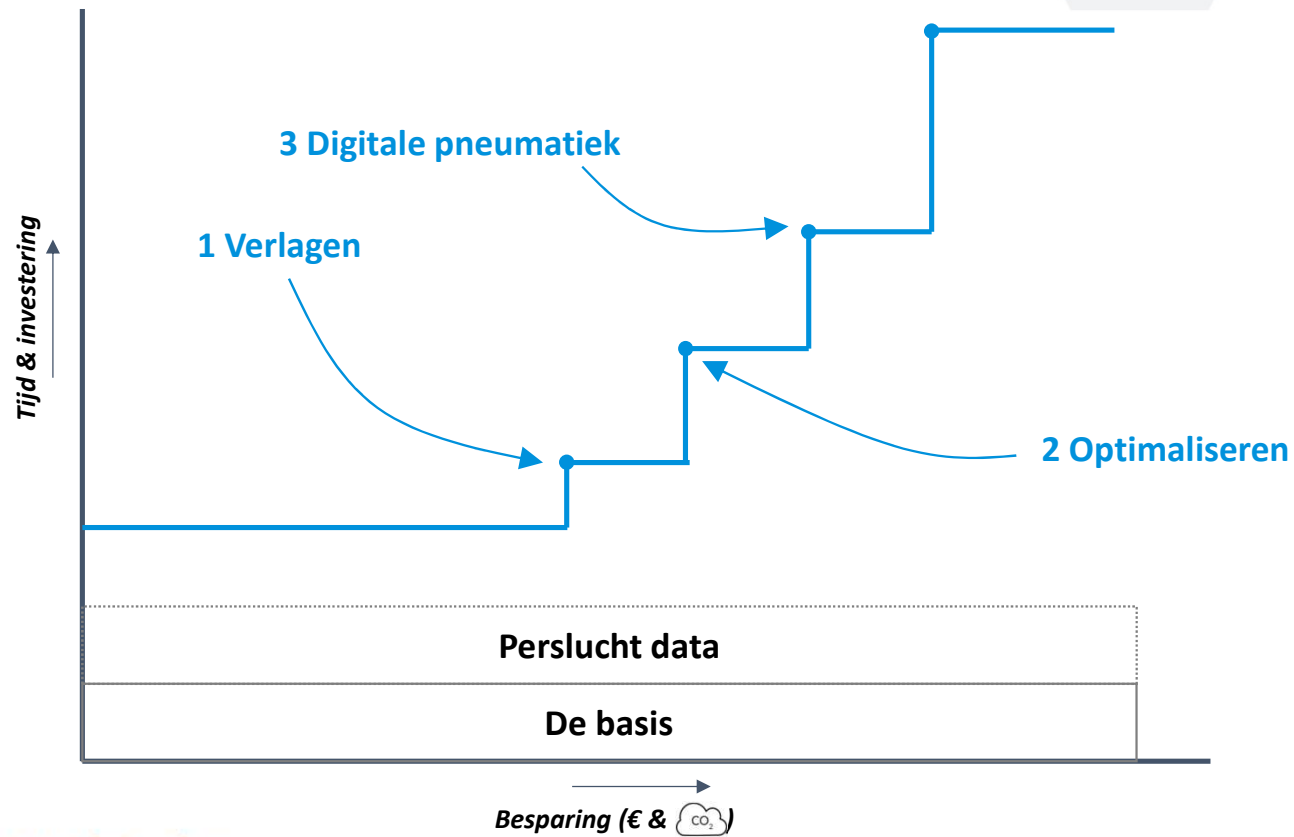
Besparing



Machinebouw

12 december 2023, Congrescentrum 1931

# Efficiëntie + productie



Machinebouw

12 december 2023, Congrescentrum 1931

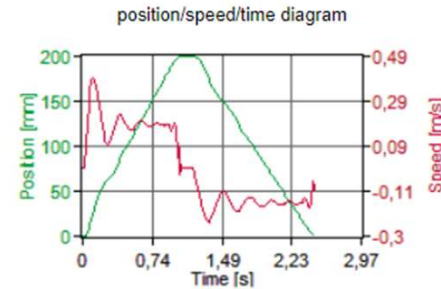
# Gebruik de $\Delta$



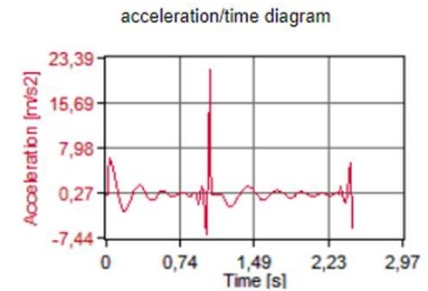
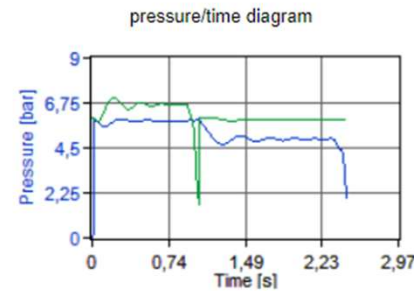
Een dubbelwerkendecilinder beweegt op **drukverschil**  
De kracht is het resultaat van de **absolute** druk

Lucht is **samendrukbaar**, „flexibel“

**Ander gedrag** dan hydrauliek of elektrische aandrijvingen



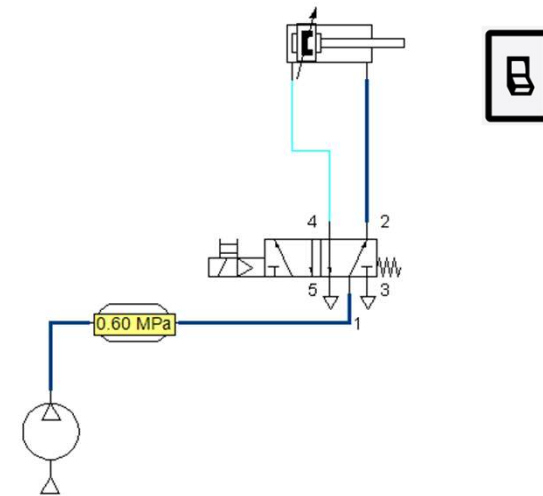
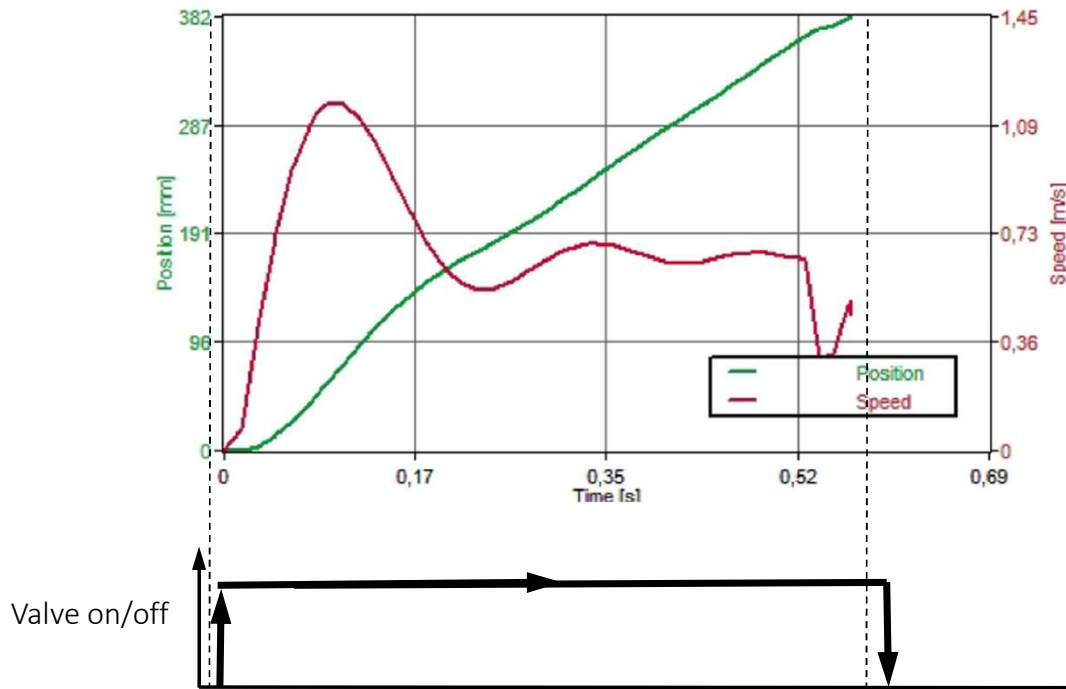
Total positioning time	2.469 s
Average speed	0.080 m/s
Impact speed	-0.109 m/s
Max. speed	0.394 m/s
Kinetic impact energy	0.061 J
Air Consumption per Cycle	2.452 l



Machinebouw

12 december 2023, Congrescentrum 1931

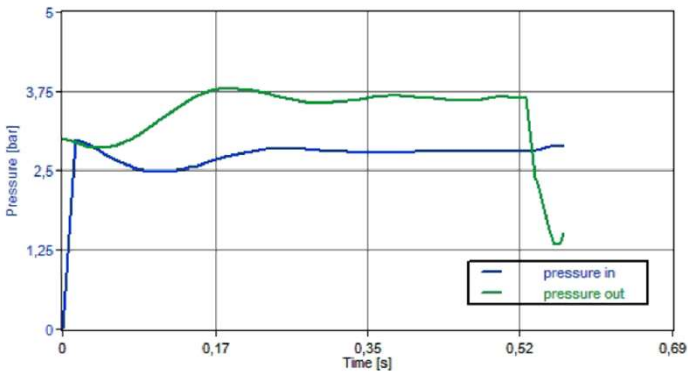
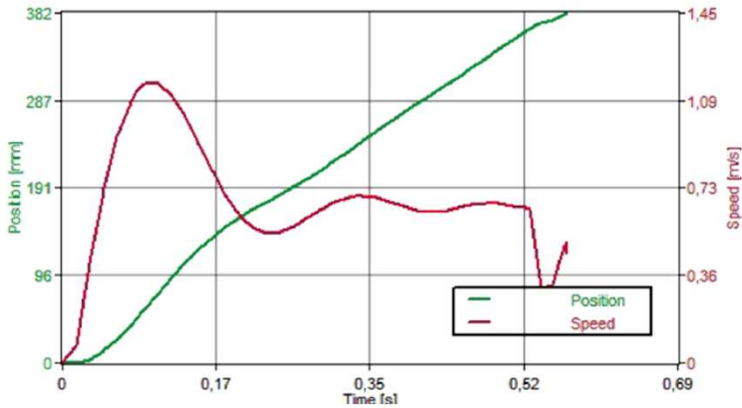
# Van calculatie naar functie



● ● ● Machinebouw

● ● ● 12 december 2023, Congrescentrum 1931

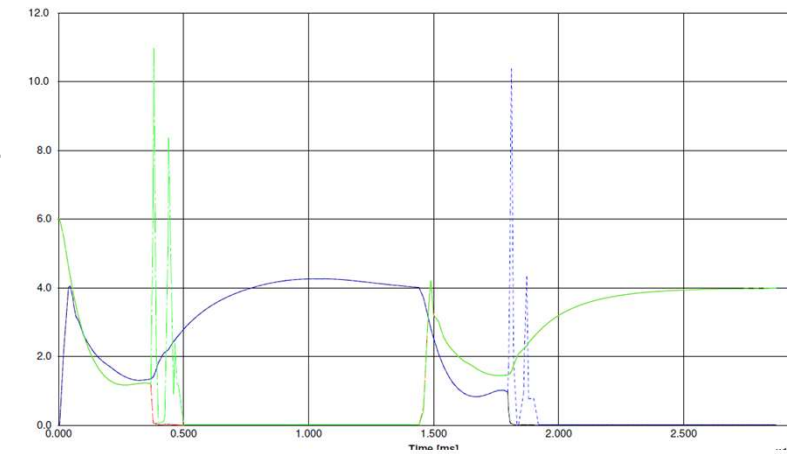
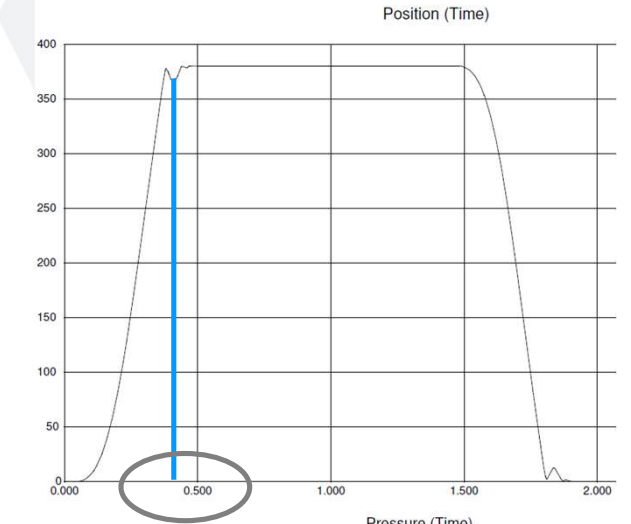
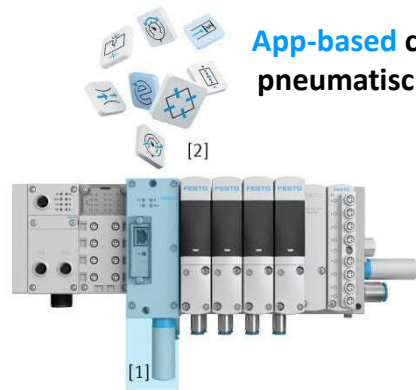
# Slim sturen



↑ Snelheid + gelijk verbruik  
= hogere output + ↓ verbruik/unit

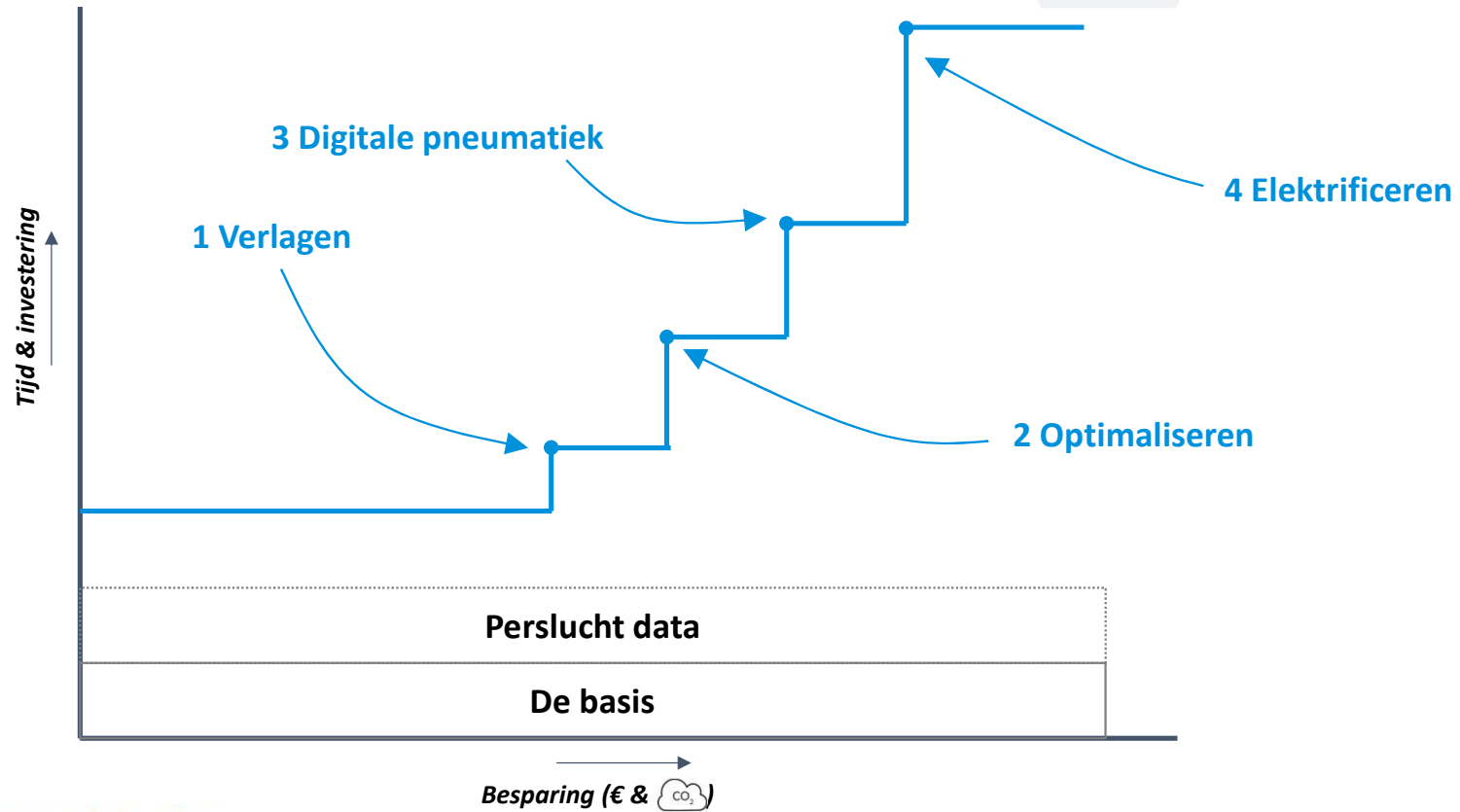


App-based controller voor pneumatische applicaties



Machinebouw  
12 december 2023, Congrescentrum

# Electrisch vs Pneumatisch

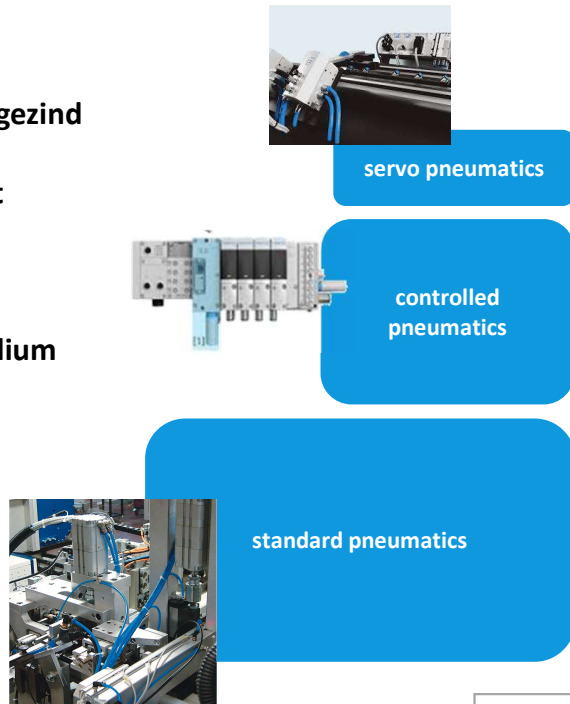


Machinebouw

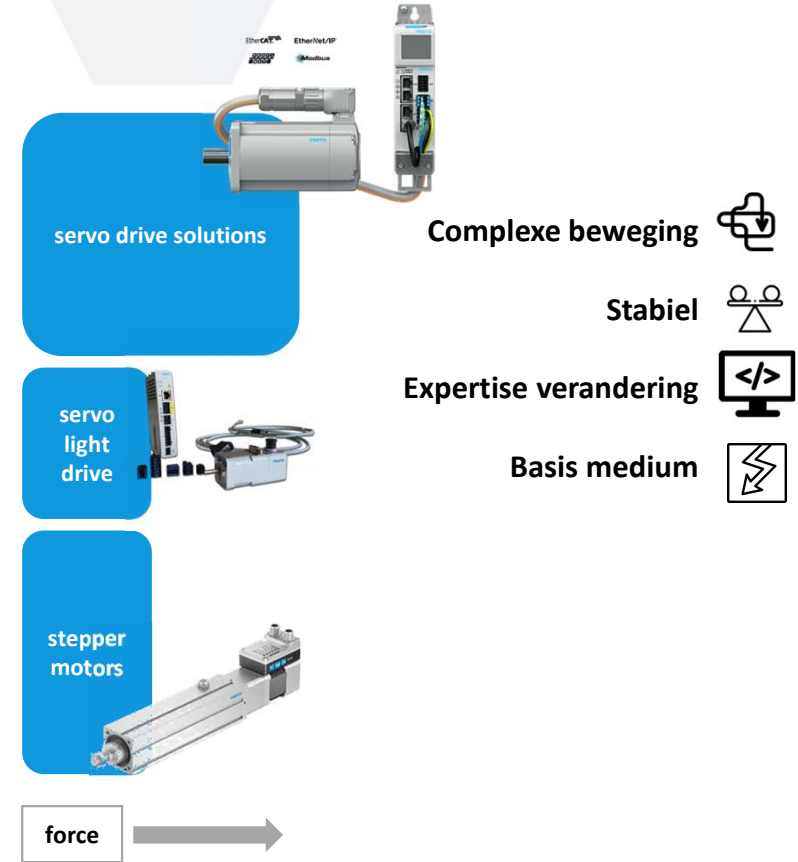
12 december 2023, Congrescentrum 1931

# Elektrisch of/en Pneumatisch

-  **Vergevingsgezind**
-  **Kracht dicht**
-  **Eenvoud**
-  **Lokaal medium**



control functions	settings
++ high control, deep settings, full motion	++
0 / + simple control, easy settings, controlled motion	+
0 basic control, minimum settings, point to point motion	0





# Vragen?

