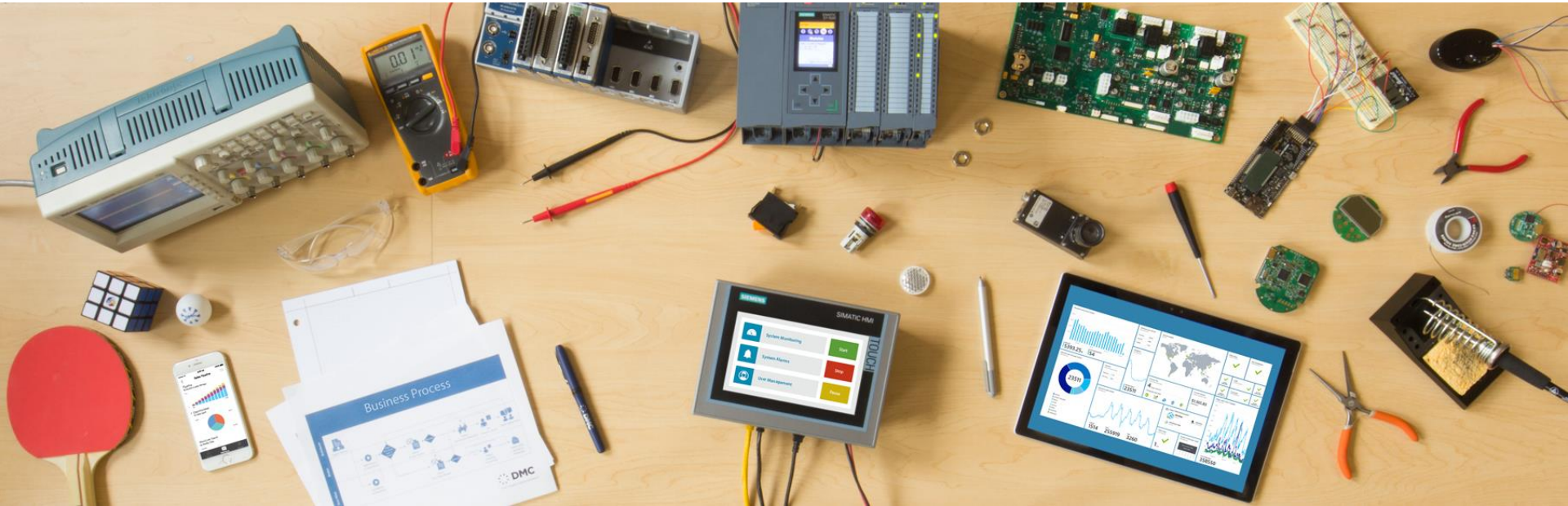




Smart People. Expert Solutions.®

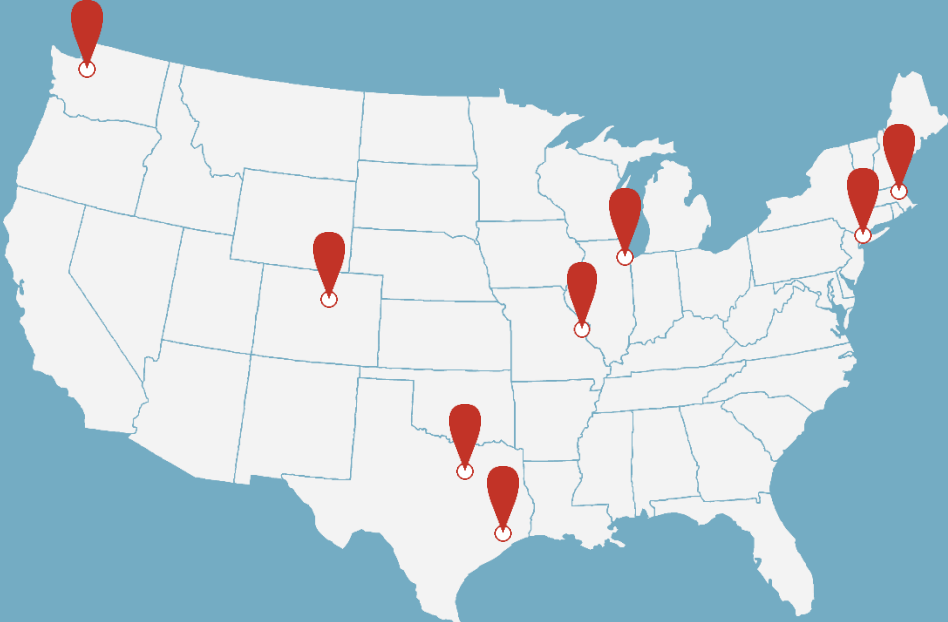
Advanced Motion Control with Starter: Efficient, Flexible, Scalable



DMC Overview



Established in 1996, DMC serves customers worldwide from offices in Chicago, Boston, Dallas, Denver, Houston, New York, Seattle, and St. Louis

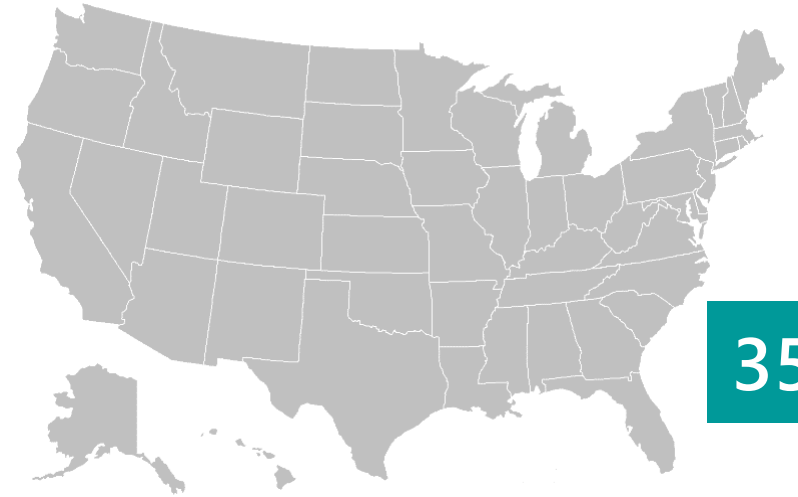


180+
employees & growing

Siemens Expertise



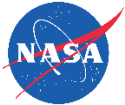
DMC has the highest number of S7 certified engineers in the US.



35+



DMC Customers



Industries Served



Automotive



Chemical



Consumer Goods



Defense Contracting



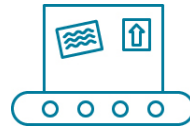
Energy & Utilities



Food & Beverage



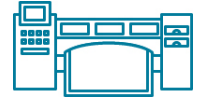
Oil & Gas
Engineering



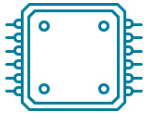
Packaging Machinery
Programming



Pharmaceutical



Printing



Semiconductor



Specialty Machinery



Telecommunications



Test & Measurement



Elizabeth Hill

Presenter Info

Elizabeth Hill

Project Engineer



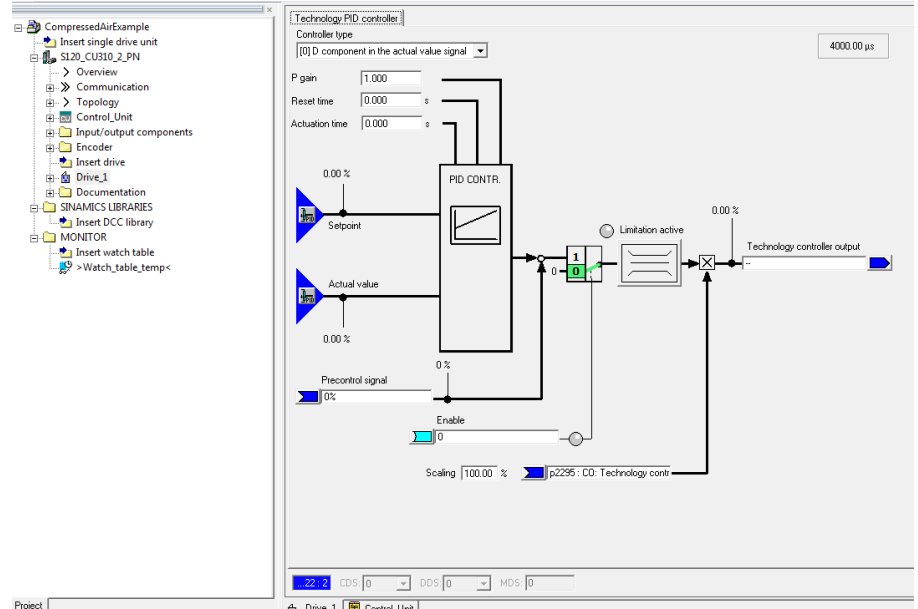
- B.E. in Mechanical Engineering and Mathematics
- Vanderbilt University

- With DMC since 2015
- Siemens certified engineer
- Experience in large scale Siemens deployments and control ecosystems
- Has developed multiple large-scale Siemens SCADA projects

Presentation Overview


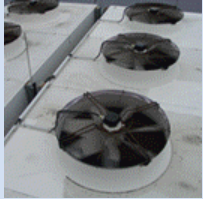






- Overview of SINAMICS Platform
- Overview of Feature Set
 - Drive – based Logic
 - PID Controls
 - Scripting
- Application Example



SINAMICS Platform

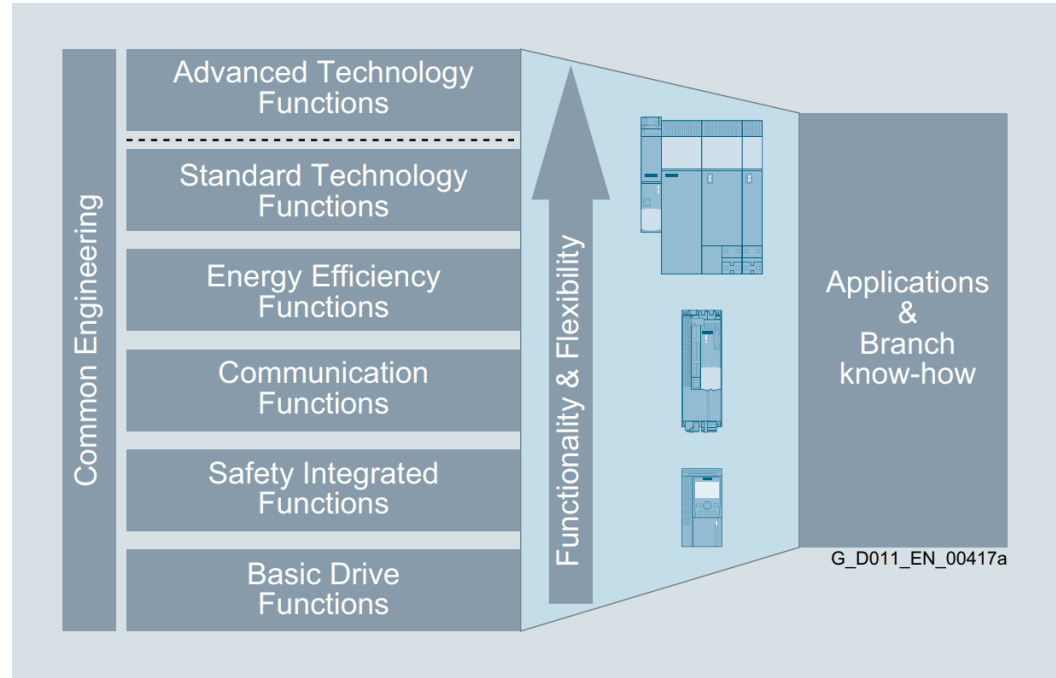


Converter	Application	Feature Set
 <p>SINAMICS V</p>		<ul style="list-style-type: none">▪ Simple and basic tasks▪ Compact and integrated operation▪ Greater ruggedness
 <p>SINAMICS G</p>		<ul style="list-style-type: none">▪ Single-axis applications▪ Optimized to your needs▪ Allow more efficient solutions
 <p>SINAMICS S</p>		<ul style="list-style-type: none">▪ Multi-axis applications▪ Superior functionality▪ Wide power range

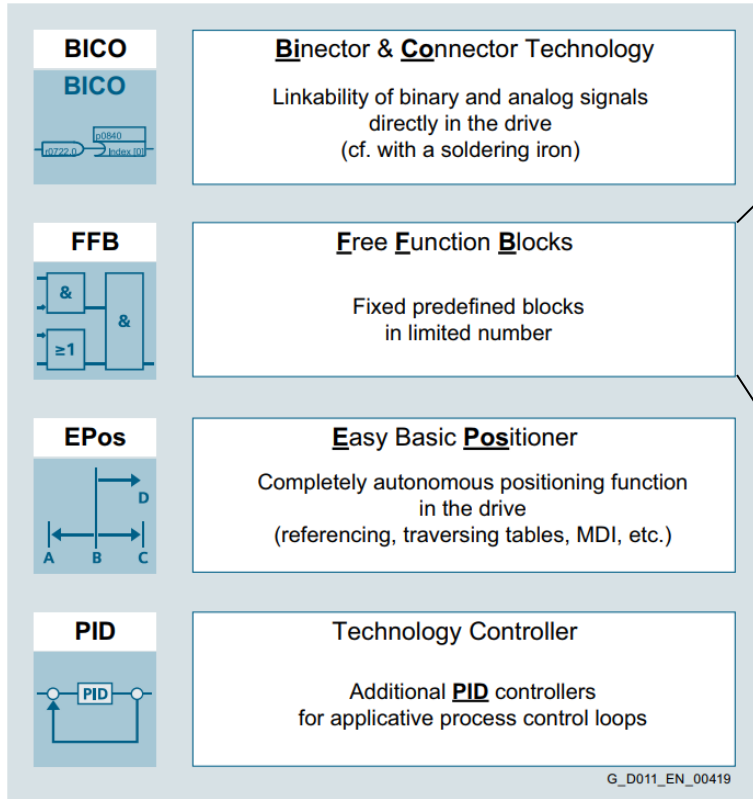
System Functionality (Beyond Motion)

The main groups are:

- Basic Drive Functions
- **Standard Technology Functions**
- Advanced Technology Functions
- Communication Functions
- Safety Integrated Functions
- Energy Efficiency Functions
- Common Engineering
- Applications & Branch know-how



Standard Technology Functions



Supported functions in the function module of the free function blocks (FFB)	
Logical functions	Programming of Boolean logic and logic operations
Arithmetic functions	Programming of mathematical functions
Timer functions	Generating of pulses and switching delays
Memory functions	Programming of binary flip-flops
Switch functions	Programming of binary and numerical switches
Control functions	Programming of functions for open-loop and closed-loop control
Complex functions	Programming of threshold value monitors and control units

*Available with S120 & G120 drives

Free Function Blocks - Ex: And

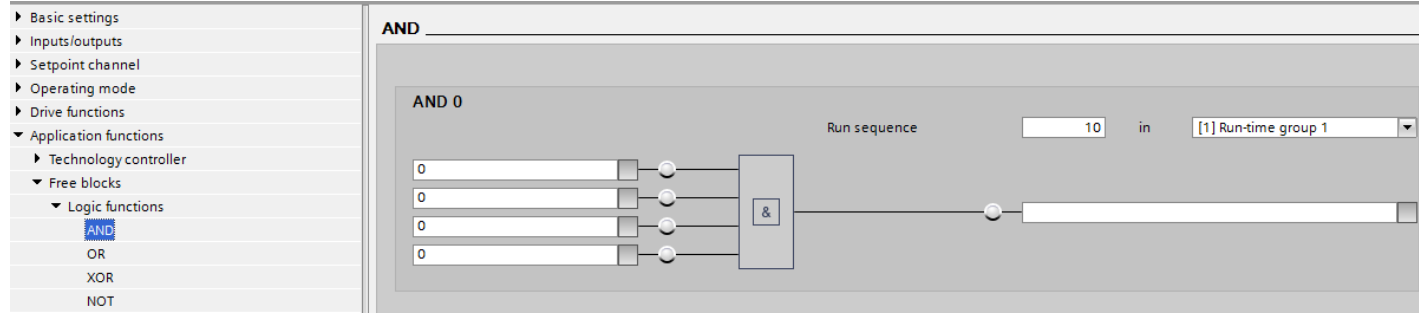


Elements of FFB

- Inputs
- Outputs

Control Parameters:

- Runtime Group
 - Calculation Freq.
 - p20000
- Sequence
 - Calculation Seq
 - 10 - 32000



	Param...	Parameter text	Offline value	Control_Unit	Unit	Modifiable to	Access level	Minimum	Maximum
	All	All	All	All	All	All	All	All	All
370	p20030	BI: AND 0 inputs							
371	p20030[0]	Input I0	0			Ready to run	1		
372	p20030[1]	Input I1	0			Ready to run	1		
373	p20030[2]	Input I2	0			Ready to run	1		
374	p20030[3]	Input I3	0			Ready to run	1		
375	r20031	BO: AND 0 output Q	0				1		
376	p20032	AND 0 run-time group	[9999]	Do not calculate		Ready to run	1		
377	p20033	AND 0 run sequence	10			Ready to run	1	0	32000







BICO Example



BICO Connection in Starter

Binector input (BI) | Connector input (CI) | Binector output (BO) | Connector output (CO)

Optimize view









 r2090.0 : BO: IF1 PROFIBUS PZD1 receive bit-serial		p681, BI: Central measuring probe synchronizing signal signal source
 r2091.0 : BO: IF1 PROFIdrive PZD2 receive bit-serial		p738, BI: CU signal source for terminal DI/DO 8
 r2091.1 : BO: IF1 PROFIdrive PZD2 receive bit-serial		p739, BI: CU signal source for terminal DI/DO 9

BICO Connection in Portal V14 (Start Drive)

▼ Basic settings

- ▶ Data sets
- Units
- Reference variables
- I/O configuration
- ▼ Inputs/outputs
 - Digital inputs
 - Relay outputs
 - Analog inputs
 - Analog outputs

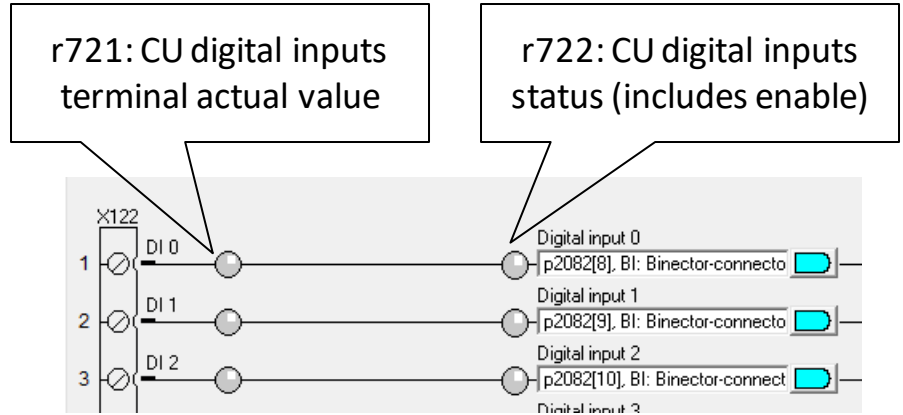
Binector input

	Value		Parameter
	0		p43 BI: Enable energy usage display
	r52.3 CO/BO: Status word 1::Fault preser		p730 BI: CU signal source for terminal DO 0
	r9772.10 CO/BO: SI status (processor 1)::		p731 BI: CU signal source for terminal DO 1
	r52.2 CO/BO: Status word 1::Operation e		p732 BI: CU signal source for terminal DO 2

BICO/ Parameters – Explained



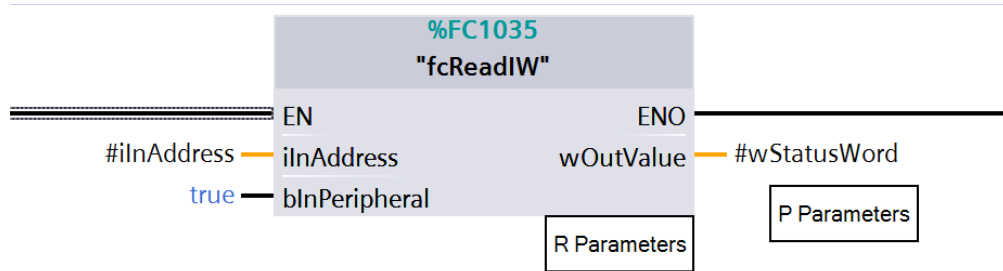
- “R” parameters
 - Status of signal
 - Cannot be written to
- “P” Parameters
 - Inputs to functions/ logic
 - Can be linked to “R” parameters



Function Call Example

wOutValue -> R

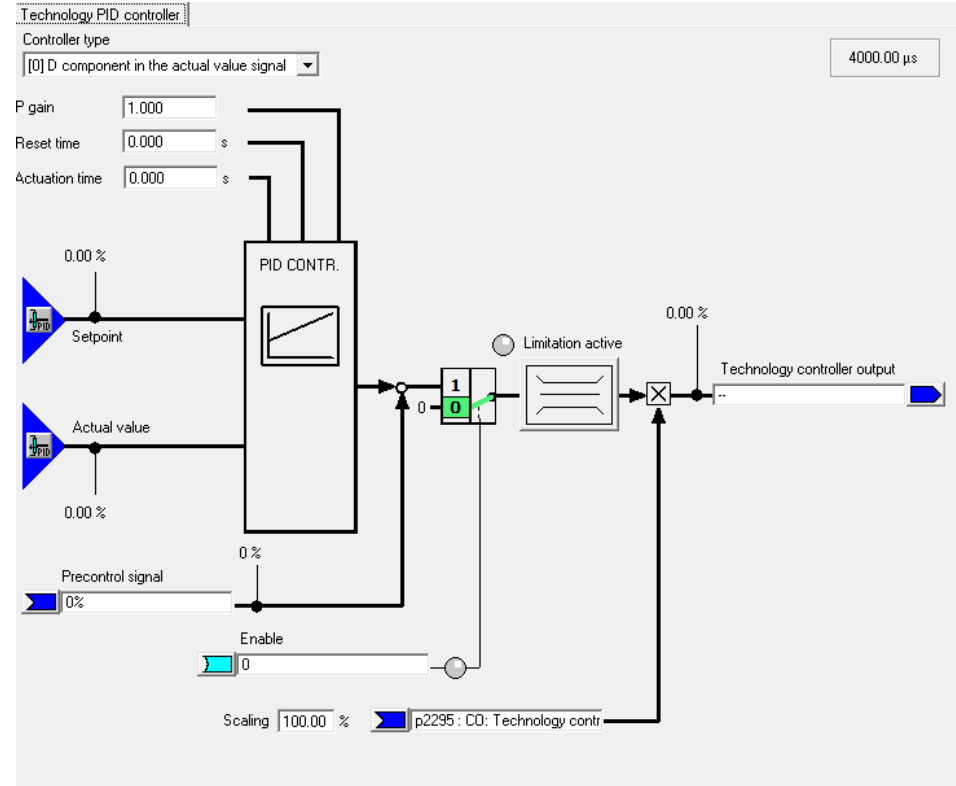
wStatusWord -> P



PID Technology Object



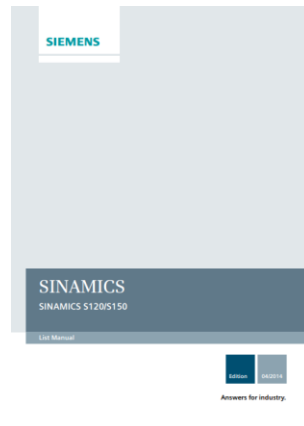
- Full PID controller support
- Conditioning on Input and Setpoint
- Output Band limiting
- Adjustable sample frequency
- Easy calculation monitoring



Parameters, Parameters – Everywhere!



- 10,000 + parameters
- Naming can be a little vague
- Sinamics List manual
 - 3000 pgs



Expert list	Param...	Data	Parameter text	Offline value Drive_1	Unit	Modifiable to	Access level	Minimum	Maximum
11285	p20219		BI: NSW 0 switch setting I	0		Ready to run	1		
11286	r20220		CO: NSW 0 output Y	0.0000		Ready to run	1		
11287	p20221		NSW 0 run-time group	[9999] Do not calculate		Ready to run	1		
11288	p20222		NSW 0 run sequence	610		Ready to run	1	0	32000
11289	p20223		CI: NSW 1 inputs			Ready to run	1		
11290	p20223(0)		Input X0	0		Ready to run	1		
11291	p20223(1)		Input X1	0		Ready to run	1		
11292	p20224		BI: NSW 1 switch setting I	0		Ready to run	1		
11293	r20225		CO: NSW 1 output Y	0.0000		Ready to run	1		
11294	p20226		NSW 1 run-time group	[9999] Do not calculate		Ready to run	1		
11295	p20227		NSW 1 run sequence	620		Ready to run	1	0	32000
11296	p20228		CI: LIM 0 input X	0		Ready to run	1		
11297	p20229		LIM 0 upper limit value LU	0.0000		Ready to run	1	-3.40282...	3.40282E...
11298	p20230		LIM 0 lower limit value LL	0.0000		Ready to run	1	-3.40282...	3.40282E...
11299	r20231		CO: LIM 0 output Y	0.0000		Ready to run	1		
11300	r20232		BO: LIM 0 input quantity at the upper limit QU	0		Ready to run	1		
11301	r20233		BO: LIM 0 input quantity at the lower limit QL	0		Ready to run	1		
11302	p20234		LIM 0 run-time group	[9999] Do not calculate		Ready to run	1		
11303	p20235		LIM 0 run sequence	640		Ready to run	1	0	32000
11304	p20236		CI: LIM 1 input X	0		Ready to run	1		
11305	p20237		LIM 1 upper limit value LU	0.0000		Ready to run	1	-3.40282...	3.40282E...
11306	p20238		LIM 1 lower limit value LL	0.0000		Ready to run	1	-3.40282...	3.40282E...
11307	r20239		CO: LIM 1 output Y	0.0000		Ready to run	1		
11308	r20240		BO: LIM 1 input quantity at the upper limit QU	0		Ready to run	1		
11309	r20241		BO: LIM 1 input quantity at the lower limit QL	0		Ready to run	1		
11310	p20242		LIM 1 run-time group	[9999] Do not calculate		Ready to run	1		
11311	p20243		LIM 1 run sequence	650		Ready to run	1	0	32000
11312	p20244		CI: PT1 0 inputs			Ready to run	1		
11313	p20244(0)		Input X	0		Ready to run	1		

Custom Data Lists (Starter Only)



CDL and Script buttons

Expert list testcdl.cdl

	Parameter	Parameter text	Offline value	Control_Unit	Unit	Modifiable to	Access lev
	All	All	All	All	All	All	All
1	<i>AND Inputs</i>						
2	p20030[0]	BI: AND 0 inputs, Input I0	Control_Unit : r722.0		Ready to run	1	
3	<i>AND Output</i>						
4	r20031	BO: AND 0 output Q	0			1	
5	<i>AND Settings</i>						
6	p20032	AND 0 run-time group	[0] Run-time group 0		Ready to run	1	
7	p20033	AND 0 run sequence	10		Ready to run	1	
8	<i>Runtime Settings</i>						
9	p20000[0]	Run-time group property...	[1] T = 1 * r20002		Ready to run	1	
10	<i>Always add RAM to ROM save if desired.</i>						
11	p971	Save drive object param...	[0] Inactive		Operation	1	
12							

Scripting (Starter Only)



CDL and Script buttons

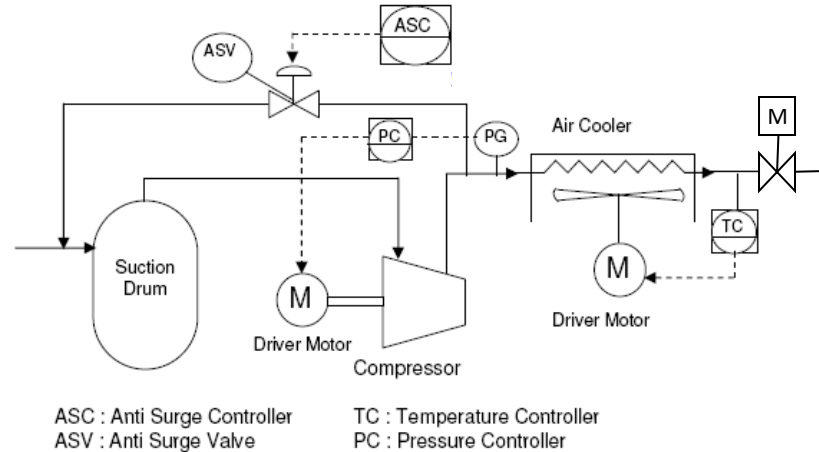
	Parameter	Parameter text	Offline value	Control_Unit	Unit	Modifiable to	Access lev
1	AND Inputs						
2	p20030[0]	BI: AND 0 inputs, Input I0		Control_Unit : r722.0		Ready to run	1
3	AND Output						
4	r20031	BO: AND 0 output Q	0				1
5	AND Settings						
6	p20032	AND 0 run-time group	[0] Run-time group 0			Ready to run	1
7	p20033	AND 0 run sequence	10			Ready to run	1
8	Runtime Settings						
9	p20000[0]	Run-time group property...	[1] T = 1 * r20002			Ready to run	1
10	Always add RAM to ROM save if desired.						
11	p971	Save drive object param...	[0] Inactive			Operation	1
12							

```
1  * 11/6/2018 Script converted from "testcdl.cdl"
2  *
3  APP.LogActive = True           * Activate output
4  *
5  On Error Resume Next
6  *AND Inputs
7  Parameters(20030, 0) = "722:0:63"      *BI: AND 0 inputs, Input I0
8  Parameters(20030, 1) = "722:2:63"      *BI: AND 0 inputs, Input I1
9  Parameters(20030, 2) = "722:3:63"      *BI: AND 0 inputs, Input I2
10 Parameters(20030, 3) = "0"             *BI: AND 0 inputs, Input I3
11 *AND Output
12 Value = (Parameters(20031, 0))         *BO: AND 0 output Q
13 *AND Settings
14 Parameters(20032, 0) = 0               *AND 0 run-time group
15 Parameters(20033, 0) = 10             *AND 0 run sequence
16 *Runtime Settings
17 Parameters(20000, 0) = 1               *Run-time group property, Run-time group 0
18 Parameters(20000, 1) = 0               *Run-time group property, Run-time group 1
19 Parameters(20000, 2) = 0               *Run-time group property, Run-time group 2
20 Parameters(20000, 3) = 0               *Run-time group property, Run-time group 3
21 Parameters(20000, 4) = 0               *Run-time group property, Run-time group 4
22 Parameters(20000, 5) = 0               *Run-time group property, Run-time group 5
23 Parameters(20000, 6) = 0               *Run-time group property, Run-time group 6
24 Parameters(20000, 7) = 0               *Run-time group property, Run-time group 7
25 Parameters(20000, 8) = 0               *Run-time group property, Run-time group 8
26 Parameters(20000, 9) = 0               *Run-time group property, Run-time group 9
27
28 Parameters(971, 0) = "1"               *Save parameters
29 On Error GoTo 0
30
```

Application Example - Demo



- 2 Drive motors
- DO
 - ASV, M: Isolation Valve
- DI
 - ASV feedback
- AI
 - Pressure Gauge, Temp C

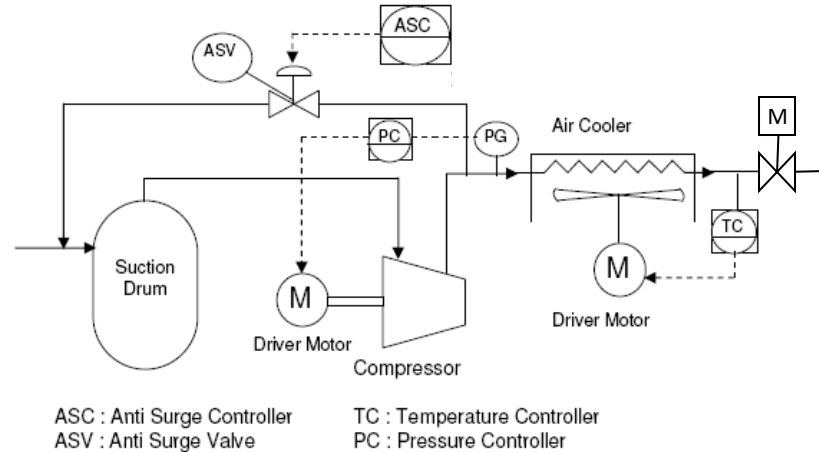


Application Example - Demo



Solution:

- Drive 1 – Pressure
 - Pressure Control PID
 - Compressor Motor
 - Feedback Pressure Gauge
- Enables
 - M – Valve is open AND
 - External Run

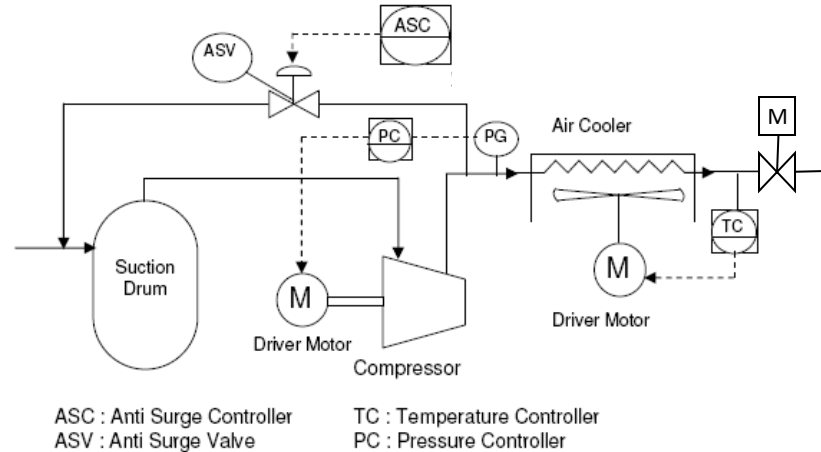


Application Example - Demo



Solution:

- Drive 2 – Temperature
 - Temperature Control PID
 - Fan Motor
 - Temperature Feedback
- Enables
 - M – Valve is open AND
 - External Run



Questions

Contact Information

DMC, Inc.

2222 N Elston Ave, Suite 200

Chicago, IL 60614

Phone:

(312) 255-8757

Email:

sales@dmcinfo.com