CONVAL® by F.I.R.S.T.

Preview of the upcoming „Actuated Valve Assembly“ module in CONVAL®

In June 2019, the recommended practice S2812-X-19 was published by WIB at Valve World Americas Conference. The RP (Recommended Practice) is called „Actuated Valve Assembly -A Recommended Practice for Part turn Automated On-Off valves“ and addresses the issue of the framework, including definitions, of the sizing and selection and mechanical integrity of the industry’s most common automated valve assemblies.

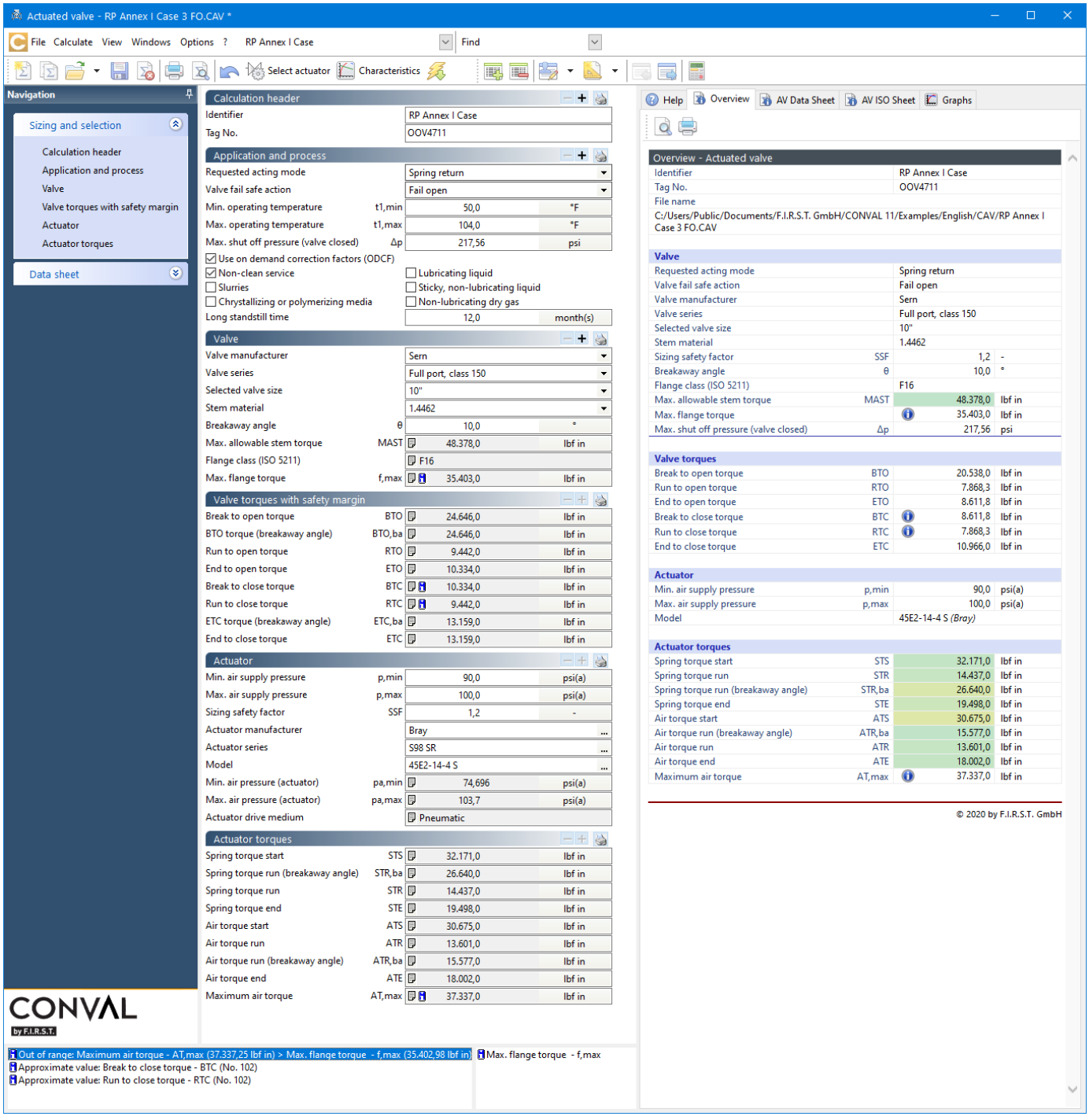
Since F.I.R.S.T. extensively supported the development of the RP both procedurally and with demonstrable prototypes, it is naturally obvious that a module in CONVAL® will soon be available that comprehensively maps the RP. This is procedurally further supported by the International Standards Organization (ISO) to accept the proposal and publish an ISO standard based on the RP.

If one were to summarize the objective of the RP in a few sentences, it would be as follows:

- If you automate "part turn on-off valves", you have to find the right actuator for the required torque, which is derived from data of the valve and the application.
- On one hand, this actuator should have a reasonable safety margin in order to operate the valve safely under all expected conditions.
- On the other hand, it should not be over-sized, if only for reasons of cost. Or even be so forceful that it damages the valve or stem.

With the implementation of the RP in the CONVAL® AV module, you can accomplish that task very easy. And finally, automatically generate the required documentation in a standardized way.

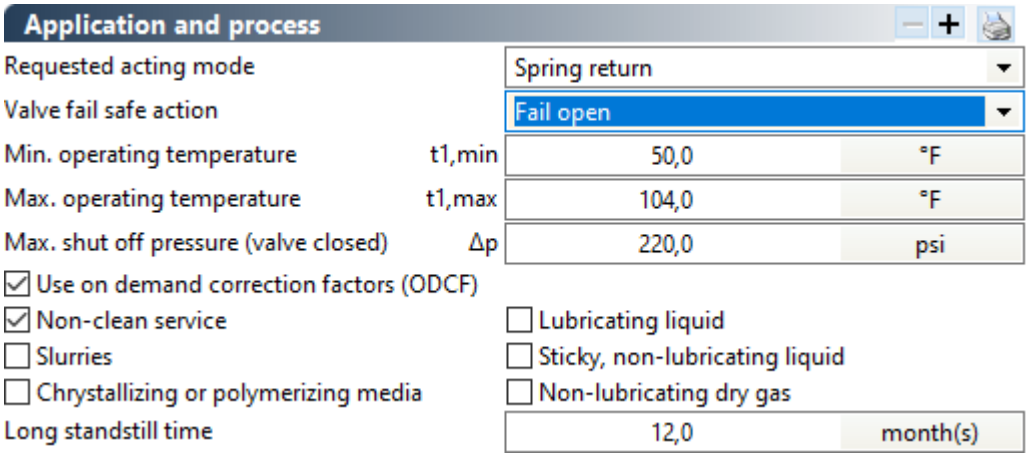
For readers familiar with the typical CONVAL® user interface, the screenshot of the ß version of the AV module will certainly look familiar.



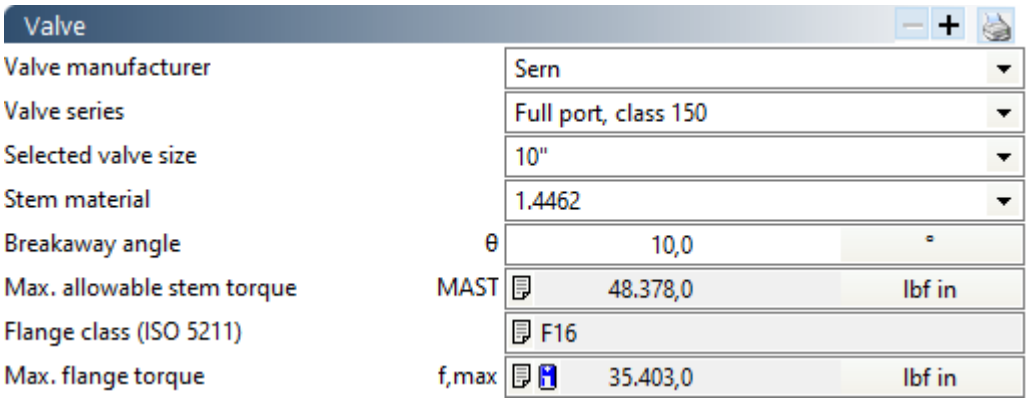
But let's have a step by step look at how to come to the result you see here.

First of all, we need to provide information on the application and process, such as you want to use a spring return or double acting actuator, the fail-safe action (Fail open/fail close), max. shut off pressure, etc.

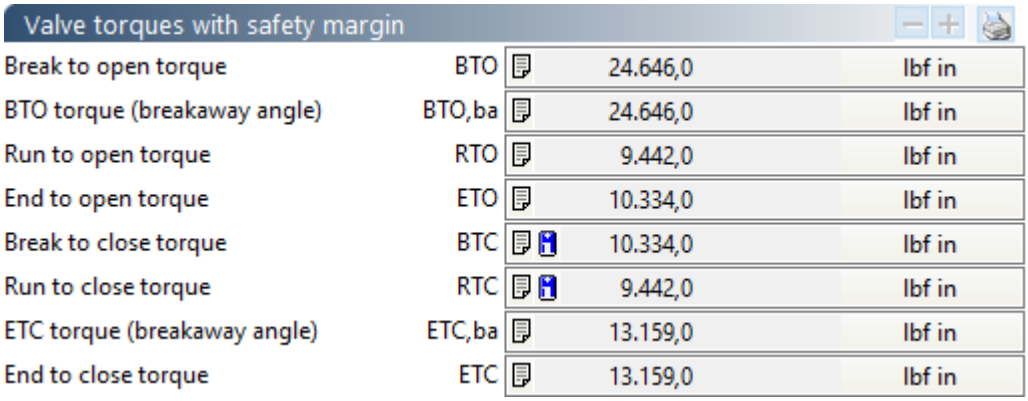
Furthermore, tell CONVAL® if you are aware of any corrections on the torque requirements that need to be made for special application considerations like „long standstill times" or „slurries". CONVAL® will then automatically account for these considerations.



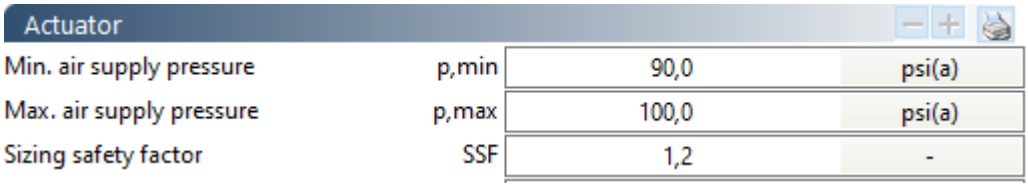
As you should know the valve you want to automate, just select the appropriate type from the database. In case it is not yet available there, providing the base torque data manually is possible.

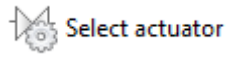


But in our case, we selected the valve from the vendor database (which is constantly growing) and automatically get all we need. Based on that information, the torque requirements are calculated.



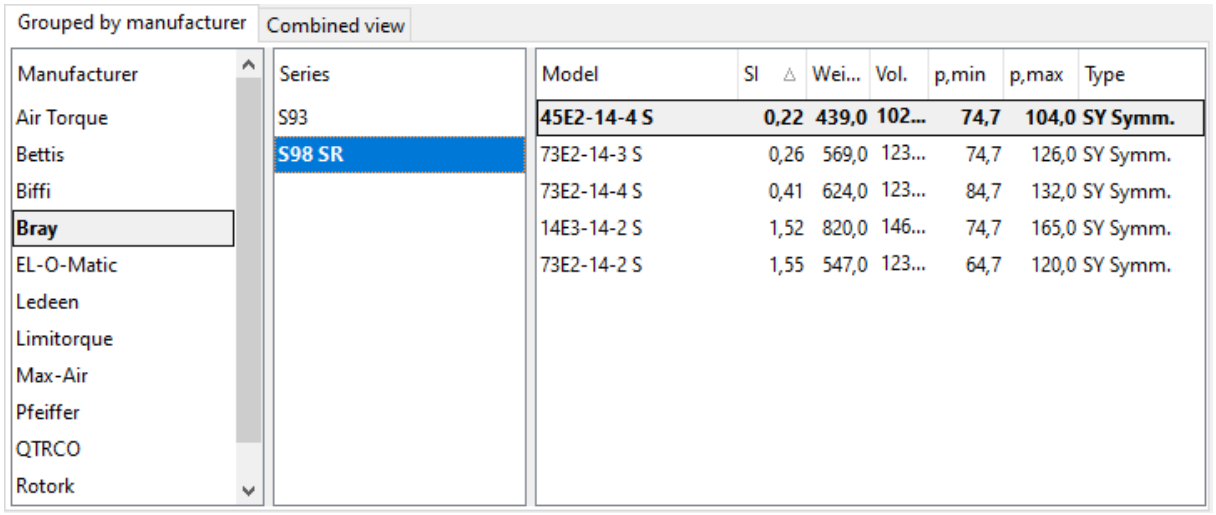
Before we now can have a look for a suitable actuator, the air pressure range for the actuator (for a pneumatic one) and a general sizing safety factor (for my safety margin) needs to be defined.



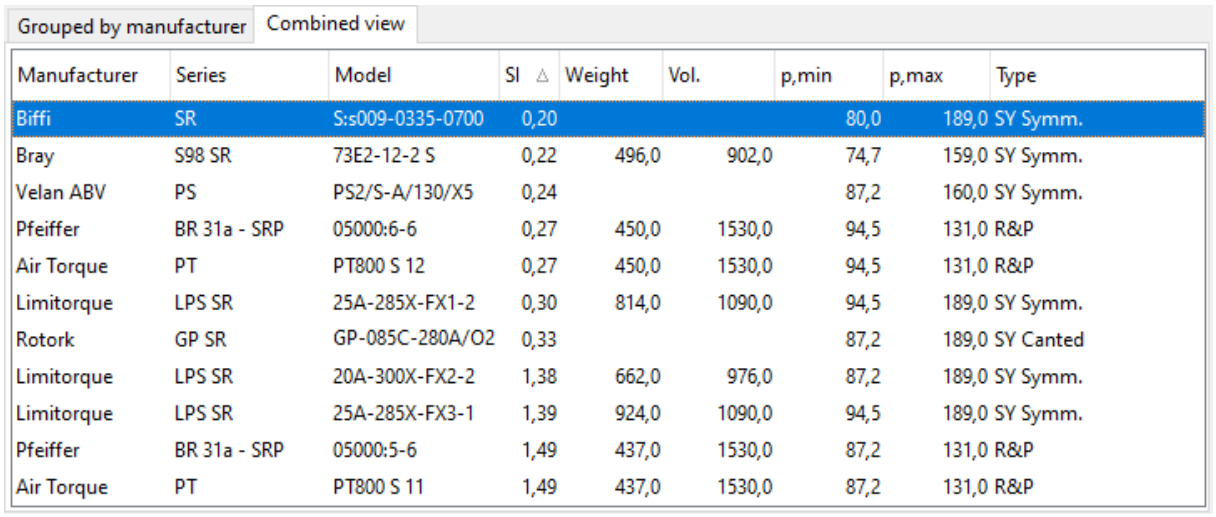
Then, simply press the 

button to get to the selection dialog.

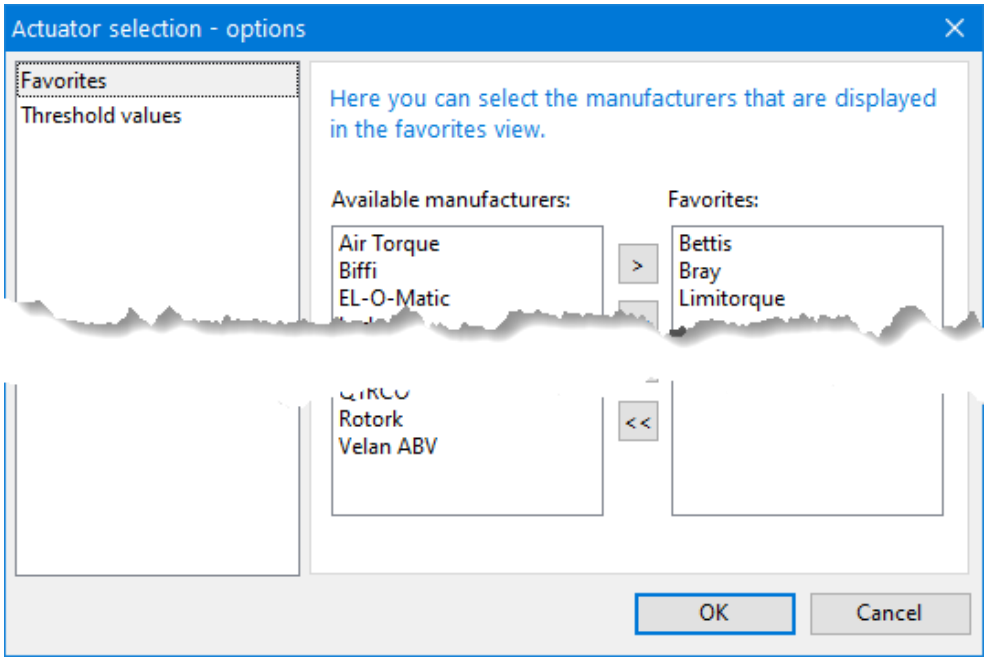
If you have a preferred vendor/series in mind, navigate directly to it and select the matching device.



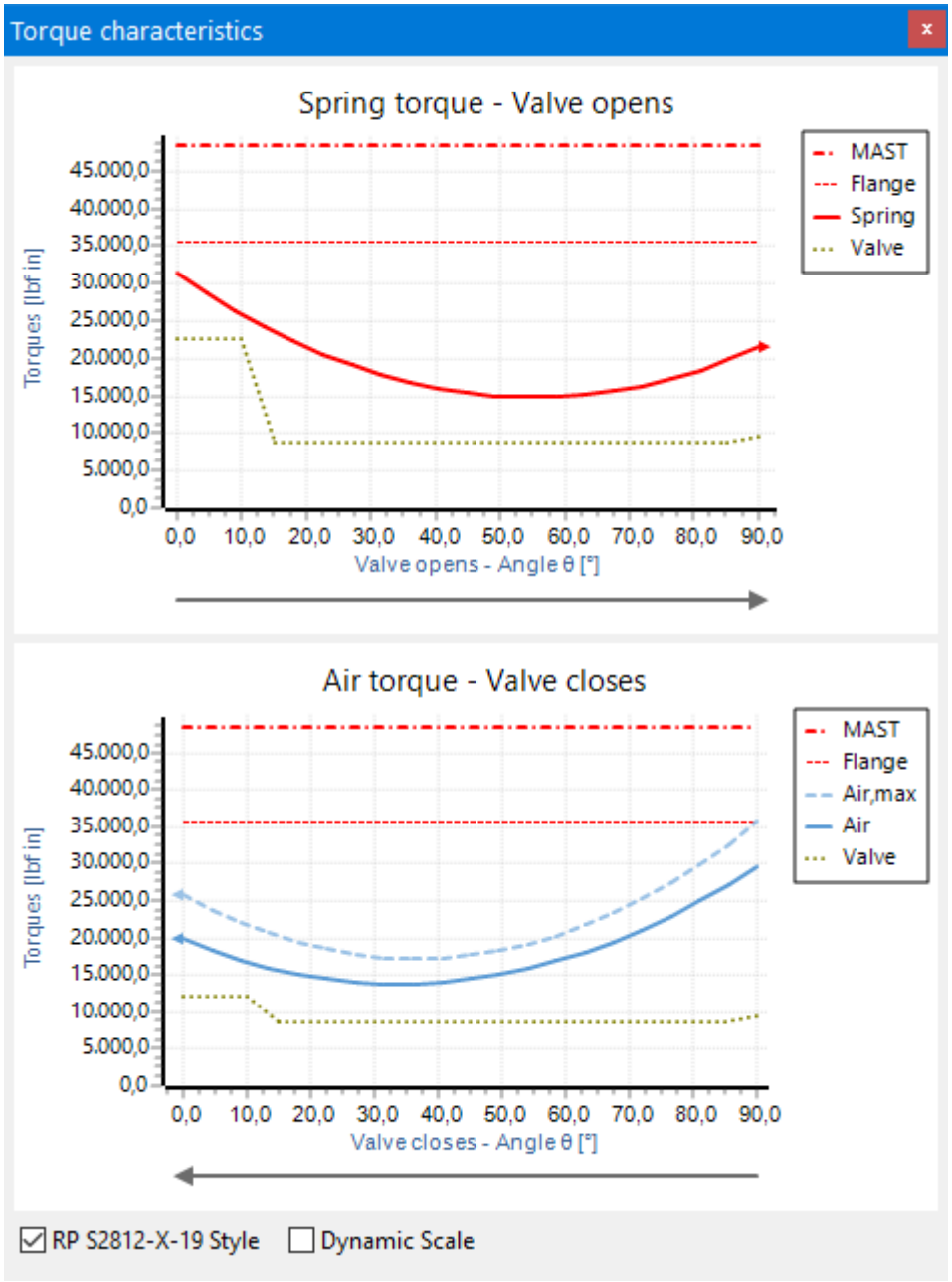
Or use a combined view showing you the suitable devices from your preferred vendor list, ordered by the Suitability Index (SI) - a key performance indicator (KPI) quantifying how closely assembly meets application requirements).



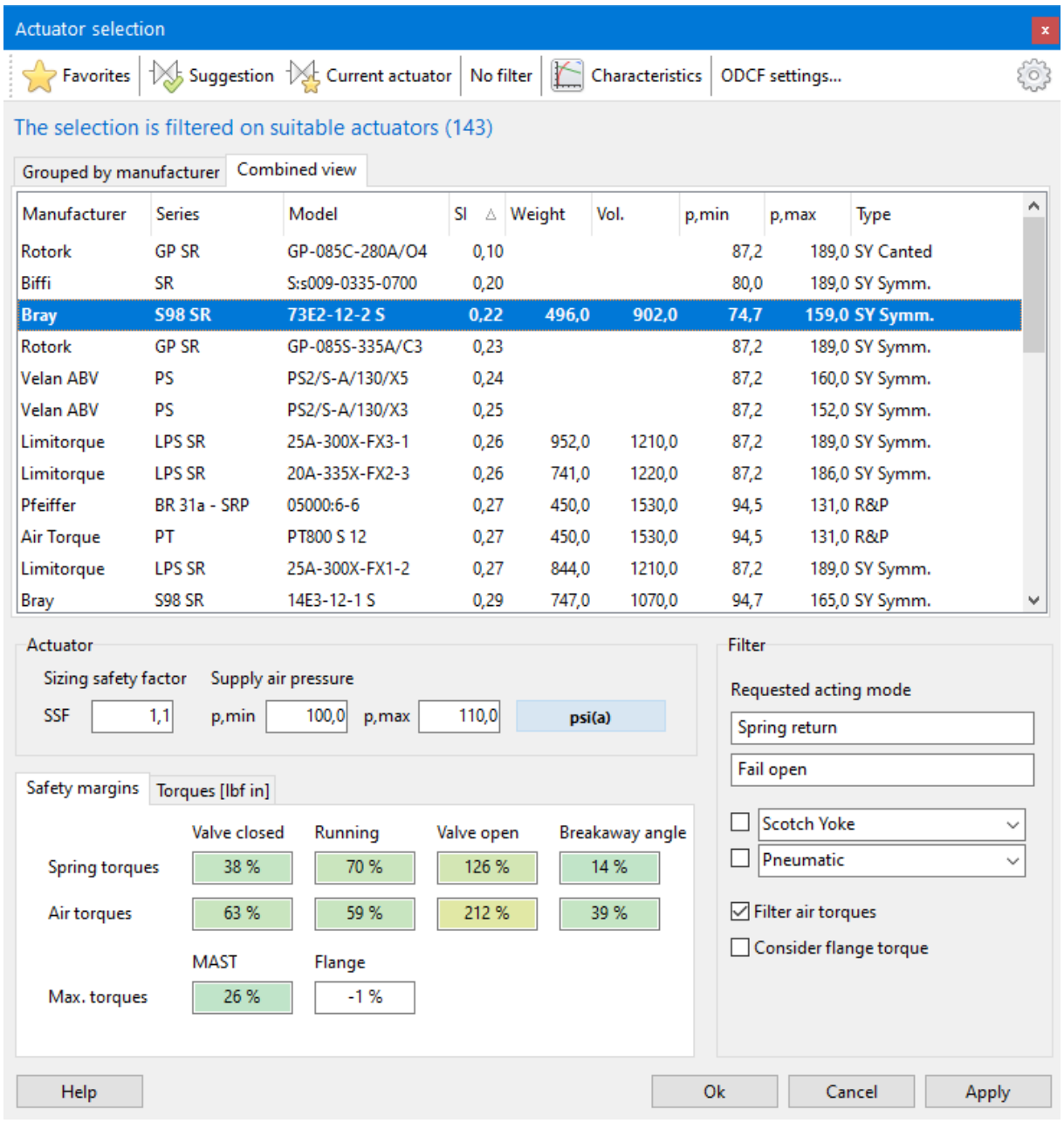
By the way, the list of preferred suppliers can of course be defined by the user.



As pictures tell you more than 1000 numbers 😉, CONVAL® supports the selection by showing you all the torques in a dynamic diagram allowing you to visually assess the margins and limits while walking through the list of possible actuator choices.



Both, the selection dialog itself…



…as well as the dynamic info view are indicating suitability by a traffic light color-coding system.

Help | Overview | AV Data Sheet | AV ISO Sheet | Graphs

Overview - Actuated valve

Identifier		RP Annex I Case	
Tag No.		OOV4711	
File name			
C:/Users/Public/Documents/F.I.R.S.T. GmbH/CONVAL 11/Examples/English/CAV/RP Annex I Case 3 FO.CAV			
Valve			
Requested acting mode		Spring return	
Valve fail safe action		Fail open	
Valve manufacturer		Sern	
Valve series		Full port, class 150	
Selected valve size		10"	
Stem material		1.4462	
Sizing safety factor	SSF	1,1	-
Breakaway angle	θ	10,0	°
Flange class (ISO 5211)		F16	
Max. allowable stem torque	MAST	48.378,0	lbf in
Max. flange torque		35.403,0	lbf in
Max. shut off pressure (valve closed)	Δp	220,0	psi
Valve torques			
Break to open torque	BTO	20.538,0	lbf in
Run to open torque	RTO	7.868,3	lbf in
End to open torque	ETO	8.611,8	lbf in
Break to close torque	BTC	8.611,8	lbf in
Run to close torque	RTC	7.868,3	lbf in
End to close torque	ETC	10.966,0	lbf in
Actuator			
Min. air supply pressure	p,min	100,0	psi(a)
Max. air supply pressure	p,max	110,0	psi(a)
Model		73E2-12-2 S *(Bray)*	
Actuator torques			
Spring torque start	STS	31.339,0	lbf in
Spring torque run	STR	14.754,0	lbf in
Spring torque run (breakaway angle)	STR,ba	25.857,0	lbf in
Spring torque end	STE	21.466,0	lbf in
Air torque start	ATS	29.631,0	lbf in
Air torque run (breakaway angle)	ATR,ba	16.784,0	lbf in
Air torque run	ATR	13.800,0	lbf in
Air torque end	ATE	19.757,0	lbf in
Maximum air torque	AT,max	35.621,0	lbf in

As soon you are satisfied with your selection, complement the sizing with additional data for documentation purposes on the datasheet page in the calculation, to finally generate the documents necessary.

AV Assembly Sizing Data Sheet

Identification								
1		Tag No.			OOV4711			End user
2		Running			Feed to boiler 1			End user
3		P&ID			PID 456			End user
4		Line number			Line-100-ABV			End user
5		Purchase order			PO 789			End user
6		Remarks			none			End user
Ambient conditions								
7		Ambient temperature	min/max		14,0	122,0	°F	End user
8		Environmental conditions			outdoor			End user
9		Environmental conditions			corrosive			End user
Application								
		Requested acting mode			Spring return			End user
10		Valve fail safe action			Fail open			End user
11		Travel time	open/close		10,0	5,0	s	End user
12		Response time	open/close		20,0	8,0	s	End user
13		Air supply pressure	min/max		72,711	159,73	psi(a)	End user
Process								
14		Medium			hydrocarbon + tar			End user
15		State / phase			liquid			End user
16		Mass flow rate				220.460,0	lb/h	End user
17		Volume flow rate				550,36	GPM(US)	End user
18		Density				56,185	lb/ft³	End user
19	1,5	Long standstill time				12,0	month(s)	End user (1)
20	1,4	Non-clean service			Yes			End user (1)
		Slurries			No			End user (1)
		Chrystallizing or polymerizing media			No			End user (1)
		Lubricating liquid			No			End user (1)
		Sticky, non-lubricating liquid			No			End user (1)
		Non-lubricating dry gas			No			End user (1)
23		Fluid operation temp.	min/max	t1,min	50,0	104,0	°F	End user (1)
24		Max. shut off pressure (valve closed)		Δp		220,0	psi	End user
25		Design pressure				435,11	psi(a)	End user
Valve								
27		Valve manufacturer			Sern			End user
28		Valve series			Full port, class 150			End user
29		Valve type			Ball valve			End user
30		Valve design			Trunnion mounted			End user
31		Port type			Full port			End user
32		Flow direction						End user
33		Seat sealing type			Soft seated			End user
34		Seat material						End user
35		Seating method			Position seated			End user
36		Pressure rating			Class 150			End user
37		Tightness rate/class						End user
38		Selected valve size			10"			End user
40	2,1	Break to open torque	net/ODCF corr.	BTO	9.780,1	20.538,0	lbf in	Valve mfr
41		Breakaway angle		θ		10,0	°	Valve mfr
42	1,4	Run to open torque	net/ODCF corr.	RTO	5.620,2	7.868,3	lbf in	Valve mfr
43	1,4	End to open torque	net/ODCF corr.	ETO	6.151,3	8.611,8	lbf in	Valve mfr
44	1,4	Break to close torque	net/ODCF corr.	BTC	6.151,3	8.611,8	lbf in	Valve mfr
45	1,4	Run to close torque	net/ODCF corr.	RTC	5.620,2	7.868,3	lbf in	Valve mfr
47	1,4	End to close torque	net/ODCF corr.	ETC	7.832,9	10.966,0	lbf in	Valve mfr
48		Max. allowable stem torque		MAST		48.378,0	lbf in	Valve mfr
49		Max. flange torque		f,max		35.403,0	lbf in	Valve mfr
50		Stem / top works dimensions provided			No			Valve mfr
Mounting kit								
51		Material						Mounting Kit mfr
53		Max. allowable coupling torque		MAST,c			lbf in	Mounting Kit mfr
54		MK mechanical integrity checked and documented			No			Mounting Kit mfr
55		Stem orientation						Mounting Kit mfr
Actuator								
57		Supply pressure	min/max	p,min	100,0	110,0	psi(a)	End user
58		Air volume	open/close		902,0	902,0	in³	
59		Sizing safety factor		SSF		1,1	-	End user
60		Actuator drive medium			Pneumatic			End user
61		Actuator drive medium quality						End user
		Acting mode			Spring return			AV Assembly Contr
62		Actuator style			Scotch Yoke (Symmetrical)			AV Assembly Contr
63		Actuator manufacturer			Bray			AV Assembly Contr
		Actuator series			S98 SR			AV Assembly Contr
		Model			73E2-12-2 S			AV Assembly Contr
64		Size					in²	AV Assembly Contr
65		Spring set			2			AV Assembly Contr
66		Spring torque start		STS		31.339,0	lbf in	Actuator mfr
67		Spring torque run		STR		14.754,0	lbf in	Actuator mfr
68		Spring torque end		STE		21.466,0	lbf in	Actuator mfr
69		Air torque start		ATS		29.631,0	lbf in	Actuator mfr
70		Air torque run		ATR		13.800,0	lbf in	Actuator mfr
71		Air torque end		ATE		19.757,0	lbf in	Actuator mfr
72		Maximum air torque		AT,max		35.621,0	lbf in	Actuator mfr
73		Max. air pressure (actuator)		pa,max		158,7	psi(a)	Actuator mfr

In addition to the documentation specified by the Recommended Practice or the forthcoming ISO standard, typical CONVAL® style calculation documentation for the AV module can, of course, always be provided in the form of a PDF containing all the information entered and calculated.

CONVAL® by F.I.R.S.T. Version 11.0 (Build 11.0.0)

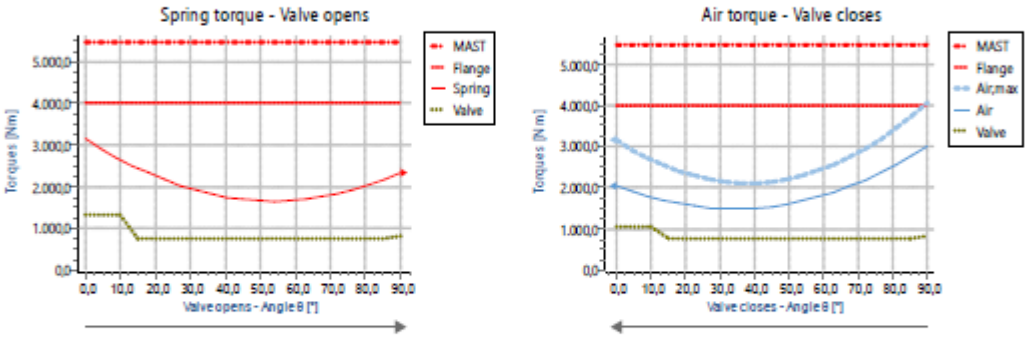
Actuated valve: RP Annex I Case 3 FO 24.08.2020 17:55:30

Mounting kit

☐ MK mechanical integrity checked and documented

Actuator

Actuator manufacturer		*Velan ABV*	
Actuator series		*PS*	
Model		*PS1/S-A/150/X3*	
Min. air supply pressure	p,min	*5,0*	bar(g)
Max. air supply pressure	p,max	*6,0*	bar(g)
Sizing safety factor	SSF	*1,2*	-
Actuator drive medium		*Pneumatic*	
Acting mode		*Spring return*	
Actuator style		*Scotch Yoke*	
Scotch yoke type		*Symmetrical*	
Spring torque start	STS	*3.165,0*	Nm
Spring torque run	STR	*1.657,0*	Nm
Spring torque end	STE	*2.352,0*	Nm
Air torque start	ATS	*3.006,4*	Nm
Air torque run	ATR	*1.491,4*	Nm
Air torque end	ATE	*2.052,6*	Nm
Maximum air torque	AT,max	*4.047,3*	Nm
Max. air pressure (actuator)	pa,max	*6,0*	bar(g)



RP Annex I Case 3 FO.CAV 4(5)

There is certainly much more to say and show, but the purpose of this article is to highlight the general process handled in the "actuated valve assembly" module. And keep in mind that the illustrated features are still under development and might change any time.

Stay tuned, there is more detailed information to come shortly. It always helps to digest the RP we are relying on 😉

