MAPLEF GREEN.1, DN20 Factory Witness Tests

In accordance with BTS 1/2019

Carried out for

Maplef

Report 102902/1 Edition 2

This report supersedes Report 102902/1 Edition 1, dated 22 April 2021

Compiled by Vitor Carneiro

17 September 2024

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Maplef Green.1 DN20 Factory Witness Tests

In accordance with BTS 1/2019

Carried out for:	Maplef Suit 420, 145 Chadwick Court North Vancouver BC V7M 3K1 Canada
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QUALITY ASSURANCE

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		Test Engineer	*Head of Laboratory*	

PREFACE

This report supersedes Report 102902/1 Edition 1, dated 22 April 2021.

In Section 7, Table 8 originally incorrectly duplicated the data in Table 7. The correct data, reflecting a maximum differential pressure of 800 Kpa, has now been inserted. This now matches the curves in Figure 4, which had always used the correct data.

CONTENTS

FIGURES

TABLES

APPENDICES

1 INTRODUCTION

This report details tests conducted on one pressure independent control valves (PICV) at Slagelse, Denmark. The tests were witnessed remotely via file sharing software by BSRIA personnel between the 26th and 28th August 2020.

This report refers to the testing of MAPLEF GREEN.1, DN 20.

2 OBJECTIVES

The objective was to determine valve performance generally in accordance with BTS 1/2019 “Test Method for PICVs and DPCVs. This standard is freely available to download on the BSRIA website.

3 APPROACH

Tests on this valve were conducted on a test rig (Denmark) against the requirements defined in BTS 1/2019 excluding Clause 2.7 – Cycling Test of BTS 1/2019.

Figure 1 Test Rig

4 ITEMS SUBMITTED FOR TEST

The valve submitted for testing is detailed in Table 1. Figure 2 shows the PICV submitted for testing.

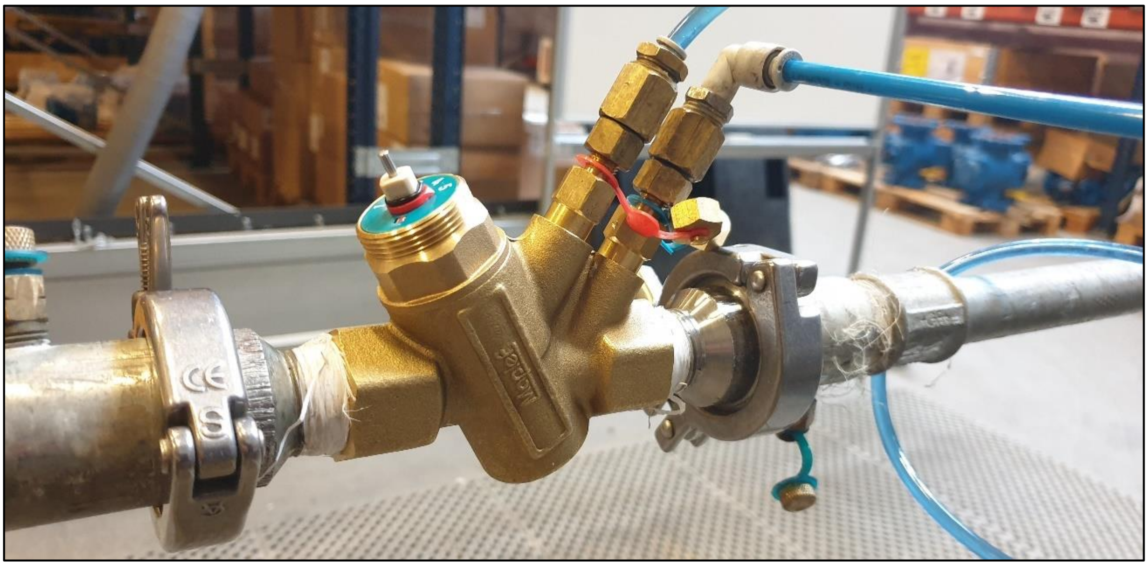
Table 1 Test item

Valve Description	Min ΔP Tested	Max ΔP Tested	Max Flow Rate	Size DN
MAPLEF GREEN.1	30 kPa	800 kPa	0,308 l/s	20

The following information/items can be found in Appendix B:

- Actuator details
- Manufacturer's specification and data

Figure 2 MAPLEF GREEN.1, DN 20



5 APPROACH AND METHODOLOGY

5.1 INSTALLATION

The MAPLEF GREEN.1, DN20 valve was installed on the test rig in line with and tested against a calibrated reference electromagnetic flow meter. The differential pressure measurement was recorded using a calibrated differential pressure transmitter, using tappings on the valve (as per manufacturer request).

All measured data was logged via a data logger on to a PC.

Note 1: The fluid medium used for all tests was water.

5.2 MEASURED FLOW VS NOMINAL FLOW

The main objective of this test is to show the ability to maintain a specific flow rate at a specific representative differential pressure between the minimum and maximum stated flow rates via the procedure detailed in Clause 2.3 of BTS 1/2019.

The valve was tested at five pre-settings including minimum and maximum operating setting at 100kPa. Three test runs per valve setting were performed.

5.3 FLOW STABILITY

This test indicates any hysteresis in the PICV flow rate performance as differential pressure rises and falls across its full range, procedure detailed in Clause 2.4 of BTS 1/2019.

The valve was tested at five pre-settings over the differential pressure range minimum to maximum (min-50kPa in 5kPa increments and 50-max in 50kPa increments) and back from maximum to zero in similar increments. Three test runs per valve setting were performed.

As per client's requirements the flow stability tests were performed at a maximum differential pressure of 400 kPa and 800 kPa.

The actuator was fitted but did not perform any automatic function.

Results can be found in section 7.2

5.4 CONTROL CHARACTERISTIC (WITH STANDARD MOTOR-DRIVEN MODULATING ACTUATOR)

The purpose of this test was to analyse the flow characteristics of the PICV with an actuator in full operation. The procedure for this test is detailed in Clause 2.5 of BTS 1/2019.

As per client's requirements the valve was tested at five pre-settings at three pressure ranges including minimum and maximum at the relevant actuator operation (e.g.0-10-0Vdc at 20 increments up and down, with at least 30 seconds at each increment).

Tests were performed for equal percentage and linear settings.

Results can be found in section 7.3 and 7.4

5.5 SEAT LEAKAGE TEST

The purpose of this test was not necessarily to prove service isolation, but to demonstrate the capability to shut off flow to the terminal or other device being controlled and was conducted with an actuator fitted and set to its closed position. It was also driven open and closed three times to demonstrate shut off. This was conducted on the test rig with the downstream pipework disconnected and an upstream pressure of 8 bar applied to the PICV.

This valve was tested to demonstrate compliance with IEC60534-4 seat leakage requirements.

5.6 EXCLUSIONS

The test work excluded cyclic tests.

6 INSTRUMENTATION

Table 2 details the instrumentation as used, serviced and maintained by the test lab was used during testing.

Table 2 Instrumentation used

Description	Instrument Identifier	Range	Calibration date
Differential Pressure Transmitter	91V227367	0 to 1000 kPa	2019-10-03
Flowmeter (20 mm)	A13315427	0 to 3000 l/h	2019-02-26
ELMA 711 Temperature Sensor	111201906	20 to 60 °C	2019-11-07

* Calibration certificates for the above instrument can be found in Appendix A

7 TEST RESULTS

The results are shown as data sets for Clauses 2.3-2.6 of BTS 1/2019

7.1 MEASURED FLOW VS NOMINAL FLOW TESTS

Table 3, Table 4 and Table 5 represent the measured flow vs nominal flow test results for each of the three runs, with Table 6 showing the average of the three runs. The average temperature for all tests was 24.7 °C.

Table 3 First Run Measured Flow

1st Run			
DN20 @ 100 kPa			
Valve	Nominal	Av rising & falling	
Pre-set	l/s	l/s	% nominal
1.0	0.018	0.021	117%
2.0	0.152	0.134	88%
3.0	0.232	0.229	99%
4.0	0.285	0.284	100%
5.0	0.308	0.323	105%

Table 4 Second Run Measured Flow

2nd Run			
DN20 @ 100 kPa			
Valve	Nominal	Av rising & falling	
Pre-set	l/s	l/s	% nominal
1.0	0.018	0.022	123%
2.0	0.152	0.147	96%
3.0	0.232	0.233	101%
4.0	0.285	0.288	101%
5.0	0.308	0.336	109%

Table 5 Third Run Measured Flow

3rd Run			
DN20 @ 100 kPa			
Valve	Nominal	Av rising & falling	
Pre-set	l/s	l/s	% nominal
1.0	0.018	0.015	86%
2.0	0.152	0.137	90%
3.0	0.232	0.224	97%
4.0	0.285	0.285	100%
5.0	0.308	0.326	106%

Table 6 Average of three runs Measured Flow

Average of 3 runs			
DN20 @ 100 kPa			
Valve	Nominal	Av rising & falling	
Pre-set	l/s	l/s	% nominal
1.0	0.018	0.019	109%
2.0	0.152	0.139	92%
3.0	0.232	0.229	99%
4.0	0.285	0.286	100%
5.0	0.308	0.328	107%

7.2 FLOW STABILITY TESTS

Table 7 and Figure 3 shows the flow limitation test results with a maximum differential pressure of 400 kPa.
The average temperature for all tests was 23.8 °C.

Table 7 Flow Limitation Tests with a maximum differential pressure of 400 kPa

Pre-set 1.0		Pre-set 2.0		Pre-set 3.0		Pre-set 4.0		Pre-set 5.0	
Differential Pressure (kPa)	Flow (l/s)	Differential Pressure (kPa)	Flow (l/s)	Differential Pressure (kPa)	Flow (l/s)	Differential Pressure (kPa)	Flow (l/s)	Differential Pressure (kPa)	Flow (l/s)
25.75	0.012	25.83	0.134	25.61	0.196	25.72	0.239	25.39	0.252
30.56	0.013	29.97	0.138	30.37	0.203	30.78	0.247	30.58	0.276
35.00	0.014	35.72	0.141	35.33	0.208	35.47	0.255	36.06	0.286
40.28	0.014	40.27	0.143	40.70	0.212	40.43	0.260	40.65	0.291
45.92	0.015	45.76	0.147	45.79	0.215	45.80	0.264	45.15	0.297
50.74	0.015	50.56	0.148	50.20	0.218	50.36	0.268	50.09	0.300
100.13	0.015	100.63	0.153	100.18	0.233	99.60	0.284	100.60	0.318
149.99	0.014	150.64	0.152	150.87	0.232	151.98	0.289	150.87	0.325
199.98	0.014	201.69	0.150	200.08	0.231	201.07	0.287	200.47	0.325
250.62	0.014	250.16	0.149	250.89	0.227	250.22	0.284	251.37	0.322
300.02	0.014	302.14	0.148	300.67	0.224	300.21	0.279	300.34	0.318
348.92	0.014	351.28	0.147	350.57	0.221	350.60	0.274	349.00	0.312
400.03	0.014	404.09	0.147	403.76	0.218	402.41	0.269	400.51	0.307
350.20	0.013	349.59	0.145	349.61	0.216	351.71	0.267	350.40	0.303
300.30	0.013	300.51	0.145	299.56	0.217	300.95	0.269	300.18	0.305
251.82	0.014	250.66	0.145	250.17	0.218	252.13	0.271	250.49	0.307
200.52	0.014	200.18	0.146	199.36	0.221	200.25	0.274	200.36	0.309
151.09	0.014	151.40	0.148	150.27	0.223	150.62	0.276	150.60	0.310
100.27	0.014	100.01	0.148	100.29	0.224	100.61	0.274	100.43	0.307
50.15	0.014	50.77	0.144	50.17	0.214	50.05	0.261	50.62	0.292
45.39	0.014	45.69	0.143	45.19	0.212	45.42	0.259	45.05	0.289

40.54	0.014	40.36	0.142	40.34	0.209	40.53	0.256	40.11	0.284
35.29	0.014	35.57	0.139	35.22	0.206	35.35	0.251	35.34	0.278
30.15	0.013	30.11	0.135	30.53	0.201	30.82	0.246	29.60	0.272
25.21	0.012	25.39	0.131	25.93	0.193	26.19	0.236	25.33	0.263

Figure 3 Flow Limitation Tests with a maximum differential pressure of 400 kPa

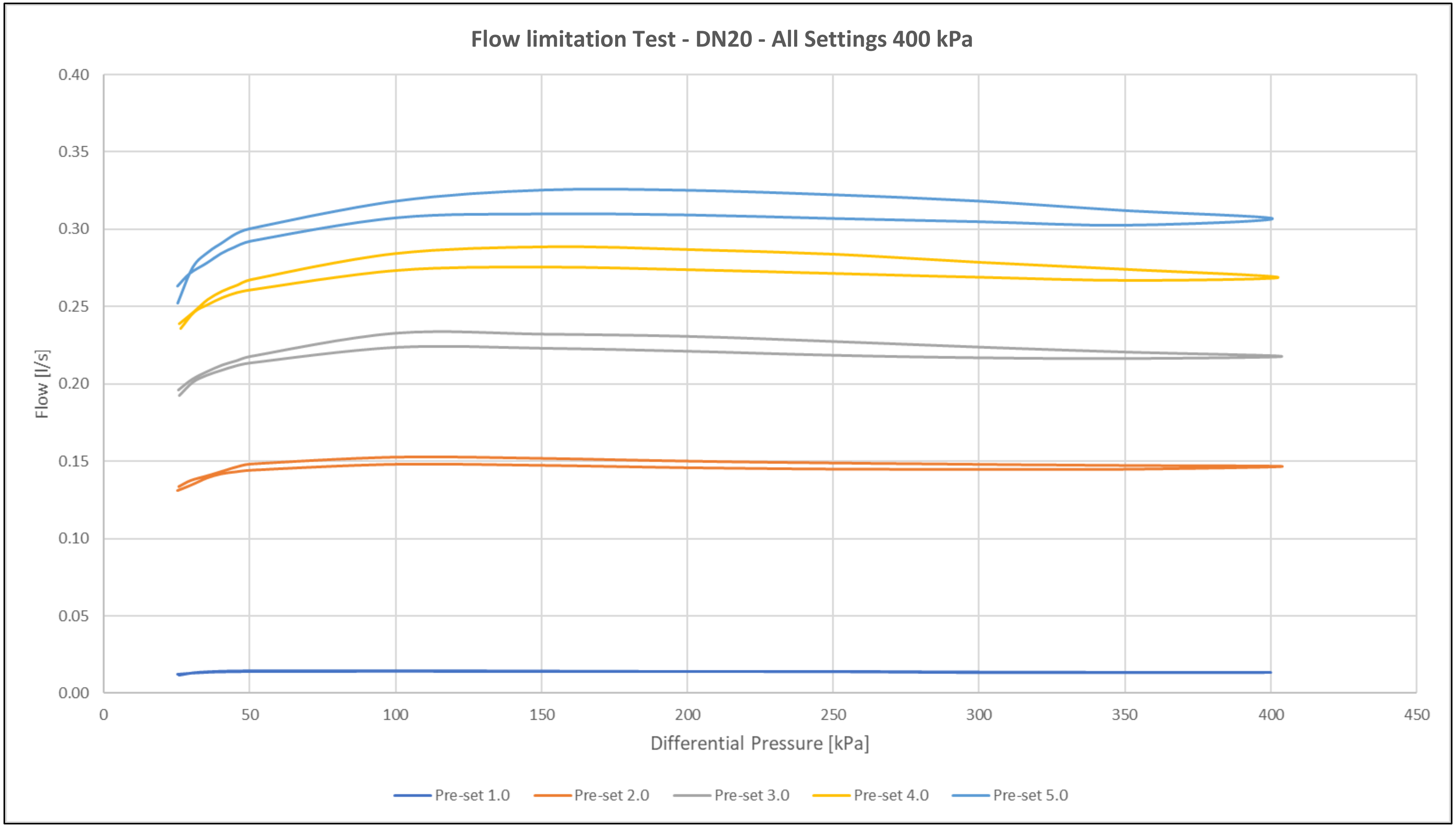


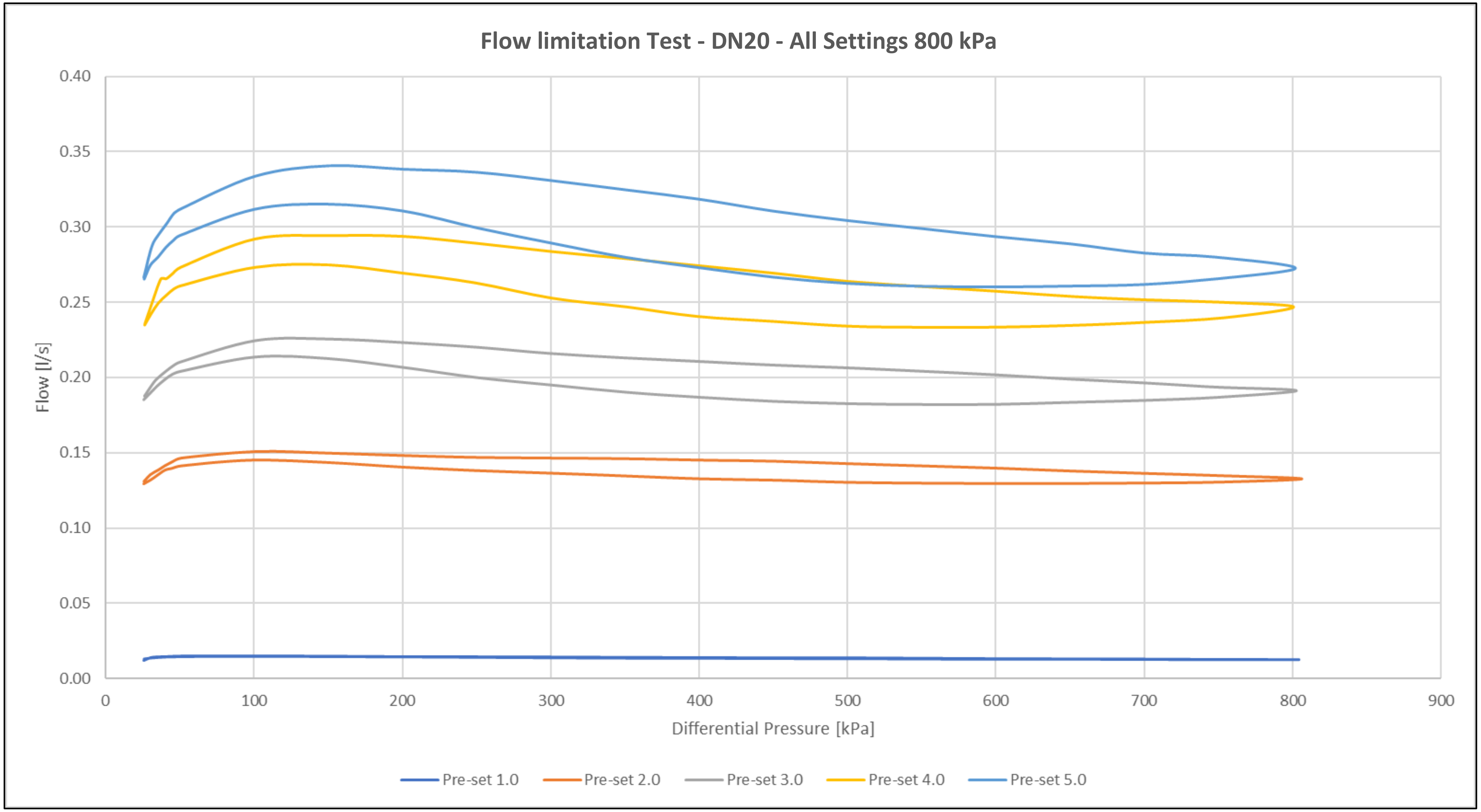
Table 8 and Figure 4 shows the flow limitation test results with a maximum differential pressure of 800 kPa. The average temperature for all tests was 23.80 °C.

Table 8 Flow Limitation Tests with a maximum differential pressure of 800 kPa

Pre-set 1.0		Pre-set 2.0		Pre-set 3.0		Pre-set 4.0		Pre-set 5.0	
Differential Pressure (kPa)	Flow (l/s)	Differential Pressure (kPa)	Flow (l/s)	Differential Pressure (kPa)	Flow (l/s)	Differential Pressure (kPa)	Flow (l/s)	Differential Pressure (kPa)	Flow (l/s)
25.57	0.012	25.84	0.131	25.85	0.187	26.06	0.235	25.42	-
30.35	0.014	30.18	0.135	32.11	0.197	30.62	0.248	30.83	0.287
34.69	0.015	35.68	0.139	35.89	0.201	36.80	0.265	35.57	0.295
40.54	0.015	40.11	0.141	40.80	0.205	40.44	0.265	40.73	0.302
45.12	0.015	45.35	0.144	45.86	0.208	45.02	0.269	45.82	0.309
50.46	0.015	51.13	0.147	50.20	0.210	50.37	0.273	50.81	0.312
100.26	0.015	101.22	0.151	101.09	0.225	100.57	0.292	100.85	0.334
150.44	0.015	150.05	0.150	150.61	0.226	150.75	0.294	150.38	0.340
200.13	0.015	201.28	0.148	200.12	0.223	200.18	0.294	200.75	0.338
250.76	0.015	249.64	0.147	250.51	0.220	250.07	0.289	249.93	0.336
300.12	0.015	300.30	0.147	299.28	0.216	300.54	0.284	300.29	0.331
350.04	0.014	350.26	0.146	349.71	0.213	350.65	0.279	350.68	0.324
400.26	0.014	402.85	0.145	400.19	0.211	401.52	0.274	399.95	0.318
450.08	0.014	450.77	0.144	449.06	0.208	450.42	0.269	449.37	0.310
500.08	0.014	499.82	0.143	502.06	0.206	498.73	0.264	500.21	0.304
549.92	0.014	552.64	0.141	549.95	0.204	550.43	0.260	550.06	0.299
599.75	0.013	601.97	0.140	600.00	0.202	600.55	0.257	600.31	0.293
650.13	0.013	651.46	0.138	650.65	0.199	652.55	0.254	650.62	0.289
700.51	0.013	700.10	0.136	702.45	0.196	701.32	0.251	700.05	0.283
749.87	0.013	749.90	0.135	748.37	0.193	751.30	0.250	748.12	0.280
804.45	0.013	806.02	0.133	802.52	0.191	800.52	0.247	802.13	0.273
752.23	0.013	752.19	0.130	750.28	0.187	753.32	0.239	750.30	0.266

703.95	0.013	700.78	0.130	701.27	0.185	700.87	0.236	699.50	0.262
650.63	0.013	649.92	0.129	649.26	0.183	651.58	0.234	651.80	0.261
600.20	0.013	599.72	0.129	599.95	0.182	599.19	0.233	601.69	0.260
550.70	0.013	549.74	0.130	550.34	0.182	549.43	0.233	550.48	0.261
502.77	0.013	500.10	0.130	501.17	0.182	500.29	0.234	499.58	0.262
451.04	0.013	451.54	0.132	450.55	0.184	449.92	0.237	450.33	0.267
400.70	0.014	401.04	0.133	400.69	0.187	398.11	0.240	401.50	0.273
350.42	0.014	349.06	0.135	351.69	0.190	351.02	0.247	350.57	0.280
300.47	0.014	299.33	0.136	301.21	0.195	300.94	0.252	300.16	0.289
250.53	0.014	250.11	0.138	251.30	0.200	248.07	0.263	250.70	0.299
200.66	0.015	199.46	0.141	200.70	0.207	200.29	0.269	200.31	0.310
149.59	0.015	150.84	0.144	149.63	0.213	150.33	0.275	149.85	0.315
100.83	0.015	98.44	0.145	100.61	0.214	100.79	0.273	100.37	0.312
50.17	0.015	51.37	0.141	49.76	0.204	50.27	0.261	49.74	0.294
45.63	0.015	44.57	0.140	44.83	0.202	45.53	0.259	45.61	0.291
40.46	0.015	40.01	0.138	39.97	0.199	40.66	0.255	40.41	0.286
35.13	0.014	34.66	0.135	34.51	0.194	35.14	0.249	35.13	0.280
30.38	0.014	30.40	0.132	30.16	0.190	30.25	0.242	29.87	0.275
25.80	0.013	25.73	0.129	25.37	0.185	25.98	0.235	25.72	0.265

Figure 4 Flow Limitation Tests with a maximum differential pressure of 800 kPa



7.3 CONTROL CHARACTERISTICS TESTS – LINEAR

Table 9 and Figure 5 shows the Control Characteristics Tests (Linear) at a fixed Differential Pressure of 30kPa.
The average temperature for all tests was 20.6 °C.

Table 9 Control Characteristics Tests (Linear – Normally Closed) at a fixed Differential Pressure of 30kPa.

Pre-set 1.0		Pre-set 2.0		Pre-set 3.0		Pre-set 4.0		Pre-set 5.0	
Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
0.5	0.006	0.5	0.016	0.5	0.018	0.5	0.020	0.5	0.021
1	0.011	1	0.031	1	0.054	1	0.065	1	0.067
1.5	0.011	1.5	0.035	1.5	0.058	1.5	0.069	1.5	0.071
2	0.012	2	0.044	2	0.069	2	0.080	2	0.083
2.5	0.014	2.5	0.053	2.5	0.079	2.5	0.091	2.5	0.093
3	0.015	3	0.061	3	0.094	3	0.111	3	0.117
3.5	0.016	3.5	0.067	3.5	0.106	3.5	0.126	3.5	0.134
4	0.017	4	0.074	4	0.116	4	0.140	4	0.150
4.5	0.018	4.5	0.080	4.5	0.124	4.5	0.150	4.5	0.165
5	0.019	5	0.087	5	0.135	5	0.165	5	0.182
5.5	0.019	5.5	0.092	5.5	0.144	5.5	0.175	5.5	0.192
6	0.020	6	0.098	6	0.152	6	0.187	6	0.200
6.5	0.021	6.5	0.105	6.5	0.161	6.5	0.198	6.5	0.212
7	0.021	7	0.115	7	0.172	7	0.213	7	0.229
7.5	0.022	7.5	0.120	7.5	0.179	7.5	0.223	7.5	0.244
8	0.022	8	0.125	8	0.186	8	0.231	8	0.255
8.5	0.023	8.5	0.130	8.5	0.193	8.5	0.239	8.5	0.265
9	0.023	9	0.132	9	0.200	9	0.249	9	0.274
9.5	0.023	9.5	0.132	9.5	0.206	9.5	0.257	9.5	0.281

10	0.023	10	0.133	10	0.207	10	0.256	10	0.281
9.5	0.023	9.5	0.132	9.5	0.205	9.5	0.254	9.5	0.280
9	0.023	9	0.132	9	0.197	9	0.246	9	0.271
8.5	0.022	8.5	0.128	8.5	0.191	8.5	0.237	8.5	0.263
8	0.022	8	0.123	8	0.185	8	0.231	8	0.255
7.5	0.022	7.5	0.119	7.5	0.178	7.5	0.222	7.5	0.240
7	0.021	7	0.113	7	0.170	7	0.211	7	0.227
6.5	0.021	6.5	0.102	6.5	0.158	6.5	0.195	6.5	0.209
6	0.020	6	0.096	6	0.149	6	0.182	6	0.199
5.5	0.019	5.5	0.089	5.5	0.139	5.5	0.170	5.5	0.188
5	0.018	5	0.083	5	0.130	5	0.158	5	0.174
4.5	0.017	4.5	0.076	4.5	0.119	4.5	0.144	4.5	0.156
4	0.016	4	0.069	4	0.109	4	0.131	4	0.140
3.5	0.015	3.5	0.062	3.5	0.097	3.5	0.114	3.5	0.120
3	0.015	3	0.056	3	0.084	3	0.099	3	0.102
2.5	0.013	2.5	0.048	2.5	0.072	2.5	0.086	2.5	0.086
2	0.012	2	0.037	2	0.060	2	0.071	2	0.074
1.5	0.010	1.5	0.023	1.5	0.045	1.5	0.057	1.5	0.059
1	0.009	1	0.016	1	0.040	1	0.051	1	0.052
0.5	0.006	0.5	0.003	0.5	0.012	0.5	0.022	0.5	0.023
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000

Figure 5 Control Characteristics Tests (Linear - Normally Closed) at a fixed Differential Pressure of 30kPa

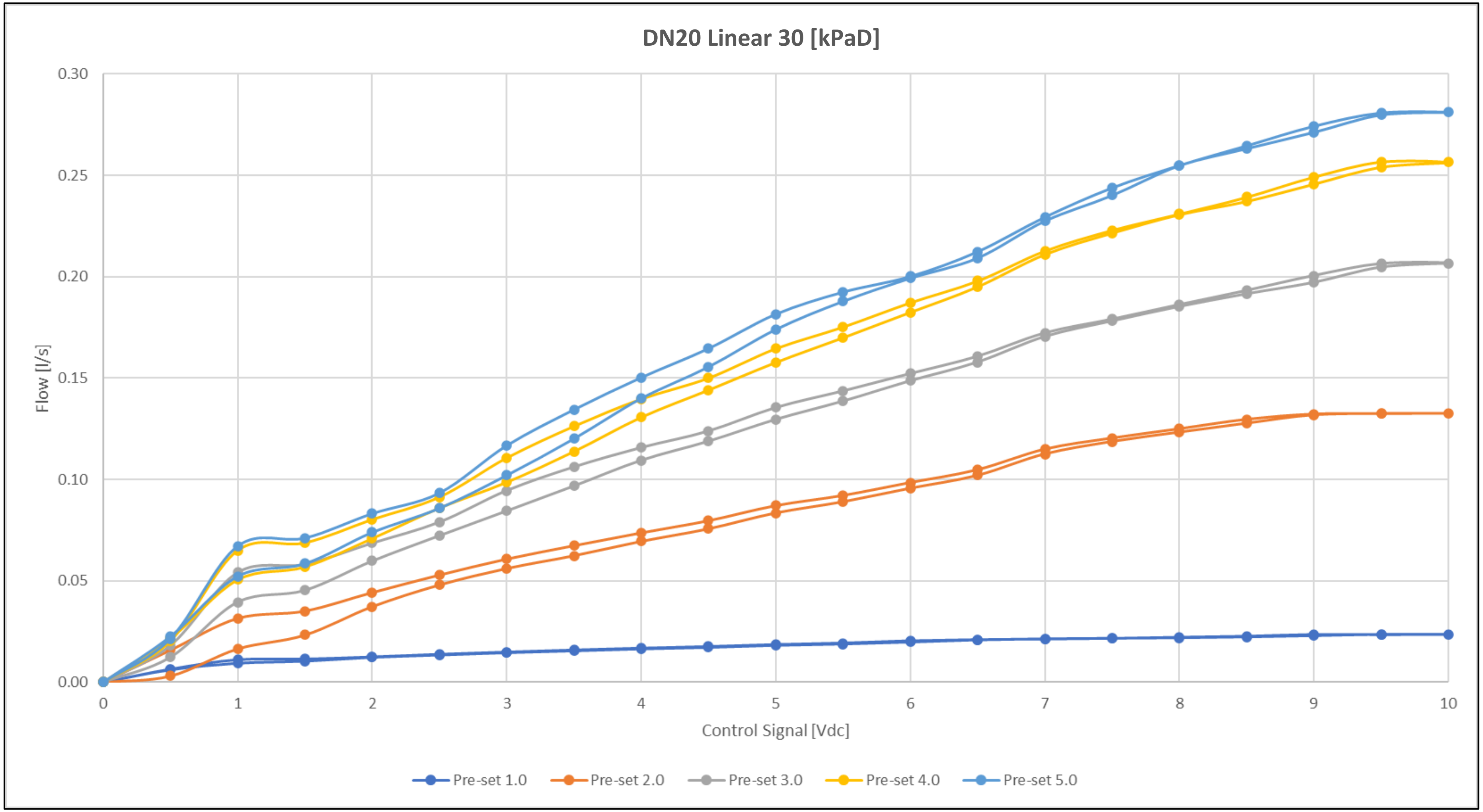


Table 10 and Figure 6 shows the Control Characteristics Tests (Linear) at a fixed Differential Pressure of 416kPa.

The average temperature for all tests was 20.6 °C.

Table 10 Control Characteristics Tests (Linear – Normally Closed) at a fixed Differential Pressure of 416 kPa

Pre-set 1.0		Pre-set 2.0		Pre-set 3.0		Pre-set 4.0		Pre-set 5.0	
Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
0.5	0.007	0.5	0.017	0.5	0.023	0.5	0.015	0.5	0.015
1	0.011	1	0.031	1	0.053	1	0.063	1	0.065
1.5	0.012	1.5	0.034	1.5	0.056	1.5	0.067	1.5	0.069
2	0.012	2	0.043	2	0.066	2	0.078	2	0.081
2.5	0.014	2.5	0.052	2.5	0.076	2.5	0.089	2.5	0.090
3	0.015	3	0.059	3	0.092	3	0.108	3	0.113
3.5	0.016	3.5	0.066	3.5	0.103	3.5	0.124	3.5	0.130
4	0.017	4	0.073	4	0.113	4	0.136	4	0.146
4.5	0.018	4.5	0.079	4.5	0.120	4.5	0.147	4.5	0.159
5	0.019	5	0.086	5	0.133	5	0.161	5	0.175
5.5	0.019	5.5	0.091	5.5	0.140	5.5	0.171	5.5	0.184
6	0.020	6	0.098	6	0.149	6	0.183	6	0.193
6.5	0.021	6.5	0.105	6.5	0.158	6.5	0.193	6.5	0.204
7	0.021	7	0.114	7	0.168	7	0.207	7	0.219
7.5	0.022	7.5	0.120	7.5	0.176	7.5	0.217	7.5	0.234
8	0.022	8	0.125	8	0.182	8	0.226	8	0.245
8.5	0.023	8.5	0.130	8.5	0.189	8.5	0.235	8.5	0.254
9	0.024	9	0.132	9	0.197	9	0.246	9	0.264
9.5	0.024	9.5	0.132	9.5	0.203	9.5	0.254	9.5	0.273
10	0.024	10	0.132	10	0.203	10	0.254	10	0.274

9.5	0.024	9.5	0.132	9.5	0.202	9.5	0.253	9.5	0.272
9	0.023	9	0.132	9	0.196	9	0.243	9	0.265
8.5	0.023	8.5	0.129	8.5	0.190	8.5	0.235	8.5	0.257
8	0.022	8	0.125	8	0.185	8	0.228	8	0.249
7.5	0.021	7.5	0.120	7.5	0.178	7.5	0.219	7.5	0.236
7	0.021	7	0.114	7	0.171	7	0.209	7	0.224
6.5	0.020	6.5	0.104	6.5	0.158	6.5	0.194	6.5	0.206
6	0.020	6	0.097	6	0.149	6	0.181	6	0.197
5.5	0.019	5.5	0.090	5.5	0.139	5.5	0.169	5.5	0.185
5	0.018	5	0.085	5	0.129	5	0.157	5	0.172
4.5	0.017	4.5	0.076	4.5	0.118	4.5	0.143	4.5	0.153
4	0.016	4	0.069	4	0.108	4	0.129	4	0.138
3.5	0.015	3.5	0.062	3.5	0.095	3.5	0.111	3.5	0.118
3	0.014	3	0.056	3	0.083	3	0.097	3	0.100
2.5	0.013	2.5	0.047	2.5	0.070	2.5	0.083	2.5	0.084
2	0.012	2	0.036	2	0.058	2	0.068	2	0.071
1.5	0.010	1.5	0.024	1.5	0.044	1.5	0.054	1.5	0.056
1	0.010	1	0.017	1	0.039	1	0.048	1	0.050
0.5	0.007	0.5	0.004	0.5	0.014	0.5	0.020	0.5	0.021
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000

Figure 6 Control Characteristics Tests (Linear - Normally Closed) at a fixed Differential Pressure of 416kPa

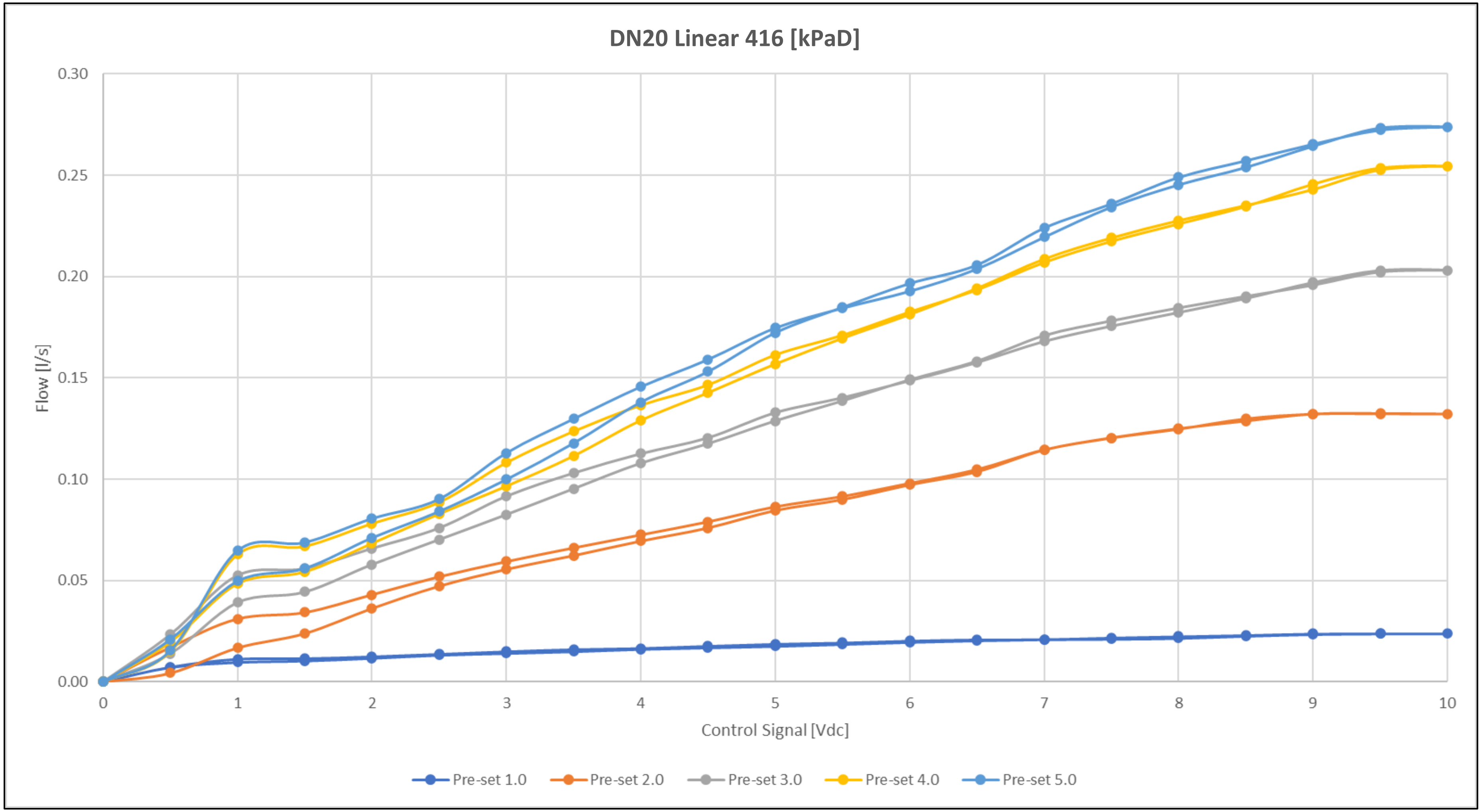


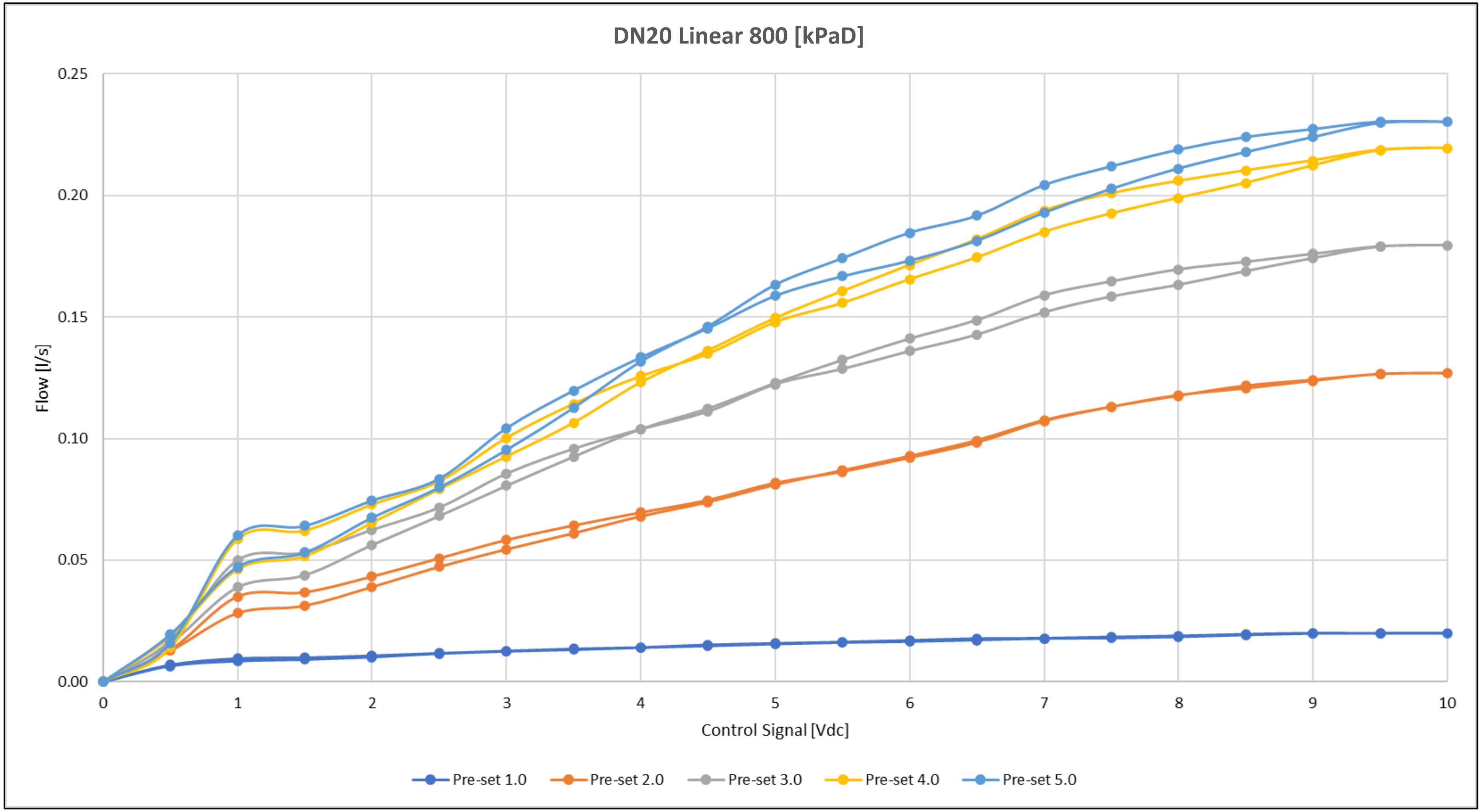
Table 11 and Figure 7 shows the Characteristics Tests (Linear - Normally Closed) at a fixed Differential Pressure of 800kPa.
The average temperature for all tests was 20.6 °C.

Table 11 Control Characteristics Tests (Linear - Normally Closed) at a fixed Differential Pressure of 800kPa

Pre-set 1.0		Pre-set 2.0		Pre-set 3.0		Pre-set 4.0		Pre-set 5.0	
Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
0.5	0.007	0.5	0.013	0.5	0.017	0.5	0.014	0.5	0.016
1	0.010	1	0.035	1	0.050	1	0.059	1	0.060
1.5	0.010	1.5	0.037	1.5	0.053	1.5	0.062	1.5	0.064
2	0.011	2	0.043	2	0.062	2	0.073	2	0.075
2.5	0.012	2.5	0.051	2.5	0.072	2.5	0.082	2.5	0.083
3	0.013	3	0.058	3	0.086	3	0.100	3	0.104
3.5	0.014	3.5	0.064	3.5	0.096	3.5	0.114	3.5	0.120
4	0.014	4	0.070	4	0.104	4	0.126	4	0.133
4.5	0.015	4.5	0.075	4.5	0.111	4.5	0.135	4.5	0.145
5	0.016	5	0.082	5	0.122	5	0.148	5	0.159
5.5	0.016	5.5	0.086	5.5	0.129	5.5	0.156	5.5	0.167
6	0.017	6	0.092	6	0.136	6	0.165	6	0.173
6.5	0.018	6.5	0.098	6.5	0.143	6.5	0.174	6.5	0.181
7	0.018	7	0.107	7	0.152	7	0.185	7	0.193
7.5	0.018	7.5	0.113	7.5	0.158	7.5	0.193	7.5	0.203
8	0.019	8	0.118	8	0.163	8	0.199	8	0.211
8.5	0.019	8.5	0.121	8.5	0.169	8.5	0.205	8.5	0.218
9	0.020	9	0.124	9	0.174	9	0.212	9	0.224
9.5	0.020	9.5	0.126	9.5	0.179	9.5	0.219	9.5	0.230
10	0.020	10	0.127	10	0.180	10	0.219	10	0.230
9.5	0.020	9.5	0.126	9.5	0.179	9.5	0.219	9.5	0.230

9	0.020	9	0.124	9	0.176	9	0.214	9	0.227
8.5	0.019	8.5	0.122	8.5	0.173	8.5	0.210	8.5	0.224
8	0.018	8	0.118	8	0.170	8	0.206	8	0.219
7.5	0.018	7.5	0.113	7.5	0.165	7.5	0.201	7.5	0.212
7	0.018	7	0.108	7	0.159	7	0.194	7	0.204
6.5	0.017	6.5	0.099	6.5	0.149	6.5	0.182	6.5	0.192
6	0.017	6	0.093	6	0.141	6	0.171	6	0.185
5.5	0.016	5.5	0.087	5.5	0.132	5.5	0.161	5.5	0.174
5	0.015	5	0.081	5	0.123	5	0.150	5	0.163
4.5	0.015	4.5	0.074	4.5	0.112	4.5	0.136	4.5	0.146
4	0.014	4	0.068	4	0.104	4	0.123	4	0.132
3.5	0.013	3.5	0.061	3.5	0.093	3.5	0.107	3.5	0.113
3	0.013	3	0.054	3	0.081	3	0.093	3	0.095
2.5	0.012	2.5	0.047	2.5	0.068	2.5	0.079	2.5	0.080
2	0.010	2	0.039	2	0.056	2	0.065	2	0.067
1.5	0.009	1.5	0.031	1.5	0.044	1.5	0.052	1.5	0.053
1	0.009	1	0.028	1	0.039	1	0.046	1	0.047
0.5	0.007	0.5	0.013	0.5	0.016	0.5	0.019	0.5	0.019
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000

Figure 7 Control Characteristics Tests (Linear - Normally Closed) at a fixed Differential Pressure of 800kPa



7.4 CONTROL CHARACTERISTICS TESTS – EQUAL %

Table 12 and Figure 8 shows the Control Characteristics Tests (Equal %) at a fixed Differential Pressure of 30kPa.
The average temperature for all tests was 20.6 °C.

Table 12 Control Characteristics Tests (Equal % - Normally Closed) at a fixed Differential Pressure of 30kPa

Pre-set 1.0		Pre-set 2.0		Pre-set 3.0		Pre-set 4.0		Pre-set 5.0	
Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]
0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000
0.5	0.009	0.5	0.017	0.5	0.013	0.5	0.019	0.5	0.023
1.0	0.010	1.0	0.035	1.0	0.047	1.0	0.047	1.0	0.048
1.5	0.011	1.5	0.037	1.5	0.049	1.5	0.050	1.5	0.051
2.0	0.011	2.0	0.037	2.0	0.051	2.0	0.052	2.0	0.054
2.5	0.012	2.5	0.039	2.5	0.053	2.5	0.055	2.5	0.057
3.0	0.012	3.0	0.040	3.0	0.056	3.0	0.058	3.0	0.060
3.5	0.013	3.5	0.041	3.5	0.058	3.5	0.061	3.5	0.063
4.0	0.013	4.0	0.042	4.0	0.060	4.0	0.063	4.0	0.065
4.5	0.013	4.5	0.043	4.5	0.062	4.5	0.065	4.5	0.068
5.0	0.013	5.0	0.046	5.0	0.065	5.0	0.069	5.0	0.073
5.5	0.014	5.5	0.050	5.5	0.072	5.5	0.077	5.5	0.081
6.0	0.015	6.0	0.056	6.0	0.079	6.0	0.084	6.0	0.086
6.5	0.016	6.5	0.062	6.5	0.090	6.5	0.097	6.5	0.103
7.0	0.017	7.0	0.070	7.0	0.106	7.0	0.117	7.0	0.127
7.5	0.018	7.5	0.078	7.5	0.117	7.5	0.135	7.5	0.149
8.0	0.019	8.0	0.086	8.0	0.129	8.0	0.150	8.0	0.168
8.5	0.021	8.5	0.095	8.5	0.144	8.5	0.169	8.5	0.189
9.0	0.022	9.0	0.112	9.0	0.167	9.0	0.202	9.0	0.222
9.5	0.025	9.5	0.132	9.5	0.195	9.5	0.237	9.5	0.268

10.0	0.025	10.0	0.137	10.0	0.205	10.0	0.255	10.0	0.283
9.5	0.025	9.5	0.134	9.5	0.199	9.5	0.244	9.5	0.272
9.0	0.023	9.0	0.116	9.0	0.173	9.0	0.210	9.0	0.228
8.5	0.020	8.5	0.093	8.5	0.141	8.5	0.164	8.5	0.184
8.0	0.019	8.0	0.082	8.0	0.124	8.0	0.143	8.0	0.160
7.5	0.018	7.5	0.074	7.5	0.112	7.5	0.126	7.5	0.139
7.0	0.017	7.0	0.065	7.0	0.096	7.0	0.106	7.0	0.114
6.5	0.015	6.5	0.057	6.5	0.081	6.5	0.087	6.5	0.090
6.0	0.015	6.0	0.051	6.0	0.072	6.0	0.079	6.0	0.082
5.5	0.014	5.5	0.045	5.5	0.063	5.5	0.067	5.5	0.071
5.0	0.013	5.0	0.040	5.0	0.056	5.0	0.057	5.0	0.061
4.5	0.012	4.5	0.038	4.5	0.051	4.5	0.051	4.5	0.054
4.0	0.011	4.0	0.036	4.0	0.049	4.0	0.048	4.0	0.052
3.5	0.011	3.5	0.035	3.5	0.046	3.5	0.045	3.5	0.048
3.0	0.010	3.0	0.033	3.0	0.044	3.0	0.041	3.0	0.045
2.5	0.010	2.5	0.031	2.5	0.041	2.5	0.036	2.5	0.039
2.0	0.008	2.0	0.030	2.0	0.038	2.0	0.031	2.0	0.034
1.5	0.008	1.5	0.027	1.5	0.035	1.5	0.025	1.5	0.028
1.0	0.006	1.0	0.025	1.0	0.031	1.0	0.019	1.0	0.022
0.5	0.006	0.5	0.014	0.5	0.015	0.5	0.006	0.5	0.008
0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000

Figure 8 Control Characteristics Tests (Equal % - Normally Closed) at a fixed Differential Pressure of 30kPa

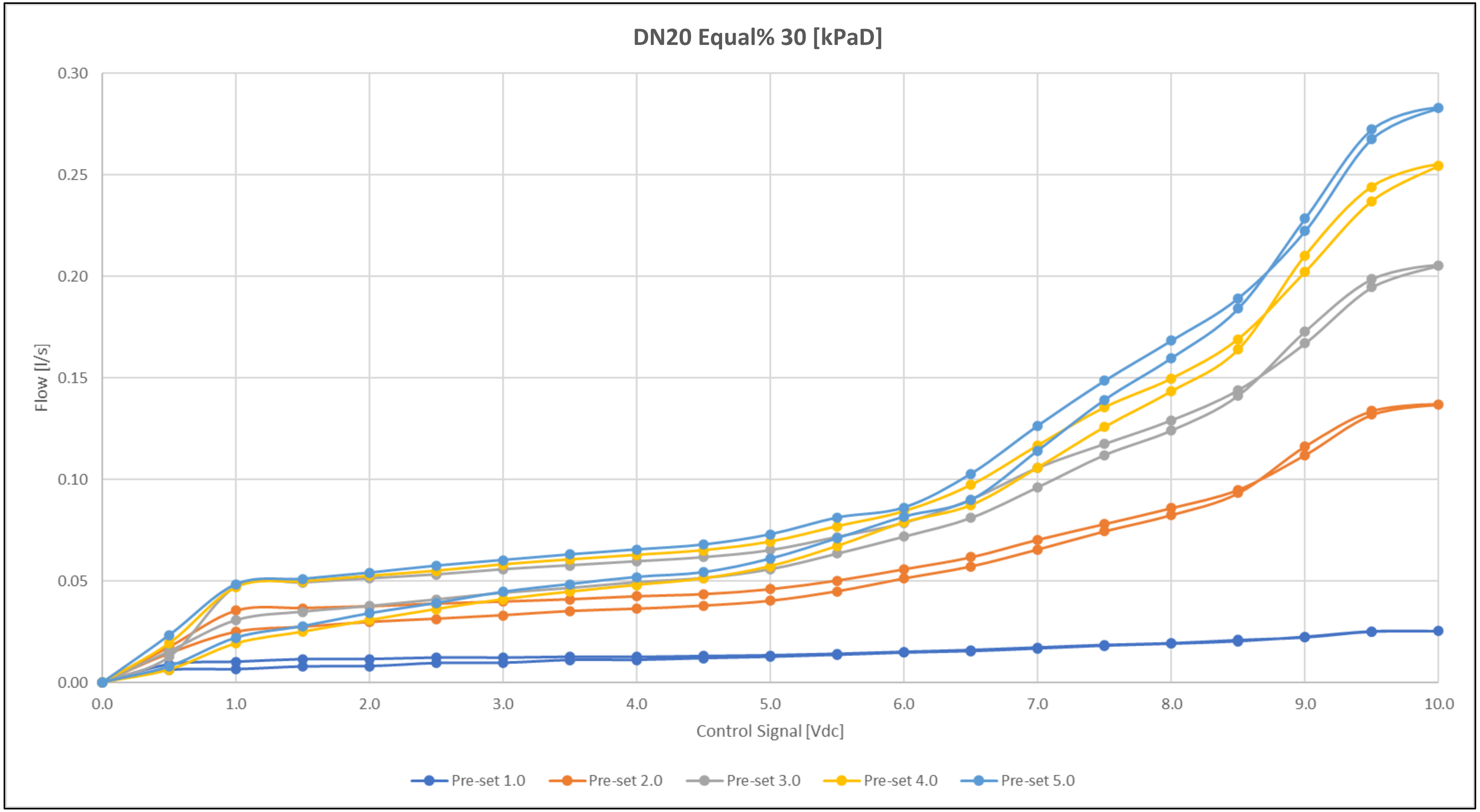


Table 13 and Figure 9 shows the Control Characteristics Tests (Equal %) at a fixed Differential Pressure of 416 kPa.
The average temperature for all tests was 20.6 °C.

Table 13 Control Characteristics Tests (Equal % - Normally Closed) at a fixed Differential Pressure of 416 kPa

Pre-set 1.0		Pre-set 2.0		Pre-set 3.0		Pre-set 4.0		Pre-set 5.0	
Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
0.5	0.010	0.5	0.024	0.5	0.020	0.5	0.005	0.5	0.014
1	0.011	1	0.027	1	0.023	1	0.045	1	0.045
1.5	0.011	1.5	0.030	1.5	0.031	1.5	0.047	1.5	0.048
2	0.011	2	0.031	2	0.031	2	0.050	2	0.051
2.5	0.012	2.5	0.033	2.5	0.037	2.5	0.052	2.5	0.054
3	0.012	3	0.034	3	0.037	3	0.055	3	0.057
3.5	0.012	3.5	0.037	3.5	0.042	3.5	0.058	3.5	0.060
4	0.012	4	0.037	4	0.042	4	0.060	4	0.062
4.5	0.012	4.5	0.040	4.5	0.048	4.5	0.062	4.5	0.065
5	0.013	5	0.043	5	0.052	5	0.066	5	0.069
5.5	0.013	5.5	0.046	5.5	0.059	5.5	0.074	5.5	0.077
6	0.014	6	0.052	6	0.069	6	0.081	6	0.082
6.5	0.015	6.5	0.058	6.5	0.075	6.5	0.093	6.5	0.097
7	0.017	7	0.067	7	0.091	7	0.112	7	0.120
7.5	0.018	7.5	0.075	7.5	0.105	7.5	0.131	7.5	0.141
8	0.018	8	0.083	8	0.117	8	0.144	8	0.159
8.5	0.020	8.5	0.091	8.5	0.130	8.5	0.164	8.5	0.179
9	0.021	9	0.109	9	0.154	9	0.196	9	0.210
9.5	0.024	9.5	0.128	9.5	0.187	9.5	0.231	9.5	0.256
10	0.024	10	0.129	10	0.189	10	0.252	10	0.274
9.5	0.024	9.5	0.129	9.5	0.188	9.5	0.240	9.5	0.264

9	0.021	9	0.109	9	0.156	9	0.199	9	0.222
8.5	0.019	8.5	0.091	8.5	0.129	8.5	0.161	8.5	0.179
8	0.018	8	0.081	8	0.115	8	0.141	8	0.155
7.5	0.017	7.5	0.072	7.5	0.100	7.5	0.123	7.5	0.135
7	0.016	7	0.064	7	0.083	7	0.103	7	0.110
6.5	0.014	6.5	0.054	6.5	0.069	6.5	0.084	6.5	0.086
6	0.013	6	0.048	6	0.062	6	0.077	6	0.078
5.5	0.013	5.5	0.042	5.5	0.051	5.5	0.064	5.5	0.068
5	0.012	5	0.036	5	0.040	5	0.054	5	0.058
4.5	0.011	4.5	0.032	4.5	0.034	4.5	0.048	4.5	0.052
4	0.011	4	0.029	4	0.026	4	0.046	4	0.049
3.5	0.011	3.5	0.028	3.5	0.026	3.5	0.042	3.5	0.046
3	0.010	3	0.023	3	0.017	3	0.038	3	0.042
2.5	0.010	2.5	0.023	2.5	0.017	2.5	0.033	2.5	0.037
2	0.009	2	0.016	2	0.009	2	0.028	2	0.031
1.5	0.009	1.5	0.016	1.5	0.009	1.5	0.022	1.5	0.025
1	0.008	1	0.010	1	0.006	1	0.017	1	0.020
0.5	0.008	0.5	0.010	0.5	0.006	0.5	0.006	0.5	0.007
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000

Figure 9 Control Characteristics Tests (Equal % - Normally Closed) at a fixed Differential Pressure of 416 kPa

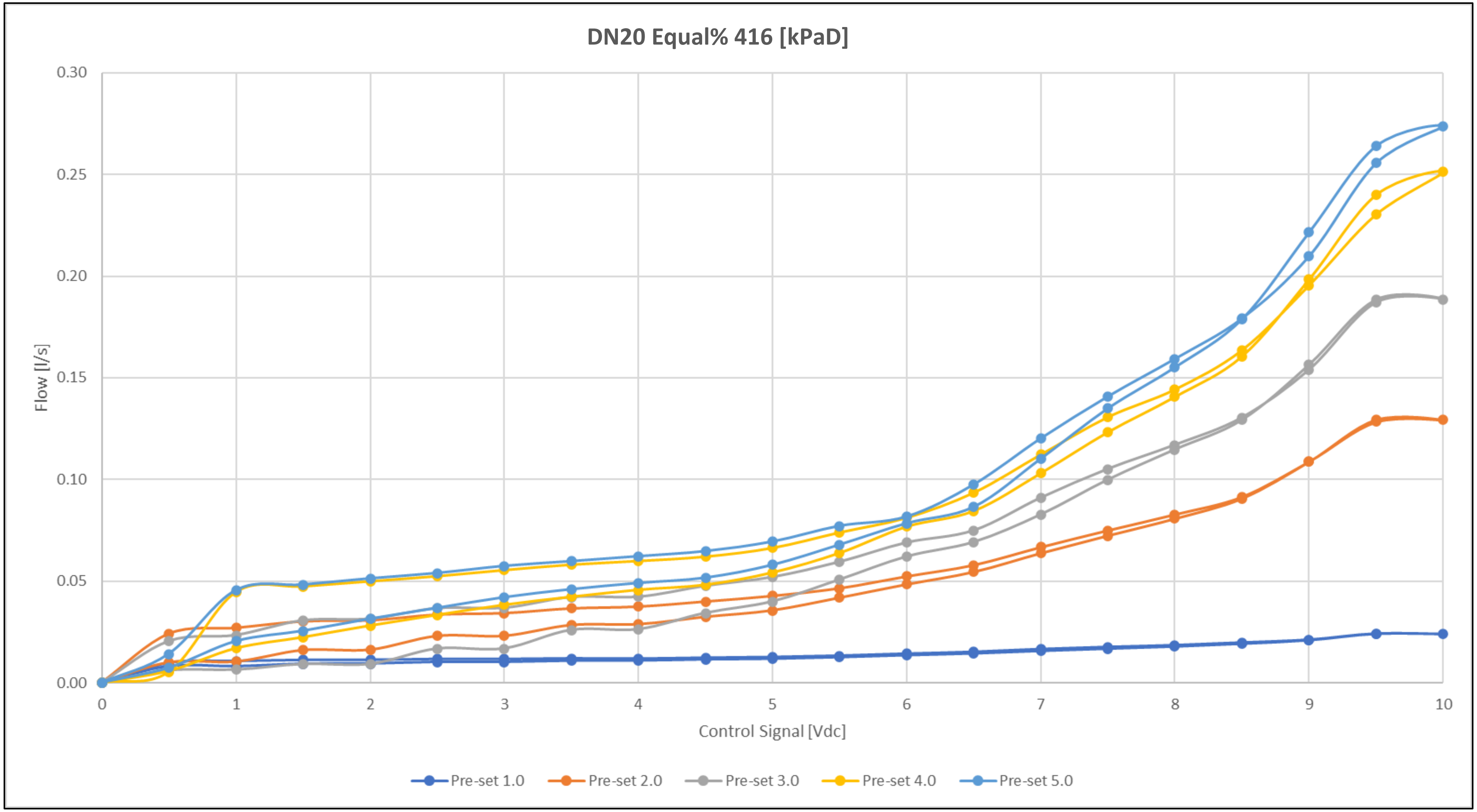


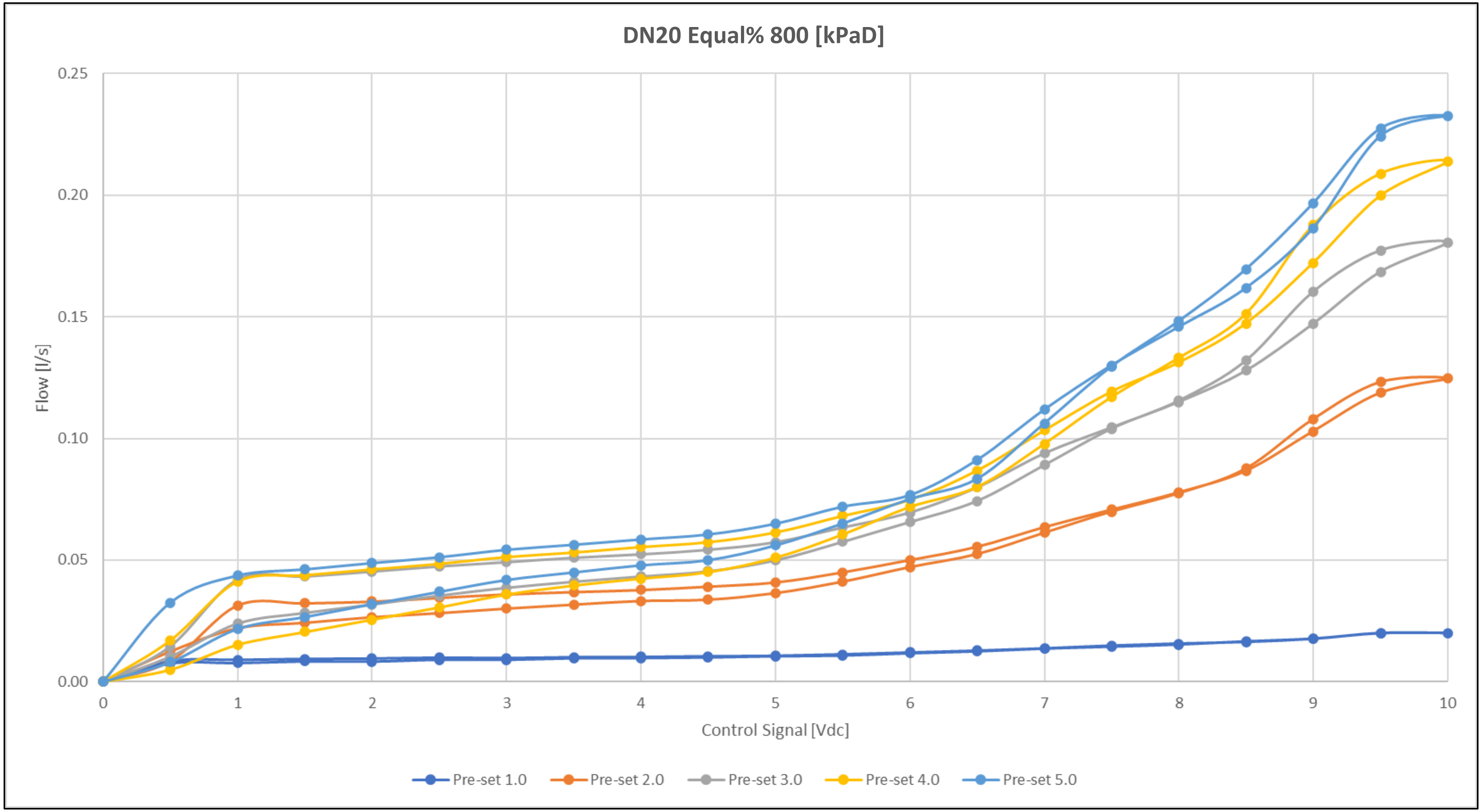
Table 14 and Figure 10 shows the Control Characteristics Tests (Equal %) at a fixed Differential Pressure of 800 kPa.
The average temperature for all tests was 20.6 °C.

Table 14 Control Characteristics Tests (Equal % - Normally Closed) at a fixed Differential Pressure of 800 kPa

Pre-set 1.0		Pre-set 2.0		Pre-set 3.0		Pre-set 4.0		Pre-set 5.0	
Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]	Control voltage (Vdc)	Flow [l/s]
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
0.5	0.008	0.5	0.009	0.5	0.015	0.5	0.017	0.5	0.033
1	0.009	1	0.031	1	0.042	1	0.041	1	0.044
1.5	0.009	1.5	0.032	1.5	0.043	1.5	0.044	1.5	0.046
2	0.010	2	0.033	2	0.045	2	0.046	2	0.049
2.5	0.010	2.5	0.034	2.5	0.047	2.5	0.049	2.5	0.051
3	0.010	3	0.036	3	0.049	3	0.051	3	0.054
3.5	0.010	3.5	0.037	3.5	0.051	3.5	0.053	3.5	0.056
4	0.010	4	0.038	4	0.052	4	0.055	4	0.059
4.5	0.011	4.5	0.039	4.5	0.054	4.5	0.057	4.5	0.061
5	0.011	5	0.041	5	0.057	5	0.061	5	0.065
5.5	0.011	5.5	0.045	5.5	0.063	5.5	0.068	5.5	0.072
6	0.012	6	0.050	6	0.070	6	0.075	6	0.077
6.5	0.013	6.5	0.055	6.5	0.080	6.5	0.087	6.5	0.091
7	0.014	7	0.064	7	0.094	7	0.103	7	0.112
7.5	0.015	7.5	0.071	7.5	0.105	7.5	0.119	7.5	0.130
8	0.016	8	0.078	8	0.115	8	0.131	8	0.146
8.5	0.016	8.5	0.087	8.5	0.128	8.5	0.147	8.5	0.162
9	0.018	9	0.103	9	0.147	9	0.172	9	0.186
9.5	0.020	9.5	0.119	9.5	0.169	9.5	0.200	9.5	0.224
10	0.020	10	0.125	10	0.181	10	0.214	10	0.233
9.5	0.020	9.5	0.123	9.5	0.177	9.5	0.209	9.5	0.227

9	0.018	9	0.108	9	0.160	9	0.188	9	0.197
8.5	0.017	8.5	0.088	8.5	0.132	8.5	0.151	8.5	0.170
8	0.015	8	0.077	8	0.116	8	0.133	8	0.148
7.5	0.014	7.5	0.070	7.5	0.104	7.5	0.117	7.5	0.130
7	0.014	7	0.061	7	0.089	7	0.098	7	0.106
6.5	0.013	6.5	0.052	6.5	0.074	6.5	0.080	6.5	0.083
6	0.012	6	0.047	6	0.066	6	0.072	6	0.075
5.5	0.011	5.5	0.041	5.5	0.058	5.5	0.061	5.5	0.065
5	0.011	5	0.036	5	0.050	5	0.051	5	0.056
4.5	0.010	4.5	0.034	4.5	0.045	4.5	0.045	4.5	0.050
4	0.010	4	0.033	4	0.043	4	0.042	4	0.048
3.5	0.010	3.5	0.032	3.5	0.041	3.5	0.040	3.5	0.045
3	0.009	3	0.030	3	0.039	3	0.036	3	0.042
2.5	0.009	2.5	0.028	2.5	0.035	2.5	0.031	2.5	0.037
2	0.008	2	0.027	2	0.032	2	0.026	2	0.032
1.5	0.008	1.5	0.024	1.5	0.028	1.5	0.021	1.5	0.027
1	0.008	1	0.022	1	0.024	1	0.015	1	0.022
0.5	0.008	0.5	0.012	0.5	0.010	0.5	0.005	0.5	0.008
0	0.000	0	0.000	0	0.000	0	0.000	0	0.000

Figure 10 Control Characteristics Tests (Equal % - Normally Closed) at a fixed Differential Pressure of 800 kPa



7.5 SEAT LEAKAGE TEST

Table 15 shows result for seat leakage test on MAPLEF GREEN.1, DN20 valve. Figure 11 shows the valve being tested.

Table 15 Seat Leakage Test Results

Valve	Pressure (kPa)	Leakage
MAPLEF GREEN.1, DN20	800	0.00 l/h

Figure 11 Seat leakage test setup

8 CONCLUSIONS

The valve demonstrated pressure independence, repeatability, seat leak tightness and linear/Eq% control characteristics in conjunction with the actuators used for test.

The test method was taken from with BSRIA Technical Standard BTS 1/2019 “Test Method for PICVs and DPCVs This is available on the BSRIA website.

The test rig, procedures and staff met the requirements for conducting tests in accordance with BTS 1/2019.

Technical data for the MAPLEF GREEN.1, DN20 was used to determine nominal flow rates and maximum and minimum settings and differential pressures.

Technical data for the MAPLEF GREEN.1, DN20 can be found on Appendix B of this report.

The tests measured pressure differential on pressure points of the valve body.

- MEASURED FLOW VS NOMINAL FLOW – Clause 2.3 of BTS 1/2019

Flow rates achieved were repeatable within ± 5 % for the total scale pre-sets tested, at the nominal differential rating pressures of 100 kPa (1 bar).

- FLOW STABILITY - Clause 2.4 of BTS 1/2019

The average flow rate of the valves tested was within ± 1.0 % of the nominal flow rate from minimum differential pressure to a maximum differential pressure of 400 kPa except for setting 1.0.

The average flow rate of the valves tested was within ± 4.0 % of the nominal flow rate from minimum differential pressure to a maximum differential pressure of 800 kPa except for setting 1.0.

- CONTROL CHARACTERISTIC (WITH ACTUATOR) (linear and equal%) - Clause 2.5 of BTS 1/2019

Flow characteristic control curves followed a linear form in combination with the actuator used during tests.

Flow characteristic control curves followed an equal percentage form in combination with the actuator used during tests.

- SEAT LEAKAGE TEST - Clause 2.6 of BTS 1/2019

MAPLEF GREEN.1, DN20 met Class V of IEC60534-4 with a leakage of 0.00 l/h at 800 kPaD differential pressure compared to the class IV limit of 0.573 l/h.

APPENDIX A: CALIBRATION CERTIFICATES

Kalibreringscertifikat

S134318
Side 1 / 2

KUNDE:
Flowcon International A/S
Trafikcenter Allé 17
4200 Slagelse

Kalibrering

Certifikat nr.: S134318
Instrument under kalibrering:
Fabrikat : Yokogawa
Model : EJA110E
Serie nr. : 91V227367

Kal af: Insatech A/S
Næstvedvej 73C
4720 Præstø
Sted: Flowcon International A/S

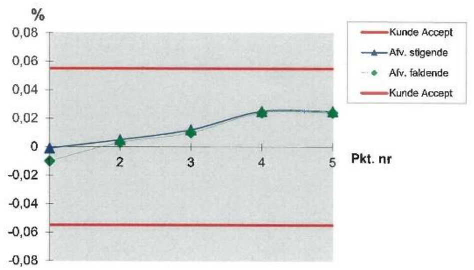
Kalibreringsdato 03.10.2019
Udstedelsesdato: 04.10.2019

Udført af : Jens Kaas Sloth

Måle punkt nr.	Tryk 1. stigende	
	Ref. [Bar g]	Målt [Bar g]
1	0,000	-0,0001
2	2,500	2,5005
3	5,000	5,0012
4	7,5000	7,5025
5	10,000	10,0025

Måle punkt nr.	Tryk 2. Faldende	
	Ref. [Bar g]	Målt [Bar g]
5	10,000	10,0024
4	7,500	7,5024
3	5,000	5,001
2	2,500	2,5003
1	0,000	-0,001

Afvigelse i % af SPAN



* Grafen kan kun tolkes i forhold til de angivne setpunkter. Den indikerede interpolering mellem punkter er alene en visuel angivelse.

Kalibreringscertifikat

S134318
Side 2 / 2

Kunde specificerede krav til setpunkt og / eller UUT specifikation

Kalib. Pkt	Setpunkt	Accept % SPAN
1	0	0,055
2	2,5	0,055
3	5	0,055
4	7,5	0,055
5	10	0,055

Reference udstyr:

ADT 811 ID nr: 340
Kalibreringscertifikat: Danak200 / 200-P-24831 Dato Udført : 11.04.2019 / Udløb : 11.04.2020

Kalibreringsmedie: Luft
Omgivelses temperatur: 20,6 °C
Kalibreringsprocedure: F5.9

Kalibreringsudstyrets måleevne
Tryk
Tryk [Barg] 0,05 mBar
Tryk [Bara] 0 mBar

* Ovenstående usikkerhed er med konfidensniveau på 95,45% (k=2)

Kommentar

Udført af : Jens Kaas Sloth

Godkendt af: Anders Børre

DANAK
CAL Reg.nr. 9

Kalibreringscertifikat

Certifikat nr.:	9.6A-E00253
Task nr.:	119-23745
Certifikat dato:	2019-02-26
Side:	1 af 3
Bilag:	-

Opgave: Kalibrering af flowmåler - onsite hos rekvirent

Kundeudstyr:

Fabrikat:	Krohne
Type:	Optiflux 1100
Serie nr.:	A13315427
Kunde ID:	-
Måleområde: [l/h]	0 - 3000
Delingsværdi:	0,01
Kalibreringspunkter:	Se side 3
Andet:	-

Rekvirent:

Rekvirent:	Flowcon International ApS
Adresse:	Trafikcenter Allé 17
Post nr. og by:	4200 Slagelse
Land:	Danmark
Att.:	Carsten Møller
Rekvisitions nr.:	-

Kalibreringsresultater: Se side 3

Kalibreret af: Morten Siemoneit

Kalibreringsdato: 2019-02-21

Sporbarhed:	Se side 2
Måleusikkerhed:	Se kalibreringsresultater
Referencebetingelser:	Se side 2

Morten Siemoneit
Tekniker
Underskriftsberettiget

Nikki Christoffersen
Ingeniør

FORCE Technology, Metrologi, Park Allé 345, DK-2605 Brøndby,
Telefon: +45 43 25 00 00 Telefax: +45 43 25 00 10 E-mail: info@forcetechnology.dk Web: www.forcetechnology.com

flowmålermaster V.1 .6.4 d. 26-02-2019

Certifikatet må kun gengives i uddrag med FORCE Technology skriftlige tilladelse
Prøvningsresultaterne gælder udelukkende for de prøvede emner

---

Certifikat nr.:	9.6A-E00253
Task nr.:	119-23745
Certifikat dato:	2019-02-26
Side:	2 af 3
Bilag:	-

Sporbarhed og referencebetingelser

Influensparametre

Laboratorie temperatur [°C]	-
Atmosfærisk tryk [mbar]	-
Relativ fugtighed [%RH]	-
Væsketemperatur [°C]	-
Tilgangstryk [barg]	-

Sporbarhed

	Referenceudstyr flow		Sporbar til	Kalibreret
	VF-V.16	1 - 20 l/h	Akkreditering nr. 9	januar 2019
	VF-V.15	20 - 150 l/h	Akkreditering nr. 9	december 2018
	VF-V.2	150 - 8000 l/h	Akkreditering nr. 9	december 2018
	VF-V.9	5000 - 80000 l/h	Akkreditering nr. 9	januar 2019
	VF-V.14	60000 - 150000 l/h	Akkreditering nr. 9	december 2018
x	VF-MOB.3	150 - 8000 l/h	Akkreditering nr. 9	september 2018
	VF-MOB.2	5000 - 80000 l/h	Akkreditering nr. 9	september 2018
	VF-MOB.17	8-160 l/min	Akkreditering nr. 9	november 2017

Referenceudstyr temperatur	Sporbar til	Kalibreret
VF-T9.6A	Akkreditering nr. 9	januar 2019
VF-T9.6B	Akkreditering nr. 9	januar 2019
VF-T9.6C	Akkreditering nr. 9	januar 2019

Referenceudstyr mA	Sporbar til	Kalibreret
Multimeter nr. 0869613	Akkreditering nr. 333	april 2018
Multimeter nr. MY57509801	UKAS 0310	juli 2018

Metode

Volumen	70.16.02 og 80.2.3.3.12
Densitet	70.12.06

Usikkerhed

Den rapporterede ekspanderede usikkerhed er angivet som standardusikkerheden multipliceret med dækningsfaktoren $k = 2$, som for en normalfordeling svarer til en dækningssandsynlighed på ca. 95%.
Standardusikkerheden er fastlagt i overensstemmelse med EA-4/02.
Ukal består af Ucmc samt aflæsningsusikkerheden på DUT.

flowmålermaster V.1 .6.4 d. 26-02-2019

Certifikatet må kun gengives i uddrag med FORCE Technology skriftlige tilladelse
Prøvningsresultaterne gælder udelukkende for de prøvede emner

Certifikat nr.:	9.6A-E00253
Task nr.:	119-23745
Certifikat dato:	2019-02-26
Side:	3 af 3
Bilag:	-

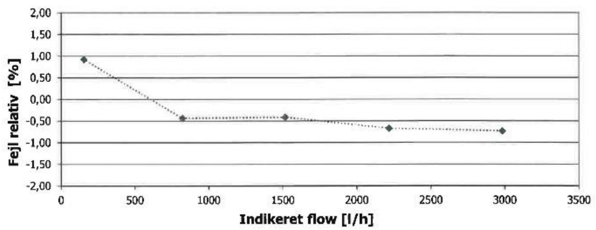
Kalibreringsresultat

Serie nr.: A13315427

Flow nr	-	Indikeret flow [l/h]	Sand flow [l/h]	Fejl absolut [l/h]	Fejl relativ [%]	U_{cmc} (k=1) [l/h]	Usikkerhedsbidrag fra DUT* (k=1) [l/h]	U_{kal}** (k=2) [%]	Antal målinger [n]
1		154,82	153,403	1,417	0,92	0,196	0,27	0,46	3
2		820,01	823,60	-3,59	-0,44	0,86	0,37	0,23	3
3		1516,87	1523,17	-6,30	-0,41	1,55	3,01	0,46	3
4		2217,37	2232,35	-14,98	-0,67	2,27	2,16	0,30	3
5		2983,08	3005,01	-21,93	-0,73	3,04	4,78	0,40	3

* Usikkerhedsbidrag fra DUT indeholder bidrag fra aflæsning samt spredningen på målingerne.

Fejlkurve



flowmålermaster V.1.6.4 d. 26-02-2019

DANAK

CAL Reg.nr. 9

FORCE TECHNOLOGY

Kalibreringscertifikat

Certifikat nr.:	9.6A-E00264
Task nr.:	119-33132
Certifikat dato:	2019-10-03
Side:	1 af 3
Bilag:	-

Opgave: Kalibrering af flowmåler - display mod vægt

Kundeudstyr:

Fabrikat:	Krohne
Type:	OPTIFLUX 1100
Serie nr.:	A13315427
Kunde ID:	-
Måleområde: [l/h]	15 - 3000
Delingsværdi:	0,01
Kalibreringspunkter: [l/h]	15; 50; 100 og 150
Andet:	Værdier er aflæst på HMI

Rekvirent:

Rekvirent:	Flowcon International ApS
Adresse:	Trafikcenter Allé 17
Post nr. og by:	4200 Slagelse
Land:	Danmark
Att.:	Lasse Wly Lorenzen
Rekvisitions nr.:	119-33132

Kalibreringsresultater: Se side 3

Kalibreret af: Jonas Hallestad Bertram

Kalibreringsdato: 2019-10-02

Sporbarhed:	Se side 2
Måleusikkerhed:	Se kalibreringsresultater
Referencebetingelser:	Se side 2

Nikki Christoffersen
Ingeniør
Underskriftsberettiget

Jonas Hallestad Bertram
Maskinmester

FORCE Technology, Metrologi, Park Allé 345, DK-2605 Brøndby,
Telefon: +45 43 25 00 00 Telefax: +45 43 25 00 10 E-mail: info@forcetechnology.dk Web: www.forcetechnology.com

flowmålermaster V.1.6.7 d. 27-07-2019

Certifikat nr.:	9.6A-E00264
Task nr.:	119-33132
Certifikat dato:	2019-10-03
Side:	2 af 3
Bilag:	-

Sporbarhed og referencebetingelser

Influensparametre

Laboratorie temperatur [°C]	20,9
Atmosfærisk tryk [mbar]	1000
Relativ fugtighed [%RH]	59,1
Væsketemperatur [°C]	20,4 - 20,5
Tilgangstryk [barg]	1,13 - 1,6

Sporbarhed

	Referenceudstyr flow		Sporbar til	Kalibreret
	VF-V.16	1 - 20 l/h	Akkreditering nr. 9	juni 2019
	VF-V.15	20 - 150 l/h	Akkreditering nr. 9	juni 2019
	VF-V.2	150 - 8000 l/h	Akkreditering nr. 9	juni 2019
	VF-V.9	5000 - 80000 l/h	Akkreditering nr. 9	juni 2019
	VF-V.14	60000 - 150000 l/h	Akkreditering nr. 9	juni 2019
	VF-MOB.3	150 - 8000 l/h	Akkreditering nr. 9	juni 2019
	VF-MOB.2	5000 - 80000 l/h	Akkreditering nr. 9	juni 2019
x	VF-M.3	1 - 25 kg	Akkreditering nr. 9	oktober 2018

	Referenceudstyr temperatur	Sporbar til	Kalibreret
	VF-T9.6A	Akkreditering nr. 9	januar 2019
	VF-T9.6B	Akkreditering nr. 9	januar 2019
	VF-T9.6C	Akkreditering nr. 9	januar 2019
x	VF-MOB.T01	Akkreditering nr. 9	marts 2019

Referenceudstyr mA	Sporbar til	Kalibreret
Multimeter nr. 0869613	Akkreditering nr. 333	april 2018
Multimeter nr. MY57509801	Akkreditering nr. 333	juli 2019

Metode

Volumen	70.14.04 og 80.2.3.3.14
Densitet	70.12.06

Usikkerhed

Den rapporterede ekspanderede usikkerhed er angivet som standardusikkerheden multipliceret med dækningsfaktoren k = 2, som for en normalfordeling svarer til en dækningssandsynlighed på ca. 95%. Standardusikkerheden er fastlagt i overensstemmelse med EA-4/02.
Ukal består af Ucmc samt aflæsningsusikkerheden på DUT.

flowmålermaster V.1 .6.7 d. 27-07-2019

Certifikat nr.:	9.6A-E00264
Task nr.:	119-33132
Certifikat dato:	2019-10-03
Side:	3 af 3
Bilag:	-

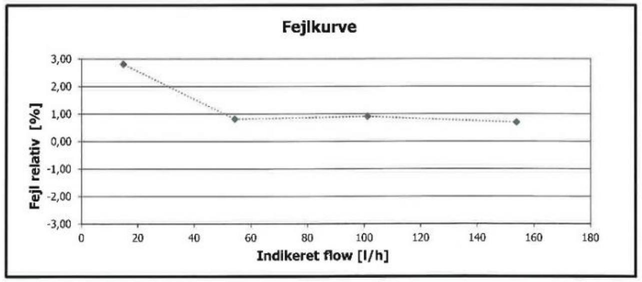
Kalibreringsresultat

Serie nr.: A13315427

Kunde ID: -

Flow	Sand Volumen	Indikeret flow	Sand flow	Fejl absolut	Fejl relativ	U_{cmc} (k=1)	Usikkerhedsbidrag fra DUT* (k=1)	U_{kal}** (k=2)	Antal målinger
nr	[l]	[l/h]	[l/h]	[l/h]	[%]	[l/h]	[l/h]	[%]	[n]
1	13,247	153,89	152,828	1,062	0,69	0,165	0,45	0,63	3
2	8,6873	101,20	100,290	0,910	0,91	0,113	0,37	0,77	3
3	5,5660	54,36	53,922	0,438	0,81	0,068	0,06	0,34	3
4	5,0468	14,82	14,4146	0,4054	2,81	0,0186	0,15	2,17	3

* Usikkerhedsbidrag fra DUT indeholder bidrag fra aflæsning samt spredningen på målingerne.
** U_{kal} består af den akkrediterede måleevne (u_{cmc}), samt bidrag fra aflæsning af DUT.



flowmålermaster V.1 .6.7 d. 27-07-2019

Element Metech A/S
Herningvej 30
DK-7470 Karup

T: +45 96 62 50 00
info.metech.dk@element.com
elementmetech.dk

KALIBRERINGSCERTIFIKAT

Udstedt af et akkrediteret kalibreringslaboratorium

Certifikat nummer	Certifikat dato		Side (af)
923559	2019-11-07		1 (4)
	Kalibreret af	Godkendt af	
	Anders René Sørensen	Klaus H. Kristensen	

KUNDE: **FLOWCON INTERNATIONAL A/S**
TRAFIKCENTER ALLÉ 17
4200 SLAGELSE

KALIBRERINGSOBJEKT: **TERMOMETER, ELMA, 711**
Serienr.: 111201906
ID nr.: -
METECH nr.: 421361
(MIO nr.:)

YDELSE: Akkrediteret Kalibrering

KALIBRERINGENS OMFANG: Element Metech kalibreringsinstruktion PMM6229.

STATUS: Der er ikke foretaget justering eller reparation.

KALIBRERINGSRESULTAT: **Alle de målte størrelser ligger inden for tolerancen med en dækningssandsynlighed på 95%.**

KALIBRERINGSDATO: 2019-11-07
(åååå-mm-dd)

MODTAGELSESDATO: 2019-11-05
(åååå-mm-dd)

KALIBRERINGSSTED: Termometrilaboratoriet, Lab. 268, 7470 Karup

OMGIVELSESFORHOLD: Temperatur: (23 ± 3) °C, Luftfugtighed: (40 ± 30) %rh

SPORBARHED: Kalibrering er foretaget med referenceudstyr, som er direkte eller indirekte sporbart til laboratoriets referencenormaler. Laboratoriets referencenormaler er sporbare til nationale eller internationale normaler.

Måleprocedurer og måleudstyr anvendt under kalibreringen er valgt så det så vidt muligt sikres at måleusikkerheden er mindre end en tredjedel af tolerancen og således at målingerne er sporbare til Det Internationale Enhedssystem (SI-systemet) hvor det er muligt. Måleusikkerheden er bestemt i overensstemmelse med EA-publikation EA-4/02. Ved bedømmelse af overensstemmelse med specifikationer er måleusikkerheden taget i betragtning. Enhver angivelse af overensstemmelse med specifikationer er kun gældende for de målte værdier. Overensstemmelse med specifikationer er bedømt ud fra retningslinjerne i ILAC-publikation ILAC-G8:03/2009.

Laboratoriet er akkrediteret af Den Danske Akkrediteringsfond – DANAK i henhold til dansk lovgivning. De akkrediterede laboratorieaktiviteter opfylder kravene i ISO/IEC 17025. DANAK er medunderskriver af EA's og ILAC's multilaterale aftaler om gensidig anerkendelse af akkrediterede kalibreringscertifikater og prøvningsrapporter.

DANAK
CAL Reg. nr. 333

Layout Edt. 4.44; XL8 Macro Edt. 7.06; BF Macro Edt. 1.84; Print 2019-11-07 12:24:07 Edt. 2
Test template: TES_PMM6229_001_124

KALIBRERINGSCERTIFIKAT

Udstedt af et akkrediteret kalibreringslaboratorium

Certifikat nummer	Side (af)
923559	2 (4)

Referenceudstyr	ID nr.	Næste kal.
Digital Temperatur Indikator, Ametek DTI 1000A	D1287	2020-09-02
Pt100 Føler, Ametek PT100STS-100B-500	D1489	2020-02-25

Øvrigt udstyr	ID nr.
Scanner, Ametek ASM-803 A	D1358
Kalibreringsbad (Olie), Heto Holten KB-22	D1312

Måleusikkerhed:

Den rapporterede ekspanderede usikkerhed er angivet som standardusikkerheden multipliceret med dækningsfaktoren k = 2, som for en normalfordeling svarer til en dækningssandsynlighed på ca. 95%. Standardusikkerheden er fastlagt i overensstemmelse med EA-4/02.

KALIBRERINGSCERTIFIKAT
Udstedt af et akkrediteret kalibreringslaboratorium

Certifikat nummer 923559 Side (af) 3 (4)

Overensstemmelsesvurdering:

Såfremt der er angivet specifikation for det enkelte måleresultat, vil der være anført en note.
Noterne angiver hvorledes de enkelte resultater er i overensstemmelse med specifikation.

Bemærk at overensstemmelsesvurderingen gælder for en dækningssandsynlighed på ca. 95%.

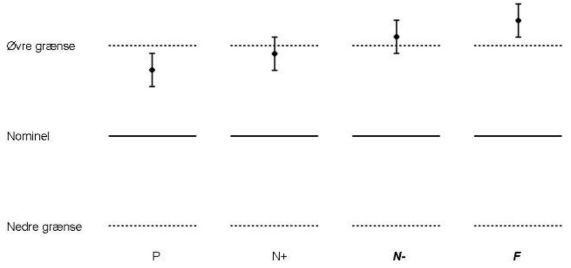
P Pass: Resultatet udvidet med den ekspanderede usikkerhed ligger inden for den angivne specifikation.

N+ Resultatet ligger inden for den angivne specifikation, men resultatet udvidet med den ekspanderede usikkerhed kan ligge uden for den angivne specifikation.

N- Resultatet ligger uden for den angivne specifikation, men resultatet udvidet med den ekspanderede usikkerhed kan ligge inden for den angivne specifikation.

F Fail: Resultatet udvidet med den ekspanderede usikkerhed ligger uden for den angivne specifikation.

NE Forholdet mellem usikkerhed og specifikation (TUR) er ikke tilstrækkeligt til at foretage en overensstemmelsesvurdering (Not Evaluated).



Ord/forkortelser der kan være brugt i certifikatet/rapporten:

NA:	Not Available	ppm:	parts per million
UUT:	Unit Under Test	TUR:	Test Uncertainty Ratio
DUT:	Device Under Test	NCR:	No Calibration Required
NT:	Not Tested	MPE:	Maximum Permissible Error
NS:	Not Specified		

KALIBRERINGSCERTIFIKAT
Udstedt af et akkrediteret kalibreringslaboratorium

Certifikat nummer 923559 Side (af) 4 (4)

Måleresultater:

Målinger er foretaget som sammenligningsmålinger i bad(e) eller tørblok kalibrator, dvs. sammenligning af kalibreringsobjekt mod referencetermometer.

Alle målinger er foretaget med "immersion depth" > 50 mm.

Temperatur:

ID-nr. probe	Reference Temperatur	Målt Temperatur	Afvigelse	Usikkerhed	Spec. [±]	a)
K257261	19,972 °C	20,0 °C	0,028 °C	0,061 °C	2,520 °C	P
	40,024 °C	40,0 °C	-0,024 °C	0,063 °C	2,540 °C	P
	60,000 °C	60,2 °C	0,200 °C	0,063 °C	2,560 °C	P

Den angivne referencetemperatur er givet i henhold til den Internationale Temperaturskala af 1990 (ITS-90).

a) Specifikation I henhold til producenten inkl. føler i henhold til EN-60584-2 klasse 1.

Bemærk at probe(r) og udlæseenhed er kalibreret som et samlet system og ikke umiddelbart kan anvendes hver for sig uden fornyet kalibrering.

Slut på dokument

APPENDIX B: MAPLEF GREEN.1 DN20 DATA SHEET

PRESSURE INDEPENDENT CONTROL VALVE

Maplef Green.0 / Green.1 / Green.2

15-40 mm / 1/2"-1 1/2"

FEATURES / CHARACTERSTICS

Insert:	
Static pressure	: 2500 kPa / 360 psi
Ambient temperature	: +1°C to +50°C / +34°F to +122°F
Media temperature[1]	: -20°C to +120°C / -4°F to +248°F
Material:	
- Insert	: Glass-reinforced PSU/POM/PPS
- Metal components (internal)	: Stainless steel
- O-rings	: EPDM
- Cone	: PPS
- Diaphragm	: 20 mm / 3/4" insert: EPDM
40 mm / 1 1/2" insert	: Hydrogenated acrylonitrile-butadiene-rubber
- Head nut	: Forged brass ASTM CuZn40Pb2
Stroke	: 20 mm / 3/4" insert: 3.4 mm / 0.13 in 40 mm / 1 1/2" insert: 5.2 mm / 0.2 in
Maximum close off pressure	: 800 kPa / 116 psi
Maximum operational ΔP	: 800 kPaD / 116 psid
Control characteristic	: linear (may be converted to equal % on actuator)
Control range	: 1:1000 / IEC 60534
Rangeability	: 100:1
Turn down ratio	: 100:1
Shut-off leakage	: ANSI / FCI 70-2 2006, Class IV / IEC 60534-4, Class IV
Flow rate range	: 20 mm / 3/4" insert: 0.0103-0.736 l/sec / 0.163-11.7 GPM 40 mm / 1 1/2" insert: 0.240-1.29 l/sec / 3.81-20.4 GPM
Valve:	
Material:	
- Housing	: Forged brass ASTM CuZn40Pb2 or DZR ASTM CuZn36Pb2As
- Ball valve	: ABV: Chemically nickel-plated brass ball
End connections[2]	: A/AB: Fixed female ISO or NPT ABV: Union end connection in brass alloy ISO or NPT
Housing taps	: AB/ABV: 1/4" ISO.

Note 1: Stated temperature rating is defined due to no external insert condensation.
Note 2: NPT only available ex. US-factory.

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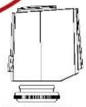
PRESSURE INDEPENDENT CONTROL VALVE

Maplef Green.0 / Green.1 / Green.2

MAPLEF ACTUATORS



Maplef MFT.0.2

Maplef MFT.0.3/0.4

Maplef Actuator[2]	MFT.0.2[3]	MFT.0.3[3]	MFT.0.4[3]
Supply voltage	24V AC -10%... +20%, 50/60Hz	230V AC ±10%, 50/60Hz	24V AC/DC -10%... +20%, 50/60Hz
Type	Thermal	Thermal	Thermal
Power consumption	1.2W	1.2W	1.2W
Control signal	Analog 0-10V, Normally closed	ON/OFF, Normally closed	ON/OFF, Normally closed
Failsafe function	Yes	Yes	Yes
Operation time4	App. 3.5 minutes	App. 4.5 minutes	App. 4.5 minutes
Ambient temperature	0°C to +60°C / +32°F to +140°F	0°C to +60°C / +32°F to +140°F	0°C to +60°C / +32°F to +140°F
Protection	IP54 including upside-down, class III	IP54 including upside-down, class II	IP54 including upside-down, class III
Cable	Plug-in, 1 m / 3 ft	Fixed, 1 m / 3 ft	Fixed, 1 m / 3 ft
Weight	0.12 kg / 0.26 lb	0.11 kg / 0.24 lb	0.11 kg / 0.24 lb

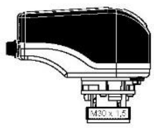
Note 2: Maplef warranty is voided using other actuators than supplied by Maplef.
Note 3: Please note if mounted on Maplef Green.2 specified leakage rate to be exceeded.
Note 4: Closing time is approximately the double dependent on ambient temperature.

Maplef Actuator[5]	MFN.0.2	MFNP.0.2	MFN.0.3	MFN.0.4
Supply voltage	24V AC/DC ±10%, 50/60 Hz	24V AC/DC ±10%, 50/60 Hz	110/230V AC ±10%, 50/60 Hz	24V AC/DC ±10%, 50/60 Hz
Type	Electrical, bi-directional synchronous motor			
Power consumption	AC: 2.5VA operating (4.7VA max) DC: 1.2W operating (2.2W max)	AC: 2.5VA operating (4.7VA max) DC: 1.2W operating (2.2W max)	5VA	AC: 2.5VA operating (4.7VA max) DC: 1.2W operating (2.2W max)
Control signal	Analog 0(2)-10V DC, <0.5mA	Analog 0(2)-10V DC, <0.5mA	Digital 2-position / 3-point floating	Digital 2-position / 3-point floating
Feedback	Yes, control signal	No	No	No
Failsafe function	No	No	No	No
Auto stroke	Yes	Yes	No	Yes
Operation time	max 22 sec/mm	max 22 sec/mm	50 Hz: 18.5 sec/mm	max 22 sec/mm
Ambient temperature	0°C to +50°C / +32°F to +122°F	0°C to +50°C / +32°F to +122°F	+2°C to +50°C / +36°F to +122°F	0°C to +50°C / +32°F to +122°F
Media temperature	0°C to +120°C / +32°F to +248°F	0°C to +120°C / +32°F to +248°F	-	0°C to +120°C / +32°F to +248°F
Humidity rating	0..85% rH, no condensation	0..85% rH, no condensation	<95% rH, no condensation	0..85% rH, no condensation
Protection	IP54, class III (IP40 upside-down) indoor use only	IP54 including upside-down, class III, indoor use only	IP54, class II	IP54, class III (IP40 upside-down) indoor use only
Cable	Fixed 5 x 0.5 mm2, 1.5 m / 5 x AWG20, 4.9 ft	Fixed 3 x 0.5 mm2, 1.5 m / 3 x AWG20, 4.9 ft	Fixed 3 x 0.3 mm2, 1 m halogen free / 3 x AWG22, 3 ft halogen free	Fixed 3 x 0.5 mm2, 1.5 m 3 x AWG20, 4.9 ft
Closing point adjustment	During operation the actuator will self-adjust according to the closing point of the valve			
Weight	0.25 kg / 0.55 lb	0.25 kg / 0.55 lb	0.25 kg / 0.55 lb	0.25 kg / 0.55 lb

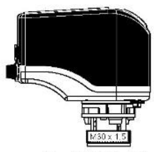
Note 5: Maplef warranty is voided using other actuators than supplied by Maplef.

Maplef Actuator[6]	MFN.1.2		MFN.1.4
Supply voltage	24V AC/DC ±10%, 50/60 Hz		
Type	Electrical, bi-directional synchronous motor		
Power consumption	AC: 5.8VA operating (6.8VA max) DC: 2.9W operating (3.3W max)		6VA, 10VA peaks
Control signal	Analog 0(2)-10V DC, <0.5mA	Digital 2-position	Digital 2-position / 3-point floating
Feedback	Yes, control signal	Yes, 0-10V DC	No
Failsafe function	Yes		Yes
Auto stroke	Yes		No
Operation time	22 sec/mm (failsafe mode: 5 sec/mm)		50 Hz: 18.5 sec/mm
Ambient temperature	0°C to +50°C / +32°F to +122°F		+2°C to +50°C / +36°F to +122°F
Media temperature	0°C to +120°C / +32°F to +248°F		-
Humidity rating	0..85% rH, no condensation		<95% rH, no condensation
Protection	IP54 including upside-down, class III, indoor use only		IP54, class II
Cable	Fixed, 5 x 0.5 mm2, 1.5 m / 5 x AWG20, 4.9 ft		Fixed, 4 wires AWG22 halogen free cable, 1 m / 3 ft
Closing point adjustment	During operation the actuator will self-adjust according to the closing point of the valve		
Weight	0.27 kg / 0.60 lb		0.30 kg / 0.66 lb

Maplef MFN.0.2/0.4/1.2 and MFNP.0.2



Maplef MFN.0.3



Maplef MFN.1.4

Note 6: Maplef warranty is voided using other actuators than supplied by Maplef.

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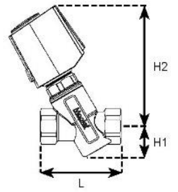
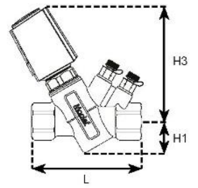
PRESSURE INDEPENDENT CONTROL VALVE

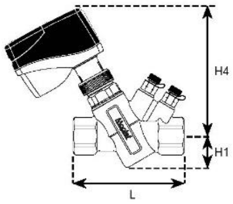
Maplef Green.0 / Green.1 / Green.2



Maplef Green.0/1 in Maplef A valve DN15/20/25 (1/2", 3/4", 1") with Maplef MFT.0.2 actuator



Maplef Green.0/1 in Maplef AB valve DN15/20/25 (1/2", 3/4", 1") with Maplef MFT.0.3/0.4 act.

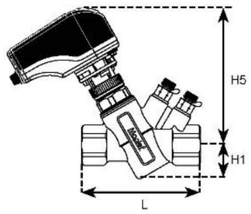


Maplef Green.0/1 in Maplef AB valve DN15/20/25 (1/2", 3/4", 1") w. Maplef MFN.0.2/0.4/1.2 + MFNP.0.2 actuator

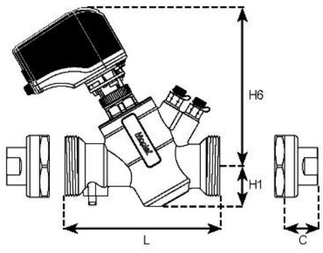
DIMENSIONS AND WEIGHTS (NOMINAL)

Model no.	Valve model	Valve size mm (in)	Insert size mm (in)	L mm (in)	H1 mm (in)	H2 MFT.0.2 actuator mm (in)	H3 MFT.0.3/0.4 actuator mm (in)	H4 MFN.0.2/0.4/1.2 MFNP.0.2 act. mm (in)	H5 MFN.0.3 actuator mm (in)	H6 MFN.1.X actuator mm (in)	End connections C[7] Female ISO (NPT)	End connections C[7] Male ISO (NPT)	End connections C[7] Sweat ISO (NPT)	Weight[8] kg (lb)
MP.X.XX.04	A	15 (½)	20 (¾)	80 (3.15)	31 (1.22)	118 (4.65)	116 (4.57)	124 (4.88)	130 (5.12)	145 (5.71)	-	-	-	0.54 (1.19)
MP.X.XX.05		20 (¾)												0.50 (1.10)
MP.X.XX.06		25 (1)		91 (3.58)										0.60 (1.32)
MP.X.XX.01	AB	15 (½)	20 (¾)	81 (3.19)	31 (1.22)	118 (4.65)	116 (4.57)	124 (4.88)	130 (5.12)	145 (5.71)	-	-	-	0.50 (1.11)
MP.X.XX.02		20 (¾)		85 (3.35)										0.52 (1.14)
MP.X.XX.07		25 (1)		102 (4.02)										0.72 (1.59)
MP.2.XX.14		25 (1)	40 (1½)	128 (5.04)	47 (1.85)	138 (5.43)	137 (5.39)	144 (5.67)	153 (6.02)	165 (6.50)	-	-	-	1.86 (4.10)
MP.2.XX.15		32 (1¼)												1.70 (3.75)
MP.X.XX.03	ABV	15 (½)	20 (¾)	122 (4.80)	33 (1.30)	118 (4.65)	116 (4.57)	124 (4.88)	130 (5.12)	145 (5.71)	22 (0.87)	24 (0.95)	20 (0.79)	0.90 (1.98)
		20 (¾)									22 (0.87)	25 (0.99)	20 (0.79)	
		25 (1)									-	39 (1.54)	22 (0.87)	
MP.2.XX.17		25 (1)	40 (1½)	162 (6.38)	42 (1.65)	138 (5.43)	137 (5.39)	144 (5.67)	153 (6.02)	165 (6.50)	35 (1.38)	40 (1.57)	34 (1.34)	2.14 (4.72)
		32 (1¼)									33 (1.30)	40 (1.57)	34 (1.34)	
		40 (1½)									33 (1.30)	42 (1.65)	-	

Note 7: Add end connection length to body length.
Note 8: Weight does not include end connections or actuator.
Note 9: For valve body.



Maplef Green.0/1 in Maplef AB valve DN15/20/25 (1/2", 3/4", 1") with Maplef MFN.0.3 actuator



Maplef Green.2 in Maplef ABV2 valve DN25/32/40 (1", 1 1/4", 1 1/2") with Maplef MFN.1.4 actuator

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PRESSURE INDEPENDENT CONTROL VALVE

Maplef Green.0 / Green.1 / Green.2

MODEL NUMBER SELECTION

MP I

Insert flow range:
0=20 mm / 3/4" insert (low flow)
1=20 mm / 3/4" insert (medium flow)
1HF=20 mm / 3/4" insert (high flow)
2=40 mm / 1 1/2" insert

Insert type of actuator:
00=no actuator
22=MFT.0.2 23=MFT.0.3 24=MFT.0.4
32=MFN.0.2 33=MFN.0.3 34=MFN.0.4 35=MFNP.0.2 42=MFN.1.2 44=MFN.1.4

Insert type of housing:
20 mm / 3/4" insert: 01=AB DN15, 1/2"
02=AB DN20, 3/4"
03=ABV1 DN15-25, 1/2"-1"
04=A DN15, 1/2"
05=A DN20, 3/4"
06=A DN25, 1"
07=AB DN25, 1"
40 mm / 1 1/2 insert: 14=AB DN25, 1"
15=AB DN32, 1 1/4"
17=ABV2 DN25-40, 1"-1 1/2"

Insert p/t plug requirements:
B=pressure/temperature plugs **P**=taps plugged - leave blank if A-body or no p/t plugs required

Insert inlet x outlet union end connections: - leave blank if A- or AB-body or no end connections required

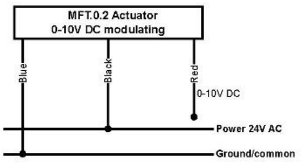
Body model and size	Female threaded	Male threaded	Sweat	
MP.0.XX.03, 15-25 mm, 1/2"-1" MP.1.XX.03, 15-25 mm, 1/2"-1"	**E**=15 mm / ½" **F**=20 mm / ¾"	**H**= 15mm/½" **I**=20mm/ ¾" **J**= 25mm/ 1"	**K**=15mm **L**=18mm **M**=22mm	**O**=½" **R**=¾" **U**=1"
MP.2.XX.17, 25-40 mm, 1"-1 1/2"	**G**=25 mm / 1" **P**=32 mm / 1¼" **Q**=40 mm / 1½"	**J**=25 mm / 1" **S**=32 mm / 1¼" **T**=40 mm / 1¾"	**N**=28mm **W**=35mm	**V**=1¼" **W**=1½"

Insert connections standard:
I=ISO (standard)

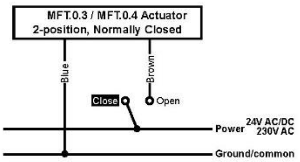
Example: MP.1.22.03.B.F.F.I=20 mm (3/4") Maplef Green, medium flow, with an ABV1-body with p/t plugs and a 24V thermal modulating actuator and DN20 (3/4") ISO female union end connections.

WIRING INSTRUCTION

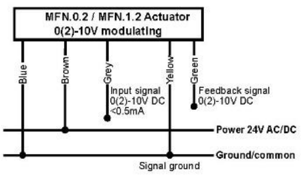
Maplef FT (analog)



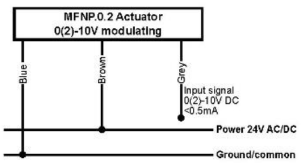
Maplef FT (digital)



Maplef FN (analog)



Maplef FNP (analog)



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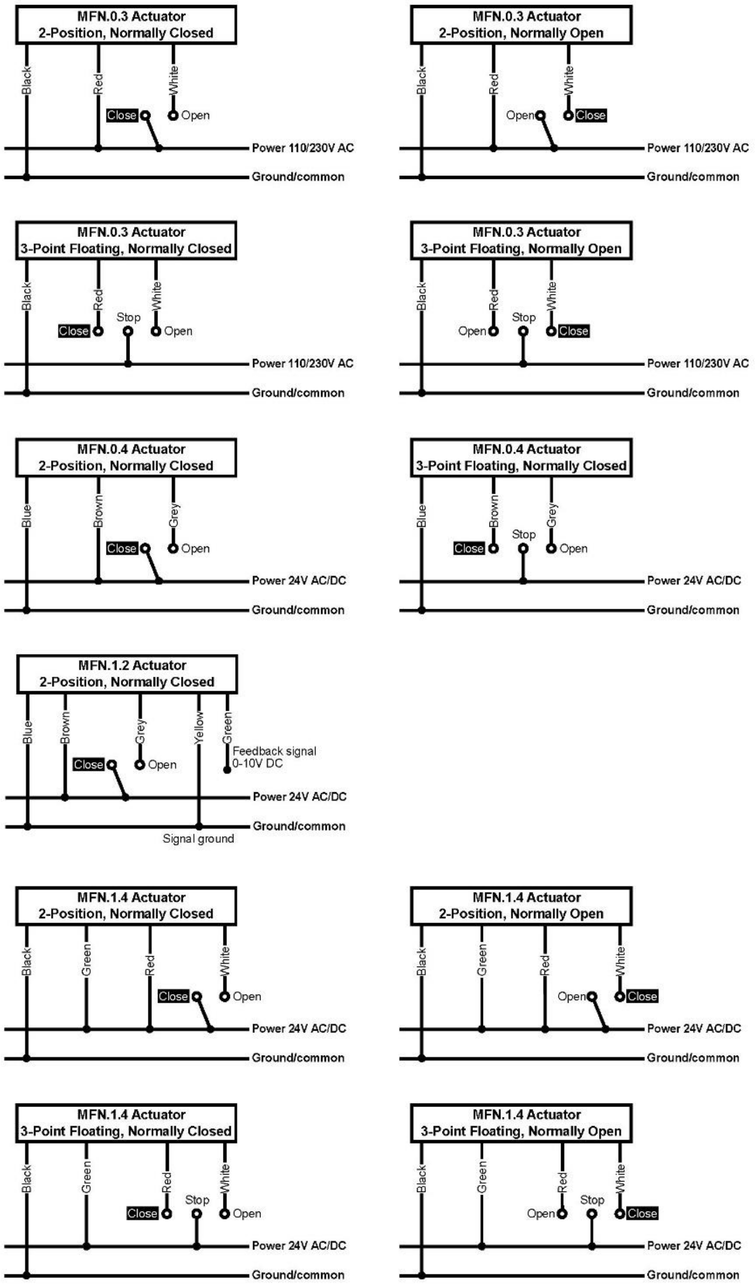
PRESSURE INDEPENDENT CONTROL VALVE

Maplef Green.0 / Green.1 / Green.2

WIRING INSTRUCTION

Maplef MFN (digital)



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PRESSURE INDEPENDENT CONTROL VALVE

Maplef Green.0 / Green.1 / Green.2

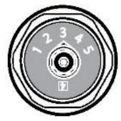
DESCRIPTION

The Maplef Green series is a range of pressure independent control valves that are two-way, modulating to accept digital or analog input signals. The valves accept 0(2)-10V, 3-point floating or ON/OFF input signals. Each valve has an adjustable maximum flow rate setting maintaining a full stroke to enable flow limitation and balancing to the coil or zone that the valve is controlling.
For use in fan-coil units, VAV applications and cooling ceilings for activation of heating or cooling.
They are available in three different valve housings, i.e. Maplef A, AB or ABV.

MAXIMUM FLOW RATE LIMITATION SETTINGS

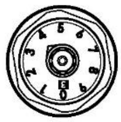
Maplef Green												
Insert size: 20 mm · 3/4"									Insert size: 40 mm · 1 1/2"			
16-600 kPaD · 2.3-87 psid[10]			30-800 kPaD · 4.4-116 psid[11]			35-800 kPaD · 5.1-116 psid[11]			16-800 kPaD · 2.3-116 psid (at setting: 2.6)			Setting
Green.0 (grey O-ring)			Green.1 (black O-ring)			Green.1HF (black O-ring)			Green.2 (black O-ring)			
l/sec	l/hr	GPM	l/sec	l/hr	GPM	l/sec	l/hr	GPM	l/sec	l/hr	GPM	
Nominal flow rate												
-	-	-	0.0178	64	0.282	-	-	-	0.240	865	3.81	1.0
0.0103	37	0.163	0.0393	142	0.624	-	-	-	0.282	1010	4.46	1.1
0.0233	84	0.370	0.0580	209	0.920	-	-	-	0.322	1160	5.10	1.2
0.0322	116	0.510	0.0743	268	1.180	-	-	-	0.361	1300	5.72	1.3
0.0419	151	0.664	0.0887	319	1.41	-	-	-	0.399	1430	6.32	1.4
0.0500	180	0.792	0.102	366	1.61	0.172	620	2.73	0.435	1570	6.90	1.5
0.0569	205	0.902	0.113	408	1.80	0.200	720	3.17	0.471	1700	7.47	1.6
0.0650	234	1.03	0.124	446	1.96	0.228	820	3.61	0.506	1820	8.02	1.7
0.0719	259	1.14	0.134	482	2.12	0.258	930	4.10	0.540	1940	8.56	1.8
0.0781	281	1.24	0.143	516	2.27	0.294	1060	4.67	0.573	2060	9.08	1.9
0.0839	302	1.33	0.152	549	2.42	0.325	1170	5.15	0.605	2180	9.59	2.0
0.0889	320	1.41	0.161	580	2.56	0.350	1260	5.55	0.636	2290	10.1	2.1
0.0942	339	1.49	0.170	611	2.69	0.375	1350	5.95	0.667	2400	10.6	2.2
0.0981	353	1.55	0.178	641	2.82	0.396	1430	6.28	0.696	2510	11.0	2.3
0.103	371	1.63	0.186	671	2.95	0.417	1500	6.61	0.725	2610	11.5	2.4
0.106	381	1.68	0.194	700	3.08	0.439	1580	6.96	0.753	2710	11.9	2.5
0.109	394	1.73	0.202	728	3.21	0.458	1650	7.27	0.780	2810	12.4	2.6
0.113	406	1.79	0.210	756	3.33	0.481	1730	7.62	0.807	2900	12.8	2.7
0.115	414	1.82	0.218	783	3.45	0.500	1800	7.93	0.832	3000	13.2	2.8
0.119	428	1.88	0.225	810	3.56	0.522	1880	8.28	0.858	3090	13.6	2.9
0.122	439	1.93	0.232	835	3.68	0.542	1950	8.59	0.882	3180	14.0	3.0
0.125	449	1.98	0.239	860	3.79	0.550	1980	8.72	0.906	3260	14.4	3.1
0.127	458	2.02	0.245	883	3.89	0.558	2010	8.85	0.930	3350	14.7	3.2
0.130	468	2.06	0.252	906	3.99	0.567	2040	8.99	0.953	3430	15.1	3.3
0.133	477	2.10	0.257	927	4.08	0.575	2070	9.12	0.975	3510	15.5	3.4
0.135	486	2.14	0.263	946	4.17	0.583	2100	9.25	0.997	3590	15.8	3.5
0.137	494	2.17	0.268	965	4.25	0.597	2150	9.47	1.02	3670	16.1	3.6
0.140	503	2.21	0.273	982	4.32	0.611	2200	9.69	1.04	3740	16.5	3.7
0.142	511	2.25	0.277	998	4.39	0.625	2250	9.91	1.06	3820	16.8	3.8
0.144	518	2.28	0.281	1010	4.46	0.639	2300	10.1	1.08	3890	17.1	3.9
0.146	526	2.31	0.285	1020	4.51	0.653	2350	10.4	1.10	3960	17.4	4.0
0.148	532	2.34	0.288	1040	4.57	0.661	2380	10.5	1.12	4030	17.7	4.1
0.149	538	2.37	0.291	1050	4.61	0.669	2410	10.6	1.14	4100	18.1	4.2
0.151	544	2.39	0.294	1060	4.66	0.678	2440	10.7	1.16	4170	18.4	4.3
0.153	549	2.42	0.296	1070	4.70	0.686	2470	10.9	1.18	4240	18.7	4.4
0.154	553	2.43	0.299	1080	4.73	0.694	2500	11.0	1.20	4300	19.0	4.5
0.155	559	2.46	0.301	1080	4.77	0.703	2530	11.1	1.21	4370	19.2	4.6
0.156	563	2.48	0.303	1090	4.80	0.711	2560	11.3	1.23	4440	19.5	4.7
0.158	567	2.50	0.305	1100	4.83	0.719	2590	11.4	1.25	4500	19.8	4.8
0.159	571	2.51	0.307	1100	4.86	0.728	2620	11.5	1.27	4570	20.1	4.9
0.160	575	2.53	0.308	1110	4.89	0.736	2650	11.7	1.29	4630	20.4	5.0

Accuracy: Greatest of either ±10% of controlled flow rate or ±5% of maximum flow rate.
Note 10: If used in pressure range 200-600 kPaD (29-87 psid), accuracy of -20% / +0% applies.
Note 11: If used in pressure range 400-800 kPaD (58-116 psid), accuracy of -20% / +0% applies.



A micrometer **setting of 3.4** as illustrated above corresponds to a maximum flow rate of

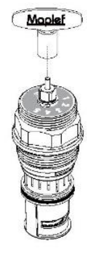
Green.0: 0.133 l/sec (2.10 GPM)
Green.1: 0.257 l/sec (4.08 GPM)
Green.2: 0.975 l/sec (15.5 GPM)



Scale setting for **Green.1HF** is reversed.

A micrometer **setting of 3.4** as illustrated above corresponds to a maximum flow rate of

Green.1HF: 0.575 l/sec (9.12 GPM)



Use the special designed key (Maplef part no. ACC0001) for micrometer setting.

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PRESSURE INDEPENDENT CONTROL VALVE

Maplef Green.0 / Green.1 / Green.2

GENERAL SPECIFICATIONS

1. PRESSURE INDEPENDENT DYNAMIC CONTROL VALVES - MAPLEF GREEN

1.1. Contractor shall install the pressure independent dynamic control valves where indicated in drawings.
1.2. Valve shall be an electronic, dynamic, modulating, 2-way, pressure independent control device.
1.3. Pressure independent dynamic control valve shall accurately control flow, independent of system pressure fluctuation.
1.4. Maximum flow setting shall be adjustable to 41 different settings within the range of the valve size.
1.5. Valve housing shall be permanently marked to show direction of flow.

2. VALVE ACTUATOR

2.a. Maplef MFT actuators

2.a.1. Actuator housing shall be rated to IP54, including upside-down mounting.
2.a.2. Actuator shall be driven by 24V or 230V AC, and shall depending on actuator choice accept 0-10V DC or ON/OFF control signal.
2.a.3. Actuator shall use full stroke and provide full authority.
2.a.4. Actuator shall have visible indication of stroke position.
2.a.5. Failsafe function shall be available on all version.
OR....

2.b. Maplef MFN actuators

2.b.1. Actuator housing shall be rated to IP54. 360° mounting shall be acceptable, IP40 at 180°.
2.b.2. Actuator shall be driven by 24V AC/DC or 110V/230V AC, and shall depending on actuator choice accept 0(2)-10V DC, 3-point floating or 2-position control signal.
2.b.3. Actuator shall use full stroke and provide full authority.
2.b.4. Actuator shall have visible indication of stroke position.
2.b.5. Feedback signal equal to control signal shall be standard on modulating versions.
2.b.6. Failsafe version shall be available for 24V AC/DC signal.
2.b.7. Optional auto stroke function shall be available on modulating version.
2.b.8. Electrical override shall be possible.

2.c.Maplef MFNP actuators

2.c.1. Actuator housing shall be rated to IP54. 360° mounting shall be acceptable.
2.c.2. Actuator shall be driven by 24V AC/DC and accept 0(2)-10V DC control signal.
2.c.3. Actuator shall use full stroke and provide full authority.
2.c.4. Actuator shall have visible indication of stroke position.
2.c.5. Optional auto stroke function shall be available on modulating version.
2.c.6. Electrical override shall be possible.

3. VALVE HOUSING

<u>3.a. Maplef A</u>

3.a.1. Valve housing shall consist of forged brass ASTM CuZn40Pb2, rated at no less than 2500 kPa(360 psi) static pressure at +120°C (+248°F).
OR....

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PRESSURE INDEPENDENT CONTROL VALVE

Maplef Green.0 / Green.1 / Green.2

GENERAL SPECIFICATIONS (..continued)

3.b. Maplef AB

3.b.1. Valve housing shall consist of forged brass ASTM CuZn40Pb2 or DZR ASTM CuZn36Pb2As,rated at no less than 2500 kPa (360 psi) static pressure at +120°C (+248°F).

3.b.2. Pressure/temperature test plugs for verifying accuracy of flow performance shall be available for all valve sizes.

OR….

3.c. Maplef ABV

3.c.1. Valve housing shall consist of forged brass ASTM CuZn40Pb2, rated at no less than 2500 kPa (360 psi) static pressure at +120°C (+248°F).

3.c.2. Valve ball shall consist of chemically nickel-plated brass (ASTM CuZn40Pb2).

3.c.3. Pressure/temperature test plugs for verifying accuracy of flow performance shall be available for all valve sizes.

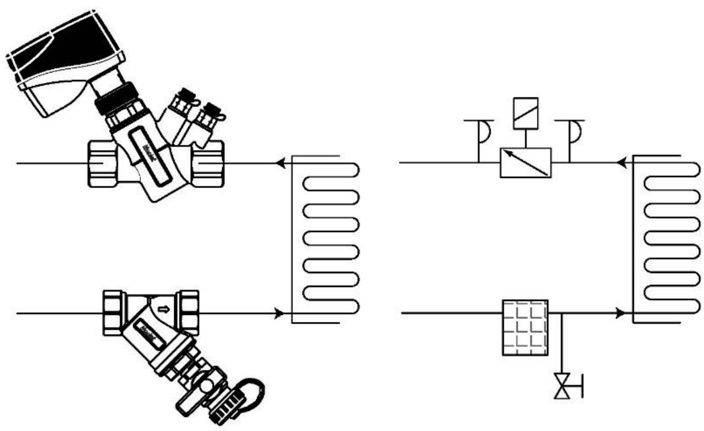
4. FLOW REGULATION UNIT

4.1. Flow regulation unit shall consist of glass-reinforced PSU/POM/PPS with an EPDM diaphragm (20 mm /3/4" insert) or a hydrogenated acrylonitrile-butadiene-rubber diaphragm (40 mm / 1 1/2" insert).

4.2. Flow regulation unit shall be readily accessible, for change-out or maintenance.Flow regulation unit shall be adjustable with the valve in-line and the system in operation.

4.3. Flow regulation unit shall be externally adjustable to 1 of 41 different flow rates without limiting the stroke length; shall be available in 3 different operational pressure ranges for DN15/20/25 (1/2", 3/4", 1") and 1 operational pressure range for DN25/32/40 (1", 1 1/4", 1 1/2"); minimum range shall be capable of being activated by 16 kPaD (2.3 psid). Further, the flow regulation unit shall be capable of controlling the flow within ±10% of rated flow or ±5% of maximum flow.

APPLICATION AND SCHEMATIC EXAMPLE



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