

## LAMPIRAN

Lampiran 1 Tabel variasi JG dan JL

		QL(ml/min)	3.97	10.97	17.96	27.97	64.99	84.40	105.98	276.96	595.04
QG(ml/min)	JL	0.033	0.091	0.149	0.232	0.539	0.7	0.879	2.297	4.935	
	JG										
		1	2	3	4	5	6	7	8	9	
3.01	0.025	10	11	12	13	14	15	16	17	18	
7.95	0.066	19	20	21	22	23	24	25	26	27	
13.98	0.116	28	29	30	31	32	33	34	35	36	
24.95	0.207	37	38	39	40	41	42	43	44	45	
51.00	0.423	46	47	48	49	50	51	52	53	54	
105.02	0.871	55	56	57	58	59	60	61	62	63	
234.03	1.941	64	65	66	67	68	69	70	71	72	
361.72	3	73	74	75	76	77	78	79	80	81	
511.00	4.238	82	83	84	85	86	87	88	89	90	
844.03	7	91	92	93	94	95	96	97	98	99	
1159.94	9.62	100	101	102	103	104	105	106	107	108	
2725.02	22.6	109	110	111	112	113	114	115	116	117	
6028.8	50	118	119	120	121	122	123	124	125	126	
6999.44	58.05	127	128	129	130	131	132	133	134	135	
7994.19	66.3	136	137	138	139	140	141	142	143	144	

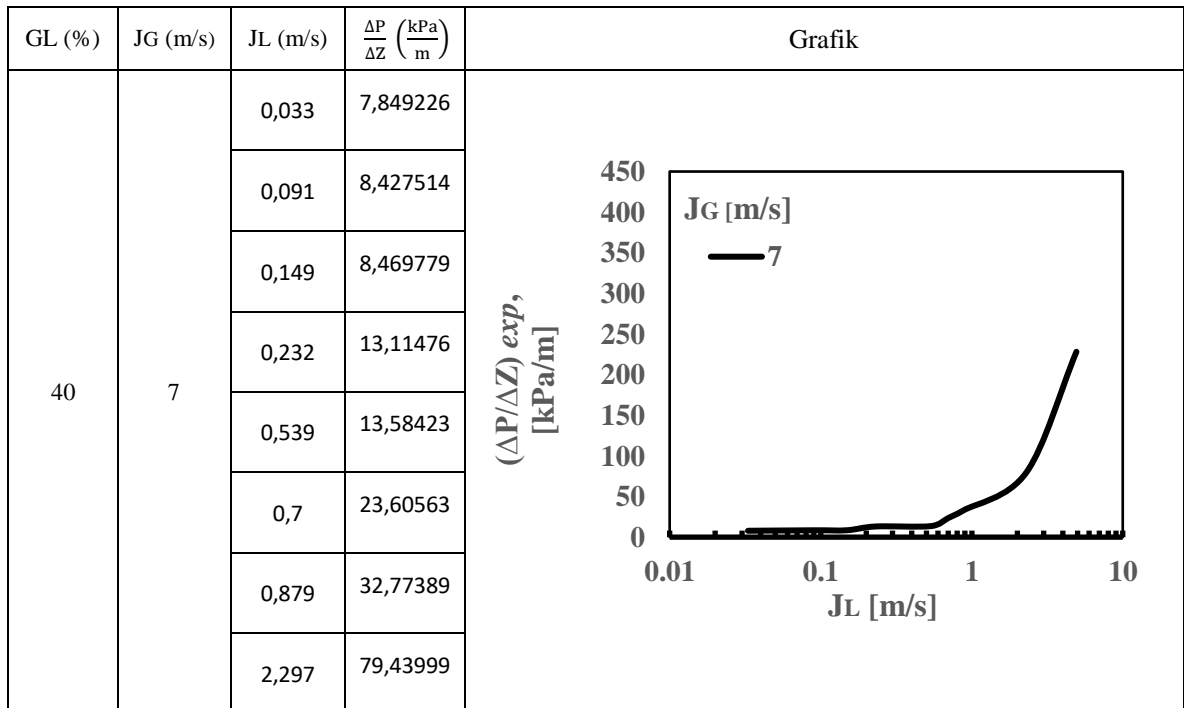
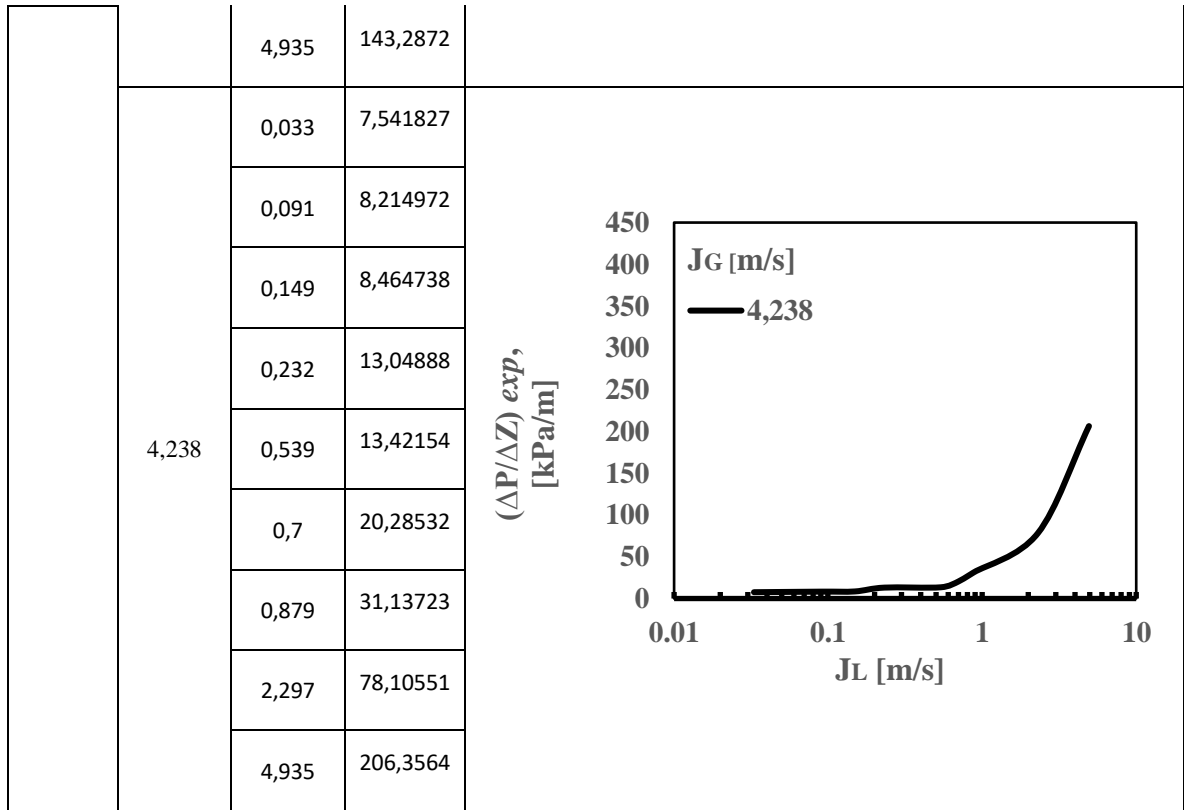
Lampiran 2 Pengaruh JG terhadap gradien tekanan dengan varian JL pada GL 40%

GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{\text{kPa}}{\text{m}}$ )	Grafik
40	0	0,033	2,890221	
		0,091	5,518238	
		0,149	5,96089	
		0,232	7,022435	
		0,539	7,632655	
		0,7	11,21848	
		0,879	14,2143	
		2,297	32,32685	
		4,935	68,34913	
		40	0,025	
0,091	6,307899			
0,149	6,576106			
0,232	9,807047			
0,539	9,929395			
0,7	14,01562			
0,879	16,21416			
2,297	32,84863			
4,935	70,97235			
	0,033		5,161976	

0,066	0,091	6,679461	
	0,149	6,737317	
	0,232	10,18788	
	0,539	10,32127	
	0,7	14,41908	
	0,879	16,40078	
	2,297	32,9968	
	4,935	76,54119	
0,116	0,033	5,217735	
	0,091	6,888081	
	0,149	7,054961	
	0,232	10,44357	
	0,539	10,96105	
	0,7	14,90998	
	0,879	16,39716	
	2,297	37,65747	
	4,935	88,80466	
0,207	0,033	5,397839	
	0,091	7,033583	
	0,149	7,101644	
	0,232	10,73387	

		0,539	11,29813	$(\Delta P/\Delta Z)_{exp}$ , [kPa/m]	
		0,7	14,48955		
		0,879	16,9798		
		2,297	38,10256		
		4,935	99,29208		
GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{kPa}{m}$ )	Grafik	
40	0,423	0,033	5,91052	$(\Delta P/\Delta Z)_{exp}$ , [kPa/m]	
		0,091	7,130017		
		0,149	7,216863		
		0,232	11,14275		
		0,539	11,77979		
		0,7	15,09806		
		0,879	18,79468		
		2,297	39,98608		
	4,935	100,2569			
	0,871	0,033	6,455752	$(\Delta P/\Delta Z)_{exp}$ , [kPa/m]	
		0,091	7,272318		
		0,149	7,339608		
		0,232	12,19194		
		0,539	12,27898		

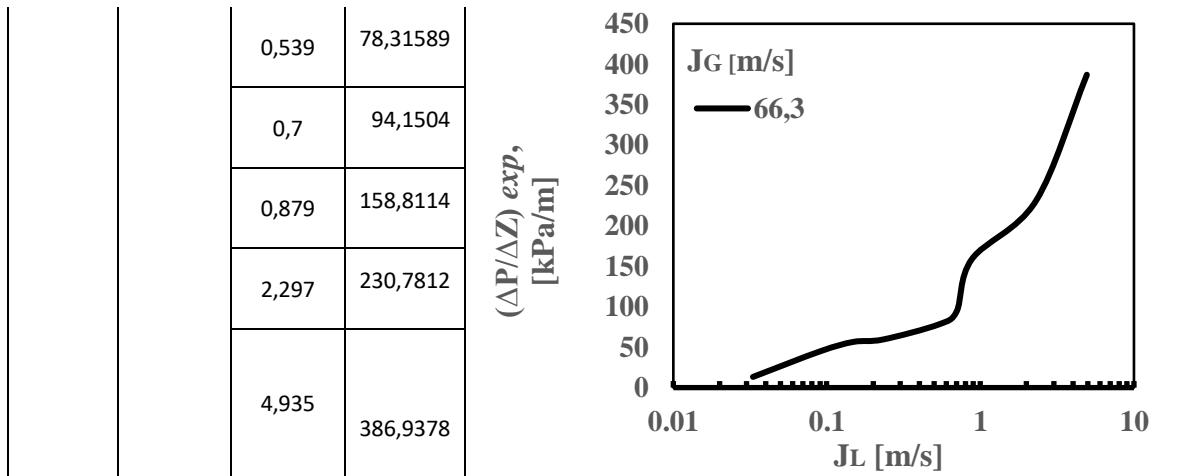
		0,7	15,3512	
		0,879	18,95285	
		2,297	44,64896	
		4,935	103,6174	
	1,941	0,033	6,509607	
		0,091	7,33119	
		0,149	7,663271	
		0,232	12,29123	
		0,539	12,58834	
		0,7	15,94859	
		0,879	20,90131	
		2,297	45,20028	
		4,935	123,9633	
	3	0,033	6,931215	
		0,091	7,789683	
		0,149	7,96182	
		0,232	12,67871	
		0,539	12,70955	
		0,7	16,26287	
		0,879	27,4401	
		2,297	66,1595	



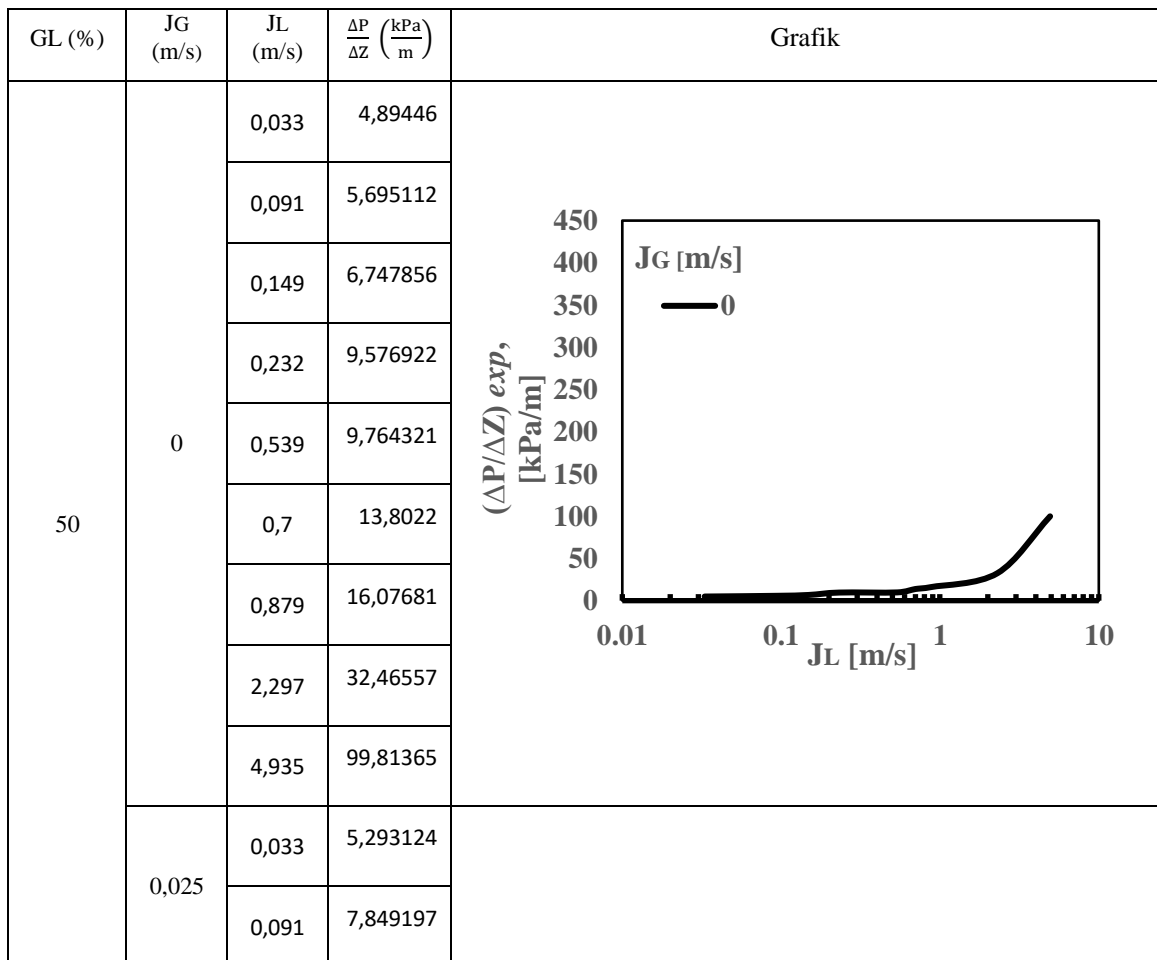
	4,935	228,1735	
9,62	0,033	7,88535	
	0,091	8,689694	
	0,149	9,294243	
	0,232	13,27481	
	0,539	13,83882	
	0,7	25,27541	
	0,879	36,225	
	2,297	86,47429	
	4,935	243,3851	
	22,6	0,033	
0,091		11,71836	
0,149		13,76637	
0,232		15,95729	
0,539		25,50051	
0,7		36,38643	
0,879		59,16071	
2,297		114,7504	
4,935		243,6002	
50		0,033	10,71124
	0,091	22,70522	

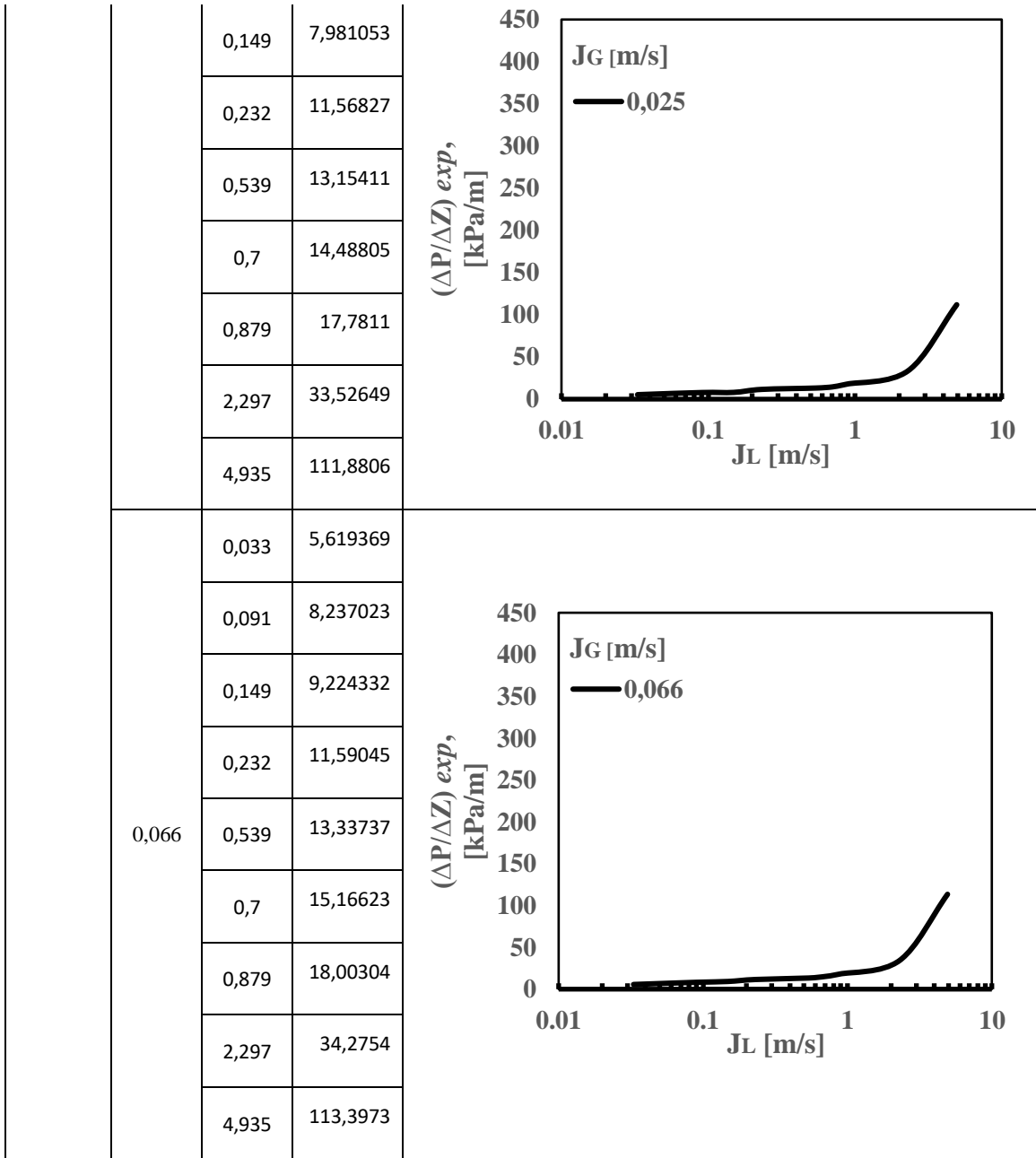
		0,149	33,2098	$(\Delta P/\Delta Z)_{exp}$ , [kPa/m]	
		0,232	36,10097		
		0,539	37,42479		
		0,7	64,05153		
		0,879	83,86635		
		2,297	143,7783		
		4,935	246,8829		
	58,05	0,033	11,1574	$(\Delta P/\Delta Z)_{exp}$ , [kPa/m]	
		0,091	26,3008		
		0,149	39,8097		
		0,232	47,20345		
		0,539	65,87005		
		0,7	78,06311		
		0,879	127,5334		
		2,297	177,2101		
		4,935	310,4011		
GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{kPa}{m}$ )	Grafik	
40	66,3	0,033	13,23474		
		0,091	45,08008		
		0,149	56,56483		
		0,232	59,47766		





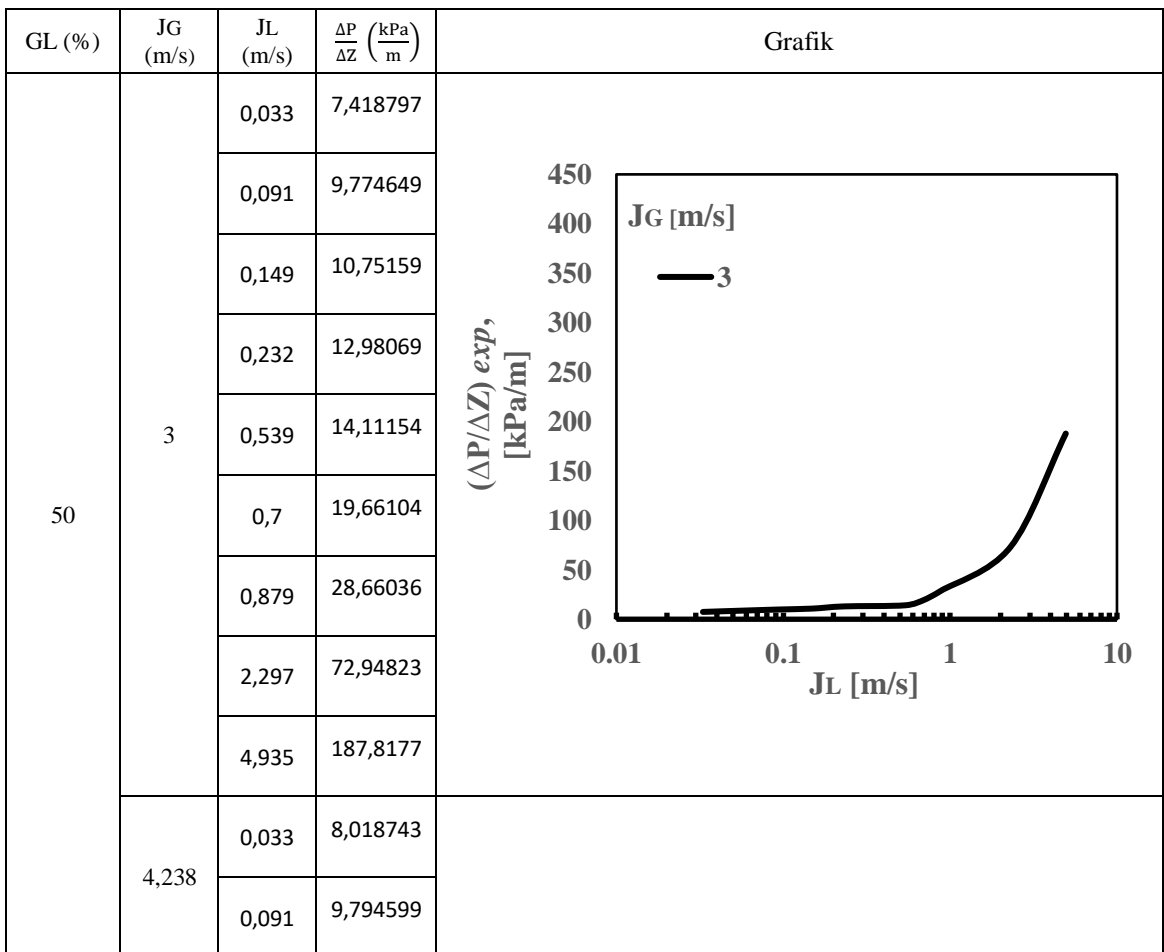
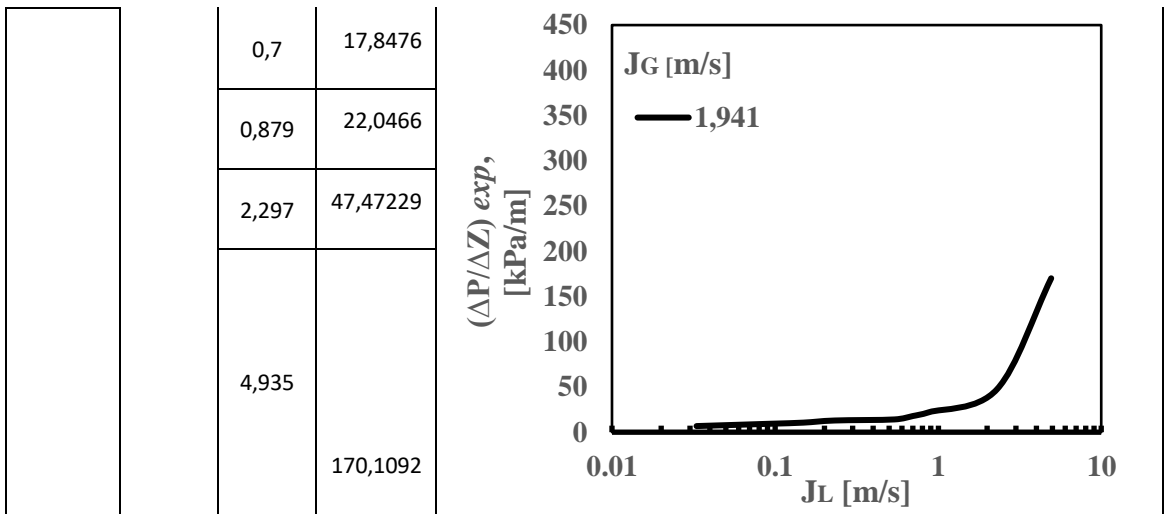
Lampiran 3 Pengaruh JG terhadap gradien tekanan dengan varian JL pada GL 50%

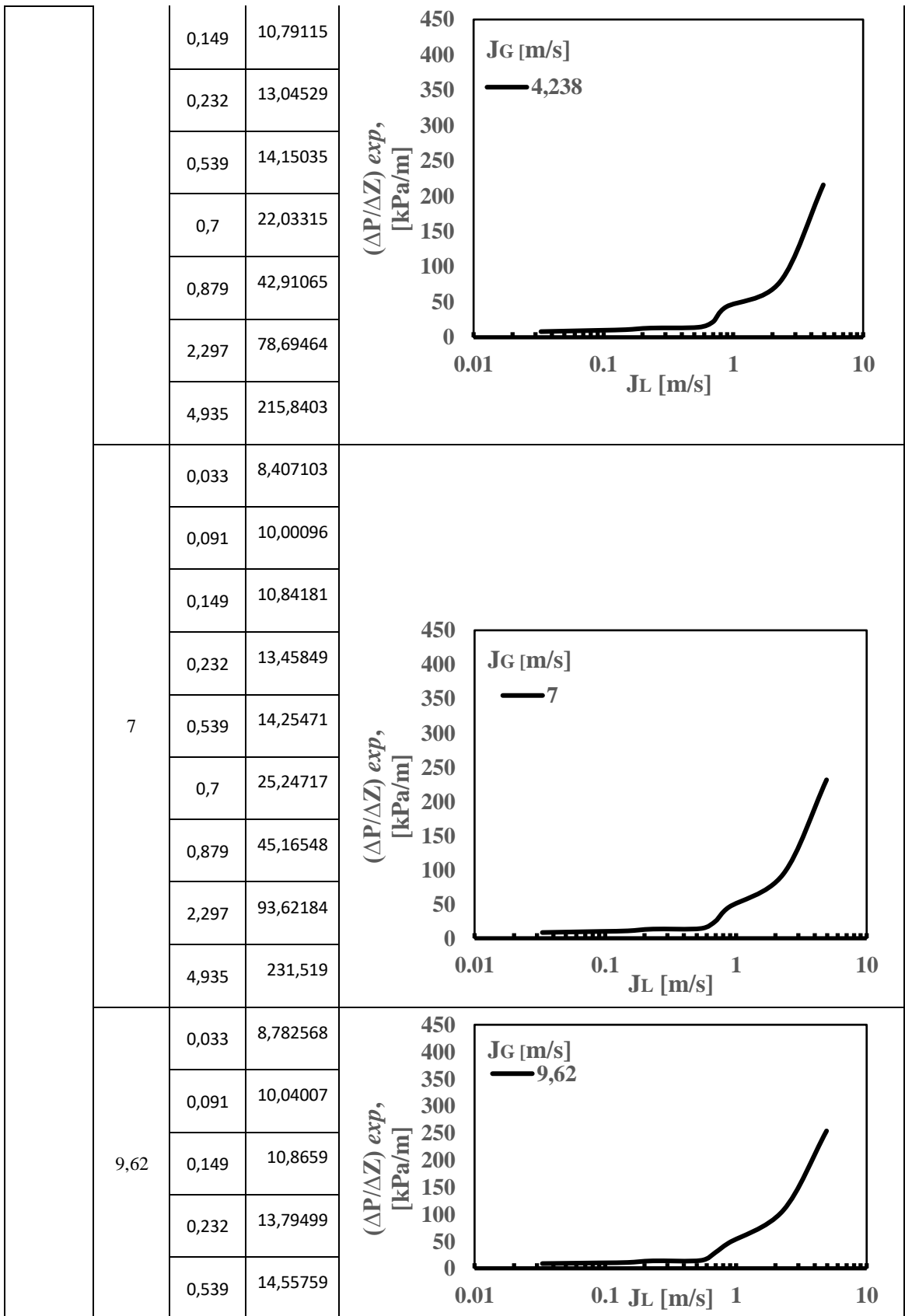


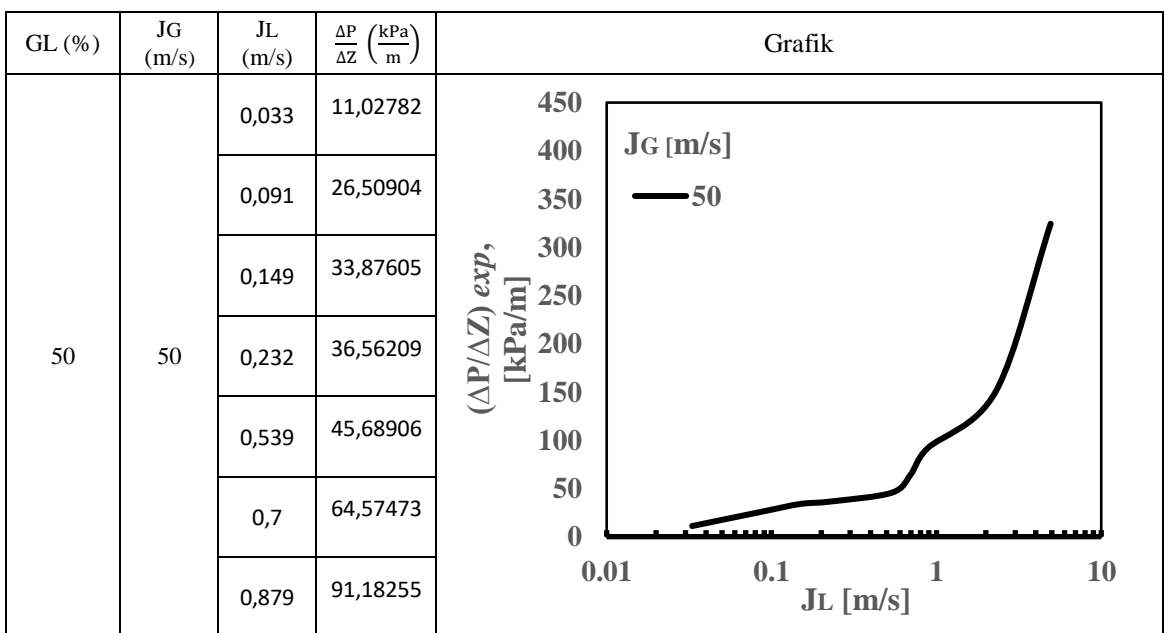
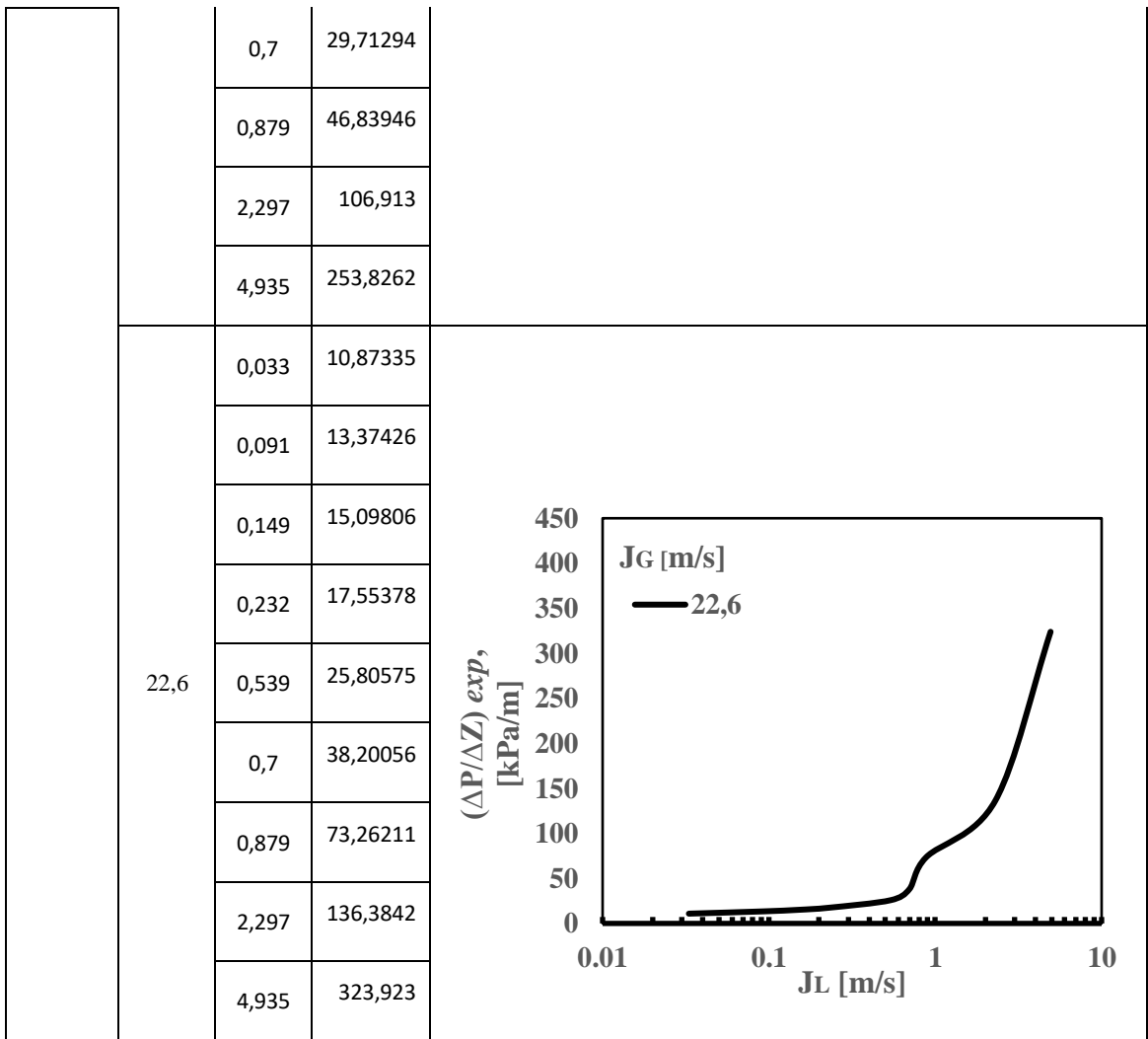


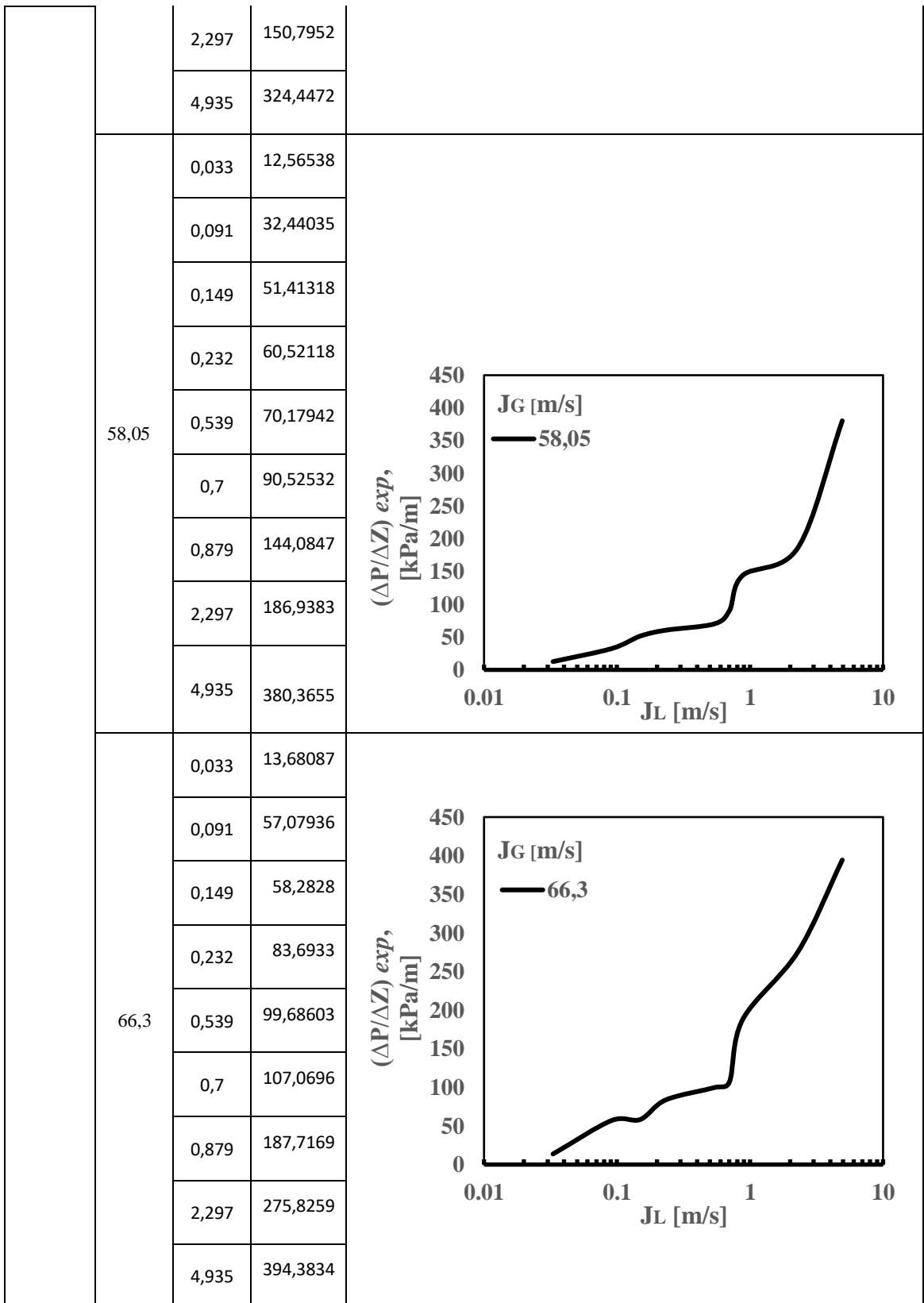
GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{\text{kPa}}{\text{m}}$ )	Grafik
	0,116	0,033	5,694788	
		0,091	8,520119	
		0,149	9,4021	
		0,232	12,01543	
		0,539	13,78284	
		0,7	15,63308	
		0,879	18,48042	
		2,297	38,81926	
		4,935	122,7954	
50	0,207	0,033	5,811205	
		0,091	8,651336	
		0,149	9,643363	
		0,232	12,15258	
		0,539	13,78555	
		0,7	16,83185	
		0,879	19,19398	
		2,297	40,44296	
		4,935	131,2222	
	0,423	0,033	6,258864	
		0,091	8,703458	

		0,149	10,08871	
		0,232	12,3292	
		0,539	13,79374	
		0,7	17,16498	
		0,879	19,6821	
		2,297	40,7655	
		4,935	130,2546	
0,871		0,033	6,717073	
		0,091	8,885408	
		0,149	10,11146	
		0,232	12,36324	
		0,539	13,88839	
		0,7	17,5578	
		0,879	20,42574	
		2,297	44,8812	
		4,935	133,2494	
1,941		0,033	6,745019	
		0,091	9,247428	
		0,149	10,55553	
		0,232	12,90803	
		0,539	14,0889	







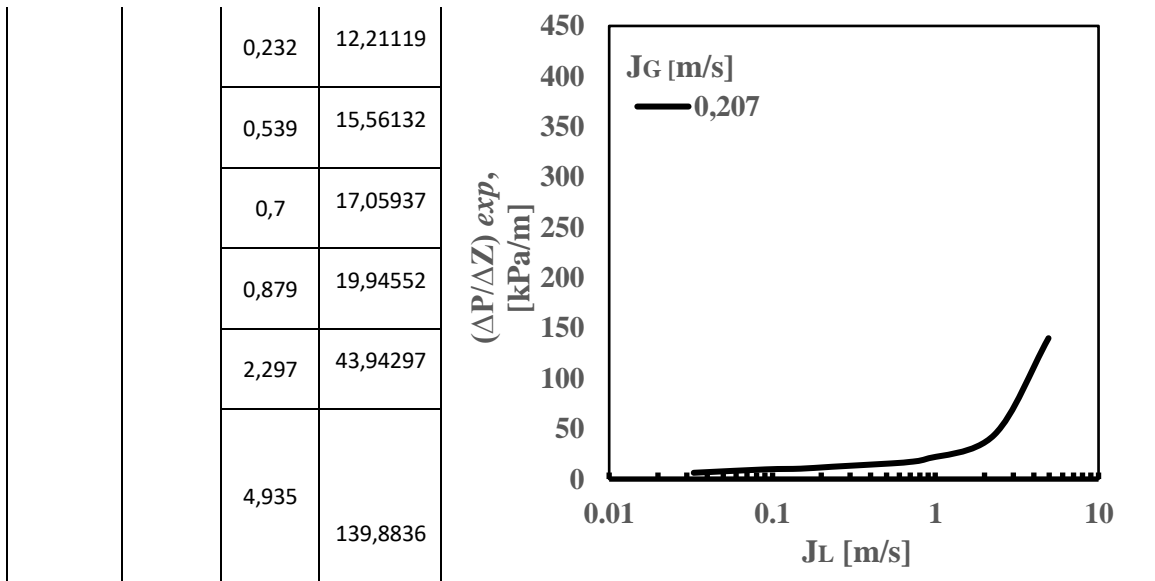




Lampiran 4 Pengaruh JG terhadap gradien tekanan dengan varian JL pada GL 60%

GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{\text{kPa}}{\text{m}}$ )	Grafik
60	0	0,033	5,316863	
		0,091	7,952582	
		0,149	8,961902	
		0,232	11,08612	
		0,539	11,20559	
		0,7	13,98883	
		0,879	16,18778	
		2,297	34,91807	
		4,935	121,5036	
	0,025	0,033	5,457216	
		0,091	8,009381	
		0,149	9,416772	
		0,232	11,61407	
		0,539	13,79184	
		0,7	14,49781	
		0,879	17,11758	
		2,297	37,05713	
		4,935	127,1012	

0,066	0,033	5,907855	
	0,091	8,357176	
	0,149	10,15524	
	0,232	11,72024	
	0,539	15,02219	
	0,7	16,07681	
	0,879	19,56605	
	2,297	37,75965	
	4,935	129,4429	
0,116	0,033	6,060558	
	0,091	9,308734	
	0,149	10,24705	
	0,232	12,18571	
	0,539	15,24754	
	0,7	16,66196	
	0,879	19,65436	
	2,297	40,29334	
	4,935	138,8336	
0,207	0,033	6,227782	
	0,091	9,613748	
	0,149	10,32199	

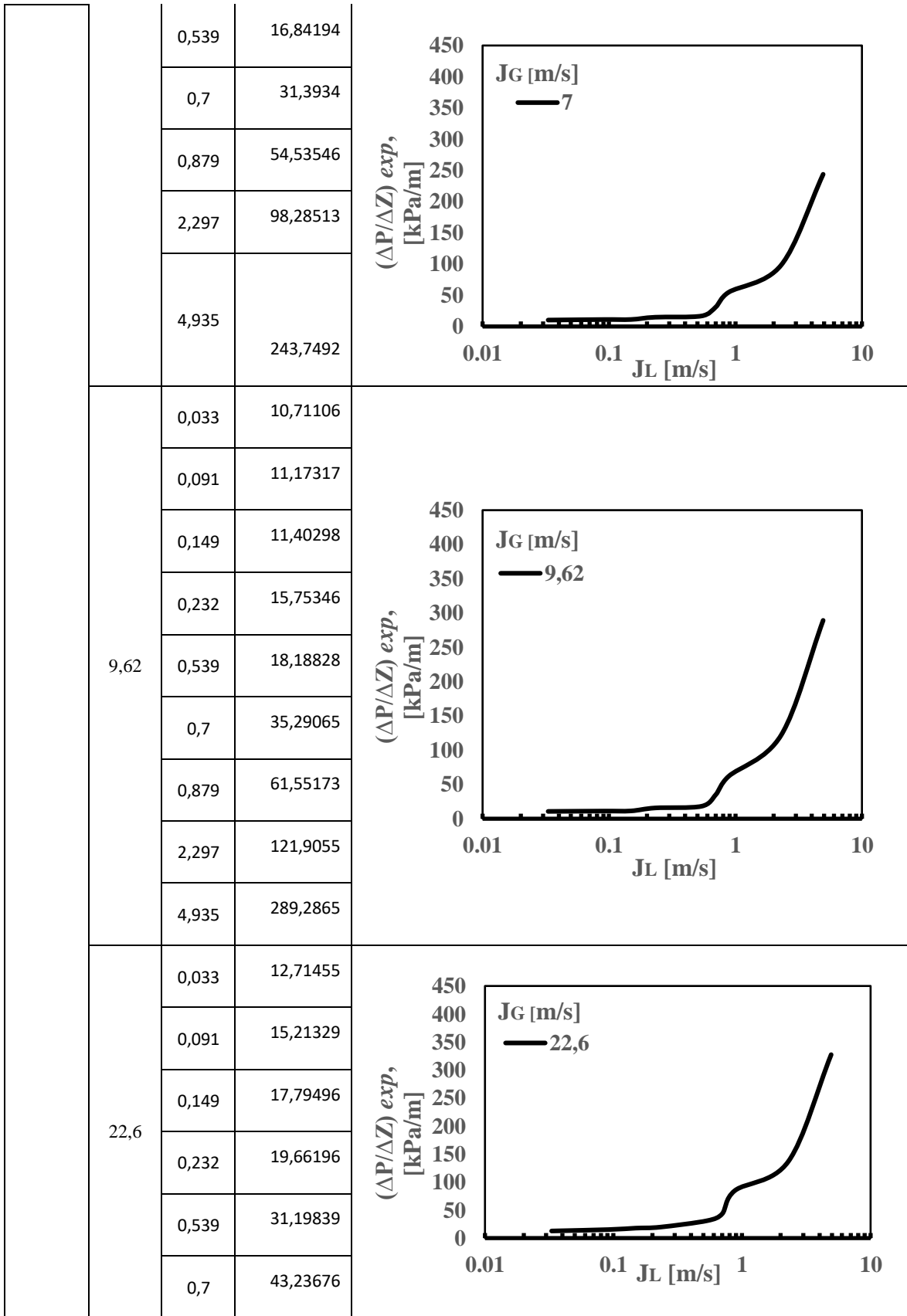


GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{kPa}{m}$ )	Grafik
60	0,423	0,033	6,307992	
		0,091	9,846922	
		0,149	10,60105	
		0,232	12,76864	
		0,539	16,35659	
		0,7	17,71533	
		0,879	20,62345	
		2,297	43,95513	
		4,935	142,1784	
	0,871	0,033	6,808642	
		0,091	10,05947	
		0,149	10,63926	
		0,232	12,80549	

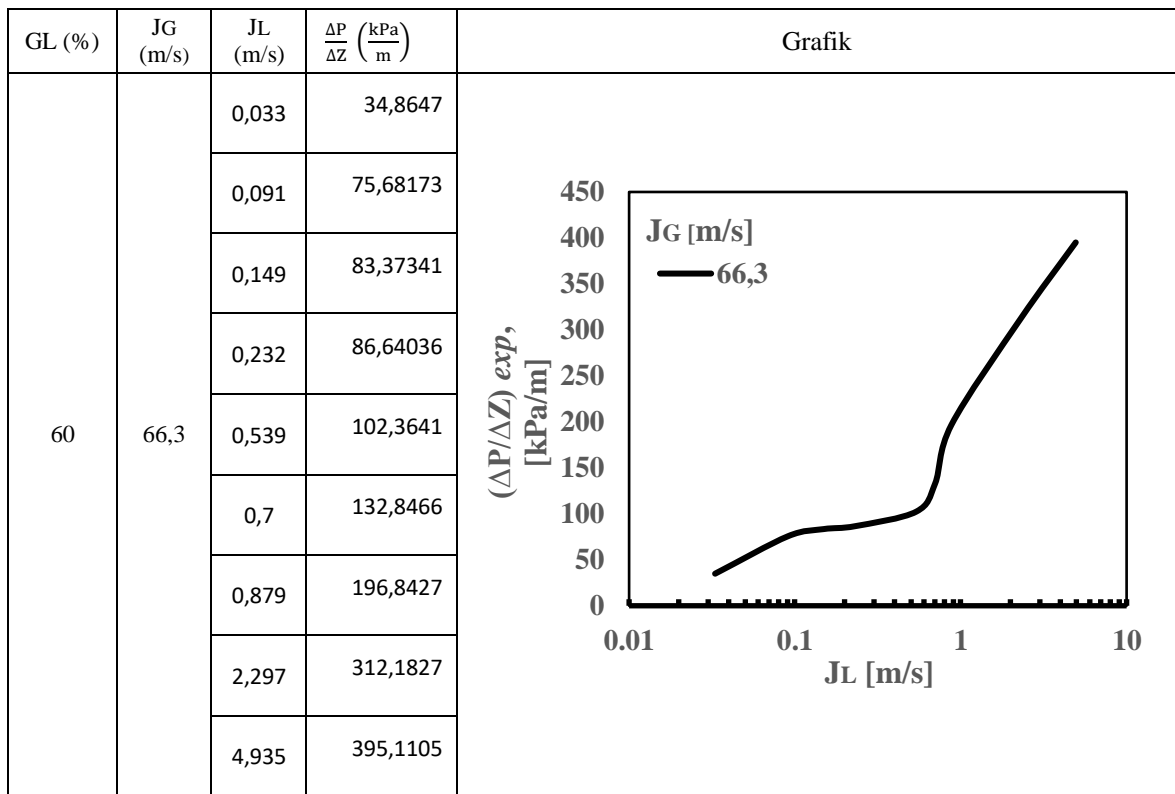
	0,539	16,48579	
	0,7	19,25716	
	0,879	21,97023	
	2,297	45,30049	
	4,935	177,8859	
1,941	0,033	7,070556	
	0,091	10,19885	
	0,149	10,72553	
	0,232	12,91702	
	0,539	16,64682	
	0,7	19,35847	
	0,879	32,4549	
	2,297	55,7082	
	4,935	198,7726	
3	0,033	7,727321	
	0,091	10,73321	
	0,149	10,87954	
	0,232	12,99955	
	0,539	16,674	

		0,7	21,04365		
		0,879	38,44707		
		2,297	74,85082		
		4,935	239,8959		
	4,238	0,033	9,492059		
		0,091	10,88042		
		0,149	10,8912		
		0,232	13,69978		
		0,539	16,68101		
		0,7	30,51075		
0,879	50,15175				
2,297	94,86013				
4,935	243,3851				

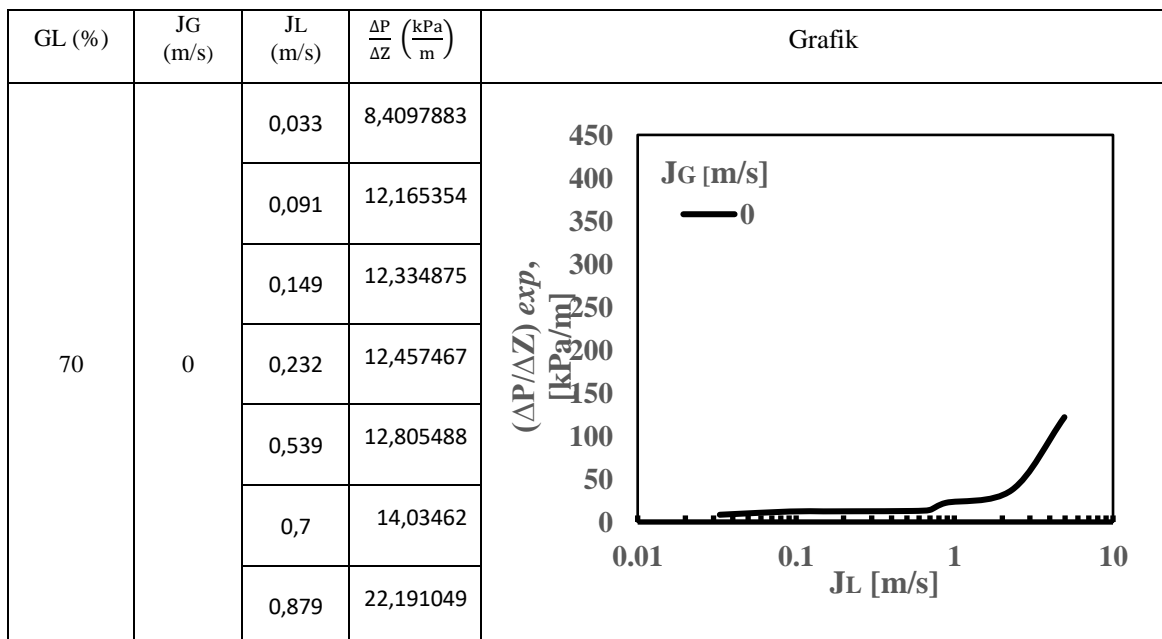
GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{kPa}{m}$ )	Grafik
60	7	0,033	10,29732	
		0,091	11,15543	
		0,149	11,22916	
		0,232	14,85356	



50	0,879	84,77732	
	2,297	137,1202	
	4,935	327,4705	
	0,033	21,33248	
	0,091	42,65868	
	0,149	45,52511	
	0,232	54,65213	
	0,539	64,33534	
	0,7	73,73227	
	0,879	126,8657	
58,05	2,297	231,4073	
	4,935	348,6416	
	0,033	22,22106	
	0,091	47,1665	
	0,149	56,96457	
	0,232	60,7116	
	0,539	77,53413	
	0,7	98,58444	
	0,879	159,5735	
	2,297	296,9169	
4,935	388,9165		



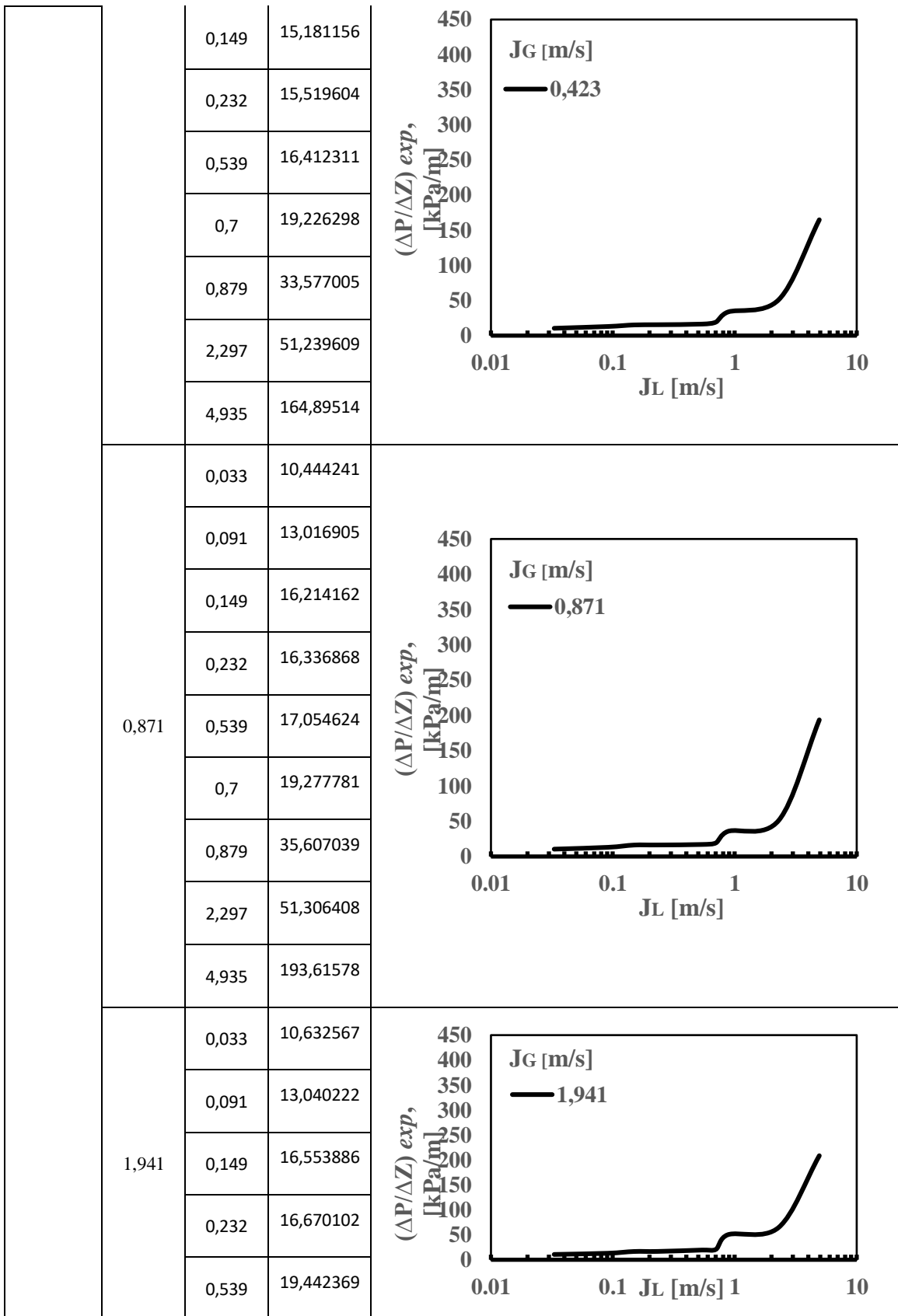
Lampiran 5 Pengaruh JG terhadap gradien tekanan dengan varian JL pada GL 70%





		2,297	37,118109	
		4,935	121,80968	
	0,025	0,033	8,5547799	
		0,091	12,251474	
		0,149	13,162663	
		0,232	13,738034	
		0,539	15,750466	
		0,7	16,545919	
		0,879	22,831477	
		2,297	37,52237	
		4,935	142,03235	
		0,066	0,033	
	0,091		12,592965	
	0,149		13,524138	
	0,232		14,346658	
	0,539		15,995411	
	0,7		16,791291	
	0,879		25,073518	
	2,297		38,802878	
	4,935		142,61335	

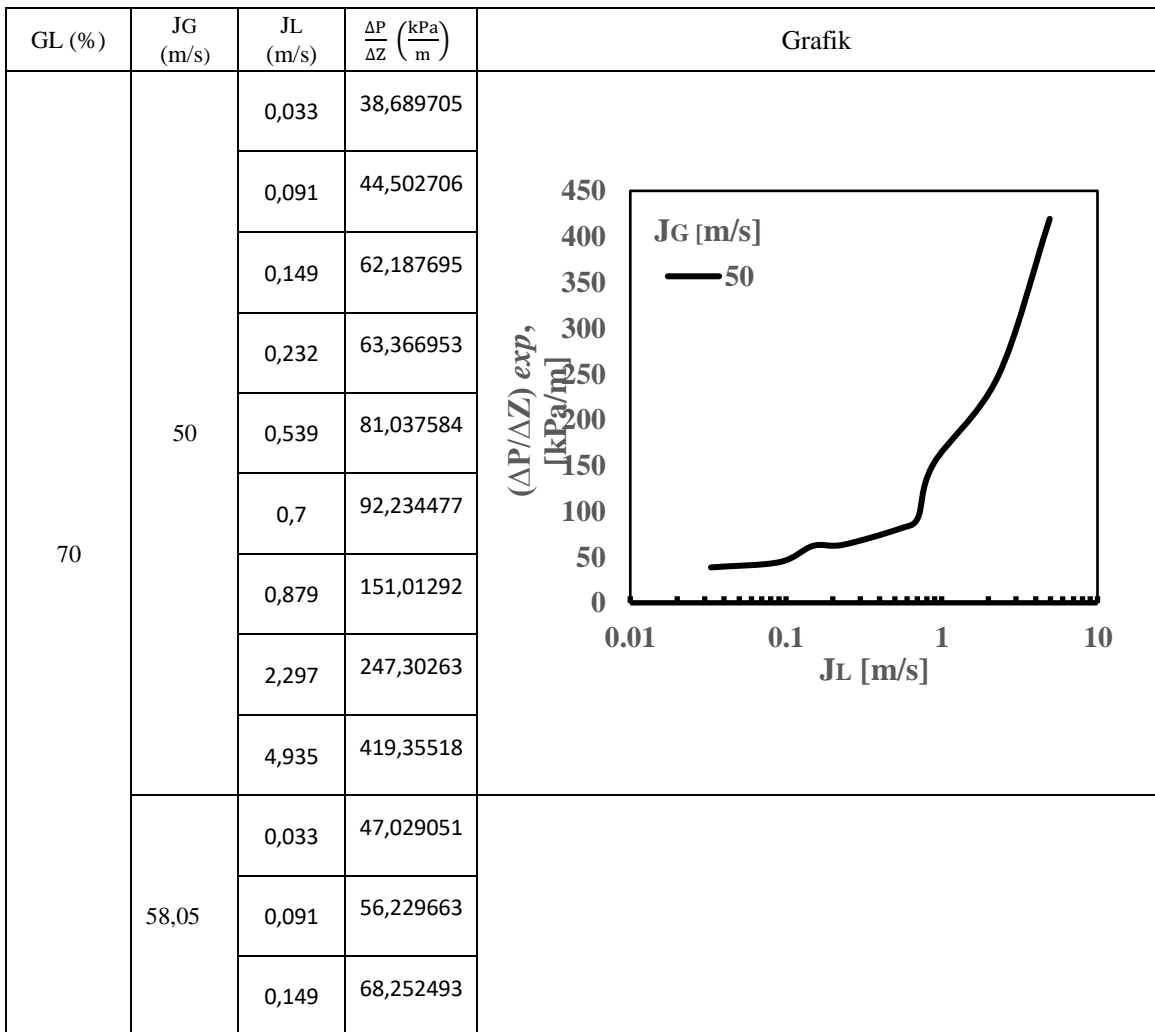
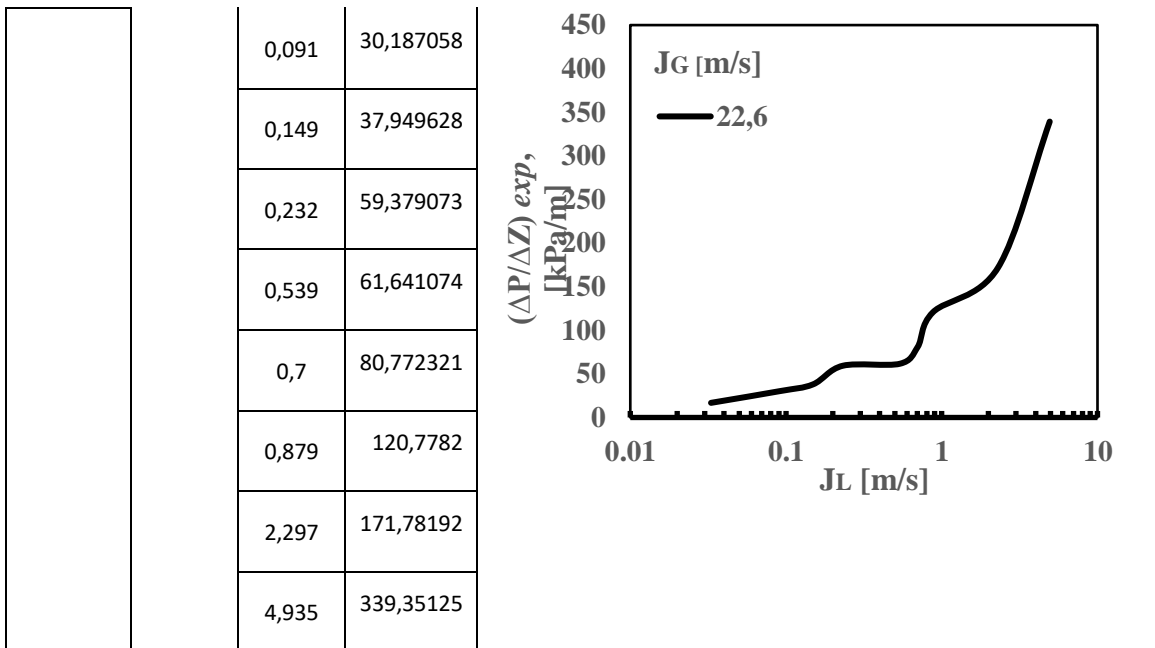
GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{\text{kPa}}{\text{m}}$ )	Grafik
70	0,116	0,033	8,9619021	
		0,091	12,810259	
		0,149	14,456454	
		0,232	14,461039	
		0,539	16,093926	
		0,7	17,212246	
		0,879	25,54528	
		2,297	42,936932	
		4,935	163,49005	
		70	0,207	
0,091	12,980693			
0,149	15,087305			
0,232	15,143378			
0,539	16,234539			
0,7	17,799542			
0,879	33,304718			
2,297	51,005243			
4,935	164,49256			
70	0,423			0,033
		0,091	12,993402	

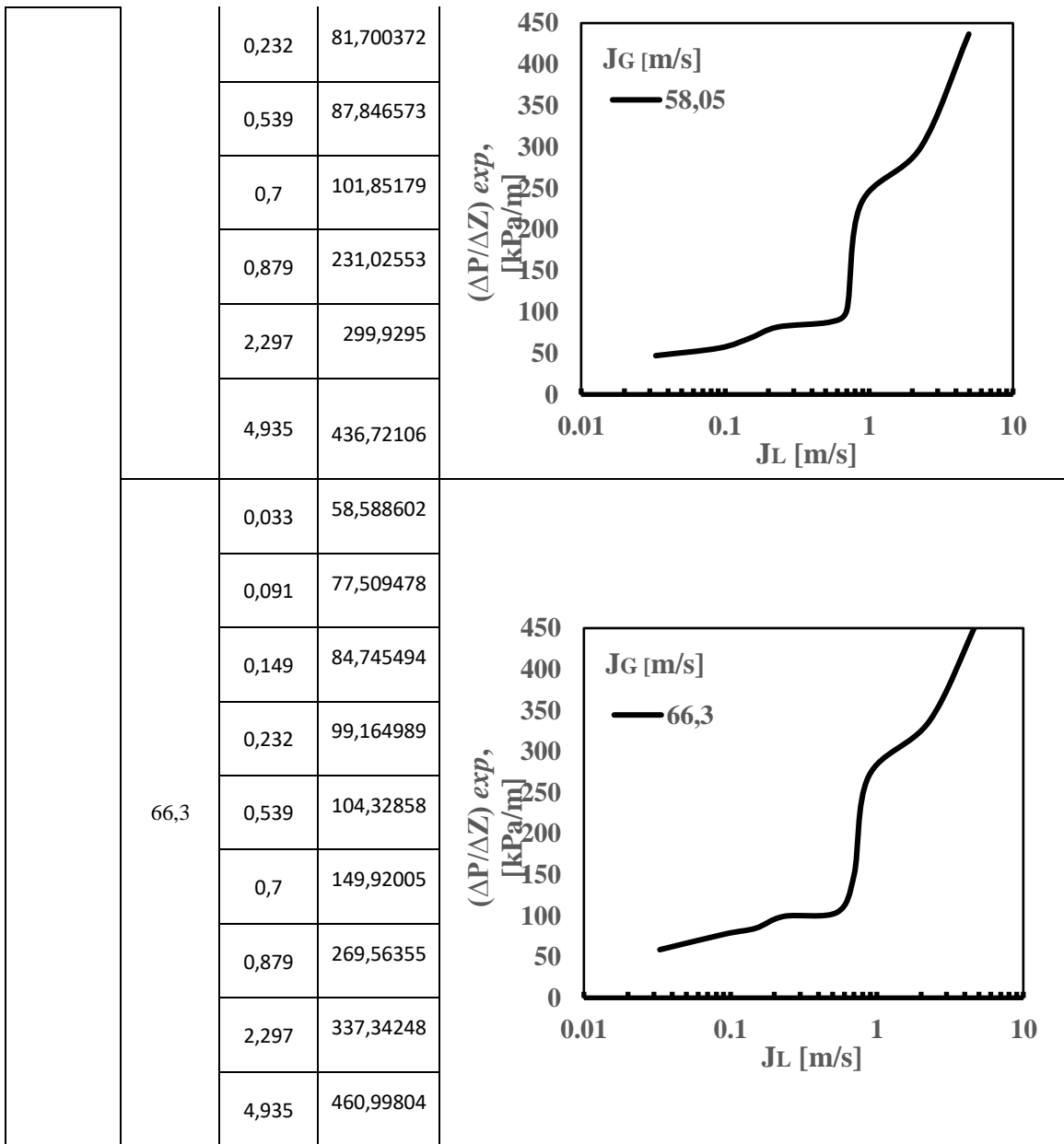


	0,7	20,782367
	0,879	50,201489
	2,297	64,944552
	4,935	208,44427

GL (%)	JG (m/s)	JL (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{kPa}{m}$ )	Grafik
70	3	0,033	10,789075	
		0,091	13,099442	
		0,149	17,308606	
		0,232	17,855522	
		0,539	21,702823	
		0,7	32,196141	
		0,879	50,500995	
		2,297	85,388294	
		4,935	257,64601	
		70	4,238	
0,091	13,499471			
0,149	18,626505			
0,232	19,176135			
0,539	23,274875			
0,7	33,77351			
0,879	52,982532			

		2,297	98,246791	
		4,935	263,53133	
	7	0,033	12,014182	
		0,091	14,160953	
		0,149	19,336751	
		0,232	19,646433	
		0,539	23,879813	
		0,7	35,020343	
		0,879	58,537713	
		2,297	103,53744	
		4,935	303,34116	
		9,62	0,033	
	0,091		14,336242	
	0,149		19,709467	
	0,232		22,775354	
	0,539		25,375125	
	0,7		56,460838	
	0,879		107,51665	
	2,297		167,28956	
	4,935		309,63232	
	22,6	0,033	16,791291	

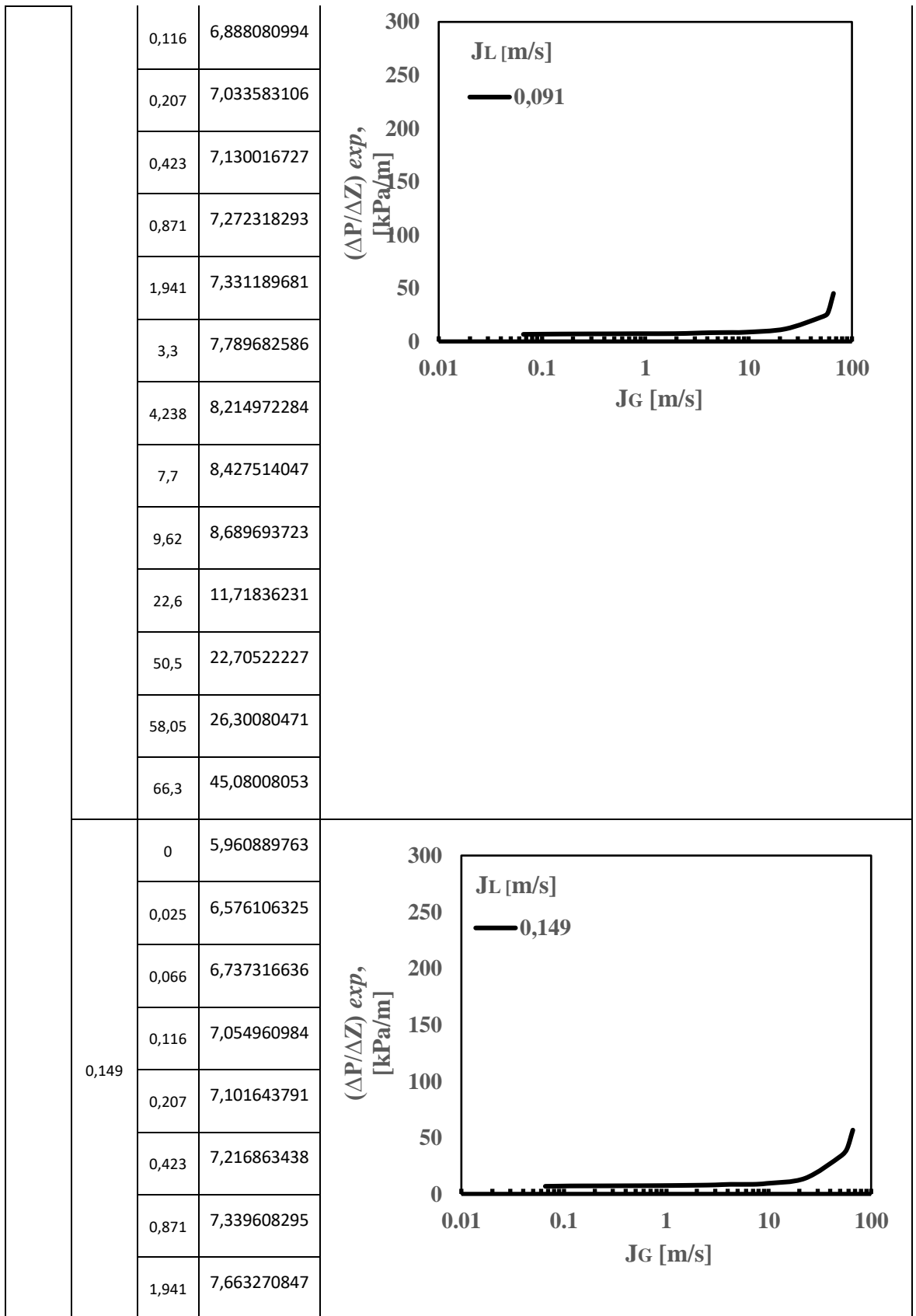




Lampiran 6 Pengaruh JL terhadap gradien tekanan dengan varian JG pada GL 40%

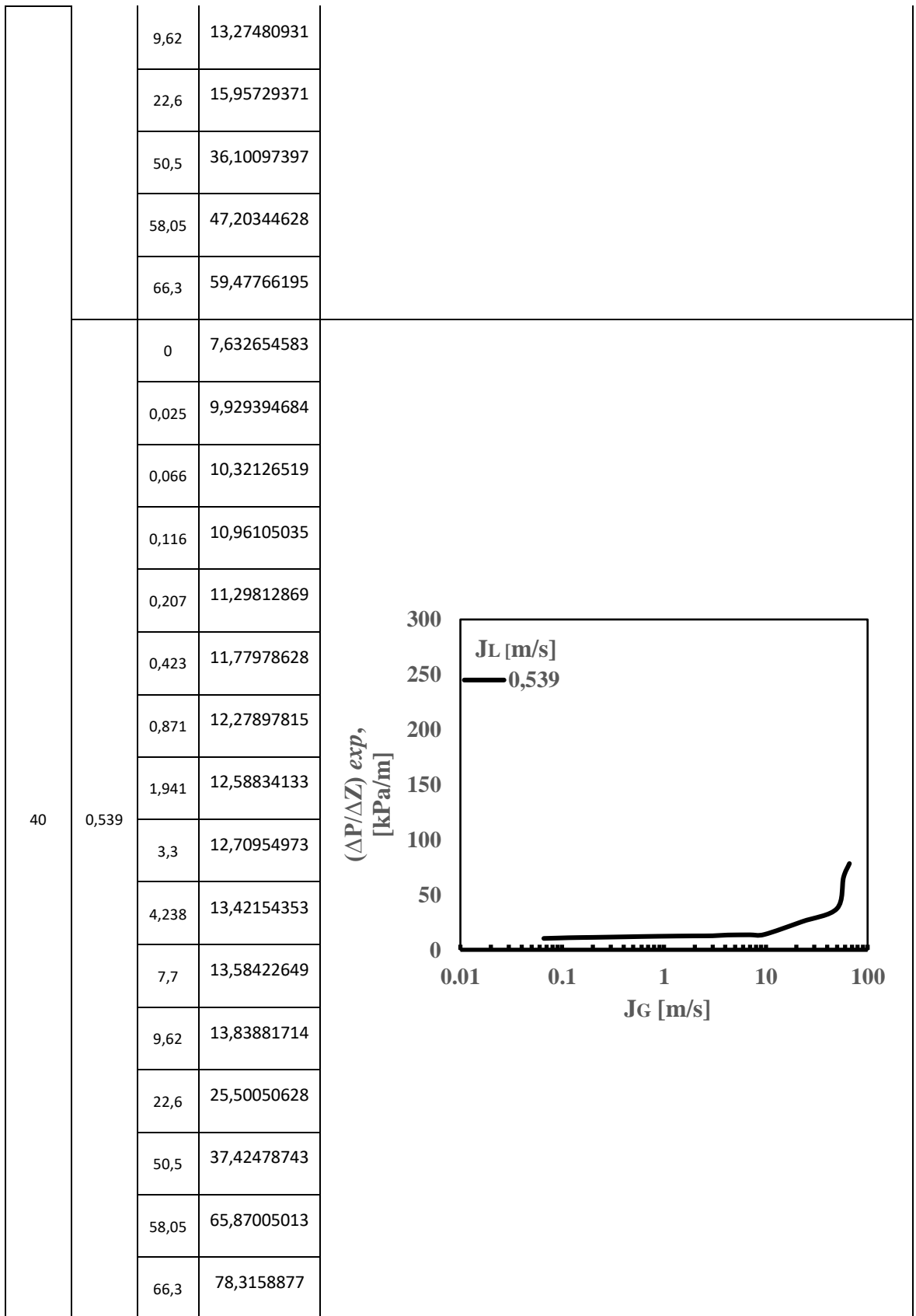
GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z} \left( \frac{\text{kPa}}{\text{m}} \right)$	Grafik
0,033	0,033	0	2,890221374	
		0,025	4,572333971	
		0,066	5,16197562	
		0,116	5,217734821	
		0,207	5,397839152	
		0,423	5,910520438	
		0,871	6,45575206	
		1,941	6,509606642	
		3,3	6,93121473	
		4,238	7,541826825	
		7,7	7,849226482	
		9,62	7,885350433	
		22,6	9,070637208	
		50,5	10,71123598	
		58,05	11,15739795	
66,3	13,23474358			
40	0,091	0	5,518237596	
		0,025	6,307898627	
		0,066	6,679461372	

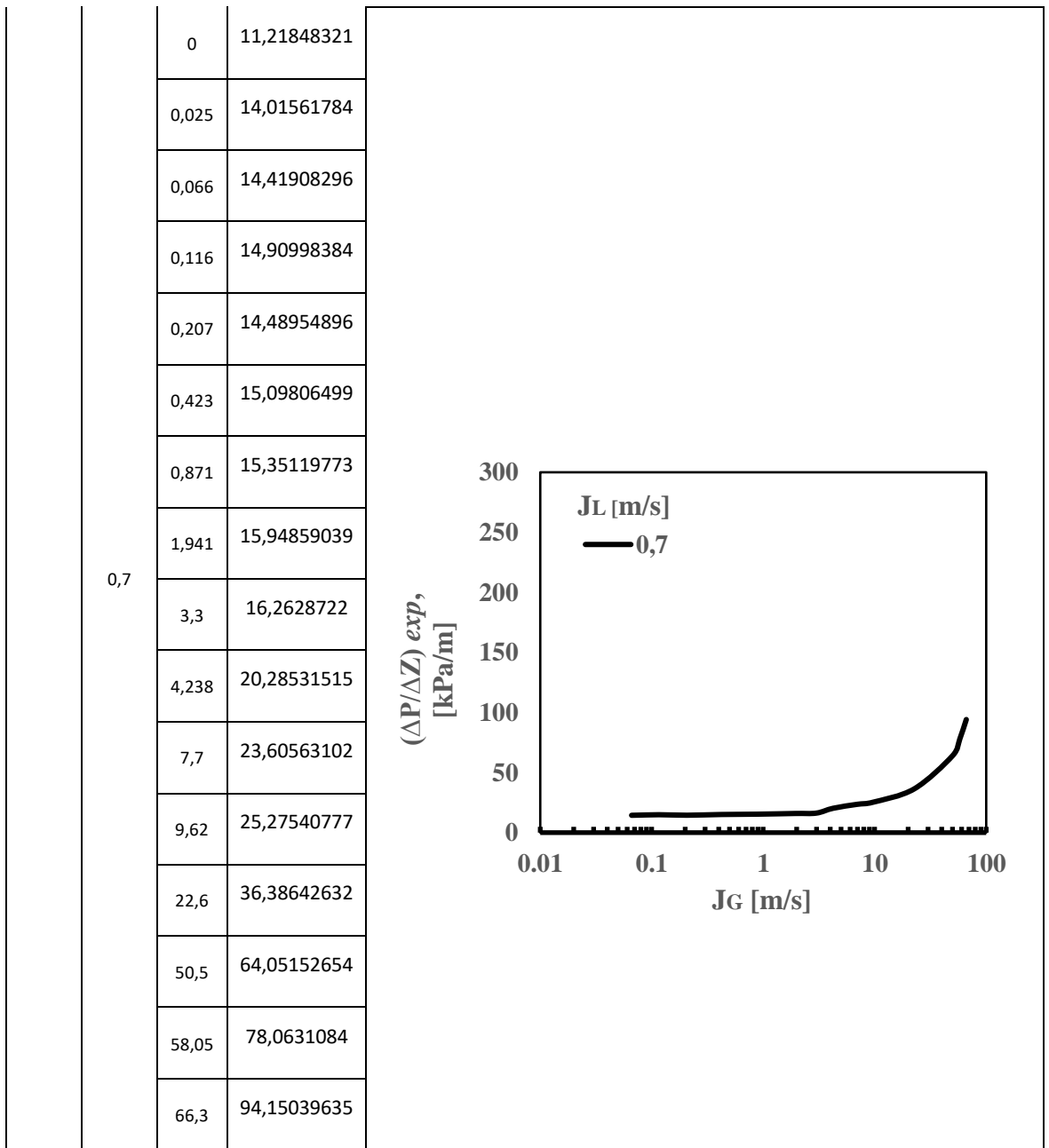




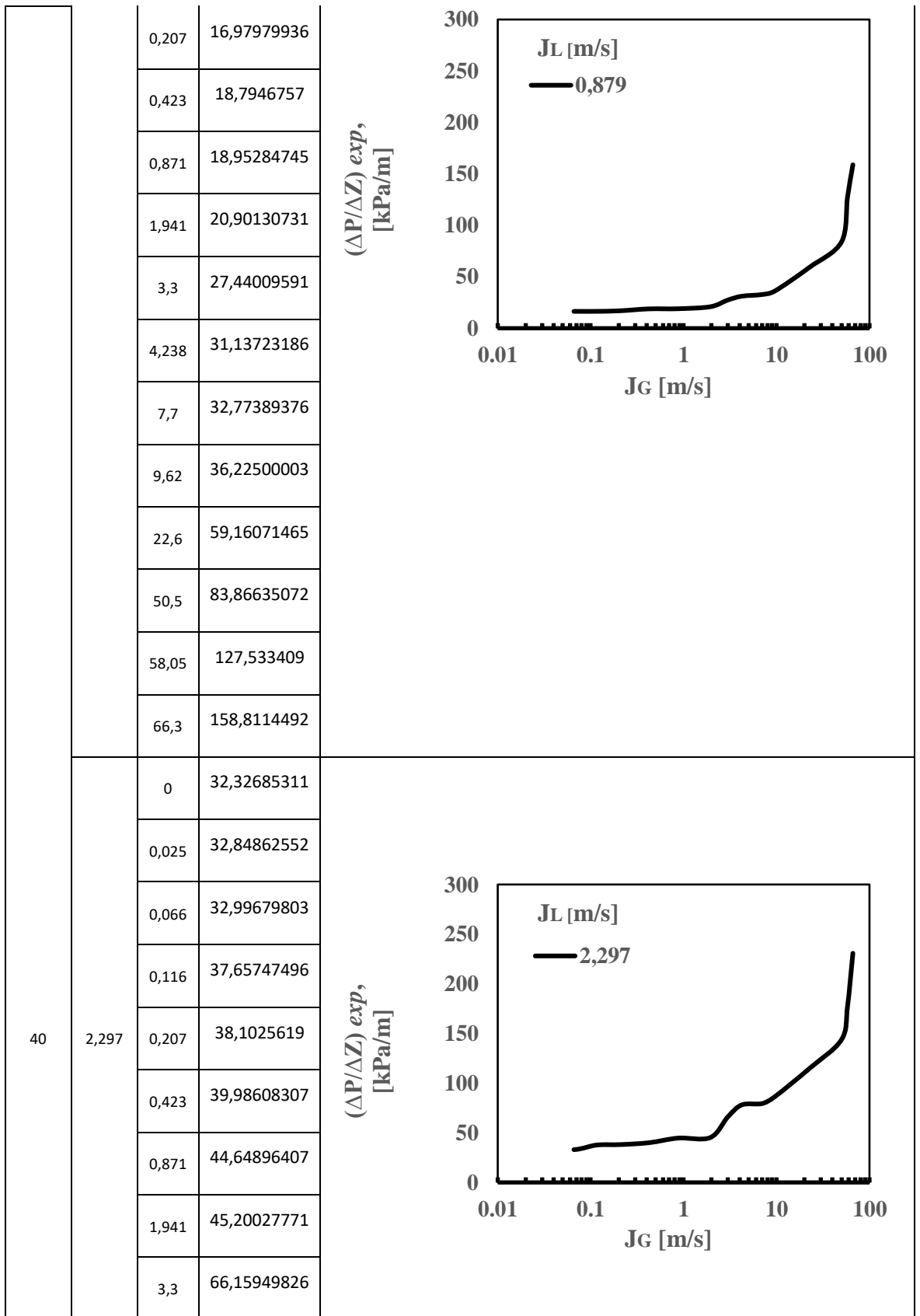
		3,3	7,961819914
		4,238	8,464737572
		7,7	8,469778923
		9,62	9,294243435
		22,6	13,76637288
		50,5	33,20979631
		58,05	39,80969962
		66,3	56,56482661

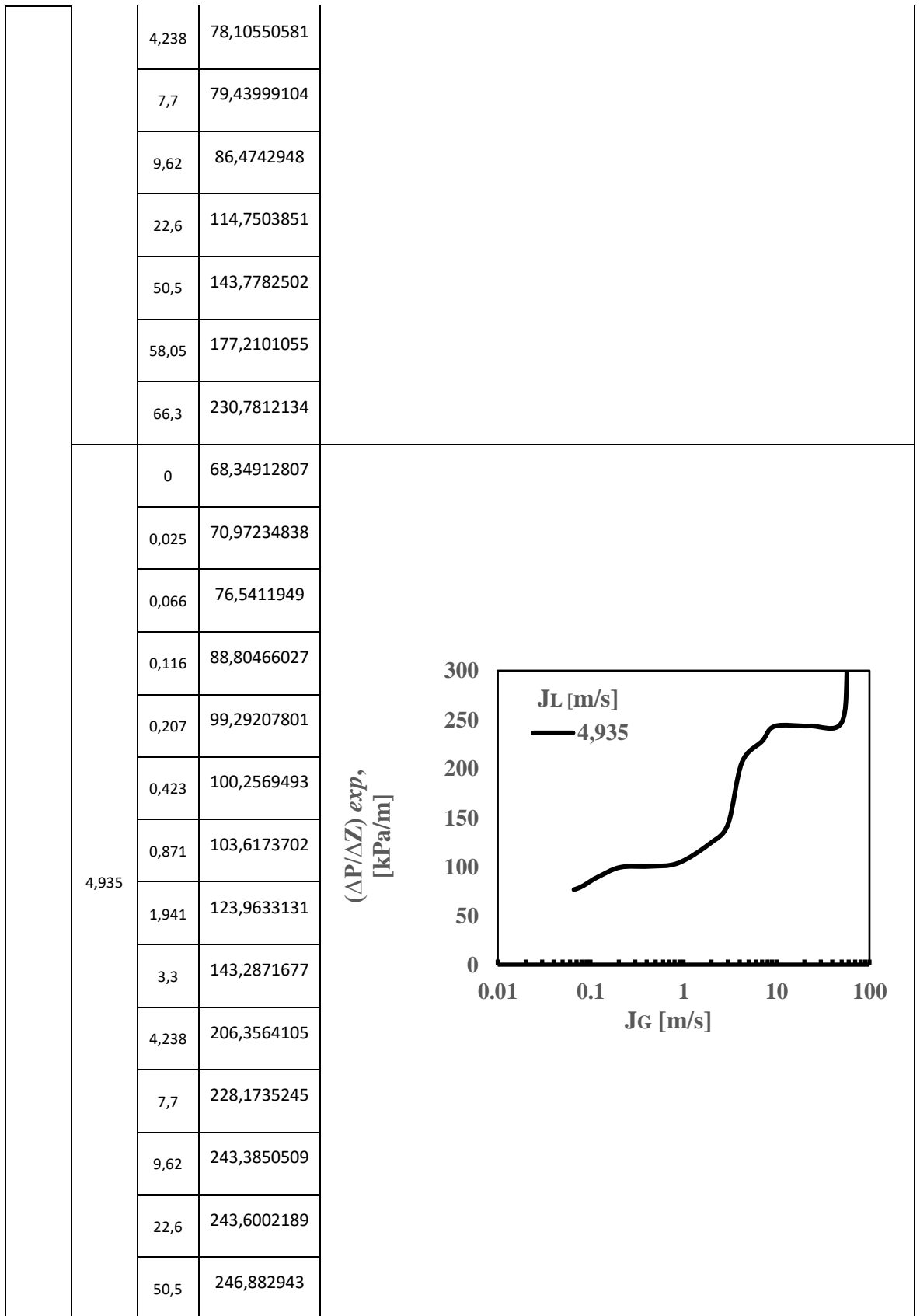
GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z} \left( \frac{\text{kPa}}{\text{m}} \right)$	Grafik
		0	7,022435192	<p>The graph plots the experimental pressure drop per unit height, <math>(\Delta P/\Delta Z)_{exp}</math> in kPa/m, against the gas velocity, JG, in m/s. The x-axis is logarithmic, ranging from 0.01 to 100 m/s. The y-axis is linear, ranging from 0 to 300 kPa/m. A horizontal line is drawn at JL = 0,232 m/s. The data points from the table are plotted, showing a sharp increase in pressure drop as JG increases, particularly for JG &gt; 10 m/s.</p>
	0,232	0,025	9,807047442	
	0,232	0,066	10,18788293	
	0,232	0,116	10,44356825	
	0,232	0,207	10,73387051	
	0,232	0,423	11,14275496	
	0,232	0,871	12,19193509	
	0,232	1,941	12,29122564	
	0,232	3,3	12,67871257	
	0,232	4,238	13,04888121	
	0,232	7,7	13,11476239	





GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z} \left( \frac{\text{kPa}}{\text{m}} \right)$	Grafik
0,879	0,879	0	14,21429712	
		0,025	16,21416205	
		0,066	16,40078038	
		0,116	16,39716258	

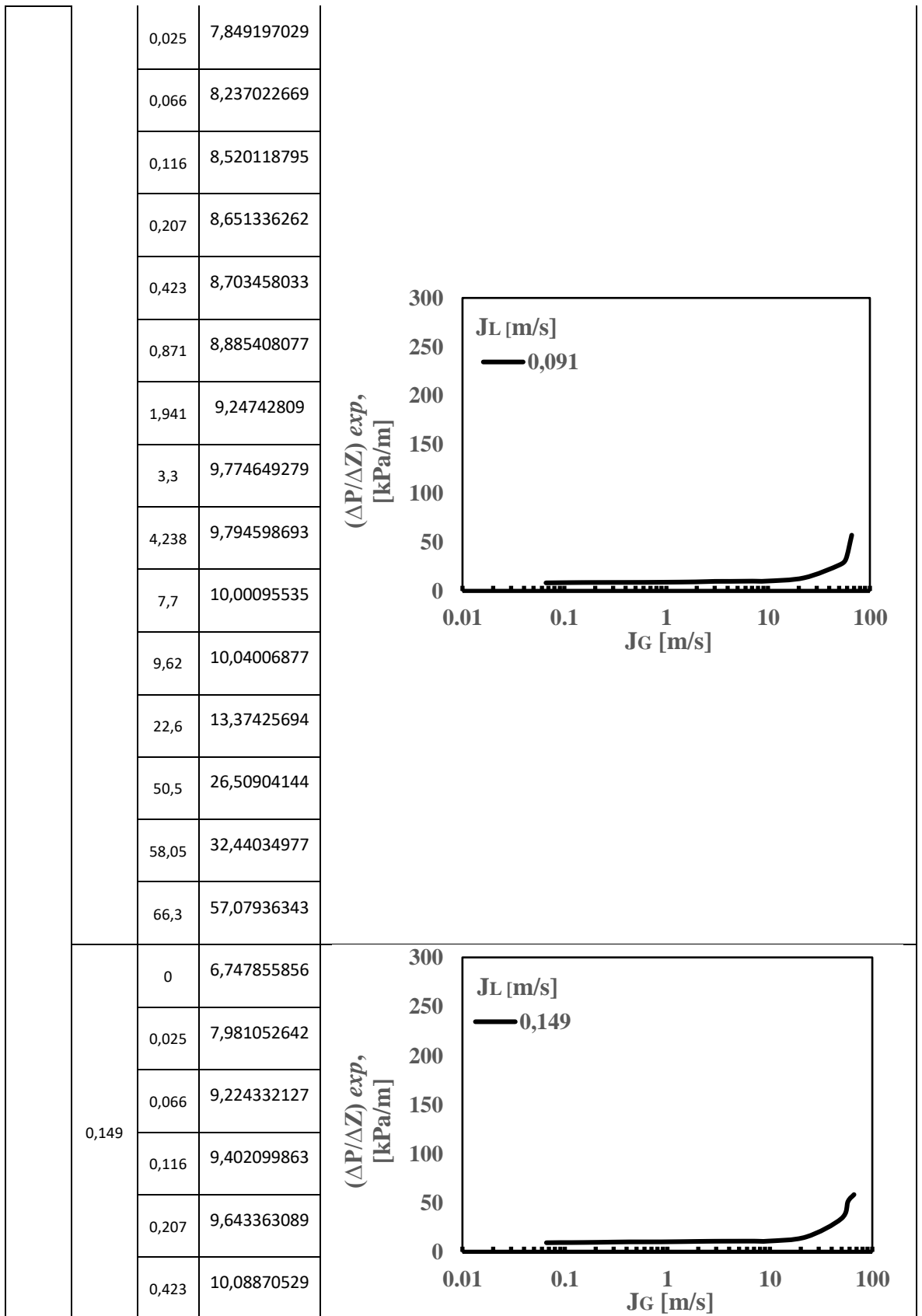




		58,05	310,4011311
		66,3	386,9378286

Lampiran 7 Pengaruh JL terhadap gradien tekanan dengan varian JG pada GL 50%

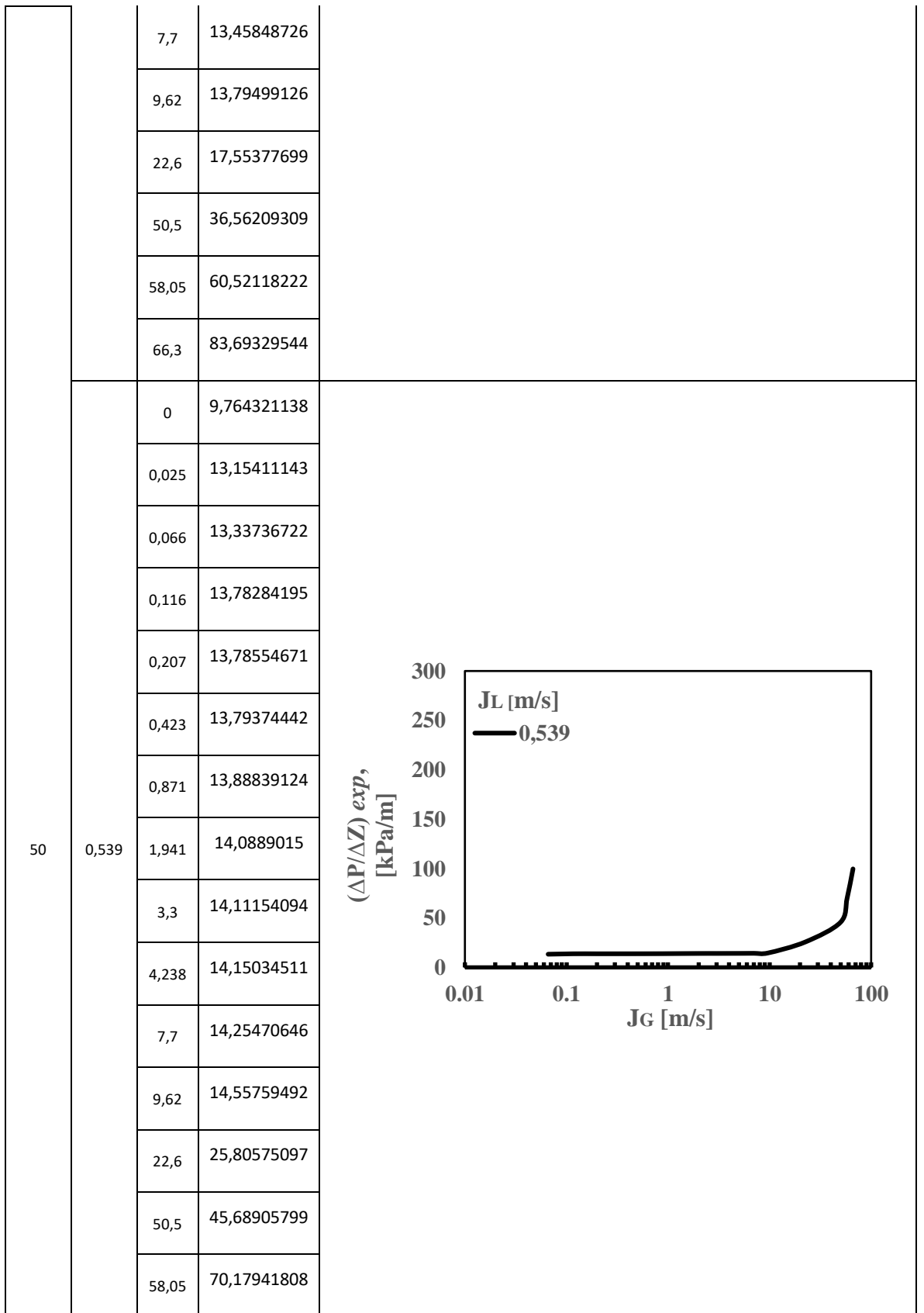
GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z} \left( \frac{\text{kPa}}{\text{m}} \right)$	Grafik
0,033	0,033	0	4,894460065	
		0,025	5,293124363	
		0,066	5,619368951	
		0,116	5,694787946	
		0,207	5,811205343	
		0,423	6,258864499	
		0,871	6,717072693	
		1,941	6,745018563	
		3,3	7,418797258	
		4,238	8,018742504	
		7,7	8,407103205	
		9,62	8,782568455	
		22,6	10,87335442	
		50,5	11,02781511	
58,05	12,56537791			
66,3	13,68087119			
50	0,091	0	5,695111928	

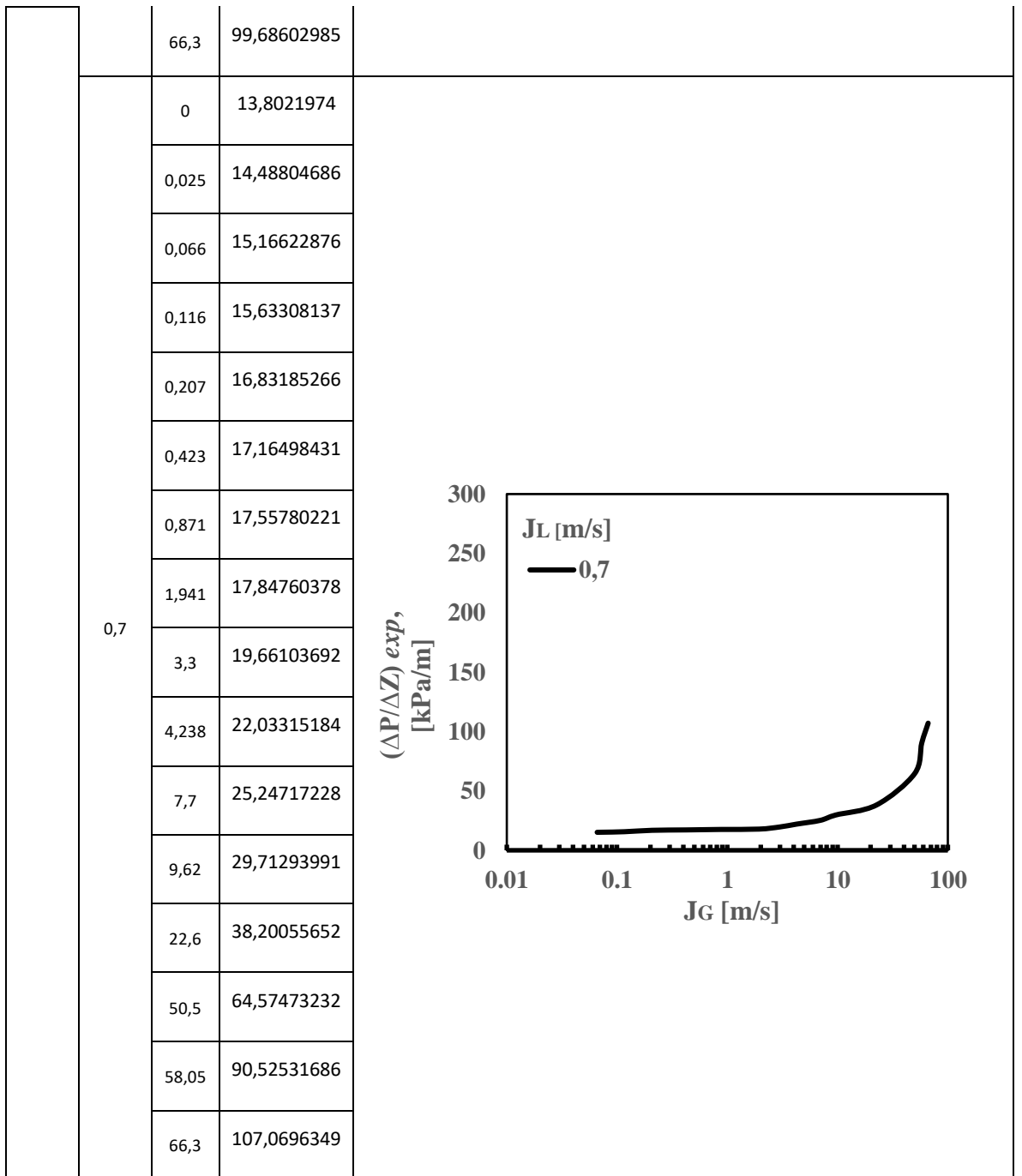




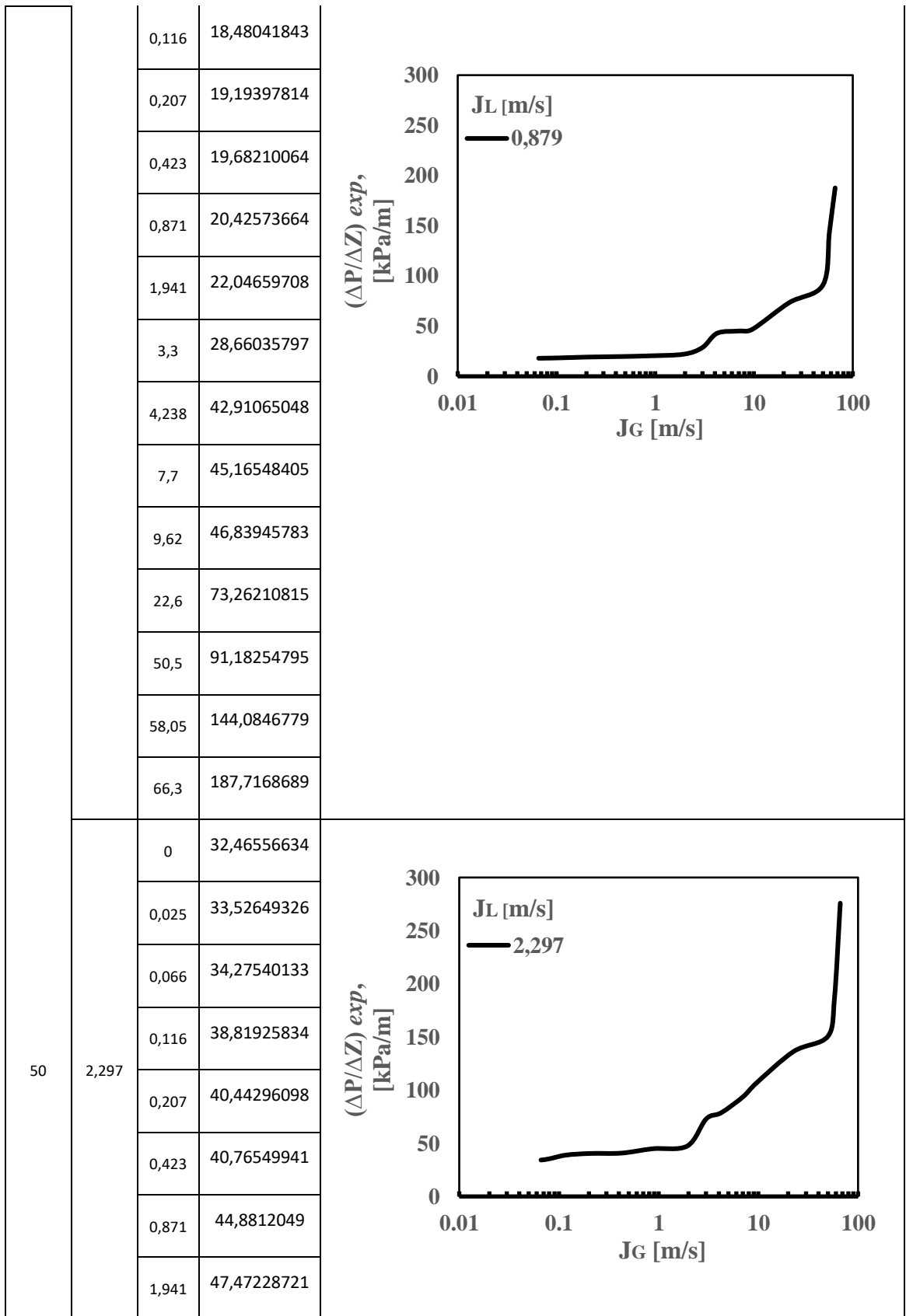
	0,871	10,11145763
	1,941	10,55552845
	3,3	10,75158642
	4,238	10,79114654
	7,7	10,84181039
	9,62	10,86589793
	22,6	15,09806008
	50,5	33,87604979
	58,05	51,41317516
	66,3	58,28280299

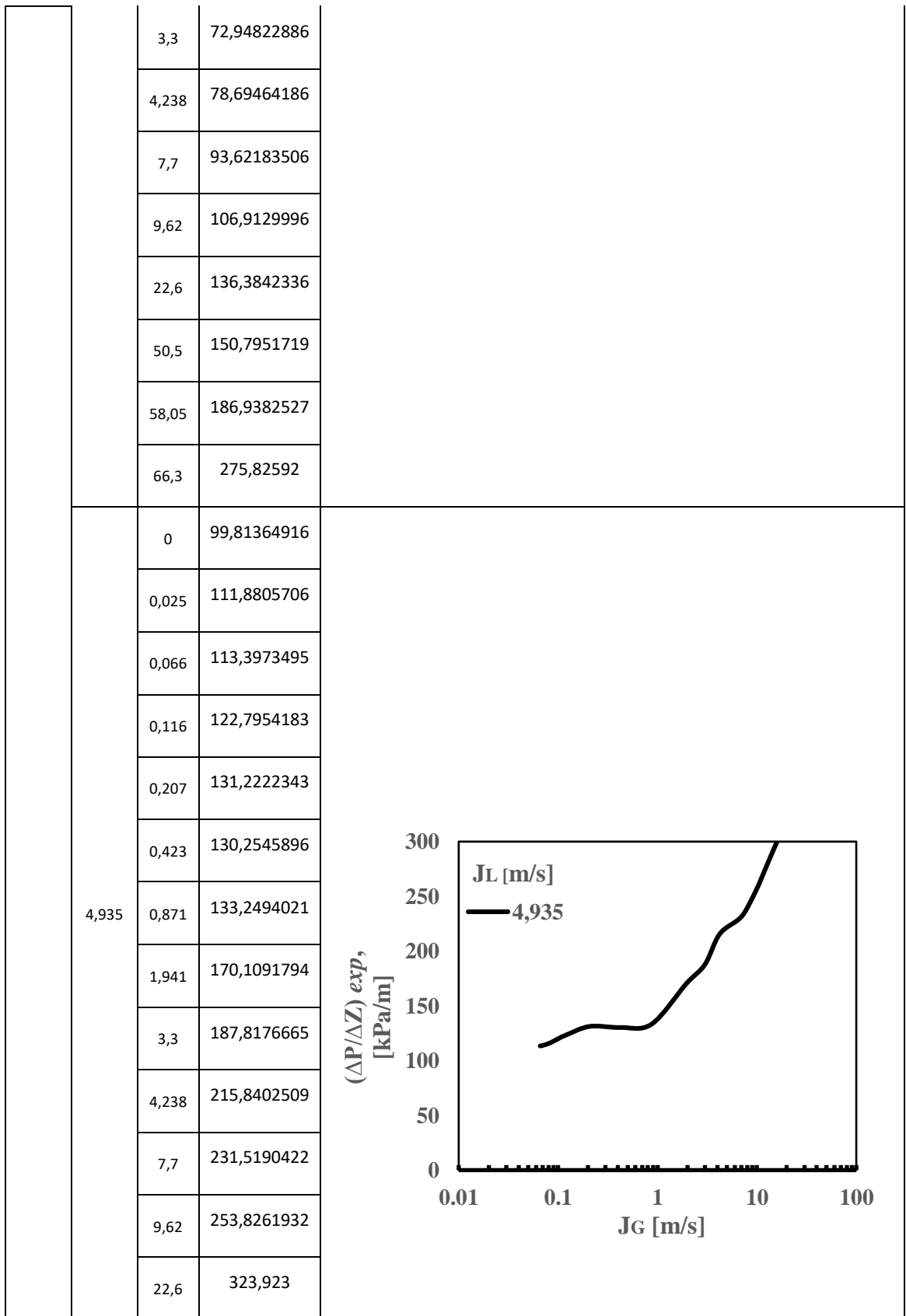
GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z}$ (kPa/m)	Grafik
		0	9,576922312	
		0,025	11,56826555	
		0,066	11,59045338	
		0,116	12,01543383	
		0,207	12,15258114	
	0,232	0,423	12,32920021	
		0,871	12,36324283	
		1,941	12,90802775	
		3,3	12,9806929	
		4,238	13,04529287	





GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z} \left( \frac{\text{kPa}}{\text{m}} \right)$	Grafik
	0,879	0	16,07680857	
		0,025	17,78110409	
		0,066	18,00304132	



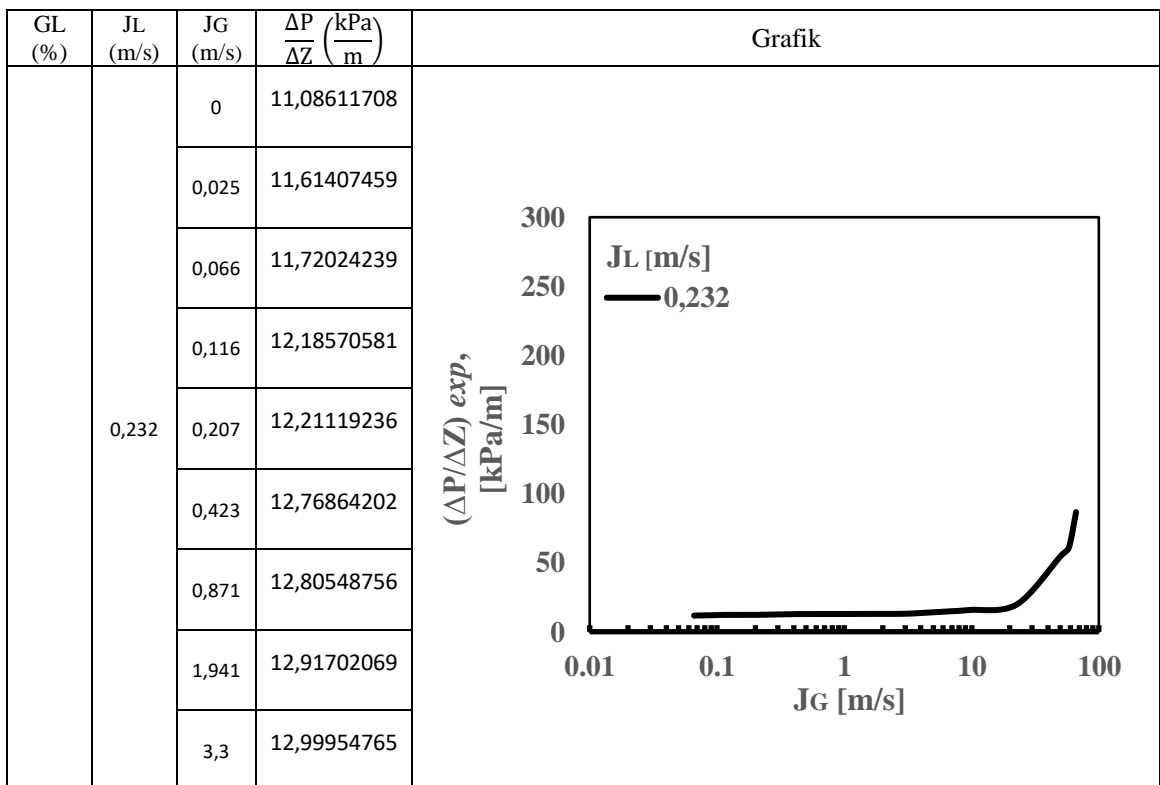
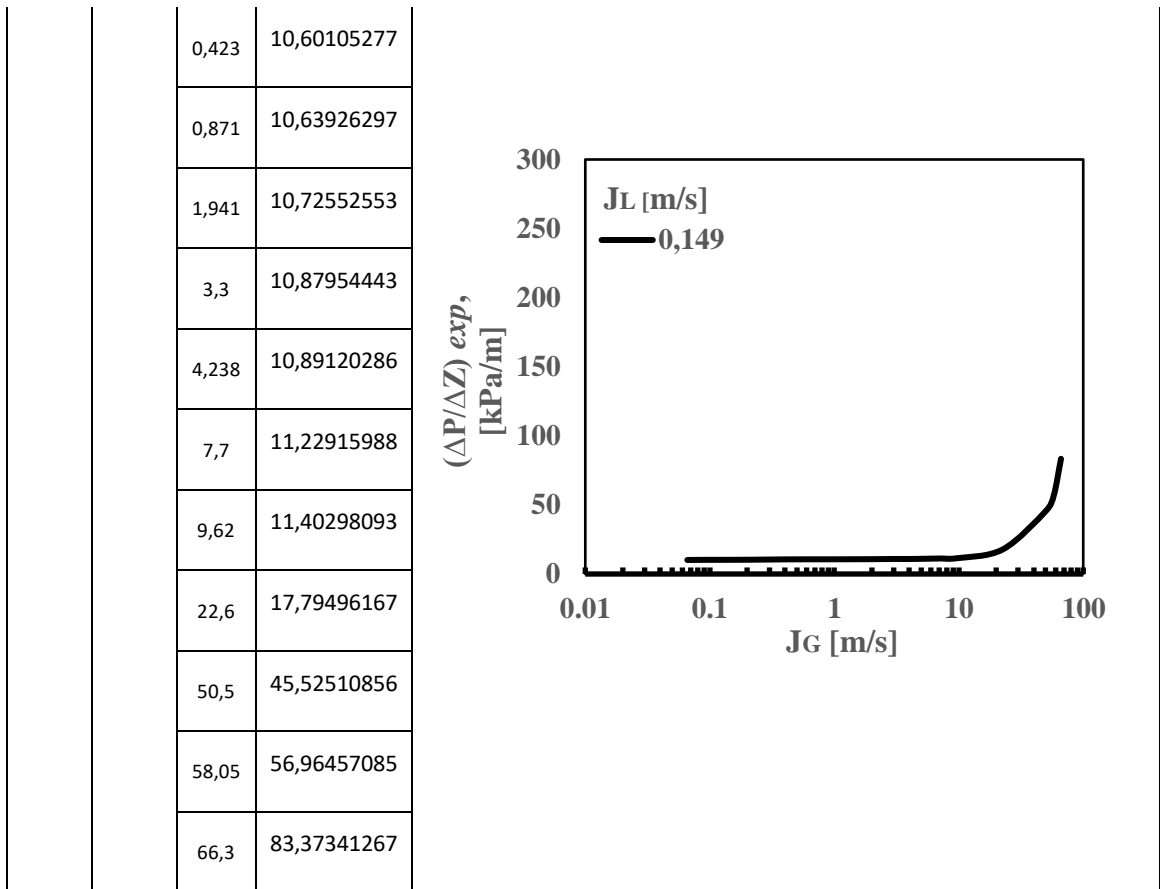


	50,5	324,4472415
	58,05	380,365503
	66,3	394,3834025

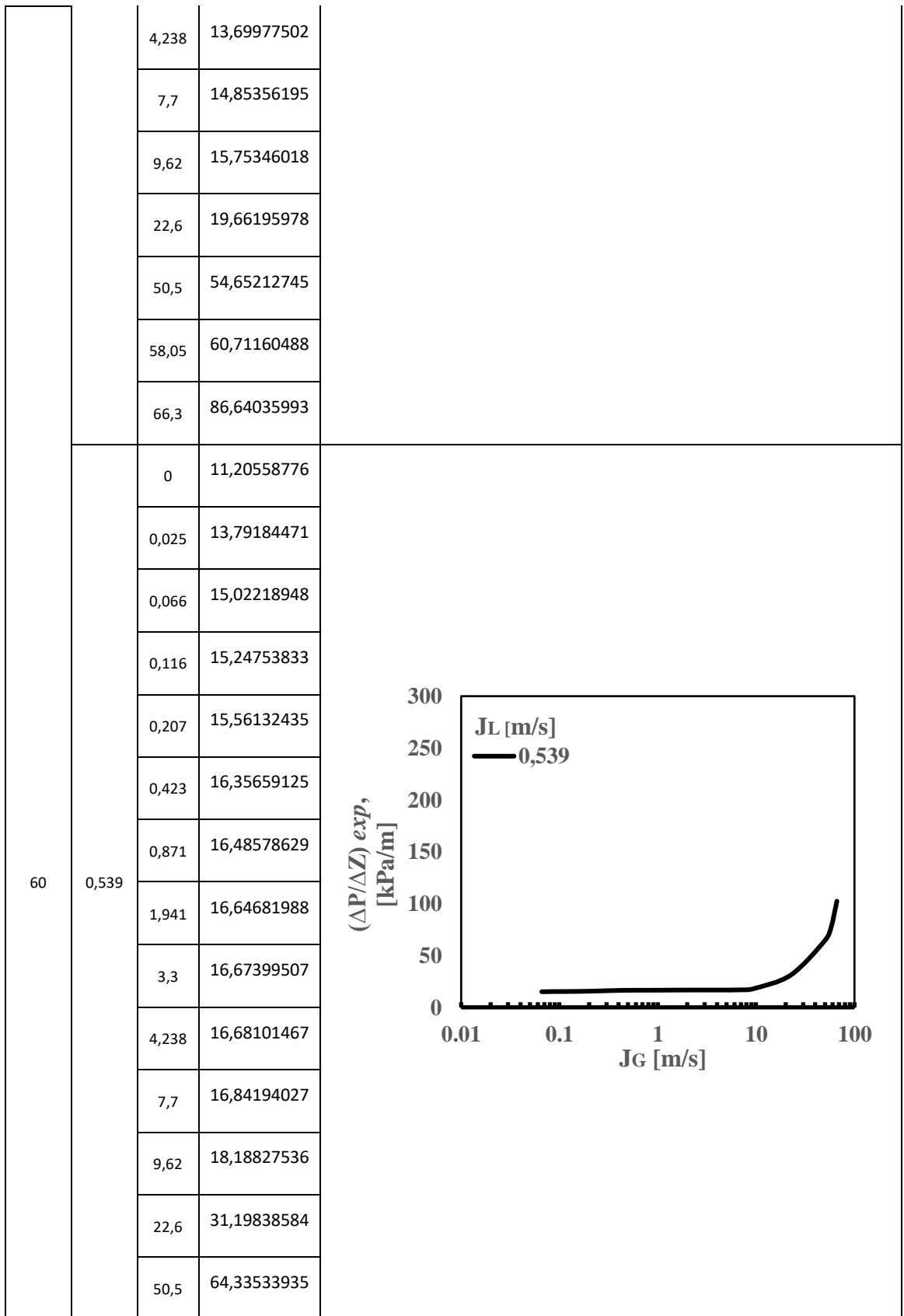
Lampiran 8 Pengaruh JL terhadap gradien tekanan dengan varian JG pada GL 60%

GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z}$ ( $\frac{\text{kPa}}{\text{m}}$ )	Grafik
0,033	0,033	0	5,31686338	
		0,025	5,457216147	
		0,066	5,907854953	
		0,116	6,060558292	
		0,207	6,227781899	
		0,423	6,307991895	
		0,871	6,808641682	
		1,941	7,070556281	
		3,3	7,727321032	
		4,238	9,492058761	
		7,7	10,29732	
		9,62	10,71106417	
		22,6	12,71455181	
		50,5	21,33248267	
		58,05	22,22106118	
66,3	34,86469936			

60	0,091	0	7,952581529	
		0,025	8,009381398	
		0,066	8,357175673	
		0,116	9,30873425	
		0,207	9,613748223	
		0,423	9,846921726	
		0,871	10,05947331	
		1,941	10,19885413	
		3,3	10,73321273	
		4,238	10,8804182	
		7,7	11,15542951	
		9,62	11,17316505	
		22,6	15,21328955	
		50,5	42,65868113	
		58,05	47,16650256	
	66,3	75,68172565		
	0,149	0	8,961902102	
		0,025	9,416772304	
		0,066	10,15523933	
		0,116	10,24705376	
0,207		10,32198678		

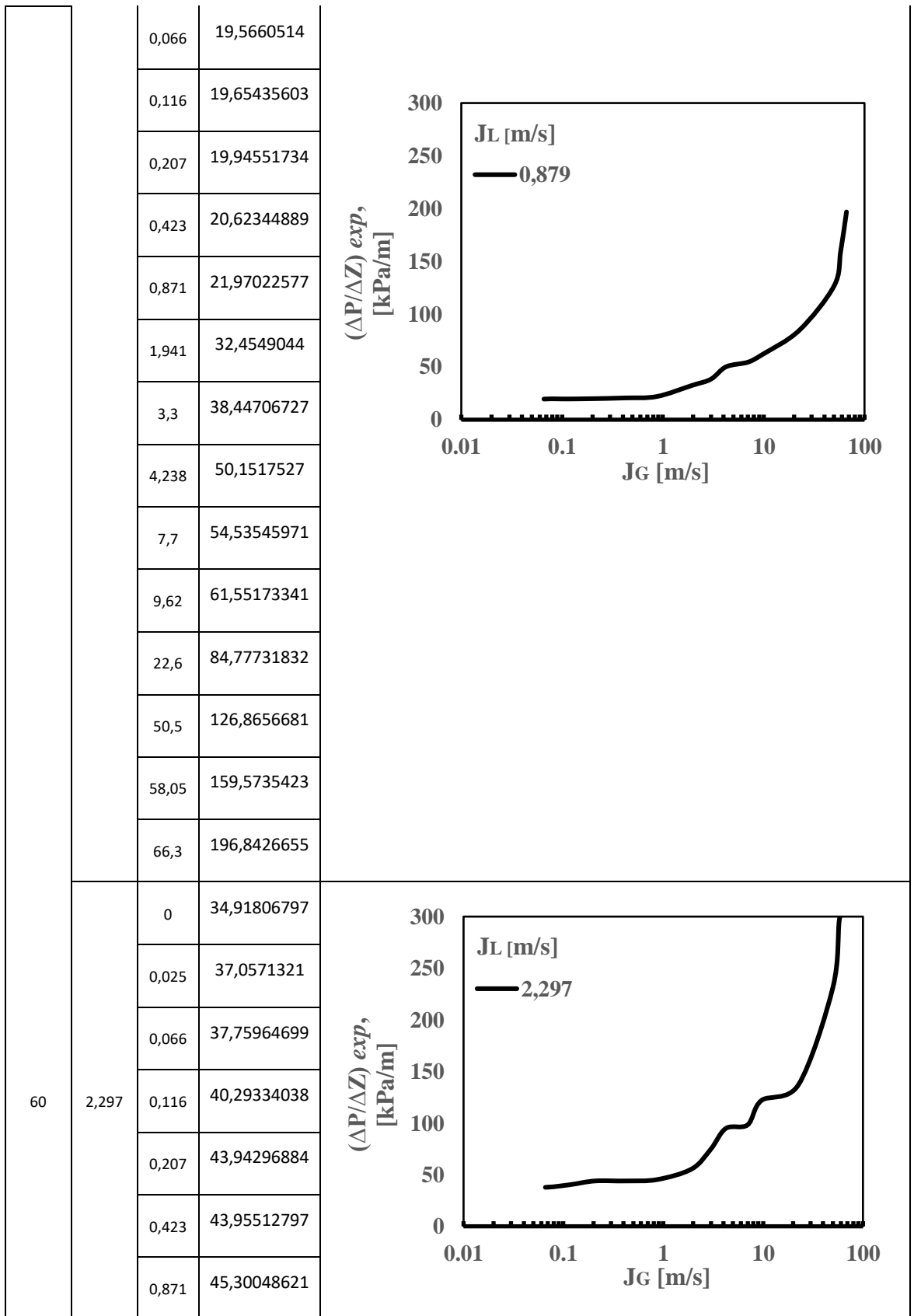


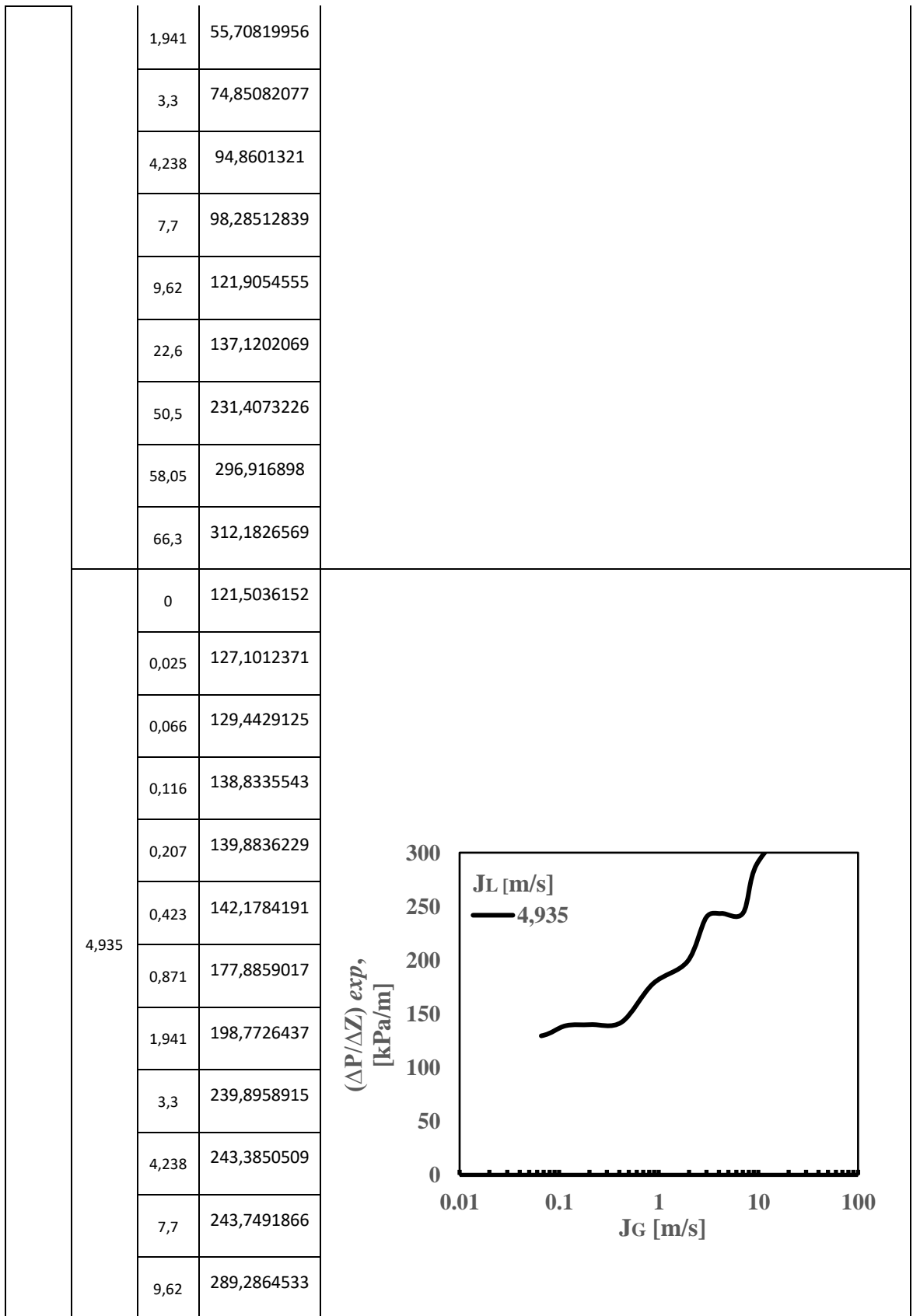




0,7	58,05	77,53413477	
	66,3	102,3641209	
	0	13,98882554	
	0,025	14,49781049	
	0,066	16,07680857	
	0,116	16,66196357	
	0,207	17,05937121	
	0,423	17,71532601	
	0,871	19,25715947	
	1,941	19,35846754	
	3,3	21,04364814	
	4,238	30,51075448	
	7,7	31,39340315	
	9,62	35,29065175	
	22,6	43,23676253	
50,5	73,7322693		
58,05	98,58443833		
66,3	132,8465898		

GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z} \left( \frac{\text{kPa}}{\text{m}} \right)$	Grafik
0,879		0	16,18777719	
		0,025	17,11758482	



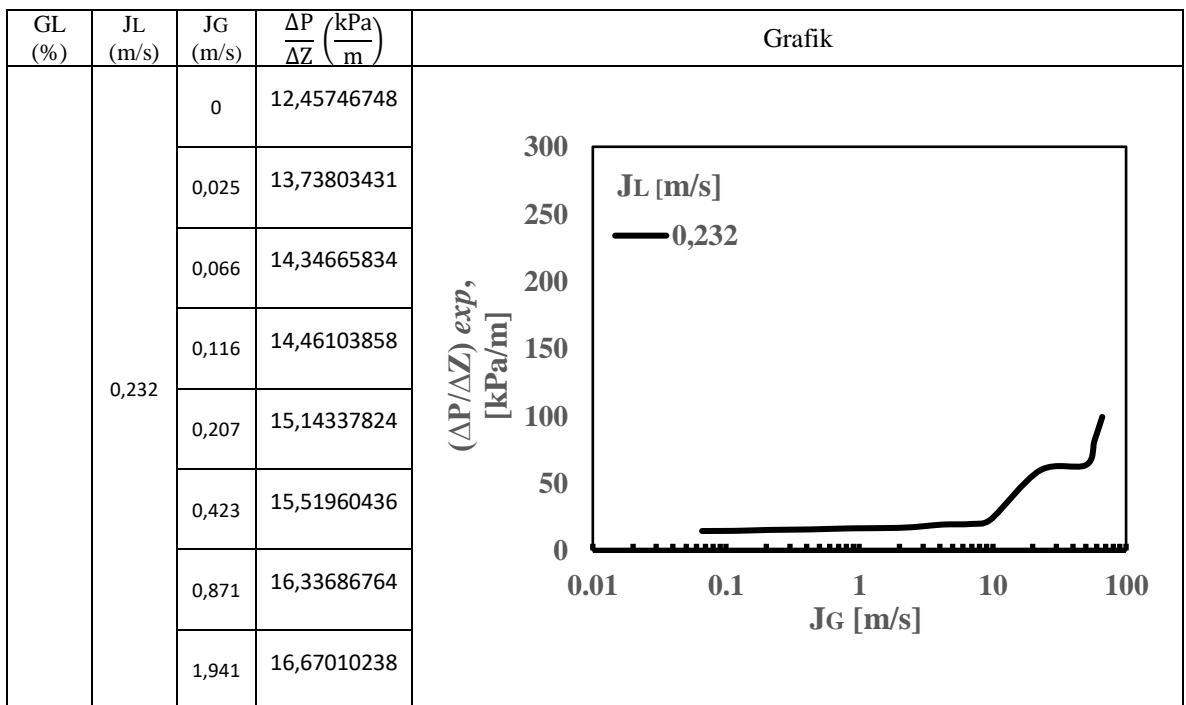
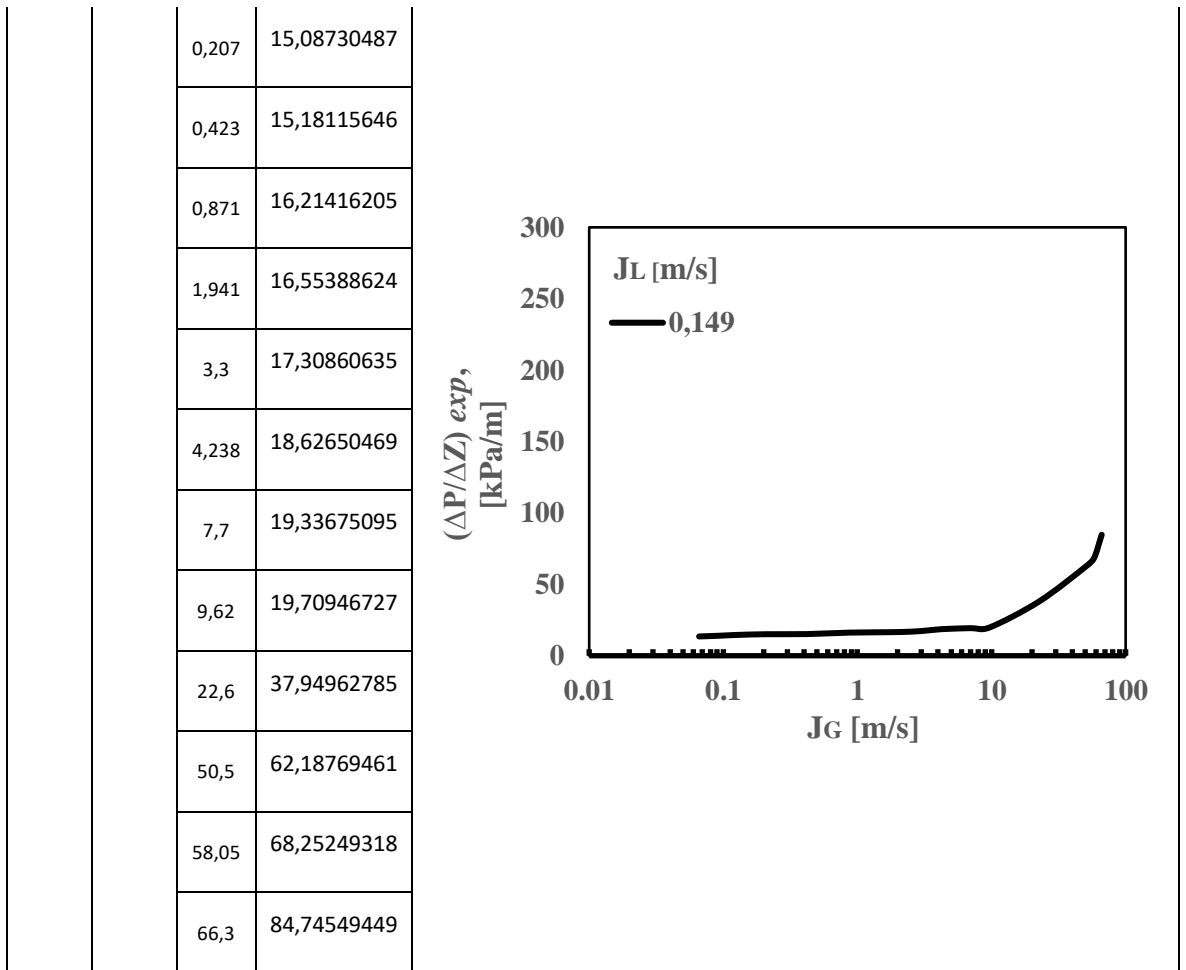


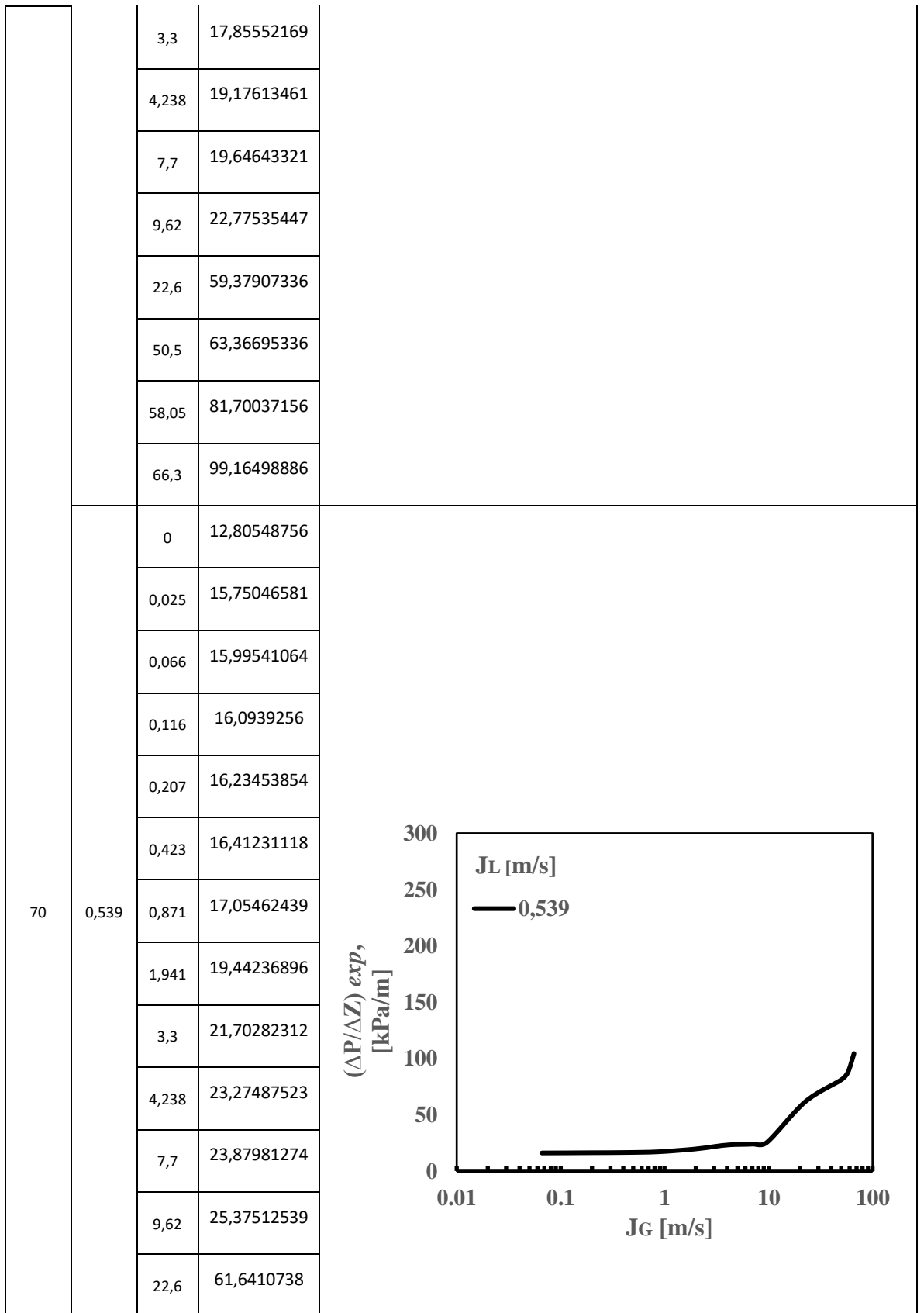
		22,6	327,4705448
		50,5	348,6416493
		58,05	388,9165267
		66,3	395,1104516

Lampiran 9 Pengaruh JL terhadap gradien tekanan dengan varian JG pada GL 70%

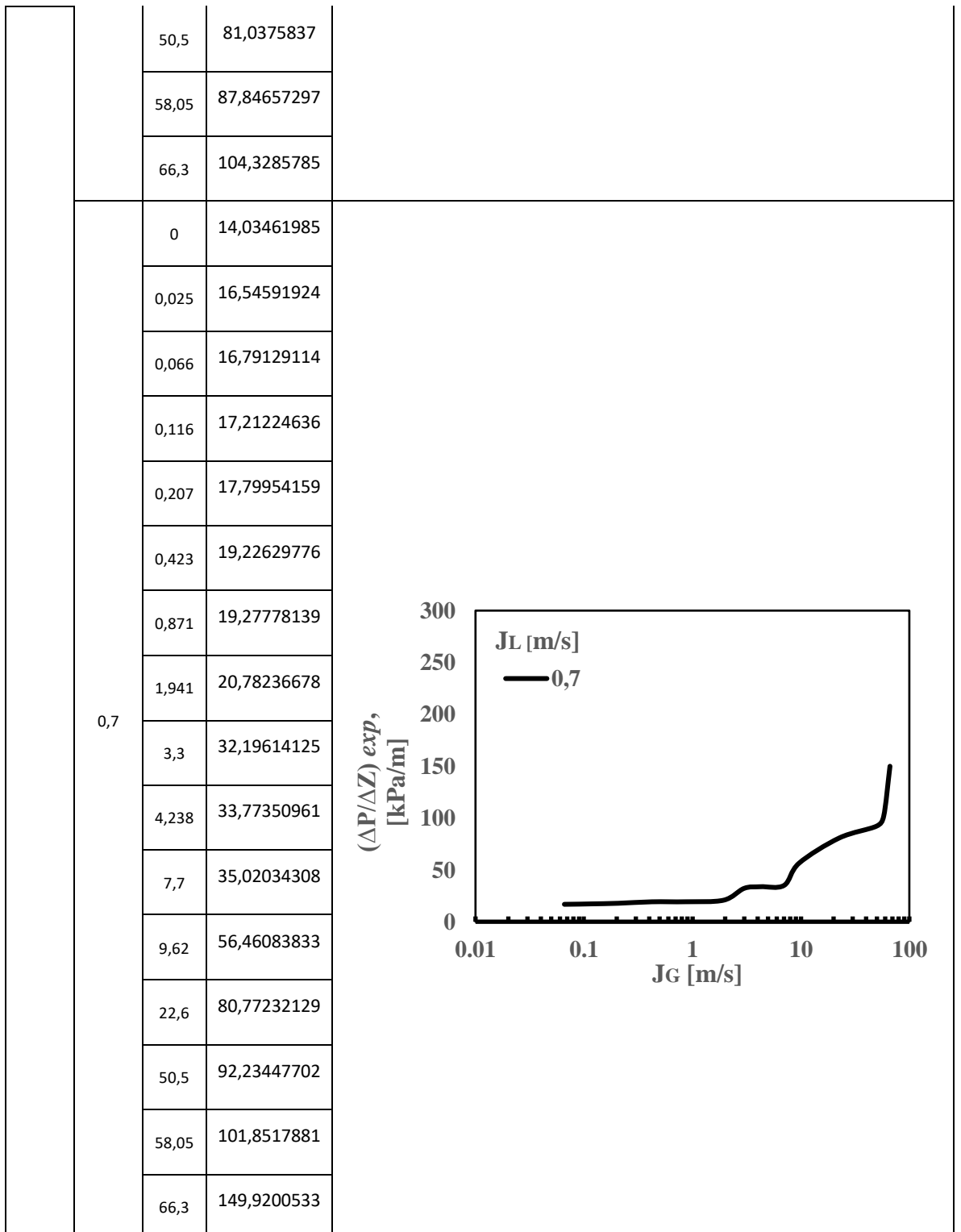
GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z} \left( \frac{\text{kPa}}{\text{m}} \right)$	Grafik
		0	8,409788325	
		0,025	8,55477992	
		0,066	8,956546588	
		0,116	8,961902102	
		0,207	9,990273777	
		0,423	10,43475693	
		0,871	10,44424076	
	0,033	1,941	10,63256735	
		3,3	10,78907502	
		4,238	10,8939518	
		7,7	12,01418208	
		9,62	12,35012157	
		22,6	16,79129114	
		50,5	38,68970496	
		58,05	47,0290509	

70	0,091	66,3	58,58860237		
		0	12,16535387		
		0,025	12,25147408		
		0,066	12,59296544		
		0,116	12,81025893		
		0,207	12,9806929		
		0,423	12,99340181		
		0,871	13,01690521		
		1,941	13,04022207		
		3,3	13,09944198		
		4,238	13,49947093		
		7,7	14,16095305		
		9,62	14,33624184		
		22,6	30,18705757		
		50,5	44,502706		
	58,05	56,22966271			
	66,3	77,5094778			
	0,149	0	12,3348748		
		0,025	13,16266258		
		0,066	13,52413771		
0,116		14,45645375			

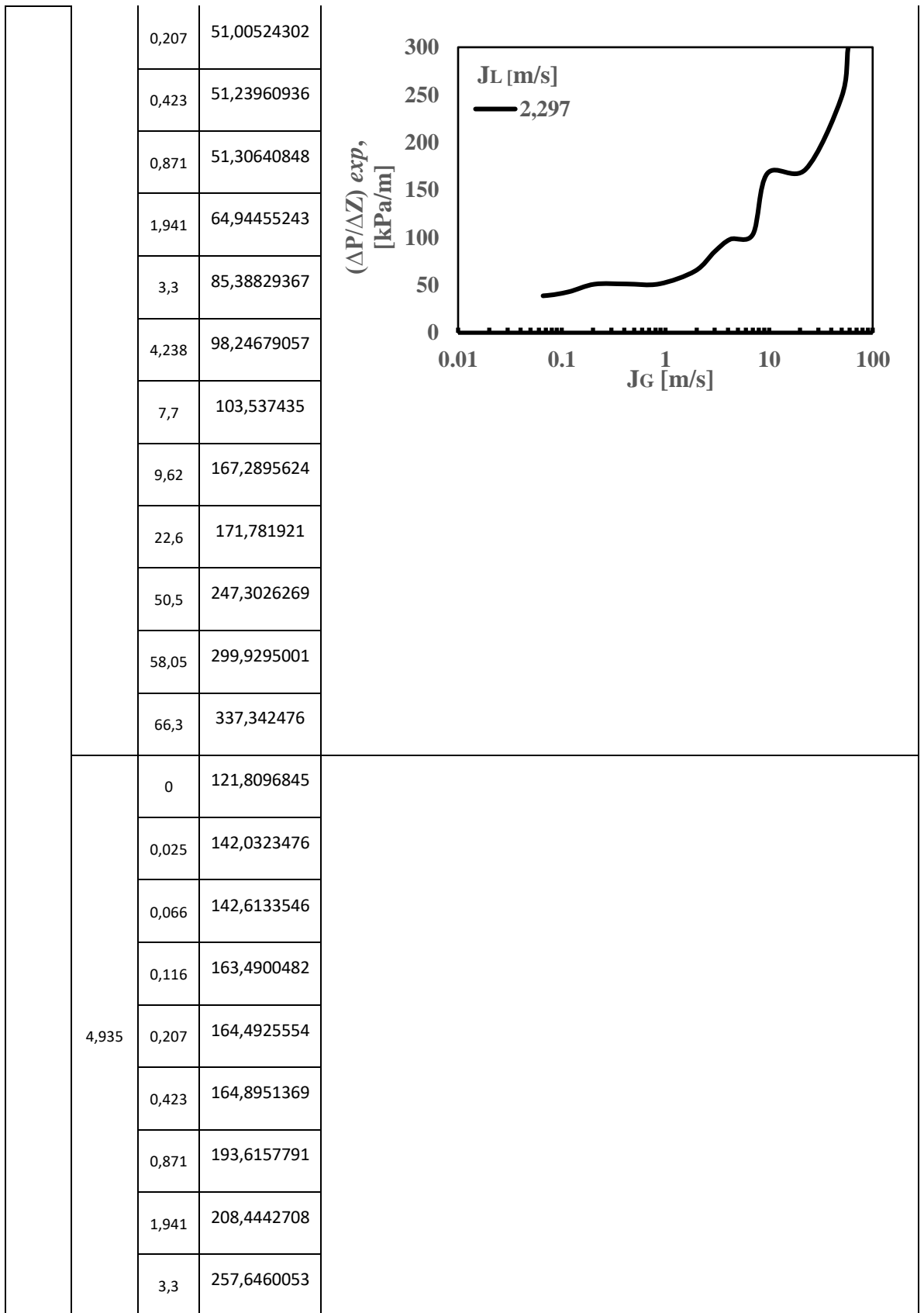








GL (%)	JL (m/s)	JG (m/s)	$\frac{\Delta P}{\Delta Z} \left( \frac{\text{kPa}}{\text{m}} \right)$	Grafik
70	0,879	0	22,1910487	
		0,025	22,83147693	
		0,066	25,07351813	
		0,116	25,54527956	
		0,207	33,30471802	
		0,423	33,57700494	
		0,871	35,60703944	
		1,941	50,20148879	
		3,3	50,50099507	
		4,238	52,98253233	
		7,7	58,53771272	
		9,62	107,516651	
		22,6	120,7781958	
		50,5	151,0129219	
		58,05	231,0255348	
66,3	269,5635467			
70	2,297	0	37,11810937	
		0,025	37,52236972	
		0,066	38,80287764	
		0,116	42,93693226	



4,238	263,5313328
7,7	303,341164
9,62	309,6323178
22,6	339,3512504
50,5	419,3551796
58,05	436,7210611
66,3	460,9980449

