PROFESIONAL ENIVIRONMENTAL
PROTECTION PRODUCTS

INSTRUCTIONS FOR USE

PNEUMATIC
PLUGS

CONTENT

1. IDENTIFICATION 7

1.1. PRODUCT TYPE 7

1.2. MANUFACTURER 7

2. PRODUCT DESCRIPTION 7

2.1. BASIC FUNCTIONS AND AREAS OF APPLICATION 7

2.2. BASIC DATA 8

2.2.1 Standard plugs plugy and plugsy 8

2.2.2 Multi-size long plugs plugy dc 11

2.2.3 Multi-size elliptical plugs plugy g and plugsy gm 12

2.2.4 Multi-size oval plugs plugy ei in plugsy ei 13

2.2.5 High-performance plugs plugy and plugsy hpf 14

2.2.6 Multi-size pillow-type plugs plugy pillow and plugsy pillow 16

2.2.7 Multi-size plugs with a larger flow-through bypass plugsy vp 17

2.2.8 Plugs for gully/manholes testing plugsy vj 18

2.2.9 Multi-size high-pressure plugs 18

2.2.10 Multi-size cone-type plugs cone plugy 19

2.2.11 Oil-resistant plugs plugy nbr 20

2.3. ENVIRONMENTAL CONDITIONS AND RESTRICTIONS OF USE 21

2.4. SAFETY AND PERSONAL PROTECTIVE EQUIPMENT 21

3. DEFINITIONS 22

4. PREPARATION OF THE PRODUCT FOR USE 23

4.1. TRANSPORT 23

4.2. SAFETY PRECAUTIONS BEFORE USE 23

4.3. REMOVAL OF PACKAGING 23

4.4. DISPOSAL OF PACKAGING 23

4.5. STORAGE AND PROTECTION OF THE PRODUCT OUT OF OPERATION 24

4.6. LOCATION OF INSTRUCTIONS AND PERIODIC TEST REPORTS 24

5. INSTRUCTIONS FOR SAFE USE 25

5.1. RECOMMENDATIONS FOR SAFE AND EFFICIENT WORK 25

5.1.1. Carrying of savatech pneumatic plugs 26

5.1.2. Working environment 27

5.2. SELECTION OF A SUITABLE SAVATECH PNEUMATIC PLUG 30

5.2.1. Selection of savatech pneumatic plug type considering its resistance to the media 30

5.2.2. Back pressure determination 30
5.2.3. Selection of a pneumatic plug 31

5.3. INFLATION SYSTEM FOR SAVATECH PNEUMATIC PLUGS 31
5.3.1. Air source for inflation of savatech pneumatic plugs 32
5.3.2. Controller for inflation and pressure control in savatech pneumatic plugs 32
5.3.3. Inflation hoses 35
5.3.4. Non-standard savatech pneumatic plugs 36

5.4. APPLICATION PROCEDURE FOR SAVATECH PNEUMATIC PLUGS 37
5.4.1. Insertion of the savatech pneumatic plug in a pipe 37
5.4.2. Deflation and disconnection of savatech pneumatic plugs 42

5.5. POSSIBLE USES OF SAVATECH PNEUMATIC PLUGS 44
5.5.1. Temporary pipeline sealing with the savatech pneumatic plugs 44
5.5.1.1. Negligible and stable back pressure values 44
5.5.1.2. Variable back pressure values 45
5.5.2. Preparation of a temporary bypass with the savatech pneumatic plugs 47
5.5.3. Use of savatech pneumatic plugs for testing in accordance with the en1610 standard 48
5.5.3.1. Testing of house drains and sewers 48
5.5.3.2. Tightness test of pipelines of larger diameters 57
5.5.3.3. Gully/manholes testing 62
5.5.3.4. Hand-held digital pressure gauge for testing with air (»L« procedure) 65

5.6. UNEXPECTED SITUATIONS 66

5.7. ACCESSORIES AND PROTECTIVE SLEEVES 69

5.8. DISPOSAL OF WASTE MATERIAL 70

5.9. BRIEF INSTRUCTIONS 71

6. MAINTENANCE AND CLEANING 72

6.1. SAFETY PRECAUTIONS 72

6.2. MAINTENANCE AND CLEANING AFTER USE 72
6.2.1. Maintenance of savatech pneumatic plugs after use 72
6.2.1.1. Replacement of connecting coupling on the SAVATECH pneumatic plug 73
6.2.2. Maintenance of supply and connecting hoses after use 75
6.2.3. Maintenance of the controllers after use 76

6.3. PREVENTIVE MAINTENANCE 76
6.3.1. General 76
6.3.2. Instructions for safe work 76
6.3.3. Periodic test of cylindrical pneumatic plugs 77
6.3.3.1. Inspection of the controller 78
6.3.3.2. Inspection of the connecting hose 78
6.3.3.3. Inspection of the SAVATECH pneumatic plug 79
6.3.4. Test procedures 79

6.3.4.1. Visual inspection of the controller 79
6.3.4.2. Tightness test of the controller 79
6.3.4.3. Function test of the controller 80
6.3.4.4. Visual inspection of the connecting hose 81
6.3.4.5. Tightness test and function test of the connecting hose 81
6.3.4.6. Visual inspection of the SAVATECH pneumatic plug 82
6.3.4.7. Periodic test of pneumatic plug 83
6.3.5. TEST CRITERIA FOR PNEUMATIC PLUGS 84
6.3.5.1. Leaks 84
6.3.5.2. Effects arising from the use of pneumatic plugs 84

6.4. SERVICE LIFE 86

6.5. TROUBLESHOOTING 87

7. WARRANTY CONDITIONS 89

7.1. GENERAL CONDITIONS 89

7.2. MANAGEMENT OF THE PRODUCTS 89

7.3. WARRANTY 89

7.4. EXCLUSION OF WARRANTY 89

7.5. MAKING A WARRANTY CLAIM 90

7.6. REMEDIES 91

7.7. CLOSING PROVISIONS 91

8. ENCLOSURES 92

8.1. BRIEF INSTRUCTIONS ON USING THE SAVATECH PNEUMATIC PLUGS 92

8.2. TEST REPORT: DATA ABOUT THE TESTED PLUG AND TEST PERFORMANCE 94

LIST OF TABLES

Table 1:	Plugs of smaller diameters Plugy – Basic technical data	8
Table 2:	Plugs of smaller diameters Plugsy – Basic technical data	8
Table 3:	Plugs of smaller diameters Plugy and Plugsy – Table of back pressure values	9
Table 4:	Multi-size plugs for larger pipeline diameters Plugy – Basic technical data	9
Table 5:	Multi-size plugs for larger pipeline diameters Plugsy – Basic technical data	10
Table 6:	Multi-size plugs for larger pipeline diameters Plugy and Plugsy – Table of back pressure values	10
Table 7:	Multi-size long plugs Plugy DC – Basic technical data	11
Table 8:	Multi-size long plugs Plugy DC – Table of back pressure values	11
Table 9:	Multi-size elliptical plugs Plugy G – Basic technical data	12
Table 10:	Multi-size elliptical plugs Plugsy GM – Basic technical data	12
Table 11:	Multi-size oval plugs Plugy EI – Basic technical data	13
Table 12:	Multi-size oval plugs Plugsy EI – Basic technical data	13
Table 13:	High-performance plugs Plugy – Basic technical data	14
Table 14:	High-performance plugs Plugsy – Basic technical data	14
Table 15:	High-performance plugs Plugy and Plugsy – Table of back pressure values	15
Table 16:	Multi-size pillow-type plugs Plugy Pillow – Basic technical data	16
Table 17:	Multi-size pillow-type plugs Plugsy Pillow – Basic technical data	16
Table 18:	Multi-size plugs with a larger flow-through bypass Plugsy VP – Basic technical data	17
Table 19:	Multi-size plugs with a larger flow-through bypass Plugsy VP – Table of back pressure values	17
Table 20:	Plugs for gully/manholes testing Plugsy VJ – Basic technical data	18
Table 21:	Multi-size high-pressure plugs Plugy HP 6 bar and Plugy HP 12 bar – Basic technical data	18
Table 22:	Multi-size high-pressure plugs Plugy HP 30 bar – Basic technical data	19
Table 23:	Multi-size high-pressure plugs Plugsy HP 30 bar – Basic technical data	19
Table 24:	Multi-size cone-type plugs – Basic technical data	19
Table 25:	Oil-resistant plugs Plugy NBR – Basic technical data	20
Table 26:	Oil-resistant plugs Plugy NBR – Table of back pressure values	20
Table 27:	Types of SAVATECH pneumatic plugs with regard to their resistance to chemicals	28
Table 28:	Table of resistance to the media	28
Table 29:	Table of controllers	34
Table 30:	Table of connecting hoses	35
Table 31:	Composition of the SAVATECH HOUSE CONNECTION TEST SET	49
Table 32:	Technical data for plugs in the SAVATECH HOUSE CONNECTION TEST SET	50
Table 33:	Accessories for pipeline testing according to the EN 1610 standard	58
Table 34:	Unexpected situations	66
Table 35:	List of accessories	69
Table 36:	List of protective sleeves	70

1. IDENTIFICATION

1.1. TYPE OF PRODUCT

- Standard plug types: Plugy, Plugsy, Plugy HPF, Plugsy HPF
- Long plugs: Plugy DC
- Elliptical plugs: Plugy G, Plugsy GM
- Oval plugs: Plugy EI, Plugsy EI
- Pillow-type plugs: Plugy Pillow, Plugsy Pillow
- Plugs with a larger flow-through bypass: Plugsy VP
- Plugs for gully/manholes testing: Plugsy VJ
- High-pressure plugs: Plugy HP 6 bar, Plugy HP 12 bar, Plugy HP 30 bar, Plugsy HP 30 bar
- Cone-type plugs: Plugy Cone

1.2. MANUFACTURER

Savatech, d.o.o.

Savatech d.o.o.
Industrial Rubber Products and Tyres

Professional Environmental Protection Products

Škofjeloška cesta 6
4502 Kranj
Slovenia

Tel: +386 (0)4 206 6388
Fax: +386 (0)4 206 6390

info.eko@savatech.si

2. PRODUCT DESCRIPTION

2.1. BASIC FUNCTIONS AND APPLICATION AREAS

The Savatech pneumatic plugs are designed for temporarily sealing of pipelines in sewerage, industrial and water line systems during maintenance works or testing.

2.2. BASIC DATA

2.2.1 STANDARD PLUGS PLUGY AND PLUGSY

Table 1: Plugs of smaller diameters Plugy – Basic technical data

PLUGY - BLOCKING PLUG

Part number	Type plugy EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve
		Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Rubber length (mm)		M thread	Thread size
508123	Z1	20	33	2.5	19	65	0.01	NA	R 1/8"
60022	Z1 1/2	33	40	2.5	32	70	0.09	NA	R 1/4"
78582	Z2	50		2.5	45	72	0.11	NA	R 1/4"
78603	Z2-3	50	75	2.5	45	80	0.12	NA	R 1/4"
76767	Z3	75		2.5	70	85	0.23	NA	R 1/4"
78604	Z3-4	75	100	2.5	70	100	0.25	NA	R 1/4"
76769	Z4	100		2.5	85	145	0.43	NA	R 1/4"
78605	Z4-6	100	150	2.5	85	165	0.47	NA	R 1/4"
76771	Z6	150		2.5	142	190	1.23	NA	R 1/4"
78606	Z6-8	150	200	2.5	142	220	1.32	NA	R 1/4"
60616	Z8	175	204	2.5	174	220	2.1	6	R 1/4"
60618	Z10	219	254	2.5	218	250	3.4	6	R 1/4"
60619	Z12	275	305	2.5	274	290	5.1	6	R 1/4"

Table 2: Plugs of smaller diameters Plugsy – Basic technical data

PLUGSY - BYPASS PLUG

Part number	Type plugy EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve	Bypass diameter (female)
		Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Rubber length (mm)		M thread	Thread size	
78607	S2	50		2.5	45	80	0.2	NA	R 1/8"	1/8"
76768	S3	75		2.5	70	85	0.34	6	R 1/8"	1/2"
78614	S3-4	75	100	2.5	70	100	0.43	6	R 1/8"	1/2"
76770	S4	100		2.5	85	145	0.6	6	R 1/8"	1/2"
78609	S4-6	100	150	2.5	85	165	0.73	6	R 1/8"	1/2"
76772	S6	150		2.5	142	190	2.13	6	R 1/8"	1"
78610	S6-8	150	200	2.5	142	220	2.38	6	R 1/8"	1"
60621	S8	175	204	2.5	174	240	3.3	6	R 1/4"	2"
60622	S10	219	254	2.5	218	300	4.7	6	R 1/4"	2"
60623	S12	275	305	2.5	274	350	7.4	6	R 1/4"	2"

Table 3: Plugs of smaller diameters Plugy and Plugsy – Table of back pressure values

BACK PRESSURE - PLUGY & PLUGSY

Plug size	Pipe diameter (mm)								
	25	40	50	75	100	150	200	250	300
1″	2.2								
1 1/2″		2.2							
2″			1.8						
2″– 3″			2	1.5					
3″				1.5					
3″– 4″				1.8	1.2				
4″					1.9				
4″– 6″					1.9	1.6			
6″						2.2			
6″– 8″						2.2	1.4		
8″							1.3		
10″								1.5	
12″									1.8

Table 4: Multi-size plugs for larger pipeline diameters Plugy – Basic technical data

PLUGY - BLOCKING PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve
		Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Rubber length (mm)		M thread	Thread size
519423	40–70	40	70	2.5	35	160	0.2	NA	R 1/4″
519424	70–150	70	150	2.5	68	300	0.4	NA	R 1/4″
60417	100–200	100	200	2.5	92	500	1.35	M6	R 1/4″
526850	150–200	150	200	2.5	142	350	1.85	M8	R 1/4″
60418	150–300	150	300	2.5	142	540	2.6	M8	R 1/4″
60419	200–400	200	400	2.5	192	600	3.6	M8	R 1/4″
60599	300–525	300	525	2.5	272	630	6.8	M8	R 1/4″
60422	350–600	350	600	2.5	322	830	9.8	M10	R 1/4″
60606	375–750	375	750	2.5	342	1050	11.9	M10	R 1/4″
60453	500–800	500	800	2.5	472	1150	19.5	M10	R 1/4″
60425	500–1000	500	1000	1.5	472	1150	19.5	M10	R 1/4″
523941	600–1200	600	1200	1.5	574	1450	38	M10	2 x R 3/8″
78959	750–1500	750	1500	1	600	2300	75	M10	2 x R 1/4″
535881	800–1800	800	1800	1	600	3000	106	M10	2 x R 1/4″

Table 5: Multi-size plugs for larger pipeline diameters Plugsy – Basic technical data

PLUGSY - BYPASS PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve	Bypass diameter (female)
		Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Rubber length (mm)		M thread	Thread size	
526849	70-150	70	150	2.5	68	300	1.7	NA	R 1/4"	1/2"
60429	100-200	100	200	2.5	92	500	2.7	M6	R 1/4"	1"
526851	150-200	150	200	2.5	142	350	3.3	M8	R 1/4"	1"
60432	150-300	150	300	2.5	142	540	4.3	M8	R 1/4"	1"
60434	200-400	200	400	2.5	192	600	7	M8	R 1/4"	2"
60630	300-525	300	525	2.5	272	630	12	M8	R 1/4"	2"
60440	350-600	350	600	2.5	322	830	16	M10	R 1/4"	2"
60632	375-750	375	750	2.5	342	1050	19.7	M10	R 1/4"	2"
60454	500-800	500	800	2.5	472	1150	32.5	M10	R 1/4"	2"
60442	500-1000	500	1000	1.5	472	1150	32.5	M10	R 1/4"	2"
523942	600-1200	600	1200	1.5	574	1450	55.5	M10	2 x R 3/8"	4"
78960	750-1500	750	1500	1	600	2300	91	M10	2 x R 1/2"	4"
535882	800-1800	800	1800	1	600	3000	117	M10	2 x R 1/2"	4"

Table 6: Multi-size plugs for larger pipeline diameters Plugy and Plugsy – Table of back pressure values

BACK PRESSURE measured in dry iron pipe (bar) - PLUGY, PLUGSY

PLUG TYPE	Pipe Diameter (mm)																			
PLUGY, PLUGSY	40	70	100	150	200	250	300	350	400	500	600	800	1000	1200	1300	1400	1500	1600	1700	1800
40-70	2	1.2																		
70-150		2.2	1.7	1.3																
100-200			2.2	1.7	1.3															
150-200				2	1.5															
150-300				2.2	2	1.4	1.2													
200-400					2.2	2	1.7	1.5	1.2											
300-525							2	1.7	1.5	1.2										
350-600								2.1	1.9	1.6	1.3									
375-750									2	1.7	1.4									
500-800										1.8	1.4	1.1								
500-1000										1	0.8	0.6	0.5							
600-1200											1	0.7	0.6	0.5						
750-1500												1	0.9	0.8	0.7	0.6	0.5			
800-1800												1	1	0.9	0.8	0.7	0.6	0.5	0.5	0.4

2.2.2 MULTI-SIZE LONG PLUGS PLUGY DC

Table 7: Multi-size long plugs Plugy DC – Basic technical data

BLOCKING PLUG - PLUGY DC

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product lenght (mm)	Product weight (kg)	Eye Bolt	Inflation valve
		Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Body length (mm)			M thread	Thread size
60073	50-75	50	75	2.5	40	490	550	0.7	NA	TR 15
60074	75-100	75	100	2.5	60	550	610	1.2	NA	TR 15
60075	100-150	100	150	2.5	80	750	810	1.8	NA	TR 15
60076	150	150	150	2.5	100	730	790	2.6	NA	TR 15

Table 8: Multi-size long plugs Plugy DC – Table of back pressure values

BACK PRESSURE (BAR) - PLUGY MEASURED IN DRY IRON PIPE

Plug type	Pipe diameter (mm)			
Plugy	50	75	100	150
50-75	2.2	2		
75-100		2.1	1.9	
100-150			2	1.8
150				1.9

2.2.3 MULTI-SIZE ELLIPTICAL PLUGS PLUGY G AND PLUGSY GM

Table 9: Multi-size elliptical plugs Plugy G – Basic technical data

PLUGY G - BLOCKING PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. allowed back pressure (bar)	Deflated plug		Diameter for insertion (mm)	Product weight (kg)	Inflation valve thread size
		Min. dia. (mm)	Max. dia. (mm)			Diameter (mm)	Length (mm)			
511807	50-80	45	80	3	1	45	280	35	0.29	R 1/4"
511808	80-130	75	130	2.5	1	76	360	40	0.37	R 1/4"
511809	100-160	100	160	2	1	98	420	45	0.56	R 3/8"
511810	150-210	145	210	2	1	140	510	50	0.78	R 3/8"
511811	200-315	200	315	2	1	200	730	70	1.25	R 3/8"
519420	315-500	315	500	1.5	0.8	315	950	90	1.45	R 3/8"

Table 10: Multi-size elliptical plugs Plugsy GM – Basic technical data

PLUGSY GM - Bypass plug

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. alow. back pressure (bar)	Deflated plug		Diameter for insertion (mm)	Product weight (kg)	Inflation valve thread size	Bypass diameter (female) (mm)
		Min. dia. (mm)	Max. dia. (mm)			Diameter (mm)	Length (mm)				
51181 2	50-80	45	80	3	1	45	490	35	0.71	R 1/4"	5
511813	80-130	75	130	2.5	1	76	570	40	0.79	R 1/4"	5
511814	100-160	100	160	2	1	98	645	45	1.01	R 3/8"	7
511815	150-210	145	210	2	1	140	760	50	1.22	R 3/8"	7
511816	200-315	200	315	2	1	200	1060	70	1.72	R 3/8"	7
519421	315-500	315	500	1.5	0.8	315	1280	90	1.9	R 3/8"	7

2.2.4 MULTI-SIZE OVAL PLUGS PLUGY EI IN PLUGSY EI

Table 11: Multi-size oval plugs Plugy EI – Basic technical data

PLUGY EI - Blocking plug

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. allowed back pressure		Deflated plug			Product weight (kg)	Eye bolt	Shackles x piece	Inflation valve
		Min. dia. (mm)	Max. dia. (mm)		Water head (bar)	Water head (m)	Diameter (mm)	Width (mm)	Length (mm)		M thread	M thread	
503485	EI 1	200/300	250/375	1.5	0.5	5	180x265	/	600	7	8	NA	TYPE 26
503486	EI 2	300/450	350/525	1.5	0.5	5	280x415	/	700	14.8	8	NA	TYPE 26
526694	EI 3 - PILLOW	400/600	500/750	1.3	0.5	5	420	660	1800	20.1	NA	12 x 2	2 x R1/2"
568807	EI 3s - PILLOW	600/900	600/900	1.3	0.5	5	636	1000	1800	26.7	NA	12 x 2	2 x R1/2"
519444	EI 4 - PILLOW	700/1050	800/1200	0.9	0.5	5	751	1180	2300	36.1	NA	12 x 2	2 x R1/2"
519447	EI 5 - PILLOW	900/1350	1000/1500	0.8	0.5	5	955	1500	2900	53.9	NA	12 x 3	2 x R1/2"
536345	EI 6 - PILLOW	1200/1800	1400/2100	0.6	0.4	4	1394	2190	3400	92.4	NA	12 x 3	2 x R1/2"

Table 12: Multi-size oval plugs Plugsy EI – Basic technical data

PLUGY EI - Bypass plug

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. allowed back pressure		Deflated plug			Product weight (kg)	Eye bolt	Shackles x piece	Inflation valve
		Min. dia. (mm)	Max. dia. (mm)		Water head (bar)	Water head (m)	Diameter (mm)	Width (mm)	Length (mm)		M thread	M thread	
504158	EI 1	200/300	250/375	1.5	0.5	5	180x265	/	600	10.2	8	NA	2"
504160	EI 2	300/450	350/525	1.5	0.5	5	280x415	/	700	17.9	8	NA	3"
526695	EI 3 - PILLOW	400/600	500/750	1.3	0.5	5	420	660	1800	25.4	NA	12 x 2	2"
568808	EI 3s -PILLOW	600/900	600/900	1.3	0.5	5	636	1000	1800	32.1	NA	12 x 2	2"
519448	EI 4-PILLOW	700/1050	800/1200	0.9	0.5	5	751	1180	2300	42.1	NA	12 x 2	2"
519449	EI 5-PILLOW	900/1350	1000/1500	0.8	0.5	5	955	1500	2900	60.8	NA	12 x 3	2"
536350	EI 6-PILLOW	1200/1800	1400/2100	0.6	0.4	4	1394	2190	3400	100.9	NA	12 x 3	2"

2.2.5 HIGH-PERFORMANCE PLUGS PLUGY AND PLUGSY HPF

Table 13: High-performance plugs Plugy – Basic technical data

PLUGY - Blocking plug

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve
		Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Rubber length (mm)		M thread	Thread size
545456	100-200	100	200	3	92	500	1.2	M6	R 1/4"
545457	150-300	150	300	3	142	540	2.3	M12	R 1/2"
545458	200-400	200	400	3	192	600	3.8	M12	R 1/2"
545460	350-600	350	600	3	322	830	8.9	M12	R 1/2"
545463	500-800	500	800	3	472	1150	23	M12	R 1/2"
545464	500-1000	500	1000	3	472	1150	23	M12	R 1/2"
545465	600-1200	600	1200	2.5	574	1500	39.1	M16	R 1/2"
545467	750-1500	750	1500	1.5	600	2300	78.7	M16	R 1/2"
545783	800-1800	800	1800	1.5	600	3000	105.1	M16	R 1/2"
545785	1000-2400	1000	2400	1	960	4000	313.7	M16	R 1/2"

Table 14: High-performance plugs Plugsy – Basic technical data

PLUGSY - Bypass plug

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve thread size	Bypass diameter
		Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Rubber length (mm)		M thread		
545468	100-200	100	200	3	92	500	2.6	M6	R 1/4"	1"
545469	150-300	150	300	3	142	540	3.9	M8	R 1/4"	1"
545470	200-400	200	400	3	192	600	6.8	M12	R 3/8"	2"
545472	350-600	350	600	3	322	830	14.8	M12	R 3/8"	2"
545473	500-800	500	800	3	472	1150	31	M12	R 3/8"	2"
545474	500-1000	500	1000	3	472	1150	31	M12	R 3/8"	2"
545475 *	600-1200	600	1200	2.5	574	1500	54.3	M16	R 1/2"	4"/6"/8"*
545476 *	750-1500	750	1500	1.5	600	2300	94.8	M16	R 1/2"	4"/6"/8" *
545784 *	800-1800	800	1800	1.5	600	3000	125.6	M16	R 1/2"	4"/6"/8" *
545787 *	1000-2400	1000	2400	1	960	4000	341	M16	R 1/2"	4"/6"/8" *

* Note: The Part numbers are for plugs 4˝

Table 15: High-performance plugs Plugy and Plugsy – Table of back pressure values

PLUGY, PLUGSY - BACK PRESSURE (BAR), MEASURED IN DRY IRON PIPE

Plug type	Pipe diameter (mm)																				
	100	150	200	250	300	350	400	500	600	800	1000	1200	1300	1400	1500	1600	1700	1800	2000	2200	2400
100 - 200 3 bar	2.6	2.1	1.7																		
150 - 300 3 bar		2.6	2.4	1.8	1.6																
200 - 400 3 bar			2.6	2.4	2.1	1.9	1.6														
350 - 600 3 bar						2.6	2.5	2	1.7												
500 - 800 3 bar								2.6	2.5	1.7											
500 - 1000 3 bar								2.6	2.5	1.7	1										
600 - 1200 2.5 bar									2.1	1.9	1.5	1									
750 - 1500 1.5 bar										1.2	1.1	1	0.9	0.8	0.7						
800 - 1800 1.5 bar										1.3	1.2	1.1	1	0.9	0.8	0.7	0.6	0.5			
1000 - 2400 1.0 bar											0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.5	0.5

2.2.6 MULTI-SIZE PILLOW-TYPE PLUGS PLUGY PILLOW AND PLUGSY PILLOW

Table 16: Multi-size pillow-type plugs Plugy Pillow – Basic technical data

PLUGY PILOW - BLOCKING PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. allowable back pressure		Deflated plug			Product weight (kg)	Eye bolt	Inflation valve
		Min. dia. (mm)	Max. dia. (mm)		Water head (bar)	Water head (m)	Diameter (mm)	Width (mm)	Length (mm)		M thread	
529411	600-1000	600	1000	1	0.7	7	580	910	2100	18	12 x 2	2 x R1/2"
529412	800-1200	800	1200	0.9	0.6	6	780	1230	2500	29	12 x 2	2 x R1/2"
529413	1200-1600	1200	1600	0.8	0.5	5	1170	1830	3200	51	12 x 3	2 x R1/2"
529414	1600-2000	1600	2000	0.6	0.4	4	1560	2450	4000	86	12 x 3	2 x R1/2"
529491	1900-2200	1900	2200	0.5	0.3	3	1850	2910	4800	100	12 x 4	2 x R1/2"
545429	2400-2500	2400	2500	0.5	0.3	3	2350	3690	5600	222	12 x 6	2 x R1/2"
545430	2600-2700	2600	2700	0.4	0.2	2	2550	4000	6500	288	12 x 6	2 x R1/2"
545431	2800-2900	2800	2900	0.3	0.1	1	2740	4300	7000	332	12 x 6	2 x R1/2"
545432	3000	3000	3000	0,3	0,1	1	2930	4600	7500	377	12 x 6	2 x R1/2"

Table 17: Multi-size pillow-type plugs Plugsy Pillow – Basic technical data

PLUGY PILOW - BYPASS PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. allowable back pressure		Deflated plug			Product weight (kg)	Eye bolt	Inflation valve	Bypass diameter (female)
		Min. dia. (mm)	Max. dia. (mm)		Water head (bar)	Water head (m)	Diameter (mm)	Width (mm)	Length (mm)		M thread		
529415	600-1000	600	1000	1	0.7	7	580	910	2100	23	12 x 2	2 x R1/2"	2"
529416	800-1200	800	1200	0.9	0.6	6	780	1230	2500	34	12 x 2	2 x R1/2"	2"
529417	1200-1600	1200	1600	0.8	0.5	5	1170	1830	3200	57	12 x 3	2 x R1/2"	2"
529418	1600-2000	1600	2000	0.6	0.4	4	1560	2450	4000	92	12 x 3	2 x R1/2"	2"
529492	1900-2200	1900	2200	0.5	0.3	3	1850	2910	4800	100	12 x 4	2 x R1/2"	2"
545433	2400-2500	2400	2500	0.5	0.3	3	2350	3690	5600	234	12 x 6	2 x R1/2"	2"
545434	2600-2700	2600	2700	0.4	0.2	2	2550	4000	6500	301	12 x 6	2 x R1/2"	2"
545435	2800-2900	2800	2900	0.3	0.1	1	2740	4300	7000	346	12 x 6	2 x R1/2"	2"
545436	3000	3000	3000	0.3	0.1	1	2930	4600	7500	392	12 x 6	2 x R1/2"	2"

2.2.7 MULTI-SIZE PLUGS WITH A LARGER FLOW-THROUGH BYPASS PLUGSY VP

Table 18: Multi-size plugs with a larger flow-through bypass Plugsy VP – Basic technical data

PLUGSY VP - BYPASS PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve	Bypass diameter (female)
		Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Rubber length (mm)		M thread	Thread size	
516942	100-150	98	150	2.5	88	370	2.2	M 6	Not removable	2"
516943	150-250	148	250	2	136	520	4.6	M 6	Not removable	3" (2")
516944	200-300	198	300	2	186	550	7.6	M 6	Not removable	4" (2")
60967	150-300	150	300	1.5	142	540	3.6	M 8	-	2"
60968	200-400	200	400	1.5	192	600	6.1	M 8	-	4" (2")
533539	300-525	300	525	1.5	272	630	11.7	M 10	R 1/4"	6" (4", 2")
60970	350-600	350	600	1.5	322	830	17	M 10	R 1/4"	6" (4", 2")
60971	500-1000	500	1000	1.5	472	1150	37.5	M 10	R 1/4"	8" (6", 4" ,2")
535873	600-1200	600	1200	1.5	574	1450	65.1	M 12	2 x R 3/8"	6"
535874	600-1200	600	1200	1.5	574	1450	70.5	M 12	2 x R 3/8"	8"
535876	750-1500	750	1500	1	600	2300	79	M 12	2 x R 1/2"	6"
535878	750-1500	750	1500	1	600	2300	83	M 12	2 x R 1/2"	8"
535879	800-1800	800	1800	1	800	3000	121	M 12	2 x R 1/2"	6"
535880	800-1800	800	1800	1	800	3000	125	M 12	2 x R 1/2"	8"

Table 19: Multi-size plugs with a larger flow-through bypass Plugsy VP – Table of back pressure values

BACK PRESSURE -MEASURED IN DRY IRON PIPE (BAR)

PLUG's size	Pipe Diameter (mm)												
	100	150	200	250	300	350	400	500	600	700	800	900	1000
100–150	1	0.8											
150–250		1	0.8	0.6									
200–300			1	0.8	0.6								
150–300		1	0.8	0.7	0.6								
200–400			1.1	0.9	0.7	0.6	0.6						
300–525					1	0.9	0.7	0.5					
350–600						0.9	0.8	0.7	0.6				
500–1000								1.1	0.9	0.8	0.7	0.6	0.6

BACK PRESSURE -MEASURED IN DRY IRON PIPE (BAR)

PLUG's size	Pipe Diameter (mm)									
	600	800	1000	1200	1300	1400	1500	1600	1700	1800
600–1200	1	0.8	0.6	0.5						
750–1500		1	0.9	0.7	0.6	0.5	0.4			
800–1800		1	1	0.8	0.8	0.7	0.6	0.5	0.4	0.4

2.2.8 PLUGS FOR GULLY/MANHOLES TESTING PLUGSY VJ

Table 20: Plugs for gully/manholes testing Plugsy VJ – Basic technical data

PLUGSY VJ - BYPASS PLUG

Type plugsy	Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Deflated plug		Product weight (kg)	Inflation valve	Bypass diameter
			Min. dia. (mm)	Max. dia. (mm)		Diameter (mm)	Length (mm)			
VJ 600-650	501841	600-650	600	650	1.5	560	360	16	R 1/4"	R 2"
VJ 600	538201	600	590	600	0.5	582	200	3.7	R 1/4"	R 2"
VJ 800	535889	800	780	800	0.5	770	200	5	R 1/4"	R 2"
VJ 1000	535890	1000	980	1000	0.5	970	200	6.5	R 1/4"	R 2"

2.2.9 MULTI-SIZE HIGH-PRESSURE PLUGS

Table 21: Multi-size high-pressure plugs Plugy HP 6 bar and Plugy HP 12 bar – Basic technical data

PLUGY HP 6 bar - BLOCKING PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. allowed back pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve thread size
		Min. dia. (mm)	Max. dia. (mm)			Diameter (mm)	Length (mm)		M thread	
60887	100-150	100	150	6	3	92	535	1.2	6	R 1/4"
60907	150-200	150	200	6	3	142	575	2	8	R 1/4"
60908	200-300	200	300	6	3	192	635	3.2	8	R 1/4"
60909	350-500	350	500	6	3	322	865	8.7	8	R 1/4"
60924	500-600	500	600	6	3	472	1185	18	10	R 1/4"

PLUGY HP 12 BAR - BLOCKING PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. allowed back pressure (bar)	Deflated plug		Product weight (kg)	Eye bolt	Inflation valve thread size
		Min. dia. (mm)	Max. dia. (mm)			Diameter (mm)	Length (mm)		M thread	
518561	100-125	100	125	12	10	92	540	1.5	6	R 1/4"
518562	150	150	150	12	10	142	580	2.7	8	R 1/4"
518563	200-250	200	250	12	10	192	640	4.3	8	R 1/4"
518564	300-350	300	350	12	10	272	670	8	8	R 1/4"
518565	400	400	400	12	10	322	870	11.5	10	R 1/4"
518566	500	500	500	12	10	472	1190	24.1	10	R 1/4"

Table 22: Multi-size high-pressure plugs Plugy HP 30 bar – Basic technical data

PLUGY HP 30 BAR - BLOCKING PLUG

Part number	Nominal size EU	Size Usage Range		Required inflation pressure (bar)	Max. allowed back pressure (bar)	Length (mm)	Rubber sleeve length (mm)	Product weight (kg)
		Min. dia. (mm)	Max. dia. (mm)					
538625	Ø 54x400	55	75	30	16	615	400	3
533837	Ø 73x400	75	100	30	16	600	400	5
533838	Ø 88x400	100	150	30	16	614	400	6.7
533839	Ø 122x400	150	200	30	16	621	400	13

Table 23: Multi-size high-pressure plugs Plugsy HP 30 bar – Basic technical data

PLUGSY HP 30 BAR - BYPASS PLUG

Part number	Nominal size EU	Size usage range		Required inflation pressure (bar)	Max. alow. back pressure (bar)	Flow through (mm)	Bypass thread ["]	Rubber sleeve length (mm)	Product weight (kg)
		Min. dia. (mm)	Max. dia. (mm)						
537553	Ø 54x400	55	75	30	16	10	3/8	400	3
537661	Ø 73x400	75	100	30	16	15	1/2	400	4.8
537323	Ø 88x400	100	150	30	16	20	3/4	400	7
537672	Ø 122x400	150	200	30	16	25	1	400	13

2.2.10 MULTI-SIZE CONE-TYPE PLUGS CONE PLUGY

Table 24: Multi-size cone-type plugs – Basic technical data

Cone Plugy – cone-type plugs

Part number	Plug type	Size usage range		Working pressure (bar)	Inflated plug				Back pressure* (bar)	Coupling
		Min. dia. (mm)	Max. dia. (mm)		Ø cap (mm)	Ø body (mm)	Lenghth* (mm)	Weight* (kg)		
574340	CP 400-1000	400	1000	1	250	1000	2000	16.79	0.5	GEKA
574341	CP 600-1500	600	1500	1	375	1500	3000	29.24	0.5	GEKA
574342	CP 700-2000	700	2000	1	450	2000	4000	45.3	0.5	GEKA
574343	CP 900-2400	900	2400	1	600	2400	4800	60.99	0.5	GEKA

2.2.11 OIL-RESISTANT PLUGS PLUGY NBR

NBR PLUGY (BLOCKING PLUG)

TYPE	PART NUMBER	SIZE USAGE RANGE		WEIGHT	WORKING PRESSURE	DEFLATED PLUG DIMENSIONS	
		MIN. DIAMETER	MAX. DIAMETER			DIAMETER	LENGTH
		[mm]	[mm]	[kg]	[bar]	[mm]	[mm]
PLUGY NBR 40-70	572791	40	70	0.3	2.5	35	160
PLUGY NBR 70-150	572792	70	100	0.8	2.5	68	300
PLUGY NBR 100-150	572793	100	150	1.2	2.5	92	500
PLUGY NBR 150-200	572794	150	200	2.2	2.5	142	540
PLUGY NBR 200-300	572795	200	300	3.2	2.5	192	600
PLUGY NBR 300-400	572796	300	400	5.5	2.5	272	630
PLUGY NBR 350-500	572797	350	500	9.0	2.5	322	830
PLUGY NBR 500-600	572798	472	600	28.0	2.5	472	1150
PLUGY NBR 600-800	572799	574	800	45.5	1.5	574	1450

Back pressure measured in A dry iron pipe (bar)

SIZE	PIPE DIAMETER [mm]											
	40	70	100	150	200	250	300	350	400	500	600	800
40-70	2.0	1.2										
70-150		2.2	1.7									
100-150			2.2	1.7								
150-200				2.2	1.2							
200-300					2.2	2.0	1.7					
300-400							2.0	1.7	1.5			
350-500								2.1	1.9	1.6		
500-600										1.8	1.4	
600-800											1.0	0.7

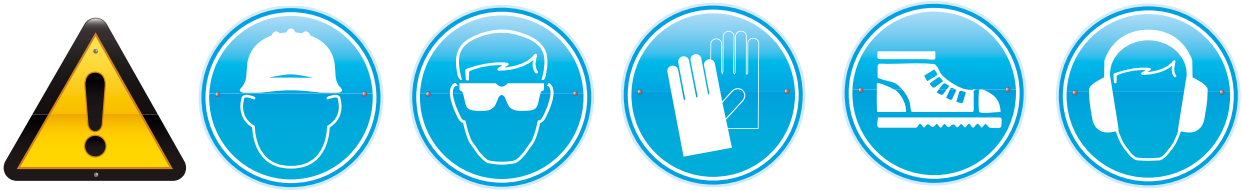
2.3. ENVIRONMENTAL CONDITIONS AND RESTRICTIONS OF USE

Product	Working temperature range	Temperatures below the minimum allowed	Temperatures above the maximum allowed
Plugy NBR	−20 to +80 °C	Not allowed	80 to 100 °C up to 30 min
Cone Plugy	−20 to +40 °C	-40 to -20 °C up to 1h	Not allowed
Other	−20 to +80 °C	-40 to -20 °C up to 1h	80 to 100 °C up to 30 min

The standard type of SAVATECH pneumatic plugs is NOT suitable for use in potentially explosive atmospheres. Such atmospheres require special, purpose-built SAVATECH pneumatic plugs. Further information on such products is available from the manufacturer.

2.4. SAFETY AND PERSONAL PROTECTIVE EQUIPMENT

When operating the SAVATECH pneumatic plugs, always wear personal protective equipment, e.g. protective helmet, goggles, gloves and footwear, and ear protection.



3. DEFINITIONS

Pneumatic plug: an inflatable rubber plug for a temporary sealing of pipelines.
Blocking pneumatic plug: a pneumatic plug for sealing the flow through a pipeline.
Bypass pneumatic plug: a pneumatic plug, which allows a controlled flow of liquids through the plug.
Vacuum packing: a controlled reduction of product volume by creating a negative pressure in it.
Working pressure: the specified pressure in the product during its use.
Back pressure: the pressure of the media in a pipeline acting on the pneumatic plug inserted in the pipe.
Controller: a device for inflating, deflating and control of the filling media in the pneumatic plug.
Safety valve: a pneumatic element for protection of pneumatic plugs against excess working pressure.
Connecting hose: a hose connecting the controller and the pneumatic plug.
Supply hose: a hose connecting the source of air and the controller.
Inflation hoses: all hoses required for inflation of pneumatic plugs.
Inlet coupling: a coupling on the controller for supply hose connection.
Outlet nipple: a nipple on the controller for connecting hose connection.
Media: gas or liquid, which contacts the outer surface of pneumatic plugs during use.
Pipe diameter: the inner, clear diameter of the pipe, in which the pneumatic plug is inserted.
Usage range: the plug's working range defined by the minimum and maximum diameter of the pipe, in which the pneumatic plug is inserted.
Contact surface: the surface of the plug that touches the pipe, in which the pneumatic plug is inserted.
Specified inflation pressure: the inflation pressure in the pipe specified by the manufacturer.
Cover of the pneumatic plug: a flat section of the plug, where the inflation connection is installed.
Bottom of the pneumatic plug: a flat section of the plug on the opposite side of pneumatic plug's cover.
Body of the pneumatic plug: a cylinder-shaped part of the plug connecting the cover and the bottom of the pneumatic plug.
Reinforced pneumatic plug: a pneumatic plug reinforced with a textile cord structure.

4. PREPARATION OF THE PRODUCT FOR USE

4.1. TRANSPORT

Pneumatic plugs with a nominal diameter below 1,000 mm are packed in a cardboard packing with a special protection of sensitive pneumatic plug's parts. Pneumatic plugs whose diameter exceeds 1,000 mm are packed in special wooden boxes.

The product not in use should be stored in a dry and dark space at temperatures from 5 °C to 25 °C.

Only exceptionally may pneumatic plugs be under vacuum during transport. After transport, immediately release the vacuum and prepack the plugs.

4.2. SAFETY PRECAUTIONS BEFORE USE

You must read the instructions before use.

We recommend that all operators of pneumatic plugs attend a training course organised by the manufacturer or an authorised training organiser.

4.3. REMOVAL OF PACKAGING

Do not use sharp items, such as knives, screwdrivers and similar, for removal of packaging, since they can damage the pneumatic plug.

4.4. DISPOSAL OF PACKAGING

Packaging is made of recyclable cardboard or wood. Deposit waste packaging in waste bins for paper or cardboard packaging. Deposit waste box in wood waste.

4.5. STORAGE AND PROTECTION OF THE PRODUCT OUT OF OPERATION

Store the SAVATECH pneumatic plugs in a dry and dark space.

Storage temperature: from +5 °C to +25 °C.

Store only clean pneumatic plugs, prior to which you should check whether they comply with the safety and technical requirements. We recommend that you place SAVATECH pneumatic plugs horizontally or vertically during storage with the inflation connections pointing upwards. Protect the inflation connections and eyebolts against mechanical damages.

4.6. LOCATION OF INSTRUCTIONS AND PERIODIC TEST REPORTS

Brief instructions for use and manufacturer's test report are enclosed to every SAVATECH pneumatic plug.

A longer version of instructions for use is available on the website at:
www.savatech.com/Manuals/index.htm
www.savatech.eu/environmental-protection-and-rescue/manuals

Keep the instructions and periodic test reports throughout the service life of the product.

5. INSTRUCTIONS FOR SAFE USE

5.1. RECOMMENDATIONS FOR SAFE AND EFFICIENT WORK

Non-compliance with operating instructions can lead to risk for the user and third persons, and cause bodily harm, which is why you should carefully read the instructions before using the product.

ATTENTION: NEVER OPERATE SAVATECH PNEUMATIC PLUGS WITHOUT USING A MECHANICAL SAFETY SUPPORT.

- **Always use the calibrated SAVATECH accessories with regard to the specified working pressure.**
- **Never exceed the maximum inflation pressure.**
- **Inflate SAVATECH pneumatic plug until reaching the specified working pressure.**
- **During use, regularly check the pressure in the pneumatic plug and refill it, if necessary.**
- **It is not allowed to use SAVATECH pneumatic plugs in the manner not described in the instructions. The manufacturer shall not be held responsible for any damage that arises from inappropriate use.**
- **Always wear the specified personal protective equipment when operating SAVATECH pneumatic plugs.**
- **Open flame and smoking are forbidden during working with SAVATECH pneumatic plugs.**
- **The standard versions of SAVATECH pneumatic plugs are not suitable for use in potentially explosive atmospheres.**

WARNING!

BEFORE USING THE SAVATECH PNEUMATIC PLUGS, CAREFULLY READ THE INSTRUCTIONS. RECOMMENDATIONS, REQUIREMENTS AND INSTRUCTIONS FOR USE OF SAVATECH PNEUMATIC PLUGS APPLY TO ALL SIZES AND TYPES OF SAVATECH PNEUMATIC PLUGS. INSTRUCTIONS FOR USE SHOULD BE MADE AVAILABLE TO ALL OPERATORS OF SAVATECH PNEUMATIC PLUGS.

Construction, manufacture and inspection guidelines for the products made by Savatech always incorporate a high level of safety, which is binding not only for the manufacturer but also for the user. The user and the manufacturer should always comply with the instructions for safe and correct work during use of the Savatech pneumatic plugs.

Please read the instructions carefully. Should you have any questions or should circumstances arise that are not described in these instructions, do not hesitate to consult your supervisor or responsible safety engineer.

5.1.1. CARRYING OF SAVATECH PNEUMATIC PLUGS

Carry SAVATECH pneumatic plugs placed upright or horizontally. Make sure that the inflation connection always faces upwards to prevent its damage in the case of a fall.

Lighter products up to 20 kg may be carried by one person only. Heavier products up to 40 kg should be carried by at least two persons.

Suitable lifting tools should be used for moving products heavier than 40 kg. Such products are equipped with eyebolts for handling with lifting devices.

Warning: Eyebolts allow loads in certain directions only. The load angle with regard to the eyebolt axis may not exceed 45°. The green arrows in Fig. 5.1 indicate the permissible load directions, whereas the red arrows indicate the impermissible load directions.

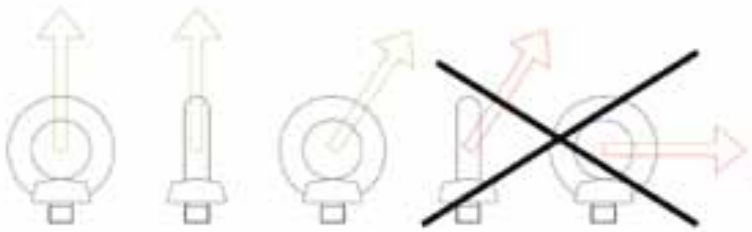


Fig. 5.1: Load directions acting on eyebolts

5.1.2. WORKING ENVIRONMENT

TEMPERATURE OF CONTACT SURFACES

The temperature of surfaces in contact with the product may not exceed 80°C. Heat can permanently damage the SAVATECH pneumatic plugs. The lowest temperature, at which the SAVATECH pneumatic plugs maintain their sealing characteristics in the pipeline, amounts to -20°C.

LIGHTING OF THE WORKING PLACE

Even though the SAVATECH pneumatic plugs are easy to position and inflate, it is dangerous to work in the dark. Make sure that the place of work is not in the dark or in the shadow. Do not use open flame for lighting in the dark.

PRESENCE OF AUTHORISED PERSONS

Only qualified persons are allowed to be present during use of SAVATECH pneumatic plugs. Other persons should keep away from the working area. If people or the environment could be exposed to extra hazards, the required additional measures should be taken to minimise such risks.

RESISTANCE TO THE MEDIA

The SAVATECH pneumatic plugs are resistant to certain types of chemicals. In selecting either Nr-Br, CR or NBR variants of pneumatic plugs (see Table 27), check the chemical resistance table for rubber materials (Table 28) or consult the manufacturer. The temperature of the media may not exceed 80 °C.

Table 25: Types of SAVATECH pneumatic plugs with regard to their resistance to chemicals

Code	Name	Outer layer composition
Without code	Nr-Br pneumatic plugs	Nr-Br rubber
🟡	CR pneumatic plugs	CR rubber
🟢	NBR pneumatic plugs	NBR rubber

Before selecting a pneumatic plug, check Table 28 for plug's resistance to the media.

The resistance classification table is in compliance with the standard ISO/TR 7620. The effect of the media on the product is classified as:

1	Negligible
2	Low
3	Medium
4	Significant

Table 26: Table of resistance to the media

Media	Concentration(%)	Temperature (°C)	NrBr	CR	NBR
Acetone		23	1	2	4
Acetylene			1	2	1
Ammonium hydroxide	10	23	1	1	1
	Conc.	23	1	1	2
Aniline		23	2	3	4
		100	4	4	4
Benzene		23	4	4	4
Boric acid	10	100	1	1	1
Brake fluid (vegetable)		50	1	1	4
Butanol		50	1	1	1
		100	4	3	1
Butyric acid				2	4
Calcium hydroxide		100	1	1	2
Calcium hypochlorite	15		4	2	3
Hydrochloric acid	20	23		4	4
Ethanol		50	1	1	1
Ether		23	4	4	2
Formaldehyde	40	23	1	1	1
	40	70			4
Glycerine		100	1	1	1
Hexanol		23	1	2	2
Hydrogen peroxide	30	23	1	1	1
	90		4	4	4
Kerosene		70	4	3	1
Methanol		50	1	1	1
Methyl chloride			4	4	4
Milk		23	1	1	1
Mineral oils No.1		100	4	1	1
Mineral oils No. 2		100	4	2	1
Mineral oils No. 3		100	4	4	1
Naphtha		23	4	4	1
Natural gas			3	1	1
Diluted nitric acid	10	50	2	3	2
Ozone (conc. 50 pphm)		40	4	2	4
Phenol		100	4	4	4
Phosphoric acid	60	50	2	2	3
Propanol		50	1	1	2
Natrium hydroxide	10	100	1	1	1
	25	100	1	1	4
Natrium hypochlorite	10	50	2	3	3
Sulphur hexafluoride				1	1
Sulphuric acid (VI)	10	100	1	1	3
	20	23	1	1	3
	25	100	1	1	4
	50	100	1	1	4
	60	100	3	4	4
	75	100	4	4	4
	96	23	4	4	4
Toluene		23	4	4	4

If Table 28 does not include the media you use, please check the standard ISO/TR 7620, or consult the manufacturer about the use of SAVATECH pneumatic plugs.

5.2. SELECTION OF A SUITABLE SAVATECH PNEUMATIC PLUG

5.2.1. Selection of savatech pneumatic plug type considering its resistance to the media

To be able to select a suitable type of SAVATECH pneumatic plug considering its resistance to the media, one should be familiar with the media, to which the outer surface of the SAVATECH pneumatic plug and its flow-through tube will be exposed. Please follow the instructions in chapter 5.1.2.

5.2.2. Back pressure determination

Always determine the back pressure the pneumatic plug has to maintain during use in the pipe.

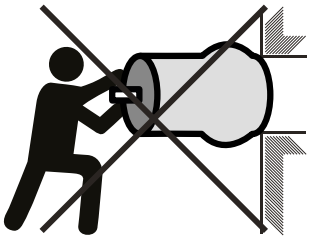
WARNING!

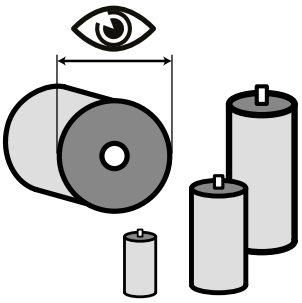
WHEN THE PNEUMATIC PLUG IS INSERTED IN THE PIPE AND FILLED WITH AIR, TREMENDOUS FORCES CAN DEVELOP IN AND BEHIND THE PLUG. THE TOTAL FORCE ACTING ON THE PNEUMATIC PLUG IS PROPORTIONAL TO THE PRESSURE AND THE SURFACE OF THE PIPE OPENING, IN WHICH THE PNEUMATIC PLUG IS INSERTED. THE BACK PRESSURE VALUES FOR SAVATECH PNEUMATIC PLUGS ARE GIVEN IN THE TABLES IN CHAPTER 2.2.

Should you have any questions concerning the back pressure determination, please consult the supervisor or responsible safety engineer.

5.2.3. Selection of a pneumatic plug

Always select the correct size of the pneumatic plug.





The lower and the upper usage ranges are defined for each SAVATECH pneumatic plug. The nominal size of the pneumatic plug or the range, in which the pneumatic plugs may be used, is clearly marked on every pneumatic plug.

Before use, always measure the inner diameter of the pipeline, in which the pneumatic plug will be inserted, and make sure that the pipe diameter corresponds to the usage range of the plug.

WARNING!

NEVER USE THE PNEUMATIC PLUG IN THE PIPE, THE DIAMETER OF WHICH IS SMALLER OR LARGER THAN THE USAGE RANGE OF THE PLUG.

5.3. INFLATION SYSTEM FOR SAVATECH PNEUMATIC PLUGS

The SAVATECH pneumatic plugs may be inflated with air only. In special cases, water is allowed for filling the plug. The use of other gases and liquids is not allowed.

It is not allowed to use controllers without built-in safety valves for inflation of SAVATECH pneumatic plugs.

When operating the plug, always observe the following combination:

This combination prevents exceeding the permitted working pressure during inflation of the plug.

5.3.1. Air source for inflation of savatech pneumatic plugs

The user is responsible for a correct and safe preparation of the air source to the maximum inlet pressure on the controller.

Every air source, which does not exceed the maximum inlet pressure on the controller, may be used for inflation of plugs. If the pressure of supply air source is higher, use pressure reducer. If the compressed air contains oil, use oil separator. WARNING: Oil vapours inside the pneumatic plug can permanently damage the material, which after a certain period can lead to destruction of the product.

5.3.2. Controller for inflation and pressure control in savatech pneumatic plugs

A controller is a dedicated pneumatic element for a safe inflation and pressure control during use and deflation of SAVATECH pneumatic plugs.

The controller is composed of an inlet safety coupling (A, Fig. 5.2), a ball valve (B, Fig. 5.2), a pressure gauge (C, Fig. 5.2), a safety valve (D, Fig. 5.2), and an outlet nipple positioned perpendicular to the safety valve.

Fig. 5.2: Controller 2.5 bar

The inlet safety coupling (Fig. 5.3) is intended for connecting the air supply to the controller. Owing to its construction, the safety coupling prevents an unintentional disconnection of the supply hose. To connect or disconnect the supply hose, turn the ring of the safety coupling until the notch on the ring engages with the screw; see the green circle in Fig. 5.3. When in this position, insert the supply hose nipple in the safety coupling so that it meshes. To disconnect the supply hose, push the ring of the safety coupling as shown with the red arrow in Fig. 5.3 and pull out the supply hose nipple.

Fig. 5.3: Safety coupling on the controller

The ball valve (B Fig. 5.2) is used for air inlet in the SAVATECH pneumatic plug. The ball valve is open and the pneumatic plug is being inflated if the ball valve lever runs parallel to the inlet safety coupling. The safety valve should be closed. When the ball valve lever is diagonally to the safety coupling, as indicated in Fig. 5.2., the ball valve is closed and the pneumatic plug is not being inflated.

The pressure gauge on the controller (C, Fig. 5.2) controls the pressure in the SAVATECH pneumatic plug.

WARNING: The correct pressure value can only be read if the ball valve of the controller is closed. The green colour on the scale of the pressure gauge indicates the permissible pressure range of pneumatic plug. The working pressure value on the pressure gauge is marked at the end of the green field.

It is forbidden to use pneumatic plugs in the red or above the red range.

A safety valve set to 1.1 x working pressure is installed for extra safety. If the permissible working pressure is exceeded, the safety valve is activated and begins to reduce pressure in the pneumatic plug.

When activated, the flow volume of the safety valve is limited. In the case of air sources with a high flow capacity, it can happen that the activated safety valve does not completely interrupt inflation of the pneumatic plug but only slows it down. The activated safety valve emits a characteristic, loud sound. Upon activation of the safety valve, the operator must immediately close the ball valve on the controller to interrupt inflation of the SAVATECH pneumatic plug.

The outlet nipple of the controller is intended for connection of connecting hose between the controller and the SAVATECH pneumatic plug.

The controller should be connected to the plug throughout the inflation of SAVATECH pneumatic plugs und also when the plug is under pressure.

Always use a suitable controller, in terms of pressure and size, for inflation of SAVATECH pneumatic plugs. Follow Table 29 for selection of a suitable controller.

Table 27: Table of controllers

Family	Plug pressure	Controller	Controller code	Inlet connection	Outlet connection
Plugy Z Plugsy Z	2.5 bar	Hand pump with pressure gauge 0-6 bar	60010		Hand pump connection
Plugy DC	2.5 bar	Hand pump with pressure gauge 0-6 bar	60010		Hand pump connection
Plugy G Plugsy GM	3 bar 2.5 bar 2 bar 1.5 bar	Single fitting controller 3.0 bar Single fitting controller 2.5 bar Single fitting controller 2.0 bar Single fitting controller 1.5 bar	537048 60310 565643 74609	Coupling Type 26 safety Coupling Type 26 safety Coupling Type 26 safety Coupling Type 26 safety	Nipple Type 26 Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugy Plugsy	2.5 bar 1.5 bar 1 bar	Single fitting controller 2.5 bar Single fitting controller 1.5 bar Single fitting controller 1.0 bar	60310 74609 74653	Coupling Type 26 safety Coupling Type 26 safety Coupling Type 26 safety	Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugy EI Plugsy EI	1.5 bar[1] 1.3 bar[1] 0.9 bar[2] 0.8 bar[2] 0.6 bar[2]	Single fitting controller 1.5 bar[1] Double fitting controller 1.0 bar[2]	74609 504061	Coupling Type 26 safety Coupling Type 26 safety	Nipple Type 26 2 x GK coupling
Plugy HPF Plugsy HPF	3 bar 2.5 bar 1.5 bar 1 bar	Single fitting controller 3.0 bar Single fitting controller 2.5 bar Single fitting controller 1.5 bar Single fitting controller 1.0 bar	547645 547646 547647 547650	Coupling Type 27 safety Coupling Type 57 safety Coupling Type 57 safety Coupling Type 57 safety	Nipple Type 27 Nipple Type 57 Nipple Type 57 Nipple Type 57
Pillow Plugy Pillow Plugsy	1 bar 0.9 bar 0.8 bar 0.6 bar 0.5 bar 0.4 bar 0.3 bar	Double fitting controller 1.0 bar	504061	Coupling Type 26 safety	2 x GK coupling
Plugsy VP	2.5 bar 2 bar 1.5 bar 1 bar	Single fitting controller 2.5 bar Single fitting controller 2.0 bar Single fitting controller 1.5 bar Single fitting controller 1.0 bar	60310 565643 74609 74653	Coupling Type 26 safety Coupling Type 26 safety Coupling Type 26 safety Coupling Type 26 safety	Nipple Type 26 Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugsy VJ	1.5 bar 0.5 bar	Single fitting controller 1.0 bar Single fitting controller 0.5 bar	74653 508270	Coupling Type 26 safety Coupling Type 26 safety	Nipple Type 26 Nipple Type 26
Plugy HP 6 BAR	6 bar	Single fitting controller 6.0 bar	531542	Coupling Type 26 safety	Nipple Type 26
Plugy HP 12 BAR	12 bar	Single fitting controller 12.0 bar	531544	Coupling Type 26 safety	Nipple Type 26
Plugy HP 30 BAR	30 bar	Single fitting controller 30.0 bar	282184	Coupling Type 26 safety	Nipple Type 26
CONE plugy	1 bar	Single fitting controller 1.0 bar	578031	GK Coupling	GK coupling
Plugy NBR	2,5 bar 1,5 bar	Single fitting controller 2,5 bar Single fitting controller 1,5 bar	583712 583711	Coupling Type 26 safety Inox Coupling Type 26 safety Inox	Nipple Type 26 Inox Nipple Type 26 Inox

NOTE: Please see SAVATECH HOUSE CONNECTION TEST SET in chapter 5.5.3. for inflation equipment for pneumatic plugs.

To deflate the SAVATECH pneumatic plug, first unscrew the protective screw on controller's safety valve (Fig. 5.4). WARNING: After plug deflation, retighten the protective screw of the safety valve, or else the next inflation using the same controller will not be possible.

The only exception is the single fitting controller 1 bar (578031) used for inflation and deflation of Cone Plugy plug. In this case, simply disconnect the supply hose and open the ball valve to deflate the plug. WARNING: You should always disconnect the supply hose first and then open the ball valve slowly and carefully.

Fig. 5.4: Unscrew the protective screw of controller's safety valve

5.3.3. Inflation hoses

Suitable inflation hoses, in terms of pressure values and dimensions, should be used for inflation of SAVATECH pneumatic plugs. To avoid using improper hoses, the standard connecting hoses SAVATECH are equipped with different types of hose nipples and couplings. Please check table 30 for selection of suitable connecting hoses.

Table 28: Table of connecting hoses

Family	Plug pressure	Hose code	Hose length	Hose colour	Inlet connection	Outlet connection
Plugy Z Plugsy Z	2.5 bar	78904 78905	2 m 5 m	Green Green		Hand pump coupling
Plugy DC	2.5 bar	60010	2 m 5 m	Green Green		Hand pump coupling
Plugy G Plugsy GM	3 bar 2.5 bar 2 bar 1.5 bar	74268 71248 76686	10 m 10 m 10 m	Red Blue Yellow	Coupling Type 26 Coupling Type 26 Coupling Type 26	Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugy Plugsy	2.5 bar 1.5 bar 1 bar	74268 71248 76686	10 m 10 m 10 m	Red Blue Yellow	Coupling Type 26 Coupling Type 26 Coupling Type 26	Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugy EI Plugsy EI	1.5 bar1 1.3 bar1 0.9 bar2 0.8 bar2 0.6 bar2	742681 712481 766861 5198172	10 m 10 m 10 m 10 m	Red Blue Yellow Yellow	Coupling Type 26 Coupling Type 26 Coupling Type 26 GK coupling	Nipple Type 26 Nipple Type 26 Nipple Type 26 GK coupling
Plugy HPF Plugsy HPF	3 bar1 2.5 bar2 1.5 bar2 1 bar2	5477141 5477152	10 m 10 m	Blue Blue	Coupling Type 27 Coupling Type 57 Coupling Type 57	Nipple Type 27 Nipple Type 57 Nipple Type 57
Pillow Plugy Pillow Plugsy	1 bar 0.9 bar 0.8 bar 0.6 bar 0.5 bar 0.4 bar 0.3 bar	519817	10 m	Yellow	GK coupling	GK coupling
Plugsy VP	2.5 bar 2 bar 1.5 bar 1 bar	74268 71248 76686	10 m 10 m 10 m	Red Blue Yellow	Coupling Type 26 Coupling Type 26 Coupling Type 26	Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugsy VJ	1.5 bar 0.5 bar	74268 71248 76686	10 m 10 m 10 m	Red Blue Yellow	Coupling Type 26 Coupling Type 26 Coupling Type 26	Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugy HP 6 BAR	6 bar	74268 71248 76686	10 m 10 m 10 m	Red Blue Yellow	Coupling Type 26 Coupling Type 26 Coupling Type 26	Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugy HP 12 BAR	12 bar	74268 71248 76686	10 m 10 m 10 m	Red Blue Yellow	Coupling Type 26 Coupling Type 26 Coupling Type 26	Nipple Type 26 Nipple Type 26 Nipple Type 26
Plugy HP 30 BAR	30 bar	74268 71248 76686	10 m 10 m 10 m	Red Blue Yellow	Coupling Type 26 Coupling Type 26 Coupling Type 26	Nipple Type 26 Nipple Type 26 Nipple Type 26
CONE plugy	1 bar	519817	10 m	Yellow	GK coupling	GK coupling
Plugy NBR	2,5 bar 1,5 bar	583709	10 m	Black CR	Coupling Type 26 Inox	Nipple Type 26 Inox

NOTES:

- A connecting hose with the same index fits an individual controller. Example: The hose 742681 fits to the controller 1.5 bar1 , whereas the hose 5198172 does not fit.
- Please see SAVATECH HOUSE CONNECTION TEST SET in chapter 5.5.3.1 for inflation equipment for pneumatic plugs.

5.3.4. Non-standard savatech pneumatic plugs

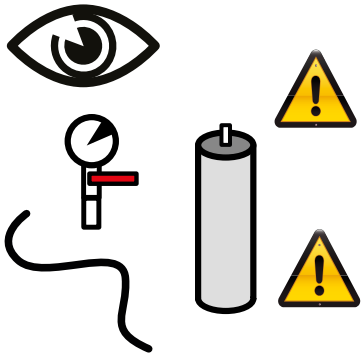
Consult the manufacture prior to using any non-standard products.

5.4. APPLICATION PROCEDURE FOR SAVATECH PNEUMATIC PLUGS

5.4.1. Insertion of the savatech pneumatic plug in a pipe

Step 1: Determine the back pressure and select a suitable SAVATECH pneumatic plug (Chapter 5.2).

Step 2: Thoroughly examine and prepare the SAVATECH pneumatic plug, air source, controller and inflation hoses at the place of using the pneumatic plug.



It is dangerous to use a damaged product or equipment; you should therefore discontinue using them and should replace them.

Should any doubts arise as to the safe use of SAVATECH pneumatic plug and equipment, remove both and consult the manufacturer about further steps.

Check the SAVATECH pneumatic plug for cracks, cuts, blisters between the rubber layers, worn-out metal parts, damaged connections or any other damages.

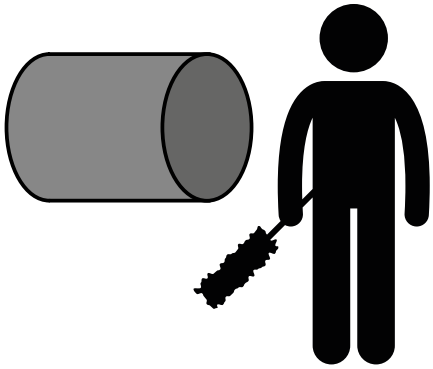
The pressure gauge on the controller should be calibrated in the specified intervals.

The pneumatic plug and accessories should be clean prior to use.

Step 3: Thoroughly clean the pipe, in which the SAVATECH pneumatic plug will be used.

Properly clean the pipe before insertion of the SAVATECH pneumatic plug. Remove all sharp particles. In this way, the required tightness and back pressure are secured and damages to the pneumatic plugs are prevented at the same time. For extra protection of the plug, we recommend mounting the protective sleeves, the list of which is given in Table 36. Mount the protective sleeve on a non-inflated pneumatic plug only. The sleeves may be mounted manually only. **WARNING: It is strictly forbidden to mount protective sleeves by means of construction machinery.**

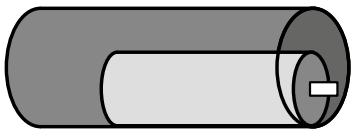
We recommend that you use high-pressure water cleaner for cleaning the pipe.



Even the smallest particles in the uncleaned pipe can cause poor sealing, reduce the back pressure and permanently damage the SAVATECH pneumatic plug.

Step 4: Insert the SAVATECH pneumatic plug in the pipe so that it is positioned horizontally and in the middle of pipe's cross-section.

The shortest distance from the beginning of the pipe to the pneumatic plug should equal the diameter of the pipe, in which the plug is inserted. During inflation, certain pneumatic plugs expand in longitudinal direction, too.



If SAVATECH pneumatic plug is inserted incorrectly, this could cause incorrect distribution of forces inside the plug, and, consequently, permanent damages to the plug.

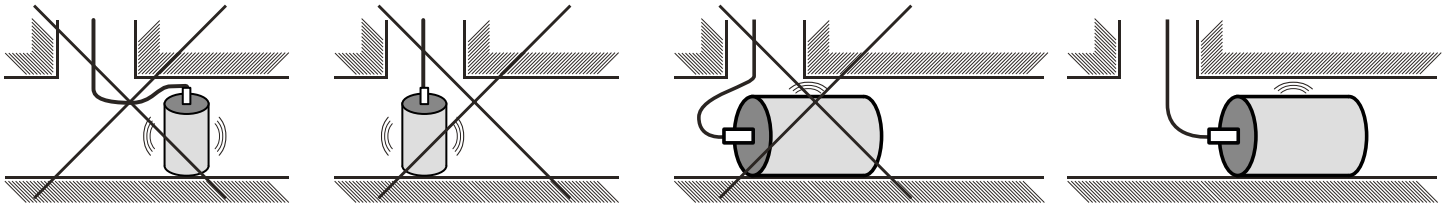
WARNING!
Before and during insertion of pneumatic plugs, observe the following basic rules:

1. NEVER INFLATE THE PNEUMATIC PLUG OUTSIDE THE PIPE.

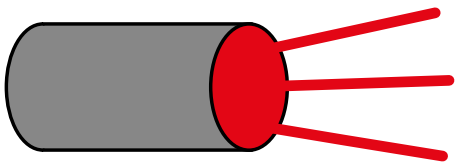
2. NEVER INFLATE THE PNEUMATIC PLUG IN THE UNCLEANED PIPE

3. INSERT THE ENTIRE PNEUMATIC PLUG IN THE PIPE.

4. THE SAVATECH PNEUMATIC PLUGS ARE DESIGNED FOR USE IN STRAIGHT PIPES ONLY.



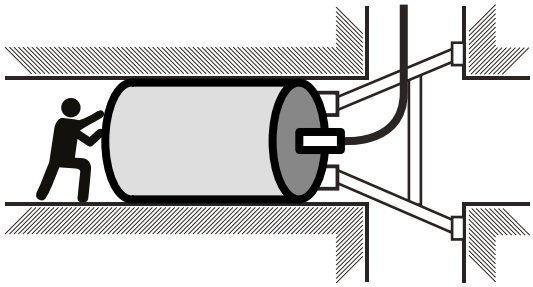
Step 5: Mount a safety support for the SAVATECH pneumatic plug.



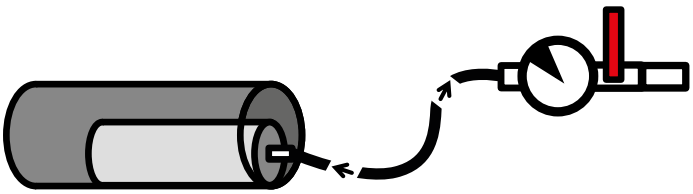
NON-APPLICATION OF A SAFETY SUPPORT CAN BE DANGEROUS TO LIFE!

Mount the safety support as appropriate in the actual circumstances and in the manner that will prevent safely and completely the SAVATECH pneumatic plug from moving in the event of an unexpected situation.

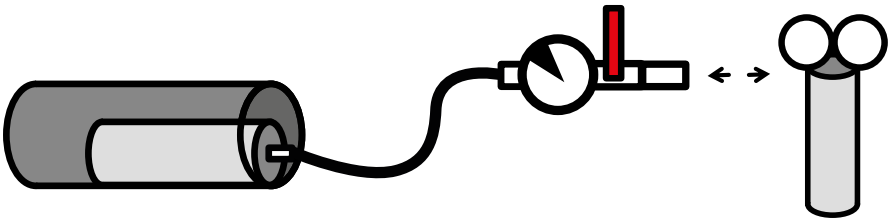
Never use eyebolts or handles on pneumatic plugs for fixing of safety supports, since these are intended solely for lowering and lifting of pneumatic plugs.



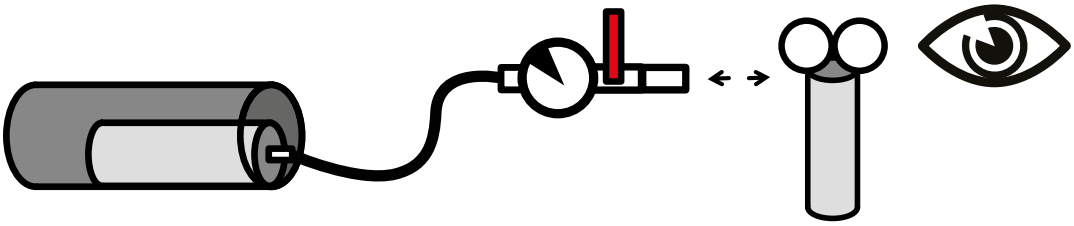
Step 6: Connect the SAVATECH pneumatic plug to the controller with the connecting hose.



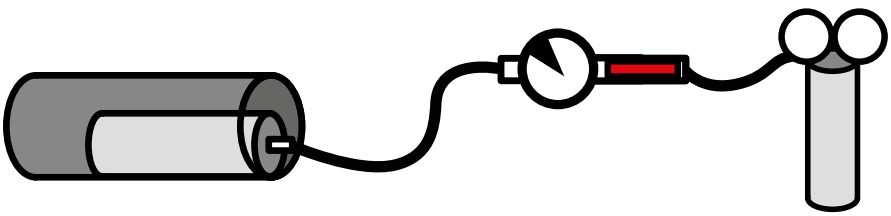
Step 7: Connect the controller to the air source with the supply hose.



Step 8: Check the air source pressure as specified in chapter 5.3.1



Step 9: Open the ball valve on the controller and begin to inflate the plug.

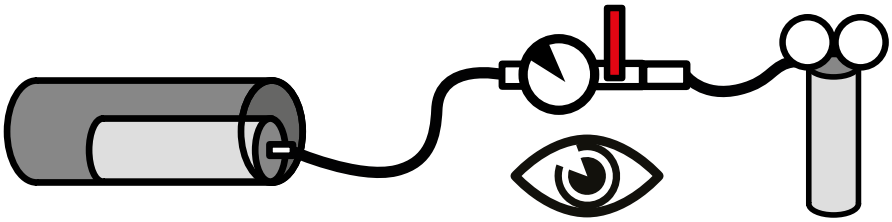


Close the ball valve on the controller and check the pressure in the pneumatic plug in time intervals, which get shorter with decreasing the difference between the working pressure and the actual pressure in the SAVATECH pneumatic plug.
WARNING: The actual pressure value can be read only if the ball valve on the controller is closed.

Since the position of the SAVATECH pneumatic plug changes during inflation, you should continually check its position in the pipe and correct it, if required. The incorrect position of the SAVATECH pneumatic plug can cause incorrect distribution of forces within the plug and, consequently, permanent damages to the plug.

WHEN THE SAVATECH PNEUMATIC PLUG COMPLETELY RESTS ON THE INNER SIDE OF THE PIPE AND IT IS UNDER PRESSURE, IT IS STRICTLY FORBIDDEN TO KEEP NEAR THE PNEUMATIC PLUG, THE PIPE, IN WHICH THE PNEUMATIC PLUG IS INSERTED AS WELL AS NEAR THE INLET OPENING OF THE SAME PIPE. Non-compliance with the instructions can cause bodily harm or even death.

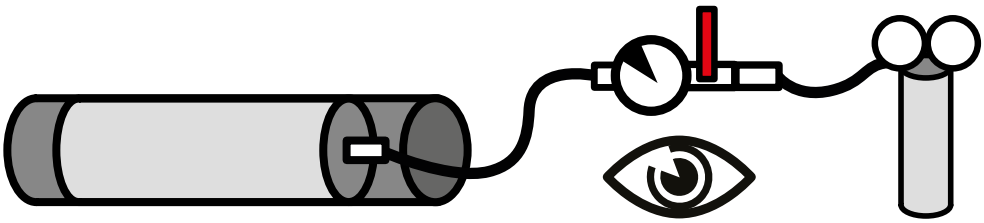
Step 10: Close the ball valve on the controller and check the pressure in the pneumatic plug in time intervals, which get shorter with decreasing the difference between the working pressure and the actual pressure in the SAVATECH pneumatic plug.
WARNING: The actual pressure value can be read only if the ball valve on the controller is closed.



Step 11: When the working pressure in the SAVATECH pneumatic plug has been reached, close the ball valve on the controller.

When the inflation procedure is stopped, the pressure in the plug is dropping noticeably for a minute, which is a normal consequence of stretching the pneumatic plug's structure. Repeatedly check the pressure in the SAVATECH pneumatic plug one minute after stopping the inflation and refill as described in Steps 4 to 6.

Check the pressure in the pneumatic plug at least every five hours. In the event of pressure drop in the SAVATECH pneumatic plug, refill the pressure in the plug.



The controller should be connected to the plug throughout the inflation of the SAVATECH pneumatic plug and when the plug is under pressure.

Never exceed the permissible working pressure of the SAVATECH pneumatic plug.

If the pressure in the SAVATECH pneumatic plug is too low, this can reduce the back pressure.

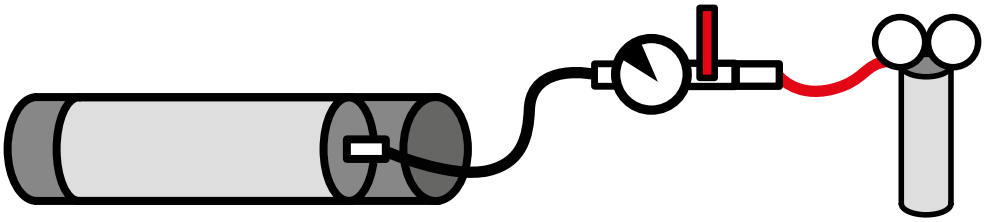
The highest permissible back pressure values are defined for SAVATECH pneumatic plugs used in a clean and dry metal pipe. Dirt deposits in the pipes (algae, fats, detergents, mould, sand etc.) can significantly reduce the back pressure values.

Pipes manufactured from low-friction coefficient materials, e.g. polyethylene pipes or new pipes with residual grease or other substances, reduce friction coefficient and, consequently, the back pressure values of the pneumatic plug.

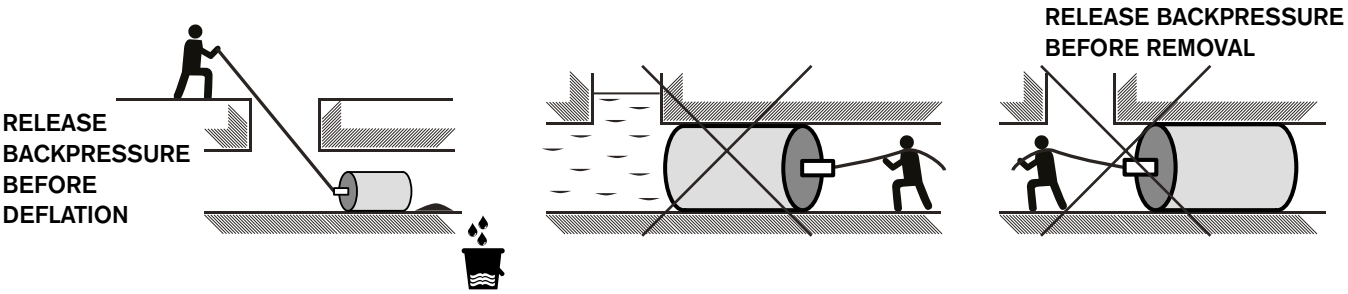
WARNING!
If unexpected situations arise during the use of SAVATECH pneumatic plugs, immediately stop working and consult your supervisor or responsible safety engineer; they will define the required measures and, if appropriate, extra cleaning of the pipe before insertion of the pneumatic plug.

5.4.2. Deflation and disconnection of savatech pneumatic plugs

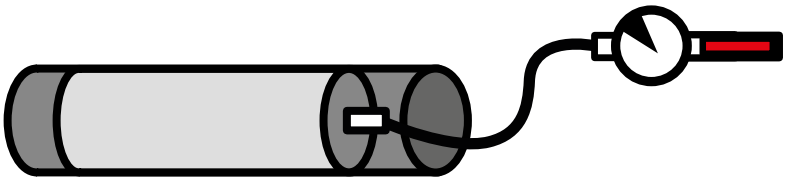
Step 1: Close the valve on the air source supply and disconnect the supply hose.



Before deflation of the SAVATECH pneumatic plug, check whether the back pressure has been completely released. DEFLATING THE PLUG WHEN THE BACK PRESSURE IS STILL PRESENT CAN BE DANGEROUS TO LIFE!



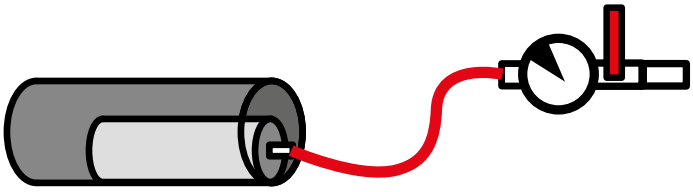
Step 2: Deflation of the plug



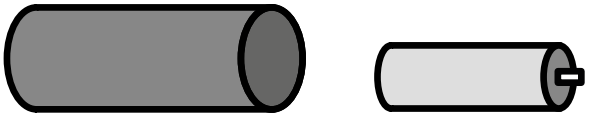
Release the pressure from the SAVATECH pneumatic plug until the pressure in the plug equals the ambient pressure and the plug gets its original, non-inflated, shape.

The vacuum procedure to accelerate deflation may be used only with the multi-size cone-type plugs CONE Plugy.

Step 3: Disconnect the connecting hose and the controller.

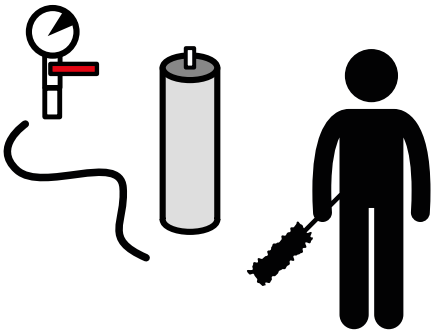


Step 4: Remove the SAVATECH pneumatic plug from the pipe.

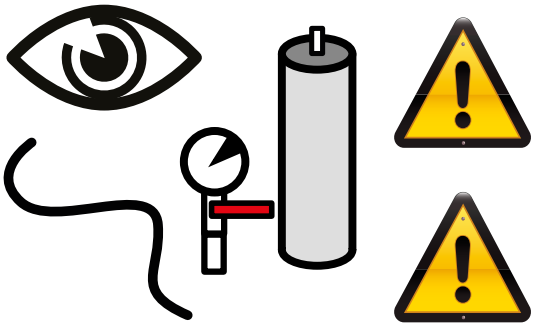


When the SAVATECH pneumatic plug is completely deflated, remove it from the pipe. Never remove the SAVATECH pneumatic plug by pulling it by the connecting hose. Pulling by the connecting hose can damage the SAVATECH pneumatic plug or the connecting hose itself, due to which further use of pneumatic plug or equipment can be hazardous. Use handles or eyebolts for pulling the plug.

Step 5: After use, clean the deflated SAVATECH pneumatic plug and equipment, and store them in accordance with the instructions.



Step 6: Thoroughly check the used SAVATECH pneumatic plug, air source, controller and inflation hoses.



Since it is dangerous to use a damaged product or equipment, you should remove them from further use and replace them.

Should any doubts arise as to the safe use of SAVATECH pneumatic plug and equipment, remove both and consult the manufacturer about further steps.

Check the SAVATECH pneumatic plug for ruptures, cuts, blisters between the rubber layers, worn-out metal parts, damaged connections or any other damages.

The pressure gauge on the controller should be calibrated in the specified intervals.

5.5. POSSIBLE USES OF SAVATECH PNEUMATIC PLUGS

With regard to their purpose of use, size and required pressure values, select a suitable SAVATECH pneumatic plug as specified in chapter 5.2.

Observe the procedure for correct use as described in chapter 5.4. Please pay special attention to the safety recommendations.

5.5.1. Temporary pipeline sealing with the SAVATECH pneumatic plugs

5.5.1.1. Negligible and stable back pressure values

For a temporary sealing of a pipeline with the SAVATECH pneumatic plugs, in which negligible back pressure values are expected, or the back pressure value is known and will remain stable over time, the following blocking pneumatic plugs made by SAVATECH can be used:

- Standard plug types: Plugy, Plugy HPF
- Long plugs: Plugy DC
- Elliptical plugs: Plugy G
- Oval plugs: Plugy EI
- Pillow-type plugs: Plugy Pillow
- High-pressure plugs: Plugy HP 6 bar, Plugy HP 12 bar, Plugy HP 30 bar
- Cone-type plugs: Plugy Cone

Since the SAVATECH blocking plugs do not allow ongoing control and back pressure release, special attention should be paid to the calculation or the estimate of the expected back pressure, selection of a suitable blocking pneumatic plug family and size, preparation of place of plug's insertion and its correct use.

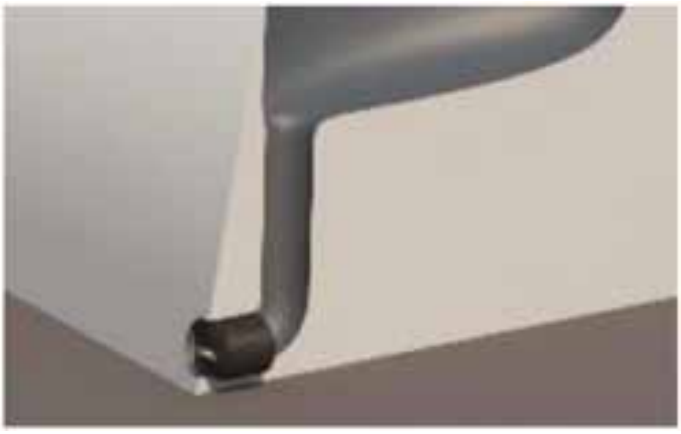


Fig. 5.5: Temporary pipeline sealing with the SAVATECH pneumatic plug

The bypass types of SAVATECH pneumatic plugs can also be used for sealing the pipelines:

- Standard plugs of types: Plugsy, Plugsy HPF
- Elliptical plugs: Plugsy GM
- Oval plugs: Plugsy EI
- Pillow-type plugs: Plugsy Pillow
- Plugs for gully/manholes testing: Plugsy VJ

In this case the flow-through tube is sealed with a corresponding plug, or, using a suitable hose, a valve with a pressure gauge (you can use equipment from Table 33) is installed indirectly on the flow-through tube. The valve with a pressure gauge enables back pressure control and release if its value increases.

USE SAFETY SUPPORTS. FAILING TO USE SAFETY SUPPORTS CAN BE DANGEROUS TO LIFE!

The pneumatic plugs of Plugsy VP type are not suitable for a temporary pipeline sealing with the back pressure.

5.5.1.2. Variable back pressure values

If the back pressure is expected to change during use of SAVATECH pneumatic plug, which increases the risk of exceeding the permissible back pressure and thus the uncontrolled move of the pneumatic plug in the pipe, use the SAVATECH bypass pneumatic plugs:

- Standard plug types: Plugsy, Plugsy HPF
- Elliptical plugs: Plugsy GM
- Oval plugs: Plugsy El
- Pillow-type plugs: Plugsy Pillow
- Plugs for gully/manholes testing: Plugsy VJ

Using a suitable hose, install a pressure gauge for back pressure control and a valve for its release (you can use the equipment from Table 33) on the flow-through tube of the SAVATECH pneumatic plug as shown in Fig. 5.6. Check the back pressure throughout the use of SAVATECH pneumatic plug. Release the back pressure by opening the valve before the pressure reaches 80% of the limit value.

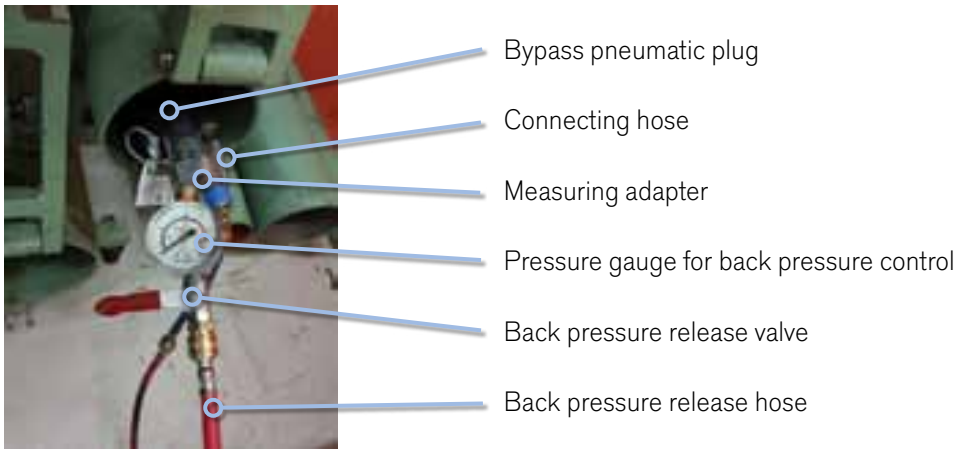


Fig. 5.6: Back pressure control by means of a standard adapter

USE SAFETY SUPPORTS. FAILING TO USE SAFETY SUPPORTS CAN BE DANGEROUS TO LIFE!

Be careful not to reduce the pressure in the pneumatic plug until the back pressure has been completely released. DEFLATING THE PLUG WHEN THE BACK PRESSURE IS STILL PRESENT CAN BE DANGEROUS TO LIFE!

The pneumatic plugs of Plugsy VP type are not suitable for a temporary pipeline sealing with the back pressure.

5.5.2. Preparation of a temporary bypass with the SAVATECH pneumatic plugs

Fig. 5.7. shows how to prepare a temporary bypass with the SAVATECH pneumatic plugs.

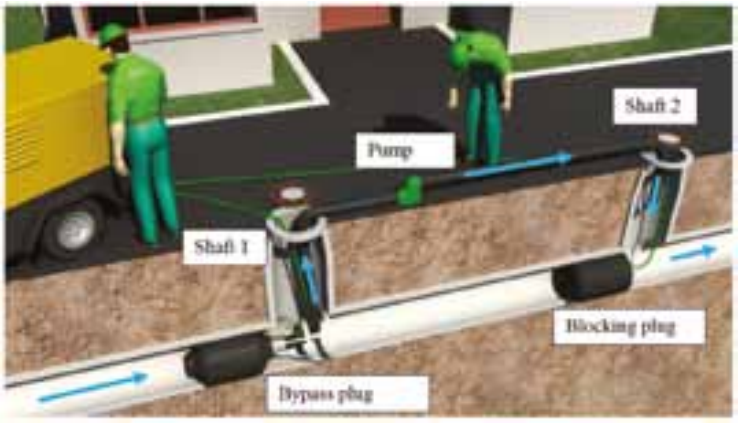


Fig. 5.7: Temporary bypass with the SAVATECH pneumatic plugs

Fig. 5.7 shows a temporary bypass from the shaft 1 to the shaft 2. Insert the SAVATECH bypass pneumatic plug in the pipe before the shaft 1. Fix a bypass hose on the plug's flow tube and through the pump to the shaft 2. Prevent water to ingress in the pipe in front of the shaft 2 using the SAVATECH blocking plug. The pump will pump the water flowing to the SAVATECH bypass plug in the pipe in front of the shaft 1 to the shaft 2 as indicated with the blue arrows in Fig. 5.7.

With regard to the situation, the following SAVATECH bypass pneumatic plugs can be used:
- Standard plug types: Plugsy, Plugsy HPF
- Elliptical plugs: Plugsy GM
- Oval plugs: Plugsy EI
- Pillow-type plugs: Plugsy Pillow
- Plugs with large flows: Plugsy VP
- Plugs for gully/manholes testing: Plugsy VJ

When larger flows are required and no noticeable back pressure values are expected, special SAVATECH pneumatic plugs Plugsy VP, which allow flows of diameters from 1/8'' to 8'', can be used.

The abovementioned SAVATECH pneumatic plugs can be used as a blocking pneumatic plug too, at which a suitable plug is to be installed on the flow-through tube.

It is not allowed to use Plugsy VP pneumatic plugs as an alternative for the SAVATECH blocking pneumatic plugs.

One of the below listed SAVATECH blocking plugs can be used as a blocking plug:
- Standard plug types: Plugy, Plugy HPF
- Long plugs: Plugy DC
- Elliptical plugs: Plugy G
- Oval plugs: Plugy EI
- Pillow-type plugs: Plugy Pillow
- High-pressure plugs: Plugy HP 6 bar, Plugy HP 12 bar, Plugy HP 30 bar, Plugy HP 30 bar
- Cone-type plugs: Plugy Cone

5.5.3. Use of SAVATECH pneumatic plugs for testing in accordance with the EN1610 standard

The SAVATECH pneumatic plugs are designed for testing tightness of pipelines and waste water sewers as specified by the EN 1610 standard under item 12.2. They are suitable for tightness test with air (»L« procedure) and water (»W« procedure).

5.5.3.1. Testing of house drains and sewers

Use the SAVATECH HOUSE CONNECTION TEST SET for testing house drains and sewers.

Please see Fig. 5.8 and Table 31 for details about the SAVATECH HOUSE CONNECTION TEST SET. See Table 32 for basic technical data.

Fig. 5.8: Composition of the SAVATECH HOUSE CONNECTION TEST SET

Table 29: Composition of the SAVATECH HOUSE CONNECTION TEST SET

1.	Bypass plug for testing
1.a	Yellow hose for inflation of both plugs with air
1.b	Blue hose for filling the space between both plugs
1.c	Red hose for measuring the pressure difference between both plugs
2.	Blocking plug
3.	Transparent hose for testing with water, 5 m
3.a	T-piece for parallel measurement
4.	Controller with safety valve for inflation
5.	Venting floater
6.	Set of filling-push rods, 6-piece
6.a	Inflation spring hose for easier insertion
6.b	Safety rope
7.	Ball valve with a gate
8	Safety element for testing with air
8.a	Adapter for testing with air
9.	Extra yellow extension hose, 3 m
10.	Transport case
11.	Adapter for hand-held digital pressure gauge
12.	Hand-held digital pressure gauge

Table 30: Technical data for plugs in the SAVATECH HOUSE CONNECTION TEST SET

HOUSE CONNECTION TEST SET - TECHNICAL DATA

Part number	Type	Size usage range		Required inflation pressure (bar)	Max. allowed back pressure (bar)	Size of deflated plug		Insertion opening (mm)	Product Weight (kg)
		Min. dia. (mm)	Max. dia. (mm)			Diameter (mm)	Length (mm)		
562158	Plugsy 100-150	100	150	2.5	0.2	80	160	100	1.5
564063	Plugy 100-150	100	150	2.5	1	98	420	100	0.6
562159	Plugsy 150-210	150	210	2.5	0.2	120	180	150	2.9
564064	Plugy 150-210	150	210	2.5	1	140	510	150	0.8

User safety instructions

For your own safety and prevention of bodily harm because of misuse, observe the following instructions:

1. **Pipes to be tested should be clean, without damages, cuts and other irregularities.**
2. **Measure the pipe diameter and select plugs of suitable size for the pipe. Plugs are designed for use in round pipes only.**
3. **Insert the pneumatic plug in the pipe. Fill the plugs with air, at which always use the controller. Owing to small sizes of plugs, we recommend using a foot pump for plug inflation. The specified working pressure (see labels on the plug) should be complied with. Throughout the use, control the plug's working pressure with the pressure gauge.**
4. **When testing with water, the water pressure in the pipe may not exceed 0.5 bar (= 5 m water column). When testing with air, the pressure in the pipe may not exceed 0.2 bar + 10%.**
5. **Before removing the plugs, make sure and check whether the pipe is free of pressure.**
6. **Before removing the plugs from the pipe, release the pressure from both plugs.**
7. **Store the plugs at room temperature in a dark and dry space.**

Testing with air (»L« procedure)

Fig. 5.9: Testing with air ("L" procedure)

Step 1: First, properly clean the drain pipe or section of the pipe you wish to test.

Step 2: Fix the spring inflation hose (No. 6.a) on the blocking plug and a corresponding number of push rods (No. 6) on the hose.

Step 3: Fix the safety rope (No. 6.b) on the blocking plug (No.2).

Step 4: Fix a corresponding number of push rods (No. 6) on the spring inflation hose (No. 6.a). WARNING: Manually tighten the blue part of the coupling on push rods for extra protection against opening.

Step 5: Fix the safety rope (No. 6.b) around the push rods (No. 6).

Step 6: Insert the blocking plug (No.2) with push rods in the pipe and push it until it reaches the desired place.

Step 7: Fix the second spring inflation hose (No. 6.a) on the last push rod (No. 6).

Step 8: Install the bypass plug (No. 1) on the second spring inflation hose (No. 6.a) and fix the other end of the safety rope (No. 6.b) through the snap hook on the bypass plug.

Step 9: Insert the bypass plug (No. 1) in the pipe.
WARNING: Turn the bypass plug so that the blue hose (No. 1.b) faces the bottom of the pipe.

Step 10: Fix the controller with the inflation safety valve (No. 4) on the yellow hose of the bypass plug (No. 1.a) and inflate both plugs up to the specified pressure. Inflate both plugs simultaneously.

Step 11: Fix a cover on the red hose of the bypass plug.

Step 12: Fix the safety element for testing with air (No. 8) on the blue measuring hose of the bypass plug (No. 1.b). Install the adapter for air filling (No. 8.a) on the medium outlet of the safety element. Install a corresponding measuring device on the free outlet.

Fig.5.10: Connection for testing with air

If using a hand-held digital pressure gauge, connect it to the free outlet via the adapter of the digital pressure gauge (No. 11) as shown in Fig. 5.11.

Fig. 5.11: Testing with air using a hand-held digital gauge

Step 13: Fill the pipe via the adapter with air. If using a compressor as the air source, make sure it is oil-free. When the specified pressure is reached, close the valve on the safety test element and begin to measure. The test pressure, test time and release criteria are defined in the EN 1610 standard.

Fig.5.12: Connection of the SAVATECH HOUSE CONNECTION TEST SET for testing with air ("L" procedure)

Step 14: When the test is finished, first release the air from the pipe by opening the ball valve on the safety element for testing with air. Then release the air from both plugs. Remove the bypass plug and pull the blocking plug from the pipe by means of push rods and safety rope. **WARNING: Make sure that both plugs are deflated before removal.**

Step 15: Clean the equipment, check and dry it. **WARNING: Be careful with the push rods if temperatures are low. Warm them to the room temperature before use.** Store the cleaned equipment with the exception of push rods in the case (No. 10).

Testing with water (»W« procedure)

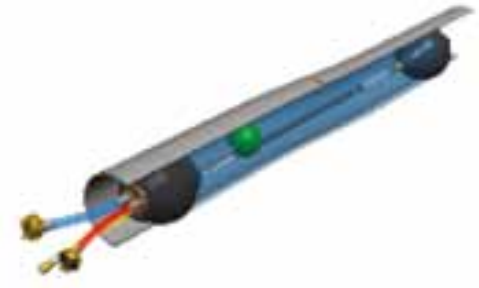


Fig. 5.13: Testing with water ("W" procedure).

Step 1: First, properly clean the drain pipe or part of the pipe you wish to test.

Step 2: Fix the floater (No. 5) on the rear end of the bypass plugs (No. 1). **WARNING: The floater should be completely screwed in the plug and turned so that the its opening faces upwards.**

Step 3: Place the spring inflation hose (No. 6.a) on the blocking plug and a corresponding number of push rods (No. 6) on the hose.

Step 4: Fix the safety rope (No. 6.b) on the blocking plug (No. 2).

Step 5: Fix a corresponding number of push rods (No. 6) on the spring inflation hose (No. 6.a). **WARNING: Manually tighten the blue part of the coupling on push rods for extra protection against opening.**

Step 6: Fix the safety rope (No. 6.b) around the push rods (No. 6).

Step 7: Insert the blocking plug (No.2) with push rods in the pipe and push it until it reaches the desired place.

Step 8: Fix the second spring inflation hose (No. 6.a) on the last push rod (No. 6).

Step 9: Fix the bypass plug (No. 1) on the second spring inflation hose (No. 6.a) and fix the other end of the safety rope (No. 6.b) through the snap hook on the bypass plug.

Step 10: Insert the bypass plug (No. 1) in the pipe. WARNING: Turn the bypass plug so that the blue hose (No. 1.b) faces the bottom of the pipe.

Step 11: Fix the controller with the inflation safety valve (No. 4) on the yellow hose of the bypass plug (No. 1.a) and inflate both plugs up to the specified pressure. Inflate both plugs simultaneously.

Step 12: Connect the yellow hose for water test (No. 3) to the red hose of the bypass plug (No. 1.c). If you wish a parallel measurement, install the T-piece for parallel measurement (No. 3.a) between the transparent measuring hose and the bypass plug. Place the transparent measuring hose vertically to enable measurement.

Fig.5.14: Connection for testing with water

Step 13: Fix the ball valve with a gate (No. 7) on the blue hose of the bypass plug and connect water supply to the ball valve.

Step 14: Open the ball valve to fill the pipe you test with water. The test pressure, test time and release criteria are defined in the EN 1610 standard.

Step 15: When the test with water is finished, open the ball valve to let the water flow from the pipe. Remove the transparent measuring hose and release the air from both plugs. Remove the bypass plug and pull the blocking plug from the pipe by means of push rods and safety rope. **WARNING: Make sure that both plugs are deflated before removal.**

Step 16: Clean the equipment, check and dry it. Store the push rods in the attached protective pipe. **WARNING: Be careful with the push rods if temperatures are low. Warm them to the room temperature before use.** Store the cleaned equipment with the exception of push rods in the case (No. 10).

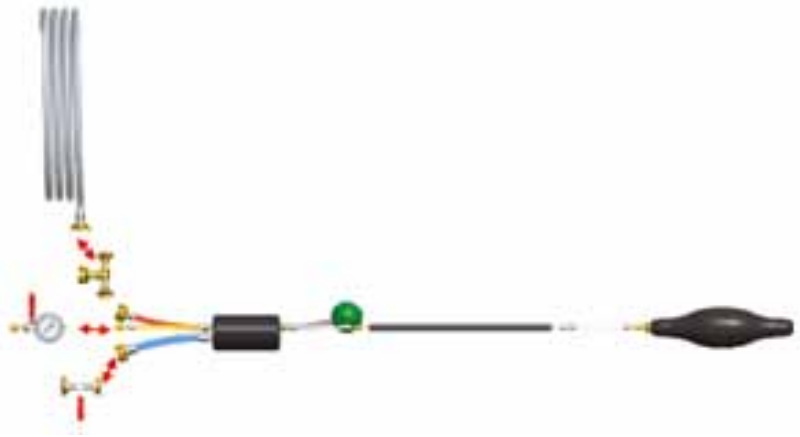


Fig. 5.15: Connection of the SAVATECH HOUSE CONNECTION TEST SET for testing with water ("W" procedure)

5.5.3.2. Tightness test of pipelines of larger diameters

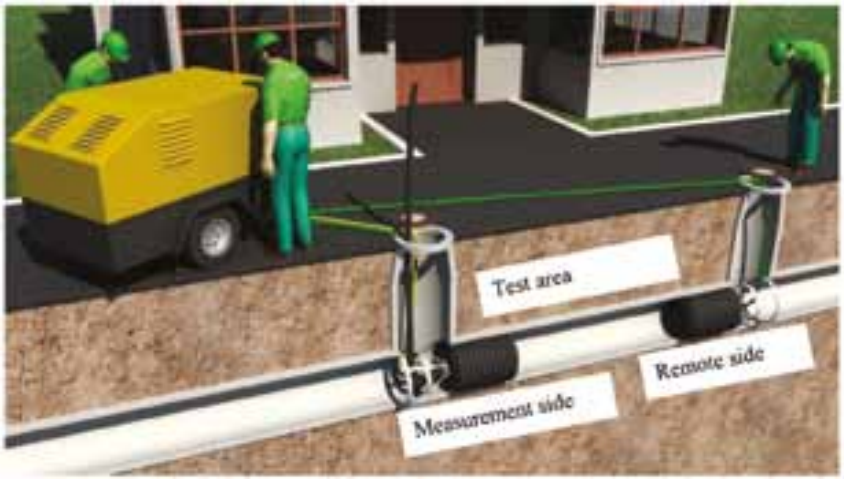


Fig. 5.16: Tightness test of pipelines of larger diameters

A combination of SAVATECH bypass and blocking pneumatic plugs (testing with air –»L« procedure) or two SAVATECH bypass pneumatic plugs (testing with water »W« procedure) can be used for tightness test of larger diameter pipelines. With regard to the situation and the pipeline shape, the following types of pneumatic plugs are available:

- Standard plug types: Plugy, Plugsy, Plugy HPF, Plugsy HPF
- Elliptical plugs: Plugy G, Plugsy GM
- Oval plugs: Plugy EI, Plugsy EI
- Pillow-type plugs: Plugy Pillow, Plugsy Pillow
- Plugs with larger bypass: Plugsy VP

Table 31: Accessories for pipeline testing according to the EN 1610 standard

Plugy Z, Plugsy S Accessories for testing according to EN 1610	
60380	Storz coupling D
60387	Storz blind coupling D
60388	Storz coupling C
60392	Storz blind coupling C
60428	Storz coupling A
60430	Storz blind coupling A
60407	Adapter, Storz D, test and measuring hose, 6 m
60412	Adapter, Storz C, test and measuring hose, 6 m
60438	Adapter, Storz A, test and measuring hose, 6 m
60446	Hose with floater R 1"
60448	Hose with floater R 2"
60439	Hose with floater R 4"
60449	Adapter R1", 2x quick coupling
60450	Adapter R2" with GK and quick coupling
60443	Adapter R4" with GK and quick coupling
76684	Connecting hose 5 m, 8 mm I.D. with quick coupling for pipe filling
60452	Connecting hose 5 m, 19 mm I.D. with GK coupling for pipe filling
78070	Measuring hose 0-0.6 bar, 10 m with nipple and pressure gauge, red

User safety instructions

For your own safety and prevention of bodily harm because of misuse, observe the following instructions:

1. **Pipes to be tested should be clean, without damages, cuts and other irregularities.**
2. **Measure the pipe diameter and select plugs of suitable sizes for the pipe.**
3. **The pneumatic plug should be pushed in the pipe at least in the length of pipe's diameter. Fill the plugs with air, at which always use the controller. The specified working pressure (see labels on the plug) should be complied with. Throughout the use, control the plug's working pressure with the pressure gauge.**
4. **When testing with water, the water pressure in the pipe may not exceed 0.5 bar (= 5 m water column). When testing with air, the pressure in the pipe may not exceed 0.2 bar + 10%.**
5. **Before removing the plugs, make sure and check whether the pipe is free of pressure.**
6. **Before removing the plugs from the pipe, release the pressure from all plugs.**
7. **Store the plugs at room temperature in a dark and dry space.**

Testing with air (»L« procedure)

Test equipment:
- SAVATECH bypass pneumatic plug
- SAVATECH blocking pneumatic plug
- Air test adapter
    - Flow 1": R1 (60449), or
    - Flow 2": R2 (60450), or
    - Flow 4": R4 (60443)
- Hand-held digital pressure gauge (582732)

Step 1: Thoroughly clean the pipeline area where the plugs will be inserted.

Step 2: Limit the area of pipeline tightness test on the remote side (Fig. 5.16) with the SAVATECH blocking plug. Seal all side pipelines.

Step 3: Tighten the adapter for air test (Fig. 5.17) on the flow-through tube of SAVATECH bypass pneumatic plug. Connect the hose for air supply in the test area to the blue coupling. Fix the hand-held digital pressure gauge on the red coupling.

Fig. 5.17: Bypass plug for testing with air

Step 4: Insert the SAVATECH bypass pneumatic plug in the pipe on the measuring side of the pipeline test area (Fig. 5.16).

Step 5: Perform testing with air according to the the EN 1610 standard.

Step 6: When the test is finished, clear the pipeline test area. Remove the SAVATECH bypass plug and blocking pneumatic plugs.
WARNING: Make sure that plugs are deflated before removal.

Step 7: Clean, check, dry and properly store the equipment.

Testing with water (»W« procedure)

Test equipment:
- Two SAVATECH bypass pneumatic plugs
- Water test adapter
    - Flow 1'': Storz D (60407), or
    - Flow 2'': Storz C (60412), or
    - Flow 4'': Storz A (60438)
- Venting floater
    - Flow 1'': (60446), or
    - Flow 2'': (60448), or
    - Flow 4'': (60439)
- Venting adapter
    - Flow 1'': Storz D (60380), or
    - Flow 2'': Storz C (60388), or
    - Flow 4'': Storz A (60428)

Step 1: Thoroughly clean the pipeline area where the plugs will be inserted.

Step 2: Tighten the venting adapter on the flow tube at the inflation connection of bypass plug. Tighten the venting floater on the other side of the flow-through tube (Fig. 5.18).

Fig. 5.18: Bypass plug for venting

Step 3: Limit the area of pipeline tightness test on the remote side (Fig. 5.16) with the bypass plug for venting (Fig. 5.18). Seal all side pipelines.

Step 4: Tighten the adapter for water test (Fig. 5.19) on the flow-through tube of the bypass pneumatic plug for measuring.

Fig 5.19: Bypass plug for measuring

Step 5: Insert the bypass plug for measuring in the pipe on the measurement side of pipeline's tightness test area (Fig. 5.16).

Step 6: Perform testing with water according to the EN 1610 standard. WARNING: Properly vent the test area.

Step 7: When the test is finished, clear the pipeline test area. Remove the SAVATECH bypass plug and blocking pneumatic plugs. **WARNING: Make sure that plugs are deflated before removal.**

Step 8: Clean, check, dry and properly store the equipment.

5.5.3.3. Gully/manholes testing

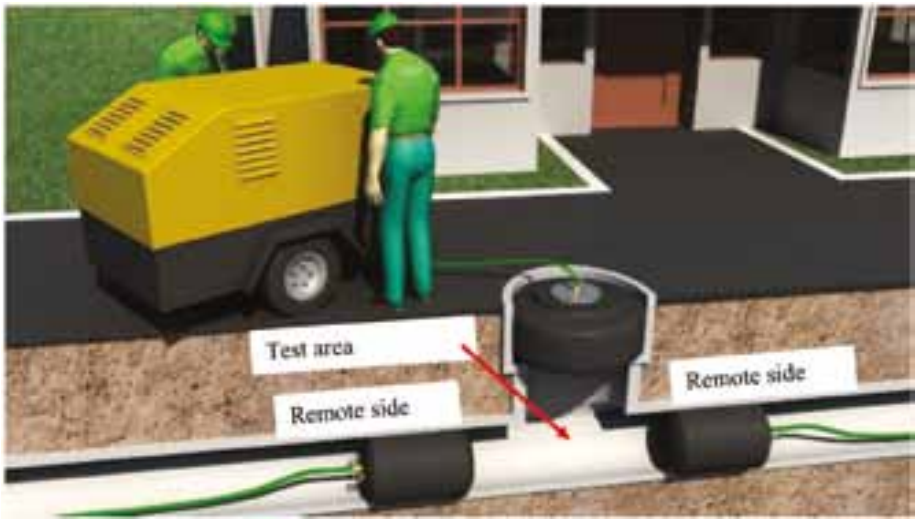


Fig. 5.20: Tightness test of gullies

A combination of SAVATECH bypass plug for gully/manholes testing Plugys VJ and two blocking plugs can be used for testing tightness of gullies with air (»L« procedure) or water (»W« procedure). With regard to the situation and the pipeline shape, the following types of pneumatic plugs are available:

- Plugs for gully/manholes testing: Plugsy VJ
- Standard plug types: Plugy, Plugy HPF
- Elliptical plugs: Plugy G
- Oval plugs: Plugy El
- Pillow-type plugs: Plugy Pillow
- Cone-type plugs: Plugy Cone

User safety instructions

For your own safety and prevention of bodily harm because of misuse, observe the following instructions:

1. **Gullies or pipeline to be tested should be clean, without damages, cuts and other irregularities.**
2. **Measure the gully and pipe diameter and select plugs of suitable sizes.**
3. **The pneumatic plug should be pushed in the pipe at least in the length of pipe's diameter. Fill the plugs with air, at which always use the controller. The specified working pressure (see labels on the plug) should be complied with. Throughout the use, control the plug's working pressure with the pressure gauge.**
4. **When testing with water, the water pressure in the pipe may not exceed 0.5 bar (= 5 m water column). When testing with air, the pressure in the gully and the pipe may not exceed 0.2 bar + 10%.**
5. **Before removing the plugs, make sure and check whether the gully and the pipe are free of pressure.**
6. **Before removing the plugs from the pipe, release the pressure from all plugs.**
7. **Store the plugs at room temperature in a dark and dry space.**

Testing with air (»L« procedure)

Test equipment:
- Plugs for gully/manholes testing: Plugsy VJ
- SAVATECH blocking pneumatic plug
- Air test adapter
    - Flow 2'': R2 (60450)
- Hand-held digital pressure gauge (582732)

Step 1: Thoroughly clean the pipeline and gully area where the plugs will be inserted.

Step 2: Limit the area of pipeline tightness test on the remote side (Fig. 5.20) with the SAVATECH blocking plug. Seal all side pipelines.

Side 3: Tighten the air test adapter on the flow-through tube on the upper side of the Plugs VJ plug for gully/manholes testing. Connect the hose for air supply in the test area to the blue coupling. Fix the hand-held digital pressure gauge on the red coupling.

Step 4: Insert the plug for gully/manholes testing Plugsy VJ in the gully (Fig. 5.20).

Step 5: Perform testing with air in accordance with the EN 1610 standard.

Step 6: When the test is finished, clear the gully test area. Remove the SAVATECH plug for gully/manholes testing Plugy VJ and blocking pneumatic plugs. **WARNING: Make sure that plugs are deflated before removal.**

Step 7: Clean, check, dry and properly store the equipment.

Testing with water (»W« procedure)

Test equipment:
- Plugs for gully/manholes testing: Plugsy VJ
- SAVATECH blocking pneumatic plugs
- Water test adapter
    - Flow 2'': Storz C (60412)
- Hand-held digital pressure gauge (582732)

Step 1: Thoroughly clean the pipeline and gully area where the plugs will be inserted.

Step 2: Limit the area of pipeline tightness test on the remote side (Fig. 5.20) with the SAVATECH blocking plug. Seal all side pipelines

Step 3: Tighten the water test adapter on the flow-through tube on the upper side of the Plugsy VJ plug for gully/manholes testing.

Step 4: Insert the plug for gully/manholes testing Plugsy VJ in the gully (Fig. 5.20).

Step 5: Perform testing with water in accordance with the EN 1610. **WARNING: Properly vent the test area.**

Step 6: When the test is finished, clear the gully test area. Remove the SAVATECH gully/manholes testing plug Plugy VJ and blocking pneumatic plugs. **WARNING: Make sure that plugs are deflated before removal.**

Step 7: Clean, check, dry and properly store the equipment.

5.5.3.4. Hand-held digital pressure gauge for testing with air (»L« procedure)

For testing pipeline tightness in accordance with the EN1610 standard and the air test method (»L« procedure), a hand-held digital pressure gauge (582732) can be used as shown in Fig. 5.21.

Fig.5.21: Hand-held digital pressure gauge for testing with air ("L" procedure).

The calibrated digital pressure gauge with the range -10 to 350 mbar and graduation 0.1 mbar enables measurement in accordance with the procedure LB, LC or LD. The measuring connection is equipped with the nipple of type 26.

Always use a regularly calibrated digital pressure gauge for measurement.

Before using the hand-held digital pressure gauge, read the original manufacturer's instructions attached to the pressure gauge.

5.6. UNEXPECTED SITUATIONS

If you detect damages on the SAVATECH pneumatic plugs, supply or connecting hoses or other components, which could compromise safety at work, immediately interrupt work and replace the damaged component. It is NOT allowed to operate SAVATECH pneumatic plugs and hoses that exhibit cracks, bulges, unusual deformations and similar.

If you consider the use of SAVATECH pneumatic plugs hazard to either persons or structures, interrupt work immediately. Consult the supervisor or responsible safety engineer about further steps.

A very loud bang sound is heard if the SAVATECH pneumatic plug destructs.

Table 32: Unexpected situations

Unexpected situation	Consequence	Procedure
The pressure in the pneumatic plug begins to drop uncontrollable and persistently. Note: a minor pressure drop is a standard consequence of plug's structure stretching during inflation, which stops a minute after stopping inflation.	An uncontrolled and dangerous move of the SAVATECH pneumatic plug due to the excessive back pressure. Damage to the plug.	Try to maintain the required working pressure with the controlled inflation until the back pressure is completely released. A correctly mounted, mandatory safety support will prevent damages to the people and structures.
A short slide of the SAVATECH pneumatic plug due to the excessive back pressure.	An uncontrolled and dangerous move of the SAVATECH pneumatic plug due to the excessive back pressure. Damage to the plug.	WARNING! The pneumatic plug is just about to finally slide. KEEP OUT OF DIRECTION, FROM WHICH THE PLUG WAS INSERTED IN THE PIPE, AS IT CAN BE DANGEROUS TO LIFE. Immediately begin to release the back pressure. A correctly mounted, mandatory safety support will prevent damages to the people and structures.
It is not possible to close the ball valve on the controller.	A pressure increase in the SAVATECH pneumatic plug, which in extreme case. can lead to its destruction	1. Immediately close the air source. When the pressure in the SAVATECH pneumatic plug increases, the safety valve is activated to reduce the pressure in the plug, or in the case of the air source with an excessive capacity, it will slow down inflation of the pneumatic plug. 2. If the back pressure develops, begin to release it. A correctly mounted, mandatory safety support will prevent damages to the people and structures. 3. Deflate the SAVATECH pneumatic plug. 4. Replace the controller.
The safety valve on the controller is activated.	In the case of a high capacity air source, the safety valve will not interrupt inflation but only slow it down.	Immediately stop inflation of the SAVATECH pneumatic plug and reduce the pressure to the specified value.
The pressure gauge on the controller fails to function during work.	A safe operation of SAVATECH pneumatic plug is disabled.	1. Begin to deflate the SAVATECH pneumatic plug as described under 5.4.2. 2. Replace the controller.
Damage to the supply hose occurs during work.	It is not possible to inflate the SAVATECH pneumatic plug.	1. Begin to deflate the SAVATECH pneumatic plug as described under 5.4.2. 2. Replace the supply hose.
Damage to the connecting hose occurs during work.	It is not possible to inflate the SAVATECH pneumatic plug.	1. Begin to deflate the SAVATECH pneumatic plug as described under 5.4.2. 2. Replace the connecting hose.
It is not possible to loosen the protective screw of controller's safety valve when deflating the SAVATECH pneumatic plug.	It is not possible to deflate the SAVATECH pneumatic plug.	Disconnect the connecting hose from the controller very carefully. WARNING: THE HOSE IS PRESSURIZED AND WHEN DISCONNECTED IT CAN MOVE UNCONTROLLABLE AND CAUSE CONTUSIONS.
In spite of the loosened protective screw of controller's safety valve during deflation of the SAVATECH pneumatic plug, the pressure in the plug does not drop. It is not possible to deflate the SAVATECH pneumatic plug.	It is not possible to deflate the SAVATECH pneumatic plug..	Disconnect the connecting hose from the controller very carefully. WARNING: THE HOSE IS PRESSURIZED AND WHEN DISCONNECTED IT CAN MOVE UNCONTROLLABLE AND CAUSE CONTUSIONS.
In spite of the disconnected connecting hose of the SAVATECH pneumatic plug, the pressure in the plug does not drop. It is not possible to deflate the SAVATECH pneumatic plug.	It is not possible to deflate the SAVATECH pneumatic plug.	Warning! Keep out of the danger zone. Consult the supervisor or responsible safety engineer and/or the manufacturer of SAVATECH pneumatic plugs.

5.7. ACCESSORIES AND PROTECTIVE SLEEVES

Please see Table 35 for the complete list of accessories. Further information is available from the manufacturer or on the manufacturer's website.

Table 33: List of accessories

Plugy Z, Plugsy S	
78904	Connecting hose, 2 m
78905	Connecting hose, 5 m
60010	Hand pump
Plugy Z, Plugsy S Accessories for test according to EN 1610	
60449	Adapter R1", 2x quick coupling
60450	Adapter R2", with GK and quick coupling
76684	Connecting hose 5 m, 8mm I.D. with quick coupling for pipe filling
60452	Connecting hose 5 m, 19mm I.D. with quick coupling for pipe filling
78070	Measuring hose 0-0.6 bar, 10 m with nipple and pressure gauge, red
Plugy, Plugsy	
528746	Compressed air cylinder 300 bar,6 l
523835	Pressure reducer 200/300 bar
531544	Single fitting controller, 12 bar
531542	Single fitting controller, 6 bar
537048	Single fitting controller, 3.0 bar
60310	Single fitting controller, 2.5 bar
565643	Single fitting controller, 2.0 bar
74609	Single fitting controller, 1.5 bar
74653	Single fitting controller, 1.0 bar
74268	Connecting hose, 10 m, red
71248	Connecting hose,10 m, blue
76686	Connecting hose,10 m, yellow
60957	Polly lift and connecting hose, 5 m
60958	Polly lift and connecting hose, 10 m
503403	Remote extension for plug 100-200
503404	Remote extension for plug 150-300, 200-400, 300-525
503407	Remote extension 350-600
60491	Push rod, 1.5m
Plugy EI, Plugsy EI, Plugy Pillow, Plugsy Pillow	
519817	Connecting hose 10 m, with safety GK coupling
504061	Double fitting controller
Plugy HPF, Plugsy HPF	
547645	Single fitting controller, 3.0 bar (type 27)
547646	Single fitting controller, 2.5 bar (type 57)
547647	Single fitting controller, 1.5bar (type 57)
547650	Single fitting controller, 1.0 bar (type 57)
547714	Connecting hose NW10, 10 m, blue (up to 500-1200) (type 27)
547715	Connecting hose HP NW12, 10 m, blue (from 600-1200) (type 57)
PLUGY HP 30 bar	
282184	Single fitting controller, 30 bar
546714	Single fitting controller, 10 m

Table 34: List of protective sleeves

PROTECTIVE SLEEVES

Part number	Size usage range		Length (mm)	Thickness (mm)	Product weight (kg)
	Min. dia. (mm)	Max. dia. (mm)			
577071	70	150	200	1.5	0.1
531489	100	200	400	2	0.3
525342	150	300	500	3	1
515570	200	400	600	4	1.6
536435	300	525	620	4	2.8
510395	350	600	800	4	3.5
510396	375	750	1000	4	4.6
510397	500	1000	1100	4	5.5
527496	600	1200	1300	6	16.9
510399	750	1500	2100	6	24.5
535884	800	1800	2300	6	29.7
565770	1000	2400	3500	8	108

5.8. DISPOSAL OF WASTE MATERIAL

Damaged or destroyed products or product whose service life has expired should be removed from use. SAVATECH pneumatic plugs belong to reusable waste products, therefore they may not be disposed as ordinary waste. Waste classification according to the valid local regulations applies.

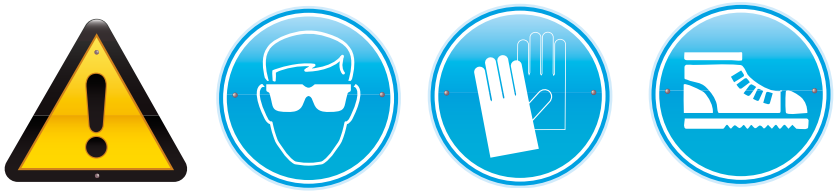
The product is partly recyclable.

5.9. BRIEF INSTRUCTIONS

For brief instructions for work with the SAVATECH pneumatic plugs please see the last page. We suggest that you copy, laminate and enclose that page to the SAVATECH pneumatic plugs to make it available to users at all times.

6. MAINTENANCE AND CLEANING

6.1. SAFETY PRECAUTIONS

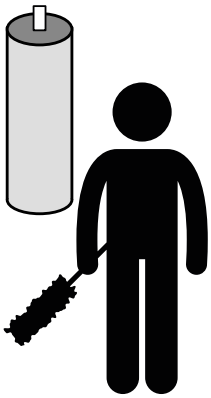


Always wear protective goggles, gloves and footwear when cleaning the SAVATECH pneumatic plugs.

6.2. MAINTENANCE AND CLEANING AFTER USE

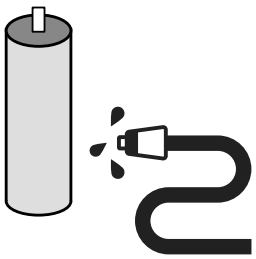
6.2.1. Maintenance of SAVATECH pneumatic plugs after use

Clean and check the SAVATECH pneumatic plug after every use. Oily and greasy stains can cause slipping of SAVATECH pneumatic plugs, while dirt fragments in the nipple prevent connection to the hose and obstruct air or water flow.



Use a brush with hard bristles for removing the agglutinated dirt from the surface of the plug. Move the brush in different directions. The use of sharp objects for dirt removal is not allowed.

When the agglutinated dirt is completely removed, clean the stains on the SAVATECH pneumatic plugs with a mild solution of dish washing detergent and warm water, and remove the rest of the dirt from the surface. Never use petrol, diluting agent, alcohol or aggressive cleaning agents.



Rinse the surface of the SAVATECH pneumatic plug with some cold clean water. A strong water jet removes the rest of dirt and detergent from the plug's surface.

The use of high-pressure cleaner is NOT allowed.

Never use solvents, hydrocarbons and other aggressive substances for cleaning the SAVATECH pneumatic plugs. The use of such substances can permanently damage or even destroy the pneumatic plug.

Allow the SAVATECH pneumatic plug to dry in the air; it should be completely dry before storage.

Never dry SAVATECH pneumatic plugs in a drier or by means of heating devices.

Carefully check the cleaned and dry SAVATECH pneumatic plug as follows:
- Check the plug for air blisters, cuts or worn-out sections that might hide under the dirt. Mark damage or defect with a chalk. Consult the manufacturer or authorised representative about the seriousness of the damage and further use of SAVATECH pneumatic plugs.
- Check the connecting coupling. If damages disable connection of connecting hose to the connecting coupling on the SAVATECH pneumatic plug, replace the coupling.

We recommend that you apply glycerine on the clean plug after use.

6.2.1.1. Replacement of connecting coupling on the SAVATECH pneumatic plug

The following items are required for replacement of the connecting coupling:
- Replacement coupling
- Open-end wrench of proper size
- Teflon sealing strip
- Soap water
- Brush for soap water application

Loosen the connecting coupling on the SAVATECH pneumatic plug with the open-end wrench as shown in Fig. 6.1.

Fig. 6.1:Removal of the connecting coupling

Wind the teflon sealing strip at least five times around the thread of the connecting coupling. Make sure that the strip is wound clockwise as shown in Fig. 6.2. If the teflon sealing strip is not properly wound, this can lead to the undesired leak of SAVATECH pneumatic plug.

Fig. 6.2: Teflon sealing strip wound on the thread of connecting coupling

Tighten the connecting coupling as shown in Fig. 6.3.

Fig. 6.3: Fixing the connecting coupling

Inflate the pneumatic plug to 1.2 x nominal minimum diameter of SAVATECH pneumatic plug. Check tightness between the connecting coupling and the plug with soap water. If you detect any leaks, loosen the coupling and reseal with the teflon sealing strip.

Fig. 6.4: Check the seal after replacement of connecting coupling

6.2.2. Maintenance of supply and connecting hoses after use

After every use, clean the supply and connecting hoses with a mild solution of dishwashing detergent and warm water. Rinse with some clean, cold water.

The use of high-pressure cleaner is NOT allowed.

Check the opening in the nipple and the coupling. If the nipple and the coupling are filled with dirt, remove it with a thin wire. Always pull the dirt from the nipple and the coupling, never push it in the hose.
Wipe the hoses with a dry cloth.

Never dry SAVATECH pneumatic plugs in a drier or by means of heating devices.

Carefully check the cleaned and dry hoses as follows:

- Check the hose for cuts or worn-out sections. Mark the damage or the defect. Consult the manufacturer or authorised representative about the seriousness of the damage and further use of hoses.
- Check the nipple. If damages disable connection to the connecting coupling on the hose, replace the hose.
- Check the coupling. If damages disable connection to the nipple on the SAVATECH pneumatic plug, replace the hose.

6.2.3. Maintenance of the controllers after use

Clean the controllers after use. Observe the periodic inspection intervals and check for faultless operation.

Store the controllers in a dry and dust-free space.

6.3. PREVENTIVE MAINTENANCE

6.3.1. General

Preventive maintenance with testing includes inspection of SAVATECH pneumatic plugs with associated equipment, performance of tests and replacement of damaged parts in order to assure user's safety.

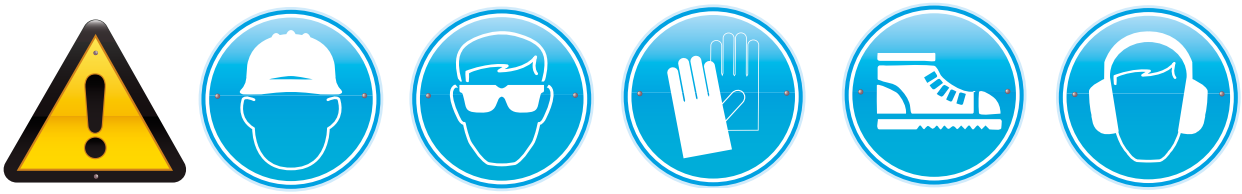
The manufacturer recommends to periodically test (5, 8,10, 11, 12, 13 and 14 years after the manufacture of pneumatic plugs) the SAVATECH pneumatic plugs, which should be performed by the manufacturer or a person authorized by the manufacturer. The test should be carried out in compliance with the procedure specified by the manufacturer. Local regulations should also be observed in periodic test performance.

6.3.2. Instructions for safe work

First, visually check the entire system and if no defects have been detected, the plugs may be tested under pressure.

Should any doubts arise as to the safe performance of the test, immediately interrupt the test and consult the manufacturer or authorized representative about further steps.

Always wear personal protection equipment during inspection and test performance. The use of protective helmet, safety goggles, gloves and footwear, and ear protection is mandatory.



Testing can take place outdoors; however, you should provide a suitable safety distance between the persons in the vicinity and the test object, as well as between the buildings in the vicinity. Testing can also take place indoors, in spaces with a properly reinforced construction, special protection, pressure release and handling outside the testing area.

The performance of pressure tests is allowed only in the pipes of suitable sizes whose hardness complies with the EN 13445-3 standard.

If damages or leaks on pneumatic plugs or damages and irregularities in equipment operation are identified during testing, interrupt testing and do NOT use these pneumatic plugs or equipment.

6.3.3. Periodic test of cylindrical pneumatic plugs

Periodic test of cylindrical pneumatic plugs may be carried out only after a visual inspection of cylindrical pneumatic plugs and equipment, tightness test of controller's hose and hoses, and function test of the controller prove these parts are faultless.

6.3.3.1. Inspection of the controller

Action			Inspection interval	Inspection operator	Procedure
1.		Visual inspection of the controller	Before use After every use Annually	A person qualified for work with pneumatic plugs	6.3.4.1.
2.		Tightness test of the controller	After every use Annually	A person qualified for work with pneumatic plugs	6.3.4.2.
3.	3.1	Function test of pressure gauge on the controller	After every use Annually	A person qualified for work with pneumatic plugs	6.3.4.3.1.
	3.2.	Function test of safety valve	After every use Annually	A person qualified for work with pneumatic plugs	6.3.4.3.2.

6.3.3.2. Inspection of the connecting hose

Action		Inspection interval	Inspection operator	Procedure
1.	Visual inspection of connecting hose	Before use After every use Annually	A person qualified for work with pneumatic plugs	6.3.4.4.
2.	Tightness and function test of connecting hose	After every use Annually	A person qualified for work with pneumatic plugs	6.3.4.5.

6.3.3.3. Inspection of the SAVATECH pneumatic plug

Action			Inspection interval	Inspection operator	Procedure
1.	1.1.	Visual inspection of non-inflated SAVATECH pneumatic plug	Before use After every use Annually	A person qualified for work with pneumatic plugs	6.3.4.6.1.
	1.2.	Visual inspection of inflated cylindrical pneumatic plug	Before use After every use Annually	A person qualified for work with pneumatic plugs	6.3.4.6.2.
2.		Periodic test of cylindrical pneumatic plug (RECOMMENDED)	5, 8, 10, 11, 12, 13 and 14 years after the manufacture	Manufacturer or person authorized by the manufacturer	6.3.4.7.

6.3.4. Test procedures

6.3.4.1. Visual inspection of the controller

Visually inspect the controller for damages:
- Inlet safety coupling
- Outlet nipple
- Pressure gauges and their scale readings
- Housing
- Protective cover of the pressure gauge

6.3.4.2. Tightness test of the controller

The necessary equipment for test performance:
- Air source
- Test tub with water
- Soap water and a brush for its application

Connect the controller to the air source and fill it up to the value 0.5 x working pressure. Immerse the entire controller in the water and check it for leaks. Take the controller from the water, dry it and, if appropriate, apply soap water on the housing surface and connection area. Visually check all components of the controller for leaks.

6.3.4.3. Function test of the controller

The function test is performed only after a successfully passed tightness test of the controller. The function test includes a pressure gauge and safety valve test.

Perform the function test outdoors only, at which a reasonable distance between the persons in the vicinity and the test object, as well as the buildings in the vicinity and the test object should be kept.

FUNCTION TEST OF PRESSURE GAUGE ON THE CONTROLLER

The necessary equipment for test performance:
- Air source
- Reference pressure gauge of accuracy class higher than the tested gauge

Use a reference pressure gauge with the same measurement range as the tested pressure gauge and with accuracy higher by one class. Connect the reference and the tested pressure gauges in series to the air source with the adjustable pressure setting. Gradually increase the pressure on the source and measure deviations of the tested pressure gauge at three points (A,B,C):

- point A: at approximately 1/3 of controller's nominal value
- point B: at approximately 2/3 of controller's nominal value
- point C: at controller's nominal value

If at any point deviation exceeds 5% of controller's nominal value, the tested pressure gauge is unsuitable for further use.

FUNCTION TEST OF SAFETY VALVE ON THE CONTROLLER

The necessary equipment for test performance:
- Air source
- Reference pressure gauge of accuracy class higher than test sample

Connect the controller to the air source with the adjustable pressure setting. Gradually increase the pressure on the controller up to the value 1.3 x working pressure or until the safety valve is activated (safety valve begins to hiss). The safety valve is faultless if activated within the range (1.1 ± 0.05) x working pressure of the controller.

6.3.4.4. Visual inspection of the connecting hose

Visually inspect for damages:
- Connecting coupling
- Nipple
- Hose

In case of ruptures, punctures, rigid sections, contact with acids or any other damages, the connecting hose is unsuitable for further use.

6.3.4.5. Tightness test and function test of the connecting hose

The necessary equipment for test performance:
- Air source
- Controller
- Test tub with water
- Soap water and a brush for soap water application

Connect the connecting hose to the air source and fill it up to the value of 0.5 x working pressure. Use the shut-off coupling. Immerse the entire hose in the water and check it for leaks. Take the hose from the water, dry it and, if appropriate, apply soap water on the surface and connection area.

The function test of the connecting hose may be performed only after a successfully passed tightness test of the connecting hose. Connect the connecting hose to the controller and gradually set the pressure in the hose to the maximum value of controller's pressure gauge. The hose is faultless if after 30 seconds the pressure drop does not exceed 5% of the maximum pressure value on the pressure gauge.

6.3.4.6. Visual inspection of the SAVATECH pneumatic plug

Perform the following test outdoors only, at which a safety distance between the persons in the vicinity and the test object, as well as between the buildings in the vicinity and the test object should be kept.

VISUAL INSPECTION OF THE NON-INFLATED SAVATECH PNEUMATIC PLUG

Visually inspect the non-inflated pneumatic plug for unusual bulges, punctures, cuts or any other mechanical damages. If necessary, apply soap water across the entire surface along with the connection and eyebolts, if any, areas. In the case of smaller plugs, press the plug by hand and check for cracks.

VISUAL INSPECTION OF THE INFLATED SAVATECH PNEUMATIC PLUG

Inflate the cylindrical SAVATECH pneumatic plug up to 1.2 x minimum nominal diameter of the selected plug. Visually inspect for unusual bulges, punctures, cuts or any other mechanical damages. If necessary, apply soap water across the entire plug's surface along with the connection and eyebolts areas. Visually check tightness of pneumatic plug and connection.

Inflate the cone-type plug CONE Plugy up to the maximum nominal diameter, at which the pressure in the plug should not exceed 0.1 bar. Visually inspect for unusual bulges, punctures, cuts or any other mechanical damages. If necessary, apply soap water across the entire plug's surface along with the connection and eyebolts areas. Visually check tightness of pneumatic plug and connection.

6.3.4.7. Periodic test of pneumatic plug

The necessary equipment for test performance:
- Test hose
- Air source
- Controller
- Test tub with water
- Soap water and a brush for soap water application

The periodic test of pneumatic plug should be performed after a visual inspection of pneumatic plug.

Choose a suitable pipe for testing the cylindrical pneumatic plug. The dimension of the pipe should correspond to the largest nominal plug's diameter. The pipe should be empty and clean.

Insert the SAVATECH pneumatic plug in the pipe and gradually inflate it up to the value of 1.0 x working pressure. After 30 seconds, repeatedly check the pressure in the plug (stretching of the pneumatic plug) and adjust it to the working pressure (1.0 x working pressure). Leave the plug inflated for 30 seconds, and then check the plug. The plug is suitable for further testing if the pressure does not drop.

Continue to inflate the SAVATECH pneumatic plug up to the pressure value 1.3 x working pressure. After 30 seconds, repeatedly check the pressure in the plug (stretching of the pneumatic plug) and adjust it to the test pressure (1.3 x working pressure). Leave the plug inflated for 30 seconds, and then check the plug. The plug is suitable if the pressure does not drop.

After testing is finished, deflate the plug and remove it from the pipe.

Visually inspect the non-inflated SAVATECH pneumatic plug for unusual bulges, punctures, cuts or any other mechanical damages. Then inflate the plug to the diameter that exceeds the minimum nominal diameter of the selected plug by 20% and inspect it visually for unusual bulges, punctures, cuts or any other mechanical damages. If necessary, apply soap water across the entire plug's surface along with the connection and eyebolts areas. Visually check for tightness of pneumatic plug and connection.

Inflate the cone-type plug CONE Plugy up to the maximum nominal diameter, at which the pressure in the plug should not exceed 0.1 bar. Visually inspect for unusual bulges, punctures, cuts or any other mechanical damages. If necessary, apply soap water across the entire plug's surface along with the connection and eyebolts areas. Visually check for tightness of pneumatic plug and connection.

6.3.5. Test criteria for pneumatic plugs

The test criteria apply to all test procedures.

6.3.5.1. Leaks

Air leaking is considered a defect. Leaks can appear on a punctured or damaged plug's body or on the bottom of the plug. Leaks can appear on metal components (coupling, flange, flow tube). Such a pneumatic plug is unsuitable for further use and testing.

6.3.5.2. Effects arising from the use of pneumatic plugs

VISIBLE CUTS

The effects arising from the use and cuts due to moving the plug in the pipe can develop. If such irregularities appear, the pneumatic plug is unsuitable for further use and testing.

CRACKS AND INDENTATIONS DUE TO HARD PARTS

Cuts, cracks and indentations on plug's surface can develop on the spots where the plug touches the pipe. If such irregularities appear, the pneumatic plug is unsuitable for further use and testing.

SPREAD REINFORCEMENT CORDS

Spread reinforcement cords can appear only with the reinforced cylindrical Savatech pneumatic plugs. Spread cord fabrics are visible in the plug's casing during inflation of pneumatic plugs outside the pipe (up to the diameter, which exceeds the minimum nominal diameter of the selected plug by 20%). The difference in spread cords may not exceed 20%. If such irregularities appear, the pneumatic plug is unsuitable for further use and testing.

DEFORMED COVER OR BOTTOM OF CYLINDRICAL PNEUMATIC PLUG

The cover or the bottom of the plug can elliptically deform during inflation of cylindrical pneumatic plugs. The difference in diameter may not exceed 5%. If the difference is higher, the pneumatic plug is unsuitable for further use and testing.

POOR QUALITY BONDING

Poor quality bonding of rubber

During inflation of pneumatic plugs, a separation of rubber body edge from the bottom can appear due to poor bonding between the rubber layers. If such an irregularity appears, the pneumatic plug is no longer suitable for further use and testing.

Poor quality rubber-to-metal bonding

During inflation of pneumatic plugs, a separation of rubber from metal, flaking, detachment, separation can appear due to poor bonding between the rubber and the built-in metal parts. In the case of bypass plugs, poor quality bonding can cause poor connection between the flow-through tube and the metal connecting piece for the same tube. If such an irregularity appears, the pneumatic plug is no longer suitable for further use and testing.

OVERLOADING OF PNEUMATIC PLUGS

If the plug is inserted in the plug incorrectly, this can cause overloading of the plug, which shows as plug's deformation (the plug inflates beyond its nominal diameter). If such an irregularity appears, the pneumatic plug is no longer suitable for further use and testing.

IMPACT OF THE ENVIRONMENT

Sunlight

Cracks can develop across the entire surface – either rubber body or bottom – of pneumatic plugs exposed to direct sunlight. If such an irregularity appears, the pneumatic plug is unsuitable for further use and testing.

Chemicals

Cracks or corroded spots can develop on pneumatic plugs exposed to aggressive substances. If such an irregularity appears, the pneumatic plug is unsuitable for further use and testing.

Inappropriate storage

Folds, containing damaged carrying layer (fabric) of the plug, can develop on pneumatic plugs not stored in accordance with the instructions or stored in vacuumed condition for a longer period. When inflated, such plugs do not to get their regular shape, and are therefore unsuitable for further use or testing.

6.4. SERVICE LIFE

If operated and maintained correctly, the service life of SAVATECH pneumatic plugs amounts to 15 years.

The SAVATECH pneumatic plugs are made from rubber and thus subject to a natural ageing process. Although a visual inspection shows that SAVATECH pneumatic plugs are still in good condition, they should be put out of operation after 15 years, since the material construction itself could hide signs of ageing.

6.5. TROUBLESHOOTING

Fault	Reason	Remedy
It is not possible to insert the supply hose correctly in controller's connecting coupling.	Dirt on the nipple or the coupling. The nipple or the coupling is damaged.	Clean the nipple and the coupling. Replace the supply hose or the controller.
It is not possible to insert the connecting hose correctly in controller's connecting couplings.	Dirt on the nipple or the coupling. The nipple or the coupling is damaged.	Clean the nipples and the couplings. Replace the hose or the controller.
SAVATECH pneumatic plug does not inflate even though the ball valve on the controller is open.	Safety valve failure. The protective screw on safety valve is unscrewed. The nipple or the coupling is blocked. The supply or the connecting hose is not correctly connected. The supply or the connecting hose is damaged and does not seal.	Replace the controller. Tighten the protective screw on the safety valve. Clean the nipple or the coupling. Check and reconnect the supply or the connecting hose. Replace the supply or the connecting hose.
SAVATECH pneumatic plug inserted in the pipe does not seal.	Liquid leaks past the pneumatic plug. Pressure drop in the pipeline test area due to poor sealing of the SAVATECH pneumatic plug.	1. Reduce the pressure in the pneumatic plug. 2. Remove the pneumatic plug. 3. Clean the contact surface between the pipe surface and the pneumatic plug. 4. Repeatedly insert the pneumatic plug in the pipe and inflate it.
No flow through the flow-through tube of the SAVATECH bypass pneumatic plug.	Liquid flow is stopped. The pipeline test area cannot be filled with air or water.	1. Reduce the pressure in the pneumatic plug. 2. Remove the pneumatic plug. 3. Clean the flow-through tube of the bypass pneumatic plug. 4. Repeatedly insert the pneumatic plug in the pipe and inflate it.
It is not possible to tighten the protective screw on controller's safety valve when deflating SAVATECH pneumatic plug.	The protective screw on safety valve is mechanically blocked.	Disconnect the connecting hose at the controller very carefully. WARNING: THE HOSE IS PRESSURIZED AND WHEN DISCONNECTED IT CAN MOVE UNCONTROLLABLE AND CAUSE CONTUSIONS. Replace the safety valve on the controller.
Despite disconnecting the connecting hose of SAVATECH pneumatic plug during deflation, the pressure in the plug does not drop. It is not possible to deflate the SAVATECH pneumatic plug.	The nipple on the connecting hose or the coupling of SAVATECH pneumatic plug is blocked.	 **Warning!** **Keep out of the danger zone.** **Consult the supervisor, responsible safety engineer and/or the manufacturer's representatives.** Clean the nipple on the connecting hose. Clean the coupling on the SAVATECH pneumatic plug.

7. PRODUCT WARRANTY

7.1. GENERAL CONDITIONS

7.1.1. These warranty conditions apply as of 30 June 2014 for Environmental Protection and Rescue Programme products, manufactured by Savatech (Products). If any provision of this warranty conditions would be contrary to any mandatory legal provisions in any particular jurisdiction, such provision shall apply to a maximum extent as provided for by such mandatory legal provisions.

7.1.2. Products which may be sold by Savatech Environmental Protection and Rescue Programme but are not manufactured by it are not covered by this warranty and are sold exclusively with warranties, if any, by their original manufacturer.

7.2. MANAGEMENT OF THE PRODUCTS

7.2.1. In order to claim a remedy pursuant to this warranty, purchaser must conform to instructions for management of the Products which are available on:

http://www.savatech.com/Manuals/index.htm

www.savatech.eu/environmental-protection-and-rescue/manuals

7.3. WARRANTY

7.3.1. Savatech warrants to the purchaser that for the period of twelve (12) months as of delivery of the Products, such Products shall be free from defects in material and workmanship, subject to normal and management of the Products, including, among others, proper storage. For high-pressure lifting bags, the warranty period amounts to thirty-six (36) months.

7.3.2. This warranty shall be in lieu of any other warranties, express or implied, including, but not limited to, any warranty of merchantability or fitness for a particular purpose.

7.4. EXCLUSION OF WARRANTY

7.4.1. Warranty shall be excluded in cases where the Products have not been used for the ordinary purpose or have been subject to abnormal conditions such as, but not limited to misuse, mishandling (such as, but not limited to, cuts, tears, vandalism, fire, wilful destruction, improper installation and/or improper maintenance, misapplication), use of unauthorized components or attachments, or if adjustments or repairs have been performed by anyone other than Savatech or its authorized agents.

7.4.2. Warranty shall also be excluded and Savatech shall not be held liable in case of force majeure circumstances, such as, but not limited to:

- war or threat of war, sabotage, insurrection, riots or requisition,
- all laws, restrictions, regulations, by-laws, prohibitions or any other measures by the governmental, parliamentary or local bodies,
- import and export regulations or embargo,
- strikes, lock-outs or other industrial measures or trade disputes (if including Manufacturer's employees or third party),
- difficulties with supply of raw materials, work force, fuel, parts or machinery,
- power blackout, break of machinery.

7.4.3. Savatech shall not be held liable for any deficiencies in Products manufactured according to drawings, designs, project drafts and/or specifications provided by the purchaser.

7.4.4. Ordinary wear and tear is not covered by this warranty.

7.5. MAKING A WARRANTY CLAIM

7.5.1. Purchaser is obliged to take delivery of the Products and perform an ordinary inspection of the Product upon delivery.

7.5.2. Any claim by the purchaser with reference to the Products shall be deemed waived unless submitted in writing to Savatech within the earlier of (I) eight days as of the discovery of the defect, or (II) twelve months as of the date of delivery of the Products or thirty-six (36) months as of delivery of high-pressure lifting bags. Discovery of the defect is deemed to have occurred when a defect could have reasonably been detected by the purchaser.

7.5.3. Claim must at least contain the following data:
- part number,
- serial number,
- description of defect

and must be substantiated by adequate evidence, such as pictures. Upon request, Savatech must be allowed to inspect the Product.

7.5.4. To obtain performance under this warranty, any products suspected of having a manufacturing defect in materials or workmanship shall be returned freight prepaid for inspection to SAVATECH d.o.o., Environmental Protection and Rescue Programme, Škofjeloška c. 6, 4000 Kranj, Slovenia.

7.6. REMEDIES

7.6.1. Savatech shall decide on a claim within forty-five (45) days after receiving a complete documentation and Product pursuant to Article 7.5.

7.6.2. Providing Savatech acknowledges the claim as justified, it shall, at its discretion, either:
- repair the Product,
- replace those components of the Product which are defective,
- replace the Product, if repair is not possible or reasonable,
- reimburse the consideration for the Product or its components which are defective.

7.6.3. Whenever Savatech repairs or replaces the Product at its expense or reimburses the purchase price, it shall reimburse the distributor or the purchaser (depending on each case), with a credit note, the same surface freight amount the distributor or the purchaser had when returning the Product to the Manufacturer.

7.6.4. Remedies pursuant to this Article 7.6 shall constitute the sole and exclusive remedy in the event of a breach of warranty. For the avoidance of doubt, Savatech shall not be held liable for any incidental, consequential and/or non-pecuniary damages or damages having a comparable effect.

7.7. CLOSING PROVISIONS

7.7.1. No statement or action by Savatech, whether express or implied, other than set forth herein, shall constitute a warranty.

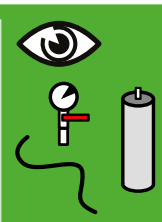
8. ENCLOSURES

8.1. BRIEF INSTRUCTIONS ON USING THE SAVATECH PNEUMATIC PLUGS

1. step

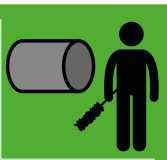
PROCEDURE	WARNINGS
Determine the back pressure and choose a suitable SAVATECH pneumatic plug.	To be able to choose a suitable SAVATECH pneumatic plug, always consider the tables of technical data and back pressures.

2. step



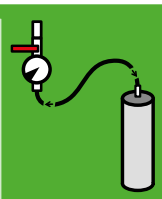
PROCEDURE	WARNINGS
Check and prepare on the place where the pneumatic plug will be used: air source, plug, controller and supply hoses.	Thoroughly check the SAVATECH pneumatic plug and other equipment before use. Using a damaged product or damaged equipment is dangerous; such a product and equipment should be replaced and removed from use.

3. step



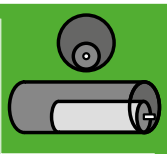
PROCEDURE	WARNINGS
Clean the pipe, in which the SAVATECH pneumatic plug will be inserted.	Even the smallest sharp particles in a non-cleaned pipe can lastingly damage the SAVATECH pneumatic plug.

4. step



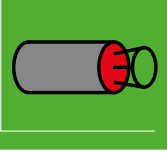
PROCEDURE	WARNINGS
Connect the air source, controller and the SAVATECH pneumatic plug.	Only a suitable controller is allowed for filling the SAVATECH pneumatic plug. The safety valve of the controller should entirely comply with the working pressure in the SAVATECH pneumatic plug.

5. step



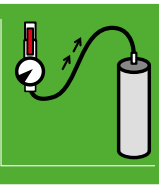
PROCEDURE	WARNINGS
Insert the SAVATECH pneumatic plug in the pipe.	Make sure that the SAVATECH pneumatic plug is positioned horizontally in the middle of the pipe's cross section.

6. step



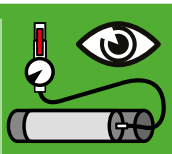
PROCEDURE	WARNINGS
Place the safety support of the SAVATECH pneumatic plug.	If the back pressure is exceeded, the risk of injuries exists as a result of not using the safety support.

7. step



PROCEDURE	WARNINGS
Inflate the SAVATECH pneumatic plug until it reaches its nominal pressure.	Keeping near the pressurized SAVATECH pneumatic plug is prohibited! Never exceed the nominal working pressure in the SAVATECH pneumatic plug.

8. step

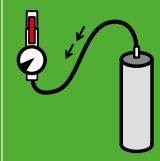


PROCEDURE	WARNINGS
Constantly check the pressure in the SAVATECH pneumatic plug during work.	If noticing a pressure change in the SAVATECH pneumatic plug, adjust its level to the specified working pressure.

9. step

PROCEDURE	WARNINGS
Release the back pressure after finishing the work.	Deflating the plug exposed to the back pressure can cause an uncontrolled shift of the plug in the direction of back pressure.

10. step



PROCEDURE	WARNINGS
Empty the SAVATECH pneumatic plug.	Before emptying the plug, repeatedly check for presence of back pressure.

11. step

PROCEDURE	WARNINGS
After use, clean and store the empty SAVATECH pneumatic plug and other equipment according to the instructions.	Follow the instructions for cleaning and storing the SAVATECH pneumatic plug.

12. step

PROCEDURE	WARNINGS
Thoroughly examine the SAVATECH pneumatic plug and the equipment.	A damaged product or equipment should be replaced and removed from use.

Non-compliance with instructions for use can result in various injuries, which is why you should read before use not only these brief instructions but also the complete instructions for use published on the websites:

www.savatech.eu/environmental-protection-and-rescue/manuals

www.savatech.com/Manuals/index.htm

PERSONAL PROTECTIVE EQUIPMENT:

When working with SAVATECH pneumatic plugs always wear the following personal protective equipment: protective clothing, protective helmet, protective goggles, protective gloves, protective footwear and ear protectors.

TEMPERATURE RANGE:

The temperature range of use is between –20 and +80 °C. The use of products at temperatures below –20 °C, but not lower than -40 °C, is limited to a maximum of 1 hour, whereas at temperatures exceeding +80 °C, the use is limited to 30 minutes, however, the temperature may not exceed 100 °C.

The standard version of SAVATECH pneumatic plugs is NOT suitable for use in potentially explosive atmospheres.

Smoking and open flame are forbidden during use of the SAVATECH pneumatic plugs.

CHOOSING A SUITABLE SAVATECH PNEUMATIC PLUG:

When choosing a suitable SAVATECH pneumatic plug, consider the technical data given in the tables as well as on the product's labels.

The SAVATECH pneumatic plugs are not resistant to all types of chemicals. When choosing between the different types such as NrBr, CR or NBR, please consider the resistance table for rubber materials or consult the manufacturer.

8.2. TEST REPORT: DATA ABOUT THE TESTED PLUG AND TEST PERFORMANCE

Visual inspection of the controller			
1.	Coupling is undamaged	YES	NO
2.	Coupling is functioning	YES	NO
3.	Valve is functioning smoothly	YES	NO
4.	Valve is free of visual defects	YES	NO
5.	Protective cover of pressure gauge is available	YES	NO
6.	Controller's housing is free of visual defects	YES	NO
7.	Maximum permissible pressure of pressure gauge is marked	YES	NO
8.	Glass of pressure gauge is undamaged	YES	NO
9.	Connection is undamaged	YES	NO
10.	Connection is operable	YES	NO
11.	Other (please state)	YES	NE

Tightness test of the controller			
12.	Controller seals	YES	NO
13.	Other (please state)	YES	NO

Function test of pressure gauge on the controller			
14.	Pressure increases in accordance with movements of controller's lever	YES	NO
15.	Pressure decreases in accordance with movements of controller's lever	YES	NO
16.	Value of pressure gauge at point A is appropriate	YES	NO
17.	Value of pressure gauge at point B is appropriate	YES	NO
18.	Value of pressure gauge at point C is appropriate	YES	NO
19.	Other (please state)	YES	NO

Function test of controller's safety valve			
20.	Safety valve is undamaged	YES	NO
21.	Safety valve activates properly	YES	NO
22.	Valve activation is accompanied by a load sound	YES	NO
23.	Repeated visual inspection shows no anomalies	YES	NO
24.	Other (please state)	YES	NO

Tightness test and function test of the connecting hose			
25.	Connecting hose can be fixed to controller	YES	NO
26.	Pressure in connecting hose changes in accordance with movements of controller's lever	YES	NO
27.	After 30 seconds, pressure drop does not exceed 10% of maximum pressure on pressure gauge	YES	NO
28.	Repeated visual inspection shows no anomalies	YES	NO
29.	Other (please state)	YES	NO

Visual inspection of the uninflated plug			
30.	Area of plug's application is clearly indicated	YES	NO
31.	Serial number is readable	YES	NO
32.	Maximum working pressure of the plug is clearly indicated	YES	NO
33.	Coupling on the plug is not damaged	YES	NO
34.	Coupling on the plug is functioning	YES	NO
35.	Eyebolts on the plug are not damaged	YES	NO
36.	No damages visible on the plug	YES	NO
37.	No cuts visible on the plug	YES	NO
38.	No ruptures visible on the plug	YES	NO
39.	No stiff sections visible on the plug	YES	NO
40.	No cord threads visible on plug's surface	YES	NO
41.	No effects resulting from contact with acids visible on the plug	YES	NO
42.	No effects resulting from contact with chemicals visible on the plug	YES	NO

43.	No foreign particles visible on plug's surface	YES	NO
44.	Plug is not decayed	YES	NO
45.	No poor rubber-to-rubber bond noticeable on the plug	YES	NO
46.	No poor rubber-to-metal bond noticeable on the plug	YES	NO
47.	Other (please state)	YES	NO

Visual inspection of the inflated plug			
48.	Area of plug's application is clearly indicated	YES	NO
49.	Serial number is readable	YES	NO
50.	Maximum working pressure of the plug is clearly indicated	YES	NO
51.	Coupling on the plug is not damaged	YES	NO
52.	Coupling on the plug is functioning	YES	NO
53.	Eyebolts on the plug are not damaged	YES	NO
54.	Plug can be inflated up to a diameter, which exceeds the smallest nominal diameter by 20%	YES	NO
55.	Plug inflates evenly	YES	NO
56.	Cord spreading is below 20%	YES	NO
57.	Elliptical distortion of plug's cap (cover or bottom) does not exceed 5%	YES	NO
58.	Plugs seals	YES	NO
59.	No air blisters visible on the plug	YES	NO
60.	No damages visible on the plug	YES	NO
61.	No cuts visible on the plug	YES	NO
62.	No ruptures visible on the plug	YES	NO
63.	No stiff sections visible on the plug	YES	NO
64.	No cord threads visible on plug's surface	YES	NO
65.	No effects resulting from contact with acids visible on the plug	YES	NO
66.	No effects resulting from contact with chemicals visible on the plug	YES	NO
67.	No foreign particles visible on plug's surface	YES	NO
68.	Plug is not decayed	YES	NO

69.	No poor rubber-to-rubber bond visible on the plug	YES	NO
70.	No poor rubber-to-metal bond visible on the plug	YES	NO
71.	Other (please state)	YES	NO

Periodic test of the pneumatic plug			
72.	Pressure in the plug rises up to the value of 1.0 x working pressure in accordance with movements of controller's lever	YES	NO
73.	Plug seals after stretching and repeated pressure adjustment after 30 seconds up to 1.0 x working pressure	YES	NO
74.	Pressure in the plug rises up to the value 1.3 x working pressure in accordance with movements of controller's lever	YES	NO
75.	Plug seals after stretching and repeated pressure adjustment after 30 seconds up to 1.3 x working pressure	YES	NO
76.	Repeated visual inspection shows no anomalies	YES	NO
77.	Other (please state)	YES	NO

PERIODIC TESTING OF CYLINDRICAL PNEUMATIC PLUGS			
Test object		**PNEUMATIC PLUG**	
Test date			
Date of the last test			
User's name			
Supervisor's name			
Code	Serial number	Year of manufacture	Remarks

Test results		
The uninflated cylindrical pneumatic plug successfully passed visual inspection.	YES	NO
The inflated cylindrical pneumatic plug successfully passed visual inspection.	YES	NO
The cylindrical pneumatic plug successfully passed the periodic test.	YES	NO

Test evaluation		
The pneumatic plug is **suitable** for further use.	YES	NO
The pneumatic plug is **unsuitable** for further use.	YES	NO

Date/signature:		

PERIODIC TESTING OF CYLINDRICAL PNEUMATIC PLUGS			
Test object	**CONTROLLER**		
Test date			
Date of the last test			
User's name			
Supervisor's name			
Code	Serial number	Year of manufacture	Remarks

Test results		
The controller successfully passed visual inspection.	YES	NO
The controller successfully passed the tightness test.	YES	NO
The pressure gauge on the controller successfully passed the function test.	YES	NO
The safety valve on the controller successfully passed the function test.	YES	NO

Test evaluation		
The controller is **suitable** for further use.	YES	NO
The controller is **unsuitable** for further use.	YES	NO

Date/signature:		

PERIODIC TESTING OF CYLINDRICAL PNEUMATIC PLUGS			
Test object		**CONNECTING HOSE**	
Test date			
Date of the last test			
User's name			
Supervisor's name			
Code	Serial number	Year of manufacture	Remarks

Test results		
The connecting hose successfully passed visual inspection.	YES	NO
The connecting hose successfully passed the tightness and function test.	YES	NO
Test evaluation		
The connecting hose is **suitable** for further use.	YES	NO
The connecting hose is **unsuitable** for further use.	YES	NO

Date/signature:		

Savatech, d.o.o.
Industrial Rubber Products and Tyres

Škofjeloška cesta 6, 4000 Kranj, Slovenia
Tel: +386 (0)4 206 63 88
Fax: +386 (0)4 206 64 60
e-mail: info.eko@savatech.si
www.savatech.si www.savatech.com