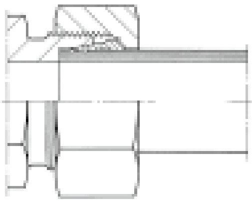
T

T

Technical information

TECHNICAL INFORMATION ON PIPE FITTINGS

1. DESIGN AND FUNCTION OF CUTTING RING THREADED CONNECTORS



The cutting ring threaded connectors manufactured by HANSA-FLEX have been used successfully in practical applications for many years.

These important components in our line of hydraulic connecting equipment are standardised according to DIN EN ISO 8434-1 and DIN 2353, and their geometrical shape serves to seal hydraulic pipes and fittings easily, reliably and safely.

They can be fitted either into the screwed joint or into specially made devices. In either case the cutting ring and its edges are moved axially as the union nut is tightened.

As the cutting ring moves along a precisely defined assembly path, its cutting edges are forced into the surface of the hydraulic pipe.

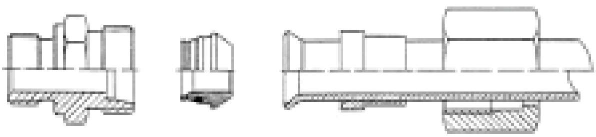
A specially shaped limit ridge prevents overtightening, the pipe material that is raised in front of the edges is cold-hardened.

The outer surfaces of the cutting ring transfer the active forces evenly over the entire sealing cone of the fitting; the internal contour is shaped so that the cutting ring is wedged between the union nut and the screwed joint and serves as a spring-loaded element.

This spring effect damps vibrations and increases the resistance of the fitting to alternating bending loads and surge pressures.

When the assembly instructions are followed, repeat fittings can be carried out safely and reliably. Cutting rings with elastomer seal work according to the same functional principle, but they are furnished with additional elastomer seals to increase operating reliability further still.

2. DESIGN AND FUNCTION OF FLARE FITTINGS



HANSA-FLEX flare fittings were originally developed for high pressure applications and are used widely in locations that are exposed to strong vibrations.

Of course, they can be fitted on the standard threaded connectors, the end of the pipe just has to be provided with a standardised 37° flare cone in preparation for fitting.

The entire fitting consists of the threaded connector, the spacer ring with O-ring seal, the pressure ring and the union nut.

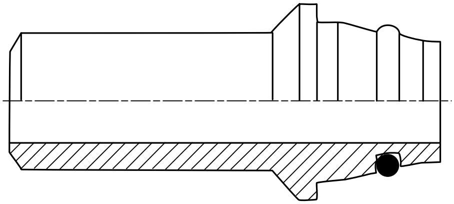
T

3. DESIGN AND FUNCTION OF THREADED WELD NIPPLES

HANSA-FLEX threaded weld nipples provide another option for connecting standardised hydraulic pipes and threaded connectors:

The sealing cone is fitted with an O-ring and is shaped so as to fit precisely inside the mating part of the threaded connector.

However, the O-ring must be removed before welding, and any stray welding material must be removed from the O-ring groove and the fitting hole.



4. GENERAL NOTES

All of the pipe fittings listed in our catalogue are manufactured in conformance with DIN 2353 or DIN EN ISO 8434-1 and are intended for applications in hydraulic connection equipment.

The HANSA-FLEX pipe fitting product line includes a large number of fitting types that surpass the requirements of this standard. In these special forms, e.g., pipe fittings with spring-back tolerances, the connector dimensions have been adapted to the pertinent standard, so that they can be replaced at any time.

All fittings are designed to withstand the operating pressures specified in the standards, in some cases the requirements of the standard are exceeded.
However, in order to function properly our fittings must have been assembled in strict compliance with the assembly instructions supplied by us.

5. MATERIALS

HANSA-FLEX cutting ring fittings are manufactured from cold-drawn or forged materials and conform to the technical conditions of delivery of pipe fittings according to DIN 3859-1 and the requirements of ISO 8434-1.

T

	Component	Identification	Material	Standard
Steel	Straight screw-in fittings	11SMnPb30+C	1.0718+C	DIN EN 10277-3
	Connecting and reducing fittings			
	Bulkhead fittings			
	Screw-in sockets			
	Union nuts			
	Flange fittings			
	Hollow screws			
	Angle, T and L screw-in fittings	11SMnPb30+C	1.0718+C	DIN EN 10277-3
	Banjo fittings			
	Soldered sockets			
	Welded sockets	S355J2G3	1.0570	DIN EN 10250-2
	Cutting rings	According to selection of manufacturer		
Stainless steel	Bar stock	X2CrNiMo17-12-2	1.4404	EN 10088-2
		X 6 CrNiMoTi 17-12-2	1.4571	EN 10088-2
	Forged blank	X2CrNiMo17-12-2	1.4404	EN 10088-2
		X 6 CrNiMoTi 17-12-2	1.4571	EN 10088-2
Brass		CuZn35Ni2	2.0540	DIN 17660 DIN EN ISO 17672

6. SURFACE PROTECTION

The surfaces of steel fitting bodies, union nuts and cutting rings are protected from corrosion as standard with a CrVI-free zinc-nickel coating conforming to DIN EN 15205.

The surfaces of HANSA-FLEX welded sockets are phosphated and oiled.

7. STANDARDISATION

Fittings

HANSA-FLEX pipe fittings are components for use in hydraulic connection equipment and are standardised in accordance with DIN 2353 and DIN EN ISO 8434-1. Their standard designations are often also used in ordering documentation. The following list shows a selection of the various designations:

T

HANSA-FLEX Identification	Designation according to standard
XVM NW...HL	Pipe fitting ISO 8434-1 – SDSC – L…xM... – B
XVM NW...HS	Pipe fitting ISO 8434-1 – SDSC – S…xM... – B
XVR NW...HL	Pipe fitting ISO 8434-1 – SDSC – L…xG... – B
XVR NW...HS	Pipe fitting ISO 8434-1 – SDSC – S…xG... – B
XVM NW...HL ED	Pipe fitting ISO 8434-1 – SDSC – L…xM... – E
XVM NW...HS ED	Pipe fitting ISO 8434-1 – SDSC – S…xM... – E
XVR NW...HL ED	Pipe fitting ISO 8434-1 – SDSC – L…xG... – E
XVR NW...HS ED	Pipe fitting ISO 8434-1 – SDSC – S…xG... – E
XV NW...HL	Pipe fitting ISO 8434-1 – SC – L…
XV NW...HS	Pipe fitting ISO 8434-1 – SC – S…
XWM NW...HL	Fitting DIN 2353 – HL...B – St
XWM NW...HS	Fitting DIN 2353 – HS...B – St
XWR NW...HL	Fitting DIN 2353 – JL...B – St
XWR NW...HS	Fitting DIN 2353 – JS...B – St
XW NW...HL	Pipe fitting ISO 8434-1 – EC – L…
XW NW...HS	Pipe fitting ISO 8434-1 – EC – S…
XTM NW...HL	Fitting DIN 2353 – OL...B – St

HANSA-FLEX Identification	Designation according to standard
XTM NW...HS	Fitting DIN 2353 – OS...B – St
XTR NW...HL	Fitting DIN 2353 – PL...B – St
XTR NW...HS	Fitting DIN 2353 – PS...B – St
XT NW...HL	Pipe fitting ISO 8434-1 – SDTC – L... – B
XT NW...HS	Pipe fitting ISO 8434-1 – SDTC – S… – B
XSA NW...HS	Pipe fitting ISO 8434-1 – WDSC – S… – B
XSA NW...HL	Pipe fitting ISO 8434-1 – WDSC – L... – B
XSV NW...HS	Pipe fitting ISO 8434-1 – BHC – S… – B
XSV NW...HL	Pipe fitting ISO 8434-1 – BHC – L... – B
XSW NW...HS	Pipe fitting ISO 8434-1 – BHEC – S… – B
XSW NW...HL	Pipe fitting ISO 8434-1 – BHEC – L... – B
XSE NW...HS	Pipe fitting ISO 8434-1 – WDBC – S… – B
XSE NW...HL	Pipe fitting ISO 8434-1 – WDBC – L... – B
UEM NW...L	Pipe fitting ISO 8434-1 – N – L... – B
UEM NW...S	Pipe fitting ISO 8434-1 – N – S... – B
SR D...	Pipe fitting ISO 8434-1 – CR – L... – B
SR D...	Pipe fitting ISO 8434-1 – CR – S... – B

Applicable standards for pipe fittings:

Technical conditions of delivery	DIN 3859-1
Assembly instructions	DIN 3859-2
Test specification	DIN 3859-3
DIN fittings (24°)	DIN 2353
	DIN EN ISO 8434-1
Flare fittings (37°)	DIN EN ISO 8434-2
ORFS fittings	DIN EN ISO 8434-3
Pipe connection side (connector)	DIN 3861
	DIN EN ISO 8434-1
Seamless precision steel pipes	EN 10305-4
Metric cyl. screw-in pins and holes:	DIN 3852-1, DIN 3852–11
	DIN EN ISO 6149-1
	DIN EN ISO 6149-3
Imperial cyl. screw-in pins and holes	DIN 3852-1, DIN 3852–11
	ISO 1179
Conical screw-in pins and holes with	
NPT thread	ANSI/ASME B1.20.1-1983
Cyl. screw-in pins and holes with UN and/or UNF thread	Conforming to ISO/DIS 11926-1/SAE J514; with UN/ UNF thread 2A/2B conforming to ANSI B1.1/ISO725
Metric fine threads	DIN 13, T5-T7
Imperial threads	DIN EN ISO 228-1

8. OPERATING TEMPERATURES OF 24° CUTTING RING FITTINGS

Material	Pressure reductions for permissible operating temperatures [°C]				
Steel	-40 °C	+20 °C	+50 °C	+100 °C	+120 °C
	0%				
Stainless steel	-60 °C	+20 °C	+50 °C	+100 °C	+200 °C
	0%		4%	11%	20%
NBR	-30 °C	+100 °C			
	0%				
FPM	-15 °C	+200 °C			
	0%				

Source: DIN 3859-1, DIN 3771-3, ISO 8434-1

EXAMPLE:
Stainless steel fitting
Pressure: 400 bar
Temperature: 200 °C
→ Pressure reduction of 20% → Pressure reduction of 80 bar (400 x 20%)
→ Fitting pressure = 400 – 80 = 320 bar

9. OPERATING PRESSURES OF 24° CUTTING RING FITTINGS

The HANSA-FLEX range of fittings is divided into three series according to pressure level and application:

LL:	very light series
L :	light series
S:	heavy duty series

Information about fittings often includes the nominal pressure, designated PN. The nominal pressure, PN, is merely an index that serves as an identifier or designator for a part or system. The PN designation is used internationally.

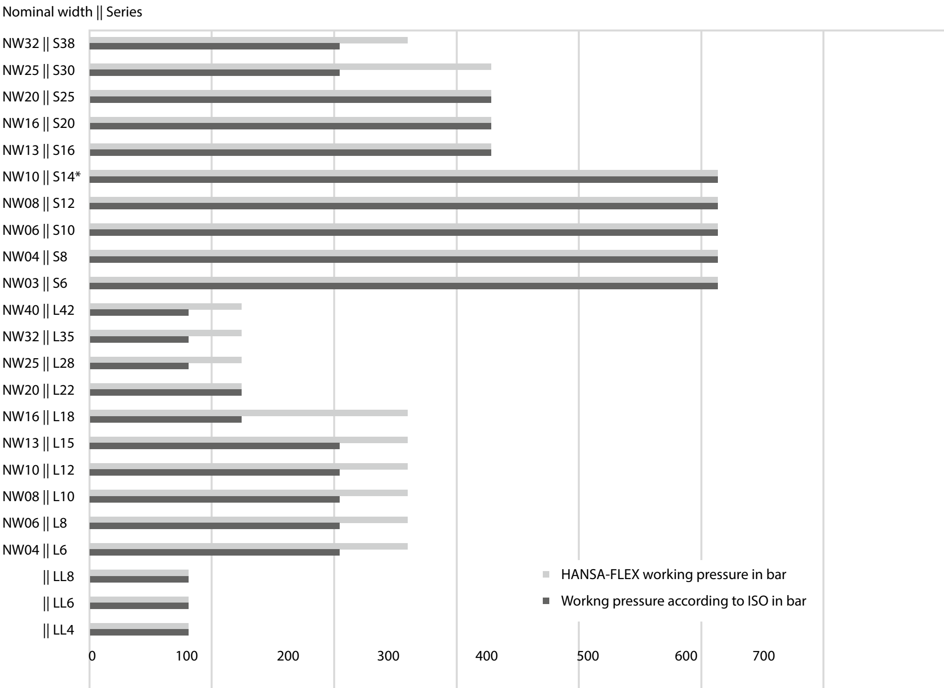
With this indication of the PN nominal pressure, HANSA-FLEX cutting ring fittings offer a quad-ruple safety factor. Flare fittings conforming to ISO 8434-2 also have a safety factor of 4.

It should be noted that this safety factor is contingent on error-free assembly and correct routing of the pipeline system.

However, HANSA-FLEX cutting ring fittings are designed in such a way that the pressure values required according to DIN EN ISO 8434-1 are exceeded. The pressure ranges indicated are based on the connector shape. The various screw-in shapes should be noted, deviations may occur under certain circumstances.

Please direct enquiries to the Application Technology department.

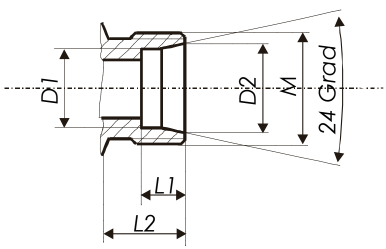
MAX. OPERATING PRESSURES OF 24° CUTTING RING FITTINGS



*) is **no longer** standardised

10. PIPE-SIDE CONNECTION OF CUTTING RING FITTINGS

The pipe-side connection of HANSA-FLEX cutting ring fittings is standardised according to DIN 3861, hole shape W and DIN EN ISO 8434-1, and it is thus guaranteed that it can also be replaced with metric fittings for hydraulic hose lines:



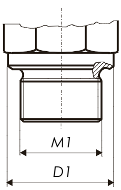
Series	External pipe diameter	Nominal pressure PN in bar	M	L1	L2	D1	D2
LL	4	100	M8x1	4	8	4	5
LL	5	100	M10x1	5.5	8	5	6.5
LL	6	100	M10x1	5.5	8	6	7.5
LL	8	100	M12x1	5.5	9	8	9.5
L	6	315	M12x1.5	7	10	6	8.1
L	8	315	M14x1.5	7	10	8	10.1
L	10	315	M16x1.5	7	11	10	12.3
L	12	315	M18x1.5	7	11	12	14.3
L	15	315	M22x1.5	7	12	15	17.3
L	18	315	M26x1.5	7.5	12	18	20.3
L	22	160	M30x2	7.5	14	22	24.3
L	28	160	M35x2	7.5	14	28	30.3

Series	External pipe diameter	Nominal pressure PN in bar	M	L1	L2	D1	D2
L	35	160	M45x2	10.5	16	35.3	38
L	42	160	M52x2	11	16	42.3	45
S	6	630	M14x1.5	7	12	6	8.1
S	8	630	M16x1.5	7	12	8	10.1
S	10	630	M18x1.5	7.5	12	10	12.3
S	12	630	M20x1.5	7.5	12	12	14.3
S*	14	630	M22x1.5	8	14	14	16.3
S	16	400	M24x1.5	8.5	14	16	18.3
S	20	400	M30x2	10.5	16	20	22.9
S	25	400	M36x2	12	18	25	27.9
S	30	400	M42x2	13.5	20	30	33
S	38	315	M52x2	16	22	38.3	41

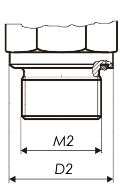
*) Size 14S is **no longer** standardised and is not approved by Germanischer Lloyd

11. SCREW-IN PINS AND HOLES FOR HANSA-FLEX CUTTING RING FITTINGS

HANSA-FLEX cutting ring fittings are available with a wide range of standardised screw-in threads, enabling them to be used for an enormous variety of applications.



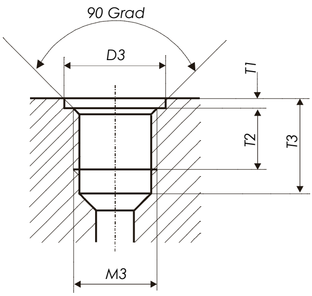
DIN 3852 Part 1 Form B and ISO 9974-3
Sealing by sealing edge



Form E and ISO 9974-2
Sealing by elastomer seal

series	External pipe diameter	M1/M2	M3	D1	D2	T1	T2	T3	D3
LL	4	M8x1	M8x1	12	-	1	8	13.5	13
LL	6	M10x1	M10x1	14	13.9	1	8	13.5	15
LL	8	M10x1	M10x1	14	13.9	1	8	13.5	15
L	6	M10x1	M10x1	14	13.9	1	8	13.5	15
L	8	M12x1.5	M12x1.5	17	16.9	1.5	12	18.5	18
L	10	M14x1.5	M14x1.5	19	18.9	1.5	14	18.5	20
L	12	M16x1.5	M16x1.5	21	21.9	1.5	12	18.5	23
L	15	M18x1.5	M18x1.5	23	23.9	2	12	18.5	25
L	18	M22x1.5	M22x1.5	27	26.9	2.5	14	20.5	28
L	22	M26x1.5	M26x1.5	31	31.9	2.5	16	22.5	33
L	28	M33x2	M33x2	39	39.9	2.5	18	26	41
L	35	M42x2	M42x2	49	49.9	2.5	20	28	51

a) **Metric** screw-in pins and holes according to DIN 3852 Part 1, Form B, and DIN 9974-2 Form E with the associated screw-in hole form X

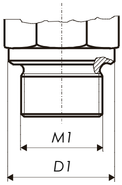


Screw-in hole according to ISO 9974-1 and DIN 3852 Part 1, Form X for screw-in pins Form A, B, and E

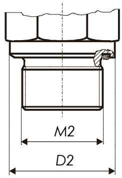
series	External pipe diameter	M1/M2	M3	D1	D2	T1	T2	T3	D3
L	42	M48x2	M48x2	55	54.9	2.5	22	30	56
S	6	M12x1.5	M12x1.5	17	16.9	1.5	12	18.5	18
S	8	M14x1.5	M14x1.5	19	18.9	1.5	12	18.5	20
S	10	M16x1.5	M16x1.5	21	21.9	1.5	12	18.5	23
S	12	M18x1.5	M18x1.5	23	23.9	2	12	18.5	25
S	14	M20x1.5	M20x1.5	25	25.9	2	14	20.5	27
S	16	M22x1.5	M22x1.5	27	26.9	2.5	14	20.5	28
S	20	M27x2	M27x2	32	31.9	2.5	16	24	33
S	25	M33x2	M33x2	39	39.9	2.5	18	26	41
S	30	M42x2	M42x2	49	49.9	2.5	20	28	51
S	38	M48x2	M48x2	55	54.9	2.5	22	30	56

T

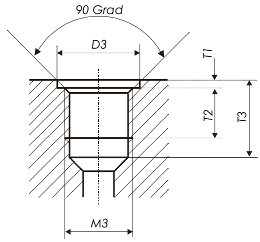
b) **Imperial** screw-in pins and holes according to DIN 3852 Part 2, Form B, and DIN 1179-2 Form E with the associated screw-in hole form X



DIN 3852 Part 2 Form B
and ISO 1179-4
Sealing by sealing edge



ISO 1179-2 Form E
Sealing by elastomer seal



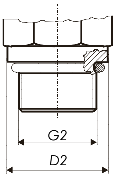
Screw-in hole according to ISO 9974-1
and DIN 3852 Part 2, Form X
for screw-in pins Form A, B, and E

Series	External pipe diameter	G1/G2	G3	D1	D2	T1	T2	T3	D3
LL	4	G 1/8"A	G 1/8"	14	13.9	1	8	13	15
LL	6	G 1/8"A	G 1/8"	14	13.9	1	8	13	15
LL	8	G 1/8"A	G 1/8"	14	13.9	1	8	13	15
L	6	G 1/8"A	G 1/8"	14	13.9	1	8	13	15
L	8	G 1/4"A	G 1/4"	18	18.9	1.5	12	18.5	20
L	10	G 1/4"A	G 1/4"	18	18.9	1.5	12	18.5	20
L	12	G 3/8"A	G 3/8"	22	21.9	2	12	18.5	23
L	15	G 1/2"A	G 1/2"	26	26.9	2.5	14	22	28
L	18	G 1/2"A	G 1/2"	26	26.9	2.5	14	22	29
L	22	G 3/4"A	G 3/4"	32	31.9	2.5	16	24	33
L	28	G 1"A	G 1"	39	39.9	2.5	18	27	41
L	35	G 1 1/4"A	G 1 1/4"	49	49.9	2.5	20	29	51

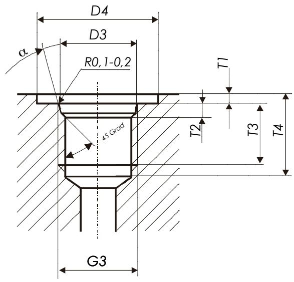
Series	External pipe diameter	G1/G2	G3	D1	D2	T1	T2	T3	D3
L	42	G 1 1/2"A	G 1 1/2"	55	54.9	2.5	22	31	56
S	6	G 1/4"A	G 1/4"	18	18.9	1.5	12	18.5	20
S	8	G 1/4"A	G 1/4"	18	18.9	1.5	12	18.5	20
S	10	G 3/8"A	G 3/8"	22	21.9	2	12	18.5	23
S	12	G 3/8"A	G 3/8"	22	21.9	2	12	18.5	23
S	14	G 1/2"A	G 1/2"	26	26.9	2.5	14	22	28
S	16	G 1/2"A	G 1/2"	26	26.9	2.5	14	22	28
S	20	G 3/4"A	G 3/4"	32	31.9	2.5	16	24	33
S	25	G 1"A	G 1"	39	39.9	2.5	18	27	41
S	30	G 1 1/4"A	G 1 1/4"	49	49.9	2.5	20	29	51
S	38	G 1 1/2"A	G 1 1/2"	55	54.9	2.5	22	31	56

T

c) Screw-in pins and holes for pipe fittings with cylindrical US threaded connections conforming to ISO 11926-2/3



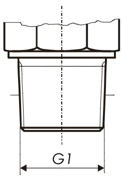
Screw-in pin with UN-UNF-2A thread and O-ring seal conforming to ISO 11926-2 and -3



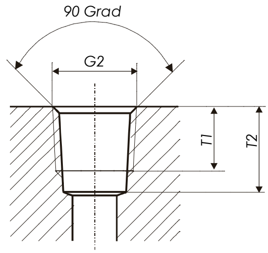
Screw-in hole with UN/UNF 2B thread for O-ring seal conforming to ISO 11926-1

Series	External pipe diameter	G1/G2	D2	D3	D4	T1	T2	T3	T4	α	O-ring
L	6, 8, 10	7/16"-20 UNF	16	12.4	21	1.6	2.4	11.5	14	12°	8.92 x 1.83
L	8	1/2"-20 UNF	17	14	23	1.6	2.4	11.5	14	12°	10.52 x 1.83
L	6, 10, 12	9/16"-18 UNF	17.6	15.6	25	1.6	2.5	12.7	15.5	12°	11.89 x 1.98
L	12, 15, 18	3/4"-16 UNF	22.3	20.6	30	2.4	2.5	14.3	17.5	15°	16.36 x 2.2
L	12, 18, 22	7/8"-14 UNF	25.5	23.9	34	2.4	2.5	16.7	20	15°	19.18 x 2.46
L	22, 28	1 1/16"-12 UN	31.9	29.2	41	2.4	3.3	19	23	15°	23.47 x 2.95
L	22, 28, 35	1 5/16"-12 UN	38.2	35.5	49	3.2	3.3	19	23	15°	29.74 x 2.95
L	35, 42	1 5/8"-12 UN	48	43.5	58	3.2	3.3	19	23	15°	37.47 x 3
L	42	1 7/8"-12 UN	55	49.8	65	3.2	3.3	19	23	15°	43.69 x 3
S	6, 8	7/16"-20 UNF	16	12.4	21	1.6	2.4	11.5	14	15°	8.92 x 1.83
S	6	1/2"-20 UNF	17	14	23	1.6	2.4	11.5	14	15°	10.52 x 1.83
S	10, 12	9/16"-18 UNF	17.6	15.6	25	1.6	2.5	12.7	15.5	15°	11.89 x 1.98
S	12, 14	3/4"-16 UNF	22.3	20.6	30	2.4	2.5	14.3	17.5	15°	16.36 x 2.2
S	16, 20	3/4"-16 UNF	22.3	20.6	30	2.4	2.5	14.3	17.5	15°	16.36 x 2.2
S	16, 20	7/8"-14 UNF	25.5	23.9	34	2.4	2.5	16.7	20	15°	19.18 x 2.46
S	20, 25	1 1/16"-12 UN	31.9	29.2	41	2.4	3.3	19	23	15°	23.47 x 2.95
S	25, 30	1 5/16"-12 UN	38.2	35.5	49	3.2	3.3	19	23	15°	29.74 x 2.95
S	30, 38	1 5/8"-12 UN	48	43.5	58	3.2	3.3	19	23	15°	37.47 x 3
S	38	1 7/8"-12 UN	55	49.8	65	3.2	3.3	19	23	15°	43.69 x 3

d) Screw-in pins and holes for pipe fittings with NPT thread conforming to ANSI/ASME B1.20.1-1983



Screw-in pin with NPT screw-in thread conforming to ANSI/ASME B1.20.1-1983



Screw-in hole for NPT thread conforming to ANSI/ASME B1.20.1-1983

Series	External pipe diameter	G1/G2	T1	T2
L	6	1/8“-27 NPT	6.9	11.6
L	8	1/4“-18 NPT	10	16.4
L	10	1/4“-18 NPT	10	16.4
L	12	3/8“-18 NPT	10.3	17.4
L	15	1/2“-14 NPT	13.6	22.6
L	18	1/2“-14 NPT	13.6	22.6
L	22	3/4“-14 NPT	14.1	23.1
L	28	1“-11.5 NPT	16.8	27.8
L	35	1 1/4“-11.5 NPT	17.3	28.3
L	42	1 1/2“-11.5 NPT	17.3	28.3

Series	External pipe diameter	G1/G2	T1	T2
S	6	1/4“-18 NPT	10	16.4
S	8	1/4“-18 NPT	10	16.4
S	10	3/8“-18 NPT	10.3	17.4
S	12	3/8“-18 NPT	10.3	17.4
S	14	1/2“-14 NPT	13.6	22.6
S	16	1/2“-14 NPT	13.6	22.6
S	20	3/4“-14 NPT	14.1	23.1
S	25	1“-11.5 NPT	16.8	27.8
S	30	1 1/4“-11.5 NPT	17.3	28.3
S	38	1 1/2“-11.5 NPT	17.3	28.3

12. TIGHTENING TORQUES FOR SCREW-IN PINS IN HANSA-FLEX CUTTING RING FITTINGS

The following list of tightening torques applies for steel fittings with zinc-nickel coated screw-in pins for locking screws and banjo couplings, all with HANSA-FLEX CrVI-free surface and a mating part manufactured from the same material.

Tightening torques for stainless steel fittings and for fittings with UN/UNF threads available upon request.
In order to achieve an optimum seal, conical screw-in threads must be provided with an additional sealing means, e.g., Teflon tape.

NOTE: The torque values apply only for the test.
The tightening torques during assembly depend on a large number of factors, including lubrication, coating and surface treatment. Please consult the manufacturer.

Series	Thread	Tightening torque in Nm ISO 1179-2 Form E (ED soft seal)	Tightening torque in Nm ISO 1179-4 Form B (metal sealing edge)	Tightening torque in Nm ISO 1179-3 Form G, H (O-ring chamber ring)	Tightening torque in Nm for screw plugs	Tightening torque in Nm for banjo fittings
L	G 1/8"	20	20	25	12	25
L	G 1/4"	50	40	50	18	40
L	G 3/8"	80	80	80	40	80
L	G 1/2"	100	150	105	75	120
L	G 3/4"	200	200	220	110	180
L	G 1"	380	380	370	190	300
L	G 1 1/4"	500	600	500	240	300
L	G 1 1/2"	600	700	600	300	600
S	G 1/8"				12	25
S	G 1/4"	60	60		18	40
S	G 3/8"	90	100		40	80
S	G 1/2"	130	170		75	120
S	G 3/4"	200	320		110	180
S	G 1"	380	380		190	300
S	G 1 1/4"	500	600		240	300
S	G 1 1/2"	600	800		300	600

Series	Thread	Tightening torque in Nm ISO 9974-2 Form E (ED soft seal)	Tightening torque in Nm ISO 9974-3 Form B (metal sealing edge)		Tightening torque in Nm for screw plugs	Tightening torque in Nm for banjo fittings
L	M10x1	20	20		12	25
L	M12x1,5	30	30		18	30
L	M14x1,5	50	50		20	50
L	M16x1,5	60	70		35	60
L	M18x1,5	80	90		50	70
L	M22,1,5	140	150		70	130
L	M26x1,5	200	210		85	140
L	M33x2	380	380		150	280
L	M42x2	500	550		280	280
L	M48x2	600	700		350	500
S	M10x1				12	25
S	M12x1,5	45	45		18	30
S	M14x1,5	60	60		20	50
S	M16x1,5	80	90		35	60
S	M18x1,5	100	120		50	70
S	M20x1,5	140	170		60	110
S	M22x1,5	150	190		70	130
S	M26x1,5				85	140
S	M27x2	200	320		100	150
S	M33x2	380	450		150	280
S	M42x2	500	600		280	280
S	M48x2	600	800		350	500

T

13. DETERMINATION OF PRESSURE LOSS IN PIPELINES

The pressure losses that inevitably occur in pipeline systems can be recorded either by measuring equipment or by calculation.

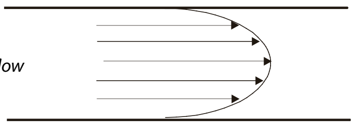
Determination of these losses precisely by calculation is associated with considerable effort, but at this point we are reproducing a few simple equations that can be used to determine approximate pressure losses in straight pipelines and fittings.

The pressure losses and flow resistance in a line system are dependent on the internal diameter of the pipe, the flow velocity and the properties of the hydraulic oil (density and viscosity).

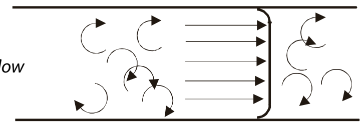
Pressure losses are caused by "fluid friction", i.e., the friction between the oil and the pipe walls, and the internal friction within the fluid.

Above a certain velocity, the laminar flow of the oil becomes a turbulent flow. Turbulent flows lead to greater heat generation in the system, with consequential losses of pressure and performance.

Laminar flow



Turbulent flow



The behaviour of the flow is also characterised by the Reynolds number Re.

If this Re number exceeds a given value, the laminar oil flow becomes a turbulent flow.

In pipelines, laminar flow is most desirable. Turbulent flow occurs most often in valves, couplings and ball valves.
The pressure losses in straight pipelines can be determined approximately with the aid of the following equations:

$$\Delta p = \lambda \times \frac{l \times \rho \times V^2 \times 10}{d \times 2} \quad \text{in bar}$$

Δp = Pressure loss in a straight pipeline (laminar or turbulent flow) in bar
λ = Pipe friction index
ρ = Density of the hydraulic oil in kg/dm^3, ρ = 0.89 kg/dm^3 = 890 kg/m^3
l = Line length in metres m
v = Flow velocity of the oil in the line in m/s
d = Internal diameter of the line in mm
v = Kinematic viscosity in cSt or mm^2/s
Q = Fluid stream in the line in l/min

HANSA FLEX

Pipe friction number for laminar flow, Re‘2320

$$\lambda_{lam.} = 64/\mathrm{Re}$$

Pipe friction number for turbulent flow, Re∃2320

$$\lambda_{turb.} = \frac{0.316}{\sqrt[4]{\mathrm{Re}}}$$

Reynolds number

$$\mathrm{Re} = \frac{V \times d}{\nu} \times 10^{3}$$

Flow velocity

$$V = \frac{Q}{6 \times d^{2} \times \frac{\pi}{4}} \times 10^{2}$$

Example:

For a straight pipeline having l = 1 m and internal diameter d = 25 mm.
The flow volume Q is 150 l/min and the flow velocity of the oil is 5 m/s.
A standard hydraulic oil HLP 46 is used, having a kinematic viscosity of

ν = 46 mm^2/s = 46 cSt and a density of 0.89 kg/dm^3
Calculate the pressure loss occurring over the total length of 1 m.

Solution:

1. Determination of Reynolds number Re:

$$\mathrm{Re} = \frac{V \times d}{\nu} \times 10^{3} = \frac{5\,{}^{m}\!/_{s} \times 25\,mm}{46\,{}^{mm^2}\!/_{s}} \times 10^{3} = 2713$$

In this case, the Reynolds number is greater than 2320, so turbulent flow conditions exist.

2. Determination of the pipe friction number for turbulent flow

$$\lambda_{turb.} = \frac{0.316}{\sqrt[4]{\mathrm{Re}}} = \frac{0.316}{\sqrt[4]{2713}} = 0.0437$$

3. Calculation of pressure loss over the total length

$$\Delta p = \lambda \times \frac{l \times \rho \times V^{2} \times 10}{d \times 2} = 0.0437\,\frac{1\,m \times 0.89\,{}^{kg}\!/_{dm^3} \times \left(5\,{}^{m}\!/_{s}\right)^{2} \times 10}{2 \times 25\,mm} = 0.194\ bar$$

However, it should be noted that these equations are only valid for straight pipeline sections. But a pipeline system consists of straight and angled sections, also fittings and other products from the inventory of hydraulic connection technology.

Therefore, the pressure losses in the individual elements must be determined separately, either by calculation or measurement, and finally added together to yield the total loss.

For the purpose of determining approximate pressure losses in individual components a drag coefficient ξ is assumed

The pressure loss in a component can be determined according to the following equation:

T

$$\Delta p = \xi \times \rho \times \frac{1}{2} V^2$$

Δp = Pressure loss in the component in bar
ξ = Drag coefficient (no unit)
ρ = Density of the hydraulic oil in kg/dm^3, ρ = 0.89 kg/dm^3 = 890 kg/m^3
v = Flow velocity of the oil in the line in m/s

It should be noted that the pressure losses can be affected by many other factors occurring in the components represented, and these calculations only allow of an approximate determination.
Therefore, in important situations, tests should be carried out on a test bench.

ASSEMBLY INSTRUCTIONS, CUTTING RING / COMPRESSION FITTING

Hydraulic lines are capable of causing serious personal injury and environmental damage, but this danger is very often underestimated in practice. Incorrect assembly or improper use of threaded connectors, pipes, and accessories can compromise the product's functional reliability, causing it to fail and possibly pose a threat to people and equipment. In extreme cases, violently spraying oil and ruptured lines can even cause fatal injuries.

We therefore recommend most strongly that these assembly instructions be strictly followed!

Machinery manufacturers and operators must also fulfil additional obligations. They are responsible for:

- ensuring that pipelines and threaded connections are used in compliance with the respective specifications
- guaranteeing scheduled monitoring and systematic inspections by authorised personnel with the appropriate qualification and knowledge of hose line equipment
- detecting and eliminating defects

This active assumption of responsibility is enshrined in the legal framework. Based on the principles of industrial safety, the equipment and product safety act, the machine and pressure device directive and the ordinance on industrial safety and health, tasks are specified further and set out in procedural regulations for those concerned.

This guide supplements the pertinent standards, guidelines and regulations. It reflects the current state of the art. No claims are made regarding completeness.

Note: All tools and materials must be checked before each assembly procedure to ensure that they are good condition.

CONTENT

ASSEMBLING A STEEL CUTTING RING
1. Full cutting ring assembly in hardened assembly stud
2. Full cutting ring assembly in screw sleeve
3. Pre-assembly in assembly stud or screw sleeve
4. Finishing assembly of manufacturer-assembled threaded connectors in screw sleeve

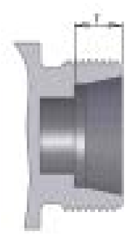
ASSEMBLING 24° SEALING CONE SCREW-ON FITTINGS (AOL/AOS)
5. Assembly of HANSA-FLEX 24° sealing cone screw-on fittings

ASSEMBLING STAINLESS STEEL CUTTING RING (VA)
6. Pre-assembly in hardened assembly stud
7. Finishing assembly of manufacturer-assembled stainless steel screw sleeves

SUPPORT BUSHES
8. Selecting the correct support bushes

SRWD..VI SOFT SEAL
9. Assembling the SRWD..VI soft seal

For complete cutting ring assembly in an assembly stud, always use assembly studs that have a corresponding depth dimension T!



	T mm ± 0,05			T mm ± 0,05
VOM NW04 HL	7,00		VOM NW03 HS	7,00
VOM NW06 HL	7,00		VOM NW04 HS	7,00
VOM NW08 HL	7,00		VOM NW06 HS	7,50
VOM NW10 HL	7,00		VOM NW08 HS	7,50
VOM NW13 HL	7,00		VOM NW10 HS	8,00
VOM NW16 HL	7,50		VOM NW13 HS	8,50
VOM NW20 HL	7,50		VOM NW16 HS	10,50
VOM NW25 HL	7,50		VOM NW20 HS	12,00
VOM NW32 HL	10,50		VOM NW25 HS	13,50
VOM NW40 HL	11,00		VOM NW32 HS	16,00
The tolerances for the LL series are the same as the tolerances for the L series				

- Pipes must be cut to size at right angles ±0.5° before all pipe fitting operations. Pipe cutters or angle grinders may not be used for this.
- Lightly deburr the insides and outsides of pipes.
- After deburring, clean the pipes.
- Use support bushes for thin-walled pipes.
- Markings (position of the nut) make it easier to determine the number of turns for path-dependent assembly.
- If necessary, use appropriate spanner extensions.

T

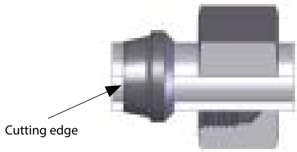
1. FULL CUTTING RING ASSEMBLY IN HARDENED ASSEMBLY STUD (VOMNW…)

INTRODUCTION

- **This instruction describes the complete assembly of a cutting ring (SRD) on the pipe in an assembly stud (VOMNW…). This is not pre-assembly!**

PREPARATION

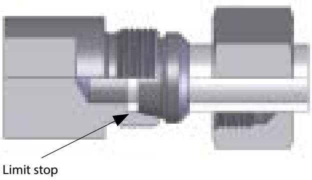
- Lightly lubricate the thread and cone of the assembly stud and the thread of the union nut.

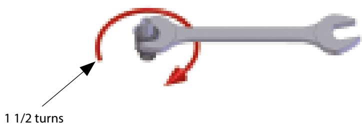


- Slide the union nut and cutting ring onto the pipe, making sure that the cutting ring is in the correct position; the cutting edges of the cutting ring must face towards the end of the pipe, otherwise assembly will be incorrect.

CUTTING RING ASSEMBLY

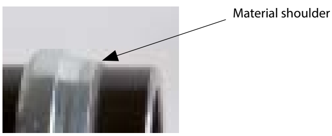
- Tighten the union nut until the force required to turn it* increases noticeably; at the same time, push the pipe firmly against the limit stop in the assembly stud, otherwise the pipe will not be cut properly. The pipe must not be allowed to turn during assembly.
- Tighten union nut 1½ turns with a spanner.





INSPECTION

- Disassemble the pipe or threaded connection and check that a clearly visible shoulder of cut material is present in front of the first (front) cutting edge. At this point, the cutting ring may be allowed to rotate, but must not move axially.



RE-ASSEMBLY

- Oil the threads of the union nut and the screw sleeve. Thread the union nut onto the screw fitting until the force required to turn it* increases noticeably. Turn the union nut of the threaded connection or pipe not more than 1/4 turn further with the spanner (tighten / tighten fully).

The cones of the assembly studs are subject to normal wear and must be checked at regular intervals with taper gauges.

* Definition of "noticeably increased force":
Tighten the union nut until the point at which it becomes noticeably more difficult to turn the union nut. At this point, for example, minor damage on the thread caused by the union nut getting caught must be overcome.
With sealing cone screw-on fittings with O-ring (AOL / AOS), the pre-stressing of the O-ring must be bridged and the sealing cone must lie metallically flush against the cone of the HL/HS connector.

T

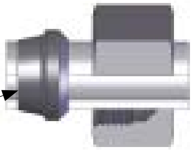
2. FULL CUTTING RING ASSEMBLY IN SCREW SLEEVE

INTRODUCTION

- **This instruction describes the complete assembly of a cutting ring (SRD) on the pipe in a screw sleeve. This is not pre-assembly!**

PREPARATION

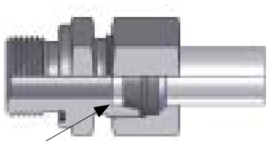
- Lightly oil the cone of the screw sleeve and the thread of the union nut.

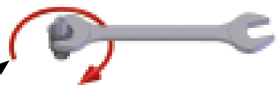


- Slide the union nut and cutting ring onto the pipe, making sure that the cutting ring is in the correct position; the cutting edges of the cutting ring must face towards the end of the pipe, otherwise assembly will be incorrect.

CUTTING RING ASSEMBLY

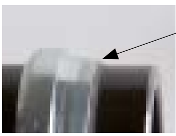
- Tighten the union nut until the force required to turn it* increases noticeably; at the same time, push the pipe firmly against the limit stop in the assembly stud, otherwise the pipe will not be cut properly. The pipe must not be allowed to turn during assembly.
- Tighten union nut 1½ turns with a spanner. Brace the screw sleeve with a spanner.





INSPECTION

- Disassemble the pipe and check that a clearly visible shoulder of cut material is present in front of the first (front) cutting edge. At this point, the cutting ring may be allowed to rotate, but must not move axially.



RE-ASSEMBLY

- Oil the thread of the union nut, the cutting ring and the screw sleeve thread. Thread the union nut onto the screw fitting until the force required to turn it* increases noticeably. Turn the union nut of the threaded connection or pipe not more than 1/4 turn further with the spanner (tighten / tighten fully).

Each screw sleeve must be used only once to assemble a cutting ring on the pipe; using the same sleeve again may impair its function. For pipes with a diameter greater than 30 mm we recommend assembling in a bench vice.

* Definition of "noticeably increased force":
Tighten the union nut until the point at which it becomes noticeably more difficult to turn the union nut. At this point, for example, minor damage on the thread caused by the union nut getting caught must be overcome.
With sealing cone screw-on fittings with O-ring (AOL / AOS), the pre-stressing of the O-ring must be bridged and the sealing cone must lie metallically flush against the cone of the HL/HS connector.

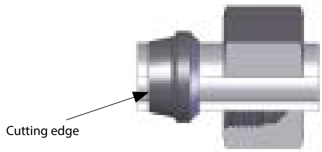
3. PRE-ASSEMBLY IN ASSEMBLY STUD OR SCREW SLEEVE

INTRODUCTION

- **This instruction describes the pre-assembly of a cutting ring (SRD) on the pipe in a pipe screw sleeve or assembly stud.**

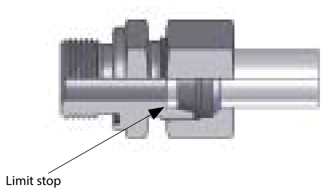
PREPARATION

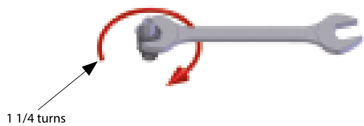
- Lightly oil the cone of the screw sleeve and the thread of the union nut.
- Slide the union nut and cutting ring onto the pipe, making sure that the cutting ring is in the correct position; the cutting edges of the cutting ring must face towards the end of the pipe, otherwise assembly will be incorrect.



CUTTING RING ASSEMBLY

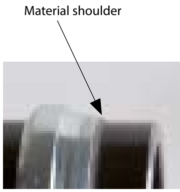
- Tighten the union nut until the force required to turn it* increases noticeably; at the same time, push the pipe firmly against the limit stop in the screw sleeve, otherwise the pipe will not be cut properly. The pipe must not be allowed to turn during assembly.
- Tighten union nut 1/4 turn with a spanner. Brace the screw sleeve with a spanner.





INSPECTION

- Disassemble the pipe and check that a clearly visible shoulder of cut material is present in front of the first (front) cutting edge. In this case, the cutting ring may be allowed to rotate, but must not move axially.



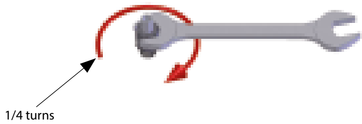
* Definition of "noticeably increased force":
Tighten the union nut until the point at which it becomes noticeably more difficult to turn the union nut. At this point, for example, minor damage on the thread caused by the union nut getting caught must be overcome.
With sealing cone screw-on fittings with O-ring (AOL / AOS), the pre-stressing of the O-ring must be bridged and the sealing cone must lie metallically flush against the cone of the HL/HS connector.

T

4. FINISHING ASSEMBLY OF MANUFACTURER-ASSEMBLED THREADED CONNECTORS IN SCREW SLEEVE

- In these threaded connections, the cutting ring has been pre-assembled by the manufacturer.
- Check that the cutting ring is positioned and seated correctly, and that the shoulder of cut material is present.
- Oil the thread of the union nut, the cutting ring and the screw sleeve thread.
- Tighten the union nut until the force required to turn it increases noticeably*.
- Tighten union nut 1/4 turns, bracing the screw sleeve with a spanner.

We recommend switching to HANSA-FLEX 24° sealing cone screw-on fittings.



5. ASSEMBLING 24° SEALING CONE SCREW-ON FITTINGS (AOL/AOS)

- Lightly oil the cone of the screw sleeve and the thread of the union nut.
- Place screw fitting (sealing cone) evenly on the theaded connection.
- Thread the union nut of the sealing cone screw-on fitting onto the screw fitting until the force required to turn it* increases noticeably.
- Turn the union nut of the sealing cone screw-on fitting or pipe not more than 1/4 turn further with the spanner (tighten / tighten fully).

*** Definition of "noticeably increased force":**
Tighten the union nut until the point at which it becomes noticeably more difficult to turn the union nut. At this point, for example, minor damage on the thread caused by the union nut getting caught must be overcome.

With sealing cone screw-on fittings with O-ring (AOL / AOS), the pre-stressing of the O-ring must be bridged and the sealing cone must lie metallically flush against the cone of the HL/HS connector.

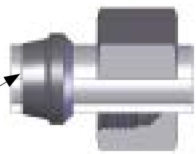
6. ASSEMBLY IN HARDENED ASSEMBLY STUD (VOMNW…) STAINLESS STEEL

INTRODUCTION

- **This instruction describes the pre-assembly of a cutting ring (SRD...VA) on the stainless steel pipe in the assembly stud and the finishing assembly of the cutting ring in the screw sleeve.**

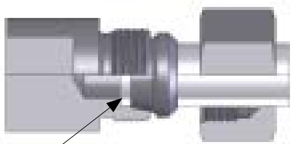
PREPARATION

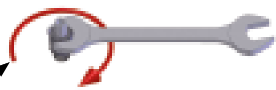
- Grease the thread and cone of the assembly stud and the thread of the union nut with HANSA-FLEX fitting grease.
- Slide the union nut and cutting ring onto the pipe, making sure that the cutting ring is in the correct position; the cutting edges of the cutting ring must face towards the end of the pipe, otherwise assembly will be incorrect.



CUTTING RING ASSEMBLY

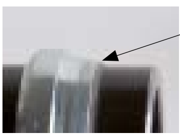
- Tighten the union nut until the force required to turn it* increases noticeably; at the same time, push the pipe firmly against the limit stop in the assembly stud, otherwise the pipe will not be cut properly.
- Tighten union nut 1/4 turn with a spanner.





INSPECTION

- Disassemble the pipe or threaded connection and check that a clearly visible shoulder of cut material is present in front of the first (front) cutting edge. In this case, the cutting ring may be allowed to rotate, but must not move axially.



FINISHING ASSEMBLY

- Grease the threads of the union nut and the screw sleeve with HANSA-FLEX assembly grease. Thread the union nut onto the screw fitting until the force required to turn it* increases noticeably. Continue turning union nut about 1/2 turn with the spanner.

T

RE-ASSEMBLY

- Grease the threads of the union nut and the screw sleeve with HANSA-FLEX assembly grease. Thread the union nut onto the screw fitting until the force required to turn it* increases noticeably. Turn the union nut of the threaded connection or pipe about 1/4 of a turn further with the spanner (tighten / tighten fully).

The cones of the assembly studs are subject to normal wear and must be checked at regular intervals with taper gauges. Each screw sleeve must be used only once for finishing assembly on the pipe; using the same sleeve again may impair its function.

It is not permitted to carry out pre-assembly in the screw sleeve!

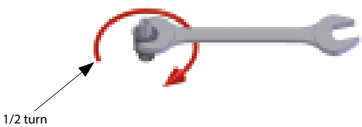
* Definition of "noticeably increased force":
Tighten the union nut until the point at which it becomes noticeably more difficult to turn the union nut. At this point, for example, minor damage on the thread caused by the union nut getting caught must be overcome.

With sealing cone screw-on fittings with O-ring (AOL / AOS), the pre-stressing of the O-ring must be bridged and the sealing cone must lie metallically flush against the cone of the HL/HS connector.

7. FINISHING ASSEMBLY OF MANUFACTURER-ASSEMBLED STAINLESS STEEL THREADED CONNECTORS IN SCREW SLEEVE

- In these threaded connections, the cutting ring has been pre-assembled by the manufacturer.
- Check that the cutting ring is positioned and seated correctly, and that the shoulder of cut material is present.
- Grease the thread of the union nut, the cutting ring and the thread of the screw sleeve with HANSA-FLEX assembly grease.
- Tighten the union nut until the force required to turn it increases noticeably*.
- Tighten union nut about 1/2 turn, bracing the screw sleeve with a spanner.

We recommend switching to HANSA-FLEX sealing cone screw-on fittings.

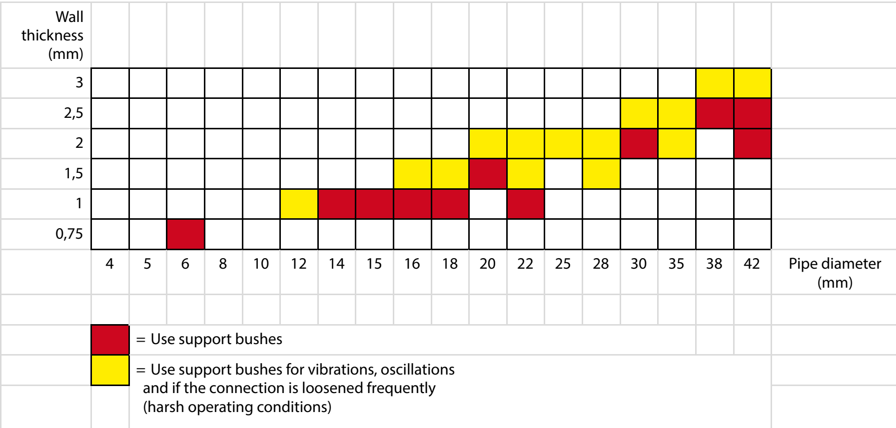


* Definition of "noticeably increased force":
Tighten the union nut until the point at which it becomes noticeably more difficult to turn the union nut. At this point, for example, minor damage on the thread caused by the union nut getting caught must be overcome.

With sealing cone screw-on fittings with O-ring (AOL / AOS), the pre-stressing of the O-ring must be bridged and the sealing cone must lie metallically flush against the cone of the HL/HS connector.

8. CORRECT SELECTION OF SUPPORT BUSHES FOR THIN-WALLED PIPES MADE FROM STEEL AND STAINLESS STEEL

HANSA-FLEX designation VSH..ID
VSH..IDVA

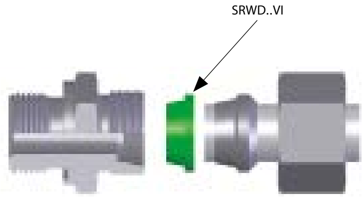


Support bushes must be inserted in the pipe before the cutting ring is assembled in all cases.
It is not permitted to assemble the support bushes later!

T

9. ASSEMBLING THE SRWD..VI SOFT SEAL

- **The SRWD..VI soft seal cannot be assembled unless the cutting ring has already been assembled correctly.**
- Disassemble the pipe and check that a clearly visible shoulder of cut material is present in front of the first (front) cutting edge.
- Slide the SRWD..VI soft seal over the cutting ring.
- Thread the union nut onto the screw fitting until the force required to turn it* increases noticeably.



a) **Fully assembled cutting ring:** Turn the union nut of the threaded connection or pipe about 30° to 60° further with the spanner (tighten / tighten fully).
b) **Pre-assembled cutting ring:** Turn the union nut of the threaded connection or pipe 1/4 turn further with the spanner on pre-assembled cutting rings.

- We recommend replacing the SRWD..VI soft seal whenever the connection is disassembled and re-assembled.

* Definition of "noticeably increased force":
Tighten the union nut until the point at which it becomes noticeably more difficult to turn the union nut. At this point, for example, minor damage on the thread caused by the union nut getting caught must be overcome.

With sealing cone screw-on fittings with O-ring (AOL / AOS), the pre-stressing of the O-ring must be bridged and the sealing cone must lie metallically flush against the cone of the HL/HS connector.

Any other tightening path on the cutting rings and pipe fittings reduces the pressure load capacity and service life of the connections and threaded connections.
As a result, the cutting ring will slip off and leaks will occur!