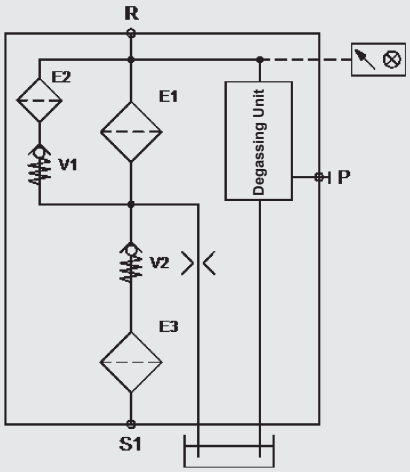
HYDAC INTERNATIONAL

TRU
Tank Reduction Unit

Symbol for hydraulic systems:



R: Return line connections
P: Low-pressure port
S1: Suction port
V1: Bypass valve
V2: Output valve
E1: Filter element
E2: Bypass filter
E3: Salvinia element

1. SIZES

1	2
	

2. TECHNICAL DATA

Filter specifications	
Nominal pressure	10 bar
Nominal flow rate	TRU 1: 400 l/min (max. flow rate 600 l/min) TRU 2: 600 l/min (max. flow rate 900 l/min)
Temperature range	-30 °C to + 100 °C
Material of filter head	Aluminium
Material of filter bowl	Steel
Material of lid	Aluminium
Clogging indicators	
Type	VMF – threaded connection G 1/8"
Pressure setting	2.0 bar
Bypass	
Cracking pressure (V1)	3.0 bar
Miscellaneous	
Seal	NBR (= Nitrile)
Installation	Tank mounting filter
Special models and accessories	Vaccum switch
Spare parts	See spare parts list
Certificates and approvals	on request
Degassing and dewatering unit	
Typical degassing rate*	6 l/h
Achievable residual water content	< 100 ppm – hydraulic oils
Permitted fluids	Mineral oils acc. to DIN 51524
Fluid operating temperature range	40 °C to 100 °C

** Typical values for ISO VG 46, 40°C at gas saturation. The degassing rate depends on the total gas content in the oil, the oil temperature, and especially the oil viscosity. With increasing viscosity, the degassing rate is reduced.*

3. GENERAL DESCRIPTION

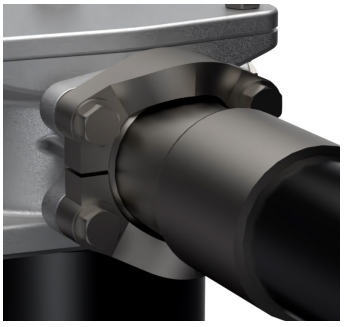
3.1 FILTER HOUSING

Design
The filter housings are designed in accordance with international regulations. They consist of a filter head, filter bowl and a bolt-on lid.

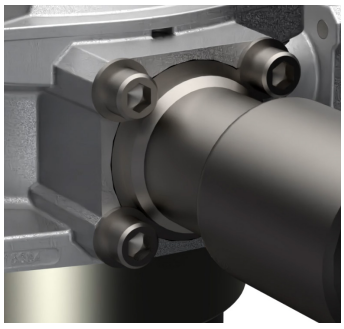
Standard model
- With bypass valve (V1)
- With degassing and dewatering unit

Description
With the TRU, HYDAC has added a revolutionary premium solution with additional active fluid conditioning to its portfolio of products for tank optimisation. Thanks to the integrated, hydraulically actuacted degassing technology, the dissolved and free air is removed from the tank and the oil is simultaneously dewatered offline. In combination with the semi-open circuit, the tank can be dimensioned for the differential operating volume actually needed, reducing its size. The circulation rate is no longer crucial for the dimensioning of the tank size. The reduction in tank size of 60% to 80% of the original volume can thus be achieved. Using the TRU thus gives OEMs and users considerable cost savings thanks to less material use, less oil and lower operating costs.

CS connection
The TRU's very special cost-saving (CS) connections are based on ISO 6162-1/-2 (SAE J518). They correspond to the sizes DN 32 and DN 51. A flanged head can be fastened to the housing directly. No split flanges are needed. This not only saves costs but also makes installation easier and faster.



Standard flange connection with flange halves



CS connection

3.2 FILTER ELEMENTS

The filter elements used in the TRU stand out for their low back-pressures, especially at high viscosities (e.g. cold starts).

They are validated and their quality is constantly monitored according to the following standards:
ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889.

The filter elements are supplied with a **collapse pressure** of **10 bar**.

3.3 COMPATIBILITY WITH OPERATING FLUIDS (ISO 2943)

- Hydraulic oils HL to HVLP (DIN 51524)

3.4 DEGASSING AND DEWATERING UNIT

The TRU can only perform active degassing and dewatering if a constant flow is applied at the low-pressure port (P).

The following conditions must be met:

• Required operating pressure:	p_{in} = 25–40 bar
• Required flow rate:	Q_{in} = 4–6 l/min
• Operating fluid:	Mineral oil acc. to DIN 51524
• Perm. contamination level:	21/19/16 or better
• ISO viscosity grade:	max. ISO VG 68

3.5 MODEL CODE

The model code is issued individually for the specific project.

Example:

• Filter assembly	TRU 1 A.X/-xxxxxxxx
• Replacement element	ELEMENT TRU 1 C
• Clogging indicator	VMF 2 F.X

3.6 NOTICES

- The filter housings must be earthed e.g. via the system/pipe.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

4. FILTER CALCULATION

The total pressure drop of a filter at a certain **flow rate Q** and a **viscosity v** consists of the sum of the **housing pressure drop $\Delta p_{housing}$** and the **element differential pressure $\Delta p_{element}$** and can be calculated as follows:

$$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$$

$\Delta p_{housing}$ [bar] = See performance curves

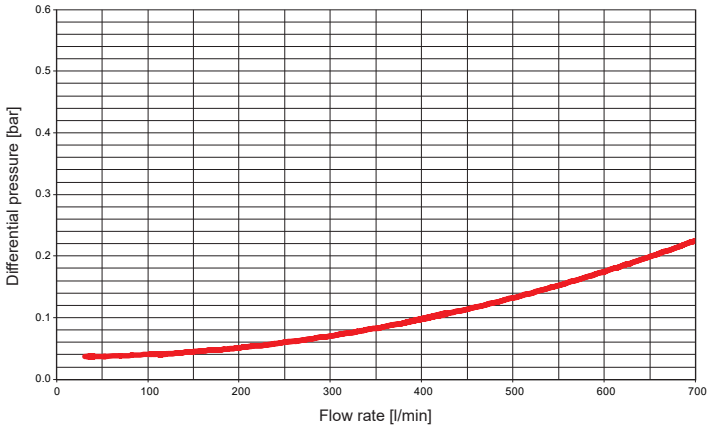
$$\Delta p_{element}\ [bar] = Q\ [l/min] \cdot \frac{SK\ [mbar/(l/min)]}{1000} \cdot \frac{v\ [mm^2/s]}{30}$$

SK = gradient coefficient (see 4.2)

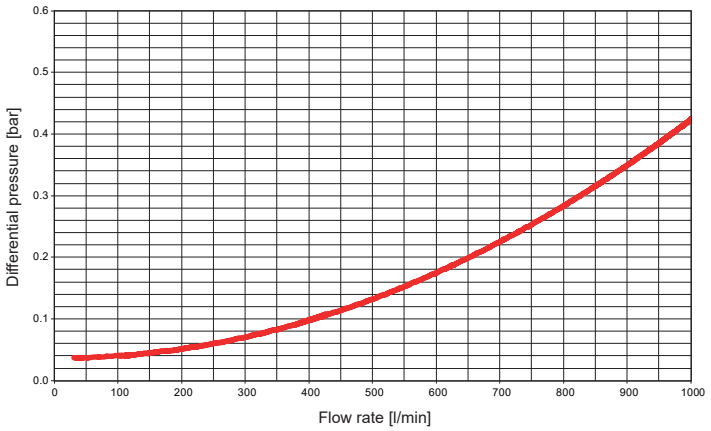
4.1 HOUSING CURVES

The housing curves are based on ISO 3968. The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

TRU 1



TRU 2



4.3 GRADIENT COEFFICIENTS (SK)

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Size	ON	
	3 µm	10 µm
1	1.69	0.67
2	1.11	0.44

4.2 MAXIMUM FLOW RATE

The following maximum permitted flow rates (Qmax) are possible for the various sizes and connection sizes in l/min:

Size	Q_{max} [l/min]
1	600
2	900

Information regarding dimensioning:

The hydraulic load on the filter element is primarily determined by the flow rate and the geometry of the particular filter element. Exceeding the maximum permitted flow rate (Q_{max}) and therefore the permitted hydraulic load can destroy the filter element.

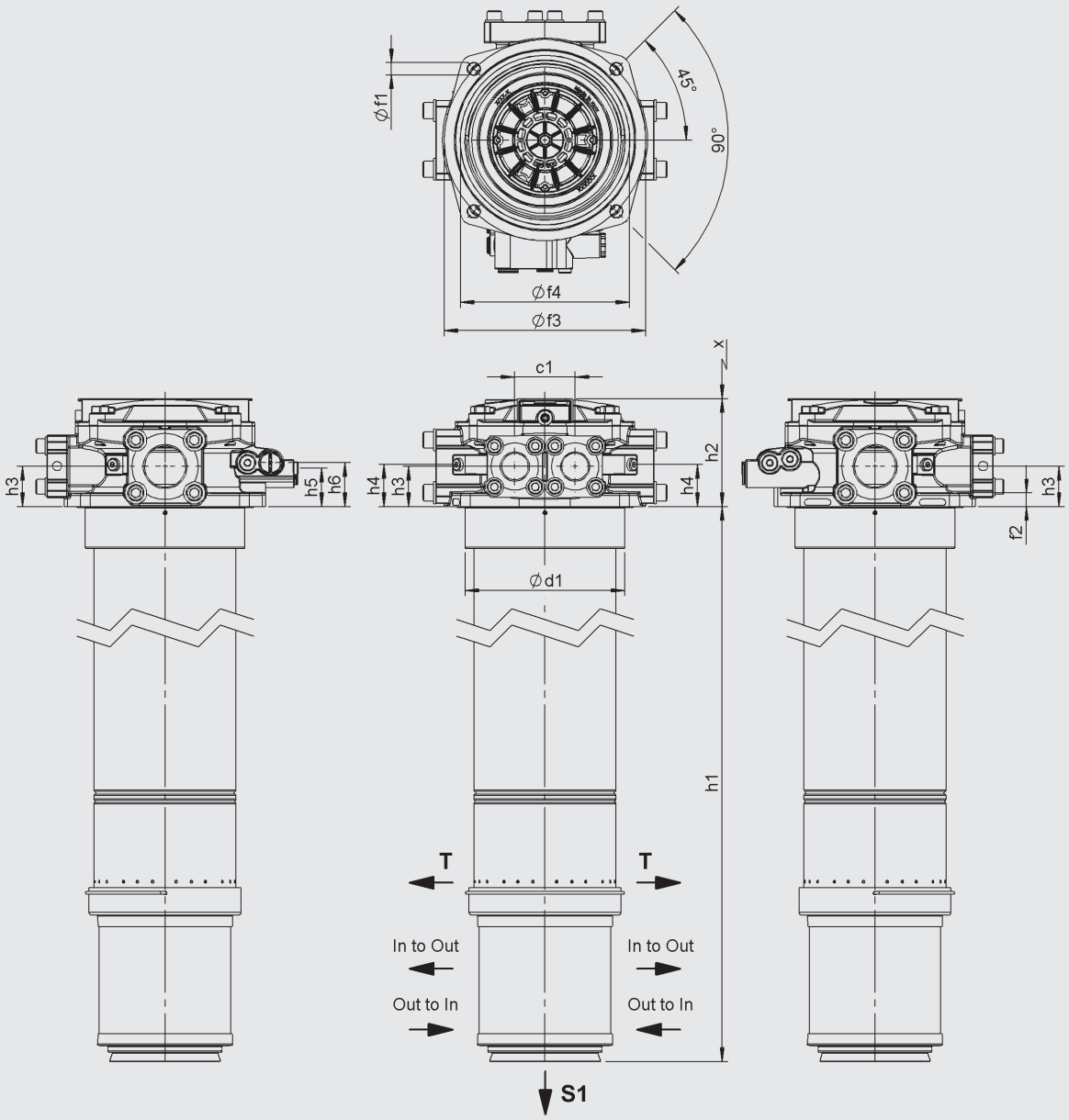
Adherence to the maximum permitted flow rate should always be ensured throughout the system project planning process.

Even the choice of operating medium can influence system performance and lead to problems during use such as electrostatic discharges.

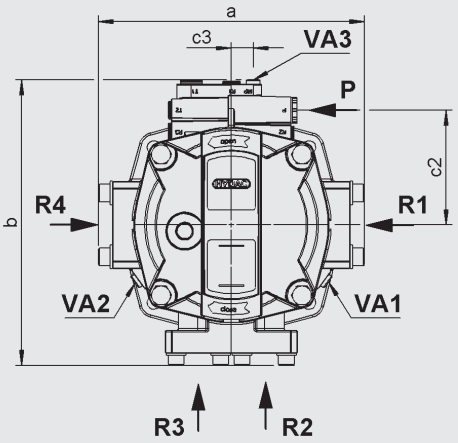
If you have any questions regarding dimensioning or project planning, please contact the Technical Sales Department at HYDAC Filtertechnik.

5. DIMENSIONS

5.1 DIMENSIONS AND CONNECTIONS



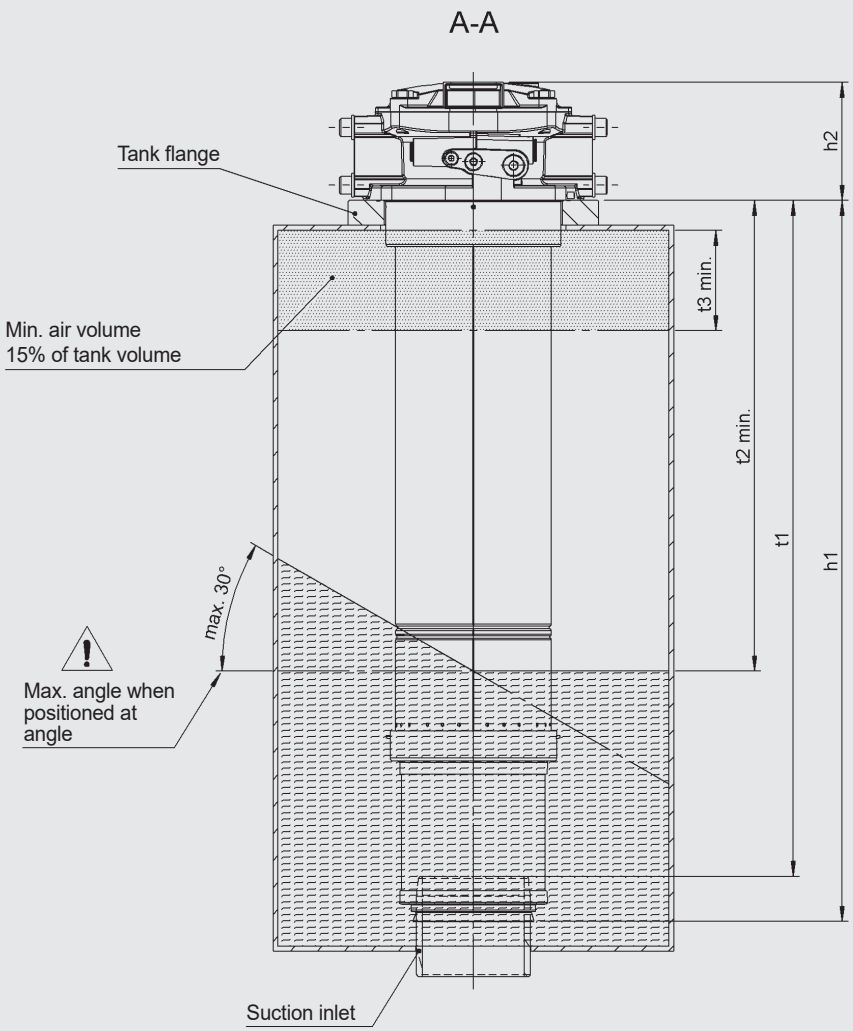
	Type	Dimension
R1	Return line connection	CS* – 2" ISO 6162-1/-2 (SAE J518)
R2		CS* – 1 ¼" ISO 6162-1/-2 (SAE J518)
R3		CS* – 1 ¼" ISO 6162-1/-2 (SAE J518)
R4		CS* – 2" ISO 6162-1/-2 (SAE J518)
S1	Suction port	4"
P	Low pressure	3/4 – 16 UNF
VA1	Clogging indicator	G 1/8"
VA2		G 1/8"
VA3		G 1/8"

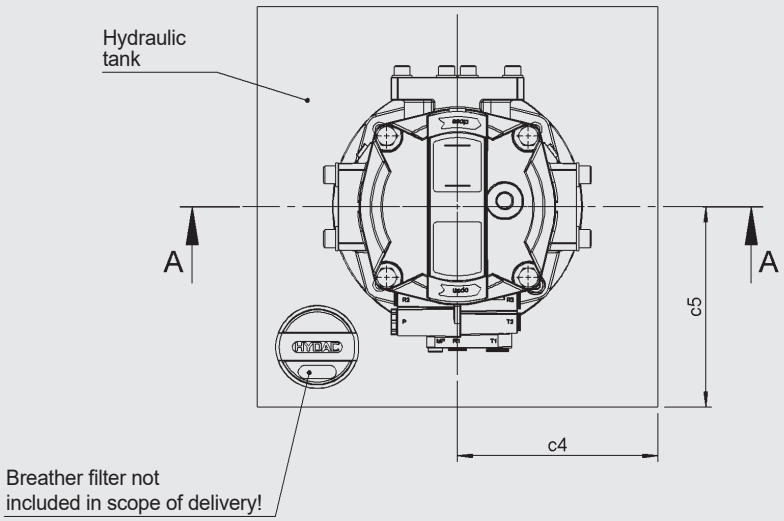


VA = clogging indicator

Size	a	b	c1	c2	c3	Ø d1	Ø f1	f2	Ø f3	Ø f4	h1	h2	h3	h4	h5	h6	x	Weight	Content
1	267	286	66	115	22	174.5	13.5	15	220	185.3	575	118	44	46	42	48	320	13.0 kg	11.0 L
2											720						465	14.0 kg	13.7 L

5.2 TANK MOUNTING SITUATION





Tank configuration

The required size of the hydraulic tank can be calculated from the actual volume differences of cylinders, accumulators, hoses etc. present in the system. In addition, it is necessary to consider a required volume for the thermal expansion of the oil and possible continuous oil losses. This volume (except for accumulators) should be doubled as a safety margin.

Rule of thumb:

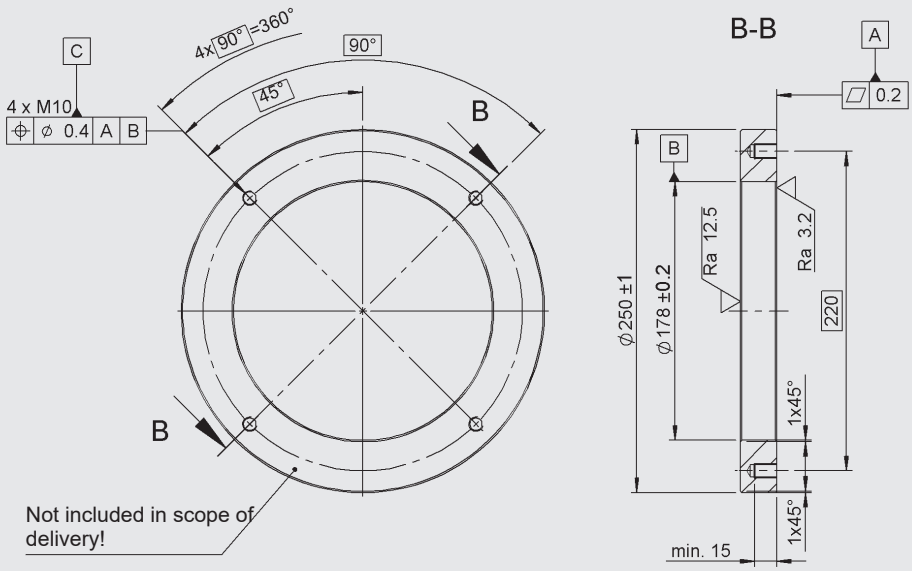
Sum of total accumulator volume + 2x sum of volume difference for cylinders, hoses, temperature expansion, etc.
= hydraulic tank oil volume

Also, it is necessary to check whether the total oil volume in the system needs to be returned to the tank when maintenance work is carried out.

Size	c4	c5	h1	h2	t1	t2 min.	t3 min.
1	min. 200	min. 200	575	118	h1 – 45	h1 – 250	~ 120
2			720				

5.3 TANK FLANGE

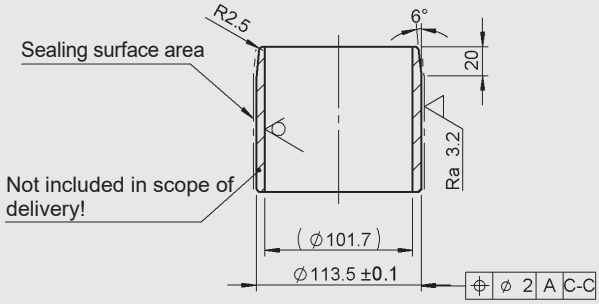
Tank flange



Notice:

- The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter. If the tank sheet metal is sufficiently stiff, the stud bolts can be resistance butt welded. As an alternative, the tank flange can be continuously welded from the inside.
- Both the tank sheet metal and the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

Suction inlet – 4" – DN 102



NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications and/or operating conditions not described please contact the relevant technical department.

Subject to technical modifications.

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