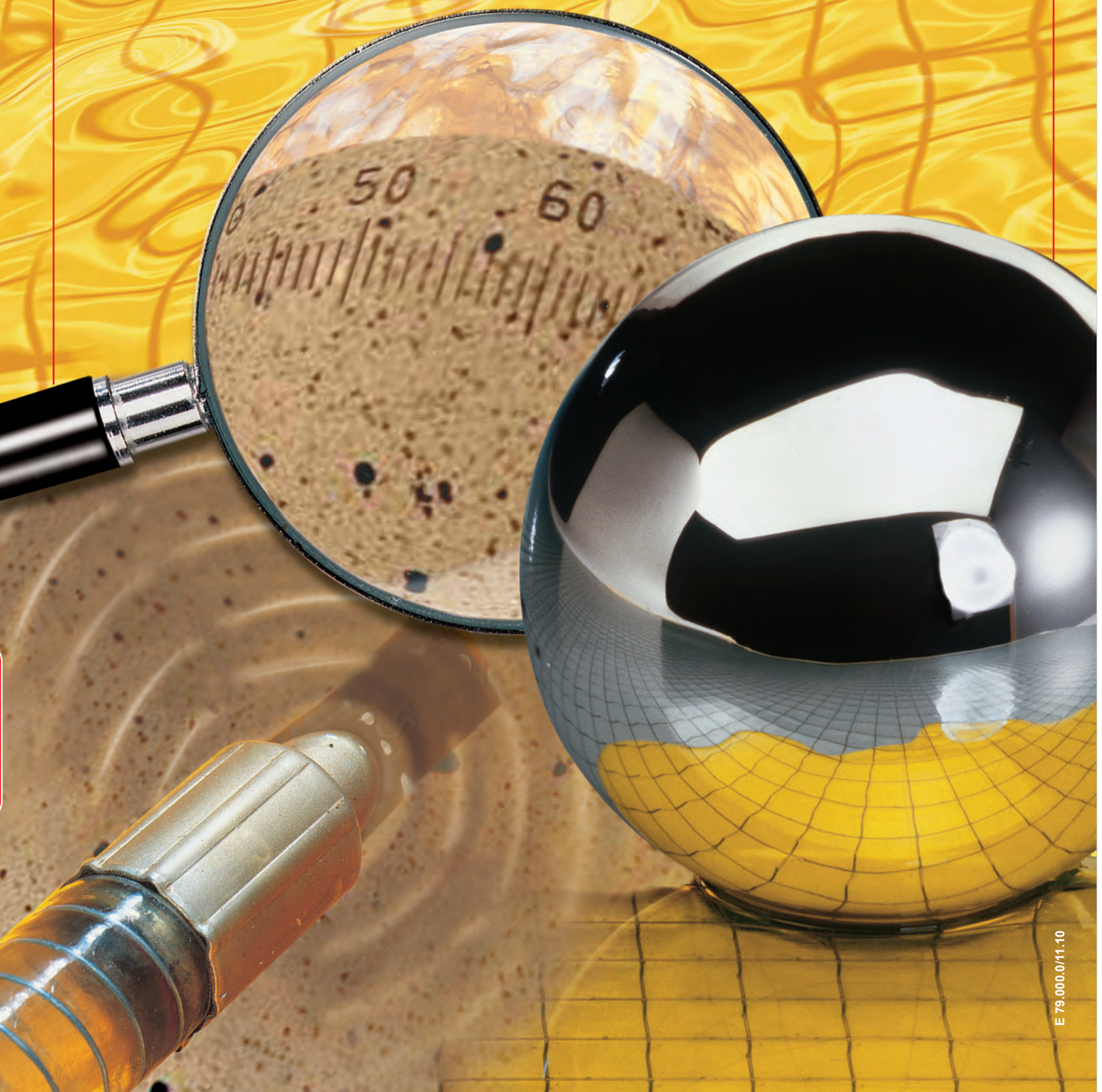
HYDAC INTERNATIONAL

Filter Systems.
Product Catalogue.



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HYDAC FILTER SYSTEMS...

HYDAC was founded in 1963 in Sulzbach / Neuweiler, where the Group Headquarters are still located today.
With over 5,000 employees, HYDAC is one of the leading suppliers of fluid technology, hydraulic and electronic equipment.

The corporation is made up of 15 independent companies. Furthermore, you can contact HYDAC quickly via its network of 10 sales offices in Germany, 50 overseas companies covering all continents and over 500 service partners worldwide.

From components to systems, HYDAC has for many years been supplying reliable products to all sectors of industry and, as an experienced partner, has supported its customers in the field of fluid service.

...more than just filter systems

Founded in 2008, HYDAC Filter Systems GmbH developed from the Filtration Technology division into an independent product division.

Hand in hand with our customers and partners, we work daily on new challenges and develop new solutions. Direct contact with our customers, proximity to the market and looking beyond our own horizons are fundamental to the continuous improvement and expansion of our product range.

As a versatile supplier of fluid service products and services, finding a solution for the customer is our priority.

The initial areas of activity in fluid service have over the years been extended by close cooperation with our customers and partners and have developed into the closely related areas of fluid monitoring and technical cleanliness.

Note

The information in this brochure relates to the operating conditions and applications described. For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

Contents

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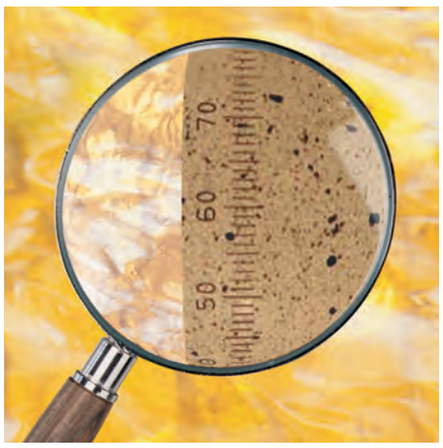
1. HYDAC FILTER SYSTEMS FOR...



Fluid Condition Monitoring

Monitoring the operating fluid from hydraulic and lubrication systems to design a condition-based maintenance programme.

- Measured variables: particle count, contamination according to ISO/SAE/NAS, water saturation
- Solutions for permanent system integration, including hydraulic and electrical adaptation (online condition monitoring)
- Plug & Play measuring equipment for short-term system analysis (offline condition monitoring)

Benefits:

- Extension of maintenance intervals
- Critical machine conditions are identified in good time
- Protection from unjustified complaints
- Basis of a guaranteed availability concept, maintenance scheduling, etc.
- Reduction in the Life Cycle Cost (LCC)

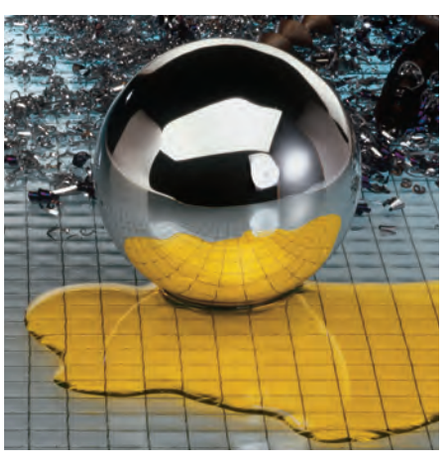
Fluid Conditioning

Stationary and mobile fluid servicing systems for filtering, dewatering, degassing and conditioning operating fluids.

- Removal of particle contamination, water, oil ageing products and gases
- Mobile and stationary conditioning systems
- Supplied ready for integration of fluid sensors
- Filter element technology specifically for offline use
- Excellent contamination retention capacity
- Low filtration ratings

Benefits:

- Improvement in service life of components and system filters
- Greater machine availability
- Longer oil change intervals
- Reduction in the Life Cycle Cost (LCC)



Technical Cleanliness

Test equipment for analyzing the technical cleanliness of components and systems.

- Extraction processes: spraying, rinsing, ultrasound (laboratory)
- Simple operation via PC-controlled sequence
- Indirect cleanliness analysis of the rinsing fluid via particle counter (end use simulation)
- Reliable and reproducible analysis results

Benefits:

- Reduction in costs as a result of fewer production failures
- Identification and elimination of weak spots in processes
- Reduction in start-up breakdowns
- Optimization of all internal and external handling processes
- Documentation of the technical cleanliness of components and systems according to standards ISO 16232 / ISO 18413

2. INDUSTRIES AND APPLICATIONS

The wide range of uses for the products from HYDAC Filter Systems ensures that they have applications in numerous sectors of industry.

Steel industry

- Fluid condition monitoring and fluid conditioning in hydraulic circuits and lubrication systems e.g. of presses, rolling mills, central hydraulics

Paper industry

- Fluid condition monitoring and fluid conditioning on calenders, refiners, dryer section/wet-end

Plastics industry

- Fluid condition monitoring and fluid conditioning to increase machine availability

Power industry

- Fluid condition monitoring and fluid conditioning of lubrication systems on turbines, boiler feed pumps, transmissions etc.

Automotive

- Monitoring the technical cleanliness of components and systems
- Process chain analysis
- Optimization of industrial part washers which are critical to cleanliness
- Fluid condition monitoring and fluid conditioning on hydraulic and lubrication systems of presses, machine tools, plastic injection moulding machines, test rigs

Machine tools

- Fluid condition monitoring and fluid conditioning on hydraulic and lubrication systems

Mining

- Fluid conditioning on mining and conveyor systems

Offshore

- Fluid condition monitoring and fluid conditioning on hydraulic and lubrication systems

Marine

- Fluid condition monitoring and fluid conditioning on hydraulic and lubrication systems

Aviation

- Fluid condition monitoring and fluid conditioning on hydraulic and lubrication systems on test rigs, fluid conditioning on kerosene filling stations

Wind power

- Fluid condition monitoring on transmissions and hydraulic systems
- Fluid conditioning on transmission systems

Mobile hydraulics

- Technical cleanliness including monitoring of the delivery condition as supplied on flushing and function test rigs
- Offline filtration and dewatering to clean biodegradable fluids and hydraulic oils

3. PRODUCT NAVIGATOR

3.1 MEASUREMENT AND ANALYSIS SYSTEMS

HYDAC offers a comprehensive range of easy-to-use measurement and analysis equipment. It is ideal for dealing with particle or liquid contaminants, no matter whether sporadic checks or permanent installation is required, whether in the laboratory or in the field. HYDAC offers the right tool for every application:

- Fluid sensors (to measure particle contamination and water saturation)
- Sampling systems
- Laboratory equipment
- Component analysis equipment
- Software and controls

Benefits:

- Availability of systems and components can be planned
- Prevention of sudden breakdowns
- Reduction of operational costs
- Prevention of catastrophic damage to systems and the subsequent supply shortages
- Preventative and condition-based maintenance

3.1.1 **Fluid sensors**
(to measure particle contamination and water saturation)

CS 1000 *Page 11*
ContaminationSensor
Compact optical particle counter

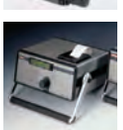
CS 2000 *Page 15*
ContaminationSensor
Optical particle counter

CSM 1000 *Page 19*
ContaminationSensor Module
Plug & Play unit for determining particle contamination and water content (optional) in the oil

CSM 2000 *Page 23*
ContaminationSensor Module
Plug & Play unit for determining particle contamination and water content (optional) in the oil

MCS 1000 *Seite 27*
MetallicContaminationSensor
Inductive particle counter

FCU 1000 *Page 29*
FluidControl Unit
Portable particle counter



FCU 2000 *Page 31*
FluidControl Unit
Portable particle counter

FCU 8000 *Page 37*
FluidControl Unit with BottleSampling Unit
Portable particle counter with bottle sample analysis unit

AS 1000 *Page 41*
AquaSensor
Water sensor to detect dissolved water (percentage water saturation)

AS 2000 *Page 43*
AquaSensor
Water sensor to detect dissolved water (percentage water saturation)

AS 8000 *Page 45*
AquaSensor
Water sensor to detect free water

FMM *Page 47*
FluidMonitoring Module
Ready-to-connect module for determining levels of particle contamination, water saturation and the oil condition (version-dependent)

3.1.2 **Sampling Systems and Laboratory Equipment**

ALPC 9000 *Page 55*
Automated Laboratory Particle Counter
Laboratory system for automatic analysis of sample bottles (500 oil samples / day)

FAS *Page 59*
FluidAnalysis Set
Test kit for analyzing oil samples

FES *Page 61*
FluidSampling Set
Test kit for taking oil samples

MM *Page 63*
Measuring Microscopes
for laboratory applications

WTK 300 *Page 67*
WaterTest Kit
Test kit for determining the water content in the oil

3.1.3 **Component Analysis Equipment / Extraction Equipment**

CTU 1000 *Page 69*
ContaminationTest Unit
Analysis equipment for determining the technical cleanliness of components and systems

CTM-SC *Page 71*
ContaminationTest Module (Supply Control)
Modular system for determining the technical cleanliness of components and systems

CTM-EB *Page 73*
ContaminationTest Module (Extraction Box)
Modular system for determining the technical cleanliness of components and systems

3.1.4 **Software and Controls**

SMU 1200 *Page 77*
SensorMonitoring Unit
Microcontroller to display, store and transfer measured values within a PC-network

SMU 1100 *Page 79*
SensorMonitoring Unit
Microcontroller to display, store and transfer measured values within a PC-network

CSI-B-1 *Page 81*
ConditionSensor Interface
Interface converter
HSI → analogue

CSI-B-2 *Page 83*
ConditionSensor Interface
Interface converter
HSI → RS 232 / RS 485

CSI-D-5 *Page 85*
ConditionSensor Interface
Interface converter
RS 485 → USB

CoCoS
ContaminationControl Software
Software for operating HYDAC particle counters CS 2000 and FCU 2000

FluMoS
FluidMonitoring Software
Software for importing, displaying and processing data from HYDAC fluid sensors with HSI interface

FluMoT
FluidMonitoring Toolkit
Driver package for linking HYDAC fluid sensors to customer's own PC software

3.2 FLUID SERVICE SYSTEMS

3.2.1 **Mobile Filter Systems**

For servicing several systems, there are convenient mobile units for particle filtration:

- Portable filtration units
- Mobile filtration units

Benefits:

- Filling and flushing is clean and efficient
- Flexible since can be used on different systems
- Relieves the main filters
- Greater system availability
- Reduction in the Life Cycle Cost

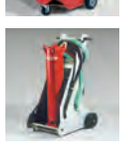
OF 7 *Seite 89*
Filtration Unit
Portable offline filtration unit up to 15 l/min
(optional with integrated contamination sensor)

OF 5 Mobile *Page 93*
Filtromat
Mobile offline filtration unit up to 40 l/min
(optional with integrated contamination sensor)

OF 5 with FCU *Page 97*
Filtromat
Mobile offline filtration unit
up to 40 l/min with integrated particle counter

TW 5 *Page 101*
Mobile Oil Transport and Filtration Unit
Mobile offline filtration unit
up to 40 l/min, tank volume: 200 l

FCC *Page 105*
FluidCarrier Compact
Mobile offline filtration unit
up to 15 l/min, tank volume: 70 l



FCM *Page 109*
FluidCleaner Mobil
Mobile offline filtration unit
up to 100 l/min

FT5 *Page 113*
Barrel Transportation and Filtration Trolley
up to 40 l/min; for standard 200 l drums

OFU *Page 117*
Filter Pump Transfer Unit
up to 100 l/min

3.2.2 **Stationary Filter Systems**

These units in their many versions are installed permanently offline. Stationary filter systems from HYDAC are designed to remove particles (with or without integrated fluid sensors)

Benefits:

- Offline filter for working filtration
- Easy to retrofit to existing systems
- Relieves the main filters
- Greater system availability
- Reduction in the Life Cycle Cost

OF 5 *Page 123*
Filtromat
Stationary offline filtration unit
up to 40 l/min

OF 5 Mini *Page 127*
Filtromat
Stationary offline filtration unit
up to 15 l/min

MRF *Page 131*
MultiRheo Filter
Stationary offline filter
up to 2,000 l/min

AMRF *Page 143*
Automotive MultiRheo Filter
Stationary offline filter (automotive)
up to 1,500 l/min

OLF 5 *Page 151*
OffLine Filter
Compact, stationary offline filtration unit
up to 15 l/min

OLF 15/30/45/60 *Page 159*
OffLine Filter
Stationary offline filtration unit
up to 60 l/min

3.2.3 **Dewatering / Degassing and other Fluid Service Systems**

The HYDAC product range has both mobile and stationary fluid service systems.

- Dewatering uses vacuum or coalescence techniques
- Elimination of acids and oil ageing products
- Degassing and servicing transformer oil
- Removal of oil from water

FAM 10 *Page 165*
FluidAqua Mobil
Mobile or stationary unit for dewatering, degassing and filtration

FAM 25-95 *Page 169*
FluidAqua Mobil
Mobile or stationary unit for dewatering, degassing and filtration

OLS *Page 175*
OffLine Separator
Stationary unit for dewatering

TCU *Page 179*
TransformerCare Unit
Service unit for transformers online / onload

IXU *Page 181*
Ion eXchange Unit
Offline unit for servicing non-flam fluids
up to 9 l/min

3.3 FILTER ELEMENTS

For the numerous offline filters in the product range, there are different types of element for removing particles and water, as surface or depth filters.

Benefits:

- Excellent filtration ratings
- Long service life as a result of high contamination retention capacity
- Reduction in the Life Cycle Cost

FM-P *Page 187*
Flexmicron Premium
Pleated elements for use in MRF / AMRF and as Betafit® elements

FM-S *Page 191*
Flexmicron Standard
Depth filter elements for use in MRF / AMRF and as Betafit® elements

FM-E *Page 195*
Flexmicron Economy
Depth filter elements for use in MRF / AMRF and as Betafit® elements

N5DM, N10DM, N5AM, N10AM
Dimicron / Aquamicron
Elements for removing particles and also water from oil

N15DM
Dimicron
Elements with very high contamination retention capacity for removing particles

3.4 HYDRAULIC AND ELECTRICAL ACCESSORIES

There is a wide range of accessories available to ensure the hydraulic and electrical integration of HYDAC products into your system is achieved both quickly and simply.

CM-RE *Page 201*
ConditioningModule-Reservoir Extraction
Vane pump up to 60 bar

SFK *Page 207*
Small Filtration Kit
Small filtration unit complete with motor-pump unit up to 0.4 l/min

Further hydraulic and electrical accessories, with connection examples *Page 209*

4. PRODUCTS

4.1. MEASUREMENT AND ANALYSIS SYSTEMS

ContaminationSensor
CS 1000 Series

Description

The Contamination Sensor CS 1000 series is an online fluid sensor for permanent monitoring of particle contamination in fluids.

The cleanliness results can either be given according to ISO/SAE or ISO/NAS classifications.

This instrument combines the latest materials and technologies with proven engineering and provides the user with a compact and robust stationary sensor.

The attractive price-performance ratio makes it especially advantageous in OEM applications for condition monitoring.

Applications

- Industrial hydraulic and lubrication systems
- Mobile hydraulics

Advantages

- As an option, can be switched between ISO 4406:1999 / SAE AS 4059 and ISO 4406:1987 / NAS 1638
- Critical machine conditions are identified in good time
- Continuous oil condition monitoring
- Condition-based maintenance planning

Technical specifications

General data	
Self-diagnostics	Continuous with error display via status LED and display
Display (only with CS 1x2x)	LED, 6-digit, each with 17 segments
Measured variables	ISO 99 (ISO 4406:1999) SAE (SAE AS 4059 (D)) or ISO 87 (ISO4406:1987) NAS (NAS 1638)
Additional variables	Flow (ml/min) Out (mA) or (VDC) Drive (%) Temp (°C) and (°F)
Mounting position	Optional (Recommended: Vertical direction of flow)
Ambient temperature range	-30 °C ... +80 °C / -22 °F ... +176 °F
Storage temperature range	-40 °C ... +80 °C / -40 °F ... +176 °F
Relative humidity	Max. 95%, non-condensing
Material of seal	FPM for CS1xx0 / EPDM for CS1xx1
Protection rating	III (safety extra-low voltage)
Protection class	IP67
Weight	1.3 kg
Hydraulic specifications	
Measuring range	Sensor measures from Class ISO 9/8/7 (MIN) to Class ISO 25/24/23 (MAX) calibrated in the range ISO 13/11/10...23/21/18
Accuracy	+/- ½ ISO class in the calibrated range
Operating pressure	300 bar max. / 4350 psi max.
Hydraulic connection	Inline or hose connection (A,B): thread G1/4, ISO 228 or flange connection (C,D): DN 4
Permitted measurement flow rate	30 ... 300 ml/min
Permitted viscosity range	1 ... 1000 mm²/s
Fluid temperature range	0 ... +85 °C, +32 ... +185 °F
Electrical data	
Connection, male	M12x1, 8-pole, to DIN VDE 0627 or IEC61984
Supply voltage	9 ... 36 VDC, residual ripple < 10%
Power consumption	3 Watt max.
Analogue output (4 conductor technique)	4 ... 20 mA output (active): Max. ohmic resistance 330Ω or 0 ... 10 V output (active): Min. load resistance 820Ω
Switching output	Passive, n-switching Power MOSFET: max. current 1.5 A; normally open
RS485 interface	2-wire, half duplex to transfer the HSI protocol in conjunction with a PC
HSI (HYDAC Sensor Interface)	1-wire, half duplex

Model code

CS 1 2 2 0 - A - 0 - 0 - 0 - 0 / - 000

Type
CS = ContaminationSensor

Series
1 = 1000 series,
4 particle size channels

Contamination codes
2 = ISO 4406 : 1999 ;
SAE AS 4059 (D) /
>4 µm$_{(c)}$ >6 µm$_{(c)}$
>14 µm$_{(c)}$ >21 µm$_{(c)}$
3 = ISO 4406 : 1987 ;
NAS 1638 / > 2 µm > 5 µm
> 15 µm > 25 µm
can be switched over
ISO 4406 : 1999 ;
SAE AS 4059 (D) / >4 µm$_{(c)}$
>6 µm$_{(c)}$ >14 µm$_{(c)}$
>21 µm$_{(c)}$ can be switched over

Options
1 = Without display
2 = With display (display can be rotated through 270°)

Media
0 = Based on mineral oil
1 = For phosphate ester

Analogue interfaces
A = 4 ... 20 mA
B = 0 ... 10 V

Switching output
0 = Switching output threshold

Digital interface
0 = RS485

Electrical connection type
0 = Male M12x1, 8-pole, pin,
to VDE0627 or IEC61984

Hydraulic connection (see Page 13)
0 = Inline or hose connection
1 = Flange connection

Modification number
000= Standard

Items supplied

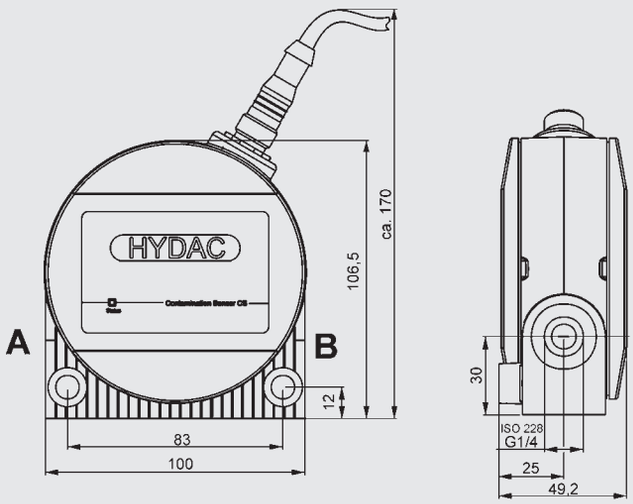
– Contamination Sensor
– CoCoS 1000 Software and Operating and Maintenance Manual on CD
– Calibration certificate
– "Getting started" guide
– 2 O-rings for flange connection version

Accessories

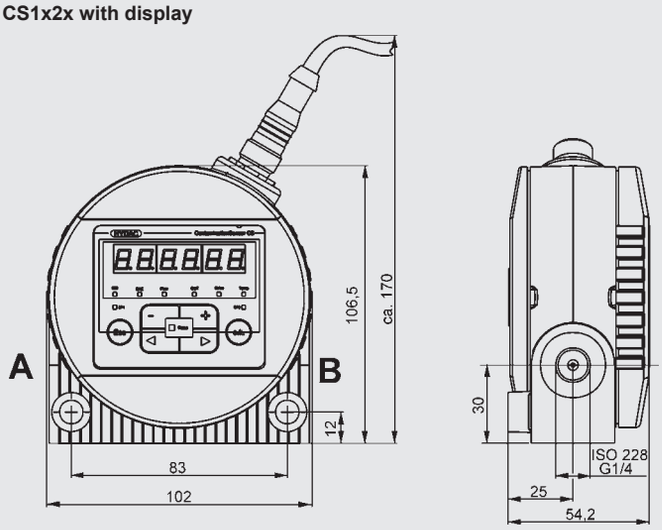
– Female connector with 2 m cable, screened, 8-pole, M12x1, Part No.: 3281220
– Female connector with 5 m cable, screened, 8-pole, M12x1, Part No.: 3281239
– Extension cable 5 m, female connector 8-pole, M12x1 / male connector 8-pole, M12x1, Part No.: 3281240
– Female connector with screw terminal, 8-pole, M12x1, Part No.: 3281243

Dimensions

CS1x1x without display

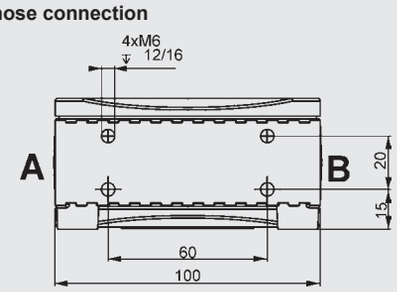


CS1x2x with display

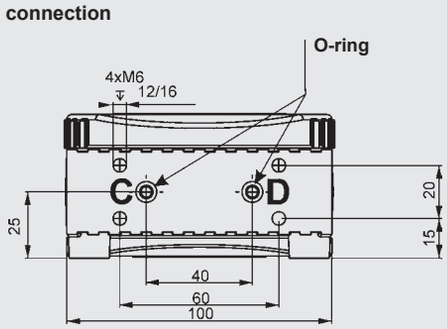


View of underside

Inline or hose connection

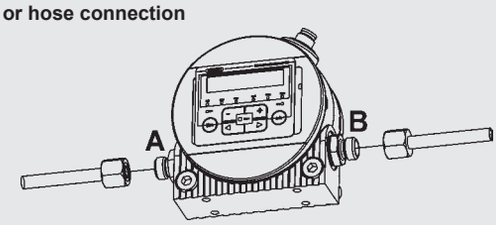


Flange connection

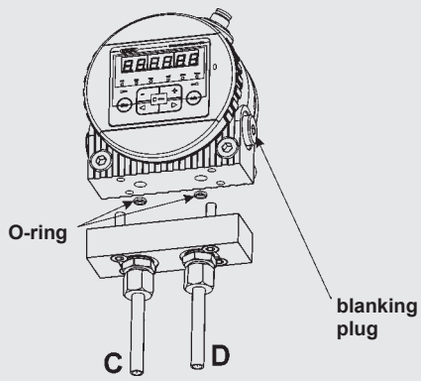


Hydraulic connection types

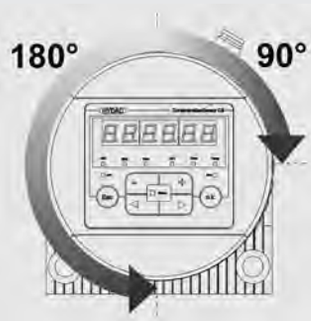
Inline or hose connection



Flange connection

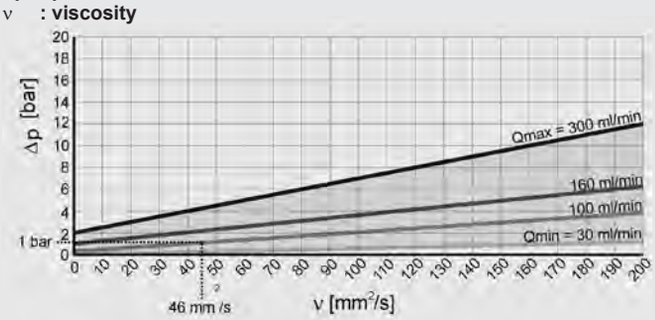


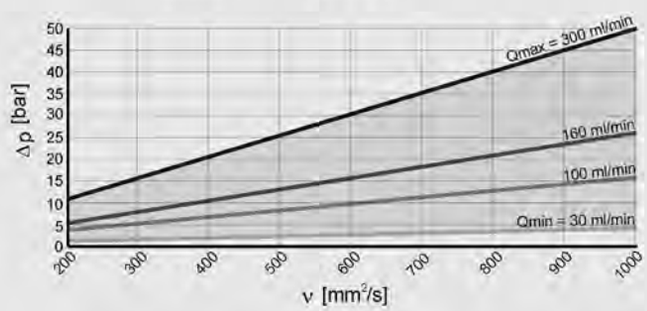
Display rotation



Pressure/Viscosity range

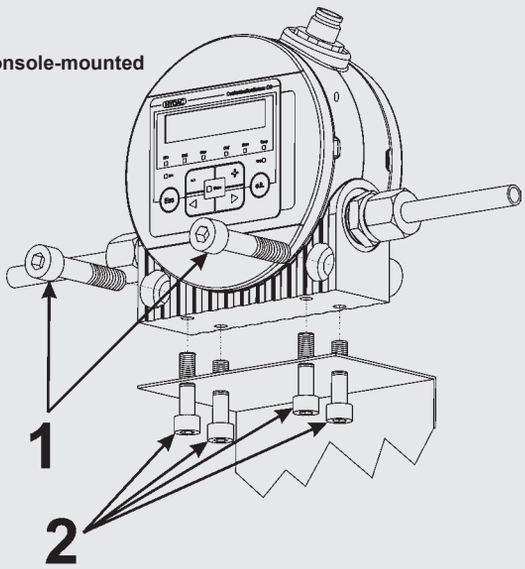
Δp : pressure
ν : viscosity





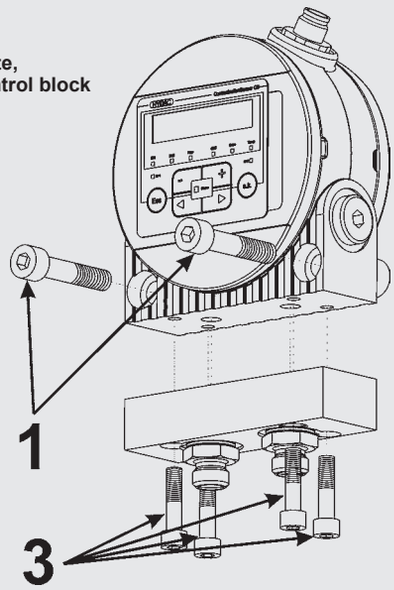
Types of mounting

Wall-mounted or console-mounted



for inline or hose connection

Mounting on flange plate, connection plate or control block



for flange connection

1 : with 2 x M8 (ISO 4762) or
2, 3 : with 4 x M6

Note

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

Subject to technical modifications.

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ContaminationSensor
CS 2000 Series

Description

The ContaminationSensor CS 2000 series is a stationary sensor for permanent monitoring of particle contamination in fluids.

It has been developed for applications in test rigs, lubrication systems and critical hydraulic systems for which dynamic trend measurement of the contamination is required.

The ContaminationSensor CS 2000 series benefits from the field-tested sensor technology used in the FCU 2000 series.

It has been developed for use in conjunction with pressure connections up to 40 bar (higher pressures possible with external pressure relief valve).

Applications

- Industrial hydraulic and lubrication systems
- Mobile hydraulics

Advantages

- Combined hydraulic and electronic compensation for fluctuations in pressure and viscosity
- Continuous self-diagnostics
- Analogue output (4 ... 20mA) or digital output (RS 485/RS 232/ Ethernet)
- PLC output
- Relay outputs (operation, warning, alarm)
- RS 232 interface for ISO Code indication

Technical specifications

Self-diagnostics	Continuous with error indication via relays and serial interface
Measuring range (calibrated)	ISO 13/11/10 ... 23/21/18. Sensor is calibrated within this range. Displays from ISO class 12/10/09 up to ISO 25/23/21.
Operating pressure	INLET: depending on the model, max. 40 bar OUTLET: max. 10 bar, rated to 350 bar
Connections	INLET: Thread G 1/4, ISO 228 OUTLET: Thread G 1/4, ISO 228
Measurement flow rate	10 ... 200 ml/min
Total flow rate (depending on model)	10 ... 800 ml/min (depending on pressure)
Fluid temperature range	0 ... + 70 °C
Supply voltage	24 V DC, ± 25%
Power consumption	25 Watt max.
Electrical data	– Output for ContaminationSensor Display – 3 relay outputs: - 1 x "ready" relay - 2 x "limit" relays – PLC output – Additional electrical output (see model code)
Ambient temperature range	0 ... +55 °C
Storage temperature range	-20 ... +85 °C
Relative humidity	max. 90%, non-condensing
Protection rating	III (safety extra-low voltage)
Protection class	IP65
Weight	4 kg

Model code

CS 2 2 3 0 - 1 - U - 3 - 2 / -

Type
CS = Contamination**S**ensor

Resolution
2 = 4 particle size channels

Contamination codes
0 = ISO 4406 : 1987; NAS 1638 / >5 µm>15 µm >25 µm>50 µm
1 = ISO 4406 : 1991; NAS 1638 / >2 µm >5 µm >15 µm >25 µm
2 = ISO 4406 : 1999; SAE AS 4059 (D) / >4 $\mu m_{(c)}$ >6 $\mu m_{(c)}$ >14 $\mu m_{(c)}$>21 $\mu m_{(c)}$

Housing
3 = For stationary use

Fluids
0 = For standard mineral oils
1 = For phosphate esters

Options
1 = Standard, without options

Supply voltage
U = 24 VDC

Pressure/viscosity range
1
2
3
4
see "Pressure/viscosity range" graphs

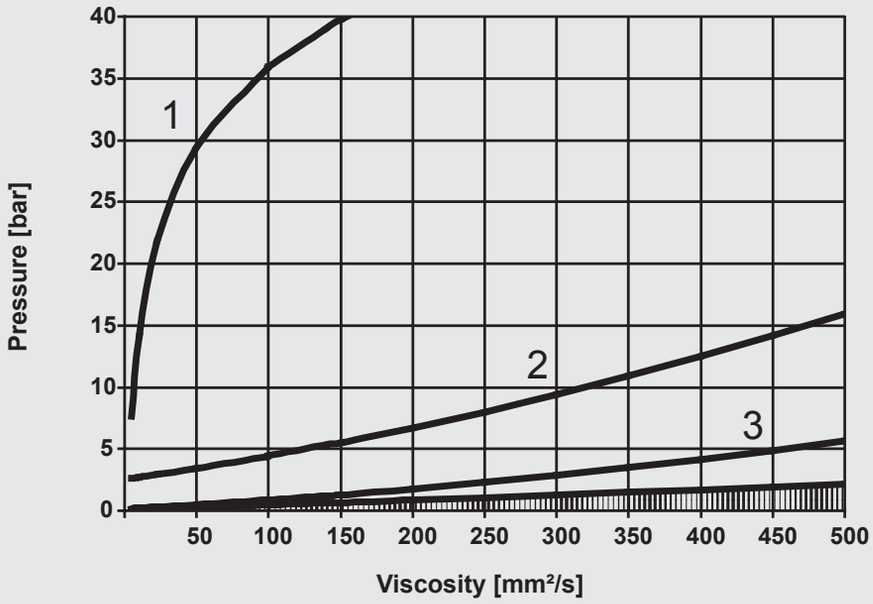
Electrical output
0 = RS232 (DIN-66348 protocol)
1 = Analogue output (only SAE/NAS and particle counts) (4-20 mA)
2 = RS485 (DIN-66348 protocol)
5 = Ethernet (IEEE 802.3TCP / IP)

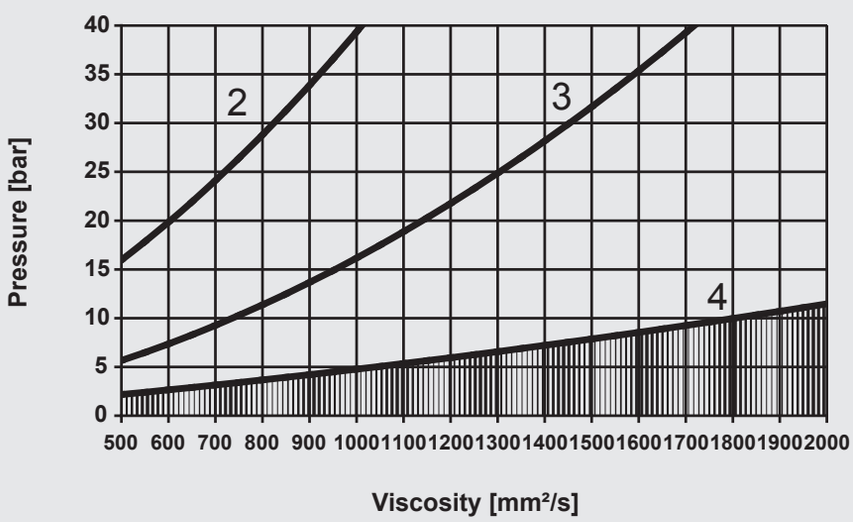
Supplementary details
without details = standard

Items supplied

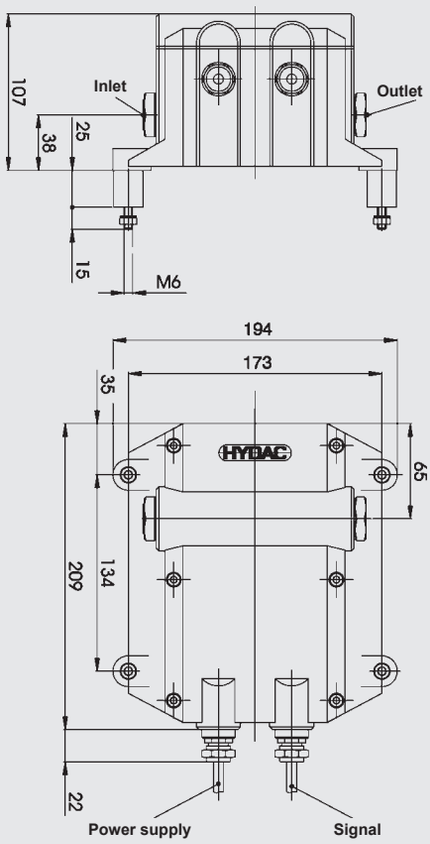
– CS 2000
– Programming cable
– Operating and maintenance instructions
– Calibration certificate

Pressure / viscosity range





Dimensions

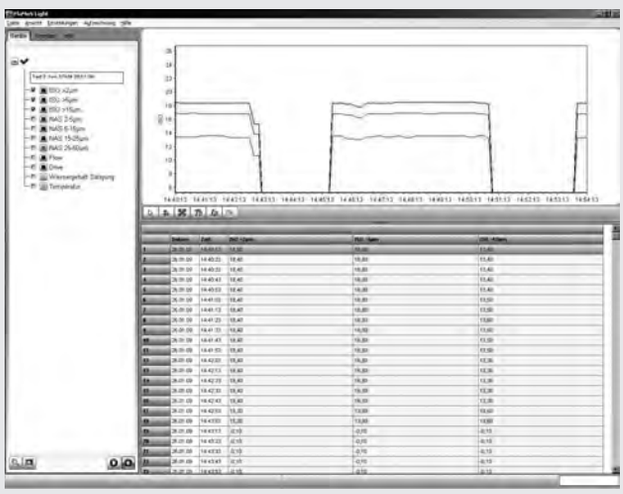


Accessories

FluMoS Light, Part No.: 3355176
FluMoS Professional, Part No.: 3371637

FluMoT, Part No.: 3355177

PC Software Package CoCoS Professional, Part No.: 3141522



ContaminationSensor Display CSD

CSD - 1 - U

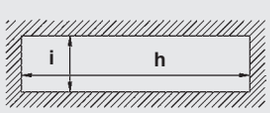
ContaminationSensor Display

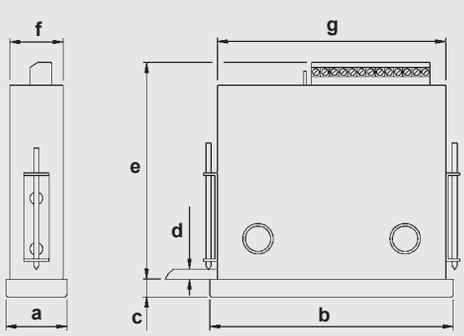
Display size
1 14 mm
2 57 mm

Supply voltage
U 24 VDC

	Part No.
CSD-1-U	3078272
CSD-2-U	3078273

Dimensions





	a	b	c	d	e	f	g	h	i
CSD-1-U	48	96	8	..6	70	44	90	92	45
CSD-2-U	96	336	3	..6	61	88	328	329	89

FluMoS

FluidMonitoring Software to read, display and process data from HYDAC fluid sensors.
(Part No.: 3355176)

FluMoT

FluidMonitoring Toolkit to integrate HYDAC sensors in customer-owned PC software.
(Part No.: 3355177)

CoCoS

ContaminationControl Software for convenient operation, graphic and tabular display, processing and transfer of CS 2000 measuring data.

Note

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

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

Subject to technical modifications.

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ContaminationSensor Module
CSM 1000 Series

Description

The ContaminationSensor Module CSM 1000 is an online condition monitoring system for detecting particle contamination in hydraulic and lubrication fluids containing a high proportion of air bubbles.

Air bubble suppression is used to dissolve the air bubbles so that they are not detected as particles.

Moreover, it is the ideal solution for analyzing the particle content of fluids, independently of the rest of the hydraulic system.

As an option other condition monitoring sensors such as the Hydac AquaSensor can be incorporated.

Applications

- Lubrication oil system in paper, steel and energy sectors
- For condition-based, pro-active maintenance
- Monitoring of component cleanliness on test rigs
- Monitoring of oil cleanliness in oil reservoirs

Advantages

- Cost-effective, self-contained solution
- Numerous data interfaces provide, amongst other things, communication via WLAN, intranet or internet
- Online monitoring of the oil cleanliness with alarm function to indicate:
  - ingress of and increase in contamination
  - increase in contamination as components start to wear
  - when there are filtration problems
- Verification of cleanliness on test rigs
- Verification of changes in the oil cleanliness as a result of inadequate servicing.

Technical specifications

Pump type	Gear pump
Operating pressure P_{in} (INLET) P_{out} (OUTLET) P_{out} (leakage line)	 -0.4 ... 0.5 bar (standard pump) -0.4 ... 120 bar (pump with increased inlet pressure) 5 bar 0.5 bar (pump with increased inlet pressure)
Permitted outlet pressure	5 bar max.
Connections	INLET: Thread G 1/4, ISO 228 OUTLET: Thread G 1/4, ISO 228 LEAKAGE: Thread G 1/4, ISO 228
Total flow rate	≈ 100 ml/min (standard pump) ≈ 180 ml/min (pump with increased inlet pressure)
Permitted operating viscosity range	10 ... 3000 mm²/sec
Permitted measurement viscosity range	10 ... 1000 mm²/sec
Permitted temperature range of fluid	0 ... + 70 °C
Permitted fluids	Hydraulic and lubrication fluids based on mineral oil
Power consumption (motor pump unit)	0.18 kW @ 50 Hz 0.21 kW @ 60 Hz
Ambient temperature range	0 ... +55 °C
Storage temperature range	-20 ... +85 °C
Relative humidity	max. 90%, non-condensing
Protection class	IP55
Weight	≈ 18 kg
ContaminationSensor:	
Self-diagnostics	Continuous with error display via status LED
Measurement range (calibrated)	Display of class ISO 9/8/7 (MIN) to class ISO 25/24/23 (MAX) Calibrated in the range ISO 13/11/10 ... ISO 23/21/18.
Supply voltage	9 ... 36 VDC, residual ripple < 10%
Power consumption	3 Watt max.
Electrical data	- Analogue output 4 ... 20 mA or 0 ... 10 V - RS485 interface - Switching output

Model code

CSM 1 2 2 0 - 1 - 1 W/N/X60/O60 –

Type
CSM ContaminationSensor Module

Resolution of ContaminationSensor
1 = 4 particle size channels

Contamination codes
2 = ISO 4406:1999; SAE AS 4059 (D) /
> 4 $\mu m_{(c)}$ > 6 $\mu m_{(c)}$ > 14 $\mu m_{(c)}$ > 21 $\mu m_{(c)}$

3 = ISO 4406:1987; NAS 1638 / > 2 µm
> 5 µm > 15 µm > 25 µm
ISO 4406:1999; SAE AS 4059 (D) /
> 4 $\mu m_{(c)}$ > 6 $\mu m_{(c)}$ > 14 $\mu m_{(c)}$ > 21 $\mu m_{(c)}$
(switchable between standards)

Options
1 = without display
2 = with display (display can be rotated through 270°)

Fluids
0 = based on mineral oil

Hydraulic version
1 = standard pump
2 = pump with increased inlet pressure, with leakage line

Electrical output of ContaminationSensor
1 = 4 ... 20 mA analogue output
2 = 0 ... 10 V analogue output

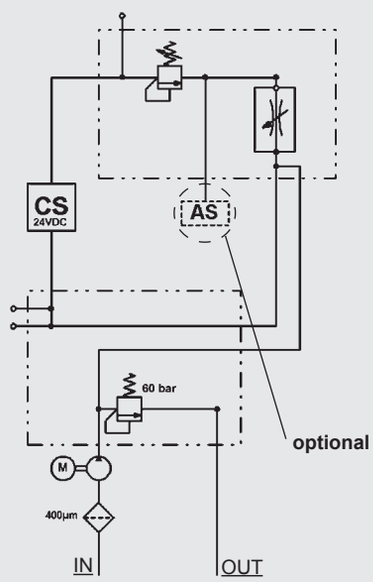
Supply voltage of motor pump unit
W/N/X60/O60 = 230 V, 50 Hz, 3Ph / 265 V, 60 Hz, 3Ph, delta circuit
400 V, 50 Hz, 3Ph / 460 V, 60 Hz, 3Ph, star circuit
N/AB/N60/AB60 = 400 V, 50 Hz, 3Ph / 400 V, 60 Hz, 3Ph, delta circuit
690 V, 50 Hz, 3Ph / 690 V, 60 Hz, 3Ph, star circuit
other voltages on request

Supplementary details
no details = standard
AS = with AquaSensor AS 1000

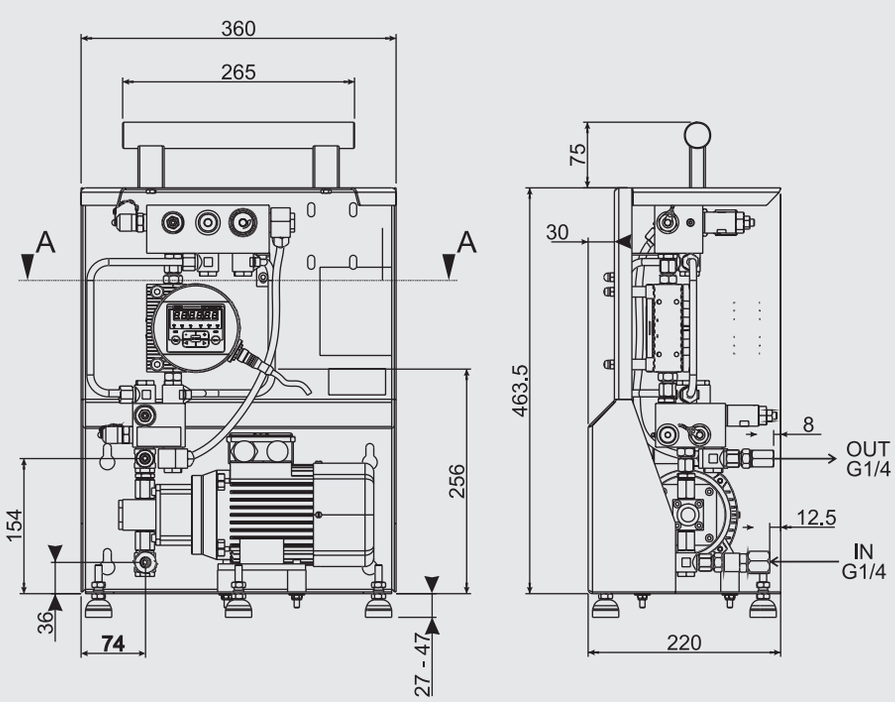
Items supplied

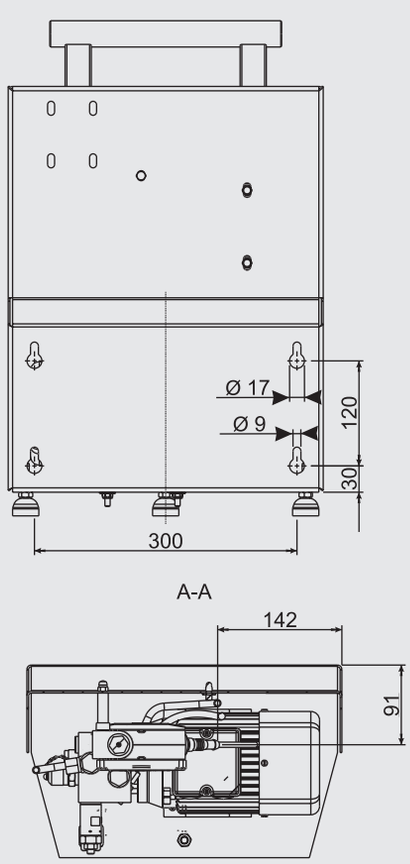
– CSM
– Operating and maintenance instructions
– CD with CoCoS 1000 software and operating manual
– Calibration certificate CS 1000

Hydraulic circuit diagram



Dimensions (mm)





Accessories for CS 1000

– ContaminationControl Software
CoCoS 1000,
Part No.: 3251484

– ContaminationSensor Interface CSI-D-5,
Part No.: 3249563
– Female connector with 2m cable,
screened, 8-pole, M12x1,
Part No.: 3281220
– Female connector with 5 m cable,
screened, 8-pole, M12x1,
Part No.: 3281239
– Extension cable 5 m,
female connector 8-pole, M12x1 /
male connector 8-pole, M12x1
Part No.: 3281240
– Female connector with screw terminal,
screened, 8-pole, M12x1,
Part No.: 3281243
– FluidMonitoring Software
FluMoS Light

Accessories for AS 1000

– ZBE 08
female connector, right-angled, 5-pole,
M12x1,
Part No.: 6006786
– ZBE 08S-02
Female connector, right-angled, with 2 m
cable, screened, 5-pole,
Part No.: 6019455
– ZBE 08S-05
Female connector, right-angled, with 5 m
cable, screened, 5-pole,
M12x1, Part No.: 6019456
– ZBE 08S-10
Female connector, right-angled, with 10 m
cable, screened, 5-pole, M12x1,
Part No.: 6023102

Note

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Subject to technical modifications.

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ContaminationSensor Module
CSM 2000 Series

Description

The ContaminationSensor Module CSM 2000 is an online condition monitoring system for detecting particle contamination in hydraulic and lubrication fluids containing a high proportion of air bubbles.

Air bubble suppression is used to dissolve the air bubbles so that they are not detected as particles.

Moreover, it is the ideal solution for analyzing the particle content of fluids, independently of the rest of the hydraulic system.

As an option, other condition monitoring sensors such as the Hydac AquaSensor can be incorporated.

Applications

- Lubrication oil system in paper, steel and energy sectors
- For condition-based, pro-active maintenance
- Monitoring of component cleanliness on test rigs
- Monitoring of oil cleanliness in oil reservoirs

Advantages

- Cost-effective, self-contained solution
- Numerous data interfaces provide, amongst other things, communication via WLAN, intranet or internet
- Online monitoring of the oil cleanliness with alarm function to indicate:
  - ingress of and increase in contamination
  - increase in contamination as components start to wear
  - when there are filtration problems
- Verification of cleanliness on test rigs
- Verification of changes in the oil cleanliness as a result of inadequate servicing.

Technical specifications

Pump type	Gear pump
Operating pressure P_{in} (INLET) P_{out} (OUTLET) P_{out} (leakage line)	 -0.4 ... 0.5 bar (standard pump) -0.4 ... 120 bar (pump with increased inlet pressure) 5 bar 0.5 bar (pump with increased inlet pressure)
Permitted outlet pressure	5 bar max.
Connections	INLET: Thread G 1/4, ISO 228 OUTLET: Thread G 1/4, ISO 228 LEAKAGE: Thread G 1/4, ISO 228
Total flow rate	≈ 100 ml/min (standard pump) ≈ 180 ml/min (pump with increased inlet pressure)
Permitted operating viscosity range	10 ... 3000 mm²/s
Permitted measurement viscosity range	10 ... 1000 mm²/s
Permitted temperature range of fluid	0 ... + 70 °C
Permitted fluids	Hydraulic and lubrication fluids based on mineral oil
Power consumption (motor pump unit)	0.18 kW at 50 Hz 0.21 kW at 60 Hz
Ambient temperature range	0 ... +55 °C
Storage temperature range	-20 ... +85 °C
Relative humidity	max. 90%, non-condensing
Protection class	IP55
Weight	≈ 20 kg
ContaminationSensor:	
Self-diagnostics	Continuous with error display via relays and serial interface
Measurement range (calibrated)	ISO 13/11/10 ... 23/21/18. Displays from ISO class 12/10/09 up to ISO 25/23/21.
Supply voltage	24 V DC ± 25%
Power consumption	25 Watt max.
Electrical data	- Output for ContaminationSensor Display - 3 relay outputs: 1 x "ready" relay 2 x "limit" relays - PLC output - Additional electrical output (see model code)

Model code

CSM 2 2 3 0 - 1 - 1 W/N/X60/O60 –

Type
CSM ContaminationSensor Module

Resolution of ContaminationSensor
2 = 4 particle size channels

Contamination codes
0 = ISO 4406 : 1987; NAS 1638 / >5 µm>15 µm >25 µm>50 µm
1 = ISO 4406 : 1991; NAS 1638 / >2 µm >5 µm >15 µm >25 µm
2 = ISO 4406 : 1999; SAE AS 4059 (D) / >4 $\mu m_{(c)}$ >6 $\mu m_{(c)}$ >14 $\mu m_{(c)}$>21 $\mu m_{(c)}$

Housing of ContaminationSensor
3 = standard

Fluids
0 = for standard mineral oils

Hydraulic version
1 = standard pump
2 = pump with increased inlet pressure, with leakage line

Electrical output of ContaminationSensor
0 = RS232 (DIN-66348 protocol)
1 = analogue output (4-20 mA)
2 = RS485 (DIN-66348 protocol)
5 = Ethernet (IEEE 802.3 TCP/IP)

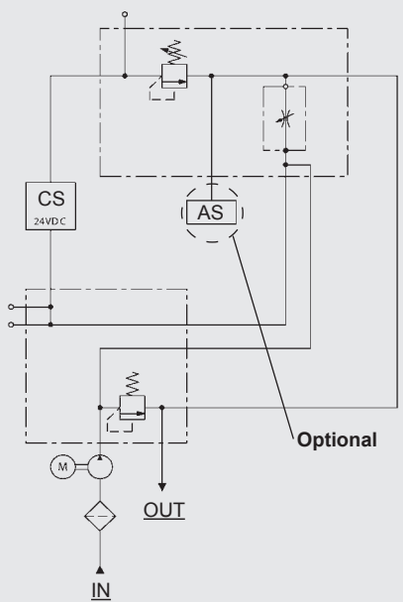
Supply voltage of motor pump unit
W/N/X60/O60 = 230 V, 50 Hz, 3Ph / 265 V, 60 Hz, 3Ph, delta circuit
400 V, 50 Hz, 3Ph / 460 V, 60 Hz, 3Ph, star circuit
N/AB/N60/AB60 = 400 V, 50 Hz, 3Ph / 400 V, 60 Hz, 3Ph, delta circuit
690 V, 50 Hz, 3Ph / 690 V, 60 Hz, 3Ph, star circuit
other voltages on request

Supplementary details
no details = standard
AS = with AquaSensor AS 1000

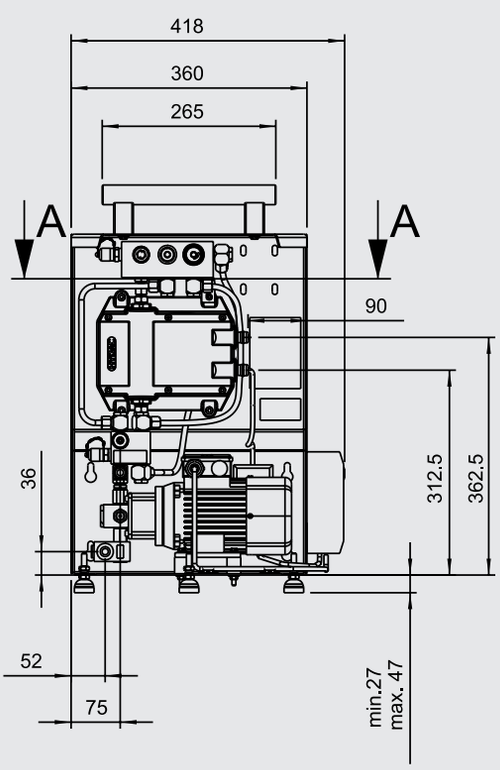
Items supplied

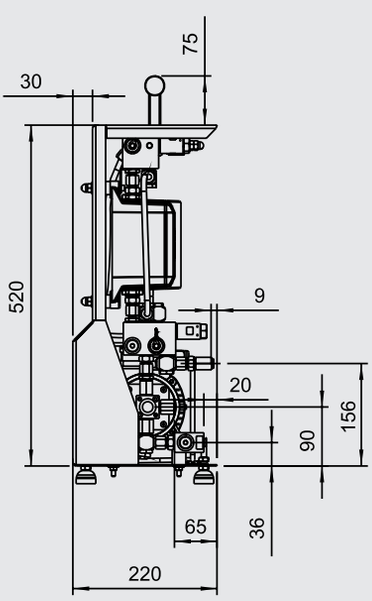
– CSM
– Programming cable
– Operating and maintenance instructions
– Calibration certificate CS 2000

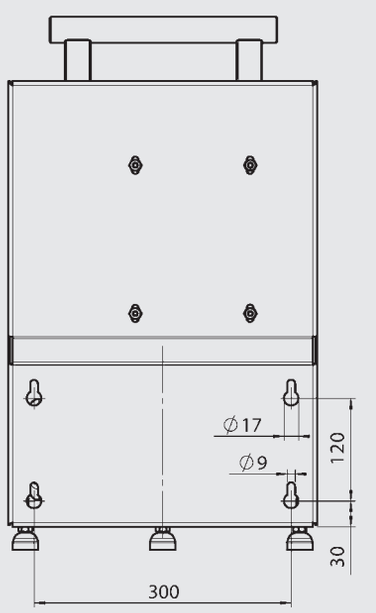
Hydraulic circuit diagram

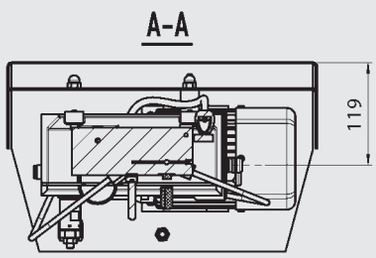


Dimensions (mm)







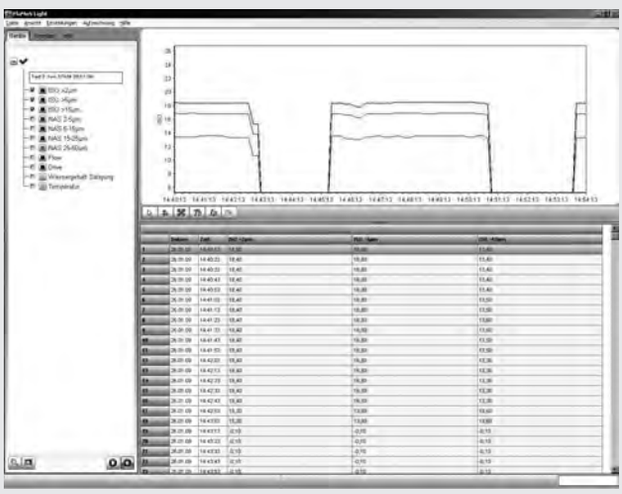


Accessories

FluMoS Light, Part No.: 3355176

FluMoT, Part No.: 3355177

PC Software Package CoCoS Professional, Part No.: 3141522



ContaminationSensor Display CSD

CSD - 1 - U

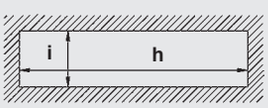
ContaminationSensor Display

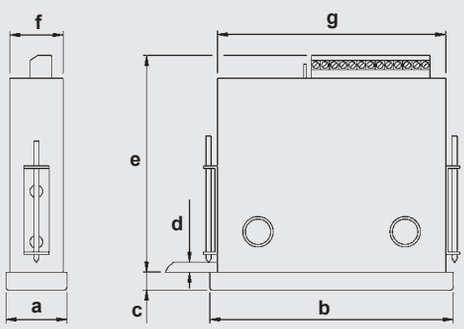
Display size
1 14 mm
2 57 mm

Supply voltage
U 24 VDC

	Part No.
CSD-1-U	3078272
CSD-2-U	3078273

Dimensions





	a	b	c	d	e	f	g	h	i
CSD-1-U	48	96	8	..6	70	44	90	92	45
CSD-2-U	96	336	3	..6	61	88	328	329	89

Accessories for AS 1000

- ZBE 08S-02
  Female connector, right-angled, with 2 m cable, screened, 5-pole,
  Part No.: 6019455
- ZBE 08S-05
  Female connector, right-angled, with 5 m cable, screened, 5-pole,
  M12x1, Part No.: 6019456
- ZBE 08S-10
  Female connector, right-angled, with 10 m cable, screened, 5-pole, M12x1,
  Part No.: 6023102

FloMoS

FluidMonitoring Software to read, display and process data from HYDAC fluid sensors.
(Part No.: 3355176)

FluMoT

FluidMonitoring Toolkit to integrate HYDAC sensors in customer-own PC software.
(Part No.: 3355177)

CoCoS

Contamination Control Software for convenient operation, graphic and tabular display, processing and transfer of CS 2000 measuring data.

Note

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

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Subject to technical modifications.

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MetallicContamination Sensor
MCS 1000 Series

Description

The MetallicContamination Sensor MCS 1000 monitors metallic particle contamination in lubrication fluid. The particles are detected by inductive measurement in which a coil system is the core element of the sensor. It detects metallic particles (ferromagnetic and non-ferromagnetic) in the > 200 µm size range.

The MCS 1000 continuously monitors the condition of the system and provides information on any early-stage damage.

The sensor is therefore a reliable tool for condition-based maintenance.

Advantages

- Early detection of impending damage to gears
- Prevents costly system downtime
- The perfect complement to optical sensors
- Measurement of metallic particles (ferromagnetic Fe and non-ferromagnetic nFe) > 200 µm
- Measurement result is not affected by air bubbles or liquid contamination in the fluid

Technical specifications

Hydraulic specifications	
Flow rate	10 ... 200 l/min
Operating pressure	Maximum 20 bar
Fluid temperature range	-40 ... +85 °C
Inlet / Outlet	Flange connection SAE 4" according to ISO 6162-1
Electrical data	
Supply voltage	9 ... 36 V DC, residual ripple < 10%
Power consumption	max. 5 W
Electrical data	
2 configurable switching outputs (n-switching Power MOSFET, normally-open)	1 x ferromagnetic particles (Fe) 1 x non ferromagnetic particles (nFe) or 1 x ferromagnetic (Fe) + non ferromagnetic (nFe) particles 1 x status signal
Switching logic	Active Low or Active High
Length of switching pulse	can be set from 5 ... 200 ms
Switching output load	max. 1.5 A
RS485 interface	2 wire, half duplex
HSI interface	1 wire, half duplex
General data	
Ambient temperature	-40 ... +70 °C
Diameter sensor cross-section	1" (25.4 mm)
Protection class to DIN 40050	IP 67
Weight	≈ 3.5 kg
Dimensions (L x W x H)	83 x 162 x 140 mm
Vibration 10 - 58 Hz 58 - 500 Hz	 0.75 mm (amplitude) 10 g (acceleration)
Shock	40 g
Detection limits	
Ferromagnetic (Fe) particles	> 200 µm (particle with volume equivalent to that of a sphere with Ø 200 µm)
Non-ferromagnetic (nFe) particles	> 400 µm (particle with volume equivalent to that of a sphere with Ø 400 µm)
Particle rate	> 25/s

Model code

MCS 1 5 1 0 - 5 - 0 / 000

Type
MCS = MetallicContamination Sensor

Series
1 = 1000 series

Contamination / Sensor cross section
5 = particles > 200 µm / 1"

Options
1 = standard

Media
0 = mineral and synthetic oils
(particularly those used in wind energy sector)

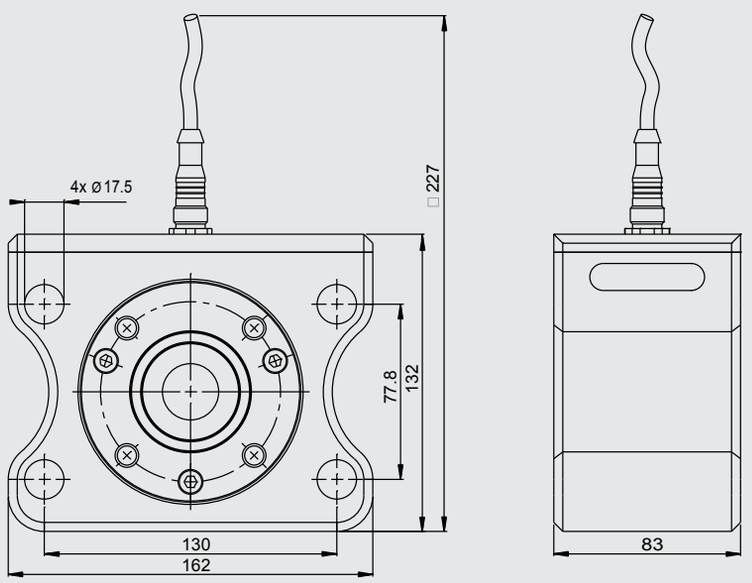
Hydraulic connection
5 = flange connection, SAE 4" to ISO 6162-1

Electrical connection
0 = standard

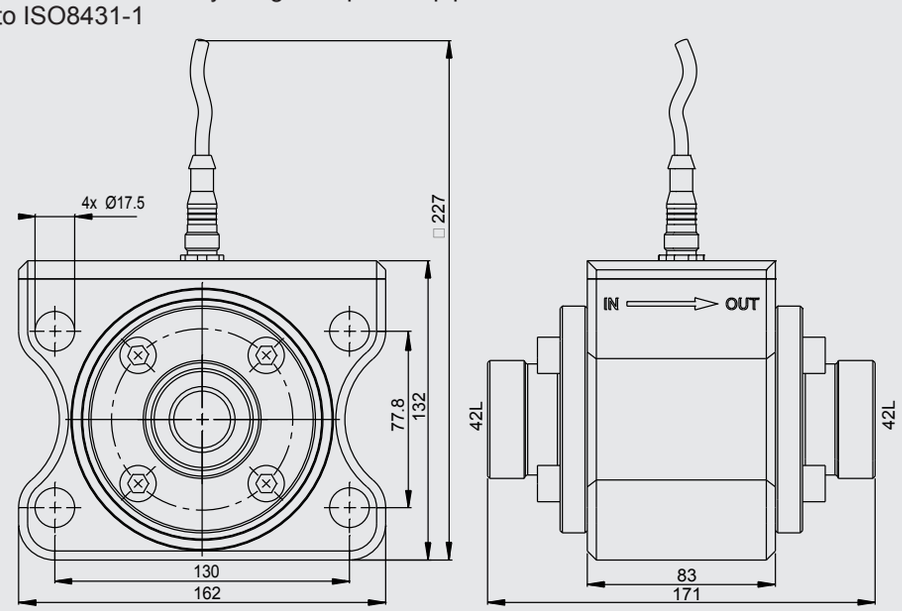
Modification number
000= standard

Dimensions (in mm)

Flange connection, SAE 4" to ISO 6162-1



MCS with accessory flange adaptor for pipe or hose connection 42L to ISO8431-1



Items supplied

– MCS 1000
– O-ring (47.22x3.53 NBR 70 Shore)
– O-ring (110.72x3.53 NBR 70 Shore)
– Operating and maintenance instructions

Accessories

– SAE 4" flange adapter set, for pipe or hose connection, 42L to ISO 8431-1
Consisting of:
2x flange adapters
2x O-rings
8x hex. head screws
8x washers
8x spring washers
Part No.: 3435426
– Flange adapter plate, SAE 4" – SAE 1 1/2"
Part No.: 3442518
– Female connector 2 m cable, screened, 8-pole, M12x1,
Part No.: 3281220
– Female connector with 5 m cable, screened, 8-pole, M12x1,
Part No.: 3281239
– Extension cable 5 m, female connector 8-pole, M12x1 / male connector 8-pole, M12x1,
Part No.: 3281240
– Female connector with screw terminal, 8-pole, M12x1,
Part No.: 3281243

Note

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Subject to technical modifications.

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FluidControl Unit
FCU 1000 Series

Description

The FCU 1000 is a portable service unit designed for short-term measurement of particle contamination, humidity level in % saturation and temperature of the fluid in hydraulic systems.

The integral pump and hoses supplied make it possible to use the FCU 1000 series for the following applications:
- control circuits
- pressure circuits
- unpressurized tanks

All measured data (ISO, SAE/NAS, % saturation and temperature in °C or °F) are stored in files (measured value files) and folders (measurement points).

Data is stored with a time stamp.

Evaluation can then be carried out conveniently on a PC in MS Excel or in our FluidMonitoring Software (FluMoS), Version 1.30 or higher.

Applications

- Hydraulic systems
- Service for mobile hydraulics
- Servicing

Advantages

- Cleanliness classes to ISO and SAE or NAS
- Integrated AquaSensor AS 1000 for measuring humidity and temperature
- Suitable for hydraulic fluids up to 350 mm²/s (hydraulic fluids up to ISO VG 68)

Technical specifications

General data	
Type of operation	Short-term operation (S4, to DIN EN 60034/VDE 0530)
Self-diagnostics	Continuously with error display via status LED and display
Display	LED, 6 / 4 / 4-digit, each with 17 segments
Measured value	ISO code / SAE Class / NAS Class / Saturation level / Temperature
Measuring range	Display of ISO Code 9/8/7 (MIN) to ISO Code 25/24/23 (MAX) Calibrated in the range ISO 13/11/10 ... ISO 23/21/18 Saturation level 0 ... 100 % Temperature -25 ... 100 °C /-13 ... 212 °F
Accuracy	+/- 1/2 ISO code in the calibrated range / ≤ ± 2 % max. over the whole range
Material of seal	FPM
Ambient temperature range	0 ... +45 °C / 32 ... 113 °F
Storage temperature range	-40 ... +80 °C / -40 ... 176 °F
Protection class	IP50 in operation IP67 when closed
Weight	≈ 13 kg
Hydraulic specifications	
Operating pressure	IN: - 0.5 ... 45 bar / -7.25 ... 650 psi OUT: 0 ... 0.5 bar / 0 ... 7.5 psi
when using adapter for pressure lines	IN: 15 ... 345 bar / 217 ... 5000 psi OUT: 0 ... 0.5 bar / 0 ... 7.5 psi
Pressure max.	345 bar / 5000 psi
Measurement flow rate	30 ... 300 ml/min (depending on viscosity)
Max. suction height	0.5 m
Permitted viscosity range	10 ... 350 mm²/s; 46 ... 1622 Sus (for hydraulic oils up to ISO VG 68)
Temperature range of medium	0 ... +70 °C / 32 ... 158 °F
Electrical data	
Supply voltage	24 V DC ±20%, residual ripple < 10% The FCU must not be used with vehicle supply systems without load dump protection of maximum 30 V DC.
Max. power / current consumption	100 Watt / 4000 mA
Interfaces	Male connection 5 pole, M12x1, USB stick and Bluetooth 1.2, class 3 (only **H**YDAC **S**ensor **I**nterface - **HSI**)

Model code

FCU 1 3 1 0 – 4 – U – AS – 1

Type
FCU = FluidControl Unit

Series
1 = 1000 series, 4 particle size channels

Contamination codes
3 = ISO 4406:1987; NAS 1638 / 2-5 µm, 5-15 µm, 15-25 µm, > 25 µm
can be switched over to
ISO 4406:1999; SAE AS 4059 (D) / > 4 $\mu m_{(c)}$ > 6 $\mu m_{(c)}$ > 14 $\mu m_{(c)}$ > 21 $\mu m_{(c)}$

Housing
1 = for portable use (plastic case with external compartment for hoses and cables)

Media
0 = based on mineral oils

Options
4 = with integrated pump

Supply voltage
U = 24 V DC

Integrated sensor
AS = AquaSensor (AS 1000 series)

Power supply adaptor
1 = 100 ... 240 V AC / 50/60 Hz / 1 Phase / 5000 mA (Europe, USA/Canada, UK, Australia, Japan)

Items supplied

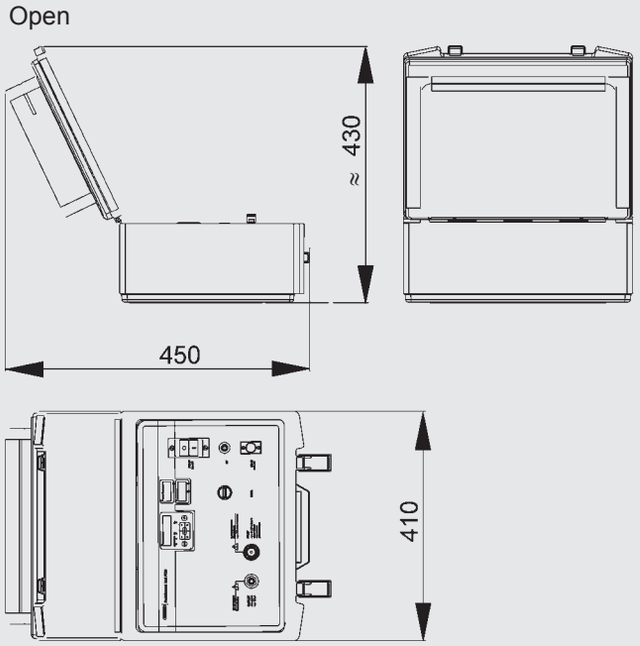
- FluidControl Unit FCU 1000
- Power supply adapter for Europe, USA/Canada, UK, Australia and Japan
- Adapter for pressure lines
- INLET pressure hose with screw connection for test point type 1620, black, length = 2 m
- INLET suction hose, open end, transparent, length = 0.3 m
- OUTLET return line hose, open end, transparent, length = 1 m
- Operating and maintenance instructions / calibration certificate
- USB memory stick

Accessories

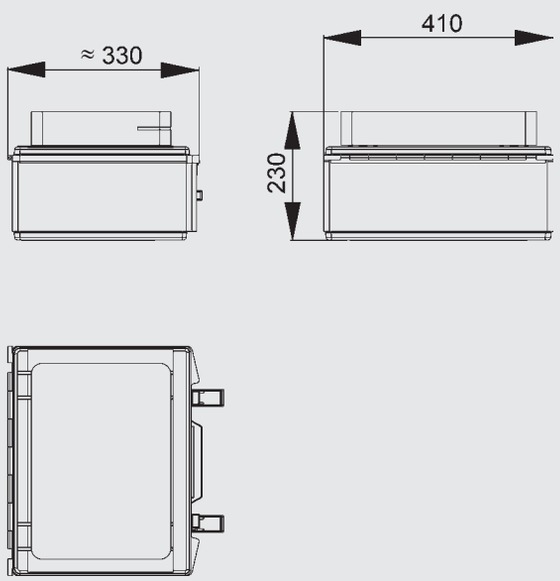
- Battery pack
- Cable with universal plug (for cigarette lighters or vehicle electrical supply connection), length = 10 m

Dimensions

Open



Closed



Note

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Subject to technical modifications.

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FCU 2210-4 FCU 2210-1

FluidControl Unit
FCU 2000 Series

Description
The Fluid Control Unit FCU 2000 is a portable service instrument for measuring particle contamination in hydraulic and lubrication systems.

The values are measured using infrared technology and are given according to ISO 4406, SAE 4059 and NAS 1638 classifications.

Applications
- Hydraulic and lubrication systems
- Servicing
- Test rigs
- Bottle sampling analysis
- Tank analysis

Advantages
- Robust design
- Cleanliness classes according to ISO 4406, SAE 4059 and NAS 1638
- Integrated graphics-capable printer
- Data output on display or via connection to a PC
- RS232 or RS485 interface

Technical specifications

	FCU 2xxx -1	FCU 2xxx -4
Continuous display of measured values via display (LCD)		
Self-diagnostics	Continuous with error indication on LCD	
Measurement range (calibrated)	ISO 12/10/9 ... 23/21/18 The instrument is calibrated within this range. Will display up to class ISO 25/23/21.	
Data memory (battery back-up)	3000 measurements	
Operating pressure: Pressure inlet Return line outlet	INLET: 1 - 350 bar, with clean filter element OUTLET: max. 3 bar	
Ports	INLET (Pressure): Minimess test coupling type 1604; the FCU can be connected to standard 1620-type connectors using the test hose supplied OUTLET: male coupling DN 7 INLET (suction): male shut-off coupling DN 6.4	
Measurement flow rate	50 - 150 ml/min	
Total flow rate	50 ... 800 ml/min (depending on pressure)	
Permitted viscosity range	1 ... 1000 mm²/s	1 ... 1000 mm²/s 1 ... 150 mm²/s (suction port, continuous duty) 150 ... 350 mm²/s (suction port, short-term duty)
Fluid temperature range	0 ... +70 °C	
Supply voltage FCU	24 VDC, ± 25%	
Power consumption	25 Watt max.	100 Watt max.
Built-in printer	Dot-matrix printer	
Serial interface	Standard: RS232 Optional: RS485	
Ambient temperature range	0 ... +55 °C	
Storage temperature range	-20 ... +85 °C	
Relative humidity	max. 90%, non-condensing	
Protection rating	III (safety extra-low voltage)	
Protection class	IP40	
Weight	≈ 11.3 kg	≈ 15.8 kg
Operating time using battery	≈ 6 hours	≈ 6 hours without pump ≈ 2 hours with pump

Model code

FCU 2 2 1 0 – 4 – M – /-BUS

Type
FCU = FluidControl Unit

Resolution
2 = 4 particle size channels

ISO Code Format
0 = ISO 4406 : 1987; NAS 1638 / >5 µm >15 µm>25 µm>50 µm
1 = ISO 4406 : 1987; NAS 1638 / >2 µm >5 µm >15 µm >25 µm
2 = ISO 4406 : 1999; SAE AS 4059 (D) / >4 $\mu m_{(c)}$ >6 $\mu m_{(c)}$ >14 $\mu m_{(c)}$>21 $\mu m_{(c)}$

Housing
1 = for portable use

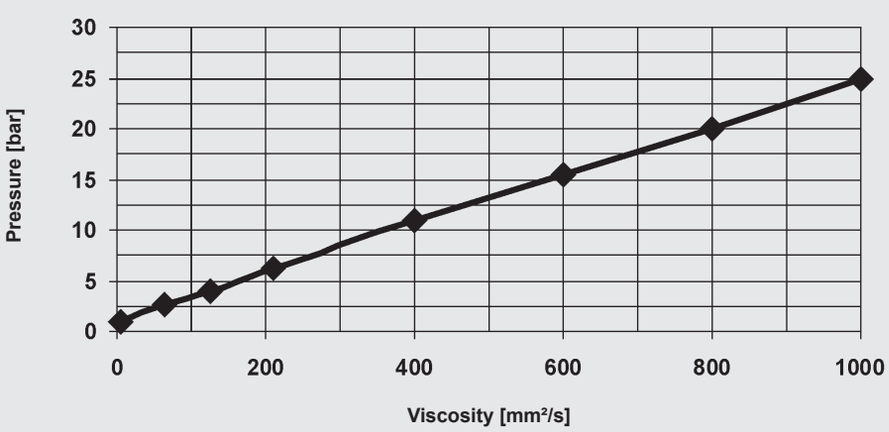
Fluids
0 = for standard mineral oils
1 = for phosphate esters (HFD-R)

Options
1 = standard, without options
4 = with integral pump (not for phosphate esters (HFD-R))

Supply voltage mains adapter
K = 120VAC / 60 Hz / 1 Phase, USA/CDN
M = 230VAC / 50 Hz / 1 Phase, Europe
N = 240VAC / 50 Hz / 1 Phase, UK
O = 240VAC / 50 Hz / 1 Phase, Australia
P = 100VAC / 50 Hz / 1 Phase, Japan

Supplementary details
No details = standard
- BUS = RS485 interface instead of RS232

Pressure required at FCU high-pressure port*



* For a flow rate of 100 ml/min, flow control valve fully open, new filter element

Items supplied

– FCU
– Power supply adapter
– High pressure inlet hose DN 4 (2m long)
– Low pressure outlet hose DN 7 (2m long)
– Operating manual
– Calibration certificate
– PC software package CoCoS Light
– Connection cable FCU / PC

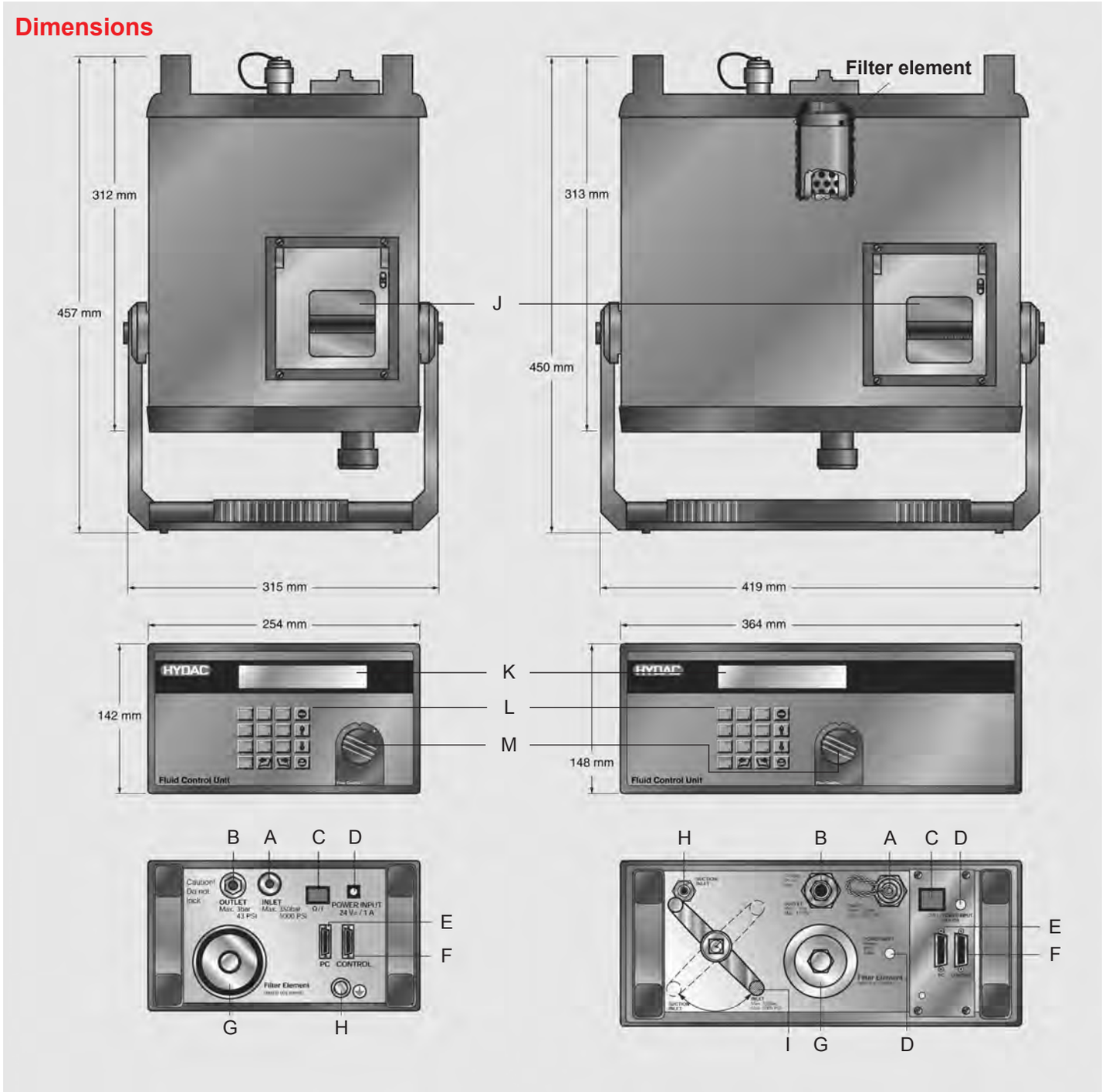
Additional for FCU 2xxx - 4

– Power supply adapter for integrated pump
– Suction hose DN 6 (1m long)
– Suction hose DN 6 (0.2m long)

Accessories

– Reservoir Extraction Unit REU
– Inlet and outlet hoses 5 m length
– PC software package CoCoS Professional
– Transport case (aluminium)

Dimensions



A = High pressure port
B = Outlet
C = On/Off switch
D = Power input 24 Volt
E = Serial port for PC connector
F = Control port
G = Cover for filter
H = Suction port
I = Change-over ball valve high pressure/suction port
J = Dot-matrix printer
K = LCD
L = Keypad
M = Flow control valve

Note

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Subject to technical modifications.

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FluidControl Unit
FCU 2000 Series
19" Panel Mounted Models

Description
The FluidControl Unit FCU 2000 for 19" Panel Mounting is designed for measuring particle contamination in hydraulic and lubrication systems.

The values are measured using infrared technology and are given according to ISO 4406, SAE 4059 and NAS 1638 classifications.

Applications
- Hydraulic and lubrication systems

Advantages
- Cleanliness classes according to ISO 4406, SAE 4059 and NAS 1638
- Data output on display or via connection to a PC
- RS232 or RS485 interface

Technical specifications

Continuous display of measured values via display (LCD)	
Self-diagnostics	Continuous with error indication on display (LCD)
Measurement range (calibrated)	ISO 12/10/9 ... 23/21/18 The instrument is calibrated within this range. Will display up to class ISO 25/23/21.
Data memory (battery back-up)	3000 measurements
Operating pressure: Pressure connection Return line connection	 INLET: 1 - 350 bar, with clean filter element OUTLET: max. 3 bar
Connections	INLET: Minimess test coupling type 1604 OUTLET: male coupling DN 7
Sensor flow rate	50 ... 150 ml/min
Outlet flow rate	50 ... 800 ml/min (depending on pressure)
Permitted viscosity range	1 ... 1000 mm²/s
Fluid temperature range	0 ... +70 °C
Power consumption	25 Watt max.
Integrated printer	Dot matrix printer
Serial interface	Standard: RS 232 Option: RS 485
3 relay outputs	1x "ready" relay 2x "limit" relays
Ambient temperature range	0 ... +55 °C
Storage temperature range	-20 ... +85 °C
Relative humidity	max. 90%, non-condensing
Protection rating	II (double insulated)
Protection class	IP40
Weight	≈ 16 kg

Model code

FCU 2 1 3 0 – 1 – M / -BUS

Type
FCU = FluidControl Unit

Resolution
2 = 4 particle size channels

ISO Code Format
0 = ISO 4406 : 1987; NAS 1638 / >5 µm >15 µm>25 µm>50 µm
1 = ISO 4406 : 1987; NAS 1638 / >2 µm >5 µm >15 µm >25 µm
2 = ISO 4406 : 1999 ; SAE AS 4059 (D) / >4 $\mu m_{(c)}$ >6 $\mu m_{(c)}$ >14 $\mu m_{(c)}$>21 $\mu m_{(c)}$

Housing
3 = for 19" panel mounting

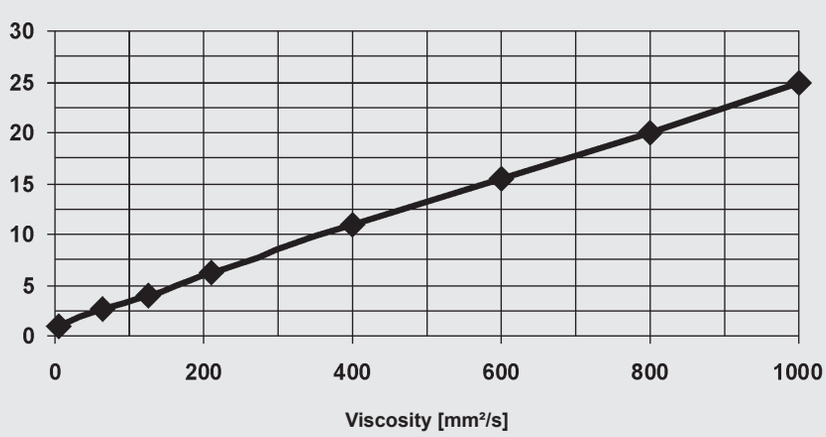
Fluids
0 = for standard mineral oils
1 = for phosphate esters (HFD-R)

Options
1 = standard, without options

Supply voltage
K = 120VAC / 60 Hz / 1 Phase, USA/CDN
M = 230VAC / 50 Hz / 1 Phase, Europe
N = 240VAC / 50 Hz / 1 Phase, UK
O = 240VAC / 50 Hz / 1 Phase, Australia
P = 100VAC / 50 Hz / 1 Phase, Japan

Supplementary details
No details: standard
-BUS = RS 485 interface instead of RS 232

Pressure required at FCU high-pressure port*



* For a flow rate of 100 ml/min, flow control valve fully open, new filter element

Items supplied

– FCU
– Mains cable
– Operating manual
– Calibration certificate
– PC software package CoCoS Light

Accessories

– Reservoir Extraction Unit REU
– Inlet and outlet hoses 5 m in length
– PC software package CoCoS Professional

Note

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FluidControl Unit
FCU 8000 Series
Portable Laser Particle Counter

Description
The FluidControl Unit FCU 8000 is designed to measure particle contamination in hydraulic and lubrication systems. It can be used in the field as a portable laser particle measuring instrument, or in the laboratory in conjunction with the Bottle Sampling Unit for analyzing oil samples.

Applications
- Field applications
- In laboratories and at service centres

Advantages
- Analysis and storage of measurement data
- Cleanliness classes according to ISO 4406, SAE 4059 and NAS 1638
- Integrated graphics-capable printer
- RS232 or RS485 interface for data output
- Easy operation

Technical specifications

Continuous display of measured values via display (LCD)	
Self-diagnostics	Continuous with error indication on display (LCD)
Measurement range (calibrated, version-dependent)	NAS 0 ... 12 / ISO 0/0/0 ... 23/21/18 / SAE 0 ... 12 The instrument is calibrated within this range. Will display up to class NAS 15 / ISO 25/23/21 / SAE 15
Data memory (battery back-up)	3000 measurements
Operating pressure: Pressure inlet Return line outlet	 INLET: 1 ... 350 bar, with clean filter element OUTLET: max. 3 bar
Ports (back of unit)	INLET: Minimess test coupling type 1620 OUTLET: male coupling DN 7
Measurement flow rate	20 ... 80 ml/min
Outlet flow rate	20 ... 800 ml/min (pressure-dependent)
Permitted viscosity range	1 ... 1000 mm²/s
Fluid temperature range	0 ... +70 °C
Supply voltage	24 V DC, ± 25%
Power consumption	25 Watt max.
Operating time with rechargeable batteries	≈ 6 hours
Integral printer	Dot matrix printer
Serial interface	Standard: RS232 Optional: RS485
Ambient temperature range	0 ... +55 °C
Storage temperature range	-20 ... +85 °C
Relative humidity	max. 90%, non-condensing
Protection rating	III (safety extra-low voltage)
Protection class	IP40
Weight	≈ 14 kg

Model code

FCU 8 1 1 0 – 1 – M /-BUS

Type
FCU = FluidControl Unit

Resolution
8 = 6 particle size channels

ISO Code Format
1 = ISO Code >2/>5/>15 µm,
NAS 2-5/5-15/15-25/25-50/50-100/>100 µm
2 = ISO Code >4/>6/>14 $\mu m_{(c)}$,
SAE >4/>6/>14/>21/>38/>70 $\mu m_{(c)}$

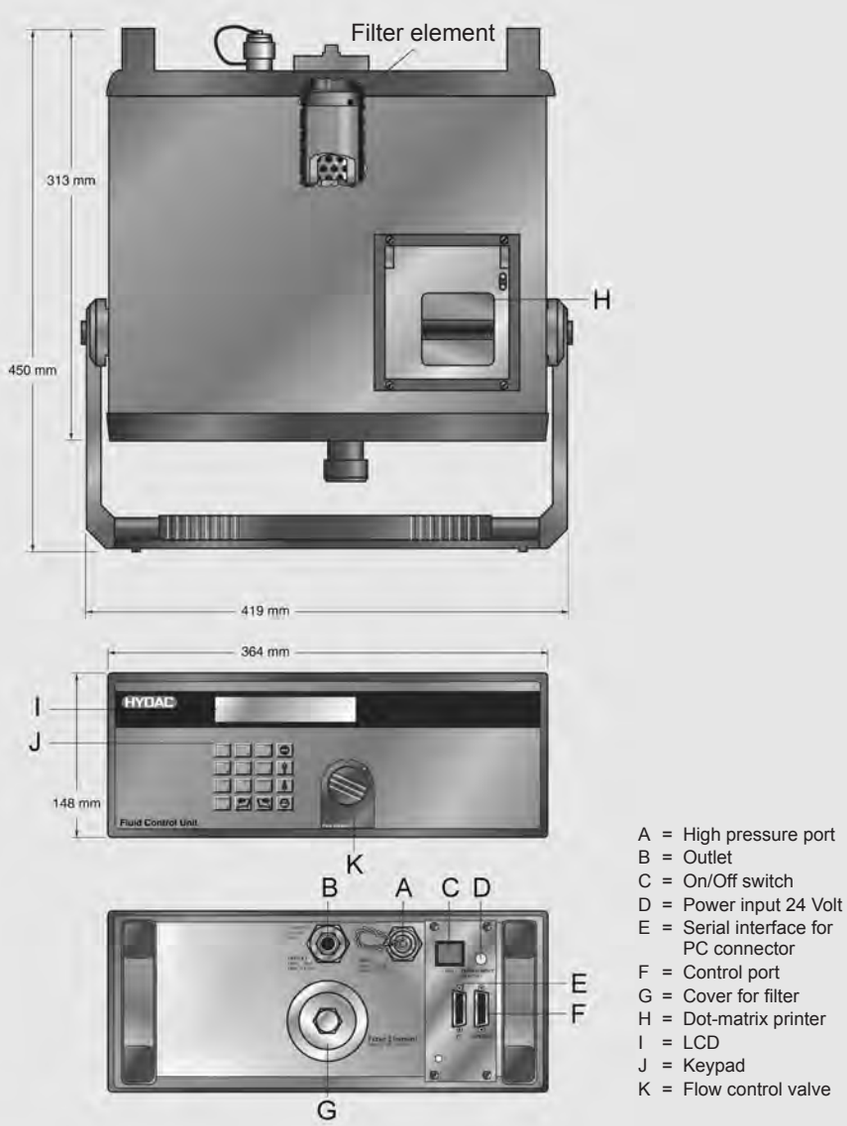
Housing
1 = for portable use

Fluids
0 = for standard mineral oils
1 = for phosphate esters (HFD-R)

Options
1 = standard, without options

Supply voltage
K = 120VAC / 60 Hz / 1 Phase, USA/CDN
M = 230VAC / 50 Hz / 1 Phase, Europe
N = 240VAC / 50 Hz / 1 Phase, UK
O = 240VAC / 50 Hz / 1 Phase, Australia
P = 100VAC / 50 Hz / 1 Phase, Japan

Supplementary details
- BUS = RS485 interface instead of RS232



A = High pressure port
B = Outlet
C = On/Off switch
D = Power input 24 Volt
E = Serial interface for PC connector
F = Control port
G = Cover for filter
H = Dot-matrix printer
I = LCD
J = Keypad
K = Flow control valve

Items supplied

– FCU
– Power supply adapter
– High pressure inlet hose DN 2 (2m long)
– Low pressure outlet hose DN 7 (2m long)
– Operating and maintenance instructions
– Calibration certificate
– PC software package CoCoS Light
– Connection cable FCU/PC

Accessories

– Reservoir Extraction Unit REU
– Inlet and outlet hoses 5 m long
– Bottle Sampling Unit BSU
– Transport case (aluminium)
– PC software package CoCoS Professional

Note

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FluidControl Unit
FCU 8000 Series
Accessories
BottleSampling Unit

Description
The BottleSampling Unit BSU is designed to be used in conjunction with the particle counter FluidControl Unit FCU 8000 to analyze oil sample bottles in the laboratory.

Applications
- Laboratory

Advantages
- This versatile combination enables the operator to use the FCU both as a portable field unit (by removing the FCU from the BSU) and also as a BottleSampler (when the FCU is replaced on the BSU again).

Technical specifications

Permitted viscosity range	1 ... 120 mm^2/s
Permitted fluids	mineral oils (or raffinates based on mineral oils), other fluids on request
Permitted rinsing fluid	low viscosity fluids, mineral oils or fluids based on mineral oils (preferably kerosene), flash point > 55 °C
Permitted fluid temperature range	0 ... 70 °C
Permitted ambient temperature range	10 ... 40 °C
Permitted storage temperature range	- 20 ... +85 °C
Permitted ambient humidity	max. 70 %
Dimensions (H x D x W)	615 mm x 365 mm x 360 mm (without FCU)
Protection class	IP40
Weight	27 kg
Services required on site *	
Compressed air supply	max. 6 bar, filtered (min. 5 µm) and dry compressed air
Compressed air connection	quick connector for hose DN6

***) not supplied**

Model code

BSU 8000 – 1 – M

Type
BSU = BottleSampling Unit

Model
8000 = suitable for the FCU 8000 Series

Options
1 = standard, without options

Supply voltage
K = 120VAC / 60 Hz / 1 Phase, USA/CDN
M = 230VAC / 50 Hz / 1 Phase, Europe
N = 240VAC / 50 Hz / 1 Phase, UK
O = 240VAC / 50 Hz / 1 Phase, Australia
P = 100VAC / 50 Hz / 1 Phase, Japan

BSU with FCU

Items supplied

– BSU
– FCU adapter
– Sample bottles
– Mains cable
– Operating manual

Accessories

– CompressedAir Unit CAU

Note

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AquaSensor
AS 1000

Description

The AquaSensor AS 1000 is the result of continued development of the successful AS 2000 series for online detection of water in oils, in particular as an OEM sensor for condition monitoring.
It measures the water content relative to the saturation concentration (saturation point) and gives the degree of saturation (saturation level) as a 4 .. 20 mA signal.

In addition the AS 1000 measures the temperature of the fluid and this, too, is given as a 4 .. 20 mA signal.

The AS 1000 therefore enables hydraulic and lubrication oils to be monitored accurately, continuously and online.

Applications

- Mobile hydraulics
- Hydraulic and lubrication systems in industry

Advantages

- Reliable as a result of its compact and robust design
- Cost-effective sensor, also for use in OEM applications
- Not necessary to calibrate sensor to different types of oil
- Pressure resistant, also under pulsation conditions
- Wide fluid temperature range
- Early detection of water problems thus preventing faults and unnecessary interruption to operations.

Technical specifications

Input data	
Degree of saturation	0 .. 100 %
Temperature	-25 .. 100 °C
Operating pressure	-0.5 .. 50 bar
Pressure resistance	max. 630 bar
Flow velocity	max. 5 m/s
Parts in contact with fluid	Mechanical connection: Stainless steel / Vacuum-metallized ceramic Seal: Viton or EPDM for each type
Output data	
Pin 2: Saturation level	
Output signal	4 .. 20 mA (corresponds to 0 .. 100 %)
Calibration accuracy	≤ ± 2 % FS max.
Accuracy when measuring in fluid	≤ ± 3 % FS typ.
Pressure dependence	± 0.2 % FS / bar
Pin 4: Temperature	
Output signal	4 .. 20 mA (corresponds to -25 .. +100 °C)
Accuracy	≤ ± 2 % FS max.
Pin 5:	**HSI** (**H**YDAC **S**ensor **I**nterface) Automatic sensor recognition
Ambient conditions	
Nominal temperature range (saturation)	0 .. +90 °C
Storage temperature range	-40 .. +100 °C
Fluid temperature range	-40 .. +125 °C
Viscosity range	1 .. 5000 mm²/s
Fluid compatibility	Mineral oil based fluids, synthetic and natural esters
CE mark	EN 61000-6-1 / 2 / 3 / 4
Protection class to DIN 40050	IP 67
Other data	
Supply voltage	12 .. 32 V DC
Residual ripple of supply voltage	≤ 5 %
Mechanical connection	G3/8 A DIN 3852
Torque value	25 Nm
Electrical connection	M12x1, 5 pole
Weight	≈ 145 g

Note: reverse polarity protection, short circuit protection provided.
FS (**F**ull **S**cale) = relative to the complete measuring range
IV (**I**nitial**V**alue)

Model code

AS 1 X 0 8 – C – 000

Type
AS = AquaSensor

Measuring range
1 = 1000 series

Medium
0 = mineral oils
1 = phosphate ester (HFD-R)

Mechanical connection
0 = G3/8 A DIN 3852

Electrical connection
8 = male connection M12x1, 5-pole
(connector not supplied)

Signal technology
C = output 1 pin 2 saturation level (4 .. 20 mA)
output 2 pin 4 temperature (4 .. 20 mA)

Modification number
000 = standard

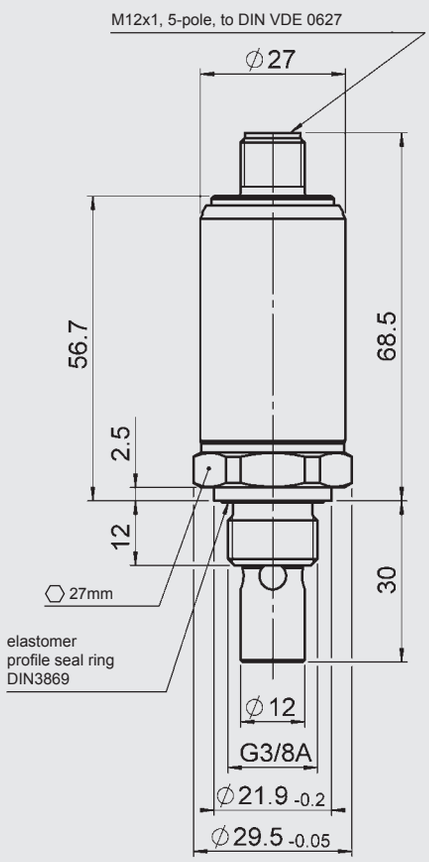
Items supplied

– AquaSensor
– Operating manual

Note

On units with a different modification number, please read the label or the technical amendment details supplied with the unit.

Dimensions



Note

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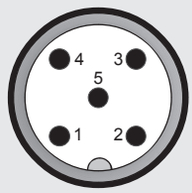
Subject to technical modifications.

Pin connections



Pin	AS 1X08-C
1	Voltage supply 12-32 VDC
2	Saturation level 4 .. 20 mA
3	GND voltage supply
4	Temperature 4 .. 20 mA
5	HSI*

* **HSI** = **H**YDAC **S**ensor **I**nterface

Accessories

ZBE 08
Female connector, right-angled, 5-pole, M12x1 → open end

ZBE 08S-02
Female connector, right-angled, with 2 m cable, screened, 5-pole, M12x1 → open end

ZBE 08S-05
Female connector, right-angled, with 5 m cable, screened, 5-pole, M12x1 → open end

ZBE 08S-10
Female connector, right-angled, with 10 m cable, screened, 5-pole, M12x1 → open end

ZBE 47S-05
Female connector, straight, with 5 m cable, screened, 5-pole, M12x1 → open end

ZBE 47S-10
Female connector, straight, with 10 m cable, screened, 5-pole, M12x1 → open end

Display and read-out options

The following interface adapters are available to interpret the AS1000:

- CSI-B-2 (Condition Sensor Interface)
- SMU1000 Series (Sensor Monitoring Unit)

The measured data can be evaluated and displayed as spreadsheets or graphically using:

- FluMoS (FluidMonitoring Software)
- FluMoT (FluidMonitoring Toolkit)

Information on other read-out options can be found on our website at www.hydac.com or please contact your HYDAC representative.

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AquaSensor
AS 2000

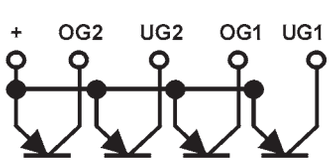
Description
The AquaSensor AS 2000 is designed for online measurement and indication of the percentage of dissolved water in hydraulic fluids. It also measures the temperature. The AquaSensor measures the level of saturation in percentage (volume %) irrespective of the oil type, age and temperature. The level of saturation indicates how much water is dissolved in the oil as a percentage of the maximum possible (total saturation). In other words 0% would indicate oil which is free of water and 100% would indicate oil which is completely saturated with water.

Applications
Applications in test rigs, lubrication systems and hydraulic systems for:

- Dynamic trend measurement of the water content
- Leakage monitoring
- Maintenance planning

Advantages
- With or without integral display
- Possible to transfer the measured values to a PC via RS 485 port
- Analogue and switching outputs

Technical specifications

Measurement range (calibrated)	Level of saturation: 0 - 100 %, Temperature: -20 .. 120 °C
Accuracy	Level of saturation: +/- 2 %, Temperature: +/- 0.4 °C at 5 .. +50 °C
Operating pressure	-0.5 .. 10 bar (-0.05 .. 1MPa)
Flow velocity	max. 4.5 m/sec
Fluid temperature range	5 .. + 90 °C
Ambient temperature	-10 .. +70 °C
Supply voltage	24 VDC (10 .. 30 VDC), max. 100 mA, residual ripple <10 %
Analogue outputs Level of saturation Temperature	 4 .. 20 mA, resolution: 0.02 mA 4 .. 20 mA, resolution: 0.02 mA
Max. ohmic resistance	500 Ω (Ohm)
Switching outputs 	2 x saturation level (OG1/UG1) 2 x temperature (OG2/UG2), Transistors via optical coupler switching to +, max. 30VDC / 100mA / 3W
Protection class	IP65
Housing	Zinc die-casting GD-ZNAl 4

Model code

AS 2 3 3 0 – 1 – U

Type
AS = AquaSensor

Measuring range
2 = Saturation level 0 - 100%,
Temperature -20 .. 120 °C

Version
0 = 4 .. 20 mA output
3 = 4 .. 20 mA output + display +
RS485 port + switching outputs

Housing
3 = For stationary use

Fluids
0 = For standard mineral oils

Length of cable (to tip of probe)
1 = 3000 mm

Supply voltage
U = 24 VDC

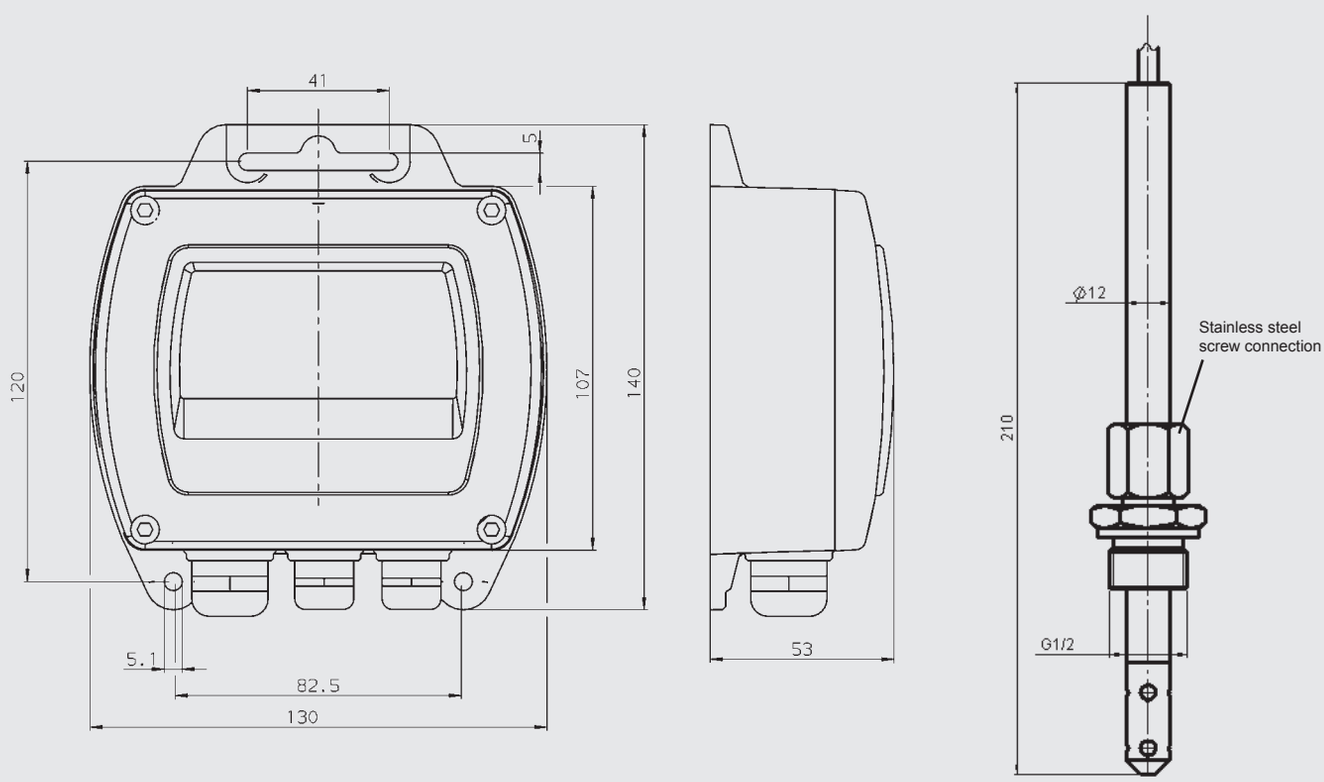
Items supplied

– AS 2000
– Stainless steel screw connection 1/2" with compression ring
– Operating manual

Accessories

– Calibration and adjustment kit Part No.: 3122629

Dimensions



Note

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

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

Subject to technical modifications.

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AquaSensor
AS 8000

Description
The AquaSensor AS 8000 has been developed to detect and measure the free water in mineral and lubrication fluids, i.e. water content in excess of the saturation point.

This sensor is designed for continuous online monitoring of the water content in volume percent (approx. 0.5% to 50%).

The signals are given via a decoder as a 4 .. 20mA signal, via an RS232 interface or as switching signals.

The parameters for the AS 8000 can be set easily via the RS 232 interface.

Applications
- Steel plants
- Paper industry
- Mills
- Marine and offshore
- Dewatering systems
- Cooling systems

Advantages
- Online monitoring of the volume of free water in the oil
- Possible to detect water ingress promptly, thus preventing malfunctions and damage to systems
- Reduces costs caused by downtimes and repairs

Technical specifications

Measurement range (calibrated)	Water content: 0.5 - 50%, Temperature: 5 ... 80 °C
Accuracy	Water content: +/- 2%
Operating pressure	max. 10 bar (1.0 MPa)
Fluid temperature range	5 ... + 80 °C
Ambient temperature	0 ... 55 °C - Sensor 0 ... 80 °C - Decoder
Supply voltage	24 VDC (10...30 VDC), max. 100 mA, residual ripple <10 %
Analogue outputs Water content	 2 x 4 ... 20 mA
Max. ohmic resistance	300 Ω (Ohm)
Switching outputs	3 x relays (1 x "ready" relay, 2 x relays for water content in vol-% programmable) max. 60V / 250 mA
Protection class	IP 20 Decoder IP 67 Sensor
Sensor material	2.0490

Model code

AS 8 0 3 0 – 1 – U

Type
AS = AquaSensor

Measuring range
8= water content in volume percent
0.5 - 50 %

Version
0= 4-20 mA output and RS232 interface

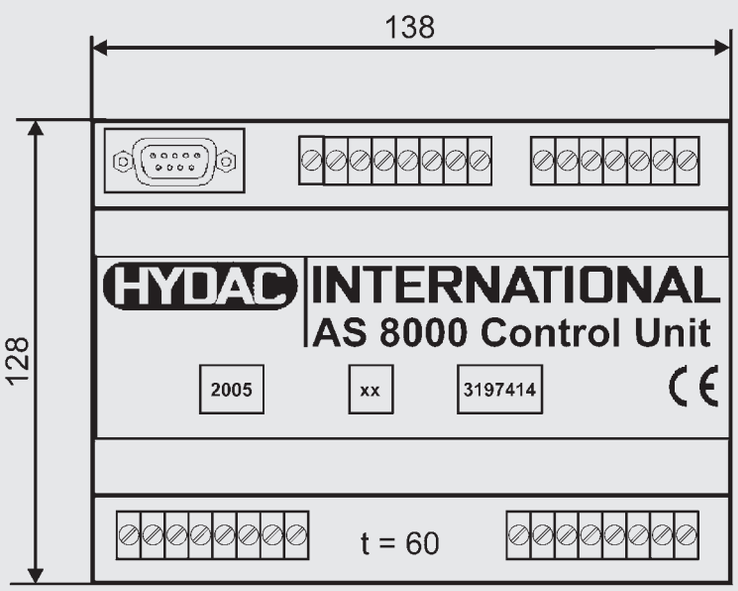
Housing
3= for stationary use

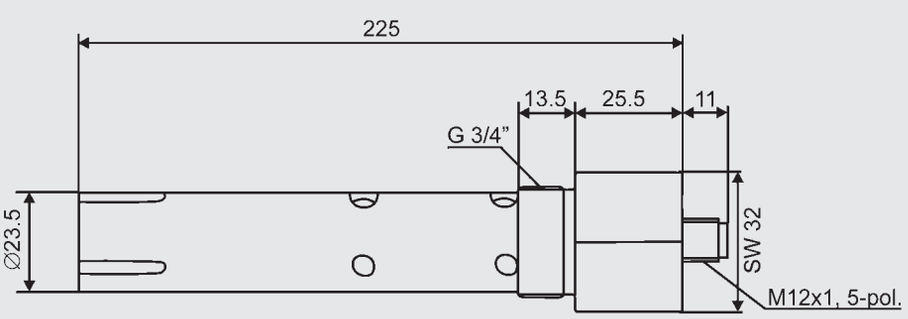
Fluids
0= for standard mineral oils

Cable lengths
1= 8000 mm
2= 15000 mm

Supply voltage
U = 24 VDC

Dimensions





Items supplied

– AS 8000 Sensor
– AS 8000 Control Unit (decoder) for 2 sensors
– Extension/connection cables
– Operating manual

Accessories

– Second sensor

Note

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Subject to technical modifications.

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Fluid Monitoring Module
FMM

Description
The FluidMonitoring Module FMM series combines two of Hydac's condition monitoring products, the ContaminationSensor CS 1000 and AquaSensor AS 1000, in one system.

It provides the user with a robust and stationary system for online measurement of

- particle contamination and
- water content (e.g. to detect leakage) in hydraulic and lubrication fluids.

The FMM series of blocks have all the necessary connections and are therefore easy to install in existing hydraulic circuits.

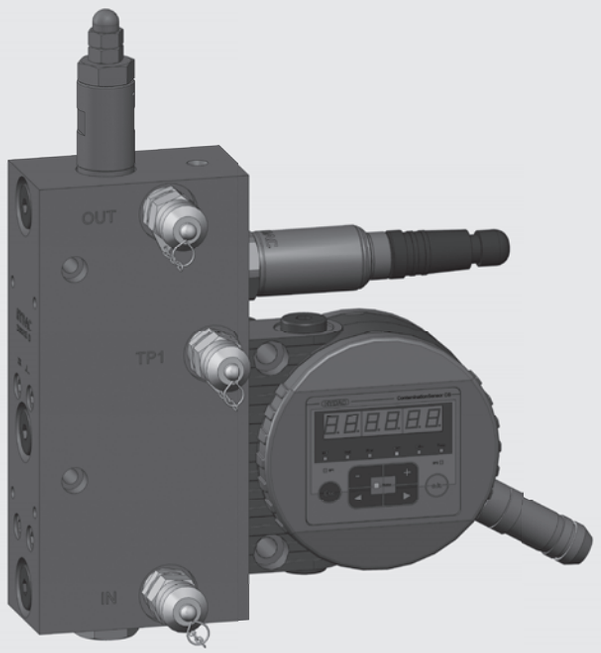
Various models are available for use in filtration & cooler/heater circuits, pressure and high pressure applications.

Advantages
- Cost-effective installation
- Critical machine conditions are identified in good time
- Continuous oil condition monitoring
- Condition-based maintenance planning

Technical specifications

General data	
FMM - O - M - ...	Offline circuits 6 ... 15 bar
FMM - P - S - ...	Pressure circuits 15 ... 300 bar
FMM - P - M - ...	Pressure circuits 15 ... 300 bar
FMM - P - L - ...	Pressure circuits 15 ... 250/300 bar
FMM - A - S - ...	Pressure circuits 15 ... 300 bar

FMM - O - M - ...
(previously known as: FMM)



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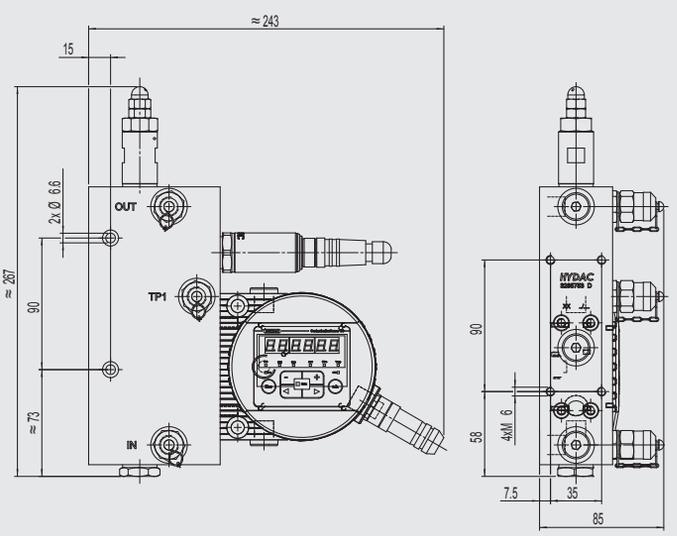
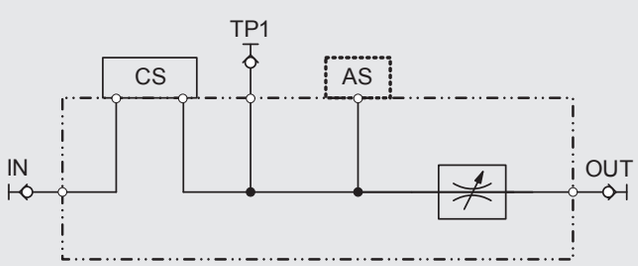


Hydraulic circuit diagram



Technical specifications

Mounting position	vertical (flow from bottom to top)
Max. operating pressure	6 ... 15 bar / 87 ... 217 psi
Minimum differential pressure	6 bar / 87 psi (recommended)
Permitted viscosity range	1 ... 350 mm²/s
Hydraulic connection (IN, OUT)	Test point type 1604 or G 1/4" (ISO 228)
Material of seal	FPM
Fluid temperature range	0 ... +85 °C / +32 ... +185 °F
Ambient temperature range	-30 ... +80 °C / -22 ... +176 °F
Storage temperature range	-40 ... +80 °C / -40 ... +176 °F
Relative humidity	max. 95%, non-condensing
Weight	4.3 kg

Model code

See last page

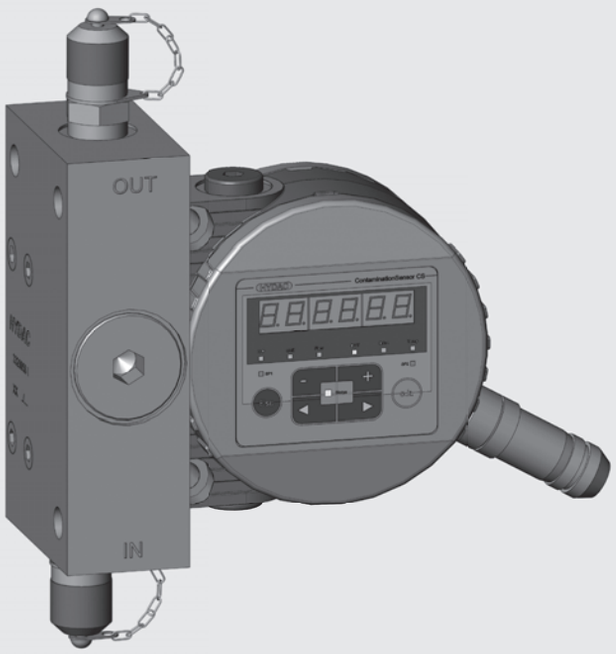
Items supplied

– 1 FMM - O - M - ...
– 1 Operating manual

Accessories

A wide range of accessories can be found in the brochure "Filter Systems Accessories" (E 7.623...), page 209 onwards.

FMM - P - S - ...
(previously known as: FMMP)



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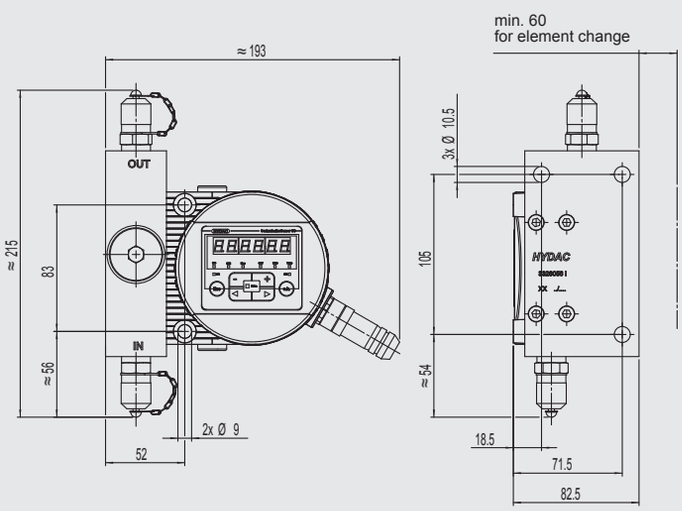
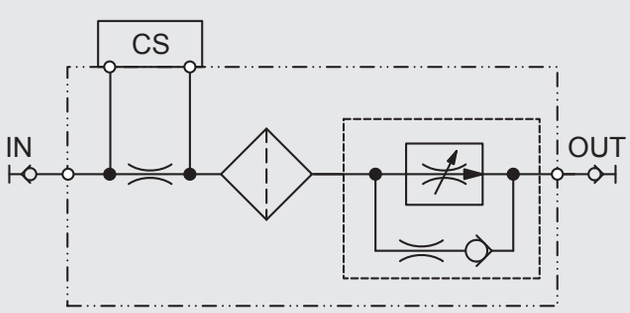


Hydraulic circuit diagram



Technical specifications

Mounting position	vertical (flow from bottom to top)
Max. operating pressure	15 ... 300 bar / 217 ... 4350 psi
Minimum differential pressure	15 bar / 217 psi
Permitted viscosity range	1 ... 350 mm²/s
Hydraulic connection (IN, OUT)	Test point type 1604 or G 1/4" (ISO 228)
Material of seal	FPM / EPDM
Fluid temperature range	0 ... +85 °C / +32 ... +185 °F
Ambient temperature range	-30 ... +80 °C / -22 ... +176 °F
Storage temperature range	-40 ... +80 °C / -40 ... +176 °F
Relative humidity	max. 95%, non-condensing
Weight	4.3 kg

Model code

See last page

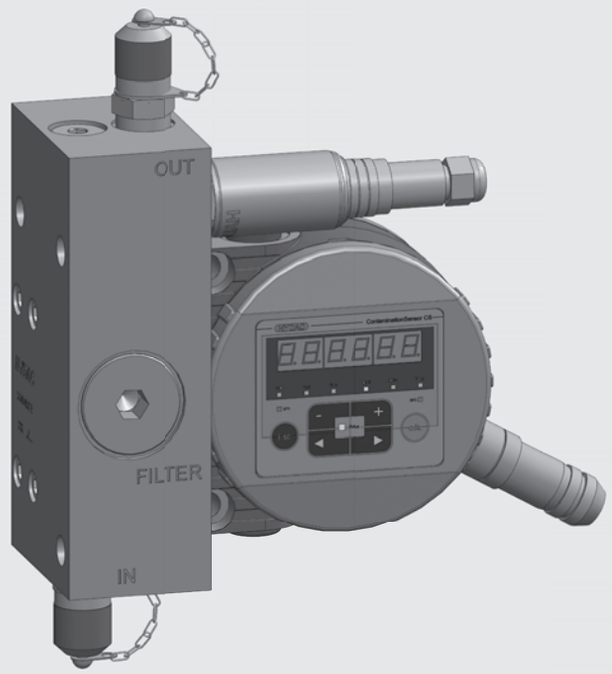
Items supplied

– 1 FMM - P - S - ...
– 1 Operating manual

Accessories

A wide range of accessories can be found in the brochure "Filter Systems Accessories" (E 7.623...), page 209 onwards.

FMM - P - M - ...



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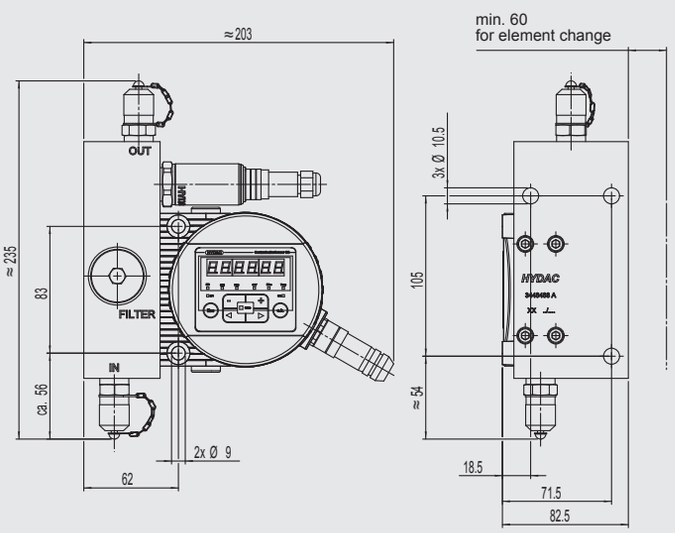
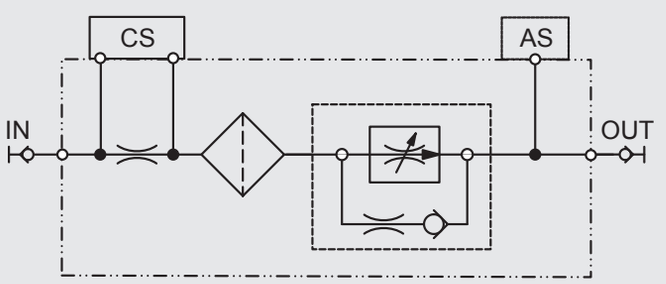


Hydraulic circuit diagram



Technical specifications

Mounting position	vertical (flow from bottom to top)
Max. operating pressure	15 ... 300 bar / 217 ... 4350 psi
Minimum differential pressure	15 bar / 217 psi
Permitted viscosity range	1 ... 350 mm²/s
Hydraulic connection (IN, OUT)	Test point type 1604 or G 1/4" (ISO 228)
Material of seal	FPM / EPDM
Fluid temperature range	0 ... +85 °C / +32 ... +185 °F
Ambient temperature range	-30 ... +80 °C / -22 ... +176 °F
Storage temperature range	-40 ... +80 °C / -40 ... +176 °F
Relative humidity	max. 95%, non-condensing
Weight	6.5 kg

Model code

See last page

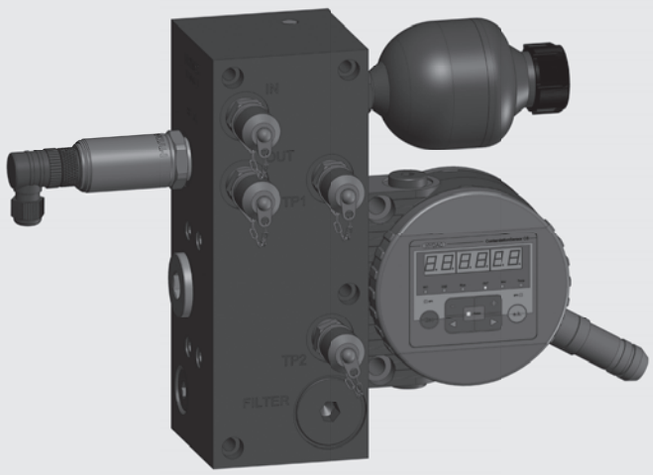
Items supplied

– 1 FMM - P - M - ...
– 1 Operating manual

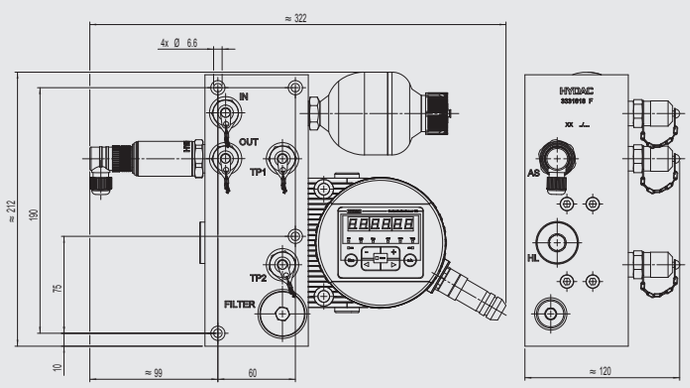
Accessories

A wide range of accessories can be found in the brochure "Filter Systems Accessories" (E 7.623...), page 209 onwards.

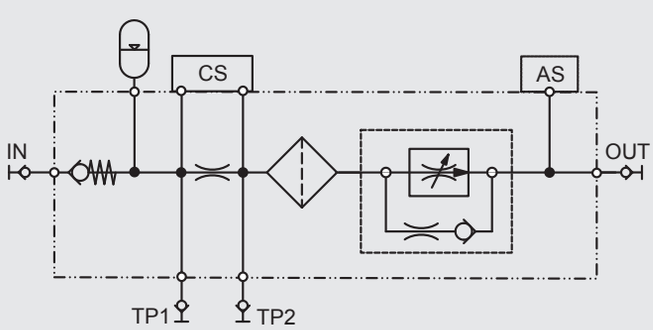
FMM - P - L - ...
(previously known as: FMMHP)



Dimensions



Hydraulic circuit diagram



Technical specifications

Mounting position	vertical (flow from bottom to top)
Max. operating pressure without hydraulic accumulator with hydraulic accumulator	 15 ... 300 bar / 217 ... 4350 psi 15 ... 250 bar / 217 ... 3625 psi
Minimum differential pressure	15 bar / 217 psi
Permitted viscosity range	1 ... 350 mm²/s
Hydraulic connection (IN, OUT)	Test point type 1604 or G 1/4" (ISO 228)
Material of seal	FPM / EPDM
Fluid temperature range	0 ... +85 °C / +32 ... +185 °F
Ambient temperature range	-30 ... +80 °C / -22 ... +176 °F
Storage temperature range	-40 ... +80 °C / -40 ... +176 °F
Relative humidity	max. 95%, non-condensing
Weight	12.5 kg

Model code

See last page

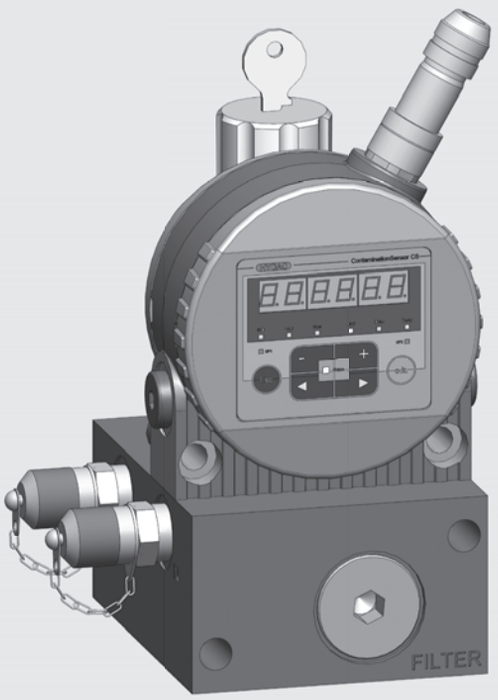
Items supplied

– 1 FMM - P - L - ...
– 1 Operating manual

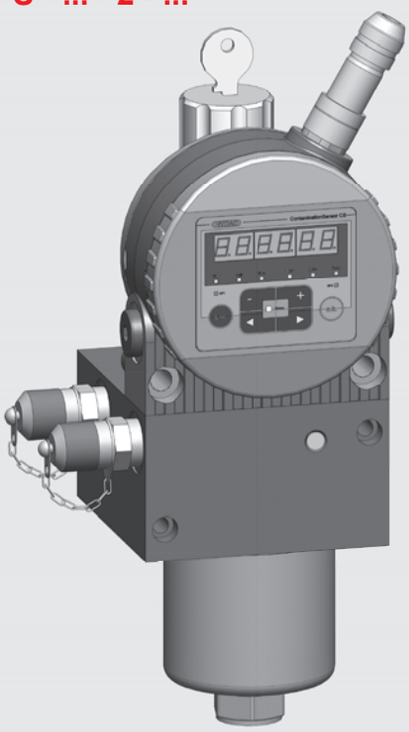
Accessories

A wide range of accessories can be found in the brochure "Filter Systems Accessories" (E 7.623...), page 209 onwards.

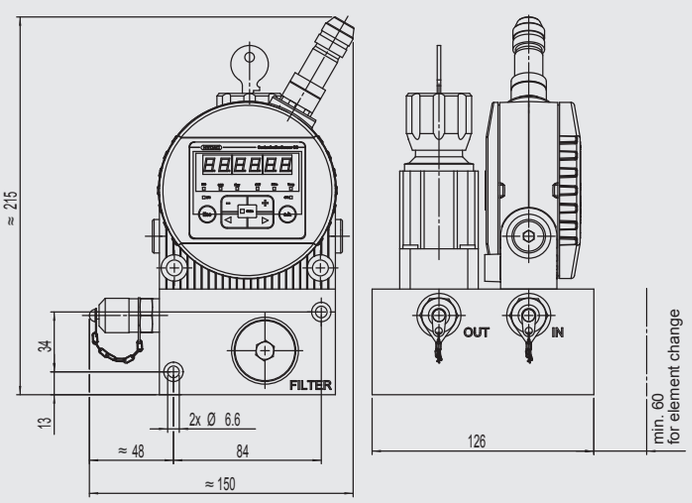
FMM - A - S - ... - 1 - ...



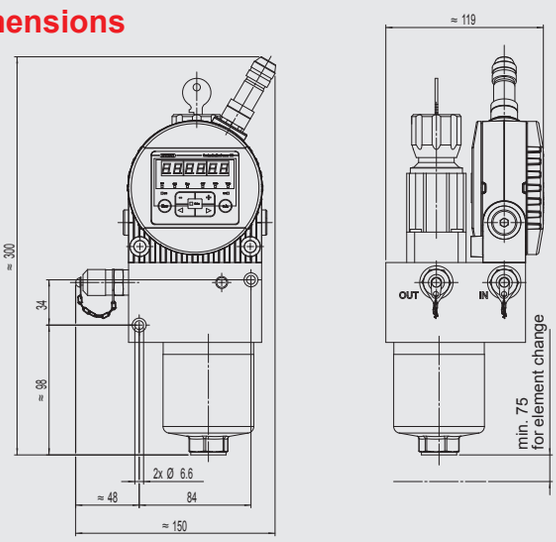
FMM - A - S - ... - 2 - ...



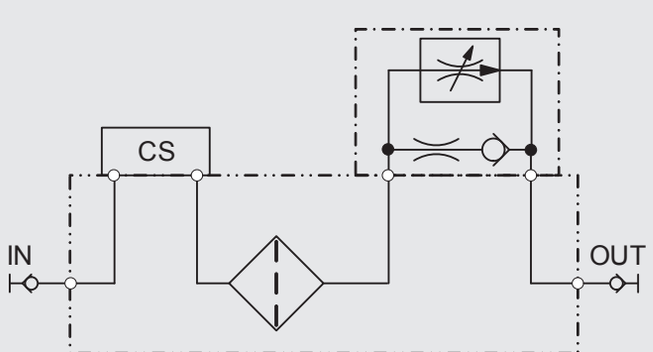
Dimensions



Dimensions



Hydraulic circuit diagram



Technical specifications

Mounting position	horizontal
Max. operating pressure	15 ... 300 bar / 217 ... 4350 psi
Minimum differential pressure	15 bar / 217 psi
Permitted viscosity range	1 ... 350 mm²/s
Hydraulic connection (IN, OUT)	Test point type 1604 or G 1/4" (ISO 228)
Material of seal	FPM / EPDM
Fluid temperature range	0 ... +85 °C / +32 ... +185 °F
Ambient temperature range	-30 ... +80 °C / -22 ... +176 °F
Storage temperature range	-40 ... +80 °C / -40 ... +176 °F
Relative humidity	max. 95%, non-condensing
Weight	10 kg (protective filter) / 14 kg (DF60)

Model code

See last page

Items supplied

– 1 FMM - A - S - ...

– 1 Operating manual

Accessories

A wide range of accessories can be found in the brochure "Filter Systems Accessories" (E 7.623...), page 209 onwards.

Model code

FMM - O - M - 0 - CS 1 2 2 0 - A - AS - 0 - 0 - 0 / -000

TYPE
FMM = Fluid Monitoring Module

Hydraulic application
O = Offline (offline circuit < 15 bar)
P = Pressure Line (pressure circuit > 15 bar)
A = Adjustable Flow Control Valve (pressure circuit > 15 bar)

Sensor combination
S = CS1000
M = CS1000 + AS1000
L = CS1000 + AS1000 + HydacLab *

Seal
0 = FPM
1 = EPDM (1) (2)

Contamination Sensor CS1000 Series
CS 1210 = ISO / SAE, without display (FPM)
CS 1220 = ISO / SAE, with display (FPM)
CS 1310 = ISO / SAE / NAS, without display (FPM)
CS 1320 = ISO / SAE / NAS, with display (FPM)
CS 1211 = ISO / SAE, without display (EPDM)
CS 1221 = ISO / SAE, with display (EPDM)
CS 1311 = ISO / SAE / NAS, without display (EPDM)
CS 1321 = ISO / SAE / NAS, with display (EPDM)

Analogue interface of the CS1000
A = 4 ... 20 mA
B = 0 ... 10 VDC

Additional sensor
Z = without
AS = AS1000
Z(AS) = set up for AS1000

Hydraulic accumulator
0 = without accumulator
1 = diaphragm accumulator SBO 250-0.075 (40 bar gas pressure) [not available in EPDM]

Filter
0 = without filter
1 = protective filter (25µm) (2)
2 = DF60 (5µm) (2)

Options
0 = no options

Modification number
000 = Modification number

(1) not for hydraulic accumulator
(2) not for FMM-O

* Set up for HydacLab

Note

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Subject to technical modifications.

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Automated Laboratory Particle Counter

ALPC 9000 Series

Description

The Automated Laboratory Particle Counter ALPC 9000 is a fully automatic laboratory particle measurement system for hydraulic and lubrication oils.

Very short measuring times permit analysis of up to 500 samples per day.

Different versions of the ALPC offer either automatic sample feed by means of 5-axis robotic arm (batch processing) or manual sample feed of individual sample bottles.

Applications

- Laboratories

Advantages

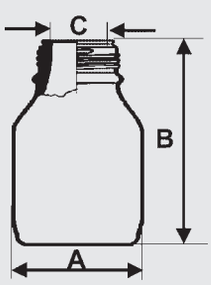
- Automatic and monitored processing of measurement and rinsing cycles.
- Rapid sample analysis due to very short cycle times for measurement and rinsing.
- Excellent repeatability of the measurement results by means of replicated testing.
- Only small sample quantities are required (≈ 50 ml).
- User-friendly operation and graphical evaluation of the results through the use of ALPC Desk software.
- Calibrated to ISO11171 and ISO4402: consequently analysis according to NAS 1638 is also possible.
- “All-in-one” system including PC, keyboard and monitor. Optionally with robotic arm.
- Bar code scanner compatible.

Technical specifications

Self-diagnostics	Continuous display and error indication on the PC
Measurement range (calibrated)	ISO 0/0/0 ... 23/21/18
Calibration ISO 4402 and ISO 11171	Particle size 5, 10, 15, 20, 25, 50, 75, 100 µm 4, 6, 10, 14, 18, 21, 38, 50 $\mu m_{(c)}$
Measured volume per sample bottle (2 ... 5 individual measurements)	10 ... 25 ml (min. sample bottle volume: 50 ml)
Sensor flow rate	30 ml/min
Measurement cycle time (measuring and rinsing; typically)	≈ 75 sec (excluding sample feed)
Permitted fluids	Hydraulic and lubrication fluids based on mineral oil
Permitted rinsing fluid	See next page "Services required on site"
Rinsing fluid consumption	≈ 50 ml / sample bottle
Permitted viscosity range	1 ... 320 mm^2 / sec
Permitted fluid temperature range	0 ... 50 °C, 32 ... 122 °F
Compressed air supply (provided by customer)	6.5 ... 8 bar, 100 l/min
Power consumption	2000 W max. (230 V, max. 8.7 A)
Permitted ambient temperature range	10 ... 45 °C, 50 ... 113 °F Depending on rinsing fluid. Higher temperatures possible on request.
Permitted storage temperature range	0 ... 70 °C, 32 ... 158 °F
Permitted ambient humidity	max. 90%, non-condensing
Weight	ALPC 9000 -1: ≈ 100 kg ALPC 9000 -2: ≈ 160 kg

Equipment

	ALPC 9000-1	ALPC 9000-2
Automatic measurement	✔	✔
Automatic rinsing	✔	✔
PC/Monitor/Keyboard	✔	✔
Individual sample bottle feed	✔	✔
Multiple sample feed of up to 44 samples on pallet		✔
Sample bottle shaker		✔
5-axis robotic arm		✔
ALPC Desk software	✔	✔
Degassing function incorporated into robotic arm		✔
Prepared for upgrade to ALPC 9000-2	✔	
Bar code scanner compatible	✔	✔



Sample bottle dimensions (other dimensions on request)

A	B	C	ALPC 9000-1	ALPC 9000-2
max. 52 mm	60 .. 120mm	25 .. 35mm		✔
max. 75mm	60 .. 150mm	25 .. 35mm	✔	

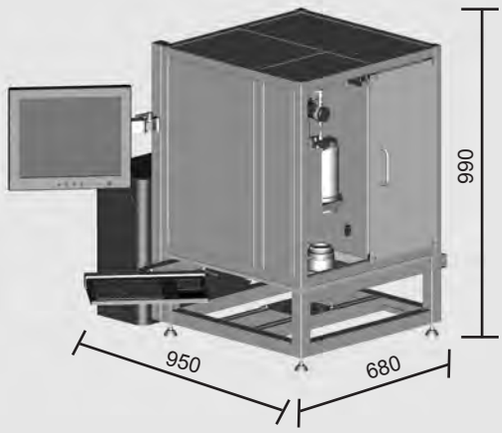
Services required on site *

- Voltage supply
- Clean, dry compressed air (see Page 61)
- Rinsing fluid: Mineral oil based fluids with flash point ≥ 56 °C (preferably kerosene). Cleanliness must be significantly better (by a factor of 2-3) than the expected sample cleanliness
- Reservoir for rinsing and waste fluids (min. 2 x 10 l)

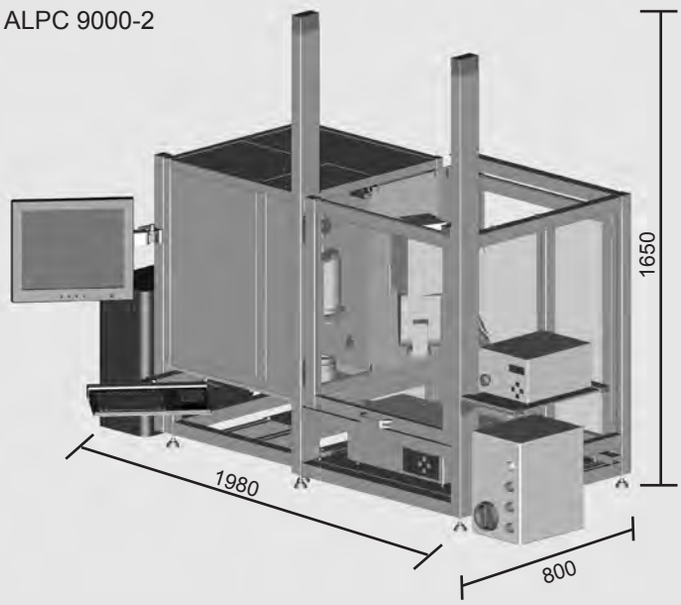
* not supplied

Dimensions (all dimensions approximate in mm)

ALPC 9000-1



ALPC 9000-2



PC Software ALPC Desk

User-friendly processing and display of the measured data using ALPC Desk software

Model code

ALPC 9000 1 M WXPDE DE

Type
ALPC = Automatic Laboratory Particle Counter

Series
9000

Sample feed
1= manual
2= automatic

Supply voltage
M = 230 VAC, 50 / 60 Hz
Other voltage on request

PC operating system
WXPUS = Windows XP US
WXPDE = Windows XP DE

Keyboard
BE = Belgium
CH = Switzerland
DE = Germany
DK = Denmark
ES = Spain
FR = France
GB = England
IT = Italy
NO = Norway
PO = Portugal
SF = Sweden, Finland
US = USA

Items supplied

- ALPC 9000-1 / 9000-2
- ALPC 9000-2 only: sample bottle shaker, robotic arm with transparent Makrolon® safety enclosure
- PC, 15" TFT monitor, keyboard with touchpad
- Software ALPC Desk installed on PC and on CD-ROM
- Calibration certificate
- Operating manual
- Service documentation installed on PC and on CD-ROM

Note

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

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

Subject to technical modifications.

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FluidAnalysis Set
FAS

Description
The FluidAnalysis Set is designed to produce contamination monitors from oil samples. These can be used to analyze samples from hydraulic and lubrication systems with regard to solid contamination. By comparing the microscopic evaluation with reference photographs, a rapid assessment of the fluid contamination (cleanliness class classification to ISO 4406, NAS 1638) can be made.

Advantages
- Simple fluid monitoring
- Confirmation of changes in oil cleanliness
- Support for condition-based maintenance

Applicable standards
- ISO 4405
- Gravimetric methods for determining the amount of contamination in hydraulic fluids.

Model code

FAS M 3

Basic type
FAS

Supply voltage
K = 110 V / 60 Hz
M = 230 V / 50 Hz

Modification number
3 = The latest version is always supplied

Spare parts list FAS

Part no.	Description
637 345	Vacuum filtration unit, consisting of: Top section (250 ml), funnel attachment, centring ring with strainer, clamp
637 344	Rubber stopper
637 343	Suction flask 1000 ml, with hose coupling
638 956	Hose Ø 6x3, Length: 1m, Material: natural silicone
607 6303	Electric vacuum pump V 700-6.0 12VDC / 500 mA
309 358	Spray bottle, 500 ml, with removable nozzle
309 371	Disposable membrane filter for spray bottle
309 354	Membrane filter discs, D = 47 mm, 0.8 µm, 100 pieces
637 341	Tweezers, 105 mm
309 377	Petri slides, type PD 1504700, 50 pieces
637 342	Measuring cylinder, 100 ml, with stopper
309 360	Wide neck plastic bottle 550 ml
607 6711	Power supply: 1. 100 - 240 VAC / 50-60 Hz 2. 12 VDC / 500 mA PS2 includes 4 adapters for Eu/US/UK/Aus
349 339	Contamination handbook

Items supplied

Key to individual items:
1: Transport case
2: Silicone hose
3: Membrane filter discs
4: Electric vacuum pump
5: Tweezers
6: Vacuum filtration unit
7: Measuring cylinder 100 ml
8: Wide neck plastic bottle, 500 ml
9: Petri slides
10: Spray bottle with membrane filter
11: Contamination handbook (not illustrated)

Note

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Subject to technical modifications.

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FluidSampling Set
FES

Description
The FluidSampling Set FES is designed for taking static and dynamic oil samples from hydraulic and lubrication systems.

Advantages
- Static and dynamic sampling possible
- Numerous accessories included

Applicable standards
- ISO 4021
- CETOP RP 95 H

Part No.
- 349 334

Items supplied

Part no.	Description
309 345	Manual vacuum pump with gauge
309 349	Aluminum adapter
3143465	Set of 2 sample bottles
309 358	Spray bottle, 500 ml, with removable nozzle
309 371	Disposable membrane filter for spray bottle, 2 pieces
309 374	Plastic hose, length = 2 m
309 342	Telescopic pointer 90 cm
627 500	Cable ties, 20 pieces
309 348	Dynamic sampler
309 350	Minimess test hose (screw coupling / screw coupling)
309 351	Minimess test hose (screw coupling / push-in coupling)
309 360	Wide neck plastic bottle 500 ml
637 561	Case
349 339	Contamination handbook

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Measuring Microscope

MM-S5-M
MM-S5-M-U

Description

These measuring microscopes are designed mainly to measure particles on filter membranes of oil samples.

The microscopes are stable and robust in design.

In accordance with the requirements of oil analysis, the optical equipment has maximum luminous intensity and consistent definition over the whole image range.

The body has the facility for coarse and fine adjustment, and there is a slide table with X and Y movements as standard which enables easy adjustment of the focus and subject position.

The integrated LED lighting with power supply provides sufficient image brightness even at high magnification.

The microscope case protects the microscope from knocks and dust.

The microscope MM-S5-M-U can be used with or without the CCD camera.

With the aid of the software supplied, it is possible to process the image on a PC or laptop. The camera images can be embedded in many Windows® applications as files.

The measuring scale in the camera lens has a scale division of 1 mm in 100 parts.

Applications

- Laboratory

Advantages

- Simple analysis of membranes (also on site)

Technical specifications

	MM-S5-M	MM-S5-M-U
DIN Huygens eyepiece	10 x M	
Achromatic lenses	4x, 10x, 20x	
Magnifications	40x, 100x, and 200x	
Supply voltage	230 V 50 Hz	
Body length	160 mm	
Total height	330 mm	
Image digitization		CCD camera
Video system		PAL colour system
Resolution		Horizontal 460 lines / vertical 400 lines
PC interface		USB port
System requirements		min. Pentium 233 MHz, Windows 98 / ME / 2000 / XP, USB port, CD-ROM drive, 32 MB RAM

Model code

MM S5 M U

Basic model
MM = Measuring microscope

Lens system
S5 = Standard eyepiece

Supply voltage
M = 230 V 50 Hz
P = 110 V 60 Hz

Image digitization
No details = Standard illumination
U = CCD camera with USB port to laptop or PC

Note

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Measuring Microscope
MM-KKE-M-C-U

Description
This measuring microscope is designed mainly to measure particles on filter membranes of oil samples. The microscope is stable and robust in design and is convenient to use. The body is adjusted by an easily operated tangent screw for coarse adjustment and a fine adjustment tangent screw, thus ensuring optimum focus at maximum magnification. The integrated lighting with power supply provides sufficient image brightness even at a magnification of 200x. The stand is fitted with a 3-part knurled revolving unit and a slide table with X and Y movements.

The optical equipment consists of the achromatic lenses: 4:1, 10:1, 20:1. These lenses are used in combination with a micrometer eyepiece with 10x magnification. The measuring scale in the eyepiece has a scale division of 1 mm in 100 parts. By using the micrometer eyepiece and the enclosed measuring card, it is possible to determine the size of the subject directly with all three lenses. The microscope case protects the microscope from knocks and dust.

Applications
- Laboratories

Advantages
- Simple analysis of membranes (also on site)

Technical specifications

Huygens eyepiece	10 x M
Achromatic lenses	4x, 10x, 20x
Magnifications	40x, 100x, and 200x
Body length	160 mm
Total height	330 mm
Paint colour	Light grey
PC interface	USB port
System requirements	min. Pentium 233 MHz, Windows 98 / ME / 2000 / XP, USB port, CD-ROM drive, 32 MB RAM

Model code

MM KKE M C U

Basic model
MM = Measuring microscope

Lens system
KKE = Triocular

Supply voltage
0 = 240 V 50 Hz (Australia)
M = 230 V 50 Hz (Europe)
P = 110 V 60 Hz (Japan)

Accessories
C = Cold light illumination

Image digitization
U = CCD camera with USB port

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WaterTest Kit
WTK300

Description
The WaterTest Kit is used for quantitative analysis of water content in volume percent in mineral and lubricating oils. Simply adding 2 reagents to the contaminated oil causes an increase in pressure in the measuring cell. This pressure increase can be read off the digital display as water content in volume % or ppm.

The following measurement ranges can be selected: 0.02...1%; 0...10% and 100...3000ppm

Time per test: approx. 2 minutes only (excluding sample preparation)

Advantages
- Plastic housing is light, shock-resistant and resistant to chemicals
- Pressure sensor is easy to clean and highly accurate
- High resolution in the lower measuring range

Model code

WTK - 3 - 0 - 0/ - D

Type
WTK = WaterTest Kit

Series
3 = Measurement ranges:
0 - 10 %
0.02 - 1 %
100 - 3000 ppm

Option
0 = Standard

Modification number
0

Language version
D = German
E = English
F = French

Items supplied *

Item	Quantity	Description
1	1	Measuring cell
2	2	REAGENT A, 500 ml bottle
3	50	REAGENT B, sachets
4	3	Disposable syringe 5 ml
5	1	Tweezers
6	1	Scissors
7	10	Disposable syringe 1 ml
8	1	Measuring beaker, 100 ml
9	1	Case
10	1	Operating manual

Spare parts *

Description	Part No.
Replacement pack, consisting of items 2 - 6	603 0669

* Quantity sufficient for 50 tests

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ContaminationTest Unit
CTU 1000 Series

Description

The Hydac ContaminationTest Unit CTU 1000 series is used to determine the surface cleanliness of lightly contaminated components.

The reasons behind this are the ever increasing demands on life expectancy of individual components and assemblies which has meant growing demands for technical cleanliness of components and systems. Starting with production, assembly and storage, this extends right through to operation of the complete system.

By analyzing the type, size and quantity of the contamination, quality standards can be verified and documented, and the required measures for improvement can be implemented.

Applications

- Automotive and supplier industry
- Transmission and engine builders
- Mobile hydraulics
- Manufacturers of hydraulic and lubrication systems and components

Advantages

- Reduction in costs as a result of fewer production failures
- Identification and elimination of weak processes
- Reduction in start-up breakdowns
- Optimization of both internal and external handling processes
- Customized documentation of the technical cleanliness of components

Technical specifications

Dimensions, overall (Height x Width x Depth)	CTU10xx: 1800 mm x 985 mm x 835 mm CTU12xx: 1800 mm x 910 mm x 1140 mm
Weight	CTU10xx: ≈ 270 kg ≈ 290 kg with ultrasonic unit CTU12xx: ≈ 310 kg
Type	mobile (mounted on casters)
Power consumption	600 W (800 W with ultrasonic unit)
Ambient temperature	15 ... 28 °C
Analysis cabinet (clean box)	
Material of clean box	Polished stainless steel
Filling with analysis fluid	Via the analysis cabinet
Control	PC controlled with user-friendly software, rinse options and rinsing volume programmable
Storage and filtration module	
Membrane holder	For Ø 47... 50 mm filter membranes
Vacuum nozzle	For faster filtration of the analysis fluid
Diffuser	For even distribution of analysis fluid over membrane
Operating pressure	- 0.8 ... 6 bar
Reservoir, test fluid	2x 20 l (1x storage reservoir, 1x suction reservoir)
Reservoir switch-over	Automatic
Filtration, analysis fluid	Fine filtration to ISO4406 min. ISO 12/9
Filter size, filtration rating	2x LF BN/HC 60, 3 µm (1xx0 series) 2x MRF-1-E/1, 1 µm (1xx1 series)
Built-in drip tray	25 litres with drain
To be provided by the operator (not included)	
Compressed air	Pre-filtered (min. 5 µm) and dry compressed air, max. 6 bar, Air flow rate: 60 l/min, Connection: Nipple DN 7.2
Voltage supply	According to order
Ultrasonic unit	100 W, 40 KHz
Basket for ultrasonic unit	Dimensions: 120 x 110 x 46 mm Mesh width: 4 mm

Model code

CTU 1 0 0 0 - M - Z - Z

Type
CTU = ContaminationTest Unit

Series
1 = 1000 Series

Size
0 = dimensions of analysis cabinet (Clean Box):
300 mm x 800 mm x 400 mm
(height (approx.) x width x depth)
2 = dimensions of analysis cabinet (Clean Box):
550 mm x 800 mm x 650 mm
(height (approx.) x width x depth)

Evaluation
0 = using analysis membranes

Analysis fluid
0 = solvent A III class
flash point > 60 °C, lower explosive limit > 0.6 Vol.%)
1 = water with surfactants, permitted ph-values 6 ... 10,
no deionized water

Supply voltage
K = 120 V AC / 60Hz / 1 Phase USA / Canada
M = 230 V AC / 50Hz / 1 Phase Europe
N = 240 V AC / 50Hz / 1 Phase UK
O = 240 V AC / 50Hz / 1 Phase Australia
P = 100 V AC / 50Hz / 1 Phase Japan

Extraction method
Z = spray, medium pressure
U = spray, medium pressure with additional ultrasonic cleaning

Supplementary details
Z = standard
R = external rinsing connections Ø 6 mm, between glove holes

Blank values

All data is dependent on the ambient conditions

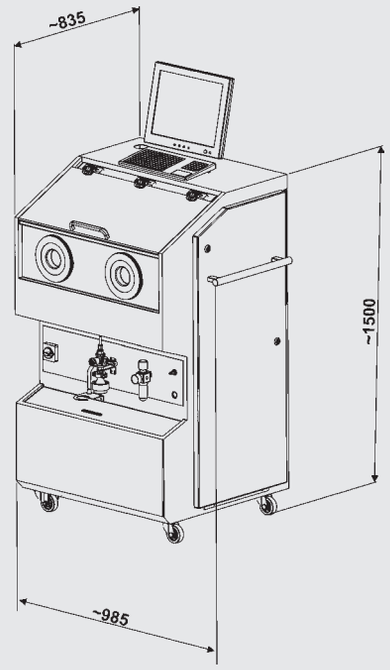
Environment	CTU 1xxx
Clean room	0.4 ... 0.6 mg
Laboratory	0.6 ... 1.0 mg
Separate sampling room	0.6 ... 1.2 mg
Factory building	1.0 ... 1.4 mg

Max. particle size [µm]	Time and effort	Cleaning time [h] after brief shutdown (≤ 24 h)	Cleaning time [h] after extended shutdown (≥ 24 h)
100*	high	1.5 ... 4	3 ... 5
150*	medium	1 ... 2	2 ... 4
250*	low	0.5 ... 1.5	1 ... 3

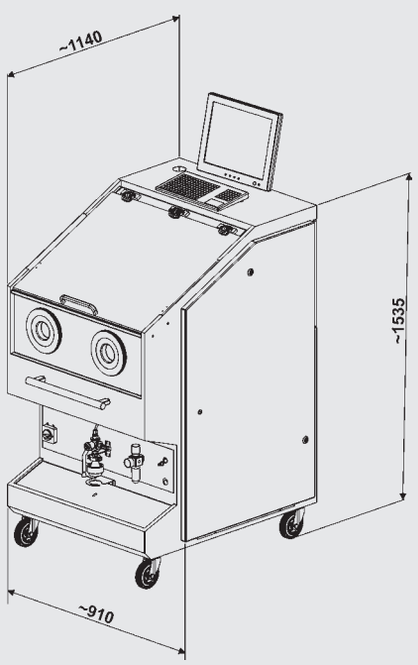
* Applies to a maximum membrane load of 0.8 mg

Dimensions

CTU 10xx



CTU 12xx



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ContaminationTest Module – Supply Control
CTM-SC

Description
The ContaminationTest Module CTM is a modular system designed to analyze the technical cleanliness of components. Solid contamination is washed off the surface of the component, samples are taken from the fluid and are subsequently analyzed using membranes.

The contamination test module CTM-SC is designed to supply fluid, control and store data for the sampling module CTM-E.

Applications
- Automotive and supplier industry
- Gear and engine builders
- Mobile hydraulics
- Production of hydraulic / lubrication system components
- Aircraft industry

Advantages
- Reduction in costs as a result of fewer production failures
- Identification and elimination of weak process steps
- Reduction in start-up breakdowns
- Optimization of internal and external processes
- Documentation of the technical cleanliness of components

Special features
- Analysis fluid can be pulsed if required
- Adjustment of compressed air
- Filling and drainage connection
- Control and monitoring of CTM-E modules
- Automatic pressure setting using software
- User-programmable extraction procedure

Technical specifications

General data	
Dimensions (Height x Width x Depth)	1.80 m x 0.90 m x 0.80 m
Housing material	S235JR powder-coated
Coupling connection	CPC coupling
Ambient temperature	15 ... 28 °C
Weight	≈ 250 kg (empty)
Reservoir, test fluid	2 x 20 litres (1x reservoir, 1x collection tank)
Reservoir switch-over	Automatic
Filtration of analysis fluid	Fine filtration to ISO4406 min. 12/9
Filter size	2x MRF-1-E/1, 1 µm
Drip tray, integral	25 litres with drain
Compressed air supply	Nipple DN 7.2
Compressed air supply (provided by customer)	Maximum 6 bar, Air flow rate: 60 l/min. Dry and pre-filtered to 5 µm
Electrical data	
Supply voltage	according to order
Power consumption	600 Watt 800 Watt with ultrasound
Protection class to DIN 40050	IP 54

Model code

CTM SC 100 0 - M

Type
CTM = ContaminationTest Module

Module
SC = Supply Control

Series
100 = Standard

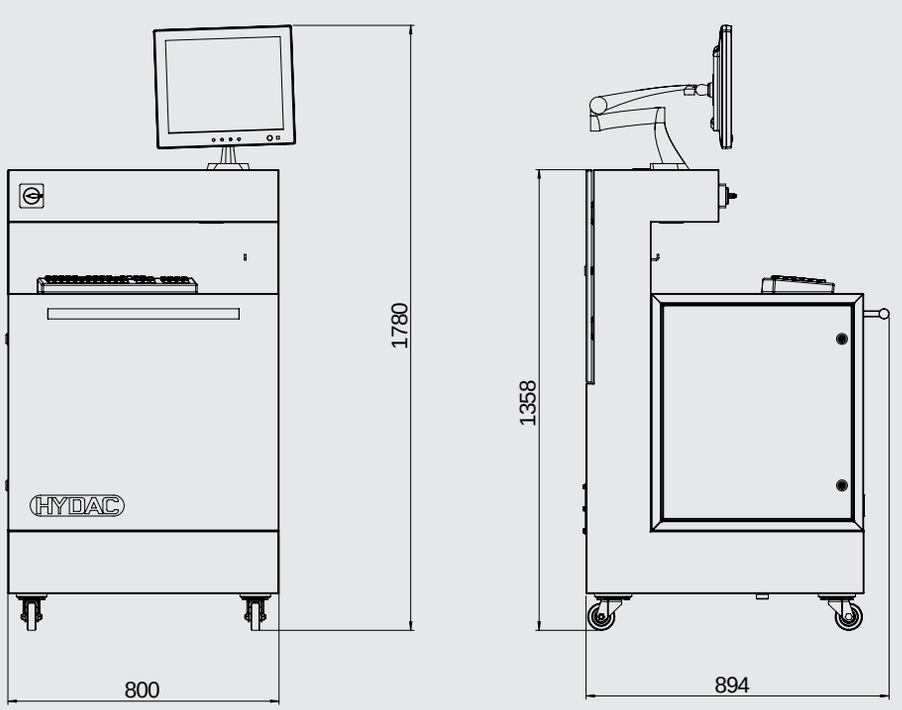
Analysis fluid
0 = solvent A III class
(flash point > 60 °C, lower explosion limit > 0.6 Vol.%)
1 = water with surfactants,
permitted pH values 6 ... 10, no deionized water

Supply voltage

K	= 120 V AC / 60 Hz / 1 phase	USA / Canada
M	= 230 V AC / 50 Hz / 1 phase	Europe
N	= 240 V AC / 50 Hz / 1 phase	UK
O	= 240 V AC / 50 Hz / 1 phase	Australia
P	= 100 V AC / 50 Hz / 1 phase	Japan

Dimensions

(All dimensions in mm)



Items supplied

– CTM-SC
- incl. monitor and monitor bracket
- PC with Windows operating system
- PLC
- Keyboard with touchpad
- Foot switch
- CTM-SC Software

– Operating and maintenance instructions

Note

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ContaminationTest Module – Extraction Box

CTM-EB

Description

The ContaminationTest Module CTM is a module system designed to analyze the technical cleanliness of components. Particle contamination is removed from the surface of the component, samples are taken from the washing fluid and are subsequently analyzed using membranes.

The extraction module CTM-EB is designed for spray extraction in conjunction with the CTM-SC.

Applications

- Automotive and supplier industry
- Gearbox and engine builders
- Mobile hydraulics
- Manufacture of hydraulic and lubrication system components
- Aircraft industry

Advantages

- Reduction in costs as a result of fewer production failures
- Identification and elimination of weak process steps
- Reduction in start-up breakdowns
- Optimization of both internal and external handling processes
- Documentation of the technical cleanliness of components

Technical specifications

General data	
Dimensions (Height x Width x Depth)	EB1200: min. 1.50 ... max. 1.75 x 1.20 x 0.90 m EB2000: min. 1.68 ... max. 1.93 x 1.40 x 1.10 m
Housing material	S235JR powder coated
Ambient temperature	15 ... 28 °C
Working height adjustment	Electrical
Working height adjustable	EB1200 = from 1.02 to 1.27 m EB2000 = from 1.08 to 1.33 m
Weight	EB1200 = 200 kg (when empty) EB2000 = 260 kg (when empty)
Coupling connection	CPC coupling
Filtration, analysis fluid	Fine filtration to ISO4406 min. ISO 12/9
Filter size	3x MRF1-E/1, 1 µm
Extraction cabinet (clean box)	
Material of Clean Box	Polished stainless steel 1.4301
Maximum load capacity	EB1200 = 31.5 kg EB2000 = 50 kg
Opening of cover	electrical
Membrane holder	For Ø 47 mm filter membranes
Electrical data	
Supply voltage	according to order
Power consumption	700 W
Protection class to DIN 40050	IP 54

Model code

CTM EB 12 0 0 - M - Z - Z / –

Type
CTM = ContaminationTest Module

Module
EB = Extraction Box

Dimensions of analysis cabinet (height x width x depth)
10 = 300 mm x 800 mm x 400 mm
12 = 550 mm x 800 mm x 650 mm
20 = 860 mm x 896 mm x 896 mm

Filtration
0 = standard

Analysis fluid
0 = solvent A III class (flash point > 60 °C, lower explosive limit > 0.6 Vol.%)
1 = water with surfactants, permitted pH values 6 ... 10, no deionized water

Supply voltage

K	= 120 V AC / 60 Hz / 1 phase	USA / Canada
M	= 230 V AC / 50 Hz / 1 phase	Europe
N	= 240 V AC / 50 Hz / 1 phase	UK
O	= 240 V AC / 50 Hz / 1 phase	Australia
P	= 100 V AC / 50 Hz / 1 phase	Japan

Extraction method
Z = spray, medium pressure

Supplementary details
Z = standard

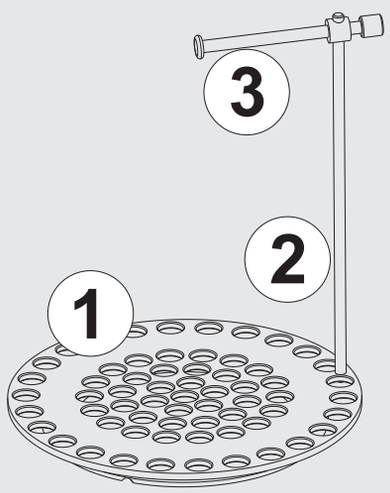
Modifications
– = without modifications

Items supplied

– CTM-EB
– Operating and maintenance manual

Accessories CTM-EB Disk

– 1200 = Part No. 3439102
– 2000 = Part No. 3422445



Item	Description
1	Disk
2	Guide rod
3	Holder
–	Bracket (only 1200 version)

Blank values

All data is dependent on the ambient conditions

Environment	CTM-EB 1200	CTM-EB 2000
Clean room	0.4 ... 0.6 mg	0.6 ... 0.8 mg
Laboratory	0.6 ... 1.0 mg	0.6 ... 1.0 mg
Separate sampling room	0.6 ... 1.2 mg	0.8 ... 1.4 mg
Factory building	1.0 ... 1.4 mg	1.0 ... 1.6 mg

CTM-EB 1200

Max. particle size [µm]	Time and effort	Cleaning time [h] after brief shutdown (≤ 24 h)	Cleaning time [h] after extended shutdown (≥ 24 h)
150*	high	1 ... 4	3 ... 8
250*	medium	1 ... 3	2 ... 6
500*	low	1 ... 2	1 ... 3

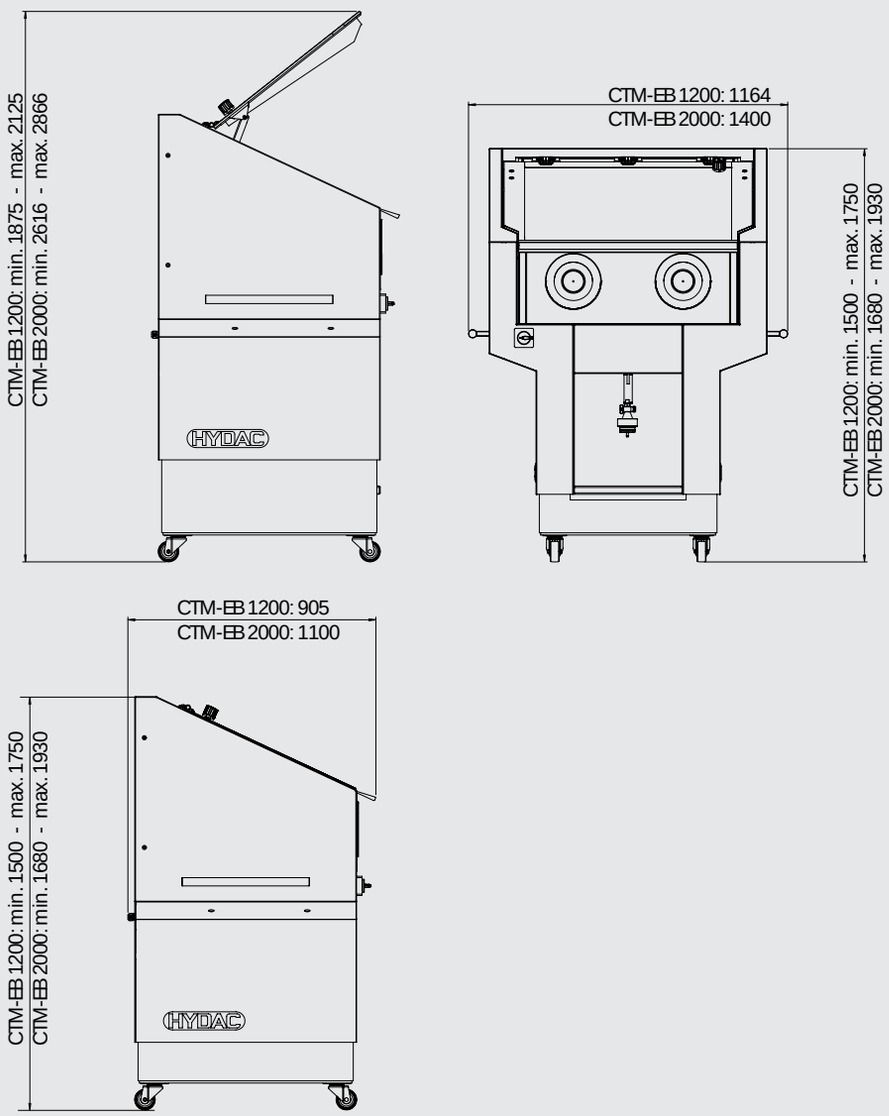
* Applies to a maximum membrane load of 0.8 mg

CTM-EB 2000

Max. particle size [µm]	Time and effort	Cleaning time [h] after brief shutdown (≤ 24 h)	Cleaning time [h] after extended shutdown (≥ 24 h)
150*	high	2 ... 5	4 ... 10
250*	medium	1 ... 4	3 ... 8
500*	low	1 ... 3	2 ... 6

* Applies to a maximum membrane load of 0.8 mg

Dimensions (All dimensions in mm)



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SensorMonitoring Unit
SMU 1200 Series

Description
The SensorMonitoring Unit SMU1200 is a display unit for HYDAC fluid sensors and is designed to display and store measured data.

The following combinations of fluid sensors can be connected directly:

- ContaminationSensor CS1000 and AquaSensor AS1000
- MetallicContamination Sensor MCS1000 and AquaSensor AS1000

Advantages
- Simple installation parallel to the customer system (Hydac Sensor Interface HSI for SMU1200, transfer of the sensor's own analogue and switching outputs).
- Simple installation using the magnetic holder or DIN rails.
- High protection class IP67. Installation in a switch cabinet is not necessary
- Plug & Work unit including the 5m connection cable required for direct connection of the sensors (sensor connections via M12x1 male connectors, no programming necessary).
- The measured data is displayed on the large display.
- Simple keypad operation.
- Data is stored in the SMU with a date and time stamp.
- Measured values can be read from the standard USB memory stick supplied, via the USB master port.
- Simple data processing and data evaluation using MS-Excel or Hydac FluidMonitoring Software FluMoS ('light version' available as freeware at www.hydac.com).
- Program restarts independently once voltage is restored; no loss of measured data.

Technical specifications

Mounting position	Optional
Self-diagnostics	Continuous with error indication on display
Display	LED, 6/4/4-digit, each with 17 segments
Rough handling (to IEC/EN 60068-2-31)	Drop height 50 mm
Ambient temperature	0 °C ... +55 °C
Storage temperature range	-40 °C ... +80 °C
Relative humidity	Maximum 95%, non-condensing
Weight	≈ 1 kg
Electrical data	
Supply voltage	12 ... 24 V DC (±10%) The SMU must not be used with vehicle supply systems without load dump protection of maximum 30 V DC.
Residual ripple	≤ 5 %
Power consumption	15 Watt, 1.25 A max.
Accuracy of the real-time clock	± 5 s/day / ± 0.5 h/year
Clock buffer	≈ 20 years
Protection rating	III (safety extra-low voltage)
Protection class	IP 67

Model code

SMU 1 2 6 0 - TU - 00 / 000

Type
SMU = SensorMonitoring Unit

Series
1 = 1000 Series

Data input
2 = Digital

Interface
6 = HSI + USB Master

Application
0 = Standard

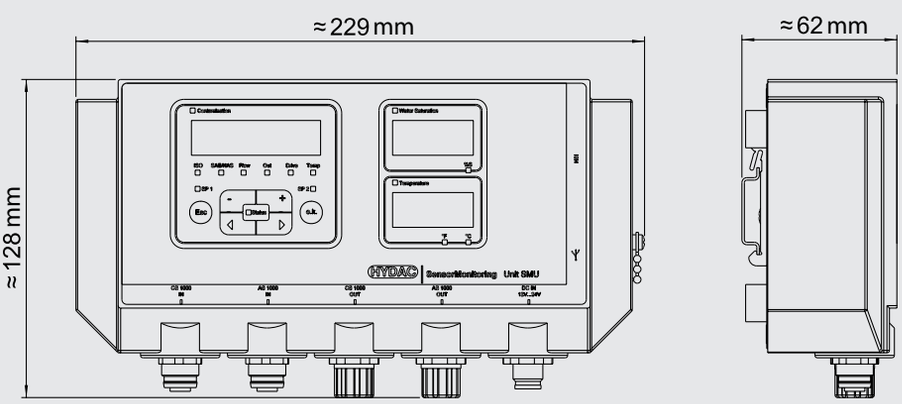
Supply voltage
TU = 12 ... 24 V DC

Sensor combination

	A	B
00 =	CS1000	AS1000
10 =	MCS1000	AS1000

Customer modification number
000 = Customer modification number

Dimensions



Items supplied

- 1 SMU 1200 series
- 1 USB memory stick
- 1 connection cable 5 pole with flying leads for power supply, L = 5m
- 2 connection cables appropriate to the sensor combination, L = 5m
- 1 FluMoS light CD
- 1 Operating manual
- 1 DIN rail, L = 20 cm to DIN EN 60715 TH35

Accessories

- Power supply PS5, 100-240 V AC / 50-60 Hz / 1.1 A -> 24 V DC / 1000 mA, Cable length = 1.8 m, Part no.: 3399939

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SensorMonitoring Unit
SMU 1100 Series

Description

The SensorMonitoring Unit SMU 1100 is a compact control unit for displaying and storing measured values in a PC network. The measured values are stored on an interchangeable MMC memory card.

The measured values of all connected sensors are shown in a rolling display.

The following sensors can be connected directly:

- ContaminationSensor CS 1000, CS 2000
- AquaSensor AS 1000, AS 2000, AS 8000
- Oil condition sensor HYDACLab® HLB1000
- Clogging Indicator VL X GW

Advantages

- Simple setup in parallel to the customer's system
- High protection class (no switch box connection required)
- Sensor connections via M12x1 male connector (no specialist personnel required for installation)
- No programming necessary
- Read-out of measured values from the MMC memory card via a card reader
- Simple data processing and evaluation using FluMoS or MS-Excel
- Transfer of the measured values via an Ethernet interface using OPC server
- Program restarts independently after a voltage loss

Technical specifications

Mounting position	Optional
Self-diagnostics	Continuously with error indication on display
Display	LCD, 4 lines, 16 segments
Rough handling (to IEC/EN 60068-2-31)	Drop height 50 mm
Ambient temperature	-25 °C ... 55 °C
Storage temperature range	-40 °C ... 70 °C
Relative humidity	Maximum 95%, non-condensing
Weight	1.3 kg
Electrical data	
Voltage supply	24 V DC (-15% / +20%)
Residual ripple	≤ 5 %
Power consumption	15 Watt
Accuracy of the real-time clock	± 5 s/day / ± 0.5 h/year
Clock buffer	≈ 72 h
Vibrations (IEC/EN 60028-2-6) - constant amplitude 0.15 mm - constant acceleration 2g	 5 ... 9 Hz 8 ... 150 Hz
Protection rating	III (safety extra-low voltage)
Protection class	IP 65

Model code

SMU 1 1 1 0 - U - 00 / 000

Type
SMU = SensorMonitoring Unit

Series
1 = 1000 Series

Data input
1 = analogue

Interface
1 = serial RS232 + Ethernet

Application
0 = Standard

Supply voltage
U = 24 V DC

Measurement sensor combination

	A	B	C
00 =	CS1000	HLB	AS1000
01 =	CS1000	HLB	AS2000
02 =	CS1000	HLB	AS8000
03 =	CS1000	HLB	GW
04 =	CS2000	HLB	AS1000
05 =	CS2000	HLB	AS2000
06 =	CS2000	HLB	AS8000
07 =	CS2000	HLB	GW
08 =	CS2000	GW	AS1000
09 =	CS2000	GW	AS2000
10 =	CS2000	GW	AS8000
11 =	CS2000	AS8000	AS1000
12 =	CS2000	AS8000	AS2000
13 =	CS1000	CS1000	CS1000

Modification number
000 = modification number

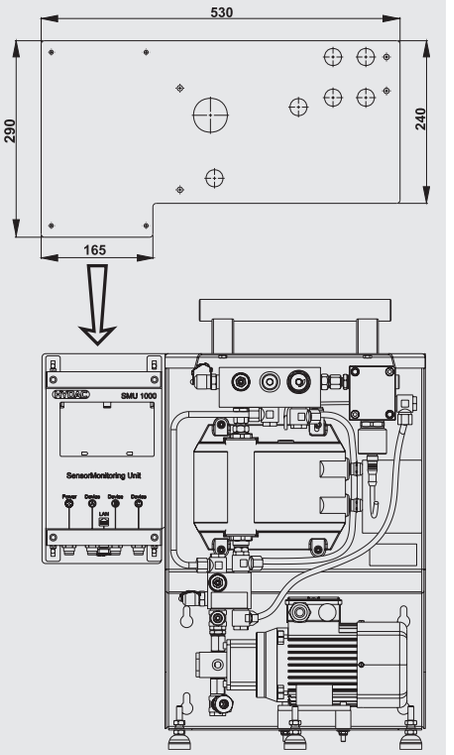
Items supplied

– 1 SMU 1100 series
– 1 MMC memory card 128 Mbyte
– 1 Connection cable 5 pole with flying leads for power supply, L = 5m
– 3 Connection cables appropriate for the sensor combination, L = 5m
– 1 Support CD with OPC Server
– 1 FluMoS light CD
– 1 Operating manual

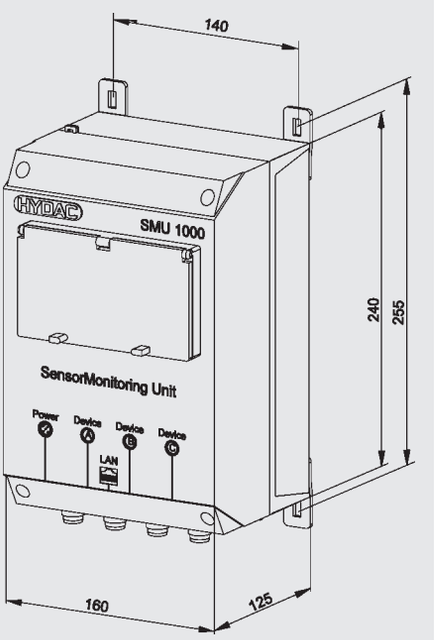
Accessories

– Power supply, 100-230 V AC / 50-60 Hz / 1 A -> 24 V DC / 1000 mA, Cable length = 1.8 m, Part No.: 3399939
– Mounting plate for SMU1000 for mounting to a CSM1000 or CSM2000, Part No.: 3403442 (see drawing)

Accessory: Mounting Plate



Dimensions



Note

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Subject to technical modifications.

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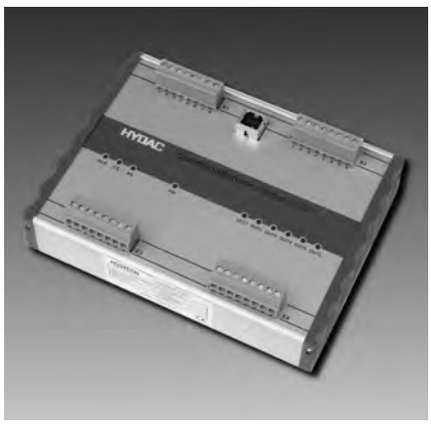


ConditionSensor Interface
CSI-B-1

Description

The ConditionSensor Interface CSI-B-1 is a further element in the HYDAC Condition Monitoring concept, connecting the sensor level with the interpretation level. HYDAC sensors supply an HSI-Signal, which is converted into individual analogue signals by the CSI-B-1. The type of output can be selected for each channel as a current or voltage signal.

In the transparent mode, the measured values can be read with the aid of the PC software FluMoS.

Special features

- 1 input channel for HYDAC sensors
- Direct connection of the sensor via screw terminals
- Automatic sensor recognition
- Very compact design
- Suitable for mounting on DIN rails
- Protection class IP 40

Technical specifications

Input data	
HSI interface	HYDAC Sensor Interface for digital coupling of sensors to male X3
Output data	
Analogue output	- 4x analogue output 4 ... 20 mA or 4x analogue output 2 ... 10 V - male X2
Switching output	- 4x relays – male X4
Ambient conditions	
Operating temperature range	-25 ... +85 °C
Storage temperature range	-30 ... +85 °C
Relative humidity	0 ... 70%, non-condensing
CE mark	EN 61000-6-2, EN 61000-6-4
Protection class to DIN 40050	IP 40
Other data	
Supply voltage of the module	24 V DC ± 10% (male X3)
Current consumption (module)	25 mA (in addition to the connected sensor)
Sensor supply	24 V DC (through the CSI)
Electrical connection	
Cross-section of connection	max. 1.5mm²
X1 : not used	Male terminal block, 8 pole RM 3.5
X2 : Analogue output, 4 channels	Male terminal block, 8 pole RM 3.5
X3 : Voltage supply + HSI	Male terminal block, 8 pole RM 3.5
X4 : Switching output	Male terminal block, 8 pole RM 3.5
USB	B
Optional pass-through mode	Can be programmed via HyperTerminal
Indication of the selected analogue output	Green LED: voltage 2 ... 10 V Red LED: current 4 ... 20 mA
Dimensions and Weight:	
Housing dimensions	142 x 105 x 35 mm
Housing	Housing to be mounted on rails (35mm) to DIN EN 60715 TH 35 (formerly DIN EN 50022)
Weight	≈ 350 g

Model code

CSI - B - 1 - 000

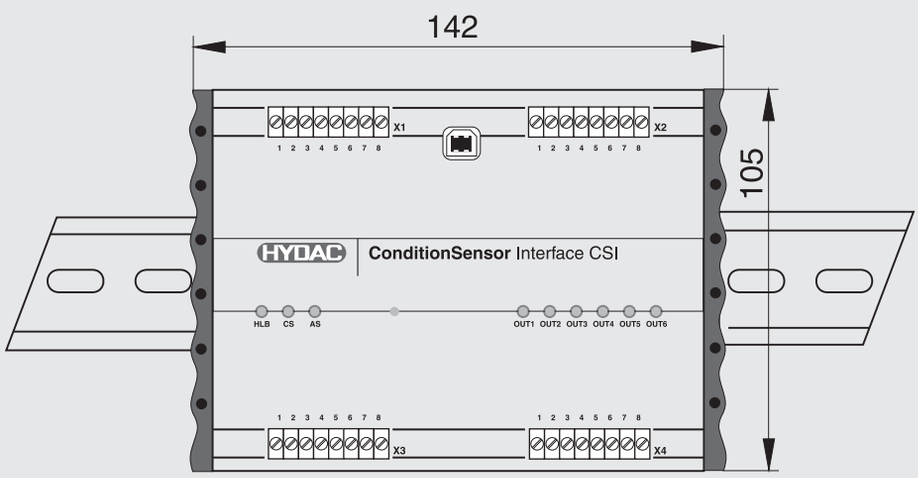
Product series
CSI = ConditionSensor Interface

Housing
B = DIN rail housing

Type of output
1 = HSI → Analogue output

Customer modification
000 = Standard

Dimensions



t = 35 mm

Terminal assignment

Terminal block –X1

Pin	Signal	Description
1	-	Not used
2	-	Not used
3	-	Not used
4	-	Not used
5	-	Not used
6	-	Not used
7	-	Not used
8	-	Not used

Terminal block –X2

Pin	Signal	Description
1	mA / V	Analogue output 1
2	mA / V	Analogue output 2
3	mA / V	Analogue output 3
4	mA / V	Analogue output 4
5	GND	Ground
6	-	Not used
7	-	Not used
8	-	Not used

Terminal block –X3

Pin	Signal	Description
1	+ 24 V	Module
2	0 V	Module
3	+ 24 V	Sensor
4	0 V	Sensor
5	HSI	Interface
6	-	Not used
7	-	Not used
8	-	Not used

Terminal block –X4

Pin	Signal	Description
1	R1 +	Relay 1
2	R1 -	Relay 1
3	R2 +	Relay 2
4	R2 -	Relay 2
5	R3 +	Relay 3
6	R3 -	Relay 3
7	R4 +	Relay 4
8	R4 -	Relay 4

Note

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ConditionSensor Interface
CSI-B-2

Description

The condition monitoring interface module CSI-B-2 is a further element in the HYDAC Condition Monitoring concept, connecting the sensor level with the interpretation level. It is an all-purpose electronic instrument for converting the HSI signal from HYDAC sensors into a standardised PC signal. Using the HYDAC "**FluMoS**" PC software, it is therefore possible to read the data and measured values of the connected sensors immediately.
The long-term memory can also be read, as well as adjustments made and parameters set on the connected sensors (the setting options are sensor-dependent).
The HSI signal can be converted either into a RS 232 or a RS 485 signal. The RS 232 port and possibly an additional standard RS 232/USB adapter can be used to connect the CSI-B-2 to any PC. By using the RS 485 port and an appropriate additional coupling module, connection to higher-level control and/or bus systems is also possible.

Special features

- Input channels for HYDAC sensors
- Direct connection of the sensors via screw terminals
- Indication of the active interface via LED (RS232 / RS485)
- Very compact design
- Suitable for mounting on DIN rails
- Protection class IP 40

Technical specifications

Input data	
HSI interface	HYDAC sensor interface for digital coupling of sensors (HSI) to male connection X2
Output data	
Signal output	Switchable: RS 485 half-duplex or RS 232 - Male X1 (RS 485) - SUB-D 9 pole female (RS 232)
Ambient conditions	
Operating temperature range	-25 ... +85 °C
Storage temperature range	-30 ... +85 °C
Relative humidity	0 ... 70%, non-condensing
CE mark	EN 61000-6-1 / 2 / 3 / 4
Protection class to DIN 40050	IP 40
Other data	
Supply voltage of the module	18 ... 35 V DC (male X1)
Current consumption (module + sensor)	30 mA to 300 mA max. (depending on the supply voltage and the sensor connected)
Sensor supply	15 V DC ± 5 % / 300 mA max. at 23 °C (male X2)
Electrical connection	
Cross-section of connection	max. 1.5mm²
X1 : module supply + RS232 / RS485	Male terminal block, 8 pole RM 3.5
X2 : sensor supply + HSI	Male terminal block, 5 pole RM 3.5
SUB-D: RS 232	9 pole female with thumbscrews
Conversion mode options	Option HSI - RS 232 or HSI - RS 485 via jumper (bridge): X1.3 - X1.4 open: HSI - RS 232 X1.3 - X1.4 closed: HSI - RS 485
Indication of active conversion mode	Green LED: HSI - RS 232 Yellow LED: HSI - RS 485
Dimensions and Weight:	
Housing dimensions	≈ 55 x 106 x 34 mm
Housing	Housing to be mounted on rails (35mm) to DIN EN 60715 TH 35 (formerly DIN EN 50022)
Weight	≈ 140 g

Note: Reverse polarity protection of the supply voltage, excess voltage, override and short circuit protection are provided.

Model code

CSI - B - 2 - 000

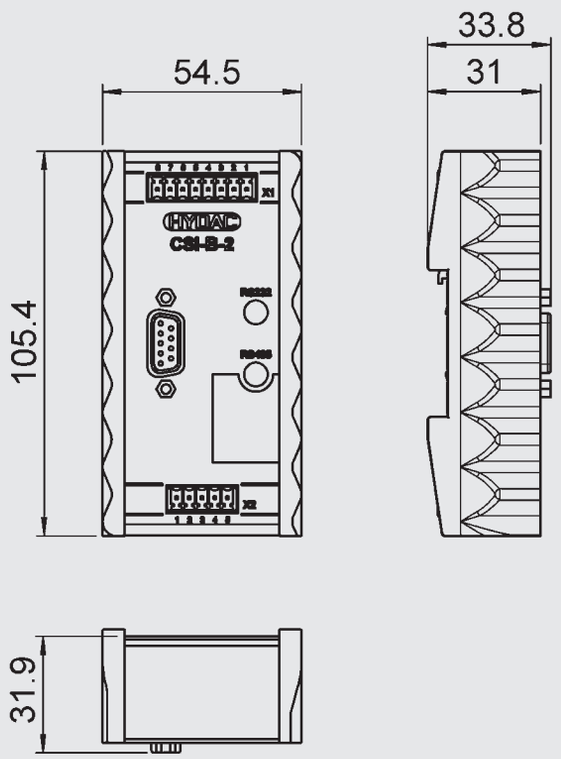
Product series
CSI = ConditionSensor Interface

Housing
B = DIN rail housing

Output type
2 = HSI → RS 232 / RS 485

Customer modification
000 = Standard

Dimensions



CSI-B-2 Kit, items supplied

Terminal assignment

Terminal block –X1

Pin	Signal	
1	RS 485 (-)	
2	RS 485 (+)	
3	3 – 4 open:	HSI to RS 232
4	3 – 4 closed:	HSI to RS 485
5	RxD RS 232 (connected to Pin 3 SUB-D 9 pole)	
6	TxD RS 232 (connected to Pin 2 SUB-D 9 pole)	
7	0 V (connected to Pin 5 SUB-D 9 pole)	
8	$+U_B$ (18 .. 35 V DC) Module supply	

Terminal block –X2

Pin	Signal
1	$+U_B$ (15 V DC) Sensor supply
2	0 V
3	HSI signal
4	0 V
5	0 V

CSI-B-2 Kit (3409462) consisting of:

1 x	CSI-B-2
3 x	Connecting cable ZBE 08S-05
1 x	Connecting cable ZBE 42S-05
1 x	Y Adapter ZBE 41
1 x	RS232 cable / USB adapter
1 x	CD "FluMoS Light"

Note

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ConditionSensor Interface
CSI-D-5

Description

The ConditionSensor Interface CSI-D-5 is a further element in the HYDAC condition monitoring concept, connecting the sensor level with the interpretation level. The fluid sensors ContaminationSensor CS 1000 and the MetallicContamination Sensor MCS 1000 supply an HSI signal via the RS485 port, which is converted by the CSI-D-5 to USB. This ensures simple connection to the PC.

The measured values can be read with the aid of the PC software FluMoS.

Special features

- Direct connection of the CS 1000 or MCS 1000 sensors
- Very compact design
- Kit includes all accessories required to read the measured values

Technical specifications

Input data	
RS485 interface	HYDAC Sensor Interface (HSI) protocol - male M12x1, 8-pole to DIN VDE 0627
Output data	
USB (B) interface	HSI Protocol
Ambient conditions	
Operating temperature range	-25 ... +75 °C
Storage temperature range	-25 ... +80 °C
Relative humidity	0 ... 95%, non-condensing
CE mark	EN 61000-6-2, EN 61000-6-4
Protection class to DIN 40050	IP 40
Other data	
Supply voltage of the module	12 V DC ± 10%
Current consumption (module)	50 mA (in addition to the connected sensor)
Sensor supply	12 V DC (through the CSI)
Electrical connection	
Cross-section of connection	max. 1.5 mm²
USB	B
Dimensions and Weight:	
Dimensions	150 x 108 x 47 mm
Housing	Desktop
Weight	≈ 350 g

Model code

CSI - D - 5 - 000

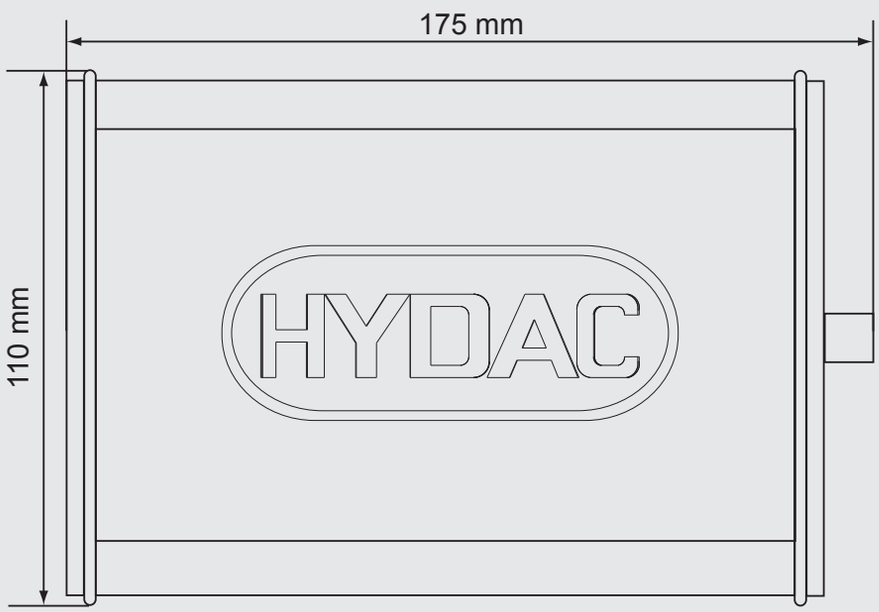
Product series
CSI = ConditionSensor Interface

Housing
D = Desktop

Output type
5 = HSI → USB

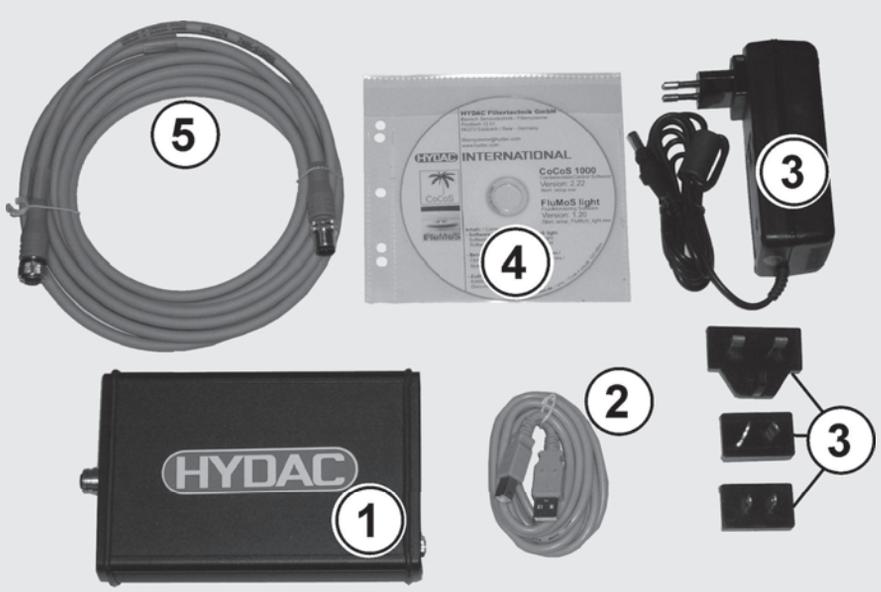
Modification
000 = Standard

Dimensions



Height = 45 mm

CSI-D-5, items supplied



CSI-D-5 Kit

CSI-D-5 Kit (3249563) consisting of:

1 x	CSI-D-5
1 x	Power supply PS2
1 x	USB A <-> B connecting cable, L = 1.8 m
1 x	Extension/connection cable, L = 5 m ZBE 43-05
1 x	CD "FluMoS Light"

Note

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4.2. FLUID SERVICE SYSTEMS

4.2.1 **Mobile Filter Systems**

Filtration Unit
OF7

Description
The filtration unit OF7 is designed as a portable service unit for filling hydraulic systems, flushing small hydraulic systems and for offline filtration.

As an option, the OF7 can be ordered with the ContaminationSensor CS 1000. This makes it possible to simultaneously monitor the particle contamination in the oil. The cleanliness class is given according to ISO, SAE and NAS classifications.

Applications
- Filtered or unfiltered filling of hydraulic systems
- Temporary offline filtration for hydraulic systems
- Filtered or unfiltered transfer of fluids

Advantages
- Improvement in service life for both components and system filters
- Extension of oil lifetime
- Greater machine availability
- Simple operation
- Compact design
- Option: continuous monitoring of oil cleanliness during the cleaning process through the use of CS 1000 (OF7CM)
- Option: built-in protection against dry running and control cable for remote maintenance (OF7K)
- Option: version for viscosities up to 1000 mm²/s and 180 filter cartridge (OF7S90Px)

Technical specifications

Max. flow rate	OF7S 15 l/min OF7K/OF7CM 10 l/min
Pump type	Vane pump
Operating pressure	3.5 bar max
Permitted suction pressure at suction port	-0.4 bar to +0.6 bar
Viscosity range	OF7S10/OF7K10: 5 ... 350 mm²/s OF7CM: 5 ... 200 mm²/s OF7S90Px: 15 ... 1000 mm²/s
Permitted operating fluid	Mineral oil (DIN 51424)
Fluid temperature	0 ... 80 °C
Ambient temperature	-20 ... 40 °C
Seals, gaskets	NBR
Protection class	IP 54
Power cable, length	2.8 m
Length of hoses	2.5 m
Hoses	Suction hose NW 20 with lance Pressure hose NW 16 with lance
Weight	OF7S10/OF7K10 ≈ 12.5 kg (empty) OF7S90Px/OF7CM ≈ 18.0 kg (empty)

Recommended standard models

Filtration unit	Part No
OF7S10P1M1B03E	92 164
OF7S10P1M1B05E	92 161
OF7S10P1M1B10E	92 162
OF7S10P1M1P10E	92 165
OF7S10P1M1B20E	92 163

Model code

OF7	S	10	P	1	M	1	B	10	E	/-C1

Basic type
OF7

Model
S = standard
K = special model
CM = Fluid Condition Monitoring

Type code
10 = standard
90(1) = special model

Seals, gaskets
P = NBR (Perbunan)

Pump type

Code	Nominal flow rate	Max. viscosity
1(1)	15 l/min	350 mm²/s
2	10 l/min	200 mm²/s

X(1) other nominal flow rates on request

Motor
D(1) = pneumatic motor
K = 1x 120 V 50 Hz, 0,18 kW
M = 1x 230 V 50 Hz, 0,18 kW
N*(1) = 3x 380-420 V 50 Hz, 3x 440-480 V (60 Hz)
T = 12 V DC, 0,2 kW
U = 24 V DC, 0,2 kW
X(1) = other voltage on request
* without on/off switch, cable or connector

Filter size
1 = element 160 (spin-on cartridge)
2(1) = element 180 (spin-on cartridge)

Filter material
B = Betamicron® (BN)
L = empty filter cartridge
P = paper (P)

Filtration rating
03 = 3 µm BN
05 = 5 µm BN
10 = 10 µm BN, P
20 = 20 µm BN

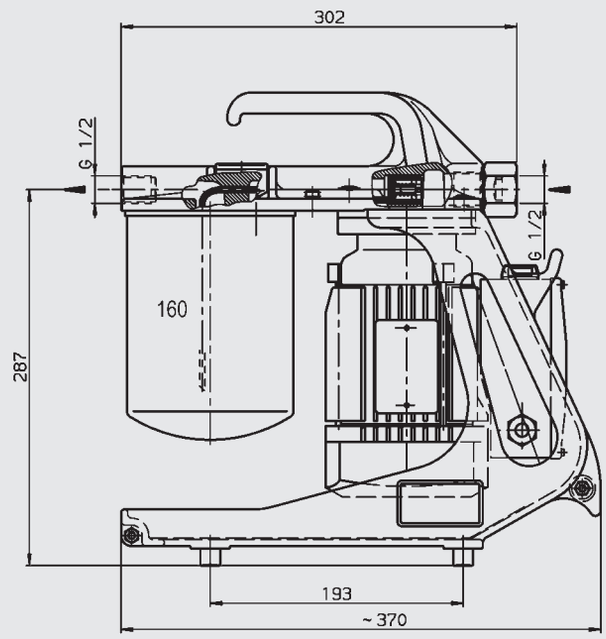
Clogging indicator
E = pressure gauge

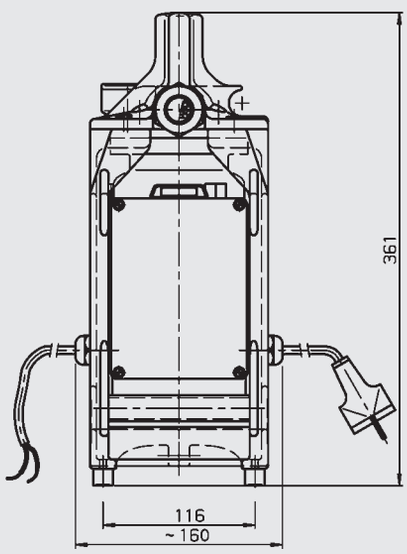
Supplementary details for model OF7CM
C1 = ContaminationSensor CS1320
Z = without ContaminationSensor

(1) Not possible for OF7CM version

Dimensions

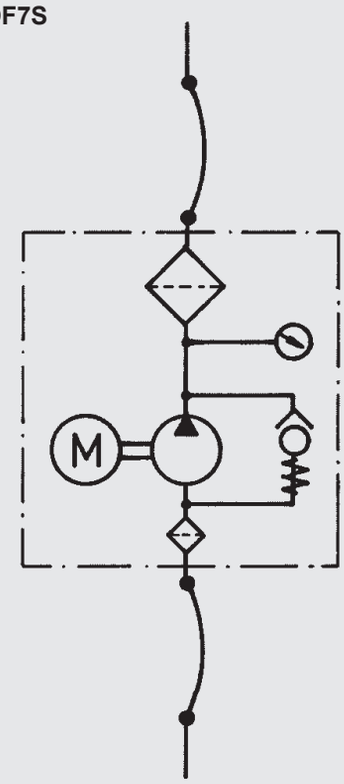
OF7S10 / OF7K10



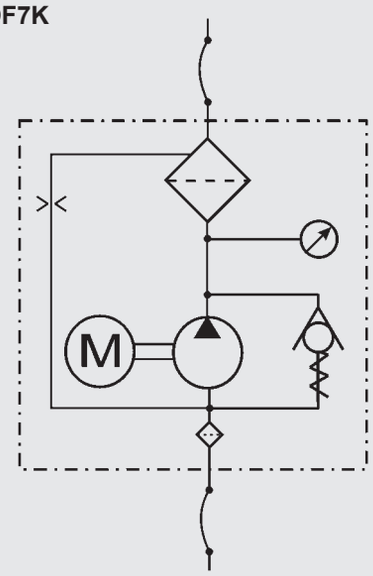


Hydraulic circuit diagram

OF7S

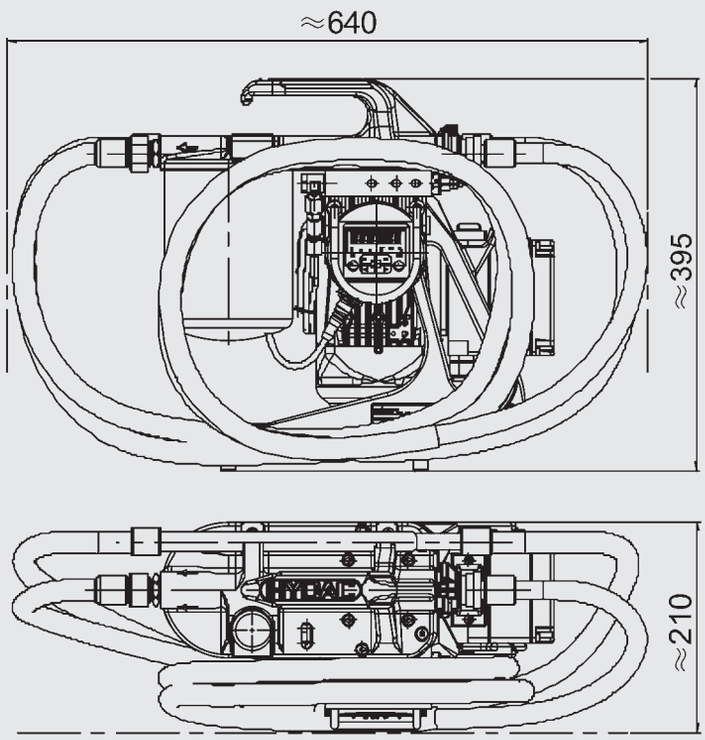


OF7K



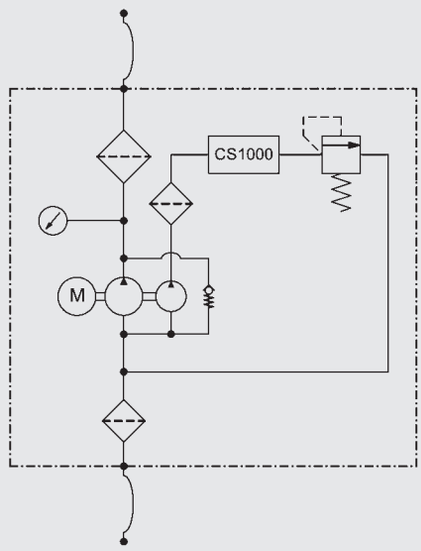
Dimensions

OF7CM10



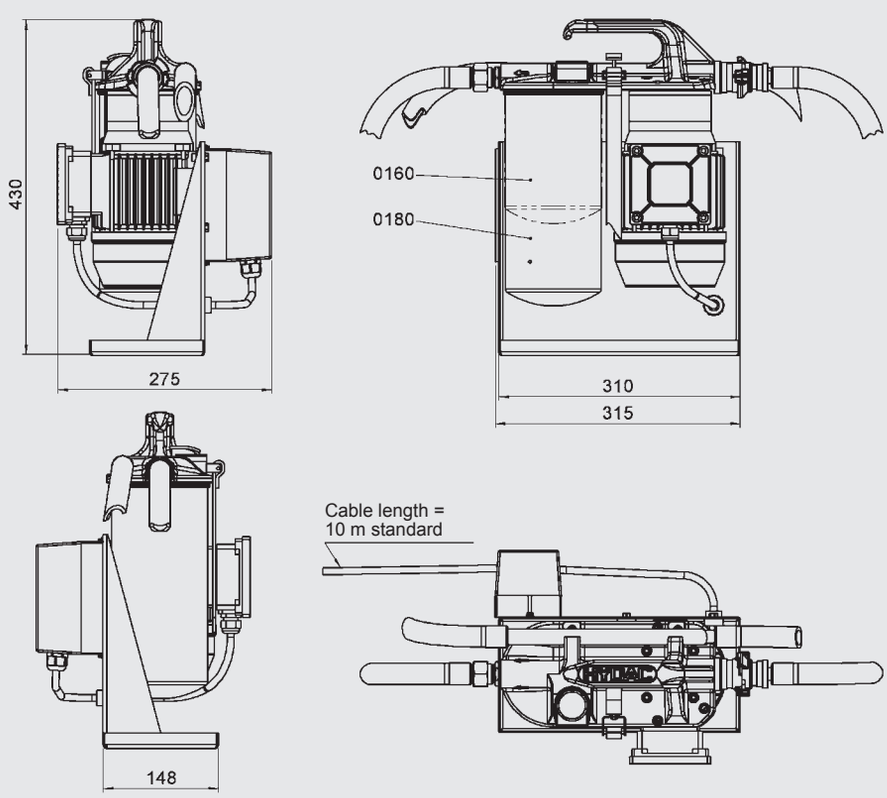
Hydraulic circuit diagram

OF7CM



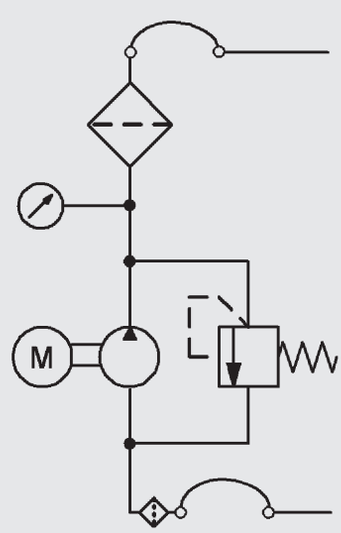
Dimensions

OF7S90



Hydraulic circuit diagram

OF7S90



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Filtromat
OF 5 mobile

Description

The filtration unit OF 5 mobile is designed to fill/filter hydraulic and lubrication tanks and to filter offline.

There is also the option (Version F) to bypass the filter when emptying tanks.

Applications

- Hydraulic and lubrication oil systems in a variety of industries

Advantages

- Convenient offline filtration
- Simple to operate
- Greater system availability
- Reduction in Life Cycle Cost LCC

Technical specifications

Pump type	Vane pump
Max. flow rate	30 l/min / 40 l/min
Operating pressure	4.5 bar
Permitted suction pressure at suction port	-0.4 bar ... +0.6 bar
Viscosity range	15 – 800 mm²/s (depending on model)
Permitted operating fluid	Mineral oil (others on request)
Fluid temperature	-10 ... 80 °C
Ambient temperature	-20 ... 40 °C
Seals, gaskets	NBR (Option: FPM)
Protection class	IP 54
Length of power cable	10 m
Length of hoses	3 m
Hose connections	Suction hose NW 30 with lance Pressure hose NW 25 with lance
Weight	≈ 75 kg

Model code

OF5 F 10 P 6 N 2 B 05 E

Basic type
OF5

Versions
F = mobile with change-over valve
L = "low cost": mobile without change-over valve

Type code
10 = standard
special models on request

Seals
P = NBR (Perbunan)
V = FPM (Viton)

Motor-pump unit

Code	Approx. flow rate at 1450 rpm	Max. viscosity	Electric motor output at 50 Hz
3	30 l/min	250 mm²/s	0.75 kW
6	40 l/min	800 mm²/s	1.5 kW

Electric motor voltage
M = 1 x 230V - 50 Hz
N = 3 x 380 - 420 V - 50 Hz, 3 x 440 - 480 V - 60 Hz
S = 3 x 500 - 600 V - 50 (60)Hz
X = special voltage

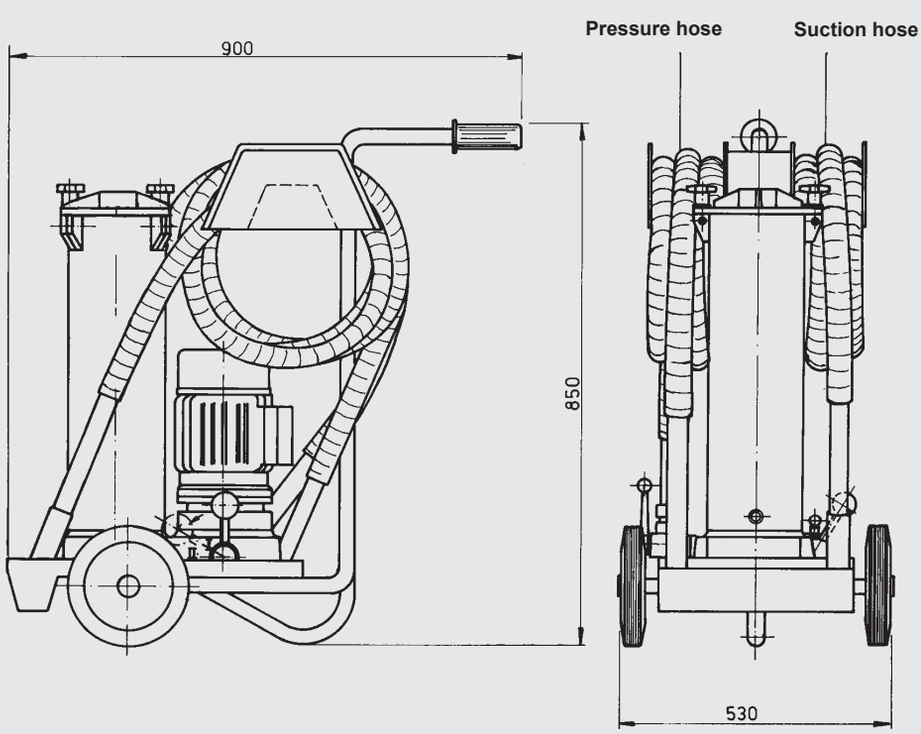
Filter size
1 = element 330
2 = element 1300

Filter material
B = Betamicron (BN3HC)
A = Aquamicron (BN/AM), (AM)

Filtration rating
03 = 3 µm BN3HC; BN/AM
05 = 5 µm BN3HC
10 = 10 µm BN3HC; BN/AM
20 = 20 µm BN3HC;
40 = 40 µm AM

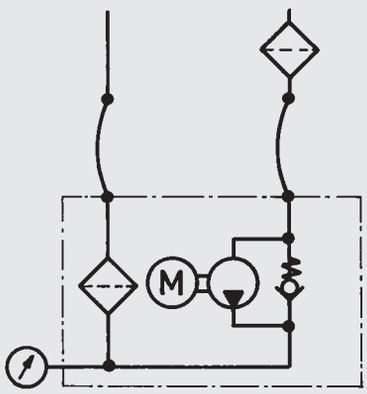
Clogging indicator
E = standard, pressure gauge
B = option: differential pressure gauge - visual (VM2B.1)
C = option: differential pressure gauge - electrical (VM2C.0)
D = option: differential pressure gauge - visual/electrical (VM2D.0)
B, C and D not for version "L"

Dimensions



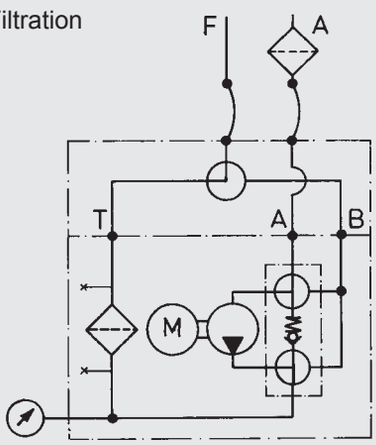
Hydraulic circuit diagram

OF 5 L ...

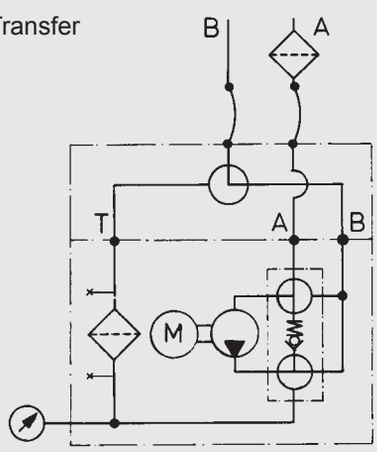


OF 5 F ...

Filtration



Transfer



Replacement elements

Filter size	Filtration rating	Element type	Part No.
1	3 µm	0330 R 003 BN4HC/-KB (-V-KB)	1262999 (1263640)
1	5 µm	0330 R 005 BN4HC/-KB (-V-KB)	1263000 (1263641)
1	10 µm	0330 R 010 BN4HC/-KB (-V-KB)	1263001 (1263642)
1	20 µm	0330 R 020 BN4HC/-KB (-V-KB)	1263002 (1263643)
1	40 µm	0330 R 040 AM /-KB (-V-KB)	1272067 (1266563)
1	3 µm	0330 R 003 BN/AM /-KB (-V-KB)	1272069 (1276690)
1	10 µm	0330 R 010 BN/AM /-KB (-V-KB)	1272068 (1281126)
2	3 µm	1300 R 003 BN4HC-/KB (-V-KB)	1263059 (1263760)
2	5 µm	1300 R 005 BN4HC-/KB (-V-KB)	1263060 (1263761)
2	10 µm	1300 R 010 BN4HC-/KB (-V-KB)	1263061 (1263762)
2	20 µm	1300 R 020 BN4HC-/KB (-V-KB)	1263062 (1263763)
2	3 µm	1300 R 003 BN/AM /-KB (-V-KB)	1267991 (1271839)
2	10 µm	1300 R 010 BN4AM /-KB (-V-KB)	1270010 (1276060)
2	40 µm	1300 R 040 AM /-KB	1267699

Note

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

Subject to technical modifications.

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Filtromat
OF 5 with FCU

Description

The filtration unit OF 5 mobile is designed to fill/filter and empty hydraulic and lubrication tanks, and to filter offline.

The built-in FluidControl Unit FCU 2000 measures the particle contamination and monitors the oil cleanliness.

Applications

- Hydraulic and lubrication oil systems in a variety of industries

Advantages

- Convenient offline filtration
- Simultaneous monitoring of the particle contamination
- Simple to operate
- Greater system availability
- Reduction in Life Cycle Cost LCC

Technical specifications

Pump type	Vane pump
Max. flow rate	40 l/min
Operating pressure	4.5 bar
Permitted suction pressure at suction port	-0.4 bar ... +0.6 bar
Viscosity range	15 ... 300 mm²/s (version-dependent, see Model Code)
Permitted operating fluid	Mineral oil (others on request)
Fluid temperature	-10 ... 70 °C
Ambient temperature	-20 ... 40 °C
Seals, gaskets	NBR
Protection class	IP 54
Power cable, length	6 m
Hoses, length	3 m
Hose connections	Suction hose NW 28 with lance Pressure hose NW 25 with lance
Weight (empty)	≈ 92 kg

Model code

OF5 C 20 P 6 N 2 B 05 C

Basic type
OF5

Versions
C = mobile, without change-over valve, with FCU

Type code
20 = with FCU 2010
21 = with FCU 2110
22 = with FCU 2210

Seals
P = NBR (Perbunan)

Motor-pump unit

Code	Approx. flow rate at 1450 rpm	Max. viscosity	Electric motor output at 50 Hz
3	30 l/min	250 mm²/s	0.75 kW
6	40 l/min	300 mm²/s	1.5 kW

Electric motor voltage
N = 3 x 380 - 420 V - 50 Hz; 3 x 440 - 480 V - 60 Hz
S = 3 x 500 - 600 V - 50 (60) Hz
X = special voltage

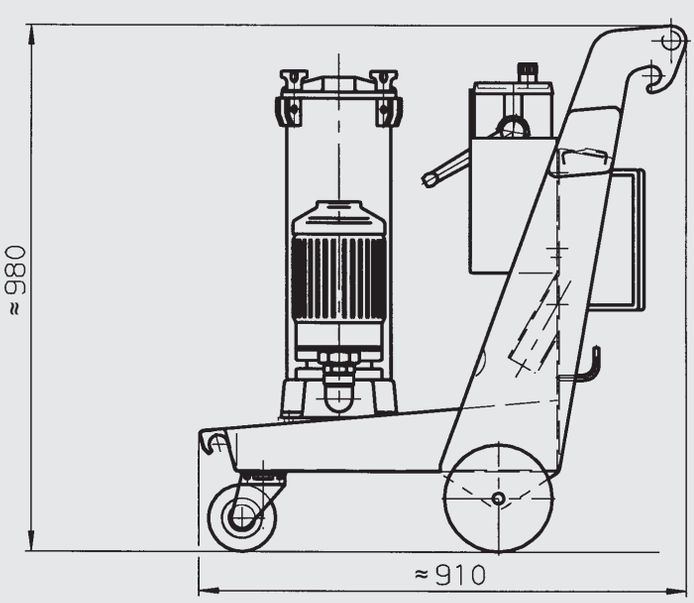
Filter size
2 = element 1300

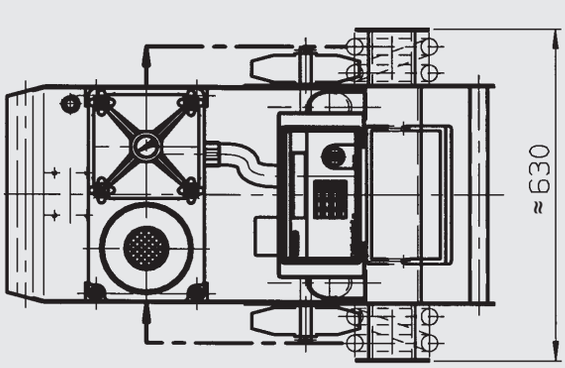
Filter material
P = Paper (P/HC)
B = Betamicron® (BN3HC)
A = Aquamicron®

Filtration rating
03 = 3 µm BN3HC; BN/AM
05 = 5 µm BN3HC
10 = 10 µm BN3HC; BN/AM
20 = 20 µm BN3HC
40 = 40 µm AM

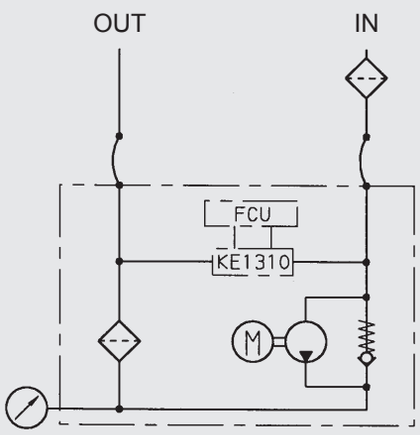
Clogging indicator
C = pressure gauge, electrical (VMF 2 C.0)

Dimensions





Hydraulic circuit diagram



Replacement elements

Filter size	Filtration rating	Element type	Part No.
2	3 µm	1300 R 003 BN4HC/-KB (-V-KB)	1263059 (1263760)
2	5 µm	1300 R 005 BN4HC/-KB (-V-KB)	1263060 (1263761)
2	10 µm	1300 R 010 BN4HC/-KB (-V-KB)	1263061 (1263762)
2	20 µm	1300 R 020 BN4HC/-KB (-V-KB)	1263062 (1263763)
2	40 µm	1300 R 040 AM/-KB	1267699
2	3 µm	1300 R 003 BN/AM/-KB (-V-KB)	1267991 (1271839)
2	10 µm	1300 R 010 BN4AM/-KB (-V-KB)	1270010 (1276060)

Note

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Mobile Oil Transport and Filtration Unit

TW 5

Description

The oil transport and filtration trolley TW 5 is a mobile oil service unit which is designed to transport oil. It also filters hydraulic and lubrication oil when filling systems and when transferring oils. The unit has a 200 l built-in tank.

A change-over valve on the unit allows the operator to bypass the filter when emptying the tank (optional).

Applications

- Hydraulic and lubrication oil systems in a variety of industries

Advantages

- Easy, safe oil transport
- Convenient offline filtration
- Easy to operate
- Greater system availability
- Reduction in Life Cycle Cost LCC

Technical specifications

Tank size	200 l
Pump type	Vane pump
Max. flow rate	30/40 l/min
Operating pressure	4.5 bar max.
Permitted suction pressure at suction port	-0.4 bar ... +0.6 bar
Viscosity range	15 ... 800 mm²/s (version-dependent, see Model Code)
Permitted operating fluid	Mineral oil (others on request)
Fluid temperature	-10 ... 80 °C
Ambient temperature	-20 ... 40 °C
Seals, gaskets	NBR (Option FPM)
Protection class	IP 54
Power cable, length	10 m
Hoses, length	3 m
Hose connections	Suction hose NW 28 Pressure hose NW 25
Weight (empty)	≈ 160 kg
Accessories	Pistol grip filling nozzle Flow meter

Model code

TW5 L 10 P 6 N 2 B 05 E

Basic type
TW 5 = Oil transport and filtration trolley

Versions
L = without change-over valve
F = with change-over valve

Type code
10 = standard
Special models on request

Seals
P = NBR (Perbunan)
V = FPM (Viton)

Motor-pump unit

Code	Approx. flow rate at 1450 rpm	Max. viscosity	Electric motor output at 50 Hz
3	30 l/min	250 mm²/s	0.75 kW
6	40 l/min	800 mm²/s	1.5 kW

Electric motor voltage
M = 1 x 230 V - 50 Hz
N = 3 x 380-420 V - 50 Hz; 3 x 440-480 V - 60 Hz
S = 3 x 500-600 V - 50 (60) Hz
X = special voltage

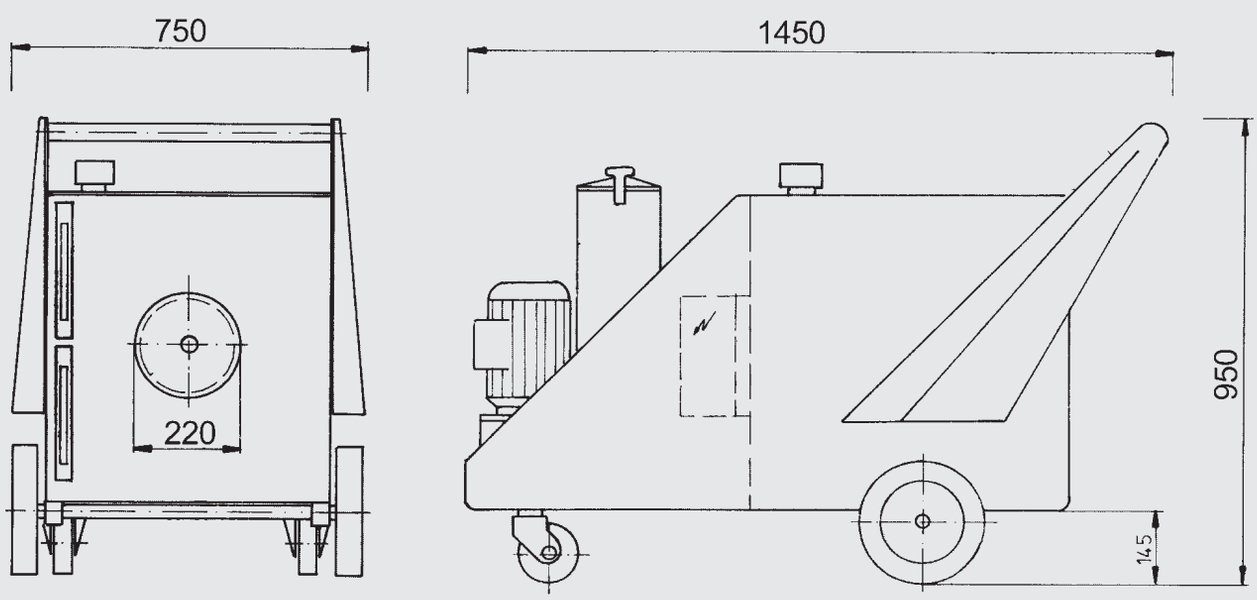
Filter size
1 = Element 330
2 = Element 1300

Filter material
B = Betamicron (BN3HC)
A = Aquamicron (BN/AM), (AM)

Filtration rating
03 = 3 µm BN3HC; BN/AM
05 = 5 µm BN3HC
10 = 10 µm BN3HC; BN/AM
20 = 20 µm BN3HC
40 = 40 µm AM

Clogging indicator
E = Standard, pressure gauge
B = Option: differential pressure gauge - visual
C = Option: differential pressure gauge - electrical
B and C not for version "L"

Dimensions

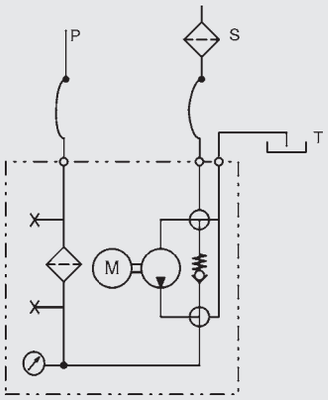


Hydraulic circuit diagram

Version F

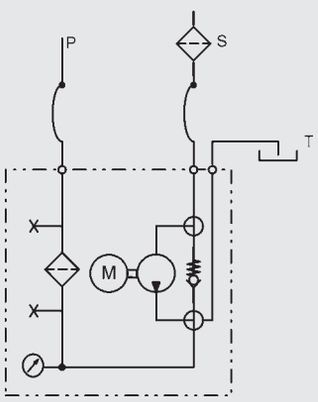
T → P
via filter

Transfer of filtered fluid from the TW5 tank to an external system



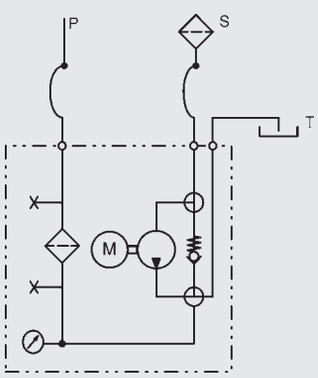
S → P
via filter

Transfer with filtration



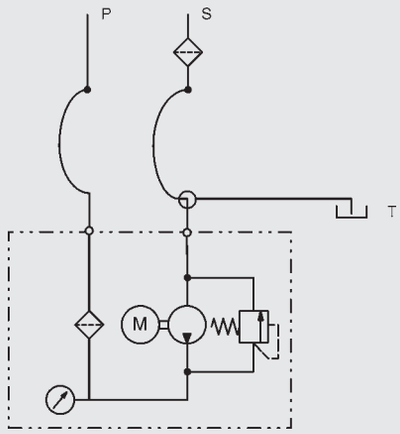
S → T
without filtration

Transfer to the TW5 tank from an external system

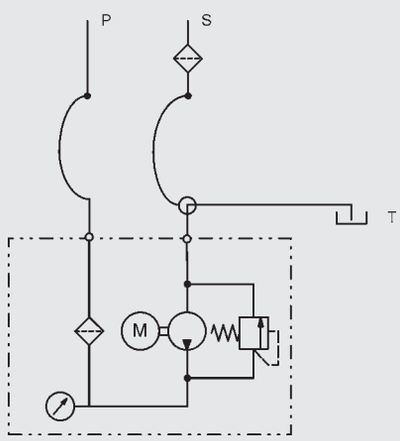


Type L

S → P
via filter



T → P
via filter



Replacement elements

Filter size	Filtration rating	Element type	Part No.
1	3 µm	0330 R 003 BN4HC/-KB (-V-KB)	1262999 (1263640)
1	5 µm	0330 R 005 BN4HC/-KB (-V-KB)	1263000 (1263641)
1	10 µm	0330 R 010 BN4HC/-KB (-V-KB)	1263001 (1263642)
1	20 µm	0330 R 020 BN4HC/-KB (-V-KB)	1263002 (1263643)
1	40 µm	0330 R 040 AM /-KB (-V-KB)	1272067 (1266563)
1	3 µm	0330 R 003 BN/AM /-KB (-V-KB)	1272069 (1276690)
1	10 µm	0330 R 010 BN/AM /-KB (-V-KB)	1272068 (1281126)
2	3 µm	1300 R 003 BN4HC-/KB (-V-KB)	1263059 (1263760)
2	5 µm	1300 R 005 BN4HC-/KB (-V-KB)	1263060 (1263761)
2	10 µm	1300 R 010 BN4HC-/KB (-V-KB)	1263061 (1263762)
2	20 µm	1300 R 020 BN4HC-/KB (-V-KB)	1263062 (1263763)
2	3 µm	1300 R 003 BN/AM /-KB (-V-KB)	1267991 (1271839)
2	10 µm	1300 R 010 BN4AM /-KB (-V-KB)	1270010 (1276060)
2	40 µm	1300 R 040 AM /-KB	1267699

Note

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Subject to technical modifications.

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FluidCarrierCompact
FCC

Description
The FluidCarrier Compact is designed to clean and transfer the fluid in machine tools with tank volumes of up to 200 l.

Particularly when introducing TPM (Total Productive Maintenance), it is essential that hydraulic and lubricating oils are filtered during top-up and that mixing of different types of oil is ruled out.

The FCC is designed to transport as well as fill/filter small quantities of fluids. It also has test points for connecting particle counters (FCU) in order to monitor the oil cleanliness. By making use of the integrated filtration unit (OLF Compact) smaller systems can be cleaned offline.

In addition there is the option of connecting a flow meter to log the volume transferred.

Advantages
- Easy, safe transport
  ⇒ 70 litre volume for filling small units, easy operation
- Filtration of filling fluid
  ⇒ via Olf–Compact ($ß_2$>1000) resulting in fewer breakdowns caused by contamination in new oil
- Monitoring
  ⇒ FCU and flow meter available as options, providing documentation of the volume and/or cleanliness following fluid service
- Mobile offline filtration unit
  ⇒ Can also be used for offline filtration

Technical specifications

Filter element	DIMICRON (2, 5, 10, 20 µm absolute) AQUAMICRON (3, 20 µm absolute)
Flow rate	FCC 5/4: 4 l/min FCC 5/15: 15 l/min
Operating pressure	3.5 bar
Viscosity range	FCC 5/4: 200-7000 mm²/s FCC 5/15: 15-1000 mm²/s
Fluid temperature range	0 ... 80 °C
Ambient temperature range	0 ... 40 °C
Seals	NBR
Protection class	IP 55 (without FCU)
Weight	≈ 60 kg empty
Tank volume	70 l
Hoses, length	2.3 m
Power cable, length	10 m

Model code

FCC –5/15 –S –N –N5DM002 –BM / –K-FA1

Basic type
FCC = Fluid Carrier Compact

Size & Flow rate
5/4 = 4 l/min
5/15 = 15 l/min

Pump type
S = Vane pump

Voltage

L	= 115V - 1Ph	G	= 440V - 3Ph
M	= 230V - 1Ph*	O	= 460V - 3Ph
W	= 230V - 3Ph*	B	= 480V - 3Ph
C	= 380V - 3Ph	S	= 500V - 3Ph
N	= 400V - 3Ph*	P	= 575V - 3Ph
R	= 415V - 3Ph		

X = other voltages on request
M60 = operation at 60Hz
* Standard in Europe according to CENELEC HD472 S1 at 50 Hz

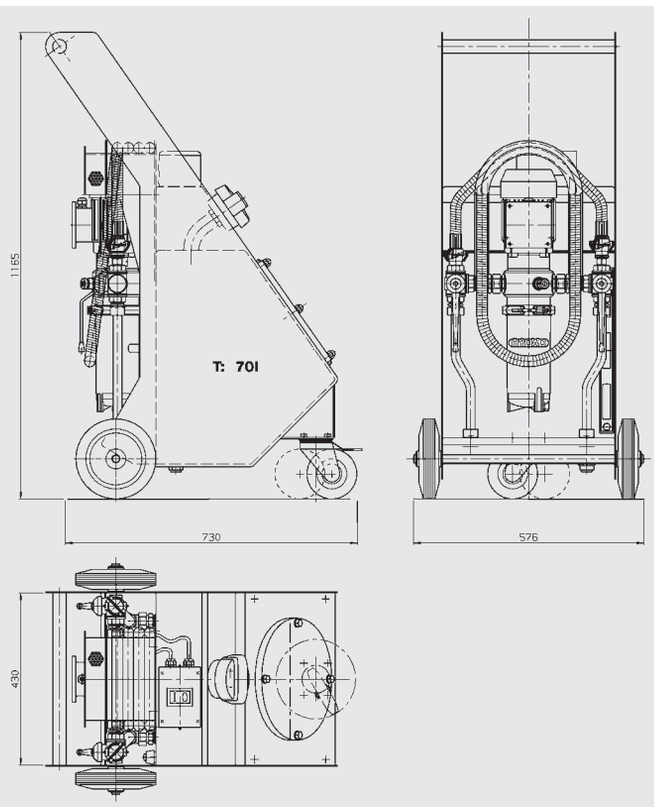
Filter element
N 5 DM 002 = DIMICRON filtration rating 2 µm absolute
N 5 DM 005 = DIMICRON filtration rating 5 µm absolute
N 5 DM 010 = DIMICRON filtration rating 10 µm absolute
N 5 DM 020 = DIMICRON filtration rating 20 µm absolute
N 5 AM 002 = AQUAMICRON® filtration rating 4 µm absolute
N 5 AM 020 = AQUAMICRON® filtration rating 20 µm absolute
Z = without filter element

Clogging indicator
BM = Differential pressure gauge, visual (VM2BM.1)
C = Differential pressure gauge, electrical (for versions FA1, FA2 and E) (VM2C.0)

Supplementary details
K = Flow meter
FA1 = On/off switch with motor circuit breaker and cut-out when filter is clogged.
Requires neutral line. For voltages up to max. 240V, 1Ph, or max. 415V, 3Ph.
clogging indicator type C or D3 required.
FA2 = On/off switch with motor circuit breaker and cut-out when filter is clogged.
Does not require neutral line. All voltages. Clogging indicator type C required.
FCU* = Equipped for connection of FCU: includes holder, test points and change-over valve
E* = Electrical control unit for automatic control of the FCC by FCU (includes option FA1 and FCU)

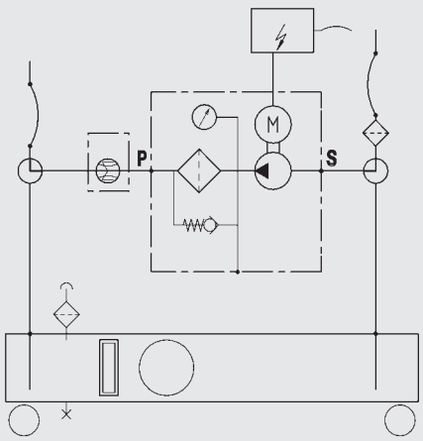
* suitable for FCU 2000 series, please order FCU separately, see FCU brochure

Dimensions

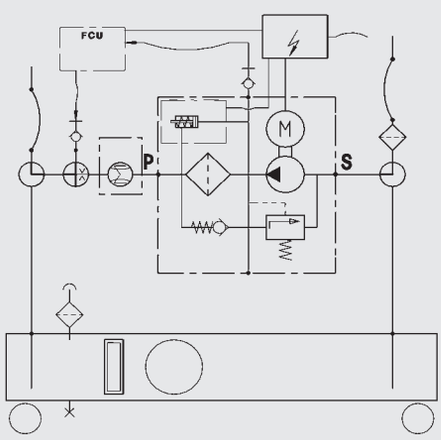


Hydraulic circuit diagram

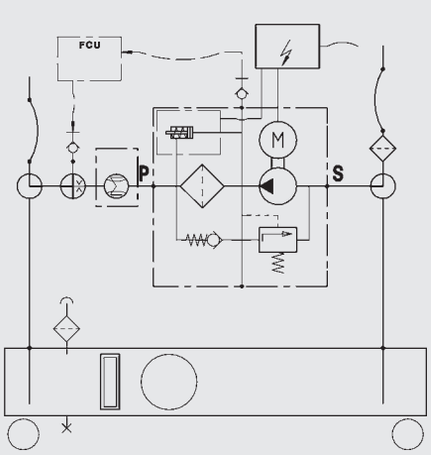
Standard model



Version with electrical control unit for automatic control of the FCC by FCU

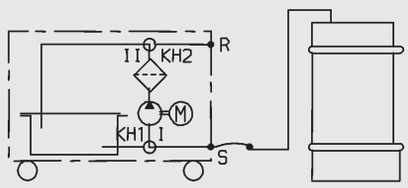


Equipped for connection of FCU: includes test points and change-over valve

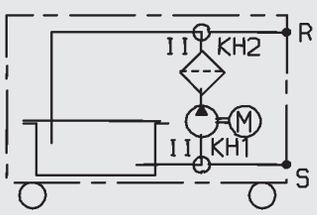


Types of operation

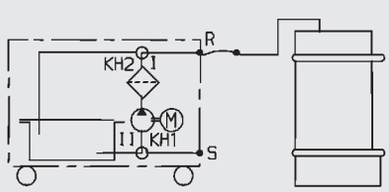
FCC - Transferring to on-board tank



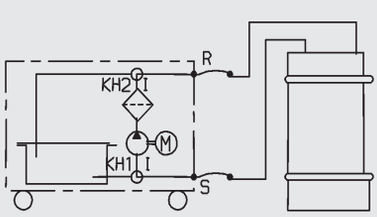
FCC - Filtration of on-board tank



FCC - Transferring to external tank



FCC - Offline filtration of external tank



Note

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FluidCleaner Mobil
FCM 60/100

Description
The FluidCleaner Mobil FCM is a mobile oil service unit and is used for offline filtration when filling systems and when transferring hydraulic and lubricating fluids.

With the FCM, HYDAC is providing a flexible and reliable service unit for conditioning oil, which significantly increases the life expectancy of operating media, components and therefore of entire systems, resulting in reduced operating costs.

Applications
- Hydraulic and lubrication systems in different industries (for example, machine tools, plastic injection moulding machines, paper mills, construction machinery, steel industry, marine & offshore, mobile industry)

Advantages
- Prevents costly component damage and system failures
- Reliable and convenient operation
- Increased oil service life
- Reduction in Life Cycle Cost LCC

Technical specifications

	Vane pump version	Gear pump version
Max. flow rate	FCM 60 = 60 l/min FCM 100 = 100 l/min	
Operating pressure	p_{max} = 6 bar	p_{max} = 10 bar
Viscosity range	15 ... 400 mm²/s	15 ... 1000 mm²/s
Permitted operating fluid	Mineral oil (DIN 51424)	
Fluid temperature	-10 ... 80 °C	
Ambient temperature	-10 ... 40 °C	
Seals, gaskets	NBR (Option: FPM)	
Protection class	IP 55	
Power cable, length	10 m	
Connections/Length of hoses Suction hose Pressure hose	 NW 38 (1 ½") / 2.5 m NW 25 (M 36x2) / 4 m	
Weight	135 kg (FCM 60)	145 kg (FCM 100)

Model code

FCM 100 L N 3B03 C/ S5D5-V

Filtration unit
FluidCleaner Mobil

Flow rate
060 = 60 l/min
100 = 100 l/min

Versions
L = vane pump without change-over (standard)
F = vane pump with change-over
K = gear pump without change-over
G = gear pump with change-over

Connection voltage
M* = 230 V / 50 Hz (1 Ph + PE)
N = 400 V / 50 Hz (3 Ph + N + PE)
S = 500 V / 50 Hz (3 Ph + PE)
X = other voltage

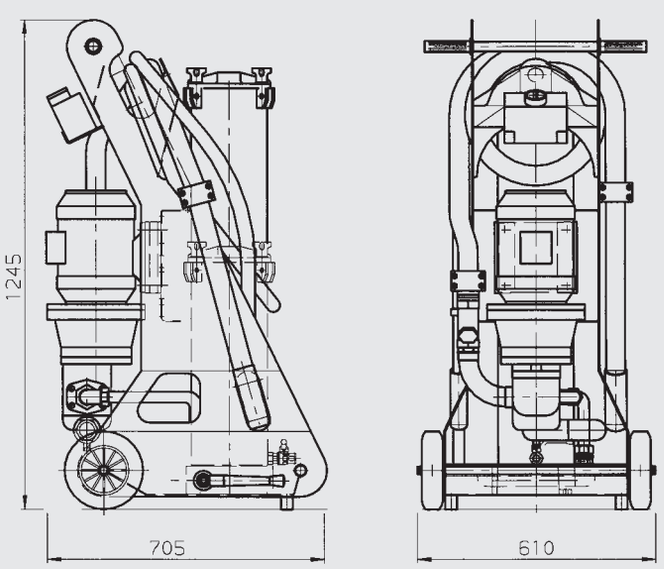
Filter design
2 = filter size 1300
3 = filter size 2600
see next page

Clogging indicator
B = visual differential pressure indicator (Standard)
C = special model - differential pressure indicator electrical (VM2C.0) with automatic motor cut-out when filter is contaminated

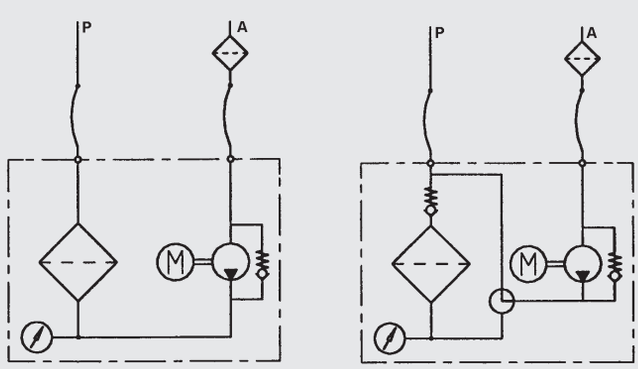
Supplementary details
no details = standard
S5 = suction hose 5 m with lance
D5 = pressure hose 5 m with lance
V = FPM (Viton) seal
SK = suction hose with threaded connection
DK = pressure hose with threaded connection

* = for type FCM 60 (1.5 kW) only

Dimensions



Hydraulic circuit diagram

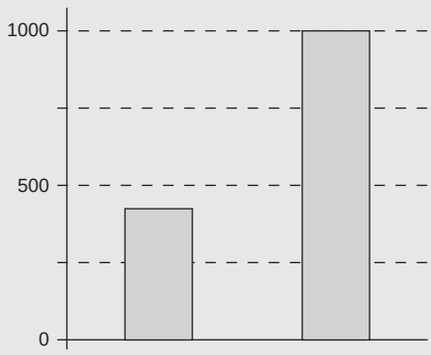


Standard model

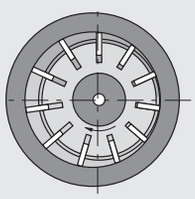
Model with change-over

Versions

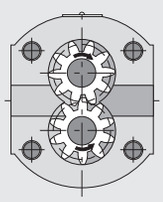
Viscosity [mm²/s]



Vane pump (standard)



Gear pump



Replacement elements

Filter size	Filtration rating	Element type	Part No.
2	3 µm	1300 R 003 BN4HC-/KB (-V-KB)	1263059 (1263760)
2	5 µm	1300 R 005 BN4HC-/KB (-V-KB)	1263060 (1263761)
2	10 µm	1300 R 010 BN4HC-/KB (-V-KB)	1263061 (1263762)
2	20 µm	1300 R 020 BN4HC-/KB (-V-KB)	1263062 (1263763)
2	40 µm	1300 R 040 AM/-KB	1267699
2	10 µm	1300 R 010 BN4AM/-KB (-V-KB)	1270010 (1276060)
2	3 µm	1300 R 003 BN/AM/-KB (-V-KB)	1267991 (1271839)
3	3 µm	2600 R 003 BN4HC/-KB (-V-KB)	1263071 (1263784)
3	5 µm	2600 R 005 BN4HC/-KB (-V-KB)	1263072 (1263785)
3	10 µm	2600 R 010 BN4HC/-KB (-V-KB)	1263073 (1263786)
3	20 µm	2600 R 020 BN4HC/-KB (-V-KB)	1263074 (1263787)
3	40 µm	2600 R 040 AM/-KB	306899
3	3 µm	2600 R 003 BN/AM/-KB (-V-KB)	1268232 (1275329)
3	10 µm	2600 R 010 BN/AM/-KB	1276840

Selection table for motor-pump unit

Version	FCM 60	FCM 100
Vane pump	1.5 kW	2.2 kW
Gear pump	2.2 kW	3.0 kW

Note

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

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

Subject to technical modifications.

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Barrel Transportation and Filtration Trolley

FT 5

Description

The barrel transportation and filtration trolley FT 5 is a mobile oil service unit. It fills/filters hydraulic and lubrication tanks. The unit is designed to carry a standard oil drum (200 l).

There is also the option to bypass the filter when emptying tanks (Version F).

Applications

- Hydraulic and lubrication oil systems in a variety of industries

Advantages

- Convenient offline filtration
- Easy, safe transport of a 200 l standard oil drum
- Easy to operate
- Filling to a defined cleanliness class
- Greater system availability
- Reduction in Life Cycle Cost LCC

Technical specifications

Max. flow rate	30/40 l/min
Operating pressure	4.5 bar max.
Viscosity range	15 ... 800 mm²/s (version-dependent)
Permitted operating fluid	Mineral oil (others on request)
Permitted suction pressure at suction port	-0.4 bar to +0.6 bar
Fluid temperature	-10 ... 80 °C
Ambient temperature	-20 ... 40 °C
Seals	NBR (Option: FPM)
Protection class	IP 54
Power cable, length	6 m
Hoses, length	3 m
Hose connections	Suction hose NW 30 with lance Pressure hose NW 25 with lance
Weight	≈ 160 kg
Accessories	Pistol grip filling nozzle Flow meter

Model code

FT5 L 10 P 6 N 2 B 05 E

Type
FT5 = Barrel Transportation and Filtration Trolley

Versions
L = without change-over valve
F = with change-over valve

Type code
10 = Standard
Special models on request

Seals
P = NBR (Perbunan)
V = FPM (Viton)

Motor-pump unit

Code	Approx. flow rate at 1450 rpm	Max. viscosity	Electric motor output at 50 Hz
3	30 l/min	250 mm²/s	0.75 kW
6	40 l/min	800 mm²/s	1.5 kW

Electric motor voltage
M = 1 x 230V - 50 Hz
N = 3 x 380 - 420 V - 50 Hz, 3 x 440 - 480 V - 60 Hz
S = 3 x 500 - 600 V - 50 (60)Hz
X = special voltage

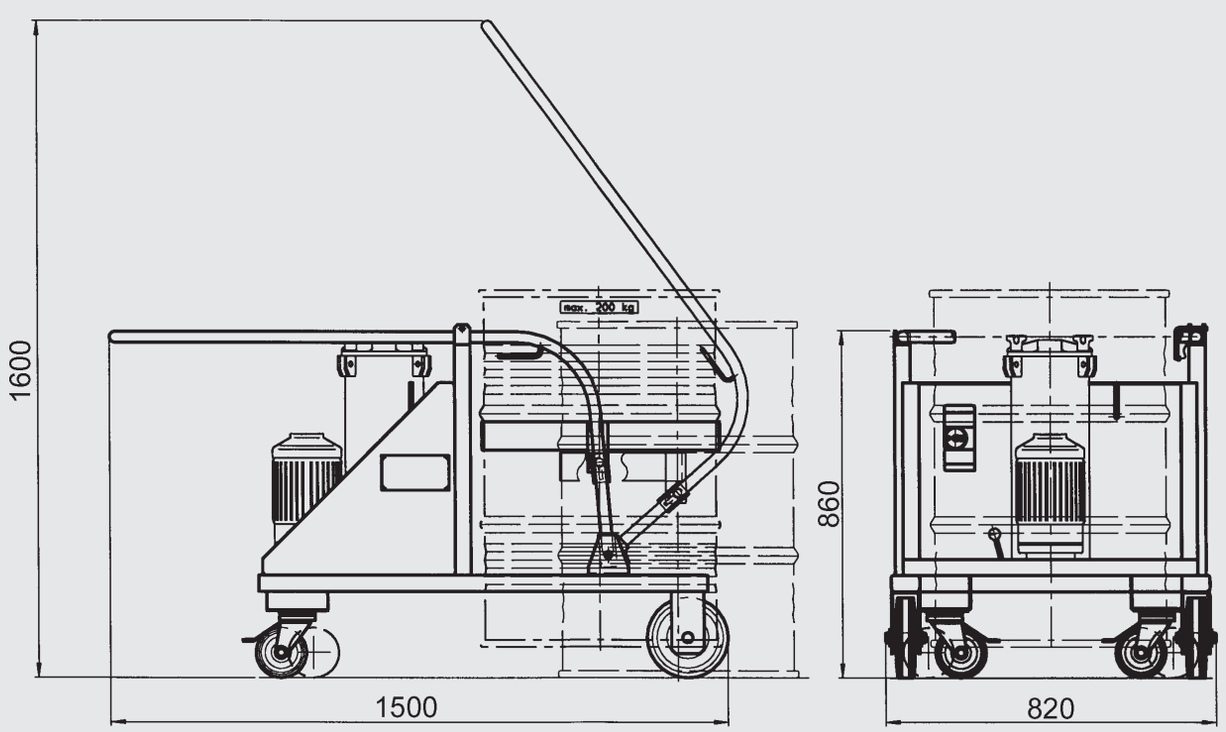
Filter size
1 = Element 330
2 = Element 1300

Filter material
B = Betamicron (BN4HC)
A = Aquamicron (BN/AM), (AM)

Filtration rating
03 = 3 µm BN4HC; BN/AM
05 = 5 µm BN4HC
10 = 10 µm BN4HC; BN/AM
20 = 20 µm BN4HC;
40 = 40 µm AM

Clogging indicator
E = standard, pressure gauge
B = option: differential pressure gauge, visual
C = option: differential pressure gauge, electrical
D = option: differential pressure gauge, visual/electrical
B, C and D not for version "L"

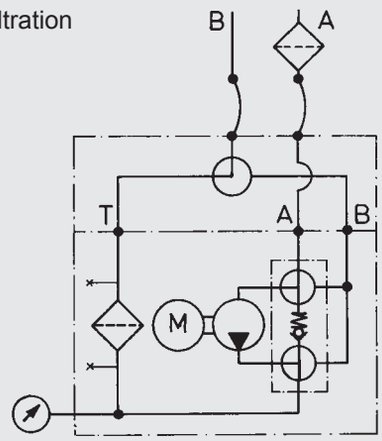
Dimensions



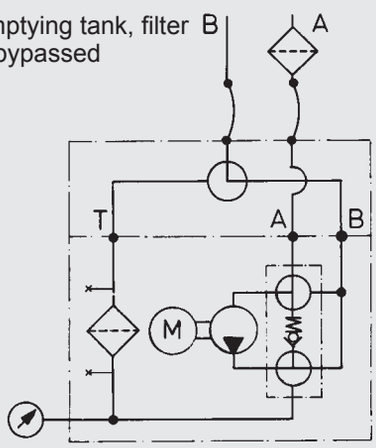
Hydraulic circuit diagram

Version F

Filtration

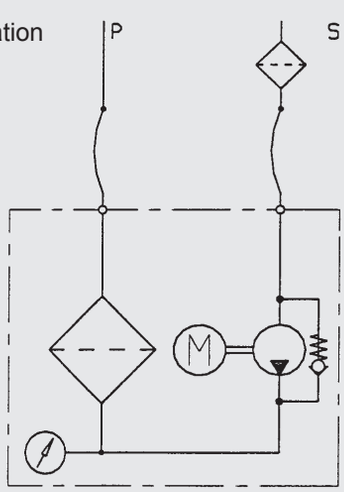


Emptying tank, filter is bypassed



Version L

Filtration



Replacement elements

Filter size	Filtration rating	Element type	Part No.
1	3 µm	0330 R 003 BN4HC/-KB (-V-KB)	1262999 (1263640)
1	5 µm	0330 R 005 BN4HC/-KB (-V-KB)	1263000 (1263641)
1	10 µm	0330 R 010 BN4HC/-KB (-V-KB)	1263001 (1263642)
1	20 µm	0330 R 020 BN4HC/-KB (-V-KB)	1263002 (1263643)
1	40 µm	0330 R 040 AM/-KB (-V-KB)	1272067 (1266563)
1	3 µm	0330 R 003 BN/AM/-KB (-V-KB)	1272069 (1276690)
1	10 µm	0330 R 010 BN/AM/-KB	1272068
2	3 µm	1300 R 003 BN4HC/-KB (-V-KB)	1263059 (1263760)
2	5 µm	1300 R 005 BN4HC/-KB (-V-KB)	1263060 (1263761)
2	10 µm	1300 R 010 BN4HC/-KB (-V-KB)	1263061 (1263762)
2	20 µm	1300 R 020 BN4HC/-KB (-V-KB)	1263062 (1263763)
2	40 µm	1300 R 040 AM/-KB	1267699
2	3 µm	1300 R 003 BN/AM/-KB	1267991
2	10 µm	1300 R 010 BN/AM/-KB (-V-KB)	1270010 (1276060)

V = Viton
KB = without bypass

Note

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Filter Pump Transfer Unit
OFU

Description
The Filter Pump Transfer Unit OFU is a mobile oil service unit and is used to filter oil when filling systems and when transferring hydraulic and lubricating fluids.

Applications
- Hydraulic and lubrication oil systems in a variety of industries

Advantages
- Convenient offline filtration
- Easy operation
- Greater system availability
- Reduction in Life Cycle Cost LCC

Technical specifications

Max. flow rate	100 l/min
Pump type	Gear pump type
Operating pressure	10 bar max
Permitted suction pressure at suction port	-0.4 bar to +0.6 bar
Viscosity range	15 ... 1000 mm²/s
Permitted operating fluid	Mineral oils (others on request)
Fluid temperature	-10 ... 80 °C
Ambient temperature	-10 ... 40 °C
Seals, gaskets	NBR (Option: FPM)
Protection class	IP 54
Power cable, length	10 m
Suction hose	2.5 m
Pressure hose	4 m
Hose connections	Suction hose NW 38 with lance, others on request Pressure hose NW 25 with lance, others on request
Weight	≈ 130 kg
Accessories	Flow meter, hose with compression ends or threaded couplings

Model code

OFU 10 P 2 N 2 B 05 B

Filter pump transfer unit, mobile
OFU

Type code
10 = standard
special model on request

Seals
P = NBR (Perbunan)
V = FPM (Viton)

Flow rate and motor output
1 = 100 l/min, 3 kW
2 = 100 l/min, 4 kW
others on request

Connection voltage
N = 3 x 380 - 420 V - 50 Hz, 3 x 440 - 480 V - 60 Hz
S = 3 x 500 - 600 V - 50 (60) Hz
X = other

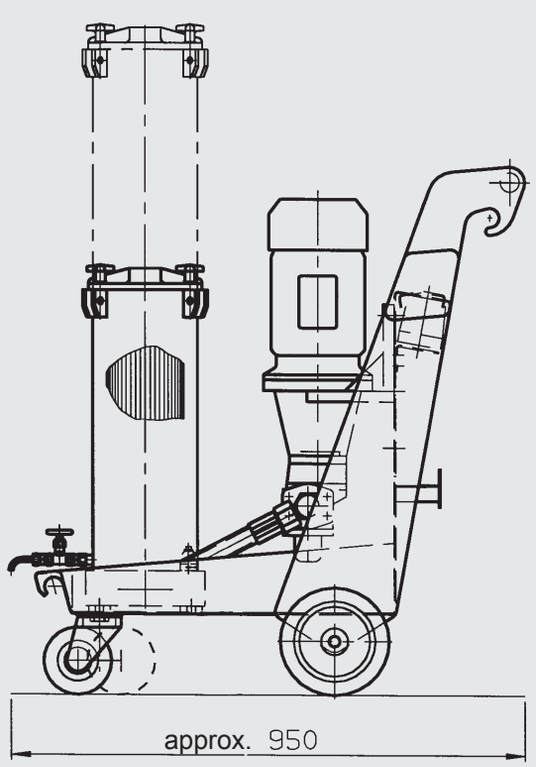
Filter housing
2 = element 1300
3 = element 2600

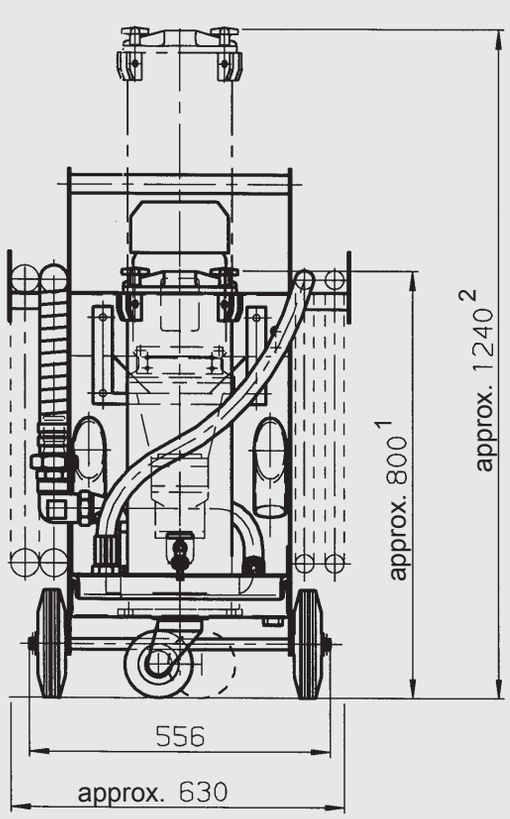
Filter material
A = Aquamicron (BN/AM), (AM)
B = Betamicron (BN3HC)

Filtration rating
03 = 3 µm BN3HC; BN/AM
05 = 5 µm BN3HC
10 = 10 µm BN3HC; BN/AM
20 = 20 µm BN3HC;
40 = 40 µm AM

Clogging indicator
B = standard: visual clogging indicator VM 2 B.1
C = special model: differential pressure switch, electrical (VM 2 C.0/-L220) with automatic motor cut-out when filter is contaminated
D = special model: differential pressure switch, visual / electrical (VM 2 D.0/-L220) with automatic motor cut-out when filter is contaminated

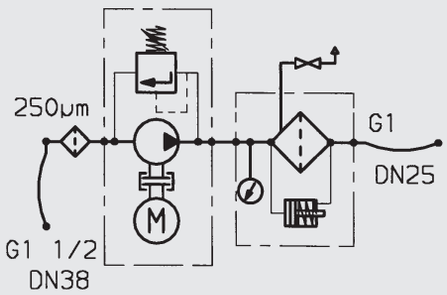
Dimensions





1 = for element 1300
2 = for element 2600

Hydraulic circuit diagram



Replacement elements

Filter size	Filtration rating	Element type	Part No.
2	3 µm	1300 R 003 BN4HC-/KB (-V-KB)	1263059 (1263760)
2	5 µm	1300 R 005 BN4HC-/KB (-V-KB)	1263060 (1263761)
2	10 µm	1300 R 010 BN4HC-/KB (-V-KB)	1263061 (1263762)
2	20 µm	1300 R 020 BN4HC-/KB (-V-KB)	1263062 (1263763)
2	40 µm	1300 R 040 AM/-KB	1267699
2	10 µm	1300 R 010 BN4AM/-KB (-V-KB)	1270010 (1276060)
2	3 µm	1300 R 003 BN/AM/-KB (-V-KB)	1267991 (1271839)
3	3 µm	2600 R 003 BN4HC/-KB (-V-KB)	1263071 (1263784)
3	5 µm	2600 R 005 BN4HC/-KB (-V-KB)	1263072 (1263785)
3	10 µm	2600 R 010 BN4HC/-KB (-V-KB)	1263073 (1263786)
3	20 µm	2600 R 020 BN4HC/-KB (-V-KB)	1263074 (1263787)
3	40 µm	2600 R 040 AM/-KB	306899
3	3 µm	2600 R 003 BN/AM/-KB (-V-KB)	1268232 (1275329)
3	10 µm	2600 R 010 BN/AM/-KB	1276840

Note

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Filtromat
OF 5

Description
The stationary fluid service unit OF5 is designed to fill/filter hydraulic and lubrication tanks and to filter offline. There is also the option (Version S only) to bypass the filter when emptying tanks.

Applications
- Hydraulic and lubrication oil systems in a variety of industries

Advantages
- Convenient offline filtration
- Easy to operate
- Increased service life for oil and components
- Reduction in Life Cycle Cost LCC

Technical specifications

Max. flow rate	30 l/min, 40 l/min
Operating pressure	4.5 bar max
Viscosity range	15 ... 800 mm²/s (version-dependent, see Model code)
Permitted operating fluid	Mineral oil (others on request)
Permitted suction pressure at suction port	-0.4 bar ... +0.6 bar
Fluid temperature	-10 ... 80 °C
Ambient temperature	-20 ... 40 °C
Seals	NBR (Option: FPM)
Protection class	IP 54
Weight (empty)	≈ 46 kg

Model code

OF5 S 10 P 6 N 1 B 05 E

Basic type
OF5

Versions
S = Stationary with change-over valve
N = Offline unit: stationary without change-over valve

Type code
10 = Standard
Special models on request

Seals
P = NBR (Perbunan)
V = FPM (Viton)

Motor-pump unit

Code	Approx. flow rate at 1450 rpm	Max. viscosity	Electric motor output at 50 Hz
3	30 l/min	250 mm²/s	0.75 kW
6	40 l/min	800 mm²/s	1.5 kW

Electric motor voltage
M = 1 x 230 V - 50 Hz
N = 3 x 380-420 V - 50 Hz; 3 x 440-480 V - 60 Hz
S = 3 x 500-600 V - 50 (60) Hz
X = special voltage

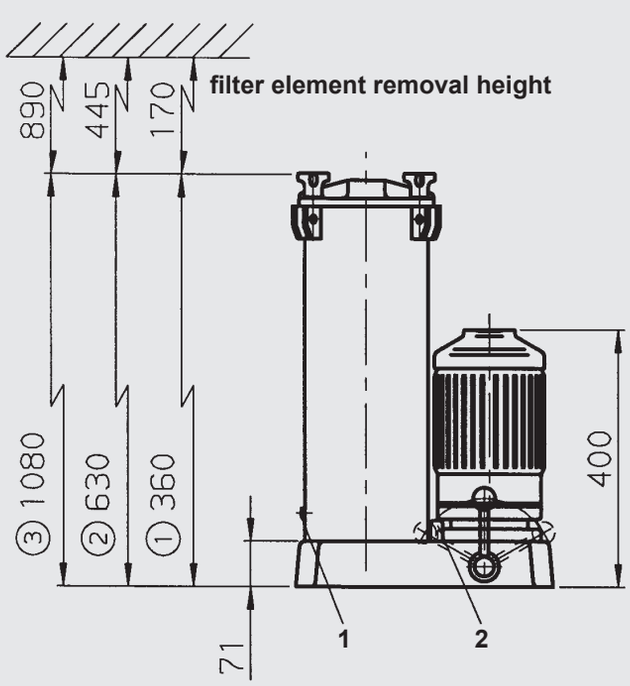
Filter size
1 = Element 330
2 = Element 1300
3 = Element 2600

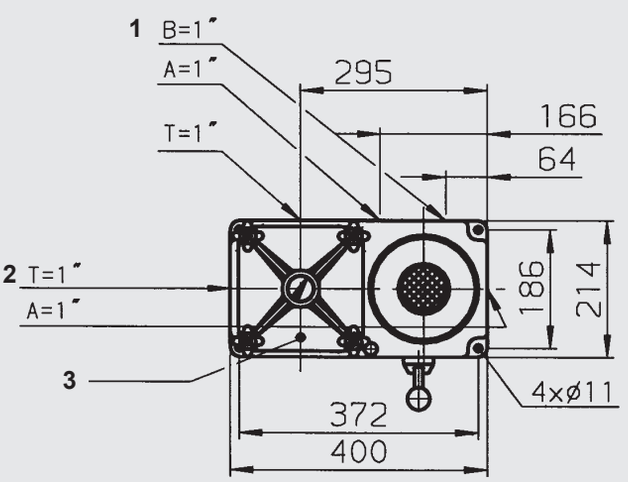
Filter material
B = Betamicron (BN4HC)
A = Aquamicron (BN/AM), (AM)

Filtration rating
03 = 3 µm BN4HC; BN/AM
05 = 5 µm BN4HC
10 = 10 µm BN4HC;BN/AM
20 = 20 µm BN4HC
40 = 40 µm AM

Clogging indicator
E = Standard, pressure gauge
B = Option: differential pressure gauge - visual
C = Option: differential pressure gauge - electrical
D = Option: differential pressure gauge - visual/electrical
B, C and D not for version "N"

Dimensions



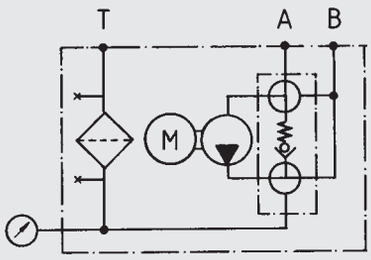


1 = connections on OF 5 S
2 = connections on OF 5 N
3 = air bleed screw

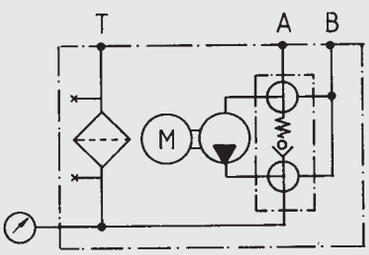
Hydraulic circuit diagram

OF5 S

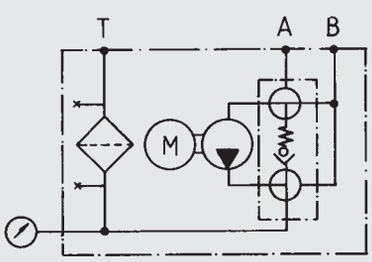
I Emptying tank, filter is bypassed
A → B



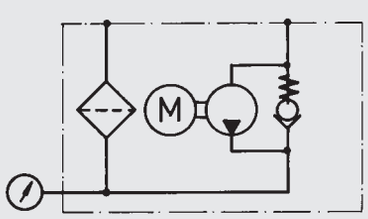
II Filtering offline A → T



III Filling via filter B → T



OF5 N



Replacement elements

Filter size	Filtration rating	Element type	Part No.
1	3 µm	0330 R 003 BN4HC/-KB (-V-KB)	1262999 (1263640)
1	5 µm	0330 R 005 BN4HC/-KB (-V-KB)	1263000 (1263641)
1	10 µm	0330 R 010 BN4HC/-KB (-V-KB)	1263001 (1263642)
1	20 µm	0330 R 020 BN4HC/-KB (-V-KB)	1263002 (1263643)
1	40 µm	0330 R 040 AM/-KB (-V-KB)	1272067 (1266563)
1	3 µm	0330 R 003 BN/AM/-KB (-V-KB)	1272069 (1276690)
1	10 µm	0330 R 010 BN/AM/-KB	1272068
2	3 µm	1300 R 003 BN4HC/-KB (-V-KB)	1263059 (1263760)
2	5 µm	1300 R 005 BN4HC/-KB (-V-KB)	1263060 (1263761)
2	10 µm	1300 R 010 BN4HC/-KB (-V-KB)	1263061 (1263762)
2	20 µm	1300 R 020 BN4HC/-KB (-V-KB)	1263062 (1263763)
2	40 µm	1300 R 040 AM/-KB	1267699
2	3 µm	1300 R 003 BN/AM/-KB	1267991
2	10 µm	1300 R 010 BN/AM/-KB (-V-KB)	1270010 (1276060)
3	3 µm	2600 R 003 BN4HC/-KB (-V-KB)	1263071 (1263784)
3	5 µm	2600 R 005 BN4HC/-KB (-V-KB)	1263072 (1263785)
3	10 µm	2600 R 010 BN4HC/-KB (-V-KB)	1263073 (1263786)
3	20 µm	2600 R 020 BN4HC/-KB (-V-KB)	1263074 (1263787)
3	40 µm	2600 R 040 AM/-KB	306899
3	3 µm	2600 R 003 BN/AM/-KB (-V-KB)	1268232 (1275329)
3	10 µm	2600 R 010 BN/AM/-KB	1276840

V = Viton
KB = without bypass

Note

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

Subject to technical modifications.

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Filtromat
OF 5 Mini

Description
The stationary fluid service unit OF5 Mini is designed to fill/filter hydraulic and lubrication tanks and to filter offline. The change-over valve is provided to bypass the filter when emptying tanks.

Applications
- Hydraulic and lubrication oil systems in a variety of industries
- Mobile hydraulics

Advantages
- Convenient offline filtration
- Very compact design
- Greater system availability
- Reduction of Life Cycle Cost LCC

Technical specifications

Max. flow rate	15 l/min
Operating pressure	4.5 bar max
Permitted suction pressure at suction port	-0.4 bar ... +0.6 bar
Pump type	Gerotor
Viscosity range	15 ... 500 mm²/s
Permitted operating fluid	Mineral oil (others on request)
Fluid temperature range	-10 ... 80 °C
Ambient temperature range	-20 ... 40 °C
Protection class	IP 55
Weight	≈ 20 kg

Model code

OF5 M 20 V 1 M 2 N5DM002 E - /–

Basic type
OF5

Version
M = Stationary with change-over valve

Type code
20 = Standard
Special models on request

Seals
V = FPM (Viton)

Motor-pump unit

Code	Approx. flow rate at 1450 rpm	Electric motor input at 50 Hz
1	15 l/min (at 40 mm²/s)	0.37 kW

Voltage

L	= 115 V - 1 Ph	T	= 12V DC
M	= 230 V - 1 Ph*	U	= 24V DC
N	= 400 V - 3 Ph*		
X	= other voltages on request		
M60	= operation at 60Hz		

* Standard in Europe according to CENELEC HD472 S1 at 50 Hz

Filter size
2 = 1 Element N5

Filter element
N 5 DM 002 = DIMICRON® 2 µm absolute
N 5 DM 005 = DIMICRON® 5 µm absolute
N 5 DM 010 = DIMICRON® 10 µm absolute
N 5 DM 020 = DIMICRON® 20 µm absolute
N 5 AM 001 = AQUAMICRON® 1 µm absolute
N 5 AM 002 = AQUAMICRON® 2 µm absolute
N 5 AM 020 = AQUAMICRON® 20 µm absolute

Clogging indicator
E = Standard, pressure gauge

Supplementary details

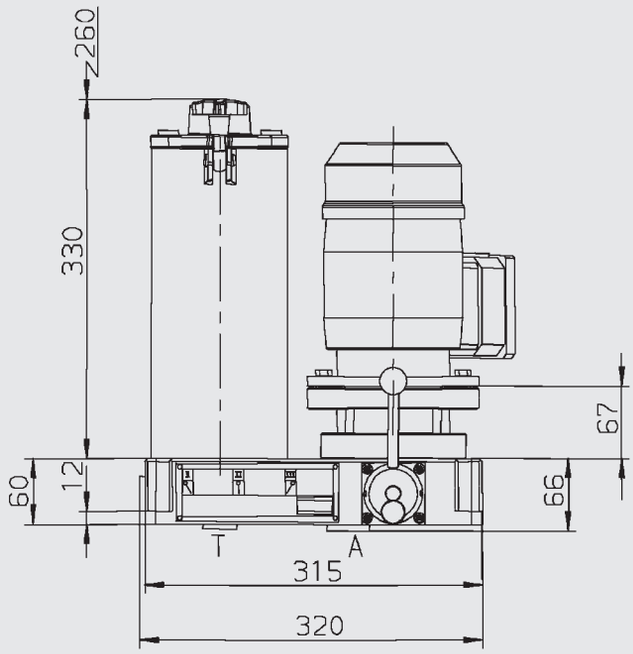
Accessories (optional)

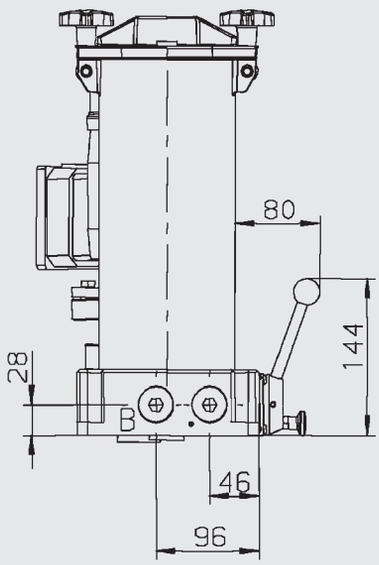
- OF5M anti-vibration mounting kit for universal mounting
  Part. No.: 3124658

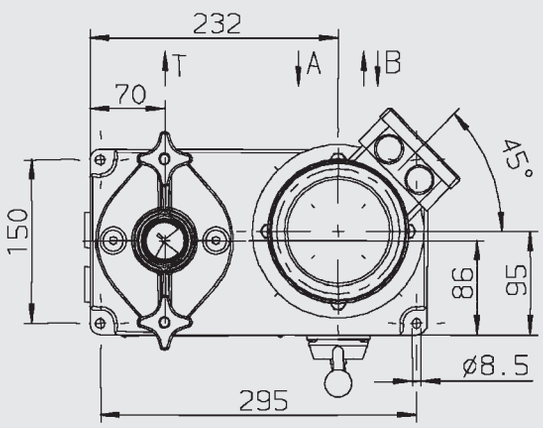
Replacement elements

Filtration rating	Element type	Part No
2 µm (Dimicron®)	N5DM002	349494
5 µm (Dimicron®)	N5DM005	3068101
10 µm (Dimicron®)	N5DM010	3102924
20 µm (Dimicron®)	N5DM020	3023508
1 µm (Aquamicron®)	N5AM001	3114428
2 µm (Aquamicron®)	N5AM002	349677
20 µm (Aquamicron®)	N5AM020	3040345

Dimensions



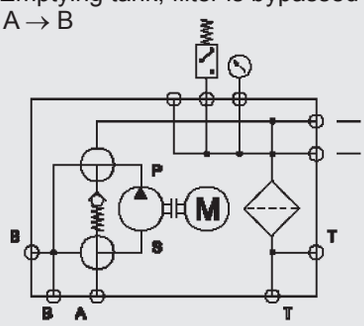




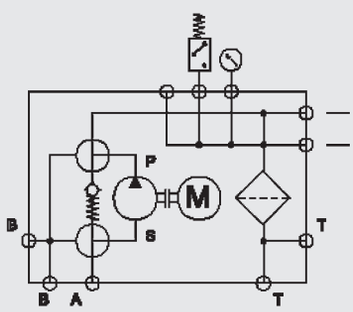
A	Suction port	G1
B	Transfer port	G3/4
T	Tank port	G3/4

Hydraulic circuit diagram

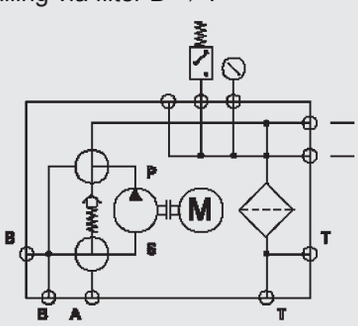
I Emptying tank, filter is bypassed
A → B



II Filtering offline A → T



III Filling via filter B → T



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MultiRheo Filter
MRF 1/2/3/4/5/6/7

Description

The MultiRheo filters of the MRF series are filter housings for use in open systems which are continually exposed to contamination.

The candle filter elements protect components such as nozzles, high pressure pumps or working filters, for example in function test rigs or industrial part washers.

There are seven sizes of filter available in single or change-over versions.

Depending on the model, between 1 and 52 elements of different lengths can be fitted.

Applications

- Function test rigs
- Industrial part washers
- Machining centres
- Filling stations
- Engine oils
- Lubrication systems

Advantages

- Economical operation ensured by high quality standards, specified filtration rates and high separation values
- Compact housing with high flow rates
- Easy element change
- Efficient protection of system and components
- Environmentally safe disposal (incinerable)

Model code

MRF – 4 – N / 17 – Q – 40 – 10 – N – E – 0 /-OC

Type
MRF = Multi Rheo Filter
MRFD = Change-Over Multi Rheo Filter

Size
1 = ≈ 76 mm Housing diameter
2 = ≈ 220 mm Housing diameter
3 = ≈ 274 mm Housing diameter
4 = ≈ 355 mm Housing diameter
5 = ≈ 406 mm Housing diameter
6 = ≈ 508 mm Housing diameter
7 = ≈ 610 mm Housing diameter

Housing material

		For size							
E	= Stainless steel #	1	2	3	4	5	6	7	1)
N	= Carbon steel uncoated	1	2	3	4	5	6	7	1)
K	= Aluminium	1							2)

For quality, see technical specifications

Number of elements

		For size						
1	= 1 filter element	1						
5	= 5 filter elements		2					
11	= 11 filter elements			3				
17	= 17 filter elements				4			
22	= 22 filter elements					5		
36	= 36 filter elements						6	
52	= 52 filter elements							7

Hydraulic connection

		For size						
D	= G 1"	1	2	3				
F	= G 1 ½"		2	3				
G	= G 2"		2	3				
L	= SAE DN50			3				
J	= DIN DN 50			3				
Q	= DIN DN 80				4			
R	= DIN DN 100					5		
V	= DIN DN 150						6	
W	= DIN DN 200							7

Element length

		For size							
10	= 10 "	1	2	3					
20	= 20 "	1	2	3					
30	= 30 "	1	2	3	4*	5*	6*	7*	* only for stainless steel
40	= 40 "	1	2	3	4	5	6	7	

Pressure range

		For size						
10	= 10 bar	1	2	3	4	5	6	7
16	= 16 bar		2	3	4	5	6	7
25	= 25 bar	1			4	5		7
40	= 40 bar	1						

Material of seal
N = NBR
F = FPM (Viton)
E = EPDM

Clogging indicator
E = Standard, pressure gauge
B = Differential pressure indicator - visual (VM 2 B.1)
C = Differential pressure indicator - electrical (VM 2 C.0)
D3 = Differential pressure indicator - visual/electrical (VM 2 D.0/-L220)
D4 = Differential pressure indicator - visual/electrical (VM 2 D.0/-L24)
D5 = Differential pressure indicator - visual/electrical (VD 2 LZ.1/-DB)
F = Pressure switch, electrical (VR 2 F.0)
O = Without clogging indicator
See Hydac brochure for Clogging Indicators (D 7.050...)

Modification number
0 = The latest version is always supplied

Supplementary details
OE = Without drain
L = Without stand / oil drip tray

[1] for FlexMicron S/E/P elements; [2] for FlexMicron K elements

Filter calculation

The total pressure drop of the filter at a certain flow rate is the sum of the housing Δp and the element Δp. The housing pressure drop can be determined using the following pressure drop curves. The filter element Δp is calculated using the R-factors (see below).

Housing Δp: Housing pressure drop graphs

The higher curve in each pair of housing curves applies to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. The lower curve applies to water at 20 °C. For turbulent flow, the differential pressure will change proportionally to the density; for laminar flow, it will change proportionally to the density and viscosity.
The flow velocity should not exceed 3 m/s at the filter inlet for oil and 4 m/s for water.

Element Δp: Pressure drop calculation for elements

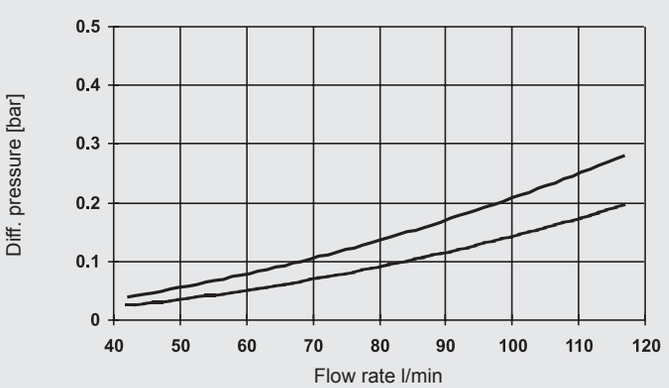
The following calculation is based on clean filter elements.

$$\Delta p\ [bar] = \frac{R \times V\ [mm^2/s] \times Q\ [l/min]}{n \times l\ [inch] \times 1000}$$

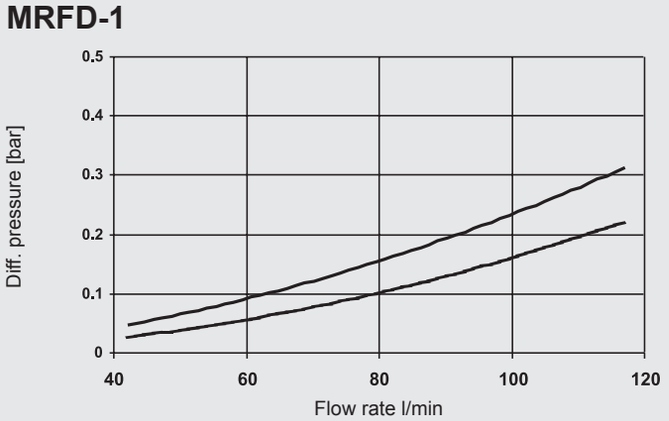
R = R factor
V = Viscosity [mm²/s]
Q = Flow rate [l/min]
n = No. of elements
L = Element length [inch]

Housing pressure drop graphs (Housing Δp)

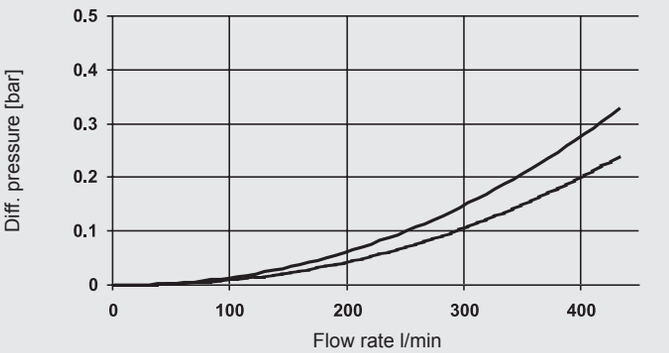
MRF-1



MRFD-1



MRF-2



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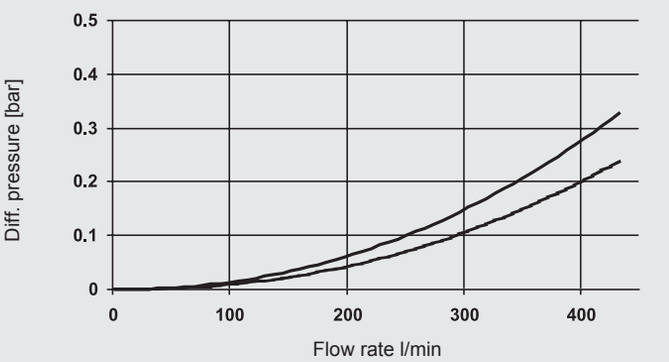
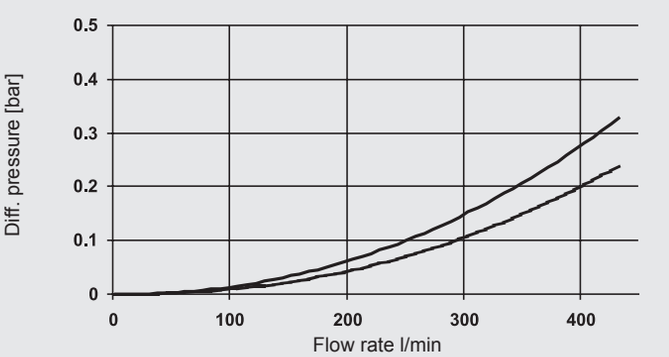
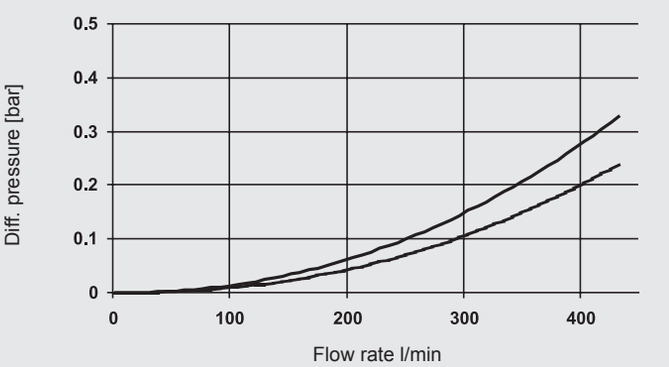


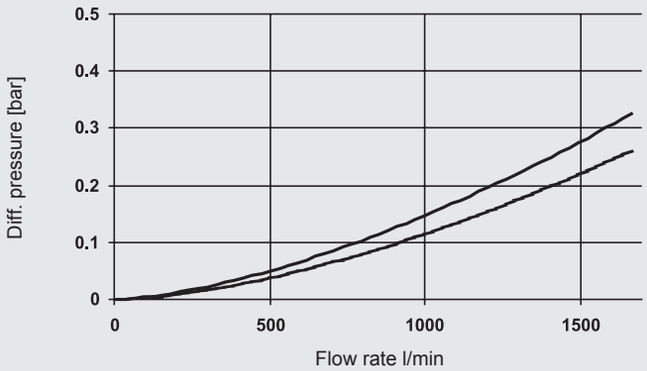
MRF-3



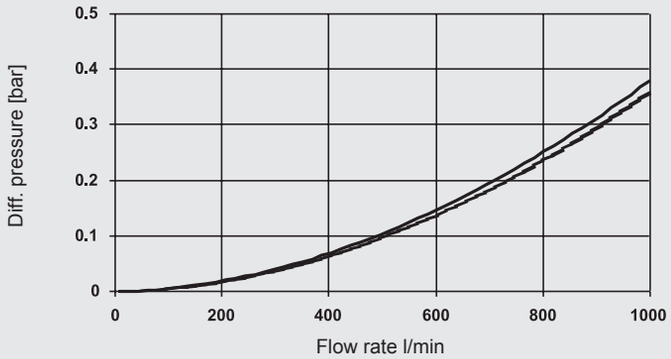
MRFD-3



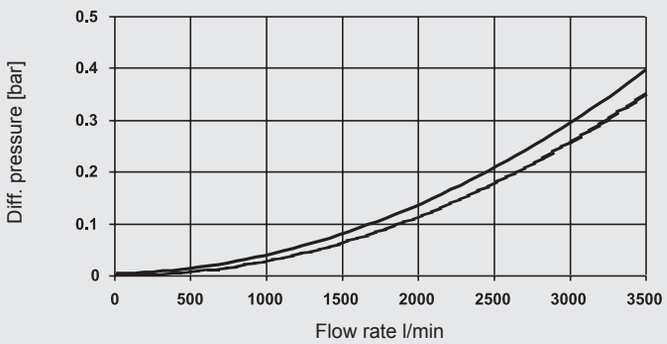
MRF-4



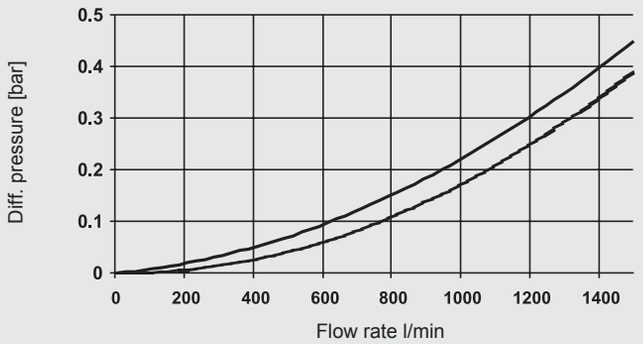
MRFD-4



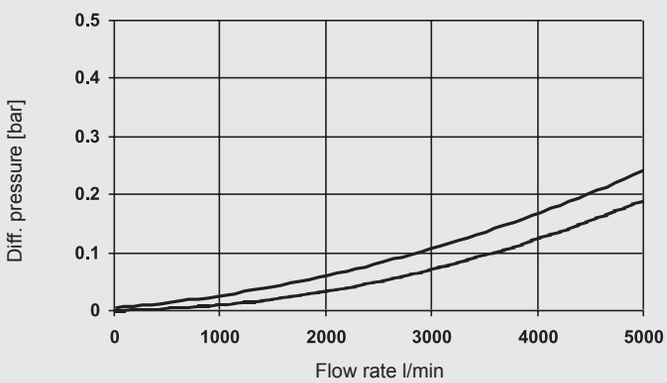
MRF-5



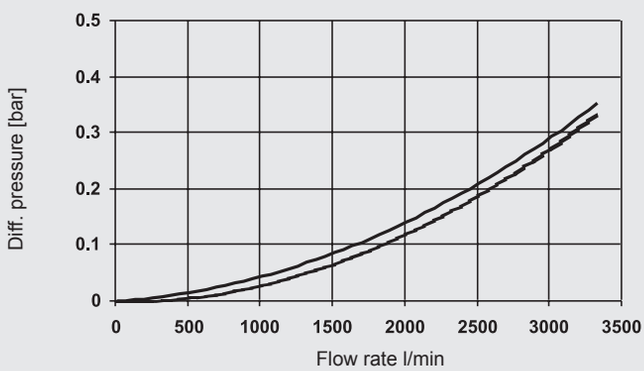
MRFD-5



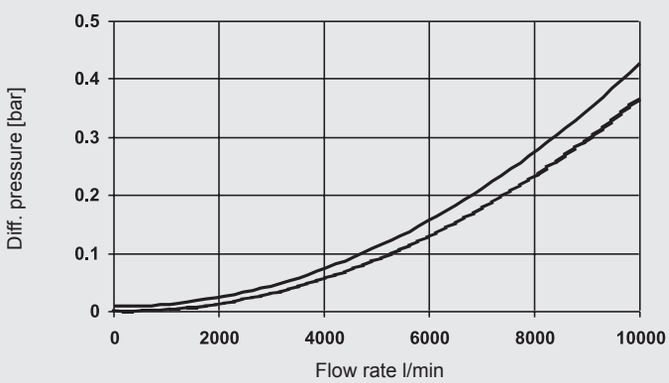
MRF-6



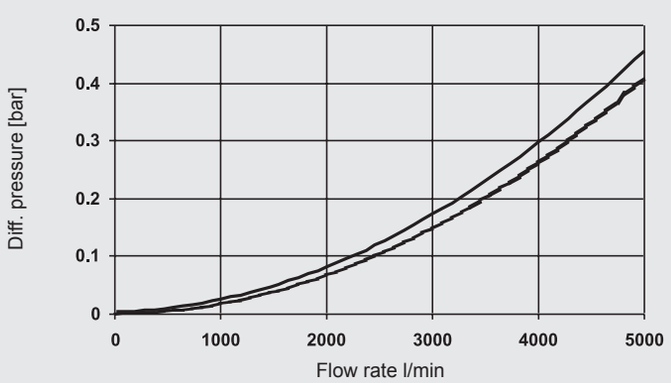
MRFD-6



MRFD-7

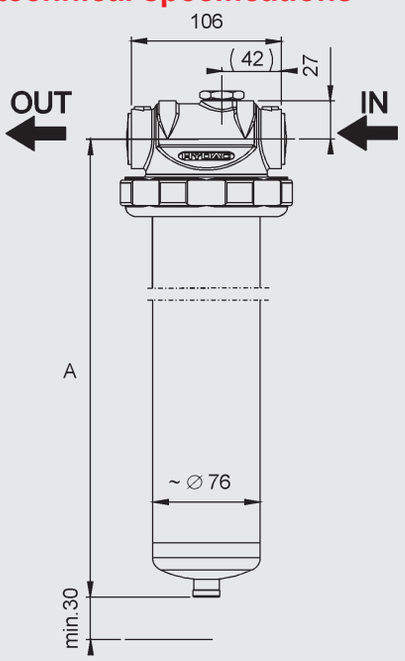


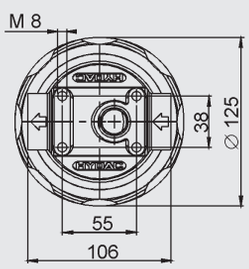
MRFD-7



Dimensions and technical specifications

MRF-1 E

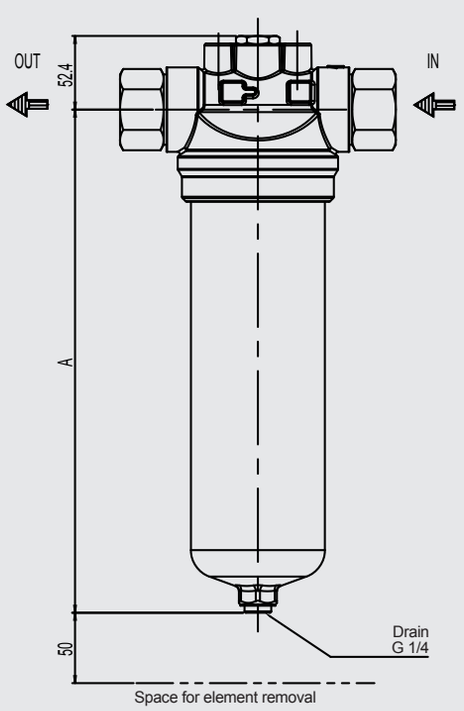


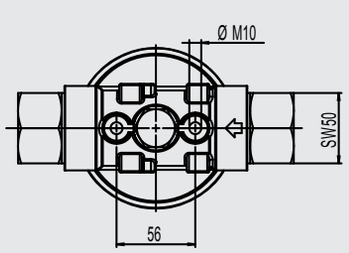


Element size	A
10 = 10"	332.5
20 = 20"	586.5
30 = 30"	816
40 = 40"	1094.5

Max. operating pressure	10 bar / 40 bar
Hydraulic connection (IN, OUT)	G 1"
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 4.5 kg 20": 5.9 kg 30": 7.4 kg 40": 8.8 kg
Volume of housing	10": 1.1 l 20": 2.2 l 30": 3.2 l 40": 7.4 l
Material of filter head	Stainless steel casting 1.4581
Material of filter bowl	Stainless steel 1.4571
Material of seals	NBR, FPM, EPDM

MRF-1 N

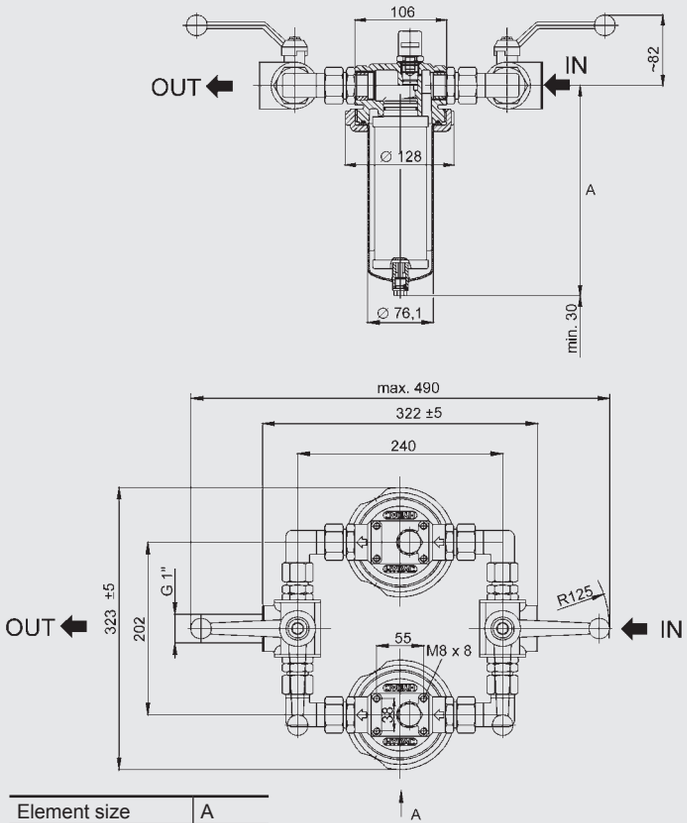




Element size	A
10 = 10"	357.5
20 = 20"	610.5
30 = 30"	864.5
40 = 40"	1118.5

Max. operating pressure	25 bar
Hydraulic connection (IN, OUT)	G 1"
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 2.3 kg 20": 3.2 kg 30": 4.2 kg 40": 5.2 kg
Volume of housing	10": 1.9 l 20": 3.2 l 30": 4.6 l 40": 5.9 l
Material of filter head	Aluminium AC-44100
Material of filter bowl	Aluminium
Material of seals	NBR, FPM, EPDM

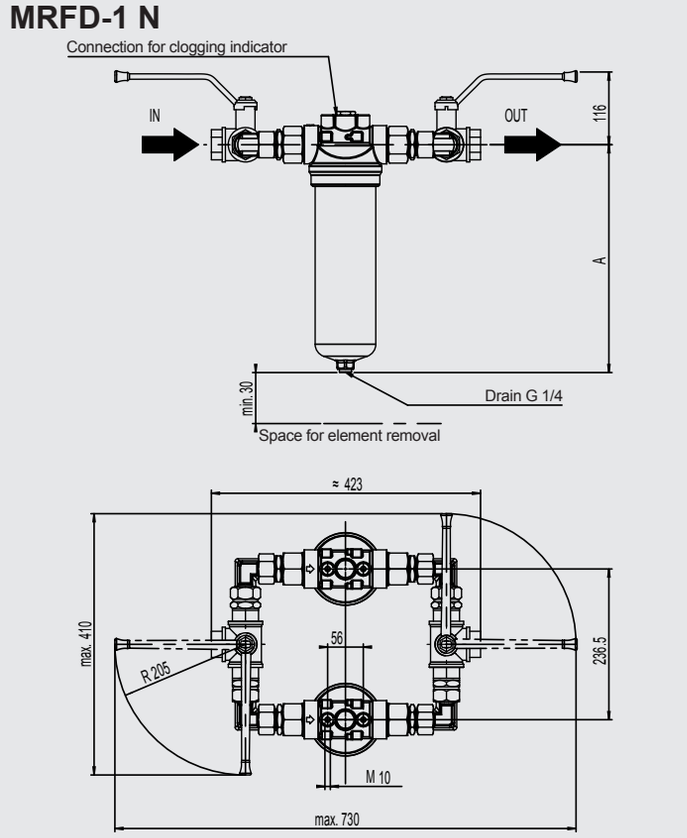
MRFD-1 E



Element size	A
10 = 10"	332.5
20 = 20"	586.5
30 = 30"	816
40 = 40"	1094.5

Max. operating pressure	10 bar / 40 bar
Hydraulic connection (IN, OUT)	G 1"
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 14 kg 20": 17 kg 30": 20 kg 40": 23 kg
Volume of housing	10": 2 x 1.1 l 20": 2 x 2.2 l 30": 2 x 3.2 l 40": 2 x 7.4 l
Material of filter head	Stainless steel casting 1.4581
Material of filter bowl	Stainless steel 1.4571
Material of seals	NBR, FPM, EPDM

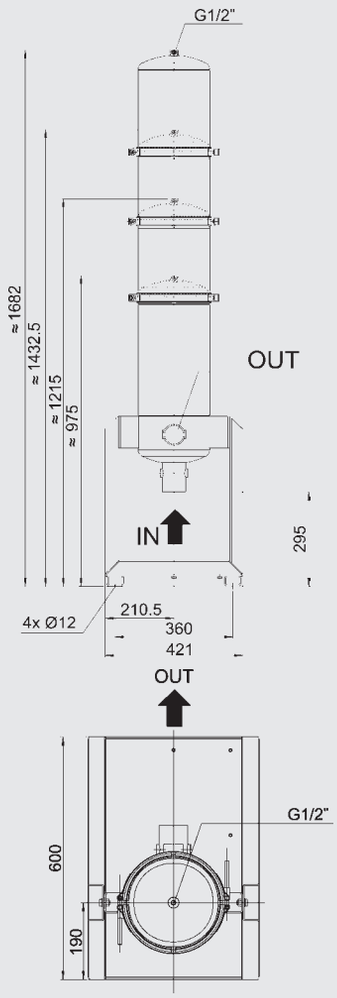
MRFD-1 N



Element size	A
10 = 10"	357.5
20 = 20"	610.5
30 = 30"	864.5
40 = 40"	1118.5

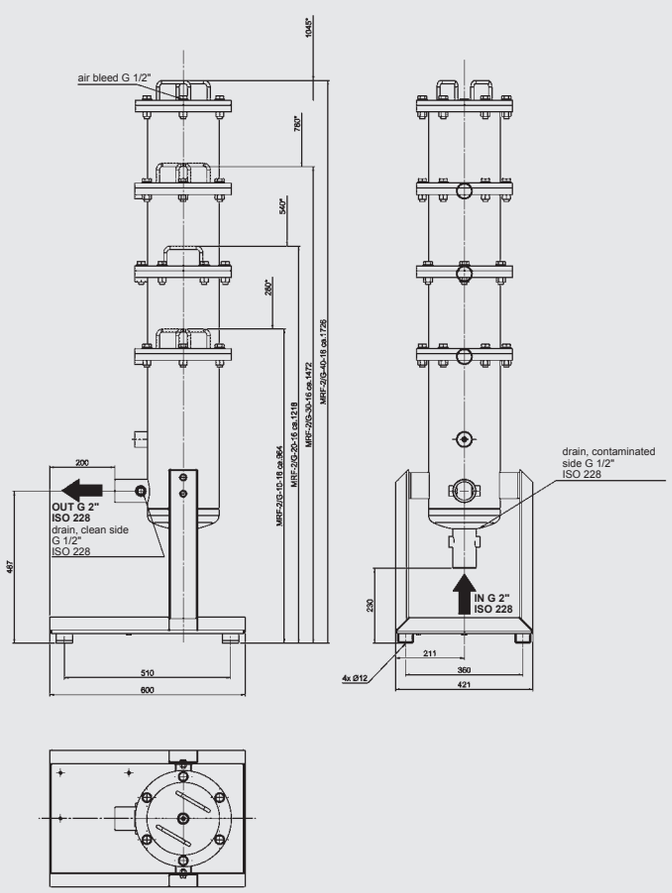
Max. operating pressure	25 bar
Hydraulic connection (IN, OUT)	G 1"
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 12.2 kg 20": 14.0 kg 30": 16.0 kg 40": 20.6 kg
Volume of housing	10": 2x1.9 l 20": 2x3.2 l 30": 2x4.6 l 40": 2x5.9 l
Material of filter head	Aluminium AC-44100
Material of filter bowl	Aluminium
Material of seals	NBR, FPM, EPDM

MRF-2



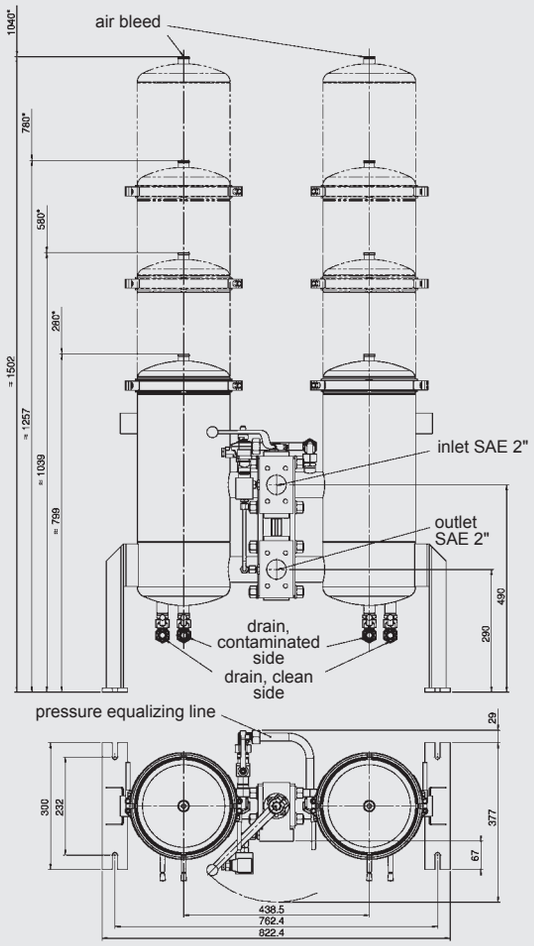
Max. operating pressure	10 bar
Hydraulic connection (IN, OUT)	G 1", G1 1/2", G2"
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 30 kg 20": 35 kg 30": 36 kg 40": 38 kg
Volume of housing	10": 16 l 20": 24 l 30": 32 l 40": 40 l
Material of filter head	Stainless steel casting 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	NBR, FPM, EPDM

MRF-2 16bar



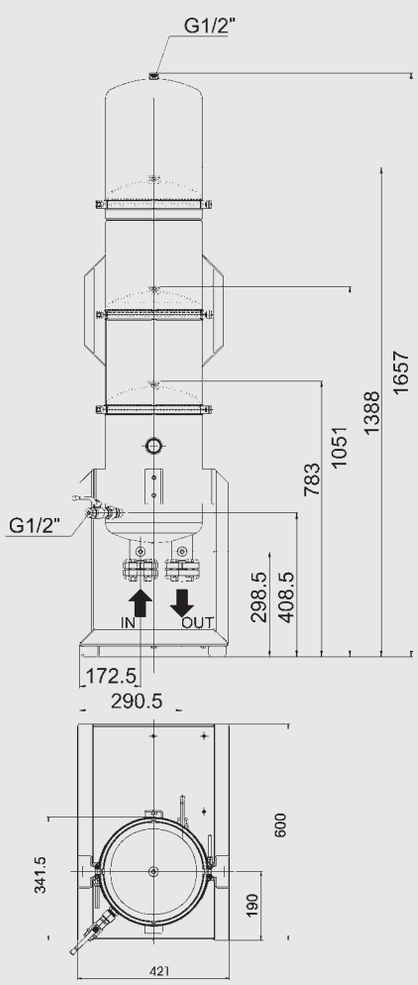
Max. operating pressure	16 bar
Hydraulic connection (IN, OUT)	G 1", G1 1/2", G2"
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 66 kg 20": 70 kg 30": 75 kg 40": 78 kg
Volume of housing	10": 21 l 20": 31 l 30": 40 l 40": 50 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	FPM, NBR, EPDM

MRFD-2 10bar



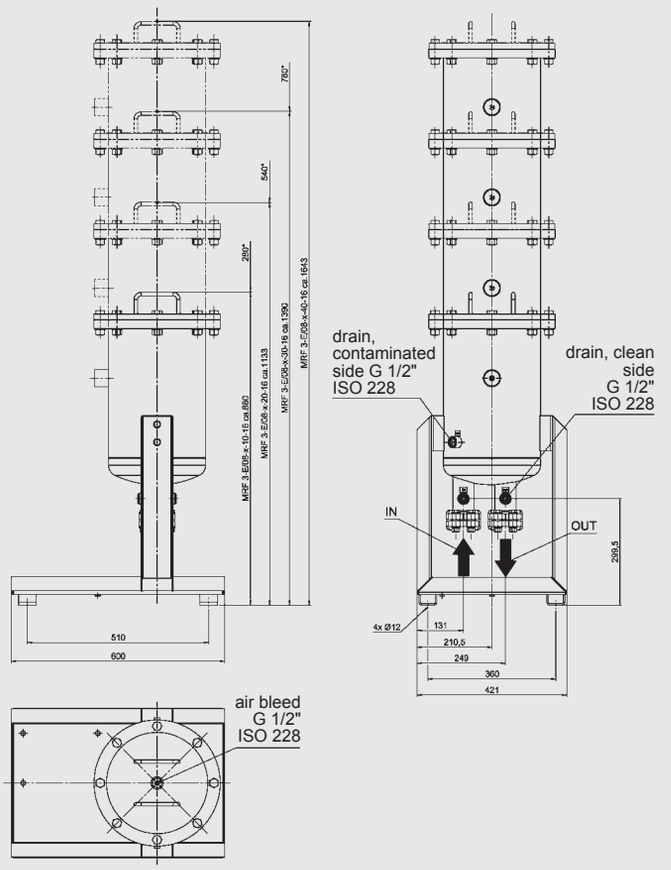
Max. operating pressure	10 bar
Hydraulic connection (IN, OUT)	SAE DN 50
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 120 kg 20": 130 kg 30": 135 kg 40": 144 kg
Volume of housing	10": 2 x 17 l 20": 2 x 26 l 30": 2 x 35 l 40": 2 x 45 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	FPM, NBR, EPDM

MRF-3



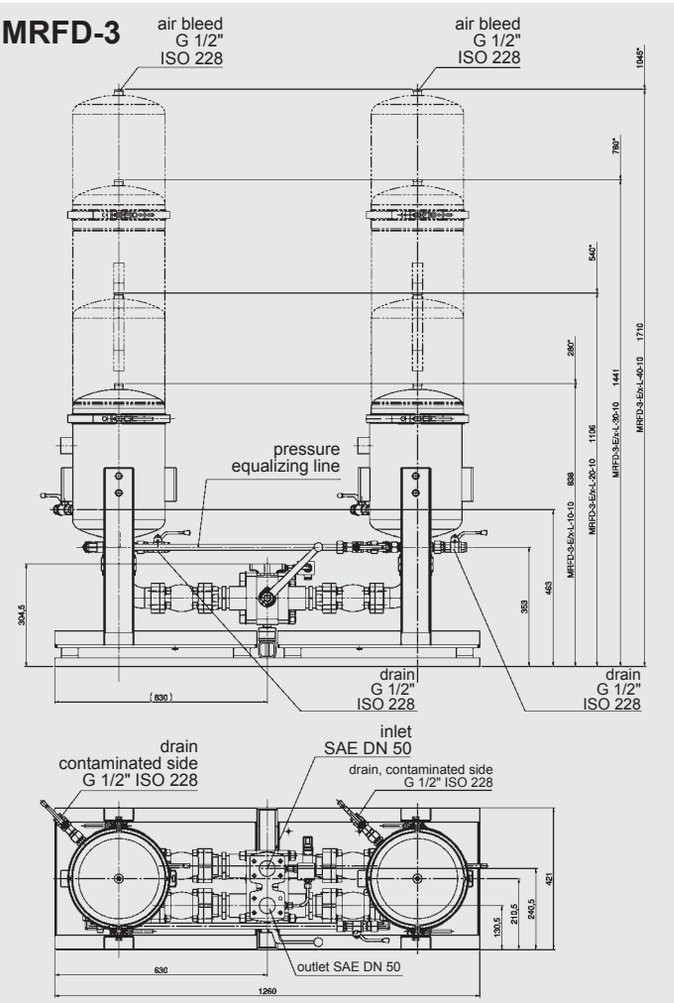
Max. operating pressure	10 bar
Hydraulic connection (IN, OUT)	G1", G1 1/2", G2", SAE DN50, DIN DN50
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 35 kg 20": 40 kg 30": 45 kg 40": 49 kg
Volume of housing	10": 21 l 20": 42 l 30": 56 l 40": 70 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	NBR, FPM, EPDM

MRF-3 16bar



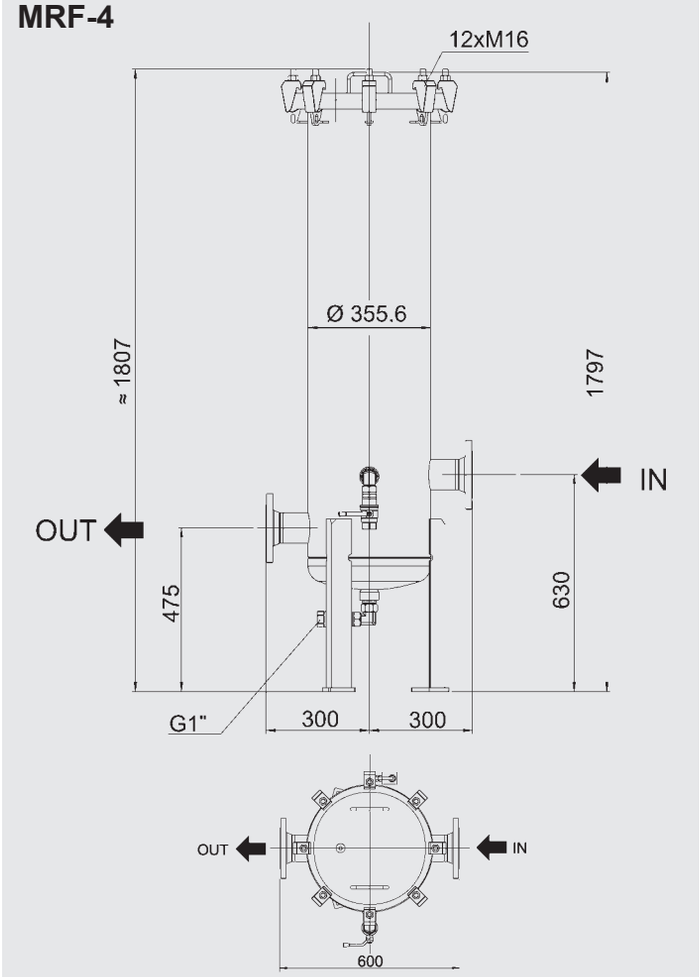
Max. operating pressure	16 bar
Hydraulic connection (IN, OUT)	G 1", G1 1/2", G2" SAE DN 50, DIN DN 50
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 105 kg 20": 110 kg 30": 120 kg 40": 125 kg
Volume of housing	10": 33 l 20": 47 l 30": 60 l 40": 71 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	FPM, NBR, EPDM

MRFD-3



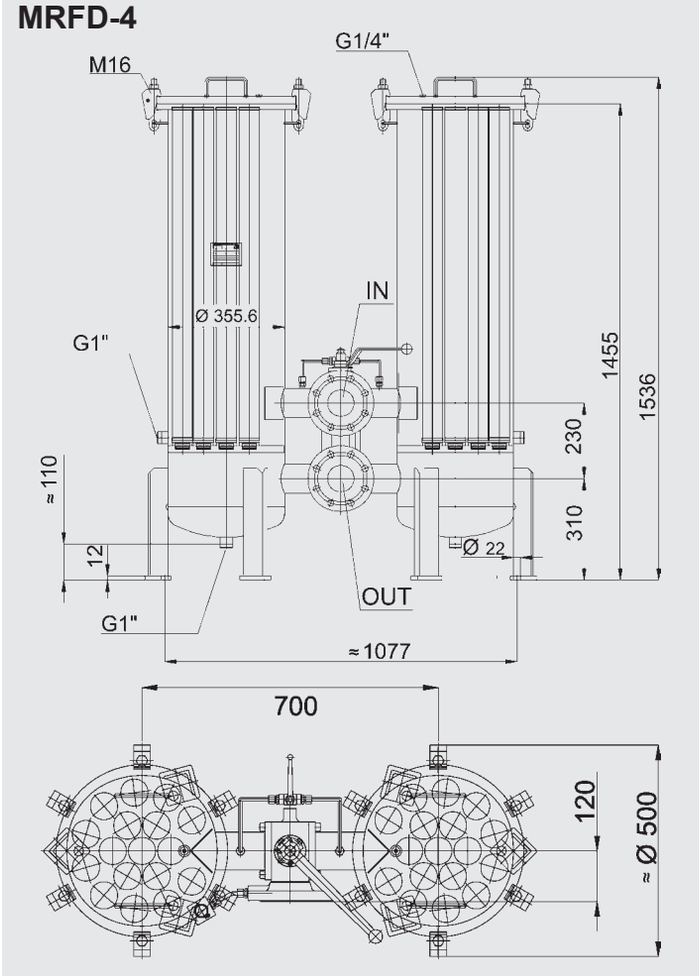
Max. operating pressure	10 bar
Hydraulic connection (IN, OUT)	SAE DN 50
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 140 kg 20": 150 kg 30": 170 kg 40": 180 kg
Volume of housing	10": 2 x 33 l 20": 2 x 47 l 30": 2 x 60 l 40": 2 x 71 l
Material of housing	Stainless steel 1.4301
Material of drip tray	S235JR powder-coated
Material of change-over valve	EN-G35-400-15
Material of seals	FPM, NBR, EPDM

MRF-4



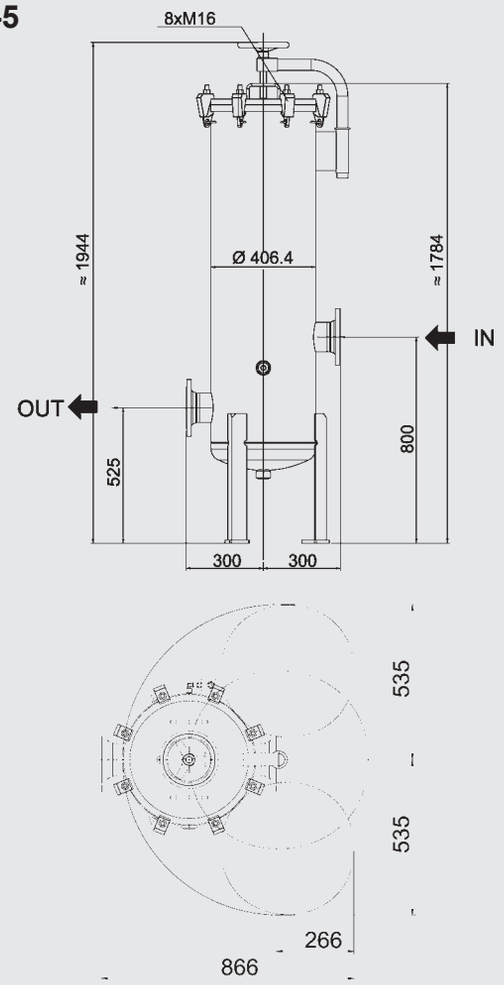
Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 80 / EN 1092
Permitted temperature range of fluid	-10 .. 90 °C
Weight	165 kg (10 bar)
Volume of housing	130 l
Material of filter head	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of filter bowl	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of seals	NBR, FPM, EPDM

MRFD-4



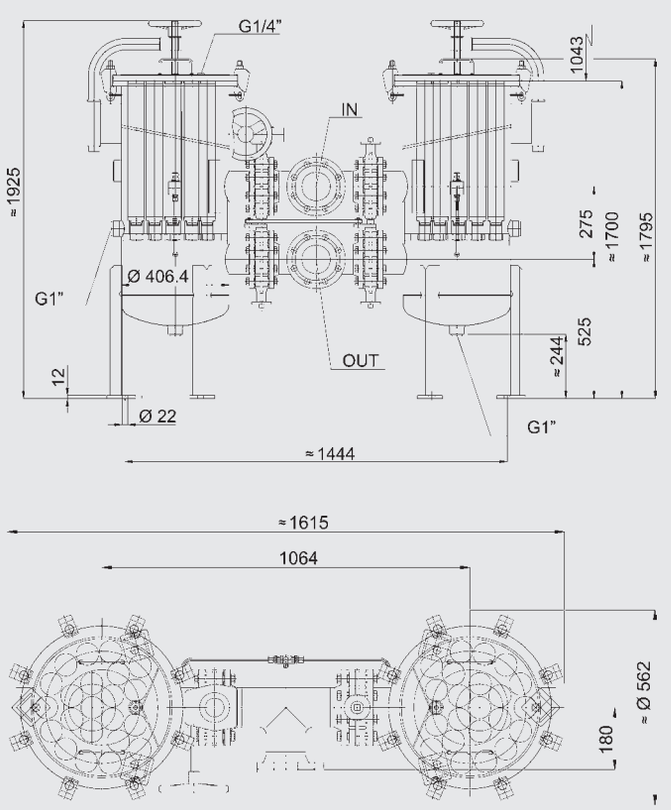
Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 80 / EN 1092
Permitted temperature range of fluid	-10 .. 90 °C
Weight	380 kg (10 bar)
Volume of housing	2 x 130 l
Material of filter head	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of filter bowl	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of seals	NBR, FPM, EPDM

MRF-5



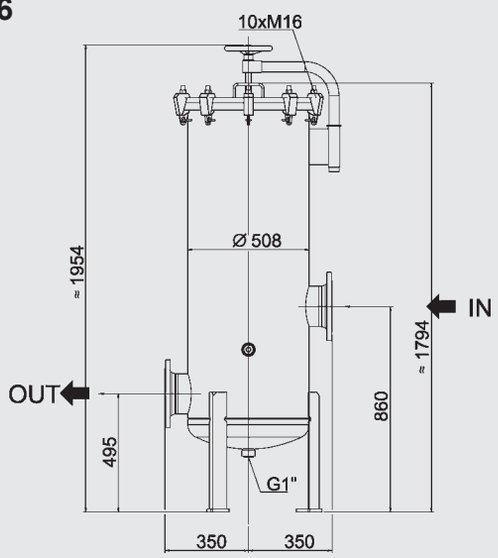
Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 100/ EN 1092
Permitted temperature range of fluid	-10 .. 90 °C
Weight	230 kg (10 bar)
Volume of housing	180 l
Material of filter head	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of filter bowl	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of seals	NBR, FPM, EPDM

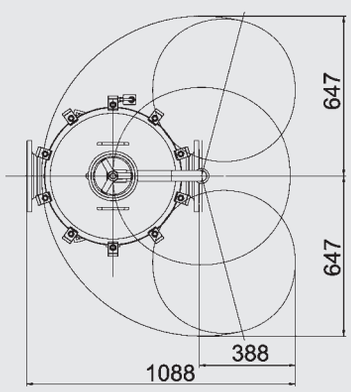
MRFD-5



Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 100/ EN 1092
Permitted temperature range of fluid	-10 .. 90 °C
Weight	530 kg (10 bar)
Volume of housing	2 x 180 l
Material of filter head	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of filter bowl	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of seals	NBR, FPM, EPDM

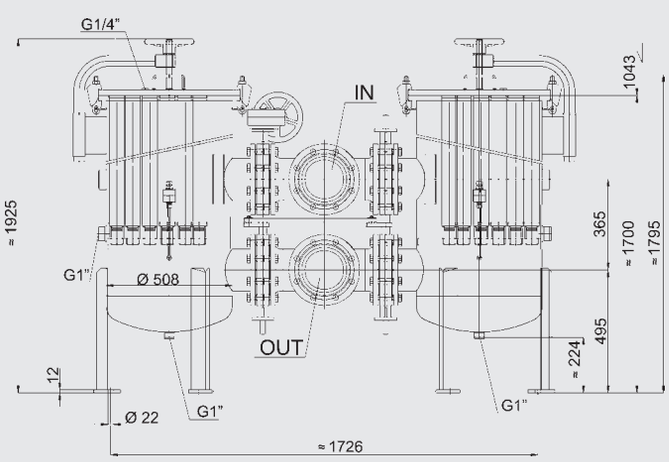
MRF-6

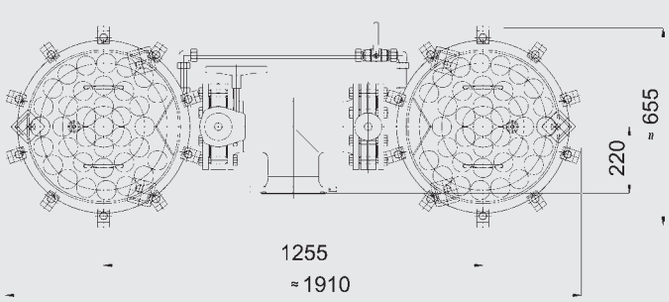




Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 150/ EN 1092
Permitted temperature range of fluid	-10 .. 90 °C
Weight	305 kg (10 bar)
Volume of housing	290 l
Material of filter head	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of filter bowl	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of seals	NBR, FPM, EPDM

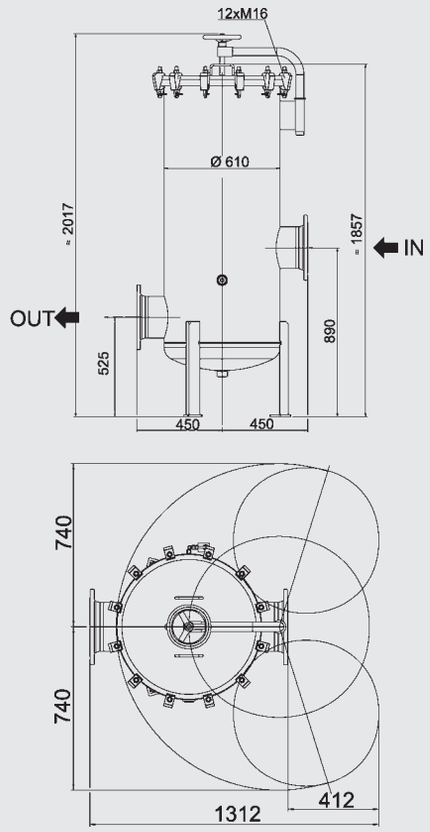
MRFD-6





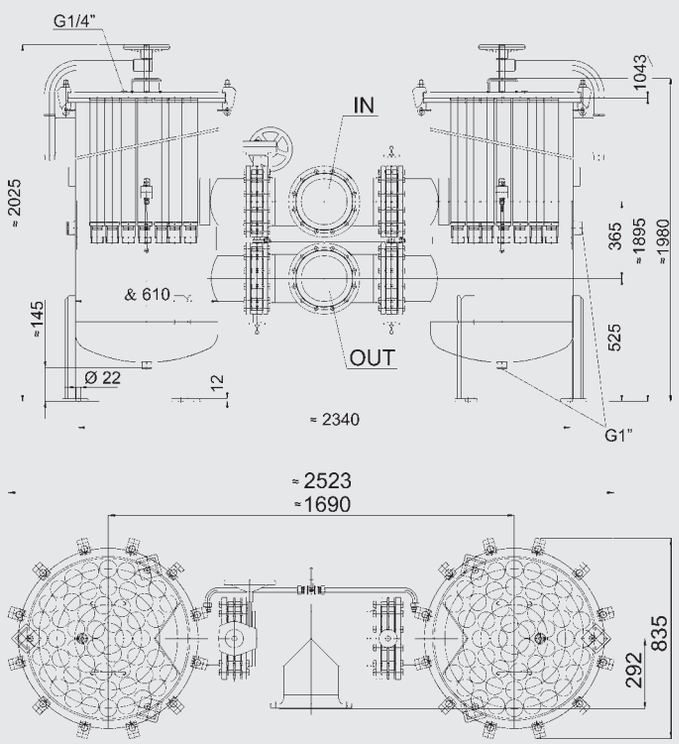
Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 150/ EN 1092
Permitted temperature range of fluid	-10 .. 90 °C
Weight	730 kg (10 bar)
Volume of housing	2 x 290 l
Material of filter head	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of filter bowl	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of seals	NBR, FPM, EPDM

MRF-7



Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 200/ EN 1092
Permitted temperature range of fluid	-10 .. 90 °C
Weight	400 kg (10 bar)
Volume of housing	465 l
Material of filter head	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of filter bowl	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of seals	NBR, FPM, EPDM

MRFD-7



Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 200/ EN 1092
Permitted temperature range of fluid	-10 .. 90 °C
Weight	920 kg (10 bar)
Volume of housing	2 x 465 l
Material of filter head	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of filter bowl	Carbon steel 1.0305, 1.0038 / Stainless steel 1.4301 or higher
Material of seals	NBR, FPM, EPDM

Note

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

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

Subject to technical modifications.

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Automotive MultiRheo Filter
AMRF 2/3/4/5/6/7

Description

The Automotive MultiRheo Filters AMRF are offline filtration units for open systems which are continually exposed to contamination.

The filter elements protect components such as nozzles, high pressure pumps or working filters, for example in function test rigs or industrial part washers.

There are various sizes with a variety of connection options available.

Applications

- Function test rigs
- Industrial part washers
- Machining centres
- Filling stations
- Engine oils
- Lubrication systems

Advantages

- Economical operation as a result of high quality standards, defined filtration rates and high separation values
- Compact housing with high flow rates
- Easy element change
- Efficient protection of system and components
- Environmentally friendly since filter elements are incinerable

Model code

AMRF – 4 – E / 15 – Q – 40 – 10 – F – D32 – 0 / – OE

Type
AMRF = Automotive MultiRheo Filter
AMRFD = Changeover Automotive MultiRheo Filter

Size
2 = ≈ 220 mm housing diameter
3 = ≈ 274 mm housing diameter
4 = ≈ 355 mm housing diameter
5 = ≈ 406 mm housing diameter
6 = ≈ 508 mm housing diameter
7 = ≈ 610 mm housing diameter

Housing material
E = Stainless steel*
* For quality, see technical specifications

Number of elements

	=		For size					
5	=	5 filter elements	2					
8	=	8 filter elements		3				
15	=	15 filter elements			4			
18	=	18 filter elements				5		
26	=	26 filter elements					6	
38	=	38 filter elements						7

Hydraulic connection

		For size					
D	= G 1"	2	3				
F	= G 1 ½"	2	3				
G	= G 2"	2	3				
L	= SAE DN50	2	3				
J	= DIN DN 50	2	3				
Q	= DIN DN 80			4			
R	= DIN DN 100				5		
V	= DIN DN 150					6	
W	= DIN DN 200						7

Element length

		For size					
10	= 10 "	2	3				
20	= 20 "	2	3				
30	= 30 "	2	3	4	5	6	7
40	= 40 "	2	3	4	5	6	7

Pressure range

		For size					
10	= 10 bar	2	3	4	5	6	7
16	= 16 bar	2	3	4	5	6	7

Material of seal
F = FPM (Viton)

Clogging indicator
D32 = differential pressure indicator (Gw.0/-V-113)
Dz = pipework for retrofitting a differential pressure gauge
Z = without clogging indicator
See HYDAC brochure for Filter Clogging Indicators (E 7.050...)

Modification number
0 = The latest version is always supplied

Supplementary details
OE = No drain
L = No stand / oil drip tray
E = Air bleed port
KL = Swing bolt
KLM = Toggle clamp

Filter calculation

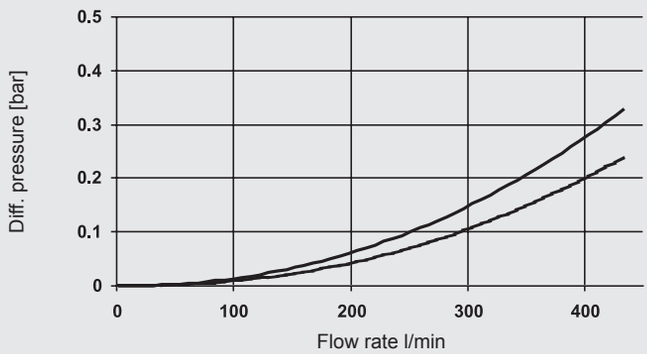
The total pressure drop of the filter at a certain flow rate is the sum of the housing Δp and the element Δp. The housing pressure drop can be determined using the following pressure drop curves. The element pressure drop is calculated using the R-factors (see Filter Element datasheet).

Housing ∆p: Housing pressure drop graphs

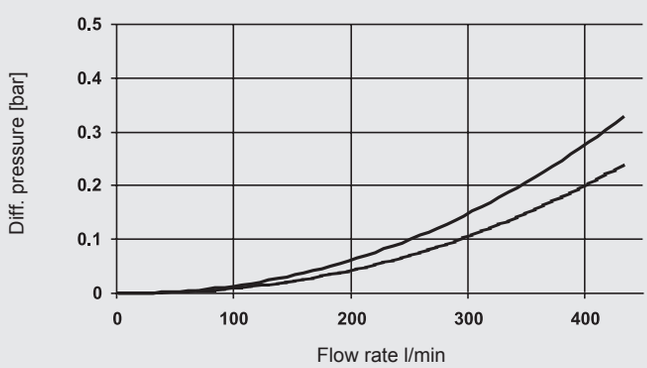
The higher of each pair of housing curves applies to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. The lower of the housing curves applies to water at 20 °C. For turbulent flow, the differential pressure will change proportionally to the density; for laminar flow, it will change proportionally to the density and viscosity. The flow velocity should not exceed 3 m/s at the filter inlet for oil and 4 m/s for water.

Housing pressure drop curves (Housing ∆p)

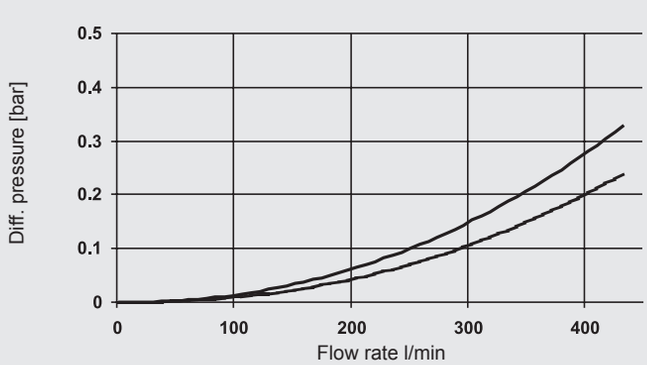
AMRF-2



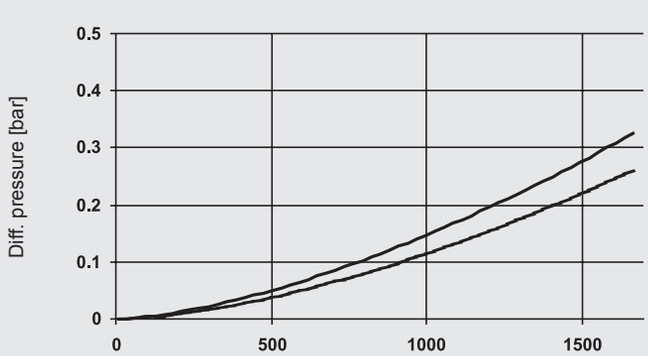
AMRFD-2



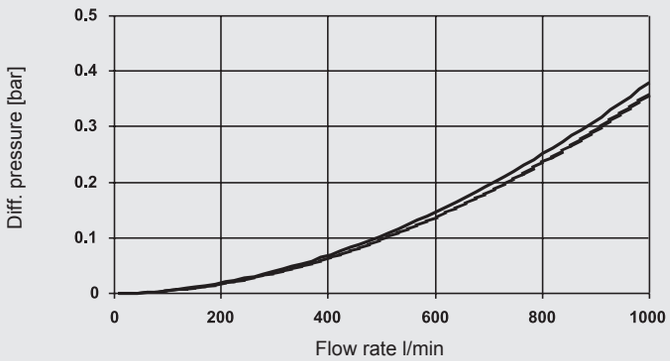
AMRF-3



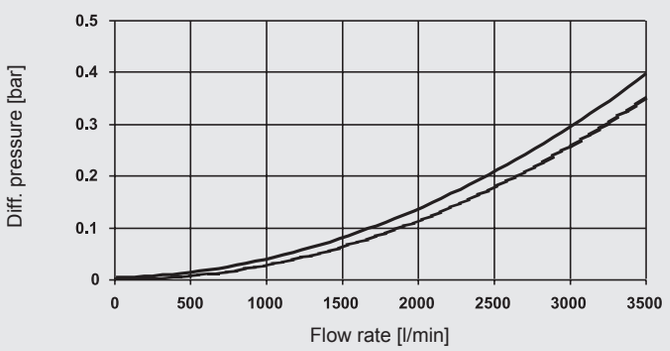
AMRF-4



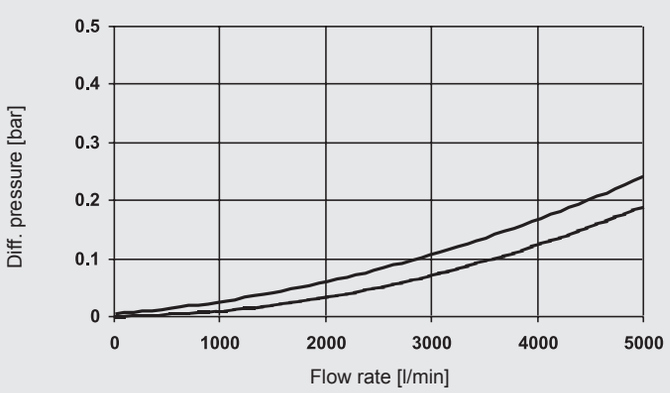
AMRFD-4



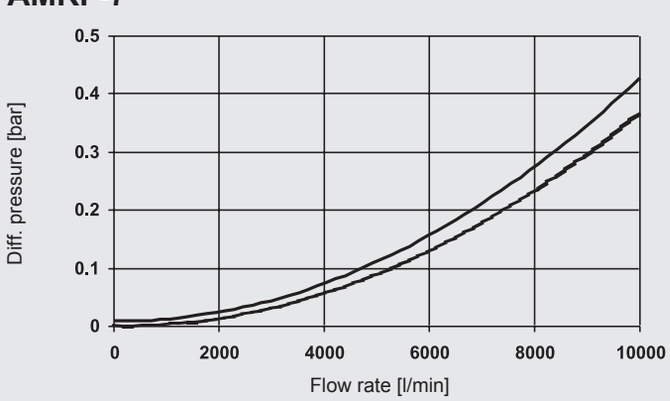
AMRF-5



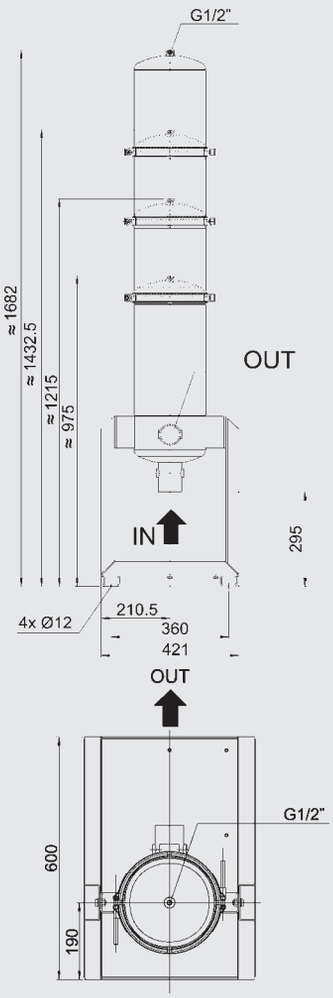
AMRF-6



AMRF-7

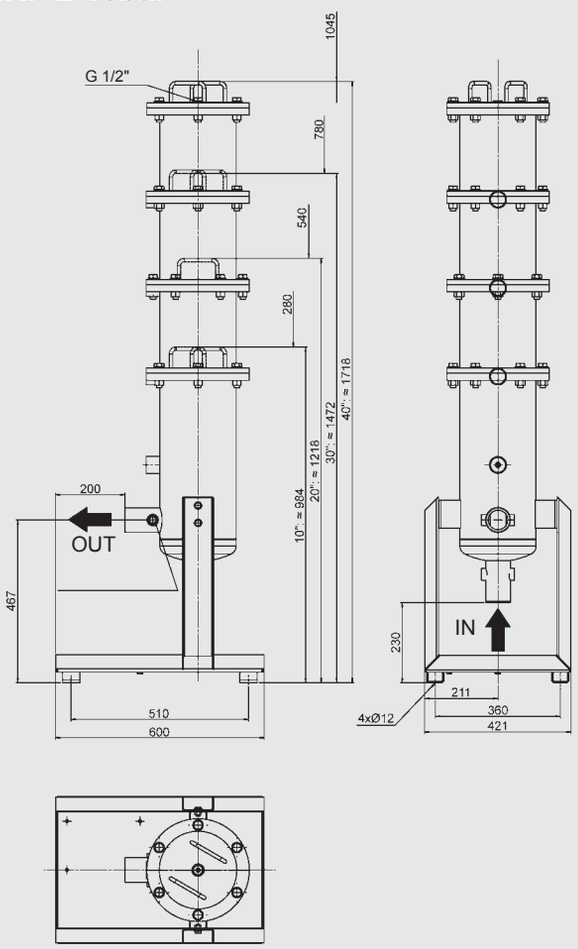


AMRF-2



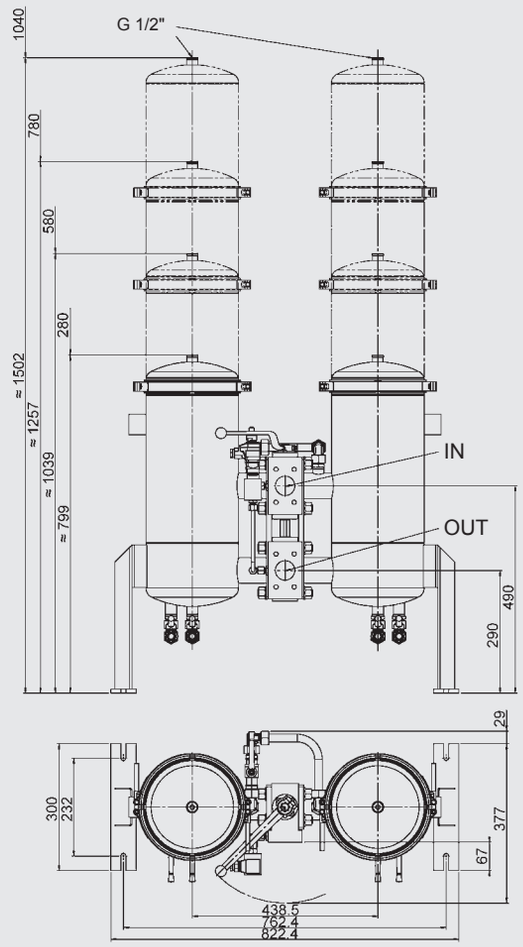
Max. operating pressure	10 bar
Hydraulic connection (IN, OUT)	G 1", G1 1/2", G2" DIN DN 50
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 30 kg 20": 35 kg 30": 36 kg 40": 38 kg
Volume of housing	10": 16 l 20": 24 l 30": 32 l 40": 40 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	FPM

AMRF-2 16bar



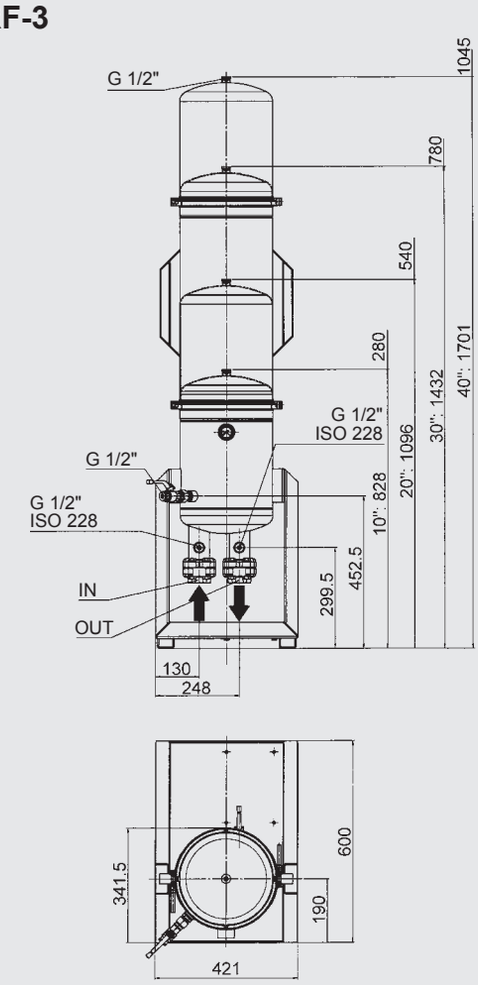
Max. operating pressure	16 bar
Hydraulic connection (IN, OUT)	G 1", G1 1/2", G2"
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 66 kg 20": 70 kg 30": 75 kg 40": 78 kg
Volume of housing	10": 21 l 20": 31 l 30": 40 l 40": 50 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	FPM

AMRFD-2 10bar



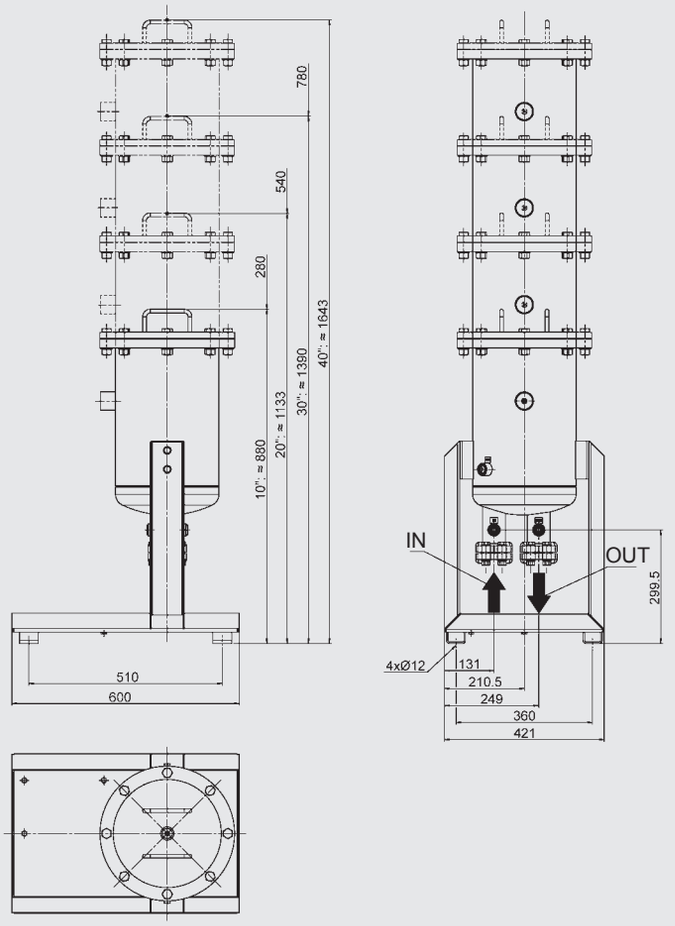
Max. operating pressure	10 bar
Hydraulic connection (IN, OUT)	SAE DN 50
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 120 kg 20": 130 kg 30": 135 kg 40": 144 kg
Volume of housing	10": 2 x 17 l 20": 2 x 26 l 30": 2 x 35 l 40": 2 x 45 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	FPM

AMRF-3



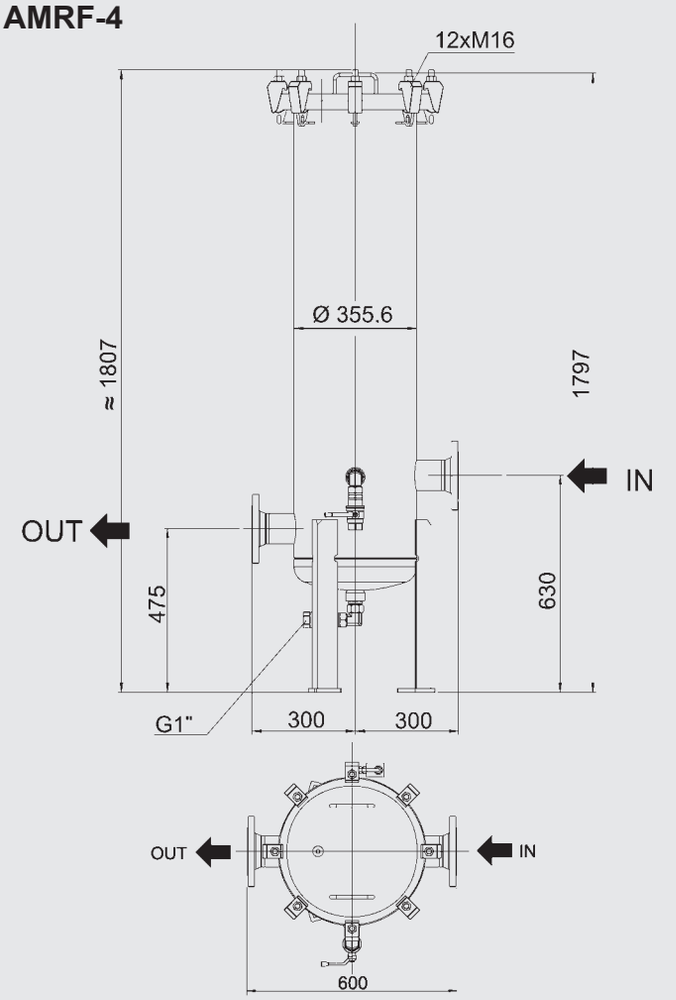
Max. operating pressure	10 bar
Hydraulic connection (IN, OUT)	G1", G1 1/2", G2", SAE DN50, DIN DN50
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 35 kg 20": 40 kg 30": 45 kg 40": 49 kg
Volume of housing	10": 21 l 20": 42 l 30": 56 l 40": 70 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	FPM

AMRF-3 16bar



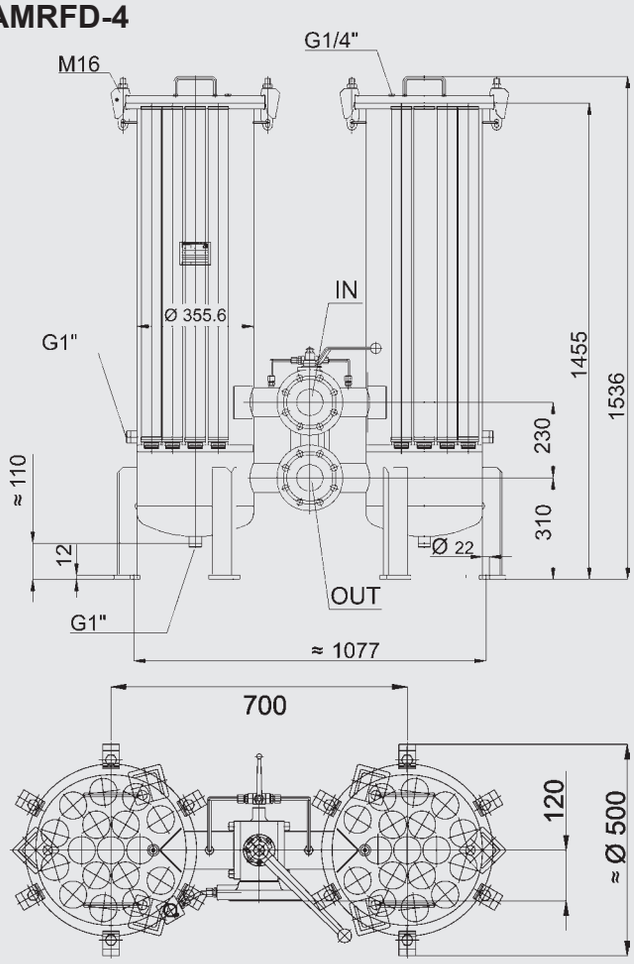
Max. operating pressure	16 bar
Hydraulic connection (IN, OUT)	G 1", G1 1/2", G2" SAE DN 50, DIN DN 50
Permitted temp. range of fluid	-10 .. 90 °C
Weight	10": 105 kg 20": 110 kg 30": 120 kg 40": 125 kg
Volume of housing	10": 33 l 20": 47 l 30": 60 l 40": 71 l
Material of filter head	Stainless steel 1.4301
Material of filter bowl	Stainless steel 1.4301
Material of seals	FPM

AMRF-4



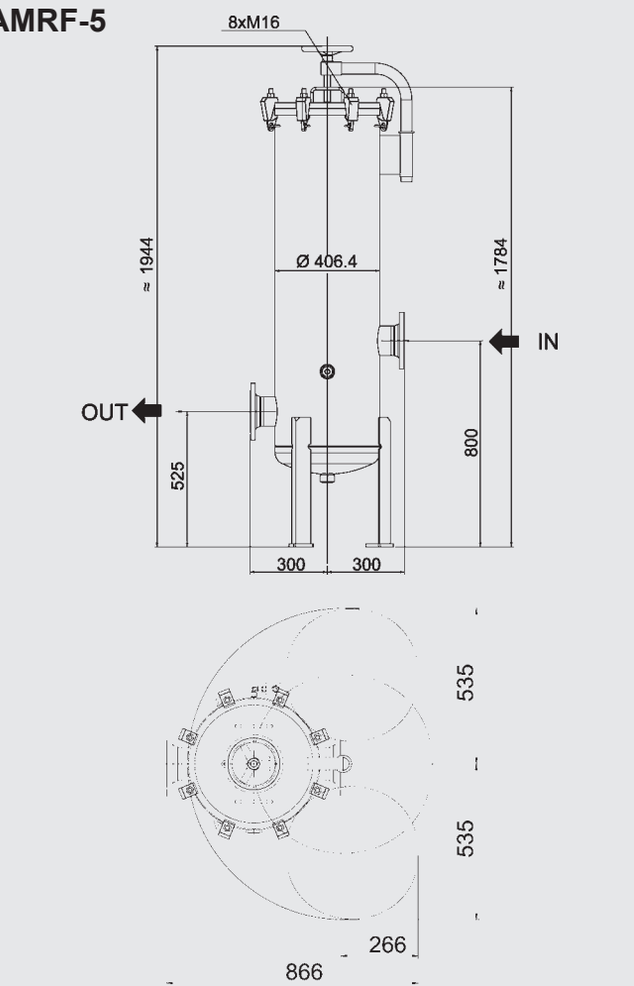
Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 80
Permitted temp. range of fluid	-10 .. 90 °C
Weight	165 kg (10 bar)
Volume of housing	130 l
Material of filter head	Stainless steel 1.4301 or higher
Material of filter bowl	Stainless steel 1.4301 or higher
Material of seals	FPM

AMRFD-4



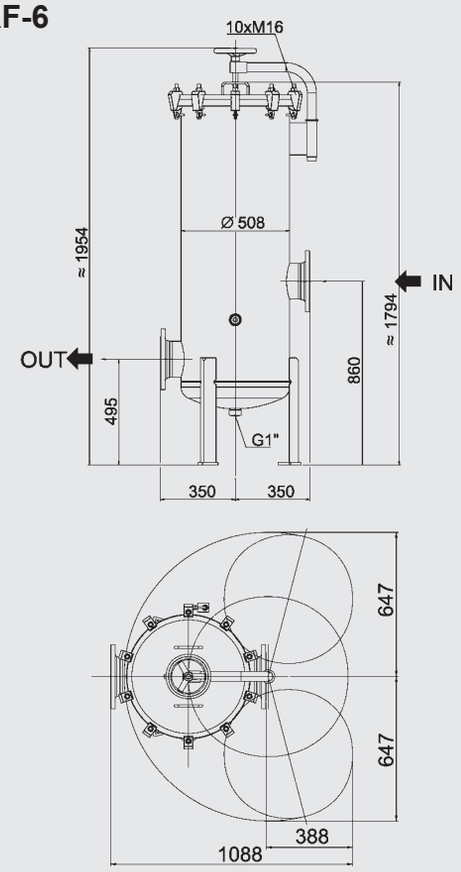
Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 80
Permitted temp. range of fluid	-10 .. 90 °C.
Weight	380 kg (10 bar)
Volume of housing	2 x 130 l
Material of filter head	Stainless steel 1.4301 or higher
Material of filter bowl	Stainless steel 1.4301 or higher
Material of seals	FPM

AMRF-5



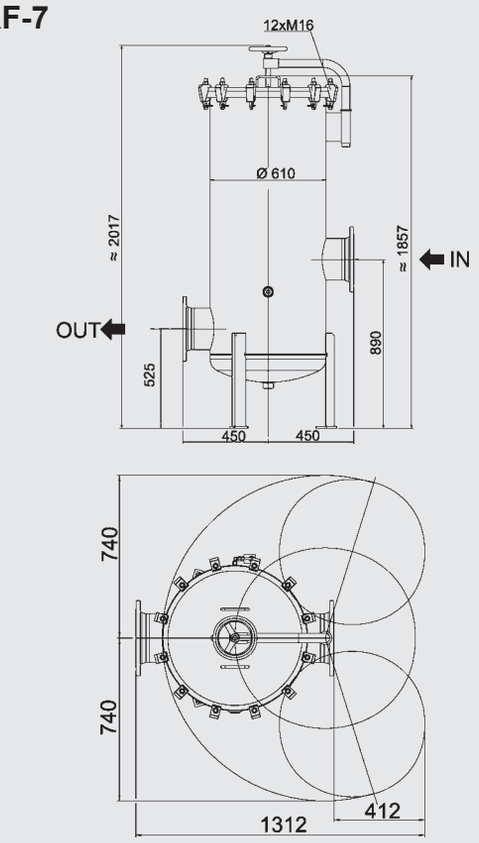
Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 100
Permitted temp. range of fluid	-10 .. 90 °C
Weight	230 kg (10 bar)
Volume of housing	180 l
Material of filter head	Stainless steel 1.4301 or higher
Material of filter bowl	Stainless steel 1.4301 or higher
Material of seals	FPM

AMRF-6



Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 150
Permitted temp. range of fluid	-10 .. 90 °C
Weight	305 kg (10 bar)
Volume of housing	290 l
Material of filter head	Stainless steel 1.4301 or higher
Material of filter bowl	Stainless steel 1.4301 or higher
Material of seals	FPM

AMRF-7



Max. operating pressure	10 bar / 16 bar
Hydraulic connection (IN, OUT)	DN 200
Permitted temp. range of fluid	-10 .. 90 °C
Weight	400 kg (10 bar)
Volume of housing	465 l
Material of filter head	Stainless steel 1.4301 or higher
Material of filter bowl	Stainless steel 1.4301 or higher
Material of seals	FPM

Note

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OffLine Filter
OLF 5 Hydraulic Line

Description
The OffLine Filter OLF 5 Hydraulic Line is designed for fine, offline filtration of hydraulic oils.

As an option the OLF5/15TV can be fitted with the ContaminationSensor CS 1000 and the AquaSensor AS 1000. This makes it possible to monitor the particle contamination and the water saturation level in the oil. The cleanliness classes are given according to ISO, SAE and NAS classifications. The water saturation is measured in volume %.

The DiMicron elements used in these filters have a particularly high contamination retention capacity.

Applications
- Machine tools
- Plastic injection moulding machines
- Mobile hydraulics
- Stationary hydraulics
- Wind power

Advantages
- Improvement of component and system filter lifetime
- Greater machine availability
- Longer intervals between oil changes
- Minimum space requirement due to compact design
- Very easy maintenance
- Elements have high contamination retention capacity
- Option: Continuous monitoring of the particle contamination and water saturation in the oil during cleaning

Technical specifications

	OLF-5...	OLF-5/15...
Filter element	DIMICRON (2 µm) DIMICRON (5 µm) DIMICRON (10 µm) DIMICRON (20 µm) AQUAMICRON (2 µm) AQUAMICRON (20 µm)	
Max. flow rate	5 l/min	15 l/min
Contamination retention capacity	DIMICRON 200g ISOMTD ® Δp=2.5 bar AQUAMICRON 185 g ISOMTD ® Δp=2.5 bar (Water absorption approx. 0.5 l at Δp=2.5 bar)	
Pump type	Vane pump	
Operating pressure	3.5 bar max.	4.5 bar max.
Viscosity range	15 ... 150 mm²/s	15 ... 1000 mm²/s
Permitt. suction pressure at the suction port of unit:	-0.4 bar to +0.6 bar	
Permitted temp. range of fluid	0 ... 80 °C	
Ambient temperature	-20 ... 40 °C	
Seals, gaskets	NBR (Option: FPM)	
Protection class	IP 54	
Weight	OLF-5-S ... ≈ 7.0 kg OLF-5-E ... ≈ 2.5 kg	OLF-5/15-T... ≈ 11.7 kg OLF-5/15-S... ≈ 11.0 kg
Version with flow control valve	Inlet pressure: p_{min} = 10 bar; p_{max} = 50 bar (OLF-5-E ...)	
Hydraulic connections:		
Inlet	OLF-5-S = 1/2" ISO 228 OLF-5-E = 3/8" ISO 228	1" ISO 228
Outlet	OLF-5-S = 1/2" ISO 228 OLF-5-E = 1/2" ISO 228	1" ISO 228

Model code

OLF 5 S 120-N N5DM002 E /-C1

Basic model
OLF = OffLine Filter
OLFCM = OffLine Filter with FluidCondition Monitoring
(only for size 5/15, version TV)

Size and nominal flow rate
5 = 5 l/min (standard)
5/15 = 15 l/min (for special applications)

Version
S = with motor (NBR) (OLF-5, OLF-5/15)
SV = with motor (FPM) (OLF-5, OLF-5/15)
E = flow control valve (NBR) (10 .. 50 bar) (OLF-5)
EV = flow control valve (FPM) (10 .. 50 bar) (OLF-5)
TV = Toploader with motor (FPM) (OLF-5/15)

Motor output voltage

	OLF-5 (-S, -SV, -E, -EV)	OLF-5/15 (-S, -SV, -TV)
120-N	120 W, 3x400 V 50 Hz	
120-M	120 W, 1x230 V 50 Hz	
120-K	120 W, 1x120 V 60 Hz	
370-N		370 W, 3x400 V 50 Hz
370-M		370 W, 1x230 V 50 Hz
370-K		370 W, 1x120 V 60 Hz
200-U	200 W, 24 V DC	200 W, 24 V DC
Z-Z (-E, -EV)	no motor	

not available

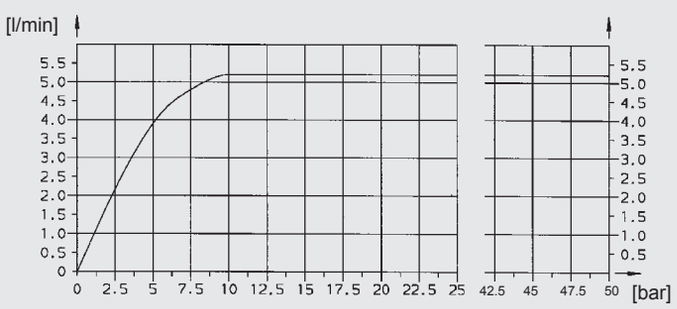
Filter element
N 5 DM 002 = DIMICRON filtration rating 2 µm absolute
N 5 DM 005 = DIMICRON filtration rating 5 µm absolute
N 5 DM 010 = DIMICRON filtration rating 10 µm absolute
N 5 DM 020 = DIMICRON filtration rating 20 µm absolute
N 5 AM 002 = AQUAMICRON filtration rating 2 µm absolute
N 5 AM 020 = AQUAMICRON filtration rating 20 µm absolute
Z = without filter element

Clogging indicator
E = standard, pressure gauge
F = pressure switch - electrical (VR2F.0)
BM = differential pressure indicator - visual (VM2BM.1)
C = differential pressure indicator - electrical (VM2C.0)
D = differential pressure indicator - visual-electrical (VM2D.0)
Z = without clogging indicator
BM, C, D not for sizes / models OLF-5-S
E, F not for sizes / models OLF-5/15

Supplementary details
A = with AquaSensor AS 1000 series
C1 = with ContaminationSensor CS 1320
C2 = with ContaminationSensor CS 1310

SRV flow control valve curve

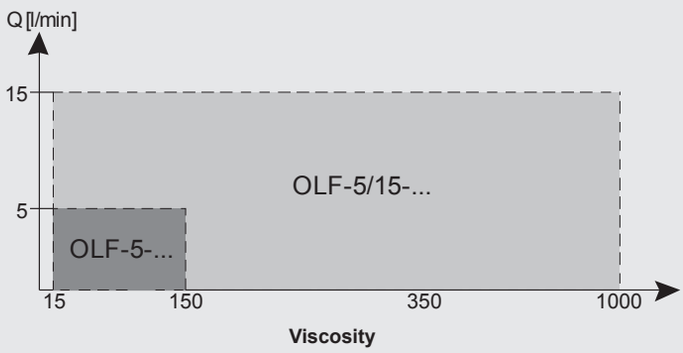
(OLF-5-E...)



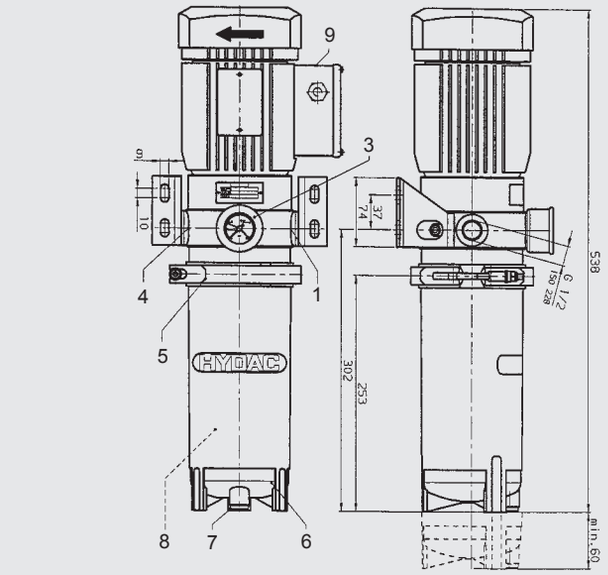
Application

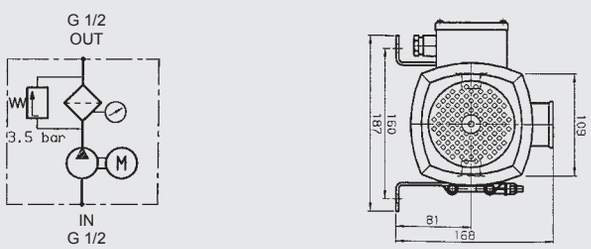
Tank volumes up to approx. 800 l

Tank volumes up to approx. 2000 l

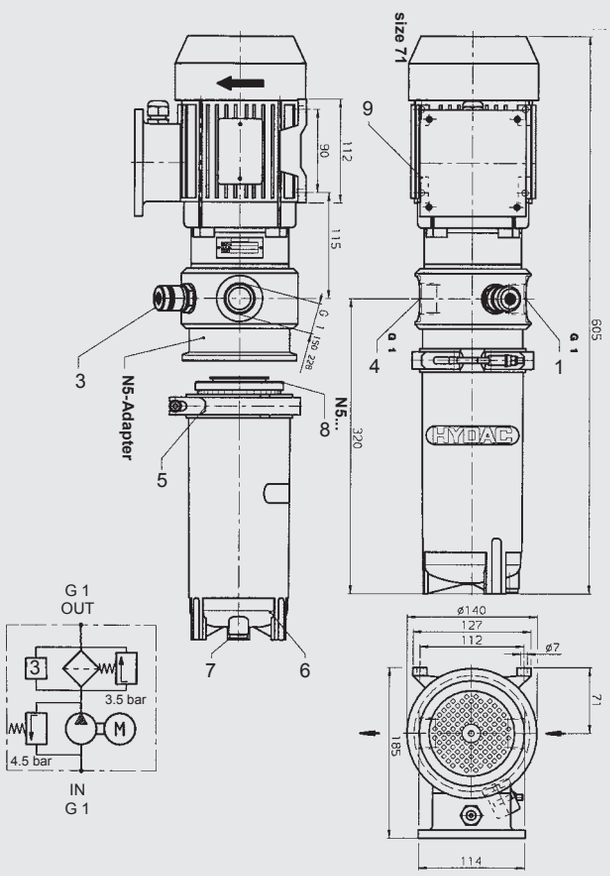


Dimensions

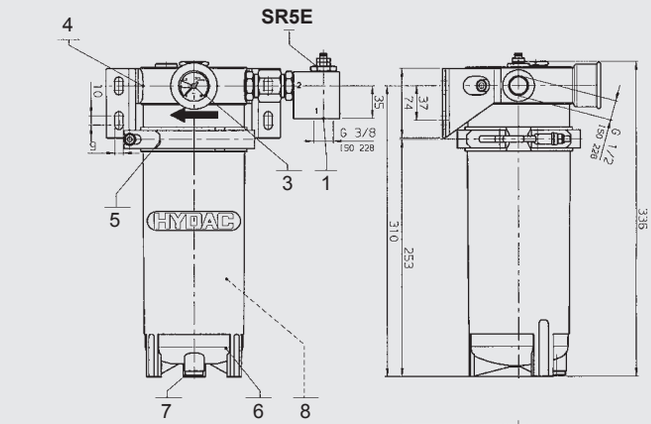


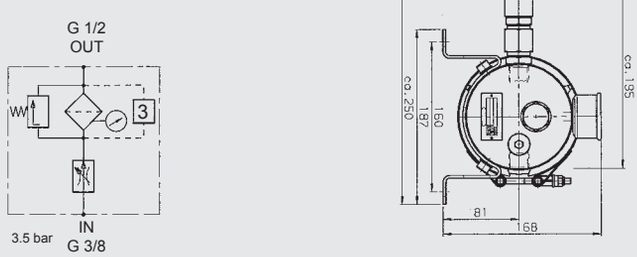


Example:
OLF-5-S...

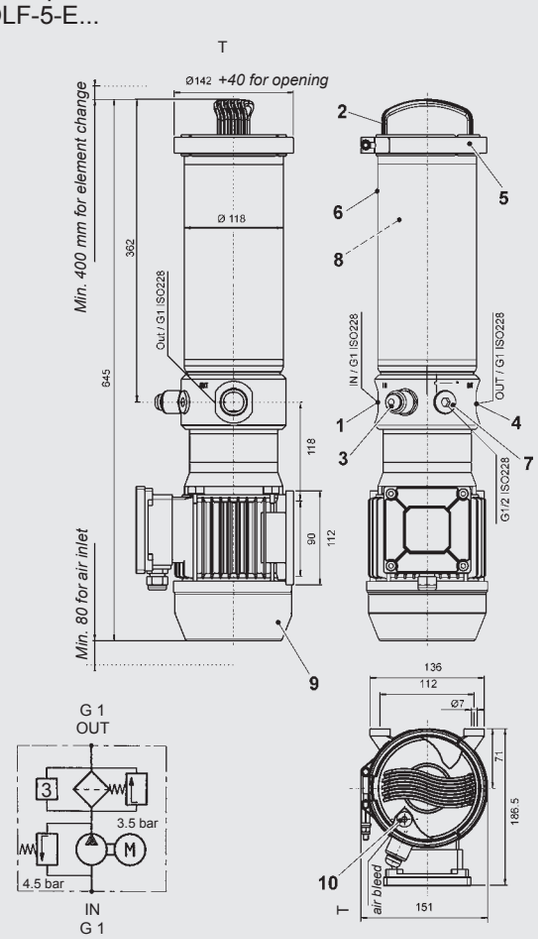


Example:
OLF-5-S...





Example:
OLF-5-E...



Example:
OLF-5/15-TV...

1 = Inlet
2 = Filter cover plate
3 = Clogging indicator
4 = Outlet
5 = Clamp
6 = Filter bowl
7 = Drain
8 = Filter element
9 = Electric motor
10 = Air bleed screw

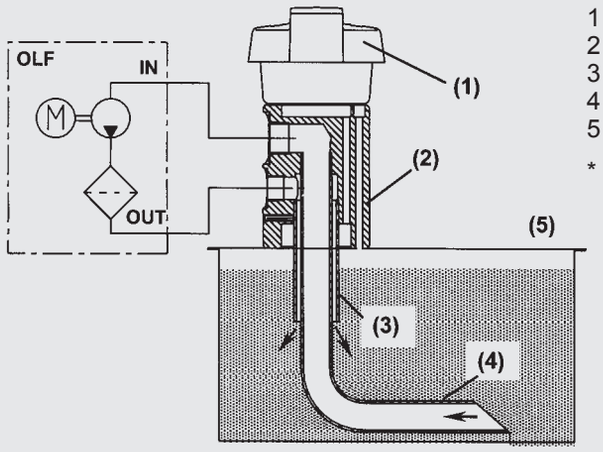
Accessories

– Tank adapter kit OLF-5-TAK

Part No. 3039235

Quick retrofit kit to connect the OLF to hydraulic systems.

Can be fitted to systems which have a breather filter with an interface to DIN 24557/Part 2.



1 = breather filter
2 = adapter *
3 = return line *
4 = suction line *
5 = tank

* Items supplied

Replacement elements

Element type	Part No.
N 5 DM 002	349 494
N 5 AM 002	349 677
N 5 DM 005	3068101
N 5 DM 010	3102924
N 5 DM 020	3023508
N 5 AM 020	3040345

Note

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OffLine Filter
OLF 5 Lubrication Line

Description
The compact fluid service units of the OLF 5 Lubrication Line are designed to filter hydraulic and lubrication fluids offline.

Different versions are available with or without motor-pump units.

On the Toploader version, the element is removed "from the top".

The Dimicron elements used in this filter have the following special features:

- Particularly high contamination retention capacity
- Environmentally safe disposal (incinerable) and
- Water absorption (optional)

Applications
- Machine tools
- Plastic injection moulding machines
- Mobile machines
- Wind power

Advantages
- Improvement of component and system filter lifetime
- Greater machine availability
- Longer intervals between oil changes
- Minimum space requirement due to compact design
- Very easy maintenance
- High contamination retention capacity of elements
- Environmentally safe disposal of elements (incinerable)

Technical specifications

Size	5/4
Filter element	Dimicron (1µm*) Dimicron (2µm*) Dimicron (5µm*) Dimicron (10µm*) Dimicron (20µm*) Aquamicron (2µm) Aquamicron (20µm) 0160 MA 03 BN (3µm) 0160 MA 05 BN (5µm) 0160 MA 10 BN (10µm) 0160 MA 20 BN (20µm) 0180 MA 03 BN (3µm) 0180 MA 05 BN (5µm) 0180 MA 10 BN (10µm) 0180 MA 20 BN (20µm)
Pump type	Vane pump
Max. flow rate	4 l/min
Contamination retention capacity	DIMICRON 200g ISOMTD® Δp=2.5 bar AQUAMICRON 185g ISOMTD® Δp=2.5 bar (water absorption approx. 0.5 l at Δp=2.5 bar) 0160 MA approx. 60g ISOMTD® Δp=2.5 bar 0180 MA approx. 100g ISOMTD® Δp=2.5 bar
Operating pressure	3.5 bar max.
Permitt. negative pressure across the suction port of the unit	-0.4 bar ... 0.6 bar
Viscosity range	15 ... 7000 mm²/s (see Page 162: Application)
Permitted temperature range of fluid	0 ... 80 °C
Ambient temperature	-20 ... 40 °C
Seals, gaskets	NBR (Option: FPM)
Protection class	IP 54
Weight	OLF-5/4-S... ≈ 11 kg OLF-5/4-SP... ≈ 11 kg

Model code

OLF 5/4 S 370-N N5DM002 BM

Basic model
OLF = OffLine Filter

Size and nominal volume
5/4 = 4 l/min (for lubrication systems)

Version
S = standard
SP = spin-on filter

Motor output voltage

	4 l/min
370-N	370 W, 3x380 - 420 V (50 Hz) 3 x 440 - 480 V (60 Hz)
370-M	370 W, 1x230 V 50 Hz
370-K	370 W, 1x120 V 60 Hz

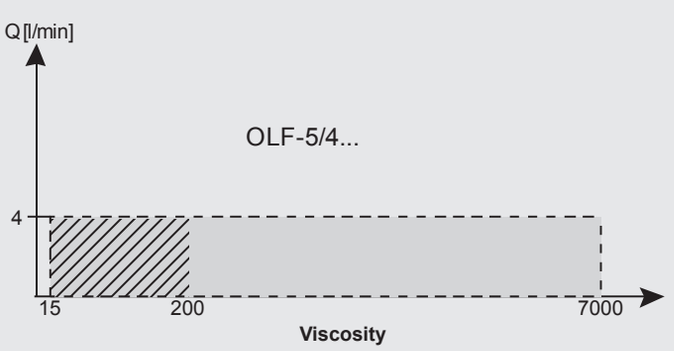
Filter element
N 5 DM 001 = DIMICRON filtration rating 1 µm absolute
N 5 DM 002 = DIMICRON filtration rating 2 µm absolute
N 5 DM 005 = DIMICRON filtration rating 5 µm absolute
N 5 DM 010 = DIMICRON filtration rating 10 µm absolute
N 5 DM 020 = DIMICRON filtration rating 20 µm absolute
N 5 AM 002 = AQUAMICRON filtration rating 2 µm absolute
N 5 AM 020 = AQUAMICRON filtration rating 20 µm absolute
M 160 B 03 = 0160 MA 03 BN, filtration rating 3 µm absolute
M 160 B 05 = 0160 MA 05 BN, filtration rating 5 µm absolute
M 160 B 10 = 0160 MA 10 BN, filtration rating 10 µm absolute
M 160 B 20 = 0160 MA 20 BN, filtration rating 20 µm absolute
M 180 B 03 = 0180 MA 03 BN, filtration rating 3 µm absolute
M 180 B 05 = 0180 MA 05 BN, filtration rating 5 µm absolute
M 180 B 10 = 0180 MA 10 BN, filtration rating 10 µm absolute
M 180 B 20 = 0180 MA 20 BN, filtration rating 20 µm absolute
Z = without filter element

Clogging indicator
BM = standard, differential pressure indicator - visual (VM2BM.1)
C = differential pressure indicator - electrical (VM2C.0)
D = differential pressure indicator - visual-electrical (VM2D.0)
Z = without clogging indicator

Application

Tank volumes up to approx. 300 l

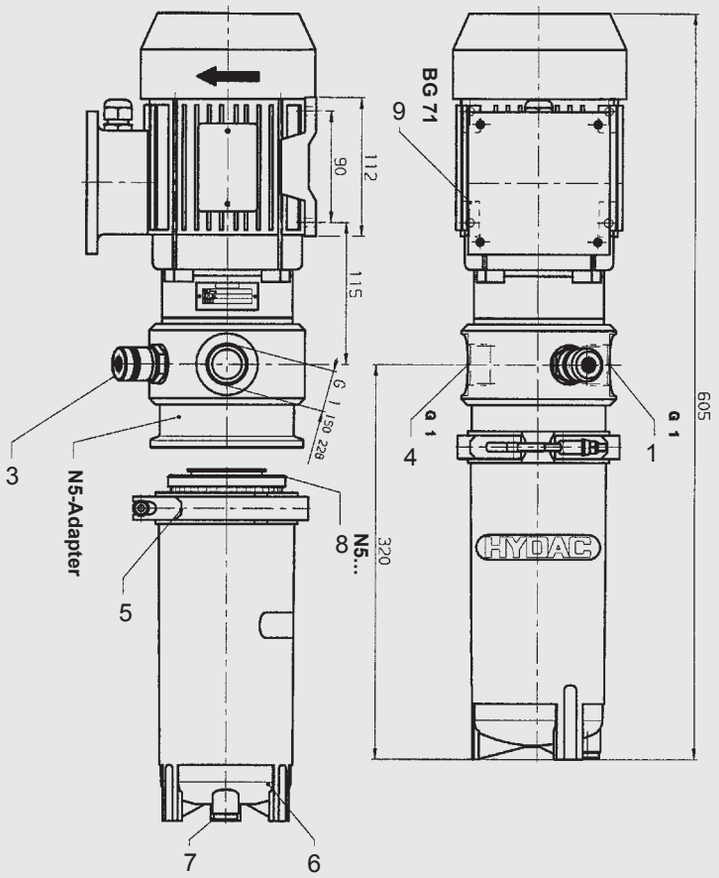
Viscosity range in which the max. flow rate will only be achieved after approx. 10 minutes if the pump is not primed.

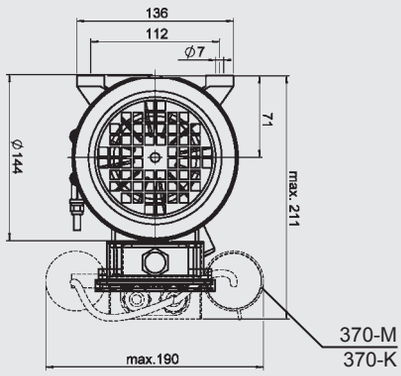


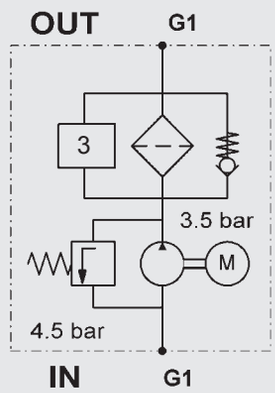
Replacement filter elements

Element type	Part Number
N5DM001	3106549
N5DM002	349494
N5DM005	3068101
N5DM010	3102924
N5DM020	3023508
N5AM002	349677
N5AM020	3040345
0160 MA 03 BN	314609
0160 MA 05 BN	315621
0160 MA 10 BN	314022
0160 MA 20 BN	315485
0180 MA 03 BN	310475
0180 MA 05 BN	315622
0180 MA 10 BN	315726
0180 MA 20 BN	315623

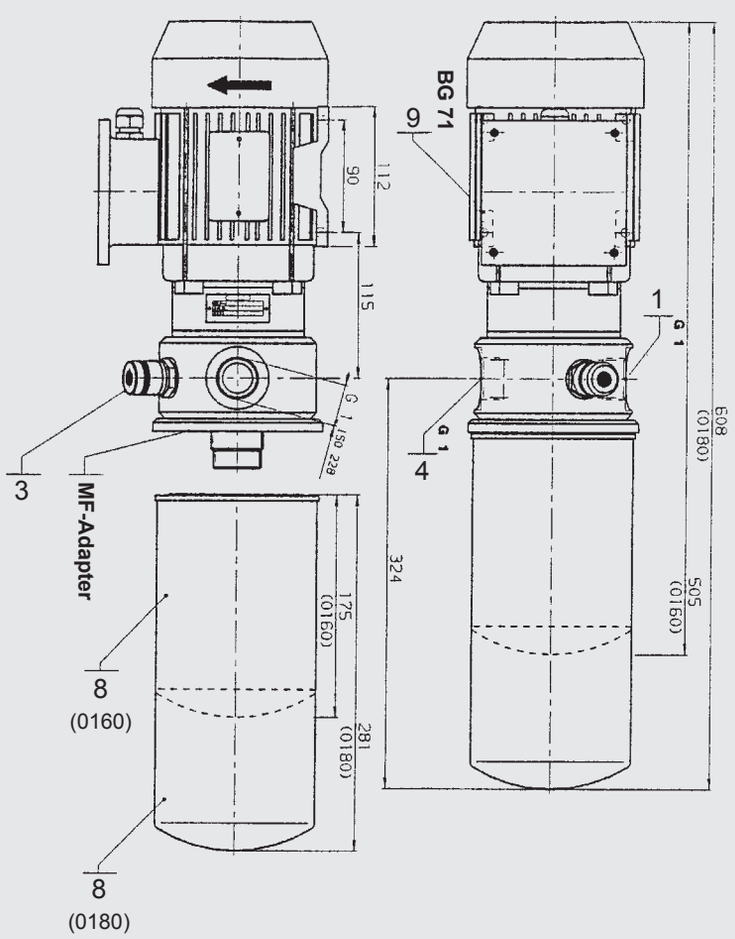
Dimensions

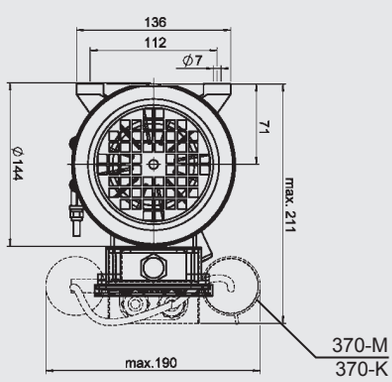


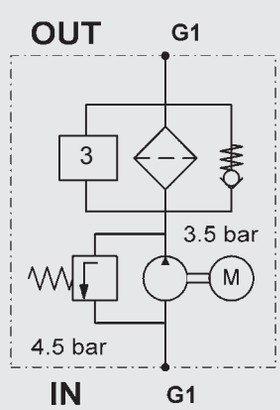




Example:
OLF-5/4-S-...







Example:
OLF-5/4-SP-...

BG= Size
1 = Inlet
2 = Option: differential pressure indicator
3 = Clogging indicator (optional)
4 = Outlet
5 = Clamp
6 = Filter bowl
7 = Drain
8 = Filter element
9 = Electric motor

Note

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

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

Subject to technical modifications.

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OffLine Filter
OLF 15/30/45/60

Description
The OLF 15/30/45/60 series of filtration units are robust off-line filters for stationary applications in hydraulic and lubrication systems with a large fluid volume.

Features of the Dimicron elements used in these filters are a particularly high contamination retention capacity and an environmentally safe method of disposal (incinerable).

Applications
- Machine tools
- Plastic injection moulding machines

Advantages
- Improvement of component and system filter lifetime
- Greater machine availability
- Longer intervals between oil changes
- Very easy maintenance
- Elements have a high contamination retention capacity
- Environmentally safe disposal of elements (incinerable)

Technical specifications

	OLF-15	OLF-30	OLF-45	OLF-60
Filter element	N15DMxxx (1x)	N15DMxxx (2x)	N15DMxxx (3x)	N15DMxxx (4x)
Contamination retention capacity to ISO 4572	500 g	1000 g	1500 g	2000 g
Filtration performance data based on ISO 4572	$\beta_{2,\ 10,\ 20,\ 30}$ > 1000 at Δp = 2 bar			
Permitted Δp across the element (bar)	5			
Material of housing	Stainless steel 1.4301			
Volume of housing in l	20	40	60	78
Max. operating pressure in bar	6			
Material of seals (standard)	NBR			
Weight of housing (kg)	11	15	24	28
Fluid temperature in °C	10 .. 80			
Technical details for motor-pump unit	**15 l/min**	**30 l/min**	**45 l/min**	**60 l/min**
Operating pressure of the pump (bar)	4.5 - 5.5			
Permitted suction pressure at suction port	-0.4 .. +0.5 bar			
Viscosity range with vane pump in mm²/s	15 - 500			
Viscosity range with gear pump in mm²/s	15 - 1000			
Viscosity range with centrifugal pump in mm²/s	1 - 20			
Motor output Vane pump Gear pump Centrifugal pump	 370 370 750	 750 750 750	 1500 1500 1500	 1500 1500 1500
Weight of vane pump (kg)	7.4	13.5	19.5	19.5
Weight of gear pump (kg)	9.5	15	22	22
Weight of centrifugal pump (kg)	15	15	25	25
Material of pump seals (standard)	NBR			
Ambient temperature	-10 .. +40 °C			
Protection class	IP 54			

Model code

OLF -30/15 -S -N60 -N15DM002 -E/ -PKZ -V

Basic type
OLF = OffLine Filter, stationary
(with pressure gauge and drain valve)

Filter size and nominal flow rate

15 l/min	30 l/min	45 l/min	60 l/min	
15/15	X	X	X	1 filter element
30/15	30/30	X	X	2 filter elements
45/15	45/30	45/45	X	3 filter elements
60/15	60/30	60/45	60/60	4 filter elements
15/ Z ; 30/ Z ; 45/ Z ; 60/ Z = without pump				
X = not available				

Code for pump type
S = vane pump
G = gear pump
W = centrifugal pump
Z = without pump

Voltage
L = 115V - 1 Ph
M = 230V - 1 Ph*
W = 230V - 3 Ph*
C = 380V - 3 Ph
N = 400V - 3 Ph*
R = 415V - 3 Ph
G = 440V - 3Ph
O = 460V - 3Ph
B = 480V - 3Ph
S = 500V - 3Ph
P = 575V - 3Ph
X = other voltage, on request
L60,M60,....= operation at 60Hz
Z = without motor
Protection type: IP55
* Standard in Europe according to CENELEC HD472 S1 at 50Hz

Filter element
N15DM002 = DIMICRON® 2 µm absolute
N15DM010 = DIMICRON® 10 µm absolute
N15DM020 = DIMICRON® 20 µm absolute
N15DM030 = DIMICRON® 30 µm absolute
Z = without filter element

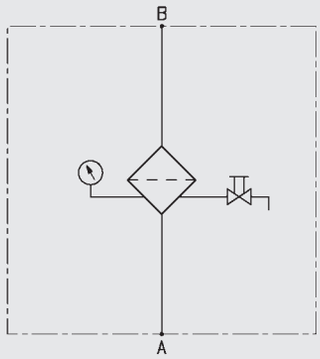
Clogging indicator
E = standard, pressure gauge
B = differential pressure indicator - visual (VM 2 BM.1)
C = differential pressure indicator - electrical (VM 2 C.0)
D3 = differential pressure indicator - visual/electrical (VM 2 D.0/-L220)
D4 = .../.../... (VM 2 D.0/-L24)
D5 = .../.../... (VM 2 LZ.1/-DB)
F = pressure switch - electrical

Supplementary details
PKZ = with on/off switch with motor circuit breaker
FA1 = with on/off switch with motor circuit breaker and cut-out when filter is clogged.
Requires neutral line. For voltages up to max. 240V, 1Ph, or max. 415V, 3Ph.
clogging indicator type C or D3 required.
FA2 = with on/off switch with motor circuit breaker and cut-out when filter is clogged.
Does not require neutral line. All voltages. Clogging indicator type C required.
V = with FPM seals
MP = Minimess test point before the filter for FCU incl. flow control valve

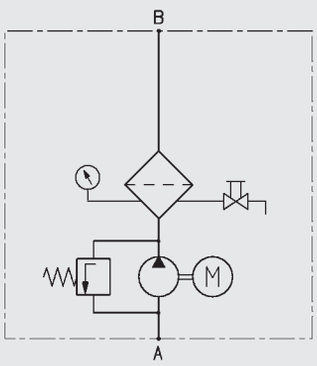
Note:
At 60 Hz operation, the flow rate increases by approx. 20%.

Hydraulic circuit diagram

OLF without motor-pump unit



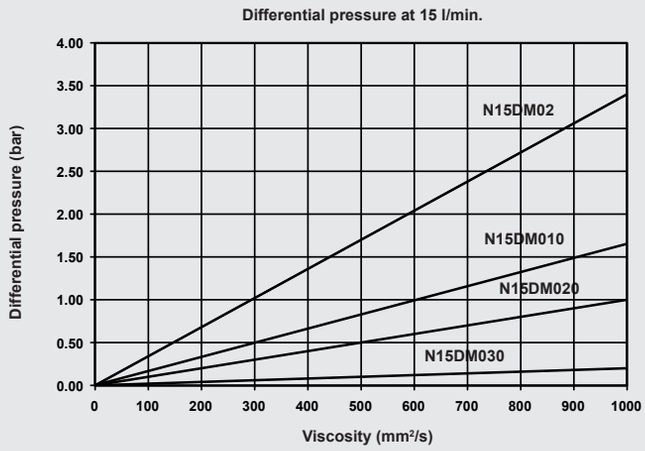
OLF with motor-pump unit



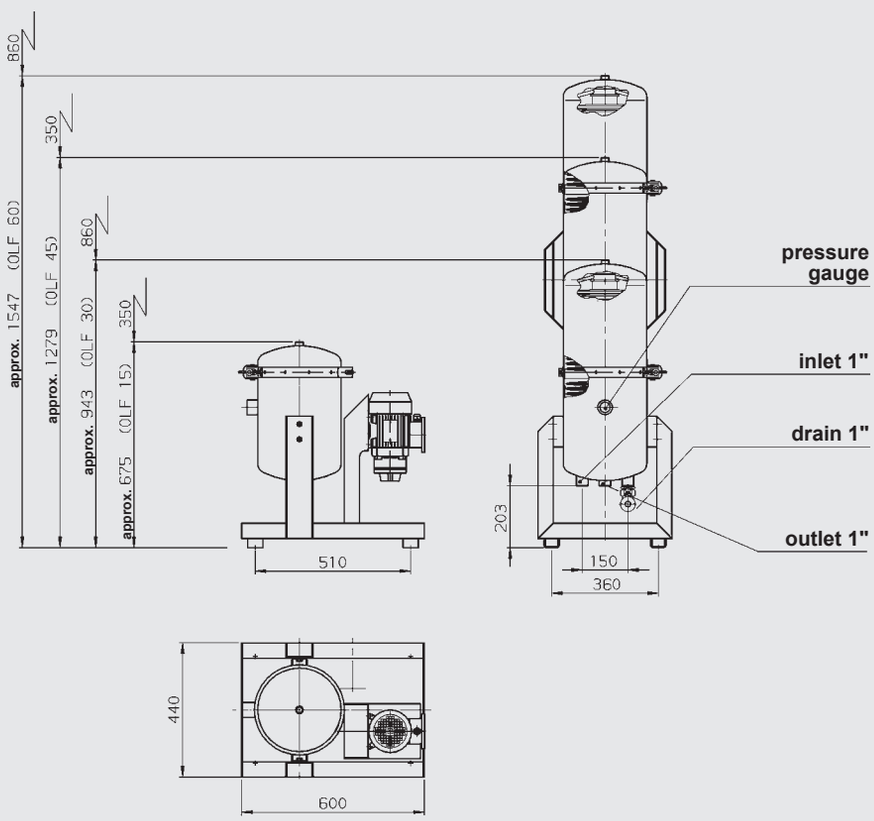
Connections

	Vane pump	Gear pump	Centri-fugal pump
Inlet (OLF 15)	G 3/4	G 3/4	G 1
Inlet (OLF 30)	G 1 1/4	G 1	G 1
Inlet (OLF 45, 60)	G 1 1/4	G 1 1/2	G 1 1/4

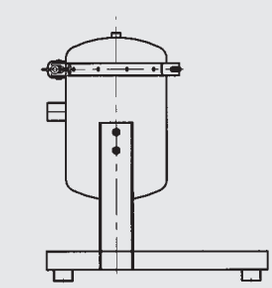
Element pressure drop

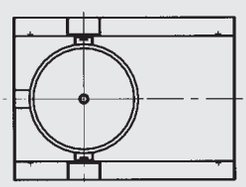


Dimensions



Example OLF-15/Z





Note

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Subject to technical modifications.

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4.2.3 **Dewatering / Degassing and other Fluid Service Systems**

FluidAqua Mobil
FAM 10

Description
The FluidAqua Mobil units in the series FAM 10 operate according to the principle of vacuum dewatering to separate free and dissolved water and gases from hydraulic and lubrication fluids.

By using HYDAC offline filter element technology with its high contamination retention capacity and separation capacity, the unit is extremely economical.

As an option, all units can be equipped with and also controlled by measuring instruments for monitoring the water content and particle contamination continuously. A built-in heater is also available as an option to increase the dewatering capacity.

The Siemens S7 series of programmable logic control (PLC) in combination with a Siemens control panel in various languages guarantees simple and reliable operation.

Advantages
Extremely low residual water levels, gas levels and particle contamination in the operating fluid ensure:

- Longer oil change intervals
- Improved component service life
- Greater machine availability
- Reduction in Life Cycle Costs (LCC)

Technical specifications

Flow rate in l/min at 50 Hz	≈ 10 (FAM-10), ≈ 15 (FAM-10/15)
Flow rate in l/min at 60 Hz	≈ 12 (FAM-10), ≈ 18 (FAM-10/15)
Permitted fluids [1]	Fluids compatible with NBR seals: ● Mineral oils to DIN 50524 ● Gear oils to DIN 51517, 51524 Fluids compatible with FPM (Viton) seals: ● Synthetic esters (HEES) DIN 51524/2 ● Vegetable oils (HETG, HTG) ● HFD fluids (not for pure phosphate ester which requires EPDM seals). Fluids compatible with EPDM seals: ● Aviation phosphoric acid esters e. g. Skydrol® or Hyjet®
Viscosity range in mm²/s	15-800
Material of seal	NBR(FPM)
Size of filter	OLF-5
Filter element	N5DMxx
Contamination retention capacity to ISO 4572	200 g
Clogging indicator	VM 2 C.0
Setting pressure of differential pressure clogging indicator	2 bar
Pump type, filtration unit	Vane pump
Pump type, drainage pump	Gear pump
Pump type, vacuum pump	Rotary vane vacuum pump
Operating pressure in bar	4.5 max.
Max. permitted pressure at suction port (without suction hose)	-0.2 ... +0.2 bar [1]
Temperature of fluid in °C (with CS)	10 ... 80 (10 ... 70)
Ambient temperature in °C	10 ... 40 [1]
Electrical power consumption in W FAM 10 / 10/15	Standard: 1500/1900 With heater: 4400/4900
External fuse required	16 A
Heating output in W (optional)	2900 (3 phase only)
Protection class	IP 54
Power cable, length in m	10
Hoses, length in m	5
Material of hoses	NBR
Inlet - Outlet	G1 / G ½
Weight when empty in kg	≈ 300
Typical dewatering speed l/h	≈ 0.8 [2]
Minimum water content in ppm	< 100 possible, < 10 ppm (insulating oil) possible
Special models on request.	

[1] others on request
[2] dependent on, for example, type of fluid, water content, temperature, age of oil

Model code

FAM 10 M 1 A/1500 05 DM 05 S Z 1 /-V

Basic model
FAM = FluidAqua Mobil

Size and nominal flow rate
10 = 10 l/min (for 50 Hz operation), 12 l/min (for 60 Hz operation)
10/15 = 15 l/min (for 50 Hz operation), 18 l/min (for 60 Hz operation)

Operating fluid
M = Mineral oil – NBR seals, tested using mineral oil *
I = Insulating oil - NBR seals, tested using insulating oil *
X = HFD-R phosphoric acid ester fluids - FPM seals, tested using HFD-R fluid *
P = Aviation phosphoric acid ester fluid e.g. Skydrol® or Hyjet®, tested using Skydrol®
B = Rapidly biodegradable oils (based on esters) - FPM seals, tested using rapidly biodegradable fluid (based on esters) *

Mechanical design
1 = stationary
2 = mobile

Voltage/Frequency/Power supply/Output
A = 400 V/50 Hz/3Ph+PE
B = 415 V/50 Hz/3Ph+PE
C = 200 V/50 Hz/3Ph+PE
D = 200 V/60 Hz/3Ph+PE
E = 220 V/60 Hz/3Ph+PE
F = 230 V/60 Hz/3Ph+PE
G = 380 V/60 Hz/3Ph+PE
H = 440 V/60 Hz/3Ph+PE
J = 230 V/50 Hz/3Ph+PE
K = 480 V/60 Hz/3Ph+PE
L = 220 V/50 Hz/3Ph+PE
M = 230 V/50 Hz/1Ph+PE
N = 575 V/60 Hz/3Ph+PE
O = 460 V/60 Hz/3Ph+PE
X = other voltage
Standard: 1500 W
Optional heater: 4400 W (3 phase only)

Filter size
05 = Standard housing, OLF-5

Filter material
DM= Dimicron®
Z = without

Filtration rating
02 = 2 µm (DM)
05 = 5 µm (DM)
10 = 10 µm (DM)
20 = 20 µm (DM)
Z = without filter elements

Vacuum pump type/Size
S = Standard

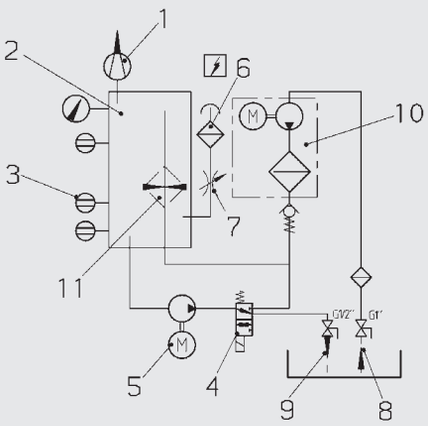
Measuring equipment
Z = without
A = with AquaSensor (AS)
C = with Contamination Sensor (CS)
AC = A + C (no control option with CS when combined with AS)

Modification code
1

Supplementary details
no details = standard
V = Viton

*Residues of test fluid will remain in the unit after testing.

Hydraulic circuit diagram



1 = Vacuum pump
2 = Vacuum column
3 = Level switch
4 = Change-over valve
5 = Drain pump
6 = Air inlet
7 = Vacuum adjustment
8 = Inlet
9 = Outlet
10 = Filtration unit
11 = Heater (optional)

Sizing

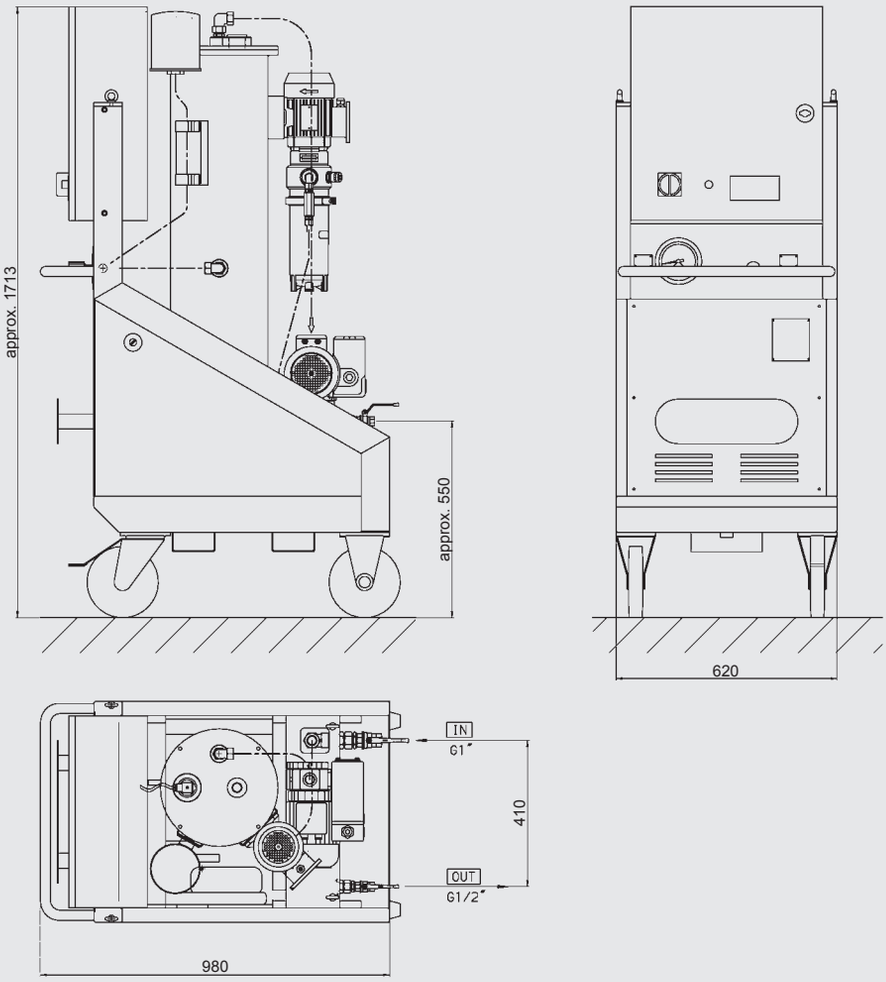
As a rough guide, the FluidAqua Mobil can be sized according to the tank volume of the system. If the water ingress per hour is known, then a unit can be selected according to the typical dewatering capacities of the various sizes.

In general, it must however be noted that sizing will depend on the application, the fluid, the temperature of the fluid and the ambient temperature, the fluid quantity and the water ingress into the system. These have a great affect on the dewatering capacity. Therefore the specifications can only serve as an indication.

Tank volume	FAM
< 2,000 l	FAM 10
2,000 –7,000	FAM 10/15
7,000 – 15,000	FAM 25 *
15,000 –25,000	FAM 45 *
25,000 –35,000	FAM 60 *
35,000 – 45,000	FAM 75 *
> 45,000	FAM 95 *

* See brochure no. 7.613... FluidAqua Mobil FAM 25/45/60/75/95 Series

Dimensions



Items supplied

– FluidAqua Mobil, ready-for-connection
– Suction and pressure hoses supplied with mobile version
– Control panel in German/English/French (other languages on request)
– Key, square 6 mm (for switch cabinet and cover panel)
– Vacuum pump oil (1 litre) for initial filling of vacuum pump
– Technical documentation consisting of:
  - Operating and Maintenance Manual
  - Electrical circuit diagram
  - Test certificate
– CE declaration of conformity

Note

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

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

Subject to technical modifications.

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FluidAqua Mobil
FAM 25/45/60/75/95 Series

Description
The FluidAqua Mobil FAM 25/45/60/75/95 series operates according to the principle of vacuum dewatering to separate free and dissolved water and gases from hydraulic and lubrication fluids. Through the use of HYDAC offline filter element technology with their high contamination retention capacity and separation capacity, the unit is highly economical.
All units have an AquaSensor AS1000 for continuous monitoring of the water content and for controlling the unit. A particle sensor CS1000 can also be fitted as an option for simultaneous monitoring of solid particle contamination.
To increase the dewatering capacity, for high viscosity fluids or for low fluid temperatures an optional heater can be built in or even retrofitted.
The Siemens S7 series of programmable logic control (PLC) in combination with a Siemens control panel in various languages guarantees simple and reliable operation.

Advantages
Extremely low residual water levels, gas levels and particle contamination in the operating fluids make for:

- Longer oil change intervals
- Improved life expectancy of components
- Greater machine availability
- Reduction in Life Cycle Costs (LCC)

Technical specifications

FAM	25	45	60	75	95
Flow rates at 50 Hz	≈ 25 l/min	≈ 45 l/min	≈ 60 l/min	≈ 75 l/min	≈ 95 l/min
Flow rates at 60 Hz	≈ 30 l/min	≈ 54 l/min	≈ 72 l/min	≈ 90 l/min	≈114 l/min
Permitted fluids**	Fluids compatible with NBR seals: ● Mineral oils to DIN 50524 ● Gear oils to DIN 51517, 51524 Fluids compatible with FPM (Viton) seals: ● Synthetic esters (HEES) DIN 51524/2 ● Vegetable oils (HETG, HTG) ● HFD fluids (not for pure phosphate ester for which EPDM seals are required).				
Sealing material	NBR (FPM optional)				
Filter size of fine filter	OLF-10		2600 MRF 3/11/40		
Filter elements of fine filter xxx= Filtration rating	N10DMxxx		2600RxxxBN4HC/-KB (-V-KB) N40MRxxx		
Clogging indicator	VM 2 C.0	VM 2 C.0	VM 2 C.0	VM 2 C.0	VM 2 C.0
Pump type, vacuum pump	Rotary vane vacuum pump		Rotary vane vacuum pump or water ring vacuum pump		
Pump type, others	Gear pumps				
Operating pressure	0 ...4.5 bar				
Permitted pressure at suction port (without suction hose)	-0.2 ...+ 1 bar				
Operation viscosity range**	15...350 mm²/sec (without built-in heater) 15...550 mm²/sec (with built-in heater)				
Fluid temperature range**	10...80 °C				
Ambient temperature range**	10 - 40 °C				
Storage temperature range**	10 - 40 °C				
Relative humidity (ambient)**	max. 90%, non-condensing				
Electrical power consumption / required external fuse*					
Without heater	3.5 kW/16A	4.5 kW/16A	5.9 kW/32A	7.5 kW/32A	7.5 kW/32A
With heater	10.5 kW/32A	13.5 kW/32A	19.5 kW/63A	25.5 kW/63A	25.5 kW/63A
Heating output (optional)	7 kW	9 kW	13.5 kW	18 kW	18 kW
Protection class	IP 54		IP 55		
Length of electric cable / plug	10 m / CEE (depending on nominal voltage, mobile version only)				
Length of hoses	5 m (mobile FAMs only)				
Material of hoses	NBR (mobile FAMs only)				
Inlet connection	G 1 1/2"				
Outlet connection	G 1"	G 1"	G 1 1/2"	G 1 1/2"	G 1 1/2"
Weight when empty	≈ 410 kg	≈ 430 kg	≈ 550 kg	≈ 590 kg	≈ 620 kg
Dimensions (L x W x H (with heater))	1375 x 690 x 1700 (1877)	1375 x 690 x 1700 (1877)	1800 x 850 x 1895 (1960)	1800 x 850 x 1895 (1960)	1800 x 850 x 1895 (1960)
Achievable residual water content	< 100 ppm – hydraulic and heavy oils < 50 ppm – turbine oils (ISO VG 32/46) < 10 ppm – transformer oils***				

* Maximum specifications given, depends on equipment
** For other fluids, viscosities or temperature ranges, please contact us.
*** Units not suitable for "Online" and "Onload" operation (transformer in operation and connected to grid).

Model code

FAM – 75 – M – 2 – A – 40 – R – H – B – AC1 – 00 /–V

Basic model
FAM = FluidAqua Mobil

Size
25 = 25 l/min 45 = 45 l/min 60 = 60 l/min
75 = 75 l/min 95 = 95 l/min

Operating medium
M = Mineral oil - NBR seals, tested with mineral oil*
I = Insulating oil - NBR seals, tested with insulating oil (Shell Diala)**
X = HFD-R fluids - FPM seals, tested with HFD-R fluid (Fyrequell)*
B = Rapidly biodegradable oils (based on esters) - FPM seals, tested with rapidly biodegradable oils based on esters*

Mechanical Type
1 = Stationary (with feet)
2 = Mobile (with casters and hose attachment)

Voltage / Frequency / Mains

A =	400 V, 50 Hz, 3 Ph	F =	230 V, 60 Hz, 3 Ph	L =	220 V, 50 Hz, 3 Ph
B =	415 V, 50 Hz, 3 Ph	G =	380 V, 60 Hz, 3 Ph	N =	575 V, 60 Hz, 3 Ph
C =	200 V, 50 Hz, 3 Ph	H =	440 V, 60 Hz, 3 Ph	O =	460 V, 60 Hz, 3 Ph
D =	200 V, 60 Hz, 3 Ph	I =	500 V, 50 Hz, 3 Ph	X =	other voltages (please state clearly when ordering)
E =	220 V, 60 Hz, 3 Ph	K =	480 V, 60 Hz, 3 Ph		

Filter size of fine filter
10 = OLF 10 Toploader (FAM 25/45 only)
26 = OFU 2600 (FAM 60/75/95 only)
40 = MRF 3/11/40 (FAM 60/75/95 only)

Vacuum pump type
R = Rotary vane vacuum pump
W = Water ring vacuum pump
WA = Water ring vacuum pump with automatic water supply

Heater
H = Heater appropriate for the size (see technical data)
Z = Without heater

Control type
B = Basic
(Control panel language: German/English/French/Spanish (other languages on request))

Measuring equipment
A = AquaSensor
AC1 = AquaSensor + ContaminationSensor ISO4406:1999
AC2 = AquaSensor + ContaminationSensor SAE AS 4059(D)
AC3 = AquaSensor + ContaminationSensor NAS 1638

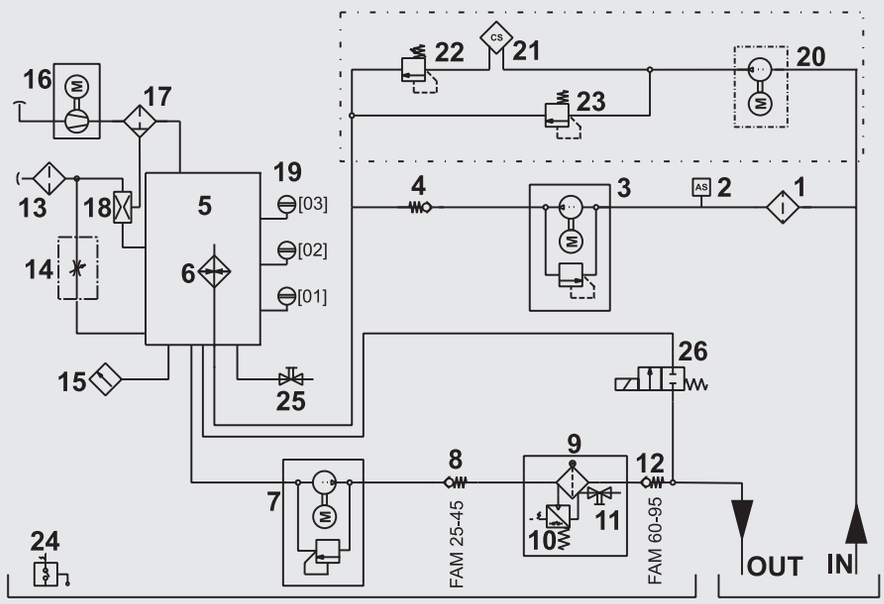
Modification number
00 = the latest version is always supplied

Supplementary details
No details = standard
V = FPM seals for **operating medium** "M" and "I" (if non-standard seal required for the particular **operating medium** (see Model Code under "Operating medium") : Example:. FAM-25-M....-/V)

*Residues of test fluid will remain in the unit after testing.
** Units not suitable for "Online" and "Onload" operation (transformer in operation and connected to grid).

Hydraulic circuit diagram

Option: ContaminationSensor CS 1000



1	Suction filter	14	Throttle valve for vacuum setting
2	AquaSensor AS 1000	15	Pressure sensor for measuring the pre-set vacuum
3	Filling pump	16	Vacuum pump
4	Check valve	17	Oil mist separator
5	Vacuum column	18	Vacuum suction nozzle for the oil mist separator
6	Heater (optional)	19	Level sensor for vacuum column
7	Drain pump	20	Pump for ContaminationSensor CS1000 (optional)
8	Check valve (FAM-25/45 only)	21	ContaminationSensor CS1000 (optional)
9	Fluid filter for separating solid particles	22	Pressure relief valve for CS1000 (optional)
10	Differential pressure switch for monitoring the filter	23	Pressure relief valve for CS1000 (optional)
11	Drain for fluid filter	24	Leakage indicator for oil drip tray
12	Check valve (only for FAM-60/75/95)	25	Drain for vacuum column
13	Air filter and dryer	26	Return valve

Type of vacuum pump

The vacuum pump used for sizes FAM 25/45 is an oil-lubricated rotary vane vacuum pump.

For FAM 45/60/95 we recommend the reliable water ring vacuum pump, which only requires mains water as the operating medium, instead of a special vacuum pump oil.

Since the vacuum produced is 100% oil-free, it has many advantages: a high level of operating reliability, excellent compatibility with water vapour and condensate, low operating costs and cool, clean and, above all, odourless discharged air.

In addition some of the water removed from the oil is recovered within the water ring vacuum pump and returned to the service water circuit of the pump. Depending on the operating conditions, the water ring vacuum pump is therefore completely self-sufficient in water.

Sizing

As a rough guide, the FluidAqua Mobil can be sized according to the tank volume of the system.

Tank volume	FAM
< 2,000 l	FAM 10 *
2,000 –7,000	FAM 10/15 *
7,000 – 15,000	FAM 25
15,000 –25,000	FAM 45
25,000 –35,000	FAM 60
35,000 – 45,000	FAM 75
> 45,000	FAM 95

* see brochure no. 7.949.1 FluidAqua Mobil FAM 10

In general, it must however be noted that sizing will depend on the application, the fluid, the temperature of the fluid and the ambient temperature, the fluid quantity and the water ingress into the system. These have a great affect on the dewatering capacity. Therefore the specifications can only serve as an indication.

		Dewatering rate
Water content	⇧	⇧
Fluid temperature	⇧	⇧
Detergent additives	⇧	⇩
Flow rate of the FAM	⇧	⇧

Heater option

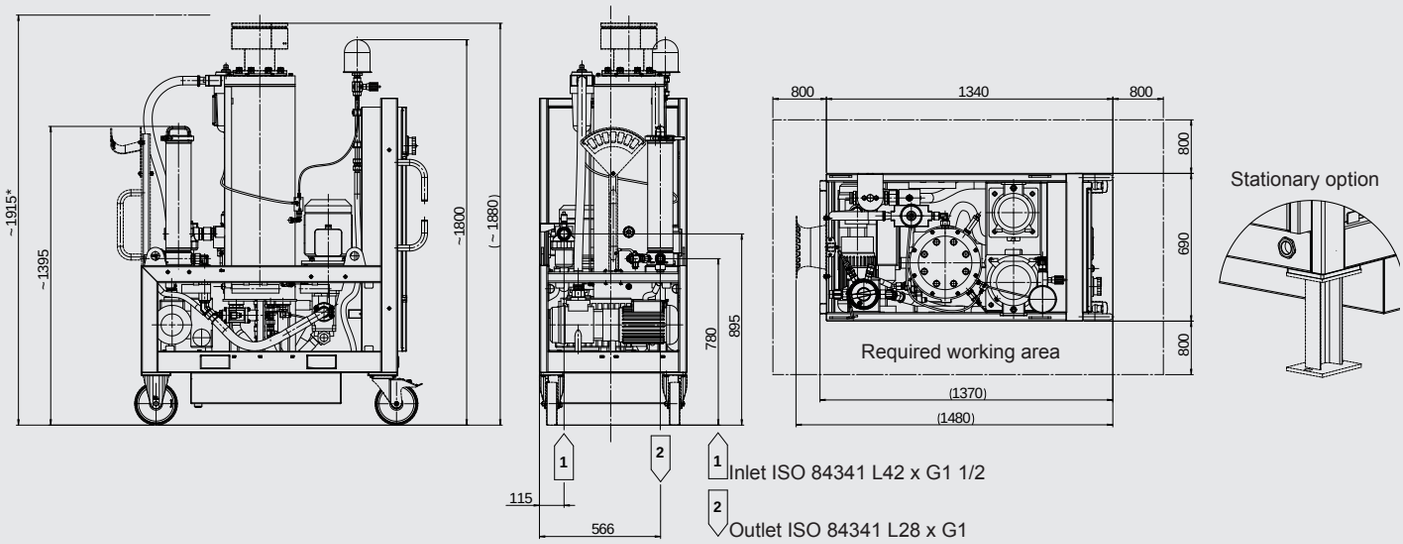
By using the built-in heater, the dewatering capacity can be increased, particularly in the case of high viscosity fluids or fluids at low temperatures.

If the temperature of the fluid is raised by 10 °C then the dewatering capacity increases by up to 50 %. The ideal temperature for dewatering is between 50 - 60 °C.

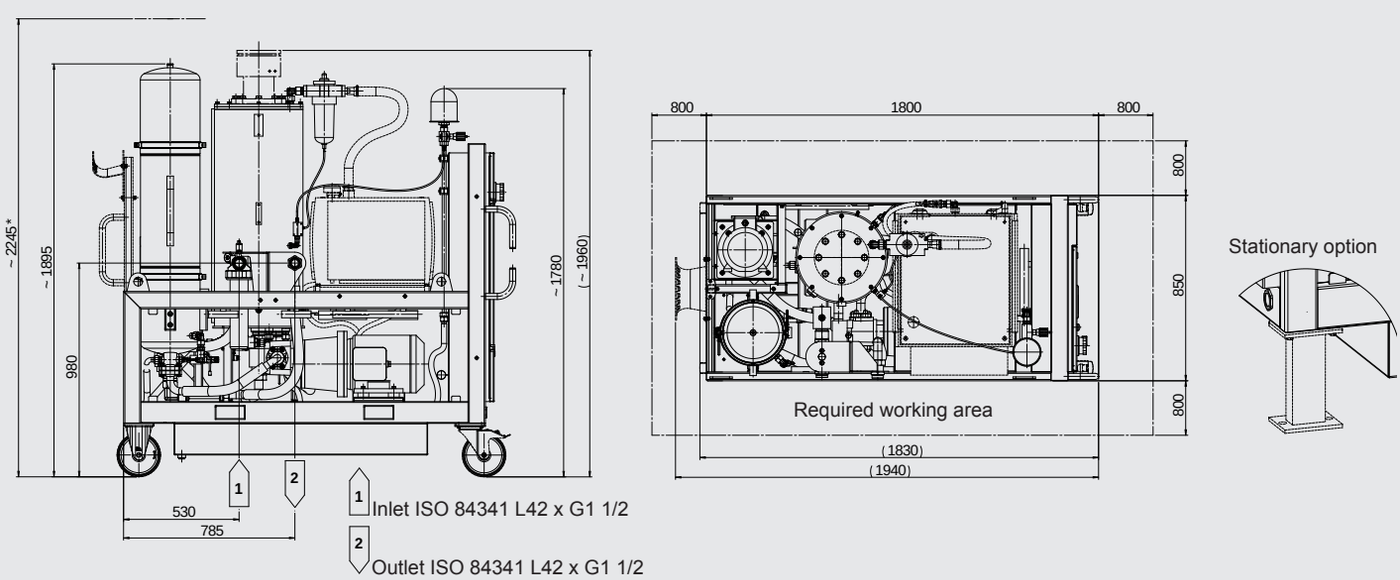
Generally speaking, for operating viscosities of between 350 ... 550 mm²/sec the heater option must be selected and the heater must be used.

Dimensions

FAM-25/45



FAM-60/75/95



Filter elements for suction filter

The suction filter is supplied fitted with a filter element.

FAM-25/45

1 filter element of the type 0160 D 200 W/HC is required.

Part number	Description	Filtration rating	Seal
1250304	0160 D 200 W/HC	200µm	NBR
1265447	0160 D 200 W/HC/-V	200µm	FPM

FAM-60/75/95

1 filter element of the type 0280 D 200 W/HC is required.

Part number	Description	Filtration rating	Seal
1269748	0280 D 200 W/HC	200µm	NBR
1271978	0280 D 200 W/HC/-V	200µm	FPM

Filter elements for fine filter

Filter elements for the fine filter must be ordered separately and must be fitted before initial operation on site.

FAM-25/45

OLF 10: 1 filter element of the type N10DMxxx is required.

Part number	Description	Filtration rating	Seal
3405124	N10DM002	2 µm	FPM
3405147	N10DM005	5 µm	FPM
3405166	N10DM010	10 µm	FPM
3405167	N10DM020	20 µm	FPM

FAM 60/75/95

OFU 2600: 1 filter element of the type 2600RxxxBN4HC/-KB (-V-KB) is required.

Part number	Description	Filtration rating	Seal
1263071 (1263784)	2600R003BN4HC/-KB (-V-KB)	3 µm	NBR (FPM)
1263072 (1263785)	2600R005BN4HC/-KB (-V-KB)	5 µm	NBR (FPM)
1263073 (1263786)	2600R010BN4HC/-KB (-V-KB)	10 µm	NBR (FPM)
1263074 (1263787)	2600R020BN4HC/-KB (-V-KB)	20 µm	NBR (FPM)

MRF 3/11/40: 11 filter elements of the type N40MRxxx-PES1F are required.

Part number	Description	Filtration rating	Seal
3178562	N40MR001-PES1F	1 µm	FPM
3362452	N40MR003-PES1F	3 µm	FPM
3178563	N40MR005-PES1F	5 µm	FPM
3178564	N40MR010-PES1F	10 µm	FPM
3205995	N40MR020-PES1F	20 µm	FPM

Items supplied

– FluidAqua Mobil, ready-for-connection (without cover panel package, see Accessories).
– Suction and pressure hoses supplied with mobile version
– Control panel
– Key, square 6 mm (for switch cabinet and cover panel)
– Oil filter wrench for suction filter
– Technical documentation consisting of:
  - Operating and Maintenance Manual
  - Electrical circuit diagram
  - Test certificate
– EC declaration of conformity

Accessories

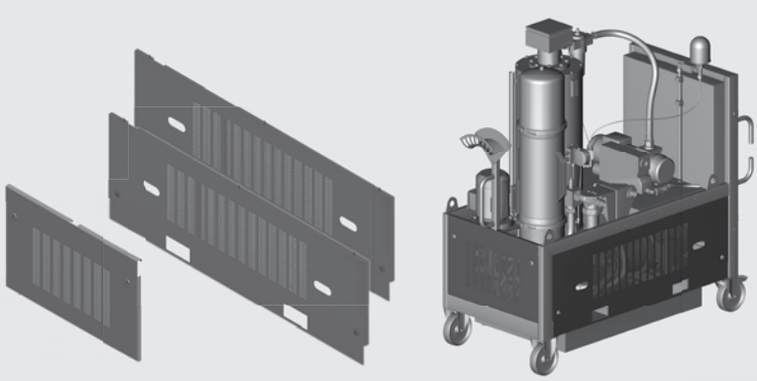
– Cover panel package: 2 x side sections, 1 x rear cover

FAM-25/45

Part number	Description
3334212	Cover panel FAM 25/45

FAM-60/75/95

Part number	Description
3334177	Cover panel FAM 60/75/95



Note

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Subject to technical modifications.

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OffLine Separator
OLS 10

Description

The OffLine Separator OLS is a dewatering unit for hydraulic oils, light gear oil and diesel fuels with densities of less than 950 kg/m³.

The dewatering process works according to the coalescence principle which means that tiny water droplets are combined into larger drops in the coalescing unit and separated from the oil by force of gravity.

The OLS is installed offline, but can also be used as a transfer unit for diesel fuel, with an optional pre-filter.

Applications

- Marine and offshore applications for sensitive systems such as steering gear, drives or deck machinery
- Diesel oil / fuel dewatering to reduce wear on engine injection nozzles and injection pumps
- Transfer lines to reduce downtimes
- Turbine lubrication oil

Advantages

- Cost-effective dewatering without causing deterioration in the oil
- Water separation is unlimited because no absorbent filter elements are used
- Stainless steel housing to prevent internal corrosion
- Simple connection as offline unit

Technical specifications

Hydraulic specifications	
Flow rate	5 l/min
Permitted fluids	Mineral oils to DIN 50524 Gear oils to DIN 51517, 51524 Diesel fuel
Fluid temperature	Mineral oil -10 ... 80 °C Diesel -10 ... 50 °C
Permitted viscosity range	15 ... 500 mm²/sec (pump type S, G) 2 … 8 mm²/sec (pump type GD)
Operating pressure	Maximum 6 bar
Permitted pressure at inlet	-0.4 … 0.6 bar (with pump) 0.5 … 2 bar (without pump)
Permitted pressure at water drain	Not pressurized
Housing material	Stainless steel 1.4301
Material of seal	NBR (FPM)
Inlet connection	G 1"
Outlet connection	G 1"
Connection for water drain	G ½"
Electrical data	
Supply voltage	See model code
Power consumption	Without heater ≈ 1 kW With heater max. 3 kW
External fuse required	16 amperes
Power cable, length	10 meters (only on options PKZ and FA2)
Protection class to DIN 40050	IP 54
General data	
Ambient temperature	-40 ... 70 °C
Storage temperature range	10 ... 40 °C
Relative humidity	Max. 80%, non-condensing
Weight	Small drip tray ≈ 80 Kg Large drip tray ≈ 150 Kg

Model code

OLS 10 / 5 - S - N - 20 - Z - BM - Z - Z - Z / V

Basic type
OLS = OffLine Separator

Size
10 = number of coalescing elements

Nominal flow rate
5 = 5 l/min

Pump type
Z = without pump
G = gear pump
GD = gear pump for diesel fuel
S = vane pump

Supply voltage
B = 480 V - 3 Ph
C = 380 V - 3 Ph
G = 440 V - 3 Ph
L = 115 V - 1 Ph
M = 230 V - 1 Ph*
N = 400 V - 3 Ph*
O = 460 V - 3 Ph
P = 575 V - 3 Ph
S = 500 V - 3 Ph
R = 415 V - 3 Ph
W = 230 V - 3 Ph*
X = other voltage (on request)
L60, M60, ...= operation at 60 Hz
Z = without motor
*) Standard in Europe according to
CENELEC HD472 S1 at 50 Hz

Element length
20 = coalescing element 20" – N20WRxxx

Pre-filter
1 = OLF 5/4 Toploader
Z = without pre-filter

Clogging indicator
BM = visual differential pressure indicator (VMxBM.1)
C = electrical differential pressure indicator (VMxC.0)
Z = without clogging indicator
E = VMF 0.6KO (pressure indicator)

Heater
1 = 1 kW heater
2 = 2 kW heater
Z = without heater

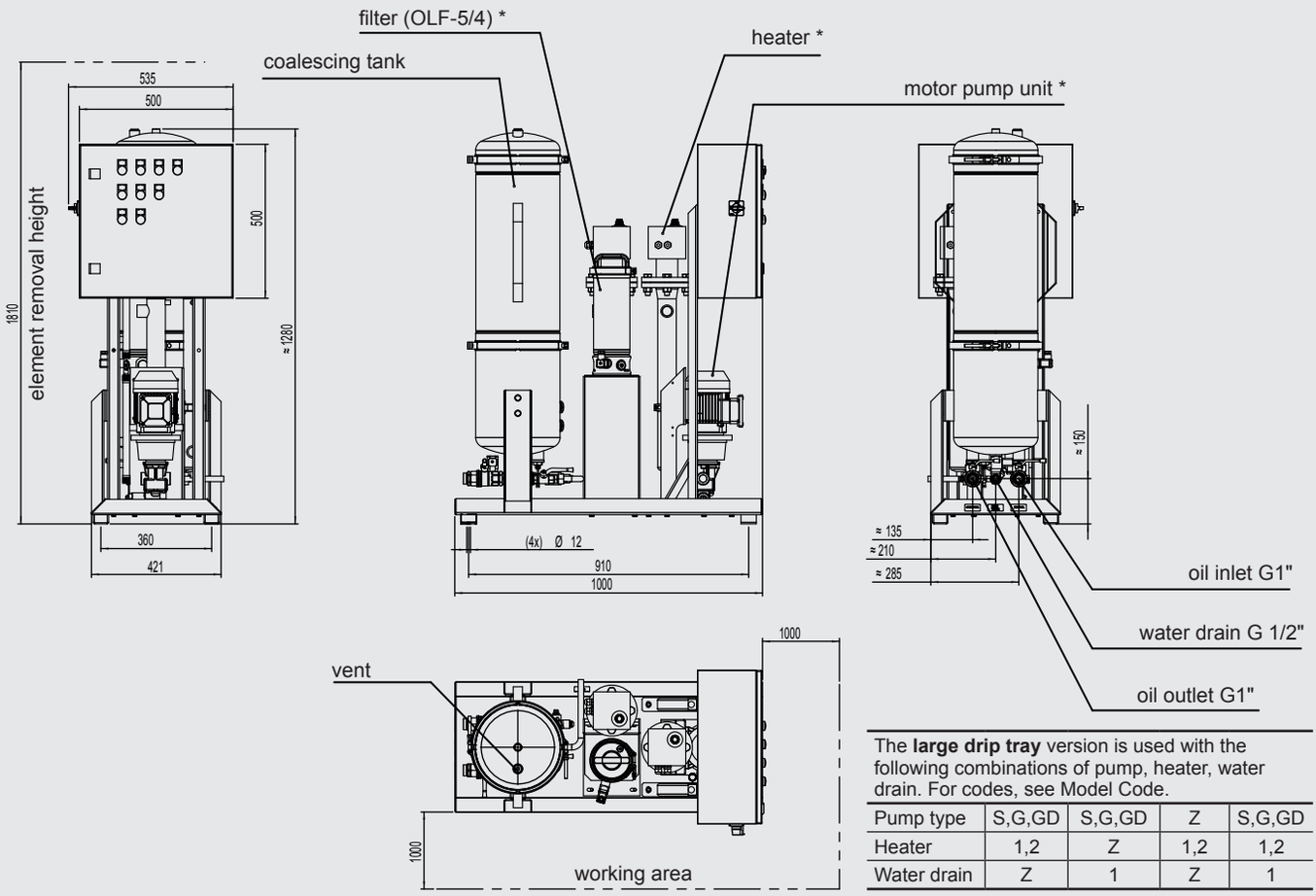
Water drain
1 = automatic
Z = manual

Measuring equipment
Z = without measuring equipment

Additional details
PKZ = On/Off switch with motor circuit breaker
FA2 = On/Off switch with motor circuit breaker and cut-off when filter is clogged.
Does **not** require neutral wire. All voltages. Clogging indicator C required.
V = Viton (FPM) seals

Dimensions (in mm)

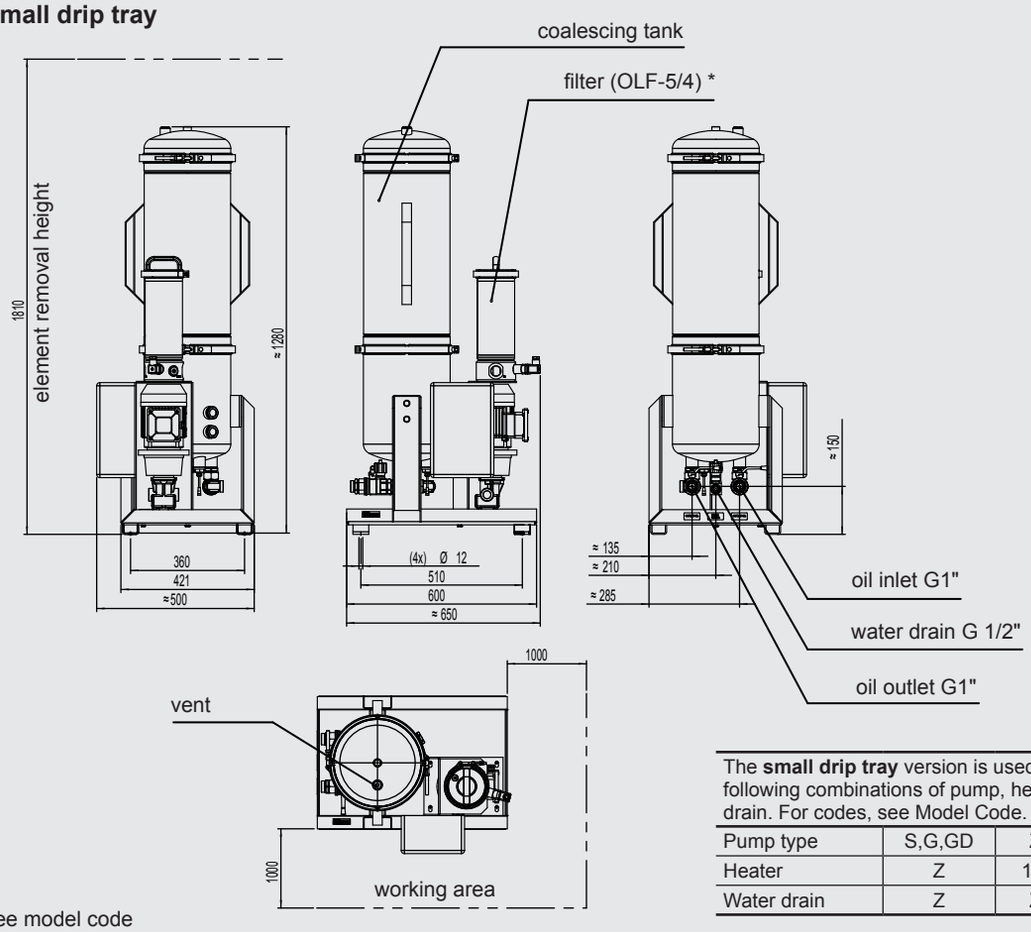
Dimensions depend on the type of OLS:
Dimensions with large drip tray



The **large drip tray** version is used with the following combinations of pump, heater, water drain. For codes, see Model Code.

Pump type	S,G,GD	S,G,GD	Z	S,G,GD
Heater	1,2	Z	1,2	1,2
Water drain	Z	1	Z	1

Dimensions with small drip tray



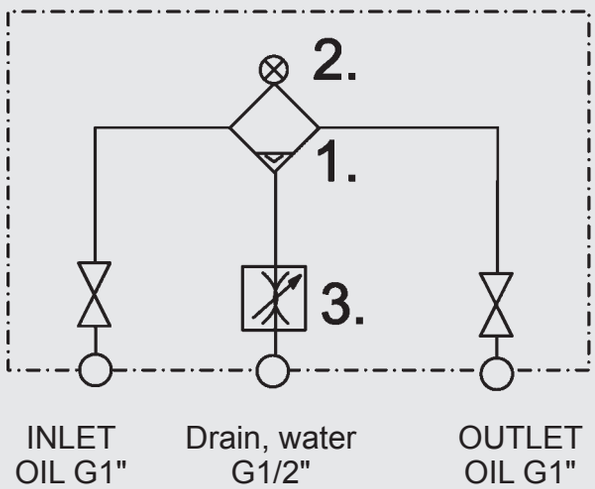
The **small drip tray** version is used with the following combinations of pump, heater, water drain. For codes, see Model Code.

Pump type	S,G,GD	Z	Z
Heater	Z	1,2	Z
Water drain	Z	Z	1

* optional equipment, see model code

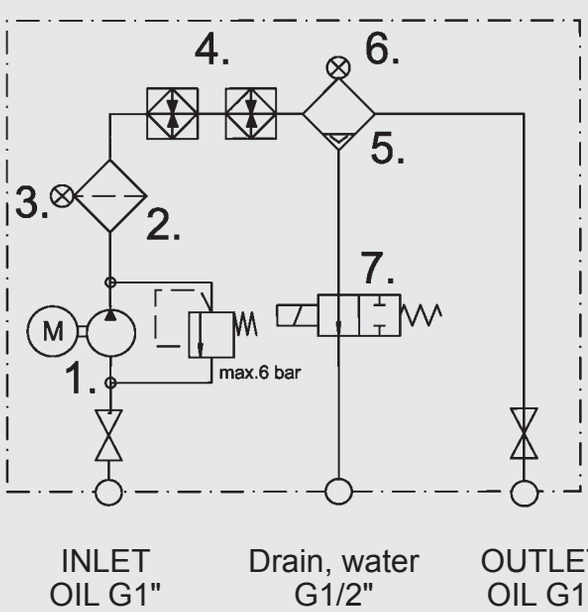
Hydraulic circuit diagram

OLS 10/5 (minimum equipment)



No.	Description
1.	Coalescing tank
2.	Clogging indicator on coalescing tank (differential pressure 0.8 bar)
3.	Manual water drain

OLS 10/5 (maximum equipment without measuring equipment)



No.	Description
1.	Motor pump unit
2.	Pre-filter (OLF-5/4)
3.	Clogging indicator on pre-filter (differential pressure 2 bar)
4.	Heater
5.	Coalescing tank
6.	Clogging indicator on coalescing tank (differential pressure 0.8 bar)
7.	Automatic water drain

Items supplied

– OLS
– Operating and maintenance instructions

Elements

Coalescing element:
– 3277940 - N20WR005-1F (5 µm)
– 3361569 - N20WR070-1F (70 µm)

The OLS 10 has 10 coalescing elements

Filter elements for pre-filter:
– 349494 - N5DM002 (2 µm)
– 3023508 - N5DM020 (20 µm)
– 3060493 - N5WHC025 (25 µm)

Recommendation:
– 2 µm pre-filter for N20WR005
– 20 µm or 25 µm pre-filter for N20WR070

Note

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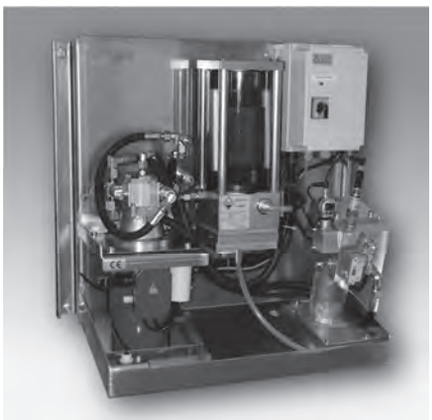


TransformerCare Unit

TCU Series
Filtration System

REDFOX

Description

The TransformerCare Unit TCU is a service unit designed to extend the operating life of oil-filled transformers and reactors.

The continuous degassing, dewatering and filtration of the insulating oil ensures that the oxygen content, water content and particle contamination in the transformer is kept low, the breakdown voltage of the insulating oil is increased and as a result the service life of the insulation is also increased. Typically the remaining service life of the transformer can be extended by a factor of three.

The flow rate is approx. 15 m³ / week, which prevents the formation of damaging turbulence in the transformer. The TCU is used throughout the life of the transformer, while the transformer is connected and in operation.

The volume of fault gases removed using the TCU corresponds to the gas formation rate in the transformer, which can be interpreted in accordance with DIN EN 60599* or DGA (Dissolved Gas Analysis). In addition, humidity and total gas content in the insulating oil can be monitored online, and an alarm can be triggered in good time in the event of significant changes.

Advantages

- Preserves the insulating property of the transformer oil
- Increased operating reliability
- Fault gas analysis is possible, similar to DGA
- Extends the remaining service life of the transformer by slowing down the process of cellulose ageing.

* DIN EN 60599 - Mineral-oil impregnated electrical equipment in service - Guide to the interpretation of dissolved and free gas analysis.

Technical specifications

General data	
Suitable for transformer sizes	5 ... 1100 MVA
Flow rate (50 Hz)	15 m³ / week for 24 hour operation
Degassing capacity	≈ 155 litres / 24 h for 10% gas content ≈ 14 litres / 24 h for 2% gas content
Dewatering capacity (adjusted to prevent excessive drying out of the cellulose insulation)	Temperature of medium 50 °C, 10 ppm water content ≈ 12 ml / 24 h for 10% gas content ≈ 1.12 ml / 24 h for 2% gas content Lower limit of water content ≈ 10 ppm. Possible to have additional cooling of the vacuum pump for better efficiency, if required.
Operating pressure	0 ... 35 bar (35 bar if outlet shut-off)
Sealing material	NBR (FPM)
Permitted pressure at suction port	0.1 ... 0.5 bar
Filtration rating	3 µm
Operating viscosity	5 ... 300 mm²/s
Fluid temperature range	-35 ... +90 °C
Ambient temperature range	-35 ... +50 °C
Storage temperature range	-20 ... +40 °C
Inlet / outlet connection	G 3/4" / G 3/8"
Mounting position	≈ 1 metre above the floor
Type of mounting	Mounting via 4 bore holes on the back of the unit
Ambient temperature	-35 ... 50 °C
Weight (empty)	≈ 60 kg
Dimensions (L x W x H)	395 x 785 x 750 mm
Relative humidity	Maximum 95%, non-condensing
Noise level max.	≈ 78 dBA, at distance of 1 m, 90° from the wall
Electrical data	
Voltage supply	(See model code)
Power consumption	≈ 550 Watt
Protection class to DIN 40050	IP 55

Model code

TCU - 1 - I - 1 - M - 3 - 3 - Z - Z - Z - 00 / –

Basic type
TCU = TransformerCare Unit

Size
1 ≈ 15 m³/week

Operating medium
I = Insulating oil, NBR seals, tested with insulating oil based on mineral oil (residues of the test oil remain in the unit after testing)

Mechanical design
1 = stationary unit

Voltage / Frequency / Power supply

A	=	400 V, 50 Hz, 3 Ph	I	=	500 V, 50 Hz, 3 Ph
B	=	415 V, 50 Hz, 3 Ph	K	=	480 V, 60 Hz, 3 Ph
C	=	200 V, 50 Hz, 3 Ph	L	=	220 V, 50 Hz, 3 Ph
D	=	200 V, 50 Hz, 3 Ph	M	=	230 V, 50 Hz, 1 Ph
E	=	220 V, 60 Hz, 3 Ph	N	=	575 V, 60 Hz, 3 Ph
F	=	230 V, 60 Hz, 3 Ph	O	=	460 V, 60 Hz, 3 Ph
G	=	380 V, 60 Hz, 3 Ph	X	=	Other voltage
H	=	440 V, 60 Hz, 3 Ph			

Filter size
3 = Type 3

Filtration rating
3 = 3 µm

Cooler
Z = without cooler

Additional equipment
GS = GasSampling Unit
Z = without GasSampling Unit

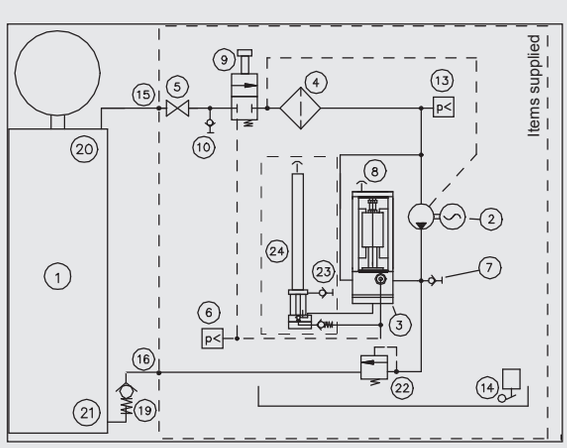
Measuring equipment
Z = without
A = AquaSensor AS 1000, sensor only connected hydraulically

Modification number
000 = the latest version is always supplied

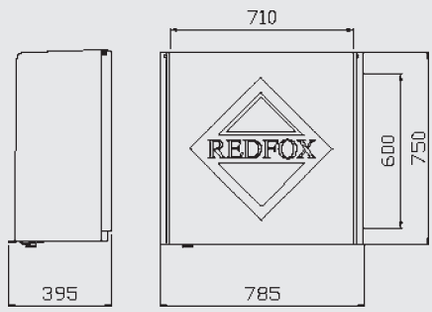
Supplementary details
V = FPM seals

Hydraulic Circuit

1. Transformer
2. Electric motor and pump
3. Redfox C
4. Particle filter
5. Manual shut-off valve
6. Vacuum pressure gauge
7. Test point
8. Air bleed valve
9. Automatic shut-off valve
10. Test point
13. Filter pressure switch
14. Float switch
15. Inlet
16. Outlet
19. Check valve 0.5 bar
20. Top connection
21. Bottom connection
22. Pressure relief valve
23. Gas test point (optional)
24. GasSampling Unit GSU (optional)



Dimensions (in mm)



Items supplied

– TCU
– Operating and maintenance manual
– Protective cover (weather protection)

Note

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Ion eXchange Unit
IXU 1/4 Series

Description

The IXU series of easy-to-service ion exchange units is designed to condition non-flam hydraulic and lubrication fluids based on phosphate esters (HFD-R).

They are effective in removing the acidic products of degradation resulting from hydrolysis and/or oxidation of the fluid as well as metal soaps present in the fluid.

The units are used offline with flow rates of up to ≈ 9 l/min on hydraulic and lubrication oil tanks.

Mobile and stationary versions of the IXU are available.

The IXU uses HYDAC's own Ion eXchange Elements (IXE) filled with ion exchange resin.

Special features

- Effective removal of acids and metal soaps.
- Free of extractable metals or particles, in contrast to fuller's earth or activated aluminium oxide.
- Units are easy to service.
- Available as a complete unit for oil service work, and as a modular system for retrofitting in existing offline circuits or for OEMs.

In addition we recommend that dewatering is carried out continuously using, for example, a FluidAqua Mobile FAM.

Advantages

- Reduction in functional problems, e.g. on servo valves
- Extended service life of the operating fluid
- Increased machine and system availability

Technical specifications

Hydraulic data *	
Neutralization number achievable	< 0.1 mg KOH / g
Typically, possible to use up to	max. TAN 1 mg KOH / g oil
Flow rate	IXU 1 ≈ 2.2 l/min IXU 4 ≈ 8.9 l/min
Fluid temperature range	+30 ... +60 °C
Operating pressure max.	8 bar
Permitted pressure at suction port N	-0.2 ... 1 bar
Viscosity range	15 ... 80 mm²/s
Permitted operating fluids	HFD-R Non-flam hydraulic fluids based on phosphate ester
Connections IN / OUT	½"
Pump type	Gear pump / without pump
Electrical data *	
Supply voltage	See model code
Electrical power consumption	0.25 ... 0.6 kW
External fuse required	16 A
Protection class to DIN 40050	IP 55
Ambient conditions	
Operating temperature range	0 ... +40 °C
Storage temperature range	0 ... +60 °C
Relative humidity	0 ... 80%, non-condensing
General data *	
Length of power cable	10 m (for versions PKZ, FA1, FA2)
Length of suction / pressure hose	5 m (for versions S5D5, SKDK)
Sealing material	FPM
Noise level at 1m	< 80 dB(A)
Weight (empty)	IXU 1 ≈ 70 kg IXU 4 ≈ 300 kg
Required fluid cleanliness	ISO 19/17/14 (ISO 4406:1999) 9A/9B/9C (SAE AS4059) We recommend that the IXU is only operated with the pre-filter available as an option, to guarantee the required fluid cleanliness.

* others on request

Model code

IXU - 4 - M - G - A - 1 - BM - Z /-S5D5-PKZ

Basic type
IXU = Ion eXchange Unit

Size
1 = 1 Ion eXchange element
IXE2xx ≈ 2.2 l/min
4 = 4 Ion eXchange elements
IXE2xx ≈ 8.9 l/min

Mechanical design
M = mobile
S = stationary

Pump type
G = gear pump with motor
Z = without pump

Voltage, frequency, power supply
A = 400 V, 50 Hz, 3 Ph
B = 415 V, 50 Hz, 3 Ph
C = 200 V, 50 Hz, 3 Ph
D = 200 V, 60 Hz, 3 Ph
E = 220 V, 60 Hz, 3 Ph
F = 230 V, 60 Hz, 3 Ph
G = 380 V, 60 Hz, 3 Ph
H = 440 V, 60 Hz, 3 Ph
I = 500 V, 50 Hz, 3 Ph
K = 480 V, 60 Hz, 3 Ph
L = 220 V, 50 Hz, 3 Ph
M = 230 V, 50 Hz, 1 Ph
N = 575 V, 60 Hz, 3 Ph
O = 460 V, 60 Hz, 3 Ph
X = other voltage (please specify)
Z = without

Pre-filter
1 = with pre-filter (OLF5 Toploader)
Z = without pre-filter

Clogging indicator
BM = differential pressure indicator – visual (VM2BM.1)
C = differential pressure indicator – electrical, required for versions FA1 and FA2 (VM2C.0)

Measuring equipment
AS = AquaSensor AS1000. Hydraulic connection only.
Additional equipment such as HYDAC HMG3000 or HMG500 is required for display and data storage.
Z = without measuring equipment

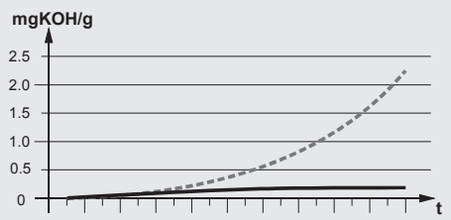
Additional details
S5D5 = suction/return line hose with lance, length = 5 metres
SKDK = suction/return line hose with threaded connection, length = 5 metres
PKZ = On/ Off switch with motor circuit breaker
FA1 = On/ Off switch with motor circuit breaker and cut-off when filter is clogged. Requires neutral wire. For voltages up to max. 240V, 1Ph, or max. 415V, 3Ph. Clogging indicator C or D3 is required.
FA2 = On/ Off switch with motor circuit breaker and cut-off when filter is clogged. Does not require neutral line. All voltages. Clogging indicator C required.

Sizing

Tank volume		Ion eXchange Unit
< 3,500 litres	=	IXU-1
3,500 – 15,000 litres	=	IXU-4
> 15,000 litres	=	2x IXU-4

Graph

Example of acidification in HFD fluids with and without Ion eXchange Unit:



without Ion eXchange Unit
with Ion eXchange Unit

Items supplied

– IXU with protective filter and additional equipment as per model code
– Operating Manual

Ion eXchange elements and filter elements for pre-filter and protective filter must be ordered separately.

Ion eXchange elements and filter elements

Ion eXchange element

IXE200:
removes acids and metal soaps - Part No. 3348961

IXE210:
removes metal soaps - Part No. 3416370

IXE220:
removes acids - Part No. 3464744

Filter elements for pre-filter and protective filter

N5DM005 (5µm) - Part No. 3068101
N5DM010 (10µm) - Part No. 3102924
One filter element per filter required.

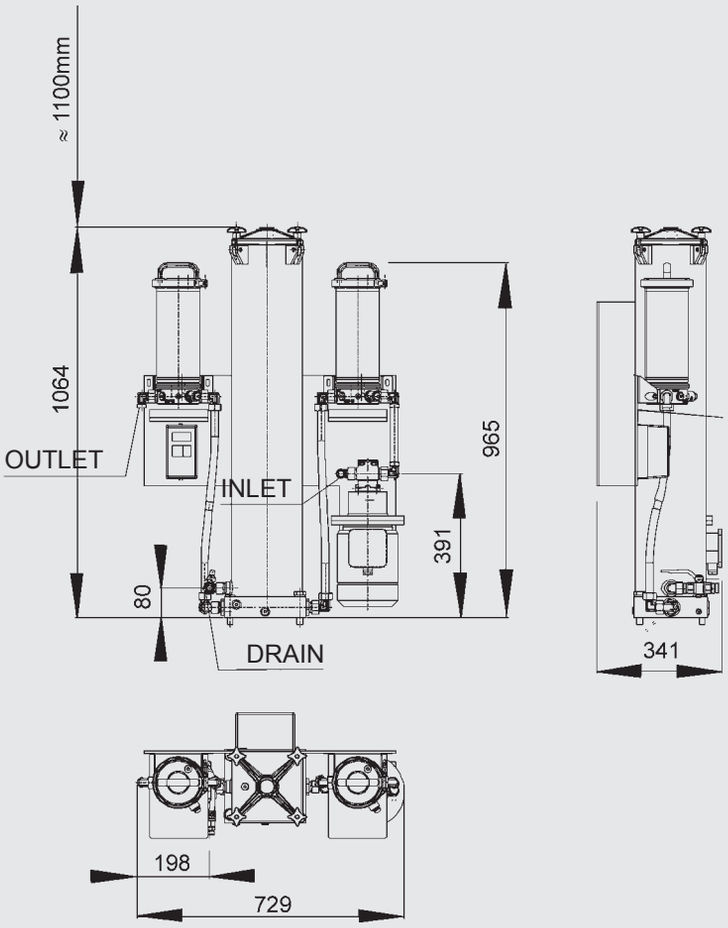
Example of required order quantity:

IXU- 4 -M-G-A -1-BM-Z /-S5D5-PKZ
4 x IXE200 element
2 x N5DM010
(for pre-filter and protective filter)

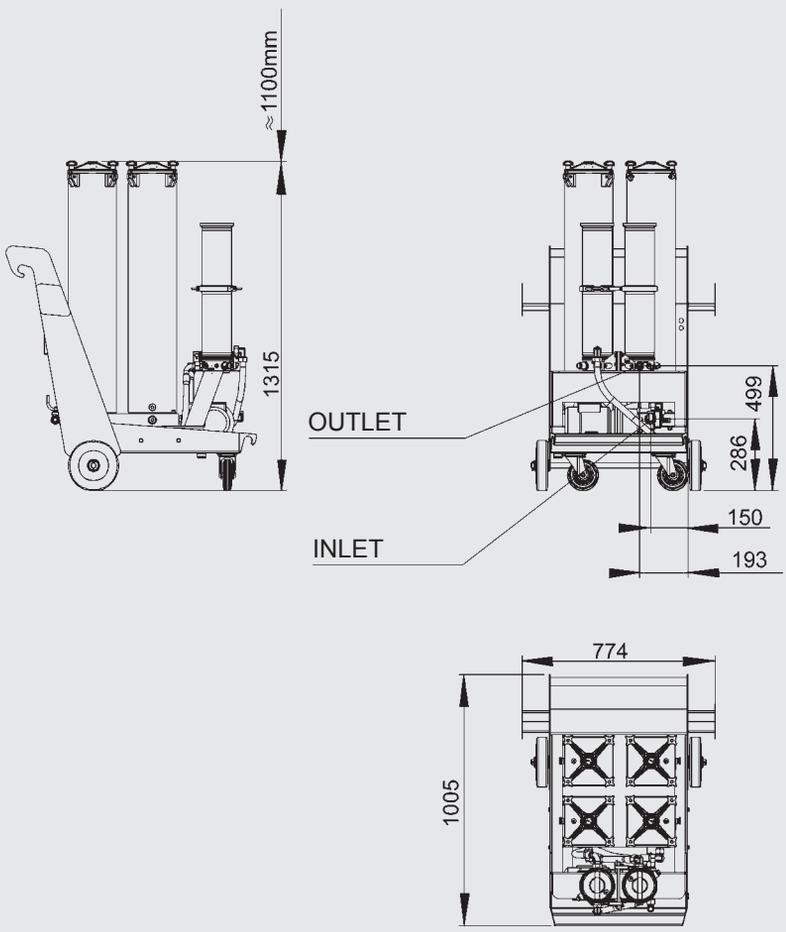
IXU- **4** -M-G-A -**Z**-BM-Z /-S5D5-PKZ
4 x IXE200 element
1 x N5DM010
(for protective filter only)

IXU- 1 -M-G-A -1-BM-Z /-S5D5-PKZ
1 x IXE200 element
2 x N5DM010
(for pre-filter and protective filter)

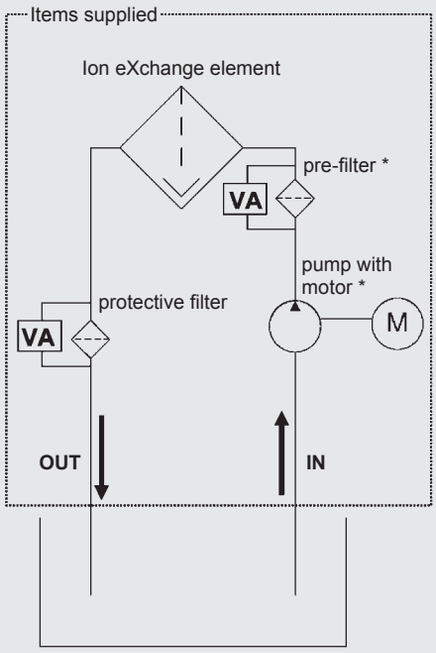
Dimensions of IXU1



Dimensions of IXU4



Hydraulic circuit diagram



VA = clogging indicator
* = optional, see model code

Note

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Subject to technical modifications.

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Flexmicron P
(Premium)

Description
The filter elements in the Flexmicron P (Premium) product line are heavy-duty elements using Pleat Technology, produced in melt-blown or high-quality glass fibre technology.

They are used particularly in applications requiring high levels of cleanliness.

Applications
- High-end industrial part washing systems (aqueous & hydrocarbon up to 100 °C)
- Flushing rigs (after part washing systems)
- Test rigs (fuel injection, braking and steering systems)
- Superfinishing with cooling lubricants (honing, grinding, turning, milling, deburring)
- Offline filtration in large hydraulic systems
- Offline filtration in lubrication systems
- Filling systems used in cleanliness applications
- Mining and metallurgy
- Metal-forming (e.g. hydroforming)

Special features
- ß-values up to 20,000
- Filtration efficiency up to 99.99%
- Filtration rating 1 ... 40 µm
- Very low starting Δp
- High differential pressure stability
- Excellent filtration efficiency, also under pulsation conditions (pressure and flow rate pulsation)
- Wide range of adapters
- Materials: Polyester, glass fibre
- Pleat technology
- Excellent fluid compatibility
- Standard element geometry

Technical specifications

General data	
Length	10", 20", 30", 40"
Filtration rating	1 ... 40 µm
$ß_x$-values	up to 20,000
Filtration efficiency	up to 99.99 %

Model code

N 40 FM-P 005 - PES 1 F

Element length
10 = 10"
20 = 20"
30 = 30"
40 = 40"

Element type
FM-P = Flexmicron P (Premium)

Filtration rating
001 = 1 µm
003 = 3 µm
005 = 5 µm
010 = 10 µm
020 = 20 µm
030 = 30 µm
040 = 40 µm

Filter material
PES = Polyester
GF = Glass fibre

End cap type
1 = plug-in adapter (1x 222 O-ring), flat end cap, element Ø 64 mm
2 = plug-in adapter (2x 222 O-ring), flat end cap, element Ø 64 mm
3 = plug-in adapter (2x 222 O-ring), flat end cap, element Ø 70 mm
5 = plug-in adapter (2x 222 O-ring), locating spigot, element Ø 70 mm
7 = bayonet (2x 226 O-ring), locating spigot, element Ø 70 mm
10 = open (gasket DOE), element Ø 64 mm
12 = Cuno adapter (hanging elements), element Ø 64 mm
others on request

Seal material
F = FPM (Viton)
N = NBR
E = EPDM

Other element types on request.

R (Resistance) factors

		Aqueous fluids	Oils	
		PES*	PES*	GF**
Filtration rating	1 µm	32.0	10.4	5.4
	3 µm	24.0	7.5	-
	5 µm	18.0	4.4	4.3
	10 µm	17.0	1.8	3.2
	20 µm	15.0	1.8	-
	30 µm	14.0	0.9	-
	40 µm	14.0	0.9	-

* ß > 5,000
** ß > 20,000

Maximum differential pressure Δp_{max} and permitted temperature range across the element:

Fluid temperature	Filter material
	PES
-10 ... 30 °C	8 bar
-10 ... 60 °C	6.5 bar
-10 ... 100 °C	5 bar

Sizing

The total pressure drop of the filter at a certain flow rate is the sum of the housing Δp and the element Δp. The housing pressure drop can be determined using the pressure drop curves. The pressure drop of the elements is calculated using the R factors.

The following calculation is based on clean filter elements.

$$\Delta p\ [mbar] = \frac{R \times V\ (mm^2/s) \times Q\ (l/min)}{n \times l\ (inch)}$$

R = R factor
V = Viscosity (mm²/s)
Q = Flow rate (l/min)
n = No. of elements
l = Element length (inch)

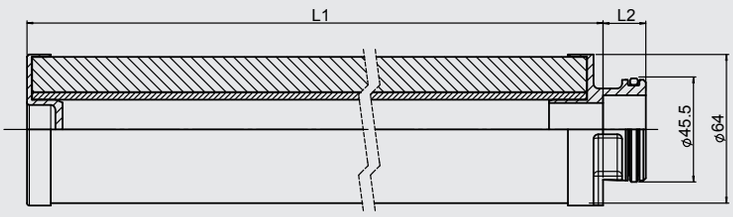
Max. permitted flow rate

Element length	Max. permitted flow rate
10"	20 l/min
13"	26 l/min
20"	40 l/min
30"	60 l/min
40"	80 l/min

Other flow rates on request.

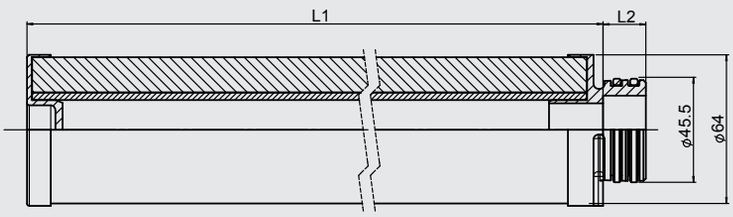
Dimensions of Flexmicron P Elements

Type 1: Plug-in adapter, 1x O-ring (-222), flat end cap



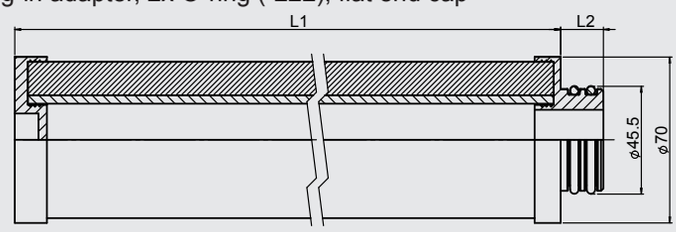
Designation	L1 in mm	L2 in mm
N10MR-P...	263	18
N13MR-P...	339	18
N20MR-P...	517	18
N30MR-P...	771	18
N40MR-P...	1025	18

Type 2: Plug-in adapter, 2x O-ring (-222), flat end cap



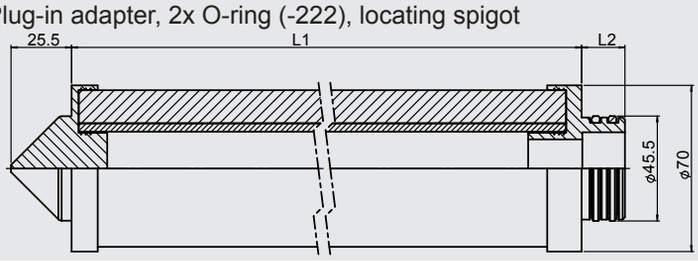
Designation	L1 in mm	L2 in mm
N10MR-P...	263	18
N13MR-P...	339	18
N20MR-P...	517	18
N30MR-P...	771	18
N40MR-P...	1025	18

Type 3: Plug-in adapter, 2x O-ring (-222), flat end cap



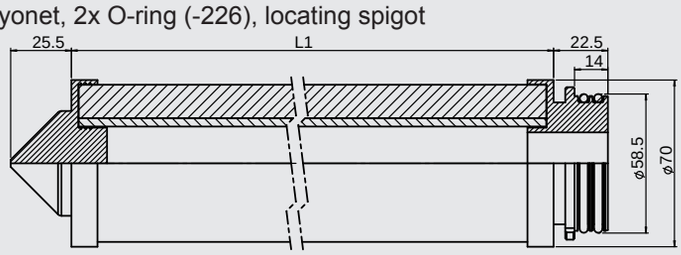
Designation	L1 in mm	L2 in mm
N10FM-P...	263	18
N13FM-P...	339	18
N20FM-P...	517	18
N30FM-P...	771	18
N40FM-P...	1025	18

Type 5: Plug-in adapter, 2x O-ring (-222), locating spigot



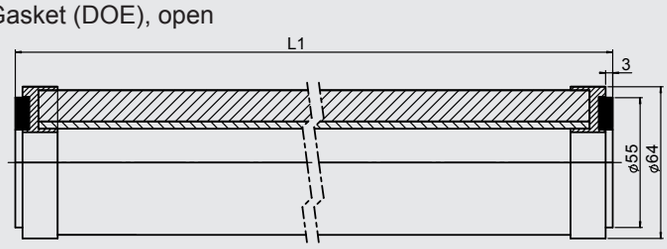
Designation	L1 in mm	L2 in mm
N10FM-P...	263	18
N13FM-P...	339	18
N20FM-P...	517	18
N30FM-P...	771	18
N40FM-P...	1025	18

Type 7: Bayonet, 2x O-ring (-226), locating spigot



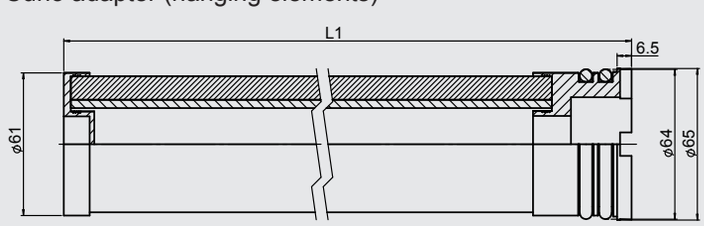
Designation	L1 in mm
N10FM-P...	241
N13FM-P...	317
N20FM-P...	495
N30FM-P...	749
N40FM-P...	1003

Type 10: Gasket (DOE), open



Designation	L1 in mm
N10MR-P...	254
N13MR-P...	330
N20MR-P...	508
N30MR-P...	762
N40MR-P...	1016
N40MR-P...-990	988

Type 12: Cuno adapter (hanging elements)



Designation	L1 in mm
N37FM-P...	977

Note

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Subject to technical modifications.

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Flexmicron S
(Standard)

Description
The filter elements in the Flexmicron S (Standard) product line are SpunSpray depth filter elements produced using melt-blown technology.

They are used particularly in applications where a high level of fluid cleanliness and material purity is required.

Applications
- Industrial part washing systems (aqueous up to 60 °C)
- Transmission test rigs, hydraulic test rigs
- Superfinishing with cooling lubricants
- Paints and coatings
- Cooling circuits on machines
- Filling systems
- Refineries, chemical industry
- Semiconductor industry
- Offline filtration in large hydraulic systems
- Offline filtration in lubrication systems

Special features
- Filtration rating 1 ... 90 µm
- Material purity
- Caps welded, not glued
- Wide range of adapters
- Good price/performance ratio
- Materials: Polypropylene, Polyamide
- SpunSpray technology, material not wound
- High level of cleanliness due to graded depth filter construction
- High contamination retention due to large depth effect of the filter material
- Excellent fluid compatibility
- Standard element geometry

Technical specifications

General data	
Length	10", 20", 30", 40"
Filtration rating	1 ... 90 µm
Filtration efficiency	99.8 %

Model code

N 40 FM-S 005 - PP 1 F

Element length
10 = 10"
20 = 20"
30 = 30"
40 = 40"

Element type
FM-S = Flexmicron S (Standard)

Filtration rating
001 = 1 µm
003 = 3 µm
005 = 5 µm
010 = 10 µm
020 = 20 µm
030 = 30 µm
040 = 40 µm
050 = 50 µm
070 = 70 µm
090 = 90 µm

Filter material
PP = Polypropylene
PA = Polyamide

End cap type
0 = compression ring (DOE), no cap or seal (Ø 63 mm)
1 = plug-in adapter (1x 222 O-ring), flat end cap (Ø 64 mm)
2 = plug-in adapter (2x 222 O-ring), flat end cap (Ø 64 mm)
10 = gasket (DOE) (Ø 63 mm)
13 = plug-in adapter (2x 222 O-ring), locating spigot (Ø 64 mm)
14 = bayonet (2x 226 O-ring), locating spigot (Ø 64 mm)
others on request

Seal material
F = FPM (Viton)
N = NBR
E = EPDM

Other element types on request.

R (Resistance) factors

		Aqueous fluids	
		PA	PP
Filtration rating	1 µm	274	321
	3 µm	116	186
	5 µm	42	132
	10 µm	15	99
	20 µm	11	54
	30 µm	6	16
	40 µm	3.8	12
	50 µm	1.9	10
	70 µm	1.1	8
	90 µm	0.6	6

Maximum differential pressure Δp_{max} and permitted temperature range at the element:

Fluid temperature	Filter material	
	PA	PP
-10..30 °C	7 bar	4 bar
-10...60 °C	5.5 bar	2 bar
-10...100 °C	3.5 bar	–

Sizing

The total pressure drop of the filter at a certain flow rate is the sum of the housing Δp and the element Δp. The housing pressure drop can be determined using the pressure drop curves. The pressure drop of the elements is calculated using the R factors.

The following calculation is based on clean filter elements.

$$\Delta p\ [mbar] = \frac{R \times V\ (mm^2/s) \times Q\ (l/min)}{n \times l\ (inch)}$$

R = R factor
V = Viscosity (mm²/s)
Q = Flow rate (l/min)
n = No. of elements
l = Element length (inch)

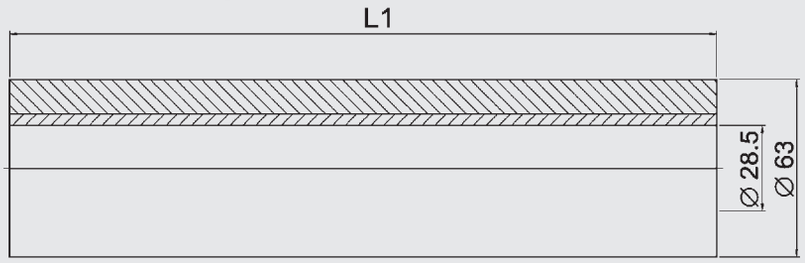
Max. permitted flow rate

Element length	Max. permitted flow rate
10"	15 l/min
20"	30 l/min
30"	45 l/min
40"	60 l/min

Other flow rates on request.

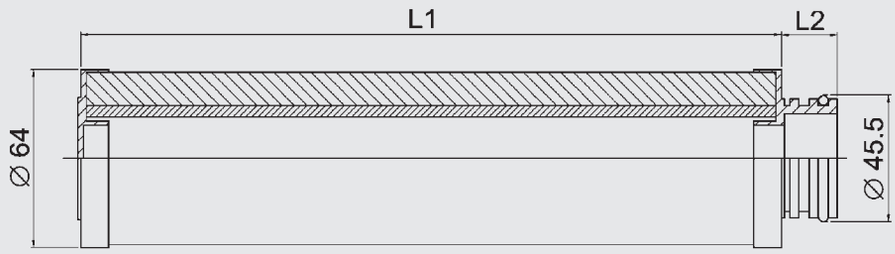
Dimensions of Flexmicron S Elements

Type 0: Compression ring (DOE), no cap or seal



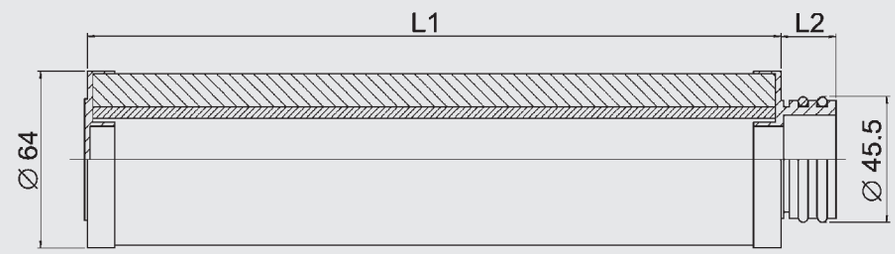
Designation	L1 in mm
N10FM-S...	254
N20FM-S...	508
N30FM-S...	762
N40FM-S...	1016

Type 1: Plug-in adapter, 1 x O-ring (-222), flat end cap



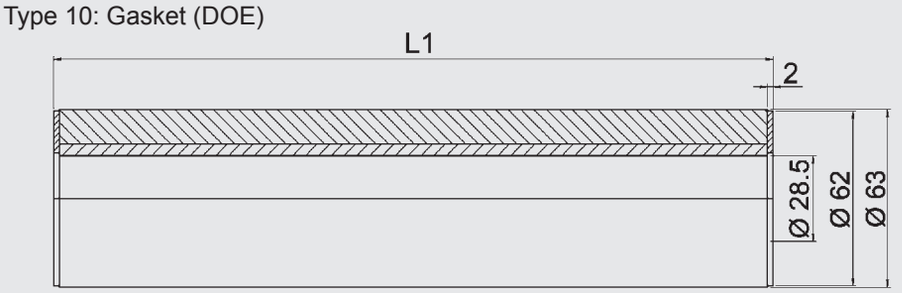
Designation	L1 in mm	L2 in mm
N10FM-S...	263	20
N20FM-S...	517	20
N30FM-S...	771	20
N40FM-S...	1025	20

Type 2: Plug-in adapter, 2 x O-ring (-222), flat end cap



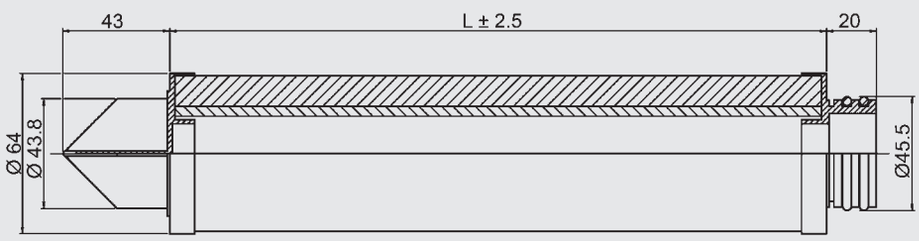
Designation	L1 in mm	L2 in mm
N10FM-S...	263	20
N20FM-S...	517	20
N30FM-S...	771	20
N40FM-S...	1025	20

Type 10: Gasket (DOE)



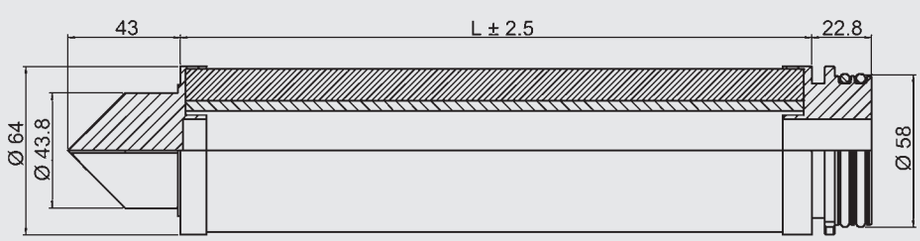
Designation	L1 in mm
N10FM-S...	254
N20FM-S...	508
N30FM-S...	762
N40FM-S...	1016

Type 13: Plug-in adapter, 2 x O-ring (-222), locating spigot



Designation	L1 in mm	L2 in mm
N10FM-S...	263	43
N20FM-S...	517	43
N30FM-S...	771	43
N40FM-S...	1025	43

Type 14: Bayonet, 2 x O-ring (-226), locating spigot



Designation	L1 in mm	L2 in mm
N10FM-S...	241	43
N20FM-S...	495	43
N30FM-S...	749	43
N40FM-S...	1003	43

Note

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Flexmicron E
(Economy)

Designation
The filter elements in the Flexmicron E (Economy) product line are depth filter elements produced using melt-blown technology.

They are used particularly in applications where an average level of fluid cleanliness and material purity is required and they provide a cost-effective solution.

Applications
- Industrial part washing systems (aqueous up to 60 °C)
- Paints and coatings
- Cooling circuits on machinery
- Refineries, chemical industry
- Processes using cooling lubricants

Special features
- Filtration efficiency 95 %
- Filtration rating 1 ... 90 µm
- Material purity
- End caps welded, not glued
- Wide range of adapters
- Cost-effective
- Materials: Polypropylene
- SpunSpray technology, material not wound
- Excellent fluid compatibility
- Standard element geometry
- Good level of cleanliness due to graded depth filter construction
- High contamination retention due to large depth effect of the filter material
- Manufactured without any contact with oil or silicon, so can be used to filter paints and coatings

Technical specifications

General data	
Length	10", 20", 30", 40"
Filtration rating	1 ... 90 µm
Filtration efficiency	95 %

Model code

N 40 FM-E 005 - PP 1 F

Element length
10 = 10"
20 = 20"
30 = 30"
40 = 40"

Element type
FM-E = Flexmicron E (Economy)

Filtration rating
001 = 1 µm
003 = 3 µm
005 = 5 µm
010 = 10 µm
020 = 20 µm
030 = 30 µm
040 = 40 µm
050 = 50 µm
070 = 70 µm

Filter material
PP = Polypropylene

End cap type
0 = compression ring (DOE), no cap or seal (Ø 63 mm)
1 = plug-in adapter (1x 222 O-ring), flat end cap (Ø 64 mm)
2 = plug-in adapter (2x 222 O-ring), flat end cap (Ø 64 mm)
10 = gasket (DOE) (Ø 63 mm)
13 = plug-in adapter (2x 222 O-ring), locating spigot (Ø 64 mm)
14 = bayonet (2x 226 O-ring), locating spigot (Ø 64 mm)
others on request

Seal material
F = FPM (Viton)
N = NBR
E = EPDM

Other types of element on request.

R (Resistance) Factors

		Aqueous fluids
		PP
Filtration rating	1 µm	37
	3 µm	29
	5 µm	20
	10 µm	11
	20 µm	8
	30 µm	6.8
	40 µm	5.4
	50 µm	4.2
	70 µm	3.1

Maximum differential pressure Δp_{max} and permitted temperature range at the element:

Fluid temperature	Filter material
	PP
-10..30 °C	4 bar
-10...60 °C	2 bar
-10...100 °C	–

Sizing

The total pressure drop of the filter at a certain flow rate is the sum of the housing Δp and the element Δp. The housing pressure drop can be determined using the pressure drop curves. The pressure drop of the elements is calculated using the R factors.

The following calculation is based on clean filter elements.

$$\Delta p\ [mbar] = \frac{R \times V\ (mm^2/s) \times Q\ (l/min)}{n \times l\ (inch)}$$

R = R factor
V = Viscosity (mm²/s)
Q = Flow rate (l/min)
n = No. of elements
l = Element length (inch)

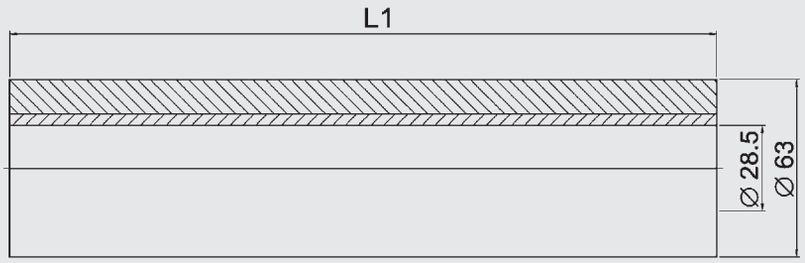
Max. permitted flow rate

Element length	Max. permitted flow rate
10"	15 l/min
20"	30 l/min
30"	45 l/min
40"	60 l/min

Other flow rates on request.

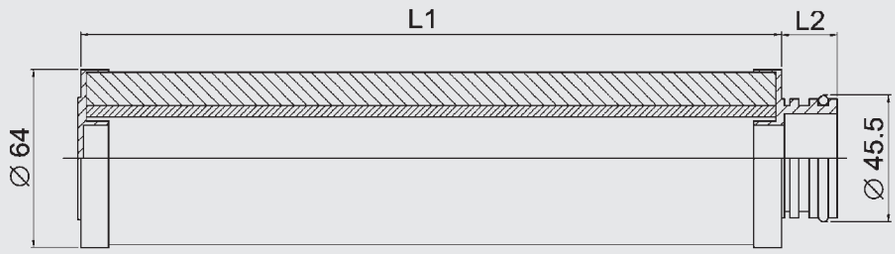
Dimensions of Flexmicron E Elements

Type 0: Compression ring (DOE), no cap or seal



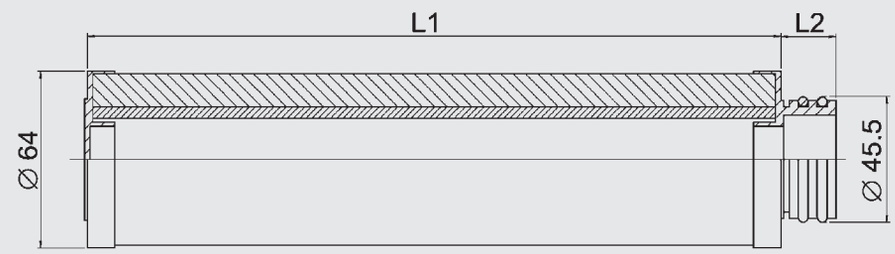
Designation	L1 in mm
N10FM-E...	254
N20FM-E...	508
N30FM-E...	762
N40FM-E...	1016

Type 1: Plug-in adapter, 1 x O-ring (-222), flat end cap



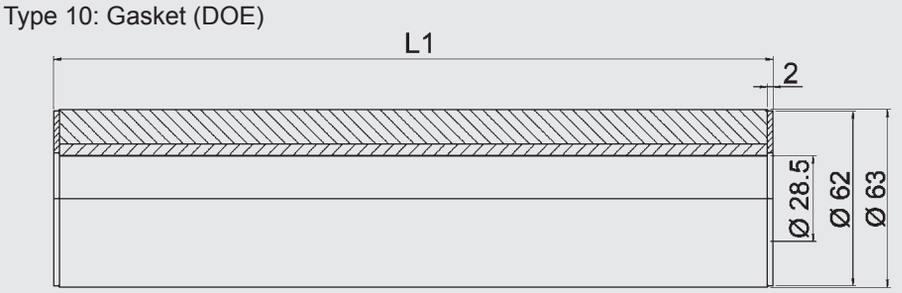
Designation	L1 in mm	L2 in mm
N10FM-E...	263	20
N20FM-E...	517	20
N30FM-E...	771	20
N40FM-E...	1025	20

Type 2: Plug-in adapter, 2 x O-ring (-222), flat end cap



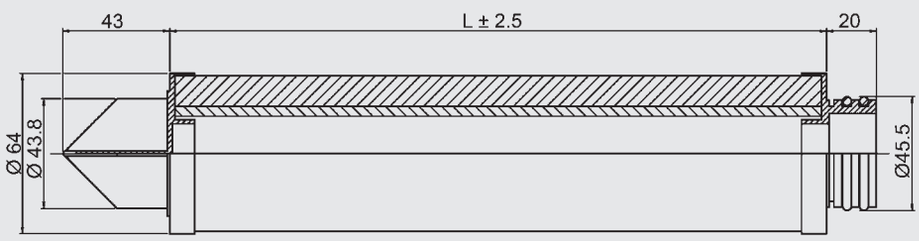
Designation	L1 in mm	L2 in mm
N10FM-E...	263	20
N20FM-E...	517	20
N30FM-E...	771	20
N40FM-E...	1025	20

Type 10: Gasket (DOE)



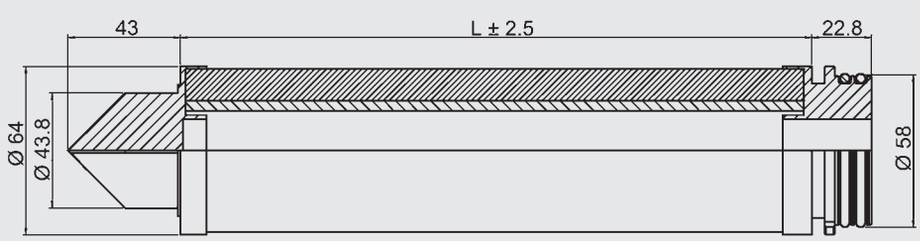
Designation	L1 in mm
N10FM-E...	254
N20FM-E...	508
N30FM-E...	762
N40FM-E...	1016

Type 13: Plug-in adapter, 2 x O-ring (-222), locating spigot



Designation	L1 in mm	L2 in mm
N10FM-E...	263	43
N20FM-E...	517	43
N30FM-E...	771	43
N40FM-E...	1025	43

Type 14: Bayonet, 2 x O-ring (-226), locating spigot



Designation	L1 in mm	L2 in mm
N10FM-E...	241	43
N20FM-E...	495	43
N30FM-E...	749	43
N40FM-E...	1003	43

Note

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Conditioning Module Reservoir Extraction
CM-RE

Description
The Conditioning Module Reservoir Extraction CM-RE is designed as an accessory to the CS ContaminationSensors and the FCU FluidControl Units.
The CM-RE is a self-priming motor-pump unit that makes it possible for the CS/FCU to measure oil cleanliness in unpressurized reservoirs, tanks or leakage lines.

The oil to be analyzed is drawn through the suction strainer at the inlet port. The gear pump supplies the oil at a maximum pressure of 60 bar (870 psi) to the pressure port so that it can be analyzed by the CS / FCU.

The pressure relief valve relieves any positive pressure via connection (T) as leakage oil.

For modules with a pump with increased inlet pressure (CM-RE-2...), internal leakage oil is drained from the pump via the separate LEAKAGE connection.

Applications
- Hydraulic and lubrication systems

Advantages
- Motor-pump unit to supply CS/FCU
- Optimum flow rate for carrying out measurements

Technical specifications

General data		
Temperature of fluid	0 ... 70 °C (32 ... 158 °F)	
Ambient temperature	0 ... 40 °C (32 ... 104 °F)	
Relative humidity	max. 90%, non-condensing	
Weight	≈ 8.5 kg	
Hydraulic specifications	**CM-RE-1-x-x**	**CM-RE-2-x-x**
Permitted pressure at inlet (IN)	- 0.4 bar ... 0.5 bar	- 0.4 bar ... 120 bar
Max. pressure at outlet (P)	30 bar* / 60 bar*	30 bar* / 60 bar*
Pump type	Gear pump	Gear pump
Max. suction height	500 mm	500 mm
Sealing material	NBR / FPM*	NBR / FPM*
Inlet (IN)	G ¼“	G ¼“
Outlet (P)	G ¼“	G ¼“
Outlet (T)	G ¼“	G ¼“
Leakage oil (LEAKAGE)	–	G ¼“

*) Depending on model

Electrical data CM-RE-x-x-W/N/X60/O60		
Voltage (delta circuit)	230 V, 50 Hz, 3 Ph	265 V, 60 Hz, 3 Ph
Voltage (star circuit)	400 V, 50 Hz, 3 Ph	460 V, 60 Hz, 3 Ph
Current consumption	1.23 A (γ) / 0.71 A (Δ)	1.18 A (γ) / 0.68 A (Δ)
Power consumption	0.18 kW	0.21 kW
Duty	100%	100%
Revolutions per minute	1425 rpm	1710 rpm
Protection class	IP55	IP55
Insulation class	F	F
Viscosity range	10 ... 3000 mm²/s	10 ... 3000 mm²/s
Total flow rate in ml/min	CM-RE-1 ≈ 90 CM-RE-2 ≈ 180	CM-RE-1 ≈ 110 CM-RE-2 ≈ 220
Weight	≈ 4.5 kg	≈ 4.5 kg
Electrical data CM-RE-x-x-N/AB/N60/AB60		
Voltage (delta circuit)	400 V, 50 Hz, 3 Ph	400 V, 60 Hz, 3 Ph
Voltage (star circuit)	690 V, 50 Hz, 3 Ph	690 V, 60 Hz, 3 Ph
Current consumption	0.71 A (γ) / 0.41 A (Δ)	0.57 A (γ) / 0.33 A (Δ)
Power consumption	0.18 kW	0.18 kW
Duty	100%	100%
Revolutions per minute	1425 rpm	1755 rpm
Protection class	IP55	IP55
Insulation class	F	F
Viscosity range	10 ... 3000 mm²/s	10 ... 3000 mm²/s
Total flow rate in ml/min	CM-RE-1 ≈ 90 CM-RE-2 ≈ 180	CM-RE-1 ≈ 110 CM-RE-2 ≈ 220
Weight	≈ 4.5 kg	≈ 4.5 kg
Electrical data CM-RE-x-x-U		
Voltage	max. 24 V DC	
Current consumption	max. 3.0 A (S4)	
Power consumption	32 W	
Duty	100% (max. 1.75 A)	
Revolutions per minute	depending on voltage max. 3700 rpm	
Protection class	IP20	
Insulation class	E	
Viscosity range	10 ... 350 mm²/s (S4)	
Total flow rate	CM-RE-1 ≈ 220 ml/min CM-RE-2 ≈ 440 ml/min (at max. voltage/rpm)	
Weight	≈ 2.4 kg	
Electrical data CM-RE-x-x-U170		
Voltage	24 V DC	
Current consumption	max. 20 A	
Power consumption	170 W	
Duty	100% (max. 5A)	
Revolutions per minute	depending on voltage max. 4200 rpm	
Protection class	IP44	
Insulation class	B	
Viscosity range	10 ... 350 mm²/s	
Total flow rate	CM-RE-1 ≈ 250 ml/min CM-RE-2 ≈ 500 ml/min (at max. voltage/rpm)	
Weight	≈ 3.9 kg	

Model code

CM - RE - 1 - 0 - W/N/X60/O60 - Z

Designation
CM = ConditioningModule

Type
RE = Reservoir Extraction

Pump
1 = Pump (standard)
2 = Pump (increased inlet pressure, with separate leakage line)

Pump protection
0 = Pump protection 30 bar
1 = Pump protection 60 bar (only for CS 1000)

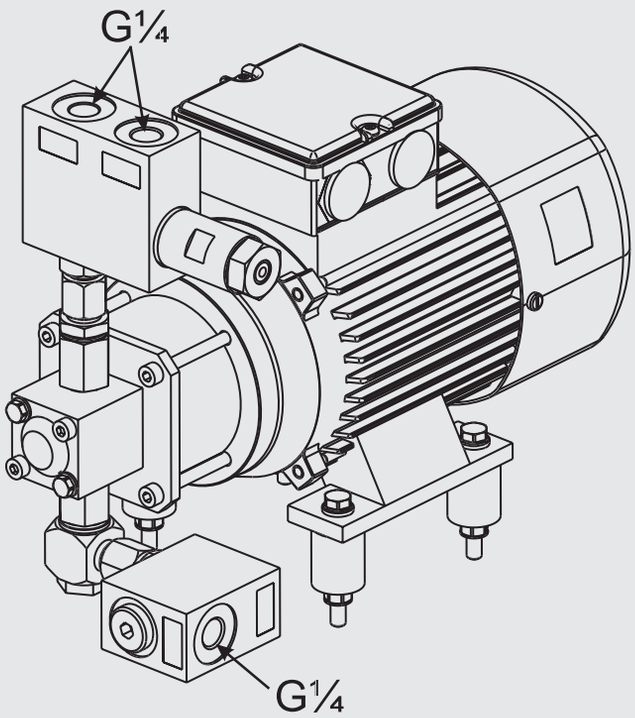
Supply voltage**

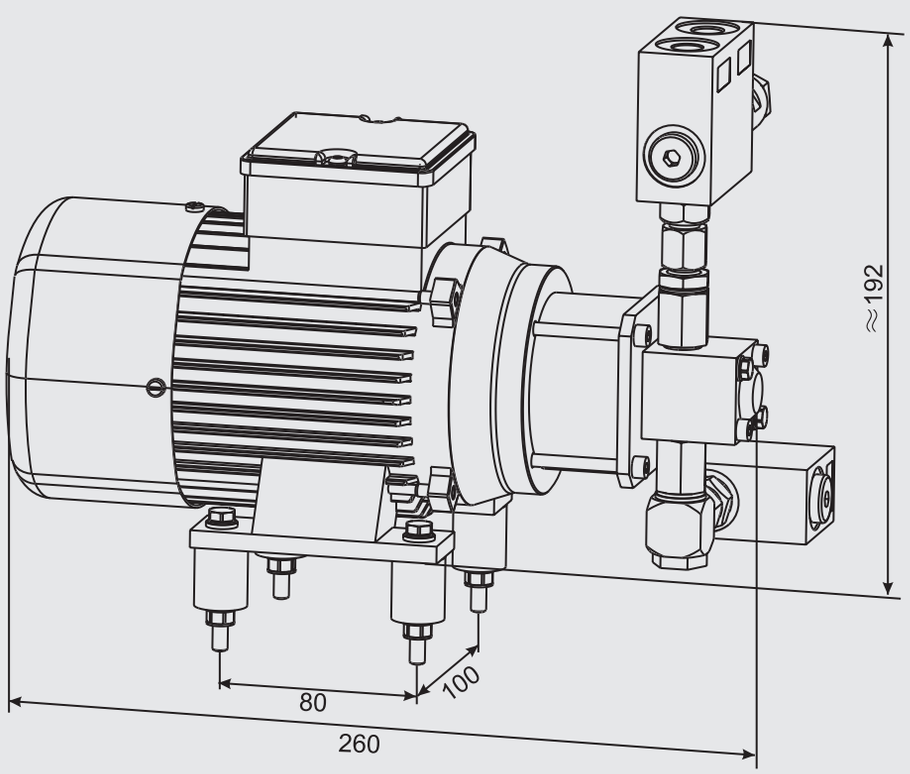
W/N/X60/O60	=	230 V, 50 Hz, 3Ph / 265 V, 60 Hz, 3Ph, Δ 400 V, 50 Hz, 3Ph / 460 V, 60 Hz, 3Ph, γ
N/AB/N60/AB60	=	400 V, 50 Hz, 3Ph / 400 V, 60 Hz, 3Ph, Δ 690 V, 50 Hz, 3Ph / 690 V, 60 Hz, 3Ph, γ
U	=	24 V DC, 32 W
U170	=	24 V DC, 170 W

**Other voltages on request

Modification
O = with adjustable throttle valve, pressure gauge and connection hose for pressure gauge
Z = without accessories

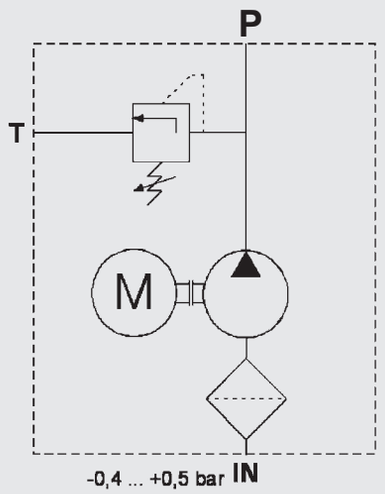
Dimensions (3-phase model)



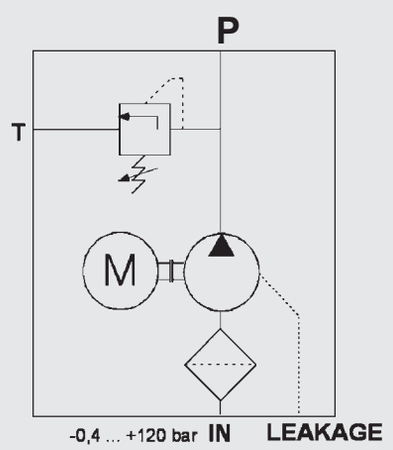


Hydraulic circuit diagram

CM-RE-1...

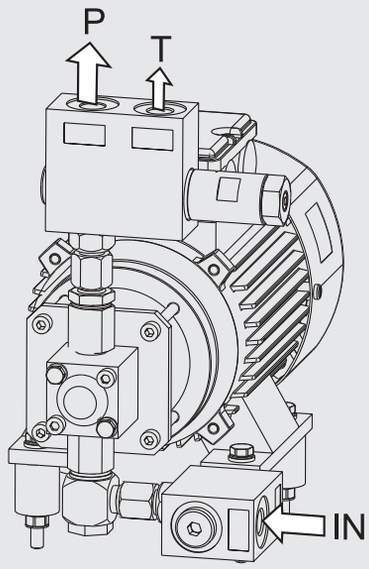


CM-RE-2...
(increased inlet pressure, with leakage oil line)

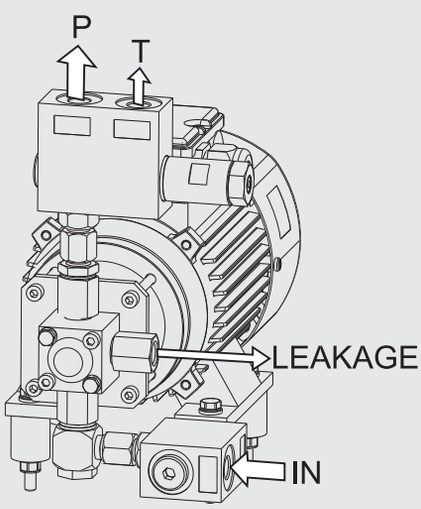


Hydraulic connection

CM-RE-1...



CM-RE-2...



IN	=	**suction connection**
P	=	**pressure connection**
T	=	**unpressurized return line**
LEAKAGE	=	**leakage / unpressurized return line**

(3-phase model only is shown. The connections of the DC model have the same configuration.)

Notes on piping / hoses

In order to keep the pressure drop as low as possible, use as few threaded connections as possible.

The pressure drop in a hydraulic line depends on:

- Flow rate
- Kinematic viscosity
- Dimensions of pipe
- Density of medium

It can be estimated for hydraulic oils as follows:

$$\Delta p\ [bar] \approx 6.8 \times \frac{L}{d^4} \times Q \times \upsilon \times \rho$$

This applies to straight pipe runs and hydraulic oils. Additional threaded connections and pipe bends increase the pressure differential.

Ensure that the difference in height between the unit and the oil level is as small as possible.

Hoses must be suitable for suction pressures of at least -0.5 bar.

Constrictions in connecting pipes must be avoided since they reduce capacity and increase the risk of cavitation.

The nominal bore of the connecting hoses/pipes must be at least as large as the inlet port sizes.

NOTE:

The maximum pressure across the IN suction port must be:

- for CM-RE-1 … = -0.4 bar ... 0.5 bar
- for CM-RE-2 … = -0.4 bar ... 120 bar

Note

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Small Filtration Kit
SFK

Description
The Small Filtration Kit SFK is a small filtration unit complete with motor pump unit for filtering fluids based on mineral oil.

With a flow rate of 0.4 l/min and an inline filter size LF60 it is used in conjunction with particle counters in laboratories and workshops.

The SFK is ideal for cleaning mineral oils being used as flushing fluids for particle counters such as the ALPC or FCU from Hydac.

Applications
- Laboratories
- Workshops

Advantages
- Complete kit including one 3 µm filter element and Tygothane tubing
- Plug & Work
- Flow rate in appropriate range

Technical specifications

Max. suction height	1 m
Flow rate	0.4 l/min at 1,500 rpm (4.3 mm²/s, 10 bar)
Permitted viscosity range	1 ... 350 mm²/s
Hydraulic connection (IN, OUT)	Hose nipple
Material of seal	NBR
Fluid temperature range	0 ... +70 °C / +32 ... +158 °F
Ambient temperature range	-20 ... +70 °C / -4 ... +158 °F
Storage temperature range	-40 ... +80 °C / -40 ... +176 °F
Relative humidity	Max. 95 %, non-condensing
Supply voltage	As per model code
Power consumption	180 W for type M
Weight	≈ 7.5 kg

Spare parts

Part no.	Description
3494773	Replacement tubing 1m incl. crimp clip
1260901	Filter element 3 µm (0060 D 003 BN4HC)

Model code

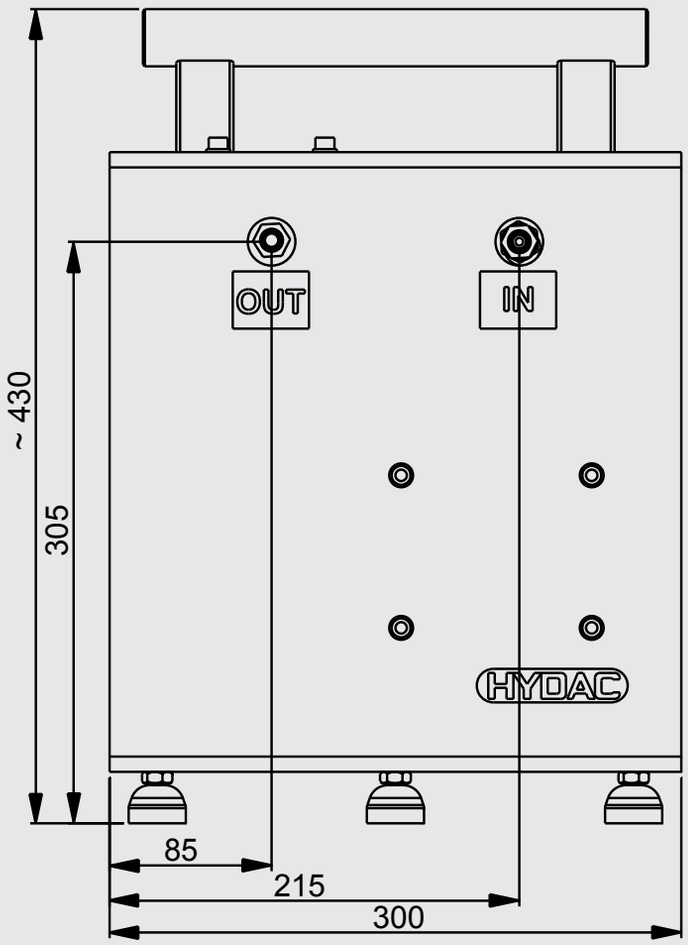
SFK 0 M

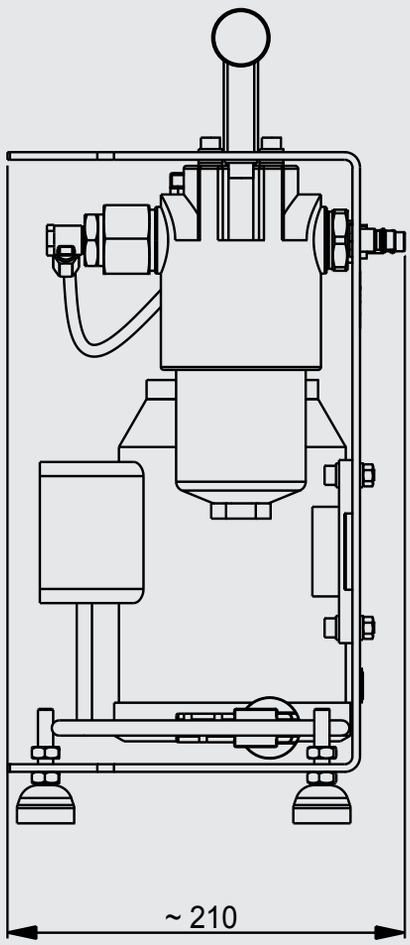
Type
SFK = Small Filtration Kit

Media
O = based on mineral oil

Supply voltage
K = 110 V / 60 Hz
M = 230 V / 50 Hz

Dimensions





Note

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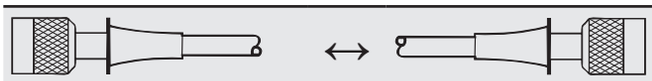
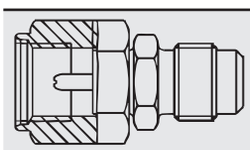
Hydraulic Accessories

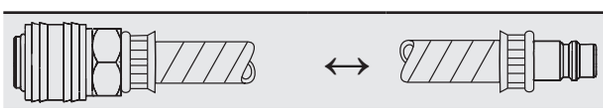
Test hose (high pressure)

			Length	Part No.
				
1604	DN4	1604	1 m	6015331
1604	DN4	1604	2 m	6001212
1604	DN4	1620	1 m	6052790
1604	DN4	1620	2 m	349150
1604	DN4	1620	5 m	1251557
1620	DN2	1620	1 m	623634
1620	DN2	1620	1.5 m	682858
1620	DN2	1620	2 m	682859

Adapter

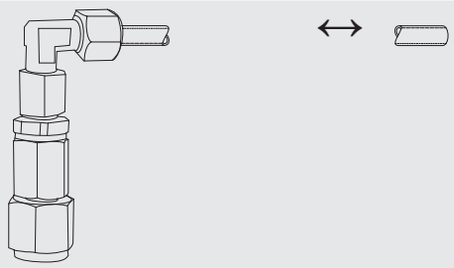
			Part No.
			
1615	↔	1620	629636
female		male	

Low pressure hose (suction/return line hose)

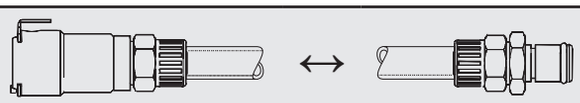
			Length		Part No.
					
Female coupling	DN7	Male coupling			
	DN7		0.6 m	PVC	1204401
	DN7		1 m	PVC	3300054
	DN7		2 m	PVC	349151
	DN7		5 m	PVC	1251558
	DN7		2 m	PA [1]	349434
	DN7		5 m	PUR	3348206

[1] only for HFD-R fluids

Suction hose



			Length	Part No.
1604	DN6	open end	0.3 m	3297276
1604	DN6	open end	0.6 m	3411391
1604	DN6	open end	1.5 m	3325744

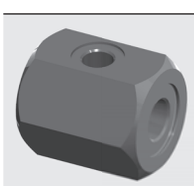


			Length	Part No.
Female coupling	DN6	Male coupling	0.25 m	3068209
Female coupling	DN6	Male coupling	1.0 m	3036098

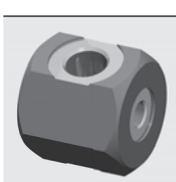
Pressure gauge kit

	Part No.
0 - 40 bar → 1604 / 1620	3491771
0 - 60 bar → 1604 / 1620	3491773
0 - 400 bar → 1604 / 1620	3491974

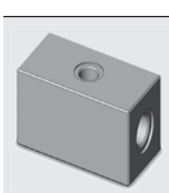
Mounting block, AS1000 / HLB



	Part No.
Mounting block, AS1000 IN: G 1/4" OUT: G 1/4"	3182134



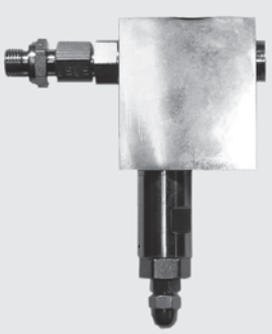
	Part No.
Mounting block, AS1000 IN: G 1/2" OUT: G 1/2"	3436505



	Part No.
Mounting block, HLB IN: G 1" OUT: G 1"	3426108

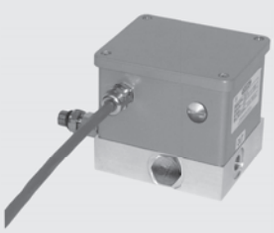
ConditioningModule Strainer [CM-S]			Part No.
	Application	Inlet CS: protective filter 400 µm (cone strainer)	3194913
	IN	G ¼ (female thread)	
	OUT	G ¼ (male thread; for screwing directly into the inlet of the CM-I)	
	Pressure range	up to 350 bar	
	Setting range	not adjustable	
	Permitted viscosity range	1 ... 1000 mm²/s	
	Items supplied	CM-S	

ConditioningModule Inlet [CM-I]			Part No.
	Application	Inlet CS: Stabilizes pressure fluctuations across the inlet of the CS by opening the return line via the adjustable pressure relief valve. A max. of 600 ml/min will be drawn off the main system.	3226048
	IN	Minimess test connection 1604 (in connection G ¼)	
	OUT	Threaded connection with male thread G ¼ for screwing directly into the inlet of the CS Return line: DN7 male connection (in connection G ¼)	
	Pressure range	up to 350 bar	
	Setting range	0 ... 30 bar (DB4E)	
	Permitted viscosity range	1 ... 1000 mm²/s	
	Connection	G1/4 for pressure gauge	
	Items supplied	CM-I , Return line hose 2m	

ConditioningModule Outlet [CM-O]			Part No.
	Application	Outlet CS: Suppresses air bubbles by pressurizing the test line and limits the flow during operation of the CS in bypass mode or with separate pump (CM-RE)	3226051
	IN	Threaded connection with male thread G ¼ for screwing directly into the outlet of the CS	
	OUT	DN7 male connection (in port G ¼)	
	Pressure range	up to 350 bar	
	Setting range	0 ... 30 bar (DB4E) Recommendation: 5 ... 10 bar (for hydraulic oils) 20 ... 25 bar (for lubrication oils)	
	Permitted viscosity range	1 ... 1000 mm²/s	
	Connection	G1/4 for pressure gauge	
	Items supplied	CM-O , Return line hose 2m	

ConditioningModules

ConditioningModule Flow Control [CM-FC]			Part No.
	Application	Outlet CS 2000: Proportional control of the flow using separate flow rate sensor which is not sensitive to contamination.	3226053
	IN	Threaded connection with male thread G ¼ for screwing directly into the outlet of the CS	
	OUT	Connection G ¼ (female thread)	
	Pressure range	up to 40 bar	
	Setting range	not adjustable	
	Permitted viscosity range	10 ... 1000 mm²/s	
	Note	Only available when ordering a CS 2xxx-1-U/-4-1. When using the CM-FC, the digital outputs (RS232, RS485 or ethernet) are no longer available.	
	Items supplied	CM-FC, Connection cable	

ConditioningModule Fluid Sensor [CM-FS]			Part No.
	Application	Outlet CS 2000: separate flow rate sensor.	3264341
	IN	Threaded connection with male thread G ¼ for screwing directly into the outlet of the CS	
	OUT	Connection G ¼ (female thread)	
	Pressure range	up to 40 bar	
	Setting range	not adjustable	
	Permitted viscosity range	10 ... 1000 mm²/s	
	Note	Only available in conjunction with an order for a CS 2xxx	
	Items supplied	CM-FS, Connection cable	

Condition Module Reservoir-Extraction CM-RE

The Condition Module Reservoir-Extraction CM-RE is designed as an accessory to the CS ContaminationSensors and the FCU FluidControl Units.

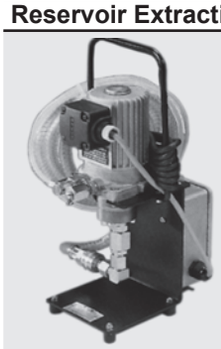
The CM-RE is a self-priming motor-pump unit that makes it possible for the CS/FCU to measure oil cleanliness in unpressurized reservoirs, tanks or leakage lines.

The oil to be analyzed is drawn through the suction strainer at the inlet port. The gear pump supplies the oil at a maximum pressure of 60 bar (870 psi) to the pressure port so that it can be analyzed by the CS / FCU.

The pressure relief valve relieves any positive pressure via connection (T) as leakage oil.

For modules with a pump with increased inlet pressure (CM-RE-2…), internal leakage oil is drained from the pump via the separate LEAKAGE connection.

Reservoir Extraction Unit REU



The Reservoir Extraction Unit REU is designed as an accessory to the FluidControl Units. The REU is a self-priming motor-pump unit that makes it possible for the FCU to measure oil cleanliness in unpressurized reservoirs, tanks or leakage lines.

The oil to be analyzed is drawn through the suction strainer at the inlet port (IN). The gear pump supplies the oil at a maximum pressure of 13.5 bar (200 psi) to the pressure port so that it can be analyzed by the FCU.

The pressure relief valve relieves any positive pressure via connection (T) as leakage oil.

SmallFiltration Kit SFK

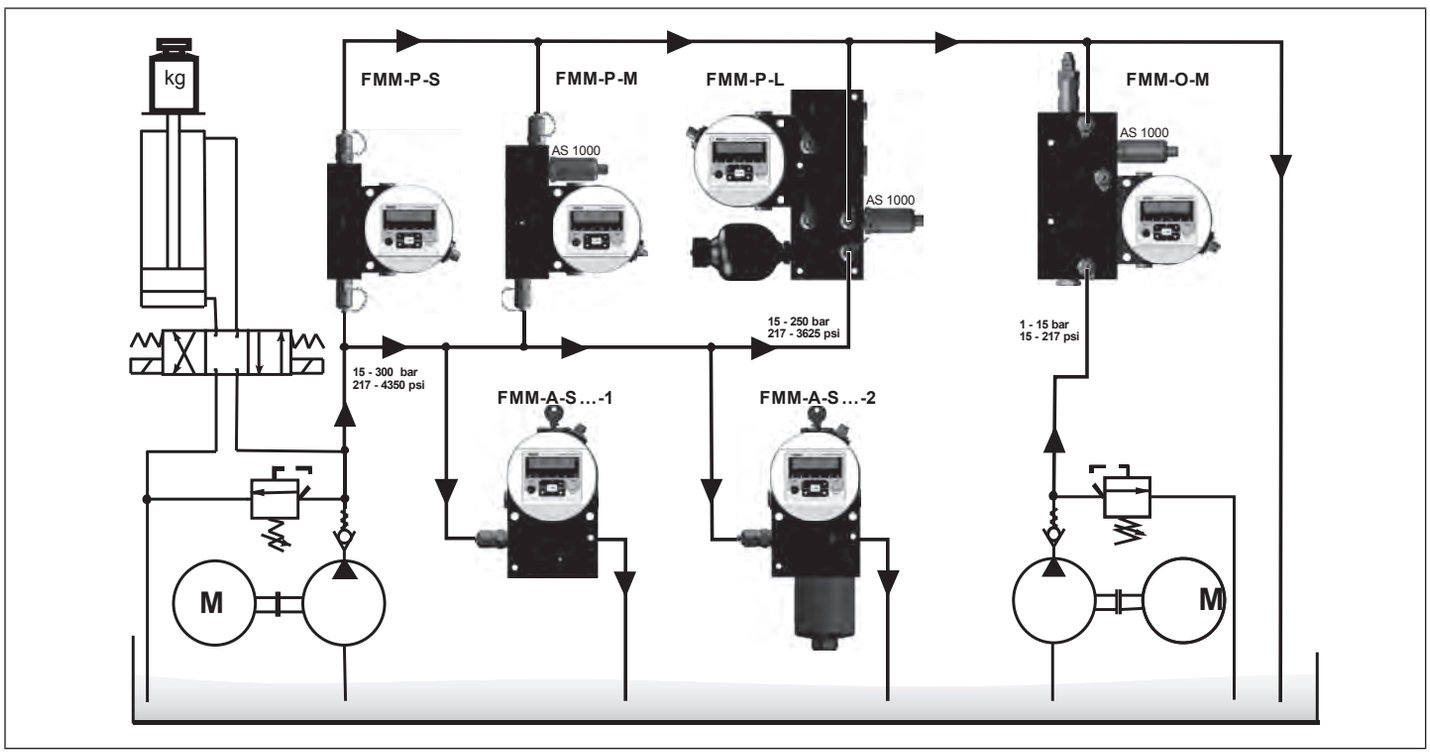
The SmallFiltration Kit SFK is a small filtration unit complete with motor-pump unit for filtering mineral oil based fluids.

With a flow rate of 0.4 l/min and an inline filter type LF60, the SFK is designed for use in conjunction with particle counters in laboratories and workshops.

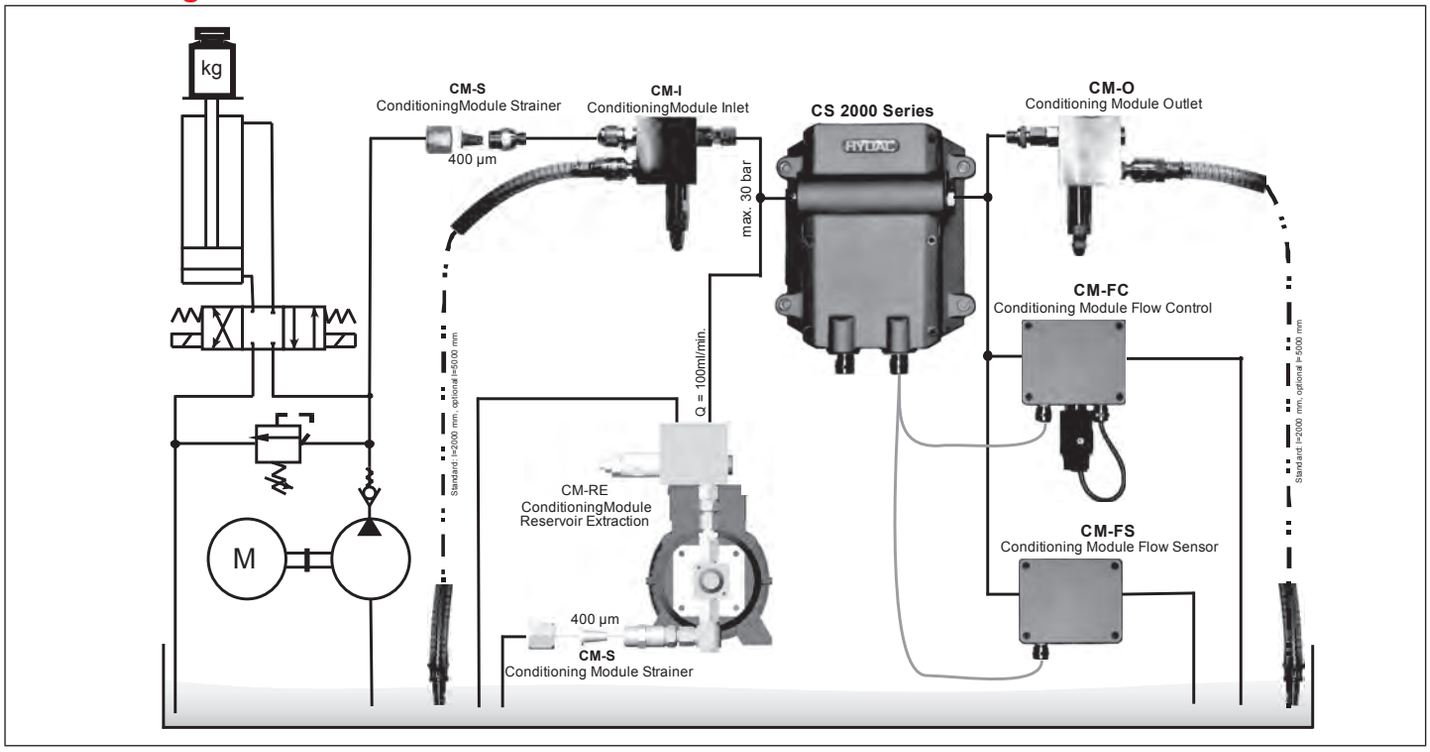
Mineral oils used as rinsing fluids for particle counters such as the ALPC or the FCU from HYDAC can be cleaned using the SFK.

Connection examples Hydraulic accessories

FluidMonitoring Modules for CS1000

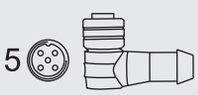


ConditioningModules for CS2000

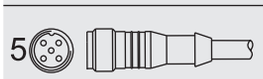
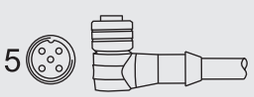
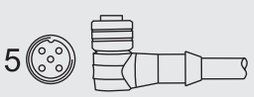


Electrical Accessories

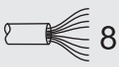
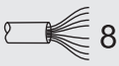
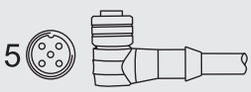
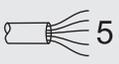
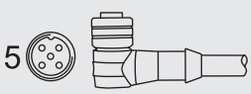
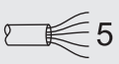
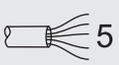
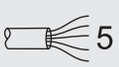
Connector, female

			Part No.
	Female connector with screw terminal, 5-pole, M12x1, to DIN VDE 0627	–	6049128
	Female connector with screw terminal, shielding, 5-pole, M12x1, to DIN VDE 0627	ZBE 08	6006786
	Female connector with screw terminal, 8-pole, M12x1, to DIN VDE 0627	ZBE 44	3281243
	Female connector with screw terminal, 8-pole, M12x1, to DIN VDE 0627	ZBE 0P	6055444

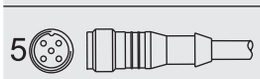
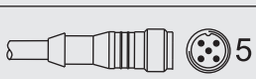
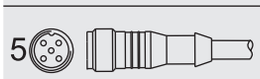
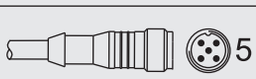
Connection cable, shielding

Connector, female	↔	Cable end open	Length		Part No.
	↔	 8 + shield	2 m	ZBE 42S-02	3281220
	↔	 8 + shield	5 m	ZBE 42S-05	3281239
	↔	 5 + shield	5 m	ZBE 47S-05	3527626
	↔	 5 + shield	10 m	ZBE 47S-10	3527627
	↔	 5 + shield	2 m	ZBE 08S-02	6019455
	↔	 5 + shield	5 m	ZBE 08S-05	6019456
	↔	 5 + shield	10 m	ZBE 08S-10	6023102
	↔	 5 + shield	30 m	ZBE 08S-30	6035063

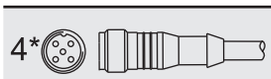
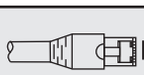
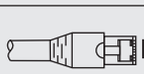
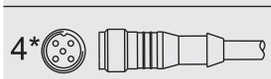
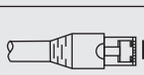
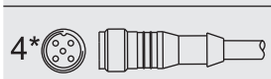
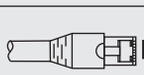
Connection cables

Connector, female	↔	Cable end open	Length		Part No.
	↔		2 m	ZBE 0P-02	6052697
	↔		5 m	ZBE 0P-05	6052698
	↔		2 m	ZBE 08-02	6006792
	↔		5 m	ZBE 08-05	6006791
	↔		5 m	ZBE 47-05	3484562
	↔		10 m	ZBE 47-10	3484564

Extension/connection cables

Connector, female	↔	Connector, male	Length		Part No.
	↔		5 m	ZBE 43-05	3281240
	↔		10 m	ZBE 43-10	3519768
	↔		2 m	ZBE 30-02	6040851
	↔		3 m	ZBE 30-03	6053924
	↔		5 m	ZBE 30-05	6040852

Connecting cables - CS 2000

Connector, female	↔	RJ45	Length		Part No.
	↔	 RJ45 Patch	5 m	ZBE 45-05	3346100
	↔	 RJ45 Patch	10 m	ZBE 45-10	3346101
	↔	 RJ45 Cross	5 m	ZBE 46-05	3346102
	↔	 RJ45 Cross	10 m	ZBE 46-10	3346103

* For CS 2000 only (“D”-coded to: IEC 61076-2-101)

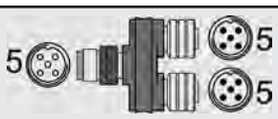
Adapter

For: AS 1000 / HYDACLab ↔ HMG

				Part No.
Connector, female		Connector, male	ZBE 36	909737

Y-Adapters

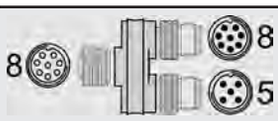
For AS 1000 / HYDACLab

				Part No.
Connector, female	 Colour: blue	Connector, male Connector, male	ZBE 26	3304374

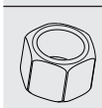
For: HMG 500 / HMG 3000
To double the number of input sockets

				Part No.
Connector, male	 Colour: black	Connector, female Connector, female	ZBE 38	3224436

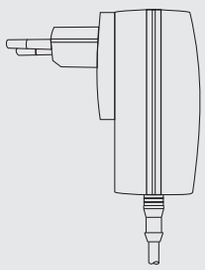
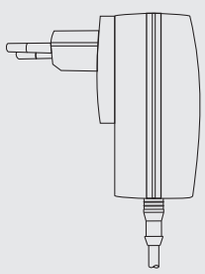
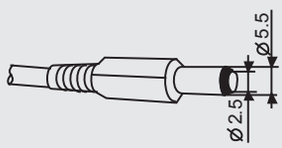
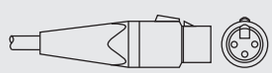
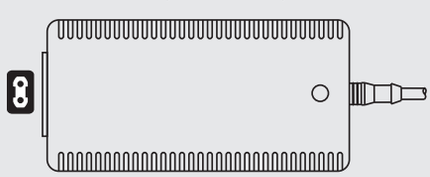
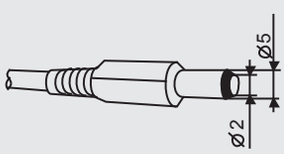
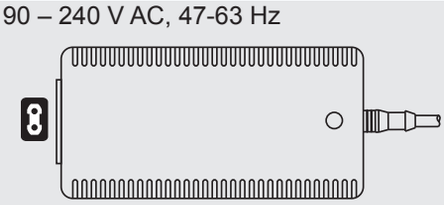
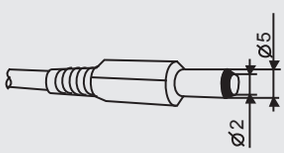
For CS 1000 <-> CSI / HMG / GSM modem

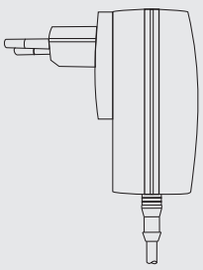
				Part No.
Connector, female	 Colour: yellow	Connector, male Connector, male	ZBE 41	910000

Dust caps

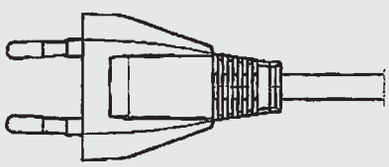
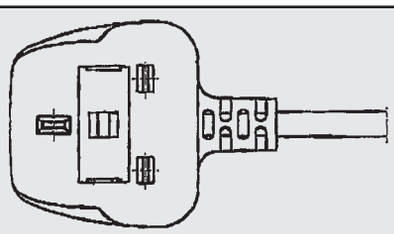
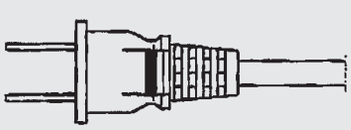
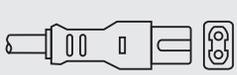
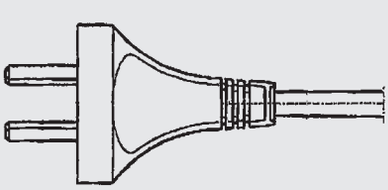
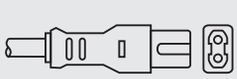
		Part No.
	Male M12 - plastic	–
	Male M12 - nickel-plated	6079195

Power supply

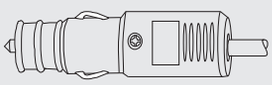
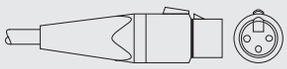
Power supply	↔	Connector, female	Length		Part No.
100 – 240 V AC, 50-60 Hz, 0.4 A  Protection class: IP40 Example: CS 1000	↔	15 V DC, 500 mA 	1.8 m	PS1	3376530
100 – 240 V AC, 50-60 Hz, 0.5 A  Protection class: IP40 Example: CSI-D-5	↔	12 V DC, 550 mA 	1.8 m	PS2	6076711
100 – 240 V AC, 50-60 Hz, 2 A  Without connecting cable Protection class: IP40 Example: FCU 1000 / MBS 1000	↔	24 V DC, 5000 mA 	1.8 m	PS3	6059933
100 – 240 V AC, 50-60 Hz, 1.1 A  Without connecting cable Protection class: IP40 Example: FCU 2000-x	↔	24 V DC, 2200 mA 	1.8 m	PS4	3090803
90 – 240 V AC, 47-63 Hz  Without connecting cable Protection class: IP40 Example: FCU 1000, Field Verification Kit	↔	12 V DC, 6600 mA 	1.6 m	PS6	6066586

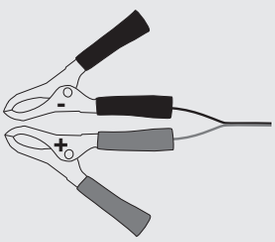
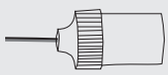
100 – 240 V AC, 50-60 Hz, 1.1 A  Protection class: IP40 Example: SMU 1000 series	24 V DC, 1000 mA ↔ 	5	1.8 m	PS5	3399939

Connecting cable for power supply (PS3 / PS4)

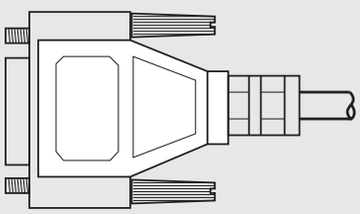
Mains plug, male	↔	Connector, female	Length		Part No.
 Europe – EN50075	↔		2 m	–	6008448
 United Kingdom	↔		2 m	–	6008447
 USA	↔		2 m	–	6008446
 Australia – A.S. 3112	↔		2 m	–	6008449

Power supply cable

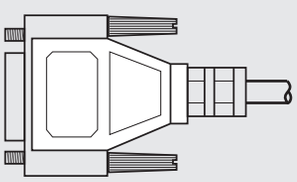
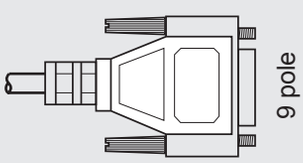
Connector, male	↔	Connector, female	Length	Part No.
max. 24 V DC  Example: FCU 1000	↔		10 m –	3306236

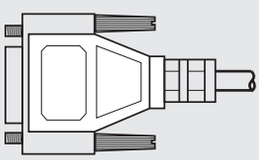
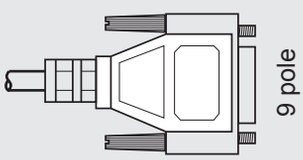
Battery clamps	↔	Connector, female	Length	Part No.
max. 24 V DC  Example: FCU 1000	↔	24 V DC 	0.5 m –	6051653

Parallel extension/connection cable

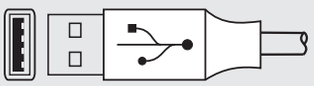
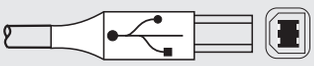
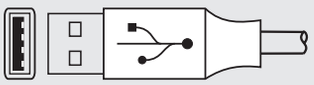
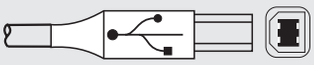
Connector, male	↔	Connector, female	Length	Part No.
25 pole  Example: FCU 2000 -> external printer	↔	CENTRONICS interface	3 m –	349157

Serial extension/connection cable

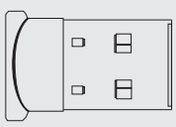
Connector, female	↔	Connector, female	Length	Part No.
15 pole  Example: FCU 2000 -> PC	↔	 9 pole	2 m –	349204

Connector, female	↔	Connector, male	Length	Part No.
9 pole  Example: ConditionSensor Interface <-> Adapter / PC (RS232 cable)	↔	 9 pole	1.8 m –	629269

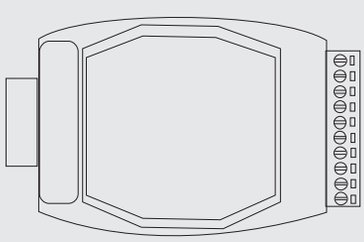
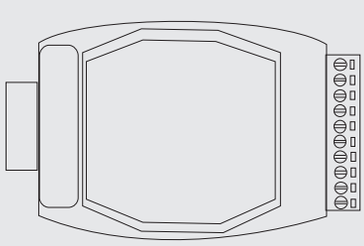
Extension/connection cable - USB

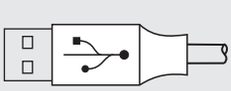
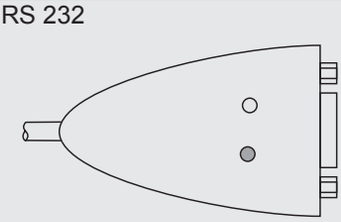
Connector, female	↔	Connector, female	Length	Part No.
A 	↔	 B	1.8 m –	6064126
A 	↔	 B	5 m –	6064127

Bluetooth/USB adapter

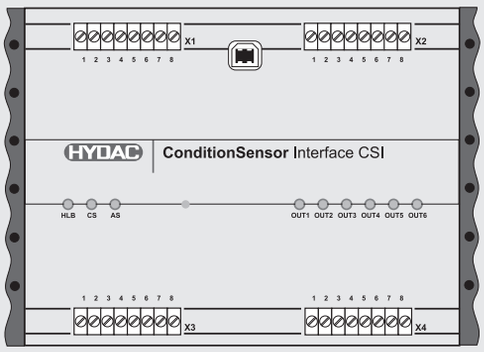
	↔		Part No.
Bluetooth 		USB (A)	6074886

Converter

Connector, female	↔	Terminal strip	Part No.
RS 232 		RS 485	6013281
USB (B) 		RS 485	6042337

Connector, female	↔	Connector, male	Part No.
USB (A) 	↔	RS 232 	6048267

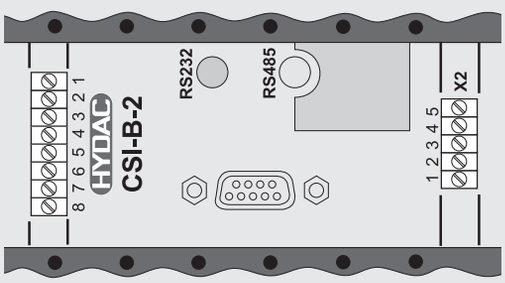
CSI-B-1



Protection class: IP40

3308212

CSI-B-2 KIT

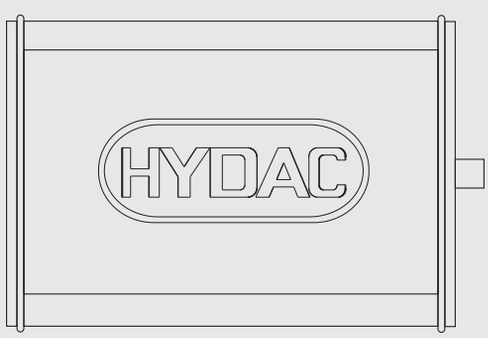


Consisting of:
- CSI-B-2
- Connection cable ZBE08S-05
- Connection cable ZBE42S-05
- Y-Adapter ZBE41
- Converter RS232/USB
- CD FluMoS Light

Protection class CSI-B-2: IP40

3409462

CSI-D-5 KIT



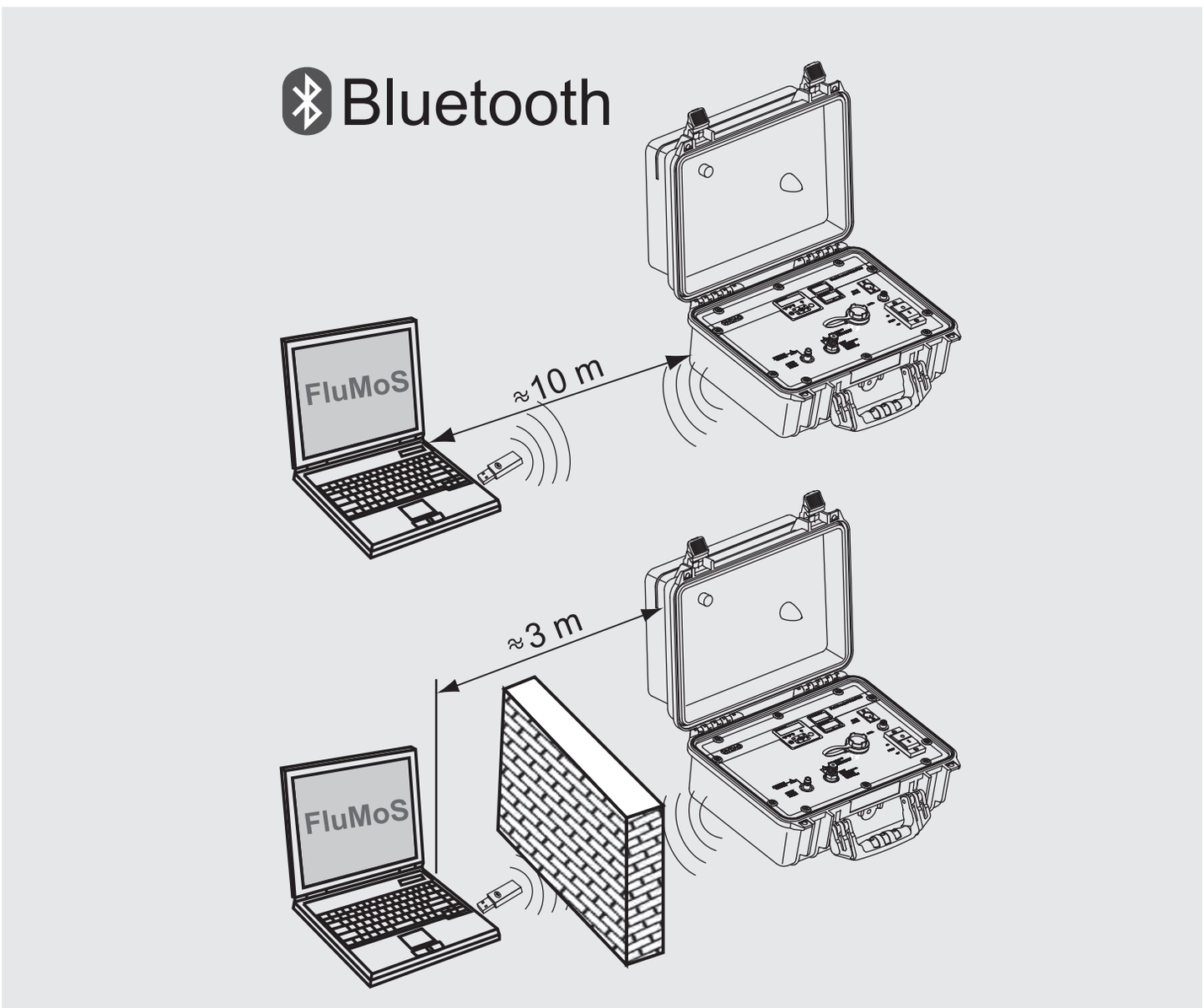
Consisting of:
- CSI-D-5
- Power supply PS2
- USB cable, L=1.8m
- Extension/connection cable ZBE43-05
- CD FluMoS Light

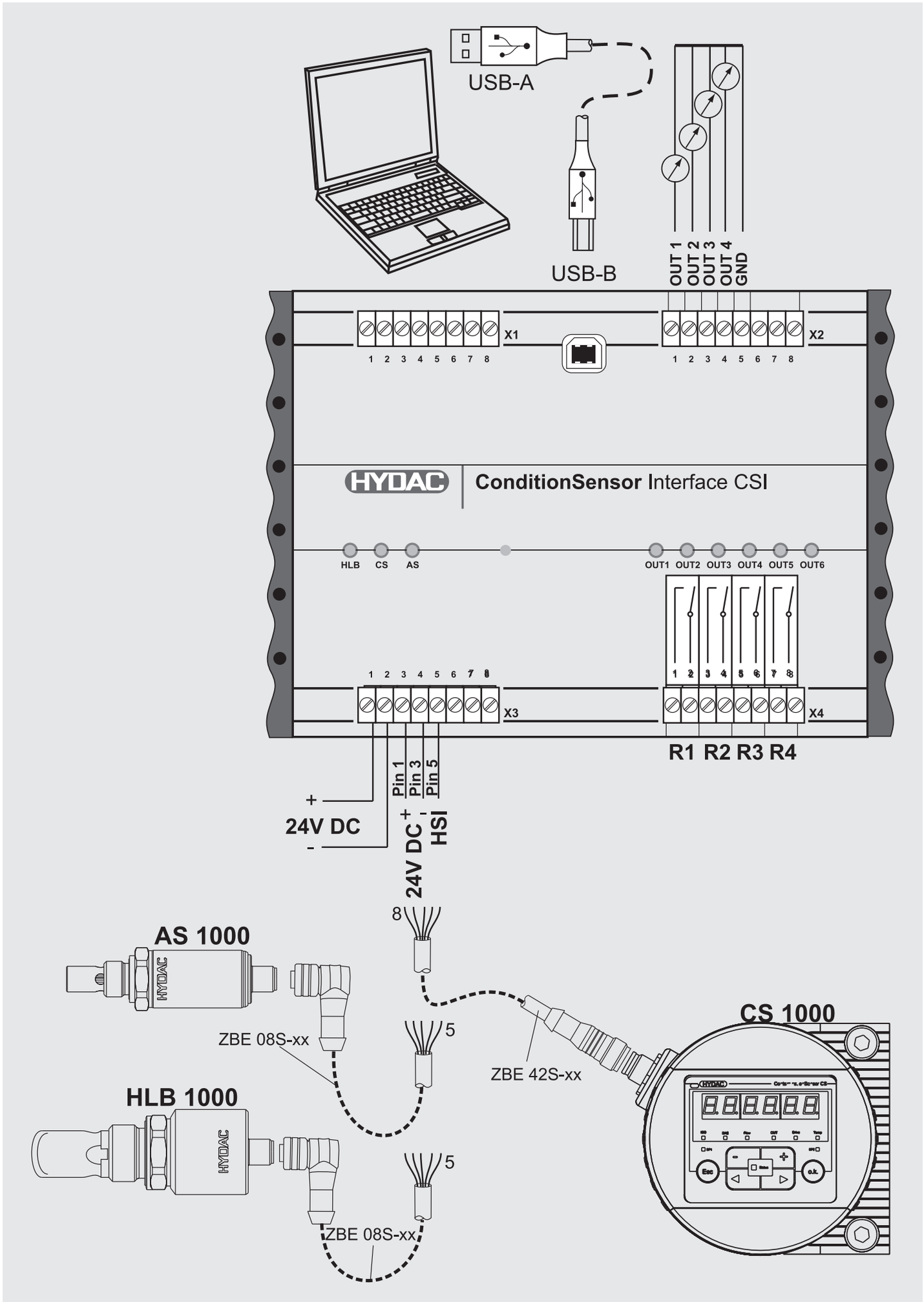
Protection class CSI-D-5: IP40

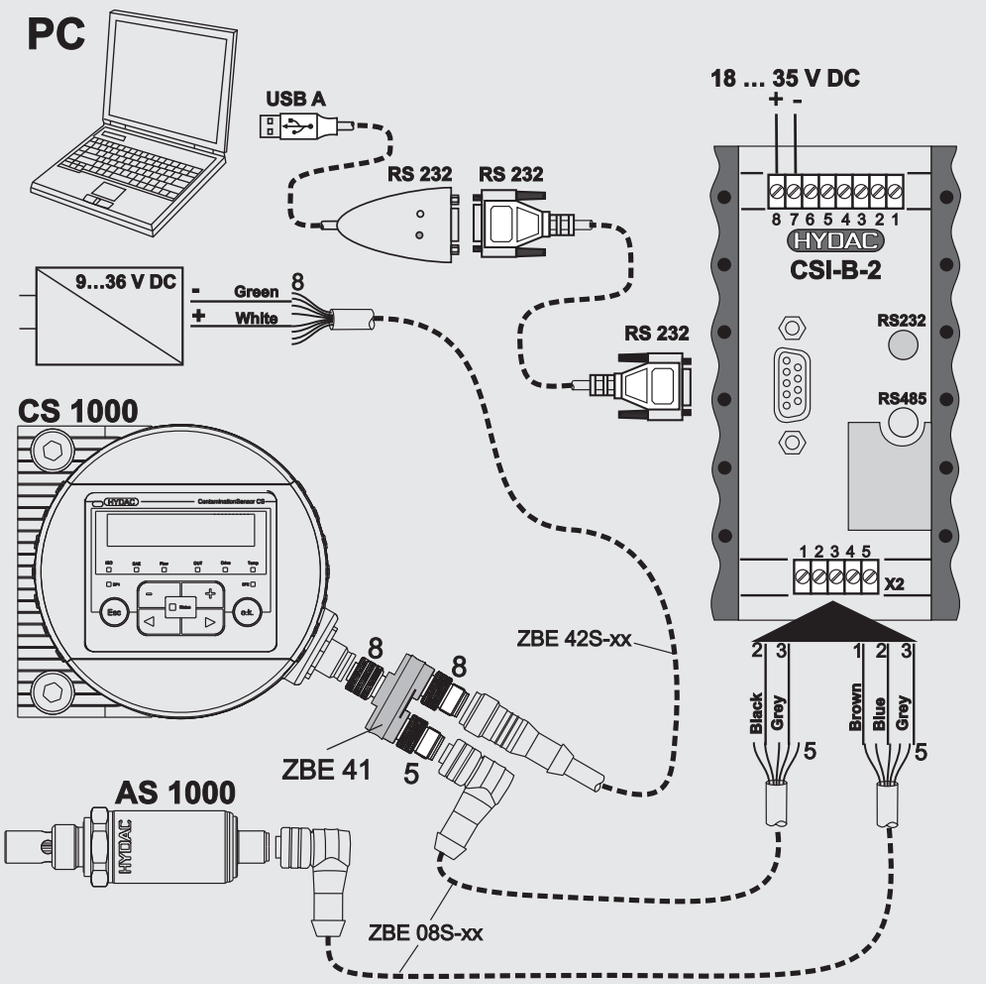
3249563

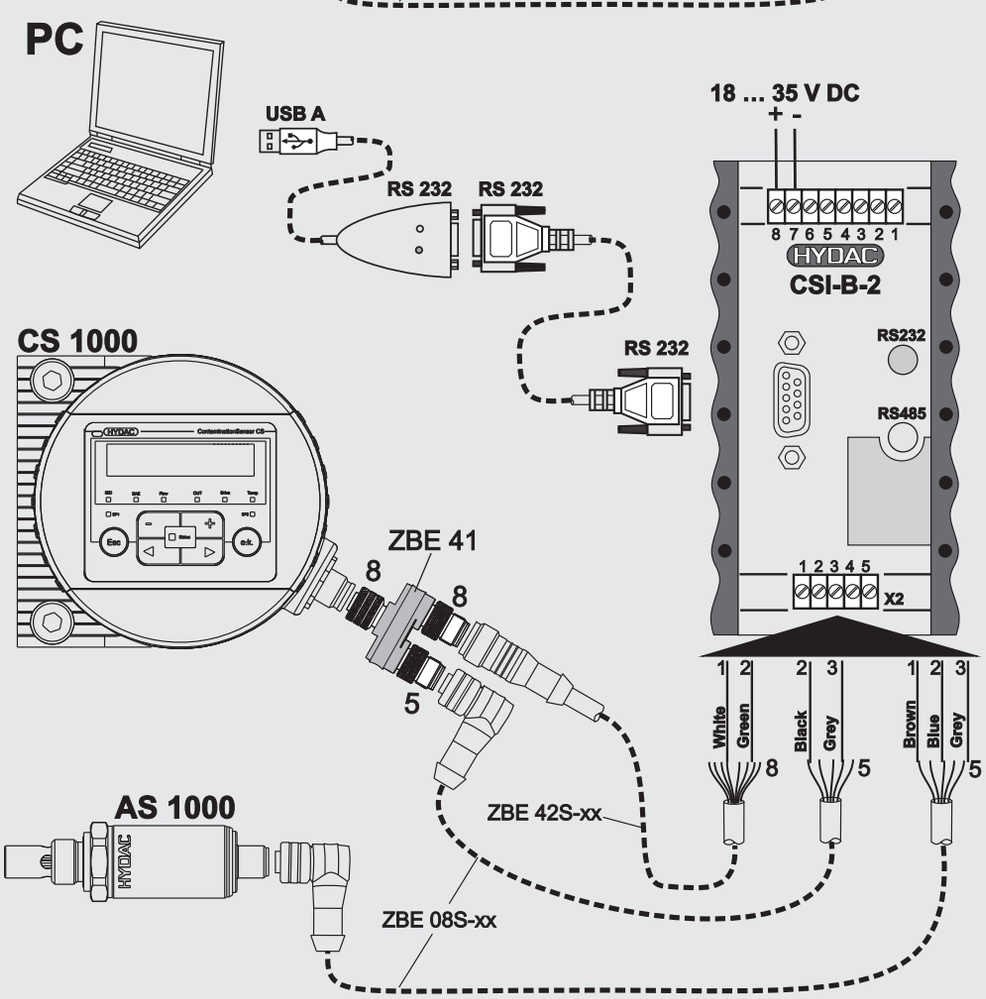
Connection examples
Electrical accessories

FCU1000 - Bluetooth

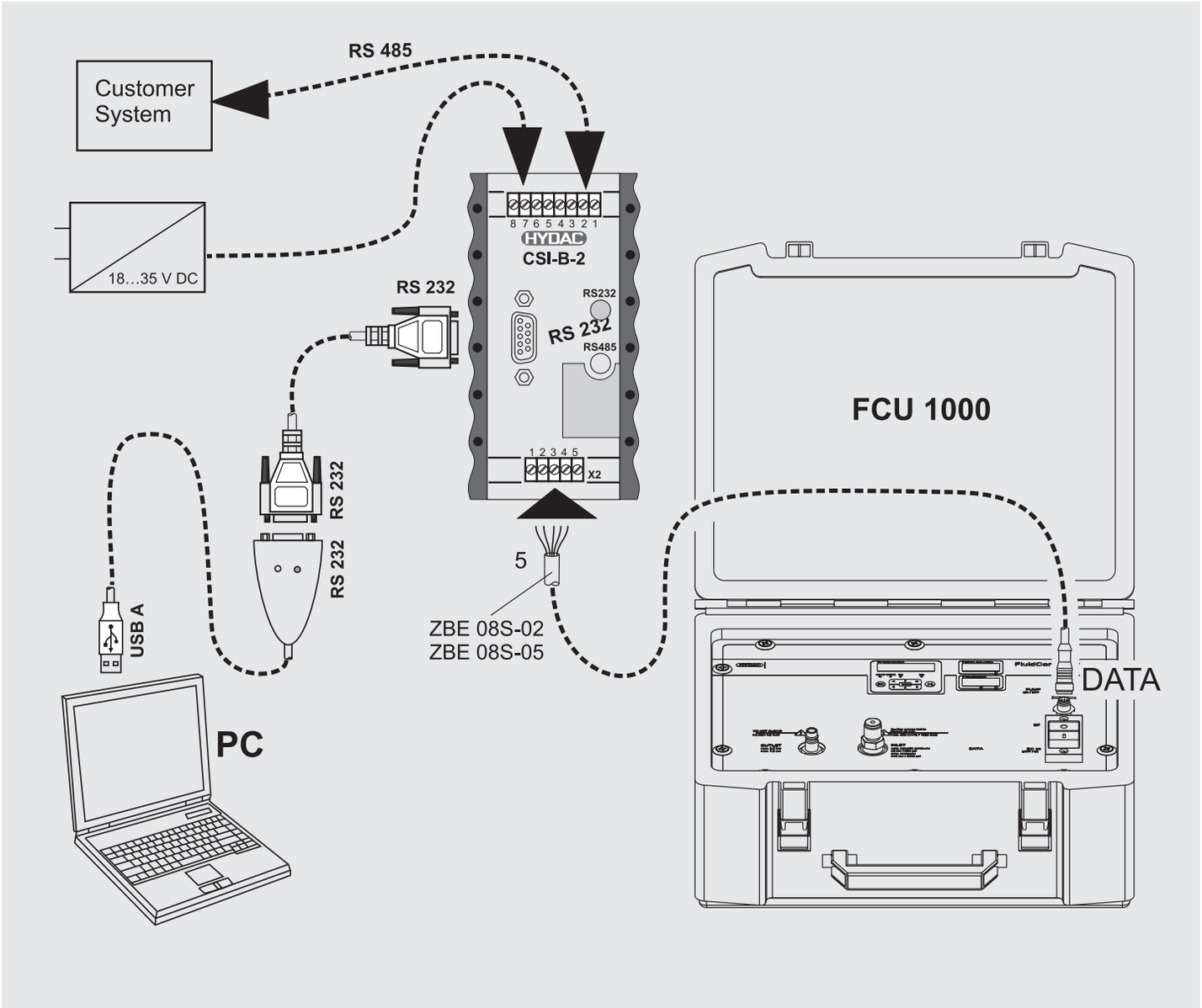



USB-A
USB-B
OUT 1
OUT 2
OUT 3
OUT 4
GND
X1
X2
1 2 3 4 5 6 7 8
HYDAC
ConditionSensor Interface CSI
HLB
CS
AS
OUT1 OUT2 OUT3 OUT4 OUT5 OUT6
X3
X4
R1 R2 R3 R4
+
24V DC
-
Pin 1
Pin 3
Pin 5
24V DC + -
HSI
8
AS 1000
ZBE 08S-xx
5
ZBE 42S-xx
CS 1000
HLB 1000
5
ZBE 08S-xx

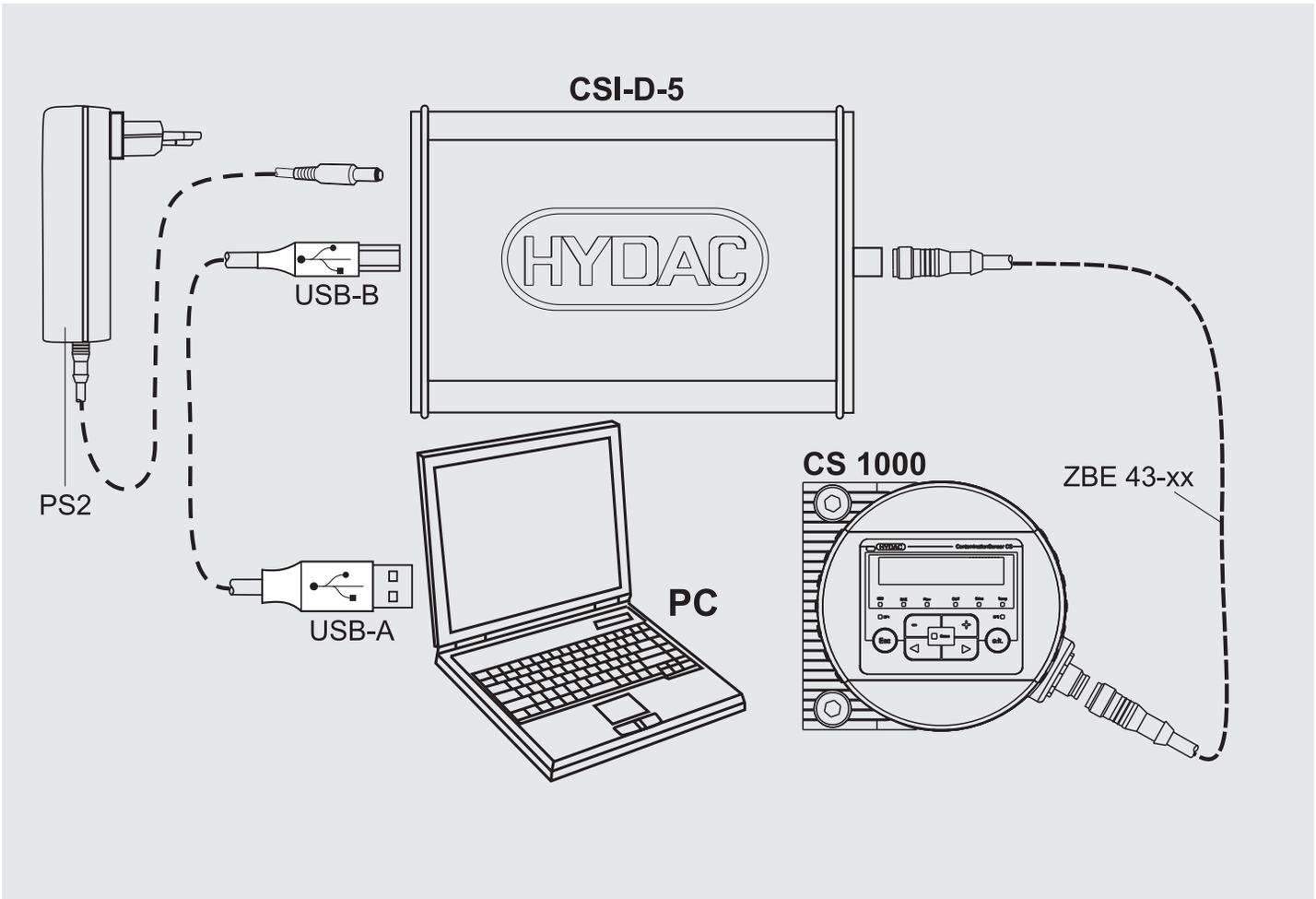

PC
USB A
RS 232
RS 232
18 ... 35 V DC
+ -
8 7 6 5 4 3 2 1
HYDAC
CSI-B-2
RS232
RS485
1 2 3 4 5
X2
9...36 V DC
- Green
+ White
8
RS 232
CS 1000
ZBE 42S-xx
8
8
ZBE 41
5
2 3
1 2 3
Black
Grey
Brown
Blue
Grey
5
5
AS 1000
ZBE 08S-xx


PC
USB A
RS 232
RS 232
18 ... 35 V DC
+ -
8 7 6 5 4 3 2 1
HYDAC
CSI-B-2
RS232
RS485
1 2 3 4 5
X2
RS 232
CS 1000
ZBE 41
8
8
5
1 2
2 3
1 2 3
White
Green
Black
Grey
Brown
Blue
Grey
8
5
5
AS 1000
ZBE 42S-xx
ZBE 08S-xx

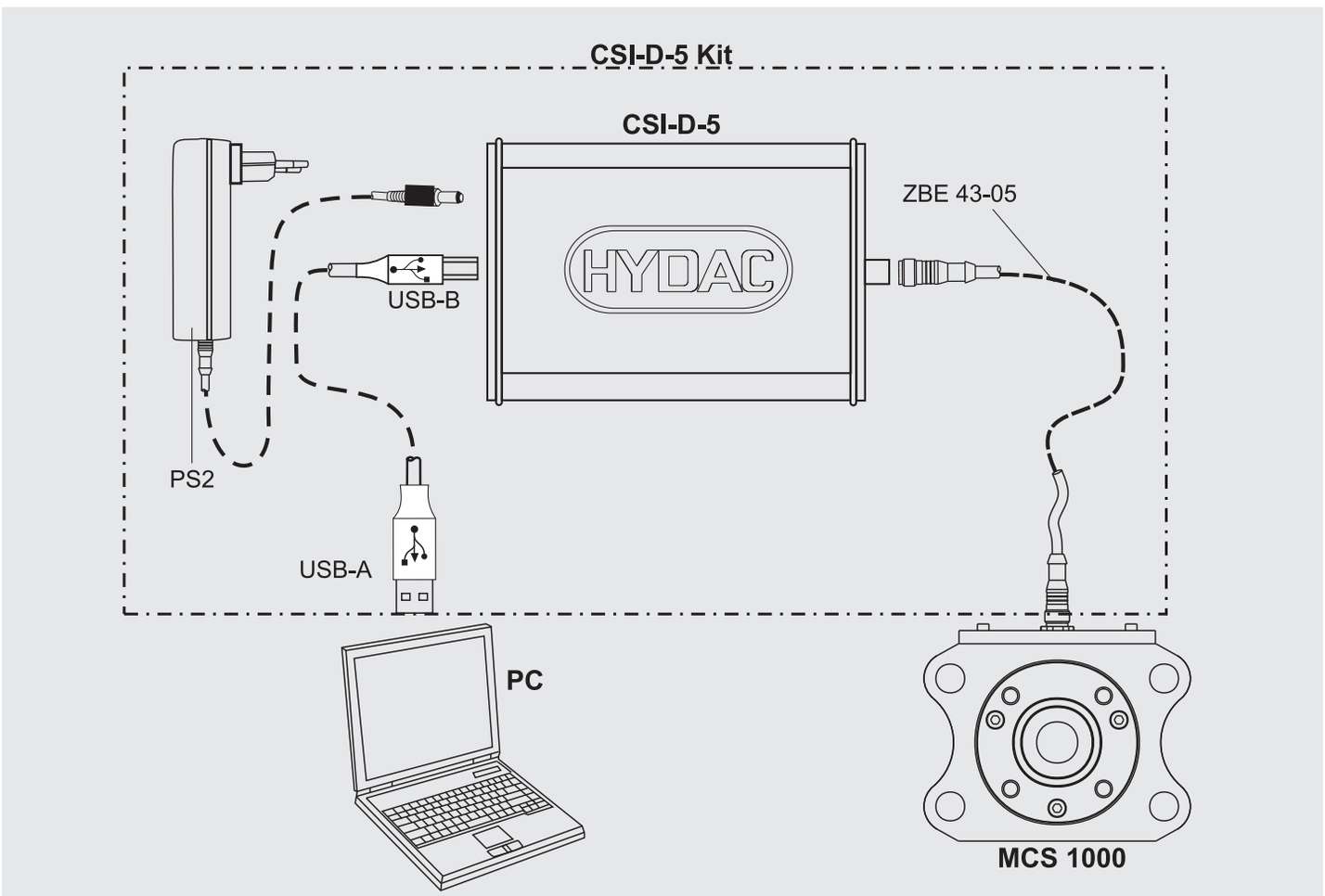
CSI-B-2 - CS1000 / AS1000 / FCU1000



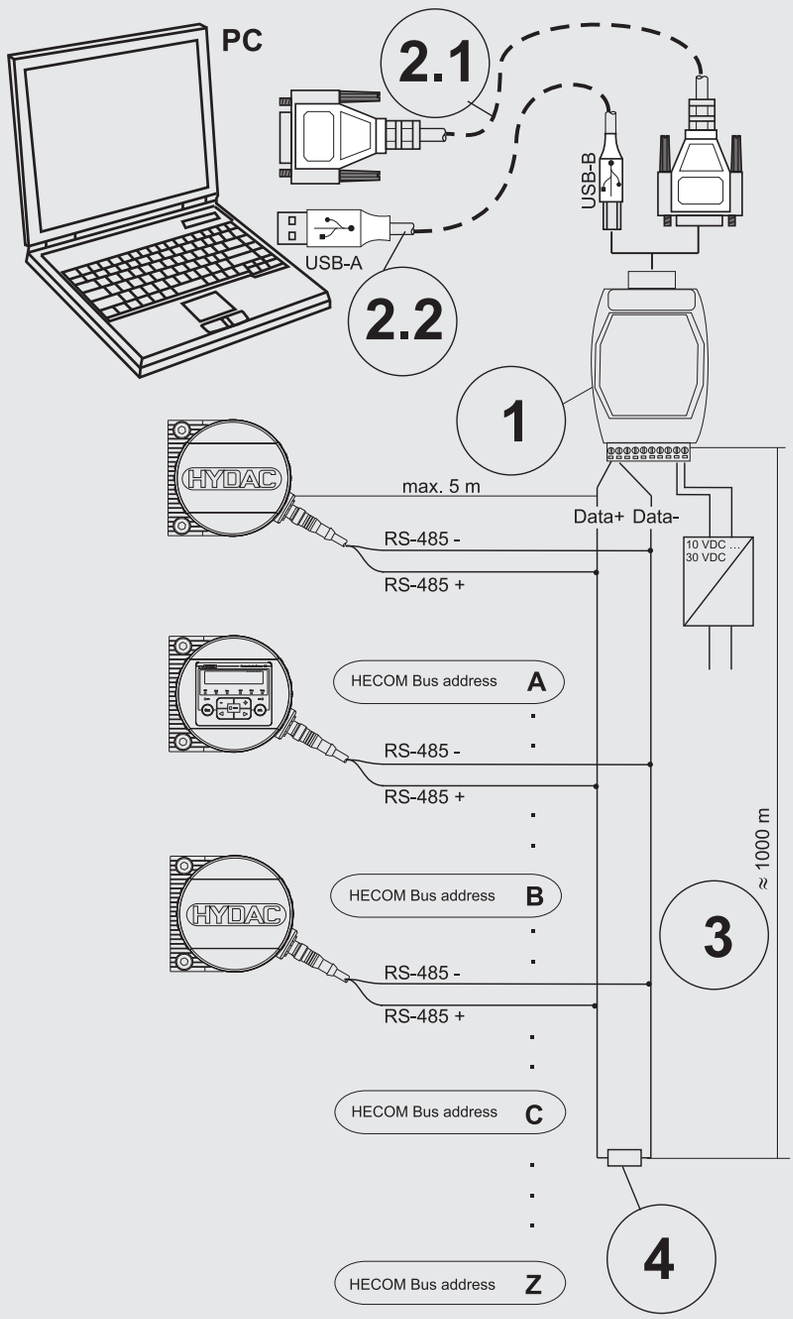
CSI-D-5 Kit - CS1000



CSI-D-5 Kit - MCS1000

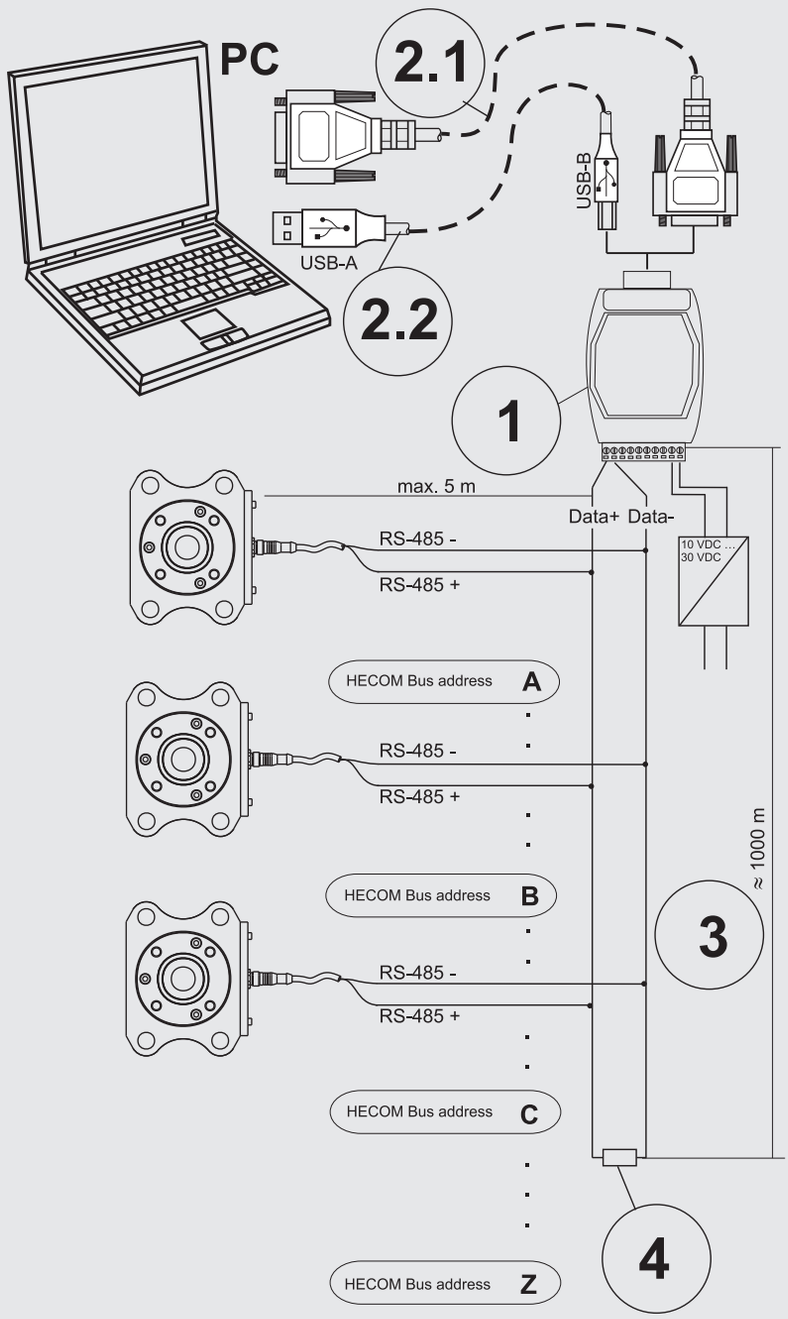


CS1000 in the RS485 BUS



Item	Description	
1	Converter	RS232 <--> RS485
1	Converter	USB <--> RS485
2.1	Extension/connection cable	RS232, 9-pole
2.2	Extension/connection cable	USB [A] <--> USB [B]
3	Cable	Twisted pair recommended
4	Terminating resistor	≈ 120 Ω

MCS1000 in the RS485 BUS



Item	Description	
1	Converter	RS232 <--> RS485
1	Converter	USB <--> RS485
2.1	Extension/connection cable	RS232, 9-pole
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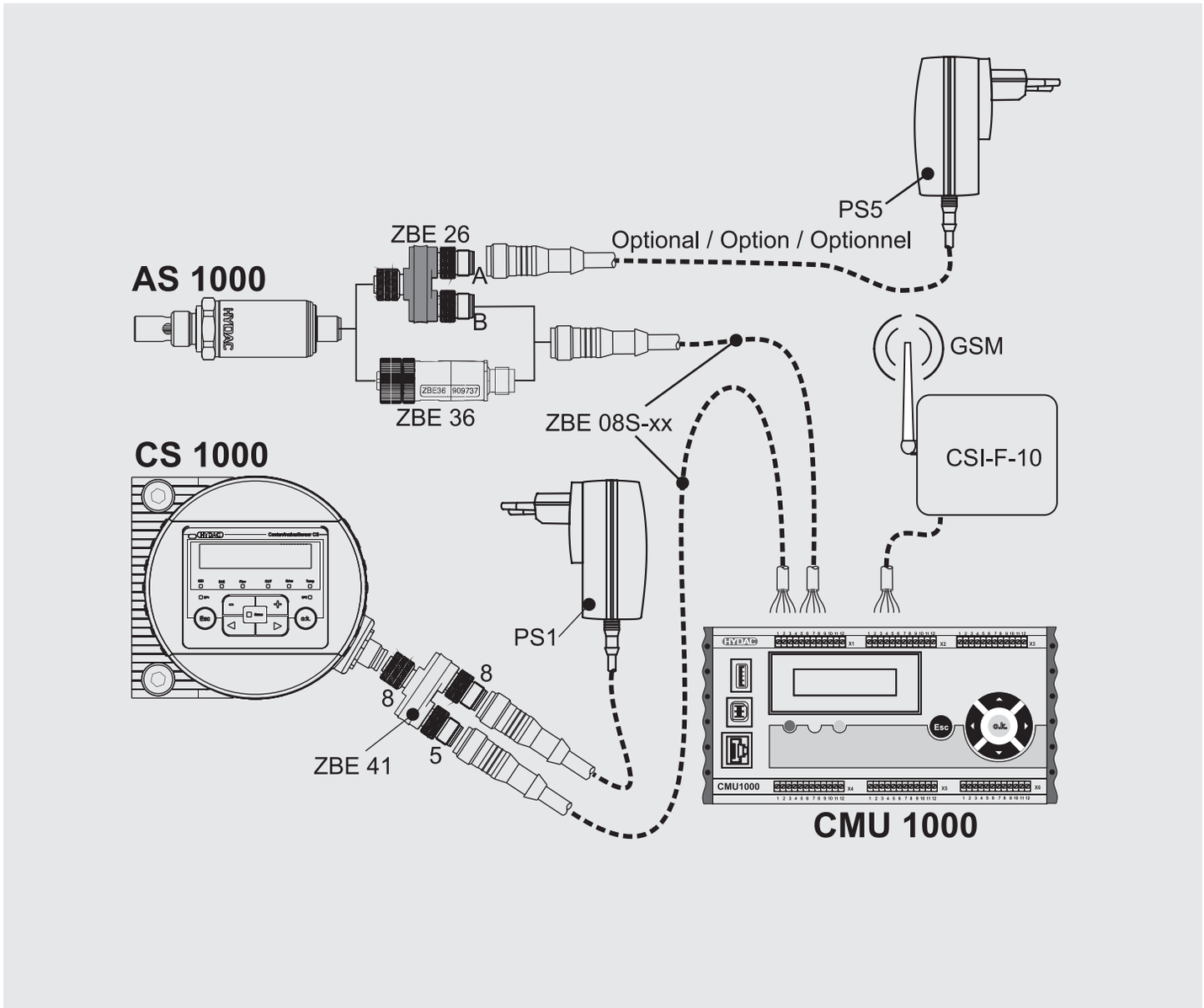
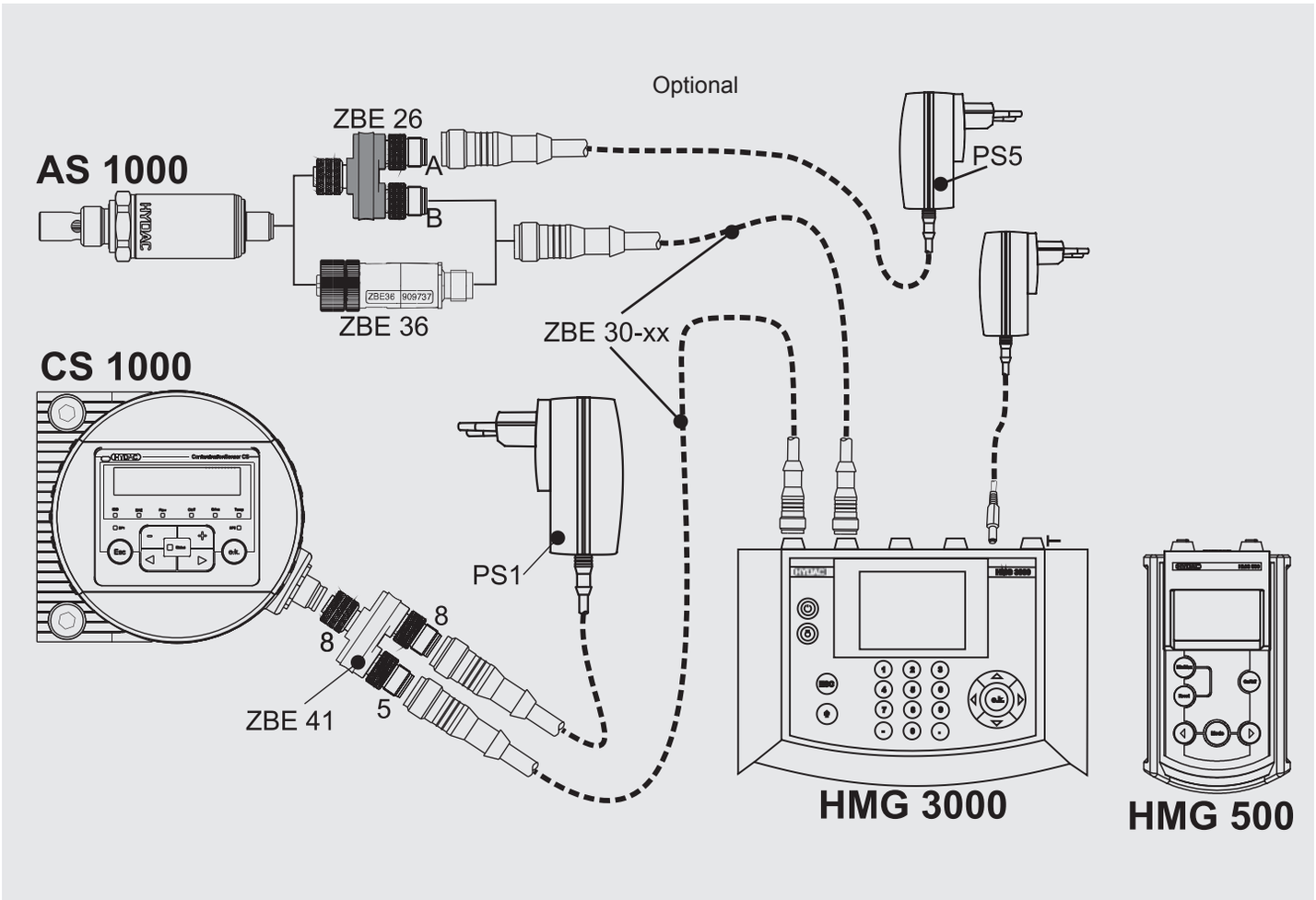
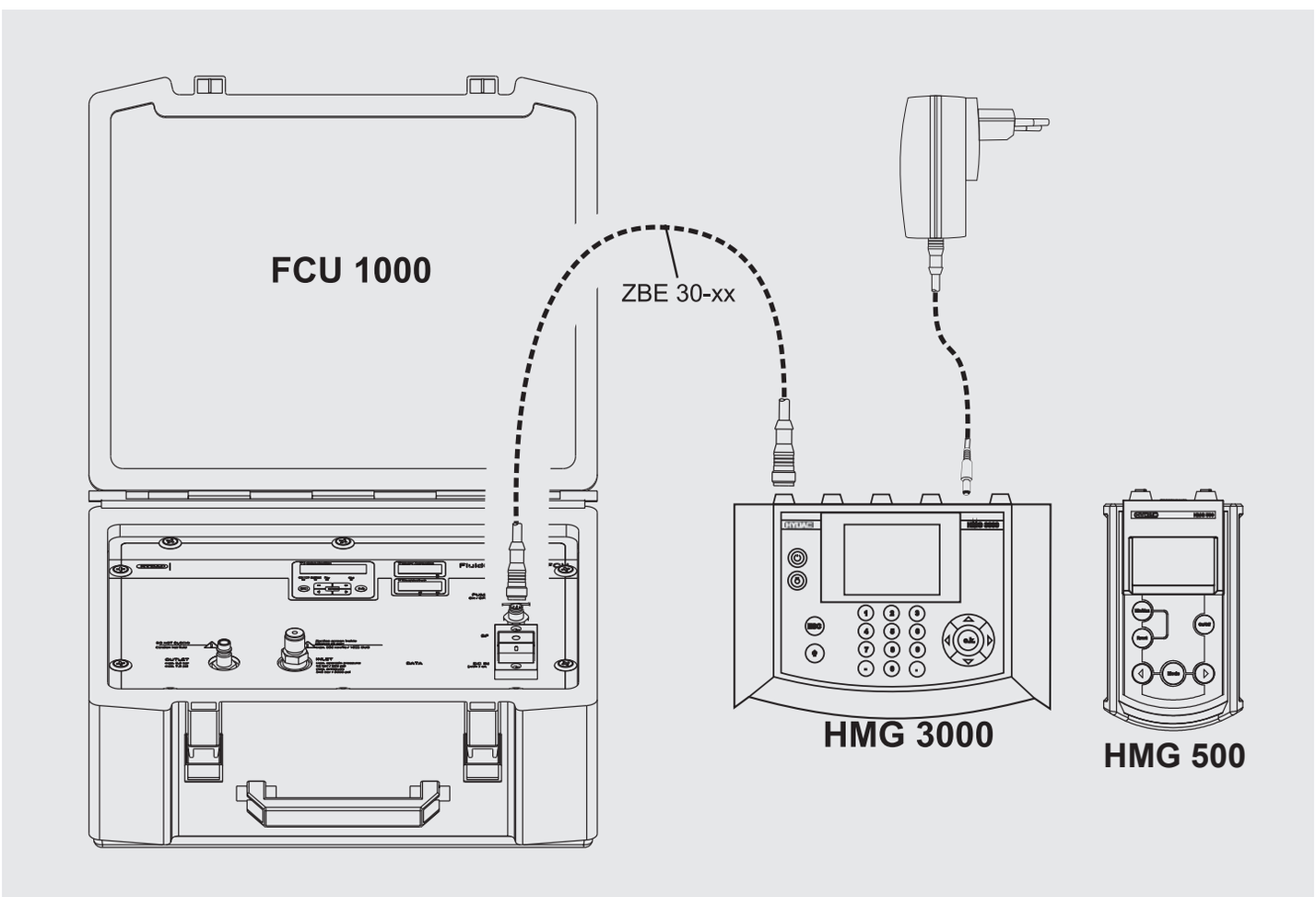
3	Cable	Twisted pair recommended
4	Terminating resistor	≈ 120 Ω


PS5
ZBE 26
Optional / Option / Optionnel
A
B
AS 1000
GSM
ZBE36 909737
ZBE 36
ZBE 08S-xx
CS 1000
CSI-F-10
PS1
8
8
5
ZBE 41
CMU1000
CMU 1000

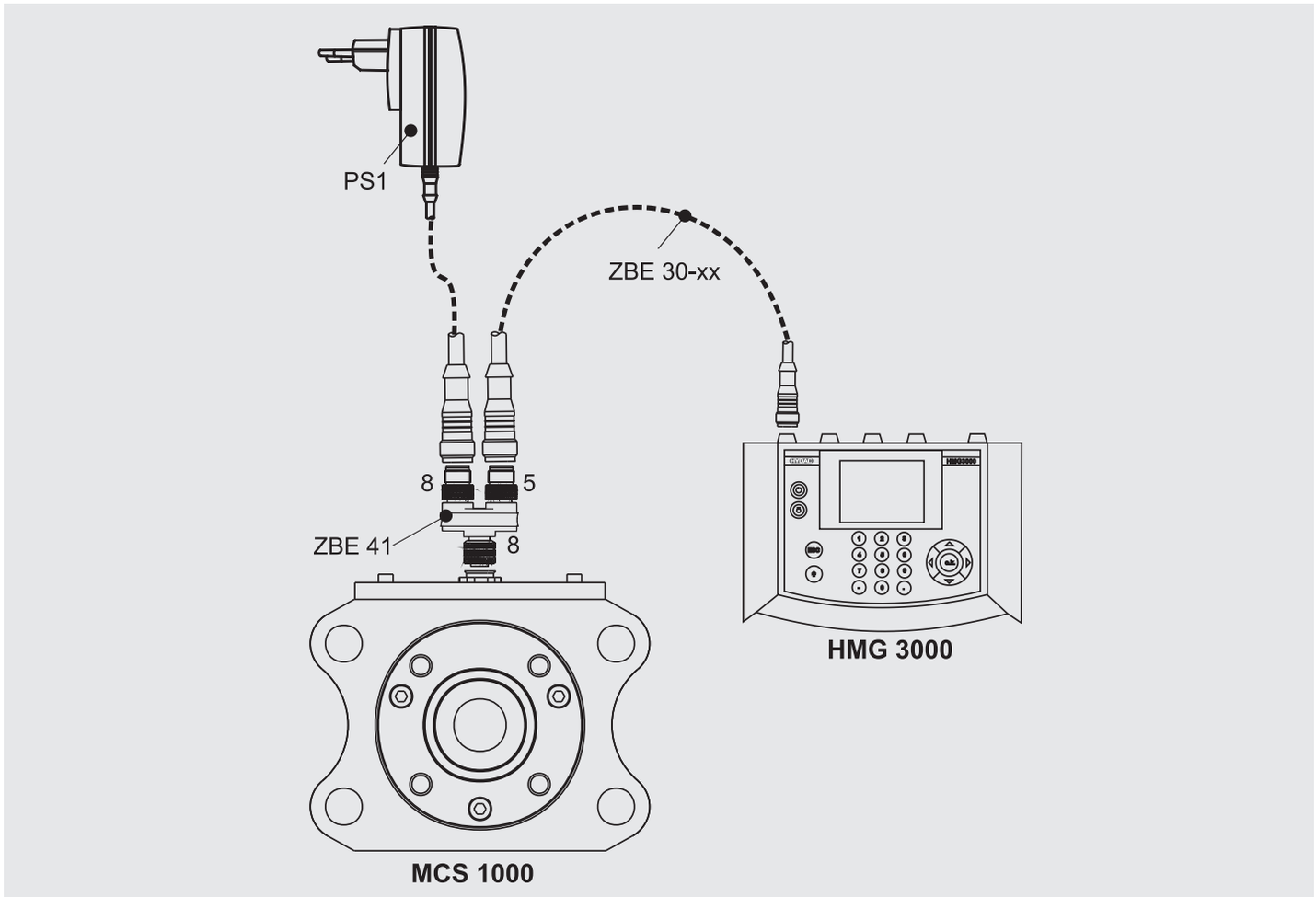
HMG3000 / HMG500 - CS1000 / AS1000



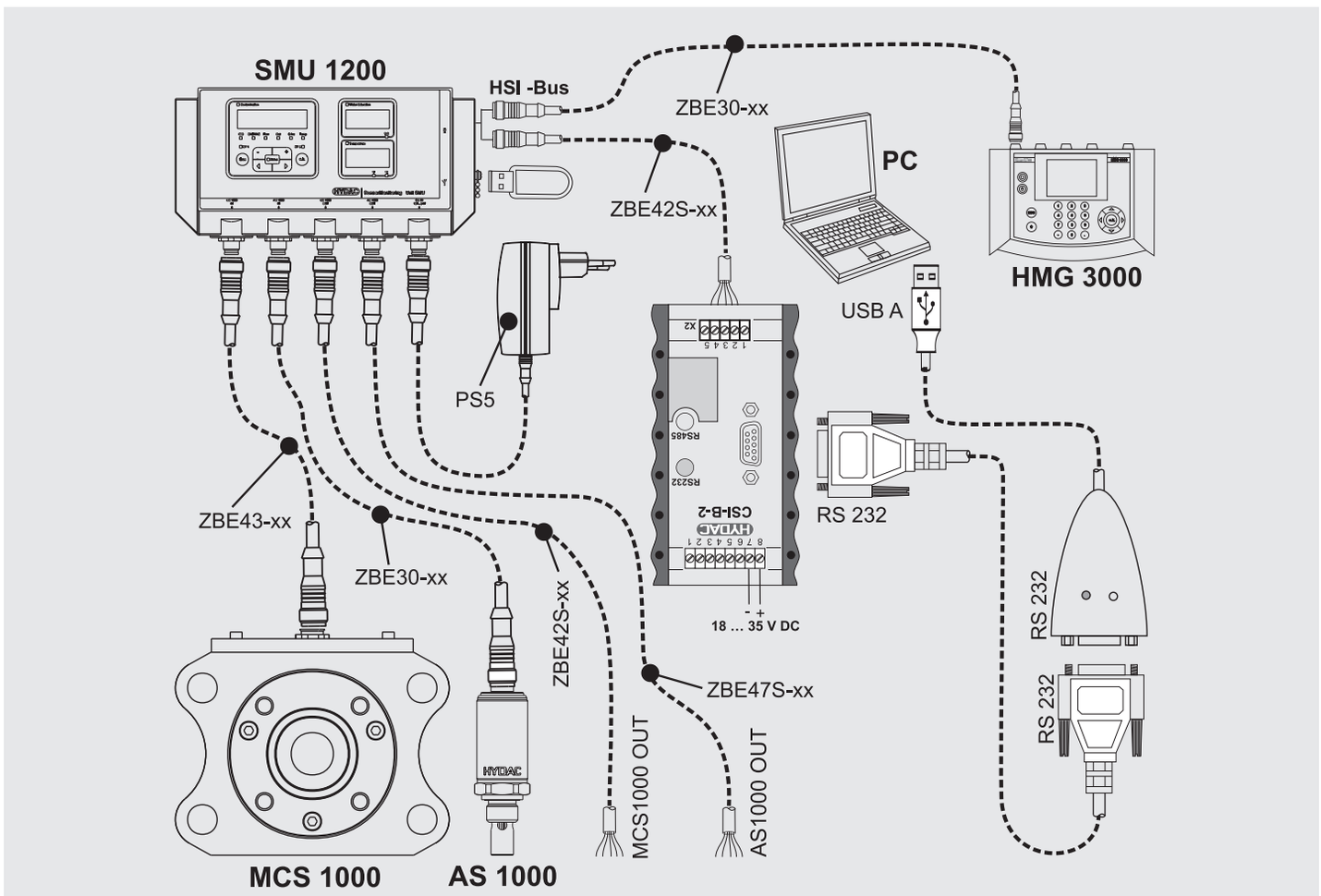
HMG3000 / HMG500 - FCU1000



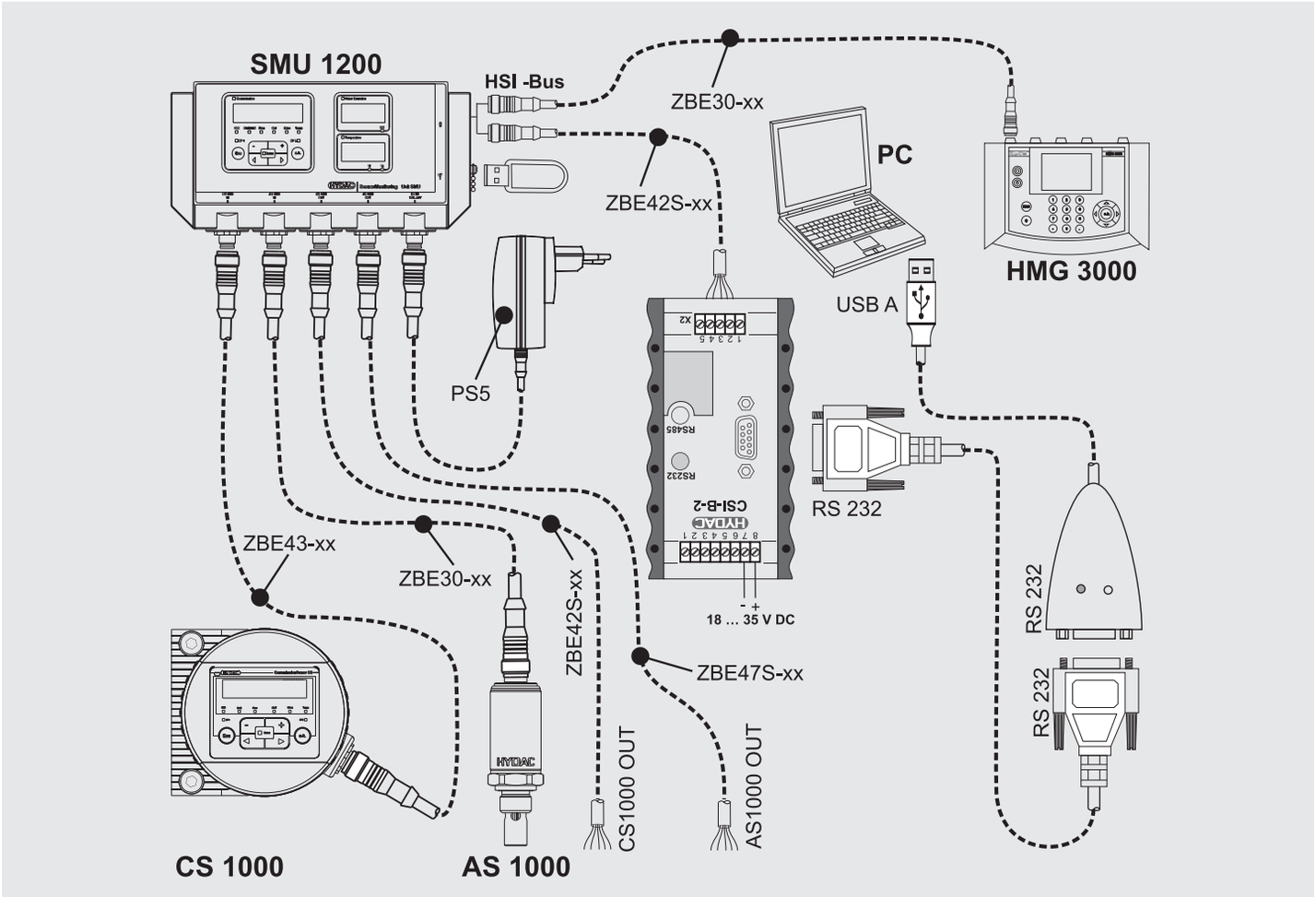
HMG3000 - MCS1000



SMU1200 / CSI-B-2 / HMG3000 - MCS1000



SMU1200 / CSI-B-2 / HMG3000 - CS1000



Note

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

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

Subject to technical modifications.

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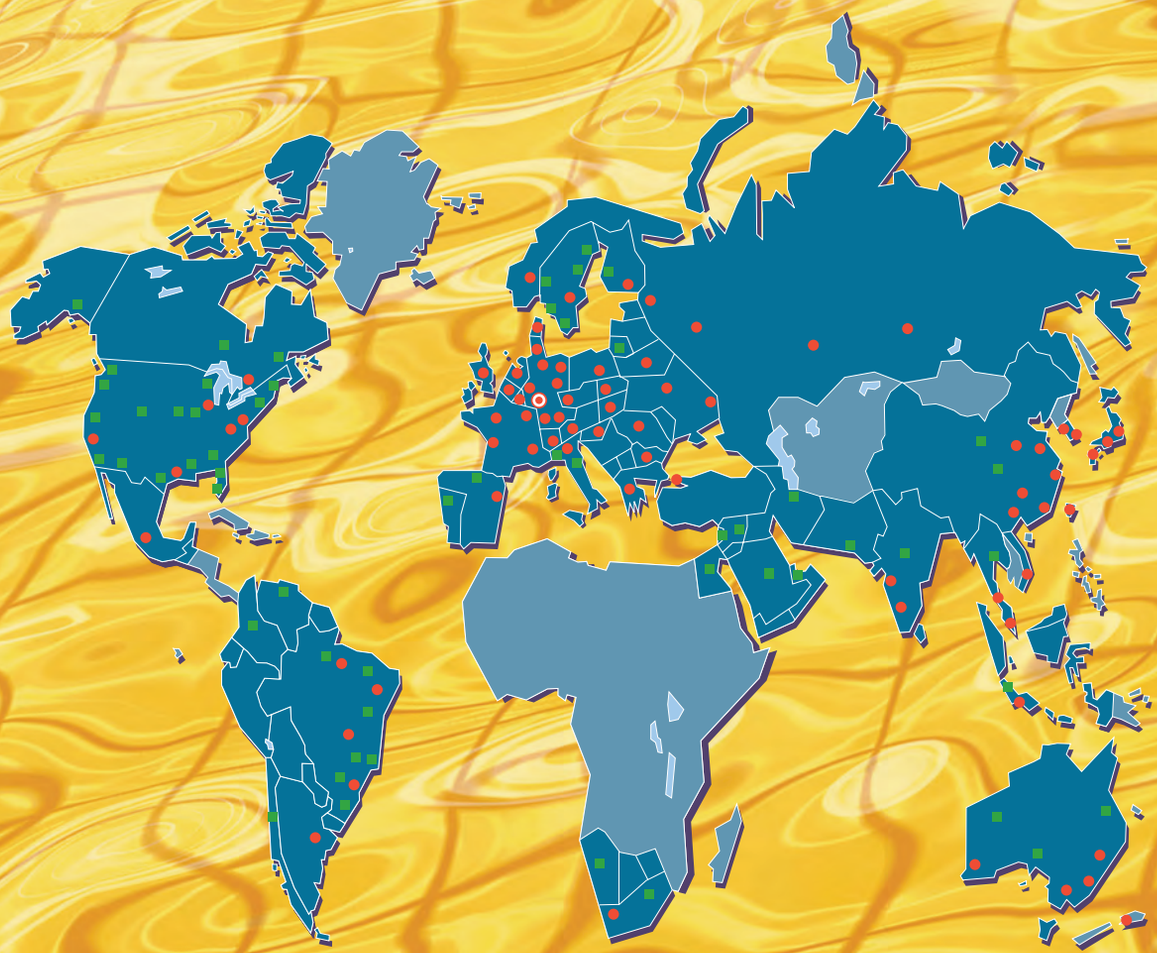

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