

ONE VISION. ZERO EMISSIONS.



ALTERNATIVE  
GASES



QUALITY. MADE IN GERMANY.

[www.dilo.com](http://www.dilo.com)





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## ECO-EFFICIENT INSULATING GASES FOR SWITCHGEAR

### ENVIRONMENTALLY FRIENDLY SF<sub>6</sub> SUBSTITUTE

The so-called „Alternative Gases“ are usually special gas mixtures with fixed defined mixing ratios calling for new, more stringent requirements on the design of the device. **SF<sub>6</sub> service and measuring devices can therefore not be used for Alternative Gases!**

As a pioneer in SF<sub>6</sub> gas handling with over 50 years of experience, we were able to combine tradition with the requirements of new gas mixtures. Even if Alternative Gases are used, the gas must be recovered from the gas compartment, during service works. The air must then be evacuated and the gas compartment refilled. In this respect, the handling does not differ noticeably from that of the SF<sub>6</sub> gas.

With our „Zero Emission Concept“ we have defined a closed technological cycle that covers all gas handling processes with high reliability and without emissions.

### ALTERNATIVE QUENCHING AND INSULATING GASES „READY FOR USE“

As part of our „DILO Certified Gas“ range of services, we can also supply on request ready-prepared mixtures of Alternative Gases in liquid or gaseous form exactly in accordance with your specifications - including a DILO quality certificate. We prepare gas mixtures based on Novec™ 4710 or Novec™ 5110, but we also supply other insulating gas mixtures - exactly according to your requirements.

Therefore, the individual gas components must not be transported and mixing of the gas on site is not necessary. The result is: high accuracy of the required gas mixtures as well as time and cost savings and thus higher operating efficiency.

Gas chromatographic and spectroscopic tests in our in-house laboratory ensure a consistently high level of quality.

Contact: [certified-gas@dilo-gmbh.com](mailto:certified-gas@dilo-gmbh.com)





## COMPLETE PRODUCT RANGE FOR SF<sub>6</sub>-FREE GAS HANDLING

### DILO PRODUCT LINES C4 AND C5

We offer all devices for the emission-free handling of gas mixtures on the basis of 3M™ Novec 4710 or 3M™ Novec 5110, ranging from service carts and measuring devices up to units for recovery of gas mixtures and mixing units. We also have the correct solution for the handling of other gas mixtures with CO<sub>2</sub>, N<sub>2</sub> or O<sub>2</sub>.



With the devices of our product lines C4 and C5, gas compartments in the medium and high voltage range can be filled and recovered without emission. The gas quality can also be reliably determined in the usual way and any leaks detected. Detailed information can be found on our website in the section „Alternative Gases“.

### MANUFACTURER-INDEPENDENT DEVELOPMENT

As a specialist for gas handling, DILO also works with manufacturers and institutes that do not focus on the basic gases mentioned above. Thanks to our in-house expertise in all fields of gas and gas mixture handling, we can offer you individual product solutions. DILO can supply you a suitable product for your special application, starting with concept development through detailed technical development and complete control development, the production of individual and special systems right up to commissioning.

Do you have any questions or need advice? We are pleased to help you.

Contact:

**Martin Göppel, Project Manager Alternative Gases**

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\*) 3M and Novec are registered trademarks of 3M

## MINI SERIES C4/C5



For professional handling of gas mixtures

### C4-B095R12

**Compressor unit for gas mixtures with 3M™ Novec™ 4710\***

Operating voltage: 220 - 240 V / 50 - 60 Hz alternating current

### C5-B095R12

**Compressor unit for gas mixtures with 3M™ Novec™ 5110\***

Operating voltage: 220 - 240 V / 50 - 60 Hz alternating current



The MINI SERIES C4/C5 is perfectly suited for efficient gas handling of small gas compartments and gas recovery down to < 5 mbar. It is specially provided for the handling of gas mixtures based on 3M™ Novec™ 4710 or 3M™ Novec™ 5110.

The working pressures allows gaseous storage in order to prevent demixing. Thus, filling of the gas mixture from the gas compartment into a transport cylinder as well as the complete removal of the gas mixture from a transport cylinder (only for gaseous supply in the cylinder) is possible.

The handy individual MINI components for recovery, consisting of a compressor and a vacuum compressor are connected to the unit via wire braided hoses.

\*) 3M and Novec are registered trademarks of 3M.

#### Technical data:

Dimensions: Length 455 mm, Width 310 mm, Height 370 mm

Weight: 28 kg

#### Standard equipment:

Oilfree DILO compressor (1.6 m<sup>3</sup>/h [at 50 Hz], 20 bar; 1.9 m<sup>3</sup>/h [at 60 Hz], 20 bar)

Particle filter

Gauge

Filling pressure reducer

DILO couplings DN8

Electric control

3 m long electrical connecting cable

Paint: green (RAL DESIGN 120 70 70)

Operating manual

#### Optional accessories at an extra charge:

Storage connection with metal bellows hose DN8 / 5 m long, DILO coupling DN8 (M28), ball valve DN8 and bottle connection - C4	C4-6-1401-R050
Storage connection with metal bellows hose DN8 / 5 m long, DILO coupling DN8 (M24), ball valve DN8 and bottle connection - C5	C5-6-1401-R050
2 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M28) - C4	C4-6-1130-R020
2 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M24) - C5	C5-6-1130-R020
5 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M28) - C4	C4-6-1130-R050
5 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M24) - C5	C5-6-1130-R050
Aluminium transport case	3-781-R021

#### Spare parts kit:

Spare parts kit for compressor	6-1081-R010
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#### Packing:

Packing for C4/C5-B095R12	3-748-R003-C
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## MINI SERIES C4/C5



For professional handling of gas mixtures

C4-B093R30

**Vacuum compressor unit for gas mixtures with 3M™ Novec™ 4710<sup>\*)</sup>**

Operating voltage: 220 - 240 V / 50 - 60 Hz alternating current

C5-B093R30

**Vacuum compressor unit for gas mixtures with 3M™ Novec™ 5110<sup>\*)</sup>**

Operating voltage: 220 - 240 V / 50 - 60 Hz alternating current

**For recovery in conjunction with compressor only**



### Technical data:

Dimensions: Length 510 mm, Width 325 mm, Height 290 mm
Weight: 24 kg

### Standard equipment:

Vacuum compressor for recovery of gas mixtures (3.3 m <sup>3</sup> /h [at 50 Hz]; 3.9 m <sup>3</sup> /h [at 60 Hz], final vacuum < 5 mbar)
Solenoid valve
Pressure sensor
Digital vacuum indication (0 - 400 mbar)
DILO couplings DN8
Electric control
2 m long electrical connecting cable
Paint: green (RAL DESIGN 120 70 70)
Operating manual

### Optional accessories at an extra charge:

2 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M28) - C4	C4-6-1130-R020
2 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M24) - C5	C5-6-1130-R020
5 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M28) - C4	C4-6-1130-R050
5 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M24) - C5	C5-6-1130-R050
Aluminium transport case	3-781-R017

### Spare parts kit:

Spare parts kit for vacuum compressor	05-1647-R100
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### Packing:

Packing for C4/C5-B093R30	3-748-R003-C
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<sup>\*)</sup> 3M and Novec are registered trademarks of 3M.

## MINI SERIES C4/C5



Portable vacuum pump unit for the evacuation of air

C4/C5-B078R09 (with ball valve)

**Operating voltage: 208 - 240 V / 50 - 60 Hz alternating current**

C4/C5-B078R09S15 (with ball valve)

**Operating voltage: 110 - 127 V / 60 Hz alternating current**

C4/C5-B078R19 (with solenoid valve)

**Operating voltage: 208 - 240 V / 50 - 60 Hz alternating current**

C4/C5-B078R19S15 (with solenoid valve)

**Operating voltage: 110 - 127 V / 60 Hz alternating current**



### Technical data:

Dimensions: Length 435 mm, Width 270 mm, Height 370 mm
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Weight: 29 kg
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### Standard equipment:

Vacuum pump for evacuation of air 16 m <sup>3</sup> /h (at 50 Hz) and 19 m <sup>3</sup> /h (at 60 Hz), final vacuum < 1 mbar
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DILLO couplings DN20
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Ball valve or solenoid valve DN20
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Digital vacuum indication (0 - 400 mbar)
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3 m long electrical connecting cable
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Operating manual
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### Optional accessories at an extra charge:

5 m long wire braided hose DN8 with coupling tongue part DN8 (M28) on one end and coupling tongue part DN20 (M48) on the other end - C4	C4-6-1173-R050
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5 m long wire braided hose DN8 with coupling tongue part DN8 (M24) on one end and coupling tongue part DN20 (M43) on the other end - C5	C5-6-1173-R050
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Aluminium transport case	3-781-R024
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### Spare parts kit:

Annual maintenance kit for vacuum pump	6-1048-R111
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### Packing:

Packing for C4/C5-B078R..	3-748-R003-C
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## MINI SERIES C4/C5



C4/C5-B077R20

**Pre-filter unit (pe 10 bar)**



### Technical data:

Dimensions: Length 180 mm, Width 105 mm, Height 360 mm
Weight: 4 kg

### Standard equipment:

Dry filter
Particle filter
DILO couplings DN8
Operating manual

### Optional accessories at an extra charge:

2 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M28) - C4	C4-6-1130-R020
2 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M24) - C5	C5-6-1130-R020
5 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M28) - C4	C4-6-1130-R050
5 m long wire braided hose DN8 with DILO coupling tongue part DN8 on both ends (M24) - C5	C5-6-1130-R050
Spare filter cartridge for dry filter	B077-20
Spare filter cartridge for particle filter	B077-06
Plastic case for C4/C5-B077R20	3-781-R022

### Packing:

Packing for C4/C5-B077R20	3-948-R005
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## ECONOMY SERIES C4/C5



For professional handling of gas mixtures

C4-G057R01

**Service cart for gas mixtures with 3M™ Novec™ 4710\*)**

C5-G057R01

**Service cart for gas mixtures with 3M™ Novec™ 5110\*)**

This series has been specially developed for the emission-free handling of gas mixtures based on 3M™ Novec™ 4710 or 3M™ Novec™ 5110 and its specific requirements. The units are equipped with a temperature control adapted to the mixed gas and allow gas recovery down to a final vacuum of < 1 mbar.

The service carts make the handling of Alternative Gases simple and convenient. Thanks to the fully automated technology the basic functions such as recovery, storage, evacuation and filling can be carried out easily.

The device is characterised by high reliability and allows simple, safe and economical handling of Alternative Gases.



- Devices for storage of liquid gas mixtures are available with a max. storage pressure of 100 bar (pe)
- Recovery of gas mixtures down to < 1 mbar
- Automatic control and 10" capacitive multi-touch panel
- Indication of the important process parameters and graphic display of the selected gas flow on the panel
- Indication units selectable on the panel (e.g. bar/mbar/kg)
- Reversing switch for direction of rotation
- Digital weighing scales for gas mixture cylinders
- Reduction to transport pressure as special function
- Coupling adapted to the basic gas to prevent wrong connection
- Integrated buffer tank (1000 l or 600 l) for gaseous intermediate storage of gas mixtures

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## ECONOMY SERIES C4/C5



For professional handling of gas mixtures

C4-G057R01

**Service cart for gas mixtures with 3M™ Novec™ 4710\***

C5-G057R01

**Service cart for gas mixtures with 3M™ Novec™ 5110\***

### Technical data:

Dimensions: Length 2.400 mm, Width 950 mm, Height 1.950 mm
Weight: 1.590 kg

### Standard equipment:

Oilfree DILLO compressor (5.7 m <sup>3</sup> /h [at 50 Hz]; 6.8 m <sup>3</sup> /h [at 60 Hz]), pressure 100 bar
Oilfree suction pump for recovery of gas mixtures (15 m <sup>3</sup> /h [at 50 Hz]; 18 m <sup>3</sup> /h [at 60 Hz]), final vacuum < 1 mbar)
Vacuum pump for evacuation of air (40 m <sup>3</sup> /h [at 50 Hz]; 48 m <sup>3</sup> /h [at 60 Hz]), final vacuum < 1 mbar)
Operation and indication of the most important process parameters via 10" multi-touch panel with protective
Adjustable pressure and vacuum units
Evaporator
Dry filter
Particle filter
Digital weighing scales for gas mixture cylinders (with automatic switch off function), 0 - 120 kg with tare function, accuracy ±20 g
Integrated buffer tank (1.000 l or 600 l) for gaseous intermediate storage
1 m long storage connecting hose, coupling tongue part DN20 and basic gas specific thread
Fork lift provisions
Frame with crane eyelets
Tool tray
Fixing and steerable rollers
Different wrenches
Operating manual

### Operating voltage:

208 - 240 V / 60 Hz
380 - 440 V / 50 Hz or 380 - 480 V / 60 Hz

### Optional accessories at an extra charge:

5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M48) - C4	C4-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M48) - C4	C4-6-1024-R050
5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M43) - C5	C5-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends (M43) - C5	C5-6-1024-R050
Plastic tarpaulin (grey)	05-0885-R301

### Packing:

Packing for C4/C5-G057R01	3-751-R014-C
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**UNIT FOR RECOVERY OF GAS MIXTURES** C4/C5

For professional handling of gas mixtures

C4-G057R51

**Service cart for gas mixtures with 3M™ Novec™ 4710<sup>\*)</sup>**

C5-G057R51

**Service cart for gas mixtures with 3M™ Novec™ 5110<sup>\*)</sup>**

This model range has been specially developed for the emission-free recovery of gas mixtures with 3M™ Novec™ 4710 or 3M™ Novec™ 5110 and its specific requirements and allows gas recovery down to a final vacuum of < 1 mbar. The devices are equipped with a compressor temperature control specially adapted to the gas mixtures. The maximum storage pressure is 100 bar (pe) and thus allows liquid storage of the gas mixture. The recovered gas quantity can be determined accurately by the integrated digital scales. A useful tool tray is also available for storing accessories and hoses.



- Devices for storage of liquid gas mixtures are available
- Recovery of gas mixtures down to < 1 mbar
- Automatic control and 3.5" panel
- Display of the most important process parameters on the panel
- Indication units selectable on the panel (e.g. bar/mbar/kg)
- Reversing switch for the direction of rotation
- Digital weighing scales for storage cylinders
- DILO threads adapted to the basic gas to prevent incorrect connection

## UNIT FOR RECOVERY OF GAS MIXTURES <sup>C4/C5</sup>



For professional handling of gas mixtures

C4-G057R51

**Service cart for gas mixtures with 3M™ Novec™ 4710<sup>\*)</sup>**

C5-G057R51

**Service cart for gas mixtures with 3M™ Novec™ 5110<sup>\*)</sup>**

### Technical data:

Dimensions: Length: 1.200 mm, Width: 800 mm, Height: 1.170 mm
Weight: 360 kg

### Standard equipment:

Oilfree DILO compressor (5.7 m <sup>3</sup> /h [at 50 Hz]; 6.8 m <sup>3</sup> /h [at 60 Hz]), pressure 100 bar
Oilfree suction pump (15 m <sup>3</sup> /h [at 50 Hz], 18 m <sup>3</sup> /h [at 60 Hz], final vacuum < 1 mbar)
Operation and indication of the most important process parameters via 3.5" touch panel
DILO coupling DN20
Particle filter
Digital weighing scales for storage cylinders (with automatic switch off function) 0 – 120 kg with tare function, accuracy ±20 g
Indicating instruments in bar / mbar
Frame with crane eyelets
Fixing and steerable rollers
Different wrenches
Tool tray
Operating manual

### Operating voltage:

208 - 240 V / 60 Hz
380 - 440 V / 50 Hz or 380 - 480 V / 60 Hz

### Optional accessories at an extra charge:

5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M48) - C4	C4-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M48) - C4	C4-6-1024-R050
5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M43) - C5	C5-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M43) - C5	C5-6-1024-R050

### Packing:

Packing for C4/C5-G057R51	3-751-R015-C
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<sup>\*)</sup> 3M and Novec are registered trademarks of 3M.

## ■ DEVICE FOR GAS ANALYSIS



For verification of several parameters with only one measurement

C4-3-039R-R...

### **MULTI-ANALYSER C<sup>4</sup> with gas return system**

This multi-functional measuring device allows the determination of up to five quality parameters with only one measurement:

- » Percentage of substance amount 3M™ Novec™ 4710 [%]
- » Moisture concentration [div.]
- » Percentage of substance amount oxygen O<sub>2</sub> [%]
- » Option: percentage of substance amount carbon dioxide CO<sub>2</sub> [%]
- » Option: concentration carbon monoxide CO [ppm]



If sensors need to be calibrated, they can be easily calibrated on site by the user. The device is immediately ready for use without loss of time based on the "Plug & Play" principle.

The MultiAnalyser C<sup>4</sup> is a battery-operated, compact, user- and maintenance-friendly device which guarantees high measuring accuracy. The unit allows different kinds of measurements and treatment of the measuring gas:

- » The measuring gas can be stored in an internal storage vessel and pumped back into the gas compartment (up to 10 bar p<sub>g</sub>)
  - » External storage of the measuring gas into a cylinder:  
For measurements on cylinders, vessels or gas compartments with higher pressure (max. inlet pressure 35 bar p<sub>g</sub>) or if the measuring gas should not be pumped back, a cylinder can be connected directly to the separate outlet (max. 10 bar p<sub>g</sub>). It is not necessary to use a pressure reducer and to separate the device from the gas cylinder or the gas compartment.
  - » External storage of the measuring gas into a collecting bag:  
An external gas collecting bag can be connected allowing continuous measurements (inlet pressure max. 35 bar p<sub>g</sub>) without pumping the gas back. It is possible to empty the external bag by means of the MultiAnalyser C<sup>4</sup> or via the connection on a service cart or compressor unit.
- No emissions of measuring gas
  - Modular interchangeability of the sensors
  - Easy and user-friendly menu navigation via high quality 7" capacitive colour touch screen
  - Storage of up to 500 measurement results with name, date and time
  - Battery and external power supply
  - USB and LAN connection
  - Adjustable user languages:  
DE, EN, FR, ES, IT, PT, CZ, PL, CN, JPN, RUS
  - Compact design, easy handling and transportation (installed in a trolley case)



## ■ DEVICE FOR GAS ANALYSIS

### C4-3-039R-R... MULTI-ANALYSER <sup>C4</sup>

Precise and correct results for subsequent measurements can be guaranteed by purging the measuring hose prior to each measurement. The gas is stored internally.

Another big advantage of the MultiAnalyser <sup>C4</sup> is its high precision. The gas moisture is measured at operating pressure. Thus, very precise results are obtained during a short measuring time even in the critical dew point range (< -40 °C). The dew point is calculated at ambient pressure. The device is very maintenance-friendly. The residual lifetime of the electrochemical sensors is displayed automatically. A very practical and useful device.

#### Technical data:

Dimensions: Length 406 mm, Width 538 mm, Height 269 mm
Weight: 25 kg
Inlet pressure: $p_a$ 0.2 - 35 bar
Operating temperature: -10 °C to +50 °C
Ambient moisture: max. 90 % relative moisture, non condensing during operation
Operating voltage: 85-264 VAC, 47-63 Hz
Number of measured values to be stored internally: 500
Interface: USB/LAN
Measuring time: variably calculated by the system, max. 15 minutes
Indication of moisture concentration in dew point °C or °F, referred to atmospheric or inlet pressure, reversible to indication in ppm <sub>v</sub>
Inlet pressure indication in bar $p_a$ or $p_a$ , psi, kPa, MPa

#### Standard equipment:

Transport case; 6 m long connecting hose with DILLO couplings DN8 (M28x1,5) and DN20 (M48x2); 2 m long connecting cable
USB stick with data file for evaluation and reading out of measured data
Operating manual

## ■ DEVICE FOR GAS ANALYSIS



C4-3-039R-R...

**MULTI-ANALYSER** <sup>C4</sup>

Sensor data:					
	Mole percent * 3M™ Novec™ 4710	Moisture	Mole percent oxygen (O <sub>2</sub> )	Option: mole percent carbon dioxide (CO <sub>2</sub> )	Option: Concentration carbon monoxide (CO)
Measuring principle	Non-dispersive infrared sensor (NDIR)	Electronic dew point measurement (capacitive)	Electrochemical reaction	Non-dispersive infrared sensor (NDIR)	Electrochemical reaction
Measuring range	0 - 10 mol-%	-60 °C to +20 °C	0 – 25 mol %	0 - 100 mol %	0,0 – 500,0 ppm
Measuring accuracy	≤ ±0,1 mol-% (at < 7%) ≤ ±0,2 mol-% (at ≥ 7%)	≤ ±2 °C (at > -40 °C) ≤ ±3 °C (at < -40 °C)	≤ ±0,2 mol %	≤ ±2 mol %	≤ ±2 % of measuring range
Adjustable limit value	0,0 - 10,0 %	-60 °C to +20 °C	0,0 - 25,0 %	0,0 - 100,0 %	0,0 – 500,0 ppm
Recommended calibration interval	2 years	2 years	2 years lifetime	2 years	2 years lifetime

\*Mole % represents the amount of substance in a mixture and is equivalent to the ideal volume fraction. Its size is independent of pressure and temperature.

**Available option of the MultiAnalyser** <sup>C4</sup>:

Single measuring device: Percentage 3M™ Novec™ 4710 (%)	C4-3-039R-R101
Two-in one measuring device: Percentage 3M™ Novec™ 4710 and moisture	C4-3-039R-R201
Three-in-one measuring device: Percentage 3M™ Novec™ 4710, moisture and oxygen O <sub>2</sub> (%)	C4-3-039R-R301
Five-in one measuring device: Percentage 3M™ Novec™ 4710, moisture and oxygen O <sub>2</sub> (%), carbon dioxide CO <sub>2</sub> (%) and carbon monoxide CO (ppm)	C4-3-039R-R501

**Optional accessories at an extra charge:**

External compressor for increase of pressure for application of the MultiAnalyser <sup>C4</sup> in medium voltage switchgear with a pressure of < 0.2 bar p <sub>g</sub>	3-826-R003
Discharge gas collecting bag	B151R95
Adapter case for measuring device	On request
6 m long connecting hose with self-closing couplings (as extension hose)	3-531-R060
Additional operating manual on CD-ROM	6-0004-R213

**Packing:**

Packing for C4-3-039R-R...	3-775-R104
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## ■ DEVICE FOR GAS ANALYSIS



For verification of several parameters with only one measurement

C5-3-039R-R...

### **MULTI-ANALYSER<sup>C5</sup> with gas return system**

This multi-functional measuring device allows the determination of up to five quality parameters with only one measurement:

- » Percentage of substance amount 3M™ Novec™ 5110 [%] in carbon dioxide CO<sub>2</sub> or nitrogen N<sub>2</sub>
- » Moisture concentration [div.]
- » Percentage of substance amount oxygen O<sub>2</sub> [%]
- » Option: percentage of substance amount carbon dioxide CO<sub>2</sub> [%]
- » Option: concentration carbon monoxide CO [ppm]



If sensors need to be calibrated, they can be easily calibrated on site by the user. The device is immediately ready for use without loss of time based on the "Plug & Play" principle.

The MultiAnalyser<sup>C5</sup> is a battery-operated, compact, user- and maintenance-friendly device which guarantees high measuring accuracy. The unit allows different kinds of measurements and treatment of the measuring gas:

- » The measuring gas can be stored in an internal storage vessel and pumped back into the gas compartment (up to 10 bar p<sub>g</sub>)
  - » External storage of the measuring gas into a cylinder:  
For measurements on cylinders, vessels or gas compartments with higher pressure (max. inlet pressure 35 bar p<sub>g</sub>) or if the measuring gas should not be pumped back, a cylinder can be connected directly to the separate outlet (max. 10 bar p<sub>g</sub>). It is not necessary to use a pressure reducer and to separate the device from the gas cylinder or the gas compartment.
  - » External storage of the measuring gas into a collecting bag:  
An external gas collecting bag can be connected allowing continuous measurements (inlet pressure max. 35 bar p<sub>g</sub>) without pumping the gas back. It is possible to empty the external bag by means of the MultiAnalyser<sup>C5</sup> or via the connection on a service cart or compressor unit.
- No emissions of measuring gas
  - Modular interchangeability of the sensors
  - Easy and user-friendly menu navigation via high quality 7" capacitive colour touch screen
  - Storage of up to 500 measurement results with name, date and time
  - Battery and external power supply
  - USB and LAN connection
  - Adjustable user languages: DE, EN, FR, ES, IT, PT, CZ, PL, CN, JPN, RUS
  - Compact design, easy handling and transportation (installed in a trolley case)

## ■ DEVICE FOR GAS ANALYSIS



C5-3-039R-R...

### **MULTI-ANALYSER** <sup>C5</sup>

Precise and correct results for subsequent measurements can be guaranteed by purging the measuring hose prior to each measurement. The gas is stored internally.

Another big advantage of the MultiAnalyser <sup>C5</sup> is its high precision. The gas moisture is measured at operating pressure. Thus, very precise results are obtained during a short measuring time even in the critical dew point range (< -40 °C). The dew point is calculated at ambient pressure. The device is very maintenance-friendly. The residual lifetime of the electrochemical sensors is displayed automatically. A very practical and useful device.

#### Technical data:

Dimensions: Length 406 mm, Width 538 mm, Height 269 mm
Weight: 25 kg
Inlet pressure: $p_e$ 0.2 - 35 bar
Operating temperature: -10 °C to +50 °C
Ambient moisture: max. 90 % relative moisture, non condensing during operation
Operating voltage: 85-264 VAC, 47-63 Hz
Number of measured values to be stored internally: 500
Interface: USB/LAN
Measuring time: variably calculated by the system, max. 15 minutes
Indication of moisture concentration in dew point °C or °F, referred to atmospheric or inlet pressure, reversible to indication in ppm <sub>v</sub>
Inlet pressure indication in bar $p_a$ or $p_e$ , psi, kPa, MPa

#### Standard equipment:

Transport case; 6 m long connecting hose with DILLO couplings DN8 (M24x1,5) and DN20 (M43x2); 2 m long connecting cable
USB stick with data file for evaluation and reading out of measured data
Operating manual

## ■ DEVICE FOR GAS ANALYSIS



C5-3-039R-R...

**MULTI-ANALYSER** <sup>C5</sup>

Sensor data:					
	Mole percent * 3M™ Novec™ 5110 in carbon dioxide (CO <sub>2</sub> ) or nitrogen (N <sub>2</sub> )	Moisture	Mole percent oxygen (O <sub>2</sub> )	Option: mole percent carbon dioxide (CO <sub>2</sub> )	Option: Concentration carbon monoxide (CO)
Measuring principle	Non-dispersive infrared sensor (NDIR)	Electronic dew point measurement (capacitive)	Electrochemical reaction	Non-dispersive infrared sensor (NDIR)	Electrochemical reaction
Measuring range	0 - 15 Mol-%	-60 °C to +20 °C	0 – 25 mol %	0 - 100 mol %	0,0 – 500,0 ppm
Measuring accuracy	≤ ±0,1 mol-% (at < 7%) ≤ ±0,2 mol-% (at ≥ 7%)	≤ ±2 °C (at > -40 °C) ≤ ±3 °C (at < -40 °C)	≤ ±0,2 mol %	≤ ±2 mol %	≤ ±2 % of measuring range
Adjustable limit value	0,0 - 15,0 %	-60 °C to +20 °C	0,0 - 25,0 %	0,0 - 100,0 %	0,0 – 500,0 ppm
Recommended calibration interval	2 years	2 years	2 years lifetime	2 years	2 years lifetime

\*Mole % represents the amount of substance in a mixture and is equivalent to the ideal volume fraction. Its size is independent of pressure and temperature.

**Available option of the MultiAnalyser** <sup>C5</sup>:

Single measuring device: Percentage 3M™ Novec™ 5110 (%) in N <sub>2</sub>	C5-3-039R-R111
Single measuring device: Percentage 3M™ Novec™ 5110 (%) in CO <sub>2</sub>	C5-3-039R-R112
Two-in-one measuring device: Percentage 3M™ Novec™ 5110 (%) in N <sub>2</sub> and moisture	C5-3-039R-R211
Two-in-one measuring device: Percentage 3M™ Novec™ 5110 (%) in CO <sub>2</sub> and moisture	C5-3-039R-R212
Three-in-one measuring device: Percentage 3M™ Novec™ 5110 (%) in N <sub>2</sub> , moisture and oxygen O <sub>2</sub> (%)	C5-3-039R-R311
Three-in-one measuring device: Percentage 3M™ Novec™ 5110 (%) in CO <sub>2</sub> , moisture and oxygen O <sub>2</sub> (%)	C5-3-039R-R312
Five-in-one measuring device: Percentage 3M™ Novec™ 5110 (%) in N <sub>2</sub> , moisture, oxygen O <sub>2</sub> (%), carbon dioxide CO <sub>2</sub> (%) and carbon monoxide CO (ppm)	C5-3-039R-R511
Five-in-one measuring device: Percentage 3M™ Novec™ 5110 (%) in CO <sub>2</sub> , moisture, oxygen O <sub>2</sub> (%), carbon dioxide CO <sub>2</sub> (%) and carbon monoxide CO (ppm)	C5-3-039R-R512

**Optional accessories at an extra charge:**

External compressor for increase of pressure for application of the MultiAnalyser <sup>C5</sup> in medium voltage switchgear with a pressure of < 0.2 bar p <sub>e</sub>	3-826-R003
Discharge gas collecting bag	B151R95
Adapter case for measuring device	On request
6 m long connecting hose with self-closing couplings (as extension hose)	3-531-R060
Additional operating manual on CD-ROM	6-0004-R213

**Packing:**

Packing for C5-3-039R-R...	3-775-R104
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\*) 3M and Novec are registered trademarks of 3M.



## ■ FOR LEAK DETECTION

For quick detection and quantification of smallest leaks

C4-3-033-R400

**LEAKSPY<sup>C4</sup> for gas mixtures with 3M™ Novec™ 4710\***

The cordless battery-operated LEAKSPY<sup>C4</sup> precisely measures the 3M™ Novec™ 4710 concentration in air by means of a non-dispersive infrared sensor (NDIR sensor) and indicates the value on a graphic display in ppm. The device allows precise localisation of leaks by searching the highest 3M™ Novec™ 4710 concentration. Thanks to the high accuracy and the low detection limit it is possible to carry out integral measurements as well as measurements for determination of leak rates.

To protect the device from particles the sensor is equipped with a filter which can be cleaned and/or exchanged easily by the operator. In case there is 3M™ Novec™ 4710 contamination already existing, the LEAKSPY<sup>C4</sup> can be adjusted to this value. Thus, it is possible to detect leaks even in already contaminated areas. The 3M™ Novec™ 4710 concentration is indicated in ppm as well as by an audible signal.



- Detection of leaks up to 3 g / year
- Quick response time
- No cross sensitivity to moisture and most volatile organic compounds (VOCs)
- Small, lightweight, easy to use
- A shoulder belt facilitates mobile and ergonomic working
- Battery-operated (operating time > 12 hours)
- Exchangeable accumulator (parallel loading of a second accumulator in separate charging unit possible)

\*) 3M and Novec are registered trademarks of 3M.

 FOR LEAK DETECTION


C4-3-033-R400

**LEAKSPY** <sup>C4</sup>**Technical data:**

Dimensions: Width 125 mm, Height 142 mm, Length 280 / 555 mm (with / without measuring sensor)
Measuring sensor length: 300 mm
Weight: 1.580 g
Power supply: lithium ion batteries (operating time > 12 hours)
Measuring range: 0 – 1.000 ppm, (3M™ Novec™ 4710)
Detection limit: 3 ppm (3M™ Novec™ 4710)
Sensitivity: 3 g 3M™ Novec™ 4710 /year
Accuracy: ≤ 50 ppm: ≤ ±2 ppm; 50 - 100 ppm: ≤ ±5 ppm; 100 - 1000 ppm: ≤ ±2 % of measuring range
No cross sensitivity to moisture (0 - 100 % relative moisture, non-condensing) and volatile organic compounds
Indication accuracy: 1 ppm <sub>v</sub>
Indication unit: ppm <sub>v</sub> , g/y, cc/s
Operating temperature: 0 °C to +50 °C
Storage temperature: -10 °C to +60 °C
Measuring principle: non-dispersive infrared sensor (NDIR)
Response time T90: < 1 s
Temperature and pressure compensated
Indication: graphic display + audible signal

**Standard equipment:**

Shoulder belt
Measuring sensor extension (length: 1 m)
Carrier case
Battery charger
1 accumulator
Separate charging unit
Operating manual

**Optional accessories (spare parts) at an extra charge:**

Shoulder belt	5009904
Measuring hose	5007237
Measuring sensor	3-033-R200-20
Particle filter	5008928
Transparent cap	5008933
Additional accumulator	5008922
Carrier case (for replacement) without foam lining	5006807
Foam lining for carrier case	5009110
Additional operating manual on CD-ROM	6-0004-R213

**Packing:**

Packing for C4-3-033-R400	3-775-R104
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## ■ FOR LEAK DETECTION



For quick detection and quantification of smallest leaks

C5-3-033-R500

**LEAKSPY<sup>C5</sup> for gas mixtures with 3M™ Novec™ 5110\***

The cordless battery-operated LEAKSPY<sup>C5</sup> precisely measures the 3M™ Novec™ 5110 concentration in air by means of a non-dispersive infrared sensor (NDIR sensor) and indicates the value on a graphic display in ppm. The device allows precise localisation of leaks by searching the highest 3M™ Novec™ 5110 concentration. Thanks to the high accuracy and the low detection limit it is possible to carry out integral measurements as well as measurements for determination of leak rates.

To protect the device from particles the sensor is equipped with a filter which can be cleaned and/or exchanged easily by the operator. In case there is 3M™ Novec™ 5110 contamination already existing, the LEAKSPY<sup>C5</sup> can be adjusted to this value. Thus, it is possible to detect leaks even in already contaminated areas. The 3M™ Novec™ 5110 concentration is indicated in ppm as well as by an audible signal.



- Detection of leaks up to 3 g / year
- Quick response time
- No cross sensitivity to moisture and most volatile organic compounds (VOCs)
- Small, lightweight, easy to use
- A shoulder belt facilitates mobile and ergonomic working
- Battery-operated (operating time > 12 hours)
- Exchangeable accumulator (parallel loading of a second accumulator in separate charging unit possible)

\*) 3M and Novec are registered trademarks of 3M.

## ■ FOR LEAK DETECTION



C5-3-033-R500

**LEAKSPY<sup>CS</sup>****Technical data:**

Dimensions: Width 125 mm, Height 142 mm, Length 280 / 555 mm (with / without measuring sensor)
Measuring sensor length: 300 mm
Weight: 1.580 g
Power supply: lithium ion batteries (operating time > 12 hours)
Measuring range: 0 – 1.000 ppm, (3M™ Novec™ 5110)
Detection limit: 3 ppm (3M™ Novec™ 5110)
Sensitivity: 3 g 3M™ Novec™ 5110 /year
Accuracy: ≤ 50 ppm: ≤ ±2 ppm; 50 - 100 ppm: ≤ ±5 ppm; 100 - 1000 ppm: ≤ ±2 % of measuring range
No cross sensitivity to moisture (0 - 100 % relative moisture, non-condensing) and volatile organic compounds
Indication accuracy: 1 ppm <sub>v</sub>
Indication unit: ppm <sub>v</sub> , g/y, cc/s
Operating temperature: 0 °C to +50 °C
Storage temperature: -10 °C to +60 °C
Measuring principle: non-dispersive infrared sensor (NDIR)
Response time T90: < 1 s
Temperature and pressure compensated
Indication: graphic display + audible signal

**Standard equipment:**

Shoulder belt
Measuring sensor extension (length: 1 m)
Carrier case
Battery charger
1 accumulator
Separate charging unit
Operating manual

**Optional accessories (spare parts) at an extra charge:**

Shoulder belt	5009904
Measuring hose	5007237
Measuring sensor	3-033-R200-20
Particle filter	5008928
Transparent cap	5008933
Additional accumulator	5008922
Carrier case (for replacement) without foam lining	5006807
Foam lining for carrier case	5009110
Additional operating manual on CD-ROM	6-0004-R213

**Packing:**

Packing for C5-3-033-R500	3-775-R104
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C4-Z1004R01

**Mixing unit for the production of gas mixtures with 3M™ Novec™ 4710\***

C5-Z1004R01

**Mixing unit for the production of gas mixtures with 3M™ Novec™ 5110\***

The mixing units have been specially developed for the handling of gas mixtures based on 3M™ Novec™ 4710 or 3M™ Novec™ 5110 and their specific requirements. A total of four gas components can be mixed. The gas mixture is circulated by the compressor to generate a homogenous mixture.

Using the integrated compressor, the generated gas mixture can be filled directly into gas compartments or for transportation, stored into cylinders with up to 100 bar.



If necessary, e.g. when changing the mixing ratio, the mixing vessel can be emptied completely (< 1 mbar). The integrated vacuum compressor also enables the complete recovery of pressure cylinders, so that any residual quantities of the insulating fluids Novec 4710 or Novec 5110 can be completely fed into the mixing process and no gas loss occurs. A device that combines the latest technology with economic efficiency.

#### Adjustable gas components:

- » C4/C5 (3M™ Novec™ 4710/5110)
  - » Carbon dioxide CO<sub>2</sub>
  - » Oxygen O<sub>2</sub>
  - » Nitrogen N<sub>2</sub>
  - » Other gas components available on request
- Gas storage: up to max. 100 bar
  - Recovery of gas down to < 1 mbar and storage into cylinder or gas compartment
  - Automatic control and 10" capacitive multi-touch panel
  - Optional operation via mobile devices
  - Digital weighing scales for pressure cylinders

\*3M and Novec are registered trademarks of 3M.



 MIXING UNIT C4/C5


C4-Z1004R01

**MIXING UNIT FOR THE PRODUCTION OF GAS MIXTURES WITH 3M™ NOVEC™ 4710<sup>\*)</sup>**

C5-Z1004R01

**MIXING UNIT FOR THE PRODUCTION OF GAS MIXTURES WITH 3M™ NOVEC™ 5110<sup>\*)</sup>****Technical data:**

Dimensions: Length 1.400 mm, Width 900 mm, Height 1.500 mm
Weight: 720 kg

**Standard equipment:**

Oilfree B280R80 compressor (5.7 m <sup>3</sup> /h [at 50 Hz]; 6.8 m <sup>3</sup> /h [at 60 Hz]) 100 bar
Vacuum compressor 3.3 m <sup>3</sup> /h (at 50 Hz) and 3.9 m <sup>3</sup> /h (at 60 Hz), final vacuum < 3 mbar
Oilfree suction pump for recovery of mixing vessel (15 m <sup>3</sup> /h [at 50 Hz]; 18 m <sup>3</sup> /h [at 60 Hz]), final vacuum < 1 mbar)
100 l mixing vessel
Particle filter
Indications in bar/mbar, kPa or psi/torr, selectable on the operating panel
Fork lift provisions
Weighing scales for mixing vessel ±2 g
3 m long storage connecting hose DN8, with coupling tongue part DN20 (filling of cylinders)
Frame with crane eyelets
Couplings DN20
Fixing and steerable rollers
Different wrenches
Paint: green (RAL DESIGN 120 70 70)
Operating manual

**Operating voltage:**

208 - 240 V / 60 Hz
380 - 440 V / 50 Hz or 380 - 480 V / 60 Hz

**Optional accessories at an extra charge:**

5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M48) - C4	C4-6-1366-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M48) - C4	C4-6-1367-R050
5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M43) - C5	C5-6-1375-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M43) - C5	C5-6-1389-R050
Digital bottle scales up to 120 kg with tare function	K091R65/ K091R67

**Packing:**

Packing for C4/C5-Z1004R01	3-751-R016-C
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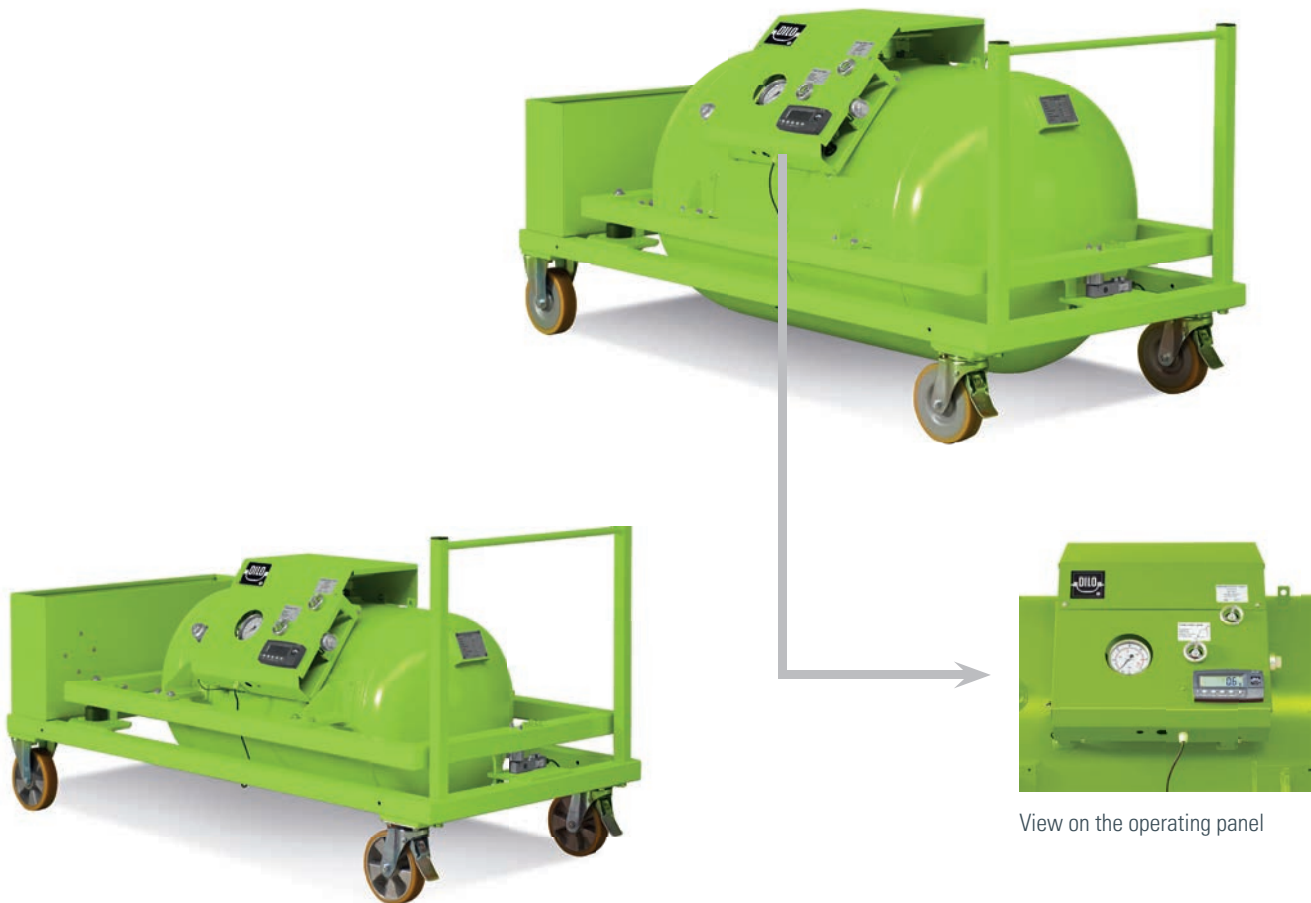
## ■ GAS STORAGE TANKS <sup>C4/C5</sup>



### C4/C5-B176R..

For gaseous storage – 300 l, 600 l or 1.000 l

These tanks offer sufficient volume to safely store or withdraw even large gas quantities. The digital integrated weighing scales allow to determine the filling weight with an accuracy of up to  $\pm 500$  g.



View on the operating panel

- For gaseous storage or withdrawal of gas
- Digital weighing scales (measuring accuracy  $\pm 0.5$  kg)
- Pressure indication in bar, MPa, psi
- Discharge of the weighing system for transport is not required
- Additional tool tray for hoses and accessories
- Stable frame with pushing bar
- Steerable and fixing rollers for comfortable transportation
- Max. operating overpressure: **25 bar**
- Version in accordance with the 2014/68/EU pressure equipment directive, ASME or SQL approval available as an option

## ■ GAS STORAGE TANKS <sup>C4/C5</sup>



C4-B176R01 / C5-B176R01

### GAS STORAGE TANK - 300 L STORAGE VOLUME



#### Technical data:

Dimensions: Length 2.000 mm, Width 950 mm, Height 1.020 mm
Weight: 442 kg
Storage volume: 300 l
Max. operating overpressure: 25 bar
Operating temperature: -10 °C to +50 °C

#### Standard equipment:

Digital weighing scales with tare function, indication reversible from kg to lbs, digit increment 0.2 kg, measuring accuracy $\pm 0.5$ kg, illuminated LCD display, accumulator system with integrated power supply
Indication unit in bar, kPa, psi
Ball valve DN8
DILLO coupling groove part DN20, M48x2 (version C4) and DN20, M43x2 (version C5)
Gauge NG 100
Safety valve
Paint: green (RAL DESIGN 120 70 70)
Operating manual

#### Optional accessories at an extra charge:

5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M48) - C4	C4-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M48) - C4	C4-6-1024-R050
5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M43) - C5	C5-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M43) - C5	C5-6-1024-R050

#### Packing:

Packing for C4/C5-B176R01	3-750-R007-C
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## GAS STORAGE TANKS <sup>C4/C5</sup>



C4-B176R02 / C5-B176R02

### GAS STORAGE TANK - 600 L STORAGE VOLUME



#### Technical data:

Dimensions: Length 2.000 mm, Width 950 mm, Height 1.020 mm
Weight: 688 kg
Storage volume: 600 l
Max. operating overpressure: 25 bar
Operating temperature: -10 °C to +50 °C

#### Standard equipment:

Digital weighing scales with tare function, indication reversible from kg to lbs, digit increment 0.2 kg, measuring accuracy $\pm 0.5$ kg, illuminated LCD display, accumulator system with integrated power supply
Indication unit in bar, kPa, psi
Ball valve DN8
DILLO coupling groove part DN20, M48x2 (version C4) and DN20, M43x2 (version C5)
Gauge NG 100
Safety valve
Paint: green (RAL DESIGN 120 70 70)
Operating manual

#### Optional accessories at an extra charge:

5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M48) - C4	C4-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M48) - C4	C4-6-1024-R050
5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M43) - C5	C5-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M43) - C5	C5-6-1024-R050

#### Packing:

Packing for C4/C5-B176R02	3-750-R007-C
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## ■ GAS STORAGE TANKS <sup>C4/C5</sup>



C4-B176R03 / C5-B176R03

### GAS STORAGE TANK - 1.000 L STORAGE VOLUME



#### Technical data:

Dimensions: Length 2.720 mm, Width 950 mm, Height 1.020 mm
Weight: 938 kg
Storage volume: 1.000 l
Max. operating overpressure: 50 bar
Operating temperature: -10 °C to +50 °C

#### Standard equipment:

Indication unit in bar, kPa, psi
Ball valve DN20
DILLO coupling groove part DN20, M48x2 (version C4) and DN20, M43x2 (version C5)
Gauge NG 100
Safety valve
Paint: green (RAL DESIGN 120 70 70)
Operating manual

#### Optional accessories at an extra charge:

5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M48) - C4	C4-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M48) - C4	C4-6-1024-R050
5 m long wire braided hose DN20 with protective metal sheathing with coupling tongue part on both ends DN20 (M43) - C5	C5-6-1069-R050
5 m long wire braided hose DN20 with coupling tongue part DN20 on both ends DN20 (M43) - C5	C5-6-1024-R050

#### Packing:

Packing for C4/C5-B176R03	3-751-R007-C
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■ FOR YOUR NOTES



■ FOR YOUR NOTES



ONE VISION. ZERO EMISSIONS.





SF <sub>6</sub> GAS	ALTERNATIVE GASES	INDUSTRIAL GAS EQUIPMENT	HIGH PRESSURE PRODUCTS
DILO CERTIFIED GAS	AFTER SALES SERVICES	TRAINING & CERTIFICATION	

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