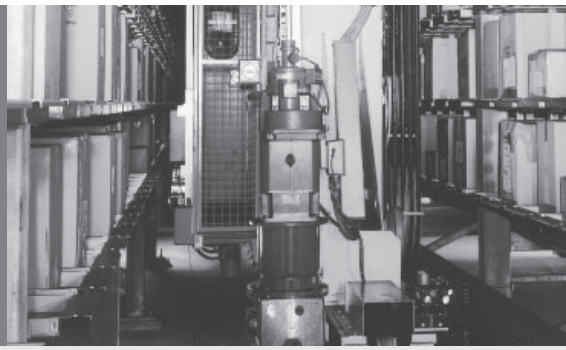
OPERATING INSTRUCTIONS



DME3000-1
Profibus

Entfernungs-Messgerät
Distance Measuring Device

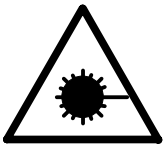
PROFI PROCESS FIELD BUS

SICK
Sensor Intelligence.

1 Contents

2 Introduction

2.1 Important information



This unit operates with a laser beam.
Do not look into the beam directly!
Laser class 2

Maximum power rating P_{max} : 3.4 mW
Pulse duration t_i : 6.8 ns
Wavelength λ : 650 nm

IEC 825 - 1 (1997)
EN 60 825 - 1 (1997)

2.2 Device description

The DME 3000 is a compact, optical distance sensor. It measures the distance from a reflector foil in accordance with the phase correlation principle (delay time measurement). A reflector foil is always located in the visual field of the sensor and is moved along the light beam. Type applications include positioning of railborn vehicles such as stacker cranes or cranes.

The DME 3000 is equipped with the following interfaces:

- ➤ Display
- ➤ Pushbuttons
- ➤ Profibus-DP interface
- ➤ Two switching outputs

See accessories in Chapter 7

2.3 Installation and wiring instructions

- ➤ Dimension drawing (see Chap. 9)
- ➤ Observe minimum measuring distance (see Chap. 6)
- ➤ Alignment aid (see Chap. 4.2.9.1)
- ➤ Connection diagram (see Chap. 4.2.6)
- ➤ Function of the outputs (see Chap. 4.2.3 OUT1 / OUT2)
- ➤ Reflector size (see Chapter 7.9)

3 Setup

The type designation of the device appears in the display when the supply voltage is connected (Fig. 1):

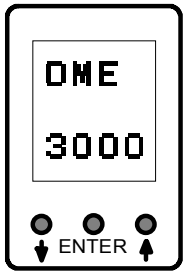


Fig. 1: DME 3000 display

After it has been initialized, the DME 3000 displays the current measuring value after 6 s. The device is then ready for operation.
Any errors detected during initialization of the device are displayed by means of an error code. Errors during initialization cause the procedure to be aborted before the measurements are started with the result that the device cannot be operated (see Chap. 5.3). If an error occurs while the measurement mode is active, the measurement is aborted, the error code is displayed and the plausibility output LOW is set.

3.1 Parameterization

Parameterization of the DME 3000 is performed via a self-explanatory menu with a tree structure containing three sublevels. The tree structure enables a parameter to be selected directly.

- ➤ All of the parameters are displayed consecutively by pressing the ENTER key repeatedly.
- ➤ The ▲ / ▼ keys are used to search for parameters and enter numeric inputs.
- ➤ Selected parameters or numeric inputs are confirmed with the ENTER key (Fig. 1).

The parameterization menu is called from the measurement mode by actuating the ▲ / ▼ key. To prevent unauthorized or inadvertent changes to the parameters, a code number must first be entered with the ▲ / ▼ keys and confirmed with ENTER (Fig. 1).

i

Note

- ➤ The code number is specified in Chap. 0 and can be made invisible when the device is handed over to the end user.
- ➤ You can scroll through the parameters quickly by keeping the ▲ / ▼ keys depressed.

If no code number is entered or the entered number is incorrect, the menu containing all of the defined parameters is displayed nevertheless. The parameter settings, however, cannot be changed.
All of the inputs confirmed with ENTER are stored in a non-volatile memory after leaving the menu (EEPROM) and are not lost when the supply voltage is disconnected.

4 Menu guidance

➤ The structure of the menu is shown on page 52

4.1 Main menu

The main menu contains the following options:

INTERFACE	Parameterization of the interfaces
SERVICE	Setup help, error displays
RETURN	Return to current measuring value display / Power On display

4.2 Parameterization of the interfaces (INTERFACE)

The INTERFACE sub-menu contains the following options:

DISPLAY	Alphanumeric display
OUT1	Switching output Q1
OUT2	Switching output Q2
PROFIBUS	Parameterization Profibus slave address and Profile selection

Note: The equipment parameters set via the menu only apply to equipment operation without active Profibus. While activating the bus all parameters are downloaded from PLC to DME (except Profibus address and Profile.

4.2.1 PROFIBUS

PROFIBUS

PROFILE

SICKPROF	Sick Profile
ENCOPROF	Encoder Profile

PBADDR	Parameterizing of the profibus slave address
Default setting	ENCOPROF PBADDR. 6

4.2.2 DISPLAY

This menu is used to define the display and the digital interface.
The display is updated in cycles of approx. 0.5 s

Default:	OFFSET	0 mm

4.2.2.1 OFFSET

Additional setting for the measuring result display, the Profibus and the switching outputs Q1 and Q2. The defined threshold refers to the displayed value.

Range: - 500 000 mm ... + 500 000 mm

Function: Display = serial interface = measuring value + offset.
Switching outputs: LOW = measuring value + offset + 0.5 x hysteresis < limit
HIGH = measuring value - offset - 0.5 x hysteresis > limit

4.2.3 OUT1 / OUT2

Menu title for configuring the switching outputs Q1 and Q2.

Default:		
	LIMIT 1 / 2:	50 000
	HYST 1 / 2:	2
	NORM 1 / 2:	Q1, Q2

4.2.3.1 LIMIT 1 / 2

Switching point setting in mm steps, LIMIT 1 and LIMIT 2 can be set independently of each other.

Range: - 500 000 mm ... + 999 999 mm

4.2.3.2 HYST 1 / 2

Setting for the switching hysteresis in steps of 2 mm (symmetrically around the switching point). If the measuring range is exceeded when LIMIT and HYST are combined, the respective end value of the measuring range is used as the hysteresis threshold value.

Range: 0 ... 254 mm

4.2.3.3 NORM 1 / 2

Inversion of the switching outputs (HIGH / LOW idle state):
Q: LOW if measuring value < switching limit
$\overline{Q}$: HIGH if measuring value < switching limit

4.2.4 Plausibility

Menu title for parameterization of the plausibility setting.

Default: 4

Range	0	1	2	4	8	16	32	64	128
Profibus Setting	0	1	2	3	4	5	6	7	8

This parameter defines the time window used to perform plausibility checks.
Measuring values are subjected to a plausibility check with regard to their traversing rate, traversing direction and traversing position.
The maximum plausibility setting is obtained with the maximum time window.
0: Plausibility error is suppressed up to 200 ms.

4.2.5 Physical Profibus Link

4.2.5.1 Parameterization Profibus slave address

This menu serves for creating the Profibus-DP slave address. The DME 3000-DP is operated via this address. Each address may only be assigned once in the network.
The Profibus-DP slave address can also be set via the Profibus-DP interface.

PB ADDR 0...126 Default 6

4.2.5.2 Transmission Technique

The DME 3000-DP uses RS-485 as transmission technique. This transmission type is the most common for PROFIBUS. The application range includes all areas in which a high transmission speed and a simple, inexpensive installation technique are required. A paired, shielded copper cable is used with a conductor pair.
The RS-485 transmission technique is very simple to operate. The installation of the paired cable does not require any expertise. The bus structure enables non-reactive linking and delinking of stations and the step-by-step operation startup of the system. Later developments do not influence the stations that are already in operation.
The transmission speed is selectable in the range between 9.6 kBit/s and 12 MBit/s. It is selected uniformly for all equipment on the bus at the operation startup of the system.

Network topology	Linear bus, active bus termination at both end, Branch lines are only permitted with baud rates ≤ 1,5 Mbit/s.
Medium	Shielded, paired cable, shielding can be eliminated depending on the ambient conditions (EMC).
Number of stations	32 stations in each segment without repeater. Expandable up to 127 with repeaters.

Table 1 : Basic features of the RS-485 transmission technique

4.2.5.3 Installation Notes for RS-485

All equipment is connected in a bus structure (line). Up to 32 subscribers (master or slaves) can be connected with each other.
The bus is terminated at the beginning and end of each segment by an active bus termination. The two bus terminations must always carry voltage for trouble-free operation.
The bus termination is **not** implemented internally in the DME 3000-DP. Supply voltage for the bus termination is available at the bus outlet plug. This 5 V supply voltage is indirect coupled from the supply voltage of the DME. The 5 V supply voltage can carry a load of 100 mA and be used for optical coupling modules if required.
Terminator: see accessories.

If more than 32 subscribers exist, repeaters (power amplifiers) must be used to connect the individual bus segments.

The max. cable length depends on the transmission speed: see Table 2.

The shown cable lengths can be extended by the use of repeaters. We recommend not connecting more than three repeaters in a series. The DME 3000-DP supports all transmission speeds cited in Table 2.

Baud rate (kBit/s)	9.6	19.2	93.75	187.5	500	1500	12000
Range/segment (m)	1,200	1,200	1,200	1,000	400	200	100

Table 2 : Ranges dependent on the transmission speed for cable type A

The information about the cable lengths in Table 2 refer to cable type A with the following values:

Characteristic impendence	135 to 165 Ω
Distributed capacity	< 30 pF / m
Loop resistance	110 Ω / km
Diameter of wire	0.64 mm
Wire cross section	> 0.34 mm²

Table 3: Cable Values

Be careful when connecting subscribers that the data cables do become not twisted. To achieve a higher degree of trouble-free operation of the system in environments with high electromagnetic spurious emission (e.g., automobile production), a shielded data cable must be used. The shielding serves to improve the electromagnetic compatibility (EMC). The braiding shield and – if applicable – the film shield below it should be connected at both sides and highly conductive via the most extensive possible area with shield terminal clamps at the protective grounding. Furthermore, make certain that the data cable is laid separated from all power cables.

The metal housing of the DME 3000-111P does not have any direct coupling to the cables, which lead out at the attachment plug (supply voltage-plus, supply voltage ground, switching outputs Q1 and Q2, Profibus signals A and B, Profibus terminator supply voltage 5 V and GND). The shields of both Profibus cables are connected via the DME 3000 connecting lead. A connection between the Profibus shield and the metal housing of the DME 3000-111P does **NOT** exist to prevent ground loops.
To achieve better shield effectiveness in environments with strong interference and still prevent the ground equalizer current from flowing via the shield of the Profibus cable, the metal housing of the DME 3000-111P and the control cabinet ground should be connected via a ground cable. This provides higher shield effectiveness and separates the ground equalizer current from the Profibus cable.

4.2.6 Pin Assignment

Using a cable adapter, the 12-pin attachment plug (M18 housing) of the DME 3000-DP is split among three cable connectors (each in M12 housing):

- Bus input (A and B cables)
- Bus output (A and B cables, 5 V supply voltage)
- DME-3000 supply voltage, two switching outputs

Confusing the normal sensor plug and the Profibus-DP plug is impossible due to different connector housing.

Bus output: 5-pin M12, female	
Pin	**Assignment**
1	5 V
2	A cable
3	GND
4	B cable
Housing	Shield

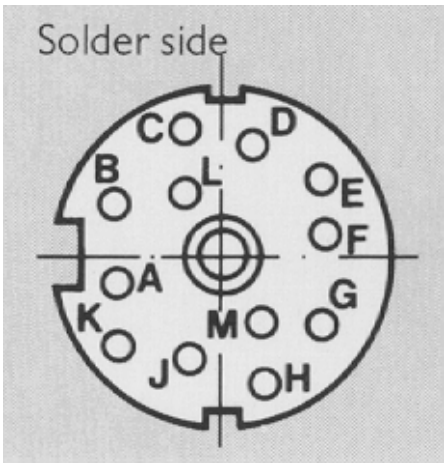
Bus input: 5-pin M12, male	
Pin	**Assignment**
1	nc.
2	A cable
3	nc.
4	B cable
Housing	Shield

Supply voltage, special signals: 4-pin M12, male	
Pin	**Assignment**
1	Uv
2	Q2
3	GND
4	Q1

Table 4: Assignment of the M12 connector of the cable adapter

Pin	Assignment	Description	
A	A1	Profibus RxD/TxD N	rs/gr
B	Q1	Switching output Q1	br
C	A2	Profibus RxD/TxD N	sw
D	B2	Profibus RxD/TxD P	-
E	U5PB	Profibus 5 V supply voltage.	rt/bl
F	GNDPB	Profibus supply voltage GND	gr
G	Uv	+18 ... 30 V DC Uv	rt
H	GNDPB	Profibus supply voltage GND	gn
J	U5PB	Profibus 5 V supply voltage	-
K	B1	Profibus RxD/TxD P	ws
L	Q2	Switching output Q2	rs
M	GND	0V (ground)	bl

Table 5: Assignment of the M18 connector at the DME 3000-DP



The supply voltage to be connected for the DME 3000-PD (pin E, pin M) and the 5 V supply voltage (pin E,J, pin F,H) supplied by the DME 3000-DP are indirect coupled. The switching outputs Q1 and Q2 connect to pin M. The Profibus data cables connect to pins F and H.

4.2.7 Profibus Profile

Two profiles are available in the DME 3000-xxxP. Dependent on the selected profile, only one GSD file is required. Integration and parameterization of the DME in a bus system is very simple with the projecting tools based on the GSD files.
The GSD file corresponds to a standardized GSD file for encoders and consequently also contains parameters, which do not affect the DME.
The specific parameters for the DME are explained below:

Expanded diagnosis = The diagnosis function from DME can activate specific functions here (e.g., excess temperature, slight reception signal or an equipment defect).
Scaling function = Deactivated means a resolution of 1 mm
Activated means a resolution of 1/8 mm
Inverting Out1/Out1 = The switching outputs Q1 and Q2 can be inverted here.
Plausibility = Settings of the plausibility time window see chapt. 4.2.4
Display offset (31-16) = BIT 16-31 of the offset value
Display offset (0-15) = BIT 0-15 of the offset value
Switching threshold output 1(31-16) = BIT 16-31 of the switching limit for switching output 1
Switching threshold output 1(0-15) = BIT 0-15 of the switching limit for switching output 1
Switching threshold output 2(31-16) = BIT 16-31 of the switching limit for switching output 2
Switching threshold output 2(0-15) = BIT 0-15 of the switching limit for switching output 2
Hysteresis output 1 = Hysteresis in mm for switching output 1
Hysteresis output 2 = Hysteresis in mm for switching output 2
Diagnosis interval x 100 ms = Definition of a time interval in which cyclical diagnosis data are transmitted. “0” means that diagnosis data are only sent if there is an error.

4.2.7.1 Encoder-Profile

This profile is compatible with the standard encoder profile.
A reservation of 32 BIT input data is made for the measurement values, 24 BIT of which are required for the measurement range of the DME.
A reservation of 32 BIT output data is also made, with which a reference value can be transmitted to the DME when BIT31 is set.
Diagnosis data of the DME can only be read via the cyclical transmission of diagnosis data. The “Expanded diagnosis” parameter must be activated for this, and a cycle time must be defined for the “Diagnosis interval”. Then the diagnosis data can be read in the diagnosis data range of the SPS (programming of the OB82 is required at S7).
Refer to the appendix for the precise distribution of the diagnosis data.

4.2.7.2 SICK-Profile

In this profile, the highest value 8 BIT of the 32 BIT input data not required for the measurement value are used for transmitting warning, status and error information.

Distribution of the input data:

BIT0-23:	Measurement value of the DME 3000
BIT24:	Status of switching output Q2
BIT25:	Status of switching output Q1
BIT26:	Status of laser on/off
BIT27:	Warning: Reception signal level too low
BIT28:	Warning: Temperature too high
BIT29:	Laser power no longer sufficient
BIT30:	Q_P: Plausibility
BIT31:	Q_{fatal}: Fatal error; send DME to plant for check

Distribution of the output data:

BIT0-23:	Offset or reference value, which should be transmitted to DME
BIT24-28:	Not assigned
BIT29:	Laser on/off
BIT30:	Transmit offset value
BIT31:	Transmit reference value

Offset value:
The offset value is added to the DME measurement value, and the total is output as a new value. The offset value is normally used to correct a known distance offset.

Reference value:
The DME measurement value is replaced by the reference value in the reference value transmission. All other measurements of the DME refer to the reference value from this point in time.

CAUTION:
Reference value and offset value are NOT stored permanently in the DME, i.e., the values must be retransmitted after a power outage.

4.2.8 Standards

DIN 19245 Profibus FMS (Field Bus Message Specification)
DIN 19245-2 Profibus DP (decentralized periphery)
IEC 1158-2 Profibus PA (process automation)
EN 50170 Volume 2 European Field Bus Standard

4.2.9 Setup help and error displays (SERVICE)

This menu is used to select the following service parameters:

ALIGN	Receive level display as alignment aid, evaluation of path attenuation
TIME	Operating hours display
INT. STATUS	Interface status: status display of the interface line
ERR. STATUS	Error status: device error status
SER NO.	Serial number of the device
RESET	Reset all of the parameters to the default status

4.2.9.1 ALIGN

This function is an alignment aid and displays the receive beam power in dB. This enables the device to be adjusted to a reflector at a considerable distance. Maximum receive display indicates optimum alignment. The light spot, which is clearly visible at large distances on the reflective foil, also serves as an alignment aid.

When the unit is set up, the alignment of the DME and the reflector size are assessed using the visible light spot.

4.2.9.2 TIME

The total number of operating hours is displayed here.

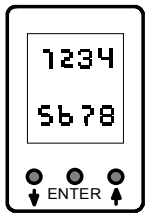
4.2.9.3 INTERFACE STATUS

The interface status of all of the interface lines is displayed here to facilitate troubleshooting. The logic level of the interface lines is as follows:
LOW = 0, HIGH = 1.
The interface lines are assigned as follows:

Q1 Q2

4.2.9.4 ERROR STATUS

The most important preliminary failure and warning messages are displayed here. The status is displayed as follows:
(0 = no error, 1 = error)



Display	RS422		
1	D7	Measuring laser properties	Service
2	D6	Reference laser properties	Service
3	D5	Internal housing temperature	Service
4	D4	Contamination	Service
5	D3	Velocity > v_{max}	Plausibility
6	D2	–	
7	D1	PLL error	Plausibility
8	D0	Plausibility cycle	Plausibility

Early warning failure messages trigger the service message Qs or the plausibility message Qp (see Chap 5.2).

4.2.9.5 SERIAL NUMBER

Serial number of the device for service support.

4.2.9.6 RESET

When RESET is selected and the ENTER key actuated for longer than 1 second, all of the parameters are reset to their original default status. The system is then restarted.

5 Error correction

The DME 3000 is equipped with the following tools for troubleshooting and error prevention:

- ➤ ERROR STATUS menu (see Chap. 4.2.9.4)
- ➤ INTERFACE STATUS menu (see Chap. 4.2.9.3)
- ➤ Plausibility message (see Chap. 5.1)
- ➤ Service message (see Chap. 5.2)
- ➤ Error code display (see Chap.5.3)

5.1 Plausibility message

Equipment error or measurement problems are reported via the Profibus diagnosis data or SICK-Profile if desired.

5.2 Service message Qs

Equipment error or measurement problems are reported via the Profibus diagnosis data or SICK-Profile if desired.

5.3 Error code display

If the DME display flashes and an error code is displayed after the supply voltage has been switched on, the device must be repaired at the factory.
Exception: error bit 6: internal temperature > 60°C. The device can be operated again if the temperature falls.

6 Technical Data

DME3000-	111 P	111 P01	311 P	311 P03
Part. No.	1 018 063	1 018 575	1 018 542	1 019 305
Supply voltage Uv	**18 to 30 V DC** (Limit values, non interchangeable)			
Residual ripple	5 Vss			
Power consumption	< 8 W (no load)			
Light transmitter	**Laser diode (red light)**			
Laser protection class	2 (IEC 825-1 / EN 60825-1)	CDRH	2 EN 60 825-1	CDRH
Service life (at 25 °C)	MTTF 50 000 h			
Light spot	d ≈ 1 m at 500 m distance			
Switching outputs	**B**			
Q1, Q2	HIGH: Uv - < 2 V, LOW: < 2 V			
Output current	100 mA (short circuit proof)			
Switching outputs Q1, Q2	invertable Q / Q not			
Switching limit	in stages (mm)			
Switching hysteresis	in steps of 2 mm			
Interfaces	**Profibus DP with RS 485**			
Baud rate	9.6 / 19.2 / 93.75 / 187.5 / 500 / 1500 / 12000 kBaud adjustable (automatic baud rate detection) Adr. 0...125			
Enclosure rating	IP 65			
Electrical Protection Class	VDE Class 2 (rated voltage 50V)			
EMV	CE			
Shock resistance	IEC 68			
Ambient temperature	-10 to 45 °C			
Storage temperature	-25 to 75 °C			
Weight	approx. 980 g			
Measuring range	**0.1 m ... 500 m**			
Resolution	**0.125 mm**			
Temperature drift	typ. 0.4 mm/K		typ. 0.2 mm/K	
Air temperature	1 ppm/K			
Air pressure	0.3 ppm/hPa			
Measuring value output	1 ms			
Initialization time	6 s			
Maximum velocity	6 m/s			

Accuracy (Recalibration after 25000 h recommended)	**± 5 mm**	(min. switch on duration 30 min, 23 °C air temperature, 977 hPa)
Reproducibility Statistical error 1 σ (min. switch on duration 30 min, constant environmental)	**0.5 mm**	**2 mm**
Measuring range with reflector:		
Reflective tape 3290	0.1 m ... 20 m	0.1 m ... 40 m
Reflective tape 7610	0.1 m ... 40 m	0.1 m ... 90 m
Reflective tape Diamond Grade	**3.0 m ... 90 m**	**0.5 m ... 250 m**
Combination reflector PL 240F	0.1 m ... 250 m	0.1 m ... 300 m
Combination reflector PL 560F	0.1 m ... 270 m	0.1 m ... 350 m
Combination reflector PL 880F	10 m ... 300 m	8.0 m ...500 m

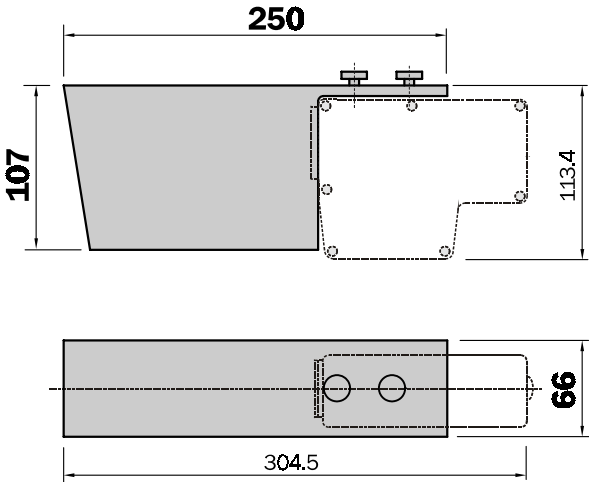
6.1 Code

The code prevents unauthorized or inadvertent changes to the parameter settings and should be made unrecognizable before the device is handed over to the operator. All of the parameters can also be displayed without the code. The code is 0314.

7 Accessories

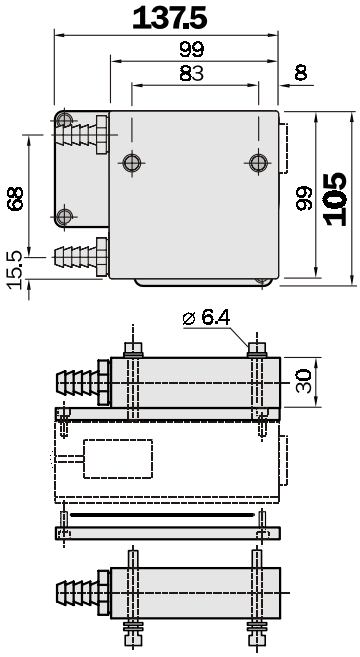
7.1 Dust-protection tube

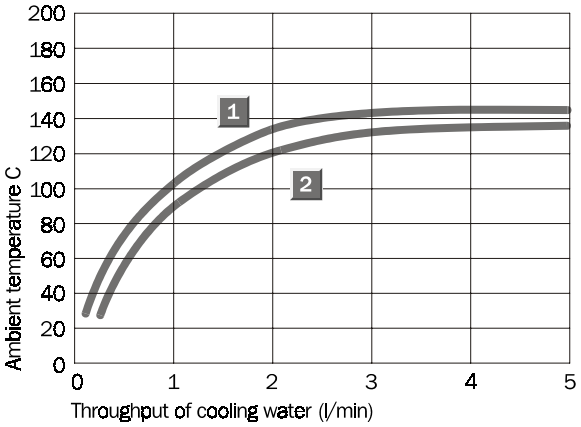
Order number 2 014 458
Type: OBS-DME



7.2 Cooling plate assembly kit

Order number 2 014 457
Type BEF-KPM-DME

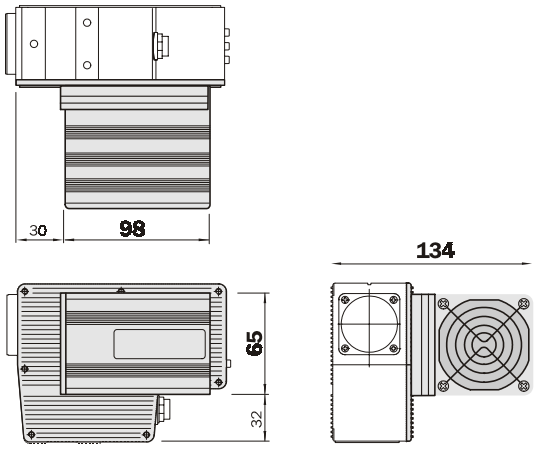




1 Temperature of cooling water 20 °C
2 Temperature of cooling water 30 °C

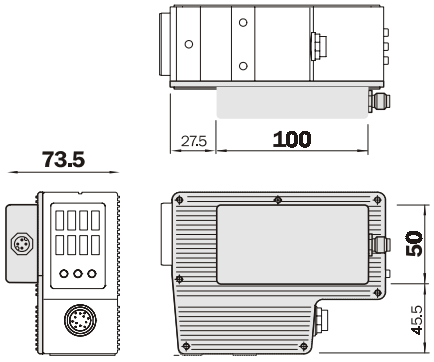
7.3 Peltier cooling unit with lid for DME

Order number 2 019 912
Type: BEF-KE-DME
Ambient temperature up to + 55 °C



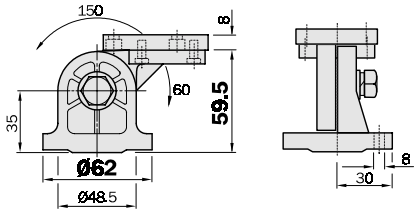
7.4 Heating element

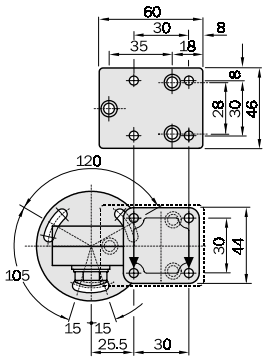
Order number 2 021 269
Type: BEF-HE-DME
Ambient temperature up to + 38 °C



7.5 Bracket

Hinged bracket
Order number 2 015 229
Type: BEF-GH-DME

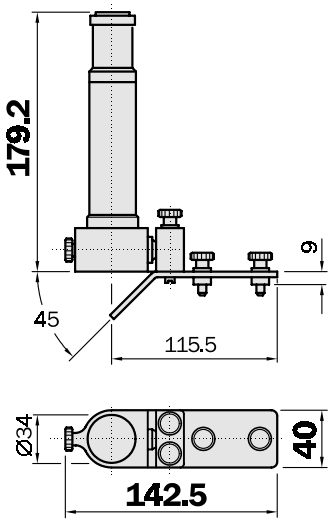




7.6 Telescopic sight

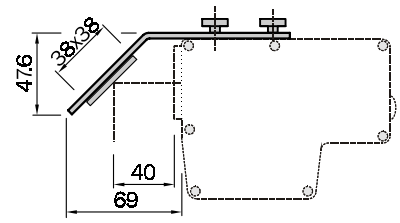
Target telescope
Order number 2 014 194
Type: OBZ-DME

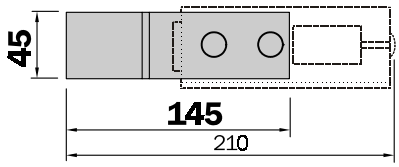
Adjustment device
Order number 2 014 191
Type: OBZ-DME-J



7.7 Corner mirror (top side)

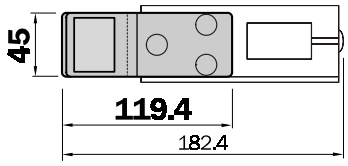
Order number 2 016 330
Type: USP-DME
The corner mirror as an optical interface has to be cleaned at regular intervals.

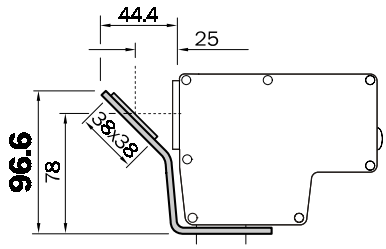




7.8 Corner mirror (bottom side)

Order number 2 022 848
Type: USP-DME-2
The corner mirror as an optical interface has to be cleaned at regular intervals.





7.9 Reflective foils

The reflector size should be selected in such a way that vibrations do not cause the light spot to drift from the reflector. If the DME is turned through 1 degree, for example, the light spot at a distance of 130 m drifts by approx. 2 m.

The following reflector sizes are recommended (ignoring vibrations and rotation):

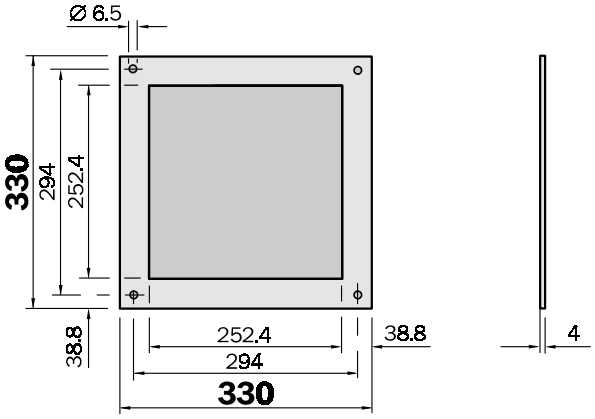
100 m 225 mm x 225 mm
200 m 500 mm x 500 mm

7.9.1 Diamond grade

Pre-assembled, max. 749 mm x 914 mm, order number 4 019 634

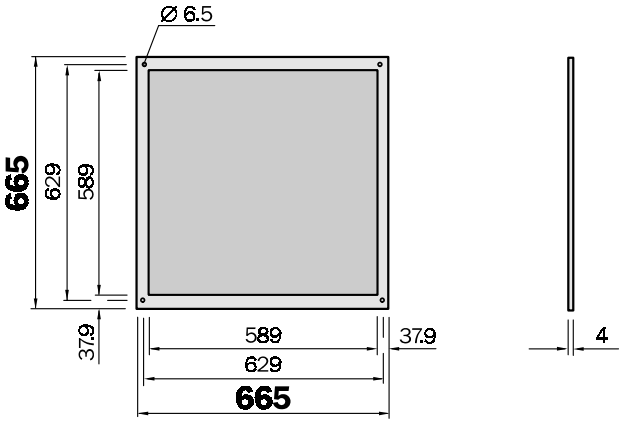
7.9.2 Reflector PL 240 DG

280 mm x 280 mm, order number 1 017 910
Type: PL 240 DG



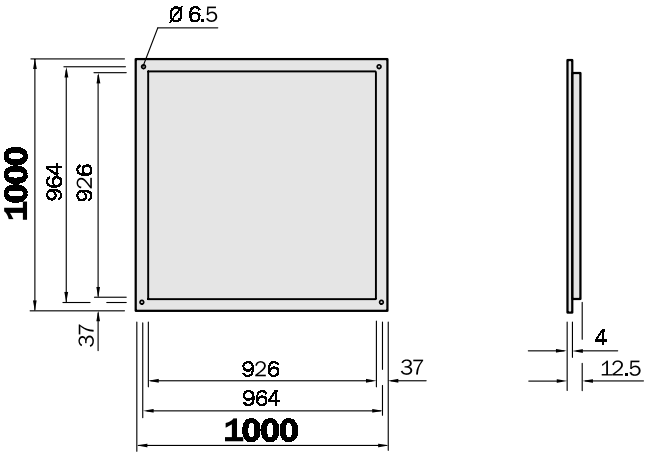
7.9.3 Reflector PL 560 DG

605 mm x 605 mm, order number 1 016 806
Type: PL 560 DG



7.9.4 Reflector PL 880 DG

914 mm x 914 mm, order number 1 018 975
Type: PL 880 DG

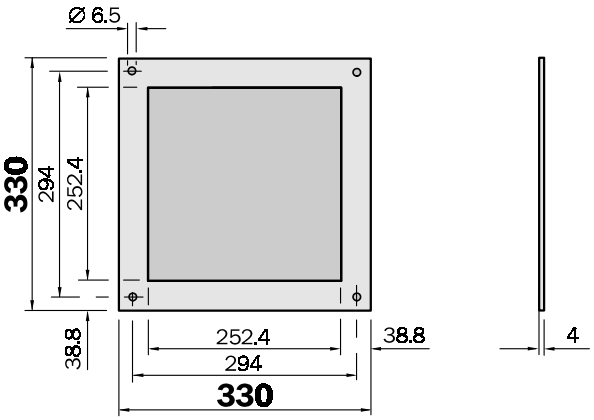


7.9.5 Reflection foil 7610 High Grain

Pre-assembled, self-adhesive, roll length 4.57 m, width 61 cm, order number 4 018 617
Type: REF-7610-K

7.9.6 Reflector PL 240-7610

280 mm x 280 mm, order number 1 019 012
Type: PL 240-7610



7.9.7 Reflection foil 3290

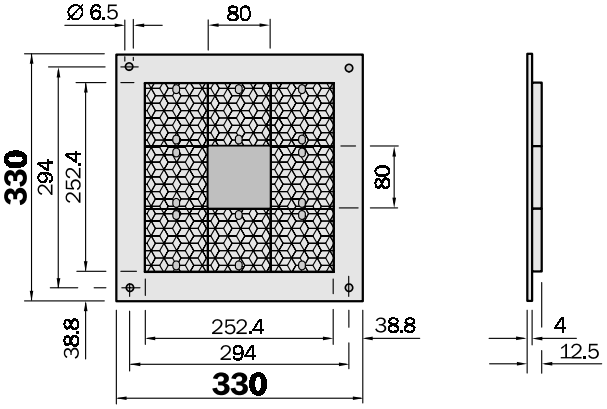
Pre-assembled, self-adhesive, roll length 4.57 m, width 91.4 cm, order number 4 018 696
Type: REF-3290-K

7.9.8 Combination reflector PL 240 F

Order number 1 013 784
Type: PL 240 F

The PL 240 F reflector is a combination reflector comprising 3 x 3 PL 80 A. The centre of the reflector is made of 7610 reflective tape.

In the near range (0.1 m ... 30 m), the DME must be aligned such that the light beam does not leave the central area. In the far range (30 m ... 300 m), the DME must be aligned such that the light beam does not leave the active reflector surface (252 mm x 252 mm).

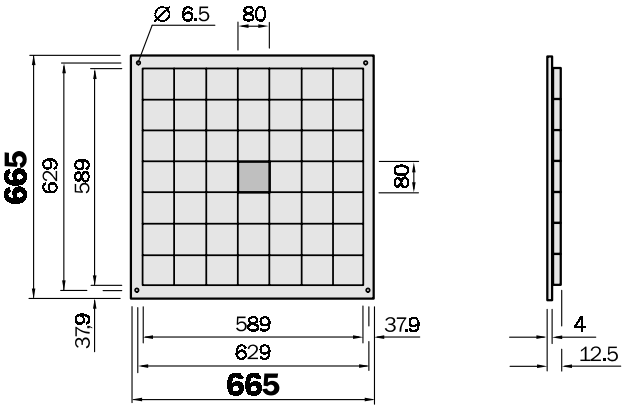


7.9.9 Combination reflector PL 560 F

Order number 1 013 785
Type: PL 560 F

The PL 560 F reflector is a combination reflector comprising 7 x 7 PL 80 A. The center of the reflector is made of 7610 reflective tape.

In the near range (0.1 m ... 30 m), the DME must be aligned such that the light beam does not leave the central area. In the far range (30 m ... 350 m), the DME must be aligned such that the light beam does not leave the active reflector surface (590 mm x 590 mm).

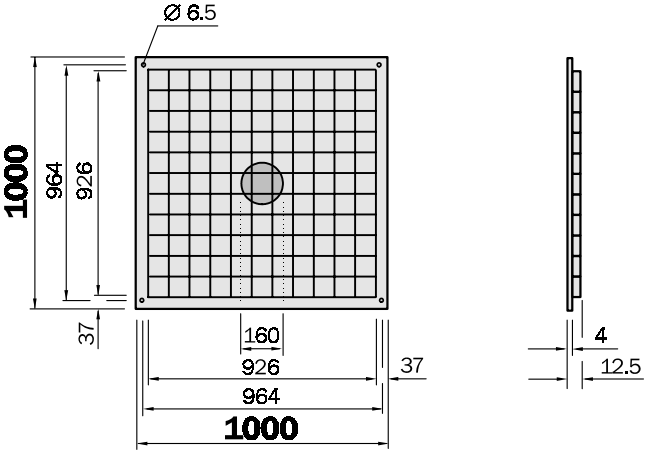


7.9.10 Combination reflector PL 880 F

Order Number 1 013 786
Type: PL 880 F

The PL 880 F reflector is a combination reflector comprising 11 x 11 PL 80 A. The center of the reflector has a lower refectivity.

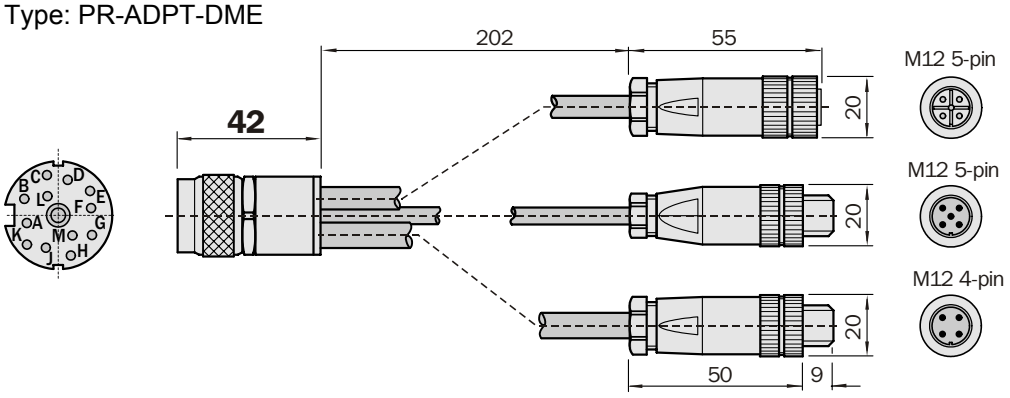
In the near range (8 m ... 30 m), the DME must be aligned such that the light beam does not leave the central area. In the far range (30 m ... 500 m), the DME must be aligned such that the light beam does not leave the active reflector surface (926 mm x 926 mm).



7.10 Cable receptacles / Connection cable

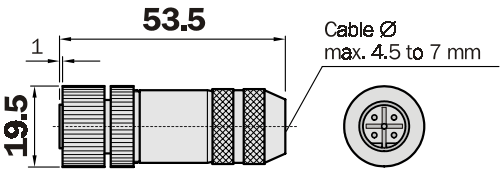
7.10.1 Profibus connection cable

Order number 2 021 463
Type: PR-ADPT-DME



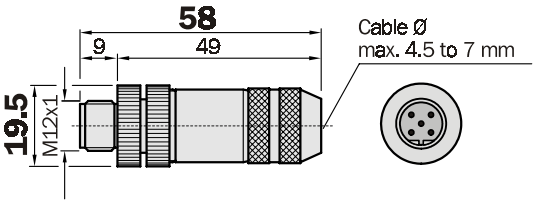
7.10.2 Profibus cable receptacle

Order number 6 021 353
Type: PR-DOS-1205-G



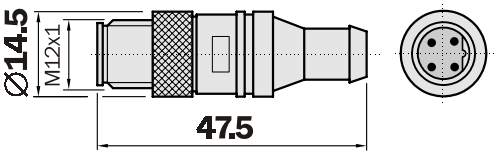
7.10.3 Profibus cable connector

Order number 6 021 354
Type: PR-STE-1205-G



7.10.4 Profibus terminal resistance

Order number 6 021 156
Type: PR-STE-END



7.10.5 Profibus cable material

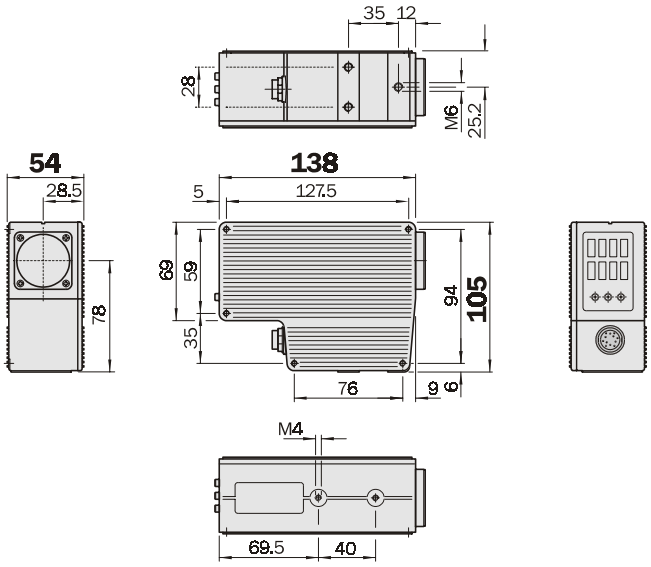
Order number 6 021 355
Type: LTG-2102-MW

Cable, 2 x 0.32 mm² (for DME 3000, Profibus)

8 Menu overview

INTERFACE	DISPLAY	OFFSET RETN	**0** 50 100
	OUT 1	LIMIT 1 HYST 1 NORM 1 RETN	**50000** **2** **Q1** / $\overline{Q1}$
	OUT 2	LIMIT 2 HYST 1 NORM 2 RETN	**50000** **2** **Q2** / $\overline{Q2}$
	PLAUSIB	0,1,2,**4**,8,16,32,64,128	
	PROFIBUS	PBA DR PROFIL	0 ... 126 **ENCOPROF** SICKPROF
	RETN		
SERVICE RETN	ALIGN TIME INT. STATUS ERRORSTATUS SER. NR. RESET RETN	dB h	

9 Dimension drawing



10 Appendix

10.1 Standards

DIN 19245 Profibus FMS (Field Bus Message Specification)
DIN 19245-2 Profibus DP (decentralized periphery)
IEC 1158-2 Profibus PA (process automation)
EN 50170 Volume 2 European Field Bus Standard

10.2 Profibus Encoder Profile Class 1

Octet is a term used in Profibus literature (e.g., Encoder Profile) for a byte within a Profibus-DP telegram. Octet number 1 corresponds to byte number 0 in the SPC3 documentation. The significance of the first bytes of a specific telegram (SAPs) is set by the Profibus-DP, all other users or is specific to a profile.
SAP is the name of a DP service or a specific telegram type.

10.2.1 DDLM_Data_Exchange Function Slave->Master

Octet	Bit	Type	Output
1..4		signed 32	Position data *from* Encoder

The measurement value supplied by the DME 3000-DP is coded as a signed 32-bit number. Octet 1 contains the MSB, Octet 4 the LSB.
The unit for position data is mm.

10.2.2 DDLM_Chk_Cfg Configuration Function

Octet	Bit	Type	Output	Class 1 32 bit
1				D1 hex
	0..3	unsigned 4	Length code	01
	4..5	unsigned 2	Input data	01
	6	unsigned 1	Word format	1
	7	unsigned 1	Consistency	1

10.2.3 DDLM_Data_Exchange Function Master->Slave

Data are preset data; MSB from Octet 1 determines whether data are adopted.

Octet	Bit	Type	Output
1...4		signed 32	Preset-Value Normal Mode: MSB = 0 (bit 31) Preset Mode: MSB = 1 (bit 31) (MSB optional bit 15)

The measurement value transmitted by the DME 3000-DP with the *DDLM_Data_Exchange* function (see above) is the total of the internally determined real measurement value and an offset value. This offset value can be changed via the parameterization or the preset function described here.
This preset function sets the current measurement value of the DME 3000-DP to the transmitted preset value and overwrites the offset value transmitted in the parameterization. The MSB of the transmitted value must be set to 1 to trigger the preset function.

$\mathbf{M_{DEX}}$	The measurement value transmitted with the Profibus-DP data exchange function to the master
$\mathbf{M_{Sensor}}$	The measurement value determined by the sensor
$\mathbf{M_{Offset}}$	Offset value, Octet 32...35 of the diagnosis data
$\mathbf{M_{Preset}}$	Preset value adopted using the data exchange function from the master

- This always applies: $\mathbf{M_{DEX} = M_{Sensor} + M_{Offset}}$
- The internal $\mathbf{M_{offset}}$ value is adopted from the internal EEPROM.
- If parameter data of the appropriate length are transmitted, the Octet 32...35 (display offset) of the diagnosis data is adopted as the new $\mathbf{M_{offset}}$ value.
- When the MSB of $\mathbf{M_{Preset}}$ is set, $\mathbf{M_{Offset}}$ is calculated so that the following applies:
  $\mathbf{M_{Preset} = M_{Sensor} + M_{Offset}}$, i.e., it is $\mathbf{M_{Offset} = M_{Preset} - M_{Sensor}}$
  The new $\mathbf{M_{offset}}$ value can be read as Octet 32...35 of the diagnosis data.

10.2.4 DDLM_Set_Prm Operating Parameters

Octet	Bit	Type	Output
9	0	bool	Code Sequenz (CW/XCW)
	1	bool	Class 2 Functionality (on/off)
	2	bool	Commissioning diag. (on/off), optional
	3	bool	Scaling function control
	4	bool	Reserved for future use
	5	bool	Reserved for future use
	6	bool	Reserved for manufacturer
	7	bool	Reserved for manufacturer

Because the DME 3000-DP is a linear encoder, which measures the absolute distance between the material scanned and the sensor, the “Code Sequence” and “Scaling function control” parameters are ignored.

The “Class 2 Functionality” must be set to ‘0’ if the diagnosis data described below should be compatible with Class 1.

Class 2 Functionality	Commissioning Diagnostic	Length of the “Diagnostic Information”
x	0	6 Byte standard diagnosis
0	1	16 Byte Class 1 diagnosis data
1	1	61 Byte Class 2 diagnosis data

10.2.5 Diagnostic Information

7		Octed string	Extended diagnostic header	Default
8		unsigned 8	Alarms (not used)	0
9			Operation status	
	0	bool	Code sequence status	
	1	bool	Class 2 functionality supported	
	2	bool	Commissioning diagnostics supported	
	3	bool	Scaling function status	
	4...7	bool	not assigned	
10		unsigned 8	Encoder type 00 ... FF	7
11...14		unsigned 32	Singleturn resolution (rotary) or Measuring Step in nm (linear)	1.000.000 nm
15...16		unsigned 16	Distinguishable revolutions	0

The bits 0...7 from Octed 8 are set fixed to “0”. Octed 9 of the diagnosis data reflects Octed 9 of the transmitted parameter data.
The values for the encoder type “Measuring Step in nm” and “Distinguishable revolutions” are fixed.
The diagnosis data are only transmitted if a fatal error occurs in the DME.

10.3 Encoder Profile Class 2

The parameters already described in Class 1 are not explained here again.

10.3.1 DDLM_Data_Exchange Function Slave->Master

Octet	Bit	Type	Output
1...4		signed long (1=MSB)	Position data *from* Encoder

10.3.2 DDLM_Chk_Cfg Configuration Function

Octet	Bit	Type	Output	Class 2 32 bit
1				F1 hex
	0...3	unsigned 4	length code	01
	4...5	unsigned 2	Input data	11
	6	unsigned 1	Word format	1
	7	unsigned 1	Consistency	1

10.3.3 DDLM_Data_Exchange Function Master->Slave

Data are preset data; MSB from Octet 1 determines whether data are adopted.

Octet	Bit	Type	Output
1...4		signed long	Preset-Value Normal Mode: MSB = 0 (bit 31) Preset Mode: MSB = 1 (bit 31) (MSB optional bit 15)

10.3.4 DDLM_Set_Prm Operating Parameters

Octet	Bit	Type	Output
9	0	bool	Code Sequenz (CW/XCW)
	1	bool	Class 2 Functionality (on/off)
	2	bool	Commissioning diag. (on/off), optional
	3	bool	Scaling function control
	4	bool	Reserved for future use
	5	bool	Reserved for future use
	6	bool	Reserved for manufacturer
	7	bool	Reserved for manufacturer
10...13		unsigned 32	Measuring units per revolution
14...17		unsigned 32	Total measuring range
18...25			Reserved for future use
26	0	bool	Reserved
	1	bool	Reserved
	2	bool	IN1 (Q1,/Q1)
	3	bool	IN2 (Q2,/Q2)
	4	bool	Write Parameter to EEPROM;ON/OFF
	5	bool	Reserved
	6	bool	Reserved
	7	bool	Reserved
27	0...3	unsigned 4	Averaging / Plausibility
	4...7	unsigned 4	Response Time
28...31		signed 32	Display Offset
32...35		signed 32	Limit Switching Output 1
36...39		signed 32	Limit Switching Output 2
40		unsigned 8	Hysteresis Switching Output 1
41		unsigned 8	Hysteresis Switching Output 1
42...43		unsigned 16	Diagnostic Intervall x 100 ms
44...46		unsigned 32	RS422 Activation

Because the DME 3000-DP is a linear encoder, which measures the absolute distance between the material scanned and the sensor, the “Code Sequence”, “Scaling function control”, “Measuring units per revolution” and “Total measuring range” parameters are ignored.
The “Class 2 Functionality” must be set to “1” if the diagnosis data described below should be compatible with Class 2.

Class 2 Functionality	Commissioning Diagnostic	Length of the “Diagnostic Information“
x	0	6 Byte standard diagnosis
0	1	16 Byte Class 1 diagnosis data
1	1	61 Byte Class 2 diagnosis data

If the “Diagnostic Interval” parameter is set to zero, the diagnosis data are only sent if a fatal error occurs in DME. If the “Diagnostic Interval” is greater than zero, the DME transmits diagnosis data regularly (time interval = “Diagnostic Interval” x 100 ms).
The “RS422 Activation” parameter is to be set to zero.

10.3.5 Diagnostic Information

7		unsigned 8	Extended diagnostic header (Length incl. header)
8		unsigned 8	Alarms (not used)
9			Operation status:
	0	bool	Code sequence status
	1	bool	Class 2 functionality supported
	2	bool	Commissioning diagnostics supported
	3	bool	Scaling function status
	4...7		not used
10		unsigned 8	Encoder type 00 .. FF
11...14		unsigned 32	Singleturn resolution (rotary) or Measuring Step in nm (linear)
15...16		unsigned 16	Distinguishable revolutions
17			Additional alarms:
	0	bool	Measuring laser error
	1	bool	Watchdog error
	2	bool	Temperature error
	3	bool	PLL lock error
	4	bool	LCU lock error
	5	bool	Hardware error
	6	bool	EEPROM Checksum error
	7	bool	EPROM Checksum error
			Plausibility
18...19			Supported alarms:
	0...7	bool	not used
	8	bool	Measuring laser error
	9	bool	Watchdog error
	10	bool	Temperature error
	11	bool	PLL lock error
	12	bool	LCU lock error
	13	bool	Hardware error
	14	bool	EEPROM Checksum error
	15	bool	EPROM Checksum error
20...21			Warnings
	0...7	bool	not used
	8	bool	Wave plausibility
	9	bool	PLL-lock detect
	10	bool	RS422 error
	11	bool	Plausibility error
	12	bool	Reception level too small
	13	bool	Temperature error
	14	bool	Reference laser error
	15	bool	Measuring laser error

22...23			*Service* Supported warnings:
	0...7	bool	not used
	8	bool	Wave plausibility
	9	bool	PLL-lock detect
	10	bool	RS422 error
	11	bool	Plausibility error
	12	bool	Reception level too small
	13	bool	Temperature error
	14	bool	Reference laser error
	15	bool	Measuring laser error
24...25		unsigned 16	Profile version
26...27		unsigned 16	Software version
28...31		unsigned 32	Operating time
32...35		signed 32	Offset value
36...39		signed 32	Manufacturer offset value
40...43		unsigned 32	Measuring units per revolution
44...47		unsigned 32	Total Measuring range in measuring units
48...57		ASCII string	Serial number (10 characters) oder (**********)
58...59			Reserved for future use
60		signed Byte	Sensor Temperature
61		signed Byte	attenuation (dB)
62...63			Reserved

The 0...7 bits from Octed 8 is set fixed to “0”. Octed 9 of the diagnosis data reflects Octed 9 of the transmitted parameter data.

The values for the encoder types “Measuring Step in nm” and “Distinguishable revolutions” are fixed.

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